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REPORT #1 DRAFT
Marine Mammal Threats Analysis
Prepared for the Orca Fund of the San Diego Foundation¹
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Introduction

Marine mammals are charismatic fauna that have demanded the attention of generations of people around the world. In the 1970s, they served as the focus of the rallying cry “save the whales;” a cry that eventually led to substantial international protections from the threat of whaling. Whales are high-end indicators of the health of the ecosystems in which they live. There is a direct correlation between their health and the health of the ocean’s biodiversity for which they are both predator and prey and serve as significant food biomass after the dead bodies come to lie on the ocean floor.

Unfortunately, the whales are not yet “saved.” A few species have begun to recover from whaling, but most marine mammal species are in decline either in number or in health. As indicator species, the continued decline of many species of marine mammals demonstrates the decline of the oceans generally and the large marine ecosystems (LMEs) in which most marine mammals live. This decline is a threat to human health and to food resources which humans take from the ocean. As charismatic species, marine mammals may serve as focal points to stimulate public opinion in favor of efforts to protect the health of LMEs and the ocean.

This report is a summary of the current literature regarding threats to marine mammals. It is not, therefore, an independent assessment. An attempt was made to collect the most recent reports and texts on the threats to marine mammals, to undertake some limited interviews with scientists and other experts and then list within a two level priority system the known threats to marine mammals. This paper begins with a short table that describes the animal species that fall into the category of marine mammals (also called sea mammals). It then proceeds with an overview section regarding the apparent quality of our knowledge of the health and welfare of marine mammals. The largest part of the paper is devoted to a detailed listing of published comments on six short- to medium-term and three long-term threats to marine mammals. The short to medium-term threats are direct fisheries interactions, overfishing by humans, marine debris, loss of habitat, ship collisions, and sound pollution. The long-term threats are whaling, climate change/ozone depletion, and bioaccumulation of toxins. Some preliminary thoughts are set forth regarding how funders might address these threats and on how to identify individuals and Environmental Non-Governmental Organizations (ENGOs) who can be effective in combating these threats. At the end of the paper a reference list is provided.

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Marine Mammals

The table below lists by species category the common names of individual species of marine mammals. However, it should be remembered that for many marine mammals “the species may not be the most significant unit of biodiversity. Populations may represent important genetic diversity that should not be ignored in measures to conserve biodiversity.” (Thorne-Miller, 1999: 45)

Cetacea³		Carnivora⁴			Sirena⁵
WHALES, PORPOISES & DOLPHINS					
Toothed Whales	Baleen Whales	Seals & Sea Lions	Polar Bears	Otters	Sea Cows & Manatees
River Dolphin	Gray Whale	Eared Seals		Marine Otter	Manatee
Dolphins	Rorquals	Walrus		Sea Otter	Dugong
Porpoises	Right Whales	True Seals			
White Whales					
Sperm Whales					
Beaked Whales					

(SOURCE – Reynolds, 1999:1-14 and MacDonald, 1993)

Overview

Many of the causes for declines in marine wildlife persist: incidental capture in fishing gear, destruction of critical habitat, and health problems related to pollution, including immunosuppression and endocrine disruption. Efforts to help populations recover are hampered by lack of research or recovery actions to identify and help species at risk, and little or no government financial support for the programs that protect and restore marine wildlife. (CMC, 2000: 23)

There are short, medium and long-term threats to marine mammals. As a result, certain species/populations within species are endangered or vulnerable (per the International Union for

³ Derived from even-toed ungulates such as cows or pigs.

⁴ Derived from ursid (bear) or mustelid (weasels).

⁵ Derived from elephants or other subungulates.

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the Conservation of Nature categories). Because marine mammals are charismatic, they get a lot of attention from environmental non-governmental organizations (ENGOS). The ENGOS seem to be able to raise money to work on these issues, precisely because of the charismatic nature of marine mammals. This even though major national foundations that support marine conservation work and research give very little for work specifically related to marine mammals. The biggest foundation with a directed focus on marine mammals provides grants in this category at an average level of \$600,000 per year. Apparently ENGOS primarily get money to work on marine mammal issues from small family foundations and individual donors. (Bedolfe)

A large percentage of humans live along the coasts. Interestingly so do a large number of marine mammals. Even the pelagic, or open ocean, marine mammals come to the coasts to breed, birth their young, and to feed. Yet, we know very little about marine mammals. Submerged in the water as is natural for them, they are hard for us to identify, much less count and estimate population sizes. They are hard to observe to learn about feeding and other important behaviors. We do not even know where a few great whale species go for half of each year. How do you lose track of the largest mammals to ever inhabit the planet? The answer is that we are terrestrial and they most certainly are not. As a result, much of our knowledge takes the form of speculation or inadequately confirmed theory. But there are some things we know about whales and other marine mammals that should make us very concerned about their long-term health and welfare.

As with all ecosystems, “an important indicator of the health of the ocean is the status of the species at the top of the web of sealife” including whales, dolphins and seals (CMC, 2000: 20). While we do not know exact numbers for many marine mammal species, we have observed a decline in their numbers as a result of reading whaling records, observing fisheries bycatch rates, or annually photographing seal rookeries. Thus the apparent declining numbers of many marine mammals indicates the ocean is not healthy. For example, “[w]hen the populations of whales were much greater, their bodies were likely a very important source of food on the sea floor; they and other mammals still provide food and habitat for a community of opportunistic creatures that move from one to the next as the bodies are consumed.” (Thorne-Miller, 1999: 101)

The decline of marine mammals is accelerating. As recently as 1993, it was thought that “the great majority of seal stocks would seem assured of survival.” (MacDonald, 1993: 251) or that “most populations of seals are probably stable or increasing.” (MacDonald, 1993: 275) Only isolated populations or subspecies of other seals were seen as rare or declining. In contrast, today we find that the “declines in southern sea otters in California and Stellar sea lions in Alaska remain largely unexplained. For many marine mammals . . . we don’t even have sufficient scientific information to know if populations are increasing or decreasing, let alone why.” (CMC, 2000: 21) According to at least one respected researcher, “the demise of marine mammals . . . is

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a fait accompli. Many species and populations have gone extinct, and others are impoverished or on the brink of extinction.” (Thorne-Miller, 1999: 16)

It is hard to find a silver bullet for marine mammal issues. Most are too large or too political for ENGOs to be effective. (Croll) Thus there needs to be a concerted effort to develop strategies which prioritize and seek to address key threats to marine mammals. It is with this in mind that we undertook to review the current state of knowledge regarding threats to marine mammals. We share this study as a starting point for discussion purposes and not to dictate action by funders or ENGOs.

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What are the most serious problems affecting marine mammals? (Or, what are the most important ways funders can make a difference?)

In this section we describe the specific threats to marine mammals identified in our research. They are divided into two levels: short- and medium-term threats, and long-term threats. These levels relate not only to the length of time before impact from the threat, but also a first attempt at prioritization of where effort should be placed. The short- and medium-term threats should respond to a short- and medium-term concerted effort, while the long-term problems are more intractable and need to be addressed within the context of much more comprehensive efforts.

Summary of Threats

Short and Medium Term Threats	Impacts
Direct Fisheries Interactions (Operational Interactions)	Accidental entanglement in gillnets and other fishing gear causing injury and death. The mortality rate for some species is so high there is a risk of extinction.
Overfishing by Humans (Biological Interactions)	Overfishing by humans of resources relied upon by marine mammals is contributing to their decline. Marine mammals are also wrongly blamed for fisheries depletion and thus exterminated like pests.
Marine Debris	Marine mammals are injured and killed by ingestion of or entanglement in marine debris. There may also be a link between pollution and lowered immunity levels.
Loss of Habitat	The physical destruction of important expanses of natural habitat is a significant contributor to the decline of marine mammals.
Ship Collisions	For some species of Whales and Sirena, collisions with ships is a major cause of mortality.
Sound Pollution	Ocean noise is causing acoustic disturbance, injury and even death to marine mammals.
Long Term Threats	Impacts
Whaling	There is a resurgent effort to undertake whaling operations.
Climate Change and Ozone Depletion	These atmospheric changes will impact the ocean's productivity and are expected therefore to have an indirect negative impact on marine mammals.
Bioaccumulation of Toxins	Direct mortality, reproductive impairment, and increased susceptibility to disease.

The Threats

Short to Medium Term

Direct Fisheries Interactions (Operational Interactions)

Marine mammal interactions with fisheries fall into two broad categories: operational interactions and biological interactions. Operational or direct interactions primarily refer to accidental entanglement in gillnets and other fishing gear which results in injury and death. The mortality rate for some marine mammal species is so high there is a risk of extinction. The following are excerpts from the current literature and interviews:

- This a key short-term threat. For example, it is responsible for the serious decline in the Harbor Porpoise on the California coast and the Vaquita in the Sea of Cortez (Croll)
- Within the environmentalist community the “need” for zero dolphin mortality from tuna fisheries interactions has almost become a litmus test regarding a group’s level of commitment to marine mammal protection. (Bedolfe, Croll)
- In California, operational interactions have a serious impact on otters. (Croll)
- Salmon aquaculture in British Columbia and in Chile has an indirect impact on marine mammals. (Bedolfe)
- Trawling harms some marine mammals. (Bedolfe)
- Several marine mammal species “are in danger of extinction, in large part from entanglements in fishing gear.” “Currently, 39 out of 144 U.S. populations of whales, dolphins and seals suffer such high levels of human-caused mortality that the populations cannot grow and recover.” (CMC, 2000: 10 and 20)
- Hawaiian monk seals drown when they become tangled in longline fishing gear. (Bedolfe and CMC, 2000: 25)
- “Operational interactions include accidental entanglement of marine mammals in gillnets and other types of fishing gear . . .” (Twiss, 1999: 3)
- “Deaths of marine mammals caused by fishery operations also involve a wide range of mammal species and types of fisheries.” (Twiss, 1999: 102)
- “Not all marine mammal mortalities due to interactions with fishing gear are immediate. Injuries to the animal, or gear fragments that remain attached to the animal, may make the animal more susceptible to death at a later time from infection, starvation, or some other cause.” (Twiss, 1999: 102-3)
- Vaquita are threatened by incidental catch in gillnets and shrimp trawls. “The only measure that would completely protect the Vaquita and possibly allow it to recover would be an enforced total ban on gillnetting and trawling activities in the northern Gulf of California.” (Twiss, 1999: 297)

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- Other than whaling, a top cause of premature death for cetaceans is their accidental death in fishing gear including purse seine nets for dolphin and drift nets for other species (Payne, 1995: 302-304).
- “Incidental catches in fishing nets of large numbers of dolphins have recently caused heavy mortality.” (MacDonald, 1993: 175)
- “Gill-nets, laid to catch salmon or capelin, also catch and drown dolphin. Inshore species of porpoises such as Dall’s and Harbor porpoises are most at risk” (MacDonald, 1993: 185)
- The eastern Pacific purse-seine tuna fishery threatens Spinner, Bridled and Common dolphins. (MacDonald, 1993: 185)
- “Because porpoises prefer to prey on open-sea fish, they are vulnerable to “incidental” capture by certain types of fishing gear set for those fish.” For example, salmon gill nets, herring weirs etc. (MacDonald, 1993: 198)
- River dolphin are often killed or injured accidentally by fishing gear. (MacDonald, 1993: 179)
- Purse-seining and trawling capture and drown seals, and discarded synthetic nets cause injury from entanglement. (MacDonald, 1993: 250)
- “Possibly the major impact fishing operations have on seals is the alteration of the ecosystem of which the seals form a part.” (MacDonald, 1993: 250)

Overfishing by humans (Biological Interactions)

Overfishing by humans of resources relied upon by marine mammals is contributing to their decline. Marine mammals are also wrongly blamed for fisheries depletion and are thus considered competitors to be exterminated like pests. The following are excerpts from the current literature and interviews:

- Fisheries management on a species-by-species basis is a threat to whales, thus ENGOs working on fisheries issues may be indirectly benefiting whales (Thorne-Miller interview)
- “1. Overfishing by humans, not whales, has been identified as a major problem for the worlds’ ocean resources. 2. Many whales feed on krill and fish species not used by humans. 3. In most cases, predatory and cannibalistic fishes are greater predators of fish than are whales and other marine mammals. 4. Hunting whales is unlikely to provide increased catch of fish species, because of the complexity of ecosystem interactions.” (NOAA, undated: 3)
- Overfishing, using trawl methods may be causing the decline of the Steller sea lion. (CMC, 2000: 25)
- Overfishing of lobster is impacting the Hawaiian monk seal (CMC, 2000: 25)
- “Fisheries have also reached a level of incomprehensible destruction . . . Commercial fishers farther offshore in international waters are not subject to national regulations and only recently have come under scrutiny.” (Thorne-Miller, 1999: 17)

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- There are “Too many boats and too much high-tech gear” focused on “maximum sustainable yield” of fish resources. (Thorne-Miller, 1999: 18)
- “The bycatch may be even more devastating to pelagic (open-ocean) ecosystems than the catch.” (Thorne-Miller, 1999: 19)
- “[Marine mammal] populations are now so small that they consume less than 8 percent of the fish production. Many marine mammals are no longer counted as major parts of the ecosystem – they are treated more as lovable or not-so-lovable tourist attractions, depending on the beholder; when they eat fish, they do so at the risk of wrath from commercial fishers. Even when we love them and protect them from harassment, we do little to protect their food supply.” (Thorne-Miller, 1999: 78-9)
- A decrease in food availability appears to be causing a decline in Steller sea lions, harbor seals, and northern fur seals in the Bering Sea and the Gulf of Alaska. (Twiss, 1999: 104)
- “Clearly, seals and sea lions do eat salmon, but we are not aware of any situations where pinnipeds have put a robust salmon population in jeopardy. The primary causes of depleted runs are almost invariably human activities (i.e. direct removal by fisheries . . .). (Twiss, 1999: 159)
- It would be imprudent, if not largely ineffective, to eliminate or reduce pinnipeds wherever they “compete” with humans. (Twiss, 1999: 175)
- Human demand is removing organisms from the ocean, which are the foods of whales. (MacDonald, 1993: 174)
- “The future of the rorquals depends on the success of the . . . conservation of their food-base, krill.” (MacDonald, 1993: 225)
- “Finally, one factor which for whales and dolphins may represent the greatest threat is the increasing need for man to exploit the sea for food . . . man is beginning to harvest a variety of food organisms (for example krill in the Southern Ocean, capelin, sand eels and sprats in the North Atlantic), which form important links in the marine food chains for cetaceans, seals and seabirds alike.” (MacDonald, 1993: 175)
- “Finally, direct competition for particular fish species may be an important potential threat [to Dolphins] as man turns increasingly to the marine environment for food.” (MacDonald, 1993: 185)

Marine Debris

Marine mammals are injured and killed by ingestion or entanglement in marine debris. There may also be a link between pollution and lowered immunity levels. This is a growing problem due to increased use of non-degradable synthetic items. The following are excerpts from the current literature and interviews:

- There may be a link between pollution and lowered immunity for marine mammals. Clearly, we know that disease is increasing (Thorne-Miller interview)

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- The “oceans are finite and destructible. Wastes dumped and drained into the ocean do not disappear; they are neither economic nor ecological externalities.” (Woodard, 2000: 227)
- “Oil pollution is a serious problem for marine and coastal fauna.” (Goudie, 2000:125)
- “Every year [marine debris] injures and kills thousands of marine animals that ingest or become entangled in the trash” among them are “large whales, Northern fur seals, Hawaiian monk seals and other threatened or endangered whales.” (CMC, 2000: 13 and Russel)
- “About 20 percent of all ocean pollution is due to activities at sea – vessel traffic, waste disposal, oil and gas exploration, and mining on the deep-sea bed. Most of the remaining 80 percent comes from activities on land.” (Thorne-Miller, 1999: 22)
- Marine mammals “are injured or killed when they become entangled in marine debris or when they ingest it.” (Twiss, 1999: 342)
- “At least three factors account for the recent increase in marine debris: (1) disposal practices rooted in the outdated notion that the ocean’s enormous size enables it to absorb all kinds of human waste without harm; (2) proliferation of synthetic materials resistant to degradation in the marine environment; and (3) increasing numbers of mariners and coastal residents using and discarding more and more synthetic items.” (Twiss, 1999: 342)
- “Because of their buoyancy and persistence, plastic items contribute disproportionately to the overall impact of marine debris. Most of the debris that either entangles animals or is found in their stomachs is made of plastic.” (Twiss, 1999: 344)
- Marine debris is estimated to impact 58% of the world’s pinniped species, and 15% of the world’s cetaceans. (Twiss, 1999: 347)
- Marine debris may be creating harmful biological impacts on entire populations of marine mammals. (Twiss, 1999: 349)

Loss of habitat

The physical destruction of important expanses of natural habitat is a significant contributor to the decline of marine mammals. The following are excerpts from the current literature and interviews:

- Ecosystem set asides, advocacy for creating marine mammal sanctuaries is becoming more and more important. (Bedolfe) [Also see Thorne-Miller, 1999: 117 et. seq.]
- “The only way to understand and conserve marine ecosystems is to study, manage, and regulate them *as* ecosystems.” (Woodard, 2000: 229) [for example, Woodard identifies in his Appendix A that there are two such ecosystems on west coast of North America: Gulf of Alaska and the Californian]
- “We must concentrate our attention on the parts of the ocean that are within national jurisdictions. Not because the high seas are unimportant but because both ocean life and the threats to it are concentrated near land.” (Woodard, 2000: 230)

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- Loss of important habitat is the cause of endangered status for several species of marine mammals. (CMC, 2000: 20)
- “As of June 2000, less than one-half of one percent of our ocean waters receive [wilderness] protection, and only one-half of one percent of that area, or less than 50 square miles, prohibits extractive use, such as fishing and mining.” (CMC, 2000: 11)
- Marine mammals are united by habitat requirements “all are dependent on an aquatic ecosystem for survival. This dependency makes them visible indicators of habitat degradation.” (Reynolds, 1999: 1)
- “Management of marine mammals (and indeed of all living resources) involves maintenance of the habitat on which a species depends, not simply maintaining the species itself; therefore, managers may tend to consider marine mammals as a group that has some common habitat requirements and perhaps common vulnerabilities.” (Reynolds, 1999: 1)
- “One of the most obvious sources of biodiversity loss is the physical destruction of significant expanses of natural habitat.” (Thorne-Miller, 1999: 20) [examples at page 21]
- There are three issues: (a) “The world’s coastal areas are being overwhelmed with people and pollution”; (b) “critical coastal resources . . . are being plundered in the name of development and lost through inertia and neglect”; and (c) “the inability of governments . . . to craft and implement rational coastal management plans is having far-reaching consequences” (Hinrichsen, 1998: 4)
- “Because they fire our imaginations so effectively, we can often marshal the political clout needed to set aside area of the earth to protect whales . . . Such sanctuaries also become havens for lesser-known species of animals and plants that are so necessary for life but that because they have not inspired us have no friends and therefore die alone. The principle seems to be this: if you want to save an area, save its most inspiring inhabitant. The rest will be maintained along with it.” (Payne, 1995: 340-1)
- The most important habitat for whales are “the ocean areas with the highest primary productivity.” (MacDonald, 1993: 169)
- “Cetaceans are not randomly distributed over any region but instead appear to be associated with oceanographic features such as upwellings (where food concentrations tend to occur), or undersea topographical features such as continental shelf slopes (which may serve as cues for navigation between areas). Breeding areas for most cetacean species (particularly small toothed whales) are very poorly known, but are better known for some of the large whales.” (MacDonald, 1993: 171)
- “Modification of the marine environment is occurring in many parts of the world.” (MacDonald, 1993: 174)
- “Actual removal of suitable habitat by the building of coastal hotel resorts, breakwaters which change local current patterns and encourage silting, and dams which regulate water flow in rivers, all impose threats.” (MacDonald, 1993: 175)

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- River Dolphins are most impacted by dam construction that inhibits their movement and water flows. (MacDonald, 1993: 179)
- “The beluga’s affinity for shallow, coastal areas poses other modern-day problems: those of habitat alteration through the construction of hydroelectric dams and offshore petroleum exploration and extraction via pipelines.” (MacDonald, 1993: 203)
- Beaked whales “like other primitive, highly specialized species such as the river dolphins . . . would seem to be incapable of exploiting changes in the ecosystem and hence may well succumb to competition from more adaptable species.” (MacDonald, 1993: 211)
- “The Mediterranean monk seal’s decline is due mainly to the loss of suitable breeding and resting habitat.” (MacDonald, 1993: 289)
- Pollution and flood control dams are a threat to manatees. (MacDonald, 1993: 296)

Ship collisions

For some species of Whales and Sirena, collisions with ships is a major cause of mortality. The following are excerpts from the current literature and interviews:

- This is an East Coast problem. It is not a problem on the West Coast, except in very urbanized ports because we have few surface feeders. (Croll)
- Collisions with boats are the cause of endangered status for several species of marine mammals. (CMC, 2000: 20)
- “Half of the right whales’ known mortality is caused by collisions with ships and entanglement in fishing gear.” (CMC, 2000: 24)
- “Collisions with boats constitute the largest identifiable source of mortality” for manatees. (MacDonald, 1993: 301)

Sound Pollution

Ocean noise is causing acoustic disturbance, injury and even death to marine mammals. The following are excerpts from the current literature and interviews:

- Sound pollution in the ocean is a key long-term issue. Not just LFA, but also cumulative effects of all ship traffic and other noise. We need to understand how is it affecting whales. (Croll)
- We know we can cause physical trauma to marine mammals with loud noise. We also believe that recurrent sound can cause permanent harm over time. (Potter)
- Since 1974 there have been seven documented instances of mixed species strandings (mixed species is very rare) that were associated with Navy activity involving active sonar systems. (Weilgert)
- Ocean noise is comprehensive, worldwide and ubiquitous. Some is from classified sources; much is from regular ship traffic. (Jasny)

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- Loud anthropogenic sound can mask over biological/natural sounds that may be crucial for marine mammals to hear. (Jasny)
- Noise may cause marine mammals to abandon traditional habitats. (Jasny)
- Low Frequency Active Sonar (known as LFA) and other active (as opposed to passive) sonar is a key emerging threat to marine mammals. (Bedolfe)
- The only likely candidate for communication among whales is sound. “Large whales have well-developed inner ears and exceptionally well-developed acoustic areas in their brains. This suggests that sound is important to them.” (Payne, 1995: 171)
- “Acoustic disturbance comes from sonic testing (for example during oil exploration), military depth charge practice and particularly from motor boat traffic.” (MacDonald, 1993: 175)
- Dolphins are impacted by acoustic disturbance from boats. (MacDonald, 1993: 185)
- Disturbance affects seals. “Recreational activities, particularly power-boating, can cause severe disturbance to seals at the breeding season.” (MacDonald, 1993: 251)
- Sound pollution is harming manatees. (MacDonald, 1993: 301)

Long-Term

Whaling

The future of whales depends on the success of the protection they have received in recent years. But this seems to be falling apart. There is a resurgent effort by Japan and Norway to undertake whaling operations. In addition, they have supported active attempts to expand indigenous whaling. Similarly, hunting of all marine mammals remains a difficult obstacle to overcome, especially in the face of long-standing indigenous traditions and in some cases subsistence need.

The following are excerpts from the current literature and interviews:

- Whaling conducted under the “scientific research” exception to the moratorium on international whaling is really commercial whaling. (Palumbi)
- Scientific whaling allows protected species to slip into the market. (Palumbi)
- Several species of whales have been brought back from the brink of extinction by international protection, which ended whaling by the vast majority of nations and in effect restricted it for those nations that refuse to stop: Norway, Japan, and Iceland. (Steuer)
- Whaling for Sperm whales was halted in 1985, but continues by some native tribes, and Japan now asserts the right to hunt Sperm whales. (Steuer)
- Japan plans to continue the expansion of whaling operations. (Steuer)
- Canadian polar bear trophy hunting and import of trophies into the US has been allowed since 1994 and may soon be expanded to allow such trophy hunts in Alaska. (Rose)
- Exploitation of marine mammals will increasingly become a threat. (Bedolfe)
- Marine animals are not commodities, they are wildlife. (Woodard, 2000: 227)

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- “Whale stocks have been reduced by at least half through uncontrolled hunting during the past half-century. Populations of the large varieties, those that have been most heavily exploited, have been cut to a tiny fraction of their former sizes, and the hunting, especially by the Russians and the Japanese, still goes on.” (Goudie, 2000:140)
- “Marine mammals have been hunted relentlessly until they are on the brink of extinction or at the very least play a far less significant role in the ecosystem.” (Thorne-Miller, 1999: 106)
- “Dolphins, porpoises, and small whales are highly vulnerable to hunting because of their small size and, in some species, their habit of riding the bow waves of vessels.” (Twiss, 1999: 303)
- Incidental kills can result in a conversion to a directed fishery focused on small marine mammals if a market is found for them. (Twiss, 1999: 303)
- River Dolphins are sometimes hunted for their oil, which is used for medicinal purposes. (MacDonald, 1993: 179)
- “The narwhal’s tusk is highly valued by collectors and museums.” (MacDonald, 1993: 203)
- Indigenous subsistence whaling that used to be sustainable, may now be a threat to whales because of non-indigenous depletion of the whale populations. For example, the Eskimo may be taking too many Bowheads in the western Bering Sea. (MacDonald, 1993: 235)
- There are “deliberate attempts to kill seals, either for their products, or because of the damage they do to fisheries” (MacDonald, 1993: 250)
- “All three species of manatees are considered by the IUCN to be threatened as a result of both historical and modern overhunting for their meat and skins” (MacDonald, 1993: 296)

Climate Change and Ozone Depletion

These atmospheric changes will impact the ocean’s productivity and are expected therefore to have an indirect negative impact on marine mammals. The following are excerpts from the current literature and interviews:

- Climate change will result in impacts that will vary according to species and population. Fortunately we know how to reverse human impact on climate change. (Würsig)
- The reduction of Arctic ice reduces the ocean’s production of copepods, a key food source for whales. (Würsig)
- Warmer water may be lethal to, or impact reproduction by, some marine mammal species. (Würsig)
- Warmer water may be lethal to some food species important to marine mammals. It may also force some predators that currently consume fish and other ocean resources to turn to marine mammals if food source availability changes. (Würsig)
- Reduction of ice and sea level rise may result in dramatic change/loss of habitat including hauling out places for pinnipeds and birthing lagoons for cetaceans. It will be especially hard

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on species with narrow habitats such as gray whales. It may also cause changes in availability and location of food sources. (Würsig)

- This is a very key long-term issue. How will marine mammals deal with global climate change? Use of whales for advocacy might be instrumental in seeking support for a campaign against climate change. (Croll)
- Climate change will impact the ocean's productivity. Based on experience with El Niño, the production of krill will be key, which will have a direct negative impact on whales. See the experience of the die-off of gray whales in 1999 and 2000. (Croll)
- John McGowan of Scripps Institution of Oceanography found that there has been a 70 percent decline in zooplankton as ocean temperatures have risen. "McGowan has documented an ecological crisis extending across a third of the North Pacific, from the Gulf of Alaska to the southern California coast." Warm water marine mammals are increasing; cold-water marine mammals are dwindling. (Woodard, 2000: 51)
- Declines in krill populations have been measured as a result of ozone depletion. (Thorne-Miller, 1999: 35)
- Climate change and global warming will impact whales. (Payne, 1995: 318-21)

Bioaccumulation of toxins

The bioaccumulation of toxins in the tissue of marine mammals (as a separate category from ingestion of marine debris discussed above) causes direct mortality, reproductive impairment, and increased susceptibility to disease. The following are excerpts from the current literature and interviews:

- This is a key long-term issue. It is less problematic on the west coast because of the offshore transport from California (Croll)
- Northern killer whales are the most contaminated with biotoxins. PCBs are serious problems. Dioxins and other persistent toxins are also being found. Males are retaining the PCBs; females rid themselves of it by passing it to their young during lactation. (Ross)
- PCBs cause reproductive failure, increased susceptibility to disease, malformations and other birth defects, and neurological deficits. (Ross)
- Killer whale contamination is an indicator of ocean contamination. (Ross)
- Most dolphin meat on the market in Japan (and labeled as whale meat) is unsafe to eat due to toxic loads in the flesh. (Palumbi)
- "Attention is drawn to the presence of synthetic organic compounds – chlorinated hydrocarbons, which build up in the fatty tissues of top predators such as seals which dwell in coastal waters." (Goudie, 2000:259)
- We are most concerned with organochlorine compounds and toxic elements, but our current state of knowledge about their impact is incomplete. Organochlorines are highly fat-soluble and accumulate in the lipids of animals. "Because the ultimate sinks for many of these

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persistent compounds are the oceans of the world, where organochlorines are rapidly absorbed to organic matter and taken up by plankton, marine mammals have been an end point in the food web accumulation of these compounds.” (Reynolds, 1999: 485-6)

- “Mounting evidence suggests that organochlorines may be detrimental to marine mammal populations” through direct mortality, reproductive impairment, and increased susceptibility to disease. (Reynolds, 1999: 499)
- “In marine mammals, blubber is the major repository for organochlorines” . . . “very few studies have attempted to estimate the absolute body load of organochlorines in marine mammals” (Reynolds, 1999: 492-3)
- Extremely high concentrations of DDT and PCBs have been reported in cetaceans from the eastern North Pacific off southern California. Also high concentrations in seals and sea lions in coastal southern California. (Reynolds, 1999: 498)
- “Marine mammal populations with high exposure to organochlorines are also likely to have been subjected to numerous other forms of human-induced stress, such as other contaminants, noise pollution and disturbance, habitat deterioration, or changes in food quantity and quality.” (Reynolds, 1999: 503)
- Whales face death from “the slow but inexorable accumulation of toxic substances in their bodies.” (Payne, 1995: 305)
- Humans are releasing toxic waste products into the ocean. (MacDonald, 1993: 174)
- “Toxic chemical pollution (particularly from heavy metals, oils and persistent chemicals) from urban, industrial and agricultural effluents may also have serious harmful effects . . .” species in enclosed seas or in coastal waters are most “vulnerable and presently showing decline.” (MacDonald, 1993: 175 and 185)
- Biotoxic products “are persistent and tend to accumulate in animals, like seals, at the top of the food chain. Pinnipeds accumulate organochlorine compounds, like DDT and PCB, mainly in the blubber, and heavy metals in the liver.” This causes impaired reproduction. (MacDonald, 1993: 251)
- Harm to seals from petroleum pollution is also a problem. (MacDonald, 1993: 251)
- “Female Ringed and Grey seals in the inner Baltic show pathological sterility attributed to pollutants.” (MacDonald, 1993: 275)
- “Recently, a more insidious threat has been implicated – pollution by organochlorine compounds, in particular polychlorinated biphenyls (PCBs). The reproductive rate of Ringed seals in the Baltic has declined sharply” (MacDonald, 1993: 275)

Preliminary Thoughts on Strategies for Funders

- Funders should identify and fund researchers and ENGOs that are effective in making a difference regarding these threats (for more on this, see the next section)

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- ☛ Funders should support broad public awareness campaigns regarding the threats to marine mammals including the relationship of human actions as causes of the threats; and the meaning of the impact on humans as the threats take hold.
- ☛ Funders should strategically coordinate funding for work on marine mammal issues to avoid duplication.
- ☛ Funders should consider focusing funding according to Large Marine Ecosystems.

Preliminary Thoughts on How to Find Who Are the Key People/ENGOS Making a Difference on These Threats

For the Orca Fund of the San Diego Foundation, we are undertaking to identify those individuals, including researchers and ENGOS who are effective at making a difference on the threats listed above. A list of ENGOS and others working on marine mammal issues was compiled through Internet searches and interviews with ten foundations and seven selected ENGOS. This list thus began with nearly 200 entries. The list was reduced to its current size by selecting groups identified with efforts to address the short- and medium-term threats listed above and by limiting our examination to those groups working within our area of geographic focus – the west coast of North America – defined by the Large Marine Ecosystems (LMEs) known at the Gulf of Alaska and the California Current.

At present, we are undertaking a review of publicly available information on these groups and rating them across 14 variables that are of interest to us. We share this methodology and format with funders in a separate document. It is hoped that by using this rating system we can identify the ten or so groups that are being most effective in addressing some of the key threats and then make an appropriate investment in their work.

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Writers approach how they write their first draft in a variety of ways. Some writers plot the entire story before they start to write, while other writers start writing and let the muse write the story. But, no matter how writers approach telling their story, they all have one thing in common. To write their stories they have to . . . sit down and write. â€œ The only way to write a first draft isâ€”write. Tweet this. Tweet. The draft is a very important stage in developing a good report. It is the stage at which the ideas are formed in detail, the writing is clarified and diagrams and such are added in, yet the work isn't finalized. This is the time when...Â This article has been viewed 48,956 times. Learn more The draft is a very important stage in developing a good report. It is the stage at which the ideas are formed in detail, the writing is clarified and diagrams and such are added in, yet the work isn't finalized. Draft â€” An unconventional order in writing signed by a person, usually the exporter, and addressed to the importer ordering the importer or the importer s agent to pay, on demand (sight draft) or at a fixed future date (time draft), the amountâ€| â€| Financial and business terms. draft â€” A written order drawn by one party, called a drawer, that directs a second party (almost always a bank), called a drawee, to pay a sum of money to a third party, called the payee. For example, a check. Drafts are used with letters of credit.â€| â€|