THE GREEN TURTLE AND MAN

by

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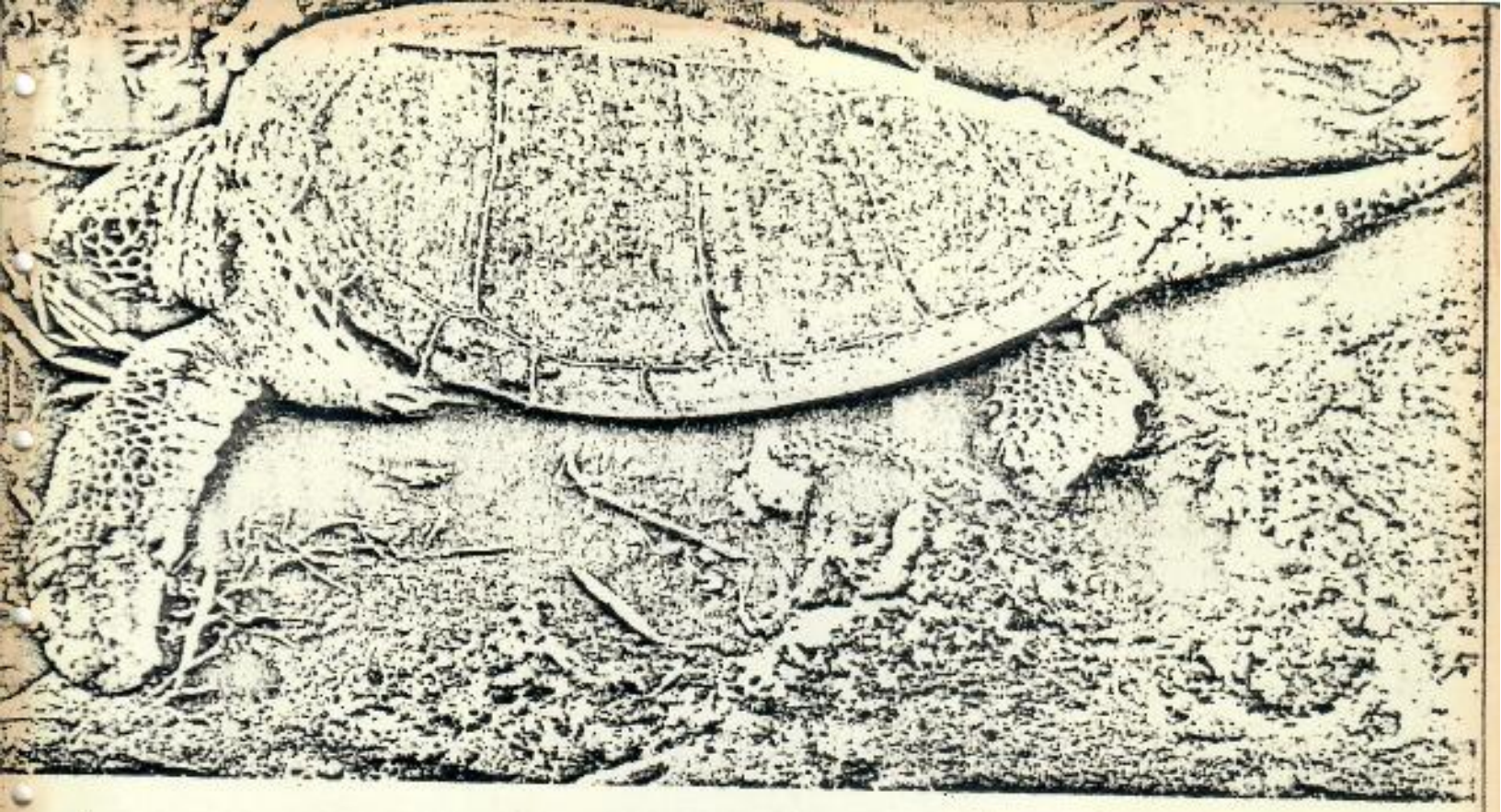


The world's most valuable reptile

The edible green turtle (*Chelonia mydas*), renowned among mid-latitude epicures, is an important protein food resource for the inhabitants of many tropical coasts. In most of the world it is prized for its flesh, but in Southeast Asia the meat is seldom eaten and instead the eggs, which are systematically harvested, form a significant adjunct to the local dietary. During the breeding season the adult green turtles congregate in sometimes prodigious numbers off selected beaches, characteristically on sparsely peopled islands, where the females deposit their eggs at night in the warm sand. This extraordinary homing instinct, as much as its morphological characteristics, distinguishes the green from other marine turtles. Although normally confined to the warm seas (temperatures above 20° C. in the coldest month), it is occasionally carried into cooler waters by drift currents or storms (see front endleaf map). Stray greens have been reported off the coasts of England and of New England, as they have off Argentina and Chile.

The countless Turtle Islands, Islas Tortugas, Iles Tortues, and Schildpad Eilanden of the tropical seas bear witness to the remarkably localized nesting activities which have made the species uniquely vulnerable at the hands of man. Today, in several areas, the green turtle is in trouble, its range and numbers having been sharply reduced by the unrelenting demand of a burgeoning human population and the continuing activities of the turtle hunters. Professor Archie Carr has observed that, although the green turtle is the most valuable reptile in the world, it would be difficult to name any animal comparable at once in economic importance and in depletion of its numbers that is so poorly known (*33*).

Alone among the marine turtles, the green turtle is a vegetarian, browsing on any of the several marine grasses (e.g., *Zostera, Thalassia, Enhalus*) that grow along the shoal margins of tropical seas, and to this is sometimes attributed the superior delicacy of its flesh. A mature female turtle normally weighs approximately 250 pounds, but individual specimens weighing as much as 700 to 800 pounds were not infrequently reported in the past, especially among the Ascension Island and Seychelles aggregations. Immature "chicken-turtles" weighing 25 to 50 pounds, however, tend to be the most prized by gourmets for steaks, but they are said to be too "watery" for good soup.

Taxonomists are not yet agreed as to the extent and significance of the differentiation between the Atlantic-Caribbean breeding populations and those of the Indo-Pacific region. Carr, in his *Handbook of Turtles,* distinguishes the Atlantic green turtle (*Chelonia mydas mydas*) from the East Pacific variety (*C.m. agassizii*), at least on a statistical basis, by the brownish coloration of the carapace and leg skin of the former and a slightly different conformation of the shell (*32*:345-65). The predominantly greenish or olive-brown *Chelonia* of the western Pacific has been distinguished from either of these as *C. m. japonica*. However, the geographical races of the species have never been subjected to morphological diagnosis and their classification remains highly tentative. Interchange of Indian Ocean and South Atlantic turtles around the Cape of Good Hope has probably always been possible, but this clearly has not been the case as between the Atlantic and the eastern Pacific populations. Karl Schmidt has pointed out, however, that the extreme differentiation within this wide-ranging species should not be expected between the east and west coasts of Central America, which were connected by one or more straits through most of Tertiary time (*184*). The major faunal barrier, he suggests, was more likely the great stretch of open water in the eastern Pacific between Polynesia and the

American coast. Genetic isolation between the sea turtles on the east side of the Atlantic and those of the tropical western Atlantic is a further possibility, though a less likely one in view of the proximity of the west coast of Africa and the east coast of Brazil.

The habit of sun basking during daylight hours, reported from widely separated Pacific localities (Islas Revillagigedo, French Frigate Shoal, Galápagos, possibly Java), appears to be distinctive for this region, and there may be feeding and nesting traits as well that likewise distinguish one breeding aggregation from another.

These giant reptiles spend almost their entire life at sea, grazing on underwater pastures. Over most of their range only the adult female ever leaves the water and this she apparently does only at intervals of several years. Then, during the summer breeding season, she may lumber ashore during the night to deposit her clutch of 100 or more soft-shelled eggs the size of ping-pong balls in a hole she digs in the soft sand, her track, like a truck-tire tread, leaving telltale evidence to the egg hunters of her visit. This procedure is repeated four or five times at intervals of ten to fourteen days, while the males mill about in the water offshore. Eggs laid at a given visit to a beach are not the ones fertilized at that time but are probably fertilized three years before, or at the last previous nesting-mating rendezvous (*40*). At the end of the breeding season the troop apparently returns to its feeding grounds, which may be, as with the Ascension Island turtles, as much as 1,000 miles away. These remarkable migrations must have been going on for a very long time. Hendrickson, who has published a comprehen-

Her eggs laid, a female green turtle, weeping and sighing, makes her laborious return to the sea. (TOM HARRISSON, SARAWAK MUSEUM)

sive study of the ecology of the green turtles of the Sarawak Turtle Islands, suggests that the unerring pin-point accuracy of their homing pattern may be attributable to "experience-memory" related to particular beaches that are associated with "satisfactory" nesting experiences. Thus, new beaches might come into favor. He believes that the majority of stray *Chelonia* nesting on atypical beaches in Malaysian waters are smaller in size than the average adult female and suggests that these may be newly matured individuals (*106*:461-62). With the single exception of that at Tortuguero, on the Caribbean side of Costa Rica, where a mainland beach is backed by extensive swamps, the largest breeding concentrations that have been recorded are found on uninhabited or sparsely populated islands. The type of beach characteristically favored seems to be steeply sloping, with a beach platform high above the flood tide, and composed of a lightweight sand of medium coarse texture that does not pack easily into a hard surface.

During the breeding season the turtles are easy prey to harpoon or spear as they drift on the surface of the sea preoccupied in copulation. On their feeding grounds when they periodically rise for air they become readily entangled in giant drift nets set by the turtle hunters. Sometimes they are wrestled into boats by strong swimmers with the aid of a rope looped around one of the front flippers, or, even more remarkably, they may be brought to gaff by a remora, or suckerfish, tied to a long leash, that attaches itself stoutly to the carapace of the feeding turtle (see Chapter 3). A wooden decoy, carved in the crude form of a turtle, is frequently employed in American waters to lure the males, which may readily be harpooned or netted as they hopefully attempt to mount the deceitful temptress. In Fiji there are fanciful stories of "turtle callers," elderly women whose chants lure the turtles out of the sea. But these creatures, it is said, cannot be tricked by professional turtle hunters. Wherever the females go ashore to lay they may be rendered helpless simply by being "turned turtle" on their backs as they lumber across the sand to or from their nests, which are above high tide and generally at least 100 feet from the shore. The eggs, which have an incubation period of about 53 days, are very likely to be stolen either by man or beast. Finally, the newly hatched baby turtles, although they instinctively scamper in a beeline for the sea, must run a gauntlet of waiting predators, such as wild dogs, raccoons, giant crabs, barracudas, sharks, and oceanic birds, from which only a lucky few survive. Considering the towering odds against it, the wonder is that the species has survived in such substantial, if dimin-

ished, numbers. "To understand something of the size of the green turtle populations (of the Caribbean) under primitive conditions," writes Carr, "is to wonder how the species can exist at all today . . . with such markedly different levels of concentrations of individuals" (32:354).

The sighing of the captive turtle, left wheezing and immobile on its back, and the great tears that ooze from its big eyes have given rise to pathetic and exaggerated accounts of the animal's suffering. Yet even when the female hauls up on the beach to lay its eggs it weeps profusely and sighs—the tears perhaps nature's way of keeping sand from caking in its eyes as it excavates its nest, the sighs an admission that the buoyancy of the water is sorely missed by a 300-pound creature that is not structurally designed for life ashore.

The only other tropical sea turtle of commercial importance is the hawksbill or caret (*Eretmochelys imbricata*), whose mottled and translucent shell is the "tortoise shell" of commerce. The hawksbill has been intensively exploited at least since Roman times, especially in the Indian Ocean and the South China Sea, but recently the market for the shell, long used for furniture veneer and inlay work and in the manufacture of articles of feminine adornment, has been largely taken over by celluloid and plastic substitutes. The eggs of the hawksbill are equally as esteemed as those of the green turtle, but, as this species generally lacks the highly developed homing instinct of the latter, their collection on a large scale is impractical. Its flesh, while appreciated by some tropical dwellers, has not found acceptance among Europeans.

The other common marine turtles, the loggerhead (*Caretta* spp.), the ridley (*Lepidochelys* spp.), and the trunkback or leatherback (*Dermochelys* spp.) are generally considered inedible. As these, too, have a pan-tropic distribution there is a certain amount of inevitable confusion in identity as between them, the hawksbill, and the green. Moreover, long-distance or mass breeding is common to all five genera of sea turtle. But for the men who know turtles or know the sea there is generally no mistaking *Chelonia mydas* with its distinctive markings both on the shell and head, its white underside or plastron, its social nesting habits, and, above all, its highly palatable flesh.

CULTURAL ATTITUDES TOWARD THE MEAT AND EGGS

The green turtle is exploited alone for its edible properties, its shell being considered worthless. The first Europeans who encountered it in the tropical seas thought of it chiefly as providing an antidote to scurvy and an *elixir vitae* of extra-

ordinary virtues. Later, especially in the West Indies, its flesh became a staple for both whites and slaves, either salted and buccaned or fresh. Baked turtle, the flesh often minced fine and cooked in its own shell, early became a plantation-house delicacy. Turtle oil, from any of several species, was used as a substitute for butter, as a lamp fuel, and as a lubricant.

By the mid-eighteenth-century a trade in live turtles had begun to develop between the West Indies and London, where green turtle and green-turtle soup were coming to have a prestige value among the well-to-do. "A plate of turtle, green and glutinous," the flavor and consistency of good veal, increasingly provided the *pièce de résistance* of diplomatic dinners and ceremonial banquets. The cartilaginous greenish substance that lines the shell, both the light-colored "calipee" and the darker "calipash," gave the soup the cherished gelatinous consistency. It was employed as part of the stock (this being made from the whole turtle, less the guts) and also was cut into small chunks and added as a garnish to each portion. Calipee and calipash are the unossified parts of the bellyplate and backbone. The calipash is widest in young turtles, for as they age the backbone extends to the edge of the shell. But the thickening with age of this layer of soft stuff tends to compensate for this change. Calipee, more abundant than calipash, is concentrated along the midstrip of the bellyplate. The term "calipee," apparently of West Indian origin, was at first applied to the belly, or underside, of the turtle while the "calipash" was the upper side or carapace. By the nineteenth century these terms had come to be applied specifically to the delicately flavored gelatinous substance that comprises much of the lower and upper shells. On the Great Barrier Reef of Australia, however, it is otherwise. There "calipash" refers to the flesh attached to the lower shield and "calipee" to that obtained from the flippers, but this is contrary to the usage elsewhere (*153*:112). In preparing calipee and calipash for shipment, the shell was first cut into strips and boiled for several hours, after which the gelatinous matter was severed from the bony plate and dried in the sun. These stone-hard strips, looking like pieces of dried glue, have been exported under the name of "turtle strips," "calipee," or, less properly, "turtle fat" to mid-latitude markets for at least a century and a half. A large turtle may produce two and a half to three and a half pounds of it, the flesh being wasted if there is no local demand or refrigeration facilities.

As a symbol of Victorian opulence turtle soup was especially esteemed by nineteenth-century English and Ameri-

can aristocrats, a cherished luxury especially associated with the Lord Mayor's and aldermen's banquets. For the initiated it stood almost in a class by itself, like oysters, "to be approached with diffidence and reverence." While its prestige today is much reduced, there is still a substantial market for clear green-turtle soup among epicures. This, coupled with a growing demand for meat within the tropics, has led the few biologists who have studied it to express concern for the future of the species.

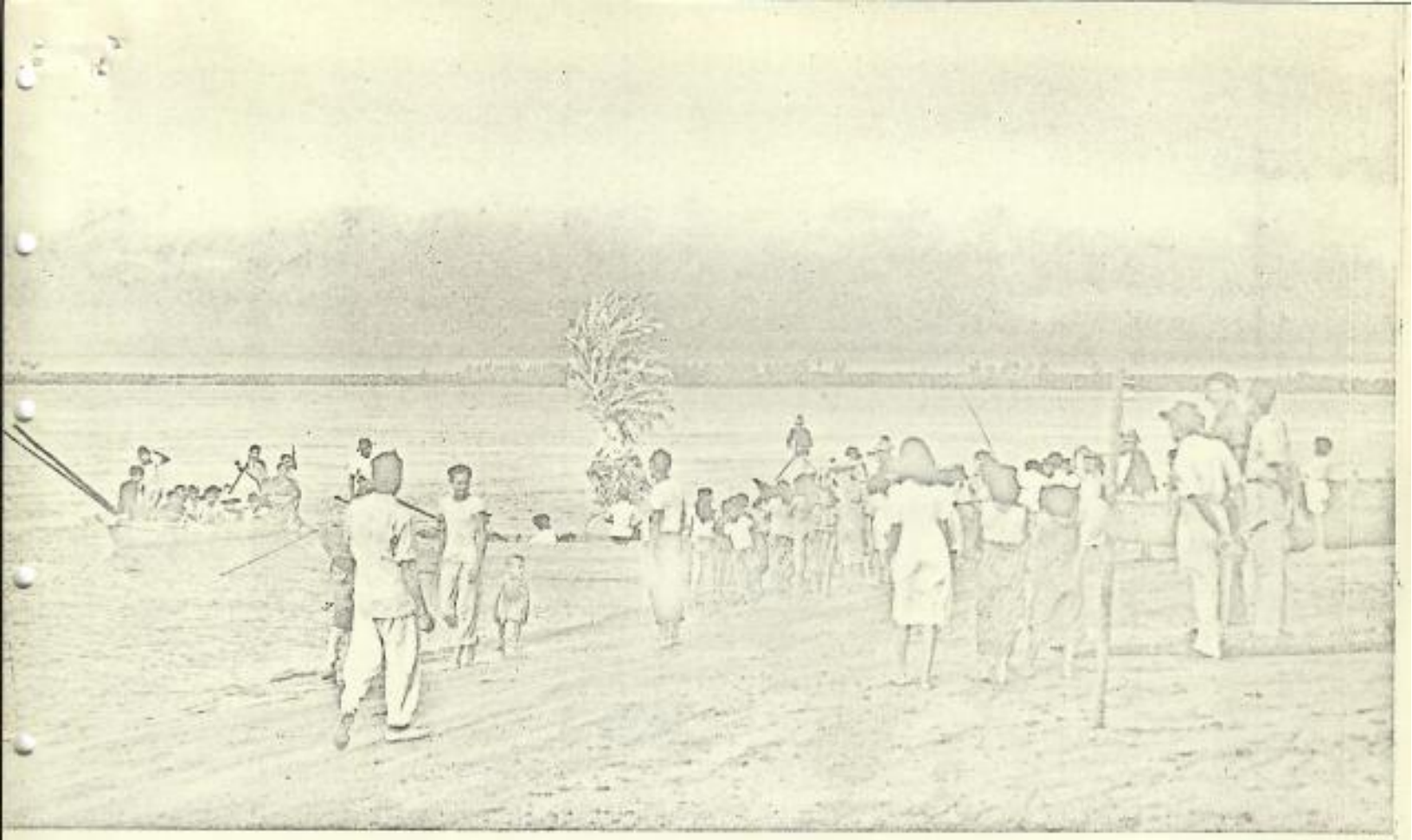
The sea turtle is sacred or held in special veneration by many peoples. In early China both the land tortoise and the sea turtle were symbolic of the good life and the long life and have always had a certain religious significance. Edward H. Shafer, of the Department of Oriental Languages of the University of California at Berkeley, informs me that the earliest Chinese literature is full of enthusiastic reports about the eating qualities of turtles. Most of these were apparently fresh-water species, but one ancient book, full of the South, the *Ch'u tz'u*, refers to the "broth of the sea turtle." We cannot be sure what species was used. The pharmacologists often recommended turtle broths and soups for their excellent tonic properties. The green turtle seems to have been less well known to the Chinese than the hawksbill. The early name of the former was *kou-pi*, a word that is unidentified in modern dictionaries of Chinese. Today it is referred to as *lü tzu-lusi*, "green sea turtle." Its flesh seems to have been especially prized. A commercial product called "*[kou-]pi* skin," which was submitted as tribute to the T'ang court by the city of Canton, could only have been calipee (*186*). It was described as being "extremely rich and savory." There is a ninth-century reference (*Ling piao lu i*) to sea turtles being common off the Kwantung coast; men could ride on their backs. There is also reference to a "kou-pi islet" on the way to Liu-ch'iu (Formosa?). The green turtle is said still to nest occasionally on some of the small islands south of Hong Kong (*108*).

Both in Asia and in the Americas the turtle was one of the mythical animals on which the world was believed to rest. The Burmese are said to consider sea turtles divine, keeping them in tanks in pagoda grounds where they are fed special foods. Among the north Australian aborigines the sea turtle is one of the principal totems. Pliny wrote of a cave-dwelling people at the entrance to the Red Sea who, although they were *Chelonophages* ("turtle eaters"), worshipped the turtle as sacred. Among many groups extraordinary medicinal virtues are attributed to the oil of turtle. It is perhaps not surprising, then, that the eating of turtle flesh is taboo among

several peoples and of ceremonial significance among others. For example, the flesh of sea turtles seems not to be consumed by most Burmese, Thai, or Malays. In its stead these people have traditionally and intensively exploited the nearby turtle islands for the eggs, seemingly with little impact on the size of the permanent populations. Hendrickson has suggested that the concentration on egg collecting and the consequent protection of living turtles as providers of eggs have been more effective means of species conservation than the more common prohibition against the taking of eggs (*106*:525). This proposition seems to be borne out in the survey of the world's green-turtle nesting beaches in the pages that follow. On the turtle beaches that have had their stock most reduced, meat not eggs has been the principal object of exploitation.

In Southeast Asia the avoidance of sea-turtle flesh is sometimes held to be a Muslim trait. For example, Thomas Forrest, in Indonesian waters nearly 200 years ago, wrote that "some of my people, who were not Muslims and eat turtle, cut the meat up small and stewed it in green bamboos" (*71*:126). However, it does not appear to be followed by the Muslim population of East Africa and Arabia. There appears to be nothing in the Koran that specifically forbids the eating of sea turtles. Moreover, the avoidance of sea-turtle flesh, though apparently not tortoise flesh, seems to be as characteristic of most coastal peoples of Burma and Thailand as of the Malays, suggesting that it may well be a pre-Muslim attitude of considerable geographic extent. Hendrickson is of this opinion (*106*:457-58). According to Theobald, "land and freshwater testudinata are a favorite article of food of all classes in Burma, save such as have embraced Islam, or Jews." But marine turtles, he noted, were generally not molested except for their eggs (*203*:8). Tandy also notes that land and river tortoises are valued by the Burmese for both flesh and eggs, but he makes no mention of sea turtles (*202*:155). Among the modern Thai the eating of turtle is considered unthinkable, although they may eat poultry, pork, and beef with relish. But this taboo seems not to extend to India. Paul Wheatley has pointed out to me that turtle and tortoise flesh were both being served at banquets in royal courts in the Kelantan Valley, Malaya, early in the seventh century, where the rituals, pageantry, and protocol were of Hindu character.

In China and India, as well as among Southeast Asia's Chinese and Indian populations and the Hindu-influenced Balinese, turtle flesh is highly regarded. Field biologists in Malaya and Sarawak, on the other hand, have found that popular attitudes against killing of adult animals are so



"Semah" turtle fertility rites at Talang Talang Besar, Sarawak.
(TOM HARRISSON, SARAWAK MUSEUM)

strong as to make it impossible to study food habits or intestinal parasites of turtles or to carry out other projects which demand the sacrifice and dissection of the creatures. This avoidance of turtle flesh most often seems to stem from the peculiarly high esteem in which sea turtles are held in this part of the world. Thus, in the Maldive Archipelago, where sea turtles abound, J. Stanley Gardiner reports that they are not eaten because the natives believe "they suckled Komburani when he hauled up the islands from the deep with his fish-hook" (75:2:1050). François Pyrard, more than 200 years earlier than Gardiner, had noted that turtle flesh was taboo among Maldivians "because, they say, this animal has some kind of conformity and kinship with man" (*171*:80:348-49).

Some native American groups seem likewise to have avoided turtle meat, perhaps in a sort of subconscious recognition of the species' vulnerability to man. Rochefort, for example, clearly stated that the Caribs of the Lesser Antilles originally did not eat turtle meat, being fearful of taking on the characteristics of that reptile (*179*:2:202-3). Yet they relished the eggs. On the west coast of Central America, and in Brazil too, some early accounts suggest that eggs or oil, rather than meat, were the primary interest of at least some aboriginal groups.

In Africa similar avoidance patterns probably existed. On the east coast, for example, the Cushite peoples of Somaliland are still today said to disdain sea-turtle flesh (95:126). In Mauritania, according to Villiers, it is especially the food of the lower classes (224:93). The Imragen Moors of Arguin in Mauritania were described by Valentín Fernandes in the sixteenth century as living largely on sea turtles (224:76).

The Europeans who first came into contact with the green turtle were not of one accord in their judgments of it. Some asserted it to be a delicious and healthful food, while others held that it was poisonous. It was generally the English who were most enthusiastic in their praise of the green turtle's virtues, perhaps because they knew it best. As a cure for scurvy and a relief from the monotony of a hardtack and salt beef diet it was much prized by the early explorers and buccaneers. George Woodbury suggests that the green turtle as much as any other natural factor was responsible for the opening up of the Caribbean and the concentration of piratical activities in that part of the world (237:106-10; see also 33:17). The great clumsy creatures were easy to catch, abundant, nourishing, and most important of all in the tropics before refrigeration, could be kept alive for weeks. William Dampier, that rough seaman who, Oliver Goldsmith observed, had added more to natural history than half of the philosophers who went before him, made repeated and extensive reference to turtles in his *Voyages*, written between 1681 and 1688. To men of his ilk the facts of green-turtle geography were of prime significance. He was the first to make clear the distinction between the edible green turtle and the other, less palatable species, especially the hawksbill and the loggerhead.

The health-giving qualities of *Chelonia mydas* were much commented on by observers of the seventeenth and eighteenth centuries. John Fryer, to whom it was "neither fish nor fowl nor good red herring," observed that "it restores vigor to the body, giving it a grace and luster as elegant as viper wine does consumptive persons and worn out prostitutes" (73:306). Indeed, many an ill-disposed Englishman on Jamaica went to the Cayman Islands during the turtling season to recover his health feasting on turtle (53:2:399). Syphilitic patients are said to have been sent to the Cape Verde Islands from Portugal for the same purpose (190:225). Both flesh and eggs were reported to be slightly aphrodisiac, and still are considered so among some peoples.

Turtle was in as great demand as a slave food in the West Indian colonies in the seventeenth and eighteenth centuries as was salt cod from Newfoundland. Gradually the reptile was

taken up by the West Indian white aristocracy. It was considered a special delicacy when eaten fresh. "To eat this animal in the highest perfection," wrote Oliver Goldsmith, "instead of bringing the turtle to the epicure, he ought to be transported to the turtle" (*82*:674). Janet Schaw, writing of her visit to Antigua in 1774-76, said, "I have now seen turtle almost every day, and tho I never could eat it at home, am vastly fond of it here, where it is indeed a very different thing. You get nothing but old ones there [London], the 'chickens' being unable to stand the voyage; and even these are starved, or at best fed on coarse and improper food. Here they are young, tender, fresh from the water, where they feed as delicately and are as great epicures as those who feed on them. . . . Could an alderman of true taste conceive the difference between [turtle soup] here and in the city, he would make the voyage on purpose, and I fancy . . . into the other world before he left the table" (*183*:95).

The special quality of turtle soup was said to be that it did not "cloy." In other words, one could eat almost any quantity of it without ill effects. Its easily assimilated proteins, without carbohydrate or fat, were said to prepare the stomach in superb fashion for what was to come. When banquets started with this soup, the diner was considered best able to enjoy the numerous rich dishes to follow. Goldsmith wrote that turtle "has become a favorite food of those who are desirous of eating a great deal without surfeiting . . . by the importation of it alive among us, gluttony is freed from one of its greatest restraints" (*82*:674). The soup, flavored with sherry, capsicums, ginger, cloves, and nutmegs, and served piping hot, was considered at its fiery best "when, after having eaten, one is obliged to rest with his mouth wide open, and cool the fevered palate with Madeira or Port" (*189*:366). In twenty years in the West Indies, one doctor professed, he had never heard of an "accident" arising from eating it! It was also held to be an ideal food for convalescents, especially when served in jellied form.

The Dutch, although they partook of it, seem to have been rather indifferent to turtle, in the East perhaps because of their close association with the Malays, who avoided the meat. The French, although interested, found but a limited supply of green turtle (*tortue franche*) available to them, most of the best turtling grounds being under English control. From the seventeenth-century account of Père Labat, the Dominican monk, of the many ways of preparing turtle that he observed in the manor houses of Martinique and Guadeloupe, it is evident that its merit was not unrecognized (*125*:1:61-62, 137-38). Yet it did not rate so much as a mention in Brillat-

Savarin's exhaustive *Physiologie du goût*, written in 1825. That the French thought of it as an English dish is suggested by the account of it in the nineteenth-century Larousse dictionary. "Like all people, says Grimod de la Reynière, the English possess some national ragouts which they esteem more through the spirit of patriotism than through conviction and the French, lovers of novelty and ever ready to judge their neighbor's possessions above their own, have the kindness to envy them. Such is turtle soup" (*128*:324). While he considered the reputation of English turtle soup fully justified, the French cuisine critic Alfred Suzanne wrote in 1904 that the green fat was esteemed by London connoisseurs more for its rarety than for its taste. As for the meat, he judged it a little dry, sometimes having a slightly disagreeable fishy flavor. In France, he noted, turtle soup was still scarcely known but by name, while in England and America it had an enormous consumption (*201*:12).

In contrast to the north Europeans, both the Spaniards and the Portuguese were for the most part singularly disinterested in turtle. After the middle of the sixteenth century their chronicles are generally silent regarding its occurrence and use. Sometimes there is evidence of a positive prejudice against eating the flesh, perhaps a reflection of native Indian attitudes which they encountered on the mainland. It is noteworthy that the English in the Antilles were not generally in direct contact with Indian populations, while on the mainland the Miskitos of Central America, their principal associates, were extraordinarily avid turtlers and turtle eaters.

Cadamosto, the first Portuguese to mention what must have been the green turtle, fed it to his crew at the Cape Verde Islands in 1456 and found it palatable (*30*:65). Oviedo, in his *Historia Natural*, called it "good and healthful food" (*163*: 111). Indeed, prior to the arrival in force of the English, the Spaniards seem to have had considerable respect for green-turtle meat as a food. In his late sixteenth-century account of Cuba, Fray Alonso Ponce (*169b*:2:373) remarks on the many small boats that came to the port of Havana loaded with large turtles that had been harpooned off the coast. They were kept in staked pens in the harbor to await buyers. Thomas Gage, the English Jesuit, who was in the New World from 1625 to 1637, observed of Havana that "all ships make their provision for Spain of tortoise meat [there]. They cut the tortoises in long thin slices . . . and dry it in the wind after they have well salted it, and so it serveth the mariners in all their voyages to Spain, and they boiled it with a little garlic, and I have heard them say that to them it tasted as well as any veal" (*206a*:334). Elsewhere he wrote of his

voyage to America: "We fed for the first week [in the West Indies] upon almost nothing but tortoise. . . . Our Spaniards made with them an excellent broth with all sorts of spices. . . . Thus, our hens, our sheep, and our powdered beef, and gammons of bacon, which we brought from Spain, were some days slighted, while with greedy stomachs we fell hard on our sea veal" (*206a*:28). Clearly, the Spaniards' prejudice against turtle meat that was later so evident had not yet taken hold. Most Spanish and Portuguese writers, however, ignored it.

Dampier, describing the turtles found on the Brazilian coast, wrote in 1699: "neither the Spaniards nor Portuguese lov(e) them; Nay they have a great antipathy against them, and would rather eat a porpoise, tho' our English count the green turtle very extraordinary food. The reason that is commonly given in the West Indies for the Spaniards not caring to eat them is the fear they have lest, being usually foul-bodied, and many of them pox'd (lying as they do so promiscuously with their Negrines and other She-slaves) they should break out loathsomely like lepers; which this sort of food, 'tis said, does much incline men to do, searching the body and driving out any such gross humours" (*53*:2:399). Richard Walter, who was with Lord Anson on his voyage around the world, writing in 1748, thought it strange, considering the scarcity of provisions on the Pacific Coast of Central America, "that a species of food so very palatable and salubrious as turtle should be proscribed by the Spaniards as unwholesome and little less than poisonous. Perhaps the strange appearance of this animal may have been the foundation of this ridiculous and superstitious aversion, which is strongly rooted in all of the inhabitants of this coast." Of the Indians and Negroes, slaves of the Spaniards, that they had taken as prizes in Peru, he noted: "These poor people being possessed with the prejudices of the country they came from, were astonished at our feeding on turtle and seemed fully persuaded that it would soon destroy us . . . it was with great reluctance and very sparingly that they first began to eat it; but the relish improving upon them by degrees, they at last grew extremely fond of it, and preferred it to every other kind of food . . . a food more luxurious to the palate than any their haughty Lords and Masters could indulge in . . ." (*226*:208).

One may ask, of course, whether the Spaniards' apparent disinterest in turtle may not have been in part a reaction to the close identification of it with the rival and hated English. Frederick Simoons, in his study of Old World food prejudices, has shown the frequency with which particular animals or foods have become identified with particular ethnic, religious, or other groups through the course of history. The tendency

to identify peoples with distinctive food habits is only a step from the rejection of foods simply because they are associated with a rival group. The pastoralists' rejection of the pig, an animal closely associated with and symbolic of the settled farmer, seems to be an extreme, but by no means isolated, example of this sort of attitude (*191*:106-25).

Even today the turtle is relatively little exploited among the descendants of the Spaniards and Portuguese in tropical America. The commercial turtlers in the Caribbean are for the most part English-speaking whites from the Cayman Islands, while the principal local markets for turtle meat are in the Negroid mainland towns such as Colón, Limón, Bluefields, and Belize where English-speaking Protestants of West Indian ancestry predominate (*165*).

THE EPICURES AND THE TURTLE TRADE

Although the virtues of turtle had long been familiar to West Indian planters and to men of the sea, its introduction onto the tables of London seems to have been curiously delayed. In Lyttelton's *Dialogues of the Dead* there is one between Apicius and Darteneuf in which the latter, who died in 1738, is made to lament that turtle was not known in his lifetime (quoted in *157*:12:168-69). The *Gentleman's Magazine* in 1753 and 1754 carried several notices of large sea turtles, brought from Ascension Island and the West Indies, being dressed at public houses in London. One of the turtles, "a present to the gentlemen of White's Chocolate House," was brought by Lord Anson. At the Kings Arms tavern in Pall Mall the mouth of the oven had to be taken down to admit the plastron of another 350-pound specimen. "It may be noted," one of the notes observed, "that what is common in the West Indies is a luxury here" (77:23:441, 498; 24:337).

Although these were certainly not the first live green turtles seen in England, they were a sufficient rarity to gain newspaper comment. "Of all the improvements in the modern kitchen," said the *World* in an account of a City of London banquet about this time, "there are none that can bear a comparison with the introduction of the turtle" (quoted in *157*:9:114-15). Dr. Samuel Johnson, in his *Dictionary* (1775), tersely defined "turtle" as a term "used among sailors and gluttons for a tortoise."

As the English demand increased, vessels in the West Indian trade were provided with flat wooden tanks in which live turtles could be deck-loaded. Although they were fed grass

and banana leaves on the journey, after arrival at the Leadenhall Street turtle tanks they still had to be "brought into flesh before being dished up to aldermen's or noblemen's tables." The largest, which were not necessarily the best, were often destined for the royal palace. For the less affluent there already were substitutes. As early as 1808 Mrs. Raffald's *Experienced English Housekeeper* was offering a recipe for "artificial" or mock turtle made from a calf's head (*174*:82-83).

Shipping losses of live greens may have been heavy. Peter Simmonds thought that "the best way to send home turtle from Ascension is to head them up in a sealed cask and have the water changed daily by the bung hole and a cork. Turtle, though the extremes of heat and cold are equally injurious to them, should always arrive in hot weather in England. Thus, an unfortunate captain on one occasion took from Ascension 200 turtles and, timing his arrival badly, brought only four alive to Bristol" (*188*:180).

Steam communication greatly facilitated the movement of live turtles across the Atlantic. By 1878 the annual arrivals were said to have reached 15,000, most of them caught by the Cayman turtle fleet and forwarded through Jamaica (*189*: 364-65). Their weights ranged from 25 to 300 pounds and their aggregate value in that year was estimated to exceed 8,000 pounds sterling. "The locality for feasting on turtle," it was written, "now has been transferred chiefly to the precincts of the City; and the Ship and Turtle, Birch's in Cornhill, the Guildhall, and Mansion House are the chief depots of consumption" (*77*:23:441).

Imports of "preserved turtle" were initiated in 1841 from Jamaica. It was admitted duty free as "fish of British taking and imported in British ships" after the entrepreneur, Henry Gunther of Kingston, assured the Commission of Privy Council for Trade that the turtles had been taken by Cayman Islanders and, thus, by British subjects (*85*). By 1880 imports of "prepared turtle" were listed as 10,800 pounds (*190*:226). This was apparently the designation applied to the sun-dried meat and calipee that in late years had begun to place turtle soup, by one account, "within the reach of the general consumer." But it was to remain pre-eminently a prestige food. Mrs. Beeton called turtle soup "the most expensive soup brought to the table," one guinea being the standard price for a quart of it. The 1909 edition of her widely read *Book of Household Management* states, "The price of live turtle ranges from 8*d*. to 2*s*. per pound, according to supply and demand. When live turtle is dear, many cooks use the tinned turtle, which is killed when caught, preserved by being put into hermetically sealed cannisters, and so sent over to England. The cost of a

tin, containing two quarts or four pounds is about £1, and for a small one, containing the green fat, 3*s.* 6*d.* From these about six quarts of good soup can be made. Sun-dried turtle is also sold, and answers very well. It requires to be soaked, as well as stewed for a long time, and put into good stock" (*14*:178-80).

The question of what makes a proper stock for turtle soup had been debated in a series of letters to the editor of the London *Times* that appeared in that paper between November 13 and 16, 1883. The claim of Sir Henry Thompson that conger eel made the best and most widely used stock and that "turtle furnishes only the garnish and the name" was vehemently refuted by the proprietors of Painter's Ship and Turtle on Leadenhall Street: "We never use or have used conger eel or stock meat of any kind; the stock is from turtles themselves, of which we kill from 4 to 8 daily. In proof of above, kindly test soup sent herewith ... and you will find it, as we guarantee, perfectly pure turtle."

Painter's was unique of its genre. "Turtle soup from Painter's in Leadenhall Street," wrote one observer at the end of the last century, "is decidedly the best thing in the shape of soup that can be had in this, or perhaps any other country." Here, it was asserted, was the only "turtle artist" in Europe (*104*:124-25). A French visitor described the establishment in 1904. A large pool of water contained upwards of fifty turtles awaiting "sacrifice." Alongside was the slaughter room and next to it the kitchen, where ten to twelve men were occupied in making this national soup, which was sent out each day to the city, to the provinces, and even to foreign markets. It brought the exorbitant price of one guinea a liter for the regular soup and twenty-five shillings for the clear soup. A bowl of turtle soup served in the restaurant cost three shillings, including the glass of punch that followed it (*201*:15).

Blending and seasoning are of the greatest importance in soup making and they call for much experience and "know-how." Like the proprietors of the Ship and Turtle, some leading present-day processors of "the Queen of Soups," such as Lusty's of London and Moore & Company of Newark, New Jersey, insist that the fins and steak or inside red muscle meat of the turtle are chiefly responsible for the flavor and that genuine "real turtle soup" of the sort that jells of its own strength on cooling is properly made only from a broth of turtle meat to which diced calipee is usually added as a relish. Others, especially in London and on the Continent, regard beef stock as an essential basis of the soup, holding that without it turtle soup tends to lack character. In this they claim the support of the famous *maître chef* Escoffier. The

so-called "mock turtle" soup generally contains no turtle whatever, calf's heads being used to simulate the gelatinous consistency of turtle soup. In the United States and Great Britain mock turtle is usually a thick soup, but on the Continent it is also prepared clear. Where the more expensive calipee is used in place of calf's heads, the soup may be designated as "real turtle soup," although properly speaking it is not such. The demand for calipee is strong and apparently growing, suggesting its increased use as an additive to soups of other stocks.

Tinned turtle products first entered mid-latitude markets sometime about the middle of the nineteenth century. Some of the first canneries were located within the tropics, close to sources of supply. A Key West factory was reported turning out 200,000 cases a year in 1880, employing ten vessels and sixty men in gathering the turtle (*190*:226). Another early one was at Pearl Lagoon, Nicaragua (*51*:274-76). The "green fat," a membrane lining the inner shell, formerly in strong demand, was often tinned separately from the meat and soup. It was once customary to serve it as a side dish, a spoonful being added to the soup if desired, but today there is no market for it. The largest shipments of tinned turtle products were to London, but New York was a substantial secondary market. Although turtle canneries have operated from time to time in Jamaica, Nicaragua, Grand Cayman, Mexico, Australia, North Borneo, and Kenya, they have been for the most part short-lived ventures. Today the larger share of the green-turtle soup and meat that goes into cans is processed either in the New York area or in London.

The leading London soup maker, John Lusty, Ltd., "By Appointment Purveyors of Real Turtle Soup to the Royal Household since the Reign of Edward VII," has been in business since at least 1851, when John Lusty was registered as a Marine Stores and Turtle Dealer at the Parnham Street address, close by the London docks and Greenwich Naval Base, where the company remains today.* Captains of the Royal Navy ships returning from the West Indies or Ascension Island often brought back live green turtles that they wished to be made into soup for presentation to "My Lords of the Admiralty," who prized it as a great delicacy. Trading vessels also brought their quota of the giant reptiles. The tinning of turtle products was initiated by Lusty's in 1870, with the West Indies as the principal source of supply. In a special

* I am grateful to Ralph Lusty of John Lusty, Ltd., for these notes on the history and present activities of his company. E. M. Hodgkinson and Samuel L. Yates of the United States Embassy in London have also been helpful.

Labels from cans of green-turtle soup and meat, produced chiefly for a gourmet clientele, suggest the diversity of this modern industry in both Europe and America.

heated indoor pool, with a sandy beach, the turtles lived a life of ease until required for the soup pots. Since World War II, however, very few live turtles have been imported, as shipping lines no longer provide deck facilities for them. Today they are usually slaughtered at the port of shipment, degutted and refrigerated. Lusty's imports perhaps 600 frozen carcasses annually, mostly from Kenya, and about 20 tons a year of Seychelles dried calipee and dried flipper and neck meat. Most of the latter is sold to others, for Lusty's gets most of its requirements from the whole carcasses it uses.

The real turtle soup, such as is served in the City of London at the Lord Mayor's banquet and similar sumptuous affairs, is a rich, gelatinous, clear soup that will set in a natural jelly even before it is completely cold and will almost "stick the lips together" when eaten. The preparation of this specialty product, in 200-gallon units, takes four to five days and requires about 2,000 pounds of turtle, the equivalent of perhaps 10 carcasses. A long, slow cook is essential to get the full benefit of the turtle and to ensure proper blending of the vegetables, herbs, spices, and wine. Before being put into cans, it is clarified. On custom orders, delivered in large crocks as a stiff gelatin, extra spice and wine are often added.

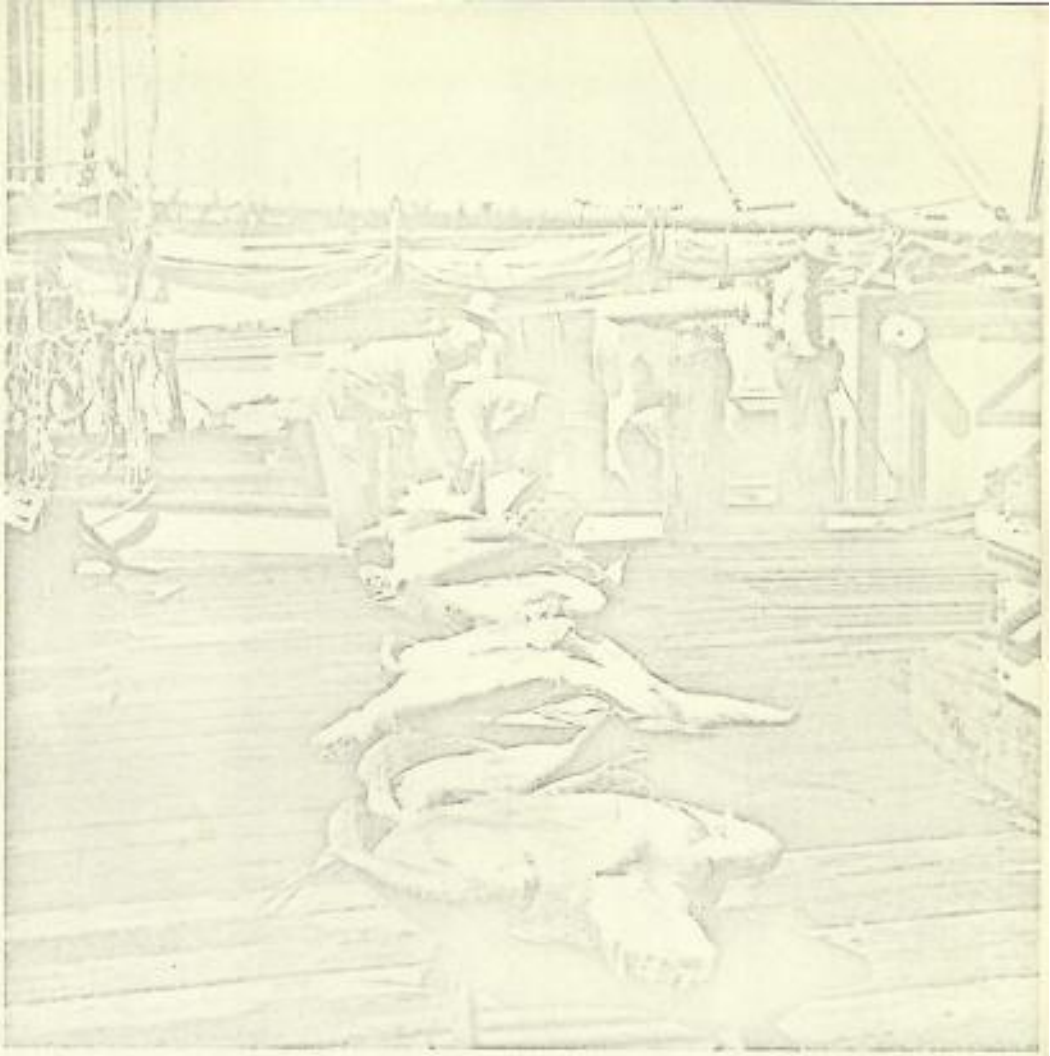
Lusty's, like other importers, also supplies fresh turtle meat

to caterers, hotels, and steamship companies for special banquets. Although the company makes several specialty soups, turtle products account for the largest part of its business. These include several types of soup, a meat extract, tinned turtle steaks in Madeira sauce, tinned calipee, a cosmetic oil for soap and face cream, and even a stick shaving soap with a turtle-oil base.

The second major London producer of real turtle soup is Bender & Cassel, Ltd., who also market bird's-nest, shark's-fin, kangaroo-tail, and other specialty soups under the trade name "Beeas." Production began in 1936. Company officials state that they import "a few hundred turtle carcasses and several tons of sun-dried calipee and calipash" each year. Most of the carcasses are from Jamaica, where turtles taken by Caymanian schooners are slaughtered and quick-frozen. The dried calipee and calipash comes both from Grand Cayman and from the Seychelles.

One recent trade estimate suggests that 1,200 frozen green-turtle carcasses may enter the London market in a year. Beach-turned females are avoided because of their generally poor condition. Most of the imports are from East Africa. On the average they run much larger than those that had earlier been brought from the West Indies, where offerings have recently dropped off sharply. Dried calipee, which in 1960 was bringing eighteen shillings ($2.25) a pound for the better quality grades of lighter color, is as important to the soup makers as are the whole carcasses. It is estimated that 30 tons of it may cross the London docks in a year, but this figure probably includes some dried meat as well as calipee destined for re-export to the Continent.

In late years a substantial demand has developed for green-turtle soup in several countries on the Continent. It is a standard feature of the menus of many luxury restaurants and hotels, particularly in the larger cities and tourist centers of Germany, the Low Countries, and, to a lesser extent, of France. In addition to imports from Great Britain there is a considerable domestic production. In Western Germany Eugen Lacroix of Frankfurt-am-Main and H. W. Appel Feinkost of Hannover are probably the principal factors in the trade, in France Edouard Artzner of Strasbourg and Conserves Morvandelles of Autun. Turtle soup is also canned in Denmark and in Switzerland. For most of these concerns the Indian Ocean is the principal source of supply, both for dried and frozen turtle meat. Increasing amounts of the finished products have recently been exported, especially to America. The Lacroix company, which has been manufacturing turtle soup since 1921, claims to use some 150 tons of cut turtle



Unloading green turtles from the Miskito Coast of Nicaragua at Key West, Florida, for transshipment to New York.
(FLORIDA STATE NEWS BUREAU)

meat and turtle carcasses annually and also claims that its product is the world's "most bought" turtle soup. But the latter claim is disputed, both in Britain and America.

In the United States the dominant company in the green-turtle and turtle-soup business is Moore & Company Soups, Inc., of Newark, New Jersey ("Ancora" brand).* The company has been making turtle soup since 1883. Formerly the turtles arrived at the port of New York deck-loaded on banana boats, but today they are trucked from Tampa, Key West, and other Florida ports turned on their backs, flippers tied, and heads supported by wooden blocks to minimize the danger of deaths from road jars. An average of two truck loads a week are received at the Newark plant, where they are held in a pond until slaughtered or, if frozen carcasses, placed in refrigerators. The tendency here is to use more red

* Andrew Perelli, vice-president of Moore & Company Soups, Inc., has provided much of the information that follows. This concern was formerly located on Manhattan Island. It moved to New Jersey following World War II because of increased requirements for space.

meat and less calipee ("shell meat") than in former days. Major hotels and restaurants may either buy direct from Florida dealers or from Moore's. As supplies are irregular and a few dealers tend to monopolize the trade, Moore & Company maintains working arrangements with Florida buyers and even some of the Cayman turtle-boat captains.

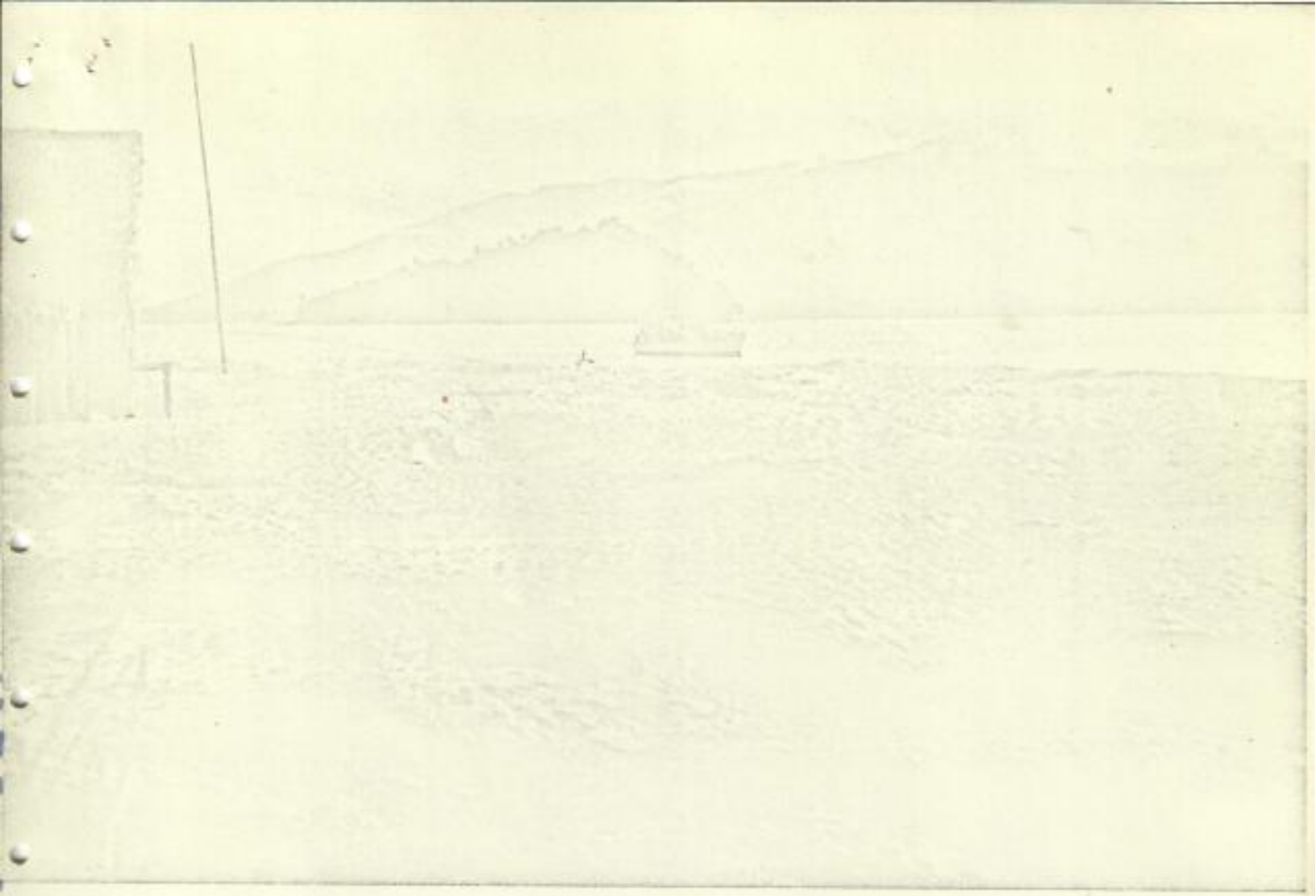
Turtle flesh apparently finds special favor among the Chinese population of New York. On August 24, 1939, the *New York Times*, describing the escape of a large sea turtle from the Fulton Street fish market, quoted an observer to the effect that 80 per cent of the turtles brought to the market were consumed by Chinese, "who believe that they acquire the turtle's longevity by eating its flesh."

During World War II frozen green-turtle steak, unrationed, was said to have been especially in demand in New York, where it replaced higher priced and hard-to-get beef. It was sold without bones for 75 to 80 cents a pound, and can still be obtained today in certain butcher shops there, as well as in many southern cities. However, the greater share of it undoubtedly goes to the canners.

Published trade statistics for 1957 list imports of 1,033,187 pounds of live turtles into the United States for that year, more than four fifths of which were from Nicaraguan and Mexican waters. No figure is given for calipee. If the average weight of the individual turtles was 160 pounds, this would mean that approximately 4,000 animals were imported, and this would not include any landings from United States vessels working in Florida waters nor any imports of calipee. While this figure would seem to be substantially in excess of the annual imports into European markets, it must be recalled that dried meat and calipee plays a much greater role there than in the American industry. Imports into the United States in 1960 were less than half as much as in 1957.

One may hazard the guess that between 15,000 and 20,000 green turtles a year find their way, in one form or another, to the commercial markets of North America and Europe, but this would include the animals slaughtered at Seychelles and elsewhere exclusively for their calipee and calipash. Although the aristocracy may consume less turtle soup today than in times past, the market has been immensely broadened. What was once reserved for the epicures of London and New York is now available on the shelves of quality groceries throughout Europe and America. The implications of such an expanding demand in the mid-latitudes, coupled with the growing population of the tropical world, are regarded as ominous by marine biologists and other persons concerned with the preservation of the species.

The beach at Talang Talang Besar, Sarawak, where up to a million green-turtle eggs may be collected in one season.
(TOM HARRISSON, SARAWAK MUSEUM)



Historical survey of the principal turtling grounds

The history of commercial turtling probably begins in the Bermudas. This isolated mid-Atlantic island group, originally an important nesting and feeding area for *Chelonia mydas*, lay conveniently athwart the sailing route between the West Indies and Europe. As early as 1594 there is an account of a shipwrecked crew using turtle oil to caulk a leaky vessel and later taking on thirteen live turtles for the continuation of their voyage to Newfoundland (*76*). In 1609 there are reports of "a great store" of greens there, yielding an oil "as sweet as any butter . . . one of them sufficing 50 men a meal." Two boats could take forty in a day. Wanton destruction of this fortuitously located meat reserve, both by harpooning and by turning the females on their backs as they came ashore to lay, followed permanent English settlement in 1612. In 1620 the

NOTE: The front endleaf map shows the location of the principal nesting beaches and feeding grounds mentioned in the text.

Bermuda Assembly, concerned with "the danger of an utter destroyinge and losse of . . . so excellente a fishe," passed what must have been one of the New World's first conservation measures (32:335). It prohibited the killing of turtles less than eighteen inches long within five leagues of the land. The penalty was to be forfeiture of fifteen pounds of tobacco. As turtles became scarce in local waters, Bermuda turtle boats moved further to sea in pursuit of them; toward the end of the eighteenth century they are reported in the Bahamas and at Ascension Island (233:374).

Today, though a few stray turtles may nest on the more remote islands of the Bermudas, they are essentially tourist curiosities (9: see also *149*). Babcock's account tells us that in 1937 there were still two turtling boats operating during the summer months where at the turn of the century there had been eight. The record catch of one of the captains, who had been turtling for forty years, was seventeen in one week and sixty in one season. The supply was inadequate to meet local demand, as it still must be, so that live turtles were being imported from the West Indies. Bermuda turtlers, hurt by high wage rates, were requesting a protective tariff! The organized turtle industry has since ceased to exist. Large turtles are no longer caught in Bermuda waters, fifty pounds being close to the average weight. These represent an itinerant population of juveniles, without eggs, and may be presumed to be flotsam that has drifted with the Gulf Stream the 800 miles from the Bahamas or the Greater Antilles. In the past, indeed, regular migrations between the Bahamas and Bermuda seem a distinct possibility.

Although the Bahamas are recorded from earliest times as supporting a large population of browsing greens, attracted by the extensive local eel-grass flats, there seems to be no evidence that they ever bred there. Mark Catesby asserted categorically that they did not, although hawksbills, loggerheads, and leatherbacks all nested on Bahaman beaches. All of the greens taken in his day were harpooned while feeding, the Carolinas providing the principal market (*41*:2: 38). The name of Green Turtle Cay, off Eleuthera Island in the Bahamas, might be taken as suggestive of at least one localized nesting beach, but there is no information as to how or when it was named.

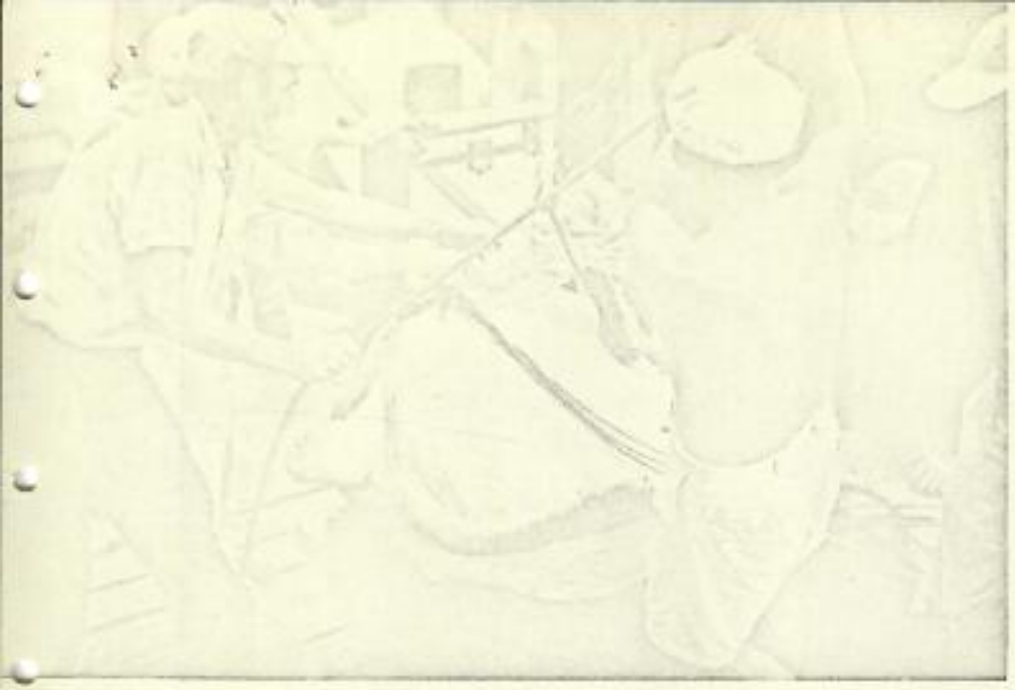
The pressure on the Bahaman green turtles was sufficient that as early as 1671 the Lord Proprietors of Carolina asked Bahaman officials to prepare a bill to be presented to Parliament "for the preservation of turtle" (*86*:7:No. 712). Apparently this instruction was not immediately carried out, for it was repeated five years later. As late as 1878 green turtles

were being sent in small numbers from Turks Island to New York markets. They seem always to have been taken in nets, usually set at the mouths of the salt-water "creeks" so common in the Bahamas (*134*:83). Boats from the Bahamas participated in the decimation of the Florida east coast and Cuban grazing flats and of the breeding school that came each year to the Dry Tortugas (*33*). The remnant Bahaman turtle population today is small and dispersed, being of no commercial importance, and the meat and eggs of other varieties are more commonly available than those of the green turtle.

John Hawkins, who called at the Dry Tortugas in July, 1563, was perhaps the first Englishman to eat turtle meat in the New World. He found it "much like veal," although the eggs he found in those turned on the beach "did not eat very swelly" (*103*:46-47). The Dry Tortugas may well have been the source of supply, too, of some of the Spanish trading sloops, laden with "hides and live turtles," that the Dutch buccaneers captured off the north coast of Cuba, near Havana, in the early years of the seventeenth century (*127*:34:45; 35:41). When Audubon was there 300 years later, turtles were still apparently abundant, perhaps more of them loggerheads than greens. He heard a report while there of one man who had harpooned 800 greens in a single month in adjacent waters, but was unable to verify it (5:2:371-80). Today this once populous nesting ground is rarely if ever visited by green turtles.

Carr believes that the Dry Tortugas beaches were once the main source of supply for Florida waters and that since their exhaustion the origin and thus the character of the remaining Florida population has changed accordingly (*37*:6-7). He estimates that as many as 1,000 green turtles may be taken annu-

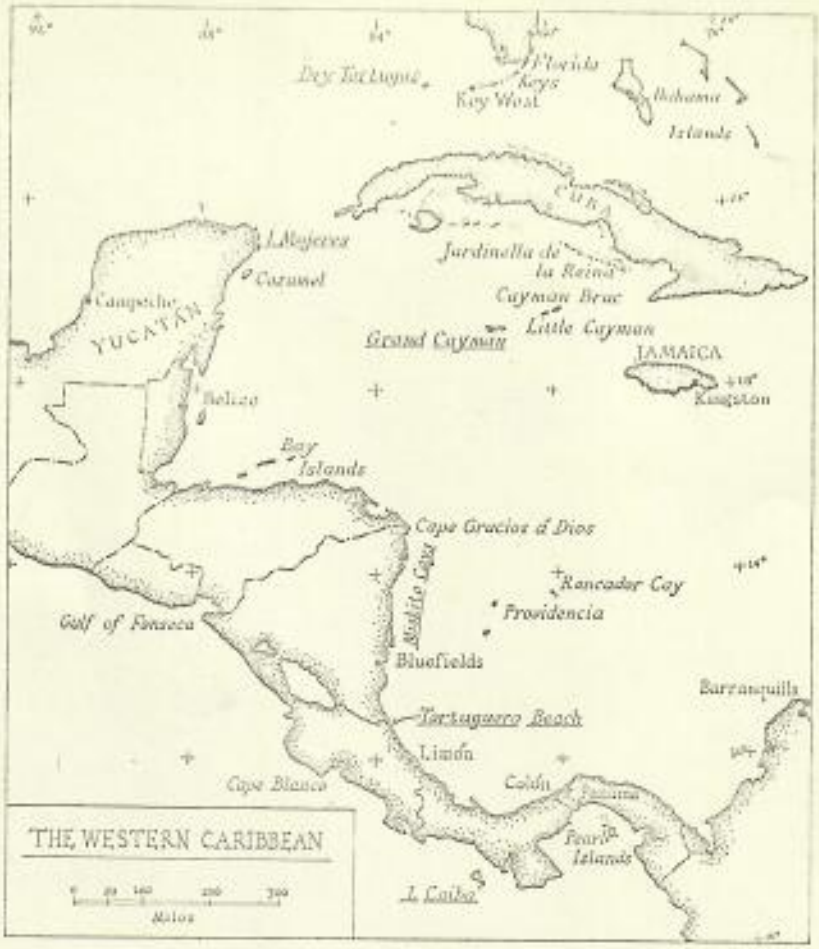
Three turtles taken at the seasonal turtle fishery off the Florida west coast. Turtle at lower left is about average size for the Florida population. That above is a 340-pound male, and the biggest taken in 20 years. The big-headed turtle at lower right is the mysterious ridley, whose breeding place until recently has been completely unknown. (CARR)



Docking a green turtle at Yankeetown, Florida. A small green-turtle industry still operates off the west coast of Florida, where each season several hundred turtles are taken between Tarpon Springs and the Apalachicola delta. Arriving in April and disappearing in November, they obviously come from distant breeding grounds — possibly in Costa Rica. (CARR)

ally in Florida waters, mostly in the grass flats off the Cedar Keys, on the Gulf side, but they are nonbreeding juveniles, probably waifs and strays from the main Caribbean population. Green turtle nestings on the Florida mainland are today quite rare. The Key West turtle trade, the town's most active industry in the 1890's, now depends largely on imports from Mexican and Central American turtling grounds. Shrimp, not turtles or sponges, dominate the Key West economy, although at least one concern still cans green-turtle soup and prepares fresh turtle meat for northern markets (*215*:513-15).

In earlier times the green turtle must have played an important role in the economy of coastal Florida. William Tecumseh Sherman, who was stationed at Fort Pierce, on the east coast, in 1840, wrote: "They are so cheap and common that the soldiers regarded it as an imposition when compelled to eat green turtle steaks instead of poor Florida beef or the usual mess-pork. I do not recall in my whole experience a spot on earth where fish, oysters, and green turtle so abound as at Fort Pierce, Florida" (*187*:19 quoted in 39:316). Green turtles are today rarely seen in the waters north of Florida, yet F. W. True wrote in 1884 that they were plentiful as far north as North Carolina where one man could catch 100 off Cape Hatteras in one day, apparently immature specimens carried by the northward-trending Gulf Stream (quoted in 32:347). Loggerhead and leatherback turtles still make their nests in some numbers on the coasts of Florida and Georgia.



THE CAYMAN ISLANDS, MISKITO COAST, TORTUGUERO AND YUCATAN

Of all the *Chelonia mydas* nesting beaches that the Europeans found in the American tropics none compared with the Cayman Islands. For nearly 200 years ships of all nations resorted there each summer to turn green turtles and to dry their flesh, an easily obtainable and palatable protein for ship or plantation stores. The Caymans early came to be the center of the Caribbean turtle industry, and the English from Jamaica, who first settled on the islands in the 1660's, came to be renowned as skilled turtlers. Although the greens no longer nest on the Caymans, nor are taken in local waters, the Cayman-based turtling fleet, operating off the Central American coast some 350 miles from Grand Cayman, still supplies the largest share of turtles entering foreign markets from the Caribbean. There can be few finer examples of cultural conservatism and persistence in the New World than that of this isolated island community of seamen.

It was Columbus himself, in 1503 on his fourth voyage, who first observed the massing of turtles at the Caymans. His brother Ferdinand wrote of the occasion, "on Wednesday May

10 we raised two very small and low islands full of turtles, as was all the sea about, so that they looked like rocks; whence these islands were called Las Tortugas" (quoted in *148*:636). The reference was to Little Cayman and Cayman Brac, about 115 miles northwest of Jamaica and 40 miles east of Grand Cayman. No stop was made.

The turtles congregated there especially during the summer months. Those who later touched at the islands at other seasons of the year were impressed rather by what were taken to be giant *iguanas*, alligators, and crocodiles that also lounged on the shore and from whence the name "Caymans" (Spanish, *caimanes*) began to appear on the charts. But it was the abundance of green turtles that brought men back. The Dutch chronicler Johannes de Laet, recounting the journey of Pieter Adriaensz Ita in July, 1630, describes one sandy beach on the northwest corner of Little Cayman "where from May to October great numbers of edible turtles come to lay their eggs in the sand . . . [so that] in a single night one or two thousand can be taken, and of such a size that 20 to 30 men can be fed with one of them" (*127*:35:170). Two thousand turtles in a single night is a quite incredible number—perhaps the author meant two hundred—but granting the exaggeration, it suggests that the nesting turtles may have been no less common on the beaches of Little Cayman than on Grand Cayman in those early years. But the latter probably persisted longer as a major supply source, the "meat market" of the English and Dutch in the Caribbean. William Jackson, who was on Grand Cayman in 1643, wrote "Hither doe infinit numbers of sea tortoises resorte to lay their eggs upon ye sandy bay, which at this time [June] swarm so thick. The island is much frequented by English, Dutch and French ships, that are purposely there to salt up ye flesh of these tortoises" (quoted in *63*:15).

"Making turtle at Caimanos" was a frequent log-book entry of vessels operating in this part of the Caribbean in the seventeenth century. A Captain James is recorded as landing 50,000 pounds of salt turtle at Jamaica in the summer of 1657, valued at *3d.* a pound. Another 43,000 pounds, brought by the same skipper two years later, was sent on to Barbados (*86*:9:Addenda 290, 316).

There were some forty sloops based at Port Royal turning turtle at the Caymans and netting them in adjacent Cuban waters when Hans Sloane wrote (ca. 1688). He observed that the meat "sustains a great many, especially of the poorer sort" on Jamaica, the live turtles being "put into pens or palisadoed places in the harbor of Port Royal" to await slaughter (*193*:1:xvii). The great Palisadoes sandspit that encloses

Kingston Harbor and on which Jamaica's international airport is built was named for these turtle pens or "palisadoes."

When French and Spanish corsairs drove the English turtle sloops from the Caymans and the south coast of Cuba in 1684, Jamaican officials considered it as a calamity. Colonel Hender Molesworth wrote to William Flathwayt in London: "The turtling trade being thus lost for awhile, Port Royal will suffer greatly. It is what masters of ships feed their men on in this port and . . . nearly 2,000 people feed on it daily here, to say nothing of what is sent inland. . . . It cannot easily be imagined how prejudicial is the interruption of the turtle trade. We must inevitably set ourselves to remove the existing instructions." To this end he asked for more armed frigates "if our Lords think that our turtlers and traders should be protected" (*86*:11:721).

Dampier, who was at the Caymans in 1675, observed that there were no feeding flats in the vicinity of the islands and surmised that the breeding turtles must come from the south keys of Cuba, forty leagues away. "And it is most certain," he wrote, "that there could not live so many there as come here in one season" (53:1:133; 2:399). Edward Long, in 1774, commented in wonderment at this annual migration, which he thought originated in the Gulf of Honduras: "without the aid of chart or compass [they] perform this tedious navigation with an accuracy superior to the best efforts of human skill; insomuch that it is affirmed that vessels, which have lost their latitude in hazy weather, have steered entirely by the noise which these creatures create in swimming, to attain the Caymana isles. . . . In these annual peregrinations across the ocean they resemble the herring shoals; which by an equally providential agency, are guided every year to the European seas. . . . The shore of the Caymanas, being very low and sandy, is perfectly well adapted to receive and hatch their eggs; and the rich submarine pastures around the larger islands afford a sufficient plenty of nourishing herbage, to repair the waste which they have necessarily undergone. Thus the inhabitants of these islands are, by the gracious dispensation of the Almighty, benefited in their turn; so that when the fruits of the earth are deficient, an ample sustenance may still be drawn from this never failing resource of turtle, or their eggs, conducted annually as it were into their very hands" (*136* quoted in 32:350-51).

Subjected to such sustained slaughter, the Cayman breeding population was doomed to extinction. By 1802 the islands were reported as contributing but a small part of the turtles that were being taken by Caymanian turtlers (*132*). Gradually the turtle boats had turned to other waters, first to the

Cuban keys and, when they too were swept clean, to the Gulf of Honduras and the Miskito Coast of Central America. By 1722 several "Jamaica vessels," some of which were possibly of Cayman origin, were annually visiting these waters to catch turtle and to buy them, together with tortoise shell, from the Miskito Indians (*68*:9:155). Dried manatee meat was also supplied to English traders for export to Jamaica. A few years later the British superintendent of the Miskito Shore establishment observed that the salt flesh of turtle from the Miskito Cays sold in Jamaica at the price of salt beef and was much esteemed. Three men and a boy might get 130 in a season, each yielding some 150 pounds of dressed meat.

The Miskito Indians may well have taught the English the art of turtling. As early as 1633 a trading station had been established among the Miskitos at Cape Gracias a Dios by English adventurers from the Puritan colony at Old Providence Island, some 160 miles to the southeast. From the beginning relations between native and trader had been amicable, and a sort of symbiotic relationship soon grew up, nurtured in part by a mutual antagonism towards the Spaniard, that survived for better than two centuries (*166*:10 ff). The Indians were not only superlative boatsmen but they had an "eye" for turtles that never ceased to amaze the Europeans. Many an English and Dutch pirate vessel carried at least one Miskitoman as a "striker" to harpoon turtle or fish for the mess table. Dampier is again our principal authority: "Their chiefest employment in their own country is to strike fish, turtle and manatee . . . for this they are esteemed and coveted by all privateers; for one or two of them in a ship will maintain 100 men, so that when we careen our ships we choose commonly such places where there is plenty of turtle or manatee for these Moskito men to strike; and it is very rare to find privateers destitute of one or more of them when the commander or most of the men are English; but they do not love the French, and the Spaniards they hate mortally" (*53*:1:39).

The first clear documentation of the presence of Caymanian turtlers at the Miskito Cays is in 1837, the year after the Cayman colony was established at Roatán in the Bay Islands of Honduras (*63*:165; *132*:56-65). Thomas Young, writing in 1842, noted that Cape Gracias a Dios was "often visited by small schooners from Grand Cayman's Island, near Jamaica, to fish for turtle near the Mosquito Keys, about 40 or 50 miles from the Cape, and which seldom return without a rich harvest. They supply the Belice and Jamaica markets with the finest green turtle, and often . . . hawksbill turtle shell, as the Mosquito Keys are very much the resort of that species

as well as the green" (238:17). Cayman boats also visited Roncador and the other uninhabited low reefs between Jamaica and Old Providence Island, but there they took chiefly hawksbills.

In the National Archives in Washington (*Miscellaneous Letters Relating to the Guano Islands,* Vol. 5) there is a contract dated September, 1869, between James W. Jennett of Brooklyn, New York, and two natives of Martinique whom he had left at Roncador to sell guano to passing ships and to await his return. He instructed them to catch and save all the green and hawksbill turtles they could and to build a turtle crawl with stone to keep them in. One dollar in gold was to be paid for each green turtle weighing above 75 pounds, one cent per pound for the smaller ones and for all hawksbills.

Every year during the season from ten to twelve vessels of Cayman registry still are to be found netting turtles at the Miskito Cays (*166*:33-37). (These Cayman vessels were more numerous in earlier years. A Bluefields newspaper reported twenty-three of them present during the summer of 1905, each taking 100 to 200 turtles. The Nicaraguan government objected at that time to their violation of the three-mile limit.) They pay Nicaraguan customs officials at Cape Gracias a Dios a nominal fee for each of the 2,000 to 3,000 green turtles annually taken under terms of a treaty of 1916 between the United Kingdom and Nicaragua. The turtle ground is a vast sandy shoal covered with marine grass and set with scattered coral rocks. Working from small catboats, the turtlers set their nets over marked rocks to which the turtles customarily retire at night and wait for them to become entangled in the nets when they surface to blow. The night's catch from each catboat is transferred to a larger schooner and on Saturday the week's turtles are taken to the "crawls" at a temporary camp on one of the cays where fresh water can be had. Archie Carr describes this turtling (33; see also *205*:13-17). Some turtles may be slaughtered and the meat sun-dried on the cays, but the majority are carried live, at the end of the season, to Grand Cayman where they may be kept in crawls for several weeks before marketing. It is apparently here that they lose much of the sea lice that gives them their somewhat unattractive appearance. Caymanian exports of green turtles in 1956 were 4,109 live animals valued at £20,000 sterling, together with 24,000 pounds of "turtle skin" (calipee) worth £18,000 sterling f.o.b. (*92*).

The inhabitants of tiny Cayman Brac have been traditionally the hawksbill fishermen, while those of Grand Cayman have confined their attentions to the green variety. Cayman Brac inhabitants are even said to prefer the flesh of the hawks-

bill to that of the green. Their method of capturing turtles is quite different, involving a "turtle trap" consisting of an iron ring about five feet in diameter to which a simple net bag is attached. The turtle is stalked in clear water and, when sighted, the net is dropped over it. But synthetic plastic products have brought about what is almost certainly the permanent collapse of the market for tortoise shell, and the great piles of shell stocked here, some of it now more than twenty years old, will probably never find a buyer. In their economic distress the people of Cayman Brac have turned in recent years to handicrafts, especially rope products, but not to green turtles (*63*:25, 359-60, 428).

Grand Cayman turtle boats can reach the turtling grounds off Nicaragua in three or four days. When the Nicaraguan government has from time to time challenged the legality of their presence off the Miskito Cays, they have shifted to Mexican waters or to Costa Rica. Traditionally there have been two turtle fishing seasons, one from January to March or April, the other from July to September. Spring and early summer, the months of roughest water, are thus avoided. But the second season of calms is also the season of hurricanes and through the years these tropical storms have taken a heavy toll of Cayman turtlers.

Briefly, in 1952, a turtle-soup cannery was in production on Grand Cayman, built and operated by the Colonial Development Corporation. The anticipated American market failed to develop and the enterprise was closed down at the end of the year after 22,000 dozen cans (8,600 cases) of soup had been produced. The 30,000-case annual capacity of the plant was never realized and the Corporation investment of £70,000 was written off as a loss when the cannery closed in May, 1953, "owing to sales failure." The report for 1953 bluntly concludes: "The Corporation should not have embarked on the production of an article of such limited luxury interest on its own. Negotiations for the disposal of the factory by lease or sale are proceeding. Under the existing agreement turtles will be taken from the fishermen's association up to June 30, 1954, and sold live in the U.S.A." (*213*:1952:34; 1953:29). So ended the Grand Cayman turtle cannery scheme.

The green turtle seldom nests on the Miskito Coast today. Yet it once may have done so. Mr. David Stoddard informs me that he has seen in the Belize Archives a proclamation dated at Bluefields July 26, 1844, prohibiting "the thoughtless and improvident practice of destroying the nests of turtles for the purpose of carrying off their eggs." This prohibition applied to the nests of all species of turtles on any portion of the Miskito Coast, its islands, keys, and shoals.

Tagging a large green turtle at Tortuguero. (CARR)

The local belief that they come from Tortuguero (Turtle Bogue), a twenty-mile stretch of black sand beach lying between Río Tortuguero and Río Parismina in Costa Rica, is being borne out by the tagging program being carried out by Archie Carr (38).* Tortuguero, indeed, appears to be the last large-scale nesting area for the Atlantic green turtle in American waters. Each summer huge fleets of turtles appear there, mate off the shore, and (the females) lay their eggs on the beach. This part of the coast, lying immediately south of the Río San Juan, has been known as a favored area for turtles since at least 1592, when there is a Dutch account telling of the great numbers that came to lay in the sand there "much as crocodiles do" (*135*:92). Their flesh, the chronicler tells us, was very good. Today it is leased in ten-mile sections to contractors for turtle-turning and egg-gathering. During the season, from June 15 to August 15, about 2,000 female turtles averaging 250 pounds each are turned by the concessionaires. By law this may be done only after the eggs have been laid, but the *veladores* ("stayers-awake") who patrol the beach each night are paid by the head for all turtles turned and are unsupervised. Taken to Limón, the turtles are placed in crawls and fed on bananas and banana leaves until sold, usually for about ten United States dollars each. The best export market is Colón, the mature females turned on the beaches being larger and less esteemed, as well as more difficult to handle, than the 100- to 150-pound specimens taken by the Cayman boats off the Miskito Cays. The English-speaking Negroes ("Creoles") of

* See back endleaf for tag recoveries in migration study.

Central America are especially fond of the meat, which normally sells at a slightly lower price than beef on the local markets. A few are shipped to Key West and other Florida ports, though not so many as in former years when banana boats carried turtle tanks on their decks.

According to one of the concessionaires, at least three times as many turtles could be taken from Tortuguero if the market warranted it. He estimates that more than three fourths of all eggs laid are lost to predators, especially dogs, and that more than 80 per cent of all baby turtles actually hatched are taken by sharks or other fish as they enter the sea. There are few historical records of the exploitation of Tortuguero. In 1923 the United States Consul at Limón estimated the annual take to be only 750 greens a year and an equal number of hawksbills. The greens sold for about $10.00 apiece, about the same as today (*212*:598-99).

Although there seems to have been no diminution in the turtle catch from Central American waters and beaches in the past fifty years, the meat-hungry settlements along the coast and the new quick-freeze storage techniques may be building up a pressure that the species will be in no position to withstand. Carr, who initiated a tagging program at Tortuguero in 1955, has emphasized the urgency of basic research in the biology of the animals, their range, breeding habits, nesting places, migrations and volume of the annual take of turtles and eggs throughout their habitat area (32:356-57). Such information would provide data on which a proper conservation program could be founded, and green turtles could perhaps be restored to their former abundance. A recent survey supported by the Caribbean Commission concludes that the principal danger to the industry as a whole is interference with the nesting turtle and that prohibition of egg taking and capture of turtles on beaches should be rigidly enforced (*115*:59-61).

There is another nesting area off the Yucatán peninsula of Mexico, second in importance only to Tortuguero, which Carr surmises may be the home of the remnant Florida west coast grazing population. This is centered on the low coral islands off the northeast corner of the peninsula, especially Isla Contoy, Isla Blanca, Isla Cancún, and the uninhabited eastern coast of the larger island of Cozumel. Green turtles are also reported to nest in considerable numbers on Banco Chinchorro (Cayo Lobos) off southern Quintana Roo. The headquarters for commercial turtlers here is Isla Mujeres, itself a raised limestone block with a cliffed coast on all but its northern tip. Although unpopulated for most of its history, Isla Mujeres is today the site of a lighthouse and small fishing community. Exports of green turtles to the United States from this part

of the Mexican coast have numbered as high as 2,000 a year, but in the summer of 1956 it was being claimed that taxes and export duties were making the trade uneconomical. At that time there were several hundred turtles in the crawls at Isla Mujeres for which it was said that no market could be found. (This information is from Señor Hilario Scumperdis, Isla Mujeres; on this turtlery documentation is scarce, but see *199*:2:355-59, 384, 411, and *65*:90-92).

The turtles of the Mexican coast had early come to the attention of the Spaniards. Juan de Grijalva's expedition of 1519 encountered Indians carrying turtle-shell shields which sparkled so in the sun that some of the soldiers contended that they were made of low-grade gold (*61*:49). At a somewhat later date (1554) the natives of at least one coastal village on the Bay of Campeche (Amescalapán, near Coatzacoalcos) were ordered to pay a tribute of five *tortugas* every two months, along with substantial amounts of cacao, maize, and cotton cloth (*145*:19). What the Spaniards may have done with these turtles is not known. They may have been hawksbills, but the use of the term *tortuga* rather than *caret* on the tribute list argues rather for the green variety. In either event the seasonal nature of their migrations does not seem to have been recognized. A few years later the village in question was reported abandoned (*despoblado*).

The green turtles that were formerly so plentiful among the cays of British Honduras may well have come from the Mexican beaches. An English logwood buyer, Nathaniel Uring, who was at Belize in 1719, observed that "Among the small islands or keys of the Bay are great numbers of green turtles, which the Baymen never want when they fish for 'em, and are mostly taken in nets." These must have been feeding turtles, although when he was at Isla Carmén on Laguna de Términos, Bay of Campeche, in July seven years earlier, he mentioned that two of his men in one night turned ten "fine, large turtle . . . on which all the ship's company feasted . . . it being that time of year when those creatures go on shore to lay their eggs" (*217*:166, 243). It was the custom of the Jamaica logwood cutters at Campeche and Belize to keep a reserve supply of live turtles in pens or crawls, and many of these found their way to the Jamaica market, where they were especially in demand as food for plantation slaves.

THE LESSER ANTILLES, THE GUIANA COAST, ALTA VELA, AND ISLA AVES

In the Lesser Antilles and along the north coast of South America green turtles seem originally to have been everywhere quite common, yet the literature does not suggest the

existence of the marked concentrations such as are often reported elsewhere. There were several favored nesting islands, however, to which turtlers repaired in season. Oviedo mentions especially Cubagua and other nearby islands off the north coast of Venezuela (*162*:lib. xix, cap. ii). Père Labat says that the French went especially to the "Iles de la Tortille" (Aves?) and other sparsely inhabited islands (*125*:1:99-102). The turtlers spent three to four months at these Iles de la Tortille taking greens and hawksbills, so they may have been some distance away. The Caymans also suggest themselves, but elsewhere Labat refers to the Caymans by name. Rochefort, on the other hand, points to St. Martin's as a particular good turtling area (*179*:1:26), while for Dampier "the best in the West Indies, both for largeness and sweetness" were found at Isla Blanco off the north coast of Venezuela where they "come up to lay in great abundance" (53:1:87). Later accounts suggest that Isla Mona (*112*), off Puerto Rico, and Isla Aves, west of Guadeloupe, were also important nesting grounds. There is a Huevos Island at the northwest tip of Trinidad that is said to be named for its turtle eggs, but these may have been of the hawksbill kind, as were those taken on Barbados. Carr reports that on the windward beaches of Trinidad, near Mayaro, there was once a big green-turtle rookery. Today they come up but seldom, perhaps because of the steady catching of nesting females, or perhaps because the roots of coconut trees, bared by the erosive action of waves, are making it increasingly difficult for the females to make their nests (*34*:114-15, 122).

Green turtles formerly laid in considerable numbers, as they still may, on certain sections of the Guiana coast. Lacépède quotes a French resident physician to the effect that about 300 live greens were taken each year between April and June near Cayenne where they came to lay. This was at the end of the eighteenth century (*126*:125-27). Stedman, about the same time, describes green-turtle meat "publicly exposed to sale by the butchers in Surinam like the shambles meat in European markets [and] esteemed as the most delicious between February and May" (*198*:1:16). Green turtles are still not uncommon along the Guiana coast, especially at Biggi Santi (Big Sandy) beach between Paramaribo and the Moroni River in Surinam, and in British Guiana west of the Courantyne mouth.

Their former abundance in Curaçao waters is evidenced by an order in 1737 restricting the slaughter of green turtles to certain streets in Willemstadt because of the offensive odors this activity produced (*114*:14; *17*:202). Today one would have to walk a long way to see a turtle slaughtered on Curaçao or the other Dutch islands. The few that are taken by drift

nets or harpoons are believed to be migrants. The latest reference to commercial exploitation of nesting turtles in this area that I have encountered is an account published in 1911 of activities on the desert island of Blanquilla (*138*:177). The island, which lies fifty miles north of Margarita, at that time was leased by the Venezuelan government to an entrepreneur who was curing turtle and goat meats and packing them in large jars for shipment to the mainland.

I have found no specific reference to turtles on Isla Tortuga or the small Islas Tortuguillas off the north coast of Venezuela. The names may have been inspired by their shape, as has been suggested to have been the case with the buccaneer-frequented Isla Tortuga (Ile Tortue) on the northwest coast of Hispaniola. The Hispaniola "La Tortuga," however, is known through a letter written in 1495 by Michele de Cuneo to have been given by Columbus, on the first voyage, to commemorate the taking of a giant turtle there (*17a*:103).

On both coasts of Hispaniola turtles, either hawksbills or greens, were extremely abundant in the first years of the Spanish occupation. "*Tartuge infinitissime, grosissime . . . optime al mangiare*" ("an infinity of giant turtles . . . optimal for eating"), wrote the Italian Cuneo of them in 1495 (*17a*: 101). There are frequent references to them in the journal of Columbus and in the works of Oviedo and Peter Martyr. The last author, the first chronicler of Spain in the Caribbean, described in terms of wonderment (Decade IV, Book 9) the reports he had heard of the mass nesting of sea turtles on the island of Alta Vela off the southwest coast of Hispaniola near Cabo Beata (*144*:1:391). Later accounts make no mention of turtles on Alta Vela, but before the English had arrived and become so closely associated with turtles, the Spaniards seem to have eaten the meat with gusto. Indeed it seems to have been Martyr who first used what was to become the standard descriptive phrase for turtle meat when he termed it the equivalent of veal (*ternero*).

Possibly the most important single surviving green-turtle nesting beach in the eastern Caribbean area today is tiny, uninhabited Isla Aves, 130 miles west of Guadeloupe and 350 miles north of the Venezuelan mainland. Briefly, in the 1850's, it was the subject of litigation among five nations, all of whom coveted it for its guano (*214*; this is a 472-page collection of correspondence concerning the question). Venezuela's claims were in the end recognized, but the islet has never been permanently occupied. A United States Air Force mapping group, on Aves in 1954 to pinpoint it as a geodetic link between North and South America, ran into unexpected trouble—turtles. During the first two weeks of July an average

of twenty big greens a night lumbered ashore, knocking down radio masts and so disturbing the camp that the personnel had to be taken off the island each evening. A few turtles were still coming ashore in October and November, when the unit returned after an absence of two and one-half months, but by the end of December all turtle activity had ceased.*

A schooner of about thirty tons gross and a smaller sloop, both operated by a St. Lucian, sail between Aves and Dominica carrying turtles to Dominica during the three summer months. The schooner carries fifty to sixty turtles on each trip and makes up to six trips during a season. Occasionally other boats may carry turtles to Dominica, so that annual receipts there probably exceed 400 animals a year. The turtles are turned on the Aves beach and carried alive to the market, water being thrown on them during the voyage. On arrival they are kept in a fresh-water pond until needed. They weigh mostly between 250 and 300 pounds. In 1959 the official price was eight cents (B.W.I.) per pound alive, but they were being sold on the black market for twelve to fourteen cents per pound and retailed by butchers at twenty-five cents. Some of the animals are sent to St. Lucia where the meat is locally consumed and the calipee and calipash are dried and shipped to London.† Lindeman reported that 200 turtles were being shipped annually in the 1870's from St. Lucia to London (*134*:86).

It is probable that the turtle population of Aves is much reduced from its former levels. Its establishment as a "turtle reserve" has recently been suggested by Venezuelan interests (*181*). But any such remedy may in the end prove futile, for the island seems to be gradually disappearing under the sea. When Père Labat was on Aves in 1705 he described it as a considerable island, two leagues (*lièves*) by three leagues in dimension and with a maximum elevation of some 45 feet. A recent survey shows it to be now scarcely 1,500 feet long, its maximum elevation 10 feet. Labat, who found an abundance of nesting turtles there, found the island supporting a vegetation that included guavas (*goyaviers*), soursops (*corossoliers*), and custard apples (*cachimans*). Today there is nothing but common purslane growing there. The area of sand suitable for nesting turtles is doubtless much reduced as a result of this drastic alteration of the island's shoreline. Should it com-

* Personal correspondence, June 26, 1958, from Major William C. Rogers, Hq., 1370th Photo-Mapping Group, Palm Beach Air Force Base; see also *133*.

† Information on the Dominica and St. Lucia trade is from William Clarke, Alameda State College, California.

pletely founder, the Aves turtles will be faced with a dilemma of considerable proportions and one which would be of much interest to students of animal behavior (*240*).

THE COAST OF BRAZIL

The tropical coasts of Brazil, from the mouth of the Amazon southward to Rio de Janeiro, are intermittently visited by nesting green turtles, but information regarding their numbers and distribution is scarce. Here, as elsewhere on southern hemisphere beaches, the main egg-laying season is from December to March or April. The seaward side of Marajó Island, at the mouth of the Amazon, is apparently an important nesting zone. Others have been described north and south of the Rio Doce (Vitória) and at Cabo Frio, near Rio de Janeiro (*81*:720). *Chelonia mydas* are also reported to frequent certain localities in Bahia, Parahyba, and other places on the north coast. Of the beaches with which Emilio Goeldi was familiar the most favored was the 50-mile stretch between the Rio Doce and Rio São Matheus and another between the Rio Riacho and the Rio Mucury. He also mentions Prado, Comechatiba, Trancoso, and Pôrto Seguro as places frequented by turtles. Many of these may have been hawksbills.

Prince Maximilian of Wied in 1816-17 described these deserted and inhospitable beaches of tropical Brazil, then visited only by Indians during the egg-laying season (*230*:95, 103). Piles of bleached turtle skeletons contributed to their melancholy aspect. The Tupi called the green turtle *suruaná*. They were apparently more interested in it for its eggs and oil than for the meat, an attitude also noted toward the freshwater Amazon river turtle. It will be remembered that the Portuguese, like the Spaniards, seem to have had but little interest in turtles, and this is further suggested by the infrequency of reference to them in the Brazilian literature. It seems probable, however, that the mainland beaches, however isolated, did not offer sufficiently favorable protection from man and other predators to permit the build-up of large breeding stocks at any one place.

Clearly not so inhospitable to greens was the isolated island of Trinidade, located in the South Atlantic Ocean some 700 miles off the Brazilian coast (20° 23′ S.). Whether the Trinidade turtles were ever commercially exploited I have been unable to establish, but in view of the island's position astride the sailing route from the Guinea coast it seems probable that they were. A British treasure-hunting expedition on the island in the 1890's at Christmas time reported that "female turtle frequent Southwest Bay in large numbers for the purpose

of depositing their eggs" (*122*:183). A few years later another party reported seeing large numbers of turtles close to the rocks off South Trinidade in the month of January (*156*:39). None were observed to haul out on the beach to lay, perhaps because of the roughness of the surf. I have found no other references to the Ilha Trinidade turtle population, but there is a Ponta das Tartarugas and a Parcel das Tartarugas on modern maps of the island. The rockiness of its shore seems to have barred nesting turtles from the otherwise attractively located Brazilian island of Fernando de Noronha off Cape São Roque.

ASCENSION ISLAND

In the English mind green turtles have always been peculiarly associated with the lonely and barren volcanic island of Ascension. Lying in the South Atlantic Ocean at 8° South latitude, more than 1,000 miles off the Guinea coast of Africa, it early became a watering and victualing place for ships homeward-bound from East India. Its coasts are mostly cliffed and rocky, but there are a few beaches composed entirely of small, rounded pieces of shell that are assaulted each year from February through April by large numbers of nesting green turtles. In the days of sail they provided a welcome respite from salt provisions and hardtack.

The Ascension turtles attracted special attention for their size as well as their numbers, and there are several reports, apparently not exaggerated, of specimens weighing 800 pounds or more. Such early chroniclers as Dampier and Captain Cook were impressed by the great distance and the pinpoint navigation skills involved in the Ascension turtle migration. Dampier, noting the absence of turtle-grass, thought they could not find feed anywhere along the steeply shelving coast of the island. "After laying time," he wrote, "you never see them" (*53*:1:391). Several observers have commented on the apparent absence of males, but it is certain that here as elsewhere the males must mill about at some distance offshore during the egg-laying season. The best guess is that these turtles spend the greater part of their lives browsing in the shallow waters of Brazil or Africa. But how they are able to find their way to so distant and isolated an island must stand as one of Nature's more perplexing secrets. In what manner and when this remarkable behavior pattern may have originated are no more answerable questions.

Ascension Island also attained a certain notoriety among nineteenth-century scientists for the fossil turtle eggs found there cemented in coral, as reported by Sir Charles Lyell.

These, however, need not necessarily have been of any great antiquity.

The earliest reference that I have found to the Ascension turtles was made by a Dutch party that took turtles on the island in the year 1600 (*119*:50:217-19; 46:154). When John Fryer was there sometime between 1672 and 1681 his men turned a total of 120 of the creatures on the beach at night with handspikes, "the flesh of some being as much as our little Indian bullocks." Ship crews, he observed, "mightily lament the want of them when they are spent, because they must return again to their salt meats" (73:185). It was chiefly the English and French vessels that called at Ascension, the Dutch most often being provisioned at the Cape, but Roggeveen was there in 1773 and noted of the turtles that the sailors never tired of them, "for they make a perfect change of their juices, freeing them entirely from the scurvy and other diseases of the blood" (87:1929:7). In the same year Bernardin de St. Pierre, who stopped there en route home from Mauritius, told of fifty turtles being turned on Ascension in a night. They were so large that they had to be taken aboard ship the next day by a high-line to avoid the rough seas. "For near a month thereafter," he wrote, "we lived wholly upon these turtles, which were kept alive ... sometimes on their back and sometimes on their belly, by throwing sea water over them several times a day." He saw several turtles that had been left on their backs to perish by earlier visitors, "a negligence altogether unpardonable of which thoughtless sailors are too often guilty" (*18*:273, 290).

Green turtles must have been early introduced into England and France by homeward-bound sailing ships out of the East Indies. The first account of this sort that I am aware of is in 1753, when the *Gentleman's Magazine* recorded that, "The turtler Captain Crayton, lately arrived [in London] from the Island of Ascension, has brought several turtles weighing above 300 pounds which have been sold at a very high price" (77: 23:441). Oliver Goldsmith, noting that turtles were found "in greatest numbers" at Ascension (ca. 1770), states that they were also salted there "to feed the slaves" (82:674). Later accounts indicate that there was a gallows between the two "ponds" in which turtles were kept, where they were slaughtered in preparation for salting. When Captain Cook stopped at Ascension in the 1770's he found a New York sloop there taking on turtles for Barbados. The week previous another, out of Bermuda, had departed with a capacity load of 105 greens. The demand for turtle in the American colonies was by then apparently greater than the supply, although Cook suspected that the Americans might be covering up clandestine

trading activities with returning East India ships by their turtling activities (*48*:67).

The island remained uninhabited until after the arrival of Napoleon at St. Helena, when the British government took possession of Ascension and established a small garrison there. Thereafter the turning of turtles on its beaches became a government monopoly. An observer in 1835 relates that their numbers and sizes "staggered one's belief" (*3*). In one year more than 2,500 turtles were reported turned on Ascension's beaches. At the height of the season 40 or 50 were normally turned each night. Two men were stationed at each of the three or four most frequented beaches for this task, the turtles being carted to the "ponds" at the settlement the next day. Later a small steam vessel was employed in a coastwise trade collecting turtles, as members of the "Challenger" expedition noted when they were there in 1876. For the few years for which there are records in the 1840's and 1850's exports of live turtles from Ascension ranged from 600 to 800 annually—750 in 1834, 600 in 1850, 650 in 1853 (*87*:1932). The figure had been reduced to 300 by 1878, perhaps in part because of the reduction in number of ships calling at the island after the opening of the Suez Canal and the introduction of steam navigation. At this time the turtle-turners, who were government employees, received a half crown for each turtle turned. They were required to wait until the eggs had been laid before the females were turned (*79*:76; *190*:225). An average of only 60 turtles a year were exported during the 1920's, and after 1932 there is no mention of exports in the Colonial Office reports. The latest report for St. Helena, of which Ascension is a dependency, simply states that at Ascension "turtles abound at certain seasons and the catching of them is controlled by license."

The apparent lack of reference to the collection of turtle eggs on Ascension is undoubtedly explained by the extraordinary abundance there of sooty terns ("wide-awakes"), whose eggs were sometimes gathered in tremendous quantities, as many as 10,000 dozen being taken in a single week during the breeding season (*204*:264). The difficulties that the United States Air Force had with these birds during World War II, when an airbase was built on Ascension, is described by James Chapin (*44*).

There apparently has been some reduction in the numbers of turtles calling at Ascension, though available accounts are inconclusive on this score. For some time now the pressure has been off and it is possible that the Ascension greens may have been successfully rebuilding their population, which late nineteenth-century observers thought to have been substan-

tially reduced from earlier times. A Colonial Office report of 1926 states that "the turtle seemingly no longer land in the vicinity of the town, while at the more remote beaches to the northwest and southeast where they formerly nested in the hundreds they are now only to be found in the tens" (87:21). The amazing Ascension turtles, whose built-in direction finders carry them probably several times in the course of their lifetime across 1,000 miles of open sea to this remote oceanic island, await the attention of biologists and conservationists.

THE CAPE VERDE ISLANDS

Ascension has its counterpart north of the equator in the Cape Verde island group (15° N.), some 250 miles off the African coast, where a similar mass influx of nesting green turtles was recorded by numerous early writers and presumably still occurs. The beaches of the drier, eastern islands of the archipelago, especially Sal, Boavista, and Maio, are those most commonly mentioned in connection with green turtles. The rainy months of May through August are the nesting months, in contrast with Ascension, where the season starts at Christmas time. The feeding grounds of these Cape Verde turtles are presumably along the mainland coast of Africa from Mauritania southward, but whether there is intermingling with the Ascension population on the Guinea coast will only be determined by an extensive tagging program.

It was from the Cape Verde Islands that we find the first reference by Europeans to the edible sea turtle. When the Venetian Cadamosto, in the service of Prince Henry the Navigator, discovered this group, site of the most ancient tropical colony of the modern world, in April or May, 1456, he found large numbers of turtles whose meat his party tested and found good, "not unlike the white flesh of veal." On Santiago Island they accordingly salted many of them "because they made good provisions for the voyage." Some of his sailors, he noted, had eaten similar turtles, "although not of such size," on earlier occasions along the mainland coast to the north, especially in the Gulf of Arguin. These sea turtles, Cadamosto wrote, were "what we call *gajandre*" (*30*:65). I do not know the origin of this presumably Italian term.

The French explorer Eustache de la Fosse, who visited the African coast in 1479, reported that leprosy was cured in those areas by a diet of turtle flesh and by rubbing the affected parts of the skin with turtle blood. On the basis of this report, Louis XI, King of France, believing he had leprosy, sent his representative to the Cape Verde Islands and the Barbary Coast in 1483 to investigate. But the King died, although not from

leprosy, before his emissary's return. In 1506 and again in 1508 we hear of Portuguese lepers (*gafos*) being brought to the islands to regain their health eating turtle meat, since during the summer "great numbers of turtles [*tartarugas*] make their nests on these islands" (*224*:84; *70*:40). Peter Simmonds mentions that syphilitics were often sent there from Portugual "to be cured by feeding on turtle flesh" (*190*:225). This of course contradicts the general impression of Portuguese disinterest in turtles suggested earlier. On this apparently more evidence is necessary. There are several Dutch references to turtles on the Cape Verdes toward the end of the sixteenth century and the early years of the seventeenth century, but there is no indication that they were any more than casually exploited.

Dampier was on Maio, in the eastern Cape Verdes, in 1683 and again in 1699, loading salt, and he noted that the blacks who lived on the island's beaches made a business of turning turtles during the rainy season and working during the remainder of the year (53:1:103-5; 2:365-67). Most of the salt was destined for Newfoundland. He considered the turtles here smaller and less sweet than those of the West Indies, but other observers thought the reverse to be true. François Leguat turned turtles on the Cape Verde beaches in November, 1690, and observed that some of these "stupid and slow creatures . . . according to the guess of the most skillful weighed 500 pounds each" (*130*:82:13). During the height of the season, he wrote, "all the shoar is covered with these animals," which seemed to have been much preferred for provisions to the goats which inhabited the islands in such prodigious quantities. It is noteworthy that Francis Drake, who was at the Cape Verdes in January and again in May, 1577, made no mention of turtles. He was impressed instead with the goats that overran the islands (*64*).

There appears to have been a seasonal migration of the residents of the more populous western Cape Verdes, especially from São Nicoláo, Santiago, and Santo Antão, to Sal Island to take turtle, either for their own use or to sell as salted provision to passing ships. In August, 1724, a French vessel was reported by Captain Roberts at Sal catching the turtles "which come to this island in great numbers," having brought thirty hands from a neighboring island to assist in catching and curing them. There were turtles on Maio, Captain Roberts observed, "but not in any great quantity." At San Juan (?), St. Phillips (Fogo), and St. Jago (Santiago) turtles also came ashore to lay, but were not much regarded as provender, "and yet at all the other islands they are accounted their most delicious food; and indeed, so they are" (*177*:390-92,

402). Portuguese ships also carried salted turtle to Brazil, large quantities having been salted down and sent to feed slaves there in the seventeenth century (45:788).

I have found no first-hand references to turtles on the Cape Verde Islands in recent literature. However, M. Alexandrino, the director of the Sal airport, informs me (March 8, 1959) that they still come ashore to nest on Sal's beaches during the months of August and September, "although not in great numbers." Some of these, at least, are loggerheads rather than greens. Indeed, J. Cadenat, marine biologist at the Institut Français d'Afrique Noire in Dakar, informs me (May 11, 1959) that on his several trips to the Cape Verdes he has never observed *Chelonia mydas*, although an occasional loggerhead (*Caretta caretta*) has been seen. There is no commercial exploitation of the turtles, but local people are said to appreciate both the eggs and the meat. It seems probable that we are dealing here with another green-turtle population that has been sharply reduced in numbers as a result of man's activities. The Cape Verde turtles, like those of Ascension, are crying for a historical and ecological study.

There are frequent references in the literature to the taking of green turtles along the shoal waters of the African coast by both Europeans and Africans, but these feeding grounds seem to have been subject to little commercial exploitation. A small turtle industry is said to have existed in recent years at Requins in Senegal. Both eggs and meat are eaten by the native populations, who use both harpoon and net to take the browsing reptiles. Occasional strays may be turned on their backs as they come ashore to lay, especially between June and August near Dakar and from October to January on the Guinea coast. The Gulf of Arguin (20° N.) and the coast of Ghana, where a rocky bottom promotes a better growth of turtle-grass and seaweed than elsewhere, are two sections of the mainland African coast that are especially frequented by turtles. There is a small Turtle Island off the coast of Sierra Leone that was formerly said to have been much favored for egg taking.* Villiers describes the utilization of turtles along the West African coast (224:71-79).

SEYCHELLES, THE KENYA-SOMALI COAST, AND MOZAMBIQUE CHANNEL

When the first Europeans arrived there, the warm waters of the Indian Ocean abounded in both hawksbill and green turtles. The fine tortoise shell of the Somali coast, the Maldives,

* Personal communication, J. Tomlinson, West African Fisheries Research Institute, Freetown, Sierra Leone, January 7, 1956.

and Ceylon had been known in the Mediterranean as a trade item at least since the early Roman Empire. It had provided the lining for Cleopatra's bath and the combs for the emperors' ladies. When Alexandria was taken by Julius Caesar, the warehouses were found so full of tortoise shell that he proposed to have it made the principal ornament of his triumph (25:5:217). In later times it was an important item in the Chinese trade (228:81-83; 28:1:935).

But with the coming of European ships the abundant and delectable green turtle attracted the primary attention. The uninhabited Mascarene Islands—Réunion, Mauritius, and Rodriguez—early became way stations for the provisioning of vessels on the route to India and the East. From numerous early reports it is apparent that green turtles were abundant about each of these islands and that they hauled up on the beaches in large numbers to lay. (See especially the many references in Grandidier and Grandidier, 83.) While it is not always clear whether early writers were referring to the green turtle, the hawksbill (*Eretmochelys imbricata*), or to giant Mascarene land tortoises, there can be no doubt that the *tortues* described as so abundant were most frequently meant to mean *Chelonia mydas*. In 1691 Leguat could still speak of the "prodigious numbers" of sea turtles at Rodriguez, while those at Réunion would have been sufficient "to abundantly and deliciously subsist the inhabitants." He wrote that some of the marine turtles both at Rodriguez and at Réunion weighed above 500 pounds. The land tortoises were smaller but no less numerous. On Rodriguez he described a herd of from 2,000 to 3,000 of the latter, stating with perhaps some exaggeration that "one might go 100 paces on their backs without setting a foot on the ground!" Their flesh he thought very delicate, the fat better than butter or the best oil, being "an excellent remedy for several distempers" (*130*:83:71-72).

At Mauritius, however, sea turtles were by then less common, although only fifty years earlier Van Dieman had proposed the sale of turtle meat to Surat and Coromandel as a promising source of profit to the Dutch who then occupied Mauritius (83:2:498). By the end of the eighteenth century, if not before, the green turtle had become rare in Mascarene waters, threatening to go the way of the extinct dodo, the solitaire bird, the dugong, and the giant land tortoises which, like it, had served to provision sailing ships bound to or from the East. The meat for the turtle broth that the French hospital on Ile de France (Mauritius) fed its scurvy patients was by this time coming from the less extensively exploited Seychelles waters to the north. Today Mauritius obtains what turtles it consumes, some 300 to 600 individuals a year,

from isolated St. Brandon's Island, its dependency 300 miles to the north.

The greatest concentration of breeding turtles in the Indian Ocean in modern times, and perhaps in antiquity, has been at the raised atoll of Aldabra and the adjacent smaller islands of Assumption and Cosmoledo, which together comprise the Aldabra group, politically appendages of the British colony of Seychelles since 1810. Assumption, a guano-covered sand bar, lies 20 miles to the south of Aldabra, while Cosmoledo, a tiny atoll, is 60 miles to its east. The Aldabra group lies 200 nautical miles northwest of Madagascar, 620 miles from East Africa, and 760 miles southeast of Mahé, principal island of the Seychelles Archipelago. While turtles are by no means rare among the more northerly and more populous high islands of the Seychelles, it is the arid southern islands that originally were teeming nesting grounds for *Chelonia mydas* from December through March or April of each year. This part of the Indian Ocean, somewhat north of the early routes of trade, seems to have been but little exploited for its green turtles until quite recent times, unless by unrecorded Arab visitors. According to Sir Robert Scott, the governor of Ile de France sent several expeditions to Agalega (southeast of Aldabra) to look for turtles between 1779 and 1787; and for some years before that, country ships from the island had been visiting the Seychelles in search of tortoise shell, turtles, and coconuts (*185*:97, 76). But the earliest reference that I have found to the serious exploitation of those on Aldabra dates from 1847, when a party of a hundred men on two ships is reported to have taken 1,200 greens "in a short time," some weighing 800 pounds (*169*). In 1862 the United States consul at Mauritius stated that 1,800 green turtles had been killed in the Seychelles to obtain 600 pounds of *cawan*, the yellow plates from the plastron, and that nearly 500,000 pounds of flesh had been left to rot on the beach. This, too, appears to have been on Aldabra. He predicted that sooner or later the turtles would abandon the islands "to seek a more undisturbed retreat in which to lay their eggs" (*109*:35-36).

Briefly in the 1870's, a group of Norwegians apparently occupied the theretofore uninhabited 18-mile-long atoll. A group of twenty-seven adults and thirteen children sailed from Bergen in July, 1879, to establish a colony on Aldabra. They were to be joined by another party of their countrymen at Nosy Bé, off Madagascar. The fate of these Norwegians is unknown (*169*).

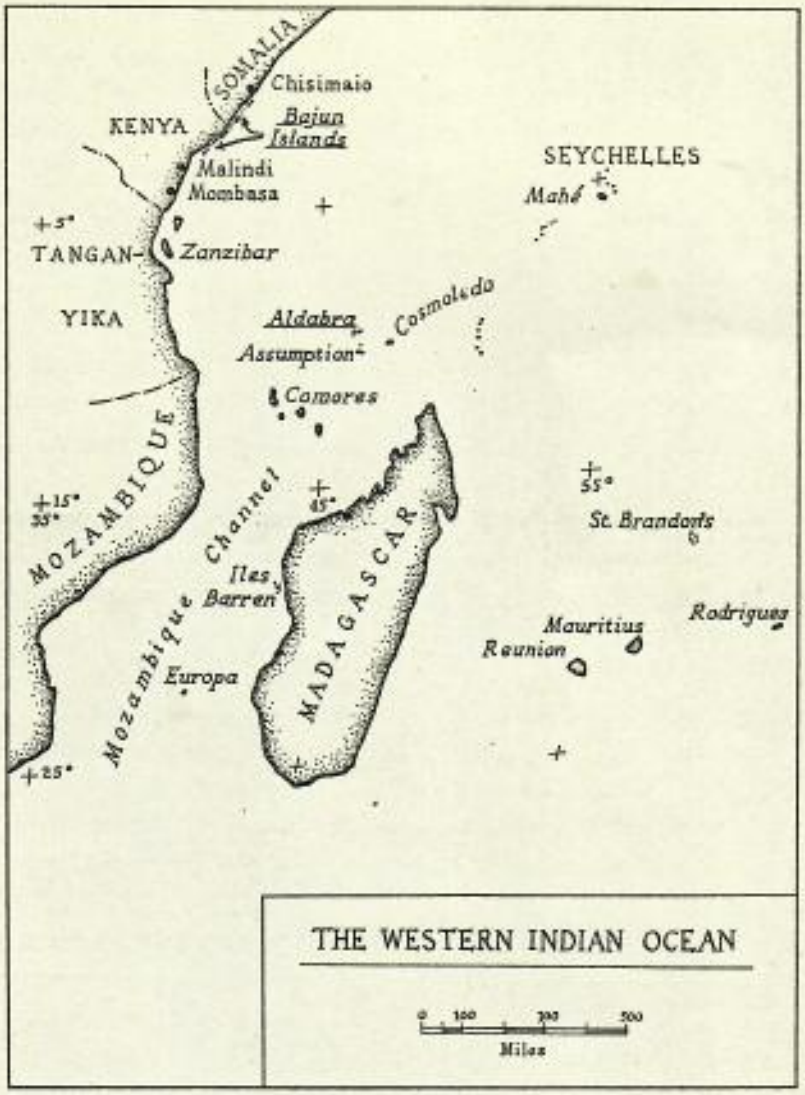
Regular commercial exploitation of the Aldabra sea turtles, however, did not begin until 1906. (This section is greatly

indebted to James Hornell, *109*; see also *156*:103.) That year the island was leased to one Walter Rothschild who imported African laborers to plant coconuts and catch turtles. From this time begins the export of dried calipee. The average 300-pound turtle yields about 3½ pounds of sun-dried calipee, in addition to perhaps 60 pounds of salted turtle meat (*quitouze*) for the local Seychelles market. The calipee traditionally has gone to the London soup makers, but the *quitouze* and any turtles kept live have been marketed in Mahé and the other northern Seychelles islands. From time to time small quantities of turtle oil have been exported as well as shell, bones, and blood for fertilizer and a *tortue marinade*, fried turtle meat packed in oil and shipped in casks.

A commission of inquiry in 1909 said that some 1,500 live turtles arrived yearly at Mahé for butchering and that these probably represented no more than one third of the number originally put aboard the schooners that carried them, so great was the mortality rate on the five-day trip. Some live turtles were already being brought from as far away as the volcanic Europa Island (22° 20′ S., 40° 20′ E.) in Mozambique Channel, nearly 1,500 miles distant from Mahé. In the latter place the meat was said to be "a staple and highly valued article of diet, taking there the place that beef occupies in Europe."

The all-time high for calipee exports from Seychelles appears to have been reached in 1912 when official statistics show that 36,900 pounds were shipped, equivalent to at least 9,000 turtles. Normally all calipee is exported (i.e., not wasted or consumed when the flesh is consumed locally), so that calipee exports provide a reasonable basis for estimating the total turtle catch.* In this period it was said to be common to turn 50 greens in a night at Aldabra, and almost as many at Assumption, where on one record night 400 are reported to have been taken. Although Cosmoledo probably never attained the annual yield of 7,000 turtles recently credited to it by William Travis in his account of green-snail collecting in the western Indian Ocean, it was certainly a significant producer (*211*:149; this figure apparently derives from *164*:296, and must be presumed a misprint). There has been a progressive decline in the numbers of turtles captured in the southern Seychelles during the past forty years. During the 1920's and 1930's the number seems to have ranged from 3,000 to 4,000 annually, mostly from Aldabra, while the figure since World War II has been closer to 1,500. Calipee exports averaged

* Personal communication, A. Jefferies, Department of Agriculture, Mahé, Seychelles, April 13, 1956.



about 4,500 to 5,000 kilograms during the 1930's, according to government reports. In 1956 the figure was 3,000 kilograms, but London trade sources consider this figure too low. By the latter date the export of turtle oil and salted turtle meat appears to have ceased, as had the export of tortoise shell.

On Cosmoledo green turtles are said to be comparatively rare, while they have practically vanished from Assumption where Travis reports that fewer than 30 a month of the big greens are seen off its shore during the season (*211*:205). The much larger Aldabra is leased to a private company that keeps a seventy-man crew there during the season, drying turtle meat and calipee on great drying trays. No live turtles are exported from the Seychelles, but in addition to calipee small quantities of that universally prized elixir, turtle oil, occasionally are listed in the trade statistics.

Official concern for the eventual fate of the Seychelles green-turtle population dates at least from 1925, when a turtle ordinance was passed prohibiting egg collection and the taking of undersized turtles. James Hornell, who was commissioned at this time to make a study of the industry, wrote that the Aldabra lessees were "pushing to the utmost," taking every turtle possible to compensate for the low price and small demand for guano, which was their primary concern at the time. The lessees' policy of indiscriminate and unrestrained slaughter, he wrote, could not but lead to the early extinction of the trade. He recommended stringent protective measures, including a closed season, continued protection of eggs, and protection from such natural enemies of the young as the frigate bird. He also urged that in the future the lessees be required to deliver a certain number of live turtles to Mahé to ensure a supply of fresh meat to that market, which often found itself without it.

Conditions, however, seem not to have materially improved. A commission, which supported the earlier proposals of Hornell, concluded in 1948 that "the fishery of the green turtle is following the familiar pattern of commercial exploitation, a pattern carried to its melancholy conclusion with the northern right whale and almost as far with the southern hump back, the fur seals of the Pribilofs, the Falklands and Patagonia, the elephant seals of South Georgia and even, one may add, the marketable bottom fish of the North Sea" (229).

Today there is a closed season at Aldabra from December through February, the principal laying months. No turtles may be harpooned at any time under the light of a torch or within 1,000 meters of the high-tide mark, and no eggs may be taken or sold at any time of the year. Assumption, together with one part of Aldabra, has been set aside as an undisturbed breeding ground and sanctuary. No government officials are stationed on the islands, however, so that control is far from complete (A. Jefferies). Mr. Harry Savy, a well-known Seychellois, obtained a fifty-year lease on the Aldabra group in 1954. "Turtles are now scarce compared with earlier in the century," a recent Colonial Office report for Seychelles cryptically notes, "doubtless due to over-exploitation." It seems possible, however, that a sustained yield program may yet be instituted here if conservation-minded officials continue to find support for their programs.

Depradations by sharks seem to be especially serious at Aldabra. Travis commented on the large numbers of turtles he saw here that were missing a flipper, usually one of the hind ones. He believes that these almost certainly have been bitten off by sharks, which are said to prefer turtle meat to

all other. A hook baited to turtle flesh, he observes, will invariably attract a shark when all other lures have failed. The very large schools of sharks here, he believes, explain his observation that the turtles carry on love-making only when the moon is bright, and then only in comparatively shallow waters. But even these precautions do not always provide them full security (*211*:168-69).

There are no extensive shoal waters around Aldabra to provide grazing for the vegetarian green turtle, and it has been surmised by Hornell and others that the great hordes resorting to the Aldabras to breed come from pastures in the Mozambique Channel. Hornell has pointed to the abundant fat that the animals carry as a food reserve which may especially fit them for long-distance migrations (*109*:41-44). This thesis is also accepted by F. D. Ommanney (*161*). Ship captains are said to report large numbers of green turtles in the channel from May to August. The species is known to occur at least as far south as Durban, where the creatures occasionally become enmeshed in shark nets placed along the beaches for the safety of bathers, but there appears to be no commercial interest in them.* Green turtles do still nest on the Mozambique and Kenya coasts, but there are no accounts of the numbers involved or the locality of this activity. They may be only random strays from the main breeding population that resorts to the Aldabra group.

Formerly sea turtles nested in substantial numbers along the more protected north and west coasts of Madagascar, at Europa Island, on the Comores, and on the Kenya and Somali offshore islands, but nesting today is said to be relatively rare, apparently because of the long continued activities of turtle turners and egg collectors. In 1923 six islets off the west coast of Madagascar (Nosy Anambo, Nosy Iranja, Chesterfield, Nosy Trozana, Nosy Bé, and Europa) were set aside by French authorities as turtle reserves. Elsewhere the taking of nesting turtles before they had laid, and of any turtle less than 50 centimeters (20 inches) long, was forbidden. But the measures are said to have been ineffective because of the impossibility of surveillance (55:201). Not mentioned, perhaps because they had already been stripped clean of turtles, were the uninhabited Barren Islands (Iles Stériles, 18° 30′ S., 43° 50′ E.) where Padre Luis Mariano in 1613 reported "great numbers of turtles," apparently laying congregations.

The Malagasy are said to be equally fond of turtle eggs and turtle meat, especially that of the greens. Most of the latter

* Personal correspondence, P. A. Clancy, Director, Durban Museum and Art Gallery, December 15, 1955.

are now taken by harpoon from outrigger canoes. Among the Sakalava, hardy sailors who have hunted turtles since time immemorial, the turtle chase is the principal sport. They maintain special altars on the beach that are consecrated to the turtle, which is considered to be sacred. Among the Vezo of the southwest coast early morning ceremonial rites, preliminary to the turtle hunt, are held in specially built beach huts (*rantsanas*). Stray nesting females are still turned on the beaches where the opportunity arises, much as they were by Arab navigators who came to Madagascar for this purpose as long ago as the ninth and tenth centuries. A good turtle turner (*mpianbinjia*) may turn 10 to 15 turtles in an average season, but this would probably include hawksbills as well as greens (*218*:74-86; *84*; 55:95-98; G. Petit in 88:1948).

The principal center of turtling activities on the African coast is the Bajun Islands of Kenya and Somaliland, whose inhabitants take green turtles with the aid of suckerfish, or remora (*Echeneis*), which, tied to a long leash, are let out to attach themselves to the carapace of the feeding greens (*94*: 324-29; see also Chapter 3). Until recently this type of turtling was carried on by the Bajuni only to meet their own need for meat, but since 1950 exports of live turtles to England, especially, have taken on major proportions. From 1954 to 1959 between 1,000 and 1,500 live turtles have been exported annually from Kenya, perhaps half of the total Bajuni catch. A substantial but unknown share of these are taken off the Somali coast immediately to the north and brought to Kenya for re-export. Bajuni fishermen are said to be supplying most of the live turtles and frozen carcasses entering English markets, almost all being taken in this singular fashion.

Due to the initiative of the Kenya Coast Oyster Company a market also has been found in Britain for turtle oil and "green fat" (calipee) from Kenya. Operations commenced in 1951, and in the following year a small turtle-soup cannery was opened. By 1954 it was estimated that 200 turtles were being slaughtered annually on the Kenya coast to supply this new plant (*116*:1951:46; 1952:75; 1953:30; 1954:31).

Concern for the future of the turtle industry led, in 1959, to green turtles being declared "Royal game" in Kenya, and their capture is now controlled by a special system of permits. The turning of turtles on the beach is strictly prohibited, and immature turtles with a carapace of less than twenty-four inches are completely protected. Under current regulations licenses to capture turtles are being granted only to skippers of boats who have traditionally engaged in this fishery, using suckerfish. In 1958 a total of twenty-three skippers held li-

censes, of whom fourteen were based at Kizingitini and three each at Malindi and Lamu. There were eleven licensed turtle dealers. The regulations call for the keeping of records showing the size and sex of all turtles taken, together with the place of their capture. It is anticipated that future conservation measures may be based on such information.*

THE CENTRAL AND EASTERN INDIAN OCEAN AND DIAMOND ISLAND

Several other islands and island groups north and east of the Seychelles in the Indian Ocean support breeding populations of sea turtles. Masira Island, off the south coast of Arabia, is one of these—"in the spring, at night, very large numbers of turtles come ashore to lay their eggs" (*56*). It is possible that these are hawksbills, for the Periplus of the Erythraean Sea, written in the first century, refers to the excellent tortoise shell produced on Masira, then called Sarapis. On Masira Island, as on the Laccadives and the Maldives (*75*: 2:1050), the literature does not always differentiate between green turtles and hawksbills. The latter also is occasonally, if not so characteristically as the green, a social nester.

James Hornell, in 1908, suggested opening up an export trade in fresh turtle from the Laccadives (quoted in 7). Favorite nesting haunts in the Laccadives were earlier reported by W. Robinson to be the uninhabited islands of Bingaram and Tingaram, each of which had a large deep-water lagoon. A third island, Suhely, was a private preserve. He observed that the eggs seemed not to be much eaten (*178*:65).

François Pyrard, in the Maldives in the seventeenth century, was apparently referring to green turtles when he wrote, "there are vast numbers of them at the Maldives and some little islands you may see inhabited by no other animals than these great turtles, but covered with them. On our arrival at the Maldives we caught a great one with 500 or 600 large eggs, like yellow hen's eggs . . . we lived on them for 3-4 days . . . the flesh [being] like veal" (*171*:80:348-49). There was another, smaller kind (hawksbill?) that he described as being "sought after by all the kings and rich people in the Indies, chiefly those of Cambay and Surat." In both the Maldives and the Laccadives, as in Malaya and Borneo, the eating of turtle flesh is taboo, but large numbers of the creatures are harpooned at sea, to be rendered into oil for caulking ships.

* Personal correspondence, D. F. Smith, Chief Fisheries Officer, Game Department, Nairobi, March 8, 1959; also *116*:1957:9.