

Results of 2001 Aerial Surveys of Humpback Whales

North of Kauai



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North Pacific Acoustic Laboratory (NPAL) Program

Submitted by:

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Abstract

Eight aerial surveys were conducted over the waters north of Kauai during the period Feb. 11 through March 31, 2001 as part of the marine mammal monitoring program of the North Pacific Acoustic Laboratory (NPAL). Since the NPAL source was not operating during 2001, these data will comprise the baseline assessment against which future surveys will be compared when the NPAL source is operating. A total of 130 marine mammal sightings were made across the eight surveys of which 116 (89%) were of humpback whale pods. Analysis of whale sightings within 40 km radius of the NPAL source revealed that the majority of humpback sightings (57%) occurred within 5km of shore (median = 4.4 km), at an average distance of 22.1 km (sd = 9.2 km) from the NPAL source. The mean distances from the NPAL source and mean distances offshore will be compared across subsequent surveys in order to assess any potential effects of the NPAL source.

Background

The 2001 aerial surveys reported here were performed as part of the marine mammal monitoring effort of the North Pacific Acoustic Laboratory (NPAL). Though sightings of all marine mammal species were recorded, the main focus was the distribution of seasonally present humpback whales, which are present in sufficient numbers during the months Jan-Apr to afford statistical comparisons of their distribution across years. This first year of monitoring was meant to serve as a baseline year, with NPAL source inactive. The observed distribution of humpback whales during subsequent years, with NPAL source active, will then be compared to these results.

Method

A total of eight weekly surveys of the waters north of the island of Kauai were performed during the period Feb. 11 through March 31, 2001. This period coincides with the time of peak residency of humpback whales based on the results of past surveys (Baker and Herman, 1981; Mobley et al., 1999a, 1999b). In order to maintain a basis of comparison with previous Kauai surveys, methods consistent with earlier 1993-98 surveys (Mobley et al. 1999b) were used.

Surveys followed pre-determined north-south tracklines spaced 13 km (7 nmi) apart projected within a 40-km radius of the NPAL source (Figure 1). One or two additional lines spaced 6.5 km (3.5 nmi) apart were added in the immediate vicinity of the NPAL source to permit greater sampling effort in that area. Starting longitudes were randomly chosen per distance sampling methodology (Buckland et al. 1993) so that the exact trackline configuration varied for each survey.

The survey aircraft was a twin-engine Partenavia Observer flying at a speed of 100 knots and an altitude of 244m (800 ft). Two experienced observers made sightings of all marine mammal species, one on each side of the aircraft. Sightings were called to a data recorder who noted the species sighted, number of individuals, presence or absence of a calf, angle to the sighting (using hand-held Suunto clinometers), and any apparent reaction to the

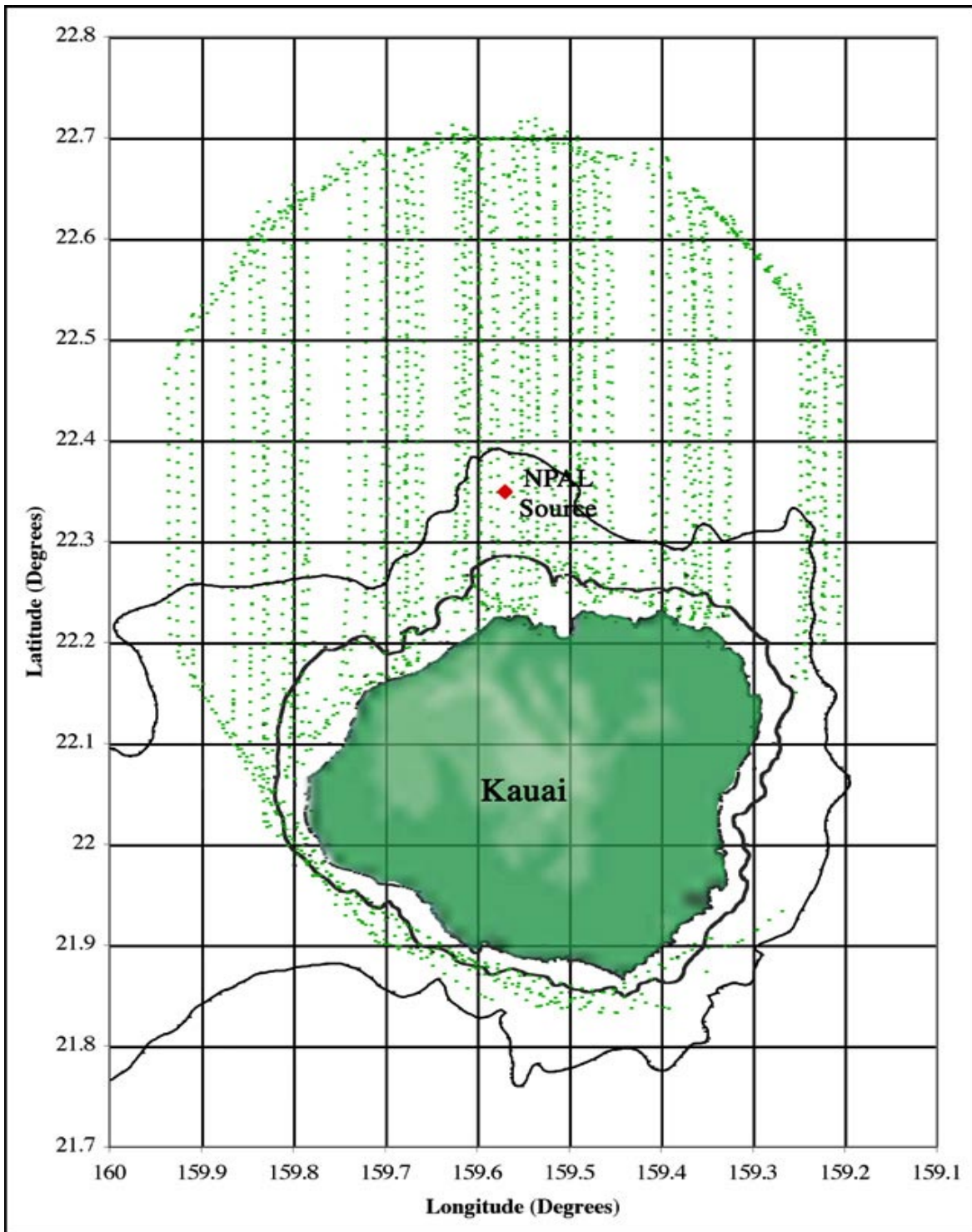


Figure 1. 2001 Survey Effort--green dots show survey effort of all eight surveys based on GPS data. Effort north of Kauai was defined by area within 40-km radius of NPAL source. Inner and outer bathymetry lines correspond to the 100 and 1000 fathom contours, respectively.

aircraft. Additionally, GPS locations were automatically recorded onto a laptop computer at 30-sec intervals, as well as manually whenever a sighting was made. Altitude was manually recorded from the plane's barometric altimeter. Environmental data (seastate, glare and visibility) were manually recorded at the start of each transect leg and whenever conditions changed. The two data sources (manual and computer) were later merged into a single Excel data file.

Results and Discussion

A total of 130 marine mammal sightings were made across the eight Kauai surveys, of which 116 (89%) were of humpback whales (Table 1). This is consistent with data from previous surveys (Mobley et al. 1999b) showing humpback whales to be the most prevalent species in the Hawaiian Islands during the months Jan-Apr. It is worthy of note that sperm whales (*Physeter macrocephalus*) were not observed during the 2001 surveys. This is the first year among six years of Kauai surveys (1993-95, 1998, 2000-01) that sperm whales were not seen.

Table 1. 2001 Kauai Survey Sightings—All Species

Species:	No. Sightings	No. Indiv.
Humpback whales (<i>Megaptera novaeangliae</i>)	116	211
Spinner dolphins (<i>Stenella longirostris</i>)	1	12
Short-finned pilot whales (<i>Globicephala macrorhynchus</i>)	1	8
Bottlenosed dolphins (<i>Tursiops truncatus</i>)	3	5
Fin whales (<i>Balaenoptera physalus</i>)	1	3
Unidentified dolphins	8	23
TOTALS:	130	262

The remainder of this report will focus on the target species, humpback whales. Table 2 summarizes the number of humpback sightings by survey date. As shown, greater numbers of whale sightings tended to correspond with lower average seastate conditions. As Beaufort seastate increases, the probability of detecting cetaceans tends to decrease (Buckland et al. 1993). For the present data, sightings of whales dropped dramatically beyond Beaufort 2-3 (Figure 2).

Table 2. Summary of 2001 Humpback Whale Sightings by Date

Survey No.	Date	No. Whales Sighted	Mean Seastate	Survey No.	Date	No. Whales Sighted	Mean Seastate
1	Feb. 11	30	3.09	5	Mar. 11	5	4.07
2	Feb. 17	12	3.69	6	Mar. 17	31	2.83
3	Feb. 24	9	2.93	7	Mar. 24	14	2.67
4	Mar. 3	10	4.28	8	Mar. 31	5	3.05

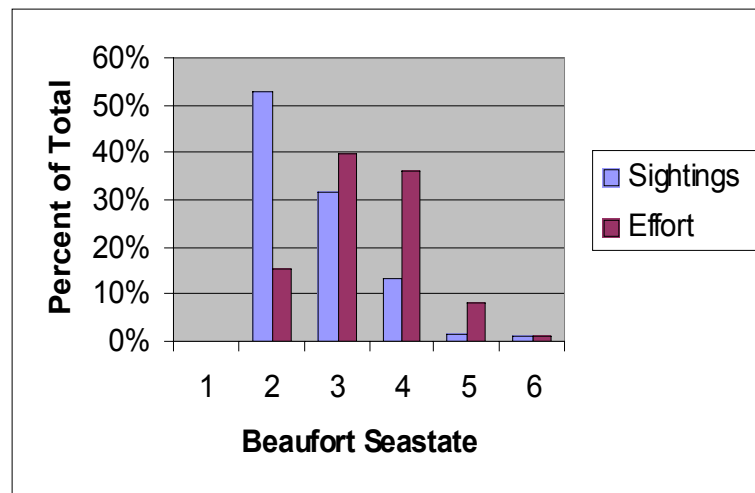


Figure 2. Survey Effort and Sightings by Seastate Condition. Sighting probabilities were strongly dependent on seastate conditions.

Humpback Whale Distribution

The distribution analyses described here are restricted to those humpbacks seen within 40-km radius of the NPAL source (N=75 sightings). Figure 3 shows the distribution of all humpback whales sighted across the eight Kauai surveys. Similar to the results of the previous ATOC MMRP surveys (Mobley et al. 1999b) most sightings (60%) occurred on or within the 100 fathom (183 m) isobath. Figures 4 and 5 summarize the distances from the NPAL source and shoreline, respectively. The majority of sightings (85%) occurred between 15 and 35 km from the NPAL source (mean = 22.13 km; sd = 9.17 km) and within 5 km of shore (57%). Given the heavy skew of the distribution shown in Figure 5, the median distance of 4.4 km is a more representative measure of central tendency for distance from shore (cf: mean = 7.58 km; sd = 9.21 km). These values will be compared against those derived in subsequent surveys when the NPAL source is active.

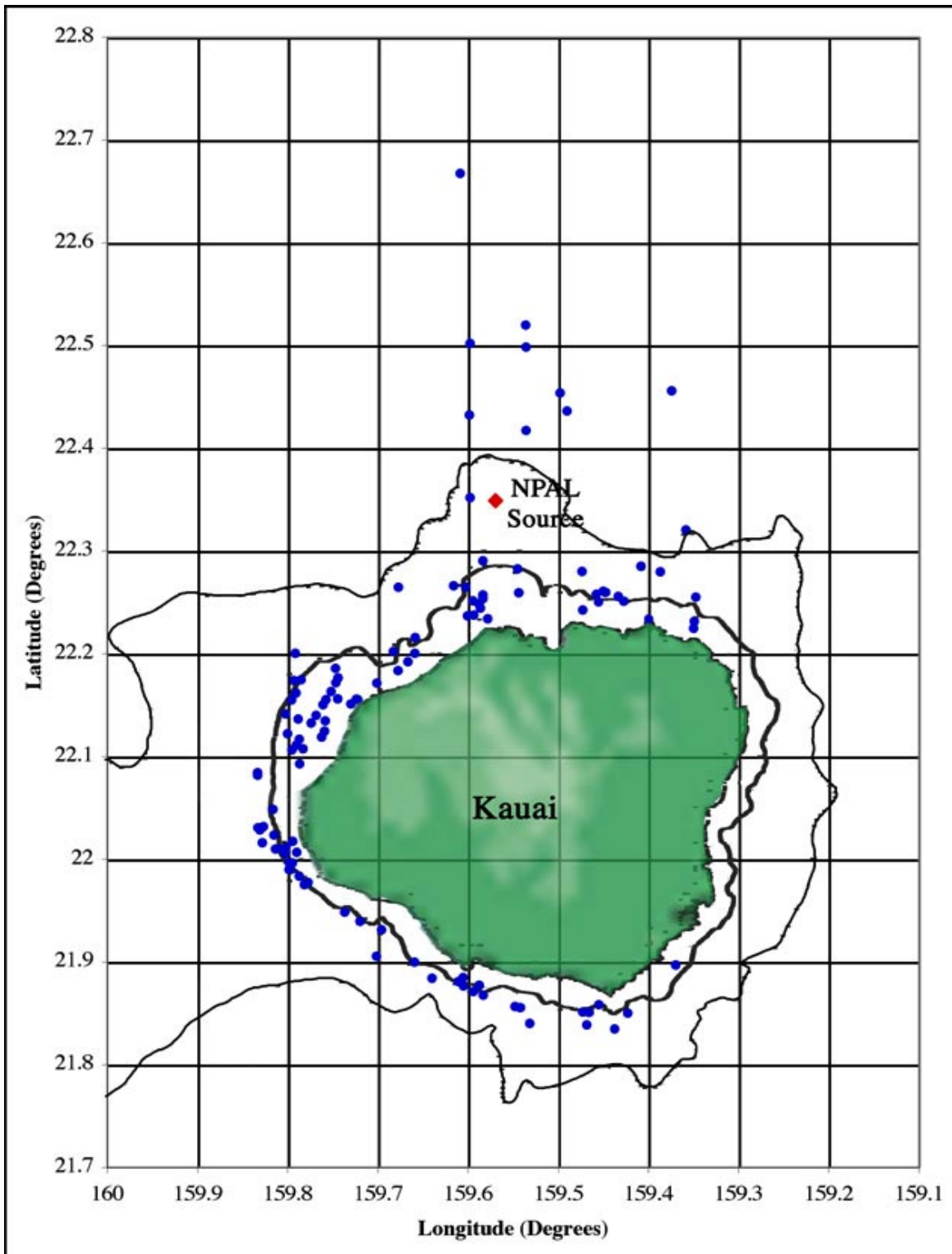


Figure 3. 2001 Humpback Whale Sightings. Blue dots indicate positions of humpback whale sightings based on GPS data. Inner and outer bathymetry lines refer to 100 and 1000 fathom contours, respectively.

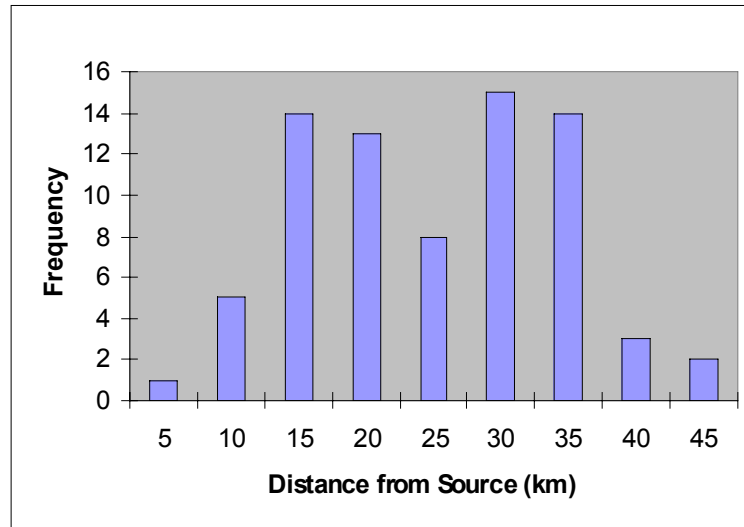


Figure 4. Histogram of distances between humpback sightings and NPAL source (in 5-km intervals).

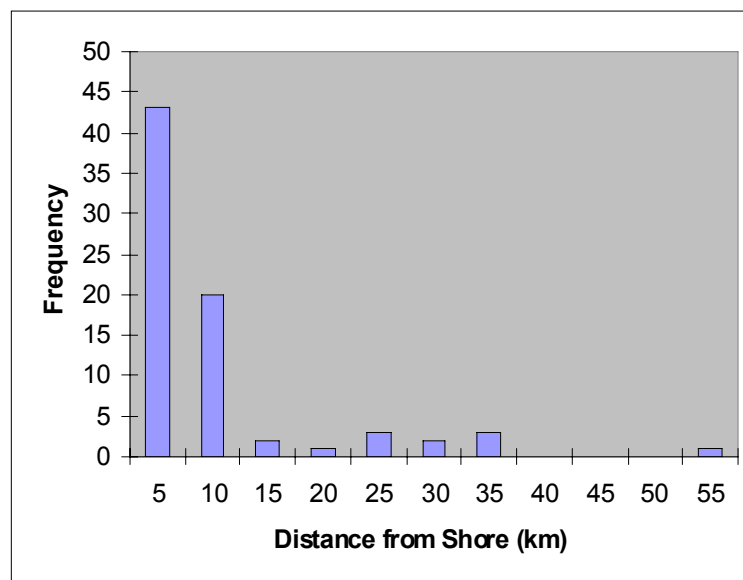


Figure 5. Histogram of distances between humpback sightings and the Kauai shoreline (in 5-km intervals).

Table 3. Results for Distance from NPAL Source and Distance from Shore (For Whale Sightings Within 40-km of NPAL Source)

Variable	N	Mean (km)	SD (km)
Distance from NPAL Source	75	22.13	9.17
Distance from Shore	75	7.58	9.21

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