

REPORT ON THE EXPERIMENTAL USE
OF LARGE MESH NETS AS A
LIVE-CAPTURE TECHNIQUE IN THE RESEARCH
OF HAWAIIAN GREEN TURTLES

prepared for
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INTRODUCTION

With the exception of ongoing studies in the Hawaiian chain, worldwide research of the life history of marine turtles has thus far focused principally on adult females at their colonial breeding sites. This can be attributed to the importance placed on the reproductive aspect, and to the high level of research efficiency obtainable at such sites where comparatively large numbers of turtles are terrestrially available for tagging and observation.

Although monitoring of the Hawaiian green turtle breeding assemblage at French Frigate Shoals continues to be essential, the major focus of my State (and pending Sea Grant) supported research is on immature turtles occurring in the ocean environment throughout the Archipelago. Objectives of this work include the determination of rates of natural growth, ages at sexual maturity, longevity, and geographical areas of developmental migrations. Such data are basic to understanding the dynamics of a population, however, they are nevertheless virtually nonexistent for any population of marine turtles.

The live-capture of turtles directly from the sea for tagging and observation purposes imposes a number of difficulties and constraints. However, work that I have thus far conducted indicates that problems can be reduced substantially by careful selection of the capturing sites and techniques used. Three basic live-capture methods have been utilized and are listed as follows:

- (1) Capture with specially designed long-handled scoops nets, used both from shore and from a small outboard powered boat. This technique has proven most successful at select sites within French Frigate Shoals and Kure Atoll.

- (2) Capture by hand, both while free diving and with the use of SCUBA. This is a low efficiency, but nevertheless effective, long term method for tagging immature turtles. To date, it has been used with varying levels of success at select sites around Midway (in cooperation with the Koral Kings Diving Club), Kure, Oahu, Lanai, and Hawaii. Assessments of additional locations in the Hawaiian chain are now in progress.
- (3) Capture with modified large mesh nets set vertically in shallow coastal waters. The use of this method as a research tool had been examined in May 1973 (at N. Kona, Hawaii) prior to adoption of Division of Fish and Game Regulation 36 (Protection of Marine Turtles). Results of the test suggested considerable potential, provided suitable precautions were exercised to avert drowning or physical injury to the turtles. Further evaluation was warranted and necessary, thereby resulting in the field trial experiment upon which this present report is based.

In December, 1976 written application was made to Mr. Michio Takata, Director, Division of Fish and Game, for permission to conduct a five day test on the live-capture of green turtles with large mesh nets. I requested that this trial be carried out with the assistance of a consultant fisherman, Mr. Arnold L. Howard of Punalu'u, Island of Hawaii. Mr. Howard has considerable knowledge of turtles and I have found it beneficial to confer with him on several occasions since making his acquaintance in June, 1974. Authorization for the conduction of the field trial

experiment was subsequently granted by the Department of Land and Natural Resources, Division of Fish and Game, through the issuance of Ammendment No. 1 to my Scientific Collecting (Research) Permit No. 7744. One of the conditions of this authorization was that a report on the test be submitted to the Director of the Division for evaluation prior to continued use of the nets.

EQUIPMENT AND METHODS

The test was conducted using four comparatively short sections of net. Two of these nets were made of cotton and measured 62' by 14' with a 26" mesh, and two were made of nylon and measured 73' by 12' with an 18" mesh. On the nylon nets, a three foot wide section of netting adjacent to the leadlines had been soaked in varathane varnish in order to reduce snagging on the ocean bottom. A large inflated tire innertube fitted with a plywood bottom was used to float the nets during the setting process.

Joined sections of net were laid out once daily over a four day period from May 4-7, 1977. Three of these settings were made at Kaalualu Bay (May 4, 5 and 7) and one was made at Punalu Bay (May 6). In each instance, one end of the net was anchored close to shore, with the set being made nearly perpendicular to the shoreline. At the specific sites selected, the depth of the water did not exceed the width of the nets and, in most cases, was considerably less. After the nets were laid out, the leadlines were examined (using mask and fins) and positioned in such a manner so as to reduce the possibility of snagging on the ocean bottom. The nets were set at approximately 1600 hours of each day and retrieved between 0530 and 0630 hours of the following day.

RESULTS

A total of 16 captures were made involving 15 green turtles, *Chelonia* (Table 1). Although considerably entangled in the netting, all were recovered alive, tagged and released with no indications of serious injury. Most of the turtles, however, appeared to be moderately fatigued from struggling in the nets, and all had minor signs of net abrasion on their front flippers. Observations made from shore of the nets' floatlines revealed that turtles did not become entangled before sunset (1900 h), and probably not before 2200 hours.

The size distribution of the turtles captured (Figure 1) suggests that the nets, both 18" and 26" mesh, were not selective for any particular size category. None of the animals could be identified as being males.

A turtle measuring $31\frac{1}{4}$ " in straight carapace length that was captured on May 4-5 was recovered on May 7-8 in nets set at the original capture site within Kaalualu Bay. The turtle was released for a second time and appeared to be vigorous and uninjured.

On May 19 an unsigned letter (postmarked Volcano, Hawaii) was received which briefly stated that an 18" turtle had been taken at Kaalualu on May 14. An enclosed tag identified the turtle as having been originally captured and released during the test at Kaalualu on May 5-6.

CONCLUSIONS

Results of this test indicate that the carefully controlled use of large mesh nets is a viable research technique for the capture of marine turtles. This is in agreement with the findings of earlier experimentation with nets conducted in May of 1973. The significant advantage of this capture method is the apparent non-selectivity for any particular size category, thereby permitting uniform sampling of an aggregation of turtles. Such sampling does not appear to be possible by the other capture methods discussed in the Introduction of this report. Another favorable factor in the use of nets is the comparatively high level of efficiency obtained for the research time and effort expended. This may, however, be expected to vary with the locations sampled as well as other variables such as time of year.

The recapture made after an interval of three days suggests that the turtles' experience of being entangled in nets did not stress them to the point of abandoning the area. A similar recapture was made in May of 1973 after an interval of only one day. Such findings also tend to indicate that the turtles did not develop an ability to detect and/or avoid nets.

The precautions that have been identified in this test as being necessary to minimize the possibility of drowning or injury to turtles are listed and discussed as follows:

- (1) use of optimal nets - Nets must have a light leadline with the adjacent netting treated with a varnishing agent in order to lessen snagging. The use of small sections of net joined together with quick release knots is particularly favorable for the rapid and efficient retrieval of captured turtles.

- (2) careful selection of capture sites - Nets must be laid at sites that are generally free of bottom obstructions (particularly coral), and in water of considerably less depth than the width of the nets.
- (3) examination and adjustment of leadlines - After the nets are laid, the leadlines must be visually inspected underwater and adjusted accordingly to reduce the possibility of snagging. In certain cases, potential obstructions must be removed from the area.
- (4) monitoring and removal of turtles - Nets must be examined at regular intervals and any captured turtles removed at the earliest feasible time. Turtles which become entangled during the nighttime hours should be removed at first light. Retrieving turtles during darkness imposes serious difficulties as well as dangers to the researchers from biting turtles and self-entanglement in the nets.

Even by observing these precautions, there is still the distinct possibility for an occasional turtle mortality or injury to result. However, the risk of such an occurrence is presently considered to be acceptable when compared to the scope and quality of the information that can be obtained.

The use of nets as a research tool in areas frequented by the public can be expected to attract interest and curiosity. In such cases, it would be essential to explain in practical terms the activity that is taking place and to maintain good public relations by whatever means

appropriate.

It should be noted that the use of large mesh nets for capturing turtles in the Northwestern Hawaiian chain is not considered to be feasible due to the probability of accidentally entangling monk seals.

REQUEST

The results and conclusions from this test support the further use of nets in a research capacity for capturing and tagging turtles. It is therefore requested that permission be granted to conduct additional and longer term capture activities around the major Hawaiian Islands. Such work would be carried out at as yet undetermined sites that are found to be consistent with the criteria set forth in this report. Notification of the specific sites selected would be made to the Division of Fish and Game well in advance of the actual work.

Authorization would also be needed for a research employee, Mr. Alan K. H. Kam, to provide me with assistance in the conduction of additional capture work with nets.

Table 1. Results of test using large mesh nets at Kaalualu and Punalu'u, Island of Hawaii

Date	Location	Settings	No. turtles captured, tagged and released
4-5 May 1977	Kaalualu	2 nylon nets joined	2
"	"	2 cotton nets joined	1
5-6 May	Kaalualu	2 nylon nets joined	3
"	"	2 cotton nets joined	2
6-7 May	Punalu'u	2 nylon nets joined	3
7-8 May	Kaalualu	all 4 nets joined	5 (1 recapture)
Total Captures			16

Figure 1. Size distribution of turtles captured in large mesh nets at Kaalualu and Punalu'u, Island of Hawaii

