[redacted]

From: Elizabeth Heeg
Sent: Friday, 16 July 2021 3:19 pm
To: [redacted]; Kirstie Knowles
Subject: FW: List of International orca/cetacean contacts

Need to stand this up with the group Ian's mentioned, including mana whenua

---

From: Elizabeth Heeg
Sent: Thursday, 15 July 2021 9:28 pm
To: Kristopher Ramm <kramm@doc.govt.nz>; Kirstie Knowles <kknowles@doc.govt.nz>
Cc: Ian Angus <iangus@doc.govt.nz>; [redacted] Jack Mace <jmace@doc.govt.nz>
Subject: FWD: List of International orca/cetacean contacts

FYI

[redacted] just keen to ensure we have legal and animal welfare aspects covered, let's chat tomorrow.

Sent from Workspace ONE Boxer

---------- Forwarded message ----------
From: [redacted]
Date: 15/07/2021 16:21
Subject: FWD: List of International orca/cetacean contacts
To: Elizabeth Heeg <eheeg@doc.govt.nz>
Cc: Ian Angus <iangus@doc.govt.nz>
Here you go,
Cheers,
[redacted]

[redacted]
Acting Manager – Marine Species Team
Whare Kaupapa Atawhai | Conservation House
Phone: [redacted]

From: [redacted]>
Sent: Thursday, 15 July 2021 4:20 pm
To: [redacted]>
Subject: RE: International orca/cetacean contacts

Hi [redacted],

List of vets/cetacean people I/we have been in contact with

- Dr [redacted] – Animal Rescue Veterinarian (IFAW)
- [redacted] – Director – Marine Mammal Rescue and Research (IFAW)
- Dr [redacted] - Animal Health and Welfare Director (Sea World Abu Dhabi)
- Dr [redacted] – Clinical Associate Professor -Aquatic Animal Health (University of Florida, ex Sea World vet)
- Dr [redacted] – Vice President of Theriogenology (Sea World)
- Dr [redacted] - Head Veterinarian & Director, Animal Health (Vancouver Aquarium)
- Dr [redacted] - Sr. Veterinarian SEA Animal Health and Rescue Hospital (Sea World)
- Dr [redacted] Professor of Veterinary and Marine Mammal Pathology (Massey University)

- There are others who have been contacted but are currently on leave and as such have not had replies – most notable is [redacted] who has been recommend by both [redacted] and [redacted] (NZ based) as an expert in orca behaviour (out of office reply say he is back 19th July)

Others in addition to the above who Wellington Zoo appear to be in contact with:

- [redacted] – Veterinary Resident (Vancouver Aquarium)
- [redacted] – Veterinarian (Sea World, Texas)

I saw on facebook that Loro Parque have also reached out though I am not sure whom to (hasn't come through to me)

I think that is everyone – though I may have missed someone out… The response to enquires from the international cetacean community has been AMAZING.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



From: [redacted] >
Sent: Thursday, 15 July 2021 3:47 PM
To: [redacted]
Cc: [redacted] >
Subject: International orca/cetacean contacts

H [redacted]
As requested, here's a short list of overseas people who I know of that we've contacted about the orca calf:

??: Vets from Seaworld and Vancouver Aquarium [redacted] has been in contact with them and can provide names)
NOAA: [redacted] (Seattle) (also [redacted] and [redacted]) – were involved with 'Springer', an orca juvenile that was managed in captivity.

I'll look for anything else that [redacted] has provided me and get back to you.

Kā mihi

[redacted] [redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz



[redacted]

From: [redacted]@auckland.ac.nz>
Sent: Friday, 16 July 2021 4:59 pm
To: Ian Angus
Cc: [redacted]
Subject: Re: Orca skin sample
Attachments: Olavarria et al 2014 NZ J Freshwater & Marine Research Killer whale genetics New Zealand.pdf

Kia ora

I will make sure the sample is filed and has Ingrid Visser as the person who collected it.

There will be no immediate results on this, we know it's a killer whale and male. It will be useful once we do a genetic project on all NZ killer whales. There was this paper in 2014 about NZ killer whale genetics and we should perhaps update with recent samples but no funding or need to do it. But we could prioritise killer whale genetics update with some of the NZCeTA money if DOC want that done?

Please let iwi and Ingrid know that there's no immediate research plan so they don't have unrealistic expectations.

Yay for science - it's been a whacky week watching and listening to this unfold. You've done some serious comms this week Ian!

Mauri ora
[redacted]

From: Ian Angus <iangus@doc.govt.nz>
Sent: 16 July 2021 14:16
To: [redacted]@auckland.ac.nz>
Cc: [redacted]
Subject: Orca skin sample

I have this. Will aim to pass to someone in the team to pass on.

Please, please can we be sure acknowledge Ingrid as the origin and report back.

Iwi also would keen to hear in time on results.

Closest I have come to actual science this week.

Sent from Workspace ONE Boxer
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SHORT COMMUNICATION

Low mtDNA genetic diversity among killer whales around New Zealand

C Olavarría[a,b]*, CS Baker[a,c] and G Tezanos-Pinto[a]**

[a]*School of Biological Sciences, University of Auckland, Auckland, New Zealand;* [b]*Fundación CEQUA, Punta Arenas, Chile;* [c]*Hatfield Marine Science Center, Marine Mammal Institute, Oregon State University, Newport, RI, USA*

(*Received 21 May 2013; accepted 21 August 2013*)

We report here the genetic diversity of killer whales around New Zealand and compare samples collected in this region (*n* 11) with larger geographic databases of mtDNA control region sequences to investigate the relationship of the New Zealand killer whales with more distant populations/ ecotypes. Eight variable sites defined four haplotypes, revealing a low mtDNA genetic diversity when compared with other cetacean species and to that observed worldwide for killer whales. The geogra phic distribution and segregation of haplotypes within New Zealand suggested that this population could be geographically structured. Only one of the New Zealand haplotypes matched with those from other distant regions (the Eastern North Atlantic and Western South Atlantic populations).

Keywords: *Orcinus orca*; killer whale; mtDNA; genetic diversity; New Zealand

Introduction

The killer whale *Orcinus orca* (Linnaeus, 1758) is reported around New Zealand coastal and offshore waters, off subAntarctic islands and the Ross Sea Dependency, Antarctica (Thomas et al. 1981; Baker 1999; Visser 2000; Department of Conservation 2012a,b) (Fig. 1). It is believed that a population of around 100–200 killer whales frequent the main islands of New Zealand (Visser 2000). It has been proposed, although not confirmed, that this population is divided into several subpopulations (Visser 2000). Extensive movements around the main islands of New Zealand have been documented for a few individuals occurring regularly within coastal waters (Visser 1999a, 2000). This might be related with seasonality, as it has been observed in other areas around the world (Baird 2000). Less is known about killer whales around the New Zealand offshore and subAntarctic islands (Kermadec, Chatham, Antipodes, Snares, Auckland and Campbell; Baker 1999; Visser 2000); however, they have been regularly recorded on the Antarctic Ross Sea Dependency (Thomas et al. 1981; Andrews et al. 2008; Ainley et al. 2009; Lauriano et al. 2011).

Four morphological forms or ecotypes of killer whales have been described in the southern hemisphere (referred to here as Types A D; Pitman & Ensor 2003; Pitman et al. 2011). Differences among the four forms is supported by historical (Mikhalev et al. 1981; Berzin & Vladimirov 1983)

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**Current address: Coastal Marine Research Group, Institute of Natural and Mathematical Sciences, Massey University, Albany, New Zealand.

Supplementary data available online at www.tandfonline.com/10.1080/00288330.2013.844721
Supplementary file 1: Table 1. Details of sample collection from killer whales (*Orcinus orca*) in New Zealand waters; **Supplementary file 2:** Figure 1. Photographs of four New Zealand killer whales (*Orcinus orca*) sampled for this genetic analysis (sample codes Oor03NZ07, Oor03NZ08, Oor05NZ12, Oor05NZ13). Photographs of individuals associated to sample Oor97NZ01 can be found in Visser & Fertl (2000).

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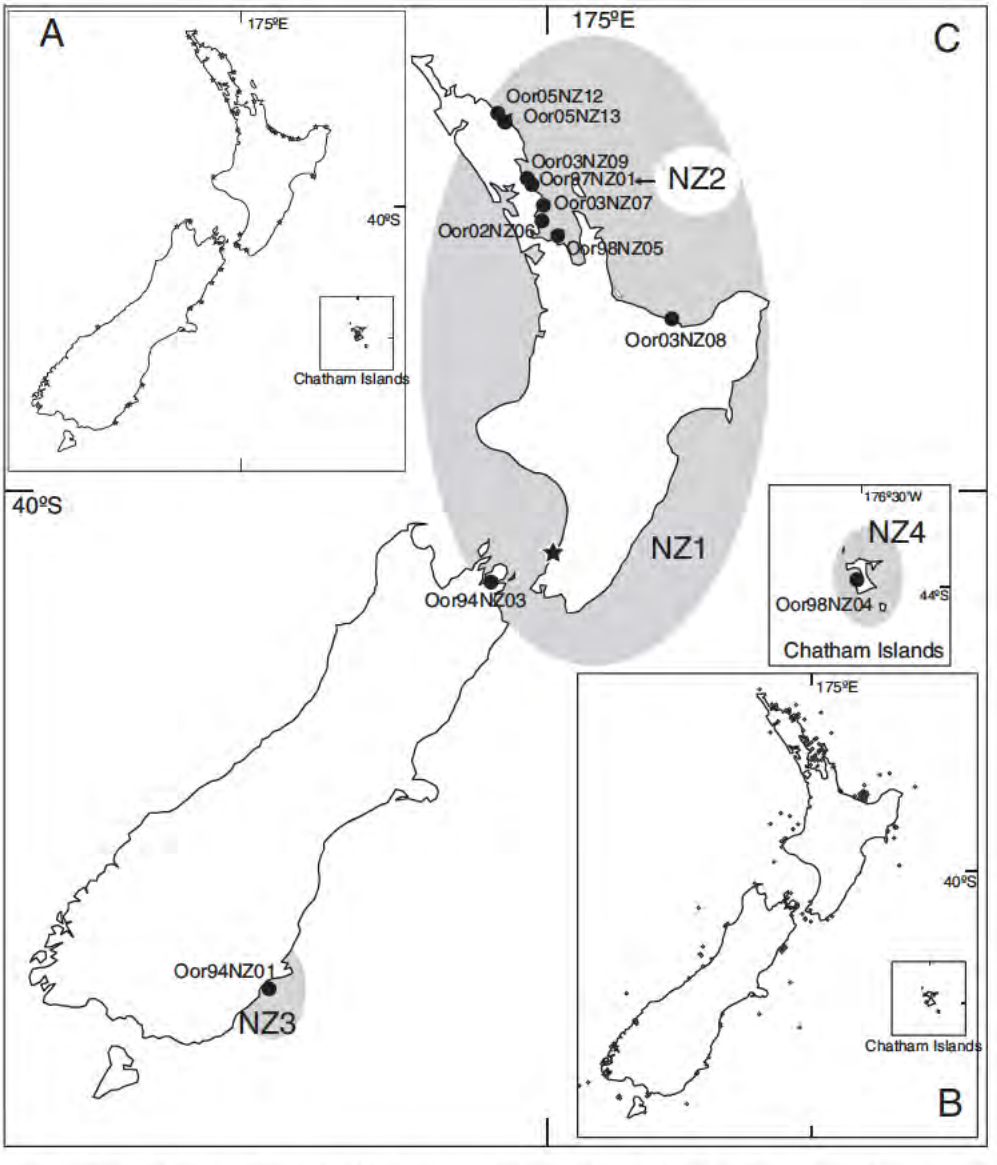


Figure 1 The distribution of killer whales (*Orcinus orca*) around New Zealand. **A**, Strandings (from 1915 to 2009; Department of Conservation 2012b). **B**, Sightings (from 1985 to 2009; Department of Conservation 2012a). **C**, Location of samples collected around New Zealand utilised in this analysis, including their haplotype assignment (sample code associated to the database of New Zealand Cetacean Tissue Archive, University of Auckland). Location of collection for Type D killer whale from Foote et al. (2013) is shown with a filled star.

and contemporary (Pitman et al. 2007) morphological data, diet specialisation (Berzin & Vladimirov 1983) and genetic analysis (LeDuc et al. 2008; Morin et al. 2010; Foote et al. 2013). New Zealand is the only place in the southern hemisphere where three out of the four forms of killer whales have been reported (Visser 1999b; Pitman & Ensor 2003; Pitman et al. 2011; Foote et al. 2013). As these

southern hemisphere forms have been described only recently, little is known about their distribution or movements.

It is believed that dependence on local prey contributes to non-random distribution and population differentiation among killer whales in other parts of the world, resulting in different foraging specialists. In the North Pacific, there is reduced gene flow among three different ecotypes: fish-eating 'residents'; marine mammal-eating 'transients'; and 'offshore' feeding on marine fish and, possibly, other offshore prey (Hoelzel et al. 1998; Ford et al. 2000; Hoelzel et al. 2007; Krahn et al. 2007; Dahlheim et al. 2008; Morin et al. 2010; Pilot et al. 2010). Benthic foraging of stingrays by killer whales has been reported to occur commonly in New Zealand, but seems uncommon elsewhere (Visser 1999a; Duignan et al. 2000).

Previous genetic analyses have included a small number ($n = 5$) of New Zealand killer whale samples for worldwide phylogeography studies, identification of putative forms/species and estimation of divergence times among types (Hoelzel et al. 2002b; Morin et al. 2010; Foote et al. 2013). Here, we report the genetic diversity of killer whales around New Zealand, and compare samples collected in this region with larger geographic databases (Hoelzel et al. 2002b; Morin et al. 2010; Foote et al. 2013) to investigate the relationship of the New Zealand killer whales with more distant populations/ecotypes.

Materials and methods

A total of 11 samples were available for analysis (Fig. 1, SF1). One sample was collected in the Chatham Islands, eight on the North Island and two on the South Island of New Zealand. Nine skin samples were collected from stranded whales. Four samples were collected from solitary live stranded animals, which were refloated and returned to the sea, and five were collected from dead stranded individuals. Two samples were collected from wild-ranging killer whales in the Bay of Islands, North Island, using a biopsy system (Krützen et al. 2002). A comparison of post ocular patches and dorsal fin photographs of three of the refloated stranded killer whales and the two wild-ranging killer whales indicated that they corresponded to different individuals. One sample included in our analysis was included previously in a published study (Hoelzel et al. 2002b). All samples were stored in 70% ethanol at −15 °C and archived in the New Zealand Cetacean Tissue Archive at the University of Auckland (Thompson et al. 2013).

Genomic DNA was extracted using a standard phenol/chloroform extraction protocol (Baker et al. 1994). Symmetrical amplification of the mtDNA control region was performed via the polymerase chain reaction (PCR Saiki et al. 1988) following standard protocols (Palumbi 1996). Two overlapping 800 base pair (bp) fragments of the mtDNA control region were amplified using the primers light-strand tPro-whale M13Dlp1.5 and heavy-strand Dlp8G (Garrigue et al. 2004), and the primers Dlp7 (5′-CCYCTTAAATAAGAC ATCV-CAATGG-3′) and M13-t-phe (5′-TGTAAAACGA CGGCCAGTTANNCATTTTCAGTGYWTTGCT TT-3′). Thermocycle profiles consisted of initial denaturation at 94 °C for 2 min, followed by 35 cycles of denaturation at 94 °C for 30 s, annealing at 54 °C for 40 s, and extension at 72 °C for 40 s. A final extension period at 72 °C for 10 min was included. PCR products were cleaned with Exo-SAP-IT (USB) and sequenced in both directions with BigDye™ terminator chemistry on an ABI3 100 DNA sequencer (Applied Biosystem), using the same amplification primers as sequencing primers. Sequencher™ (version 4.1.2, Genes Codes Co.) was utilised for the alignment and assembly of the overlapping sequences. The program MacClade version 4.0 (Maddison & Maddison 2000) was used to identify variable sites and unique haplotypes. Genetic diversity was estimated at haplotype (h) and nucleotide (π) levels using Arlequin version 3.5.2.1 (Excoffier et al. 2005). Molecular identification of sex was based on amplification of *sry* fragment following the protocol of Gilson et al. (1998) and confirmed by field morphological observations of dorsal fin (Heyning & Dahlheim 1988).

Sequences were compared to the worldwide sample datasets reported by Hoelzel et al. (2002b) and Morin et al. (2010), including also the recent

sequence of a Type D killer whale obtained by Foote et al. (2013), to identify shared haplotypes. Morin et al. (2010) and Foote et al. (2013) complete mitochondrial genome data was trimmed to match the consensus region used in our analysis. In addition to the previous dataset, a sequence from Colombia (sample provided by S. Caballero), one from Chile (sample provided by J. Acevedo) and seven from the Japan and Korea meat markets were included in our analysis for comparisons (for more details on Japan and Korea markets surveys see Baker et al. 1996, 2000, 2006).

Results

The full length of the mtDNA control region (915 bp) was sequenced from seven of the individual New Zealand killer whales and nearly complete lengths from three other individuals (SF1). One of the samples could be sequenced for only the first 582 bp of the control region. The molecular sex identification confirmed the sex identification in the field of all the samples: nine males and two females. A total of eight variable sites defined four haplotypes (Table 1).

Among the 11 individuals, the most common haplotype (NZ1) was represented by eight individuals from the North Island and the northern tip of the South Island (Fig. 1). The other three haplotypes (NZ2, NZ3 and NZ4) were represented by only one individual each. Two of these were observed in the southern part of the South Island, the Chatham Islands and one in the North Island, within the range of the common NZ1 haplotype.

Given the finding of only four haplotypes and the relatively small sample size, the mtDNA diversity observed in the New Zealand population was low compared with other cetacean species (New Zealand killer whales: $\pi = 0.0018 \pm 0.0013$ and $h = 0.491 \pm 0.175$; see Pichler & Baker [2000] and Hoelzel et al. [2002a]) for values of genetic diversity on cetacean species) and to that observed at worldwide level for killer whales ($\pi = 0.0052 \pm 0.0031$, Hoelzel et al. 2002b) and some regional populations of odontocetes.

The New Zealand killer whale mitochondrial sequences obtained here were compared to

Table 1 Variable sites of New Zealand killer whales (*Orcinus orca*) haplotypes compared to haplotype ANTRS from Hoelzel et al. (2002b) representing a Type A killer whale and Morin et al. (2010) southern hemisphere killer whales Types A, B and C haplotypes. Numbers indicate the position in relation to the beginning of the control region 5′ end.

Code	62	86	98	107	113	267	273	280	281	301	389	406	454	455	476	500	523	536	908
ANTRS*	G	C	G	T	T	C	A	T	C	A	T	A	T	C	C	C	T	A	C
AntA1**	.	.	A	.	.	.	.	C	T	.	C	.	.	.	.	.	.	.	.
AntB1**	.	.	A	.	.	.	.	C	T	.	.	.	.	.	T	.	.	G	.
AntC3**	.	.	A	.	.	.	.	C	T	.	.	.	.	.	T	.	.	G	T
Type D**	.	.	A	C	C	.	G	C	T	G	C	G	.	T	.	.	C	.	.
NZ1***	.	.	A	.	.	.	G	C	T	T	.	.	.	.	.	.	.	.	.
NZ2†	A	.	A	.	.	.	G	C	T	T	.	.	.	.	.	.	.	.	.
NZ3††	.	T	A	.	.	T	G	C	T	.	.	.	C	T	.	T	.	.	.
NZ4†††	.	.	A	.	.	.	.	C	T	.	.	.	.	.	.	.	.	.	.

*ANTRS haplotype reconstructed from Hoelzel et al (2002b); **Genebank accession numbers AntA1: GU187217, AntB1: GU187215 and AntC3: GU187207 from Morin et al (2010) and Type D: KF164610 from Foote et al (2013); ***Matched with haplotype WSPNZ1 in Hoelzel et al (2002b) and SWPUNZ haplotype in Morin et al (2010) datasets; †Matched with haplotype WSPNZ2 in Hoelzel et al (2002b) dataset; ††Genebank accession number KC465959; †††Genebank accession number KC465960

haplotypes from other geographic populations around the world. Two of the four New Zealand haplotypes (NZ3 and NZ4) did not match with other haplotypes from either datasets (sequences were deposited in GenBank accession no. KC465959 and KC465960, respectively). Our NZ1 haplotype corresponded to one of the haplotypes from New Zealand (WSPNZ1) previously reported by Hoelzel et al. (2002b) and one (SWPUNZ) reported by Morin et al. (2010). Our NZ2 haplotype matched with one haplotype from Hoelzel et al. (2002b); WSPNZ2), for the reason that this individual (Oor97NZ01) was included in both studies. The only New Zealand haplotype shared with any other region around the world was NZ1. Based on the available sequence length this haplotype is shared with whales from the Eastern North Atlantic and Western South Atlantic populations. It is possible that this identity is the result of a weak phylogeographic signal in the killer whale mtDNA control region, or of recent common ancestry of these extensively separated populations, as has been recently shown by Morin et al. (2010).

Discussion

The geographic distribution and segregation of the New Zealand mtDNA haplotypes obtained here suggest that this population could be geographically structured. The mostly non-overlapping distribution of the four haplotypes suggests some degree of segregation that may be the result of a reduced number of matrilineal groups and some degree of local philopatry. A more intensive and wide-ranging sampling is needed to assess this, together with the incorporation of demographic data into the analysis.

An alternative explanation for the observed geographic distribution of haplotypes could be that the different haplotypes represent the different morphological forms or ecotypes of killer whales reported in New Zealand (Visser 1999b, 2000; Pitman & Ensor 2003; Pitman et al. 2011). Photographic records indicate that five of our New Zealand samples (Oor97NZ01, Oor03NZ07, Oor03NZ08, Oor05NZ12, Oor05NZ13; SF Fig. 1), which included both NZ1 and NZ2 haplotypes, were collected from the type of killer whales found worldwide (Pitman & Ensor 2003). It is not possible to rule out that the more geographically and genetically distant killer whales from Chatham Islands and South Island represent different forms as no photographic records were available. However, two specific fixed differences reported for Types B and C killer whales (in positions 476 [T] and 536 [G] of the mtDNA control region; Morin et al. 2010), were not present in New Zealand killer whales. This suggests that these individuals did not correspond to either of these forms (SF Table 1). The comparison of New Zealand haplotypes with the recently reported sequence of a Type D killer whale (Foote et al. 2013) also confirmed that our samples did not represent this poorly described form.

Supplementary files

Supplementary file 1: Table 1. Details of sample collection from killer whales (*Orcinus orca*) in New Zealand waters.

Supplementary file 2: Figure 1. Photographs of four New Zealand killer whales (*Orcinus orca*) sampled for this genetic analysis (sample codes Oor03NZ07, Oor03NZ08, Oor05NZ12, Oor05NZ13).

Photographs of individuals associated to sample Oor97NZ01 can be found in Visser & Fertl (2000).

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vation (Northland). Genetic analyses were supported by a New Zealand Marsden Fund and an International Fund for Animal Welfare (IFAW) grants to C.S. Baker, a University of Auckland International Doctoral Scholarship to C. Olavarría and a University of Auckland Postgraduate Tuition Fee Bursary to G. Tezanos Pinto. Biopsy samples were collected under permit to CSB from the New Zealand Department of Conservation and animal ethics protocols AEC/02/2002/R9 and AEC/02/2005/R334 from the University of Auckland.

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[redacted]

From: [redacted]
Sent: Friday, 16 July 2021 9:23 pm
To: [redacted]
Subject: FW: Orca calf - animal welfare assessment

I didn't get to call [redacted], can one of you follow it up? This is a person Ian asked me to contact through [redacted] as possibly good for animal ethics advice, maybe on the TAG.
[redacted]

From: [redacted]@massey.ac.nz>
Sent: Friday, 16 July 2021 12:33 pm
To: [redacted]>
Subject: Re: Orca calf - animal welfare assessment

Hi again [redacted]

I've spoken with [redacted] again and she'd be happy for you to give her a call this afternoon if you have time:

[redacted]-

Cheers

[redacted]

[redacted], PhD, Diplomate ACVP, BVSc, BSc
Professor of Veterinary and Marine Mammal Pathology
Deputy Head of School and Dean of Postgraduate Studies
School of Veterinary Science
Massey University, Palmerston North, NZ

From: [redacted]
Sent: Friday, July 16, 2021 10:36 AM
To: [redacted]
Cc: [redacted]
Subject: RE: Orca calf - animal welfare assessment

Thanks [redacted]
Absolutely fine to give my contact details. Thanks a lot
[redacted]

Kā mihi

[redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz

Department of Conservation
Te Papa Atawhai

From: [redacted]@massey.ac.nz>
Sent: Friday, 16 July 2021 10:32 am
To: [redacted]
Cc: [redacted]
Subject: RE: Orca calf - animal welfare assessment

Hi [redacted]

I spoke to our welfare person last night. She's going to have a look at the document that we wrote up after the last orca calf incident to get an idea of what would be involved and will get back to me. She's extremely busy at the moment and a bit worried about balancing her time commitments.

Do you mind if I give her your contact number in case she wants to contact you directly?

[redacted]

From: [redacted]@doc.govt.nz>
Sent: Friday, 16 July 2021 10:08 AM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@doc.govt.nz>
Subject: RE: Orca calf - animal welfare assessment

Hi [redacted]
Just checking in on progress with this.

Also Ian Angus wanted me to let you know that a decision has been made that there will not be an autopsy performed on the orca calf, in the event that it dies.

Thanks
[redacted]

From: [redacted]@massey.ac.nz>
Sent: Thursday, 15 July 2021 3:38 pm
To: [redacted]
Cc: [redacted]
Subject: RE: Orca calf - animal welfare assessment

Hi [redacted]

I haven't received a text from you so maybe something went wrong there? My mobile number is [redacted].

With the 2016 orca baby in Tauranga we had a group at Massey involved in discussions, which included a veterinary welfare specialist. He has since retired but we have another person here who may be able to help. She is teaching for big chunks of most days this week but I will try to get hold of her as soon as I can and then get back to you if that's OK?

Ngā mihi

[redacted]

[redacted] PhD, Diplomate ACVP, BVSc (Dist), BSc

Professor of Veterinary and Marine Mammal Pathology
Deputy Head of School and Dean of Postgraduate Studies
Tāwharau Ora - School of Veterinary Science
Massey University

Tennent Drive, Palmerston North 4442, New Zealand
[redacted]@massey.ac.nz

From: [redacted]
Sent: Thursday, 15 July 2021 3:27 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]
Subject: Orca calf - animal welfare assessment

Kia ora [redacted]
Following up on the text I sent you.
I'm working as part of the technical group on the incident with the orca calf at Plimmerton. Ian Angus mentioned that you might have a contact at Massey with particular expertise regarding the assessment of animal welfare, and criteria & guidance to help decision-making on what actions to take in these sort of situations.
Are you able to give me information and/or have a chat about it? Feel free to email or call me.

Kā mihi

[redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: +[redacted]

www.doc.govt.nz



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[redacted]

From: [redacted]@massey.ac.nz>
Sent: Friday, 16 July 2021 11:58 pm
To: [redacted]
Subject: FW: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

Importance: High

Kia ora [redacted]

As a member of the IWC Strandings Expert Panel, your email came to me via the IWC Chair [redacted].

Below is my email response to the IWC chair and panel which I am sending on to you directly for your reference. I am asking specific questions of this situation since I know the department would value clear international guidance in this somewhat complex situation.

Best wishes, [redacted]

From: [redacted]
Sent: Friday, 16 July 2021 10:48 PM
To: [redacted]@groups.iwc.int>
Subject: RE: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
Importance: High

Kia ora folks,

Thanks [redacted] for contacts including [redacted] – he will be a good point of contact as will any other orca specialists the panel can suggest (especially if working with wild orca). Myself, [redacted] and many in NZ have been advising to different degrees on various aspects of this orca neonate since the incident began last Sunday (we are now Friday night here – so 6 days into this event).

The confirmed body length of this male orca neonate is 2.1m (so a little less than prior estimated 2.5-3). It further has fading foetal folds, no erupted teeth and a yellowish eye patch.

New Zealand has no captive/rehab facilities for cetacean. As such, this neonate has for the previous 6 days been held in a penned off boat ramp in New Zealand's capital city of Wellington. In the last 24 hours he was relocated to a temporary salt water pool due to adverse conditions. He has received veterinary assisted feeding in the form of electrolytes, nutrients and fish oil.

Considering the developing situation – I am going to be frank and ask the IWC SEP for its expert opinion on the following;

1. How do you rate the survival probability of this individual in the coming 48-72hrs based on size and degree of dependence?

2. How do you rate the welfare impacts to this this individual in the coming 48-72hrs based on size and degree of dependence?

Apologies for these direct questions but we are now 6 days in and this situation would benefit from informed international advice. DOC are understandably having to manage multiple stakeholders in this complex situation presently so any scientific guidance that the IWC EP can provide to help inform sound decision-making would be beneficial.

Thanks in advance for your input folks – much appreciated.

[redacted]

[redacted], PhD
Professor – Marine Biology
Rutherford Discovery Fellow – Royal Society Te Aparangi

Cetacean Ecology Research Group | School of Natural and Computational Sciences | Massey University
Private Bag 102 904, North Shore, Auckland 0745, New Zealand
Physical Address: Building 5, Gate 4, The Station Crescent, Albany, Auckland, New Zealand

[redacted] [redacted] http://www.cetaceanecology.org



From: [redacted]
Sent: Friday, 16 July 2021 6:41 PM
To: [redacted]@groups.iwc.int>
Subject: Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

H[redacted]
Ocean Park in Hong Kong had a KW for many years and although thatvwas before current head vets time, many of the staff there are the same, if you are looking for husbandry experience. Head vet at OP is [redacted] (several folks in SEP know him well) I am happy to chat to him too and HK is a closer time zone to NZ than Europe for emergency help, if ever required.

[redacted]@oceanpark.com.hk>

[redacted] used to work with OPs killer whale, she is a vet and still in HK. I can track her email down if required.

Hope helps!

Cheers
[redacted]

On Fri, 16 Jul 2021, 16:20 [redacted]@unipd.it> wrote:

> Dear collegues,
>
> I've received this request from New Zealand. I've already suggest to contact [redacted] and I think that her with other experts could provide support. Who could join this advisory group? do you know any other person out of the SEP that could help on this?

Best

[redacted]

-------- Messaggio Inoltrato --------

Oggetto: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
Data: Thu, 15 Jul 2021 21:54:58 +0000
Mittente:[redacted]
A [redacted] @unipd.it [redacted] @unipd.it>

Bonjourno [redacted]

We have a situation here in New Zealand of an orca calf separated from its natal pod and presently being held and cared for. Your name was mentioned (as the lead for the IWC Stranding Network Expert Panel) by [redacted] of NOAA.

We are seeking international advice on our response, and **I would like your advice on who might be the best person(s) internationally to be on an expert advisory panel**. The person would need the right expertise & experience with orca/cetacean incident management and veterinary science.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At midday the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf in a semi-enclosed boatramp area (seawater).

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching both aerial and on the water has failed to locate the pod. The calf has been kept in the water for the past few days, and was moved last night to a temporary holding pool to avoid a storm forecast. We have been getting a wide range of veterinary advice within NZ.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made.

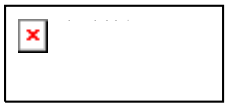
I realise it's the middle of the night in Italy. It's possible our advisory group membership will be decided before you can reply, but it's useful in any case for you to be informed of this incident.

Can you also provide **your phone contact details** in case a call is necessary.

Kā mihi

[redacted] [redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz



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[redacted]

From: [redacted]
Sent: Friday, 16 July 2021 12:42 pm
To: [redacted]
Subject: FW: Seeking expert advisors for an orca incident

For your info. I'll add [redacted] contact details to my Technical document on doccm.

From: [redacted]@seattleaquarium.org>
Sent: Friday, 16 July 2021 12:21 pm
To: Meg Rutledge <merutledge@doc.govt.nz>; [redacted]
Cc: Ian Angus <iangus@doc.govt.nz>; [redacted]
Subject: RE: Seeking expert advisors for an orca incident

Ki Ora Meg –

Happy to support in any way possible. Here's the other example of a wayward juvenile orca that was successfully reunited I mentioned https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/orphan-killer-whale-a73-springer

[redacted]
Director of Life Sciences
Seattle Aquarium

Ex situ coordinator for IUCN/SSC Cetacean Specialist Group

[redacted]
1483 Alaskan Way | Pier 59 | Seattle | WA 98101-2051

Inspiring Conservation of Our Marine Environment

From: Meg Rutledge <merutledge@doc.govt.nz>
Sent: Thursday, July 15, 2021 5:19 PM
To: [redacted]@seattleaquarium.org>
Cc: Ian Angus <iangus@doc.govt.nz>; [redacted]
Subject: RE: Seeking expert advisors for an orca incident

Kia or [redacted],
Thank you for time to talk right now. I am sharing the below email with you, and urgent support would be greatly appreciated. Your extensive experience with cetaceans including transportation and critical care support would be of great value,

[redacted] telephone number is [redacted] He is a kiwi, currently living and working in Seattle. He is available for the next couple of hours if you want to talk,

Regards,
Meg

From: [redacted]>
Sent: Friday, 16 July 2021 11:26 am
To: Meg Rutledge <merutledge@doc.govt.nz>
Subject: Seeking expert advisors for an orca incident

Hi Meg
As discussed just now, here's some background that could be sent to your Seattle contact [redacted]…
Thanks
[redacted]

We have a situation here in New Zealand of an orca calf separated from its natal pod and presently being held and cared for. Your name was mentioned (as the lead for the IWC Stranding Network Expert Panel) by [redacted] of NOAA.
We are seeking international advice on our response, and **I would like your advice on who might be the best person(s) internationally to be on an expert advisory panel**. The person would need the right expertise & experience with fields like orca/cetacean incident management, veterinary science, animal ethics and welfare.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At midday the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf in a semi-enclosed boatramp area (seawater).

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching both aerial and on the water has failed to locate the pod. The calf has been kept in the water for the past few days, and was moved last night to a temporary holding pool to avoid a storm forecast. We have been getting a wide range of veterinary advice within NZ.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made.

It's possible our advisory group membership will be decided before you can reply, but it's useful in any case for you to be informed of this incident.

Can you also provide **your phone contact details** in case a call is necessary.

Kā mihi

[redacted])
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: +[redacted]

www.doc.govt.nz

Department of Conservation
Te Papa Atawbai

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[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Friday, 16 July 2021 5:01 pm
To: [redacted]
Subject: Fwd: Orca Calf 'Toa'

Hey guys,

[redacted] was a couple of years below me at vet school and just sent me the below email regarding Toa. I assume we don't need any further assistance given that we're getting plenty of advice from US vets? I'm all for advice but I feel like we have had heaps! Happy to ask for their advice too though of course, pending what you guys think.

Are we able to provide her an update as per the latter part of her email, or just refer her to the DOC updates?

Cheers

Get Outlook for iOS

From: [redacted]@vrtp.com.au>
Sent: Friday, July 16, 2021 4:57:13 PM
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@vrtp.com.au>
Subject: Orca Calf 'Toa'

Hi [redacted],

Just wanted to reach out to see who the best person was within Wellington Zoo in relation to Sea World offering our support to assist you guys in any way that we can. Happy to supply veterinary assistance over the phone and/or on the ground as required.

We have been getting a sensational amount of requests in relation to 'Toa' the Orca calf so any updates that you have for us would be greatly appreciated.

Hop all is well,

Regards

Dr [redacted] | Veterinarian |M [redacted]@vrtp.com.au
Sea World | Sea World Drive, Main Beach QLD 4217 | seaworld.com.au

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[redacted]

From: [redacted]@ulpgc.es>
Sent: Friday, 16 July 2021 11:21 pm
To: [redacted]
Cc: [redacted]@groups.iwc.int; [redacted]
Subject: Killer whale calf ---URGENT

Dear all

The best advice I can give you regarding this issue is to contact with people who have large experience with killer whales in all these aspects that now are not easy questions ..... not easy answer.

My contacts are in Loro Parque ([redacted], scientific director) and [redacted] (a top Veterinarian in Marine Mammals). They are aware and ready to try to help.

Good luck
[redacted]

Antes de imprimir este correo electrónico, piense bien si es necesario hacerlo: el medio ambiente es una cuestión de todos.
Please consider the environment before printing this email.

[redacted]

From: [redacted]@vanaqua.org>
Sent: Saturday, 17 July 2021 12:51 pm
To: [redacted]
Cc: [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi all,

Having been in this situation a few times in my career I know that you are likely going to be faced with some difficult decisions. It sounds like you have a calf that is responding to care and you have a care and monitoring plan moving forward. I understand clearly that the primary objective is re-unification with other whales. I think everyone wants that of course. However, are there any thoughts at all at trying to place this animal should it not be releasable or is that out of the question? Obviously we have COVID issues limiting some options but are any of the Australian facilities able to provide a home for a time? I know many of the veterinary and animal care folks at Sea World Gold Coast for example. They are pretty great. I do not mean to cloud the situation at all but I know a home for non-releasable animals makes my job a lot easier.

Very best wishes on this incredible undertaking. You are all doing such a great job.

[redacted]

[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]
E [redacted]@vanaqua.org

vanaqua.org

Vancouver Aquarium
845 Avison Way, Vancouver, BC, Canada V6G 3E2

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[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 11:15 pm
To: [redacted]
Subject: Fw: ORCA GOBIERNO NUEVA ZELANDA
Attachments: Cetacean artificial milk formula-2018.pdf

Hi team,

I reached out to the Loro Parque team yesterday at [redacted] request (following up on them trying to reach us) - here is their very interesting response.

Great verification of age (2-2.5 months).

Sounds like we may need to further review the feeding protocol.

[redacted]

From: [redacted] >
Sent: Saturday, 17 July 2021 11:00 PM
To: [redacted]
Cc: [redacted] @loroparque-fundacion.org>; [redacted] @loroparque.com>; [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

I have been copied to a few mails exchanges and thought I would just add herewith our most recent formula (with which we raised two killer whale calves - that are still with us) but mainly the timing of administration. The biggest issue we found out (and the reason for failure before) is the high volume administered in a short time.

It will have to be fed 24/24 to start with until it can stabilize.

If you cannot have access to zoologica milk powder (but often to be found in zoological institutions), I have also used human milk powder - without lactose - with success.

With a size of 2,15 m - your calf will probably be about 2 to 2,5 months old (the size of our male calf at that age).

For our calves at that age, we really found out that 9L per day is a great maximum (when going higher they started developing medical problems (delay in digestion and inflammation of the digestive system), and these problems can also only be identified if you can take blood regularly and especially perform ultrasounds of the digestive system (together with being able to recognize and assess their digestive organs). They will NOT show these digestive problems behaviourally until they are pretty far. Problem is to reach the necessary calories, as mum's milk is way more caloric than what we can offer them. And the mistake then is going up with the formula.

We would start around the clock - every 2 hours - with a low volume of intubation/bottle- and then we'd raise the volume slowly up to 1000 - 1300 ml (over weeks) max per intubation/bottle and start having longer times at night without feeding.

Up to an age of 9-10 months, 12 L would be the great maximum - but generally we had to go back down to less because of changes identified in the blood and by ultrasound - all related to food.

The other major issue we have found over time is starting to feed fish too early - which I absolutely not recommend (not before 6 months of age, and still, in small quantities).

These are in the big lines the lessons we learned by raising 3 calves, 2 having been successful, and having learned the mistakes from the other one.

What is also very helpful is to add tensio-actives (simethicone) with every formula administration (certainly if by bottle), because they will swallow large quantities of air. Their abdomen is not “distendable” like in other species, and this high quantity of air in their guts can make them very uncomfortable.

Please let me know if I can help you in any other way.

Greetings

[redacted]

On 17 Jul 2021, at 12:19, [redacted] wrote:

Hi [redacted]

Thank you very much for the reply! I belive Ian and Ingrid have been busy on-site so probably aren't keeping up with email.

Thank you for the offer of advice on formula and hand rearing. We are also in consultation with a team of Sea World and Vancouver Aquarium vets who have experience in hand rearing. They have provided us with their formula which is what we have adapted based on what is avaliable in NZ for now.

Medically he appears stable at this stage - bloods have been collected twice and nothing alarming. Regular monitoring of resp rate, ins and outs, movement etc are ongoing.

I would also be interested in your teams thoughts on the age of this individual. He is 2.15m long, does not have fully erupted teeth and has the faint remnants of foetal folds still visible.

There are no facilities in NZ that house captive cetaceans and as such we are trying to determine his suitability for release to the wild.

Thank you again for reaching out - have discovered the cetacean community really is fantastic in a situation like this. Such wealth of knowledge and generosity in sharing that knowledge.

Kindest Regards,

[redacted]

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Friday, 16 July 2021 10:52 PM
To: [redacted]
Cc: [redacted]
<[redacted]@loroparque.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Dear [redacted]

I am [redacted], director of Loro Parque Foundation, and I was trying to contact both Dr. Visser and Ian Angus to offer our help and share our experience in hand rearing orca calves from birth. I have copied [redacted], our consultant veterinarian and [redacted], DVM, one of our vets specialized in cetaceans. They can share their experience and diagnostic skills with you, as well as the critical parameters to hand rear an orca calf.

We are happy to help in any way you need to keep Toa health and safe so it can be reunited with the family pod as soon as possible.

Best regards,

[redacted]

[redacted] PhD.
Director

Loro Parque Fundación
Avda. Loro Parque • 38400 Puerto de la Cruz
[redacted]

<firma25aniv_2.jpg>

De: Formulario Contacto Loro Parque
Enviado: viernes, 16 de julio de 2021 5:25:23 (UTC) Hora del meridiano de Greenwich: Dublín, Edimburgo, Lisboa, Londres
Para: media
Asunto: Nueva consulta desde loroparque.com | Prensa | [redacted]

Nombre: [redacted]

Email [redacted]

Teléfono: [redacted]

Mensaje: Kia Ora,

My names is [redacted] and I am a veterinarian with the Department of Conservation in New Zealand. I have been involved in the response to the stranded orca calf and saw that you were trying to reach out to offer help.

If someone was able to email on the above email address I would be interested in making contact.

Kindest Regards,

[redacted]

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Dr [redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 8:48 am
To: [redacted]; Ian Angus; Kirstie Knowles; [redacted]
Subject: Fw: Stranded orca calf in New Zealand

Just going to continue to forward advice that is important for any decisions that are going to be made over the weekend.

From: [redacted]@ifaw.org>
Sent: Saturday, 17 July 2021 4:57 AM
To: [redacted]
Cc: [redacted] <bsharp@ifaw.org>
Subject: Re: Stranded orca calf in New Zealand

Ugh, thank you. Unfortunately with that information, I do not feel it would be humane to release this calf now unless a lactating female could be confirmed in a pod if located (small calves present) or until it is fully weaned (many months). At that point, after being in captivity for so long I doubt he would be able to assimilate back into a pod. One can always hope but the window on that would be extremely small. Oh man, so tough. Hang in there!

From: [redacted]@doc.govt.nz>
Date: July 16, 2021 at 12:29:20 PM EDT
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: Re: Stranded orca calf in New Zealand

Thanks so much [redacted]

That is as I thought from a read of her avaliable information. Definitely keen on people with stranding experience.

Just to let you know, we have received confirmation on the length of this individual at 2.15m placing it much younger than has currently been suggested by the biologist. [redacted] as confirmed this places the calf at less than 3 months of age as opposed to the 4-6 months of age that has so far been proposed.

[redacted]

From: [redacted]@ifaw.org>
Sent: Saturday, 17 July 2021 4:21 AM
To: [redacted]
Cc: [redacted] <bsharp@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Thanks [redacted] was the one I couldn't remember the name of when we talked yesterday. I'm not sure I would use her as an expert for this situation given (as far as I understand) her lack of experience with stranded animals and her primary experience being evaluating welfare of long-term captive cetaceans. If you are forming a

panel, might be someone you could include, but I would also urge the inclusion of individuals with considerable experience making difficult decisions for stranded cetaceans. We will let you know what we hear back from our contacts for this.

[redacted]

From: [redacted]@doc.govt.nz>
Date: July 16, 2021 at 12:31:19 AM EDT
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Hi [redacted]

A question for the morning – this is the person I am aware of how appears to be in the animal welfare space [redacted] Definitely has some cetacean experience but looks like predominantly in a captive situation rather than a rescue/rehab type situation.

Would love any thoughts you might have on her as a contact.

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 13 July 2021 3:50 AM
To: [redacted]@doc.govt.nz>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Thanks for the great info, [redacted]. What a tough situation.

First things first – vets to contacts for continuing care/feeding for the calf, if it is decided to pursue this:

1. [redacted] – University of FL – long time (past) SeaWorld vet with tons of experience with orcas: [redacted]@ufl.edu
2. [redacted] – now with San Diego Zoo Global, but also a long-time SeaWorld vet with tons of orca experience: [redacted]@SDZWA.org
3. [redacted] – SeaWorld Abu Dhabi (just transferred from SeaWorld San Diego) – time zone might be a little better for you guys and [redacted] is great to work with and he likely has the most up-to date protocols for calf rearing [redacted]@seaworld.com

To be honest, if this stranding occurred here, I would euthanize that animal since the likelihood of success is almost non-existent based on my experience. Pods don't abandon calves without reason, so it is likely that this animal had a pre-existing condition that led to its stranding and abandonment. But I realize that the situation there may be different from a political and cultural standpoint. And, of course that is also easier said than done if IV access is questionable (although I know DOC has significant experience with ballistic euthanasia).

Was the animal listing to the left when put back in the water for holding? In the video it looked like the calf was maintained in left lateral recumbency on the trailer. If that occurred for a long period of time, the left lung likely collapsed under the weight and hopefully can reinflate, but the atelectasis can still last hours. By holding the animal in the water, more natural chest excursion can occur, hopefully allowing the atelectasis to correct itself and also allowing the calf to oxygenate more effectively. While holding in the water, trying to do physical therapy (up and down tail movements to simulate swimming) can help to minimize potential scoliosis that can develop from stranding (muscle contraction on one side, especially when in lateral recumbency). Also do range of motion with the pectoral flippers if possible. These exercises can be done for 10-15 min at a time a few times a day to start, depending on how the animal tolerates it. Based on how that animal was held initially this would be a significant

concern of mine, that the animal would develop significant muscle contracture, which is often unresolvable. Muscle relaxants can be used (like methocarbamol), in addition to pain meds and anti-inflammatories (meloxicam) to help prevent/attempt to treat, but its not always successful.

If continued care is elected, a full workup is indicated. I attached our current physical exam form that can help guide the PE. I also attached our reference ranges for both PE and bloodwork. These are largely based on stranded short beaked common dolphins since that is what we see most frequently, but should be reasonably applicable to orcas.

For a calf I would be most interested in hydration status, glucose, liver values and a CBC – but a full CBC/chem panel would be best. I would think this calf is old enough to have stabilized glucose, but that would be high on my list to check, since septicemia is possible and the animal has been fasted. Muscle enzymes (CK, LDH, AST) and lactate should be monitored for trends (may be significantly high after the night in the trailer). Anemia is a consistent negative prognostic indicator for our stranded dolphins, as is marked neutropenia. Of course look for dehydration as well on the bloodwork to guide fluid therapy.

Ultrasound examination of the calf would be useful, especially to look at the lungs for any evidence of pneumonia. Great paper on pulmonary ultrasound in dolphins attached. The calf is small enough that it is a useful tool. Of course a hearing test (AEP or BAER) would be ideal, as deafness can be a reason for calf abandonment. But I don't think anyone in NZ has the equipment to do this. Our team does – so if there is serious interest in this, we could potentially discuss. Alternatively placing hydrophones in the water to see if the calf is vocalizing at all might be another possible tool. Although we haven't used this diagnostically, and it certainly wouldn't be a definitive thing, if the calf is not vocalizing, that would be a poor prognostic indicator in my book.

Any feces or urine production that they could appreciate?

It is important to point out in general, that cetacean rehab is expensive, labor intensive and has a very low success rate historically. I fear that this calf may die within a few weeks if held in care. If it does survive and regains its health, its most likely outcome would be permanent placement in a managed care facility since likelihood of successful reintroduction to a pod would be almost nil. I really hate to be the pessimist here, but I think it is important to be realistic when taking on such an endeavor. If the pod is not relocated in the next day or two, the decision should be made whether permanent placement or euthanasia would be the most humane outcome for this animal. As more time goes on, like you said, likelihood of reintroducing to a pod is getting smaller and smaller. So I would say holding for 3-4 days total with an absolute MAX of one week (obviously would have to tube feed it ASAP) is your window for releasing. And as I mentioned before, the likelihood that the calf was not accidentally abandoned is extremely high.

I cc'd [redacted] as well in case he has anything else to add.

Happy to continue to help as best I can from here. Please keep me posted if you can. Sure wish I could be there to help and so sorry you all are having to endure this really difficult situation!

Best,[redacted]

From: [redacted]
Sent: Monday, July 12, 2021 6:43 AM
To: [redacted]@ifaw.org>
Subject: Stranded orca calf in New Zealand

Hi [redacted]

Thank you again so vey much for answering my plea for help last night – so very much appreciated! Managed to get the calf kept in the water overnight which was a great initial step as they had been planning to trailer it again for the night.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was

given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching today both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. For videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night.

A Zoo veterinarian was attending this afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended. I have not heard as to what the assessment was or how the procedure went.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made. As such I was wondering if you were willing to provide advice on the follow points (or had any colleagues you could put me in touch with that would be willing to provide advice).

- Indicators for the health of the calf to assist in our decision-making – clinical exam? Behaviour? Any templates to assist in assessing the health of the animal?
- If the decision is to continue with oral fluids by tube is there any advice of how often this should be done?
- If the decision was to persist for longer then what are the feeding recommendations for an orca calf (I am assuming SeaWorld and Loro Parque would be the people to contact about this – do you have any direct contacts for them?)
- Also interested in what thoughts are around the releasability of an animal like this – presumably the longer it is held the lower the chances of successfully reuniting it with a pod.

Thank you so very much in advance for any thoughts or advise – It is so very much appreciated by us all.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



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[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Saturday, 17 July 2021 8:42 am
To: [redacted]
Cc: [redacted]; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Thank you so much for sending that paper and information through. The on-site team are able to get regular length and girth measurements. There was talk yesterday of the possibility of getting scales that would be suitable to weigh him as well.

Thank you to everyone for all your help with the calf!

[redacted]

From: [redacted]@SeaWorld.com>
Sent: 17 July 2021 05:06
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org <[redacted]@vanaqua.org>; [redacted]>
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

[redacted],

The estimated age of the calf should not change the current nutritional plan. I would however emphasize that with hand-rearing, we utilize weight gain to ensure that calves are getting the appropriate calories and growing. Caloric needs are predicated on energy expenditure (swimming/diving activity and thermoregulation), so fat content within the diet, volume and frequency of feedings may need to be adjusted to get adequate weight gain. Body weight measurements are optimal, but recorded sequential measurements of length and girth can provide an estimate of growth.

Regards,
[redacted]

From: [redacted]
Sent: Friday, July 16, 2021 8:55 AM
To: [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]>
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so much for the quick confirmation of what I suspected. I have passed your message directly on to the decision making team.

Do let us know if this changes anything we should be doing veterinary or nutrition wise in the immediate short term.

Thank you again,

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Saturday, 17 July 2021 2:07 AM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]<[redacted]@SeaWorld.com>; [redacted]vanaqua.org [redacted]@vanaqua.org>; [redacted]>
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi, based on total length from captive animals the predicted ages at lenght are listed as follows:

birth: 232 cm
1 month: 243 cm
2 month: 253 cm
3 month: 262 cm
4 month: 270 cm
5 month: 278 cm
6 month: 286 cm

There is a large predicted error (see attached paper).

However, put the total lenght data, along with the yellow eye patch and fetal folds would all point to a very young animal < 3 months.

All information indicates that this animal is non-releasable.

Thanks, [redacted]

[redacted], DVM, PhD
Vice President of Conservation Research and Animal Health
SeaWorld Parks and Entertainment
Corporate Zoological Operations

7007 SeaWorld Drive
Orlando, FL 21821
[redacted]

From: [redacted]>
Sent: Friday, July 16, 2021 12:02 AM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]

[redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org [redacted]@vanaqua.org>; [redacted]@gmail.com>
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi team,

We managed to get the vets on site to measure this individual for us today.

Total length 2.12m
Girth in front of dorsal fin 1.42m
Girth behind dorsal fin 1.17m

Would be very interested in how those measurements fit with other neonates (I am aware they will be from other populations but hopefully will still give some guide). As before other factors are relatively yellow eye patch, no (or few) erupted teeth and in some photos I believe I can still see foetal folds.

We are also interested in how often you would recommend repeating these measurements and which of the girth measurements is most useful for weight estimates.

Thank you so much for any thoughts.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



From: [redacted]@SeaWorld.com>
Sent: Thursday, 15 July 2021 8:31 AM
To: [redacted]@doc.govt.nz>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

We have not received any measurements, a length and girth measurement would help tremendously!

[redacted]

On Jul 14, 2021, at 1:22 PM, [redacted] > wrote:

Good morning (afternoon?) to you all,

Thanks you very much for this information you are echoing all our concerns and the advice that we have been providing to the decision makers since day one. The biology space with regards to orca in NZ is challenging as there is one person who holds this information and therefore no way to independently verify the accuracy. The information given on day one was that the pod this calf was from is known but it is one that is occasionally seen then disappears for months on end.

I was also wondering if I could seek clarification as to an age estimate on this individual – I have requested the length measurements (or you may already have them) but in discussions with the Zoo team yesterday they indicated that the calf does not yet have erupted teeth. From the information I can find that would indicate this animal is less than 3 months old (current estimates being provided by the biologist are that it is 4-6 months old). Would appreciated any thoughts you have on verifying the age.

Just reiterating there is no facility in New Zealand that can take this animal and at this stage the possibility of sending off-shore for permanent care is not considered an option. The only only long term option (which I don't feel is a real option) would be to fully hand-raise then attempt to re-wild. Would love any thoughts on have on that as well.

Thanks again for your support,

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 15 July 2021 4:07 AM
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]
<[redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>;
[redacted]@vanaqua.org; [redacted]@gmail.com>
Subject: RE: Stranded orca calf in New Zealand

Good day [redacted] and all,

We appreciate all your efforts for trying to support this calf and I echo [redacted] comments about disposition of a dependent calf. If a suitable long term home is not available in NZ or Australia then you and your Team will need to make a decision on how long to continue the supportive management of the calf … I agree, that with each day the outlook for a successful reintroduction wanes and the overall welfare of the calf will weigh heavy into the decision-making …
do the biologists have an idea of how often the pod travels by the site location?

We will continue to help, as much as possible,
Regards,
[redacted]

From: [redacted]
Sent: Wednesday, July 14, 2021 2:32 AM
To: [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so much and thank you again all for your support thus far! [redacted] (senior vet at Wellington Zoo) has looped me in on your direct clinical advice email thread which is fabulous and much appreciated. Very keen for you to continue to liaise directly with the Wellington Zoo team with regards to direct day to day medical care though I would very much appreciate staying in the loop.

My role is to help collate and provide technical advice to the Department of Conservation team with regards to ongoing plans for this calf and to help with interpretation of the veterinary advice so that the decision makers can make decisions based on the best advice available. As such I am keen to start having conversations around medium to longer term health monitoring in an attempt to get some objective measure in place to help assess how this individual is doing.

We are also keen to have input into long term prognosis for return to the wild. As you are no doubt aware there are no facilities in New Zealand that can provide long-term care for a cetacean neonate. We are very concerned about the level of habituation to humans that is already occurring in such a young animal and are interested in any thought on realistic ability to return this individual to the pod (sssuming it can be found). We note that everything we have read indicates that a neonate of this age in any other location would be deemed non-releasable and placed in permanent human care. I am not saying it is impossible that a return to the pod might happen but it feels more unlikely with every day that passes.

I am not sure if this is the right forum for these kinds of conversations or if you would rather focus on providing advice on the medical stabilisation and nutritional support side of things. If the latter is the case have you any suggestions as to the right people we should be talking to about longer term prognosis?

Once again thank you all so very much for your support and help from afar – it is appreciated more than you will ever know as we will not be able to properly express our thanks.

Kindest Regards,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/

<image001.png>

<image002.png>

<image003.png>

<image004.jpg>

From: [redacted]@SeaWorld.com>
Sent: Wednesday, 14 July 2021 5:38 AM
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: RE: Stranded orca calf in New Zealand

Hi [redacted],

We are interested in helping from afar, but obviously understand the challenges with the situation. One thing that would help, would be to have one spokesperson from NZ, as there appears to be 2 email strings about this calf…so I'm looking to consolidate information about calf coming to us at SeaWorld and [redacted] at Vancouver and [redacted]

Who should be the main contact from NZ?
I will be the main contact for SeaWorld and will share information with my colleagues.

What is the short-term plan and is there a long term contingency plan?
I understand that a more scheduled feeding regimen was to begin, in the past 12 hrs, how is that going?
Do you plan to get another blood sample?

With regards,
[redacted]

[redacted], **DVM** | Sr. Veterinarian
SEA An mal Health and Rescue Hospital
500 SeaWorld Drive | San Diego | CA 92109
[redacted]

<image005.jpg>

From: [redacted]
Sent: Tuesday, July 13, 2021 5:01 AM
To: [redacted]@seaworldabudhabi.com>; [redacted]@vanaqua.org; [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

H[redacted]

Thank you so very much for your message and the support of the team already. We are all so very appreciative of all the advice and help in ensuring this little calf gets the best possible chance at being stable and in a condition it could be returned if the pod were found.

Time Zones could be a little challenging but if there was a possibility to talk to some or all of you via teams tomorrow that would be very much appreciated and I would be keen to make any meeting work that would suit you all (I will be asleep for the next 8 ish hours but back on line from about 7:30 NZ time tomorrow). We cast a very wide net in the initial messages as we know you are all incredibly busy and weren't sure if people would be able to respond to us – the response has been overwhelming in the level of support which has been incredible heart-warming – that said definitely keen to streamline comms with the most appropriate people.

Let me know if you are indeed available for a talk via teams,

Thank you again so much for the support you have all provided,

Kindest Regards,

[redacted]

From: [redacted]@seaworldabudhabi.com>
Sent: Tuesday, 13 July 2021 6:55 PM
To: [redacted]@vanaqua.org; [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: RE: Stranded orca calf in New Zealand

Hello [redacted],
Pleasure "e" meeting you and thanks for reaching out! I believe our Drs. [redacted] (SeaWorld) and [redacted] (Vancouver Aquarium) have already been in contact with Dr. [redacted] there and have shared our feeding and nutrition recommendations. I think they are waiting on bloodwork results to help direct further medical recommendations. I have included them on here so they can share with you what they shared with Dr. Whitehead already and also shorten the communication chain. No need for to many cooks in the kitchen 😉 Will be happy to setup a conference or Microsoft teams call if you would like. I can be available any time that works for everybody. I watched some of this on the news, great job on the monumental effort your team has put in thus far. Hopefully we can get this little guy back on track!
Please do not hesitate to reach out for anything, always happy to help.
[redacted]

<image006.png>

[redacted]
Animal Health and Welfare Director
Zoological
M [redacted]
D [redacted]
E [redacted]@seaworldabudhabi.com
W www.seaworldabudhabi.com

PO BOX 128717, ABU DHABI, UAE
Operated by Farah Experiences LLC

From: [redacted]
Sent: Monday, July 12, 2021 11:16 PM

To: [redacted]@seaworldabudhabi.com>
Subject: Stranded orca calf in New Zealand

Kia ora (hello) from New Zealand,

My name is [redacted] and I am a wildlife veterinarian working for the Department of Conservation in New Zealand. I received your contact from [redacted] as a veterinarian who may be able to help provide advice with regards to an orca calf that stranded here just under 48 hours ago. I am on the technical advisory group for the response to this situation and am hoping to provide a strong veterinary voice to the recommendations.

A bit of history on the calf - Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded – report is that it was swept up into a rock pool and stranded there. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependent on the mother. Unfortunately despite extensive searching yesterday both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. From videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night. Last night the calf was kept in the water and the mobility appears to be slowly improving but is still not great.

A Zoo veterinarian attended the site yesterday afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended following advice from Sarah. I have not heard as to what the assessment was or how the procedure went at this stage.

We know the chances of a dependant calf being reunited with a pod are slim but the technical advisory group has been requested to investigate options for supporting the calf to allow time for an attempt to be made.

I was particularly reaching out to you all to seek advice on the what are the **feeding recommendations for an orca calf** if the decision was made to persist with attempts to relocate the pod. Given being located in NZ we have a lot of milk replacers for domestic animals but certainly nothing specific for cetaceans so I am not sure if there is anything in the country that would even work as a milk replacer.

Very keen to have any thoughts or advice you have on this case. Sarah has been fabulous and provided wonderful initial advice it just both our knowledge is very limited in the nutrition of neonatal cetaceans hence reaching out to you all.

Thank you so much for your time and any thoughts,

Kindest Regards,

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Saturday, 17 July 2021 5:06 am
To: [redacted]
Cc: [redacted]; [redacted]@vanaqua.org; [redacted]
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

[redacted],

The estimated age of the calf should not change the current nutritional plan. I would however emphasize that with hand-rearing, we utilize weight gain to ensure that calves are getting the appropriate calories and growing. Caloric needs are predicated on energy expenditure (swimming/diving activity and thermoregulation), so fat content within the diet, volume and frequency of feedings may need to be adjusted to get adequate weight gain. Body weight measurements are optimal, but recorded sequential measurements of length and girth can provide an estimate of growth.

Regards,
[redacted]

From: [redacted]
Sent: Friday, July 16, 2021 8:55 AM
To: [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so much for the quick confirmation of what I suspected. I have passed your message directly on to the decision making team.

Do let us know if this changes anything we should be doing veterinary or nutrition wise in the immediate short term.

Thank you again,

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Saturday, 17 July 2021 2:07 AM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]<[redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org [redacted]@vanaqua.org>; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi, based on total length from captive animals the predicted ages at lenght are listed as follows:

birth: 232 cm
1 month: 243 cm
2 month: 253 cm
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There is a large predicted error (see attached paper).

However, put the total lenght data, along with the yellow eye patch and fetal folds would all point to a very young animal < 3 months.

All information indicates that this animal is non-releasable.

Thanks, [redacted]

[redacted], DVM, PhD

Vice President of Conservation Research and Animal Health

SeaWorld Parks and Entertainment

Corporate Zoological Operations

7007 SeaWorld Drive

Orlando, FL 21821

[redacted]

[redacted]

From: [redacted]@doc.govt.nz>
Sent: Friday, July 16, 2021 12:02 AM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted] <[redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org [redacted]@vanaqua.org>; [redacted]
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi team,

We managed to get the vets on site to measure this individual for us today.

Total length 2.12m
Girth in front of dorsal fin 1.42m
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Would be very interested in how those measurements fit with other neonates (I am aware they will be from other populations but hopefully will still give some guide). As before other factors are relatively yellow eye patch, no (or few) erupted teeth and in some photos I believe I can still see foetal folds.

We are also interested in how often you would recommend repeating these measurements and which of the girth measurements is most useful for weight estimates.

Thank you so much for any thoughts.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



From: [redacted]@SeaWorld.com>
Sent: Thursday, 15 July 2021 8:31 AM
To: Lydia Uddstrom <luddstrom@doc.govt.nz>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

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[redacted]

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We will continue to help, as much as possible,
Regards,
[redacted]

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Sent: Wednesday, July 14, 2021 2:32 AM
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Cc: [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>;

[redacted]@vanaqua.org; [redacted]
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted],

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Once again thank you all so very much for your support and help from afar – it is appreciated more than you will ever know as we will not be able to properly express our thanks.

Kindest Regards,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
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<image001.png>

<image002.png>

<image003.png>

<image004.jpg>

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Sent: Wednesday, 14 July 2021 5:38 AM
To: [redacted]
<[redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]
[redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>;
[redacted]@vanaqua.org; [redacted]
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Who should be the main contact from NZ?
I will be the main contact for SeaWorld and will share information with my colleagues.

What is the short-term plan and is there a long term contingency plan?
I understand that a more scheduled feeding regimen was to begin, in the past 12 hrs, how is that going?
Do you plan to get another blood sample?

With regards,
[redacted]

[redacted], **DVM** | Sr. Veterinarian
SEA An mal Health and Rescue Hospital
500 SeaWorld Drive | San Diego | CA 92109
[redacted]

<image005.jpg>

From: [redacted]
Sent: Tuesday, July 13, 2021 5:01 AM
To: [redacted]@seaworldabudhabi.com>; [redacted]@vanaqua.org;
[redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

H[redacted]

Thank you so very much for your message and the support of the team already. We are all so very appreciative of all the advice and help in ensuring this little calf gets the best possible chance at being stable and in a condition it could be returned if the pod were found.

Time Zones could be a little challenging but if there was a possibility to talk to some or all of you via teams tomorrow that would be very much appreciated and I would be keen to make any meeting work that would suit you all (I will be asleep for the next 8 ish hours but back on line from about

7:30 NZ time tomorrow). We cast a very wide net in the initial messages as we know you are all incredibly busy and weren't sure if people would be able to respond to us – the response has been overwhelming in the level of support which has been incredible heart-warming – that said definitely keen to streamline comms with the most appropriate people.

Let me know if you are indeed available for a talk via teams,

Thank you again so much for the support you have all provided,

Kindest Regards,

[redacted]

From: [redacted]@seaworldabudhabi.com>
Sent: Tuesday, 13 July 2021 6:55 PM
To: [redacted]@vanaqua.org; [redacted] [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: RE: Stranded orca calf in New Zealand

Hello [redacted],
Pleasure "e" meeting you and thanks for reaching out! I believe our [redacted] (SeaWorld) and [redacted] (Vancouver Aquarium) have already been in contact with Dr. [redacted] there and have shared our feeding and nutrition recommendations. I think they are waiting on bloodwork results to help direct further medical recommendations. I have included them on here so they can share with you what they shared with Dr. [redacted] already and also shorten the communication chain. No need for to many cooks in the kitchen 😉 Will be happy to setup a conference or Microsoft teams call if you would like. I can be available any time that works for everybody. I watched some of this on the news, great job on the monumental effort your team has put in thus far. Hopefully we can get this little guy back on track!
Please do not hesitate to reach out for anything, always happy to help.
[redacted]

[redacted]
Animal Health and Welfare Director
Zoological
[redacted]
E [redacted]@seaworldabudhabi.com
W www.seaworldabudhabi.com

PO BOX 128717, ABU DHABI, UAE
Operated by Farah Experiences LLC

<image006.png>

From: [redacted]
Sent: Monday, July 12, 2021 11:16 PM
To: [redacted]@seaworldabudhabi.com>
Subject: Stranded orca calf in New Zealand

Kia ora (hello) from New Zealand,

My name is [redacted] and I am a wildlife veterinarian working for the Department of Conservation in New Zealand. I received your contact from [redacted] as a veterinarian who may be able to help provide advice with regards to an orca calf that stranded here just under 48 hours ago. I am on the

technical advisory group for the response to this situation and am hoping to provide a strong veterinary voice to the recommendations.

A bit of history on the calf - Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded – report is that it was swept up into a rock pool and stranded there. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependent on the mother. Unfortunately despite extensive searching yesterday both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. From videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night. Last night the calf was kept in the water and the mobility appears to be slowly improving but is still not great.

A Zoo veterinarian attended the site yesterday afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended following advice from Sarah. I have not heard as to what the assessment was or how the procedure went at this stage.

We know the chances of a dependant calf being reunited with a pod are slim but the technical advisory group has been requested to investigate options for supporting the calf to allow time for an attempt to be made.

I was particularly reaching out to you all to seek advice on the what are the **feeding recommendations for an orca calf** if the decision was made to persist with attempts to relocate the pod. Given being located in NZ we have a lot of milk replacers for domestic animals but certainly nothing specific for cetaceans so I am not sure if there is anything in the country that would even work as a milk replacer.

Very keen to have any thoughts or advice you have on this case. Sarah has been fabulous and provided wonderful initial advice it just both our knowledge is very limited in the nutrition of neonatal cetaceans hence reaching out to you all.

Thank you so much for your time and any thoughts,

Kindest Regards,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
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http://kakaporecovery.org.nz/

<image001.png>

<image002.png>

<image003.png>

<image007.jpg>

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Saturday, 17 July 2021 4:55 am
To: [redacted]
Cc: [redacted]@vanaqua.org; Justin Rosenberg
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted],

I am not sure what recommendations have been made so I cannot say if changes need to be done. However, I have full confidence in Dr. [redacted] and others on this list to continue to adjust and make recommendations for the calf as needed.

Take care, [redacted]

From: [redacted]
Sent: Friday, July 16, 2021 11:55 AM
To: [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted] <[redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so much for the quick confirmation of what I suspected. I have passed your message directly on to the decision making team.

Do let us know if this changes anything we should be doing veterinary or nutrition wise in the immediate short term.

Thank you again,

[redacted]

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To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org [redacted]@vanaqua.org>; [redacted]
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7007 SeaWorld Drive

Orlando, FL 21821

[redacted]

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[redacted], **DVM** | Sr. Veterinarian
SEA An mal Health and Rescue Hospital
500 SeaWorld Drive | San Diego | CA 92109
[redacted]

<image005.jpg>

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Sent: Tuesday, July 13, 2021 5:01 AM
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[redacted]

<image006.png>

[redacted]
Animal Health and Welfare Director
Zoological
[redacted]
[redacted]@seaworldabudhabi.com
W www.seaworldabudhabi.com

PO BOX 128717, ABU DHABI, UAE
Operated by Farah Experiences LLC

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My name is [redacted] and I am a wildlife veterinarian working for the Department of Conservation in New Zealand. I received your contact from [redacted] as a veterinarian who may be able to help provide advice with regards to an orca calf that stranded here just under 48 hours ago. I am on the technical advisory group for the response to this situation and am hoping to provide a strong veterinary voice to the recommendations.

A bit of history on the calf - Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded – report is that it was swept up into a rock pool and stranded there. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependent on the mother. Unfortunately despite extensive searching yesterday both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. From videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night. Last night the calf was kept in the water and the mobility appears to be slowly improving but is still not great.

A Zoo veterinarian attended the site yesterday afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended following advice from Sarah. I have not heard as to what the assessment was or how the procedure went at this stage.

We know the chances of a dependant calf being reunited with a pod are slim but the technical advisory group has been requested to investigate options for supporting the calf to allow time for an attempt to be made.

I was particularly reaching out to you all to seek advice on the what are the **feeding recommendations for an orca calf** if the decision was made to persist with attempts to relocate the pod. Given being located in NZ we have a lot of milk replacers for domestic animals but certainly nothing specific for cetaceans so I am not sure if there is anything in the country that would even work as a milk replacer.

Very keen to have any thoughts or advice you have on this case. Sarah has been fabulous and provided wonderful initial advice it just both our knowledge is very limited in the nutrition of neonatal cetaceans hence reaching out to you all.

Thank you so much for your time and any thoughts,

[redacted],

Lydia

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/

<image001.png>

<image002.png>

<image003.png>

<image007.jpg>

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Saturday, 17 July 2021 2:07 am
To: [redacted]
Cc: [redacted]
a@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand
Attachments: Clark_et_al-2000-Marine_Mammal_Science.pdf

Hi, based on total length from captive animals the predicted ages at lenght are listed as follows:

birth: 232 cm
1 month: 243 cm
2 month: 253 cm
3 month: 262 cm
4 month: 270 cm
5 month: 278 cm
6 month: 286 cm

There is a large predicted error (see attached paper).

However, put the total lenght data, along with the yellow eye patch and fetal folds would all point to a very young animal < 3 months.

All information indicates that this animal is non-releasable.

Thanks, [redacted]

[redacted], DVM, PhD
Vice President of Conservation Research and Animal Health
SeaWorld Parks and Entertainment
Corporate Zoological Operations

7007 SeaWorld Drive
Orlando, FL 21821
[redacted]

From: [redacted]@doc.govt.nz>
Sent: Friday, July 16, 2021 12:02 AM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]
[redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org
[redacted]@vanaqua.org>; [redacted]
Subject: RE: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi team,

We managed to get the vets on site to measure this individual for us today.

Total length 2.12m
Girth in front of dorsal fin 1.42m
Girth behind dorsal fin 1.17m

Would be very interested in how those measurements fit with other neonates (I am aware they will be from other populations but hopefully will still give some guide). As before other factors are relatively yellow eye patch, no (or few) erupted teeth and in some photos I believe I can still see foetal folds.

We are also interested in how often you would recommend repeating these measurements and which of the girth measurements is most useful for weight estimates.

Thank you so much for any thoughts.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



From: [redacted]@SeaWorld.com>
Sent: Thursday, 15 July 2021 8:31 AM
To: [redacted]
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

We have not received any measurements, a length and girth measurement would help tremendously!

[redacted]

On Jul 14, 2021, at 1:22 PM, [redacted] wrote:

Good morning (afternoon?) to you all,

Thanks you very much for this information you are echoing all our concerns and the advice that we have been providing to the decision makers since day one. The biology space with regards to orca in NZ is challenging as there is one person who holds this information and therefore no way to independently verify the accuracy. The information given on day one was that the pod this calf was from is known but it is one that is occasionally seen then disappears for months on end.

I was also wondering if I could seek clarification as to an age estimate on this individual – I have requested the length measurements (or you may already have them) but in discussions with the Zoo team yesterday they indicated that the calf does not yet have erupted teeth. From the information I can find that would indicate this animal is less than 3 months old (current estimates being provided by the biologist are that it is 4-6 months old). Would appreciated any thoughts you have on verifying the age.

Just reiterating there is no facility in New Zealand that can take this animal and at this stage the possibility of sending off-shore for permanent care is not considered an option. The only only long term option (which I don't feel is a real option) would be to fully hand-raise then attempt to re-wild. Would love any thoughts on have on that as well.

Thanks again for your support,

[redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 15 July 2021 4:07 AM
To: [redacted]@doc.govt.nz>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>; [redacted]@vanaqua.org; [redacted]>
Subject: RE: Stranded orca calf in New Zealand

Good day [redacted] and all,

We appreciate all your efforts for trying to support this calf and I echo [redacted] comments about disposition of a dependent calf. If a suitable long term home is not available in NZ or Australia then you and your Team will need to make a decision on how long to continue the supportive management of the calf … I agree, that with each day the outlook for a successful reintroduction wanes and the overall welfare of the calf will weigh heavy into the decision-making …
do the biologists have an idea of how often the pod travels by the site location?

We will continue to help, as much as possible,
Regards,
[redacted]

From: [redacted]
Sent: Wednesday, July 14, 2021 2:32 AM
To: [redacted]@SeaWorld.com>; [redacted]
<[redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>;

[redacted]@vanaqua.org; [redacted]
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so much and thank you again all for your support thus far! [redacted] (senior vet at Wellington Zoo) has looped me in on your direct clinical advice email thread which is fabulous and much appreciated. Very keen for you to continue to liaise directly with the Wellington Zoo team with regards to direct day to day medical care though I would very much appreciate staying in the loop.

My role is to help collate and provide technical advice to the Department of Conservation team with regards to ongoing plans for this calf and to help with interpretation of the veterinary advice so that the decision makers can make decisions based on the best advice available. As such I am keen to start having conversations around medium to longer term health monitoring in an attempt to get some objective measure in place to help assess how this individual is doing.

We are also keen to have input into long term prognosis for return to the wild. As you are no doubt aware there are no facilities in New Zealand that can provide long-term care for a cetacean neonate. We are very concerned about the level of habituation to humans that is already occurring in such a young animal and are interested in any thought on realistic ability to return this individual to the pod (sssuming it can be found). We note that everything we have read indicates that a neonate of this age in any other location would be deemed non-releasable and placed in permanent human care. I am not saying it is impossible that a return to the pod might happen but it feels more unlikely with every day that passes.

I am not sure if this is the right forum for these kinds of conversations or if you would rather focus on providing advice on the medical stabilisation and nutritional support side of things. If the latter is the case have you any suggestions as to the right people we should be talking to about longer term prognosis?

Once again thank you all so very much for your support and help from afar – it is appreciated more than you will ever know as we will not be able to properly express our thanks.

Kindest Regards,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/

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<image003.png>

<image004.jpg>

From: [redacted]@SeaWorld.com>
Sent: Wednesday, 14 July 2021 5:38 AM
To: [redacted]
[redacted]@wellingtonzoo.com>
Cc: [redacted]@SeaWorld.com>; [redacted]
[redacted]@seaworldabudhabi.com>; [redacted]@SeaWorld.com>;
[redacted]@vanaqua.org; [redacted]@gmail.com>
Subject: RE: Stranded orca calf in New Zealand

Hi [redacted],

We are interested in helping from afar, but obviously understand the challenges with the situation. One thing that would help, would be to have one spokesperson from NZ, as there appears to be 2 email strings about this calf…so I'm looking to consolidate information about calf coming to us at SeaWorld and [redacted] at Vancouver and [redacted]

Who should be the main contact from NZ?
I will be the main contact for SeaWorld and will share information with my colleagues.

What is the short-term plan and is there a long term contingency plan?
I understand that a more scheduled feeding regimen was to begin, in the past 12 hrs, how is that going?
Do you plan to get another blood sample?

With regards,
[redacted]

[redacted] | Sr. Veterinarian
SEA An mal Health and Rescue Hospital
500 SeaWorld Drive | San Diego | CA 92109
[redacted]

<image005.jpg>

From: [redacted]
Sent: Tuesday, July 13, 2021 5:01 AM
To: [redacted]@seaworldabudhabi.com>; [redacted]@vanaqua.org;
[redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi [redacted]

Thank you so very much for your message and the support of the team already. We are all so very appreciative of all the advice and help in ensuring this little calf gets the best possible chance at being stable and in a condition it could be returned if the pod were found.

Time Zones could be a little challenging but if there was a possibility to talk to some or all of you via teams tomorrow that would be very much appreciated and I would be keen to make any meeting work that would suit you all (I will be asleep for the next 8 ish hours but back on line from about

7:30 NZ time tomorrow). We cast a very wide net in the initial messages as we know you are all incredibly busy and weren't sure if people would be able to respond to us – the response has been overwhelming in the level of support which has been incredible heart-warming – that said definitely keen to streamline comms with the most appropriate people.

Let me know if you are indeed available for a talk via teams,

Thank you again so much for the support you have all provided,

Kindest Regards,

[redacted]

From: [redacted]@seaworldabudhabi.com>
Sent: Tuesday, 13 July 2021 6:55 PM
To: [redacted]@vanaqua.org; [redacted] [redacted]@SeaWorld.com>; [redacted]@SeaWorld.com>
Subject: RE: Stranded orca calf in New Zealand

Hello [redacted],
Pleasure "e" meeting you and thanks for reaching out! I believe our [redacted] (SeaWorld) and [redacted] (Vancouver Aquarium) have already been in contact with Dr. [redacted] there and have shared our feeding and nutrition recommendations. I think they are waiting on bloodwork results to help direct further medical recommendations. I have included them on here so they can share with you what they shared with Dr. [redacted] already and also shorten the communication chain. No need for to many cooks in the kitchen 😉 Will be happy to setup a conference or Microsoft teams call if you would like. I can be available any time that works for everybody. I watched some of this on the news, great job on the monumental effort your team has put in thus far. Hopefully we can get this little guy back on track!
Please do not hesitate to reach out for anything, always happy to help.
[redacted]



[redacted]
Animal Health and Welfare Director
Zoological
[redacted]
E [redacted]@seaworldabudhabi.com
W www.seaworldabudhabi.com

PO BOX 128717, ABU DHABI, UAE
Operated by Farah Experiences LLC

From: [redacted]
Sent: Monday, July 12, 2021 11:16 PM
To: [redacted]@seaworldabudhabi.com>
Subject: Stranded orca calf in New Zealand

Kia ora (hello) from New Zealand,

My name is [redacted] and I am a wildlife veterinarian working for the Department of Conservation in New Zealand. I received your contact from [redacted] as a veterinarian who may be able to help provide advice with regards to an orca calf that stranded here just under 48 hours ago. I am on the

technical advisory group for the response to this situation and am hoping to provide a strong veterinary voice to the recommendations.

A bit of history on the calf - Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded – report is that it was swept up into a rock pool and stranded there. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependent on the mother. Unfortunately despite extensive searching yesterday both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. From videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night. Last night the calf was kept in the water and the mobility appears to be slowly improving but is still not great.

A Zoo veterinarian attended the site yesterday afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended following advice from [redacted]. I have not heard as to what the assessment was or how the procedure went at this stage.

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Very keen to have any thoughts or advice you have on this case. [redacted] has been fabulous and provided wonderful initial advice it just both our knowledge is very limited in the nutrition of neonatal cetaceans hence reaching out to you all.

Thank you so much for your time and any thoughts,

Kindest Regards,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/

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ASPECTS OF GROWTH IN CAPTIVE KILLER WHALES (*ORCINUS ORCA*)

STEVEN T. CLARK
DANIEL K. ODELL
C. THAD LACINAK
SeaWorld, Inc.,
Corporate Zoological Operations,
7007 SeaWorld Drive,
Orlando, Florida 32821-8097, U.S.A.
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ABSTRACT

Morphometrics from 25 captive killer whales (11 captive-born) were collected at SeaWorld parks from 1984 to 1995 to determine age-specific growth parameters. For sexes combined, the body-volume index was the most accurate predictor of body weight. However, predicting weight from total length was appropriate, although it may underestimate weight of pregnant animals. Among captive-born calves, a Gompertz model was the best predictor of weight and length at age. Estimates for length and weight at birth were done using data from *in utero* and neonatal calves. For ages 1–5 yr, models indicate that males grew in both weight and length at slower rates. Growth rates in males may surpass those of females at approximately 5–6 yr of age.

Key words: cetacean age and growth, Gompertz, body-volume index, captive cetaceans.

Documentation of growth rates for free-ranging killer whales (*Orcinus orca*) is an important part of understanding their life history. Any study intending to document growth rates has two basic components. There must be some accurate determination of size (*e.g.*, body length or weight) and age. In general, among odontocetes, counting dentinal growth layer groups (GLGs) is one of the methods by which age is estimated (Kasuya *et al.* 1974, Perrin *et al.* 1976, Lockyer 1978, Perrin and Henderson 1984, Myrick *et al.* 1988, Hohn *et al.* 1989, Read *et al.* 1993, Amano *et al.* 1996, Fernandez and Hohn 1998) and has been used in killer whale studies as well (Christensen 1982, 1984). Photogrammetric analyses (Bigg 1982, Heimlich-Boran 1986) or information gathered during whaling operations can be used to determine killer whale size and estimated age through allometric relationships (Tomilin 1957, Nishiwaki and Handa 1958, Olesiuk *et al.* 1990, Guinet and Bouvier 1995).

All of the methods described have their limitations and may be subject to

bias, most likely due to the difficulties in gathering information from wild marine mammals (Anderson and Fedak 1987, Gales 1989, Deutsch *et al.* 1990). The analysis of GLGs may be biased depending on the skill and expertise of the investigator (Hohn 1990). Gathering information about allometric growth rates through photogrammetric techniques requires predictions from structures visible to the investigator and assumes allometric growth between these structures. Finally, since the focus of many whaling operations was not necessarily scientific in nature, data such as length, weight, and sex may have been occasionally misinterpreted and samples of teeth (for GLG analysis) may have been lost. Gathering accurate age, growth, and allometric information from wild populations of killer whales is difficult.

Thus, analyses of data from captive populations can provide a valuable tool to add to our knowledge of life history parameters of killer whales and other odontocetes (*e.g.,* Kasuya *et al.* 1986, Duffield and Miller 1988).

Materials and Methods

SeaWorld parks have maintained killer whales since 1965 (Duffield *et al.* 1995). Data for this study were collected through December 1995 on 25 animals (16 females, of which 7 were captive-born; 9 males, 4 captive-born). Because the exact birth dates of the captive-born animals are known, a time series of their size-at-age may be used to establish baseline growth patterns for their wild counterparts.

Animals of unknown age were used to compute allometric relationships between weight and body-volume index and between weight and total length.

As part of SeaWorld's husbandry program, all animals were measured at 2–4-wk intervals, at which time a suite of 11 measurements (based on Norris 1961) was recorded. Weights were collected approximately monthly by having whales slide out onto a hydraulic scale (Model 747-915-40; Emery Winslow Scale Company, Seymour, CT). The parameters total length (TL), girth at the anterior origin of the dorsal fin (GAODF), and body weight were analyzed. A body-volume index (BV), originally developed for Steller sea lions (*Eumetopias jubatus*) (Castellini and Calkins 1993), was calculated using the formula: $BV = TL \times (GAODF)^2$.

Linear relationships between body weight and BV were explored. All analyses involving age were carried out only for the captive-born killer whales.

Numerous models have been suggested to describe growth as a function of age. We tested the von Bertalanffy, logistic, and Gompertz models in attempts to characterize growth. Due to the prevalence of the Gompertz model in cetacean age and growth studies (Perrin and Henderson 1984, Doidge 1990, Read and Gaskin 1990, Read *et al.* 1993, Ferrero and Walker 1995, Fernandez and Hohn 1998) and its appropriateness for this particular dataset (as indicated by analysis of residuals), we used it as well to allow for interspecific comparisons. The model used follows Fitzhugh (1975):

$$WT \quad \text{or} \quad TL = W_{\text{inf}} \quad \text{or} \quad L_{\text{inf}} \times [\exp(-b \times \exp(-k \times t))]$$

where WT or TL is the weight or total length of the animal, W_{inf} or L_{inf} is the asymptotic weight or length growth value for this particular dataset, exp is the natural logarithm, b is the integration constant, k is the growth rate constant, and t is age (in days). Model-predicted weights and total lengths were used to evaluate sexual differences in growth rates. Only ages 1–6 yr were used for this comparison, as the oldest known-age male in the dataset was 6 yr old. The difference between weight or total length at 6 yr and 1 yr of age was then divided by 5 (the number of yearly intervals) to obtain an approximation of the overall mean yearly growth rate during this time period.

Analyses to estimate weight and length at birth were based upon a smaller dataset ($n = 4$) of three *in utero* calves before or at term and one calf that died at 11 d of age. Weight and length at birth were estimated directly from the model by substituting an age of 0 d into the equation; therefore, there was no variance associated with this estimate. The Gompertz model begins describing growth at conception (Laird *et al.* 1965, Jolicoeur *et al.* 1992). Hence, this allowed us to use developmental ages (evaluated as minus days of age; *e.g.*, a calf estimated at three days prior to birth would have an age of "−3") calculated from determination of estimated time of conception through analysis of female serum progesterone data (Walker *et al.* 1988, Duffield *et al.* 1995) of the three *in utero* calves as age variables in order to determine growth parameters. Due to the small size of our dataset (two males and two females), sexually dimorphic differences in weight and length at birth were not evaluated.

This study is unique in that it includes a mixture of cross-sectional (size of all animals in a dataset at particular ages) and longitudinal (multiple measurements of individual animals over a period of time) dimensions. To deal with this combination of data types we used a technique employed recently in a study which contained similarly mixed data (Read *et al.* 1993) and described in Sokal and Rohlf (1995) as jackknifing. Specifically, the jackknifing technique is a non-parametric approach to obtain model parameter estimates from a mixture of longitudinal and cross-sectional data. It consists of separating the dataset into categories, removing a particular category, then estimating model parameters on the reduced dataset. The previously removed category is then replaced and another category of data is removed. Read *et al.* (1993) separated their dataset into categories of size. In this study, categories were based on individual animals.

Model parameters were initially obtained for the entire dataset of all animals, then a particular animal's data (*e.g.*, animal 7806) were removed, the model was run again, the removed animal's data were replaced, another particular animal's data were removed and the model was run again. These iterations produced parameter estimates which are used to calculate pseudovalues for each model run by the formula: pseudovalue $= n * St - (n - 1) * S_{t-1}$; where n is number of categories in the dataset, St is the parameter estimate based upon the entire dataset, S_{t-1} is the parameter estimate based upon the dataset minus the removed animal's data. Pseudovariances associated with parameter estimates from each model run were calculated by the formula: pseu-

dovariance = (pseudovalue obtained from a particular run − average of all pseudovalues from the entire dataset)^2. Overall parameter estimates and variances were calculated by averaging the pseudovalues and pseudovariances from each model run. Standard errors and 95% confidence limits were determined from the overall variances (Sokal and Rohlf 1995).

All analyses presented in this study were done using the SYSTAT statistical package (version 6.1 for Windows, SPSS, Inc., 1996).

Results

In the analyses of weight and total length at age, models were determined from datasets containing in excess of 250 and 1,000 data points, respectively. In order to minimize confusion in App. Fig. 3–5, average weights and total lengths at various age intervals were plotted. Plots of individual trajectories and Gompertz parameter estimates of growth in weight and total length for all captiveborn calves are provided in the appendix.

Body volume index and weight—A linear relationship existed between body weight and body volume index (r^2 = 0.99) (Table 1, App. Fig. 1). The gap in data between ~70 and 80 m^3 is due to the fact that few animals in the SeaWorld collection were in this size range at the time of these analyses. Most were older individuals of unknown age or smaller animals (known-age, captiveborn calves) that had not yet achieved that size.

Total length and weight—The relationship between body weight and total length was exponential (r^2 = 0.97) (Table 1, App. Fig. 2). The poorer fit with animals at total lengths ≤350 cm was probably due to the limited data at these smaller sizes. In order to investigate the possibility that the data from the three *in utero* and one neonate calves exerted a degree of leverage on the curve, dragging it downward, models were run after removing these animals. The results of these reduced models did not significantly change the model parameter estimates.

Age and weight—Weight-at-age was described by a Gompertz relationship (r^2 = 0.90) (Table 1). Analyses of the dataset of calves <6 mo of age places weight at birth at 153.8 kg. Separate curves were fitted for males and females (Table 1, App. Fig. 3). For ages 1–6 yr, males grew slower than females (182.0 kg/yr *vs.* 247.9 kg/yr, respectively). Among males, closer inspection of Appendix Figure 4 revealed what may be an accelerated growth rate somewhere between 5 and 6 yr of age for the only captive-born male that was that old. Examination of length at 6 yr of age for this animal revealed that it was clearly outside the estimated 95% confidence intervals for asymptotic weight in Table 1.

Age and total length—A Gompertz function was used to describe the relationship (r^2 = 0.90) between age and total length (Table 1). Direct computation from the dataset of calves <6 mo of age yielded an estimated length at birth of 232.6 cm. Males grew more slowly than females for ages 1–6 yr (27.7 cm/yr *vs.* 36.0 cm/yr). However, as is evident in Appendix Figure 4 (and similar to App. Fig. 3), male growth rate appeared to increase at about 5–6 yr of age and may have became greater than the female growth rate as the

Table 1. Jackknife estimates, standard errors, and 95% confidence intervals for allometric and growth equations for captive killer whales at SeaWorld parks.

Equation	Parameter estimates	Standard errors	95% confidence intervals
Body volume index (m^3) and weight (kg)			
weight = b_0 + b_1 * body volume index			
b_0	−109.7	10.5	(−131.5)–(−87.9)
b_1	43.2	0.3	42.6–43.7
Total length (cm) and weight (kg)			
weight = a * total length^b			
a	6.0^{-6}	2.3^{-6}	1.2^{-6}–10.8^{-6}
b	3.2	0.4	2.4–3.9
Age (days) and weight (kg)			
weight = W_{inf} * [exp ($-b$ * exp)($-k$ * age))]			
sexes combined (>6 mo)			
W_{inf}	3,097.4	883.1	1,153.7–5,041.1
b	2.0	1.0^{-2}	1.8–2.3
k	5.0^{-4}	2.0^{-3}	9.0^{-5}–8.2^{-4}
sexes combined (<6 mo)			
W_{inf}	313.2	23.6	238.1–388.3
b	0.7	8.0^{-2}	0.2–4.7
k	1.0^{-2}	4.0^{-3}	(-2.7^{-3})–2.3^{-2}
males (6 mo–5 yr)			
W_{inf}	1,225.9	52.3	1,080.7–1,371.1
b	1.3	0.1	1.0–1.7
b	2.0^{-3}	3.0^{-3}	1.2^{-3}–2.8^{-3}
females (all ages)			
W_{inf}	2,763.0	273.6	2,132.1–3,393.9
b	2.3	0.2	1.8–2.8
k	7.0^{-4}	1.0^{-4}	7.7^{-4}–1.2^{-3}
Age (d) and total length (cm)			
total length = L_{inf} * [exp($-b$ * exp($-k$ * age))]			
sexes combined (>6 mo)			
L_{inf}	552.6	11.4	527.4–577.7
b	0.8	3.0^{-2}	0.7–0.8
k	1.0^{-3}	1.0^{-3}	5.0^{-4}–1.0^{-3}
sexes combined (<6 mo)			
L_{inf}	347.0	261.7	(−485.7)–1,179.7
b	0.4	0.7	(−1.8)–2.6
k	4.0^{-3}	4.0^{-3}	(-8.7^{-3})–1.7^{-2}
males (6 mo–5 yr)			
L_{inf}	413.3	8.0	391.0–435.5
b	0.6	0.1	0.3–0.9
k	3.0^{-3}	5.0^{-3}	1.6^{-3}–4.4^{-3}
females (all ages)			
L_{inf}	544.2	9.6	521.5–566.9
b	0.8	3.0^{-2}	0.7–0.9
k	1.0^{-3}	1.0^{-3}	1.2^{-3}–7.6^{-3}

average total length at age 6 was greater than the 95% confidence intervals computed for asymptotic length in Table 1.

Discussion

For the captive killer whales in this study, the body-volume index is an accurate predictor of weight. This is useful because of the logistic difficulties of obtaining weight data from animals (alive or dead) in the field or in oceanaria. Determining girth of a live animal in the field is difficult, and a relationship which predicts weight from a variable that is more easily measured (*e.g.*, total length) is necessary. However, a problem may arise when attempting to estimate the weight of female whales that might be pregnant. As would be expected, pregnant killer whales increase in girth up until parturition, rapidly declining following birth of the calf (App. Fig. 5). Therefore, using only total length as a predictor of weight could yield an underestimate. The use of the body-volume index would eliminate this problem and should be used to estimate weight of killer whales (particularly adult females) when practical.

Up until the age of 6 yr, rate of growth in total length for male and female captive-born animals was similar to that estimated by Bigg (1982) (37 cm/yr) for a similar time period in wild eastern North Pacific animals. Likewise, Duffield and Miller (1988) estimated growth rates of 21 and 39 cm/yr for wild-caught captive killer whales of Atlantic origin (their analysis supported separating North Atlantic killer whales into two groups) and 38 cm/yr in captive animals from the North Pacific. The contrasts seen in growth rates among the animals in this and previous studies may be attributable to a variety of factors including, but not limited to, differences in nutrition, energy requirement, overall health, genetic background (the genetic origin of our captive-born calves is almost exclusively Iceland), and/or parasite load.

We found for ages 1–6 yr that the male growth rate was lower than that for females. This is in contrast to Christensen (1984, fig. 4), who appears to have suggested that growth rates of male and female North Atlantic killer whale are similar up to about 15 yr old. However, comparing this work to our results may be misleading, as the regression line was fit by eye and does not contain any males between the ages of 2 and 8 yr (an important time frame in our study).

Overall, SeaWorld's male killer whales grew at slower rates in weight and length than females, at least up until about 5 or 6 yr old. The greater weights and total lengths of males seen in Figures 4 and 6 may be the result of greater birth weights and lengths. Our inadequate dataset of animals <6 mo of age did not allow this to be examined. Clearly, the magnitude of increase in the male curves in both figures began to decrease (or decay) more rapidly than in females. If these trends continued, males would end up shorter and lighter than females. How can we explain the overall greater weight and total length of adult male killer whales at SeaWorld parks (t-test, weight: $t = 5.61$; $P < 0.01$, total length: $t = 3.98$; $P < 0.01$), as well as among adult males examined in studies of wild populations (Fraser 1934, 1938; Nishiwaki and

Handa 1958; Mikhalev *et al.* 1981, Ivanshin 1981, Christensen 1984, Duffield and Miller 1988) (Table 2)? Several investigators have reported an adolescent male growth spurt in length in odontocetes (Best 1970, Cockcroft and Ross 1990, Read *et al.* 1993). For North Atlantic killer whales, Christensen (1984) reported this growth spurt at ~550–610 cm total length, which corresponds to an estimated age of 15 yr (based upon GLG counts). None of our known-age males have reached these lengths or age. An adolescent growth spurt may also account for the differences seen in the relationship between age and weight of adult males and females. What may be an accelerated growth rate in our oldest captive-born male is presumably too early to be considered an adolescent growth spurt, as this animal was just 6 yr old at the time of these analyses. Due to the limited sample size (only one animal), precise growth modeling beyond 5 yr of age in males was inappropriate. Since this animal's weight and total length at this age were clearly outside the asymptotic weight and length 95% confidence intervals, it was reasonable to assume that a significant change in growth rate may have occurred. Confirmation of this will only be substantiated by further data collection. However, the apparent increase in growth rate at approximately 5–6 yr of age was noteworthy. Perhaps growth spurts in maturing male killer whales are not limited to a single event; indeed, organismal growth appears to be a complex mixture of varying growth rates throughout ontogeny (Laird 1967). Alternatively, since this animal was not born at a SeaWorld park and was not obtained until it was approximately 3 yr old, this increase in growth may be related to its dietary or health history.

Duffield and Miller (1988) provided an alternative explanation for the attainment of larger sizes in male killer whales. They did not find accelerated male growth in total length upon reaching reproductive maturity; they suggested that the overall larger size reached by males was because they continued to grow after female growth had ceased. They suggested that the point at which growth rate decreases is different for males and females, with male growth slowing at about 12–16 yr and female growth slowing earlier, somewhere around 9–12 yr. Similar results have been described for other odontocetes (Read *et al.* 1993, Read and Tolley 1997). As the captive-born male killer whales get older, it will interesting to observe whether they exhibit either an adolescent growth spurt or continue to grow steadily after female growth has ceased.

In spite of the lack of data, model-calculated length at birth (232.6 cm) was within the range of estimates reported by other investigators (range: 213–244 cm; Fraser 1934, Scheffer and Slipp 1948, Jonsgård and Lyshoel 1970, Bigg 1982, Perrin and Reilly 1984, Heimlich-Boran 1986, Duffield and Miller 1988, Olesiuk *et al.* 1990), but shorter than the 274 cm reported by Nishiwaki and Handa (1958).

Further work should attempt to obtain data from animals less than 6 mo of age to refine estimates of the age and growth parameters. Upon examining the models, it was apparent that the gap in data between birth and 6 mo was significant. There is a consistently poorer fit at smaller sizes (weight and length) and lower ages (<6 mo) (Fig. 2, 3, 5). Growth during the first 6 mo

Table 2. Average total length (cm) and weight (kg) with standard deviations (SD) and ranges among physically mature killer whales at SeaWorld parks.

Sex	Average total length (cm)	*n*	SD	Range	Average body weight (kg)	*n*	SD	Range
Males	657.2	5	32.1	604–681	4,088.0	3	523.9	3,620–4,654
Females	548.1	13	38.4	491–622	2,441.5	8	632.9	1,887–3,874

must be substantial in order to reach the sizes predicted by the model from the birth sizes estimated. Specifically, the larger size of 6 mo-old males, in spite of a growth rate from 6 mo to 5 yr of age that was slower than that of females, suggests that either males were born and remained larger than females at least until 2 yr old or that growth in males from birth to 6 mo was greater than in females. These are questions that can only be examined as data on the first 6 mo of growth become available.

Information gained from this study may be useful in validating allometric relationships used by investigators in field studies. For instance, Heimlich-Boran (1986) correlated blowhole-to-dorsal-fin-tip length with total length in order to provide a predictor of total length from photogrammetric information. Future captive-born calves will afford us the opportunity to examine this relationship more closely.

Heimlich-Boran (1986) and Olesiuk *et al.* (1990) examined change in the height-to-width (width = base length) ratio of the dorsal fin as an indicator of male sexual maturity, a relationship that should be examined in captive-born males as they enter puberty.

In conclusion, because of the logistic problems involved with obtaining accurate estimates of age and size from wild animals, age and growth parameters from captive killer whales may provide significant insight into their life history. In spite of the likely influences of genetics, differences in nutrition, parasitic infestations, energetics, prey availability, and various other environmental conditions between captive animals and wild animals, the models presented provide baseline information for examining the dynamics of age and growth in captive and wild killer whales.

Acknowledgments

We would like to extend our thanks to C. Tompkins, T. Turner, D. Force, and M. Scarpuzzi of the animal training staff at the SeaWorld parks in California, Florida, Ohio, and Texas for the collection of data. Additionally, our appreciation is extended to Bruce Ackerman, Douglas DeMaster, Deborah Duffield, Ronald Kastelein, John E. Reynolds III, and Randall Wells for review of an earlier draft of this manuscript. Nélio B. Barros is all-deserving of thanks and appreciation for his careful editing of manuscript drafts and insightful comments pertaining to its science. Thank you to Megan Stolen for the many discussions dealing with growth models and her constant support. Finally, we are appreciative of comments on an earlier version of this manuscript from R. Ferrero and an anonymous reviewer. This is SeaWorld technical contribution No. 9603-F.

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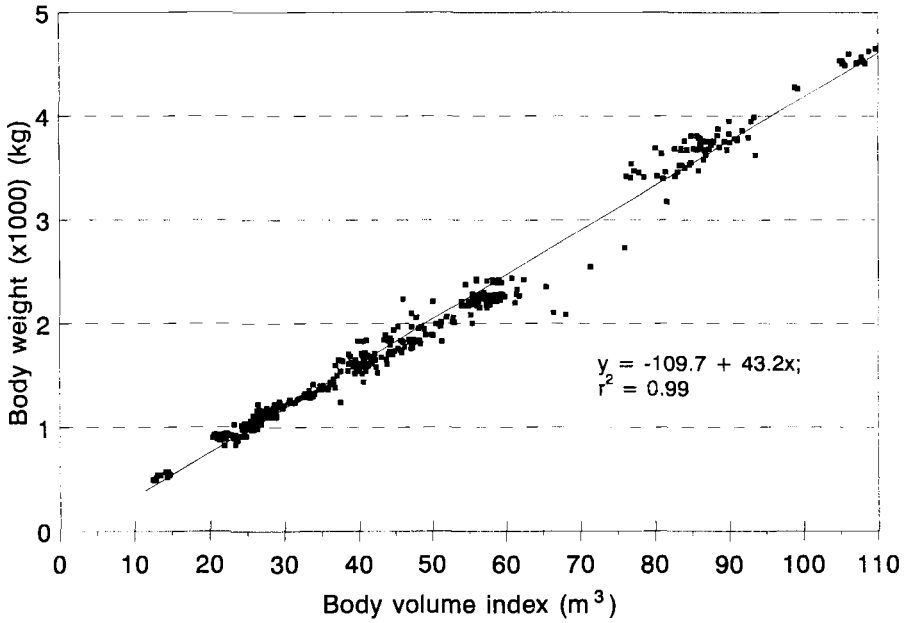
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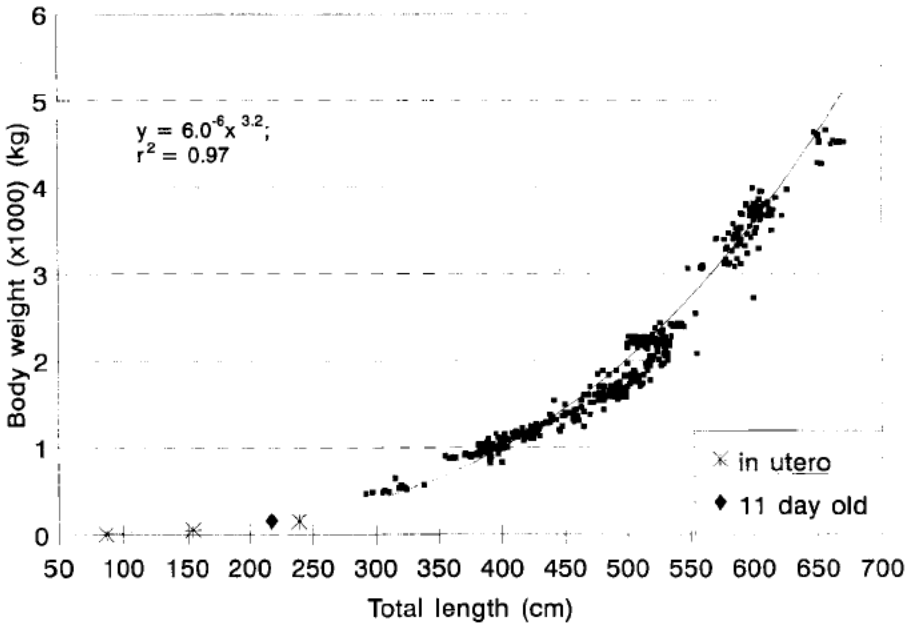
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APPENDIX

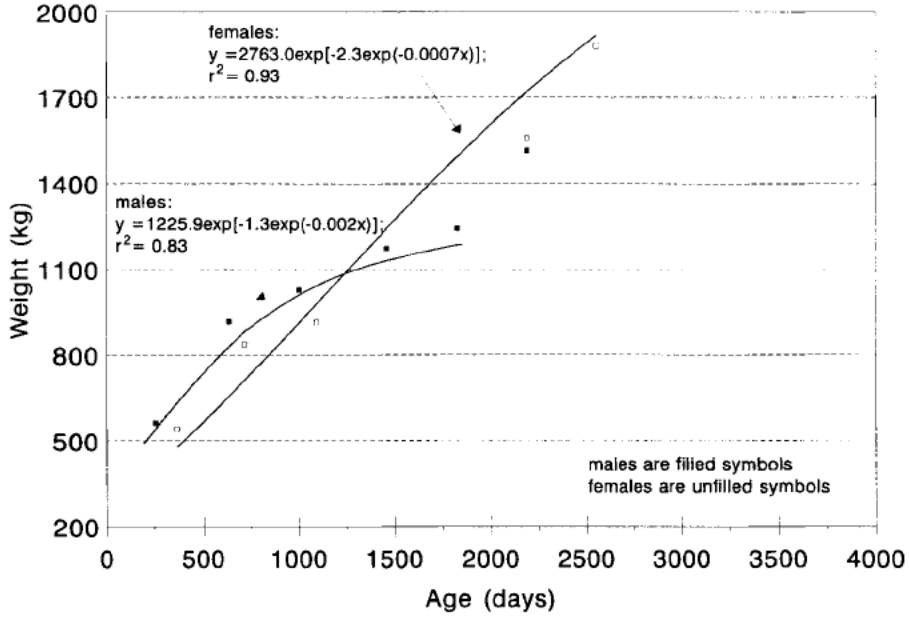
Individual trajectories of growth in weight and total length with age plotted for each captive-born calf. Identification numbers those listed as per Duffield *et al.* (1995). Gompertz parameter estimates indicated in each figure.



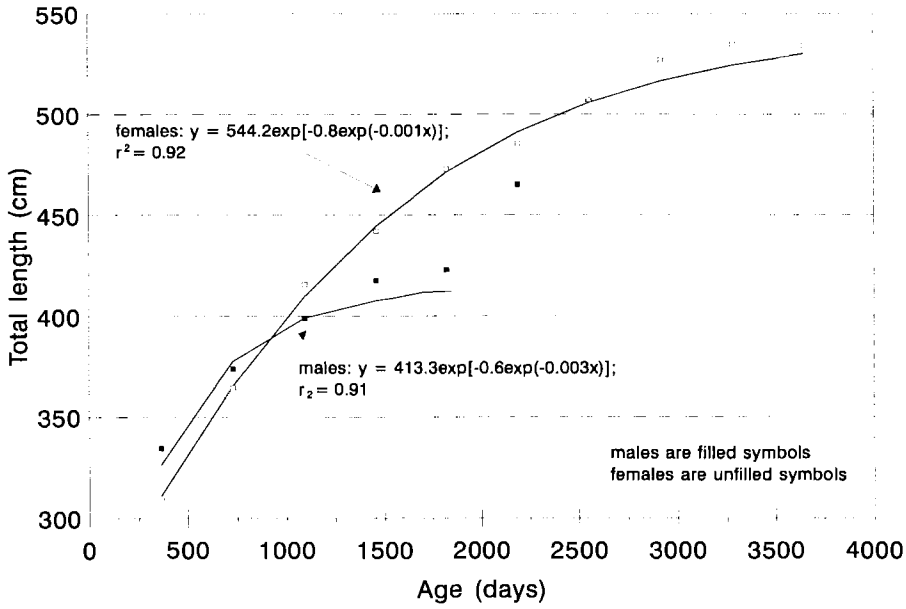
Appendix Figure 1. Linear relationship between body weight (kg) and body volume index (m^3) [= TL × $(GADOF)^2$] in captive killer whales from SeaWorld parks, sexes combined (males: n = 9; females: n = 16).



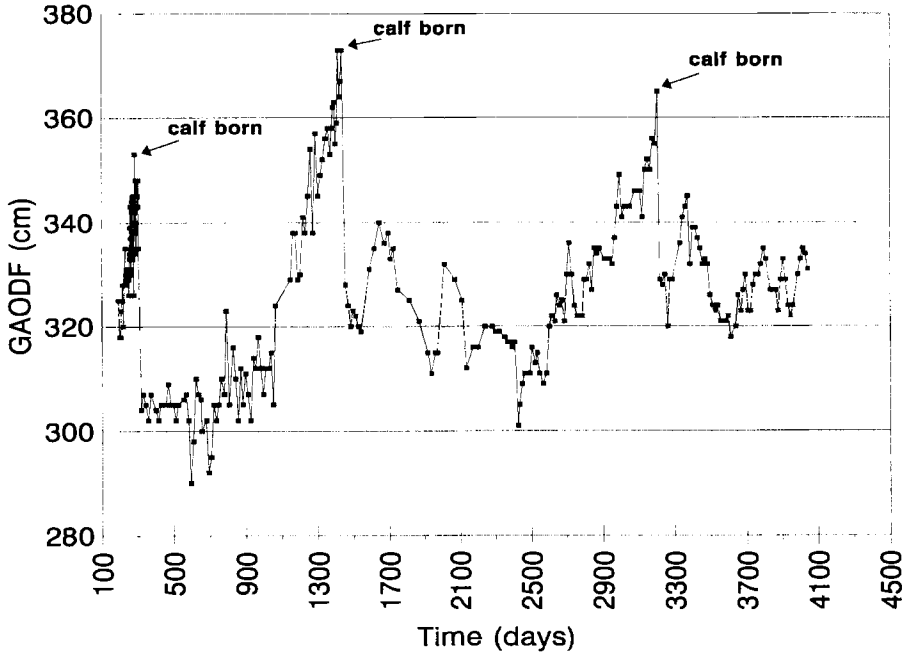
Appendix Figure 2. Exponential relationship between body weight (kg) and total length (cm) in captive killer whales from SeaWorld parks, sexes combined (males: n = 9; females: n = 16).



Appendix Figure 3. Gompertz non-linear relationship between weight (kg) and age (days) for captive killer whales from SeaWorld parks (males: n = 4; females: n = 7). Due to number of data points (n > 250), only average weights at various age intervals plotted for empirical data. Male growth model plotted until 5 yr of age (1,825 d).



Appendix Figure 4. Gompertz non-linear relationship between total length (cm)and age (d) between sexes for captive killer whales from SeaWorld parks (males: $n = 4$; females: $n = 7$). Due to number of data points ($n > 1{,}000$), only average total lengths at various age intervals plotted for the empirical data. Male growth model plotted until 5 yr of age (1,825 d).



Appendix Figure 5. Relationship between girth at anterior origin of dorsal fin (*GAODF*) (cm) and time (d) during pregnancies for female killer whale (7806) from SeaWorld parks.

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Saturday, 17 July 2021 10:29 pm
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

Many thanks for the update, I understand the situation and imagined that everybody should be terrible busy. I am really happy we have contacted.

[redacted] can make a good guess in the age of the individual based on the tables of growth of our calves. She also has the most detailed information on nutritional composition of the formula, and the amount to feed at this stage. This is really important, as there is a high risk of over feeding.

We are in the other side of the World, but if we can be of any assistance sending anything to prepare the formula, please let us know.

Best luck in taking care and finding the family pod.

Kindest regards,

[redacted]

Enviado desde mi iPad

El 17 jul 2021, a las 11:16, [redacted]> escribió:

Hi [redacted],

Thank you very much for the reply! I belive Ian and Ingrid have been busy on-site so probably aren't keeping up with email.

Thank you for the offer of advice on formula and hand rearing. We are also in consultation with a team of Sea World and Vancouver Aquarium vets who have experience in hand rearing. They have provided us with their formula which is what we have adapted based on what is avaliable in NZ for now.

Medically he appears stable at this stage - bloods have been collected twice and nothing alarming. Regular monitoring of resp rate, ins and outs, movement etc are ongoing.

I would also be interested in your teams thoughts on the age of this individual. He is 2.15m long, does not have fully erupted teeth and has the faint remnants of foetal folds still visible.

There are no facilities in NZ that house captive cetaceans and as such we are trying to determine his suitability for release to the wild.

Thank you again for reaching out - have discovered the cetacean community really is fantastic in a situation like this. Such wealth of knowledge and generosity in sharing that knowledge.

Kindest Regards,

[redacted]

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Friday, 16 July 2021 10:52 PM
To: [redacted]@doc.govt.nz>
Cc: [redacted]
[redacted]@loroparque.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Dear [redacted]

I am [redacted], director of Loro Parque Foundation, and I was trying to contact both Dr. Visser and Ian Angus to offer our help and share our experience in hand rearing orca calves from birth. I have copied [redacted], our consultant veterinarian and [redacted], DVM, one of our vets specialized in cetaceans. They can share their experience and diagnostic skills with you, as well as the critical parameters to hand rear an orca calf.

We are happy to help in any way you need to keep Toa health and safe so it can be reunited with the family pod as soon as possible.

Best regards,

[redacted]

[redacted]
Director

Loro Parque Fundación
Avda. Loro Parque • 38400 Puerto de la Cruz
[redacted]

<firma25aniv_2.jpg>

De: Formulario Contacto Loro Parque
Enviado: viernes, 16 de julio de 2021 5:25:23 (UTC) Hora del meridiano de Greenwich: Dublín, Edimburgo, Lisboa, Londres
Para: media
Asunto: Nueva consulta desde loroparque.com | Prensa | [redacted]

Nombre: [redacted]

Email: [redacted]

Teléfono: [redacted]

Mensaje: Kia Ora,

My names is [redacted] and I am a veterinarian with the Department of Conservation in New Zealand. I have been involved in the response to the stranded orca calf and saw that you were trying to reach out to offer help.

If someone was able to email on the above email address I would be interested in making contact.

Kindest Regards,

[redacted]

Caution - This message and accompanying data may contain information that is confidential or subject to legal privilege. If you are not the intended recipient you are notified that any use, dissemination, distribution or copying of this message or data is prohibited. If you received this email in error, please notify us immediately and erase all copies of the message and attachments. We apologise for the inconvenience. Thank you.

[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 11:00 pm
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA
Attachments: Cetacean artificial milk formula-2018.pdf

Hello all

I have been copied to a few mails exchanges and thought I would just add herewith our most recent formula (with which we raised two killer whale calves - that are still with us) but mainly the timing of administration. The biggest issue we found out (and the reason for failure before) is the high volume administered in a short time.

It will have to be fed 24/24 to start with until it can stabilize.

If you cannot have access to zoologica milk powder (but often to be found in zoological institutions), I have also used human milk powder - without lactose - with success.

With a size of 2,15 m - your calf will probably be about 2 to 2,5 months old (the size of our male calf at that age).

For our calves at that age, we really found out that 9L per day is a great maximum (when going higher they started developing medical problems (delay in digestion and inflammation of the digestive system), and these problems can also only be identified if you can take blood regularly and especially perform ultrasounds of the digestive system (together with being able to recognize and assess their digestive organs). They will NOT show these digestive problems behaviourally until they are pretty far. Problem is to reach the necessary calories, as mum's milk is way more caloric than what we can offer them. And the mistake then is going up with the formula.

We would start around the clock - every 2 hours - with a low volume of intubation/bottle- and then we'd raise the volume slowly up to 1000 - 1300 ml (over weeks) max per intubation/bottle and start having longer times at night without feeding.

Up to an age of 9-10 months, 12 L would be the great maximum - but generally we had to go back down to less because of changes identified in the blood and by ultrasound - all related to food.

The other major issue we have found over time is starting to feed fish too early - which I absolutely not recommend (not before 6 months of age, and still, in small quantities).

These are in the big lines the lessons we learned by raising 3 calves, 2 having been successful, and having learned the mistakes from the other one.

What is also very helpful is to add tensio-actives (simethicone) with every formula administration (certainly if by bottle), because they will swallow large quantities of air. Their abdomen is not "distendable" like in other species, and this high quantity of air in their guts can make them very uncomfortable.

Please let me know if I can help you in any other way.

Greetings

[redacted]

On 17 Jul 2021, at 12:19, Lydia Uddstrom [redacted] > wrote:

Hi [redacted]

Thank you very much for the reply! I belive Ian and Ingrid have been busy on-site so probably aren't keeping up with email.

Thank you for the offer of advice on formula and hand rearing. We are also in consultation with a team of Sea World and Vancouver Aquarium vets who have experience in hand rearing. They have provided us with their formula which is what we have adapted based on what is avaliable in NZ for now.

Medically he appears stable at this stage - bloods have been collected twice and nothing alarming. Regular monitoring of resp rate, ins and outs, movement etc are ongoing.

I would also be interested in your teams thoughts on the age of this individual. He is 2.15m long, does not have fully erupted teeth and has the faint remnants of foetal folds still visible.

There are no facilities in NZ that house captive cetaceans and as such we are trying to determine his suitability for release to the wild.

Thank you again for reaching out - have discovered the cetacean community really is fantastic in a situation like this. Such wealth of knowledge and generosity in sharing that knowledge.

Kindest Regards,

[redacted]

[redacted]

From: [redacted] @loroparque-fundacion.org>
Sent: Friday, 16 July 2021 10:52 PM
To: [redacted]
Cc: [redacted]
[redacted] @loroparque.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Dear [redacted]

I am [redacted] director of Loro Parque Foundation, and I was trying to contact both Dr. Visser and Ian Angus to offer our help and share our experience in hand rearing orca calves from birth. I have copied [redacted], our consultant veterinarian and [redacted], DVM, one of

our vets specialized in cetaceans. They can share their experience and diagnostic skills with you, as well as the critical parameters to hand rear an orca calf.

We are happy to help in any way you need to keep Toa health and safe so it can be reunited with the family pod as soon as possible.

Best regards,

[redacted]

[redacted], PhD.
Director

Loro Parque Fundación
Avda. Loro Parque • 38400 Puerto de la Cruz
[redacted]

<firma25aniv_2.jpg>

De: Formulario Contacto Loro Parque
Enviado: viernes, 16 de julio de 2021 5:25:23 (UTC) Hora del meridiano de Greenwich: Dublín, Edimburgo, Lisboa, Londres
Para: media
Asunto: Nueva consulta desde loroparque.com | Prensa | [redacted]

Nombre: [redacted]

Email: [redacted]

Teléfono: [redacted]

Mensaje: Kia Ora,

My names is [redacted] and I am a veterinarian with the Department of Conservation in New Zealand. I have been involved in the response to the stranded orca calf and saw that you were trying to reach out to offer help.

If someone was able to email on the above email address I would be interested in making contact.

Kindest Regards,

[redacted]

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notified that any use, dissemination, distribution or copying of this message or data is prohibited. If you received this email in error, please notify us immediately and erase all copies of the message and attachments. We apologise for the inconvenience. Thank you.

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

CETACEAN FORMULA

1. Blend (for 3 minutes)

- 333 ml water
- 250 gr herring (freshly defrosted- only filets to start with). Better to grind the fish prior to blending (less chunks)

2. Add & blend for another minute or until smooth

- 115 g Zoologic 30/55 powder
- 115 g of Zoologic 33/40 powder
- 25 mL of fish oil (salmon oil) (DO NOT use fish liver oil)
- 15 mL of 50% Dextrose or 7.5 g of dextrose powder
- 3.5 g lecithin
- 1.25 g of dicalcium phosphate (crushed with mortar and pestle)
- 125 mg Taurine
- 5 g salt (NaCl)
- (3 tabs lactobacillus)

3. Add another 333 ml water and blend until smooth

4. Add 50 ml heavy whipping cream (40% fat) and blend until smooth. Remove chunks if necessary for bottle feeding.

5. Add 1/2 Akwavit cetacean vitamin (Grind to powder) right before feeding (stir into formula) – (This is the same rate as you would feed per kg of fish for an adult dolphin. This will assure adequate thiamine for the calf.)

The basic formula components is to be increased proportionally to obtain the calf's volume and calories requirements.
Kcal/100 ml of formula has to be determined (fish type depending).

The preparation can be kept maximum 24 hours at 4C and needs to be slowly warmed (bain marie) until 35C for administration.

[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 9:55 pm
To: [redacted]
Cc: [redacted] Kirstie Knowles
Subject: Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

I will upload the formula we used and timing/volume of administration in a moment for a +\- 3 month old calf

Sent from my iPhone

On 17 Jul 2021, at 11:42, [redacted] > wrote:

Dear [redacted]
Many thanks for getting in touch so quickly. The whatsapp group you have joined has the NZ vets and care crew on it and your expertise is extremely valuable.

Dear DOC colleagues,
Is there anyone [redacted] should talk to directly regarding feeding, at this critical time.

Regards
[redacted]

On Sat, 17 Jul 2021, 18:42 [redacted] > wrote:

Dear all

Thank you for contacting me and I will do my outmost to help out.

My expertise, specifically related to this situation, is indeed with the care and upbringing of 2 killer whale calves that couldn't be raised by their mother. For one the mother showed no interest at all and for the other one the mother had no milk. Both are resident at Loro Parque in Tenerife with one being now 11 years old and the other one will be 3 in the fall. We have a broad experience with adapted milk formula for killer whales calves hence and the follow-up of such young animals. We also have extended references of health parameters (blood work - ultrasound - weight evolution) of very young animals.

Let me know how I can assist you. I have also just joined the WhatsApp group.

Greetings

[redacted]

On 17 Jul 2021, at 07:31, [redacted]@unipd.it> wrote:

Dear [redacted] and all the collegues involved in this event,

thanks again for your engagement of the IWC Stranding Initiative Expert Panel. We have within our strandings group exchanged some initial dialogue around the unfortunate situation in New Zealand and offer here some initial comments/ suggestions from the IWC Expert Panel. Just to note, this feedback represents the initial response of responding panelists and more feedback will likely occur when time zones of the remaining membership permit their response.

Since I'll be out of office we've decided that dr. [redacted] (in cc) could act as regional contact also because her timezone is closer than mine offering a prompt response to this situation.

In the first instance, panelists have identified a number of veterinarians and orca behaviourists whom they recommend you engage for additional input. Some of these individuals we believe may have already be linked into the WhatApp Group that has been established to offer further real time support. Names suggested included [redacted] (USA) who has experience with neonates [redacted]@ufl.edu), Ingrid Visser (New Zealand) who we understand is already on the ground, [redacted] (Hong Kong) who has captive husbandry expertise [redacted]@oceanpark.com.hk), [redacted] (USA) who was formerly at Sea World working with orca but now Director of Wildlife Health at San Diego Zoo Wildlife ([redacted]@gmail.com) and [redacted] who has a broad experience with killer whales in facilities under human care [redacted]@lacavemmvs.com); both [redacted]@oregonstate.edu) and [redacted]@zoology.ubc.ca) offer expertise in orca behaviour and ecology.In the context of the this event, we understand New Zealand has not captive or rehab facilities for cetaceans and as such, we understand this poses a greater urgency around the questions of viability and possible longer term survival.

Our understanding is there has been no confirmed sighting of the natal pod since the event itself on 11 July. In light of these facts, a couple of our panellists have noted the significant challenges and potential longer term ramifications of neonatal rescues. While all agree rapid reunification with the natal pod is the ideal outcome, we acknowledge that the opportunity to do that is rapidly diminishing. Recognizing that difficult situation, we enquire if humane euthanasia has yet been considered? We appreciate making the decision to euthanize is likely to be very difficult but we also note the extremely challenging situation that is being faced and the probability of success seems considerably less than those initial days.

If euthanasia is not being considered as an imminent option and the plan is to still release, a suggestion to satellite tag this animal for monitoring purposes has been made. Indeed, we understand the IFAW team have already sent a TDR tag. Undoubtedly reunification is the ideal outcome but the welfare cost to this individual is of course also a notable consideration. In this regard, I understand the IFAW stranding manager [redacted]@ifaw.org) and Marine Mammal Stranding Veterinarian [redacted]@ifaw.org) have recently been added to the WhatsApp channel. If welfare assessments are to be further considered, other useful contacts may include [redacted] based in Australia [redacted]@animalwelfareexpertise.com) or [redacted] based in New Zealand [redacted]@massey.ac.nz).

Hope these first information could be useful for you supporting your decisions and future steps

Best regards

[redacted]

Il 16/07/21 11:29, [redacted] ha scritto:

> Thanks [redacted]
> Can you please "reply all" to this email, as we are rotating roles as the incident progresses.
> Regards
> [redacted]
>
> ---
>
> **From:** [redacted]@unipd.it>
> **Sent:** Friday, 16 July 2021 6:17 pm
> **To:** [redacted]
> **Subject:** Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
>
> Dear [redacted]
>
> thanks for contacting me. Since I'm a vet pathologist and with poor expertise on killer whales I will pass your request the Stranding Exper Panel.
>
> In the meanwhile our expert panel, an expert from New Zealand is present (Dr. [redacted] - Massey University), if you've not yet contacted her..
>
> I will come back to you ASAP
>
> [redacted]

Il 15/07/21 23:54, [redacted] ha scritto:

Bonjourno [redacted]
We have a situation here in New Zealand of an orca calf separated from its natal pod and presently being held and cared for. Your name was mentioned (as the lead for the IWC Stranding Network Expert Panel) by [redacted] of NOAA.
We are seeking international advice on our response, and **I would like your advice on who might be the best person(s) internationally to be on an expert advisory panel**. The person would need the right expertise & experience with orca/cetacean incident management and veterinary science.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At midday the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf in a semi-enclosed boatramp area (seawater).

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching both aerial and on the water has failed to locate the pod. The calf has been kept in the water for the past few days, and was moved last night to a temporary holding pool to avoid a storm forecast. We have been getting a wide range of veterinary advice within NZ.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made.

I realise it's the middle of the night in Italy. It's possible our advisory group membership will be decided before you can reply, but it's useful in any case for you to be informed of this incident.

Can you also provide **your phone contact details** in case a call is necessary.

Kā mihi

[redacted] [redacted])
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz

<image001.png>

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--
Prof. [redacted], DVM, PhD
Dipartimento di Biomedicina Comparata e Alimentazione (BCA) - Università degli Studi di Padova
Cetaceans strandings Emergency Response Team (CERT)
Centro Interuniversitario per la Ricerca sui CEtacei (CIRCE)

AGRIPOLIS - Ed. Museo
Viale dell'Università 16
35020 - Legnaro (PD)

[redacted]

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[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium

[redacted]
www.lacavemmvs.com

[redacted]

From: [redacted]@ifaw.org>
Sent: Saturday, 17 July 2021 4:22 am
To: [redacted]
Cc:
Subject: RE: Stranded orca calf in New Zealand

Thanks [redacted]. [redacted] was the one I couldn't remember the name of when we talked yesterday. I'm not sure I would use her as an expert for this situation given (as far as I understand) her lack of experience with stranded animals and her primary experience being evaluating welfare of long-term captive cetaceans. If you are forming a panel, might be someone you could include, but I would also urge the inclusion of individuals with considerable experience making difficult decisions for stranded cetaceans. We will let you know what we hear back from our contacts for this.

[redacted]

From: [redacted]>
Date: July 16, 2021 at 12:31:19 AM EDT
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Hi [redacted]

A question for the morning – this is the person I am aware of how appears to be in the animal welfare space [redacted] Definitely has some cetacean experience but looks like predominantly in a captive situation rather than a rescue/rebab type situation.

Would love any thoughts you might have on her as a contact.

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 13 July 2021 3:50 AM
To: [redacted]
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Thanks for the great info, [redacted]. What a tough situation.

First things first – vets to contacts for continuing care/feeding for the calf, if it is decided to pursue this:

1. [redacted] – University of FL – long time (past) SeaWorld vet with tons of experience with orcas: [redacted]@ufl.edu
2. [redacted] – now with San Diego Zoo Global, but also a long-time SeaWorld vet with tons of orca experience [redacted]@SDZWA.org
3. [redacted] – SeaWorld Abu Dhabi (just transferred from SeaWorld San Diego) – time zone might be a little better for you guys and [redacted] is great to work with and he likely has the most up-to date protocols for calf rearing: [redacted]@seaworld.com

To be honest, if this stranding occurred here, I would euthanize that animal since the likelihood of success is almost non-existent based on my experience. Pods don't abandon calves without reason, so it is likely that this animal had

a pre-existing condition that led to its stranding and abandonment. But I realize that the situation there may be different from a political and cultural standpoint. And, of course that is also easier said than done if IV access is questionable (although I know DOC has significant experience with ballistic euthanasia).

Was the animal listing to the left when put back in the water for holding? In the video it looked like the calf was maintained in left lateral recumbency on the trailer. If that occurred for a long period of time, the left lung likely collapsed under the weight and hopefully can reinflate, but the atelectasis can still last hours. By holding the animal in the water, more natural chest excursion can occur, hopefully allowing the atelectasis to correct itself and also allowing the calf to oxygenate more effectively. While holding in the water, trying to do physical therapy (up and down tail movements to simulate swimming) can help to minimize potential scoliosis that can develop from stranding (muscle contraction on one side, especially when in lateral recumbency). Also do range of motion with the pectoral flippers if possible. These exercises can be done for 10-15 min at a time a few times a day to start, depending on how the animal tolerates it. Based on how that animal was held initially this would be a significant concern of mine, that the animal would develop significant muscle contracture, which is often unresolvable. Muscle relaxants can be used (like methocarbamol), in addition to pain meds and anti-inflammatories (meloxicam) to help prevent/attempt to treat, but its not always successful.

If continued care is elected, a full workup is indicated. I attached our current physical exam form that can help guide the PE. I also attached our reference ranges for both PE and bloodwork. These are largely based on stranded short beaked common dolphins since that is what we see most frequently, but should be reasonably applicable to orcas.

For a calf I would be most interested in hydration status, glucose, liver values and a CBC – but a full CBC/chem panel would be best. I would think this calf is old enough to have stabilized glucose, but that would be high on my list to check, since septicemia is possible and the animal has been fasted. Muscle enzymes (CK, LDH, AST) and lactate should be monitored for trends (may be significantly high after the night in the trailer). Anemia is a consistent negative prognostic indicator for our stranded dolphins, as is marked neutropenia. Of course look for dehydration as well on the bloodwork to guide fluid therapy.

Ultrasound examination of the calf would be useful, especially to look at the lungs for any evidence of pneumonia. Great paper on pulmonary ultrasound in dolphins attached. The calf is small enough that it is a useful tool. Of course a hearing test (AEP or BAER) would be ideal, as deafness can be a reason for calf abandonment. But I don't think anyone in NZ has the equipment to do this. Our team does – so if there is serious interest in this, we could potentially discuss. Alternatively placing hydrophones in the water to see if the calf is vocalizing at all might be another possible tool. Although we haven't used this diagnostically, and it certainly wouldn't be a definitive thing, if the calf is not vocalizing, that would be a poor prognostic indicator in my book.

Any feces or urine production that they could appreciate?

It is important to point out in general, that cetacean rehab is expensive, labor intensive and has a very low success rate historically. I fear that this calf may die within a few weeks if held in care. If it does survive and regains its health, its most likely outcome would be permanent placement in a managed care facility since likelihood of successful reintroduction to a pod would be almost nil. I really hate to be the pessimist here, but I think it is important to be realistic when taking on such an endeavor. If the pod is not relocated in the next day or two, the decision should be made whether permanent placement or euthanasia would be the most humane outcome for this animal. As more time goes on, like you said, likelihood of reintroducing to a pod is getting smaller and smaller. So I would say holding for 3-4 days total with an absolute MAX of one week (obviously would have to tube feed it ASAP) is your window for releasing. And as I mentioned before, the likelihood that the calf was not accidentally abandoned is extremely high.

I cc'd [redacted] as well in case he has anything else to add.

Happy to continue to help as best I can from here. Please keep me posted if you can. Sure wish I could be there to help and so sorry you all are having to endure this really difficult situation!

Best, [redacted]

From: [redacted]>
Sent: Monday, July 12, 2021 6:43 AM
To: [redacted]@ifaw.org>
Subject: Stranded orca calf in New Zealand

Hi [redacted]

Thank you again so vey much for answering my plea for help last night – so very much appreciated! Managed to get the calf kept in the water overnight which was a great initial step as they had been planning to trailer it again for the night.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching today both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. For videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night.

A Zoo veterinarian was attending this afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended. I have not heard as to what the assessment was or how the procedure went.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made. As such I was wondering if you were willing to provide advice on the follow points (or had any colleagues you could put me in touch with that would be willing to provide advice).

- Indicators for the health of the calf to assist in our decision-making – clinical exam? Behaviour? Any templates to assist in assessing the health of the animal?
- If the decision is to continue with oral fluids by tube is there any advice of how often this should be done?
- If the decision was to persist for longer then what are the feeding recommendations for an orca calf (I am assuming SeaWorld and Loro Parque would be the people to contact about this – do you have any direct contacts for them?)
- Also interested in what thoughts are around the releasability of an animal like this – presumably the longer it is held the lower the chances of successfully reuniting it with a pod.

Thank you so very much in advance for any thoughts or advise – It is so very much appreciated by us all.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/

[redacted]

From: Kirstie Knowles
Sent: Sunday, 18 July 2021 10:25 am
To: Dave Smith
Subject: FW: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

Hi Dave.
Email from IWC below with recommended experts (pretty much all on our radar already).
Note I don't think this group has the more recent age assessment.

Kirstie Knowles (she/her)
Manager Marine Ecosystems – *Kaimātanga Mātai Ahu Moana*
Aquatic Unit, Biodiversity Group – *Kāhui Kanorau Koiora*
Department of Conservation – *Te Papa Atawhai*
Focal point for: IUCN-WCPA, Local Gov Coastal-SIG, Sustainable Seas Challenge, NZ Marine Sciences Society
☎ [redacted]

Mon	Tues	Wed	Thurs	Fri
✓	🏠	✓	✓	🏠

✓ = In the office; 🏠 = Working remotely; X = Not at work



From: [redacted]@unipd.it>
Sent: Saturday, 17 July 2021 5:31 pm
To: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Cc: [redacted]
Subject: Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

Dear [redacted] and all the collegues involved in this event,

thanks again for your engagement of the IWC Stranding Initiative Expert Panel. We have within our strandings group exchanged some initial dialogue around the unfortunate situation in New Zealand and offer here some initial comments/ suggestions from the IWC Expert Panel. Just to note, this feedback represents the initial response of responding panelists and more feedback will likely occur when time zones of the remaining membership permit their response.

Since I'll be out of office we've decided that dr. [redacted] (in cc) could act as regional contact also because her timezone is closer than mine offering a prompt response to this situation.

In the first instance, panelists have identified a number of veterinarians and orca behaviourists whom they recommend you engage for additional input. Some of these individuals we believe may have already be linked into the WhatApp Group that has been established to offer further real time support. Names suggested included [redacted] (USA) who has experience with neonates [redacted] Ingrid Visser (New Zealand) who we understand

is already on the ground, [redacted] (Hong Kong) who has captive husbandry expertise ([redacted]@oceanpark.com.hk), [redacted] (USA) who was formerly at Sea World working with orca but now Director of Wildlife Health at San Diego Zoo Wildlife [redacted]@gmail.com) and [redacted] who has a broad experience with killer whales in facilities under human care [redacted] and [redacted]@lacavemmvs.com); both [redacted]@oregonstate.edu) and [redacted]@zoology.ubc.ca) offer expertise in orca behaviour and ecology.In the context of the this event, we understand New Zealand has not captive or rehab facilities for cetaceans and as such, we understand this poses a greater urgency around the questions of viability and possible longer term survival.

Our understanding is there has been no confirmed sighting of the natal pod since the event itself on 11 July. In light of these facts, a couple of our panellists have noted the significant challenges and potential longer term ramifications of neonatal rescues. While all agree rapid reunification with the natal pod is the ideal outcome, we acknowledge that the opportunity to do that is rapidly diminishing. Recognizing that difficult situation, we enquire if humane euthanasia has yet been considered? We appreciate making the decision to euthanize is likely to be very difficult but we also note the extremely challenging situation that is being faced and the probability of success seems considerably less than those initial days.

If euthanasia is not being considered as an imminent option and the plan is to still release, a suggestion to satellite tag this animal for monitoring purposes has been made. Indeed, we understand the IFAW team have already sent a TDR tag. Undoubtedly reunification is the ideal outcome but the welfare cost to this individual is of course also a notable consideration. In this regard, I understand the IFAW stranding manager [redacted]@ifaw.org) and Marine Mammal Stranding Veterinarian [redacted]@ifaw.org) have recently been added to the WhatsApp channel. If welfare assessments are to be further considered, other useful contacts may include [redacted] based in Australia [redacted]@animalwelfareexpertise.com) or [redacted] based in New Zealand [redacted]@massey.ac.nz).

Hope these first information could be useful for you supporting your decisions and future steps

Best regards

[redacted]

Il 16/07/21 11:29, [redacted] ha scritto:

> Thanks [redacted]
> Can you please “reply all” to this email, as we are rotating roles as the incident progresses.
> Regards
> [redacted]
>
> ---
>
> **From:** [redacted]@unipd.it>
> **Sent:** Friday, 16 July 2021 6:17 pm
> **To:** [redacted]
> **Subject:** Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
>
> Dear [redacted],
>
> thanks for contacting me. Since I'm a vet pathologist and with poor expertise on killer whales I will pass your request the Stranding Exper Panel.
>
> In the meanwhile our expert panel, an expert from New Zealand is present (Dr. [redacted] - Massey University), if you've not yet contacted her..

I will come back to you ASAP

[redacted]

Il 15/07/21 23:54, [redacted] ha scritto:

> Bonjourno [redacted]
> We have a situation here in New Zealand of an orca calf separated from its natal pod and presently being held and cared for. Your name was mentioned (as the lead for the IWC Stranding Network Expert Panel) by [redacted] of NOAA.
> We are seeking international advice on our response, and **I would like your advice on who might be the best person(s) internationally to be on an expert advisory panel**. The person would need the right expertise & experience with orca/cetacean incident management and veterinary science.
>
> A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At midday the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf in a semi-enclosed boatramp area (seawater).
>
> Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching both aerial and on the water has failed to locate the pod. The calf has been kept in the water for the past few days, and was moved last night to a temporary holding pool to avoid a storm forecast. We have been getting a wide range of veterinary advice within NZ.
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> We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made.
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> I realise it's the middle of the night in Italy. It's possible our advisory group membership will be decided before you can reply, but it's useful in any case for you to be informed of this incident.
>
> Can you also provide **your phone contact details** in case a call is necessary.
>
> Kā mihi

[redacted] [redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz

Department of Conservation
Te Papa Atawbai

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--

Prof. [redacted], DVM, PhD
Dipartimento di Biomedicina Comparata e Alimentazione (BCA) - Università degli Studi di Padova
Cetaceans strandings Emergency Response Team (CERT)
Centro Interuniversitario per la Ricerca sui CEtacei (CIRCE)

AGRIPOLIS - Ed. Museo
Viale dell'Università 16
35020 - Legnaro (PD)

[redacted]

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--

Prof. [redacted], DVM, PhD
Dipartimento di Biomedicina Comparata e Alimentazione (BCA) - Università degli Studi di Padova
Cetaceans strandings Emergency Response Team (CERT)
Centro Interuniversitario per la Ricerca sui CEtacei (CIRCE)

AGRIPOLIS - Ed. Museo
Viale dell'Università 16
35020 - Legnaro (PD)

[redacted]

[redacted]

From: [redacted]
Sent: Sunday, 18 July 2021 11:11 pm
To: Kirstie Knowles; Ian Angus; [redacted]
Subject: Fwd: FW: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

An email from [redacted] for you.
[redacted].

Sent from Workspace ONE Boxer

---------- Forwarded message ----------
From: "[redacted]@massey.ac.nz>
Date: 16/07/2021 11:59 pm
Subject: FW: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
To: [redacted]
Cc:
Kia ora[redacted]

As a member of the IWC Strandings Expert Panel, your email came to me via the IWC Chair [redacted]

Below is my email response to the IWC chair and panel which I am sending on to you directly for your reference. I am asking specific questions of this situation since I know the department would value clear international guidance in this somewhat complex situation.

Best wishes, [redacted]

From: [redacted]
Sent: Friday, 16 July 2021 10:48 PM
To: [redacted]@groups.iwc.int>
Subject: RE: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
Importance: High

Kia ora folks,

Thanks [redacted] for contacts including [redacted] – he will be a good point of contact as will any other orca specialists the panel can suggest (especially if working with wild orca). Myself, [redacted] and many in NZ have been advising to different degrees on various aspects of this orca neonate since the incident began last Sunday (we are now Friday night here – so 6 days into this event).

The confirmed body length of this male orca neonate is 2.1m (so a little less than prior estimated 2.5-3). It further has fading foetal folds, no erupted teeth and a yellowish eye patch.

New Zealand has no captive/rehab facilities for cetacean. As such, this neonate has for the previous 6 days been held in a penned off boat ramp in New Zealand's capital city of Wellington. In the last 24 hours he was relocated to a temporary salt water pool due to adverse conditions. He has received veterinary assisted feeding in the form of electrolytes, nutrients and fish oil.

Considering the developing situation – I am going to be frank and ask the IWC SEP for its expert opinion on the following;

1. How do you rate the survival probability of this individual in the coming 48-72hrs based on size and degree of dependence?

2. How do you rate the welfare impacts to this this individual in the coming 48-72hrs based on size and degree of dependence?

Apologies for these direct questions but we are now 6 days in and this situation would benefit from informed international advice. DOC are understandably having to manage multiple stakeholders in this complex situation presently so any scientific guidance that the IWC EP can provide to help inform sound decision-making would be beneficial.

Thanks in advance for your input folks – much appreciated.

[redacted]

[redacted], PhD
Professor – Marine Biology
Rutherford Discovery Fellow – Royal Society Te Aparangi

Cetacean Ecology Research Group | School of Natural and Computational Sciences | Massey University
Private Bag 102 904, North Shore, Auckland 0745, New Zealand
Physical Address: Building 5, Gate 4, The Station Crescent, Albany, Auckland, New Zealand

[redacted] http://www.cetaceanecology.org



From: [redacted]>
Sent: Friday, 16 July 2021 6:41 PM
To: [redacted]@groups.iwc.int>
Subject: Re: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE

Hi [redacted]
Ocean Park in Hong Kong had a KW for many years and although thatvwas before current head vets time, many of the staff there are the same, if you are looking for husbandry experience. Head vet at OP is [redacted] (several folks in SEP know him well) I am happy to chat to him too and HK is a closer time zone to NZ than Europe for emergency help, if ever required.

[redacted]@oceanpark.com.hk>

[redacted] used to work with OPs killer whale, she is a vet and still in HK. I can track her email down if required.

Hope helps!

Cheers
[redacted]

On Fri, 16 Jul 2021, 16:20 [redacted]@unipd.it> wrote:

Dear collegues,

I've received this request from New Zealand. I've already suggest to contact [redacted] and I think that her with other experts could provide support. Who could join this advisory group? do you know any other person out of the SEP that could help on this?

Best

[redacted]

-------- Messaggio Inoltrato --------

Oggetto: Seeking an expert advisor for an orca incident - URGENT REPLY PLEASE
Data: Thu, 15 Jul 2021 21:54:58 +0000
Mittente:[redacted]
A:s[redacted]@unipd.it [redacted]@unipd.it>

Bonjourno [redacted]
We have a situation here in New Zealand of an orca calf separated from its natal pod and presently being held and cared for. Your name was mentioned (as the lead for the IWC Stranding Network Expert Panel) by [redacted] of NOAA.
We are seeking international advice on our response, and **I would like your advice on who might be the best person(s) internationally to be on an expert advisory panel**. The person would need the right expertise & experience with orca/cetacean incident management and veterinary science.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At midday the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf in a semi-enclosed boatramp area (seawater).

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching both aerial and on the water has failed to locate the pod. The calf has been kept in the water for the past few days, and was moved last night to a temporary holding pool to avoid a storm forecast. We have been getting a wide range of veterinary advice within NZ.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made.

I realise it's the middle of the night in Italy. It's possible our advisory group membership will be decided before you can reply, but it's useful in any case for you to be informed of this incident.

Can you also provide **your phone contact details** in case a call is necessary.

Kā mihi

[redacted] [redacted]
Technical Advisor Marine | Mātanga Mātai Ahu Moana
Hokitika Office
Phone: [redacted]

www.doc.govt.nz



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[redacted]

From: [redacted]@vanaqua.org>
Sent: Sunday, 18 July 2021 2:30 pm
To: [redacted]
Cc: [redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Hi all,

Thanks for the kind words. The SeaWorld guys are the obvious experts here but a couple of points.

1) habituation of a calf is unfortunately a secondary concern. Bottle feeding may possibly increase it but really all of the handling, floating, interacting and feeding even by gavage adds to it. Babies get habituated. It's how it goes. And, unfortunately, a baby that does not get used to humans (is habituated) does not do well. These animals need that social interaction. The point is the habituation due to bottle feeding is minimal in the scope of things.

2) yes these are signs that could be associated with discomfort/colic.

3) these guys are designed to take in small amounts in very high frequency. Unfortunately we can't match the caloric density but I would increase frequency of feeding with longer intervals at night so there is a chance to rest/sleep. Sometimes folks forget that babies need to rest. And though sleep is obviously much different in cetaceans, some longer breaks from handling are a good thing.

4) if bottle feeding watch your electrolytes and make sure Na and Cl are not increasing - as in the animal is bringing in a lot of seawater. That can be a real problem

I have no problem with bottle feeding if it is meeting your needs and the animal is in positive caloric balance.

Cheers all!

[redacted]

[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]

This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they were addressed. If you have received this email in error, please notify us immediately.

On Jul 17, 2021, at 7:22 PM, [redacted]@wellingtonzoo.com> wrote:

Thanks so much [redacted], you and the rest of the team have been such an immense help to us while we do our best to support this little calf, I can't thank you enough.

We've had a few troubles with the tube feeding for the little calf in the last two days – using the tube we can technically get the food/fluid volumes in that we need to but the calf is more and more regularly going to the bottom of the pen after feeding and hunching over looking like it has some discomfort. This resolves pretty quickly, and there are no other clinical signs (during feeding or in general) but this sign is understandably giving the feeders some concerns. In the last 24 hours they have tried giving a couple of feeds from a bottle instead, to see if this helped prevent this behaviour.

The bottle feeding so far seems to be getting in the volumes we planned, although over a slightly longer feeding time, and without any signs of discomfort that they were seeing with the tube feeding.

I appreciate that there are probably risks of habituation associated with bottle feeding, but I'm also concerned that tube feeding is starting to cause some problems and may not be the most appropriate approach if these signs of post-tubing discomfort persist. I am not very familiar at all with the behaviour of this species, so I was wondering if you had any thoughts on chances/concerns of habituation with bottle feeding please, and also if you had any thoughts on the behaviours that the feeders have observed after tube feeding – are we correctly interpreting this as discomfort? If bottle feeding is appropriate, do you have any tips on how to reduce habituation?

Our current feeding plan is:

- Using a slightly modified version of your orca formula (estimated by Ashley to be ~1450kcal/L).
- We started with small volumes (250ml formula) QID on 14/07/21, making this up to a total of 3L fed per feed using ½ strength electrolyte solution (vytrate) to help maintain hydration.
- Since then we've been slowly increasing the volume of formula fed per feed (and reducing the volume of electrolytes per feed, keeping the total volume per feed at 3L).
- The ultimate plan is to eventually have the calf on all formula with no additional electrolyte solution.
- In the last two days we've increased the frequency of feeds and reduced the total volume down from 3L to see if this will reduce the post-feed clinical signs (in case he was feeling uncomfortably full), but this has not really made a difference.
- So as at 18/07/21 (today) he is receiving: 1L formula + 1L half strength electrolyte solution (2L total) every 3.5 hours, for a total of 7 feeds today (= a total of 7L formula + 7L electrolytes).
- We are planning on measuring girth/length frequently, seeing if we can find a way to weigh him regularly, and taking bloods ~2x a week to monitor PCV/TP/biochem – all to help monitor if we are meeting his caloric requirements

The search for his natal pod is ongoing. Unfortunately we've had some terrible weather and sea conditions the last two days, which severely restricted search efforts and meant that no release was possible for safety reasons (should a pod have been found). But the weather looks like it's clearing again now and the search will continue.

Thanks again for all of your time and expertise, very much appreciated.
Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
PH [redacted]
E [redacted]@wellingtonzoo.com | **W** www.wellingtonzoo.com |
<image003.jpg>
<image004.jpg>

From: [redacted]@SeaWorld.com>
Sent: 15 July 2021 14:05

To: [redacted]@vanaqua.org>; [redacted]
[redacted]@wellingtonzoo.com>
Cc: [redacted]@massey.ac.nz>; [redacted]
[redacted]d@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted]>;
[redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

I agree with [redacted]. We will often give nystatin orally TID in combination with ab therapy if an animal will be on treatment for several weeks, if short-term then not indicated.

Initially it was thought that he was listing, however from the videos, I saw him list to both sides, roll and appeared to be looking at people on the outside of the circle causing him to tilt to the side...so I did not consider it significant. Is he still doing behavior or do are you seeing any other postural abnormalities?

His history of why he stranded was suspect, so we thought it best to cover him empirically...as pneumonia/ bacterial infection, parasite migration, algal toxin, malnutrition and trauma are the most common causes of health compromise that leads to animals stranding. His clinical signs and minimum data base diagnostics rule-out many differentials, and it's possible we won't know what caused him to strand.

Hope for the best,
[redacted]

On Jul 14, 2021, at 6:25 PM, [redacted]@vanaqua.org> wrote:

Hi there,

Yes that sounds good on the meds. As for antifungals, yes they may be indicated with long term antibiotic therapy especially when more than one antibiotic has been used and of course the concurrent steroid is also a factor to consider. Kinda like in any species. But I would not automatically start it for this case. You have been pretty conservative with both Ab and steroid use. If there is an indication I would not hesitate but I see none for now.

Great work with this calf everyone.

[redacted]

Marty

<VanAqua-300px_9ae645ef-f355-45be-b66f-2816dd0c5fb8.png>

[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]
[redacted]vanaqua.org

vanaqua.org

<facebook-18-blk_1d7ea773-af19-4880-8467-5ce61bc5e535.png>
<twitter-18-blk_a1f1f5e9-0546-48c2-9556-34d0b8e37d6a.png>
<instagram-18-blk_be3f2e8d-0a56-4df9-873e-010b73748a56.png>
<youtube-18-blk_3f426358-b249-4f28-90bb-a659dbcd0f3a.png>

Vancouver Aquarium
845 Avison Way, Vancouver, BC, Canada V6G 3E2

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On Jul 14, 2021, at 6:16 PM, [redacted]
<[redacted]@wellingtonzoo.com> wrote:

Thank you [redacted], and thank you everyone so much for your help and support so far, it's been just an incredible help and we're so grateful.

He's had three doses of dex at 0.05mg/kg IM SID, so we'll give him a half dose tomorrow (0.025mg/kg IM) and then stop entirely, if you're happy with that as well?

At this stage we're planning on continuing the enrofloxacin 5mg/kg IM BID for a total of 7 days and then stopping, unless you recommend continuing on with this for longer (or shorter)?

I've had it mentioned to me by one of our biologists that antibiotic use in cetaceans often results in fungal infections, and that some people like to administer antifungals concurrently. I can't find any references to support this, so I was wondering if I could please run this (possibly silly) question past you as well please?

I've just had a quick look over the CBC and blood smear examination result that has come through from the lab and I can't see any abnormalities (will have a closer look soon). The blowhole cytology is also normal and shows no signs of inflammation.

Thanks again for all your support.
Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | **W** www.wellingtonzoo.com |
<image003.jpg>
<image004.jpg>

From: [redacted]@massey.ac.nz>
Sent: 15 July 2021 12:36
To: [redacted]@SeaWorld.com>
Cc: [redacted]@vanaqua.org>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted],
[redacted]@SeaWorld.com>; [redacted]
<[redacted]@wellingtonzoo.com>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted]
<[redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Thank you [redacted] that all makes sense. Will work on going slowly and see how he does.

From: [redacted]@SeaWorld.com>
Date: Wednesday, 14 July 2021 at 5:39 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@vanaqua.org>, [redacted]
[redacted]@wellingtonzoo.com>,
[redacted]@SeaWorld.com>, [redacted]
[redacted]@wellingtonzoo.com>, [redacted]
[redacted]@wellingtonzoo.com>,
<[redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Hi [redacted],

The 100% formula should provide all caloric requirements and hydration, so I think you can phase out the electrolyte if the calf is receiving the full amount of formula. A lot is dependent on how the calf is processing the formula, input=output, in fecal consistency(ie. Formula Pooh) and weight gain.

Changes to phase out electrolytes or volume are best done incrementally by 25-50%. Sounds like he should be able to handle more volume, based on the initial tubing, but as formula is thicker it will take more to metabolize the formula. It seems that he should be able to tolerate more volume based on initial tubing volumes.

The formula sent is a species guideline, and adjustments can be made to meet each individual's needs based on environmental differences. Please feel free to share with the local team and make necessary adjustments to ensure adequate hydration, which can be observed with changes in fecal consistently and general behavior. We will often monitor weight gain with neonates that are being fed formula to ensure adequate growth…I know this will be difficult in your scenario, however you could get consistent girth and length measurements to estimate growth rate.

I would probably phase out the steroid with decreasing doses…it is probably no longer needed.

Hope that makes sense? Let me know if I left anything out or you have addition questions,
[redacted]

On Jul 13, 2021, at 10:00 PM, [redacted] [redacted]@massey.ac.nz> wrote:

Sorry—lastly the blood glucose taken on site this morning was 6.5 mmol/L.

From: [redacted] [redacted]@massey.ac.nz>
Date: Wednesday, 14 July 2021 at 4:56 PM
To: [redacted] <[redacted]@SeaWorld.com>
Cc: [redacted] [redacted]@vanaqua.org>, [redacted] [redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted] [redacted]@wellingtonzoo.com>, [redacted] <[redacted]@wellingtonzoo.com>, [redacted] [redacted]@gmail.com>, [redacted]@doc.govt.nz [redacted]@doc.govt.nz>
Subject: Re: Stranded orca calf in New Zealand

Blood results from today attached! 😊

From: [redacted] [redacted]@massey.ac.nz>
Date: Wednesday, 14 July 2021 at 4:55 PM
To: [redacted] [redacted]@SeaWorld.com>
Cc: [redacted] [redacted]@vanaqua.org>, [redacted] [redacted] <[redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted] [redacted]@wellingtonzoo.com>, [redacted]@wellingtonzoo.com>, [redacted]

[redacted]

Subject: Re: Stranded orca calf in New Zealand

Thank you so much for your quick response and advice!

We ran a second biochem on the calf today which I've attached the results of. The biggest changes were a slight increase in PCV suspected to be secondary to dehydration and a decrease in TP. For the most part everything looks ok still. We have extra whole blood and serum saved as well. On the photo, the numbers written in parentheses were from his first blood test on the 12th.

We also started tube feeding formula this morning. We have started with introducing very small amounts of slurried formula so he only received 500 ml at each feeding today (with four total feedings or 1.6 L slurry). The initial feeding was diluted to 50% strength and each subsequent feeding has been increased by 25% strength each time so he is now getting 100% strength feeds (although these are being given with 2.5 liters of vytrate at the same time at the moment).

I've done a rough nutritional calculation for the version of the formula that we are making which gave a calorie content of approximately 5881 cal/4 L (which is one batch of recipe). Meaning he has only received ~2352 calories of feed today. This is obviously well under the recommended amount of 120 kcal/kg/day. We are wondering how quickly we should be increasing the volume of formula fed to safely meet his metabolic requirements. In the orca formula document you sent previously you mentioned not feeding greater than 13.5 L/day. Based on our formula and an estimated weight of ~200 kg he would need 16 L/day to meet his requirements. A related question is whether you have any advice around phasing out vytrate and replacing it with just formula. The formula itself is quite high water content so we were wondering if we should only be relying upon it for hydration.

Our intended feed roster for tomorrow was using 500 ml full strength formula with 2.5 liters of vytrate 4 times during the day. I know it was recommended that we feed every 2 hours and with a vet on site all day that is something we can start doing to help ramp up his caloric intake. The team on-site is closely monitoring faecal output as well.

In regards to the formula recipe that you sent, we are considering starting to get help making it from

some of the on-site vet team we have been collaborating with. Obviously we have diverged from your original recipe based on what is available to us, but we wanted to check to see if you are comfortable with us sharing the recipe for our version of your formula with that team.

For medications, the calf is receiving 5 mg/kg enrofloxacin BID and 0.05 mg/kg dexamethasone SID. We are not administering any other meds at this time.

Apologies for the lengthy email—I hope all that made sense!

Thank you so much once again and we look forward to hearing back!

[redacted]

From: [redacted]@SeaWorld.com>
Date: Wednesday, 14 July 2021 at 4:17 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@vanaqua.org>, [redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted]@wellingtonzoo.com>, [redacted]@wellingtonzoo.com>, [redacted]
Subject: Re: Stranded orca calf in New Zealand

[redacted]

Actually [redacted] commented that for this guy you could probably start lower on a midazolam dose since it is really just for an anxiolytic, recommend go with 0.1-0.15 mg/kg IM…should be plenty.

[redacted]

On Jul 13, 2021, at 6:02 PM, [redacted]@seaworld.com> wrote:

Hi [redacted]

While transport in stretcher suspended in water transport unit is recommended, transport out-of-water can be done but recognize it will cause more cardiopulmonary stress to the animal. I would look into getting a 2-3" memory foam mattress for additional comfort on the mattress, provide pectoral fin cut-outs as you have done for the mattress.

We and others have transported dolphins for advanced diagnostics (i.e. CT) for up to 4 hrs out-of-water on padded stretchers with "wetting" methods to keep skin moist. We've had adult killer whales out-of-water during procedures for up to 2 hours without significant compromise.
I would have hand sprayers or water pump sprayers (found at hardware store), towels, additional foam padding or pieces of closed-cell foam/foam mattress, waterproof sunscreen (zinc can trap heat at skin surface and lead to sloughing), in case of sun exposure or provide adequate shade during transport.
Monitor respirations, respiratory effort, heart rate (sometimes easier to see or palpate then listen too), vocals or lack thereof. Keep skin moist at all times, check pressure points if on mattress or areas that may rub.
Depending on air temp and wind, he should be able to maintain body temp, however, if you have a cable thermistor for rectal temperature that may be useful to determine if he needs thermal support (emergency space blankets are handy).
Emergency medical kit – standard ER meds, injectable midazolam (can

cause respiratory depression, dose 0.5 mg/kg IM), flumazenil 0.02 mg/kg IV/IM, butorphanol (0.1 mg/kg IM, can cause respiratory depression), naltrexone 0.1 mg/kg IM, doxopram

I can send you more specifics on dosage, if you need it…

Others may have additional suggestions, that's what's on the top of my head at moment.

How are the feedings going?

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Tuesday, July 13, 2021 4:27 PM
To: [redacted]
Cc: [redacted]@vanaqua.org>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Hello everyone,

We completed our morning treatments and got a second blood sample. At the moment we are working on developing plans to attempt a possible relocation with all the parties involved here and have been asked to provide input on the veterinary aspect of welfare of the calf during transport and relocation.

There are a number of aspects of this scenario that are concerning (and certainly something we have no experience with ourselves) so

are wondering if you have any advice to give regarding monitoring the health and welfare of this animal during the process (for example time he can safely be kept out of the water and what support is needed ie wet towels, zinc oxide if transported during day?) We can monitor basic vitals such as respiratory rate during this process but are hoping for any additional advice or recommendations.

In terms of a setup for transport we are still waiting on a sling so at the moment what we have is mattresses with areas cut out for his pectoral fins to slot into. He would be transported on this on the back of a boat out to the area of attempted release. There would be designated people to keep him wet as well. This setup would only be used if there was an attempted release prior to the arrival of a sling.

I realize this is quite a difficult attempt to coordinate and we sincerely appreciate any and all input you may have.

[redacted]

On 13/07/2021, at 8:40 PM, [redacted] wrote:

> Not sure how often you will be getting blood, but can add in a sed rate (erythrocyte sedimentation rate) to have a very crude assessment of inflammation while all other diagnostics are pending. In a pinch, I have used capillary tubes and then kept them undisturbed as vertical as possible

for an hour - after which you measure the “drop” in RBC (or the “volume” of plasma). You won’t be able to compare to any reference value, but it can be very helpful at tracking trends over time - an increasing rate of sedimentation is suggestive of worsening inflammatory disease somewhere.

As [redacted] said, keep going! Nice work so far.

[redacted]

Sent from my iPhone

On Jul 13, 2021, at 12:14 AM, Martin Haulena <Martin.Haulena@v

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Sunday, 18 July 2021 2:22 pm
To: [redacted]
Cc: [redacted]

Subject: RE: [EXTERNAL] Re: Stranded orca calf in New Zealand

Thanks so much [redacted], you and the rest of the team have been such an immense help to us while we do our best to support this little calf, I can't thank you enough.

We've had a few troubles with the tube feeding for the little calf in the last two days – using the tube we can technically get the food/fluid volumes in that we need to but the calf is more and more regularly going to the bottom of the pen after feeding and hunching over looking like it has some discomfort. This resolves pretty quickly, and there are no other clinical signs (during feeding or in general) but this sign is understandably giving the feeders some concerns. In the last 24 hours they have tried giving a couple of feeds from a bottle instead, to see if this helped prevent this behaviour. The bottle feeding so far seems to be getting in the volumes we planned, although over a slightly longer feeding time, and without any signs of discomfort that they were seeing with the tube feeding.

I appreciate that there are probably risks of habituation associated with bottle feeding, but I'm also concerned that tube feeding is starting to cause some problems and may not be the most appropriate approach if these signs of post-tubing discomfort persist. I am not very familiar at all with the behaviour of this species, so I was wondering if you had any thoughts on chances/concerns of habituation with bottle feeding please, and also if you had any thoughts on the behaviours that the feeders have observed after tube feeding – are we correctly interpreting this as discomfort? If bottle feeding is appropriate, do you have any tips on how to reduce habituation?

Our current feeding plan is:

- Using a slightly modified version of your orca formula (estimated by [redacted] to be ~1450kcal/L).
- We started with small volumes (250ml formula) QID on 14/07/21, making this up to a total of 3L fed per feed using ½ strength electrolyte solution (vytrate) to help maintain hydration.
- Since then we've been slowly increasing the volume of formula fed per feed (and reducing the volume of electrolytes per feed, keeping the total volume per feed at 3L).
- The ultimate plan is to eventually have the calf on all formula with no additional electrolyte solution.
- In the last two days we've increased the frequency of feeds and reduced the total volume down from 3L to see if this will reduce the post-feed clinical signs (in case he was feeling uncomfortably full), but this has not really made a difference.
- So as at 18/07/21 (today) he is receiving: 1L formula + 1L half strength electrolyte solution (2L total) every 3.5 hours, for a total of 7 feeds today (= a total of 7L formula + 7L electrolytes).
- We are planning on measuring girth/length frequently, seeing if we can find a way to weigh him regularly, and taking bloods ~2x a week to monitor PCV/TP/biochem – all to help monitor if we are meeting his caloric requirements

The search for his natal pod is ongoing. Unfortunately we've had some terrible weather and sea conditions the last two days, which severely restricted search efforts and meant that no release was possible for safety reasons (should a pod have been found). But the weather looks like it's clearing again now and the search will continue.

Thanks again for all of your time and expertise, very much appreciated.
Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]@SeaWorld.com>
Sent: 15 July 2021 14:05
To: [redacted]@vanaqua.org>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@massey.ac.nz>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

I agree with [redacted]. We will often give nystatin orally TID in combination with ab therapy if an animal will be on treatment for several weeks, if short-term then not indicated.

Initially it was thought that he was listing, however from the videos, I saw him list to both sides, roll and appeared to be looking at people on the outside of the circle causing him to tilt to the side…so I did not consider it significant. Is he still doing behavior or do are you seeing any other postural abnormalities?

His history of why he stranded was suspect, so we thought it best to cover him empirically…as pneumonia/ bacterial infection, parasite migration, algal toxin, malnutrition and trauma are the most common causes of health compromise that leads to animals stranding. His clinical signs and minimum data base diagnostics rule-out many differentials, and it's possible we won't know what caused him to strand.

Hope for the best,
[redacted]

> On Jul 14, 2021, at 6:25 PM, [redacted]@vanaqua.org> wrote:
>
> Hi there,
>
> Yes that sounds good on the meds. As for antifungals, yes they may be indicated with long term antibiotic therapy especially when more than one antibiotic has been used and of course the concurrent steroid is also a factor to consider. Kinda like in any species. But I would not automatically start it for this case. You have been pretty conservative with both Ab and steroid use. If there is an indication I would not hesitate but I see none for now.
>
> Great work with this calf everyone.
>
> Best wishes,
>
> [redacted]
>
> <VanAqua-300px_9ae645ef-f355-45be-b66f-2816dd0c5fb8.png>
>
> [redacted], **DVM, MSc, DACZM**
> Head Veterinarian & Director, Animal Health

P [redacted]

vanaqua.org

Vancouver Aquarium
845 Avison Way, Vancouver, BC, Canada V6G 3E2

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On Jul 14, 2021, at 6:16 PM, [redacted]@wellingtonzoo.com> wrote:

Thank you[redacted], and thank you everyone so much for your help and support so far, it's been just an incredible help and we're so grateful.

He's had three doses of dex at 0.05mg/kg IM SID, so we'll give him a half dose tomorrow (0.025mg/kg IM) and then stop entirely, if you're happy with that as well?

At this stage we're planning on continuing the enrofloxacin 5mg/kg IM BID for a total of 7 days and then stopping, unless you recommend continuing on with this for longer (or shorter)?

I've had it mentioned to me by one of our biologists that antibiotic use in cetaceans often results in fungal infections, and that some people like to administer antifungals concurrently. I can't find any references to support this, so I was wondering if I could please run this (possibly silly) question past you as well please?

I've just had a quick look over the CBC and blood smear examination result that has come through from the lab and I can't see any abnormalities (will have a closer look soon). The blowhole cytology is also normal and shows no signs of inflammation.

Thanks again for all your support.
Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]@massey.ac.nz>
Sent: 15 July 2021 12:36
To: [redacted]@SeaWorld.com>

Cc: [redacted]@vanaqua.org>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted]
[redacted]@SeaWorld.com>; [redacted]
[redacted]@wellingtonzoo.com>;
[redacted]@wellingtonzoo.com>;
[redacted]@gmail.com>; [redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Thank you [redacted]; that all makes sense. Will work on going slowly and see how he does.

From: [redacted]@SeaWorld.com>
Date: Wednesday, 14 July 2021 at 5:39 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@vanaqua.org>, [redacted]
[redacted]@wellingtonzoo.com>, [redacted]
[redacted]@SeaWorld.com>, [redacted]
[redacted]@wellingtonzoo.com>,
[redacted]@wellingtonzoo.com>,
[redacted]
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Hi [redacted]

The 100% formula should provide all caloric requirements and hydration, so I think you can phase out the electrolyte if the calf is receiving the full amount of formula. A lot is dependent on how the calf is processing the formula, input=output, in fecal consistency(ie. Formula Pooh) and weight gain.

Changes to phase out electrolytes or volume are best done incrementally by 25-50%. Sounds like he should be able to handle more volume, based on the initial tubing, but as formula is thicker it will take more to metabolize the formula. It seems that he should be able to tolerate more volume based on initial tubing volumes.

The formula sent is a species guideline, and adjustments can be made to meet each individual's needs based on environmental differences. Please feel free to share with the local team and make necessary adjustments to ensure adequate hydration, which can be observed with changes in fecal consistently and general behavior. We will often monitor weight gain with neonates that are being fed formula to ensure adequate growth…I know this will be difficult in your scenario, however you could get consistent girth and length measurements to estimate growth rate.

I would probably phase out the steroid with decreasing doses…it is probably no longer needed.

Hope that makes sense? Let me know if I left anything out or you have addition questions,
[redacted]

On Jul 13, 2021, at 10:00 PM, [redacted]
[redacted]@massey.ac.nz> wrote:

Sorry—lastly the blood glucose taken on site this morning was 6.5 mmol/L.

From: [redacted]@massey.ac.nz>
Date: Wednesday, 14 July 2021 at 4:56 PM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@vanaqua.org>, [redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted]@wellingtonzoo.com>, [redacted]@wellingtonzoo.com>, [redacted]
Subject: Re: Stranded orca calf in New Zealand

Blood results from today attached! 😊

From: [redacted]@massey.ac.nz>
Date: Wednesday, 14 July 2021 at 4:55 PM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@vanaqua.org>, [redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted]@wellingtonzoo.com>, [redacted]@wellingtonzoo.com>, [redacted]
Subject: Re: Stranded orca calf in New Zealand

Thank you so much for your quick response and advice!

We ran a second biochem on the calf today which I've attached the results of. The biggest changes were a slight increase in PCV suspected to be secondary to dehydration and a decrease in TP. For the most part everything looks ok still. We have extra whole blood and serum saved as well. On the photo, the numbers written in parentheses were from his first blood test on the 12th.

We also started tube feeding formula this morning. We have started with introducing very small amounts of slurried formula so he only received 500 ml at each feeding today (with four total feedings or 1.6 L slurry). The initial feeding was diluted to 50% strength and each subsequent feeding has been increased by 25% strength each time so he is now getting 100% strength feeds (although these are being given with 2.5 liters of vytrate at the same time at the moment).

I've done a rough nutritional calculation for the version of the formula that we are making which gave a calorie content of approximately 5881 cal/4 L (which is one batch of recipe). Meaning he has only received ~2352 calories of feed today. This is obviously well under the recommended amount of 120 kcal/kg/day. We are

wondering how quickly we should be increasing the volume of formula fed to safely meet his metabolic requirements. In the orca formula document you sent previously you mentioned not feeding greater than 13.5 L/day. Based on our formula and an estimated weight of ~200 kg he would need 16 L/day to meet his requirements. A related question is whether you have any advice around phasing out vytrate and replacing it with just formula. The formula itself is quite high water content so we were wondering if we should only be relying upon it for hydration.

Our intended feed roster for tomorrow was using 500 ml full strength formula with 2.5 liters of vytrate 4 times during the day. I know it was recommended that we feed every 2 hours and with a vet on site all day that is something we can start doing to help ramp up his caloric intake. The team on-site is closely monitoring faecal output as well.

In regards to the formula recipe that you sent, we are considering starting to get help making it from some of the on-site vet team we have been collaborating with. Obviously we have diverged from your original recipe based on what is available to us, but we wanted to check to see if you are comfortable with us sharing the recipe for our version of your formula with that team.

For medications, the calf is receiving 5 mg/kg enrofloxacin BID and 0.05 mg/kg dexamethasone SID. We are not administering any other meds at this time.

Apologies for the lengthy email—I hope all that made sense!

Thank you so much once again and we look forward to hearing back!

[redacted]

From: [redacted]@SeaWorld.com>
Date: Wednesday, 14 July 2021 at 4:17 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@vanaqua.org>, [redacted]@wellingtonzoo.com>, [redacted]@SeaWorld.com>, [redacted]@wellingtonzoo.com>, [redacted]@wellingtonzoo.com>, [redacted]
Subject: Re: Stranded orca calf in New Zealand

[redacted]

Actually [redacted] commented that for this guy you could probably start lower on a midazolam dose since it is really just for an anxiolytic, recommend go with 0.1-0.15 mg/kg IM…should be plenty.

[redacted]

On Jul 13, 2021, at 6:02 PM, [redacted] > wrote:

Hi [redacted]

While transport in stretcher suspended in water transport unit is recommended, transport out-of-water can be done but recognize it will cause more cardiopulmonary stress to the animal. I would look into getting a 2-3" memory foam mattress for additional comfort on the mattress, provide pectoral fin cut-outs as you have done for the mattress.

We and others have transported dolphins for advanced diagnostics (i.e. CT) for up to 4 hrs out-of-water on padded stretchers with "wetting" methods to keep skin moist. We've had adult killer whales out-of-water during procedures for up to 2 hours without significant compromise.
I would have hand sprayers or water pump sprayers (found at hardware store), towels, additional foam padding or pieces of closed-cell foam/foam mattress, waterproof sunscreen (zinc can trap heat at skin surface and lead to sloughing), in case of sun exposure or provide adequate shade during transport.
Monitor respirations, respiratory effort, heart rate (sometimes easier to see or palpate then listen too), vocals or lack thereof. Keep skin moist at all times, check pressure points if on mattress or areas that may rub.
Depending on air temp and wind, he should be able to maintain body temp, however, if you have a cable thermistor for rectal temperature that may be useful to determine if he needs thermal support (emergency space blankets are handy).
Emergency medical kit – standard ER meds, injectable midazolam (can cause respiratory depression, dose 0.5 mg/kg IM), flumazenil 0.02 mg/kg IV/IM, butorphanol (0.1 mg/kg IM, can cause respiratory depression), naltrexone 0.1 mg/kg IM, doxopram
I can send you more specifics on dosage, if you need it…

Others may have additional suggestions, that's what's on the top of my head at moment.

How are the feedings going?

[redacted]

From [redacted]@massey.ac.nz>
Sent: Tuesday, July 13, 2021 4:27 PM
To: [redacted]
Cc: [redacted]@vanaqua.org>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Re: [EXTERNAL] Re: Stranded orca calf in New Zealand

Hello everyone,

We completed our morning treatments and got a second blood sample. At the moment we are working on developing plans to attempt a possible relocation with all the parties involved here and have been asked to provide input on the veterinary aspect of welfare of the calf during transport and relocation.

There are a number of aspects of this scenario that are concerning (and certainly something we have no experience with ourselves) so are wondering if you have any advice to give regarding monitoring the health and welfare of this animal during the process (for example time he can safely be kept out of the water and what support is needed ie wet towels, zinc oxide if transported during day?) We can monitor basic vitals such as respiratory rate during this process but are hoping for any additional advice or recommendations.

In terms of a setup for transport we are still waiting on a sling so at the moment what we have is mattresses with areas cut out for his pectoral fins to slot into. He would be transported on this on the back of a boat out to the area of attempted release. There would be designated people to keep him wet as well. This setup would only be used if there was an attempted release prior to the arrival of a sling.

I realize this is quite a difficult attempt to coordinate and we sincerely appreciate any and all input you may have.

[redacted]

On 13/07/2021, at 8:40 PM, [redacted] > wrote:

> Not sure how often you will be getting blood, but can add in a sed rate (erythrocyte sedimentation rate) to have a very crude assessment of inflammation while all other diagnostics are pending. In a pinch, I have used capillary tubes and then kept them undisturbed as vertical as possible for an hour - after which you measure the “drop” in RBC (or the “volume” of plasma). You won’t be able to compare to any reference value, but it can be very helpful at tracking trends over time - an increasing rate of sedimentation is suggestive of worsening inflammatory disease somewhere.
>
> As [redacted] said, keep going! Nice work so far.
>
> [redacted]
>
> Sent from my iPhone
>
> On Jul 13, 2021, at 12:14 AM, [redacted] @vanaqua.org> wrote:
>
> My mistake. 41 was your reference to a normal. Not your corrected number for this animal. Agreed with [redacted]. Not unusual. But a recheck is warranted. It should not be going lower. Going down and a BUN going up with no other

obvious cause could be some GI bleeding. Also not unusual but needs addressing.

<VanAqua-300px_aa92c88f-1f67-47e7-95c0-296dd768713a.png>

[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal He

P[redacted]

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On Jul 12, 2021, at 8:40 PM, [redacted]

[redacted]

From: [redacted]@vanaqua.org>
Sent: Sunday, 18 July 2021 12:17 pm
To: Lydia Uddstrom
Cc: [redacted];
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Much appreciated!

[redacted] DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]

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On Jul 17, 2021, at 5:13 PM, [redacted]@doc.govt.nz> wrote:

Hi [redacted]

Oh goodness, please don't apologise! It is critical that we keep getting advice such us yours so that people understand the options elsewhere in the world and it is up to the decision makers here to decide what is possible based on that advice.

You are echoing the advice that has been given all along and there is power in that unity.

Thank you again,

[redacted]

From: [redacted]@vanaqua.org>
Sent: Sunday, 18 July 2021 12:10 PM
To: [redacted]@doc.govt.nz>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@seaworld.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@seaworld.com>; [redacted]@seaworld.com>; [redacted]@wellingtonzoo.com>
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Thank you and understood. Apologies for not knowing this.

Very happy to help however I can. You are in good hands with either [redacted]
M.

<image001.png>

[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]

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or entity to whom they were addressed. If you have received this email in error, please notify us immediately.

On Jul 17, 2021, at 4:49 PM, [redacted] wrote:

H[redacted] and team,

Thank you for this comment. NZ law as it is would not allow for the placement of this animal in permanent human care here in NZ or elsewhere. We are pushing forward with scenario planning and [redacted] has been contacted to hopefully be a part of that wider technical advisory group (thank you [redacted]) for a veterinary/international voice on this situation.

We will keep updating and seeking advice as you all are very much the experts in this most challenging of situations.

Many thanks to you all,

[redacted]

From: [redacted]@vanaqua.org>
Sent: Saturday, 17 July 2021 12:51 PM
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@seaworld.com>; [redacted]@wellingtonzoo.com>; [redacted]@seaworldabudhabi.com>; [redacted]@seaworld.com>; [redacted]@seaworld.com>; [redacted]@wellingtonzoo.com>
Subject: Re: [EXTERNAL] RE: Stranded orca calf in New Zealand

Hi all,

Having been in this situation a few times in my career I know that you are likely going to be faced with some difficult decisions. It sounds like you have a calf that is responding to care and you have a care and monitoring plan moving forward. I understand clearly that the primary objective is re-unification with other whales. I think everyone wants that of course. However, are there any thoughts at all at trying to place this animal should it not be releasable or is that out of the question? Obviously we have COVID issues limiting some options but are any of the Australian facilities able to provide a home for a time? I know many of the veterinary and animal care folks at Sea World Gold Coast for example. They are pretty great. I do not mean to cloud the situation at all but I know a home for non-releasable animals makes my job a lot easier.

Very best wishes on this incredible undertaking. You are all doing such a great job.

[redacted]



[redacted], DVM, MSc, DACZM
Head Veterinarian & Director, Animal Health

P [redacted]
E [redacted]@vanaqua.org

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845 Avison Way, Vancouver, BC, Canada V6G 3E2

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[redacted]

From: [redacted]@ifaw.org>
Sent: Sunday, 18 July 2021 2:32 pm
To: [redacted]
Subject: RE: Stranded orca calf in New Zealand

Happy to help however we can. Will keep an eye out.

From: [redacted]
Sent: Saturday, July 17, 2021 19:52
To: [redacted]@ifaw.org>
CC: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

H[redacted]

Just to let you know we are pushing forward today with finalising members of the international advisory group. If you had had any thoughts on who might be good to include let us know (I have put your names forward as options too, I hope that is ok).

[redacted]

From: [redacted]@ifaw.org>
Sent: Saturday, 17 July 2021 4:22 AM
To: [redacted]>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Thanks [redacted]. [redacted] was the one I couldn't remember the name of when we talked yesterday. I'm not sure I would use her as an expert for this situation given (as far as I understand) her lack of experience with stranded animals and her primary experience being evaluating welfare of long-term captive cetaceans. If you are forming a panel, might be someone you could include, but I would also urge the inclusion of individuals with considerable experience making difficult decisions for stranded cetaceans. We will let you know what we hear back from our contacts for this.

[redacted]

From: [redacted]
Date: July 16, 2021 at 12:31:19 AM EDT
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Hi [redacted]

A question for the morning – this is the person I am aware of how appears to be in the animal welfare space [redacted]. Definitely has some cetacean experience but looks like predominantly in a captive situation rather than a rescue/rebab type situation.

Would love any thoughts you might have on her as a contact.

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 13 July 2021 3:50 AM
To: [redacted]>
Cc: [redacted]@ifaw.org>
Subject: RE: Stranded orca calf in New Zealand

Thanks for the great info, [redacted]. What a tough situation.

First things first – vets to contacts for continuing care/feeding for the calf, if it is decided to pursue this:

1. [redacted] – University of FL – long time (past) SeaWorld vet with tons of experience with orcas: [redacted]@ufl.edu
2. [redacted] – now with San Diego Zoo Global, but also a long-time SeaWorld vet with tons of orca experience: [redacted]@SDZWA.org
3. [redacted] – SeaWorld Abu Dhabi (just transferred from SeaWorld San Diego) – time zone might be a little better for you guys and [redacted] is great to work with and he likely has the most up-to date protocols for calf rearing: [redacted]@seaworld.com

To be honest, if this stranding occurred here, I would euthanize that animal since the likelihood of success is almost non-existent based on my experience. Pods don't abandon calves without reason, so it is likely that this animal had a pre-existing condition that led to its stranding and abandonment. But I realize that the situation there may be different from a political and cultural standpoint. And, of course that is also easier said than done if IV access is questionable (although I know DOC has significant experience with ballistic euthanasia).

Was the animal listing to the left when put back in the water for holding? In the video it looked like the calf was maintained in left lateral recumbency on the trailer. If that occurred for a long period of time, the left lung likely collapsed under the weight and hopefully can reinflate, but the atelectasis can still last hours. By holding the animal in the water, more natural chest excursion can occur, hopefully allowing the atelectasis to correct itself and also allowing the calf to oxygenate more effectively. While holding in the water, trying to do physical therapy (up and down tail movements to simulate swimming) can help to minimize potential scoliosis that can develop from stranding (muscle contraction on one side, especially when in lateral recumbency). Also do range of motion with the pectoral flippers if possible. These exercises can be done for 10-15 min at a time a few times a day to start, depending on how the animal tolerates it. Based on how that animal was held initially this would be a significant concern of mine, that the animal would develop significant muscle contracture, which is often unresolvable. Muscle relaxants can be used (like methocarbamol), in addition to pain meds and anti-inflammatories (meloxicam) to help prevent/attempt to treat, but its not always successful.

If continued care is elected, a full workup is indicated. I attached our current physical exam form that can help guide the PE. I also attached our reference ranges for both PE and bloodwork. These are largely based on stranded short beaked common dolphins since that is what we see most frequently, but should be reasonably applicable to orcas.

For a calf I would be most interested in hydration status, glucose, liver values and a CBC – but a full CBC/chem panel would be best. I would think this calf is old enough to have stabilized glucose, but that would be high on my list to check, since septicemia is possible and the animal has been fasted. Muscle enzymes (CK, LDH, AST) and lactate should be monitored for trends (may be significantly high after the night in the trailer). Anemia is a consistent negative prognostic indicator for our stranded dolphins, as is marked neutropenia. Of course look for dehydration as well on the bloodwork to guide fluid therapy.

Ultrasound examination of the calf would be useful, especially to look at the lungs for any evidence of pneumonia. Great paper on pulmonary ultrasound in dolphins attached. The calf is small enough that it is a useful tool. Of course a hearing test (AEP or BAER) would be ideal, as deafness can be a reason for calf abandonment. But I don't think anyone in NZ has the equipment to do this. Our team does – so if there is serious interest in this, we could potentially discuss. Alternatively placing hydrophones in the water to see if the calf is vocalizing at all might be

another possible tool. Although we haven't used this diagnostically, and it certainly wouldn't be a definitive thing, if the calf is not vocalizing, that would be a poor prognostic indicator in my book.

Any feces or urine production that they could appreciate?

It is important to point out in general, that cetacean rehab is expensive, labor intensive and has a very low success rate historically. I fear that this calf may die within a few weeks if held in care. If it does survive and regains its health, its most likely outcome would be permanent placement in a managed care facility since likelihood of successful reintroduction to a pod would be almost nil. I really hate to be the pessimist here, but I think it is important to be realistic when taking on such an endeavor. If the pod is not relocated in the next day or two, the decision should be made whether permanent placement or euthanasia would be the most humane outcome for this animal. As more time goes on, like you said, likelihood of reintroducing to a pod is getting smaller and smaller. So I would say holding for 3-4 days total with an absolute MAX of one week (obviously would have to tube feed it ASAP) is your window for releasing. And as I mentioned before, the likelihood that the calf was not accidentally abandoned is extremely high.

I cc'd [redacted] as well in case he has anything else to add.

Happy to continue to help as best I can from here. Please keep me posted if you can. Sure wish I could be there to help and so sorry you all are having to endure this really difficult situation!

Best, [redacted]

From: [redacted]>
Sent: Monday, July 12, 2021 6:43 AM
To: [redacted]@ifaw.org>
Subject: Stranded orca calf in New Zealand

H [redacted]

Thank you again so vey much for answering my plea for help last night – so very much appreciated! Managed to get the calf kept in the water overnight which was a great initial step as they had been planning to trailer it again for the night.

A little more history…. Pod was seen Sunday morning free swimming – calf was with adult female. At lunch time the calf was found stranded. An attempt was made to refloat it at the stranding site but wasn't successful. Advice was given to trailer it to a better location and retry a refloat with hopes the pod was still near enough to hear. Unfortunately no joy so the decision was made to keep the calf on mattresses on a trailer overnight.

Calf is estimated to be 2.5-3m long and believed to still be dependant on the mother. Unfortunately despite extensive searching today both aerial and on the water failed to locate the pod. The calf was kept in the water for the day. For videos I have seen it appears to be suffering buoyancy/stability issues and lists heavily to one side. There is a suggestion that this is due to compression of a pectoral fin from its positioning the first night.

A Zoo veterinarian was attending this afternoon to assess the calf and attempt to give it electrolytes via an orogastric tube as we recommended. I have not heard as to what the assessment was or how the procedure went.

We know the chances of a dependant calf being reunited with a pod are slim but have been requested to investigate options for supporting the calf to allow time for an attempt to be made. As such I was wondering if you were willing to provide advice on the follow points (or had any colleagues you could put me in touch with that would be willing to provide advice).

- Indicators for the health of the calf to assist in our decision-making – clinical exam? Behaviour? Any templates to assist in assessing the health of the animal?
- If the decision is to continue with oral fluids by tube is there any advice of how often this should be done?

- If the decision was to persist for longer then what are the feeding recommendations for an orca calf (I am assuming SeaWorld and Loro Parque would be the people to contact about this – do you have any direct contacts for them?)
- Also interested in what thoughts are around the releasability of an animal like this – presumably the longer it is held the lower the chances of successfully reuniting it with a pod.

Thank you so very much in advance for any thoughts or advise – It is so very much appreciated by us all.

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



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[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 12:39 pm
To: Kirstie Knowles; [redacted]
Subject: FW: ORCA GOBIERNO NUEVA ZELANDA

Hi team,

Hope this morning has gone well. Just extra confirmation from the vets at Loro Parque who have handraised two orca calf that there is no need for people to be in the water 24/7 with this animal. Not sure they anything can be done about it… but just keeps confirming our advice from day one.

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Sunday, 18 July 2021 8:57 PM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]
Just to add some detail to [redacted] response. Our calves were monitored 24/7 but the interactions were reduced as soon as the calves were able to swim by themselves avoiding the walls. Since then the interactions were just for feeding, medical procedures and weighting.
In this case you have to consider the risk of excessive habituation for a future release, in my opinion as soon as the calf is habituated to the place the interaction with humans should be reduced to feeding and veterinary procedures. There is no need to have people 24/7 in the water with the animal when is able to float and swim alone.
Best,
[redacted]

Enviado desde mi iPhoñe

> El 18 jul 2021, a las 1:52, [redacted] > escribió:
>
> Hi,
>
> Thank you, that is really helpful. We are just concerned about the level of habituation to humans that is occuring and the issues that might pose for reintegration with a pod. Good to know you support the level of interaction at this stage.
>
> [redacted]
>
> ---
>
> **From:** [redacted] >
> **Sent:** Sunday, 18 July 2021 12:34 PM
> **To:** [redacted]
> **Cc:** [redacted] @loroparque-fundacion.org>; [redacted] @loroparque.com>; [redacted]
> **Subject:** Re: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

No. Our calves were always separated from the group, but yes, they were receiving attention all the time. As calves, they really need it.

Cheers

[redacted]

Sent from my iPhone

On 17 Jul 2021, at 23:50, [redacted] > wrote:

Hi [redacted]

Thank you again! Apologies there are a few different avenues that are being used to garner advice so I think you have been copied in in a few places because of that.

Thank you for the formula and the feeding schedule advice. Early on the calf was getting larger volumes but of predominantly electrolytes in an attempt to rehydrate him. Now the formula strength has increased the volumes have decreased though I will review the schedule in light of your advice!

A further question about the husbandry of your calves if I may... Did they stay with the rest of the group through the handrearing process or were they kept alone? What was the level of human attention in those early months? Currently the calf here has people with him 24/7 and we are looking to understand the nesscesity of this.

Thank you again for reaching out and for your detailed response yesterday. Much appreciated!

[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 11:00 PM
To: [redacted]
Cc: [redacted] @loroparque-fundacion.org>; [redacted] @loroparque.com>; [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

I have been copied to a few mails exchanges and thought I would just add herewith our most recent formula (with which we raised two killer whale calves - that are still with us) but mainly the timing of administration. The biggest issue we found out (and the reason for failure before) is the high volume administered in a short time.

It will have to be fed 24/24 to start with until it can stabilize.

If you cannot have access to zoologica milk powder (but often to be found in zoological institutions), I have also used human milk powder - without lactose - with success.

With a size of 2,15 m - your calf will probably be about 2 to 2,5 months old (the size of our male calf at that age).

For our calves at that age, we really found out that 9L per day is a great maximum (when going higher they started developing medical problems (delay in digestion and inflammation of the digestive system), and these problems can also only be identified if you can take blood regularly and especially perform ultrasounds of the digestive system (together with being able to recognize and assess their digestive organs). They will NOT show these digestive problems behaviourally until they are pretty far. Problem is to reach the necessary calories, as mum's milk is way more caloric than what we can offer them. And the mistake then is going up with the formula.

We would start around the clock - every 2 hours - with a low volume of intubation/bottle- and then we'd raise the volume slowly up to 1000 - 1300 ml (over weeks) max per intubation/bottle and start having longer times at night without feeding.

Up to an age of 9-10 months, 12 L would be the great maximum - but generally we had to go back down to less because of changes identified in the blood and by ultrasound - all related to food.

The other major issue we have found over time is starting to feed fish too early - which I absolutely not recommend (not before 6 months of age, and still, in small quantities).

These are in the big lines the lessons we learned by raising 3 calves, 2 having been successful, and having learned the mistakes from the other one.

What is also very helpful is to add tensio-actives (simethicone) with every formula administration (certainly if by bottle), because they will swallow large quantities of air. Their abdomen is not "distendable" like in other species, and this high quantity of air in their guts can make them very uncomfortable.

Please let me know if I can help you in any other way.

Greetings

[redacted]

On 17 Jul 2021, at 12:19, [redacted] > wrote:

Hi [redacted]

Thank you very much for the reply! I belive Ian and Ingrid have been busy on-site so probably aren't keeping up with email.

Thank you for the offer of advice on formula and hand rearing. We are also in consultation with a team of Sea World and Vancouver Aquarium vets who have experience in hand rearing. They have provided us with their formula which is what we have adapted based on what is avaliable in NZ for now.

Medically he appears stable at this stage - bloods have been collected twice and nothing alarming. Regular monitoring of resp rate, ins and outs, movement etc are ongoing.

I would also be interested in your teams thoughts on the age of this individual. He is 2.15m long, does not have fully erupted teeth and has the faint remnants of foetal folds still visible.

There are no facilities in NZ that house captive cetaceans and as such we are trying to determine his suitability for release to the wild.

Thank you again for reaching out - have discovered the cetacean community really is fantastic in a situation like this. Such wealth of knowledge and generosity in sharing that knowledge.

Kindest Regards,

[redacted]

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Friday, 16 July 2021 10:52 PM
To: [redacted]
Cc: [redacted]
[redacted]@loroparque.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Dear [redacted],

I am [redacted], director of Loro Parque Foundation, and I was trying to contact both Dr. Visser and Ian Angus to offer our help and share our experience in hand rearing orca calves from birth. I have copied [redacted], our consultant veterinarian and [redacted], DVM, one of our vets specialized in cetaceans. They can share their experience and diagnostic skills with you, as well as the critical parameters to hand rear an orca calf.

We are happy to help in any way you need to keep Toa health and safe so it can be reunited with the family pod as soon as possible.

Best regards,

[redacted]

[redacted] PhD.
Director

Loro Parque Fundación
Avda. Loro Parque • 38400 Puerto de la Cruz
[redacted]

[redacted]

<firma25aniv_2.jpg>

De: Formulario Contacto Loro Parque
Enviado: viernes, 16 de julio de 2021 5:25:23 (UTC) Hora del meridiano de Greenwich: Dublín, Edimburgo, Lisboa, Londres
Para: media
Asunto: Nueva consulta desde loroparque.com | Prensa
| [redacted]

Nombre: [redacted]

Email: [redacted]

Teléfono: [redacted]

Mensaje: Kia Ora,

My names is [redacted] and I am a veterinarian with the Department of Conservation in New Zealand. I have been involved in the response to the stranded orca calf and saw that you were trying to reach out to offer help.

If someone was able to email on the above email address I would be interested in making contact.

Kindest Regards,

[redacted]

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[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 8:41 pm
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello [redacted]

Thank you for asking.

We went up to 50mg per formula administration - the liquid form - but really followed the gas formation by ultrasound.

Qua age, as mentioned before, that was how old our male calf was when 2m12, so around 2-2.5 month, but this can differe.

I will look now at the pics of our 3 hand-reared calves in regards to teeth erruption

Dr. [redacted], from the Oceanografic in Valencia, has worked on age extimation in cetaceans based on flipper XR. It would be helpful to try this as well. I believewe have CR of the flipper on one of our calves at that age.

I am traveling now to LP and will gather that info for you.

In regards to medical follow up with people who have had KW calves, I would suggest to be cc on the same e-mails, otherwise the info will everytime travel from one to the others.

Greetings

[redacted]
Sent from my iPhone

On 19 Jul 2021, at 02:27, [redacted]

[redacted] > wrote:

Hi all,

Sorry we did have an additional question - dose of tensio-actives (simethicone) do you use? (Is it dosed per kg of animal or per L of formula?)

Thanks all!

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]

[redacted]
www.lacavemmvs.com

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Monday, 19 July 2021 9:30 pm
To: [redacted]; Ian Angus
Cc: [redacted]
Subject: FW: Vet info for neonate orca Toa
Attachments: Vet guide to small cetacean euthanasia.pdf

Importance: High

Kia ora folks

I appreciate we are well ahead of the decision-making process here (forgive me) and that survival is still the option being pursued presently. However, in the event euthanasia is the end situation for Toa, we wanted to think ahead here. Attached is an option which maybe more public friendly compared to our usual ballistics based euthanasia protocol.

At less than 2.2m, Toa would be considered a small cetacean whom has already had veins accessed by veterinarians during blood sampling. On this premise, we think with forward planning, there could be an option to do chemical euthanasia which would potentially be less distressing to the public.

Our PhD [redacted] (copied) has reached out to British Diver Marine Life Rescue veterinarian [redacted] (also copied) who has kindly provided this guide for reference (if and only should we need it). [redacted] has also offered to provide any assistance we should need later in the process – kind thanks again [redacted]

Ngā tauwhirotanga o te wā

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Monday, 19 July 2021 8:50 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@bdmlr.org.uk
Subject: Vet info for neonate orca Toa
Importance: High

Hi [redacted]

As we discussed earlier, I have copied in [redacted] who is the vet for BDMLR.
She has kindly provided the attached for chemical euthanasia and has said that she is happy to answer any questions, if this is needed to ensure Toa's welfare.

Thanks,

[redacted]

[redacted]

Marine Biologist

PhD Student

Cetacean Ecology Research Group

School of Natural and Computational Sciences

Massey University

Auckland

New Zealand

Cetacean Ecology Research Group
www.cetaceanecology.org

www.cetaceanecology.org/

Australia and New Zealand Student Chapter SMM Committee member

European Cetacean Society National Contact Person for New Zealand

British Divers Marine Life Rescue: Veterinary guide to small cetacean euthanasia

This document is designed to aid qualified veterinary surgeons in the euthanasia of small cetaceans via the intravenous injection of barbiturates.

Clearly, this method of euthanasia will only be possible in cetaceans up to a certain size- beyond that the drug volumes required to be injected are impractical. If you are faced with a cetacean you consider too large for euthanasia with 'routine' drugs, please contact BDMLR head office for advice from a veterinary consultant.

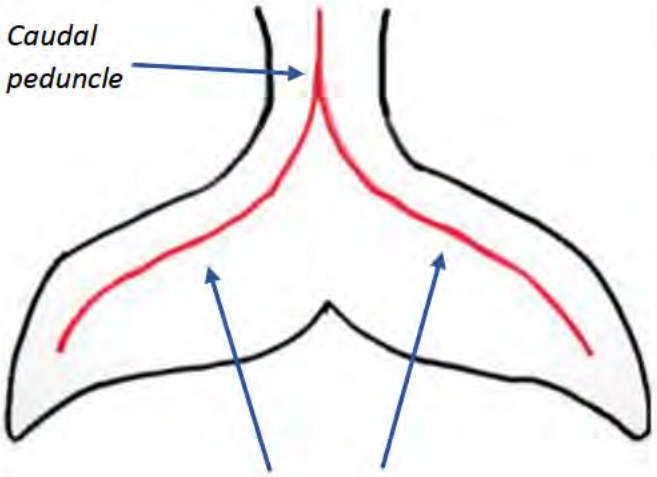
Site of injection: most commonly, the euthanasia drug is injected into the central tail veins, which can be very superficial (see diagram below- these veins are accessible on the dorsal and ventral surface of each fluke). The author recommends inserting a butterfly needle on an extension line to accommodate for some movement of the animal and to make delivering a large volume of drug easier. An alternative site is the caudal peduncle- where the vessels come together at the midline and can be accessed ventrally. The intraperitoneal route can be used as a last resort, but the time to unconsciousness will be delayed.

Dose rates: 60-200 mg/kg of pentobarbital (a normal 'dog dose' should be sufficient in most cases) or Somulose (secobarbital sodium and cinchocaine hydrochloride) can be used in larger animals (at 0.25ml/kg bodyweight). Follow all recommended health and safety precautions on these products datasheets.

Needles sizes: 1-2 inch, 18-21G needles will be required depending on the size of the animal (up to 3.5-inch-long needles may be needed in cetaceans with a thick blubber layer when going intraperitoneal).

Sedation: very stressed animals may require sedation before euthanasia can take place if they cannot be safely restrained or their welfare is being compromised. Please call BDMLR head office and ask to speak to a veterinary consultant if this is required.

Health and safety: even in smaller cetacean species the tail should be restrained while the procedure is carried out as a suddenly thrashing tail has the potential to cause injuries.



Central tail veins

Lengths/weights:

The lengths and weights of more commonly encountered species are provided in a table on the next page (provided by CSIP) to assist with drug volume estimates. Remember, often stranded cetaceans have chronic underlying health issues, and may weigh significantly less than the estimate (animals in poor body condition have visible 'dipping' of the muscle masses below the dorsal fin).



Good BC *Moderate BC* *Poor BC*

Remember- any animal euthanased chemically will need to be removed from the beach and disposed of safely!

Questions? If you have any questions or concerns please call BDMLR Head office (01825 765546) and ask to speak to a veterinary consultant for further advice.

HARBOUR PORPOISE		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
0.7 m	6.5 kg	2.5 cm / 1 inch
1.0 m	25 kg	5 cm / 2 inch
1.5 m	70 kg	5 cm / 2 inch
1.8 m	80 kg	5 cm / 2 inch
COMMON AND STRIPED DOLPHINS		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
1.0 m	20 kg	2.5 cm / 1 inch
1.5 m	60 kg	3.75 cm / 1.5 inch
2.0 m	125 kg	5 cm / 2 inch
2.5 m	150 kg	5 cm / 2 inch
ATLANTIC WHITE-SIDED DOLPHINS		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
1.2 m	40 kg	2.5 cm / 1 inch
1.5 m	60 kg	3.75 cm / 1.5 inch
2.0 m	140 kg	5 cm / 2 inch
2.5 m	190 kg	5 cm / 2 inch
2.7 m	200 kg	5 cm / 2 inch
WHITE-BEAKED DOLPHINS		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
1.2 m	40 kg	5 cm / 2 inch
1.5 m	75 kg	5 cm / 2 inch
2.0 m	150 kg	5 cm / 2 inch
2.5 m	260 kg	6.25 cm / 2.5 inch
2.8 m	300 kg	6.25 cm / 2.5 inch
RISSO'S AND BOTTLENOSE DOLPHINS		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
1.5 m	65 kg	5 cm / 2 inch
2.0 m	150 kg	6.25 cm / 2.5 inch
2.5 m	260 kg	6.25 cm / 2.5 inch
3.0 m	370 kg	8.75 cm / 3.5 inch
3.5 m	480 kg	8.75 cm / 3.5 inch
4.0 m	600 kg	8.75 cm / 3.5 inch
PILOT WHALES		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
1.75 m	75 kg	5 cm / 2 inch
2.0 m	150 kg	6.25 cm / 2.5 inch
3.0 m		8.75 cm / 3.5 inch
4.0 m	2 tonnes	8.75 cm / 3.5 inch
6.0 m	3.5 tonnes	8.75 cm / 3.5 inch
MINKE WHALES		
Length	Maximum likely weight	Minimum needle size for intramuscular injections
2.0 m	150 kg	6.25 cm / 2.5 inch
2.5 m	350 kg	6.25 cm / 2.5 inch
4.0 m		8.75 cm / 3.5 inch
7.0 m	5 tonnes	8.75 cm / 3.5 inch
8.5 m	7 tonnes	8.75 cm / 3.5 inch

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 3:12 pm
To: Ian Angus
Cc: Kirstie Knowles
Subject: RE: Technical international experts

FYI, I just had a call from [redacted] and she has been approached for comment by SMC. She was clear that she will discuss euthanasia as an increasingly likely outcome for this animal, based on welfare concerns.

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 2:30 pm
To: Ian Angus <iangus@doc.govt.nz>
Cc: Kirstie Knowles <kknowles@doc.govt.nz>
Subject: RE: Technical international experts

Here are the contact details:
[redacted]@unipd.it
[redacted]@noaa.gov

Cheers,
[redacted]

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 12:16 pm
To: Ian Angus <iangus@doc.govt.nz>
Cc: Kirstie Knowles <kknowles@doc.govt.nz>
Subject: Re: Technical international experts

I don't personally know any of those folks, but they seem reasonably qualified. Just note that the [redacted] listed below is different to the [redacted] in our TAG.

It would perhaps be good to have someone from the IWC Strandings expert panel, who have already advised. [redacted] is the chair of that group and is a vet. I can send his details in a bit, though they're probably already in the technical document [redacted] put together.

[redacted] of NOAA would also be good, as she dealt with some of the similar situations with orca in the US. Same story with her contact details.

Cheers
[redacted]

On 19/07/2021 12:06 pm, Ian Angus <iangus@doc.govt.nz> wrote:

> Any names leap out? Or alternatives? Can you copy in both Kirstie and myself.

Sent from Workspace ONE Boxer

---------- Forwarded message ----------
From: Bronwyn Saunders <bsaunders@doc.govt.nz>
Date: 19/07/2021 11:35 am
Subject: Technical international experts
To: Kirstie Knowles <kknowles@doc.govt.nz>,Ian Angus <iangus@doc.govt.nz>,Sarah Owen <sarahowen@doc.govt.nz>,Jack Mace <jmace@doc.govt.nz>,[redacted],Elizabeth Heeg <eheeg@doc.govt.nz>
Cc: [redacted]Media <Media@doc.govt.nz>

Hi

We're keen to involve the Science Media centre in assisting media and others on animal welfare and ethics as part of the orca operation. Can we please get a list and contact details of vets/experts that we've been consulting with who would be willing to talk to media about the issues that need to be considered. Keen to have wider voices than just DOC and Ingrid in this space.

I've pulled together a list of contacts involved with the Canadian reunification of Springer many years ago and your advice on these as potential media spokespeople would be welcome as well.

Thanks

Bronwyn

Researchers/rescuer Springer orca

https://www.noaa.gov/stories/saving-springer-part-2-going-public-to-rescue-creature-in-distress

https://www.whaleresearch.com/ourpeople

[redacted] – Centre for Whale Research

[redacted]

[redacted] – Marine consultant microbiologist/vet

h[redacted]

[redacted] retired Zoological Operations at SeaWorld

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Monday, 19 July 2021 12:15 pm
To: [redacted]
Cc: [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

Would you possibly be able to check in with [redacted] please to see what dose of tensio-actives (simethicone) she recommends using per feed? (I've not used these medications before so don't know if this is measured on a per kilo of body weight basis or on a per L of food fed basis?).

Thank you!
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com |

From: [redacted]>
Sent: 18 July 2021 14:47
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Fw: ORCA GOBIERNO NUEVA ZELANDA

Hi team,

Also see email below from Loro Parque vet who has also reached out. She is also echoing the need to keep feed volumes low. Not sure how this compares to the original advice from Sea World.

Don't want to cloud the picture but if anything here is useful or you want to be in touch directly then no problem!

[redacted]

From: [redacted]@doc.govt.nz>
Sent: Sunday, 18 July 2021 9:50 AM
To: [redacted]>
Cc: [redacted]@loroparque-fundacion.org>; [redacted]@loroparque.com>; [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

Thank you again! Apologies there are a few different avenues that are being used to garner advice so I think you have been copied in in a few places because of that.

Thank you for the formula and the feeding schedule advice. Early on the calf was getting larger volumes but of predominantly electrolytes in an attempt to rehydrate him. Now the formula strength has increased the volumes have decreased though I will review the schedule in light of your advice!

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Thank you again for reaching out and for your detailed response yesterday. Much appreciated!

[redacted]

From: [redacted]
Sent: Saturday, 17 July 2021 11:00 PM
To: [redacted]
Cc: [redacted]@loroparque-fundacion.org>; [redacted]@loroparque.com>; [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

I have been copied to a few mails exchanges and thought I would just add herewith our most recent formula (with which we raised two killer whale calves - that are still with us) but mainly the timing of administration. The biggest issue we found out (and the reason for failure before) is the high volume administered in a short time.

It will have to be fed 24/24 to start with until it can stabilize.

If you cannot have access to zoologica milk powder (but often to be found in zoological institutions), I have also used human milk powder - without lactose - with success.

With a size of 2,15 m - your calf will probably be about 2 to 2,5 months old (the size of our male calf at that age).

For our calves at that age, we really found out that 9L per day is a great maximum (when going higher they started developing medical problems (delay in digestion and inflammation of the digestive system), and these problems can also only be identified if you can take blood regularly and especially perform ultrasounds of the digestive system (together with being able to recognize and assess their digestive organs). They will NOT show these digestive problems behaviourally until they are pretty far. Problem is to reach the necessary calories, as mum's milk is way more caloric than what we can offer them. And the mistake then is going up with the formula.

We would start around the clock - every 2 hours - with a low volume of intubation/bottle- and then we'd raise the volume slowly up to 1000 - 1300 ml (over weeks) max per intubation/bottle and start having longer times at night without feeding.

Up to an age of 9-10 months, 12 L would be the great maximum - but generally we had to go back down to less because of changes identified in the blood and by ultrasound - all related to food.

The other major issue we have found over time is starting to feed fish too early - which I absolutely not recommend (not before 6 months of age, and still, in small quantities).

These are in the big lines the lessons we learned by raising 3 calves, 2 having been successful, and having learned the mistakes from the other one.

What is also very helpful is to add tensio-actives (simethicone) with every formula administration (certainly if by bottle), because they will swallow large quantities of air. Their abdomen is not “distendable” like in other species, and this high quantity of air in their guts can make them very uncomfortable.

Please let me know if I can help you in any other way.

Greetings

[redacted]

On 17 Jul 2021, at 12:19, [redacted] > wrote:

Hi [redacted]

Thank you very much for the reply! I belive Ian and Ingrid have been busy on-site so probably aren't keeping up with email.

Thank you for the offer of advice on formula and hand rearing. We are also in consultation with a team of Sea World and Vancouver Aquarium vets who have experience in hand rearing. They have provided us with their formula which is what we have adapted based on what is avaliable in NZ for now.

Medically he appears stable at this stage - bloods have been collected twice and nothing alarming. Regular monitoring of resp rate, ins and outs, movement etc are ongoing.

I would also be interested in your teams thoughts on the age of this individual. He is 2.15m long, does not have fully erupted teeth and has the faint remnants of foetal folds still visible.

There are no facilities in NZ that house captive cetaceans and as such we are trying to determine his suitability for release to the wild.

Thank you again for reaching out - have discovered the cetacean community really is fantastic in a situation like this. Such wealth of knowledge and generosity in sharing that knowledge.

Kindest Regards,

[redacted]

[redacted]

From: [redacted]@loroparque-fundacion.org>
Sent: Friday, 16 July 2021 10:52 PM
To: [redacted]
Cc: [redacted]
[redacted]@loroparque.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Dear [redacted]

I am [redacted], director of Loro Parque Foundation, and I was trying to contact both Dr. Visser and Ian Angus to offer our help and share our experience in hand rearing orca calves from birth. I have copied [redacted], our consultant veterinarian and [redacted], DVM, one of our vets specialized in cetaceans. They can share their experience and diagnostic skills with you, as well as the critical parameters to hand rear an orca calf.

We are happy to help in any way you need to keep Toa health and safe so it can be reunited with the family pod as soon as possible.

Best regards,

[redacted]

[redacted], PhD.
Director

Loro Parque Fundación
Avda. Loro Parque • 38400 Puerto de la Cruz
[redacted]

<firma25aniv_2.jpg>

De: Formulario Contacto Loro Parque
Enviado: viernes, 16 de julio de 2021 5:25:23 (UTC) Hora del meridiano de Greenwich: Dublín, Edimburgo, Lisboa, Londres
Para: media
Asunto: Nueva consulta desde loroparque.com | Prensa [redacted]

Nombre: [redacted]

Email: [redacted]

Teléfono: [redacted]

Mensaje: Kia Ora,

My names is [redacted] and I am a veterinarian with the Department of Conservation in New Zealand. I have been involved in the response to the stranded orca calf and saw that you were trying to reach out to offer help.

If someone was able to email on the above email address I would be interested in making contact.

Kindest Regards,

[redacted]

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[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

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[redacted]

From: [redacted]@loroparque.com>
Sent: Monday, 19 July 2021 5:11 am
To: [redacted]
Cc: [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hello [redacted]

How is going the situation?

I completely agree with the suggestions of [redacted].
Really, it is very import to take blood regularly and perform ultrasounds of the whole body and, specially, check the digestive system to be sure that is working.

Let us know if you need more info.

Best regards,
[redacted]

Loro Parque - Clinica Veterinaria

Avda. Loro Parque s/n
38400 Puerto de la Cruz – Tenerife – España
☎ [redacted]
[redacted]@loroparque.com
www.loroparque.com

De: [redacted]
Enviado el: domingo, 18 de julio de 2021 1:55
Para: [redacted]
CC: [redacted]
Asunto: Re: ORCA GOBIERNO NUEVA ZELANDA

Hi,

Thank you, that is really helpful. We are just concerned about the level of habituation to humans that is occuring and the issues that might pose for reintegration with a pod. Good to know you support the level of interaction at this stage.

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 4:58 pm
To: [redacted]
Subject: RE: VHF tag for small cetacean
Attachments: Lotek VHF tags.pdf

Hi [redacted]

We have some VHF tags from Lotek/Sirtrak. I have attached the invoice so you can research the specifications. I have no idea if these will work for your application, though!

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 2:52 pm
To: [redacted]
Subject: FW: VHF tag for small cetacean

Hi both-
Please see below for context, but [redacted] has raised a good point. Do you know of anyone in NZ who has VHF tags for use on pinnipeds that might be able to be adapted for use on the orca calf?

Cheers,
[redacted]

[redacted]

From: [redacted]@cawthron.org.nz>
Sent: Monday, 19 July 2021 2:33 pm
To: [redacted]
Subject: RE: VHF tag for small cetacean

Hey [redacted]

Sorry I don't know of any VHF tags that we have handy at Cawthron.
Simon would like know of some that were or are being used for seal or sea lion work with either you or MPI or overseas. But not sure whether those would be applicable in this case.
But I'm afraid I don't have any knowledge and we don't have the suction cup tags here yet either. We do have some VHF location gear if that helps.

Good luck,
[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 2:27 PM
To: [redacted]@cawthron.org.nz>
Subject: FW: VHF tag for small cetacean

Hi [redacted],
I forgot that [redacted] was down south, so I'll flick this on to you in the hopes that you might know of something...

Cheers,
[redacted]

[redacted]

From: [redacted]
Sent: Monday, 19 July 2021 2:26 pm
To: [redacted]@auckland.ac.nz>; [redacted]@massey.ac.nz>; [redacted]@cawthron.org.nz>
Cc: Ian Angus <iangus@doc.govt.nz>
Subject: VHF tag for small cetacean

Hi all-
I'm sure you're aware of the situation with the orca calf in Plimmerton. This remains a difficult situation and we're attempting to plan for all contingencies. One of these is the potential release of this animal, should a pod of orca be located in the vicinity. This comes with its own concerns, however, not the least of which is whether the pod will accept him or not. As such, we are considering the requirement to have a tag on the animal so that it can be relocated to assess whether the reunion has been successful.

IFAW has already sent one of their satellite tags which is suitable for attaching to a small calf. The tag does not have a VHF transmitter on it, however, so will be less useful for locating the calf on the water should the need arise. My question to you is: do you have a VHF tag which could be made available, or know anyone locally who might?

We're well aware of the wide range of views on this incident, so I stress again that this enquiry is contingency planning rather than a direct reflection of the actual course of action which will be taken.

Regards,
[redacted]

[redacted]
Technical Advisor, Marine Species
Kaimātanga Takutaimoana
Department of Conservation – *Te Papa Atawhai*
[redacted]

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Tax Invoice

SIP12610

Lotek NZ Limited
8A Goddard Lane
P. O. Box 8460
Havelock North, 4157
New Zealand

Telephone: +64 6 877 7736
Email: info.nz@lotek.com
Website: www.lotek.com
GST: 68-126-134
NZBN: 9429038861512

Invoice Address:
Department of Conservation
Ōtepoti Office
Level 1 John Wickliffe House
265 Princes Street
Dunedin
9054
Contact: [redacted]

Delivery Address:
Department of Conservation
Ōtepoti Office
Level 1 John Wickliffe House
265 Princes Street
Dunedin
9054
Contact: [redacted]

Invoice Date: 04 Jun 2021
Salesperson: [redacted]
Account No.: HC05858
Tax No.:
Payment Terms: 20th of the Month
Sales Order No.:
Purchase Order No.: PO 24035
Order Date: 30 Jun 2021

Item No.	Description	Quantity	Unit Price	Discount %	Total Price
AAA001007	V2G 154C VHF CORE	8	262.00		2,096.00
4-000403-MAG	MAGNET FERRITE ROUND 15mm x 8mm	5	1.00	100	
LBL000052	LABEL VHF NIMROD 2 STAGE WRAPPED GOODS	1	0.01	100	
FREIGHT	FREIGHT + INSURANCE	1	27.00		27.00

Payment Terms: **20th of the Month**

We would appreciate prompt payment by: **20 Jul 2021**

When making payment by telegraphic transfer to ASB NZ in favour of Lotek NZ Limited, Swift Code: ASBBNZ2A, Bank Account Number: 12-3197-0020200-00, please reference your Account No. HC05858 and Invoice No. SIP12610.

Invoice Discount: :	5.01
Subtotal :	2,123.00
Tax :	318.45
Total NZD:	**2,441.45**

If you wish to pay via credit card, please note there will be a 3% fee.

The Lotek Terms & Conditions are available at **www.lotek.com/legal/terms-and-conditions** , and the Lotek Limited Warranty is available at **www.lotek.com/legal/warranty**
By purchasing or using equipment and/or services from Lotek, you agree to and intend to be bound by the Lotek Terms & Conditions, and Lotek Limited Warranty found online. Please read these documents carefully as they form a legally binding agreement between you and Lotek. Hard copies of these documents will be provided to you upon your request.

[redacted]

From: [redacted]@auckland.ac.nz>
Sent: Monday, 19 July 2021 2:58 pm
To: [redacted]
Cc: Ian Angus
Subject: Re: VHF tag for small cetacean

Hi all

Sorry we can't help with this. We have no VHF transmitter tags, or any tags available for this task.

[redacted]

From: [redacted]
Sent: 19 July 2021 14:25
To: [redacted]@auckland.ac.nz>; [redacted]@massey.ac.nz>; [redacted]@cawthron.org.nz>
Cc: Ian Angus <iangus@doc.govt.nz>
Subject: VHF tag for small cetacean

Hi all-
I'm sure you're aware of the situation with the orca calf in Plimmerton. This remains a difficult situation and we're attempting to plan for all contingencies. One of these is the potential release of this animal, should a pod of orca be located in the vicinity. This comes with its own concerns, however, not the least of which is whether the pod will accept him or not. As such, we are considering the requirement to have a tag on the animal so that it can be relocated to assess whether the reunion has been successful.

IFAW has already sent one of their satellite tags which is suitable for attaching to a small calf. The tag does not have a VHF transmitter on it, however, so will be less useful for locating the calf on the water should the need arise. My question to you is: do you have a VHF tag which could be made available, or know anyone locally who might?

We're well aware of the wide range of views on this incident, so I stress again that this enquiry is contingency planning rather than a direct reflection of the actual course of action which will be taken.

Regards,
[redacted]

[redacted]
Technical Advisor, Marine Species
Kaimātanga Takutaimoana
Department of Conservation – *Te Papa Atawhai*
[redacted]

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[redacted]

From: [redacted]@massey.ac.nz>
Sent: Monday, 19 July 2021 2:35 pm
To: [redacted]
Cc: Ian Angus
Subject: RE: VHF tag for small cetacean

Hi [redacted] – we don't have VHF only sate tags as provided by IFAW

[redacted]

From: [redacted]@doc.govt.nz>
Sent: Monday, 19 July 2021 2:26 pm
To: [redacted]@auckland.ac.nz>; [redacted]@massey.ac.nz>; [redacted]@cawthron.org.nz>
Cc: Ian Angus <iangus@doc.govt.nz>
Subject: VHF tag for small cetacean

Hi all-
I'm sure you're aware of the situation with the orca calf in Plimmerton. This remains a difficult situation and we're attempting to plan for all contingencies. One of these is the potential release of this animal, should a pod of orca be located in the vicinity. This comes with its own concerns, however, not the least of which is whether the pod will accept him or not. As such, we are considering the requirement to have a tag on the animal so that it can be relocated to assess whether the reunion has been successful.

IFAW has already sent one of their satellite tags which is suitable for attaching to a small calf. The tag does not have a VHF transmitter on it, however, so will be less useful for locating the calf on the water should the need arise. My question to you is: do you have a VHF tag which could be made available, or know anyone locally who might?

We're well aware of the wide range of views on this incident, so I stress again that this enquiry is contingency planning rather than a direct reflection of the actual course of action which will be taken.

Regards,
[redacted]

[redacted]
Technical Advisor, Marine Species
Kaimātanga Takutaimoana
Department of Conservation – *Te Papa Atawhai*
DDI: [redacted]

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[redacted]

From: [redacted]
Sent: Tuesday, 20 July 2021 8:35 am
To: [redacted]
Cc: [redacted] Ian Angus
Subject: RE: Vet info for neonate orca Toa

Thanks [redacted] As you might imagine, we are juggling many things but are attempting to plan for various contingencies. I will ensure this information is fed into the discussion around euthanasia.

Regards,
[redacted]

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Monday, 19 July 2021 9:30 pm
To: [redacted] Ian Angus <iangus@doc.govt.nz>
Cc: [redacted]@massey.ac.nz> [redacted]@bdmlr.org.uk>
Subject: FW: Vet info for neonate orca Toa
Importance: High

Kia ora folks

I appreciate we are well ahead of the decision-making process here (forgive me) and that survival is still the option being pursued presently. However, in the event euthanasia is the end situation for Toa, we wanted to think ahead here. Attached is an option which maybe more public friendly compared to our usual ballistics based euthanasia protocol.

At less than 2.2m, Toa would be considered a small cetacean whom has already had veins accessed by veterinarians during blood sampling. On this premise, we think with forward planning, there could be an option to do chemical euthanasia which would potentially be less distressing to the public.

Our [redacted] (copied) has reached out to British Diver Marine Life Rescue veterinarian [redacted] (also copied) who has kindly provided this guide for reference (if and only should we need it). [redacted] has also offered to provide any assistance we should need later in the process – kind thanks again [redacted].

Ngā tauwhirotanga o te wā

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Monday, 19 July 2021 8:50 PM
To: [redacted]@massey.ac.nz>
Cc: [redacted]@bdmlr.org.uk
Subject: Vet info for neonate orca Toa
Importance: High

Hi [redacted]

As we discussed earlier, I have copied in [redacted] who is the vet for BDMLR.
She has kindly provided the attached for chemical euthanasia and has said that she is happy to answer any questions, if this is needed to ensure Toa's welfare.

Thanks,

[redacted]

[redacted]

Marine Biologist

PhD Student

Cetacean Ecology Research Group

School of Natural and Computational Sciences

Massey University

Auckland

New Zealand



www.cetaceanecology.org/

Australia and New Zealand Student Chapter SMM Committee member

European Cetacean Society National Contact Person for New Zealand

[redacted]

From: [redacted]@massey.ac.nz>
Sent: Tuesday, 20 July 2021 12:55 pm
To: [redacted]
Cc: [redacted]
Subject: Recommended contacts

Importance: High

[redacted] – for expert commentary on cholic and welfare science I recommend

[redacted] – Welfare Scientist Massey University
[redacted] - Veterinarian Department of Conservation

Ngā tauwhirotanga o te wā

[redacted]

[redacted], PhD
Professor – Marine Biology
Rutherford Discovery Fellow – Royal Society Te Aparangi

Cetacean Ecology Research Group | School of Natural and Computational Sciences | Massey University
Private Bag 102 904, North Shore, Auckland 0745, New Zealand
Physical Address: Building 5, Gate 4, The Station Crescent, Albany, Auckland, New Zealand

[redacted] [redacted]@massey.ac.nz http://www.cetaceanecology.org

Cetacean Ecology Research Group
www.cetaceanecology.org

[redacted]

From: [redacted]
Sent: Tuesday, 20 July 2021 12:58 pm
To: [redacted]
Cc: [redacted]
Subject: VHF tag for orca calf in New Zealand

Hi [redacted]

Thanks you so much for your advice on the situation with this orca calf in NZ. [redacted] passed on your contact details and said that you are proposing the application of a VHF enabled tag to this animal to allow for closer tracking. I am working to get the ethics approval sent through to our ethics committee to allow for the tagging of this individual and as such I was wondering if you had any details on what tag you would advise and how it would be applied so that I could include those details in the application.

Thanks so much,

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand

http://kakaporecovery.org.nz/



[redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 4:27 am
To: [redacted]
Subject: Fw: Tag for stranded orca calf in New Zealand
Attachments: AM-A397A-A-00.pdf; Splash TDR.jpg

Hi [redacted],

I asked [redacted] for his thoughts on VHF vs the satellite tag. I think he makes a very good point with regards to using air support for close approach being better than double tagging.

If you are happy I am inclined to modify the application based on this advice to explain why satellite is preferred over the VHF options.

[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 3:07 AM
To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Certainly. Attached is the spec drawing of the current model and a photo of one of our older tags of the same type, though there may be minor differences from the newer model that was sent. Also keep in mind that the photo has the flaps trimmed to the first hole and the tag that was sent has all three hole options still on the flap (like in the spec drawing).

The accuracy of the satellite tag transmissions depends on a lot of factors. The biggest factor for accuracy is the number of satellites that are present on the horizon when the tag breaks the surface. The more satellites the better the location. Here are the accuracy estimates from the CLS website based on location class:

- Class 3: better than 250 m radius
- Class 2: better than 500 m radius
- Class 1: better than 1500 m radius
- Class 0: over 1500 m radius

I did a satellite pass prediction for satellite coverage in New Zealand through the CLS Argos website and the tag has been set to transmit only when satellites should be present. This means that there are “dark” hours where the tag will not be transmitting at all. The transmitting hours for that tag is from 0400 – 1300 UTC and 1700-2400 UTC. Converting that to local time means that hits could be received from 0500-1200 NZST and then again from 1600-0100 NZST.

Concerning dual tagging with satellite and VHF, it would be worth a conversation because there are a lot of things to consider, but here are some initial thoughts. In our earliest tag deployments back in 2010 we did send out two common dolphins and one pilot whale with both a satellite tag and VHF tag. For several reasons we stopped after only a few cases. The biggest was that it required two attachment holes which negated the benefit of the single pin attachment. More recent research by [redacted] has shown how important it is to have a tag on the lower 1/3’rd of the dorsal fin for optimum drag reduction. Attaching two tags makes it impossible to keep both tags on the lower part of the dorsal fin. Also newer technologies are available now, specifically the CLS Goniometer, that weren’t available back then for intercepting the satellite signal in order to track more fine scale. It should also be considered that one of the best options for relocating a satellite tagged animal post-release is aerial support if DOC is able to provide those assets.

Like I said those are only a few points but would be happy to discuss them further.
[redacted]

From: [redacted]>
Sent: Monday, July 19, 2021 8:54 PM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Thank you [redacted]!

Is the tag essentially the same in appearance as the *MK10-A?* If not – any chance of an up to date photo of one 😊
Ah yep that makes sense! (suspected tagging the mum was the most likely scenario).

Sorry another question – how accurate are the satellite locations? There is talk about applying a VHF tag as well to allow for close approach and visualisation of the calf post release. I do not have details yet on the proposed type of tag for that.

Just wondered if you had any experience of tracking in on the SPLASH tags to get a visual on the individual it is attached to and how possible that might be.

Thanks again for all you are doing!

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 20 July 2021 12:48 PM
To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Hi [redacted],
Happy to update. Updates are below and answers are below in blue

- *The SPLASH 10-397A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 86.0 g, L 190 x W 22 x H 30 mm). The attachment site will be aseptically prepared then a local anaesthetic will be applied. Briefly, a sterile, zinc plated brass cork borer bit on a cordless drill will be used to create the attachment point, and a disinfected, delrin pin with stainless steel washers and zinc-coated screws will be used to attach the satellite tag. At current transmission parameters the tag is expected to transmit for 70-110 d (Sharp per comms.).”*

  (I don’t have an up to date length on the whip antennae. That length is close, if not correct, but I can’t confirm that off the tag specs I have)
- Have you tagged calves before? (or any species) We have not. If we are releasing a dependant calf it would only be released with it’s mother and the mother would be tagged. We have tagged independent juveniles with fully erupted teeth.

It looks like the Splash tag will arrive in Wellington on Thursday. I am getting the tracking number and will pass that along as soon as I have it.
[redacted]

From: [redacted]
Sent: Monday, July 19, 2021 7:35 PM
To: [redacted]@ifaw.org>

Cc: [redacted]@ifaw.org>
Subject: Tag for stranded orca calf in New Zealand

Hi [redacted]

[redacted] and I are working on the ethics proposal to be allowed to tag this orca calf and I just wondered if I could check a few details with you….

- **Is this still accurate?** If not – which variety of tag are you sending 😃 *"The MK10-A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 72.0 g, L 9 W 9 H: 7.6 9 3.0 9 2.0 cm). Briefly, a sterile, zinc plated brass cork borer bit on a cordless drill will be used to create the attachment point, and a disinfected, threaded delrin pin with zinc-coated, nylon insert, steel lock nuts will be used to attach the satellite tag. MK10-A tags are expected to transmit for 190–220 d (Sharp et al 2016)."*

- Have you tagged calves before? (or any species)

Thank you!!!!

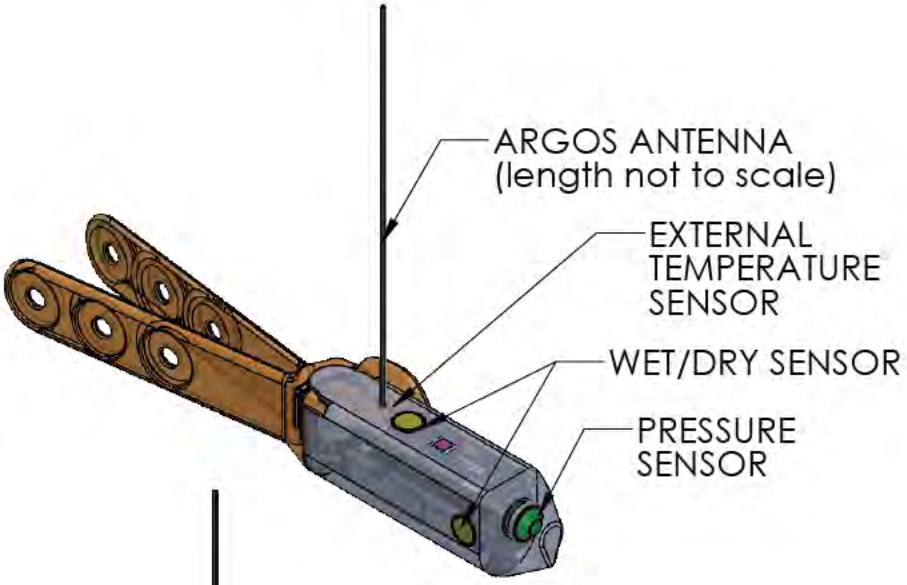
😊 [redacted]

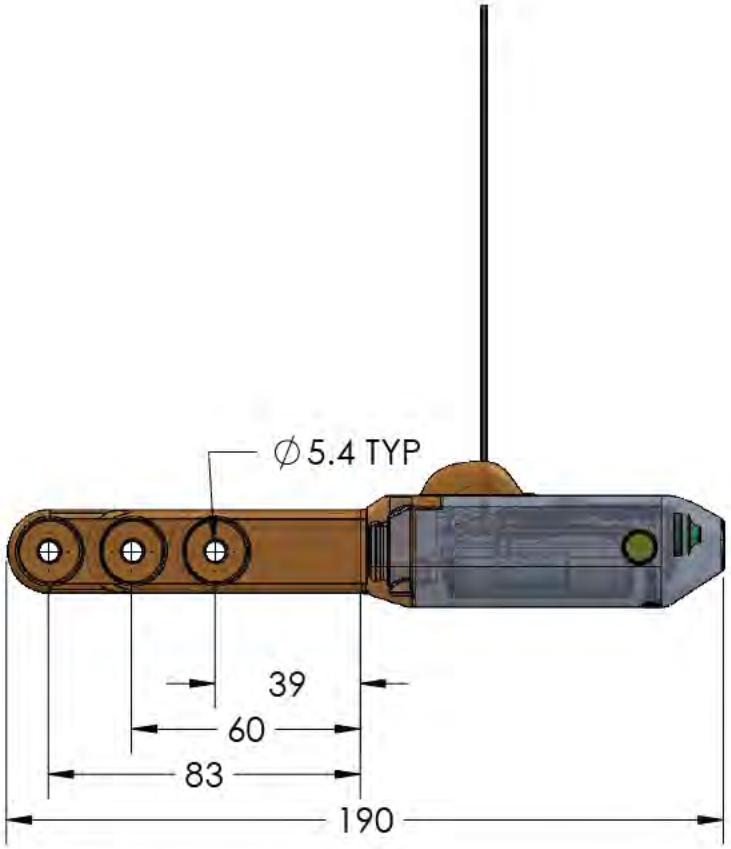
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Wildlife Computers Proprietary Drawing
Not to be reproduced, copied, or used as the basis for manufacture or sale without written permission.

Wildlife Computers

SPLASH10-397A, Single-point Finmount, 2-Lay

DIMENSION (L x W x H) 190 x 22 x 30mm	SIZE A	DWG NO AM-A397A-A-00		REV -
WEIGHT IN AIR 86 g	DRAWN	NAME AV	DATE 14-Aug-20	
PRESSURE RESISTANCE 2000m		SCALE: 1:2	SHEET 1 OF 1	
ATTACHMENT FINMOUNT		DO NOT SCALE DRAWING		

IFAW

[redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 12:22 pm
To: [redacted]
Subject: Gonionmeter for satellite tag tracking

Hi [redacted]

I had missed this link… it looks amazing and like it would very much allow for the equivalent of a VHF type tracking
https://www.clsamerica.com/argos-goniometer

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand

http://kakaporecovery.org.nz/



[redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 8:16 am
To: [redacted]
Subject: Re: Fw: Tag for stranded orca calf in New Zealand

It also occurs to me that we may have a logistical issue if you are required to be present for the tag insertion. Either you will need to be on call in Wellington, or we'll have to plan an operation to apply it before a pod is located.

Perhaps think about this and whether the AEC application is affected. We can talk later.

On 21/07/2021 4:27 am, [redacted] > wrote:
Hi [redacted],

I asked [redacted] for his thoughts on VHF vs the satellite tag. I think he makes a very good point with regards to using air support for close approach being better than double tagging.

If you are happy I am inclined to modify the application based on this advice to explain why satellite is preferred over the VHF options.

[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 3:07 AM
To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

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part of the dorsal fin. Also newer technologies are available now, specifically the CLS Goniometer, that weren't available back then for intercepting the satellite signal in order to track more fine scale. It should also be considered that one of the best options for relocating a satellite tagged animal post-release is aerial support if DOC is able to provide those assets.

Like I said those are only a few points but would be happy to discuss them further.
[redacted]

From: [redacted]
Sent: Monday, July 19, 2021 8:54 PM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Thank you [redacted]

Is the tag essentially the same in appearance as the *MK10-A?* If not – any chance of an up to date photo of one 😊
Ah yep that makes sense! (suspected tagging the mum was the most likely scenario).

Sorry another question – how accurate are the satellite locations? There is talk about applying a VHF tag as well to allow for close approach and visualisation of the calf post release. I do not have details yet on the proposed type of tag for that.

Just wondered if you had any experience of tracking in on the SPLASH tags to get a visual on the individual it is attached to and how possible that might be.

Thanks again for all you are doing!

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 20 July 2021 12:48 PM
To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Hi [redacted]
Happy to update. Updates are below and answers are below in blue

- *The SPLASH 10-397A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 86.0 g, L 190 x W 22 x H 30 mm). The attachment site will be aseptically prepared then a local anaesthetic will be applied. Briefly, a sterile, zinc plated brass cork borer bit on a cordless drill will be used to create the attachment point, and a disinfected, delrin pin with stainless steel washers and zinc-coated screws will be used to attach the satellite tag. At current transmission parameters the tag is expected to transmit for 70-110 d (Sharp per comms.).”*

  (I don't have an up to date length on the whip antennae. That length is close, if not correct, but I can't confirm that off the tag specs I have)
- Have you tagged calves before? (or any species) We have not. If we are releasing a dependant calf it would only be released with it's mother and the mother would be tagged. We have tagged independent juveniles with fully erupted teeth.

It looks like the Splash tag will arrive in Wellington on Thursday. I am getting the tracking number and will pass that along as soon as I have it.
[redacted]

From: [redacted]
Sent: Monday, July 19, 2021 7:35 PM
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: Tag for stranded orca calf in New Zealand

Hi [redacted]

[redacted] and I are working on the ethics proposal to be allowed to tag this orca calf and I just wondered if I could check a few details with you….

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Thank you!!!!

😊 [redacted]

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[redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 6:45 am
To: [redacted]
Subject: Re: Fw: Tag for stranded orca calf in New Zealand

Yes, I think that seems sensible. We don't know if air support will be available, but it's a reasonable option.

I note that [redacted] has responded now. Someone has said they had VHF aerials we could borrow, but I forget who. Maybe Cawthron, but I'll dig that up. I think we continue that conversation, even if using a VHF tag is unlikely.

On 21/07/2021 4:27 am, [redacted] > wrote:

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Thank you!!!!

😊 [redacted]

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[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 2:03 pm
To: [redacted]
Subject: RE: Tag for stranded orca calf in New Zealand

Yes near real time tracking can be accomplished by using the CLS app. New satellite hits are processed by the system and show up in the app in about 5 to 10 minutes from transmission. This is the method we used as recently as this past April to relocate one of the common dolphins we had released.

From: [redacted]
Sent: Tuesday, July 20, 2021 8:19 PM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Hi [redacted]

Thank you both so much for the information below – exceptionally informative and helpful. We have submitted an ethics proposal to the committee that needs to consider the ethics of allowing this manipulation on the orca calf. The goniometer option looks amazing with regards to fine scale tracking if needed! Even just getting to within 250m from a good fix is useful. During the transmitting hours are you able to get close to real time location data? Is this done through an app? (Apologies if we have discussed this previously and I have forgotten!)

Thank you also [redacted] for the copy of the guidelines from NOAA. We have seen a similar document previously – great to know this is currently under review and the guidelines remain the same!

Thanks again for all your quick responses and in depth support in the response to this exceptionally difficult scenario.

[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 4:24 AM
To: [redacted]@ifaw.org>; [redacted]>
Subject: RE: Tag for stranded orca calf in New Zealand

And just to elaborate on what [redacted] mentioned below. Our initial 'location-only' satellite tags (non-dive profile) had a VHF transmitter integrated (was a great option that is unfortunately not available in the wildlife computers tags). Since the TDR (dive tags) did not have it integrated, we attached a separate VHF tag (see image attached from 2010 short finned pilot whale attachment – note the old version of the TDR is attached here and we would also trim the flap now instead of leaving the more anterior hole empty, and the image is a little messy with blood from the attachment site. So please don't share this image widely as it doesn't reflect current practices, but I just want to give you an idea of what it looked like for us when we did it a decade ago).

We did some fairly intensive vessel based post-release monitoring back in 2010 using the combination of satellite-linked positions and VHF signal. To do that, you need a directionalizing VHF antennae (Yagi). The tracking worked well for us, and would be even easier with an animal that may be slower moving and easier to track than common dolphins. Like Brian mentioned, now that technology has improved and a goniometer can be used to intercept the satellite signal, we would prefer to use that technology for visual resights – but can't speak to its utility as we have not yet used it ourselves for that purpose at sea.

The impact of two holes drilled and two separate tag attachment points in the dorsal fin as well as the less ideal more distal positioning of the VHF tag should all be considered from a welfare standpoint. We would not choose to attach two separate tags like this again within our agency, but understand that positions on that may vary. With a younger calf and a potentially softer dorsal fin, the more distal tag attachment would be concerning for me, the more proximal one would not. Additionally, relying on VHF only (rather than satellite tag with dive profiles) markedly limits your ability to relocate the animal after release. I would only recommend VHF tagging in addition to satellite tagging and not as a suitable alternative. VHF has to have ideal conditions for vessel or aerial operations and you need to have a good idea of where to start looking (range is extremely small). VHF tracking from land can not be relied upon for a release candidate like this (although it could be a supplemental method if the calf is close to shore).

On a separate but related note, I have been reviewing our national release criteria best practices document for other reasons and found some sections that may be useful to you as your make your disposition decision for the calf. These documents are the standardized protocols for all marine mammal stranding response in the US. They are currently available in draft form and being reviewed, but they are very close to what will be the final draft. A link to the documents online is here: https://www.fisheries.noaa.gov/resource/document/draft-programmatic-environmental-impact-statement-mmhsrp The appendices (where all the actual protocols are) is at the bottom of that website.

I would note that this calf would not be a release candidate under the US policy. If it were maternally independent, it would most likely fall under the "conditionally releasable" category – which you will see in some of the language. I attached just a few of the more applicable excerpts – you can find more at the link above if you are interested.

Hope that helps!

Best,[redacted]

From: [redacted]@ifaw.org>
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[redacted]

From: [redacted]
Sent: Tuesday, 20 July 2021 5:20 pm
To: Kirstie Knowles; Bronwyn Saunders
Cc: Elizabeth Heeg
Subject: RE: Vet names

Hi All,

The other vets who have been quite involved so far are:

Dr [redacted] - Animal Rescue Veterinarian (IFAW)
Dr [redacted] – Clinical Associate Professor -Aquatic Animal Health (University of Florida, ex Sea World vet)
Dr [redacted] - Head Veterinarian & Director, Animal Health (Vancouver Aquarium)

Let me know if you need contact details for any of the above or for the SeaWorld vets/[redacted] below.

[redacted]

From: Kirstie Knowles <kknowles@doc.govt.nz>
Sent: Tuesday, 20 July 2021 4:42 PM
To: Bronwyn Saunders <bsaunders@doc.govt.nz>
Cc: [redacted] Elizabeth Heeg <eheeg@doc.govt.nz>
Subject: Vet names
Importance: High

Hi Bronwyn,
Key Vet is the Wellington Zoo vet who's been leading advice: [redacted] @wellingtonzoo.com
DOC veterinary lead is [redacted] – cc'd.

[redacted] – can you provide names of veterinary experts that you think would be good people for the Science-media centre to talk to for a non-DOC perspective on the orca situation?

There are MANY international ones Bronwyn but you should have that on the IWC email.

Note the official TAG members are:

[redacted] – Seaworld (VET)
[redacted] – Seaworld (VET)
[redacted] – IFAW
[redacted]
Ingrid Visser
[redacted] - Wellington Zoo
[redacted] - Massey
[redacted] – UC Davis
[redacted] – DOC
Ian Angus – DOC
[redacted] – Ngāti Toa representative
[redacted] (WWF) – probably coming off after this morning's conversation?

Kirstie Knowles (she/her)
Manager Marine Ecosystems – *Kaimātanga Mātai Ahu Moana*
Aquatic Unit, Biodiversity Group – *Kāhui Kanorau Koiora*
Department of Conservation – *Te Papa Atawhai*
Focal point for: IUCN-WCPA, Local Gov Coastal-SIG, Sustainable Seas Challenge, NZ Marine Sciences Society
☎ +[redacted]

Mon	Tues	Wed	Thurs	Fri
✓	🏠	✓	✓	🏠

✓ = In the office; 🏠 = Working remotely; X = Not at work



[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 4:24 am
To: [redacted]
Subject: RE: Tag for stranded orca calf in New Zealand
Attachments: IFAW10-214Gm_50.jpg; Excerpts from the Draft PEIS Appendix V for NOAA MMHSRP May 2021.docx

And just to elaborate on what [redacted] mentioned below. Our initial 'location-only' satellite tags (non-dive profile) had a VHF transmitter integrated (was a great option that is unfortunately not available in the wildlife computers tags). Since the TDR (dive tags) did not have it integrated, we attached a separate VHF tag (see image attached from 2010 short finned pilot whale attachment – note the old version of the TDR is attached here and we would also trim the flap now instead of leaving the more anterior hole empty, and the image is a little messy with blood from the attachment site. So please don't share this image widely as it doesn't reflect current practices, but I just want to give you an idea of what it looked like for us when we did it a decade ago).

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The impact of two holes drilled and two separate tag attachment points in the dorsal fin as well as the less ideal more distal positioning of the VHF tag should all be considered from a welfare standpoint. We would not choose to attach two separate tags like this again within our agency, but understand that positions on that may vary. With a younger calf and a potentially softer dorsal fin, the more distal tag attachment would be concerning for me, the more proximal one would not. Additionally, relying on VHF only (rather than satellite tag with dive profiles) markedly limits your ability to relocate the animal after release. I would only recommend VHF tagging in addition to satellite tagging and not as a suitable alternative. VHF has to have ideal conditions for vessel or aerial operations and you need to have a good idea of where to start looking (range is extremely small). VHF tracking from land can not be relied upon for a release candidate like this (although it could be a supplemental method if the calf is close to shore).

On a separate but related note, I have been reviewing our national release criteria best practices document for other reasons and found some sections that may be useful to you as your make your disposition decision for the calf. These documents are the standardized protocols for all marine mammal stranding response in the US. They are currently available in draft form and being reviewed, but they are very close to what will be the final draft. A link to the documents online is here: https://www.fisheries.noaa.gov/resource/document/draft-programmatic-environmental-impact-statement-mmhsrp The appendices (where all the actual protocols are) is at the bottom of that website.

I would note that this calf would not be a release candidate under the US policy. If it were maternally independent, it would most likely fall under the "conditionally releasable" category – which you will see in some of the language. I attached just a few of the more applicable excerpts – you can find more at the link above if you are interested.

Hope that helps!

Best, [redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, July 20, 2021 11:07 AM

To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Certainly. Attached is the spec drawing of the current model and a photo of one of our older tags of the same type, though there may be minor differences from the newer model that was sent. Also keep in mind that the photo has the flaps trimmed to the first hole and the tag that was sent has all three hole options still on the flap (like in the spec drawing).

The accuracy of the satellite tag transmissions depends on a lot of factors. The biggest factor for accuracy is the number of satellites that are present on the horizon when the tag breaks the surface. The more satellites the better the location. Here are the accuracy estimates from the CLS website based on location class:

- Class 3: better than 250 m radius
- Class 2: better than 500 m radius
- Class 1: better than 1500 m radius
- Class 0: over 1500 m radius

I did a satellite pass prediction for satellite coverage in New Zealand through the CLS Argos website and the tag has been set to transmit only when satellites should be present. This means that there are "dark" hours where the tag will not be transmitting at all. The transmitting hours for that tag is from 0400 – 1300 UTC and 1700-2400 UTC. Converting that to local time means that hits could be received from 0500-1200 NZST and then again from 1600-0100 NZST.

Concerning dual tagging with satellite and VHF, it would be worth a conversation because there are a lot of things to consider, but here are some initial thoughts. In our earliest tag deployments back in 2010 we did send out two common dolphins and one pilot whale with both a satellite tag and VHF tag. For several reasons we stopped after only a few cases. The biggest was that it required two attachment holes which negated the benefit of the single pin attachment. More recent research by [redacted] has shown how important it is to have a tag on the lower 1/3'rd of the dorsal fin for optimum drag reduction. Attaching two tags makes it impossible to keep both tags on the lower part of the dorsal fin. Also newer technologies are available now, specifically the CLS Goniometer, that weren't available back then for intercepting the satellite signal in order to track more fine scale. It should also be considered that one of the best options for relocating a satellite tagged animal post-release is aerial support if DOC is able to provide those assets.

Like I said those are only a few points but would be happy to discuss them further.
[redacted]

From: [redacted]
Sent: Monday, July 19, 2021 8:54 PM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Thank you [redacted]

Is the tag essentially the same in appearance as the *MK10-A?* If not – any chance of an up to date photo of one 😊
Ah yep that makes sense! (suspected tagging the mum was the most likely scenario).

Sorry another question – how accurate are the satellite locations? There is talk about applying a VHF tag as well to allow for close approach and visualisation of the calf post release. I do not have details yet on the proposed type of tag for that.

Just wondered if you had any experience of tracking in on the SPLASH tags to get a visual on the individual it is attached to and how possible that might be.

Thanks again for all you are doing!

[redacted]

From: [redacted]@ifaw.org>
Sent: Tuesday, 20 July 2021 12:48 PM
To: [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Hi [redacted],
Happy to update. Updates are below and answers are below in blue

- *The SPLASH 10-397A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 86.0 g, L 190 x W 22 x H 30 mm). The attachment site will be aseptically prepared then a local anaesthetic will be applied. Briefly, a sterile, zinc plated brass cork borer bit on a cordless drill will be used to create the attachment point, and a disinfected, delrin pin with stainless steel washers and zinc-coated screws will be used to attach the satellite tag. At current transmission parameters the tag is expected to transmit for 70-110 d (Sharp per comms.).”*

  (I don’t have an up to date length on the whip antennae. That length is close, if not correct, but I can’t confirm that off the tag specs I have)

- Have you tagged calves before? (or any species) We have not. If we are releasing a dependant calf it would only be released with it’s mother and the mother would be tagged. We have tagged independent juveniles with fully erupted teeth.

It looks like the Splash tag will arrive in Wellington on Thursday. I am getting the tracking number and will pass that along as soon as I have it.
[redacted]

From: [redacted]
Sent: Monday, July 19, 2021 7:35 PM
To: [redacted]@ifaw.org>
Cc: [redacted]@ifaw.org>
Subject: Tag for stranded orca calf in New Zealand

Hi [redacted],

[redacted] and I are working on the ethics proposal to be allowed to tag this orca calf and I just wondered if I could check a few details with you….

- **Is this still accurate?** If not – which variety of tag are you sending 😀 *“The MK10-A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 72.0 g, L 9 W 9 H: 7.6 9 3.0 9 2.0 cm). Briefly, a sterile, zinc plated brass cork borer bit on a cordless drill will be used to create the attachment point, and a disinfected, threaded delrin pin with zinc-coated, nylon insert, steel lock nuts will be used to attach the satellite tag. MK10-A tags are expected to transmit for 190–220 d (Sharp et al 2016).”*

- Have you tagged calves before? (or any species)

Thank you!!!!



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Excerpts from the Draft PEIS for NOAA MMHSRP May 2021

Appendix V – Standards for Release following Rehab

The full document and appendices can be found:
https://www.fisheries.noaa.gov/resource/document/draft-programmatic-environmental-impact-statement-mmhsrp

P 161: In most release cases, NMFS requires the release of marine mammals within six months of admission to rehabilitation (50 CFR 216.27(a)). This assessment can be done at more frequent intervals or earlier in the process of rehabilitation such as for obvious non-release cases (*e.g.,* neonatal cetaceans, blind or deaf animals, etc.). Rather than staying in a rehabilitation situation for up to six months, it may be in the best interest of the animal to immediately assess, determine releasability, and transfer to a more suitable permanent care facility. This is particularly important for all marine mammals that need socialization or expert care.

Developmental and Life History Assessment. In order to be deemed "Releasable," all rehabilitated marine mammals should have achieved a developmental stage wherein they are nutritionally independent. Nursing nutritionally dependent animals should not be released in the absence of their mothers. The ability of a young marine mammal to hunt and feed itself independently of its mother is critical to successful integration into the wild. Also of great importance is achievement of a robust, seasonally appropriate body condition such that the animal has adequate reserves for survival. Other developmental issues, such as reproductive status and advanced age, seldom stand alone as determinants of release candidacy, but are evaluated in conjunction with the overall health assessment. The Assessment Team should seriously consider information concerning the natural life history for the species. Therefore, it is important that the makeup of the team include someone with expertise or working understanding of the species behavior and life history. Important questions to be addressed include:

1. Does the species depend on a social unit for survival or does it exist solitarily in the wild;
2. Has the animal developed the skills necessary to find and capture food in the wild;
3. Has the animal developed the social skills required to successfully integrate into wild societies;
4. Is there knowledge of their home range or migratory routes; and
5. Does the animal have skills in predator recognition and avoidance?

In other words, how important is it to the survival of the animal to be released with or near other conspecifics? The Assessment Team can work with NMFS to consult with outside experts to evaluate the animal and address these questions. Greater details regarding developmental assessment are included in the appropriate section for each taxonomic group.

Behavioral and Ecological Assessment and Clearance. In order to be deemed "Releasable," a marine mammal should meet basic behavioral criteria, some of which are specific for taxa. Across taxonomic groups, behavioral requirements for release include demonstration of normal breathing, swimming, and diving with absence of aberrant (*i.e.*, abnormal) behavior, auditory, and/or visual dysfunction that may significantly compromise survival in the wild and/or suggest diseases of concern. The rehabilitated animal should also demonstrate the ability to recognize, capture, and consume live prey prior to its release when access to live natural prey is feasible, or, in the case of manatees, the ability to identify and feed on appropriate forage types. Because abnormal behavior may reflect illness or injury, this evaluation should be done in concert with the attending veterinarian and the medical assessment. The behavioral clearance

should be part of the overall recommendation for release that is passed on to NMFS or FWS. Outstanding concerns regarding the behavioral suitability of the marine mammal for release are to be discussed with NMFS or FWS. Additional information is included in the behavioral assessment section for each taxonomic group.

Also included in this thought process, is the concept of ecological status. This concept attempts to integrate the medical and behavioral evaluations into an extrapolation of how the animal would likely do in the wild when exposed to typical ecological pressures (personal comm. Wells 2005). It goes beyond the assessment of the current condition of the animal in an artificial environment at the rehabilitation facility relative to a limited set of immediately observable or measurable parameters. It places the animal in its current rehabilitated condition in the context of life in the wild. This process recognizes the importance of a team approach, involving complementary expertise, to evaluate the probability that a rehabilitated animal will survive and thrive back in the wild. It would be useful to include in the deliberations a behavioral ecologist with knowledge of the specific species (or closely related species) solutions to ecological challenges in the wild. The behavioral ecologist would be familiar with the species habitat, including oceanographic parameters, ranging patterns, life history, feeding ecology, potential predators, social structure, and anthropogenic threats likely to be faced by the animal once it is released.

Medical Assessment and Clearance. Although this document focuses on the evaluation and preparation of rehabilitated marine mammals for release, the medical assessment spans the entire time the animal is in rehabilitation and is critical to understanding the animal's health prior to release. The medical assessment includes information related to any health trend and diagnostic testing, treatment, and response to treatment. The attending veterinarian should perform a hands-on physical examination upon or near admission and prior to the release determination. The attending veterinarian should review the animal's complete history including all stranding information, diagnostic test results (*i.e.*, required by NMFS or FWS), and medical and husbandry records including whether the animal had been exposed to other wild or domestic animals just prior to and/or during rehabilitation or had attacked and/or bitten a human while being handled. It should be noted that strict measures are to be in place to prevent any disease transmission from other wild and domestic animals and humans during the rehabilitation process. The goal of required testing requested by NMFS or FWS is to safeguard the health of wild marine mammal populations and this is achieved by testing for diseases that pose a significant morbidity or mortality risk to wild populations.

Other diseases include those that are of zoonotic or public health and safety concern and the agencies will require immediate notification to assure proper protocols are put into place. The agencies may request testing for other emerging diseases as part of a surveillance program to identify potential epidemics of concern or to determine health trends. Additional testing may be required if the animal was part of an official UME. Specific testing requirements (*i.e.,* pre-release health screen) will come from the NMFS MMHSRP through the RSC, National Stranding Coordinator, or National Veterinary Medical Officer and follows the term and responsibilities stated in the NMFS SA.

Throughout the rehabilitation period, the frequency of physical exams and decisions for performance of additional diagnostic testing are determined by the attending veterinarian. The animal should be closely monitored for disease throughout rehabilitation. Regardless of the precise cause of the animal's

stranding, the stranding event itself and the animal's abrupt transition to a captive environment can cause significant stress, which may increase its susceptibility to disease. Should the animal become infected with such a pathogen during rehabilitation, it could become ill or become a carrier of that pathogen, and may pose a threat to a naïve wild population or even public health if it is released.

The attending veterinarian is urged to utilize the full spectrum of diagnostic modalities available for health assessment of the animal. In addition to basic blood work, serology, microbial culture, cytology, urinalysis, and fecal exam, advanced techniques for pathogen detection such as polymerase chain reaction (PCR), microarrays, and toxicology assessments are also available. A number of imaging techniques including various radiology modalities, bronchoscopy, and laparoscopy may also be utilized. The marine mammal literature has expanded to include numerous references on the performance and interpretation of diagnostic tests (Gulland *et al.* 2018).

Except as otherwise noted, acquisition of blood for a complete blood count (CBC) and chemistry profile will be required by NMFS and FWS upon admission of a marine mammal to a rehabilitation facility. Such blood work should generally be repeated by the original laboratory, to avoid problems with inter-laboratory variability, prior to release of the marine mammal. Microbial culture and isolation (*i.e.,* aerobic and anaerobic bacterial, viral, fungal) may be a part of the medical evaluation and done upon admission and before exit from rehabilitation centers. Such paired tests help determine the types of pathogens that a marine mammal may have acquired in the wild and those that may have been acquired during its rehabilitation. Because the number of pinnipeds entering a rehabilitation facility annually may be quite high and presenting with similar diagnosis, particularly in El Niño years, NMFS may waive additional clinical evaluation as mentioned above for each pinniped but instead require that a percentage of these animals entering a facility have a thorough clinical workup. This will be dependent on several factors, such as the stranding location, time of year, the clinical diagnosis upon admission, and disease status of the wild population (*e.g.,* ongoing outbreaks, UMEs, etc.). For walrus and polar bears, testing requirements will be on a case-by- case basis. The NMFS or FWS stranding coordinators can provide guidance on this and other recommendations mentioned above.
The attending veterinarian interprets the results of blood work and additional diagnostic tests in light of physical exam findings, the animal's age, reproductive status, molt status, behavior, and other relevant or situational factors. Circumstances surrounding the stranding, recent environmental events, and known health issues of resident wild marine mammals are factors that may provide information regarding the health status of the stranded marine mammal. The attending veterinarian should also consider if the animal was held in close proximity to other animals (*e.g.,* pen/pool mates) undergoing rehabilitation and the disease history of those animals (*e.g.,* within facility transmission). A number of references provide data useful for the interpretation of marine mammal diagnostic tests (Gulland *et al.* 2018).

Post-Release Monitoring. Post-release monitoring is a key method by which the efficacy of rehabilitation efforts can be assessed and revised. Such monitoring may also provide an opportunity to recover individuals that are unable to readjust to the wild. Simple post-release monitoring plans include such methods as visually tracking tagged or marked animals by land, air, or sea. More costly radio-telemetry and satellite tracking are highly desirable methods of post-release monitoring as they provide detailed information of the movement and behavior of released marine mammals. Post-release monitoring is recommended for all rehabilitated marine mammals and is required for some taxonomic groups, such as cetaceans, depending on release category. The intensity of post-release monitoring efforts is determined by such factors as the age and species of the marine mammal, its status as threatened or endangered, and concerns regarding its health or developmental issues that may impact its ability to readjust to the wild. Advanced post-release monitoring techniques may be required for "Conditionally Releasable" animals when significant concerns regarding their chances of survival exist. All post-release

monitoring plans for rehabilitated marine mammals are to be approved in writing by, and coordinated with, NMFS or FWS. NMFS may require the submission of follow-up monitoring summaries at specified intervals post- release (*e.g.,* weekly, monthly), until such time as contact with the animal has ended. The final update should include tracking data and an evaluation of the success of the release along with recommendations for future cases. NMFS may use these data in order to make future revisions to marine mammal rehabilitation and release guidelines. In order to compare individual cases, standardization of data collection protocols for monitoring released animals is highly recommended and may be required by NMFS. Formal study of post-release monitoring data and its dissemination to the Stranding Network will aid in the assessment of marine mammal rehabilitation and release programs.

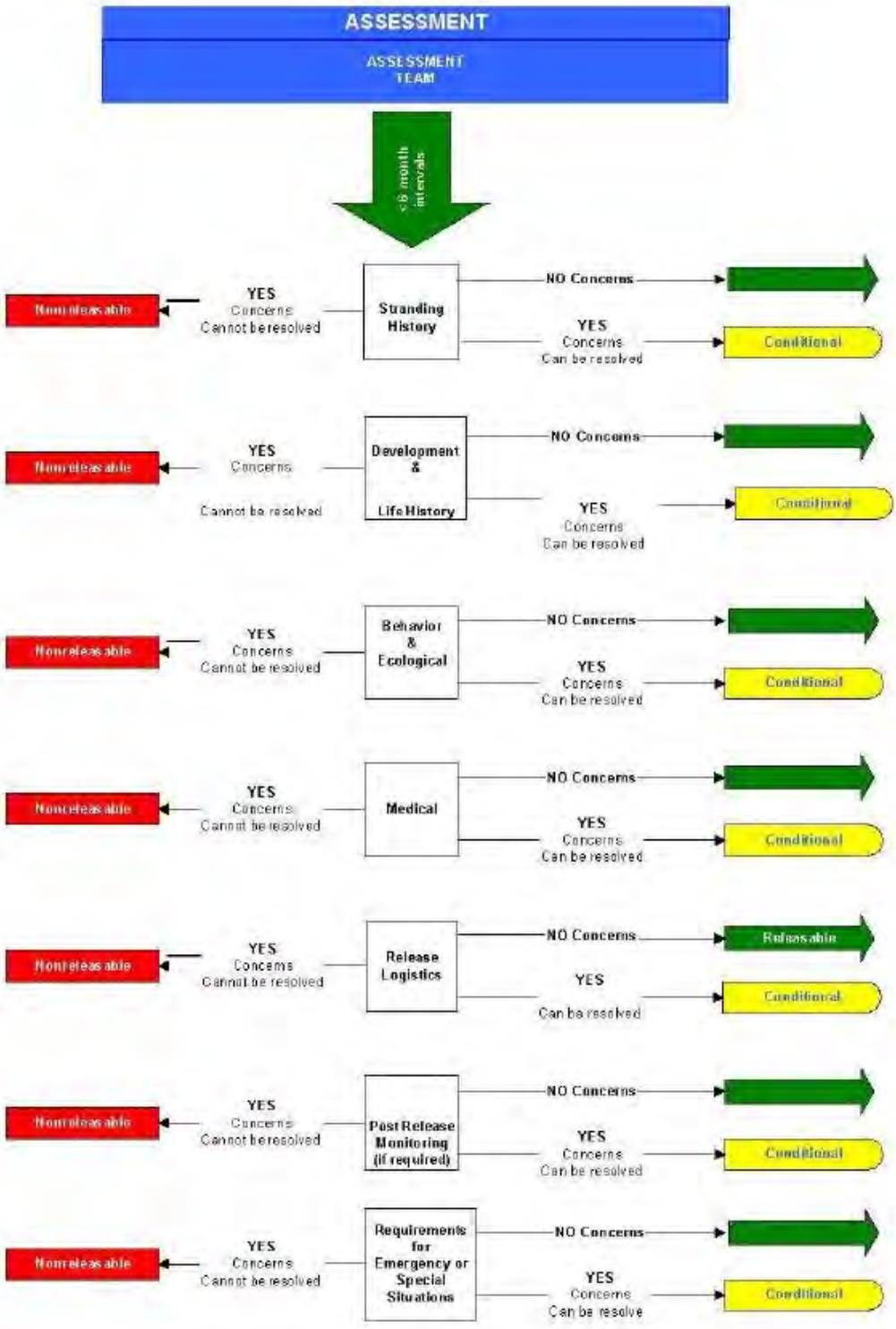


Figure 2.2 Steps and General Parameters for Animal Release Assessment

Developmental Assessment of Cetaceans

A fundamental criterion for developmental clearance of a rehabilitated cetacean is that it has attained a sufficient age to be nutritionally independent, including the ability to forage and hunt. Sub-adult and adult cetaceans are both nutritionally and socially independent, and these developmental considerations will not impact release determinations. The cetacean calf grows from a state of total nutritional dependence through nursing to partial maternal dependence as it learns to forage for prey. Eventually the young cetacean achieves total nutritional independence and forages completely on its own. Social learning is an important component of calf development, and includes things such as social interactions, learning how to forage, predator avoidance, navigation, etc. Social independence may take longer, depending on species. A calf's social independence needs to be evaluated prior to release. Factors including individual and species variations, rehabilitation practices, health status, plus environmental factors influences the rate at which such social development occurs (see Appendix F for Developmental Stages by Cetacean Species).

- Sub-adult and adult cetaceans are considered socially and nutritionally independent and should be considered to meet the developmental criteria for releasability.
- Very young nursing calves, that strand alone or whose mothers die, are considered nutritionally and socially dependent. Nutritionally and socially dependent (neonatal and very young nursing) calves will be deemed "Non- Releasable" (case-by-case review for ESA species may be conducted). Cases involving older calves and juveniles that may have some foraging skills may be considered nutritionally independent, but may still be socially dependent. These age classes will be considered "Conditionally Releasable" or "Non-Releasable" on a case-by-case basis. If "Conditionally Releasable", a thorough assessment, optimum release planning, and subsequent post-release monitoring is required.

Reproductive status in and of itself does not impact release candidacy unless a female strands with its calf or gives birth during rehabilitation. A single pregnant female should be returned to the wild as soon as both medical and behavioral clearance has been achieved and NMFS approves of the release plan.
Considerations for cow/calf cetacean pairs - All mother-calf cetacean pairs are deemed "Conditionally Releasable" and must be fully discussed with NMFS. The well-being of both the mother and the calf is to be carefully considered in such cases. Efforts should be made to reduce their time in captivity and to keep the mother-calf pair together, yet allow for continued treatment and rehabilitation of both individuals, if warranted. In situations where a nursing, dependent calf strands with its mother and both animals achieve medical and behavioral clearance, the calf should be released with its mother, assuming it meets all of the other criteria for release. A stranding of a mother/calf pair may be the result of illness or injury to either the mother, calf, or both. If the calf dies or is euthanized, the mother could be considered for release following a thorough and appropriate assessment. If the mother dies or is euthanized, the calf (if nutritionally and socially dependent) will be considered "Non-Releasable" or be euthanized.

[redacted]

From: [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 3:07 am
To: [redacted]
Subject: RE: Tag for stranded orca calf in New Zealand
Attachments: AM-A397A-A-00.pdf; Splash TDR.jpg

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Cc: [redacted]@ifaw.org>
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- **Is this still accurate?** If not – which variety of tag are you sending 😃 *“The MK10-A satellite tag (Wildlife Computers, Redmond, WA, Figure 1) proposed for use here has a single 185 mm flexible whip antenna, wet/dry sensor and 3.5 V AA battery (weight: 72.0 g, L 9 W 9 H: 7.6 9 3.0 9 2.0 cm). Briefly, a*

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SITE SELECTION CRITERIA

The following is a list of potential site criteria for long-term care of multiple cetaceans (5-8 animals). These criteria can be scaled and customized according to the species and number of animals, as well as duration of care.

Environmental and physical characteristics:

- Minimum surface area – in the region of 500m X 500m (understanding the "length" and "width" of a sanctuary will be irregular), which is 250,000 square meters or nearly 62 acres (this is based on long-term care of multiple animals);
    - Ideally the sanctuary area would be more than 100 acres, but ~65 is a minimum for the long-term care of 5-8 animals;
    - Depth – Within the sanctuary area there should be a variety of depths with substantial areas of 15+ meters. This should include space for dives of up to 10 meters as well as shallow depths. The variety will create an enriching environment for the animals;
    - There can be very shallow areas, as long as the depths for the sanctuary overall are as above, but care should be taken that areas where animals might accidentally strand as the tide goes out are minimized;
- Volume – 3.75million cubic meters (assuming a min depth of 15m over the entire sanctuary surface area), or nearly a billion US gallons; The volume will vary in direct relationship to the variety of depth;
- Tidal range – As long as minimum depths are measured at mean low tide, tidal range is relatively unimportant. It can be 2m, 6m, even 10m, as long as the minimum depth at mean low tide meets the above requirements and risk of stranding as tide recedes is minimized;
- Water temperature – The water at the surface and mid-depth should be within the normal annual range for the species being cared for at the sanctuary;
- Salinity – approximately **25-35 ppm;**
- Water turnover – See below re "strong currents phenomenon." Water within the sanctuary boundaries should probably turnover completely at least **once every few days;**
- Divisibility – Must be able to separate animals that are not compatible. At a minimum, should be able to divide the sanctuary into half as many separate areas as there are whales, e.g., for eight (8) whales, should be able to divide the sanctuary into a minimum of four (4) separate areas. These areas should be visually, even if not acoustically, shielded from each other;
- Bluffs and cliffs can be present, but accessibility to the entire shore-line must be possible, even if only by small craft. If there are issues along the shore-line, staff must be able to access the problematic area to correct the problem, whatever it may be.

To be avoided:

Natural

- Seasonal ice cover;
- Areas with known excessive weather systems or phenomena (e.g., hurricanes, gale-force winds, hail) – if unavoidable, location needs natural buffers;
- Currents powerful enough to adversely impact the sanctuary (riptides or other strong current phenomenon that may threaten structural integrity);
- Excessive freshwater influx (rivers are acceptable if they do not lower salinity beyond appropriate levels within the sanctuary boundaries – see below).

Artificial

- Human effluent, e.g., areas with significant point sources of pollution or run-off, including storm water run-off, agricultural run-off, sewage outfalls (treated or not), or rivers with significant pollution problems;
- Known harmful algal bloom or marine mammal die-off occurrences;
- Areas with significant levels of pollutants, such as organochlorines or heavy metals, in the water within the sanctuary boundaries. Areas with significant marine debris should also be avoided – if this is not possible, regular monitoring and removal of marine debris should be part of routine maintenance by staff;
- Nearby major shipping lanes or large marinas. Anthropogenic sources of underwater sound in general should be minimized. Acoustic readings with hydrophones should routinely be performed during the site selection process. In-air sources of loud sound, e.g., industrial activity, should be minimal;
- Ocean farming that is actively changing the local environment (such as significant nutrient loading);
- Areas with significant nearby sources of air pollution (such as factories or major multiple-lane highways);
- Areas with significant populations of feral dogs or cats.

Whale Aid

Whale Aid, a project of the Whale Sanctuary Project, consists of a team that is highly experienced in planning for and implementing the rehabilitation, care, and reintroduction of cetaceans. These cetaceans have either been held in captivity or are wild cetaceans in need of human assistance for survival (such as live stranded animals).

Past projects of Whale Aid team members include:

- Keiko – The effort return Keiko, the orca from the movie Free Willy who was captive at a marine park in Mexico City, to his home waters in Iceland. The project included rehabilitation in Oregon before transport to a sea pen in Iceland where he was cared for and thrived for 4 years living in a netted enclosed bay, with a sea pen, as well as being taken out into the open ocean for "open ocean walks."
- Springer – The rehabilitation and reintroduction of a young orca who was found out of habitat and separated from her family. Springer was successfully rehabilitated in a sea pen and then reintroduced to the wild where she has thrived and fully reintegrated into her natal population and has subsequently had two healthy calves.
- Back to the Blue – The successful rehabilitation and reintroduction of 2 formerly captive bottlenose dolphins into the waters off the coast of Turkey.
- J50 – The effort to medical respond to the needs of an ailing free swimming orca calf. Medication evaluations and treatments were administered in the wild, and plans were developed for a rehabilitation and release effort.
- Russian Whale Jail – The effort to secure the reintroduction of 87 beluga and 10 orca captured illegally in eastern Russia. All of the animals were returned to the wild.
- Sk'aliCh'elh-tenaut – The development of a responsible and comprehensive plan to return Sk'aliCh'elh-tenaut (the orca known as Lolita) from the Miami Seaquarium where she has been captive for over 50 years, to her natal waters in the Salish Sea. This plan has been created for the Lummi, an indigenous community working to secure Sk'aliCh'elh-tenaut's return home.

Additionally, Whale Aid team members have led and assisted in numerous stranding responses, disentanglements, oil spill responses, natural disaster responses, research, and health evaluations of wild marine mammals, including cetaceans, pinnipeds, sirenians, and mustelids.

The above listed projects illustrate the broad expertise of the Whale Aid team who can advise on the creation of specific plans needed to respond to whale stranding's and other situations that may benefit from the application of their experience.

IFAW

[redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 6:08 am
To: [redacted] Kirstie Knowles; [redacted]
Subject: VHF Tag

Hi There,

I'm so sorry for not responding sooner, we've been in the middle of the a move and haven't had access to internet for the last couple of days.

[redacted] or Kirstie do you have access to antennas and receivers for a VHF tag and if so do you know what the frequency range is?

VHF receivers are set for different frequency so it's important that we have the correct receiver and antenna for the tag.

If you don't have access to receivers and antennas I think it maybe possible to borrow a couple of receivers and antennas from NMFS. I spoke with them yesterday and they were going to see what they had available and they are supposed to get back to me today with what may be available.

[redacted], I don't have the specs of the tag at this time but I've attached a photo of what they look like and how they would be attached.

Hope this helps and should have more info. later today.

All the very best,

[redacted]

[redacted]

From: Ian Angus
Sent: Thursday, 22 July 2021 6:43 am
To: Kirstie Knowles; Kirsty Prior
Cc: [redacted]
Subject: Fwd: Whale Sanctuary Documents for Toa..
Attachments: SITE SELECTION CRITERIA_Whale Sanctuary Project_20July2021.docx; Whale Aid Background_20July2021.docx; Confidential-Sk'aliCh'elh-tenaut Operational Plan_29Jun2021.pdf

Guidance if needed in seeking alternative sites.
Ian

Sent from Workspace ONE Boxer

---------- Forwarded message ----------
From: Ingrid Visser [redacted]@orca.org.nz>
Date: 21/07/2021 9:04 pm
Subject: Whale Sanctuary Documents for Toa..
To: Ian Angus <iangus@doc.govt.nz>
Cc:

From: [redacted]
Sent: 21 July 2021 10:25:04 am NZST
To: Ingrid Visser [redacted] Ingrid Visser [redacted]@orca.org.nz>
Cc: [redacted]
Subject: Documents for today...

Hey [redacted]

Ok - attached is a copy of the WSP site selection criteria, Sk'aliCh'elh-tenaut's Operational Plan (a confidential copy which the Lummi elders are in support of your sharing with whom you feel this is most appropriate), and a quick write up on the experience of Whale Aid to help with precedent. Let us know if there is anything else that would be helpful and keep us posted on what you need next.

Best of luck - you guys are doing awesome and Toa couldn't have anyone better in his camp :)

All the best,
[redacted]

--
whalesanctuaryproject.org

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Sent from my Android device with K-9 Mail. Please excuse my brevity and thumb driven typos.

Bringing Sk'aliCh'elh-tenaut Home

OPERATIONAL PLAN

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The following operational plan has been designed for the safe and responsible return of Sk'aliCh'elh- tenaut from the Miami Seaquarium to her home waters in the Salish Sea. This plan is a living document and will remain flexible to incorporate new data as it is obtained.

The operational plan is designed to always prioritize the well-being of Sk'aliCh'elh-tenaut and Sk'aliCh'elh (her southern resident orca family), as well as to protect the Salish Sea ecosystem (her home), and respond to the commitment of the Lummi (her relations) to bring her home and be respectful to the interests of other people in the Salish Sea region.



Our Xa xalh Xechning to qwe'lhol'mechen: Sk'aliCh'elh-tenaut's return to Xw'ullemy

Sk'aliCh'elh-tenaut, the orca also known as Tokitae and/or Lolita, was violently taken from her family in Xw'ullemy (the Salish Sea) in 1970 and has been held at the Miami Seaquarium ever since. Her fifty year captivity must end now; it is time to bring her home.

Bringing Sk'aliCh'elh-tenaut home to her family in Xw'ullemy is our Xa xalh Xechnging (sacred obligation), as we are her family. Our Xwlemi Chosen (Lummi language) term for "orca" is qwe'lhol'mechen, which means "our relations under the water." Our ancestral teachings hold that orcas are people in killer whale regalia, our oral traditions tell of literal kinship between the killer whale people and our people. Since time immemorial, we have shared our traditional territory and have been in reciprocal relationship with qwe'lhol'mechen.

We call out specifically the Southern Resident Killer Whale population as our family members. The J, K, and L pods bear the Lummi family name Sk'aliCh'elh. We held a Sna'teng (traditional naming ceremony) for Sk'aliCh'elh to affirm our spiritual and kinship bonds. We have held ceremonial feedings for Sk'aliCh'elh because they have been hungry, and we feed community members who are hungry. This is our Schelangen, our traditional way.

Sk'aliCh'elh-tenaut means "a female member of the Sk'aliCh'elh family." She belongs to our family, to the Sk'aliCh'elh family, and to Xw'ullemy. The abduction of Sk'aliCh'elh-tenaut created a wound which now must be healed. As Lhaq'temish (Lummi people), we are calling for her return. This is our inherent spiritual, cultural, and family right. She, herself, also has inherent rights to be with her family at home.

We are supported in the work to bring Sk'aliCh'elh-tenaut home by the United Nations Declaration on the Rights of Indigenous People, by Western law and by Western science. In order for these Western ideas to be put into practice in a good way, in a way that supports natural and spiritual law, they must be guided by Indigenous worldview and ceremony.

As Lhaqtemish people, we are guided by our ancestors and the principle of A'ahs'qe'xie: the idea that everything is connected, and that the relationships between things have properties, energy, and agency. Flowing from the principle of A'ahs'qe'xie is the truth that the entire web is changed and affected by any change to any strand or thing on that web. For instance, bringing Sk'aliCh'elh-tenaut home is healing not only for her, but for her family, our family, Xw'ullemy,

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for Indigenous peoples fighting similar battles, and for everyone who loves and has been called by Sk'aliCh'elh-tenaut. Healing one strand of the web helps heal the whole web.

In bringing Sk'aliCh'elh-tenaut home, we are bringing her back into her native culture and spiritual home as well as her physical home. A Lummi cultural representative will be Sk'aliCh'elh-tenaut's companion throughout this process, to love her, support her, and to let her know that she is not alone and that she is coming home. Part of Sk'aliCh'elh-tenaut's ongoing care will include Lummi cultural and spiritual companionship and care. Before the logistical work of the operational plan begins with Sk'aliCh'elh-tenaut's health evaluation, a ceremony will be held for Sk'aliCh'elh-tenaut and for the whole team involved with her homecoming. The way will be spiritually cleared for her safe return and loving homecoming.

Our commitment to Sk'aliCh'elh-tenaut is for life and beyond. We honor our ancestors, we do not stop feeling their presence just because they are no longer here with us. It is our sacred responsibility to give Sk'aliCh'elh-tenaut the best and healthiest life possible, from now and for the rest of her days. If she should happen to make her journey to the ancestors while in the Xw'ullemy habitat, we will tend to her body and spirit as we would with any relation. We will pray for her and bury her in our Lhaqtemish way.

Our Lummi work for Sk'aliCh'elh-tenaut's return is housed in the Lummi-led non-profit Sacred Lands Conservancy. The SLC has commissioned the Whale Sanctuary Plan to collaborate with the world's top experts on a plan that will safely bring our relation home, and will ensure her and her Sk'aliCh'elh family's continued well-being.

The late hereditary Chief of Lummi, Tsilixw, was our cultural and spiritual guide. He came with us when we ceremonially fed our hungry Sk'aliCh'elh family, he held ceremony to clear the way for our work with qwe'lhol'mechen and Sk'aliCh'elh-tenaut. We hold him in our hearts as we continue this work, and his teachings continue to guide us. He shared with us a message from our ancestors, "Heal qwe'lhol'mechen, heal the Salish Sea, and we will heal." Now that he walks with the ancestors, we carry this message. Bringing Sk'aliCh'elh-tenaut home is part of the work to heal qwe'lhol'mechen, the Salish Sea, and our community.

The work in this operational plan to return Sk'aliCh'elh-tenaut to Xw'ullemy begins, ends, and is grounded in our culture, spirit, and ceremony.

Tah-Mahs (Ellie Kinley), President
Squil-le-he-le (Raynell Morris), Vice-President
Sacred Lands Conservancy

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The following plan has been prepared for the Sacred Lands Conservancy by Jeff Foster, Katy Foster, and Charles Vinick of the Whale Sanctuary Project.

A special thanks to the professionals who provided consultation during the drafting of this plan:

Dr. Deborah Giles, PhD
Dr. Frances M.D Gulland, Vet MB, PhD
Dr. Brian Joseph, DVM
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Dr. Stephanie A. Norman, DVM, PhD
Dr. Heather Rally, DVM
Dr. Stephen Raverty, DVM, PhD
Dr. J Pete Schroeder, DVM
Dr. Michael Weiss, PhD

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1. BACKGROUND

The following is intended to provide context for the operational plan.

**It should be noted that over the years Sk'aliCh'elh-tenaut has been referred to within the captive industry by the names of Tokitae and Lolita.*

1.1 Brief History of Sk'aliCh'elh-tenaut's Life Since Capture

Sk'aliCh'elh-tenaut was captured in Penn Cove, Washington state, in 1970. It is believe that all three southern resident orca pods were at one point enclosed behind the nets during the Penn Cove captures. Of the animals initially captured in the nets, a smaller subset was permanently removed from the wild and sold to marine parks. This included Sk'aliCh'elh-tenaut, who was believed to be around 4 years old at the time. After capture Sk'aliCh'elh-tenaut was sold to the Miami Seaquarium in Miami Florida and has remained there ever sense.

Since arriving at the Miami Seaquarium, Sk'aliCh'elh-tenaut has lived and preformed daily (typically multiple times per day) in the same pool. Her pool is 12ft deep around the perimeter and gradually deepens to 20ft at the center of the pool. The largest contiguous area of the pool is approximately 80ft by 35ft.

From the time of her arrival until 1980, Sk'aliCh'elh-tenaut shared this space with another wild caught southern resident orca named Hugo. Hugo was captured prior to Sk'aliCh'elh-tenaut and had resided at the Miami Seaquarium for approximately two years prior to her arrival. Hugo died of brain aneurysm in 1980.

Sk'aliCh'elh-tenaut currently continues to live and perform in the same pool at the Miami Seaquarium, and now shares the space with two Pacific White Sided dolphins. Sk'aliCh'elh-tenaut is now the only endangered southern resident orca that is in captivity.

1.2 Southern Resident Orca Lineage

Sk'aliCh'elh-tenaut is believed by researchers to be a member of L-Pod. She is suspected to possibly be the daughter of L25 "Ocean Sun", a L-Pod matriarch who is still alive today.

In 2015 NOAA Fisheries ruled that Sk'aliCh'elh-tenaut's status as a captive animal did not preclude her from being listed under the Endangered Species Act.

1.3 Relocation Habitat

The following operational plan is designed for the safe and responsible relocation of Sk'aliCh'elh-tenaut from her current pool at the Miami Seaquarium to an ocean-based habitat in the Salish Sea.

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The ocean-based habitat (from hereon referred to as *Ocean Habitat*) will consist of a fully enclosed, netted space of 20,000 square feet with a constant depth of 30ft (inner habitat), surrounded by an enclosed buffer zone of approximately 15 acres (barrier net). The inner habitat will include nets hung from a supportive structure on which staff can work. The larger enclosed buffer zone will consist of nets hung from buoys. This design for Sk'aliCh'elh-tenaut's enclosure locates the inner habitat structure within the larger restricted area defined by a barrier net creating a buffer zone between the inner habitat structure and the barrier net. The barrier net will enclose a buffer zone between Sk'aliCh'elh-tenaut and the open Salish Sea waters. This design also allows Sk'aliCh'elh-tenaut to be acoustically linked to her environment, and also allows for her to live in the natural sea water of the Salish Sea.

At the Ocean Habitat, necessary husbandry and medical care will be maintained to ensure that the needs of Sk'aliCh'elh-tenaut are met. The site will include 24-hour monitoring and security for the safety of Sk'aliCh'elh-tenaut and the public.

The Salish Sea is an important area in the natural range of the southern resident orca population and are thus Sk'aliCh'elh-tenaut's natal home waters.

1.4 Past Precedent

Each of the stages presented in this plan has been proven to be appropriate and viable in multiple cetacean transports and relocations by the captive industry, the U.S. Navy, and cetacean reintroduction projects such as the Keiko project.

Health and behavioral evaluation techniques for both wild and captive orcas have been long established and refined in both the captive industry and by the marine mammal research community. Models of conditioning techniques, including conditioning in preparation for transport, have been developed and utilized by both the captive industry and cetacean rehabilitation and reintroduction projects.

The captive industry and the U.S. Navy have a long history transporting cetaceans, including orcas, over distances both short and long. The history of successful orca transport includes long-haul air transport, overland transport, and ocean transport. The precedent for safe transport of orcas has been so well established that SeaWorld routinely transports orcas among its parks. Rehabilitation and repatriation projects have successfully followed these same established methods of transport for orcas and other cetaceans. The Keiko project successfully transported an orca from Mexico City, Mexico to Newport, Oregon, and then on to Vestmannaeyjar, Iceland.

Care of cetaceans, including orcas, has traditionally included use of ocean-based habitats for long-term care. Captive care of orcas began in ocean-based habitats, and there is extensive existing knowledge about how to care for captive orcas in this type of setting. Additionally, the U.S. Navy continues to house and care for cetaceans in ocean-based habitats.

Cetacean rescue, rehabilitation, and repatriation projects have successfully utilized ocean-based habitats as an alternative to land-based concrete pools. These ocean-based habitats have allowed

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for effective transition into a more natural setting, while still allowing for any necessary care of the cetacean/s. Examples of successful implementation of ocean-based habitats have included projects such as The Back to the Blue Project of the Born Free Foundation, which successfully rehabilitated two long-term captive bottlenose dolphins in an ocean-based habitat and then successfully repatriated both dolphins to the wild. On the Keiko Project, Keiko, the orca, was moved from a concrete pool at a marine park to a more natural environment where he received the majority of his care at an ocean-based habitat. Keiko thrived in this more natural and dynamic environment.

The stages outlined in this plan, are backed by a strong foundation of established techniques of health and behavioral evaluation, conditioning, transport, and care for cetaceans in ocean-based habitats. This plan builds on that foundation to best serve the needs of Sk'aliCh'elh-tenaut and the Salish Sea ecosystem in which the Ocean Habitat will exist.

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2. HEALTH & BEHAVIORAL EVALUATION IN MIAMI

"*In the Lhaqtemish way, the Lummi hold ceremony before a relative goes through a life change, or undergoes Western medical evaluation or treatment. A cultural representative will work spiritually with Sk'aliCh'elh-tenaut as well as with the people who are part of her team. This spiritual and cultural work will ground the physical and scientific work that will follow." –Squil-le-he-le & Tah-Mahs*

Prior to implementation of any conditioning, a complete and comprehensive evaluation will be performed by highly qualified marine mammal veterinarians and behavioralists. This evaluation will look at present health and behavioral condition, as well as include a thorough examination of past medical and behavioral records. The results of the initial evaluation will inform whether and how to proceed with the remaining protocols in this plan. Ongoing monitoring of Sk'aliCh'elh-tenaut will continue throughout the remainder of pre-transport, transport, and on-site care.

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2.1 Review of Records & History

- Veterinary review of all husbandry, training, and health records (i.e. total food intake, food species and percentages, supplements, behavior, weight, diagnostic, laboratory, reproductive history, and treatment) for a minimum of the most recent 10 years;
- Review of water quality records (i.e. chemistry and microbiology) for a minimum of the most recent 10 years, along with water temperature records, if available;
- Interviews of past and current veterinarians, husbandry personnel, and facilities staff, to extent possible;
- Gather all historical data on any medical emergencies, when they occurred, and Sk'aliCh'elh-tenaut's response to emergency interventions;
- Review any infectious disease history of any past or current tank mates.

2.2 Initial Facility Observations

- Familiarization with the Miami Seaquarium and
- its design, engineer support/maintenance , husbandry and medical procedures and functions;
- Observation of a normal day's activity at Sk'aliCh'elh-tenaut's pool. May require observations of multiple days.

2.3 Behavioral Evaluation & Ethogram

An ethogram will be used to evaluate Sk'aliCh'elh-tenaut's current behavioral patterns, daily routines, and use of her pool. The ethogram will evaluate multiple parameters, including but not limited to:

- Time spent in various behavioral categories;

- Time spent at the surface vs. underwater;
- Time spent interacting with people and types of interaction;
- Time spent interacting with tank mates and types of interaction;
- Resting and feeding patterns (duration, timing, quality)
- Stereotypies.

In addition to a behavioral ethogram, general behavioral observations will be recorded throughout the pre-transport phase, noting patterns (usual and unusual) and trends. Behavioral observations will include special attention to changes in the quality of her interactions with husbandry and veterinary staff, as well as her pool mates.

2.4 Initial Health Evaluation

Sk'aliCh'elh-tenaut's initial health evaluation will remain flexible based on findings and at the discretion of her veterinary team but will include key objectives to be evaluated. The evaluation will conform to the IUCN Guidelines for health assessments for wildlife reintroduction (Woodford 2000). These objectives include:

- *Visual Examination/Clinical Evaluation:*
    - Up-close and distant visual observations of her skin, teeth, eyes, anus, genital opening, blowhole, overall body condition and symmetry, her general appearance, her interaction with tank mates, her activity level, and her mentation and responsiveness;
    - Check for abnormalities in buoyancy, abnormal diving behavior (as compared to her normal patterns), or listing to one side when at rest;
    - This will be done in coordination with her training staff, who observe her daily and have an understanding of what is currently 'normal' for Sk'aliCh'elh-tenaut;
- *Morphometrics:*
    - Weight should be taken to establish a baseline and any past seasonal trends in weight should be identified in the review of records and history;
    - Systematic body measurements will be taken;
    - Obtain baseline blubber thickness measurements via ultrasound;
- *Skin:*
    - Evaluate skin for inconsistencies (past or present), including mapping of scars, wounds, blemishes and other lesions. Close inspection of mucocutaneous junctions and external mucosa of the blowhole, esophagus, vagina, and anal areas for lesions associated with relevant mycotic or viral organisms. Obtaining swabs, cytology, or biopsy, of any lesions as needed. Thorough examination for the presence of any papilloma-virus lesions or any other viral skin lesions;
- *Vision:*
    - Ocular examination, including evaluation of corneal and conjunctival health, fundic examination, evaluation of capacity for vision (menace response, pupillary light reflex, visual cues), and assessment of any specific indications of discomfort. The main goals of an ocular examination are to confirm that vision is adequate to navigate a new environment and that there are no active lesions that may progress to blindness;

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- *Hearing:*
    - Evaluation of auditory capacity and acoustic responsiveness. If an acoustic or bio sonar deficiency is detected, more extensive examination will be conducted;
- *Dental:*
    - Examination of dentition using digital radiography, including microbiology cultures and antibiotic sensitivity testing as needed;
- *Pulmonary:*
    - Evaluation of pulmonary function and blood oxygenation status;
    - Collect baseline photos/video of her respirations for later comparisons as needed;
    - Evaluation of exhaled gasses;
    - Collect specimens (via differential agar plate respiratory sample and direct swab of blowhole opening) for bacterial culture to evaluate the presence of potential respiratory pathogens, evaluate antibiotic sensitivity, and to establish baseline respiratory microbiome data (proteomics and metabolomics) for later comparisons as needed (a change in upper respiratory microbiome after relocation is anticipated);
    - Ultrasound of abdomen and chest to gather baseline pulmonary data (noting limitations of ultrasound due to the size and density of the whale);

  **Metabolic and respiratory function, as well as respiratory microbiome data may be hard to interpret due to limited existing data on comparable animals (i.e., orcas of similar age, genetics, and life history). However, this data will be collected to establish a baseline understanding of Sk'aliCh'elh-tenaut that can be used to detect changes in her health via ongoing monitoring;*
- *Cardiac:*
    - Given Sk'aliCh'elh-tenaut's age, a complete cardiac workup using ultrasound and electrocardiography will be performed, to the extent possible with the limitations of its effectiveness in orca;
- *Urinary Health:*
    - Collect urine for diagnostic evaluation, such as (but not limited to) evidence of any proteinaceous casts, calculi or evidence of inflammation or infection;
- *Digestive Health:*
    - Collect stool sample for cytology, parasitology, and bacterial culture, as well as to establish a baseline gut microbiome data (proteomics and metabolomics) for future comparison;
    - Evaluation of mucus membranes and structures of the oral cavity;
    - Gastric and esophageal evaluation via gastric wash and/or endoscopy will be considered to evaluate upper gastrointestinal mucosa health;
- *Immune System:*
    - Immune system cell and cytokine profiling;
    - Ultrasound evaluation of lymph nodes
    - Careful review of past medical history for evidence of immune function;
- *Blood Sampling:*
    - Blood sampling for routine hematology and serum chemistry, including enzyme panels and evaluation of inflammation markers;
    - All results will be compared to historic values to evaluate trends and outliers, and will be interpreted in the context of Sk'aliCh'elh-tenaut's historic test results and

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results from ongoing monitoring. It should be noted that many of the more specialized tests are not validated for orcas and do not have established normal ranges for the species, therefore interpretation outside of the context of Sk'aliCh'elh-tenaut's health trends will be only be considered in consultation with a team of veterinary clinicians;

- *Hormones:*
  - Fecal and breath hormone analyses for comparison to data obtained from wild southern resident orcas (these results will be validated or confirmed through analysis of blood hormone levels). It should be noted that these results will not likely be necessary for determining fitness for transport;
  - If possible to do without the additional sampling increasing the stress on Sk'aliCh'elh-tenaut (as determined by her care and veterinary team), measure if cortisol levels mirror outward stress response during conditioning for transport (some level of stress is anticipated in any transport and relocation);
- *Pathogens:*
  - Screening for presence and past exposure to viral pathogens of high priority concern for southern resident orcas, and assessment of transmission potential of any findings (with particular attention paid to Brucella, morbillivirus, poxvirus, and herpesvirus, as well as any pathogens specifically identified in marine mammals stranded in Florida). Additionally, Sk'aliCh'elh-tenaut will be tested for COVID-19 prior to transport. Timing of testing to be determined by Sk'aliCh'elh-tenaut's veterinary team and experts in marine mammal pathology/epidemiology.
  - Screening of sputum, blow and feces for bacterial, fungal, protozoal, and parasitic agents. This will include conventional bacteriology (including screening for Mycobacteria by molecular studies), parasitology and mycology. Antibiotic resistance will be determined;
- *General:*
  - Check for abdominal masses via ultrasound (noting limitations of ultrasound due to the size and density of the whale);
  - Evaluation of any specific health concerns revealed during the review of records and history, with follow up or repeat studies, as indicated.

Ongoing health monitoring will continue throughout the pre-transport phase, the exact protocols of which will be determined based on the findings in her initial evaluation and any specific recommendations from NOAA and DFO. In addition to the initial assessment and ongoing health monitoring, a detailed pre-transport health assessment will be conducted 2-4 weeks prior to transport, and will included serology to specifically screen for pathogens prior to transport.

**The use of therapeutics will be avoided unless absolutely necessary. This will ensure that Sk'aliCh'elh-tenaut's immune system is best suited to quickly and appropriately respond to the environmental conditions in the Ocean Habitat. Given Sk'aliCh'elh-tenaut's age, extra care will be given to this point. If therapeutics are deemed necessary, they will be administered in the best interest of Sk'aliCh'elh-tenaut, under the direction and supervision of her veterinary clinician team.*

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3. CONDITIONING IN MIAMI

The conditioning plan will be further tailored to Sk'aliCh'elh-tenaut's needs based on the findings from the initial health assessment and behavioral evaluation. The conditioning plan will remain flexible throughout the pre-transport phase; however, it will include key conditioning objectives (environmental, physical, and transport acclimatization) to be implemented on a timeline according to her response and progress. Implementation of the conditioning phase will be overseen by her husbandry and veterinary teams, always with the best interest of Sk'aliCh'elh-tenaut. Her response to conditioning objectives will be measured behaviorally and physiologically, according to protocols designed by her husbandry and veterinary teams after her initial health assessment and behavioral evaluation (once her baseline is understood). To ensure the wellbeing of Sk'aliCh'elh-tenaut throughout, these protocols will include specific thresholds under which each activity should be suspended.

Conditioning objectives will begin with establishing trust between Sk'aliCh'elh-tenaut and the staff that will be involved in her care going forward. This portion of the pre-transport phase is extremely important and a period of 2-3 months at the beginning of the pre-transport phase has been allocated solely for this purpose while concurrently conducting her health evaluation. Should Sk'aliCh'elh-tenaut respond in a quick and positive manner to this phase of conditioning, its duration may be shortened.

3.1.1 Training Staff (Introductions & Bonding)

Throughout the pre-transport phase, Sk'aliCh'elh-tenaut will maintain contact and interactions with her current training and veterinary staff, through her day-to-day care and the maintenance of important husbandry behaviors, and later through conditioning work on new behaviors specific to acclimation for transport.

Throughout this phase, any new training/husbandry staff who will accompany Sk'aliCh'elh-tenaut to the Ocean Habitat will be gradually introduced. Training staff that will not be accompanying Sk'aliCh'elh-tenaut, will slowly reduce their contact time with her. If feasible, training staff with whom she has formed strong bonds will relocate with Sk'aliCh'elh-tenaut to the Ocean Habitat so as to reduce the stress of transport and introduction to a new environment.

3.1.2 Feeding

Sk'aliCh'elh-tenaut's current diet (type, quality, amount and supplements) will be maintained throughout the pre-transport phase unless otherwise indicated by her veterinary care team based on her health needs. This includes all supplements. If it is determined that an adjustment should be made, the transition will be made incrementally.

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3.2 Conditioning Objectives

3.2.1 Pool Temperature

The water temperature in Sk'aliCh'elh-tenaut's pool should be gradually lowered to acclimate her to the temperature she will experience in her Ocean Habitat that is approximately 44-54°F throughout the year. This range is within the thermoneutral zone for her species. For the purposes of planning, a goal of lowering her pool temperature to roughly 49°F (annual average) can be used and further refined when an approximate date of transport and the chilling capacity of her pool at Miami Seaquarium are known. The gradual change in Sk'aliCh'elh-tenaut's pool temperature will be overseen by her veterinary team and the pace will be tailored to her response (using indices determined by her veterinary team after her baseline has been established) so as to avoid an adverse response to this change.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°F	45.6	44.8	45.8	47.2	48.2	51	50.8	53.3	52.3	50.2	48.6	47.4

Figure 1. Sample of average monthly temperatures for Orcas Island, WA.

If feasible, a shade structure will be constructed over a portion of Sk'aliCh'elh-tenauts pool for the conditioning period.

In addition to temperature, salinity and other physiochemical properties of her pool in Miami will be evaluated and gradually adjusted to be more similar to the Salish Sea if possible.

3.2.2 Physical Conditioning

Sk'aliCh'elh-tenaut's physical stamina should be increased gradually to prepare her for life in a significantly larger and more dynamic habitat. Some of this physical conditioning will take place gradually and naturally once she has arrived at the Ocean Habitat, and some of it will be incorporated into her conditioning protocols while still in Miami.

While in her pool in Miami, the husbandry team will increase Sk'aliCh'elh-tenauts's physical stamina by incorporating 'speed swims', 'bows', 'A to B's' and other exercise behaviors into her daily routine at an increasing duration. Additionally, she will be conditioned for increasingly long underwater swims. The goal will be to increase her daily activity level from her baseline as assessed in her initial evaluation. Physical conditioning will be overseen by Sk'aliCh'elh-tenaut's husbandry and veterinary teams (in consultation with marine mammal physiologists).

Conditioning of Sk'aliCh'elh-tenaut's immune system prior to transport will be considered by her veterinary team. This could include introducing her to potential new immune challenges (but not pathogens) found in the Salish Sea via exposure to Salish Sea water, etc., allowing her immune system to begin readying itself for her new environment. This type of conditioning will be considered, but only be conducted prior to transport if deemed appropriate and safe by her

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veterinary team, in consultation with infectious disease specialists and immunologists. Efforts to reduce possible stress during each phase will be made to ensure that Sk'aliCh'elh-tenaut's immune system is not compromised during conditioning.

3.2.3 Acoustics

Natural and ambient sounds will be recorded at the location of the Ocean Habitat in the Salish Sea. These sounds will include ambient underwater noise, allospecific vocalizations, and limited conspecific vocalizations, including from southern resident orcas. Sk'aliCh'elh-tenaut will be exposed to these sounds via carefully monitored playbacks in her pool in Miami.

These playbacks will serve to introduce her to the ambient sounds in the vicinity of the Ocean Habitat. During playbacks, Sk'aliCh'elh-tenaut will be filmed and carefully monitored, both acoustically and visually (ethograms will be conducted), for vocalizations, signs of stress or other adverse responses.

3.2.4 Daily Routine

During the pre-transport phase, Sk'aliCh'elh-tenaut's daily routine will gradually become more variable. The goal is to increase her dynamic interactions with her environment, which will serve to prepare her for her transition to the Ocean Habitat. Variability will initially be gradually introduced and will be increased based on her responsiveness.

During this phase, the goal will be to introduce one novel stimulus (or new way of using stimulus) each day (once she has shown an ability to accept variability). Novel stimulus will include things such as:

- Remote deployment feeding devises, such as feeder tubes
- Water hoses
- Variability in water sessions
- Variability in quantity and timing of feeds throughout the day (total daily feed amounts will not change)
- Introduction to new people
- Introduction to new acoustics
- Transport training sessions

3.3 Conditioning for Transport

Training specific to transport activities will be conducted to allow Sk'aliCh'elh-tenaut to gain comfort and familiarity with the process and limit unforeseen complications during the actual transport. Given Sk'aliCh'elh-tenaut's age, training for transport will proceed at a gradual pace and be driven entirely by her response to the conditioning process. The plan described below has been designed assuming Sk'aliCh'elh-tenaut has not had any recent conditioning for transport, and allows for a slow pace of up to 4 months for this type of conditioning.

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3.3.1 Stretcher Training

The goal of stretcher training will be to acclimatize Sk'aliCh'elh-tenaut to being maneuvered into a stretcher in preparation for transport. *See section 4.12.1 for a description of the stretcher*.

All staff participating in stretcher training will be knowledgeable of the whole process and fully-trained in their individual rolls within it, prior to beginning stretcher training.

Stretcher training will begin with lowering the water level in her pool to a level in which she can safely be guided into a stretcher manned by a minimum of 6 qualified in-water husbandry staff (referred to for transport activities as 'care team'). The water level in the pool will be lowered to a point where Sk'aliCh'elh-tenaut is limited in her ability to move freely but is not resting on the pool floor (assuming that the refill rate of her pool allows for this to be done safely and efficiently). Safe restraint practices will be followed as necessary for her care team to safely guide her into the stretcher. The stretcher will have cables pre-attached to the lifting poles at all six of the main attachment points, and the cables will come together at an attachment point to secure them to a crane. While 'walking' Sk'aliCh'elh-tenaut into the stretcher, these cables will be held out of way by care team.

A soft line will be on hand in case the care team needs to utilize it for help in guiding Sk'aliCh'elh-tenaut into the stretcher.

A member of the care team will be designated as the 'in-water lead' to coordinate all in-water work with the crane operator. The crane operator will coordinate and communicate solely with the 'in-water lead' and no one else will provide instructions to the crane operator. For redundancy, a backup 'in-water lead' will be designated from the care team. Prior to beginning each stretcher training session, the 'in-water lead' and crane operator will discuss any signals to be used and possible risks.

As Sk'aliCh'elh-tenaut is lifted out of the water, the care team will guide the stretcher, as needed, using four tag lines and ensure that it doesn't spin. These taglines will be attached to the main connection points on each end of the stretcher poles.

Sk'aliCh'elh-tenaut will be lifted out of the water slowly. This process will be very carefully monitored by her veterinary team, particularly if she has not been lifted out of the pool recently. Lifting will be paused before her body is completely clear of the water to allow the care team to ensure that Sk'aliCh'elh-tenaut is loaded correctly and riding comfortably in the stretcher (ensuring that her pectoral fins are appropriately aligned, her body is level, etc.). Once she is completely clear of the water, her weight will be taken. Once a weight has been obtained, Sk'aliCh'elh-tenaut will be gently lowered back into the water. Total time in the stretcher will never exceed 1 hour during the stretcher training sessions.

While Sk'aliCh'elh-tenaut is being weighed, the water level in the pool will begin to be raised back up to normal levels. As she is being lowered back into the pool, the water level will be

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rising, however the care team will still be able to stand on the bottom (chest deep) at the time in which Sk'aliCh'elh-tenaut is returned to the water. Once Sk'aliCh'elh-tenaut is lowered back into the water and is neutrally buoyant, the care team will 'open' the stretcher by holding the cables away from the whale and will then proceed to gently guide Sk'aliCh'elh-tenaut from the stretcher. Two scuba divers will be on standby in case they are needed to support the care team or in the event Sk'aliCh'elh-tenaut becomes tangled when exiting the stretcher.

Throughout this process Sk'aliCh'elh-tenaut will be monitored closely for signs of stress. Signs of a stress reaction will result in immediate reversal of the steps and return to the water.

Upon completion of this exercise, Sk'aliCh'elh-tenaut will be rewarded with primary (food) and secondary (social contact) reinforcement. This training exercise will be repeated with increasing frequency and increasing duration of time spent out of the water.

3.3.2 Cradle Training

The goal of cradle training will be to build upon stretcher training and acclimatize Sk'aliCh'elh-tenaut to being inside a cradle ('box') in preparation for transport. *See section 4.12.3 for a description of the cradle.*

All staff participating in stretcher training will be knowledgeable of the whole process and fully-trained in their individual rolls within it, prior to beginning stretcher training.

Cradle training will begin by following the steps listed above for stretcher training. Rather than lowering Sk'aliCh'elh-tenaut back into the pool after obtaining a weight, Sk'aliCh'elh-tenaut will be lowered into a cradle. The cradle will contain enough water for Sk'aliCh'elh-tenaut to be neutrally buoyant while resting within the stretcher (fig. 3).

Initially Sk'aliCh'elh-tenaut will only be lowered into the cradle for a few minutes at a time. The duration of time in the cradle will increase in subsequent training sessions assuming Sk'aliCh'elh-tenaut tolerates this exercise well. The maximum amount of time Sk'aliCh'elh-tenaut will spend in the cradle during a training session is 30 minutes.

As the duration of this exercise increases, it will become possible to include the step of transferring the in-water stretcher weight from the crane to crossbars attached to the top of the cradle, with Sk'aliCh'elh-tenaut being neutrally buoyant in the cradle. To do this, two crossbars will be placed across the top of the cradle, one in the front (above the stretcher's forward attachment points) and one at the back (above the stretcher's rear attachment points). Two chains will be hung from each cross bar, with one being attached to each of the main attachment points on the stretcher poles. Once the stretcher poles are securely attached to the chains, the cable connecting the stretcher to the crane will be detached from all points. During this time Sk'aliCh'elh-tenaut will be resting in the stretcher maintaining neutral buoyancy. Attachments will then be checked before reversing the steps in preparation for lifting Sk'aliCh'elh-tenaut back out of the cradle.

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If necessary, whenever Sk'aliCh'elh-tenaut is in the cradle two members of the care team will be in her cradle with her to monitor her and make any necessary adjustments for her comfort and safety. Two additional staff members will be outside the cradle assisting with any necessary adjustments.

A lightweight cotton sheet, hand-pumped garden sprayer, and A&D ointment will be on hand in case the elements dictate extra protection for Sk'liCh'elh-tenaut during these training sessions.

Upon being safely lifted back out of the cradle, Sk'aliCh'elh-tenaut will be returned to her pool following the steps outlined above for stretcher training.

Throughout this process Sk'aliCh'elh-tenaut will be monitored closely for signs of stress. Signs of a stress reaction will result in immediate reversal of the steps and return to the water. The veterinary team will consider monitoring fecal samples for stress hormones before and after conditioning exercises to complement other observations.

Upon completion of this exercise, Sk'aliCh'elh-tenaut will be rewarded with primary (food) and secondary (social contact) reinforcement. This training exercise will be repeated with increasing frequency and increasing duration of time spent out of the water.

If deemed necessary by the husbandry and veterinary teams, an additional step will be incorporated into Sk'aliCh'elh-tenaut's conditioning for transport. This step will include loading Sk'aliCh'elh-tenaut onto the transport truck, driving for a short distance to condition her to road vibration in the cradle, and end by returning her to her pool. This step will follow the loading procedures outlined in *section 4.2.1*. Whether to include this step will be determined by her husbandry and veterinary teams based on her demeanor in the cradle.

3.4 Pacific White Sided Dolphins

Sk'aliCh'elh-tenaut is currently being housed with two Pacific White Sided dolphins. Sk'aliCh'elh-tenaut's relationship with these dolphins will be evaluated by veterinarians and behavioral experts to assess whether it could be helpful to move the dolphins with Sk'aliCh'elh-tenaut to her new home (if feasible and advised), or whether it will be in Sk'aliCh'elh-tenaut's best interest to remove the dolphins from her pool during the pre-transport phase.

Should it be deemed in the best interest of Sk'aliCh'elh-tenaut and the Pacific White Sided dolphins to be relocated to the Ocean Habitat together, comparable but species-specific protocols for health assesments, behavioral evaluations, and conditioning objectives for the Pacific White Sided dolphins will be prepared and implemented by the veterinary and husbandry teams.

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3.5 Conditioning Timeline

The timeframe for conditioning will be dictated by the response of Sk'aliCh'elh-tenaut to the conditioning objectives and transport training exercises. A very conservative timeframe (fig. 2) will be utilized as a baseline for logistical planning; however, this timeframe will remain flexible so as to always ensure that Sk'aliCh'elh-tenaut's needs are prioritized. It is likely that conditioning will be shorter than this conservative timeframe. Conditioning will begin with a period of trust development (introductions and bonding with training staff), after which time other conditioning objectives and transport training exercises will be concurrently introduced (listed above).

	Bonding w/ Training Staff	Conditioning Objectives	Transport Training Sessions
Month 1	Introducing	-	-
Month 2	Bonding	-	-
Month 3	Bonding	Conditioning	1 session
Month 4	Bonding	Conditioning	2 sessions
Month 5	Bonding	Conditioning	4 sessions
Month 6	Bonding	Conditioning	4 sessions

Figure 2. Sample Conditioning Timeframe

3.6 Health Criteria for Safe Transport

Sk'aliCh'elh-tenaut must be deemed sufficiently healthy for transport by her veterinary team and be free of any uncontrolled transmissible pathogens prior to transport to the Ocean Habitat.

3.7 Behavioral Criteria for Safe Transport

Sk'aliCh'elh-tenaut must meet the following behavioral criteria in order to be a candidate for safe transport from the Miami Seaquarium to the Ocean Habitat:

- Exhibits minimal stress response (as defined by behavioral criteria developed by the husbandry and veterinary teams) when exposed to natural and ambient sounds from the Salish Sea.
- Exhibits minimal stress response (as defined by behavioral criteria developed by the husbandry and veterinary teams) in reaction to gradual variability increase in daily routine.
- Stamina and/or acceptance to change is increasing with physical conditioning exercises.
- Able to complete stretcher training exercise (up to 1 hour in stretcher) exhibiting minimal stress response (as defined by behavioral criteria developed by the husbandry and veterinary teams).

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- ☐ Able to complete cradle training exercise (up to 30 min in cradle) exhibiting minimal stress response (as defined by behavioral criteria developed by the husbandry and veterinary teams).

3.8 Staff

The following staff will be directly involved in the evaluation and conditioning phases of the project. (Staff responsible for non-profit organizational activities to sustain the organization including fundraising are not included in the following list.)

Operations Director (x1) – Directing all operations and staff
Operational Coordinator (x1) – Working with the Director to coordinate all operations
Marine Mammal Veterinarian (x2 in consultation) – Health evaluation and monitoring of Sk'aliCh'elh-tenaut to ensure she meets criteria for transport
Lead of Animal Husbandry (x1) – Lead coordinator of animal care throughout evaluation and conditioning period
Animal Husbandry Team (x3) – Conditioning and training (in conjunction with at least 2 members her current training team in Miami) of Sk'aliCh'elh-tenaut in preparation for transport
Lummi Cultural Representative (x1-2) – Overseeing all cultural and spiritual considerations

Heavy equipment (crane) will be operated by highly trained personnel employed by the partner venders.

3.9 Evaluation & Conditioning Equipment Checklist

- ☐ Watertight cradle
- ☐ Stretcher w/ pec holes
- ☐ Stretcher poles w/ lifting eyes
- ☐ Stretcher pole caps
- ☐ Cross bars for transport cradle
- ☐ Baffles
- ☐ 4 tag lines
- ☐ Adjustable lifting cables for crane
- ☐ Straps, & chains (for adjustments within transport box)
- ☐ Soft tail line
- ☐ Heavy duty locking carabiners
- ☐ Emergency medical supplies for staff
- ☐ Emergency medical supplies for Sk'aliCh'elh-tenaut
- ☐ Heart rate monitor
- ☐ Stopwatch
- ☐ Write-In-The-Rain notebooks & pencils
- ☐ Hand-pumped garden sprayer
- ☐ Large ice chests (full with ice)
- ☐ A&D ointment
- ☐ Dry suits & gloves for care team
- ☐ Light weight cotton sheet (1)
- ☐ Towels & sponges
- ☐ Soft foam (a couple mattress size pieces)
- ☐ Waterproof radios
- ☐ Extra batteries
- ☐ Case of electrical tape
- ☐ GoPro cameras
- ☐ Body mass scale
- ☐ Zip ties
- ☐ Tool kit

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4. TRANSPORT

A Lummi cultural representative will be with Sk'aliCh'elh-tenaut throughout the transport to attend to her emotional, cultural, and spiritual needs, including song and ceremony.
–Squil-le-he-le and Tah-Mahs

This transport plan is designed to allow for the most efficient and reliable transport of Sk'aliCh'elh-tenaut from the Miami Seaquarium to the Ocean Habitat in the Salish Sea. This plan may be altered as new equipment/transport options become available and more is learned about Sk'aliCh'elh-tenaut and her needs.

**Approximate payload cannot be calculated at this time as the exact size and dimensions of Sk'aliCh'elh-tenaut are unknown. Once the whale's measurements are known, exact dimensions of the stretcher, cradle, and associated water weight can be calculated, and transport plans can be altered if needed.*

4.1.1 Monitoring

Throughout the transport, Sk'aliCh'elh-tenaut will be monitored by two attending veterinarians and the husbandry/transport team (five qualified personnel and one lead of animal husbandry) collectively referred to as the 'care team'. At least one member of her care team will be a trainer or veterinarian from Miami Seaquarium with whom she has a long-established relationship and comfort. Consideration will be given to a second trainer who is experienced with transport of live animals.

Detailed protocols for health and behavioral monitoring during transport will be developed specifically for Sk'aliCh'elh-tenaut by her care team prior to initiating transport. These criteria will be based on her responses and behavior during the conditioning period. These protocols will include, but are not limited to, procedures for monitoring heart rate, respirations, and behavioral changes. A fetal doppler will be used to monitor heart rate at regular intervals and as deemed necessary by veterinary staff. Respirations (timed and recorded) and behavioral observations will be ongoing.

If observations are made by non-veterinary care team members, veterinary staff will be immediately informed if there is a change in respiration pattern or another important health indicator. A complete medical response crash kit for the whale will accompany the team at all times throughout the transport, and any interventions will be under the supervision of the attending veterinarian.

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4.2 Loading at Miami Seaquarium

4.2.1 Procedure

The transport truck and crane will be on site at the Miami Seaquarium 12 hours prior to the start of transport procedures. A backup truck and crane will be on standby in case of a breakdown or other unforeseen need.

Due to the warm climate of Florida, and the potential for traffic within the city, the transport will begin in the late evening hours and proceed throughout the night. The exact transport time will not be made public and will be planned around local police recommendations and aircraft availability.

Prior to loading, the cradle will be secured to the truck. The cradle will be fixed on top of aluminium aircraft pallets using cargo straps. The interface between the cradle and the aircraft pallets will be padded with neoprene to reduce the potential for vibration between the hard surfaces. The aluminium aircraft pallets will then be secured to the truck bed, on top of locked rollers, using cargo straps. The cradle will be positioned so that once loaded, Sk'aliCh'elh-tenaut's head will be facing the front of the truck. This system will be checked to ensure all components are securely fastened in place prior to initiating loading operations with Sk'aliCh'elh-tenaut.

Loading will follow many of the same steps practiced with Sk'aliCh'elh-tenaut during her stretcher and cradle training sessions. During loading procedures, activity around the pool edge will be minimized. All personnel will be instructed to refrain from unnecessary fast movements and loud noises, so as to keep the environment calm for Sk'aliCh'elh-tenaut.

To begin loading, Sk'aliCh'elh-tenaut will be guided to the med area of her Miami pool. As was practiced in her training sessions, once the whale is properly positioned, the water level will be lowered to a level in which she can be safely guided into a stretcher manned by 6 qualified care team members. The water level in the pool will be lowered to a point where Sk'aliCh'elh-tenaut is limited in her ability to move freely but is not resting on the pool floor (assuming that the refill rate of her pool allows for this to be done safely and efficiently). This will allow the care team to safely guide her into the stretcher. The stretcher will have custom made adjustable lifting cables (*see section 4.12.6*) pre-attached to the lifting poles at all six of the main attachment points, and the cables will come together at an attachment point to secure them to a crane. While 'walking' Sk'aliCh'elh-tenaut into the stretcher, these cables will be held out of way by the care team.

A soft line will be on hand in case the care team needs to utilize it to help guide Sk'aliCh'elh-tenaut into the stretcher.

An 'in-water lead' will be designated (from the care team) to coordinate all in-water work with the crane operator. The crane operator will coordinate and communicate solely with the 'in-water lead', and no one else will provide instructions to the crane operator. For redundancy, a backup 'in-water lead' will be designated from the care team. Prior to beginning transport

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loading, the 'in-water lead' and crane operator will discuss any signals to be used and possible risks.

As Sk'aliCh'elh-tenaut is lifted out of the water, the care team will guide the stretcher as needed using four tag lines and ensuring that it doesn't spin. These taglines will be attached to the main connection points on each end of the stretcher poles.

Sk'aliCh'elh-tenaut will be lifted out of the water slowly. Lifting will be paused before her body is completely clear of the water to allow the in-water personnel to ensure that Sk'aliCh'elh-tenaut is loaded correctly and comfortably in the stretcher (ensuring that her pectoral fins are appropriately aligned, her body is level, etc.).



Image 1. Keiko being lowered into a cradle. (McCord Air Museum Collection)

Sk'aliCh'elh-tenaut will then be gently lowered into a cradle. The cradle will contain enough water for Sk'aliCh'elh-tenaut to be neutrally buoyant while resting within the stretcher (fig. 3). The water in the cradle will be fresh water, and if necessary, contain ice to keep the temperature cool during transport. The water used in her transport will be chlorinated to 1ppm, which will control any bacterial growth during transport.

The care team will continuously keep Sk'aliCh'elh-tenaut cool and moist by utilizing hand pump garden sprayers containing a mixture of ice and fresh water. This will begin when Sk'aliCh'elh-tenaut is lowered into the cradle and will continue throughout the entire transport.

Two crossbars will be placed across the top of the cradle, one in the front (above the stretcher's forward attachment points) and one at the back (above the stretcher's rear attachment points). Two chains will be hung from each cross bar, with one being attached to each of the four outer main attachment points on the stretcher poles. Once the stretcher poles are securely attached to

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the chains, the cable connecting the stretcher to the crane will be detached from all six attachment points. During this time Sk'aliCh'elh-tenaut will be resting in the stretcher maintaining neutral buoyancy.

Finally, baffles will be fitted and secured to the cradle in both the front and rear. Attachments will then be checked to ensure that they are all properly secured.

While baffles are being secured, the care team may apply A&D ointment around the edges of Sk'aliCh'elh-tenaut's blowhole to prevent chapping. A&D ointment may be applied as necessary throughout the transport if it appears as though any of Sk'aliCh'elh-tenaut's skin is drying (such as the skin on the dorsal fin area).

The care team will drape a lightweight cotton sheet, with a hole cut for Sk'aliCh'elh-tenaut's dorsal fin, over the whales back. A section of sheet will be custom fit for the dorsal fin, and will be used as necessary to prevent drying. Care will be taken to ensure the sheet is not near Sk'aliCh'elh-tenaut's blow hole and eyes. The sheet will be kept moist at all times and will be continually checked and repositioned as necessary throughout transport.

The custom adjustable lifting cables (specifically made for the stretcher) and tag lines will travel with the care team for the duration of transport. Additionally, the care team will be responsible for ensuring that all care equipment travels with the team throughout the duration of the transport (A&D ointment, sheets, sprayers, notebooks, medical monitoring equipment such as a heart rate monitor, emergency equipment for the whale and the staff, etc.).

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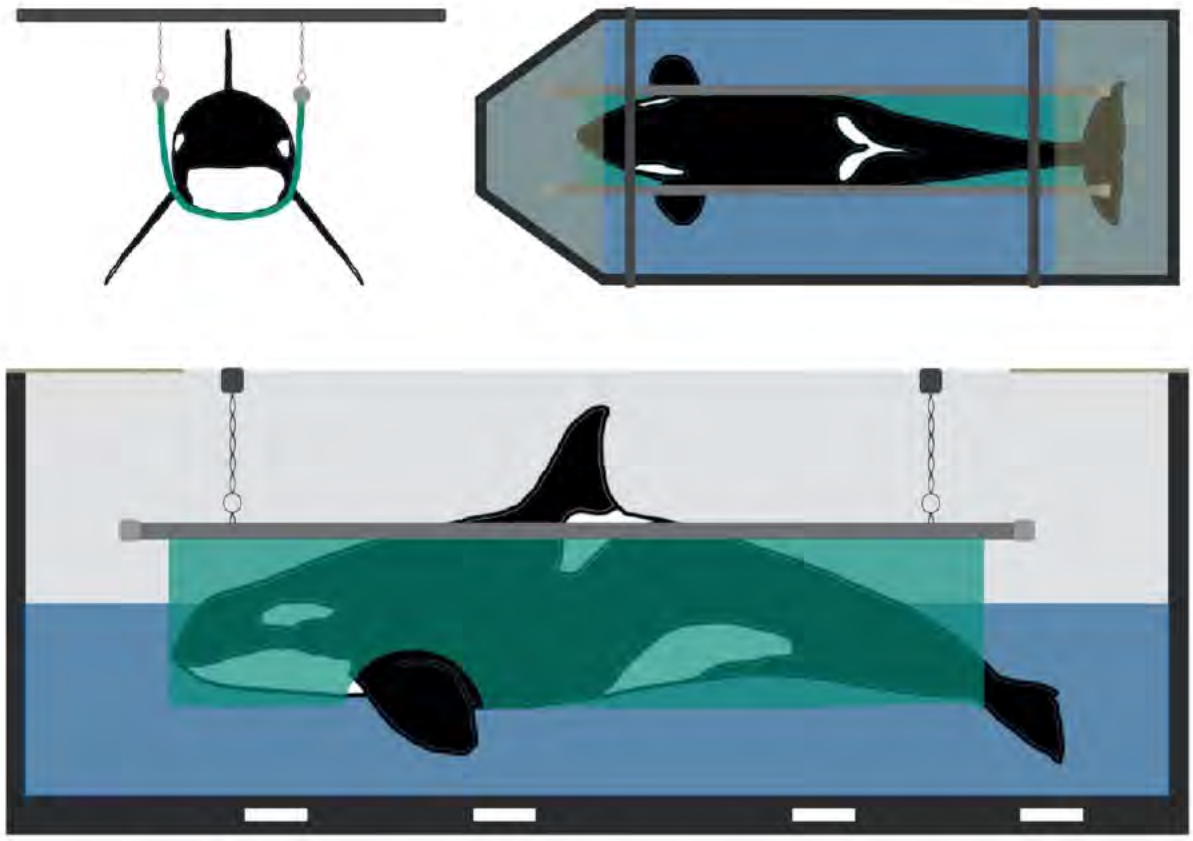


Figure 3. Positioning of Sk'aliCh'elh-tenaut once fully loaded in the stretcher and cradle.

4.3 Truck Transport - Florida

4.3.1 Truck

A flatbed roller deck trailer, capable of handling heavy loads, will be utilized for ground transport of Sk'aliCh'elh-tenaut. This will allow for easy loading and unloading. Prior to the start of transport, the transport truck (fully loaded will the cradle) will be measured to ensure safe clearance for any overpasses on the planned route and all potential alternatives.

A tractor trailer is an alternative to a flatbed roller deck trailer and may be used based on availability at the time of transport. If a tractor trailer is used, a backup semi-tractor will travel with the transport team throughout 'truck transport' in case of emergency.

**All vehicles used throughout transport will be fueled and fuel tanks checked prior to transport, and will have preventative maintenance checks (lights, signals, brakes, etc.) prior to and on the day of use. Additionally, transport vehicles will be selected to ensure that exhaust is discharged at an elevation that does not present a risk to Sk'aliCh'elh-tenaut or her care team.*

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4.3.2 Security

Prior to beginning transport, a police escort will be arranged for security while on the route from the Miami Seaquarium to MIA.

4.3.3 Procedure

Prior to the truck transport, a dry run drive of the route will be made (at similar time and day of the week), identifying all potential delays that may be encountered. Routine or unusual points of potential traffic delays, potential physical obstacles for large trailers, and all other possible obstacles and travel impediments will be reviewed and considered. Alternative routes will be mapped out for use in case of delay on the night of transport. Miami-Dade county will be notified of the transport and planned route, and will be asked to advise the transport team of any road closures or other potential impacts on the truck transport route. As an added layer of redundancy, the police escort will also be aware of any transportation changes in the county. On the day of transport but prior to the transport beginning, support staff will drive the route to identify any last minute changes.

All staff (care team, etc.) involved in the truck transport will receive safety training and be fitted with appropriate safety gear (such as harnesses) prior to transport.

Prior to leaving the Miami Seaquarium any points of congestion of onlookers/media (such as immediately outside the seaquarium), will be partitioned off so that onlookers are kept safe and do not become an obstruction for the transport truck and team. The timing of transport will not be made publicly available.

Permission will be obtained from the local police department for the care team to ride in the back of the trailer with Sk'aliCh'elh-tenaut.

After Sk'aliCh'elh-tenaut is secured for truck transport, two members of her care team will be prepared to get inside the cradle with her, attending and monitoring her if necessary. The rest of her care team will be traveling with Sk'aliCh'elh-tenaut and able to support as needed.

The truck driver will be advised to avoid any unnecessary sudden use of breaks, turns, or acceleration, in order to keep the ride as smooth as possible. Truck speed will be limited to 55mph. Escorting police vehicles will travel both in front of and behind the transport truck.

During the transport to the airport ice will be added to the water in Sk'aliCh'elh-tenaut's cradle, to maintain the water at the temperature similar to that of Sk'aliCh'elh-tenaut's normal pool temperature at the Miami Seaquarium prior to transport. The temperature of her transport water will be monitored by her care team.

Airport security staff will be notified with an expected ETA when the transport truck is nearing the airport. Once at the airport, the transport truck and team will clear security and approach the aircraft, parking in a predetermined loading position.

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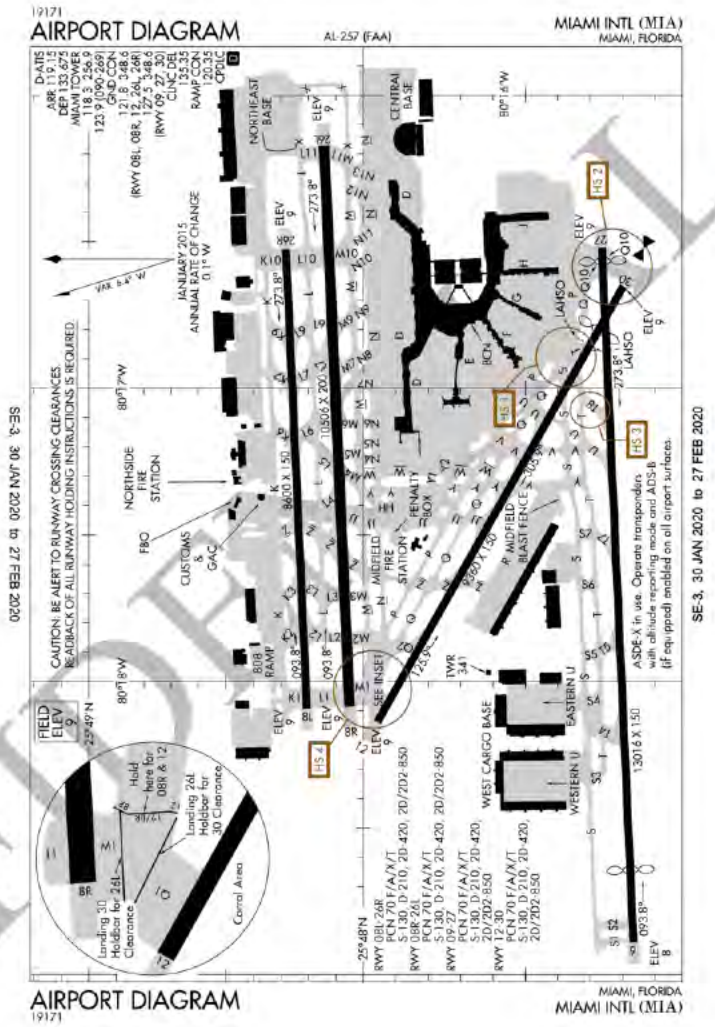
4.4 Loading at Airport - Miami

4.4.1 Airport

Miami International
Airport (MIA)
25°47′36″N 080°17′26″W

Elevation – 9ft
Runways – Asphalt

1. Length – 8,600ft
   Direction – 8L/26R
2. Length – 10,506ft
   Direction – 8R/26L
3. Length – 13,016ft
   Direction – 9/27
4. Length – 9,360ft
   Direction – 12/30



4.4.2 Security

Transport truck arrival, unloading, and aircraft loading procedures will be coordinated in advance with airport security staff to ensure that security is maintained throughout the time spent at MIA.

4.4.3 Procedure

Prior to air transport of Ski'aliCh'elh-tenaut, a walk-thru will be conducted with airport staff (including security) at MIA, to ensure smooth operations during arrival and aircraft loading for transport. This walk-thru will be conducted one week prior to transport and then again one day

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prior to transport. All necessary personnel will obtain necessary clearance for airport loading procedures prior to the start of transport.

**If a C-17 or C-130 is utilized, prior to the transport truck arriving at the airport, a palletized water tank, pump, and hoses, will be preloaded and secured within the aircraft. This water tank will be filled with chilled fresh (as per FAA regulations) water which will be used to replace the water in Sk'aliCh'elh-tenaut's cradle during air travel.*

A Cochran loader will be staged at the aircraft, and back-up Cochran loader will be available on site.

After the transport truck has been parked in the loading position next to the aircraft, the aluminum aircraft pallets will be detached from the truck bed (they will remain attached to the cradle). The cradle will then be either winched or hand rolled off the truck bed and directly onto the Cochran loader. The cradle will be secured to the Cochran loader using cargo straps or an automatic locking devise.

The Cochran loader will transport the cradle to the aircraft and then proceed to load the cradle into the aircraft. Sk'aliCh'elh-tenaut's cradle will be loaded onto the aircraft so that her head faces the front of the aircraft. The cargo & aircraft team will secure the cradle containing Sk'aliChe'elh-tenaut when the cradle is in the required position in the aircraft.

If allowed (by the airline/airport), two members of Sk'aliCh'elh-tenaut's care team will remain in the water with her or on the edge of the cradle at all times during aircraft loading procedures. If this is not allowed during the loading process, the care team will be in close proximity to Sk'aliCh'elh-tenaut and on standby if needed. Once the cradle is secured within the aircraft, the care team will resume normal monitoring and care operations.



Image 2.. Loading Keiko for air transport (McCord Air Museum Collection)

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4.5 Air Transport – Florida to Washington

Flight info MIA-PAE
Distance: 2733mi (4397km)
Duration: 5-5.5hr flight time
Time difference: 3h

4.5.1 Aircraft

An Airlines for America (A4A) classified aircraft will be used for the air transport of Ski'aliCh'elh-tenaut from Florida to Washington. The air transport will be completed by a C-130, C-17, 747, or 777, with preference given to a 747 or 777. All are cargo aircraft with tail or nose loading capabilities.

If a 747 or 777 are not available at the time of transport, alternative plans utilizing a C130 or C17 will be made. Both the C-130 and C-17 have the disadvantage of likely requiring a refueling stop or air-to-air refueling part way through the cross-country flight. A direct flight is strongly preferable.

If a C-130 or C-17 is utilized, alternative plans to land at Bellingham International Airport (BLI) will be considered.

In a C-17 the additional step of removing the water from Sk'aliCh'elh-tenaut's cradle during takeoff and landing may be required. If that is the case, plans to freshen the water in the cradle during each refilling will be made (as noted in italics in *sections 3.4-3.6*).



Image 3. C-17 (McCord Air Museum Collection)

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4.5.2 Procedure

Prior to departure, the airline will be provided with a detailed manifest of all personnel involved in the loading, transport, and unloading of Sk'aliCh'elh-tenaut. All required documentation for hazardous materials (batteries, medical supplies, etc.) will be completed as required by the airline prior to departure.

Sk'aliCh'elh-tenaut's care team will not be in her cradle during takeoff, but as soon as is allowed by the aircrew, her care team will resume normal care and monitoring. During the flight, the care team will remain in the water if needed to make Sk'aliCh'elh-tenaut comfortable. Personnel will exit the water and monitor her from the side of the cradle if Sk'aliCh'elh-tenaut is calmer without people in the water with her and she will be closely monitored to make that determination. Water temperature will be monitored, and ice will be added if needed to maintain optimal temperature range.

The pilot will be requested to maintain a gradual rate of acceleration and deceleration, as well as minimal incline during take-off and landing. The air travel plan will stipulate that pressure will be maintained at an altitude equivalent to 3500'. If Sk'aliCh'elh-tenaut is responding well during transport the cabin pressure can be raised up to 5000' if necessary due to weather or other conditions that would benefit from a higher altitude. During the flight, the internal cabin temperature will be maintained between 52-58 degrees for the duration of the flight. This will help to maintain a similar temperature within the cradle.

During landing all personnel will be securely seated and not in the cradle with Sk'aliCh'elh-tenaut.

**If a C-17 is utilized, it may be required that water is removed from Sk'aliCh'elh-tenaut's cradle before takeoff and landing. If this is the case, the following procedure will be followed. Just prior to takeoff the water in Sk'aliCh'elh-tenaut's cradle will be drained or pumped out of the aircraft using a siphon. After the cradle is drained the doors of the aircraft will be secured and aircrew and passengers will be seated for takeoff. As soon as possible after takeoff, chilled fresh water from the water tank will be pumped into Sk'aliCh'elh-tenaut's cradle. The cradle will be filled with water to the point where she is neutrally buoyant and rests comfortably. Care team staff (3-4) will enter the water with Sk'aliCh'elh-tenaut to reposition her and adjust the equipment as needed. Twenty to thirty minutes prior to landing the water in Sk'aliCh'elh-tenaut's cradle will be pumped back into the water tank.*

**If a C-17 or C-130 are utilized, it is likely that a refueling stop will be necessary. If a refueling stop is required, the transport plan will be altered to include this stop. The site of any refueling stop will be have a truck mounted water tank (fresh water) available waiting on site as well as additional ice, stand-by overland transport equipment, and risk management plans designed specific to the location of the stop. During any refueling stop, the care team will maintain normal care of Sk'aliCh'elh-tenaut.*

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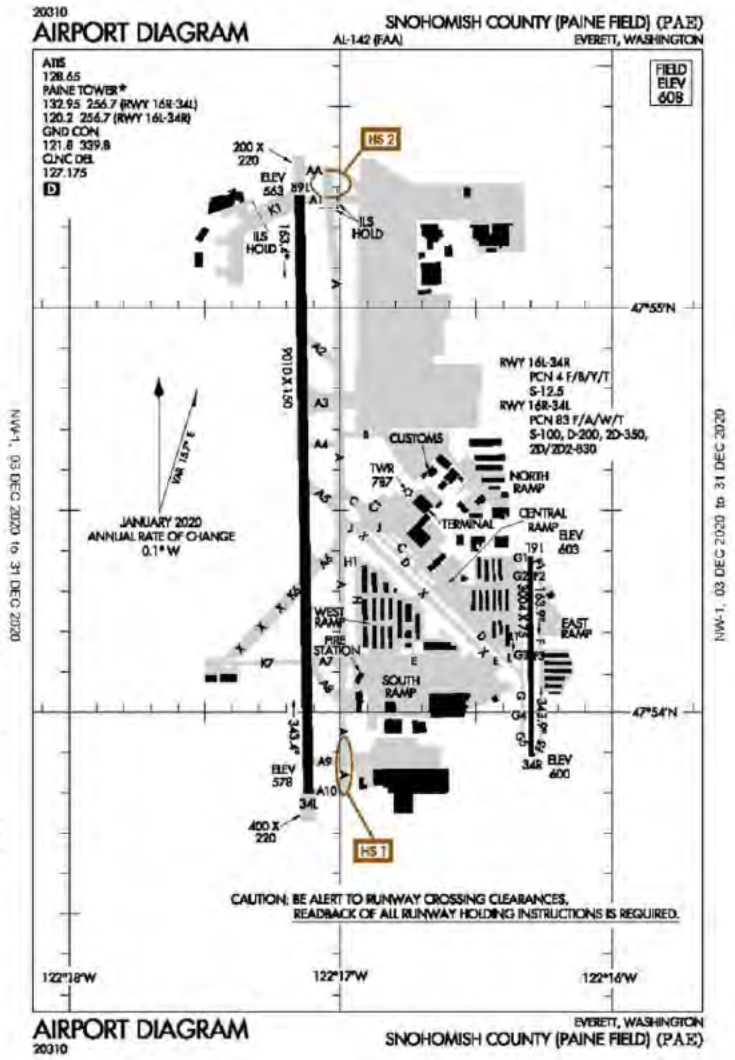
4.6 Unloading at Airport – Everett

4.6.1 Airport

Paine Field Everett (PAE)
47°54′22″N 122°16′53″W

Elevation – 608ft
Runway –
Concrete/Asphalt

1. Length – 9010ft
   Direction 16/34
2. Length – 3004ft
   Direction 16/34



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4.6.2 Security

Aircraft unloading/truck loading procedures will be coordinated ahead of time with airport security staff to ensure that security is maintained throughout the time spent at PAE.

4.6.3 Procedure

Special permission will be obtained during the planning phases to land at PAE.

Prior to air transport of Sk'aliCh'elh-tenaut, a walk-thru of landing and unloading procedures will be conducted with airport staff, including airport security, at PAE, to ensure smooth operations during landing and unloading. This walk-thru will be conducted one week prior to transport, and then again one day prior to transport. All necessary personnel will obtain necessary clearance for airport unloading procedures prior to the start of transport.

The flatbed roller deck transport trailer truck will be staged at the airport 4-6 hours prior to the anticipated arrival of the aircraft. Prior to the aircraft's arrival, the truck will be moved to the aircraft unloading location. A Cochran loader will also be staged at this location. A back-up Cochran loader will be available on site.

After the aircraft has come to a stop in the unloading location, the doors will be opened and unloading procedures will commence. The cradle, which remains fixed on top of aluminium aircraft pallets using cargo straps, will be detached from the aircraft and unloaded by airport/aircraft crew onto the Cochran loader. The cradle will be secured to the Cochran loader using cargo straps or an automatic locking devise.

While the cradle is being unloaded from the aircraft, the transport truck will be parked in a loading position next to the aircraft. The Cochran loader will deliver the cradle to the transport truck, at which time it will be winched or hand loaded onto the roller deck of the truck. The aluminium aircraft pallets will then be secured to the truck bed, on top of locked rollers, using cargo straps. Sk'aliCh'elh-tenaut's cradle will be loaded onto the truck so that her head faces the front of the vehicle. This system will be checked to ensure all components are securely fastened in place prior to beginning truck transport with Sk'aliCh'elh-tenaut.

If allowed by the airline/airport, two members of Sk'aliCh'elh-tenaut's care team will remain in the cradle with her or on the edge of the cradle at during aircraft unloading procedures. If this is not allowed during the unloading process, the care team will be in close proximity to Sk'aliCh'elh-tenaut and on standby. Once the cradle is secured on the transport truck, the care team will resume normal monitoring and care operations.

**If a C-17 or C-130 is utilised, a truck equipped with a water tank, pump, and hoses will be staged at PAE prior to landing. This water tank will be full of chilled saltwater and will be used to replace the water in Sk'aliCh'elh-tenaut's cradle for the next phase of transport. Fresh water will no longer need to be used from this point forward. If the cradle was drained upon landing, once the cradle is secured, chilled salt water (held in the on-site truck mounted water tank), will be pumped into Sk'aliCh'elh-tenaut's cradle. The cradle will be filled with water to the point where she is neutrally buoyant and rests comfortably. Three to four care team staff will enter the water with Sk'aliCh'elh-tenaut to reposition her and adjust the equipment as needed. The goal will be for total out-of-water time to not exceed one hour.*

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4.7 Truck Transport - Washington

4.7.1 Truck

A flatbed roller deck trailer, capable of handling heavy loads, will be utilized for ground transport of Sk'aliCh'elh-tenaut. This will allow for easy loading and unloading. Prior to the start of transport, the transport truck (fully loaded will the cradle) will be measured to ensure safe clearance for any overpasses on the planned route and all potential alternatives.

A tractor trailer is an alternative to a flatbed roller deck trailer and may be used based on availability at the time of transport. If a tractor trailer is used, a backup semi-tractor will travel with the transport team throughout 'truck transport' in case of emergency.

**All vehicles used throughout transport will be fueled and fuel tanks checked prior to transport, and will have preventative maintenance checks (lights, signals, brakes, etc.) prior to and on the day of use. Additionally, transport vehicles will be selected to ensure that exhaust is discharged at an elevation that does not present a risk to Sk'aliCh'elh-tenaut or her care team.*

4.7.2 Security

Prior to beginning transport, a police escort will be arranged for security while on route from PAE to the Port of Anacortes.

4.7.3 Procedure

Prior to the truck transport, a dry run drive of the route will be made (at similar time and day of the week), identifying all potential delays that may be encountered. Routine or unusual points of potential traffic delays, potential physical obstacles for large trailers, and all other possible obstacles and travel impediments will be reviewed and considered. Alternative routes will be mapped out in case of delay at the time of transport. Snohomish and Skagit counties will be notified of the transport and planned route, and will be asked to advise the transport team of any road closures or other potential impacts on the truck transport route. As an added layer of redundancy, the police escort will also be aware of any transportation changes in the county. On the day of transport but prior to the transport beginning, support staff will drive the route to identify any last minute changes.

All staff (care team, etc.) involved in the truck transport will receive safety training and be fitted with appropriate safety gear (such as harnesses) prior to transport.

Prior to leaving PAE, any points of congestion of onlookers/media, such as immediately outside the airport or at the harbour, will be partitioned off so that onlookers are kept safe and do not become an obstruction for the transport truck and team. The timing of transport will not be made publicly available.

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Permission will be obtained from the local police department for the care team to ride in the back of the trailer with Sk'aliCh'elh-tenaut.

After Sk'aliCh'elh-tenaut is secured for truck transport, two members of her care team will be prepared to get inside the cradle with her, attending and monitoring her if necessary. The rest of her care team will be traveling with Sk'aliCh'elh-tenaut and able to support as needed.

As in Miami, the truck driver will be advised to avoid any unnecessary sudden use of breaks, turns, or acceleration, in order to keep the ride as smooth as possible. Truck speed will be limited to 55mph. Escorting police vehicles will travel both in front of and behind the transport truck.

If needed, during the transport to the airport ice will be added to the water in Sk'aliCh'elh-tenaut's cradle, to maintain the water at the temperature similar to that of Sk'aliCh'elh-tenaut's normal pool temperature at the Miami Seaquarium prior to transport. The temperature of her transport water will be monitored by her care team.

The director of operations for the Port of Anacortes will be notified with an expected ETA when the transport truck is nearing the port. Once at the harbour, the transport truck and team will clear security and approach the barge, parking in a predetermined loading position.

4.8 Loading at Port - Anacortes

4.8.1 Port

Port of Anacortes Pier 2
48°48′31″N 122°36′28″W

The Port of Anacortes Pier 2 offers a 37'6" deep, ~14-acre marine terminal facility including a 462ft concrete pier. This will allow more than enough room for transfer of Sk'aliCh'elh-tenaut from a truck to a barge, as well as allow for use of a barge large enough to accommodate the truck if a barge of that size is available.

4.8.2 Procedure

The barge utilized will be large enough to allow for the transport truck to drive directly onto the barge.

The transport truck will drive directly onto the vessel, at which time it will be secured by the barge crew. During this time, the care team will check to ensure that Sk'aliCh'elh-tenaut is still riding comfortably within the cradle. Once the transport truck is secured, the barge will begin its journey to the Ocean Habitat.

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**The following procedure outlines the plan if a barge large enough to drive the transport truck onto is not available at the time of transport and a smaller barge must be utilised.*

One crane will be staged at the harbor approximately 12 hours prior to anticipated arrival of Sk'aliCh'elh-tenaut. This on-land crane will be equipped with standard lifting cables. An additional crane will be located on the barge in preparation for transport. These cranes will be used for transfer of Sk'aliCh'elh-tenaut from the truck to the barge. Additionally, a truck equipped with a water tank, pump, and hoses, will be staged at the harbor. This water tank will be full of chilled saltwater. The on-land crane will be positioned optimally for the barge loading process prior to the anticipated arrival of the transport truck.

As was done in earlier phases of the transport, an 'in-water' lead and, if necessary, a backup 'in-water' lead, will be in charge of all communication with the crane operators.

Once the transport truck has arrived at the predetermined barge loading location in the harbor, the baffles will be removed. The custom lifting cables will then be attached to the barge crane and the lifting eyes on the stretcher poles and the chains connecting the stretcher poles to the crossbars will be detached. The crossbars will then be removed. Simultaneously, the cargo straps securing the cradle to the aluminium aircraft pallets will be detached. The stretcher containing Sk'aliCh'elh-tenaut will then be slowly raised out of the cradle. The care team will guide the stretcher as needed using four tag lines and ensuring that it doesn't spin. These taglines will be attached to the main connection points on each end of the stretcher poles, just as they were in Miami.

Lifting will be paused before Sk'aliCh'elh-tenatut's body is completely clear of the water, to allow the care team to ensure that Sk'aliCh'elh-tenaut is loaded correctly in the stretcher for lifting (her pectoral fins are appropriately aligned, etc.).

As Sk'aliCh'elh-tenaut is being lifted in the stretcher by the barge crane, the team will begin draining water from the cradle. While the water is draining, standard lifting cables will be attached between the cradle and the on-land crane. When the water has drained to a level at which the on-land crane operator deems safe for lifting, the crane will begin to lift the cradle and transfer it onto the barge. After the cradle is positioned on the deck of the barge, it will be secured, taking care to ensure that the cradle will position Sk'aliCh'elh-tenaut's head toward the front of the vessel. Once secured, chilled saltwater from the water tank will be used to refill the portion of the cradle that had been previously drained.

Simultaneously to the cradle being secured and water being refilled, the barge crane lifting Sk'aliCh'elh-tenaut in the stretcher will slowly lower her into the cradle with her head toward the front of the vessel. The cradle will be filled with water until it contains enough water (saltwater containing ice to keep the temperature cooler than her pool at the time of transport) for Sk'aliCh'elh-tenaut to be neutrally buoyant while resting within the stretcher.

The two crossbars will then be placed across the top of the cradle, one in the front and one at the back. Two chains will be hung from each cross bar, with one being attached to each of the main attachment points on the stretcher poles. Once the stretcher poles are securely attached to the

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chains, the cable connecting the stretcher to the crane will be detached from all points. During this time Sk'aliCh'elh-tenaut will be resting in the stretcher maintaining neutral buoyancy.

If marine conditions warrant, baffles will be fitted once again and secured to the cradle in both the front and rear. Attachments will then be checked to ensure they are all properly secured.

4.9 Barge Transport – Anacortes to West Sound

It is approximately 20 miles from Port of Anacortes Pier 2 to the Ocean Habitat in West Sound.

4.9.1 Barge

A barge with a large enough capacity to carry a crane with a minimum 60ft reach will be utilized for transport. If available, a barge large enough to drive the transport truck directly onto will be utilized and is preferred.

4.9.2 Procedure

Once Sk'aliCh'elh-tenaut is comfortably situated in the cradle and the barge has left the harbor, two personnel from the care team will remain in the water during the barge transport if needed to make Sk'aliCh'elh-tenaut comfortable. Personnel will exit the water and monitor from the side of the cradle if Sk'aliCh'elh-tenaut is calmer without people in the water with her and she will be closely monitored to make that determination. Water temperature will be monitored, and ice may be added if need to maintain optimal temperature range. Normal health monitoring and care operations will continue throughout the barge transport.

4.10 Unloading at Ocean Habitat

4.10.1 Procedure

Upon arrival at the Ocean Habitat, the barge will pull into a predetermined docking location as close to the med pool area as possible, guided by line handlers on the habitat structure.

The care team will then divide in a predetermined configuration into two teams, one that remains with the whale for unloading from the barge and a receiving team in the habitat. The unloading care team will begin unloading procedures as the receiving care team transfers to the habitat.

The baffles (if attached) will be removed. The custom lifting cables will then be attached to the barge crane and the lifting eyes on the stretcher poles, as the chains connecting the stretcher poles to the crossbars will be detached. The crossbars will then be removed. The stretcher containing Sk'aliCh'elh-tenaut will then be slowly raised out of the cradle. The unloading care

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team will guide the stretcher as needed using four tag lines and ensuring that it doesn't spin. These taglines will again be attached to the main connection points on each end of the stretcher poles.

Lifting will be paused before Sk'aliCh'elh-tenatut's body is completely clear of the water to allow the unloading care team to ensure that Sk'aliCh'elh-tenaut is resting comfortably in the stretcher.

Control of the tag lines will be transferred from the unloading care team to the receiving care team as Sk'aliCh'elh-tenaut is lifted from the barge to above the med pool area of the habitat. The med pool floor will be raised to a height that allows for the receiving care team to stand in chest deep water (just deep enough for Sk'aliCh'elh-tenaut to swim while the care team can still maintain control). Once in the med pool, the receiving care team will begin to feed Sk'aliCh'elh-tenaut. When she has exhibited trust in the receiving care team (as determined behaviorally by the care team), one of the med pools gates will be opened with the other remaining closed. This will allow access to only one half of the habitat. Sk'aliCh'elh-tenaut will be lowered into the med pool so that her head faces the open gate.

After the receiving care team gently guides Sk'aliCh'elh-tenaut out of the stretcher, she will be guided through the med pool gate and into the open octagon side of the habitat (referred to as 'initial space'). The med lift gate will be closed behind her. During this period of her early exploration of the initial space, the med lift floor will be lowered; however, the med lift gate will remain closed allowing the initial space to remain partitioned off from the rest of the habitat.

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4.11 Transport Time

Transport Phase	Expected Duration	Total Transport Time:
Loading at Miami Seaquarium	1-2 hours	
Truck Transport - Florida	1-1.5 hour	
Loading at Airport - Miami	1-2 hours	
Air Transport	5-5.5 hours	
Unloading at Airport - Everett	1-2 hours	
Truck Transport - Washington	1.5-2 hours	**14.5-20.5 hours**
Loading at Harbour - Anacortes	.5-1 hours	
Barge Transport (traveling at 5-6 knots)	3-3.5 hours	
Unloading at the Ocean Habitat	.5-1 hour	

Figure 4. Transport times.

**Add 2-3 additional hours for each refuelling stop during the air transport, if necessary. If a barge large enough to accommodate the transport truck is not available at the time of transport, add an additional 1-2 hours during the loading at the harbour of Anacortes.*

4.12 Equipment

4.12.1 Stretcher

The stretcher will be made of a 2ply ballistic nylon, with a soft koel lining around the front and back end and the pec holes, to minimize abrasion. The pec holes will be designed to enable Sk'aliCh'elh-tenaut to ride comfortably in the stretcher. The stretcher fabric will have pole pockets sewn into it and will have reinforcing stitching throughout.

4.12.2 Stretcher Poles

The stretcher poles will be made of 21'6" schedule 40 galvanized and coated carbon steel pipe with lifting eyes. The poles will be fitted to the stretcher and cradle.

4.12.3 Cradle

The transport cradle will be designed to hang Ski'aliCh'elh-tenaut comfortably while loaded on a stretcher within the cradle. The cradle will safely hold enough water to float the whale in the stretcher in a neutrally buoyant position, so as to prevent the development of hot spots or other expressions of physical stress during transport.

The cradle will be made of plywood lined with fiberglass and a vinyl liner to create a smooth and watertight interior surface. The plywood will be ¾ inch marine grade and will be encased in a steel support frame with a minimum of four forklifting points at the base.

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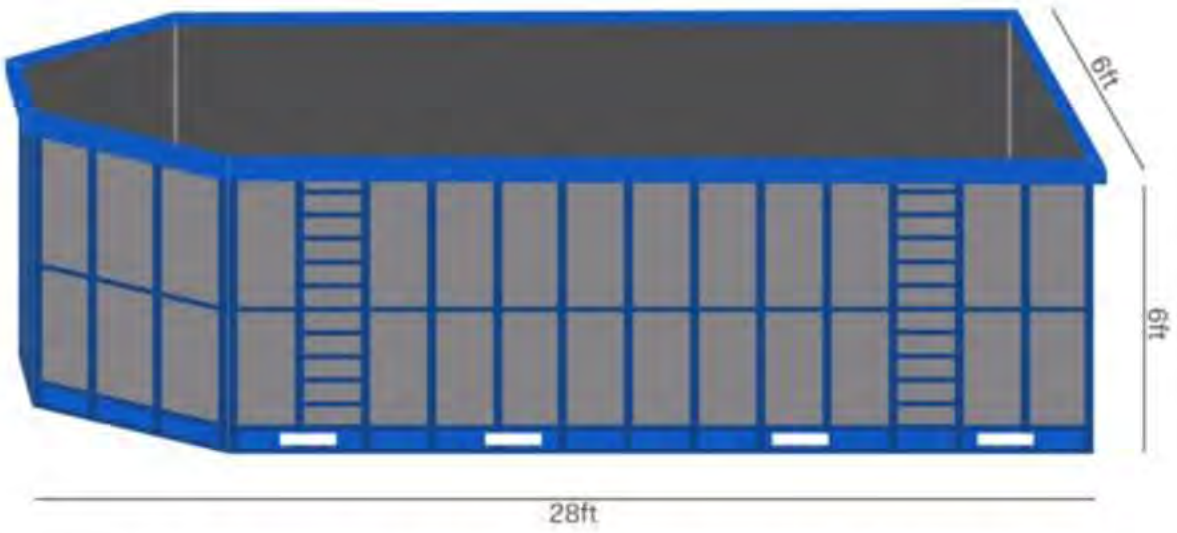


Figure 5. Cradle. The dimensions listed are based on the assumed size of Sk'aliCh'elh-tenaut and will be refined once accurate measurements of the whale are obtained.

4.12.4 Baffles

The baffles will be made with the same material as the inner transport box (plywood lined with fiberglass) and will be designed to fit over the forward and rear portions of the cradle top without covering Sk'aliCh'elh-tenaut's blowhole. The baffles will serve to minimize spillage while in transport.

4.12.5 Crossbars

There will be two steel crossbars that will fit over the supporting frame of the cradle and be lockable along the top rail of the cradle frame. Each crossbar will be equipped with two hooks with which to hang the chain that will attach to Sk'aliCh'elh-tenaut's stretcher.

4.12.6 Lifting Cables

A set (primary & back up) of ½ inch, six-point, stainless steel wire rope lifting cables will be customized to fit Sk'aliCh'elh-tenaut's stretcher.

4.12.7 Cochran Loader

A Cochran loader will be utilized at both the departing and arriving airports to load the cradle with Sk'aliCh'elh-tenaut on and off of the aircraft. Cochran loaders are self-propelled loading elevators specifically designed for the task of loading cargo aircraft.

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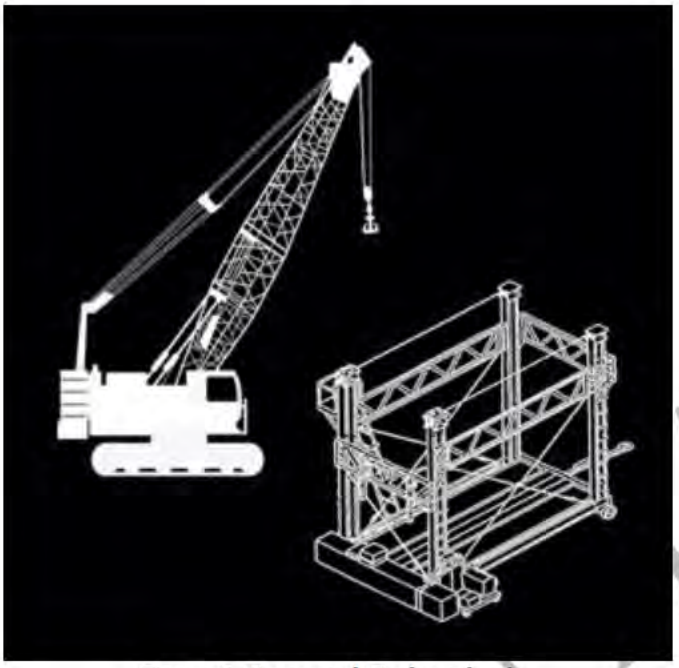


Figure 6. Crane and Cochran loader.

4.12.8 Crane

At the Miami Seaquarium a 60-ton hydraulic crane will be used for training and loading procedures.

For barge unloading operations in Washington, a barge-based crane with the capacity to lift 12,000lbs at a minimum of 60ft reach will be utilized. If a large enough barge to carry the transport truck is not available, a secondary 60-ton hydraulic land-based crane will be utilized in addition to the barge-based crane.

4.12.9 Water Transfer Device (if necessary)

A minimum 1400-gallon towable water trailer with a pump will be utilized for water transfers on the aircraft and on the ground if necessary, based on the aircraft utilized.

4.13 Staff

The following staff will be directly involved in the transport phase of the project. Additionally, supporting staff will oversee all non-profit operations to sustain the project.

Operations Director (1x) – Directing all transport operations from on site
Operational Coordinator (x1) – Working with the Director to coordinate all transport operations from the final destination (Ocean Habitat)

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Marine Mammal Veterinarian (x2) – Medical care and health monitoring of Sk'aliCh'elh-tenaut (care team)
Lead of Animal Husbandry (x1) – Lead coordinator of animal care throughout transport (care team lead)
Animal Husbandry Team (x5) – Care and transport operations for Sk'aliCh'elh-tenaut (care team)
Lummi Cultural Representative (x1-2) – Overseeing all cultural and spiritual considerations

Additionally, the Director of Marine Operations and Marine Operations Team will be on-hand at the Ocean Habitat for the arrival of Sk'aliCh'elh-tenaut.

Trucks, Aircraft, and heavy equipment (cranes & Cochran loaders) will be operated by highly trained personnel employed by the partner venders.

4.14 Transport Equipment Checklist

(To meet or exceed IATA regulations)

- ☐ Watertight cradle
- ☐ Stretcher w/ pec holes
- ☐ Stretcher poles w/ lifting eyes
- ☐ Stretcher pole caps
- ☐ Cross bars for transport cradle
- ☐ Baffles
- ☐ 4 tag lines
- ☐ Adjustable lifting cables for crane
- ☐ Straps, & chains (for adjustments within transport box)
- ☐ Soft tail line
- ☐ Truck and/or airplane tie downs (for both cradle and holding tank)
- ☐ Heavy duty locking carabiners
- ☐ Water holding tank w/ pumps & hoses
- ☐ Copy of all relevant permits
- ☐ Emergency medical supplies for staff
- ☐ Emergency medical supplies for Sk'aliCh'elh-tenaut, including intubation kit and (if feasible) emergency O2
- ☐ Heart rate monitor
- ☐ Stopwatch
- ☐ Write-In-The-Rain notebooks & pencils
- ☐ Fish tote for transporting supplies & equipment
- ☐ 150-200lbs of Sk'aliCh'elh-tenaut's current food (frozen)
- ☐ Hand pump garden spray pumps (4-6)
- ☐ Large ice chests (full with ice)
- ☐ A&D ointment
- ☐ Head lamps for care team
- ☐ Dry suits & gloves for care team
- ☐ Light weight cotton sheet (2)
- ☐ Towels & sponges
- ☐ Small electric pool vac (to remove waste from cradle)
- ☐ Soft foam (a couple mattress size pieces)
- ☐ Extra 5 gallon water jugs
- ☐ Waterproof radios
- ☐ Extra batteries
- ☐ Case of electrical tape
- ☐ Zip ties
- ☐ Tool kit

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4.15 Transport Risk Management Plan

Proper preparation, both of Sk'aliCh'elh-tenaut and her team, prior to transport will be the most effective way to manage risk throughout the process.

In addition, emergency equipment, such as a complete medical crash kit for Sk'aliCh'elh-tenaut and a comprehensive emergency medical kit for personnel will accompany the team at all times during the transport.

4.15.1

Potential Issue

Adverse weather conditions that impact the transport.

Mitigation

Adverse weather, including thunder and lightning storms, tornadoes and even hurricanes, that have the potential to impact the transport is possible. If adverse and impactful weather is expected, delay of the entire transport will be considered. The forecast for all locations involved in the transport will be monitored closely prior to and throughout transport, and alternative plans will be made prior to initiation of transport if significantly adverse weather is expected.

4.15.2

Potential Issue

Sk'aliCh'elh-tenaut responds poorly to loading at Miami Seaquarium on the evening of transport.

Mitigation

This is unlikely to happen if Sk'aliCh'elh-tenaut has been given time in the conditioning period to develop comfort with the cradle loading process. However, she will be carefully monitored for signs of stress throughout the process and if she appears to be responding poorly to the loading efforts, the veterinary team will make a decision about whether it is appropriate to abandon the loading effort for the day. If that decision is made, Sk'aliCh'elh-tenaut will be quickly returned to her pool with the water raised and she will be made comfortable.

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4.15.3
Potential Issue

There is a problem with the loading crane in Miami.

Mitigation

A back-up crane option will be available on standby on the evening of the transport in case such issues arise. If a switch to a backup crane is needed, the team will take the steps necessary to make the transition as quickly and comfortably as possible for Sk'aliCh'elh-tenaut. Those in charge of coordination will ensure that all subsequent steps are adjusted for any timing shifts incurred by the change, and will ensure that everyone involved in each step of the transport is made aware of any changes to the overall timeline.

4.15.4
Potential Issue

There is a mechanical issue with the truck, or another issue that deems the transport truck unusable. This applies to the trucks in either Miami or Washington.

Mitigation

A back-up truck option will be available on standby during both truck transports in case such issues arise. Transfer between trucks will require the use of a crane or forklift. In Miami the crane used for loading will remain on standby until Sk'aliCh'elh-tenaut is in the air. In Washington the land-based crane, if needed, will be on standby at the port, and additional resources (cranes and forklifts) will be identified along the finalized truck transport route prior to transport.

If a switch to a backup truck is needed, the team will take the steps necessary to make the transition as quickly and comfortably as possible for Sk'aliCh'elh-tenaut. Those in charge of coordination will ensure that all subsequent steps are adjusted for any timing shifts incurred by the change and will ensure that everyone involved in each step of the transport is made aware of any changes to the overall timeline.

4.15.5
Potential Issue

Traffic, roadblocks, or other truck transport delays.

Mitigation

Prior to and throughout the transport, those in charge of coordination will be in communication with the counties (Miami-Dade, Snohomish, and Skagit) to stay up to date on any traffic/road

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issues and inform the transport team of alternative routes. In the event of an unforeseen road delay (such as an accident), the driver and police escort will exit the route at the nearest opportunity and an alternative route will be taken.

4.15.6
Potential Issue

There is a mechanical issue with the aircraft, or another issue that deems the use of the transport aircraft unusable.

Mitigation

Prior to leaving MIA, if there is an issue with the aircraft that cannot be quickly and safely addressed, the team will reverse course and return to the Miami Seaquarium and transport will be called off for the day. The care team will ensure that Sk'aliCh'elh-tenaut is returned to her pool as quickly and comfortably as possible.

In the event that a refuel stop is incorporated into the transport plan, contingency plans specific to the refuelling airport will be made. Although it is extremely unlikely that an issue with the aircraft will arise at a refuelling stop, the closest backup resources (alternative plane options, etc.) will be located prior to transport beginning. In addition, a water tank truck with chilled fresh water will be on stand-by at the refuelling airport in case of a delay.

Prior to transport, the flight path (as well as likely alternatives) will be mapped out and available resources will be identified near airports along the route/s. This will ensure that the appropriate resources are available in the event that the aircraft experiences mechanical or other issues while on route and has to make an unscheduled landing. Special attention will be paid to proximity to emergency fresh and saltwater pool access at potential emergency stops along the flight path.

4.15.7
Potential Issue

There is a mechanical issue with the barge tug boat, or another issue that deems the tug boat unusable.

Mitigation

A back-up tug boat option will be available on standby at the Port of Anacortes. If a switch to a backup tug boat is needed, the team will take the steps necessary to make the transition as quickly and comfortably as possible for Sk'aliCh'elh-tenaut. Those in charge of coordination will ensure that the team at the Ocean Habitat awaiting Sk'aliCh'elh-tenaut's arrival is aware of any anticipated delays.

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5. ON-SITE CARE

Before any work starts, a blessing for Sk'aliCh'elh-tenaut's new home will be held at the site. As with all phases of Sk'aliCh'elh-tenaut's return home, her Lummi cultural caretaker will hold ceremony and will cleanse her, clearing the way for her. While Sk'aliCh'elh-tenaut's ongoing physical needs will be met by the team, her Lummi caretaker will regularly visit to ensure her continued emotional and spiritual well-being. –Squil-le-he-le and Tah-Mahs

5.1 Initial Transition Phase

Sk'aliCh'elh-tenaut will be introduced to her new habitat in a gradual manner, the pace of which is contingent on her comfort level with her surroundings. The overarching goal of maintaining flexibility with the pace of this phase is to minimize any stress on Sk'aliCh'elh-tenaut.

5.1.1 Acclimatization Period

A. Introduction to Ocean Habitat

After Sk'aliCh'elh-tenaut has been unloaded at the Ocean Habitat, time will be given for Sk'aliCh'elh-tenaut to familiarize herself with the initial space and become comfortable. Her behavior and acoustics will be closely monitored to determine how well she is transitioning (*for details on monitoring see section 5.2.3*).

Once she has demonstrated comfortable use of the initial space and is relaxed in her new surroundings as determined by the care team, the med lift gates will be opened and Sk'aliCh'elh-tenaut will be able to freely access her entire area. If at any time she begins to exhibit signs of distress, she can again be isolated in a smaller portion of the Ocean Habitat and allowed time to feel comfortable within a smaller space while being attended by familiar husbandry staff.

A veterinarian with experience caring for odontocetes will remain onsite throughout the initial transition period and will be on call at all times.

It is anticipated that Sk'aliCh'elh-tenaut will go through a normal period of transition in which she will be challenged by the new environment. Veterinary staff will closely monitor this transition and in consultation with the operations director and other specialists, and will adjust management strategies based on her initial and ongoing health evaluation.

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B. Initial Feeding

Sk'aliCh'elh-tenaut's diet at the Miami Seaquarium will be maintained upon initial arrival at the Ocean Habitat (including all dietary supplements). Maintaining her current diet throughout the transition phase will serve to lessen potential stressors and limit variables to be assessed in her on-going health monitoring throughout the transition phase. The specifics of this diet are currently unknown; however, it is likely to include herring, capelin, mackerel and/or squid.

It is likely that Sk'aliCh'elh-tenaut will take a few days to transition back to her normal feeding level/routine due to a new and stimulating environment. Food will be offered at frequent intervals by hand from familiar husbandry staff with secondary reinforcement to encourage comfort in her new environment, until she has regained her pre-transport feeding level. Any changes to Sk'aliCh'elh-tenaut's baseline feeding level in response to her new environment (i.e. response to higher activity level, response to cold water, etc.) will be carefully monitored by her husbandry and veterinary teams.

5.2 Long-term Care

5.2.1 Husbandry

A highly skilled and experienced animal husbandry team will be charged with the long-term care of Sk'aliCh'elh-tenaut. This team will handle her daily care, including feeding, enrichment management, training (for behaviors necessary for her wellbeing only), and assisting the veterinarians, as needed, during any medical procedures (routine or otherwise). Daily records will be kept and used to review new developments and modify husbandry practices as necessary.

A. Feeding

After a successful acclimatization period, Sk'aliCh'elh-tenaut will be gradually transitioned to a more locally derived diet. This will include weaning her off of any non-regionally available fish such as mackerel, which will serve to lower the potential environmental impacts of the project. Supplements will be maintained unless deemed unnecessary by Sk'aliCh'elh-tenaut's veterinary team. Any changes to her diet and/or supplementation will be done gradually and in consultation with specialists in the field of marine mammal nutrition and physiology.

After acclimatization, Sk'aliCh'elh-tenaut's feeding schedule will continue to increase in variability. This will include things such as varying the location, timing, and quantity of feeds, while always maintaining a standard caloric intake within a 24-hour period. The goal with this will always be to keep the variability stimulating and positive for Sk'aliCh'elh-tenaut. This will encourage her to engage with her new environment in a dynamic and interesting way.

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B. Enrichment

A variety of enrichment devises and techniques will be used to encourage Sk'aliCh'elh-tenaut to engage with her new environment.

Enrichment techniques may include, but are not limited to:

- Fish deployment devices during feedings;
- Feeder tubes;
- Bubbles;
- Water jets/hoses;
- Mirrors;
- Acoustics;
- Natural items (such as kelp or driftwood);

C. Training

Specific behaviors necessary for the ongoing care of Sk'aliCh'elh-tenaut will be maintained through continued conditioning. These behaviors and associated training programs will be adapted specifically to the Ocean Habitat. This training will be limited to only what is necessary for the wellbeing of Sk'aliCh'elh-tenaut and will include maintenance of behaviors necessary for exercise/conditioning, medical care, and emergency situations (i.e. Sk'aliCh'elh-tenaut's ability to enter the med pool area when asked).

5.2.2 Medical Care

Two veterinarians (one primary and one back-up) with extensive experience working with marine mammals and specifically with orcas will be on retainer to lead routine health checks, and consult, in person and remotely, on Sk'aliCh'elh-tenaut's medical care. The animal husbandry and marine operations (marine ops) teams will work closely with these veterinarians to ensure that Sk'aliCh'elh-tenaut is always carefully monitored for any signs of illness or other health concerns.

A. Routine

Routine health monitoring protocols will be developed by Sk'aliCh'elh-tenaut's veterinarians based on her health condition and current needs. These protocols will remain adaptable throughout Sk'aliCh'elh-tenaut's care. To ensure good preventative medical care, baseline routine health monitoring will include:

- Monthly hematology and serum chemistry tests;
- Monthly examination of fecal, blow and sputum samples
- Routine infectious disease screening program with particular attention paid to known pathogens in the Salish Sea;

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- Daily veterinary observations coordinated by the veterinarians and husbandry teams;
- Comprehensive record keeping, including the development of nomograms specific to Sk'aliCh'elh-tenaut's health.

In addition to routine health monitoring, Sk'aliCh'elh-tenaut's microbiome will be reassessed after her initial transition to the Ocean Habitat. This will serve to establish a new baseline with which to monitor her health.

B. Special Circumstances

Sk'aliCh'elh-tenaut's habitat will be designed in a way that allows for ongoing remote monitoring by cameras and hydrophones, as well as facilitate rapid veterinary access to her if she clinically deteriorates or becomes uncooperative.

C. Passing

If our relation journeys to spirit while in the Ocean Habitat, we will hold ceremony and take care of her earthly body as we would for any relation. We will be guided in this by our spiritual leaders. –Squil-le-he-le and Tah-Mahs

If Sk'aliCh'elh-tenaut lives out her life in the Ocean Habitat, upon her passing the following steps will be taken:

- Cultural and spiritual considerations will be overseen by Lummi cultural representatives;
- A complete necropsy and histopathology will be performed by qualified experts, with assistance from the Northwest Indian College. This will be overseen by Lummi cultural representatives to ensure cultural and spiritual beliefs are respected;
- Sk'aliCh'elh-tenaut's skeleton will be given to the Northwest Indian College for rearticulation and long-term education and cultural purposes;
- Sk'aliCh'elh-tenaut's remains will be buried at a location determined by the Lummi to be culturally and spiritually appropriate. Care will be taken to ensure compliance with state agencies regarding any environmental considerations.

Lummi cultural representatives will oversee and guide every step of this process.

5.2.3 Monitoring

A. Above Water Visual:

Weatherproof above water cameras will be placed around the parameter of the Ocean Habitat to gather visual observations from multiple angles and perspectives. This system of above water cameras will record the daily activity around the habitat of both Sk'aliCh'elh-tenaut and her care team. The cameras will record footage to be archived as well as to be connected to an on-site system which allows them to be monitored in real time by the animal husbandry, veterinary and

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marine ops team. Photogrammetry via drone will be considered as a method of monitoring Sk'aliCh'elh-tenaut's body condition.

B. Underwater Visual:

Underwater cameras will be placed around the perimeter of the Ocean Habitat at varying depths to gather visual observations from multiple angles (facing both in and out of the habitat) in varying water visibility. Underwater cameras will be placed so that they enable visual inspection of the nets. This system of underwater cameras will record the daily activity underwater in, and just outside of, Sk'aliCh'elh-tenaut's habitat. The underwater cameras will record footage to be archived as well as to be connected to an on-site system which allows them to be monitored in real time by the animal husbandry and marine ops teams.

C. Acoustic:

The Ocean Habitat will be designed to include a long-term passive acoustic monitoring (PAM) system. This system of hydrophones will record the daily acoustics of both Sk'aliCh'elh-tenaut and the ambient sounds in and around her habitat, as well as allow for the acoustics to be monitored in real time by the animal husbandry and marine ops teams.

5.2.4 Research

The uniqueness of this project allows for a variety of research opportunities. Passive data collection will be ongoing at the Ocean Habitat (imagery, acoustics, behavioral observations, etc.) and this data can be made available to the research community and educational facilities (such as the Northwest Indian College) with the goal of furthering scientific and cultural understanding of Sk'aliCh'elh-tenaut and the Salish Sea.

This project will always seek to be responsive to public concerns and collaborative with research and educational communities. Research proposals will be reviewed by the Operations Director, tribal representatives and veterinarians, and will be conducted only when it is non-invasive (i.e. passive acoustic monitoring) or is the direct result of Sk'aliCh'elh-tenaut's routine or necessary care (i.e. results of ongoing health monitoring), or directly pertains to the wellbeing of Sk'aliCh'elh-tenaut and/or Sk'aliCh'elh (southern resident orcas). Her autonomy and wellbeing will always be the top priority.

5.2.5 Marine Operations & Security

Marine operations (marine ops) and security will be performed by the marine ops team. All marine ops staff be skilled in boat handling and maintenance, net cleaning and repair, have necessary dive certifications, and will receive training in outreach and education for the project. In addition, marine ops staff will attend training with the Islands' Oil Spill Association (IOSA).

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A. Security

The marine ops staff will provide 24/7 security for Sk'aliCh'elh-tenaut, 365 days a year. This security will include maintaining the physical buffer around the habitat which will provide Sk'aliCh'elh-tenaut with a high level of protection at all times.

B. Night Monitoring

When the animal husbandry staff is not onsite (nighttime), the marine ops staff will conduct monitoring (visual observations and observations utilizing the above and underwater camera systems and hydrophones) of Sk'aliCh'elh-tenaut and the facility, all of which will be archived in a long-term database.

C. Boat Handling & Maintenance

The facility will have two marine vessels with which the marine ops staff will conduct patrols of the barrier net, shuttle divers for net cleaning and maintenance, and respond in the event of an emergency. All marine ops staff will be skilled and licensed boat drivers. The marine ops team will tend to all routine maintenance and repair of the marine vessels.

D. Net & Structure Maintenance

The marine ops staff will conduct routine checks of the inner habitat structure and barrier net. This team will consist of highly skilled scuba divers that will routinely preform underwater net inspections and repair, cleaning of the habitat structure, and facility maintenance and repair.

Net and structure cleaning will take place as needed (most frequently in the summer season), to remove any bioaccumulation on both the net and structure. A net cleaning system will be utilized for efficient cleaning of the net.

5.3 Staff

The following staff will be directly involved in the on-going care of Sk'aliCh'elh-tenaut and the Ocean Habitat. Additionally, supporting staff will oversee all non-profit operations to sustain the project.

Operations Director (x1) – Directing all operations and staff
Operational Coordinator (x1) – Working with the Director to coordinate all operations
Marine Mammal Veterinarian (x2 in consultation)– Ongoing health and medical care of Sk'aliCh'elh-tenaut
Lead of Animal Husbandry (x1) – Lead coordinator of animal care at the Ocean Habitat

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Animal Husbandry Team (x5) – Daily care of Sk'aliCh'elh-tenaut, including feeding, assisting the veterinary team, and training when necessary
Director of Marine Ops (x1) – Directing all marine based operations at the Ocean Habitat
Marine Ops Team (x8) – Faculty and net maintenance, security and night monitoring
Lummi Cultural Representative (x1-2) – Overseeing all cultural and spiritual considerations

5.4 Ocean Habitat Equipment Checklist

- ☐ Above Water Cameras
- ☐ Underwater Cameras
- ☐ Computers
- ☐ Back Up Hard Drives Or Server Network
- ☐ Binoculars
- ☐ EPIRBs
- ☐ GPSs
- ☐ Depth Finders
- ☐ Splash Suits
- ☐ Portable Weather Station
- ☐ Ship To Shore Marine Radio
- ☐ Rain Gear
- ☐ Rubber Boots
- ☐ Survival Or Mustang Suits
- ☐ Boat & Habitat Safety Equipment (flares, fire extinguisher, etc.)
- ☐ Life Vests
- ☐ Throw Bags
- ☐ Misc. Water Rescue Equipment
- ☐ Emergency Oil Spill equipment
- ☐ Body Hooks
- ☐ Extra Lines
- ☐ Booties & Gloves
- ☐ Weights
- ☐ Weight Belts
- ☐ Tanks
- ☐ Dive Computers
- ☐ Hoods
- ☐ Underwater Lights
- ☐ Air Compressor
- ☐ Hookah Compressor w/ Regulators
- ☐ Tool Kit
- ☐ Water Proof Lights
- ☐ Write-In-The-Rain Books
- ☐ Hot Water Maker
- ☐ Spare Boat Parts
- ☐ Stainless Steel Buckets
- ☐ Knives
- ☐ Gloves
- ☐ Biodegradable Disinfectants
- ☐ Cutting Boards
- ☐ Storage Containers
- ☐ Towels
- ☐ Drying Rack
- ☐ Fish Scale
- ☐ Daily Data Sheets (for recording feeding, supplements, and behavior)
- ☐ PAM Monitoring System
- ☐ Dry Suits
- ☐ Masks, Fins, Snorkels
- ☐ BCDs
- ☐ Regulators, SPGs, & Alternate Air (Octo's)
- ☐ Power washer
- ☐ Net Cleaning Equipment
- ☐ Underwater Slates
- ☐ Emergency Medical Kit For Staff
- ☐ Emergency Medical Kit For Sk'aliCh'elh-tenaut
- ☐ Misc. Husbandry Supplies
- ☐ Misc. Veterinary Supplies

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6. SITE

6.1 The Ocean Habitat

The Ocean Habitat will be located off the west side of Haida Point in West Sound, Orcas Island, Washington State. The Ocean Habitat is adjacent to Lummi land, and situated in a geographic location that is relatively protected from significant marine weather events and offers close access to needed infrastructure. It is not located in an important foraging or resting habitat for the southern resident orcas, reducing any potential risks that Sk'aliCh'elh-tenaut's presence might pose to the SRKW. Haida Point also provides a geographic acoustic barrier to the boat traffic of the West Sound Marina.



Figure 7. West Sound, Orcas Island.



Figure 8. The Ocean Habitat and barrier net will be adjacent to Lummi land on a feature known as Haida Point. The barrier net will allow for buffer zone that maintains a minimum of a 100m around the inner habitat structure in all places. Total area of the space enclosed by the barrier net is 15 acres.

The Ocean Habitat facility will meet and exceed APHIS (Animal and Plant Health Inspection Service), and AWA (Animal Welfare Act).

**The following description of the Ocean Habitat is pending formal design and may be modified as is deemed necessary by marine engineers.*

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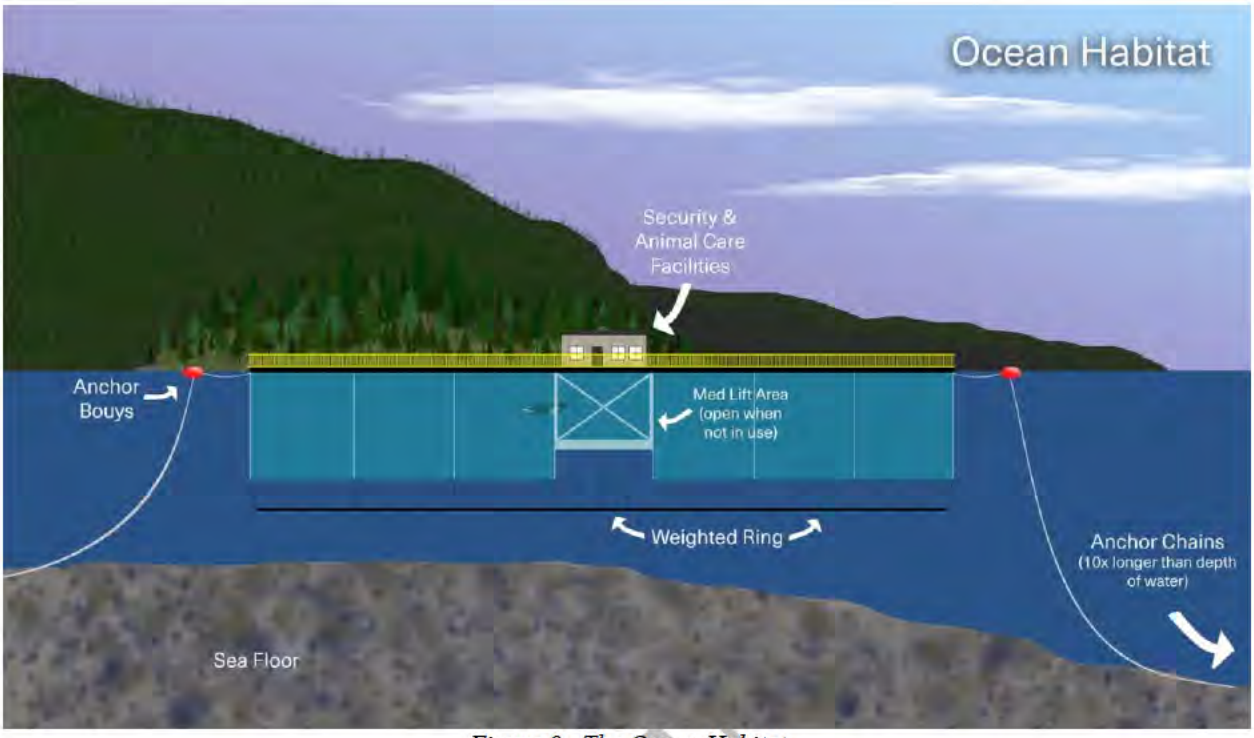


Figure 9. The Ocean Habitat

6.1.1 Inner Habitat

The inner habitat at the Ocean Habitat will be constructed with a design similar to the habitat used for the Keiko Project. This habitat design has proven to withstand extreme adverse weather and sea conditions, while allowing safe operations for staff and a large and secure living space for the whale.

The habitat dimensions are 250 feet long by 100 feet wide. The nets themselves will be configured in an hourglass shape, with a rectangular medical lift (med lift) located in the center of two octagon shaped enclosures. This configuration allows for the partitioning of portions of the habitat if needed, such as during Sk'aliCh'elh-tenaut's initial introduction. During normal operations, the gates on either side of the med lift section will remain open to allow Sk'aliCh'elh-tenaut free roam of the entire habitat.

The habitat structure consists of 30-inch HDPE pipe, on top of which are positioned platforms and a perimeter walkway made of ChemGrade or similar material. The perimeter walkway allows access to the entire inner habitat. One floating feeding platform is located in each octagon section of the habitat providing two distinct feeding platforms in the habitat. A raised aluminum walkway is located on either side of the med lift to enable quick access from one side of the habitat to the other.

The habitat will be designed in a way which minimizes potential resting areas for wild birds and pinnipeds, thus mitigating the potential for the habitat itself to act as an attractant to wildlife.

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6.1.2 Med Lift

The med lift section is located in the center of the habitat. This is the best location in the habitat to provide structural support for lifting operations (i.e. lifting Sk'aliCh'elh-tenaut up into shallower water or completely dry when needed for medical care). It consists of a solid platform located at the base of the med lift area nets. The solid platform is constructed out of ChemGrade or similar material. The med lift has a galvanized frame structure and is partitioned off from the rest of the habitat using net panel gates, when the med lift is in use. The med lift is equipped with an integrated scale system so that the veterinary and husbandry teams can weigh Sk'aliCh'elh-tenaut during routine health evaluations. The med pool containing the med lift will be large enough to hold Sk'aliCh'elh-tenaut for an extended time if necessary for medical diagnostics and treatment.



Figure 10. The Ocean Habitat is 250ft long and 100ft wide. The structure consists of two large octagon shaped net enclosures, joined in the middle by a pass through med lift. The platforms adjacent to the med lift support small structures where animal care, monitoring, and marine operations staff activities can take place.

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6.1.3 Facilities

The facility will contain two habitat-based structures for use in daily/nightly operations. The facilities will consist of:

- Building A containing equipment necessary for monitoring of Sk'aliCh'elh-tenaut and for security of the Ocean Habitat including computer systems to receive live video and acoustic feeds, as well as general medical and husbandry equipment. Building A also contains dry space for staff during adverse weather, as well as an emergency bunk and small kitchen for situations requiring staff to stay on the habitat structure for an extended period of time during adverse weather considerations or in the event that Sk'aliCh'elh-tenaut needs intensive medical care, etc.

- Building B contains marine operations equipment, such as repair and maintenance equipment and tools, as well as a dive locker and air compressor. Building B also houses a bathroom with a shower and marine-approved non-discharging toilet.



Image 4. Side view of Keiko's habitat in Iceland. (Keiko Project Collection)

6.1.4 Net

The habitat netting will be constructed of 72-ply Dyneema knotless netting. Dyneema netting is made of ultra-high molecular weight polyethylene fiber. If feasible, a bio-based Dyneema can be used which is neutrally buoyant. Dyneema netting is extremely durable and long lasting. The 72-ply braided twine is 5.6mm in diameter and has a 1,496kg break strength. The knotless interwoven design minimizes abrasion for both equipment and marine life and allows for a stable mesh size throughout the life of the net. The mesh size of the net will be determined after thorough environmental review, so that a size appropriate to both ongoing maintenance and mitigation of potential entanglement, is utilized.

The netting on the inner habitat is hung from the habitat structure itself and extends to a depth of 30ft below the habitat. A weighted ring is attached to the bottom of the habitat to help the netting maintain form during stronger patterns of water movement.

All nets at the Ocean Habitat will be routinely checked, cleaned of any biofouling, and repaired and replaced as needed.

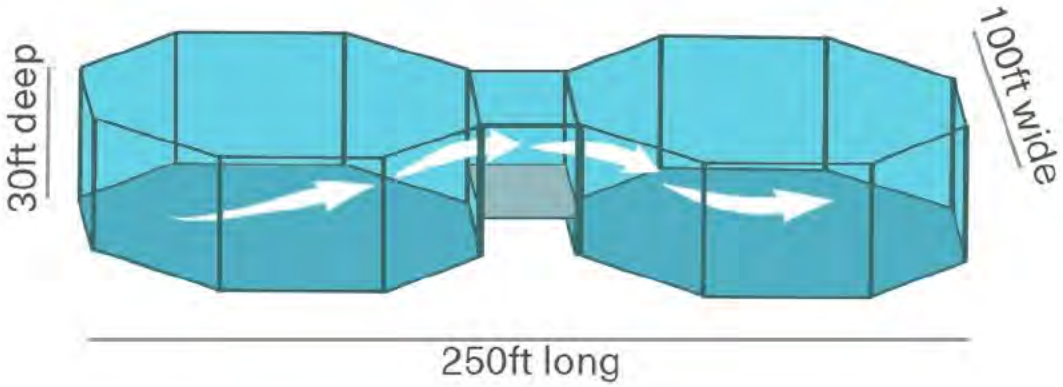


Figure 11. The Ocean Habitat nets hangs from the habitat structure in an hourglass pattern. The nets in both octagon shaped inner habitat spaces are 30ft deep. The pass through med lift located in the center of the two octagon areas remain open so Sk'aliCh'elh-tenaut can move freely through and have access to the complete habitat whenever the med lift is not actively in use.

6.1.5 Barrier Net

The barrier net creates the outer edge of the buffer zone around Sk'aliCh'elh-tenaut, and encloses the entire 15 acres of the Ocean Habitat. The net material itself is fabricated of Dyneema 8-inch stretch mesh. Border ropes on the barrier netting are fabricated of 9mm Dyneema rope.

A 0.74kg/m lead line is woven into the netting parallel to the bottom of the net to help keep the net taught throughout tidal cycles and wind events. The base of the net is anchored to the sea floor with a combination of heavy chain (grade-80 mid-pitch link chain), and a series of helical anchors fixing the barrier net to the sea floor on both sides.

At the surface, the net is hung from a buoy line, consisting of large buoys tightly spaced. This creates a significant obstacle to discourage trespassing. At multiple places along the barrier net including at the corner points, marker buoys labeled with 'Exclusion Zone' are affixed by chain to the buoy line. These marker buoys are connected to a long anchor change extending on the outside of the barrier net, which not only serve as information signs, but also provide additional structural support to the top portion of the barrier net. Some marker buoys will be mounted with wireless cameras for real time monitoring of the net perimeter.

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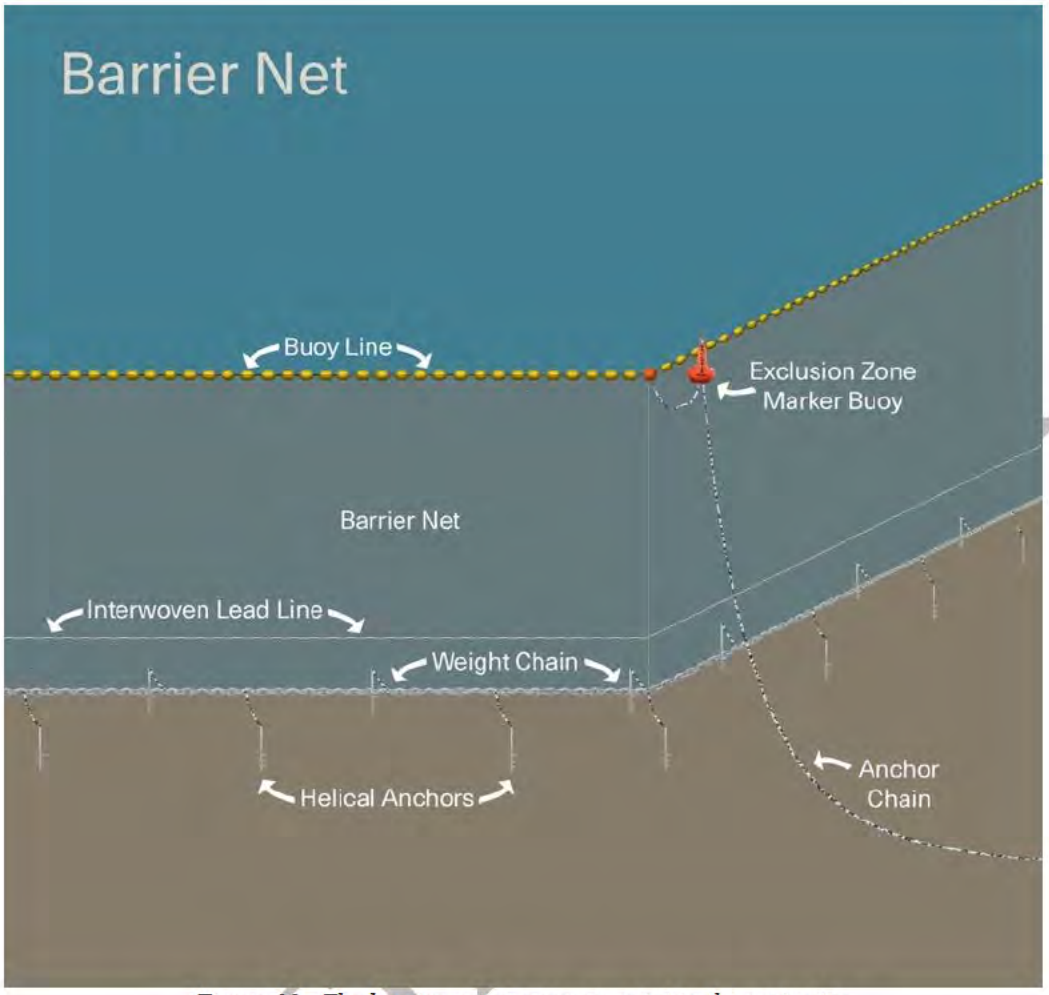


Figure 12. The barrier net at a corner point in the perimeter.



Figure 13. Exclusion Zone marker buoy and helical anchor.

6.1.6 Net Cleaning System

Regular maintenance and cleaning will occur on all nets within the Ocean Habitat. The exact cleaning system will consist of either marine operations scuba diving teams manually cleaning nets and/or automated net cleaning systems.

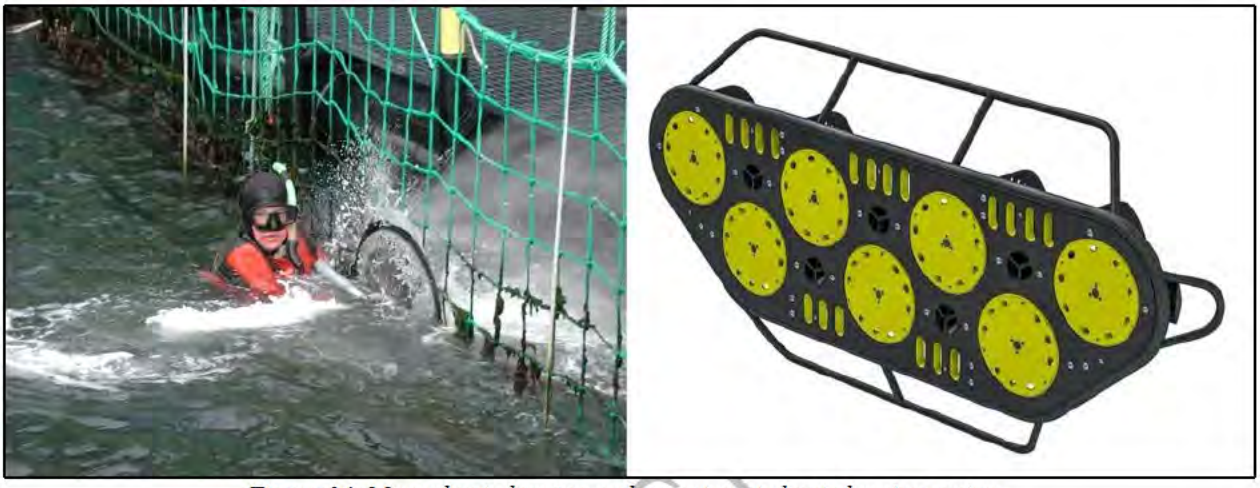


Figure 14. Manual net cleaning and an automated net cleaning system.

6.1.7 Boats

A minimum of two marine workboats will be deployed to provide access to all external areas of the habitat and the barrier net for security and maintenance, as well as to shuttle personnel back and forth to shore.

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7. ON-SITE RISK MANAGEMENT PLAN

A special thanks to Ken Carrasco for his consultation in the drafting of this section of the plan.

The Ocean Habitat facility will follow OSHA safe workplace standards for marine operations and as adopted by other professional organizations working in similar circumstances. Volunteers working near the water will be required to meet the same equipment and training standards as full-time professional personnel, and thus all references to "personnel" in this document will include volunteers. All equipment (including inspections and preventive maintenance), training, and contingency protocols will be documented and archived in a database.

Several small vessels will be based at the Ocean Habitat. These vessels will be electric powered, allowing for the advantages of no fuel and oil on the water, quiet operation, and reliability.

7.1 General Safety

7.1.1 Equipment

The Ocean Habitat will be stocked with sufficient approved Type V personal flotation devices for all staff and guests, and 'person-in-the-water' (PIW) ' rescue equipment including USCG approved Type 4 throwable devices and ladders for egress from the water will be obvious and readily available. Type II and III devices will also be readily available for use during potentially hazardous situations.

Personnel will be required to wear their properly fitted PFD whenever near the water. Personnel near the water are additionally required to: 1) work in groups of at least two, 2) not work in inclement weather or conditions of poor visibility except during bonafide urgent or emergency situations, 3) have advised shore-based personnel of their specific location and anticipated tasks, and 4) have the ability to communicate with those shore personnel with, for example, radios operating on the FRS frequencies.

The facility will be equipped with emergency signalling equipment standard on marine vessels including VHF radios and flares. The Coast Guard's Sector Seattle, National Marine Fisheries Service, Washington Dept. of Fish and Wildlife, and the San Juan County Sheriff's Department Marine Patrol will be informed of the Ocean Habitat location and status changes.

As described below, fully stocked first aid kits will be readily available and will include AEDs and O2. In addition, blankets and other equipment for hypothermia response will be part of the first aid equipment.

OHSA-approved personal protection equipment will be stocked onsite for response to fuel, oil, or other hazardous material spill.

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7.1.2 Contingency Planning

Site specific protocol development to anticipate unusual situations is a necessary preliminary step and will include response protocols for medical emergencies, PIW emergencies, collisions with the habitat structure and its appurtenances, collisions between boats in close proximity, fuel and oil spills originating on-site or in close proximity, severe weather, air quality impacts from numerous boats in the vicinity, upwind wildfires, or gasoline spills; fire at the upland facility, flooding, disabled boats drifting by wind or current toward the habitat, structural failures of the net, leakage of stray electrical voltage into the water, medical emergencies aboard unassociated vessels but in close proximity, overenthusiastic curious members of the public, earthquakes, and tsunamis.

7.1.3 Training

All professional and volunteer staff will be required to attend appropriate trainings and to ensure that the completion of these trainings are documented in the database. Core personnel will be required to have a current First Aid certification including CPR, AED, and O2 administration training. Given the location and the nature of work on a marine based facility, employees will be encouraged to obtain Wilderness First Aid certifications. Boat operators will be required to have a boater's education card or a Coast Guard license as a professional mariner if the situation requires.

Trainings will be conducted in-house, except the boater's education card and the First Aid card which can be obtained through approved third parties such as the Coast Guard Auxiliary, Orcas Island Fire and Rescue, or the Red Cross.

Personnel will understand that response to any hazardous material such as fuel, oil, or other chemical will be limited to only those with current HAZWOPER certification. The 8-hour annual HAZWOPER renewal will be tailored to the site.

7.1.4 Underwater Operations

Exceptional standards for equipment, protocols, and certifications will be required of those who participate in underwater work and these will be established using the aid of organizations. Whether the dives on the net meet the OHSA definition of "scientific" rather than "commercial" will determine the standards of requirements to be met. (29 C.F.R. § 1910.402). All staff members involved in scuba diving on the job will be required to have a minimum of a Rescue Diver certification.

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7.2 Medical Emergencies

**The following section refers to human medical emergencies of staff and guests.*

Medical emergencies will largely be avoided by following carefully crafted safety protocols for all operations; however, it is always possible that unforeseen medical emergencies can occur. In order to ensure quick response to such emergencies, staff will be highly trained and appropriate emergency equipment will be maintained onsite.

The Ocean Habitat will be equipped with an AED and emergency O2, as well as at least two complete emergency medical field kits. Emergency medical kits and equipment will be marked and highly visible, and all staff and visitors will be made aware of their locations and the locations of other safety equipment. Emergency medical kits and equipment will be checked monthly and maintained.

Emergency response plans for rapidly getting a trauma or medical patient to high level medical care will be coordinated with Orcas Island Fire & Rescue, Island Air Ambulance, and Airlift Northwest so as to ensure the quickest possible evacuation from the habitat and transport to appropriate care.

Hospitals

Primary care, as well as acute injury and illness care is available locally on Orcas Island through the UW Medicine Primary Care Orcas Island Clinic.

PeaceHealth Peace Island Medical Center
1117 Spring St
Friday Harbor, WA 98250
360-378-2141
Level 4 Trauma Center

Island Hospital
1211 24th St
Anacortes, WA 98221
360-299-1300
Level 3 Trauma Center

Peace Health St. Joseph Medical Center
2901 Squalicum Parkway
Bellingham, WA 98225
360-734-5400
Level 2 Trauma Center

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UW Medicine/Harborview Medical Center
325 Ninth Ave
Seattle, WA 98104
206-744-3000
Level 1 Trauma Center

Memberships for emergency air evacuation with both Island Air Ambulance and Airlift Northwest, will be maintained for all on-site employees.

7.3 Fire

Fire mitigation begins with prevention. All staff will receive training in marine fire safety and will be knowledgeable in how to use all fire safety equipment located at the Ocean Habitat. Training will include fire and emergency communication drills. Every guest to the habitat structure will be given a safety briefing that will include an introduction to the location of fire safety equipment.

Each building on the habitat structure will be equipped with multiple smoke and carbon monoxide detectors as well as multiple fire extinguishers rated for marine use. All fire safety equipment on the habitat structure will meet or exceed Coast Guard requirements and will be regularly checked and maintained. Sensitive equipment on the habitat structure will be marine grade and subject to regular inspection. Smoking will be prohibited at the Ocean Habitat.

7.4 Severe Weather

Severe weather emergency protocols will include proper design and maintenance of the Ocean Habitat facilities. This will include the development of a hydrodynamic model of the Ocean Habitat site including evaluation of the severity range of normal and abnormal weather events, careful design by marine engineers to ensure the facility design meets the standards necessary to withstand the force of 50-year and 100-year storms, and regular maintenance of nets, habitat structure, and facilities.

In addition, even though the West Sound site is well protected from the most severe weather events, the precise location of the habitat will be selected so that it is in the most protected position possible.

Training for severe weather emergencies will be conducted with all staff and will include drills in ‘man overboard’ and other rescue scenarios. Emergency medical kits will include items specific to weather related emergencies, such as hypothermia wrap equipment.

Weather patterns will be recorded and monitored at the Ocean Habitat, and local and regional forecasts will be closely monitored. Protocols will be set in place for conditions which exceed the limits of human safety on the habitat, but every effort will be made to maintain a human presence on the habitat structure with Sk’aliCh’elh-tenaut at all times.

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7.5 Tsunami

Risk

San Juan County is at risk of tsunami under specific circumstances. In the event of a large earthquake on the subduction zone located off the outer Washington coast, it is predicted that a tsunami can be anticipated to reach San Juan County in between 45-90 minutes. It is also possible for a tsunami in the county to be triggered by an earthquake centered in the Puget Sound region, resulting in a larger and more rapidly arriving tsunami. Far less likely, a tsunami could be triggered by a major earthquake in the Aleutian Islands, a chain of events that would allow for a number of hours warning.

Due to varying bathymetry, topography, and geography, not all areas of shoreline in the county will be directly impacted in the event of a tsunami. The most recent computer models based on a Cascadia subduction zone quake of a 9.0 magnitude do not predict that the West Sound site within San Juan County will be a significant tsunami inundation zone. However, due to the nature of the Ocean Habitat, possible increased current action has been considered in evaluating potential mitigation strategies.

Tsunami mitigation action will be taken based on the level of alert:

Product	Likely Wave Action	Recommended Actions
Information Statement	Minor waves at most	No action suggested
Watch	Danger level not yet known	Stay alert for more info
Advisory	Strong currents likely Inundating wave possible	Stay away from the shore
Warning	Inundating wave possible	Full evacuation suggested

Figure 15. Tsunami alert system.

Mitigation

The Ocean Habitat will be equipped with multiple NOAA Weather Alert Radios. These tone radios will be kept in the main staff areas ensuring that notification of any emergency, including tsunamis, will be detected by staff 24/7. Marine radios will be monitored on the habitat structure and all associated marine vessels, and will offer an added level of redundancy in emergency monitoring.

In the event of a tsunami *Informational Statement*, normal operations will continue with special attention paid to any further updates regarding the situation.

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In the event of a tsunami *Watch*, normal operations will continue while preparations for further tsunami mitigation action will begin. This will include beginning to prepare Sk'aliCh'elh-tenaut and the staff for a possible response. Special attention will be paid to any further updates regarding the situation.

In the event of a tsunami *Advisory or Warning*, tsunami mitigation action will immediately begin. According to NOAA, the majority of tsunamis are less than 10 feet. Due to the length and angle of anchor chain, a water rise of this size can be safely ridden out on the habitat structure. If the warning/advisory is issued for a small wave height, staff will immediately begin preparing the habitat structure and Sk'aliCh'elh-tenaut by securing anything on the structure that could come loose. All staff will put on personal floatation devices and take measures to ensure that all staff is safe and remains accounted for. If a tsunami is anticipated to have a greater impact than can be safely weathered at the Ocean Habitat, mitigation may include taking Sk'aliCh'elh-tenaut on a 'boat walk' under the guidance of highly trained staff, and evacuating all staff not needed for the 'boat walk' to shore for immediate evacuation to higher ground. In the event that this is the case, prior to vacating the Ocean Habitat steps will be taken to secure the facility if time allows for doing so safely. The 'boat walk' will be directed to reach a predetermined location based on the origin and nature of the tsunami. This location will be in deeper water where the effects of the tsunami can be safely ridden out. Sk'aliCh'elh-tenaut and the 'boat walk' team will remain in the designated location until all danger of tsunami has passed.

7.6 Earthquake

The major risk of an earthquake is a resulting tsunami. If the earthquake is located in a region that can cause a tsunami at the site of the Ocean Habitat, tsunami protocols will be followed.

The infrastructure of the facility, including storage of fuels and food items, will be designed so that in the event of a large earthquake which causes the failure of the containment areas the materials will flow in a direction away from the habitat structure.

7.7 Water Quality Including Petroleum Spills

Oil spill preparedness for the Ocean Habitat will address the prevention of a range of low-level petroleum intrusion from regular marine vessel operations and land runoff (including from the neighbouring road) to response of high-level oil spill emergencies, such as an oil tanker spill.

A thorough understanding of the hydrology of the area will be gained from study of surface and underwater flow, so that the behavior of a spill can be quickly predicted depending on product and depth of the water.

A surface water drainage plan will be developed prior to construction which will contain incidental and accidental discharges of petroleum products from parking areas, buildings and

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roads on the adjacent land. An oil-water separator will be installed into the surface water system with an established regular schedule of monitoring.

Stormwater from roadways has been implicated to cause severe impacts to surrounding waters (e.g., Longfellow Creek in Seattle) and runoff from the neighbouring road will be treated with material such as AbTech's '"smart sponges" which absorb hydrocarbons, heavy metals, and bacteria. https://www.abtechindustries.com/smart-sponge

The objective of spill containment at the site will be the exclusion of petroleum or other chemicals spilled into surrounding waters or the neighbouring road, as very little petroleum will be held on site.

To prevent the intrusion of low-level oil spillage (bilge spillage, etc.) from the surrounding marine waters, the Ocean Habitat will be designed with a surface layer oil skirt around the entire habitat structure perimeter. The habitat structure's 30-inch HDPE pipe should it sit low enough in the water to effectively exclude surface oils from Sk'aliCh'elh-tenaut's habitat. In addition, oil containment boom fencing will be available to be deployed as needed. The Ocean Habitat will be equipped with oil absorbent socks and pads to clean any visible spillage quickly and effectively. The Ocean Habitat will be stocked with adsorbent pads produced exclusively for petroleum and as well as those designed as universal adsorbents (typically a grey color) which are useful for oils, coolants, solvents, and other industrial chemicals that may be stocked in the facility.

The Ocean Habitat will be equipped with an oil containment boom for exclusion and prevention of oil spill intrusion. This will serve to protect Sk'aliCh'elh-tenaut and the marine ecosystem in the area surrounding the Ocean Habitat. In addition, the project will work with San Juan County to make the oil spill equipment housed at the Ocean Habitat available within the county network of emergency oil spill response known as Islands Oil Spill Response (IOSA).

Buoys signifying a no-go perimeter area outside the net will additionally serve as anchor points during boom deployment, greatly simplifying and reducing the time required for boom deployment during an emergency. Two boom end connectors can be welded to each buoy for easy and quick fastening. The buoys will utilize the best available technology to avoid damage to the seabed and will be anchored sufficiently to avoid dislodging during large storms.

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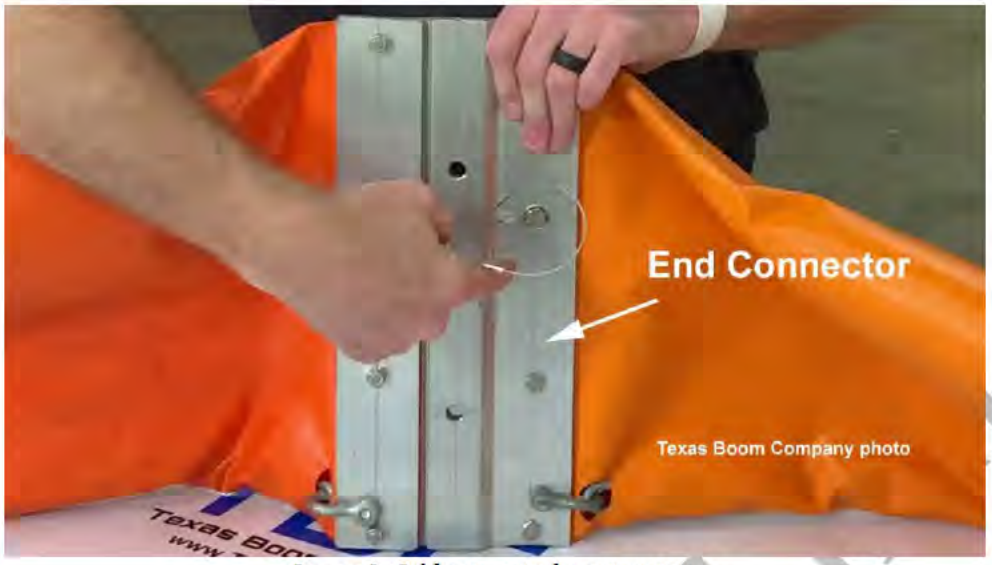


Image 5. Oil boom attachment system.

Ocean Habitat marine ops staff will be required to maintain current certification in HAZWOPER (Hazardous Waste Operations and Emergency Response) safety training and training specific to containment, recovery, and diversion of oil on the water. All staff will be encouraged to receive this training as well as to receive training in oiled wildlife search and rescue.

Current location of large oil spill response equipment on Orcas Island:

South:

- 1700 ft of oil containment boom near ferry dock, on trailer, along with anchor systems and other spill response equipment;
- ***Scoter,*** 13 ft work skiff, with 30 hp outboard on trailer just off Killebrew Lake Road.

Southwest:

- 800 ft of oil containment boom on yellow DOE trailer at Deer Harbor.

Central:

- 800' ft of oil containment boom on yellow DOE trailer in Eastsound.

If a response contractor is arranged (MSRC, IOSA, or Towboat), the following will apply:
The Ocean Habitat will document any pre-need arrangements with primary response action contractors approved by the Washington State Department of Ecology. This documentation will include the name, address, telephone number, and position with the company. In addition, a formal statement signed by the facility and the primary response action contractor will contain the following information:

(1) Specific response actions the contractor is responsible for providing;

(A) Provide the response services and equipment listed for that contractor in the contingency plan;

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(B) Respond if a discharge occurs;

(C) Notify the facility immediately if the contractor cannot carry out the response actions specified in the contract or the contingency plan;

(D) Give written notice at least 30 days before terminating its contract with the facility;

(E) Respond to a department-conducted discharge exercise required of the facility;

(F) Continuously maintain in a state of readiness, in accordance with industry standards, the equipment and other spill response resources to be provided by the contractor under the contingency plan.

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8. ECOLOGICAL RISK MANAGEMENT PLAN

The following is a summary of potential ecological risks of returning Sk'aliCh'elh-tenaut to the Salish Sea, possible mitigation strategies, and research needed. Special attention has been paid to impacts on the southern resident orca population.

8.1 Disturbance to Local Wildlife

8.1.1 Concern

The Salish Sea is home to a wide variety of marine species, some of whom have been known to exhibit reactions to the vocalizations of orcas. In the Salish Sea, humpback whales (Cure et al. 2015), grey whales (Cummings & Thompson 1971) and harbor seals (Deecke et al. 2002) have all been documented to respond to orca calls. Should such reactions from Sk'aliCh'elh-tenaut's vocalizations be extreme or distract from critical activities such as foraging, her presence could negatively impact the local ecosystem in the vicinity of her habitat (based on the distance at which her vocalizations may travel underwater based on local topography and bathymetry).

Orcas have the potential to disturb species other than marine mammals, including fish and sea birds. Herring have exhibited a significant behavioral response to orca vocalizations (Doksæter et al. 2008) and it is possible that salmon may respond as well.

Transient/Biggs ecotype orcas have been observed harassing and killing sea birds for reasons other than foraging (Williams et all 1990) and may therefore pose a risk of disturbance and mortality to these species. This is believed to be a culturally derived behavior and southern resident orcas have not been observed interacting with seabirds this way.

8.1.2 Mitigations

Because the proposed site location is an area that is within the range of both the southern resident and transient/Biggs orcas, the presence of Sk'aliCh'elh-tenaut (a southern resident orca believed to be from L-pod) is unlikely to introduce any new vocalization types to the marine species that inhabit the area, and therefore, mitigation measures are not anticipated to be necessary. To confirm this, the characteristics of her calls will be analyzed and compared to that of other southern resident orcas. The proposed site will be compared with known records of pinniped and cetacean habitat use, which will consist of a careful review of sighting records, scientific literature review, and consultation with leading experts in the appropriate fields. If necessary, additional survey work will be conducted. If the proposed site is found to overlap with any important marine mammal foraging habitat, resting habitat, or transit corridors, and mitigation measures are considered necessary, a new and more appropriate site location will be considered.

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Additionally, the Ocean Habitat will be located in an area that is geographically limiting of acoustic travel (i.e. surrounding topography and bathymetry significantly limit acoustic range).

The Ocean Habitat will not be located in an important area of nesting or feeding for sensitive seabird species and will not overlap with important habitat for salmon foraging or transit.

Prior to transport, any documented interactions between Sk'aliCh'elh-tenaut and birds will be evaluated.

8.1.3 Research Needed

While the location of the Ocean Habitat will greatly reduce the likelihood of disturbance to marine mammals, salmon, and sea birds, the extent of the impact of Sk'aliCh'elh-tenaut's calls on the ecosystem in the immediate area of the Ocean Habitat is unknown. To better understand potential impacts, a play back study of Sk'aliCh'elh-tenaut's calls will be conducted at the proposed site prior to the development of the site. The parameters and any elicited responses of this study will be determined by appropriate experts.

In order to better understand cetacean, pinniped, and other wildlife habitat use in the location of Sk'aliCh'elh-tenaut's proposed Ocean Habitat, a comprehensive review of site specific sighting data will be conducted. In addition, acoustic profiling of the proposed site will be conducted. Review of this initial data will inform whether additional data collection is needed to better understand the habitat use for species of concern (such as southern resident and transient orcas).

8.2 Pathogen Transmission

8.2.1 Concern

Having been kept in a captive care facility, Sk'aliCh'elh-tenaut may have been exposed to (or may be carrying) pathogens that could negatively impact marine mammal species native to the Salish Sea. Of particularly concern is her family, the southern resident orcas. This population has a number of recognized threats, including some that may increase susceptibility to novel infectious pathogens. High level of persistent organic pollutants (Hickie et al. 2007) and nutrition stress (Ayers et al. 2012; Fearnbach et al. 2018) increase vulnerability. Additionally, despite a social structure made up of distinct units, southern resident orcas may still be highly susceptible to disease outbreaks that may adversely impact the entire population (Weiss et al. 2020).

8.2.2 Mitigation

In order to be transported to the Ocean Habitat in the Salish Sea, Sk'aliCh'elh-tenaut must meet health and behavioral criteria that signify she is deemed safe and approved for transport. The

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criteria will be determined by an expert panel of leading marine mammal veterinarians, researchers, field biologists, and behavioral scientists, in consultation with government managers, following standards recommended by the IUCN for minimizing disease risks in wildlife reintroduction (Woodford 2000) . Part of these health criteria will include thorough evaluation and testing for known infectious pathogens of marine mammals, of wildlife in the Pacific Northwest, and reported in marine mammals in Florida over the past decade. Special focus will be paid to pathogens specifically seen in captive orcas, and high priority infectious agents such as marine Brucella, cetacean poxvirus, cetacean morbillivirus, and herpes viruses that may adversely impact individual and population health (Gaydos et al. 2004). If any pathogens are identified in initial health screenings, a course of treatment in Miami will be determined by the marine mammal veterinary team. In the event that she tests positive for antibodies based on a past infection, follow up confirmatory testing will be pursued. If she has a pathogen that cannot be readily treated but may be endemic in the wild population or can be safely managed long-term, the potential impact on her future health and potential transmission to conspecifics in the wild will be evaluated by the veterinary team, in consultation with infectious disease experts and NOAA and DFO managers. Sk'aliCh'elh-tenaut will only be transported from Miami to the Salish Sea if she meets the criteria of being free of transmissible pathogens of concern.

Once at the Ocean Habitat, Sk'aliCh'elh-tenaut will be routinely tested for pathogens found in conspecifics and other marine mammals in the Salish Sea, based on protocols developed by her veterinary team. In addition to regular monitoring of Sk'aliCh'elh-tenaut's health, water testing will be routinely conducted. These tests will focus on the water quality parameters as well as routine microbiology screening (coliform counts and possible pathogen screening).

The design for Sk'aliCh'elh-tenaut's enclosure is to locate the inner habitat structure within a larger restricted area defined by a barrier net which will create a buffer zone between the inner habitat structure and the barrier net. The barrier net will enclose a buffer zone between Sk'aliCh'elh-tenaut and the open Salish Sea waters to prevent physical contact and minimize the spread of any potential pathogens between Sk'aliCh'elh-tenaut and wild cetaceans in the vicinity. The exact distance of the buffer zone will be determined after a hydrodynamic model of the site has been created and possible transmission pathways specific to the site have been defined. Once established, this distance will be maintained unless more rigorous study of disease and Sk'aliCh'elh-tenaut deems this unnecessary, or if response or preparation for an emergency situation requires that Sk'aliCh'elh-tenaut be moved to a temporary location (such as in a tsunami response).

In addition to the above precautions, the Ocean Habitat will be located in a site not frequently visited by orcas (residents or transients/Biggs) or other cetacean species.

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8.3 Human Attraction to the Ocean Habitat

8.3.1 Concern

Sk'aliCh'elh-tenaut's presence in a constant location (Ocean Habitat) may potentially serve as a significant novelty or attraction for people. Increased temptation to visit the area (both by land and sea) may lead to an increase of disturbance on the local wildlife populations.

8.3.2 Mitigation

The inner habitat structure will be surrounded by a barrier net, creating a visual barrier around Sk'aliCh'elh-tenaut that limits both disturbance to her and visibility to boaters and kayakers thereby reducing temptation. This buffer zone will serve as an enforced no-go zone, that will be monitored 24/7. All staff will be trained in education and outreach, so that any staff monitoring the barrier net will be able to enforce the no-go zone and provide the public with education about the project, the local ecosystem, and how to behave so as to create the least impact. Staff on the habitat structure will be able to access all areas of the barrier net and shoreline as needed with marine vessels. The upland property adjoining the Ocean Habitat is private.

In addition to visual monitoring, a passive acoustic monitoring (PAM) system will be used to monitor the area at all times.

8.4 Waste Excretion

8.4.1 Concern

Sk'aliCh'elh-tenaut will be restricted to the inner habitat area and without adequate tidal flushing or current flow, waste, organic waste or detritus may accumulate beneath and around the net and lead to changes in the benthic habitat or ecology with potential eutrophication that may negatively impact the immediate area.

Frequent use of pharmaceuticals (a practice sometimes used within the captive industry), may result in some quantity passing into the surrounding ecosystem.

8.4.2 Mitigation

Cetaceans have a relatively high digestive net efficiency with 30% or less of feed being excreted as waste (Dierauf et al 2018). With careful monitoring of food intake and good flushing at the site, it is believed to be unlikely that a single orca will concentrate an ecologically significant amount of biomass waste in the area of the Ocean Habitat. To ensure adequate flushing of the

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area, a hydrodynamic model will be created for the site, and tidal and current flow characteristics will be thoroughly reviewed. Potential average daily excrement from Sk'aliCh'elh-tenaut will be calculated and any potential for impacts based on the flushing rates of the site will be reviewed prior to final selection or development of the site. Sk'aliCh'elh-tenaut's daily rate and volume of defecation may be determined at the aquarium and provide some guidelines for waste accumulation at the site.

If Sk'aliCh'elh-tenaut is kept with companion animals (such as the Pacific white sided dolphins with whom she is housed in Miami), complete assessment of daily excrement will be evaluated for each animal.

Pharmaceuticals will be administered to Sk'aliCh'elh-tenaut only when absolutely necessary, under the direction and supervision of a clinical veterinarian with extensive experience in marine mammal medicine. The method of administering them will be controlled to minimize potential environmental contamination. For example, if she is administered a treatment in a fish, she will be hand fed and consumption of the entire fish will be confirmed via above and underwater visual observations. If the fish is not consumed in its entirety, the fish will be collected by divers. While thorough health evaluations have not yet been conducted, it is unlikely that Sk'aliCh'elh-tenaut will require prophylactic ongoing administration of pharmaceuticals. Due to her age, Sk'aliCh'elh-tenaut will not require use of a contraceptives.

Water (throughout the water column) and sediment samples will be collected during seasonal changes and after significant rainfall prior to Sk'aliCh'elh-tenaut's arrival. Results from analysis of these samples will provide baseline water quality data in the location of the Ocean Habitat. After Sk'aliCh'elh-tenaut has arrived in the Ocean Habitat, water and sediment samples will continue to be collected on a regular basis and compared to the baseline data and results from designated surrounding (control) areas. Sampling frequency will increase during and immediately following the use of any pharmaceuticals. A long-term monitoring plan is being developed in conjunction with the Northwest Indian College.

8.5 Conclusion

While additional data and analysis are needed to provide more detailed answers to questions surrounding bringing Sk'aliCh'elh-tenaut to the Ocean Habitat in the Salish Sea, strict mitigation strategies will be implemented to ensure that Sk'aliCh'elh-tenaut's presence in the Salish Sea does not adversely impact the local ecosystem or conspecifics. It is reasonable to consider an ecologically responsible return of Sk'aliCh'elh-tenaut to the Salish Sea based upon:

- A precautionary approach throughout;
- careful evaluation of clinical and behavioral data prior to making a final decision on relocating her;
- a scientifically informed facility design and location selection;
- environmentally sound husbandry/medical practices;
- ongoing monitoring;

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- continued review and evolution of mitigation strategies to fit the best available science.

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Appendix A - SITE ACQUISITION

A.1 Environmental Analysis

Prior to securing a lease for the selected site, extensive environmental analysis will be conducted. This will serve the dual purpose of meeting federal, state, and county requirements, as well as ensuring that the site selected will best meet Sk'aliCh'elh-tenaut's needs.

This environmental analysis will be conducted in collaboration with the Northwest Indian College, as well as other educational institutions and private labs.

Environmental analysis will include:

- Weather & Climate Assessment
  - Review of historical weather and climate data;
  - Gather observational data on site;
  - Create a temporary telemetry station on site if needed.
- Acoustics Analysis
  - Collection of underwater acoustic data from the site;
  - Analysis of ambient acoustics and their potential impact on Sk'aliCh'elh-tenaut.
- Bathymetry Mapping
  - Multibeam sonar transect survey.
- Geological Assessment
  - Compile all known and pertinent geological data.
- Benthic Survey
  - Collection of grab/core samples from the sea floor;
  - Underwater video;
  - Quadrant photos of the seabed.
- Hydrodynamic Modeling
  - Collection of data via an Acoustic Doppler Current Profiler (bottom-mounted & surface towed);
  - Development of a site-specific hydrodynamic model.
- Habitat Assessment
  - Identify all terrestrial, fresh water, and marine species that could be impacted by the project;
  - Identify specific concerns;
  - Develop a plan for mitigation of those concerns.
- Algal & Plankton Sampling
  - Identification of all benthic and free-floating species.
  - Test water for biotoxins domoic acid, saxitoxin if potential harmful algal species present
- Sediment Assessment
  - Assess physical characteristics of bottom sediment;
  - Biogeochemical analysis;

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    - Test for heavy metals;
    - Test for organic compounds;
    - Test for other known contaminants;
    - Bioassay work if needed.
- Water Quality Profiling
    - Temperature profile;
    - Salinity profile;
    - Dissolved oxygen tests;
    - pH tests;
    - Turbidity tests;
    - Contaminant testing;
    - Bioassay work if needed.
- Impacts Assessment
    - Calculate potential nutrient load based on Sk'aliCh'elh-tenaut's potential output;
    - Assess risk of pathogen transmission;
    - Assess acoustic disturbance risk;
    - Assess other potential inter and intra-specific interaction risks;
    - Develop mitigation plan to address all potential risks;
    - Complete a biological assessment utilizing a regional habitat biologist, as per the county requirements.

In addition to environmental analysis, stakeholders will be consulted, and cultural considerations will be identified. This work will include:

- Tribal Consultation (overlapping U&A holders);
- Stakeholder Consultation;
- Archeological Assessment.

A.2 Site Permitting

In order to secure rights for the water space utilized for Sk'aliCh'elh-tenaut's Ocean Habitat, there are a number of county, state, and federal permits that need to be obtained. Due to the novelty of this project, the list of required permits and necessary pre-permitting studies may evolve as authorizing agencies (particularly county) develop a customized permitting path. Below is an overview of all currently necessary permits, authorizations, and leases for the acquisition of the site in San Juan County.

The majority of necessary site permitting can be applied for with the submission of a JARPA (Joint Aquatic Resources Permit Application) application form.

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A.2.1 Federal

- U.S. Army Corps of Engineers - Section 10 & Section 404
  - Fee unlikely
  - 60-120 days to approval
  - Biological Evaluation describing impacts to ESA-listed species is likely required
  - Apply for permitting through the JARPA system
- U.S. Coast Guard - Private Aids to Navigation (PATON)
  - No fee
  - 3 month average time to approval
  - Apply for permitting through the JARPA system

A.2.2 State

- Washington Department of Ecology - 401 Water Quality Certification
  - No fee
  - 1 year for approval
  - Apply for permitting through the JARPA system
- Washington Department of Fish and Wildlife - Hydraulic Project Approval (HPA)
  - No fee
  - 45 day standard processing time (may be expedited)
  - Apply for permitting through the APPS system
- Washington Department of Natural Resources - Aquatic Use Authorization
  - $25 application fee
  - Lease fee as determined by DNR, based the upland property per/acre value
  - A security deposit on the lease will be required (exact cost unknown)
  - Required 'record of survey' from a licensed aquatic lands surveyor
  - 6 months – 1 year for processing
  - DNR water lease is typically around 12 years in length; however, a lease of up to 30 years can be obtained (with renewals possible thereafter)
  - The lease price and term length are based on the needs of the project (i.e. the project represents an activity that cannot take place on land, and is of long duration)
  - Apply for lease through the JARPA system

A.2.3 County

- Shoreline Permit – Conditional Use Permit

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- Timeframe and fees are unknown as this is a novel project for the county
- Process of working with the county will begin by requesting a site assessment, as well as submission of a 'pre-application', at which point the county can provide more detail on specific requirements
- A Fish & Wildlife Habitat Conservation Report is required by most counties, and this will be completed by the regional habitat biologist

**Hiring a land use consultant during the county permitting process is recommended by San Juan County. Jeff Otis (land use consultant on Orcas Island) has been recommended.*

**Due to the co-manged species of the Salish Sea Ecosystem, Canadian authorities will also be consulted.*

A.2.4 Timeline (standard)

- 1-2 years to obtain all permits
- 1 additional year to secure DNR lease

(some parts of this process are likely to be expedited for this project)

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Appendix B - PERMITTING

Federal Permitting to Transport and House Ska'aliCh-elh-tenaut

Consultation with NOAA/NMFS (National Marine Fisheries Services) and USDA will be necessary for the Lummi to understand how NMFS & USDA regulations may inform the First Nation process for transport and housing of Sk'aliCh'elh-tenaut.

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[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 1:00 pm
To: [redacted]
Subject: Re: Tag for stranded orca calf in New Zealand

Hi [redacted]

I have been requested on site so have been rapidly packing and am about to jump on a plane to Wellington. I am not sure how tomorrow is going to go - but am certainly very keen for a run through as soon as possible. Also keen to get my hands on the tag and equipment to do a stocktake of additional needs.

If it is OK, may I txt you later today NZ time once I have determined how realistic a catch up tomorrow is?

Thank you again for all your support. You and [redacted] have both gone out of your way to be supportive and provide the best possible advice. I can not thank you enough for that.

[redacted]

From: [redacted]@ifaw.org>
Sent: Thursday, 22 July 2021 12:54 PM
To: [redacted]
[redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

No apologies at all. Glad to hear Fedex released it and it arrived.

From: [redacted]>
Sent: Wednesday, July 21, 2021 8:52 PM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Subject: RE: Tag for stranded orca calf in New Zealand

Hi [redacted],
Apologies, I meant to send you a message last night and it got lost in the chaos. Yes, the satellite was delivered to the office yesterday afternoon and is being looked after by the managers at the moment.

Thanks for your additional information about the battery and attachment duration, as well as the training refresher. I'm sure [redacted] will come back to you before too long.

Cheers,
[redacted]

[redacted]
DDI: [redacted]

From [redacted]@ifaw.org>
Sent: Thursday, 22 July 2021 12:13 pm
To: [redacted]@ifaw.org>

Cc: [redacted]>
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Talk soon,
[redacted]

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Sent: Wednesday, July 21, 2021 7:10 AM
To: [redacted]@ifaw.org>; [redacted]@ifaw.org>
Cc: [redacted]
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HI [redacted]

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My response would be that battery life dictates the length of tag transmission and corrosion the time to the tag detaching and these timeframes are the closest to the same which can be achieved.

Would love your thoughts on a response to this question if you have time.

Thanks again!

[redacted]

From [redacted]@ifaw.org>
Sent: Wednesday, 21 July 2021 4:24 AM
To: [redacted]@ifaw.org>; [redacted]>
Subject: RE: Tag for stranded orca calf in New Zealand

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The impact of two holes drilled and two separate tag attachment points in the dorsal fin as well as the less ideal more distal positioning of the VHF tag should all be considered from a welfare standpoint. We would not choose to attach two separate tags like this again within our agency, but understand that positions on that may vary. With a younger calf and a potentially softer dorsal fin, the more distal tag attachment would be concerning for me, the more proximal one would not. Additionally, relying on VHF only (rather than satellite tag with dive profiles) markedly limits your ability to relocate the animal after release. I would only recommend VHF tagging in addition to satellite tagging and not as a suitable alternative. VHF has to have ideal conditions for vessel or aerial operations and you need to have a good idea of where to start looking (range is extremely small). VHF tracking from land can not be relied upon for a release candidate like this (although it could be a supplemental method if the calf is close to shore).

On a separate but related note, I have been reviewing our national release criteria best practices document for other reasons and found some sections that may be useful to you as your make your disposition decision for the calf. These documents are the standardized protocols for all marine mammal stranding response in the US. They are currently available in draft form and being reviewed, but they are very close to what will be the final draft. A link to the documents online is here: https://www.fisheries.noaa.gov/resource/document/draft-programmatic-environmental-impact-statement-mmhsrp The appendices (where all the actual protocols are) is at the bottom of that website.

I would note that this calf would not be a release candidate under the US policy. If it were maternally independent, it would most likely fall under the "conditionally releasable" category – which you will see in some of the language. I attached just a few of the more applicable excerpts – you can find more at the link above if you are interested.

Hope that helps!

Best, [redacted]

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Subject: RE: Tag for stranded orca calf in New Zealand

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Like I said those are only a few points but would be happy to discuss them further.
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Just wondered if you had any experience of tracking in on the SPLASH tags to get a visual on the individual it is attached to and how possible that might be.

Thanks again for all you are doing!

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😊 [redacted]

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Attachments: Sat tag protocol_2021.pdf

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Purpose

This protocol outlines the procedure for attaching single pin satellite tags (both position-only and dive-recording TDR) to the dorsal fin of stranded cetaceans. These procedures are adapted from Dr. Randall Wells' protocols provided with the Wildlife Computers tags according to IFAW veterinary discretion and in order to better meet our needs for tagging stranded cetaceans in the field. These tags can and have been used by IFAW on stranded cetaceans of varying sizes, from juvenile harbor porpoises to humpback whales. Tag attachment procedures are kept as sterile as possible, given the field conditions and take anywhere from 5 – 15 minutes, depending on the tagger and how quickly materials are placed into the cold sterile soak.

Safety Considerations and Personal Protection Equipment

Ideally, tagging operations (especially the ring block and drilling) should be performed when IFAW's Mobile Dolphin Rescue Clinic is not in motion. However, initial activities can be started while underway (cold sterilization, sterile scrub, etc).

Stranded dolphins and whales have almost never reacted to the application of the satellite tag during the procedure (over 130 tags applied over the past decade). But it is always best to be mindful that the animal may react to tagging, and to ensure that the danger zone is cleared of other responders when tagging is occurring. In some situations, ensuring that the peduncle and tail are properly restrained may be the safest option. Proper communication between the staff and volunteers attending the dolphins is essential to ensure that everyone is aware of the procedure and stays in a safe.

Cidex® OPA cold sterile solution is a hazardous chemical and can be an eye, skin, and respiratory irritant. Do not get in eyes, on skin or on clothing. Avoid inhalation. Harmful if swallowed. May cause allergic reaction in some people. See original container and/or SDS sheet for further information.

Proper Personal Protective Equipment for participation in this procedure includes:

- Exam gloves (sterile gloves when indicated by the protocol)
- Face mask
- Liquid-impervious clothing

Materials (in the Satellite Tagging Kit)



- Satellite tags to keep in the kit at all times:
  - 2 SPOTs – 1 with long flanges (3 holes), 1 with short flanges (1 hole)
  - 1 SPLASH – long flanges (3 holes)
- Ryobi cordless drill with 3/8" chuck
- Dental infuser kit (infuser, mepivacaine cartridges)
- Zinc plated brass cork borers 8 mm diameter (2)
- Strong magnets (3)
- Silicone gel & connector plugs
- Attachment supplies
  - Assorted length segments of 8mm Delrin sleeves (4 of each length of commonly used sizes), pre-threaded (done by using the self-tapping screws ahead of time to speed up attachment in the field).
  - 8mm stainless steel washers (2 per tag attachment, plus extras)
  - Zinc plated steel 3/8" #10-14 self-tapping screws with pan head type (Phillips head) (2 per tag attachment, plus extras)





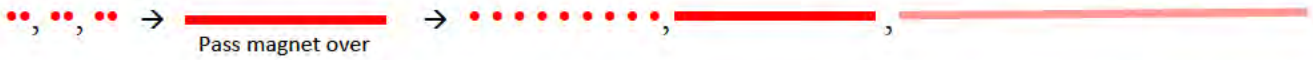
- Calipers (1)
- Metal file (1)
- Shears (1)
- Vice-grips (1)
- Forceps (2)
- Hemostats (1)
- Short shaft Phillips head screwdrivers (2)
- Small square cutting board (1)
- Sterile saline wound wash spray (1)
- Sterile gauze pad packs (10)
- Non-sterile cotton swabs (5 sets)
- Betadine / Povidone-iodine / Chlorhexidine surgical scrub bottle (1)
- Betadine / Povidone-iodine swab sticks (4 sets)
- Sterile isopropyl alcohol wipes (20 each) or bottle of isopropyl and gauze pack
- Cold sterile (Cidex) soak in small container for attachment parts & tools
- Chlorhex ointment (or other disinfectant ointment) (1)
- Sterile gloves (4 pairs each of size 7 & 9)
- Nolvasan in sterile container (add water to dilute for soaks as a backup)
- Sterile water bottle
- Lidocaine-soaked sterile swabs (6)
- Cryovials (8)
- Prep tray for holding supplies



Procedure

1. Select an appropriate candidate for tagging (borderline case, single release, unusual species, unusual release location, etc.) *Notify NOAA.*
    a. Position the animal so that it is safe to work around him/her, and so that the animal is comfortable (upright, resting on foam).
    b. Ensure that proper supportive care is given throughout the entire tag attachment process and that environmental stressors (sound, movement) are minimized. The animal's respiration rate and behavior should be monitored and recorded throughout the procedure.
2. Activate the satellite tag
    a. Briefly apply magnet to the small dark grey circle (circled in yellow).
    b. When the light comes on, remove the magnet.
    c. The light will flash:





Initially, a series of two quick flashes will occur three times in a row (this indicates the tag is in STAND-BY mode), then the light is solid-on for a few seconds (pass magnet over tag again during this solid-on time to change the tag setting to "ON"), then a series of 16 fast flashes occurs (indicating that tag is set to 'ON'), then the light stays solid-on again for a few seconds, then turns off.

3. Record the tag (PTT) # on the animal's datasheet.
4. Assign roles and notify others in the trailer at the start of the tagging process. The tagging process requires at least 1 staff (primary tagger) and 1 trained assistant. All involved should don a new clean pair of non-sterile gloves to start.
5. Clean the surface of the dorsal fin of any mud, sand or debris.
6. With the satellite tag in hand, determine the best attachment location for the tag. The exact location will differ depending on the size and shape of the dorsal fin and the animal, but follow these general guidelines:
    a. The hole should be placed ~35-40 mm cranial to the trailing edge of the dorsal fin.
    b. The hole should be 1/3 of the way up the dorsal fin from the base towards the tip.
    c. The "V" at the connection of the tag flanges should fit snugly against the trailing edge of the fin at a point where the fin is fairly vertical.

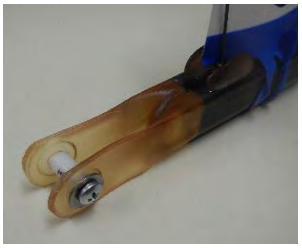


Figure 2. Tag attachment and disinfection site: blue circle indicates proposed tag attachment site, yellow area indicates surgical prep area.

7. Decide which tag flange hole (if multiple are present) is ideal for proper tag placement, and trim and sand smooth any holes that are longer than the desired attachment hole to reduce drag.
8. Measure thickness of the fin at desired tag application site with calipers to determine the proper delrin sleeve length to use. The delrin sleeve length should be just longer than the thickness of the fin at that location.
9. Mark the tag attachment site with a sharpie (pigmented fins may need to be marked with a bright silver marker and slightly indented to note the intended location).
10. Place the following supplies and tools into Cidex soak to cold sterilize for 12min:
    a. Screws (3), washers (3), Delrin sleeves (of appropriate sizes based off fin width) attach 1 screw/washer to one side of likely sleeve, drill bit, forceps, & screwdrivers.
11. Aseptically prepare the proposed attachment site on both sides of the fin (see Figure 2):

a. Use betadine/povidone-iodine (or Chlorhexidine) surgical scrub swabs, begin at the proposed attachment site and work outward in a circular motion of increasing diameter (spiral). Once at the outside of the spiral, start again from the center with a new scrub (do not drag the used scrub back into the center of your attachment site to prevent contamination).
b. Repeat with multiple new scrubs for 5 minutes total contact time of the surgical scrub on each side of the fin. To expedite the process, have two people do this at the same time on either side of the dorsal fin.
c. Finally, scrub the area in the same pattern with isopropyl alcohol to remove the scrub residue and let air dry.

12. Administer Mepivacaine ring block to dorsal fin:
    a. Using a dental injector with a small gauge short needle (27 g), inject mepivacaine at four locations approximately 1 cm from the center of the attachment site (at the top, bottom and sides of a 1cm radius circle around the center of the attachment point. Insert the needle to almost the full width of the fin, inject once, then as you draw the needle back out, inject one or two additional times in order to cover the full width of the fin with local anesthetic.
    b. Wait ~5 minutes before proceeding with tag attachment. Time to effect is estimated to be 1-4 mins and local analgesia should last ~1 hour (specific to Mepivacaine).
13. Using sterile gauze, apply chlorhexidine ointment to:
    a. One side of the small cutting board
    b. Both flanges (inside and out) of the satellite tag
    c. Place the board and satellite tag into the prep tray, maintaining sterility
14. Add the following to your prep tray:
    a. Sterile saline spray, sterile lidocaine-soaked swabs, sterile glove packs, clorhexidine container, cryovials, & non-sterile dry cotton-tipped swabs.
15. Fit the tag with chlorhexidine flanges to the dorsal fin again and press the flanges at the desired attachment site against the fin, marking the proposed attachment site with the attached chlorhex ointment. Try to remain as close to the originally identified site as possible. Place the tag back in the prep tray.
16. Prepare your drilling set up:
    a. Have assistant insert cold sterilized bit into drill chuck with sterile forceps.
    b. Tighten the chuck and, looking straight into bore, run the drill to make sure the bit is centered and doesn't wobble.
    c. Do not let the bit touch anything!
17. Assistant places chlorhexidine side of cutting board firmly up against the far side of dorsal fin (opposite the side where the primary tagger is positioned) to act as a backer board for the drilling.
18. Primary tagger aligns the drill bit at the marked attachment site, perpendicular to the dorsoventral (vertical) axis, and parallel to the left-right (horizontal) axis with help from someone looking head or tail-on to assure correct alignment.
19. Start-up the drill first without touching the bit to the dorsal fin to determine if the animal will react to the noise alone (usually they do not), if no startle reflex is observed, or once the animal has calmed, drill a level hole through the fin as quickly and precisely as possible. Remove the bit from the attachment site (do not need to run the drill to do this).
20. Flush the bored hole with sterile saline spray and quickly insert lidocaine-soaked swabs into the attachment hole for additional local analgesia. Leave in place while you prepare the tag attachment.
21. Expel the skin sample from drill bit using the back end of one of the non-sterile swabs. Measure skin plug with calipers & select appropriate delrin sleeve length (1-2 mm longer than the length of the dorsal fin plug). Place skin sample into cryovial, label and place into cooler or refrigerator.
22. Primary tagger changes into sterile gloves & only performs sterile tasks going forward.
23. Assistant uses sterile forceps to pick up the selected delrin sleeve (with screw & washer assembly in place on one end), rinses it with sterile water or saline, and hands it to the primary tagger along with the satellite tag.



24. Insert free end of the delrin sleeve through the hole of one of the flanges. Be careful not to drop the sterilized delrin sleeve assembly during this step. The fit can be tight, occasionally.
25. Assistant removes lidocaine swabs from dorsal fin hole.
26. Digitally separate the flanges slightly and insert the free end of the delrin sleeve into the dorsal fin hole so it comes out the other side and meets the hole on the opposite flange.
27. Assistant uses sterile forceps to retrieve a second screw & washer assembly from the cold sterile, rinses with sterile saline or water, and hands to the primary tagger.
28. Screw this assembly into the other side of the delrin sleeve (on the outside of the tag flange) using screwdrivers engaging the screws on each side of the dorsal fin. Screw in to desired flap tightness (a playing card thick space should remain between the fin and the flange on each side of the fin). Do not make attachment too tight, but the tag should also not move too freely.
29. Double check that tag placement looks good.
30. Photograph the tag/dorsal fin on both sides, preferably with a solid (light) color background behind the fin and a photo scale.

Order of Operations Overview (for quick reference during field operations when protocol details are understood)

1. Activate tag with a magnet and verify tag operation
    - Record tag (PTT) # on datasheet
2. Clean the dorsal fin of mud and sand
3. Identify proper tag attachment site and mark, trim excess tag flange if necessary
4. Measure width of fin at desired tag application site with calipers
5. Place tools into Cidex soak for 12min
    - Forceps, screwdrivers, hemostats, drill bit, delrin sleeves, washers, screws
6. Surgically prep the tagging area area
7. Administer Mevipocane ring block to dorsal fin
8. Apply chlorhexidine ointment to flat side of cutting board and tag flanges
9. Apply tag to dorsal fin in desired location, peel tag flaps back carefully to leave chlorhex mark to show attachment site
10. Load bit into drill
11. Bore the hole, flush with saline and insert with lidocaine soaked swabs
12. Measure skin plug with calipers & select appropriate delrin sleeve length
13. Put on sterile gloves & only do sterile tasks going forward
14. Have assistant use sterile forceps to hand sterile items out from cidex soak and rinse with sterile water or saline
15. Have assistant remove lidocaine swabs from attachment hole
16. Insert delrin sleeve/screw/washer assembly into one tag flange, then insert that into the dorsal fin hole.
17. Attach second washer/screw assembly to opposite side of the delrin sleeve over the tag flange
18. Re-verify tag placement and operation
19. Photograph tag attachment

[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 9:52 pm
To: [redacted]; Kirstie Knowles
Subject: RE: VHF Tag

Hi [redacted],

Apologies form being slow to reply especially given you are moving and have still managed to send messages!

I was trained by [redacted] in the application of satellite tags and they are giving us a refresher tomorrow so I am fairly comfortable with the procedure 😊

If you have time – I am keen to understand why a VHF is so strongly recommended. I know it can provide better close in directional guidance (I am very familiar with telemetry as we use it a lot for kākāpō). Just given the impact of a second attachment point and increased drag I am not sure I am convinced this is needed given the accuracy of modern satellite tags especially with air support (which we anticipate will be available).

The tag IFAW have supplied us has accuracy of

- Class 3: better than 250 m radius
- Class 2: better than 500 m radius
- Class 1: better than 1500 m radius
- Class 0: over 1500 m radius

Near real time tracking can be accomplished by using the CLS app. With new satellite hits are processed by the system and showing up in the app in about 5 to 10 minutes from transmission.

These are the standard recievers we have https://www.telonics.com/products/vhfReceivers/tr-4.php I know these are pretty old school now and there are TR-8 also available covering the entire band from 138MHz to 235MHz. Yagi (antennae) frequency range - 150- 250MHz.

Would love your thoughts if possible.

[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 6:11 AM
To: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Subject: VHF Tag

Hi [redacted]

Attached is the specs of the tag we're hoping to have donated by NMFS.

We would be using a single point attachment on the trailing edge of the dorsal.

[redacted] should be able to send you the attachment protocols, unfortunately I am are in the process of moving and I can't seem to locate the protocol that we typically use.

When we were on the TAG call over the weekend, someone (possibly Ingrid) mentioned that they had access to receivers and antennas. Do you know what frequencies they would be? It's important to make sure that the tag that we send is the same frequency range as the antennas and receivers that you have access too.

Good luck down there and all the very best!



[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 6:11 am
To: [redacted]; Kirstie Knowles
Subject: VHF Tag
Attachments: Screen Shot 2021-07-21 at 10.37.23 AM.png

Hi [redacted]

Attached is the specs of the tag we're hoping to have donated by NMFS.

We would be using a single point attachment on the trailing edge of the dorsal.

[redacted] should be able to send you the attachment protocols, unfortunately I am are in the process of moving and I can't seem to locate the protocol that we typically use.

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Good luck down there and all the very best!

[redacted]



MM100 Marine Mammal Backmount

Add to Quote

"B" suffix indicates enhanced range model.

Overview | Model Specs | Why ATS?

Series MM100 Models

Model #	Weight	Battery Life
MM110	10 g	56 - 73 days
MM120	13 g	140 - 182 days
MM130B	19 g	74 - 100 days
MM150	20 g	280 - 365 days
MM160B	25 g	185 - 249 days
MM170B	31 g	245 - 331 days
MM190B	48 g	400 - 540 days

ADD SELECTED TO QUOTE

Download Spec Sheet (pdf)

Technical Specifications

Transmitter Type	Crystal controlled 2-stage (“B” suffix denotes 3-stage)
Calibration Tolerance	±2.5kHz
Frequency Stability	±2.5kHz, -20ºC to 40ºC
Pulse Rate and Width	Typical on time 20ms, off time 1100ms (controlled by uC; Programmed options available)
Pulse Rate Variation	0.01%/volt, ±0.01% for temperatures -20ºC to +40ºC
Battery	Lithium
Activation	By removing magnet
Encapsulation	Electrical resin, water-proof, specific gravity: 1.12

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Thursday, 22 July 2021 5:24 pm
To: [redacted]
Cc: [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Thanks so much [redacted]

I've caught up with [redacted] who is a zoo/wildlife vet with DOC and will be orca-side this afternoon and for the next week, along with some other vets/biologists. We would be very interested on a Teams call tomorrow 8am our time, if you are still free and available for that time slow – yes please.

I will set up an invite for that and send it to you. I'm not very familiar with the technology so I'm not sure if it can be forwarded on to others – but if so feel free to invite anyone else you would like in the conversation. I'll invite our team, [redacted], and the vets who have been on-site for most of this week. We would be especially interested in talking about options for a short term and medium term feeding plan (recipe, frequency, volumes etc) based on our recent feeding experiences and talking about some tips on how to tweak things on a feed-by-feed or day-by-day basis, based on how he's going.

Also I put you wrong on the recipe earlier – we are using sardines, not anchovies :)

Thanks so much everyone.
Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com |

From: [redacted]@SeaWorld.com>
Sent: 22 July 2021 11:31
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]@wellingtonzoo.com>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

We often do not add fish right away to the formula and ensure that they are eating it consistently, then gradually add it in. We have seen some cetacean calves have issue with salmon oil also, as it can be very high in % fat …however we know there are populations like the Pacific NW orcas that feed solely on salmon, so we know that they can tolerate it. We had similar problems with a stranded Cook Inlet beluga calf that had issues with the fat content in the diet and we had to back way off and start fresh with straight Zoologic formula and gradually add in fish in small amounts, because the oil can be a factor, but may be necessary when they are tolerating formula better to get the calories up.

Because you are finding yourselves diluting the formula with electrolyte solution, I would take out the salmon oil and fish and feed just formula, increasing percentage to 50 to 75%, then gradually add more oil in 50 ml increments.

It is better to feed 100% formula without fish then dilute formula with fish that is aversive. Do you have other species of fish that may be "blander" – sardines …what to the penguins eat there? Anchovies? Or other fish?

Happy to get on a Teams call tomorrow at 8 am your time if you want to chat more….

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 3:52 PM
To: [redacted]@SeaWorld.com>; [redacted]@loroparque.com>; [redacted]
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

I was wondering how best to loop these two groups together then I saw that [redacted] had already done it, so I hope that it's okay to hop in on this thread with our vets too please?

The main problems we are having with the calf at the moment are associated with feeding. I was wondering if I could run a few questions past you around this please? I'm not immediately on-site myself yesterday or today, so I am passing information that the team there have passed on to me.

- Since the bout of colic overnight between Monday and Tuesday this week, he has had no more signs of gut pain. This resolved after he passed a few large faecals that night, so I suspect it was possibly volume-in-abdomen related pain with a full stomach and a full colon. He was rested until the morning after the colic resolved (no feeds until first thing in the morning), then he was given just vytrate for the first few feeds, and since then he's been on ½ strength formula – aiming for 10 feeds a day, at 1½ hour intervals, as much as he'll take up to about 1.5L per feed. We are aiming to start increasing our way to full strength formula again today.
- His current formula consists of:
    - 6 cups Milligans lamb milk replacer (300 g powder with 1.5 liters water)
    - 3000 mg dicalcium phosphate
    - 1000 mg Taurine
    - 1100 ml water
    - 1100 ml 0.9% NaCl injection
    - 120 ml 50% Dextrose
    - 200 ml salmon oil
    - 0.7 kg filleted anchovies and viscera
    - 3 mazuri tablets
    - (Makes 4 liter total volume, calculated to have ~1450kcal/L)
- This morning the team on-site have made the observation that he doesn't appear to "like" the fish component of the formula that we're feeding. Last night he spat the teat of the bottle out on a few occasions when it was full of formula, but when it was replaced with vytrate (an electrolyte solution) he drank readily from the bottle. This morning they split the diet into a few different components (I believe one batch of lamb milk with salmon oil, one batch of vytrate, and one batch of blended anchovies). When they fed these items separately, he readily bottle fed the milk/salmon oil, readily bottle fed the vytrate, but refused to feed on the bottle with the blended anchovies alone. When they told me that they'd tried this I advised to not feed the diet in separate components, and to try making a fresh batch of complete formula in case the older formula had aged a bit and developed a funny taste. I also recommended that if he was refusing bottle feeds that they stomach tube that feed so that we're still making sure that we're meeting

fluid and caloric requirements as best as possible. He has not consistently refused formula from the bottle before and was feeding fine as far as I know Tuesday and most of Wednesday this week.
- Do you have any comments on the above? Any recommended changes? If it does seem like a food aversion to the fish component, could we try a different fish species like salmon or something?

And [redacted] in reply to your question in the other email chain: they haven't yet got a weight on him but hope to do so in the next couple of days – weather and equipment permitting! His recent girth measurements are as follows, which seems to suggest no measurable weight loss using this technique, although I appreciate this technique is sub-optimal. Will keep asking for girth data and monitor for trends while we await weight/s.

- On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m.
- On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m

Thanks so much for all of your time on this so far, we really appreciate all your time and expertise.
Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 7:21 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

Thanks for the update. Hopefully the minor adjustments in formula volume and frequency can be dialed in, each animal is different and as your team has learned it is not as black and white as it should be, trial and see, welcome to marine mammal rehabilitation.
US probe size used is generally a 4-5 MHz probe. We and others have used portable laptop US, such as GE Logiqbook or Sonosite machines. Due to his size, one should be able to get fairly decent scans, however a small animal ultrasonographer will find that the image is not as good as small animal due to the attenuation of sound by the blubber layer. We usually have animals line-up on their side or at an angle so they can continue to breath regularly with mild restraint. One can reach under with probe and scan from ventral midline as well, a pair of goggles with HMDI connection and converter are helpful to see the image in goggles then straining to see on screen. For abdominal scan, important to recognize organ position (left – stomach, intestinal tract, kidney, bladder if full and right- liver, GI (connecting channel), kidney, bladder, testes may be small in him), note echogenicity, organ position, motility and thickness of GI tract and if any free fluid or ascites is present.

[redacted] can add other specifics too, she is a US wizard 😉

Look forward to see recent blood parameters.

Keep going with great effort, thanks,
[redacted]

From: [redacted]>
Sent: Wednesday, July 21, 2021 5:18 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted] and team,

Apologies it has been a rather frantic couple of days. The calf had a bout of colic 48 hrs ago which appeared to resolved fairly rapidly with removal of the formula and reverting to electrolyte feeds. The formula has been slowly re introduced since then. We have been trying to balance the advice around timing and volume of feeds received from all thee incredible vets who are helping us out.

Below is the vet update from today as provided by [redacted] – Head vet at Wellington Zoo who is leading the on-site veterinary response.

Overall he appears fairly stable. We are talking to a veterinary imaging specialist about coming to ultrasound the calf so I imagine we may have a bunch of questions about probe size etc in the next 24ish hours. We are currently working on the information we have on ultrasounding cetaceans from the CRC Manual of Marine Mammal Medicine to get the ultra-sonographer started on some reading.

Thanks so much for your ongoing interest and any thoughts you might have on the update below.

[redacted]

A veterinary update on Toa from today.

1) Current medical findings

Lab tests:

- A blowhole culture taken 12/07/21 grew a light growth of E.coli and no fungi. This is of no clinical concern given the light growth and no signs of respiratory disease. It is likely that we'll repeat blowhole cultures throughout his time in care to monitor for trends.
- We are awaiting faecal results from samples submitted to the lab today: for parasitology, gram stain, salmonella culture and occult blood.
- A urine sample was collected and tested today:
    - USG today was 1.014. Some reference ranges for urine testing have been circulated amongst the vet teams (thanks [redacted]) which indicate that our urine testing results so far are normal for this species.
- Blood was taken today by the HUHA team (thank you!):
    - In house biochem: Generally of no concern. His blood urea nitrogen (BUN) has increased slightly above normal, but this is likely to do with having recently eaten a protein rich meal (= formula). This analyte also increases with kidney disease/dehydration, but all our other blood and urine tests indicate that he is well hydrated and his kidneys are functioning normally. There are some other minor deviations from normal which are of no clinical significance at this stage but which we will monitor the trends of over time.
    - CBC: will be sent to the lab tomorrow
    - Serum electrophoresis: will be sent to the lab tomorrow
    - Cholesterol/triglycerides: will be sent to the lab tomorrow
    - Some historical blood has been stored in our -80˚C freezer.
- We are awaiting cytology and culture on eye discharge submitted to the lab today.

Physical exam:

- Wounds:

    - The abrasions to the underside of the tail flukes and the underside of the chin, and the deep lacerations near his tail fluke laterally to his spine are healing well.
    - The very outer edges of his pectoral flippers and the outer edge of his right tail fluke have some areas of full thickness skin wounds. These do not show any sign of infection (no swelling, discharge etc). These are being monitored.
    - A small blister on the skin near his blowhole (~1cm diameter) is being monitored.
- His right eye is being held shut more than his left and there is mild swelling of the eyelids of the right eye. These changes are still present but appear reduced in severity today. We have contacted some local veterinary ophthalmologists and are waiting to see if they are able to come examine the eye and what their availability is.
- Girth measurement update:
    - On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m
    - On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m
    - Girth measurements have some limitations in their use to assess body condition, but these results indicate no immediate significant weight loss. We will continue to monitor this over time to assess his response to feeding and the success of feeding.
- There is some minor swelling at the sites where injections were previously administered. He is not currently receiving injectable medications and these sites will be monitored.

2) <u>Proposed medical/nutrition plan moving forward</u>

His current medical care consists of:

Ongoing recording of respiratory rate, defaecation (regular today) and urination (observed today).

Fluids/feeding:

- We use the following two calculations to plan his food and fluid requirements for the day.
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Additional medications:

- Oral de-gas medication (simethicone) is ongoing since 19/07/21 to help prevent problems from air that is gulped during feeding.

Plan for regular monitoring:

- We're still putting together some monitoring parameters which will help us assess his health and welfare on a daily-weekly basis. Will keep you updated as this develops, it will likely involve semi-regular blood samples if possible (1-2x per week), respiratory rates, girth/length measurements, weight (if possible), bowel movements, observations/videos of movement/behaviour etc – so similar to what we're already doing/communicating.

He is still in the pool, but as of today (21/07/21) he is back in sea water.

Thanks so much everyone for all your ongoing time and expertise. If you have any questions or comments please don't hesitate to get in touch.

Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]
Sent: Wednesday, 21 July 2021 5:10 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

Just wondering how things are evolving with the little critter?

Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]
www.lacavemmvs.com

> On 19 Jul 2021, at 09:41, [redacted] > wrote:
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> Hello [redacted]
>
> Thank you for asking.
>
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In regards to medical follow up with people who have had KW calves, I would suggest to be cc on the same e-mails, otherwise the info will everytime travel from one to the others.

Greetings

[redacted]
Sent from my iPhone

On 19 Jul 2021, at 02:27, [redacted] wrote:

Hi all,

Sorry we did have an additional question - dose of tensio-actives (simethicone) do you use? (Is it dosed per kg of animal or per L of formula?)

Thanks all!

[redacted]

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[redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 4:33 pm
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

[redacted]

Thank you for sending, much appreciated. I'd like to see his ALP stay high, as an indicator of growth... otherwise the changes present do not appear to be significant. With better metabolism and positive energy balance, I would watch for ALP and TP to rebound.

The full panel is helpful to monitor for change, so I'd recommend sending at least one sample weekly to the reference lab. Iron is another indicator of inflammation that is important to monitor, along with fibrinogen and erythrocyte sedimentation rate.

with regards,
[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 5:52 PM
To: [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]i@wellingtonzoo.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hello everyone,

I've attached our spreadsheet with all current blood parameters (we are waiting for a few samples to come back from the lab so will add those in and resend when we have them). I've also included the Reference Ranges for SI units [redacted]. Converted them from the paper "Effect of age, sex, and season on the variation in blood analytes of a clinically normal ex situ population of killer whales (Orcinus orca)" for calves 0 to < 3 years.

[redacted] BA DVM
Resident Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
E [redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 11:31 am
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]@wellingtonzoo.com>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

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…however we know there are populations like the Pacific NW orcas that feed solely on salmon, so we know that they can tolerate it. We had similar problems with a stranded Cook Inlet beluga calf that had issues with the fat content in the diet and we had to back way off and start fresh with straight Zoologic formula and gradually add in fish in small amounts, because the oil can be a factor, but may be necessary when they are tolerating formula better to get the calories up.

Because you are finding yourselves diluting the formula with electrolyte solution, I would take out the salmon oil and fish and feed just formula, increasing percentage to 50 to 75%, then gradually add more oil in 50 ml increments.

It is better to feed 100% formula without fish then dilute formula with fish that is aversive. Do you have other species of fish that may be "blander" – sardines …what to the penguins eat there? Anchovies? Or other fish?

Happy to get on a Teams call tomorrow at 8 am your time if you want to chat more….

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 3:52 PM
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Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

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The main problems we are having with the calf at the moment are associated with feeding. I was wondering if I could run a few questions past you around this please? I'm not immediately on-site myself yesterday or today, so I am passing information that the team there have passed on to me.

- Since the bout of colic overnight between Monday and Tuesday this week, he has had no more signs of gut pain. This resolved after he passed a few large faecals that night, so I suspect it was possibly volume-in-abdomen related pain with a full stomach and a full colon. He was rested until the morning after the colic resolved (no feeds until first thing in the morning), then he was given just vytrate for the first few feeds, and since then he's been on ½ strength formula – aiming for 10 feeds a day, at 1½ hour intervals, as much as he'll take up to about 1.5L per feed. We are aiming to start increasing our way to full strength formula again today.
- His current formula consists of:
    - 6 cups Milligans lamb milk replacer (300 g powder with 1.5 liters water)
    - 3000 mg dicalcium phosphate
    - 1000 mg Taurine
    - 1100 ml water
    - 1100 ml 0.9% NaCl injection
    - 120 ml 50% Dextrose
    - 200 ml salmon oil
    - 0.7 kg filleted anchovies and viscera
    - 3 mazuri tablets
    - (Makes 4 liter total volume, calculated to have ~1450kcal/L)
- This morning the team on-site have made the observation that he doesn't appear to "like" the fish component of the formula that we're feeding. Last night he spat the teat of the bottle out on a few occasions when it was full of formula, but when it was replaced with vytrate (an electrolyte solution) he drank readily from the bottle. This morning they split the diet into a few different components (I believe one batch of lamb milk with salmon oil, one batch of vytrate, and one batch of blended anchovies). When they

fed these items separately, he readily bottle fed the milk/salmon oil, readily bottle fed the vytrate, but refused to feed on the bottle with the blended anchovies alone. When they told me that they'd tried this I advised to not feed the diet in separate components, and to try making a fresh batch of complete formula in case the older formula had aged a bit and developed a funny taste. I also recommended that if he was refusing bottle feeds that they stomach tube that feed so that we're still making sure that we're meeting fluid and caloric requirements as best as possible. He has not consistently refused formula from the bottle before and was feeding fine as far as I know Tuesday and most of Wednesday this week.

- Do you have any comments on the above? Any recommended changes? If it does seem like a food aversion to the fish component, could we try a different fish species like salmon or something?

And [redacted] in reply to your question in the other email chain: they haven't yet got a weight on him but hope to do so in the next couple of days – weather and equipment permitting! His recent girth measurements are as follows, which seems to suggest no measurable weight loss using this technique, although I appreciate this technique is sub-optimal. Will keep asking for girth data and monitor for trends while we await weight/s.

- On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m.
- On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m

Thanks so much for all of your time on this so far, we really appreciate all your time and expertise.
Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
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Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 7:21 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

Thanks for the update. Hopefully the minor adjustments in formula volume and frequency can be dialed in, each animal is different and as your team has learned it is not as black and white as it should be, trial and see, welcome to marine mammal rehabilitation.
US probe size used is generally a 4-5 MHz probe. We and others have used portable laptop US, such as GE Logiqbook or Sonosite machines. Due to his size, one should be able to get fairly decent scans, however a small animal ultrasonographer will find that the image is not as good as small animal due to the attenuation of sound by the blubber layer. We usually have animals line-up on their side or at an angle so they can continue to breath regularly with mild restraint. One can reach under with probe and scan from ventral midline as well, a pair of goggles with HMDI connection and converter are helpful to see the image in goggles then straining to see on screen. For abdominal scan, important to recognize organ position (left – stomach, intestinal tract, kidney, bladder if full and right- liver, GI (connecting channel), kidney, bladder, testes may be small in him), note echogenicity, organ position, motility and thickness of GI tract and if any free fluid or ascites is present.

[redacted] can add other specifics too, she is a US wizard 😉

Look forward to see recent blood parameters.

Keep going with great effort, thanks,
[redacted]

From: [redacted]
Sent: Wednesday, July 21, 2021 5:18 AM
To: [redacted]>
Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted] and team,

Apologies it has been a rather frantic couple of days. The calf had a bout of colic 48 hrs ago which appeared to resolved fairly rapidly with removal of the formula and reverting to electrolyte feeds. The formula has been slowly re introduced since then. We have been trying to balance the advice around timing and volume of feeds received from all thee incredible vets who are helping us out.

Below is the vet update from today as provided by [redacted] – Head vet at Wellington Zoo who is leading the on-site veterinary response.

Overall he appears fairly stable. We are talking to a veterinary imaging specialist about coming to ultrasound the calf so I imagine we may have a bunch of questions about probe size etc in the next 24ish hours. We are currently working on the information we have on ultrasounding cetaceans from the CRC Manual of Marine Mammal Medicine to get the ultra-sonographer started on some reading.

Thanks so much for your ongoing interest and any thoughts you might have on the update below.

[redacted]

A veterinary update on Toa from today.

1. Current medical findings

Lab tests:

- A blowhole culture taken 12/07/21 grew a light growth of E.coli and no fungi. This is of no clinical concern given the light growth and no signs of respiratory disease. It is likely that we'll repeat blowhole cultures throughout his time in care to monitor for trends.
- We are awaiting faecal results from samples submitted to the lab today: for parasitology, gram stain, salmonella culture and occult blood.
- A urine sample was collected and tested today:
    - USG today was 1.014. Some reference ranges for urine testing have been circulated amongst the vet teams (thanks [redacted]) which indicate that our urine testing results so far are normal for this species.
- Blood was taken today by the HUHA team (thank you!):
    - In house biochem: Generally of no concern. His blood urea nitrogen (BUN) has increased slightly above normal, but this is likely to do with having recently eaten a protein rich meal (= formula). This analyte also increases with kidney disease/dehydration, but all our other blood and urine tests indicate that he is well hydrated and his kidneys are functioning normally. There are some other minor deviations from normal which are of no clinical significance at this stage but which we will monitor the trends of over time.
    - CBC: will be sent to the lab tomorrow
    - Serum electrophoresis: will be sent to the lab tomorrow
    - Cholesterol/triglycerides: will be sent to the lab tomorrow
    - Some historical blood has been stored in our -80˚C freezer.
- We are awaiting cytology and culture on eye discharge submitted to the lab today.

Physical exam:

- Wounds:
    - The abrasions to the underside of the tail flukes and the underside of the chin, and the deep lacerations near his tail fluke laterally to his spine are healing well.
    - The very outer edges of his pectoral flippers and the outer edge of his right tail fluke have some areas of full thickness skin wounds. These do not show any sign of infection (no swelling, discharge etc). These are being monitored.
    - A small blister on the skin near his blowhole (~1cm diameter) is being monitored.
- His right eye is being held shut more than his left and there is mild swelling of the eyelids of the right eye. These changes are still present but appear reduced in severity today. We have contacted some local veterinary ophthalmologists and are waiting to see if they are able to come examine the eye and what their availability is.
- Girth measurement update:
    - On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m
    - On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m
    - Girth measurements have some limitations in their use to assess body condition, but these results indicate no immediate significant weight loss. We will continue to monitor this over time to assess his response to feeding and the success of feeding.
- There is some minor swelling at the sites where injections were previously administered. He is not currently receiving injectable medications and these sites will be monitored.

2. <u>Proposed medical/nutrition plan moving forward</u>

His current medical care consists of:

Ongoing recording of respiratory rate, defaecation (regular today) and urination (observed today).

Fluids/feeding:

- We use the following two calculations to plan his food and fluid requirements for the day.
    - His daily fluid requirements are estimated to be 40-80ml/kg/d (= 8-16L per day).
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- Please do not offer him any solid food yet. This needs to be introduced very carefully, and only once he's old enough and once the formula feeding is stable and reliable or this could cause quite significant gut upsets.

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Thanks so much everyone for all your ongoing time and expertise. If you have any questions or comments please don't hesitate to get in touch.

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Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
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Sent from my iPhone

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[redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 1:11 pm
To: [redacted]
Cc: [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

If he starts to "baahhhh" , then you know when to start adding fish 😉

On a more serious note, dialing in the right formula for cetaceans can be challenging. Many older formulas (1970's) used heavy whipping cream and those of us newer in the field saw lots of intestinal upset with cream, so we moved to menhaden or salmon oil. Menhaden is more bland and was well tolerated but it's hard to find now, so we graduated to salmon oil, but as mentioned we've had some animals (ie. beluga and killer whales that have been refractory). However, in order to get more caloric density for growth, some form of fish oil is necessary once it is tolerated.

[redacted] may have some additional advice on what she has experienced at LP. We sent people over to help with the first calf at LP and they had some hurdles with oil and cream too....so while increasing the caloric content of the diet is worthwhile for eventual weight gain, getting the animals on a basic 100% formula is a better starting place for then adding to it. Some animals will take to the oil fine or we've had to modify based on the natural diet of the animal (ie. pygmy sperm whale required blended squid formula).

I don't know what your local fisheries are, but you may investigate what other fish oils and or large fish are available. I can't recall what they fed dolphins at Sea World Gold Coast, but there must be a vendor or supplier that they use.

Regards,
[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 5:21 PM
To: [redacted]@SeaWorld.com>
Cc: [redacted]
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Thanks [redacted], this is super helpful. We're doing a slight changing of the guard in the next few days in that [redacted] (cc'd here) will likely be based on-site at the orca location from this afternoon/tomorrow onwards. Will have a chat with her when I see her this afternoon and make a plan with regards to a teams call tomorrow but I imagine we may be keen.

Will keep you posted!
Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
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Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 7:21 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

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Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | [redacted]

From: [redacted]>
Sent: Wednesday, 21 July 2021 5:10 AM
To: [redacted]>
Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

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Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
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8310 Assbroek
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[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Thursday, 22 July 2021 12:53 pm
To: [redacted]
Cc: [redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA
Attachments: Toa blood results.xlsx

Hello everyone,

I've attached our spreadsheet with all current blood parameters (we are waiting for a few samples to come back from the lab so will add those in and resend when we have them). I've also included the Reference Ranges for SI units [redacted]. Converted them from the paper "Effect of age, sex, and season on the variation in blood analytes of a clinically normal ex situ population of killer whales (Orcinus orca)" for calves 0 to < 3 years.

[redacted] BA DVM
Resident Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
E [redacted]@wellingtonzoo.com

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 11:31 am
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]@wellingtonzoo.com>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

We often do not add fish right away to the formula and ensure that they are eating it consistently, then gradually add it in. We have seen some cetacean calves have issue with salmon oil also, as it can be very high in % fat …however we know there are populations like the Pacific NW orcas that feed solely on salmon, so we know that they can tolerate it. We had similar problems with a stranded Cook Inlet beluga calf that had issues with the fat content in the diet and we had to back way off and start fresh with straight Zoologic formula and gradually add in fish in small amounts, because the oil can be a factor, but may be necessary when they are tolerating formula better to get the calories up.

Because you are finding yourselves diluting the formula with electrolyte solution, I would take out the salmon oil and fish and feed just formula, increasing percentage to 50 to 75%, then gradually add more oil in 50 ml increments.

It is better to feed 100% formula without fish then dilute formula with fish that is aversive. Do you have other species of fish that may be "blander" – sardines …what to the penguins eat there? Anchovies? Or other fish?

Happy to get on a Teams call tomorrow at 8 am your time if you want to chat more….

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 3:52 PM
To: [redacted]@SeaWorld.com>; [redacted]@loroparque.com>; [redacted]

Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

I was wondering how best to loop these two groups together then I saw that [redacted] had already done it, so I hope that it's okay to hop in on this thread with our vets too please?

The main problems we are having with the calf at the moment are associated with feeding. I was wondering if I could run a few questions past you around this please? I'm not immediately on-site myself yesterday or today, so I am passing information that the team there have passed on to me.

- Since the bout of colic overnight between Monday and Tuesday this week, he has had no more signs of gut pain. This resolved after he passed a few large faecals that night, so I suspect it was possibly volume-in-abdomen related pain with a full stomach and a full colon. He was rested until the morning after the colic resolved (no feeds until first thing in the morning), then he was given just vytrate for the first few feeds, and since then he's been on ½ strength formula – aiming for 10 feeds a day, at 1½ hour intervals, as much as he'll take up to about 1.5L per feed. We are aiming to start increasing our way to full strength formula again today.
- His current formula consists of:
    - 6 cups Milligans lamb milk replacer (300 g powder with 1.5 liters water)
    - 3000 mg dicalcium phosphate
    - 1000 mg Taurine
    - 1100 ml water
    - 1100 ml 0.9% NaCl injection
    - 120 ml 50% Dextrose
    - 200 ml salmon oil
    - 0.7 kg filleted anchovies and viscera
    - 3 mazuri tablets
    - (Makes 4 liter total volume, calculated to have ~1450kcal/L)
- This morning the team on-site have made the observation that he doesn't appear to "like" the fish component of the formula that we're feeding. Last night he spat the teat of the bottle out on a few occasions when it was full of formula, but when it was replaced with vytrate (an electrolyte solution) he drank readily from the bottle. This morning they split the diet into a few different components (I believe one batch of lamb milk with salmon oil, one batch of vytrate, and one batch of blended anchovies). When they fed these items separately, he readily bottle fed the milk/salmon oil, readily bottle fed the vytrate, but refused to feed on the bottle with the blended anchovies alone. When they told me that they'd tried this I advised to not feed the diet in separate components, and to try making a fresh batch of complete formula in case the older formula had aged a bit and developed a funny taste. I also recommended that if he was refusing bottle feeds that they stomach tube that feed so that we're still making sure that we're meeting fluid and caloric requirements as best as possible. He has not consistently refused formula from the bottle before and was feeding fine as far as I know Tuesday and most of Wednesday this week.
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And [redacted] in reply to your question in the other email chain: they haven't yet got a weight on him but hope to do so in the next couple of days – weather and equipment permitting! His recent girth measurements are as follows, which seems to suggest no measurable weight loss using this technique, although I appreciate this technique is sub-optimal. Will keep asking for girth data and monitor for trends while we await weight/s.

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		12/07/2021 Inhouse lab	12/07/2021 External lab	14/07/2021	21/07/2021 Inhouse lab	Reference Ranges (SI Units)
Haematology	RBC		3.42			3.59-3.77
	HGB		134.00			141.9-146.9
	HCT	0.29	0.39	0.35	0.35	40.76-42.13
	MCV		113.00			111.31-114.48
	MCH		39.00			38.77-39.99
	MCHC		345.00			345.3-351.9
	WBC	4.06	7.10			6.032-6.851
	MONO	0.12	0.20			no reference
	MONO %	3	3.00			no reference
	LYMPH	0.73	0.90			no reference
	LYMPH%	18	13.00			no reference
	NEUT	3.2	5.90			no reference
	NEUT %	79	83.00			no reference
	BAND		0.10			no reference
	BAND %		1.00			no reference
	THROMB	Adequate				no reference
	FIB		2.00			2.48-2.82
	ALB	53	36	50	33	33.9-36.1
	ALP	777	878	652	490	673.1-746.6
	ALT		19		40	15.62-21.71
	AST	85		95	234	48-55.18
	Ca	2.52	2.77	2.53	2.49	2.22-2.27
	GGT	12		14	12	6.01-10.5
	TP	61	61	58	54	55.4-60.5
	GLOB	9	25	8	23	21-25
	BUN	11.7	12.8	13.5	19.7	12.42-14.13
	CK	478		250	288	225.2-253.6
	Phos	2.86	3	2.4	1.39	2.06-2.19
	Mg	0.97		0.78	0.91	no reference
	GLU		7.4	6.5	4.9	6.6-7.0
	Amyl		<5	<5		no reference
	Tot. Bil		5		2	1.54-1.88
	CRE		95		39	71.6-89.28
	Na		153		144	155-156.4
	K		6.9		5.1	4.01-4.11
	Iron		10			5.4-25.1

[redacted]

From: [redacted] >
Sent: Thursday, 22 July 2021 6:19 am
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Thank you for the update [redacted]

Let me know if you need some help in reviewing the blood samples as we have probably over hundreds of samples from our 3 killer whale calves before they were 6 months old.

I looked back at the measurements of our female calves as well (we had one male and two females). At one month of age the size was 2,23 m for one for a weight of 175 kg. The other one weighted 180 kg at one month of age (but don't have her length). The male was smaller - was 2,34 cm at 2,5 months of age and 207 kg.

I am still trying to find back pictures of their teeth when very young (as you said the teeth are not erupted yet in your calf) and will come back to you asap.

Please let me know how I can help for ultrasound … this is really what I do a lot with killer whales.

From our side and our 3 calves, I will keep on stressing: be careful about the volume. Spread it over time and 9 L seem a big maximum. We have managed to reach higher calories (though rarely reached mother's milk) but using electrolyte reconstitution powder in the water (instead of plain water) - reaching an extra 800 kcal day (80 kcal/packet/feeding) and adding salmon oil (went up to 10 ml per feed (you need to check the digestion and/or diarrhoea though), so about another 940 kcal/day. It is a nice addition when you need to get calories to a calf.
I'd be more than happy to link with [redacted] as well if you so wish.

Hope things will move in the good way. Any sighting about his pod?

Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
[redacted]
www.lacavemmvs.com

On 21 Jul 2021, at 13:18, [redacted] > wrote:

Hi [redacted] and team,

Apologies it has been a rather frantic couple of days. The calf had a bout of colic 48 hrs ago which appeared to resolved fairly rapidly with removal of the formula and reverting to electrolyte feeds.

The formula has been slowly re introduced since then. We have been trying to balance the advice around timing and volume of feeds received from all thee incredible vets who are helping us out.

Below is the vet update from today as provided by [redacted] – Head vet at Wellington Zoo who is leading the on-site veterinary response.

Overall he appears fairly stable. We are talking to a veterinary imaging specialist about coming to ultrasound the calf so I imagine we may have a bunch of questions about probe size etc in the next 24ish hours. We are currently working on the information we have on ultrasounding cetaceans from the CRC Manual of Marine Mammal Medicine to get the ultra-sonographer started on some reading.

Thanks so much for your ongoing interest and any thoughts you might have on the update below.

[redacted]

A veterinary update on Toa from today.

1. Current medical findings

Lab tests:

- A blowhole culture taken 12/07/21 grew a light growth of E.coli and no fungi. This is of no clinical concern given the light growth and no signs of respiratory disease. It is likely that we'll repeat blowhole cultures throughout his time in care to monitor for trends.
- We are awaiting faecal results from samples submitted to the lab today: for parasitology, gram stain, salmonella culture and occult blood.
- A urine sample was collected and tested today:
    - USG today was 1.014. Some reference ranges for urine testing have been circulated amongst the vet teams (thanks [redacted] !) which indicate that our urine testing results so far are normal for this species.
- Blood was taken today by the HUHA team (thank you!):
    - In house biochem: Generally of no concern. His blood urea nitrogen (BUN) has increased slightly above normal, but this is likely to do with having recently eaten a protein rich meal (= formula). This analyte also increases with kidney disease/dehydration, but all our other blood and urine tests indicate that he is well hydrated and his kidneys are functioning normally. There are some other minor deviations from normal which are of no clinical significance at this stage but which we will monitor the trends of over time.
    - CBC: will be sent to the lab tomorrow
    - Serum electrophoresis: will be sent to the lab tomorrow
    - Cholesterol/triglycerides: will be sent to the lab tomorrow
    - Some historical blood has been stored in our -80˚C freezer.
- We are awaiting cytology and culture on eye discharge submitted to the lab today.

Physical exam:

- Wounds:
    - The abrasions to the underside of the tail flukes and the underside of the chin, and the deep lacerations near his tail fluke laterally to his spine are healing well.
    - The very outer edges of his pectoral flippers and the outer edge of his right tail fluke have some areas of full thickness skin wounds. These do not show any sign of infection (no swelling, discharge etc). These are being monitored.
    - A small blister on the skin near his blowhole (~1cm diameter) is being monitored.
- His right eye is being held shut more than his left and there is mild swelling of the eyelids of the right eye. These changes are still present but appear reduced in severity today. We have

contacted some local veterinary ophthalmologists and are waiting to see if they are able to come examine the eye and what their availability is.

- Girth measurement update:
    - On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m
    - On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m
    - Girth measurements have some limitations in their use to assess body condition, but these results indicate no immediate significant weight loss. We will continue to monitor this over time to assess his response to feeding and the success of feeding.
- There is some minor swelling at the sites where injections were previously administered. He is not currently receiving injectable medications and these sites will be monitored.

2. <u>Proposed medical/nutrition plan moving forward</u>

His current medical care consists of:

Ongoing recording of respiratory rate, defaecation (regular today) and urination (observed today).

Fluids/feeding:

- We use the following two calculations to plan his food and fluid requirements for the day.
    - His daily fluid requirements are estimated to be 40-80ml/kg/d (= 8-16L per day).
    - His daily caloric requirements are 120-125kcal/kg/d.
- Today the plan is to feed him 10x feeds of 50:50 formula to 50% vytrate at 1.5 hour-intervals. No colic or other signs of gut disease have been observed since overnight on Monday night/very early Tuesday morning.
    - This is a step back on our diet increases, with a plan to slowly increase again in future when his gut settles so that we can aim to meet his caloric requirements.
- We will see how we go on this feeding plan for the rest of today and will be in touch in the morning to see how you went and what our plan will be for 22/07/21.
- Please do not offer him any solid food yet. This needs to be introduced very carefully, and only once he's old enough and once the formula feeding is stable and reliable or this could cause quite significant gut upsets.

Additional medications:

- Oral de-gas medication (simethicone) is ongoing since 19/07/21 to help prevent problems from air that is gulped during feeding.

Plan for regular monitoring:

- We're still putting together some monitoring parameters which will help us assess his health and welfare on a daily-weekly basis. Will keep you updated as this develops, it will likely involve semi-regular blood samples if possible (1-2x per week), respiratory rates, girth/length measurements, weight (if possible), bowel movements, observations/videos of movement/behaviour etc – so similar to what we're already doing/communicating.

He is still in the pool, but as of today (21/07/21) he is back in sea water.

Thanks so much everyone for all your ongoing time and expertise. If you have any questions or comments please don't hesitate to get in touch.

Kind regards,

[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com |



<image001.png>

From: [redacted]
Sent: Wednesday, 21 July 2021 5:10 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
[redacted]@SeaWorld.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

Just wondering how things are evolving with the little critter?

Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]
www.lacavemmvs.com

On 19 Jul 2021, at 09:41, [redacted] > wrote:

Hello [redacted]

Thank you for asking.

We went up to 50mg per formula administration - the liquid form - but really followed the gas formation by ultrasound.

Qua age, as mentioned before, that was how old our male calf was when 2m12, so around 2-2.5 month, but this can differe.

I will look now at the pics of our 3 hand-reared calves in regards to teeth erruption

Dr. [redacted], from the Oceanografic in Valencia, has worked on age extimation in cetaceans based on flipper XR. It would be helpful to try this as well. I believewe have CR of the flipper on one of our calves at that age.

I am traveling now to LP and will gather that info for you.

In regards to medical follow up with people who have had KW calves, I would suggest to be cc on the same e-mails, otherwise the info will everytime travel from one to the others.

Greetings

[redacted]

Sent from my iPhone

On 19 Jul 2021, at 02:27, [redacted]

[redacted]z> wrote:

Hi all,

Sorry we did have an additional question - dose of tensio-actives (simethicone) do you use? (Is it dosed per kg of animal or per L of formula?)

Thanks all!

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
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Belgium
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www.lacavemmvs.com

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[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Thursday, 22 July 2021 5:31 pm
To: [redacted]
Cc: [redacted]
Subject: FW: Cetacean euthanasia protocol - just in case
Attachments: Cetacean Euthanasia.pdf; NetworkGuidanceLargeWhaleEuthanasia.pdf

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
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From: [redacted]@SeaWorld.com>
Sent: 20 July 2021 04:57
To: [redacted]@wellingtonzoo.com>
Subject: RE: Cetacean euthanasia protocol - just in case

Hi [redacted],

Here is a summary document of recommended protocol and drug doses for managed odontocetes... also attached NOAA Stranding Network guidelines for wild large whales, that can be a reference for large whale strandings.

Regards,
[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Sunday, July 18, 2021 5:02 PM
To: [redacted]t@SeaWorld.com>
Subject: [EXTERNAL] RE: Cetacean euthanasia protocol - just in case

[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
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E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com |

From: [redacted]@SeaWorld.com>
Sent: 19 July 2021 11:53
To: [redacted]@wellingtonzoo.com>
Subject: RE: Cetacean euthanasia protocol - just in case

Hi [redacted],

Yes, I had the same idea…as ballistics are pretty old school 😉! Will try to get info to you by tomorrow.

Regards,
[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Sunday, July 18, 2021 4:08 PM
To: [redacted]@SeaWorld.com>
Subject: [EXTERNAL] Cetacean euthanasia protocol - just in case

Hi [redacted]

It was lovely to catch you sort-of-in-person today at the meeting :) I was wondering if I could please ask you for your orca euthanasia protocol? Not that euthanasia is on the cards immediately, and pending of course discussions on preferred mode of euthanasia should this be recommended, but I'm just keen to check our drug and equipment stock levels just to make sure that we have everything we need should we need to in a hurry.

Thank you so very much!
Kind regards,
[redacted]

[redacted] BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)
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Euthanasia Guidelines - Cetacean

From ... The AVMA Guidelines for the Euthanasia of Animals: 2020 edition, p. 96.

S7.5 Captive Marine Mammals

S7.5.1 Acceptable methods

"Intravenous (IV) administration of barbiturates and their derivatives can be a rapid and reliable method of euthanasia for small pinnipeds, small odontocetes, and sirinids…The advantage of using barbiturates is that death is usually rapid. Unfortunately, voluntary peripheral vasoconstriction by cetaceans or hypovolemic shock can limit access to peripheral veins. There is also risk of injury for personnel attempting venipuncture if animals are not restrained. Furthermore, tissue residues can present challenges for disposal of the animal's remains and personnel are responsible for ensuring that secondary toxicity does not occur.

Intramuscular (IM) administration of sedatives or anesthetics may be required to immobilize large, anxious, or fractious animals to ensure animal and personnel safety prior to administration of IV euthanasia agents. Agents that have been successfully used alone or in combination for this purpose include tiletamine-zolazepam, ketamine, xylazine, meperidine, fentanyl, midazolam, diazepam, acepromazine and etorphine. Veterinarians should be aware that administration of anesthetics or sedatives in fat layers can result in prolonged time to effect and diminished depth of sedation and anesthesia."

Pre-euthanasia - managed or wild cetaceans are safely restrained within a stretcher or beached out-of-water on medical floor or foam mat by experienced personnel. IM injection with benzodiazepines, opioids, and alpha-2 agonist is highly recommended and often enough to calmly induce unconsciousness, apnea, and death. Additional agents, such as, Telazol®, xylazine, or propofol can be used, in addition to drug cocktail, or substitute similar agents based on animal's size and supply of drugs.

Immobilization Doses proposed below have been used with the following species:

Bottlenose dolphin, melon-headed whale and killer whale

Midazolam:	1 – 1.5 mg/kg	IM
Medetomidine:	0.3 – 0.5 mg/kg	IM
Butorphanol:	0.65 - 1 mg/kg	IM
+/- Acepromazine:	0.1 - 1 mg/kg	IM
+/- Tiletamine-Zolazepam (Telazol):	1 – 2 mg/kg	IM
+/- Propofol:	1 - 2 mg/kg	IV

Euthanasia agents, if needed following immobilization:

Pentobarbital: 10 mg/kg or to effect	IV
KCl: 1:1 with pentobarbital volume	IV

Observations:

The immobilization drug combination results in quiet, profound respiratory depression, unconsciousness, and progressive cardiac arrest. There is minimal excitation or movement of the flukes. Respirations quickly cease to apnea within minutes. Heart rate can be monitored with ECG leads placed on animal or with visual signs of contraction. Bradycardia progresses to cardiac arrest within 10-20 minutes. Co-morbidity or age can exacerbate effect. Additional neurologic signs to evaluate include jaw tone, blowhole tone, palpebral and corneal reflexes.

Network Guidance for Large Whale Euthanasia

West Coast Region
2018

Challenges & Considerations: Every large whale stranding event is unique and poses different challenges. Some of these challenges include; logistics, environmental conditions, animal size and behavior, publicity, pharmaceutical and resource limitations, and disposal of the carcass. Many considerations need to be included in the decision making process such as the welfare of the animal, personnel safety, and the availability of trained and licensed individuals.

Animal Concerns: When a cetacean strands onshore gravitational effects lead to the respiratory and circulatory collapse (Geraci & Lounsbury 2005). The animal can also experience severe skin blistering, live animal scavenging, hyperthermia, distress and serious injury. There are many things the Network can do to address some of these animal welfare concerns by providing hospice care if euthanasia is not appropriate, during the time prior to implementing euthanasia or if an animal can be refloated during conducive tidal conditions. Please see the Live Large Whale Stranding Protocol for response guidance, including supportive hospice care.

Decision Making: Qualified veterinarians may recommend that euthanasia is the most humane option for the whale based on the condition of the animal, the circumstances, and available resources. Euthanasia will be discussed on a case by case basis and the decision will be made by the NOAA Regional Stranding Coordinator in consultation with the local Network group, attending veterinarian, and Marine Mammal Health and Stranding Response Program (MMHSRP) staff. If a decision is made to euthanize a large whale, the procedure will be conducted by qualified personnel under the authorization of the MMHSRP permit.

Euthanasia Options: Many options of euthanasia have been considered but have significant limitations and concerns.

- Pentobarbital: High relay toxicity potential, environmental concerns, high aquatic persistence, and proper carcass disposal.
- Ballistics: Not currently recommended for large cetaceans over 4-8 m (AVMA 2013).
- Explosives: Requires specialized training, limitation of access to explosives, lack of public acceptance.
- Exsanguination: Considered inhumane unless performed on heavily sedated, unconscious, or moribund animals (AVMA 2013).
- Potassium Chloride Method: Currently the preferred method for euthanasia of large whales in the United States when proper carcass disposal may not be possible. The KCl method has proven successful in several cases with little relay toxicity risk, the ability for natural carcass disposal, and a fairly reasonable cost (~ $1000 per case).

Potassium Chloride Method: This method involves a cardiac needle insertion following deep sedation and analgesia. Saturated KCl solution is acceptable in a two-step euthanasia when proceeded by unconsciousness or general anesthesia (AVMA 2013). This method requires custom-made long needles for Intramuscular (IM) or Intracardiac (IC) injection sites. IM can be administered into the large epaxial muscles just lateral or midline anterior or posterior to the dorsal fin. IC can be administered and the heart may be

accessed from the right or left axillary space or a parasternal approach may also be used. Lidocaine infused into the blubber before the insertion of the IC needle is encouraged.

What You Need: Several resources are required to employ the KCl method successfully.

- Custom-made needles: Collaborative Development of Recommendations for Euthanasia of Stranded Cetaceans: See Page 72 of the Tech memo (Page 80 of the PDF).
- Sedatives and KCl: See below paragraph on successfully used sedatives. KaliSel is a widely available fine-grained readily dissolvable Potassium Chloride product that is used in pools and can be used for euthanasia of large whales.
- KCl Kit: See Large Whale Euthanasia Application Kit
- Accurate weight estimate: See below graph or download the WhaleScale app on your iPhone.
- Dosages: Collaborative Development of Recommendations for Euthanasia of Stranded Cetaceans. Attached below.
- Team of experienced staff: See Responder Roles below.
- [redacted]
- Consultation with a veterinarian: See contacts below.
- Data collection: Collaborative Development of Recommendations for Euthanasia of Stranded Cetaceans. Attached below.

Live Animal Sampling:

Sedatives: Midazolam, butorphanol, acepromazine, and xylazine have been successfully used in sedating large whales. Acepromazine and Xylazine blood and tissue concentrations in euthanized whales have been measured and were not sufficiently high to be a concern for relay toxicity to scavengers, although trimming of IM injection sites for safe disposal is recommended as a precaution.

Response by the Whale: Last swim, mouth gaping, arching. Witnessing the procedure and whale response may be difficult and the process should be explained if the media and public are present using very clear talking points (See Live Whale Strandings Q&A).

Time of Death: This time varies for each case. The time from sedation to death ranges from 48 minutes to 2 hours and 18 minutes, with most of the time devoted to easing the whale into a nonresponsive state for IC injection of KCl (Low-Residue Euthanasia of Stranded Mysticetes, Harms, 2014). The time from KCl being administered to death ranges from 4 minutes to 10 minutes (Low-Residue Euthanasia of Stranded Mysticetes, Harms, 2014).

Weight estimate: Lockyer, 1976. WhaleScale app also available for iPhone.
https://cmast.ncsu.edu/blog/2017/06/whalescale-hits-apple-app-store/

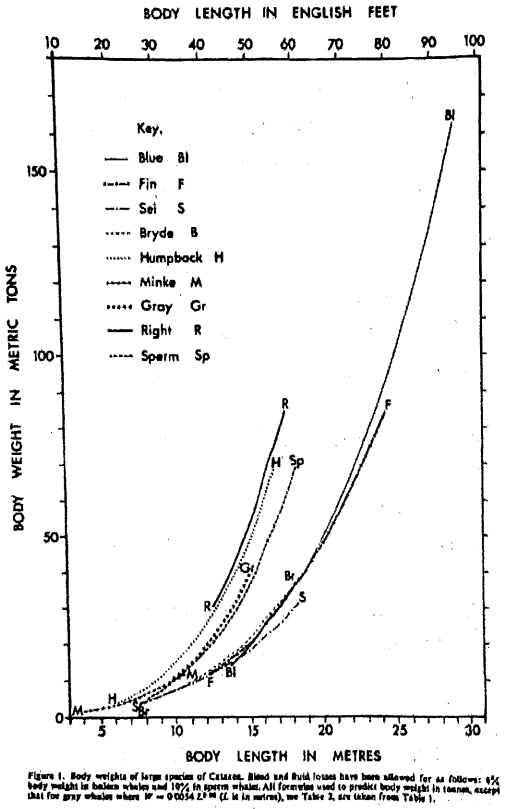


Figure 1. Body weights of large species of Cetacea. Blood and fluid losses have been allowed for as follows: 6% body weight in baleen whales and 10% in sperm whales. All formulae used to predict body weight in tonnes, except that for gray whales where $W = 0.0054\ L^{2.66}$ (L is in metres), see Table 2, are taken from Table 1.

Downloaded from biosphere.stanford.edu at North Carolina State University on March 9, 2011

Responder Roles: Identify roles and responsibilities for each network member on scene.

i. On-site Coordinator – Responsible for the safety of volunteers at the scene, response planning decisions, and coordination with local authorities. This individual is a Stranding Agreement Holder, Agreement Holder Co-investigator, NOAA Fisheries MMHSRP staff or designee. The On-site Coordinator may conduct the field health assessment or delegate the task to a specialist or veterinarian at the scene.

ii. Media and Information Coordinator – Responsible for communicating with NOAA Fisheries West Coast Region staff (Regional Stranding Coordinator), representing the response team to the media, and providing information about the response to the public.

iii. Field Health Assessment – To be conducted by the On-site Coordinator or designated veterinarian or species specialist.

iv. Designated Veterinarian – To be identified by the On-site Coordinator. The designated veterinarian is responsible for overseeing the animal husbandry team and for making all health decisions in coordination with the on-site coordinator.

v. Animal Husbandry Team – Support staff for the response under the direction of the On-site Coordinator and responsible for animal care and humane treatment. Tasks include applying zinc oxide, keeping the animal comfortable (protection from sun burn, cooling, keeping the animal wet), monitoring the overall condition of the animal, monitoring respirations, etc.

vi. Field Safety Team – Support staff under the direction of the On-Site Coordinator; responsible for public safety and limiting animal stress. Tasks include establishing a safety perimeter to limit access (public, media) to the animal and to reduce stressors to the animal during the response. Maintaining crowd control in a non-confrontational manner. Directing media and public information inquiries to the Media and Information Coordinator.

1. Notifying the On-site Coordinator if Law Enforcement assistance is required for crowd control or additional public safety support.
    a. NOAA's Office of Law Enforcement: 206-526-6133 Seattle, 206-526-4851 Duty Agent West Coast Region (rotates to a new officer or agent every two weeks).
    b. Washington Department of Fish and Wildlife Enforcement 1-877-933-9847
    c. Oregon State Police 503-378-3720
    d. California Department of Fish and Wildlife Enforcement 1-888-334-2258
    e. United States Coast Guard – Notification of the stranding event

vii. After the event is over the entire team and those involved should de-brief.

Emergency Euthanasia Contacts

Organization	Name	Contact Information	Information
Oregon State University	[redacted]	[redacted]	[redacted] has the only large whale euthanasia kit available. Based in Newport, Oregon. Requires sedatives and potassium chloride.
SeaDoc Society	[redacted] Has a dozen 17 gauge 23" needles for injecting anesthetic available for Network use		Veterinarian based on Orcas Island, WA available to sedate and euthanize stranded live whales if needed.
Sea Life Response, Rehab, Research	[redacted] Has a dozen 17 gauge 23" needles for injecting anesthetic available for Network use		Vet Tech based in West Seattle, WA available to provide large whale euthanasia kit.

Marine-Med	[redacted]	Veterinarian based in the Seattle, WA area available to sedate and euthanize live whales if needed.
The Marine Mammal Center	[redacted]	Based in Sausalito, CA available to sedate and euthanize live whales if needed. Please contact the on call veterinarian first.
Northcoast Marine Mammal Center	[redacted]	Based in Crescent City, CA
Channel Islands Marine & Wildlife Institute	[redacted]	Based in Santa Barbara, CA
California Wildlife Center	[redacted]	Based in Malibu, CA
Marine Mammal Center, LA	[redacted]	Based in San Pedro, CA
Pacific Marine Mammal Center	[redacted]	Based in Laguna Beach, CA
Sea World	[redacted]	Based in San Deigo, CA
North Carolina State University	[redacted]	National expert on large whale euthanasia using large dosages of potassium chloride. Available for consultation.
University of North Carolina	[redacted]	Large whale euthanasia expert. Available for consultation.

Live Large Whale Strandings Q& A

West Coast Region
2018

Q: Why do whales strand?
Large whales may strand alive for a number of reasons, including complex topographic and oceanographic conditions, contaminants, weather conditions, natural toxins such as domoic acid or saxitoxin poisoning, disease, emaciation or malnourishment, and human caused injuries. Each case is different and the West Coast Marine Mammal Stranding Network responds to all large whale cases to better understand what factors may have contributed to the stranding.

Q: Are whale populations healthy on the West Coast of the United States?
After 45 years of protection under the Marine Mammal Protection Act many whale populations are recovering and are reaching healthy population levels. Gray whales are common along the West Coast and were removed from the endangered species list in 1994. Six species of whales found along the West Coast are currently listed under the Endangered Species Act including the Blue whale, Fin whale, Humpback whale (some distinct population segments have been recently delisted), Northern Pacific Right Whale, Sei whale and the Southern Resident Killer whale.

Q: How common is it for a large whale to strand alive?
In recent years, an average of 8 large whales have stranded alive around the United States. In most cases, the whales have died within 24 hours of the initial stranding, even after returning to deeper water. In the past three years, across the United States at least 4 live stranded large whales successfully freed themselves but all subsequently re-stranded and died. In the Pacific Northwest in the past 2 years, 4 whales stranded alive and then died onshore. In about two instances each year nationwide, a decision is made to humanely euthanize a large whale that strands alive.

Q: Can large whales be saved when they strand?
Every large whale stranding event is unique and poses different challenges. Human safety is put first in every case when considering how to respond. When a whale strands onshore a primary concern is that gravitational effects (increased pressure from being out of the water) can lead to respiratory and circulatory collapse (Geraci & Lounsbury 2005). The animal can also experience severe skin blistering, live animal scavenging, hyperthermia, distress and serious injury. The West Coast Marine Mammal Stranding Network has used several supportive care methods to address some of these concerns during past live whale strandings, such as using sheets, water buckets and sprayers to keep whales wet and cool while waiting for the tide to rise or when considering other options, including euthanasia. There may be instances when the whale cannot be safely accessed by the response team so monitoring the whales' condition from a distance may be required.

Q: What are the limitations to responding to a live large whale stranding?
Some of the challenges and limitations include; logistics particularly for remote locations, environmental conditions such as weather and wave conditions, animal size and behavior, public interest and busy locations, resource limitations, and disposal of the carcass if the animal expires. Many considerations and risks need to be evaluated to guide a response such as the welfare of the animal, personnel safety, and the availability of trained and licensed individuals.

Q: Why can't a whale be pulled off of the beach?
Moving large whales has serious safety risks for the whale and for the Network responders involved. Trying to pull or push a large whale from the beach can also be very resource intensive as specialized equipment is required, which may or may not be readily available within the critical 24-36 hours after the stranding. Towing live whales by the tail can result in seriously injuring or dislocating the tail, causing paralysis and is therefore considered inhumane. While there are YouTube videos of "successful" whale re-floating which generally involve putting a rope or cable around the peduncle/tail of the animal and pulling it off the beach/sandbar with a boat, based on input from veterinarians and discussions by the International Whaling Commission this action is likely to cause pain and physical harm to the animal. It can injure tail muscles reducing the ability of the whale to swim, feed, and avoid predators. In the worst case scenario this process could break the spinal cord which would then paralyze the animal. Creating a harness to put around the pectoral flippers to pull the animal forward would be a physiologically better alternative but this method still has multiple complications; getting the harness around a grounded whale is near impossible, if you are successful the harness needs to be safely released so the animal is not entangled, and this quick release harness has yet to be developed.

Q: Can the area around the animal be dredged so it can swim away?
Dredging to remove sediment or sand around a stranded whale has not been tried very often due to resource limitations and potential environmental impacts/approval process. Dredging would require availability of an appropriate vessel as well as the necessary authorization to be given quickly in an emergency situation, within 24 hours if possible. Dredging to help one animal can also result in significant unintended environmental consequences and may negatively impact other species in the area. Anecdotally, previous attempts to dredge the area around a whale have ended with the whale rolling into the dredged "hole" and then, unable to right itself to breathe, it drowned.

Q: When does the Network consider euthanasia?
If a stranded large whale is in overall poor condition (emaciated, malnourished, severe internal or external injuries, dependent calf with no adult present) and remains onshore after 1-2 tidal cycles euthanasia will be considered. This will be discussed on a case by case basis and the decision is made by the NOAA Regional Stranding Coordinator in consultation with the local Network group, attending veterinarian, and Marine Mammal Health and Stranding Response Program (MMHSRP) staff. This does not mean that euthanasia will be considered in every case, in some areas of Washington and Oregon the location and limited resources may prevent us from intervening safely or considering euthanasia. The weight of a large whale onshore can result in pressure necrosis on the underlying muscles and their lungs can collapse when a whale is not supported by water. Even if a whale was able to free itself during a subsequent incoming tide it would not likely survive the stranding following an extended period out of the water. Qualified veterinarians may recommend that euthanasia is the most humane option for the whale based on the condition of the animal, the circumstances, and available resources. If a decision is made to euthanize a large whale, the procedure will be conducted by qualified personnel under the authorization of the MMHSRP permit.

Q: What means of euthanasia are available for large whales?
Many options for humanely euthanizing animals have been considered in order to weigh risks with animal welfare concerns. Currently the preferred method for euthanasia of large whales is through a dose of potassium chloride (KCl). This has been used successfully in several cases with little toxicity risk to other animals that may scavenge the carcass after euthanasia allowing for natural carcass disposal, and at a

fairly reasonable cost for resource limited Networks. This method involves deep sedation so the animal is fully unconscious or 'asleep' before administering the potassium chloride. The location and condition of the animal in shallow water or if fully dry stranded may impact the ability of a Network veterinarian to safely approach the whale to administer the solution.

Q: Will the whale be in pain? Will the whale react? How long will it take?
The whale is first given a high dose of a strong sedative and an analgesic (painkiller) before being given the dose of potassium chloride to stop the heart. The initial doses are given with long, skinny needles that do not cause much pain, similar to a vaccine shot. The potassium chloride is then delivered through a large intracardiac needle that reaches the heart. As part of that process, the veterinarian needs to get backflow from the needle to make sure it is in the right place. This process may cause the whale to bleed at the injection site, which can look much worse when a relatively small amount of blood mixes with water. The whale may react by gaping its mouth or by raising the pectoral flippers or flukes which is known as the "last swim". This may be difficult to witness but if euthanasia is being administered, qualified veterinarians have determined it is the most humane option for the whale. The time of death varies for each case; sedation to death can range from 48 minutes to 2 hours and 18 minutes. From the time the potassium chloride is administered to death ranges from 4 minutes to 10 minutes. The potassium chloride works by inhibiting the ability of the heart muscles to contract and effectively stops the heart when administered.

Q: What are the options for responding to a free swimming large whale that has an injury, unusual behavior, or is debilitated?
There are very few options for treating a free swimming large whale. Many times treatment with medication such as antibiotics cannot address the underlying reason of why the animal is debilitated or injured. The West Coast Marine Mammal Stranding Network can consider administering antibiotics on a case by case basis if the treatment could lead to the improved condition of the whale. Large free swimming whales cannot be humanely euthanized at sea, the tools to do so safely simply do not exist at this point in time.

Q: What can be learned from live large whale strandings?
Every year there are thousands of reports of stranded marine mammals (this includes whales, dolphins, porpoises, seals and sea lions) throughout the West Coast Region. Each case can hold important information about the species which can contribute to scientific research or public education. The West Coast Marine Mammal Stranding Network conducts necropsies on large whales that have stranded to better understand the cause of death by collecting a range of samples for analysis. The analysis of these samples may take weeks or even months, but as results become available we can share those results with members of the public or the media if requested. The necropsy is extremely important; it provides valuable insight into the health of these animals and the data collected may help animals in the future.
For more information on major findings from research related to stranded animals on the West Coast, please
visit: http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/stranding_network_publications.html

Q: What is the West Coast Marine Mammal Stranding Network?
The National Oceanic and Atmospheric Administration (NOAA) West Coast Marine Mammal Stranding Network was established in the early 1990's under the Marine Mammal Protection Act (MMPA). Members of the network respond to marine mammal stranding events along the California, Oregon, and Washington coasts and is part of a nationwide network. To learn more about the West Coast Marine Mammal Stranding

Network please
visit: http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/stranding_network.html

Q: How are the Network responders authorized?
The network is composed of cooperating scientific investigators and institutions, volunteer networks and individuals. Other organizations also involved are wildlife and fisheries agencies and state and federal law enforcement. Each group is authorized by NOAA Fisheries to respond to marine mammal strandings within a specific geographic response area through a Stranding Agreement or Stranding Rehabilitation Agreement. The Marine Mammal Protection Act authorizes local or State government officials to respond in the normal course of their duties under 50 CFR 216.22.

Q: What role does NOAA play?
NOAA's Marine Mammal Health and Stranding Response Program was formalized by the 1992 Amendments to the Marine Mammal Protection Act and NOAA's National Marine Fisheries Service was designated as the lead agency to coordinate related activities. Each Region (Alaska, Pacific Islands, West Coast, Southeast, and Greater Atlantic) has a Regional Stranding Coordinator that oversees the Network responders. For contact information for your Regional Stranding Coordinator please
visit: http://www.nmfs.noaa.gov/pr/health/coordinators.html

Guidelines for Live Stranded Cetaceans*
West Coast Region 2018

*Even under the best circumstances, cetacean rescue involves some element of risk, and the larger the animal, the greater the difficulties and potential hazards. It is better to abandon a rescue attempt than risk serious injury to the team (Geraci & Lounsbury, 2005).

1. When you receive a phone call about a live stranded cetacean (whale, dolphin or porpoise):
    a. Ask for the reporting parties name, phone number, record the date and the time of the call, species (or description), status (how long it has been alive and stranded on the beach, injuries, etc.), and the exact location. If this is an ESA listed species contact your NOAA Fisheries Regional Stranding Coordinator to coordinate response under Permit 18786-03.
    b. Respond as quickly as possible – in some cases reporting parties are willing to assist until you are able to get on scene.
        i. Before you arrive at the site or leave the office look at the tide cycle for the day to determine how long the animal will be out of the water, including weather conditions (wind, wave action, temperature) and sunrise/sunset times to help determine safe periods of access.
        ii. The minimum supplies you will need to respond to a live cetacean stranding are: zinc oxide, vegetable or mineral oil, large thin sheets, several buckets, stopwatch or wrist watch that marks seconds to monitor respiration, tape for creating a perimeter, a tape measure to determine length (for calculating estimated weight), business cards for outreach, Level A data form, gloves, tide table book, boots, and appropriate clothing.

2. Responding to a live cetacean stranding:
    a. Arrive at the site.
    b. Assess human safety concerns immediately then proceed to confirm the circumstances of the stranding.
        i. Identify species, condition, and location of the animal.
        ii. Large Whale (See #3)
        iii. Small Dolphin or Porpoise (See #4)
    c. Identify roles and responsibilities for each network member on scene.
        i. On-site Coordinator – Responsible for the safety of volunteers at the scene, response planning decisions, and coordination with local authorities. This individual is a Stranding Agreement Holder, Agreement Holder Co-investigator, NOAA Fisheries MMHSRP staff or designee. The On-site Coordinator may conduct the field health assessment, delegate the task to a specialist or veterinarian at the scene, or share the responsibility with a specialist or veterinarian at the scene.
        ii. Media and Information Coordinator – Responsible for communicating with NOAA Fisheries Regional MMHSRP, representing the response team to the media, and providing information to the public about the response.
        iii. Field Health Assessment – To be conducted by the On-site Coordinator or designated veterinarian or species specialist. This may include collecting

samples (blood, skin, whale lice, etc.) and completing steps identified in 3 (d) or 4 (d) below.

iv. Animal Husbandry Team – Support staff for the response under the direction of the On-site Coordinator and designated veterinarian, and responsible for animal care and humane treatment. Tasks include applying zinc oxide, keeping the animal comfortable (protection from sun burn, cooling, keeping the animal wet), monitoring the overall condition of the animal, monitoring respirations, etc.

v. Field Safety Team – Support staff under the direction of the On-Site Coordinator; responsible for public safety and limiting animal stress. Tasks include establishing a safety perimeter to limit access (public, media) to the animal and to reduce stressors to the animal during the response. Maintaining crowd control in a non-confrontational manner. Directing media and public information inquiries to the Media and Information Coordinator. Notifying the On-site Coordinator if Law Enforcement assistance is required for crowd control or additional public safety support.

3. Live Large Whale Strandings
   a. Remember, your safety comes first. Do NOT approach the animal if it is thrashing in shallow water or on the beach.
   b. If the whale is on the beach and is not moving - slowly approach from the front or side; avoid abrupt movements, loud sounds, or bright lights.
   c. Do a basic health assessment of the animal.
      i. <u>KEEP CLEAR of the mouth, pectoral flippers, and flukes.</u>
      ii. Look at the overall condition of the animal – is the skin sloughing or blistering? Are there any obvious wounds or injuries? Fresh blood?
      iii. Is the animal:
         1. Alert? (Aware and responsive)
         2. Weakly responsive? (Responsive only after stimulation)
         3. Non-responsive? (Not responding to noise or touch. A gentle tapping near the eye should elicit a blink.)
      iv. How often is the whale breathing? Use a stopwatch to time breathing intervals.
         1. Normal breathing intervals for large whales are once every fifteen to twenty minutes (Geraci & Lounsbury, 2005). In the case of a live gray whale stranding in Washington the respirations were typically once every five minutes. There is little data on what normal respirations are for live strandings but this is important to monitor respiratory fatigue.
         2. If the respirations are slower than expected, a firm splash of water over the closed blowhole may stimulate breathing.
      v. Determine the length and age class of the animal (age class length and weight estimates for Pinnipeds and Cetaceans are available in the WCMMSN stranding handbook under the Species ID section; weight estimates from length can also be determined from WhaleScale app, available for iPhones).
   d. Cover the whale with a large sheet if possible – this will help protect the skin from sun exposure. Do NOT cover the blowhole with the sheet. Use zinc oxide on the

areas still exposed (the blowhole and head). An application of zinc oxide will protect the skin from sun and windburn and help prevent dehydration; it can be purchased at any drug store.

i. Stay clear of the flukes and pectoral flippers – if the animal attempts to move you will be in a dangerous position.

e. Pour buckets of water over the animal to keep the sheet wet – this will help keep the animal cool while it is out of the water. Always apply water from a source close to the skin to minimize the startle reflex. You could also consider using a garden sprayer to mist the animal.

i. We encourage network members to be working around the animal and the public to be a safe distance away. Proper gear such as wet or dry suits should be worn by responders if they are going to be in the water with the animal. If the public is on scene and is helping with the response make sure they know the basics (do not pour water near the blowhole, stay clear of flukes and pectoral flippers, and once the incoming tide covers the pectoral flippers they will be asked to go to shore).

f. Continue to monitor and tend to the animal while it is onshore. Once the incoming tide has covered the front pectoral fins and the water is midway up the side of the animal move back from the animal. Monitor from shore.

g. Hopefully the animal will refloat once it is covered by the incoming tide. In previous cases the whale has not attempted to swim away until it had been covered by the tide for ~ 1 hour.

i. If the animal is able to swim away try to monitor its behavior from shore or from a small boat – is the animal surfacing in regular intervals? Regular surfacing for a slow traveling gray whale is roughly 5-7 minutes between surface series with 3 to 4 breaths per series, but may be longer (12 – 15 minutes) if it was a terminal dive.

ii. Long-term monitoring through tagging (satellite, VHF) is the most reliable means of determining whether the animal has survived. Identification from photographs of distinguishing marks (dorsal fin, humpback whale flukes, gray whale pectoral fins) may be used to resight an animal returning to the water or if it restrands in another location.

h. The West Coast Region does have the tools to euthanize large whales safely and humanely when it is appropriate to do so. The first step in the response is to keep the animal as comfortable as possible while it is stranded by administering supportive hospice care for the first 1-2 tidal cycles. If the animal remains on shore after 1-2 tidal cycles without refloating or expiring we may consider euthanasia. The decision to euthanize is not taken lightly and will be discussed by the Regional Stranding Coordinator, local stranding response group, MMHSRP staff and the attending veterinarian.

4. Live Small Dolphin or Porpoise Strandings (NOTE: consult specific response plan for killer whales)

a. Remember, your safety comes first. Do NOT approach the animal if it is thrashing in shallow water or on the beach.

b. The West Coast Region does not currently have a rehabilitation facility that can admit small dolphins or porpoises. We have several options:

i. Release the animal if it is healthy or viable – can the animal be moved back into the water? (See (e) below)
ii. If the animal is too large to move into the water, you can leave it onshore until the tide comes in. (See (f) below)
iii. Transport the animal to a facility for euthanasia. (See (g) below)
iv. Euthanize the animal on scene. (See (h) below)

c. If the dolphin or porpoise is on the beach and is not moving - slowly approach from the front or side; avoid abrupt movements, loud sounds, or bright lights.
d. Do a basic health assessment of the animal.
    i. KEEP CLEAR of the mouth and flukes.
    ii. Look at the overall condition of the animal – is the skin sloughing? Are there any obvious wounds or injuries? Fresh blood?
    iii. Is the animal:
        1. Alert? (Aware and responsive)
        2. Weakly responsive? (Responsive only after stimulation)
        3. Non-responsive? (Not responding to noise or touch. A gentle tapping near the eye should elicit a blink)
    iv. How often is the animal breathing? Use a stopwatch to time breathing intervals.
        1. Normal breathing intervals for small dolphins and porpoises are six to eight breaths per minute (Geraci & Lounsbury, 2005). There is little data on what normal respirations are for live strandings but this is important to monitor for respiratory fatigue.
        2. If the respirations are slower than expected, a firm splash of water over the closed blowhole may stimulate breathing.
    v. Determine the length and age class of the animal (age class length and weight estimates for Pinnipeds and Cetaceans are available in the WCMMSN stranding handbook under the Species ID section; weight estimates from length can also be determined from WhaleScale app, available for iPhones).
e. Option i: Release the animal if it is healthy or viable – can the animal be moved into the water? A well planned release offers the best chance of survival.
    i. An animal can be placed onto a stretcher and then lifted to the water's edge. Once the animal is in the stretcher make sure no seams or creases press into the skin.
    ii. If the animal will remain in the stretcher for more than 20 minutes provide openings for the flippers and genital region.
    iii. If you do not have a stretcher at the site you can carry the animal to the water's edge by supporting the midsection – do not carry the animal by holding onto the flippers, dorsal fin, or flukes.
    iv. Once in the water support the animal keeping the blowhole above the surface. Acclimation is not complete until the animal is able to surface on its own to breathe. Acclimation can take time and proper gear such as wet or dry suits should be worn by responders if they are going to be in the water with the animal.

v. If the animal does not attempt to swim away, continues to restrand, or is non-responsive you need to reassess the situation and consider options iii (g) or iv (h) listed below.

f. Option ii: If the animal is too large to move back into the water, you can leave it onshore until the tide comes in.
    i. Cover the animal with a sheet or towels if possible – this will help protect the skin from sun exposure. Do NOT cover the blowhole with the sheet. Use zinc oxide on the areas still exposed (the blowhole and head). An application of zinc oxide will protect the skin from sun and windburn and help prevent dehydration.
        1. Stay clear of the flukes– if the animal attempts to move you will be in a dangerous position.
    ii. Pour buckets of water over the animal to keep the sheet wet – this will help keep the animal cool while it is out of the water. Always apply water from a source close to the skin to minimize the startle reflex.
        1. Summer: Provide shade for the animal, drape the sheet over the animal leaving the dorsal fin exposed, keep sheets moist, and dig holes for the flippers and fill with water.
        2. Winter: Provide protection from the wind if possible; drape the sheet over the animal and cover the dorsal fin and flukes with cloths soaked in vegetable or mineral oil, and dig holes for the flippers.
    iii. Continue to monitor and tend to the animal while it is onshore.
    iv. Hopefully the animal will refloat once it is covered by the incoming tide. Once in the water support the animal keeping the blowhole above the surface. Acclimation is not complete until the animal is able to surface on its own to breathe. Acclimation can take time and proper gear such as wet or dry suits should be worn by responders if they are going to be in the water with the animal.
    v. If the animal is able to swim away try to monitor its behavior from shore or from a small boat – is the animal surfacing in regular intervals?
    vi. If the animal does not attempt to swim away, continues to restrand, or is non-responsive you need to reassess the situation and consider options iii (g) or iv (h) listed below.

g. Option iii: Transport the animal to a facility for euthanasia.
    i. Identify an authorized facility that you can take the animal to and call them to confirm before removing the animal from the beach. You need to determine if they have the means to euthanize the animal when you arrive.
    ii. Cetaceans can be transported on stretchers, thick foam pads, or air mattresses.
    iii. Protect the animal from sun, wind, and exhaust fumes, and keep it cool and wet.
    iv. Transport the animal in a head first direction.
    v. When you arrive at the facility have the attending vet monitor the animal's respiratory rate, record body temperature, and collect a blood sample. The

animal should be euthanized as quickly as possible to prevent continued distress.

vi. After the animal has been euthanized consider doing a full necropsy. If you are unable to conduct a necropsy, please contact other network members to see if they have an interest in doing so.

h. Option iv: Euthanize the animal on scene.
    i. This should only be done by authorized individuals with the proper training and state accreditations.
    ii. The animal should be removed from the beach due to the toxicity of the euthanasia solution; it must be removed or buried deeply (after necropsy) if pentobarbital-containing euthanasia solution is used. After the animal has been euthanized consider doing a full necropsy. If you are unable to conduct a necropsy, please contact other network members to see if they have an interest in doing so.

[redacted]

From: Elizabeth Heeg
Sent: Friday, 23 July 2021 9:09 am
To: Bronwyn Saunders; Jack Mace; Ian Angus; Kristopher Ramm; Sarah Owen; Reg Kemper
Cc: Kirstie Knowles; Kevin OConnor
Subject: RE: List of experts consulted on orca calf incident
Attachments: List of expert advisers.docx

Now with attachment

From: Elizabeth Heeg
Sent: Friday, 23 July 2021 9:08 am
To: Bronwyn Saunders <bsaunders@doc.govt.nz>; Jack Mace <jmace@doc.govt.nz>; Ian Angus <iangus@doc.govt.nz>; Kristopher Ramm <kramm@doc.govt.nz>; Sarah Owen <sarahowen@doc.govt.nz>; Reg Kemper <rkemper@doc.govt.nz>
Cc: Kirstie Knowles <kknowles@doc.govt.nz>; Kevin OConnor <koconnor@doc.govt.nz>
Subject: FW: List of experts consulted on orca calf incident

FYI – since you'd asked for these figures as well Bronwyn

From: Kirstie Knowles <kknowles@doc.govt.nz>
Sent: Thursday, 22 July 2021 3:40 pm
To: [redacted]>; Elizabeth Heeg <eheeg@doc.govt.nz>
Subject: RE: List of experts consulted on orca calf incident

Thanks [redacted]
Elizabeth I would say at least 5 animal ethics people – 3 through AEC and 2 international IFAW people.

Kirstie Knowles (she/her)
Manager Marine Ecosystems – *Kaimātanga Mātai Ahu Moana*
Aquatic Unit, Biodiversity Group – *Kāhui Kanorau Koiora*
Department of Conservation – *Te Papa Atawhai*
Focal point for: IUCN-WCPA, Local Gov Coastal-SIG, Sustainable Seas Challenge, NZ Marine Sciences Society
☎ [redacted]

Mon	Tues	Wed	Thurs	Fri
✓	🏠	✓	✓	🏠

✓ = In the office; 🏠 = Working remotely; X = Not at work



From: [redacted]
Sent: Thursday, 22 July 2021 3:30 pm

To: Kirstie Knowles <kknowles@doc.govt.nz>; Elizabeth Heeg <eheeg@doc.govt.nz>
Subject: List of experts consulted on orca calf incident

Hi both,
I've quickly compiled a list of people who have provided advice and support to the orca calf incident. This is a minimum, and I'm certain that there are (many) others that I'm missing. The list is attached, with the summary counts below. This includes the TAG members and all other external sources of advice that I'm aware of, and excludes DOC staff except Lydia and the AEC members:

Total minimum number of advisors = 47

- Iwi - 2
- Veterinarians or orca husbandry experts – minimum of 22
- Animal ethics experts – minimum of 4
- Stranding response experts – minimum of 12
- Marine mammal researchers – 3
- Experts on foreign rehabilitation and release guidelines – 4

Cheers,
[redacted]

[redacted]
Technical Advisor, Marine Species
Kaimātanga Takutaimoana
Department of Conservation – *Te Papa Atawhai*
DDI: [redacted]

Total numbers (excluding DOC Aquatic and Ops staff):

- Iwi - 2
- Veterinarians or orca husbandry experts – minimum of 22
- Animal ethics experts – minimum of 4
- Stranding response experts – minimum of 12
- Marine mammal researchers – 3
- Experts on foreign rehabilitation and release guidelines – 4

DOC staff – 3 technical advisors, 1 veterinarian, 3 animal ethics experts
Aquatic Unit technical and science advisors: [redacted]
Veterinarians: [redacted]
Animal ethics committee: [redacted] Meg Rutledge, [redacted] (from SPCA)

TAG members – 2 iwi representatives, 5 veterinarians, 1 stranding response expert, 1 orca researcher, 1 animal ethics expert, 1 husbandry expert
Iwi: [redacted]
Wellington Zoo vet: [redacted]
HUHA vets: [redacted]
Orca researchers: Ingrid Visser (ORT and WR.org)
Stranding response expert: [redacted] (IFAW)
Sea World veterinarian: [redacted]
Academic veterinarian: [redacted] (UC-Davis)
Orca husbandry: [redacted]
Animal ethics: [redacted] (Massey)

Veterinarians or orca husbandry experts – minimum of 16
Wellington Zoo vets: [redacted] (+possibly others)
HUHA vets: [redacted] (+possibly others)
Loro Parque vets: [redacted]
Sea World: [redacted]
Vancouver Aquarium: [redacted]
Massey Uni: [redacted]
U of Florida: [redacted]

Stranding response experts– minimum of 11
IFAW: [redacted]
IWC strandings expert panel: [redacted] + at least 8 other panel members

Marine mammal researchers
Massey Uni: [redacted]
Auckland Uni: [redacted]

Experts on US rehabilitation and release guidelines
NOAA: [redacted]
Seattle Aquarium: [redacted]

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 1:08 pm
To: [redacted]
Cc: [redacted] Kirstie Knowles
Subject: Re: VHF Tag

Hi [redacted]

Thanks so much for that. I haven't got a lot of spares as far as derrilin sleeves etc so if they were able to be sent too that would be awesome or I could ask [redacted] to send more.

Sounds like it would make sense to get a tag in the post but in the meantime if the opportunity presented can apply the satellite tag and take it from there.

Is it easy to source a VHF tag that would work with the frequency of our recievers and yagis? If so who is best to communicate to about that?

Thank you again!

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 12:56 PM
To: [redacted]
Cc: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Subject: Re: VHF Tag

Hi [redacted]

Thank you for passing along the frequency range of your receivers and yagis it's very helpful. So by the Sound of it you will only need the tag, correct?

The reason I strongly suggest pairing a VHF tag with a SAT tag is that even with the new satellites the lag time often exceeds 10 min before receiving a location. Even with optimal sea conditions and a class 3 signal (range of within 250m) an animal swimming at an average swim speeds and average div times the animal can often be out of visual range by the time you receive a signal.

I am very familiar with the limitations of Wildlife Computers Spot 5 and splash tags, I helped develop and test these tags over the last 20 years. They are fantastic tags but for this application, with a high profile animal in the middle of a NZ winter I feel its very important to pair the Sat. with the VHF line of sight tag. In my opinion the addition of one more small hole is certainly worth the peace of mind knowing that you've done everything you possibly could for the animal in your post release effort, it would be foolish not too.

Hope this makes sense and helps.

Good luck and all the very best!

[redacted]

Sent from my iPhone

On Jul 22, 2021, at 2:51 AM, [redacted] wrote:

H[redacted]

Apologies form being slow to reply especially given you are moving and have still managed to send messages!

I was trained by [redacted] in the application of satellite tags and they are giving us a refresher tomorrow so I am fairly comfortable with the procedure 😊

If you have time – I am keen to understand why a VHF is so strongly recommended. I know it can provide better close in directional guidance (I am very familiar with telemetry as we use it a lot for kākāpō). Just given the impact of a second attachment point and increased drag I am not sure I am convinced this is needed given the accuracy of modern satellite tags especially with air support (which we anticipate will be available).

The tag IFAW have supplied us has accuracy of

- Class 3: better than 250 m radius
- Class 2: better than 500 m radius
- Class 1: better than 1500 m radius
- Class 0: over 1500 m radius

Near real time tracking can be accomplished by using the CLS app. With new satellite hits are processed by the system and showing up in the app in about 5 to 10 minutes from transmission.

These are the standard recievers we have https://www.telonics.com/products/vhfReceivers/tr-4.php I know these are pretty old school now and there are TR-8 also available covering the entire band from 138MHz to 235MHz. Yagi (antennae) frequency range - 150- 250MHz.

Would love your thoughts if possible.

[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 6:11 AM
To: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Subject: VHF Tag

Hi [redacted]

Attached is the specs of the tag we're hoping to have donated by NMFS.

We would be using a single point attachment on the trailing edge of the dorsal.

[redacted] should be able to send you the attachment protocols, unfortunately I am are in the process of moving and I can't seem to locate the protocol that we typically use.

When we were on the TAG call over the weekend, someone (possibly Ingrid) mentioned that they had access to receivers and antennas. Do you know what frequencies they would be? It's important to make sure that the tag that we send is the same frequency range as the antennas and receivers that you have access too.

Good luck down there and all the very best!



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[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Friday, 23 July 2021 2:58 pm
To: [redacted]
Cc:
Subject: RE: Supplies for tagging

Wonderful! It would be very exciting if you need this soon!

From: [redacted]
Sent: Friday, 23 July 2021 2:53 pm
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: RE: Supplies for tagging

Oh you are amazing! Will see if I can get EMLA cream from a pharmacy. Sounds like a brilliant kit set up! Thank you! (Super happy with F10 😀)

Team are sorting someone to come collect the gear!

From: [redacted]@wellingtonzoo.com>
Sent: Friday, 23 July 2021 2:20 PM
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: RE: Supplies for tagging

No EMLA unfortunately, sorry. We also don't have the cidex but put F10 in instead so you'll just need to rinse it off really well. The betadine ointment expired last year but was never opened so should be ok I think. We haven't been able to get more in so that's all we have. We also didn't make up the iodine swab sticks for the same reason. Everything else should be there though!! Did you have a plan for picking it up or do we need to find a courier to get it out there?

On an unrelated note, how are the feeds going today?

[redacted] BA DVM
Resident Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
E [redacted]@wellingtonzoo.com

From: [redacted]
Sent: Friday, 23 July 2021 1:49 pm
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: Re: Supplies for tagging

Ooh have you got Emla cream too?

From: [redacted]>
Sent: Friday, 23 July 2021 1:45 PM
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>

Cc: [redacted]@wellingtonzoo.com>
Subject: Re: Supplies for tagging

Maybe confirmed but no IDs yet...

Sounds like not moving anywhere today but need to be ready for tomorrow

---

From [redacted]@wellingtonzoo.com>
Sent: Friday, 23 July 2021 1:05 PM
To: [redacted]>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: RE: Supplies for tagging

[redacted] is onto it!
Confirmed sighting?

Me tiaki, kia ora!

[redacted]
Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph +[redacted]
E [redacted] | W www.wellingtonzoo.com |



From: [redacted]
Sent: 23 July 2021 13:01
To: [redacted]@wellingtonzoo.com>; [redacted]wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: RE: Supplies for tagging

Sheeesshhhh.... Sighting..... Might all be kicking off today or tomorrow.... Probably need to pick up tonight if that was possible...!

From: [redacted]wellingtonzoo.com>
Sent: Friday, 23 July 2021 12:29 PM
To: [redacted]i@wellingtonzoo.com>
Cc: [redacted]wellingtonzoo.com>
Subject: RE: Supplies for tagging

No worries—it will likely be the nurses doing a lot of this to be fair...I just need to make sure for the non-consumables that they don't mind first.

From: [redacted]
Sent: Friday, 23 July 2021 12:28 pm
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>

Cc: [redacted]wellingtonzoo.com>
Subject: RE: Supplies for tagging

You are amazing! THANK YOU! I was wondering if some kidney dishes and just general stuff like that might be useful too (I like them for sterilising and prep etc)

From: [redacted]wellingtonzoo.com>
Sent: Friday, 23 July 2021 12:24 PM
To: [redacted]wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: RE: Supplies for tagging

H[redacted]

I'm happy to get this together for you today assuming the nurses don't mind me packing a few extra things away!

[redacted]

From: [redacted]doc.govt.nz>
Sent: Friday, 23 July 2021 12:22 pm
To: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>
Subject: Supplies for tagging

Hi Team,

I have a list of things I would love to get to enable tagging if possible. Where it says "bottles" of things I wonder about small containers unless you are happy to supply bottles!

With the lidocaine it is often just put in serum blood tube or similar and the cotton buds are just soaked in it… Could also just borrow a bottle and draw it up as needed.

From Zoo

- Forceps (2)
- Hemostats (1)
- Sterile saline wound wash spray (1)
- Sterile gauze pad packs (10)
- Non-sterile cotton swabs (5 sets)
- Betadine / Povidone-iodine / Chlorhexidine surgical scrub bottle (1)
- Betadine / Povidone-iodine swab sticks (4 sets)
- Sterile isopropyl alcohol wipes (20 each) or bottle of isopropyl and gauze pack
- Cold sterile (Cidex) soak in small container for attachment parts & tools
- Chlorhex ointment (or other disinfectant ointment) (1)
- Sterile gloves (a few pairs of whatever you have)
- Sterile water/saline bottle
- Lidocaine-soaked sterile cotton tips
- Cryovials
- Prep tray for holding supplies

Let me know if anything isn't possible and I will see what I can do!

Thanks again for all you are doing!

[redacted]

[redacted]
Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*
Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand
Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand
http://kakaporecovery.org.nz/



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[redacted]

From: Elizabeth Heeg
Sent: Friday, 23 July 2021 6:29 pm
To: [redacted]@massey.ac.nz; [redacted]@animalwelfareexpertise.com
Cc: Kristopher Ramm; Kirsty Prior; Reg Kemper; Sarah Owen; [redacted]
Subject: FW: Toa and ethical decision making

Kia ora [redacted],
I'm the Director of the Aquatic Unit here at the Department of Conservation in New Zealand and Kirstie Knowles who's in my team sent me your kind offer below.

I was wondering if either of you would be available for a meeting we're holding with our iwi partners Ngāti Toa and also Ingrid from Whale Rescue at 4pm tomorrow to discuss the options around Toa's care and welfare. I could also discuss with you earlier in the day with the technical team if you're able.

Appreciate that this would be a poor time frame for Europe but [redacted] would be great if we could have you there.

Thanks
Elizabeth



From: [redacted]massey.ac.nz>
Sent: Friday, 23 July 2021 1:37 pm
To: [redacted]animalwelfareexpertise.com>; [redacted]@massey.ac.nz>
Cc: [redacted]; Kirstie Knowles <kknowles@doc.govt.nz>; Ian Angus <iangus@doc.govt.nz>; Lydia [redacted]
Subject: RE: Toa and ethical decision making
Importance: High

Hi [redacted]– thanks for reaching out and sorry for my delayed response.

I know DOC have engaged welfare scientist and Massey colleague [redacted] (copied) but I haven't had an opportunity to catch up with her so I am a unclear as to what actual on the ground welfare assessment/monitoring is underway presently. [redacted], are you able to confirm?

I know Toa is getting excellent health assessments from the veterinarians who are doing a first class job with health monitoring but I am imagining robust behavioural welfare assessments are underway too, hopefully by someone independent of the care team itself. This independence is important I feel as we are starting to note large contradictions between the official vet informed DOC updates versus that of onsite rescue team. Yesterday evening, especially due to the stark contrasts in messaging, the public seemed very confused by conflicting posts. An independent assessor of welfare would go a long way in this regard and perhaps [redacted] has already recommended someone or even has someone on the ground already.

I am copying in the DOC Lead Ian Angus and the DOC Technical Advisory Group (TAG) here in case they are keen to chat about the stakeholder work you discuss below for the Belgian Government in case this could also be of assistance in this case with Toa.

Thanks again for reaching out [redacted] – appreciate it.

[redacted]

From: [redacted] animalwelfareexpertise.com>
Sent: Tuesday, 20 July 2021 11:38 PM
To: [redacted] massey.ac.nz>
Subject: Toa and ethical decision making

Hi [redacted] !

Hope all is well - saw your piece on the news re. Toa and think you're spot on. Must be such a difficult situation.

I wanted to reach out as I'm running an ethical study at the moment with the Belgian Government, where the approach has many parallels with Toa's situation. I'm working with a group of stakeholders to evaluate different scenarios using a modified ethical matrix approach.

The goal is not to come out with a decision, but to build consensus around the harms and benefits to the animal/people/the environment of each alternative scenario.

I was thinking that a similar approach might be really useful for Toa's situation, since I'm sure there are many stakeholders with different opinions about what should happen. It could be done in one session if need be.

Let me know if any of this sounds like it could be useful. I'm also aware that the government probably has lots of people working on this already, so no problem if they've got it covered!

All the best,

[redacted]

[redacted]
Founder, Animal Welfare Expertise
www.animalwelfareexpertise.com
[redacted]

[redacted]

[redacted]

From: [redacted]@zoo.nsw.gov.au>
Sent: Friday, 23 July 2021 7:44 pm
To: [redacted]
Cc: [redacted]
Subject: RE: FW: Milk replacers available in Australia

Oops, sorry [redacted]. I didn't see your reply.

If [redacted] used that in practice then go with what's worked on orcas! I was just formulating on the fly based on sea lions ☺

[redacted]
Zoo & Wildlife Nutritionist


I acknowledge the traditional custodians of the land on which I live and work, and pay my respect to Elders both past & present.

From: [redacted]
Sent: Friday, 23 July 2021 5:31 PM
To: [redacted]
Cc: [redacted]@aucklandzoo.co.nz>; [redacted]@zoo.nsw.gov.au>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Re: FW: Milk replacers available in Australia

Yes. I use double strength divetelact with supplemental Calogen. Can you get those products?

On Fri, Jul 23, 2021 at 4:18 PM [redacted] wrote:

> Hi [redacted],
>
> Thanks so much for putting us in touch [redacted]! We have been corresponding closely with SeaWorld, Vancouver Aquarium and Loro Parque vets over this little calf. We were hoping for some local knowledge on milk replacer options in Australia.
>
> The calf is a 2.15m long male who stranded on the 11th July. Witnessed stranding whereby the calf was washed into a rock pool by misadventure. He was brought into care at that stage. Age estimates vary from 2-6 months of age. As far as we can so far determine he appears to be medically stable (though we know this can change very quickly). Our biggest challenge is getting a milk formula correct. In the USA they use Zoologic 50/32 (I think those are the correct numbers) which is 50% fat. The option we have readily available here is AnLamb which is only 25% fat.
>
> There are currently many scenarios in play but our job is to do our best to care for him whilst he is in human care. As such I was interested in knowing if you had any thoughts on specialist milk replacers with higher fat content.

Thanks so much for any help,

[redacted]

From: [redacted] >
Sent: Friday, 23 July 2021 5:45 PM
To: [redacted] @aucklandzoo.co.nz>; [redacted]
[redacted]
Cc: [redacted] @zoo.nsw.gov.au; [redacted] @aucklandzoo.co.nz>
Subject: Re: FW: Milk replacers available in Australia

Have we got a length on this calf? Estimated age?

On Fri, Jul 23, 2021 at 3:26 PM [redacted] @aucklandzoo.co.nz> wrote:

> [redacted],
>
> Would you be able to advise [redacted] (DOC vet) on feeding options for a stranded ORCA calf? Hope you don't mind me sharing your contact details.
>
> [redacted]
>
> [redacted] is our nutritionist and may have some insight into formulas for your team. [redacted] has been a Sea World Australia vet who has a lot of experience with cetaceans in captivity and stranding (and wrote the cetacean chapters in the Medicine of Aus Mammals 1 & 2). They should be able to help you out. I don't have much of the back story for this calf, so please share its history and reasoning behind hand-raising it with these guys so they understand your goals (and for me, too).
>
> All the best…New Zealand awaits your visit!!
>
> [redacted]
>
> [redacted] | Zoo and Wildlife Veterinarian
> **Auckland Zoo | Te Whare Kararehe o Tamaki Makaurau**
> **Wildlife Conservation Science at work**
> Private Bag 78700, Grey Lynn
> Auckland 1245, New Zealand
> –
> [redacted]
> www.aucklandzoo.co.nz

From: [redacted]>
Sent: Friday, 23 July 2021 11:54 am
To: [redacted]@aucklandzoo.co.nz>
Cc: [redacted]@wellingtonzoo.com>; Ashley Whitehead [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Milk replacers available in Australia

HI [redacted]

Hope all is going well up in Auckland. I was wondering If you had any thoughts… or could put me in touch with anyone from Taronga that might have thoughts on what milk replacers are available in Australia. We are just reviewing the diet for the orca calf and talking to the Sea World (USA) vets they have a milk replacer which is 50% fat (our current NZ version is 25% fat).

My immediate thought was Wombaroo as I know they have some pretty niche diets but thought you might have some contacts too.

Thanks so much!

[redacted]

[redacted]

Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*

Postal address: Department of Conservation, PO Box 743, Invercargill 9840, New Zealand

Physical address: Department of Conservation, Level 7, 33 Don Street, Invercargill 9480, New Zealand

http://kakaporecovery.org.nz/

[redacted]

From: [redacted]@zoo.nsw.gov.au>
Sent: Friday, 23 July 2021 7:41 pm
To: [redacted]
Cc: [redacted]
Subject: RE: FW: Milk replacers available in Australia

Hi [redacted],

I'd start with your AnLamb but use thickened cream and flax oil to bump up the fat level. You could use fish oil but we've just found the fish oil we've had is really inconsistent.

When we want to increase the fat in Wombaroo's sea lion formula which is 27% fat, we warm 500ml cream (35% fat) and 200ml oil to about 30° C. Then slowly add 250-300g of the milk powder and mix gently to avoid aeration. To reduce lactose content we add lactase drops (e.g. Lacteeze™) to the cold cream beforehand. We'll make it with less or without the oil (and 300g powder vs 250g) if more concerned with hydration over calorie intake.

I would definitely contact Wombaroo if you had time but I'm also copying in [redacted]. She is the nutritionist from Sea World in the USA. I understand you spoke to the vets there but just in case they didn't reach out to her, she might have info on orca milk or have some other suggestions that don't involve shipping overseas ☺

Cheers,
[redacted]

[redacted]
Zoo & Wildlife Nutritionist


I acknowledge the traditional custodians of the land on which I live and work, and pay my respect to Elders both past & present.

From: [redacted]
Sent: Friday, 23 July 2021 4:19 PM
To: [redacted]@aucklandzoo.co.nz>
Cc: [redacted]@zoo.nsw.gov.au>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: RE: FW: Milk replacers available in Australia

Hi [redacted],

Thanks so much for putting us in touch [redacted]! We have been corresponding closely with SeaWorld, Vancouver Aquarium and Loro Parque vets over this little calf. We were hoping for some local knowledge on milk replacer options in Australia.

The calf is a 2.15m long male who stranded on the 11th July. Witnessed stranding whereby the calf was washed into a rock pool by misadventure. He was brought into care at that stage. Age estimates vary from 2-6 months of age. As far as we can so far determine he appears to be medically stable (though we know this can change very quickly). Our

biggest challenge is getting a milk formula correct. In the USA they use Zoologic 50/32 (I think those are the correct numbers) which is 50% fat. The option we have readily available here is AnLamb which is only 25% fat.

There are currently many scenarios in play but our job is to do our best to care for him whilst he is in human care. As such I was interested in knowing if you had any thoughts on specialist milk replacers with higher fat content.

Thanks so much for any help,

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 5:45 PM
To: [redacted]@aucklandzoo.co.nz>; [redacted]
Cc: [redacted]@zoo.nsw.gov.au; [redacted]@aucklandzoo.co.nz>
Subject: Re: FW: Milk replacers available in Australia

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>
> Would you be able to advise [redacted] (DOC vet) on feeding options for a stranded ORCA calf? Hope you don't mind me sharing your contact details.
>
> [redacted]
>
> [redacted] is our nutritionist and may have some insight into formulas for your team [redacted] has been a Sea World Australia vet who has a lot of experience with cetaceans in captivity and stranding (and wrote the cetacean chapters in the Medicine of Aus Mammals 1 & 2). They should be able to help you out. I don't have much of the back story for this calf, so please share its history and reasoning behind hand-raising it with these guys so they understand your goals (and for me, too).
>
> All the best…New Zealand awaits your visit!!
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> [redacted]
>
> [redacted] **| Zoo and Wildlife Veterinarian**
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> Private Bag 78700, Grey Lynn
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> –
> [redacted]
> www.aucklandzoo.co.nz

From: [redacted]
Sent: Friday, 23 July 2021 11:54 am
To: [redacted]@aucklandzoo.co.nz>
Cc: [redacted]@wellingtonzoo.com>; [redacted]
<[redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: Milk replacers available in Australia

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Thanks so much!

[redacted]

[redacted]

Veterinary Advisor Kākāpō - *Kaitohutohu Rata Kararahe Kākāpō*

Department of Conservation - *Te Papa Atawhai*

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http://kakaporecovery.org.nz/

[redacted]

From: [redacted]@animalwelfareexpertise.com>
Sent: Friday, 23 July 2021 7:18 pm
To: Elizabeth Heeg
Cc: [redacted]@massey.ac.nz; Kristopher Ramm; Kirsty Prior; Reg Kemper; Sarah Owen; [redacted]
Subject: Re: FW: Toa and ethical decision making

Hi [redacted],

Thanks very much for your email, and thanks also [redacted] for linking us up!

Elizabeth I'd be very happy to join the meeting tomorrow and contribute in any way I can. I'm actually based in Sydney, so 4pm NZ time would work fine for me. I'm also available earlier in the day if needed.

Many thanks,

[redacted]

[redacted]
Founder, Animal Welfare Expertise
www.animalwelfareexpertise.com
[redacted]

[redacted]

On Fri, 23 Jul 2021 at 16:28, Elizabeth Heeg <eheeg@doc.govt.nz> wrote:

> Kia ora [redacted],
>
> I'm the Director of the Aquatic Unit here at the Department of Conservation in New Zealand and Kirstie Knowles who's in my team sent me your kind offer below.
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> I was wondering if either of you would be available for a meeting we're holding with our iwi partners Ngāti Toa and also Ingrid from Whale Rescue at 4pm tomorrow to discuss the options around Toa's care and welfare. I could also discuss with you earlier in the day with the technical team if you're able.
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> Appreciate that this would be a poor time frame for Europe but [redacted] would be great if we could have you there.

Thanks

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Sent: Friday, 23 July 2021 1:37 pm
To: [redacted]@animalwelfareexpertise.com>; [redacted]@massey.ac.nz>
Cc: [redacted]; Kirstie Knowles <kknowles@doc.govt.nz>; Ian Angus <iangus@doc.govt.nz>; Lydia [redacted]
Subject: RE: Toa and ethical decision making
Importance: High

Hi [redacted] – thanks for reaching out and sorry for my delayed response.

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Thanks again for reaching out [redacted] – appreciate it.

[redacted]

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Sent: Tuesday, 20 July 2021 11:38 PM
To: [redacted]@massey.ac.nz>
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Let me know if any of this sounds like it could be useful. I'm also aware that the government probably has lots of people working on this already, so no problem if they've got it covered!

All the best,

[redacted]

[redacted]
Founder, Animal Welfare Expertise
www.animalwelfareexpertise.com
[redacted]

[redacted] [redacted]

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 6:20 am
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

I am sorry I can't attend the Teams call tonight (your morning) but would be happy to set up another time later on if you would like to discuss ultrasound or formulas again.

With the data provided here below I checked back the girth measurements we had from our calves and at 1,5 month of age, our female was 1,38 cm behind the pectoral fins.

I concord with [redacted] that it is better to have formula in without fish than something aversive.

Going back again to some previous discussion, from our experience with the 3 calves, the issue was really the volume of formula. I know I keep on stressing this, but we absolutely found out that a volume of 1,5 L if you have such small calves (and actually even in older calves), will yield problem with time and it will crash. Better to have lower volume more frequently than having ups and down. I think it is also better to have a calf growing slower than what is expected when fed by mum, because it is not possible to give him as much calories, than having it crash regularly/regurgitate/having colics because of a volume he cannot process (not to mention the effects on the digestive system).

I am working on getting to you an excel file with our day to day formula over time (and the findings/ultrasounds/blood results) for you to compare. I will also make up a power point on what to look on ultrasound (definitely the digestive system) when scanning your animal. I just need a bit of time to do this, but will try asap.

To answer also a former question about survival chances. I believe that if the calf has no major health issues, it is very possible to raise him with artificial formula. The question of re-introduction in a pod or not is however out of my league.

Greetings to all

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]
www.lacavemmvs.com

On 22 Jul 2021, at 10:39, [redacted] wrote:

Hi Team,

So sorry for the radio silence today as I have been travelling to site. Certainly interesting to see it all in person. The calf has been moved back to the sea pen so will be interesting to see if a bit more movement and energy expenditure results in him being more interested in the feeds.

A quick talk to the HUHA team indicated that they think there may be some issues with hi not liking the teat that is being used.

Will be great to hopefully talk a bunch of this through tomorrow.

Thank you again for the advice on ultrasounding as well (and all the other advice!) You are all just so amazing.

Thank you!

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Thursday, 22 July 2021 5:24 PM
To: [redacted]@SeaWorld.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]@wellingtonzoo.com>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Thanks so much [redacted]

I've caught up with [redacted] who is a zoo/wildlife vet with DOC and will be orca-side this afternoon and for the next week, along with some other vets/biologists. We would be very interested on a Teams call tomorrow 8am our time, if you are still free and available for that time slow – yes please.

I will set up an invite for that and send it to you. I'm not very familiar with the technology so I'm not sure if it can be forwarded on to others – but if so feel free to invite anyone else you would like in the conversation. I'll invite our team, [redacted], and the vets who have been on-site for most of this week. We would be especially interested in talking about options for a short term and medium term feeding plan (recipe, frequency, volumes etc) based on our recent feeding experiences and talking about some tips on how to tweak things on a feed-by-feed or day-by-day basis, based on how he's going.

Also I put you wrong on the recipe earlier – we are using sardines, not anchovies :)

Thanks so much everyone.
Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com |

From: [redacted]@SeaWorld.com>
Sent: 22 July 2021 11:31
To: [redacted]@wellingtonzoo.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]
<[redacted]@wellingtonzoo.com>; [redacted]>;
[redacted]@loroparque.com>; [redacted]@doc.govt.nz>; [redacted]
[redacted]@wellingtonzoo.com>
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

We often do not add fish right away to the formula and ensure that they are eating it consistently, then gradually add it in. We have seen some cetacean calves have issue with salmon oil also, as it can be very high in % fat …however we know there are populations like the Pacific NW orcas that feed solely on salmon, so we know that they can tolerate it. We had similar problems with a stranded Cook Inlet beluga calf that had issues with the fat content in the diet and we had to back way off and start fresh with straight Zoologic formula and gradually add in fish in small amounts, because the oil can be a factor, but may be necessary when they are tolerating formula better to get the calories up.

Because you are finding yourselves diluting the formula with electrolyte solution, I would take out the salmon oil and fish and feed just formula, increasing percentage to 50 to 75%, then gradually add more oil in 50 ml increments.

It is better to feed 100% formula without fish then dilute formula with fish that is aversive. Do you have other species of fish that may be "blander" – sardines …what to the penguins eat there? Anchovies? Or other fish?

Happy to get on a Teams call tomorrow at 8 am your time if you want to chat more….

[redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Wednesday, July 21, 2021 3:52 PM
To: [redacted]@SeaWorld.com>;
[redacted]@loroparque.com>; [redacted]
[redacted]
Cc: [redacted]wellingtonzoo.com>; [redacted]
[redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

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The main problems we are having with the calf at the moment are associated with feeding. I was wondering if I could run a few questions past you around this please? I'm not immediately on-site myself yesterday or today, so I am passing information that the team there have passed on to me.

- Since the bout of colic overnight between Monday and Tuesday this week, he has had no more signs of gut pain. This resolved after he passed a few large faecals that night, so I suspect it was possibly volume-in-abdomen related pain with a full stomach and a full colon. He was rested until the morning after the colic resolved (no feeds until first thing in the morning), then he was given just vytrate for the first few feeds, and since then he's been on

½ strength formula – aiming for 10 feeds a day, at 1½ hour intervals, as much as he'll take up to about 1.5L per feed. We are aiming to start increasing our way to full strength formula again today.

- His current formula consists of:
    - 6 cups Milligans lamb milk replacer (300 g powder with 1.5 liters water)
    - 3000 mg dicalcium phosphate
    - 1000 mg Taurine
    - 1100 ml water
    - 1100 ml 0.9% NaCl injection
    - 120 ml 50% Dextrose
    - 200 ml salmon oil
    - 0.7 kg filleted anchovies and viscera
    - 3 mazuri tablets
    - (Makes 4 liter total volume, calculated to have ~1450kcal/L)
- This morning the team on-site have made the observation that he doesn't appear to "like" the fish component of the formula that we're feeding. Last night he spat the teat of the bottle out on a few occasions when it was full of formula, but when it was replaced with vytrate (an electrolyte solution) he drank readily from the bottle. This morning they split the diet into a few different components (I believe one batch of lamb milk with salmon oil, one batch of vytrate, and one batch of blended anchovies). When they fed these items separately, he readily bottle fed the milk/salmon oil, readily bottle fed the vytrate, but refused to feed on the bottle with the blended anchovies alone. When they told me that they'd tried this I advised to not feed the diet in separate components, and to try making a fresh batch of complete formula in case the older formula had aged a bit and developed a funny taste. I also recommended that if he was refusing bottle feeds that they stomach tube that feed so that we're still making sure that we're meeting fluid and caloric requirements as best as possible. He has not consistently refused formula from the bottle before and was feeding fine as far as I know Tuesday and most of Wednesday this week.
- Do you have any comments on the above? Any recommended changes? If it does seem like a food aversion to the fish component, could we try a different fish species like salmon or something?

And [redacted] in reply to your question in the other email chain: they haven't yet got a weight on him but hope to do so in the next couple of days – weather and equipment permitting! His recent girth measurements are as follows, which seems to suggest no measurable weight loss using this technique, although I appreciate this technique is sub-optimal. Will keep asking for girth data and monitor for trends while we await weight/s.

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- On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m

Thanks so much for all of your time on this so far, we really appreciate all your time and expertise.
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[redacted]

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Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | <image001.jpg> | <image002.jpg>

From: [redacted]@SeaWorld.com>
Sent: Thursday, 22 July 2021 7:21 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
[redacted]
Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted]

Thanks for the update. Hopefully the minor adjustments in formula volume and frequency can be dialed in, each animal is different and as your team has learned it is not as black and white as it should be, trial and see, welcome to marine mammal rehabilitation.
US probe size used is generally a 4-5 MHz probe. We and others have used portable laptop US, such as GE Logiqbook or Sonosite machines. Due to his size, one should be able to get fairly decent scans, however a small animal ultrasonographer will find that the image is not as good as small animal due to the attenuation of sound by the blubber layer. We usually have animals line-up on their side or at an angle so they can continue to breath regularly with mild restraint. One can reach under with probe and scan from ventral midline as well, a pair of goggles with HMDI connection and converter are helpful to see the image in goggles then straining to see on screen. For abdominal scan, important to recognize organ position (left – stomach, intestinal tract, kidney, bladder if full and right- liver, GI (connecting channel), kidney, bladder, testes may be small in him), note echogenicity, organ position, motility and thickness of GI tract and if any free fluid or ascites is present.

[redacted] can add other specifics too, she is a US wizard 😉

Look forward to see recent blood parameters.

Keep going with great effort, thanks,
[redacted]

From: [redacted]
Sent: Wednesday, July 21, 2021 5:18 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]
[redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted] and team,

Apologies it has been a rather frantic couple of days. The calf had a bout of colic 48 hrs ago which appeared to resolved fairly rapidly with removal of the formula and reverting to electrolyte feeds. The formula has been slowly re introduced since then. We have been trying to balance the advice around timing and volume of feeds received from all thee incredible vets who are helping us out.

Below is the vet update from today as provided by [redacted] at Wellington Zoo who is leading the on-site veterinary response.

Overall he appears fairly stable. We are talking to a veterinary imaging specialist about coming to ultrasound the calf so I imagine we may have a bunch of questions about probe size etc in the next 24ish hours. We are currently working on the information we have on ultrasounding cetaceans from the CRC Manual of Marine Mammal Medicine to get the ultra-sonographer started on some reading.

Thanks so much for your ongoing interest and any thoughts you might have on the update below.

[redacted]

A veterinary update on Toa from today.

1. Current medical findings

Lab tests:

- A blowhole culture taken 12/07/21 grew a light growth of E.coli and no fungi. This is of no clinical concern given the light growth and no signs of respiratory disease. It is likely that we'll repeat blowhole cultures throughout his time in care to monitor for trends.
- We are awaiting faecal results from samples submitted to the lab today: for parasitology, gram stain, salmonella culture and occult blood.
- A urine sample was collected and tested today:
    - USG today was 1.014. Some reference ranges for urine testing have been circulated amongst the vet teams (thanks [redacted]) which indicate that our urine testing results so far are normal for this species.
- Blood was taken today by the HUHA team (thank you!):
    - In house biochem: Generally of no concern. His blood urea nitrogen (BUN) has increased slightly above normal, but this is likely to do with having recently eaten a protein rich meal (= formula). This analyte also increases with kidney disease/dehydration, but all our other blood and urine tests indicate that he is well hydrated and his kidneys are functioning normally. There are some other minor deviations from normal which are of no clinical significance at this stage but which we will monitor the trends of over time.
    - CBC: will be sent to the lab tomorrow
    - Serum electrophoresis: will be sent to the lab tomorrow
    - Cholesterol/triglycerides: will be sent to the lab tomorrow
    - Some historical blood has been stored in our -80˚C freezer.
- We are awaiting cytology and culture on eye discharge submitted to the lab today.

Physical exam:

- Wounds:
    - The abrasions to the underside of the tail flukes and the underside of the chin, and the deep lacerations near his tail fluke laterally to his spine are healing well.
    - The very outer edges of his pectoral flippers and the outer edge of his right tail fluke have some areas of full thickness skin wounds. These do not show any sign of infection (no swelling, discharge etc). These are being monitored.
    - A small blister on the skin near his blowhole (~1cm diameter) is being monitored.
- His right eye is being held shut more than his left and there is mild swelling of the eyelids of the right eye. These changes are still present but appear reduced in severity today. We have contacted some local veterinary ophthalmologists and are waiting to see if they are able to come examine the eye and what their availability is.
- Girth measurement update:
    - On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m
    - On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m
    - Girth measurements have some limitations in their use to assess body condition, but these results indicate no immediate significant weight loss. We will continue to monitor this over time to assess his response to feeding and the success of feeding.
- There is some minor swelling at the sites where injections were previously administered. He is not currently receiving injectable medications and these sites will be monitored.

2. <u>Proposed medical/nutrition plan moving forward</u>

His current medical care consists of:

Ongoing recording of respiratory rate, defaecation (regular today) and urination (observed today).

Fluids/feeding:

- We use the following two calculations to plan his food and fluid requirements for the day.
  - His daily fluid requirements are estimated to be 40-80ml/kg/d (= 8-16L per day).
  - His daily caloric requirements are 120-125kcal/kg/d.
- Today the plan is to feed him 10x feeds of 50:50 formula to 50% vytrate at 1.5 hour-intervals. No colic or other signs of gut disease have been observed since overnight on Monday night/very early Tuesday morning.
  - This is a step back on our diet increases, with a plan to slowly increase again in future when his gut settles so that we can aim to meet his caloric requirements.
- We will see how we go on this feeding plan for the rest of today and will be in touch in the morning to see how you went and what our plan will be for 22/07/21.
- Please do not offer him any solid food yet. This needs to be introduced very carefully, and only once he's old enough and once the formula feeding is stable and reliable or this could cause quite significant gut upsets.

Additional medications:

- Oral de-gas medication (simethicone) is ongoing since 19/07/21 to help prevent problems from air that is gulped during feeding.

Plan for regular monitoring:

- We're still putting together some monitoring parameters which will help us assess his health and welfare on a daily-weekly basis. Will keep you updated as this develops, it will likely involve semi-regular blood samples if possible (1-2x per week), respiratory rates, girth/length measurements, weight (if possible), bowel movements, observations/videos of movement/behaviour etc – so similar to what we're already doing/communicating.

He is still in the pool, but as of today (21/07/21) he is back in sea water.

Thanks so much everyone for all your ongoing time and expertise. If you have any questions or comments please don't hesitate to get in touch.

Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | <image001.jpg> | <image002.jpg>

From: [redacted]
Sent: Wednesday, 21 July 2021 5:10 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]

[redacted]@SeaWorld.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

Just wondering how things are evolving with the little critter?

Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]
www.lacavemmvs.com

On 19 Jul 2021, at 09:41, [redacted] > wrote:

Hello [redacted]

Thank you for asking.

We went up to 50mg per formula administration - the liquid form - but really followed the gas formation by ultrasound.

Qua age, as mentioned before, that was how old our male calf was when 2m12, so around 2-2.5 month, but this can differe.

I will look now at the pics of our 3 hand-reared calves in regards to teeth erruption

[redacted], from the Oceanografic in Valencia, has worked on age extimation in cetaceans based on flipper XR. It would be helpful to try this as well. I believewe have CR of the flipper on one of our calves at that age.

I am traveling now to LP and will gather that info for you.

In regards to medical follow up with people who have had KW calves, I would suggest to be cc on the same e-mails, otherwise the info will everytime travel from one to the others.

Greetings

[redacted]
Sent from my iPhone

On 19 Jul 2021, at 02:27, [redacted]

[redacted] > wrote:

Hi all,

Sorry we did have an additional question - dose of tensio-actives (simethicone) do you use? (Is it dosed per kg of animal or per L of formula?)

Thanks all!

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

Caution - This message and accompanying data may contain information that is confidential or subject to legal privilege. If you are not the intended recipient you are notified that any use, dissemination, distribution or copying of this message or data is prohibited. If you received this email in error, please notify us immediately and erase all copies of the message and attachments. We apologise for the inconvenience. Thank you.

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[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 9:30 pm
To: [redacted]
Cc: [redacted]
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all
Just received the news. I am very sorry for the outcome. I think everybody did a great job in doing everything possible to help him out.
Thank you to all
[redacted]

Sent from my iPhone

On 23 Jul 2021, at 08:12, [redacted] wrote:

Hi [redacted]

No problem – sorry for such short notice! We have a plan for moving forward and will see how that goes. Volume is certainly right down at the moment as that is all he will tolerate. I am seriously encouraging a return to at least partial tube feeding to top his intake up (currently taking between 400-650ml a feed).

A powerpoint on ultrasound images sounds amazing – thank you so very much for that – so appreciate you thinking to work on putting one together!

Unfortunately I think the re-introduction question is out of all our leagues… it is unprecedented…. There are a lot of scenarios being run and ethics discussions. Will be interesting to see where we get to.

Thank you again for all your help and support – I can not say enough how much we appreciate (especially as I struggle to find the time to message at all at times!)

Thank you

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 6:20 AM
To: [redacted]
Cc: [redacted]@wellingtonzoo.com>; [redacted]@SeaWorld.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@loroparque.com>; [redacted]@wellingtonzoo.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

I am sorry I can't attend the Teams call tonight (your morning) but would be happy to set up another time later on if you would like to discuss ultrasound or formulas again.

With the data provided here below I checked back the girth measurements we had from our calves and at 1,5 month of age, our female was 1,38 cm behind the pectoral fins.

I concord with [redacted] that it is better to have formula in without fish than something aversive.

Going back again to some previous discussion, from our experience with the 3 calves, the issue was really the volume of formula. I know I keep on stressing this, but we absolutely found out that a volume of 1,5 L if you have such small calves (and actually even in older calves), will yield problem with time and it will crash. Better to have lower volume more frequently than having ups and down. I think it is also better to have a calf growing slower than what is expected when fed by mum, because it is not possible to give him as much calories, than having it crash regularly/regurgitate/having colics because of a volume he cannot process (not to mention the effects on the digestive system).

I am working on getting to you an excel file with our day to day formula over time (and the findings/ultrasounds/blood results) for you to compare. I will also make up a power point on what to look on ultrasound (definitely the digestive system) when scanning your animal. I just need a bit of time to do this, but will try asap.

To answer also a former question about survival chances. I believe that if the calf has no major health issues, it is very possible to raise him with artificial formula. The question of re-introduction in a pod or not is however out of my league.

Greetings to all

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]
www.lacavemmvs.com

> On 22 Jul 2021, at 10:39, [redacted] > wrote:
>
> Hi Team,
>
> So sorry for the radio silence today as I have been travelling to site. Certainly interesting to see it all in person. The calf has been moved back to the sea pen so will be interesting to see if a bit more movement and energy expenditure results in him being more interested in the feeds.
>
> A quick talk to the HUHA team indicated that they think there may be some issues with hi not liking the teat that is being used.
>
> Will be great to hopefully talk a bunch of this through tomorrow.
>
> Thank you again for the advice on ultrasounding as well (and all the other advice!) You are all just so amazing.
>
> Thank you!
>
> [redacted]

From: [redacted]@wellingtonzoo.com>
Sent: Thursday, 22 July 2021 5:24 PM
To: [redacted]@SeaWorld.com>
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Thanks so much [redacted]!

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Also I put you wrong on the recipe earlier – we are using sardines, not anchovies :)

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[redacted]

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Sent: Wednesday, July 21, 2021 3:52 PM
To: [redacted]@SeaWorld.com>; [redacted]@loroparque.com>; [redacted]@icloud.com>
Cc: [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>; [redacted]@wellingtonzoo.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

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Subject: RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted],

Thanks for the update. Hopefully the minor adjustments in formula volume and frequency can be dialed in, each animal is different and as your team has learned it is not as black and white as it should be, trial and see, welcome to marine mammal rehabilitation.
US probe size used is generally a 4-5 MHz probe. We and others have used portable laptop US, such as GE Logiqbook or Sonosite machines. Due to his size, one should be able to get fairly decent scans, however a small animal ultrasonographer will find that the image is not as good as small animal due to the attenuation of sound by the blubber layer. We usually have animals line-up on their side or at an angle so they can continue to breath regularly with mild restraint. One can reach under with probe and scan from ventral midline as well, a pair of goggles with HMDI connection and converter are helpful to see the image in goggles then straining to see on screen. For abdominal

scan, important to recognize organ position (left – stomach, intestinal tract, kidney, bladder if full and right- liver, GI (connecting channel), kidney, bladder, testes may be small in him), note echogenicity, organ position, motility and thickness of GI tract and if any free fluid or ascites is present.

[redacted] can add other specifics too, she is a US wizard 😉

Look forward to see recent blood parameters.

Keep going with great effort, thanks,
[redacted]

From: [redacted]>
Sent: Wednesday, July 21, 2021 5:18 AM
To: [redacted]>
Cc: [redacted]@loroparque.com>; [redacted]
<[redacted]@SeaWorld.com>
Subject: [EXTERNAL] RE: ORCA GOBIERNO NUEVA ZELANDA

Hi [redacted] and team,

Apologies it has been a rather frantic couple of days. The calf had a bout of colic 48 hrs ago which appeared to resolved fairly rapidly with removal of the formula and reverting to electrolyte feeds. The formula has been slowly re introduced since then. We have been trying to balance the advice around timing and volume of feeds received from all thee incredible vets who are helping us out.

Below is the vet update from today as provided by [redacted] – Head vet at Wellington Zoo who is leading the on-site veterinary response.

Overall he appears fairly stable. We are talking to a veterinary imaging specialist about coming to ultrasound the calf so I imagine we may have a bunch of questions about probe size etc in the next 24ish hours. We are currently working on the information we have on ultrasounding cetaceans from the CRC Manual of Marine Mammal Medicine to get the ultra-sonographer started on some reading.

Thanks so much for your ongoing interest and any thoughts you might have on the update below.

[redacted]

A veterinary update on Toa from today.

1. Current medical findings

Lab tests:

- A blowhole culture taken 12/07/21 grew a light growth of E.coli and no fungi. This is of no clinical concern given the light growth and no signs of respiratory disease. It is likely that we'll repeat blowhole cultures throughout his time in care to monitor for trends.
- We are awaiting faecal results from samples submitted to the lab today: for parasitology, gram stain, salmonella culture and occult blood.
- A urine sample was collected and tested today:
    - USG today was 1.014. Some reference ranges for urine testing have been circulated amongst the vet teams (thanks [redacted] which indicate that our urine testing results so far are normal for this species.
- Blood was taken today by the HUHA team (thank you!):

    - In house biochem: Generally of no concern. His blood urea nitrogen (BUN) has increased slightly above normal, but this is likely to do with having recently eaten a protein rich meal (= formula). This analyte also increases with kidney disease/dehydration, but all our other blood and urine tests indicate that he is well hydrated and his kidneys are functioning normally. There are some other minor deviations from normal which are of no clinical significance at this stage but which we will monitor the trends of over time.
    - CBC: will be sent to the lab tomorrow
    - Serum electrophoresis: will be sent to the lab tomorrow
    - Cholesterol/triglycerides: will be sent to the lab tomorrow
    - Some historical blood has been stored in our -80˚C freezer.
- We are awaiting cytology and culture on eye discharge submitted to the lab today.

Physical exam:

- Wounds:
    - The abrasions to the underside of the tail flukes and the underside of the chin, and the deep lacerations near his tail fluke laterally to his spine are healing well.
    - The very outer edges of his pectoral flippers and the outer edge of his right tail fluke have some areas of full thickness skin wounds. These do not show any sign of infection (no swelling, discharge etc). These are being monitored.
    - A small blister on the skin near his blowhole (~1cm diameter) is being monitored.
- His right eye is being held shut more than his left and there is mild swelling of the eyelids of the right eye. These changes are still present but appear reduced in severity today. We have contacted some local veterinary ophthalmologists and are waiting to see if they are able to come examine the eye and what their availability is.
- Girth measurement update:
    - On 16/07/21: length 2.12m, girth in front of dorsal fin 1.42m, girth behind dorsal fin 1.17m
    - On 20/07/21: girth at widest point in front of dorsal fin 1.42m, girth at widest point behind dorsal fin 1.17m, girth at pectoral fin insert 1.34m
    - Girth measurements have some limitations in their use to assess body condition, but these results indicate no immediate significant weight loss. We will continue to monitor this over time to assess his response to feeding and the success of feeding.
- There is some minor swelling at the sites where injections were previously administered. He is not currently receiving injectable medications and these sites will be monitored.

2. <u>Proposed medical/nutrition plan moving forward</u>

His current medical care consists of:

Ongoing recording of respiratory rate, defaecation (regular today) and urination (observed today).

Fluids/feeding:

- We use the following two calculations to plan his food and fluid requirements for the day.
    - His daily fluid requirements are estimated to be 40-80ml/kg/d (= 8-16L per day).
    - His daily caloric requirements are 120-125kcal/kg/d.
- Today the plan is to feed him 10x feeds of 50:50 formula to 50% vytrate at 1.5 hour-intervals. No colic or other signs of gut disease have been observed since overnight on Monday night/very early Tuesday morning.
    - This is a step back on our diet increases, with a plan to slowly increase again in future when his gut settles so that we can aim to meet his caloric requirements.
- We will see how we go on this feeding plan for the rest of today and will be in touch in the morning to see how you went and what our plan will be for 22/07/21.

- Please do not offer him any solid food yet. This needs to be introduced very carefully, and only once he's old enough and once the formula feeding is stable and reliable or this could cause quite significant gut upsets.

Additional medications:

- Oral de-gas medication (simethicone) is ongoing since 19/07/21 to help prevent problems from air that is gulped during feeding.

Plan for regular monitoring:

- We're still putting together some monitoring parameters which will help us assess his health and welfare on a daily-weekly basis. Will keep you updated as this develops, it will likely involve semi-regular blood samples if possible (1-2x per week), respiratory rates, girth/length measurements, weight (if possible), bowel movements, observations/videos of movement/behaviour etc – so similar to what we're already doing/communicating.

He is still in the pool, but as of today (21/07/21) he is back in sea water.

Thanks so much everyone for all your ongoing time and expertise. If you have any questions or comments please don't hesitate to get in touch.

Kind regards,
[redacted]

[redacted] **BVSc, MVSc (Zoo Animal and Wildlife Health), MANZCVS (Avian Health)**
Senior Veterinarian | Animal Care and Science | Wellington Zoo Trust
200 Daniell Street | Newtown | Wellington 6021
Ph [redacted]
E [redacted]@wellingtonzoo.com | W www.wellingtonzoo.com | <image001.jpg> | <image002.jpg>

From: [redacted]
Sent: Wednesday, 21 July 2021 5:10 AM
To: [redacted]
Cc: [redacted]@loroparque.com>; [redacted]@SeaWorld.com>
Subject: Re: ORCA GOBIERNO NUEVA ZELANDA

Hello all

Just wondering how things are evolving with the little critter?

Greetings

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assbroek
Belgium
[redacted]

[redacted]
www.lacavemmvs.com

On 19 Jul 2021, at 09:41, [redacted] > wrote:

Hello [redacted]

Thank you for asking.

We went up to 50mg per formula administration - the liquid form - but really followed the gas formation by ultrasound.

Qua age, as mentioned before, that was how old our male calf was when 2m12, so around 2-2.5 month, but this can differe.

I will look now at the pics of our 3 hand-reared calves in regards to teeth erruption

[redacted], from the Oceanografic in Valencia, has worked on age extimation in cetaceans based on flipper XR. It would be helpful to try this as well. I believewe have CR of the flipper on one of our calves at that age.

I am traveling now to LP and will gather that info for you.

In regards to medical follow up with people who have had KW calves, I would suggest to be cc on the same e-mails, otherwise the info will everytime travel from one to the others.

Greetings

[redacted]
Sent from my iPhone

On 19 Jul 2021, at 02:27, [redacted]

[redacted] wrote:

Hi all,

Sorry we did have an additional question - dose of tensio-actives (simethicone) do you use? (Is it dosed per kg of animal or per L of formula?)

Thanks all!

[redacted]

[redacted]
Marine Mammal Veterinary Services
Daverlostraat 186
8310 Assebroek
Belgium
[redacted]
www.lacavemmvs.com

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[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 3:39 pm
To: [redacted]; Elizabeth Heeg; Kirstie Knowles
Cc: Ian Angus; Kristopher Ramm; Meg Rutledge
Subject: RE: Toa and ethical decision making

Hi team,

Agreed, the main focus at this stage is on physical health – would be interested in what an external view would show.

From my assessment – he is swimming and moving well, is able to submerge, when he went back in the sea he was racing around so I am certainly pleasantly surprised from all those aspects. How that relates to how he would do in the open ocean remains to be seen should that be attempted.

My biggest concern at the moment is nutrition. There have been some problems with getting him onto milk (which is not unusual for orca calves). That is the primary focus at this stage as far as supporting him. To that end we had a good discussion with [redacted] at SeaWorld this morning to help with some problem solving and seems to be going better this afternoon. Will keep working on that!

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 3:13 PM
To: Elizabeth Heeg <eheeg@doc.govt.nz>; Kirstie Knowles <kknowles@doc.govt.nz>
Cc: Ian Angus <iangus@doc.govt.nz>; [redacted] Kristopher Ramm <kramm@doc.govt.nz>; Meg Rutledge <merutledge@doc.govt.nz>
Subject: RE: Toa and ethical decision making

Hi all,
Just my view, but it's likely that the welfare assessment on site is going to be focused directly on the physical health of the animal, rather than a holistic well-being assessment that a welfare/ethics specialist would undertake. I think it would be great to have [redacted] more involved, but note that she was quite open in the TAG meeting that she had no cetacean experience and probably couldn't comment directly on many things that would factor into determining what's best for this animal.

Another thing to consider is having her review and comment on the scenarios document. That would be useful as well, as she could possibly provide an objective viewpoint on the 'reasonableness' of our analysis.

Cheers,
[redacted]

[redacted]

From: Elizabeth Heeg <eheeg@doc.govt.nz>
Sent: Friday, 23 July 2021 3:03 pm
To: Kirstie Knowles <kknowles@doc.govt.nz>
Cc: [redacted] Ian Angus <iangus@doc.govt.nz>; [redacted]; Kristopher Ramm <kramm@doc.govt.nz>; Meg Rutledge <merutledge@doc.govt.nz>
Subject: RE: Toa and ethical decision making

Thanks
Would it make sense for us to talk to both of these scientists in the next 24 hours before our next meeting, or include them in a meeting?

The lack of an ethicist in our meeting was raised today.

Thanks
E

From: Kirstie Knowles <kknowles@doc.govt.nz>
Sent: Friday, 23 July 2021 2:18 pm
To: Elizabeth Heeg <eheeg@doc.govt.nz>
Cc: [redacted] Ian Angus <iangus@doc.govt.nz>; [redacted]; Kristopher Ramm <kramm@doc.govt.nz>
Subject: RE: Toa and ethical decision making

Hi all,
I would like advice on this one.
[redacted] – can you confirm what animal welfare monitoring is already happening at site?

Kirstie Knowles (she/her)
Manager Marine Ecosystems – *Kaimātanga Mātai Ahu Moana*
Aquatic Unit, Biodiversity Group – *Kāhui Kanorau Koiora*
Department of Conservation – *Te Papa Atawhai*
Focal point for: IUCN-WCPA, Local Gov Coastal-SIG, Sustainable Seas Challenge, NZ Marine Sciences Society
☎ +[redacted]

Mon	Tues	Wed	Thurs	Fri
✓	🏠	✓	✓	🏠

✓ = In the office; 🏠 = Working remotely; X = Not at work



From: [redacted]@massey.ac.nz>
Sent: Friday, 23 July 2021 1:37 pm
To: [redacted]@animalwelfareexpertise.com>; [redacted]@massey.ac.nz>
Cc: [redacted]; Kirstie Knowles <kknowles@doc.govt.nz>; Ian Angus <iangus@doc.govt.nz>; [redacted]
Subject: RE: Toa and ethical decision making
Importance: High

Hi [redacted] – thanks for reaching out and sorry for my delayed response.

I know DOC have engaged welfare scientist and Massey colleague [redacted] (copied) but I haven't had an opportunity to catch up with her so I am a unclear as to what actual on the ground welfare assessment/monitoring is underway presently. [redacted], are you able to confirm?

I know Toa is getting excellent health assessments from the veterinarians who are doing a first class job with health monitoring but I am imagining robust behavioural welfare assessments are underway too, hopefully by someone independent of the care team itself. This independence is important I feel as we are starting to note large contradictions between the official vet informed DOC updates versus that of onsite rescue team. Yesterday evening, especially due to the stark contrasts in messaging, the public seemed very confused by conflicting posts. An independent assessor of welfare would go a long way in this regard and perhaps [redacted] has already recommended someone or even has someone on the ground already.

I am copying in the DOC Lead Ian Angus and the DOC Technical Advisory Group (TAG) here in case they are keen to chat about the stakeholder work you discuss below for the Belgian Government in case this could also be of assistance in this case with Toa.

Thanks again for reaching out [redacted] – appreciate it.

[redacted]

From: [redacted]@animalwelfareexpertise.com>
Sent: Tuesday, 20 July 2021 11:38 PM
To: [redacted]@massey.ac.nz>
Subject: Toa and ethical decision making

Hi [redacted]

Hope all is well - saw your piece on the news re. Toa and think you're spot on. Must be such a difficult situation.

I wanted to reach out as I'm running an ethical study at the moment with the Belgian Government, where the approach has many parallels with Toa's situation. I'm working with a group of stakeholders to evaluate different scenarios using a modified ethical matrix approach.

The goal is not to come out with a decision, but to build consensus around the harms and benefits to the animal/people/the environment of each alternative scenario.

I was thinking that a similar approach might be really useful for Toa's situation, since I'm sure there are many stakeholders with different opinions about what should happen. It could be done in one session if need be.

Let me know if any of this sounds like it could be useful. I'm also aware that the government probably has lots of people working on this already, so no problem if they've got it covered!

All the best,

[redacted]

[redacted]
Founder, Animal Welfare Expertise
www.animalwelfareexpertise.com
[redacted]

[redacted]

From: [redacted]
Sent: Friday, 23 July 2021 11:44 pm
To: [redacted]; Kirstie Knowles
Subject: Re: VHF Tag

Hi [redacted],

You have probably seen the news that this calf unfortunately died tonight.

Thank you again for the advice and the offer to source a VHF tag for us.

Hope the rest of your move goes well!

[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 9:51 PM
To: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Subject: RE: VHF Tag

Hi [redacted]

Apologies form being slow to reply especially given you are moving and have still managed to send messages!

I was trained by [redacted] in the application of satellite tags and they are giving us a refresher tomorrow so I am fairly comfortable with the procedure 😊

If you have time – I am keen to understand why a VHF is so strongly recommended. I know it can provide better close in directional guidance (I am very familiar with telemetry as we use it a lot for kākāpō). Just given the impact of a second attachment point and increased drag I am not sure I am convinced this is needed given the accuracy of modern satellite tags especially with air support (which we anticipate will be available).

The tag IFAW have supplied us has accuracy of

- Class 3: better than 250 m radius
- Class 2: better than 500 m radius
- Class 1: better than 1500 m radius
- Class 0: over 1500 m radius

Near real time tracking can be accomplished by using the CLS app. With new satellite hits are processed by the system and showing up in the app in about 5 to 10 minutes from transmission.

These are the standard recievers we have https://www.telonics.com/products/vhfReceivers/tr-4.php I know these are pretty old school now and there are TR-8 also available covering the entire band from 138MHz to 235MHz. Yagi (antennae) frequency range - 150- 250MHz.

Would love your thoughts if possible.

[redacted]

From: [redacted]
Sent: Thursday, 22 July 2021 6:11 AM
To: [redacted] Kirstie Knowles <kknowles@doc.govt.nz>
Subject: VHF Tag

Hi [redacted]

Attached is the specs of the tag we're hoping to have donated by NMFS.

We would be using a single point attachment on the trailing edge of the dorsal.

[redacted] should be able to send you the attachment protocols, unfortunately I am are in the process of moving and I can't seem to locate the protocol that we typically use.

When we were on the TAG call over the weekend, someone (possibly Ingrid) mentioned that they had access to receivers and antennas. Do you know what frequencies they would be? It's important to make sure that the tag that we send is the same frequency range as the antennas and receivers that you have access too.

Good luck down there and all the very best!

[redacted]