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SEA TURTLES AND THEIR TRADITIONAL USAGE IN TOKELAU

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ABSTRACT

The conservation status, ecology, and cultural importance of sea turtles at the three Polynesian atolls of Tokelau are presented. The green turtle, Chelonia mydas, is the most common species, occurring as a migrant breeder mostly during September through November. The hawksbill, Eretmochelys imbricata, is present in small numbers at all three atolls, but nesting is only known at Nukunonu Atoll. A third species, the loggerhead, Caretta caretta, has also been recorded on rare occasions. In Tokelau, sea turtles are considered "sacred fish" (ika hā) that must be shared among the entire village by an equitable system known as inati. The number of sea turtles has declined within historical times apparently as a result of modern and more efficient hunting methods.

A main objective of this research is to help the Tokelauans effectively manage sea turtles so that these animals can continue to be part of the native diet and culture. Based on this study's findings, 11 recommendations for conservation are offered that either build upon, or reinforce, existing traditional practices. These conservation measures may also be applicable to sea turtle populations used by other insular people of the Pacific.

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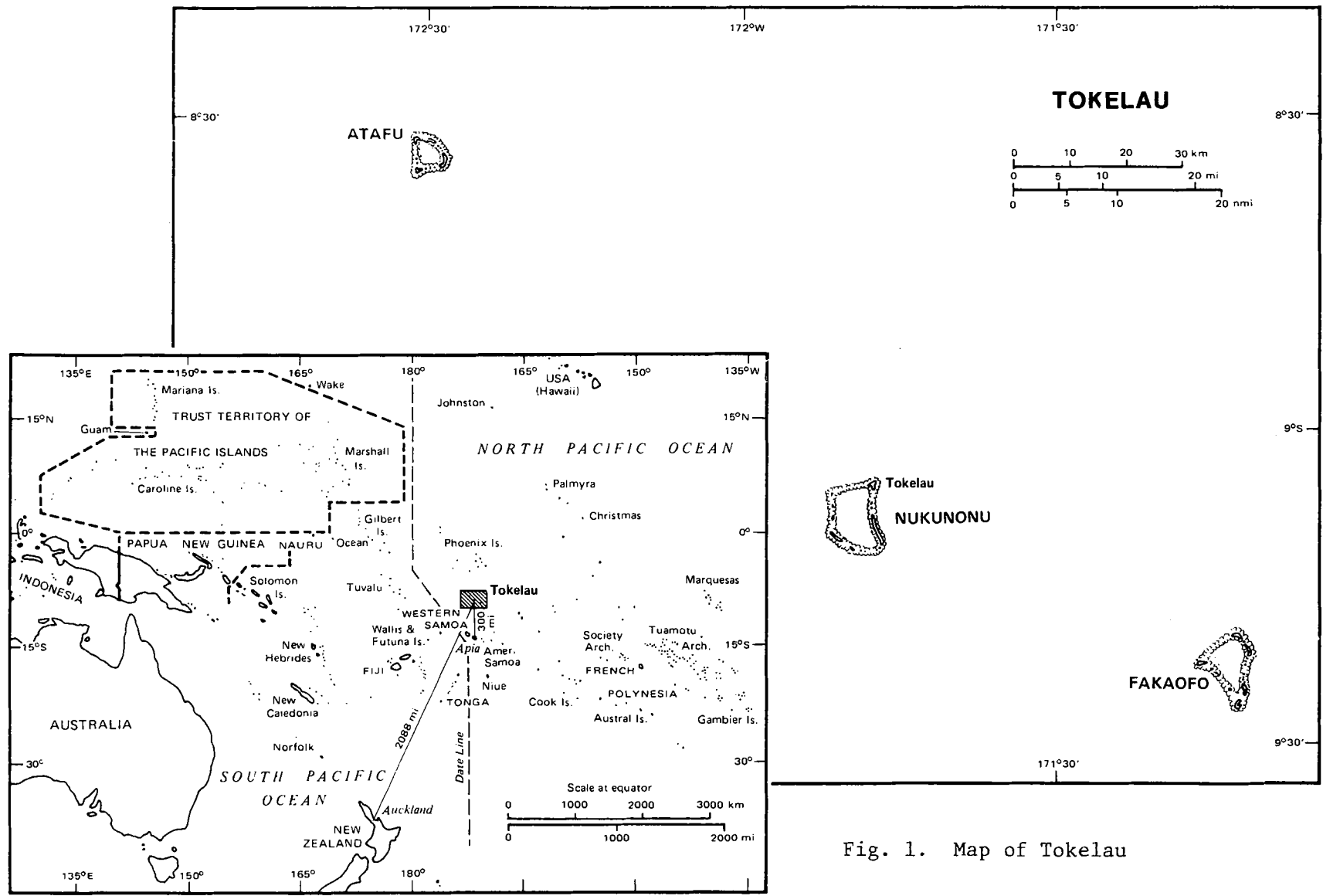


Fig. 1. Map of Tokelau

INTRODUCTION

This paper presents results of a field study undertaken in October of 1981 to assess the status, ecology, and human usage of sea turtles at the three Polynesian atolls of Tokelau in the central South Pacific Ocean. The ultimate aim of this study is to work in harmony with the native people to help conserve the area's sea turtles so they will continue to be part of the Tokelauan diet and culture.

The method being pursued to achieve this objective is to build upon existing traditional conservation practices, while taking into account the current biological knowledge of sea turtles and the legitimate needs of island people striving for an improved life. The need for such efforts in the Pacific is considerable. To a great extent, the numerous small islands of Polynesia, Micronesia, and Melanesia share the common problems of being extremely limited in natural resources and isolated from the outside world. These factors are even more pronounced on low coral atolls with small human populations. The Tokelau group is in many ways representative of such circumstances, where subsistence living is carried out in a remote island environment. Numerous changes have been brought about by outside influences over the past 125 years, but the basic cultural bonds and sense of unity among the people remain intact. There is a desire to retain many of the traditional ways of life, while selectively incorporating new ideas and more material goods and services into the culture. To maintain the necessary balance, it is essential that the environmental components upon which the culture depends remain viable. Sea turtles are one of these elements that constitute a high-protein seasonal food source offering welcome variety to the native diet. The capture, preparation, and sharing of turtles also serve as a social function that helps to strengthen and enrich the village community.

Sea turtles were formerly of considerable importance to many Pacific islanders. In addition to being a prized and nutritious food, they played key roles in certain religious ceremonies held at stone structures built on their behalf (Buck 1932a, 1932b; Emory 1947). The scutes and bones of turtles were used to fashion decorative ornaments, fishhooks, tattoo needles, and a variety of other implements. Sea turtle motifs were incorporated into petroglyphs and other works of art, as well as songs, dances, and folklore (Burrows 1933; Emory 1933; Pukui and Elbert 1971).

The decline in the importance of sea turtles within Pacific island cultures can be attributed to a number of factors, one of which is the decline of the resource itself. At many islands, traditional conservation methods that buffered turtles and other marine resources from overexploitation have deteriorated considerably, and in some cases disappeared completely. Three interrelated factors identified by Johannes (1978) that have contributed to this breakdown include the

introduction of money economies, the decline of traditional authority, and the imposition of new laws and practices by foreign powers. The available evidence shows that the numbers of turtles throughout the Pacific islands have decreased markedly during historical times. However, for some areas no documentation exists on former levels of abundance and nesting distribution. Such information urgently needs to be gathered from the elders of each island before it is lost. A greater overall effort needs to be undertaken to conserve Pacific sea turtles, in collaboration with the people that are culturally linked to them. There is already a growing awareness of the problem, as demonstrated by recent reports and actions recommended (South Pacific Commission/National Marine Fisheries Service 1980; World Conference on Sea Turtle Conservation 1980). Also, information presented in McCoy (1974) and Pritchard (1977) for Micronesia, Balazs (1980) for Hawaii, Vaughan (1981) for the Solomon Islands, and Hirth (1971), Balazs (1977), and Dahl (1980) for Pacific islands in general, provides a basis for expanding and refining sea turtle conservation studies in the Pacific.

The study reported herein focuses attention on three atolls that are believed to be representative of many small islands scattered across the Pacific. Because of funding and other limitations, it will probably never be possible to carefully investigate the interrelations of turtles and people at all of these locations. I therefore plan to continue using Tokelau as a model study area, with the monitoring and cooperative assistance being carried out through fishermen, village elders, and other authorities that I met during my visit.

TOKELAU

Physiography

Tokelau consists of three coral atolls named Fakaofu, Nukunonu, and Atafu located between lat. 8° to 10°S and long. 171° to 173°W (Figure 1). The islands lie in a straight path extending from south-east to northwest. Fakaofu, the southernmost island, is 65 km from Nukunonu and 150 km from Atafu, the northernmost island. The group is about 500 km north of Upolu and Savai'i, the two large volcanic islands that comprise the independent nation of Western Samoa. The nearest neighbors to the west of Tokelau are the atolls of Tuvalu, which are about 650 km away. The atolls of the northern Cook Islands are situated to the east of Tokelau. Pukapuka, the closest of the group, is 500 km away. Gardner, Hull, and Sydney, three atolls in the Phoenix group (part of Kiribati), are about 450 km to the north of Tokelau, but all are currently uninhabited. Swain's, a 2-km long coral island known to the people of Tokelau as Olosega, lies 175 km south of Fakaofu. This island has historic cultural ties with Tokelau; however, since 1925 it has been a territory of the United States under the administration of American Samoa. Only about 15 people now live on Swain's Island.

The atolls of Tokelau consist of reefs that encircle large lagoons that lack a deepwater passage. Waves break on these protective reefs and flow over into the lagoon where relatively calm waters prevail. Many of the reefs are entirely bare during periods of low tide. On the ocean side of the reef the bottom drops off rapidly to great depths just a short distance from shore. Numerous islets (motu) ranging up to 6 km long, 400 m wide, and 5 m above sea level are located along the reefs. The motu soil is composed of coral sand and rubble generally low in organic matter. The principal vegetation cover consists of coconut palms, Cocos, along with Pandanus, Scaevola, and Tournefortia. Other noteworthy native plants include Cordia subcordata (kanava), Pisona grandis (pukakakai), Pemphis acidula (ngagie), Hernandia nymphaeaefolia (pukavaka), and Morinda citrifolia (nonu). The estimated total land area of each atoll is 250 ha for Fakaofu, 260 ha for Nukunonu, and 205 ha for Atafu.

The southeast trade winds prevail in Tokelau from April to September, and northerly or variable winds prevail during the remaining hotter months of the year. The average temperature is 28°C and the average annual rainfall about 290 cm. Precipitation is greater during the months of October through March. Wells have been dug at each atoll, but most drinking water is obtained from coconuts and the collection of rainwater. Hurricanes are not common, but can cause great damage when they pass through the area. Severe storms are known to have hit Tokelau in 1846, 1914, and 1966.

Some good overall accounts of the physiography of Tokelau can be found in Macgregor (1937), Bryan (1942), Great Britain Naval Intelligence (1943), and Hooper and Huntsman (1973). Published information on the biota of Tokelau is available for the topics of seabirds (Wodzicki and Laird 1970), rats (Kirkpatrick 1966; Mosby and Wodzicki 1973), lizards (Whitaker 1970), arthropods (Hinckley 1969; Yaldwyn and Wodzicki 1979), and vegetation (Parham 1971; Whistler 1981). Wiens (1962) provides a comprehensive treatise on the environment and ecology of atolls in general, including some specific aspects of Tokelau.

Historical Overview

The discovery of Tokelau by European and American seamen started in 1765 with the sighting of Atafu. Nukunonu was discovered in 1791, but Fakaofu was not found until 1835. During the mid-1800's Christian missionaries became established on all three islands. In the 1860's the population was substantially reduced by the introduction of epidemic diseases and kidnapping by Peruvian slavers. Several foreign traders, mainly of Portuguese descent, settled in the islands during the latter 1800's and, through intermarriage, established family lines that continue to the present-day Tokelauans. A number of other ethnic groups were also absorbed into the genetic makeup of the population.

In 1877 the islands were placed under British protection and in 1916 Britain annexed the group. At that time Tokelau was known as the Union Islands. In 1925, responsibility for Tokelau was transferred to the New Zealand Government with administration being carried out from

Western Samoa. In 1948 the islands were formally incorporated as a territory of New Zealand. This status continues to the present with Tokelauans being full citizens of New Zealand. The group's external matters are handled by the Office for Tokelau Affairs based in Apia, Western Samoa.

An interesting event in the history of Tokelau that seems to be missing from the available literature is that a small U.S. Coast Guard loran station existed on Atafu in 1944 as part of the Pacific war effort.

The People

The Tokelauans are a stock of Polynesians that share a common language, culture, homeland, and way of life. The origin and early settlement of the islands are not clearly known; however, certain similarities exist with each of the surrounding Polynesian cultures. The traditional histories of Tokelau suggest separate founding populations at each atoll, and record the subsequent hegemony of Fakaofu by driving off the "true" Atafuans and conquering the people of Nukunonu. Atafu was not resettled until about 1800. Fakaofu's dominance was symbolized by the location of the temple and stone effigy of Tui Tokelau on that island (J. W. Huntsman, personal communication in April 1982).

Since the turn of the century the affinity with Samoan culture has increased in Tokelau due to such factors as greater travel opportunities on supply ships from Apia, use of the Samoan Bible, and broadcasts by Samoan radio stations. The Tokelauan language of the Polynesian family has only been written for about the past 15 years.

The population of Tokelau within historic times was reduced to a low of 200 in the 1860's, and reached a high of nearly 2000 during the 1960's. Emigration has occurred over the years, some of which was stimulated by a desire for wage employment and the limitations of natural resources, especially following the hurricane of 1966. There are now about 2500 Tokelauans living permanently in New Zealand, a few hundred in Western Samoa, and at least 150 in Hawaii (see Cooke 1975). This latter group originated from contract laborers on Swain's Island who were able to travel to American Samoa, and later north to Hawaii. The current population of Tokelau is approximately 1600, including about 675 people on Fakaofu, 350 on Nukunonu, and 575 on Atafu.

The people at Nukunonu and Atafu all live in a single village whereas at Fakaofu a second motu has been populated due to crowding at the historic village site. Each atoll operates as a relatively separate social unit since there is no transportation between islands except when a supply ship comes from Apia. During 1981 there was approximately one ship every 2 months.

Life in Tokelau is organized around kinship groups known as *kāiga*. Daily activities involve various forms of fishing and the harvesting of food crops, including coconuts that are dried into copra for export.

Groups of men must regularly travel to the outlying uninhabited motu of the atoll to gather coconuts. The majority of the food consumed is obtained locally from the atoll and the surrounding ocean. In addition to coconuts, other basic food crops are breadfruit, pandanus, and pulaka, Cyrtosperma chamissonis. Pigs and chickens have been introduced to the village motu and provide supplemental sources of animal protein, usually reserved for special occasions.

Tokelau society is traditionally egalitarian in ethic and cognatic in terms of descent and inheritance. Each atoll is governed by a Council of Elders (taupulega) representative of the kāiga groups. In addition, a village commissioner (faipule) and mayor (pulenuku) serve as elected officials. Close family ties exist in Tokelau and there is great respect for the aged.

Comprehensive information on the ethnology of Tokelau has been assembled by Burrows (1923) and Macgregor (1937). Detailed studies of the demography, kinship relations, and other cultural aspects of Tokelau have been published during recent years by Huntsman (1971, 1977), Hooper and Huntsman (1973), and Huntsman and Hooper (1975, 1976). An enlightening popular account of life in Tokelau has been produced by the New Zealand Department of Education (Keen 1976).

Sea Turtles

Very little information has been published on the status and ecology of sea turtles in Tokelau. The available material can be summarized as follows.

In a consultancy report on turtle resources of the South Pacific, Hirth (1971), based on an interview with Dr. J. Huntsman, stated that "Green turtles [Chelonia mydas] and to a much lesser extent hawksbills [Eretmochelys imbricata] still nest in the Tokelau Islands (September - October) but their numbers are said to be rapidly decreasing." Wodzicki (1972) indicated that "Five species of marine turtles lay their eggs on the beaches [of Tokelau], and in the past used to be an important food item for the islands but unfortunately have lately been very low in numbers." In a later paper, Wodzicki (1973) again briefly mentioned five species being present, and added that "turtle nesting grounds in the Tokelau require further study and protection." The five species were not listed and no other details were given. Yaldwyn and Wodzicki (1979) stated that four marine turtles have been identified from local reports, and that the green turtle appears to nest but is subjected to considerable human predation. In a short interview with Mr. N. Walters at the Office for Tokelau Affairs in 1977, I was told that turtles of undetermined species nest along the ocean beach of Taulagapapa, a motu on the east side of Nukunonu (Balazs 1982a). During early 1980, correspondence pertaining to Tokelauan turtles was sent to me by the resident school principals on Nukunonu and Atafu, and the former school principal of Fakaofu now serving as the Director of Education. These letters revealed that three kinds of turtles are known to nest in Tokelau: the green turtle and, far less frequently, the hawksbill and loggerhead, Caretta caretta. The breeding season was

said to extend from June through December, with the peak months being September, October, and November. Large numbers of turtles were clearly not involved, but those present were valued by the people. These facts, along with other background information contained in the letters, provided me with a sound basis for planning field research in Tokelau.

The ethnologic information on Tokelau assembled by Macgregor (1937) contains several references to sea turtles involving such aspects as fishing, cooking, ceremony, fishhooks, and folklore. Huntsman (1969) provided a description of the preparation and ceremonial distribution of two turtles captured at Nukunonu in 1967. Huntsman (1977) also recorded and translated into English the Tokelauan tale of "Hina and the turtle" which had been published earlier by Burrows (1923) in a different version.

STUDY METHODS

My study visit to Tokelau was carried out from 17 to 27 October 1981 in conjunction with a scheduled visit of the 58-m supply vessel, MV Frysna, chartered by the Office for Tokelau Affairs. The principal methods used to collect information on sea turtles consisted of 1) personal interviews, especially with village elders, fishermen, and other Tokelauans identified as having special knowledge; 2) firsthand surveys of beach and ocean areas at each atoll; 3) firsthand observations of the preparation and ceremonial distribution of turtles captured at Fakaofu; and 4) photographic documentation of pertinent aspects of the visit. Dossiers containing photos and drawings of the different sea turtle species were assembled for use during the interviews. These and other educational materials were left with village authorities and schools on each atoll. Many of the interviews were conducted with the aid of a translator to ensure an accurate understanding. Mr. Semu Uili, Officer for Agriculture and Fisheries, served admirably in this capacity and was of invaluable assistance as my guide and gracious host. A list of the people interviewed appears in the Appendix.

It was possible to spend 4 consecutive days and nights at Fakaofu because a general council meeting (fono) of all three atolls was held at this occasion in conjunction with the vessel's arrival. This convergence of a large number of people at Fakaofu enhanced my opportunities to gather information. The time I spent aboard the MV Frysna traveling between Apia and Tokelau, and back and forth between the three atolls, also afforded good opportunities to talk with people about sea turtles.

FINDINGS

Status and Ecology

Species present

The green turtle is the most common sea turtle at all three atolls of Tokelau, and is a seasonal breeder present mostly from September through November. During this time, mating pairs appear a short distance off the ocean side of the reef, and nesting occurs on certain sand beaches. For the rest of the year adults are far less frequently seen, but immature turtles about 40 to 60 cm in carapace length continue to be present in the lagoon and along the outer reef. The hawksbill is also known at all three atolls; however, Nukunonu is the only site where nesting occurs, and then only on rare occasions.¹ Most of the hawksbills seen are of an immature size that, like the young green turtles, appear to live throughout the year both in the lagoon and immediately outside the reef. The loggerhead is a third species known in Tokelau (exclusively from Nukunonu), but it is an uncommon nester. My informant from Nukunonu, 84-year-old Palehau Leone, who is an outstanding authority on all aspects of Tokelauan life, told me that "this reddish turtle comes from far away to nest, and when it does a greater number of green turtles can be expected." Vaughan (1981) mentioned a related belief at Santa Ysabel in the Solomon Islands where the capture of a loggerhead, a rare species not known to nest, is a good omen for the prospects of catching green turtles. Photographs and descriptions that I provided of the leatherback, *Dermodochelys coriacea*, revealed that this turtle is totally unknown in Tokelau, although great interest was shown in its size, body form, and pelagic life habits.

Tokelauans call the green turtle "fonu," a general name for sea turtles also used in several other areas of Polynesia, including Samoa and Tonga. In Tahiti and Hawaii, green turtles are called "honu," and in Fiji (Melanesia), "vonu." The hawksbill in Tokelau is called "fonu una" (literally "scale turtle") because of its thick scutes. Two less common names used for this species in Tokelau are "fonu puhi" and "kea puhi," which refer to the hawksbill's beak being elongated like an eel's. Other than fonu, there is no special name for the loggerhead turtle. The name "tuahivalu" (literally "eight backbones") was also given to me as a type of turtle. However, after considerable discussion among my informants, it was decided that this refers to an exceptionally large turtle measuring eight human hands laid along the carapace. This would be a length of at least 140 cm, the upper limit of the largest green turtles ever recorded in the scientific literature. No "tuahivalu" are known to have been caught or seen in Tokelau during this generation. In Pukapuka the largest green turtles

¹Small numbers of green turtle and the hawksbill are known to nest at Olosega. The small human population is reported to take turtles and eggs from the beaches whenever possible.

are called "mataweo," while the ordinary ones are "wonu" (Beaglehole and Beaglehole 1938).

A female turtle in Tokelauan is called "ika fua" and the male "ika tane." Two turtles joined together copulating are called "ulugaafonu." The word used when referring to any small or young turtle was repeatedly given to me as "kea." Similar words are used solely for the hawksbill in the Tuamotuan (tīfai-kea) and Hawaiian (honu'ea) languages of Polynesia.

Nesting habitat

The nesting habitat on all three atolls is somewhat limited by extensive shoreline areas of beachrock (limestone) and coral shingle. Fine coral sand beaches suitable for nesting are interspersed along these inhospitable shores, and probably make up not more than 25 per cent of the existing coastline on the ocean sides of the motu. Nesting is not common on the lagoon sides, even though there are some suitable sand beaches. The ocean-side beaches where nesting takes place at each atoll are shown in Figures 2 and 3. Many of these are on the east-northeast sides which are generally more windward and farthest from the motu where the villages are situated.

Most of the beaches I examined had thick vegetation growing almost to the high tide line. Nearly all of the beaches are inaccessible to nesting turtles during periods of low tide because the seaward approach over the fringing reef becomes bare and exposes jagged coral rocks. A turtle that finishes nesting at such times is completely stranded until the tide rises.

Abundance and trends

The number of adult males and females captured in recent years during each breeding season has been approximately 20 at Nukunonu, 10 at Fakaofu, and 15 at Atafu. Not much effort seems to be directed at catching the immature turtles, except on special opportunities. Based on interviews and my firsthand surveys of beaches, I estimate the number of nesting females present each season to be approximately 70 at Nukunonu, 30 at Fakaofu, and 20 at Atafu (total: 120). This initial estimate will need to be refined as more information becomes available.

I asked my elder informants to give me some idea of how many adult turtles were captured during each season when they were young men. Palehau Leone was 18 years old in 1915 and he estimated that "3-4 turtles per day" were taken at that time, or about 90-120 per season. Nemia Tuvala, 65-year-old expert fisherman of Fakaofu, recalled that at least 20 turtles were caught each season in the 1930's. Kalolo Mika, 78-year-old expert fisherman and the son of Mika, Macgregor's (1937) principal informant, stated that about 80 per season were taken at Atafu in the 1920's. This information seems consistent with Macgregor's (1937) general appraisal for Atafu in 1932 that "many turtles are caught" during the mating and nesting period.

In considering the above catch data, it is important to note that turtles can now be located and taken far more efficiently than before due to the widespread use of outboard motors and more sophisticated capture methods. Even with this increased efficiency, it is still not possible to catch as many turtles as before.

Species description

It was only possible to examine specimens of the green turtle. A male and female seen captured at Fakaofu had carapace lengths of 91 and 105 cm, respectively. I was told that females are almost always bigger than males. The shell colorations and other dorsal surfaces of the two turtles at Fakaofu differed significantly. The female was mostly black and reddish-brown with yellowish streaks. The male was basically olive and had black flecks. The plastrons of both turtles were whitish-yellow. Recently excised shells from a 103-cm female at Fakaofu, and a 104-cm female at Nukunonu, were black and olive. A 102-cm shell at the home of Luciano Perez in Nukunonu was also black and olive. Turtle shells are not commonly used for decoration in Tokelau. Instead, they are either cut up and eaten or thrown away.

At the home of Mrs. Siniua Sosene on Fakaofu, I examined a 35-cm turtle that had been raised as a pet for about 2-1/2 years. The turtle was hatched from one of four eggs she had received as part of a clutch shared among the village. The shell had radiations of reddish-brown, with cream-colored infusions and some black streaks. The plastron was whitish-yellow. This healthy, fine-looking animal was being held in a small container of sea water next to the house where it was fed fish and coconut. Every so often village children took it for a swim in the lagoon. Several turtles raised by other families from the same clutch of eggs have escaped during similar outings.

Food sources

My informants told me that the green turtle's main food source is green algae. Algae are seldom, if ever, used for human food in Tokelau, and consequently there was not a great familiarity with the species present. The hydrozoan, Velella velella (called "hehema"), was also mentioned as a food item sometimes found in the stomach of green turtles. This was reported to be a common invertebrate in Tokelau. I saw a number of them on the beach at Nukunonu, as well as aggregations floating at the sea surface as we motored through calm waters between Apia and Tokelau.

I was able to thoroughly examine the gut contents of the two turtles caught at Fakaofu. The female's digestive tract was completely empty except for a single piece of blue polyethylene plastic about 15 cm long. The male, however, had algal food material throughout its entire tract. The fresh contents of the stomach consisted mostly of the green alga, Valonia aegagropila, and lesser quantities of the brown alga, Turbinaria ornata. The only other material found was a small bird feather in the large intestine.

Epizoics and diseases

Numerous small barnacles, Platylepas hexastylus, were present on the tail and neck regions of the two adults caught at Fakaofu. In addition, the male had patches of red alga (probably Polysiphonia tsudana) growing in these same areas. The juvenile turtle being raised by Mrs. Sosene also had red alga growing on its shell.

A small number of the turtles captured in Tokelau are reported to have an abnormal condition described as "watery and shrunken flesh." Turtles with this disorder are not emaciated and cannot be recognized by any external signs. These turtles are usually not used for food, but on the rare occasions when they have been eaten, no sickness resulted. Sister Juliana, a Tokelauan serving at the Catholic Mission on Nukunonu, told me that it is traditional on her island to sing and talk in the presence of turtles that have been captured to keep their meat from becoming watery and shrunken. At times when turtles are caught late in the afternoon, it is necessary for this ritual to continue throughout the night until the next morning when butchering takes place.

The tumors or fibrous growths that are sometimes seen in Hawaiian (Balazs 1980) and other populations of green turtles are unknown in Tokelau.

Natural predators

I was unable to find any direct evidence of predation on turtles or eggs, except for human predation. Nevertheless, there are a number of species in Tokelau that constitute potential threats and undoubtedly take turtles.

In the terrestrial environment there are hermit crabs, Coenobita spp., ghost crabs, Ocypode spp., Polynesian rats, Rattus exulans, two species of frigate birds, Fregata ariel and F. minor, and reef herons, Egretta sacra. All of these are known predators of hatchlings and eggs at certain other breeding areas. Except for rats, none of the above appeared abundant at the time of my visit. However, large predator aggregations may build up at other times of the year.

In the marine environment, sharks and other carnivorous fish can prey on hatchlings, especially during the vulnerable time when they cross over a shallow reef to reach deep water. Large groupers, Epinephelus spp., sometimes prey on immature turtles up to about 30 kg, and large sharks are known to eat turtles of all sizes, including the largest adults. The tiger shark, Galeocerdo cuvier (called "mokoha"), an important predator of sea turtles throughout the tropics, occurs in Tokelau but apparently not in great numbers. At Fakaofu I saw the jaws of a 3-m tiger shark hooked earlier in the year by villagers fishing from a small boat at night just outside the reef. The stomach did not contain any remains of turtles. It was my impression that such large sharks are not common, or at least not commonly encountered, in

Tokelau. Shark attacks on humans are reported to be very rare, but this may be because Tokelauans seldom dive or swim at night.

Many people that I talked to told me of the Tokelauan belief or rumor that the mother turtle returns to the waters near her nesting site when the eggs hatch so she can eat her young. No one has actually witnessed this event or recovered hatchlings from the stomach of a turtle. Possibly such predation was indeed documented at some time in the past, since there are a few records from other areas of adult turtles (leatherbacks) eating hatchlings (ridleys).

High-seas migrations

The green turtles that breed in Tokelau are absent for most of the year. There can be little doubt that they are coming from, and returning to, some distant feeding pasture. The actual location of this resident area (or areas) is unknown, but must be many hundreds of kilometers away. Green turtles breeding at other sites in the Pacific are known to make similar migrations (see Balazs 1982b). At Scilly Atoll in French Polynesia, green turtles tagged while breeding have been recovered at foraging areas to the west all across the Pacific, including Tonga, Fiji, Wallis Island, New Caledonia, and Vanuatu.

None of my informants had ever heard of a tag being found on a turtle in Tokelau. In addition, no traditional knowledge seems to exist on where the turtles may go when they are not in Tokelau. Although admittedly speculative, I believe that a likely possibility where the turtles may go would be the coastal waters of Western Samoa. Immature and adult green turtles are found in Western Samoa, but nesting does not take place. Green turtles nesting at tiny Rose Atoll (14°33'S, 168°09'W), the geologically oldest site in the Samoan Archipelago, may also use feeding grounds in Western Samoa. However, no recoveries have thus far been made of the turtles I tagged at this site in November 1980 and October 1982.

The origin of the few loggerheads and hawksbills that nest in Tokelau is also unknown. Hawksbills could, however, be permanent residents, as is suspected for certain other areas. Loggerheads are not common in the Pacific islands, although sizable numbers occur in New Caledonia and on the Great Barrier Reef, and at least some occur in Fiji.

In considering the migrations of Tokelauan turtles, it is interesting to note that in the tale of "Hina and the turtle," Hina rides on the back of the turtle (Kea) to Fiji and Tonga, but only ventures ashore when they arrive at Vavau. I have been unable to determine if Vavau refers to the group of islands by that name in Tonga, or to Bora Bora in French Polynesia which had the ancient name of Vavau. In other Tokelauan tales, there are clear references made to the Vavau in Tonga (J. Huntsman, personal communication in April 1982).

Human Usage

Methods of capture

Most turtles captured in Tokelau are taken while they are copulating in waters just outside the reef. There is some evidence to suggest that the leeward sides of the atolls are preferred mating areas, and the lagoon waters are not usually used.

When a mating pair is sighted from land, men from the village either swim out or launch their small outboard-powered aluminum boats and cautiously approach the turtles. Using skill and strength, the turtles are physically restrained by hand or with the aid of a rope. This is essentially the same method of capture described by Macgregor (1937). In recent years, however, the use of an iron hook and line to snag turtles has become popular. Fewer turtles are lost by this technique and not as many men are needed. A hook and line also increases the chances of catching mating turtles that are accidentally encountered at night when villagers are fishing for other species. A turtle caught at Nukunonu a week before my arrival was taken under these circumstances.

A traditional belief in Tokelau is that a man whose wife is pregnant will frighten off a pair of turtles if he is involved in the attempted capture. Consequently, these men are forbidden from joining the hunting party. A woman at Fakaofu in her eighth month of pregnancy was one of several people that related this belief to me.

Another one of my informants, Hosea Kirifi, told me an interesting story about an accident that happened many years ago at Fakaofu during an attempt to catch a large turtle. One of the men became entangled in a rope he had tied to the turtle. The turtle dove and pulled the man down to a great depth. The last thing the man remembered before losing consciousness was hearing a high-pitched noise (probably from pressure against his eardrums). The other men in the hunting party thought he had surely drowned and was lost. However, a few minutes later the turtle, in a state of exhaustion, and the unconscious man still tangled in the line, rose to the surface. The man recovered and lived to an elderly age, but could never hear again.

A second method used in Tokelau to catch turtles is to find the females while they are nesting. This method is used on overnight visits to the motu to gather coconuts, or when the Council of Elders sends a special party of men to a particular motu where turtle is likely to nest. When a turtle is found nesting, it is either tied to a pole and carried or dragged upside down back to the boat.

The use of outboard motors and aluminum boats is now widespread at Fakaofu and Nukunonu and has almost completely replaced the traditional outrigger canoes made from kanava trees. In past years, these canoes were powered exclusively by sail or paddle. During my visit I only saw one such sailing canoe at Fakaofu and the few others present had outboard motors.

Greater time and effort were once required to travel to the outlying motu, some of which involve round trips of 10-22 km. Although it is now far easier to reach the motu, I was unable to determine if this has influenced the number of overnight visits being made during expeditions to gather coconuts. If fewer stays now occur because of increased mobility (e.g., the men are returning to the village to spend the night at home), then there would be less opportunity to encounter nesting turtles. However, a turtle's tracks and fresh nesting site would be found when the men return the following morning. Most of the time the eggs would be taken, and eventually the turtle if it returns to this same site to nest again.

The current ability to travel faster and easier with outboard motors does not mean that freedom exists to visit all of the motu at any time. As a traditional means of conserving the coconut resource, the Council of Elders decides which motu may be visited during a certain time period. All others are off-limits, except by special permission. This control by the Elders applies to motus owned in common by the village, as well as land held by the kāiga groups that collectively make up most of the atoll. To some extent, these restrictions have probably also served as a conservation buffer for nesting turtles.

Although seldom used, another method of catching turtles in Tokelau is to harpoon them from the reef flat at low tide when they swim in close to feed on algae. Porpoises are also occasionally taken by this technique.

The least common method of taking turtles in Tokelau is to simply find them stranded on the reef flat at low tide. Such strandings are apparently rare, or at least not often seen by the people. The two turtles captured while I was at Fakaofu were found stranded by a group of children. Nemia Tuvala of Fakaofu told me that some years ago he found an adult female stranded on the reef between Fenua Fala and Fenua Fala, the two nearly adjacent motu where the villages are located. This capture was said to be significant for the following reason. Nemia's "grandfather's grandmother" had the name of Fonu. Within this family, there is the belief that a turtle will be captured a day or two after the death of a family member. Nemia's aunt died shortly before he found the turtle. Emory (1947) reported a similar belief at Napuka in the Tuamotu Archipelago, where the spirit of a deceased person was thought to lead a turtle to land 1 year after death.

Egg collection

Clutches of turtle eggs are dug up and taken whenever they are found at Fakaofu and Nukunonu. At Atafu the Council of Elders has placed a ban on the taking of eggs, except for a few that are allowed to be removed from each nest. According to Tokelauan custom, all eggs taken at each atoll must be given to the Elders for distribution among the village. The Elders also determine when the turtle will reneest by careful inspection of the opaque disk that forms on each egg and becomes progressively larger as the embryo develops. Knowing that a turtle will usually nest again at 2-week intervals, the Elders compute

an estimated date for the turtle to return based on the age of the eggs from the previous clutch. Men are then sent to the motu on this date to catch the turtle when it comes ashore. The technique assumes that a turtle renests on the same motu, and this indeed happens most of the time. The same reliable method of calculating the renesting date is also used in the Solomon Islands (Vaughan 1981), Palau (Pritchard 1977), and elsewhere throughout the Pacific.

Another method used at some islands to determine the renesting date involves counting the number of eggs in the clutch. There is no known scientific basis for this practice, and it is highly unlikely that meaningful results are obtained. Johannes (1981) mentioned that this technique is used in Tokelau, when actually the literature he cited pertained to Pukapuka in the northern Cook Islands where the counting method is known to have been used (Beaglehole and Beaglehole 1938).

There is no indication in the traditional history of Tokelau that the taking of turtle eggs was ever prohibited. Macgregor (1937) does not mention turtle eggs, although he lists "birds' eggs" as one of the ancestral foods of Tokelau. Bans on the taking of turtle eggs are known to have existed within a number of other Pacific island cultures, and some are still in effect (Johannes 1978, 1981). The taking of eggs at Pukapuka was not allowed in the past (Beaglehole and Beaglehole 1938). The people of Pukapuka attribute the lifting, or cultural breakdown, of this ban as being responsible for the decline of turtles at their atoll.

The ban on taking turtle eggs at Atafu was put into effect during the early 1970's. This action appears to have resulted in part from the advice of American Peace Corps Volunteer, Alan Banner, and the South Pacific Commission's Fishery Advisor, Val Hinds. The suggestion to implement this conservation measure was probably made to all three atolls, but Atafu is the only site where it was adopted as a continuing policy.

Turtle eggs that are taken and distributed among the village may be eaten or sometimes reburied for the purpose of hatching a pet turtle. According to Kalolo Mika, turtles raised as pets in captivity are not eaten because they have an unpleasant taste. They are also not raised to a large size because of an absence of adequate holding facilities.

At Fakaofu turtle eggs are described as watery and not considered palatable if they are more than 4 days old. At Nukunonu, I was told that eggs less than 10 days old are preferred. A method of cooking turtle eggs is to roast them directly in a fire.

Ownership and restrictions

In the Tokelauan culture sea turtles along with swordfish, sailfish, porpoise, and whales,² are classified as "sacred fish" (ika ha). The significance of this designation is that such animals are owned collectively by the entire village, and cannot be taken for personal use. When a turtle is captured, it is ceremonially shared with everyone through an intricate and equitable procedure known as "inati." Huntsman (1969) describes the inati system as "the reflection of the Tokelauan ideology of equality, whereby each individual receives from or contributes to the village or moiety his fair share."

In past years anyone who kept a sacred fish for his own use was punished by having his house burned and his property and canoe broken up (Macgregor 1937). At the present time, a person violating this traditional code would be severely rebuked by the Council of Elders. As a result, the family would be humiliated and the stigma could last for years. I was told of an incident that happened two generations ago involving a man who caught and ate a turtle on an outlying motu. Even now this man's descendants are sometimes the subject of ridicule by other villagers as the result of this incident.

In Tokelau all of the inhabitants, including women and children, are permitted to eat turtles if they so desire. No restrictions seem to have existed in the past, although certain portions such as the head were reserved for the chief. In a number of other Pacific island cultures, turtles could formerly only be eaten by select groups, usually limited to chiefs or adult men.

Macgregor (1937) indicated that certain forms of animal life, including turtles, used to be revered as family spirits or gods. The animal so designated was never caught, injured, or eaten by members of that family. I found no evidence that this belief still exists, although certain individuals within families will not eat turtle. Possibly this involves the small number of people who have recently converted to the Seventh Day Adventist Church, some members of which will not eat turtle for religious reasons (see the Bible Leviticus 11 and 19, Deuteronomy 14).

Huntsman and Hooper (1975) mentioned that women within the Tokelauan culture are perceived as having "close links" with spirits, as well as fish, turtles, and birds. This may be the reason why no women at Fakaofu were involved in any aspect of the butchering and distribution of the two turtles I witnessed. When I inquired about this matter my informants confirmed that women are never involved, but the cultural basis for exclusion was not known.

At Atafu I was told that the green turtle and the hawksbill (though now rarely caught) are both eaten and taste equally good. The

²Whales are sometimes found washed up along the windward sides of the atolls.

females of both species are always preferred over the males. No restrictions have ever existed on eating hawksbills, and the poisoning that occasionally happens elsewhere in the Pacific has never been known in Tokelau. However, a fatality recently resulted from eating a balloonfish (Tetraodontidae or Diodontidae) at Fakaofu, and symptoms indicative of ciguatera poisoning have occurred at Nukunonu from eating a fish called "fagamea" (probably the red snapper, Lutjanus bohar).

Distribution

When a turtle or other sacred fish was caught in the old days, it was carried to the village meeting ground (malae) for ceremonial prayers of thanks offered to the god Tui Tokelau. The turtle was put on display for all to view, and later killed and cut up by a specially appointed man (tauvaega) who divided it among the people (Macgregor 1937).

Considerable ceremony and socialization are still associated with the distribution of a turtle. The tauvaega, or inati supervisor, presides over a team of men and boys that systematically divide the turtle into portions assigned to each family in the village. The entire turtle is consumed, except for the bile, scales, gut contents and, occasionally, the shell. While at Fakaofu, I was able to watch the full procedure of processing and distribution of the two turtles found stranded on the reef. The tauvaega of Fakaofu, Kalepo Mativa, as well as Nemia Tuvala and other participants, were most accommodating in allowing me full access to the work area and permission to take photographs. The following is a descriptive account of this event, starting when the turtles were first captured at about noontime on 22 October 1981.

The two turtles were transported from the reef by boat to the village motu of Fenua Fale, where they were placed on their bellies in the shade close to the lagoon shore. Although the turtles were not injured in any way, they exhibited very little activity or alertness, unlike the green turtles I am familiar with in Hawaii. They made no attempt to crawl to the water, even though it was in clear view just a few meters away. Furthermore, none of the villagers seemed concerned that they would try to escape. The only explanation I can offer for the turtles' lethargic behavior is that their earlier mating activity had left them in an exhausted state. This would be consistent with the fact that they did not swim off the reef when they sensed the tide receding, but rather allowed themselves to become stranded.

An interatoll rugby tournament was scheduled to take place that day, so after considerable discussion it was decided to postpone processing the turtles until the next morning. The turtles were eventually turned over on their backs where they remained unattended throughout the night.

Starting at about 8 p.m. and lasting until after midnight, traditional singing and dancing took place at the village meetinghouse as part of the festivities of the general council meeting. The turtles

were well within hearing distance of this merriment, but not in the immediate vicinity. In keeping with the Tokelauan spirit of pride and friendly competition, people from Nukunonu later told me that turtles at their atoll are much better looked after, and never left alone, when they have to be held overnight. Ateli Perez, an elder at Nukunonu who was quoted by Huntsman (1977), provided some interesting insight on this tradition in a speech he gave at the Nukunonu meetinghouse on 10 October 1967:

"We are all singing here in keeping with the ancient custom to which we still adhere. When a pair of turtles are captured in the late afternoon and are not used, old ladies come and guard over the turtle couple, sitting at the side and sing songs to cause them to stay awake. So we are sitting here at the side of the turtles and we sing. Because of another ancient belief, we come and sit beside the turtles lest a bush spirit (gaveve) steal them in the night. This is an ancient custom to which we still hold to this very night. This is the meaning of our joy-making and singing here."

The processing of the two turtles at Fakaofu started at about 8 a.m. A number of people, including many children, were gathered in the area. The turtles were first stunned in the traditional Tokelauan manner of delivering five to six heavy blows to the ventral neck and pectoral regions using a blunt instrument, in this case the hammer side of a long-handled axe. This causes massive internal hemorrhaging but very little external bleeding. When I first heard of this method, I was admittedly apprehensive from a humane standpoint. However, after seeing it take place, I am convinced that it is actually less cruel than many of the techniques employed elsewhere throughout the world. Sea turtles are simply not easy animals to kill or render unconscious by any method.

Immediately after striking the turtles, the plastron was removed by cutting along the border with a sharp knife. While this was still in progress, other workers were reaching into the turtle and ladling out all of the blood that had collected in the body cavity. Still other workers were busy building a number of small fires on coral stones for use as cooking stoves. Two of these sites were used to stew the blood in large metal pots.

The eggs in the female were carefully separated from the oviduct and counted into baskets woven from palm fronds. A total of 300 was present. All of them were immature and there was no sign of shelling.

After being separated from the body, the flippers, head, tail, and plastron were singed in the fires to loosen the keratinous epidermal scales. Each piece was then meticulously peeled clean of this inedible material. The four front flippers with the meaty pectoral regions still attached were each taken and presented as gifts to the visiting people from Atafu, Nukunonu, and Apia, and the general council meeting delegates.

The stomach and intestines were removed in one piece and carried a short distance into the lagoon where they were cut open lengthwise and washed clean. Along with the other viscera, this material was cut up into sections and combined with the remaining pieces of meat, bone, and cartilage.

The two shells were not cut up because they were initially intended to be saved as decoration for the village meetinghouse. This plan was later changed when offers were made to the Council of Elders to buy the shells. As a result, one was sold to a Tokelauan living in Apia, and the other to a Tokelauan residing on Fakaofu who eventually returned to New Zealand where he has lived for some years. According to Kalolo Mika, turtle shells have traditionally been cut up and eaten after removing the horny scutes. It was explained that the shell, which is mostly bone, is usually given to the young men because their teeth are strong enough to chew on it. On the other hand, the plastron, which has less bone and more cartilage and therefore is easier to chew, is given to the older people whose teeth may not be as good.

When the processing was completed, Kalepo supervised the other workers in assembling the proper allotment for each family or inati group. To serve as a guide, he had a list of the 76 family names for Fakaofu and the number of people in each unit. The quantity and composition of the shares seemed to be very carefully considered before a decision was reached. Because a sizable amount of the turtle meat had been given to the visitors, it was necessary to incorporate portions of a village-owned pig so that each share would be adequate. When the apportionment was finally completed, all of the shares rested on palm frond mats spread out neatly on the ground. A call was then given throughout the village signifying that children from each family should come to the area. After everyone had arrived, Kalepo read off each name and the children came forward with a bowl or basket to claim their share. At that time, a few immature eggs were also added by the workers. The food was subsequently taken back to each family home where it was prepared for the afternoon meal. Methods of cooking include wrapping the meat in leaves and baking it under fire-heated rocks, or grilling the meat directly on the rocks. The stewed blood, along with small pieces of meat and viscera that had been added, were not distributed but instead eaten by the workers when their duties were finished. The entire butchering and distribution process ended at about 11:30 a.m. and took 3-1/2 hours.

The activities that I observed at Fakaofu differed in a few respects from the information supplied by Macgregor (1937) for Atafu, and by Huntsman (1969) for Nukunonu. Macgregor (1937) mentioned that the person who first sighted a turtle was entitled to claim a larger share. None of my informants indicated that this practice is followed at the present time. Huntsman (1969) stated that at Nukunonu the parts of the male and female turtles were kept separate and used in equal quantities whenever possible to make up the shares. I saw no evidence of this at Fakaofu; however, the large portions of the meat that were given as gifts may have influenced the distribution procedure. For Nukunonu, Huntsman (1969) also indicated that the head, heart, liver,

and kidneys, were allocated to either the Mission personnel, the doctor, the oldest man in the village, or the workers that processed the turtle. My informants at Fakaofu told me that until recently the head was presented to the oldest man in the village as a token of respect. Although this custom was not being followed at the time of my visit, there were plans to ask the Council of Elders to have it reinstated. According to Kalolo Mika, the head of a turtle is always given to the oldest man at Atafu. Luciano Perez explained to me that the traditional "head portion" at Nukunonu incorporates some of the neck and a nice piece of adjoining meat from the pectoral area.

Based on the shell lengths, I estimated that the total edible weight of the two turtles distributed at Fakaofu was not less than 190 kg, or 280 g (0.62 lb) for every man, woman, and child that lives on the atoll. Using the same estimate for edible weight, and the data previously presented on human population and number of turtles captured, it is possible to compute the approximate average amount of turtle consumed per person during each breeding season. The resulting values would be 1.4 kg (3.1 lb) for Fakaofu, 5.4 kg (11.9 lb) for Nukunonu, and 2.5 kg (5.5 lb) for Atafu. These quantities make a distinct contribution to the protein nutrition of the Tokelauans. However, to be accurately appraised, the values must also be viewed in light of the enjoyment that is derived from eating this highly prized and savory food.

Other cultural aspects

During the course of my visit to Tokelau, and my literature search, a number of miscellaneous cultural components involving sea turtles were identified.

The school principal at Atafu, Tenise Atoni, told me that the uneaten bone scraps from the shares received by each family are usually thrown into the ocean in the belief that they will attract turtles to the atoll. In Hawaii the opposite view is held, at least for raw turtle parts and blood, and discarding such material into the sea is believed to drive turtles away.

There is a Tokelauan expression called "hila fonu" for a particular red sunset. Hosea Kirifi told me that when a hila fonu is observed a turtle is likely to come ashore in the evening. Macgregor (1937) also mentioned this expression, which he wrote as "la sila fonu" and translated as "the sun like a turtle's breastplate." This was listed as a descriptive Tokelauan phrase for an "orange reflection of the sunset in the clouds, common near the equator."

Macgregor (1937) stated that in the old days the ear lobes of all babies were perforated shortly after birth, and that earrings of turtle shells or bone were sometimes inserted later in life. Although a number of people that I encountered had a pierced ear, none of them had this type of earring. Macgregor (1937) also described the ancient use of turtle bones made into tattoo puncturing instruments (pakiau) and thatching awls for splitting pandanus leaves. I found no indication of

these items being currently used. Tattooing is reported to have been banned when the missionaries first arrived.

Throughout the Pacific islands the thick horny scutes from the shell of the hawksbill turtle were formerly a premium material for making fishhooks. Two types were crafted in Tokelau: the one-piece hook used for line fishing with bait, and the composite hook used for trolling from a canoe or casting from shore (Macgregor 1937). Iron hooks and plastic lures have now replaced these traditional products, mostly because they are convenient to obtain, but also due to the present scarcity of adult hawksbills. I did, however, learn of a possible renewed interest in making the traditional hooks and teaching this skill to the younger generation. In this regard, I was even asked if I knew of a source where hawksbill scutes could be bought for such a purpose.

Tokelauan handicrafts are recognized as being among the finest in the Pacific islands. The most commonly produced items are woven baskets, fans and mats, and small boxes with tightly fitting lids carved from kanava wood. Two other crafted items also of superb quality, but less commonly seen, are carved wooden turtles and authentic-looking turtle shells. The shell replicas are usually made from Tournefortia ("tausunu") wood. Iere Kirifi of Fakaofu is a master woodcarver of these fine objects.

Since the willing conversion of the people to Christianity, there has been no form of worship to the ancient god Tui Tokelau, even though a portion of this coral-rock image is still present in the meeting-house at Fakaofu. An invocation said to Tui Tokelau in the old days asked that the heavens send down the necessities of life to their small atolls--rain, calm, light, coconut blossoms, fish, and among other things, "he tai fonu" (plenty of turtle).

Singing and dancing continue to be an integral part of the Tokelauan culture. One of the traditional songs for dancing that Macgregor (1937) recorded from Kalolo Mika's father in 1932 tells of a turtle hunt in which Tinilau, a mischievous character of Polynesian mythology, allows the turtle to escape. The title of this short composition is "Song of catching the turtle," and the translated words are as follows:

"The turtle of the deep sea,
The turtle of the deep sea is hunted.
Chase away the young children.
Who congratulates Tinilau
Alas! there is nothing.
Tinilau continues to dance."

RECOMMENDATIONS FOR CONSERVATION

The information brought together in this paper should give the Tokelauans a better perspective of the nature and limits of their sea

turtle resource. As the first document of its kind dealing with the turtles of Tokelau, the report should also be a stimulus for discussions within the Council of Elders at each atoll. I am hopeful that this increased awareness and focus of attention will result in steps to strengthen the survival outlook of turtles and their traditional role in the Tokelauan culture.

The available evidence strongly suggests that there has been a long-term decline in the number of turtles breeding in Tokelau. There has also probably been a reduction in the size of the adults, considering that much larger turtles (tuahivivalu) are known to have existed in past years. The most probable major cause of this deterioration is the biological inability of the turtle stock to remain stable against the levels of harvesting of adults and eggs that have been carried out over the years. Although these excessive harvesting levels may be partially caused by hunting pressures at the distant (and unknown) feeding areas, it is likely that the greatest impacts result from catching too many turtles and digging up too many eggs in Tokelau where breeding occurs. All sea turtles are known to be particularly vulnerable at their breeding site. This is because the reproductively mature and ecologically more valuable adults converge at relatively small areas where they are more susceptible to capture due to their density, high visibility, preoccupation with mating, and excursions on land to nest. When these same adults are at their distant feeding areas, they are usually distributed over many miles of coastal waters, are not readily visible, and almost never go ashore. In the feeding areas they are simply much more difficult to find and catch.

In the past, the mechanisms used by certain Pacific islanders to protect turtle stocks from overharvesting included prohibitions on taking eggs or taking adults while they are on the beach, establishing certain motu as inviolate sanctuaries, permitting only a certain number of turtles to be captured, and restricting the consumption of turtles to chiefs. None of these practices seem to have existed in Tokelau, although possibly at one time there was a total ban on taking eggs, such as the one known at the closest neighboring atoll to the east, Pukapuka. Even without such a ban, I suspect that turtles in Tokelau were fairly well buffered during the old days because of the greater difficulties in traveling to the outlying motu and outside the reef to catch them. Also, a greater percentage of the turtles pursued may have evaded capture in the past when the iron hook-and-line technique was not employed, and outboard motors were not available. The fact that special rules governing the taking of turtles apparently were not imposed in Tokelau suggests to me that a very large supply of turtles may have existed in relation to the human population. If this was true, as it may very well have been, the governing elders and chiefs would not have felt any need to limit the number of turtles captured. In the resource-limited atoll environment of Tokelau, the appearance of large numbers of turtles at a certain time of the year, and their departure just a few months later, could understandably motivate the small human population to catch as many as their hunting capabilities and rate of consumption would allow. Under these fruitful conditions,

which undoubtedly continued year after year with little perceptible change, there would have been no reason to believe that this particular resource actually did have limits. McCoy (1974) described such a philosophy in the Caroline Islands where the seasonal coming and going of breeding turtles have falsely engendered "a faith in their perpetual return."

Whereas fewer turtles now nest in Tokelau, they have by no means vanished altogether. However, if the downward trends continue, this unfortunate outcome could very well take place. There are a number of examples of this pattern at other Pacific islands to support such a prediction. Because of our present inadequate understanding of the population dynamics and life history of sea turtles, there are no proven or guaranteed methods for rebuilding a depleted stock. Nevertheless, there are a number of conservation practices that can reasonably be expected to aid in the restoration. Green turtles living in the wild may take many years, even decades, to grow to maturity, so the implementation of these practices cannot be expected to produce quick results. Instead, any sacrifices made by this generation of Tokelauans, by taking fewer turtles and foregoing egg collection, must be regarded as an investment to benefit their grandchildren and subsequent generations. This may be a difficult challenge for people living in a remote atoll environment. However, some action is essential if the turtle resource in Tokelau is to be sustained. From information I received during my visit, it would appear that the survival problems confronting turtles are similar to the difficulties being experienced by the kanava tree, which also takes many years to reach a large size. I therefore believe it is necessary for Tokelauans to consider turtles from the same judicious perspective as they now view the kanava tree. Both of these components of the environment require special management and planning for the future.

In conclusion, I will offer a list of conservation recommendations for the Council of Elders to consider at each atoll. In this list I have purposely only presented a basic framework. If the decision is made to adopt some of these measures, which I hope it will be, then the details must of course be worked out by the Elders themselves to ensure compatibility with Tokelauan ideals and way of life. My suggested conservation measures or options to aid sea turtles in Tokelau are as follows:

1. The collection of eggs should be stopped at all three atolls. Eggs should be left in their nests on the beaches to incubate naturally and produce hatchlings that can replenish the turtle stock. Atafu has already initiated such a measure, and the other two atolls should follow this example. The collection of one or two egg clutches each season under the Elders' supervision would be appropriate to meet the needs of villagers who want to raise a few turtles for pets.

2. All hawksbill and loggerhead turtles should be granted full protection for at least 10 years in an effort to prevent these species from becoming extinct as a breeding stock in Tokelau.

3. At each atoll, some limit or quota should be placed on the number of green turtles that are captured. Currently, there are no limits and as many as possible are taken. Consideration should be given to taking more males than females, since each male is capable of fertilizing several females. In setting quotas, as many females as possible should be permitted to escape capture so they can lay eggs to replenish the stock. The females that are allowed to be taken should be captured later in the breeding season (November and December) after they have had the chance to lay eggs.

4. Any female taken on the beach should be allowed to first nest and lay her eggs.

5. Certain motu, or defined sections of known nesting beach at each atoll, should be designated as "turtle sanctuaries" for the purpose of replenishing the stock. No turtles or eggs should be taken from these sites.

6. The use of more efficient and so-called modern methods of catching turtles in the water should be discouraged. The traditional manner of catching turtles should be encouraged because it involves challenge, strength, skill, pride, and a sense of accomplishment.

7. Tokelauan sea turtles or their parts should not be sold for money. The turtles are simply too valuable of a resource to the culture. The selling of such a native resource, once started, is difficult to stop and is a proven social and ecological disruption.

8. The schools should include information in their teaching program that covers the interesting cultural, biological, and conservation aspects of sea turtles. The teaching program should especially focus on young children.

9. A special effort should be made to strengthen or restore any appropriate cultural aspect that involves sea turtles (i.e., songs, dances, folklore).

10. Consideration should be given to teaching the young people the skill of making traditional fishhooks for fishing purposes from the scutes of the hawksbill turtle. An ample quantity of the raw scutes needed for this purpose can probably be obtained at no cost from confiscated stock being held by U.S. Government officials in Hawaii. Under no circumstances should hawksbill scutes be bought from a commercial source, since this species is seriously endangered with extinction throughout most of its range.

11. Records should be kept of the shell length, sex, capture location, and number of turtles taken during each season. Also, if interest exists, tags should be used at each atoll to try to find out where the turtles go when they are not in Tokelau.

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REFERENCES

- Balazs, G.H. 1977. South Pacific Commission turtle project: a constructive review and evaluation with recommendations for future action. Consultancy report prepared for the South Pacific Commission, Noumea, New Caledonia. Hawaii Inst. Mar. Biol., Univ. Hawaii, Kaneohe, 54 pp.
- Balazs, G.H. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. U. S. Dep. Commer., NOAA Tech. Memo. NMFS NOAA-TM-NMFS-SWFC-7, 141 pp.
- Balazs, G.H. 1982a. Status of sea turtles in the central Pacific Ocean. In K. A. Bjorndal, ed.: Biology and conservation of sea turtles (Wash., D.C.: Smithsonian Institution Press), 243-252.

- Balazs, G.H. 1982b. Sea turtles: A shared resource of the Pacific islands. South Pac. Comm. Fish. Newsl. 23: 22-24.
- Beaglehole, E. and Beaglehole, P. 1938. Ethnology of Pukapuka. Bernice P. Bishop Mus. Bull. 150: 1-499.
- Bryan, E.H., Jr. 1942. American Polynesia and the Hawaiian chain. (Honolulu: Tongg Publ. Co.), 253 pp.
- Buck, P.H. 1932a. Ethnology of Tongareva. Bernice P. Bishop Mus. Bull. 92: 1-225.
- Buck, P.H. 1932b. Ethnology of Manihiki and Rakahanga. Bernice P. Bishop Mus. Bull. 99: 1-238.
- Burrows, E.G. 1933. Native music of the Tuamotus. Bernice P. Bishop Mus. Bull. 109: 1-107.
- Burrows, W. 1923. Some notes and legends of a south sea island. J. Polynesian Soc. 32: 143-173.
- Cooke, M. 1975. A birthday party for the prince, fit for a king. The Honolulu Advertiser, 17 November, B1-2.
- Dahl, A.L. 1980. Regional ecosystems survey of the South Pacific area. South Pac. Comm., Tech. Pap. 179. 99 pp.
- Emory, K.P. 1933. Stone remains in the Society Islands. Bernice P. Bishop Mus. Bull. 116: 1-179.
- Emory, K.P. 1947. Tuamotuan religious structures and ceremonies. Bernice P. Bishop Mus. Bull. 191: 1-101.
- Great Britain Naval Intelligence. 1943. Pacific Islands - Eastern Pacific. Volume 2, B.R. 519B, London, 739 pp.
- Hinckley, A.D. 1969. Ecology of terrestrial arthropods on the Tokelau atolls. Atoll Res. Bull. 124: 1-18.
- Hirth, H.F. 1971. South Pacific islands - marine turtle resources. Report prepared for the Fisheries Development Agency Project. Rome: FAO. 34 pp.
- Hooper, A. and Huntsman, J. 1973. A demographic history of the Tokelau Islands. J. Polynesian Soc. 82: 366-411.
- Huntsman, J.W. 1969. Kin and coconuts on a Polynesian atoll: socio-economic organization of Nukunonu, Tokelau Islands. Bryn Mawr College, Ph.D. thesis. [Unpublished.]
- Huntsman, J.W. 1971. Concepts of kinship and categories of kinsmen in the Tokelau Islands. J. Polynesian Soc. 80: 317-354.

- Huntsman, J. 1977. Ten Tokelau tales. Collected, translated, and edited by Judith Huntsman. Working papers in anthropology, archaeology, linguistics, and Maori studies, No. 47, Department of Anthropology, Auckland, New Zealand. Also printed with Tokelau and English text as "Kakai Tokelau" by the Office for Tokelau Affairs, Apia, Western Samoa.
- Huntsman, J. and Hooper, A. 1975. Male and female in Tokelau culture. J. Polynesian Soc. 84: 415-430.
- Huntsman, J. and Hooper, A. 1976. The 'desecration' of Tokelau kinship. J. Polynesian Soc. 85: 257-273.
- Johannes, R.E. 1978. Traditional marine conservation methods in Oceania and their demise. Annu. Rev. Ecol. Syst. 9: 349-364.
- Johannes, R.E. 1981. Words of the lagoon. (Berkeley: University of California Press). 245 pp.
- Keen, G. 1976. Atoll. School Publications Branch, Department of Education, Wellington. 49 pp.
- Kirkpatrick, R.D. 1966. Mammals of the Tokelau Islands. J. Mammal. 47: 701-704.
- Macgregor, G. 1937. Ethnology of Tokelau Islands. Bernice P. Bishop Mus. Bull. 146: 1-183.
- McCoy, M.A. 1974. Man and the turtle in the Central Carolines. Micronesica 10: 207-210.
- Mosby, J. and Wodzicki, K. 1973. Food of the kimoa (Rattus exulans) in the Tokelau Islands and other habitats in the Pacific. N. Z. J. Sci. 16: 799-810.
- Parham, B.E.V. 1971. The vegetation of the Tokelau Islands with special reference to the plants of Nukunonu Atoll. N. Z. J. Bot. 9: 576-609.
- Pritchard, P.C.H. 1977. Marine turtles of Micronesia. (San Francisco: Chelonia Press). 83 pp.
- Pukui, M.K., and Elbert, S.H. 1971. Hawaiian-English dictionary. (Honolulu: University Press of Hawaii). 402 pp.
- South Pacific Commission/National Marine Fisheries Service. 1980. Joint SPC/NMFS Workshop on Marine Turtles in the Tropical Pacific Islands, Noumea, New Caledonia, 11-14 December 1979. Report of meeting. 16 pp.
- Vaughan, P.W. 1981. Marine turtles: a review of their status and management in the Solomon Islands. Fisheries Division, Ministry of Natural Resources, Honiara, Solomon Islands. 70 pp.

- Whistler, W.A. 1981. A naturalist in the South Pacific north to Tokelau. The Bulletin (Pac. Trop. Bot. Gard.), 11: 29-37.
- Whitaker, A.H. 1970. A note on the lizards of the Tokelau Islands, Polynesia. Herpetologica 26: 355-358.
- Wiens, H.J. 1962. Atoll environment and ecology. (New Haven: Yale University Press). 532 pp.
- Wodzicki, K. 1972. The Tokelau Islands. South Pac. Bull. 22(1): 37-41.
- Wodzicki, K. 1973. The Tokelau Islands - environment, natural history and special conservation problems. Regional Symposium on Conservation of Nature - Reefs and Lagoons, 5-14 August 1971, Pap. 10, South Pac. Comm., Noumea, New Caledonia.
- Wodzicki, K. and Laird, M. 1970. Birds and bird lore in the Tokelau Islands. Notornis 17: 247-276.
- World Conference on Sea Turtle Conservation. 1980 . Sea turtle conservation strategy: abridged version. South Pac. Comm. Fish. Newsl. 21: 8-15.
- Yaldwyn, J.C. and Wodzicki, K. 1979. Systematics and ecology of the land crabs (Decapoda: Coenobitidae, Grapsidae and Gecarcinidae) of the Tokelau Islands, Central Pacific. Atoll Res. Bull. 235: 1-53.

Appendix: Persons interviewed in Tokelau

Nukunonu

Palehau Leone	- 84-year-old Elder
Lucianno Perez	- Fisherman and Principal of Matiti School
Henry Joseph	- Fisherman and Tokelau Public Service
Sister Juliana Perez Soln	- Catholic Mission
Niko Pule	- Fisherman
Kalolo Perez	- Tokelau Public Service

Atafu

Kalolo Mika	- 78-year-old Master Fisherman and son of Mika, Macgregor's (1937) principal informant
Amusia Patea	- Faipule
Tema Nouata	- Puluenuku
Tenise Atoni	- Principal of Matauala School
Aleni Viliamu	- Tokelau Public Service

Fakaofu

Nemia Tuvala	- 65-year-old Master Fisherman
Kalepo Mativa	- Tauvaega
Hosea Kirifi	- Tokelau Director of Education
Siniua Sosene	- Owner of captive-reared turtle
Elizabeth and John Pereira	- Fisherman and resident
Moana Rimoni	- Resident
Mr. and Mrs. Fetalaiga Uili	- Fisherman and resident
Senitu Iasona	- Participant in inati ceremony
Sakaria Petelesio	- Tokelau Public Service
Janeta Siaon	- Resident

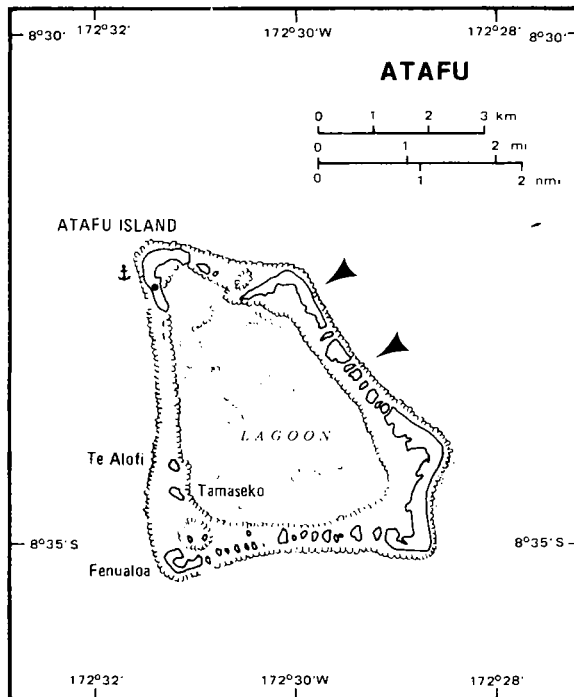
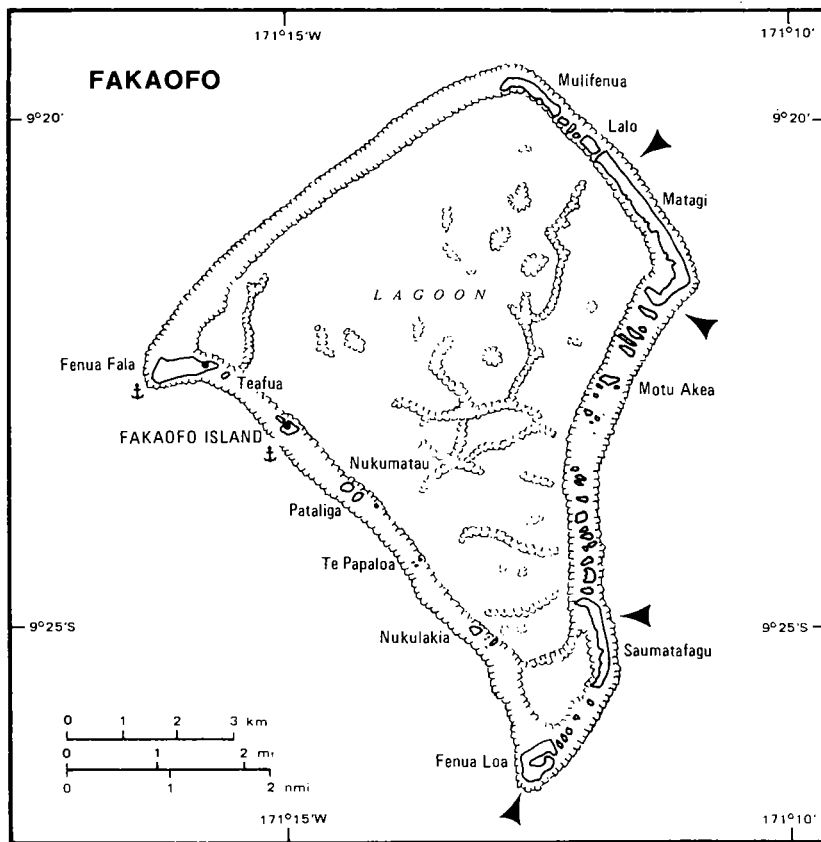


Fig. 2. Principal nesting areas at Atafu and Fakaofu

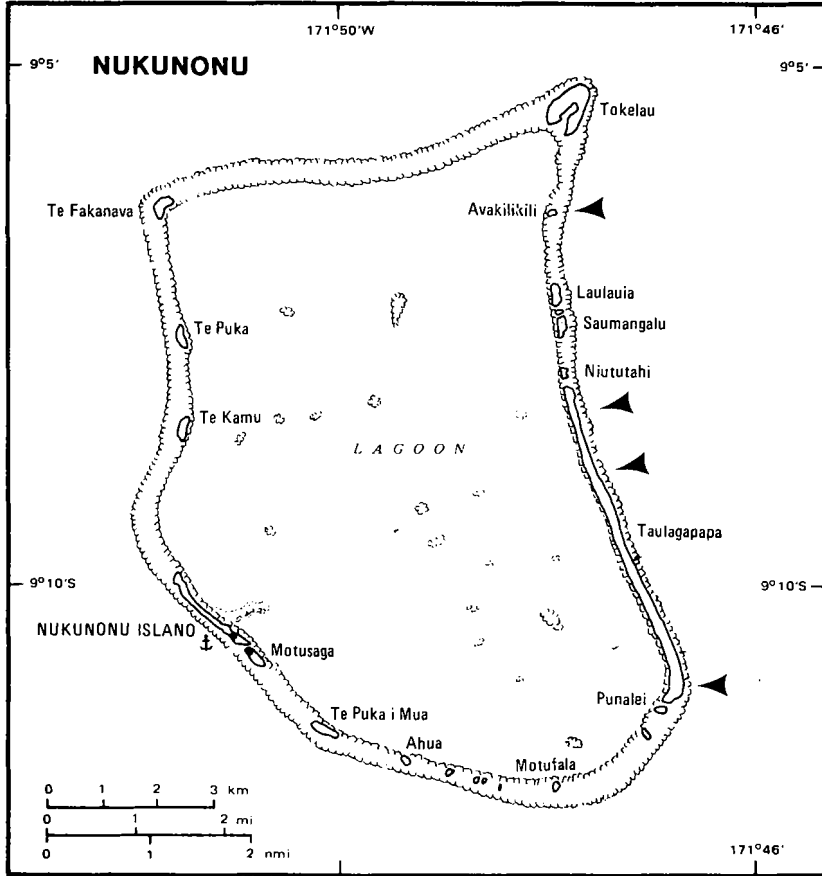


Fig. 3. Principal nesting areas at Nukunonu



1. Nesting beach at Nukunonu at low tide



2. Ocean shoreline at Atafu showing jagged coral rock and wrecked Taiwan fishing vessel



3. Henry Joseph with the 104-cm carapace of a green turtle caught at Nukunonu



4. Adult female green turtle caught while stranded on the reef at Fakaofu



5. Adult male green turtle caught at Fakaofu



6. Siniua Sosene at Fakaofu with her captive-reared pet green turtle



7. Kalepo Mativa, the tauvaega of Fakaofu, presiding over the distribution of turtle



8. Village children at Fakaofu after receiving their family share of turtle meat and immature eggs



9. Village landing and small boat channel at Fenua Fale, Fakaofu; the MV Frysna is offshore



10. Village landing at Nukunonu



11. Master Fisherman Kalolo Mika and relatives
in their family home at Atafu



12. Fleet of aluminum boats with outboard motors
anchored off Fenua Fala at Fakaofu