Reducing Ship Strikes on Large Cetaceans in the Santa Barbara Channel and Channel Islands National Marine Sanctuary

I. Introduction

Following the highly unusual deaths of several blue whales in the Santa Barbara Channel and greater Southern California Bight during the fall of 2007, two of which involved confirmed ship strikes, the Channel Islands National Marine Sanctuary Advisory Council expressed a strong interest in understanding what had happened and helping to find solutions to the problem. Ultimately, Sanctuary staff would like to receive from the Sanctuary Advisory Council a set of short and long term recommendations on how best to address, manage and minimize vessel collision risks to large Cetaceans within the Santa Barbara Channel. Short-term advice is sought no later than May 2008, prior to the return of blue whales to the region, and should be focused on those actions that could be quickly implemented. Advice related to longer-term solutions need not be completed by May 2008. The Sanctuary Advisory Council formed a subcommittee on November 16, 2007 that took on the responsibility, working with Sanctuary staff, to develop a process proposal for consideration by the Sanctuary Advisory Council (SAC or Advisory Council). The SAC reviewed and approved the following proposal at their January 25, 2008 meeting.

This document provides background on the 2007 ship strikes, the role of the SAC, research and monitoring needs, and the role of education and outreach. A variety of other information needs are outlined on shipping activities, mapping, and aircraft operations. Also included is a short list of potential options warranting further review for reducing the risk of ship strikes on large Cetaceans.

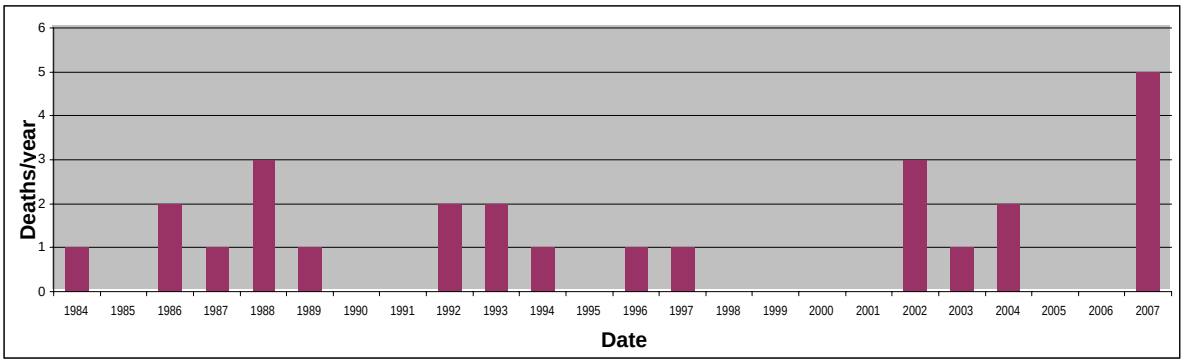
II. Background

Blue whales (*Balaenoptera musculus***)** are widely appreciated as the largest animal that has ever lived on this planet and as a species that has undergone profound depletion as a consequence of commercial whaling and other human impacts. The current status of the Eastern Pacific Stock is approximately 1,744 (CV = 0.28) animals. They are protected under the Endangered Species Act as well as the Marine Mammal Protection Act[1]. A distinct population of the Eastern Pacific Stock spends a significant fraction of the year in the Santa Barbara Channel and within the boundaries of the Channel Islands National Marine Sanctuary (CINMS or Sanctuary), approximately from June- through November, feeding on vast clouds of planktonic krill.

During the fall of 2007 there were five confirmed blue whale fatalities in the Southern California Bight. Previously, the greatest number of blue whale fatalities in one year off of California was three (1988 and 2002 respectively), and these fatalities were separated by hundreds of miles (Marin to San Diego County in 2002) and several months. Five fatalities between the months of

[1] NMFS Blue Whale Stock Assessment (2004) http://www.nmfs.noaa.gov/pr/pdfs/sars/po2004whbl-en.pdf

September and November across a space focused on the Northern Channel Islands are anomalous, warranting additional research (see figure below). Of the four whales that have been examined, including an adult female and nearly full term infant combination, at least three were struck by ships and ship strikes are indicated as the proximal cause of death of at least two of them. While ship strikes may have been the proximal cause, it remains to be seen if other variables or contributing factors, such as domoic acid, mid-frequency acoustic testing, ambient noise sources, infectious disease, and an unusually shallow and/or dispersed aggregation of krill or simply increased local density of whales may have been contributing factors. In 2004, NOAA's National Marine Fisheries Service (NMFS) determined that the Potential Biological Removal (PBR) of this species as 1.4 whales per year in U. S. waters based on their current, endangered population status.[2] The PBR is the maximum number of animals, not including natural mortalities that can be removed from a stock while allowing the stock to reach or maintain its optimum sustainable population. NMFS has designated the 2007 incidents as an Unusual Mortality Event (UME). A UME is defined under the Marine Mammal Protection Act as "a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response."



III. Role of the Sanctuary Advisory Council

At their November 16, 2007 meeting the Sanctuary Advisory Council expressed a strong interest in understanding and providing guidance to the responsible agencies. As a first step they formed a subcommittee that worked with CINMS staff to design a Sanctuary Advisory Council-based pubic process to develop advice on reducing ship strikes to large cetaceans in the Santa Barbara Channel. The SAC offers several advantages for serving as a focal group to help develop recommendations on this issue. Membership of the SAC includes relevant agencies involved with protection of large cetaceans (e.g., NMFS, NMSP) and large vessel traffic (USCG), as well as the shipping industry (via the Marine Exchange of Southern California). The SAC also has a set meeting schedule that assures these parties will meet every two months, fosters collaborative discussions and strengthens partnerships. The SAC can also bring additional resources to this issue from existing sub groups, called Working Groups, whose members have expertise in science (i.e., the Research Activities Panel), marine conservation (i.e., the Conservation Working Group), and education. SAC meetings serve as natural public forums that are readily accessible to the community, and which facilitate clear communication between agencies and the public.

[2] NMFS Blue Whale Stock Assessment (2004) http://www.nmfs.noaa.gov/pr/pdfs/sars/po2004whbl-en.pdf

Advisory Council members offer a wealth of knowledge and wisdom based on their experience with the waters of the Santa Barbara Channel. Finally, the Advisory Council has a proven track record of crafting sensible, forward-looking management advice that can be implemented by NOAA and other agencies.

Sanctuary Advisory Council Subcommittee

Formed by the Sanctuary Advisory Council on November 16, 2007, the Subcommittee on Large Cetaceans and Shipping was asked to work with Sanctuary staff to develop a proposal for involving the Council and others in a publicly-accessible process focused on addressing this issue. This staff and Subcommittee proposal was presented to the Sanctuary Advisory Council for discussion and was adopted at the January 2008 meeting.

Subcommittee Membership:

1. Dianne Black, SAC Chair, and Santa Barbara County
2. Linda Krop, SAC Vice Chair, Conservation Representative and Chair Conservation Working Group
3. LTJG Brittany Steward, US Coast Guard District 11, Living Marine Resources
4. Elizabeth Petras, NMFS SW Office of Protected Resources
5. Capt. Manfred H.K (Manny) Aschemeyer, Marine Exchange of Southern California
6. Dr. Robert Warner, UCSB Ecology, Evolution, & Marine Biology, and RAP Chair
7. Steven Schwartz, Environmental Protection Specialist, NAVAIR Sustainability Office, US Navy, Point Mugu
8. Russell Galipeau, Superintendent, Channel Islands National Park (added by SAC Jan. 2008)

Short term-recommendations for improving protection of large cetaceans should ideally be delivered to the Sanctuary Advisory Council not later than their May 30, 2008 meeting. Given this short time horizon the SAC subcommittee is best suited to address the short term tasks and develop recommendations. Specifically, tasks include a review of the USCG, NMFS, and CINMS operations, outreach and actions during the fall of 2007 when the ship strikes occurred. Input by May 2008 will allow for subcommittee recommendations to be acted upon by the Advisory Council (e.g., endorsed, adopted, passed-along) and delivered to the CINMS Superintendent (and, by extension, other agencies and organizations, as appropriate) prior to the summer arrival of blue whales to the Santa Barbara Channel. Another task for the subcommittee is to discuss and detail expectations and roles of a future potential working group to address longer-term solutions to reducing ship strikes.

Potential Working Group and Membership

Sanctuary Advisory Council Working Groups are composed of Advisory Council members and persons outside the Advisory Council. All Working Groups are chaired by a member of the Advisory Council and function under the purview of the Advisory Council. A number of standing Working Groups have been formed to provide the Council with ongoing input on such

areas as research, education, commercial fishing, recreational fishing, Chumash interests, and conservation issues. In addition, task-specific Working Groups are occasionally established by the Advisory Council to address specific issues, and then are disbanded once final advice is submitted to the SAC. As with all Advisory Council meetings, Working Group meetings are open to the public.

A task-specific Working Group could provide an appropriate organizing structure to bring together agency representatives, stakeholders and experts to focus on this issue and provide management recommendations to the Sanctuary Advisory Council. Working Group membership could include representation from:

- NOAA National Marine Fisheries Service, Office of Protected Resources, SW Region
- NOAA National Marine Fisheries Service, Southwest Fisheries Science Center
- NOAA Channel Islands National Marine Sanctuary
- West Coast regional NMS office representation
- United States Coast Guard, Sector LA/LB
- United States Coast Guard, District 11
- International Maritime Organization (IMO)
- United States Navy
- Santa Barbara Museum of Natural History – Michelle Berman
- Regional Air Quality Control Board representatives
- Conservation Community
- Marine Exchange of Southern California - Capt. Manny Aschemeyer
- Shipping Industry
- Ports and Harbors
- Tourism / Business – whale watch industry
- Recreational boaters/yachters
- Commercial fisheries

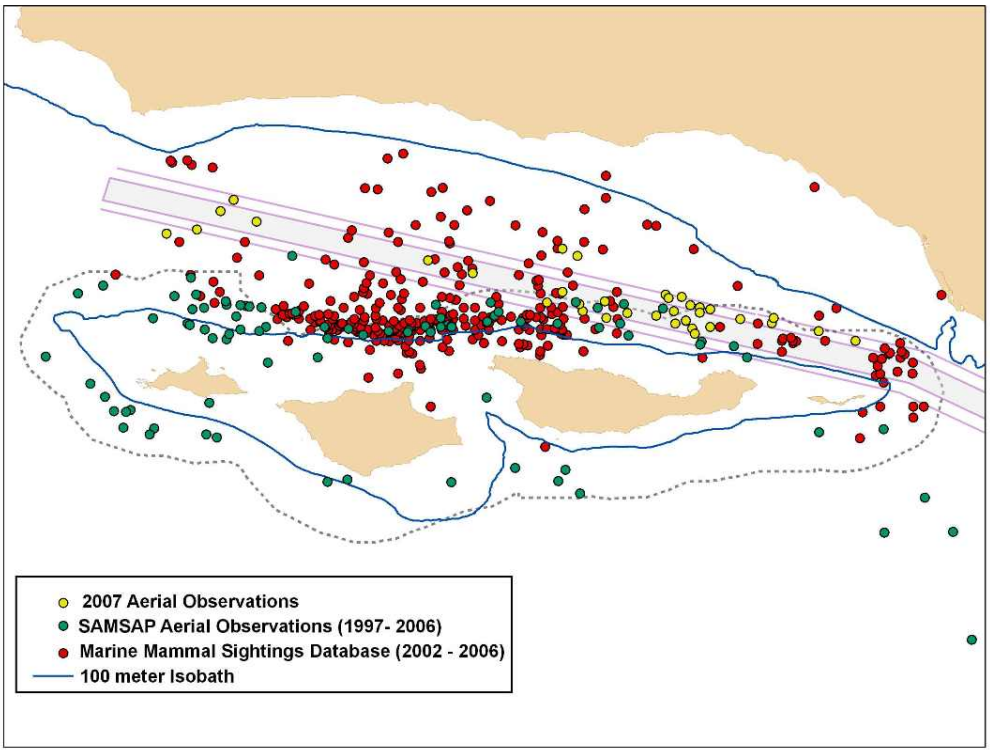
Working Group meetings and timelines

It is expected that recommendations for potential long-term solutions will take more time to develop. An end point to a Working Group's deliberations has not yet been determined or estimated, but should be part of the group's initial charge. The number of Working Group meetings has not yet been determined. In-person meetings are desired, and would be held in public settings.

IV. Research and Data Needs

Given this year's blue whale mortalities there is a need for monitoring to evaluate the status of the great whales (e.g., gray, blue, humpback, fin, sei, minke and sperm) in the sanctuary and Santa Barbara Channel, and the patterns of habitat use with an eye toward management of whale-ship interactions.

Since 1999 CINMS has been maintaining a database of marine mammal sightings. Over 4800 whale sightings have been documented by diverse citizen-observers who have recorded observations of marine mammals, including eight whale species. While the data are limited by the lack of a structured sampling design, they are useful in illustrating the distribution of the whales in the Santa Barbara channel. In the map below the colored dots represent the distribution of over 700 blue whale sightings in the sightings database or made by CINMS staff over the entire period from 2002 to now. Also plotted is the boundary of the CINMS (dotted line), the 100m isobath (solid blue line) and the shipping lanes.



Potential Science Advisors

- Robert Warner (UCSB, MSI, Chair of RAP)
- Bruce Mate, (University of Oregon)
- Meagan McKenna, (Scripps Institute of Oceanography)
- Bill McClellan (UNC Willmington)
- Don Kroll (UCSC)
- Karin Forney or Jim Carretta of the SWFSC

Others might include:

- John Calambokidis (Cascadia Research)
- Baldo Marinovic (UCSC)
- Gerry Kooyman (SIO)
- Ann Pabst (UNCW)

It remains to be seen if the spatial distribution of the whales varies year to year in a predictable manner, or if specific oceanographic events are predictive of seasonal distribution variation. The concentration of blue whale observations along the 100-130m isobaths along the north side of the islands along the CINMS boundary is consistent with models of whale behavior that are based on interactions with daily movement behavior of krill inferred from studies in other places in the Pacific. In addition, it is clear that the concentration of sightings overlaps with the shipping lanes at the eastern part of the CINMS creating an increased potential for whale/ship interactions. Any potential management of whale/ship interactions will require input from monitoring designed across this scale and addressing the distributions of krill, the wind and currents that determine their densities, the water quality upon which they depend and the abundance and distribution of whales.

Working with diverse partners CINMS is preparing a comprehensive monitoring plan to address this need. The plan includes recruiting and adapting current monitoring and adding a modest set of data collection tasks to produce a monitoring program that meets management and the community's need for data at a truly modest additional cost. Proposed monitoring components include:

Ongoing Research and Monitoring Activities

Continue SAMSAP[3] overflights. Continue current aerial flight surveys with some redesign and conduct additional flights to cover whale monitoring in addition to current enforcement and human use of sanctuary resource monitoring.

Maintain and update the Marine Mammal Observation Database within CINMS. The value of the database is apparent on inspection in the figure above – among other things this provides the pilot data that informs the development of an economical survey design. Value here will be added by enhanced outreach to the community of data contributors (predominantly members of the Channel Islands Naturalist Corps) that emphasizes the value of the data being contributed by these citizen-scientists who regularly ride with the local whale watch vessels.

Continue to monitor broad-band acoustics in the Sanctuary. Current activities include research monitoring of acoustics within the channel conducted by partners at Scripps Institution of Oceanography (SIO). This scientific activity will collect data on anthropogenic as well as biogenic noise sources and needs to be coordinated with other assets to maximize value to this monitoring program.

Continue to coordinate with ongoing research on blue whale movement within the CINMS. Research groups from Oregon State University and the Cascadia Research Collective are tracking movements of individual whales and cataloging the identities of individual whales with photo databases. This monitoring of individual behavior and movement patterns is critical to interpreting population-level data collected in other monitoring activities.

[3] Sanctuary Aerial Monitoring Spatial Analysis Program

Possible New Research and Monitoring Activities

Deploy the R/V Shearwater[4] for a structured survey design to assess marine mammal and sea bird abundance with visual survey transects around the islands. These surveys will adopt the protocols used in the Gulf of the Farallones National Marine Sanctuary.
Monitor krill distributions with acoustics already aboard the R/V Shearwater simultaneous with the visual survey transects and supplement this with acoustics and validation plankton tows at targeted "sentinel" transect sites. These protocols have been deployed in Monterey Bay and could be adapted for implementation here with modest additional resources.

Sample water quality for chlorophyll a, nitrate and domoic acid. Indexes of primary productivity and nutrients will be critical to interpreting the observed krill distribution patterns. Currently, R/V Shearwater monitors water temperature, salinity, dissolved oxygen and pH on a continuous basis with an onboard flow-through water sampling device. Funds are required to add sensors for chlorophyll a and nitrate to this on board suite of instruments. Water samples will be collected as a part of the proposed Shearwater transect surveys for later assay for domoic acid and other toxins.

Coordinate with physical oceanography and remote sense research programs at the University of California Santa Barbara (UCSB). Developing predictive relationships between physical oceanographic processes that are amenable to remote sense monitoring and whale behavior will require coordination of field monitoring and remote sense research from the beginning. In addition to sea surface current sensing and satellite imagery for water temperature and productivity, UCSB research programs have developed high resolution circulation modeling products that can powerfully improve the relevance of remote sense data to predicting krill distributions.

Pulling these elements together will provide a comprehensive monitoring plan that, when enacted, will address many questions critical to management of these great whales. These questions may include:

- What is the population status of whales that are using the CINMS domain and the adjacent waters?
- What are the spatial and temporal patterns of habitat usage by these whales – where habitat incorporates large and medium scale oceanographic features and processes?
- How are patterns of habitat usage related to patterns of primary and secondary productivity?
- Are there predictive relationships that relate monitored water conditions to whale distribution on a scale that can mitigate whale ship interactions?
- Are there specific times of day or season where whale/ship interactions are more or less likely?

The monitoring plan as described provides additional research and monitoring dividends that include:

- Status assessments of the seabirds that use CINMS resources

[4] http://channelislands.noaa.gov/res/vessel_part.html

- Status assessments of other marine species in the CINMS, including gray, humpback and fin whales and possibly sea turtles.
- Status monitoring and evaluation of water quality in diverse contexts that include human use and recreation.

The elements of this monitoring plan leverage ongoing work in the CINMS and the local research community (UCSB & SIO). However, to deploy the comprehensive plan that will address these questions CINMS will require supplemental resources. Additional hardware needed includes a multi-stage plankton sampler and additional water quality sensors for the R/V Shearwater. Some additional funds will be required to supplement the current SAMSAP activities with additional aerial surveys. A contract staff position is needed to process the physical and biological samples. In addition, two full-time two-year post-doctoral level positions would be needed to perform analytical synthesis of the information; one of these will focus on the marine biological and ecosystem information, and the other will focus on informatics and the integration of large scale remote sensing data with on the ground monitoring data.

V. Other Research and Data Needs

A variety of other needs have been initially identified and should be further explored, including:

- Tracking and analyzing large vessel traffic with the Automated Identification System (AIS) and SAMSAP;
- Ascertain relative levels of vessel compliance for piloting notices and recommendations for reduced vessel speeds that are distributed by the LA/Long Beach MAREX and the US Coast Guard. For example, existing AIS data from last fall could be overlaid upon a schedule showing the release dates of the various notices that were released to mariners during the UME, to quantitatively establish what language and which channels proved most successful in achieving compliance among vessels for the recommended changes to navigation.
- Understanding economics of the shipping industry – historical, current and projections for future, global shipping data and influences;
- Identification of various jurisdictions and administrative and regulatory processes relevant for implementation of any policy recommendations;
- Research technology driven solutions, including an assessment of technology that is available to detect and deter whales. Representatives from various technology interests could assist the group with this portion of the study.

- Learning from various case studies:
  - Stellwagen Bank National Marine Sanctuary (NMS) - Right whales and Boston harbor (http://rwhalesightings.nefsc.noaa.gov/)
  - Gray's Reef National Marine Sanctuary – Right whale avoidance regulations and programs (http://graysreef.noaa.gov/)
  - Hawaiian Islands Humpback Whale National Marine Sanctuary -- Humpback whales and safe boating (http://hawaiihumpbackwhale.noaa.gov/safe_boating.html)
  - History of the establishment of the Santa Barbara Channel Traffic Separation Scheme (TSS)

- Designation of Areas to be Avoided (ATBA), such as at the Olympic Coast National Marine Sanctuary (http://olympiccoast.noaa.gov/protection/atba/welcome.html)

VI. Potential Strategies to Reduce Ship Strikes

The Sanctuary Advisory Council has engaged in discussions regarding potential strategies to reduce ship strike risk. However, no preferred strategy has been identified because more information and discussion is needed. Effective strategies should strive to protect large cetaceans in the Santa Barbara Channel while also facilitating ship traffic safely, efficiently, and economically. It is envisioned that a variety of ideas will be considered in a Working Group process. Suggestions mentioned to date include:

- Adjust ship speeds. Consider temporal, seasonal and geographic conditions.
- Place observers on board ships when large whales are in the Channel
- Adjust shipping lanes: consider options within the Santa Barbara Channel, outside the Channel, and seasonal variations.
- Timely distribution of whale siting data to shipping industry

Research is needed on the relative effectiveness of these and potentially other methods to actually reduce shipstrikes, in addition to understanding the diverse variables in play. It will be critical to create a timeline for the development of interim measures as well as longer term recommendations.

VII. Education and Outreach

Effective education and outreach will target specific audiences on how to protect large cetaceans in the Santa Barbara Channel and Channel Islands National Marine Sanctuary. A first step would be to characterize different audiences affected by this issue (i.e. shipping industry, whale watch operators, marine mammal stranding program response centers, etc.) and identify tools (press releases, Local Notice to Mariners, etc.) and modes of delivery (website, notice to mariners, etc) to effectively distribute information. This would entail providing adequate resources (staff and products) to communicate effectively and to interface with the different audiences in our region. One of the primary sanctuary interfaces with the public is the Channel Islands Naturalist Corp Volunteer (CINC) program. CINC volunteers provide interpretation about wildlife, including cetaceans, aboard whale watch vessels and Channel Islands National Park Island Concessionaire vessels operating out of Channel Islands, Ventura, and Santa Barbara Harbors. They also provide outreach at different venues including events like whale watch festivals, Earth Day events and other settings, and offer presentations to schools and community groups. Another important interface is coordinating communications with the media and other partners. It will be important to develop appropriate communication tools about any measures being taken to strategically address and understand this issue.

Initial Suggestions:

- Define and develop an outreach strategy to effectively communicate to the shipping industry (conduct a needs assessment);
- Develop a media strategy and talking points related to this issue in preparation of the summer migration of large cetaceans to the SB Channel and CINMS;
- Train CINC volunteers and provide them with appropriate materials to interpret the issue to the public;
- Maintain and update a current website related to this issue that would include regular updates from the working group;
- Provide real-time whale location information on CINMS/other partner websites.
- Sanctuary education and outreach staff to serve as liaisons to Principle Information Officers of partnering agencies and organizations;
- Coordinate the development of various outreach products to address different audiences identified by the Working Group, including these possible short term approaches:
    - USCG Sector LA/LB - Notice to Mariners (NOTAM) – hourly and weekly (district level)
    - NOAA National Weather Service Oxnard office -- regular weather radio broadcasts
    - Sanctuary Website
    - Other partner websites and newsletters (e.g. SBMNH[5])
    - Provide near real time whale locations and maps to mariners
    - MAREX broadcasts and communication with the shipping industry

VIII. Operations

During the 2007 blue whales/ship strike incidents, Sanctuary staff coordinated regular overflights of the shipping lanes with the U.S. Coast Guard and the California Department of Fish and Game. During overflights, sanctuary staff recorded the locations of blue whales and blue whale behavior. This data was then compiled using Geographic Information System (GIS) software to create blue whale distribution maps. The maps provided near real-time information to mariners about the presence and general distribution of blue whales. The maps were shared with a variety of agencies and entities, including the NMFS Office of Protected Resources, U.S. Coast Guard, California Department of Fish and Game, the Santa Barbara Museum of Natural History, the Marine Exchange of Southern California, and whale scientists. It is envisioned that such services will be important for managing whale/ship interactions, and that a Subcommittee discussion of this will provide additional insights and recommendations.

Regional Aircraft Operation Assets

- USCG Air Station Los Angeles - HH-65 helicopter flight support
- USCG Air Station Sacramento - C-130 flight support
- California Department of Fish and Game – Partenavia flight support (via use of CINMS enforcement fund)
- NOAA/CINMS flight observers

[5] Santa Barbara Museum of Natural History

- Scheduling flights, determining flight paths, developing data recording sheets, mapping locations, (factor in seasons and geography)