Spinner Dolphins, *Stenella longirostris*, at Lele'iwi Beach Park

by Emi Takei

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Department of Marine Science
University of Hawai'i at Hilo
Senior thesis research

ABSTRACT

Spinner dolphins, *Stenella longirostris* are primarily found in pelagic waters of the tropical to warm temperate oceans. In a few areas, notably western Central America and Hawai'i, this species frequents the coastal waters, and provides researchers with a rare window on spinner dolphin biology and ecology. *Stenella longirostris* on the leeward side of the island of Hawai'i have been studied for 28 years by several researchers, but this species has never been studied on the windward or Hilo side. At Lele'iwi Beach Park, Hilo, Hawai'i, *S. longirostris* were sighted every month during a five month observation period between September 1996 to February 1997. Spinner dolphins were seen on 50% of the 34 observation days. Group size was estimated to range from 28 to 100 on any one day. When spinner dolphins were observed at Lele'iwi Beach Park, the average time spent in the area by the animals was 60 min. Active swimming and several types of aerial displays were recorded. The aerial behaviors seen in this study area were similar to those previously reported from Ke'alakekua Bay which is one of the most popular resting coves for spinner dolphins on the leeward side of Hawai'i.

INTRODUCTION

Over the last 28 years, spinner dolphins, *Stenella longirostris,* in the Hawaiian islands have been studied by

several researchers (Norris and Dohl 1980, Norris et al. 1994, Ostman 1994). These studies have steadily increased our knowledge of wild spinner dolphins, including their distribution, their circumisland movement pattern, and their habitual resting areas (coves) around the island of Hawai'i (Norris and Dohl 1980). For example, Norris and Dohl (1980) found seven areas of regular occupancy, and four localities with more transient occupancy around the island of Hawai'i, except for the northeast shore (Fig.1). These areas of regular occupancy are described as places where "spinner dolphins come inshore during daylight hours to enter a quiescent period of some hours duration" (Norris and Dohl 1980) and also are characterized by shallow water (<50 m deep), sandy bottoms, and proximity of deep water (>500 m deep). A similar movement pattern is seen in the studies of dusky dolphins, *Lagenorhynchus obscurus* (Wursig and Wursig 1980): the dolphins moved into shallow water while resting, and occupied deeper water while surface feeding. Ke'alakekua Bay has been well-studied as one of the rest coves on the leeward side of Hawai'i island. The studies at Ke'alakekua Bay reveal information about the diurnal cycle and patterns of movement of spinner dolphins. However, because spinner dolphins were not found from Kaloli Point to the northern end of the island ('Upolu Point) (Norris and Dohl 1980), this species has not been studied in the windward areas. This paper reports on the occurrence of spinner dolphins of

Lele'iwi Beach Park, which is located north of Kaloli Point on the eastern side of Hawai'i (Fig.1). I focused on how often and how long spinner dolphins stay in this area, as well as their behavior. Finally, I determined, by using the criteria from the previous studies performed at Ke'alakekua Bay, (Norris and Dohl 1980) whether Lele'iwi Beach Park is a resting area for spinner dolphins.

METHODS

Spinner dolphins were surveyed at Lele'iwi Beach Park, Hawai'i island (lat. 19 40'40"N, long. 155 10'90"W) (Fig.1) from September 1996 through February 1997 except for the month of December. Three observation sites (Fig.2) were established: 1) near sea level in front of the pavilions at Lele'iwi Beach Park which faces to the north, 2) on the lanai of the sixth floor in the Hale Moana building which is about 20 m high above the ground, and 3) along the rocky shore between the other two sites, where dolphins came closest to the shore. The visual searches were performed with binoculars at random times at least six times per day. Each scan lasted at least 10 min. Estimates of school size were computed by counting the dorsal fins of dolphins when they came up to the surface as a group. In order to get the best estimate, an average number was taken from separate counts made by two people. The arrival time of dolphins was recorded when they were first spotted on the surface. The departure time of the dolphins was considered to be 10 min after

an observer lost sight of any dolphins. The dolphins' activity level was determined by counting every aerial behavior. Other information was gathered about weather, sea conditions, and disturbances such as boats, divers, and swimmers in the water at the observation time as suggested by Altmann (1974). By the Sperman rank correlation, the relationship between the animals presence, and weather and sea conditions were analyzed. An association between the number of types of aerial behaviors and the number of animals present was also analyzed statistically.

RESULT

FREQUENCY

Dolphins were seen 17 days (50%) out of 34 observation days. The results for each month are as follows: 6 days out of 8 days in September, 2 days out of 7 days in October, 3 days out of 7 days in November, 3 days out of 6 days in January , and 3 days out of 6 days in February. Regardless of a big winter storm in November 1996, there was no significant difference in dolphins' visits. However, the group size ~~is~~ was significantly larger in January and February. The estimated group size was about 28 to 100 on any one day (Fig. 3).

LENGTH OF STAY

The range of time that dolphins stayed at Lele'iwi was between 25 min. to 90 min. between 6 a.m. to 6 p.m. The average was 60 min. (Figure 4). However, there were a few

occasions when the dolphins did not stay, and just passed by Lele'iwi waters.

AERIAL BEHAVIORS

Nine different aerial behaviors were recognized in addition to normal swimming back and forth (Figure 5,6,7). The aerial behavior terminology is consistent with previous studies by Norris and Dohl (1980). The spin, which dolphins spin three to five times around the long axis of their body while in the air, was performed most (Figure 8). The second most frequent display was the tail-over-head leap, which is when dolphins jump out of the water with their tail over their head and then reenter tail first. Both spin and tail-over-head are highly energetic displays. When the different slaps, using tail, head, or back were started, large water splashes were made (Figure 5). During this time it was hard to see the details to determine which type of slaps were made. It looked like they were playing with each other. Other different types of leaps, such as arcuate and salmon were observed. The arcuate leap is a simple jump, and is seen when dolphins are swimming fast. The salmon leap is similar to the dive a swimmer makes in a race: the body is extended and arched and snapped forward once in the air (Figure 6). Nose-out and tail-out, are movements made at sea level, and are not so obvious (Figure 7). The nose-out is when the dolphin's rostrum sticks out from the surface. The tail-out is when the dolphin's tail is in the air.

STATISTICAL RESULTS

The number of animals present and sea conditions did not show a significant correlation ($r=-0.089 < 0.340$, the critical r-value at alpha=0.05 when n=34). However, there was a slightly positive correlation between the number of animals present and sunny weather ($r=0.347 > 0.340$). The correlation between of the number of animals present and the number of types of aerial behaviors was also positive and significant ($r=0.898 > 0.340$) which means that as the number of animals increased, so did the variety of aerial behaviors.

DISCUSSION

The types of aerial behaviors recorded at Lele'iwi Beach Park were almost same as that in Ke'alakekua Bay which is a known resting cove for spinner dolphins. Norris and Dohl considered each aerial behaviors as some kind of cue for the whole school of dolphins in the Ke'alakekua Bay study. For example, nose-outs at the end of a resting period is often the first sign that the school as a whole is waking up (Norris et al. 1994). Researchers can then predict the dolphins' next movement (Norris and Dohl 1980, Norris et al. 1994). Although I could not see such a pattern in my study, several of the same displays might have been working as cues for dolphins at Lele'iwi. Resting swimming which is moving back and forth slowly at the surface was seen clearly at Lele'iwi Beach Park.

Several of the physical characteristics of Lele'iwi, such as deep water (>500 m) nearby, shallow water (<50 m) near shore (Balder 1992), and white sandy sea floor (personal survey), fulfill the criteria of a resting cove for spinner dolphins (Norris and Dohl 1980). However, long-term observations, including new techniques, such as underwater viewing (Ostman 1994) and aerial survey (Scott and Perryman 1991) may provide a clearer determination of Lele'iwi Beach Park's role in spinner dolphin society. From this study, seasonal differences in spinner dolphin visits (Shane 1980) to Lele'iwi Beach Park cannot be seen due to the short, 5 month observation period, however, the results of this study prove that Lele'iwi Beach Park is a windward site that spinner dolphins come and visit frequently.

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CAPTIONS

Figure 1. Map of Hawai'i island

Figure 2. Study area: Lele'iwi Beach Park, Hilo, Hawai'i. Three dots indicate observation sites.

Figure 3. Average school size of spinner dolphins entering Lele'iwi during 5 month.

Figure 4. Average amount of time spinner dolphins spent per day in Lele'iwi Beach Park.

Figure 5. Three different types of slap.

Figure 6. Three different types of leap.

Figure 7. A nose-out, tail-out, and spin.

Figure 8. Types of aerial behaviors of spinner dolphins seen at Lele'iwi Beach Park.

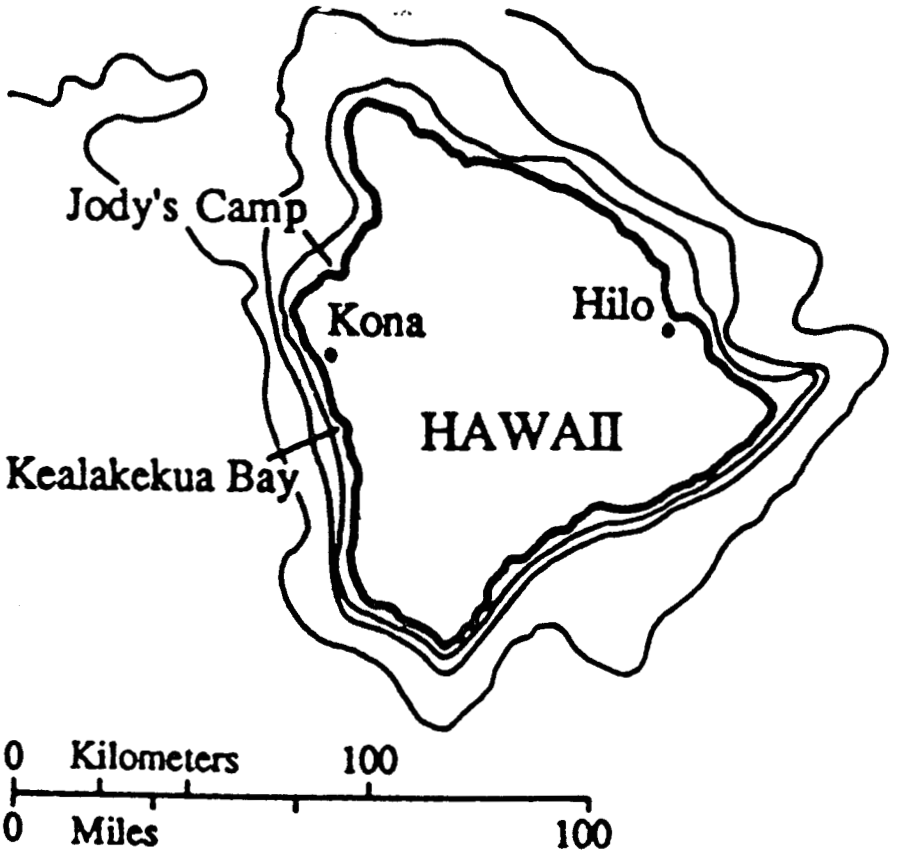
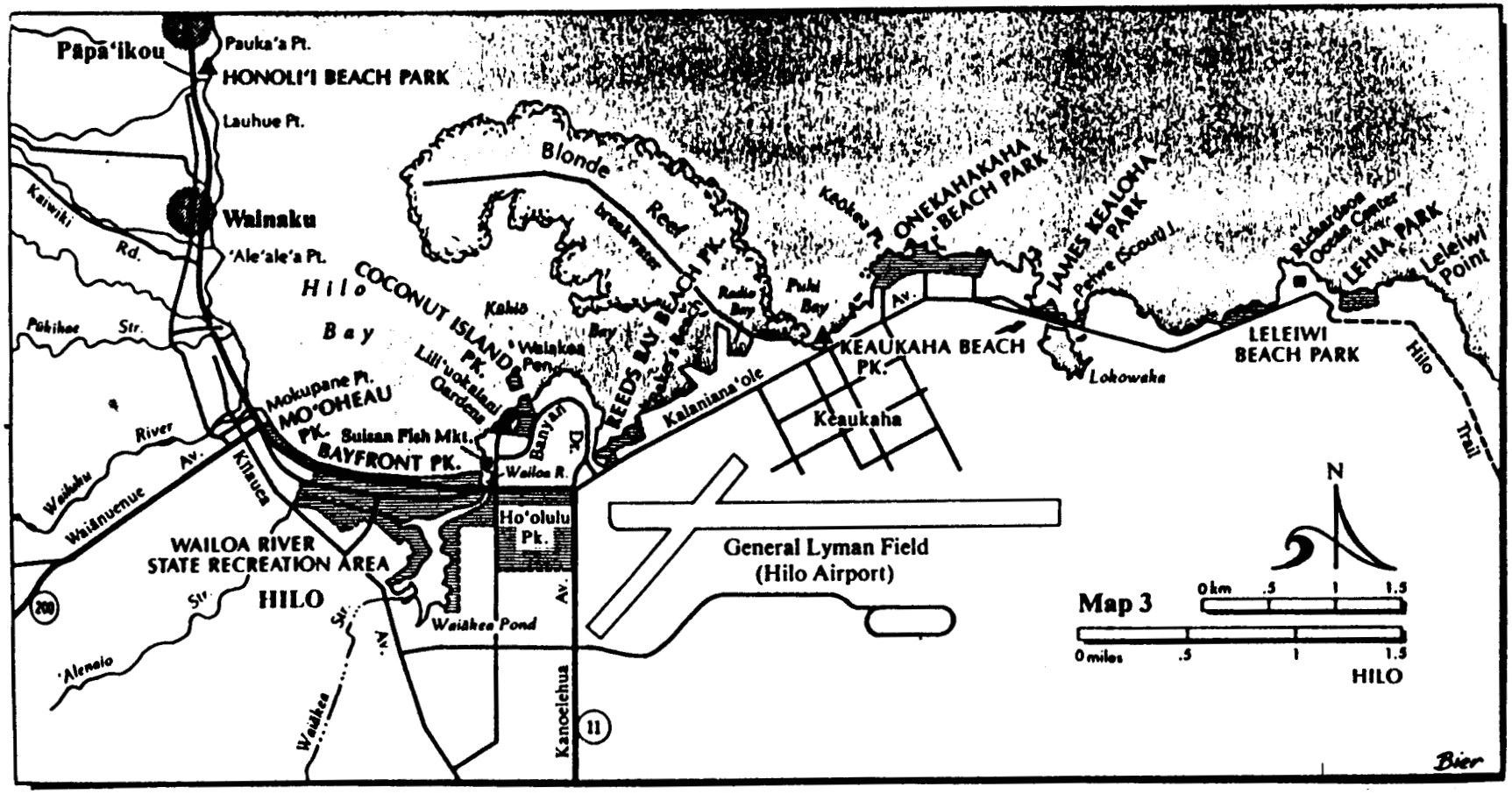

Jody's Camp
Kona
Hilo
HAWAII
Kealakekua Bay
0 Kilometers 100
0 Miles 100

Figure 1


Pāpā'ikou
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HONOLI'I BEACH PARK
Lauhue Pt.
Kaiwiki Rd.
Wainaku
'Ale'ale'a Pt.
Hilo Bay
COCONUT ISLAND PK.
Lili'uokalani Gardens
Kalo
Waiakea Pen
Blonde Reef
breakwater
KEED'S BAY BEACH PK.
Radio Bay
Puhi Bay
Keokea P.
ONEKAHAKAHA BEACH PARK
JAMES KEALOHA PARK
Pahoe (Scout) I.
Richardson Ocean Center
LEHIA PARK
Leleiwi Point
Av.
KEAUKAHA BEACH PK.
Keaukaha
Lokowaka
LELEIWI BEACH PARK
Hilo Trail
Kalaniana'ole
Pākihae Str.
Mokupane Pt.
MO'OHEAU PK.
Suisan Fish Mkt.
BAYFRONT PK.
Banyan Dr.
Wailoa R.
Waiākea River
Waiānuenue Av.
Kilauea
Ho'olulu Pk.
WAILOA RIVER STATE RECREATION AREA
HILO
Waiākea Pond
General Lyman Field (Hilo Airport)
'Alenaio
Waiākea
Kanoelehua
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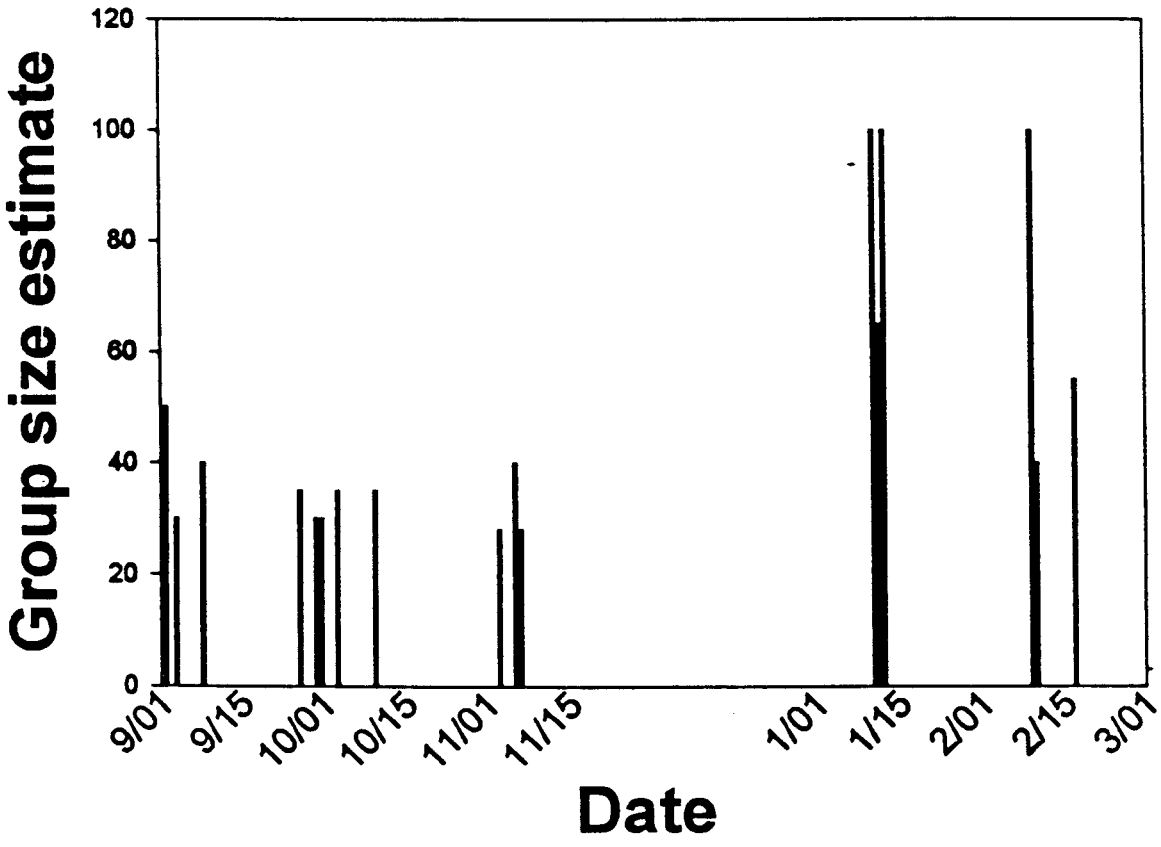
Figure 2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40
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9/15
10/01
10/15
11/01
11/15
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1/15
2/01
2/15
3/01
Date

Figure 3

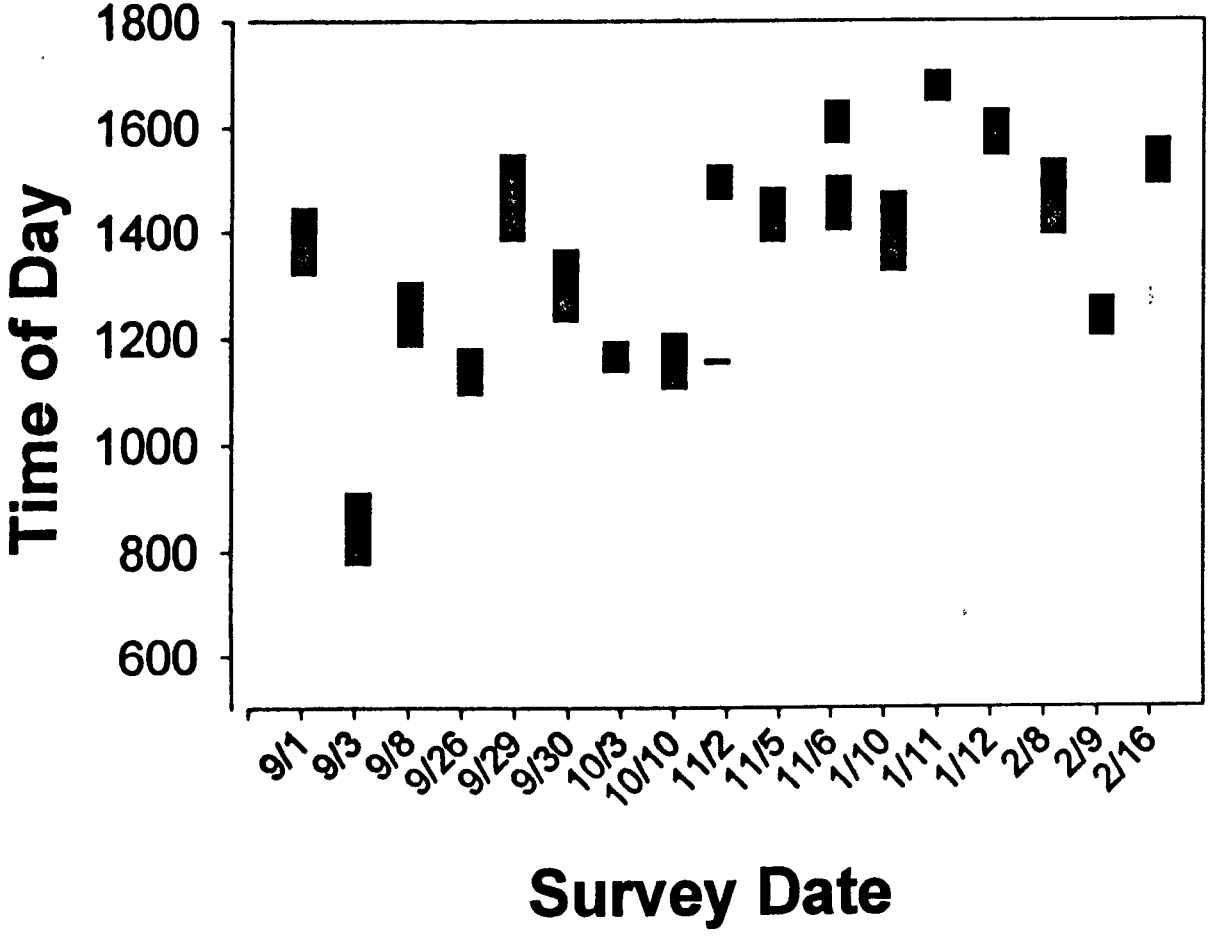
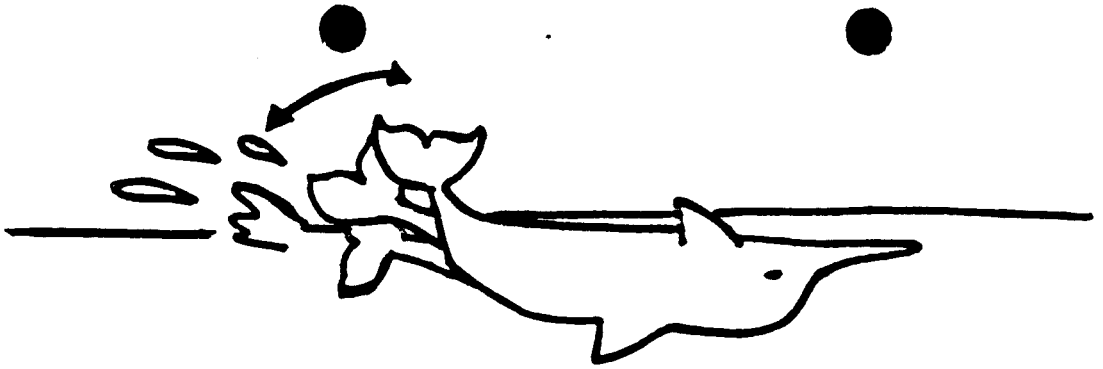
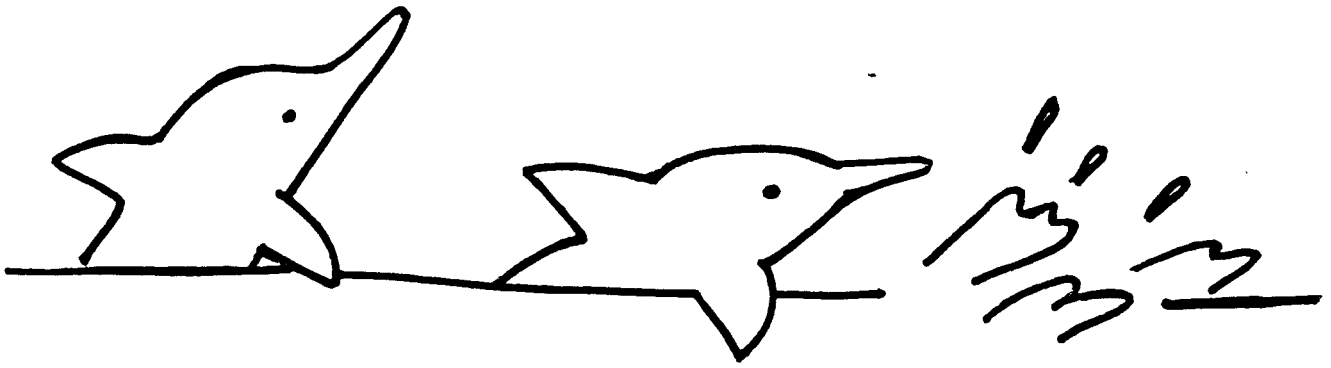

1800
1600
1400
1200
1000
800
600
Time of Day
9/1
9/3
9/8
9/26
9/29
9/30
10/3
10/10
11/2
11/5
11/6
1/10
1/11
1/12
2/8
2/9
2/16
Survey Date

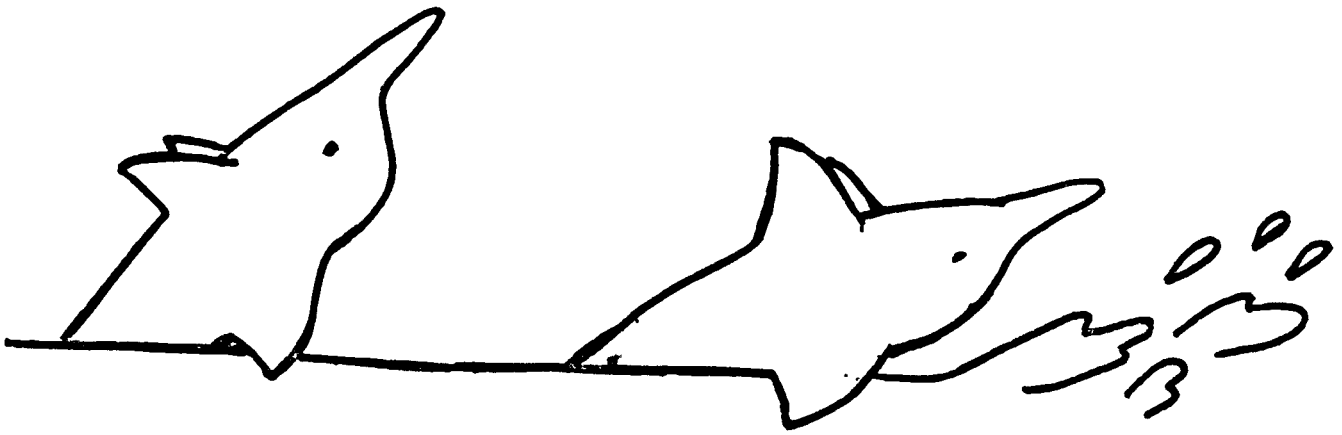
Figure 4



Tail Slap(ST)

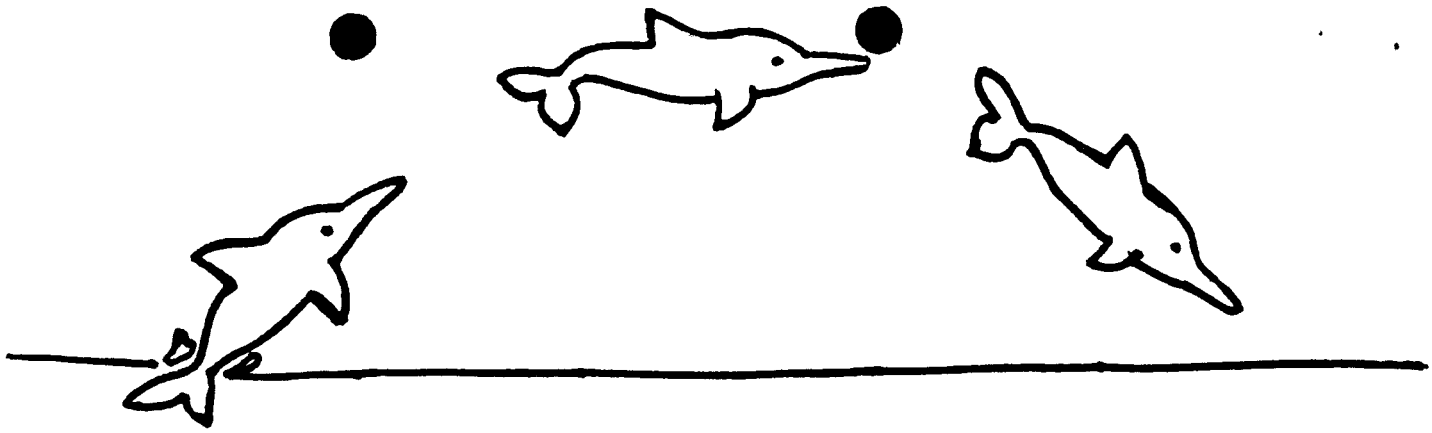


Head Slap(HS)

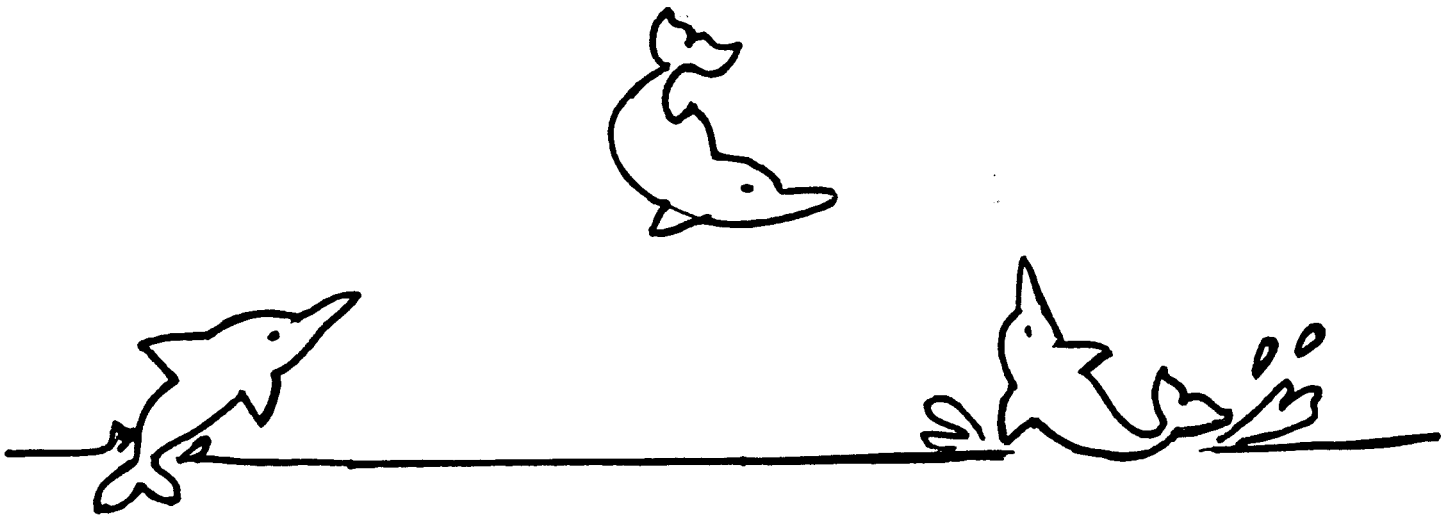


Back Slap(BP)

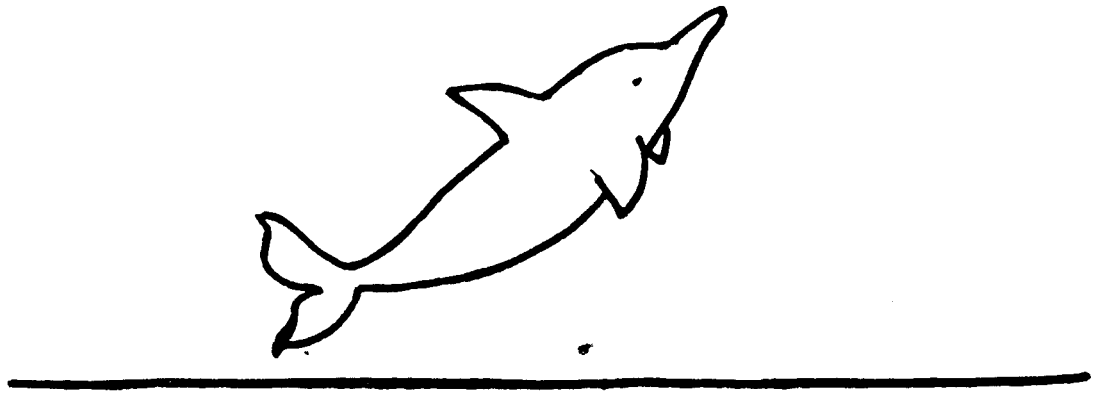
Figure



Arcuate Leap (AL)

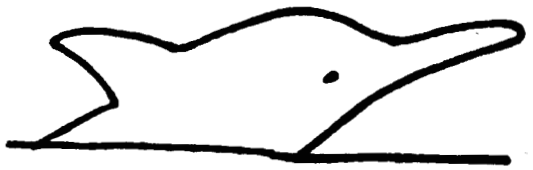


Tail-Over-Head Leap (TH)



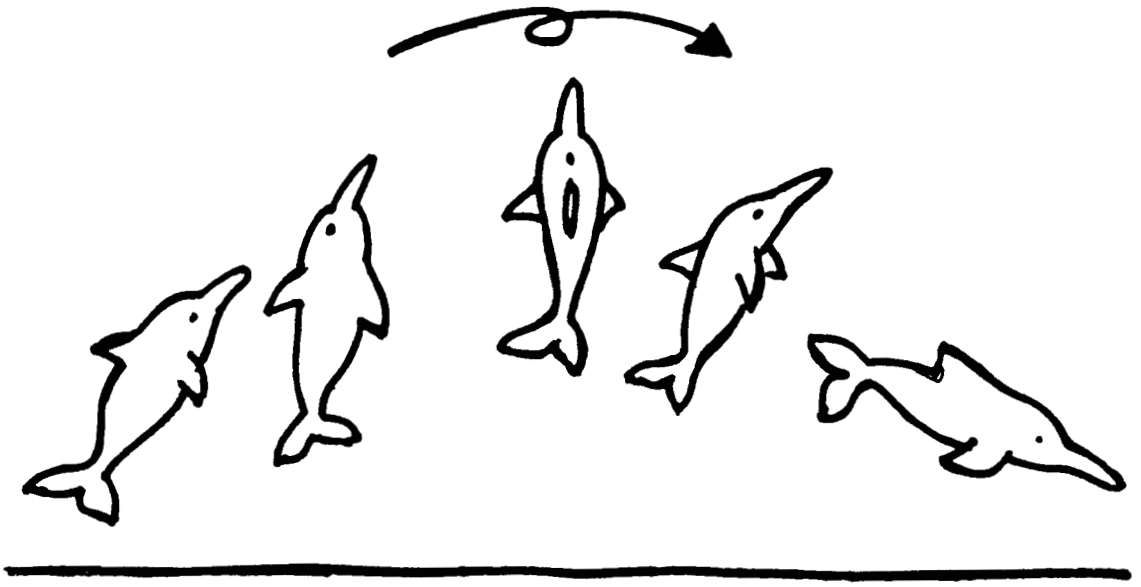
Salmon Leap (SL)

Figure 6



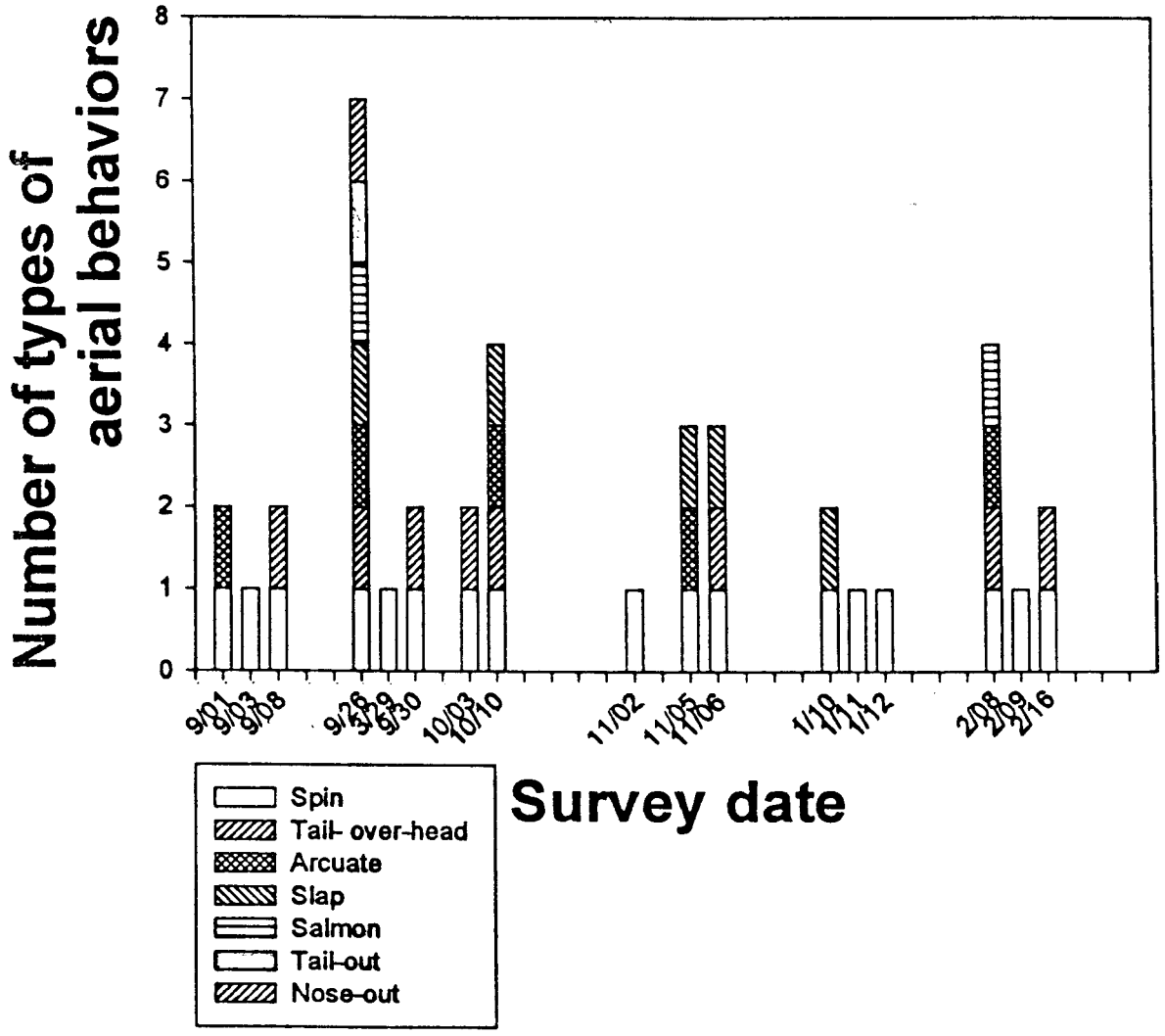
Nose-Out (NO)

Tail-Out (TO)



Spin (SP)

Figure 7


Number of types of aerial behaviors
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10/10
11/02
11/05
11/06
1/10
1/11
1/12
2/08
2/09
2/16
Survey date
Spin
Tail- over-head
Arcuate
Slap
Salmon
Tail-out
Nose-out

Figure 8

Spinner Dolphin (*Stenella longirostris*) in Lele'iwi Beach Park

Project Proposal

by Emi Takei

August 1996
University of Hawai'i at Hilo
Marine Option Program
Department of Marine Science

Project Summary

Hawaiian warm water has several wild marine mammals which have not only a high possibility of attracting people, especially tourists but also a high risk of being disturbed by people. Spinner dolphin, *Stenella longirostris*, in this proposal is one of these animals. The best way to have good relationships with animals is understanding, learning, and protecting them. In order to understand this animal on the windward side of the island of Hawai'i, the goal of this study is to provide information of the frequency, population, and purpose of spinner dolphins in Lele'iwi Beach Park, which have not studied yet. The aerial behaviors of the animals in this study area will be compared with that in Ke'alakekeua Bay, leeward side of the island of Hawai'i.

Introduction

Over the last twenty eight years, spinner dolphins, *Stenella longirostris,* in the Hawaiian islands have been studied by several researchers, including Kenneth S. Norris. These studies have steadily increased on knowledge of wild spinner dolphins, including their distribution, their circumisland movement pattern, and their habitual resting areas (coves) around the island of Hawai'i (Norris et al. 1994). For example, Norris and Dohl (1980) found seven areas of regular occupancy and four localities with more transient occupancy around the entire of the island of Hawai'i except for the northeast shore. These areas are described as places where "spinner dolphins come inshore during daylight hours to enter a quiescent period of some hours

duration" and also are characterized by shallow water with a depth 50 m or less, sandy bottoms, and closeness to deep water of more than 500 m (Norris and Dohl 1980). A similar movement pattern is seen in the studies of dusky dolphins, *Lagenorhynchus obscurus*, (Wursig and Wursig 1980): the dolphins moved in shallow water while resting and in deeper water while surface feeding. Ke'alakekua Bay has been well studied as one of rest coves on the leeward side of Hawai'i island. The studies at Ke'alakekua Bay especially reveal information about the diurnal cycle and patterns of movement of spinner dolphins. However, because spinner dolphins were not found from Kaloli Point to the northern end of the island ('Upolu Point) (Norris and Dohl 1980), this species has not been studied in the windward areas. Therefore, I would like to look at the spinner dolphins of Lele'iwi Beach Park, which is located north of Kaloli Point on the eastern side of Hawai'i. I would like to focus on how often and how long spinner dolphins stay in this area, how many animals come together, and whether the same animals come every time. Finally, I would like to determine, by using the criteria from the previous studies performed at Ke'alakekua Bay, (Norris and Dohl 1980, Norris et al. 1994) whether Lele'iwi Beach Park is a resting area for spinner dolphins.

Proposed research

Spinner dolphins will be surveyed at Lele'iwi Beach Park, Hawai'i (lat. 19° 40'40"N; long. 155° 10'90"W) from September 15 through November 15 1996. I will use the same methods as Norris et al. (1994) in Ke'alakekua Bay in order to compare their

results and my study. I will establish two observation points: one is near sea level in front of the pavilions at Lele'iwi Beach Park which faces to the north. The other observation point is on the lanai of the sixth floor in the Hale Moana building which is located about 250 m from Lele'iwi Beach Park. The lanai might have enough height for theodolite tracking (Wursig et al. 1991) but it seems to have only a partial ocean view. However, if it is possible to use the theodolite method, I will be able to track the animals in Lele'iwi.

From the observation points, I will scan Lele'iwi with binoculars for 10 min every half hour until I find the dolphins. I will also determine, using a compass in what direction the dolphins are coming and going.

Once the dolphins are in Lele'iwi, I will determine their activity level in order to figure out that the animals come to Lele'iwi Beach Park for resting. I will count every aerial behavior and describe types of behavior such as nose-outs, slaps, leaps, and spins in order to classify this information in the same way as Norris and Dohl (1980). These observations will be made during 1-minute intervals. I will gather other information about boats, divers, and swimmers in the water at the same time.

I will dive with SCUBA to figure out whether or not the bottom of Lele'iwi meets the criteria for a suitable spinner dolphin resting area, which is sandy bottom, for spinner dolphins. In order to know the features of the bottom topography of Lele'iwi Beach Park, I will also use the depth contour map of the United States National Ocean Service (NOS).

I'm still looking for the best way to obtain estimates of the spinner dolphins populations in Lele'iwi. One method is aerial photogrammetry (Scott and Perryman 1991); this requires the researcher to photograph the schools of dolphins that are entirely within the frame from the small aircraft. The photographs will be taken by using color transparency film and then magnified by the projector to count the numbers of animals. Perryman and Lynn (1993) suggested exposing this through a medium yellow filter from their experiment because the filter will significantly reduce the amount of blue light reaching the film.

I will use standard statistical techniques to test for differences and similarities of observations in Lele'iwi Beach Park and Ke'alakekua Bay. For each observation day, I will measure water temperatures and gather tidal information from the predictive tide tables and wind directions from the Internet.

Budget

Binoculars ----- $80

SCUBA tank------ $5