UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

MARC ANDERSON, KELLY NELSON, *and* JULIETTE MORIZUR,

Plaintiffs,

v.

SEAWORLD PARKS AND ENTERTAINMENT, INC.,

Defendant.

Case No.: 3:15-cv-02172-JSW-JCS

EXPERT REPORT OF DR. INGRID N. VISSER

Dated: February 8, 2019

CONTAINS INFORMATION DESIGNATED CONFIDENTIAL BY SEAWORLD

Table of Contents

List of Schedules

I. INTRODUCTION

1. My name is Dr. Ingrid Visser. I have prepared this report pursuant to my role as an expert witness retained by counsel for Mr. Marc Anderson, Ms. Kelly Nelson, and Ms. Juliette Morizur ("Plaintiffs") in this case. I have been asked to provide an opinion on the accuracy of various statements made by defendant SeaWorld Parks & Entertainment, Inc. ("SeaWorld") regarding its captive killer whales.

2. This report summarizes my current opinions given the information I have been able to review to date. My work on this matter is ongoing, and if additional information becomes available, I may modify or supplement my analyses and opinions. I understand further that SeaWorld will be submitting expert reports in this case as well. I intend to review and provide a response, if necessary, to those reports as well.

3. The opinions in this report are my own. I have no relationship with Plaintiffs, nor do I have any relationship with Plaintiffs' attorneys apart from this case, nor do I have any financial interest in the outcome of this case.

4. Throughout this report and in the cited documents, I have attempted to consistently use metrics (with imperial in brackets, when given). Additionally, for dates, if not written in full, I use the yyyymmdd format. This system allows for chronological sorting, removes ambiguities with regards to USA vs international date format as well as reduces potential for errors.

II. PROFESSIONAL BACKGROUND & QUALIFICATIONS

5. I am a marine scientist specializing in the research and rescue of *Orcinus orca*, commonly known as the orca or killer whale, and other cetacean species. I have over twenty years of experience in cetacean research. Specifically, my research on free-ranging orca focuses on their overall health as well as daily behaviours, with an emphasis on their foraging activities and social interactions. My research includes field surveys (land, boat, and aerial), behavioural and photo-identification studies, biopsy and scat collection, and necropsies on various species. My curriculum vitae, which summarizes my professional background, experience, and qualifications, is attached as Annexure A to this report.

6. In 1990, I graduated with a Bachelor of Science degree in Zoology from Massey University in New Zealand. Subsequently, in 1992, I received a Master of Science degree in Marine Science from Auckland University in New Zealand. Finally, in 2000, I received a Doctor of Philosophy degree in Environmental and Marine Science from Auckland University in New Zealand. My PhD thesis, which focused on the study of orcas, was the first of its kind in New Zealand and the South Pacific.

7. In addition to my PhD thesis, I have published at least 27 scientific articles. My publication record also includes 29 conference presentations and eight reports.

8. I have conducted research on orcas in the wild at various locations around the world, including Antarctica (the Peninsula, the Weddell Sea, and in the Ross Sea), Argentina, Canada, Iceland, New Zealand, Papua New Guinea, Russia

(Kamchatka), and the United States (Alaska and the San Juan Islands of Washington). Additionally, I have observed and/or collected data on orca from areas including Australia, Chile, Fiji, Honduras, Indonesia, Namibia, Norway, Portugal, Tonga, South Pacific and South Africa. A brief sample of these research projects are listed below:

a. Since 1998, I have served as founder, director, and principal scientist of the Orca Research Trust, an organisation dedicated to facilitating orca research.

b. In 2001, I established the first long-term, non-lethal research project for orca in Antarctica and founded the Antarctic Killer Whale Identification Catalogue, the first photo identification catalogue for the area.

c. In 2002, I founded the Papua New Guinea Orca Research Project. I continue to serve as its director and principal scientist.

d. In 2004, I co-founded the Punta Norte Orca Research organisation, the only research project focused on the little-known orca off Argentina. I continue to serve as its director and principal scientist.

9. In addition to my research on free-ranging orca, I study orca in captivity. I have observed all the orca currently on public display in captivity (and in three facilities which no longer hold orca), in 14 different facilities across nine different countries: Argentina, Canada (two facilities), China, France, Japan (two facilities), the Netherlands, Russia, Spain, and the United States (four facilities, including three SeaWorld facilities).

10. I have observed 12 other species of cetaceans (not including hybrids) held in captivity: *Cephalorhynchus commersonii* (Commerson's dolphin); *Delphinus delphis* (common dolphin); *Delphinapterus leucas* (beluga); *Globicephala macrorhynchus* (short-finned pilot whale); *Inia geoffrensis* (Amazonian river dolphin); *Lagenorhynchus obliquidens* (Pacific white-sided dolphin); *Neophocaena phocaenoides* (finless porpoise); *Phocoena phocoena* (harbour porpoise); *Pseudorca crassidens* (false killer whale); *Sousa chinen*sis (Indo-Pacific humpback dolphin); *Stenella attenuata* (Pan-tropical spotted dolphin); *Tursiops aduncus* (Indo-Pacific bottlenose dolphin); *Tursiops gilli* (bottlenose dolphin); and *Tursiops truncatus* (bottlenose dolphin).

11. I have also observed all 12 of these species free-ranging in their natural habitats.

12. To date, I have visited 35 facilities holding cetaceans in captivity across 16 countries: Argentina, Australia, Belgium, Canada, France, Germany, Hong Kong, Italy, Japan, Malta, the Netherlands, New Zealand, Russia, Spain, Switzerland, and the United States.

13. Since 2010, I have conducted investigations of various captive cetacean facilities and produced reports regarding the conditions therein, primarily regarding orca. My focus has been on *inter alia* the lack of species-specific environmental enrichment, the stereotypic behaviours that manifest themselves as a result of stress from the dearth of enhancement of otherwise typically featureless tanks, and the

health implications of the foregoing. These behaviours include instances of self-harm and environmental injuries.

14. My other research findings have included aggression between captive orca. I have also noted poor facility conditions (such as peeling paint which the animals can ingest and can require invasive medical procedures to remove) and water quality issues (such as over-chlorination which can damage the animal's eyes). Additionally, I have taken note of, and documented, the collapsing and collapsed dorsal fins of orca in captivity. Finally, I have taken note of, and extensively documented, the poor dental condition of orca in captivity and I have published in a peer-reviewed journal, specifically on this topic.

15. In addition to research into captive cetaceans, I have observed at least 36 other species of cetaceans free-ranging in their natural habitats around the world, from the Arctic to the Antarctic. This has included Antarctica (Ross Sea, Oates Coast, Weddell Sea, Peninsula), Argentina, Australia, Bahamas, Canada (West and East coast), Cabo Verde, Chile, Egypt, England, Fiji, Greece, Greenland, Iceland, Indonesia, Japan, Kiribati, Malaysia, Maldives, Mexico, Micronesia, Morocco, Namibia, Norway, New Zealand, Papua New Guinea, Philippines, Russia (Kamchatka), Portugal, Scotland, Saint Lucia, Samoa, Solomon Islands, South Africa, Spain, Spitsbergen (high Arctic), Sri Lanka, Sudan, Taiwan, Tonga, Turkey, United States of America (Alaska, West and East coast mainland, Hawaii), Vanuatu and Yemen.

16. To help promote research, as well as provide platforms for conservation, I have co-founded and helped to run a variety of cetacean-orientated non-profit organizations at both the national and international levels. These organizations include the Free Morgan Foundation in the Netherlands, the World Cetacean Alliance and Dolphinaria-Free Europe.

17. Since 1998, I have been involved in the rescue of hundreds of individual stranded cetaceans from eight different species as well as the successful disentanglement of three different species of cetaceans. Whale-Rescue.org, another non-governmental organization I have co-founded, is the only NGO in New Zealand certified to conduct disentanglements.

18. In December 2018, I was appointed to the New Zealand Government National Animal Welfare Advisory Committee, with particular reference to my expertise regarding animals used in entertainment.

19. I have testified as an expert at several legal and legislative proceedings. From 2011 through 2013, I served as an expert before the Administrative and High Courts of the Kingdom of the Netherlands, in litigation involving the captive orca known as Morgan. In January 2018, I testified in another trial regarding the same orca before the Netherlands Raad van State Court.

20. In June 2017, I appeared as an expert before the Canadian Standing Senate Committee on Fisheries and Oceans in reference to Bill S-203, An Act to Amend the Criminal Code and other Acts (ending the captivity of whales and dolphins).

21. Recently, in June 2018, I presented before the European Union's Parliamentary Petitions Committee regarding EU Law 338/97 (the Convention on International Trade in Endangered Species of Wild Fauna and Flora).

22. Additionally, as detailed in Schedule 15, I have studied cetaceans at a number of museums worldwide, and also participated in a number of necropsies.

III. INFORMATION CONSIDERED

23. I have considered information from a variety of sources, including: (i) information produced in this litigation; (ii) information from independent research; and (iii) information from interviews of people with knowledge relevant to this case. I have also considered publicly available scientific research, including that published in peer-reviewed journals, scientific reports, thesis, as well as white and grey literature *inter alia* newspaper articles. Additionally, databases available to the public (e.g., online databases and data generated through FOIA requests and Government websites) have been consulted. Various documents such as Senate transcripts and discovery from other court cases were also consulted. I have studied the skeletal material (including teeth) of orca at a number of museums, private collections and those on display at various venues. The information I have considered is listed in Schedule 1, as well as the footnotes and other citations in this report. The materials listed in Schedule 1 have informed my opinions in this report and I reserve the right to rely on them at any hearing for this case, as well as at trial.

24. I understand that discovery is ongoing in this matter. I reserve the ability to consider further discovery in this case, including, for example, additional expert reports, transcripts of depositions, and documents produced, if any.[1]

IV. BACKGROUND ON ORCA

25. Orca are described as one of the most spectacular and desirable species to see when watching wild cetaceans in the ocean.[2] Like the terrestrial 'Big Five' animals to see in Africa (buffalo, elephant, leopard, lion, rhinoceros),[3] orca are considered one of the charismatic mega-fauna of the oceans. Tourism industries have been built around taking people to specifically see this species in the wild, in various locations around the world *inter alia* Argentina, Australia, Canada (British Columbia), Iceland, Norway and the United States (Washington State).

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[1] I understand that SeaWorld produced a number of documents in January 2019—*i.e.*, just a few weeks before this report was due. I have not been able to conduct a meaningful review of those documents as of February 8, 2019. I reserve the right to opine on them later, including in any subsequent report I submit in this case.

[2] DUFFUS, D. A. & Dearden, P. (1993). *Recreational use, valuation, and management, of killer whales (Orcinus orca) on Canada's Pacific coast*. Environmental Conservation, pp. 20, 149-156.

BAIRD, R. W. (2002). *Killer whales of the world - Natural history and conservation,* Stillwater, MN, USA, Voyageur Press.

[3] CARO, T. & Riggio, J. (2013). *The Big 5 and Conservation*. Animal Conservation, pp.16, 261-262.

26. Orca are strikingly pigmented; typically black and white (although some ecotypes are grey and white), with a variable area of grey behind the dorsal fin.[4] See Figures 1 and 2.

27. Found in all the major oceans of the world, from the high Arctic to the Antarctic as well as in the tropical and temperate waters between, orca are one of the most wide-spread of all the cetacean species.[5]

28. One of the earliest scientific descriptions of any orca comes from a stranding which occurred in 1558 on the coast of Germany. But it wasn't until 200 years later, in 1758, that the species was formally named as *Orcinus orca,* which is still the Latin name in use today. Since then, there have been numerous publications describing the species, including proposed name changes such as *Delphinus orca* (in

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[4] BAIRD (2002).

[5] JEFFERSON, T. A. et al. (2008). *Marine mammals of the world. A comprehensive guide to their identification,* Amsterdam, Academic Press.

REEVES, R. R. et al. (2002). *Guide to marine mammals of the world,* New York, Chanticleer Press, Inc.

RICE, D. W. (1998). *Marine mammals of the world - Systematics and distribution,* Lawrence, Kansas, Allen Press, Inc.

1860),[6] proposed new species,[7] and a range of publications giving us insights into the species.

29. Dedicated scientific field research on orca picked up tremendously over the last several decades. The core of the research came about because orca can be recognized as individuals. The use of photo-ID for orca was established by Dr. Mike Bigg and his colleagues, and was discussed in their 1976 publication, where they wrote:

> Firstly, however, we developed a new censusing method which now provide information population size, interchange of stocks between British Columbia, Washington and the identification of stocks which were cropped. The method involves photographic identification

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[6] DAHLHEIM, M. E. & Heyning, J. E. (1999). *Killer whale Orcinus orca (Linnaeus, 1758). In:* Ridgway, S. H. & Harrison, R. J. (eds.) *Handbook of Marine Mammals*. London: Academic Press.

GESSNER, K. (1558). *Piscium & aquatilium animantium natura.* Historia animalium.

HEYNING, J. E. & Dahlheim, M. E. (1988). *Orcinus orca*. Mammalian Species, 304, 1-9.

LINNAEUS, C. (1758). *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.,* Stockholm, Sweden, Laurentii Salvii.

[7] BERZIN, A. A. & Vladimirov, V. L. (1983). Novyi vid kosatki (Cetacea, Delphinidae) iz vod Antarktiki (A new species of killer whale (Cetacea, Delphinidae) from Antarctic waters). *Zoologicheskii Zhurnal,* 62, 287-295.

ESCHRICHT, D. F. (1866). *On the species of the genus Orca inhabiting the northern seas. In:* Flower, W. H. (ed.) *Recent memoirs on the Cetacea*. London: Ray Society.

of individual whales based on distinctive dorsal fin and saddle patch characteristics.[8]

30. Today, orca are one of the most studied of any of the cetacean species . For example, I have in my personal library over 1,400 publications either specifically on orca or containing pertinent data on orca.

31. Over time, the scientific community have gained a better understanding of this species and its role in the ecosystem. As such, orca are now considered a "management umbrella species" in that when an orca population is appropriately protected and remains viable, by default, their habitat and all the other species which live within that habitat, will benefit from that overarching protection.

32. Therefore, orca can also be considered 'flagship' species with a corresponding high conservation value intrinsically for their own sake but also as a platform for education and conservation.

33. I explain certain important terms in the below paragraphs, followed by a discussion on certain particularly fascinating aspects of orca.

1) Terms and Definitions

34. Alveolus (plural alveoli). Hollow cavity in the body and in the context of this report, specifically tooth sockets. In orca, the alveoli are distinguishable as separate sockets with older animals having a hard bone structure (septum) between

[8] BIGG, M. A. et al. (1976). Abundance and movements of killer whales off eastern and southern Vancouver Island with comments on management: 1-45. (page 1).

the alveoli, which supports each tooth, where as in young animals the alveoli are not separated and there is a grove where the teeth are embedded.

35. Cetacean(s). The collective term for whales, dolphins and porpoises. *e.g.*, a dolphin is a cetacean.

36. Delphinid. A member of the Delphinidae (dolphins). See Odontocete for more details.

37. Dorsal fin. The fin found on the midline back of a cetacean. It is nonmuscular, highly vascularized and contains collagenous connective tissue (and no bones). There are studies that suggest that the dorsal fin may help stabilize ceataceans hydrodynamically and that they are involved in thermoregulation.

38. In males the dorsal fin may reach up to 1.8m tall and is generally triangular in shape, compared to females where the fin is typically no more than 0.7m tall and often falcate in shape (*see* Figure 1). The dorsal fin can be used for unique identification of an orca, but changes in shape and size, as well as any acquired scars, must be taken into account as an animal matures.

39. Ecotype. A population of orca with a distinctive set of characteristics, *inter alia*, morphology, pigmentation (*see* Figure 2), genetics, culture, dialect, prey preference, foraging specialistion, natal dispersal and general cultural differences.

Ecotypes can be divided by geographic boundaries (such as Ocean basins) or by choice (where sympatric ecotypes may live side by side but choose not to interbreed).[9]

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[9] There is only speculation as to how many ecotypes of orca are found around the world. At least 10 are recognised by some scientists, others predict there are likely to be twice as many. Some scientists propose these are all the same species, with different species, sub-species and/or races, whilst others claim that the ecotypes are just variations on a spectrum. Examples of the different ecotypes can be found in the scientific literature and in online websites.

BAIRD, R. W. & Stacey, P. J. (1988). *Foraging and feeding behavior of transient killer whales*. Whalewatcher*,* 22, pp. 11-15.

BIGG, M. A. et al. (1987). *Killer whales: A study of their identification, genealogy and natural history in British Columbia and Washington State,* Nanaimo, B.C, Phantom Press and Publishers.

DAHLHEIM, M. E. et al. (2008). *Eastern temperate North Pacific offshore killer whales (Orcinus orca): Occurrence, movements, and insights into feeding ecology*. Marine Mammal Science*,* 24, pp. 719-729.

FORD, J. K. B. & Ellis, G. M. (2014). *You Are What You Eat: Foraging Specializations and Their Influence on the Social Organization and Behavior of Killer Whales*. *In:* Juichi, Y. & Karczmarski, L. (eds.) *Primates and Cetaceans: Field Research and Conservation of Complex Mammalian Societies*. Springer Japan.

FORD, J. K. B. et al (1994). *Killer whales: The natural history and genealogy of Orcinus orca in British Columbia and Washington State,* Vancouver, University of British Columbia Press.

FORD, J. K. B. et al. (2000). *Killer whales: The natural history and geneology of Orcinus orca in British Columbia and Washington*, University of British Columbia Press.

HOYT, E. (1984). *Orca: The whale called killer,* Ontario, Camden House Publishing Ltd.

LEDUC, R. G. at al. (2008). *Mitochondrial sequence divergence among Antarctic killer whale ecotypes is consistent with multiple species*. Biology Letters*,* 4, pp. 426-429.

MATKIN, C. O. et al. (2007). *Ecotypic variation and predatory behavior among killer whales (Orcinus orca) off the eastern Aleutian Islands, Alaska*. Fisheries Bulleti*n,* 105, pp. 74-87.

40. Eye-patch. White pigmented area on the side of the head of an orca. Variable in shape, size and orientation based on the ecotype[10], *see* Figure 2. Individual variation within an ecotype is so unique it is like a human fingerprint – no two are alike (even between left and right side of an orca). *See* Figures 4 and 6. The eye-patch pigmentation remains stable over the life of an orca, allowing for identification of an orca, in the same way that a dorsal fin/saddle patch can be used. The eye is located slightly below the anterior edge of the eye-patch. *See* Figure 5.

41. Falcate. Curved like a sickle; hooked shape – in this report specifically refers to dorsal fins.

42. Homodont. Animals that have teeth that are all of the same form are termed homodonts; homodont dentition is seen in most toothed species of cetaceans

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MORIN, P. A. et al. (2010). *Complete mitochondrial genome phylogeographic analysis of killer whales (Orcinus orca) indicates multiple species*. Genome Research.

MORIN, P. A. et al. (2006). *Genetic analysis of killer whale (Orcinus orca) historical bone and tooth samples to identify western U.S. ecotypes*. Marine Mammal Science, 22, pp. 897-909.

RIESCH, R. et al. (2012). *Cultural traditions and the evolution of reproductive isolation: ecological speciation in killer whales?* Biological Journal of the Linnean Society, 106, pp. 1-17.

SAULITIS, E. L. et al. (2005). *Vocal repertoire and acoustic behavior of the isolated AT1 killer whale subpopulation in southern Alaska*. Canadian Journal of Zoology, 83, pp. 1015-1029.

http://www.seawatchfoundation.org.uk/orca-ecotypes-its-not-all-black-and-white/

[10] VISSER, I. N. & Mäkeläinen, P. (2000). *Variation in eye-patch shape of killer whales (Orcinus orca) in New Zealand waters*. Marine Mammal Science, 16, pp. 459-469.

(odontocetes). In homodont odontocetes such as orca, aside from a variation in size, all of the teeth are anatomically the same, generally conical in shape, and typically interdigitating with each other. *See* Figure 35.

43. Killer Whale. See orca.

44. Mandible. Lower jaw or jawbone.

45. Mandibular symphysis. The junction zone between the left and the right mandible. Also referred to as the 'end of the chin'.

46. Maxillae. Upper jaw, typically contains teeth, as is the case with orca.

47. Odontocete. A member of the toothed whale, dolphin and porpoise group. This group includes the largest of the toothed whales, the sperm whale (*Physeter macrocephalus*), as well as the smallest of dolphins, such as the Hector's dolphin (*Cephalorhynchus hectori*), and the porpoises, such as the harbour porpoise (*Phocoena phocoena*). Within the Odontocetes are the Delphinids (the dolphins), of which orca are the largest (*see* Figure 10)

48. Orca (also known as killer whale), Latin name *Orcinus orca*. The name 'orca' can be use as a singular or a plural (although 'orcas' may also be used for plural). Orca are odontocetes and delphinids. The name 'killer whale' is used predominantly in North America. It is believed to originate from the transposing of the description 'killer of whales'. Considered one of the most intelligent of the non-primate animals, orca exhibit distinct cultures in various populations, as well as variations in body size and pigmentation (see Ecotype).

49. *Orcinus orca*. The Latin nomenclature for orca (killer whale).

50. Pectoral Fin(s). The 'side' fins. In orca these are large 'paddle' shaped fins. They are typically positioned at approximately 45° out from the body. The pectoral fins on adult males can be more than 1.5m across, one of the characteristic sexual dimorphisms of this species.

51. Photo-ID. Each orca has a unique combination of pigmentation (eye-patches, saddle patches etc) and a unique dorsal fin. To record these features researchers use photographs help to document each animal and monitor changes over time. This photo-identification (photo-ID) can be likened to a 'mug-shot' book for humans, with each animal having a catalogue number and relevant details recorded into a database. *See* Figure 6. The first scientific paper to recognize that a dolphin could be identified as a unique individual was only published in 1955.[11] The first publication recognizing that orca could be identified as individuals was published only in 1976.[12]

52. Post-ocular patch. See eye-patch.

53. Rostrum. A zoological term for the projection/anterior prolongation of the mandibles & maxillae in cetaceans. Occasionally called the 'beak.' In orca the external (visible) rostrum is short and more rounded, especially when compared to a dolphin. *See* Figures 7 and 8.

[11] CALDWELL, D. K. (1955). *Evidence of home range of an Atlantic bottlenose dolphin*. Journal of Mammalogy, 36, pp. 304-305.

[12] BIGG, M. A. et al. (1976). Abundance and movements of killer whales off eastern and southern Vancouver Island with comments on management.

54. Saddle patch. Grey area of pigmentation below and/or behind the dorsal fin, often extending forward on to the lateral thorax. The saddle patch pigmentation is typically non-existent at birth and develops over the first six-months to a year. Once fully developed it remains stable over the life span of an orca, although it may acquire scars or changes in pigmentation due to scaring, such as from cookie-cutter shark bites.[13] See Figure 3. The unique pigmentation, which is different between the left and right side of an individual can be used to identify an orca, in the same way that a dorsal fin/eye-patch can be used.

55. Sexual dimorphism. Where the two sexes of the same species exhibit different characteristics beyond the differences in their sexual organs. In the case of orca the adult males are larger overall, have taller dorsal fins which are typically triangular (compared to falcate for females) and they have larger pectoral fins and curled tail flukes.

56. Tail Fluke(s). The non-bony section of the tail complex, that lies across the horizontal plane of the animal. In older adult male orca the tips curl inwards.

57. The black and white body pigmentation (with small grey area behind the dorsal fin, called the saddle patch) is conspicuous and distinctive. The eye is located slightly below and near the front of the white area on the head (termed the

[13] DWYER, S. L. & Visser, I. N. (2011). *Cookie cutter shark (Isistius sp.) bites on cetaceans, with particular reference to killer whales (orca) (Orcinus orca).* Aquatic Mammals, 37, pp. 111-138.

post-ocular patch, or the eye-patch) (also, see Fig. [1]). Male (A,B), female (C,D), showing difference in dorsal fin shape and size (note, sexes are not to scale as adult males may be up to 2m larger than adult females).

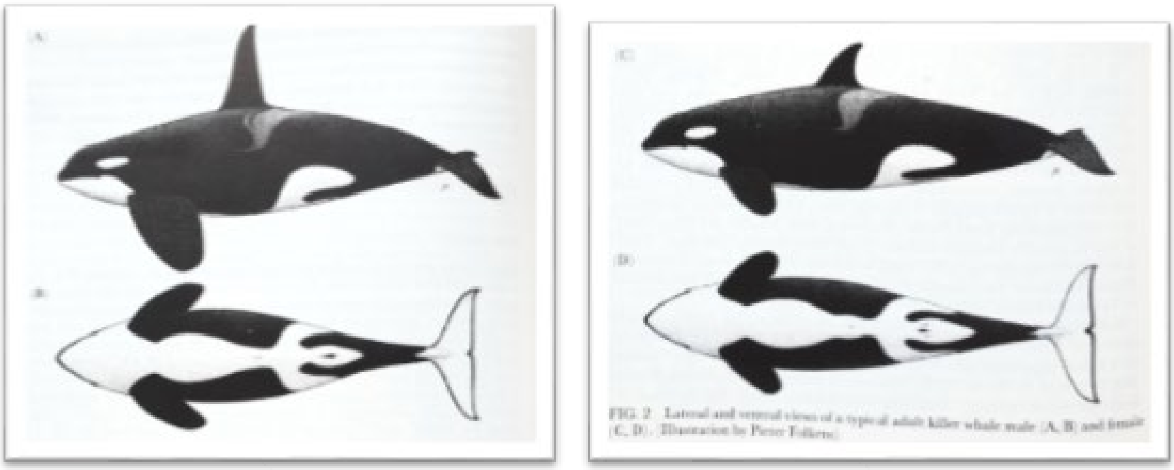

Figure [1]

58. The image below, Figure [2], is a schematic illustration of 10 ecotypes of orca. Both male and female examples of each ecotype are shown, in scale relative to the sexual dimorphism as well as between the ecotypes. The size and orientation of the eye-patch is a key feature in distinguishing ecotypes, as well as the over-all pigmentation. The 'yellowish' colouring of two ecotypes is due to a diatom that grows on their skin during summer, not their actual pigmentation. Some scientists speculate that there are likely more than twice as many ecotypes found around the world.

Figure [2][14]

59. The below image, Figure [3], depicts the grey saddle patch of female orca in Antarctic waters, with two cookie cutter shark bite marks (arrows).

[14] Image cropped from NOAA poster.

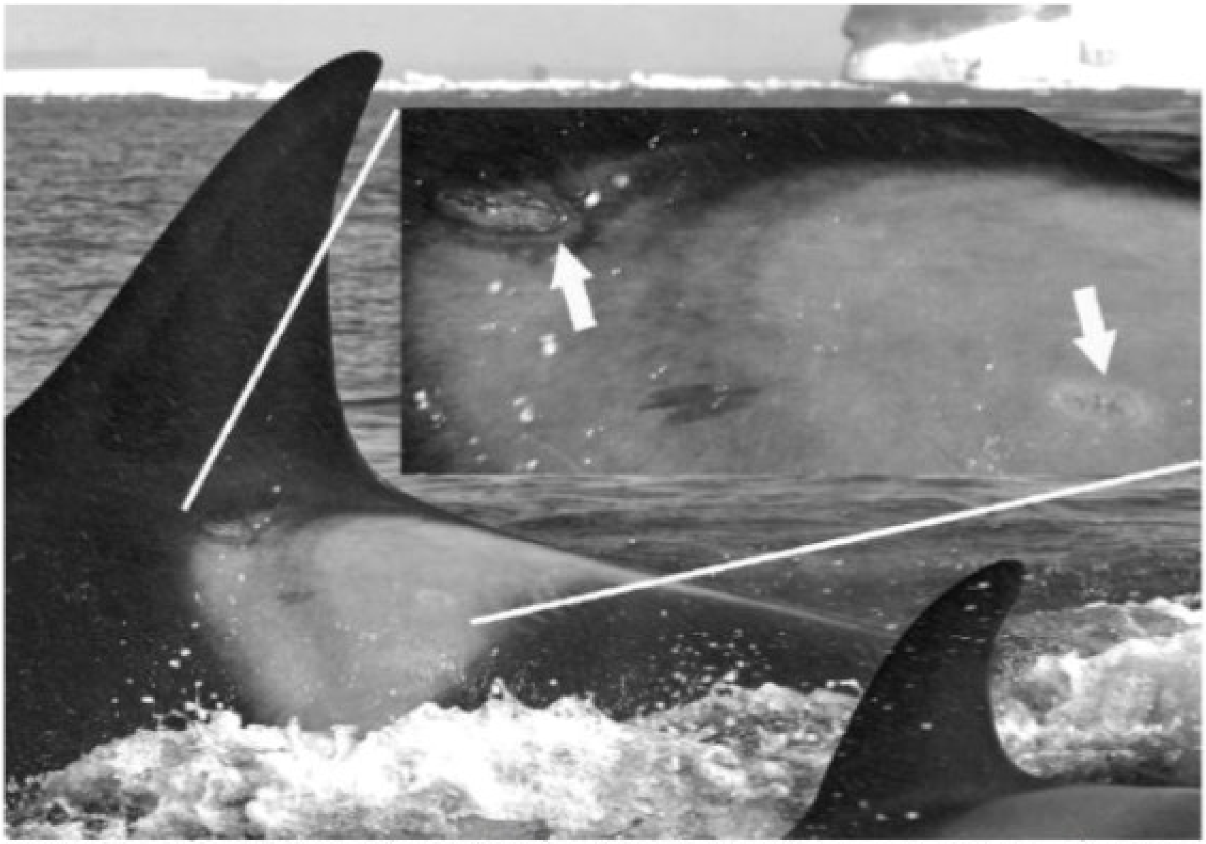

Figure 2. 18 February 2007, two cookie cutter shark bite marks (indicated by white arrows) on the left saddle patch of a presumed adult female *Type A* orca in Antarctic waters (note icebergs in background); the bite mark on the anterior edge of the saddle patch appears more recent (based on the state of healing) than the less-defined scar in the centre of the saddle patch. This female was accompanied by a neonate calf (Record #4.19, Table 4). (Photo by Ingrid Visser)

Figure [3][15]

60. The below image, Figure [4], depicts examples of the variation of left eye-patches of orca, within a single population (New Zealand coastal orca).

[15] Image from Dwyer & Visser (2011) (their Fig. 2, page 114).

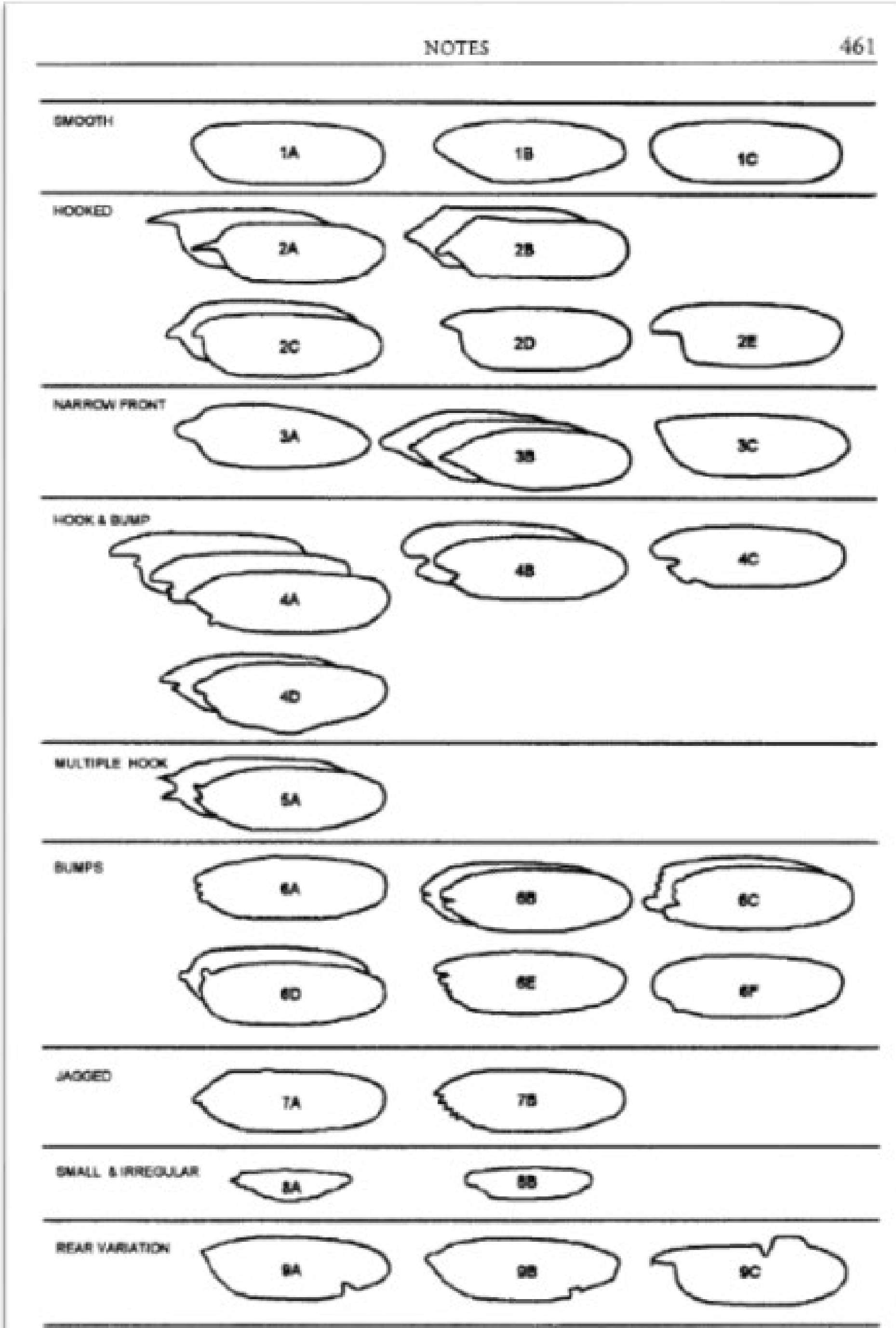

Figure 1. Variation in killer whale eye-patch shape in New Zealand waters.

Figure [4][16]

[16] Image from Visser & Mäkeläinen (2000) (their Fig. 1).

61. The below image, Figure [5], depicts the location of the eye (arrow), in relation to the eye-patch (white area on side of head). Also note damage to the teeth in this female orca, called Orkid (SeaWorld Catalogue # SWC-OO-8826), at SeaWorld San Diego. She was born in captivity at SeaWorld on 19880923, making her 26 years, 9 months, 20 days old, when this photo was taken on 20150712. [redacted]

Figure [5][17]

62. The below image, Figure [6], is a Photo-ID chart of Morgan (Microchip # 528210002335926), a wild-born orca claimed to be owned by SeaWorld for a number

[17] Photo ©, Ingrid N. Visser.

of years, residing currently at Loro Parque in Spain. Note the differences between her left and right eye-patch (bottom row of images). This orca, after only a short period in captivity, had worn many of her nearly pristine teeth to the gums and was continually banging her mandibular symphysis (end of her chin) on the concrete and opening wounds, in self-harming behaviour (see middle photo).

Figure [6][18]

63. The below images, Figures [7] and [8], illustrate cetaceans (top: *Orcinus orca* (orca), bottom: *Delphinus delphis* (common dolphin)) fast surfacing in the ocean, showing the differences in the rostrum length and shape.

[18] Photos © Ingrid N. Visser. Chart prepared by the Free Morgan Foundation.

Figures [7] [8][19]

[19] Photos © Ingrid N. Visser.

64. The below image, Figure [9], is a life-size museum replica orca skull and teeth, showing interlocking homodont dentition. Skull held at Orca Research & Education Center, New Zealand.

Figure [9][20]

65. The below image, Figure [10], is a schematic of the 71 recognized species (as of 2008) of odontocetes (toothed whales, dolphins and porpoises). Note, two ecotypes of orca are shown, but they are still considered one species.

[20] Photo © Ingrid N. Visser

Figure [10][21]

2) Intelligence

66. Cetaceans have been shown to be among the most intelligent animal species. Indeed, it is their intelligence, and their ability to be trained that makes them so desirable for captivity and public exhibition.

67. Similar to higher primates,[22] they have been shown to have distinct personalities,[23] and have also been shown to be capable of understanding abstract concepts.[24] Dolphins are able to discriminate between numbers of objects, and tests have shown that they can, at the very least, distinguish between a "few" and "many"

[21] Pages 24-27 in JEFFERSON, T. A. et al. (2008). *Marine mammals of the world. A comprehensive guide to their identification*, Amsterdam, Academic Press.

[22] Personalities have been observed in various higher primates. *See* KONEČNÁ, M. *et al*. (2012). *Personality in Barbary macaques (Macaca sylvanus): Temporal stability and social rank*. Journal of Research in Personality 46*:* pp. 581–590 (barbary macaques); WEISS, A. *et al*. (2011). *The big none: No evidence for a general factor of personality in chimpanzees, orangutans, or rhesus macaques*. Journal of Research in Personality 45: pp. 393–397 (rhesus macaques); MANSON, J.H. and Perry, S. (2013). *Personality structure, sex differences, and temporal change and stability in wild white-faced capuchins (Cebus capucinus).* Journal of Comparative Psychology 127*:* pp. 299–311 (white-faced capuchins); WEISS, A. *et al*. (2006). *Personality and subjective well-being in orangutans (Pongo pygmaeus and Pongo abelii).* Journal of Personality and Social Psychology 90: pp. 501–511 (orangutans); KING, J.E. and Figueredo, A.J. (1997). *The five-factor model plus dominance in chimpanzee personality*. Journal of Research in Personality 31: pp. 257–271 (chimpanzees).

[23] ÚBEDA, Y. et al. (2018). *Personality in captive killer whales (Orcinus orca): A rating approach based on the five-factor model.* Journal of Comparative Psychology, advance online publication available at http://dx.doi.org/10.1037/com0000146.

[24] HERMAN, L.M. et al. (1994). *Bottlenose dolphins can generalize rules and develop abstract concepts*. Marine Mammal Science 10: pp. 70–80.

objects,[25] and know what is numerically "less."[26] This was believed to be a uniquely human attribute, suspected to be linked to the possession of a complex language.[27] Indeed, orcas have been observed mimicking novel behaviors of other orcas, another sophisticated behavior,[28] as well as mimicking sounds of conspecifics, mechanical devices and other mammals, including humans.[29]

68. Studies showing that cetaceans are self-aware provides additional evidence of their high intelligence levels.[30] These studies include those

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[25] YAMAN, S. et al. (2004). *Preliminary results about numerical discrimination in the bottlenose dolphin (Tursiops truncatus).* European Research on Cetaceans 15: pp. 118–122.

[26] JAAKKOLA, K. et al. (2005). *Understanding of the concept of numerically "less" by bottlenose dolphins (Tursiops truncatus).* Journal of Comparative Psychology 119: pp. 296–303.

[27] *See generally* HOLDEN, C. (2004). *Life without numbers in the Amazon.* Science 305: p. 1093.

[28] ABRAMSON, J.Z. et al. (2013). *Experimental evidence for action imitation in killer whales (Orcinus orca).* Animal Cognition 16: pp. 11–22.

[29] *See* ABRAMSON, J. Z. et al (2018). *Imitation of novel conspecific and human speech sounds in the killer whale (Orcinus orca).* Proc. R. Soc. B285, no. 1871: 20172171; FOOTE, A. D.et al. (2006). *Killer whales are capable of vocal learning.* Biology Letters 4: pp. 1-4.

[30] *See* HERMAN, L.M. (2012). *Body and self in dolphins.* Consciousness and Cognition 21: pp. 526–545 (research "demonstrates an advanced capability of dolphins for motor imitation of self-produced behaviors and of behaviors of others, including imitation of human actions, supporting hypotheses that dolphins have a sense of agency and ownership of their actions and may implicitly attribute those levels of self-awareness to others") (p. 526). Herman explains the high level of awareness—of both self and how other individuals perceive the environment—in dolphins as "the demands of social living in complex networks of sometimes collaborating and sometime competing individuals, and in which identification and knowledge of the behavioral and social propensities of others is paramount. In such societies a strong sense of self and other might emerge as an adaptive trait.

demonstrating that cetaceans recognize their image in a mirror and, in addition, are able to use that image to investigate their body.[31] In humans, the ability to recognize one's own image in a mirror does not develop until the age of two.[32] Bottlenose dolphins, orcas and false killer whales have all been reported to display behavior suggesting self-recognition.[33] Previously only the great apes had demonstrated self-recognition, and these results were not consistent for all subjects.[34]

Knowing yourself and knowing others would be immensely beneficial, as expressed through self-recognition, self-awareness, body-awareness, and attributions of these traits to others" (p. 540). The conclusion was that dolphins have exhibited considerable evidence of high-level cognitive ability and understanding—with higher levels of awareness of self and others than exhibited by human toddlers.

[31] MARTEN, K. and Psarakos, S. (1995). *Evidence of self-awareness in the bottlenose dolphin (Tursiops truncatus)*. In S.T. Parker et al. (eds.), Self-Awareness in Animals and Humans: Developmental Perspectives (Cambridge, United Kingdom: Cambridge University Press), pp. 361–379; REISS, D. and Marino, L. (2001). *Mirror self-recognition in the bottlenose dolphin: A case for cognitive convergence*. Proceedings of the National Academy of Sciences 98: pp. 5937–5942.

[32] AMSTERDAM, B. (1972). *Mirror self-image reactions before age two.* Developmental Psychobiology 5: pp. 297–305.

[33] DELFOUR, F. and Marten, K. (2001). *Mirror image processing in three marine mammal species: Killer whales (Orcinus orca), false killer whales (Pseudorca crassidens) and California sea lions (Zalophus californianus)*. Behavioural Processes 53: pp. 181–190.

[34] GALLUP, G.G. (1970). *Chimpanzees: Self-recognition*. Science 167: pp. 86–87; Gallup, G.G. (1982). *Self-awareness and the emergence of mind in primates*. American Journal of Primatology 2: pp. 237–1248; SUAREZ S.D. and Gallup G.G. (1981). *Self-recognition in chimpanzees and orangutans, but not gorillas*. Journal of Human Evolution 10: pp. 173–188; ANDERSON, J. (1984). *Monkeys with mirrors: Some questions for primate psychology*. International Journal of Primatology 5: pp. 81–98.

3) Lifespans

69. Lifespans of orca in captivity do not match healthy populations in the wild. A smaller percentage of captive orca achieve important milestones (such as sexual maturity and/or menopause), compared to those orca who are free-ranging.[35]

70. Per published research, male orcas in Northeast Pacific populations have an estimated maximum life span of 60 - 70 years and female orcas have a maximum estimated life span of 80 - 90 years.[36] Photo-identification has identified at least four female orcas in British Columbia who were adult-sized (at least 15 years of age) when the study started in 1973 and were still alive in 2014[37]— *i.e.*, they were

[35] SW00515; *see also* Schmitt Dep. Tr. at 177-78 [redacted]

[36] FORD, J.K.B. (2009). *Killer whale: Orcinus orca*. In W.F. Perrin *et al*. (eds.), Encyclopedia of Marine Mammals, 2nd edition (San Diego, California: Academic Press), pp. 650–657.

[37] It is unlikely that all four orcas were exactly the same minimum age for adulthood in 1973, and therefore experts believe that one or more of these females were actually older than 56 in 2014. For a list of individual whales in the Pacific Northwest populations with known or estimated ages, *see* OLESIUK, P.F. et al. (1990). *Life history and population dynamics of resident killer whales (Orcinus orca) in the coastal waters of British Columbia and Washington State*. Report of the International Whaling Commission, Special Issue 12: pp. 209–242; FORD, J.K.B. et al. (1994). *Killer whales* (Vancouver, British Columbia: University of British Columbia Press); ELLIS, G. et al. (2011). *Northern resident killer whales of British Columbia: Photo-identification catalogue and population status to 2010*. Canadian Technical Report of Fisheries and Aquatic Sciences 2942 (Nanaimo, British Columbia: Department of Fisheries and Oceans), available at http://www.dfo-mpo.gc.ca/Library/343923.pdf; TOWERS, J.R. et al. (2015). *Photo-identification catalogue and status of the northern resident killer whale population in 2014*. Canadian Technical Report of Fisheries and Aquatic Sciences 3139 (Nanaimo, British Columbia: Department of Fisheries and Oceans), available at http://publications.gc.ca/collections/collection_2016/mpo-dfo/Fs97-6-3139-1-eng.pdf.

(at least) 56 years old in 2014. In contrast, captive orcas of either sex rarely live longer than 30 years in captivity, including at SeaWorld.[38]

71. Research also shows that the overall mortality rate for captive orcas was and remains higher than that of free-ranging orcas.[39]

72. Captive orcas fall short on survivorship as well: A study published in 2015 used several methods to assess survivorship, and concluded that although

[38] *See, e.g.*, SeaWorld's Response to Plaintiffs' Request For Admission No. 11 ("SeaWorld admits that, as of September 13, 2017, of all killer whales ever in SeaWorld's collection, less than 8% were older than 35 at the time of death[.]."); *see also* Robeck Dep. Ex. 94 (SW000515); DEMASTER, D.P. and Drevenak, J.K. (1988). *Survivorship patterns in three species of captive cetaceans*. Marine Mammal Science 4: pp. 297–311; SMALL, R.J. and DeMaster, D.P. (1995). *Survival of five species of captive marine mammals*. Marine Mammal Science 11: pp 209–226; JETT, J. and Ventre, J. (2015). *Captive killer whale (Orcinus orca) survival. Marine* Mammal Science 31: pp. 1362–1377; www.orcahome.de/orcastat.htm.

[39] *See, e.g.*, [redacted] *see also* DEMASTER and Drevenak, (1988) pp. 297–311; WELLS, R.S. and Scott, M.D. (1991). *Estimating bottlenose dolphin population parameters from individual identification and capture-release techniques*. Report of the International Whaling Commission, Special Issue 12: pp. 407–415; OLESIUK, P.F. *et al*. (1990) pp. 209–242; Humane Society of the United States (1993). *Small Whale Species: The Case Against Captivity* (Washington, DC: The Humane Society of the United States); BALCOMB, K.C. (1994). *Analysis of age-specific mortality rates of Puget Sound killer whales versus SeaWorld killer whale*s. Prepared for The Humane Society of the United States (Washington, DC: The Humane Society of the United States); SMALL, R.J. and DeMaster, D.P. (1995). *Survival of five species of captive marine mammals*. Marine Mammal Science 11: pp. 209–226; WOODLEY T.H. et al. (1997*). A Comparison of Survival Rates for Free-Ranging Bottlenose Dolphins* (Tursiops truncatus)*, Killer Whales (Orcinus orca), and Beluga Whales* (Delphinapterus leucas). Technical Report No. 97–02 (Guelph, Ontario: International Marine Mammal Association, Inc.); PATTERSON, K. et al. (2013). *Annual survivorship rates (ASR) of captive killer whales: No improvement in 20 years*. Paper presented at the 20th Biennial Conference on the Biology of Marine Mammals, Dunedin, New Zealand, pp. 9-13 December 2013.

captive orca survival rates had improved in recent years, that "survival to age milestones [was] remarkably poorer for captive killer whales than for wild whales."[40]

73. Dr. Lori Marino explains, the impact of captivity on orca lifespans as follows:[41]

> [C]hronic stress [associated with captivity] leads to immunosuppression and susceptibility to physical disease in marine mammals that impacts mortality rates.[42] Captivity for orcas is catastrophic. Most captive orcas do not survive past the age of 20 years.[43] The natural average lifespan for male and female orcas is 29.2 and 50.2 years, respectively, with a maximum longevity of 60 and 90 years,

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[40] JETT and Ventre (2015) at p. 12.

[41] Marino, L., The Marine Mammal Captivity Issue: Time For a Paradigm Shift, in The Palgrave Macmillan Series on Animal Ethics Edited by Andrew Linzey and Priscilla Cohn, available online at http://whalesanctuaryproject.org/content/uploads/Marine-Mammal-Captivity-Time-for-a-Paradigm-Shift.pdf (short form citations replaced with footnotes).

[42] ST. AUBIN, D.J. & Geraci, J.R. (1988). *Capture and handling stress suppresses circulating levels of thyroxine (T4) and triiodothyronine (T3) in beluga whales Delphinapterus leucas*. Physiological Zoology 61(2): pp 170-175; NODA K. et al. (2007) *Relationship between transportation stress and polymorphonuclear cell functions of bottlenose dolphins*, *Tursiops truncatus*. J Vet Med Sci 69(4): pp. 379–383; SPOON T.R. & Romano T.A. (2011). *Neuroimmunological response of beluga whales (Delphinapterus leucas) to translocation and a novel social environment.* Brain, Behavior and Immunity 26(1): pp. 122-131.

[43] WILLIAMS V.(2001). *Captive Orcas, Dying to Entertain You*, Whale and Dolphin Conservation Society (WDCS), https://uk.whales.org/sites/default/files/dying-to-entertain-you.pdf.

respectively.[44] DeMaster and Drevenak[45] estimated the annual mortality rate for captive orcas at 7.0%, and two additional studies by Small and DeMaster[46] and Woodley, Hannah and Levine[47] both estimated captive annual mortality rates at 6.2% (excluding calves), considerably higher than the 2.3% annual mortality rate figure for wild populations (DeMaster and Drevanek).[48]

A recent review of orca health in captivity substantiates the many health risks by reporting two cases of deaths from mosquito-borne illnesses (St. Louis encephalitis and West Nile) in captive orcas. Unlike their wild counterparts, who are rarely stationary and spend a significant amount of time under water, captive orcas are often confined in pools too shallow for their body length and typically spend hours every day floating motionless on the surface, leaving them vulnerable to biting mosquitos and, therefore, a variety of blood-borne illnesses.[49] Moreover, most captive orcas are not provided shade from ultra-violet

[44] FORD, J.K.B. (2009). *Killer whale (Orcinus orca)*. In Encyclopedia of Marine Mammals, edited by William F. Perrin, Bernd Wursig, and J.G.M. Thewissen, pp. 650-656., San Diego: Academic Press; FORD, J. K. et al. (2000). *Killer Whales*. University of British Columbia Press, Vancouver; OLESIUK P. et al. (1990) pp. 209–244; WELLS R.S. & Scott M.D. (1990). *Estimating bottlenose dolphin population parameters from individual identification and capture-release techniques*. In: Hammond PS, Mizroch SA, Donovan GP, editors. Individual recognition of cetaceans: Use of photo-identification and other techniques to estimate population parameters. Rep Intl Whaling Comm Special Issue 12: 407–415; WOODLEY T.H. et al. (1997). *A comparison of survival rates for captive and free-ranging bottlenose dolphins (Tursiops truncatus), killer whales (Orcinus orca) and beluga whales (Delphinapterus leucas)*. International Marine Mammal Association Technical Report, pp. 97-02.

[45] DEMASTER & Drevenak (1988) pp. 297–311.

[46] SMALL & DeMaster (1995) pp. 209–226.

[47] WOODLEY et al. (1997). App. 97-02.

[48] DEMASTER & Drevenak (1988) pp. 297–311.

[49] JETT, J. & Ventre, J. (2012). *Orca (Orca orcinus) captivity and vulnerability to mosquito-transmitted viruses*, Journal of Marine Animals andTheir Ecology 5(2), 9-16.

> radiation and are often subject to its immunosuppressing effects.[50] And, to add insult to injury, captive orcas typically suffer from dental problems associated with raking their teeth on gates and hard parts of their tank. Thus, their teeth are often drilled and left open to the air, exposing them to all kinds of bacteria.[51] To combat infections they are given chronic doses of antibiotics which, in turn, reduce their immunity to diseases and ultraviolet effects. Jett and Ventre[52] suggest that this destructive cycle of poor welfare has long term consequences that account for short lifespans and high mortality for captive orcas.

74. Thirty orca have reportedly died at SeaWorld parks since 1980: three were three months of age or younger, with an additional 14 stillbirths or miscarriages.[53] The public display industry defends the high infant mortality rate in captivity based on an alleged high infant mortality rate in the wild, but this position contradicts the industry's argument that captivity shields wildlife from the rigors of the harsh natural environment. Captivity provides veterinary care, and reduces the uncertainties of foraging and the pressures of dealing with competitors, pollution, parasites, predators and other factors such as entanglements, boat strikes, etc. Yet,

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[50] JETT & Ventre. (2012).

[51] JETT, J. & Ventre, J. (2011). *Keto & Tilikum Express the Stress of Orca Captivity*. The Orca Project.

[52] JETT & Ventre (2012).

[53] See *http://orcahome.de/orcastat.htm* for a complete list of all known captive orcas — this website is periodically updated and is reportedly compiled from official government records (primarily from the United States, as other countries do not require inventories), media reports, and information submitted by animal activists around the world. The list is likely incomplete regarding pregnancies, unborn fetuses, spontaneous abortions (miscarriages), and stillbirths, making the calculated calf survival rate generous. *See also* www.cetabase.org.

as discussed above, captive orcas continue to experience an increased risk of dying at any given time in life than do free-ranging orcas. This is not surprising given the mortality rates seen for other wide-ranging predator species in captivity, a situation scientists have ascribed to stress and physiological dysfunction.[54]

75. I am aware of no reliable studies that show that the longevity of captive and wild orca are comparable.

4) Social behavior

76. Studies have shown that "culture"—or specialized behaviors that are taught to, and learned by, animals within the group or population, within and across generations—exists within many marine mammal populations.[55] Experts Dr. Naomi A. Rose, Dr. E.C.M. Parsons, and Dr. Richard Farinato[56] explain the importance of these learned behaviors:

> Many of these behaviors are important for the survival of the animals in the wild, such as specialized foraging techniques that allow successful prey capture in a particular ecosystem and unique vocalizations—dialects, in effect—that apparently serve to enhance group cohesion

[54] *See* CLUBB, R. & Mason, G. (2003). *Captivity effects on wide-ranging carnivores*. Nature 425, p. 463–474.

[55] *See* RENDELL, L. & Whitehead, H.P. (2001). *Culture in whales and dolphins*. Behavioral and Brain Sciences 24, p. 309-382; *see also* ROSE, N. A., Parsons, E. C. M. & Farinato, R. (2009). *The Case Against Marine Mammals In Captivity*. The Human Society of the United States and the World Society for the Protection of Animals, p. 10-11.

[56] ROSE, et al.(2009).

and recognition.[57] Recent research has highlighted the importance of culture in the conservation of marine mammals, calling it a source of fundamental survival skills.[58] It has long been known that whales and dolphins learn essential life skills from their mothers and also other group members. This is one of the reasons that cetaceans… stay so long with their mothers—for a lifetime in the case of male orcas in several populations, for example.

Despite the importance of culture in marine mammals, captive facilities do not take this into account in the husbandry (care and maintenance practices) of their animals…[59] Unfortunately, captive facilities routinely separate cetacean calves from their mothers and move them to other facilities or enclosures long before they would

[57] *See* RENDELL, L. et al.(2001), p. 309–382, for a detailed description of culture and its importance in whale and dolphin populations. To look at the importance of culture in orcas, see YURK et al.(2002), p. 1103–1119.

[58] WHITEHEAD, H. et al., (2004). *Culture And Conservation Of Non-Humans With Reference To Whales And Dolphins: Review And New Directions*. (2004). Biological Conservation 120, p. 431–441.

[59] An example of the problems that occur when captive facilities neglect the importance of culture is illustrated by Keiko, the orca made famous by the Free Willy movies. Keiko had been removed from his family group in Iceland at the age of one or two years. He was eventually sold to a facility in Mexico (after spending periods in an Icelandic enclosure and a dolphinarium in Canada), where he had no other orcas for company; his only companions were the occasional bottlenose dolphin. Scientists analyzing Keiko's calls (his "language") found them underdeveloped. He also mimicked and incorporated into his vocalizations both bottlenose dolphin calls and strange rhythmic sounds that were believed to be imitations of pool machinery. Consequently, when Keiko was being prepared for release back into the wild, his caretakers understood that not only did he have to be retaught how to catch fish, but he would not be able to communicate with wild whales until (and unless) he relearned how to "speak orca." TURNER, V. L. G. (1997). *The underwater acoustics of the killer whale (Orcinus orca).* Master's thesis, University of Southampton, United Kingdom/Woods Hole Oceanographic Institution, Massachusetts. Clearly, "Behavioral traits that are learned or culturally transmitted are especially prone to rapid loss in captivity." SNYDER, N. F. R., et al. (1996). *"Limitations Of Captive Breeding In Endangered Species Recovery* p. 341.

accumulate the skills necessary to fend for themselves in the wild. For example, Sumar, a male orca born at SeaWorld Orlando, was separated from his mother at only 6 months of age and was moved to California when he was less than 10 months old. Similar cases have been recorded for other orcas.[60]

… Another problem with this loss of culture in captive cetaceans is the associated increase in marine mammal mortality. Female cetaceans learn essential nursing skills from their mothers and also from other females in their population, sometimes acting as babysitters for the calves of other mothers. Separating calves from their mothers or other females from their population at an early age, or forcing animals to become pregnant when too young to have learned essential skills or achieved the maturity to rear a calf,[61] can lead to high levels of infant mortality.[62]

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[60] [redacted] *See* http://orcahome.de/orcastat.htm for additional details.

[61] [redacted] In the wild, female orcas have their first calf between 11 and 16 years of age, with an average first pregnancy at 15 years of age. FORD, J. K. B. (2002). *Killer whale, Orcinus orca*, in Encyclopedia of Marine Mammals, edited by W. F. Perrin et al. (San Diego: Academic Press), p.669–676. Apart from lacking cultural knowledge, these females may also suffer physiological damage from the stress placed on their bodies by having a calf so young, similar to that seen in humans.

[62] A study by researchers at Harderwijk Marine Mammal Park in the Netherlands mentions the high rate of calf mortality in captive display facilities and how a female dolphin in Harderwijk's care had successively drowned three calves born in captivity. As a result, a training program was launched to try to train the female not to reject her calf and to accept simulated suckling behavior from a model calf. Despite the training, the next calf who was born to the trained female died 15 days after birth as the result of an infection that the authors' paper suggests resulted from a wound inflicted by the mother immediately after the calf's birth.

77. Kohana, a female orca kept at Loro Parque in the Canary Islands, serves as another example of the importance of socialization. Born in May 2002, Kohana was impregnated when she was seven years of age. She had been living without any adult female orcas since she was younger than four, as she was transferred to Loro Parque from SeaWorld Orlando with three other young orca in February 2006. With nobody to teach her maternal skills, Kohana rejected her first calf, Adán, born in 2010, as well as her second calf, Vicky, born in late summer 2012.[63] Moreover, the reported father of these calves was Kohana's uncle, making the calves inbred.[64] Both her calves were hand-reared, only one successfully; Vicky died at 10 months of age. Kohana's lack of maternal behavior toward her newborns—she apparently simply swam away from them and never attempted to nurse them—is understood to be linked to the lack of her socialization from her mother or other adult females.[65]

78. In several free-ranging populations such as the Northern and Southern Resident orca (who live off of the west coast of North America), both males and

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KASTELEIN, R. A. & Mosterd, J. (1995). *Improving parental care of a female bottlenose dolphin (Tursiops truncatus) by training*, Aquatic Mammals 21, p.165–169.

[63] See VISSER, I. N. (2012). *Report on the Physical & Behavioural Status of Morgan, the Wild-Born Orca held in Captivity, at Loro Parque, Tenerife, Spain*, available online at http://www.freemorgan.org/wp-content/uploads/2012/11/Visser-2012-Report-on-the-Phyisical-Status-of-Morgan-V1.2.pdf.

[64] LOTT, R. & Williamson, C. (2017). *Cetaceans in captivity*, In A. Butterworth (ed.), Marine Mammal Welfare (Cham, Switzerland: Springer), p. 161–181.

[65] See *www.orcahome.de/orcastat.htm* for details regarding the orcas discussed in this paragraph (last visited February 4, 2019).

females associate with their mothers for their entire lifetimes, forming highly stable, multi-generational groups that are typically closed to immigration.[66] Dispersal of offspring (of either sex) is almost universal in mammals, with orca populations (e.g., the Northern and Southern Resident) being a rare exception. The strong social bonds between mother and offspring extend well into adulthood:

> "For male offspring ≤30 years old, there is a 3.1-fold increase in mortality risk in the year after their mother's death .... For males >30, this risk increases to 8.3-fold.... In contrast, female offspring ≤30 show no increase in mortality risk, whereas those >30 show some increase in risk (2.7-fold) in the year after their mother's death … Importantly, the magnitude of this effect does not differ between reproductive and postreproductive females. Indeed, for offspring >30, the death of a postreproductive mother increases mortality risk 13.9-fold in sons and 5.4-fold in daughters in the year after their mother's death."[67]

79. Ford (2009) explains that:

> "Social organization based on matrilineal descent may be typical of killer whales globally. In other regions where long-term photo-identification studies have been undertaken, close and prolonged associations of mothers and offspring are commonly seen (e.g., Norway, Crozet

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[66] *See, e.g.*, SW-AND0066283 [redacted] *see also* SeaWorld's Response to Plaintiffs' Interrogatory No. 17 (no evidence of wild killer whales separating from their mothers during their lifetimes); WRIGHT, B. et al. (2016). *Kin-directed food sharing promotes lifetime natal philopatry of both sexes in a population of fish-eating killer whales, Orcinus orca*, Animal Behaviour Volume 115, p. 81-95, available online at https://www.sciencedirect.com/science/article/pii/S0003347216000737; see also https://ars.els-cdn.com/content/image/1-s2.0-S0003347216000737-mmc1.mp4.

[67] FOSTER et al. (2012), *Adaptive Prolonged Postreproductive Life Span in Killer Whales*, Science 14 Sep 2012: Vol. 337, Issue 6100, p. 1313, available online at http://science.sciencemag.org/content/337/6100/1313.

> Islands, Argentina). Temporal persistence of these bonds may be a primary variable determining group sizes and structure."[68]

80. Some orca populations reportedly have family ties so persistent and well-defined that family members generally stay within a 4 km (2.5 mile) radius of each other at all times.[69]

81. Similarly, food-sharing (a social behaviour often linked to matrilines[70]) continues into adulthood in orcas.[71]

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[68] FORD, et al. (2009), p. 653.

[69] *See* FORD, et al. (2009), p. 650–657; *see also* BIGG, M.A. *et al.* (1990). *Social organization and genealogy of resident killer whales (Orcinus orca) in the coastal waters of British Columbia and Washington State,* Report of the International Whaling Commission, Special Issue 12, p. 383–405.

[70] WRIGHT et al. (2016) p.81-95.

[71] *See, e.g.*, around New Zealand (Visser, I. N. (1999). "Benthic foraging on stingrays by killer whales (*Orcinus orca*) in New Zealand waters." Marine Mammal Science 15(1): 220-227; Visser, I. N. (2000). Orca (Orcinus orca) in New Zealand waters. Ph.D. Dissertation, University of Auckland; Visser, I. N., J. Zaeschmar, J. Haliday, A. Abraham, P. Ball, R. Bradley, S. Daly, T. Hatwell, T. Johnson, W. Johnson, L. Kay, T. Maessen, V. McKay, N. Turner, B. Umuroa and D. S. Pace (2010). "First Record of Predation on False Killer Whales (*Pseudorca crassidens*) by Killer Whales (*Orcinus orca*)." Aquatic Mammals 36(2): 195-204. Visser, I. N., J. Berghan, R. van Meurs and D. Fertl (2000). "Killer whale (*Orcinus orca*) predation on a shortfin mako shark (*Isurus oxyrinchus*) in New Zealand waters." Aquatic Mammals 26(3): 229-231.), for Resident ecotypes (Wright et al, 2016), for the Transient ecotype (Baird, R. W. (1994). Foraging behaviour and ecology of transient killer whales (*Orcinus orca*) Ph.D. Dissertation, Simon Fraser University, Burnaby, British Columbia, Canada.), off the coast of Norway (Stenersen, J. and T. Similä (2004). Norwegian killer whales, Tringa forlag.), at Punta Norte, Argentina (Hoelzel, A. R. (1991). "Killer whale predation on marine mammals at Punta Norte, Argentina; Food sharing, provisioning and foraging strategy." Behavioral Ecology and Sociobiology 29: 197-204.), for the Type A ecotype off Antarctica (Visser, I. N., T. G. Smith, I. D. Bullock, G. D. Green, O. G. L. Carlsson and S. Imberti (2008). "Antarctic Peninsula killer whales (*Orcinus orca*) hunt seals and a penguin on

82. Although some populations of orca maintain very strong matrilineal societies, some have more fission-fusion societies.[72] But even these populations maintain long-term associations (years) between and within the sexes and as such the social units are based on long-term stable membership.

5) Foraging

83. During their evolutionary history, orca have developed adaptations that make them into the apex predator that we currently see. With their eclectic range of prey[73] as evidence of their efficiency, and with their extremely wide range of foraging techniques providing outstanding examples of their role in the ocean environment, they are the ocean's ultimate apex predator.

84. Below are two examples of the varied foraging techniques orca have developed around the world. In the first image, Figure [11], an adult male intentionally stranding as he comes onto the beach to take a South American sealion (*Otaria flavescens*) pup, Punta Norte, Argentina. In the second image, Figure [12],

floating ice." Marine Mammal Science 24(1): 225-234), Costa Rica (Fertl, D. C., A. Acevedo-Gutiérrez and F. L. Darby (1996). "A report of killer whales (*Orcinus orca*) feeding on a carcharhinid shark in Costa Rica." Marine Mammal Science 12(4): 606-611.).

[72] *See, e.g.,* Visser, I.N. (2000), Orca (Orcinus orca) in New Zealand Waters. PhD Dissertation, University of Aukland; *see also* Bisther, A. and D. Vongraven (1995). Studies of the social ecology of Norwegian killer whales (Orcinus orca). Whales, seals, and man. A.S. Blix, L.Walloe and O. Ultang, Elsevier Science B.V.: 169-176.

[73] *See* details provided in Section VI(2)(4)(1). *See also* Schedule 8 (an excess of 140 prey species recorded to date).

two females and their offspring cooperatively hunt for a long-tailed stingray (*Dasyatis thetidis*), Bay of Islands, New Zealand.

Figure [11][74]

Figure [12][75]

85. It is common for orca in the wild to forage cooperatively. This has been documented from the high-Arctic to the Antarctic and many locations between. In the first picture below, Figure [13], four orca forage in a kelp bed for an eagle ray (New Zealand). In the second picture below, Figure [14], five orca cooperatively hunt a crabeater seal on an ice floe by creating a wave. This event involved the orca anticipating the results their actions would create and appeared to be a training session for the young orca present (see Visser et al 2008 for details).

[74] Photo © Ingrid Visser.

[75] Photo © Ingrid Visser.

Figure [13][76]

[76] Photo © Ingrid Visser.

Figure [14][77]

86. There are many more examples in the scientific literature, of the wide range of foraging methods used by orca. Inherently intertwined with foraging methods, particularly in association with cooperative hunting, are numerous records of orca food sharing. This important social aspect can result in provisioning of younger animals or be sharing between group members. In the below image, an older orca (right) shares food (an eagle ray) with a younger orca off the coast of New Zealand. Although the ray was caught by the older animal, it was shared with the younger who is not its calf. Such provisioning has been documented across all age and sex classes in orca, including adult-to-adult sharing.[78] It has also been

[77] Photo © Ingrid Visser.

[78] VISSER, I. N. (2000). *Orca (Orcinus orca) in New Zealand waters,* Ph.D. Dissertation, University of Auckland.

documented for compromised animals (*e.g.*, an orca with a spinal deformity who had apparently lost her mother was provisioned by a number of different (and presumably unrelated) groups).[79]

Figure [15][80]

87. In the below pictures, an adult female orca hunts for an eagle ray (*Myliobatis tenuicaudatus*), Bay of Islands, New Zealand.

[79] STENERSEN, J. & T. Similä (2004). *Norwegian killer whales, Tringa forlag,*.

VESTER, H. (2012). *Re-sighting over a seventeen year period, of an orca known as "Stumpy" Lofoten Island in northern Norway in 2012,* Unpublished report. Henningsvaer, Ocean Sounds Non-Profit Organisation, p. 4.

[80] Photo © Ingrid Visser.

Figure [16][81]

88. In the below pictures, a female orca rams an adult false killer whale (*Pseudorca crassidens*) so hard it flies into the air, likely resulting in a broken back (left). The false killer whale is hit so hard it somersaults through the air (right).[82]

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[81] Photos © Ingrid Visser.

[82] See more details regarding the hunt, including the calf in VISSER, I. et al (2010). *First Record of Predation on False Killer Whales (Pseudorca crassidens) by Killer Whales (Orcinus orca)*, Aquatic Mammals 36(2), p. 195-204.

Figure [17][83]

89. In the below picture, Figure [18], a broadnosed seven gill shark (*Notorhynchus cepedianus*) can be seen upside-down in the mouth of an adult female orca (note blood coming out of mouth of shark). In the picture that follows, Figure [18], a shortfin mako shark (*Isurus oxyrinchus*), is seen held in the mouth of a sub-adult male. Both images were shot off the New Zealand coast.

[83] Photos © Tommy Hatwell/Explore Images.

Figure [18][84]

Figure [19][85]

90. *See* Table [1] below for further examples of elasmobranchs that this population has been documented foraging on. At least 11 species of elasmobranchs have been documented as prey for the New Zealand coastal orca and it has been established that they are the primary food. Seven of these species have raised denticles on their skin resulting very rough surfaces (indicated by (R) in the table), two have moderately (M) rough skin or only certain areas of larger raised denticles[86]. The remaining two have a surface layer of mucous which may reduce contact between the denticles and the teeth of the orca. Despite extensive elasmobranch-foraging, the orca from this population have 'pristine' teeth (*see* Section VI(2)(4)).

Elasmobranch species	**Source**
eagle ray *Myliobatis tenuicaudatus*	**Visser**, I. N. (1999). *Benthic foraging on stingrays by killer whales (Orcinus orca) in New Zealand waters*. Marine Mammal Science, 15(1), p. 220-227.
long-tailed stingray **(M)** *Dasyatis thetidis*	**Visser**, I. N. (1999). *Benthic foraging on stingrays by killer whales (Orcinus orca) in New Zealand waters*. Marine Mammal Science, 15(1), p. 220-227.
short-tailed stingray **(M)** *Dasyatis brevicaudatus*	**Visser**, I. N. (1999). *Benthic foraging on stingrays by killer whales (Orcinus orca) in New Zealand waters*. Marine Mammal Science, 15(1), p. 220-227.
basking shark **(R)** *Cetorhinus maximus*	**Visser**, I. N. (2001). *Foraging behaviour and diet of (Orcinus orca) in New Zealand waters*. Paper presented at the 14th Biennial Conference on the Biology of Marine Mammals, Vancouver, British Columbia, Canada.
blue shark **(R)** *Prionace glauca*;	**Visser**, I. N. (2001). *Foraging behaviour and diet of (Orcinus orca) in New Zealand waters*. Paper

84 Photos © Ingrid Visser.

85 Photos © Ingrid Visser.

86 COMPAGNO, L. J. V., Ed. (1984). *FAO species catalogue. Vol 4 Sharks of the world. Fisheries Synopsis*, Part 1. Hexanchiformes to Laminformes, Rome: Food and Agriculture Organisation.

	presented at the 14th Biennial Conference on the Biology of Marine Mammals, Vancouver, British Columbia, Canada.
broadnosed sevengill shark **(R)** *Notorhynchus cepedianus*	**Visser**, unpublished data
hammerhead shark **(R)** *Sphyrna zygaena*	**Visser**, I. N. (2005). *First observations of feeding on thresher (Alopias vulpinus) and hammerhead (Sphyrna zygaena) sharks by killer whales (Orcinus orca) which specialise on elasmobranchs as prey*. Aquatic Mammals, 31(1), p. 83-88. doi: 10.1578/AM.31.1.2005.83
school shark **(R)** *Galeorhinus galeus*	**Visser**, I. N. (2000). *Killer whale (Orcinus orca) interactions with longlines fisheries in New Zealand waters*. Aquatic Mammals, 26(3), p. 241-252.
shortfin mako shark **(R)** *Isurus oxyrinchus*	**Visser**, I. N., Fertl, D., Berghan, J., & van Meurs, R. (2000). *Killer whale (Orcinus orca) predation on a shortfin mako shark (Isurus oxyrinchus), in New Zealand waters*. Aquatic Mammals, 26(3), p. 229-231.
thresher shark **(R)** *Alopias vulpinus*	**Visser**, I. N. (2005). *First observations of feeding on thresher (Alopias vulpinus) and hammerhead (Sphyrna zygaena) sharks by killer whales (Orcinus orca) which specialise on elasmobranchs as prey*. Aquatic Mammals, 31(1), p. 83-88. doi: 10.1578/AM.31.1.2005.83
torpedo ray *Torpedo fairchildi*	**Visser**, I. N. (2001). *Foraging behaviour and diet of (Orcinus orca) in New Zealand waters*. Paper presented at the 14th Biennial Conference on the Biology of Marine Mammals, Vancouver, British Columbia, Canada.

Table [1]

6) Research on wild orca

91. As one of the most studied cetaceans in the wild (along with bottlenose dolphins and humpback whales), we have a solid baseline of information about orca, from which to understand this species. For example, within my personal library

alone, I have over a thousand articles on wild orca which cover a wide range of topics, i*nter alia*;

a. *Social aspects* (including associations, group sizes, dispersal (and non-dispersal), food sharing, reproduction, aggression, baby-sitting, relatedness, group foraging, cooperation, influence of status, hierarchies and post-reproductive roles).

b. *Distribution* (including geographical range(s) of various ecotypes during daily and longer time frames, distances travelled during daily and long-range travels). For example, multiple ecotypes have now been documented travelling in excess of 100 km to 200 km (124 miles) per day.[87]

[87] *See, e.g.*, LAURIANO, G., R. Eisert, S. Panigada, E. Ovsyanikova, N, I. N. Visser, P. H. Ensor, R. Currey, B. Sharp and M. Pinkerton (2015). *Activity, seasonal site fidelity, and movements of Type-C killer whales between the Ross Sea (Antarctica) and New Zealand*. Convention on the Conservation of Antarctic Marine Living Resources (Type C (Antarctica, Ross Sea)); MATKIN, C. O., D. R. Matkin, G. M. Ellis, E. Saulitis and D. McSweeney (1997). *Movements of resident killer whales in Southeastern Alaska and Prince William Sound, Alaska*.Marine Mammal Science 13(3), p. 469-475. (Alaskan Resident; six days moved "for a minimum average speed of 5.1 km/h for the direct route distance of 740 km", = 123 km per day); MATTHEWS, C. J., S. P. Luque, S. D. Petersen, R. D. Andrews and S. H. Ferguson (2011). *Satellite tracking of a killer whale (Orcinus orca) in the eastern Canadian Arctic documents ice avoidance and rapid, long-distance movement into the North Atlantic*. Polar Biology 34(7), p. 1091-1096 (Canadian Arctic; 159.4 km/day); ANDREWS, R. D., R. L. Pitman and L. T. Ballance (2008). *Satellite tracking reveals distinct movement patterns for Type B and Type C killer whales in the southern Ross Sea, Antarctica*.Polar Biology 31, p 1461-1468. (Type B whale (pinniped prey specialist), a maximum of 114 km day (although mostly averaged 56 km)); DURBAN, J. W. and R. L. Pitman (2011). *Antarctic killer whales make rapid, round-trip movements to subtropical waters: evidence for physiological maintenance*

c. *Ecotypes* (at least 10 different ecotypes described so far, research has included genetics, acoustics, social structures, morphology, prey preferences, distribution, stable isotopes, necropsies etc).

d. *Foraging behaviour* (more than 140 different species of prey have now been recorded for orca – arguably one of the most diverse diets documented for any cetacean species and perhaps also for all predators, including terrestrial species). To put this into perspective, one of the top feline predators, the cougar, has been documented predating on approximately 60 species from across its range of North, Central and South Americas.[88]

e. *Diving depths & durations* (currently[89] the maximum depth recorded for an orca is for an adult female who dove to 1087m (3566 ft) but who also "*regularly dove >750m*" (2460 ft). That female was considered to be diving to "shallow" depths when the depths were <100m (328 ft). The current maximum duration for a single dive is over 11 minutes (however, note that this was recorded during the 1087m dive with a

migrations? Biology Letters online. (Type B; in 42 days travelled 9392 km [=223.6 km/day]).

[88] HORNOCKER, M. N., Sharon (2009). *Couger: Ecology and Conservation*. Chicago, University of Chicago Press.

[89] Previous deepest dive was reported in REISINGER, R., M. Keith, R. D. Andrews, and PJN de Bruyn (2015). *Movement and diving of killer whales (Orcinus orca) at a Southern Ocean archipelago.* Journal of Experimental Marine Biology and Ecology 473, p. 90-102, where the maximum dive depth was 767.5m.

speed of 12.6km per hour (7.8 miles), so longer dives at shallower depths are to be expected). One study, investigating the factors influencing the diving behaviour of fish-eating orca found that dive rates did not change with age, or between males and females.[90]

f. *Systematics, morphology, anatomy, reproduction, natural history, acoustics* (all of these aspects have been investigated in various ecotypes, at a range of locations and for decades now).

V. BACKGROUND ON KILLER WHALE CAPTIVITY

92. Orca are one of the most numerous of cetacean species held in captivity, along with bottlenose dolphins (*Tursiops truncatus*) and beluga whales (*Delphinapterus leucas*).[91] Captivity of cetaceans started when harbor porpoises were kept (as early as the 1400's),[92] and thereafter flourished through a proliferation of marine parks, aquarium and oceanariums in the late 1930s, soon after it was discovered that dolphins could be trained to perform in staged animal shows.[93] The

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[90] BAIRD, R. W., M. B. Hanson and L. M. Dill (2005). *Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and interannual variation in diving rates*. Canadian Journal of Zoology 83, p. 257-267.

[91] MARINO L., *The Marine Mammal Captivity Issue: Time For a Paradigm Shift*, in The Palgrave Macmillan Series on Animal Ethics. http://whalesanctuaryproject.org/content/uploads/Marine-Mammal-Captivity-Time-for-a-Paradigm-Shift.pdf

[92] ODELL, D. K. and L. Wlodarski (2009). *Marine parks and zoos*. Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, Academic Press, p. 692-695.

[93] MITMAN Gregg, *Reel Nature: America's Romance with Wildlife on Film*, p. 168, B00BET0C2M, 2012, University of Washington Press.

capture of killer whales began in 1961.[94] Between then and November 2018, approximately 166 killer whales have been collected from the wild, of which 129 are already dead.[95] As of the same date, 71 orcas continue to be held in tanks globally (37 wild-captured, plus 34 captive-born).[96]

1) Capture of wild killer whales

93. Early attempts to capture killer whales ended in injuries and deaths of the animals. The first reported attempt to capture a killer whale was in 1961. A 17-foot-long female orca was found disoriented, swimming next to Newport Harbor, California.[97] Per news reports, several failed attempts were made to catch the orca, before she was finally trapped by the tangle of nets and was carried ashore to be trucked to Marineland South Pacific, in South of Los Angeles. She was held in a tank at the park, where she reportedly kept crashing into the walls of the tank. The orca was swimming at high speed around the tank before it convulsed and died.

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[94] *"Killer Whale Netted in Newport Harbor"*. (1991) Independent-Press-Telegram Newspaper of Long Beach, California / Bob Geivet. Retrieved February 25, 2014.

[95] *See* https://uk.whales.org/wdc-in-action/fate-of-captive-orcas.

[96] *Id.*

[97] *"Killer Whale Netted in Newport Harbor"*. (1991). Independent-Press-Telegram Newspaper of Long Beach, California / Bob Geivet. Retrieved February 25, 2014; *"Newport Specimen' November, 1961 / Behavioral, Antatomical and Pathological Data on the 'Newport Specimen"*". Marineland of the Pacific Historical Society. Archived from the original on April 7, 2014. Retrieved February 25, 2014; see also MESSENGER Stephen, *Remembering Wanda, the First Killer Whale taken into captivity*, The Dodo, https://www.thedodo.com/remembering-wanda-the-first-ki-498461409.html.

Behavioral, Antatomical and Pathological Data on the "Newport Specimen"

On 17 November 1961, Brown was notified by officials of the Harbor Department, Newport Beach, California, that a killer whale had been seen in the yacht turning basin of Newport Harbor. This animal had been observed swimming in the general area for several days prior to the call. On the same day, a party from Marineland of the Pacific drove to Newport, and upon sighting the animal's dorsal fin as it surfaced to breathe, it became immediately apparent that the animal was a female.

The following morning, 18 November, Frank Brocato, Marineland's Director of Collections, together with his crew, arrived at Newport at 6:30 AM aboard the fishing vessel *Geronimo* and made an attempt to capture the animal. The techniques usually employed to capture cetaceans failed, owing mainly to the turbidity of the harbor water and the whale's refusal to run the bow of the vessel. It was therefore decided to attempt to capture the animal by using a large net. The net, 1200 feet long by 75 feet deep, was successfully set in a large circle around the whale. However, after the collectors had bunched the floats and had restricted the whale's movements to a circle approximately 100 feet in diameter, the animal broke through the meshes. Shortly before her escape, she was seen to lie on the surface and emit a number of loud eructations through the pursed blow-hole, after which the animal was observed to lie on her back in the water and smack her flukes upon the surface with great force.

Upon breaking the net she resumed her normal swimming pattern. After recovering the net and effecting repairs, another attempt was made. The animal appeared to anticipate the intentions of the men and evaded the net, surfacing to breathe some 50 feet outside the encircled area. The final attempt to capture the animal was made at 3:00 PM, and Captain Brocato and his crew were successful at this time in netting and finally securing the whale alongside *Geronimo's* hull. A deflated rubber raft was pulled in position beneath the whale. This, after inflation, was towed ashore and the animal was lifted onto a truck and successfully transported to Marineland.

Upon being placed into the 100 by 50 by 19 foot oval fish tank at approximately 10:00 PM, the whale initially struck her snout a glancing blow on one of the walls. She then commenced to swim slowly around the confines of the tank, her behavior being similar to that of newly-introduced smaller delphinids. The following morning, the whale was observed holding a newly-killed ocean sunfish in her mouth. This fish was not consumed, however, and during the remainder of the day many attempts were made to induce feeding. Marineland divers attached lines to bonita, and "worried" the killer whale with these as she slowly encircled the enclosure. The animal made several attempts to bite the food and it was at this time that the worn condition of her teeth was first observed. At 8:30 AM on 20 November, the whale became violent and after encircling the tank at great speed and striking her body on several occasions, she finally swam into a flume way, convulsed and expired.

134 *Bulletin So. Calif. Academy Sciences / Vol. 63, Pt. 3, 1964*

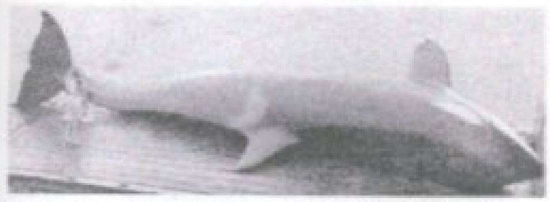

Figure 4. Dorsal view of the Newport killer whale. Photograph by W. R. Monahan, Marineland of the Pacific.

marineland
Copyright 2003 - MOTHS, Marineland of the Pacific Historical Society

Upon her removal from the tank, the following measurements were obtained. The measurements were made over the curve of the body, from point to point, on the left side.

Weight: 9007 kilograms
Total length (tip of snout to fluke notch): 521 centimeters
Tip of snout to middle of eye: 55
Tip of snout to inside corner of mouth crease: 41
Tip of snout to anterior origin of flipper: 115
Tip of snout to apex of cephalic melon: 15
Tip of snout to center of blowhole: 73
Tip of snout to center of anus: 364
Tip of snout to center of dorsal fin: 239
Anterior origin to tip of left flipper: 73
Anterior origin to tip of right flipper: 74
Axilla to tip of left flipper: 59
Greatest width of left flipper: 45
Depth of median notch of flukes: 9
Width of spread flukes, tip to tip: 135
Median notch in flukes to closest portion of the posterior curve of dorsal fin: 262
Length of dorsal fin base: 64
Height of dorsal fin: 53
Blowhole width: 11
Projection of upper jaw beyond lower jaw: 14
Length of genital slit: 47
Girth at blowhole: 116
Girth at origin of flippers: 134
Girth at origin of dorsal fin: 159
Girth at anus: 88
Girth at origin of flukes: 40

Tip of snout to eye patch: 55
Length of eye patch (patch gray in color): 50-55
Profile of caudal stock: slightly falcate

Pathologists from the Los Angeles County Livestock Department performed a necropsy the same morning. Death was due to acute gastroenteritis and pneumonia. The former condition was no doubt secondary to a massive nematode infestation of the first and second stomach compartments. Also it was felt that the great stress experienced by the animal during capture and confinement contributed to the pathological condition.

Of particular interest was the discovery of an advanced athrosclerosis. Both the heart and the major blood vessels showed considerable disease.

The animal's brain weighed 4500 grams, and showed remarkably high development.

During the dissection of the head and jaws, a fracture of the right ramus of the mandible was found. This was comminuted, and numerous sequestra were found encapsulated in the affected area. The lesion appeared to be of long standing and probably caused the animal great discomfort during life. It should be repeated, however, that the fracture apparently had not displaced the jaw to suggest that the excessive tooth wear was a result of the such an injury.

This concludes the section of the paper with respect to the "Newport Specimen." Visitors interested in acquiring a copy of the entire paper may do so by contacting us at research@marinelandofthepacific.org and a copy will be sent to you for a nominal fee.

Figure [20][98]

94. Similarly, the second orca reported to have been captured, Moby Doll (despite the name, a male), had been harpooned in 1964.[99] He was taken to Vancouver, British Columbia and put on display, but only survived for only three months.

95. The third reported capture occurred in June 1965 when a 22-foot (6.7m) male orca was found in a salmon net close to shore near Namu, British Columbia.[100] The orca was named Namu, after the place of his capture. He was sold for display to

[98] Adapted from *Marineland of the Pacific Historical Society. Archived from the original on April 7, 2014. Retrieved February 25, 2014.*

[99] *See* "A listing of dolphin/whale captures," available online at https://www.pbs.org/wgbh/pages/frontline/shows/whales/etc/cron.html.

[100] WGBH Frontline: "Edward 'Ted' Griffin, The Life and Adventures of a Man Who Caught Killer Whales" Retrieved March 28, 2008.

the Seattle public aquarium and died a year later, in July 1966.[101] Reportedly, a bacterial infection, as a result of polluted water in his tank, caused Namu's death.[102] Namu was the first whale to actually perform in captivity, and his short life at the aquarium is said to have led to the Pacific Northwest's "black and white gold rush."[103]

96. Shortly after Namu's capture, in October 1965, Shamu, a young 14 foot (4.25m), 2000 lb (900 kg) female Southern Resident orca was captured off Penn Cove, Puget Sound to be a companion for Namu at Seattle public aquarium.[104] Shamu's name has been reported to mean "Friend of Namu" (or, alternatively, "She-Namu").[105] However, Shamu reportedly did not get along with Namu and so was sold to SeaWorld in San Diego in December 1965.[106]

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[101] LYKE, M. L. . (2006) *Granny's Struggle: A black and white gold rush is on*, Seattle P-I, link Accessed 27 March 2008

[102] *Id.*; *see also* https://www.pbs.org/wgbh/pages/frontline/shows/whales/etc/cron.html; http://archive.kuow.org/post/remembering-namu-killer-whale-breeding-program-ends.

[103] RECHBERG, M. J. (2011). *Dying to Entertain Us or Living to Educate Us? A Comprehensive Investigation of Captive Killer Whales, Their Trainers, and How the Law Must Evolve to Meet Their Needs*. 31 J. Nat'l Ass'n Admin. L. Judiciary Iss. 2 Available at: http://digitalcommons.pepperdine.edu/naalj/vol31/iss2/7, at 732.

[104] "The Killer in the Pool", Zimmermann, Tim, *Outside Magazine*, 2010 July last accessed February 4, 2019; see also *"Granny's Struggle: A black and white gold rush is on"*, Lyke, M. L., Seattle Post-Intelligencer 2006 October 11 last accessed February 4, 2019; "Stories of Captive Killer Whales," available online at https://www.pbs.org/wgbh/pages/frontline/shows/whales/etc/orcas1.html last accessed February 4, 2019;

[105] https://www.orlandovillas.com/florida_guide/how-did-shamu-get-her-name.aspx

[106] *"SeaWorld Investigation: Secrets Below the Surface". KGTV San Diego. Retrieved July 23, 2018.*

97. Shamu was made to perform at SeaWorld until an incident on April 19, 1971, in which she bit the legs and hips of Anne Eckis, a SeaWorld employee who was trying to ride her as part of a filmed publicity event. Shamu refused to release the woman until other workers came to the rescue and pried the orca's jaws apart with a pole.[107] [redacted][108] She was estimated to be about 3 years at the time of her capture and was approximately 9 years old when she died.

"Shamu - Orca Aware". Orca Aware.

[107] *Eckis v. Sea World Corp.* [Civ. No. 14458. Court of Appeals of California, Fourth Appellate District, Division One. November 19, 1976.] [64 Cal. App. 3d 1] (justia.com link)

"Killer Whale Bites Girl In Marine Act Rehearsal". Toledo Blade. Associated Press. April 20, 1971. Retrieved September 22, 2014.

https://www.youtube.com/watch?v=dMNfyXbBfqA.

[108] SW000515

Figure [21][109]

98. *"Over 150 animals [orca] worldwide, mostly juveniles, have been taken from their wild family groups and sold into captivity since 1965."*[110] The Southern Resident population of the Northeast Pacific lost 48 of its members to captivity, and the population since then is endangered.[111] They were identified as endangered in November 2005, "with decreased genetic diversity as a result of excessive captures as one of the factors leading to their decline."[112]

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109 https://www.youtube.com/watch?v=dMNfyXbBfqA.

110 RECHBERG, M. J. (2011) p. 733.

111 POLLARD, S. (2014). *Puget Sound Whales For Sale. The fight to end orca hunting*, Charleston, London, The History Press.

POLLARD, S. (2019). *A Puget Sound Orca in Captivity: The Fight to Bring Lolita Home*.

112 RECHBERG, M. J. (2011). p. 733 (citing Margaret M. Krahn et. al., 2004 Status Review of Southern Resident Killer Whales (Orcinus Orca) Under the Endangered Species Act, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION 60-61 (2004), available online at https://repository.library.noaa.gov/view/noaa/3402).

99. I understand that, as a result of the captures of orca for the captivity industry, the USA government adopted the Marine Mammal Protection Act in 1972 to restrict the capture of orca in U.S. territories.[113] The capture then moved to other sea territories: in Iceland, 64 orca were captured alive, of which 55 were exported to marine parks between 1976 and 1988.[114] The last reported Icelandic capture took place in October 1989.[115] Since then, increased public awareness led to the Minister of Fisheries denying capture permits.[116]

100. Following that, captures of orcas were operated in Japan.[117] Reportedly, 19 orcas were sent into captivity, of which only 5 remained alive by 2001,[118] and none remain alive today.[119]

101. The most recent location for orca captures has been in Russian waters (in the Sea of Okhotsk, to the north of Japan and west of Kamchatka Peninsula).

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113 https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/marine-mammal-protection-act.html

114 WILLIAMS V., (2001). *Captive Orcas, Dying to Entertain You*, Whale and Dolphin Conservation Society (WDCS). https://uk.whales.org/sites/default/files/dying-to-entertain-you.pdf

115 *Id.* (2001).

116 *Id.*

117 *Id.*

118 *Id.*

119 https://web.archive.org/web/20190202040106/https://www.hakaimagazine.com/features/sale-wild-russian-killer-whales/

102. Starting in 2003, the western world began to learn of the horrific techniques that were still being used to capture wild orca, and the deaths that were a commonplace result. These techniques were the same ones that SeaWorld had employed to capture orca off the Pacific Northwest coast and in Iceland.

103. In 2012, the first orca taken from the wild since Morgan in June 2010,[120] was taken from the Sea of Okhotsk. Named Narnia, she was estimated to be approximately 5 years old when captured.[121]

104. In 2013 at least eight, probably more orca were reportedly captured in a series of events and many shipped to China.[122]

105. By 2017, the Chinese aquarium industry had started to 'boast' about their 'orca breeding' program, but details about the whales still remain elusive and it seems that they do not have any sexually mature male orca. Photographs show the orca inside a small indoor facility, associated with Chimelong Ocean Park, Chimelong, China.

[120] http://www.freemorgan.org/morgan-2/

[121] https://web.archive.org/web/20190202035626/http://orcahome.de/orcastat.htm

[122] Details about these animals (including actual numbers captured) have been kept confidential, even to the point that the whales, most of who are now believed to have been in China for over five years, remain unnamed in the most updated online databases, such as 'www.orcahome.de' and 'cetabase.org'.

106. At least two, possibly three whales from the Russian captures were planned to be used at the opening of the 'Winter Olympics' (held in Sochi, Russia).[123] They were held in atrocious conditions, in a variety of facilities, including a rusting metal tanks for months and moved around the country.[124]

107. Three of the Russia orca, taken from the wild during that same capture timeframe (including Narnia[125]) were sent to the then newly built Russian 'Moskvarium', an aquarium in Moscow which also now houses bottlenose dolphins and beluga.

108. More recently (2018), at least 10 orca were captured in the same Sea of Okhotsk area, apparently intended to be sold to the Chinese for their fast-expanding aquarium industry, modelled on the SeaWorld orca shows.[126]

2) Killer whales born in captivity

109. Currently, there are approximately 71 orcas held in captivity globally (37 wild captured, plus 34 captive-born).[127] According to a former trainer, "*part of the*

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[123] *See* https://www.cbc.ca/news/canada/british-columbia/sochi-winter-olympics-orca-whale-exhibit-sparks-outrage-1.2498621; https://www.mirror.co.uk/news/world-news/winter-olympics-killer-whales-sochi-3012316.

[124] *See* https://web.archive.org/web/20180423091757/http://orcahome.de/narnia.htm; https://web.archive.org/web/20180425000655/http://www.orcahome.de/nord.htm; https://web.archive.org/web/20180423091751/http://orcahome.de/juliet.htm; *see also* http://www.earthisland.org/journal/index.php/articles/entry/where_in_the_world_is_narnia_the_sochi_olympics_orca/.

[125] https://web.archive.org/web/20180423091757/http://orcahome.de/narnia.htm

[126] http://chinacetaceanalliance.org/en/china-cetacean-alliance/

[127] https://us.whales.org/wdc-in-action/fate-of-captive-orcas

reason [SeaWorld] built the three Shamu Stadiums in the three parks is because apparently the facilities were not big enough to allow the babies to nurse and [SeaWorld's orcas] did have some calves born that didn't survive."[128]

110. Kalina, a female orca born in September 1985 at SeaWorld Orlando, was the first captive-born orca calf to survive more than two months.[129] Kalina's mother is an Icelandic female named Katina, and her father, Winston (also known as Ramu III), was a Pacific Southern Resident, making Kalina an Atlantic/Pacific hybrid, something that would not naturally occur in the wild.[130]

111. The first killer whale successfully conceived through artificial insemination was Nakai, who was born to Kasatka at the SeaWorld park in San Diego in September 2001.[131] A female killer whale named Kohana, the second killer whale conceived in this manner, was born at the same park eight months later.[132]

112. While other killer whale exhibitors may continue to breed killer whales, SeaWorld announced in 2016 that it would discontinue breeding. That breeding ban included the SeaWorld orca held at Loro Parque, in Tenerife, Spain.

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[128] http://collider.com/samantha-berg-carol-ray-blackfish-interview/

[129] https://www.historychannel.com.au/articles/first-killer-whale-born-in-captivity/. See also : https://www.dailykos.com/stories/2016/6/12/1537326/-The-Source-of-my-SeaWorld-Disillusionment-Keet-s-Family-Tree-Part-2

[130] *"Kalina" Orca Spirit. Retrieved February 15, 2009.*

[131] *"Artificially inseminated killer whale gives birth"* BBC. Retrieved February 14, 2009.

[132] Kasatka is Kohana's grandmother. "Kohana" Friend of the Orcas. Retrieved February 12, 2009.

3) An overview of the consequences of captivity

113. The overwhelming evidence shows that captivity, at least under the conditions prevalent among marine parks such as SeaWorld, does not suit orca well for multiple reasons. As Lori Marino Ph.D., a neuroscientist and expert in animal behavior and intelligence, explains, captivity is detrimental to orca health:[133]

> Captive dolphins and whales display physical and behavioral abnormalities stemming from chronic stress.[134] The United States Marine Mammal Inventory Report published by the National Marine Fisheries Service lists numerous stress-related disorders, such as ulcerative gastritis, perforating ulcer, cardiogenic shock and psychogenic shock as 'cause of death' along with immunodeficiency-based infections.[135] One of the common manifestations of stress, besides physical illness, is behavioral abnormalities. These include behavioral stereotypies, i.e., repetitive purposeless behaviors,[136] self-

[133] MARINO, L., *The Marine Mammal Captivity Issue: Time For a Paradigm Shift*. The Palgrave Macmillan Series on Animal Ethics Edited by Andrew Linzey and Priscilla Cohn, available online at http://whalesanctuaryproject.org/content/uploads/Marine-Mammal-Captivity-Time-for-a-Paradigm-Shift.pdf (short form citations replaced with footnotes).

[134] STEWART, K.L. and Marino, L. (2009) *Dolphin-human interaction programs: Policies, problems, and practical alternatives*. Policy paper for Animals and Society Institute.

[135] United States Marine Mammal Inventory Report. (2010). National Marine Fisheries Service, Office of Protected Resources.

[136] DEFRAN R. H. & Pryor, K. (1980). *The behavior and training of cetaceans in captivity*. Herman L, ed. Cetacean Behavior: Mechanisms and Functions. New York: John Wiley and Sons, p. 319 – 364; MURRAY, F. E. (1978). *A stereotyped behavior pattern in dolphins*. Fowler Murray E, ed. Zoo and wild animal medicine. Philadelphia: WB Saunders. p. 33–34; ANDREW, G. (1977). *A stereotyped behavior pattern in dolphins*. Aquat Mamm 5: 15–17; SWEENEY, J.C. (1988). *Specific pathologic behavior in aquatic mammals: Self- inflicted trauma*. Soundings: Newsletter of the Intl Marine Animal Trainers Assoc 13(1), 7.

> mutilation and self-inflicted trauma,[137] as well as excessive aggressiveness towards other cetaceans and humans.[138] Confinement impacts not only physical freedom but social relationships… As further evidence that captive cetaceans are psychologically stressed by captivity, they are often given anti-anxiety psycho-active drugs. For example, two male orcas at SeaWorld Orlando were acting aggressively toward a very young calf (and even trying to mate with her). They, and the calf's mother, were all given diazepam, a drug initially marketed as Valium and used to treat panic attacks, general anxiety, and seizures.[139] There is every indication that drugs like this are used regularly to "mellow out" anxious and disturbed captive whales and dolphins.

114. Additionally, captivity fails to replicate the cultural and social aspects of wild orcas' lives. As humans have, orcas have adapted to different natural environments which has in turn has led to the development of different orca cultures, each defined mostly by their diet and communication, that are learned, passed down over the generations, and refined over time. For example, researchers have found that depending on their culture, orcas will eat different kinds of fishes or mammals,[140] and have different hunting practices,[141] and even have their own dialects to

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137 SWEENEY, J.C. (1988), p.7.

138 MARINO, L.and Frohoff, T.(2011). *Towards a New Paradigm of Non-Captive Research on Cetacean Cognition.* PLoS ONE 6(9): e24121. doi:10.1371/journal. pone.0024121.

139 Affidavit by Michael Walsh, SeaWorld trial.

140 FORD, J. K. B., Graeme M. Ellis, Craig O. Matkin, Michael H. Wetklo, Lance G. Barrett-Lennard, and Ruth E. Withler. (2011). *Shark Predation and Tooth Wear in a Population of Northeastern Pacific Killer Whales*. Aquatic Biology, 11, p. 213–24.

141 NEIWERT, D. (2015). *Of Orcas and Men. What Killer Whales Can Teach Us*. New York: Overlook Press.

communicate with one another.[142] In captivity, orcas are frequently separated from their own, and even mixed with animals from other cultures, causing stress and conflict. Dr. Marino describes the social complexity of orca as follows:

> Possibly the most important component of who dolphins and whales are is their level of sociality. Although not all cetaceans are highly social, those species kept in captivity, ironically, tend to be among the most socially complex. All three, bottlenose dolphins, beluga whales, and orcas, develop slowly with very long juvenile periods in which they learn the social and material skills needed in adulthood. Alloparental care in the wild is common in all three species.[143] Moreover, cultural traditions have been identified in many species of cetaceans, including the bottlenose dolphin and the killer whale.[144]
>
> . . . Resident orcas in the North American Pacific Northwest live in matrilineal social units, which are themselves parts of pods, which are members of clans, and one to three clans form a community.[145] These nested levels of social units are distinguished by dialects and other behavioral traditions formed by social learning. For instance, dialect similarity is related to group closeness; dialect similarity decreases as one compares matrilineal groups within pods, pods within clans, clans within communities, and communities.[146]

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[142] MORTON, A. (2004). *Listening to Whales: What the Orcas Have Taught Us*. New York: Ballantine Books.

[143] LEUNG, Elaine S., Vergara, Valeria, and Barrett-Lennard, Lance G. (2010). *Allonursing in captive belugas (Delphinapterus leucas).* Zoo Biology 29: 633-637.

[144] Rendell, L.& Whitehead, H. (2001) p. 309-324; WHITEHEAD, H.(2011). *The culture of whales and dolphins. In Whales and Dolphins: Cognition, culture, conservation and human perceptions* (ed by Philippa Brakes and Mark P. Simmonds)., p149-165.

[145] BIGG, M.A., et al. (1990), p. 383-405.

[146] DEECKE, Volker B., Ford, John K., and Spong, Paul. (2000). *Dialect change in resident killer whales: Implications for vocal learning and cultural transmission.*

> Orca groups can be extremely complex in terms of the roles families and individuals play in the group. For instance, many orca groups are matrilineal and rely on family relationships for survival. Moreover, within populations, some matrilines play a more central role in the social network than others and are, therefore, critical for maintaining the group's integrity. Thus, individual orcas in a group are not generic or interchangeable and the effects of the removal of individual whales depends upon their role in the social network.[147]

115. Wild captures also have a detrimental impact on wild populations of orca, as Dr. Naomi A. Rose, Dr. E.C.M. Parsons, and Dr. Richard Farinato explain:

> The detrimental impacts of removing animals from a population might be most clearly seen in the case of orcas in Washington State. From 1962 until it was made illegal under state law in 1976, 45 orcas were taken from the Southern Resident population in Washington State. At least 11 animals died during capture, and the surviving 34 were shipped to aquaria and dolphinaria, of which only one animal is currently alive.[148] The current population is believed to have been effectively halved by these removals[149] and was recently listed as endangered under

Animal Behaviour 40, p. 629-638; FORD, et al.(2000). ; YURK, H.(2003). *Do killer whales have culture? In Animal social complexity: intelligence, culture, and individualized societies*. (eds. F.B.M. de Waal and P. L. Tyack), p. 465 – 467.

[147] WILLIAMS, R.and Lusseau, D. (2006). *A killer whale social network is vulnerable to targeted removals*. Biology Letters 2(4), p.497-500.

[148] This whale is Lolita, also known as Tokitae, a female orca currently kept at Miami Seaquarium. Lolita is one of only four captive orcas known to have surpassed 30 years of age and one of only two who are believed to have survived past 40 (she was captured in 1970, when she was estimated to be 4–5 years of age; the other over-40 orca is Corky of SeaWorld San Diego).

[149] An analysis by the Center for Whale Research estimated that if the Southern Resident captures had not taken place, the number of reproductively active orcas in the population would be 44 percent greater. These individuals would have given birth to approximately 45 surviving calves. The number of captured animals (all of whom theoretically could have survived to the present day), plus these "potential"

> the U.S. Endangered Species Act, partially because of the impacts from these removals.[150]
>
> Historically, another hot spot for capture activity was Iceland— dozens of orcas were captured for foreign trade in a live-capture fishery sanctioned by the Icelandic government in the 1970s and 1980s. These captures stopped in the late 1980s, when the controversy surrounding live orca captures increased. They also occurred historically in the waters off Japan but ended due to local depletions in the late 1980s. Orcas had not been seen off Wakayama Prefecture in Japan for 10 years when a pod was sighted in February 1997. Ten animals were captured by fishermen from Taiji, of which five, all juveniles or sub-adults, were sold to dolphinaria and aquaria and the remainder released . . . All five of these young animals were dead after less than 12 years; this outcome is appalling in a species known to live as long as humans do.

116. Certain aspects of the harms of captivity on orca, particularly captivity at SeaWorld, are discussed in greater detail in later sections of this report.

VI. IMPACT OF CAPTIVITY AT SEAWORLD ON THE HEALTH AND WELFARE OF SEAWORLD'S ORCA

117. Orca, in the form of the contemporaneous species we recognise today, have evolved over millions of years, with the earliest identified *Orcinus*-like specimens coming from the Pliocene (~ 5 to 3 million years ago). One of the better

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calves, suggests that the population has approximately 90 fewer orcas than it might have had without the captures. The population today is approximately 90 whales. Jacobs, S. (2003). *Impact of the captures between 1962 and 1973 on the Southern Resident killer whale community*. (Friday Harbor, Washington: Center for Whale Research, 2003), http://orcahome.de/impact.htm.

[150] The Southern Resident population of orcas was listed as endangered in November 2005. See http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/killerwhale.htm.

studied fossil ancestors of orca is *Orcinus citoniensis,*[151] an extinct species of orca that lived from 3.6 to 2.5 million years ago. In contrast, modern humans have been around for only approximately two to three hundred thousand years.[152]

118. By keeping orca in captivity, SeaWorld removes the environmental facets that drove these adaptations to develop, and also strips each individual animal of the opportunities to express its natural behaviours, eradicates its prospects to make choices, and eliminates variation in its life. Instead, its life is completely controlled by its captors: from the time of the day they get fed, what food they receive, what they must do to get that food, to whom they can mix with and whom they can mate with.

119. This section discusses and evaluates, in the context of animal welfare standards (explained below), some of the health and welfare issues arising from captivity of orca.

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151 CAPELLINI, G. (1883). *Di un'orca fossile scoperta a Cetona in Toscana*. Memorie Accademia delle Scienze dell'Istituto di Bologna 4(4): pp. 665-687.

152 MCHENRY, H.M (2009). *Human Evolution.* In Michael Ruse; Joseph Travis. *Evolution: The First Four Billion Years*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press. p. 265.

TRINKAUS E. (2005). *Early Modern Humans*. Annual Review of Anthropology. 34: pp. 207–30.

120. It is worth noting that a large number of independent scientists have expressed concern about the health and welfare of orca in captivity. In Schedule 14, I present an illustrative list of such scientists.[153]

1) Overview of Animal Welfare Standards

121. Various standards (or measures) are used in industries involving animals to evaluate the animals' health and wellbeing. These are known as "animal welfare standards." 'Welfare' refers to the physical, mental or emotional 'state' of an animal as it attempts to cope with its environment. Signs and symptoms serve as indicators to assess how well that happens. For example, visible ribs of an animal (sign) may be a physical indicator that the animal is experiencing hunger and thirst (symptoms). Similarly, behaviour can be instructive as well: attempts to move towards food or water — or eating food rapidly — may be signs of the same symptoms as visible ribs. These demonstrate that something is compromising welfare for the animal. Since members of intelligent species cope with difficult conditions in different ways, any single indicator can show that welfare is poor for that animal, or even across a group of animals. In some instances, there may be multiple indicators presenting at the same time.

122. A basic set of animal welfare standards is the "Five Freedoms." This standard is widely recognized, including by the World Organization for Animal

[153] *See also* SW-AND0252569 (Dr. Naomi Rose's opinions on some of the issues relevant to this case).

Health (OIE),[154] and the Food and Agriculture Organization of the United Nations. The latter organization provides the following description of the evolution of the Five Freedoms and related welfare standards:

> In 1965, the British Government commissioned an investigation into the welfare of farmed animals and thereafter proposed that all animals should have freedom to stand up, lie down, turn around, groom themselves and stretch their limbs. These became known as the "Five Freedoms" (Farm Animal Welfare Council, 2009). In 1993, the United Kingdom Farm Animal Welfare Council (FAWC) decided that the original definitions concentrated too much on space requirements and on the comfort-seeking aspects of behaviour, to the exclusion of other relevant elements of animal welfare such as good food, good health and safety. The expanded Five Freedoms now established by the FAWC are:
>
> 1. freedom from hunger and thirst – by ready access to fresh water and a diet designed to maintain full health and vigour;
>
> 2. freedom from discomfort – by the provision of an appropriate environment including shelter and a comfortable resting area;
>
> 3. freedom from pain, injury or disease – by prevention or through rapid diagnosis and treatment;
>
> 4. freedom to express normal behaviour – by the provision of sufficient space, proper facilities and company of the animal's own kind; and
>
> 5. freedom from fear and distress – by the assurance of conditions that avoid mental suffering.
>
> The Five Freedoms have been widely accepted as a statement of fundamental principles of animal welfare. Although they do not provide detailed guidance on the

[154] *See, e.g.,* http://www.oie.int/en/animal-welfare/animal-welfare-at-a-glance/; see also https://www.oie.int/doc/ged/D7597.PDF.

> treatment and care of animals, they serve as a useful framework for the assessment of whether animals' basic welfare needs are being met on farms, in markets, during transport, in lairages (holding pens for animals awaiting slaughter) and during slaughter. They have been included or referred to in national legislation, for example in New Zealand's Animal Welfare Act (1999) where they were used as part of the definition of animals' "physical, health and behavioural needs" (sec. 4), and Costa Rica's Animal Welfare Act (1994) where they are considered the "basic conditions" for animal welfare (art. 3). The Five Freedoms have also been adapted and incorporated into regional agreements such as the European Convention for the Protection of Animals Kept for Farming Purposes (1976), although there they were expanded to include far broader animal welfare provisions.[155]

123. The Food and Agriculture Organization also describes the "Welfare Quality" standards, that were prepared based on the Five Freedoms:

> As a complement to the Five Freedoms, 12 criteria for the assessment of animal welfare have been identified by the Welfare Quality Project (WQP), a research partnership of scientists from Europe and Latin America funded by the European Commission. The WQP aims to develop a standardized system for assessing animal welfare – a system that would be implemented in Europe – and more generally to develop practical strategies and measures to improve animal welfare (Welfare Quality, 2009).
>
> The WQP criteria for the assessment of animal welfare are:
>
> 1. Animals should not suffer from prolonged hunger, i.e. they should have a sufficient and appropriate diet.
>
> 2. Animals should not suffer from prolonged thirst, i.e. they should have a sufficient and accessible water supply.
>
> 3. Animals should have comfort around resting.

155 http://www.fao.org/docrep/013/i1907e/i1907e01.pdf.

4. Animals should have thermal comfort, i.e. they should neither be too hot nor too cold.

5. Animals should have enough space to be able to move around freely.

6. Animals should be free from physical injuries.

7. Animals should be free from disease, i.e. farmers should maintain high standards of hygiene and care.

8. Animals should not suffer pain induced by inappropriate management, handling, slaughter or surgical procedures (e.g. castration, dehorning).

9. Animals should be able to express normal, non-harmful social behaviours (e.g. grooming).

10. Animals should be able to express other normal behaviours, i.e. they should be able to express species-specific natural behaviours such as foraging.

11. Animals should be handled well in all situations, i.e. handlers should promote good human-animal relationships.

12. Negative emotions such as fear, distress, frustration or apathy should be avoided, whereas positive emotions such as security or contentment should be promoted.

The WQP emphasizes that these 12 criteria are animal-centred, aimed at assessing an animal's experience of its own situation. Although resource-based and management-based criteria are also relevant to assessing the entire animal welfare situation, according to the WQP such criteria are secondary to those assessing the animal's experience. Since they reflect a wide consensus, the WQP criteria provide a powerful framework for the development of legislation in line with international animal welfare principles . . .[156]

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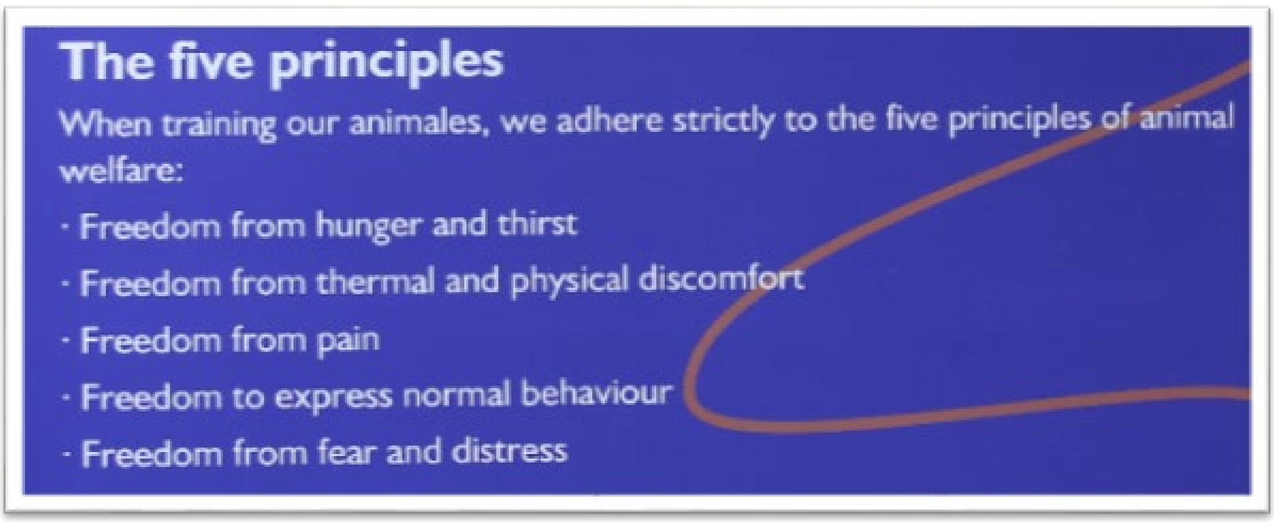
[156] *Id.*

124. Parks at which SeaWorld orca are held recognize—and claim to adhere to—the Five Freedoms. For example, Figures [22] and [23] below depicts signage at Loro Parque enumerating the freedoms,[157] and Figure [24] below is a screenshot from SeaWorld's website claiming to have formulated standards to "accomplish a state of welfare above and beyond these basic freedoms."

[157] Loro Parque has apparently adapted the third freedom, i.e., "freedom from pain, injury or disease" to simply "freedom from pain."



Figures [22] and [23][158]

[158] *See* http://www.freemorgan.org/5-freedoms/ (accessed on February 5, 2019).

Figure [24][159]

125. Another set of animal welfare standards — one that can be viewed as a modifications of the Five Freedoms — is the "Five Domains." This model is also widely recognized, including, for example by the World Association of Zoos and Aquariums (WAZA).[160] I understand SeaWorld and Loro Parque are members of WAZA.[161] Figure [25] is an infographic published by the association that explains the standards:

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[159] Screenshot from https://seaworld.org/conservation/animal-welfare/providing-the-opportunities-to-thrive/ (last accessed on February 6, 2019).

[160] *See, e.g.*, http://www.waza.org/files/webcontent/1.public_site/5.conservation/animal_welfare/WAZA%20Magazine%2016.pdf.

[161] Some of SeaWorld's orca were held at Loro Parque until late 2017 when SeaWorld transferred ownership of those orca to Loro Parque. SeaWorld Form 8-K EX-99.1 SEC filing 7 November 2017. [redacted] *See* SW-AND0252580. In this

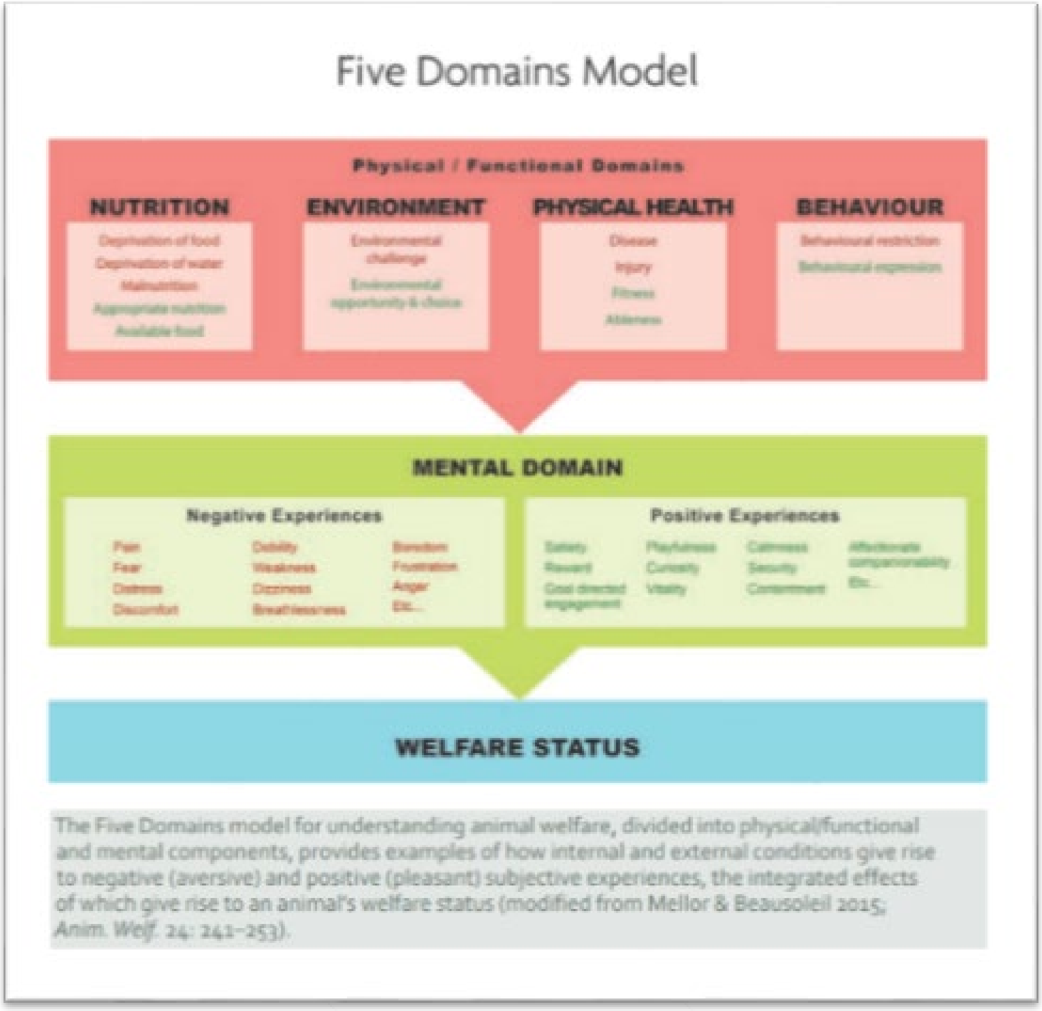

Figure [25][162]

126. The C-Well® model, propounded by Clegg et al. (2015), is another set of animal welfare standards which focuses on cetaceans maintained in zoological

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report, unless specified otherwise, my discussion of SeaWorld and SeaWorld orca include the Loro Parque and the orca held there.

[162] *Id.*; *see also* MELLOR, D.J, et al., *THE SCIENCES OF ANIMAL WELFARE*, Wiley Blackwell (2009) at 6.

facilities.[163] Clegg, on the website of her organization called Animal Welfare Expertise, describes the model as follows:

> The Cetacean Welfare Assessment, or C-Well, was developed in 2013 in a collaboration between the University of Miami and Dolphins Plus, Dolphin Cove and Island Dolphin Care in the Florida Keys. The objective of the project was to adapt a well-established farm animal welfare assessment (WelfareQuality®) to captive dolphins. Globally, this was the first effort to develop a comprehensive assessment for zoo animals using welfare science principles. The measures were established using published literature on dolphin health, behaviour, physiology, anatomy, cognition, and ecology, with an emphasis on normal and abnormal states. Throughout the process, professional expertise from other welfare scientists, veterinarians and marine mammal curators was systematically included. Measures were then tested practically on the 20 dolphins at the facilities and further refined, with repeated applications to animals in poorer health or social standing.
>
> The C-Well© contains 36 measures, the majority of which are animal-based, which each follow a standardised scoring system (0 = good welfare, 1 = sub-optimal/adequate welfare, 2 = poor welfare). The assessment is designed to be objective, practical and "strategically redundant," *i.e.* some of the measures aim to capture the same phenomenon, reducing the chance of signs being missed. It measures individual dolphin welfare, and has the ability to make comparisons across demographics (e.g. sex and age), as well as between facilities to establish 'best practices'. A detailed instruction manual was developed alongside the C-Well to allow third party assessors to conduct the

[163] *See* CLEGG, ILK et. al. (2015), *C-Well: The development of a welfare assessment index for captive bottlenose dolphins (Tursiops truncatus)*, Animal Welfare, Volume 24, Number 3, August 2015, pp. 267-282(16); see also CLEGG, I. (2018). *Can We Assess Marine Mammal Welfare in Captivity and in the Wild? Considering the Example of Bottlenose Dolphins*. Aquatic Mammals. 44. pp. 181-200. 10.1578/AM.44.2.2018.181.

> measures. The process and an overview of the C-Well measures was published in the journal Animal Welfare (Clegg, Borger-Turner & Eskelinen, 2015, contact us for a copy).[164]

127. The C-Well model, as explained in Table 1 of Clegg (2015), relies on 11 criteria to assess welfare, with the 11 criteria further subdivided into 36 "measures."[165]

128. There are other animal welfare standards as well. For example, most recently, Brando et al. proposed the "24/7" model, which included evaluation of 14 standards, and described the model as follows:

> We have combined these two approaches [Five Domains and Welfare Quality], and adapted and extended the 12 welfare criteria to assess any captive animal in our 24/7 approach (see below). We focus here on zoo-housed animals, but the approach is applicable to any captive animal. . .
>
> For 24/7, we propose that welfare assessments should be planned at specific times, at important changes and/or transitions (e.g. particular requirements such as shelter, heating or cooling might be necessary with a change of season). A change in the care staff is another example. When someone who has cared for certain individuals for many years is retiring, early planning and continued animal welfare assessment can help identify, prevent and address possible negative impacts. Assessment is also needed when an animal is moved in or out of the group (through death or transfer). Revisiting the workshop questions at pre-determined times would increase the

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[164] https://www.animalwelfareexpertise.com/the-cetacean-welfare-assessment.

[165] CLEGG, ILK et. al. (2015), *C-Well: The development of a welfare assessment index for captive bottlenose dolphins (Tursiops truncatus)*, Animal Welfare, Volume 24, Number 3, August 2015, pp. 267-282(16).

> likelihood that an animal's needs and preferences are attended too as much as possible.[166]

129. Another important animal welfare model is the one proposed by Dawkins, which suggests guidelines for evaluating animal welfare "based on the answers to two [basic] questions: Q1: Will it improve animal health? and Q2: Will it give the animals something they want?"[167]

130. SeaWorld's orca are not thriving.[168] To the contrary, based on *any* of the animal welfare models discussed above—namely Five Freedoms, Five Domains, Dawkins, C-Well, and 24/7—the welfare of captive orca at SeaWorld is materially compromised. In this Section VI, I discuss in detail the violations / deficiencies in SeaWorld's care and treatment of its orca and the detrimental impact of captivity at SeaWorld on the health and wellbeing of the orca.

131. For an illustration of the application of the animal welfare models, my 2016 report evaluating the welfare of the SeaWorld orca at Loro Parque may be

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[166] BRANDO, S. and Hannah M. Buchanan-Smith (2018). The 24/7 approach to promoting optimal welfare for captive wild animals. Behavioural Processes 156 (2018) 83–95.

[167] *See* DAWKINS, M.S. (2008), *The science of animal suffering*. Ethology 114: pp. 937-945:. doi:10.1111/j. 1439-0310.2008.01557.x; *see also* DAWKINS, M.S. (2006) *A user's guide to animal welfare science*. Trends in Ecology and Evolution 21: pp. 77-82. http://dx.doi.org/10.1016/j.tree.2005.10.017.

[168] GASS Dep. Tr. at 116-117 [redacted]

referred to.[169] I incorporate the aforesaid 2016 report herein. It should be noted that, even though I focused on the C-Well model and the Five Freedoms in my 2016 report,[170] the same conclusion is arrived at using any of the other models. It is also important to note that, because the challenges orca face in captivity at SeaWorld are correlated, interlinked and often compounded (*see* Schedule 3), any of the issues discussed in the following sections can demonstrate deficiencies on multiple welfare standards. For example, SeaWorld's provision of inadequate space and insufficiently complex enclosures to the orca are a violation of not only C-Well criterion no. 5, but because they lead to environmental and conspecific injuries as well as stereotypies, are also violations of at least C-Well criterion nos. 6, 9 and 10. Accordingly, merely because I discuss certain issues under the heading relating to SeaWorld's housing facilities, exhibition tanks and other habitats, does not mean that those same issues do not provide evidence of deficiencies in C-Well measures (or other animal welfare standards) relating to aspects of welfare *other than* enclosures.

[169] VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain.* Available at http://www.freemorgan.org/wp-content/uploads/2016/07/Visser-Lisker-2016-Ongoing-concerns-regarding-Seaworld-orca-held-at-Loro-Parque-V1.3.pdf (last accessed February 6, 2019).

[170] The C-Well model is tailored specifically to cetaceans. The Five Freedoms provides the foundation for the various models (including C-Well).

2) Compromised welfare relating to SeaWorld's housing facilities, exhibition tanks, and other habitats

1. Overview

132. Orca are large animals — as SeaWorld acknowledges.[171] Heyning & Dahlheim (1988)[172] and citations therein explain: "*Female killer whales generally attain a body length of 7.0 m and males 8.2 m (Mitchell, 1975); however, maximum lengths of 8.5 m for females and 9.8 m for males have been reported (Perrin and Reilly, 1984). Killer whales are robust. Few animals have been weighed but a maximum recorded mass was 3,100 kg for a 6.35 m female and 4,000 kg for a 6.04 m male (Hoyt, 1981).*"

133. Eleven years later, in their next seminal work Dahlheim & Heyning (1999)[173] stated: "*sexual dimorphism occurs in body size, flipper size, and height of the dorsal fin. Females attain a body length of up to 7.7 m and males 9.0m (Heyning and Brownell, in prep.)*" and "*[a]lthough few animals have been weighed, maximum*

[171] See SeaWorld Infobook ("[K]iller whales are the largest predators of mammals ever known.") (available at https://web.archive.org/web/20100213102910/http://www.seaworld.org/infobooks/KillerWhale/physchkw.html).

[172] At page 2, HEYNING, J. E. and M. E. Dahlheim (1988). *Orcinus orca*. Mammalian Species 304: pp. 1-9.

[173] At page 287, DAHLHEIM, M. E. and J. E. Heyning (1999). *Killer whale Orcinus orca (Linnaeus, 1758).* Handbook of Marine Mammals. S. H. Ridgway and R. J. Harrison. London, Academic Press. 6: pp. 281-322.

accurate weights of 3810 kg for a 6.70m female and 5568kg for a 6.75m male have been obtained B. Andrews, personal communication)."[174]

134. The largest male ever recorded was 9.8 m (32 ft) and weighed 10,000 kg (22,000 lb), while the largest female ever recorded was 8.5 m (28 ft) and weighed 7,500 kg (16,500 lb).[175]

135. Orca are also wide-ranging, fast-moving and deep-diving predators. In the wild, they reportedly travel up between 60 and 225 km (35 to 140 miles) in a day, reach speeds as high as 50 km (30 miles) an hour, and regularly dive from 500 to over 1000 meters deep.[176] The complexity of the lives of these animals in the wild is also illustrated through the multitude of records of orca travelling great distances. The Convention on the Conservation of Migratory Species of Wild Animals (or "CMS")

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[174] I understand B. Andrews refers to former SeaWorld employee, Brad Andrews.

[175] JEFFERSON, T. A. et al. (1993). *FAO Species Identification Guide. Marine Mammals of the World*. Rome: Food and Agriculture Organization of the United States.

[176] *See* DURBAN, J.W. & Pitman, R.L. (2012). *Antarctic killer whales make rapid, round-trip movements to sub-tropical waters: Evidence for physiological maintenance migrations?* Biology Letters 8: pp. 274– 277; MATTHEWS, C.J.D. *et al.* (2011). *Satellite tracking of a killer whale (Orcinus orca) in the eastern Canadian Arctic documents ice avoidance and rapid, long-distance movement into the North Atlantic*. Polar Biology 34: pp. 1091–1096; EISERT, R. et al. (2015). *Seasonal site fidelity and movement of type-C killer whales between Antarctica and New Zealand*. Paper presented to the Scientific Committee at the 66th Meeting of the International Whaling Commission, 22 May–3 June 2015, San Diego, California. SC/66a/SM09; BAIRD, R.W. *et al.* (2005). *Factors influencing the diving behaviour of fish-eating killer whales: Sex differences and diel and interannual variation in diving rates*. Canadian Journal of Zoology 83: pp. 257–267; REISINGER, R.R. et al. (2015). *Movement and diving of killer whales (Orcinus orca) at a Southern Ocean archipelago.* Journal of Experimental Marine Biology & Ecology 473: pp. 90–102.

recognises this nomadic lifestyle by listing orca in as Appendix II species, and as such they have been determined to be a species which migrates or passes through a range of territorial waters.[177]

136. Despite having visited each of the SeaWorld facilities numerous times, one aspect that I notice every time I walk into these facilities is the small size of the orca tanks. Each one of the SeaWorld orca tank systems is not only small overall, but the total area is subdivided into various smaller tanks. Moreover, the tanks appear overcrowded since multiple orca are held together in the limited space that is provided. I discuss the issues arising from the above in this section.

2. Dimensions

137. Orca tanks at SeaWorld range from 8 to 35 feet in depth and 170 feet long. For example, the specific dimensions of SeaWorld San Diego's orca tanks are below.

[177] https://www.cms.int/en/species/orcinus-orca; see also https://www.cms.int/sites/default/files/document/II_7_Orcinus_orca_Australia_e.pdf. Despite their inclusion as a migratory species, Loro Parque (SeaWorld's former affiliate where SeaWorld orcas were on display) wrongly informs the public that orca are "Not Included" in CMS or the Convention on the Trade in Endangered Species. I discuss dissemination of this and other misinformation concerning orcas in Section VI(2)(4)(13) below.

Pool	Approximate Dimensions	Approximate Surface Area
A	35' deep x 170' long x 80' wide	11,692 sf
B	15' deep x 118' long x 75' wide	9,504 sf
C	15' deep x 118' long x 75' wide	9,819 sf
D	9' deep x 53' long x 25' wide	1,489 sf
E Existing	30' deep x 125' long x 75' wide (google earth)	10,729 sf

Figure [26][178]

Figure [27][179]

138. For perspective, below is an image comparing the orca habitat (arrow) at SeaWorld San Diego with the parking space (outlined in yellow) at SeaWorld San Diego.

[178] SW528 at SW000544 (California Coastal Commission Report). These are representative of the orca tanks at other SeaWorld facilities. For example, the show tank at SeaWorld Orlando measures approximately 58m (190 ft) at its maximum length and 11m (36 ft) at its deepest depth. The show tank at SeaWorld San Antonio measures 70m (228 ft) at its maximum length and 12 m (40 ft) at its deepest depth. The show tank at Loro Parque has a maximum length of 50.8m and a maximum depth of 12m.

[179] https://www.thedodo.com/seaworld-tank-size-1282993451.html

Figure [28][180]

139. The size, depth, shape, surroundings, props, colors, and textures of enclosures at SeaWorld are ill-suited for orca in light of the above. The below infographics elucidate this point:

[180] Image adapted from Google Earth. *See also* https://www.thedodo.com/seaworld-tank-size-1282993451.html; https://www.seaworldofhurt.com/things-bigger-than-an-orca-tank-seaworld/ (comparing the tanks to other everyday things).

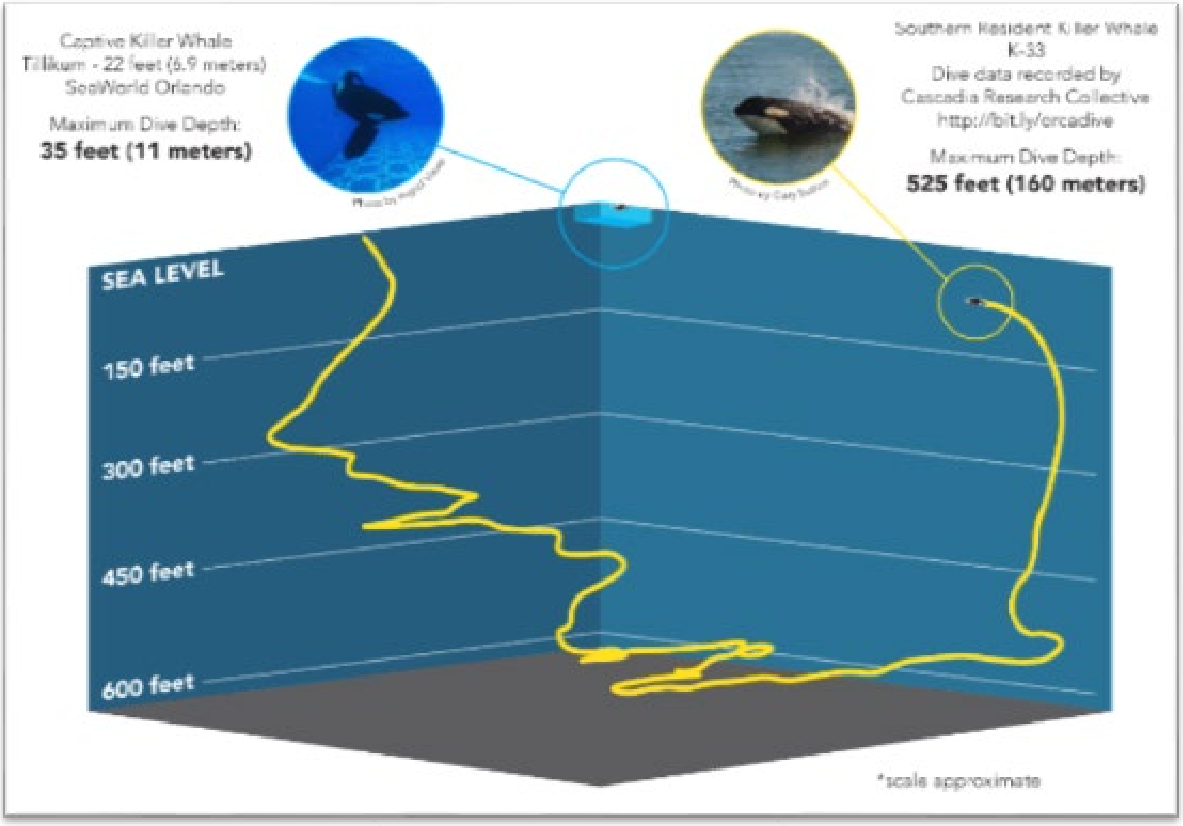


Figure [29][181]

140. Note the small blue box, between the two orca above. This represents the maximum depth that an orca at SeaWorld Orlando is restricted to, due to the shallow tank system. The yellow line represents a single dive of K-33 (also known as Tika), a male orca belonging to the Southern Resident community of orca. The example of K33's dive profile is worth noting within the framework of an approximate 6 hour 'track' observed (see Figure [30] below).

181 Image adapted from https://www.seaworldfactcheck.com/kwtanks.htm.

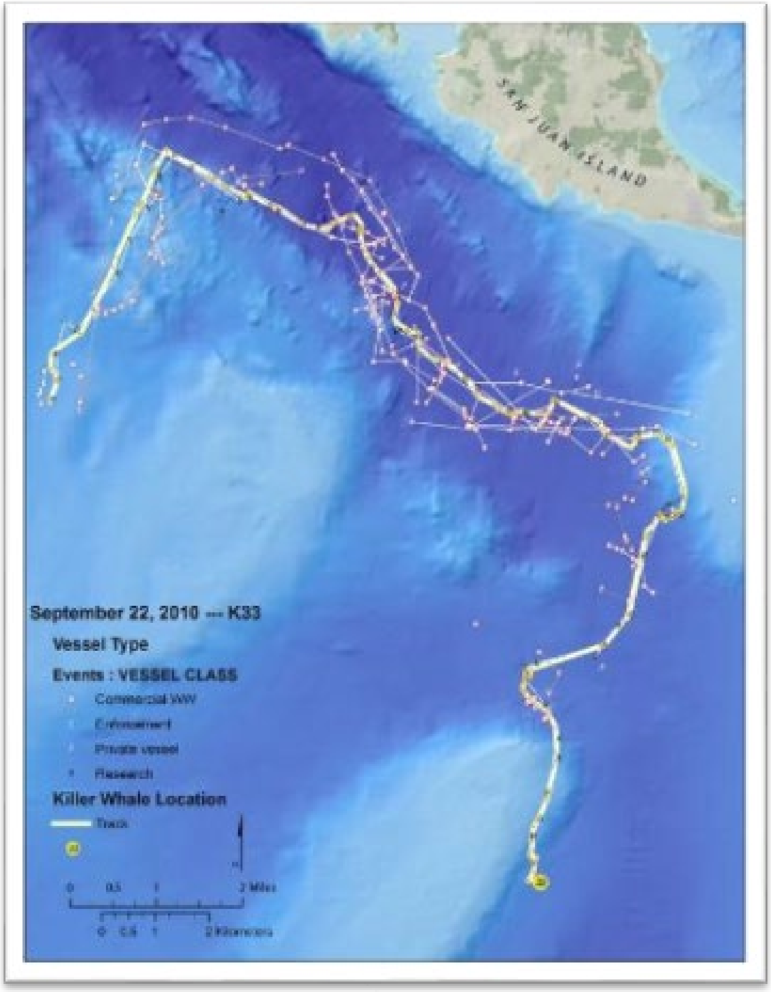


Figure [30][182]

141. Using the SeaWorld San Diego facility complex as an example, I describe some of the conditions in detail and place those within the framework of what is known about orca in the wild. [redacted]

[182] Image adapted from https://www.seaworldfactcheck.com/kwtanks.htm.

[redacted]

Figure [31][183]

142. Figure [31] below is SeaWorld San Diego, from Google Earth. The maximum straight-line distance (as indicated in yellow) that an orca at this facility could travel, if the gate between C tank and A tank (show tank) was left open, is approximately 60 m (the maximum distance in C tank alone is approx. 36m, whilst in A (across the front of the stage) is approximately 50m). The small tank size is also illustrated when noting the size of the orca compared to the tanks. Two orca can be seen in tank A (show tank), two in tank B, five in C tank (three in the middle, two at

[183] Photo © Ingrid N. Visser.

opposite gates). The number of body lengths (which varies, based on sex and age) that each whale can swim in a straight line, is given in Table [2].

Figure [31]

Orca	Sex	Age*	Length	A tank max. # of lengths (in 50m)	B tank max. # of lengths (in 36m)	A+B tanks max. # of lengths (in 60 m)
Ulises	M	41.1	[redacted]	[redacted]	[redacted]	[redacted]
Orkid	F	30.4	[redacted]	[redacted]	[redacted]	[redacted]
Keet	M	26.0	[redacted]	[redacted]	[redacted]	[redacted]
Shouka	F	25.9	[redacted]	[redacted]	[redacted]	[redacted]
Nakai	M	17.4	[redacted]	[redacted]	[redacted]	[redacted]
Ikaika	M	16.4	[redacted]	[redacted]	[redacted]	[redacted]
Kalia	F	14.1	[redacted]	[redacted]	[redacted]	[redacted]
Makani	M	5.9	[redacted]	[redacted]	[redacted]	[redacted]
Amaya	F	4.2	[redacted]	[redacted]	[redacted]	[redacted]

Table [2][184]

184 Straight-line distances that the orca at SeaWorld can swim, in relation to their body lengths. [redacted] SW-AND0126126. Ages are

143. If all the gates, of all the tanks at SeaWorld San Diego were left open and an orca swam around the perimeter, then the maximum distance the orca could swim in a circuit would be approximately 356.49m, as measured on Google Earth. To put this into perspective, in order to swim 1km, an orca would need to swim 2.8 times around the full perimeter. In order to match the 200km distance (a distance which a number of orca have been documented swimming as a daily average) the captive orca would need to swim 560 circuits. I have seen no evidence that the captive orca swim anywhere near that amount, and to the contrary, the evidence suggests that the captive orca log (float without swimming) for extraordinary lengths of time (up to 16.7 hours per day).[185]

144. Within the confines of any one facility, the area that the orca actually have available to them is reduced further by, and strictly controlled by, the trainers who use the gates in order to contain and separate the orca. I discuss SeaWorld's use of gates to force separations later in this Section.

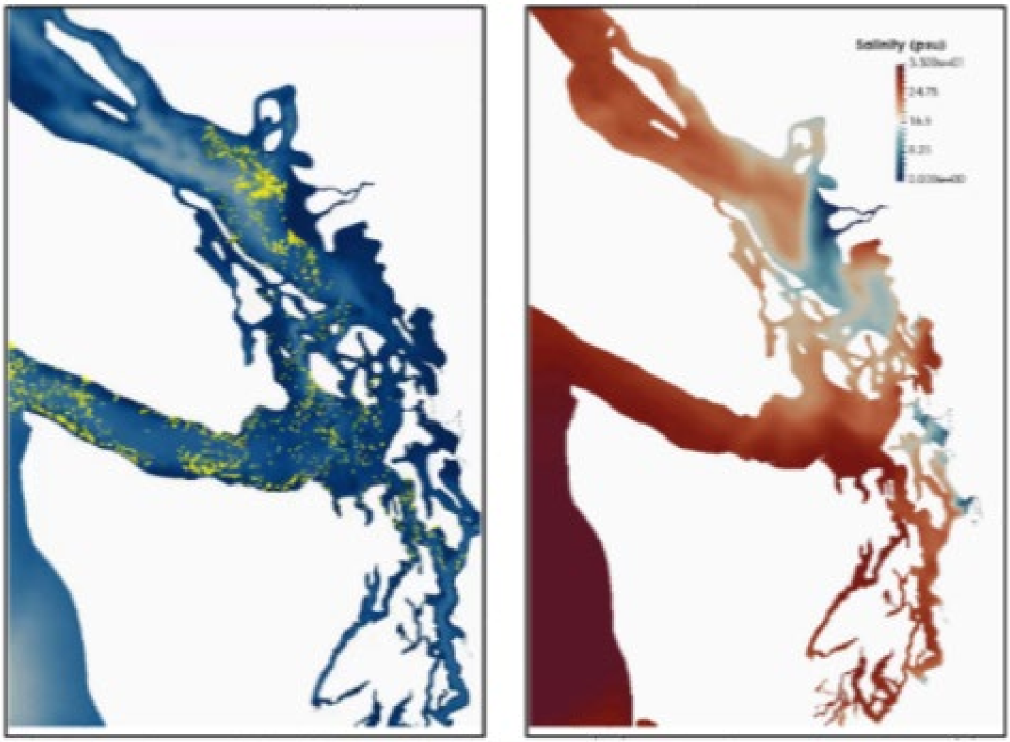
calculated as of February 8, 2019. [redacted] SW-AND0126126, [redacted]

[185] WORTHY, G. A. J. et al. (2013). *Basal metabolism of an adult male killer whale (Orcinus orca)*. Marine Mammal Science 30(3): pp. 1229-1237.

Figure [32]

3. Impact on the captive orcas' health and wellbeing

145. Whilst travelling in the ocean, an orca experiences a wide range of environmental and ecological changes. These can impact on the animal in a multitude of ways, many of which may be compounded, impacted by, or be mutually exclusive from, each other. For example, a tidal current flowing against the direction that an orca swims, would require the animal to swim harder if it wished to make progress. That tidal current might bring with it changes in salinity, and/or temperature and each of those may result in more or less prey or other species the orca might encounter. Figure [33] below comprises of two 'gifs' which show, in the animated versions available online, the salinity and tidal transport for the Salish Sea, where the Southern Resident community of orca, including K-33 are often documented.



Surface layer transport in the Northwest Straits

Animation of sea surface salinity

Figure [33][186]

146. By contrast, at SeaWorld, the orca do not experience similar environmental and ecological changes. Although the inadequate stimulation and enrichment experienced by SeaWorld's orca are discussed later in Section VI(4)(5), it is worth noting here that SeaWorld's orca have been observed to spend over 16 hours a day — almost 70% of the time — "resting."[187] Specifically, Worthy et al. reported as follows:

[186] The animation may be seen at: https://web.archive.org/web/20190202082028/https://salish-sea.pnnl.gov/.

[187] WORTHY, G. A. J. et al. (2013). *Basal metabolism of an adult male killer whale (Orcinus orca).* Marine Mammal Science 30(3): pp. 1229-1237.

> Activity budget data was obtained by animal care staff observing the animal continuously (24 h/d) for a period of seven consecutive days, during which time durations of different behavioral states were monitored and recorded. These behavioral states consisted of resting (<1.0 m/s), slow speed swimming (1.0 m/s), moderate swimming (2.0 m/s), and active swimming/performing (3.0 m/s) and were collectively used to generate a time-activity budget that could be compared to food intake as an independent assessment of metabolic expenditure. On average the whale spent 69.6% (16.7 h) of the day resting, 13.3% (3.2 h) of the day undertaking slow speed swimming (1.0 m/s), 12.5% (3.0 h) of the day doing moderate swimming (2.0 m/s), and 4.5% (1.1 h) active swimming and/or performing similar to adult ex situ killer whales in Kriete (1995). Using a linear regression of Kriete's (1995) data on cost of swimming, in conjunction with our activity budget data, resulted in an estimated daily energy expenditure of 358 MJ/d (equations and results in Table 2).

147. I believe the time "resting" includes time undertaking another stereotypy connected with the tank sizes — *i.e.*, "logging" or floating at the surface like logs. Captive orca sometimes float motionless near the surface of the water in excess of 15 minutes, for up to hours at a stretch.[188] This excessive level of logging is abnormal and does not resemble the active, highly mobile behavior of free-ranging

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[188] JETT, J. and J. M. Ventre (2012). *Orca (Orcinus orca) captivity and vulnerability to mosquito-transmitted viruses*. Journal of Marine Animals and Their Ecology 5(2): pp. 9-16.

WORTHY, G. A. J. et al. (2013). *Basal metabolism of an adult male killer whale (Orcinus orca)*. Marine Mammal Science 30(3): pp. 1229-1237.

ROSE, N. A. et al. (2017). *Improving captive marine mammal welfare in the United States: Science-based recommendations for improved regulatory requirements for captive marine mammal care*. Journal of International Wildlife Law & Policy 20(1): pp. 38-72.

orca.[189] Diseases carried by insects and pests therefore are a risk unique to captive orca. Indeed, at least two captive orca have died from mosquito-borne illness.[190]

148. Spending an inordinate amount of time floating at the surface are also a contributing factor for the orcas' collapsed dorsal fins.[191] For example, excess exposure to the sun results in over-heating which causes fibers to denature which in turn negatively impacts structural integrity.[192] Exacerbating the problem is the dehydration that SeaWorld's orca experience.[193] Dehydration leads to overheating (and the counter-current heat exchange in the dorsal fin becomes over-worked and/or compromised), which leads to further over-heating and denaturing of the connective

[189] *See, e.g.*, MATTHEWS, C. J. et al. (2011). *Satellite tracking of a killer whale (Orcinus orca) in the eastern Canadian Arctic documents ice avoidance and rapid, long-distance movement into the North Atlantic*. Polar Biology 34(7): pp. 1091-1096.

REISINGER, R. R., et al. (2015). *Movement and diving of killer whales (Orcinus orca) at a Southern Ocean archipelago.* Journal of Experimental Marine Biology and Ecology 473: pp. 90-102.

[190] BUCK et al. (1993); St. Leger et al. (2011); Jett and Ventre (2012). *See also* https://www.scribd.com/document/50313202/SeaWorld-Orca-Kanduke-Killed-by-a-Mosquito-Bite-Necropsy-Article-Attached-Here; see also https://sites.google.com/site/voiceoftheorcas/the-current-story/mosquitoeshavekilled2seaworldorcashastheanyonenoticed.

[191] JETT & Ventre, Killer Whales, Theme Parks & Controversy, An Exploration of the Evidence, pp. 135 (https://www.scribd.com/document/265647897/Killer-Whales-Theme-Parks-Controversy-An-Exploration-of-the-Evidence)

[192] *See* https://web.archive.org/web/20190129055113/https://www.eventbrite.com/e/what-seaworld-and-blackfish-mean-for-san-diego-tickets-11374935739#; see also https://www.youtube.com/watch?v=TT0X_n-dVHA.

[193] Dehydration is also a result of food depravation — discussed in more detail in Section VI(4)(1) below.

tissue and loss of structural integrity. I discuss the issue of dorsal fin collapse in greater detail in Section VII below.

149. Logging also exposes the orca to sunburn.[194] Moreover, because tanks are typically painted a light or bright blue color (to increase visibility of the animals to spectators), and because enclosures typically lack shade,[195] and the water is typically clear, light is often reflected back at captive orca (versus in the wild, where sub-surface natural features are rarely highly reflective, the water is typically rich with plankton and dissolved organic matter, thereby reducing the light filtering through and, where the orca can dive deep, there is reduced sunlight).[196] This results in captive orca being exposed to higher levels of ultra violet (UV) light than in nature, which is believed to be harmful and increase risk of eye lesions,[197] infections, and

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[194] JETT, VENTRE, Killer Whales, Theme Parks & Controversy, An Exploration of the Evidence, pp. 139 (https://www.scribd.com/document/265647897/Killer-Whales-Theme-Parks-Controversy-An-Exploration-of-the-Evidence)

[195] COUQUIAUD (2005). I understand that shade is not a requirement of US regulations. Rose *et al.* (2017). *See also* SW-AND0143938 [redacted]

[196] TEDETTI, M. and R. Sempéré (2006). *Penetration of ultraviolet radiation in the marine environment. A review*. Photochemistry and Photobiology 82: pp. 389-397.

[197] *See* Schedule 13 [redacted] *see also* SW-AND0251684 [redacted]

premature cataracts.[198] I discuss captivity related injuries, including sunburns, in greater detail later in this Section.[199]

150. Logging can also result in skin issues such as desiccation and cracking. [redacted][200] [redacted][201] [redacted]

[198] The effects of excessive UV exposure have only been examined in detail in pinnipeds (COLITZ *et al.*, 2010; GAGE, 2011; GAGE and Francis-Floyd, 2018), but is almost certainly an issue for killer whales as well. See GAGE and Francis-Floyd, 2018 at p. 758 ("Exposure to excessive amounts of UV light may be exacerbated by animals habituated to looking toward the sun for fish rewards or to consume their daily diets. Keepers and trainers should strive to offer fish in such a way that the animals is protected from looking directly at the sun").

[199] *See also* Schedule 4(a) [redacted] Schedule 4(b) [redacted]; and Schedule 7(a) [redacted]

[200] SW-AND0191496.

[201] SW-AND0189654.

[redacted][202] [redacted]

[redacted][203]

151. Dermatology issues affect other areas of the body as well, such as the underside or lateral areas of the orca. [redacted][204]

152. [redacted]

[202] SW-AND0189674.

[203] SW-AND0189693. [redacted] *See, e.g.*, SW-AND0137020 [redacted]

[204] SW-AND0184011.

[redacted] [205]

153. Additionally, I noted that near the end of her life, Kasatka (a female orca held at SeaWorld San Diego) began to show graphic skin lesions. I was sent photographs from various people who had visited the park and I obtained more from the internet.[206] Another orca, Malia (held in SeaWorld Orlando) has been photographed with skin issues that look similar in nature to the ones Kasatka had during the early stages of her illness.[207]

154. The enclosures' overall size, shape, and depth are apparently determined by the need for high visibility to the park visitors.[208] Orcas' perception of the world is largely acoustic,[209] and the acoustic properties of concrete tanks are problematic for them. This includes persistent noise from machinery used to achieve

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[205] SW-AND0191558.

[206] *See* Schedule 7(a).

[207] *Id.*

[208] COUQUIAUD, 2005 provides a survey of facilities around the world, in an effort to identify the best and the worst of dolphinarium designs. The author, a proponent of public display at the time she conducted this survey, recognized that many facilities fall short of maximizing dolphin welfare. She noted the priority in enclosure design: "The display of animals in a theatre setting allowed the oceanarium to accommodate large crowds and present shows. Until very recently, this remained the only type of display, with small additional features for husbandry and training purposes; it is still the dominant presentation type for shows around the world" (p. 283).

[209] ROSE, N. A. et al. (2009). *The case against marine mammals in captivity*, The Human Society of the United States and the World Society for the Protection of Animals, pp.21.

high water clarity, for example, water treatment methods such as filtration, ozonation and chlorination. Similarly, any activity nearby that transmits vibrations through a tank's walls, such as construction or traffic, can increase stress.[210] Any sharp angles in a tank's configuration can cause reverberation and echoes — including, for example, of the animals' own natural vocalizations — that can be stressful.[211] Problems relating to noise are discussed further in Section VI(4)(3) below.

155. Economics also influences design; it becomes prohibitively expensive to build larger enclosures.[212] Finally, efficiency of maintenance and disinfection dictates slick surfaces as opposed to naturalistic textures and substrates.

[210] Because captive cetaceans have their heads fully out of the water much of the time — for example, awaiting commands and food — and also spend a lot of the time at the surface, excessive noise above the surface can be problematic too. *See* GALHARDO, L. et al. (1996). *Spontaneous activities of captive performing bottlenose dolphins (Tursiops truncatus*). Animal Welfare 5(4): pp 373-389.

[211] WRIGHT, A. J.et al. (2007). *Do marine mammals experience stress related to anthropogenic noise?* International Journal of Comparative Psychology 20: pp. 250-273; WRIGHT, A. J. et al. (2007). *Anthropogenic noise as a stressor in animals: a multidisciplinary perspective*. International Journal of Comparative Psychology 20(2): pp. 250-273.

[212] *See* CONQUIAUD, 2005 ("Artificial facilities tend to be downsized compared to natural ones for economic reasons"). As an example, SeaWorld announced a new initiative, called "Blue World," in 2014. This was a plan to nearly double the volume of the current orca complexes at its parks, starting in San Diego. This project, had it been implemented at all three parks, would have cost approximately US $300 million (WEISBERG, 2015). When the project was approved by the California Coastal Commission (see endnote 576) only if the company ended its orca breeding program, SeaWorld ultimately cancelled the project.

156. In addition, captive marine mammals often have no provision to go "off display" *(e.g.*, to retire to an area away from the main exhibit area, out of view of the public) or to otherwise escape from other animals in the tank at will; [redacted][213] It is generally recognized that larger tanks decrease aggression and increase breeding success.[214] SeaWorld's failure to provide tanks of adequate sizes is evident from the serious aggressive interactions between animals, including, in some cases, interactions that resulted in serious injury and even death.[215] Aggression among SeaWorld's captive orca is discussed in greater detail in Sections VI(2)(4)(b)(1) and VI(4)(11) below.

157. SeaWorld's small tanks also preclude sufficient or meaningful exercise. [redacted]

[redacted]

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[213] *See*, *e.g.*, SCHMITT Dep. Tr. at 64-65 [redacted]

[214] CALDWELL *et al.* (1968); MYERS and Overstrom (1978); and ASPER *et al.* (1988).

[215] VENTRE, J. & J. Jett (2015). *Killer whales, theme parks and controversy: An exploration of the evidence*. Animals and tourism. Understanding diverse relationships. K. Markwell. UK, Channel View Publications 305: pp. 128-145.

[redacted][216]

158. The inadequate activity and stimulation also leads to the orca chewing on enclosure materials. I recently co-authored a paper discussing this issue at some length.[217] I incorporate the findings of that research herein and rely on it in support of my opinions. To provide a brief overview, the abstract of that paper is reproduced below:

ABSTRACT

Objectives: Tooth damage as a result of oral stereotypies is evident in captive orca, yet little research on the topic exists. This study examines the associations between dental pathology, sex, facility, duration of captivity and other factors in captive orca.
Design: We evaluated mandibular and maxillary teeth from dental images of 29 captive orca owned by a US-based theme park. Each tooth was scored for coronal wear, wear at or below gum line and bore holes. Fractured and missing teeth were also noted. Summary statistics described the distribution and severity of pathologies; inferential statistics examined how pathologies differed between sexes, between wild-captured and captive-born orcas and between captive orca at four facilities. We also evaluated how dental pathology and duration of captivity were related.
Results: Approximately 24% of whales exhibited "major" to "extreme" mandibular coronal tooth wear, with coronal wear and wear at or below gum line highly correlated. More than 60% of mandibular teeth 2 and 3 exhibited fractures. Bore holes were observed primarily among anterior mandibular teeth, with more than 61% of teeth 2 and 3 bearing evidence of having been drilled. Four of five orca with the highest age-adjusted tooth pathology indices were captive-born.
Conclusions: Various dental pathologies were observed across all whales, with pathologies beginning at a young age. Oral stereotypies exhibited by captive orca contributed to the observed dental damage. By making dental and health records of captive whales publicly available, the theme park industry is uniquely positioned to provide further insight into dental pathology and resultant health consequences in captive orca.

Figure [34][218]

[216] SW-AND0191533

[217] See JETT, Visser, Ventre, et al., *Tooth damage in captive orcas (Orcinus orca)*, available online at https://www.scribd.com/document/361126704/Tooth-damage-in-captive-orcas-Orcinus-orca, for a detailed discussion on the issue of tooth damage as a result of oral stereotypies in captive orca.

[218] *Id.*

159. By way of additional context, captive cetaceans wear down and/or break their teeth because they persistently and stereotypically grind their teeth on the concrete walls of their tanks and/or "pop" their jaws on the metal gates between their enclosures.[219] In addition to their evolutionary adaptations for deep-diving and long-distance swimming, captive orca, due to their size, intelligence, and social complexity, may be more frustrated, bored and/or stressed and therefore appear to exhibit this problem to the extent that they do. I discuss teeth-related issues in greater detail in Section VI(2)(4) below.

160. Without a doubt the evolved abilities of orca to dive to great depths (currently 1,087m) and maintain sustained travel (in excess of 200km per day, for months at a time) are severely and brutally curtailed in captivity. The argument that orca at their facilities do not "need" to swim or dive because they are provided with food fails to recognise their evolutionary history, their innate drive to express these natural behaviours, all of which results in frustrations, aggression and stereotypies. There is extensive literature on the issues of confinement for a range of species.

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[219] GRAHAM, M. S. and P. R. Dow (1990). *Dental care for a captive killer whale, Orcinus orca*. Zoo Biology 9(4): pp. 325-330; VENTRE, J. and J. Jett (2015). *Killer whales, theme parks and controversy: An exploration of the evidence*. Animals and tourism. Understanding diverse relationships. K. Markwell. UK, Channel View Publications 305: pp. 128-145; VISSER, I. N. and R. B. Lisker (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Free Morgan Foundation: 67; JETT, J., I. N. Visser, J. Ventre, J. Waltz and C. Loch (2017). *Tooth damage in captive orcas (Orcinus orca)*. Archives of Oral Biology 84: pp. 151-160.

4. Issues relating to captive orca teeth

a) Overview of orca dentition

161. Dentition is similar in all dolphins, including orca, as the teeth are all similar in shape. Dolphins are therefore termed 'homodont animals'. Within the mouth of an orca, the teeth vary in size; being larger in the middle and descending in size both anteriorly and posteriorly. Figure [35] below depicts the top and bottom rows of orca teeth. Specifically, it shows the upper left (UL) and lower left (LL) teeth from an adult free-ranging female orca (525cm long) from New Zealand waters, showing the variation in size of teeth. Anterior is to the left of the frame. The lower jaw (mandible) had 11 teeth, compared to the upper jaw (maxillae) which had 13 teeth, with one being a vestigial (non-functioning) tooth (far left). Note the curvature on the teeth, which when in situ would face inwards. The surface facing the camera is flattened and would orientate to the posterior of the mouth.

Figure [35][220]

162. Orca typically have 10 to 12 (occasionally up to 14)[221] teeth, in each of the quadrants of their mouth, for a total of 40-56 teeth. Typically, the upper and

[220] Photo © Ingrid N. Visser; *see also* SW-AND0013309 at SW-AND0013360.

[221] ESCHRICHT, D. F. (1866). On the species of the genus Orca inhabiting the northern seas. *In:* Flower, W. H. (ed.) *Recent memoirs on the Cetacea*. London: Ray Society; Scammon, C. M. 1874. *The marine mammals of the Northwestern coast of North America, together with an account of the American whale-fishery*, New York, G. P. Putnam's Sons.

lower teeth interlock when the mouth is closed. In an adult orca the teeth typically range up to 10 cm in length,[222] or occasionally up to 13 cm.[223]

163. When *in situ*, the teeth would be imbedded in the alveoli (tooth sockets) up to just below the cingulum ('ring' or 'collar') or 'neck' of the tooth, which is the zone of the tooth where the gum, in a healthy orca, would typically be present. The teeth lie with the curve towards the inside of the mouth. See Figures [36] and [37] below depict orca mandibles (museum replica) with teeth *in situ*, showing the inward curve of the teeth.

[222] FORD, J. K. B. (2009). *Killer whale*. Orcinus orca. In: Perrin, W. F., Würsig , B. & Thewissen, J. G. M. (eds.) Encyclopedia of marine mammals. San Diego: Academic Press. pp. 650-657; *see also* JETT, J., Visser, I. N., Ventre, J., Waltz, J. & Loch, C. (2017). *Tooth damage in captive orcas (Orcinus orca).* Archives of Oral Biology, 84, pp. 151-160.

[223] NISHIWAKI, M. (1972). General Biology. Mammals of the Sea: Biology and Medicine. S. H. Ridgway. Springfield, Illinois, Charles C Thomas: 3-204. p. 290.

Figure [36][224]

Figure [37][225]

164. Orca teeth are single-rooted, which when viewed from the side are flattened anterior-posteriorly. The posterior side of the tooth has a shallow groove, corresponding to a slight bulge on the anterior side of the tooth.

165. Orca teeth, when viewed from the side, have a roughly spindle-shape, being conical at the coronal (tip) end, widening below the gumline and narrowing towards the root. The coronal end is slightly curved in most of the teeth, with the curve typically angled inwards. The most variation in shape is seen in the posterior teeth.[226]

166. In their 1980 seminal work on age determination in odontocetes, Perrin & Myrick noted that: "*… except for their larger size, the teeth of large delphinids* [such as orca] *are similar to those of the dolphins in most respects. They are simple, slightly-recurved conical teeth consisting of complexly layered dentine covered coronally by a mantle of enamel and surrounding basally by thin, poorly layered cementum.*"[227]

167. In most odontocetes the tooth form is similar between species having the same fundamental tooth structure. Each tooth is comprised of (from the outside,

[224] Skull held at Orca Research & Education Center, New Zealand. Photo © Ingrid N. Visser.

[225] Skull held at Orca Research & Education Center, New Zealand. Photo © Ingrid N. Visser.

[226] Visser, unpublished data.

[227] PERRIN, W. F. & Myrick, A. F. (eds.) (1980). *Age Determination of Toothed Whales and Sirenians*. Special Issue 3. Reports of the International Whaling Commission. pp 229.

working inwards); enamel (on the coronal end of the tooth), cementum (on the root end of the tooth), dentine, and pulp cavity/root (both with associated tissues) (e.g., see Fig. 9, page 49 in Perrin & Myrick, 1980).[228]

168. Holmstrom, in the 'Dentistry' chapter of the CRC Handbook of Marine Mammal Medicine (now in it's 3rd Edition, in 2018) describes the teeth of marine mammals as follows:

> The tip of the crown (top of the tooth) is a pointed prominence on the occlusal surface of the tooth and is known as the cusp. The cusp is covered with enamel, the hardest substance in the body, and will survive normal use and even some abuse without problems. However, the enamel, which is normally only present above the gumline, may fracture in patients who chew shells, bones and other hard substances given for enrichment (e.g., ice cubes and frozen fish). The deepest part of the root is known as the apex, and it is the apex, in most species, where blood vessels and nerves enter the tooth, either through a series of small channels known as the apical delta or through larger canals known as the apical foramen."[229]

169. Perrin & Myrick (1980) provide multiple examples of cross sections of the teeth of a range of odontocete species, including orca.[230] In all the Delphinidae the tooth structure is the same as that given in their figure 9 (shown below in Figure [38] of this report).

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[228] *Ibid*, Fig. 9, at page 49

[229] Page 503.

[230] *Ibid*, at pages 101 & 150.

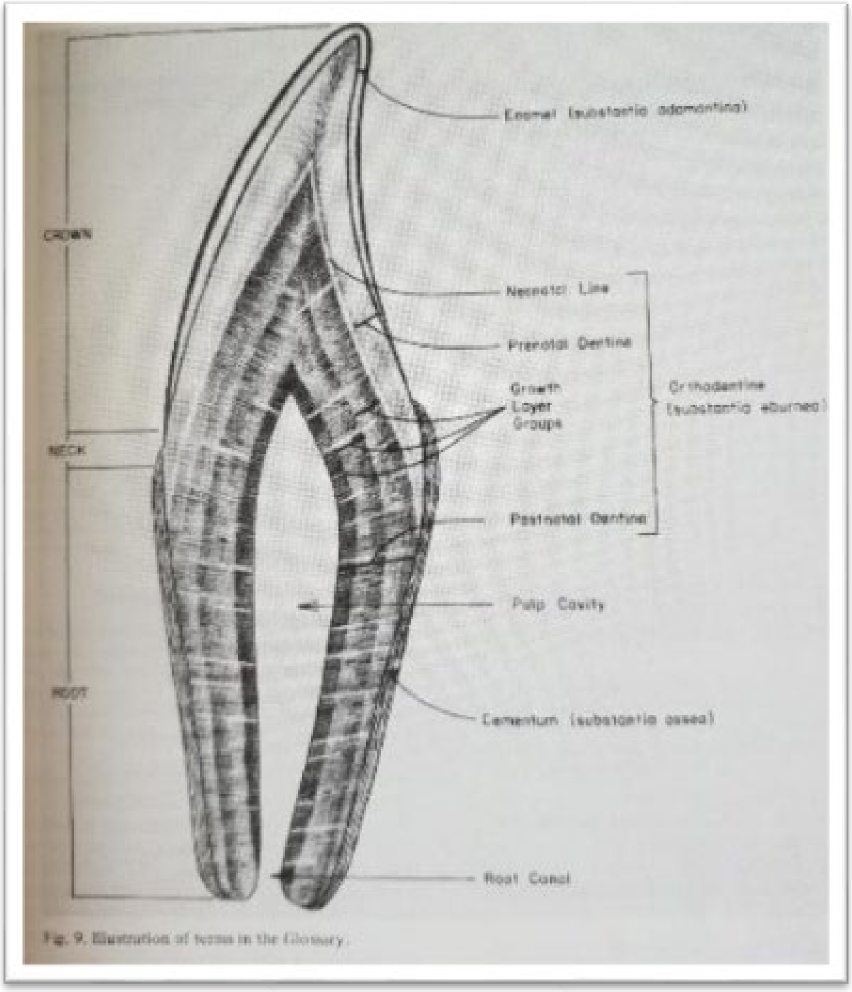

Figure [38]

170. Johnsen (1985),[231] provides a schematic drawing of a mature human tooth, which is a typical representation of a mammalian tooth. This also shows the sensory nerve locations in the pulp and dentin (his Fig. 5, page 557, shown below in Figure [40] of this report).

[231] JOHNSEN, D. C. (1985). *Innervation of the dentin, predentin, and pulp*. Journal of Dental Research, 64, pp. 555-563.

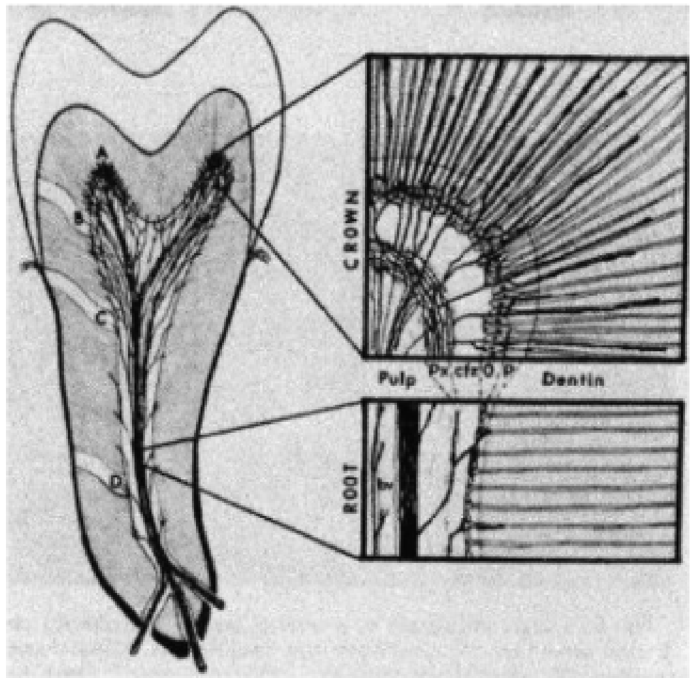

Fig. 5 — Schematic drawing showing sensory nerve location in pulp nd dentin of a mature tooth. The percentages of innervated dentinal tu-ules at the specified regions, A-D, follow: A, more than 40% (Arwill, 967; Byers, 1977; Lilja, 1979; Holland, 1981); B, 4.1-8.3%; C, 0.2-.0%; D, 0.02-0.2% (Fearnhead, 1957). Note the different structure of 1e plexus of Rashkow (Px), cell-free zone (cfz), odontoblastic layer (O), re-dentin (P), and dentin in the crown as compared with the root. Inner-ation of blood vessels (bv) is indicated. (Courtesy M.R. Byers, Univer-ity of Washington; modified from Fearnhead, 1957)

Figure [40]

171. It is well established that odontocetes (including orca) have tooth pulp.[232] Tooth pulp is innervated tissue which is also found in the root of the tooth.

[232] PERRIN, W. F. & Myrick, A. F. (eds.) (1980). *Age Determination of Toothed Whales and Sirenians*. Special Issue 3: Reports of the International Whaling Commission.

The root is connected to the nerves in the mandibular arch via the alveolar branches (Fig. 3 in Peredo et al (2017), shown below in Figure [41] of this report).[233]

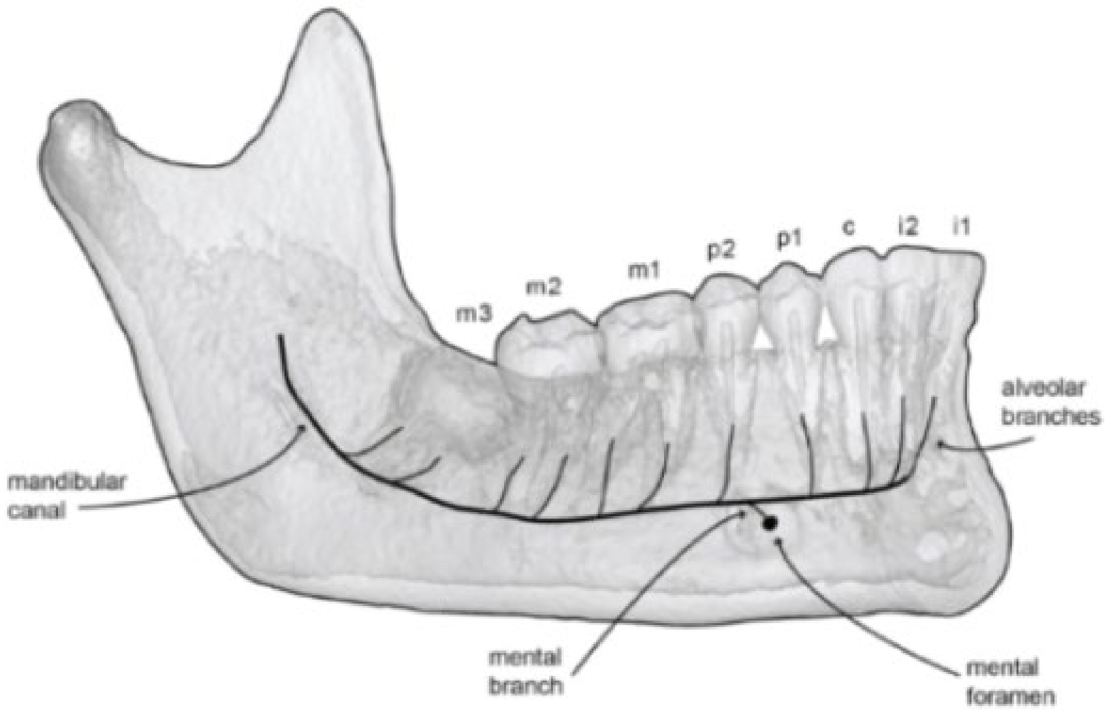

Fig 3. Internal canal system of the mammalian mandible. 3D model of a human mandible with line art illustration highlighting the generalized mammalian condition for innervation and vascularization of the mandible. The mandibular canal gives off dorsomedial branches to each root of each tooth, as well as mental branches that exit the mandible through mental foramina by which the lips and gums are vascularized and innervated.

https://doi.org/10.1371/journal.pone.0178243.g003

Figure [41]

172. The tooth pulp, when exposed by carries, chewing, biting, cribbing, rubbing or self-harming behaviour (typically as a by-product of stereotypies – defined

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[233] PEREDO, C. M. et al. (2017). *Alveoli, teeth, and tooth loss: Understanding the homology of internal mandibular structures in mysticete cetaceans*. PLoS ONE, 12, e0178243.

as abnormal, repetitive behaviour with no outwardly obvious function), but also when exposed due to drilling by SeaWorld staff, is highly sensitive.

(1) SeaWorld's incorrect claims regarding nerves

173. SeaWorld incorrectly claims that orca teeth have no nerves. [redacted][234] This is incorrect. As discussed below, there is ample scientific evidence (going back decades, and even into the 1800s), that mammalian teeth have highly innervated dental pulp.[235] The book "Anatomy of dolphins: insights into body structure and function" states the following:

> "The teeth of mammals are in most species (including man) constituted by (1) an erupted part visible over the gums (crown); (2) a neck, that separates the crown from the root; (3) one or more roots that are placed in the tooth socket below the gingival surface; **and (4) a pulp cavity containing connective, vascular, and nervous tissue that fills also the root canal: Sensitivity of the tooth is carried by trigeminal fibers that enter the pulp from ramification of the superior and inferior alveolar nerve."**[236]

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[234] Schmitt Dep. Tr. 116:1-3.

[235] OWEN, R. (1840). *Odontography; or a treatise on the comparative anatomy of the teeth; their physiological relations, mode of development, and microscopic structure, in the vertebrate animals*, London, Hippolyte Bailliere.

BRADLAW, R. (1936). *The Innervation of Teeth. Proceedings of the Royal Society of Medicine*, Section of Odontology, pp. 507-518.

[236] page 340 in COZZI, B., S. Huggenberger and H. Oelschlager (2016). Anatomy of dolphins: insights into body structure and function. Amsterdam, Boston,

174. Orca are the largest of the dolphin family and depending on the age of the animal, the tooth pulp may encompass more than 90% of the internal structure of the tooth in younger animals,[237] to approximately 10% in older animals.[238] The pulp area is reduced as an orca ages, due to the Growth Layer Groups, which are deposited inwards, in a series of "*elongated nested cones*."[239]

175. Depicted in Figure [42] below are teeth from a young male captive orca (261 cm long, 216 kg), showing extremely large pulp area, with corresponding thin tooth structure.

Heidelberg, London, New York, Oxford, Paris, San Diego, San Francisco, Singapore, Sydney, Tokyo Academic Press (emphasis added).

[237] Visser, unpublished data (replica orca tooth maintained at Orca Research Trust in New Zealand).

[238] PERRIN, W. F. & Myrick, A. F. (eds.) (1980). *Age Determination of Toothed Whales and Sirenians*. Reports of the International Whaling Commission. Special Issue 3. pp 229.

[239] PERRIN, W. F. & Myrick, A. F. (eds.) (1980). *Age Determination of Toothed Whales and Sirenians*. Reports of the International Whaling Commission. Special Issue 3, p. 19.

Figure [42][240]

176. Depicted in Figure [43] below are teeth from a subadult free-ranging female orca (525 cm long) from New Zealand waters, showing reduction of the pulp area, with corresponding thickening of the tooth structure.

[240] Visser, unpublished data. Photo Ingrid N. Visser.

Figure [43][241]

177. Depicted in Figure [44] below are teeth from an adult free-ranging female orca (570cm long) from New Zealand waters, showing reduction of the pulp area (but pulp still present), with corresponding thickening of the tooth structure.

[241] Visser, unpublished data. Photo Ingrid N. Visser.

Figure [44][242]

178. Such innervated dental pulp, when stimulated (*e.g.*, through drilling) has been recognised as associated with intense pain. Gomez (2011), in a review of the sensory function of dental pulp, specifically in relation to pain, noted that:

> Dental pulp is a highly vascularized and innervated tissue. The neural component of the pulp tissue consists of motor and sensory nerve fibers, the latter coming from the cranial nerve V; all stimuli that provoke these fibers will result in a painful sensation. Dental pulp tissue is not the only tissue with this characteristic. The eye cornea and the tympanic membrane of the ear are also sources of pure pain and like the pulp, of high neural density.[243]

179. Likewise, Trowbridge (1986) noted that:

> The sensory system of the pulp appears to be well suited for signalling potential damage to the tooth. The tooth is innervated by a large number of A (myelinated) and C (unmyelinated) nerve fibers. These include both sensory afferent fibers and sympathetic fibers that modulate pulpal

[242] Visser, unpublished data. Photo Ingrid N. Visser.

[243] GOMEZ, N. (2011). *Dental pulp sensory function. Pain.* Electronic Journal of Endodontics Rosario, 10, pp. 540-552.

> blood flow. In the peripheral pulp, branches of the sensory nerves give rise to an interlacing network of fibers known as the subodontoblastic plexus. From this plexus nerve fibers extend to the odontoblastic layer, predentin, and dentin and terminate as free nerve endings. *All forms of pulpal stimulation are perceived as noxious and stimulation gives rise only to pain.*[244]

180. [redacted]

- [redacted][245]
- [redacted][246]
- [redacted][247]

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[244] TROWBRIDGE, H. O. (1986). *Review of dental pain-histology and physiology*. Journal of Endodontics, 12, pp. 445-452 (emphasis added).

[245] SW-AND0137405 [redacted]

[246] SW-AND0272810 [redacted]

[247] SW-AND0183322 [redacted]

- [redacted][248]
- [redacted][249]
- [redacted][250]
- [redacted][251]
- [redacted][252]
- [redacted][253]
- [redacted][254]

181. [redacted][255]

[248] SW-AND0191317 [redacted]

[249] SW-AND0191319 [redacted]

[250] SW-AND0140493

[251] SW-AND0191326 [redacted]

[252] SW-AND0244699 [redacted]

[253] SW-AND0183525

[254] SW-AND0183318 [redacted]

[255] *See, e.g.*, SW-AND0108518, SW-AND0135281, SW-AND0138712, SW-AND0145202, SW-AND0146331, SW-AND0151169, SW-AND0179644, SW-AND0179662, SW-AND0179672, SW-AND0179678, SW-AND0179681, SW-AND0179683, SW-AND0179687, SW-AND0179688, SW-AND0186466, SW-AND0187446, SW-AND0187464, SW-AND0188032, SW-AND0188056, SW-AND0188419, SW-AND0188529, SW-AND0188723, SW-AND0191129, SW-

(2) SeaWorld's incorrect claims regarding enamel

182. In a public debate, held at San Diego, in which SeaWorld employees, Dr. Todd Robeck and Dr. Kristy Burtis, were participating, and for which I was sitting in the audience, the SeaWorld employees incorrectly argued that orca teeth are "soft" and "don't have the common enamel that you see on other animals:"

> **Todd Robeck:** "Dr. Rose is, is, uh, well aware that killer whales, uh, there are many different types of killer whales in the wild, there are different, they're called ecotypes, and based on what their food preferences they have, it affects their teeth; their teeth are very soft, they don't have the common enamel that you see on other animals, just mainly of dentin, so it's a very soft structure. And so there are many ecotypes that have shaved down teeth as they get older and through their, their basic interaction with their prey. . . And you know, in addition to that, that's - so we know they have soft teeth, right? So we know it's based on food preference, we know they can get worn down teeth commonly by eating herring and mackerel. We also give them toys: they have the, ropes to chew on, things to enhance their welfare in the environment, to challenge them, to stimulate them; they play with these things. No, they don't play with ropes in the wild unless someone throws them over the board, you know, a boat; but they play with kelp, they play with other things. This is a natural behavior that we're interacting with them. These things, with soft teeth, they will naturally wear down. So there is no issue here: this is a natural phenomenon that happens with killer whales in the wild and at SeaWorld."[256]

AND0191316, SW-AND0191466, SW-AND0191678, SW-AND0244562, SW-AND0244677, SW-AND0244699, SW-AND0271304, SW-AND0271489, SW-AND0273668.

[256] SW-AND0012975 (emphasis added).

183. However, these statements are incorrect. Odontocetes have evolved enamel on their teeth for millions of years, with one study of archaeocetes (ancient, extinct cetaceans) teeth from the late Oligocene (33.9 million years ago to 23.03 million years ago) and the Pliocene (5.333 million years ago to 2.58 million years ago) clearly showing enamel, albeit that there was variation in the thickness of the enamel (75–580 µm).[257]

184. Orca, specifically, have enamel on their teeth. Indeed, studies have shown orca teeth to have the second hardest mean hardness value for enamel tested in the 10 species of delphinids.[258] This is shown in Figure [45(a)] below where orca are indicated by 'Oo'. Specifically, orca teeth have the fourth hardest outer enamel, second hardest mid-layer enamel and the hardest inner layer of enamel of the dolphins (10 species) measured.[259]

[257] LOCH, C., KIESER, J.A. & FORDYCE, R.E. (2015). *Enamel ultrastructure in fossil cetaceans (Cetacea: Archaeoceti and Odontoceti).* PLoS ONE e0116557. doi:10.1371/journal.pone.0116557.

[258] *See* LOCH, C., Swain, M. V., van Vuuren, L. J., Kieser, J. A. & Fordyce, R. E. (2013). *Mechanical properties of dental tissues in dolphins (Cetacea: Delphinoidea and Inioidea).* Archives of Oral Biology 58(7): Figure 3, p. 776.

[259] *See* LOCH, C., Swain, M. V., van Vuuren, L. J., Kieser, J. A. & Fordyce, R. E. (2013). *Mechanical properties of dental tissues in dolphins (Cetacea: Delphinoidea and Inioidea).* Archives of Oral Biology 58(7): Figure 4, p. 776.

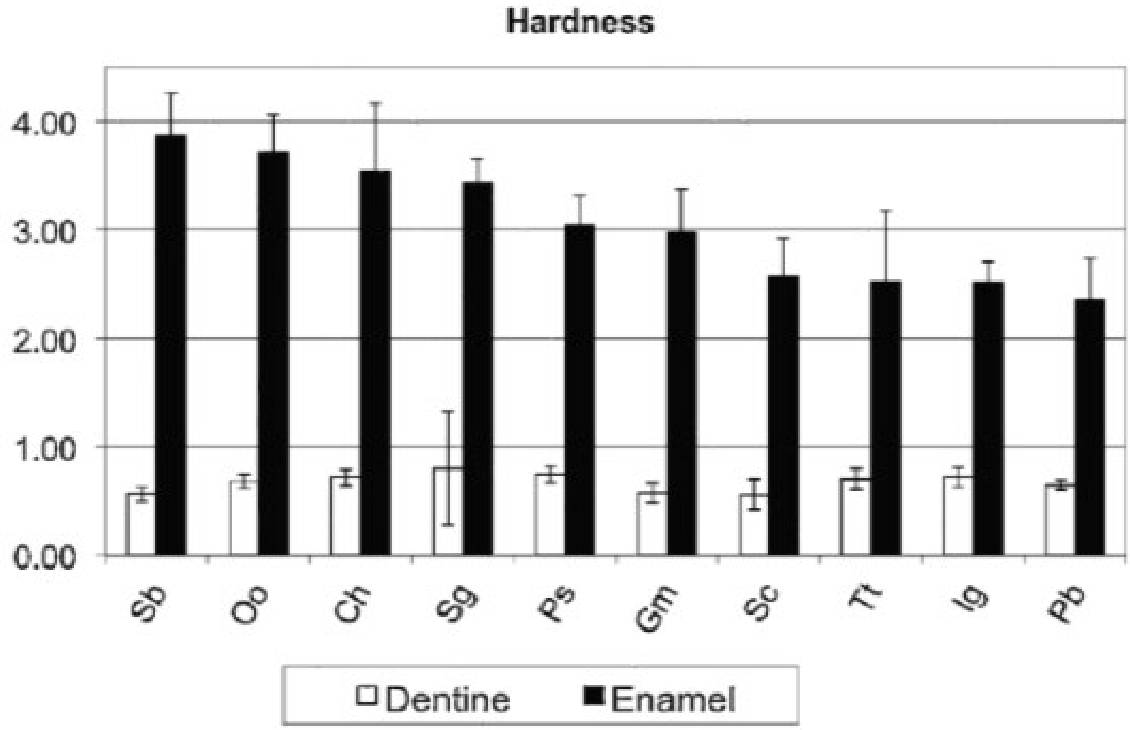

Fig. 3 – Mean hardness values in GPa ± SD for enamel and dentine in 10 dolphin species. Abbreviations: see Table 1.

Figure [45(a)][260]

185. As early as 1866, the eminent, well-respected and detail-oriented scientist Prof. Eschricht[261] had described the teeth of orca and noted:

[260] LOCH, C., Swain, M. V., van Vuuren, L. J., Kieser, J. A. & Fordyce, R. E. (2013). *Mechanical properties of dental tissues in dolphins (Cetacea: Delphinoidea and Inioidea).* Archives of Oral Biology 58(7): pp. 773-779.

[261] "*…who devoted the greater part of an active life to the study of the Cetacea*" ESCHRICHT, D. F., Reinhart, J., & Lilljeborg, W. (1866): *Recent memoirs on the Cetacea*. W. H. Flower (ed.). London, Ray Society: pp. vii (Preface), 151-188 (Part II , *On the species of the genus Orca inhabiting the northern seas*)

> The teeth of the killers are, in several respects, distinguished from those of all other Cetaceans. Their free portion resembles that of the cachalot's [sperm whale's] teeth, representing, as in these, a curved cone with an obtuse point and a comparatively broad base, only that it is most commonly somewhat compressed having two indistinct margins, an exterior one convex, and an interior one concave; but more minutely examined, especially when cut through transversely, it is observed to have quite a different structure, for whereas the cachalot's teeth only consist of dentine covered with cement, but without any enamel, at all events, except at the extreme tip, from which it is soon worn off, the teeth of the Orcas are on the contrary provided with a complete covering of enamel to their free portion.[262]

186. In 2013, orca (Oo) were found to have the second highest 'mean hardness value' (in GPa ± SE) of 10 dolphin species (with *Steno bredanensis* (Sb) Rough-toothed dolphin, on the far left - having the hardest enamel). In comparison to values reported for humans, cattle and sand tiger sharks, the orca had harder teeth than both cattle and the sharks, with only humans surpassing all other species measured.[263] This is shown in Figure [45(b)] below.

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https://ia800306.us.archive.org/11/items/recentmemoirsonc00esch/recentmemoirsonc00esch.pdf.

[262] ESCHRICHT, D. F., Reinhart, J., & Lilljeborg, W. (1866): *Recent memoirs on the Cetacea*. W. H. Flower (ed.). London, Ray Society: pp. 170-171 (Part II , *On the species of the genus Orca inhabiting the northern seas*) (emphasis added) https://ia800306.us.archive.org/11/items/recentmemoirsonc00esch/recentmemoirsonc00esch.pdf.

[263] *See* LOCH SANTOS DA SILVA, C., *Morphology, structure and evolution of teeth in fossil and modern odontocetes (Cetacea)* (2013), Figure 4.3, p. 108.

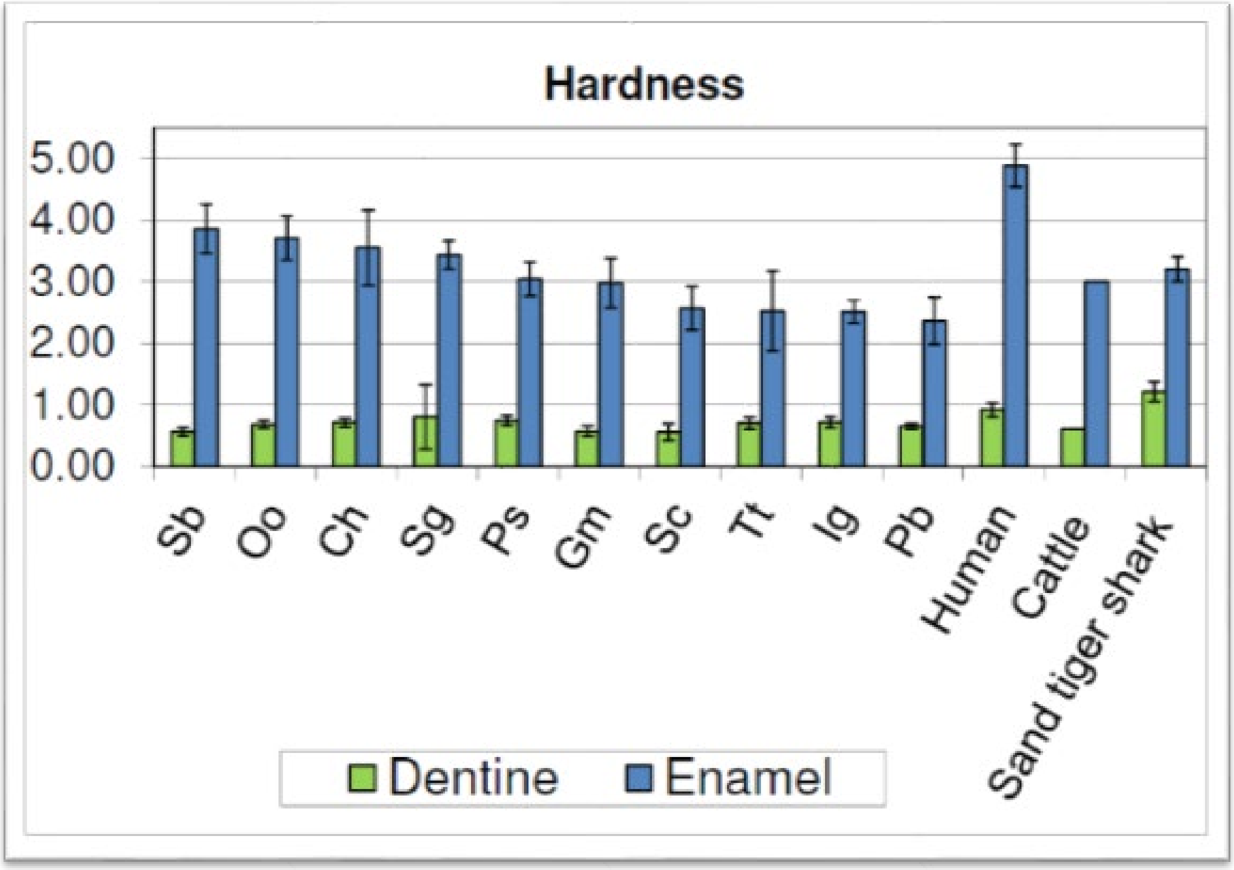

Figure [45(b)][264]

b) Tooth damage among SeaWorld's captive orcas

187. When I first visited SeaWorld (June 2013, Orlando), I was struck by a number of things. Not only was the facility much smaller than I had anticipated, but the animals showed a large number of issues – from the subtle skin discolourations (that many people may not notice, but are clearly visible in the photographs that I took during that visit) to the extremely obvious rake marks, collapsed (and collapsing) dorsal fins and, importantly, the extent and degree of damage to their teeth. I have

[264] *See* LOCH SANTOS DA SILVA, C., *Morphology, structure and evolution of teeth in fossil and modern odontocetes (Cetacea)* (2013), Figure 4.3, p. 108.

visited the three SeaWorld USA facilities 20 times as follows and during each and every visit I have observed the aforesaid issues and more:

30 Sept 2012 – San Diego
5 June 2013 – Orlando
6 June 2013 – Orlando
29 May 2014 – Orlando
30 May 2014 – Orlando
05 June 2014 – San Diego
06 June 2014 – San Diego
06 July 2015 – Orlando
07 July 2015 – Orlando
09 July 2015 – San Antonio
10 July 2015 – San Antonio
11 July 2015 – San Antonio
12 July 2015 – San Diego
13 July 2015 – San Diego
14 July 2015 – San Diego
07 Oct 2015 – San Diego
07 Nov 2016 – Orlando
08 Nov 2016 – Orlando
26 Nov 2018 – San Diego
30 Nov 2018 – San Diego

188. Additionally, I have visited the SeaWorld-owned orca held at Loro Parque in Spain 30 times, as follows and during each and every visit I have observed the same issues and more:

10 June 2012 – Loro Parque
17 June 2012 – Loro Parque
21 June 2012 – Loro Parque
23 June 2012 – Loro Parque
27 June 2012 – Loro Parque
29 June 2012 – Loro Parque
02 July 2012 – Loro Parque
03 July 2012 – Loro Parque
20 July 2012 – Loro Parque
21 Oct 2012 – Loro Parque
22 Oct 2012 – Loro Parque
23 Oct 2012 – Loro Parque
09 Dec 2012 – Loro Parque
10 Dec 2012 – Loro Parque
11 Dec 2012 – Loro Parque
17 Nov 2013 – Loro Parque
18 Nov 2013 – Loro Parque
19 Nov 2013 – Loro Parque
09 Mar 2014 – Loro Parque
10 Mar 2014 – Loro Parque
20 Apr 2016 – Loro Parque
21 Apr 2016 – Loro Parque
22 Apr 2016 – Loro Parque
09 May 2017 – Loro Parque
10 May 2017 – Loro Parque
11 May 2017 – Loro Parque
06 Oct 2017 – Loro Parque
07 Oct 2017 – Loro Parque
08 Oct 2017 – Loro Parque
17 Nov 2018 – Loro Parque

189. With regards to the teeth of the SeaWorld orca, it was clear to me that the damage to their teeth was significant and that I had not seen anything like that in orca in the wild, or in museum specimens.

190. The cause of the damage seen in captivity at SeaWorld is restricted to just a few possible sources. It is due to: the barren hard-sided enclosures (with metal gates constructed of bars); aggression between the whales which manifests itself in an array of behaviours which damage their teeth, *inter alia* 'jaw popping' and raking; and 'toys'. Put simply, the orca chew on hard surfaces and/or hit their teeth on the metal gates and this is the primary causation. The damaged teeth are then drilled and/or filed and that dentistry results in loss of structural integrity, often further exacerbating the original damage when the behaviours repeat themselves.

191. Therefore, SeaWorld's enclosures lead to modified behaviours, which lead to damage, which requires dentistry, which reduces the viability of the tooth, which is damaged further when the behaviour repeats itself. I discuss these aspects in greater detail in Sections VI(4) below and depict it diagramatically in Schedule 3.

192. It is worth noting that in captivity at SeaWorld, the tooth damage often starts very young and is extreme within just a few years of age. For example, see Figure 3b and 3d from Visser & Lisker of Adán when he was only 5 years, 6 months old. Figure [46] shows a close up of Adán's offending teeth, left side. Note hypertrophic tissue damage (discolouration) to end of the mandibles from self-mutilating stereotypic behaviours (such as banging jaw against concrete).

Figure [46]

193. Greenwood (2015), the visiting veterinarian for SeaWorld/Loro Parque wrote on the 29th of September 2015 that he observed Adán and noted; "*Several teeth in his lower jaw showed wear down to the pulp level, but only one had been drilled open, the rest being still vital. One tooth was broken.*"[265] It is unclear from this description which teeth Greenwood was referring to (left or right), but regardless; tooth (mandible L1) is worn to gum and at least two teeth (mandible L2, L3) have substantial holes, have been drilled and are both worn to the gum. Furthermore, another tooth (mandible L4) appears to have been previously drilled, but is now

[265] GREENWOOD, A.G., Lewis, J.C., Thornton, S.M. (2015) *Health and welfare assessment of the killer whale group held at Loro Parque, Tenerife*. International Zoo Veterinary Group (emphasis added), http://www.freemorgan.org/wp-content/uploads/2016/07/20150929-GREENWOOD-Health-welfare-assessment-KW-at-Loro-Parque.pdf.

fractured and splintered into parts, is worn to the gum and has gum overgrowth. One tooth (mandible L5) has a smaller hole at what is now the apex, indicative of drilling and also has severe apical wear. The tooth (mandible L6) has moderate wear as the apical section is worn off.[266]

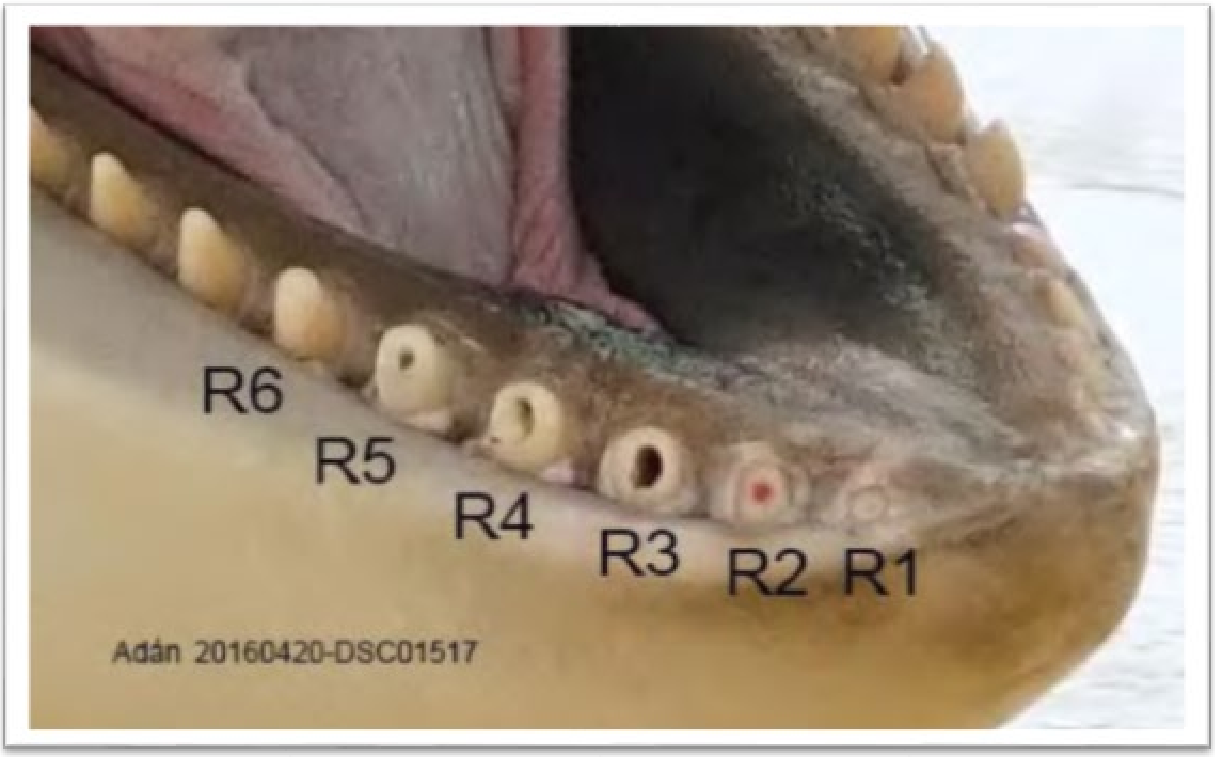

Figure [47][267]

194. In captivity at SeaWorld, the damage can also be very rapid. For example, one orca that I have monitored, a wild-born female now named Morgan,

[266] *See* SW-AND0151140 [redacted] *see also* SW-AND0143942-78 [redacted]

[267] Adán, close up of offending teeth, right side. Note tooth wear on opposing (left) side is partially visible. (*See* VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Figure 3b,

showed a swift deterioration of her teeth from nearly pristine upon arrival at Loro Parque to at least 75% damage to mandibular teeth in under 4 years. The extent of the damage is such that teeth have been worn to the gum, broken and even fractured completely in half (*see* figure 5 from VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, www.freemorgan.org).[268]

195. Figure [48] below provides a photographic timeline of the self-mutilation and deterioration of Morgan's teeth at *Loro Parque*. Morgan arrived at *Loro Parque* on 29 of November 2011. Her teeth had started to show apical wear upon her arrival and this escalated dramatically between June 2012 and November 2012 (top two photos – see dates embedded as yyyymmdd, in top right of each photo). Morgan has been documented as chewing on concrete since at least 2012. Each tooth that is labelled has been damaged. Note the increase in the number of labelled teeth and also the severity of damage – including apical wear, sections breaking off and

www.freemorgan.org. Tooth (mandible R1) apparently has small hole, may or may not be drilled and is worn to the gum. Tooth (mandible R2) shows exposed red tissue (pulp) inside a drilled hole and is worn to the gum. Tooth (mandible R3) has been drilled and is nearly worn to the gum. Teeth (mandible R4, R5) have been drilled and have severe apical wear with the buccal edge worn to gum. Tooth (mandible R6) shows moderate apical wear. Data and figures extracted from VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Figure 3d, www.freemorgan.org. Photos © Ingrid N. Visser.

[268] I understand that SeaWorld has produced limited records pertaining to Morgan during discovery — including dental records.

fractures. Given that this orca has been held at *Loro Parque* for less than half its life and that she arrived with her teeth in relatively robust condition, this level of damage is alarming and disturbing.[269]

[269] *See generally* SW-AND0143931 [redacted]

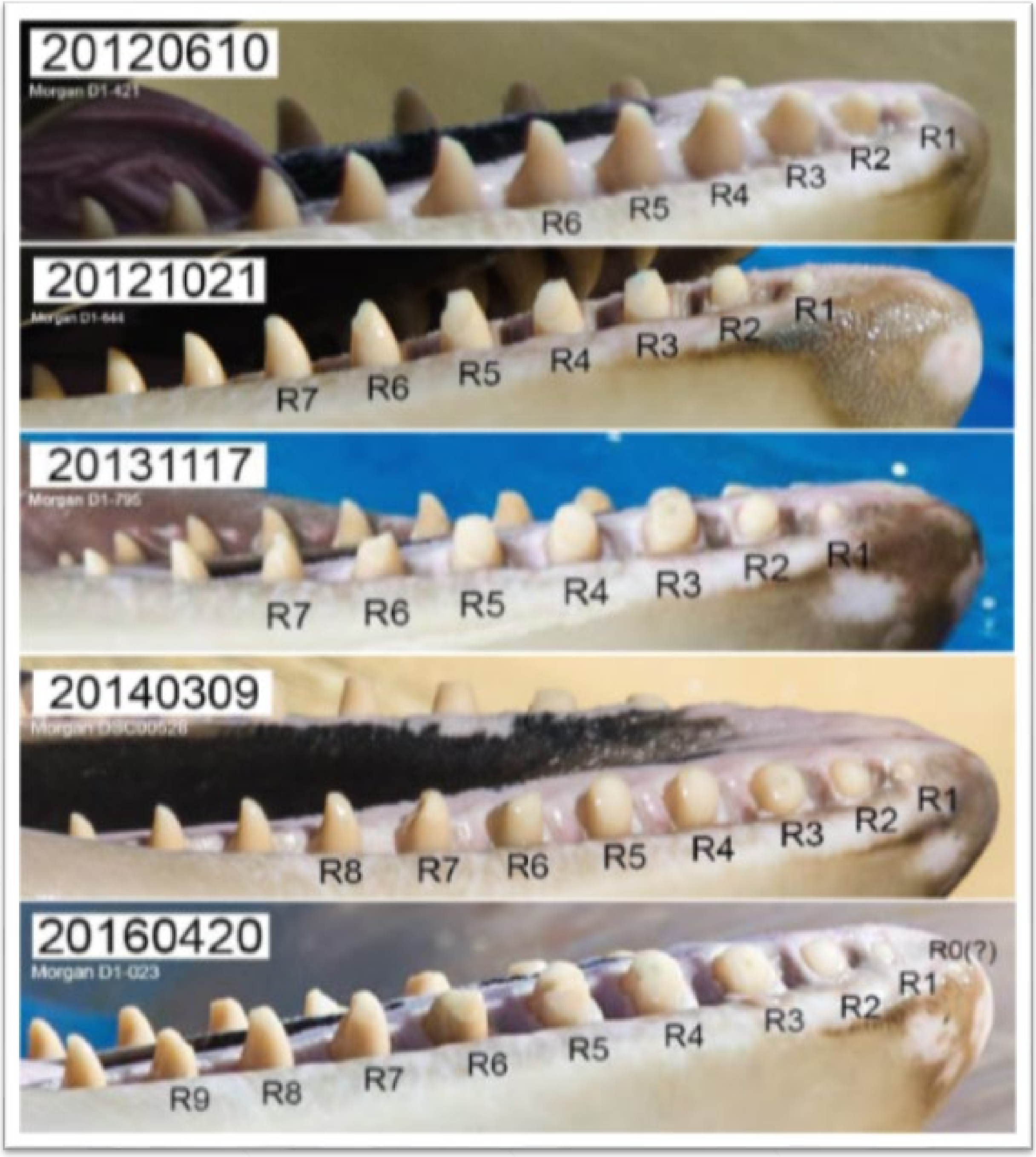

Figure [48][270]

(1) Aggression

196. Damage to teeth is not seen only in the wild-born animals. For example, Ikaika, a male born in captivity on 20020825 at SeaWorld Orlando, shows extensive

dental issues to both his front and back teeth. In Figure [49] below, a photograph taken at San Diego on 20150712, he was 12 years, 10 months, 17 days old. He has only six of his 24 mandibular teeth which are not 'extremely' or 'moderately' damaged. [redacted]

Figure [49][271]

197. It is worth noting that, not only does Ikaika have poor dentition, but his story is indicative of the social stressors that are placed on captive orca – particularly those which are moved between facilities. [redacted][272] [redacted]

[271] Photo © Ingrid N. Visser.

[272] SW000515.

[redacted][273]

198. Such transport not only separated Ikaika permanently from his mother, but also subjected him to the stress of learning and adapting to the social hierarchies[274] at each of the other two facilities. The social standing of an orca, including a male orca, is strongly bonded to, and directly influenced by, their mothers' social position within a pod.[275] Given that Ikaika was removed from his mother, he would have entered each facility with no matrilineal-assisted ranking at all. [redacted]

[273] SW000515.

[274] SAPOLSKY, R. M. (2005): *The influence of social hierarchy on primate health. Science* 308, no. 5722, pp. 648-652.

BARTOLOMUCCI, A. Palanza, P., Sacerdote, P., Panerai, A. E., Sgoifo, A., Dantzer, R. & Parmigiani. S. (2005). *Social factors and individual vulnerability to chronic stress exposure.* Neuroscience and Biobehavioral Reviews 29: pp. 67-81.

[275] In studies of post-reproductive life-spans of orca, the researchers found that "For male offspring ≤30 years old, there is a 3.1-fold increase in mortality risk in the year after their mother's death (Fig. 1). For males >30, this risk increases to 8.3-fold." FOSTER, E. A., Franks, D. W., Mazzi, S., Darden, S. K., Balcomb, K. C., Ford, J. K. B. & Croft, D. P. (2012). *Adaptive prolonged postreproductive life span in killer whales*. Science. 337: p. 1313.

And that "Sons are more likely than daughters to follow their mothers" BRENT, L. J. N., Franks, D. W., Cant, M. A. & Croft, D. P. (2015). *Ecological knowledge, leadership, and the evolution of menopause in killer whales* Current Biology 25: pp. 1-5.

[redacted] For example, the court documents from *SeaWorld vs Marineland of Canada, Inc* reveal that there was aggression between Ikaika and his tank mates both before and after he was moved and by Ikaika to his trainers at Marineland of Canada (including taking the arm of a trainer into his mouth).[276] The same documents further reveal that the aggression was dealt with by isolating him and/or drugging him.

199. [redacted] (*see* Schedule 4(a))[277] [redacted][278] This is the same drug he was given to control sexual aggression towards his infant half-sister and his mother and [redacted][279]

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[276] *See* affidavit of former SeaWorld employee Dr. Lanny Cornell dated March 28, 2011 (and the documents attached thereto), filed in *SeaWorld Parks & Entertainment LLC v. Marineland of Canada Inc.* ("Cornell (2011) Affidavit"), available online at https://www.scribd.com/doc/215567388/Seaworld-v-Marineland-Aff-of-Lanny-Cornell; *see also* https://whalesanctuaryproject.org/custody-battle-captive-orca/ https://www.thestar.com/news/gta/2011/07/16/custody_of_killer_whale_plays_out_in_court.html.

[277] *See* Burtis Tr. at 89:7-15 ([redacted]

[278] *See, e.g.*, SW-AND0191030 [redacted] SW-AND0191030 [redacted] SW-AND0183352 [redacted] *see also* Schedule 7(b).

[279] CRONIN, M. (2014) *SeaWorld gave valium to whales for "grotesque" behavior uncommon in the wild*, https://www.thedodo.com/why-seaworld-gave-valium-to-un-493104672.html

200. Ikaika was documented as having an extensive history of dental problems; by the time he was only four years, two months and 20 days old, "*His medical records and behavioural chart confirm that Ikaika has had dental infections in or around September 2005, November 2005, and April 2006*" (see Paragraph 19, Cornell (2011) Affidavit).

201. In his affidavit, Dr. Cornell also noted that there was another flare up of Ikaika's dental infections by writing "*Ikaika's dental infection of November 14, 2006 was not his first.*" (see Paragraph 19, Cornell (2011) Affidavit). [redacted][280] [redacted]

[redacted][281]

202. [redacted][282]

[280] SW-AND0090783.

[281] SW-AND0191031; *see also* SW-AND0183526 [redacted]

[282] SW-AND0191031.

203. [redacted][283]

204. [redacted][284]

205. The social stresses given in this case study of Ikaika are prevalent throughout captivity – and more details are provided in the Schedule 4(a). However, it is worth noting here that there is a strong correlation between chronic stress triggers (such as loss of control, over-crowding), chronic stress behaviours (such as aggression, self-harming and stereotypies) and dental damage in captive orca.[285]

206. Additionally, in captivity the orca are only given food that do not typically touch their teeth (*i.e.*, the food is placed into the back of the mouth) and does

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[283] SW-AND0191031 (emphasis added)

[284] See SW-AND0191031.

[285] *See, e.g.*, Schedule 3.

not require manipulation (due to positioning and small size). Figure [50] below depicts the typical feeding method for orca in captivity at SeaWorld; a handful of fish is dumped into the back of the mouth of a 'stationed' orca. The fish (and ice) do not touch the animal's teeth and the fish are so small that no food manipulation is required. Note dropped fish on floor in both photographs and cubes of red gelatine in corner of the mouth of 'Keto', left.

Figure [50][286]

207. In captivity, the types of food the orca are fed are restricted to thawed fish and cephalopods (squid, etc.) (*see* Schedule 8). They do not include any of the prey items that may have rough external surfaces, such as sharks – which can potentially wear down the teeth. The food orca are fed in captivity does not contain

[286] VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Figure 2, www.freemorgan.org. Photos © Ingrid N. Visser.

any of the other prey items which have been documented as prey in wild orca (over 140 species are now documented),[287] which includes larger prey which may require prey manipulation (such as elephant seals,[288] which weigh up to 3,700kg and reach up to 5.8m in length;[289] halibut flat-fish,[290] which weigh up to 40kg[291] and reach 2.67m in length).[292]

208. As discussed earlier, in the wild such large prey items are caught and handled as a social group by the orca and are then shared.[293] This natural, social-bonding (aggression-deflecting) behaviour[294] is completely eliminated by all the

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[287] SONG, Y. (2018). *Feeding habits of different killer whale (Orcinus orca) ecotypes and populations*. Bachelor of Science BSc, Wuhan University.

[288] GUINET, C. (1992). *Comportement de chasse des orques (Orcinus orca) autour des iles Crozet*. Canadian Journal of Zoology 70(9): pp. 1656-1667.

[289] JEFFERSON, T. A., Webber, M. A. & Pitman, R. L. (2008). *Marine mammals of the world. A comprehensive guide to their identification*. Amsterdam, Academic Press.

[290] JONES, I. M. (2006). *A Northeast Pacific offshore killer whale (Orcinus orca) feeding on a Pacific halibut (Hippoglossus stenolepis)*. Marine Mammal Science 22(1): pp.198-200.

[291] SOUTHWARD, G. M., & Chapman, D. G. (1965). *Utilization of Pacific Halibut stocks. Report to the International Pacific Halibut Commission*. pp. 1-33.

[292] JONES, I. M. (2006). *A Northeast Pacific offshore killer whale (Orcinus orca) feeding on a Pacific halibut (Hippoglossus stenolepis)*. Marine Mammal Science 22(1): p.199.

[293] GUINET, C. (1992). *Comportement de chasse des orques (Orcinus orca) autour des iles Crozet*. Canadian Journal of Zoology 70(9): pp. 1656-1667.

[294] CAMPBELL, A. (2008). *Attachment, aggression and affiliation: The role of oxytocin in female social behavior*. Biological Psychology 77(1): pp. 1-10.

LIM, M. M. & Young, L. J. (2006). *Neuropeptidergic regulation of affiliative behavior and social bonding in animals*. Hormones and Behavior 50: 506-517.

SeaWorld facilities which hold them captive, based on their feeding regime (see above).

209. The orca at SeaWorld San Diego have attempted to resurrect this behaviour, by 'baiting' in birds (gulls, egrets, herons and pelicans),[295] capturing them and then cooperatively dismembering them.[296] The bird baiting is not always successful and food sharing opportunities are limited, but given the relatively small sizes of the birds and the social behaviour that they produce, the food sharing that is seen only serves to emphasize how important this is to the orca who have been deprived of it by the feeding protocols.

210. Figure [51] below depicts SeaWorld's orca baiting egrets — birds that are subject to attempts (and successes) of the orca hunting them.

[295] MILIUS, S. (2005). *Getting the gull: Baiting trick spreads among killer whales*. Science News 168(8): p. 118.

[296] Videos taken by the public at SeaWorld San Diego have documented this behaviour for a number of years now (since at least 2008). Bird baiting also been described at Marineland of Canada; MILIUS, S. (2005). *Getting the gull: Baiting trick spreads among killer whales*. Science News 168(8): p. 118.

Figure [51][297]

211. Figure [52] below depicts two screen grabs from a video showing the remains of a brown pelican (*Pelecanus occidentalis*). In the second photo, you can see another orca joining the "food-sharing."

[297] Photos © Ingrid N. Visser. Note also, the 'Boomer' ball up on the concrete. I discuss toys in greater detail in Section VI(2)(4)(b)(3) below. Note also the raised-head bolts screwed into the concrete (along the top of the blue painted area at water level, presumably to stop the orca going onto the concrete area).

Figure [52][298]

212. Food-sharing is a common way to facilitate social bonding and is common among free-ranging orca, but due to the way in which all SeaWorld orca are

[298] *See* https://www.youtube.com/watch?v=52o5yV6G7tY.

fed, they are deprived of this important behaviour. Such a dearth of means to express this fundamental social-bonding may be one of the contributing factors towards the elevated aggression observed in captive orcas. Graham and Noonan (2009)[299] describe such aggression by stating that "*Agonistic interactions* [between captive orcas] *are among the most consequential of all social behaviors*". Confined orca have shown conspecific aggression since the initial phases of the industry[300] and the aggression continues today.[301]

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[299] GRAHAM, M. A. & Noonan, M. (2009). *The acoustic signature of aggression in the killer whale (Orcinus orca): A shift in acoustic features and call type*. Animal Behavior Society. Pirenopolis, Brazil.

[300] BURGESS, K. (1968). *The behaviour and training of a Killer whale Orcinus orca at San Diego Sea World.* International Zoo Yearbook: p. 202.

MARTINEZ, D. R. & Klinghammer, E. (1970). *The behavior of the whale Orcinus orca: a review of the literature*. Zeitschrift fuer Tierpsychologie 27: pp. 828-839.

MARTINEZ, D. R. & Klinghammer, E. (1978). *A partial ethogram of the killer whale (Orcinus orca L.).* Carnivore 1(1): pp. 13-26.

[301] ANDERSON, R., Waayers, R. & Knight, A. (2016). *Orca behavior and subsequent aggression associated with oceanarium confinement.* Animals 6: pp. 1-16.

2011 Cornell Affidavit in *SeaWorld Parks & Entertainment v. Marineland of Canada* (Ontario Super. Ct., o. 52783/11).

GRAHAM, M. A. & Noonan, M. (2010). *Call types and acoustic features associated with aggressive chase in the killer whale (Orcinus orca).* Aquatic Mammals 36(1): pp. 9-18.

NOONAN, M., Steigerwalt, T. & Schneider, L. (2003). *Circadian rhythmicity in intraspecific aggression in captive killer whales.* 15th biennial conference on the Biology of Marine Mammals, Greensboro, North Carolina, The Society of Marine Mammologists.

JETT, J., Visser, I. N. Ventre, J., Waltz, J. & Loch, C. (2017). *Tooth damage in captive orcas (Orcinus orca).* Archives of Oral Biology 84: pp. 151-160.

213. [redacted][302] [redacted][303] [redacted]

SANCHEZ HERNANDEZ, P. & Molina Borja, M. (2013). *Análisis del comportamiento de un groupo de orcas (Orcinus orca) que se alojan en Loro Parque* [Translation: Analysis of the behavior of a group of orcas (Orcinus orca) that are kept in captivity at Loro Parque.]: p. 16.

JETT, J. S. & Ventre, J. M. (2011). *Keto & Tilikum Express the stress of orca captivity*, The Orca Project: p. 22.

VISSER, I. N. (2012). *Report on the physical & behavioural status of Morgan, the wild-born Orca held in captivity, at Loro Parque, Tenerife, Spain*, Free Morgan Foundation: p. 35.

VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Free Morgan Foundation: pp. 1-67.

[302] SW-AND0183519 (emphasis added).

[303] SW-AND0183520 (emphasis added).

[redacted][304]

214. [redacted][305]

215. [redacted][306] [redacted]

304 SW-AND0183525 (emphasis added).

305 SW-AND0183527.

306 SW-AND0191030 (emphasis added).

(2) Cribbing

216. [redacted]

[redacted]

Figure [53][307]

217. Whilst on the surface, a superficial perception may give the impression that the damage seen on the teeth of captive orca is the same as in the wild, a closer analysis of the available data shows that is not the case. To begin with, it is important to establish the aetiology of the damage in both environments as therein lies the fundamental difference.

218. I have observed 54 captive orca (at 16 different facilities) and I have observed stereotypic behaviour (abnormal, repetitive behaviour) in every one of these

[307] Schmitt at 121:4-11; *but see* SW-AND0138784 [redacted]

individuals. One of the more common stereotypies is gnawing/chewing on the enclosure (commonly termed 'cribbing', particularly when referring to horses).

219. Cribbing in horses is recognised as a behaviour that is specific to those held in confined spaces. In a review of this issue, Wickens & Heleski (2010)[308] wrote "*The behavior is not known to occur in feral, free-ranging horses, but is observed in domestic (Houpt and McDonnell, 1993; Mills, 2002) and captive wild horses, e.g. Przewalski horse (Boyd, 1986).*" The same can be said for orca, in that there is not a single instance of this behaviour being reported outside of captivity, despite hundreds-of-thousands of hours of field research, including underwater observations. However, orca born in the wild and brought into captivity regularly show cribbing behaviour[309] and deterioration of the teeth can be rapid.

220. Wickens & Heleski (2010) also stated that "*Performance of crib-biting behavior has been reported to occupy from 15% (Nicol et al., 2002) up to 65% (Bachmann et al., 2003a) of the daily time budget.*"[310]

221. Figures [54] and [55] below depict examples of Morgan the orca gnawing on the concrete structures. She exhibited this behaviour repeatedly.

---

308 WICKENS, C. L. & Neleski, C. R. (2010). *Crib-biting behavior in horses: A review*. Applied Animal Behaviour Science 128: p. 2 (emphasis added).

309 *E.g., see* GRAHAM, M. S. & Dow, P. R. (1990). *Dental care for a captive killer whale, Orcinus orca*. Zoo Biology 9(4): pp. 325-330.

VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*, Free Morgan Foundation: pp. 1-67.

310 WICKENS, C. L. & Neleski, C. R. (2010). *Crib-biting behavior in horses: A review*. Applied Animal Behaviour Science 128: p. 2 (emphasis added).

Figure [54][311]

[311] VISSER, I. N. (2012). *Report on the physical & behavioural status of Morgan, the wild-born Orca held in captivity, at Loro Parque, Tenerife, Spain*, Free Morgan Foundation: Figure 22, p. 35. Photos © Ingrid N. Visser.

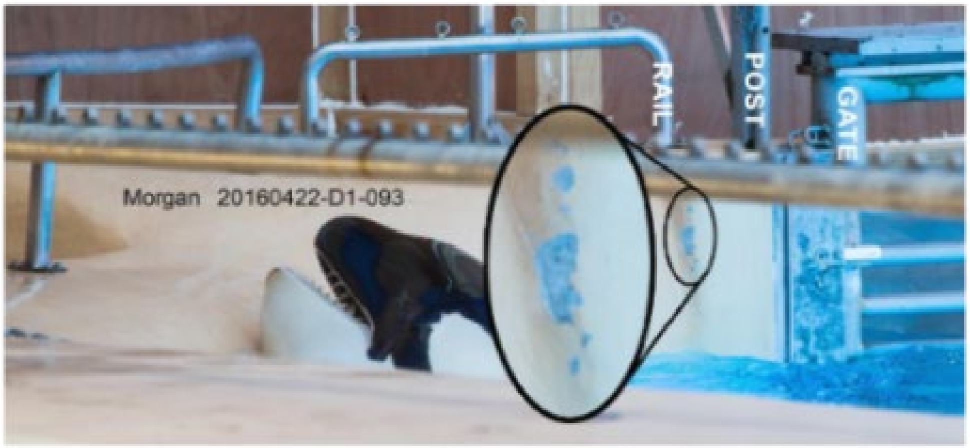

Figure 25a. Morgan attempting to chew on the concrete in the east tank. The lowered water level due to maintenance on the west tank, exposed a corner of the tank, to the right of Morgan (see enlarged area) that has been chewed by the orca (possibly Morgan herself), exposing the underlying blue paint and/or the concrete. Previous photographs (*e.g.*, see Visser 2012) have shown Morgan with blue paint on her teeth and Figure 25b shows Morgan in 2014 chewing the concrete in the area enlarged in this image.

Figure 25b. Morgan chewing on the concrete in the east tank. Despite the water level being higher in this 2014 photograph, a small section of concrete can be seen as damaged (see enlarged area). Note the gate, post and safety rail positions labelled in both photographs to allow cross referencing of Morgan's position and the area damaged in Figure 25a. The wooden maintenance separators are not present in this 2014 photograph, rather the water from the west tank is visible.

Figure [55][312]

(3) Toys

222. In captivity at SeaWorld, the barren enclosures necessitate 'enrichment devices' (ED's, commonly called 'toys') to be given to the orca. Such toys are limited in their scope (in terms of construction materials and design) to avoid the orca destroying them and potentially harming themselves through consuming the parts or cutting themselves on the broken parts.

223. As such the industry falls back on only a few items that are robust enough to withstand the attention of the orca. For example, a "*large* [hollow] *ball with holes*" was a toy used to study enrichment value in an experiment that included one wild-born male orca approximately 15 years old, held at SeaWorld Orlando.[313]

224. [redacted]

[312] From Visser, I. N. and R. B. Lisker (2016). Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain, Free Morgan Foundation: 67. Photos © Ingrid N. Visser (top) and Rosina Lisker (bottom).

[313] KUCZAJ, S., Lacinak, T., Fad, O, Trone, M., Solangi, M. & Ramos, J. (2002). *Keeping environmental enrichment enriching*. International Journal of Comparative Psychology 15: 127-137 & Table 1.

[redacted][314] [redacted]

225. [redacted][315] [redacted]

226. [redacted] (Fig. [57]), [redacted] Figure [56] [redacted]

[314] [redacted]

[315] SAMBROOK, T. D. & Buchanan-Smith, H. M. (1997). *Control and complexity in novel object enrichment*. Animal Welfare 6(3): 207-216.

[redacted]

Figure [56][316]

227. [redacted]

[316] Photos © Ingrid N. Visser.

[redacted]

[redacted]

Figure [57][317]

[317] Photos © Ingrid N. Visser. Images adjusted for contrast.

228. SeaWorld's orca suffer tooth damage in part due to the toys that are given to them. For example, when asked on 20171009, Dr. Javier Almunia, with Loro Parque testified under oath in Court at Puerto de la Cruz, Tenerife, Spain as follows:[318]

> **02:38:35 – Public Prosecutor –** Environmental enrichment. Do orcas also have it in that pool?
>
> **JA –** They do, although not permanently. What is used is some environmental enrichment throughout some planning in which toys are placed, some elements they manipulate and play with. They must be very hard to resist the orcas' strength. For instance, they have firefighting hoses attached to buoys so that they can grab them, play, throw them… You have to place some things. You must not forget these animals in the open sea don't usually swim among algae, rocks and such. They do when they are close to the coast, but there isn't a huge number of elements in the pelagic ocean that need to be replicated. So, what needs to be done is to maintain the social group active, because socialization is the best environmental enrichment for many animals, and also, having this kind of toys used by the caretakers in certain moments so that the animals---
>
> **02:39:33 – Public Prosecutor –** So, in short, what they mainly have are toys to control the socialization issue.
>
> **JA -** Yes.

[318] *See also* BURTIS Dep. Tr. at 211-12 [redacted]

02:40:30 – Judge – There's something I haven't quite understood, because you do state that the orcas show some dental problems.

JA – (Nods)

02:40:29 – Judge – You stated those are common problems, both in the wild and in captivity. Why do they present dental problems in captivity?

JA – Usually that's because they manipulate objects that are tough. They don't need to be too aggressive because orcas have a dental constitution… let's say… eerm… very weak, or easily erodible. For instance, there's a group of orcas in Iceland who feed in herring--

02:41:03 – Judge – I am asking about orcas in Loro Parque. How do the orcas you have in Loro Parque damage their teeth?

JA – By being in contact with any physical element.

02:41:10 – Judge – What kind of physical element?

JA – It can be the tanks wall, or the metal in the gates, or the toys they play with… The ropes… The toys are usually very resistant items so that they don't break and prevent they wouldn't swallow them accidentally. Any element of that kind.

02:41:30 – Judge – Why would they suffer that kind of problems in the wild?

JA – Also due to contact with any physical element. For instance, by herring suctioning, their teeth can wear off completely until they're worn off to the mandible [sic]. For instance, when they feed on sea mammals with tough bones, a tooth can break when they chew on a bone. When they feed on sharks -orcas that feed on sharks- have their teeth completely worn off due to the shark's skin's abrasion. With physical elements on the bottom, such as rocks—anything can cause tooth wear.

229. SeaWorld appears to have started giving more natural toys to the orca, such as seaweed (kelp, *Macrocystis pyrifera*). It is unclear how frequently this type of natural enrichment is given as I could find no records of it in the documents produced by SeaWorld,[319] and it may have been provided to the orca specifically for the site inspection. I noted that orca continued to play with the kelp for the entire duration of the behind-the-scenes site inspection (post being given the kelp, i.e., approximately 1.5 hrs). As depicted in Figure [58] below, during the site inspection the orca were given seaweed (kelp, *Macrocystis sp.*). Kelp such as this will not damage their teeth.

[319] As noted above, SeaWorld produced a number of documents in January 2019 that I have not been able to review meaningfully.

Figure [58][320]

230. Figure [59] below depicts variations on the theme of hoses and hard toys for the orca. On the left is an orca holding a yellow fabric 'hose' in its mouth, which is attached to a flat hard disc. That disk would normally float and requires substantial force to pull underwater, creating pressure on the teeth. On the right is a similar concept, where an adult male orca (Tilikum, now deceased) has a hose grasped at the front of his mouth. The hose has a ball and two discs and the force

[320] Photos © Ingrid N. Visser. Note the stadium in the background, preventing the orca from having any visual 'horizon' and confining them visually as well as physically.

with which he has pulled the toy under water is indicated by the bubbles surrounding the ball.

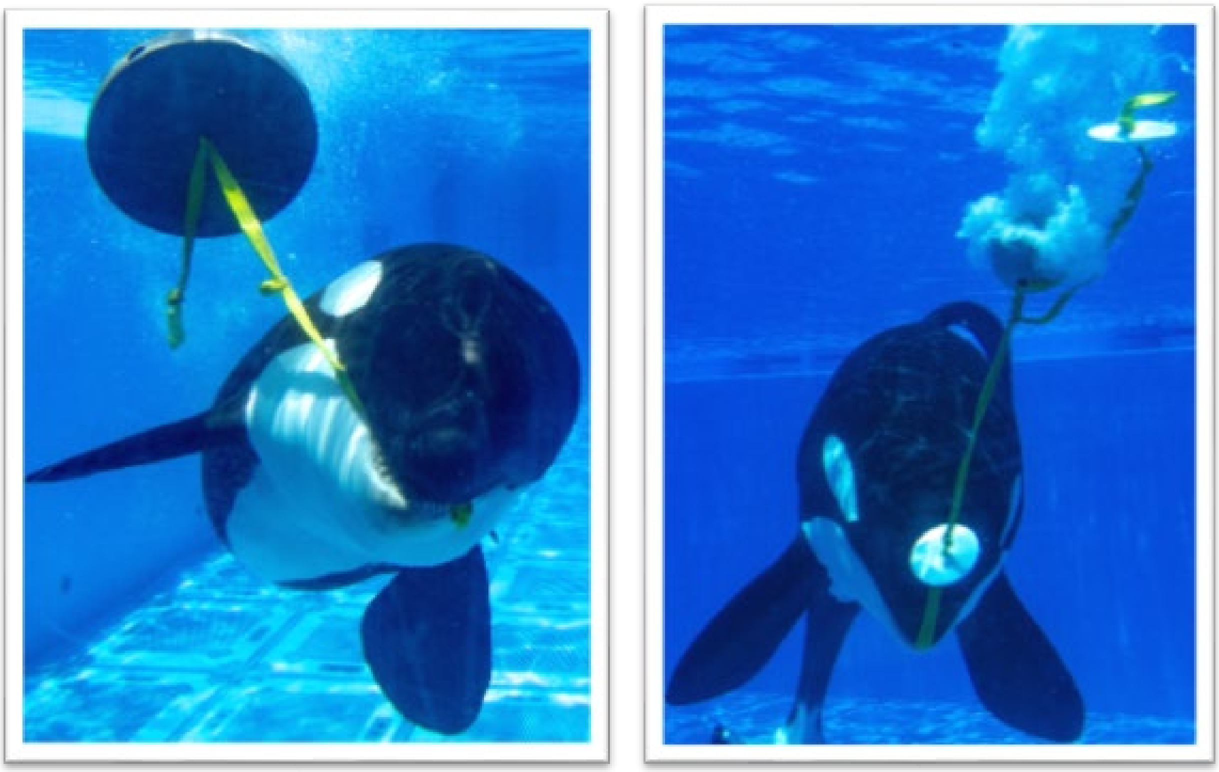

Figure [59][321]

231. Figures [60] - [62] below are three photographs showing orca in the wild playing with seaweed such as *Ecklonia radiata*. Larger pieces are carried in 'balancing games' (top), or carried around in the orca's mouths (middle) as are smaller pieces (bottom). All images from New Zealand. Of note is that no orca in this population have been documented with damaged teeth.

[321] Both photos, SeaWorld Orlando, © Ingrid N. Visser.

Figures [60], [61] and [62][322]

232. Figures [63] - [65] below are three photographs showing seaweeds such as *Macrocystis pyrifera* being 'carried' by orca (even during hunting, *e.g.*, see sealion pup to right of photo at top) or draped over fins. It may be a type of 'massage' tool or a toy. Additionally, these orca have been seen mouthing seaweeds (Visser, unpublished data) and they hunt marine mammals (*see* Figures [63], [64], [65], and [66]).

[322] Photos © Ingrid N. Visser (middle screen grab from video).

Figures [63], [64], [65][323]

233. Figure [66] below shows an adult male orca (at least 30 years old) coming onto the beach at Punta Norte, Argentina, about to capture a sealion pup (with two in the water beside the orca). The open mouth shows the pristine teeth (see closeup). This same orca has been photographed playing with and mouthing seaweed.

[323] Photos from Argentina © Ingrid N. Visser.

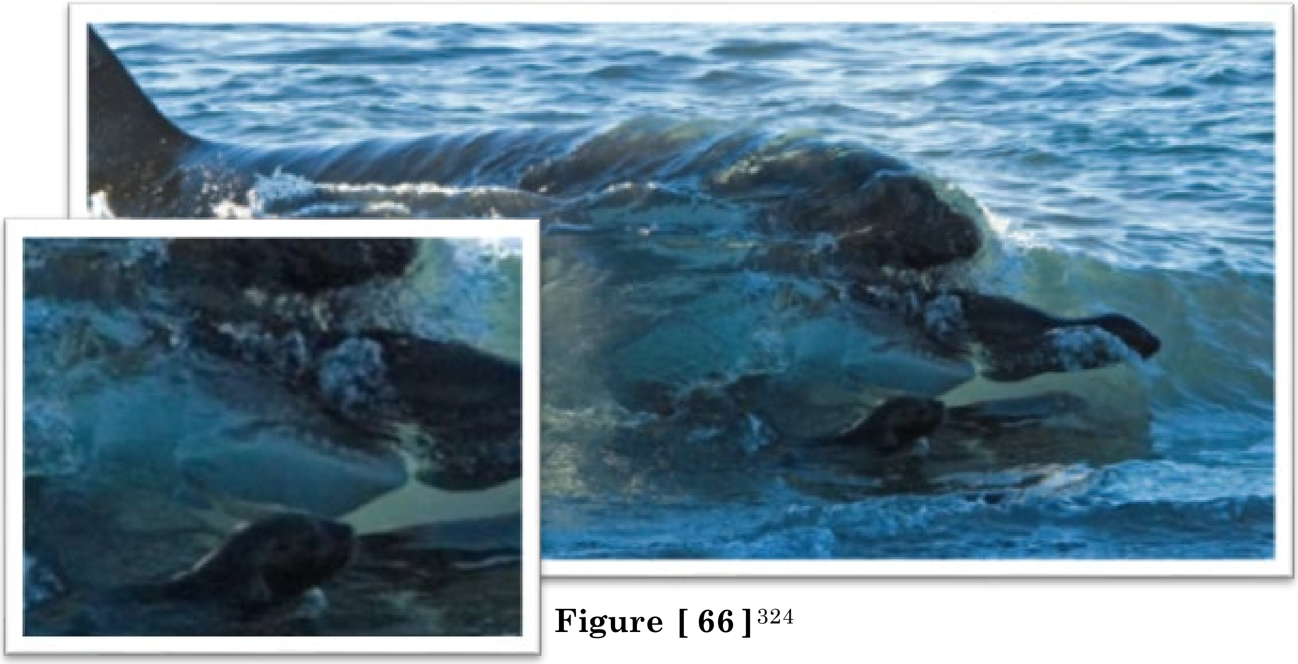

Figure [66][324]

c) SeaWorld's incorrect claims regarding tooth damage among wild orcas

234. SeaWorld claims that the damage to the teeth of their whales is similar to that seen in wild free-ranging whales. Specifically, SeaWorld claims that "a lot of" wild orcas have "the exact same tooth profile" as SeaWorld's captive orca. SeaWorld's position, shown below in Figure [67], is incorrect.[325]

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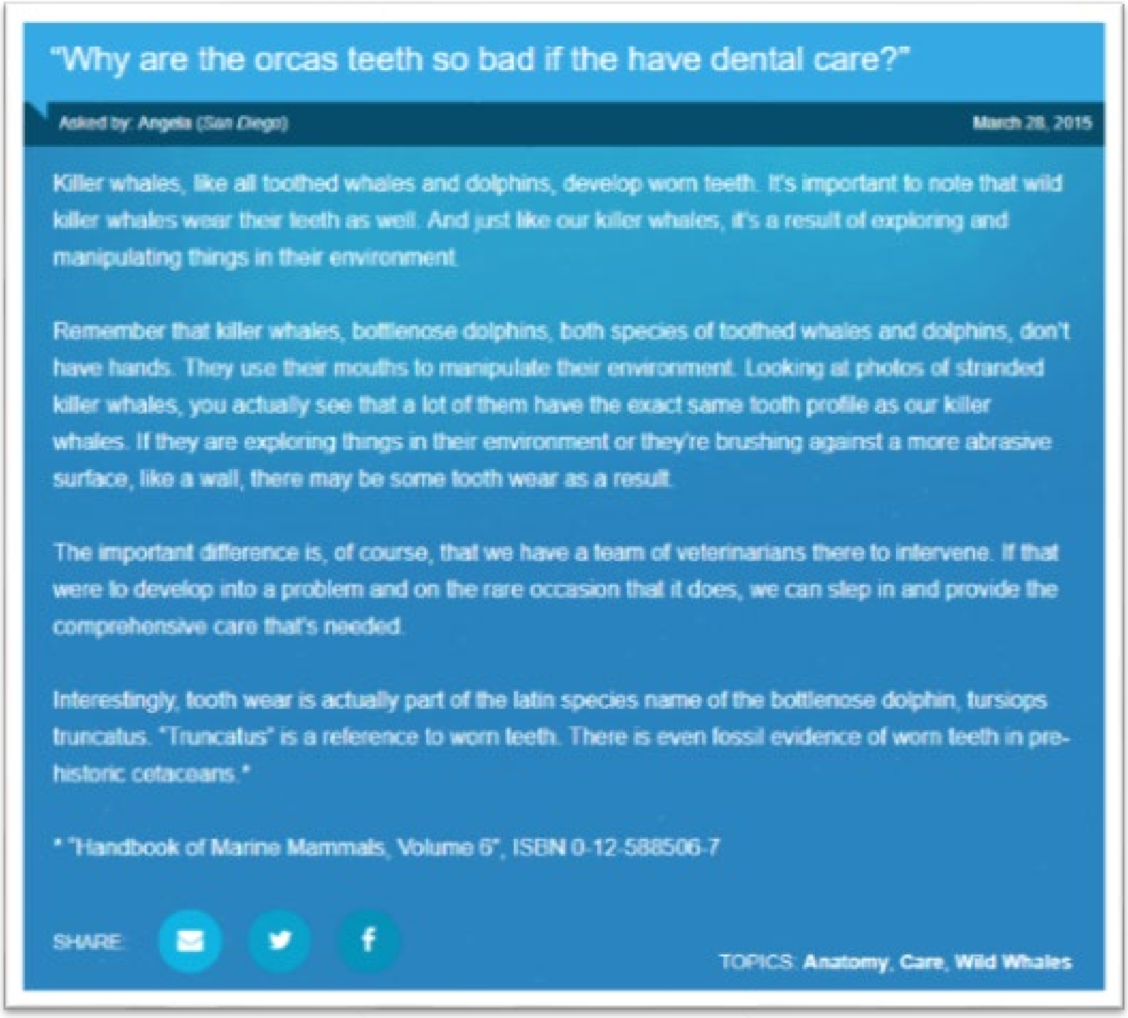
[324] Photo © Ingrid N. Visser.

[325] On the website SeaWorld Fact Check (www.seaworldfactcheck.com), of which I am one of the co-founders (http://www.seaworldfactcheck.com/whoweare.htm) and for which I compiled the following text, we have reproduced a question posed by a member of the public (via Twitter) and SeaWorld's response. In addition, we have the Fact Check information (*i.e.*, our analysis).



"Why are the orcas teeth so bad if the have dental care?"

Asked by: Angela (San Diego) March 28, 2015

Killer whales, like all toothed whales and dolphins, develop worn teeth. It's important to note that wild killer whales wear their teeth as well. And just like our killer whales, it's a result of exploring and manipulating things in their environment.

Remember that killer whales, bottlenose dolphins, both species of toothed whales and dolphins, don't have hands. They use their mouths to manipulate their environment. Looking at photos of stranded killer whales, you actually see that a lot of them have the exact same tooth profile as our killer whales. If they are exploring things in their environment or they're brushing against a more abrasive surface, like a wall, there may be some tooth wear as a result.

The important difference is, of course, that we have a team of veterinarians there to intervene. If that were to develop into a problem and on the rare occasion that it does, we can step in and provide the comprehensive care that's needed.

Interestingly, tooth wear is actually part of the latin species name of the bottlenose dolphin, tursiops truncatus. "Truncatus" is a reference to worn teeth. There is even fossil evidence of worn teeth in pre-historic cetaceans.*

* "Handbook of Marine Mammals, Volume 6", ISBN 0-12-588506-7

SHARE

TOPICS: Anatomy, Care, Wild Whales

Figure [67]

235. In its response to the original question, SeaWorld is essentially claiming that captive orca dentition is "normal." This is incorrect as explained in SeaWorld Fact Check's response. I agree with that response and reproduce it below:

> From trainer and visitor observations, captive killer whales break and wear their teeth because they persistently grind them on the concrete walls and metal gates of their enclosures out of boredom or neurosis. However, there have been few peer-reviewed papers examining this common problem, because the facilities holding killer whales have published very little of substance on captive killer whale dentition. One paper

(Graham and Dow 1990) describes one whale's damaged dentition and the treatment for it. This paper clarified that the teeth of this one animal were worn by "biting a cement structure in the pool." Indeed, the authors note that for whales in net pens, "there are no hard surfaces to chew on, so tooth wear is not evident after several years in captivity."

Almost all captive killer whales suffer moderate to severe wear at the tip and occasional breakage (here are three random photos downloaded from the Internet):

Figure 1. There are several drilled out teeth, teeth worn to the gums, and broken teeth in these three photos. There are many more such photos available on the Internet. While less than a handful of juvenile to adult captive killer whales suffer no wear or breakage, this is the exception rather than the rule. These three photos are representative of most captive killer whale teeth.

Killer whale teeth in the wild generally do not suffer severe wear at the tip (and only very rarely exhibit breakage) and when they do, this wear occurs at the population level and is associated with prey type (e.g., in the northeastern Pacific offshore ecotype, severe tooth wear is associated with feeding on sharks; Ford et al. 2011) or feeding method (e.g., in Type 1 North Atlantics, severe tooth wear is associated with suction-feeding; Foote et al. 2009). Pacific transient ecotype teeth show slight wear, associated with feeding on other marine mammals (Ford et al. 2011). Generally mammal eaters show wear on the sides of the tooth more than on the tip (Caldwell and Brown 1964). Northeastern Pacific resident and Type 2 North Atlantic teeth suffer no wear at the tip and only some on the sides (Ford et al. 2011; Foote et al. 2009). In all these papers, tooth wear is attributed to prey type or feeding method, not to general manipulation of objects in the environment.

> Given that captive killer whale teeth rarely or never touch the fish they are fed (thawed frozen fish are dropped directly into the open mouths of the animals and are rarely handled by the animals' teeth in any way), this begs the question of how their teeth wear or break like this. SeaWorld's response consists of two major points: 1) that moderate wear occurs when the whales' teeth "brush against" abrasive surfaces such as the walls (the suggestion is that this happens only occasionally and even inadvertently and is more than a slight touch but far less than a concentrated grinding); and 2) that "a lot" of stranded killer whales have poor dentition, which is the result of simple "manipulation" of objects in their environment. This claim does not distinguish the populations from which such stranded whales come; it simply implies that many whales from all populations have teeth similar to those of captive killer whales and for similar reasons. This is incorrect.

236. SeaWorld Fact Check cites the following references in support of the above explanation. These references also support my opinion that SeaWorld's claim that its orcas' dentition is normal is incorrect.

- CALDWELL, D.K. and Brown, D.H. (1964). *Tooth wear as a correlate of described feeding behavior by the killer whale, with notes on a captive specimen*. Bulletin So. Calif. Academy Science 63,p. 128-140

- FORD et al. (2011). *Shark predation and tooth wear in a population of northeastern Pacific killer whales*. Aquatic Biology 11, p. 213-224

- FOOTE, A. et al. (2009). *Ecological, morphological and genetic divergence of sympatric North Atlantic killer whale populations*. Molecular Ecology 18, p. 5207–5217

- GRAHAM, M.S. & Dow, P.R. (1990). I. Zoo Biology 9, p. 325-330

237. The pattern of tooth wear and breakage seen in SeaWorld's orca is not seen in the wild. If teeth do wear down in free-ranging orcas, it is due to prey type or

feeding method, and generally occurs over a lifetime (rather than within a few years, as in captivity). For example, in the Northeast Pacific the 'Offshore' orca ecotype, wear is attributable to feeding on sharks, which have rough, abrasive skins.[326] In 'Type 1' North Atlantic orca, tooth wear is associated with suction-feeding.[327] A lifetime of water rushing past the teeth, as individuals suction fish into their mouths, could slowly wear away the teeth on the upper and lower jaw, although generally the teeth are not worn to the gum line and the pulp is not exposed. Contrastingly, Northeast Pacific Resident, 'Type 2' North Atlantic, and New Zealand Coastal orca have very little tooth wear,[328] while mammal-eating 'Transients' show only slight wear, from tearing apart large mammal prey.[329]

238. To elaborate on the above points, as per Table [1] above, the New Zealand coastal orca have documented foraging on a range of elasmobranchs (sharks, rays and skates). Elasmobranchs typically have rough to moderately rough skin.[330] It has been speculated that this rough skin may be the cause of dental wear in one

[326] Ford et al., 2011.

[327] Foote et al., 2009.

[328] Foote et al., 2009; Ford et al., 2011.

[329] Ford et al., 2011.

[330] COMPANGNO, L. J. V., Ed. (1984). FAO species catalogue. Vol 4 Sharks of the world. Fisheries Synopsis. Part 1. Hexanchiformes to Laminformes, Rome: Food and Agriculture Organisation.

population of free-ranging orca (termed the 'Offshores' due to their typical core distribution being out in the open ocean).[331]

239. Another paper often cited by SeaWorld is that of 'Type 1' and 'Type 2' orca from the North Atlantic. Again, it is only speculated by the authors as to the aetiology of the dental damage, but in this case it is not the prey type (herring and mackerel – both 'slimy' fish), but rather the foraging method (i.e., that the orca use 'suction' feeding – and that the repetitive flow of water over the teeth has worn them down over time). They write:

> All adult specimens [Type I] with haplotypes 29–35 had significant tooth wear indicating that they share a common foraging method, e.g. suction-feeding on whole herring or mackerel. However, the range in d15N values suggests that subsets of individuals are additionally persistently feeding at a higher trophic level. This is consistent with observational data of small subsets of naturally marked identified individuals belonging to the Icelandic and Norwegian herring eating populations persistently predating seals.[332]

240. Foote et al (2009) also looked at genetics and stable isotope values and together with the tooth wear, concluded that the evidence regarding their prey "*indicate*[d] *Type 1 to be a generalist while the Type 2 appears to be highly specialized*."

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[331] FORD, J. K. B. et al. (2011). *Shark predation and tooth wear in a population of northeastern Pacific killer whales*. Aquatic Biology 11(3), p. 213-224.

[332] FOOTE, et al. (2009). *Ecological, morphological and genetic divergence of sympatric North Atlantic killer whale populations*. Molecular Ecology 18(24), p. 5207-5217 (citations omitted).

241. The tooth wear of these two orca populations, despite a completely different aetiology as to tooth wear, are often touted by SeaWorld as 'the answer' and 'validation' that the dental damage observed on orca in captivity is "*the same*" or at the very least "*similar*" to that observed in the wild.

242. The pattern of tooth damage and wear in captive orca, however, differs in two main ways; it is asymmetrical (the lower jaw shows more wear and breakage than the upper and the forward teeth show more damage than the middle teeth, almost certainly due to the mechanics of how captive orca grind their teeth on the walls and pop their jaws on metal) and there is more breakage (as distinct from wear) than is typically seen in free-ranging orcas. Twenty-four percent of captive orcas show "extreme" damage to their teeth, while almost all show some degree of damage.[333]

243. To elaborate, as noted above, it has been well documented that the captive orca at SeaWorld and Loro Parque gnaw on the concrete and other hard surfaces. Orca don't masticate (grind and chew), but their teeth are interlocking and have evolved for grasping and tearing. The teeth, in an orca which does not have dental damage, are effective precision 'tools.' For example, Figure [68] below depicts the underside of an eagle ray wing, recovered from an orca kill. The spacing of the lacerations from the teeth is 3 to 3.5cm (1 to 1.5 in), indicative of an adult (which also conforms with the field data collected that day). The lacerations occur because of the

[333] JETT, et al.(2017). *Tooth damage in captive orcas (Orcinus orca).* Archives of Oral Biology 84, p. 151-160.

cooperative 'tearing apart' of the ray (see Figure [68]), in order to expose the liver, which is then shared and consumed.

Figure [68][334]

244. Figure [69] below depicts ray carcasses recovered from New Zealand coastal orca, during a single foraging event. Four eagle rays and one long-tailed ray were collected. In each instance the rays were grasped in the teeth by two orca and pulled apart, in many instances in an almost surgical manner.

334 Photo © Ingrid N. Visser.

Figure [69]

245. In order to understand the implication of the stereotypic behaviour of gnawing/chewing/cribbing, it is worth reverting back to some basic anatomy. The structure of an orca's skull, position of the teeth and the protruding soft-tissues, prohibit an orca from gnawing on flat surfaces like tank walls, with its back teeth. The wear on the teeth of captive orca is substantially different between upper (maxillae) and lower (mandibular) teeth.[335]

[335] JETT, J., I. N. Visser, J. Ventre, J. Waltz and C. Loch (2017). *Tooth damage in captive orcas (Orcinus orca)*. Archives of Oral Biology 84: pp. 151-160.

246. In the maxillae of the upper 'lip' the tissue is very stiff – almost to the point of being inflexible, and as such, it provides a definitive 'guard' over the teeth. That is, the lip can't be curled up over the teeth, like a dog's or a human's. Rather, it remains as a relatively firm one-sided sheath on the buccal (cheek) side of the teeth (Figures [66], [70], [71], and [72]) and may 'protect' the teeth to some degree. Jett et al (2017)[336] documented the dental damage of the SeaWorld orca (including those held at Loro Parque) and stated "*Overall, maxillary teeth generally presented fewer pathologies than mandibular teeth across categories…*".

247. Those teeth that are damaged in the maxillae (upper jaw) of captive orca are often broken, rather than just worn, or have apparently been extracted. Jett et al (2017) stated: "*… more fractures were observed in maxillary teeth 1 and 2 (3.92 and 19.61%, respectively) than mandibular teeth 1 and 2 (1.79 and 14.29%, respectively). Similarly, a higher percentage of missing teeth were observed in maxillary teeth 1 and 5–8 (2.04, 3.92, 3.94, 4, and 2.22%, respectively) than mandibular teeth 1 and 5–8 (1.72, 1.72, 0, 1.72, and 0%, respectively).*"[337]

248. Therefore, most of the damage from gnawing/chewing/cribbing primarily impacts their front teeth. Jett et al (2017) found "*The highest percentages*

[336] *Ibid*.

[337] *Ibid*.

of mandibular teeth exhibiting wear at or below the gum line occurred in teeth 1–5 (85.96, 61.40, 41.82, 32.14, and 26.32%, respectively)."[338]

249. Likewise, the number of fractured mandibular teeth found on the SeaWorld orca was high – with 25.45% and 22.64% of teeth 8 & 9, respectively, cracked, chipped, broken or fractured.[339] The aetiology for this damage appears to be different to that found on the other teeth and may be due to toys, gates or other hard surfaces.

250. All this damage is in direct contrast to most wild populations of orca. For example, despite the New Zealand coastal orca foraging primarily on elasmobranchs, their teeth are typically pristine. For example, Figure [70] below shows the pristine teeth of a stranded, adult male orca, estimated to be more than 30 years old at the time. This adult male is part of the New Zealand coastal population of orca who specialise in foraging for elasmobranchs, including those with rough skin, and yet, he shows no sign of dental damage. Similarly, Figure [71] shows an adult female (at least 45 years old) about to surface, with an eagle ray held upside down in her mouth. Her pristine teeth, inter-tooth spacing and pink gums are all clearly visible. She is part of the New Zealand coastal population of orca who specialise in foraging for elasmobranchs. Finally, Figure [72] shows an adult (at least 25 years

[338] *Ibid.*

[339] *Ibid.*

old) free-ranging female orca in New Zealand waters in 2019, with pristine teeth and gums.

Figure [70][340]

[340] Photo © Ingrid N. Visser.

Figure [71][341]

[341] Photo © Ingrid N. Visser.

Figure [72][342]

251. Because dead fish are dropped (or tossed) directly into the open mouths of captive orca — meaning food rarely, if ever, contacts their teeth — one would expect very little tooth wear at all, similar to the near-pristine teeth seen in salmon-eating

[342] Photo © Ingrid N. Visser. Note also the inter-tooth spacing, allowing for the interlocking of maxillae and mandibular teeth, is apparent, as is the 'pink' colouring of the gums.

Resident orca in the northeast Pacific,[343] or the New Zealand Coastal orca, as examples. Yet this is not the case. Therefore, SeaWorld's claim that tooth wear and breakage in captive orcas is "normal" and the result of routine manipulation of objects in their enclosures[344] cannot be correct. This degree of damage to the teeth is not normal and may be a factor in the shortened life spans of captive orcas.[345]

252. I understand that SeaWorld donates some of the skeletons of its orca to the Museum of Osteology, Oklahoma. I understand, however, that SeaWorld extracts and retains the teeth from the skulls of those orca. I believe that those teeth would further demonstrate the extent of tooth damage SeaWorld's captive orca suffer.

d) Consequences of tooth damage and issues with SeaWorld's dental care of its captive orcas

253. Industry standards for veterinary care of marine mammals have examples of dental charts freely available (e.g., see Figure [73] below). In the paper I co-authored, discussing the dental damage on captive orca, we provided an extremely simplified version of such a chart (Figure [75]). I have not been able to locate any dental charts of similar nature, to the industry standard or the simplified version, in the documents provided by SeaWorld, nor I could find any reference to such dental charts that might be used by SeaWorld but not provided. The keeping of

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[343] FORD *et al.* (2011).

[344] See, e.g., *www.seaworldfactcheck.com/teeth.htm*.

[345] The connection between poor dental health and systemic disease (such as pneumonia and heart disease) is well-established in other mammals, including humans (Li *et al*, 2000; Niemiec, 2008).

dental records such as these is considered standard practice in marine mammal medicine, for example see the dental charts depicted in Holmstrom (2018) (and illustrated here as Figures XX and YY), for pinnipeds and where he states (under the heading 'Oral Examination') "The oral examination should always be conducted systematically. … Each tooth should be examined using both an explorer, looking for fractures, mobility, and other defects, and also a periodontal probe evaluating the depth of each tooth's sulcus or pocket. Be sure to note the amount of plaque and calculus on each tooth, because an abnormal amount of plaque and calculus on one tooth as compared to the others may indicate pain and disease. Examine the periodontal tissue for gingival inflammation, hyperplasia, changes in texture, and/or other abnormalities. Record the findings on oral exam in the animal's dental chart; then use the chart to keep a visual record of the patient's oral health status."[346]

254. Figures [73] and [74] below depict dental charts for marine mammals (pinniped examples are given) from Holmstrom, S. E. (2018). Dentistry. CRC Handbook of marine mammal medicine. Gulland, Dierauf and Whitman (Eds). Boca Raton, Florida, USA, CRC Press: pp. 501-516. Their Fig. 22.4.

[346] HOLMSTROM, S. E. (2018). Dentistry. *CRC Handbook of marine mammal medicine*. F. M. D. Gulland, L. A. Dierauf and K. L. Whitman. Boca Raton, Florida, USA, CRC Press: pp. 501-516.

508 Dentistry

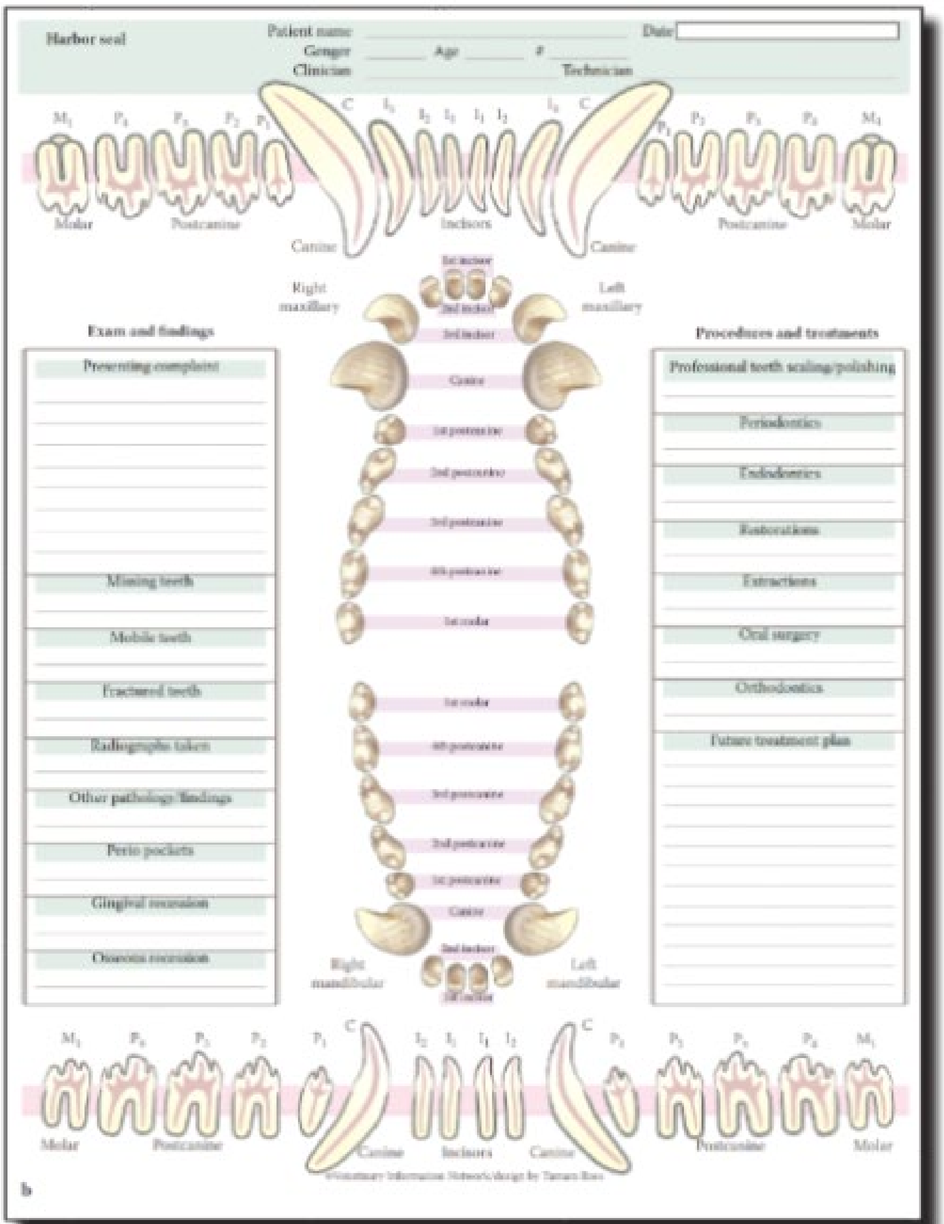

Figure 22.4 (b) Dental chart for a harbor seal (and most phocid seals). (Both images courtesy of Veterinary Information Network, which may be copied and reproduced for clinical practice.)

Figure [73]

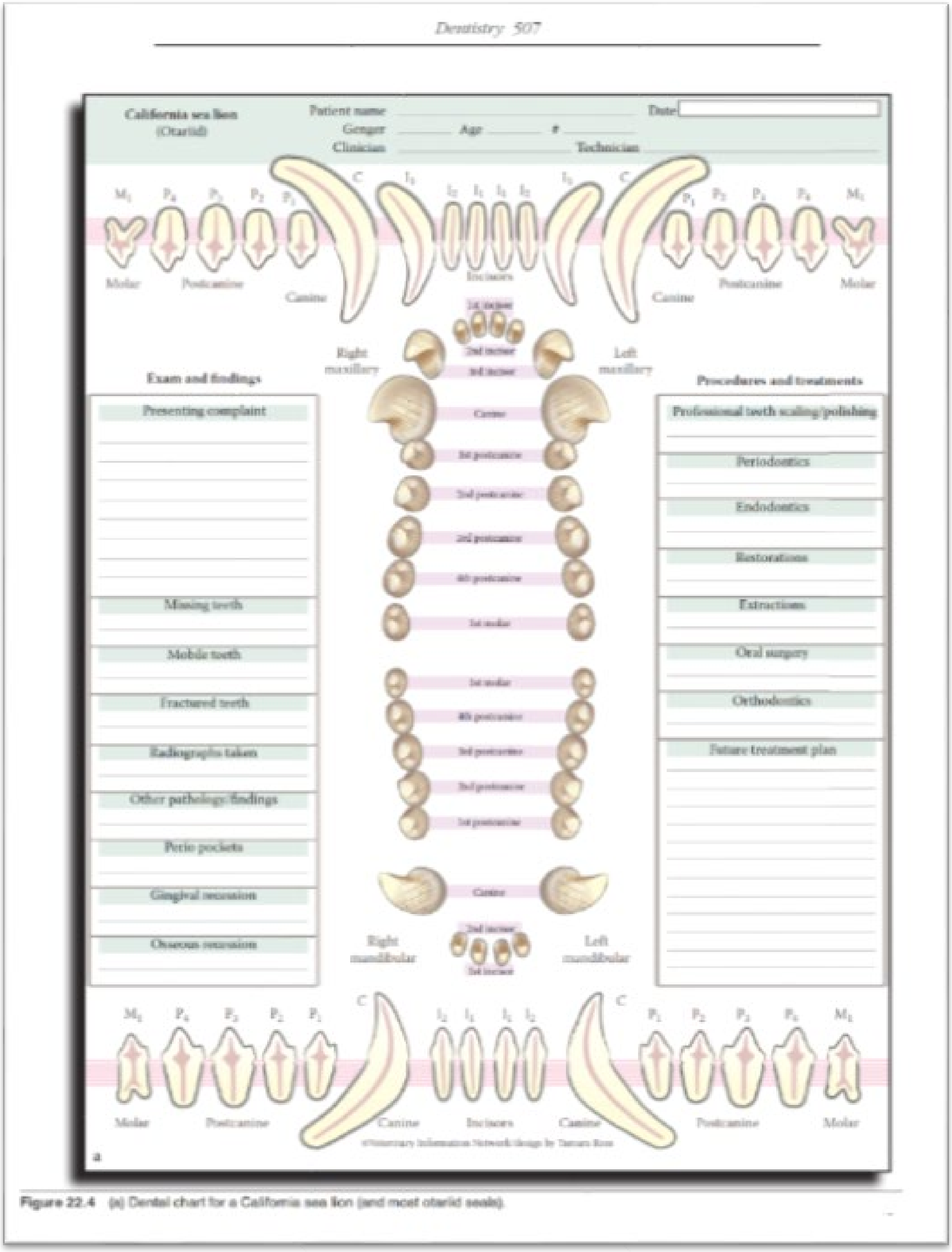

Figure 22.4 (a) Dental chart for a California sea lion (and most otariid seals).

Figure [74]

255. Figure [75] below depicts a simplified (homodont) dental chart of orca teeth, where the dental configuration is 12 teeth per quadrant. From Jett, J., I. N. **Visser**, J. Ventre, J. Waltz and C. Loch (2017). "Tooth damage in captive orcas (*Orcinus orca*)." *Archives of Oral Biology 84*: 151-160., their Figure 1.

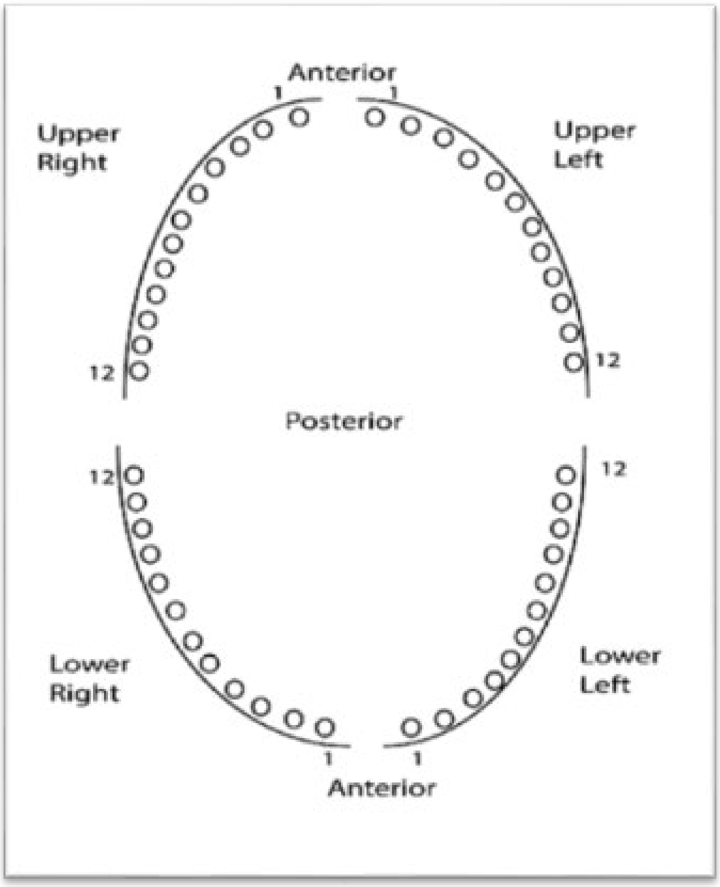

Figure [75]

256. The extent to which captive orcas wear down their teeth exposes the pulp and nerves, and veterinarians must then drill the teeth out. Drilling the teeth empties the pulp cavity, removing some of the living tissue that is prone to infection and opening the cavity for disinfection. This leaves open holes, as the aquatic

environment apparently precludes using amalgam fillings.[347] [redacted]

> [redacted]
>
> [redacted]
>
> [redacted]
>
> [redacted][348]

[347] JETT, J., I. N. Visser, J. Ventre, J. Waltz and C. Loch (2017). *Tooth damage in captive orcas (Orcinus orca).*" Archives of Oral Biology 84: pp. 151-160; VENTRE, J. and J. Jett (2015). *Killer whales, theme parks and controversy: An exploration of the evidence.* Animals and tourism. Understanding diverse relationships. K. Markwell. UK, Channel View Publications. 305: pp.128-145; Dr. Lanny Cornell submitted an affidavit in the court case wherein SeaWorld sought to recover Ikaika, in which he described Ikaika's chronic dental infections, due to the drilling out of his teeth, and the constant care the whale required to address this problem. He stated, "These roots [of Ikaika's teeth] are open, allowing bacteria to enter and cause infections" (p. 5 in Cornell, 2011).

[348] See page 117-118 (objections omitted); *see also* SCHMITT Dep. Tr. at 116:5-11 [redacted]

257. [redacted][349] But these drilled-out teeth are also entry points for pathogens and infections. [redacted][350] As dental pathology is associated with increased infection rate, this contributes to the orcas short lifespan. It also shows considerable psychological stress in orcas held in captivity.[351]

258. [redacted][352] [redacted]

259. Exacerbating the problem is SeaWorld's practice of requiring its trainers, who are not qualified to perform dental procedures,[353] to perform tooth

[349] *See, e.g.*, BURTIS Dep. Tr. at 94:2-19 [redacted]

[350] *See, e.g.*, SW-AND0261272, SW-AND0260925.

[351] DVORSKY G, Captive Orca Whales Are So Bored They're Destroying Their Teeth, Gizmodo, October 12th 2017, https://gizmodo.com/captive-orca-whales-are-so-bored-theyre-destroying-thei-1819398225

[352] *See, e.g.*, SW-AND0139985, SW- AND0148990, SW-AND0148992, SW-AND0149338 (including attachments: SW-AND0149339 through SW-AND0149349), SW-AND0149392, SW-AND0151138, SW-AND0151154, SW-AND0151124, and SW-AND0151140.

[353] It is my understanding that this is contrary to industry best practices. See, e.g., GULLAND, Frances M.D., et al., CRC Handbook of Marine Mammal Medicine, 3rd edition, at Chapter 22 ("Veterinary dentistry involves the professional consultation, evaluation, diagnosis, prevention, and treatment (nonsurgical, surgical, or related procedures) of conditions, diseases, and disorders of the oral cavity and maxillofacial area and their adjacent and associated structures. *Dentistry is provided by a licensed veterinarian, within the scope of his/her education, training, and experience, and in accordance with the ethics of the profession and applicable*

"drillings" and "flushings." Per Dr. Dold's testimony in the OSHO case, reproduced below in Figures [76] - [81], about 70% of the orcas have had their teeth drilled, and it is "not uncommon for [tooth flushing] to be a twice-a-day procedure."[354] This underscores the extent to which SeaWorld must undertake unnatural maintenance just to keep its captive orcas alive and free from infection.

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laws established by the American Veterinary Dental College (AVDC; 2016) in 1988.") (emphasis added).

[354] *See also* SCHMITT Dep. Tr. at 149:6-23 [redacted]

Q. How about the health of the killer whale's teeth? How is that maintained?

A. Killer whale teeth are soft, and in both wild and in the animals in our collection, killer whales will erode the surface of their teeth, exposing the pulp cavity, and that can be and is a common management concern of ours, and the way it is managed is that the teeth are regularly flushed. We flush out the pulp cavity.

So, just like a human tooth, a killer whale tooth is hard on the outside, soft on the inside so the trainers will once or twice a day use a bacterial static antiseptic solution sometimes. Sometimes, they'll just use saline water to flush out that pulp cavity and remove any debris that's within the pulp cavity.

Q. How close would they need to be to do that procedure?

A. Well, the way we currently do it, they are right next to the animal's mouth, and they usually have a hand on the whale's chin, and they use a water pick, modified in some cases, and it depends a little bit where you go from park to park, the tool they're using to flush the tooth out. But, the behavior is the same where they have the animal with their chin resting on the side of the pool and they may not keep constant

1731

contact with their hands all the time, but they will use their hands to ask the whale to put its face in position where they can then pass the catheter and flush out that pulp cavity.

Q. How often would that need to be done?

A. It really depends on the individual animal, it depends on the individual tooth, but it's not uncommon for that to be a twice-a-day procedure.

Q. And, are you ever involved in moving, actually physically moving a killer whale from one facility to another?

A. Certainly.

1743

couldn't get a blood sample or blood draw from a particular whale, at what point would that be brought to your attention?

A. I think it would be brought to my attention -- it depends. We talk regularly in a weekly conference call just routinely. If the failure to get a blood sample from a particular animal were such that it was, say, interfering with and substantially affecting our regularly preventive health program, it would be a topic of conversation, and I would be involved.

Q. Now, you and your staff perform medical procedures or veterinary procedures, I think you referred to killer whales?

A. Yes.

Q. And, the trainers, they're not performing the medical procedures or the veterinary procedure itself?

A. That's right. So, the trainers perform samples collection, and the trainers perform -- there is one behavior that the trainers perform that is a dental procedure. There are times where with regards to the whale's teeth, if they have an abscess or an infection within the pulp cavity of the tooth that's under pressure, we will sometimes do an apical core where we drill out the center of the tooth and relieve the pressure, allow the exudate to be released and that also

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gives us access then to clean and flush that area.
That is a procedure, if you will, that the trainers will do, and that's not a tooth root extraction. We would never have a trainer do a tooth root extraction. It is the minor dental procedures that we will have the trainers do.
Q. So, that minor dental procedure is called drilling out the tooth?
A. You could refer to it as such.
Q. And, that's been done on most of the whales in Sea World's collection?
A. It's been done on many.
Q. Do you know whether it's 10 or 20 or whatever?
A. There's 20 and in North America, and I can figure it out if you give me a second just how many it is. Do you want me to tell you the actual number?
Q. You can give me an approximation. I'm not going to ask you to say it's 17 and, you know, it's really 16. An estimate.
A. Do you know how many?
Q. The way this works is I get to ask you questions.
A. I know, but I would like to answer a question with a question. Yes, I would say it is probably 14 of

1746

the 20.

Q. So, somewhere in the neighborhood of 70 percent, give or take?

A. Yes.

Q. Now, you don't allow trainers to perform any actual medical procedures other than that tooth drilling, if you will?

A. To my knowledge, no.

1766

of killer whale teeth in the wild and in captivity?
A. Yes.
Q. And, the killer whales in captivity who have their teeth drilled out, that's sometimes a result of killer whales breaking their teeth on the metal gates of the pools?
A. Well, I mean, there is that nuance, but the whales do not grab the gates and fracture them on the metal. The teeth are typically broken on other hard surfaces within there, but your characterization that they're breaking them on the metal is not the case.
Q. They're wearing them down by sometimes --
A. Some means or another.
Q. Has Sea World studied what the cause of the killer whale teeth breakage is?
A. We understand the cause of the killer whale tooth breakage. It could be a number of things.
Q. Including?
A. Including concrete, so they're in concrete pools, certainly. So, some of it may be a tooth versus concrete, some of it may be tooth versus other whales, and by that I mean if a whale bites down on another whale and the whale spins away, you may fracture off the tip of a tooth that way. So, these are some of the other ways.

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Figures [76] - [81][355]

[355] Trial testimony of Dr. Chris Dold in the OSHO Case.

5. Abandoned plans to improve orca tanks and make them larger

260. Former trainer John Jett recalls that on his first day at SeaWorld, he was trouble and "saddened by how relatively small the pools were and how little time most of the whales spent swimming throughout the day."[356] In 2015, SeaWorld announced a $300 million tank expansion project that would provide a better environment for orca, closer to what they could have in the wild. . The project, called "Blue World", still included the old tanks, including the stage to showcase orca.[357] The project was abandoned a year later.[358]

[356] EMMONS K (2012), *Former SeaWorld trainers speak out about captivity*, BlueFreedom, https://bluefreedom.org/2012/03/former-seaworld-trainers-speak-ou.html

[357] HILL, T. (2015). *SeaWorld's New Killer Whale Plan: Bigger Tanks but the Shows Go On*, takepart, http://www.takepart.com/article/2015/01/22/seaworlds-new-killer-whale-plan-bigger-tanks-not-bigger-shows

[358] MCCABE, A. (2016) *SeaWorld San Diego officially cancels plans for $100 million orca tank expansion*, Inside The Magic, https://insidethemagic.net/2016/04/seaworld-officially-cancels-plans-for-100-million-orca-tank-expansion/

Figure [82][359]

3) Compromised welfare relating to SeaWorld's personnel

261. SeaWorld's personnel taking care of the animals on a day-to-day basis are not required to be qualified in animal husbandry. For example, SeaWorld's

[359] STONE, K. (2015). *Killer Clash: SeaWorld's Fate May Hinge on 'Blue World' Vote*, Times of San Diego https://web.archive.org/web/20190207043253/https://timesofsandiego.com/business/2015/10/07/killer-clash-seaworlds-fate-may-hinge-on-blue-world-vote/; *see also* SW-AND0001311, SW-AND0010417, SW-AND0010419, SW-AND0013309 at SW-AND0013344, SW-AND0013362, SW-AND0013373, and SW-AND0011640 for additional details about SeaWorld's abandoned Blue World project. This project

requirements for a trainer are: (a) the applicant should "love animals," (b) have "physical strength and atheltic ability" including "pass[ing] a rigorous swim test," and (c) because "trainers must perform and speak in front of large audiences," they should have "experience in public speaking or drama," including passing a "microphone test."[360] No formal training in marine biology or experience with marine animals is required, and indeed, while a college degree is "preferred," even a college degree is "not required to be eligible for an animal training position."[361] Apparently, the "best background" an applicant can have "is experience working with animals," and preferrably "large animals."[362]

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illustrates how the orca habitats could be made more natural and enriching than they are at present.

[360] SeaWorld Website about Animal Training career, in cache as of December 10 2018, https://webcache.googleusercontent.com/search?q=cache:nV_41CQqgGEJ:https://seaworld.org/animal-info/animal-infobooks/animal-training/animal-training-careers+&cd=1&hl=en&ct=clnk&gl=us&client=safari; see also GOLDBERG R., *What it takes to work here: SeaWorld*, Minyanville, (2010). http://www.minyanville.com/special-features/articles/seaworld-training-sea-world-training-work/6/15/2010/id/28532.

[361] SeaWorld Website about Animal Training career, in cache as of December 10 2018, https://webcache.googleusercontent.com/search?q=cache:nV_41CQqgGEJ:https://seaworld.org/animal-info/animal-infobooks/animal-training/animal-training-careers+&cd=1&hl=en&ct=clnk&gl=us&client=safari; see also GOLDBERG R., *What it takes to work here: SeaWorld*, Minyanville, (2010). http://www.minyanville.com/special-features/articles/seaworld-training-sea-world-training-work/6/15/2010/id/28532; SW-AND0013309 at SW-AND0013353 [redacted]

[362] SeaWorld Website about Animal Training career, in cache as of December 10 2018, https://webcache.googleusercontent.com/search?q=cache:nV_41CQqgGEJ:https://sea

262. Newly hired trainers learn the job from the senior trainers already at SeaWorld for a long period. A former trainer said, "I was overwhelmed with excitement as senior trainers took me under their wing and taught me the 'ways of SeaWorld'."[363] She commented that although she was just a trainer, she was asked to "monitor the animals' health, weigh them, clean teeth, and perform sonograms on females to check on pregnancies, to name just a few things."[364] [redacted][365]

world.org/animal-info/animal-infobooks/animal-training/animal-training-careers+&cd=1&hl=en&ct=clnk&gl=us&client=safari; see also GOLDBERG R., *What it takes to work here: SeaWorld*, Minyanville, (2010) http://www.minyanville.com/special-features/articles/seaworld-training-sea-world-training-work/6/15/2010/id/28532.

[363] KRIPNER, K. (2016), *I Was A SeaWorld Trainer For 7 Years. Here's My Story*, https://www.mindbodygreen.com/0-23094/i-was-a-seaworld-trainer-for-7-years-heres-my-story.html

[364] KRIPNER, K. (2016), *I Was A SeaWorld Trainer For 7 Years. Here's My Story*, https://www.mindbodygreen.com/0-23094/i-was-a-seaworld-trainer-for-7-years-heres-my-story.html

[365] Sarah Fishbeck, a former diver who left SeaWorld in 2013, explained in an interview: "[New trainers] believe what they're doing is right because all of their training is from SeaWorld."[365] *See* SCHELLING A (2015), *Ex-SeaWorld Employee: 'If You Speak Out Against It, You're Fired'*, The Dodo, https://www.thedodo.com/seaworld-former-diver-speak-out-fired-1502017204.html. Fishbeck claimed that she was never handed any protocol or safety procedures about swimming near the orcas. SCHELLING A (2015)., *Ex-SeaWorld Employee Gives Chilling New Details About Orca Mistreatment*, The Dodo, 2015, https://www.thedodo.com/seaworld-orcas-peel-skin-off-each-other-1498617162.html ("There was no procedure for us . . . not once was I ever given training or what to do if a whale got in a pool with us."). Fishbeck also stated that SeaWorld ignored incidents of aggression involving the animals and the trainers whenever they could, explaining that SeaWorld's policy was: "Well are you injured… well then it didn't

4) Compromised welfare relating to SeaWorld's killer whale related practices and policies

263. A number of SeaWorld's practices and policies indicate that SeaWorld places the business interests of the park (*e.g.*, guest entertainment) over the welfare of its orca. I briefly discuss some examples of such practices and policies in this section, as well as the impacts they have on the health and wellbeing of SeaWorld's orca.

1. Feeding, nutrition, and foraging

264. SeaWorld has long faced whistleblowers revealing SeaWorld's practice of keeping its orca hungry so as to keep them alert for performances. For example, John Hargrove, a former "Senior 1 Trainer"[366] at SeaWorld, describes SeaWorld's food deprivation practices in his book,[367] and publicly revealed that: "*Despite* [SeaWorld]'s

happen.:" *See id.* Samantha Berg, another former trainer at SeaWorld, revealed: "SeaWorld likes to portray relationship the trainers have as something special . . . but the truth is all about operant conditioning," meaning that the relationship is built on the fact that the whales knows it has to modify its behavior in order to get food. *See* Samantha Berg & Jeffrey Ventre on Relationships with Captive Whales & Dolphins, YouTube, posted by Jeffrey Ventre in 2013, https://www.youtube.com/watch?v=suodnIJIMf4&feature=youtu.be; *see also* DUNNING, D. (2011), The Dunning–Kruger Effect: On Being Ignorant of One's Own Ignorance, available online at https://www.demenzemedicinagenerale.net/images/mens-sana/Dunning_Kruger_Effect.pdf.

[366] HARGROVE, J. and H. Chua-Eoan (2015). *Beneath the Surface: Killer whales, Seaworld, and the truth beyond Blackfish*, St Martin's Press, p. 71 ("In SeaWorld San Antonio, where I rejoined SeaWorld, I was a Senior 1 Trainer").

[367] HARGROVE, J. and H. Chua-Eoan (2015). *Beneath the Surface: Killer Whales, SeaWorld, and the Truth Beyond Blackfish*, St Martin's Press

continued attempts to manipulate the truth, food deprivation was common & was approved by management & vets. 'Working weight'."[368] Similarly, on a blog run by four ex-SeaWorld orca trainers, Dr. John Jett says that "*Hungry whales generally seemed to perform much better and more consistently, which of course was the objective*," and Dr. Jeffrey Ventre recalls that when he worked there, "*the order was to "hold the animals at half base," (or 3/4 base, etc.) meaning if a whale consumed 200 pounds of fish on a given day, hold him or her to 100 lbs*."[369]

265. SeaWorld itself has publicly denied it keeps the orca hungry, with Brian Rokeach a SeaWorld orca trainer, stating in a SeaWorld video:

> The movie blackfish asserts that we use food as the only motivator to work with our animals, and that's simply not true. Our animals receive all of their food, all of their nourishment, regardless of how they perform throughout the day. They do not have to come into the show to be fed. Uh, in fact, one of the bigger challenges that we have day in and day out, both with the whales, with the dolphins, with all of our animals is holding them back and keeping them out of the shows. Much of their reinforcement, much of that food comes for just hey, sitting back with me, hang out with me, have fun back here. The shows are concurrently reinforcing for them because they enjoy doing them.[370]

[368] Post by John Hargrove on Twitter, April 11th 2015 at 9:16pm, https://twitter.com/johnjhargrove/status/586971051537514496

[369] JETT, J. and J. Ventre (2015), *A Statement on Food Deprivation at SeaWorld,* Blog, http://voiceoftheorcas.blogspot.com/2015/04/food-deprivation-at-seaworld.html

[370] How often does SeaWorld feed its killer whales? | SeaWorld®, Youtube, posted by SeaWorld® Parks & Entertainment in 2014, https://www.youtube.com/watch?v=oEOP2rwdE7c

266. [redacted][371] [redacted][372]

267. As per numerous publications by SeaWorld veterinarians between 2004 and 2018, SeaWorld's orca are "fed at a rate of approximately 2-3% of body weight per day."[373] Using the 2-3% body weight as the criteria as to how much food each orca should be receiving, it is easy to calculate the (range of) food by weights that each of the orca should be receiving.

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[371] SeaWorld's statement — specifically, the sentence that "*Much of [the orcas'] reinforcement, much of that food comes for just hey, sitting back with me, hang out with me, have fun back here*" — implies that a considerable amount of time is spent by the trainers interacting with the orcas. This is also incorrect, as I address in Section VI(4)(5) below.

[372] [redacted] I expect that, should SeaWorld produce the Loro Parque records, they would reveal a similar practice.

[373] TANG, K. N.et al. (2018). *Serum cobalamin and folate concentrations as indicators of gastrointestinal disease in killer whales (Orcinus orca).* Journal of Zoo and Wildlife Medicine 49(3): pp. 564-572; *see also* Schedule 8 for additional references.

268. [redacted][374] [redacted][375] [redacted]

- [redacted] SW-AND0190787 [redacted]
- [redacted] SW-AND0190788 [redacted]
- [redacted] SW-AND0190793 [redacted]
- [redacted] SW-AND0190796 [redacted]
- [redacted] SW-AND0190802 [redacted]
- [redacted] SW-AND0190807 [redacted]
- [redacted] SW-AND0190943 [redacted]

269.

270. [redacted]

271. I note that there are calorific differences between the fish species that SeaWorld feeds its orca, and that consideration for this should be given. Additionally, I note that calorific content of each of the fish species will change during the seasons and also between years. [redacted]

[374] *See* SW-AND0191723 through SW-AND0276785.

[375] See SW-AND0047900 through SW-AND0064135, SW-AND0069626 through SW-AND0069631, SW-AND0073580 through SW-AND0073586, SW-AND0085203 through SW-AND0094368, SW-AND0100171 through SW-AND0100358, SW-AND0108516 through SW-AND0108524, SW-AND0130663 through SW-AND0150487, and SW-AND0150985 through SW-AND0273697,

[redacted] and the descriptions in Tang et al (2018) and Robeck & Nollens (2013) do not indicate that either of these aspects were taken into account, despite the studies each extending over different seasons.

272. [redacted][376]

273. [redacted][377]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[376] SW-AND0191528 (emphasis added).

[377] *See* SW-AND0274583. [redacted] SW-AND0191487.

274. [redacted][378]

275. [redacted]

[redacted][379]

276. [redacted][380] [redacted]

The table is presented in Schedule 6(a).

277. Further, as noted above, SeaWorld has publicly stated that it does not deprive the orca of food for 'misbehaving' or 'uncooperative' behaviour. [redacted]

[378] SW-AND0191487.

[379] SW-AND0191466.

[380] SW-AND0010655.

[redacted][381] [redacted][382]

278. [redacted][383]

279. [redacted][384]

[381] SW-AND0002585.

[382] SW-AND0034955.

[383] SW-AND0191327; *see also* Schmitt Tr. at 173:10-17, 175 [redacted]

[384] SW-AND0108516 (to) SW-AND0108518; *see also* SW-AND0182799.

280. [redacted][385]

281. [redacted]

[385] SW-AND0191030.[386] BATES SW-AND0137049; *see also* SW-AND0191466 [redacted] (emphasis added).

[redacted].[386]

282. I have seen orca at SeaWorld regurgitate fish. Regurgitation has been linked to food deprivation. Regurgitation has also been linked to dental damage.[387]

[redacted]

[386] BATES SW-AND0137049; *see also* SW-AND0191466 [redacted] (emphasis added).

[387] LOCH, C. et al. (2013). *Dental erosion in South Atlantic dolphins (Cetacea: Delphinidae): a macro and microscopic approach.* Marine Mammal Science 29, no. 2 (2013): pp. 338-347.

[redacted][388]

283. [redacted][389] This indicates that their diet, of a limited variety of frozen fish, is deficient in some manner.[390] Schedule 12 provides further evidence of the foregoing.

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[388] SW-AND0147792.

[389] *See* Schedules 7(b), 12; *see also* ROBECK, T. R. and H. H. Nollens (2013). *Hematologic and serum biochemical parameters reflect physiological changes during gestation and lactation in killer whales (Orcinus orca).* Zoo Biology 32: pp. 497-509.

TANG, K. N. et al. (2018). *Serum cobalamin and folate concentrations as indicators of gastrointestinal disease in killer whales (Orcinus orca).* Journal of Zoo and Wildlife Medicine 49(3): pp. 564-572.

[390] See pp. 760-764 in GERACI (1986); pp. 42-43 in HOYT (1992); pp. 811-816 in WORTHY (2001), pp. 365-366 in COUQUIAUD (2005); and pp. 719-721 in ROSEN and Worthy (2018). ROSEN and Worthy (2018) note that "Both a lack of diet diversity and the reliance on frozen foods present potential nutritional challenges" (p. 719). In particular, vitamins A, D, and E have to be supplemented for marine mammals, as the levels are much lower in frozen fish than in live fish. As a result, "vitamin supplementation of marine mammal food in zoos and aquariums has become standard practice" (p. 719). In contrast, "[v]itamin deficiency is not likely an issue in wild marine mammals, even during seasonal periods of fasting" (p. 722). Captive marine mammals also have to be supplemented with freshwater, as fresh fish provide all the water needs for free-ranging marine mammals, while freezing and storage of fish causes loss of water content (and water soluble vitamins). This is usually done through provision of gelatin blocks, of which a large proportion of its mass is freshwater, as several marine mammal species will not drink at all. Of note is that gelatin is derived from collagen obtained from various body parts (skin,

284. Further, the natural foraging behaviors of most predators in captivity are severely compromised.[391] Although orca are apex predators, in captivity they are not permitted to exercise any meaningful part of their behavioral repertoire that is related to hunting and foraging. Stereotypical behaviors, severe aggression toward conspecifics and humans, and other behavioural problems, arise in predators denied their natural foraging behavior.[392]

2. Breeding

285. SeaWorld's breeding practices are problematic for various reasons, including that SeaWorld breeds its orca at ages younger than would be natural or healthy for the whale, and also more frequently. In the wild, for example, female orca have their first calf between the ages of 11 and 16, with an average first successful pregnancy at 15 years of age.[393] In contrast, it is common to see younger orca being

bones and connective tissues) of animals such as domesticated cattle and chicken– food types wild orca would not normally consume.

[391] CLUBB and Mason (2003; 2007); see also WALKER and Coe (1990) (reporting the frequency with which captive cetaceans consumed debris: "Captive cetaceans have been known to ingest a wide variety of foreign material. Objects such as cotton gloves, tin cans, plastic bags, bottles, pens, coins, flashbulbs, plastic combs, nails, steel wool cleaning pads, plastic toys, and women's jewelry are some of the articles reported. . . The reasons for the high incidence of foreign body ingestion in captive cetaceans are not clear. The captive environment, due to its obvious spatial limitations, is at best an abnormal one. The social behavior of these animals has been severely altered." (p. 750).

[392] See, e.g., CLEGG, I. L. K. et al. (2017). *Applying welfare science to bottlenose dolphins (Tursiops truncatus)*. Animal Welfare 26(2): pp. 165-176.

[393] FORD, J.K.B. (2009). *Killer whale: Orcinus orca*. In W.F. Perrin *et al.* (eds.), *Encyclopedia of Marine Mammals*, 2nd edition (San Diego, California: Academic Press), pp. 650–657.

impregnated at SeaWorld. [redacted][394] She gave birth to Keto, a male (now held at Loro Parque, Spain). Keto sired two calves with his niece, Kohana.

286. Similarly, Kohana, a female orca also now kept at Loro Parque in the Canary Islands, was impregnated (by her uncle, Keto) when she was seven years of age. Apart from lacking cultural knowledge, these captive females bred so young, may also suffer physiological damage from the stress placed on their bodies by having a calf so early in life, similar to that seen in humans. As discussed above, Kohana rejected her first calf, Adán, born in 2010, as well as her second, Vicky, born in late summer 2012. Both calves were inbred (see Figure [83]).

[394] *See, e.g.*, SW-AND0104073 at 18; *see also* www.orcahome.de.

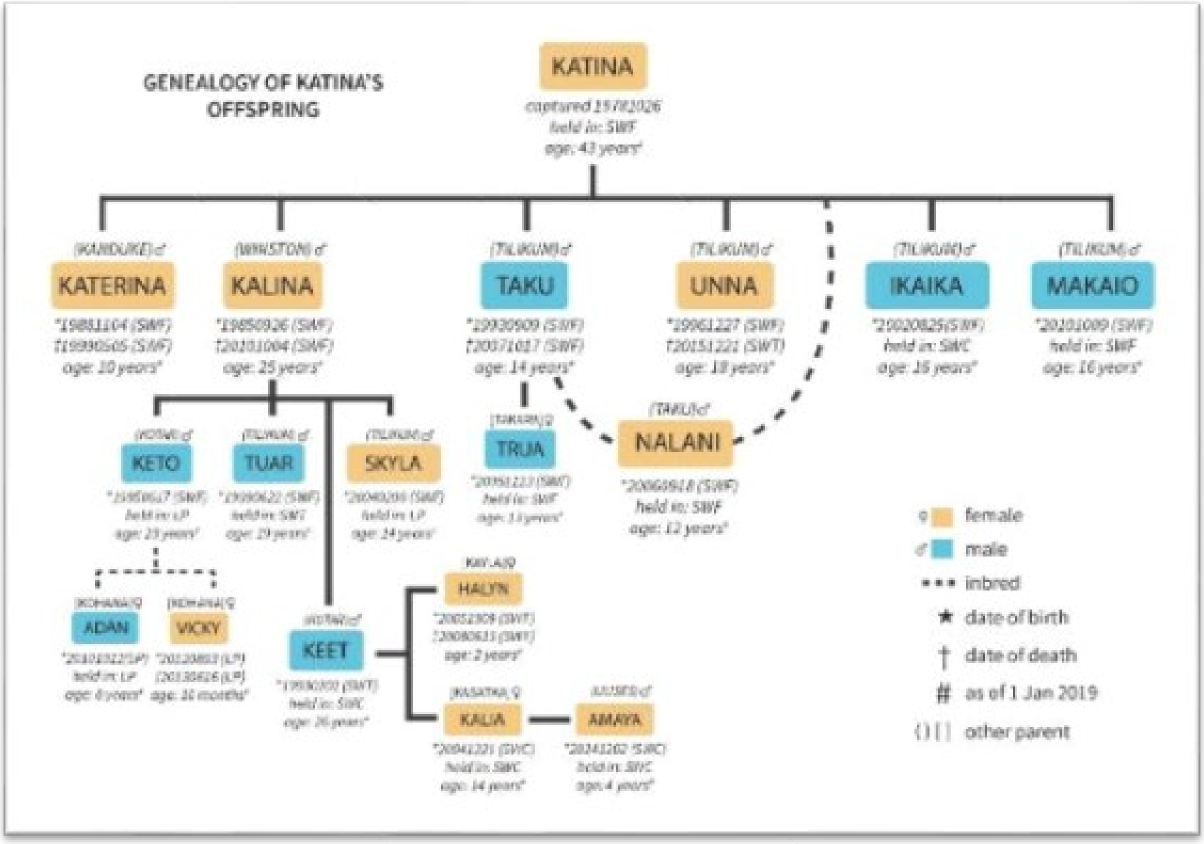

Figure [83][395]

287. Morgan, who gave birth on 22 September 2018 at Loro Parque in the Canary Islands, Spain, has also failed to nurse her calf properly, requiring staff to step in and bottle feed the newborn.[396] Morgan was approximately 11 years of age when she gave birth. In the wild, Morgan would have participating in alloparenting

[395] Genealogy data extracted from www.cetabase.org, www.orcahome.org, and KIELTY, J. (2011). *Marine Mammal Inventory Report (Deficiencies).* St Pete Beach, Florida, USA, The Orca Project Corp (unpublished report, available from https://theorcaproject.wordpress.com/2011/03/18/noaa-nmfs-marine-mammal-inventory-report-deficiencies/): 25.

[396] *See, e.g.*, https://web.archive.org/web/20190207065955/https://voiceoftheorcas.blogspot.com/.

("baby-sitting") of other calves,[397] or otherwise seen other females in their family group rearing calves.[398]

288. I have not seen evidence of calf rejection occurring among wild orca.[399]

289. And the fact that some of SeaWorld's breeding efforts are successful does not constitute evidence of good welfare.400 Most animals, even those held in suboptimal conditions, will breed given the opportunity; while unsuccessful attempts at breeding may indicate that a species is not adjusting to captivity,[401] successful breeding in itself does not indicate the opposite.[402] Indeed, research has found that

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[397] WAITE, J. M. (1988). *Alloparental care in killer whales (Orcinus orca),* University of California, Santa Cruz.

[398] [redacted] (*see* SW-AND0052609) [redacted] *See* SW-AND0131807 [redacted]

[399] I understand that SeaWorld also does not have any evidence of calf-rejection occurring among free-ranging orca. *See* SeaWorld's Response to Plaintiffs' Interrogatory No. 16.

[400] CLEGG, I. L. K. et al. (2017). *Applying welfare science to bottlenose dolphins (Tursiops truncatus).* Animal Welfare 26(2): pp. 165-176.

[401]

CLUBB, R. and G. J. Mason (2003). *Animal welfare: captivity effects on wide-ranging carnivores*. Nature 425: pp. 473-474.

CLUBB, R. and G. J. Mason (2007). *Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures*. Applied Animal Behaviour Science 102: pp. 303-328.

[402] The prevalence of "puppy mills" — places where dogs are kept in often fetid kennels and substandard cages to produce puppies for pet stores — illustrates this.

captive-bred animals generally have lower reproductive success than wild-caught captive animals, regardless of facility or species.[403] This lower success rate is *despite* the removal of most of the potential causes of mortality (such as predators, environmental conditions and lack of food) and *despite* the addition of veterinarian care, medications and supplements. In essence, with all these factors taken into account, breeding success of orca should far exceed that in the wild.

290. Furthermore, "Although SeaWorld San Diego's male and female killer whales live together and regularly mate, none has achieved a natural conception at the park in more than 10 years."[404] and the requirement of artificial insemination (AI) to produce a calf, is indicative that the orca are not adapted to captivity and are not thriving.

3. Noise

291. Because cetaceans are acoustically orientated and rely heavily on sound for many of their basic and important life functions, noise can act as a stressor – with

E.g., see GILL, J. A. (2014). *Environmental impacts of one puppy mill among many*. Commercial Animal Breeding and Puppy Mills. 43: pp. 259-284.

[403] In a study of captive birth rates of 44 species, Farquharson *et al.* (2018) concluded "our [research] shows that wild-born animals generally have higher reproductive success than their captive born counterparts in captive environments, across multiple industries and irrespective of taxonomy" (p. 8).

[404] https://web.archive.org/web/20190204065525/https://www.sandiegouniontribune.com/sdut-second-seaworld-killer-whale-pregnant-2002jan11-story.html. This report was published on 20020111.

short and long-term impacts.[405] Wright et al (2007) noted that: "Observed effects of noise on marine mammals include: changes in vocalisations, respiration, swim speed, diving and foraging behaviour; displacement; avoidance; shifts in migration path; stress; hearing damage and strandings, but responses of marine mammals to noise can often be subtle and barely detectable [to human observers]."[406]

292. The 19 international authors of the Wright et al (2007) paper state:

> … determined that noise acts as a stressor to marine mammals. Furthermore, … repeated and prolonged exposures to stressors (including or induced by noise) will be problematic for marine mammals of all ages. A range of issues may arise from the extended stress response including, but not limited to, suppression of reproduction (physiologically and behaviorally), accelerated aging and sickness-like symptoms.[407]

293. The orca at SeaWorld are maintained in tanks that are inside theme parks (and at Loro Parque, a zoo / theme park hybrid). SeaWorld Orlando[408], San

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405 WRIGHT, A. J.et al. (2007). *Do marine mammals experience stress related to anthropogenic noise?* International Journal of Comparative Psychology 20: pp. 250-273.

406 WEILGART, L.S. 2007. *A brief review of known effects of noise on marine mammals*. International Journal of Comparative Psychology 20: 159-168.

407 *Ibid.*

408 Russon, G. (2017) *SeaWorld extends night fireworks show date*, Orlando Sentinel, https://web.archive.org/web/20190202093354/https://www.orlandosentinel.com/travel/attractions/seaworld/os-bz-sea-world-extends-dates-20170719-story.html

Antonio[409] and San Diego[410] all have night-time fireworks displays at various times of the year and multiple stadiums with various types of shows (e.g., 'rock concerts' are held at SeaWorld Orlando under the 'bands, brew & BBQ fest')[411]. Fireworks and loud 'leisure' noise such as music have been established as causes of hearing loss in humans[412].

294. All four facilities have roller coasters. I have used Google Earth to make approximate measurement of the distance from the roller coaster to the orca tanks. SeaWorld Orlando's roller coaster is approximately 142m from the orca tanks; San Antonio's is approximately 156m from the orca tanks; San Diego's is located approximately 105m from the orca tanks; and Loro Parque's is located less than 60m from the orca tanks.

295. Inside each of the facilities, construction noise as well as vibrations from vehicles, water pumps and other mechanical devices such as hydraulic motors for

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[409] *SeaWorld San Antonio presents Fourth of July Celebration*, culturemap San Antonio https://web.archive.org/web/20190202093644/http://sanantonio.culturemap.com/eventdetail/seaworld-san-antonio-fourth-july-celebration-2018/

[410] *SeaWorld San Diego Fireworks*, SeaWorld website, https://web.archive.org/web/20190202093756/https://seaworld.com/san-diego/shows/fireworks/

[411] BEVIL, D. and O. Sentinel (2013), *SeaWorld: Willie Nelson not coming to Bands, Brews & BBQ fest,* Hartford Courant, https://web.archive.org/web/20190202174727/https://www.courant.com/entertainment/os-seaworld-willie-nelson-concert-20131205-post.html

[412] MAASEN, M.et al. (2001). *Ear damage caused by leisure noise*. Noise & Health 4(13): pp. 1-16.

gate closures can be pervasive. During my visit to SeaWorld San Diego for the site inspection on 2081128, I noted the extensive network of pipes running over and beside the orca tank system. In Figure [84] below, three orca swim in B tank, near Gate #1 and the 'slide over' zone. This view is from the medical tank and looks towards the stadium (which can be viewed in the background and obscures all visual horizons). The 'water fall' can be seen 'cascading' down from above the orca, into the stadium area and a 'deterrent bar' with raised bolt heads is in place on the 'slide over'. A large-bore pipe (light blue in colour), presumably feeds the water fall. In Figure [85] that follows, a close up of this same image is shown, with the labyrinth of smaller pipes visible, only some of which are indicated by red arrows.

Figure [84][413]

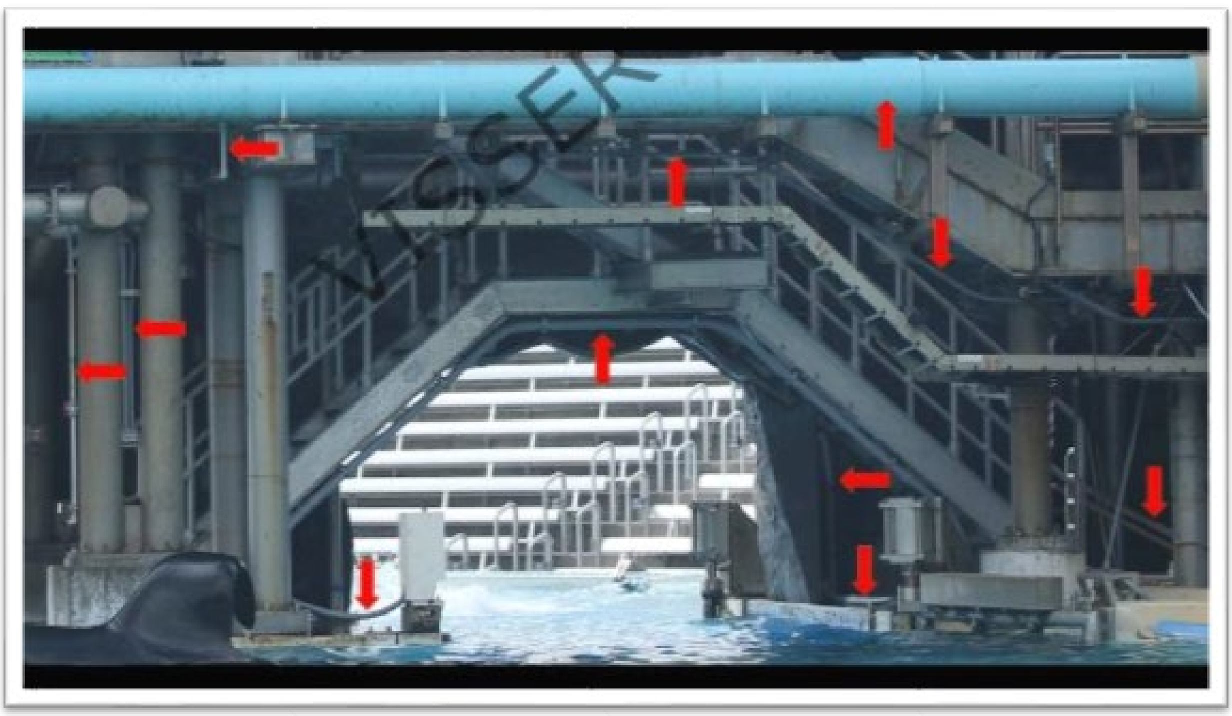

Figure [85][414]

296. In Figure [86] below, you can see five of the 10 orca held at San Diego SeaWorld, in B tank, approaching the platform between B and C tanks. The

'industrial landscape' of the facility is abundantly clear and the only 'natural' feature in the environment is an egret perched on the top of a sloping roof area.

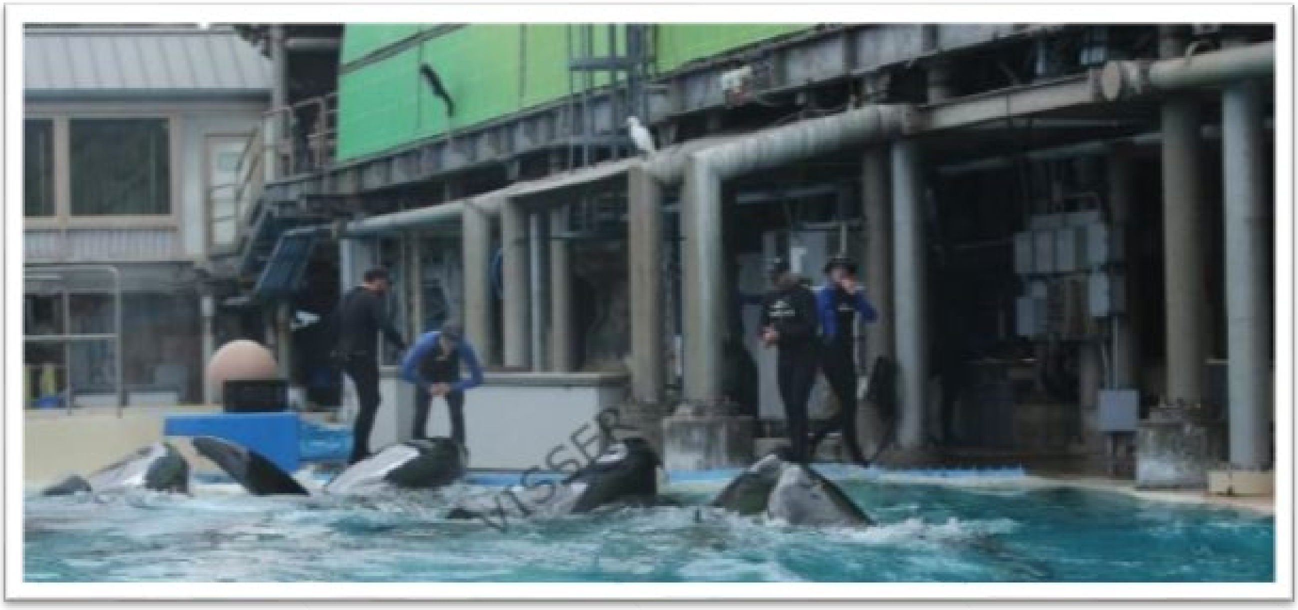

Figure [86][415]

297. During my visit to Loro Parque on 20160422, I accompanied a 'behind the scenes' tour, available for a fee to the paying public. During that tour we were shown one, of the apparently many, rooms containing pumps, filters and water treatment machines (Fig. [87]). As discussed above, noise from these types of machines likely contributes to the stress experienced by SeaWorld's orca.

413 Photo © Ingrid N. Visser.

414 Photo © Ingrid N. Visser.

415 Photo © Ingrid N. Visser.

Figure [87][416]

298. Construction noise is likely to have a major impact on the orca. Of note is a study of bottlenose dolphins, conducted at the Barcelona Zoo. Cortisol (a hormone noted for its links to stress in captive cetaceans) was found to be elevated up to 300-fold, in reaction to nearby construction.[417]

299. The veterinarian(s) at Miami Seaquarium recognised the potential stressors that construction would induce, and as such a female captive orca was regularly prescribed prophylactic antibiotics prior to construction (even minor repair

[416] Photo © Ingrid N. Visser.

[417] MONREAL-PAWLOWSKY, T. et al. (2017). *Daily salivary cortisol levels in response to stress factors in captive common bottlenose dolphins (Tursiops truncatus): a potential welfare indicator*. Veterinary Record 0.1136/vr.103854: pp. 1-3.

work) in the stadium adjoining her tank, to counter act any stress-related issues that might arise (Visser, 2016).

300. [redacted] (*see* Figure [83] above) [redacted][418]

301. [redacted][419]

[418] SW-AND0184681 (emphasis added).

[419] SW-AND0191156 (emphasis added).

302. During my visits to Loro Parque on 20160420, 21 and 22, I noted that the west tank was completely empty of water and a high exclusion barrier had been erected around the tank. The barrier was comprised of wood panels and a blue canvas upper barrier. As shown in Figure [88] below, the construction barrier of wood and canvas surrounded the west tank, adjacent to the tank where the orca performed. The water level for the complex was lowered by approximately 0.5m during the three days that I visited the facility.[420]

Figure [88][421]

303. I have noted that, in recent years, Loro Parque has installed a large pump adjacent to the medical east tanks, with wide-bore pipes running into/from both

[420] *See, e.g.,* Figure [55], Morgan chewing on the concrete with the lowered water level.

[421] Photo © Ingrid N. Visser.

those tanks. The pump, as shown in Figure [89] below using wide yellow arrows, is mounted within a few meters of the side of the tank, with no housing or other sound insulation. The two wide-bore pipes are also shown (in narrow yellow arrows) discharging/sucking from/to the medical tank (left, grey arrow) from/to the west tank (right, grey box). The proximity of the pump to the side of the tank is likely to cause excessive noise and vibration.[422]

Figure [89][423]

304. Scheifele et al (2012), when measuring the ambient noise levels for their bottlenose dolphin exhibit noted: "*Life support pump machinery, including primary*

[422] Also visible in this image, a collection of toys that follow the same basic theme of the toys at SeaWorld (ball, fender/barrel, 'disc' - in this case square, but similar in conceptand fire hose). Additionally, bars with 'raised' additions (in this case hexagonal nuts, apparently welded to the bar – wide blue arrow) and a chain (narrow blue arrow) are in place to prevent and/or deter the orca from passing from one tank to another.

[423] Photo © Ingrid N. Visser.

and secondary pump and filter systems, is the greatest contributor to structure-borne ambient noise in aquarium habitats, with intensity directly related to the exhibit's proximity to the machinery room."

305. The SeaWorld orca at all four facilities are therefore exposed to sound sources that are chronic (e.g., water pumps; filtration systems) and intermittent (e.g., fireworks, construction, drilling, gate closures, roller coasters), which are likely to affect the animals' stress levels, particularly if subjected to them continually over time.

306. Concern about acoustic stress on captive cetaceans tends to focus on underwater sound sources (e.g., see Scheifele et al., 2012). This bias apparently revolves around the assumption that captive marine mammals spend most of their time below the water's surface. However, that assumption is erroneous as most captive marine mammals, including fully aquatic ones such as dolphins and orca, are at or near the surface much of the time. They are often to be found with their heads above water, watching trainers in anticipation of signals, performing above-water ticks during shows (such as slide-outs on to the concrete stages), stationed by their trainers and waiting for reinforcement (i.e., food) during training and/or shows,[424] and at times raised completely out of the water in the medical tanks (*see* Fig. [90]). Additionally, orca calves who are hand-reared are typically fed with their heads out

[424] GALHARDO, L. et al. (1996). *Spontaneous activities of captive performing bottlenose dolphins (Tursiops truncatus).* Animal Welfare 5(4), p. 373-389.

of the water[425] (*e.g.*, Fig. [91], compared to in the water, in a natural posture). This abnormal posture exposes the young animal to extreme noise, especially during shows with their loud music, loud commentary and crown noise (crowds are often encouraged to make more noise). Therefore, in-air noise levels are extremely relevant to captive orca (Couquiaud, 2005, Rose et al., 2017).

307. Figure [90] below depicts two orca (left, Tekoa – male, and right, Kohana – female) raised out of the water using the medical tank hydraulic lifting floor. This photograph was taken during the show on 20110918 at Loro Parque. The orca were exposed to the noise of the commentary, music and crowd. Note the light coloured floor of the medical tank, which bounces back sunlight (even when submerged to maximum depth of 4.2m)[426] and as such can have an adverse effect on the sensitive eyes of the orca.

[425] https://web.archive.org/web/20190202233940/https://voiceoftheorcas.blogspot.com/2019/01/loro-parques-baby-orca-ula-possibly-in.html

[426] KREMERS, D., et al. (2012). *Vocal sharing and individual acoustic distinctiveness within a group of captive orcas (Orcinus orca).* Journal of Comparative Psychology 126(4), p. 433-445.

Figure [90][427]

308. Figure [91] below depicts a trainer at Loro Parque feeding the four-month old orca Ula (offspring of Morgan), in late Jan 2019. Note the unnatural above-water posture the calf must maintain in order to receive milk. Given that the medical tank (where this bottle-feeding is occurring) has a floor that can be raised, there is no appropriate reason for the calf to not be fed while completely in the water. There are multiple photos of this type of inappropriate hand-rearing posture throughout the SeaWorld facilities.

[427] Photo © Ingrid N. Visser.

Note the unnatural "nursing" position & skin discoloration at the left eye patch

Figure [91][428]

309. During shows, the auditorium/stadium complexes at SeaWorld and Loro Parque act as sound reflectors, bouncing the loud music and crowd noise back towards the orca (Fig. [92]). Figure [92] below depicts the stadium at Loro Parque, with a 'dome' arching over the seating area. On the day of my visit, an exclusion barrier of wood and canvas is erected around the west tank (left) due to construction work in that tank. I have sat in these stadiums on numerous occasions, at each of these facilities, and noticed the excessively loud noise from the music, commentary and the crowds. I have experienced ear-ache and/or headaches during these visits, which I attribute to the excessively loud noise.

[428] Photo sourced via Voice of the Orcas.

Figure [92][429]

4. Pathogens and medications

310. Trainers have previously reported that SeaWorld dosed the orca with behavioral modification medications such as Valium to try to keep them calm and/ or subdued.[430] Benzodiazepines (such as Valium ®) were reportedly administered

[429] Photo © Ingrid N. Visser.

[430] CRONIN, M. *SeaWorld Gave Valium To Whales For "Grotesque" Behavior Uncommon In The Wild*, The Dodo https://www.thedodo.com/why-seaworld-gave-valium-to-un-493104672.html; *see also* affidavit of former SeaWorld employee Dr. Lanny Cornell dated March 28, 2011 (and the documents attached thereto), filed in *SeaWorld Parks & Entertainment LLC v. Marineland of Canada Inc.*, available online at https://www.scribd.com/doc/215567388/Seaworld-v-Marineland-Aff-of-

during handling, transport, and when transferred animals were required to acclimate to a new enclosure and/or social group.[431] Again, SeaWorld's public denials[432] have been disproved by the evidence produced in this case:

REQUEST FOR ADMISSION NO. 28:

Admit that SeaWorld has administered the psychotropic medication diazepam to some SeaWorld Orcas.

RESPONSE TO REQUEST FOR ADMISSION NO. 28:

Admitted.

Figure [93][433]

311. The same is true for other serious medications— for example, [redacted] Regu-mate® and opioids like tramadol.[434] Dolphinaria and aquaria

Lanny-Cornell (describing various health issues, including dental problems, of Ikaika, as well as use of medications such as diazepam).

431 LOTT & Williamson (2017);

HAULENA, M. & Schmitt, T. (2018). *Anesthesia*. CRC Handbook of marine mammal medicine. F. M. D. Gulland, et al. Boca Raton, Florida, USA, CRC Press: 567-606.

432 See, e.g., https://www.seeker.com/killer-whales-on-valium-common-practice-1768443270.html (reportedly stating that ""none of the killer whales (orca) at SeaWorld San Diego are on these medications [*i.e.*, benzodiazepine].").

433 SeaWorld's Response to Plaintiffs' Request for Admission No. 28.

434 See SeaWorld's Response to Plaintiffs' Request for Admission Nos. 26, 27; *see also* DOLD Dep. Tr. at 136-138, 141, 142 ([redacted] see also ROBECK Dep. Tr. at 165, 174, 176-77; SCHMITT Dep. Tr. at 70-72 [redacted] SCHMITT Dep. Tr. at 138 [redacted] SW-AND0013309 at SW-AND0013320.

also routinely administer prophylactic antibiotics and anti-fungal and ulcer medications to captive cetaceans.[435] Bacterial and viral infections are a common cause of death among captive cetaceans, including orca.[436] Yet, US federal regulations do not require monitoring of water quality for any potential bacterial or viral pathogens (or other possible sources of disease), other than general "coliforms."[437] Pneumonia, which is generally a secondary condition occurring as a result of some other initial condition, such as stress or a compromised immune system,[438] is a commonly cited cause of death among captive orca. Furthermore,

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[435] More information regarding the practice of administering routine medications can be found in Stoskopf (2018) and Gulland et al. (2018); see also Society for Marine Mammalogy (2014), which has relevant guidelines generated by its Ethics Committee.

[436] *See, e.g.*, SCHMITT Dep. Tr. at 127 [redacted] *see also* SW-AND0256378 at SW-AND0256384 [redacted]

[437] Scientists have proposed guidelines for killer whale display facilities to test for pathogenic bacteria, as well as other pathogens or chemicals that might negatively affect the animals' health (such as chlorine, copper, ozone, nitrates, and ammonia). See Couquiaud, 2005; Rose *et al.,* 2017.

[438] For example, see Padgett and Glaser (2003) and Segerstrom and Miller (2004). See also online health sites at https://medlineplus.gov/ency/article/000093.htm and https://www.healthline.com/health/pneumonia-weakened-immune-system. In a veterinary presentation specifically about captive cetaceans, it was noted that pneumonia "can be considered a disease of mismanagement. Cetaceans require good air quality, including high rates of air exchange at the water surface in indoor facilities." (Gage, 2010, p. 8).

frequent use of antibiotics is a concern generally, as it can lead to bacterial resistance to antibiotics, making treatment of infections all the more difficult.[439]

312. Approximately 10 to 20 percent of captive marine mammal deaths are reported as from undetermined causes. "[T]heir lack of mobile facial expressions and body language with which humans can empathize (such as shivering or cowering) make developing health problems difficult to recognize."[440] An all too common pattern is for facility personnel to find an animal lacking in appetite and for that animal to die within one or two days of this discovery—long before any treatment program can be determined, let alone administered. For example, recently, on January 28, 2019, Kayla, a 30-year old female orca at SeaWorld Orlando died after first showing signs of "discomfort" just two days prior.[441] Veterinary care for cetaceans is still developing and some procedures common for terrestrial mammals are still rare for them; for example, although it has become possible to administer anesthesia to cetaceans, it is

[439] Interview of Dr. Pierre Gallego; *see also* SW-AND0048165 [redacted]

[440] ROSE, N. A.,et al. (2009). *The case against marine mammals in captivity*. The Human Society of the United States and the World Society for the Protection of Animals, at 24.

[441] See, however, SW-AND0179688 [redacted]

risky, and requires considerable expertise, personnel support, and specialized equipment for successful application.[442]

SeaWorld Saddened to Announce Death of Orca

January 28, 2019

SHARE

It is with great sadness that SeaWorld announces that Kayla, a 30-year-old female orca, died the morning of Jan. 28, 2019, with her animal care specialists by her side. The exact cause of death will not be known until the results of a post-mortem examination are complete, which may take several weeks. The entire SeaWorld family is deeply saddened by the loss.

Kayla began showing signs of discomfort on Saturday (Jan. 26) afternoon. Her veterinarians immediately began treatment based on a physical examination. Unfortunately, her condition worsened through the next two days. Although animal care specialists and veterinarians devoted around the clock attention to Kayla, she did not survive.

Figure [94][443]

313. [redacted]

[442] HAULENA, M. & S, T. (2018). *Anesthesia*. CRC Handbook of marine mammal medicine. F. M. D. Gulland, L. A. et al. Boca Raton, Florida, USA, CRC Press, p. 567-606.

[443] https://seaworld.com/orlando/blog/seaworld-saddened-to-announce-death-of-orca/; see also https://www.usatoday.com/story/money/2019/01/29/seaworld-orca-kayla-dies-suddenly-orlando-age-30/2708210002/.

5. Inadequate enrichment and stimulation

314. SeaWorld claims that, for its captive orca, training and performances adequately replace the stimulation of hunting and indeed serves as a form of enrichment. These claims do not hold up to scientific scrutiny. As Dr. Naomi A. Rose, Dr. E.C.M. Parsons, and Dr. Richard Farinato explain:

> Performing animals are trained to demonstrate a series of conditioned behaviors. Some of these behaviors are also naturally occurring behaviors, but many are merely based on natural behaviors that have been performed out of context and exaggerated and altered almost beyond recognition. The most common training method, called operant conditioning, uses food as a primary positive reinforcer. For some animals, this means that satisfaction of hunger is dependent on performing tricks; for others, hunger is deliberately induced so the reinforcer will be effective. This is not food deprivation per se, for a complete food portion is ultimately provided each day, but the use of food as a reinforcer reduces some animals to little more than beggars. Their lives obsessively revolve around the food presented during shows and training sessions. Patrons of any captive marine mammal show can easily observe the animals' attention fixed on the buckets of food. For these animals, natural feeding and foraging rhythms and cycles, as well as independence of any kind, are lost. It is difficult to accept the self-serving argument put forward by the public display industry that training provides an adequate substitute for the stimulation of natural foraging or the other actions exhibited by wild animals.[444]

[444] ROSE, N. A., et al. (2009). *The case against marine mammals in captivity*, The Human Society of the United States and the World Society for the Protection of Animals, at 33.

315. Having considered the small tank systems that the SeaWorld orca are held in, I wanted to do a basic comparison to the stimulus that an orca in the wild might encounter, compared to the cramped and barren conditions of captivity.

316. No matter where an orca in the wild lives, from the ice to the tropics, it will encounter a complex and dynamic environment; environmental conditions and biota are the predominant aspects. Physically, *inter alia,* the orca encounter waves, wind, rain, solar radiation, currents, tides, Ph variations in water, turbidity, salinity, water temperature changes (during each dive, during tidal changes, during seasons and across distance). Topography for those orca who live in coastal zones has a major influence on all these facets. Additionally, each time an orca dives it is subjected to light changes as light rapidly dissipates underwater and there is there is rarely any significant light beyond 200 m (656 feet). Furthermore, during each dive an orca will experience pressure changes as it descends and ascends.

317. One of the significant aspects of the ocean, be it coastal or open water, is the varied flora and fauna. The types of flora and fauna range from planktonic plants and animals to giant kelp forests and marine mega-fauna (such as other whales and dolphins, fishes, birds etc.) would feature in their daily lives. To elucidate what an orca might encounter on any given day, in terms of marine mega-fauna I have created Schedule 8, which is an 'ecosystem' spreadsheet. I searched online and in my reference library for details of species which an orca living in Icelandic waters and an orca living in the waters of British Columbia / Washington State might encounter. I then also compiled a list of known prey from those two locations. I chose

those two locations because these are primary 'founder' locations of the origin stock of the SeaWorld orca. I then did a comparison to the situation for the orca held in captivity at SeaWorld.

318. There was an undisputable difference between the wild and captivity 'systems,' showing the dearth of biological input they are subjected to and the scarcity of variety in their lives.

319. [redacted][445]

6. Medical isolation

320. Medical isolation enclosures are generally much smaller than primary enclosures—and indeed this is true for SeaWorld's parks as well.[446] Dolphinaria generally argue that medical tanks are only temporary quarters and insist this distinction makes their restrictiveness acceptable. However, some animals, such as sexually mature males, hand-reared calves, or aggressive individuals of either sex, are often sequestered in these tiny tanks. Tilikum, the male orca responsible for the deaths of three people, was reportedly held for hours in the SeaWorld Orlando

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[445] *See, e.g.*, SW-AND0260337 [redacted]

[446] *See, e.g.*, Figure [31] above.

medical enclosure, in which he could barely turn around after killing his trainer, Dawn Brancheau.[447]

321. [redacted][448]

322. Similarly, Adán, the male calf born to Kohana at Loro Parque was isolated in the medical tank for months, as he had to be hand-reared. He was moved into the main enclosure complex only when Morgan was transferred from the Netherlands.[449]

7. Interference with natural behaviors

323. Natural behaviors and social interactions, such as those associated with mating, maternal care, weaning, and dominance, are altered significantly in captivity

[447] *See* HARGROVE, J. & Chua-Eoan, H. (2015). Beneath the Surface: Killer whales, Seaworld, and the truth beyond Blackfish, St Martin's Press, p. 197 - 198 .

[448] SW-AND0142358 [redacted]

[449] VISSER, I. N. & Lisker, R.B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque*, Tenerife, Spain, Free Morgan Foundation: 67.

at SeaWorld.[450] As Dr. Naomi A. Rose, Dr. E.C.M. Parsons, and Dr. Richard Farinato explain:

> In most cases, these behaviors are strictly controlled by the needs of the facility and the availability of space.[451] The needs of the animals are considered secondary. . . For instance, weaning is timed to suit the needs of the facility, as opposed to the needs of the pup, cub, or calf, because the offspring may be disruptive to the social group or because space is limited. Dominance interactions can be aberrant and abnormally violent,[452] as the animals must adjust their behaviors in response to the small living space and the artificial age and sex composition of the captive social group.
>
> … Stress has been recognized and discussed in this report as a factor that can severely affect the health of captive wildlife, including marine mammals.[453] Stress in mammals can manifest in many ways, including weight loss, lack of appetite, anti-social behavior, reduced calving success, arteriosclerosis (hardening of the arteries), stomach ulcers, changes in blood cell counts, increased

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[450] ROSE, N. A. et al. (2009). *The case against marine mammals in captivity*, The Human Society of the United States and the World Society for the Protection of Animals, at 33.

[451] "Life in a controlled environment may impede certain aspects of normal social dynamics," COUQUIAND , *A survey of the environments of cetaceans in human care: Whales, dolphins, and porpoises: Presentation of the cetaceans*, p. 296.

[452] The extreme example of this was the fatal 1989 interaction between Kandu V and Corky II at SeaWorld San Diego. Kandu had a dependent calf at the time, and Corky had shown interest in the calf—Kandu had apparently repulsed her interest previously, in a show of dominance. Her final, excessively violent attack on Corky, which led to her own death, was fatal precisely because it occurred in restricted space, where tensions were exacerbated, and neither whale had an escape route.

[453] For examples and discussion of how stress can affect the health of marine mammals, see DIERAUF, L. A., *Stress in marine mammals*, in CRC Handbook of Marine Mammal Medicine, edited by Dierauf, 295–301; FAIR & Becker, "Review of stress in marine mammals."

susceptibility to diseases (reduced immune response), and even death.[454]

Short-term acute stress will occur as the result of pursuit, confinement, and physical handling experienced during capture or the transport process.[455] Long-term chronic stress will result once an animal is permanently confined in captivity.

The aggression and violence of which orcas are capable were clearly witnessed at SeaWorld San Diego in August 1989, when an Icelandic female (Kandu V) rammed a northeastern Pacific female (Corky II) during a show. Although trainers tried to keep the show going, blood began to spurt from a severed artery near Kandu's jaw. SeaWorld staff then quickly ushered away the watching crowd. Forty-five minutes after the blow, Kandu died. It should be noted that two orcas from different oceans would never have been in such proximity naturally, nor is there any record of an orca being killed in a similarly violent encounter in the wild.[456]

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[454] For extended discussions of these stress effects, see FOWLER, M. E., *Stress*, in Zoo and Wild Animal Medicine, edited by M. E. Fowler (Philadelphia: W. B. Saunders, 1978), 33–34; MOBERG; G. P., *Influence of stress on reproduction: A measure of well-being," in Animal Stress*, edited by G. P. Moberg (Bethesda, Maryland: American Physiological Society, 1985), 245–268; WEINER, H. , *The concept of stress and its role in disease onset*, in Perspectives on Stress and Stress-Related Topics, edited by F. Lolas and H. Mayer (New York: Springer-Verlag, 1987), 96–103;SAPOLSKY, R. M., *Why Zebras Don't Get Ulcers: A Guide to Stress, Stress Related Diseases and Coping* (New York: W. H. Freeman, 1994); APANIUS, B. (1998). *Stress and immune defense*. Advances in the Study of Behavior 27, p. 133–153; ROMERO & Butler, *Endocrinology of stress*.

[455] NIELSEN, L., *Chemical Immobilization of Wild and Exotic Animals* (Ames, Iowa: Iowa State University Press, 1999).

[456] While bottlenose dolphins have been observed attacking and even killing conspecific calves, orcas have never been seen violently attacking conspecifics in the wild (interactions have never been seen to escalate to serious injury)—only other marine mammal species.

> In 1991, a group of orcas killed trainer Keltie Byrne at Sealand of Victoria, Canada. In front of a shocked audience, the orcas held Byrne underwater until she drowned. Eight years later, one of those same orcas, Tillikum, was discovered one morning with the dead body of a man, named Daniel Dukes, draped on his back at SeaWorld Orlando. Dukes had also drowned and suffered a host of minor injuries incurred both pre and postmortem, suggesting that Tillikum had once again held a person underwater until he died. Dukes had apparently either snuck into the facility at night or stayed in the park after closing in an attempt to swim with the whale, calling into question the park's security procedures.[457]

324. Indeed, although SeaWorld maintained that Dukes' death was caused by hypothermia, rather than animal-induced injury,[458] the official autopsy report,[459] publicly available under Florida law, indicates otherwise. Dukes' autopsy report makes no mention of hypothermia, either as a primary cause of death or a contributing factor; instead, the only cause of death recorded is drowning. It also describes multiple contusions and abrasions over much of his body; approximately 40 separate injuries occurring *before* he died,[460] strongly suggesting that Tilikum dragged Dukes around the tank before Dukes finally drowned.

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[457] LISTON, B. *Florida whale victim a drifter who likely drowned*, Reuters North America, 7 July 1999.

[458] https://www.foxbusiness.com/politics/seaworld-of-problems

[459] https://www.scribd.com/doc/119465495/Daniel-Dukes-Medical-Examiners-Report

[460] RECHBERG , M. J. (2011). *Dying to Entertain Us or Living to Educate Us? A Comprehensive Investigation of Captive Killer Whales, Their Trainers, and How the Law Must Evolve to Meet Their Needs*. Journal of the National Association of Administrative Law Judiciary 31 (2), p. 748. Available at: http://digitalcommons.pepperdine.edu/naalj/vol31/iss2/7

325. Likewise, on Christmas Eve 2009, Keto, a male orca, killed 29-year-old trainer Alexis Martínez at Loro Parque, a Zoo/theme park in the Canary Islands, a territory of Spain. Keto, owned by SeaWorld, had been transferred from SeaWorld San Antonio to Loro Parque in February 2006. Martínez died after Keto rammed him against the side of the tank, inflicting lacerations and severe internal injuries.[461] Two years earlier, in October 2007, another trainer at Loro Parque, Claudia Vollhardt, was injured by Tekoa, the other male orca sent to the Canary Islands by SeaWorld in February 2006. Vollhardt's arm was broken in two places and required surgery. The whale also inflicted chest injuries.[462]

326. Another example is the death of Dawn Brancheau on February 24, 2010 at SeaWorld Orlando. Tilikum, the male orca who killed Daniel Dukes 11 years earlier and Keltie Byrne eight years before that, grabbed Brancheau, one of SeaWorld's most experienced orca trainers, pulled her into the water, and ultimately killed her.[463] Brancheau's injuries were substantial—her autopsy report states that she died of blunt force trauma and drowning. She reportedly suffered a broken jaw, neck, and ribs, a dislocated elbow and knee, and a severed arm, with part of her scalp

[461] PARSONS, E. C. M. (2012). *Killer whale killers*. Tourism in Marine Environments 8(3), p. 153-160.

[462] Sydney Morning Herald, 2007; ZIMMERMAN, 2011; PARSONS, 2012.

[463] PARSONS, E. C. M. (2012). *Killer whale killers*. Tourism in Marine Environments 8(3), p. 153-160.

removed, exposing her skull.[464] The amount of water in her sinuses was actually minimal and probably not sufficient to cause drowning.

327. There have also been many "incidents" — as SeaWorld refers to them— that, while not resulting in a trainer's death, could easily have done so. For example, in November 2006, a female orca named Kasatka held SeaWorld orca trainer Ken Peters underwater by his foot at SeaWorld San Diego, coming close to drowning him.[465] Peters suffered a broken foot and puncture wounds from the whale's teeth. Just three weeks before this incident, another female orca, Orkid, had also grabbed a SeaWorld orca trainer, Brian Rokeach, by the ankle and dragged him underwater. Rokeach luckily escaped.[466] Dr. Naomi A. Rose, Dr. E.C.M. Parsons, and Dr. Richard Farinato discuss additional examples:

> [A] young orca called [Kyoquot] attacked his trainer, Steve Aibel, at SeaWorld San Antonio in July 2004. During a show, the animal hit Aibel, pushed him underwater, and positioned himself between the trainer and the exit ramp of the pool. Aibel was rescued from the whale by another staff member only after several minutes of being unable to bring the animal under his control.[467] In November 2006,

[464] RECHBERG, M. J. (2011). *Dying to Entertain Us or Living to Educate Us? A Comprehensive Investigation of Captive Killer Whales, Their Trainers, and How the Law Must Evolve to Meet Their Needs*. Journal of theNational Association of Administrative Law Judiciary 31(2), p. 749. Iss. 2 Available at: http://digitalcommons.pepperdine.edu/naalj/vol31/iss2/7

[465] *See, e.g.*, https://www.youtube.com/watch?v=5B_poyjBqYE.

[466] PARSONS, E. C. M. (2012). *Killer whale killers*. Tourism in Marine Environments 8(3), p. 153-160.

[467] See www.abc.net.au/news/newsitems/200407/s1163433.htm for a description of this incident.

the orca Kasatka held trainer Ken Peters underwater by his foot, at SeaWorld San Diego.[468] On 6 October 2007, trainer Claudia Vollhardt was injured by an orca named Tekoa at the dolphinarium Loro Parque, in Tenerife, Canary Islands. The whale broke the trainer's forearm in two places and inflicted chest injuries.[469]

The risks to trainers posed by captive orcas were thoroughly considered and summarized in the narrative summary and information memorandum initially prepared by an inspector for California's Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA) after the incident with Kasatka and Ken Peters in 2006. SeaWorld managers had notified Cal/OSHA of the November incident the next day as a matter of routine, due to the serious nature of the injury. However, routine is a matter of perspective. SeaWorld saw the incident as a minor employee injury, but after a thorough review of this and other trainer-orca incidents (see above), the state inspector came to a different conclusion: "[I]n the simplest of terms…swimming with captive orcas is inherently dangerous and if someone hasn't been killed already it is only a matter of time before it does happen."

328. SeaWorld reportedly maintains an "incident log" of aggressive or potentially aggressive interactions between orca and humans. Between 1988 and 2011, 98 incidents had been logged at SeaWorld Orlando alone,[470] a number that

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[468] The trainer received a broken foot as a result of this incident. See http://www.msnbc.msn.com/id/15964896/ for a description.

[469] See http://www.smh.com.au/news/whale-watch/woman-surviveskiller-whale-ordeal/2007/10/09/1191695867426.html for a description of this incident. At least 19 other captive orca attacks or accidents in dolphinaria have been recorded (for a list, which spans the early 1970s to 1999, see http://www.angelfire.com/gu/orcas/attack.html).

[470] *See* TOMPKINS, C. (2011). Testimony of Charles Tompkins, SeaWorld vice-president of animal training, in *Secretary of Labor v. SeaWorld of Florida LLC* (transcript), September 21. In addition, three additional incidents were reported in

underestimates the total number of incidents, as other aggressive interactions are known to have occurred, but have not been recorded. Indeed, a number of these incidents came to light during testimony at the administrative law hearing after SeaWorld challenged the citation issued by OSHA for the death of Dawn Brancheau.[471] For example, SeaWorld noted in the "animal profile" of Kayla, a female orca at SeaWorld Orlando, that she had been involved in seven aggressive interactions. However, only one was recorded in the official incident log.[472] SeaWorld representative Chuck Tompkins conceded in his testimony that "we missed a few" incidents in the official log.[473]

329. The dangers posed by orca aggression in captivity have been long recognized, even prior to the incidents discussed above. For example, a leading marine mammal veterinary handbook stated the following:

> "Aggression expressed by killer whales toward their trainers is a matter of grave concern. Show situations involving water behaviors with trainers and orcas have become popular in recent years. Aggressive manifestations toward trainers have included butting, biting, grabbing, dunking, and holding trainers on the bottom of tanks preventing their escape. Several situations have resulted

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the Orlando log for SeaWorld-owned whales at Loro Parque in the Canary Islands during the 1988-2011 period. *See also* PARSONS, E. C. M. (2012). *Killer whale killers*. Tourism in Marine Environments 8(3),p. 153-160.

[471] PARSONS, E. C. M. (2012). *Killer whale killers*. Tourism in Marine Environments 8(3),p. 153-160.

[472] *Id.*

[473] p. 457, line 20 in TOMPKINS, 2011. SeaWorld, had for example, also failed to log Dawn Brancheau's death in the 'incident log'.

> in potentially life-threatening incidents. In a few such cases, we can attribute this behavior to disease or to the presence of frustrating or confusing situations, but in other cases, there have been no clear causal factors."[474]

330. I understand from Plaintiffs' counsel that, after Dawn Brancheau's death, the federal OSHA cited SeaWorld for subjecting employees to a workplace that contained "recognized hazards that were causing or likely to cause death or physical harm to employees." OSHA issued its citation on 23 August 2010,[475] and determined that SeaWorld's violation was "willful," i.e., SeaWorld "intentionally and knowingly" exposed employees to possibly lethal harm and had "made no reasonable effort to eliminate" the risk.[476] SeaWorld appealed the citation, which resulted in the citation being upheld— but the degree of offense being downgraded from "willful" to "serious."[477] Waterwork was effectively banned as a result, meaning SeaWorld could no longer have trainers in the water with the orca during performances.

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[474] SWEENEY, J. C. (1990). *Marine mammal behavioral diagnostics*. In L. A. Dierauf (Ed.), CRC handbook of marine mammal medicine: Health, disease and rehabilitation (pp. 53–72). Boca Raton, FL: CRC Press, p. 61 - 62.

[475] GROVE , L. L. (2010). Citation and notification of penalty, OSHA, USDL, Inspection No. 314336850, August 23, 2010. Tampa, FL: US Department of Labor. Retrieved August 30, 2011, from https://www.scribd.com/document/65453799/OSHA-Citation-and-Notification-of-Penalty-to-SeaWorld.

[476] *See http://www.dol.gov/compliance/guide/osha.htm*; see also Parsons 2012.

[477] *Sec. of Labor v. SeaWorld of Fla.,* 24 OSH Cas. (BNA) 1303 (OSHRCALJ), 2012 OSHD (CCH) P 33247, 2012 WL 3019734, slip op. at *9-10, *33-34 (No. 10–1705, 2012), available at *https://www.dol.gov/sol/regions/PDFs/ATLdecisionSeaWorld.pdf.*

8. Entrusting animals to sub-standard facilities such as Loro Parque

331. Loro Parque, a commercial zoo / theme park with animal shows, is located in the town of Puerto de la Cruz, Tenerife, Canary Islands, Spain. It provides additional examples of SeaWorld's deficient care for its orca. In 2004, Loro Parque entered into an agreement with SeaWorld USA to house, display and breed four of their orca,[478] [redacted][479]

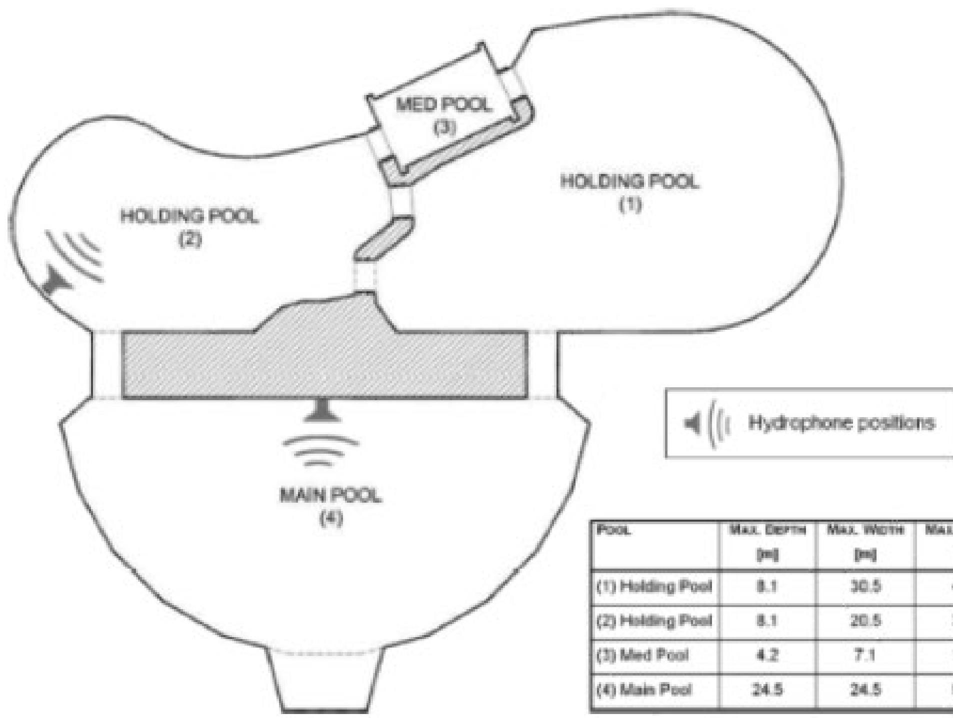
332. Loro Parque sought permission from the Spanish Authorities to build a tank system to hold four orca.[480] It subsequently built a four-tank complex, comprised of one show tank, two 'back tanks' and a small medical tank.[481] The tanks are depicted below:

[478] http://www.freemorgan.org/wp-content/uploads/2018/02/Loro_Parque_Killer_Whale_Facility_Service_Loan_Agreement-PACER-USCA-Case-12-1375.pdf

[479] SW000515.

[480] http://www.freemorgan.org/pdfs/USDA-APHIS-AWA-Evaluation-4-Killer-Whales-SW-to-LP-USDA-FOIA-11-313.pdf

[481] KREMERS,, D.etal. (2012). Vocal sharing and individual acoustic distinctiveness within a group of captive orcas (*Orcinus orca*). Journal of Comparative Psychology, p. 433-445.



Pool	Max. Depth [m]	Max. Width [m]	Max. Length [m]
(1) Holding Pool	8.1	30.5	44.8
(2) Holding Pool	8.1	20.5	36.5
(3) Med Pool	4.2	7.1	12.4
(4) Main Pool	24.5	24.5	50.5

Figure 1. Diagram of the orcas' facility including pool dimensions and hydrophone positions. The hydrophone in the main pool (4) was used for recording group repertoire data; both hydrophones were used to allocate the recorded sounds to an individual when the orcas had access only to holding pool (2) and the main pool (4).

Figure [95][482]

333. In February 2006, Loro Parque received four young orca; two males, Keto (born 17 Jun 1995, SeaWorld Orlando),[483] and Tekoa (born 08 Nov 2000,

[482] KREMERS et al. (2012), their Figure 1, page 3. Loro Parque tank system, orientated in an approximate north direction, with west to the left of frame. The 'main' tank is the show tank – with the roughly rectangular zone at the southern edge not an extension, but rather a 'slide out' for the whales to perform on and it has no water.

[483] KIELTY, J. (2011). *Marine Mammal Inventory Report (Deficiencies)*. St Pete Beach, Florida, USA: The Orca Project Corp (unpublished report, available from https://theorcaproject.wordpress.com/2011/03/18/noaa-nmfs-marine-mammal-inventory-report-deficiencies/). And https://web.archive.org/web/20190108224153/http://orcahome.de/orcastat.htm

SeaWorld Orlando)[484], and two females, Kohana (born 03 May 2002, SeaWorld San Diego)[485] and Skyla (born 09 Feb 2004, SeaWorld Orlando)[486] on loan from SeaWorld.[487]

334. In 2004 and 2005, before the orca were brought to Loro Parque, eight animal trainers from the park were reportedly sent to Sea World parks in Texas and Florida for training.[488]

335. On December 24, 2009, orca trainer Alexis Martinez, age 29, was killed during a Christmas show rehearsal when he was attacked by one of the orca, presumably Keto, resulting in his drowning.[489]

And VISSER, I. N. & Lisker, R. B. (2016). *Ongoing concerns regarding the SeaWorld orca held at Loro Parque, Tenerife, Spain*. Free Morgan Foundation. Available from the Free Morgan Foundation. http://www.freemorgan.org/visser-lisker-2016-ongoing-welfare-concerns/

484 *Ibid.*

485 *Ibid.*

486 *Ibid.*

487 "*Six of these killer whales are presently on loan to a third party pursuant to an agreement entered into in February 2004. Pursuant to this agreement, we receive an annual fee, which is not material to our results of operations. In addition to generating incremental revenue for our business, the agreement provides for additional housing capacity for our killer whales. The agreement expires in 2031 and is renewable at the option of the parties*." (SeaWorld Form S-1/A SEC filing, 2 April 2014, see http://www.seaworldinvestors.com/sec-filings/2014/default.aspx).

488 "SeaWorld had trained a group of Loro Parque killer whale trainers at its San Antonio and Orlando parks." https://www.outsideonline.com/1886916/blood-water

489 https://www.onegreenplanet.org/animalsandnature/keto-the-other-whale-who-killed-his-trainer/.

336. During the OSHA court case, SeaWorld employee's disparaged Loro Parque, including the staff who work there.[490]

337. On the 29 November 2011, a wild-born female orca, named Morgan, of approximately 3 to 5 years of age, was transferred to Loro Parque, from Dolfinarium Harderwijk a dolphinarium in the Netherlands. It is my understanding that, as a wild-born orca, in the European Union, Morgan is afforded a higher level of legal protection than captive-born individuals. I understand that that includes restrictions against being traded, sold or used for primarily commercial purposes. Indeed, research and breeding are also restricted, unless an exception permit is issued. In Morgan's case, I understand that a permit was issued exclusively for research. [redacted]

[490] During the legal proceedings, which ran from 19 September 2011 through 18 November 2011, SeaWorld's attorneys and multiple witnesses made statements and offered testimony calling into question Loro Parque's competence to hold and care for orca. Secretary of Labor vs. Sea World of Florida, LLC. (2011) US Occupational Safety and Health Review Commission (OSHRC) Docket No. 10-1705:214. The transcript of the proceedings, which I have relied on in forming my opinions in this report, may be found online at http://www.freemorgan.org/pdfs/Secretary-of-Labor-vs-SeaWorld-Transcript-of-Proceedings-OSHRC-Docket-No-10-1705.pdf. The following statement made by SeaWorld's attorney during the hearing is instructive of the testimony offered in that case: "There has been no establishment that Loro Parque is a company that would be considered [by] someone as a leader in the field to be someone that you would attribute industry recognition from. In fact, the testimony that has been presented in this case would be the opposite. They're not an industry leader."

[redacted][491] and then bred again in April 2017.[492] She has since given birth to a calf which has a deformity and a likely pathogen.[493] Notably, Morgan's April 2017 pregnancy occurred after SeaWorld had announced in March 2016 that it would no longer breed its orca.[494]

338. I prepared two reports on Loro Parque—one in 2012 and the other in 2016—shedding light on the animal welfare concerns associated with the SeaWorld orca held at that park.[495] I incorporate those two reports herein.

339. In late 2017, SeaWorld announced that the orca they loaned to Loro Parque now belonged to the Spanish amusement park.[496]

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[491] *See, e.g.,* SW-AND0131807.

[492] Morgan delivered a calf in September 2018. Orca typically have a 17-month gestation, which would mean Morgan became pregnant around April 2017. *See, e.g.*, *See* affidavit of former SeaWorld employee Dr. Lanny Cornell dated March 28, 2011 (and the documents attached thereto), filed in *SeaWorld Parks & Entertainment LLC v. Marineland of Canada Inc.*, available online at https://www.scribd.com/doc/215567388/Seaworld-v-Marineland-Aff-of-Lanny-Cornell.

[493] See, e.g., https://voiceoftheorcas.blogspot.com/.

[494] See, e.g., http://s1.q4cdn.com/392447382/files/doc_news/SeaWorld-Announces-Last-Generation-Of-Orcas-In-Its-Care.pdf (SeaWorld press release stating: "The company will end all orca breeding as of today.").

[495] VISSER, I.N. (2012), for the Free Morgan Foundation. *Report on the Physical & Behavioural Status of Morgan, the Wild-Born Orca held in Captivity, at Loro Parque, Tenerife, Spain.* http://www.freemorgan.org/wp-content/uploads/2012/11/Visser-2012-Report-on-the-Phyisical-Status-of-Morgan-V1.2.pdf; VISSER, I.N. &. Lisker, R.B. for the Free Morgan Foundation (2016) *Ongoing Concerns Regarding the SeaWorld Orca Held at Loro Parque, Tenerife, Spain.* http://www.freemorgan.org/wp-content/uploads/2016/07/Visser-Lisker-2016-Ongoing-concerns-regarding-Seaworld-orca-held-at-Loro-Parque-V1.3.pdf

[496] *See, e.g.*, SeaWorld Form 8-K EX-99.1 SEC filing 7 November 2017.

9. Captivity Related Injuries

340. Wild cetaceans who have pale skin or who spend a lot of time at the surface, or who become stranded, are known to get sunburnt.[497]

341. As described earlier, orca are predominantly black (*i.e.*, they do not have pale skin on their dorsal surface - except for the saddle-patch) but are known to get sunburnt in captivity,[498] and two former SeaWorld trainers write that: "*Orcas in marine parks sometimes suffer from sunburn, and trainers or animal care staff will apply sun-block and black (colored) zinc oxide to the backs of those animals which show signs of burn, or who otherwise spend inordinate amounts of time surface resting.*"[499] These same two ex-trainers, in a book chapter stated: "*Although dark pigmentation might confer protection against UVR among some mammals (49), we commonly observed sunburnt dorsal surfaces of the captive orcas we worked with, especially among those animals prone to sustained logging. Sunburns we observed*

[497] BOSSLEY, M. I. and Woolfall, M.A. (2014). *Recovery from severe cutaneous injury in two free ranging bottlenose dolphins (Tursiops spp.).* Journal of Marine Animals and Their Ecology 7(1), p. 12-16.

MARTINEZ-LEVASSEUR et al. (2011). *Acute sun damage and photoprotective responses in whales*. Proceedings of the Royal Society, B Biological Sciences 278, p. 1581-1586.

[498] DIEBEL, L. & Casey, L. (2013). *Marineland: Inside the Controversy*. Toronto Star Newspapers Limited, One Yonge St. Toronto, ON M5E 1E6, Canada, Toronto Star Newspapers Limited under the imprint Star Dispatches.

[499] JETT, J. S. & Ventre, J.M. (2011). *Keto & Tilikum Express the stress of orca captivity*, Unpublished report available from The Orca Project, p. 1 - 22.

presented as discolored, peeling epidermis sometimes accompanied by small blisters …"[500]

342. [redacted][501]

343. [redacted][502] [redacted]

500 JETT, J. and. Ventre, J.M. (2012). *Orca (Orcinus orca) captivity and vulnerability to mosquito-transmitted viruses*. Journal of Marine Animals and Their Ecology 5(2), p. 9-16.

501 SW-AND0053836.

502 *Id.*

[redacted][503] [redacted][504]

344. [redacted][505]

345. In 2010, 12 veterinarians (including three current or ex-SeaWorld veterinarians, McBain, Reidarson, and Schmitt) published a paper on the risk factors associated with cataracts and lens luxations in captive pinnipeds (seals, sealions and walrus) in the United States and the Bahamas. They found that captive pinnipeds with no shade were 10 times more likely to develop eye issues. The conclusions they drew included *inter alia*, that diseases of the lens commonly affect captive pinnipeds and that access to UV-protective shade. They noted that "*Living conditions for*

[503] SW-AND0183310.

[504] SW-AND0053836.

[505] SW-AND0191535.

pinnipeds in the wild, where they primarily sleep on land and open their eyes to hunt and swim, are in contrast to conditions in some facilities (ie, with little to no shade), where captive pinnipeds are required to perform on stages without sufficient shade and in shallow, brightly colored pools."[506]

346. Likewise, veterinarian Dr. Laurie Gage discusses captive pinniped eye problems in her paper of 2008 and provides this robust assessment of the situation for the animals "*… captive pinnipeds are frequently housed in pools painted a light blue color which is very effective at reflecting most of the UV light energy back towards the animals as they dive and swim. As well, captive pinnipeds are often housed in deep grottos or pools where they must look up frequently to see out of the exhibit or to catch fish… When keepers, trainers, or members of the public feed the animals they may inadvertently force the animals to look directly into the sun to get their fish reward. These conditions may cause damage to the eyes of captive pinnipeds because they are forced to be exposed to far more UV light than their wild counterparts*."[507]

347. This is not a dissimilar situation for orca at SeaWorld, in that there is little to no shade from the UV light, that the tanks are bright blue (and light blue) coloured tanks and the animals are routinely required to perform. [redacted]

[506] COLITZ, Carmen et al. (2010). *Risk factors associated with cataracts and lens luxations in captive pinnipeds in the United States and the Bahamas*. *Journal of the American Veterinary Medical Association* 237(4), p. 429-436.

[507] GAGE, Laurie J. (2011) *Captive pinniped eye problems, we can do better*. *Journal of Marine Animal Ecology* 4, p. 25-28.

[redacted]

348. In a video released by SeaWorld and posted on 20160308 by the newspaper Orlando Sentinel,[508] both tips of Tilikum's tail flukes could be seen and both exhibited lesions, with his right tail fluke lesion open and red. Figure [96] is a screen grab from SeaWorld's video of Tilikum, showing SeaWorld veterinarian Dr. Scott Gearhart and trainer Daniel Richardville (Animal Training Supervisor) taking blood samples from Tilikum. Both tail fluke tips are visible and both have open lesions which are not addressed or discussed in the video. Note his right tail fluke (held by the trainer) has an open, red, lesion, visible alongside the trainers' arm. The SeaWorld staff opined that the curling of the tail fluke was a result of his confinement in shallow tanks.[509]

[508] https://web.archive.org/web/20190203065213/https://www.orlandosentinel.com/business/tourism/os-seaworld-tilikum-health-declining-20160308-story.html

[509] https://www.orlandosentinel.com/business/tourism/os-seaworld-tilikum-health-declining-20160308-story.html

Figure [96]

349. Eight months prior to that video being released, on 20150707, I visited SeaWorld Orlando and whilst there I photographed Tilikum's tail flukes (Fig. [97]). At the time, and as documented in the photographs, I noted that there were open wounds on both the left and right tips, [redacted] I attributed the wounds I observed to continual and chronic abrasion of the flukes against the bottom of a tank that was too shallow for animal of his size/length.

350. Figure [97] below depicts the tail flukes of Tilikum, an adult male orca held at SeaWorld Orlando. The upper image shows the curling of the flukes and the abrasions on the tips of his flukes (most obvious on his left fluke, in this photograph). The lower image shows a close up of the wounds, including one section that has an

open (red) lesion and another that may constitute scar tissue or necrotic tissue. This image was taken from the public viewing area of the stadium, approximately 50m away from Tilikum.

Figure [97][510]

351. Despite decades of research on this species and having observed hundreds of free-ranging orca, I have never seen anything like this on any individual (of either sex, of any age), except for those orca in captivity.

[510] Photo © Ingrid N. Visser.

352. [redacted][511]

353. SeaWorld's staff, including veterinarians, appear to be unaware that curvature of the tail flukes is a natural occurrence in sexually mature male orca[512]—this may be because captive orca at SeaWorld rarely reach age-related milestones, such that this characteristic is displayed. This lack of knowledge about the basic life-history and physical traits of orca is also apparent in the way Kelly Flaherty Clark (Director of Animal Training) states at 0m15s in the same video "*Tili* [Tilikum] *came from Sealand of the Pacific, he definitely needed to put on some weight, his dorsal fin had that same curve to it, his tail flukes had that same curve to them, and his teeth*

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[511] SW-AND0191466.

[512] "Flukes... (the tips of which curl downward in males)" in FORD, J. K. B. (2002). *Killer whale (Orcinus orca)*. Encyclopedia of marine mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, Academic Press, p.669.

NESNICK, S. & Ralls, K. (2018). *Sexual dimorphisim*. Encyclopedia of Marine Mammals. B. Würsig, J. G. M. Thewissen and K. M. Kovacs. San Diego, Academic Press.

looked a lot like they do today, they needed to be cared for…" Describing the curved tail flukes as a 'negative' aspect by the SeaWorld staff, including management (who released the video) reveals the lack of knowledge and/or training of SeaWorld staff. Figure [98] below depicts the tail flukes of six different adult male orca, in New Zealand waters between 1995 and 2012. The curling of the tips is a secondary sexual characteristic, similar to the larger pectoral fins and tall dorsal fin this species develops as they age.[513] Each photo shows a different 'pose' to illustrate the curled flukes maintain their overall shape, regardless of position and that this trait is not a facet of movement. The flukes retain their shape even underwater whilst swimming.

[513] NESNICK, S. & Ralls, K. (2018). *Sexual dimorphisim.* Encyclopedia of Marine Mammals. B. Würsig, J. G. M. Thewissen and K. M. Kovacs. San Diego, Academic Press.

Figure [98][514]

354. [redacted] [515] [redacted]

514 Photos © Ingrid N. Visser.

515 SW-AND0191466

10. Tank Hazards

355. SeaWorld's tanks for its captive orca contain features that can be—and indeed are—hazardous to the health of the orca. Two important examples are the gates SeaWorld uses to separate its tanks and orca, and the blue paint that it uses in its tanks, presumably to maximize visibility. I discuss these hazards in this section.

356. Using SeaWorld San Diego as an example, the gates (#1 to #10) are illustrated in Figure [31]; the 'med pool' gate controls shown in Figure [99] below, depicting the panels for gates # 5 (between medical tank and B); #6 (between medical tank and C); and #7 (between medical tank and the narrow 'race' through to gates #10 & #8 as per details in Figure [100]). Note that of these four gates, only #7 shows a green light. The others are red, indicating closed.

[redacted]

Figure [99][516]

357. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[516] Photo © Ingrid N. Visser.

[redacted]

Figure [100][517]

358. Figure [101] below shows Tanks B and C from a high vantage point. Between shows, on 20181126, the orca appeared to be confined to Tank C (left) and Tank B (right). Both gates (far corners left and right of each tank, respectively) to the show tank (A) were closed. Tank C contained at least two orca, whilst Tank B contained at least three (two are upside down, with one lying nearly on top of the

[517] Photo © Ingrid N. Visser.

other). The small size of these 'back' tanks is apparent in this image which was taken from the 'viewing tower'.

Figure [101][518]

359. There are additions to the tops of the gates, to apparently discourage the orca from attempting to pass over them. For example, bars (to raise the gate height) and bolts with raised heads screwed onto the tops of the bars (*see* Fig. [102]). These deterrents do not always work, apparently; one orca, listed in a peer-reviewed study

[518] Photo © Ingrid N. Visser.

on intestinal volvulus (twisted gut) in cetaceans,[519] and described an adult female captive orca from SeaWorld, was presented as "case No. 18". On p. 595 the authors (who included three SeaWorld veterinarians Drs Nollens, Robeck and Schmitt write that "*Five days prior to death, the animal was found leaning over a gate*." and go on to state that the death may have an "… *etiology of a sudden change in abdominal organ arrangement*." Table 1 in the same study noted the orca's "accident with gate."

360. Figure [103] below shows the gate # 6, between the medical tank (D) and tank C, at SeaWorld San Diego. Note the bar across the top, presumably to raise the height and the raised bolt heads, presumably to add additional deterrent to the orca.

361. [redacted] (Fig. [83]), [redacted]

[519] *See* BEGEMAN, L. et al., *Intestinal Volvulus in Cetaceans*. Veterinary Pathology 50(4), p. 590-596; *see also* TANG, K. N. et al. (2018). *Serum cobalamin and folate concentrations as indicators of gastrointestinal disease in killer whales (Orcinus orca)*. Journal of Zoo and Wildlife Medicine 49(3),p. 564-572.

[redacted]

[redacted] [redacted][520]

[redacted]

Figure [102][521]

362. Figure [103] below shows the hinge-end of gate #6, between the medical tank (D) and tank C, at SeaWorld San Diego. Gate #4, between tanks B and C is visible in the background, with the same height-raising bar and raised-head bolts across the top. See Fig. [104] for close up of chipped concrete and peeling paint.

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[520] *See* Schedule 4(b); *see also* BURTIS Dep. Tr. at 72:3-15 [redacted] (objections omitted).

[521] Photo © Ingrid N. Visser.

[redacted]

Figure [103][522]

363. [redacted]

522 Photo © Ingrid N. Visser.

[redacted]

Figure [104][523]

364. Figure [105] below shows Keto, an adult male orca held at Loro Parque, Spain, undergoing an endoscopy in the medical tank (the floor has been raised so that he is effectively stranded). This endoscopy required a large block of wood to be lodged in his mouth and secured by a rope under his chin and people pulling ropes attached to the block . The block has a hole in the middle so that a long tube can be threaded through it and into the gastro-intestinal tract.

[523] Photo © Ingrid N. Visser.

Figure [105][524]

365. This procedure appears to be traumatic for Keto, who is seen in the video thrashing around and grunting. The poor level of trainer control is also evident. Endoscopies do not need to be so traumatic for the animal, if they are trained properly. Fig. [105] below shows an unrestrained bottlenose dolphins, in the water, remaining 'on station' during an endoscopy, for an example).

[524] See https://www.youtube.com/watch?v=7ZFnfv1DL7M. Photos from screen grabs of video by Suzanne Allee.

Figure [105][525]

11. Aggression

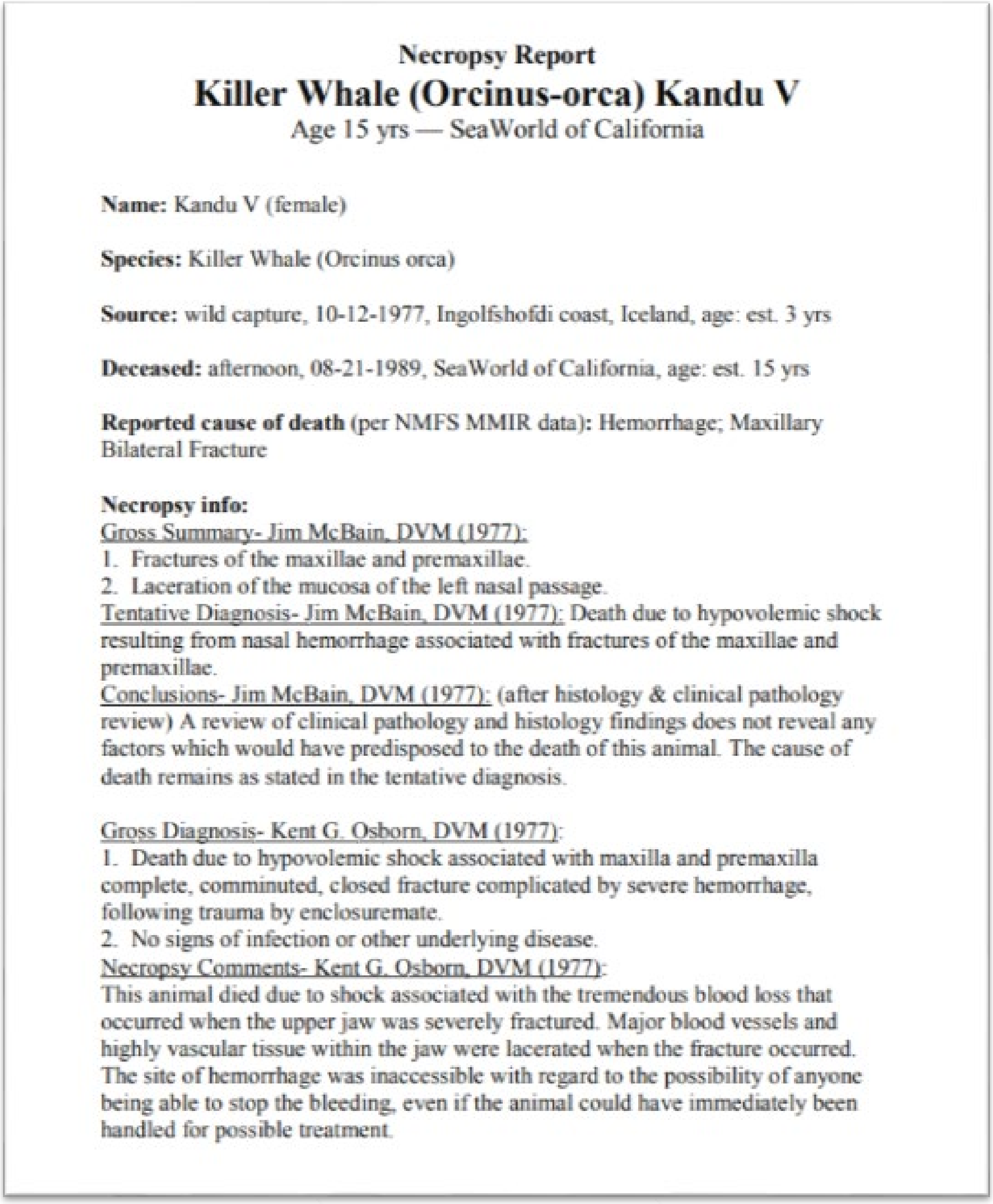
366. As discussed above, extreme aggression is seen among SeaWorld captive orca, unlike what been reportedly witnessed — or what I have witnessed — in the wild.

367. For example, in 1989, a female orca named Kandu held at SeaWorld San Diego attacked an older female, Corky II. The attack was so violent that Kandu broke her own jaw, severed an artery and died.[526] Figure [106] below is Kandu's necropsy report identifying the cause of death as: "hypovolemic shock resulting from nasal hemorrhage associated with fractures of the maxillae and premaxillae." Figure [107]

[525] Photo © Ingrid N. Visser.

[526] Reza and Johnson, 1989; Parsons, 2012; Ventre and Jett, 2015

is a photograph of the incident, underscoring the force with which Kandu attacked Corky II. Figures [108] and [109] provide a further description of the incident.



Necropsy Report

Killer Whale (Orcinus-orca) Kandu V

Age 15 yrs — SeaWorld of California

Name: Kandu V (female)

Species: Killer Whale (Orcinus orca)

Source: wild capture, 10-12-1977, Ingolfshofdi coast, Iceland, age: est. 3 yrs

Deceased: afternoon, 08-21-1989, SeaWorld of California, age: est. 15 yrs

Reported cause of death (per NMFS MMIR data): Hemorrhage; Maxillary Bilateral Fracture

Necropsy info:
Gross Summary- Jim McBain, DVM (1977):
1. Fractures of the maxillae and premaxillae.
2. Laceration of the mucosa of the left nasal passage.

Tentative Diagnosis- Jim McBain, DVM (1977): Death due to hypovolemic shock resulting from nasal hemorrhage associated with fractures of the maxillae and premaxillae.
Conclusions- Jim McBain, DVM (1977): (after histology & clinical pathology review) A review of clinical pathology and histology findings does not reveal any factors which would have predisposed to the death of this animal. The cause of death remains as stated in the tentative diagnosis.

Gross Diagnosis- Kent G. Osborn, DVM (1977):
1. Death due to hypovolemic shock associated with maxilla and premaxilla complete, comminuted, closed fracture complicated by severe hemorrhage, following trauma by enclosuremate.
2. No signs of infection or other underlying disease.

Necropsy Comments- Kent G. Osborn, DVM (1977):
This animal died due to shock associated with the tremendous blood loss that occurred when the upper jaw was severely fractured. Major blood vessels and highly vascular tissue within the jaw were lacerated when the fracture occurred. The site of hemorrhage was inaccessible with regard to the possibility of anyone being able to stop the bleeding, even if the animal could have immediately been handled for possible treatment.

Figure [106][527]

[527] https://www.scribd.com/doc/85186230/Necropsy-Killer-Whale-Kandu-V.

Figure [107][528]

[528] https://timzimmermann.com/2010/09/14/do-orcas-at-marine-parks-injure-one-another/

Dr. Nancy Foster
Director, Office of Protected
Resources and Habitat Program
National Marine Fisheries Service
1335 East-West Highway, Rm. 8268
Silver Spring, MD 20910

Dear Dr. Foster:

As you know, an accidental death of a female killer whale, known as Kandu, occurred on August 21, 1989, at Sea World of California. Kandu is the mother of a 12 month old calf who was not involved in the accident.

During an afternoon show, Kandu and another female whale, Corky, were stationed with their trainers in the north back pool. Kandu was signaled by her trainer to swim into the main presentation pool. She turned, as if taking the signal, opened her mouth very wide and struck Corky broadside. The two adult whales made a fast lap of the north back pool. Kandu then swam into the main presentation pool with her calf.

RECEIVED

In the main presentation pool, Kandu remained motionless at the surface facing the south back pool through a gate. At this time there was no visible blood or any other physical indication of Kandu's injury. She did not respond to her trainers. Kandu and her calf moved towards the north back pool meeting Corky as she entered the main presentation pool. Kandu and Corky stirred up white water and swam a fast lap. None of the trainers present believe that the two whales made contact in the main presentation pool during this behavior.

Kandu returned to the north back pool, her calf following, and Corky remained in the main presentation pool. As Kandu returned to the north back pool, she took the first observed breath since the initial impact, exhaling large amounts of blood, alerting the trainers to her injury. The veterinary and animal care staff were immediately notified of the injury. Trainers at the north back pool monitored Kandu while trainers

Figure [108][529]

[529] https://www.scribd.com/doc/85186230/Necropsy-Killer-Whale-Kandu-V.

The veterinary staff arrived within three to four minutes of the incident and suspected a serious traumatic injury deep within the skull because of the bright color and volume of blood which suggested arterial bleeding. Still accompanied by her calf, Kandu was directed into a specially designed medical treatment pool. The purpose of her placement in this smaller pool was to diminish her activity as a means of reducing her blood pressure to induce clotting. Sadly, her condition was irreversible. As Kandu began to lapse into unconsciousness the veterinary staff concluded that her calf would be safer if the two returned to one of the larger back pools. Kandu died in a back pool shortly afterwards, with her calf nearby.

Necropsy results revealed that the conditions peculiar to the impact placed upward and backward pressure on Kandu's upper jaw, causing fractures of the maxillae (both upper jaw bones). These fractured bones lacerated large arteries as well as the membrane lining to the nasal passage. Bleeding was rapid, leading to shock and death about 40-45 minutes after the initial impact.

Figure [109][530]

368. [redacted][531]

[530] https://www.scribd.com/doc/85186230/Necropsy-Killer-Whale-Kandu-V.

[531] *See* BURTIS Dep. Tr. at 104:2-9 [redacted] see also *http://www.seaworldfactcheck.com/health.htm*

Figure [110][532]

[532] https://www.peta.org/blog/orca-badly-hurt-seaworld-clash/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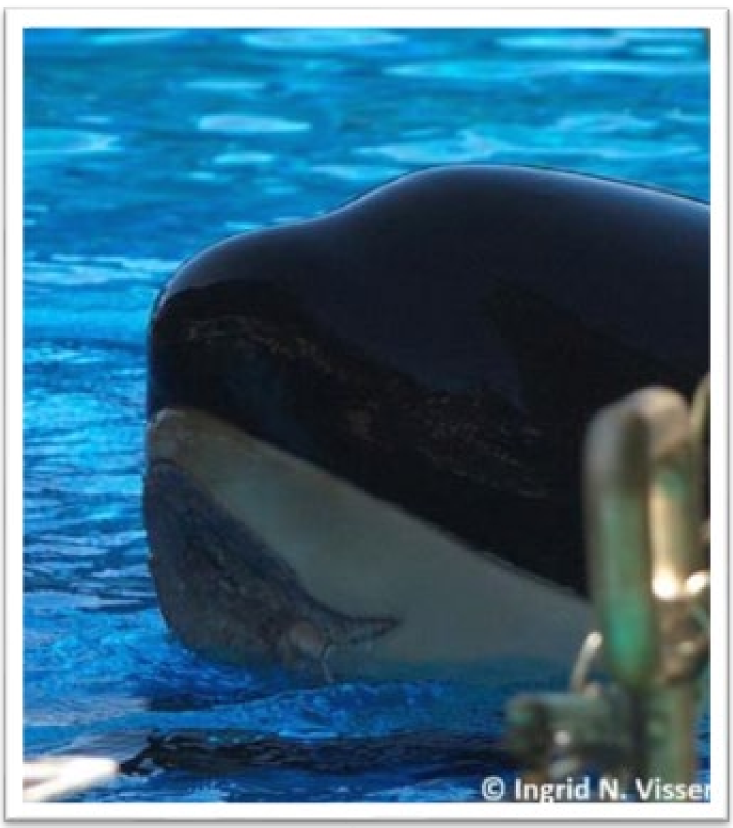
© Ingrid N. Visser

Figures [111] - [114][533]

[533] https://timzimmermann.com/2012/10/01/nakai-photos-and-backstory/.

Figure 1. Nakai's wound 10 days post injury. Four puncture marks are visible at the lower right of the wound and the spacing of these matches the spacing of orca teeth (compare the spacing to Nakai's own teeth). 30 September 2012, taken at SeaWorld San Diego.

Figure [115][534]

369. [redacted]

[redacted][535]

370. Likewise, in April 2018, Katina, a female held at SeaWorld Orlando, was injured in 2018, appearing with a large tear at the base of her dorsal fin after interacting with other orca in her tank.[536] Figure [116] below depicts Katina, a wild-born female orca, who was captured off the coast of Iceland when she was approximately two years old, who now lives in SeaWorld Orlando. On or around 20180317, Katina was involved in an altercation with an undisclosed number of orca. That altercation resulted in the massive tear to her dorsal fin. Katina was taken from the wild on 19781026, making her approximately 41 years old when she was injured.

[534] http://www.seaworldfactcheck.com/health.htm.

[535] SW-AND0183541.

[536] RUITER, J. (2018); see also https://www.seaworldofhurt.com/orca-katina-ripped-dorsal-fin/; https://www.clickorlando.com/theme-parks/seaworld/matriarch-of-orca-whale-pod-treated-for-split-fin-seaworld-officials-say; https://www.orlandosentinel.com/news/os-seaworld-katina-dorsal-fin-injury-20180401-story.html; https://ftw.usatoday.com/2018/06/orca-with-horrific-injury-to-dorsal-fin-performing-again-at-seaworld.

Figure [116][537]

371. [redacted][538]

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[537] Photo © Heather Murphy/Ocean Advocate News. *See* https://whalesanctuaryproject.org/orca-katina-suffers-injury-to-dorsal-fin/; *see also* https://www.seaworldofhurt.com/orca-katina-ripped-dorsal-fin/.

[538] *See, e.g.*, SW-AND0191009; *see also* SW-AND0136984, SW-AND0140493, SW-AND0180768, SW-AND0182799, SW-AND0182807, SW-AND0183213, SW-AND0183518, SW-AND0183539, SW-AND0183550, SW-AND0183798, SW-

372. The above are not isolated incidents of aggression, as confirmed by SeaWorld employees. For example, former water quality diver Sarah Fishbeck recalls diving to the bottom of the orca tanks and finding long strips of what looked like black rubber, which was actually skin the orca would peel off each other.[539] [redacted]

373. Such injuries arise not only because of the inability of animals to retreat or escape aggression from other animals,[540] but also because of the artificial

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AND0187446, SW-AND0190381, SW-AND0190618, SW-AND0191030, SW-AND0191053, SW-AND0191316, SW-AND0191653, SW-AND0192231, SW-AND0192366, SW-AND0195660, SW-AND0197279, SW-AND0200372, SW-AND0201313, SW-AND0202211, SW-AND0202828, SW-AND0204313, SW-AND0207478, SW-AND0209595, SW-AND0210274, SW-AND0211560, SW-AND0212166, SW-AND0215532, SW-AND0215532, SW-AND0216957, SW-AND0219789, SW-AND0221220, SW-AND0221816, SW-AND0221816, SW-AND0223172, SW-AND0224149, SW-AND0225676, SW-AND0227320, SW-AND0227749, SW-AND0229099, SW-AND0230707, SW-AND0233881, SW-AND0235594, SW-AND0238765, SW-AND0239324, SW-AND0239809, SW-AND0240550, SW-AND0243143, SW-AND0244567, SW-AND0262016, SW-AND0263900, SW-AND0267575, SW-AND0269438, SW-AND0273698, SW-AND0276416 [redacted]

[539] SCHELLING A, *Ex-SeaWorld Employee Gives Chilling New Details About Orca Mistreatment*, The Dodo, 2015, https://www.thedodo.com/seaworld-orcas-peel-skin-off-each-other-1498617162.html; *see also* DOLD Dep. Tr. at 90:4-12 [redacted]

[540] WAPLES, K. A. and N. J. Gales (2002). *Evaluating and minimising social stress in the care of captive bottlenose dolphins (Tursiops aduncus).* Zoo Biology 21, p.: 5-26; ROSE, N. A., G. Hancock Snusz, D. M. Brown and E. C. M. Parsons (2017). *Improving captive marine mammal welfare in the United States: Science-based*

groupings at SeaWorld. Unlike in the wild, the orca do not have the option to choose with whom they associate, but rather their social groupings are determined by those operating the facility, causing potentially significant social stress.[541]

12. Forced Separations

374. Contributing to the stress experienced by its captive orca, SeaWorld has a practice of separating orca from one another, including family members, for a variety of purposes.

375. [redacted]

recommendations for improved regulatory requirements for captive marine mammal care. Journal of International Wildlife Law & Policy 20(1), p. 38-72.

[541] WAPLES, K. A. and N. J. Gales (2002). *Evaluating and minimising social stress in the care of captive bottlenose dolphins (Tursiops aduncus)*. Zoo Biology 21, p. 5-26.

[redacted][542]

376. [redacted] "The highest non-management level in Sea World's hierarchy is senior trainer 1 (Exh. C-1, Section IX)"[543] — [redacted]

[542] SW-AND0244701.

[543] Page 5 of OSHRC Docket No. 10-1705, Secretary of Labor, *Complainant v. SeaWorld of Florida LLC*, Before: Administrative Law Judge Ken S. Welsch DECISION AND ORDER, available from: https://www.dol.gov/sol/regions/PDFs/ATLdecisionSeaWorld.pdf.

[redacted][544]

377. In a peer-reviewed paper by Robeck et al (2004) (in which four of the six authors are SeaWorld veterinarians: Drs. Robeck, Gearhart, Reidarson and McBain), the authors state that: "*During the AI procedures, candidate females were kept isolated from any breeding age males for 2 wk before and for 2 wk after the inseminations*."[545]

378. Such separations (even short-term) can be stressful for the orca. [redacted][546]

[544] SW-AND0276916

[545] p 651 in ROBECK, T. R., K. J. Steinman, S. Gearhart, T. R. Reidarson, J. F. McBain and S. L. Monfort (2004). *Reproductive physiology and development of artificial insemination technology in killer whales (Orcinus orca).* Biology of Reproduction, 71, p. 650-660.

[546] SW-AND0185304.

379. [redacted][547]

380. Such extensive social reshuffling is undocumented in any population of orca in the wild (including those who have a fission-fusion society – see details describing this type of social structure elsewhere in this report).

381. The levels of aggression that are described within [redacted] the accounts, videos and photographs I have seen in the public domain, and the injuries I have seen when I have visited SeaWorld are, in my professional opinion, a facet of this constant artificial restructuring of the social groupings in such an unnatural and unstable manner.

382. [redacted]

[547] SW-AND0276916.

[redacted]

383. In wild populations of orca, it is important to note that the social structures are predominantly established through non-aggressive stable matrilines with matrifocal animals key to the social structure[548]. In effect, there are no documented cases of aggression involving attacks like those described as occurring frequently at SeaWorld. Although altercations do occur in the wild (*e.g.*, see the paper I authored regarding prolific body scars on two male orca in the waters off New Zealand), they occur very rarely. Indeed, in the intervening years since I published these accounts (in 1998), no other such raking has been published (by myself or any other researchers, worldwide).

384. [redacted][549] [redacted]

[548] BRENT, L. J. N., D. W. Franks, M. A. Cant and D. P. Croft (2015). *Ecological knowledge, leadership, and the evolution of menopause in killer whales*. Current Biology, 25, p. 746-750.

FOSTER, E. A., D. W. Franks, S. Mazzi, S. K. Darden, K. C. Balcomb, J. K. B. Ford and D. P. Croft (2012). *Adaptive prolonged postreproductive life span in killer whales*. Science. 337, p. 1313.

FOSTER, E. A., D. W. Franks, L. J. Morrel, K. C. Balcomb, K. M. Parsons, A. M. Van Ginneken and D. P. Croft (2012). *Social network correlates of food availability in an endangered population of killer whales, Orcinus orca*. Animal Behavior, 83, p.731-736.

[549] *See, e.g.*, BURTIS Dep. Tr. at 128:9-23 [redacted]

[redacted][550]

385. [redacted]

550 SW-AND0186992 (emphasis added).

[redacted][551]

13. Dissemination of other misinformation

386. As noted above, CMS (*i.e.*, the Convention on the Conservation of Migratory Species of Wild Animals) recognises the nomadic lifestyle of orca, having determined them to be a species that migrates or passes through a range of territorial waters.[552] Despite this inclusion as a migratory species, I noted when, in September 2011, I visited Loro Parque in Spain (where SeaWorld orca are on display), that their 'educational' signage (a small plaque next to the show times) erroneously listed the orca as "Not Included" under CMS. Additionally, I noted that Loro Parque had also erroneously listed the orca as "Not Included" in the CITES (Convention on the Trade in Endangered Species), when in both cases orca are in fact 'listed' as species of concern. It is my understanding that both CMS and CITES are global treaties to which Spain is a signatory.

387. By 2015, Loro Parque had changed the layout of their signage. However, that new sign (Figs. [117], [118], and [119]), at the stadium main entrance still failed to convey correct information to the public, erroneously listing that orca were

[551] SW-AND0185909.

[552] https://www.cms.int/en/species/orcinus-orca
https://www.cms.int/sites/default/files/document/II_7_Orcinus_orca_Australia_e.pdf

'Not Included' under CMS listing (*i.e.*, conveying that they were not a species that would warrant inclusion in the exclusive group of 'wide-ranging' animals).

388. Loro Parque's error was exposed in a comprehensive report,[553] and shortly afterwards, in 2015, Loro Parque attempted to correct their mistake by placing a sticker over the offending section (Fig. [120]). However, despite this "correction," the signage at the second gate still remains incorrect (as of Jan 2019, Fig. [121]).

389. Figure [117] below depicts the front entrance stadium sign at Loro Parque, where the SeaWorld orca perform three shows a day, throughout year. The sign, which contains the full educational component (lower left), contains erroneous information (*see* Fig. [118]). Note that the Orca Ocean entertainment "Showtime" section and the warnings to visitors of the prohibitions against eating, drinking and smoking, both literally and figuratively, dwarf the education information section.

[553] SPIEGL, M. and I. N. Visser (2015). *CITES and the Marine Mammal Protection Act: Comity and Conflict at Loro Parque,* Free Morgan Foundation, p.129.

Figure [117][554]

390. Figure [118] below depicts the 2015-2019 version of the 'educational' component of the sign at Orca Ocean stadium, Loro Parque. This is the only sign in the area and it incorrectly portrays the depth that the animals live in (or perhaps the maximum depths they dive to – the information is not clear as to what exactly it pertains to) and the food types that they consume (leaving out major food groups such as elasmobranchs, cephalopods and cetaceans.

[554] Photo taken 20151006 © Ingrid N. Visser.

Figure [118]

391. Figures [119], [120], and [121] depict the CMS (left) and CITES (right) component of the 'educational' section of the signage at Loro Parque, housing the SeaWorld orca. Specifically, Figure [119] is from a sign at the front gate of the stadium (taken in 2011) and the same verbiage and illustration appeared on the new sign in 2015 (see Fig. [120]). Following exposure for their misleading information, Loro Parque 'corrected' the mistake (middle image) by placing a sticker over only this offending section (failing to correct any of the other errors). As shown in Fig. [121],

the sign at the secondary entrance to the stadium has remained uncorrected (as of Jan 2019, lower image) since it was first photographed in 2011.

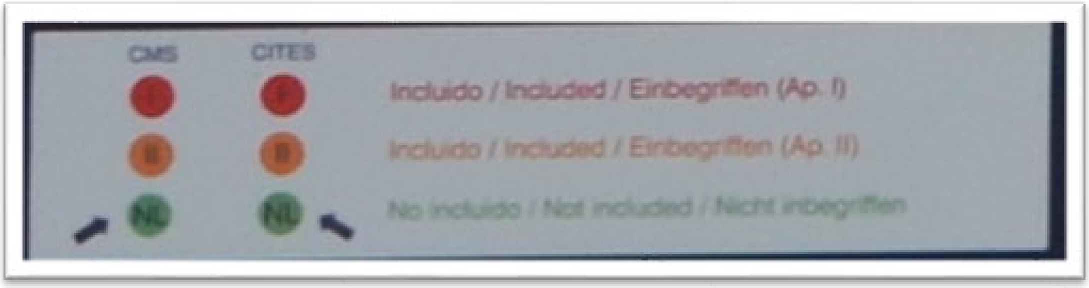


Figure [119][555]

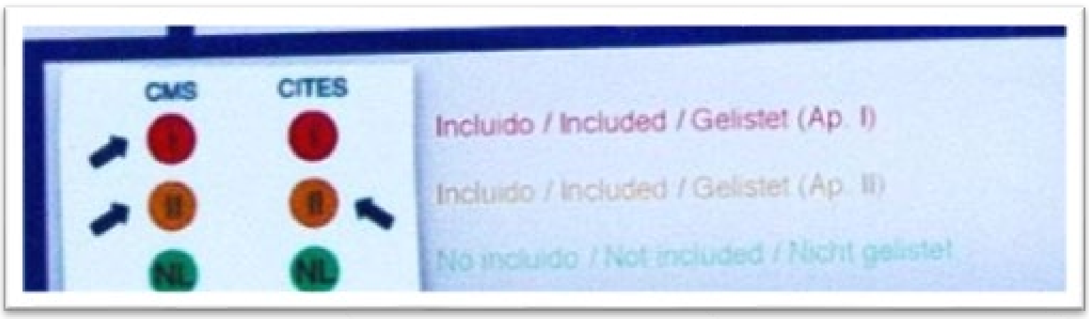


Figure [120][556]

Figure [121][557]

555 Primary entrance (2011 - 2015).

556 Primary entrance (2015).

557 Secondary entrance (2011-2019).

392. Both the primary and secondary gate signs have always stated incorrectly that the maximum depth that orca dive to is 500m (or, if interpreted another way, the maximum depth of water the species can be found in is 500m – both of which are incorrect by at least 500 m).

393. Both signs do not portray an accurate picture of the incredibly wide range of prey items that orca consume, leaving off, *inter alia* the major prey groups of elasmobranchs (sharks and rays), cephalopods (squids and octopus) as well as cetaceans (whales and dolphins).

394. Such information is not only duplicitous, but it also indicates a lack of knowledge of the basic requirements for the species.

VII. OPINION ON SEAWORLD'S CAPTIVE ORCA'S DORSAL FINS

1) Background

1. Dorsal Fin Function

395. Orca have evolved over millions of years and have adapted to a fully-aquatic life. As detailed earlier, they are sexually dimorphic, with the adult males being larger overall (in length, girth and weight), and also having larger pectoral fins, curled tail flukes and a dorsal fin that is up to 1.8m in height. The dorsal fins of adult male orca are generally 'triangular' in shape. The dorsal fins serve a critical function as a thermoregulator through the use of countercurrent heat exchange.

396. From as early as 1936, systemic studies of the cetacean anatomical systems had revealed artery-vein bundles in dorsal fins and hypothesized that they

function as 'heat sinks.'[558] By 1955, researchers published papers on the counter-current heat exchange blood vessel systems of cetaceans.[559] They also noted differences in the number of bundles of arteries and veins in the dorsal and pectoral fins, and tail flukes. They documented the similarities between different species (in this case bottlenose dolphins and Pacific white-sided dolphins (*Lagenorhynchus acutus*)).[560] They published the first photographs of these bundles, shown below in Figure [122].

[558] SLIJPER, E. J. (1936). *Die Cetaceen : vergleichend-anatomisch und systematisch : ein Beitrag zur vergleichenden Anatomie des Blutgefäss-, Nerven- und Muskelsystems, sowie des Rumpfskelettes der Säugetiere, mit Studien über die Theorie des Aussterbens und der Foetalisation*. S-Gravenhage, Nijhoff.

[559] SCHOLANDER, P. F. and W. E. Schevill (1955). *Counter-current vascular heat exchange in the fins of whales*. Journal of Applied Physiology 8(3), p. 279-282.

[560] *Id*.

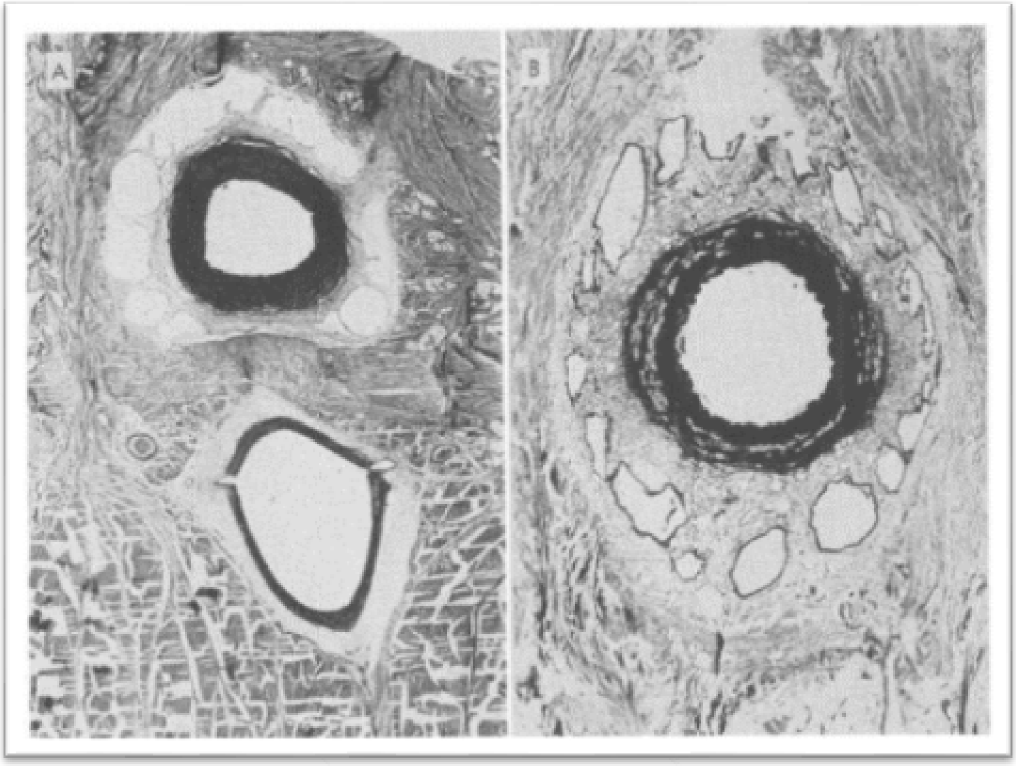


Figure [122][561]

397. The photos in Figure [122] above show sections through the tail fluke (left) and dorsal fin (right) of a bottlenose dolphin, illustrating the bundles comprised of the arteries surrounded by veins.

398. Over the decades, the function of dorsal fins in cetaceans was further investigated by various researchers,[562] and it is generally accepted that the dorsal fin

[561] *Id.* at 281.

[562] [1] See list of references in 'VISSER, personal scientific library' – but some relevant works include;

COZZI, B., S. Huggenberger and H. Oelschlager (2016). *Anatomy of dolphins: insights into body structure and function.* Amsterdam, Boston, Heidelberg, London, New York, Oxford, Paris, San Diego, San Francisco, Singapore, Sydney, Tokyo Academic Press.

is a 'thermoregulatory window' – a zone of high blood flow that is involved in thermoregulation. It also generally accepted that dorsal fins, as part of that thermoregulatory window, have an extensive network of blood vessels (as illustrated in a bottlenose dolphin in Figure [123] below), that acts as a counter-current heat exchange. As shown in Figure [123], the periarterial venous rete (PAVR) system is comprised of a network (rete) of arteries, each of which is surrounded by veins, which creates a counter-current heat-exchange system. As warm blood flows to the dorsal fin through an artery, it gives off heat to the blood returning to the core of the whale through its veins. This is a significant way to save heat, as the heat would otherwise be lost to the water.

FELTS, W. J. L. (1966). *Some functional and structural characteristics of cetacean flippers and flukes.* Whales, Dolphins and Porpoises. K. S. Norris. California, University of California, p. 255-396.

PAVLOV, V. V. (2003). *Wing design and morphology of the harbour porpoise dorsal fin.*Journal of Morphology 258, p. 284-295.

MEAGHER, E. M., W. A. McLellan, A. J. Westgate, R. S. Wells, D. Frierson and D. A. Pabst (2002). T*he relationship between heat flow and vasculature in the dorsal fin of wild bottlenose dolphins Tursiops truncatus.* The Journal of Experimental Biology 205, p.: 3475-3486.

SCHOLANDER, P. F. and W. E. Schevill (1955). *Counter-current vascular heat exchange in the fins of whales.* Journal of Applied Physiology 8(3), p. 279-282

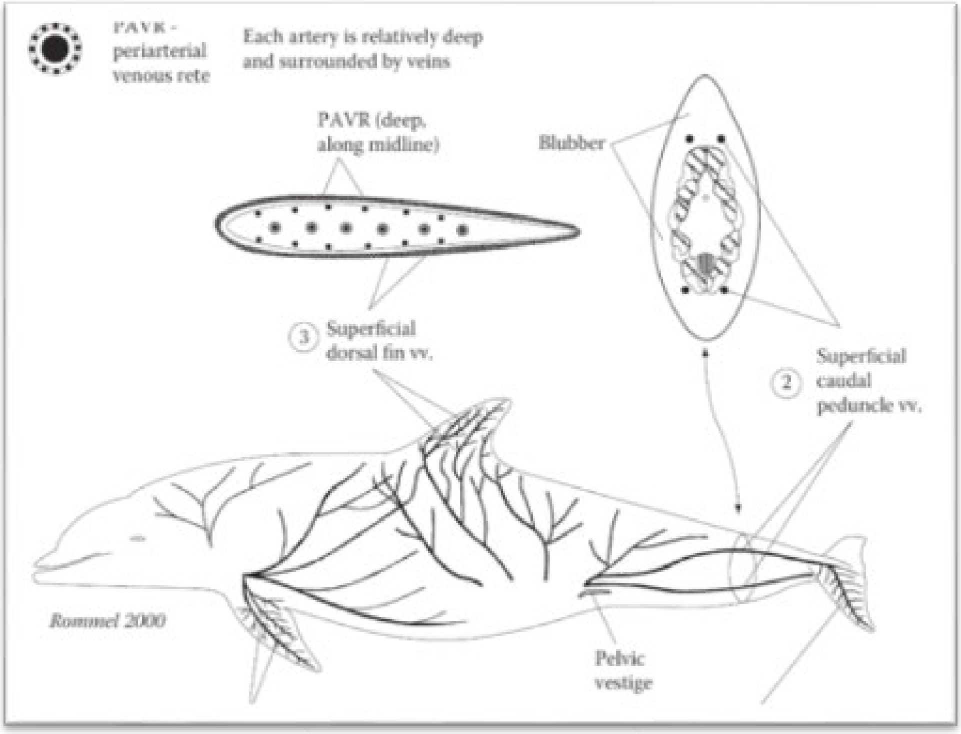


Figure [123][563]

399. A simplified counter-current heat exchange, with a schematic of the bundle of central artery & circumarterial veins (lower right) is shown below in Figure [124]. As shown in the figure, the counter-current system involves warm blood from the body core (pumped by the heart, through the arterial system), reaching the extremities (such as the pectoral fins, flukes and the dorsal fin). The now relatively-cooled blood then returns from these extremities. The close proximity of the veins to the arteries in the 'bundles' results in an 'exchange' of heat as the blood flow passes by. A photograph of these bundles, *in situ* in a transection of an orca dorsal fin, is provided below in Figure [125] (three bundles are visible).

[563] GULLAND et al. (2018), CRC Handbook of Marine Mammal Medicine, p.828.

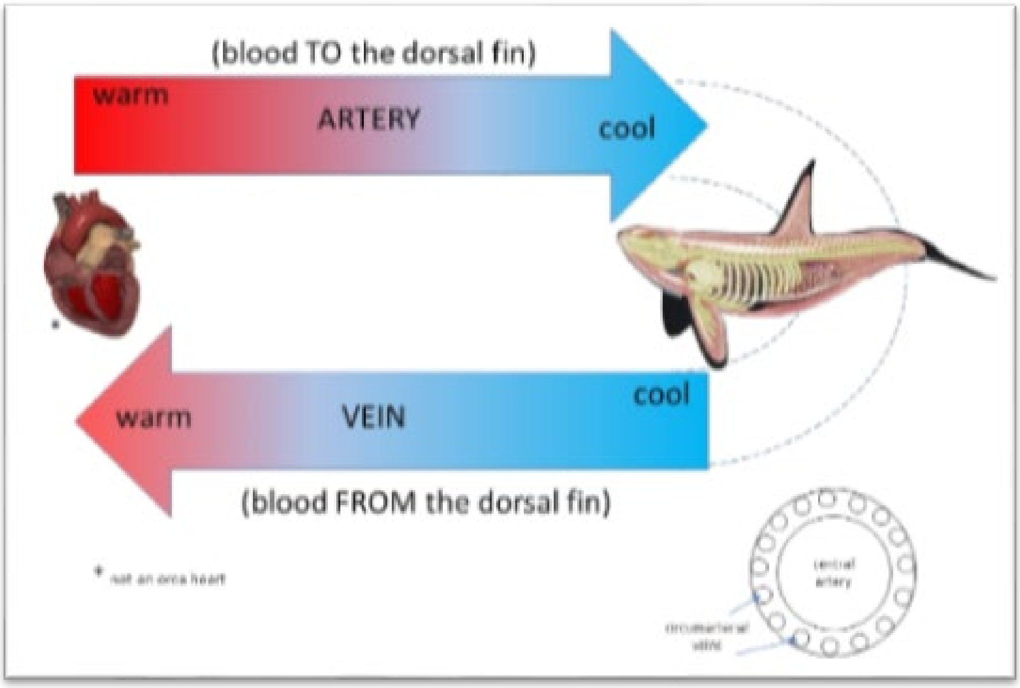


Figure [124][564]

[564] Schematic © Ingrid N. Visser.

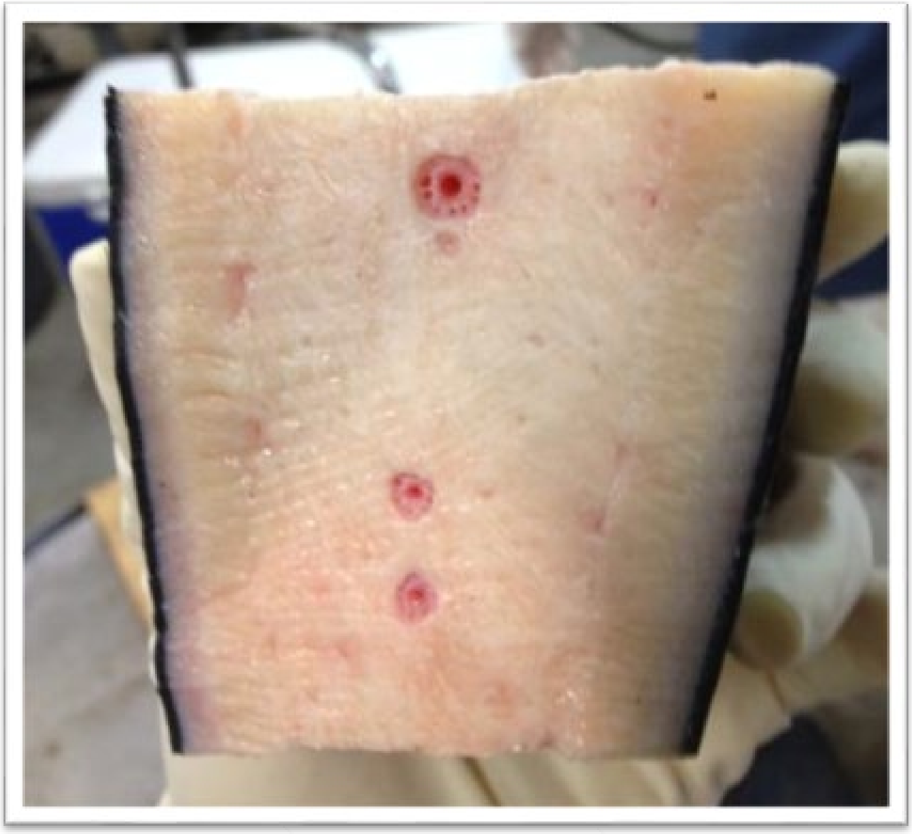


Figure [125][565]

400. SeaWorld has a section termed 'Thermoregulation' on its 'Bottlenose dolphins / adaptations' webpage,[566] which includes a gif (animated graphic) showing how an artery-vein heat-exchange system works. I have reproduced screenshots of SeaWorld's website in Figure [126] below:

565 Photo © Juliana Houghton, https://julianahoughton.wordpress.com/tag/dorsal-fin/.

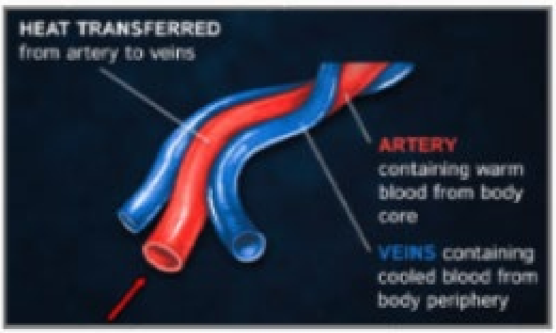
566 https://web.archive.org/web/20190206162104/https://seaworld.org/animals/all-about/bottlenose-dolphin/adaptations/.

Thermoregulation

Like other mammals, dolphins maintain a constant body temperature. A dolphin's core body temperature is about 36° to 37°C (96.8° to 98.6°F), about the same as that of a human.

Dolphins have several thermoregulatory strategies to retain or release heat.

- **Decreased surface-to-volume ratio.** The dolphin's fusiform body shape and reduced limb size decrease the amount of surface area exposed to the external environment. This helps dolphins conserve body heat. Dolphins adapted to cooler, deeper water generally have larger bodies and smaller flippers than coastal dolphins, further reducing the ratio of surface area to overall body mass.
- **Increased insulation.** Dolphins deposit most of their body fat into a thick layer of blubber. This blubber layer insulates the dolphin, helping to conserve body heat. Blubber differs from fat in that it contains a fibrous network of connective tissue in addition to fat cells. A bottlenose dolphin's body fat generally accounts for about 18% to 20% of its body weight.
- **Heat exchange system.** A bottlenose dolphin's circulatory system adjusts to conserve or dissipate body heat and maintain body temperature. Arteries in the flippers, flukes, and dorsal fin are surrounded by veins. Thus, some heat from the blood traveling through the arteries is transferred to the venous blood rather than the environment. This countercurrent heat exchange aids dolphins in conserving body heat.
  - In cold water, circulation may decrease to blood vessels near the surface of the flippers, flukes, and dorsal fin, and increase to blood vessels circulating blood to the body core, thus conserving body heat.
  - During prolonged exercise or in warm water, a dolphin may need to shed excess heat. In this case, circulation increases to blood vessels near the surface of the flippers, flukes, and dorsal fin, and decreases to blood vessels circulating blood to the body core. Excess heat is shed to the external environment.



In general, bottlenose dolphins have a higher metabolic rate than land mammals of similar size. This increased metabolism generates a great deal of body heat.

Mammals lose body heat when they exhale. But dolphins conserve a considerable amount of heat because they breathe less frequently than land mammals.

Figure [126][567]

401. The screenshots in Figure [126] from SeaWorld's website explain the importance of the dorsal fin for thermoregulation. Indeed, the heat flux in bottlenose

[567] https://web.archive.org/web/20190206162104/https://seaworld.org/animals/all-about/bottlenose-dolphin/adaptations/

dolphins can more than double in their dorsal and pectoral fins after exercise, illustrating again, the importance of the dorsal fin for thermoregulation.[568]

402. Similarly, at deposition, SeaWorld's veterinarian Dr. Dold, characterized the dorsal fin as a "radiator" and described the critical function it plays in orca.[569] Moreover, Dr. Dold's publications cite peer-reviewed papers about thermoregulation, including that involving dorsal fins. For example, in a paper on the basal metabolism of an adult male orca (named Tilikum), Dr. Dold stated: "*Most direct assessments of metabolism in cetaceans have focused on smaller species, with a number of studies examining basal metabolism. . . and thermoregulatory capabilities (e.g., Williams et al. 1999, Williams et al. 2001, Meagher et al. 2002).*"[570] Dr. Dold has acknowledged the importance of temperature control for cetaceans in his other writings too, for example regarding the transporting marine mammals (under the section for cetaceans).[571] He observed:

> Temperature control is of paramount importance. Since most of a cetacean's body is enclosed within a layer of thick, insulating blubber, thermoregulation in the water is controlled through constriction or dilation of the peripheral

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[568] HAMPTON, I. F. G. and G. C. Whittow (1976). *Body temperature and heat exchange in the Hawaiian spinner dolphin, Stenella longirostris.* Comparative biochemistry and physiology 55A, p. 195-197.

[569] Dold Dep. Tr. at 58:5–59:16.

[570] WORTHY, G. A. J., T. A. M. Worthy, P. K. Yochem and C. Dold (2014). *Basal metabolism of an adult male killer whale (Orcinus orca).*" Marine Mammal Science 30(3), p. 1229-1237.

[571] YIP, K. A. and C. Dold (2018). *Marine Mammal Transport.* CRC Handbook of marine mammal medicine. F. M. D. Gulland, L. A. Dierauf and K. L. Whitman. Boca Raton, Florida, USA, CRC Press, p799, 801.

> vessels in the heavily vascularized pectoral flippers, tail flukes, and dorsal fin (Slijper 1979). Consequently, cetaceans are less able to dissipate excess heat when removed from the water, due to the lower thermal conductivity of air.

403. The thermoregulatory function of the dorsal fin is especially significant for an orca. During a single dive, the range of temperatures that an orca may experience can be dramatic. For example, off the coast of Japan, tags on diving sperm whales demonstrated: "The temperature profiles showed a rapid decline in the upper 200 m from the surface in both areas: from 27.0°–29.0°C to 18.7°–19.3°C off the Ogasawara Islands and from 20.3°–21.5°C to 10.1°C off the Kumano Coast").[572] The dive profiles of the sperm whales reached depths within those recorded for orca, in various studies from around the world.[573]

404. The ability of an orca to maintain optimal body temperature in a variety of water temperatures, within a single dive, speaks to the efficiency of their thermal regulation adaptation. This ability is also maintained whilst the animals are extremely active in the water (*i.e.*, swimming, foraging, etc.), across seasons and migrations, across different reproductive states (*e.g.*, a pregnant female), and across

[572] AOKI, K., M. Amano, M. Yoshioka, M. Kyoichi, D. Tokuda and N. Miyazaki (2007). *Diel diving behavior of sperm whales off Japan.*" Marine Ecology Progress Series 349, p. 277-287, 282.

[573] See list of references in 'VISSER, personal scientific library' the maximum depth recorded at 1087m, by; TOWERS, J. R., P. Tixier, K. A. Ross, J. Bennett, J. P. Y. Arnould, R. L. Pitman and J. W. Durban (2018). *Movements and dive behaviour of a toothfish-depredating killer and sperm whale.*" ICES Journal of Marine Science, p. 1-14.

all ages (*e.g.*, small calves vs. large adults). Given the effectiveness of this system, it allows the individual to stay warm in water (keeping in mind that water has a thermal conductivity 24 times greater than that of air), by utilizing blubber and the counter-current blood vessels.

405. These same thermoregulatory mechanisms have evolved in orca, and indeed all marine mammals, to not only conserve heat, but to also disperse heat when necessary, in an attempt to counteract overheating. Therefore, when the normal functioning of the dorsal fin is compromised, an orca could potentially overheat. Should overheating arise, it would cause problems with basic body functions that any mammal would face, such as dehydration, blood chemistry imbalances, metabolic regulation issues, neural system dysfunction and all the side effects (short-term or chronic) that may develop.

406. Proper temperature regulation is critical to an orca's health, including the healthy functioning of its organs. Studies of both male and female sex organs in cetaceans (which are internal) have shown that "*Cooled venous blood from the surfaces of the dorsal fin and flukes enters the abdominal cavity … the morphology … suggests that it acts as a "heat sink" for the adjacent tissues. … The countercurrent heat exchanger created [in females]… is similar in design to that of the countercurrent heat exchanger described for male cetaceans*."[574]

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[574] ROMMEL, S. A., et al. (1993). *Functional morphology of the vascular plexuses associated with the cetacean uterus*. The Anatomical Record 237, p. 538-546; ROMMEL, S. A., et al. (1992). *Anatomical evidence for a countercurrent heat exchanger associated with dolphin testes*. The Anatomical Record 232, p. 50-156.

2. Dorsal fin irregularities

407. A healthy cetacean dorsal fin is straight (*i.e.*, perpendicular to the animal's body). Damage to the structural integrity of the fin can cause a curvature, or deformity in the dorsal fin; such a fin is atypical. Plaintiffs' counsel have advised me that although SeaWorld recognizes that various dorsal fin irregularities exist,[575] it does not have any understanding of what the irregularities, including "bent" or "collapsed" dorsal fins, actually are.[576]

408. These irregularities are classified based on two broad factors: (1) the height of the section of the fin that has lost structural integrity and (2) the angle of the curvature. When less than 50% of the dorsal fin, as measured by height, has lost structural integrity, the dorsal fin is "bent." But, when 50% or more of the dorsal fin has lost structural integrity, the dorsal fin is "collapsed." Collapsed dorsal fins can be subcategorized into "fully" or "partially" collapsed dorsal fins. A partially collapsed dorsal fin is one that curves at less than 45 degrees from the perpendicular axis to the orca's body, while a fully collapsed dorsal fin is one that curves at greater than 45 degrees.[577] The photos below in Figure [127] illustrate the difference in curvature between a bent fin and a fully collapsed fin.

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[575] SeaWorld's Response to Plaintiffs' Interrogatory No. 3 ("Dorsal fin irregularities . . . include dorsal fins that are curved, wavy, twisted, scarred, bent, or collapsed.").

[576] SeaWorld's Response to Plaintiffs Interrogatory No. 15.

[577] KASTELEIN, R., R. Triesscheijn, and N. Jennings. (2016). *Reversible Bending of the Dorsal Fins of Harbor Porpoises (Phocoena phocoena) and a Striped Dolphin (Stenella coeruleoalba) in Captivity*.p. p. 221 (quantifying dorsal fin bending in harbor porpoises by measuring degrees from perpendicular axis to body)

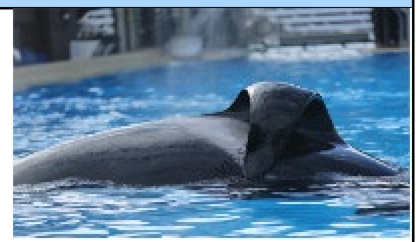
Bent fin	**Partially collapsed fin**	**Fully collapsed fin**
		

Figure [127][578]

409. Plaintiffs' counsel further advise me that SeaWorld is claiming that the term "collapse" as used in relation to orca dorsal fins is "vague and ambiguous."[579] [redacted]

[578] http://orcahome.de/makaio.htm; Photos from my November 28, 2018 inspection of SeaWorld San Diego.

[579] SeaWorld's Objections and Responses to Pls. First Set of Requests for Admission, Objection to Definition No. 3 ("SeaWorld objects to this definition ["collapsed dorsal fin"] as vague and ambiguous; DOLD Dep. Tr. at 55:19-24 [redacted] ROBECK Dep. Tr. at 42:17-21 [redacted] *see also* SCHMITT Dep. Tr. at 33-37 [redacted]

[redacted][580]

2) Dorsal fin irregularities among SeaWorld orca

410. The evidence I have reviewed indicates that most, if not all, of SeaWorld's adult male orca suffer from dorsal fin collapse. For example, SeaWorld concedes that "most of [its] adult male killer whales have curved dorsal fins."[581] [redacted][582] [redacted]

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[580] *See, e.g.*, GASS Dep. Tr. at 182:15-18 [redacted]

[581] SeaWorld's Second Supplemental Responses to Plaintiffs' Second Interrogatories, Supplemental Response to Interrogatory No. 3.

[582] SCHMITT Dep. Tr. at 19:2-22:2; *see also* ROBECK Dep. Tr. at 51:1-9 [redacted]

Q. [redacted]

MR. ISER: Object to form.

THE WITNESS: [redacted]

Figure [128][583]

411. On November 28, 2018, I visited SeaWorld's San Diego park for a site inspection. During my inspection, I observed, photographed, and filmed the orca at the facility, including the adult male orca.[584] I also viewed images of SeaWorld's orcas obtained from other sources, for example, in SeaWorld's document production, from my own visits to SeaWorld, and on the internet. [redacted]

412. Although less prevalent, I have observed dorsal fin irregularities during my inspection of adult female orca at SeaWorld San Diego.[585] Moreover, of the four

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[583] SCHMITT Dep. Tr. at 43:18-24.

[584] I understand that the photographs and videos from that inspection have been provided to SeaWorld. I have relied on those in the preparation of this report and reserve the right to rely on those materials at any hearing in this case, including at trial.

[585] *See, e.g.*, SW-AND0184140 [redacted] at SW-AND0184272 [redacted]

adult female orca at SeaWorld San Diego, Shouka has a partially collapsed dorsal fin, as illustrated in the Figure below (Shouka is the left orca).

Figure [129][586]

413. My observations of dorsal fin collapse in SeaWorld's adult orca, both male and female, are consistent with studies regarding captive orca in general. For example, Dr Naomi Rose (2009) wrote that not only do nearly all captive male orca have fully collapsed dorsal fins, but many captive females similarly suffer from "fully or partially collapsed dorsal fins."[587]

586 http://orcahome.de/shouka.htm

587 ROSE, N. A., Parsons, E. C. M. & Farinato, R. (2009). *The Case Against Marine Mammals In Captivity*. The Human Society of the United States and the World Society for the Protection of Animals, p. 52.

3) Dorsal fin irregularities in the wild

414. Dorsal fin irregularities are rare among wild orca. I understand that SeaWorld does not dispute this, and recognizes that "the most recent research of well-studied free-ranging populations noted a percentage of individuals with bent dorsal fins between .7 and 5.6."[588]

415. In addition to the incidence of bent dorsal fins among wild orca being under 6%, the evidence shows that less than 1% of wild orca exhibit collapsed dorsal fins.[589] In addition, to my knowledge no free-ranging female orca has been observed with a collapsed dorsal fin[590].

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[588] SeaWorld's Objections and Responses to Plaintiffs' First Requests for Admission, p. 5; SeaWorld' Objections and Responses to Pls. First Set of Requests for Admission, Request No. 6; *see also* GASS Dep. Tr. at 182:15-18 [redacted] *id.* at 184:6-13 [redacted] JACOBS Dep. Tr. at 106:24-107:6 [redacted]

[589] ROSE, et al. (2009), p.52 (only one to five percent of whales in British Columbia have fully collapsed fins); Visser 2000 (Orca (*Orcinus orca*) in New Zealand Waters) at 181 (0.01% of Alaska whales have collapsed or bent fins); Visser 2000 at 181(0.57% of Norway whales have collapsed or bent fins); JETT and Ventre 2012 (only about one percent of wild orcas exhibit dorsal fin collapse)

[590] I am not aware of any reports of a free-ranging female orca having a collapsed dorsal fin. I also reviewed the following catalogues and found no free-ranging orca with collapsed dorsal fins:

416. Based on my decades of studying wild orca across the world, including my field work and rescuing orca, it is my opinion that dorsal fin collapse in the wild is typically caused by a severe event – such as an illness, stranding or an injury (e.g., shooting, entanglement or collision with vessels).[591] Therefore, the statistics of dorsal fin collapse in the wild are likely artificially inflated due to external causative factors of collapse, such as these severe events, as opposed to causes that SeaWorld believes cause dorsal fin irregularities: "age, stress, attacks from other whales, and time spent at the surface."[592]

417. Notwithstanding this inflation of collapsed dorsal fins due to trauma, the incidence of collapse is drastically different (lower) in the wild, compared to in the

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BIGG, M. A., G. M. Ellis, J. K. B. Ford and K. C. Balcomb (1987). *Killer whales: A study of their identification, genealogy and natural history in British Columbia and Washington State*. Nanaimo, B.C, Phantom Press and Publishers.

BURDIN, A. M., E. Hoyt, H. Sato and O. A. Filatova (2006). THE KILLER WHALES OF EASTERN KAMCHATKA. Seward, Alaska, Alaska SeaLife Center.

FORD, J. K. B., G. M. Ellis and K. C. Balcomb (1994). *Killer whales: The natural history and genealogy of Orcinus orca in British Columbia and Washington State*. Vancouver, University of British Columbia Press.

HEISE, K., G. M. Ellis and C. Matkin (1991). *A catalogue of Prince William Sound killer whales*, North Gulf Oceanic Society.

TIXIER, P., N. Gasco, C. Roche and C. Guinet (2009). *Catalogue de Photo-Identification 2009*. Orques des Iles Crozet. Beauvoir sur Niort, Centre d'Etudes Biologiques de Chizé - CNRS: 30.

[591] NMFS (2008), at II-46

[592] SeaWorld's Response to Plaintiffs' Interrogatory No. 3.

SeaWorld population. For example, 1 in 30 males in the New Zealand population had a collapsed dorsal fin.[593]

4) Evidence shows that captivity at SeaWorld contributes to higher incidence and severity of dorsal fin irregularities among killer whales

1. <u>Orca in captivity spend significantly more time "logging" as compared to orca in the wild, contributing to dorsal fin collapse</u>

418. Orca in captivity spend inordinate periods of time at the surface with their dorsal fins partially or fully exposed. For example, one female, three weeks post-partum, was documented 'resting' "(hanging motionless at the surface or in depth and lying on the bottom of the pools)" 54% of the time.[594] When discussing cetacean sleep regarding orca observed at SeaWorld San Diego, Dr. Oleg Lyamin stated that they "*can be completely immobile for about 1 h or even longer while floating at the surface.*"[595]

419. From when orca were first subjected to captivity, it was recognized that they spent considerable amounts of time 'at the surface'. For example, Spencer et al (1967) wrote "*When completely undisturbed, Namu often floated on the surface, back arched, with the blowhole above water, breathing at fairly regular intervals.*"[596]

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[593] Ibid.

[594] LYAMIN, O. I., O. V. Shpak and J. M. Siegel (2003). *Ontogenesis of rest behavior in killer whales*. <u>Sleep</u> 26 p. 116.

[595] LYAMIN, O. I., P. R. Manger, S. H. Ridgeway, L. M. Mukhametov and J. M. Siegel (2008). *Cetacean sleep: An unusual form of mammalian sleep*. Neuroscience and Biobehavioral Reviews, 32, p. 1451-1484.

[596] SPENCER, M. P., T. A. Gornall, III and T. C. Poulter (1967). *Respiratory and cardiac activity of killer whales*. Journal of Applied Physiology 22, p. 974-981.

420. Two ex-SeaWorld orca trainers have discussed the logging behavior of captive orca at SeaWorld and stated that "*[u]nlike their wild counterparts who are rarely stationary, captive orcas typically spend hours each day (mostly at night) floating motionless (logging) during which time biting mosquitoes access their exposed dorsal surfaces*." And they noted that "*[w]e routinely observed long periods of logging behavior during night watch duties at the park, which coincided with the presence of biting mosquitoes*." They specifically refer to logging, small tanks and dorsal fins when they write "*[c]ompared to wild orcas who are rarely stationary (32), orcas in captivity spend much of their daily cycle logging (floating motionless) due to the spatial constraints imposed by living in shallow pools. This size limitation is evidenced by the fact that Kanduke* [an adult male orca held at SeaWorld] *lived in a pool system where only one pool was deeper (10.9m) than he was long (6.7m). Logging behavior is especially prevalent among captive male orcas, which we estimate to comprise >50% of their total daily behavioral repertoire, on average. Evidence of the inordinate time spent surface resting is thought by some to manifest in the many collapsed dorsal fins of adult captive males. In contrast, less than one percent of wild adult males exhibit this physical abnormality, as wild orcas spend too little time with dorsal fins unsupported by the water column to affect collapse*." They reiterate and draw attention to the size of the tanks in comparison to the size of the orca "*[l]ogging behavior, in which animals float motionless at the surface of the water, is especially common among large males who are often longer than the depths of the pools they inhabit*." They linked the logging to other issues associated with the behavior when

they stated "*we commonly observed sunburnt dorsal surfaces of the captive orcas we worked with, especially among those animals prone to sustained logging*."[597]

421. As another example, one adult male orca (Tilikum) was estimated to be only "27 yr of age" and was held at SeaWorld for years.[598] A study conducted on him included "[a]ctivity budget data … obtained by animal care staff [by] observing the animal continuously (24 h/d) for a period of seven consecutive days, during which time durations of different behavioral states were monitored and recorded. These behavioral states consisted of resting (<1.0 m/s), slow speed swimming (1.0 m/s), moderate swimming (2.0 m/s), and active swimming/performing (3.0 m/s) and were collectively used to generate a time-activity budget that could be compared to food intake as an independent assessment of metabolic expenditure. On average the whale spent **69.6% (16.7 h) of the day resting**, 13.3% (3.2 h) of the day undertaking slow speed swimming (1.0 m/s), 12.5% (3.0 h) of the day doing moderate swimming (2.0 m/s), and 4.5% (1.1 h) active swimming and/or performing[.]"[599]

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[597] JETT, J. and J. M. Ventre (2012). *Orca (Orcinus orca) captivity and vulnerability to mosquito-transmitted viruses*. Journal of Marine Animals and Their Ecology, 5(2), p. 9-16.

[598] WORTHY, G. A. J., T. A. M. Worthy, P. K. Yochem and C. Dold (2013). *Basal metabolism of an adult male killer whale (Orcinus orca)*. Marine Mammal Science, 30(3), p. 1229-1237.

[599] WORTHY, G. A. J., T. A. M. Worthy, P. K. Yochem and C. Dold (2013). *Basal metabolism of an adult male killer whale (Orcinus orca)*. Marine Mammal Science, 30(3) p. 1229-1237 (emphasis added).

422. Captive orca have been noted to spend more than three times as much time at the surface, than orca in the wild.[600] In the wild, orca spend approximately 95% of their time underwater.[601]

423. [redacted]

- BURTIS Dep. Tr. at 205:13-21 [redacted]
- DOLD Dep. Tr. at 65:9-66:8 [redacted]

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[600] JACOBSEN, J. 1990. *The social ways of sleeping orca*. Whalewatcher, Fall1990, p. 6-8;

FORD, J. K. B. (2008). *Killer whale. Orcinus orca*. In: PERRIN, W. F., WÜRSIG, B. & THEWISSEN, J. G. M. (eds.) Encyclopedia of marine mammals. San Diego: Academic Press; FORD, J. K. B. (1989). *Acoustic behaviour of resident killer whales (Orcinus orca) off Vancouver Island, British Columbia*. Canadian Journal of Zoology, 67, p. 727-745; JACOBSEN, J. (1985). *Respiratory patterns during rest and sleep of the killer whales (Orcinus orca) in the Johnstone Strait, British Columbia*. CETUS, 6, 18.

[601] BAIRD, R. W. 2000. *The killer whale. Foraging specializations and group hunting*. In: MANN, J., CONNOR, R. C., TYACK, P. L. & WHITEHEAD, H. (eds.) Cetacean Societies: Field studies of dolphins and whales. Chicago: University of Chicago Press.

[redacted]

- GASS Dep. Tr. at 178:18-23 [redacted]
- JACOBS Dep. Tr. at 107:1-3 [redacted]
- ROBECK Dep. Tr. at 79:19-23 [redacted]
- WILLIAMS Dep. Tr. at 75:10-17 [redacted]

424. It has been hypothesized that because orca in captivity spend more time at the surface, their dorsal fins are exposed to the ambient air and increased sunlight, increasing the temperature of the collagen in the fins and leading to collapse.[602]

[602] NMFS (National Marine Fisheries Service) (2008)., *Recovery plan for southern resident killer whales (orcinus orca)*, at II-46; GASS Dep. Tr. at 178:18-23 [redacted] ROBECK Dep. Tr. at 260:24-261:9 [redacted]

2. Reduced exercise contributes to dorsal fin collapse

425. As noted in this report above, the dimensions and temperatures of the tanks in which the orca are kept are substantially similar. For example, the dimensions of the tanks at SeaWorld San Diego are as follows.

Pool	Approximate Dimensions	Approximate Surface Area
A	35' deep x 170' long x 80' wide	11,692 sf
B	15' deep x 118' long x 75' wide	9,504 sf
C	15' deep x 118' long x 75' wide	9,819 sf
D	9' deep x 53' long x 25' wide	1,489 sf
E Existing	30' deep x 125' long x 75' wide (google earth)	10,729 sf
E Proposed	18' deep x 75' long x 43' wide	3,903 sf
F Proposed	50' deep x 255' long x 160' wide; 350' wide (on the arc)	27,688 sf
	Total (existing):	43,233 sf
	Total (proposed):	64,095 sf

Figure [130][603]

The tanks at SeaWorld Orlando all have "… *water temperature within the whale's presumed thermoneutral zone (13°C)*."[604] Similarly, the tanks at SeaWorld San Antonio and SeaWorld San Diego all have ".... *water kept at approximately 14°C year-round*."[605]

[603] 2015 SeaWorld California Coastal Commission Report.

[604] WORTHY, G. A. J., T. A. M. Worthy, P. K. Yochem and C. Dold (2013). *Basal metabolism of an adult male killer whale (Orcinus orca)*. Marine Mammal Science, 30(3), p.1229-1237.

[605] O'BRIENT, et al. (2016) *Androgen and glucocorticoid production in the male killer whale (Orcinus orca): influence of age, maturity, and environmental factors*.

426. Orcas require a vast expanse of water to exercise, swimming up to 200km and regularly diving over 500m per day, in the wild. The space and volume of water provided to an orca kept captive in a tank is deficient, as discussed above in Section VI(2). As a result of what are virtually sedentary existences, the orca suffer decreases in blood pressure.[606] Prolonged periods of living with reduced blood pressure can also contribute to structural changes in the dorsal fins' collagen, leading to collapse.[607] As an illustration of the deleterious effects of a lack of exercise, a male transient whale that was stranded began showing indicia of dorsal fin collapse after three days, but the fin "regained its natural upright appearance as soon as the whale resumed strong normal swimming upon release."[608]

427. In the ocean, orcas tend to swim vast distances, including by swimming in a straight line. Orca are also powerful animals that can reach speeds of 10-15

[606] NMFS (National Marine Fisheries Service) (2008).*Recovery plan for southern resident killer whales (orcinus orca).* at II-46.

[607] *Id.*

[608] NMFS (National Marine Fisheries Service) (2008). *Recovery plan for southern resident killer whales (orcinus orca).* at II-46; *see also* KASTELEIN et al. (2016), at p. 223 ("The positive influence of improving health status (and associated improved swimming behavior) on the straightness of the dorsal fin was seen in several of the porpoises. . . In order sometimes develop bent dorsal fins to avoid dorsal fin bending in captive cetaceans, we recommend that the direction of the current in pools should be changed often and that environments should be made as stimulating as possible."). In porpoises, therefore, correlation has been demonstrated between (a) size of tanks and the straightness of the dorsal fins, as well as between (b) animal health and straightness of the dorsal fins. There is no reason to believe such correlation would not be seen in orca.

km/h.[609] By contrast, in captivity, orca, unable to swim freely as they would in the vast ocean, often swim continuously in circles. Such repetitive movement can also contribute to the collapse of a dorsal fin.[610]

3. SeaWorld orca's dorsal fin deformities are exacerbated by the tricks they perform during shows

428. SeaWorld's orca are required to perform breaches during shows, as shown below in Figure [131]. During this maneuver, an orca often lands on its dorsal fin, having to withstand a tremendous amount of pressure. In Figure [131], Keto, an adult male SeaWorld orca held at Loro Parque, breaches onto his collapsed dorsal fin. His dorsal fin can be seen to hold its collapsed shape, despite the whale being completely upside-down. The orca, weighing approximately 4,000 kg, lands directly onto its collapsed dorsal fin. [redacted][611]

[609] FORD, J. K. B. (1989). *Acoustic behaviour of resident killer whales (Orcinus orca) off Vancouver Island, British Columbia*. Canadian Journal of Zoology, 67, p.727-745, 732

[610] ROSE, N. A. et al. (2009). *The Case Against Marine Mammals in Captivity* The Human Society of the United States and the World Society for the Protection of Animals, at p. 45.

[611] SW-AND025124; *see also* DOLD Dep. Tr. at 90:4-12 [redacted]


Figure [131]

5) Evidence shows that dorsal fins deformities can be detrimental to the health of killer whales.

429. Dorsal fin collapse is itself detrimental to orca health and can lead to additional health problems. It is also a compounding problem because overheating (a potential consequence of bent or collapsed dorsal fins, as discussed below), is also a contributing factor to dorsal fin irregularity. [redacted][612]

430. First, because a healthy dorsal fin is critical to an orca's regulation of its internal body temperature, a collapsed dorsal fin will cause chronic long term health issues. When a dorsal fin loses its structural integrity and becomes bent or collapsed,

[612] *See* ROBECK Dep. Tr. at 260:24-261:9 [redacted]

the thermoregulatory function of the fin can become compromised. Without proper thermoregulation, an orca's body temperature will not be properly maintained, leading to overheating, dehydration, and dried or cracked skin. [redacted][613]

431. [redacted][614] Necrosis is the death of cell tissue. It is of particular concern as cells that die by necrosis may release harmful chemicals to neighboring cells. Further, if necrosis is significant, the damaged tissue may not grow back. Necrosis is also known to be caused by impaired blood flow,[615] a consequence of dorsal fin collapse as discussed above. [redacted]

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[613] *See, e.g.*, SW-AND0189114 at SW-AND0189819 [redacted] SW-AND0272163 at SW-AND0272169 [redacted] SW-AND0190381 at SW-AND0190595 [redacted] Schedule 10b [redacted]

[614] *See* DOLD Dep. Tr. at 103:7-16 [redacted] DOLD Dep. Tr. at 97:2-5 [redacted]

[615] *See* GOLSTEIN, P. and Kroemer, G.. (2007). *Cell death by necrosis: towards a molecular definition.* Trends in Biochemical Science, 32:1, p. 37-43.

[redacted][616] [redacted][617]

432. Necrosis is not the only health issue that collapsed dorsal fins cause. They can (and do) also lead to dermatitis and other skin conditions. When a dorsal fin is collapsed to one side, the hydrodynamics of an orca swimming underwater are dramatically altered. The flow of water over an orca's body is critical in exfoliating dead skin cells. However, when a dorsal fin collapses to one side, the flow of water underneath the fin is limited. Further, as described above, SeaWorld's orca swim only a fraction of what orca have evolved to swim in the wild, compounding the lack of water flow under the collapsed dorsal fin. Over time, the dead skin cells began to accumulate, which can lead to dermatitis. Dermatitis manifests itself in the form of open sores and infections.[618] [redacted][619]

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[616] *See* DOLD Dep. Tr., Ex. 117 [redacted]

[617] SW-AND0202828, at SW-AND0202902 [redacted]

[618] Jacob, S., M. Miller and E.M. Herro. (2011). *Atopic Dermatitis—A historical review*, Skin & Aging 19 (Suppl) 1–11.

[619] *See, e.g.*, SW-AND0185697 [redacted] at p. SW-AND0185790 [redacted] SW-AND0185902 [redacted] at p. SW-AND0185911 [redacted]

433. Moreover, dorsal fin collapse can also lead to a severe skin condition called keratosis. For example, the dorsal fin of Winston was observed to be "extremely keratotic looking":

[redacted]

APPEARANCE: Appearance was good, except for skin lesions on the chin (keratosis) and at the base of the dorsal fin. Animal was very old in appearance generally.

WEIGHT: approx. 12,000 lbs. LENGTH: 24'7" GIRTH:

GROSS NECROPSY FINDINGS:

INTEGUMENT: Keratosis is evident on the mandible at the chin. The base of the dorsal fin (left side, inner curvature) was extremely keratotic looking with hyperepithelial response.

MUSCULOSKELETAL: Normal except for the dorsal lumbar and coccygeal muscles behind the dorsal fin, which are ischemic and pale.

RESPIRATORY: There is acute pulmonary congestion with frothy tracheal fluid. Both the right and left lungs contain numerous marble-size (1-2 cm) abscess lesions with greenish tinged exudate.

Figure [132][620]

434. [redacted][621] Keratosis is a skin tumor that may progress to skin cancer.[622]

VIII. CONCLUSION

435. Based on all the materials I have reviewed to date, it is my opinion that captivity at SeaWorld is generally harmful to orca health. I disagree with SeaWorld's claim that its "*killer whales are content and well adapted to their homes, as evidenced by their physical condition, behavior and social interactions with each other and with*

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[620] Necropsy Report of Winston, available online at https://www.scribd.com/document/85192405/Necropsy-Killer-Whale-Winston.

[621] SW-AND0185697 [redacted] at p. SW-AND0185727.

[622] FUCHS et al. (2007) *The Kinetics of Skin Cancer: Progression of Actinic Keratosis to Squamous Cell Carcinoma.*

training and caretaker personnel through exercise, play, and other enrichment activities, appetite, reproduction, health, and longevity."[623]

436. It is also my opinion that dorsal fin collapse is much more prevalent among SeaWorld's captive orca than wild orca, and that such collapse is not "normal." Moreover, it is my opinion that dorsal fin collapse is harmful to orca health and wellbeing.

* * *

Place: New Zealand

Dated: February 9, 2019

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Dr. Ingrid Visser

[623] SeaWorld's Second Supplemental Response to Plaintiffs' Second Set of Interrogatories.