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Karin A. Forney
Donald R. Kobayashi

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Karin A. Forney and Donald R. Kobayashi

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
110 Shaffer Road
Santa Cruz, California 95060

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U.S. DEPARTMENT OF COMMERCE
Carlos M. Gutierrez, Secretary
National Oceanic and Atmospheric Administration
VADM Conrad C. Lautenbacher, Jr., Undersecretary for Oceans and Atmosphere
National Marine Fisheries Service
William T. Hogarth, Assistant Administrator for Fisheries

Updated Estimates of Mortality and Injury of Cetaceans in the Hawaii-based Longline Fishery, 1994-2005

Karin A. Forney
National Marine Fisheries Service, NOAA
Southwest Fisheries Science Center
110 Shaffer Road
Santa Cruz, California 95060
Karin.Forney@noaa.gov

and

Donald R. Kobayashi
National Marine Fisheries Service, NOAA
Pacific Islands Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822
Donald.Kobayashi@noaa.gov

ABSTRACT

This report presents updated estimates of annual mortality and serious injury of cetaceans for the Hawaii-based longline fishery during 1994-2005, including information on set type and targeted fish species. The fishery has targeted primarily tunas and swordfish, although swordfish sets were prohibited north of the equator by Hawaii-based vessels between 2001 and early 2004. Observer coverage ranged from 3.6% to 5.5% during 1994-1999 and then increased to 22-34% during 2001-2005. Estimated fishing effort totaled 159,572 sets, including 122,864 sets targeting tunas, 13,160 sets targeting swordfish, and 23,548 sets targeting species other than swordfish using swordfish-style methods. Annual effort was roughly constant at about 12,000 sets through 2001 and then increased to over 18,000 sets through 2005. During 24,542 observed sets, 67 cetaceans were observed hooked or entangled. Seven of the observed cetaceans were dead (2 short-finned pilot whales, *Globicephala macrorhynchus*, 2 false killer whales, *Pseudorca crassidens*, 1 pan-tropical spotted dolphin, *Stenella attenuata*, 1 bottlenose dolphin, *Tursiops truncatus*, and 1 Blainville's beaked whale, *Mesoplodon densirostris)*. The 60 other hookings and entanglements involved injuries of 18 false killer whales, 9 Risso's dolphin, *Grampus griseus*, 5 short-finned pilot whales, 3 bottlenose dolphins, 2 spinner dolphins, *Stenella longirostris*, 3 humpback whales, *Megaptera novaeangliae*, 1 sperm whale, *Physeter macrocephalus*, 1 short-beaked common dolphin, *Delphinus delphis*, 1 Bryde's whale, *Balaenoptera edeni*, 1 Blainville's beaked whale, and 16 unidentified cetaceans. One additional sperm whale was injured in an experimental longline set, but this set was not included in the estimation of fleet-wide mortality and serious injury. The severity of injuries sustained by cetaceans was evaluated based on observer descriptions of the nature of the interaction, using previously established guidelines. Interactions with insufficient information to make a

determination of the severity of injury were prorated based on the severity of known interactions for each species. Sixteen cetaceans were categorized as not seriously injured and 44 as seriously injured. The majority of the 67 injuries and mortalities occurred in international waters (n=40), but 40% occurred within U.S. EEZ waters of the Hawaiian Islands (n=19), Palmyra Atoll (n=7), and Johnston Atoll (n=1). Annual fleet-wide mortality, serious injury, and non-serious injury were estimated using a stratified analysis separating trip type and EEZ area during the period 1994-2005.

INTRODUCTION

In 1994, concern over sea turtle bycatch led the National Marine Fisheries Service (NMFS) to initiate a mandatory observer program for the Hawaii-based longline fishery, which operated since about 1990 in the central North Pacific, in an area extending roughly from 10N to 45N and 170E to 140W (see Figure 1). During the mid 1990s, the fishery targeted primarily bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), and swordfish (*Xiphias gladius*), although albacore tuna (*Thunnus alalunga*), marlins, and other bony fishes were also occasionally targeted. Bycatch documented with roughly 4% observer coverage included several species of sea turtles, seabirds, and a variety of cetaceans (Kleiber 1999, McCracken 2000). The total annual estimated mortality and serious injury of the Hawaiian stock of false killer whale (*Pseudorca crassidens*) has exceeded the level allowable under the Marine Mammal Protection Act (MMPA), and this stock has been considered strategic under the MMPA since 2000 (Forney et al. 2000, Carretta et al., in press). In recent years, the fishery has undergone several regulatory changes to reduce bycatch of sea turtles and seabirds, including a 2001 ban on swordfish-style fishing north of the equator by vessels based in Hawaii[1], and a subsequent 2004 re-opening of the swordfish portion of the fishery with new gear restrictions designed to protect sea turtles. During the swordfish closure period, a portion of the Hawaii-based swordfish fleet operated out of California, where the swordfish prohibitions did not apply, until 2004 regulations prohibited swordfish targeting trips by California-based longline fleet east of 150W longitude, the fishery's primary area of operation[2] (Forney 2004).

Between 1994 and 2001, the fishery consisted of three distinct components, one targeting swordfish, one targeting tunas, and one that uses swordfish-style methods to target species other than swordfish. From 2001 through 2004 only deep-set tuna fishing was permitted, and since the 2004 implementation of regulations to protect sea turtles and seabirds, the Hawaii-based longline fishery has included two distinct components: a shallow-set fishery (targeting primarily swordfish) and a deep-set component (targeting primarily tunas). Each component of the fishery differs in geographic area of operation, gear characteristics, and set operation details, such as time of day and depth of set. Although the differences are known to influence rates of interaction with some cetacean species, data on set type have not reliably been available from logbook data, which are required to estimate total fishing effort. For this reason, a previous analysis of mortality and injury of cetaceans (Forney 2004) was based on total effort for all trip types combined, without consideration of target species or set type.

In this analysis, we have developed methods of differentiating set types in logbook and observer data to allow for a stratified analysis of mortality and injury of cetaceans for the period

[1] See Final Rule, Federal Register Vol. 67, No. 113, pages 40232-40238, June 12, 2002.
[2] See Final Rule, Federal Register Vol. 69, No. 48, pages 11540-11545, March 11, 2004.

1994-2005. Furthermore, to facilitate assessment of the status of marine mammals within the separate EEZ regions, we have assigned effort and estimated cetacean takes separately for waters outside U.S. Pacific EEZs and within U.S. EEZ waters of the Hawaiian Islands, Palmyra Atoll, and Johnston Atoll, Baker Island, and Jarvis Island.

METHODS

For purposes of this analysis, 'take' is defined as the injury or mortality of a cetacean during fishing operations, generally caused by hooking and/or entanglement. Incidental take data were collected between the years of 1994 and 2005 by onboard observers trained in the collection of longline fishery data on catch, bycatch, species interaction, gear characteristics, and relevant environmental variables[3]. Longline fishing vessels operating out of Hawaii were assigned observers to achieve a fleet-wide target level of coverage (about 4% in 1994-99, then increasing to 20-34% during 2001-2005). During the initial years of lower coverage, observer coverage was intentionally biased towards swordfish trips because of concern over sea turtle bycatch in this component of the fleet. Between 1999 and 2003, observer coverage for the Hawaii-based fleet was expected to be more representative of total effort following implementation of a new sampling system. Since early 2004, observer coverage has been 100% in the shallow-set (swordfish) fishery, and 25-28% in the deep-set (tuna) fishery. Following each trip, data were edited, processed and entered according to established NMFS protocols. Total fleet-wide effort, including both observed and unobserved sets, was estimated from logbook data.[4] For the present analysis, relevant data fields were extracted and re-processed to estimate mortality, serious injury and non-serious injury for all observed cetacean species both within and outside of the U.S. EEZs.

Set type determination

In the previous analysis (Forney 2004), set types were determined for observed trips based on declared target fish species, hooks per float, and hook size. These variables, however, were not available in the logbook data, which are used to determine total fleet-wide effort. Therefore, an alternate algorithm was developed using Classification and Regression Tree (CART) analyses to assign 1994-2003 sets to swordfish-targeting, swordfish-style, or tuna-style components of the fleet based on variables that are routinely reported in logbooks. For sets during 1995 and later, key variables such as target species and hooks per float were recorded in the logbook records, allowing a simple, primary decision tree that gave similar results to the previous classification used by Forney (2004). Prior to 1995, however, target species and hooks per float were not recorded in the logbook records, and a more extensive secondary classification tree was developed, potentially including latitude, longitude, season, time of set, time of haul, total number of hooks, and number of light sticks. For both time periods, trees were selected to provide the lowest classification error with the fewest variables when applied to the observer data, for which set type could be more accurately determined on the basis of the additional variables used by Forney (2004). The primary tree (Figure 1A) classified set types as follows:

[3] National Marine Fisheries Service, Pacific Islands Region Observer Program, Honolulu, HI.
[4] National Marine Fisheries Service, Pacific Islands Fisheries Science Center, Honolulu, HI.

Swordfish-targeting (shallow sets): If the number of hooks per float was <10.5 and the target species was listed as swordfish.

Swordfish-style (shallow sets): If the number of hooks per float was < 10.5 and the target species was not swordfish.

Tuna-style (deep sets): If the number of hooks per float was >10.5.

The secondary tree (Figure 1B) was more complicated and included latitude, season, time of set, and number of hooks. For all sets reported in logbook data, the primary tree was used to assign set type whenever possible; in all other cases, the secondary tree was used to estimate set type.

Beginning in 2004, the classification was modified to match the regulatory definitions of the shallow-set and deep-set fisheries. Based on the new regulations, a deep set was defined as any set with at least 15 hooks per float and no light sticks used; all other sets were considered shallow sets.

Cetacean Injury Severity Determination

The physical condition of hooked or entangled marine mammals was determined at sea by the on-board observer as one of the following (PIRO 2003):

D = dead,
I = injured, swimming/breathing abnormally, or released with gear attached,
A = released with no gear attached and swimming/breathing normally, or
U = unknown, if the animal is lost from sight before a determination can me made.

These physical condition categories do not distinguish between serious injuries, defined by NMFS[5] as those likely to result in mortality, and non-serious injuries, from which the animal is expected to recover. Under the MMPA, marine mammal stock assessments must evaluate both human-caused mortality and serious injury of marine mammals. Therefore, for this analysis, a determination regarding the seriousness of injuries was made based on the observer's written description of each interaction and guidelines established by a 1997 workshop on differentiating serious and non-serious injury of marine mammals taken incidental to commercial fishing operations (Angliss and DeMaster 1998). Injuries were considered serious if the animal ingested the hook, was hooked in the head or mouth, or was released with substantial gear attached (e.g. a long segment of line trailing or wrapped around the body, sometimes including attached floats). Injuries were considered non-serious if the animal was hooked in a region other than the head and released with no or minimal gear attached (e.g. a single hook and a short segment of line, relative to the animal's body size) or completely freed from all gear prior to release. In cases where the observer's written comments were insufficient to make a clear determination based on these criteria, the seriousness was initially scored as unknown, and later pro-rated by species based on the proportion of other observed injuries that could be determined to be either serious or non-serious.

[5] Code of Federal Regulations; 50 CFR part 229.2

Mortality Estimation

Analytical methods of mortality estimation were limited to simple ratio calculations, stratified by set type, year, and EEZ area, because of the small number of interactions observed. Previous analyses of 1994-98 Hawaii longline observer data (Kleiber 1999) indicated that total mortality estimates were similar whether calculations were based on trips, sets or number of hooks fished. In the present analysis, sets were used as the unit of effort to allow differentiation of set types. Mortality, serious injury, and non-serious injury of each cetacean species, M_s, was estimated separately for each year, y, and EEZ area, e, as the sum of the estimates for each set type, i:

$$M_{y,e,s} = \sum_{i=1}^{3} E_{i,y,e} \cdot \frac{m_{i,y,e,s}}{O_{i,y,e}} \qquad (1)$$

where $E_{i,y,e}$ = Total estimated fishing effort (# sets) for sets of type i during year y within EEZ area e

$m_{i,y,e,s}$ = Number of mortalities, serious injuries, or non-serious injuries, respectively, of species s during all observed sets of type i during year y and within EEZ area e

$O_{i,y,e}$ = Observed fishing effort (# sets) for sets of type i during year y within EEZ area e

Total fishing effort, E_i, was estimated from logbook data. In cases where there was reported fishing effort, but no observer coverage of a given set type for a particular EEZ and year, $m_{i,y,e,s}/O_{i,y,e}$ was estimated based on the data for sets of that type made in all years within that EEZ. If the multi-year $\Sigma O_{i,e}$ was also zero, then $m_{i,y,e,s}/O_{i,y,e}$ for that set type was estimated based on the data for all years and EEZs combined. [This substitution was necessary mainly for unobserved swordfish-type effort between 2002 and 2004, and during some years for Palmyra Atoll and Johnston Atoll]. For purposes of mortality estimation by calendar year, sets were assigned to calendar years based on the date of haul. Estimates of observed and total effort by calendar year in this report may, therefore, vary slightly from those published in other summaries based on the date of vessel landings or arrival (e.g., Ito and Machado 2001[6], Forney 2004). Coefficients of variation (CV) for M_s were calculated on the basis of the likelihood function of the Poisson (rare event) distribution.

Mortality, serious injury, and non-serious injury of cetaceans was estimated separately for U.S. EEZ waters of the Hawaiian Islands, Palmyra Atoll, Johnston Atoll, and for non-EEZ waters (Figure 1), because combined mortality and serious injury of marine mammals in fisheries within U.S. waters is required to be below the Potential Biological Removal (PBR) of each stock. No marine mammal takes were observed during 1994-2005 in U.S. EEZs of other central Pacific islands within the range of the fishery, but few sets were observed in these other EEZs (see Table 1, Figure 2). Mortality, serious injury, and non-serious injury were calculated based only on the number of each type of interaction observed within each EEZ category.

[6] Annual reports summarizing logbook data for the Hawaii longline fishery are available from the Pacific Islands Science Center at http://www.nmfs.hawaii.edu; Quarterly and annual reports for the Hawaii longline observer program are available from the Pacific Islands Region at http://swr.nmfs.noaa.gov/pir

RESULTS

Effort and Set Type Classification

Estimated total fishing effort for 1994-2005 was 159,572 sets, or about 13,300 per year. Since 2002, effort has increased from about 12,000 to over 18,000 sets per year. Observer coverage (# sets) ranged from a low of 3.5% in 1999 to a high of 27.7% in the deep-set fishery and 100% in the shallow-set fishery (Table 1), for a total of 24,542 sets observed during the study period. The set classification algorithm identified 13,160 sets as swordfish-targeting, 122,864 sets as tuna-style, and 23,548 sets as swordfish-style (targeting species other than swordfish using similar gear). Set type classification errors, compared to the methods used in Forney (2004), were 0.4% for the primary tree alone (Fig 1A), 2.0% for the secondary tree alone, and 0.2% for the mixed classification used in this analysis (the secondary tree was used only when variables for the primary tree were missing). Percent observer coverage varied considerably by set type and year, as the sampling priorities and fishing patterns changed. This underscores the need for an analysis that is stratified by both set type and year, because observer coverage was not proportional to total fishing effort. The apparent percent coverage rate greater than 100% for swordfish-targeting sets during 2001 (Table 1) represents reporting errors in the logbook data (e.g. only 31 sets were reported although 54 were observed) around the time of the prohibition on swordfish sets north of the equator. Further investigation of such reporting discrepancies is, therefore, warranted.

Cetacean Species Observed Taken

Marine mammal species taken (with number of takes observed) included short-beaked common dolphin, *Delphinus delphis* (n=1); spinner dolphin, *Stenella longirostris* (n=2); pantropical spotted dolphin, *Stenella attenuata* (n=1); bottlenose dolphin, *Tursiops truncatus* (n=4); Risso's dolphin, *Grampus griseus* (n=9); false killer whale, *Pseudorca crassidens* (n=20); short-finned pilot whale, *Globicephala macrorhynchus* (n=7); Blainville's beaked whale, *Mesoplodon densirostris* (n=2); humpback whale, *Megaptera novaeangliae* (n=3); Bryde's whale, *Balaenoptera edeni* (n=1), and sperm whale, *Physeter macrocephalus* (n=1) (Table 2). One additional sperm whale was taken in an experimental set during April 2002; this trip was not included in the mortality estimation analysis. On 16 occasions, the observer was not able to identify the species of cetacean, generally because the animal broke free or disappeared before sufficient characteristics could be seen, or because of poor weather or darkness. Based on the observers' description and probable/possible identification, candidate species for each of these interactions were identified (Table 2) to aid in pro-rating of injury types (see below). Six of the unidentified cetaceans were determined to be either false killer whales or short-finned pilot whales. Takes occurred throughout the area of the fishery (Figs 2-3), and during all set types (Table 3, Figs 4-6).

Condition of animals taken

Seven of the observed cetaceans were dead upon gear retrieval. Injured animals (n=60) were either hooked, entangled or both (Table 2). The seriousness of injury could be determined based on the observer's notes for 44 of the injured animals, resulting in 30 seriously injured and 14 not seriously injured. All injured false killer whales and Risso's dolphins for which sufficient information was provided by the observer were determined to be seriously injured, because they were hooked in the mouth or had ingested the hook. Injured large whales and small dolphins

were generally hooked in the tail or fins or lightly entangled and considered not seriously injured. Short-finned pilot whales included 2 dead animals, four seriously injured, and one not seriously injured animal. Based on these patterns, the eight remaining injuries of identified species were prorated as follows (Table 2): two Risso's dolphins (both serious), five false killer whales (all serious), and one spinner dolphin (not serious). Pro-rating of undetermined injury types for the seven unidentified cetaceans included consideration of likely or possible species identification. For example, unidentified cetaceans that were determined to be either false killer whales or short-finned pilot whales were prorated based on the patterns for these two species, taking into account the nature of hookings and entanglements observed. Finally, the single sperm whale taken during the experimental trip was released with line wrapped around its body and no determination or proration could be made regarding the severity of the injury.

Cetacean Take Rates and Estimates of Mortality and Injury

Cetaceans were reported on 67 occasions during 24,542 observed sets, yielding an average take rate of 2.7 cetaceans per 1000 sets. Although sample sizes are small, cetacean deaths occurred at a similar rate during swordfish-targeting and tuna-style sets: six out of seven (86%) cetacean mortalities occurred during tuna sets, which represented about 83% of all observed sets. Given that a cetacean was hooked or entangled, however, a lower proportion of swordfish-targeting sets (4.5%, 1 out of 22) resulted in the cetacean's death than tuna-style sets (14.0%, 6 out of 43). This may be attributable to the deeper target depth of hooks in tuna sets, which may prevent hooked animals from reaching the surface to breathe. Overall cetacean take rates (Tables 2, 4) appeared to be highest during sets targeting swordfish (6.5 cetaceans per 1000 sets) and lower during tuna or swordfish-style sets (2.1 and 2.5 cetaceans per 1000 sets, respectively). Apparent species-specific differences in take rates by set type and EEZ area (Tables 3-4) are likely related to the distribution of each species, with northern species such as Risso's dolphin taken primarily during higher-latitude swordfish-targeting sets (Fig. 4), and tropical species such as false killer whales and short-finned pilot whales taken primarily during lower-latitude tuna or swordfish-style sets (Figs. 5-6). Within the U.S. EEZs (Table 4), Palmyra Atoll appears to exhibit a higher take rate (7.6 cetaceans per 1000 sets) than either the Hawaiian Islands or Johnston Atoll (1.8 and 1.3 cetaceans per 1000 sets, respectively). This difference is most apparent for false killer whales and unidentified cetaceans, many of which are likely to have been false killer whales (Table 2). Take rates for non-U.S. waters are intermediate, about 3.4 cetaceans per 1000 sets.

Estimated rates of cetacean mortality, serious injury, and non-serious injury for the Hawaii-based fleet (Tables 5-8) are on the order of a few individuals to tens of individuals per year, depending on species and EEZ area. There was considerably variability between years, and impacts are expected to vary by region and species.

DISCUSSION

The Hawaii-based longline fishery for swordfish and tunas has undergone a number of changes during the period of this analysis (1994-2005). Previous analyses were not stratified by set type or EEZ (Kleiber 1999, Forney 2004) and assumed that observer coverage within each category was representative of the behavior of the remainder of the fleet. The analysis presented here indicates that this was not a good assumption (Table 1). In the present analysis, differences

in observer coverage and total effort by year, set type, and EEZ area were explicitly included to reduce this source of bias. The accuracy of this stratified analysis, however, depends on the accuracy of the set type classification for both observed and unobserved sets. The classification error rate for the observer data set was low (0.2%), but logbook data are less complete and less reliable than observer data and the classification error rate for unobserved sets is likely to have been higher by an unknown amount. One notable discrepancy is apparent during 2001, where the number of swordfish sets reported in logbooks is less than the number of such sets actually observed (Table 1), resulting in an estimated observer coverage rate exceeding 100%. If improvements in logbook data quality and cross-checking are possible, it may be possible to reduce some of these classification errors in the future. The precision of estimates of mortality, serious injury, and non-serious injury for the Hawaii-based longline fleet remains low (Table 5), because takes are rare events and sample sizes for estimation are small.

Estimates for some species and years differ considerably from earlier, unstratified estimates (Forney 2004), particularly in years where observer coverage by set type was not representative of the fleet-wide distribution of effort. For example, the stratified estimate of false killer whale takes in waters of the Hawaiian Islands EEZ during 1997 was 74 (CV=1.0) in the present analysis, compared to an estimate of only 22 animals (CV=1.0) in Forney 2004. This difference is attributable to the fact that the take was observed in a swordfish-style set, for which the observer coverage rate was considerably lower than for the entire fleet (Table 1). Although both estimates have high coefficients of variation, the stratified estimates presented here are expected to exhibit less bias attributable to differential observer coverage.

Although trips were the selection unit for placing observers aboard fishing vessels, it was not possible to use trips as the sampling unit for this stratified analysis, because different set types could be made within a single trip, particularly during the early part of the fishery. For this reason, sets were used as the sampling unit; however, sets within a trip are not independent. Although point estimates for cetacean bycatch have been shown to be similar using trips or sets (Kleiber 1999), variance calculations may be biased by an unknown amount because of the lack of independence between sets. Since 2004, the fishery has been separated into two distinct components, which are regulated and observed separately. The shallow-set (swordfish) component of the fleet is presently required to have 100% observer coverage, while the deep-set (tuna) component is required to have a minimum of 20% coverage. This will allow use of trips as the sampling unit in future bycatch estimation for the deep-set fishery, which will improve the accuracy of variance estimates.

Species-specific take rates for many species are likely to be underestimated, because 24% (16/67) of observed cetacean takes were not identified to the species level, resulting in the additional estimated takes of 70 cetaceans outside of U.S. EEZs, 50 cetaceans within the U.S. EEZ of the Hawaiian Islands, and five cetaceans within the U.S. EEZ of Palmyra Atoll. Most of these unidentified cetaceans were reported during tuna sets, which are typically hauled during darkness when the observer has poor visibility of hooked or entangled animals. Many of the unidentified animals are likely to have been false killer whales, because they were reported as *"either false killer whale or short-finned pilot whale"* and false killer whales are the most frequently taken species. Therefore, species-specific estimates presented here should be considered minimum estimates of mortality, serious injury, and non-serious injury, particularly for false killer whales, short-finned pilot whales and other 'possible' species listed in Table 2. Additional uncertainty in estimates of serious and non-serious injuries is introduced by the unknown fate of animals released alive but injured. The guidelines and prorating used in this

analysis provide a framework for assigning injuries to a level of seriousness, but the absence of information on the actual fate of the injured animals introduces considerable uncertainty.

Population-level impacts of the reported mortality and injury levels depend on each species' population size and stock structure within the area of the fishery. Limited information is available on the stock structure of false killer whales found around Hawaii, Palmyra Atoll, and elsewhere in the central and eastern Pacific Ocean. Takes of false killer whales around Hawaii are of concern because this stock has been considered *strategic* under the MMPA since 2000 (Forney et al. 2000) and genetic studies have shown that animals around the Hawaiian Islands are genetically distinct from false killer whales elsewhere in the eastern tropical Pacific (Chivers et al. 2007). The best available estimate of population size for false killer whales within the Hawaiian Islands EEZ is only 484 individuals (CV=0.93, Barlow and Rankin 2007), resulting in a potential biological removal (PBR) of 2.4 false killer whales per year (Carretta et al., in press). The average estimated annual rate of serious injury of false killer whales within the Hawaiian Islands EEZ during 2001-2005 is 4.9 (CV=0.41), exceeding the PBR. The abundance of false killer whales within EEZ waters of Palmyra Atoll was estimated to be 1,329 (CV =0.65), resulting in a PBR of 7.7 false killer whales per year. The average rate of serious injury for false killer whales within EEZ waters of Palmyra Atoll during 2001-2005 was 1.9 per year (CV=0.59), below the PBR (Carretta et al., in press). The take rate of false killer whales was over 4-fold higher within EEZ waters of Palmyra Atoll (3.3 per 1000 sets) compared to the Hawaiian Islands EEZ (0.7 per 1000 sets) and waters outside U.S. EEZs (0.8 per 1000 sets). This may be caused by higher densities of false killer whales around Palmyra Atoll (Barlow and Rankin 2007). It is unknown whether the difference in false killer whale density between Palmyra Atoll and Hawaii is habitat-related, or whether it might indicate that false killer whales have been depleted in Hawaiian waters, where fishing effort has been considerably greater since at least 1990.

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Table 1. Estimated total sets, observed sets, estimated percent observer coverage, observed cetacean takes, and cetacean take rates (per set), by EEZ area, year, and set type for the Hawaii-based longline fishery during 1994-2005. [Note: See text for discussion of estimated percent observer coverage > 100%.]

		Swordfish					Swordfish Type					Tuna					All Set Types				
EEZ area	Year	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets
ALL	1994	4,140	222	5.4%	0	0.0	1,818	110	6.1%	0	0.0	4,841	177	3.7%	0	0.0	10,799	509	4.7%	0	0.0
	1995	1,922	152	7.9%	3	19.7	3,229	131	4.1%	0	0.0	6,570	266	4.0%	0	0.0	11,721	549	4.7%	3	5.5
	1996	1,361	249	18.3%	2	8.0	3,689	115	3.1%	0	0.0	6,568	278	4.2%	1	3.6	11,618	642	5.5%	3	4.7
	1997	1,153	262	22.7%	3	11.5	3,744	58	1.5%	1	17.2	6,944	178	2.6%	0	0.0	11,841	498	4.2%	4	8.0
	1998	1,240	188	15.2%	2	10.6	3,737	129	3.5%	0	0.0	7,516	274	3.6%	1	3.6	12,493	591	4.7%	3	5.1
	1999	892	165	18.5%	5	30.3	3,181	29	0.9%	0	0.0	8,725	267	3.1%	0	0.0	12,798	461	3.6%	5	10.8
	2000	629	321	51.0%	3	9.3	3,446	128	3.7%	1	7.8	8,858	984	11.1%	3	3.0	12,933	1,433	11.1%	7	4.9
	2001	31	54	174.2%	1	18.5	557	87	15.6%	0	0.0	11,601	2,661	22.9%	9	3.4	12,189	2,802	23.0%	10	3.6
	2002	14	0	0.0%	0	-	147	0	0.0%	0	-	13,956	3,501	25.1%	9	2.6	14,117	3,501	24.8%	9	2.6
	2003	0	0	-	0	-	0	0	-	0	-	14,849	3,258	21.9%	5	1.5	14,849	3,258	21.9%	5	1.5
	2004	136	121	89.0%	0	0.0	-	-	-	0	-	15,881	3,946	24.8%	8	2.0	16,017	4,067	25.4%	8	2.0
	2005	1,642	1,646	100.2%	3	1.8	-	-	-	0	-	16,555	4,585	27.7%	7	1.5	18,197	6,231	34.2%	10	1.6
	ALL	**13,160**	**3,380**	**25.7%**	**22**	**6.5**	**23,548**	**787**	**3.3%**	**2**	**2.5**	**122,864**	**20,375**	**16.6%**	**43**	**2.1**	**159,572**	**24,542**	**15.4%**	**67**	**2.7**
Outside	1994	3,042	152	5.0%	0	0.0	422	35	8.3%	0	0.0	851	42	4.9%	0	0.0	4,315	229	5.3%	0	0.0
	1995	1,462	126	8.6%	3	23.8	1,282	32	2.5%	0	0.0	1,759	77	4.4%	0	0.0	4,503	235	5.2%	3	12.8
	1996	1,139	187	16.4%	2	10.7	1,803	47	2.6%	0	0.0	1,922	105	5.5%	1	9.5	4,864	339	7.0%	3	8.8
	1997	903	243	26.9%	3	12.3	2,052	35	1.7%	0	0.0	2,196	67	3.1%	0	0.0	5,151	345	6.7%	3	8.7
	1998	874	158	18.1%	1	6.3	2,103	86	4.1%	0	0.0	2,765	112	4.1%	0	0.0	5,742	356	6.2%	1	2.8
	1999	712	116	16.3%	4	34.5	2,067	11	0.5%	0	0.0	3,701	70	1.9%	0	0.0	6,480	197	3.0%	4	20.3
	2000	467	280	60.0%	3	10.7	2,214	43	1.9%	1	23.3	3,707	327	8.8%	3	9.2	6,388	650	10.2%	7	10.8
	2001	27	53	196.3%	1	18.9	190	16	8.4%	0	0.0	4,300	811	18.9%	4	4.9	4,517	880	19.5%	5	5.7
	2002	13	0	0.0%	0	-	82	0	0.0%	0	-	6,091	1,481	24.3%	4	2.7	6,186	1,481	23.9%	4	2.7
	2003	0	0	-	0	-	0	0	-	0	-	7,315	1,463	20.0%	0	0.0	7,315	1,463	20.0%	0	0.0
	2004	129	115	89.1%	0	0.0	-	-	-	0	-	8,279	2,076	25.1%	4	1.9	8,408	2,191	26.1%	4	1.8
	2005	1,087	1,092	100.5%	2	1.8	-	-	-	0	-	7,831	2,124	27.1%	4	1.9	8,918	3,216	36.1%	6	1.9
	ALL	**9,855**	**2,522**	**25.6%**	**19**	**7.5**	**12,215**	**305**	**2.5%**	**1**	**3.3**	**50,717**	**8,755**	**17.3%**	**20**	**2.3**	**72,787**	**11,582**	**15.9%**	**40**	**3.5**
Hawaii	1994	1,094	70	6.4%	0	0.0	1,394	75	5.4%	0	0.0	3,841	135	3.5%	0	0.0	6,329	280	4.4%	0	0.0
	1995	460	26	5.7%	0	0.0	1,947	99	5.1%	0	0.0	4,705	184	3.9%	0	0.0	7,112	309	4.3%	0	0.0
	1996	222	62	27.9%	0	0.0	1,886	68	3.6%	0	0.0	4,501	172	3.8%	0	0.0	6,609	302	4.6%	0	0.0
	1997	250	18	7.2%	0	0.0	1,692	23	1.4%	1	43.5	4,454	99	2.2%	0	0.0	6,396	140	2.2%	1	7.1
	1998	366	30	8.2%	1	33.3	1,626	43	2.6%	0	0.0	3,679	111	3.0%	1	9.0	5,671	184	3.2%	2	10.9
	1999	180	49	27.2%	1	20.4	1,114	18	1.6%	0	0.0	4,461	173	3.9%	0	0.0	5,755	240	4.2%	1	4.2
	2000	162	41	25.3%	0	0.0	1,232	85	6.9%	0	0.0	3,680	412	11.2%	0	0.0	5,074	538	10.6%	0	0.0
	2001	4	1	25.0%	0	0.0	367	71	19.3%	0	0.0	5,799	1,471	25.4%	2	1.4	6,170	1,543	25.0%	2	1.3
	2002	1	0	0.0%	0	-	65	0	0.0%	0	-	6,097	1,422	23.3%	1	0.7	6,163	1,422	23.1%	1	0.7
	2003	0	0	-	0	-	0	0	-	0	-	7,064	1,689	23.9%	5	3.0	7,064	1,689	23.9%	5	3.0
	2004	7	6	85.7%	0	0.0	-	-	-	0	-	6,537	1,563	23.9%	3	1.9	6,544	1,569	24.0%	3	1.9
	2005	555	554	99.8%	1	1.8	-	-	-	0	-	8,486	2,431	28.6%	3	1.2	9,041	2,985	33.0%	4	1.3
	ALL	**3,301**	**857**	**26.0%**	**3**	**3.5**	**11,323**	**482**	**4.3%**	**1**	**2.1**	**63,304**	**9,862**	**15.6%**	**15**	**1.5**	**77,928**	**11,201**	**14.4%**	**19**	**1.7**
Palmyra	1994	0	0	-	0	-	0	0	-	0	-	123	0	0.0%	0	-	123	0	0.0%	0	-
	1995	0	0	-	0	-	0	0	-	0	-	82	0	0.0%	0	-	82	0	0.0%	0	-
	1996	0	0	-	0	-	0	0	-	0	-	81	0	0.0%	0	-	81	0	0.0%	0	-
	1997	0	0	-	0	-	0	0	-	0	-	93	2	2.2%	0	0.0	93	2	2.2%	0	0.0
	1998	0	0	-	0	-	8	0	0.0%	0	-	891	46	5.2%	0	0.0	899	46	5.1%	0	0.0
	1999	0	0	-	0	-	0	0	-	0	-	442	24	5.4%	0	0.0	442	24	5.4%	0	0.0
	2000	0	0	-	0	-	0	0	-	0	-	848	84	9.9%	0	0.0	848	84	9.9%	0	0.0
	2001	0	0	-	0	-	0	0	-	0	-	916	238	26.0%	3	12.6	916	238	26.0%	3	12.6
	2002	0	0	-	0	-	0	0	-	0	-	1,007	372	36.9%	4	10.8	1,007	372	36.9%	4	10.8
	2003	0	0	-	0	-	0	0	-	0	-	132	5	3.8%	0	0.0	132	5	3.8%	0	0.0
	2004	0	0	-	0	-	-	-	-	0	-	462	132	28.6%	0	0.0	462	132	28.6%	0	0.0
	2005	0	0	-	0	-	-	-	-	0	-	91	14	15.4%	0	0.0	91	14	15.4%	0	0.0
	ALL	**0**	**0**	**-**	**0**	**-**	**8**	**0**	**0.0%**	**0**	**-**	**5,168**	**917**	**17.7%**	**7**	**7.6**	**5,176**	**917**	**17.7%**	**7**	**7.6**

Table 1 (continued). Estimated total sets, observed sets, estimated percent observer coverage, observed cetacean takes, and cetacean take rates (per set), by EEZ area, year, and set type for the Hawaii-based longline fishery 1994-2005.

		Swordfish					Swordfish Type					Tuna					All Set Types				
EEZ area	Year	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets	Est Tot Sets	Obs Sets	Est % Covg	Obs Cet	Cet / 1000 Sets
Johnston	1994	4	0	0.0%	0	-	2	0	0.0%	0	-	26	0	0.0%	0	-	32	0	0.0%	0	-
	1995	0	0	-	0	-	0	0	-	0	-	24	5	20.8%	0	0.000	24	5	20.8%	0	0.0
	1996	0	0	-	0	-	0	0	-	0	-	64	1	1.6%	0	0.000	64	1	1.6%	0	0.0
	1997	0	0	-	0	-	0	0	-	0	-	201	10	5.0%	0	0.000	201	10	5.0%	0	0.0
	1998	0	0	-	0	-	0	0	-	0	-	181	5	2.8%	0	0.000	181	5	2.8%	0	0.0
	1999	0	0	-	0	-	0	0	-	0	-	121	0	0.0%	0	-	121	0	0.0%	0	-
	2000	0	0	-	0	-	0	0	-	0	-	615	161	26.2%	0	0.000	615	161	26.2%	0	0.0
	2001	0	0	-	0	-	0	0	-	0	-	575	141	24.5%	0	0.000	575	141	24.5%	0	0.0
	2002	0	0	-	0	-	0	0	-	0	-	618	177	28.6%	0	0.000	618	177	28.6%	0	0.0
	2003	0	0	-	0	-	0	0	-	0	-	302	95	31.5%	0	0.000	302	95	31.5%	0	0.0
	2004	0	0	-	0	-	-	-	-	0	-	568	161	28.3%	1	0.006	568	161	28.3%	1	6.2
	2005	0	0	-	0	-	-	-	-	0	-	140	16	11.4%	0	0.000	140	16	11.4%	0	0.0
	ALL	**4**	**0**	**0.0%**	**0**	**-**	**2**	**0**	**0.0%**	**0**	**-**	**3,435**	**772**	**22.5%**	**1**	**1.3**	**3,441**	**772**	**22.4%**	**1**	**1.3**
Jarvis	1994	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1995	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1996	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1997	0	1	-	0	0.000	0	0	-	0	-	0	0	-	0	-	0	1	-	0	0.0
	1998	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1999	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	2000	0	0	-	0	-	0	0	-	0	-	8	0	0.0%	0	-	8	0	0.0%	0	-
	2001	0	0	-	0	-	0	0	-	0	-	11	0	0.0%	0	-	11	0	0.0%	0	-
	2002	0	0	-	0	-	0	0	-	0	-	143	49	34.3%	0	0.000	143	49	34.3%	0	0.0
	2003	0	0	-	0	-	0	0	-	0	-	35	6	17.1%	0	0.000	35	6	17.1%	0	0.0
	2004	0	0	-	0	-	-	-	-	0	-	35	14	40.0%	0	0.000	35	14	40.0%	0	0.0
	2005	0	0	-	0	-	-	-	-	0	-	7	0	0.0%	0	-	7	0	0.0%	0	-
	ALL	**0**	**1**	**-**	**0**	**0.0**	**0**	**0**	**-**	**0**	**-**	**239**	**69**	**28.9%**	**0**	**0.0**	**239**	**70**	**29.3%**	**0**	**0.0**
Baker	1994	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1995	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1996	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1997	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1998	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	1999	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	2000	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	2001	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	2002	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-
	2003	0	0	-	0	-	0	0	-	0	-	1	0	0.0%	0	-	1	0	0.0%	0	-
	2004	0	0	-	0	-	-	-	-	0	-	0	0	-	0	-	0	0	-	0	-
	2005	0	0	-	0	-	-	-	-	0	-	0	0	-	0	-	0	0	-	0	-
	ALL	**0**	**0**	**-**	**0**	**-**	**0**	**0**	**-**	**0**	**-**	**1**	**0**	**0.0%**	**0**	**-**	**1**	**0**	**0.0%**	**0**	**-**

Table 2. Summary of observed cetacean takes in the Hawaii-based longline fishery, 1994-2005. Set Type: S=swordfish-targeting, (S) = swordfish-style, T = tuna-style, E=Experimental. Species codes: DD = short-beaked common dolphin; GG = Risso's dolphin; GM = short-finned pilot whale; MD = Blainville's beaked whale; MN = humpback whale; PC = false killer whale; PM = sperm whale; SA = pan-tropical spotted dolphin; SL = spinner dolphin; TT = bottlenose dolphin; UC = unidentified cetacean.

Trip-Set Number	Set Date	Lat (N)	Long (W)	Set Type	EEZ	SST (°F)	Set Depth (m)	Species Code	Possible Species IDs	Recorded Animal condition	Injury Determination	*Prorated Injury Severity*	*Cond*	Injury determination criteria / Comments
LL1583-07	Feb-05	32.3	-155.9	S	Outside	64.0	60.0	BE	BE	Injured	Not Serious		*N*	Line came off whale after mainline cut
LL0353-19	Dec-00	35.6	142.1	S	Outside	61.6	30	DD	DD	Injured	Not Serious		*N*	Line around fluke, released with minimal line attached
LL0061-02	Mar-95	30.9	150.4	S	Outside	65.0	27	GG	GG	Injured		*Serious*	*S*	*7/7 GG serious*
LL0063-01	Mar-95	30.5	148.2	S	Outside	64.7	30	GG	GG	Injured	Serious		*S*	Hooked in mouth
LL0160-12	Mar-97	30.7	154.4	S	Outside	66.4	29	GG	GG	Injured	Serious		*S*	Hooked in mouth / hook ingested
LL0161-01	Mar-97	30.4	157.6	S	Outside	65.6		GG	GG	Injured	Serious		*S*	Hooked in mouth
LL0242-09	Feb-99	31.2	160.9	S	Outside	65.1		GG	GG	Injured	Serious		*S*	Hooked in mouth
LL0284-02	Jan-00	31.6	135.9	S	Outside	63.5	25	GG	GG	Injured	Serious		*S*	Hook ingested
LL0400-02	Jan-01	33.2	148.0	S	Outside	62.9	30	GG	GG	Injured		*Serious*	*S*	*7/7 GG serious*
LL1556-02	Jan-05	32.7	-156.6	S	Outside	61.2	9.0	GG	GG	Injured	Serious		*S*	Hook ingested
LL1778-13	Aug-05	29.2	-140.8	T	Outside	75.6	100.0	GG	GG	Injured	Serious		*S*	Hooked in mouth, gear from snap to hook remained
LL0148-05	Dec-96	35.9	142.1	S	Outside	65.0	22	GM	GM	**Dead**			*D*	**Line tangled around caudal peduncle**
LL0305-02	Jul-00	33.1	170.1	S	Outside	75.0	25	GM	GM	Injured	Serious		*S*	Hooked in mouth / hook ingested
LL0331-05	Oct-00	15.1	161.5	T	Outside	81.2	60	GM	GM	**Dead**			*D*	**Hooked in mouth**
LL0526-01	Aug-01	06.5	163.0	T	Palmyra	85.3		GM	GM	Injured	Not Serious		*N*	Entangled, appeared to break free of line
LL0535-11	Sep-01	16.4	162.2	T	Outside	81.5	150	GM	GM	Injured	Serious		*S*	Hooked in mouth
LL1281-08	Apr-04	15.3	166.7	T	Johnston	79.2	250	GM	GM	Injured	Serious		*S*	Entangled around body, released entangled and with ~4 m of trailing line
LL1599-02	Mar-05	12.0	-165.0	T	Outside	79.6	90.0	GM	GM	Injured	Serious		*S*	Released with two wraps of monp around head
LL0725-10	Apr-02	22.8	156.4	T	Hawaii	72.9	95	MD	MD	**Dead**			*D*	**Hooked in fluke**
LL1904-13	Nov-05	25.9	-159.5	T	Outside	79.3	45.0	MD	MD	Injured	Not Serious		*N*	Hooked in fluke, hook ripped out leaving 3-4" fluke injury, whale swam away slowly

Table 2 (continued). Summary of observed cetacean takes in the Hawaii-based longline fishery during 1994-2005.

Trip-Set Number	Set Date	Lat (N)	Long (W)	Set Type	EEZ	SST (°F)	Set Depth (m)	Species Code	Possible Species IDs	Recorded Animal condition	Injury Determination	*Prorated Injury Severity*	*Cond*	Injury determination criteria / Comments
LL0433-03	Feb-01	21.6	162.3	T	Hawaii	76.0	127	MN	MN	Injured	Not Serious		*N*	Entangled in substantial line and & 2 floats; freed itself from gear before swimming away
LL0860-12	Oct-02	24.8	151.6	T	Outside	77.9	250	MN	MN	Injured	Not Serious		*N*	Line wrapped around fluke
LL1222-01	Feb-04	16.2	159.8	T	Outside	76.9	236	MN	MN	Injured	Not Serious		*N*	Entangled (probably pectorals or flukes); released with line and buoy attached.
LL0173-11	Aug-97	19.8	158.8	(S)	Hawaii	81.4	24	PC	PC	Injured	Serious		*S*	Hooked in mouth / hook ingested
LL0201-20	Apr-98	26.1	165.1	S	Hawaii	72.6	27	PC	PC	Injured	Serious		*S*	Hooked in mouth / hook ingested
LL0392-03	Jan-01	20.1	164.0	T	Outside	78.8	218	PC	PC	Injured	Serious		*S*	Hooked in mouth
LL0418-05	Feb-01	05.2	163.6	T	Palmyra	81.3	91	PC	PC	Injured		*Serious*	*S*	*13/13 PC serious*
LL0446-01	May-01	19.1	166.5	T	Outside	76.5		PC	PC	Injured		*Serious*	*S*	*13/13 PC serious*
LL0656-17	Feb-02	07.0	161.7	T	Palmyra	82.8	95	PC	PC	Injured		*Serious*	*S*	*13/13 PC serious; Hooked*
LL0663-10	Feb-02	05.2	152.0	T	Outside	81.0	218	PC	PC	Injured	Serious		*S*	Hooked in mouth
LL0695-11	Mar-02	06.6	163.2	T	Palmyra	82.9		PC	PC	Injured	Serious		*S*	Hooked in mouth
LL0808-03	Jul-02	15.8	161.1	T	Outside	81.1	150	PC	PC	Injured	Serious		*S*	Hooked in mouth
LL0850-02	Sep-02	29.0	149.0	T	Outside	76.9	275	PC	PC	Injured	Serious		*S*	Hook ingested
LL1108-09	Oct-03	19.4	154.2	T	Hawaii	73.6	300	PC	PC	Injured		*Serious*	*S*	*13/13 PC serious; Released with two 13-m branchlines around body*
LL1125-11	Nov-03	22.0	156.4	T	Hawaii	79.5	200	PC	PC	Injured	Serious		*S*	Hooked in mouth
LL1196-13	Jan-04	17.7	160.4	T	Outside		200	PC	PC	Injured		*Serious*	*S*	*13/13 PC serious; hooked in mouth or pectoral fin; released trailing 12m line*
LL1212-11	Feb-04	18.2	153.0	T	Hawaii	78.9	100	PC	PC	Injured	Serious		*S*	Hooked in mouth (hook embedded next to tooth); released trailing 0.5m line
LL1233-06	Mar-04	17.6	162.5	T	Outside	78.6		PC	PC	Injured	Serious		*S*	Hooked in head/beak/mouth; released railikng unknown amount of line
LL1249-10	Mar-04	13.8	161.1	T	Outside	78.9	150	PC	PC	Injured	Serious		*S*	Hook ingested; released with 2 ft of trailing line
LL1379-11	Aug-04	17.0	158.0	T	Hawaii	80.0	100	PC	PC	**Dead**			*D*	**Hooked in jaw**
LL1403-04	Sep-04	18.3	159.9	T	Hawaii	83.0		PC	PC	Injured	Serious		*S*	Hooked in mouth
LL1846-09	Sep-05	21.3	-153.8	T	Hawaii	85.6	167.0	PC	PC	**Dead**			*D*	Dead
LL1848-05	Sep-05	22.6	-151.1	T	Outside	78.7	100.0	PC	PC	Injured	Serious		*S*	Released with 10-15m of mainline and branchlines wrapped around flukes and trailing behind animal

Table 2 (continued). Summary of observed cetacean takes in the Hawaii-based longline fishery during 1994-2005.

Trip-Set Number	Set Date	Lat (N)	Long (W)	Set Type	EEZ	SST (°F)	Set Depth (m)	Species Code	Possible Species IDs	Recorded Animal condition	Injury Determination	*Prorated Injury Severity*	*Cond*	Injury determination criteria / Comments
EX0745	Apr-02	28.5	164.4	E	Outside			PM	PM	Injured			*N/A*	Experimental set; Not prorated
LL0257-08	May-99	27.7	170.1	S	Hawaii	74.3	25	PM	PM	Injured	Not Serious		*N*	Entangled, apparently got free
LL0559-05	Oct-01	06.3	164.7	T	Palmyra	85.6	42	SA	SA	**Dead**			*D*	**Line wrapped around beak**
LL0164-25	Apr-97	26.3	156.5	S	Outside	71.9	18	SL	SL	Injured	Not Serious		*N*	Hooked in fluke
LL0348-08	Nov-00	25.2	157.5	(S)	Hawaii	77.0	35	SL	SL	Injured		*Not Serious*	*N*	*1/1 other SL not serious*
LL0063-11	Mar-95	29.9	147.6	S	Outside	65.5	30	TT	TT	Injured	Serious		*S*	Hooked in mouth
LL0240-06	Jan-99	32.1	145.1	S	Outside	64.8	40	TT	TT	Injured	Serious		*S*	Hook ingested
LL0962-02	Feb-03	23.2	154.0	T	Hawaii	74.4	250	TT	TT	**Dead**			*D*	**Entangled; mainline and branchline wrapped around flukes**
LL1990-05	Dec-05	23.8	-160.2	T	Hawaii	75.6	150.0	TT	TT	Injured	Serious		*S*	Released with >5m branchline hooked into body in front of pec fin
LL0126-03	May-96	14.0	162.0	T	Outside	79.8	78	UC	PC,GM	Injured		*Serious*	*S*	*17/18 PC,GM serious; swam away slowly with gear attached*
LL0134-09	Aug-96	36.9	175.8	S	Outside	73.1	30	UC	ZU	Injured	Not Serious		*N*	Hooked in fluke
LL0191-03	Jan-98	31.5	153.9	S	Outside	64.0	25	UC	GG,TT	Injured		*Serious*	*S*	*10/10 GG,TT serious*
LL0228-10	Nov-98	21.1	164.7	T	Hawaii	76.5	50	UC	ZU	Injured		*Not Serious*	*N*	*2/2 ZU,MD not serious*
LL0239-11	Jan-99	31.9	153.7	S	Outside	66.8	23	UC	PC,GM,GG, TT,ZU	Injured		*Serious*	*S*	*27/30 other PC,GG,GM,TT,ZU,MD serious*
LL0270-03	Dec-99	33.7	147.5	S	Outside	66.5	29	UC	PC,GG,GM	Injured	Serious		*S*	Hooked in mouth
LL0302-01	May-00	24.6	152.8	T	Outside	75.2	91	UC	PC,GM	Injured	Not Serious		*N*	Float line wrapped around tail
LL0323-13	Oct-00	16.5	165.0	T	Outside	82.4	100	UC	PC,GG,TT	Injured		*Serious*	*S*	*23/23 PC,GG,TT serious; Hooked*
LL0387-16	Jan-01	19.0	159.1	T	Hawaii	78.3	146	UC	PC,GM	Injured		*Serious*	*S*	*Hooked; 17/18 other PC,GM serious*
LL0558-06	Oct-01	11.7	169.8	T	Outside	83.8	218	UC	PC,GM	Injured		*Serious*	*S*	*17/18 other PC,GM serious*
LL0792-08	Jun-02	05.9	161.7	T	Palmyra	84.3	364	UC	UC	Injured	Not Serious		*N*	Hooked; swam away with no gear attached

Table 2 (continued). Summary of observed cetacean takes in the Hawaii-based longline fishery during 1994-2005.

Trip-Set Number	Set Date	Lat (N)	Long (W)	Set Type	EEZ	SST (°F)	Set Depth (m)	Species Code	Possible Species IDs	Recorded Animal condition	Injury Determination	*Prorated Injury Severity*	*Cond*	Injury determination criteria / Comments
LL0804-04	Jul-02	06.6	164.0	T	Palmyra	84.6		UC	SA,SL,GG,TT	Injured	Not Serious		*N*	Hooked in body/tail & entangled; broke free
LL0993-11	Apr-03	24.2	158.4	T	Hawaii	75.3		UC	SA,SL,GG,TT, PC,GM,DD	Injured	Serious		*S*	Hooked; released with 10m trailing line on 3m animal
LL1152-06	Nov-03	22.5	160.8	T	Hawaii	81.1	182	UC	PC,GM	Injured	Serious		*S*	Hooked in the mouth, released with 20ft trailing line
LL1634-08	Apr-05	27.3	-166.8	S	Hawaii	71.4	17.0	UC	UC	Injured	Not Serious		*N*	Freed itself from gear after line cut
LL1888-10	Oct-05	21.6	-156.1	T	Hawaii	78.8	200.0	UC	PC,GM	Injured		*Serious*	*S*	*17/18 PC,GM serious; entangled in unknown manner; released with unknown gear attached*

Table 3. Summary of observed cetacean species killed (D), seriously injured (S) and not seriously injured (N), by EEZ area and by set type, for the Hawaii-based longline fishery during 1994-2005.

EEZ Area or Set Type	Cetacean Take Type	Bryde's whale *Balaenoptera edeni* (BE)	Short-beaked common dolphin *Delphinus delphis* (DD)	Risso's dolphin *Grampus griseus* (GG)	Short-finned pilot whale (GM) *Globicephala macrorhynchus*	Blainville's beaked whale *Mesoplodon densirostris* (MD)	Humpback whale *Megaptera novaeangliae* (MN)	False killer whale *Pseudorca crassidens* (PC)	Sperm whale *Physeter macrocephalus* (PM)	Pantropical spotted dolphin *Stenella attenuata* (SA)	Spinner dolphin *Stenella longirostris* (SL)	Bottlenose dolphin *Tursiops truncatus* (TT)	Unid.cetacean (UC)	All Cetaceans
BY EEZ AREA														
All areas (n=24,542)	**Total**	**1**	**1**	**9**	**7**	**2**	**3**	**20**	**1**	**1**	**2**	**4**	**16**	**67**
	D				2	1		2		1		1		7
	S			9	4		1	18				3	10	45
	N	1	1		1	1	2	0	1		2		6	15
Outside (n=11,582)	**Total**	**1**	**1**	**9**	**5**		**2**	**9**			**2**	**2**	**8**	**39**
	D				2									2
	S			9	3			9				2	6	29
	N	1	1				2				2		2	8
Hawaii (n=11,201)	**Total**					**2**	**1**	**8**	**1**			**2**	**6**	**20**
	D					1		2				1		4
	S						1	6				1	4	12
	N					1			1				2	4
Palmyra (n=917)	**Total**				**1**			**3**		**1**			**2**	**7**
	D									1				1
	S							3						3
	N				1								2	3
Johnston (n=772)	**Total**				**1**									**1**
	D													
	S				1									1
	N													
BY SET TYPE														
All Sets (n=24,542)	**Total**	**1**	**1**	**9**	**7**	**2**	**3**	**20**	**1**	**1**	**2**	**4**	**16**	**67**
	D				2	1		2		1		1		7
	S			9	4		1	18				3	10	45
	N	1	1		1		2		1		2		6	14
Swordfish (n=3,380)	**Total**	**1**	**1**	**8**	**2**			**1**	**1**		**1**	**2**	**5**	**22**
	D				1									1
	S			8	1			1				2	3	15
	N	1	1						1		1		2	6
SwordType (n=787)	**Total**							**1**			**1**			**2**
	D													
	S							1						1
	N										1			1
Tuna (n=20,375)	**Total**			**1**	**5**	**2**	**3**	**18**		**1**		**2**	**11**	**43**
	D				1	1		2		1		1		6
	S			1	3		1	16				1	7	29
	N				1	1	2						4	8

Table 4. Summary of take rates (per 1000 sets) for cetacean species killed (D), seriously injured (S) and not seriously injured (N), by EEZ area and by set type, for the Hawaii-based longline fishery during 1994-2004.

EEZ Area or Set Type	Cetacean Take Type	Bryde's whale *Balaenoptera edeni* (BE)	Short-beaked common dolphin *Delphinus delphis* (DD)	Risso's dolphin *Grampus griseus* (GG)	Short-finned pilot whale (GM) *Globicephala macrorhynchus*	Blainville's beaked whale *Mesoplodon densirostris* (MD)	Humpback whale *Megaptera novaeangliae* (MN)	False killer whale *Pseudorca crassidens* (PC)	Sperm whale *Physeter macrocephalus* (PM)	Pantropical spotted dolphin *Stenella attenuata* (SA)	Spinner dolphin *Stenella longirostris* (SL)	Bottlenose dolphin *Tursiops truncatus* (TT)	Unid.cetacean (UC)	All Cetaceans
BY EEZ AREA														
All areas (n=24,542)	**Total**	**0.04**	**0.04**	**0.37**	**0.29**	**0.08**	**0.12**	**0.81**	**0.04**	**0.04**	**0.08**	**0.16**	**0.65**	**2.73**
	D	0.00	0.00	0.00	0.08	0.04	0.00	0.08	0.00	0.04	0.00	0.04	0.00	0.29
	S	0.00	0.00	0.37	0.16	0.00	0.04	0.73	0.00	0.00	0.00	0.12	0.41	1.83
	N	0.04	0.04	0.00	0.04	0.04	0.08	0.00	0.04	0.00	0.08	0.00	0.24	0.61
Outside (n=11,582)	**Total**	**0.09**	**0.09**	**0.78**	**0.43**	**0.00**	**0.17**	**0.78**	**0.00**	**0.00**	**0.17**	**0.17**	**0.69**	**3.37**
	D	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
	S	0.00	0.00	0.78	0.26	0.00	0.00	0.78	0.00	0.00	0.00	0.17	0.52	2.50
	N	0.09	0.09	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.17	0.00	0.17	0.69
Hawaii (n=11,201)	**Total**	**0.00**	**0.00**	**0.00**	**0.00**	**0.18**	**0.09**	**0.71**	**0.09**	**0.00**	**0.00**	**0.18**	**0.54**	**1.79**
	D	0.00	0.00	0.00	0.00	0.09	0.00	0.18	0.00	0.00	0.00	0.09	0.00	0.36
	S	0.00	0.00	0.00	0.00	0.00	0.09	0.54	0.00	0.00	0.00	0.09	0.36	1.07
	N	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.00	0.00	0.00	0.18	0.36
Palmyra (n=917)	**Total**	**0.00**	**0.00**	**0.00**	**1.09**	**0.00**	**0.00**	**3.27**	**0.00**	**1.09**	**0.00**	**0.00**	**2.18**	**7.63**
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	0.00	1.09
	S	0.00	0.00	0.00	0.00	0.00	0.00	3.27	0.00	0.00	0.00	0.00	0.00	3.27
	N	0.00	0.00	0.00	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.18	3.27
Johnston (n=772)	**Total**	**0.00**	**0.00**	**0.00**	**1.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.30**
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BY SET TYPE														
All Sets (n=24,542)	**Total**	**0.04**	**0.04**	**0.37**	**0.29**	**0.08**	**0.12**	**0.81**	**0.04**	**0.04**	**0.08**	**0.16**	**0.65**	**2.73**
	D	0.00	0.00	0.00	0.08	0.04	0.00	0.08	0.00	0.04	0.00	0.04	0.00	0.29
	S	0.00	0.00	0.37	0.16	0.00	0.04	0.73	0.00	0.00	0.00	0.12	0.41	1.83
	N	0.04	0.04	0.00	0.04	0.00	0.08	0.00	0.04	0.00	0.08	0.00	0.24	0.57
Swordfish (n=3,380)	**Total**	**0.30**	**0.30**	**2.37**	**0.59**	**0.00**	**0.00**	**0.30**	**0.30**	**0.00**	**0.30**	**0.59**	**1.48**	**6.51**
	D	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
	S	0.00	0.00	2.37	0.30	0.00	0.00	0.30	0.00	0.00	0.00	0.59	0.89	4.44
	N	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.30	0.00	0.59	1.78
SwordType (n=787)	**Total**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.27**	**0.00**	**0.00**	**1.27**	**0.00**	**0.00**	**2.54**
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	1.27
	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00	0.00	1.27
Tuna (n=20,375)	**Total**	**0.00**	**0.00**	**0.05**	**0.25**	**0.10**	**0.15**	**0.88**	**0.00**	**0.05**	**0.00**	**0.10**	**0.54**	**2.11**
	D	0.00	0.00	0.00	0.05	0.05	0.00	0.10	0.00	0.05	0.00	0.05	0.00	0.29
	S	0.00	0.00	0.05	0.15	0.00	0.05	0.79	0.00	0.00	0.00	0.05	0.34	1.42
	N	0.00	0.00	0.00	0.05	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.20	0.39

Table 5. Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters outside U.S. EEZs.

Outside of U.S. EEZs													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	**Obs**	**Est**	**CV**	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Brydes whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	**1**	**1**	**1.00**	-	-	-	-	-	-	1	1	1.00
	Total	**1**	**1**	**1.00**	-	-	-	-	-	-	1	1	1.00
Short-beaked common dolphin	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	**1**	**2**	**1.00**	-	-	-	-	-	-	1	2	1.00
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**1**	**2**	**1.00**	-	-	-	-	-	-	1	2	1.00
Risso's dolphin	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	**2**	**23**	**0.71**	-	-	-	2	23	0.71	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	**2**	**7**	**0.71**	-	-	-	2	7	0.71	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	**1**	**6**	**1.00**	-	-	-	1	6	1.00	-	-	-
	2000	**1**	**2**	**1.00**	-	-	-	1	2	1.00	-	-	-
	2001	**1**	**1**	**1.00**	-	-	-	1	1	1.00	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	**2**	**5**	**0.82**	-	-	-	2	5	0.82	-	-	-
	Total	**9**	**44**	**0.43**	-	-	-	9	44	0.43	-	-	-
Short-finned pilot whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	**1**	**6**	**1.00**	1	6	1.00	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	**2**	**13**	**0.88**	1	11	1.00	1	2	1.00	-	-	-
	2001	**1**	**5**	**1.00**	-	-	-	1	5	1.00	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-
	Total	**5**	**28**	**0.52**	2	17	0.74	3	11	0.63	-	-	-
Blainville's beaked whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	Total	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00

Table 5 (continued). Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters outside U.S. EEZs.

Outside of U.S. EEZs (continued)													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	**Obs**	**Est**	**CV**	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Humpback whale	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**2**	**8**	**0.71**	-	-	-	-	-	-	2	8	0.71
False killer whale	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**2**	**11**	**0.71**	-	-	-	2	11	0.71	-	-	-
	2002	**3**	**12**	**0.58**	-	-	-	3	12	0.58	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**3**	**12**	**0.58**	-	-	-	3	12	0.58	-	-	-
	2005	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-
	Total	**9**	**39**	**0.34**	-	-	-	9	39	0.34	-	-	-
Spinner dolphin	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
Bottlenose dolphin	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**1**	**12**	**1.00**	-	-	-	1	12	1.00	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**1**	**6**	**1.00**	-	-	-	1	6	1.00	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**2**	**18**	**0.74**	-	-	-	2	18	0.74	-	-	-
Unidentified cetacean	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**2**	**24**	**0.79**	-	-	-	1	18	1.00	1	6	1.00
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**1**	**6**	**1.00**	-	-	-	1	6	1.00	-	-	-
	1999	**2**	**12**	**0.71**	-	-	-	2	12	0.71	-	-	-
	2000	**2**	**23**	**0.71**	-	-	-	1	11	1.00	1	11	1.00
	2001	**1**	**5**	**1.00**	-	-	-	1	5	1.00	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**8**	**70**	**0.39**	-	-	-	6	53	0.46	2	17	0.74

Table 6. Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters within the U.S. EEZ of the Hawaiian Islands.

Hawaiian Islands EEZ													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Blainville's	1994	-	-	-	-	-	-	-	-	-	-	-	-
beaked whale	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	**1**	**4**	**1.00**	1	4	1.00	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	1	4	1.00	-	-	-	-	-	-
Humpback whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
False killer whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	**1**	**74**	**1.00**	-	-	-	1	74	1.00	-	-	-
	1998	**1**	**12**	**1.00**	-	-	-	1	12	1.00	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	**2**	**8**	**0.71**	-	-	-	2	8	0.71	-	-	-
	2004	**3**	**13**	**0.58**	1	4	1.00	2	8	0.71	-	-	-
	2005	**1**	**3**	**1.00**	1	3	1.00	-	-	-	-	-	-
	Total	**8**	**110**	**0.68**	2	8	0.71	6	102	0.73	-	-	-
Sperm whale	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	2000	-	-	-	-	-	-	-	-	-	-	-	-
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
Spinner dolphin	1994	-	-	-	-	-	-	-	-	-	-	-	-
	1995	-	-	-	-	-	-	-	-	-	-	-	-
	1996	-	-	-	-	-	-	-	-	-	-	-	-
	1997	-	-	-	-	-	-	-	-	-	-	-	-
	1998	-	-	-	-	-	-	-	-	-	-	-	-
	1999	-	-	-	-	-	-	-	-	-	-	-	-
	2000	**1**	**14**	**1.00**	-	-	-	-	-	-	1	14	1.00
	2001	-	-	-	-	-	-	-	-	-	-	-	-
	2002	-	-	-	-	-	-	-	-	-	-	-	-
	2003	-	-	-	-	-	-	-	-	-	-	-	-
	2004	-	-	-	-	-	-	-	-	-	-	-	-
	2005	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**1**	**14**	**1.00**	-	-	-	-	-	-	1	14	1.00

Table 6 (continued). Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters within the U.S. EEZ of the Hawaiian Islands.

Hawaiian Islands EEZ (continued)													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	**Obs**	**Est**	**CV**	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Bottlenose dolphin	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**1**	**4**	**1.00**	1	4	1.00	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**1**	**3**	**1.00**	-	-	-	1	3	1.00	-	-	-
	Total	**2**	**8**	**0.71**	1	4	1.00	1	3	1.00	-	-	-
Unidentified cetacean	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**1**	**33**	**1.00**	-	-	-	-	-	-	1	33	1.00
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**2**	**8**	**0.71**	-	-	-	2	8	0.71	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**2**	**4**	**0.81**	-	-	-	1	3	1.00	1	1	1.00
	Total	**6**	**50**	**0.68**	-	-	-	4	16	0.50	2	34	0.97

Table 7. Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters within the U.S. EEZ of Palmyra Atoll.

Palmyra Atoll EEZ													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	**Obs**	**Est**	**CV**	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Short-finned pilot whale	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	-	-	-	-	-	-	1	4	1.00
False killer whale	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-
	2002	**2**	**5**	**0.71**	-	-	-	2	5	0.71	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**3**	**9**	**0.59**	-	-	-	3	9	0.59	-	-	-
Spotted dolphin	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**1**	**4**	**1.00**	1	4	1.00	-	-	-	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	1	4	1.00	-	-	-	-	-	-
Unidentified cetacean	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**2**	**5**	**0.71**	-	-	-	-	-	-	2	5	0.71
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**2**	**5**	**0.71**	-	-	-	-	-	-	2	5	0.71

Table 8. Estimated mortality, serious injury, and not serious injury of cetaceans in the Hawaii-based longline fishery during 1994-2004 for waters within the U.S. EEZ of Johnston Atoll.

Johnston Atoll EEZ													
		Total			Mortality			Serious Injury			Not Serious Injury		
Species	Year	**Obs**	**Est**	**CV**	Obs	Est	CV	Obs	Est	CV	Obs	Est	CV
Short-finned pilot whale	1994	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1995	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1996	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1997	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1998	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	1999	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2000	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2001	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2002	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2003	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	2004	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-
	2005	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-
	Total	**1**	**4**	**1.00**	-	-	-	1	4	1.00	-	-	-

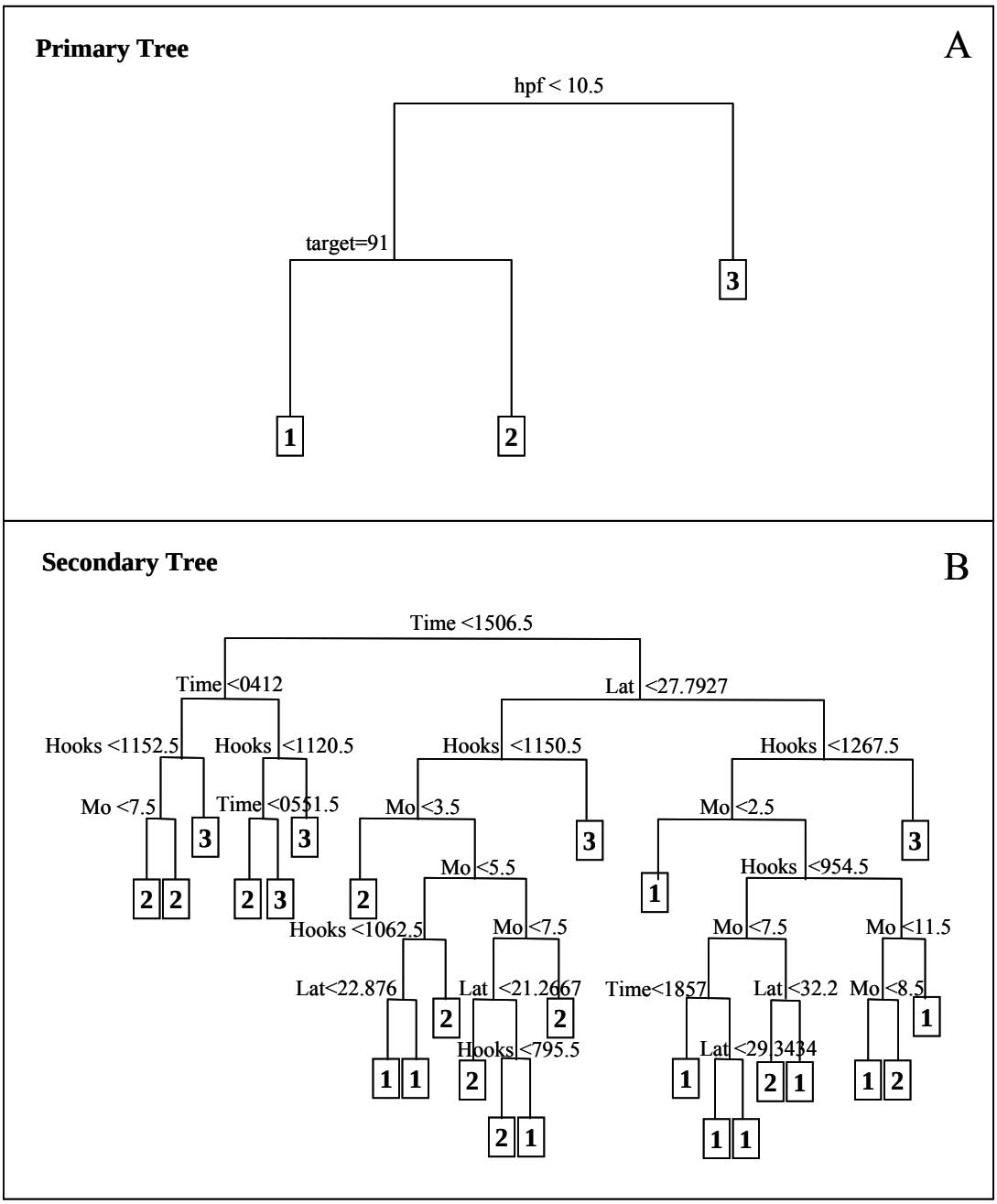

Figure 1. Classification tree structure for primary (A) and secondary (B) decision trees used to assign set types for 1994-2003, coded as (numbers in boxes): 1 = Swordfish-targeting, 2 = Swordfish-style, 3 = Tuna-style. At each decision point, a true condition moves down the tree to the left, a false condition moves down to the right. The secondary tree was used only if variables for the primary tree were missing. Key: hpf = Hooks per float; 'Target=91' = Target species swordfish; Hooks = No. hooks, Mo = Month, Lat = Latitude, Time = Set start time. Sets made during 2004 and 2005 were assigned type codes 1 (shallow sets) or code 2 (deep sets), based on regulatory definitions (see Methods).

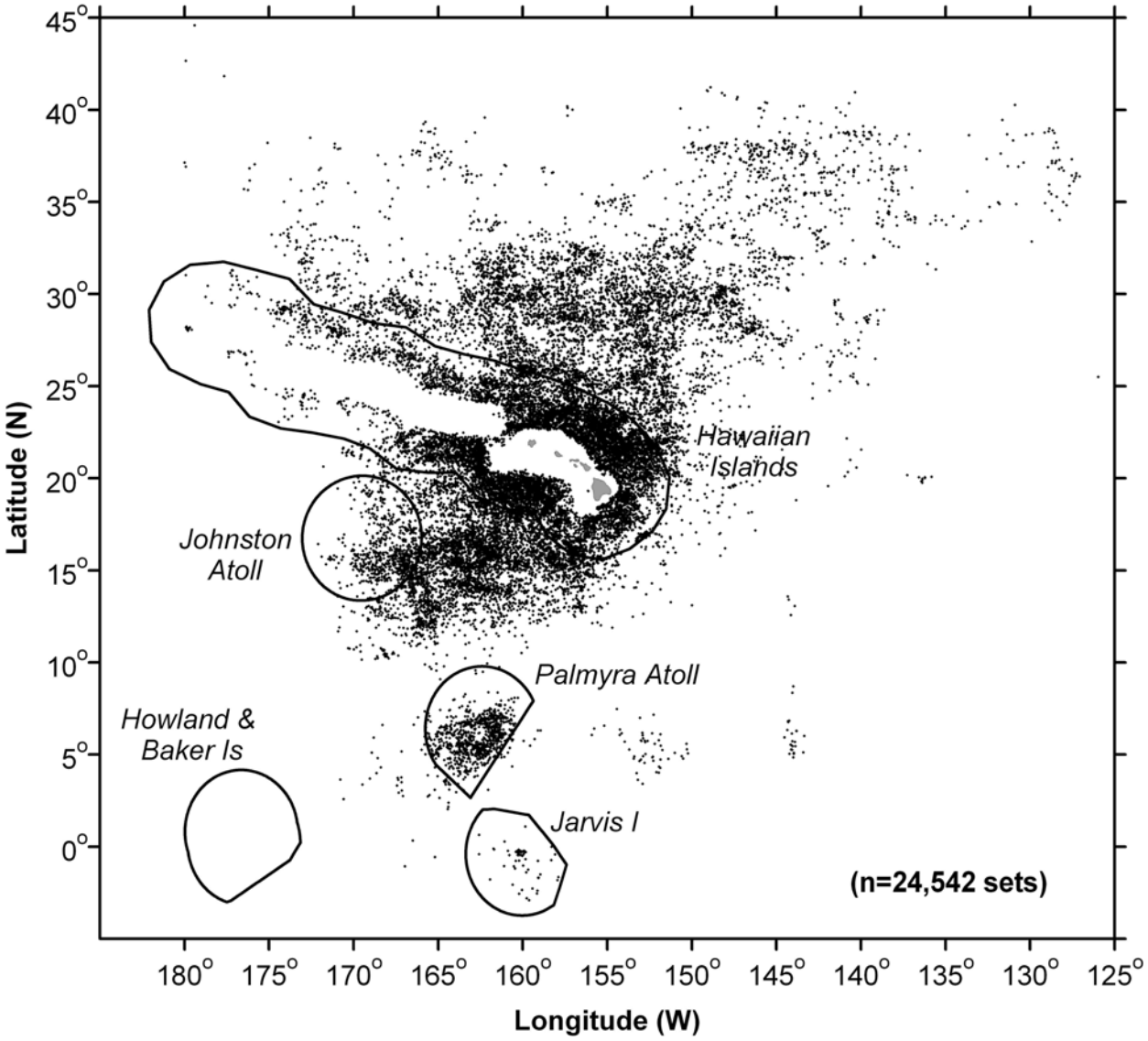

Figure 2. Locations of observed sets in the Hawaii-based longline fishery during 1994-2005. Lines represent U.S. EEZ waters surrounding the Hawaiian Islands and other central Pacific islands within the range of the fishery.

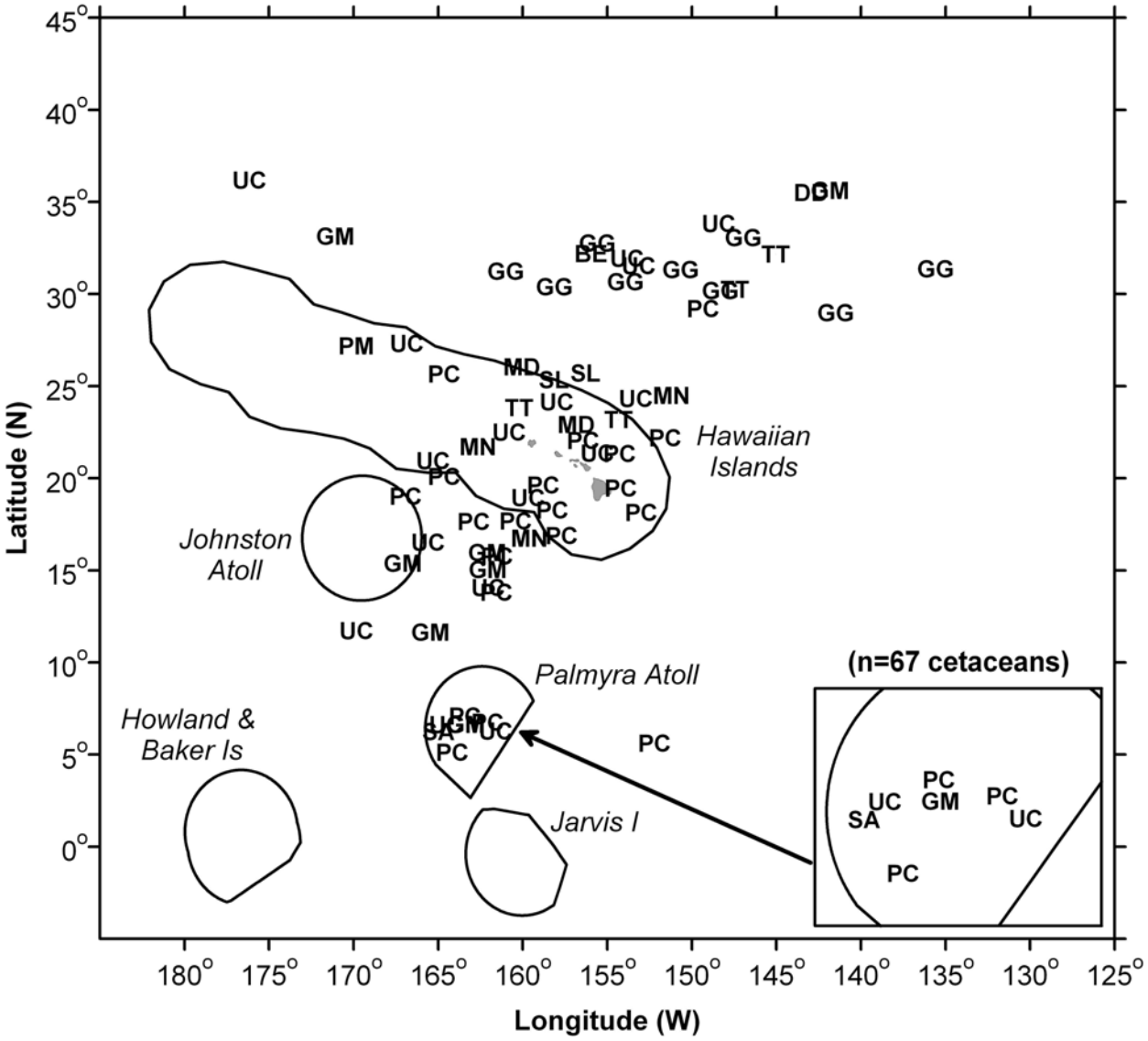

Figure 3. Locations of observed cetacean takes in the Hawaii-based longline fishery during 1994-2005. Lines represent U.S. waters surrounding the Hawaiian Islands and other central Pacific islands within the range of the fishery. Key to species codes: BE = Bryde's whale; DD = short-beaked common dolphin; GG = Risso's dolphin; GM = short-finned pilot whale; MD = Blainville's beaked whale; MN = humpback whale; PC = false killer whale; PM = sperm whale; SL = spinner dolphin; SA = pantropical spotted dolphin; TT = bottlenose dolphin; UC = unidentified cetacean.

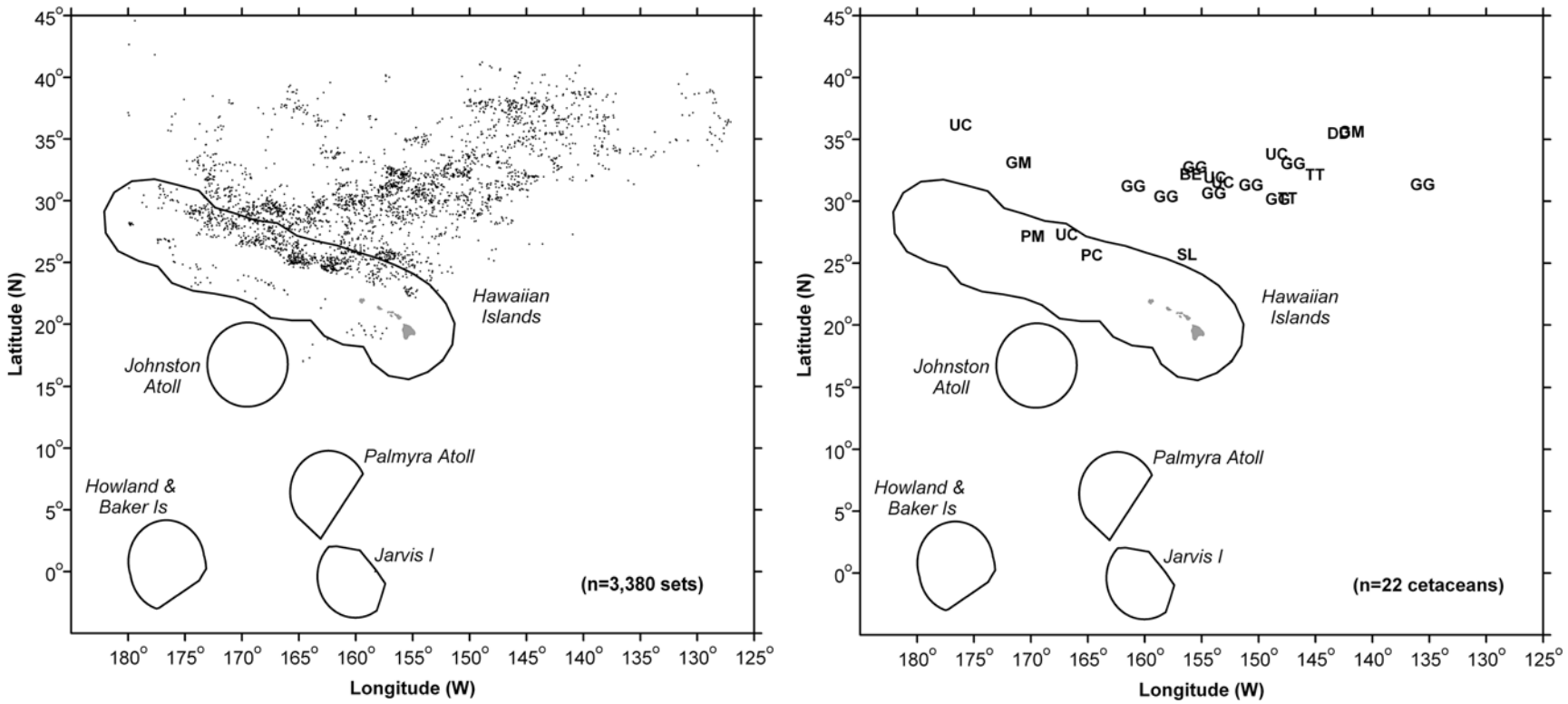

Figure 4. Locations of observed sets and cetacean takes for swordfish-targeting effort in the Hawaii-based longline fishery during 1994-2005. Lines represent U.S. waters surrounding the Hawaiian Islands and other central Pacific islands within the range of the fishery. Key to species codes: BE = Bryde's whale; DD = short-beaked common dolphin; GG = Risso's dolphin; GM = short-finned pilot whale; PC = false killer whale; PM = sperm whale; SL = spinner dolphin; TT = bottlenose dolphin; UC = unidentified cetacean.

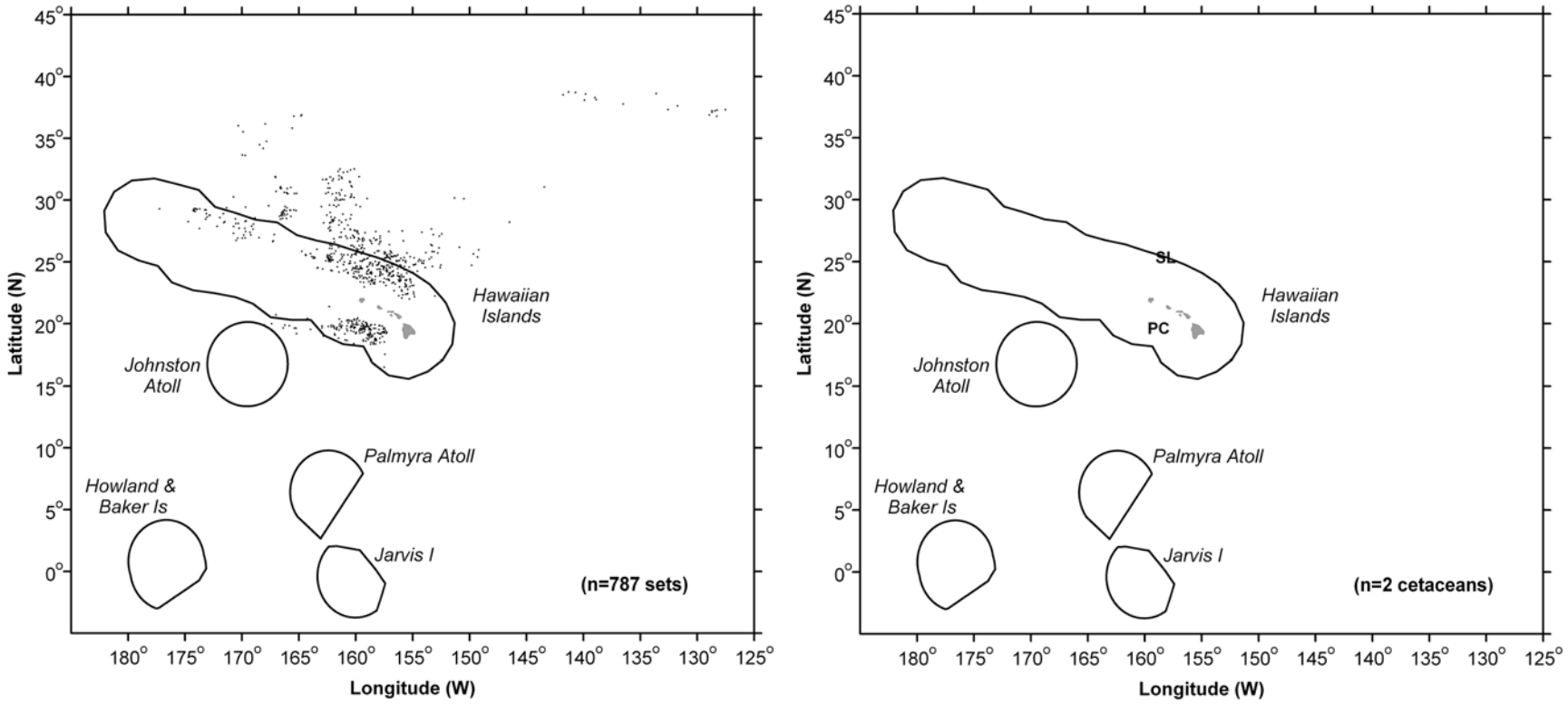

Figure 5. Locations of observed sets and cetacean takes for swordfish-style effort (targeting species other than swordfish) in the Hawaii-based longline fishery during 1994-2005. Lines represent U.S. waters surrounding the Hawaiian Islands and other central Pacific islands within the range of the fishery. Key to species codes: PC = false killer whale; SL = spinner dolphin.

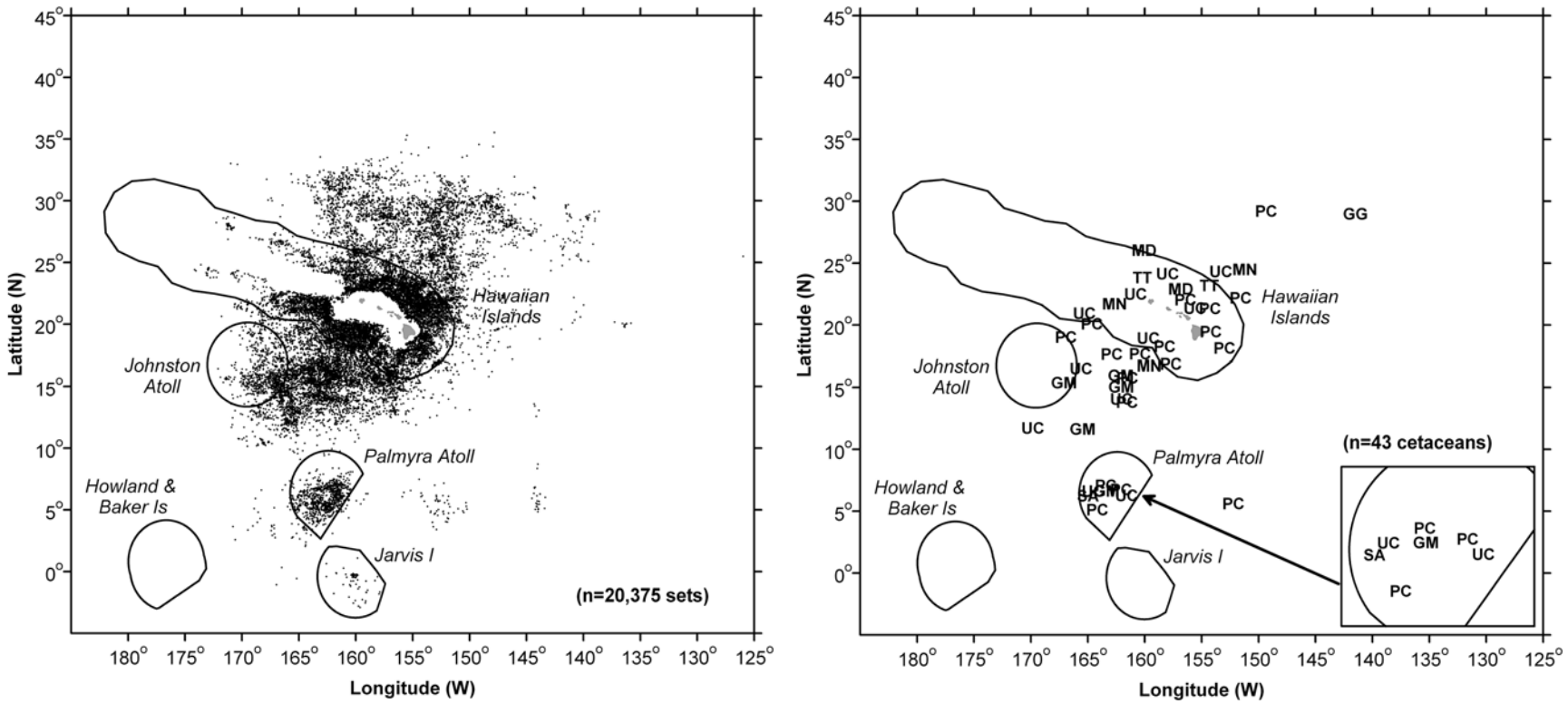

Figure 6. Locations of observed sets and cetacean takes for tuna-style effort in the Hawaii-based longline fishery during 1994-2005. Lines represent U.S. waters surrounding the Hawaiian Islands and other central Pacific islands within the range of the fishery. Key to species codes: GG = Risso's dolphin; GM = short-finned pilot whale; MD = Blainville's beaked whale; MN = humpback whale; PC = false killer whale; SA = pantropical spotted dolphin; TT = bottlenose dolphin; UC = unidentified cetacean.

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