

Estimation of Year 2004 Incidental Takes of Sea Turtles, Seabirds, and Marine Mammals in the Hawaii Longline Deep Set Fishery¹

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This report provides year 2004 incidental take estimates of protected species by the Hawaii longline deep set fishery. Incidental take estimates are provided for all protected species where there exist at least one recorded incidental take in the Hawaii Longline Observer Database System. This database includes all verified observed trips from February 1994 through December 2004. An incidental take refers to an animal that was observed hooked or entangled. The incidental take estimate is the estimated total number of incidental takes for all trips landing in the specified time period by the Hawaiian longline deep set fishery. The longline deep set fishery is defined as any commercial fishing trip by a vessel with a Hawaii longline permit that departs or returns at a Hawaiian port, excluding those trips using a certificate for swordfishing.

The take estimates are based on a random sample. For year 2004, observed trips were drawn using two sampling schemes. The primary scheme was a systematic sample. Before departing on a fishing operation, longline vessels were required to call the NOAA Fisheries contractor at least 72 hours prior to their intended departure date. To select a sample, calls were ordered and numbered sequentially in the order they were accepted. From herein, this number is referred to as the call number. Prior to the beginning of a quarter, a systematic sample of call numbers was drawn by PIFSC and supplied to the current contractor. The trips associated with these selected call numbers were to be sampled. Although every reasonable effort was made to sample selected trips, there were some selected trips that departed without an observer. In this situation, it was recorded that the trip was not sampled and a short explanation of why it was not sampled was given. If a trip was selected but did not leave within a reasonable amount of time, the observer was usually reassigned to a different trip. When the vessel was ready to depart an observer was assigned to it. Because the number of observers was limited it was impractical to obtain the full targeted coverage under the systematic design. Therefore, the systematic design was select slightly under that targeted coverage, typically 5% under. The additional trips were then selected using a secondary sampling scheme. This secondary scheme was used when all trips selected by the systematic sample were covered and an observer needed to be assigned to a trip. In this instance, a trip was randomly selected with equal probability from the calls received that day that were not previously selected. If more than one observer needed to be assigned to a vessel, the appropriate number of trips was sampled with equal probability from this pool of call-ins. The coverage obtained by the day scheme was flexible and dependent on the need to accommodate observers. This additional sampling does depart from a traditional probability sample since the day when additional samples were drawn was not randomly selected but determined by the need to draw additional samples. After each quarter the contractor sent a record of the sampling of trips to PIFSC.

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Because the systematic sample was selected quarterly, incidental take estimates were estimated on a quarterly basis and then summed for the year's total estimate. A trip's incidental take was assigned to the quarter when the vessel returned to port after completing the trip. The contractors sampling records were used to approximate sampling probabilities. The sampling probabilities during the periods when additional samples were drawn were computed by enumerating the number of call-ins during consecutive periods of comparable coverage. It was then assumed that the additional trips were selected with equal probability from those trips that had not been selected as part of the systematic sample. When coverage was below that of the anticipated systematic sample, the sampling probabilities were computed by enumerating all call-ins during this period and assuming that the trips sampled were selected with equal probability. Because the coverage level changed with the fluctuations in observer availability and fishing activity, trips were not selected with equal probability. Therefore, the Horvitz-Thompson estimator was used to estimate total take as it takes into account unequal sampling probabilities. The incidental take records used to compute the Horvitz-Thompson estimator were those available in the Longline Observer Database System on 2 February 2005.

Confidence intervals for the quarterly take estimates were computed using the approximated sampling probabilities and assuming that a species' take per trip were independent Poisson variates with a constant mean value. The assumption that the average take rate was constant throughout a quarter is questionable but necessary to compute confidence intervals. Confidence intervals for the yearly total were not computed as it seems unreasonable to assume take rates were constant throughout the year.

Table 1. Year 2004 estimated incidental take and corresponding 95% confidence intervals (c.i.) for the Hawaii deep set longline fishery.

	Quarter								
	1		2		3		4		Total
Species	Take	c.i.	Take	c.i.	Take	c.i.	Take	c.i.	Take
Turtles									
Loggerhead	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Leatherback	10	[2,28]	0	[0,12]	0	[0,13]	5	[1,19]	15
Olive Ridley	5	[1,23]	11	[3,27]	19	[6,45]	11	[3,29]	46
Green	0	[0,14]	5	[1,19]	0	[0,13]	0	[0,12]	5
Albatrosses									
Black-footed	16	[4,36]	0	[0,12]	0	[0,13]	0	[0,12]	16
Laysan	10	[2,28]	0	[0,12]	0	[0,13]	0	[0,12]	10
Dolphins									
Spotter	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Spinner	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Bottlenose	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Risso	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Whales									
Pilot	0	[0,14]	3	[1,15]	0	[0,13]	0	[0,12]	3
Humpback	6	[1,23]	0	[0,12]	0	[0,13]	0	[0,12]	6
False	15	[3,35]	5	[1,19]	8	[2,25]	0	[0,12]	28
Sperm	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0
Beaked	0	[0,14]	0	[0,12]	0	[0,13]	0	[0,12]	0