Injury Determinations for Marine Mammals Observed Interacting with Hawaii and American Samoa Longline Fisheries During 2017

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Abstract

Data on marine mammal interactions (i.e., hookings and entanglements) with the Hawaii and American Samoa longline fisheries observed during 2017 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 are used to compute 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, 14 marine mammal interactions were observed in 2017; most involved false killer whales (57.1%), resulted in death or serious injury (64.3%), and occurred outside the U.S. exclusive economic zone (EEZ) (85.7%). In the Hawaii shallow-set fishery, 6 marine mammal interactions were observed in 2017; 3 involved Guadalupe fur seals (50.0%), while most resulted in death or serious injury (66.7%) and occurred outside the U.S. EEZ (100.0%). In the American Samoa deep-set fishery, 2 marine mammal interactions were observed in 2017; one involving a seriously injured false killer whale and the other a non-seriously injured rough-toothed dolphin, both within the U.S. EEZ.

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 (SARs) 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 (2019) requires estimates of M&SI from 2013 to 2017.

The pelagic longline fisheries based in Hawaii consist of a deep-set fishery targeting tunas and a shallow-set fishery targeting swordfish. Observer coverage for these fisheries began in 1994 and has been maintained at current levels since the shallow-set fishery reopened from a 4-year closure in 2004. A deep-set tuna fishery is also based in American Samoa and has been observed since 2006. Present observer coverage for the two deep-set fisheries is approximately 20% annually, 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 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 2017. 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. Previous reports summarizing outcomes of marine mammal interactions with these fisheries included injury determinations from all 5 years associated with a given SAR year (e.g., Bradford and Forney, 2017), even though only the most recent year(s) of determinations was unpublished (e.g., Bradford and Forney, 2016). To reduce redundancy and increase efficiency, the present and subsequent reports will only cover injury determinations that

[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)

have not previously been published. The last year of published injury determinations for marine mammals observed interacting with Hawaii and American Samoa longline fisheries was 2016 (Bradford, 2018).

Methods

Observer data on marine mammal interactions in the Hawaii and American Samoa longline fisheries during 2017 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. The author of this report (ALB) maintained 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 was 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 when 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.

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 author of this report (ALB) and, as instructed by NMFS (2012), sent for an additional independent review to another NMFS Science Center staffer (Karin Forney of the Southwest Fisheries Science Center, SWFSC) experienced in evaluating injury severity for cetaceans interacting with longline fisheries (e.g.,

Forney, 2010). Any differences between the initial and reviewed determinations were discussed and reconciled jointly.

Occasionally, U.S. West Coast pinniped species interact with the Hawaii shallow-set longline fishery when fishing operations take place outside the U.S. EEZ and closer to the U.S. mainland than to Hawaii. Given that these species are assessed by the SWFSC, the SWFSC has assumed responsibility for making and reporting injury determinations for any U.S. West Coast pinnipeds observed interacting with the Hawaii longline fisheries. However, to maintain completeness in the present injury determination report on marine mammals interacting with the Hawaii and American Samoa longline fisheries, injury determinations for cetaceans and pinnipeds were summarized together, although the associated SWFSC report was cited as the source for the pinniped injury determinations.

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 and Discussion

Injury Determination Review

A total of 22 marine mammal interactions were observed in the three fisheries combined during 2017. While 2 (9.1%) of these interactions resulted in deaths, most (90.9%, n = 20) involved injured animals and required injury determination. Three of the shallow-set interactions (Table 2) resulted in injured U.S. West Coast pinnipeds that were evaluated by the SWFSC (Carretta et al., in review). For the remaining interactions, the author and the independent reviewer largely agreed on the initial injury determinations, although questions were raised about a few interactions. These interactions were subsequently revisited and discussed by both parties. In most cases, after discussing relevant details of the interactions, the initial determinations of the author were unanimously confirmed. However, in two cases, the determination changed following input from the independent reviewer. Specifically, the determination changed from "non-serious" to "CBD" for the Hawaii deep-set interaction on 05/22/17 and from "CBD" to "serious" for the Hawaii deep-set interaction on 10/28/17 (Table 2).

Hawaii Longline Fisheries

In 2017, 14 marine mammals were observed interacting with the Hawaii deep-set fishery, including 8 (57.1%) false killer whales, 4 (28.6%) unidentified cetaceans, 1 (7.1%) Risso's dolphins (*Grampus griseus*), and 1 (7.1%) common bottlenose dolphin (*Tursiops truncatus*) (Table 2 and 3). Two (14.3%) of the interactions were deaths (neither carcass was retained), 7

(50.0%) were serious injuries, 2 (14.3%) were non-serious injuries, 1 (7.1%) involved prorating a large whale interaction as 0.75 serious injury (and 0.25 non-serious injury; NMFS, 2012), and 2 (14.3%) were classified as CBD. A majority of the interactions (85.7%, n = 12) occurred outside the U.S. EEZ. The 2 (14.3%) interactions within the U.S. EEZ occurred around the main Hawaiian Islands (MHI) and involved false killer whales from the pelagic stock (Table 2; Figure 1). Interactions outside the U.S. EEZ were concentrated north of the MHI (Figure 1). Marine mammal interactions observed in the deep-set fishery during 2017 were consistent with observed interactions from 2004 to 2016 (Forney, 2010; Bradford and Forney, 2014, 2017; Bradford, 2018) in terms of the primary species involved (i.e., false killer whale) and the number and species composition of takes. However, compared to 2004–2008 (Forney, 2010), takes outside the U.S. EEZ were more northerly distributed in 2017, similar to more recent years (Bradford and Forney, 2014, 2017; Bradford, 2018). Seven MMAP reports were submitted by Hawaii deep-set longliners during 2017. All of the reports were associated with observed takes.

In 2017, 6 marine mammals were observed interacting with the Hawaii shallow-set fishery, including 3 (50.0%) Guadalupe fur seals (*Arctocephalus townsendi*), 2 (33.3%) Risso's dolphins, and 1 (16.7%) striped dolphin (*Stenella coeruleoalba*) (Tables 2 and 4). Four (66.7%) of the interactions were serious injuries, and 2 (33.3%) were non-serious injuries. All of the interactions occurred outside the U.S. EEZ, spanning northeast from the Hawaiian Islands to the outer boundary of the U.S. West Coast EEZ (Figure 2). Relatively fewer marine mammal interactions were observed in the shallow-set fishery during 2017 compared to most years from 2004 to 2016 (Forney, 2010; Bradford and Forney, 2014, 2017; Bradford, 2018), and 2017 is the first year that Guadalupe fur seals were the primary species involved. The more northerly distribution of takes in 2017 is similar to more recent years (Bradford and Forney, 2014, 2017; Bradford, 2018) than to the 2004–2008 period (Forney, 2010) and explains the increased prevalence of U.S. West Coast pinnipeds. No MMAP reports were submitted by Hawaii shallow-set longliners during 2017.

American Samoa Longline Fishery

In 2017, 2 marine mammals were observed interacting with the American Samoa deep-set fishery: 1 false killer whale that was seriously injured and 1 rough-toothed dolphin (*Steno bredanensis*) that was non-seriously injured (Tables 5–6). Both of the interactions occurred within the U.S. EEZ around American Samoa (Figure 3). Marine mammal interactions observed in the deep-set fishery during 2017 were consistent with observed interactions from 2008 to 2016 (Bradford and Forney, 2014, 2017; Bradford, 2018) in terms of the number, species composition, and distribution of takes. Two MMAP reports were submitted by American Samoa deep-set longliners during 2017. Both of the reports were associated with observed takes.

Acknowledgements

Much appreciation goes to the on-board observers who collected the interaction data, as well as the staff of PIRO and the Pacific Islands Fisheries Science Center who manage the data and maintain the Longline Observer Data System. Jamie Marchetti (PIRO Observer Program) was particularly instrumental in this effort, responding quickly to frequent data requests and questions. Kevin Brindock, Jean Higgins, and Adam Kurtz (PIRO) also participated in the meetings with returning observers, assuming full responsibility of a few meetings when ALB

was out of the office. Thanks to Karin Forney for providing reviews of the injury determinations and to Lance Garrison (Southeast Fisheries Science Center) for an additional review of the injury determinations made for the two pelagic stock false killer whales. The Pacific Scientific Review Group and PIRO performed an additional review of the full set of injury determinations. This report was improved by comments from Nancy Young, Jamie Marchetti, and Scott Baker.

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Table 1. Species code, common name, and scientific name of marine mammals relevant to the 2017 observation period of the Hawaii and American Samoa longline fisheries.

Code	Common name	Scientific name
AT	Guadalupe fur seal	*Arctocephalus townsendi*
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*
GG	Risso's dolphin	*Grampus griseus*
MN	Humpback whale	*Megaptera novaeangliae*
PC	False killer whale	*Pseudorca crassidens*
PM	Sperm whale	*Physeter macrocephalus*
SB	Rough-toothed dolphin	*Steno bredanensis*
SC	Striped dolphin	*Stenella coeruleoalba*
TT	Common bottlenose dolphin	*Tursiops truncatus*
UC	Unidentified cetacean	-
UD	Unidentified dolphin	Delphinid

Table 2. Injury determinations for marine mammals observed interacting with Hawaii longline fisheries during 2017, using the most recent established criteria for distinguishing serious from non-serious injury of marine mammals (Tables 1–3 in NMFS, 2012). Interactions (n = 20) are in order of trip number (confidential data; not shown). 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, 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. SS = shallow-set fishery; DS = deep-set fishery; P = pelagic stock; CBD = cannot be determined. Table continues on following two pages.

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	2017	12/23/16	SC	SC	6	Injured	Non-serious	S5c	Hooked in mouth, but dehooked; interaction was unlikely to have caused capture myopathy and no evidence of additional injuries
DS	Outside	2017	02/07/17	PC	PC	10	Dead	Dead	n/a	Hooked in mouth (presumably ingested)
DS	Outside	2017	03/05/17	PC	PC	10	Injured	Serious	S2 or S5a, S6	Hooked in head area (possibly mouth or ingested); cut free with hook, 0.5-m wire leader, 45-g weight, and 10-ft branchline attached
DS	Outside	2017	03/14/17	PC	PC	10	Dead	Dead	n/a	Hooked in mouth (possibly ingested) and entangled around caudal peduncle by branchline
DS	Outside	2017	03/08/17	TT	TT	10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook, 0.5-m wire leader, 45-g weight, and 5.5-m branchline attached
DS	Outside	2017	03/07/17	UC	UD	10	Injured	CBD	S5a or S5d	Hooked in unknown body location; broke free with hook attached
DS	Outside	2017	03/17/17	UC	BF, GG	7	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook, 0.5-m wire leader, 45-g weight, and unknown amount of branchline attached
SS	Outside	2017	04/13/17	GG	GG	8	Injured	Serious	S5a, S6	Hooked in mouth; broke free with hook and <12-in mono leader attached
DS	Outside	2017	05/22/17	PC	PC	10	Injured	CBD	S5c	Hooked in mouth, but partially straightened hook and was freed; nature and extent of struggle, as well as behavior during handling, are suggestive of capture myopathy effects, but limited information to make further inference
DS	Hawaii (P)	2017	07/01/17	PC	PC	13	Injured	Non-serious	S7b	Entangled around mid-section to caudal peduncle by at least 4 wraps of floatline, but freed itself; interaction was unlikely to have caused capture myopathy and no evidence of additional injuries other than superficial line marks
DS	Outside	2017	08/30/17	GG	GG	12	Injured	Serious	S6	Hooked in unknown body location (possibly head or mouth); broke free with hook, 0.6-m wire leader, 45-g weight, and 11.1-m branchline attached
DS	Outside	2017	09/03/17	PC	PC	15	Injured	Serious	S6	Hooked in unknown body location (possibly head or mouth); broke free with hook, 0.4-m wire leader, 45-g weight, and 14-ft branchline attached
DS	Outside	2017	09/16/17	UC	TT	9	Injured	Non-serious	S5c	Hooked in mouth, but pulled free of hook; interaction was unlikely to have caused capture myopathy and no evidence of additional injuries

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	2017	09/28/17	PC	PC	10	Injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); cut free with hook, 0.6-m wire leader, 45-g weight, and 9-ft branchline attached
SS	Outside	2017	11/01/17	AT	AT	4	Injured	Serious	P6	See Carretta et al. (in review) for details
DS	Hawaii (P)	2017	10/28/17	PC	PC	12	Injured	Serious	S6 or S8a	Possibly hooked in unknown body location, but definitely entangled around caudal peduncle by branchline that either got hooked or tangled back on itself; broke free with hook, 0.4-m wire leader, 45-g weight, and unknown amount of branchline attached
SS	Outside	2017	11/17/17	AT	AT	4	Injured	Non-serious	P5c	See Carretta et al. (in review) for details
SS	Outside	2017	12/03/17	AT	AT	4	Injured	Serious	P6	See Carretta et al. (in review) for details
SS	Outside	2017	11/28/17	GG	GG	5	Injured	Serious	S5a, S6	Hooked in mouth; cut free with hook and 3-m mono leader attached
DS	Outside	2017	12/12/17	UC	BB, BE, BM, BP, MN, PM	Not Specified	Injured	Prorate 0.75 Serious	L10	Hooked or entangled in unknown body location(s); broke free with hook, 45-g weight, and possibly some amount of branchline 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 2017. 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
GG	2017	-	-	-	-	-	1	-	-
PC	2017	-	1	1	-	2	3	-	1
TT	2017	-	-	-	-	-	1	-	-
UC	2017	-	-	-	-	-	1.75	1.25	1

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 2017. Species codes are defined in Table 1. Year is the vessel return year.

		Hawaii EEZ				Outside U.S. EEZ			
Species Code	Year	D	SI	NSI	CBD	D	SI	NSI	CBD
AT	2017	-	-	-	-	-	2	1	-
GG	2017	-	-	-	-	-	2	-	-
SC	2017	-	-	-	-	-	-	1	-

Table 5. Injury determinations for marine mammals observed interacting with American Samoa (AS) deep-set (DS) longline fishery during 2017, using the most recent established criteria for distinguishing serious from non-serious injury of marine mammals (Tables 1–3 in NMFS, 2012). Interactions (n = 2) 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	2017	03/02/17	SB	SB	6.6	injured	Non-serious	S5c	Hooked in mouth, but dehooked; interaction was unlikely to have caused capture myopathy and no evidence of additional injuries
DS	AS	2017	05/24/17	PC	PC	13	injured	Serious	S2 or S5a, S6	Hooked in mouth (possibly ingested); broke free with hook and 10-m 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 2017. Species codes are defined in Table 1. Year is the vessel return year. There were no observed interactions with this fishery outside the U.S. EEZ during 2017.

		American Samoa EEZ			
Species Code	Year	D	SI	NSI	CBD
PC	2017	-	1	-	-
SB	2017	-	-	1	-

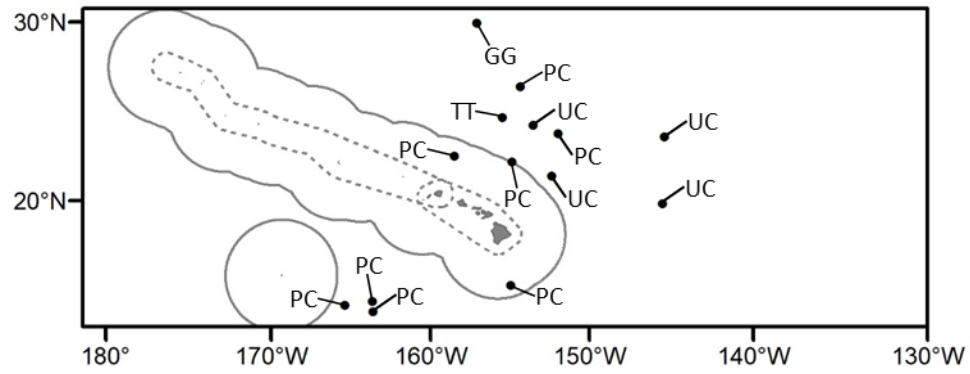

Figure 1. Locations of observed marine mammal interactions with the Hawaii deep-set longline fishery during 2017. Solid gray outlines represent U.S. EEZs; dotted gray outlines are (from south to north): 1) the estimated range of the MHI insular stock of false killer whales, and 2) the estimated range of the Northwestern Hawaiian Islands stock of false killer whales. Takes are labeled by species code (defined in Table 1).

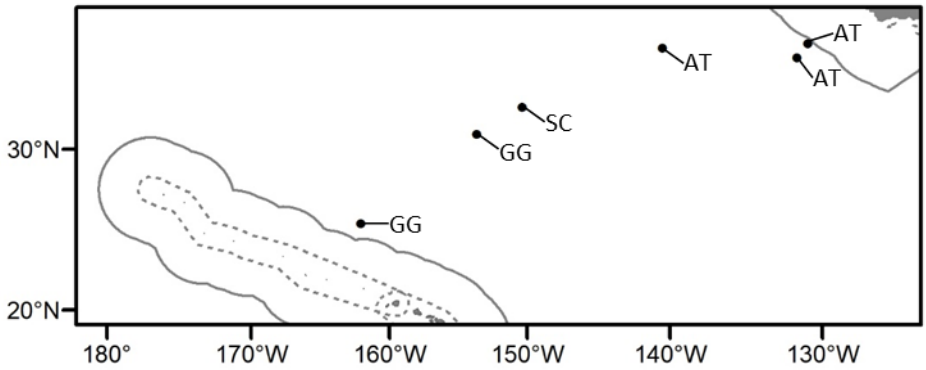

Figure 2. Locations of observed marine mammal interactions with the Hawaii shallow-set longline fishery during 2017. Solid gray outlines represent U.S. EEZs; dotted gray outlines are (from south to north): 1) the estimated range of the MHI insular stock of false killer whales, and 2) the estimated range of the Northwestern Hawaiian Islands stock of false killer whales. Takes are labeled by species code (defined in Table 1).

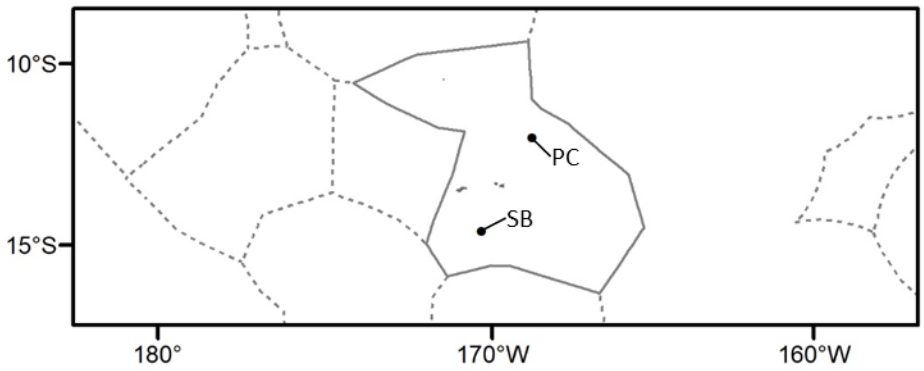

Figure 3. Locations of observed marine mammal interactions with the American Samoa deep-set longline fishery during 2017. Solid outlines represent the U.S. EEZ; dotted gray outlines are non-U.S. EEZs. Takes are labeled by species code (defined in Table 1).

Appendix

Specific factors that are considered in the application of some of the injury categories (NMFS, 2012) to marine mammal interactions in the Hawaii and American Samoa longline fisheries. L = large whale category (Table 1 in NMFS, 2012); S = small cetacean category (Table 2 in NMFS, 2012); P = pinniped category (Table 3 in NMFS, 2012).

Injury category[1]	Factors considered
L3	This category was used to cover the case of an animal that had wrapped gear from which the animal was disentangled or freed itself, as there is currently not a category to cover this scenario.
L5a, L5b	Although not the practice of all members of the NMFS Determination Staff Working Group, these categories were applied when lacerations from fishing gear were reported. This use accounted for injuries remaining after the gear was removed.
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).
S5b, S5c, S5d, S7b, P5b, P5c, P7b	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 considered 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.

Description of injury categories (from Tables 1–3 in NMFS, 2012): L3 – loose wrap, bridled, or draped gear; L5a – deep laceration; L5b – superficial laceration; S2 – ingested gear or hook(s); S5a – hook(s) in head regardless of the presence of gear; S5b – hook(s) confirmed in lip only, external tissue outside of teeth, no trailing 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; P5b – hook(s) confirmed in head (excluding criterion P5a), or in lip only (external tissue outside of teeth), no trailing gear; P5c – hook(s) in any body part, but hook(s) is removed or pulls out; 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; and P7b – anchored, immobilized, or entangled before being freed without gear attached..