

# **Differentiating Serious and Non-Serious Injury of Marine Mammals:**

## **Report of the Serious Injury Technical Workshop 10-13 September 2007, Seattle, Washington**

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This Technical Memorandum contains recommendations of Federal Government participants and the workshop Steering Committee concerning the guidance and process for distinguishing serious from non-serious injuries. These recommendations do not represent official NMFS policy

## EXECUTIVE SUMMARY

### Background

The Marine Mammal Protection Act (MMPA) section 117 requires the National Marine Fisheries Service (NMFS) to prepare stock assessment reports (SAR) for all stocks of marine mammals that occur in waters under the jurisdiction of the United States. These reports summarize human-caused mortalities and serious injuries to marine mammals by source. In addition, MMPA section 118 requires commercial fisheries to reduce mortality and serious injury of marine mammals to insignificant levels approaching a zero mortality and serious injury rate. This charge requires that NMFS distinguish between injuries that are serious and those that are not serious. NMFS defined “serious injury” in regulations (50 CFR 229.2) as “any injury that will likely result in mortality.” However, the MMPA and its legislative history do not provide guidance on how severe an injury must be to qualify as “serious.”

To promote national consistency for interpreting the regulatory definition of serious injury, NMFS convened a workshop in April 1997 to discuss available information related to the impact of injuries to marine mammals incidental to commercial fishing operations (Angliss and DeMaster, 1998). Since 1997, additional information has been collected on human-caused injuries to marine mammals and survival rates of certain individual and/or species of marine mammals. For this reason, NMFS convened the Serious Injury Technical Workshop on September 10-13, 2007, with the primary objectives to: 1) review the recommendations and guidance from the 1997 workshop; 2) review new information obtained since the first workshop; and 3) discuss the use of, and necessary changes to, existing guidance for distinguishing serious from non-serious injuries. The 2007 workshop extended beyond discussions related only to marine mammal-commercial fishery interactions. Although other sources of human-caused injuries were mentioned during the workshop, much of the 2007 workshop discussions focused on types of injuries commonly observed from encounters with vessels and fisheries (e.g., blunt force trauma, penetrating, hidden, and gear and hooking injuries) because these interactions have been examined to the greatest extent.

The 2007 workshop consisted of two sessions: an open session (Days 1-3) attended by over 65 federal and non-federal participants, and a closed session (Day 4) attended by 36 federal participants. NMFS invited workshop participants based on their expertise in marine mammal serious injury issues, including marine mammal management, policy, marine mammal biology, pathobiology, and veterinary medicine. The primary purposes of Days 1-3 were to present a synthesis of new science and to gather new information on injured marine mammals. The information from Days 1-3 was also used to provide a scientific basis for recommendations by government officials in the closed session on Day 4. The primary purpose of the closed session (Day 4) was to draw on Days 1-3 presentations and discussions to consider potential changes to the existing serious injury guidance and associated administrative approaches.

The topics addressed during Days 1-3 included:

- 1) Evaluation of current data and determination systems (in plenary and breakout sessions);
- 2) Overview of new information on survival of injured marine mammals (large cetaceans, small cetaceans, pinnipeds, and manatees);
- 3) Pathobiology of injuries; and

- 4) Breakout activities to address key questions on the topic of determining severity of injuries to marine mammals.

## **Presentation Sessions (Days 1-2)**

### Current Data Sources and Collection Programs

This session included presentations by the NMFS observer, stranding, and disentanglement programs. The presentations were designed to describe the types of information that are collected in these programs and the scope (including limitations) of the kinds of information that are reasonable to collect. In this way, these presentations provided workshop participants with a background of the information used to distinguish between serious and non-serious injuries in order to inform discussion and lead to realistic suggestions on the types of additional data needs for distinguishing between serious and non-serious injuries.

### Current Serious Injury Determination Systems

Representatives from each NMFS region provided presentations describing the types of data collected and associated challenges, evaluating regional approaches for distinguishing serious from non-serious injuries, and the overall challenges each region faces. Workshop participants then discussed and evaluated the procedures described in each presentation for distinguishing serious from non-serious injuries. The most common comments from participants indicated a need for more national consistency in distinguishing between serious and non-serious injuries, and for increased communication between data collectors, stranding networks, and the staff responsible for distinguishing between serious and non-serious injuries.

### New Information on the Survival of Injured Marine Mammals: Large Cetaceans, Small Cetaceans, and Manatees

Invited speakers presented and discussed new information obtained over the past decade on the survival of injured marine mammals by taxonomic group (large cetaceans, small cetaceans, and manatees). The presentations were designed to present information gathered since the 1997 workshop from longitudinal studies of various cetacean populations and scar-based analyses. Following the presentations, in plenary sessions, participants discussed if and how the information presented could be incorporated into the system for distinguishing serious from non-serious injuries.

### Pathobiology of Injuries

The final group of presentations addressed the pathobiology of injuries. The presentations were designed to describe how pathobiology may be used to determine whether an injury caused or contributed to the death of an animal, information that could serve to help predict the lethality of injuries to marine mammals. Following the presentations, in plenary sessions, participants discussed if and how the information presented could be incorporated into the system for distinguishing serious from non-serious injuries.

## **Subgroup Discussions (Day 3)**

Day 3 of the workshop was devoted to morning and afternoon breakout session discussions, which were designed to address the following six topics without gathering consensus

recommendations from the group (i.e., all suggestions were considered opinions of individual participants):

*Concurrent morning sessions:*

- 1) Longitudinal/survival rates from a modeling perspective;
- 2) Categorization of injuries and pathological consequences: Gear-related injuries; and
- 3) Categorization of injuries and pathological consequences: Sharp, blunt force, and penetrating injuries.

*Concurrent afternoon sessions:*

- 4) Large cetaceans;
- 5) Small cetaceans; and
- 6) Pinnipeds and other species.

### Key Outcomes from Day 3 Subgroup Discussions

Most common comments related to serious injury criteria and the determination process:

- 1) NMFS should develop a risk assessment/matrix approach for use in distinguishing serious from non-serious injuries that is nationally consistent (incorporating flexibility while limiting subjectivity) and is based on factors affecting survival for each marine mammal species.
- 2) NMFS should gather a national panel annually, including NMFS staff from each region, decision analysis experts, and other external experts to review serious injury determinations.
- 3) NMFS should revise (and/or develop) and use consistent terminology based on the observable physical injuries to objectively describe injuries.

Diverging views related to serious injury criteria and the determination process:

- 1) Aside from assuming all injuries are mortal unless proven otherwise, a new approach is unlikely to significantly increase the number of injuries classified as “serious injuries” for large whales if it relies on anecdotal reports, as do current large whale systems. Even in well-documented populations, individuals are under observation by researchers for a small fraction of their lives.
- 2) We must differentiate between means for improving the accuracy of injury assessment and prognosis when injuries are observed, and means for improving the accuracy of estimates of all (observed and unobserved) human-caused mortality and serious injury. The reliance on anecdotal reports makes these distinctly different for large whales.

Most common comments related to data needs:

- 1) The observer, stranding, and disentanglement programs are collecting useful data and have improved over the past decade. Further improvements could be made by standardizing data between all regions and between data collection programs; and increasing communication and coordination between NMFS staff from different programs and different regions.
- 2) NMFS should examine data collected by a variety of NMFS programs and external researchers to determine whether injured animals are documented in multiple data sets.
- 3) NMFS should continue longitudinal studies for currently well-monitored marine mammal populations and begin (or expand) studies for lesser or unmonitored populations.

Most common comments related to the categorization of injuries:

- 1) Participants agreed the following are or could be considered serious injuries for all marine mammals species:
  - Ingestion of gear;
  - Constricting lines or lines with the potential to constrict as an animal grows;
  - Head trauma; and
  - Body cavity penetration.
- 2) Physiological and behavioral differences exist between species and taxonomic groups, which cause differences in the severity of certain injuries for different species.
- 3) Vessel size and speed “source” information should be included in any guidance for distinguishing between serious and non-serious injuries because the severity of the injury resulting from a vessel strike depends on the size and speed of the vessel.

### **Recommendations of Government Staff: Updated Process and Guidance for Distinguishing Serious from Non-Serious Injury (Day 4)**

The primary purpose of the closed federal session was to draw on presentations and discussions from the first three days, consider what has worked well in distinguishing serious from non-serious injuries since 1997, what has not worked well, and recommend potential changes to the existing serious injury guidance (Angliss and DeMaster, 1998, and subsequent NMFS Regional publications).

#### Key Outcomes from Day 4 Discussions:

- 1) Most of the Day 4 participants expressed the view that the current serious injury guidance should be revised and updated to capture current knowledge about impacts of injury on marine mammals and to strive for improvements in national consistency in distinguishing serious from non-serious injuries.
- 2) Nearly all the Day 4 participants recognized that NMFS is close to where it should be in the assessments of detected animals. However, undetected injuries exist that are not being incorporated into population assessments; therefore, NMFS needs to devise a mechanism to better account for undetected injuries. One participant noted that the development of one single set of criteria was not the appropriate mechanism for accounting for undetected injuries.
- 3) The Day 4 participants supported the development and publication of an official NMFS policy to reflect the recommended serious injury guidance discussed on Day 4 (outlined below). This policy should strive for nationally consistent criteria to use when distinguishing serious from non-serious injuries, while allowing for flexibility in data-rich situations. This policy should also include what is meant by the term “likely” in the definition for serious injury, “injury that will *likely* result in a mortality,” because different working definitions are currently in use for different stocks nation-wide. However, participants specifically recommended against pursuing these changes through rulemaking. Creating a legal definition for the term *likely* in the serious injury definition is not necessary and could have far-reaching implications beyond the realm of serious injury determinations.

- 4) Federal participants constructed a matrix containing revised guidance for distinguishing serious from non-serious injuries (Table 1 below). The recommendations are expressed in matrix form multiple injury scenarios arrayed across three taxonomic groups of marine mammals: large cetaceans, small cetaceans, and pinnipeds. Table 1 is based upon guidance from the 1997 Workshop (Angliss and DeMaster, 1998) and technical memoranda from NMFS' Northeast Fishery Science Center (Cole *et al.*, 2005; Cole *et al.*, 2006; Nelson *et al.*, 2007; Glass *et al.*, 2008). Table 1 categorizes each injury scenario as “serious injury,” “not serious injury,” or “cannot be determined/case specific” (CBD) for each taxonomic group. Table 1 incorporates a synthesis of new information presented and discussed at the workshop.

This table is meant to provide a starting point/guidance for distinguishing serious from non-serious injuries in situations where there are little data and/or the resighting of an injured animal is unlikely. Participants recognized that alternate guidance may be available in data-rich situations where an injured animal has a higher likelihood of being resighted (as with baleen whales in the NER). The purpose of the table is to improve national consistency in distinguishing serious from non-serious injuries, and to provide a starting point for developing future NMFS policy for distinguishing serious from non-serious injuries.

In addition to specific revisions and updates to the existing guidance, Table 1 outlines two substantial recommended changes from the current process for distinguishing between serious and non-serious injuries as a whole:

- Expand the dichotomous determination process (all injuries are “serious” or “not serious”) to include a third category representing uncertain cases (injuries can now be classified as “serious,” “not serious,” or “CBD/case specific”). The recommended addition of a “CBD/case specific” category takes into account two circumstances: 1) there is insufficient information about the impact of a particular injury to determine whether it is a serious or non-serious injury; and/or 2) it is possible to determine whether a particular injury is a serious or non-serious injury, but additional factors must be considered on a case-by-case basis.
- Create guidance with separate criteria for different marine mammal taxonomic groups, to allow for differences in physiology and the amount and type of data that are available.

**Table 1: Recommended Serious Injury Criteria for Different Taxonomic Groups \***

<b>SI = Serious Injury; NSI = Not Serious Injury; CBD/case specific = Potential SI, but either 1) insufficient information about the impact of a particular injury, or 2) additional factors must be considered on a case-by-case basis to determine the severity; n/a = not applicable; TBD= To Be Determined; ■ = areas lacking near-complete agreement among Day 4 participants.</b>				
<b>Criterion</b>	<b>Injury/Information Categories</b>	<b>Large Cetaceans</b>	<b>Small Cetaceans</b>	<b>Pinnipeds</b>
<b>Pre-Existing Guidance (included in Angliss and DeMaster (1998) and/or NEFSC publications, retained with no changes)</b>				
1	Ingestion of gear or hook	SI	SI	SI
<b>Modified Criteria (some aspects retained from guidance provided in Angliss and DeMaster (1998) and/or NEFSC publications, with some changes or additions)</b>				
2	A free-swimming animal observed at a date later than its human interaction, exhibited a marked change in skin discoloration, lesions near the nares, fat loss, or increased cyamid loads, etc.	SI	SI	SI
3	Gear constricted on any body part, or likely to become constricting as the animal grows	SI	SI	SI
4	Uncertain whether gear is constricting, but appendages near the entanglement's point of attachment are discolored	SI	SI	SI
5	Anchored/immobilized (not freed)	SI	SI	SI
6	Head trauma (including eye injuries)	SI	SI	SI
7	Hook in mouth (excluding case 9 below), no trailing gear	CBD/case specific	SI	SI
8	Hook confirmed in head (excluding mouth), no trailing gear	NSI	SI	CBD/case specific
9	Hook confirmed in lip only, no trailing gear	n/a	CBD/case specific	CBD/case specific
10	Gear attached to free-swimming animal with potential to 1) wrap around pectoral fins/flippers, peduncle, or head; 2) be ingested; or 3) accumulate drag	■ CBD/case specific	SI	SI
11	Animal freed from gear and released without gear	CBD/case specific	CBD/case specific	CBD/case specific
12	Social animal separated from group or released alone	CBD/case specific	CBD/case specific	CBD/case specific
13	Dependent animal (e.g., calf, pup) alone post-interaction	SI	SI	SI
14	Wrap(s) of gear around pectoral fin/flippers, peduncle, head, abdomen, or chest	CBD/case specific	SI	SI
<b>New Criteria</b>				
15	Deep, external cut or laceration to body	CBD/case specific	CBD/case specific	CBD/case specific
16	Body cavity penetration by foreign object or body cavity exposure	SI	SI	SI



<b>Criterion</b>	<b>Injury/Information Categories</b>	<b>Large Cetaceans</b>	<b>Small Cetaceans</b>	<b>Pinnipeds</b>
17	Visible blood loss	CBD/case specific	CBD/case specific	CBD/case specific
18	Loss or disfigurement of dorsal fin	CBD/case specific	CBD/case specific	n/a
19	Partially severed flukes (transecting midline)	SI	SI	n/a
20	Partially severed flukes (not transecting midline)	CBD/case specific	CBD/case specific	n/a
21	Partially severed pectoral fins or flippers	CBD/case specific	CBD/case specific	CBD/case specific
22	Severed pectoral fins or flippers	CBD/case specific	CBD/case specific	SI
23	Entanglement, immobilization or entrapment of a certain duration before being freed (TBD, species-dependent)	SI	SI	SI
24	Body trauma not covered by cases 6, 15, and 16 above (e.g., broken appendages, hemorrhaging)	CBD/case specific	CBD/case specific	CBD/case specific
25	Detectable fractures	SI	SI	SI
26	Hook in appendage, without trailing gear or with trailing gear that does not have the potential to wrap, be ingested, or accumulate drag	NSI	NSI	NSI
27	Animal brought on vessel deck following entanglement/entrapment	n/a	SI	CBD/case specific
28	Vertebral transection	SI	SI	SI
29	Dog Bites <sup>o</sup>	n/a	n/a	CBD/case specific

\* See number 4 on page 7 above for additional details on the intent and purpose of Table 1.

<sup>o</sup> This criterion was not included by the Day 4 Participants. The workshop Steering Committee added this criterion for clarity. About ¾ of the Day 4 participants preferred subsuming dog bites under criteria 6, 15, 16, or 24 (depending on the injury inflicted by the dog bite). The pinniped experts generally preferred to include dog bites in a separate category, because of the additional potential for inter-species disease transmission.