12. Sea turtles of the Cayman Islands

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Introduction

The Cayman Islands social and economic history is tied to the marine turtles. The impact of these turtle species on the development of the Islands is illustrated by the prominent role the turtle plays as a symbol of the Islands – in its currency, national seal and flag. The turtle continues to figure prominently in the economic future of the Islands because of the current land-based, commercial operation of the Cayman Turtle Farm in Grand Cayman. However, the present turtle population in the waters of the three Cayman Islands is only a shadow of what was once considered the major nesting ground of the green sea turtle, *Chelonia mydas*, in the Caribbean.

Species occurring in the Cayman Islands

Four sea turtle species occur in the Cayman Islands, *Chelonia mydas*, *Eretmochelys imbricata*, *Caretta caretta*, and *Dermochelys coriacea* (Fig. 12.1). Various accounts of hybrid turtles are summarized in Lewis (1940), but if ever frequent in the Cayman Islands, they are now not known (Carr 1967). All sea turtles exhibit streamlining favorable for swimming, with non-retractile head and limbs. Extensive taxonomic and descriptive detail of each species can be found in Carr (1952) and Pritchard (1979).

The green sea turtle, *Chelonia mydas*, is the largest of the hard-shelled marine turtles, averaging 160 kg at maturity. Although green sea turtles are still consumed as a source of protein in the limited areas where there are sufficient resources for subsistence level harvest, their meat is renowned as a gourmet item. The gelatinous material obtained from rendering the bony plates of the carapace and plastron provides the basis for turtle soup. The green colored fat, from which the green turtle gets its name, yields a high grade oil used in cosmetics.

The scalation of the green turtle normally consists of four pairs of costal scutes, five central scutes, eleven pairs of marginals, a pair of supracaudals, and a single broad nuchal. The scutes of the green turtle are normally thin and therefore not valuable for artistic purposes.

The hatchling green sea turtle weighs approximately 20 g and has an almost black carapace and white plastron. As the turtle grows the carapace lightens, with color variations from tan to brown to olive to black and pattern variations of a radiated sun-burst to a blotchy or dull monotony. The geographic location of a particular turtle population may show some regularity in carapace color and pattern and in average size of the mature turtles.

The hawksbill turtle, *Eretmochelys imbricata*, has similar carapace scalation to the green sea turtle, but is smaller, approximate mature weight 70 kg, and has a more narrow and elongated shape. The bill-like appearance of the hawksbill upper jaw, the serrated marginal scutes, and the overlapping, or imbricated, carapace scutes characterize this species prized for its thick and colorful scutes which supply the 'tortoise shell' market.

The loggerhead turtle, *Caretta caretta*, is characterized by an abnormally large head. The carapace has five central and five pairs of lateral scutes. The juvenile and sub-adult turtles have a very definite ridge on the central scutes. The

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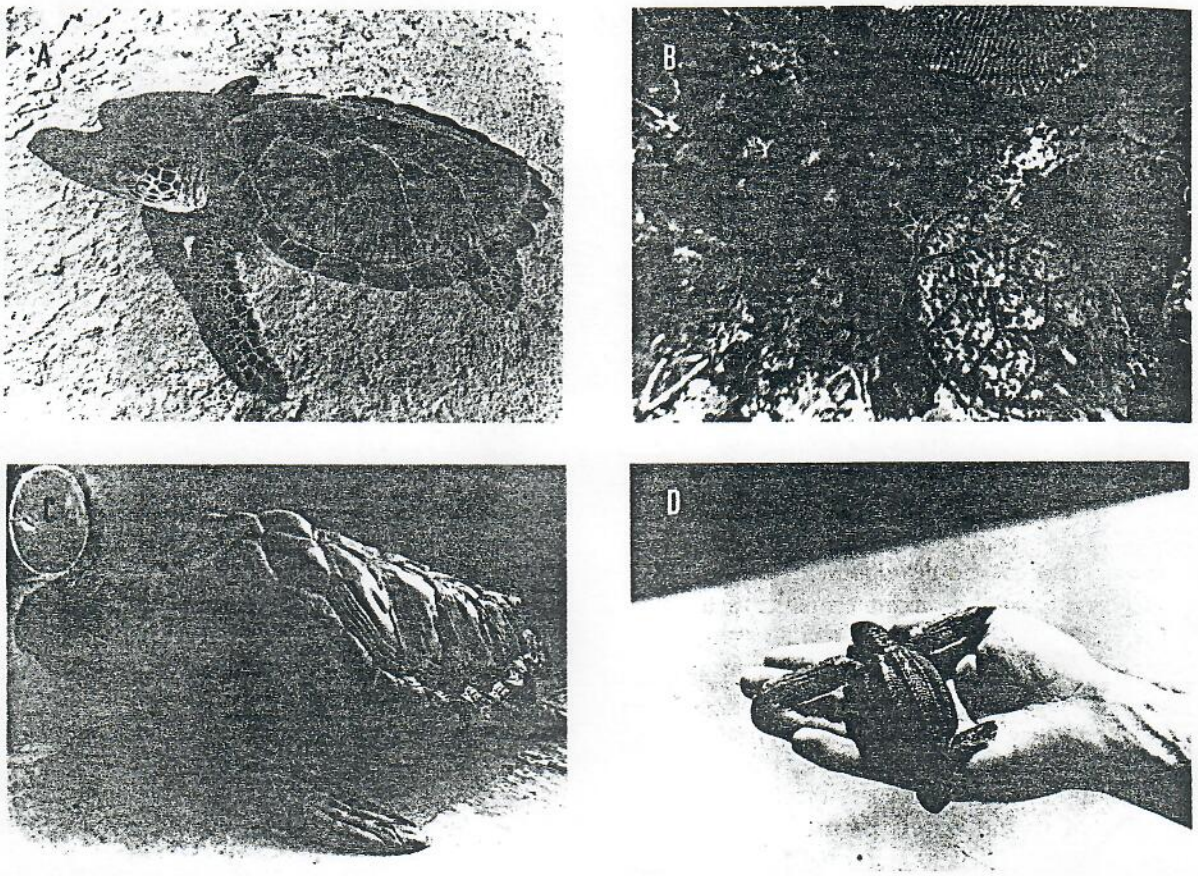

Figure 12.1. Four species of sea turtles found in the Cayman Islands. A, captive reared juvenile *Chelonia mydas*; B, wild adult *Eretmochelys imbricata* at rest among coral reef; C, captive reared adult *Caretta caretta*; D, hatchling *Dermochelys coriacea*, a representative specimen from the Pacific coast of Mexico.

carapace is red-brown in color with the plastron yellow to tan. Adults range in size from 90–160 kg.

The leatherback turtle, *Dermochelys coriacae*, is unquestionably the largest of the sea turtle species. Unconfirmed reports would suggest carapace lengths of over 2 m, but collected specimens and verified reports would place the average mature carapace length at 0.8 m, with an average weight of 360 kg. The leatherback is distinguished by the absence of any scutes on the carapace or plastron, no scales on the skin, and no claws. There are five longitudinal ridges on the carapace which give considerable rigidity to the primarily black carapace. The juvenile leatherbacks and to some extent, the adult turtles, have white spots on the shell and skin.

Natural history

Sea turtles are generally migratory animals, moving from feeding to nesting grounds. Among some populations the migrations occur over great distances, with individual animals being recorded as traversing thousands of miles. Other populations migrate only a few hundred miles between feeding and nesting grounds. A few areas have resident populations which feed and reproduce in the same general locality (Booth & Peters 1972). Little is known about what mechanisms the sea turtles use for migration, but suggestions involving magnetic fields, smell, temperature effects, ocean currents and celestial navigation have been made (Carr 1967).

Sea turtles spend their entire lives in the water,

except for nesting by the females and the emergence of the hatchlings from the nest and their run down the beach to the water. The period of time in the life history of the sea turtle from the time the hatchlings enter the water until the turtles appear as sub-adults on known feeding grounds is undefined (Brongersma 1970). This period of time, known popularly as the 'lost year', may cover a period of several years. The hypothesis receiving the most support at the current time is that the juveniles drift in ocean currents and may be associated with sargassum weed drifts (Carr & Meylan 1980). Once the sea turtle enters a feeding colony or area the turtle appears to remain with this feeding group. In addition, once a mature female begins nesting at a nesting ground, she generally returns to the same nesting beach for all subsequent nesting. These recruitment hypotheses have been well supported by the large amount of data collected from world wide tagging programs. Because of similar behavioral patterns shown in other species, many sea turtle behavioralists support the idea that hatchlings may return to the beach from which they hatch to reproduce. However, because of the past inability to tag a turtle in such a manner that the tag can be retained when the turtle matures to over 2500 × its hatchling size, or to otherwise identify hatchlings as adults, this has not been proven.

The nesting period of the turtle's life history has been the most easily studied since the turtles are relatively easily observed. Although there are inter-species differences, the general pattern of mating, nesting, and hatching is similar for all the species. At the onset of the reproductive season, the turtles, both males and females, begin to congregate at the nesting grounds. Mating precedes nesting. The female is generally receptive to mating for a period of 5 days (Wood & Wood 1980). For the green sea turtle, the female begins nesting approximately 30 days following mating. She generally lumbers up the beach at night, selects a nest site, digs a body pit with her front flippers, constructs a nest chamber with her rear flippers, covers her nest and body pit, and then returns to the water. The entire process may take several hours. The clutch size for any sea turtle species varies considerably depending upon both the individual and geographic location, but 100 eggs per clutch is a reasonable approximation. Most females will lay more than one clutch during a nesting season with subsequent nesting occurring 8–15 days apart. Again, as with clutch size, the number of nests per female per season is variable among the individuals of a nesting colony and the geographic location, varying from 1 to 10, with major nesting areas averaging 3–4 clutches per female during a single nesting season. The females do not nest every season and the pattern of intra seasonal nesting may vary from every year to every 3 to 4 years. Egg size corresponds to the respective size of the species, ridleys laying the smallest egg and leatherbacks laying the largest eggs. Following nesting, the eggs will hatch in 50–80 days. Specific nesting parameters for different species and geographic locations are summarized in Pritchard (1979).

The green sea turtle is different from the other sea turtles in that its diet is primarily herbivorous after the first year or two. Although it is an opportunistic feeder and may consume quantities of jelly fish and other marine invertebrates, its primary diet is made up of sea grasses or algae, in areas where these are more predominant. The hawksbill feeds among tropical reefs and its diet consists of sponges and to a lesser extent molluscs, small crustaceans, echinoderms and fish. The loggerhead, a subtropical feeder with heavy jaws, feeds upon heavy molluscs and crabs. The leatherback is an open ocean feeder, feeding mainly upon jellyfish. The variety of diets and feeding zones for the different sea turtle species may be adaptive and override intra-species competition.

Habitats in the Cayman Islands

Approximately 25% of the combined coastlines of the three Cayman Islands are sandy beaches (Parsons 1984). Extensive areas of sandy beach exist along the coast of Grand Cayman and Little Cayman and to a lesser extent in Cayman Brac. Long, deep, sandy beaches are favored by the green and leatherback sea turtles who dig deep body pits. Probable nesting beaches on Cayman Brac are primarily low and rocky and would be suitable for hawksbill and loggerhead nesting. These two species dig shallow nest pits and egg

Figure 12.2. Turtle grass, *Thalassia testudinum*, beds in North Sound with associated *Cassiopeia* in center of figure.

chambers, and hawksbill particularly are known to nest where the beaches are rocky and not used by other species. The remaining coastline of the three islands has extensive stretches of mangrove swamp, ironshore (extensive limestone deposit rising above and into the littoral zone), and boulder ramparts (formed by high energy processes) and are unsuitable for nesting.

The most dominant feature pertaining to sea turtle feeding is the extensive areas of turtle grass prevalent in the sounds surrounding Grand Cayman, Cayman Brac, and Little Cayman. Approximately 60% of the 80 km^2 of North Sound is covered with *Thalassia testudinum*, turtle grass, and interspersed with green algae of the genera *Halimeda*, *Penicillus*, and *Rhipocephalus* and an abundant population of bivalves (Roberts 1977). Often associated with these turtle grass beds are populations of jellyfish, particularly of the genera *Aurelia* and *Cassiopeia* (Fig. 12.2). South Sound and Frank Sound of Grand Cayman and South Hole Sound of Little Cayman also have extensive turtle grass beds. There are limited turtle grass areas along the south coast of Cayman Brac.

The fringing reef separating the various sounds from the open ocean are non-contiguous around the islands. These shallow reefs support a variety of coral communities including *Acropora*, *Millepora*, *Montastrea*, and *Diploria*. Finding suitable niches among these shallow corals are many small crustaceans, molluscs, and fishes. At various distances from the coast and in deeper water, 10–30 m, are coral-encrusted shelves abundant in corals prevalent on the fringing reefs and abounding in various marine invertebrates favored in the diets of hawksbills. There are also scattered patch reefs in the sounds as well as the open sand flats of the unprotected bays of the islands. The variety of invertebrates and fish could provide feed for loggerheads and hawksbills. The Cayman Islands are surrounded by some of the deepest waters in the Caribbean and the continental shelf area is minimal with an estimated area of 255 km^2 for the 204 km of coastline (Parsons 1984). Strong offshore currents circulate around the islands. The amount of shelf area would limit large feeding populations for the islands and support the historical accounts of large nesting populations rather than resident feeding populations. The currents would have facilitated dispersal of hatchlings.

Historical turtle fishery

In the past the Cayman Islands supported a huge sea turtle rookery. Historical references are summarized in Hirst (1910). Briefly, in the 16th and 17th centuries, the Cayman Islands were used as a provisioning stop by ships to furnish a supply of red meat. The turtles could be kept alive on board for many days by trussing the flippers together and turning the turtles on their backs. By the beginning of the 19th century this huge rookery was wiped out and turtlers of the Cayman Islands were sailing to Cuba, Nicaragua and Honduras to fish turtles. Green sea turtles apparently were the primary turtle of the Cayman Islands rookery and most references indicated that the turtles were abundant during the summer months which corresponds to the now known mating and nesting season for Caribbean turtles. Reports of the occurrence and breeding of leatherbacks, loggerheads, and hawksbills are also summarized in Hirst, 1910.

The traditional turtling industry of the Cayman Islands was subsequently based on a fishing fleet

sailing from the Cayman Islands to catch turtles in Cuban waters until the 19th century, when the banks and shoals near Nicaragua, Honduras, and Costa Rica became the primary fishing grounds. The green sea turtles, traditionally fished by turtlers from Grand Cayman, were exported to the United States and Jamaica for meat and soup products. The hawksbill turtles, traditionally fished by turtlers from Cayman Brac, were processed and the shell exported while the meat was consumed locally (Rebel 1974). In the last three decades, however, international regulations affecting sea turtles have virtually eliminated trade in wild sea turtles. Because of overfishing and habitat destruction, most populations of all sea turtle species are endangered or threatened. In the Cayman Islands, present national legislation now controls the take of sea turtles and regulates the number, species, size and season for turtling by traditional methods for local consumption only (Cayman Islands Government 1985).

Present Status of Wild Turtles

The current population of wild sea turtles in Cayman (this excludes the Cayman Turtle Farm population which will be mentioned below) is minimal. Increased public awareness and concern of both public and governmental bodies has enabled better correlation of the isolated turtle sightings and nestings. The phenomenal growth in the tourism industry in the Islands in the past two decades, centered around the dive industry, has focused attention on the marine life, particularly sea turtles, which are a majestic sight while swimming. The construction of condominiums and hotels on many, if not all, of the beaches suitable for sea turtle nesting has resulted in infrequent turtle nestings, due to significant changes to the nesting habitat. Seven Mile Beach in Grand Cayman has particularly been developed as the deep, sparsely vegetated sands favored by sea turtles are also favored by man. Reports clearly indicate that bright lights disorient hatchlings and can result in high mortality from hatchlings wandering away from the sea into traffic areas (Raymond 1984).

Between 1971–1991, 78 nests have been verified, including 43 loggerheads nests, 17 green, 1 leatherback, 6 hawksbill, and 11 indeterminate (probably loggerhead from size of eggs and nest site). The nests were confirmed by on-site verification or multiple reports for the same nest by reliable sources. In cooperation with the national Department of Environment, Education, Recreation and Culture, the Farm has coordinated aerial surveys, ground surveys, and tag and recapture programs to various degrees on all three islands. The aerial and ground surveys began in 1982 and have resulted in 41 nests being collected, incubated at Cayman Turtle Farm, and the hatchlings released from the collection site. The survival rate of the eggs and hatchlings are increased by guarded incubation and release for those nests collected from threatened areas, i.e. below high tide and heavily trafficked beaches. Additional nests have most likely been laid and excavated for consumption as has been suggested by several colloquial reports. One loggerhead nest was confirmed from Little Cayman and one green nest from Cayman Brac. The remainder were found in Grand Cayman.

The collection of two green nests from a constructed beach at Beach Bay (sand was moved into a leveled limestone coastline for a condominium project) was particularly interesting. This beach was twice probed the year before because of turtle tracks, but was found to be very shallow, less than 15 cm, and very rocky. The green female was therefore very successful in finding the apparently only area on this strip of beach suitable for construction of a nest. One could speculate that this was a new recruit for the Cayman Islands nesting population. The instances of hawksbill nestings have occurred on a short, rocky beach (Half Moon Bay, Grand Cayman) considered by residents to be frequented by hawksbills in the past.

Cayman Turtle Farm release programme

Cayman Turtle Farm in Grand Cayman commercially raises the green sea turtle. The farm has been in operation since 1968, first operating in Salt Creek, a small inlet in North Sound, utilizing floating pens for rearing the turtles. The operation was transferred to a land-based operation on the northwest coast in 1971. Prior to 1978, the

farm collected mature breeders and eggs from Surinam, Nicaragua, Costa Rica, Ascension, Guyana, and the USA until it was able to establish its own breeding herd which now produces all the animals necessary for its operation. The farm operates as a private, incorporated company of the Cayman Islands and the Cayman Islands government currently owns all the shares of the company. The farm is a major tourism attraction on Grand Cayman and until 1979, when the USA closed its market to the farm's turtle products, was a leading exporter and employer in Grand Cayman. The farm currently produces 1,800 turtles a year for local consumption. Since its inception, the farm has necessarily relied heavily on research and because of the international status of sea turtles as threatened or endangered species, has addressed the question of conservation of the species in the Cayman Islands.

Besides the accidental release of turtles during storms, particularly while operating in Salt Creek, the farm has released numbers of captive bred green sea turtles as hatchlings or yearlings into the waters of the Cayman Islands. Between 1980–1991, 26,995 turtles have been released. During the past eight years, many of the hatchlings have been tagged with a 'living tag' (Hendrickson & Hendrickson 1981; Wood & Wood 1985). This method of tagging involves autographing a section of white plastron to the darker carapace. The tag then grows with the turtle and allows for identification of a group of turtles depending upon the location of the tag in the scalation of the carapace. This method of tagging may allow for the identification of hatchlings as adults. Since 1984, turtles released as yearlings are tagged with a titanium flipper tag which offers a reward for the return of the tag (Fig. 12.3). The tagging and release of both yearlings and hatchlings will help aid in determining their survivability and where they go during their early years. Of the 16,422 hatchlings released, 15,338 had received a 'living tag'. Of the 10,573 yearlings released, 5,959 had received a titanium tag and 2,744 of these turtles also had received a 'living tag'.

Since 1984, 291 green turtles tagged by Cayman Turtle Farm have been recaptured either in local waters or overseas. In addition, 83 other turtles, including 20 hawksbill turtles, have been captured, tagged and released during tag-recapture efforts of the farm in North Sound, Grand Cayman.

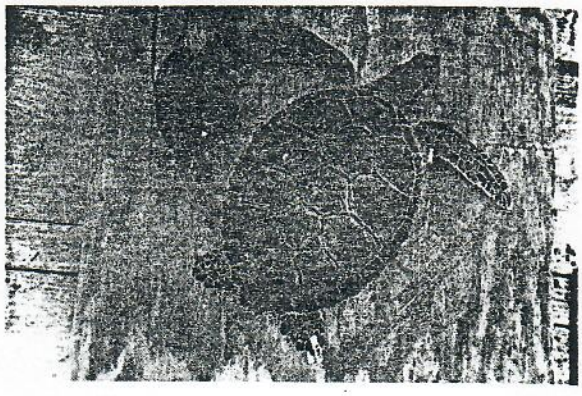

Figure 12.3. Captive reared green turtles, six month old and 18 month old specimens, with representative tags. The younger turtle on the left has a living tag in the right coastal #4 scute. The older turtle on the right has a living tag in the left coastal #2 scute; a plastic roto-tag in the right rear flipper; a titanium tag in the trailing edge of the right front flipper; and a mutilation notch in a left marginal.

Of the 5,959 titanium tagged yearlings, 271 have been recaptured, a recapture rate of 4.5%. None of the turtles released as hatchlings have been recaptured. Of the turtles released by the farm and recaptured, 54% have been recaptured in waters surrounding Grand Cayman. The remaining have been recaptured overseas from localities such as Honduras, Nicaragua, Belize, Mexico, USA and Venezuela. However, 91% of the overseas returns come from Cuba which has an active turtle fishery. Twenty-six percent of the turtles have been recaptured within a year of release; 33% within 1–2 years of release; 31% within 2–3 years of release, and 10% within 3–4 years of release.

Of the turtles recaptured locally, growth data are available for 63 turtles. Average percentage weight gain is 40% of that observed for farm-reared turtles. Local tag and recapture efforts concentrate in North Sound, where turtles are netted, weighed, measured and released. Between 1985 and February 1992, nets have been set a total of 863 net days resulting in the capture of 198 green sea turtles and 20 hawksbill sea turtles in North Sound, Grand Cayman. Five other turtles were recovered locally from Seven

Mile Beach on the west coast of Grand Cayman and from inland ponds where the turtles were obviously placed by residents. Sixty-six percent of the turtles recaptured locally have cutaneous fibropapillomas, a condition increasingly observed among turtle populations worldwide (Jacobson et al. 1989; Smith & Coates 1938). Turtles that had been in the wild for more than one year were more likely to have these fibropapillomas than those in the wild for less than one year, 74% versus 28%. Two turtles have been recaptured more than once that have shown an improvement in the infestation, with a complete disappearance of all fibropapillomas within one to two years.

North Sound appears to be a good feeding ground for both the green and hawksbill juvenile sea turtle. One could not at the present time predict the carrying capacity of such a vast resource, but it can certainly be projected to support a substantially greater number of turtles than currently resident.

Dive operators and residents report to the farm or the national Department of Environment, Education, Recreation and Culture sightings of sea turtles. Although the reporting is somewhat sporadic, sightings of sea turtles in the Cayman waters have been reported during every month of the year. The majority represents turtles seen by dive operators in shallow depths, 5–20 m. Numbers of young green sea turtles are regularly reported following releases. Sub-adult green sea turtles are most frequently seen in North Sound while young hawksbill sea turtles are spotted frequently among shallow reefs and reef shelves. The few adults sighted have been seen in deeper waters and in the early summer months, corresponding to the nesting season. The last known sighting of a leatherback turtle, other than the reported nesting, was in 1974 when a juvenile weighing 1.3 kg, carapace length 24.5 cm, was caught by a local fisherman.

Two unique habitats have been utilized by the green sea turtles in the Cayman Islands. Several young green sea turtles, most likely turtles released by the farm, have been found in the network of canals constructed by Mosquito Research and Control Unit and in various marl pits (formed by the removal of fill for construction). These marl pits are sufficiently isolated from the sea that the salinity is below that of the open sea, and the turtles have likely been placed in these by local residents. Most of the turtles found so far have been in good condition and apparently fed on mangrove roots and other flora surrounding these isolated brackish ponds.

In June 1983, 49 green sea turtle yearlings from the farm were flown to Little Cayman and released into Tarpon Lake. The turtles were placed into the lake to act as a control against the vast beds of algae which covered roughly one-half the lake at the time. The average weight of the turtles was 1.1 k. In February 1985, 12 turtles were removed from the lake which was now void of any algae. Nine were identified as being from the group released in June 1983; the other three were probably placed into the lake earlier by local residents. All the turtles were emaciated and the nine identified turtles showed little growth. The turtles had been observed by local fishermen to have done well while the algae was available, but were reduced to eating mangrove roots in the few months prior to their release. The salinity of the lake was 62 ppt (measured in the winter and may fluctuate seasonally). That the turtles were able to survive and apparently do well until the feed source was eliminated, confirms the adaptability of the green sea turtle.

Conclusion

Sea turtle populations are declining world wide. Their migratory nature demands international agreement on their management and trade. The Cayman Islands rookery is no more, but the Cayman Islands have the potential to re-establish, support, and maintain a resident local population. The small number of nestings that do occur in the Cayman Islands may be new recruits to the islands, a remnant of the centuries old rookery, or misdirected females from another breeding colony. The maintenance or re-establishment of a resident population will necessarily depend upon a balance between development of the natural resources and legislative control and enforcement of turtle utilization.

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