# INNOVATIVE TECHNIQUES TO FACILITATE FIELD STUDIES OF THE GREEN TURTLE, *CHELONIA MYDAS*

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## INTRODUCTION

This paper describes five safe, simple, and inexpensive techniques to enhance research of green turtles in the wild. All of these methods have been successfully employed and are currently in use in the Hawaiian Islands. In most cases, the procedures are believed to also be applicable to other species of sea turtles. However, they have not yet been tested by the author in that capacity. In keeping with sound research practices and to prevent the possible spread of disease, any equipment coming into contact with a turtle should be properly cleansed before being used on another turtle. In those instances where disease may be a special concern, two complete sets of equipment should be used: One for turtles that appear to be healthy, another for those showing an affliction. It is also reminded that the appropriate federal and state permits, or authorization (whether U.S.A. or foreign), may be needed prior to implementing most of the procedures described here.

**ORAL EXAM USING A SPECULUM:** Carefully inspecting a turtle's mouth during field studies can yield valuable information that might otherwise be overlooked. Oral examinations can readily detect the presence of significant injuries or abnormalities, tumors such as fibropapillomas, foreign objects like fishhooks, and parasites including leeches and amphipods. Residual food particles may also be seen that can give insight into the turtle's natural diet. A vaginal speculum provides a safe and easy means for opening a turtle's mouth and holding it open without risk of injury to the turtle or the researcher. Once inserted and adjusted to the open position, the speculum will flex slightly to accommodate the turtle and prevent damage or undue stress as the animal intermittently bites down. Vaginal speculums are commonly used in veterinary and human gynecological medicine. They come in several different sizes and can be purchased for under $30 from most veterinary supply companies.

**ESOPHAGEAL FLUSHING OF FOOD COMPONENTS:** Techniques to safely sample food components for dietary studies of live green turtles have been used in Hawaii since 1976 (Balazs 1980). Oral examinations and the collection of fresh fecal pellets are two procedures employed to recover residual food particles for identification. However, the most productive technique has been the controlled infusion of water to flush out food items by using a plastic tube inserted partially into the esophagus. This method has been refined over the years to increase effectiveness and make it more applicable for quick and convenient use under field conditions.

The turtle is first placed on its back in a comfortable and accessible position. For turtles weighing less than about 25 kg, the researcher's lap offers an ideal working site. Once in position, the turtle's mouth is opened with a speculum, as previously described. An oral inspection is conducted to determine if there is any reason why the sampling protocol should not proceed. Once a favorable assessment has been reached, a short piece of thick-walled rubber hose of the appropriate size is inserted into the mouth while the speculum is removed (Figure 1). A stout rubber band is then carefully placed around the turtle's head and jaw to guard against the mouth opening wider and the hose falling out. The hose insert should be of sufficient size and firmness to prevent it from collapsing when the turtle periodically bites down. Fabric-reinforced automobile radiator hose, or washing machine drain hose, can be obtained for this purpose.

With a little resourcefulness, short sections of hose of different diameters can be inserted into one another to custom assemble the desired wall thickness and outside diameter needed for the turtles being sampled. A length

of clear plastic aquarium tubing of suitable diameter for the size of the turtle being sampled is then securely attached to the screw-on top of an enema syringe. A small hose clamp works well for this purpose. Several different styles of enema syringes are available at drugstores for under $20. The diameter of the tubing used should be small enough for unincumbered entry through the hose insert into the esophagus, but not so small that the tube folds back on itself. Again, the size of the turtle being sampled will dictate what is actually used. It is helpful to have a wide assortment of aquarium tubing on hand to meet the different needs encountered. The preliminary testing and evaluation of an array of tubing diameters, wall thicknesses, and lengths during routine necropsies of turtles is advisable before working with live animals.

The next step in the sampling process is to liberally lubricate the end of the tubing with edible vegetable oil. A "no-stick cooking spray," like Pam, offers a convenient means of application. The lubricated tube is then gently passed through the hose and guided down the esophagus. There is no danger of entering the trachea because (1) the hose insert protects against this; (2) the glottis is locked shut during breath holds; and (3) the size of the tubing used is almost always larger in diameter than the open glottis. The movement of the tubing through the esophagus once inserted can be felt and monitored by placing your fingers on the ventral surface of the turtle's neck. The tubing only needs to be inserted to the approximate point where the anterior edge of the plastron meets the skin of the neck. Very little if any resistance will be encountered when properly inserting a lubricated tube for this limited distance.

With the enema syringe filled with clean seawater, the screw-on top is attached and the flow of water started. The stream of water, controlled by squeezing and releasing the syringe, serves to flush particles of algae or sea grass from the posterior region of the esophagus or "holding crop." Such food is held there in a compacted fashion before being passed along to the secretory stomach. No food is obtained by this technique from the secretory stomach. Only the flushing action of the water reaches the crop, and not the tubing itself. A holding container, or fine-mesh screen, can be used to catch (or filter) the water once the backflow starts out of the mouth. Alternately lowering and elevating the posterior of the turtle will aid in the flushing action. If a container instead of a filter is used to catch the backflow, the water can be easily decanted and the denser food particles collected. At least one assistant is needed to conduct this highly effective and benign food sampling technique.

**DURABLE CARAPACE MARK FOR EASY VISUAL IDENTIFICATION:** A simple and durable carapace marking method to individually recognize turtles from a distance constitutes a valuable research tool. The ability to identify turtles in this manner enhances data collection and sharply reduces the level of disturbance during encounters after the initial flipper tagging. Reidentifying a nesting turtle by having to read its flipper tag requires a researcher to closely approach and handle the turtle on each occasion. Eliminating this repetitious intrusion clearly is necessary if nesting turtles are to be studied with minimum impact.

Various kinds of paint have been applied to the carapace of sea turtles by other workers for identification purposes, but none is known to have remained readable over the several-month period of nesting. During 1989 a wide array of adhesives, paints, and other potentially tenacious agents were tested using captive green turtles at Sea Life Park in Hawaii (Balazs 1989). Two-part catalytic products were not included in this study as they were considered impractical to use under field conditions. A total of 59 items were examined in this study, ranging from peel-off adhesives to sealant foams, felt-tip markers, crayons, fingernail polish, and numerous brush-on and spray paints (complete list available upon request). With few exceptions, poor retention was shown by all of these products, and none proved acceptable for the purpose and time span intended. Based on this work, it was concluded that a combination of causes prevents lasting adhesion. Such adverse factors include constant immersion in seawater, abrasion to the carapace from several sources, and, perhaps the most important, normal constant shedding and regeneration of the scutes at the cellular level. Substances applied to the smooth carapace surface, even when scrubbed clean, are liable to early loss due to these factors.

Following some additional experimentation, a practical solution to the problem was finally achieved. Using a high speed (20,000 rpm) battery powered tool called a dremel "moto-tool," the desired identification numbers were mildly engraved 1-2 mm deep into (but not through) a carapacial scute. A light-colored paint was then

applied to the inscription where it was retained and served to prominently display the numbers. The skillful use of this tool is easily mastered with little practice. There is virtually no response from the turtle during the 30-second engraving procedure; hence, no physical restraint of the animal is needed. At least 20 turtles can be engraved with up to four characters on each turtle by using a single fully charged dremel moto-tool. The tool is reasonably priced at about $60. Adult turtles marked in this manner at Sea Life Park still have readable engravings after nearly 3 years.

Field testing of the technique took place during the 1990 and 1991 nesting seasons at French Frigate Shoals in cooperation with the U.S. Fish and Wildlife Service. A total of 260 green turtles were marked without problems and easily identified during renesting encounters. Hawksbills and loggerheads also should be highly suited for this technique; however, ridleys, flatbacks (and of course leatherbacks) are not likely to be amenable because of their exceptionally thin scutes. Immature green turtles in Hawaii have also been engraved to facilitate easy recognition during underwater research activities. The technique again proved successful, although a shallower engraving is required, and the marks usually disappear as the result of regrowth within 6-12 months.

**SIMPLE WAY TO CINCH A TURTLE:** Field studies often necessitate that turtles be weighed. A piece of rope can be effectively used to rapidly secure a turtle for weighing (Figure 2). The manner of cinching the rope allows the carapace, and not the flippers, to support the turtle's full weight when lifted. This technique also provides a convenient way to transport a turtle with minimum stress. Several different lengths of rope are desirable when working with a broad size range of turtles. Braided 1/2-inch diameter nylon line of a high quality is recommended. Cinching a turtle in this fashion for weighing has been found to be superior to the use of cargo webbing and other contrivances. Such methods often enmesh and impede the head and flippers, resulting in more struggling and stress.

**POSTPAID SIGHTING REPORT CARDS:** The judicious use of postpaid, self-addressed, turtle-sighting report cards offers an excellent opportunity for researchers to receive potentially important information from the public. Observations that may be conveyed in this manner include the location, number, and activity of the turtles seen, as well as human and other adverse impacts. A card with a brief and uncomplicated format is highly recommended (Figure 3). A short conservation message or law enforcement reminder printed on the card is also advisable. Information received by the researcher can be acted upon by detailed telephone interviews, on-site studies, or in other ways deemed appropriate.

The actual scope and magnitude of distributing the sighting cards will be dictated by the specific needs and financial status of the project involved. The prepaid postage is essential for the successful use of the card. At current postal rates in the U.S.A., 1000 cards can be posted for only $190.

Lifeguards, tour boat operators, and recreational fishermen have proven to be especially worthwhile contacts for the use of these cards. However, virtually any conscientious individual who spends an extended time in, on, or along the ocean is a potentially valuable informant.

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Figure 1. Rubber hose insert in place with aquarium tubing passed through it in preparation for esophageal flushing of food components.

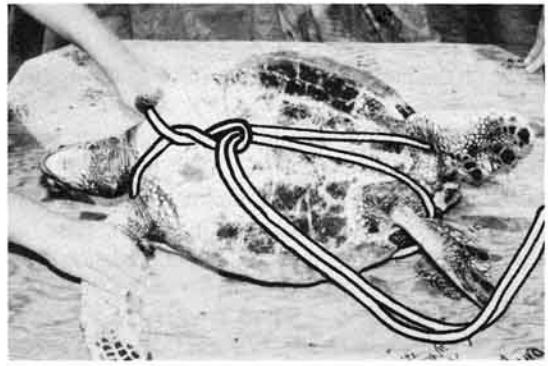

Figure 2. Method of cinching a turtle for weighing using a braided nylon line.

**SIGHTING INFORMATION TURTLE AND SEAL**

Animal sighted (circle): Turtle Seal
Number of animals: _____ Type, if known: _____
Date: _____ Observer: _____
Address & phone
Time: _____ (optional): _____
Location: _____
Observed from (circle): shore, boat (name: _____),
while skin or SCUBA diving (on surface or at _____ feet deep).
Estimated size (length): _____
Comments: (such as color pattern: injuries; scar patterns; tumors; whether flipper tags are present(Y/N); color and number of the tag(s); bleach marks (number/letter); behavior; and weather)

Seals and sea turtles are protected under Federal and State law.
**DO NOT DISTURB.**

Figure 3. Postpaid sighting report card successfully used in the Hawaiian Islands.

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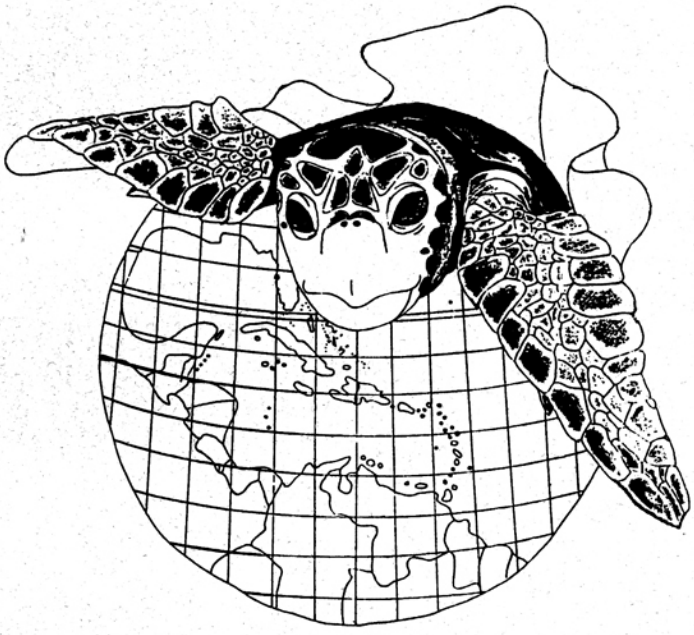

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