

ATOLL RESEARCH BULLETIN

No. 278

MARINE TURTLES OF THE LEEWARD ISLANDS, LESSER ANTILLES

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ISSUED BY

THE SMITHSONIAN INSTITUTION

WASHINGTON, D. C., U.S.A.

DECEMBER 1983

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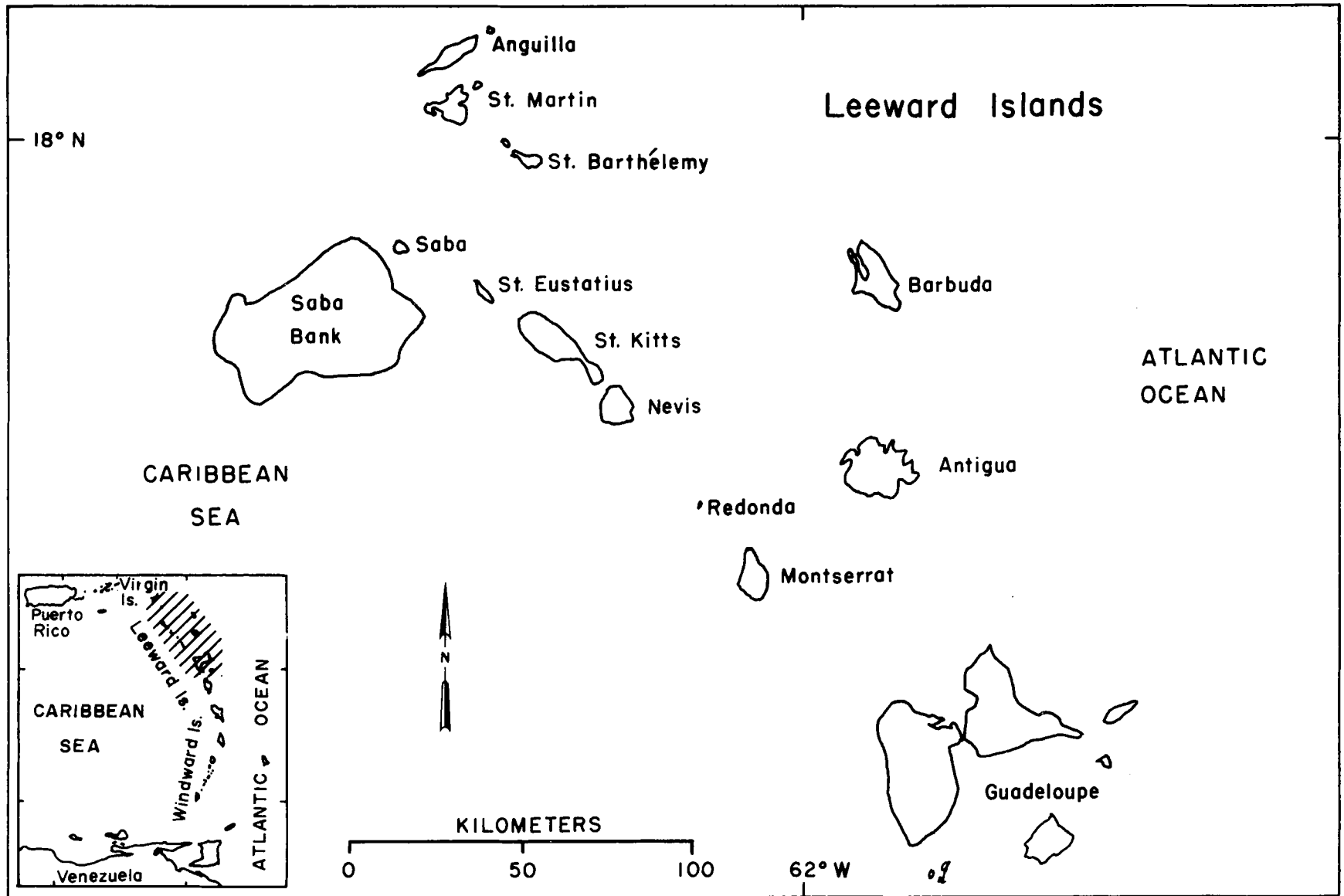


Figure 1. Leeward Islands

# MARINE TURTLES OF THE LEEWARD ISLANDS, LESSER ANTILLES

BY

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## INTRODUCTION

Although marine turtles are conspicuous members of the Caribbean fauna, significant gaps remain in our knowledge of their distribution and status within the region. Nowhere is knowledge more fragmentary than for the Lesser Antilles which, following the definition of Bond (1978), include those islands from Saba and Anguilla south and east to Barbados and Grenada. Comprising 17 major islands and 16 banks, the Lesser Antilles lie in an arc some 630 km long, and provide nesting and foraging habitats for four species of marine turtles: the green turtle (Chelonia mydas), hawksbill (Eretmochelys imbricata), leatherback (Dermochelys coriacea) and loggerhead (Caretta caretta). Although the olive ridley (Lepidochelys olivacea) occurs peripherally in the wider Caribbean region, it is considered a waif in the Lesser Antilles. Kemp's ridley (Lepidochelys kempii) has not been recorded from this region.

The present paper is concerned with the marine turtle fauna of the northern group of islands of the Lesser Antilles, the Leewards (Fig. 1). Although the terms Leeward Islands and Windward Islands have historically been associated with the British islands, rather than with the French or Dutch, the official boundary at latitude 15°40'N serves as a convenient dividing line for the island chain, and this is the criterion that has been adopted for this paper. Results of a survey of the turtle fauna of the Windward Islands have been reported previously (Caribbean Conservation Corporation, 1980; Carr et al., 1982).

Bacon (1981) reviewed the literature pertaining to the status and distribution of marine turtles in the Western Atlantic. For five of the eleven Leeward Islands, he reported a complete lack of information. For the remaining six, the literature he cited is largely limited to isolated nesting records, many of which lack specific locality data. Guadeloupe is the only island for which detailed information on the turtle fauna is available (Caribbean Conservation Corporation 1980; Carr et al., 1982). General comments about species distribution and abundance in the Leewards were given by Carr et al. (1982). ECNAMP (1980) mapped turtle nesting localities in the Leewards in a series of resource atlases; data from the present study were incorporated in that for all the islands except Montserrat and St. Barthélemy. An overview of marine turtle populations in the Caribbean region was presented by Rainey and Pritchard (1972). Their evaluation of conservation problems remains pertinent to the Lesser Antilles. Publications concerning recent exploitation of marine turtles in the region include Kermarrec

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(1976), Cato et al. (1978), Carr and Meylan (1980) and Meylan and Mack (1983). The forthcoming proceedings of the Western Atlantic Turtle Symposium, a Caribbean-wide meeting held in July 1983, in Costa Rica, will add much to knowledge of Caribbean turtles.

The present paper is a preliminary description of the marine turtle fauna of the Leeward Islands. It covers a large area that has received almost no previous attention, and it deals with an animal group that presents unique sampling difficulties. Because of limited time and resources, the aim of the study has been modest--merely to begin filling the enormous gap in knowledge of the turtles of this region, and to provide background for improved conservation and management practices. All marine turtles that occur within the Lesser Antilles, with the exception of the loggerhead, are considered endangered by the International Union for the Conservation of Nature and Natural Resources (Groombridge, 1982).

#### METHODS

As are all mobile marine species, sea turtles are difficult to survey. Seasonal and ontogenetic shifts in habitat occupation compound the difficulty. In a short-term study, the surveyor is also hindered by unfamiliarity with the location of appropriate habitats, or by the lack of means to reach these habitats. When one spends only a short time in an area, it is unusual to see any live marine turtles at all, as those who have undertaken surveys of this type know. One survey technique that has been demonstrated to yield useful information is interviewing (Carr et al., 1982). Interviews, carefully structured and executed, allow one to take advantage of the lifelong experiences of others. It is of no small advantage that sea turtles are of commercial value. Interviews are particularly effective when conducted with fishermen whose livelihoods have depended on their ability to catch turtles. Such people are keenly aware of the habitat preferences, seasonality and movements of these animals, and because of this, they can be valuable sources of information.

In the present study interviews were the primary method of gathering data. The interviews were conducted informally, but followed a procedural outline and standardized questionnaire developed by Carr et al. (1982). Informants included primarily fishermen, but also, fisheries personnel, divers, boat captains, other residents and some tourists. An effort was made to evaluate the experience and reliability of each informant, and several interviews were usually conducted at each locality to try to obtain corroboration.

Direct observations were used to corroborate and supplement the interview data. Beaches were surveyed for evidence of nesting (some several times), and whenever possible boat surveys were carried out in foraging habitats. An exhaustive search for specimens and information was made in public markets, fisheries offices, airports, hotels, and shops of many descriptions.

Field work was carried out during six short surveys, between April 1980 and May 1983, except in the case of Guadeloupe, which was surveyed

in December 1978. Coverage of individual islands was roughly comparable; slightly more time was spent gathering information at Anguilla and Montserrat.

Nesting and foraging localities for turtles indicated on the maps include only data gathered during the present study. Information from other sources cited in the text is not included, nor are sites of desultory nesting. Data presented on the maps are by no means complete. For some areas, no information was available. I would appreciate any additions or corrections that readers can offer.

## RESULTS

### Anguilla (18°18'N, 63°17'W)

Anguilla is the northernmost island in the Leewards chain (Fig. 1). Situated 8 km north of St. Martin, the 90 km<sup>2</sup> island extends NE to SW for 26 km. It includes several small, uninhabited cays: Dog Island, Prickly Pear Cays, Seal Island, Sandy Island and Sombrero Island (Fig. 2). There are extensive reefs off the north coast of the island, along a line running westward from Island Harbour to Prickly Pear Cays; fringing reefs are present along most of the south coast (ECNAMP, 1980). The numerous short, white sand beaches around the island are potentially good nesting sites for turtles.

The green turtle and the hawksbill are the most common marine turtle species in Anguillan waters. Both are year-round residents, and both are represented by juvenile, subadult and adult size classes. Green turtles are reported to reach great size (227 kg), which is typical of the species in the Eastern Caribbean. Leatherbacks and loggerheads also occur around Anguilla, but in much smaller numbers. The ridley is not known from this locality. Vernacular names for each species are given in Table 1.

The hawksbill is the principal species nesting on Anguilla. The beaches on Dog Island (Savannah Bay, Stoney Bay, Pigfish Bay and Great Bay) are said to be the most frequently used nesting sites, although some nesting occurs on Prickly Pear Cays and on the main island, as well. A nest found by a resident of North Hill Village at Katouche Bay, in August 1979, contained 200 eggs, and thus was presumably the nest of a hawksbill. Despite the existence of much suitable habitat the total number of hawksbills nesting annually on Anguilla and its associated cays appears to be relatively low.

Green turtles rarely nest on Anguilla. One reliable informant recalled seeing a 227 kg green turtle nest at Pigfish Bay, Dog Island, some ten years ago. Local lore is that Anguillan green turtles do not nest at all on Anguilla, but instead migrate to Aves Island, 257 km west of Guadeloupe, to nest. This may well be the case. Although some solitary nesting does occur, the green turtle is primarily a group nester, and Aves is the only colonial nesting site known for the species in the Eastern Caribbean (Rainey and Pritchard, 1972).

The leatherback, although rare around Anguilla, is well known by residents because of its distinctive appearance. It occurs only as a

nesting visitant. On the mainland, one or two leatherbacks nest each year on the northwest coast (Road Bay, Mead's Bay, Long Bay and Barnes Bay), and there are reports of even more sporadic nesting on the southeast coast at Sandy Hill, Mimi Bay and Captains Bay. It is likely that these turtles are strays from other nesting colonies--perhaps those in the British and U. S. Virgin Islands. Several tagged leatherbacks have been captured on Anguilla, according to residents, but I could not discover the origin of the tags.

Although nesting by leatherbacks on the main island is uncommon, a number of informants reported nesting on nearby Scrub Island. Scrub Island is uninhabited and seldom visited, and it is possible that a small colony of Dermochelys nests there. The reports deserve further investigation.

There are no reliable records of nesting by loggerheads on Anguilla. It is not even known whether mature individuals occur in the area.

Anguilla is one of the few localities in the Eastern Caribbean where hawksbills can be seen, more or less predictably, in foraging habitats around the main island. Throughout much of the region, they have been extirpated from shallow coastal waters by divers and net fishermen, and persist only in more inaccessible offshore habitats. Both hawksbills and green turtles are frequently sighted by residents from the cliffs at North Hill Village and Lower South Hill, and at Isaac's Cliff.

Green turtles, particularly juveniles, can be seen feeding in bays around the main island. Many informants reported seeing them in groups. On the main island, Mead's Bay is considered by local divers to be one of the best places to observe both green turtles and hawksbills.

There is good foraging habitat for hawksbills on the extensive reef that lies north of the island, and for both hawksbills and green turtles around the offshore cays. Both species are frequently sighted at Dog Island, Prickly Pear Cays and Sandy Island. One diver reported a group of 15 green turtles, ranging in weight from approximately 18 to 27 kg, on the eastern side of Sandy Island. A young green turtle captured by a diver at Sandy Island in August 1980, bore a tag that had been put on by the Florida Department of Natural Resources in 1975, when the turtle was released at Cape Canaveral, Florida (R. Witham, in litt.).

Hawksbills are also seen around Sombrero Island, some 48 km northwest of Anguilla. The island is uninhabited, but a boat travels there from Anguilla every 15 days to service the lighthouse. Curiously, all informants who mentioned Sombrero commented on the large size of the hawksbills there.

Information about foraging by loggerheads in Anguillan waters is fragmentary. Some reports were received that loggerheads feed around Dog Island, Scrub Island and Sandy Island, but identification of this species by most Anguillans seems to be unreliable--probably because of the turtle's scarcity there. The species definitely does occur around the island, however. The author saw a subadult on 12 April 1980 that had just been caught in a net at Scilly Cay, near Island Harbour (Pl.

1). On the rather crude public scale at Island Harbour, the turtle weighed 54.5 kg. In general, fishermen consider this species to be rare.

Marine turtles appear to be more abundant around Anguilla than at most of the other Leeward Islands. This abundance can at least partly be attributed to the fact that the island has extensive nesting and foraging habitats, many of which are located on and around offshore cays. Evidence of the value of these less accessible habitats is the abundance of turtles at Dog Island, situated some 13 km from the main island. The slow rate of development of the tourism industry has also been a positive factor in the continued survival of Anguilla's turtle fauna. The usual pressures exerted by the souvenir trade, and the market for turtle meat to supply hotel restaurants, have been minimal.

The survival outlook of marine turtles on Anguilla is by no means secure, however. Populations are already depleted, and exploitation pressures are rapidly escalating as tourism in the region increases. A factor that is already taking a toll is the export of turtles and turtle products to neighboring islands, particularly St. Martin.

A change in the method of fishing turtles is also having a negative effect on populations. The traditional method of setting tangle nets is dying out as costs for net materials and gasoline increase, and as fishermen turn to the more lucrative lobster business. Only about ten people were engaged in setting nets for turtles in 1980. The new generation catches turtles with spearguns. For the most part, they are young divers, who comb the reefs looking for lobster, fish and conch. They take turtles only opportunistically. With spearguns for weapons, however, they are able to catch nearly every turtle they encounter, and as a result, far more are being killed than ever before. Also, smaller size classes are for the first time included in the harvest. The hawksbill is by far the most vulnerable species, because it shares the habitat of the lobster. A few divers who have become aware of the profit to be had in the tortoiseshell trade now concentrate their efforts on hawksbills.

The meat of green turtles and hawksbills is sold locally to private individuals and to hotels on the island. In 1980, the price was approximately US\$2/kg. Fishermen also carry meat to St. Martin to sell, where there is a steady demand to supply the many hotel restaurants. Live turtles are occasionally transported on the ferry that runs to Marigot, St. Martin. The meat of the leatherback is eaten on Anguilla, but is probably not exported. Eggs of all species are taken whenever they are found, but there appears to be no commerce in them--presumably because of their scarcity.

Tortoiseshell is sold to buyers on St. Martin, or to entrepreneurs from St. Thomas and Puerto Rico, who periodically visit Anguilla for this purpose. The price for raw shell in 1980 was US\$20/kg. There is currently no local handicraft in tortoiseshell.

Carapaces of hawksbills and green turtles are dried and prepared for local sale, or are sold to shops on St. Martin. Currently, this trade is small in magnitude. Shells of 15 juvenile hawksbills and one subadult green turtle were seen by the author for sale at various places



on Anguilla. All of the hawksbills were well below the 9 kg minimum size limit (Table 2), and thus had been captured illegally.

Several nesting beaches on Anguilla have been, or are currently being, mined for sand for construction purposes: Shoal Bay, Mead's Bay and Barnes Bay (ECNAMP, 1980). The impact of these operations on sea turtle nesting has not been assessed.

Anguilla has no sanctuaries or parks that provide protection for sea turtles (Table 3). However, a proposal under consideration recommends the establishment of three protected marine areas: Seal Island Coral Reef Reserve, which would include Seal Island, the eastern Prickly Pear Cay and an extensive tract of the north barrier reef; Sandy Island National Marine Park; and Shoal Bay National Marine Park (A. Putney, *in litt.*). All three could potentially benefit sea turtles, provided that specific regulations for their protection were included. Another area that deserves consideration as a possible sanctuary is Dog Island and its surrounding cays and reefs.

#### Saint Martin (18°05'N, 63°03'W)

Saint Martin is approximately 120 km<sup>2</sup> in size and is situated on Anguilla Bank, along with the islands of Anguilla, St. Barthélemy and Ile Fourche. The northern half of the island is a dependency administered through Guadeloupe, an overseas department of France; the southern half is one of six Netherlands Antilles, administered by a central government based in Curaçao. Major cays associated with St. Martin are Flat Island (Ile Tintamarre), Pinel Island and Green Cay, all of which lie off the windward (eastern) coast (Fig. 3). None is inhabited.

The waters around St. Martin are relatively shallow in depth (18-27 m). There are extensive seagrass beds off the northwestern and southwestern coasts. The northwestern seagrass bed is 11,600 ha in size (ECNAMP, 1982). Coral reefs extend along much of the coastline. Detailed descriptions of the shoreline are given by Vroman (1968). Most of the island's sandy beaches are on the southern and northwestern coasts; those on the windward shore are, in general, deeply eroded. Sand mining for construction purposes is carried out at nearly a dozen beaches around the island (ECNAMP, 1980). The beaches on the southern coast are among the most commercially developed in the Eastern Caribbean. Hotels and condominiums are under construction on much of the French coast as well, and there will soon be few beaches on the entire island that remain undeveloped.

The green turtle and hawksbill are the principal marine turtle species around St. Martin. Neither appears to be very abundant. The loggerhead and leatherback are also present but rarely encountered.

The frequency of nesting by all marine turtle species is apparently quite low. A few hawksbills and even fewer green turtles nest at Guana Bay and Oyster Pond on the windward coast, at Long Bay on the southwestern tip of the island, and on Flat Island. Divers have seen copulating pairs of both species in the Oyster Pond area.

Nesting by the leatherback is extremely uncommon, with only one or two individuals observed on the beaches annually. In the recent past leatherbacks have nested at Long Bay and Simpson Bay. Hermans (1961) reported the nesting of a leatherback on St. Martin on 17 April 1960. There are no reports of nesting by Caretta.

Hawksbills occupy reef habitats along the eastern coast of the island, especially off Oyster Pond, Flat Island and Pinel Cay. Two juveniles caught by a diver at Guana Bay had been feeding on a variety of sponges. Hawksbills are also found around Pelican Cay (Guana Cay), and at Man O'War Shoals, 3.2 km directly south of Philipsburg.

Green turtles forage in the extensive Thalassia beds off the northwestern coast. A turtle fisherman from Grand Case sets nets for green turtles at Point du Bluff, west of Marigot. In former times, green turtles could be seen foraging in the harbor at Philipsburg, but with the construction of a deep-water pier at Point Blanche, and the accompanying increase in ship traffic, they are now rarely sighted.

Turtles (species not identified) are also reported to forage around the rocky islet Molly Beday, a sea bird rookery. A resident of nearby St. Barthélemy witnessed the capture of seven turtles there in only a few hours in the late 1960's.

Turtles are not known to live in Simpson Bay Lagoon, although it has at times been freely connected to the ocean. There are currently two inlets, one on the south side of the island at Simpson Bay, and the other on the north.

Population levels of marine turtles on St. Martin appear to be low, despite the presence of much suitable foraging habitat. Although it is not clear what factors may have operated there in the past, commercial exploitation and loss of nesting habitat are the major problems today. Spearfishing is commonly practiced, as is the taking of female turtles and their eggs from nesting beaches. A few French fishermen still employ tangle nets. Fishermen from other islands--notably St. Barthélemy--also set nets around St. Martin. Turtle meat is occasionally sold at the public market in Marigot, the main town on the French side of the island.

Although some turtles are captured for local sale or subsistence use, the greatest pressure on St. Martin's turtle populations is exerted by the tourist industry. Souvenirs made from turtles, and turtle steaks for restaurants, are in great demand in the tourist-oriented economy. For the most part, the supply of turtles is provided by divers who use spearguns. The depleted status of local stocks necessitates travel by the divers to neighboring islands, such as Anguilla and St. Eustatius. There is also an active trade in tortoiseshell. In 1980, one tortoiseshell dealer in St. Martin was buying shell from several islands in the northern Leewards, and exporting it to Holland. Despite the high price he offered, US\$100/kg, he was able to purchase less than half as much shell as formerly, presumably because hawksbill populations have been so badly depleted.

There are no laws protecting marine turtles on Dutch St. Martin. Controversy about the respective jurisdictions of the central government

and the local island government has resulted in this situation, which prevails not only on St. Martin but also on Saba and St. Eustatius. The French portion of the island, as a dependency, is subject to the laws of Guadeloupe. Legislation bearing on turtles is summarized in Table 2.

St. Martin currently has no marine parks or sanctuaries, although several areas are under consideration (ECNAMP, 1980) (Table 3). Of these, Man O'War Shoal, Pelican Cay and Molly Beday are of importance as foraging habitat for turtles. Whether protection will be given to marine turtles in these sanctuaries is not known.

Saint Barthélemy (17°53'N, 62°50'W)

Saint Barthélemy lies 18 km southeast of St. Martin, and is also a dependency administered through Guadeloupe. The small rocky island is roughly 25 km in area. It includes several uninhabited islands and cays, the largest of which are Ile Fourche, Ile Bonhomme, Ile Frégate, Ile Toc Vers, and La Tortue (Fig. 4). There is almost no reef habitat around the island and its associated cays, but there are extensive seagrass beds off much of the coast (ECNAMP, 1980). There are several relatively short, white sand beaches that appear to be suitable nesting habitat for sea turtles.

Four species of marine turtles occur at St. Barthélemy: the green turtle, hawksbill, loggerhead and leatherback. Of these, the green turtle and hawksbill are by far the most common. They are seen primarily in coastal habitats, whereas the loggerhead and leatherback, on the rare occasions that they are seen, are encountered in the open sea. So few loggerheads occur that one turtle fisherman interviewed at Flamand had seen only five in his lifetime of some 50 years. The last he had captured 8-10 km offshore; its straight carapace length was 52 cm (Pl. 5).

The beach at Anse Columbier and one on Ile Fourche were indicated as nesting sites by ECNAMP (1980). The species involved was not identified. Very little evidence of nesting was found during the present survey. Reports of incidental nesting at Flamand presumably involved hawksbills, although one leatherback had nested there in the recent past. Flamand residents reported that turtles formerly nested there in somewhat greater numbers, but never in any concentration. No other reports of nesting by leatherbacks were received. It appears that the loggerhead does not nest at all on the island.

A resident of the village of Corossol reported that turtles used to nest on the small beach at this village up until 15 years ago, but had ceased to do so after bright lights were installed behind the beach. The species of turtle was not identified.

The only nesting attributed by informants to the green turtle was that of a single turtle that emerged at Anse de Grande Saline in 1978. Grande Saline and nearby Anse du Gouverneur are two of the largest beaches on the island. They are on the southern coast, which is sparsely inhabited and difficult to reach by car. Because of their relative isolation, they hold the most promise as nesting sites for sea turtles. The beaches were not visited during the present survey. Sand mining is carried out at Grande Saline (ECNAMP, 1980).

ECNAMP (1980) identified feeding areas at Anse du Gouverneur and Anse de Grande Saline on the southern coast, off the northwestern peninsula near Columbier, and to the southwest of Ile Fourche. These feeding grounds closely correspond to seagrass beds described in the same publication, and are presumably pastures where green turtles forage.

At one time, turtles occupied feeding habitats around the many small cays. They have been depleted in these nearshore habitats, according to local fishermen, who complain that they now must travel farther to set their nets--to Ile Fourche, or to neighboring St. Eustatius or St. Martin. A tortoiseshell buyer from St. Martin reported having tried to purchase a "huge mound" of shell that St. Bart fishermen had accumulated from hawksbills caught around St. Eustatius.

Residents of St. Barthélemy recognize a decline in local turtle population levels, and offer as evidence reduced nesting levels and smaller catches. One net fisherman caught 40 turtles in 1975; in 1980, he caught only one, although he claimed to have tried equally hard. During the same year, another fisherman in the same village caught only three.

The number of men setting nets for turtles is small--probably fewer than seven on the island. Nobody is dependent on turtle fishing for a livelihood. They catch turtles to obtain meat for their own consumption, and to sell in their villages. To what extent the meat is sold to restaurants is not known. To an increasing extent, the fishermen also seek income from raw tortoiseshell--which was selling for US\$18/kg in 1980--and from polished carapaces. The shells are sold directly to tourists. No turtle souvenirs were seen for sale in the shops in Gustavia.

Legislation pertaining to sea turtles is summarized in Table 2. There are no parks or protected marine areas.

#### Saba (17°38'N, 63°14'W)

Saba, another island of the Netherland Antilles, is situated 45 km south of St. Martin. It is approximately 13 km<sup>2</sup> in area. The island rises steeply from an ocean depth of about 650 m, and is formed by the cone of an extinct volcano. There are few sheltered bays around the rocky coastline and no permanent beaches, although seasonal accumulations of sand are occasionally used for nesting by sea turtles. There are only small, scattered patches of seagrass along the coast, the most extensive of which lie off Flat Point and Old Booby Hill; there is almost no reef habitat (ECNAMP, 1980) (Fig. 5). Saba Bank, an extensive shallow, sandy shelf, lies southwest of the island.

The green turtle and the hawksbill are the only marine turtle species commonly seen at Saba. Of these, the green turtle is said to be the more common. Both are seen year-round in foraging habitats around the island. On rare occasions, leatherbacks are sighted on Saba Bank, presumably when passing in migration to other destinations. Only one report of a loggerhead was heard; the turtle had been captured on Saba Bank.

Saba has virtually no permanent beaches and it is difficult to imagine any but the most desultory nesting by sea turtles on the seasonally deposited beaches. Residents insist, however, that hawksbills and green turtles do nest on rare occasions at Cave of Rum Bay, Well Bay and Fort Bay. The numbers are undoubtedly very small. One octogenarian recalled the nesting of a leatherback at Fort Bay many years ago.

Both green turtles and hawksbills have been seen mating in Saban waters. Curiously, there have been several sightings of green turtles mating around the buoy in the harbour at Fort Bay. The turtles appear to be attracted to the floating buoy, as they are to decoys which fishermen sometimes use to catch them. The curved carapace length of a female green turtle that had been captured with a speargun while mating at the buoy was 115 cm. This is considerably larger than the average size of green turtles in the western Caribbean and comparable to that of turtles nesting at Aves Island.

Because of the island's small size and steeply sloping coastal shelf, there is limited foraging habitat for turtles. That which exists, however, appears to be well populated by green turtles, and to a lesser extent, by hawksbills. During the days when turtle nets were used, favorite netting locations--and thus, presumably, good feeding areas for turtles--were Ft. Bay, Cove Bay and Green Island (Pl. 9). Although turtle netting is not practiced today, information on turtle foraging areas is available from members of local scuba clubs. They report seeing adult green turtles and hawksbills around Green Island; green turtles in the area north of Corner Point, and along the south coast between Giles Quarter and Tent Bay; and hawksbills on the reef at Core Gut Bay. Green turtles are also seen by fishermen out on Saba Bank, but no one interviewed had knowledge of their abundance or seasonality there.

Turtles at Saba are said to be "not so plentiful, now." The hawkbill is thought to be particularly scarce, largely as a result of spearfishing. A former turtle fisherman considered turtles too scarce today to make setting nets worthwhile.

Indeed, not a single net fisherman could be identified on Saba in 1980. Turtles used to figure more prominently in the island's culture. During the early part of the century, Sabans used to sail by schooner to Aves Island to harvest green turtles. The men were dropped off on Aves for two week periods to turn turtles as they came up to nest. The ship then returned to transport them and their catch of as many as 50 turtles back to Saba. A small number of men on the island have customarily been involved in setting turtle nets in Saban waters. In the 1940's there were four turtlers operating out of The Bottom.

Although the practice of fishing for turtles with nets has essentially died out, spearfishing has replaced it. Spearfishing is very popular, especially among members of the active scuba clubs on the island. Club members estimate that only 10-20 turtles are killed annually with spearguns, but it is likely that the catch exceeds this. It was surprising to learn that even adult turtles are taken in this manner, as evidenced by the capture of the 115-cm green turtle at Fort

Bay. In order to capture such large turtles, a long line and a float are attached to the spear to allow pursuit of the turtle by boat, once the spear is well-lodged. The turtle can be quickly tired in this way, and then landed with little difficulty. Although spearfishing constitutes the greatest threat to turtles at Saba today, they are also captured and killed on the rare occasions that they are encountered on the beach.

Turtle meat is popular among Sabans, as are turtle curios. Polished carapaces are on display in many homes. One craft shop in Windwardside offered for sale the shells of five hawksbills and two green turtles, all of which had been taken from turtles captured with spearguns. The magnitude of the souvenir trade is small at present, owing to the small number of shops and tourists. There is no evidence of trade in tortoiseshell, presumably because the number of hawksbills that are caught is relatively small.

There are no laws pertaining to sea turtles, and no protected marine areas.

#### Saint Eustatius (17°30'N, 63°00'W)

Saint Eustatius, or Statia, as it is called, lies 22 km southeast of Saba, and is one of the Netherlands Antilles. It is of volcanic origin, and is approximately 30 km<sup>2</sup> in area (Fig. 6). Much of the shoreline is rocky and steep, with few beaches suitable for nesting by sea turtles. Coral reefs encircle almost the entire island, with the greatest development off the southwest quadrant; a large seagrass bed lies north of Oranjestad Bay (ECNAMP, 1980).

The hawksbill and green turtle are the only marine turtles that commonly occur. The hawksbill, which is said to be the more common of the two, appears to be relatively abundant, compared to population levels at neighboring islands. This is presumably due to the availability of extensive reef habitat and to an unusually low level of exploitation. The leatherback is known only from a few nesting records. The loggerhead has not been recorded.

Few turtles of any species nest at Statia. Those that do, favor beaches on the Atlantic side. The locality most frequently named by informants as a sea turtle nesting site is Zeelandia, in Concordia Bay. This is a wide, high-energy beach, backed by high dunes. It is the longest on the island--approximately 2 km in length. Both green turtles and hawksbills are reported to nest there on rare occasions. The leatherback has also been observed. Because of the orientation of Zeelandia with respect to Atlantic currents, it is subject to seaborne pollution; it also serves as the solid waste disposal site for the island (ECNAMP, 1980).

No nesting is reported on the second-largest beach on the island, that at Oranjestad, the capital. This is a relatively low-energy shore, and because of its proximity to the capital, it is heavily used by people. Single reports were received of nesting by hawksbills on small beaches at Nap, Corre Corre Bay, Kay Bay and Crook Bay, but were not corroborated by other interviews.

Divers from the local scuba club see hawksbills of all sizes on the reefs around Statia, and off the south coast near White Wall. Green turtles have been observed blowing in the harbour at Oranjestad. One fisherman related his view that small green turtles sleep in an area near the pier in the harbour, and move offshore each day to feed. Twenty years ago, when nets were still used to catch turtles, Oranjestad Bay, Jenkins Bay and White Wall were preferred netting locations.

Little information is available on population trends of Statia's marine turtles. Several of the residents interviewed believed that fewer turtles nested at present than formerly. This, in itself, is a weak criterion, however, because there is no evidence that the level of nesting was ever significant.

Statia's turtle populations seem to be subject to less pressure from exploitation than elsewhere in the region, at least at the present time. Netting is not practiced, and apparently has not been for several years. Turtles are captured by spearfishermen, but because there is relatively little tourism on the island, the usual markets for curios and turtle meat do not exist, and the catch appears to be small. No trade in tortoiseshell was reported, although it may occur. Turtles are killed on the nesting beaches whenever they are encountered, and unknown numbers are taken by net fishermen and divers from other islands. There is no legislation regarding their capture.

There is a protected marine area near Jenkins Bay (ECNAMP, 1980). The bay was once considered a good foraging area for turtles, but its status today is unknown.

#### St. Kitts (17°20'N, 62°45'W)

St. Kitts, or St. Christopher, as it is officially named, lies 112 km southwest of St. Eustatius. It and the nearby island of Nevis have in the past been politically united as an Associated State linked to Great Britain. They gained independence in September 1983. The 168 km<sup>2</sup> island is of volcanic origin, and lies on a bank with St. Eustatius and Nevis. Most of the population of 36,000 is concentrated along the coastline; the long southeastern peninsula is nearly uninhabited (Fig. 7). The best nesting habitat for turtles is on the Atlantic coast, where an extensive beach stretches more or less continuously from the Cayon River to North Frigate Bay. There are also several small beaches around the tip of the southeastern peninsula. The beaches on the western coast of the island are relatively flat and narrow. Coral reefs extend along much of the coast and are particularly numerous on the windward side between Canada Estate and North Frigate Bay, and at Dieppe. There are extensive seagrass beds covering 1,200 ha around the southeastern peninsula (ECNAMP, 1980, 1982).

Three species of marine turtles commonly occur at St. Kitts. The green turtle and hawksbill are seen year-round and are represented by a wide range of size groups. The leatherback is present almost exclusively during the nesting season. The loggerhead is seen only rarely.

The nesting season for leatherbacks is March through May. They nest on the Atlantic coast, principally between the Cayon River and Key

Ghut, but also, to a lesser extent, on beaches as far south as Sand Bank Bay. Residents of the village of Key reported that 8-12 leatherbacks nest annually between the Cayon River and Key Ghut. On 19 May 1983 there were seven tracks of varying ages on the beach. The black sand beach is wide and has a high platform. Its approach from the sea is unobstructed, whereas beaches to the south are to varying degrees blocked by coral reefs.

Leatherbacks also nest in small numbers on the western coast at Belle Tete, the sandy promontory just north of Sandy Point Town. Caldwell and Rathjen (1969) reported the capture of a leatherback on this beach in June, 1968. This is also a black sand beach. It has a steeper profile than is characteristic of beaches on the leeward coast and is an area of sand accretion. Sand mining has been carried out there for many years (Pl. 4). Five leatherback tracks of varying ages were found on this beach during a survey on 18 May 1983. Another leatherback was reported to have nested during the period 19-26 May.

Hawksbills and, to a lesser extent, green turtles, nest sporadically on the island. The most frequently mentioned nesting sites for both species are on the tip of the southeastern peninsula--at Major Bay, Banana Bay, Cockleshell Bay, Mosquito Bay and Sand Bank Bay. These beaches are accessible only by boat, a factor that has probably contributed to their continued status as nesting sites. Both species also nest incidentally at Conaree and Belle Tete.

Green turtles forage, occasionally in groups, on the north coast at Willett's Bay and around the southeastern peninsula. Hawksbills are seen on shallow reefs around Dieppe, Belle Tete and Canada Estate. One loggerhead was reported to have been caught inside the reef at Dieppe, and another off Key Ghut.

Sea turtle populations at St. Kitts are considered by most residents to be declining. Net fishermen complain about declines in annual catches. Catch rates for fishermen today are of the order of 10-20 per year. A turtle fisherman at Dieppe used to catch 50 turtles per year in the early 1960's; in 1979, he caught a total of four green turtles and hawksbills, and one leatherback. He implied that he had exerted equal effort during both periods--although this is a difficult point to establish. Approximately ten people on the island still set nets for turtles. None are exclusively dependent on this for their livelihood, but the meat and income are undoubtedly an important contribution to their subsistence. Most of the turtles that are caught are immature green turtles. Legislation regarding the capture of turtles is summarized in Table 2.

Meat of all species of sea turtles is eaten; that of the leatherback is the least preferred. Meat is sold in many villages, and occasionally in the public market in Basseterre. It is also sold to local hotels. The price in 1980 was US\$0.80/kg; it had increased to US\$1.60/kg by 1983. Turtle eggs are also eaten, but are rarely sold. The oil of the leatherback is widely used for medicinal purposes.

In May 1983 tortoiseshell sold for US\$24/kg. Some of the shell is worked locally, but most is exported raw. There is currently little use of turtles for souvenirs, presumably because of the low level of tourism.



There are currently no sanctuaries or parks on St. Kitts that provide protection for marine turtles. However, a planned protected area around the southeastern peninsula would include important foraging areas.

Nevis (17°09'N, 62°35'W)

Nevis is separated from St. Kitts by a strait 3.2 km wide. The roughly circular island, 93 km<sup>2</sup> in area, is a volcanic cone that rises to a peak of 985 m. Coral reefs are present around much of the coast, and extensive seagrass beds lie off the northwest and southern shores (ECNAMP, 1980) (Fig. 8).

The green turtle and hawksbill are the most common turtles around Nevis, the former being the more abundant. Both species are represented by a wide range of size classes. The leatherback is also known to occur, but only as an infrequent nesting visitant. The loggerhead is the least common species; the few individuals that have been seen were immature.

There is little nesting habitat for sea turtles on the island. The most extensive beach is Pinney's Beach. It is a flat, low-energy shore, backed by coconut groves, and located close to Charlestown, the capital. Because it is one of the few beaches on the island, it is heavily frequented by residents and tourists. There are reports that green turtles and hawksbills have nested there in the past, but it seems doubtful that much nesting occurs today. Caldwell and Rathjen (1969) reported nesting by a leatherback on the western coast of Nevis in 1966. According to the original source of this information, the leatherback had nested on Pinney's Beach (A. Anslyn, pers. comm.). This was considered by local people to be an unusual event.

Several small beaches on the southeast coast--at Indian Castle Estate and north of Red Cliff--are probably the only localities on the island that are still regularly used for nesting. Hawksbills nest there in very small numbers, as do leatherbacks. The second leatherback mentioned in Caldwell and Rathjen's paper (1969) had nested on the beach north of Red Cliff (A. Anslyn, pers. comm.). In terms of physical characteristics, these beaches seem to be marginal nesting habitat. Indian Castle Beach is partly cobble. It is heavily littered with debris, and the sandiest section is fronted by emergent rocks. The dunes behind it are being extensively mined for sand. The beach directly north of Red Cliff, called Black Bay by local residents and White Bay on the map, is also partially blocked by reefs. It is nearly flat, and its upper reaches are waterlogged in places. In May 1983, it was fouled by seaborne tar. That turtles nest at these southeast localities at all is probably due to the scarcity of beaches in the area, and to their relative isolation.

Green turtles forage widely around the island. They are caught in nets off the southeast and southwest coasts, and in the vicinity of Newcastle. Several have borne tags originally put on at the nesting beach on Aves Island, suggesting that Nevis may be one of the resident feeding grounds for that population. Hawksbills are captured in nets in the Black Bay area, although less frequently than green turtles.

There is limited information available on changes in population levels of marine turtles on Nevis. A tortoiseshell buyer in Charlestown reported a decrease in the amount of tortoiseshell that he was able to purchase from fishermen on the island--from 136 kg/yr in 1975 to 91 kg/yr in 1980. Inasmuch as hunting pressure increased during this period, a decline in the hawksbill population may have occurred. The status of green turtles around Nevis is unknown.

At least a dozen people on Nevis, most of whom live in Hanley's Road, Bath Village, and Newcastle, fish for turtles with tangle nets (Pl. 7). They fish turtles to supplement their incomes and diets; none are solely dependent on turtlefishing for their livelihood. Five to 15 turtles per year were reported to be the average catch per fisherman, although there is considerable fluctuation from year to year. Most of the turtles caught are green turtles.

In May 1983 turtle meat was selling for US\$1.60/kg. The meat of the green turtle is preferred, but all species are eaten. Leatherback meat is sometimes mixed with meat of other species, and sold to hotel restaurants. When abundant, green turtles are shipped alive on the ferry or the "lighters" to the public market at Basseterre, St. Kitts. The price in 1983 was US\$0.80/kg live weight, US\$2.00/kg dressed. Turtle oil, principally derived from the leatherback, is widely used as a home remedy for colds.

There is an active market for tortoiseshell on Nevis. In 1980, a buyer in Charlestown was purchasing shell from fishermen around the island for US\$16/kg and reselling it to a dealer from St. Lucia. The price in 1983 ranged from \$16 to \$24. Other buyers from Puerto Rico, Dominica and Guadeloupe periodically canvas the fishermen at their homes. There is limited marketing of tortoiseshell and polished turtle carapaces in local tourist shops. The ban on importation of turtle products into the United States is said to have sharply curtailed this trade in recent years.

There are no protected marine areas around the island.

#### Barbuda (17°40'N, 61°50'W)

Barbuda, a coral limestone island, is located 41 km north of Antigua, and lies on the same shallow submarine shelf. The two islands are politically united as a two-state nation within the Commonwealth, having gained independence from Great Britain in 1981. Barbuda has a land area of approximately 160 km<sup>2</sup>. The only settlement is the village of Codrington, situated on the east coast of a large lagoon (Fig. 9). An exceptionally high percentage of the coast line is composed of sandy beaches. Coral reefs encircle most of the perimeter of the island. An enormous seagrass bed (19,800 ha) lies off the western coast (ECNAMP, 1980, 1982).

Four species of sea turtles occur at Barbuda: the green turtle, hawksbill, loggerhead and leatherback. Local names for the various species are given in Table 1. The green turtle and hawksbill are the most common, occurring as juveniles, subadults and adults. Green turtles are the more abundant of the two, and, as elsewhere in the region, they attain great size (227 kg). Both species are present

year-round in foraging habitats. Loggerheads are much less common than green turtles or hawksbills, but are well known to fishermen. Most are of intermediate size, weighing approximately 18-45 kg. The leatherback is the least common species at Barbuda.

Green turtles and hawksbills are the principal species that nest on the island. Nesting density is probably higher on Barbuda than on any other island in the Leewards, but absolute numbers are still very modest. Nesting localities are shown in Figure 9. The shore from Billy Point to The River is almost continuous beach, and green turtles and hawksbills are reported to nest along all of it. Hawksbills are the predominant nesters on the beach that extends from Spanish Well Point to Coco Point (Plate 8). Nesting probably occurs on several additional beaches on the east coast, but was not reported because of a lower level of surveillance by fishermen.

Only a few leatherbacks nest on the island each year. One that emerged at The River in 1979 became entrapped by debris and died of exposure. Loggerheads are not known to nest.

Green turtles and hawksbills are common in foraging habitats all around the island. A fisherman who sets nets inside the reef at Welch Point catches only green turtles there. Hawksbills are more common on the reefs near Goat Point and Cedar Tree Point. Immature green turtles have been caught in mangrove areas inside the entrance to Codrington Lagoon. The Creek, as the entrance area is called, is a favorite netting location. A juvenile green turtle estimated to weigh less than a kilogram was reportedly seen resting on top of a net at this location. Opinions as to whether hawksbills also enter the lagoon to feed were contradictory. Loggerheads are said to be most common around the northwestern end of the island.

The greatest number of turtles is caught in nets during January and February. Fishermen attribute this to the "groundswell" that occurs during this season. They believe that heavy seas and turbid water force turtles to move into shallow coastal areas to feed.

Cato *et al.* (1978) discussed exploitation of turtles at Barbuda. Heavy exploitation has continued, and possibly increased, since their report. Turtles are captured to provide meat for hotel restaurants in Antigua and Guadeloupe, and to a lesser extent, in St. Thomas and Puerto Rico. During the winter season live green turtles are flown out several times a week on cargo planes that come to Barbuda to pick up lobsters. Most of these are subadult and adult green turtles; juvenile turtles are kept for local consumption (Pl. 6). A resident who coordinates the export business reported that "several hundred" are exported annually. Turtle carapaces and tortoiseshell are also exported. There is no tourism on Barbuda to support a local souvenir trade.

Turtles are caught by both net fishermen and lobster divers (Pl. 3). A single fisherman may set as many as eleven nets. Loggerheads are sometimes released alive, when the meat of other preferred species is available. Turtles are also chased with outboard-powered boats and captured by hand. Small ones are taken incidentally in trammel nets. One fisherman reported that on several occasions he had found loggerheads floating at sea entangled in pieces of netting. He

associated these events with the presence of Japanese fishing boats in the area, and was of the opinion that the entangled turtles had been cut loose from trawls and left to drift.

Turtles and eggs are routinely taken from nesting beaches. Surveillance for tracks is carried out by boat, incidental to other fishing activities.

Changes in population levels of marine turtles at Barbuda are difficult to assess because of changes in fishing methods and effort. The growth of the lobster fishery into a major industry has had significant repercussions, by increasing the number of people out on the reefs, and by providing a mechanism to transport live turtles to market that would not otherwise exist.

No information on the occurrence of turtles at Palaster Reef Marine Park, off the southern tip of the island, was gathered during the survey.

#### Antigua (17°05'N, 61°50'W)

Antigua lies 64 km east of Nevis, and 64 km north of Guadeloupe. Along with its dependencies, Barbuda and Redonda, it was an Associated State linked to the United Kingdom until independence was gained in November 1981. The 280 km<sup>2</sup> island has a deeply indented shoreline with numerous white sand beaches and protected bays (Fig. 10). Coral reefs are well developed off the northern and eastern coasts; bays along the northern coast are fringed by mangroves and shelter seagrass beds (ECNAMP, 1980).

Green turtles and hawksbills are the most common marine turtles in Antiguan waters, the green turtle being the more abundant of the two. Both occur there year-round and are represented by a wide range of size classes. Leatherbacks are observed only rarely. Two informants were familiar with the loggerhead, but its occurrence at Antigua needs confirmation.

The hawksbill is the principal species nesting on the island. Nesting is reported on several beaches in the Five Islands Village area: Galley Bay, Landing Bay, Hawksbill Bay, Pinching Bay and Long Bay. Of these, Pinching Bay is reported to be the best, although even there nesting density is apparently of the order of only a few individuals per year. Deep Bay and all of the above bays except Long Bay were surveyed on 7 September 1980. No tracks were found, and local residents reported that no turtles had nested on those beaches so far that year. ECNAMP (1980) listed Deep Bay and all other west coast beaches south to Johnson's Point as turtle nesting areas; the species involved was not identified.

Elsewhere around Antigua, hawksbills and, more rarely, green turtles nest at Pasture Bay on Long Island, Grape Bay on Guiana Island, and at Long Bay, near Willikies. Hawksbills used to nest in Dutchman's Bay, but do so only rarely today. Hawksbills have been seen mating on the outer edge of the reef near Urlings in May.

Leatherbacks nest only rarely on Antigua, as reported by Bacon (1971). One caught in a net off Jolly Beach several years ago was

believed to have been approaching to nest. Another emerged to lay 112 eggs on one of the beaches on the north coast on 7 April 1981. On 20 May 1981 residents identified a nesting turtle as the same individual.

The bays on the northern coast of Antigua provide particularly good foraging habitat for green turtles, and for this reason most netting is carried out in this area. Nets are also set at feeding sites on the western and southern coast at Hawksbill Bay, Pinching Bay, Dark Wood, Urlings, and Mt. Carmel. Green turtles and a smaller number of hawksbills are captured at all localities.

Turtles also forage around the uninhabited island of Redonda, which is politically associated with Antigua and Barbuda. The 2.6 km<sup>2</sup> island lies 42 km southwest of Antigua, and is surrounded by deep water. During calm weather spearfishermen from Montserrat travel there to catch turtles. Three green turtles (32, 32, and 42 cm in straight carapace length) and two hawksbills (27 and 47 cm straight carapace length) were caught there in a single day in November 1980 by one diver. There is no nesting habitat for turtles on the rocky island.

A decline has been noted in both the number of turtles caught at Antigua (Rebel, 1974) and in the number of turtles nesting (Cato et al., 1978). Hawksbill nesting, in particular, is said to have once been more frequent.

There are approximately a dozen fishermen on the island who still set nets for turtles. The practice was apparently more common in the past. Rebel (1974) gave landing statistics for Antigua for the period 1943-1948. The average annual catch during these years was 67 turtles (range 40-116). These were almost certainly turtles that had been taken in nets. Statistics on turtle landings are no longer kept, so comparison with today's fishery is not possible. In 1980 a turtle fisherman at Urlings reported that he was catching an average of 24 turtles per year, most of which were green turtles. At Willikies, a fisherman reported catching 50 turtles in 1978, and a total of 20 (16 green turtles, 4 hawksbills) between October 1979 and late April 1980. As elsewhere in the region, turtles are caught to an increasing extent by spearfishermen who are diving for lobsters, reef fish and conch.

A large percentage of the turtle meat available on the island is sold under contract by the fishermen to hotel restaurants. Some meat is sold in the villages at US\$0.80/kg.

Tortoiseshell is worked locally and is marketed in tourist shops in St. John's. It is also exported raw (Pl. 2). In 1980 the price paid to fishermen for raw shell was US\$12/kg. Shell buyers go directly to the fishermen's homes to purchase it. Whole polished carapaces are sold to local souvenir shops.

Because of the high value of turtle products, turtles are usually captured on the nesting beach whenever they are encountered. The meat and shell of an adult hawksbill that had been caught at Galley Bay in June 1979 brought the captor US\$111. Residents of Five Islands Village used to hunt for turtles regularly on the beach, but they do so rarely today, presumably because so few turtles emerge.

Table 3 lists existing and proposed parks at Antigua that include marine areas. No information on the occurrence of marine turtles in Diamond Reef Marine Park was gathered during the present survey. The park lies approximately 4 km northwest of the island. The proposed park at Guiana Island would include a turtle nesting beach, Grape Bay, as well as foraging habitat. The second proposed park is on the southern coast, and it would also include a known turtle foraging area.

Montserrat (16°45'N, 60°15'W)

The British colony of Montserrat lies in the southern Leewards, 43 km southwest of Antigua. It is a rugged volcanic island, approximately 100 km<sup>2</sup> in area. Much of the 49 km shoreline is formed by steep cliffs or boulders. The only permanent beach on the windward (eastern) side is a 0.6 km stretch at Farm Bay, directly south of Blackburne Airport (Fig. 11). There are nine beaches on the leeward coast, ranging in length from 0.1 to 1.4 km. All are dark volcanic sand except the northernmost, Rendezvous Bay, which is composed of white coral sand. Depending on the season, there are temporary sand deposits in patches along the rocky coast, and the more substantial of these provide nesting habitat for turtles.

Seagrass beds are located off the northern and southern extremes of the island, around Bransby Point, and off Blackburne Airport (ECNAMP, 1980). The coastal shelf is extremely narrow off the southern end of the island, the 90 m bathymeter line being only 0.6 km offshore. Small scattered patches of reef are present along all but the windward coast (ECNAMP, 1980). An artificial reef was under construction between Isles Bay and Fox's Bay in mid-1983.

Green turtles and hawksbills are the only marine turtles commonly found around Montserrat. Both are year-round residents and are represented by a wide range of size classes. Adult green turtles reach very large size; one offered for sale in a local gift shop measured 104 cm in straight carapace length. Green turtles weighing as much as 180 kg are reported to occur. Hawksbill carapaces that I examined on the island ranged in size from 19.5 to 84 cm in straight-line length. The leatherback and the loggerhead are rarely encountered, either on the beach or in the water.

There is little nesting by marine turtles on Montserrat, presumably because of constant human activity on the island's few beaches. Beaches are used for recreational purposes, and because there are no natural harbors, fishermen store their boats there. The incidental nesting that does occur can be mostly attributed to hawksbills. ECNAMP (1980) indicated nesting sites (species not identified) at the following leeward beaches: Rendezvous Bay, Carr's Bay, Little Bay, Soldier Ghaut Bay, Old Road Bay and Isles Bay. Judging from information gathered during the present survey, these are most likely sites of incidental hawksbill nesting. Most nesting takes place at Rendezvous Bay, one of the less accessible beaches on the island. A nest discovered by local residents at this beach on 18 February 1980 contained 250 eggs, and thus was probably made by a hawksbill. Hawksbills apparently still nest at Old Road Bay, in spite of heavy human usage. Three disoriented hawksbill hatchlings were reported found on the golf course adjacent to this beach on 17 January 1980.

Some local residents believe that green turtles also nest on the island, but no evidence of recent nesting was found during the present survey. Bacon (1971) reported nesting by green turtles, as well as hawksbills, at Little Bay and Isles Bay.

Nesting by the leatherback is extremely rare, but does occur. A surprising record is that of a leatherback that emerged to nest in May 1980 at Whoppin Bay, a narrow, rocky beach adjacent to Plymouth. Another was reported to have nested years ago on the beach in front of Plymouth cemetery. Turtles are also reported to nest at Farm Bay, but it is not known which species are involved.

Green turtles and hawksbills are relatively common in foraging habitats around the island. One of the best feeding areas for both species is off the lower southwestern coast. One spearfisherman caught seven green turtles (26.5 to 41 cm straight carapace length) and three juvenile hawksbills there during September and October 1980. Larger turtles also occur in the same area, but they tend to stay in deeper water and are not usually pursued by the divers. Another informant reported seeing a group of 12 green turtles, ranging in size from 10 to 30 kg, feeding near the southern tip of the island. Other foraging areas around Montserrat are indicated in Fig. 11. A fisherman who sets nets around the northern end of the island reported catching more hawksbills than green turtles.

Rebel (1974) described the turtle fishery that existed on Montserrat in the 1940's. The fishing season was April to November. Sixteen nets were in use in 1948. During that year seventy turtles were landed at Plymouth, and an unknown number in the northern sector of the island. To a limited extent netting is still practiced today in the northern part of the island. The government apparently has discouraged the taking of turtles by buying the nets from the fishermen. Only a few individuals on the island still know how to make them, and the shortage has become a limiting factor. To an increasing extent, turtles are caught by young divers who use spearguns. Legislation regulating the capture of turtles is given in Table 2.

Turtle meat is usually sold privately, although during the open season it may be found at the public market or in restaurants in Plymouth. Green turtle meat is preferred to that of other species. One fisherman reported exporting small quantities of turtle oil to St. Kitts.

There has apparently been trade in tortoiseshell for many years. Rebel (1974) reported that 45.5 kg, valued at US\$96, was exported from Montserrat in 1948. The price for raw shell in 1980 was US\$13/kg. Some is worked locally, but most is exported raw. The prisoners at the jail are employed making tortoiseshell jewelry that is marketed at local shops.

In 1980, there was an active curio trade in turtles. Almost every tourist shop in Plymouth, and even some bars, had polished carapaces of green turtles and hawksbills for sale. The carapace of an 84 cm hawksbill was priced at US\$74. Most of the shells for sale were of juvenile or subadult turtles. In 1983, this trade seemed to have abated somewhat. One shopkeeper attributed the decline to the U.S. ban on

importation of turtle products. Tourists were apparently better informed about the law, or had heard about confiscation procedures at U.S. entry ports. The decline in sales was affecting local divers, who are the suppliers of the shops. One diver showed me an automobile trunk full of carapaces that he had been unable to sell.

Loss and degradation of nesting habitat are also factors affecting turtle populations on Montserrat. Little Bay, one of the less disturbed beaches remaining on the island, is to be developed into a large resort hotel site. Sand mining for construction purposes is being practiced at several beaches, including Fox's Bay and Farm Bay. Mining operations at Farm Bay have radically altered the beach profile. Whether sea turtles have been affected is not known, but they are reported to nest there. There are no protected marine areas.

#### Guadeloupe (16°20'N, 61°30'W)

Guadeloupe, an overseas department of France, includes two large islands, Grande Terre and Basse Terre (1513 km<sup>2</sup>), and a number of smaller islands that are considered dependencies. Two of these, St. Martin and St. Barthélemy, have already been considered. The others--La Desirade, Marie Galante and Les Saintes--are adjacent to Grande Terre and Basse Terre, and are treated herein (Fig. 12). Beaches and important marine habitats around the various islands are mapped by ECNAMP (1980).

Four species of marine turtles occur at Guadeloupe: the green turtle, hawksbill, loggerhead, and leatherback. Olive ridleys may be occasional waifs in the area. A head and three carapaces of a fifth species, the olive ridley (Lepidochelys olivacea), were seen for sale at Basseterre, but a local origin could not be confirmed. I have seen only one live ridley (37 cm curved carapace length) in the Lesser Antilles. It was caught at Case-Pilote, Martinique, in December 1978. Vernacular names for sea turtles are given in Table 1.

Green turtles and hawksbills are the most common species at Guadeloupe. Both are year-round residents, and are represented by juvenile, subadult and adult size classes. Green turtles weighing as much as 250 kg have been captured. The carapace of a green turtle measuring 112 cm in straight-line length was seen for sale in Basseterre. Loggerheads are considerably less abundant than green turtles or hawksbills, but are well known to fishermen. They are seen more frequently around Grande Terre than elsewhere at Guadeloupe. Juveniles of this species are rarely observed. Almost all of the 38 loggerheads examined on the island were of subadult size. The leatherback is the least common species; only hatchlings and adults have been observed.

Nesting localities are indicated in Figure 12. Hawksbills and green turtles are the principal nesters, but neither nests in any abundance. The small islets in Grand Cul-de-Sac Marin (Ilet à Fajou and Ilet à Caret) are preferred nesting locations. Both species are also reported to nest in small numbers on beaches around the north coast of Basse Terre and on Ilet à Kahouanne. On rare occasions, leatherbacks have also been recorded on these beaches. One was reported to have



nested at Kahouanne in early December 1978. Kahouanne is a French name for the loggerhead. One informant reported that loggerheads also nest on the islet, but this seems doubtful, inasmuch as mature individuals apparently occur only rarely in Guadeloupe waters.

Turtles used to nest at several localities on the west coast of Basse Terre, but no longer do so. Many parts of this coast have been developed for tourism. There is a nesting beach on the south coast of Basse Terre at Trois Rivières. In addition to green turtles and hawksbills, the leatherback is said to nest there "regularly."

Few nesting beaches were identified on Grande Terre. Those at Anse Bertrand and Port Louis were not visited during the survey. Nesting is reported on Les Saintes, La Desirade, Iles de la Petite Terre and Marie Galante, but the species involved were not identified. No specific beaches were named for the first three localities; on Marie Galante, nesting is reported to occur at Ballet Beach. None of these islands was visited during the survey.

Grand Cul-de-Sac Marin, a sheltered area with seagrass beds and reefs, was identified as one of the most important feeding areas for turtles. A portion of it, including Ilet à Fajou, has been under consideration as a marine park for several years. Small green turtles and hawksbills forage on reefs off the central east coast of Basse Terre near Petit-Bourg. Foraging areas for turtles around Les Saintes and Marie Galante are also reported although specific localities were not identified. Turtle fishermen at Vieux-Fort travel to these islands daily to set nets. No information was gathered about foraging areas around eastern and southern Grande Terre.

There appears to have been a very definite decline in population levels of marine turtles at Guadeloupe. Fourteen out of 15 informants questioned on this point considered sea turtles to be less abundant than formerly. Only a fisheries officer considered there to have been no change in their abundance. Nesting has reportedly declined at beaches near Deshaies, Capesterre and St. Francois, and to have ceased altogether on most of the west coast of Basse Terre. Several informants could recall nesting at Vieux-Habitants some fifteen years ago. Fishermen at Ste. Rose, Deshaies and Vieux-Fort report that the number of turtles caught in nets has decreased.

Marine turtles are exploited to a greater extent at Guadeloupe than anywhere in the Lesser Antilles, with the possible exception of Martinique. Much of the exploitation is directly tied to the tourist industry. There is a tremendous trade in souvenirs of all kinds--polished carapaces, stuffed turtles, tortoiseshell jewelry and artifacts, etc. The largest producer of souvenirs is the jail at Basseterre, where prisoners are trained to manufacture them. The prison operates a gift shop that sells souvenirs at both the retail and wholesale level. In December 1978, I was permitted to take a quick inventory of their stock. A minimum of 103 turtles (37 green turtles, 28 hawksbills, 35 loggerheads, 3 olive ridleys) was represented by the carapaces, whole stuffed specimens and dried heads that were on display or stored in supply rooms. The guard apologized for how few turtles were on hand, explaining that a large order had just been filled.

Turtles at the jail were said to be caught locally, although this point needs further verification.

Turtle souvenirs are also available in many towns and villages (Pl. 10). In 1978, polished carapaces were priced at US\$69-184. Tortoiseshell is worked by local artisans, and it is also exported to France. Not all of it is obtained locally. Buyers from Guadeloupe canvas islands throughout the Lesser Antilles for raw tortoiseshell scutes, buying them for a fraction of their resale value.

Meat of all species of turtles is consumed. That of the leatherback is even preferred by some residents. Meat is sold locally in villages, at Pointe-a-Pitre.

The legislation bearing on marine turtles is summarized in Table 2.

#### ACKNOWLEDGEMENTS

Primary funding for the study was provided by a grant from the U.S. National Marine Fisheries Service to the Caribbean Conservation Corporation (Surveys of Sea Turtle Populations and Habitats in the Western Atlantic, contracts 03-78-D08-0025 and NA 80-GA-C-00071, A. Carr, Principal Investigator). Supplemental funds were provided by the World Wildlife Fund (Project #1499, the Ecology and Conservation of the Caribbean Hawksbill, Eretmochelys imbricata). The study would not have been possible without the kind and generous cooperation of the many people who shared their knowledge of marine turtles. Several individuals provided invaluable logistic support for the field work: Clive Carty, Mitch Harrigan, Nat Hodge, Leslie Richardson (Anguilla); Jo Vliegen (St. Martin); Eric Burton and family, Irving Joseph (Barbuda); John Fuller (Antigua); Jay Blankenship, Bob Gibson, John Jeffers, Franklin Margetson, Phillip Menzes, Malcom Tuitt (Montserrat). Thanks are due my husband Peter Meylan for help in carrying out the field work in Guadeloupe, and for support during my many absences from home. K. Bjorndal, J. Kaufmann, A. Carr and P. Meylan commented on various parts of the manuscript. I thank Bill Adams for his skillful preparation of the maps, and Grace Russell for putting the manuscript in final form.

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	Green turtle ( <u>Chelonia mydas</u> )	Hawksbill turtle ( <u>Eretmochelys imbricata</u> )	Leatherback turtle ( <u>Dermochelys coriacea</u> )	Loggerhead turtle ( <u>Caretta caretta</u> )
Anguilla	greenback		river turtle river horse trunkback lanternback	
St. Martin	greenback		river horse rubberback leathercoat	
St. Barthélemy	tortue	caret	batacle	kahouanne
Saba			trunkback	
St. Eustatius			river turtle	
St. Kitts	greenback		river turtle trunkback	mulatto
Nevis	greenback		river turtle	bullhead
Barbuda			bandora	mulatto
Antigua			river turtle walava	mulatto
Montserrat			river turtle horse turtle	
Guadeloupe	tortue verte tortue tortue blanche	caret	batacle luth	kahouanne tortue jaune

Table 1. Vernacular names of sea turtles in the Leeward Islands. Standard English names are also widely used.

	Date of Legislation	Protected Species	Closed Season	Minimum Capture Size	Punishment for Violation
Anguilla	1948 (revised 1977)	all species	1 June-30 Sept (turtles, eggs)	> 9 kg	Fine $\leq$ US\$37 Forfeiture of goods, equipment
St. Martin	Neth.--none Fr. see Guadeloupe				
St. Barthélemy	see Guadeloupe				
Saba	none				
St. Eustatius	none				
St. Kitts	1948	all species	1 June-30 Sept. (turtles, eggs)	> 9 kg	Fine $\leq$ \$US9 Forfeiture of goods, equipment
Nevis	"	"	"	"	"
Barbuda	1927 (revised 1962)	all but <u>Caretta</u>	1 June-30 Sept. (turtles, eggs)	> 9 kg	Forfeiture of goods, equipment
Antigua	"	"	"	"	"
Montserrat	1951	all species	1 June-30 Sept. (turtles, eggs)	> 9 kg	Fine $\leq$ \$US18 Forfeiture of goods, equipment
Guadeloupe	1979	<u>Chelonia</u> <u>Eretmochelys</u> <u>Deremochelys</u>	15 May-15 Sept. ( <u>Chelonia</u> , <u>Eretmochelys</u> ) year-round ( <u>Deremochelys</u> ) year-round (eggs, all spp.)	>60 cm carapace length ( <u>Chelonia</u> & <u>Eretmochelys</u> )	

Table 2. Legislation pertaining to marine turtles in the Leeward Islands, Lesser Antilles.

	<u>Existing</u>	<u>Proposed</u>
Anguilla	None	Seal Island Reserve, Sandy Island, Shoal Bay
St. Martin	None	Guana Cay, Molly Beday, Hen and Chicken, Cay Bay, Man O'War Shoal
St. Barthélemy	None	None
Saba	None	None
St. Eustatius	Jenkins Bay	None
St. Kitts	None	southeastern peninsula
Nevis	None	None
Barbuda	Palaster Reef Marine Park	Codrington Lagoon
Antigua	Diamond Reef Marine Park	Guiana Island to Great Bird Island; Fisher's Hill to Proctor's Point
Montserrat	None	None
Guadeloupe	Ilets à Goyaves	Grand Cul-de-Sac Marin

Table 3. Marine parks and protected areas in the Leeward Islands, Lesser Antilles. Source: ECNAMP 1980, 1982; A. Putney, in litt.

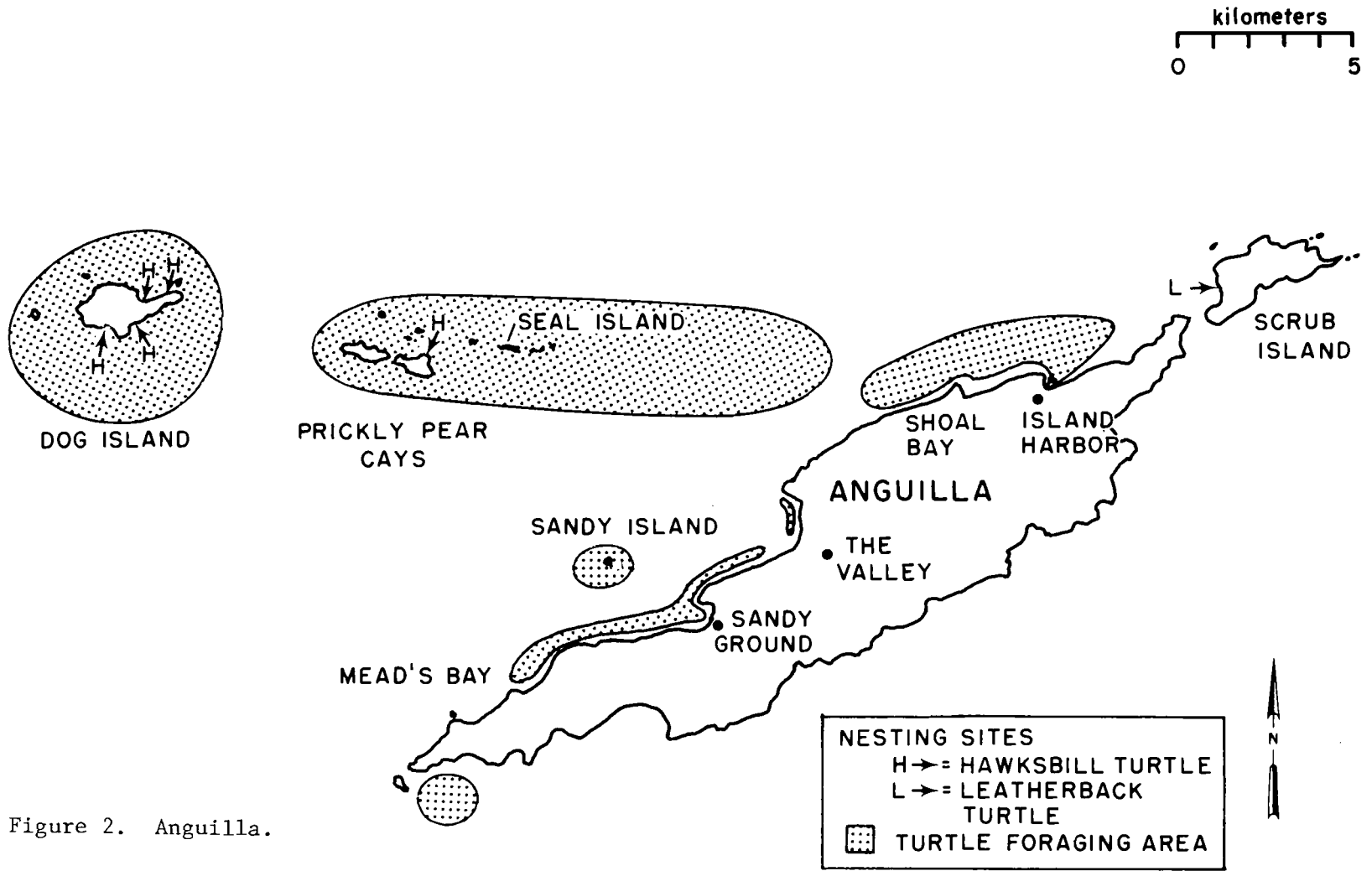


Figure 2. Anguilla.

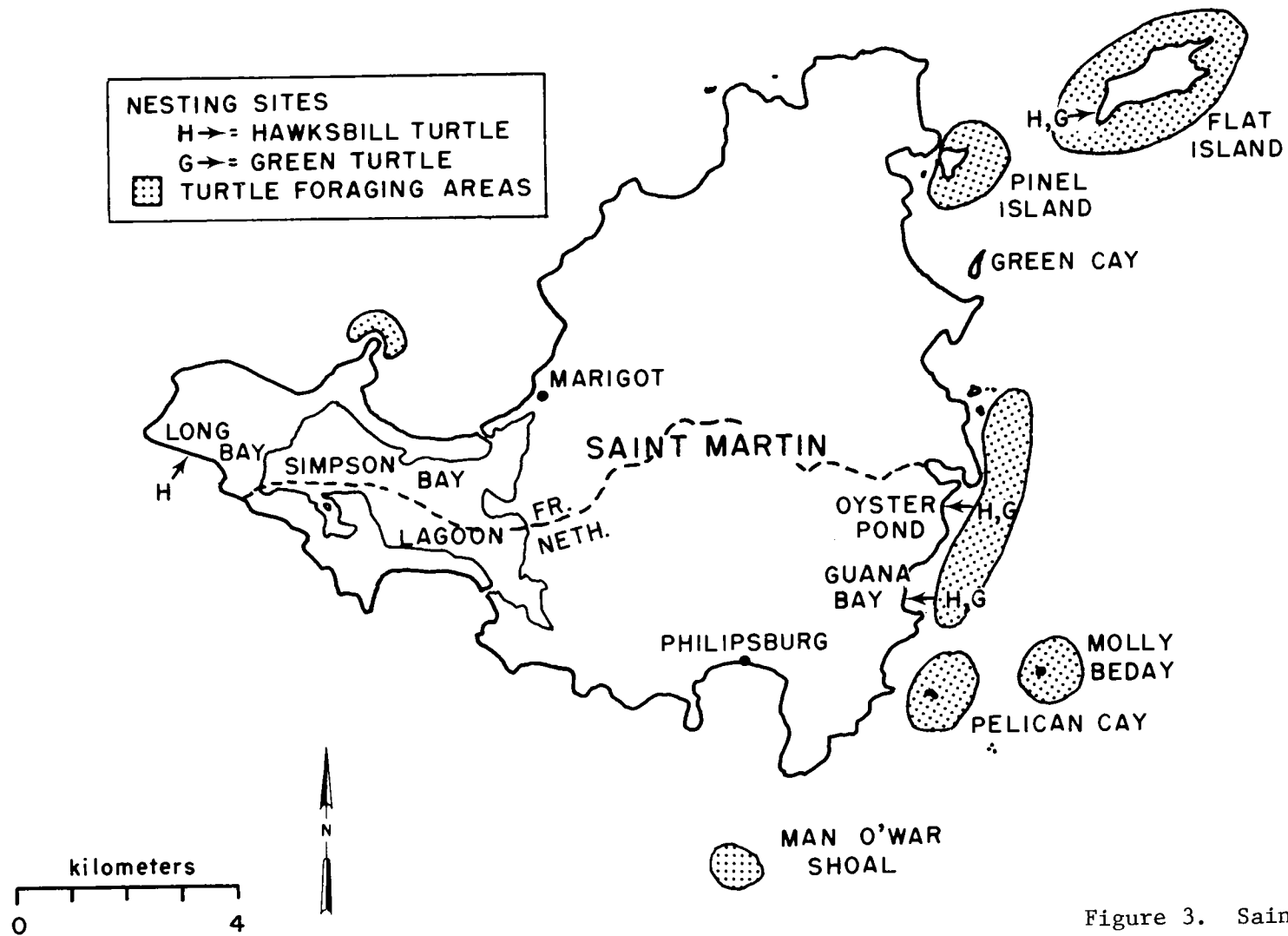


Figure 3. Saint Martin.



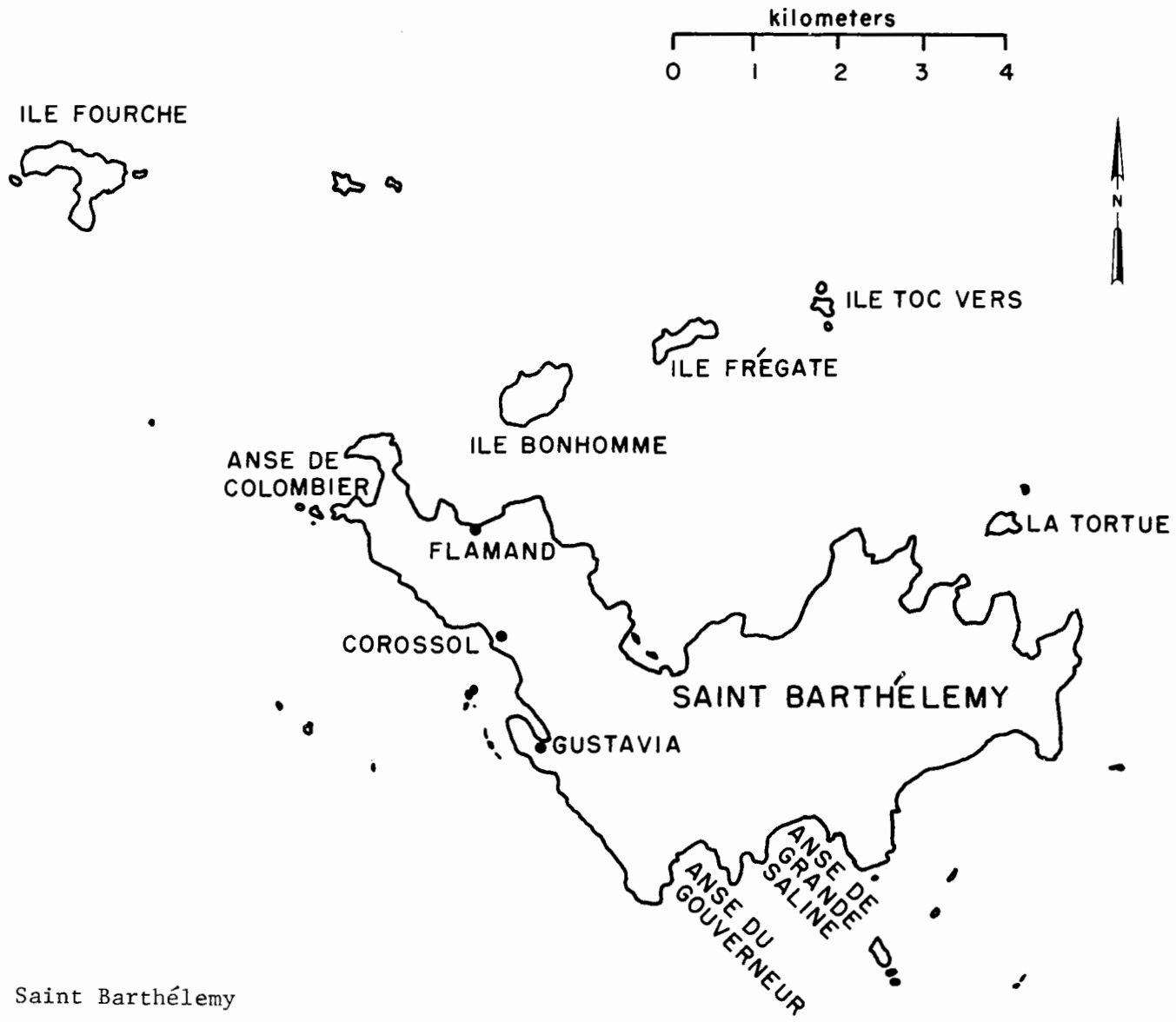


Figure 4. Saint Barthélemy

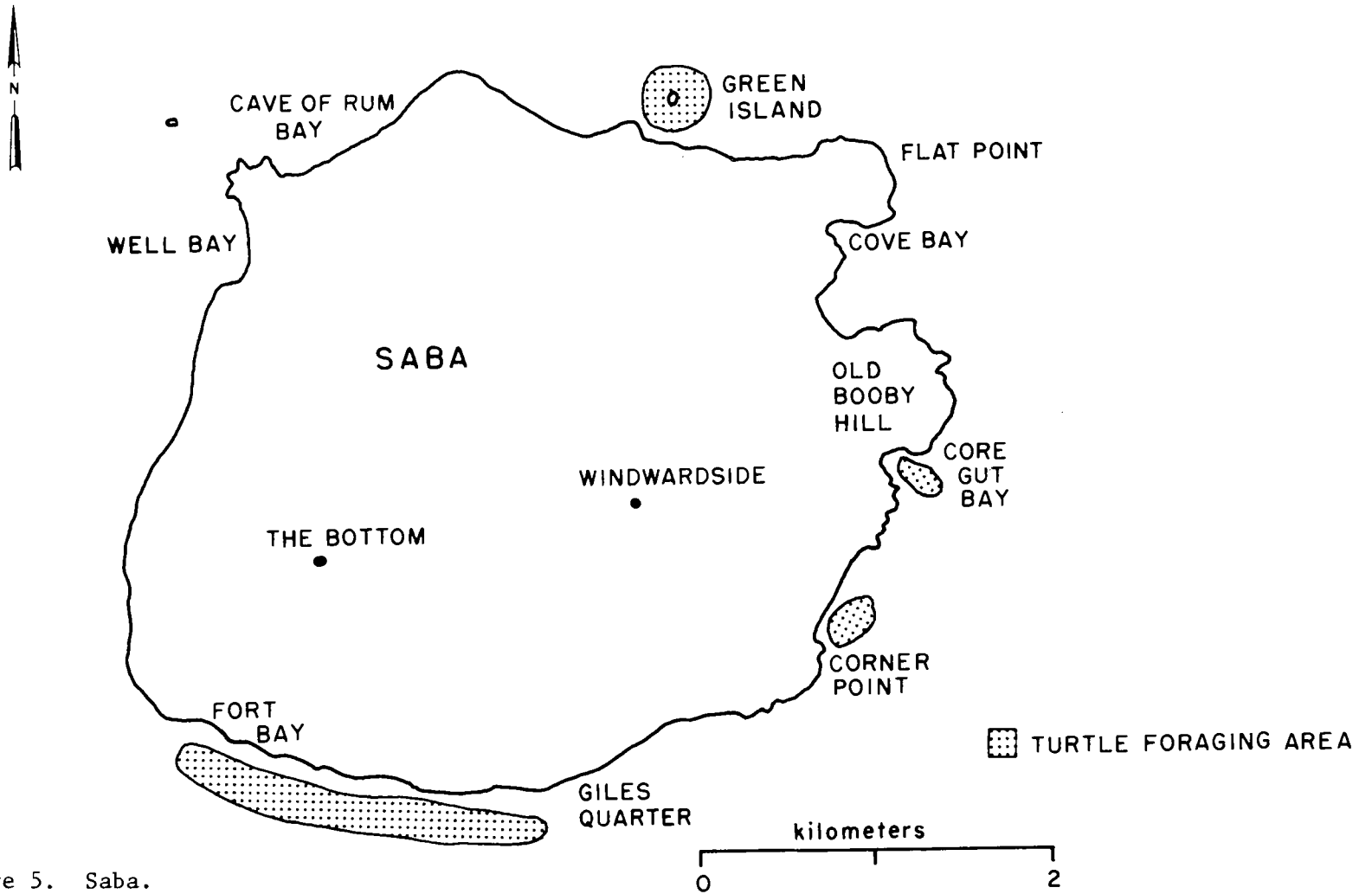


Figure 5. Saba.

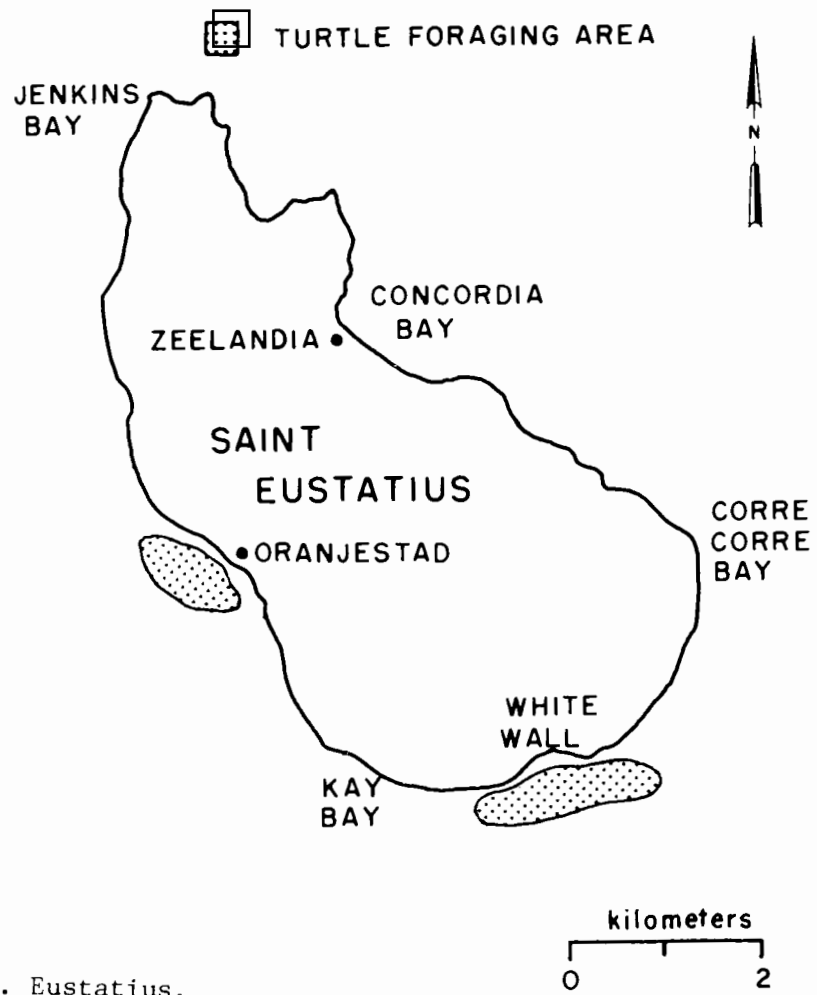


Figure 6. St. Eustatius.

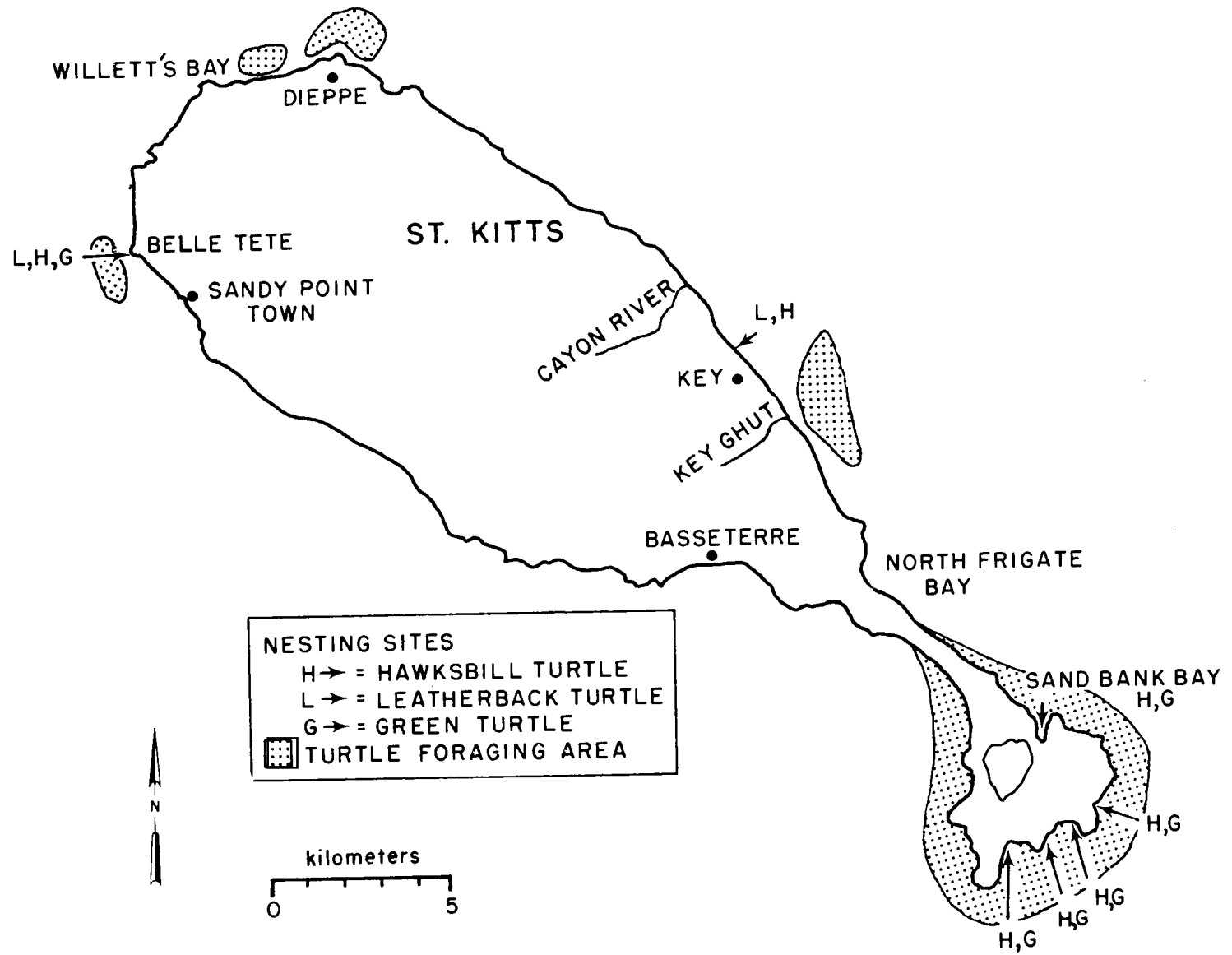


Figure 7. St. Kitts.

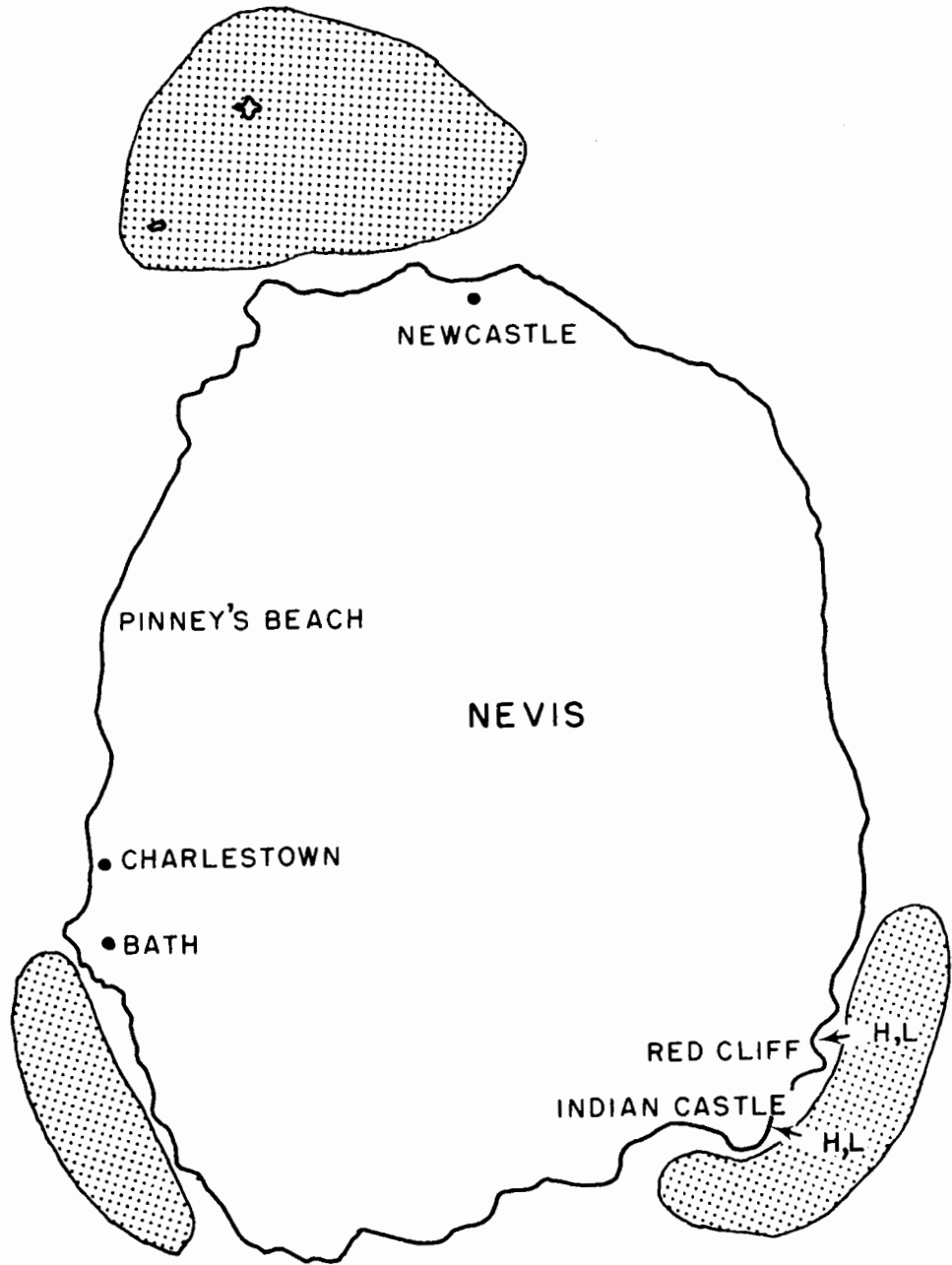
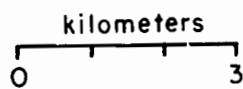
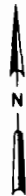


Figure 8. Nevis.



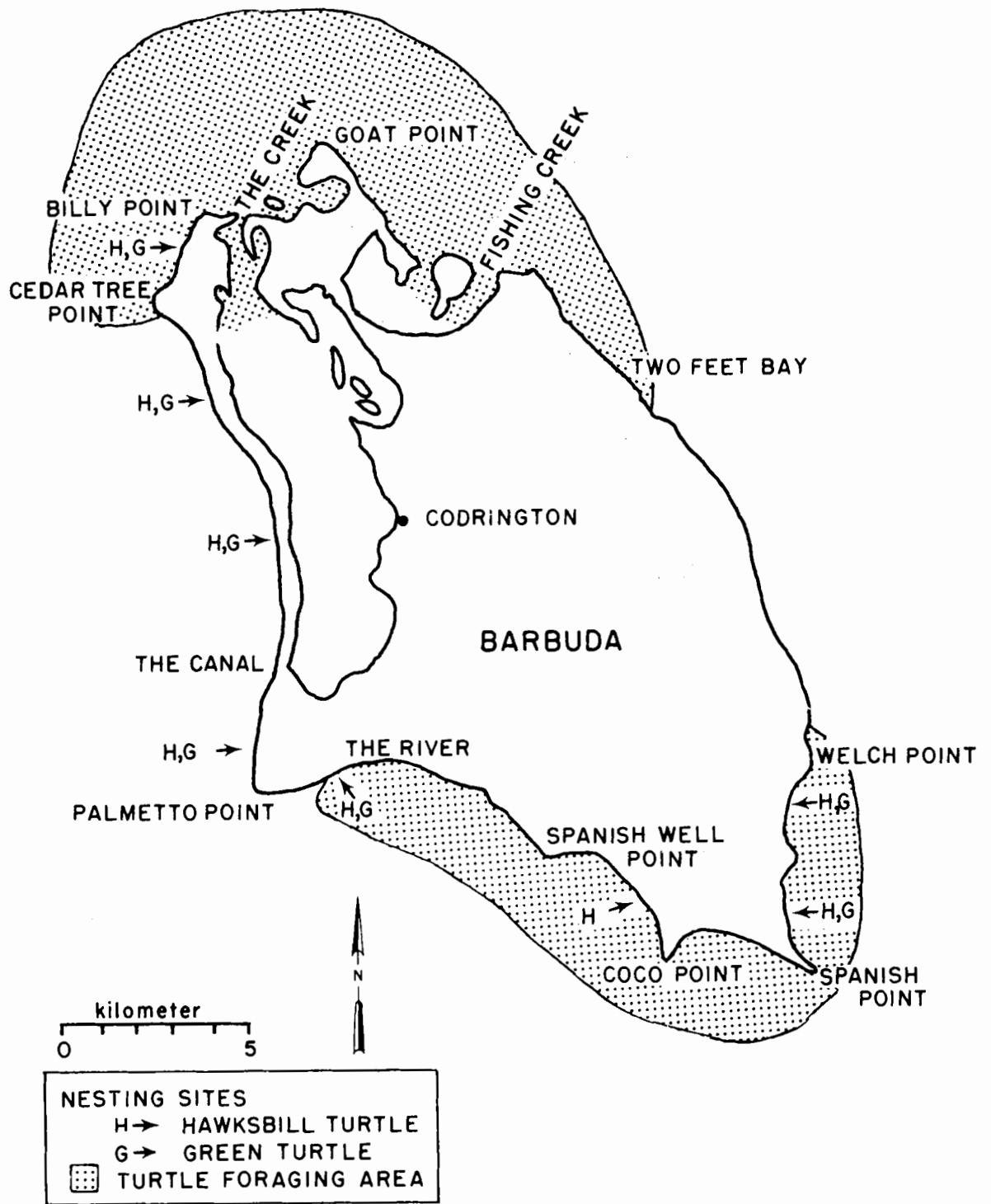


Figure 9. Barbuda.

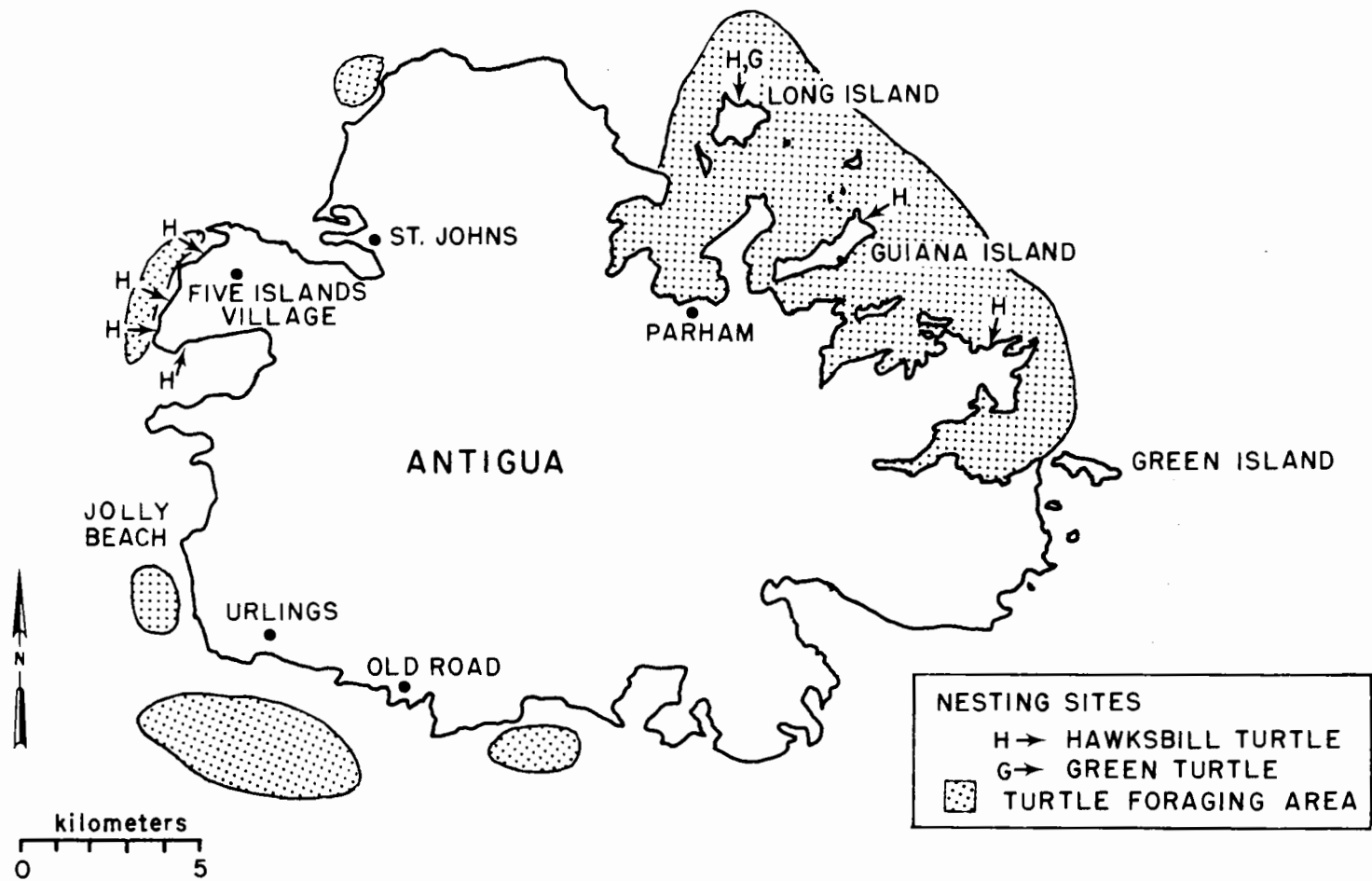


Figure 10. Antigua.

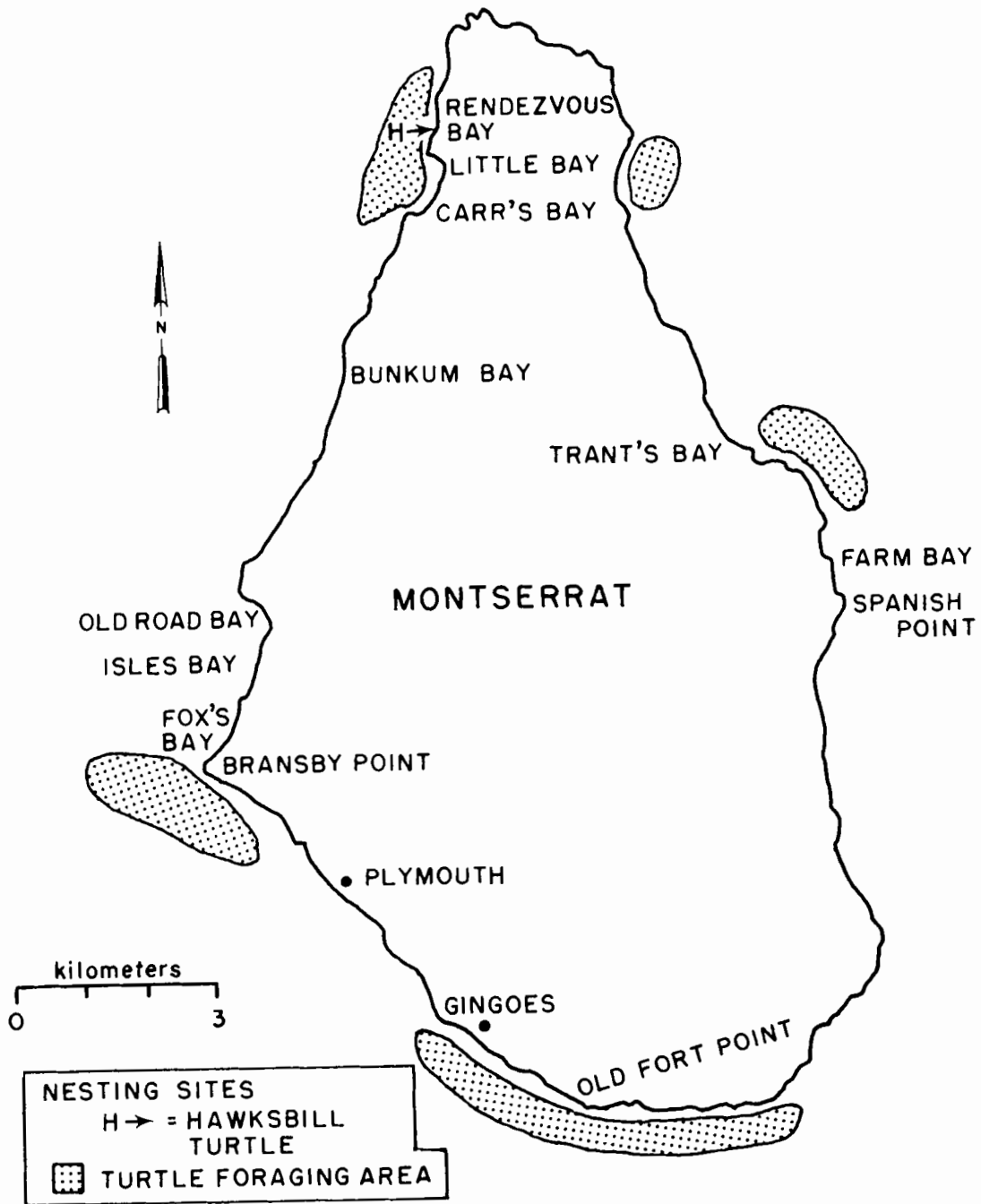


Figure 11. Montserrat.



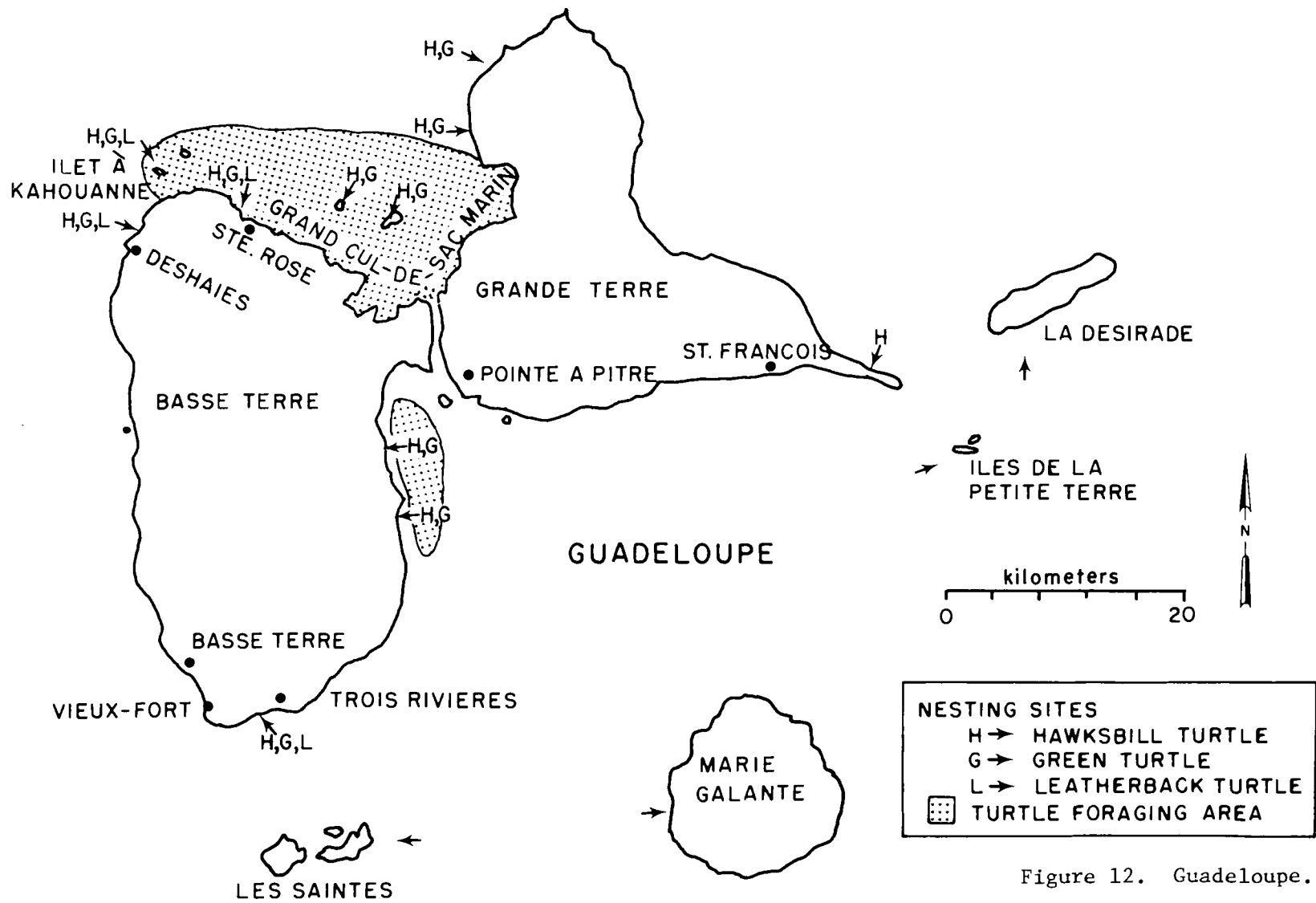


Figure 12. Guadeloupe.



Pl. 1. Loggerhead turtle (*Caretta caretta*)  
(54.5 kg) caught at Scilly Cay, Anguilla.



Pl. 2. Tortoiseshell scutes from hawksbill  
turtle (*Eretmochelys imbricata*).



Pl. 3. Young hawksbill turtle (*Eretmochelys imbricata*)  
(5.2 kg) caught by lobster diver, Barbuda.



Pl. 4. Effects of sand mining on nesting beach, Belle Tete, St. Kitts.



Pl. 5. Immature loggerhead turtle (*Caretta caretta*), St. Barthélemy.



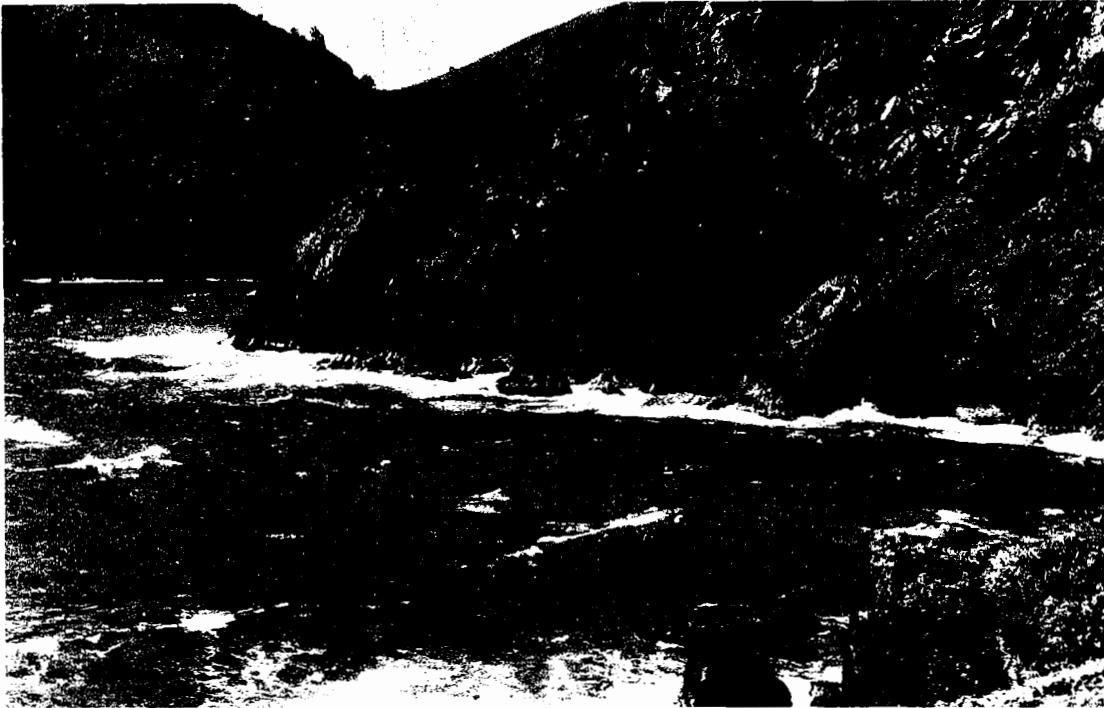
Pl. 6. Green turtles (*Chelonia mydas*) awaiting export, Barbuda.



Pl. 7. Drying carapaces of hawksbills (*Eretmochelys imbricata*) and green turtles (*Chelonia mydas*) captured in nets at Nevis.



Pl. 8. Nesting beach at Coco Point, Barbuda.



Pl. 9. Rocky cliffs along the coast of Saba provide foraging habitat for green turtles (*Chelonia mydas*) and hawksbills (*Eretmochelys imbricata*).



Pl. 10. Turtles being prepared for stuffing as souvenirs, Capesterre, Guadeloupe.