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Dr. Barbara Kohn
Senior Staff Veterinarian
Docket No. APHIS-2006-0085
Regulatory Analysis and Development
PPD, APHIS, Station 3A-03.8
4700 River Road, Unit 118
Riverdale, MD 20737-1238
Submitted via https://www.regulations.gov/#!docketDetail;D=APHIS-2006-0085

Re: *81 FR 5629, Docket No. APHIS-2006-0085*

Dear Dr. Kohn:

The Animal Welfare Institute (AWI), on behalf of Animal Defenders International, Born Free Foundation, Born Free USA, Center for Whale Research, Cetacean Society International, In Defense of Animals, the International Marine Mammal Project, Kimmela Center for Animal Advocacy, Marine Connection, Orca Research Trust, People for the Ethical Treatment of Animals, Whale and Dolphin Conservation, and Zoocheck, is submitting comments on the proposed rule by the Animal and Plant Health Inspection Service (APHIS) to amend the regulations of the Animal Welfare Act (AWA) (7 USC 2131 *et seq.*), under 9 CFR Part 3, Subpart E, concerning the humane handling, care, treatment, and transportation of marine mammals in captivity (Docket No. APHIS-2006-0085), as published in the *Federal Register* on February 3, 2016 (*81 FR 5629*). We have previously submitted comments on the section of the proposed rule regarding information collection requirements under the Paperwork Reduction Act (44 USC 3501 *et seq.*) and incorporate those comments herein by reference.

AWI and the undersigned groups wish to clarify at the outset that **we oppose the public display of marine mammals**. We believe that every aspect of their life history characteristics, especially the wide-ranging, predatory habits of cetaceans, pinnipeds, and polar bears, makes them unsuited to confinement (Clubb and Mason 2003, 2007). We hold that the welfare of captive marine mammals cannot be adequately safeguarded because they are *inherently* unsuited to confinement. However, we acknowledge that at present the public display of marine mammals is a legal activity, and therefore provide the following comments, supported by current science and industry best practice, in our continuing effort to improve captive marine mammal welfare, with the understanding that it is impossible to achieve adequate welfare for these taxa.

INTRODUCTION

While we support some of the proposed amendments, overall we are disappointed with this proposed rule, which has been 14 years in the making (see Advanced Notice of Proposed Rulemaking [ANPR], *67*

FR 37731, published May 30, 2002) and under consideration for fully 20 (see *60 FR 27049*, published May 22, 1995 and *66 FR 239*, published January 3, 2001). We are also disappointed that many of our recommendations submitted in 2002, which referenced available science and industry best practice at that time, were not incorporated into the proposed rule. We are concerned that it took five years, from 1996 until 2001, for the agency to finalize amendments that were developed through *consensus* among a broad range of stakeholders in a negotiated rulemaking (see p. 5630; all page numbers refer to *81 FR 5629* unless otherwise specified), in which AWI participated.[1] We urge APHIS to finalize this proposed rule expeditiously, but **it must be substantially revised before it is finalized, as in its current form it does not even approach "insur[ing] that animals intended…for exhibition purposes …are provided humane care and treatment" (7 USC § 2131(1)), as required under the AWA.**

We note that throughout the proposed rule, APHIS requests or otherwise solicits any relevant scientific data in the form of peer-reviewed studies or other documentation to inform the agency's efforts to update the regulations. In several places, APHIS claims it is not aware of any relevant scientific data. This is perhaps the most troubling aspect of the proposed rule; in fact, there is a considerable and growing body of published research that is relevant to the various regulations in question, notably the requirements for space, temperature, lighting and water quality, as well as regarding health and disease issues and noise. Yet in 14 years (or 20, depending on one's viewpoint), APHIS has apparently made little effort to identify or review this body of research. Instead, it leaves the public to do so during a 3-month comment period.

Despite the unreasonable nature of this request, we have made every effort to reference a broad selection of this literature (we emphasize that this is a mere fraction of the relevant science that is available), as well as to identify other relevant documents, such as the regulations promulgated in other national jurisdictions and the standards of professional associations, and to provide highlighted .pdf copies of all the documentation cited herein. **We fully expect APHIS to review these references (and any other relevant materials the agency identifies) during the finalization process and to modify the proposed rule accordingly.**

We also note that the proposed rule considers one of the agency's goals to be "minimiz[ing] additional costs and renovations at existing facilities" (p. 5639). There are several such statements in the proposed rule, regarding the agency's efforts to minimize costs to the regulated community for any renovations or upgrades needed to comply with new standards. This concept of minimizing costs within the regulated community is not relevant under the AWA and indeed implies that no matter what current science or industry best practice determines is a true reasonable minimum, APHIS would not adopt it, if it is, by some arbitrary measure, too costly for a majority of the regulated community. This makes a mockery of the *Animal* Welfare Act and makes it the *Industry* Welfare Act.[2]

Interestingly, in the same section, we note a statement by APHIS that its proposal to change a standard (the acceptable lower limit of salinity) will "benefit the health and well-being of the animals by *maintaining pools closer to the actual conditions the animals would find in nature*" (p. 5639, emphasis

[1] Given this participation, AWI incorporates the record from the 1995-1996 negotiated rulemaking process herein by reference.

[2] "In expounding a statute, we must not be guided by a single sentence or member of a sentence, but look to the provisions of the whole law, and to its object and policy." *United States v. Heirs of Boisdoré*, 49 U.S. (8 How.) 113, 122, 12 L.Ed. 1009 (1850).

added). In fact, this concept could (and should) have been applied to *every parameter* addressed in the regulations. That is, pools that are closer in width and depth to "actual conditions the animals would find in nature," air and water temperatures that are closer to "actual conditions the animals would find in nature," lighting regimes that are closer to "actual conditions the animals would find in nature," and so on, would greatly "benefit the health and well-being" of captive marine mammals to an extent currently *not* enjoyed by any animal in licensed facilities meeting the minimum AWA standards (or even, in many cases, industry best practice). **APHIS acknowledges by this statement that the appropriate metric to use throughout the regulations is what is reasonably close to "actual conditions the animals would find in nature."** Yet the current standards and this proposed rule, as noted throughout these comments, by and large do not require conditions that are at all remotely close to natural conditions.

We note and acknowledge that the AWA is responsible for promulgating only *minimum* standards. Throughout our comments, we seek to make a determination of such real-world, achievable conditions. Even with the understanding that the agency must set only minimum standards, we conclude, based on the present state of scientific knowledge on the behavior and ecology of marine mammals, that the current standards, especially for space, are wholly inadequate to safeguard captive marine mammal welfare, or even to maintain it at some remotely acceptable level. Most of the proposed amendments (or lack thereof) do little to change this status quo.

Several papers from our literature review (e.g., Ugaz et al. 2009; Scheifele et al. 2012; Clark 2013) note the paucity of research on the welfare of captive marine mammals, particularly cetaceans. We draw the following conclusion: Unlike a vast array of other species, whether terrestrial wildlife or domesticated animals (see, e.g., Morgan and Tromborg 2007; Whitham and Wielebnowski 2013; Hartstone-Rose et al. 2014), marine mammals, especially cetaceans, have been at best rare subjects of welfare research and at worst ignored as welfare research subjects. Those who control access to these species – the regulated community – are at fault for this research paucity and therefore cannot use it as an argument against updating and revising captive marine mammal standards.

The lack of welfare research on captive marine mammals is certainly no excuse for the *agency* not to update or revise the captive marine mammal regulations. This is because, unlike the zoo and aquarium community, marine mammal field biologists have been prolific in the past 15-20 years. As noted in Wells (2009) and Couquiaud (2005), and as a general rule in animal welfare science (see, e.g., Morgan and Tromborg 2007; McPhee and Carlstead 2010; Whitham and Wielebnowski 2013), and as acknowledged by APHIS itself in this proposed rule, research from free-ranging wildlife and an understanding of their natural behavior and ecology are key to informing appropriate welfare standards for animals in captivity (i.e., to determining "actual conditions the animals would find in nature"). There is a considerable and growing body of research on the ecology and behavior of free-ranging marine mammals, given ever-improving technologies and methodologies for tracking and observing these long-difficult-to-study species, **all of which should have been consulted by the agency when preparing this proposed rule and *must be* consulted when finalizing it.**

OVERVIEW

Legal Standards

Animal Welfare Act

In enacting the AWA, Congress found that the "regulation of animals and activities as provided in this Act is necessary to prevent and eliminate burdens upon such commerce and to effectively regulate such commerce, in order (1) to insure that animals intended…for exhibition purposes…are provided humane care and treatment; (2) to assure the humane treatment of animals during transportation in commerce" (7 USC § 2131). Congress further found it "essential to regulate…the transportation, purchase, sale, housing, care, handling, and treatment of animals by carriers or by persons or organizations engaged in using them for research or experimental purposes or for exhibition purposes" (*Id.*).

The goal of the AWA is clear: humane treatment of animals, in this case, marine mammals held in captivity. "[T]he Animal Welfare Act…is explicitly concerned with the quality of animal life, rather than the number of animals in existence."[3] The statute does not define the term humane, however. In the absence of a statutory definition for any term in question, it is appropriate to "look to the common usage of words for their meaning."[4] The Merriam-Webster Dictionary defines humane as "marked by compassion, sympathy, or consideration for humans or animals".[5] The Cambridge Dictionary defines it as "showing kindness, care, and sympathy toward others, especially those who are suffering."[6] A Google search for the term humane provides two definitions: "having or showing compassion or benevolence" and "inflicting the minimum of pain."[7] It is also reasonable to look to definitions found in other statutes, including those that are related to the relevant statute. For example, the Marine Mammal Protection Act (MMPA) states that "[t]he term 'humane' in the context of the taking of a marine mammal means that method of taking which involves the least possible degree of pain and suffering practicable to the mammal involved" (16 USC § 1362(4)).

The AWA's legislative history states the existence of a need "to ensure [sic] the public that adequate safeguards are in place to prevent unnecessary abuses to animals, and that everything possible is being done to decrease the pain of animals during experimentation and testing."[8] "Beginning with the legislation passed in 1966 (Public Law 89–544), the United States Government has implemented a statutory mandate that small helpless creatures deserve the care and protection of a strong and enlightened public."[9] Congress placed animal exhibitions within the scope of the AWA after hearings documenting how inhumane conditions at these exhibitions affected the people who came and watched the animals there.[10]

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[3] *Animal Legal Defense Fund v. Glickman*, 154 F.3d 426, 438 (D.C. Cir. 1998).
[4] *Animal Legal Defense Fund v. USDA*, 789 F.3d 1206, 1216 (11th Cir. 2015), quoting *Consol. Bank, N.A., Hialeah, Fla. v. U.S. Dep't of Treasury,* 118 F.3d 1461, 1464 (11th Cir. 1997).
[5] http://www.merriam-webster.com/dictionary/humane
[6] http://dictionary.cambridge.org/us/dictionary/english/humane
[7] https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=humane
[8] 123 CONG. REC. 29,155 (1985) (statement of Sen. Dole).
[9] 116 CONG. REC. 40,159 (1970) (statement of Rep. Mizell); see also HR REP. No. 91–1651, at 1 (1970).
[10] See Care of Animals Used for Research, Experimentation, Exhibition, or Held for Sale as Pets: Hearings on HR 13957 before the Subcomm. on Livestock and Grains of the House Comm. on Agriculture, 91st Cong. 38 (1970)

It is also appropriate to look at how the courts have interpreted the term "humane." In the AWA context, the court found a plaintiff was injured by witnessing "animals living under inhumane conditions," which included "a Japanese Snow Macaque [living] in a cage 'that was a distance from and not in view of the other primate cages'…The only cage enrichment device this animal had was an unused swing…Similarly, [he] saw a large male chimpanzee named Barney in a holding area by himself."[11]

It is often easier for those involved with animal welfare to recognize when an activity or condition is inhumane, rather than expound upon what is humane. In the context of captive marine mammals, this is of course where the APHIS regulations are of the utmost importance. "The primary purpose of the Act is to ensure the humane care and treatment of various animals used in research or for exhibition or kept as pets. 7 USC § 2131. To this end, the Act requires, *inter alia*, that the Secretary of Agriculture 'promulgate standards to govern the humane handling, care, treatment, and transportation of animals by dealers, research facilities, and exhibitors.' *Id*. § 2143(a)(1)."[12]

In the many years that have passed since the Secretary of Agriculture last revised the captive marine mammal regulations under review in this proposed rule, scientific understanding of marine mammals has grown exponentially and **the revised regulations *must* reflect this growth in knowledge. If APHIS fails to do so, it will be acting in a manner considered arbitrary and capricious under the Administrative Procedure Act.[13]**

(letter from John M. Mehrtens) (hereinafter Hearings); *id*. at 39 (letter from Chris Sullivan); *id*. at 67 (statement of Pearl Twyne); *id*. at 79 (statement of Mary Frances Morrisette).

[11] *Animal Legal Defense Fund v. Glickman*, 154 F.3d at 444-445.

[12] *Animal Legal Defense Fund, Inc. v. Espy*, 29 F.3d 720, 722 (1994) (ALDF II).

[13] An agency's action promulgating a final rule "may be set aside if found to be 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.'" *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 41 (1983) (citation omitted) (finding the agency acted arbitrarily and capriciously in promulgating a final rule where it did not "cogently explain why it has exercised its discretion in a given manner"). "[A] fundamental requirement of administrative law is that an agency set forth its reasons for decision; an agency's failure to do so constitutes arbitrary and capricious agency action." *Amerijet Int'l Inc. v. Pistole*, 753 F.3d 1343, 1350 (D.C. Cir. 2014) (internal quotation marks and citation omitted) (finding agency's action arbitrary where it provided programmatic boilerplate rather than reasoned explanation and the court could not discern if the agency had considered the substance). "[C]onclusory statements will not do; an agency's statement must be one of reasoning." *Id.* (internal quotation marks omitted); *see also Bluewater Network v. Salazar*, 721 F. Supp. 2d 7, 38 (D.D.C. 2010) (finding a final rule relying upon a conclusory analysis in an EA to be arbitrary and capricious because it was not based on reasoned explanations). "Normally, an agency rule would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *State Farm*, 463 U.S. at 42. Although "an agency need not discuss every item of fact or opinion included in the submissions made to it," Courts will reverse a final agency rule "when the agency did not engage the arguments raised before it." *Del. Dep't of Nat. Res. & Envtl. Control v. E.P.A.*, 785 F.3d 1, 11 (D.C. Cir. 2015), *as amended* (July 21, 2015) (citation and internal quotations omitted) (finding EPA's rulemaking was arbitrary and capricious where the EPA "heard" commenters' concerns about the rule, yet failed to respond to serious objections). Nor can APHIS turn "a blind eye to significant information" brought before it or abdicate its responsibility to develop a record and consider the information contained therein. *Nat. Res. Def. Council v. U.S. E.P.A*., 808 F.3d 556, 573-74 (2d Cir. 2015) (finding "the lack of information…is due in large part to EPA's arbitrary and capricious decision to oppose developing such information," resulting in an "incomplete record – one lacking meaningful discussion"). Should APHIS choose not to address critical issues such as outdated space requirements based on practice and understanding from 30 years ago, it is nonetheless required to provide a reasonable

The AWA also requires consultation and cooperation between the Secretary of Agriculture and federal, state, and local governmental bodies "concerned with the welfare of animals used for research, experimentation or exhibition, or administration of statutes regulating the transportation in commerce or handling in connection therewith of any animals when establishing standards pursuant to section 2143 of this title and in carrying out the purposes of this chapter. The Secretary shall consult with the Secretary of Health and Human Services prior to issuance of regulations" (7 USC § 2145). While the proposed rule mentions some input from the National Oceanic and Atmospheric Administration (NOAA) (p. 5636), **there is no indication in the proposed rule that specific, AWA-mandated consultation with this or other relevant agencies has occurred. This must be addressed in the final rule.**

National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 USC § 4321 *et seq*.) established a framework within the federal government by which agencies must factor environmental considerations into their decision-making processes. NEPA is America's "basic national charter for protection of the environment" (40 CFR § 1500.1(a)). NEPA ensures that federal agencies "will have available, and will carefully consider, detailed information concerning significant environmental impacts" and that such information "will be made available to the larger [public] audience that may play a role in both the decision-making process and the implementation of the decision."[14] **With its publication of this proposed rule, APHIS has failed to fulfill its NEPA obligations.** NEPA requires the agency to consider the full range of potential environmental impacts associated with this rulemaking.

This rulemaking does not appear to fall within the realm of categorical exclusions, as delineated by 7 CFR 1b.3 and the US Department of Agriculture (USDA) Departmental Policy for NEPA, nor is APHIS specifically listed at 7 CFR 1b.4 as one of the USDA agencies that receives a NEPA categorical exclusion. **If APHIS is invoking a NEPA categorical exclusion, it must clarify its reasoning for it in the final rule.**

APHIS' NEPA Implementing Procedures describe the classification of actions normally requiring environmental impact statements, as well as those normally requiring environmental assessments but not necessarily environmental impact statements (7 CFR § 372.5(a) and (b)). **At a minimum, we believe this rulemaking falls within those actions normally requiring environmental assessments**, delineated in 7 CFR § 372.5(b), as it involves an entire program or at least a more discrete program component; it is a rulemaking that seeks to remedy specific animal health risks or that may affect opportunities on the part of the public to influence agency environmental planning and decision-making; and it could potentially involve "Planning, design, construction, or acquisition of new facilities, or proposals for modifications to existing facilities."

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explanation for its decision not to amend the rule according to current science or industry best practice. *Am. Horse Prot. Ass'n, Inc. v. Lyng*, 812 F.2d 1, 7 (D.C. Cir. 1987) (remanding to the Secretary for an opportunity to explain the denial of a petition for rulemaking or to institute new rulemaking on the practice of soring horses where petitioners allege that developments since regulations were originally promulgated have demonstrated their inadequacy).

[14] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

Endangered Species Act

Under Section 7(a)(1) of the Endangered Species Act (ESA) (16 USC § 1536(a)(1)) and its implementing regulations at 50 CFR Part 402, all federal agencies must utilize their authorities to carry out programs for the conservation of threatened and endangered species.[15] Many species of marine mammal found in captivity, such as manatees, polar bears, sea otters, and various cetacean and pinniped species, are listed as threatened or endangered under the ESA.[16] In addition to any required permits under § 104 of the Marine Mammal Protection Act (MMPA) (16 USC § 1374), ESA-listed species require a scientific research or enhancement permit under § 10(a)(1)(A) in order to be held at captive display facilities.[17] These § 10(a)(1)(A) permits trigger the need for consultation under § 7(a)(2) of the ESA (16 USC § 1536(a)(2)) between APHIS and, depending on the marine mammal species, the National Marine Fisheries Service (NMFS) or the US Fish and Wildlife Service (USFWS). **On a broader level, despite the fact that these regulations cover the care of endangered species in captivity, APHIS has never undergone Section 7 consultation with NMFS or the USFWS with respect to the regulations' potential impacts on listed species. APHIS must now do so for purposes of this rulemaking.**

Section 7(a)(2) of the ESA requires action agencies to ensure, in consultation with NMFS and/or the USFWS, that their actions do not jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (16 USC § 1536(a)(2)). In fulfilling these requirements, "each agency shall use the best scientific and commercial data available" (*Id.*). To fulfill the substantive purposes of the ESA, federal agencies are required to engage in consultation with NMFS and/or the USFWS to ensure that "any action authorized, funded, or carried out by such agency…is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the adverse modification of habitat of such species…determined…to be critical" (16 USC § 1536(a)(2)).

Section 7 consultation is considered to be the heart of the ESA[18] and is required for "any action [that] may affect listed species or critical habitat" (50 CFR § 402.14). Agency action is defined broadly to include "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas" (*Id.* § 402.02). Even "actions intended to conserve listed species or their habitat" are considered agency actions that require consultation (*Id.*). Similarly, the threshold for determining whether a proposed project may affect listed species is low and includes "any possible effect, whether beneficial, benign, adverse, or of an undetermined character."[19]

Lolita, the lone surviving captive member of the Southern Resident Killer Whale (SRKW) Distinct Population Segment (DPS), held at the Miami Seaquarium, was included in the endangered listing under

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[15] *Pyramid Lake Paiute Tribe of Indians v. U.S. Dep't of the Navy, 898 F.2d 1410, 1416 (9th Cir. 1990).*

[16] See Endangered and Threatened Marine Species under NMFS' Jurisdiction at http://www.nmfs.noaa.gov/pr/species/esa/listed.htm; see also USFWS International Affairs, Marine Mammals, at http://www.fws.gov/international/animals/marine-mammals.html.

[17] See NOAA Fisheries Public Display of Marine Mammals, http://www.nmfs.noaa.gov/pr/permits/public_display.htm; see also NOAA Fisheries Public Display Permit for Marine Mammals, http://www.nmfs.noaa.gov/pr/permits/nonreleasable.htm.

[18] *Karuk Tribe of Cal. v. U.S. Forest Serv.*, 681 F.3d 1006, 1019 (9th Cir. 2012).

[19] See Interagency Cooperation – Endangered Species Act of 1973, as Amended (*51 FR 19926*, published on June 3, 1986).

the ESA for her population of origin (she was initially excluded).[20] We recognize that there is an ongoing legal action regarding the issue of whether, as a result of the non-AWA compliant conditions under which Lolita is held, Miami Seaquarium is in violation of Section 9 of the ESA (16 USC § 1538(a)) and its corresponding regulations (50 CFR §§ 17.40(B)(i)–(ii)), which prohibit the "take" (including harassment and harm) of members of the SRKW DPS.[21] **Regardless of the outcome of that lawsuit, APHIS has a duty to consult with NMFS with regard to Lolita under Section 7.**

Inconsistent Consultation of Scientific Literature

Throughout the rule and starting with the summary, APHIS claims that it will base its proposals on "current industry and scientific knowledge and experience" (p. 5629). However, a clearly relevant publication – a special issue of *Aquatic Mammals* (the journal of the European Association of Aquatic Mammals, a professional association of the regulated community), entitled "A survey of the environments of cetaceans in human care" (Couquiaud 2005) – was apparently not consulted by APHIS during the formulation of this proposed rule. This publication addresses only captive cetaceans, but several of its recommendations, e.g., for water quality standards, are applicable to all marine mammals. Given that this is the only peer-reviewed publication of which we are aware (after an extensive literature search) addressing, through a survey of dozens of facilities worldwide and onsite visits to several others, the very elements under APHIS' purview, this omission is inexplicable. **APHIS must consult this publication during the finalization of this rule**.

The key chapter in Couquiaud (2005) for purposes of this proposed rule is chapter 6, Life Support Systems, but several other chapters have relevant information. There is no excuse for the agency's failure to consult this source when developing this proposed rule. Indeed, a strong argument can be made that this publication should have been the basis, at least for cetacean standards, for any proposed rule published by an agency purporting to base standards on "current industry and scientific knowledge and experience."

Furthermore, while the proposed rule refers to peer-reviewed papers for proposed changes to some standards (e.g., lighting requirements, § 3.102(c), which the agency proposes to make "more specific," p. 5634), it claims it is "unaware" (p. 5633) of such papers for other standards and therefore proposes no substantive changes (e.g., temperature requirements, § 3.102(a)). However, regarding temperature, a US Navy study examined cold-water tolerance in bottlenose dolphins (Yeates and Houser 2008) – APHIS' failure to identify this research suggests that its review of the literature was selective or cursory, and in some cases non-existent. In addition, the proposed rule states that the most appropriate temperature ranges for marine mammals "[are] not readily tabulated" (p. 5633); however, we direct the agency's attention to Table 2.3 of Couquiaud (2005), in chapter 2, p. 299, in which species-specific temperature ranges for all regulated cetacean species are presented in tabulated form. For additional discussion of temperature standards, see below under "Indoor Facilities: § 3.102."

[20] See National Oceanic and Atmospheric Administration Final Rule Listing Endangered or Threatened Species: Amendment to the Endangered Species Act Listing of the Southern Resident Killer Whale Distinct Population Segment (*80 FR 7380*, published on February 10, 2015), amending the regulatory language of the ESA listing to remove the exclusion for captive whales from the SRKW DPS.

[21] See *People for the Ethical Treatment of Animals v. Miami Seaquarium,* No. 1:15-cv-22692-UU (S.D. Fla. filed July 20, 2015).

It is difficult to fathom why the agency was aware of scientific papers related to some standards but not others, when there are at least some (and in some cases many) published papers addressing all relevant standards included in this proposed rule. **APHIS must consult the full range of available scientific literature on relevant aspects of marine mammal biology and ecology to inform its efforts while finalizing this rule.**

Inconsistent Decisions on which Sections to Amend or Augment

The proposed standards are a mixture of strengthening changes (primarily in ways with minor impacts), weakening changes (with some significant impacts), and most notably *no* changes, either through not amending existing regulations or failure to add new regulations as discussed in the ANPR. For example, **APHIS has chosen not to amend the current space requirements, which is simply unacceptable given the large body of recent research demonstrating the fine-scale daily movement patterns of various species within every taxon of marine mammals**, including killer whales (*Orcinus orca*) (see e.g., Durban and Pitman 2012), bottlenose dolphins (*Tursiops truncatus*) (see e.g., Gubbins 2002), beluga whales (*Delphinapterus leucas*) (see e.g., Hauser et al. 2014), polar bears (*Ursus maritimus*) (see e.g., Amstrup et al. 2001), sea otters (*Enhydra lutris*) (see e.g., Bodkin et al. 2004), manatees (*Trichechus* spp.) (see e.g., Deutsch et al. 2003), and pinnipeds (see e.g., Cunningham et al. 2009; Kuhn and Costa 2014). **APHIS' claim that it does not have "sufficient scientific or other supporting data to propose space requirements [sic] changes at this time" (p. 5635) is inexplicable given this large and growing body of research**. Frankly, not revising the current space requirements is the greatest failure of the proposed rule to make significant improvements to captive marine mammal welfare. See further discussion below under "Space Requirements: § 3.104."

As an example of not adding new regulations, despite asking the public in the ANPR if noise standards should be added to the regulations and receiving comments supporting such an addition, the proposed rule does not include any noise standards for indoor or outdoor facilities, nor does it explain or justify this omission in any way. Yet in several instances, licensee noise levels, particularly in-air, are extremely high (e.g., in some theme parks, virtually every night, there is a fireworks display directly over marine mammal enclosures; in others, roller coasters are placed in close proximity to marine mammal enclosures – personal observation). Couquiaud (2005) includes a section on noise concerns (pp. 344-345) and offers some common sense recommendations to mitigate noise. **We strongly recommend that APHIS formulate noise standards and consult Couquiaud (2005) when doing so.** For additional discussion of noise standards, see below under "Recommended Additions to the Regulations."

Replacing Resource/Engineering-Based Standards with Performance-Based Standards

In several instances, easily enforced quantitative (resource/engineering-based) standards, using parameters that can be measured, have been replaced by difficult-to-enforce, more qualitative (performance-based) standards[22] (particularly in § 3.111, for interactive programs). This is a major

[22] *Resource-based* (or engineering-based) standards are strictly quantitative, requiring specific management practices and specific facility conditions to be provided to the animals. *Performance-based* standards tend to be more qualitative, requiring management practices, facility conditions, or animal behavior to attain or demonstrate certain subjective states, such as "sufficient," "adequate," or "normal." What constitutes these qualities is not universally agreed. *Animal-based* standards are also quantitative, requiring the animals to demonstrate certain

weakening of the regulations. **Wherever possible *and* supported by current science or industry best practice, and certainly *both*, legal standards should be quantitative, because this makes their enforcement easy and straightforward for inspectors**. The standards should be based on bright-line rules that allow for sufficient enforcement of the AWA.

There is a long history of poor enforcement of performance-based standards, and thus they can only be justified when engineering-based standards *cannot* be established using current science or industry best practice.[23] Ideally, animal welfare standards would be animal-based; i.e., based on measurements of an

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behaviors (or *not* to demonstrate certain behaviors) and to attain certain physical states (Whitham and Wielebnowski 2013).

[23] The court, in *Animal Legal Defense Fund, Inc. v. Glickman*, 204 F.3d 229 (D.C. Cir. 2000) generally acknowledged the inherent superiority of resource-based or "engineering standards" to performance-based standards in the AWA context with respect to primates. See also Joyce Tischler, A Brief History of Animal Law, Part II (1985-2011), 5 STAN. J. ANIMAL L. & POL'Y 27, 65 (2012), observing that "just a few years after" *Animal Legal Defense Fund, Inc. v. Glickman*, "the USDA itself admitted that its AWA [performance-based] regulations were inadequate to provide guidance to its own inspectors." Citing the USDA Employee Opinions on the Effectiveness of Performance-Based Standards for Animal Care Facilities (APHIS) 1996, Tischler notes "[a]s early as 1996, the USDA was aware that there were significant problems with the vague 'standards' established by its" 1991 final regulations for primates. "Facility inspectors were unable to determine whether the facilities were providing adequate enrichment to the primates, or whether the plans were actually being implemented."

The *Amended Petition for Rulemaking to Prohibit Public Contact with Big Cats, Bears, and Nonhuman Primates*, filed with APHIS by The Humane Society of the United States and other NGOs (*78 FR 47215,* published on August 5, 2013) (aka Petition to Develop Regulations to Prohibit Public Contact with Potentially Dangerous Animals, regulations.gov Docket ID APHIS-2012-0107), discusses in detail the numerous problems with performance-based standards, noting that they are "vague, entirely subjective, and do not clearly inform licensees, inspectors, or the public which activities are prohibited." With regard to big cats, for example, the petition explains:

> The regulations are most confusing as applied to big cats, since lions and tigers are explicitly mentioned as examples of dangerous animals in Section 2.131(d)(3), [sic] "during public exhibition" such big cats must be "under the direct control and supervision of a knowledgeable and experienced animal handler." 9 C.F.R. § 2.131(d)(3). In addition to being under the "direct control" of the handler, big cats (as with all other animals) "must be handled so there is minimal risk of harm to the animal and to the public, with sufficient distance and/or barriers between the animal and the general viewing public so as to assure the safety of animals and the public." *Id.* at § 2.131(c)(1). Thus, licensees, inspectors, and the public are left to their own subjective determinations of whether a big cat is indeed under a handler's "direct control" and what constitutes "sufficient distance and/or barriers" for an individual big cat. *See Antle v. Johanns*, 2007 WL 5209982 (D.S.C. 2007), *aff'd per curiam*, 264 F. App'x 271 (4th Cir. 2008), [sic] (upholding USDA decision that found a violation of 9 C.F.R. § 2.131 when persons who are to be photographed with an adult big cat are allowed to stand behind the cat without any barrier between the cat and the persons being photographed).
>
> A hodgepodge of agency guidance further complicates this subjective standard and creates confusion for determining when public contact with a particular big cat is allowed. Several agency documents suggest that APHIS generally interprets this performance standard as being violated when the public handles a big cat under the age of 8 weeks or over the age of 12 weeks... (p. 16)

animal's behavioral or physical state (Whitham and Wielebnowski 2013), and many zoos are moving toward such standards. However, it is unlikely that regulators will ever be in a position to implement and enforce such standards, given the infrequent nature of inspections; therefore, clear, resource- or engineering-based standards are necessary.

While in some cases performance-based standards may offer a flexible approach towards oversight of some activities, they are frequently ineffective. In this instance, they are most certainly *not* being proposed in response to an earnest survey of existing scientific literature or a conscientious effort to develop enforceable standards. We maintain that licensed facilities require explicit regulation to safeguard the well-being of captive marine mammals.

DETAILED COMMENTS

Definitions: § 1.1

Several of the changes under § 1.1 are clarifications and of a housekeeping nature and, in general, we accept these changes without comment.

We support the amendment to the definition of "primary enclosure." We are aware that, in the past, licensees have claimed that only the "show" pool must meet all the standards of the AWA. Clearly, aside from specific exemptions for specific conditions (e.g., space in medical tanks), all enclosures must meet all requirements, e.g., for space, lighting, temperature, and water quality.

The proposed new definition of "interactive program" includes all marine mammals "except for potentially dangerous marine mammals, such as, but not limited to, polar bears" (p. 5632). We point out that *all* marine mammals, with the possible exception of manatees – and then only because they are slow – are "potentially dangerous."[24] Even sea otters are capable of inflicting serious bite wounds (Kirkpatrick et al. 1955), while pinniped bites can cause serious infections (aka "seal finger"; Hunt et al. 2008). Certainly all cetaceans, especially killer whales, can inflict serious injury and even kill (Parsons 2012). The proposed language implies (despite the phrase "but not limited to") that the only marine mammal species that should not be used in interactive programs is the polar bear. The polar bear, a large ice-dependent predator, is an obvious inclusion on any list of species excluded from interactive programs; however, so is the killer whale. **The agency must insert "killer whales" here as well, given the species' history of seriously injuring and killing trainers and others in captivity (Parsons 2012).** The agency may feel the phrase "but not limited to" addresses this concern, but the obvious omission of this equally dangerous marine mammal becomes a tacit acceptance of the use of killer whales in interactive programs.

The petition goes on to explain that:

> This difficulty in enforcement is demonstrated by the fact that licensees who routinely offer public contact with big cats, bears, and nonhuman primates are very rarely cited for violations of the performance standards in the handling regulations, despite abundant evidence of the negative animal welfare impacts from such activities. (p. 20)

[24] We direct APHIS' attention to WDC's comments submitted in support of the aforementioned Petition to Develop Regulations to Prohibit Public Contact with Potentially Dangerous Animals, Docket ID APHIS-2012-0107, which request that the petition be extended to include marine mammal species and to exclude direct physical contact specifically with whales and dolphins in public display programs.

We appreciate the clarification that interactive programs will include wading and dockside/deck encounters. We are concerned, however, that APHIS intends to specifically include "therapeutic programs" in the proposed definition, without additional commentary. The scientific evidence for the therapeutic efficacy of Dolphin-Assisted Therapy (DAT) is highly debated and far from confirmed (Humphries 2003; Marino and Lilienfeld 2007; Baverstock and Finlay 2008). **APHIS should not mention DAT without addressing the controversy surrounding this practice**; otherwise, this phrase, even in passing, becomes a tacit acceptance of the legitimate therapeutic nature of DAT, which cannot be supported by the scientific literature.

We also strongly oppose the exclusion of feeding/petting pools from the proposed definition of "interactive program." We appreciate that the public does not necessarily enter the animals' enclosures in such programs, but they still interact with the animals to a degree far beyond what is seen in the other type of public-animal interaction that is proposed for exclusion from the definition (i.e., during performances and shows). We do not oppose excluding performance and show interactions, but feeding/petting programs allow the public to handle and provide food to the animals, an activity that is otherwise restricted to trained personnel in the regulations (see § 3.105(c): "…food…*must be given* by an employee or attendant responsible to management who has the necessary knowledge to assure that each marine mammal receives an adequate quantity of food to maintain it in good health" (emphasis added)). ***By definition*, feeding/petting programs violate this section of the regulations and thus cannot simply be ignored.** See additional comments regarding this point under "Interactive Programs: § 3.111" below.

In several jurisdictions of which we are aware, lead veterinarians for cetacean facilities are small animal or terrestrial animal veterinarians with at times very little experience (often no more than a few weeks) treating or otherwise monitoring the health of marine mammals. The current definition of "attending veterinarian" legalizes this same situation in the US, given that the definition gives no required number of years of experience with the "species being attended."[25] This is clearly inappropriate for marine mammals, given their highly specialized needs. The requirements found in the current § 3.111(c)(5) for attending veterinarian ("has at least the equivalent of 2 years full-time experience…with [relevant marine mammal species] medicine within the past 10 years") would ensure that a marine mammal attending veterinarian has the necessary experience to address specific medical issues that arise with these taxa. **We strongly recommend the insertion of the following language (in bold) to the definition of "attending veterinarian":**

> Attending veterinarian means a person who has graduated from a veterinary school accredited by the American Veterinary Medical Association's Council on Education, or has a certificate issued by the American Veterinary Medical Association's Education Commission for Foreign Veterinary Graduates, or has received equivalent formal education as determined by the Administrator; has received training and/or experience in the care and management of the species being attended; **if attending marine mammals, has at least the equivalent of 2 years full-time experience (4,160 or more hours) with relevant marine mammal species medicine**

[25] "'Attending veterinarian' means a person who has graduated from a veterinary school [and] has received training and/or experience in the care and management of the species being attended" (current § 1.1).

within the past 10 years; and who has direct or delegated authority for activities involving animals at a facility subject to the jurisdiction of the Secretary.

Variances: § 3.100

General

Given that APHIS does not propose to amend the space requirements, the decision to make § 3.100 operative again makes no sense whatsoever. One presumes all licensees are already in compliance with the current space requirements and any new facility would be built to code, so to speak, so why any facility would need a variance is completely unclear.

We therefore oppose making this section operative again. **The agency should not grant variances to the space requirements in § 3.104, which are already the minimum and therefore anything less will *by definition* compromise the welfare of captive marine mammals.** The justification for doing so – "This will provide regulated facilities greater flexibility in complying with the regulations and standards" (p. 5632) – is irrelevant. There is no mandate to "provide greater flexibility" to the regulated community under the AWA. Even if it were relevant, there is no need to provide facilities with greater flexibility when all existing facilities are presumably already in compliance with current standards and any new facilities would be built to meet revised standards.

Of course, if the final rule differs substantially from the proposed rule and does require facilities to upgrade their enclosures to meet *new* space requirements, then this section may need to become operative again. Under that circumstance, **we recommend the following**:

Setting of time limits

If APHIS finalizes this proposed rule to make § 3.100 operative again, despite our comments above, or to revise the space requirements as we recommend below under "Space Requirements: § 3.104," then our main concern with the proposed amendments to this section is the omission of any time limits on a variance (per our comments in response to the ANPR in 2002). Without time limits, any variance can become a lifetime variance, even though the amendments specify, under proposed § 3.100(d) (pp. 5648-5649), that only variances requested because of "ill or infirm marine mammals that cannot be moved without placing their well-being in jeopardy…may be granted for up to the life of the marine mammals involved". Additionally, proposed §§ 3.100(f) and (g) (p. 5649), regarding research and emergencies, state that these provisions "cannot be used to avoid complying with § 3.104."

Yet nowhere in § 3.100 is there a time limit on variances; there is only a requirement to provide the time period requested for a variance (proposed § 3.100(b)(4), p. 5648). There are no penalties specified for violation of this time period; **therefore, a facility can *de facto* maintain the variance conditions beyond the time period specified *with impunity*.** The entirety of § 3.104 thus becomes meaningless, in a sense, whenever a variance is granted, as a facility may never come into compliance with the space requirements, yet will suffer no consequences. This simply makes no sense.

Addressing conflict of interest concerns

Regarding proposed § 3.100(d), it is not specified who determines if a marine mammal is "ill or infirm." For clarity's sake, **we recommend the addition of the following language, to be inserted after the full stop at the end of the last sentence of this paragraph: "The health condition of any marine mammal considered by a licensed facility to be ill or infirm will be evaluated by a recognized veterinary expert selected by the Deputy Administrator,"** consistent with proposed § 3.100(c) (p. 5648) ("two recognized experts selected by the Deputy Administrator" may write a report on potential adverse impacts on marine mammals affected by a variance request). **We support the language in proposed § 3.100(c),** which amends the original language of this provision, which specified "two experts recommended by the [Association of Zoos and Aquariums] and approved by the Deputy Administrator" may write a report on variance impacts (9 CFR Part 3, Subpart E, § 3.100(c)). **APHIS cannot and must not rely on health evaluations by licensee veterinary staff or experts recommended by the regulated community when evaluating the justification for a variance, as such individuals have a clear conflict of interest.**

Indoor Facilities: § 3.102

(a) Ambient temperature

GENERAL

Wherever relevant and possible, APHIS must provide acceptable species-specific temperature ranges under § 3.102(a), using current science and industry best practice (see above under "Overview – Inconsistent Consultation of Scientific Literature" for additional comments on the necessity of species-specific temperature ranges). APHIS' proposal to maintain the current, performance-based temperature regulations is insufficient to safeguard the welfare of marine mammals. Indeed, the current performance-based language found in this section cannot prevent violations of the general standard that temperatures should be "in accordance with the currently accepted practices as cited in appropriate professional journals or reference guides" (p. 5633). The comment in the proposed rule that the negotiated rulemaking panel (the Committee) discussed the importance of appropriate temperatures, but "there was not enough published scientific data available to develop a list of acceptable temperature ranges for each marine mammal species" (p. 5633), is irrelevant, as that was 20 years ago and a considerable amount of research has been conducted in the interim.

APHIS specifically notes the importance of appropriate temperature ranges for animal welfare ("Animals kept in a temperature range appropriate to their species benefit from improved health and welfare," p. 5633).[26] The peer-reviewed literature emphasizes that inappropriate temperatures are a stressor, particularly for polar species (for a review, see Morgan and Tromborg 2007). Therefore, it is unclear why APHIS has not made an effort over the past 14 years to research and tabulate appropriate temperature ranges (at least for those species where such data are available, and many species *do* have such data available – see below) for this proposed rule.

[26] We note that the citation in the footnote for this statement is the first edition for Geraci and Lounsbury (1993) rather than the second edition in 2005, which was greatly expanded.

The proposed performance-based standard is likely to be sufficient to provide appropriate temperatures for manatees and sea otters in indoor facilities. However, polar taxa and taxa with a variety of species with a variety of temperature tolerances require quantitative, engineering-based standards.

CETACEANS

The current standards arguably allow housing species from widely divergent geographic regions, e.g., beluga whales (Arctic) and bottlenose dolphins (temperate/tropical), in the same enclosure. This is clearly inappropriate.

Bottlenose dolphins have actually been tested for cold-water tolerance. The results from Yeates and Houser (2008), along with data found in papers addressing habitat characteristics (see e.g., references consulted for Table 2.3 in Couquiaud 2005; Toth et al. 2011), establish a science-based lower limit for temperature for bottlenose dolphins: **no less than +12° C for enclosures housing only adults, one degree higher than the lowest critical temperature for the smallest adult dolphin in the Yeates and Houser study; no less than +14° C for enclosures housing adults and calves, which corresponds to the lowest temperature in which dolphins of all age classes were found in the Toth et al. study.** These lower temperature limits would ensure that the most vulnerable dolphins, i.e., smaller animals, including calves, would be adequately protected from cold stress. For other cetacean species, Table 2.3 in Couquiaud (2005) offers appropriate temperature ranges in tabulated form.

While free-ranging bottlenose dolphins can adapt to year-round living in waters as cold as +9-10° C (Wilson et al. 1999; Couquiaud 2005), there are physiological consequences that may in fact constitute the mechanism limiting this species' distribution into higher latitudes (Wilson et al. 1999). Populations of bottlenose dolphins found in these colder regions have a higher prevalence and severity of skin lesions, which may signal that the immune response of these dolphins is challenged in ways the immune response of dolphins in warmer climates is not (Wilson et al. 1999). **Therefore, failing to set a lower temperature limit for this species (we recommend no less than +12° C for adults-only enclosures, rather than +10° C, to mitigate risk for negative immune response impacts) may compromise the health of captive animals and is not supported by the evidence available from free-ranging populations.**

As APHIS states it "will develop guidelines for appropriate temperature ranges for marine mammal species based on scientific and published data when, and if, it becomes available" (p. 5633), **we strongly recommend that APHIS develop guidelines for appropriate temperature ranges for cetaceans based on the values in Table 2.3 in Couquiaud (2005) and the references cited above**, as these scientific data are published and available now. These temperature ranges offer a science-based guideline that would, *inter alia*, preclude housing belugas (0°-10° C) and bottlenose dolphins (10°-30° C) in the same enclosure. **For belugas, we recommend that for the three winter months, water temperatures should be no greater than +5° C (acknowledging the difficulty in maintaining freezing saltwater temperature in a captive enclosure). For the rest of the year, Couquiaud's upper limit of no greater than +10° C can be used.**

POLAR BEARS

Based on information from the University of Guelph,[27] average January temperature in the Arctic ranges from about -40° C to 0° C and winter temperatures can drop below -50° C. Average July temperatures range from about -10° C to +10° C. Mean daily temperatures in Canada's Arctic (where approximately 60% of the world's polar bears live or range[28]) is -15° C to -5° C. Summer temperatures reach a mean of +10° C in Canada's Arctic, with southern ranges (i.e., Manitoba, where the southernmost polar bear population, the Western Hudson Bay population, is found) reaching a summer mean of +15° C.

Despite these freely available data on Arctic temperatures, most polar bears in zoos and aquariums are frequently subjected to temperatures far in excess of +25° C (during summer in an outdoor facility anywhere in the US) and may never experience temperatures even approaching freezing (at any season in an indoor facility). Indeed, polar bears housed in indoor facilities appear never to experience temperatures below +10° C (personal observation). Polar bears in indoor facilities in the US are therefore living in what amounts to perpetual summer for their species' natural geographic distribution.

The Association of Zoos and Aquariums (AZA) notes the following in its *Polar Bear (*Ursus maritimus*) Care Manual* (AZA Bear TAG 2009):

> There has been no scientific determination of minimum or maximum temperatures for polar bears cared for in zoos and aquariums. Though polar bears originate from an arctic environment, most are tolerant of fluctuating temperatures, as summers in Churchill, Manitoba can average 64°F (17.8° C), but can reach more than 79°F (26°C) degrees. It is not known if there is an optimal temperature range for polar bears or if and how they utilize environmental resources to thermoregulate within this wide range of environmental conditions. (p. 9)

We find this paragraph very perplexing and urge APHIS to discount it when considering industry best practice on this point.[29] The AZA mentions summer temperatures in the southernmost region of the polar bear's distribution as if these are typical maximums for the species, when in fact the Western Hudson Bay population (the one – and only – population found in Churchill, Manitoba) is at the extreme southern edge of the species' distribution and indeed has been in decline in recent years due to climate change impacts (Stirling and Derocher 2012). No other polar bear populations experience summer temperatures much above +15° C and some probably never see a summer's day warmer than +10° C or even +5° C.[30] Clearly polar bears are *not* "tolerant of fluctuating temperatures" – population decline and a clear lower latitude range limit set by the species' susceptibility to heat stress are hardly "tolerance." In addition, polar bears are ice-dependent – they are not found anywhere sea-ice does not form for at least a large portion of the year. This hardly represents "a wide range of environmental conditions."

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[27] http://www.arctic.uoguelph.ca/cpe/environments/climate/climte_present/temp/arc_winter.htm#

[28] http://pbsg.npolar.no/en/status/status-table.html

[29] We note that the absence of a scientific determination of minimum and maximum temperatures for polar bears cared for in zoos and aquariums is due to the failure of zoos and aquariums to conduct relevant research to make this determination. The regulated community cannot use its own failure as justification for maintaining polar bears in temperatures entirely inconsistent with temperatures experienced by free-ranging polar bears in natural habitat.

[30] See http://pbsg.npolar.no/en/status/population-map.html for a map of the 19 known polar bear populations and their distributions.

It is not relevant *why* polar bears are ice-dependent (see comments below on adaptations and the irrelevance of their causes when considering captive wildlife welfare, under "Space Requirements: § 3.104 – General"); what is relevant from a welfare perspective is that they *are*. The welfare-irrelevant *why* of their sea-ice dependence involves their prey preferences and hunting techniques; the welfare-relevant *consequence* is that all of their physiological adaptations maximize body heat retention. *Hyper*thermia is a more significant health concern in polar bears than *hypo*thermia (even the AZA acknowledges this: "Heat stress is a greater risk to healthy polar bears than cold" (AZA Bear TAG 2009, p. 9)). To then argue that maintaining polar bears in perpetual summer safeguards their welfare is neither logical nor science-based.

We strongly recommend that APHIS set air temperature standards for indoor polar bear enclosures at no greater than 0° C for at least the three winter months and the rest of the year at no greater than +12° C (mid-range between Arctic summer highs of +10° C and +15° C). Warmer microclimates within the enclosure may be present, but the air temperature generally for the entire enclosure should meet these standards. **Water temperature requirements should be similar – at least the three winter months at no greater than +5° C (recognizing that providing freezing seawater with ice is likely infeasible) and the rest of the year at no greater than +10° C.** If the expense of maintaining these minimums is too great, a facility should not house polar bears.

The complete lack of anything approaching natural temperature variation in indoor polar bear enclosures is quite possibly a major contributor (in addition to inadequate space requirements – see below under "Space Requirements: § 3.104") to the poor welfare this species generally suffers in captivity (Clubb and Mason 2003, 2007; Morgan and Tromborg 2007). The current, performance-based standard (and thus the proposed standard as well) is that temperatures must be sufficient to "provide for [marine mammals'] health and well-being, and to prevent discomfort" (p. 5649). The current industry best practice for temperatures of indoor polar bear enclosures is insufficient to prevent discomfort at the least and at most may impact polar bear health (polar bears appear to eat less and maintain thinner blubber layers in captivity as a means of coping with inappropriately high temperatures – personal observation), meaning this standard is already routinely being violated. **Quantitative, seasonally-adjusted temperature ranges will clarify and improve enforcement of standards for polar bears** or, for that matter, any marine mammal species held in licensed facilities (see above under "Overview – Replacing Resource/Engineering-Based Standards with Performance-Based Standards").

PINNIPEDS

See "Outdoor Facilities: § 3.103" for comments on appropriate temperature guidelines for pinnipeds. Generally speaking, given that temperature can be controlled indoors, the principal temperature-related health threat to tropical, temperate and sub-arctic pinnipeds, i.e., heat stress, is not (or should not be) a significant concern in indoor facilities.

Walruses, however, face the same problems as polar bears when housed in indoor facilities. Just as with polar bears, **walruses should not be housed in perpetual summer temperatures and substrate temperatures should be lower than for other pinnipeds for at least the three winter months** (as they can spend up to 17% of their time hauled-out on ice – Udevitz et al. 2009). We recommend the same temperature standards for walruses as for polar bears: **air temperature maintained at no greater than**

0° C for at least the three winter months and the rest of the year at no greater than +12° C (mid-range between Arctic summer highs of +10° C and +15° C). Again, warmer microclimates within the enclosure may be present, but the air temperature generally for the entire enclosure should meet these standards. **Water temperature should be no greater than +5° C for at least the three winter months and the rest of the year no greater than +10° C. At least 50% of the substrate in dry resting areas should be cooled to near freezing temperature for at least the three winter months as well.** Again, if meeting these requirements is too expensive for a facility, then a facility should not house walruses.

SIRENIANS

Polar species are susceptible to heat stress; in contrast, sirenians are highly susceptible to cold stress. Just as polar bear distribution into lower latitudes is limited by the species' ability to cope with warmer temperatures, so sirenian distribution into higher latitudes is limited by the taxon's ability to cope with cold water (Deutsch et al 2003). "Cold" to a manatee is +19-20° C. This is a *clear* lower temperature limit for this species. **APHIS should establish a lower water temperature limit for sirenians of 22° C, as this is the upper limit of the lower temperature range individual manatees have been found to tolerate (Deutsch et al. 2003).**

(b) Ventilation

We find this section a welcome exception to the tendency in the proposed rule to shift from quantitative to performance-based standards. The proposed amendments to § 3.102(b) are much more detailed than the current language and offer quantitative ventilation rates that can be measured and thus will be easily enforced by inspectors (the current language is entirely performance-based). **The rate proposed appears adequate, as it is based on human standards, giving it a solid scientific basis.**

(c) Lighting

We find this section another welcome exception to the tendency in the proposed rule to shift from quantitative to performance-based standards. We also note the relatively large body of research on which these standards are based (cited in footnote 8 on p. 5634). We express again our confusion that APHIS identified these studies and recognized their relevance to § 3.102(c), but did not identify or recognize studies relevant to § 3.102(a), when the body of research is equally extensive (see above). However, while the proposed rule states that "to the extent possible" (p. 5649) lighting regimes should be used that approximate the lighting conditions encountered by a species in nature, adjusting lighting regimes to accommodate a species' natural lighting conditions **should not be discretionary; it should be mandatory**.

Couquiaud (2005) discusses how natural spectrum lamps and automatic time switches can be coupled with outdoor ambient light-sensitive photocells to replicate natural outdoor lighting conditions indoors (p. 347). Such systems can be fitted with dimmers that would allow the progressive reduction and amplification of light intensity to mirror outdoor lighting conditions. **We recommend that APHIS include specific reference to these technologies in the final rule.**

Our only other substantive comment on this section is regarding the requirement for 6 hours of uninterrupted darkness during each 24-hour period. While this is an improvement over the current

standards, it is insufficient to safeguard the well-being of polar marine mammals (which include, *inter alia*, polar bears, walruses, and beluga whales). As noted in Morgan and Tromborg (2007), "Lighting conditions in captive environments are designed for human convenience" (p. 268). The statement in the proposed rule that "6 hours [is] a reasonable minimum, since we think it may correspond with typical work hours at a facility" (p. 5634) highlights this perfectly. What corresponds to typical work hours is utterly irrelevant, for two reasons. One, the convenience of the staff at a licensed facility is not a legal standard found in the AWA. Two, modern lighting technology allows a facility to provide nocturnal lighting during daylight hours in indoor facilities, while still allowing visitors to view the animals.

Polar marine mammals experience far more than six hours of uninterrupted darkness on a seasonal basis and the standard in general does not provide for seasonal changes in daylight duration, which are extreme for these species and an integral element of their natural history. **APHIS must require an appropriate lighting regime for polar animals.** All polar marine mammals experience seasonal periods with near or total 24-hour darkness and near or total 24-hour daylight. **We recommend that any indoor facility housing polar marine mammals provide a minimum of 18 hours of darkness during the three winter months (20-24 hours would be just as appropriate, but 18 hours is a *minimum*) – the proposed standard would apply for the three summer months and the transition from one season to the next should be gradual, as it is in nature. At the equinoxes, 12 hours of light and 12 of dark should be provided.** During the extended darkness periods, licensed facilities can use the same lighting protocols and technologies they use for nocturnal animal exhibits, to allow visitors to view the animals.

The proposed standard under this section is to provide lighting that "*is appropriate* for the species involved" (emphasis added, p. 5649). Under no circumstances can the provision of 18 hours of daylight and 6 hours of darkness 365 days a year meet this standard for any polar marine mammal species.

Outdoor Facilities: § 3.103

We note that this section does not have a provision for lighting requirements. This is no doubt because outdoor facilities are subject to natural lighting, but in fact outdoor facilities have artificial lighting – many facilities, particularly those in theme parks, have artificial lights well into nighttime hours. Indeed, from our understanding, many parts of a facility might have artificial lighting all night long, due, *inter alia*, to security concerns, meaning that *no animals in outdoor enclosures at such a facility have any uninterrupted darkness at night*. This is an inconsistency with the indoor facility requirements, which APHIS simply ignores. **We recommend that the agency develop a requirement that allows marine mammals (and all captive wildlife) held in outdoor facilities to experience at least six hours of uninterrupted and *full* darkness every night.** Security concerns can be addressed with appropriate technology, such as infrared cameras.

<u>(a) Environmental temperatures</u>

GENERAL

We support the revision to this section that changes the standard from temperatures that "do not adversely affect their health and comfort" (p. 5634) to temperatures that "are in accordance with currently accepted practices for the species, as cited in appropriate professional journals or reference guides" (p. 5649); this makes the two temperature sections for indoor and outdoor facilities consistent

and provides for standards that are based on peer-reviewed science rather than performance. However, see our discussion above regarding how the lack of quantitative temperature limits can easily lead to violations of this standard. **Our comments above, under "Indoor Facilities: § 3.102" regarding minimum acceptable temperature ranges, are relevant for outdoor facilities as well, for water temperatures for all species but also for air temperatures for polar species, with some additional points below.**
PINNIPEDS

Morgan and Tromborg (2007) note that enclosure substrates may have thermal properties, including color, that make thermoregulation easier or more difficult for wildlife. In captive enclosures, lighter-colored substrate reflects light, which can cause the development of overheated microclimates within a pinniped enclosure, even when shade is provided (Langman et al. 1996; the reflectance of light-colored gunite "eliminated functional shade" (p. 407)). Conversely, free-ranging California sea lions (*Zalophus californianus*) prefer rookeries with lighter-colored substrate and larger-sized rocks (for shade), because in natural habitat, these result in cooler microclimates (Gonzalez-Suarez and Gerber 2008). So while cooler microclimates are achieved with opposing substrate colors in captivity and the wild, the result is the same in both environments – reduced heat stress for the animals.

Given the very broad range of temperatures in which individual pinnipeds find themselves, especially in temperate and sub-arctic regions and particularly when hauled-out, we acknowledge the difficulty in tabulating meaningful species-specific temperature ranges for the various pinniped species found in captivity. However, **APHIS should establish a minimum requirement to provide substrate (in both dry resting areas and pools) for pinnipeds housed in outdoor facilities open to natural sunlight that is colored to minimize heat stress, particularly during summer months.** Some substrate material (such as asphalt) may itself become hot if it is dark-colored; other material (such as gunite) may result in overly warm microclimates if light-colored, due to high reflectivity. Highly reflective surfaces are also a problem for ocular health in pinnipeds (Colitz et al. 2010;[31] Gage 2011), so requiring less reflective surfaces for temperature control would address two significant health concerns simultaneously.

We recognize that dark-colored substrate[32] may make the animals more difficult to see for visitors. We urge the regulated community to conduct research to determine an optimal color for specific substrates to maximize visibility in and out of the water while minimizing light reflection. We were unable to identify any such studies in our literature search. **Until scientific information becomes available justifying uniformly light-colored substrate, APHIS must establish a requirement for substrates to be colored to minimize heat stress and ocular damage (regardless of visibility impacts), a requirement that is science-based.**

(b) Shelter

We strongly support the proposed change to require shade for marine mammals housed outdoors. While we are aware of only a few studies[33] addressing the impacts of lack of shade on marine mammals

[31] This paper is attributed incorrectly in the proposed rule to L. Gage (see footnote 13 on p. 5635). It is in fact by C. Colitz and colleagues.
[32] "Dark" is any color that absorbs most of the natural spectrum of light (see Langman et al. (1996), which indicated darker gunite absorbed 92% of light).
[33] We note that the absence of studies on the impacts on marine mammals of unnatural exposure to UV radiation is once again due to the failure of zoos and aquariums to conduct such studies – they control access to their

housed outdoors (see e.g., Colitz et al. 2010; Gage 2011; several of APHIS' own inspection reports note eye damage to cetaceans and pinnipeds[34]), it is intuitive and logical that the various physical impacts of overexposure to UV radiation on marine mammals – most obviously sunburn and ocular damage – would not be as great an issue in the wild, as marine mammals either spend most of their time submerged at depth, in habitats with substrates that are not highly reflective of light (Couquiaud 2005), or at a minimum not looking directly upward (Gage 2011).

Licensees might argue that many marine mammal taxa, such as cetaceans, have no access to shade in the wild, so shade cannot be deemed a minimum requirement in captivity. However, captive enclosures for marine mammals are generally painted white or pale blue (Langman et al. 1996; Morgan and Tromborg 2007; Gage 2011; personal observation), apparently to make the animals easily visible to visitors. These colors increase light reflectance and expose the animals to high levels of UV radiation even at the bottom of tanks 10 m in depth, and of course many tanks are far shallower than 10 m, even for cetaceans. In short, as noted in Couquiaud (2005), the natural mechanism used by marine mammals, especially cetaceans, to minimize UV radiation exposure (i.e., spending most of the time submerged in deep water or in shallow water with non-reflective substrates) is absent or impossible to utilize in captivity. **Shade is thus a necessity in captivity.**

(c) Perimeter fence

There are no proposed amendments to this section. Generally, we accept the adequacy of this section, with one major exception.

APHIS allows marine mammals to be used in traveling facilities or acts (see §§ 3.103(c)(4) and 3.104(e)), and in fact dispenses with the requirement for adequate perimeter fencing for such facilities. Under no circumstances can the conditions found in traveling facilities adequately safeguard the welfare of any marine mammal species. Pinnipeds are the most common taxon found in traveling acts, but this prevalence does not prevent their welfare from being harmed by the conditions under which they are held. Polar bears have historically been used in traveling acts and, as noted elsewhere in these comments, no polar species can be adequately provided for in a traveling facility. In jurisdictions other than the US, even cetaceans are found in traveling facilities and in fact there are currently no US regulatory or legislative provisions prohibiting the use of cetaceans in traveling facilities. **We strongly recommend that APHIS write a new section, e.g., § 3.103(d), that expressly prohibits the use of marine mammals – or, at a minimum, cetaceans and polar bears – in traveling facilities and acts.**

Space Requirements: § 3.104

Generally, research results indicate that ranging patterns in marine mammals (or any wildlife species) are tied to food distribution or prey movements (other factors, such as habitat characteristics, also determine ranging patterns). Licensees frequently note that food is provided in captivity and therefore food acquisition-necessitated ranging patterns in the wild are irrelevant to space requirements in

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animals and if they do not allow access for certain research and do not conduct it themselves, said research is not conducted. The regulated community cannot use its own failure as an argument against requiring shade.

[34] Animal Plant Health Inspection Service. 2002. Routine Inspection Report: SeaWorld San Antonio, March, USDA; Animal Plant Health Inspection Service. 2007. Routine Inspection Report: Los Angeles Zoo, March, USDA; Animal Plant Health Inspection Service. 2010. Routine Inspection Report: Six Flags Discovery Kingdom, November, USDA.

captivity (i.e., captive marine mammals do not *need* to range widely because they have food directly provided for them). This argument fails utterly at the biological level and is inconsistent with natural selection as scientists understand it.

All species adapt to their environment. If marine mammals are wide-ranging because of prey distribution and movements, then they become physiologically adapted to these large home ranges or migratory movements. In short, they *must* travel these distances (and ideally have control over their movements to or from resources and threats; see e.g., Whitham and Wielebnowski 2013) to maintain their health and safeguard their welfare, regardless of *why* they travel these distances (Clubb and Mason 2003, 2007; McPhee and Carlstead 2010). An obvious parallel is found in humans – as an increasing body of human health research attests, because we evolved as hunter/gatherers, if we do not exercise or remain active at a minimum level even in the modern world where we do not need to hunt or gather, then we suffer serious health consequences. *Why* we move is not relevant to our individual physical health or well-being; it is relevant simply *that* we move. The same is true for all animals, including marine mammals.

A very strong argument can be – and has been – made that wide-ranging carnivores such as polar bears and cetaceans should not even be maintained in captivity (Clubb and Mason 2003, 2007). We agree with this argument. In the following comments on space requirements, wherever we offer recommended minimum enclosure dimensions, we do so *not* to endorse such dimensions as adequate but with the pragmatic intention of improving the welfare of captive marine mammals in US facilities.

We note that for certain species (i.e., pinnipeds, polar bears, and sea otters), APHIS proposes to add language that requires "pool exit and entry areas be of a depth and grade that allows for easy access and exit for [animals] of all ages and infirmities" (p. 5636). **We support this revision throughout § 3.104**.

<u>(a) General</u>

We accept some "housekeeping" changes in this provision, e.g., the first half of § 3.104(a)(2) and the combining of several tables throughout the full section, without comment.

We note the new language in the second half of § 3.104(a)(2), which authorizes APHIS to "determine if partial obstructions in a horizontal dimension compromise the intent of the regulations and/or significantly restrict the freedom of movement of the animal(s) in the enclosure" (p. 5650). We believe this additional clarity is an improvement (and frankly think that making such determinations has *always* been within APHIS' purview), but also **contend that this proposed provision must be used only to *disallow* partial obstructions, rather than *allow* them**, as *by definition* "minimum horizontal dimension" (MHD) should encompass the concept of a minimum distance in a horizontal plane that an animal can move *without restriction* (i.e., without any obstruction, partial or otherwise).

The current regulatory language, which APHIS does not propose to amend, under this provision states that "Marine mammals must be housed in primary enclosures that comply with the minimum space requirements prescribed by this part. These enclosures must be constructed and maintained so that the animals contained within are provided *sufficient space, both horizontally and vertically, to be able to make normal postural and social adjustments with adequate freedom of movement*, in or out of the water" (current § 3.104(a), emphasis added). **We contend that it is simply impossible for this general**

standard to be met for *any* species of marine mammal held in captivity with the current space requirements. It is completely nonsensical for the agency to retain this general standard, which is based on widely-accepted animal welfare concepts and which we support, while simultaneously retaining the current space requirements. The current space requirements are woefully inadequate and are in no way based on current science or industry best practice. **While they may have been based on best practice 30 years ago, in 2016 they are outdated and completely arbitrary.**

(b) Cetaceans

The proposed rule discusses the possibility of revising the average adult body lengths of three species of cetacean, based on data provided by the Alliance of Marine Mammal Parks and Aquariums (AMMPA) and the AZA. The requested revisions would result in decreased calculated minimum space requirements for these species. **APHIS *cannot* revise the average adult body length of these three species under these circumstances, for two clear reasons.** One, NOAA has communicated to APHIS that "these figures do not take into account animals potentially added from the wild…nor does it provide information on morphometrics that may have been published more recently" (p. 5636). In short, the government agency with expertise on these taxa does not support this revision. Two, any revision that results in *decreased* space requirements is simply not supported by current science or industry best practice (see below). Therefore, *if* APHIS decides to revise the average adult body lengths of these three species based on the information provided by professional associations representing the regulated community, then the method by which it calculates minimum space requirements must also be revised (see detailed discussion below regarding our recommended bases for determining minimum space requirements).

Indeed, one of the signatories of this letter recommended, during the ANPR process, basing space requirements on *maximum* adult body length, not average adult body length (see comments submitted by Whale and Dolphin Conservation Society, 2002). This is far more precautionary than the current standard and addresses NOAA's comment to a certain extent. *If* APHIS retains basing space requirements on adult body length, **we recommend using maximum adult body length, as the body length of any given adult individual can greatly exceed the average** (Couquiaud 2005).

KILLER WHALES

For up to two killer whales, a facility need only provide a circular tank with a diameter twice as wide and a depth half as deep as an average adult killer whale is long (Table 1). This standard was developed over 30 years ago, when very little was known about free-ranging killer whales. This standard would not allow an adult whale to position itself fully in the vertical plane (its tail would touch and drag on the bottom before the animal reaches full upright orientation), so it clearly cannot make "normal postural adjustments." Given this, it is completely irrational to claim that the current space requirements for killer whales meet the general standard established in § 3.104(a).

However, the latest research makes it abundantly clear that **minimum space requirements must be amended *substantially* to allow killer whales to "make normal postural and social adjustments with adequate freedom of movement" both horizontally and vertically**. Killer whales are large, wide-ranging predators; indeed, they are the top predator in the ocean. They routinely swim multiple kilometers in straight lines and are capable of travelling as many as 223 km a day for up to 30-40 days without rest

(Durban and Pitman 2012; Matthews et al. 2011; Eisert et al. 2015). Home ranges are often 3000-5000 km north to south (see e.g., Dahlheim et al. 2008). They routinely dive to depths in excess of 500 m and a "shallow" dive is in excess of 7 m – in some populations, individuals dive in excess of 200 m up to a dozen times a day (Reisinger et al. 2015), while in others, they dive deeper than 150 m at least once every five hours (Baird et al. 2005). To argue that a tank less than 15 m wide and only 3.66 m deep (Table 1) safeguards this species' well-being and results in humane treatment is genuinely ludicrous.

Given that it would be unrealistic – although arguably wholly rational and scientifically justified – to demand a minimum standard that allows a killer whale to perform horizontal and vertical movements that are consistent with the growing body of data from telemetry studies, **the standard must, at a minimum, allow a killer whale to move in the horizontal plane in a straight line for at least 10-12 tail strokes, i.e., a MHD of 100 m, and in the vertical plane twice a typical "shallow" dive and also twice the average adult body length, i.e., a minimum depth of 15 m (Table 1). The other required dimensions (minimum surface area and volume) should be calculated *per killer whale* (not for 1-2 animals), based on this MHD and this minimum depth** (see following sections)**.** These minimum space requirements would arguably allow a killer whale to make at least *some* – however few – "normal postural adjustments" both horizontally and vertically.

This standard is clearly achievable, because at least one licensee actually proposed to construct such an enclosure. SeaWorld San Diego proposed to build the so-called Blue World Project, with dimensions similar to those proposed above[35]. Therefore such an enclosure is clearly both possible in an engineering sense and affordable in a financial sense.

Impacts under current industry best practice

We urge APHIS not to argue that a more reasonable minimum might be the dimensions of the current largest primary enclosure holding killer whales in the US, i.e., a MHD of approximately 23 m and a minimum depth of approximately 10 m. These dimensions clearly cause killer whales to suffer significant welfare impacts (other aspects of captive conditions for killer whales, including artificial social groupings and lack of environmental enrichment, are additional factors affecting welfare). One of the most obvious impacts of insufficient space, leading to insufficient movement, is the fully collapsed dorsal fins that distinguish captive male killer whales from free-ranging males (Ventre and Jett 2015). While not yet identified as a significant health or welfare problem, this physical deformity is emblematic of the inadequacy of the space afforded captive killer whales under industry best practice.

There are, however, clear welfare impacts on captive killer whales under industry best practice. Referring to the most recent survivorship data (noting that survivorship is not necessarily the most important metric when measuring welfare – see, e.g., Mason 2010), while captive killer whale survivorship has improved over the past 30 years, it still only matches that of populations of free-ranging whales known to be imperiled (Robeck et al. 2015). Annual survivorship rates of killer whales at SeaWorld are on a par with those of three populations of whales in the northeastern Pacific. The southern resident (SR) population was listed as endangered in 2005 under the US Endangered Species

[35] Architectural documents available from the California Coastal Commission and also available from AWI on request.

Act.[36] The northern resident (NR) population is listed as threatened under the Canadian Species at Risk Act.[37] Only the Alaskan population of whales is unlisted. The SRs are facing multiple threats, including severe food shortages.[36] The NRs are more robust, but also faced severe food shortages in the mid- to late 1990s. This led to elevated mortality in the population during this period (Olesiuk et al. 2005).

Robeck et al. (2015) made their captive-vs-free-ranging comparison using only data from a time period (2000-2015) for captive whales during which survivorship was highest, while conversely using data from the full time period (1975-2015 and 1984-2015) during which SRs/NRs and Alaskan whales have been studied respectively, including the periods during which the SRs and NRs were food-limited and their health compromised (Baird 2001; Ford et al. 2009; Ward et al. 2009). So survivorship in the best years for captive whales was no better than survivorship during a period that included the worst years known for endangered and threatened free-ranging whales.

Robeck et al. (2015) concluded that captive killer whale welfare is now on a par with that of free-ranging whales, but many of these "comparable" free-ranging whales are experiencing far from optimal welfare; indeed, they have faced famine in recent years. Therefore, under the current licensee (i.e., industry best practice) standards, which far exceed the current AWA standards, the captive environment appears to affect killer whale survivorship in ways similar to degraded natural habitats. Clearly, industry best practice, including existing enclosure sizes, is insufficient to safeguard killer whale welfare in captivity.

Jett and Ventre (2015) also looked at survivorship, but with different methodologies, including the Kaplan-Meier and Cox proportional hazard models. Rather than compare their captive killer whale results with free-ranging populations, they focused on evaluating captive survivorship by sex, facility (U.S. vs. foreign), captive-born vs. wild-captured, pre- vs. post-1 January 1985, and animal age upon entering captivity (Jett and Ventre 2015). They too found that survivorship in captivity has improved over time; however, survival to age milestones, including sexual maturity and menopause, is poor compared to the wild. A key result was that Kaplan-Meier survivorship curves noticeably drop at two clear life history stages in captive killer whales – the juvenile and adolescent life stages (these drops are not necessarily paralleled in free-ranging whales; see e.g., Olesiuk et al. 1990; Matkin et al. 2014; Jett and Ventre 2015). They concluded that, for juveniles, this was a result of routine separations from mothers and suggested that "managers may be advised to avoid the potentially stressful separation of captive-born calves and mothers between 2.0 and 6.0 yr of age as can happen in the transfer of whales between parks" (p. 1374). For adolescents, "This latter discrepancy suggests that advancing into physical and sexual maturity in the captive environment represents unique challenges to captive-born whales" (p. 1374).

In addition, there have been mortalities in captive killer whales caused by pathogens highly unlikely to be encountered by free-ranging whales. In particular, mosquito-borne pathogens would rarely be encountered or transmitted to free-ranging killer whales, as free-ranging killer whales are dynamic and always moving and are typically found in marine waters away from mosquito-infested areas. Yet at least two captive killer whales have died from mosquito-borne illness in low latitude, inland areas (Buck et al. 1993; St. Leger et al. 2011; Jett and Ventre 2012). These deaths were almost certainly caused by the relative sedentariness of captive killer whales compared to their free-ranging counterparts, and their

[36] http://www.nmfs.noaa.gov/pr/species/mammals/whales/killer-whale.html
[37] http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=698

tendency to float motionless near the surface in excess of 15 minutes, up to hours at a time (Jett and Ventre 2012; personal observation). This behavioral pattern, which greatly differs from the dynamic norm for free-ranging animals (see e.g., Baird et al. 2005; Durban and Pitman 2012; Matthews et al. 2011; Reisinger et al. 2015; Eisert et al. 2015), can be attributed to the comparatively limited space captive killer whales have to perform normal movement patterns, and these abnormal patterns occur in enclosures that far exceed the minimum standards APHIS proposes to retain.

Finally, from trainer and visitor observations, captive killer whales wear and break their teeth (primarily in the lower jaw rather than the upper) because they persistently grind their teeth on the concrete walls and "pop" their jaws on the metal gates of their enclosures (Ventre and Jett 2015). We assume APHIS inspectors can corroborate these observations. Almost all captive killer whales suffer moderate to severe apical wear of their teeth and occasional breakage. Most have open holes drilled in their teeth (after wear or breakage), which the most diligent flushing by caretakers cannot prevent serving as entry points for pathogens into the animal's system (Ventre and Jett 2015). In all mammals, poor dentition can lead to poor health (e.g., Li et al. 2000).

However, there have been few peer-reviewed papers examining this common problem in captive killer whales; the facilities holding this species 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" (p. 325). Indeed, the authors noted 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" (p. 326).

Killer whale teeth in the wild generally do not suffer severe apical wear (and only very rarely exhibit breakage) and when they do, this wear occurs at the population level, is typically symmetrical (that is, it occurs in both the upper and lower jaws) and is attributed to prey type (e.g., in the northeastern Pacific offshore ecotype, severe apical tooth wear is attributed to 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 apical wear, associated with feeding on other marine mammals (Ford et al. 2011). Generally the teeth of mammal-eaters show lateral more than apical wear (Caldwell and Brown 1964). Northeastern Pacific resident and Type 2 North Atlantic teeth suffer no apical wear and only some lateral wear (Ford et al. 2011; Foote et al. 2009).

In all these papers, the authors note that when apical tooth wear occurs (which is the exception, not the rule), it is likely due to prey type or feeding method. Given that captive whales' teeth almost never touch their food (fish are dropped directly into the open mouths of stationed whales), the etiology of the apical tooth wear seen in captive killer whales must be different (i.e., it is from stereotypical grinding of the teeth on walls and gates). The cause of this common stereotypy has not been studied as it should have been by licensees, but it is most likely the lack of space afforded the animals by even the most generous enclosures found in the regulated community.

Given poor survivorship and the diseases and deformities unique to captivity, which are almost certainly the result of, *inter alia*, inadequate space leading to behavioral abnormalities and harmful stereotypies, **APHIS must revise the current space requirements for killer whales to exceed industry best practice, to allow the animals, at least to *some* degree, to "make normal postural and social adjustments with adequate freedom of movement" both horizontally and vertically.**

Other standards

We note that space requirements vary widely under other jurisdictions (both professional and national); we offer two examples here as background for APHIS' deliberations when finalizing this proposed rule. The AMMPA, a professional association, requires certain minimum space requirements for a facility to receive AMMPA accreditation (AMMPA 2008). We in no way endorse these standards, but we do note that these standards represent what the regulated community considers *minimum* best practice (the AMMPA, by its own definition,[38] represents the best facilities in the regulated community, dedicated to the "highest standards").

For cetaceans, including killer whales, the AMMPA does not set a MHD, which is difficult to understand, given that cetaceans are wide-ranging in nature and typically swim significant distances in straight lines. In the ANPR, APHIS asked "Which is more important, minimum width or longest straight-line swimming distance? Should we require any specific straight-line swimming distance?" (*67 FR 37731*, p. 37732). Clearly the ability for such a wide-ranging oceanic predator to swim in a straight line for at least a few body lengths is key to an individual's well-being, given its natural history. (Our response to APHIS' question in the ANPR was that we find both equally important, as the MHD prevents licensees from constructing what are essentially chutes, long but narrow; while straight-line swimming is at the heart of a cetacean's natural swimming behavior. **We believe setting a MHD that allows straight-line swimming for several tail strokes – see above – is a simple means of reconciling the two**.)

The AMMPA minimum depth for killer whales is 5.25 m. Its minimum volume per killer whale for the first two whales is 959 m^3 (that is, 1918 m^3 for up to two whales). For every additional *two* killer whales, 1079 m^3 of water must be added (539.5 m^3 per animal, but even if only one killer whale is added, the additional volume of water must be 1079 m^3). The MHD for at least two killer whales under the regulations of the United Kingdom (UK Regulations) is 15 m, equivalent to the current MHD in the US. However, minimum depth is 12 m, more than three times the current AWA minimum depth requirement. Under UK Regulations, the minimum volume for 1-5 killer whales is 12,000 m^3 (2400 m^3 per whale), with 2500 m^3 required for each additional whale above five (see Table 1 for these dimensions).

The current AWA volume requirement per whale for up to two killer whales is 307.9 m^3, with each additional whale above two requiring an additional 153.95 m^3. Thus overall the AMMPA and UK dimensions greatly exceed those of the AWA and the UK depth requirement is similar to our recommendation. **If the AMMPA and UK Regulations are seen as industry best practice, the AWA space requirements for killer whales do not even approach best practice standards.**

Conclusion

APHIS almost certainly chose not to change space requirements (for any marine mammal species) due to the perceived cost to licensees to retrofit or expand marine mammal enclosures. However, in the case of killer whales, only *one* facility in the US, with *one* animal, maintains an enclosure that would be affected by even a modest change in the current space requirements for this species. All other facilities housing killer whales would not be affected by even a modest increase in space requirements, as they

[38] http://www.ammpa.org/about.html

already have enclosures that far exceed the current minimum standards. This means that based on industry best practice alone, the current minimum standards for killer whales are outdated and maintaining these minimum standards is unjustified and highly arbitrary. Regulating to the lowest common denominator (i.e., the smallest existing enclosure) is not the legal standard nor, when the smallest existing enclosure was originally built in the 1960s, justified in any way.

Both current science *and* industry best practice support increased space requirements for killer whales. The cost to licensees to achieve major space increases might be significant, but it would not be prohibitive (see comment above regarding the Blue World Project). **Therefore, a much larger enclosure than industry best practice was and is achievable and it is the *minimum* that should be required for killer whales, based on current science.**

BOTTLENOSE DOLPHINS

For up to two bottlenose dolphins, a facility need only provide a circular tank with a diameter of 7.32 m and a depth of 1.83 m. This standard was developed over 30 years ago, when very little telemetry work had been done with free-ranging bottlenose dolphins (such work did not really begin until the mid-1990s, around the same time as the negotiated rulemaking). This standard would not allow a dolphin of average length to position itself fully in the vertical plane. Given this, once again it is irrational to claim that the current minimum space requirements for bottlenose dolphins meet the general standard established in § 3.104(a).

A large number of studies examining movement patterns, habitat usage, diving behavior, and other behavioral and ecological characteristics have now been done on various populations of bottlenose dolphins (see e.g., Mate et al. 1995; Defran et al. 1999; Gubbins 2002; Ingram and Rogan 2002; Hastie et al. 2003; Corkeron and Martin 2004; Klatsky et al. 2008; Sprogis et al. 2016). These studies have shown a wide variety of home range sizes, daily ranging patterns, habitat usage, and dive profiles. However, a common result of these studies shows bottlenose dolphins ranging far more widely (in the range of tens of kilometers per day; e.g., Mate et al. 1995) and diving more deeply (up to 450 m; Klatsky et al. 2008) than was generally supposed 30 years ago and certainly than any tank or sea pen complying with industry best practice can accommodate. **Based on this large and still emerging body of science, the current APHIS space requirements for this species are simply unacceptable.**

The smallest core range we were able to identify in the scientific literature for a single bottlenose dolphin was 0.6 km^2 (Gubbins 2002), which equates to 600,000 m^2. The *minimum* surface area per animal for bottlenose dolphins found by Couquiaud (2005) in her global survey of facilities was 14 m^2 (so for two animals, it would be 28 m^2). The *median* surface area she found per animal was actually 91 m^2 (so for two dolphins, it would be 182 m^2). Yet the current AWA minimum surface area per animal for up to two bottlenose dolphins, a standard APHIS does not propose to change, is merely 4.4 m^2 or 5.5 m^2, depending on the origin of the animal (Atlantic or Pacific, respectively; p. 5652). The minimum volume Couquiaud found was 46 m^3 per dolphin, yet the AWA minimum volume is 38.48 m^3 per dolphin (76.97 m^3 for up to two dolphins, regardless of subspecies). The minimum volume required for each additional dolphin under the AWA is 10.79-13.36 m^3, for Atlantic and Pacific subspecies respectively (Table 1). Clearly the AWA minimum dimensions for up to two bottlenose dolphins have no basis in current science or industry best practice and maintaining them cannot be justified.

To say the least, these standards are blatantly outdated and arbitrary (one must ask why the MHD, minimum depth, and minimum volume for up to two bottlenose dolphins is the same regardless of subspecies when the other dimensions are different depending on subspecies – this is inexplicably arbitrary). Indeed, setting minimum dimensions for up to two (or four) animals and then setting volumes required for additional animals at a level in no obvious way related to these initial levels is and has always been arbitrary – **all minimum dimensions should be *per animal* and should be additive, which will also make enforcement easier.**

The standard must, at a minimum, allow a bottlenose dolphin to move in the horizontal plane in a straight line for at least 10-12 tail strokes, i.e., an MHD of 35 m, and in the vertical plane at least twice the average length of a dolphin (using the average length of Pacific bottlenose, the larger of the two subspecies), i.e., a minimum depth of 6 m. Minimum surface area should be no less than 14 m^2 per dolphin, in line with minimum industry practice (Couquiaud 2005) (any enclosure with a MHD of 35 m will have a surface area in excess of this minimum, however, and therefore another approach would set the minimum surface area to Couquiaud's median, i.e., 91 m^2 per dolphin, which would be in line with Italy's standard). Minimum volume should be no less than 63 m^3 per dolphin, in line with minimum industry practice (AMMPA 2008 – see below). This would solidly base all minimum space requirements for bottlenose dolphins on either current science or industry best practice (see Table 1 for these dimensions).

Wells (2009) notes that it is difficult to recreate natural social groupings for bottlenose dolphins in captivity. With that in mind, we note that numerous publications clarify that average group size for bottlenose dolphins is generally 10 dolphins or fewer (see e.g., Irvine et al. 1981; Ingram and Rogan 2002; Cubero-Pardo 2007; Wells 2009; Toth et al. 2011). Therefore, for bottlenose, **if the group size in a licensed facility is more than 10 dolphins, at least two enclosures, each meeting the minimum dimensions, must be provided and freely accessible to all dolphins *at all times*.** At a minimum, this would provide the animals an *opportunity* to sort themselves into more natural-sized groups (even if the composition is not natural), which may reduce aggression (Bassos and Wells 1991; Couquiaud 2005) and the negative impacts of social stress (Waples and Gales 2002).

Effects of enclosure size

We identified only three papers that address the issue of enclosure size and impacts on bottlenose dolphins in the literature (Bassos and Wells 1996; Shyan et al. 2002; Ugaz et al. 2009[39]). Bassos and Wells (1999) found that dolphins were more active in the larger of two tanks and concluded that "increasing pool size enhances energetic opportunities for the animals and may decrease aggressive encounters" (p. 324). Ugaz et al. (2009) found similar results, although in their case the two enclosures differed additionally in that one was "open" (i.e., a sea pen) as well as larger, while the other was "closed" (i.e., a tank, although using natural seawater). The dolphins were significantly more active and

[39] Ugaz et al. (2013) was a follow-up paper to Ugaz et al (2009). The authors examined dolphins in two closed (tank) and two open (sea pen) facilities, focusing on this difference (open versus closed) rather than size (although, as with Ugaz et al. [2009], the open facilities were larger than the closed facilities). Ugaz et al. (2013) confirmed the behavioral results of Ugaz et al. (2009), but also looked at salivary cortisol levels, as a direct measure of stress. Dolphins in the larger, open facilities had significantly lower salivary cortisol levels than dolphins in the smaller, closed facilities.

exhibited more natural swimming patterns in the larger sea pen enclosures than in the smaller tank enclosures.

Shyan et al. (2002) approached the question differently; rather than evaluate activity level and type in tanks of different sizes, they measured tank preference. That is, they sought to determine which tank(s) captive dolphins preferred to occupy. They found that the dolphins in their study spent more time in the smaller two of three tanks when allowed free access to all three tanks. The authors therefore concluded that dolphins might prefer smaller enclosures.

There are several problems with this conclusion. One, the smaller tanks were shallower as well as having shorter MHDs than the larger tank. It may be that bottlenose dolphins prefer shallower depths (in this case, 5.5 m versus 8.2 m, so both still far in excess of the current APHIS minimum depth requirement), but, if depth was similar, might still prefer greater horizontal dimensions. The enclosures in the other two studies were of similar depth (that is, they differed primarily in the horizontal dimension). **It may be that bottlenose dolphin enclosures should have varying depths, including shallow areas of ≤1 m, to more closely simulate natural topography.**

Two, the larger tank had public underwater viewing windows, while the smaller tanks did not. The dolphins may have simply preferred to be "off view" more than "on view" to visitors at the underwater viewing windows. The authors did not address this possibility in their discussion. Three, the dolphins clearly preferred one of the smaller tanks over the other, when the two smaller tanks were virtually identical in size and shape and were accessed via similar gates. It was possible that the dolphins had some degree of negative association with the less-preferred smaller tank or even the larger tank (perhaps aggressive incidents had occurred in them historically, for example) or strong positive associations with the preferred smaller tank (perhaps food was offered or enrichment occurred more often in this tank). The authors did address this possibility in their discussion. The study design could not distinguish or eliminate any of these confounding factors. Therefore, all this study actually did was determine that the dolphins, for *some* reason(s) that could not be precisely identified, preferred one tank over two others and that tank happened to be smaller than one of the other two.

We wish to note that the paucity of literature measuring captive dolphin (or any other marine mammal) preference, activity levels, health, cortisol levels, stereotypies, or any other relevant factor related to tanks of varying horizontal and vertical dimensions is *not* an acceptable excuse for APHIS to disregard the growing body of literature on telemetry studies of free-ranging bottlenose dolphins and *is* a telling sign of the true (dis)regard licensees have for their animals' welfare. In the 20 years since the end of the negotiated rulemaking process, when the participants, including AWI, could not come to consensus on space requirements (largely because of a lack of research), the regulated community has failed to conduct the research necessary to fully address this question. (The agency has not pushed for this research either, apparently.) This is disturbing, to say the least.

Impacts under current industry best practice

While bottlenose dolphins do not typically suffer all of the physical deformities (i.e., collapsed dorsal fins) to the same extent as those documented for killer whales (personal observation) and their survivorship compares more favorably to free-ranging dolphins than that of killer whales (Small and DeMaster 1995; Venn-Watson et al. 2015), they still suffer direct impacts under industry best practice.

For example, some also suffer from poor dentition to varying degrees, as well as damage to the tips of their rostrums (personal observation; see Appendix I).

Additionally, they appear to be more susceptible to certain diseases and health conditions than free-ranging dolphins. The prevalence of hemochromatosis, a disease resulting from excess accumulation of iron in the blood, is striking in captive bottlenose dolphins compared to those in the wild (Johnson et al. 2009; Venn-Watson et al. 2012; Mazzaro et al. 2012; Venn-Watson et al. 2013). Cetaceans in general have much larger stores of oxygen, bound to the iron-based molecules hemoglobin and myoglobin, than terrestrial mammals (see, e.g., Parsons 2013), an adaptation to diving. Apparently this increased level of hemoglobin and myoglobin in their blood and muscle becomes a liability in captivity, where deep diving and long breath-holds (that is, the reasons for needing the ability to store high levels of oxygen) are not needed or indeed possible.

Free-ranging dolphins spend more than 70% of their time fully below the surface (e.g., Mate et al. 1995), some portion of that time at depths greater than 10 m, and routinely hold their breath longer than one minute. Captive dolphins spend at least a quarter of their time with their heads above water (e.g., Galhardo et al. 1996), let alone at the surface, never dive below 10 m (since their tanks do not exceed that depth), and rarely hold their breath for more than a minute (personal observation). In short, these mammals, specially adapted to diving (deepest dives are ≥450 m; Klatsky et al. 2007) and holding their breath (≥8 min; Corkeron and Martin 2004), commonly suffer from a disease in captivity that appears to be caused by the very nature of captive conditions, where deep dives are not possible and long breath-holds rarely occur. We could not identify any research describing the prevalence of this disease among other captive marine mammal species but hypothesize it could be relatively common in species that routinely dive to depth in the wild.

Currently treatment is limited to phlebotomy (Johnson et al. 2009), a surreal throwback to 19th century human medicine. It seems less invasive, more natural, and more humane to treat this condition by mandating providing dolphins the option of diving deeper than is currently possible under industry best practice – and indeed training captive dolphins to perform multi-minute breath-holds as a husbandry measure. As noted above, **enclosures should have varying depths, ranging from at least twice the length of an average bottlenose dolphin (i.e., 6 m) to ≤1 m. At least half of the enclosure should meet or exceed the minimum depth requirement of 6 m and, as is currently the standard, only the portion of the tank that meets the minimum depth requirement can be used to calculate the required minimum surface area and volume.**

At least two captive dolphins are known to have died due to infections that set in after being raked by another dolphin in the same enclosure (Buck et al. 1987; Zapulli et al. 2005). It is possible that this sequence of events has occurred more often, but simply not been described in the literature. This particularly violent level of aggression (similar to that described below for killer whales; Ventre and Jett 2015) is likely a byproduct of the relatively small space provided to captive dolphin groups, and the subsequent inability of subordinate animals to escape the aggressive behavior of dominant individuals (see e.g., Waples and Gales 2002). In addition, dominance hierarchies in the wild are relatively stable and clearly established, leading to reduced aggression (see e.g., Sachser et al. 1998). In captivity, the routine redistribution of animals between gated enclosures for husbandry and performances purposes and the relatively frequent transfers of dolphins between facilities likely destabilize dominance hierarchies, which may result in increased aggressive interactions.

Other standards

The AMMPA minimum space requirements for bottlenose dolphins are a depth of 2.55 m, a volume of 222 m^3 (for 1-4 dolphins, so 56 m^3 per dolphin), and a volume of 125.4 m^3 for every *two* additional dolphins above four (63 m^3 per dolphin, but if only one dolphin is added, the additional volume must still be 125.4 m^3) (AMMPA 2008) (Table 1). These exceed or greatly exceed the current minimum space requirements under the AWA.

We identified standards in three other national jurisdictions for bottlenose dolphins; the United Kingdom (UK Regulations), Italy (Italy Regulations), and Brazil (Brazil Regulations). Of these, only Italy actually has bottlenose dolphins on captive display. The UK regulation for MHD is 7 m, for minimum depth is 5.6 m, and for minimum volume for 1-5 dolphins is 1000 m^3 (200 m^3 per dolphin). Each additional dolphin needs 200 m^3. Other than MHD, these dimensions greatly exceed the current minimum space requirements under the AWA. The Italy regulation for MHD is 7 m, for minimum depth is 4.5 m in at least half the enclosure, with 3.5 m in the rest, for minimum surface area is 400 m^2 for 1-5 dolphins (80 m^2 per dolphin), and for minimum volume is 1600 m^3 for 1-5 dolphins (320 m^3 per dolphin). Each additional dolphin needs 400 m^3 (Table 1). Again, other than MHD, these dimensions greatly exceed the US requirements.

We note that under AMMPA standards and in both the UK and Italy, additional dolphins require *greater or equal* additional volume per dolphin than is required per dolphin for the first four or five animals (the AWA requirement for additional volume for each dolphin in excess of the first two is far less than for the first two).

Finally, the Brazil standard for MHD is 14 m, for minimum depth is 6 m, and for minimum volume is 1600 m^3 for *two* dolphins (800 m^3 per dolphin) (Brazil Regulations). Each additional dolphin needs 400 m^3 (Table 1). These Brazilian standards are the largest minimum dimensions under any known jurisdiction. So best practice within the regulated community and the standards in three other national jurisdictions have minimum space requirements that far exceed the current AWA space requirements, which were developed over 30 years ago and which APHIS has proposed to retain unchanged. **This is the very definition of arbitrary**.

BELUGA WHALES

For up to two beluga whales, a facility need only provide a circular tank with a diameter of 8.54 m and a depth of 2.14 m (Table 1). This standard was developed over 30 years ago, when very little telemetry work had been done with free-ranging beluga whales. As with killer whales, minimum depth is only half as deep as an average beluga is long, so a beluga could not position itself fully in the vertical plane and its tail would drag on the bottom long before achieving full vertical orientation. Given this, once again it is irrational to claim that the current minimum space requirements for beluga whales meet the general standard established in § 3.104(a).

Beluga whales are more difficult to tag than delphinids due to their lack of a dorsal fin. Nevertheless, numerous telemetry studies have been conducted using tags of various designs (see e.g., Richard et al. 2001; Suydam et al. 2001; Martin et al. 2001; Hauser et al. 2014, 2015). Before these studies, it was generally believed that belugas were primarily coastal in distribution, relatively sedentary, and favored

shallow water (Richard et al. 2001). In the past 15 years, studies have clarified that belugas in fact regularly travel 10-20 km per day and can cover 60-70 km in 24 hours (Hauser et al. 2014). More striking, belugas are capable of much deeper dives than was formally believed; a recent study tracked belugas diving to 900 m and found they dove in excess of 600 m at least once daily (Hauser et al. 2015). Belugas commonly dive between 10 and 50 m (Hauser et al. 2015). Dives up to 16 min have been observed (Martin et al. 2001) and belugas regularly dive to the bottom of their habitat (Martin et al. 2001; Kingsley et al. 2001) and spend up to 80% of their time below the surface (Kingsley et al. 2001). **Based on this still emerging body of science, the current APHIS space requirements for this species are completely unacceptable.**

Given beluga diving profiles and their Arctic habitat (where coastal topography can drop relatively steeply, as much Arctic coastline was affected by glaciation[40]), this species, perhaps more than delphinids, needs deeper tanks based on average adult body length. **The minimum depth requirement should be 20 m – twice the depth of a typical "surface-oriented" dive in the wild (Hauser et al. 2015). The MHD must, at a minimum, allow a beluga whale to move in the horizontal plane in a straight line for at least 10-12 tail strokes, i.e., 50 m. Minimum surface area should be no less than 14 m^2 per beluga, in line with minimum industry practice (Couquiaud 2005), although other approaches would base minimum surface area on our recommended MHD or on Couquiaud's (2005) median surface area (91 m^2). Minimum volume should be no less than 154 m^3 per beluga, in line with minimum industry practice (AMMPA 2008 – see below). All minimum dimensions should be *per beluga*, which will make enforcement easier** (see Table 1 for these dimensions).

Impacts under current industry best practice

We note that captive breeding for belugas has a poor record.[41] Again, while not definitive, a poor breeding record in captivity suggests welfare is compromised (Clubb and Mason 2003, 2007; Mason 2010). Although research on this situation in captive belugas is lacking, it is reasonable to conclude that captive conditions for this species have played a role in this poor breeding record. In addition, data on beluga longevity in the wild (Stewart et al. 2006) suggest that survivorship is lower in captivity. We therefore conclude that industry best practice conditions are insufficient to safeguard the welfare of captive belugas.

We also note that impacts on beluga dentition may be similar to those for killer whales and bottlenose dolphins.[42]

Other standards

The AMMPA minimum space requirements for beluga whales are a depth of 3.45 m, a volume of 547.2 m^3 (for 1-4 belugas, so 136.8 m^3 per whale), and a volume of 307.8 m^3 for every *two* additional belugas above four (153.9 m^3 per beluga, but if only one beluga is added, the additional volume must still be 307.8 m^3) (AMMPA 2008) (Table 1). These dimensions exceed or greatly exceed the current minimum

[40] http://education.nationalgeographic.org/encyclopedia/continental-shelf/
[41] http://www.nmfs.noaa.gov/pr/permits/georgia_aquarium_belugas.htm
[42] http://i1-news.softpedia-static.com/images/news-700/Beluga-Whale-Living-at-SeaWorld-San-Antonio-Dies.jpg?1377678305

space requirements under the AWA. We note again that under AMMPA standards, each additional beluga requires an additional volume that is greater than that required per beluga for the first four animals (the AWA requirement for additional volume for each beluga in excess of the first two is far less than for the first two). The Brazil Regulations stipulate that belugas shall have a MHD of 14 m, a minimum depth of 7 m, a minimum volume per animal of 800 m^3, and for each additional animal a minimum volume of 400 m^3 (the MHD and volume values are the same as for *Tursiops*) (Table 1). These standards far exceed the current AWA standards.

So best practice for belugas within the regulated community and the standards in one other national jurisdiction provide for minimum space requirements that far exceed the current AWA space requirements, which were developed over 30 years ago. The latest science clearly indicates beluga whales travel more widely and dive more deeply than was previously supposed. **Maintaining the current space requirements for belugas is therefore completely arbitrary and fails to provide humane conditions for this species**.

OTHER CETACEANS

Similar arguments regarding the inadequacy of current space requirements can be made for all other cetaceans held in captivity. However, data regarding fine-scale movement patterns are less numerous for these other species – with the possible exception of pilot whales (*Globicephala* spp.) (see e.g., Baird et al. 2002; Aguilar et al. 2008) and false killer whales (*Pseudorca crassidens*) (see e.g., Baird et al. 2008, 2012) – than for killer whales, bottlenose dolphins, and beluga whales, the three most commonly held species of cetacean in captivity. Regardless, most other captive cetaceans are delphinids (there are one or two porpoise species held in licensed facilities) and therefore the generic aspects of the information presented above for killer whales and bottlenose dolphins are applicable to them. They are *all* large, wide-ranging (both horizontally and vertically) predators and the current space requirements are woefully inadequate to safeguard their welfare.

(c) Sirenians

Sirenians appear to have two distinct movement patterns: small-scale, local movements and large-scale, longer distance movements (see e.g., Deutsch et al. 2003; Sheppard et al. 2006; Castelblanco-Martinez 2013). The “small-scale” movements are on the order of kilometers over the course of several days; the large-scale movements are on the order of hundreds of kilometers over the course of months (Deutsch et al. 1998; Deutsch et al. 2003).

Given these ranging patterns, the APHIS default – a MHD only two times the average adult body length and half as deep as an average adult body is long – is once again inadequate. Manatees and dugongs (*Dugong dugon*) are slower than cetaceans and are grazers rather than hunters and thus may cope better than these predators when provided relatively small spaces in captivity, but the current minimum dimensions are still clearly insufficient to allow sirenians to “make normal postural and social adjustments with adequate freedom of movement” both horizontally and vertically. While we cannot make a recommendation for space requirements based on industry best practice for this taxon (as we could not identify any industry best practice information for sirenians, such as that found in Couquiaud [2005] for cetaceans), **we strongly contend that the current space requirements are inadequate to safeguard the welfare of captive sirenians based on their natural history and ranging patterns.** APHIS

of course should have the data necessary to determine best practice in facilities under its jurisdiction (it must have enclosure dimensions for all facilities under its jurisdiction, as it would otherwise be unable to determine if said facilities were in compliance with the regulations). **Therefore, we recommend that APHIS develop new space standards for sirenians based either on industry best practice – i.e., setting the minimum space requirements to match existing maximum dimensions of US facilities – or the science describing the natural ranging patterns of these species (or ideally both).**

(d) Pinnipeds

The ranging patterns of pinniped species vary widely. It has long been assumed that pinnipeds, especially certain species of seal, are relatively sedentary (Lesage et al. 2004), at least outside of annual migratory periods. Nevertheless, there is a large and growing body of telemetry studies that indicates that many pinniped species range (at least seasonally) relatively widely (see e.g., Lesage et al. 2004; Cunningham et al. 2009; Kuhn and Costa 2014), dive fairly deep (see e.g., Photopoulou et al. 2014; Kuhn and Costa 2014; Lowther et al. 2015), and spend less than a quarter of their time hauled out (see e.g., Cunningham et al. 2009; Udevitz et al. 2009). However, in many pinniped enclosures, the space dedicated to the tank of water is relatively small compared to the dry resting area offered (personal observation). Given the natural pinniped pattern of time spent in water and on dry land, this tendency in licensed facilities is problematic for the animals' welfare.

The current AWA regulations state that "the minimum surface area of a pool of water for pinnipeds shall be at least equal to the dry resting or social activity area *required*" (current § 3.104(d)(3)(i), emphasis added). Given how small the current minimum space requirements for dry resting areas are for pinnipeds, it is entirely possible (and legal) for facilities to provide pools of water that are in fact much smaller than the dry resting area they provide, despite what the agency appears to intend by this language. **This language should thus be clarified, as follows: "The minimum surface area of a pool of water for pinnipeds shall be at least equal to the dry resting or social activity area *provided*"** (emphasis added). Given that pinnipeds generally spend less than a quarter of their time hauled out, providing equivalently-sized dry resting and pool areas, even when a facility exceeds the minimum space requirements, should be the *minimum* required. **In short, if they provide larger dry resting areas than the minimum, they should also provide larger pools than the minimum.**

In our opinion, the formula used to calculate the dry resting or social activity area required for pinnipeds (see current § 3.104(d)(2)(i) and (ii)) is arcane, confusing, and entirely arbitrary (the formula is not based on any science or statistical analysis of natural haul-out areas). This formula was devised in 1984 and had no scientific basis then (or now). **We strongly recommend that this formula be scrapped in its entirety** and a simpler, more straightforward way of determining minimum space requirements for dry resting areas (and thus for pools) be devised. (**We support the new Table 4**, which provides "user-friendly" dimensions, but believe the dimensions should not be based on the arcane formula in (2)(ii).)

We recommend that minimum surface area for pinniped tanks be determined based on an animal's ability to swim in a straight line for at least several body lengths (so all minimum dimensions for pools would derive from a MHD based on straight-line swimming ability, similar to our recommendation for cetaceans), and surface area and volume requirements should be per animal. Minimum depth should be at least twice the average adult body length, as pinnipeds routinely dive to far greater depths than was supposed in 1984 (see e.g., Kuhn and Costa 2014, which describes a California sea lion dive to 60

m as "shallow" – p. 1297). Dry resting areas should have the same surface area as pools. So rather than pools having the same surface area as dry resting areas, as is currently the case, with the dry resting area calculated from an arcane and arbitrary formula, dry resting areas should have the same surface area as pools, with pool MHD, minimum depth, and minimum surface area based on the species' average adult body length, natural history and swimming abilities.

Unfortunately we were unable to identify a document similar to Couquiaud (2005) for pinnipeds. Therefore we have no recent data on industry best practice regarding pinniped enclosure sizes, as we do for cetaceans and polar bears (AZA Bear TAG 2009 – see below). **However, as for sirenians, APHIS should have the actual enclosure dimensions for all facilities under its jurisdiction. It should review the size of pinniped enclosures nationwide – both pools and dry resting areas – and determine industry best practice, so that its minimum space requirements are solidly based on what is actually happening in 2016, rather than arbitrary values and formulas from 1984.**

Finally, **we fully support the proposal to treat California sea lions as Group II pinnipeds when two or more sexually mature males are maintained together**, thus requiring visual barriers (e.g., fences, rocks, or foliage) to provide relief from any aggression during breeding season.

(e) Polar bears

The current understanding of ranging patterns for, and the impacts of captivity on, polar bears clearly suggest that best practice standards in the regulated community are utterly inadequate to safeguard this species' well-being. Given this, the current AWA space requirements for this species, which are well below industry best practice standards, are not only arbitrary but profoundly inhumane.

We agree that, at a minimum, primary enclosures must provide polar bears with a pool of water, a dry resting and social activity area, and a den (see § 3.104(e)). However, the current minimum space requirements for these enclosure elements are neither science-based nor consistent with industry best practice. In nature, polar bears often have home ranges on the order of tens of thousands of km^2 (see e.g., Amstrup et al. 2001; in Parks et al. 2006, one collared female's home range was determined to be approximately 300,000 km^2). Within these massive home ranges, bears traverse hundreds, if not thousands, of kilometers in a year (see e.g., Lentfer et al. 1983; Amstrup et al. 2001; Parks et al. 2006). Recent telemetry work has determined that polar bears are also capable of longer breath-holds than was previously supposed; one bear was tracked on a 3 min dive during which it covered 45-50 m without surfacing (Stirling and van Meurs 2015).

The AWA regulations require a minimum of 37 m^2 of dry resting and social activity area for up to two polar bears, with an additional 3.72 m^2 of dry resting and social activity area for each additional polar bear. Given the natural ranging patterns of this species and the tendency of the species to be solitary outside of breeding season, these minimum space requirements are, quite frankly, ludicrous. Indeed, the AZA recommends that up to two polar bears be given 500 m^2 of dry resting and social activity area, with each additional bear receiving 150 m^2 of area (AZA Bear TAG 2009). **While still woefully inadequate, this is an order of magnitude more than the AWA currently requires and presents APHIS with clear industry best practice, making its intention to retain the current space requirements entirely arbitrary.**

The AWA regulations require a pool of water be provided with a MHD of 2.5 m, a minimum depth of 1.5 m, and a minimum surface area of 9 m^2 for up to two polar bears. For each additional bear, the surface area of the pool must be increased by 3.7 m^2. However, the AZA recommends that a polar bear pool have a minimum depth of 3 m and a minimum surface area of 70 m^2 (AZA Bear TAG 2009). **While still inadequate, these industry best practice standards are once again an order of magnitude greater than the AWA standards.**

We believe there is no justification in current science or industry best practice to require less than the AZA minimum standards for polar bears in terms of space. Both the natural history of this species and the research found in the zoo literature (see e.g., Clubb and Mason 2003, 2007) strongly indicate that not even current best practice standards are sufficient to prevent compromised welfare in polar bears. Polar bears are among the zoo species mostly likely to exhibit persistent stereotypies, most notably pacing. Therefore, maintaining APHIS minimum space requirements, which are far below industry best practice, is simply arbitrary and violates the general humane standard of the AWA. **Therefore, we recommend a minimum dimension of 250 m^2 per animal for dry resting and social activity areas and no less than 3 m depth and 35 m^2 of surface area per animal for pools.**

The current AWA standards allow for polar bears to be used in traveling facilities and acts (see above, under "Outdoor Facilities: § 3.103"). **We strongly recommend that APHIS prohibit the use of polar bears in traveling facilities.** Historically, the welfare of polar bears in traveling acts has been severely compromised.[43] It is simply inappropriate for an agency charged with safeguarding the welfare of certain animals to allow the use of a highly specialized, Arctic predator in traveling facilities, which inherently cannot provide the conditions necessary to protect this species' well-being.

(f) Sea otters

The average adult body length of a sea otter given in the AWA regulations is 1.25 m (current § 3.104(f), Table V). The AWA minimum depth required for a sea otter tank is currently 0.9 m. As noted above for other species, this means that a sea otter cannot position itself fully in the vertical plane and thus the general standard found in § 3.104(a) is clearly violated by this minimum depth.

In addition, the mean foraging dive depths for sea otters in Alaska are bimodal – either 8 m or 44 m (Bodkin et al. 2004). Sea otters are capable of diving to 100 m (Bodkin et al. 2004), far deeper than supposed historically. The latest science clearly does not support a tank that is less than one meter deep for this species. **Given the "shallow" bimodal foraging dive depth, at a minimum a sea otter tank should be 8 m deep.**

Sea otters range up to 50 km along a coastline (Laidre et al. 2009), making the MHD of 3.75 m completely inadequate. Sea otters in nature also spend almost half their time resting/floating in the water (Laidre et al. 2009), a behavioral pattern that does not appear to be replicated in captivity (personal observation). This may be because the surface area of the required pool of water in a sea otter enclosure does not encourage "rafting," a behavior where a group of sea otters float within touching distance of each other, often segregated by sex (Riedman and Estes 1990). **Any pool for sea otters**

[43] http://abcnews.go.com/WNT/story?id=129983&page=1

should at a minimum be of a size and design that accommodates this natural behavior for at least four sea otters; otherwise, the general standard in § 3.104(a) will be violated.

Water Quality: § 3.106

(a) General

The proposed rule notes that APHIS has conducted a "review of recent studies of water quality and waterborne pathogens affecting marine mammals" (p. 5629). This review is curious, given that apparently APHIS did not conduct similar reviews of temperature ranges, noise impacts, or enrichment needs, let alone space requirements. We also note that here and with ventilation, standards suitable for humans were part of the review. Similar standards exist for temperature and lighting, we assume, and therefore **we recommend that APHIS consult the human literature and regulations for *all* the relevant provisions when finalizing this proposed rule.**

We also find that this review was apparently limited in scope; were it appropriately extensive, the proposed rule would have amended the standards to include additional quantitative monitoring requirements for enclosure water, including, *inter alia*, chlorine, copper, and ammonia (Couquiaud 2005). Couquiaud (2005) provides an excellent discussion of water quality (which holds for all marine mammals, not just cetaceans) and includes Table 6.2 (p. 355), which offers acceptable ranges for marine mammals for numerous factors. These ranges are based both on the published literature (see Couquiaud's reference list) and industry best practice, based on the survey she conducted. This is clearly relevant and directly useful to APHIS in updating its water quality standards under this section. **We recommend that APHIS adopt or adapt Couquiaud's Table 6.2 (or a subset of it) for its water quality standards, given that a range of values (rather than a point value) for each factor is provided therein and these ranges have a solid basis in current science and industry best practice.**

(b) Bacterial standards

Overall, we find the changes to this section an improvement. We find the new total and fecal coliform levels an improvement over the current standard and **fully support adding tests for *Enterococci*, *Pseudomonas*, and *Staphylococcus* levels**. We note however, that the proposal does not mandate all three tests, but rather only one of the three. **We recommend APHIS make all three tests mandatory (using the conjunctive "and" rather than "or" between proposed § 3.106(b)(ii) through (iv), p. 5656), given that each of these pathogens indicates a different health problem and water quality concern.**

We especially support the requirement to test for specific pathogens when there is evidence of health problems at the facility or a potential health hazard to the animals. For example, if an animal is known to be harboring a specific pathogen such as *Candida*, then testing for *Candida* in the areas in which this animal has been held, or in enclosures sharing water with those areas in which this animal has been held, are essential and the proposed revision would address this.

The new follow-up sampling regime when colony counts exceed the minimum standard for any of these tests is also an improvement. Finally, the performance-based clarification that chemical additives must not cause harm or discomfort not only when these chemicals are added to the water but throughout the time they are present in the water is a minor improvement. We find this clarification to be a good

example of how performance-based standards can be difficult to enforce; one would suppose it was obvious that the standard found in current § 3.106(b)(2) was always intended to encompass not only the time during which the chemicals were added but throughout the time they were present in the water. That this has actually been a source of confusion or debate between the regulated community and the agency is difficult to fathom, but highlights why performance-based standards are problematic.

We concur that water that is *too* hygienic (i.e., practically sterile) is both an unrealistic and unhealthy standard for marine mammal tanks. However, this is only the case when the water is artificially maintained (either because it is artificially salinized and comes from local freshwater sources, or because it is natural seawater but not close enough to the coast to be freely flowing in and out of the enclosures(s) and must still be filtered and treated). **We recommend that APHIS insert a clarification that when natural seawater is used in a system that allows rapid turnover and essentially free flow in and out of an enclosure, coliform counts near or even at zero are acceptable, because *they are natural*.** Obviously counts above the minimum in such a water system would be addressed in the same manner from an enforcement perspective as with any other system, as it would indicate the natural source is contaminated.

We strongly recommend that APHIS establish *quantitative standards* for additional chemicals, especially, but not necessarily limited to, chlorine, copper, ozone, nitrates, and ammonia (see Couquiaud 2005, Table 6.2). The current, non-specific requirement to monitor "e.g.," chlorine, ozone, and copper levels is meaningless without a quantitative standard and without a specific and comprehensive list of chemicals. A table with minimum required values would be the clearest way to present the standards. Again, we direct the agency to Couquiaud (2005)'s Table 6.2 for guidance.

(c) Salinity

We support the change to require salinated water for all relevant marine mammals, but strongly oppose the exemption for "pinnipeds where oral administration of sodium chloride (salt) supplements at appropriate levels for the species, as determined by the attending veterinarian, is provided and saltwater eye baths are used on a daily basis" (p. 5656). There is simply no justification, in the species' natural history, current science, or industry best practice, to provide pinnipeds, which are wholly marine animals, with freshwater only. This rulemaking is the ideal opportunity for APHIS to correct a situation that should never have been allowed in the first place. **There should be *no* exemptions to § 3.106(c)(1) except for river dolphins**, which are the only "marine" mammals that are truly freshwater species. Any other exemptions are for the convenience of the licensees only and said convenience is not a standard under the AWA.

We strongly support the change to § 3.106(c)(2), wherein the salinity of only natural lagoon or coastal enclosures can drop below 24 parts per thousand. We concur that this reflects "the current level of scientific knowledge and accepted industry practices" (p. 5639). **We also support the addition of salinity testing to the suite of tests required, as clearly this is the only way to enforce the standard**.

(d) Water clarity

We support the addition of this new provision. We note that Couquiaud (2005), in Table 6.2, provides a quantitative measure for turbidity, but we accept a performance-based standard for this parameter.

We also support the requirement for all water quality records to be maintained *onsite*, although we recommend that they be available to APHIS inspectors for at least *three* years. Proposed improvements in water quality standards may help protect the health of marine mammals, but also of human participants in interactive programs (see next section).

Interactive Programs: § 3.111

General

As we noted at the outset of these comments, we do not support the public display of marine mammals. In particular, **we oppose interactive programs**, as we consider them to be an additional stressor for species already stressed by baseline captive conditions, a hazard for the human participants, and, perhaps most importantly (as this is true regardless of the ability to mitigate welfare impacts), an activity that perpetuates an inconsistent message to the public about the appropriateness of close contact with wildlife. To our knowledge, there are no other large, unrestrained, adult wild animals – let alone predators – with which the public is still allowed to so openly and directly interact (other than, perhaps, elephants, during "elephant rides," which are also highly controversial). We believe that all such interactions with unrestrained adult mammals are dangerous and irresponsible. However, again recognizing that such programs are regretfully still legal in the US, we offer these comments in our ongoing effort to improve captive marine mammal welfare.

On p. 5632 of the proposed rule, footnote 2 states:

> We note that interactive programs have been operating for over 20 years without any indications of health problems or incidents of aggression in marine mammals, as evidenced by medical records maintained by licensed facilities and observations by experienced APHIS inspectors.

This entire statement is without merit. We cannot emphasize strongly enough that reporting requirements for interactive programs have been suspended for 17 years (and for five years before that, reporting requirements were under review and therefore not operational). Interactive programs were required to report human injuries for only six months in 1998-1999, before enforcement of this requirement (along with the rest of § 3.111) was suspended (*64 FR 15918*). Therefore, the blanket statement that there are "no indications of health problems or incidents of aggression" in interactive program animals has no empirical basis beyond annual APHIS inspections, which are insufficient to draw such a comprehensive conclusion, especially given that licensees have not been required to report any incidents of aggression to inspectors.

In addition, there is nothing in the peer-reviewed published literature that supports the first claim (absence of health problems in interactive program animals). While there are some papers (e.g., Trone et al. 2005; Miller et al. 2011) offering limited datasets to support the absence of *behavioral abnormalities* associated with participating in interactive programs (although Miller et al. (2011) found that interactive program dolphins exhibited increased aggression with conspecifics, although this occurred before rather than after interactive sessions), there are no data regarding the health of marine

mammals participating in interactive programs of which we are aware. **APHIS *cannot* make such a statement without citing scientific literature to support it.**

"Observations by experienced APHIS inspectors" do not obviate the need for scientific support for the first claim. As noted in our comments submitted on March 4 regarding information collection under the Paperwork Reduction Act, an APHIS inspection is a snapshot of the animals in a facility. Therefore, this claim, which refers to long-term trends in health, cannot be supported by anything gleaned from once-yearly inspections. Additionally, unless APHIS or licensees have analyzed medical records systematically for trends or correlations with interactive program participation (and ideally published this analysis in a veterinary journal), then the "medical records maintained by licensed facilities" also cannot be used to support the claim. "Eyeballing" medical records would not necessarily reveal such trends or correlations – robust statistical analyses of long-term datasets are the minimum necessary to support such a claim.

In fact, the literature suggests there are numerous pathogens of concern that are zoonotic (transmissible between humans and marine mammals and vice versa) (see e.g., Goertz et al. 2011), making this footnoted claim even less supportable. There are also potential health risks from contaminants. Sunscreen toxins have been found in free-ranging dolphins and can be transmitted from mothers to fetuses (Alonso et al. 2015), which raises the alarming possibility that swimmers could, over time, poison marine mammals used in interactive programs. We are unaware of any facility requirement for swimmers to shower before entering the water in a marine mammal enclosure (see AMMPA (2013), which indicates that accredited facilities must only require guests to wash hands and step in foot baths). Consequently, **APHIS must offer more than a footnote without a reference before asserting that interactive programs do not pose a health risk to marine mammals used in them.**

As for whether interactive programs pose a risk to human participants, there are even fewer data on this point. We posit that the apparent absence of a link between interactive program participation and disease in humans is more due to a lack of examination than a true absence. We strongly urge the agency – and human health advocates and officials – to conduct studies of people who participate in these programs (especially more than once in their lifetimes) to evaluate the possible *human* health risks. Certainly marine mammal handlers, who are frequently exposed to the animals, face unique health risks (Hunt et al. 2008). *Staphylococcus aureus*, including drug resistant strains, is common in dolphins (Venn-Watson et al. 2008) and may be zoonotic (Faires et al. 2009). *Clostridium perfringens* infection has been fatal in at least one captive dolphin (Buck et al. 1987); this is among the most common pathogens responsible for food poisoning in humans[44] and was isolated from the tank water in that case. *Brucella* is also common in cetaceans and is zoonotic (Van Bressem et al. 2009; Guzmán-Verri et al. 2012), although cetacean strains to date appear to have low infectivity and virulence in humans. Nevertheless, the true danger posed by cetacean strains of *Brucella* to humans remains unknown (Guzmán-Verri et al. 2012). Other pathogens, such as *Toxoplasma*, may also pose some degree of risk to people in close contact with infected cetaceans (Van Bressem et al. 2009). Tuberculosis in pinnipeds has been transmitted to caretakers (Kiers et al. 2008).

Regarding the second claim (that there have been no incidents of aggression in interactive programs), we point out again that for 17 years, licensees have been under no obligation whatsoever to keep

[44] http://www.cdc.gov/foodsafety/diseases/clostridium-perfringens.html

reports of any kind regarding aggressive incidents in interactive programs. **Therefore, the absence of such records at licensed facilities, noted during inspections or otherwise, means *absolutely nothing*.**

This footnote is an example of APHIS' careless approach to providing references in this proposed rule, even though several relevant to this point were provided during the 2002 ANPR comment period. Evidence of dolphin injuries, including photos, at dolphin petting pools and citations of specific incidents leading to human injury in swim-with encounters were provided to APHIS over the past 10 years. Several of these photos are presented to the agency *again* in Appendix I.

Feeding/petting programs

The assumption that trained personnel will closely supervise feeding by the public in feeding/petting programs is not sufficient to satisfy the requirement in § 3.105(c) that food must be given and handled by trained personnel (see above under "Definitions: § 1.1"). The public has been known to offer non-food items during feeding/petting programs, to drop fish on the ground and then retrieve it and subsequently feed it to marine mammals, and in other ways to violate the requirements of § 3.105 (WDCS and HSUS 2003). **Either feeding/petting programs must have their own provisions in § 3.111 or they must be prohibited outright. APHIS cannot simply allow this activity to occur without specific regulations governing it.**

We strongly recommend that feeding/petting pools be prohibited outright. We believe that most licensed facilities no longer offer feeding programs, so this prohibition would have no significant logistical or financial impact on licensees. **It would, however, prevent any such programs from being introduced** and end the clear inconsistency between § 3.105(c) and feeding/petting programs that has always existed.

(a) Space requirements

We strongly oppose the proposed changes to this section. The space requirements for bottlenose dolphins in current § 3.104 are already completely inadequate to safeguard the welfare of the animals, let alone protect the safety of swimmers. Changing these quantitative space requirements to performance-based standards would make the situation worse.

We are not aware of a single "swim-with" interactive program currently under APHIS jurisdiction where the sanctuary areas are as small as the current AWA standards. If interactive programs currently operating in the US have sanctuary areas with current AWA minimum dimensions, APHIS should declare this and provide data on the "inviting" nature of these areas when swimmers are in the water. We are not aware of any published literature showing how or when dolphins use sanctuary areas that are as small as current AWA minimums. The only published paper of which we are aware on use of sanctuary areas, Kyngdon et al. (2003), which showed that sanctuary use increased significantly when swimmers were in the water, involved a pool with a sanctuary area that was larger than the minimum space requirements proposed by APHIS (10 m wide x 15 m long x 4 m deep – APHIS proposal is 7.3 m wide x 7.3 m long x 1.8 m deep). The sanctuary area was actually smaller than the interactive area, but of a size and accessibility that was clearly "inviting," since the animals increased their use of it during interactive sessions.

APHIS has requested the public to provide the agency with comment and published scientific data on this issue (p. 5640), but the lack of such information does not mean the agency's proposal is acceptable or supportable. To our knowledge, the agency has zero data, either from current science or industry best practice, to support the concept that a tank area as small as proposed would be "inviting" to bottlenose dolphins, or any other species typically used in interactive programs when swimmers are in the water. It therefore has zero data that such a small enclosure would serve the purpose of providing the dolphins with safe haven when they do not wish to interact with swimmers. In addition, given the risks to swimmers should a dolphin (or sea lion) become aggressive or choose not to respond to the control trainer's commands (especially if it feels it does not have a safe haven to retreat to), establishing performance-based standards for the interactive area that might ultimately not provide adequate space for swimmers to avoid aggressive animals and exit the pool safely is frankly irresponsible.

We therefore strongly recommend that space requirements for interactive programs be based on our recommendations above under "Space Requirements: § 3.104" for bottlenose dolphins, regardless of the species involved in the program. **The sanctuary area should, at a minimum, meet the standards we recommend for primary enclosures under that section**. We do recognize that the interactive area can be smaller than the sanctuary area (depending on the latter's size), as this may allow greater control over the animals, which improves safety for swimmers (Samuels and Spradlin 1995). Therefore, the interactive area should be no less than half the size of the sanctuary area in terms of MHD (i.e., 17.5 m). **The minimum surface area, volume, and depth requirements in current § 3.111(a) should be retained for the interactive area.**

We do not oppose the removal of a buffer area from the regulations, as long as the sanctuary area has minimum dimensions as we recommend and the animals are free to move into the sanctuary area without restriction and cannot be recalled from the sanctuary area. While we support the intention of the proposal that the degree of free and unrestricted access and "inviting" nature of the sanctuary area would be assessed through observation during non-interactive periods (per the study design of Kyngdon et al. (2003)), we have concerns that this assessment would be by the facility as well as an APHIS inspector. We doubt the facility's ability to assess this situation without bias. **We therefore recommend that the assessment be conducted by the inspector and an independent observer/expert selected by the Deputy Administrator, similar to language proposed for § 3.100.**

(c) Employees

We strongly oppose the proposed changes to this section. Marine mammals have specific handling, care, and treatment requirements, given their evolutionary adaptations to an aquatic ecology. In all ways, employee background and experience should be specific to marine mammals. Performance-based standards for employee qualifications are insufficient to safeguard the welfare of captive marine mammals, particularly with regard to veterinary care. See our recommendation above under "Definitions: § 1.1" regarding attending veterinarian qualifications.

Rather than weaken the quantitative standards found in the current § 3.111(c) by making them performance-based and thus virtually impossible to enforce (e.g., by what or whose measure is a head trainer's knowledge of marine mammal husbandry "demonstrable" (p. 5641)?), these standards should be retained and applied to the entire subpart. We acknowledge that applying these standards solely to

interactive programs is not logical, but the solution is not to eliminate them from the regulations altogether. **It is to apply them to this entire subpart of the regulations.**

(d) Handling

In addition to requiring the screening of interactive program marine mammals for good health (proposed § 3.111(d)(3), p. 5657), we recommend a requirement that human participants be similarly screened. The final rule should require the disclosure by all human participants of any illness, particularly of an infectious nature, before entering a marine mammal enclosure. The AMMPA (AMMPA 2013) requests that "a guest certify that he/she is in good physical health with no illnesses, disabilities, injuries…[and that a program] preclude guests with any respiratory infection, opens sores, or other outward signs of contagious illness from interacting with dolphins" (p. 7). **We support inclusion in the final rule of similar language, but recommend this be mandatory** (not a "request").

We support the change in proposed § 3.111(d)(4) (p. 5657) that requires at least one attendant per marine mammal in an interactive session. This is consistent with the results of Samuels and Spradlin (1995), wherein controlled sessions, with a trainer having direct control over an animal and its interactions with participants, maximized the safety of participants. It also facilitates the requirement in § 3.111(d)(2) that the "trainer, handler, or attendant must, at all times, control the nature and extent of the marine mammal interactions with the public during a session using the trained responses of the program animal" (p. 5657).

However, APHIS proposes to change current § 3.111(e)(1) (proposed § 3.111(d)(1), p. 5656)), to extend the interactive time between marine mammals and the public from two hours to three. This proposed amendment is based on "information provided by licensees with long-standing interactive programs involving, for example, bottlenose dolphins, beluga whales, spinner dolphins, California sea lions, and harbor seals, which *suggested* that the marine mammals would not be harmed by a modest increase in interactive time per day" (p. 5641, emphasis added). APHIS then requests data or evidence supporting or opposing this change.

This change is not "modest," as it actually represents a 50% increase in interaction time. It is also based on a *suggestion* from the regulated community. To call this a conflict of interest and a failure to base an amendment on data in the first instance is being charitable. **We strongly oppose this change, as it takes a precautionary time limit and extends it based on a heavily biased *suggestion* from the regulated community.** Until there are scientific data and analyses – which the regulated community sorely needs to provide in general on the impacts of interactive programs on marine mammals – supporting this change, the agency cannot justify it.

We also strongly oppose removing the quantitative requirements for human participant-to-interactive marine mammal and human participant-to-attendant ratios of 3:1 and replacing them with performance-based standards in proposed § 3.111(d)(4) (p. 5657). We would accept that these ratios apply only to interactive programs where swimmers are present (as opposed to waders or dockside interactions, where the proposed performance-based standards may be sufficient), but they must continue to apply to swim-with interactions. Once again, without data to support such changes, the agency cannot justify them. Interactive swim-with programs have had 17 years to conduct research – to determine safe human to dolphin ratios, non-harmful interactive times per day, characteristics that

make a sanctuary area "inviting," the absence (or presence) of health impacts, and so on – which would have allowed the agency to base any and all changes to this section on scientific data. Anecdotal *suggestions* and snapshot observations (see next paragraph) are not an acceptable substitute for systematic data and analyses. **Therefore, what appears to be a complete lack of current science supporting any of the proposed revisions strongly argues for retaining the current, more precautionary, more *enforceable* standards under § 3.111 until relevant data become available justifying any changes.**

We note footnote 27 on p. 5641, asserting that "programs are observed routinely by the attending veterinarian and the APHIS inspector to ensure safe functioning of the program." This statement is without merit. An attending veterinarian has no particular expertise in monitoring the safe functioning of an interactive program – an attending veterinarian's expertise is in medicine, not behavior or even husbandry. In addition, as noted before, the APHIS inspector gets a snapshot of a facility or an interactive program during an inspection – he or she will not develop a good understanding of the daily functioning of an interactive program from an annual inspection (which one presumes is the "routine" observation). **If APHIS is referring to some special, more frequent monitoring or observations of interactive programs by APHIS inspectors, then this should be clarified and data provided (number of observations annually, number of incidents with X number of attendants, with Y number of attendants, and so on) in the final rule.**

We oppose the removal, in proposed § 3.111(d)(4) (p. 5657), of the requirement to consult with APHIS to discuss personnel changes in cases where the facility has had more than two session incidents over a year's time. The primary basis for this removal, the lack of accident or injury data (from p. 5642; note that the lack is due not to the absence of incidents but to the absence of data on incidents), is without merit. See our earlier comments on the 17-year enforcement suspension of the interactive program regulations, which makes the lack of incident reports, which have not been required throughout this period, entirely meaningless.

We oppose the removal, in proposed § 3.111(d)(5) (p. 5657), of the requirement that interactive program participants must agree in writing to abide by the rules and instructions before participating in an interactive session. APHIS is of course able to enforce the standards, but without a signed acknowledgement by participants, it might be more difficult to expel them from a program for "breaking the rules" when they never technically agreed to do so in the first place. This requirement should be reinstated in the final rule.

We support the requirement, in proposed § 3.111(d)(5) (p. 5657), to direct complaints to the Animal Care Field Operations office, rather than APHIS Animal Care headquarters, as this is the most direct route to resolving any complaints and concerns. **We recommend that contact details be provided to participants in a written handout rather than a posting at the site, because participants, for many reasons, may need to reach a field office after they have left the facility.**

<u>(e) Veterinary care</u>

We oppose the removal of the enhanced requirements for veterinary care for interactive programs, particularly on-site monthly evaluations and biannual physical examinations (current § 3.111(g)(1) and (3)). Absent systematic evidence to the contrary (i.e., peer-reviewed publications of studies regarding

health impacts of interactive programs on marine mammals – see above), APHIS cannot justify the removal of these enhanced veterinary requirements. These requirements are precautionary, as the marine mammals in interactive programs are exposed directly to the public and are (as noted extensively above) at increased susceptibility to injury and disease as a result of these direct interactions.

(f) Recordkeeping

In general we find the changes proposed for this section to be the most confusing and poorly supported of the entire proposed rule. Given that the standards found in § 3.111 have not been enforced for 17 years, and therefore the detailed records required in current § 3.111(f) have not been kept uniformly across all interactive programs in the US (one presumes some facilities have kept some of these records as a matter of course, while others may not have kept any of them) and presumably have not been reviewed or evaluated by APHIS inspectors (since enforcement was suspended, removing the authority of the inspectors to review such records, which may not have been kept anyway), the comment in the proposed rule that the agency is "proposing to amend [this section] by streamlining its content to reduce the burden on the regulated parties" (p. 5643) is without merit. There has been *no burden* on the regulated community for 17 years; an amendment cannot reduce the burden to below zero.

We oppose the removal of the requirement in current § 3.111(f)(5)(i) and (ii) to record statistical summaries of the number of minutes per day that each animal participated in an interactive session and the number of human participants per month in the interactive program. Removing these requirements is consistent with the proposal to change current § 3.111(e)(4) from quantitative ratios to performance-based standards, to which we object; if the quantitative standards are maintained, as we strongly recommend, then these statistical summaries are important data to determine whether a facility is adhering to those standards, as well as to the standard found in current § 3.111(e)(1). While we recognize that proposed § 3.111(f)(3) (p. 5657) would allow APHIS to evaluate whether current § 3.111(e)(1) is being violated, a statistical summary would ease APHIS' oversight burden, a concept APHIS never seems to consider when it repeatedly proposes to ease the regulatory burden on the licensed community.

We strongly oppose reducing the time period during which records must be kept, from three years in the current regulations to one year, in the proposed rule. We note *again* that for 17 years no records described in this section have been required to be kept by interactive programs. Decreasing the time these records must be kept to one year from three years before any facility has ever even had to keep them at all is, to say the least, premature. As noted earlier, very few papers on the impacts of interactive programs on the *health* of these animals have been published; the few on behavioral impacts have had very small sample sizes overall. Maintaining, *inter alia*, health and behavioral records as required in current § 3.111(f)(3) and proposed § 3.111(f)(2) (p. 5657) for only one year as opposed to three would reduce the value of these records to any independent researcher. From our perspective, the only purpose in reducing the time these records must be kept is to reduce transparency and the research value of the data contained within them. We see no other reason for this change, since the data must still be recorded (so the reporting burden is not reduced) and storage is not an issue, since most of the data can be stored electronically.

We support the only two proposed amendments that improve the recordkeeping section. **We support proposed § 3.111(f)(4) (p. 5657) to expand the requirement for reporting aggressive or injurious incidents to include other members of the public and facility staff, as well as participants in interactive programs, and to include incidents that occur during training as well as interactive sessions**. **We strongly recommend that injuries in feeding/petting pools also be included in this reporting requirement (see Appendix I) – this inclusion would be automatic if feeding/petting pools were included in the definition of "interactive program," as we recommend above. We also support the requirement to report any change to the program within 30 calendar days, rather than semi-annually.** This allows for more timely evaluation by the agency of whether any such changes are consistent with requirements.

RECOMMENDED ADDITIONS TO THE REGULATIONS

Noise

In its 2002 ANPR, APHIS asked "Should noise thresholds be established for each species?" (*67 FR 37731*, p. 37732). Our response to this was an unequivocal yes and we urged the agency to consult with the Marine Mammal Commission (which, given that this was 14 years ago, APHIS had sufficient time to do) in researching this topic and developing species-specific noise standards. This apparently did not occur.

As noted earlier, under "Overview – Inconsistent Decisions on which Sections to Amend or Augment", **we strongly recommend the formulation of species-specific noise standards for indoor and outdoor facilities. APHIS should consult Couquiaud (2005) when formulating these standards.** Her recommendations are largely performance-based, with some clear mandates (e.g., lining the walls of indoor facilities with sound-dampening material). Along these lines, **APHIS could (and should) prohibit loud, intermittent, impulsive sounds (which are most likely to elicit stress responses; see e.g., Romano et al. 2004; Wright et al. 2007) near marine mammal enclosures, from sources such as fireworks and roller coasters (the latter of which have the added concern of transmitting intermittent vibrations through substrate whenever the cars pass closest to enclosures), and limit received decibel levels of mechanical noise from facility equipment as measured along the pool walls, floors, structures and acoustic nodes within a tank.** There is now a considerable body of research on noise impacts on marine mammals (see e.g., Romano et al. 2004; Miksis-Olds et al. 2007; Wright et al. 2007), including in captivity, **which APHIS must consult when addressing this point.**

We note that licensees often claim that marine mammals are not bothered by in-air noise (see, e.g., Scheifele et al. 2012, which measured in-air sound levels at Georgia Aquarium but discussed the results only in terms of what was audible underwater).[45] This argument rests on the assumption that captive marine mammals (including cetaceans) spend most of their time below the water's surface, as free-ranging marine mammals do. In fact, most captive marine mammals, including cetaceans, are at the surface much of the time (see e.g., Galhardo et al. 1996, who noted that captive bottlenose dolphins spend at least a quarter of their time with their heads out of water, alert for commands and food

[45] However, even Scheifele et al. (2012) noted that "care should still be taken not to locate public address speakers (those used for the demonstrations and shows in aquariums) over the water, since the coupling of sound pressure is significant in the vertical plane" (p. EL92; note, however, that they do not address the in-air component of the sound emitting from such public address speakers and its potential impact on cetaceans stationed by trainers or otherwise with their ears above water).

delivery from their trainers), with their ears in-air, rendering this argument invalid. **Any noise limits must be for in-air as well as underwater and should be species-specific, using audiograms (if known) of the relevant species.**

Enrichment

Morgan and Tromborg (2007) noted the following:

> Prior to the introduction of the concept of environmental enrichment…most artificial environments were structurally simple and unresponsive to behavior. Typically, these environments did not provide animals with opportunities to interact with their surroundings in ways which promoted the development of sensory and cognitive abilities, or that allowed display of species-typical behaviors. (p. 264)

This remains the case today for marine mammals across the board when they are held in concrete tanks (our comments below may not apply to some sea pen facilities, which have some natural enrichment features) – the need to provide an aquatic portion to the enclosure, especially when it is saltwater, which is corrosive, leads the facility to design a "structurally simple" enclosure that is "unresponsive to behavior." Most tanks are smooth-sided concrete and painted some light color (to show the animals clearly to visitors), with few if any features below the waterline (such as artificial rockwork). There is no vegetation, no other wildlife present in the enclosure (such as fish or invertebrates) and limited water movement (there is water turnover, but rarely are there any artificial currents or wave action). In short, in most marine mammal enclosures, there is *no* opportunity "to interact with their surroundings in ways that promote[] the development of sensory and cognitive abilities, or that allow[] display of species-typical behaviors." Thus many of the stereotypies associated with captive marine mammals appear to arise from the inability to display species-typical behaviors (such as traveling for any significant distance in a straight line) *and* a lack of enrichment in their enclosures (see e.g., Kuczaj et al. 2002; Morgan and Tromborg 2007; Franks et al. 2010; Canino and Powell 2010).

We also note that many marine mammal species, including virtually all of the cetaceans, are not strictly on a diurnal cycle (Kingsley et al. 2001; Hastie et al. 2003; Sekiguchi and Kohshima 2003; O'Corry-Crowe et al. 2009; see, however, Baird et al. 2005 and Suzuki et al. 2003). This is intuitive, as most marine mammal activity cycles are tied to prey movements, which in the marine environment may mean greater accessibility at nighttime, while for cetaceans, their echolocation abilities and deep diving make daylight somewhat immaterial to guiding their activity cycles. What this means in practice in captive environments is that leaving them alone all night, with no human interaction (versus a typical day, during which they interact frequently with trainers and handlers, as well as each other) can create behavioral and psychological problems, including simple boredom.

In short, few wildlife species held in zoos and aquariums need enrichment more than marine mammals, given their cognitive abilities, social complexities, far-ranging habits, and other biological and ecological characteristics, yet few get as little enrichment as they do. A beach ball, a hula hoop, a Frisbee, or a plastic pipe floating in the tank are often the only enrichment any marine mammal might receive. This paradox is at the heart of why we consider the current standards, for space especially, to be so profoundly inadequate for these taxa.

The current AWA regulations contain no reference to environmental enrichment under these sections (in, e.g., §§ 3.102 or 3.103, Indoor and Outdoor Facilities). As an example of regulatory language referring to enrichment, the European Zoo Directive (Council Directive 1999/22/EC of 29 March 1999), Article 3, "Requirements applicable to zoos," states:

> Member States shall take measures under Article 4, 5, 6 and 7 to ensure all zoos implement the following conservation measures (including): Accommodating their animals under conditions which aim to satisfy the biological and conservation requirements of the individual species, *inter alia,* by providing *species specific enrichment of the enclosures*… (emphasis added)

In addition, Couquiaud (2005) notes that topography is one primary element that is neglected in captive environments, where irregular shapes, interesting bottom-scapes, and other design features can diversify and enrich an artificial environment and increase the welfare of cetaceans in them. As noted above in "Space Requirements: § 3.104 – Bottlenose dolphins," enclosures could have varied bottom topography, with different depths as a form of enrichment.

Lack of space in an enclosure (a problem for all captive marine mammals – see above under "Space Requirements: § 3.104") might be compensated for to at least some degree when the animals are able to *do more* within that enclosure (McPhee and Carlstead 2010). Yet, as with other research (e.g., on tank size preference), research on enrichment possibilities for marine mammal species is limited (Clark 2013). We must ask again why this is so. **We strongly recommend that APHIS review papers addressing enrichment for captive marine mammals – we have identified the following, but urge APHIS to search for others if they exist: Cox et al. (1996), Hawke et al. (2000), Kuczaj et al. (2002), Kastelein et al. 2007; Canino and Powell (2010), Clark (2013), Anzolin et al. (2014), and Hocking et al. (2015) – and add a requirement, in §§ 3.102 or 3.103 (Indoor and Outdoor Enclosures), for some form of enrichment, including a requirement to monitor the "attractiveness" of the enrichment and periodic review of its use if such monitoring indicates habituation or waning interest by the animals.**

Retreat Space

An absence of retreat space (a part of the enclosure out of view of the visiting public and/or conspecifics) can be a significant stressor for some species (Morgan and Tromborg 2007). Therefore, in most modern zoo enclosures, there is some section of the enclosure that is out of view of the public, leading many a zoo visitor to assume that an enclosure is completely empty. This is no doubt a constant challenge for the modern zoo or aquarium: How to satisfy the animals' need to have some time during the day without visitors constantly watching them, or to move far enough away from a conspecific within the enclosure to be out of view of that conspecific, while also providing the visitor with a satisfactory viewing experience. Regardless, modern zoos and aquariums know that providing this space is essential to safeguard animal well-being.

Most marine mammal social groupings in captivity are wholly artificial in composition (in terms of age, sex class, and/or relatedness) (see e.g., Wells 2009); therefore, social stress can be significant (see e.g., Waples and Gales 2002). Virtually all cetaceans, sea otters, manatees, and most pinnipeds have no freely accessible retreat space in their exhibits (personal observation). This means that they cannot go off display voluntarily, but only when handlers open gates or doors to allow them access. Polar bears and some pinnipeds are the only marine mammals of which we are aware to usually or at least often

have accessible retreat space, at least in terms of each other (i.e., they can retreat from conspecifics, if not necessarily the viewing public). This absence of retreat space can lead, and has indeed led, to serious aggressive interactions between animals, in at least some cases leading to serious injury and even death (e.g., in 1989, when the killer whale Kandu attacked Corky at SeaWorld San Diego, broke her own jaw, and died; Ventre and Jett (2015)).

APHIS should require all primary enclosures for every species of marine mammal to have retreat space. As with sanctuary areas in interactive programs (which are not necessarily off-view to the public), this retreat space should be inviting and freely accessible to all animals at all times. We would accept that it can be smaller than a primary enclosure, but it must still be inviting. It should primarily be for escaping the viewing public, but should also serve as retreat space from conspecifics. Shyan et al. (2002) is an example of a situation where bottlenose dolphins, when freely given a choice, appeared to prefer a smaller space than the main enclosure, possibly simply because it lacked an underwater viewing window and was more distal to the public area.

CONCLUSION

As noted earlier, AWI participated in the negotiated rulemaking process in 1995-1996. In addition, some of the other signatories to this letter have been involved for over a decade in providing specific input to the agency on the captive marine mammal regulations. From our perspective, we have waited 20 years for this proposed rule, a period during which marine mammal science progressed tremendously; however, apparently APHIS's undertanding of the basic needs of captive marine mammals more or less stood still. This is extremely disappointing.

We support several of the amendments found in the proposed rule and note this support throughout our comments. However, these amendments have minor positive impacts overall. The vast majority of the proposed changes, and especially the majority of the provisions with *no* proposed changes, will mean that the negative impacts that marine mammals have suffered from the outset of their maintenance in captivity will continue unabated, unless APHIS substantially revises the proposed rule when finalizing it. Most of the choices APHIS made regarding the provisions it changed and those it did not are arbitrary and capricious, based neither on current science nor industry best practice. They appear to be simply convenient for the agency and the regulated community, even though most licensed facilities currently under the jurisdiction of 9 CFR Part 3, Subpart E have enclosures and conditions that far exceed the current AWA standards. APHIS missed a clear opportunity here to return the US captive marine mammal standards to a leadership position globally. As it is, they are not only among the weakest in the world now, but will remain so if the proposed rule is not substantially changed.

Given the long delay in publishing this proposed rule, the agency's failure to consider current science or industry best practice when formulating most of it, the comparatively short public comment period, and the high potential for the proposed rule to undergo significant revision, which would require an additional round of public review, we request that APHIS reconvene the stakeholders who comprised the negotiated rulemaking Committee, in an effort to expeditiously reconcile the undoubtedly diverse input it will receive during the comment period. In essence, we request a continuation of the negotiated rulemaking process, which otherwise terminated in 1996, to facilitate, and increase the efficiency of, the

finalization process. Even if the Committee cannot (again) reach consensus, its discussions should assist the agency in its deliberations and formulation of a final rule.

We strongly recommend that APHIS substantially revise the proposed rule per our comments above. The proposed rule as it stands is neither solidly based on current science nor industry best practice and therefore does not accomplish the stated goal of the agency – to base its proposal on "current industry and scientific knowledge and experience" (p. 5629). It most certainly does not meet the standard of the AWA, to "insure that animals intended…for exhibition purposes…are provided humane care and treatment" (7 USC § 2131(1)).

Thank you for the opportunity to comment on this important and far-reaching matter.

Sincerely,

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Marine Mammal Scientist

Cc: Dr. Rebecca Lent, Executive Director, Marine Mammal Commission
Donna Wieting, Director, Office of Protected Resources
The Honorable Adam Schiff, House of Representatives
The Honorable Jared Huffman, House of Representatives
The Honorable Dianne Feinstein, Senate

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All references are available as .pdf copies for download at AWA comment letter references. This link will expire as of July 1, 2016. We are also posting a CD with these files to the address in the proposed rule.

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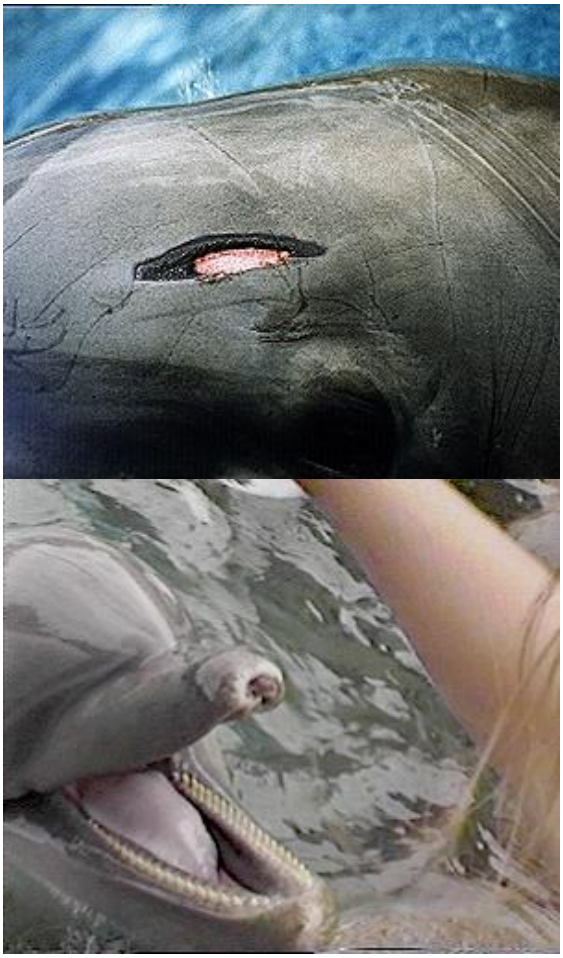
Appendix I

Photographs of dolphins participating in feeding/petting pools (credit: WDC):



In 2012, at SeaWorld Orlando, an 8-year-old girl was bitten by a dolphin and suffered puncture wounds while participating in a dolphin feeding encounter at the Key West exhibit.[46] See also USDA Inspection Report, Sea World of Florida (Aug. 29, 2006) for a description of a petting/feeding pool incident that led to a citation, as follows:

- "There have been several instances of public injury at the [dolphin] exhibit."
- "The licensee cannot produce any written records … as to exactly how many incidences have occurred, and exactly what those injuries were."
- "Based upon conversations with the licensee who indicated that there were more than the 2 recent injuries, *it is this inspector's opinion that these public injuries are more than an isolated occurrence and occur with some frequency*" (emphasis added).
- "[I]t is conceivable that a member of the public can potentially get bit, scraped, or injured by the dolphin's teeth during . . . petting activity. These injuries occur very quickly and unexpectedly."

[46] R. Hernández, *SeaWorld Attack: Video Captures Dolphin Biting Little Girl*, Orlando Sentinel (Dec. 1, 2012)

Photographs of dolphin teeth and rostrums in standard exhibits (credit: Orca Research Trust):

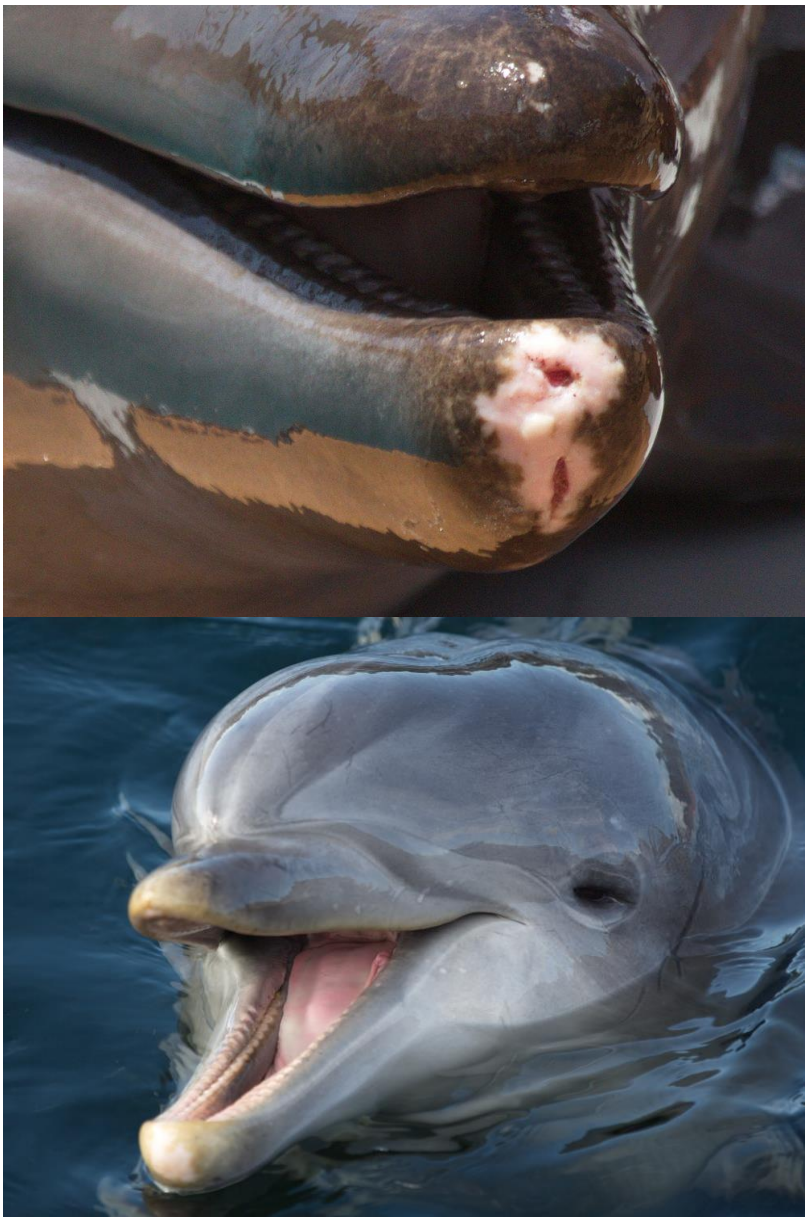


Table 1. Comparison of space requirement standards, ***per animal***

Species	Dimensions (meters (m), m^2, and m^3)	Current AWA standard	Couquiaud (2005) minimum identified[1]	United Kingdom	Italy	Brazil	Alliance of Marine Mammal Parks and Aquariums (AMMPA)	AWI recommendations[2]
Killer whales (*Orcinus orca*) Average adult length: 7.32 m – AWA 5.25 m – AMMPA	MHD[3] Minimum depth[4] Min surface area[5] Minimum volume[6] Min vol each add'l animal[7]	14.64 3.66 31.55 307.89 153.95	n/a	15 **12** 2,400[8] 2,500 n/a	n/a	n/a	n/a 5.25[9] n/a 959[10] 539.5[11]	**100**[12] **15** not calculated not calculated not calculated
Bottlenose dolphins (*Tursiops truncatus*) Average adult length: 2.74 m – AWA 2.55 m – AMMPA	MHD Minimum depth Min surface area Minimum volume Min vol each add'l animal	7.32 1.83 4.42[13] 38.48[14] 10.79	n/a n/a **14 *or* 91**[15] 46 46	7.0 5.6 n/a 200[16] 200	7.0 3.5/4.5[17] **80**[18] 320[19] 400	14.0 **6.0** n/a 800[20] 400	n/a 2.55 n/a 55.58[21] **62.7**[22]	**35**[23] **6** **14 *or* 91** **63** **63**[24]
Beluga whales (*Delphinapterus leucas*) Average adult length: 4.27 m – AWA 3.45 m - AMMPA	MHD Minimum depth Min surface area Minimum volume Min vol each add'l animal	8.54 2.14 10.74 27.56 30.63	n/a	n/a	n/a	14.0 7.0 n/a 800[25] 400	n/a 3.45 n/a 136.8[26] **153.9**[27]	**50**[28] **20**[29] **14 *or* 91** **154** **154**[30]

[1] Couquiaud did not actually identify the cetacean species for these dimensions, but the most commonly held species in her survey was the bottlenose dolphin

[2] For our recommendations, all dimensions are per animal and additive, except for MHD and minimum depth, which are independent of the number of animals held in an enclosure

[3] Minimum horizontal dimension (in meters) – this is independent of the number of animals held in an enclosure, for all sources

[4] Minimum depth (in meters) – this is independent of the number of animals held in an enclosure, for all sources

[5] Minimum surface area per animal, for up to 2 animals (in m^2) – min SA is not additive (so min SA required for 1 *or* 2 animals is twice the per animal min SA, or 63.09 m^2)

[6] Minimum volume per animal, for up to 2 animals (in m^3) – min vol is not additive (so min vol required for 1 *or* 2 animals is twice the per animal min vol, or 615.79 m^3)

[7] Minimum volume for each additional animal in excess of 2

[8] Minimum volume per animal, for up to 5 animals – min vol is not additive (so min vol required for 1 *to* 5 animals is five times the per animal min vol, or 12,000 m^3)

[9] Minimum depth is 2.55 m or one average adult body length of the longest species housed in an enclosure, whichever is greater

[10] Minimum volume per animal, for up to 2 animals – min vol is not additive (so min vol required for 1 *or* 2 animals is twice the per animal min vol, or 1,918 m^3)

[11] Minimum volume per animal, for each additional 2 animals – min vol is not additive (so min vol required for 1 *or* 2 add'l animals is twice the per animal min vol or 1,079 m^3)
[12] This value is based on information from the peer-reviewed scientific literature; see text
[13] Minimum surface area per animal, for up to 2 animals – min SA is not additive (so min SA required for 1 *or* 2 animals is twice the per animal min SA, or 8.84 m^2)
[14] Minimum volume per animal, for up to 2 animals – min vol is not additive (so min vol required for 1 *or* 2 animals is twice the per animal min vol, or 76.97 m^3)
[15] The minimum surface area identified by Couquiaud was 14 m^2; the median surface area she identified was 91 m^2
[16] Minimum volume per animal, for up to 5 animals – min vol is not additive (so min vol required for 1 *to* 5 animals is five times the per animal min vol, or 1000 m^3)
[17] Minimum depth is 3.5 m but must be at least 4.5 m in half of enclosure
[18] Minimum surface area per animal, for up to 5 animals (in m^2) – min SA is not additive (so min SA required for 1 *to* 5 animals is five times the per animal min SA, or 400 m^2)
[19] Minimum volume per animal, for up to 5 animals – min vol is not additive (so min vol required for 1 *to* 5 animals is five times the per animal min vol, or 1600 m^3)
[20] Minimum volume per animal, for up to 2 animals – min vol is not additive (so min vol required for 1 *or* 2 animals is twice the per animal min vol, or 1600 m^3)
[21] Minimum volume per animal, for up to 4 animals – min vol is not additive (so min vol required for 1 *to* 4 animals is four times the per animal min vol, or 222.3 m^3)
[22] Minimum volume per animal, for each additional 2 animals – min vol is not additive (so min vol required for 1 *or* 2 add'l animals is twice the per animal min vol or 125.4 m^3)
[23] This value is based on information from the peer-reviewed scientific literature; see text
[24] For our recommendations, the minimum volume is additive, so for one dolphin, it would be 63 m^3 and for five dolphins, it would be 315 m^3
[25] Minimum volume per animal, for up to 2 animals – min vol is not additive (so min vol required for 1 *or* 2 animals is twice the per animal min vol, or 1600 m^3)
[26] Minimum volume per animal, for up to 4 animals – min vol is not additive (so min vol required for 1 *to* 4 animals is four times the per animal min vol, or 547.2 m^3)
[27] Minimum volume per animal, for each additional 2 animals – min vol is not additive (so min vol required for 1 *or* 2 add'l animals is twice the per animal min vol or 307.8 m^3)
[28] This value is based on information from the peer-reviewed scientific literature; see text
[29] This value is based on information from the peer-reviewed scientific literature; see text
[30] For our recommendations, the minimum volume is additive, so for one beluga, it would be 154 m^3 and for five belugas, it would be 770 m^3