1976-1979
KAULA

NAVY FOI

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September 24, 1976

Memo for the Files

SUBJECT: OBSERVATIONS ON MARINE RESOURCES OF KAULA ISLAND, September 14-15, 1976

INTRODUCTION

Kaula and Kahoolawe Islands are used by the U.S. Navy for air and sea strike exercises. Kaula island, located about 20 miles Southwest of the island of Niihau is inhabited predominantly by seabirds. Thus, the Navy being concerned with the welfare of the fauna and flora of Kaula, periodically sponsors surveys to determine the biotic status and the extent of damage caused by the military exercises. This report covers observations on marine resources made by Kenji Ego and Henry Sakuda, aquatic biologists of the Division of Fish and Game, Department of Land and Natural Resources during September 14-15, 1976.

SURVEY SCHEDULE

The survey team consisting of 12 Navy and State personnel from Oahu and Kauai was transported to Kaula island by a Marine Corps helicopter, arriving at about 11:15 a.m. on September 14, 1976. During the stay on the island, the main body of 10 survey personnel remained on the top of the island making observations on birds, plants and other terrestrial creatures while the two aquatic biologists descended to the wave terrace to observe the marine features. After an overnight camp on the wave terrace, the aquatic biologists rejoined the survey group at the top of the island and were transported off Kaula by military helicopter about 2:25 p.m. on September 15, 1976. Travel time by helicopter from Kaula to Barking Sands, Kauai was about 30 minutes and from there to the Halawa heli-pad in Pearl Harbor on Oahu was about an additional hour.

TOPOGRAPHY OF THE ISLAND

Kaula is a crescent shaped island about 3/4 mile long surrounded by sheer cliffs dropping to sealevel from the rounded top of the island. The cliffs drop abruptly into the sea along the western slope and onto a 30 foot wide wave terrace (with many tide pools) about five feet above sea level along the eastern (windward) side of the island. The wave terrace is separated into three sections. by two impassable crevices. One section of the terrace is located along the northeastern tip of the island while the other two larger sections extend along the entire eastern concave length of the island.

PREVIOUS MARINE SURVEYS

Two marine surveys have been made previously to Kaula Island. Once in 1971 to the wave terrace on the northeastern tip of the island and again in January, 1976 to the wave terrace on the eastern side of the island where observations were made during this survey. The descent to the wave terrace was made along about the same route used in January, following a shallow erosion gully from the 350 foot level to about 60 feet from the bottom and finally descending down onto the terrace via a crevice with the aid of a rope.

MARINE OBSERVATIONS

Observations on marine features during the one-day stay on the wave terrace were difficult to make due to the very rough sea conditions encountered. Fishes observed in the tide pools on the wave terrace include the aholehole (Kuhlia sandvicensis), manini (Acanthurus sandvicensis), kupipi (Abudefduf sordidus), blennies (Istiblennius zebra), and gobies (Bathygobius fuscus). Invertebrates present were the aama crab (Grapsus grapsus) and opihi (Helcioniscus sp.). Aama crab, blennies and gobies were easily caught by hand for use as bait for fishing.

Fishes caught with light spinning tackle using crab meat and strips of blennies for bait include two (seven-inch) trigger fishes (Melichthys buniva and M. vidua), one (nine-inch) moano (Parupeneus multifasciatus), one (eight-inch) poo-paa (Cirrhitus alternatus), and one (12-inch) wrasse (Thalassoma purpureum). An omilu (Caranx melampygus) (about 18 inches) was also hooked and lost in the rough water along the edge of the wave terrace.

Fishing with weighted lines resulted in constant snagging of the bottom and a considerable amount of fishing time was spent in repairing the lines. Thus, the catch of fishes for the three hours of fishing by two-men was relatively poor.

Some nightfishing was also done along the wave terrace with baited hook kept on the surface of the water with a floater. The fishing was very difficult due to the availability of only a flashlight and a small propane lantern as a source of light and the very rough water conditions which made the retrieval of the line in the semi-darkness hazardous. As a result no fish was caught after about an hour of fishing.

On the morning of the second day, a sample of opihi was collected for Dr. Allison Kay of the University of Hawaii during a 45 minute period along the wave terrace. Here again, the very rough sea conditions required that one person act as a wave watcher to warn the person picking opihi of oncoming large waves.

The ascent to rejoin the survey group at the 350 foot level of the island was started at about 8:25 a.m. and completed about 10:35 a.m. (about two hours and ten minutes).

CONCLUSION

Successful sampling of fishes with pole and line and making observations along the waters edge depends on sea conditions. Because of the rough seas encountered during the trip, shore fishing and sampling of opihi was difficult and hazardous.

Climbing of the cliff from the 350 foot landing to the wave terrace at sea level was extremely hazardous, especially since overnight gear and provisions needed to be packed in. Landing onto the wave terrace by skiff or rubber raft launched from a larger boat anchored off the island should never be attempted even under moderate sea condition because of dangerous surge conditions which generally prevail.

Henry M. Sakuda

Henry M. Sakuda
Aquatic Biologist

Copy to Sakuda

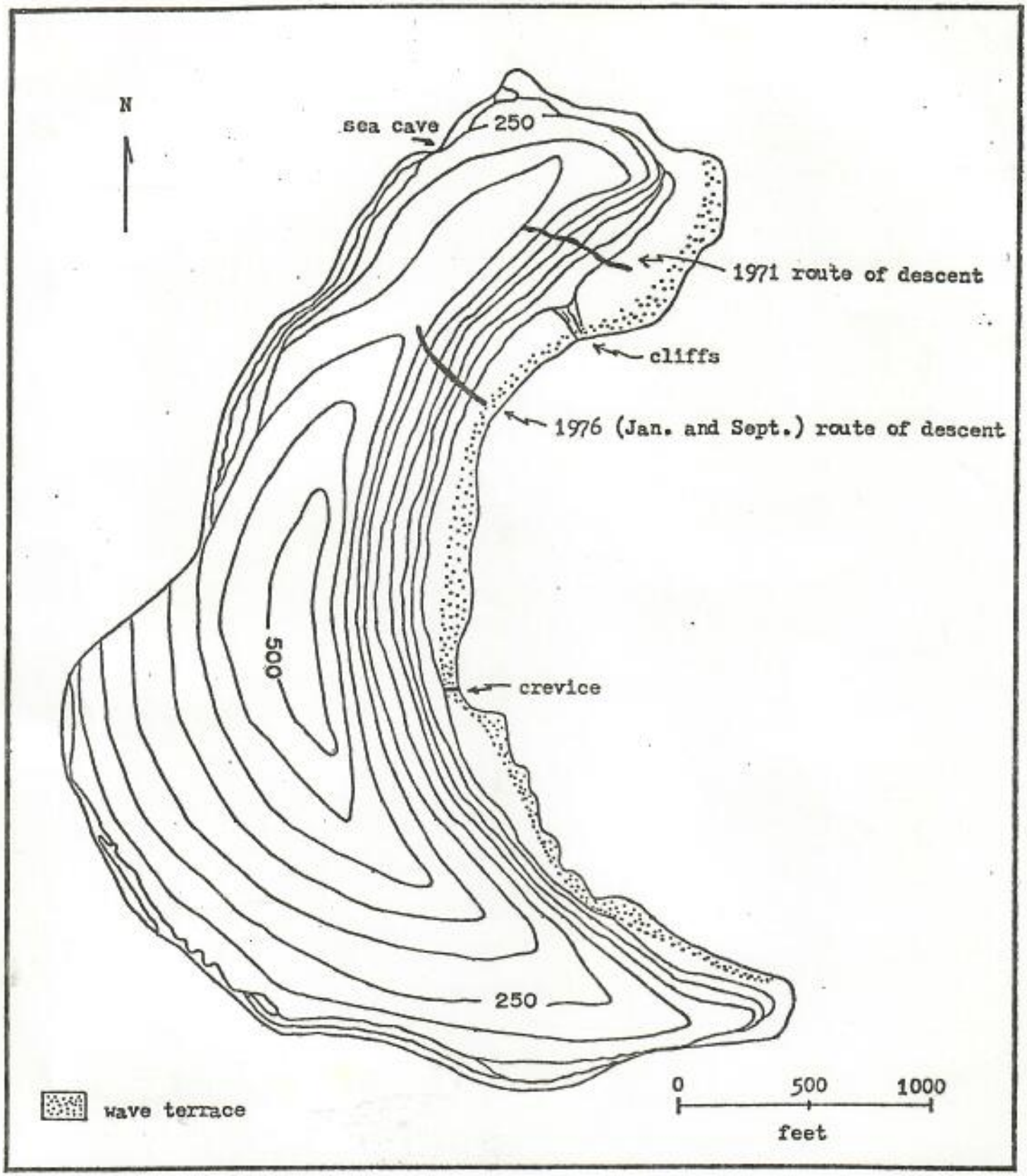

Figure 1. Kaula Island

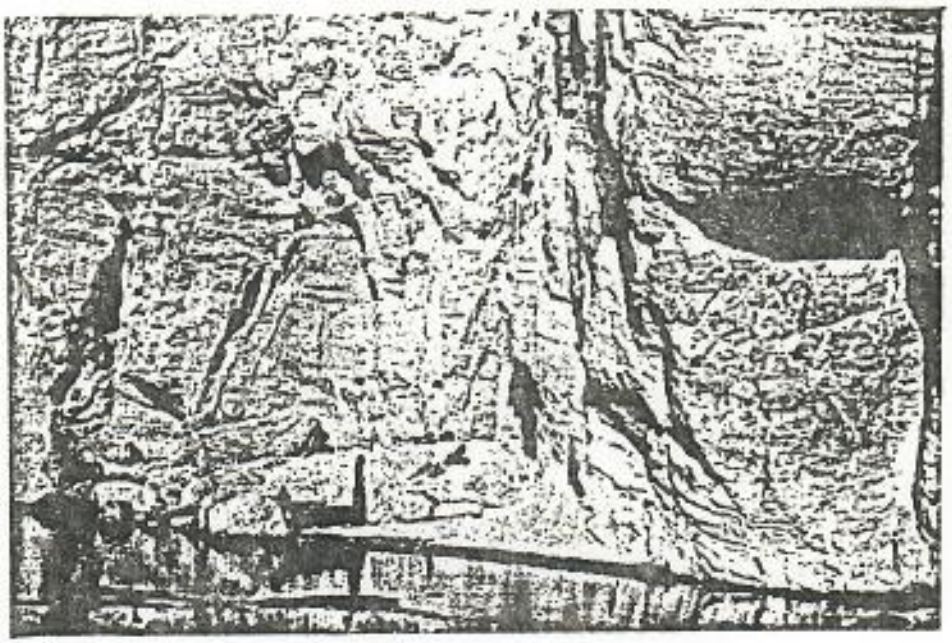

Figure 2. The cliff that was descended by rope to reach the wave terrace on Kaula Island (Note rope left for the ascent).

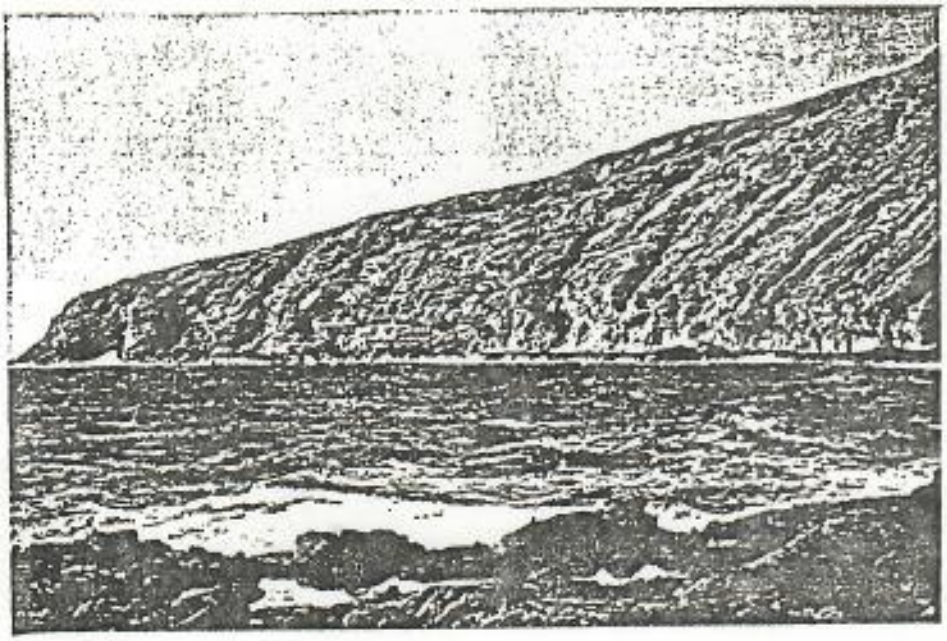

Figure 3. Looking across the Southeastern slope of Kaula Island.

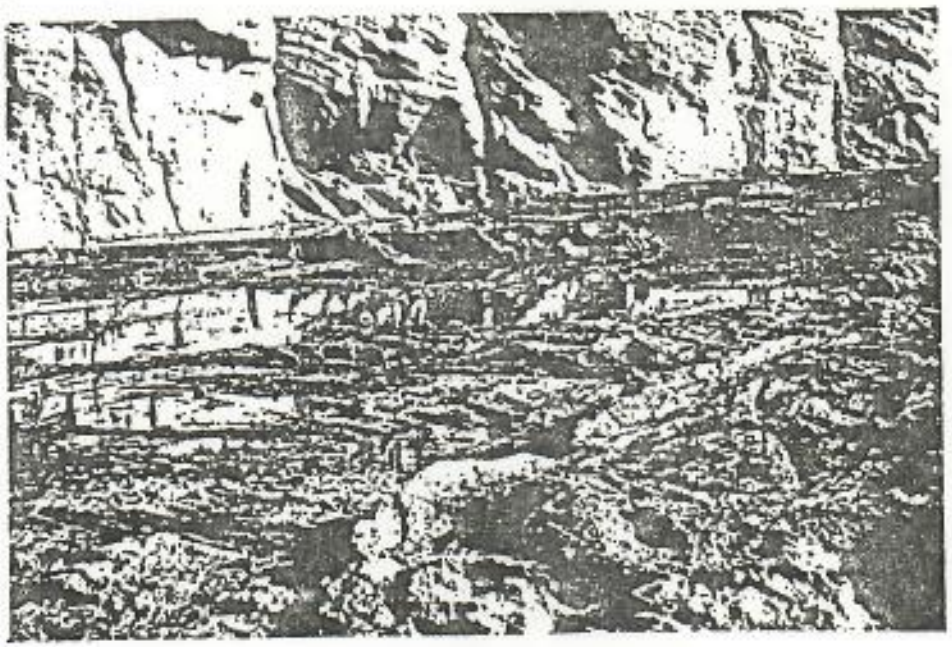

Figure 4. Tide pools on the wave terrace of Kaula Island.

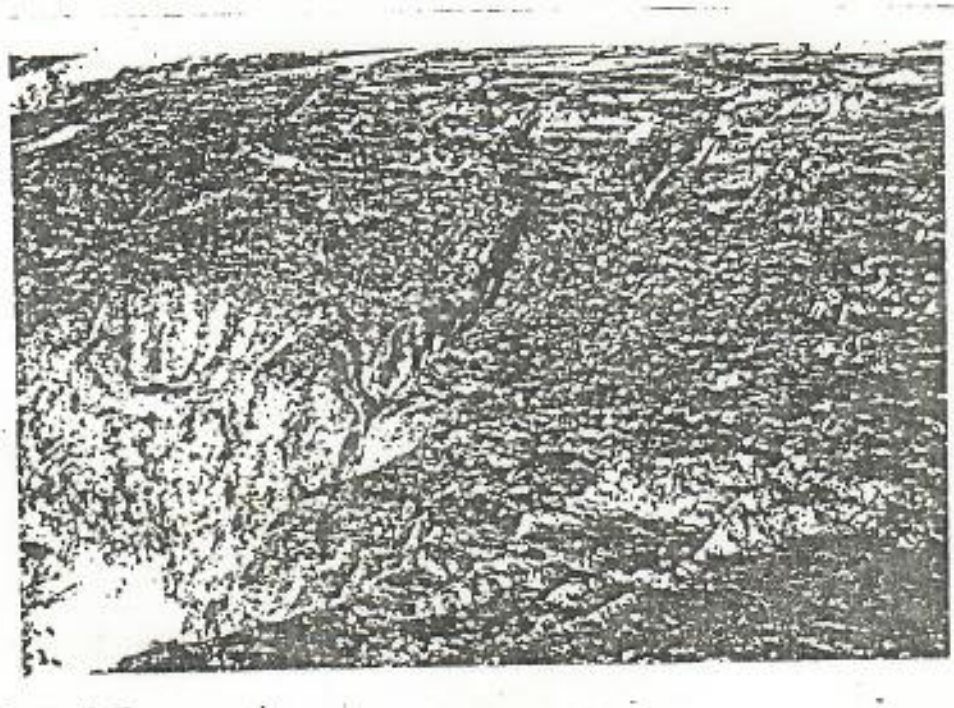

Figure 5. Opihi (white dots) along the seaward face of the wave terrace of Kaula Island.

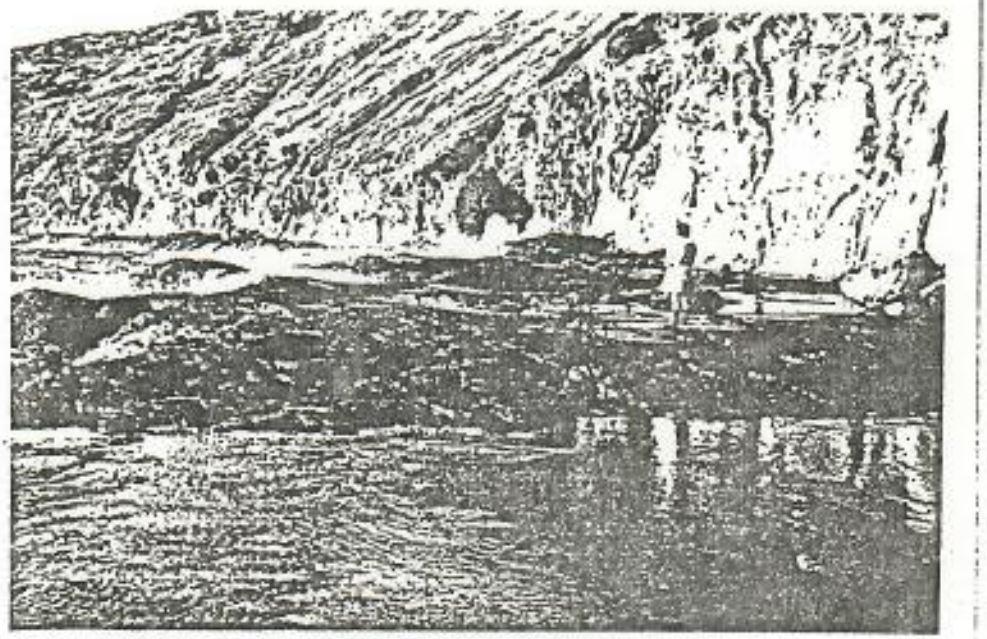

Figure 6. Waiting for wave to recede before continuing to pick opihi on Kaula Island.

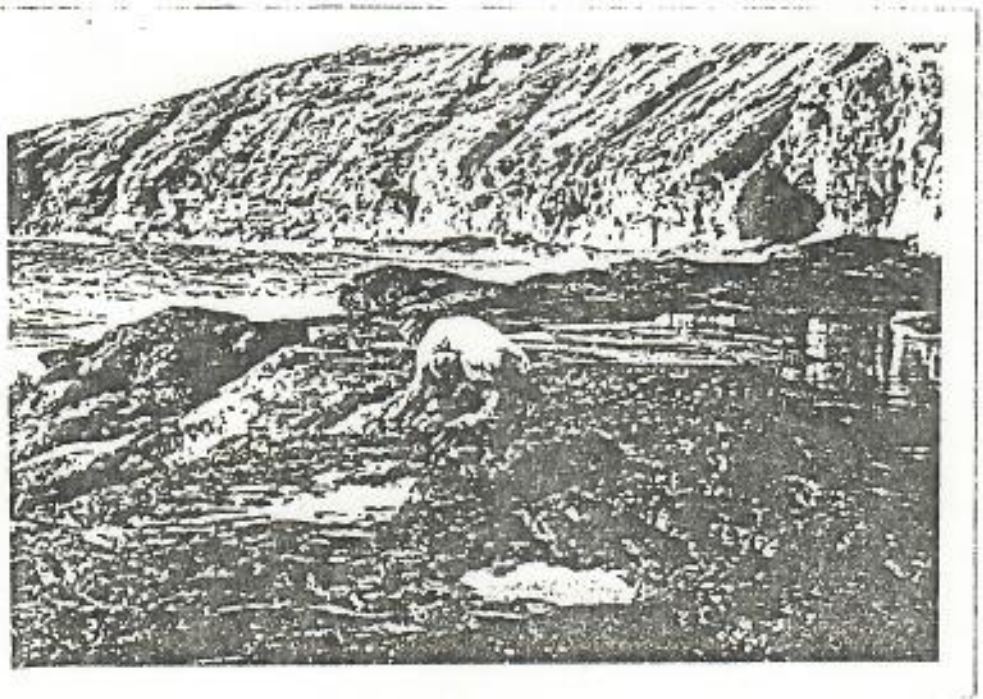

Figure 7. Picking opihi on the edge of the wave terrace on Kaula Island.

Kaula Rock

16 MAR 1979

Estimation of the Breeding Sooty Terns at Kaula Rock, Hawaii

During the period March 6-8, 1979 Ron Walker, Tom Telfer, and Vernon Byrd visited Kaula Rock (21°39'N, 160°32'W) to estimate populations of birds, part of the semi-annual inventory program established by Walker. By far the most abundant breeding species was Sooty Tern. The birds occupied six distinct colonies with small scattered groups outside the main colonies (Fig.1). The Sooty Terns nested on the base plate which formed a 20-25 slope away from the old volcanic cone's center. Scattered small rock particles and vegetation over the plate's surface provided wind protection for the eggs. Nesting birds apparently avoided areas where wind protection was lacking, but non-incubating terns and other species used these areas for roosting.

Because of the difficulty of specifying the accuracy of "guesstimates" of the number of Sooty Terns seen at Kaula Rock, we decided to use a simple random sampling scheme to estimate the number of eggs present. Less than 1% of the clutches contained two eggs; the remainder had one egg. Most eggs had apparently been laid within the past two weeks and no chicks were found.

Methods:

The boundaries of major tern colonies were established by pacing from established points on the island(e.g. the old light house marked + on Fig.1). Three 5m. wide strip transects were then randomly selected in each of the five largest colonies. Eggs were censused in the two smaller colonies. A line was stretched across the colony to delineate the transect center, and Telfer and Byrd counted eggs 2.5m. each side of the line. Counts were converted to eggs/m^2 and recorded. The three estimates for each colony were averaged to provide an estimate of the eggs/m^2 in each colony. Calculation of the standard

Other Lands-Kaula Rock

error for a"t"distribution at the 0.1 level provides an estimate of the interval within which the population mean falls.

Results:

Tern egg density within colonies A-D varied from .32 to .08 eggs/m^2 (Table 1), but intra-colony variation was relatively low(standard errors .035-.05). Variation in density between colonies seemed to result more from the percentage of unoccupied areas in a colony than it did from differences in nearest neighbor distances (Table 2).

Colony X seemed to have been abandoned. About 300 eggs were present on March 9 after a strong wind had blown for 12 hours. Two or three times as many eggs had been present March 6, but many were cracked or pecked and the wind blew the egg shells away. Probably flooding was a factor in the colony desertion, since heavy rain occurred in mid-February. Balazs (pers. comm.) saw waterfalls coming from Kaula Rock Feb. 18, 1979 when he was aboard a vessel nearby. Many eggs appeared to be partially burried in rocks, suggesting flooding. Probably the abandoned eggs were the earliest eggs laid this spring and the attended eggs we found were laid after the heavy rains.

The small colonies (E and F) were censused, but exact colony sizes were not determined.

In the active tern colonies on Kaula Rock we estimated that around 15,000 eggs were present March 6-8, 1979. We have no way of determining how many non-breeding terns were present in the area, but the eggs represent about 30,000 breeders.

Vernon Byrd
March 1979

FIGURE 1. SOOTY TERN COLONIES ON KAULA ROCK
MARCH 6-8, 1979

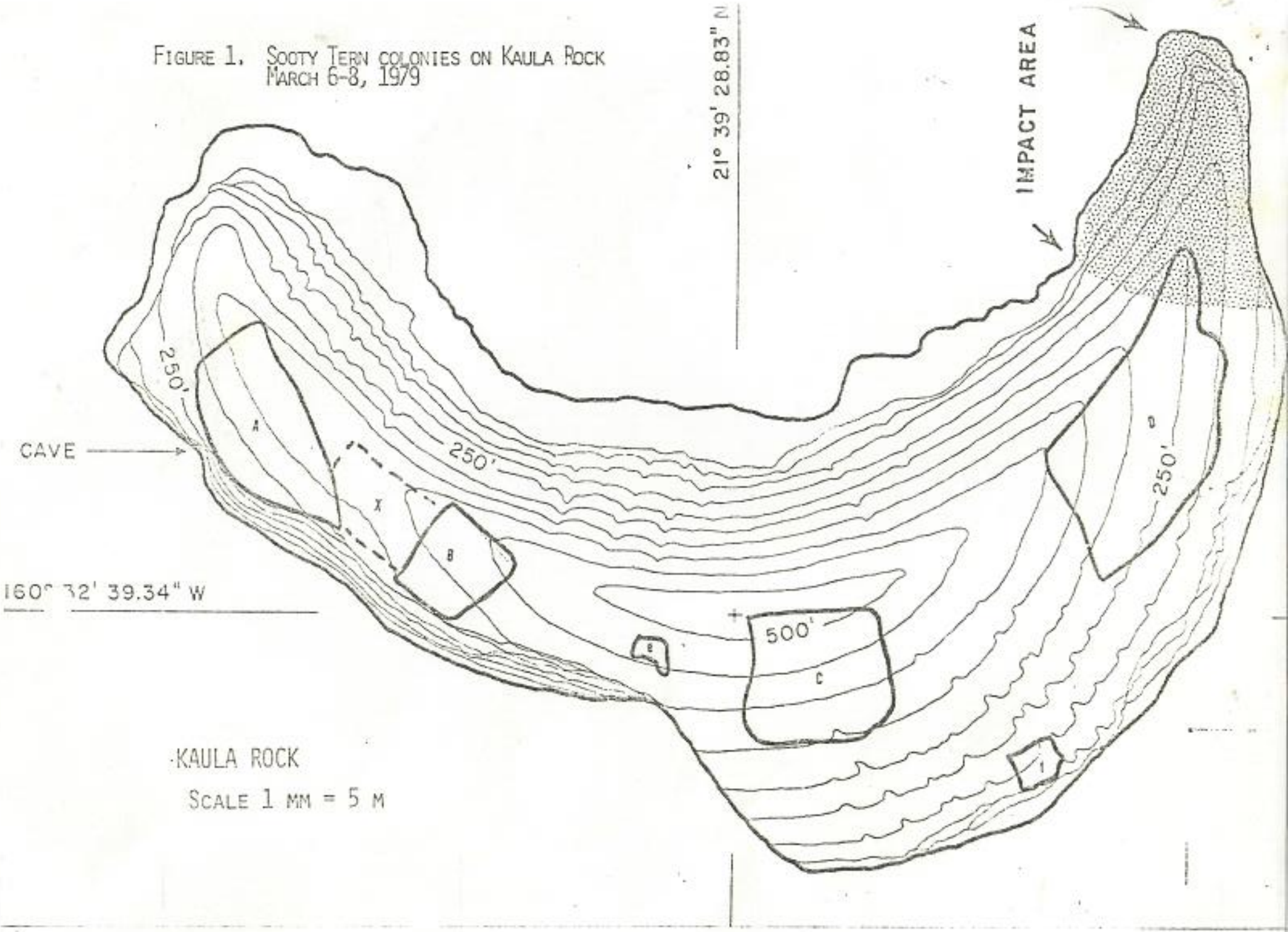

Table 1. Sooty Tern eggs at Kaula Rock March 6 to 8, 1979

Colony	Area (m^2)	Average eggs/m^2	Standard Error (±)	Estimated Total Eggs
A	15,156	.32	.04	4,850 ± 600
B	7,344	.08	.05	588 ± 360
C	17,656	.14	.035	2,472 ± 618
D	29,531	.22	.04	6,497 ±1,186
Sub-Total				14,407 ±2,764
E				351
F				375
Total				15,133 ±2,764