2009 HUMPBACK WHALE NATIONAL MARINE SANCTUARY CONDITION REPORT

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The document that follows is a copy of the DRAFT Humpback Whale National Marine Sanctuary Condition Report that was disseminated to three individuals who served as peer reviewers. In December 2004, the White House Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review (OMB Bulletin) establishing peer review standards that would enhance the quality and credibility of the federal government's scientific information. Among other information, these standards apply to Influential Scientific Information (ISI), which is information that can reasonably be determined to have a "clear and substantial impact on important public policies or private sector decisions." The Condition Reports are considered Influential Scientific Information. For this reason, these reports are subject to the review requirements of both the Information Quality Act and the OMB Bulletin guidelines. Therefore, following the completion of every report they are reviewed by a minimum of three individuals who are considered to be experts in the field, were not involved in the development of the report, and are not Office of National Marine Sanctuaries employees. Following the External Peer Review the comments and recommendations of the reviewers were considered by sanctuary staff and incorporated, as appropriate, into a final draft document. In some cases sanctuary staff reevaluated the status and trend ratings and when appropriate, the accompanying text in the document was edited to reflect the new ratings.

The comments and suggested edits that were received from the reviewers are embedded in the below draft. The final Humpback Whale NMS Condition Report may be downloaded from: http://sanctuaries.noaa.gov/.

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Hawaiian Islands Humpback Whale National Marine Sanctuary
Condition Report

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Comment [kb1]: One of the stated goals of the report is to “identify gaps in current monitoring efforts, as well as causal factors that may require monitoring and potential remediation in the years to come”. As such, this condition review should try to proactively identify topics of concern. This is problematic however, as the only “resource” officially recognized by the Hawaiian Islands Humpback Whale National Marine Sanctuary are humpback whales, and with a few exceptions, this report attempts to assess the condition of the sanctuary in relation only to humpback whales. There are a variety of statements regarding the sanctuary goals and mission that suggest the coverage and scope of the condition report should be broader:

“the sanctuary mission is to “facilitate uses compatible with the primary purpose of resource protection, including those traditional and customary uses of native Hawaiians”” (page 34)

“The sanctuary’s goal is to increase understanding of the distributions and functional linkages of marine organisms and their habitats in space and time to …

Comment [kb2]: There has been a lot of effort put into the HIHWNMS Condition Report and the authors are to be commended on the product. Inasmuch as the HIHWNMS is a single species sanctuary, the humpback whale, its status, biology, needs, and threats should be emphasized. While many of these items are present in the report, I found there to be an imbalance of information. In particular, the relevant background information on the humpback whale is inadequate (I have suggested a paragraph to fill in key information). It is critical to present the basic biology and behavior of this species in order to understand its needs and develop appropriate measured for its continued protection and conservation. Finally, in the section on future actions by the Sanctuary to mitigate pressures, these actions should include continuation of support for research into the behavior and biology of the humpback whale in areas that are vital to its conservation (e.g., efforts to understand the mating system of this species, efforts to better understand habitat use in this species).

Comment [kb3]:
- The report does not accurately report on the condition of resources and is not ready to be used to influence agency and private sector decisions. The report has the potential to confuse the public and pose a risk due to the conclusions and other statements made that are not supported by the report or by NOAA policy.
- This report shows only a cursory attempt to collect, analyze and report on the condition of resources. Many areas of the report are incomplete or significantly deficient where information is readily available from NMFS, from other relevant agencies and researchers, and from open sources.
- This report should not be released before significant improvements are made since it neither provides an accurate summary of the resource and it's environment, threats and stressors nor does it adequately portray the actual management responses to these issues

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Cover photo credits left to right:

Map: Bathymetric grids derived from multiple sources prepared by: The Coral Reef Ecosystem Division of NOAA's Pacific Islands Fisheries Science Center with funding from NOAA's Coral Reef Conservation Program.

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About this Report

This "condition report" provides a summary of resources in the National Oceanic and Atmospheric Administration's Hawaiian Islands Humpback Whale National Marine Sanctuary, pressures on those resources, current condition and trends, and management responses to the pressures that threaten the integrity of the marine environment. Specifically, the document includes information on the status and trends of water quality, habitat, living resources and maritime archaeological resources and the human activities that affect them. It presents responses to a set of questions posed to all sanctuaries (Appendix A). Resource status of Hawaiian Islands Humpback Whale sanctuary is rated on a scale from good to poor, and the timelines used for comparison vary from topic to topic. Trends in the status of resources are also reported, and are generally based on observed changes in status over the past five years, unless otherwise specified.

Sanctuary staff consulted with a working group of outside experts familiar with the resources and with knowledge of previous and current scientific investigations. Evaluations of status and trends are based on interpretation of quantitative and, when necessary, non-quantitative assessments, and the observations of scientists, managers and users. The ratings reflect the collective interpretation of the status of local issues of concern among sanctuary program staff and outside experts based on their knowledge and perception of local problems. The final ratings were determined by sanctuary staff. This report has been peer reviewed and complies with the White House Office of Management and Budget's peer review standards as outlined in the Final Information Quality Bulletin for Peer Review.

This is the first attempt to describe comprehensively the status, pressures and trends of resources at Hawaiian Islands Humpback Whale National Marine Sanctuary. Additionally, the report helps identify gaps in current monitoring efforts, as well as causal factors that may require monitoring and potential remediation in the years to come. The data discussed will enable us to not only acknowledge prior changes in resource status, but will provide guidance for future management challenges.

Summary and Findings

The Hawaiian Islands Humpback Whale National Marine Sanctuary (sanctuary) is designated to protect the humpback whale *(Megaptera novaeanagliae)* and its habitat in Hawai'i. The sanctuary enables citizens and government to work collectively on safeguarding the humpback whale breeding and calving range in waters around the main Hawaiian Islands, an area that supports over half the North Pacific humpback whale population. Encompassing 1,370 square miles of federal and state waters within the main Hawaiian Islands, the sanctuary extends from the shoreline to the 100-fathom isobath (183-meter depth) and is composed of five separate marine protected areas (MPAs) accessible from six of the eight main Hawaiian Islands. The sanctuary's configuration presents unique challenges and opportunities for protecting sanctuary resources, developing programs, and increasing public awareness of humpback whales throughout the state. Through education, outreach, research, and cultural activities, the sanctuary strives to protect humpback whales and their habitat in Hawai'i. This continued protection is crucial to the long-term recovery of this endangered species.

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The sanctuary is supported by the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) and administered jointly through a compact agreement and memorandum of understanding with the State of Hawai'i. The sanctuary was congressionally designated in 1992 by the Hawaiian Islands National Marine Sanctuary Act (HINMSA), and was fully established in 1997 with the State of Hawa'i's acceptance and approval of the sanctuary's first management plan and final Environmental Impact Statement. The management plan for the sanctuary was last reviewed and revised in 2002. In preparation for the sanctuary's next management plan review scheduled for the summer of 2009, the program is in the process of an internal review of the effectiveness of site programs and policies relative to the sanctuary's mandated goals. This condition report will serve as background and supporting material for the review of the Hawaiian Islands Humpback Whale National Marine Sanctuary's management plan, which will enable us to better understand, protect, and utilize the nation's marine environment.

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The responses to the set of questions found in this report focus primarily on the effects or potential effects of pressures on the sanctuary as they relate to humpback whales and their habitat, which are the responsibilities of the Hawaiian Islands Humpback Whale National Marine Sanctuary. With the exception of Question 3, they do not address concerns from the standpoint of habitats or resources over which the sanctuary does not have authority or other types of responsibility. The resources protected by the sanctuary appear to be in "good" to "fair" condition. Water quality parameters in the sanctuary appear to be in "good" to "good/fair" condition reflecting the fact that most issues occur in nearshore waters and therefore are not likely to pose threats to humpback whales. Habitats used by humpback whales in the sanctuary are rated as being in "good/fair" condition as some preferred habitat is affected by open ocean aquaculture and an increasing number of artificial reefs. The status of humpback whales is rated as "good/fair," however; their health is rated as "fair." Although humpback whale abundance is increasing in the sanctuary, there have also been an increasing number of reported collisions, entanglements, and associated impacts (e.g., lesions and impairment of movement and other important behaviors). Currently, these two stressors have been documented to be the greatest (up to 60%) human cause of actual mortality for this and other humpback whale populations in the U.S, making these the human activities of greatest concern to the sanctuary. The integrity of maritime archaeological resources in the sanctuary is rated as "fair" because there has been a gradual loss of historical artifacts due to land development, dredging, and coastal erosion, primarily at sites that have not been documented.

This condition report also attempts to include the most up-to-date information from the SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks), where appropriate and available. The project was a 2.5 year comprehensive study of North Pacific humpback whales in all of their known habitats. The Hawaiian Islands Humpback Whale National Marine Sanctuary played a major role in initiating, funding and coordinating this project, which has produced new abundance and growth rate estimates, detailed information about movement and population level assessments of health and human impacts.

National Marine Sanctuary System and System-Wide Monitoring

The National Marine Sanctuary System manages marine areas in both nearshore and open ocean waters that range in size from less than one to almost 140,000 square miles. Each area has its own concerns and requirements for environmental monitoring, but ecosystem structure and function in all these areas have similarities and are influenced by common factors that interact in comparable ways. Furthermore, the human influences that affect the structure and function of these sites are similar in a number of ways. For these reasons, in 2001 the program began to implement System-Wide Monitoring (SWiM). The monitoring framework (NMSP 2004) facilitates the development of effective, ecosystem-based monitoring programs that address management information needs using a design process that can be applied in a consistent way at multiple spatial scales and to multiple resource types. It identifies four primary components common among marine ecosystems: water, habitats, living resources, and maritime archaeological resources.

By assuming that a common marine ecosystem framework can be applied to all places, the National Marine Sanctuary System developed a series of questions that are posed to every sanctuary and used as evaluation criteria to assess resource condition and trends. The questions, which are shown on the following page and explained in Appendix A, are derived from both a generalized ecosystem framework and from the National Marine Sanctuary System's mission. They are widely applicable across the system of areas managed by the sanctuary program and provide a tool with which the program can measure its progress toward maintaining and improving natural and archaeological resource quality throughout the system.

Similar reports summarizing resource status and trends will be prepared for each marine sanctuary approximately every five years and updated as new information allows. The information in this report is intended to help set the stage for the management plan review process. The report also helps sanctuary staff identify monitoring, characterization and research priorities to address gaps, day-to-day information needs and new threats.

Comment [kb4]: It is misleading to group open ocean aquaculture with artificial reefs.

The report states that "these two stressors have been documented to be the greatest (up to 60%) human cause of actual mortality for this and other humpback whale populations in the U.S., making these the human activities of greatest concern to the sanctuary." This statement is not correct and should be deleted based on actual reporting to NOAA under the Marine Mammal Protection Act.

-Section 118 of the Marine Mammal Protection Act requires NMFS to place all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals occurring in each fishery (16 U.S.C. 1387(c)(1)). Reports of interactions between commercial fisheries and marine mammals are published annually in the Federal Register.

-As published in NOAA's List of Fisheries for 2009 (Federal Register Vol. 73, No. 231, Monday, December 1, 2008, pages 73032-73076):

- Marine aquaculture fisheries in the Pacific Ocean are classified as Category III – i.e., annual mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the potential biological removal (PBR) for each marine mammal stock (see page 73032).

- There have been no documented reports of marine mammal species and stocks incidentally killed or injured in the Hawaii offshore pen culture fishery (see Table 1 – List of Fisheries/Commercial Fisheries in the Pacific Ocean, page 73060)

-We are providing a copy of the List of Fisheries for 2009 as a reference to be cited in the report. The authors should contact NOAA Fisheries' Office of Protected Resources for the latest data on interactions with marine mammals, which must be reported under the Marine Mammal Protection Act. The NOAA Aquaculture Program is not aware of any entanglements to date.

Comment [kb5]: re: text box, 3rd bullet:

1.From the SPLASH project, it appears that slightly over 50% of the North Pacific humpback whale population migratory to Hawaiian waters each winter. Change 2/3 to 50% or 1/2.

Hawaiian Islands Humpback Whale National Marine Sanctuary

- A series of five noncontiguous marine protected areas distributed across the main Hawaiian Islands, each with its own distinct natural character and social significance.
- One of the world's most important humpback whale habitats.
- An estimated two-thirds of the entire North Pacific humpback whale population migrate to Hawaiian waters each winter to breed, calve, and nurse their young.
- Hawai'i's coral reefs remain in relatively good condition, and are noted for their isolation and endemism.

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Hawaiian Islands Humpback Whale National Marine Sanctuary Condition Summary Table

Status:

Good	Good/Fair	Fair	Fair/Poor	Poor	Undetermined

Trends: ▲ Conditions appear to be improving.
— Conditions do not appear to be changing.
▼ Conditions appear to be declining.
? Undetermined trend.
N/A Question not applicable.

The following table summarizes the "State of Sanctuary Resources" section of this report. The first two columns list 17 questions used to rate the condition and trends for qualities of water, habitat, living resources, and maritime archaeological resources. The Rating column consists of a color, indicating resource condition, and a symbol, indicating trend (see key for definitions). The Basis for Judgment column provides a short statement or list of criteria used to justify the rating. The Description of Findings column presents the statement that best characterizes resource status, and corresponds to the assigned color rating. The Description of Findings statements are customized for all possible ratings for each question. Please see Appendix A for further clarification of the questions and the Description of Findings statements.*

#	Questions/Resources	Rating	Basis for Judgment	Description of Findings	Sanctuary Response
WATER					
1	Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality?	—	Most areas with problems, including elevated turbidity, are nearshore and restricted to bays and harbors; these problems are unlikely to pose threats to humpbacks.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.	Regulations prohibit discharging or depositing any material in the state-regulated waters of the sanctuary. The sanctuary is working with agency partners to improve compliance with water quality regulations.
2	What is the eutrophic condition of sanctuary waters and how is it changing?	—	Locations with chronic nutrient enrichment and extensive macroalgae blooms are limited to some nearshore waters, and may be increasing in extent or severity, but are not known to pose threats to humpbacks.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.	
3	Do sanctuary waters pose risks to human health?	—	With the exception of occasional closures of some nearshore swimming areas, conditions are unlikely to adversely affect compatible uses of the sanctuary.	Selected conditions that have the potential to affect human health may exist but human impacts have not been reported.	
4	What are the levels of human activities that may influence water quality and how are they changing?	—	Numerous activities occur, but management actions have reduced some impacts; therefore, overall levels do not appear to be changing.	Some potentially harmful activities exist, but they do not appear to have had a negative effect on water quality.	
HABITAT					
5	What is the abundance and distribution of major habitat types and how is it changing?	▼	Some preferred habitat is affected by open ocean aquaculture and an increasing number of artificial reefs.	Selected habitat loss or alteration has taken place, precluding full development of living resource assemblages, but it is unlikely to cause substantial or persistent degradation in living resources or water quality.	Altering the seabed of the sanctuary is prohibited. Collaboration with DLNR and NOAA Fisheries on proposed aquaculture projects, review of proposals, reduction of surface cage areas, relocation of facilities to less whale dense water, and enhancement of whale impact monitoring and reporting program.
6	What is the condition of biologically-structured habitats and how is it changing?	**N/A**	N/A	N/A	
7	What are the contaminant concentrations in sanctuary habitats and how are they changing?	—	The low levels of some contaminants in humpback tissues are believed to be acquired in feeding areas, not in the Hawaiian Islands, even though some contaminants may be present in Hawaiian habitats.	Contaminants do not appear to have the potential to negatively affect living resources or water quality.	
8	What are the levels of human activities that may influence habitat quality and how are they changing?	▼	Increasing impacts from vessel traffic (noise and collisions); concerns over increasing number of aquaculture facilities, as well as altered watershed runoff due to development and fallow agricultural lands.	Selected activities have resulted in measurable habitat impacts, but evidence suggests effects are localized, not widespread.	
LIVING RESOURCES					
9	What is the status of biodiversity and how is it changing?	▲	Historical reductions in abundance, recent published estimates of increasing	Selected biodiversity loss has taken place, precluding full community development and function, but it is unlikely to cause substantial or	SPLASH project examines North Pacific humpbacks

Comment [kb6]: need to state that humpback whales fast on the breeding-calving grounds. Thus, the effect of water quality on fish stocks in Hawaii as a food resource is not relevant for humpbacks in Hawaii.

Comment [kb7]: Define what constitutes "state-regulated waters of the sanctuary" (e.g., up to 3 nm offshore).

Comment [kb8]: the table needs to be revised to reflect that there is no evidence that open ocean aquaculture is negatively affecting habitat (#5 and #8). This would be easiest to do by showing open ocean aquaculture as a separate entry and indicating a neutral (rather than declining) trend.

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			humpback abundance, and likelihood that associated species could benefit, recognizing that populations are still increasing.	persistent degradation of ecosystem integrity*.	and human impacts. Education and outreach create learning opportunities, increase awareness, and promote stewardship. Regulations reduce vessel and aircraft disturbance, and discharges in state-regulated sanctuary waters. The sanctuary provides training and tools, develops techniques, and coordinates whale disentanglements; conducts workshops and issue avoidance guidelines to reduce ship strike risks.
10	What is the status of environmentally sustainable fishing and how is it changing?	**N/A**	N/A	N/A	
11	What is the status of non-indigenous species and how is it changing?	—	No known invasives that affect humpbacks or their habitats.	Non-indigenous species are not suspected or do not appear to affect ecosystem integrity* (full community development and function).	
12	What is the status of key species and how is it changing?	▲	Increasing humpback abundance estimates and annual recruitment rates, though populations are still below historic levels in the North Pacific.	Selected key or keystone species are at reduced levels, perhaps precluding full community development and function, but substantial or persistent declines are not expected.	
13	What is the condition or health of key species and how is it changing?	▼	Increasing number of reported entanglements and associated impacts (e.g., lesions, and impairment of movement and other behavior.).	The diminished condition of selected key resources may cause a measurable but not severe reduction in ecological function, but recovery is possible.	
14	What are the levels of human activities that may influence living resource quality and how are they changing?	▼	Increasing number of reported collisions and entanglements (often from fishing gear encountered elsewhere).	Selected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive problem.	
MARITIME ARCHAEOLOGICAL RESOURCES					
15	What is the integrity of known maritime archaeological resources and how is it changing?	▼	Gradual loss of historical artifacts due to land development, dredging, and coastal erosion, primarily at sites that have not been documented.	The diminished condition of selected archaeological resources has reduced, to some extent, their historical, scientific, or educational value, and may affect the eligibility of some sites for listing in the National Register of Historic Places.	An archaeological assessment inventoried existing maritime resources, and examined current management efforts, threats, and the potential for joint management and collaboration.
16	Do known maritime archaeological resources pose an environmental hazard and is this threat changing?	?	Data on wrecks that may pose hazards are insufficient to determine threat or trend.	N/A	
17	What are the levels of human activities that may influence maritime archaeological resource quality and how are they changing?	▼	Increasing diving due to technical advances provides greater uncontrolled access; continued coastal development.	Selected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive problem.	

* The responses to the questions found in this report are based primarily on the effects or potential effects of pressures on the sanctuary as they relate to humpback whales and their habitat, which are the responsibilities of the Hawaiian Islands Humpback Whale National Marine Sanctuary. With one exception (Question 3), they do not address concerns or resources over which the sanctuary does not have authority or other responsibility.

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Site History and Resources

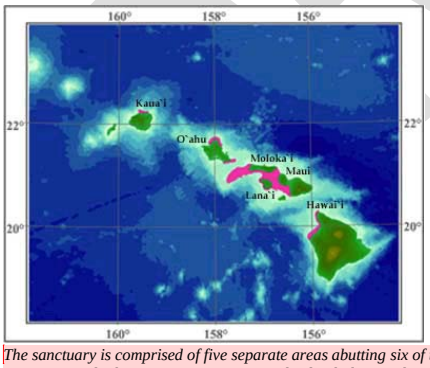
Overview

The warm and shallow waters surrounding the main Hawaiian Islands constitute one of the world's most important humpback whale (*Megaptera novaeangliae*) habitats. Scientists estimate that two-thirds of the entire North Pacific humpback whale population migrate to Hawaiian waters each winter to mate, calve, and nurse their young. The continued protection of humpback whales and their habitat is crucial to the long-term recovery of the endangered species. (HIHWNMS 2002)

The Hawaiian Islands Humpback Whale National Marine Sanctuary (sanctuary) was congressionally designated in 1992 by the Hawaiian Islands National Marine Sanctuary Act (HINMSA) to protect the humpback whale and its habitat in Hawai'i. The sanctuary is managed through a partnership between the State of Hawai'i Department of Land and Natural Resources (DLNR) and the National Oceanic and Atmospheric Administration (NOAA). Under the HINMSA, the sanctuary is also authorized by Congress to "identify, designate, and manage areas of the marine environment of special national, and in some cases international, significance due to their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities." NOAA and DLNR are currently in the process of developing background information on living marine resources and maritime heritage resources to be considered by federal, state and community partners. Resources will then be evaluated for their national significance and for the potential to be included in those resources protected by the sanctuary. The marine resources listed for evaluation by state and community partners include dolphins, other whales, Hawaiian monk seals, sea turtles, and maritime heritage resources including historic downed aircraft and sunken ships. (HIHWNMS 2007)

Location

Encompassing 1,370 square miles of federal and state waters, the sanctuary extends from the shorelines of Hawai'i to the 100-fathom isobath (183-meter depth), and is composed of five separate marine protected areas (MPAs) accessible from six of the main Hawaiian Islands. The boundary of the sanctuary consists of the submerged lands and waters off the coast of the Hawaiian Islands seaward from the shoreline, cutting across the mouths of rivers and streams. All commercial ports and small boat harbors in the State of Hawai'i are excluded from the sanctuary boundary. (HIHWNMS 2002, 2007)



The sanctuary is comprised of five separate areas abutting six of the major islands of the State of Hawai'i. (Sources. Hawai'i topography: USGS DEM, Ocean bathymetry: ETOPO5, Humpback Whale NMS boundary: NOAA).

The sanctuary is actually a series of five noncontiguous marine protected areas distributed across the main Hawaiian Islands, each with its own distinct natural character and social significance. Encompassing about half of the total sanctuary area, the largest contiguous portion of the sanctuary is delineated around Maui, Lāna'i, and Moloka'i. The four smaller portions are located off the north shore of Kaua'i, off Hawai'i's Kona coast, and off the north and

Comment [kb9]: The document should clarify in the introduction why discussions of turtles, fish, corals, etc., are relevant to the sanctuary condition report (e.g., are they part of the sanctuary habitat, indicators of whale health, etc.).

The document should clarify in the introduction that the primary authority and responsibility for the protection of the Humpback whale is in the Endangered Species Act and the Marine Mammal Protection Act, through NMFS and the Sanctuary augments this protection in this place.

Comment [kb10]: " change "two-thirds" to slightly more than one-half. See. and Table 18 of SPLASH report (Calambokidis et al., 2008).

Comment [kb11]: Is there a reference for this?

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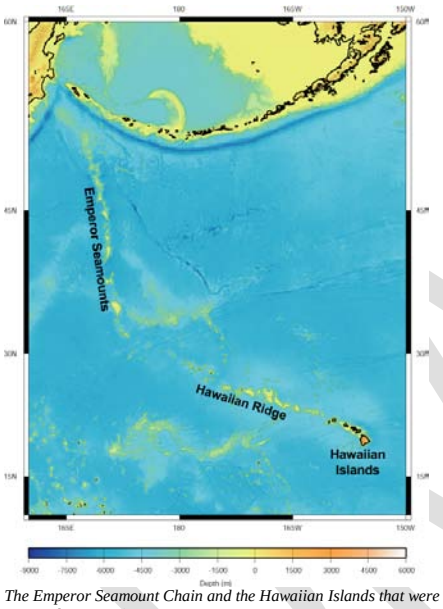
Comment [kb12]: Need to insert figure numbers and call-outs

southeast coasts of O‘ahu. The five areas of the sanctuary cover relatively shallow offshore areas created by the development of the Hawaiian Islands chain. (HIHWNMS 2002)

Geology

Over the past 70 million years or more, the combined processes of magma formation, volcano eruption and growth, and continued movement of the Pacific Plate over a magmatic "hotspot" have left a long trail of volcanoes across the Pacific Ocean floor. The Hawaiian Ridge-Emperor Seamounts chain extends 3,728 miles from the "Big Island" of Hawai‘i to the Aleutian and Kamchatka trenches off Alaska and Siberia respectively. The Hawaiian Islands themselves are a very small part of the chain and are the youngest islands in the immense, mostly submarine mountain chain composed of more than 80 volcanoes.



The Emperor Seamount Chain and the Hawaiian Islands that were formed over the Hawaiian Hot Spot. (Source: Monterey Bay Aquarium Research Institute)

A sharp bend in the chain indicates that the motion of the Pacific Plate abruptly changed about 43 million years ago, as it took a more westerly turn from its earlier northerly direction. Why the Pacific Plate changed direction is not known, but the change may be related in some way to the collision of India into the Asian continent, which began about the same time.

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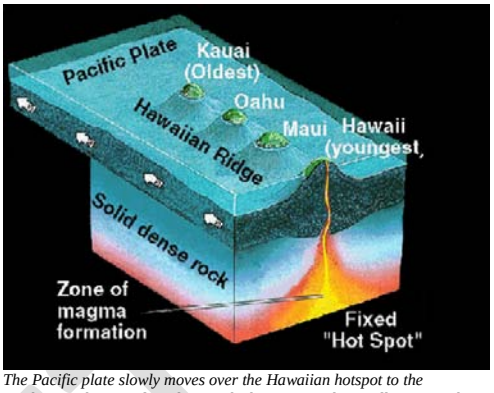

The Pacific plate slowly moves over the Hawaiian hotspot to the northwest. The area directly over the hotspot is volcanically active. The activity decreases and eventually stops as the plate moves on. The result is the Hawaiian Island chain. (Diagram: U.S. Geological Survey). Geologists have long assumed that the Hawaiian hotspot was stationary. However, current research suggests that it actually drifted southward between 47 and 81 million years ago. http://news-service.stanford.edu/news/2003/august6/seamount-86.html

As the Pacific Plate continues to move west-northwest, the Island of Hawai‘i will be carried beyond the hotspot by plate motion, setting the stage for the formation of a new volcanic island in its place. In fact, this process may currently be underway. Lō‘ihi Seamount, an active submarine volcano, is forming about 22 miles off the southern coast of Hawai‘i. Lō‘ihi already has risen about 2 miles above the ocean floor to within 1 mile of the ocean surface. According to the hotspot theory, assuming Lō‘ihi continues to grow it will become the next island in the Hawaiian chain. In the geologic future, Loihi may eventually become fused with the Island of Hawai‘i, which itself is composed of five volcanoes knitted together: Kohala, Mauna Kea, Hualālai, Mauna Loa, and Kīlauea. (http://pubs.usgs.gov/gip/dynamic/Hawaiian.html)

Water: Oceanographic Conditions

The waters surrounding Hawai‘i are affected by seasonal variations in climate and ocean circulation. The surface temperature of the oceans around the main Hawaiian Islands follow a north-south gradient and range from 24°C (75°F) in winter and spring to 26-27°C (79-81°F) in late summer and fall. The depth of the thermocline, where water temperature reaches 10°C (50°F) is 450 meters (1,500 feet) northwest of the islands and 300 meters (1,000 feet) off the island of Hawai‘i. Surface currents generally move east to west and increase in strength moving southward. With the exception of some lee areas (e.g., between Maui, Molokai, Lanai, and Kahoolawe), the seas are rougher between islands than in the open ocean, because wind and water are funneled through the channels. Waves are larger in the winter months than in the spring and are generally bigger on the northern shores of the islands than the southern shores. Marine organisms have adapted to these general climatologic and oceanographic conditions. (Mitchell et. al. 2005)

Comment [kb13]: This should be referenced. This seems deeper than I recall.

Deleted: T

The Northeast trade winds predominate throughout the year in Hawai‘i, but reach maximum intensity between spring and fall. These winds can produce substantial waves as they move across the Pacific toward Hawai‘i. Trade winds diminish during the night and gradually increase throughout the morning to maximum wind speeds in the afternoon. Increased wind speed results in an increase in the size of wind-driven waves (Jokiel 2006).

False-color satellite image of the Po‘ipū area, on the coast of Kaua‘i, after a storm. A white line of debris indicates how far inland the storm waves traveled. (Photo: NOAA)

A unique aspect of the geographical location of Hawai‘i is direct exposure to long-period swells emanating from winter storms in both the northern and southern hemispheres. Breaking waves from surf generated by Pacific storms is the single most important factor in determining the community structure and composition of exposed reef communities throughout the main Hawaiian Islands (Dollar 1982, Dollar and Tribble 1993, Dollar and Grigg 2004, Jokiel et al. 2004). The exception to this general rule is sheltered embayments that make up less than 5% of the coastal areas of the main Hawaiian Islands. (Friedlander et al. 2005)

Habitat

Hawai‘i is one of the most isolated archipelagos in the world. Because the islands are located in the middle of the Pacific Ocean, Hawai‘i’s coral reefs are exposed to large open ocean swells and strong trade winds that have a major impact on the structure of these coral reef communities. The main Hawaiian Islands consist of populated, high volcanic islands with non-structural reef communities and fringing reefs abutting the shore. (Friedlander et al. 2005)

With its boundaries including waters from the shoreline to depths of 600 feet in many areas, the sanctuary encompasses a variety of marine ecosystems, including seagrass beds and coral reefs. Much of the sanctuary has fringing coral reefs close to shore and deeper coral reefs offshore. Hawai‘i’s coral reefs are noted for their isolation and endemism. In Hawai‘i’s reef ecosystems, corals and coralline algae are the dominant reef-building organisms. The corals found in the sanctuary include finger coral (*Porites compressa;* nä pöhaku puna), cauliflower coral (*Pocillopora meandrina*; nä ko‘a), and lobe coral (*Porites lobata*; nä pöhaku puna). The deeper reefs lie in the “twilight zone” of the sanctuary below 200 feet. These deep reef ecosystems have their own unique assemblages, many of which are depth-adapted versions of species found at shallower depths. (HIHWNMS 2002)

The waters around the main Hawaiian Islands of Kaua‘i, O‘ahu, Hawai‘i, Maui, Moloka‘i, Lāna‘i, and Kaho‘olawe constitute one of the world’s most important North Pacific humpback whale habitats and a primary region in the U.S. where humpbacks reproduce. Newborn and nursing calves with cows are seen throughout the winter. Cows with calves appear to preferentially use leeward, nearshore waters with the 10-fathom isobath, especially along the north coast of Lāna‘i (Herman et al. 1980, Forestell 1986), Mā‘alaea Bay, Maui (Hudnall 1978), and the west Maui area (Glockner-Ferrari and Ferrari 1985, Glockner and Venus 1983). This general habitat use pattern has remained fairly consistent. (HIHWNMS 2002).

Comment [kb14]: paragraph needs re-writing and expansion with the most up-to-date information available. Suggested substitution: Add “Niihau” to list of main Hawaiian Islands that host humpback whales as significant numbers have been sighed around that island (see Mobley, 2005). Also, put islands in order from North to South. Suggested substitute text for line 3. “Neither mating nor birthing has been witnessed in this species (see Clapham, 2000; Pack et al., 2002). However, the 11.5-month gestation period combined with the sighting of many small calves throughout the winter season suggests that both mating and calving occur during the winter season and possibly its shoulders. Humpbacks are not equally distributed among the islands. The largest concentrations may be found in the “four-island region” (i.e., the waters between the islands of Maui, Molokai, Lanai, and Kahoolawe) as well as the area known as Penguin Bank, a bank extending approximately 25 nm southwest of west Molokai. Both locations consist of expansive areas of shallow (< 183 m) water and are preferred by mothers with calves (Herman et al., 1980). This general habitat pattern has remained fairly consistent (Mobley et al., 1999; Mobley et al., 2001). Additionally, there appears to be habitat use preferences by some female humpbacks based on their reproductive state (Craig & Herman, 2000).

DRAFT

Living Resources

Humpback Whales

Throughout the winter season, thousands of humpback whales are in Hawaiian waters to mate and give birth. By summer, they disappear from the Hawaiian horizon, traveling up to 4,000 miles to the nutrient-rich subarctic region of the North Pacific Ocean where they spend several months foraging for food. The humpbacks live off their energy reserves during winter before returning once again to renew their life cycle in Hawai‘i’s warm, tropical waters.

A breaching humpback whale. (Photo: Doug Perrine, NOAA)

Humpback whales are the focus of the sanctuary, which was designated by Congress to protect them and ensure the health and safety of critical humpback breeding habitat in Hawaiian waters. Although humpbacks were once plentiful in oceans worldwide, the global population was depleted by the commercial whaling industry at the start of the 20th century. In 1973, the United States government made it illegal to hunt, harm, or even disturb humpback whales. Because of their perilous brush with near-extinction, the animals were officially listed as endangered and remain so to this day. While many subsequent laws and policies have been added to reduce human threats to humpbacks, the sanctuary is unique in its mission of helping the public and government work together to ensure that an endangered species’ breeding habitat will become a lasting haven. (HIHWNMS 2002)

Additional Marine Resources

On November 4, 1992, the Hawaiian Islands Humpback Whale National Marine Sanctuary was designated by the Hawaiian Islands National Marine Sanctuary Act (HINMSA) (Subtitle C of Public Law 102-587, the Oceans Act of 1992). In 1997, the sanctuary’s management plan and final environmental impact statement was completed. Later that year, the Governor of the State of Hawai‘i approved the plan and its regulations as applied in state waters. Through a cooperative agreement, the sanctuary is co-managed by the National Oceanic and Atmospheric Administration (NOAA) and the State of Hawai‘i Department of Land and Natural Resources (DLNR). Section 2304 of the HINMSA established the purpose of the sanctuary. Section 2304(b)(4) and the subsequent revised management plan of 2002 require the sanctuary to identify and evaluate other resources and ecosystems of national significance for possible inclusion in the sanctuary.

These other marine resources have been identified through public scoping meetings held in 1993, 1994, and 2003 as well as public hearings and comments on the Draft Environmental Impact Statement and Management Plan, recommendations from the Sanctuary Advisory Council, and recommendations from DLNR. The marine resources listed for evaluation by state and community partners include other whales and dolphins, Hawaiian monk seals, sea turtles, and maritime heritage resources such as historic downed aircraft and sunken ships.

The sanctuary, with the support of the Governor, will evaluate all candidate resources for national significance and assess the ability of the sanctuary to protect them. The assessment will include feasibility and practicality of adding resources given current and projected funding and staff levels. The process that began in 2008 is part of the

Comment [kb15]: Endangered Species Act (ESA) is not mentioned until p.14, and then only under “Sea Turtles of Hawaii” section. It is not mentioned in any of the preceding cetacean sections or the proceeding monk seal section. There is no mention of the Marine Mammal Protection Act (MMPA) until p.32, and then only with respect to humpbacks. There is no mention of the Hawaiian humpback whale 100-yard approach regulation, promulgated under the ESA. These statutes and regulation protect “the focus of the Sanctuary” (see p. 12 “Humpback whales are the focus of the sanctuary . . .”) and should be mentioned consistently and accurately throughout the document and particularly in the “Living Resources” section. (Note: humpback whales and monk seals are described as “endangered,” but it is not clear how that term is used – colloquially or as describing their legal status under a U.S. Federal statute? Second paragraph on page 12 even mentions that they were “listed,” but does not mention the ESA specifically. ESA listing is only mentioned in the “Status of Sanctuary Resources” section on p.32). This document could provide an opportunity to demonstrate how NMFS and NOS use their statutory mandates to accomplish mutual goals? If so, the “Living Resource” section and the “Response to Pressure” section (p.36) could serve that purpose well.

Comment [kb16]: Considering that humpback whales are the focus of the sanctuary, this background information on humpback whales is too abbreviated. I suggest changing the first paragraph to the following. “Throughout the winter season, thousands of humpback whales of all age classes can be found in Hawaiian waters (Craig et al., 2003). The primary focus of adult humpbacks is mating and calving. Sexual maturity in this species is about 5 years of age (Chittleborough, 1965; Clapham, 1992). A current summary of humpback whale ecology may be found in Clapham (2000). Sexually mature female humpback whales produce a single calf on average every 2 to 3 years, though some females have been recorded calving in consecutive years. On the breeding grounds, the operational sex ratio is approximately 2 to 1 favoring males. Consequently, female humpbacks are a limiting resource for which male humpbacks compete. On the breeding grounds, female humpbacks are rarely observed alone and single females with and without calf are often “escorted” by one or more male humpbacks presumably in search of mating opportunities. In addition to escorting females and competing with …

Comment [kb17]: define plentiful

Comment [kb18]: Change sentence to “Commercial whaling during the first half of the 20th century dramatically reduced the numbers of humpbacks worldwide from an estimated 150,000 to perhaps 10% of that number. Humpbacks in the North Pacific were thought to have numbered about 15,000 before this period of whaling (Rice, 1978). Although a moratorium on whaling for North Pacific humpbacks was put into place by the International Whaling Commission in 1965, Soviet whaling actually continued through 1971, leaving between 1,200 and 1400 individuals in the population (Gambell, 1976; Johnson & Wolman, 1984). In 1973…(continue here with remainder of paragraph).

sanctuary's management plan review and will include opportunities for public comment through statewide public scoping meetings in 2009. Following the scoping meetings action plans to address priority issues will be developed and draft and final management plans will be released for further public review. The following summarizes potential species that may be included in protective management measures by the sanctuary.

Whales and dolphins

The order Cetacea (dolphins and whales) consists of two suborders: Odontocetes (toothed cetaceans) and Mysticetes (baleen whales). Generally, a useful distinction between them is one of size because the great whales are all Mysticetes, with the exception of the sperm whale, which is an Odontocete. Sizes of cetaceans in Hawai'i at maturity range from the spinner dolphin at 6 feet long and approximately 180 lbs. to the blue whale at 100 feet long and up to 200 tons. The following covers all known species of cetaceans in Hawai'i except the humpback whale.

Nearshore Species

Four species of cetaceans are more commonly seen in nearshore areas for at least part of their daily activities: spinner dolphins (*Stenella longirostris*), bottlenose dolphins (*Tursiops truncatus)*, pantropical spotted dolphins (*Stenella attenuata*) and false killer whales (*Pseudorca crassidens*). Of these species, the spinner dolphin and the bottlenose dolphin are the most frequently seen.

The nearshore populations of cetaceans are distributed throughout Hawai'i. Recent evidence indicates that resident island-associated populations exist for at least three of these four species. Nearshore cetaceans are usually found in small groups that range from 1-10 for bottlenose dolphins and 30-120 for spotted dolphins and spinner dolphins (Baird, pers. comm.). Sightings of certain species with other dolphins or whale species have also been documented. Feeding strategies vary among nearshore cetacean species in the main Hawaiian Islands. For instance, bottlenose dolphins feed primarily on fish and invertebrates that live near the bottom, while spinner dolphins feed on mesopelagic prey that includes squid, fish, and shrimp.

Spinner dolphins: During the day spinner dolphins use bays and other nearshore habitats at regular sites around the main Hawaiian Islands to rest and care for their young. Distribution and abundance are thought to correlate with the amount of available resting habitat on each island and total abundance in the main Hawaiian Islands is estimated at 1,488 individuals (Barlow 2006).

Bottlenose dolphins: These dolphins primarily have a coastal range; however, some populations occur in offshore deepwater areas as well. Recent research on bottlenose dolphins in the main Hawaiian Islands suggests that individuals are resident to the islands and that multiple, demographically-independent populations of island-associated bottlenose dolphins exist (Baird et al. 2007). There are as many as four discrete populations of bottlenose in the main Hawaiian Islands that correspond to the four main island groupings of Kaua'i and Ni'ihau, O'ahu, the 4-island-area (Maui, Moloka'i, Lana'i, and Kaho'olawe), and Hawai'i island (Baird et al. 2007). A total of 336 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2007) and Barlow (2006) estimated a population size of 465 individuals in the main Hawaiian Islands.

Spotted dolphins: Around Maui and Lana'i, spotted dolphins usually remain in shallower, nearshore water ranging from 100 to 300 meters but they are found in deeper water off Hawai'i, Kaua'i, Lana'i, and Ni'ihau (Baird et al. 2001). The estimate for spotted dolphins in the entire Hawai'i Exclusive Economic Zone is 10,260 (Barlow 2006); however, spotted dolphins have small home ranges and may not move between islands (Mitchell et al. 2005).

False killer whales: These whales are found in both shallow and deep water in the main Hawaiian Islands and a recent study documented their occurrence off the islands of Hawai'i, O'ahu, and the 4-island-area. Current estimates for population abundance in the Hawaiian Archipelago indicate it is a relatively small population. According to Baird et al. 2005 and Mobley et al. 2000, there are approximately 120 individuals around the main Hawaiian Islands and an estimated 484 individuals for the entire Hawaiian EEZ (Baird et al. 2008).

Pelagic Species

Mysticete populations have been documented in offshore areas of Hawai'i: minke whale (*Balaenoptera acutorostrata*), sei whale (*Balaenoptera borealis*), Bryde's whale (*Balaenoptera edeni*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), and northern right whale (*Eubalaena japonica*).

Comment [kb19]: For sea turtles information on population trends is included, but no information on trends of other species of whales or dolphins is noted. It should be noted that "there is no information on population trend" for all species of whales and dolphins except for false killer whale.

Comment [kb20]: This section on Whales and dolphins is confusing. Minke whales are a mysticete and are smaller than some odontocetes found in Hawaiian waters (e.g., sperm whales).

Deleted: This

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Comment [kb21]: "Nearshore species" should be changed to "Shallow-water species" – some of the so-called pelagic species are found very near shore off the Kona coast of Hawai'i where deep water comes close to shore.

Comment [kb22]: Based on Barlow (2006) the most abundant of the four "near-shore species" around the main Hawaiian Islands (his "Main Island Stratum") are pantropical spotted dolphins, followed by spinner dolphins and bottlenose dolphins. In the long-term odontocete research efforts undertaken by Cascadia Research spotted dolphins are also encountered more frequently. Spinner dolphins may be the "most frequently seen" but only because of their resting in near-shore areas during the day, but they do not appear to be the most common odontocete in shallow-water areas. For spinner dolphins there is evidence of multiple isolated ...

Comment [kb23]: The population estimate for pantropical spotted dolphins is for the entire EEZ, while for other species an estimate from around the main Hawaiian Islands (or both) is given. Barlow ...

Comment [kb24]: Since there is strong evidence of genetic structuring in false killer whale populations within the EEZ, this should be noted (Chivers et al. 2007), so that the estimates given a ...

Comment [kb25]: This statement needs a reference. For spinner dolphins at lease, you should use Kim Andrew's work. Robin Baird has published on Tursiops and Pseudorca.

Comment [kb26]: There is evidence of island-associated populations of all four near-shore species: spinner dolphins (Andrews et al. 2006); pantropical spotted dolphins (Courbis et al. 2007); false killer ...

Comment [kb27]: Numerous sources being cited are outdated; many other sources are not included in the version being reviewed. There is current information readily available in many cas ...

Comment [kb28]: You should cite Norris et al 1994 for spinner dolphins.

Comment [kb29]: (Norris et al, 1994; Lammers, 2004)

Comment [kb30]: Is this the estimate for the entire EEZ? If so, it is considered highly underestimated by many because Barlow's cruise did not consider shallow water habitats, where spinne ...

Comment [kb31]: This statement should be referenced, or the word 'documented' should be dropped.

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The offshore Odontocete species that have been documented in Hawai‘i are as follows: short-finned pilot whale (*Globicephala macrorynchus*), pygmy killer whale (*Feresa attenuata*), Risso's dolphins (*Grampus griseus*), Longman's beaked whale (*Indopacetus pacificus*) pygmy sperm whale (*Kogia breviceps*), dwarf sperm whale (*Kogia sima*), Fraser's dolphin (*Lagenodelphis hosei*), Blainville's beaked whale (*Mesoplodon densirostris*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), sperm whale (*Physeter macrocephalus*), striped dolphin (*Stenella coeruleoalba*), rough-toothed dolphin (*Steno bredanensis*), and Cuvier's beaked whale (*Ziphius cavirostris*).

Comment [kb32]: It should be noted that there is no information to assess population trends of any of the species of deep-water odontocetes. Published citations are available for evidence of resident populations of rough-toothed dolphins (Baird et al. 2008c) and pygmy killer whales (McSweeney et al. 2009).

Comment [kb33]: This should also be referenced, or the word 'documented' should be dropped

There is limited quantitative information on deep-water cetacean abundance in Hawai‘i; however recent studies are obtaining information on abundance and distribution. The logistics of data collection on these species are inherently difficult and most studies have been done by small boat surveys (R. Baird, Cascadia Research, pers. comm.), large vessels (Barlow 2006) or aerial survey (Mobley 2000). Research is needed to determine population abundance, habitat use, site fidelity and movements around the main Hawaiian Islands and the entire island chain to understand the population dynamics and requirements of these species.

The primary habitat of these species is deep, offshore waters of 100 meters or more but they can occur within State waters, especially in areas such as Hawai‘i and Southwest Maui County that have steep drop-offs. Short-finned pilot whales show high site fidelity off the coast of Kona, Hawai‘i and off southwest Lana‘i but also move among islands. Evidence suggests that there are also resident island-associated populations of pygmy killer whales, dwarf sperm whales, Cuvier's beaked whales, Blainville's beaked whales, melon-headed whales, and rough-toothed dolphins (McSweeney et al. 2007; R. Baird, Cascadia Research, pers. comm.).

Sea Turtles of Hawai'i

Five species of sea turtles are found in the nearshore and pelagic environments around the Hawaiian Islands: *honu* or green turtle (*Chelonia mydas*), *honu‘ea* or *‘ea* hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), and olive ridley turtle (*Lepidochelys olivacea*).

The hawksbill and leatherback turtles are listed as endangered and the green, loggerhead and olive ridley are listed as threatened under the Endangered Species Act. With limited baseline data on population abundance and historical distribution, many unknowns remain regarding current population trends for most species of sea turtles. Certain species in Hawai‘i have more detailed information on trends in comparison to populations distributed elsewhere in the Pacific. The green sea turtle population has been increasing in Hawai‘i over the last few decades (Balazs and Chaloupka 2004, Balazs and Chaloupka 2006). This increase raises new questions for wildlife managers regarding human interaction, indigenous harvest, and possible de-listing. The hawksbill sea turtle population trend remains unknown, and a historical abundance for this population is lacking. The loggerhead turtle is declining in the North Pacific (Polovina et al. 2006).

Green sea turtle. (Photo: Ursula Keuper-Bennett/Peter Bennett

Hawaiian monk seals

Īlioholoikauaua, or Hawaiian monk seals (*Monachus schauinslandi*), are the most endangered seal species in the US. Only an estimated 1,200 seals remain and the species is headed toward extinction if urgent action is not taken. The major breeding populations are at six locations in the Northwestern Hawaiian Islands. However, an increase of

monk seal occurrence in the main Hawaiian Islands within the last decade has been observed. Ensuring the continued natural growth of the Hawaiian monk seal in the main Hawaiian Islands is essential to their recovery (NMFS 2007).

It is estimated that approximately 10% of the Hawaiian monk seal population may occur within the main Hawaiian Islands. Beaches in the main Hawaiian Islands are increasingly being used by monk seals. Haulouts, sightings, and births have been reported on all of the main Hawaiian Islands (HIHWNMS 2007).

Comment [kb34]: Reference?

Other key living resources
Other important components of the sanctuary's reef ecosystems include algae; marine invertebrates, such as shrimp, lobster, crabs, and sea urchins; fish, such as parrotfish, wrasses, damselfish, surgeon fish, goatfish, jacks; and sharks. Deep-reef fish include squirrelfish, soldierfish, surgeonfish, snappers, and emperors. (HIHWNMS 2002)

Hawaiian monk seal female nursing its pup. (Photo: Chad Yoshinaga)

Maritime Archaeological Resources

Comment [kb35]: The report does not sufficiently acknowledge that all human activities have some impact, and that aquaculture is one of the multiple uses that is allowed under the Sanctuaries management plan. In addition, aquaculture is part of traditional Hawaii culture.

The section on Marine Archeological Resources notes that the Sanctuary includes ancient stone fish ponds, a form of aquaculture. Since aquaculture has historically been part of the traditional culture of Hawaii, it is appropriate to consider aquaculture as a compatible human use of the Sanctuary.

The Hawaiian archipelago has a long history of continuous and intensive maritime activity, and possesses many historic shipwrecks and other types of submerged archaeological sites. However, efforts to discover, assess, and protect these resources have only just begun. The existing maritime archaeological resource inventory for resources within the sanctuary's boundaries is comprised of two categories of site information: 1) vessels and historic aircraft reported lost within the sanctuary, and 2) vessels and historic aircraft wreck sites confirmed by survey within the sanctuary. The inventory currently lists 185 ship and aircraft losses in the sanctuary pre-1957 (50 years old or older). Of these, some have been salvaged and some completely broken up and lost over time. Twenty-two sites have been confirmed by some level of field investigation. The sanctuary also encompasses many sites of ancient stone fish ponds, once prominent features in the Hawaiian landscape. Near shore waters can reveal traces of fishing tools and artifacts associated with coastal settlements. (HIHWNMS 2007)

Maritime archaeological resources in the Hawaiian Islands are representative of important phases in Hawai'i's history. When discovered on the seafloor, maritime archaeological sites can serve as unique windows into the past, providing opportunities for historians, archaeologists, sport divers, and the general public to experience and appreciate these public resources in a responsible manner. Nineteenth century whaling shipwrecks represent some of the earliest sites in the main Hawaiian Islands. Five of these historic whalers have been reported lost within the sanctuary. Other reported losses include nineteenth and early twentieth century inter-island commercial vessels, both sail and steam, many from the formative days of Hawai'i's plantation period. A variety of vessel types reflect the Hawaiian, American, and Pacific/Asian multicultural setting among the islands. (HIHWNMS 2007)

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The bow of the Marshall Mars, *an enormous World War II era seaplane lost south of Oahu in 1950, and discovered in 2004 (Photo: NOAA/HURL)*
(http://www.noaanews.noaa.gov/stories2004/s2354.htm)

The U.S. Navy also has an important history among the islands. Over 80 naval ships and submarines, and more than 1,480 naval aircraft, have been lost in the Hawaiian Islands. Of the many aircraft, more than 70 historic civilian, army, and navy aircraft were lost within the current sanctuary/state boundaries alone. The technical development of flying boats in Hawai‘i dates back to the 1920’s and 1930’s as do the oldest submerged aviation crash sites (located). Many of these navy wrecks and aircraft crashes are also wartime grave sites that deserve appropriate respect and protection. (Van Tilburg 2003, HIHWNMS 2007)

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Pressures on the Sanctuary

The same coastal waters of Hawai‘i that cradle humpback breeding activity are also subject to heavy use by residents and visitors. Ocean-related industries include activities in recreation, tourism, maritime, ocean science and technology, commercial fishing, aquaculture and seafood marketing. Many activities of tourism, Hawai‘i’s number one economic engine, are based in ocean resources and would not be sustainable without quality water and aesthetic beauty of clean and open coasts. Ocean transportation is also vital to the State’s economy. Approximately 750 miles of Hawaiian Island coastline are served by 10 commercial ports and 21 small boat harbors. Hawai‘i residents place a high value on everyday access to the ocean for many purposes, including recreation.

Despite their economic significance, Hawaiian coastal waters near urbanized areas are coming under ever increasing population pressures from human and land-based pressures that threaten the health of the marine environment. (Dollar and Grigg 2004)

Vessel Traffic

Hawai‘i’s coral reefs attract visitors from around the world and provide the economic foundation for over 1,000 ocean tourism companies, with annual gross revenues estimated at $700 million per year. Over 80 percent of Hawai‘i’s tourists participate in ocean recreational activities, generating almost $364 million each year in added value (Cesar et al. 2002). (HCZMP 2006)

As the population of Hawai‘i increases, dependence on ocean transportation is expected to increase. About 80 percent of Hawai‘i’s food and merchandise is imported, of which 98 percent arrives by ship to commercial harbors around the State (Lee and Olive 1994). Some commercial port facilities would already be at capacity without ongoing adjustments to the shipping lines’ operations and efforts to optimize land use by the Harbor Division of the Department of Transportation (DOT). Such adjustments will extend terminal capacities, but ultimately without the expansion of commercial harbors to accommodate the growing demand of imported goods, Hawai‘i’s residents may experience delays in the delivery of essential commodities as well as higher shipping costs. (HCZMP 2006)

The Hawai‘i Superferry approaching Honolulu. (Photo: Associated Press, Marco Garcia)

In mid-2007, the Hawai‘i Superferry began ferry service between O‘ahu and the islands of Maui and Kaua‘i, with daily service to the Island of Hawai‘i scheduled to begin in 2009. Most of the harbors the Superferry will use were designed to accommodate freight, and the influx of up to 866 passengers and 282 cars will require DOT harbors to reallocate space for this operation. The DOT Harbors Division is updating its long-range master plans to address the robust growth and new marine operations that will challenge the commercial harbors system. (HCZMP 2006)

Comment [kb36]: There are two potential “pressures on the sanctuary” that need to be discussed: 1) alternative energy production (e.g., the proposed wave energy development project on Penguin Bank); and 2) naval exercises, including submarine torpedo testing. There is a submarine torpedo testing range inside sanctuary waters between Maui and Kaho‘olawe that has the potential to impact whales in a variety of ways (collisions with torpedos, disruption of behavior from high intensity sounds), and anti-submarine warfare exercises operation outside of the sanctuary have the potential to cause behavioral disturbance of whales inside the sanctuary from mid-frequency sonar use.

Comment [kb37]: Given the very recent interest from Grays Harbor in constructing wave generation stations throughout Penguin Bank, there should be a section in this report addressing this issue in terms of its affect on habitat loss for the humpbacks.

Comment [kb38]: The report’s emphasis on aquaculture as a stressor is inconsistent with its treatment of tourism, which is mentioned only in passing. Tourism is one of the most common human activities in the sanctuary, while aquaculture is very limited (currently only two open ocean sites in Hawaii, and only one in the Sanctuary itself). The level of concern over the impacts of aquaculture is not based on observed impacts, since aquaculture has no documented interactions with whales.

- Tourism vessel interactions with whales need to be addressed in the report.

- Vessel traffic associated with ocean tourism should be highlighted in its own section, and the impacts of whale viewing pleasure craft, glass bottom tour boats, etc. need to be assessed and included in the Condition Report.

Comment [kb39]: need to insert “military activities”

Comment [kb40]: 2. The report does not sufficiently acknowledge that all human activities have some impact, and that aquaculture is one of the multiple uses that is allowed under the Sanctuaries management plan. In addition, aquaculture is part of traditional Hawaii culture. ...

Comment [kb41]: Vessel traffic section is inadequate. Out-of-date references, no description of inter-island vessel (including tug/barge, etc.) traffic and it relevance to sanctuary. All information is readily available and analysis would be simple.

Comment [kb42]: Consider modifying section on Hawaii SuperFerry as its activities have recently ceased until a supreme court ordered EISis completed by the State. It is unknown at this time if Hawaii Superferry will resume operations in Hawaii. Nonetheless, a section on large vessel traffic including high speed vessels like ferries and their ...

Comment [kb43]: Section on Hawaii Superferry contains only meaningless history and shoreside facts, not relevant information on vessel and its operation to inform a decision regarding its potential impacts. Fortunately, this section can be deleted.

Comment [kb44]: Not anymore…

Over the past five years, the frequency of confirmed vessel-whale collisions has increased as Hawai‘i’s humpback whale population has grown and the number of vessels operating in Hawai‘i’s waters has increased. Although there are currently insufficient data to confirm with scientific certainty that the collision frequency has increased in absolute terms, the annual number of confirmed collisions has generally increased over the past 20 years (Lammers et al. 2003). At least seven collisions occurred in Hawai’i in the years 1998-2003, including four that resulted in the death or serious injury to whales. In the 2005-2006 whale season, a record of six confirmed collisions occurred. At least two resulted in serious injury to humpback calves. Vessel-whale collisions also have serious safety consequences for vessel operators and their passengers. In 2001, a captain was knocked unconscious when his boat hit a whale outside of Kahului harbor, Maui. Serious damage to vessels can also result from vessel-whale collisions. After colliding with at least one humpback off Maui in 2006, a large whale-watching vessel required extensive repairs to its steering and propulsion systems. Growing concern over vessel-whale collisions led to the September 2003 Vessel-Whale Collision Avoidance Workshop in Kīhei, Maui. Sponsored by the sanctuary and its partners, the workshop provided a forum for resource managers, scientists, and representatives of the marine community from around the world to assess ship strike risks to whales in Hawai‘i and to identify possible actions to reduce the occurrence of vessel-whale collisions in Hawaiian waters and throughout the system of national marine sanctuaries. (NMSP 2003)

Comment [kb45]: somewhere in this paragraph it should state that part of the apparent increase in collisions may be accounted for by a failure to report collisions in the early 1970s or 80s compared to current years. Also, it should be mentioned that a whale-vessel collision working group was formed by the Hawaiian Islands Humpback Whale National Marine Sanctuary Advisory Council.

Comment [kb46]: Shipstrike section only goes up to 2006. Report should include more recent data.

Comment [kb47]: These numbers need to be referenced to the report they came from: Lammers, Pack and Davis, 2003.

A humpback whale calf off Maui displays severe injuries to its back that experts believe were caused by a ship propeller. (Photo: Honolulu Advertiser library)

The operation of commercial and recreational thrillcraft, water sledding, parasailing vessels and high-speed motorcraft may also adversely affect humpback whales in Hawaiian waters due to the unique characteristics of these vehicles. Small, fast and highly maneuverable craft possess high thrust capability and horsepower relative to their size and weight enabling them to make sharp turns at high speeds and alter direction rapidly. These watercraft features pose a unique threat and can disturb wildlife. (Need Citation)

Comment [kb48]: If you are going to mention the thrill craft issue, you need to inform the reader when thrill craft operations were stopped in Maui waters during the breeding season, and also that thrill craft continue to operate during the breeding season in other Hawaiian waters where humpbacks are found.

Comment [kb49]: “Whale viewing, recreation, and tourism” need to be added to the list of activities that may adversely affect humpback whales in Hawaiian waters.

Comment [kb50]: Many conclusions drawn and statements made are not supported (too numerous to cite them all). As one example: on Pg. 18 there is a statement that thrillcraft (et al.) may adversely affect humpback whales. But the text nearby tends to support an opposite conclusion (highly maneuverable and low overall weight to avoid collision and mitigate injuries). No source is cited for further information, so the reader is left with an arbitrary and capricious conclusion. If there is information available regarding observed or reported effects, it should be included. At a minimum, further treatment of the general characteristics of these craft, relative to the locations and behavior characteristics of the humpbacks is needed. Some of the adverse effects are documented in scientific literature presented in UFO Chuting case. (Also, there is no mention in this report of this case and its meaningful outcome and legislative “fix.”

Glockner-Ferrari and Ferrari (1985) reported a change in distribution of humpback whales associated with increasing levels of vessel traffic. According to their observations, the percentage of females with calves seen resting and nursing in shallow waters (10 fathoms or less) adjacent to Maui’s northwestern shore declined from 77.6% for the period 1976-1979 to 17.5% in 1983. In 1988, only 1.5% of mother-calf sightings occurred within 0.4 km of shore (D.A. Glockner-Ferrari, pers. comm.). Although noise from boats and high-speed thrill craft activities may have contributed to this reported movement, Glockner-Ferrari and Ferrari (1987) note that pollution and runoff may also have been important factors (NMFS 1991).

Deleted: Although noise from boats and high-speed thrillcraft activities are a likely causative agent, Glockner-Ferrari and Ferrari (1987) pointed out that pollution and runoff may also be factors contributing to the changing distribution of whales around Maui. (NMFS 1991)

Ocean resource use conflicts are increasing as commercial ocean recreational uses compete with public recreational uses and access to beaches and marine areas. Resource allocation issues, user conflicts, and stress on the marine ecosystem will become more prevalent without proactive management and the setting aside of significant and appropriate areas for conservation and public access. (HCZMP 2006)

Marine Debris

Each year tons of marine debris drifts through Hawai‘i’s waters and washes onto its shorelines, posing a threat to humpback whales, Hawaiian monk seals, sea turtles, sea birds and other wildlife from entanglement or ingestion. The debris, especially derelict fishing gear significantly damages the benthic substrate, especially coral and algae communities, as it washes over the reefs. While some of the marine debris is generated from land-based sources, including storm-water runoff, dumps and landfills, streams, sewer overflow, storm drains, and litter, marine-based sources such as trawl nets, gill nets, and other fishing gear lost or discarded by fishing fleets cause significant damage to Hawai’i’s coral reefs. The impacts of marine debris are particularly apparent because atmospheric and oceanographic forces cause ocean surface currents to converge on Hawai’i, bringing the vast amount of debris floating throughout the North Pacific to the islands. (Wilkinson 2004, HCZMP 2006)

Comment [kb51]: Wherever entanglements and derelict fishing gear are mentioned it would be accurate to include cargo nets and other lost or discarded rope and line to possible source of entanglement, rather than singling out fishing gear, since numerous vessel types may also contribute to this type of waste. Conclusions on the source of entanglements are not supported. Definitive statements on pg 19 should be backed down to “may get entangled” at best based on an understanding of the information available.

The southeastern Waiohinu-Ka Lae coast on the island of Hawai‘i is a known area of accumulation for marine debris within the main Hawaiian Islands. During 2005-2006, the NOAA Marine Debris Program funded a cleanup of this area. (Photo: NOAA)

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Marine mammal entanglement is a significant threat to the North Pacific stock of humpback whales migrating to Hawai‘i each winter. Recent results from the analyses of entanglement scarring indicate that up to 30% of the Hawaiian population have been entangled at least once in their lives (Calambokidis et al. 2007). Since 2002, there have been 23 humpback whales reported entangled in waters off of Hawai‘i, and the actual number of entangled whales is likely greater, as many are thought to go undetected or unreported. Some of Hawai‘i’s humpbacks get entangled in fishing gear (active and derelict) in their feeding grounds in the northern Pacific and carry it with them to Hawai‘i, while others are entangled locally in debris that either drifted in or originated from Hawai‘i. Entanglement in fishing gear and other marine debris may result in drowning, starvation, physical trauma, systemic infections, or increased susceptibility to other threats such as ship strikes. Overall, scientists still do not know exactly how many whales die each year from this threat, but studies estimate that entanglement is the most significant cause of human-induced death among all cetaceans. (Walker and Coe 1990, Laist 1996, Clapham et al. 1999)

Throughout the main Hawaiian Islands and the Northwestern Hawaiian Islands, derelict or “ghost” nets, are often found as large conglomerations washed up on shorelines, snagged on reefs, or drifting in offshore waters. Since 1996, NOAA divers have removed over 540 tons of nets from the reefs and shorelines of the Northwestern Hawaiian Islands. Much of the debris seen fouling reefs and shorelines in Hawai‘i are from fisheries sources in the Pacific; the types of gear used in Hawai‘i-based fisheries are rarely seen. (Donohue et al. 2001)

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Fishing

Fishing has been a way of life for Hawai‘i’s people for centuries, with fish and shellfish providing the major protein source for the Hawaiian people (Kamakau 1839, Titcomb 1972). However, the coastal fisheries in Hawai‘i have undergone enormous changes over the past 100 years (Shomura 1987, Friedlander 2004). Overfishing is cited as the primary reason for the declining resources both by general ocean users (DLNR-DAR 1988) and commercial fishers (Harman and Katekaru 1988).

The proliferation of long and inexpensive gill nets has allowed new fishers to enter the fishery and set nets deeper and in locations not previously harvested (Clark and Gulko 1999). Intensive fishing pressure on highly prized and vulnerable species has led to substantial declines in catch and size as well as raised concerns about the long-term sustainability of these stocks (Smith 1993; Friedlander and Parrish 1997; Friedlander and DeMartini 2002).

Fisheries may affect marine ecosystems in numerous ways, and vice versa. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can also affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. Historically, federal fishery management focused primarily on ensuring long-term sustainability by preventing overfishing and by rebuilding overfished stocks. However, the reauthorization of the Magnuson-Stevens Fisheries Conservation and Management Act in 1996 placed additional priority on reducing non-target or incidental catches, minimizing fishing impacts to habitat, and eliminating interactions with protected species. While fisheries management has significantly improved in these areas in recent years, there is now an increasing emphasis on the need to account for and minimize the unintended and indirect consequences of fishing activities on other components of the marine environment such as predator-prey relationships, trophic guilds, and biodiversity (Dayton et al. 2002, Browman et al. 2004, WPFMC 2005).

Humpback whale entangled in fishing gear believed to be used for trapping crab. This suggests the whale dragged the gear from Alaska to Hawai‘i. The animal is emaciated, collapsing inward, and is an unhealthy light gray rather than the usual dark gray to black color. (Photo: Ed Lyman, Hawaiian Islands Humpback Whale National Marine Sanctuary)

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Entrapment and entanglement in active fishing gear (O’Hara et al. 1986) is the most frequently identified source of human-caused injury or mortality to humpback whales. Humpback whales are large enough to break through netting before becoming entangled, but they occasionally entangle in the lead or anchor ropes, which they cannot break. Drowning or starvation may result if humans do not intervene to free the whales. The incidence of entanglements could at least slow, and perhaps prevent population recovery, especially if human efforts to rescue the whales were reduced or if fishing effort increased. (Clapham et al. 1999)

Coastal Pollution

Humpback whales occur adjacent to human population centers and are affected by human activities throughout their range. Both habitat and prey are affected by human-induced factors that could impede recovery, including introduction and/or persistence of pollutants and pathogens from waste disposal, and disturbance or displacement caused by noise. (Need Citation)

Anthropogenic noise could potentially adversely affect humpback whales by disrupting resting, feeding, courtship, calving, nursing, migration or other activities. Large ships may create disturbing noise for many kilometers around the vessel (Tyack 1989). Whale watching boats and research boats often specifically direct their activities toward whales and may remain in their vicinity for long periods. Noise from airplanes and helicopters presents another source of disturbance for whales. Noise from industrial activities that may cause disturbance to humpback whales are offshore oil, gas or mineral exploration and exploitation. These activities increase vessel traffic, produce loud sounds for seismic profiling, place structures in areas used by whales, and introduce noises from drilling and production into the environment. (Richardson et al. 1995, Clark et al. 1999, Au and Green 2000)

Seven major wastewater treatment plants discharge to the coastal ocean in Hawai‘i. All but two of the plants discharge through deepwater outfalls (>40m). Several studies have been undertaken to determine the impact, if any, of the outfalls on the health of aquatic animals and plants. The conclusion of one study was that “there is no quantitative evidence supporting the view that the discharge of sewage is impacting the shallow reef resources shoreward of the two [shallow water] sewage outfalls” (E.A. Kay, J.H. Bailey-Brock, and R.E. Brock, all of the University of Hawai’i). Other discharges permitted through the National Pollutant Discharge Elimination System (NPDES), such as those from aquaculture facilities, shipyards, and power plants, release waste and cooling water through outfalls into estuaries or coastal waters (Friedlander et al. 2005).

A relatively new form of potential point source discharge of nutrients is from open ocean cage aquaculture, the first such venture being located approximately 3 km offshore of Ewa on the southern shoreline of O‘ahu. Continued monitoring of the water column in the vicinity has revealed that suspended nutrient subsidies are relatively small and diluted within tens of meters of the cages. Monitoring of benthic community structure under the cages has revealed a localized region of markedly different infauna, presumably as a result of particulate delivery to the sediment surface from the cages. Studies suggest there is not a strong likelihood that particulate material from the aquaculture cages will result in negative effects to inshore coral communities. (Friedlander et al. 2005)

Sedimentation runoff is a leading cause of alteration of reef community structure in the main Hawaiian Islands. Several major sources of erosion have ceased or are reversing, which will likely lower the potential for negative effects in the future. Examples include the closure of large agricultural plantations, cessation of live fire training on the island of Kaho‘olawe, and culling programs of feral ungulates on the islands of Lāna‘i and Moloka‘i. (Friedlander et al. 2005)

Comment [kb52]: The State of Hawaii is currently considering legislation that would change the state water quality standards to less stringent standards for fecal indicator bacteria in coastal recreational waters. If this passes, water quality is likely to decrease, increasing risk both to human users of the sanctuary and marine wildlife within the sanctuary.

Comment [kb53]: Please see the following for possible citation (Goetschius et al., 2003; Herman, L. M. et al., 2003; Herman, E. K., 2003)

Comment [kb54]: I would use Richardson et al 1995 ‘Marine Mammals and Noise’

Comment [kb55]: My recollection is that Au and Green (2000) did not show disturbance of humpbacks by engine noise. Also, to my knowledge there is no evidence of engine noise of a research vessel being associated with humpbacks changing their behavior or leaving an area. For threats from other types of anthropogenic noise associated with man-made mid-range or low-frequency sonars, see Herman, L. M. et al. (2003).

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Comment [kb56]: Where did this quote come from?

Comment [kb57]: cite original report(s)

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Comment [kb58]: cite original report(s)

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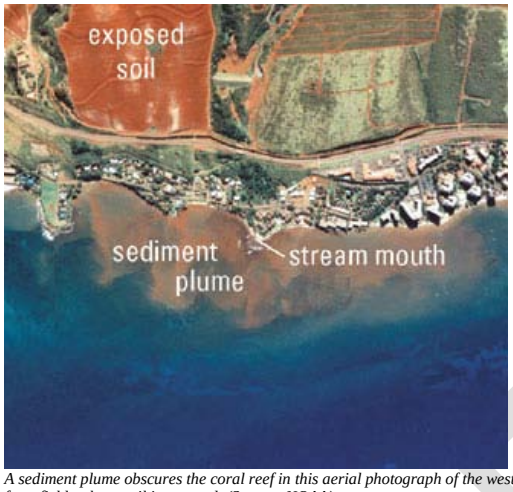

A sediment plume obscures the coral reef in this aerial photograph of the western coast of Maui. The sediment was transported by stream runoff from fields where soil is exposed. (Source: NOAA)

In many areas of the Hawaiian Islands, nearshore water chemistry is a mixture of oceanic water and freshwater emanating from both submarine groundwater discharge at or near the shoreline and surface water runoff. Groundwater in Hawai‘i typically contains two to three orders of magnitude higher concentrations of dissolved nitrogen and phosphorus than seawater. Thus, groundwater nutrients are an important natural factor of nearshore marine water chemistry. The groundwater nitrogen load reflects natural background and anthropogenic sources from wastewater and fertilizers (Friedlander et al. 2005).

Comment [kb59]: cite original literature

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Cesspools are a potentially harmful source of untreated wastewater, containing nutrients and pathogens that seep into the ocean along the shoreline. Hawai‘i has an estimated 100,000 cesspools, more than any other state (Friedlander et al. 2005, EPA, unpubl. data).

Stormwater runoff has the potential to be a threat to the marine environment during heavy rains. In 2006, O‘ahu endured 42 days of nonstop rain that caused sewer to overflow through manholes and contributed to the break of the beachwalk force main in Waikiki. In March of 2006, there were as many as 16 sewer overflows happening at the same time. These heavy rains resulted in a 48 million gallon spill into the Ala Wai Canal. As a result, more than 1,600 beaches temporarily closed or posted a swimming advisory due to bacteria levels that exceeded federal public health standards. In 2006, Hawai‘i's beaches saw 1,073 rain advisories and 32 posted warnings. Total advisory and warning days for events lasting six consecutive weeks or less at Hawai‘i’s beaches tripled to 6,507 in 2006 from 2,228 in 2005 (Dorfman and Stoner 2007).

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The USGS recently completed an assessment of water quality of streams and groundwater on the island of O‘ahu during 1999-2001 (Anthony et al. 2004). Anthony et al. (2004) found toxic contaminants in streams that drain urban and agricultural lands, and in groundwater supplies (although few chemicals exceeded the drinking water standards in groundwater). In O‘ahu’s urban streams, some of the highest levels of termite-treatment chemicals in the U.S. were reported. The USGS conducted no analyses in the marine environment where ocean mixing and dilution must be considered. Based on USGS findings, screening of estuaries and coastal waters for toxic contaminants are easily transported to the ocean with storm flows and may be deposited at stream mouths and on reef flats (Friedlander et al. 2005).

Comment [kb60]: There are some missing words in this sentence.

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Comment [kb61]: The picture that is painted here does not square with the table at the beginning of the document where water quality is rated as “good” and “good/fair”. Perhaps it should be qualified or put in the context of humpback whale habitat, not coastal areas in general.

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Open Ocean Aquaculture

Otherwise known as mariculture or cage culture, open ocean aquaculture involves the production of fish in floating pens and/or submerged cages. A typical system includes a land-based hatchery or other source of juvenile fish coupled with pens and/or cages placed in the ocean where the juvenile fish are fed and allowed to "grow out" to a size suitable for harvest, sale and consumption. (Need Citation)

Kona Blue aquaculture. (Photo: NOAA)

Open ocean aquaculture has gained increased popularity in Hawai'i and elsewhere as a source of fish protein and an attractive alternative to capture fisheries. Two open ocean aquacultures are currently in operation in Hawaiian waters, with one of these located within the sanctuary. Both existing projects use fish cages submerged to about 40 feet deep to grow out the fish. Several cages, each made of special materials and netting enclosing about 2,600 cubic meters, are typically moored in an array. Numerous anchors and extensive lengths of mooring line are typically required to secure the cages against ocean currents and wave energy. The project currently located in the sanctuary covers an area of approximately 90 acres through which more than four miles of mooring line are suspended in the water to an average depth of about 180 feet. (Need Citation)

With little research and monitoring related to humpback whale impacts accomplished to date in Hawai'i or elsewhere on this relatively new form of ocean use, the extent to which open ocean aquaculture has adverse impacts on Hawai'i's humpback whales is not known. Nevertheless, the large areas of prime whale habitat occupied by these projects and the great lengths of line and numerous objects (cages, buoys, feeding tubes, etc.) suspended in the water column has led to concerns regarding potential negative impacts. These concerns include:

- Displacement from habitat and/or habitat loss
- Entanglement
- Attraction of predators
- Collision by competitive groups
- Interaction with calves and juveniles
- Increased disturbance from vessels

(Need Citation)

Coastal Development

Coastlines of Hawai'i continue to be developed for a variety of land uses. On all of the islands, agricultural lands (primarily for sugarcane and pineapple) are changing to residential and resort uses. Coastal development can bring a suite of social and environmental consequences including conflicts over shoreline access and viewplanes, the need for flood water storage and protection, infrastructure demands, and degradation of coastal waters from cumulative increases in runoff and groundwater contamination. Changes in land use from large-scale agriculture, which periodically exposes land to erosion, may result in an overall decrease in sediment delivery to the ocean. (Friedlander et al. 2005)

Comment [kb62]:

The assessment of the impacts of open ocean aquaculture in the Condition Report is based on speculation and perceived concerns, not documented impacts to date. The "Pressures on the Sanctuary" section of the report should note that there are already mechanisms in place to properly site open ocean aquaculture projects and impose reasonable conditions to avoid/limit potential negative impacts (i.e., Sanctuary special use permits plus multiple state and federal permit requirements). For example, altering the seabed of the sanctuary is already prohibited and other types of impacts can be kept within acceptable limits through proper siting, permit conditions, and best management practices.

There is no evidence that aquaculture has negatively affected habitat or whales, or that sanctuary conditions have declined due to open ocean aquaculture in Hawaii or elsewhere according to monitoring or required reporting information from the two projects in Hawaii and from another project using similar technology in New Hampshire.

If the concern is with future expansion of open ocean aquaculture in Hawaii, the report should a) provid ...

Comment [kb63]:

The discussion of Open Ocean Aquaculture on page 23 is highly speculative and needs to be revise ...

Comment [kb64]: The current state of knowledge about the impacts of cage aquaculture is not incorporated into this report.

Comment [kb65]: should mention that aquaculture includes production of shellfish as well as finfish

Comment [kb66]: o delete this sentence. NOAA views aquaculture as a complement to, not a substitute for, commercial fishing

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Comment [kb67]: citation consider using "Herman, E. Y. K., Goetschius, K. J. C., & Herman, L. M. (2005). Potential threats to humpback whales (Part E): Entanglement, fish farms, and separated ...

Comment [kb68]: 2nd and 3rd paragraphs – The description of the open ocean aquaculture site in the Sanctuary uses exaggerated language ("numerous anchors", "extensive lengths of mooring line", "four miles of mooring line", "90 acres", "large areas o ...

Comment [kb69]: You have not yet defined a competitive group, so this bullet will be confusing to the reader. See my earlier additions to humpback whale biology and behavior.

Comment [kb70]: The listed concerns are speculative and are not based on observed impacts. If they are mentioned at all, they should be described as "perceived concerns" along with a statement that there have been no collisions or entanglements to ...

Comment [kb71]: consider citing the 5 threat reports by Herman and colleagues for the HIHWNMS

Satellite image of Waikiki's heavily developed shoreline. (Photo: University of Hawaii)

Harbor facilities on all the main Hawaiian Islands are being improved to accommodate new large cruise ships, the Hawai‘i Superferry (an inter-island car/cargo ferry), and large container ships. Harbor improvements involve dredging to deepen and widen entrance channels and turning basins, as well as construction of new piers, waterfront work areas, jetties, and break-walls. The harbor improvements have the potential to impact coral reefs and areas used for recreation, such as surfing and canoeing. Proposed expansions can affect longshore transport and water quality as well. (Friedlander et al. 2005)

It is uncertain whether nearby intensive human activities have inhibited occupation by or repopulation of humpback whales in their habitats. However, one place where this may have occurred is O‘ahu. Herman (1979) summarized evidence from newspaper reports and other sources to suggest that humpbacks occurred along the coast of O‘ahu from the 1930’s to 1950’s, but not after the later 1960’s. Although the apparent disappearance could be related to increased commercial hunting in the North Pacific during the early 1960's Herman (1979) speculated that accelerated coastal development of O‘ahu may have displaced the whales, citing potential disturbance by pile drivers and other construction noises, increased runoff, and increases in boat and air traffic. This interpretation is complicated by the complete lack of documentation of the existence of humpback whales around the Hawaiian Islands prior to about 1850 (Herman 1979), and also by Herman et al.'s (1980) report that whales, including some calves, occur along the O‘ahu coast during March and April, perhaps as they begin the northward migration. (Need Citation)

Comment [kb72]: This is confusing! Certainly humpbacks are still found along Oahu’s coasts from December-April!

Comment [kb73]: With respect to a citation for Oahu humpbacks, you can use aerial survey data by Mobley et al. (2001) as well as the reports by Lammers et al. (2000) and Lammers et al. (2001).

Climate Change

Most of the world’s leading scientists agree that global warming caused by human activity is occurring. The exact implications of these changes are unknown, but it is predicted that there will be reduced productivity of Southern Ocean ecosystems and unpredictable weather events caused by increasing ocean water temperatures, changing ocean currents, rising sea levels and reductions in sea ice. (Need Citation)

The potential impacts of climate and oceanographic change on humpback whales are twofold:

Habitat availability. Humpback whale migration, feeding, resting, and calving site selection may be influenced by factors such as ocean currents and water temperature. Any changes in these factors could affect humpback whale population recovery by rendering currently used habitat areas unsuitable or undesirable.

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Food availability. Changes to climate and oceanographic processes may also lead to decreased productivity and different patterns of prey distribution and availability. Such changes would certainly affect the feeding grounds of dependent predators such as humpback whales.

(Need Citation)

Hawaiian waters show a trend of increasing temperature over the past several decades that is consistent with observations in other coral reef areas of the world (Coles and Brown 2003). The first documented multi-locational coral bleaching occurred in Hawai‘i in late summer of 1996, with a second event in 2002 (Jokiel and Brown 2004). These bleaching events were triggered by a prolonged regional positive oceanic sea surface temperature anomaly greater than 1°C that developed offshore during the time of the annual summer temperature maximum. High solar energy input and low winds further elevated inshore water temperatures by 1-2°C in reef areas with restricted water circulation (e.g., Kāne‘ohe Bay, O‘ahu) and in areas where mesoscale eddies retain water masses close to shore for prolonged periods of time. (Friedlander et al. 2005)

Recent scientific studies have revealed an important link between patterns of natural climate variability, such as the El Niño-Southern Oscillation (ENSO) cycle, and the migratory patterns of important pelagic species like tuna. The eastward expansion of warm water in the Pacific during an El Niño appears to be associated with an eastward displacement of some commercially important tuna stocks such as skipjack (Pacific Islands Regional Assessment Group 2001).

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Introduced Species

The coral reef communities surrounding the Hawaiian Islands have been inundated with introduced species over the last century (Coles et al. 1999, Eldredge and Smith 2001, Friedlander et al. 2002a). Due to extreme isolation and subsequent high levels of endemism, alien invaders pose a significant threat to the native diversity of these unique marine environments. Perhaps because Hawai‘i lies in the middle of the Pacific Ocean and is located on shipping routes across the Pacific, the islands have intercepted more non-indigenous marine species (NIMS) than other tropical locations (Carlton 1987). The estimated number of NIMS in Hawai‘i includes 287 invertebrates, 20 algae, 20 fish, and 12 flowering plant species (Eldredge and Smith 2001). While the majority of NIMS in Hawai‘i are invertebrates, many of these species are cryptic and/or have remained in highly disturbed harbors and other fouling environments. These factors have made it difficult to determine the impacts and interactions that the invaders may be having on native marine flora and fauna. However, the larger and more conspicuous non-indigenous marine algae have become increasingly more common along Hawaiian shores over the last several decades (Smith et al. 2002, Smith et al. 2004, Smith 2003, Friedlander et al. 2005).

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Bluestripe snappers (Lutjanus kasmira, or “ta’ape”) were introduced to the main Hawaiian Islands in the late 1950's for commercial fishing. (Photo: James Watt)

Though not all introduced species will become invasive, those that do can have significant negative impacts in the areas where they become established. Sometimes the impacts are dramatic; but more often they are subtle and may escape notice for some time. Throughout the world, and in Hawai‘i, the negative environmental impacts of invasive species cause loss of native biodiversity due to:

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- invasive species preying upon native species;
- decreased habitat availability for native species;
- additional competition;
- parasites and disease;
- smothering and overgrowth (leading to loss of key reef building species);
- genetic dilution;
- functional changes of freshwater, estuarine, other inland waters, and nearshore marine ecosystems;
- alterations in nutrient cycling pathways;
- decreased water quality (Shluker 2003)

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Disease

Coral populations in the Hawaiian Archipelago continue to be spared from epidemic disease outbreaks, unlike many other coral reefs around the world. Baseline surveys for coral disease were recently conducted at 18 sites around O‘ahu. The average prevalence of disease (number of diseased colonies/total number of colonies) was estimated at 0.95% (range 0-4.4%). Differences in disease prevalence were found among coral genera, with *Porites* having the highest prevalence of disease. The most common condition found on *Porites* was growth anomalies or ‘tumors.’ Prior studies found growth anomalies on *Porites* from both O‘ahu and Hawai‘i Island (Hunter 1999, Work and Rameyer 2001).

Deleted: (Friedlander et al. 2005)

Another common disease found along the Hawaiian Archipelago is *Porites* trematodiasis caused by the larval stage of the digenetic trematode, *Podocotyloides stenometra* (Aeby 1998). The greatest abundance of infected coral has been found on the reefs in Kāne‘ohe Bay on the windward side of O‘ahu (Aeby 2003). General coral necroses also commonly occur on Hawaiian reefs. No major die-off of corals has ever been documented due to disease in Hawai‘i. However, increasing human usage and the impacts of global climate change are causing concern about the health of Hawaiian reefs (Friedlander et al. 2005).

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The endangered Hawaiian green sea turtle is affected by fibropapillomatosis (FP), a disease that causes external and internal tumors in turtles. Turtles with FB also have significant additional complications including inflammation with vascular flukes, bacterial infections, poor body condition, and necrosis of the salt gland (Work et al., in press). Evidence suggests the herpes virus as a probable cause or co-factor of FP (Herbst 1995). In Hawai‘i, FB has been found in 40-60% of observed turtles, with juvenile turtles constituting most of the cases (Balazs and Pooley 1991). A recent study found that the majority of stranded turtles were juvenile turtles affected by FB and suggested that FP may detrimentally affect survival in juveniles (Work et al., in press). As such, FP may pose a significant threat to the long-term survival of the species (Quackenbush et al. 2001).

Comment [kb74]: Is this still in press?

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Recreational Diving

Shipwrecks in the main Hawaiian Islands provide popular resources for recreational diving opportunities, but access can sometimes lead to the loss of historic properties. Many divers, often unaware of preservation laws, have removed artifacts from maritime archaeological sites with relative freedom. In the State of Hawai‘i there have been few cases of preservation management. Unfortunately, sites in the sanctuary and throughout the main Hawaiian Islands have been negatively impacted. Two cases provide recent examples of resource damage. On O‘ahu a dive boat operator placed a non-permitted mooring attachment to an F4U-1 Corsair navy aircraft that ditched in Maunalua Bay in 1944. This attachment damaged the engine, airframe, and cowling of the historic federal property. On Maui sport divers have located a PB4Y-1 navy aircraft which ditched near Mā‘alaea Bay in 1944. Photographs from the site indicate that the aft turret 50-caliber machine guns may have been illegally removed. Both of these sites lie in state and sanctuary waters, and both cases may be violations of state (HRS Chapter 6E) and federal (Sunken Military Craft Act) preservation laws (HIHWNMS and SOH 2007a).

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State of Sanctuary Resources

This section provides summaries of the conditions and trends within four resource areas: water, habitat, living resources, and maritime archaeological resources. For each, sanctuary staff and selected outside experts considered a series of questions about each resource area. The set of questions derive from the National Marine Sanctuary System's mission, and a system-wide monitoring framework (NMSP 2004) developed to ensure the timely flow of data and information to those responsible for managing and protecting resources in the ocean and coastal zone and to those that use, depend on, and study the ecosystems encompassed by National Marine Sanctuaries. Appendix A (Rating Scheme for System-Wide Monitoring Questions) clarifies the set of questions and presents statements that were used to judge the status and assign a corresponding color code on a scale from "good" to "poor." These statements are customized for each question. In addition, the following options are available for all questions: "N/A" – the question does not apply; and "undetermined" – resource status is undetermined. In addition, symbols are used to indicate trends: "▲" – conditions appear to be improving; "**▬**" – conditions do not appear to be changing; "▼" – conditions appear to be declining; and "**?**" – the trend is undetermined.

Comment [kb75]: It would be good to know more about who answered these questions. How many outside experts? How were the responses processed? Were they averaged quantitatively somehow? It is important to know whether this document is a self evaluation, or is an unbiased assessment.

This section of the report provides answers to the set of questions. Answers are supported by specific examples of data, investigations, monitoring and observations, and the basis for judgment is provided in the text and summarized in the table for each resource area. Where published or additional information exists, the reader is provided with appropriate references and Web links.

Some of the questions refer to the term "ecosystem integrity." When responding to these questions experts and sanctuary staff judged an ecosystem's integrity by the relative wholeness of ecosystem structure, function, and associated complexity, and the spatial and temporal variability inherent in these characteristics, as determined by its natural evolutionary history. Ecosystem integrity is reflected in the system's "ability to generate and maintain adaptive biotic elements through natural evolutionary processes" (Angermeier and Karr 1994). It also implies that the natural fluctuations of a system's native characteristics, including abiotic drivers, biotic composition, symbiotic relationships, and functional processes are not substantively altered and are either likely to persist or be regained following natural disturbance. It should be noted that the responses focus primarily on the effects or potential effects of pressures on the sanctuary as they relate to humpback whales and their habitat, which are the responsibilities of the Hawaiian Islands Humpback Whale National Marine Sanctuary. They do not address concerns from the standpoint of habitats or resources over which the sanctuary does not have authority or other types of responsibility, with one exception. Question 3, relating to human health risks, is addressed because one of the principles of the National Marine Sanctuaries Act is ensuring continued public access to sanctuaries, as long as that access is compatible with the primary mission of resource protection. Thus, while human health may have little to do with the condition of humpback whales and their habitat, and regardless of the cause or source of the health risk to humans, it is important to track and report on this quality.

Comment [kb76]: Although I can understand why, this seems counter-intuitive considering how much time has been spent describing all the major resources present in the Sanctuary

Water

1. Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality and how are they changing?

Because water quality problems observed in some nearshore waters of the sanctuary do not appear to have affected the majority of sanctuary waters or the humpback whales inhabiting these waters, this question is rated as "good and not changing."

Comment [kb77]: This is a 'just so' statement without any supporting evidence. You should at least say something like: 'In the opinion of the majority of the experts polled, including water quality experts,…'

Although few stress-inducing changes in oceanographic and atmospheric conditions have been defined within the context of sanctuary water quality, growing human populations throughout much of the area adjoining the sanctuary generate larger anthropogenic inputs and negatively affect certain aspects of water quality. Naturally-driven resuspension of sediment (and associated contaminants) may be a concern in southeast Oahu, west Maui, and south Molokai. Ocean acidification and increasing water temperature (Würsig and Gailey 2002) have been raised as factors potentially resulting in regionally accelerated rates of change in water quality, but have not been systematically assessed. Localized changes in circulation or sedimentation resulting from coastal construction or dredge spoil

disposal are generally isolated, short-term occurrences (Dollar and Grigg unpubl.data). In most coastal areas dynamic ocean conditions result in the rapid dispersal of deposited sediment.

Comment [kb78]: 2005?

During the period from approximately the 1950s to the 1970s, poorly treated sewage was discharged on the shallow offshore areas of Sand Island (Dollar 1979) and in Kaneohe Bay (Smith et al. 1981). In the 1980s, Hawai‘i took significant action to improve coastal water quality by removing most wastewater outfalls from bays and shallow waters. Moving sewage outfalls to deep offshore waters (~40-75 m) has allowed significant recovery to the previously stressed areas (Smith et al. 1981, Dollar and Grigg unpubl.data).

Comment [kb79]: 2005?

2. What is the eutrophic condition of sanctuary waters and how is it changing?

Similar to question 1 above, eutrophication and associated benthic algae blooms observed in some nearshore waters of the sanctuary do not appear to have affected the majority of sanctuary waters or the humpback whales inhabiting these waters. Therefore, this question is rated as “good and not changing.”

Comment [kb80]: See comment above

Chronic nutrient enrichment and potentially-associated planktonic and/or benthic algal blooms are known to occur in some nearshore areas of groundwater input to sanctuary waters. Nutrient sources for this input include natural groundwater background, fertilizer leaching, sewage effluent injection wells, and leaking/failing wastewater disposal systems. Although algal overgrowth and other competitive interactions have led to geographically isolated shifts in dominance in the benthic assemblage, nutrient enrichment is only one of numerous factors that may be driving these changes. Although little work has been done on assessing impacts of eutrophication on water column productivity in Hawai’i, nutrient enrichment may be a factor in the occurrence of harmful algal blooms that affect human health via fish consumption. Nevertheless, there is hope that recent changes in agricultural practices and improvements in wastewater treatment and disposal (e.g., banning of large capacity cesspools in 2006) will limit the future extent of these threats.

Comment [kb81]: If no citation, we might want to say “Anecdotal evidence suggests that chronic enrichment…”

3. Do sanctuary waters pose risks to human health and how are they changing?

Although occasional closures of some nearshore swimming areas occur due to pollutant concentrations that may adversely affect human health, this question is rated as “good/fair” because beach closures have had a limited effect on access to sanctuary resources, and there is no evidence to suggest that these conditions are changing. It is important to note, however, that water quality data are limited or lacking in many streams and coastal segments, and most offshore areas of the sanctuary. Therefore, it should not be assumed the reader should not get the impression that this rating has strong support from water quality monitoring data.

Comment [kb82]: The reader should not get the impression

Water quality at beaches in Hawai‘i is monitored for bacteria that would indicate a risk to human health. Pollutant concentrations normally decrease sharply with distance from shore, and offshore water quality is generally good. Hawai‘i’s Department of Health (DOH) regularly monitors indicator bacteria (*Enterococcus*) at swimming beaches. In recent years, DOH has also collected data on turbidity, nutrients, and chlorophyll at specified shoreline stations and in perennial streams. DOH uses these data, and other available data that meet specific quality criteria, to identify streams and coastal segments that are “water quality impaired” (i.e., where state water quality criteria are regularly exceeded). The number of listed waters corresponds, roughly, with island population size (Friedlander et al. 2005).

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POLLUTANTS	Hawai‘i	Kaua‘i	Maui	Moloka‘i	O‘hau
Sediments	14	7	41	2	45
Enterococcus	8	9	3	ND	23
Nutrients	4	5	11	1	54
Chlorophyll a	8	2	22	ND	34
Toxics: Metals, pesticides, PCBs	ND	ND	ND	ND	3
Total Coastal Stations Listed	20	16	41	2	61
Population Size	148,677	876,156	58,463	128,241	7,404

Number of waterbodies by island where ambient pollutant concentrations regularly exceed State water quality criteria. (Source: Friedlander et al. 2005)

Comment [kb83]: Note spelling of Oahu.

The impaired coastal waters are primarily harbors, semi-enclosed bays, and protected shorelines, where mixing is reduced and resident time of pollutants is long when compared with exposed coasts. Several bays that have coral reefs, such as Kāneʻohe Bay and Pearl Harbor (Oʻahu), Nawiliwili Bay (Kauaʻi), and Hilo Bay (Hawaiʻi), are included on the list. The most widely distributed coastal pollutants are nutrients, sediments, and *Enterococcus*. (Friedlander et al. 2005)

Comment [kb84]: It is not clear to me why there is such a thorough discussion of general water quality issues related to human health. These locations are not in Sanctuary waters. The focus should be on what is the KNOWN impact only in waters relevant to the Sanctuary. Let the DOH worry about the rest of the State.

In general the Hawaiʻi Department of Health (DOH) does not consider coastal waters with high *Enterococcus* indicator bacteria test results to represent a threat to human health. This is because in tropical waters, *Enterococcus* may result from animal waste or soils, instead of human sewage, which the indicator bacteria was intended to signal. Recent studies presented at the 2006 BEACH Conference suggest that *Enterococcus* reproduces in biofilm found in drainage pipes, concrete channels and river rocks, and in beach sand. For these reasons, Hawaiʻi uses a secondary indicator, *Clostridium perfringens* to determine if human fecal contamination is involved. Turbidity was the most common pollutant to trigger a coastal water listing. The DOH believes these are due to polluted runoff, and is focusing its polluted runoff control program on selected watersheds to make measurable improvements. (DOH 2008)

Comment [kb85]: what does "these" mean?

Concerns also include evidence of bacterial contamination and biotoxicological contamination in fish intended for consumption. From 2003 to 2004, the State of Hawaiʻi Department of Health (DOH) issued fish contamination advisories concerning high levels of mercury for 16 fish species in marine waters statewide. In 1998, DOH extended to all Oahu urban streams (including those that drain to sanctuary waters) a fish and shellfish advisory in the Ala Wai Canal. All of these fish consumption advisories remain in effect (see U.S. Environmental Protection Agency National Listing of Fish Advisories at http://134.67.99.49). Ciguatera Fish Poisoning, also known as Tropical Fish Poisoning, may occur when consuming certain fish taken at certain times from certain areas of sanctuary waters. The ciguatoxin responsible for this poisoning is produced by the benthic dinoflagellate, *Gambierdiscus toxicus*, found alone and in association with various algae on coral reefs and hard surfaces in tropical waters (Hokama 1988).

4. What are the levels of human activities that may influence water quality and how are they changing?

Because some human activities are known to have had localized impacts on water quality, the response to this question is rated as "good/fair." Management actions have reduced the levels or threats posed by some activities while other activities, primarily related to urbanization, continue to increase. Therefore, the overall trend is rated as not changing. Whether these are equally offsetting trends is debatable.

Discharges that may directly affect water quality in sanctuary waters are limited to vessels, a few mariculture facilities, a single sewage outfall (East Honolulu), Oahu municipal separate storm sewer systems, and other land-based point sources that have yet to be inventoried. Due to prevailing atmospheric circulation patterns, deposition of airborne chemicals at sea from global sources may be more significant than that from local sources. Dredging and trawling activities are of limited scope, generally occur well outside of sanctuary waters, and dredging operations are tightly regulated to minimize resuspension impacts. Human activities that generate nonpoint source diffuse pollution (including groundwater-associated nutrient enrichment) and polluted runoff (during both dry weather and wet weather conditions) are of greatest overall concern due to their possible association with changes in temperature, salinity, pH, oxygen, light availability, and nutrient status, and with bacterial contamination, toxic contamination, particulate loading, reef sedimentation, and their combined/cumulative impacts. This is reflected in the multitude of waterbody segments within and adjacent to sanctuary waters where water quality is impaired by excessive pollutants according to the State DOH and the U.S. EPA. (DOH 2008)

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Examples of trends of specific activities that potentially affect water quality are as follows: increasing levels of urbanization are likely to lead to higher levels of point source (e.g. industrial facilities) and non-point source (e.g., deposition from fossil fuel burning) pollution; decreasing levels of agricultural runoff, a reduction in the number of large cesspools, and greater use of sewage pumpouts by vessels could offset, to some degree, the effects of urbanization. The destructive terrestrial impacts of feral ungulates in Hawaiʻi do not appear to be changing.

Comment [kb86]: Paragraph on p. 21 suggests otherwise.

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Water Quality Status & Trends

Good	Good/Fair	Fair	Fair/Poor	Poor	Undet.

▲= Improving ▬ = Not changing ▼= Declining
? = Undetermined trend N/A = Question not applicable

Issue	Rating	Basis for Judgment	Description of Findings
Stressors	▬	Most areas with problems, including elevated turbidity, are nearshore and restricted to bays and harbors; these problems are unlikely to pose threats to humpbacks.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.
Eutrophic Condition	▬	Locations with chronic nutrient enrichment and extensive macroalgae blooms are limited and nearshore to some nearshore waters, and may be increasing in extent or severity, but are not known to pose threats to humpbacks.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.
Human Health	▬	With the exception of occasional closures of some nearshore swimming areas, conditions are unlikely to adversely affect compatible uses of the sanctuary.	Selected conditions that have the potential to affect human health may exist but human impacts have not been reported.
Human Activities	▬	Numerous activities occur, but management actions have reduced some impacts; therefore, overall levels do not appear to be changing.	Some potentially harmful activities exist, but they do not appear to have had a negative effect on water quality.

Habitat

5. What are the abundance and distribution of major habitat types and how are they changing?
Due to the slowly increasing number of facilities related to aquaculture and artificial reefs, and impacts associated with these facilities, condition was rated as "good/fair" and "declining.'

While it is not clear why humpbacks prefer certain habitat types in Hawaiian waters, they appear to favor shallow, clear water and sandy bottom habitats with low rugosity. Their habitat requirements may have to do with improved sound transmission, and visual cues associated with animal interactions. Water clarity in offshore areas does not appear to have been significantly affected by human activities in the region. However, humpback habitat may be somewhat threatened by the slowly increasing number of aquaculture and artificial reef facilities. Among other impacts from these facilities, they can affect water quality, vessel traffic patterns, attraction of predators, and disease and parasite transmission. (Need Citation)

6. What is the condition of biologically-structured habitats and how is it changing?
There are no biologically structured habitats that appear to be associated with or required by humpback whales in the sanctuary. For this reason, this question was not addressed.

7. What are the contaminant concentrations in sanctuary habitats and how are they changing?
Because there is no evidence that contaminants exist at substantial levels in humpback whale habitats in the sanctuary, the response to this question is rated as "good and not changing."

Data on contaminants in humpback habitats in the Hawaiian Islands are very limited. However, in a study testing the utility of semi-permeable membrane devices to monitor water quality, investigators found low concentrations of pesticides, including chlordane, dieldrin and chlorpyrifos, and low concentrations of PAHs in nearshore waters off Maui near one area adjacent to a large tract of agricultural land. The levels were considered unlikely to exert adverse effects on ecosystem resources (GERG 2001). Bothner et al. (2006), working in a coral reef habitat off Molakai, found….. Most contaminants found in humpback whales are assumed to have been acquired in their feeding grounds, particularly if the feeding grounds are near industrialized areas (Elfes, M.S. thesis). But Hawaiian waters are not feeding grounds for humpbacks, and investigators are not concerned about this method of acquisition of toxicants while the whales are in their calving and mating grounds. In addition, humpback and other baleen whales, because they feed on small organisms, are believed to be at a much lower risk to ingested contaminants than

Comment [kb87]: The impacts of open ocean aquaculture are exaggerated. To date, there has been no significant effect on water quality and no evidence of disease amplification affecting wild stock. This is based on monitoring data from the two projects in Hawaii (Kona Blue and Cates), the University of New Hampshire project, and projects in Puerto Rico (SnapperFarm monitoring data and University of Miami reporting under NOAA-funded National Marine Aquaculture Initiative grants) and the Bahamas (Larry Brand and Daniel Benetti publications). A benthic effects study of area under the Cates' cages did not find any significant effects except for normal benthic composition changes directly under the cages.

Comment [kb88]: Change to "Humpback whales in Hawaiian waters prefer waters less than 183-m in depth and are especially concentrated in waters with expansive shallow areas typically with sandy bottoms with low rugostiy (Herman et al.,1980: Mobley et al., 1999). Evidence that shallow waters are preferred for calf rearing comes from a study by Craig and Herman (2000) that showed that calves formed a greater portion of the population in the four-island region than off the north west coast of the Big Island. The former has an extensive shallow habitat while for the latter, shallow areas are much more limited.

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Comment [kb89]: use one or more of threat reports for sanctuary by Herman and colleagues.

Comment [kb90]: Contaminants concentrate in long-lived top predators, so assessing contaminant levels in a species that does not feed within the Sanctuary is inappropriate. Based on studies of pollutant levels in false killer whales from the insular Hawaiian population (Ylitalo et al. 2008), which frequently utilize sanctuary waters (Baird et al. 2008a, 2008b), contaminant levels within sanctuary habitats should probably be considered quite high, and levels of some (e.g., PBDEs) are probably increasing rapidly.

… in regards to contaminants in sanctuary habitats, the chart reviewing Habitat Status and Trends (page 31) includes a "good" and "not changing" listing for contaminants, based on low levels of contaminants in humpback whale tissues being acquired elsewhere, rather than in the Hawaiian habitats. This particular assessment should be made on contaminants in Sanctuary habitats, not based simply on humpback whale contaminant levels, particularly since the Sanctuary is currently assessing adding resources. High levels of several contaminants have been documented in false killer whales in Hawaiian waters (Ylitalo et al. 2008). This is a population that regularly uses Sanctuary waters (Baird et al. 2008a, 2008b), and of all species of odontocetes, false killer whales are probably the best candidate to be added as a Sanctuary resource (smallest population size, …

Comment [kb91]: Is there no evidence because there are no data, or because level are very low?

Comment [kb92]: ???

Comment [kb93]: Citation is missing

toothed whales, which feed on organisms with much higher levels of bio-accumulated contaminants (Clapham et. al. 1999). Furthermore, there is no reason to suspect that there are significant levels of contaminants within humpback whale habitats of the sanctuary.

Need citations for this question…All that we are aware of is that most samples from feeding areas are not published yet: Cristienne Elfes (might be an abstract?), Brownell & Clapham

8. What are the levels of human activities that may influence habitat quality and how are they changing?
Due to continuing increases in human activities that either have already, or are likely to have at least localized impacts on humpback habitats in the Hawaiian Islands, this response to this question is rated as "fair" and getting worse.

A number of land and ocean-based human activities are increasing in frequency and intensity in the Hawaiian Islands, any of which could affect humpback whale habitats. On land, development in Hawaiian watersheds continues to increase. The impacts to the marine environment include those associated with runoff and its effects on water and habitat quality, as well as increased levels of contaminant delivery. Furthermore, patterns of runoff could be affected by the combined effects of increasing urbanization and greater acreage of fallow agricultural land (e.g. pineapple and sugarcane fields). In coastal and marine areas, activities that either do or could affect humpbacks and their habitats include the following: increasing space use by aquaculture facilities; the use of artificial reefs to increase desirable habitat and concentrate fish; increasing noise in the environment and the increasing potential for vessel-whale collisions due to more and larger ships; and the use of acoustic-based monitoring by the military. Shifts in local habitat use by cows with calves have been noted and attributed to increasing coastal development and increasing use of high-speed boats, parasail boats and jet skis near shore (Glockner-Ferrari and Ferrari 1985, Forestell 1986).

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Comment [kb94]: However, neither of which have been appreciably impacted, according what is written above.

Comment [kb95]: The reference to "increasing space used by aquaculture facilities" is a perceived concern that is not based on the reality of only one site within the sanctuary. Tourism boats should be added to the list of activities that may influence habitat quality.

Habitat Status & Trends

Good	Good/Fair	Fair	Fair/Poor	Poor	Undet.

▲ = Improving ▬ = Not changing ▼ = Declining
? = Undetermined trend N/A = Question not applicable

Issue	Rating	Basis for Judgment	Description of Findings
Abundance/Distribution	▼	Some preferred habitat is affected by open ocean aquaculture and an increasing number of artificial reefs.	Selected habitat loss or alteration has taken place, precluding full development of living resource assemblages, but it is unlikely to cause substantial or persistent degradation in living resources or water quality.
Structure	N/A	NA	NA
Contaminants	▬	The low levels of some contaminants in humpback tissues are believed to be acquired in feeding areas, not in the Hawaiian Islands, even though some contaminants may be present in Hawaiian habitats.	Contaminants do not appear to have the potential to negatively affect living resources or water quality.
Human Activities	▼	Increasing impacts from vessel traffic (noise and collisions); concerns over increasing number of aquaculture facilities, as well as altered watershed runoff due to development and fallow agricultural lands.	Selected activities have resulted in measurable habitat impacts, but evidence suggests effects are localized, not widespread.

Comment [kb96]: the Basis for Judgment column should be modified to refer to "perceived" concerns over increasing number of aquaculture facilities (number has not actually increased, and concerns are not based on observed impacts from existing facilities). Tourism should also be addressed as a human activity affecting habitat status and trends.

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Living Resources

9. What is the status of biodiversity and how is it changing?

Considering historical reductions in the abundance of humpback whales, and recent data showing measurable increases, the condition of biodiversity as it relates to resources of this sanctuary is rated as "good/fair" and "improving."

Humpback whales are listed as "endangered" under the Endangered Species Act, and therefore designated as "depleted" under the Marine Mammal Protection Act. As a result, the Western North Pacific humpback whale stock is classified as a strategic stock (Angliss and Lodge 2003). In 1992, there were an estimated 4,000 humpback whales in the Central North Pacific population that visited Hawai'i. More recent estimates based on the SPLASH project put the population just above 10,000 (Calambokidis et al. 2008). Single individuals may stay in Hawaiian waters for as little as two weeks during the approximately six-month whale season. Thus, at any one time the abundance of humpback whales in Hawai'i is less than the total population size. Recent analyses from SPLASH estimates that the population of Hawaii's humpbacks is increasing at an annual rate up to six percent (Calambokidis et al. 2008). While there is some uncertainty over historic populations of humpbacks in Hawaiian waters, as well as debate over whether humpback whales migrated to the waters they currently use in Hawai'i prior to 100 or 150 years ago (Herman 1979), there seems to be convincing evidence of increasing abundance basin-wide in the North Pacific Ocean (Calambokidis et al 2008).

It has been suggested that the significant increase in numbers of humpbacks distributed around Kaua'i and Ni'ihau over a 10 yr period (1980 to 1990) may have resulted from whales 'spilling over' from the four islands region (Maui, Lana'i, Moloka'i, Kaho'olawe) as that population increased (Mobley et al. 1999). Additionally, Johnston et al. (2007) suggested that this expansion may now include the Northwestern Hawaiian Islands.

Humpback whales are very protective of their calves and prefer the shallow areas around the islands of Maui, Moloka'i and Lāna'i, possibly due to calmer water conditions. (Photo: Dave Matilla NOAA/NMFS)

Increases in the abundance of humpback whales in the North Pacific could affect, in several ways, numerous other species that could be a threat to their health and mortality. Some species can feed on dead or dying neonate, juvenile, or adult whales. Tiger sharks have been observed on numerous occasions over the last few years preying on whales in the Hawaiian Islands. Higher levels of mortality, which accompany higher populations, increase the level to which whale biomass serves as a food source for benthic and pelagic organisms, and marine bird communities. Other materials, such as skin sloughing off the animals, or placental remains are also density dependent, and can serve as food for other species. Studies on these processes, however, have not been conducted in the sanctuary.

Comment [kb97]: After the summaries of the Living Resources, the overall comment was, "so what?" There is no demonstration of how the sanctuary could assist in these living resources' protection, conservation or recovery to help the reader understand the relevance of this section. A limited and cursory species review with no well-articulated reason for being included in this report.

Comment [kb98]: Report discusses marine mammal status but does not even mention NMFS Stock Assessment Reports (SARS). SARs provide abundance, stock structure, and population trend information, general species information and human threats. The information contained in the SARs should be used to update the species described in the "Additional Marine Resources; Whales and dolphins; Hawaiian monk seals," especially for key species the sanctuary hopes to add through their management review process (e.g., monk seals, spinner dolphins).

Comment [kb99]: Recognizing that humpback whales are the only "resource" officially listed through the sanctuary, the answer to the status of biodiversity should either be "not applicable", or this section should be broadened to include other species that utilize the sanctuary.

Comment [kb100]: change to "Data collected between 1990 and 1993 produced an estimate of about 6,000 individuals, with about 4,000 visiting Hawaii (Calambokidis et al., 1997)." Fifth sentence, for residency reference (Craig et al., 2001; Mate et al., 1998). For the Herman (1979) reference in the final sentence, say "prior to 200 years ago…" not 100 to 150 years ago. One hundred years ago would be 1908 and there were certainly humpbacks in Hawaii at that time.

Comment [kb101]: The Report should better incorporate the recent "SPLASH" data for humpback whales in the body of the document (not just in the "Status of Sanctuary Resources" section at the end of the document). SPLASH is introduced on p. 4, but not actually discussed until p. 32 (and then only in a limited manner).

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10. What is the status of environmentally sustainable fishing and how is it changing?
Experts involved in evaluating resources of the Hawaiian Islands Humpback Whale National Marine Sanctuary were of the opinion that this question is not relevant to the status of humpback whales and their habitat. For this reason, this question was not addressed.

Comment [kb102]: Given that the sanctuary is considering adding additional species as "resources", this question should be addressed.

11. What is the status of non-indigenous species and how is it changing?
The rating of "good" and "not changing" is based on the fact that there are no known instances of invasive species impacting or being affected by Pacific humpback whale populations in Hawai'i. Non-native species do occur in Hawaiian waters, but they do not appear to have affected humpback whale habitats, nor do they interfere with activities or the health of whales in any known way.

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12. What is the status of key species and how is it changing?
The basis for the rating of "good/fair" and "improving" is similar to Question 9 (status of biodiversity), primarily because the Hawaiian Island Humpback Whale National Marine Sanctuary is focused on a single species. Thus humpbacks are currently the only key species of concern to this sanctuary. The "good/fair" status recognizes that published estimates of North Pacific humpbacks suggest that they are still at reduced abundance compared to historic levels. The number of humpback whales in the North Pacific may have numbered approximately 15,000 individuals prior to exploitation (Rice 1978). Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century (Rice 1978). This mortality estimate likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994). Nevertheless, the population currently appears to be increasing at a rate of around 7% per year (Mitchell et al. 2005).

Comment [kb103]: How valid is Rice's (1978) value of 15,000 humpbacks prior to exploitation? Population estimates typically have some stated uncertainty – is there a way of assessing uncertainty associated with this estimate? Given the methods used, could the historic numbers have been 10,000, or 20,000, with equal likelihood of it being 15,000 individuals?

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Comment [kb104]: You said 6% and cited Calambokidis (2008) above

13. What is the condition or health of key species and how is it changing?
Because of the high number of injuries and scars caused by entangled debris on whales, as well as the effects on their behavior (swimming, feeding, courting, etc.), the response to this question is rated as "fair" and "declining."

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Recent surveys (Cascadia Research 2007) of humpbacks in Hawai'i and elsewhere in the range of North Pacific humpbacks indicate a widespread occurrence of entanglement in fishing gear and marine debris. This material can cause abrasions, lesions, debilitating injury, or death, depending on the amount and location of entangled gear. Even without injury, it can impair swimming and feeding ability, leading to isolation of individual members of groups, and/or metabolic stress. Presumably, stressed animals would also be likely to alter normal behaviors associated with courting, breeding, giving birth, and nursing their young.

It is unlikely that the entangled gear seen on whales in Hawai'i originates locally. Some of it is probably from the summer feeding grounds where much more fishing occurs, involving traps with lines and surface floats, and nets (trawls and gill nets). The gear might also be encountered during migration, where it collects along oceanic fronts, where debris carried from around the North Pacific accumulates.

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While methods are available to measure scars and other indications of physical and behavioral impacts by entanglement, it is more difficult to determine specifically to what extent these and other stressors are affecting the health of the whales. The sanctuary currently works in collaboration with both private and federal scientists in order to develop ways to assess these impacts through established techniques such as biopsy tissue sampling and experimental techniques such as breath and skin collection. The sanctuary does not currently conduct regular assessments of contaminant or pathogen levels in humpback whales in Hawai'i.

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Comment [kb105]: Can't biopsy samples collected for SPLASH provide information about this?

14. What are the levels of human activities that may influence living resource quality and how are they changing?
Due to an increasing level of several human activities, some outside of Hawaiian waters, as well as increasing numbers of reports of whales in distress, the response to this question is rated "fair/poor" and is considered to be getting worse.

Comment [kb106]: NMFS: Sources of anthropogenic noise other than "ships" are mentioned as "human activity which may influence living resource quality" in the body of the document, but not included in answer to question 14 on p. 34.

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The problem of marine debris, documented above, may have origins in places outside Hawaiian waters. It results from a number of human activities, including fishing, vessel traffic (intentional or unintentional dumping), coastal runoff and discharges, aquaculture, and more. Some of these activities are increasing in frequency and intensity and pose a rising threat to marine mammals, sea turtles, birds, and other animals affected by marine debris. Humpback whales are especially vulnerable because they need to frequently break the surface to breathe, and because their

Comment [kb107]: Aquaculture is not a contributor to marine debris at this time.

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patterns of migration take them across oceanic fronts. Both these behaviors put them in places where marine debris tends to accumulate.

Reports of whale/vessel collisions are also increasing. The higher speed and number of vessels, both large and small, combined with the increasing population of humpback whales, makes collisions more and more likely, and potentially more lethal (Laist et al. 2001). Ships also affect the acoustic environment of the ocean, resulting in an uncertain level of impact on species like humpbacks, which are highly dependent on vocalization for communication and feeding.

It is unclear what level of impact might be associated with an increasing number of artificial reefs and aquaculture facilities. Both involve concentrations of biomass, which could affect disease transmission or the likelihood of introducing parasites to wild populations (Need Citation). But this has been a concern primarily for the farmed or aggregating species and closely related species. Beyond the risks of entanglement and habitat loss, it is not known how humpbacks might be affected.

Comment [kb108]: Is there a way to assess whether the per whale rate of vessel collision is changing? Although the absolute number of collisions may be increasing due to the increase in population size, the rate could be decreasing due to increased awareness of vessel operators in areas of high humpback whale concentrations.

Comment [kb109]: The Lammers et al 2003 report should be cited here.

Comment [kb110]: To whales? How?

Comment [kb111]: If you include marine debris in here as a vector for invasives (true) then you can use these citations:

Aliani, S. and A. Molcard (2003). "Hitch-hiking on floating marine debris: macrobenthic species in the Western Mediterranean Sea." Hydrobiologia 503(1): 59-67.

Barnes, D. K. A. and P. Milner (2005). "Drifting plastic and its consequences for sessile organism dispersal in the Atlantic Ocean." Marine Biology 146(4): 815-825.

Gregory, M.R. (2004). "Marine debris:hangers-on and hitch-hiking aliens." Derelict fishing gear and related marinedebris: an educational outreach seminaramong APEC partners, January 13-16,2004 Honolulu, Hawaii, Seminar Proceedings, 40-44.

Comment [kb112]: delete this sentence

Comment [kb113]: o This paragraph is highly speculative ("could affect disease transmission", even though this is not likely), and fails to note that disease and parasite transmission is not an issue for whales. Also, an often cited study of sea lice in British Columbia is disputed and should not be the basis for conclusions here. Paragraph states "it is not known how humpbacks might be affected", so authors should not speculate. Should monitor and observe, then use existing mechanisms in permitting and enforcement regulations.

Living Resources Status & Trends

Good	Good/Fair	Fair	Fair/Poor	Poor	Undet.

▲= Improving ▬ = Not changing ▼= Declining
? = Undetermined trend N/A = Question not applicable

Issue	Rating	Basis for Judgment	Description of Findings
Biodiversity	▲	Historical reductions in abundance, recent published estimates of increasing humpback abundance, and likelihood that associated species are also benefitting, recognizing that populations are still recovering.	Selected biodiversity loss has taken place, precluding full community development and function, but it is unlikely to cause substantial or persistent degradation of ecosystem integrity.
Extracted Species	NA	NA	NA
Non-Indigenous Species	▬	No known invasives that affect humpbacks or their habitats	Non-indigenous species are not suspected or do not appear to affect ecosystem integrity (full community development and function).
Key Species Status	▲	Increasing humpback abundance estimates and annual recruitment rates, though populations are still below historic levels in the North Pacific.	Selected key or keystone species are at reduced levels, perhaps precluding full community development and function, but substantial or persistent declines are not expected.
Key Species Condition	▼	Increasing number of reported entanglements and associated impacts (e.g., lesions, and impairment of movement and other behavior).	The diminished condition of selected key resources may cause a measurable but not severe reduction in ecological function, but recovery is possible.
Human Activities	▼	Increasing number of reported collisions and entanglements (often from fishing gear encountered elsewhere).	Selected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive problem.

Maritime Archaeological Resources

15. What is the integrity of known maritime archaeological resources and how is it changing?

The response to this question was rated as "fair" and "declining" because of the gradual loss of integrity of coastal and shallow water sites, many of which have not even been surveyed.

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The Hawaiian Islands Humpback Whale National Marine Sanctuary does not have jurisdiction over maritime archaeological resources, but some historic resources do influence sanctuary management. Further, the sanctuary mission is to "facilitate uses compatible with the primary purpose of resource protection, including those traditional and customary uses of native Hawaiians." For these reasons, it is important to monitor the integrity of these resources.

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In general, archaeological remains in shallow water suffer much more than those in deeper water. Often they are broken up, though some artifacts, especially if buried or on the leeward sides of islands, can remain intact over time. Deep sites, which in the Pacific are known to contain historic aircraft and vessels, are less affected by surf and surge.

Fish ponds constructed by early Hawaiians (many of the remains can be seen along the coasts of the Hawaiian Islands) are important cultural heritage sites and serve both education and outreach purposes today. Other artifacts along the coast have also been found (e.g., a traditional fishing site discovered while dredging for a sand replenishment project). There are other culturally significant sites, such as certain points of land, and sacred sites that have yet to be documented. There are reports of five whaling vessels lost in the sanctuary and more than ten elsewhere in the Hawaiian Islands, as well as artifacts associated with the whaling industry (e.g., Thrum various years; Van Tilburg 2002). There are concerns that coastal erosion may be affecting buried artifacts from coastal sites in some locations. Very few surveys, however, have been conducted, and there is a need for greater documentation.

16. Do known maritime archaeological resources pose an environmental hazard and is this threat changing?
Because of a lack of information on the locations or threats posed primarily by World War II sunken vessels, both the status and trend for the response to this question were rated as "undetermined."

Maritime archaeological resources do not usually represent immediate threats to the environment. In some cases, long term impacts from chemical leaching (e.g., iron from hulls) can occur, and there is the potential for World War II era shipwrecks to release hazardous material, such as fuel, into the environment as they disintegrate. But neither has been quantified at the present time in the sanctuary due to the lack of survey data. Numerous ordnance carriers were lost in the area, but their locations and threat have not been assessed.

17. What are the levels of human activities that may influence maritime archaeological resource quality and how are they changing?
Due to the increased access to known shipwrecks provided by new diving technologies, and threats posed to coastal sites by various development activities, the response to this question is rated as fair/poor and getting worse. Recreational divers continue to visit known shipwrecks, and due to advances in diving technology (e.g., technical mixed-gas diving and closed-circuit rebreathers), divers are locating and visiting deeper aircraft and shipwreck sites. Thus, an increasing number of maritime archaeological resources are becoming accessible at a time when there is a lack of preservation awareness and resource management. Coastal development increasingly threatens nearshore maritime archaeological resources and cultural sites. Construction of roads, buildings, resorts, and breakwalls, beach replenishment projects, and harbor dredging all can have direct impacts on both buried artifacts and exposed sites.

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Maritime Archaeological Resources Status & Trends

Good	Good/Fair	Fair	Fair/Poor	Poor	Undet.

▲ = Improving ▬ = Not changing ▼ = Declining
? = Undetermined trend N/A = Question not applicable

Issue	Rating	Basis for Judgment	Description of Findings
Integrity	▼	Gradual loss of historical artifacts due to land development, dredging, and coastal erosion, primarily at sites that have not been documented	The diminished condition of selected archaeological resources has reduced, to some extent, their historical, scientific, or educational value, and may affect the eligibility of some sites for listing in the National Register of Historic Places.
Threat to Environment	?	Data on wrecks that may pose hazards are insufficient to determine threat or trend.	NA
Human Activities	▼	Increasing diving due to technical advances provides greater uncontrolled access; continued coastal development	Selected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive problem.

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Response to Pressures

This section provides a summary of existing and proposed responses to pressures on marine resources of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Existing sanctuary responses and management actions are enacted to implement the final regulations issued by NOAA and to protect natural resources of the sanctuary.

Sanctuary Management

The sanctuary covers approximately 1,370 square miles of federal and state territory within the main Hawaiian Islands. To ensure fair management of this multi-jurisdictional area, NOAA and the State of Hawai‘i signed an Intergovernmental Compact Agreement in 1997. This enables the sanctuary to operate as a partnership between NOAA and the Sate of Hawai‘i Department of Land and Natural Resources.

The sanctuary has sought to strengthen its working relationships with other government agencies and organizations involved in protecting humpback whales and natural resources in Hawai‘i’s humpback whale habitat. This approach is aimed at increasing flexibility, mobilizing staff resources, avoiding duplication, and broadening opportunities for citizen participation in ocean stewardship. A cooperative management strategy has been very effective in capitalizing on the sanctuary’s strengths in education and public outreach. While many agencies share the mission of protecting humpback whales, the sanctuary is unique in its vigorous efforts to communicate the public interests at stake in Hawai‘i's humpback whale habitat. The sanctuary initially worked to identify state, federal, and county agencies with similar missions in order to involve them and to provide information on national marine sanctuaries. Since then, the sanctuary has used public events and public information tools to highlight their operations and emphasize the relationships and cohesiveness of marine protection agencies working to ensure health and safety within sanctuary waters.

Vessel Traffic

To address a growing concern regarding the increased occurrence of collisions between vessels and humpback whales, the Sanctuary Advisory Council Vessel Strike Working Group and its partners sponsored a workshop in September 2003 to assess ship strike risks to whales in Hawai‘i and to identify possible actions to reduce the occurrence of vessel/whale collisions in Hawaiian waters and throughout the National Marine Sanctuary System. Over 75 resource managers, scientists, industry leaders, and representatives of the marine community participated. Discussions and presentations during the workshop generally suggest that vessel collisions with whales are an issue to be aware of in Hawaiian waters, but it is not a critical problem at the present time. However, participants strongly support efforts to monitor the various parameters to improve management of the issue, including conducting assessments of whale population growth, whale behavior trends and increased ship traffic in waters surrounding the Hawaiian Islands. Improving data collection and storage of information on the occurrence of vessel strikes and “near misses” with whales was also widely supported. In addition, the participants were also strongly in favor of increased education and outreach efforts as an important management tool to decreasing the incidence of whale vessel collisions. (NMSP 2003)

Comment [kb115]: There are nine sub-headings in the “responses to pressures” section, the first seven of which are “pressures” (i.e., threats), whereas the last two (“protected species” and “marine archaeological resources) are not – clearly these last two paragraphs do not belong under the “responses to pressures” section.

There is considerable inconsistency in how the various “responses to pressures” are addressed. As much as is possible, each section should include: 1) relevant rules and prohibitions; 2) how effective the compliance/enforcement is of these rules or prohibitions; 3) what other actions (e.g., education) are taking place; and 4) what else could be done (e.g., proposed or potential responses). Some sections do a good job with some of these components, but none of the sections deal with them all adequately. If the sanctuary is not doing anything relevant to pressures, this should be noted explicitly (e.g., The sanctuary is not playing a role in fishery management or regulation within the sanctuary). Some note should be made of management tools used elsewhere, to illustrate the range of potential responses, even if they are not currently being utilized within the HIHWNMS. For example, with the section on fishing, protected areas are noted, but none of the other standard fishery management practices used elsewhere to regulate fishing are noted (fishing licenses, catch limits, size limits). Rather than just note that state programs “are designed to conserve and replenish marine resources state-wide”, how effective such programs are should be discussed, as they imply that the existing mechanisms effectively deal with the issues. The Olympia Coast National Marine Sanctuary has aerial overflight restrictions (no flying below 2000’) within a mile of the mainland shore as well as offshore islands. Such options should be mentioned for sensitive areas within the HIHWNMS.

Comment [kb116]: I don’t understand why there is no mention of the Lammers, Pack and Davis 2003 report that was commissioned and paid for by the Sanctuary. This report clearly illustrates an increasing trend in whale/vessel collisions over the past three decades and offers recommendations.

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Participants prioritize recommendations at the Workshop on Management Needs to Minimize Vessel Collisions with Whales. (Photo: NOAA)

Since the 2003 workshop, the sanctuary has disseminated collision avoidance guidelines that have been featured annually in newspaper articles, lectures, workshops, harbor signs and outreach events and products. In 2006, the sanctuary implemented an Ocean Etiquette Campaign with targeted outreach activities including a brochure and seven boater workshops held throughout the islands. (HIHWNMS and SOH 2007b)

National Marine Sanctuaries Act (NMSA) regulations prohibit the following activities in Hawaiian Islands Humpback Whale National Marine Sanctuary waters:

- Approaching, or causing a vessel or other object to approach, within the sanctuary, by any means, within 100 yards of any humpback whale except as authorized under the Marine Mammal Protection Act (MMPA), and the Endangered Species Act (ESA); and
- Operating any aircraft above the sanctuary within 1,000 feet of any humpback whale except as necessary for takeoff or landing from an airport or runway, or as authorized under the MMPA and the ESA.

(NMSA Regulations http://sanctuaries.noaa.gov/library/national/15cfr922a.pdf)

Comment [kb117]: These restrictions are no different than those outside the Sanctuary. What additional protection does the Sanctuary provide in Sanctuary waters?

Marine Debris

Globally, the leading known human cause of humpback whale mortality is entanglement by both active and derelict ropes and nets. The sanctuary leads efforts to mitigate effects of entanglement locally, nationally and internationally. Locally, sanctuary personnel train others and develop unique tools and techniques to free entangled whales and coordinate rescue responses concerning humpback whales in distress in Hawaiian waters. Nationally, sanctuary personnel advise NOAA Fisheries on entanglement issues as invited participants in workshops and through comparative research on entanglement scarring. Internationally, sanctuary personnel have conducted disentanglement workshops in Mexico and New Zealand, and participants on the Bycatch Subcommittee of the International Whaling Commission's Scientific Committee. (HIHWNMS and SOH 2007b)

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Efforts to disentangle a humpback whale in Hawaiian waters on Feb. 12, 2005. Rescuers position themselves to remove entangled gear from the whale. (Source: NOAA)

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National Marine Sanctuaries Act (NMSA) regulations prohibit the following activities in Hawaiian Islands Humpback Whale National Marine Sanctuary waters:

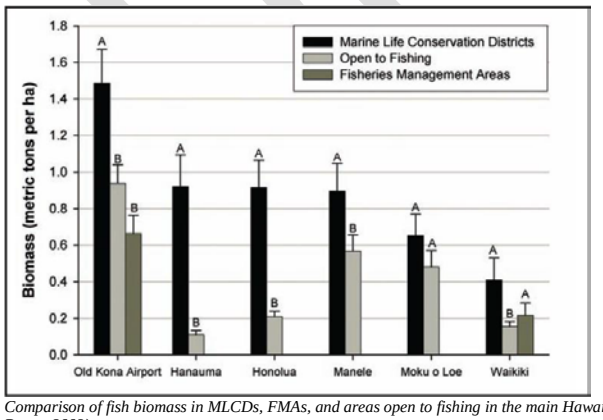
Discharging or depositing any material or other matter in the sanctuary; altering the seabed of the sanctuary; or discharging or depositing any material or other matter outside the sanctuary if the discharge or deposit subsequently enters and injures a humpback whale or humpback whale habitat, provided that such activity: (i) requires a Federal or State permit, license, lease, or other authorization; and (ii) is conducted without such permit, license, lease, or other authorization, or not in compliance with the terms or conditions of such permit, license, lease, or other authorization.

(NMSA Regulations http://sanctuaries.noaa.gov/library/national/15cfr922a.pdf)

Fishing

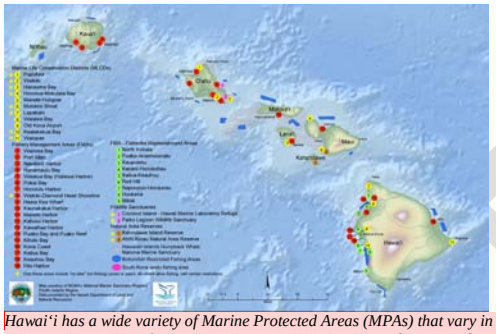
The traditional system in Hawai‘i emphasized social and cultural controls on fishing with a code of conduct that was strictly enforced (Friedlander et al. 2002b; Poepoe et al., in press). After western contact, a breakdown of the traditional kapu system and the demise of the watershed as a management unit led to the virtual elimination of traditional Hawaiian fisheries management practices (Smith and Pai, 1992; Lowe 2004, Friedlander et al. 2005)

Comment [kb118]: is this still in press?



Comparison of fish biomass in MLCDs, FMAs, and areas open to fishing in the main Hawaiian Islands. (Source: adapted from Friedlander and Brown 2003)

Hawai‘i has a wide variety of Marine Protected Areas (MPAs) that vary in size and level of protection. These include Marine Life Conservation Districts (MLCD), Fisheries Management Areas (FMA), Fisheries Replenishment Areas (FRA), a Marine Laboratory Refuge (MLR), Natural Area Reserve (NAR), Kahoolawe Island Reserve (KIR), and National and State Wildlife Refuges. The Hawai‘i Department of Land and Natural Resources, Division of Aquatic Resources (DLNR/DAR) administers the state’s MLCD, FMA, FRA, programs, which are designed to conserve and replenish marine resources state-wide, and the Western Pacific Regional Fisheries Management Council and NOAA’s National Marine Fisheries Service manages fisheries in federal waters. Hanauma Bay, O‘ahu was created in 1967 as the first MLCD; 10 more MLCDs have been established since then. The State is currently evaluating its existing system of MPAs and exploring options for the creation of a network of marine managed areas, to ensure coral reef sustainability, and rehabilitation and enhancement of fisheries. (DLNR-DAR 2005)



Hawai‘i has a wide variety of Marine Protected Areas (MPAs) that vary in size and level of protection. These include Marine Life Conservation Districts (MLCD), Fisheries Management Areas (FMA), Fisheries Replenishment Areas (FRA), a Marine Laboratory Refuge (MLR), Natural Area Reserve (NAR), Kahoolawe Island Reserve (KIR), and National and State Wildlife Refuges. Data source: Hawaii Department of Land and Natural resources. Map produced by the Office of National Marine Sanctuaries, Pacific Islands Region.

Comment [kb119]: This is a repetitive paragraph—is there a figure or table that belongs here?

Coastal Development and Coastal Pollution

The condition of the marine and coastal waters of the sanctuary is vulnerable to both land based pollution as well as from marine sources. Sources of concern include pollutant runoff from impervious surfaces, farms, feedlots, golf courses and other uses. Marine sources of pollution result from human activities that discharge water or wastes in the ocean from sea-based activities. (DLNR-DAR 2005)

When the sanctuary was designated in 1997, NOAA received public comments that emphasized that the sanctuary should, in cooperation with boat operators, promote proper disposal of sewage from vessels, encourage compliance with existing laws and help implement existing regulations and programs to address water quality issues. To this end, the sanctuary supports the efforts by the State of Hawai‘i for the development of more pump-out facilities to be available on every island at all major harbors. Currently, boat operators find the process of utilizing existing facilities, or contracting with private companies for pumping at their harbor, both costly and time consuming. Because of this, many discouraged boat owners dump their waste at sea. The practice of vessels discharging sewage in the ocean outside of the 3-mile limit that delineates state waters has been an ongoing issue for a number of ocean enthusiasts, especially off Maui. (Need Citation)

Comment [kb120]: For this and the citations on the next page see appropriate threat reports by Herman and colleagues for Sanctuary

Discharges in the Hawaiian Islands Humpback Whale National Marine Sanctuary are prohibited if they do not comply with an existing federal or state permit, license, lease or other authorization. These regulations prohibit discharging or depositing any material or matter in the sanctuary or discharging or depositing any material or other matter outside the sanctuary if the discharge or deposit subsequently enters the sanctuary and injures a humpback whale or humpback whale habitat, provided that such activity requires a federal or state permit, license or other authorization and is conducted without or not in compliance with such permit or license. Because there is no existing state or federal rule that prohibits discharges from vessels outside the 3-mile limit, the practice is legal within the federal waters of the sanctuary. (NMSA Regulations http://sanctuaries.noaa.gov/library/national/15cfr922a.pdf)

Comment [kb121]: My read on this is that there are no special restrictions in the Sanctuary. Is this correct? If not, how is discharging in the Sanctuary regulated differently than in other State or Federal waters?

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At this time, NOAA is working with its agency partners (United States Coast Guard, Environmental Protection Agency, State of Hawai‘i Department of Health, and Maui County) and the community to find workable solutions to ensure better compliance with existing water quality regulations. To this end, NOAA understands that the best workable solution is to support and supplement existing State and Federal programs that will provide improvements to harbor facilities and the installation of pump out facilities at all harbors – a solution that will help Hawai‘i’s boaters to practice operations that are friendlier to Hawaii’s marine environment. The sanctuary has also provided $10,000 to the State of Hawai‘i Department of Land and Natural Resources to support the County of Maui’s interim efforts to subsidize costs for pump-out trucks for commercial vessels at Ma`alaea Harbor on Maui. The effort is to accommodate vessels until the State of Hawai‘i is able to complete harbor improvements which will include a pump out facility at Ma`alaea Harbor. The project is several years from completion. (Need Citation)

Open Ocean Aquaculture

Sanctuary accomplishments addressing concerns associated with ocean aquaculture have involved close collaboration with the state Department of Land and Natural Resource’s (DLNR’s) Office of Conservation and Coastal Lands (OCCL) and NOAA’s National Marine Fisheries Service to ensure that potential humpback whale impacts are considered in all OCCL permitting and consultation activities associated with existing and proposed open ocean aquaculture projects. This collaboration has resulted in various whale impact mitigation measures being addressed as conditions in the permit issued for the cage culture within sanctuary waters, including the reduction of surface cage area, relocation of the facility to less whale dense waters, and inclusion of a whale impact monitoring and reporting program. Sanctuary management and technical staff have also consulted with OCCL on at least four other proposed aquaculture projects, reviewing proposals, articulating impact concerns and proposing potential mitigation measures. (Need Citation)

Any party that wishes to engage in offshore aquaculture within state marine waters must obtain a series of permits and authorizations from both federal and state agencies, including:

- A permit from the Army Corps of Engineers for any activity that obstructs or alters navigable waters of the U.S, in conjunction with an application to Hawai‘i’s Coastal Zone Management Plan Program.
- A Special Management Area (SMA) Use Permit from the appropriate County Planning Department, if the facility will be located within a designated SMA.

(Need Citation)

If the facility will operate within a state conservation district, applicants must submit a Conservation District Use Application and a management plan to the DLNR OCCL. Similarly, applicants must apply to the DLNR for an Ocean Lease, which authorizes the DLNR to lease state marine waters and submerged lands for all conservation district lands. In conjunction, applicants must submit an Environmental Assessment and possibly an Environmental Impact Statement, to the DLNR. Depending on the exact nature of the project and necessary construction activities, additional DLNR approvals may be required. (Need Citation)

Concentrated aquatic animal production facilities, which are defined as those producing more than 100,000 pounds of warm water species, are considered point sources subject to the National Pollutant Discharge Elimination System (NPDES) program. Therefore, operators of such facilities must submit a NPDES permit application. NPDES permits include numeric and qualitative standards for pollutant discharges, monitoring and reporting requirements, as well as any other special conditions issued at the discretion of the Director. After September 22, 2004, similar operators must also comply with EPA’s national effluent guideline for concentrated aquatic animal production. (Need Citation)

Applicants must also apply for a Zone of Mixing permit for discharges to state waters, a Department of Health Solid Waste Permit, and also comply with the Clean Water Act. (Need Citation)

Comment [kb122]: On page 40, under “Sanctuary Response”, the report notes the “various whale mitigation measures being addressed as conditions in the permit”. The effectiveness of these measures needs to be acknowledged in earlier sections of the report and taken into account in assessing the impacts and trends associated with open ocean aquaculture in Hawaii. To alleviate concerns about siting of additional aquaculture facilities in the Sanctuary, a mapping or marine zoning exercise should be undertaken to identify areas suitable for cage culture operations. The State of Hawaii’s aquaculture development office may have undertaken elements of such a survey/study several years ago which, if available, could be a starting point for a collaborative effort between the State of Hawaii, NOAA, and stakeholders.

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Comment [kb123]: At what point is the Sanctuary engaged in the permitting process if the proposed facility is in Sanctuary waters?

Comment [sg124]: Is this an accurate statement?

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Diseases, Climate Change and Coral Bleaching

With coral reefs around the world in decline, the main Hawaiian Islands present a unique opportunity to characterize a relatively intact coral reef ecosystem and to understand the degree of natural variability in an environment with varying levels of anthropogenic influences. Studying these ecosystems may also make an important contribution toward understanding the impacts of disease and global climate change on coral reefs.

The sanctuary's goal is to increase understanding of the distributions and functional linkages of marine organisms and their habitats in space and time to improve ecosystem-based management decisions. The following strategies have been identified to support continued characterization and monitoring of main Hawaiian Islands marine ecosystems:

Habitat mapping

Bathymetry mapping cruises were conducted over the past five years, and it is estimated that 87% of the sanctuary is now mapped. This advancement in documenting the sanctuary includes the complete mapping of Penguin Bank, an important habitat for humpback whales in Hawai'i. The characteristics of the area, bounded by Maui, Moloka`i, Lana`i, and Kaho`olawe, along with the extension of the shallow Penguin Bank southwest of Moloka`i, represents a unique, semi-enclosed, shallow protected sea in the midst of an expansive ocean. In 1997, at the time of the initial sanctuary Environmental Impact Statement and Management Plan, very little information had been published about the specific characteristics of this inter-island area. The bathymetry collected during a research cruise in 2005 was added to the synthesis in order to make a preliminary assessment of seafloor characteristics across the state. The synthesis, begun by Hawai'i Underwater Research Lab (HURL), incorporates data from a wide variety of mapping groups and includes academic, state, and federal data. (HIHWNMS and SOH 2007b)

SPLASH (Structure of Populations, Levels of Abundance, and Status of Humpbacks)

The primary objectives of the SPLASH program are to improve the description of the stock structure of humpback whales in the North Pacific, to understand the abundance and trends of these stocks, and to assess the human impact on them. The program is a cooperative effort of researchers from the United States, Canada, Mexico, Japan, Russia, the Philippines, and Central America. Data collection is primarily obtained through the field techniques of photo-identification of whale flukes and biopsy tissue sampling in the humpback whales' breeding and feeding grounds. The sanctuary, in partnership with the State of Hawai'i Department of Land and Natural Resources, coordinated seven teams in Hawai'i, while conducting its own fieldwork on Penguin Bank and assisting with Hawai'i Island, Maui and Kaua`i. Between 2004 and 2006, researchers in Hawai'i encountered 3,624 groups of whales, resulting in the identification of 8,037 individuals. Researchers collected 15,252 images for use in photo-ID and human impact analysis, 5,689 fluke IDs, and 2,032 biopsies over the project's duration. (HIHWNMS and SOH 2007b)

Education and Outreach

The sanctuary's mission is to enhance public awareness, understanding, and appreciation of the marine environment. The sanctuary has focused its education program on making its constituents aware of humpback whales and the ocean they live in, with the understanding that ocean literate citizens will not only help protect endangered humpback whales but all natural resources. To address the issue of ocean literacy, the sanctuary implements a variety of activities that focus on three major areas: enhancing learning opportunities, increasing ocean awareness, and promoting ocean stewardship. (HIHWNMS and SOH 2007b)

Introduced Species

In response to concern for introductions that may cause or are likely to cause economic or environmental harm, and/or harm to human health, the State of Hawai'i released the Aquatic Invasive Species Management Plan in September 2003 (Shulker 2003). Aquatic invasive species (AIS) are considered to be a serious problem in Hawai'i, posing a significant threat to residents and visitors, as well as to Hawai'i 's native plants, animals, and associated native ecosystems. The purpose of the plan is to act as a tool to enhance the coordination of current management efforts, identify remaining problem areas and gaps, and recommend additional actions needed to effectively address AIS issues in Hawai'i. It was developed with guidance from the Federal Aquatic Nuisance Species Task Force as well as input from representatives of state and federal agencies, industry, non-governmental organizations, and other stakeholders. The plan focuses on marine and freshwater alien species of concern and outlines a coordinated approach to minimize the harmful ecological, economic, and human health impacts of AIS. It is the first

Comment [kb125]: While the three sub-sections under the "diseases, climate change, and coral bleaching" section are worth including, they are not particularly related to this topic and should be moved appropriately.

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Comment [kb126]: ??? Are we talking about the same Hawaiian islands I live on? I think this statement needs to either be backed up by a very solid citation or reconsidered to reflect the actual situation. The NWHI may be 'remote' and pristine (arguable), but the main Hawaiian Islands are certainly neither.

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Comment [kb127]: I'm not quite sure why SPLASH is presented almost as a footnote to what the Sanctuary has accomplished over the past few years. SPLASH is one of the most significant things the Sanctuary has been involved in as far as science and conservation research. It should be emphasized MUCH more and given its own section in this report.

Comment [kb128]: Specific countries?

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Comment [kb129]: Same as the comment above! The Sanctuary IS education and outreach! Why is so much time spent in descriptions of the resources and real and imagined problems, but only three sentences are devoted to summarize the Sanctuary's main activity?

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comprehensive plan for aquatic nuisance species developed for a tropical marine ecosystem. (Friedlander et al. 2005)

Comment [kb130]: What does all this have to do with the Sanctuary? Is the Sanctuary involved in any way?

Protected Species

There are three federal acts, as well as multiple state statutes, that protect specific species in the Hawaiian Islands. The federal acts are the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and the Migratory Bird Treaty Act (MBTA). The ESA of 1973 provides for the conservation of species at risk of extinction throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The MMPA of 1972 established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, as well as the importing of marine mammals and marine mammal products into the United States. The MBTA of 1918 implements various treaties and conventions between the United States and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds.
(http://www.nmfs.noaa.gov/pr/laws/mmpa.htm)
(http://www.nmfs.noaa.gov/pr/laws/esa.htm)
(http://www.fws.gov/laws/lawsdigest/migtrea.html)

National Marine Sanctuaries Act regulations prohibit the following activities in Hawaiian Islands Humpback Whale National Marine Sanctuary waters:

- Taking any humpback whale in the sanctuary except as authorized under the MMPA and the ESA; and
- Possessing within the sanctuary (regardless of where taken) any living or dead humpback whale or part thereof taken in violation of the MMPA or the ESA.

(NMSA Regulations http://sanctuaries.noaa.gov/library/national/15cfr922a.pdf)

Comment [kb131]: Again, no different than what is permitted outside the sanctuary. Does the Sanctuary provide ANY additional protection? Also, as a sanctuary focusing singularly on a protected species, this should be the principal section of the report. Here is where you should talk about what you are actually doing to protect whales. Why are you just reminding us of Federal law?

Maritime Archaeological Resources

In recognition of the variety of maritime archaeological resources in Hawaii, as well as the current threats and acknowledged lack of resource management in this area, the chairperson of the State of Hawaii's Department of Land and Natural Resources addressed a letter to sanctuary co-managers (Doc No 0606AJ14) in 2006, recommending that the program consider adding maritime archaeological resources to the sanctuary's management plan through the management plan review process. The state's letter noted that these kinds of resources "are of national significance and can provide valuable information about various facets of Hawai'i's maritime heritage." Letters of support have also been received from the University of Hawai`i Marine Option Program, Naval Historical Center, National Park Service Submerged Resources Center, and sport diving organizations. A brief maritime archaeological assessment document was subsequently developed by the Pacific Islands regional office for the sanctuary, addressing the existing inventory, current resource management efforts, current threats, and the potential for joint management and future collaboration in this preservation field. (HIHWNMS and SOH 2007a)

DRAFT

Concluding Remarks

Comment [kb132]: The report does not sufficiently acknowledge that all human activities have some impact, and that aquaculture is one of the multiple uses that is allowed under the Sanctuaries management plan. In addition, aquaculture is part of traditional Hawaii culture.

-In the Concluding Remarks (page 43), management of natural and cultural resources within the sanctuary should consider sustainable uses.

It is important to recognize that the responses to the questions found in this report are based primarily on the effects or potential effects of pressures on the sanctuary as they relate to humpback whales and their habitat, which are the current responsibilities of the Hawaiian Islands Humpback Whale National Marine Sanctuary. These responses may or may not apply to other threatened, endangered, or culturally significant resources that exist within sanctuary waters. Furthermore, the identification of marine resources in addition to humpback whales and their habitat was stipulated by Congress in the 1992 HINMSA. In response to this Congressional mandate, the support of the Governor of Hawaii, and overwhelming public opinion, the sanctuary is currently implementing a process to identify new marine resources appropriate for protection by the sanctuary. As part of the current management plan review process, the public will have numerous opportunities to comment on the management of natural and cultural resources within the sanctuary beginning at scoping meetings in August of 2009.

This condition report is the first attempt to comprehensively describe the status, pressures and trends of resources in the Hawaiian Islands Humpback Whale National Marine Sanctuary. By doing so, this report helps to identify the pressures and their impacts on marine ecosystems that may warrant monitoring and remediation in the years to come. It is important to understand the factors that help to structure the resources of the sanctuary, and how uses of its resources may affect their health, viability and longevity. The information presented in this report enables managers to look back and consider past changes in the status of the resources, and provides guidance for continued resource management as we face future challenges imposed by existing and emerging threats such as increasing interaction with shipping, marine debris, aquaculture, coastal populations, alternative energy production, artificial reefs, and climate change.

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It is noteworthy that nine of the questions addressed in this condition report received a ranking of "good" or "good/fair," reflecting the relatively unimpaired condition of natural resources in the sanctuary. However, equally important to note is that five of the issues were scored either "fair" or "fair/poor" and "declining". These five issues dealt with the impacts of human activities on habitat and living and maritime archeological resources.

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A focus of the sanctuary in the future will be to continue to provide research-based public outreach and education to reduce unwanted human-impacts on sanctuary resources. Additional, the sanctuary will continue to work towards strengthening the bond between the land, sea, and the people of Hawaii. Recognizing both traditional values and ecological knowledge in natural resource management decisions will help to ensure the continued success of the Hawaiian Island Humpback Whale National Marine Sanctuary.

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Acknowledgements

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Deleted: Maritime Archaeology and History of the Hawaiian Islands Foundation

The report benefited significantly from a preliminary review, and we are grateful for comments received on a draft of the report provided by Suzanne Finney (Maritime Archaeology and History of the Hawaiian Islands Foundation), Megan Forbes (NOAA Marine Debris Program), June Harrigan-Lum (retired, affiliation?), Rebecca Hommon (U.S. Navy),David Penn (State of Hawaii Department of Health), Hans Van Tilburg (Hawaiian Islands Humpback Whale

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Additional Resources

Bishop Museum: http://www.bishopmuseum.org

Endangered Species Act: http://www.nmfs.noaa.gov/pr/laws/esa/

Hawai’i Coral Reef Initiative Research Program: http://www.hawaii.edu/ssri/hcri/

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Hawai'i Institute of Marine Biology: http://www.hawaii.edu/HIMB

Hawaiian Islands Humpback Whale National Marine Sanctuary: http://hawaiihumpbackwhale.noaa.gov

Marine Conservation Biology Institute: http://www.mcbi.org

Marine Mammal Protection Act: http://www.nmfs.noaa.gov/pr/laws/mmpa/

Marine Protected Areas of the United States: http://www.mpa.gov

Migratory Bird Treaty Act: http://www.fws.gov/laws/lawsdigest/migtrea.html

NOAA's Coral Reef Conservation Program: http://www.coralreef.noaa.gov

NOAA's Coral Reef Information System (CoRIS): http://www.coris.noaa.gov

NOAA's National Marine Fisheries Service: http://www.nmfs.noaa.gov

NOAA's Ocean Explorer: http://www.oceanexplorer.noaa.gov

NOAA's Office of National Marine Sanctuaries: http://sanctuaries.noaa.gov/

Papahānaumokuākea Marine National Monument: http://hawaiireef.noaa.gov

State of Hawaii's Department of Land and Natural Resources: http://www.hawaii.gov/dlnr

U.S. Fish and Wildlife Service: http://www.fws.gov

U.S. Geological Survey. The Long Trail of the Hawaiian Hotspot: http://pubs.usgs.gov/gip/dynamic/Hawaiian.html
Western Pacific Fishery Management Council: http://www.wpcouncil.org

Woods Hole Oceanographic Institution: http://www.whoi.edu

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Appendix A:

Rating Scheme for System-Wide Monitoring Questions

The purpose of this appendix is to clarify the 17 questions and possible responses used to report the condition of sanctuary resources in "Condition Reports" for all national marine sanctuaries. Individual staff and partners utilized this guidance, as well as their own informed and detailed understanding of the site to make judgments about the status and trends of sanctuary resources.

The questions derive from the National Marine Sanctuary System's mission, and a system-wide monitoring framework (NMSP 2004) developed to ensure the timely flow of data and information to those responsible for managing and protecting resources in the ocean and coastal zone, and to those that use, depend on and study the ecosystems encompassed by the sanctuaries. They are being used to guide staff and partners at each of the 14 sites in the sanctuary system in the development of this first periodic sanctuary condition report. Evaluations of status and trends may be based on interpretation of quantitative and, when necessary, non-quantitative assessments and observations of scientists, managers and users.

Some of the questions refer to the term "ecosystem integrity." When responding to these questions experts and sanctuary staff judged an ecosystem's integrity by the relative wholeness of ecosystem structure, function, and associated complexity, and the spatial and temporal variability inherent in these characteristics, as determined by its natural evolutionary history. Ecosystem integrity is reflected in the system's "ability to generate and maintain adaptive biotic elements through natural evolutionary processes" (Angermeier and Karr 1994). It also implies that the natural fluctuations of a system's native characteristics, including abiotic drivers, biotic composition, symbiotic relationships, and functional processes are not substantively altered and are either likely to persist or be regained following natural disturbance. Please note that the responses to the set of questions found in this report focus primarily on the effects or potential effects of pressures on the sanctuary as they relate to humpback whales and their habitat, which are the responsibilities of the Hawaiian Islands Humpback Whale National Marine Sanctuary. With the exception of Question 3, they do not address concerns from the standpoint of habitats or resources over which the sanctuary does not have authority or other types of responsibility.

Following a brief discussion about each question, statements are presented that were used to judge the status and assign a corresponding color code. These statements are customized for each question. In addition, the following options are available for all questions: " N/A" - the question does not apply; and "Undet." - resource status is undetermined.

Symbols used to indicate trends are the same for all questions: "▲" - conditions appear to be improving; "▬" - conditions do not appear to be changing; "▼" - conditions appear to be declining; and "?" – trend is undetermined.

Question 1 (Water/Stressors): Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality and how are they changing?

This is meant to capture shifts in condition arising from certain changing physical processes and anthropogenic inputs. Factors resulting in regionally accelerated rates of change in water temperature, salinity, dissolved oxygen or water clarity could all be judged to reduce water quality. Localized changes in circulation or sedimentation resulting, for example, from coastal construction or dredge spoil disposal can affect light penetration, salinity regimes, oxygen levels, productivity, waste transport and other factors that influence habitat and living resource quality. Human inputs, generally in the form of contaminants from point or nonpoint sources, including fertilizers, pesticides, hydrocarbons, heavy metals and sewage, are common causes of environmental degradation, often in combination rather than alone. Certain biotoxins, such as domoic acid, may

be of particular interest to specific sanctuaries. When present in the water column, any of these contaminants can affect marine life by direct contact or ingestion, or through bioaccumulation via the food chain.

[Note: Over time, accumulation in sediments can sequester and concentrate contaminants. Their effects may manifest only when the sediments are resuspended during storm or other energetic events. In such cases, reports of status should be made under Question 7 – Habitat contaminants.]

Good	nditions do not appear to have the potential to negatively affect living resources or habitat quality.
Good/Fair	ected conditions may preclude full development of living resource assemblages and habitats, but are likely to cause substantial or persistent declines.
Fair	ected conditions may inhibit the development of assemblages and may cause measurable but not ere declines in living resources and habitats.
Fair/Poor	ected conditions have caused or are likely to cause severe declines in some but not all living resources l habitats.
Poor	ected conditions have caused or are likely to cause severe declines in most, if not all, living resources l habitats.

Question 2 (Water/Eutrophic Condition): What is the eutrophic condition of sanctuary waters and how is it changing?

Nutrient enrichment often leads to planktonic and/or benthic algae blooms. Some affect benthic communities directly through space competition. Overgrowth and other competitive interactions (e.g., accumulation of algal-sediment mats) often lead to shifts in dominance in the benthic assemblage. Disease incidence and frequency can also be affected by algae competition and the resulting chemistry along competitive boundaries. Blooms can also affect water column conditions, including light penetration and plankton availability, which can alter pelagic food webs. Harmful algal blooms often affect resources, as biotoxins are released into the water and air, and oxygen can be depleted.

Good	nditions do not appear to have the potential to negatively affect living resources or habitat quality.
Good/Fair	ected conditions may preclude full development of living resource assemblages and habitats, but are likely to cause substantial or persistent declines.
Fair	ected conditions may inhibit the development of assemblages and may cause measurable but not ere declines in living resources and habitats.
Fair/Poor	ected conditions have caused or are likely to cause severe declines in some but not all living resources l habitats.
Poor	ected conditions have caused or are likely to cause severe declines in most if not all living resources l habitats.

Question 3 (Water/Human Health): Do sanctuary waters pose risks to human health and how are they changing?

Human health concerns are generally aroused by evidence of contamination (usually bacterial or chemical) in bathing waters or fish intended for consumption. They also emerge when harmful algal blooms are reported or when cases of respiratory distress or other disorders attributable to harmful algal blooms increase dramatically. Any of these conditions should be considered in the course of judging the risk to humans posed by waters in a marine sanctuary.

Some sites may have access to specific information on beach and shellfish conditions. In particular, beaches may be closed when criteria for safe water body contact are exceeded, or shellfish harvesting may be prohibited when contaminant loads or infection rates exceed certain levels. These conditions can be evaluated in the context of the descriptions below.

Good	nditions do not appear to have the potential to negatively affect human health.
Good/Fair	ected conditions that have the potential to affect human health may exist but human impacts have not

n reported.

Fair	ected conditions have resulted in isolated human impacts, but evidence does not justify widespread or sistent concern.
Fair/Poor	ected conditions have caused or are likely to cause severe impacts, but cases to date have not suggested ervasive problem.
Poor	ected conditions warrant widespread concern and action, as large-scale, persistent and/or repeated ere impacts are likely or have occurred.

Question 4 (Water/Human Activities): What are the levels of human activities that may influence water quality and how are they changing?

Among the human activities in or near sanctuaries that affect water quality are those involving direct discharges (transiting vessels, visiting vessels, onshore and offshore industrial facilities, public wastewater facilities), those that contribute contaminants to stream, river, and water control discharges (agriculture, runoff from impermeable surfaces through storm drains, conversion of land use), and those releasing airborne chemicals that subsequently deposit via particulates at sea (vessels, land-based traffic, power plants, manufacturing facilities, refineries). In addition, dredging and trawling can cause resuspension of contaminants in sediments.

Good	v or no activities occur that are likely to negatively affect water quality.
Good/Fair	ne potentially harmful activities exist, but they do not appear to have had a negative effect on water ality.
Fair	ected activities have resulted in measurable resource impacts, but evidence suggests effects are alized, not widespread.
Fair/Poor	ected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive blem.
Poor	ected activities warrant widespread concern and action, as large-scale, persistent, and/or repeated ere impacts have occurred or are likely to occur.

Question 5 (Habitat/Abundance & Distribution): What are the abundance and distribution of major habitat types and how are they changing?

Habitat loss is of paramount concern when it comes to protecting marine and terrestrial ecosystems. Of greatest concern to sanctuaries are changes caused, either directly or indirectly, by human activities. The loss of shoreline is recognized as a problem indirectly caused by human activities. Habitats with submerged aquatic vegetation are often altered by changes in water conditions in estuaries, bays, and nearshore waters. Intertidal zones can be affected for long periods by spills or by chronic pollutant exposure. Beaches and haul-out areas can be littered with dangerous marine debris, as can the water column or benthic habitats. Sandy subtidal areas and hardbottoms are frequently disturbed or destroyed by trawling. Even rocky areas several hundred meters deep are increasingly affected by certain types of trawls, bottom longlines and fish traps. Groundings, anchors and divers damage submerged reefs. Cables and pipelines disturb corridors across numerous habitat types and can be destructive if they become mobile. Shellfish dredging removes, alters and fragments habitats.

The result of these activities is the gradual reduction of the extent and quality of marine habitats. Losses can often be quantified through visual surveys and to some extent using high-resolution mapping. This question asks about the quality of habitats compared to those that would be expected without human impacts. The status depends on comparison to a baseline that existed in the past - one toward which restoration efforts might aim.

Good	bitats are in pristine or near-pristine condition and are unlikely to preclude full community velopment.
Good/Fair	ected habitat loss or alteration has taken place, precluding full development of living resource emblages, but it is unlikely to cause substantial or persistent degradation in living resources or water ality.
Fair	ected habitat loss or alteration may inhibit the development of assemblages, and may cause measurable not severe declines in living resources or water quality.

Fair/Poor	ected habitat loss or alteration has caused or is likely to cause severe declines in some but not all living ɔurces or water quality.
Poor	ected habitat loss or alteration has caused or is likely to cause severe declines in most if not all living ɔurces or water quality.

Question 6 (Habitat/Structure): What is the condition of biologically-structured habitats and how is it changing?

Many organisms depend on the integrity of their habitats and that integrity is largely determined by the condition of particular living organisms. Coral reefs may be the best known examples of such biologically-structured habitats. Not only is the substrate itself biogenic, but the diverse assemblages residing within and on the reefs depend on and interact with each other in tightly linked food webs. They also depend on each other for the recycling of wastes, hygiene and the maintenance of water quality, among other requirements.

Kelp beds may not be biogenic habitats to the extent of coral reefs, but kelp provides essential habitat for assemblages that would not reside or function together without it. There are other communities of organisms that are also similarly co-dependent, such as hard-bottom communities, which may be structured by bivalves, octocorals, coralline algae, or other groups that generate essential habitat for other species. Intertidal assemblages structured by mussels, barnacles, algae and seagrass beds are other examples. This question is intended to address these types of places where organisms form structures (habitats) on which other organisms depend.

Good	ɔitats are in pristine or near-pristine condition and are unlikely to preclude full community velopment.
Good/Fair	ected habitat loss or alteration has taken place, precluding full development of living resources, but it ınlikely to cause substantial or persistent degradation in living resources or water quality.
Fair	ected habitat loss or alteration may inhibit the development of living resources and may cause asurable but not severe declines in living resources or water quality.
Fair/Poor	ected habitat loss or alteration has caused or is likely to cause severe declines in some but not all living ɔurces or water quality.
Poor	ected habitat loss or alteration has caused or is likely to cause severe declines in most if not all living ɔurces or water quality.

Question 7 (Habitat/Contaminants): What are the contaminant concentrations in sanctuary habitats and how are they changing?

This question addresses the need to understand the risk posed by contaminants within benthic formations, such as soft sediments, hard bottoms, or biogenic organisms. In the first two cases, the contaminants can become available when released via disturbance. They can also pass upwards through the food chain after being ingested by bottom dwelling prey species. The contaminants of concern generally include pesticides, hydrocarbons and heavy metals, but the specific concerns of individual sanctuaries may differ substantially.

Good	ntaminants do not appear to have the potential to negatively affect living resources or water quality.
Good/Fair	ected contaminants may preclude full development of living resource assemblages, but are not likely to ıse substantial or persistent degradation.
Fair	ected contaminants may inhibit the development of assemblages and may cause measurable but not ere declines in living resources or water quality.
Fair/Poor	ected contaminants have caused or are likely to cause severe declines in some but not all living ɔurces or water quality.
Poor	ected contaminants have caused or are likely to cause severe declines in most if not all living resources water quality.

Question 8 (Habitat/Human Activities): What are the levels of human activities that may influence habitat quality and how are they changing?

Human activities that degrade habitat quality do so by affecting structural (geological), biological, oceanographic, acoustic or chemical characteristics. Structural impacts include removal or mechanical alteration, including various fishing techniques (trawls, traps, dredges, longlines and even hook-and-line in some habitats), dredging channels and harbors and dumping spoil, vessel groundings, anchoring, laying pipelines and cables, installing offshore structures, discharging drill cuttings, dragging tow cables, and placing artificial reefs. Removal or alteration of critical biological components of habitats can occur along with several of the above activities, most notably trawling, groundings and cable drags. Marine debris, particularly in large quantities (e.g., lost gill nets and other types of fishing gear), can affect both biological and structural habitat components. Changes in water circulation often occur when channels are dredged, fill is added, coastal areas are reinforced, or other construction takes place. These activities affect habitat by changing food delivery, waste removal, water quality (e.g., salinity, clarity and sedimentation), recruitment patterns and a host of other factors. Acoustic impacts can occur to water column habitats and organisms from acute and chronic sources of anthropogenic noise (e.g., shipping, boating, construction). Chemical alterations most commonly occur following spills and can have both acute and chronic impacts.

Good	w or no activities occur that are likely to negatively affect habitat quality.
Good/Fair	ne potentially harmful activities exist, but they do not appear to have had a negative effect on habitat ılity.
Fair	ected activities have resulted in measurable habitat impacts, but evidence suggests effects are alized, widespread.
Fair/Poor	ected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive blem.
Poor	ected activities warrant widespread concern and action, as large-scale, persistent and/or repeated ere impacts have occurred or are likely to occur.

Question 9 (Living Resources/Biodiversity): What is the status of biodiversity and how is it changing?

This is intended to elicit thought and assessment of the condition of living resources based on expected biodiversity levels and the interactions between species. Intact ecosystems require that all parts not only exist, but that they function together, resulting in natural symbioses, competition and predator-prey relationships. Community integrity, resistance and resilience all depend on these relationships. Abundance, relative abundance, trophic structure, richness, H' diversity, evenness and other measures are often used to assess these attributes.

Good	ıdiversity appears to reflect pristine or near-pristine conditions and promotes ecosystem integrity (full nmunity development and function).
Good/Fair	ected biodiversity loss has taken place, precluding full community development and function, but it is ikely to cause substantial or persistent degradation of ecosystem integrity.
Fair	ected biodiversity loss may inhibit full community development and function and may cause asurable but not severe degradation of ecosystem integrity.
Fair/Poor	ected biodiversity loss has caused or is likely to cause severe declines in some but not all ecosystem nponents and reduce ecosystem integrity.
Poor	ected biodiversity loss has caused or is likely to cause severe declines in ecosystem integrity.

Question 10 (Living Resources/Extracted Species): What is the status of environmentally sustainable fishing and how is it changing?

Commercial and recreational harvesting are highly selective activities, for which fishers and collectors target a limited number of species, and often remove high proportions of populations. In addition to removing significant amounts of biomass from the ecosystem, reducing its availability to other consumers, these activities tend to disrupt specific and often critical food web links. When too much extraction occurs (i.e. ecologically unsustainable harvesting), trophic cascades ensue, resulting in changes in the abundance of non-targeted species

as well. It also reduces the ability of the targeted species to replenish populations at a rate that supports continued ecosystem integrity.

It is essential to understand whether removals are occurring at ecologically sustainable levels. Knowing extraction levels and determining the impacts of removal are both ways that help gain this understanding. Measures for target species of abundance, catch amounts or rates (e.g., catch per unit effort), trophic structure and changes in non-target species abundance are all generally used to assess these conditions.

Other issues related to this question include whether fishers are using gear that is compatible with the habitats being fished and whether that gear minimizes by-catch and incidental take of marine mammals. For example, bottom-tending gear often destroys or alters both benthic structure and non-targeted animal and plant communities. “Ghost fishing” occurs when lost traps continue to capture organisms. Lost or active nets, as well as lines used to mark and tend traps and other fishing gear, can entangle marine mammals. Any of these could be considered indications of environmentally unsustainable fishing techniques.

- **Good** raction does not appear to affect ecosystem integrity (full community development and function).
- **Good/Fair** raction takes place, precluding full community development and function, but it is unlikely to cause stantial or persistent degradation of ecosystem integrity.
- **Fair** raction may inhibit full community development and function and may cause measurable but not ere degradation of ecosystem integrity.
- **Fair/Poor** raction has caused or is likely to cause severe declines in some but not all ecosystem components and uce ecosystem integrity.
- **Poor** raction has caused or is likely to cause severe declines in ecosystem integrity.

Question 11 (Living Resources/Non-Indigenous Species): What is the status of non-indigenous species and how is it changing?

Non-indigenous species are generally considered problematic and candidates for rapid response, if found, soon after invasion. For those that become established, their impacts can sometimes be assessed by quantifying changes in the affected native species. This question allows sanctuaries to report on the threat posed by non-indigenous species. In some cases, the presence of a species alone constitutes a significant threat (certain invasive algae). In other cases, impacts have been measured and may or may not significantly affect ecosystem integrity.

- **Good** n-indigenous species are not suspected or do not appear to affect ecosystem integrity (full community velopment and function).
- **Good/Fair** n-indigenous species exist, precluding full community development and function, but are unlikely to se substantial or persistent degradation of ecosystem integrity.
- **Fair** n-indigenous species may inhibit full community development and function and may cause measurable not severe degradation of ecosystem integrity.
- **Fair/Poor** n-indigenous species have caused or are likely to cause severe declines in some but not all ecosystem nponents and reduce ecosystem integrity.
- **Poor** n-indigenous species have caused or are likely to cause severe declines in ecosystem integrity.

Question 12 (Living Resources/Key Species): What is the status of key species and how is it changing?

Certain species can be defined as “key” within a marine sanctuary. Some might be keystone species, that is, species on which the persistence of a large number of other species in the ecosystem depends - the pillar of community stability. Their functional contribution to ecosystem function is disproportionate to their numerical abundance or biomass and their impact is therefore important at the community or ecosystem level. Their removal initiates changes in ecosystem structure and sometimes the disappearance of or dramatic increase in the abundance of dependent species. Keystone species may include certain habitat modifiers, predators, herbivores and those involved in critical symbiotic relationships (e.g. cleaning or co-habitating species).

Other key species may include those that are indicators of ecosystem condition or change (e.g., particularly sensitive species), those targeted for special protection efforts, or charismatic species that are identified with certain areas or ecosystems. These may or may not meet the definition of keystone, but do require assessments of status and trends.

Good	y and keystone species appear to reflect pristine or near-pristine conditions and may promote ecosystem egrity (full community development and function).
Good/Fair	ected key or keystone species are at reduced levels, perhaps precluding full community development l function, but substantial or persistent declines are not expected.
Fair	e reduced abundance of selected keystone species may inhibit full community development and ction and may cause measurable but not severe degradation of ecosystem integrity; or selected key cies are at reduced levels, but recovery is possible.
Fair/Poor	e reduced abundance of selected keystone species has caused or is likely to cause severe declines in ne but not all ecosystem components, and reduce ecosystem integrity; or selected key species are at stantially reduced levels, and prospects for recovery are uncertain.
Poor	e reduced abundance of selected keystone species has caused or is likely to cause severe declines in system integrity; or selected key species are a severely reduced levels, and recovery is unlikely.

Question 13 (Living Resources/Health of Key Species): What is the condition or health of key species and how is it changing?

For those species considered essential to ecosystem integrity, measures of their condition can be important to determining the likelihood that they will persist and continue to provide vital ecosystem functions. Measures of condition may include growth rates, fecundity, recruitment, age-specific survival, tissue contaminant levels, pathologies (disease incidence tumors, deformities), the presence and abundance of critical symbionts or parasite loads. Similar measures of condition may also be appropriate for other key species (indicator, protected or charismatic species). In contrast to the question about keystone species (#12 above), the impact of changes in the abundance or condition of key species is more likely to be observed at the population or individual level and less likely to result in ecosystem or community effects.

Good	e condition of key resources appears to reflect pristine or near-pristine conditions.
Good/Fair	e condition of selected key resources is not optimal, perhaps precluding full ecological function, but stantial or persistent declines are not expected.
Fair	e diminished condition of selected key resources may cause a measurable but not severe reduction in logical function, but recovery is possible.
Fair/Poor	e comparatively poor condition of selected key resources makes prospects for recovery uncertain.
Poor	e poor condition of selected key resources makes recovery unlikely.

Question 14 (Living Resources/Human Activities): What are the levels of human activities that may influence living resource quality and how are they changing?

Human activities that degrade living resource quality do so by causing a loss or reduction of one or more species, by disrupting critical life stages, by impairing various physiological processes, or by promoting the introduction of non-indigenous species or pathogens. (Note: Activities that impact habitat and water quality may also affect living resources. These activities are dealt with in Questions 4 and 8, and many are repeated here as they also have direct effect on living resources).

Fishing and collecting are the primary means of removing resources. Bottom trawling, seine-fishing and the collection of ornamental species for the aquarium trade are all common examples, some being more selective than others. Chronic mortality can be caused by marine debris derived from commercial or recreational vessel traffic, lost fishing gear and excess visitation, resulting in the gradual loss of some species.

Critical life stages can be affected in various ways. Mortality to adult stages is often caused by trawling and other fishing techniques, cable drags, dumping spoil or drill cuttings, vessel groundings or persistent anchoring.

Contamination of areas by acute or chronic spills, discharges by vessels, or municipal and industrial facilities can make them unsuitable for recruitment; the same activities can make nursery habitats unsuitable. Although coastal armoring and construction can increase the availability of surfaces suitable for the recruitment and growth of hard bottom species, the activity may disrupt recruitment patterns for other species (e.g., intertidal soft bottom animals) and habitat may be lost.

Spills, discharges, and contaminants released from sediments (e.g., by dredging and dumping) can all cause physiological impairment and tissue contamination. Such activities can affect all life stages by reducing fecundity, increasing larval, juvenile, and adult mortality, reducing disease resistance, and increasing susceptibility to predation. Bioaccumulation allows some contaminants to move upward through the food chain, disproportionately affecting certain species.

Activities that promote introductions include bilge discharges and ballast water exchange, commercial shipping and vessel transportation. Releases of aquarium fish can also lead to species introductions.

- Good: w or no activities occur that are likely to negatively affect living resource quality.
- Good/Fair: ne potentially harmful activities exist, but they do not appear to have had a negative effect on living ource quality.
- Fair: ected activities have resulted in measurable living resource impacts, but evidence suggests effects are alized, not widespread.
- Fair/Poor: ected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive blem.
- Poor: ected activities warrant widespread concern and action, as large-scale, persistent and/or repeated severe pacts have occurred or are likely to occur.

Question 15 (Maritime Archaeological Resources/Integrity): What is the integrity of known maritime archaeological resources and how is it changing?

The condition of archaeological resources in a marine sanctuary significantly affects their value for science and education, as well as the resource's eligibility for listing in the National Register of Historic Places. Assessments of archaeological sites include evaluation of the apparent levels of site integrity, which are based on levels of previous human disturbance and the level of natural deterioration. The historical, scientific and educational values of sites are also evaluated and are substantially determined and affected by site condition.

- Good: own archaeological resources appear to reflect little or no unexpected disturbance.
- Good/Fair: ected archaeological resources exhibit indications of disturbance, but there appears to have been little or reduction in historical, scientific or educational value.
- Fair: e diminished condition of selected archaeological resources has reduced, to some extent, their historical, entific or educational value and may affect the eligibility of some sites for listing in the National gister of Historic Places.
- Fair/Poor: e diminished condition of selected archaeological resources has substantially reduced their historical, entific or educational value and is likely to affect their eligibility for listing in the National Register of toric Places.
- Poor: e degraded condition of known archaeological resources in general makes them ineffective in terms of torical, scientific or educational value and precludes their listing in the National Register of Historic ces.

Question 16 (Maritime Archaeological Resources/Threat to Environment): Do known maritime archaeological resources pose an environmental hazard and how is this threat changing?

The sinking of a ship potentially introduces hazardous materials into the marine environment. This danger is true for historic shipwrecks as well. The issue is complicated by the fact that shipwrecks older than 50 years may be considered historical resources and must, by federal mandate, be protected. Many historic shipwrecks,

particularly early to mid-20th century, still have the potential to retain oil and fuel in tanks and bunkers. As shipwrecks age and deteriorate, the potential for release of these materials into the environment increases.

Good	own maritime archaeological resources pose few or no environmental threats.
Good/Fair	ected maritime archaeological resources may pose isolated or limited environmental threats, but stantial or persistent impacts are not expected.
Fair	ected maritime archaeological resources may cause measurable, but not severe, impacts to certain ctuary resources or areas, but recovery is possible.
Fair/Poor	ected maritime archaeological resources pose substantial threats to certain sanctuary resources or areas, l prospects for recovery are uncertain.
Poor	ected maritime archaeological resources pose serious threats to sanctuary resources, and recovery is ikely.

Question 17 (Maritime Archaeological Resources/Human Activities): What are the levels of human activities that may influence maritime archaeological resource quality and how are they changing?

Some human maritime activities threaten the physical integrity of submerged archaeological resources. Archaeological site integrity is compromised when elements are moved, removed or otherwise damaged. Threats come from looting by divers, inadvertent damage by scuba diving visitors, improperly conducted archaeology that does not fully document site disturbance, anchoring, groundings, and commercial and recreational fishing activities, among others.

Good	or no activities occur that are likely to negatively affect maritime archaeological resource integrity.
Good/Fair	ne potentially relevant activities exist, but they do not appear to have had a negative effect on maritime haeological resource integrity.
Fair	ected activities have resulted in measurable impacts to maritime archaeological resources, but evidence gests effects are localized, not widespread.
Fair/Poor	ected activities have caused or are likely to cause severe impacts, and cases to date suggest a pervasive blem.
Poor	ected activities warrant widespread concern and action, as large-scale, persistent, and/or repeated ere impacts have occurred or are likely to occur.

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Appendix B:

Consultation with Experts and Document Review

The process for preparing condition reports involves a combination of accepted techniques for collecting and interpreting information gathered from subject matter experts. The approach varies somewhat from sanctuary to sanctuary, in order to accommodate differing styles for working with partners. The Hawaiian Islands Humpback Whale National Marine Sanctuary approach was closely related to the Delphi Method, a technique designed to organize group communication among a panel of geographically dispersed experts by using questionnaires, ultimately facilitating the formation of a group judgment. This method can be applied when it is necessary for decision-makers to combine the testimony of a group of experts, whether in the form of facts or informed opinion, or both, into a single useful statement.

The Delphi Method relies on repeated interactions with experts who respond to questions with a limited number of choices to arrive at the best supported answers. Feedback to the experts allows them to refine their views, gradually moving the group toward the most agreeable judgment. For condition reports, the Office of National Marine Sanctuaries uses 17 questions related to the status and trends of sanctuary resources, with accompanying descriptions and five possible choices that describe resource condition.

In order to address the 17 questions, sanctuary staff selected and consulted outside experts familiar with water quality, living resources, habitat, and maritime archaeological resources. A small workshop (around 10-20 participants) was convened where experts participated in facilitated discussions about each of the 17 questions. Experts represented various affiliations including Clancy Environmental Consultants, Environmental Protection Agency, Hawai'i Department of Land and Natural Resources, Kalaupapa National Historical Park, Maritime Archaeology and History of the Hawaiian Islands Foundation, Regional Counsel Navy Region Hawaii; Environmental Division, and the University of Hawaii Marine Option Program. At the workshop each expert was introduced to the questions, was then asked to provide recommendations and supporting arguments, and the group supplemented the input with further discussion. In order to ensure consistency with Delphic methods, a critical role of the facilitator was to minimize dominance of the discussion by a single individual or opinion (which often leads to "follow the leader" tendencies in group meetings) and to encourage the expression of honest differences of opinion. As discussions progressed, the group converged in their opinion of the rating that most accurately describes the current resource condition. After an appropriate amount of time, the facilitator asked whether the group could agree on a rating for the question, as defined by specific language linked to each rating (see Appendix A). If an agreement was reached, the result was recorded and the group moved on to consider the trend in the same manner. If agreement was not reached, the facilitator instructed sanctuary staff to consider all input and decide on a rating and trend at a future time, and to send their ratings back to workshop participants for individual comment.

Comment [kb138]: This is according to my list that the following people attended and that they are affiliated with these organizations:

Eric Brown
Suzanne Finney
Steve Gittings
Kelly Gleason
Rebecca Hommon
Cindy Hungter
David Mattila
Naomi McIntosh
Jeff Rosen
Hans Van Tilburg
Jeff Walters
Wendy Wiltse
Paul Wong

Please confirm that I'm not missing anyone and that their affiliations are correct.

The ratings and text found in the report are intended to summarize the opinions and uncertainty expressed by the experts, who based their input on knowledge and perceptions of local conditions. Comments and citations received from the experts were included, as appropriate, in text supporting the ratings.

The first draft of the document was sent back to the subject experts for what was called an Initial Review, a 21-day period that allows them to ensure that the report accurately reflected their input, identify information gaps, provide comments or suggest revisions to the ratings and text. Upon receiving those comments, the writing team revised the text and ratings as they deemed appropriate. The final interpretation, ratings, and text in the draft condition report were the responsibility of sanctuary staff, with final approval by the sanctuary manager. To emphasize this important point, authorship of the report is attributed to the sanctuary alone. Subject experts were not authors, though their efforts and affiliations are acknowledged in the report.

The second phase of review, called Invited Review, involved particularly important partners in research and resource management, including NOAA's Marine Debris Program and NOAA's National Marine Fisheries Service. These bodies were asked to review the technical merits of resource ratings and accompanying text, as

Comment [kb139]: Edit this based on who the report is sent to.

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well as to point out any omissions or factual errors. The comments and recommendations of invited reviewers were received, considered by sanctuary staff, and incorporated, as appropriate, into a final draft document.

A draft final report was then sent to XXX, XXX, and XXX who served as external peer reviewers. This External Peer Review is a requirement that started in December 2004, when the White House Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review (OMB Bulletin) establishing peer review standards that would enhance the quality and credibility of the federal government's scientific information. Along with other information, these standards apply to Influential Scientific Information, which is information that can reasonably be determined to have a "clear and substantial impact on important public policies or private sector decisions." The Condition Reports are considered Influential Scientific Information. For this reason, these reports are subject to the review requirements of both the Information Quality Act and the OMB Bulletin guidelines. Therefore, following the completion of every condition report, they are reviewed by a minimum of three individuals who are considered to be experts in their field, were not involved in the development of the report, and are not ONMS employees. Comments from these peer reviews were incorporated into the final text of the report. Furthermore, OMB Bulletin guidelines require that reviewer comments, names, and affiliations be posted on the agency website: http://www.osec.doc.gov/cio/oipr/pr_plans.htm. Reviewer comments, however, are not attributed to specific individuals. Reviewer comments are posted at the same time as with the formatted final document.

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The National Marine Sanctuary System

The Office of National Marine Sanctuaries, part of the National Oceanic and Atmospheric Administration, serves as the trustee for a system of 14 marine protected areas encompassing more than 150,000 square miles of ocean and Great Lakes waters. The 13 national marine sanctuaries and one marine national monument within the National Marine Sanctuary System represent areas of America's ocean and Great Lakes environment that are of special national significance. Within their waters, giant humpback whales breed and calve their young, coral colonies flourish, and shipwrecks tell stories of our maritime history. Habitats include beautiful coral reefs, lush kelp forests, whale migrations corridors, spectacular deep-sea canyons, and underwater archaeological sites. These special places also provide homes to thousands of unique or endangered species and are important to America's cultural heritage. Sites range in size from less than one to almost 140,000 square miles and serve as natural classrooms, cherished recreational spots and are home to valuable commercial industries. The sanctuary system represents many things to many people and each place is unique and in need of special protections.

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