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Injury Determinations for Marine Mammals Observed Interacting with Hawaii and American Samoa Longline Fisheries During 2009-2013

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Pacific Islands Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
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Injury Determinations for Marine Mammals Observed Interacting with Hawaii and American Samoa Longline Fisheries During 2009-2013

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Abstract

Marine mammal interactions (i.e., hookings and entanglements) with the Hawaii and American Samoa longline fisheries observed during 2009-2013 were compiled, and the number of marine mammal deaths, serious injuries, and non-serious injuries by fishery, species, and management area were assessed. These values form the basis of the mortality and serious injury estimates included in the stock assessment reports of stocks impacted by these fisheries. Injury determinations were made using a nationally standardized process and established criteria for distinguishing serious from non-serious injuries (National Marine Fisheries Service, 2012). In the Hawaii deep-set fishery, 45 marine mammal interactions were observed from 2009 to 2013; most involved false killer whales (53.3%), resulted in death or serious injury (75.6%), and occurred outside the U.S. exclusive economic zone (EEZ) (55.6%). In the Hawaii shallow-set fishery, 43 marine mammal interactions were observed from 2009 to 2013; most involved Risso's dolphins (39.5%), resulted in death or serious injury (69.8%), and occurred outside the U.S. EEZ (90.7%). In the American Samoa deep-set fishery, 13 marine mammal interactions were observed from 2009 to 2013; most involved rough-toothed dolphins (46.2%), resulted in death or serious injury (92.3%), and occurred within the U.S. EEZ (76.9%).

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INTRODUCTION

The Marine Mammal Protection Act (MMPA) mandates that incidental mortality and serious injury (M&SI) of marine mammals from commercial fishing operations be reduced to insignificant levels. Regulations define serious injury as an injury that will likely result in mortality.[1] In 2012, the National Marine Fisheries Service (NMFS) clarified its interpretation of this definition as any injury that is more likely than not to result in mortality.[2] The process for distinguishing serious from non-serious injuries pursuant to the MMPA was also revised (NMFS, 2012).[3] These revisions were aimed at making the injury determination process more consistent and transparent, as well as providing additional guidance for cases that would have previously been classified as "cannot be determined." Estimates of M&SI by source are compiled and averaged over 5-year periods and included in the marine mammal stock assessment reports (SAR) required by the MMPA. The combined process of observer data approval, injury determination, M&SI estimation, internal and external peer review, and MMPA-specified SAR public review causes a 2-year lag between the M&SI estimation period and the SAR year. The current SAR year (2015) requires estimates of M&SI from 2009 to 2013.

The pelagic longline fisheries based in Hawaii consist of a deep-set fishery targeting tunas and a shallow-set fishery targeting swordfish. A deep-set tuna fishery is also based in American Samoa. Observer coverage for the two deep-set fisheries is approximately 20% annually (although for the American Samoa fishery it was less than 10% prior to 2010 and ranged between 25 and 33% in 2010–2011), while the shallow-set fishery operates under 100% observer coverage. Interactions (i.e., hookings or entanglements) with protected species, including marine mammals, are documented by the on-board observers. Observer data are used to determine the number of marine mammal deaths, serious injuries, and non-serious injuries by fishery, species, and management area. A False Killer Whale Take Reduction Plan (FKWTRP) was finalized in 2012, which includes eight regulatory measures designed to reduce the M&SI of false killer whales (*Pseudorca crassidens*) in Hawaii-based longline fisheries.[4] Most of the measures, including closed areas and captain and crew training and notification, went into effect 31 December 2012, while gear requirements for the Hawaii deep-set fishery went into effect 27 February 2013.

The present report provides a summary of the mortality and injury severity of marine mammals observed interacting with Hawaii and American Samoa longline fisheries during 2009-2013. For the fully observed shallow-set fishery, the number of deaths and serious injuries represents total marine mammal bycatch during this period. For the partially observed deep-set fisheries, the number of deaths and serious injuries is a sample of total marine mammal bycatch, which must be quantitatively estimated. Estimates of total marine mammal bycatch from 2009 to 2013 by fishery, species, and management area are reported elsewhere (McCracken, 2015).

[1] 50 *CFR* 229.2
[2] NMFS Policy Directive PD 02-238
[3] 77 *Federal Register* 3233 (23 January 2012)
[4] 77 *Federal Register* 71259 (29 November 2012)

METHODS

Observer data on marine mammal interactions in the Hawaii and American Samoa longline fisheries during 2009-2013 were extracted from the web-based Pacific Islands Region Longline Observer Data System using the *Datatrawler* interface and compiled in a spreadsheet. These data include details about the trip (i.e., fishery type, duration, gear and bait used), the interaction (i.e., date, time, location, duration, description of events, behavior of animal, nature of injury, amount and type of gear left on animal), and the species involved (i.e., length, identifying characteristics). Copies of the original data forms and, if available, photos and videos taken during the interaction were also obtained and reviewed. In late June of 2012, the lead author of this report (ALB) began an ongoing practice of meeting (in-person or via phone) with the observers of marine mammal interactions and their NMFS Pacific Islands Regional Office (PIRO) Observer Program debriefers upon return of the observers to port. The purpose of these meetings is to seek clarification, when needed, on aspects of the collected data that may be relevant to injury determination. Notes from these meetings were assembled and reviewed along with the electronic data, data form copies, and available imagery.

The PIRO Observer Program assigned a species code to each marine mammal interaction based on the species involved (Table 1). The species code UC (unidentified cetacean) was used when the cetacean species taken could not be identified by the observer or verified by NMFS staff upon review of photos or video and a biopsy sample was not collected. Species identification for pygmy and dwarf sperm whales (*Kogia* sp.) and beaked whales is difficult, and thus a genus or family code is often assigned to interactions involving those species. For some UC interactions, the description, sketches, photos, and videos recorded by the observer indicated one or more candidate (or probable) species. These probable species were identified and reported as part of the present assessment. UC interactions that were determined to involve either false killer whales or short-finned pilot whales (*Globicephala macrorhynchus*) were assigned the species code BF ("blackfish") for injury determination and bycatch estimation. To maintain consistency with the bycatch estimation, marine mammal interactions were considered to have occurred in the calendar year the fishing vessel returned to port. The geographic locations of the interactions were plotted and the exclusive economic zone (EEZ) and management area of the interaction determined. When interaction locations were not available, the begin location of the associated haul was used.

The observer recorded the condition of the animal involved in each interaction as either dead or injured. Injury severity (i.e., serious or non-serious) of each injured animal was subsequently determined using the revised guidelines and criteria presented in NMFS (2012). Specific factors were considered in the application of some of the injury categories to the interactions (see Appendix for details of how these categories were applied). When there was insufficient information to establish injury severity, the case was classified as "cannot be determined" (CBD). Injury determinations were made independently by the authors of this report (ALB and KAF) and, as instructed by NMFS (2012), sent for additional independent review to another NMFS Science Center staffer (Lance Garrison, Southeast Fisheries Science Center) experienced

in evaluating injury severity for cetaceans interacting with longline fisheries (e.g., Garrison, 2007; Garrison and Stokes, 2014). Any differences between the initial and reviewed determinations were discussed and reconciled jointly.

MMPA regulations direct commercial fishermen to submit a Marine Mammal Authorization Program (MMAP) Mortality/Injury Reporting Form (MMAP report) when their operations lead to mortality or injury of marine mammals. The level of detail requested by these forms is much less than that of the observer data forms, making it difficult to determine injury severity in most cases. MMAP reports cannot be used for bycatch estimation because they are not obtained using a quantifiable sampling scheme, but they could potentially provide minimum estimates of M&SI for species not observed interacting with the fishery. In the Pacific Islands Region, MMAP reports are infrequently submitted and generally overlap with observed takes. However, all MMAP reports from the Pacific Islands Region were reviewed and any unobserved interactions were noted and discussed in the context of injury determination.

RESULTS

Injury Determination Review

A total of 101 marine mammal interactions were observed in the three fisheries combined during the 2009-2013 period. Most (88.1%, n = 89) of these interactions involved injured animals and required injury determination. For most interactions, the authors and the third, independent reviewer agreed on the initial injury determinations. However, a few interactions were scored differently by the third reviewer. These interactions were subsequently revisited and discussed by the three parties. In most cases, a relevant detail had not been fully considered by the third reviewer, and the initial determinations of the authors were unanimously confirmed. However, in one case (shallow-set interaction on 11/05/11; Table 2), the determination changed from "CBD or serious" to "serious" following input from the third reviewer.

Hawaii Longline Fisheries

From 2009 to 2013, 45 marine mammals were observed interacting with the deep-set fishery, including 24 (53.3%) false killer whales, 7 (15.6%) unidentified cetaceans, 4 (8.9%) blackfish, 4 (8.9%) common bottlenose dolphins (*Tursiops truncatus*), 1 (2.2%) pygmy killer whale (*Feresa attenuata*), 1 (2.2%) Risso's dolphin (*Grampus griseus*), 1 (2.2%) short-finned pilot whale, 1 (2.2%) sperm whale (*Physeter macrocephalus*), 1 (2.2%) rough-toothed dolphin (*Steno bredanensis*), and 1 (2.2%) striped dolphin (*Stenella coeruleoalba*) (Tables 2-3). Six (13.3%) of the interactions were deaths, 28 (62.2%) were serious injuries, 6 (13.3%) were non-serious injuries, 1 (2.2%) involved prorating a large whale interaction as 0.75 serious (NMFS, 2012), and 4 (8.9%) were classified as CBD. A majority of the interactions (55.6%, n = 25) occurred outside the U.S. EEZ. All 20 (44.4%) interactions within the U.S. EEZ occurred around the Hawaiian Archipelago (i.e., not within the EEZ around the U.S. Pacific Remote Island Areas). Hawaii EEZ takes were roughly evenly distributed north and south of the main Hawaiian Islands (MHI), while takes outside the U.S. EEZ were concentrated north of the MHI (Fig. 1). Marine mammal interactions observed in the deep-set fishery during 2009-2013 were consistent with

observed interactions from 2004 to 2008 (Forney, 2010) in terms of the primary species involved (i.e., false killer whales) and the number and species composition of takes, although takes outside the U.S. EEZ were more northerly distributed during the current period. Thirteen MMAP reports were submitted by Hawaii deep-set longliners during 2009-2013. Twelve (92.3%) of the reports were associated with observed takes. The one exception was a report from an unobserved trip describing a bottlenose dolphin hooked in the mouth. Although the injury would be considered serious (Table 2 in NMFS, 2012), this species is already accounted for by observed interactions.

From 2009 to 2013, 43 marine mammals were observed interacting with the shallow-set fishery, including 17 (39.5%) Risso's dolphins, 7 (16.3%) common bottlenose dolphins, 3 (7.0%) false killer whales, 3 (7.0%) striped dolphins, 3 (7.0%) unidentified cetaceans, 2 (4.7%) unidentified Mesoplodont beaked whales, 2 (4.7%) unidentified beaked whales, 1 (2.3%) blackfish, 1 (2.3%) short-beaked common dolphin (*Delphinus delphis*), 1 (2.3%) northern elephant seal (*Mirounga angustirostris*), 1 (2.3%) Blainville's beaked whale (*Mesoplodon densirostris*), 1 (2.3%) humpback whale (*Megaptera novaeangliae*), and 1 (2.3%) rough-toothed dolphin (Tables 2 and 4). Four (9.3%) of the interactions were deaths, 26 (60.5%) were serious injuries, 10 (23.3%) were non-serious injuries, 2 (4.7%) involved prorating a large whale interaction as 0.75 serious (NMFS, 2012), and 1 (2.3%) was classified as CBD. Most of the interactions (90.7%, n = 39) occurred outside the U.S. EEZ. All 4 (9.3%) interactions within the U.S. EEZ occurred around the Hawaiian Archipelago. All takes, whether inside or outside the U.S. EEZ, were roughly evenly distributed throughout the core shallow-set fishing area north of the MHI (Fig. 2). Marine mammal interactions observed in the shallow-set fishery during 2009-2013 were consistent with observed interactions from 2004 to 2008 (Forney, 2010) in terms of the primary species involved (i.e., Risso's dolphins), species composition, and general distribution of the takes, although there were more interactions in the current period. Three MMAP reports were submitted by Hawaii shallow-set longliners during 2009-2013. All three reports were associated with observed takes.

American Samoa Longline Fishery

From 2009 to 2013, 13 marine mammals were observed interacting with the deep-set fishery, including 6 (46.2%) rough-toothed dolphins, 4 (30.8%) false killer whales, 1 (7.7%) blackfish, 1 (7.7%) unidentified cetacean, and 1 (7.7%) Cuvier's beaked whale (*Ziphius cavirostris*) (Tables 5–6). Two (15.4%) of the interactions were deaths, 10 (76.9%) were serious injuries, and 1 (7.7%) was a non-serious injury. Most of the interactions (76.9%, n = 10) occurred within the U.S. EEZ around American Samoa. The 3 (23.1%) interactions outside the U.S. EEZ occurred within the EEZ of the Cook Islands (n = 2) and Niue (n = 1). American Samoa EEZ takes were concentrated in the western portion of the region (Fig. 3). Five MMAP reports were submitted by American Samoa deep-set longliners during 2009–2013. Three of the reports were associated with observed takes. Of the two reports covering unobserved takes, one describes two short-finned pilot whales hooked in an unknown body location and the other recounts a bottlenose dolphin hooked in the pectoral fin, with all three animals released with trailing gear. Although the length of the two pilot whales was not reported, the recorded length of the trailing gear was clearly longer than the whales, indicating that the pilot whales were both seriously injured (Appendix; Table 2 in NMFS, 2012). The length of the trailing gear was not reported for the bottlenose dolphin, so an injury determination could not be made. Although insufficient details

were provided to allow verification of the species identifications, neither pilot whales nor bottlenose dolphins were accounted for by observed interactions.

Other Considerations

As described in the Appendix, the NMFS (2012) small cetacean injury category S15 was used in the case of a dependent animal left with a seriously injured mother, but was not applied to animals of dependent size potentially released alone post-interaction, which is also encompassed by the category. S15 was not used in this respect because the category description does not currently include criteria for establishing when a dependent animal can be considered alone. With more guidance (e.g., an interaction time or distance amount that would likely lead to separation of an injured dependent), it may be possible to use this category more broadly in future injury assessments. Given that injury determinations are considered in 5-year periods, some of the determinations presented herein could change if the broader application of S15 occurred within the next 4 years. Specifically, the injury determination for one of the Hawaii deep-set interactions (01/15/13) and four of the Hawaii shallow-set interactions (04/13/10, 12/12/10, 12/19/10, and 03/7/13) (Table 2) could change from non-serious to serious, depending on expanded future criteria for applying category S15.

The Hawaii deep-set interaction on 03/01/13 (Table 2) was the first to be observed in this fishery after the FKWTRP was fully in effect. The FKWTRP specifies both short-term (i.e., 6-month) and long-term (i.e., 5-year) goals for reducing the M&SI of false killer whales in Hawaii-based longline fisheries.[5] Monitoring the short- or long-term effectiveness of the FKWTRP is beyond the scope of this report but is under the purview of the PIRO and the federally-appointed False Killer Whale Take Reduction Team.[6] Preliminary results from a NMFS analysis of pre- and post-FKWTRP injury determinations for false killer whale and blackfish interactions in the Hawaii deep-set fishery, using data from 2001-2014, indicate that there is not a statistically significant difference in either the rates of observed M&SI or the proportion of interactions resulting in non-serious injuries between the two periods. Further, the analysis suggests that only relatively large (40-50%) reductions in observed M&SI would be statistically significant within 3-5 years of the FKWTRP implementation, but a relatively smaller (20-30%) decrease in the proportion of interactions resulting in serious injuries, if present, should be detectable within 3-5 years.[7]

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[5] 77 *Federal Register* 71259 (29 November 2012)

[6] http://www.nmfs.noaa.gov/pr/interactions/trt/falsekillerwhale.htm

[7] http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/pdfs_mtg7/final_false_killer_whale_trt_mtg_7_key_outcomes_memo__6-17-15_.pdf

Young (PIRO) also participated in the meetings with returning observers, assuming full responsibility of a few meetings when ALB was in the field. Lance Garrison, the Pacific Scientific Review Group, and PIRO provided additional reviews of the injury determinations. This report was improved by comments from Jamie Marchetti, Erin Oleson, and Nancy Young.

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Table 1.--Species code, common name, and scientific name of marine mammals relevant to the 2009-2013 observation period of the Hawaii and American Samoa longline fisheries.

Code	Common name	Scientific name
BB	Sei whale	*Balaenoptera borealis*
BE	Bryde's whale	*Balaenoptera edeni*
BF	"Blackfish" = PC or GM	
BM	Blue whale	*Balaenoptera musculus*
BP	Fin whale	*Balaenoptera physalus*
DD	Short-beaked common dolphin	*Delphinus delphis*
FA	Pygmy killer whale	*Feresa attenuata*
GG	Risso's dolphin	*Grampus griseus*
GM	Short-finned pilot whale	*Globicephala macrorhynchus*
MA	Northern elephant seal	*Mirounga angustirostris*
MD	Blainville's beaked whale	*Mesoplodon densirostris*
MN	Humpback whale	*Megaptera novaeangliae*
PC	False killer whale	*Pseudorca crassidens*
PM	Sperm whale	*Physeter macrocephalus*
SA	Pantropical spotted dolphin	*Stenella attenuata*
SB	Rough-toothed dolphin	*Steno bredanensis*
SC	Striped dolphin	*Stenella coeruleoalba*
SL	Spinner dolphin	*Stenella longirostris*
TT	Common bottlenose dolphin	*Tursiops truncatus*
UC	Unidentified cetacean	
UM	Mesoplodont beaked whale	*Mesoplodon* sp.
ZI	Cuvier's beaked whale	*Ziphius cavirostris*
ZU	Unidentified beaked whale	Ziphiid whale

Table 2.--Injury determinations for marine mammals observed interacting with Hawaii longline fisheries during 2009-2013, using the most recent established criteria for distinguishing serious from non-serious injury of marine mammals (Tables 1-3 in NMFS, 2012). Interactions are in order of trip number (confidential data; not shown). SS = shallow-set fishery; DS = deep-set fishery; CBD = cannot be determined. For false killer whale or potential false killer whale takes within the U.S. EEZ around Hawaii, the stock(s) occurring in the take location is indicated: pelagic (P), MHI insular (I), or Northwestern Hawaiian Islands (N), based on stock boundaries presented in Bradford et al. (2015). Species codes are defined in Table 1. Animal size estimates were generally made by the observers in ft, so are reported in this unit for consistency. Gear measurement units (ft or m) are reported as made by the observers.

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
SS	Outside	2009	12/20/08	UC	BB, BE, BM, BP	40	Injured	Prorate 0.75 Serious	L10	Hooked and possibly entangled in unknown body location, (likely fluke or posterior portion of body); broke free with hook, 8-m mono leader, and 60-g weight attached
SS	Outside	2009	12/13/08	GG	GG	In Error	Injured	Serious	S2 or S5a	Hooked in mouth (possibly ingested); broke free with hook and 0.1-m mono line attached
DS	Hawaii (P)	2009	02/13/09	PC	PC	8	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook, 0.5-m wire leader, 45-g weight, and 3-ft branchline attached
DS	Hawaii (P)	2009	02/18/09	PC	PC	9	Injured	Serious	S6	Hooked and entangled in tail stock; cut free with two hooks, two 0.7-m wire leaders, two 45-g weights, and 2-4-ft branchlines attached
SS	Outside	2009	04/12/09	GG	GG	4-5	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Outside	2009	04/14/09	PC	PC	7	Injured	Serious	S5a, S6	Hooked in mouth; broke free with hook, 0.3-m wire leader, 45-g weight, and 5-m branchline attached
DS	Hawaii (P)	2009	04/19/09	PC	PC	9	Injured	Serious	S6	Hooked in unknown body location (possibly mouth); cut free with hook, 0.3-m wire leader, 45-g weight, and 15-m branchline attached
DS	Outside	2009	05/04/09	UC	UC	18	Injured	CBD	Possibilities: one or more of S5a, S5d, S6, S7b, S8a, or S8b	Unknown if hooked or entangled, but mainline came under tension when animal surfaced; broke free, but unknown how much or if any gear attached (retrieved gear was in a tangle)

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Outside	2009	05/04/09	UC	UC	15	Injured	Non-serious	S7b	Appeared to drag mainline, but animal freed itself with no stress or breakage of gear; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of associated injury
DS	Outside	2009	04/22/09	PC	PC	12	Dead	Dead	n/a	Entangled in branchline, with two wraps around caudal peduncle
SS	Hawaii (P)	2009	06/04/09	PC	PC	9	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook, 9.3-m mono leader, 80-g weight, and 6-m branchline attached
DS	Outside	2009	06/29/09	TT	TT	9.8	Injured	Serious	S5a	Hooked in mouth; cut free with hook and <10-cm mono leader attached
DS	Outside	2009	06/27/09	PC	PC	20	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook, 0.5-m wire leader, and 45-g or 60-g weight attached
DS	Outside	2009	07/31/09	PC	PC	10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.5-m wire leader, 60-g weight, and 10.5-m branchline attached
DS	Outside	2009	07/31/09	PC	PC	7	Injured	Serious	S6	Hooked in unknown body location; cut free with hook, 0.5-m wire leader, 60-g weight, and 11.9-m branchline attached
DS	Outside	2009	08/30/09	UC	BF, TT	6.6-9.8	Injured	Non-serious	S5c	Hooked in unknown body location, but pulled free of hook; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Outside	2009	10/22/09	PC	PC	6-7	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook, 0.5-m wire leader, 45-g weight, and 4-ft branchline attached

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
SS	Outside	2009	12/04/09	GG	GG	12	Injured	Serious	Possibilities: one or more of S5a, S5d, S6, S8a, or S8b	Hooked and entangled in unknown body location(s); one line cut and animal broke free of others, but gear retrieved indicates several hooks and portions of branchline attached; multiple tangled and broken branchlines indicate animal struggled extensively and likely suffered capture myopathy
SS	Outside	2010	12/02/09	GG	GG	4.5-5	Dead	Dead	n/a	Hooked in mouth and entangled around pectoral fin
DS	Outside	2009	12/23/09	PC	PC	8	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook, 0.5-m wire leader, 60-g weight, and 0.3-m branchline attached
SS	Outside	2010	01/16/10	GG	GG	13.1	Injured	Serious	S2 or S5a, S6	Hooked in mouth or head (possibly ingested); broke free with hook and 4.8-m mono leader attached
SS	Outside	2010	02/21/10	TT	TT	8-10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook and 1-3-m branchline attached
SS	Outside	2010	02/23/10	SC	SC	5	Injured	Serious	S5a	Hooked in mouth (with line wrapped through mouth); cut free with hook and 2-in branchline attached
SS	Outside	2010	03/02/10	GG	GG	7	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook and 8-m branchline attached
SS	Outside	2010	03/08/10	GG	GG	6	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook and 5-m branchline attached
SS	Outside	2010	03/01/10	UC	SC, TT	9	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
SS	Outside	2010	03/16/10	GG	GG	6.6-9.8	Injured	Serious	S5a, S6	Hooked in mouth; broke free with hook and 7-m branchline attached
SS	Outside	2010	04/13/10	GG	GG	5	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Hawaii (P)	2010	07/11/10	PC	PC	13	Injured	Serious	S2, S6	Hooked in mouth (presumably ingested); cut free with hook, 0.5-m wire leader, 45-g weight, and 3-m branchline attached
DS	Hawaii (P)	2010	07/03/10	PC	PC	8	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook, 0.5-m wire leader, 45-g weight, and 1.2-m branchline attached
DS	Outside	2010	08/01/10	TT	TT	10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.5-m wire leader, 60-g weight, and 10.1-m branchline attached
SS	Outside	2010	09/19/10	TT	TT	6	Injured	Serious	S5a	Hooked in mouth and entangled around body; cut free with hook and 6-in branchline attached
DS	Hawaii (P)	2010	10/11/10	UC	BF	12	Injured	Serious	S5a, S6	Hooked in mouth; broke free with hook, 0.6-m wire leader, 45-g weight, and a few feet of branchline attached
DS*	Hawaii (P)	2010	10/22/10	PC	PC	14	Injured	Non-serious	S5c	Hooked in head area (possibly mouth or ingested), but straightened hook and was freed; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Hawaii	2010	11/07/10	GG	GG	8	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.5-m wire leader, 45-g weight, and 3-m branchline attached
SS	Outside	2010	11/05/10	SC	SC	4.7	Dead	Dead	n/a	Entangled around body behind pectoral fins by a single loop of branchline that was hooked onto itself
SS	Outside	2010	11/18/10	GG	GG	Not specified	Injured	Serious	S6	Hooked in unknown body location; broke free with hook and 3-m branchline attached
DS	Outside	2010	12/01/10	UC	BF, SB, TT	4.5-5.5	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); broke free with hook, swivel, 0.7-m wire leader, 45-g weight, and 18-in branchline attached

*This take occurred as part of the experimental fishery designed to evaluate the effectiveness of "weak" circle hooks (Bigelow et al., 2012) and will be considered separately during the estimation of M&SI.

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Outside	2010	12/02/10	PC	PC	7	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, swivel, 0.7-m wire leader, 45-g weight, and 3-6-in branchline attached
DS	Outside	2010	12/21/10	UC	BF, SB, TT	Not specified	Injured	CBD	Possibilities: one or more of S5a, S5d, S6, S8a, or S8b	Hooked and/or entangled in unknown body location(s); animal broke free, but unknown how much gear attached (some branchlines missing hooks and one 0.4-m wire leader had snapped); this interaction shared similarities with that from 12/04/09, except had less information to make inference about capture myopathy and presumably less gear remained on animal
SS	Outside	2011	12/12/10	GG	GG	6	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
SS	Outside	2011	12/19/10	TT	TT	6	Injured	Non-serious	S5c	Hooked in head area (possibly mouth), but pulled free of hook; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
SS	Outside	2011	12/24/10	UC	BF	Not specified	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); broke free with hook, 1-m mono leader, and likely 45-g weight and part of branchline attached
SS	Outside	2011	02/03/11	GG	GG	6	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook and 3-m mono line attached
SS	Outside	2011	02/03/11	GG	GG	10	Injured	Serious	S5a, S6	Hooked in mouth; broke free with hook and 2-3-ft mono leader attached
SS	Outside	2011	02/08/11	GG	GG	6	Injured	Serious	S6	Hooked in unknown body location; released with hook, 1-m mono leader, 60-g weight, and 14-m branchline attached
SS	Outside	2011	02/18/11	UM	UM	15	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook and 5-m mono leader attached

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
SS	Outside	2011	03/05/11	TT	TT	7	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook and 1-ft mono leader attached
DS	Hawaii (P)	2011	02/18/11	PC	PC	12	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); released with hook, 0.5-m wire leader, 45-g weight, and 13.7-m branchline attached
DS	Hawaii (P)	2011	02/18/11	PC	PC	12	Injured	CBD	Possibilities: one or more of S5a, S5d, S6, S8a, or S8b	Unknown if hooked or entangled, but mainline came under tension when animal surfaced; animal broke free and one of the next branchlines came up broken; presumably hook, 0.5-m wire leader, 45-g weight, and an unspecified amount of branchline attached
SS	Outside	2011	03/22/11	MD	MD	16.4	Injured	Non-serious	S7b	Appeared to get stuck on mainline, but animal freed itself and all gear retrieved; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of associated injury
SS	Outside	2011	04/11/11	UC	ZU	32.8	Injured	Serious	S6	Entangled in mainline, which was wrapped twice around the body anterior to dorsal fin; cut free with 50-m mainline attached
SS	Hawaii (P)	2011	05/15/11	PC	PC	10	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Hawaii	2011	05/27/11	PM	PM	25-30	Injured	Prorate 0.75 Serious	L10	Unknown if hooked or entangled, but mainline came under tension when animal surfaced; cut free with hook, 0.5-m wire leader, 45 g weight, 12-m branchline, and 25-30-ft mainline possibly attached
DS	Outside	2011	06/19/11	SC	SC	6.8	Dead	Dead	n/a	Entangled in wire leader, which was wrapped 3-4 times around caudal peduncle with the hook caught on branchline

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Hawaii (P)	2011	09/30/11	PC	PC	12	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); broke free with hook, 0.5-m wire leader, 45-g weight, and 10-m branchline attached
DS	Hawaii (I,P)	2011	10/12/11	UC	BF	14	Injured	Serious	S6	Hooked in unknown body location (possibly mouth); broke free with hook, 0.5-m wire leader, 45-g weight, and 9-m branchline attached
SS	Outside	2011	11/05/11	DD	DD	5	Injured	Serious	S7b	Entangled in mainline and branchline around beak and body, but animal eventually freed when line cut; presumed prolonged interaction time, nature and extent of struggle, and a consideration of species indicate interaction likely to have caused capture myopathy
SS	Outside	2011	11/13/11	MN	MN	30	Injured	Prorate 0.75 Serious	L10	Entangled in mainline, which was wrapped tightly around caudal peduncle; cut free with potentially up to four 8.7-m branchlines, including hooks, 7-m mono leaders, and 80-g weights, along with unknown amount of mainline
DS	Outside	2011	12/06/11	UC	BF	15	Injured	Non-serious	S7b	Entangled in mainline around caudal peduncle, but animal freed itself of all gear; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of associated injury
SS	Outside	2012	01/05/12	UC	UC	8	Injured	Serious	S6	Unknown if hooked or entangled, but animal surfaced attached to branchline; broke free with hook, 60-g weight, and 10-m mono line attached
SS	Outside	2012	01/26/12	SC	SC	5	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; observed interaction was presumably brief (unlikely to have caused capture myopathy) and no evidence of additional injuries

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
SS	Outside	2012	02/29/12	TT	TT	10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook and <1-m mono leader attached
DS	Hawaii (P)	2012	03/16/12	PC	PC	19.7	Injured	CBD	Possibilities: one or more of S2, S5a, S5d, S6, S8a, or S8b	Hooked and/or entangled in unknown body location(s); broke free with hook and 0.5-m wire leader attached
SS	Hawaii (P)	2012	05/03/12	PC	PC	13	Injured	CBD	S7b	Entangled in mainline, which was wrapped multiple times around caudal peduncle; broke free of gear, but limited information to make inference about capture myopathy and extent of injury
DS	Outside	2012	06/12/12	UC	UC	5	Injured	Serious	S6	Unknown if hooked or entangled, but animal surfaced attached to branchline; cut free with hook, 0.4-m wire leader, 45-g weight, and 10-m branchline attached
DS	Hawaii (I,N,P)	2012	10/29/12	PC	PC	14-18	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.8-m wire leader, 60-g weight, and 17-m branchline attached
DS	Outside	2012	12/01/12	UC	BF	13.1	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); cut free with hook, 0.4-m leader, 45-g weight, and 10-m branchline attached
SS	Outside	2013	01/27/13	UM	UM	12	Injured	Non-serious	S5c	Hooked in fluke, but dehooked; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Hawaii (I,N,P)	2012	12/25/12	PC	PC	7	Injured	Serious	S5a	Hooked in mouth; attempted dehooking, but cut free with hook attached
SS	Outside	2013	01/14/13	TT	TT	4	Dead	Dead	n/a	Entangled in branchline, which was wrapped several times around caudal peduncle; animal died during observed portion of interaction
SS	Outside	2013	01/25/13	GG	GG	7	Injured	Serious	S2, S6	Hooked in mouth (presumably ingested); cut free with hook and 1-1.5 ft mono leader attached

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Hawaii	2013	01/05/13	FA	FA	5.9	Dead	Dead	n/a	Entangled around fluke and pectoral fin by two loops of branchline that was either hooked on itself or the pectoral fin of the animal
DS	Outside	2013	01/15/13	PC	PC	8	Injured	Non-serious	S5c	Hooked in unknown body location, but pulled free of hook; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
DS	Hawaii (P)	2013	01/29/13	PC	PC	14	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook, 0.25 m wire leader, 45 g weight, and 6-10 m branchline attached
DS	Outside	2013	02/13/13	GM	GM	7	Dead	Dead	n/a	Hooked in mouth
SS	Outside	2013	02/28/13	GG	GG	6	Injured	Serious	S5a or S5b, S6	Hooked in mouth (possibly lip only); cut free with hook and 4-5 ft mono leader attached
SS	Outside	2013	02/26/13	ZU	ZU	12	Injured	Serious	S6	Hooked in fluke; cut free with hook, 6 m mono leader, 75 g weight, and 11 m branchline attached
DS	Outside	2013	02/21/13	PC	PC	10	Injured	Serious	S2 or S5a, S6	Hooked in unknown body location (likely the head, mouth, or ingested); broke free with hook, 0.6 m wire leader, 45 g weight, and possibly a small amount of branchline attached
SS	Outside	2013	03/07/13	GG	GG	6	Injured	Non-serious	S5c, S7b	Hooked in caudal peduncle and entangled around body, through mouth, and around dorsal and pectoral fins, but dehooked and freed of gear; observed interaction was brief (unlikely to have caused capture myopathy) and additional injuries were considered superficial
DS	Hawaii	2013	03/01/13	UC	TT	In Error	Injured	Serious	S6	Hooked in unknown body location; broke free with hook, 0.8 m wire leader, 45 g weight, and 5 m branchline attached
SS	Hawaii	2013	04/24/13	SB	SB	7	Dead	Dead	n/a	Hooked in mouth

Table 2 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	Outside	2013	04/20/13	PC	PC	12	Injured	Non-serious	S5c	Hooked in unknown body location, but pulled free of hook; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of additional injuries
SS	Outside	2013	04/30/13	TT	TT	9	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook and 1-3 ft mono leader attached
DS	Outside	2013	05/04/13	TT	TT	7	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.5 m wire leader, 60 g weight, and 5 m branchline attached
DS	Hawaii	2013	05/24/13	SB	SB	5	Dead	Dead	n/a	Entangled in mainline, which was wrapped twice around body and several times around caudal peduncle and fluke
DS	Outside	2013	07/18/13	TT	TT	6	Dead	Dead	n/a	Hooked in mouth (presumably ingested)
SS	Outside	2013	11/13/13	MA	MA	6	Injured	Serious	P2 or P5a, P6	Hooked in mouth (possibly ingested); cut free with hook and 9 m mono leader attached

Table 3.--Summary of deaths (D), serious injuries (SI), non-serious injuries (NSI), and injuries with a severity that cannot be determined (CBD) observed in the Hawaii deep-set longline fishery during 2009-2013. Species codes are defined in Table 1. Year is the vessel return year. Non-integer values for large whales indicate the use of injury categories with prorated severity (Table 1 in NMFS, 2012).

		Hawaii EEZ				Outside U.S. EEZ			
Species Code	Year	D	SI	NSI	CBD	D	SI	NSI	CBD
BF	2009								
	2010		1						
	2011		1					1	
	2012						1		
	2013								
FA	2009								
	2010								
	2011								
	2012								
	2013	1							
GG	2009								
	2010		1						
	2011								
	2012								
	2013								
GM	2009								
	2010								
	2011								
	2012								
	2013					1			
PC	2009		3			1	6		
	2010		2	*			1		
	2011		2	1	1				
	2012		2		1				
	2013		1				1	2	
PM	2009								
	2010								
	2011		0.75	0.25					
	2012								
	2013								
SB	2009								
	2010								
	2011								
	2012								
	2013	1							
SC	2009								
	2010								
	2011					1			
	2012								
	2013								
TT	2009						1		
	2010						1		
	2011								
	2012								
	2013					1	1		
UC	2009							2	1
	2010						1		1
	2011								
	2012						1		
	2013		1						

*This take occurred as part of the experimental fishery designed to evaluate the effectiveness of "weak" circle hooks (Bigelow et al., 2012) and will be considered separately during the estimation of M&SI.

Table 4.--Summary of deaths (D), serious injuries (SI), non-serious injuries (NSI), and injuries with a severity that cannot be determined (CBD) observed in the Hawaii shallow-set longline fishery during 2009-2013. Species codes are defined in Table 1. Year is the vessel return year. Non-integer values for large whales indicate the use of injury categories with prorated severity (Table 1 in NMFS, 2012).

		Hawaii EEZ				Outside U.S. EEZ			
Species Code	Year	D	SI	NSI	CBD	D	SI	NSI	CBD
BF	2009								
	2010								
	2011						1		
	2012								
	2013								
DD	2009								
	2010								
	2011						1		
	2012								
	2013								
GG	2009						2	1	
	2010					1	5	1	
	2011						3	1	
	2012								
	2013						2	1	
MA	2009								
	2010								
	2011								
	2012								
	2013						1		
MD	2009								
	2010								
	2011							1	
	2012								
	2013								
MN	2009								
	2010								
	2011						0.75	0.25	
	2012								
	2013								
PC	2009		1						
	2010								
	2011			1					
	2012				1				
	2013								
SB	2009								
	2010								
	2011								
	2012								
	2013	1							
SC	2009								
	2010					1	1		
	2011								
	2012							1	
	2013								
TT	2009								
	2010						2		
	2011						1	1	
	2012						1		
	2013					1	1		
UC	2009						0.75	0.25	
	2010							1	
	2011								
	2012						1		
	2013								
UM	2009								
	2010								
	2011						1		
	2012								
	2013							1	
ZU	2009								
	2010								
	2011						1		
	2012								
	2013						1		

Table 5.--Injury determinations for marine mammals observed interacting with American Samoa (AS) deep-set (DS) longline fishery during 2009-2013, using the most recent established criteria for distinguishing serious from non-serious injury of marine mammals (Tables 1-3 in NMFS, 2012). Interactions are in order of trip number (confidential data; not shown). Species codes are defined in Table 1. Animal size estimates were generally made by the observers in ft, so are reported in this unit for consistency. Gear measurement units (ft or m) are reported as made by the observers.

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury categories	Interaction details and case-specific factors
DS	AS	2011	01/06/11	UC	BF	6	Injured	Serious	S6	Hooked on trailing edge of fluke and entangled in mono line around fluke blade; broke free with hook and 3-4-ft branchline attached
DS	AS	2011	11/27/10	SB	SB	7.2	Injured	Serious	S4, S5c	Hooked in fluke blade; barely moving when first observed, so brought on deck; returned to water free of gear, where animal floated motionless at surface; animal already appeared to have suffered from capture myopathy prior to prolonged handling time
DS	AS	2011	11/28/10	SB	SB	7	Injured	Non-serious	S7b	Entangled around body by multiple loose wraps of another vessel's branchline, which was hooked to branchline of current vessel; unraveled line and animal freed of gear; observed interaction was brief (unlikely to have caused capture myopathy) and no evidence of associated injury
DS	AS	2011	01/05/11	PC	PC	13.1	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); cut free with hook and 9-10-m branchline attached
DS	Cook Islands	2011	02/19/11	PC	PC	8	Injured	Serious	S6	Hooked in dorsal fin; cut free with hook and 10-ft branchline attached
DS	Cook Islands	2011	02/20/11	PC	PC	5	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook and 10- ft branchline attached
DS	AS	2011	03/05/11	SB	SB	7	Injured	Serious	S6	Entangled in branchline (unknown if hooked), which was wrapped around caudal peduncle; cut free with hook and at least 2-ft branchline left tangled around caudal peduncle

Table 5 (continued).

Fishery type	EEZ area	Vessel return year	Take date	Species code	Probable species code	Estimated size (ft)	Recorded condition	Injury determination	Injury category	Interaction details and case-specific factors
DS	AS	2011	03/10/11	SB	SB	6	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with presumably hook and unknown amount of branchline (possibly 1-m) attached
DS	AS	2011	04/27/11	SB	SB	7	Injured	Serious	S6	Hooked in trailing edge of fluke; cut free with hook and 3-ft branchline attached
DS	AS	2011	07/01/11	UC	SA, SB, SC, SL, TT	6	Injured	Serious	S5d or S6	Hooked in pectoral fin and entangled in branchline, which formed a figure 8 between the pectoral fin and mouth; noted weakened state and sinking post-interaction indicate interaction likely to have caused capture myopathy
DS	AS	2011	09/03/11	ZI	ZI	9.8	Dead	Dead	n/a	Entangled in branchline around caudal peduncle
DS	AS	2013	03/11/13	SB	SB	4.9	Dead	Dead	n/a	Hooked in lip, although line furrows suggest animal was entangled in branchline around mouth and potentially pectoral fin
DS	Niue	2013	10/12/13	PC	PC	12	Injured	Serious	S5a	Hooked in mouth; broke free with hook and no more than 1-2-ft branchline attached

Table 6.--Summary of deaths (D), serious injuries (SI), non-serious injuries (NSI), and injuries with a severity that cannot be determined (CBD) observed in the American Samoa deep-set longline fishery during 2009-2013. Species codes are defined in Table 1. Year is the vessel return year.

		American Samoa EEZ				Outside U.S. EEZ			
Species Code	Year	D	SI	NSI	CBD	D	SI	NSI	CBD
BF	2009								
	2010								
	2011		1						
	2012								
	2013								
PC	2009								
	2010								
	2011		1				2		
	2012								
	2013						1		
SB	2009								
	2010								
	2011		4	1					
	2012								
	2013	1							
UC	2009								
	2010								
	2011		1						
	2012								
	2013								
ZI	2009								
	2010								
	2011	1							
	2012								
	2013								

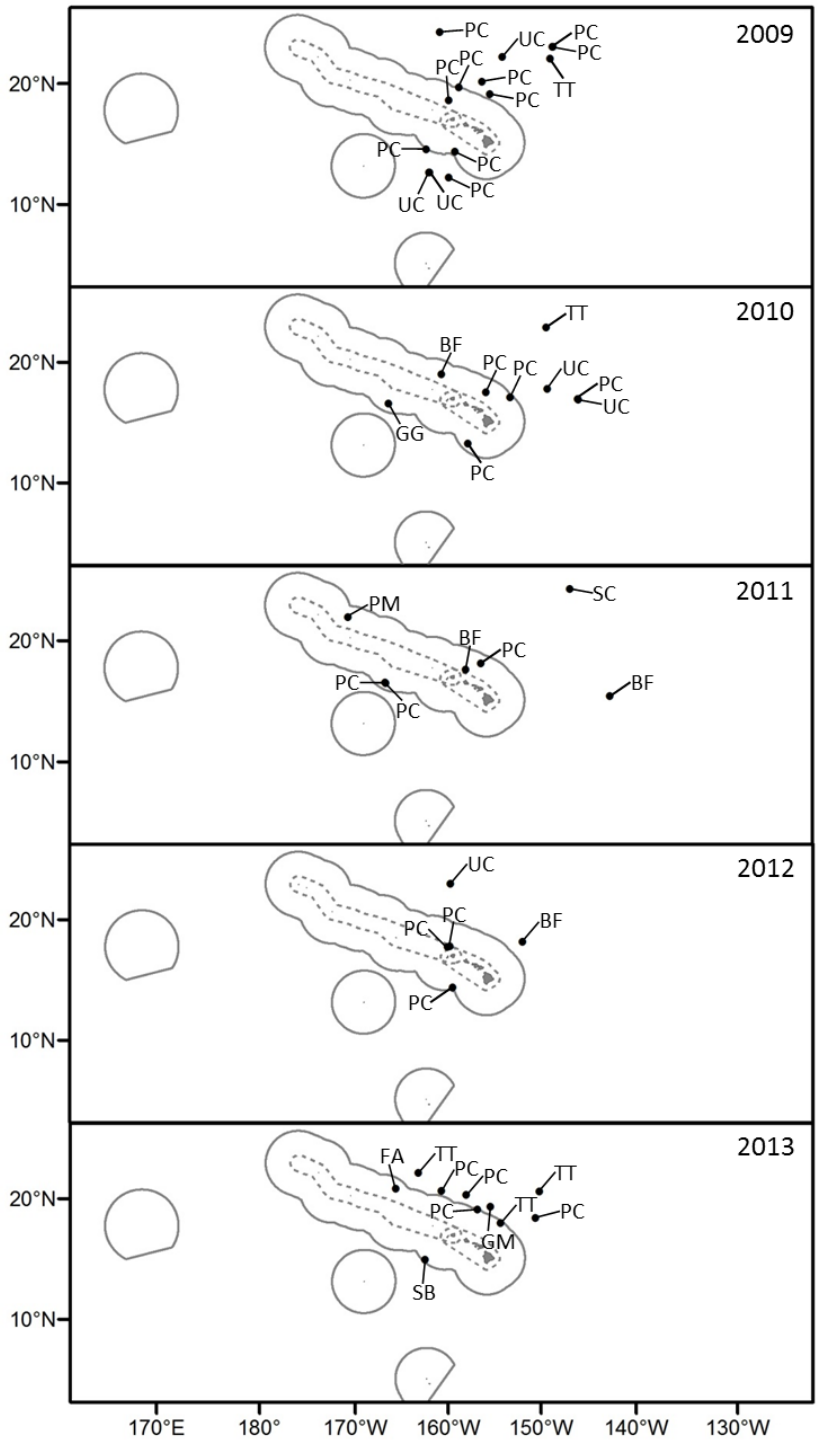

Figure 1.--Locations of observed marine mammal interactions with the Hawaii deep-set longline fishery during 2009-2013. Solid gray outlines represent U.S. EEZs; dotted gray outlines are (from south to north): 1) the estimated range of the MHI insular stock of false killer whales, and 2) the estimated range of the Northwestern Hawaiian Islands stock of false killer whales. Takes are labeled by species code (defined in Table 1).

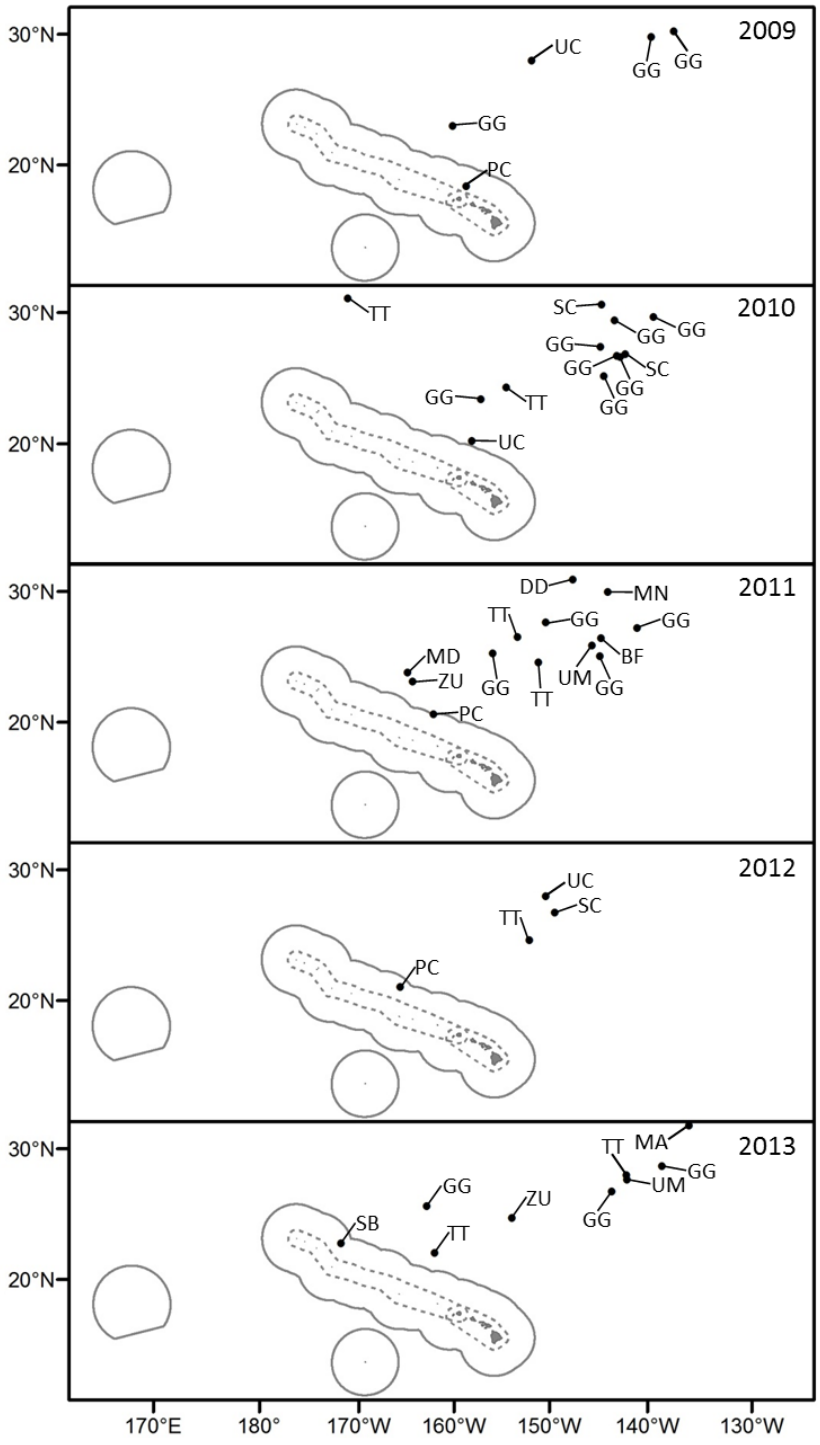

Figure 2.--Locations of observed marine mammal interactions with the Hawaii shallow-set longline fishery during 2009-2013. Solid gray outlines represent U.S. EEZs; dotted gray outlines are (from south to north): 1) the estimated range of the MHI insular stock of false killer whales, and 2) the estimated range of the Northwestern Hawaiian Islands stock of false killer whales. Takes are labeled by species code (defined in Table 1).

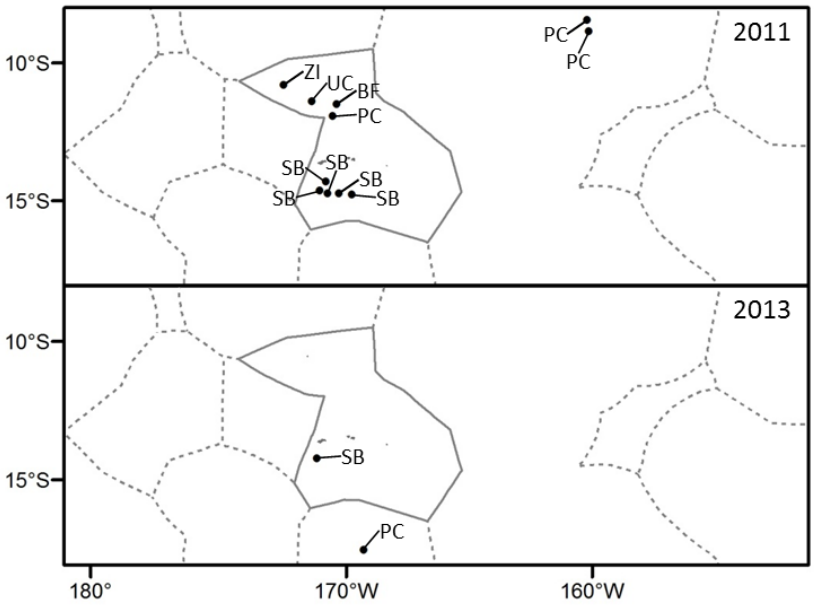

Figure 3.--Locations of observed marine mammal interactions with the American Samoa deep-set longline fishery during 2009-2013. Years without observed interactions are not shown. Solid outlines represent the U.S. EEZ; dotted gray outlines are non-U.S. EEZs. The three takes outside the U.S. EEZ are within the EEZ of the Cook Islands (*n* = 2, 2011) and Niue (*n* = 1, 2013). Takes are labeled by species code (defined in Table 1).

Appendix.--Specific factors that were considered in the application of some of the injury categories (NMFS, 2012) to marine mammal interactions in the Hawaii and American Samoa longline fisheries. S = small cetacean category (Table 2 in NMFS, 2012); P = pinniped category (Table 3 in NMFS, 2012).

Injury category[1]	Factors considered
S2, S5a, P2, P5a	The observers were generally able to determine when an animal was hooked in the mouth (or at least the head area), based on the presence of line coming from that region. However, it was more difficult to confirm whether the hook had been ingested. If the observer indicated that the hook was seen embedded in the mouth (or other part of the head), S5a or P5a was used. If the observer specified that the line came from the mouth, but that the hook or leader was not seen and that ingestion was presumed, S2 or P2 was applied. Otherwise, the interaction was classified as "S2 or S5a" or "P2 or P5a" to account for the possibility of ingestion. This classification did not affect the injury determination, as S2, P2, S5a, and P5a each represent a serious injury (NMFS, 2012).
S5c, S5d, S7b	For these categories that require "case-specific" injury determinations, a consideration of capture myopathy was included in the determination process (NMFS, 2012). Specific interaction characteristics that were considered were: 1) duration of the event, 2) behavior of the animal during the interaction and upon release, and 3) known species-specific sensitivity to capture myopathy. Interactions that were prolonged, resulted in the animal actively struggling and appearing lethargic upon release, and involved a species with known sensitivity (e.g., *Stenella* spp.) were considered more likely to have caused capture myopathy. For some interactions, the interaction duration and animal behavior were specified by the observer. For others, these attributes were implied from the event description or supporting information that suggested a lengthy period of struggle (e.g., the animal was pulled to the vessel from a long distance, the gear associated with the animal was tangled).
S6, P6	The length and body location of line remaining attached to the animal was considered relative to the length of the animal (as estimated by the observer). If the remaining line was longer than the animal, regardless of where the remaining line was attached, then S6 or P6 was used. S6 or P6 was also applied if the remaining line was shorter than the animal, but attached in a location where the line could be ingested, wrap around the goosebeak or other body parts, or become snagged on something in the environment. If the remaining line was shorter and not in a position to pose a risk, then S6 or P6 was not used.
S5d, S6	When wrapped line remained attached to an animal, these categories were consistently considered more appropriate to apply to the interaction than S8a or S8b. While the line might have been in a constricting (S8a) or loose (S8b) wrap prior to the animal breaking away or being cut free from the bulk of the gear, the observers were generally not able to assess the nature or persistence of the wrap post-release. Thus, accounting for the length and body location of the line and determining its potential (S6) or not (S5d) to wrap, be ingested, or become snagged on something in the environment was more applicable.
S15	This category was only applied in the context of a dependent animal being left with a seriously injured mother. Even though it was possible to infer dependent status for many of the injured animals (using observer size estimates, published estimates of size-at-weaning, and supporting visual information), the category description does not offer guidance as to how to determine whether a dependent animal was released alone post-interaction. Therefore, the category was not used in that way, but as described in the text, may apply to relevant interactions pending future guidance.

[1]Description of injury categories (from Tables 2–3 in NMFS, 2012): S2 – ingested gear or hook(s); S5a – hook(s) in head regardless of the presence of gear; S5c – hook(s) in any body part, but hook(s) is removed or pulls out; S5d – hook(s) in appendage or body, without trailing gear or with trailing gear that does not have potential to: 1) become a constricting wrap on animal, 2) be ingested, 3) accumulate drag, or 4) become snagged on something in the environment, anchoring the animal; S6 – gear attached to free-swimming animal with potential to: 1) become a constricting wrap on animal, 2) be ingested, 3) accumulate drag, or 4) become snagged on something in the environment, anchoring the animal; S7b – anchored, immobilized, entangled, or entrapped before being freed without gear attached; S15 – dependent animal (i.e., calf, juvenile) released alone post-interaction or dependent animal left with a seriously injured or dead mother; P2 – ingested gear or hook(s); P5a – hook(s) in mouth regardless of presence of gear; and P6 – gear attached in any manner to free-swimming animal with potential to: 1) become a constricting wrap on animal, 2) be ingested, 3) accumulate drag, or 4) become snagged on something in the environment, anchoring the animal.

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