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Injury Determinations for Humpback Whales and Other Cetaceans Reported to NOAA Response Networks in the Hawaiian Islands during 2007-2012

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ABSTRACT

Reports of cetaceans with human-caused injuries in Hawaiian waters are made each year to the Pacific Islands Region Marine Mammal Response Network (PIR-MMRN, coordinated by the Pacific Islands Regional Office) and the Hawaiian Islands Entanglement Response Network (HIERN, coordinated by the Hawaiian Islands Humpback Whale National Marine Sanctuary). These injury reports have largely involved humpback whales that were entangled in fishing gear or marine debris or struck by a vessel. Previously, determinations of injury severity (i.e., serious or non-serious) for Hawaiian cetaceans, using systematic and nationally-consistent criteria, have only been made for cetaceans observed interacting with the Hawaii pelagic longline fisheries. Accordingly, most injuries reported to PIR-MMRN and HIERN have not been accounted for in the mortality and serious injury (M&SI) estimates that are a key component of the Stock Assessment Reports (SARs) for cetaceans in Hawaiian waters. The present paper addresses this gap by providing a summary of injury determinations for cetaceans in Hawaii reported injured by human causes during 2007-2012. Injury determinations were made using a revised process and refined criteria for distinguishing serious from non-serious injuries (National Marine Fisheries Service, 2012). From 2007-2012, 95 reports of cetaceans with human-caused injuries were identified, which include 39 humpback whales involved in vessel collisions, 48 humpback whales entangled in fishing gear, one other cetacean struck by a vessel, and seven other cetaceans hooked or entangled in fishing gear or marine debris. Only the 2008-2012 determinations are relevant to the 2014 SAR year. The 76 humpback whale vessel collisions and entanglements during 2008-2012 led to 34.88 serious injuries and one mortality. The resulting average of 7.18 mortalities and serious injuries per year can be considered a minimum estimate of M&SI from Hawaii for use in the 2014 SAR. For the other cetaceans in 2008-2012, serious injury determinations of relevance to the SAR were made for spinner dolphins of the Hawaii Island (n=2) and Oahu/4-Islands[1] (n=1) stocks, a spotted dolphin of the 4-Islands stock, and a sei whale of the Hawaii stock. More effort is needed to report, document, and monitor injured Hawaiian cetaceans other than humpback whales.

[1] The 4-Islands region comprises the islands of Maui, Molokai, Lanai, and Kahoolawe.

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INTRODUCTION

The Marine Mammal Protection Act (MMPA) requires the National Marine Fisheries Service (NMFS) to prepare Stock Assessment Reports (SAR) for marine mammal stocks occurring in U.S. waters. Along with information on stock abundance and status, the SAR includes an estimate of the annual human-caused mortality and serious injury by source. The definition of a serious injury, as used by NMFS, is any injury that is more likely than not to result in mortality.[2] The process and criteria for distinguishing serious from non-serious injuries pursuant to the MMPA were recently revised (NMFS 2012).[3] Estimates of human-caused mortality and serious injury (M&SI) are compiled and averaged over five-year periods for inclusion in the SAR. However, the process of injury determination, including internal and external peer review, and the MMPA-specified SAR public review leads to a 2-year lag between the M&SI estimation period and the SAR year. The 2014 SAR year requires estimates of M&SI from 2008 to 2012.

Reports of injured and dead cetaceans in the U.S. Exclusive Economic Zone of the Hawaiian Islands (Hawaiian EEZ) are received each year by the Pacific Islands Region Marine Mammal Response Network (PIR-MMRN), which is coordinated by the Pacific Islands Regional Office (PIRO), and the Hawaiian Islands Entanglement Response Network (HIERN), which is coordinated by the Hawaiian Islands Humpback Whale National Marine Sanctuary. These two agencies work closely together and are part of the greater NOAA Fisheries Marine Mammal Health and Stranding Response Program. Most of the injury reports involve humpback whales (*Megaptera novaeangliae*) that are entangled in fishing gear or marine debris or have been struck by a vessel. However, occasionally reports of other species are received. While reported cetaceans have traditionally been assessed for injury and impact by PIR-MMRN or HIERN, and response efforts mobilized as appropriate, determinations of injury severity (i.e., serious or non-serious) for injured cetaceans, using systematic and nationally-consistent criteria, have previously only been made for cetaceans observed interacting with the Hawaii pelagic longline fisheries (e.g., Forney 2010, Bradford and Forney 2014). Further, injury determinations based on reports to PIR-MMRN or HIERN have not previously been accounted for in estimates of M&SI for the affected stocks.

To address this gap, the present paper provides a summary of injury determinations for cetaceans in and around the Hawaiian EEZ reported injured by human causes to the PIR-MMRN and HIERN during 2007-2012. As these injury reports are opportunistic and not a part of a quantifiable and directed sampling scheme, resulting determinations of serious injury (or mortality) cannot be used to estimate undocumented M&SI from the same source. However, these serious injuries and mortalities can serve as minimum estimates of M&SI by source and should be included in the relevant SAR (NMFS 2005). Although only the 2008-2012 minimum estimates of M&SI are relevant to the 2014 SAR, the 2007 injury determinations are included because they were the first to be made and were previously only reported in preliminary form (Bradford and Lyman 2013). This paper also summarizes reports from previous years of cetaceans other than humpback whales injured by human causes for the purpose of obtaining additional qualitative information on the sources of injuries and the species involved. Humpback whales were excluded from this summary because their susceptibility to gear entanglement and

[2] NMFS Policy Directive PD 02-238
[3] 77 *Federal Register* 3233 (23 January 2012)

vessel collisions in Hawaiian waters is well established (e.g., Mazzuca *et al*. 1998, Lammers *et al*. 2013, Lyman 2014), whereas outside of the pelagic longline fisheries, less is known about anthropogenic injuries for other Hawaiian cetaceans.

Most cetacean species that occur in the Hawaiian EEZ are recognized as Hawaii stocks, with differentiation as pelagic and island-associated stocks for some species. Hawaiian stocks of cetaceans are assessed and managed by the NMFS Pacific Islands Fisheries Science Center (PIFSC) and PIRO, respectively. However, humpback whales that overwinter in the Hawaiian EEZ are part of the central North Pacific (CNP) stock, which falls under the purview of the NMFS Alaska Fisheries Science Center (AFSC) and the Alaska Regional Office. Therefore, in terms of SAR preparation, the determinations contained herein are directed at AFSC for humpback whales and at PIFSC for all other cetaceans.

METHODS

The PIR-MMRN maintains an electronic database of over 1,000 records with summary information (e.g., date, species, location, condition) for each stranded or injured marine mammal report made from 1848 to the present. Generally, these records are associated with case-specific documentation, such as a Level A Form, a necropsy report, or photographs. The PIR-MMRN database was accessed and cetacean records in and around the Hawaiian EEZ from 1848 to 2012 (n=564) were extracted. These records were reviewed for two purposes: 1) to identify reports from 2007-2012 of cetaceans injured by human causes so that injury determinations could be made and incorporated into M&SI estimates for the affected stocks; and 2) to identify pre-2007 reports of cetaceans other than humpback whales with evidence of human-caused injury so that additional qualitative information could be obtained on injury sources and susceptible species.

The PIR-MMRN reports identified as part of the first objective were supplemented with 90 confirmed injury reports (i.e., containing sufficient descriptive information from a reliable source) maintained in the HIERN database. The HIERN database records overlapped in large part with those in the PIR-MMRN, but were more complete because the HIERN was the primary data source. Further supplementing the compiled reports was an injury report identified in a 2009 PIR-MMRN newsletter[4] that was not incorporated in the PIR-MMRN database. The merged set of 2007-2012 injury reports was evaluated and the injury severity of each injured cetacean was determined using the revised guidelines and criteria presented in NMFS (2012). When follow-up (observation or response) of injured individuals occurred, which was often the case for entangled humpback whales, an injury determination was made both before and after follow-up and any mitigation efforts, so that the appropriate number of mortalities and serious injuries can be considered when classifying commercial fisheries on the MMPA-mandated List of Fisheries (LOF) and when comparing M&SI estimates with the Potential Biological Removal (PBR) value reported in the SAR. That is, initial injury determinations prior to follow-up and mitigation are used in LOF fisheries classifications, and determinations after these efforts are relevant to the PBR comparisons (NMFS 2012).

[4] http://www.fpir.noaa.gov/Library/PRD/Marine%20Mammal%20Response/MMRN_12-newsletter.v2.1.21.10.pdf

Injury determinations were made collaboratively by the authors, with EL taking the lead on the humpback whale reports and ALB on the reports of other cetaceans. Additional interpretation or consideration was required in the application of some of the injury categories for injured large whales (see Appendix for details of how these categories were applied). As directed by NMFS (2012), the preliminary injury determinations were then sent for independent review to members of the NMFS Determination Staff Working Group with applicable expertise (Forney 2010, Henry *et al*. 2012). The humpback injury determinations were reviewed by A. Henry (NMFS Northeast Fisheries Science Center), and the other cetacean injury determinations were reviewed by K. Forney (NMFS Southwest Fisheries Science Center). Differences between the preliminary and reviewer determinations were discussed and reconciled by ALB and EL, with input from the reviewers as needed.

Follow-up and mitigation efforts of entangled cetaceans, particularly disentanglement activities by the HIERN, often involved the photo-documentation and occasionally the collection of entangling gear. The HIERN made substantial efforts, in collaboration with PIRO and other partner agencies, to identify the gear type and associated fishery (if applicable) for the humpback entanglement cases. However, unlike other regions where there are dedicated gear specialists, staff resources in the Pacific Islands were insufficient to systematically review the gear in all cases. A summary of the information available for a systematic gear review for all the cetacean entanglements is included along with the injury determinations. For the humpback entanglements, the details and available results of gear reviews conducted to date are included along with assessment of the possibility of further classification from additional review efforts.

RESULTS AND DISCUSSION

In total, 95 reports of cetaceans with human-caused injuries from 2007-2012 were identified. The reports involve 39 humpback whales struck by or that otherwise made contact with vessels (Table 1), 48 humpback whales entangled in fishing gear (Table 2), an unidentified large whale struck by a vessel, and seven other cetaceans hooked or entangled in fishing or other gear (Table 3). The other cetaceans include a bottlenose dolphin (*Tursiops truncatus*), three spinner dolphins (*Stenella longirostris*), a sperm whale (*Physeter macrocephalus*), a pantropical spotted dolphin (*Stenella attenuata*), and a sei whale (*Baleanoptera borealis*).

The review process highlighted the challenging nature of some of the humpback whale injury events and revealed differences in the ways some injury categories are applied (Appendix). For the 87 humpback whale vessel collisions and entanglements, the injury determinations of the reviewer differed from the preliminary determinations in 17 (19.5%) cases (n=5 vessel collisions and n=12 entanglements; Table 4). Follow-up discussions led to changes in four of the preliminary entanglement injury determinations (Table 4). Further dialog and consensus building among all members of the NMFS Determination Staff Working Group could reduce the variability in injury determinations between member subsets and lead to needed clarifications for some of the injury categories (Appendix). However, considerable regional differences in entangling gear type, whale seasonal ecology (e.g., stage in migratory cycle), and opportunities for follow-up and mitigation will remain that will likely continue to influence the injury

determination process at a regional scale. The reviewer of the other cetacean injury determinations was in agreement with all of the preliminary determinations.

For the 2008-2012 period relevant to the 2014 SAR, the humpback whale vessel collisions (n=34) led to 11.88 serious injuries (note that some large whale injury categories involve prorating injuries as proportionally serious; NMFS 2012) for comparison to PBR (Table 1). The 2008-2012 humpback whale entanglements (n=42) led to 27.5 serious injuries and one mortality for consideration with the LOF and 23 serious injuries and one mortality for comparison to PBR (Table 2). Overall, there were 34.88 serious injuries and one mortality in Hawaii relevant to the PBR comparison of CNP humpback whales in the 2014 SAR. Thus, the average of 7.18 serious injuries per year can be considered a minimum estimate of M&SI resulting from vessel collisions and entanglements reported in Hawaiian waters.

For the other cetaceans in 2008-2012, there were a total of five serious injuries for consideration with the LOF and five serious injuries for comparison with PBR values (Table 3). The serious injuries of relevance to the SAR were from spinner dolphins of the Hawaii Island (n=2) and Oahu/4-Islands (n=1) stocks, a spotted dolphin of the 4-Islands stock, and a sei whale of the Hawaii stock. An additional 0.56 serious injury could have been used for PBR comparison, but this value was associated with an unidentified large whale.

The HIERN makes an effort to cross-match the injured humpback whales that were adequately photo-identified with other CNP humpback whale photo-identification catalogs. However, there are not dedicated personnel to systematically pursue identification of injured individuals to the greatest extent possible, and the CNP stock of humpback whales numbers in the thousands of individuals (Allen and Angliss 2014). Additionally, many reports are made without images suitable for photo-identification. Based on identification efforts to date, there are no individuals of any cetacean species known to have been injured more than once between 2007 and 2012. Thus, for the purposes of establishing minimum estimates of M&SI, all injured cetaceans summarized here are considered to represent separate individuals. There may actually be cases where a given individual is associated with more than one injury report, which would lead to a positive bias in the resulting minimum M&SI estimates. However, any positive bias is unlikely to exceed the level of undocumented M&SI from vessel collisions and fishing gear entanglement, indicating that the values reported here are appropriate minimum estimates of M&SI.

Of the 48 humpback whale entanglements from 2007-2012, gear type was identified for 20 (41.7%) of them, involving Alaska pot gear (n=5), Hawaii pot gear (n=5), longline[5] (n=5), and hook and line (n=5) (Table 2). Ten (50.0%) of the 20 entanglements with known gear types were further linked to specific fisheries, including six commercial pot gear entanglements (n=2 Alaska king crab, n=2 Hawaii crab, n=1 Alaska tanner crab, and n=1 Alaska shrimp) and four recreational troll entanglements (n=4 hook and line). Although a substantial effort was made to review the photographed and collected gear, staff resources did not allow a complete review in all cases. The best assessment of available gear and photographs suggests additional effort in identifying gear type or fishery is warranted for four of the 28 humpback whale cases where both

[5] Observed humpback whale interactions with the Hawaii longline fisheries between 2008 and 2012 (n=2) are summarized in Bradford and Forney (2014).

gear type and fishery are unknown, and for seven of the 10 cases where gear type is known but the fishery is not (Table 2). Gear type and fishery is currently unknown for all six fishery-related injuries of other cetaceans from 2007-2012, but additional review to identify these characteristics is recommended for four of the cases (Table 3).

Of the 408 PIR-MMRN database records from before 2007, 26 reports of cetaceans (other than humpback whales) with evidence of human-caused injuries were identified (Table 5). The injury sources range from fishery-related (n=22), vessel collision (n=3, including a collision with an entangled individual), possible shooting (n=1), and unknown object (n=1). The injuries involved three bottlenose dolphins, one Cuvier's beaked whale (*Ziphius cavirostris*), one pygmy killer whale (*Feresa attenuata*), two pygmy sperm whales (*Kogia breviceps*), one sperm whale, six spinner dolphins, two striped dolphins (*Stenella coeruleoalba*), and 10 unidentified cetaceans.

Cetaceans in Hawaiian waters, particularly humpback whales, are subject to human-caused injuries from a variety of sources, which should be accounted for in the SAR. For cetaceans other than humpback whales, more effort and resources are needed to report, document, and monitor individuals injured from sources other than the pelagic longline fisheries. The PIR-MMRN is presently expanding its efforts in this regard primarily through communicating to various partners the value of reporting injured cetaceans and by initiating a "cetacean of concern" program, whereby injured cetaceans are documented in a manner aimed at increasing awareness of and opportunities for monitoring each individual.

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TABLES

Table 1.--Injury determinations for humpback whales reported to be struck by vessels in Hawaiian waters during 2007-2012, using the most recent established criteria for distinguishing serious from non-serious injury of large whales (Table 1 in NMFS 2012).

Report date	Age class	Vessel length (ft)	Vessel speed (kts)	Event summary	Observed injury	Injury categories	Injury determination	Value for PBR
02/07/07	Unknown	65	20	Ferry vessel struck whale. Whale not observed, but blood seen in water.	Blood in water	L6a, L11	Serious	1
03/08/07	Subadult	30	0	Tour rigid hull inflatable stopped when whale fluke print observed off bow. Whale surfaced and made contact with bow. Whale observed for >20 minutes and did not show signs of injury.	None observed	L6c	Non-serious	0
04/01/07	Subadult	65	10	Tour catamaran struck whale. Whale observed for approximately 20 minutes and did not show signs of injury.	None observed	L6c	Non-serious	0
04/13/07	Calf	51	18	Unspecified vessel struck whale. Whale observed for unspecified period of time and photos taken of injury.	6-10 parallel lacerations (4-6 in deep) between dorsal fin and fluke; blood in the water	L5b, L6b (calf)	Serious	1
01/10/08	Adult	30	13	Tour vessel struck whale. Whale surfaced after strike without signs of injury. Vessel stayed in area for an hour to observe whale, but no confirmed resights made.	None observed	L6b	Prorate 0.20 Serious	0.20
01/28/08	Calf	44	6	Tour catamaran struck whale. Whale surfaced after strike without signs of injury.	None observed	L6c	Non-serious	0
02/05/08	Subadult	34	8	Private motor vessel struck whale. Whale observed for over an hour and did not show signs of injury.	None observed	L6c	Non-serious	0
02/27/08	Adult	?	?	Military vessel struck whale. Whale observed for unspecified period of time and did not show signs of injury.	None observed	L12	Prorate 0.36 Serious	0.36
02/28/08	Subadult	65	<10	Tour vessel throttled back from 12.5 kts when whale observed several feet below bow. Boat had slowed, but was not quite stopped (inferred speed <10 kts), when whale surfaced and made contact with vessel. Whale observed for >30 minutes and injury observed. Minor damage found on vessel.	Laceration involving only blubber layer forward of dorsal fin	L5b, L6c	Non-serious	0
03/04/08	Calf	29	13	Tour vessel struck whale. Whale observed for a couple of minutes; blood seen in water.	Blood in water	L6b (calf), L11	Serious	1
03/05/08	Adult	64	?	Tour catamaran struck whale (mother with associated calf). Whales surfaced after strike without signs of injury.	None observed	L7b	Prorate 0.14 Serious	0.14
03/05/08	Calf	64	?	Tour catamaran struck mother of this associated calf. Whales surfaced after strike without signs of injury.	None observed	L8	Prorate 0.14 Serious	0.14
03/21/08	Adult	65	3	Tour catamaran under sail turned into wind when whales observed off bow. Whales surfaced again closer to vessel, and one whale made contact with vessel as it dove. Whale surfaced after contact and did not show signs of injury.	None observed	L6c	Non-serious	0
03/27/08	Adult	30	19	Tour vessel struck whale, but unknown if mother or calf (or both) were struck. Precautionarily, presumed both whales struck for injury determination. Whales surfaced once after strike and did not show signs of injury.	None observed	L6b	Prorate 0.20 Serious	0.20

Table 1 (*continued*)

Report date	Age class	Vessel length (ft)	Vessel speed (kts)	Event summary	Observed injury	Injury categories	Injury determination	Value for PBR
03/27/08	Calf	30	19	Tour vessel struck whale, but unknown if mother or calf (or both) were struck. Precautionarily, presumed both whales struck for injury determination. Whales surfaced once after strike and did not show signs of injury.	None observed	L6b (calf)	Serious	1
04/11/08	Calf	?	?	Tour vessel discovered whale with injuries consistent with vessel strike (date and location of strike unknown). Whale observed five and six days later. Wounds appeared more open and attacks by tiger sharks observed.	>20 parallel lacerations (some deep) between head and dorsal fin	L5a, L12 (calf)	Serious	1
04/16/08	Calf	?	?	Research vessel discovered whale with injuries consistent with vessel strike (date and location of strike unknown).	>10 parallel lacerations (superficial) along left flank; three deeper gashes on caudal peduncle	L5b, L12 (calf)	Serious	1
02/05/09	Calf	65	?	Tour vessel struck whale. Whale observed for 15 minutes; blood seen in water.	Blood in water	L7a (calf), L11	Serious	1
02/21/09	Calf	50	8	Tour catamaran struck whale. Whale surfaced after strike without signs of injury.	None observed	L6c	Non-serious	0
02/27/09	Adult	28	1	Whale made contact with research vessel with pectoral flipper.	None observed	L6c	Non-serious	0
03/01/09	Calf	65	0	Tour vessel was drifting with engine off when whale made contact with vessel.	Superficial gash on back	L5b, L6c	Non-serious	0
03/22/09	Subadult	24	20	Tour rigid hull inflatable seemingly rode over back of whale. Whale surfaced once after strike and did not show signs of injury.	None observed	L6b	Prorate 0.20 Serious	0.20
03/23/09	Calf	15	10	Tour catamaran tender went into neutral when calf did headrise off bow. Vessel was still moving forward when whale did a peduncle throw and made contact with pontoon. Driver suffered minor injuries. After catamaran retrieved 15 minutes later, a mother-calf pair was observed in the area and did not show signs of injury.	None observed	L6c	Non-serious	0
03/27/09	Adult	34	5	Research vessel was working with a large group of whales when one whale turned on side near vessel and began pectoral slapping. Back and pectoral flipper made contact with vessel. Whale observed for 30 minutes and did not show signs of injury.	None observed	L6c	Non-serious	0
03/29/09	Subadult	15	5	Rigid hull inflatable slowed when whale observed off bow. Vessel was still moving forward when whale did a peduncle throw and made contact with bow. Event occurred in low light conditions.	None observed	L6c	Non-serious	0
12/08/09	Subadult	30	25	Tour rigid hull inflatable struck whale. Whale surfaced after contact and did not show signs of injury.	None observed	L6b	Prorate 0.20 Serious	0.20
01/08/10	Subadult	65	13	Tour vessel and whale made contact (unknown if it was a direct strike). Whale observed for unspecified period of time and did not show signs of injury. Only indication of contact on vessel was algae film rubbed off from hull.	None observed	L6a	Serious	1

Table 1 (*continued*)

Report date	Age class	Vessel length (ft)	Vessel speed (kts)	Event summary	Observed injury	Injury categories	Injury determination	Value for PBR
02/14/10	Adult	32	10	Rigid hull inflatable was lifted by whale that surfaced in front of vessel. Five passengers were knocked over, including three into the water, and some suffered minor injuries. Whale surfaced once after contact and did not show signs of injury.	None observed	L6c	Non-serious	0
02/24/10	Calf	65	10	Whale surfaced under tour catamaran. Whale surfaced with mother after contact and did not show signs of injury. Only indication of contact on vessel was algae film rubbed off from hull.	None observed	L6c	Non-serious	0
02/28/10	Calf	?	?	Whale discovered with injuries consistent with vessel strike (date and location of strike unknown).	Multiple lacerations (severity unknown) near dorsal fin	L11, L12 (calf)	Serious	1
02/13/11	Subadult	31	9	Private catamaran struck whale. Whale observed for unspecified period of time and did not show signs of injury.	None observed	L6c	Non-serious	0
02/16/11	Adult	31	?	Fishing vessel observed to have struck whales. Whales observed for unspecified period of time; blood seen in water.	Blood in water	L7b, L11	Prorate 0.52 Serious	0.52
02/16/11	Calf	31	?	Fishing vessel observed to have struck whales. Whales observed for unspecified period of time; injury observed and blood seen in water.	5-6 lacerations (severity unknown) along left flank above pectoral flipper; blood in the water	L7b (calf), L11	Serious	1
02/21/11	Subadult	25	26	Research vessel struck breaching whale. Two operators suffered injuries requiring medical attention. Whale observed for unspecified period of time and did not show signs of injury. Vessel sustained damage to the hull.	None observed	L6b	Prorate 0.20 Serious	0.20
03/08/11	Adult	55	4	Tour vessel unexpectedly had close encounter with whale that seemingly became agitated and made contact with vessel, which was not under power. Whale observed for unspecified period of time; injury observed.	Superficial scratches on dorsal fin	L5b, L6c	Non-serious	0
01/19/12	Calf	20	<10	Whale surfaced under tour vessel slightly lifting the stern. Whale surfaced with mother after contact; blood seen in water.	Blood in water	L6c, L11	Prorate 0.52 Serious	0.52
01/24/12	Adult	16.8	12	Unspecified vessel struck whale. Whale observed for unspecified period of time and did not show signs of injury.	None observed	L6b	Prorate 0.20 Serious	0.20
12/28/12	Calf	?	?	Whale discovered with injuries consistent with vessel strike (date and location of strike unknown).	Gouge (1 ft deep) on left side forward of dorsal fin (muscle tissue visible)	L5a, L12 (calf)	Serious	1

Table 2.--Injury determinations for humpback whales reported to be entangled in fishing gear in Hawaiian waters during 2007-2012, using the most recent established criteria for distinguishing serious from non-serious injury of large whales (Table 1 in NMFS 2012). The "initial" injury determination is associated with the condition of the whale prior to any follow-up and mitigation efforts and may be used for List of Fisheries (LOF) fisheries classifications. The condition of the whale following a change in entanglement status, whether by mitigation or self-release, is reflected in the "follow-up" injury determination, which is used for Potential Biological Removal (PBR) comparison. Note that in cases where there were no follow-up or mitigation efforts, the initial and follow-up determinations are the same. An injury determination of serious followed by an asterisk indicates that the basis of the determination was the significant health decline caused by the injury (NMFS 2012).

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
01/11/07	Adult	Over 160ft of line went through the mouth and trailed along the right side of the body (two buoys wedged in left side of mouth). Whale was moderately emaciated and showed other signs of significant health decline (cyamid carpet and rough skin).	L3	Serious*	1	Partially disentangled; over 110ft of trailing line removed from whale. Whale still showed signs of significant health decline.	L3	Serious*	1	Unknown	Unknown	Recovered gear reviewed by two level 5 responders. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
02/06/07	Adult	Line went through the mouth and trailed along both sides of the body forming a bundle of gear with two metal rods. One wrap of line pinned left flipper. Whale had moderate wounds from line. Whale was extremely emaciated and showed other signs of significant health decline (cyamid carpet and light and rough skin).	L2, L5b	Serious	1	Partially disentangled; over 325ft of line including metal rods removed from whale. Moderate wounds remained, and whale still showed signs of significant health decline.	L3, L5b	Serious*	1	Alaska pot gear	Unknown	Recovered gear reviewed by two level 5 responders. Little identifying information on gear to identify fishery. Limited possibility of further classification from additional review effort.
02/23/07	Subadult	Several hundred feet of line wrapped tightly around peduncle and fluke blades and trailed behind whale along with two buoys. Whale had moderate wounds from line.	L2, L5b	Serious	1	Fully disentangled. Moderate wounds remained.	L5b	Non-serious	0	Hawaii pot gear	Unknown	Recovered gear reviewed by two level 5 responders and state specialist. Little identifying information on gear to identify fishery. Known gear configuration and line type may be enough to determine fishery with additional review effort.
03/02/07	Adult	Line went through the mouth forming a loose bridle. Line trailed from bridle along with two polyballs. Whale had moderate wounds from line. Whale was moderately emaciated and showed other signs of significant health decline (cyamid carpet and rough skin).	L3, L5b	Serious*	1	Fully disentangled. Moderate wounds remained, and whale still showed signs of significant health decline.	L5b	Serious*	1	Alaska pot gear	King crab	Recovered gear reviewed by a level 5 responder and identified using license number on buoy. Further information might be obtained from interviewing fisher.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
03/17/07	Subadult	Line wrapped tightly around mid-section. Line or netting was trailing wrap. Whale had deep wound from line.	L2, L5a	Serious	1	No response	L2, L5a	Serious	1	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
12/09/07	Subadult	Line wrapped tightly at least two times around peduncle and trailed behind whale. Whale had superficial wound from line.	L2, L5b	Serious	1	No response	L2, L5b	Serious	1	Longline	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify fishery. Images may contain enough information to determine fishery with additional review effort.
01/02/08	Calf	Line was hanging from baleen on right side of mouth.	L3	Non-serious	0	No response	L3	Non-serious	0	Hook and line	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify fishery. Limited possibility of further classification from additional review effort.
01/26/08	Subadult	Line trailed from unknown location forward on body along right side and over dorsal fin. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/10/08	Adult	Line went through the mouth, trailed along both sides of the body, and wrapped loosely over the peduncle, forming a bundle of gear with a deflated polyball. Whale had superficial wounds from line.	L3, L5b	Non-serious	0	Response mounted, but whale not tagged or disentangled.	L3, L5b	Non-serious	0	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
04/25/08	Calf	Line trailed from unknown location forward on body along both sides, with a buoy at one of the ends. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted and whale tagged, but whale not disentangled. All gear recovered the next day (either whale self-released or tag package pulled gear off whale).	n/a	Non-serious	0	Hawaii pot gear	Unknown	Recovered gear reviewed by a level 5 responder, state officials, and PIR Observer Program staff. Little identifying information on gear to identify fishery. Known gear configuration and other markings may be enough to determine fishery with additional review effort.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
12/13/08	Adult	Line draped over back, wrapped loosely under peduncle forming a bundle, and trailed behind whale. More line trailed along right side. Whale had moderate wounds from line. Whale was slightly emaciated with rough skin, but was not considered to be in significant health decline.	L3, L5b	Non-serious	0	Partially disentangled; over 115ft of trailing line removed from whale. Moderate wounds remained.	L3, L5b	Non-serious	0	Longline	Unknown	Recovered and photographed gear reviewed by a level 5 responder and disentanglement network members. Little identifying information on gear to identify fishery. Gear and images may contain enough information to determine fishery with additional review effort.
12/28/08	Subadult	Line wrapped tightly around fluke blades and trailed behind whale. Whale had significant wounds from line. Whale was extremely emaciated and showed other signs of significant health decline (cyamid carpet and rough skin).	L2, L5a	Serious	1	No response	L2, L5a	Serious	1	Unknown	Unknown	Photographed gear reviewed by level 5 responder. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
01/12/09	Subadult	Over 120ft of line trailed behind whale from unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
01/13/09	Subadult	Line and seemingly other components of pot gear attached to at least peduncle of whale. Lack of constricting gear not confirmed. Whale had superficial wounds from line.	L5b, L10	Prorate 0.75 Serious	0.75	Partially disentangled; part of line and floats removed from whale. Superficial wounds remained.	L5b, L10	Prorate 0.75 Serious	0.75	Hawaii pot gear	Crab	Recovered gear reviewed by a level 5 responder and local fishers interviewed leading to identification of gear.
01/19/09	Adult	Line attached to at least peduncle and trailed behind whale. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/01/09	Subadult	Line went through the mouth forming a tight bridle. Line trailed along body (with a buoy attached), went around peduncle, and trailed behind whale. Whale had superficial wounds from line. Whale was moderately emaciated and showed other signs of significant health decline (cyamid carpet).	L2, L5b	Serious	1	Fully disentangled. Superficial wounds remained.	L5b	Serious*	1	Alaska pot gear	Shrimp	Recovered gear reviewed by a level 5 responder. Gear traced to fisher, who was interviewed for additional information.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
02/20/09	Adult	Two lines (at least one seemingly from mouth) wrapped loosely around back, forming a bundle of gear. Line trailed from bundle. Whale had superficial wounds from line. Whale was slightly emaciated, but was not considered to be in significant health decline.	L3, L5b	Non-serious	0	Response mounted, but whale not tagged or disentangled.	L3, L5b	Non-serious	0	Unknown	Unknown	Photographed gear reviewed by two level 5 responders. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
03/11/09	Adult	Line wrapped around least peduncle and trailed behind whale. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
12/01/09	Subadult	Line went through mouth forming a tight bridle. Two lines trailed from knot of bridle, with one line ending in a bundle. Whale had moderate wounds from line. Whale was slightly emaciated, but was not considered to be in significant health decline.	L2, L5b	Serious	1	Fully disentangled. Moderate wounds remained.	L5b	Non-serious	0	Unknown	Unknown	Recovered gear reviewed a level 5 responder. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
12/24/09	Subadult	Line wrapped around peduncle. Line observed to be weighted and anchoring whale.	L2	Serious	1	Response mounted, but whale not re-located in location where anchored. Presumed that whale became free of anchoring gear, but was still entangled.	L10	Prorate 0.75 Serious	0.75	Hawaii pot gear	Possibly crab	No gear recovered and gear not documented, but numerous eyewitness accounts were reviewed by a level 5 responder and state officials. Limited possibility of further classification from additional review effort.
12/25/09	Subadult	Line wrapped tightly at least four times around peduncle and fluke blades, pinning a spade anchor under the flukes. Two lines trailed over 60ft behind whale. Whale had deep wound from line. Whale was not emaciated, but showed other signs of significant health decline (cyamid carpet, light skin).	L2, L5a	Serious	1	Fully disentangled. Deep wound remained, and whale still showed signs of significant health decline.	L5a	Serious	1	Longline	Unknown	Recovered gear reviewed by a level 5 responder. Little identifying information on gear to identify fishery. Known gear configuration and line type may be enough to determine fishery with additional review effort.
12/30/09	Unknown	Approximately 70ft of line trailed behind whale from unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
01/04/10	Adult	Line wrapped tightly several times around body and trailed behind whale with a buoy attached. Whale had deep wounds from line. Whale was moderately emaciated and showed other signs of significant health decline (cyamid carpet, rough skin).	L2, L5a	Serious	1	Response mounted and whale tagged, but whale not disentangled.	L2, L5a	Serious	1	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
01/07/10	Adult	Line loosely wrapped around rostrum and both pectoral flippers.	L3	Non-serious	0	Response mounted, but whale self-released from gear.	n/a	Non-serious	0	Longline	Unknown	Recovered gear reviewed by a level 5 responder. Little identifying information on gear to identify fishery. Known gear configuration and line type may be enough to determine fishery with additional review effort.
01/24/10	Adult	Line wrapped loosely over back from under head (possibly from mouth) forming a bridle. Two lines trailed from knot of bridle, with one line attached to a buoy. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify gear type or fishery. Unique buoy may allow further classification with additional review effort.
01/31/10	Subadult	Whale swam into gear and was hooked in unknown location on body. Approximately 100ft of line trailed from whale.	L4	Non-serious	0	No response	L4	Non-serious	0	Hook and line	Recrea-tional troll	No gear recovered and gear not documented, but interaction was self-reported by fisher, who was interviewed by a level 5 responder.
02/07/10	Unknown	Line (possibly net) entangled whale in unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/21/10	Subadult	Line tightly wrapped around right fluke blade, with two buoys attached behind fluke. Line trailed behind whale with a third buoy possibly attached. Whale had moderate wound from line.	L2, L5b	Serious	1	Response mounted, but whale not re-located.	L2, L5b	Serious	1	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Images suggest Hawaii pot gear, but not confirmed. Images may contain enough information to determine gear type and fishery with additional review effort.
04/07/10	Subadult	At least one (possibly another) set of pot gear tightly wrapped around both pectoral flippers anchoring whale. Whale had superficial wounds from line.	L2, L5b	Serious	1	Fully disentangled. Superficial wounds remained.	L5b	Non-serious	0	Hawaii pot gear	Crab	Recovered gear reviewed by a level 5 responder and returned to fisher.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
12/16/10	Adult	Approximately 50ft of line and several buoys trailed behind whale (mother with associated calf) from flukes. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Images suggest Hawaii pot gear, but not confirmed. Images may contain enough information to determine gear type and fishery with additional review effort.
12/16/10	Calf	Approximately 50ft of line and several buoys trailed behind mother of this associated calf. Lack of constricting gear not confirmed.	L8	Prorate 0.75 Serious	0.75	No response	L8	Prorate 0.75 Serious	0.75	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Images suggest Hawaii pot gear, but not confirmed. Images may contain enough information to determine gear type and fishery with additional review effort.
01/18/11	Subadult	Approximately 120ft of line and buoy trailed behind whale from unknown location on body. Lack of constricting gear not confirmed. Whale was slightly emaciated with rough skin, but was not considered to be in significant health decline.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Alaska pot gear	King crab	Photographed gear reviewed by a level 5 responder. Gear traced to fisher, who was interviewed for additional information.
01/28/11	Adult	Over 225ft of line and buoy trailed behind whale from unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/16/11	Subadult	Line with buoy trailed behind whale from unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/19/11	Subadult	Over 40ft of line and buoy trailed behind whale from unknown location on body. Lack of constricting gear not confirmed. Whale had some cyamids and rough skin, but was not considered to be in significant health decline.	L10	Prorate 0.75 Serious	0.75	Partially disentangled; buoy and some line recovered from whale.	L10	Prorate 0.75 Serious	0.75	Longline	Unknown	Recovered gear reviewed by a level 5 responder and Office of Law Enforcement officer. Gear traced to fisher, who was interviewed (with an interpreter) for additional information. May be able to determine fishery with additional interview effort.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
02/25/11	Adult	Mesh net draped loosely over rostrum and later right pectoral flipper of whale.	L3	Non-serious	0	Response mounted, but whale self-released from gear.	n/a	Non-serious	0	Unknown	Unknown	Photographed gear reviewed by two level 5 responders. Little identifying information on gear to identify gear type or fishery. Gear likely marine debris and not from an active set. Limited possibility of further classification from additional review effort.
03/30/11	Adult	Over 120ft of line trailed behind whale (mother with associated calf) from unknown location on body (possibly hooked). Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Hook and line	Recrea-tional troll	Photographed gear reviewed by two level 5 responders. Limited possibility of further classification from additional review effort.
03/30/11	Calf	Over 120ft of line trailed behind mother (possibly hooked) of this associated calf. Lack of constricting gear not confirmed.	L8	Prorate 0.75 Serious	0.75	No response	L8	Prorate 0.75 Serious	0.75	Hook and line	Recrea-tional troll	Photographed gear reviewed by two level 5 responders. Limited possibility of further classification from additional review effort.
11/05/11	Subadult	Line tightly wrapped around mid-section. Net seemingly entangled head and right pectoral flipper. Whale was slightly emaciated, but was not considered to be in significant health decline.	L2	Serious	1	Response mounted, but whale not re-located.	L2	Serious	1	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Little identifying information on gear to identify gear type or fishery. Limited possibility of further classification from additional review effort.
01/01/12	Subadult	Net wrapped from rostrum to peduncle, with a buoy near gear. Whale was reported dead at sea.	n/a	Dead	1	No response	n/a	Dead	1	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
01/03/12	Subadult	Line wrapped multiple times around peduncle and fluke blades and trailed behind whale with a polyball attached. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response, but subsequent observation indicates whale self-released from gear.	n/a	Non-serious	0	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
01/06/12	Subadult	Over 20ft of line and buoy trailed behind whale from unknown location on body with a polyball attached. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.

Table 2 (*continued*)

Report date	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type	Fishery	Fishery review details
01/11/12	Subadult	Line wrapped tightly around right pectoral flipper with four buoys attached. Whale had superficial wounds from line. Whale was moderately emaciated and showed other signs of significant health decline (rough skin).	L2, L5b	Serious	1	Response mounted and whale tagged, but whale not disentangled.	L2, L5b	Serious	1	Unknown	Unknown	Photographed gear reviewed by a level 5 responder. Three of four buoys identified as originally being Alaska longline gear for halibut using license number on buoy. However, presence of unassociated buoy and three-year period between setting of gear and entanglement suggests gear was either marine debris or repurposed. Limited possibility of further classification from additional review effort.
01/16/12	Adult	Black mooring buoy entangled whale in unknown location on body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response, but subsequent observation indicates whale self-released from gear.	n/a	Non-serious	0	Unknown	Unknown	Possible FAD, but no gear recovered and gear not documented enough to confirm.
01/18/12	Unknown	Line (possibly net) entangled whale around rostrum, although gear appeared to works its way down the body. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	No response	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/01/12	Subadult	Approximately 30ft of line trailed behind whale from unknown location on body with three buoys with a flag attached. Lack of constricting gear not confirmed.	L10	Prorate 0.75 Serious	0.75	Response mounted, but whale not re-located.	L10	Prorate 0.75 Serious	0.75	Unknown	Unknown	No gear recovered and gear not documented enough for a review of gear type and fishery.
02/02/12	Adult	Line went through mouth forming a secure bridle before trailing approximately 15ft behind whale. A bundle of gear had formed on left side of mouth, near dorsal fin, and near caudal peduncle; a polyball was attached near dorsal fin and caudal peduncle. Whale had superficial wounds from line. Whale was slightly emaciated, but was not considered to be in significant health decline.	L2, L5b	Serious	1	Response mounted, but whale not tagged or disentangled.	L2, L5b	Serious	1	Alaska pot gear	Tanner crab	Photographed gear reviewed by a level 5 responder. Images may contain enough information to trace gear to fisher with additional review effort.
02/17/12	Adult	Whale swam into gear and was hooked in unknown location on body. Unknown amount of line trailed from whale.	L4	Non-serious	0	No response	L4	Non-serious	0	Hook and line	Recrea-tional troll	Witnessed by a level 5 responder. Limited possibility of further classification from additional review effort.

Table 3.--Injury determinations for cetaceans other than humpback whales reported to be injured in Hawaiian waters during 2007-2012, using the most recent established criteria for distinguishing serious from non-serious injury of cetaceans (Tables 1-2 in NMFS 2012). The "initial" injury determination is associated with the condition of the whale or dolphin prior to any follow-up and mitigation efforts. For fishery-related injuries, the initial determination is used for List of Fisheries (LOF) classification. The final known condition of the individual, regardless of injury type, follow-up, or mitigation, is reflected in the "follow-up" injury determination, which is used for Potential Biological Removal (PBR) comparison. Note the vessel collision on 01/24/11 occurred outside the Hawaiian EEZ.

Report date	Species	Stock	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type and fishery summary
8/15/2009	Bottlenose dolphin	Hawaii Island	Adult?	Dolphin frequenting an aquaculture pen array observed multiple times over the year with a hook in its mouth (right corner). Hook accumulated fouling growth by late spring. Report date represents PIRMMRN unsuccessful attempt to dehook the dolphin. Dolphin was slightly emaciated, but foraging.	S5a	Serious	1	Dolphin was seen around 2/20/12 without the hook and in normal body condition.	S5c	Non-serious	0	Gear not recovered, but photographs available. Hook was large and made of stainless steel. PIRMMRN official suggested it was for live bait trolling, but this suggestion has not been confirmed. Additional review effort warranted.
11/26/2009	Spinner dolphin	Oahu/4-Islands	Unknown	Dolphin observed hooked in the mouth (right lower jaw with mouth pinned open). Short metal leader and weight attached to hook. Several scrapes and/or cuts (not fresh) observed on right side of dolphin's head. Dolphin last seen on 11/28/09.	S5a	Serious	1	No response	S5a	Serious	1	Gear not recovered or photographed.
9/13/2010	Sperm whale	Hawaii	Adult	Whale observed with line and net near mouth, but moved backwards and was interpreted to be self-releasing from gear. All gear collected.	L3	Non-serious	0	No response, but subsequent observation indicates whale self-released from gear.	n/a	Non-serious	0	Gear recovered, but is presently unidentified. Additional review effort warranted.
9/20/2010	Spotted dolphin	4-Islands	Unknown	Dolphin observed with several wraps of line between leading edge of dorsal fin and under the peduncle, with an additional wrap around the peduncle and over the flukes. A bundle of gear was attached midway between dorsal fin and fluke. Line on dorsal fin was beginning to pinch in.	S8b	Serious	1	No response	S8b	Serious	1	Gear photographed, but is presently unidentified. Additional review effort warranted.
1/24/2011	Unidentified large whale	n/a	Unknown	Military vessel (203 m traveling at an unknown speed) turned to avoid a group of whales observed off bow, but struck a whale. Whale not observed, but blood seen in water.	L7a, L11	Prorate 0.56 Serious	n/a	No response	L7a, L11	Prorate 0.56 Serious	0.56	n/a

Table 3 (*continued*)

Report date	Species	Stock	Age class	Event summary	Initial injury categories	Initial injury determination	Value for LOF	Response outcome	Follow-up injury categories	Follow-up injury determination	Value for PBR	Gear type and fishery summary
3/18/2011	Sei whale	Hawaii	Subadult	Over 30 ft of heavily-fouled line wrapped twice under peduncle and over fluke blades trailed behind whale and ended in a bundle of line. Whale had moderate wounds from line. Whale was moderately emaciated and considered to be in significant health decline.	L2, L5b	Serious	1	Response mounted and whale tagged, but whale not disentangled.	L2, L5b	Serious	1	Gear photographed, but is presently unidentified. Additional review effort warranted.
9/4/2011	Spinner dolphin	Hawaii Island	Unknown	Dolphin observed with net entangling rostrum (preventing mouth from opening) and trailing the length of the dolphin.	S8a	Serious	1	No response	S8a	Serious	1	Gear not recovered or photographed.
7/30/2012	Spinner dolphin	Hawaii Island	Unknown	Dolphin observed with a ring or band of debris around its rostrum (preventing mouth from opening). Dolphin was slightly emaciated.	S8a	Serious	n/a	No response	S8a	Serious	1	n/a

Table 4.--Summary of humpback whale vessel collisions and entanglements in Hawaiian waters during 2007-2012 that resulted in different preliminary and reviewer injury determinations. The final injury determinations resulting from follow-up discussions are shown along with a rationale for the determination. The injury determination "categories" are based on the most recent established criteria for distinguishing serious from non-serious injury of large whales (Table 1 in NMFS 2012). The injury determination "values" refer to the number of serious injuries relevant to either List of Fisheries classification or Potential Biological Removal comparison. For entanglements, a "|" is used to separate the initial and follow-up injury determination categories and values. An injury determination value of 1 followed by an asterisk indicates that the basis of the determination was the significant health decline caused by the injury (NMFS 2012).

Report date	Injury type	Preliminary injury determination		Reviewer injury determination		Final injury determination		Final determination rationale
		Categories	Value	Categories	Value	Categories	Value	
03/02/07	Entanglement	L3, L5b | L5b	1* | 1*	L3 | n/a	1* | 0	L3, L5b | L5b	1* | 1*	Whale in significant health decline was disentangled while still on breeding ground. Whale must migrate to improve nutritive condition.
03/27/08	Vessel collision	L6b (calf)	1	L8	0.2	L6b (calf)	1	Unknown if mother, calf, or both were struck. Reviewer assumed only the mother, but the precautionary scenario that both were struck was considered more appropriate.
04/16/08	Vessel collision	L5b, L12 (calf)	1	L5b	0	L5b, L12 (calf)	1	Applying L12 when observed injuries confirm a vessel collision prevents a determination bias for calves.
04/25/08	Entanglement	L3 | n/a	0 | 0	L10 | n/a	0.75 | 0	L10 | n/a	0.75 | 0	Agreed with reviewer that there was not sufficient supporting evidence to use L3 for the initial determination.
12/13/08	Entanglement	L3, L5b | L3, L5b	0 | 0	L10 | L10	0.75 | 0.75	L3, L5b | L3, L5b	0 | 0	Considered that there was sufficient supporting evidence to use L3 for the initial and follow-up determinations.

Table 4 (*continued*)

Report date	Injury type	Preliminary injury determination		Reviewer injury determination		Final injury determination		Final determination rationale
		Categories	Value	Categories	Value	Categories	Value	
02/05/09	Vessel collision	L7a (calf), L11	1	L7a	0.56	L7a (calf), L11	1	Report implied some uncertainty that the calf in the group was the whale struck. Reviewer assumed a non-calf member, but the precautionary scenario presented in the reliable report was considered more appropriate.
02/20/09	Entanglement	L3, L5b | L3, L5b	0 | 0	L10 | L10	0.75 | 0.75	L3, L5b | L3, L5b	0 | 0	Considered that there was sufficient supporting evidence to use L3 for the initial and follow-up determinations.
12/24/09	Entanglement	L2 | L10	1 | 0.75	L10 | L10	0.75 | 0.75	L2 | L10	1 | 0.75	Considered that there was sufficient supporting evidence to use L2 for the initial determination.
01/07/10	Entanglement	L3 | n/a	0 | 0	L10 | n/a	0.75 | 0	L3 | n/a	0 | 0	Considered that there was sufficient supporting evidence to use L3 for the initial determination.
01/24/10	Entanglement	L3 | L3	0 | 0	L10 | L10	0.75 | 0.75	L10 | L10	0.75 | 0.75	Agreed with reviewer that there was not sufficient supporting evidence to use L3 for the initial and follow-up determinations.
01/31/10	Entanglement	L4 | L4	0 | 0	L10 | L10	0.75 | 0.75	L4 | L4	0 | 0	Considered that there was sufficient supporting evidence to use L4 for the initial and follow-up determinations.
02/21/10	Entanglement	L2, L5b | L2, L5b	1 | 1	L10 | L10	0.75 | 0.75	L2, L5b | L2, L5b	1 | 1	Considered that there was sufficient supporting evidence to use L2 for the initial and follow-up determinations.

Table 4 (*continued*)

Report date	Injury type	Preliminary injury determination		Reviewer injury determination		Final injury determination		Final determination rationale
		Categories	Value	Categories	Value	Categories	Value	
02/28/10	Vessel collision	L11, L12 (calf)	1	L11	0.52	L11, L12 (calf)	1	Applying L12 when observed injuries confirm a vessel collision prevents a determination bias for calves.
02/16/11	Vessel collision	L7b, L11	0.52	L7b	0.14	L7b, L11	0.52	Unknown if blood in water was from mother, calf, or both. Reviewer assumed only the calf, but the precautionary scenario that both were bleeding was considered more appropriate.
02/25/11	Entanglement	L3 | n/a	0 | 0	L10 | n/a	0.75 | 0	L3 | n/a	0 | 0	Considered that there was sufficient supporting evidence to use L3 for the initial determination.
03/30/11	Entanglement	L4 | L4	0 | 0	L10 | L10	0.75 | 0.75	L10 | L10	0.75 | 0.75	Agreed with reviewer that there was not sufficient supporting evidence to use L4 for the initial and follow-up determinations.
03/30/11	Entanglement	n/a | n/a	0 | 0	L8 | L8	0.75 | 0.75	L8 | L8	0.75 | 0.75	By agreeing with reviewer that the injury of the whale above (mother) was L10 instead of L4, the use of L8 for this whale (calf) was required.

Table 5. Summary of PIR-MMRN reports (1848-2006) of cetaceans in Hawaiian waters (other than humpback whales) with evidence of human-caused injuries. Reports are organized alphabetically by species common name and then chronologically.

Species	Stock	Year	Evidence of human interaction
Bottlenose dolphin	4-Islands	1991	Drowned dolphin found dead with imprint of gillnet on body.
Bottlenose dolphin	4-Islands	1998	Entangled dolphin found dead.
Bottlenose dolphin	4-Islands	2006	Entangled dolphin seen alive at sea.
Cuvier's beaked whale	Hawaii	1998	Possibly entangled whale (with scars and cuts from fishing gear) found dead.
Pygmy killer whale	Hawaii	2006	Hook and line scars on the mouth of a whale found dead (not likely related to morbidity).
Pygmy sperm whale	Hawaii	1947	Hooked whale caught on handline (status of whale unknown).
Pygmy sperm whale	Hawaii	1994	Entangled whale stranded alive and transferred to Sea Life Park (subsequently died).
Sperm whale	Hawaii	1990	Whale stranded alive (subsequently died) that had ingested gear (line and net in stomach).
Spinner dolphin	Hawaii Island	1991	Dolphin seen alive at sea entangled in fishing line.
Spinner dolphin	Kauai/Niihau	1993	Dolphin stranded alive (subsequently died) that had possibly been hooked and had a fractured jaw bone.
Spinner dolphin	Oahu/4-Islands	1994	Dolphin found dead that had possibly been shot with an arrow.
Spinner dolphin	Kure/Midway	2000	Dolphin seen alive at sea entangled in fishing net.
Spinner dolphin	Hawaii Island	2005	Dolphin seen alive at sea entangled in fishing line.
Spinner dolphin	Oahu/4-Islands	2006	Entangled dolphin seen alive at sea.
Striped dolphin	Hawaii	1993	Dolphin stranded alive (subsequently died) that had multiple lesions possibly related to a fishery interaction.
Striped dolphin	Hawaii	2005	Dolphin stranded alive (subsequently died) that was entangled.
Unidentified cetacean	n/a	1990	Entangled stenellid found dead.
Unidentified cetacean	n/a	1994	Entangled cetacean seen alive at sea.
Unidentified cetacean	n/a	1997	Entangled baleanopterid struck by vessel.
Unidentified cetacean	n/a	1998	Cetacean struck by vessel.
Unidentified cetacean	n/a	1998	Entangled cetacean seen alive at sea.
Unidentified cetacean	n/a	1998	Cetacean struck by vessel.
Unidentified cetacean	n/a	2002	Cetacean seen alive at sea with steel rod protruding from back.
Unidentified cetacean	n/a	2002	Delphinid seen alive at sea hooked on buoy and with plastic coming out of mouth.
Unidentified cetacean	n/a	2002	Entangled whale found dead.
Unidentified cetacean	n/a	2005	Possibly entangled whale seen alive at sea.

APPENDIX

Additional interpretation or consideration required in the application of some of the injury categories (NMFS, 2012) to large whales injured in Hawaiian waters during 2007-2012. L = large whale category (Table 1 in NMFS, 2012).

Injury categories[1]	Application of categories
L2, L3, L10	1) Although not the practice of all members of the NMFS Determination Staff Working Group, particularly members assessing injured whales on their feeding grounds, an entangled humpback whale that showed signs of a significant health decline was still considered to be seriously injured after partial or full disentanglement (e.g., whale reported entangled on 03/02/07). The rationale for the serious determination in such cases is that the whales are on their breeding grounds and still have to migrate in order to improve their nutritive condition. 2) When follow-up observations indicated that a whale had self-released from entangling gear (e.g., whale reported entangled on 01/03/12), the observed entanglement was still reflected in the initial injury determination that may be used for List of Fisheries classification. This approach is different than that used for marine mammals released from gear by fishermen in real-time (i.e., when the injury determination is made after the fishermen releases the animal from the gear; NMFS 2012). However, in the present context, an initial injury determination is needed to account for the unknown duration of the entanglement and the resulting impact to the whale.
L5a, L5b	Although not the practice of all members of the NMFS Determination Staff Working Group, these categories were applied whenever lacerations were reported, even for fishery-related injuries. This use accounted for one or more injuries resulting from an entanglement in the event that the whale was disentangled. That is, if an entanglement caused a deep laceration, that laceration would remain, even if all gear was removed from the whale (e.g., whale reported entangled on 12/25/09).
L8	Along with other members of the NMFS Determination Staff Working group, a dependent calf of a mother with an injury of prorated severity was assigned the same prorated injury determination as the mother (e.g., calf of whale reported entangled on 12/16/10).
L12	Although not the practice of all members of the NMFS Determination Staff Working Group, this category was applied along with L5a, L5b, or L11 when a whale was observed with clear vessel collision injuries, even if the actual collision was not reported. The rationale for this use is that it prevents a bias in the injury determination process for calves. That is, if a calf was reported struck by a vessel of any size and unknown speed, even with no resulting visible injuries, it would be considered seriously injured because "a strike to a calf by a vessel of any size when speed is unknown will be considered a serious injury" (NMFS, 2012). However, a calf with superficial injuries clearly indicating a vessel collision (L5a) would be considered non-seriously injured if the collision itself was not reported. To avoid this determination bias from unreported collisions, L12 was used when observed injuries were sufficient confirmation that a collision had occurred (e.g., calf reported injured on 04/16/08).

[1]Description of injury categories (from Table 1 in NMFS, 2012): L2 – constricting wrap; L3 – loose wrap, bridled or draped gear; L5a – deep laceration; L5b – superficial laceration; L8 – dependent calf of a dead or seriously injured mother; L10 – evidence of entanglement; and L12 – vessel strike observed.