

**YEAR 2001
SANCTUARY OCEAN COUNT
RESULTS**

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INTRODUCTION

The Humpback Whale (*Megaptera novaeangliae*) is the only mysticete that spends a considerable amount of time in Hawaiian waters (Shallenberger 1981). Anecdotal and historical reports suggest that the presence of humpback whales in Hawai'i may be relatively recent with respect to the history of the islands (Tomich 1986). Humpback whales visiting Hawaiian waters between the months of December and April are part of the Central North Pacific stock, which spends its summers foraging in the waters of Southeastern Alaska (Payne et al. 1997).

On December 1991, the National Marine Fisheries Service (NMFS) completed the Final Recovery Plan for the Humpback Whale (NOAA 1995), which included in its goals the maintaining and enhancing of humpback whale's habitat, the reduction of human related effects, the monitoring of key population parameters, and the promotion of a State/Federal partnership for the administration and implementation of the plan. An extensive list of research priorities was developed during a workshop held on Maui (Payne et al. 1997), and an educational and public outreach agenda for the Hawaiian Island Humpback Whale National Marine Sanctuary (HIHWNMS) was developed.

The Sanctuary Ocean Count was born out of the need to fulfill the educational and public outreach goals set forth during the Maui workshop, and was designed to provide Hawai'i's residents and visitors with the opportunity to actively participate in the evaluation of the status of humpback whales on their breeding grounds by conducting a yearly shore-based census during peak breeding season. Although the census does not claim to provide scientifically accurate results regarding abundance and distribution patterns of humpback whales around the main Hawaiian Islands, it certainly is a tool to supplement scientific information, to promote public awareness about the humpback whales and the whale watching opportunities that are available from Hawai'i's shores, and to get a sense of how whales use inshore waters on an average peak season day. The annual Sanctuary Ocean Count has been conducted since 1997, first only around the Island of O'ahu, then on O'ahu and the Big Island in 1999, and finally, during the year 2000 Sanctuary Ocean Count, shore sites were manned also on Kaua'i.

The 2001 Sanctuary Ocean Count was sponsored by the Hawaiian Islands Humpback Whale National Marine Sanctuary, with contributions from the Hawai'i Natural Heritage Program, Fuji Film and Oceanwide Science Institute. The current report is a summary of the results of the 2001 Sanctuary Ocean Count, and is intended to corroborate existing scientific data and to provide baseline information in geographic areas where no scientific monitoring is being conducted. In addition, comparison among yearly Sanctuary Ocean Count estimates (which are obtained approximately at the same time each year) may provide some insight into which areas are preferred by humpback whales and to suggest locations where research or more intense monitoring is needed.

VOLUNTEER TRAINING

Two types of volunteers were identified by sanctuary personnel: Site Leaders, and regular volunteers. Site Leaders were people willing to participate in training sessions to become able to coordinate, manage and train regular volunteers at the shore-based sites assigned to them. Regular volunteers did not have to undertake any formal training and could show up at their chosen shore-based site on the day of the count and assist Site Leaders in data collection and whale observation.

Site leader training was conducted during two sessions on O‘ahu, one at the Hālonā Blowhole shore-site on Windward O‘ahu, and one at Sea Life Park during the Whale Celebration Day on February 2001. Additional site leader training was conducted on the Big Island and on Kaua‘i. Trained Site Leaders were instructed to meet regular volunteers at their shore-based site on the day of the count and to conduct a brief training session on how to collect behavioral information. The collection of behavioral information was done as a pilot study to determine whether the current protocol would work with volunteers.

CENSUS SITES

The 2001 Sanctuary Ocean Count was conducted at 41 sites around the Island of O‘ahu, 20 sites around the Big Island (Hawai‘i), and 10 sites around Kaua‘i. Each of these sites was manned by at least one Site Leader who was responsible for the collection of census data and for the coordination of regular volunteers. The 2001 Sanctuary Ocean Count was conducted on February 24th between 0900 and 1215.

COUNT PROCEDURES

Four times, starting on the hour (at 0900, 1000, 1100, and 1200), for a period of exactly 15 minutes, the waters visible from land-based sites were scanned for the presence of humpback whales. When a whale was sighted, it was tallied and monitored so that it would not be recounted.

At the end of the 15-minute period the number of whales observed was reported on the Point Count Data Sheet (Figure 1). If a distinction between adult whales and calves was possible the respective totals for adults and calves were also noted. Only whales seen at the surface during the 15-minute period were counted. Site Leaders were asked not to record whales they sighted before the start of the count or immediately after the 15 minutes even if they were aware of the whale’s presence.

If other species of marine mammals were sighted during the count they were also tallied using a similar procedure. Other species likely to be sighted from land are primarily the spinner dolphin, the spotted dolphin and the bottlenose dolphin. Site Leaders were asked to estimate school size for these species but not to report number of calves, because it is often difficult to determine how many calves are present in a dolphin school at a distance, since animals tend to surface in sub-groups at different intervals, especially when the schools are large.

BEHAVIORAL OBSERVATION PROCEDURES

Behavioral observations were recorded by pairs of volunteers following a focal pod (which could be composed of one or more animals). A pod was defined as a group of whales in close proximity and interacting in some way. Each pair of volunteers could either follow a different pod or the same pod. Volunteers were asked to pick one whale in the pod to be the focal animal and to try and follow the behaviors of that animal only.

Detailed behavioral observations were taken at 15-minute intervals; a break of 15-minutes followed, where volunteers could stretch and interact but still keep a visual on the focal pod so that they could resume detailed observations again after the break. This on-off pattern continued until the pod was lost, too far (> 1 mile), out of the area, or until the observers decided to leave. If the whale was underwater at the start of the 15-minute period, observations were started at the first surfacing event.

Focal pods were chosen haphazardly. The requirement for a pod choice was that the sighting was made within a mile from shore and that, in general, a pair of volunteers chose the first pod coming to the surface when they were ready to begin observations. A behavioral observation, therefore, always started with a surfacing event.

Volunteers recorded the following information on the Focal Follow Sheet (Figure 2), every minute:

TIME = time of day the observation was made (using hours and minutes)

NUMBER OF ANIMALS = total number of whales seen

NUMBER OF ADULTS = total number of whales that appeared to be adults

NUMBER OF CALVES = total number of whales that appeared to be calves

POD or SCHOOL ID = number or letter code given at the beginning of each minute each time the whale being observed was seen. A change of the letter code (done by going up one letter) was made every time the number of whales in the pod belonging to the whale being observed changed

DISTANCE FROM OBSERVER (IN MILES) = estimated distance from the observer to the sighting in miles. If the distance was less than a mile it was indicated as 0.X miles. Each volunteer was provided with a Distance Cheat Sheet to help estimating distances more accurately

SIGHTING ANGLE (0° to 180°) = Zero degrees was designated as the far left side of the field of view and 180° was the far right side, assuming the shoreline was straight. In some cases, when promontories with a wider viewing area were present at the site, a wider range of angles was used. The point straight ahead of the observer was designated as 90°. Observers estimated the angle to the whale sighting using these parameters as guidelines

DIRECTION OF MOVEMENT (0° to 360°) = If the animal was stationary the direction of movement was designated as NONE. If there was a directionality to the animal's movement, similar criteria as for the sighting angle were used: 0° or 360° indicated the far left side (animal(s) moving from right to left) and 180° the far right side (animal(s) moving from left to right). If the animal was moving away from the observer in a straight line the direction was indicated as 90°. If it was moving straight toward the observer it was indicated as 270°

OBSERVER'S CONFIDENCE LEVEL = This subjective category indicated whether the observer was confident about the observation just made. **H = High**, 100% sure, comfortable with observation; **M = Medium**, fairly comfortable with observation, **L = Low**, unsure

BEHAVIORAL EVENTS = Five behavioral events were recorded. These behaviors were chosen as indicators although many other behavioral events could be displayed by a particular animal. The chosen behaviors were:

S	=	surfacing	The whale breaks the surface and takes a breath
B	=	breach	The whale jumps out of the water
SL	=	slap	The whale slaps the water with its tail, body or pectoral fin
SH	=	spy hop	The head comes out of the water in vertical position and slowly
FL	=	floating	The whale is motionless at the surface

RESULTS AND DISCUSSION

Volunteer Participation and Data Reporting

Over 900 volunteers signed up to participate on O'ahu (as compared to 300 in the year 2000), 100 signed up on the Big Island, and 60 on Kaua'i. Many of the volunteers were island residents (from children to senior citizens), however the HIIHWNMS office got a lot of calls from mainland and foreign visitors (New Zealand, Australia, Canada) who planned their vacations around the Sanctuary Ocean Count.

In addition to volunteers on the ground, two groups conducted aerial surveys in conjunction with the count. One group was STI, a high-tech company that uses heat-seeking technology to determine a whale's location underwater. The second aerial survey was conducted by a member of the Navy Reserve accompanied by two biologists from Oceanwide Science Institute.

The count data reported for the 2001 Sanctuary Ocean Count represent an improvement from previous years. The procedures used and the data sheet format appeared to have been simpler for Site Leaders to follow. Recommended changes in the datasheet are outlined in Figure 2 (**changes are in italics**). These changes are designed to better guide Site Leaders in identifying which species are likely to be seen from shore and to report number of animals sighted.

Results for the focal animal observations were overall disappointing. One problem resulted from the fact that training was done by Site Leaders at the site, and not directly by Sanctuary scientists. This may have resulted in discrepancies in the way information was conveyed by each Site Leader, and by the difficulties inherent with this type of observations. Overall, the Focal Follow Sheet required too much information and was complicated. In addition, following an animal at sea can be difficult depending on distance from shore, weather conditions, or number of animals surrounding the one being observed. Long dive intervals may be interpreted by inexperienced observers as lost contacts with the animal and vice-versa. It is highly advisable to eliminate this portion of the data collection from the program for the time being and concentrating the effort to streamline the actual count procedures and ensure a high level of training of the Site Leaders involved.

For future consistency of Sanctuary Ocean Count data, counts that are going to be subjected to analysis should be conducted at designated shore sites, which do not change year after year. These sites should be chosen so that there is a minimum amount of potential geographic overlap among the areas being observed. Therefore, if two sites are overlapping by more than 50%, only a pre-determined one of the two should be used for analysis purposes.

Another issue that makes comparisons potentially difficult from year to year and from site to site is the different size of the areas being surveyed for the presence of whales. In particular, the difference in number of whales seen at different sites may be correlated with the area of water visible from shore, not with the suitability of the site. It would be useful, for example, to know the exact elevation of each site so that effective distance being monitored offshore could be determined.

Point Counts: O'ahu

Of the 42 sites where volunteers were posted, 40 submitted results. An average of 58 whales (S.D. = ± 18) was reported for all sites around O'ahu between 0900 and 1215, with totals per count ranging from 35 to 77 (Table 1). The highest number of whales was counted in the morning (0900 to 0915), the lowest around noon (1200 to 1215).

With the exception of Pōka'i Bay, Lanikai Beach and Hālonā Blowhole, not much variation in number of whales sighted occurred during the four counts. On average, only one whale per site was observed for all counts combined. During the early morning count (0900 to 0915) two sites accounted for 44% of the sightings (Pōka'i Bay, along the Wai'anae coast, with 11 whales, and Hālonā Blowhole, on the windward side near Makapu'u Point, with 24 whales). The second count (1000-1015) was overall low (0-6

whales) for all reported sites, including Pōka'i Bay and Hālonā Blowhole, where the counts tapered down to three whales each. Number of whales reported increased during the third count (1100-1115) with the highest number of whales (12) reported for Lanikai Beach. Low number of whales reported per site and highest number of sites with no sighting during the last count contributed to it being the lowest count of the day. There appeared to be a higher sighting rate of humpback whales during the early morning count and a lowest rate around noon (Figure 3). Possible explanations for this trend are a movement of animals offshore at this time of day, longer time intervals, or looser observer coverage (many volunteers started leaving around noon and observer interest may have decreased toward the end of the event).

Number of sites where no whales were reported varied for each of the counts (0900-0915: 21 sites; 1000-1015: 19 sites; 1100-1115: 17 sites; 1200-1215: 22 sites), and was overall high (51% on average). It should be pointed out that some sites saw whales during times when counts were not being conducted, but generally in low numbers (1 or 2 animals) and for brief periods of time.

In order to compare results for the year 2000 and 2001, which were collected using different procedures, the number of whales observed throughout the counts (which lasted for 3 consecutive hours at each site in the year 2000 and two hours spread over four 15-minute intervals in the year 2001) was calculated, yielding a sighting frequency of approximately three whales/hr for both years. Mobley and Kalambokitis (unpublished data) have suggested, from independent studies in Hawai'i and California, that the Central North Pacific stock of humpback whales is increasing at an average rate of 7% per year. It should therefore be expected that number of whales around the main Hawaiian Islands should reflect this increase. Because humpback whales tend to shift their distribution between islands year after year and within the same season (Baker et al. 1986, Cerchio et al. 1991), counts around one particular island may fluctuate up or down irregardless of the increase in population numbers.

When counts for sites located along the four main shorelines of the island (South Shore, Windward, North Shore and Wai'anae Coast) were pooled (Table 4) and compared by standardizing results as number of whales per hour (number of hours of observation per number of sites), data suggested a higher sighting rate for the Windward coast (4-5 whales per hour) and North Shore (three whales per hour). This trend was apparent also in the year 2000. Again, these results should be interpreted with caution. The literature reports that there should be more whales where there is shallower water, and this, around O'ahu occurs mainly off the South Shore and Wai'anae coast where the shallow banks are wider. The fact that more whales were seen off the Windward Coast and North Shore may be a consequence of the steeper slopes found along this coastlines, which cause whales to stay closer to shore on average. In addition, sites along these shorelines are, on average, more elevated and afford a better visibility than sites along the South Shore and Wai'anae Coast. In addition, disturbance from vessel traffic on the South Shore may cause whales to use otherwise suitable environments with less frequency.

Point Counts: Hawai'i

Nineteen out of 20 sites on Hawai'i submitted results (Table 2). Number of whales sighted was higher than for O'ahu and Kaua'i. Pooling all four counts, an average of 132 whales (S.D. = ± 27) were sighted (corresponding to approximately 12 whales per site hour). Similarly to O'ahu, the largest number of whales was sighted during the early morning count (157 animals) and the lowest number of whales was reported for the noon count (84 animals). Five sites, namely Royal Kona, Kehena, Volcanoes National Park, Keauhou, and Honokōhau, reported between 0 and 2 animals throughout the observation period. On average, sites with no sightings were 23%. The highest average per count was reported at 'Upolu Point, near Kohala Bay on the Kona Coast (24 ± 6 animals).

Point Counts: Kaua'i

Volunteers at 12 sites participated to the count. All sites submitted their results (Table 3). Only 17% of the sites reported no whales for at least one of the counts, but whales were seen at all sites (approximately eight whales per site per hour). Average number of whales for all counts was 47 (S.D. = ± 12). The highest counts were obtained at Ninini Lighthouse with a consistent number of whales throughout the morning (13, 12, 11 and 6 respectively). As for O'ahu and Hawai'i, the lowest number of animals was seen during the noon count, although on average number of whales did not vary much with time of day.

Behavioral Observations: O'ahu

Overall, the quality of the O'ahu data was poor. The majority of volunteers did not understand or did not follow the sampling procedures. For the purpose of consistency, only data collected according to the protocol were chosen for analysis, and even these were sometimes unclear. As a consequence, only results for 18 sites are reported. It is difficult to evaluate the usefulness of such data set, because of the average low level of training of the observers. It was clear from the quality of the data obtained, that the sampling procedures need to be streamlined, and that a higher level of training is required to ensure useful information is being obtained. In particular volunteers misunderstood the importance of observing only one whale for the duration of the behavioral observation period and reported behaviors for whales at different distances from the observer within the same observation period.

Dive times for whales around O'ahu ranged between 0.87 minutes (Mōkapu Point) and 3.59 minutes (Ma'ili Point), for a 15-minute observation period. Longer dive times may have been recorded if whales were observed for longer than 15 minutes at a time. Breaching occurred, with varied intensity, at 89% of the sites sampled and some surface activity was reported for 94% of the sites. Volunteers at Ka'ena Point, Waimea and Portlock reported the highest number of breaches per minute of observation (approximately one breach every two minutes).

Behavioral Observations: Hawai'i and Kaua'i

Data on behavior were not, overall, collected according to the outlined procedures yielding little information about dive intervals and behavioral state distribution. In particular, it was difficult to understand if the volunteers were following one animal or several different animals at the same time. The doubts originated from the fact that distances from the observer varied dramatically from one minute to the other (for example, one observation reported the animal one mile away from the observer and one minute later six miles away, and from the fact that sighting angles also varied radically from one observation to the other. For this reason, data were not analyzed in detail. Overall, there was a wide variability in the quality of the data reported by volunteers. In truth, some data sheets could have been analyzed, but the yield from this information would have been minimal in comparison to the effort of entering the information into a database for analysis.

Odontocete Sightings

All odontocetes reported appeared to be spinner dolphins (Table 5). Spinner dolphins were seen at two sites on O'ahu, one site on Kaua'i (Kapa'a Overlook), five sites on Hawai'i. School sizes may be an underestimate in most cases since it is difficult for an observer at a distance to see the entire school especially if the animals are resting and come to the surface at different intervals. For this reason, no inference was made on number of spinners seen based on these counts.

Table 1 - Number of humpback whales reported by trained site leaders for each of the four 15-minute Point Counts conducted simultaneously at 42 sites around the Island of Oahu on 24 February, 2001. There were four counts at each site. Each count lasted exactly 15 minutes. Average number of whales per site and Standard Deviation from the mean are also reported.

Site Name	Count 1 0900-0915	Count 2 1000-1015	Count 3 1100-1115	Count 4 1200-1215	Average Per Site	Standard Deviation
Ewa Beach	0	0	0	0	0	0
Ko'olina	0	0	0	0	0	0
Barber's Point	0	0	0	0	0	0
Nānākuli Beach	0	0	0	0	0	0
Ma'ili Point	0	3	3	4	3	2
Poka'i Bay	11	3	0	1	4	5
Lahilahi Point	0	0	0	0	0	0
Ké'ā'au Beach Park	1	0	0	3	1	1
Mā'kua Beach	2	1	0	0	1	1
Ka'ena Point	0	1	0	1	1	1
Ka'ena Point (North)	3	3	1	1	2	1
Mokule'ia	0	4	2	2	2	2
Pua'ena Point	0	0	3	0	1	2
Waimea	-	-	-	-	-	-
Shark's Cove	3	6	5	1	4	2
Sunset Beach	1	1	1	0	1	1
Turtle Bay	0	2	1	3	2	1
Mā'laekahana	0	0	0	0	0	0
La'ie	5	4	2	0	3	2
Hau'ula	0	0	0	0	0	0
Swanzy Beach Park	1	2	1	2	2	1
Kualoa	0	2	2	2	2	1
Pyramid Rock	2	4	1	0	2	2
Mōkapu Point	2	0	2	3	2	1
Lanikai Beach	3	2	12	0	4	5
Waimānalo	1	0	0	0	0	1
Makapu'u Lighthouse	-	-	-	-	-	-
Bellows Beach Park	1	1	4	2	2	1
Hā'ona Blowhole	24	3	2	0	7	11
Lana'i Lookout	6	0	6	0	3	3
Hanauma Bay	5	1	2	1	2	2
Hanauma Bay	0	0	5	1	2	2
Spitting Caves	0	0	3	3	2	2
Black Point	2	2	0	0	1	1
Diamond Head	0	2	1	0	1	1
Magic Island	1	0	0	0	0	1
Kaka'ako	0	0	0	0	0	0
Wa'ialae	0	1	3	2	2	1
'Ilikai	0	0	0	0	0	0
Mā'kai Pier	0	0	0	0	0	0
Sandy Beach	3	4	3	1	3	1
Portlock	0	0	2	2	1	1

Table 2 - Summary of the results of the 2001 Sanctuary Ocean Count at 20 sites around the Island of Hawai'i (Big Island), reporting number of humpback whales sighted. There were four counts at each site. Each count lasted exactly 15 minutes. Average number of whales per site and Standard Deviation from the mean are also reported.

Site Name	Count 1 0900-0915	Count 2 1000-1015	Count 3 1100-1115	Count 4 1200-1215	Average Per Site	Standard Deviation
'Upolu Point	22	33	22	18	24	6
Kohala Bay	7	15	8	12	11	4
Lapakahi	11	10	5	12	10	3
Pu'ukoholā	5	7	9	2	6	3
MM7 Kawaihae	12	10	9	11	11	1
Hilton Waikoloa	10	11	14	5	10	4
Keāhole Point	-	-	-	-	-	-
Royal Kona	1	0	0	0	0	1
Keauhou Lookout	2	3	3	1	2	1
Kealakekua Bay	4	2	4	1	3	2
Richardson Park	4	0	2	4	3	2
Lapāuhoehoe	2	0	2	0	1	1
Kiholo Bay	7	9	13	11	10	3
Onomea	32	9	8	-	16	14
O'okala	21	13	22	-	19	5
Kahena	0	0	2	2	1	1
Volcanos National Park	0	0	0	0	0	0
Kukio	7	4	9	5	6	2
Ali'i Drive (Keahou)	0	0	1	0	0	1
Honokōhau	0	0	2	0	1	1

Table 3 - Summary of the results of the 2001 Sanctuary Ocean Count at 12 sites around the Island of Kaua'i, reporting number of humpback whales sighted. There were four counts at each site. Each count lasted exactly 15 minutes. Average number of whales per site and Standard Deviation from the mean are also reported.

Site Name	Count 1 0900-0915	Count 2 1000-1015	Count 3 1100-1115	Count 4 1200-1215	Average Per Site	Standard Deviation
Lumaha'i Lookout	0	4	6	1	3	2.75
Princeville Hotel	1	4	1	0	2	2
Crater Hill (west), Kīlauea Point	8	8	6	5	7	2
Crater Hill (east), Kīlauea Point	2	6	5	5	5	2
Kapa'a Lookout	3	3	3	1	3	1
Ahukini State Park, Līhu'e	2	3	0	1	2	1
Ninini Lighthouse	13	12	11	6	11	3
Māhā'ulepū	0	3	6	0	2	3
Makahua'ena Point	2	3	5	6	4	2
Port Allen Cemetery, Ele'ele	3	6	4	6	5	2
Waimea Canyon Drive	6	4	0	0	3	3
PMRF (Mana)	6	5	2	0	3	3

Table 4 – Minimum and maximum number of whales observed along the four coastlines of O‘ahu in 2001 during four 15-minute counts between 0900 and 1215.

Location	Number of Sites	Min Whales	Max Whales	Best Site
South Shore	10	8	13	Wai‘alae Iki
Wai‘anae Coast	9	3	14	Pōka‘ī Bay
North Shore	7	7	16	Shark’s Cove
Windward Coast	14	14	50	Hālonā Blowhole

Table 5 – Odontocete sightings during the 2001 Sanctuary Ocean Count on O‘ahu, Hawai‘i and Kaua‘i.

Island	Site	Number of Animals
O‘ahu	Waimea	1-3
	Ka‘ena	9
Hawai‘i	Lapakahi	1
	Royal Kona	2-?
	Kealakekua	?
	Kiholo Bay	40-60
	Keauhou	4
Kaua‘i	Kapa‘a Overlook	20

Date _____

Site # _____

Site Name _____

Site Leader _____

Phone # _____ - _____

Observe area for 15 minutes then tally all observations:

Time	Species	Adults	Calves	Comments
0900	Humpback Whales			
	<i>Spinner Dolphins</i>			
	<i>Other Species</i>			<i>Specify species here if known:</i>
	<i>Other Species</i>			<i>Specify species here if known:</i>
Time	Species	Adults	Calves	Comments
1000	Humpback Whales			
	<i>Spinner Dolphins</i>			
	<i>Other Species</i>			<i>Specify species here if known:</i>
	<i>Other Species</i>			<i>Specify species here if known:</i>
Time	Species	Adults	Calves	Comments
1100	Humpback Whales			
	<i>Spinner Dolphins</i>			
	<i>Other Species</i>			<i>Specify species here if known:</i>
	<i>Other Species</i>			<i>Specify species here if known:</i>
Time	Species	Adults	Calves	Comments
1200	Humpback Whales			
	<i>Spinner Dolphins</i>			
	<i>Other Species</i>			<i>Specify species here if known:</i>
	<i>Other Species</i>			<i>Specify species here if known:</i>

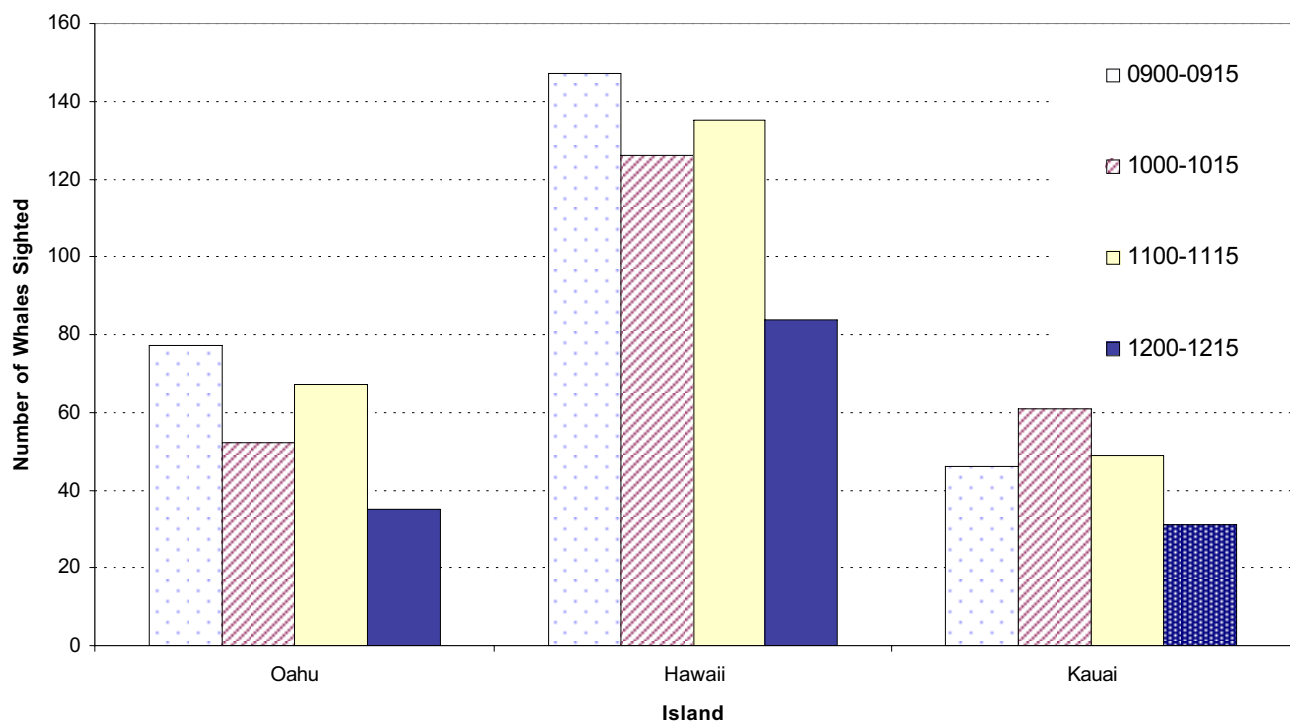


Fig. 3 – Absolute number of humpback whales reported during the four observation periods (0900-0915; 1000-1015; 1100-1115; 1200-1215) on the islands of O‘ahu, Hawai‘i and Kaula‘i on 24 February 2001.

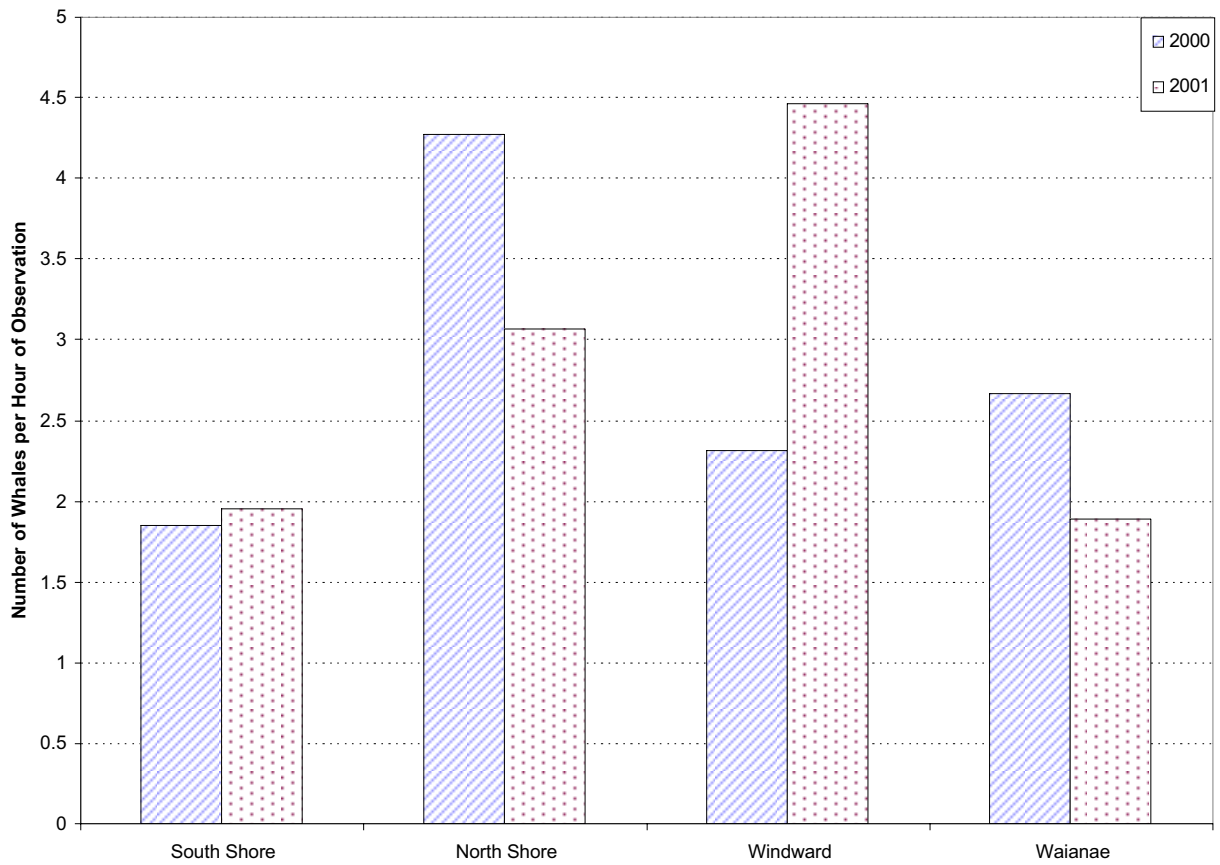


Fig. 4 – Comparison between number of whales counted per hour around the Island of O’ahu in 2000 and 2001.

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