
Subsistence Hunting of Turtles in the Western Pacific: The Caroline Islands

ABSTRACT

The Caroline Islands comprise numerous low coral atolls and islands as well as high volcanic islands. Some of the remote coral islands are used by sea turtles, mostly the green turtle, *Chelonia mydas*, as nesting areas during the season which generally lasts from March to September. Green turtles, and to a lesser extent hawksbills, *Eretmochelys imbricata*, are found year-round in the lagoons of the high islands. The inhabitants of the coral atolls, the "outer islanders" have, for the most part, developed methods of capture and utilization exceeding those of the islanders residing in the administrative centers of Truk, Ponape, Yap, and Kosrae. However, population pressures, the emergence of a "money economy," and other factors have increased the pressures on turtles throughout the region. The decline in importance of traditional tabus and the preference for modern boats and motors over traditional canoes have led to the disappearance of the protective buffer these customs once provided. Turtles face increased harvesting, and there is a need for a conservation system to replace the original tabus. Any such system must be designed with the people in mind and worked out in partnership with them.

Stretching from 131° East to 163° East Longitude, the Caroline Islands comprise a series of both high volcanic and low coral islands and atolls placed in a rough line totaling 3,200 km in length. On the easternmost limit is the high volcanic island of Kosrae; the west is bounded by the small coral island of Tobi. The total land area does not exceed 1,193 km² of dry land. The lagoon area, on the other hand, encompasses 8,546 km² and a total of about 950 islands and islets. The ocean area inside the present political boundaries of the Federated States of Micronesia (Yap, Truk, Ponape, and Kosrae) and Palau exceeds 3.4 million km².

Within this vast expanse of ocean, sprinkled among

the island chain are a few uninhabited atolls and single islands, all coralline in structure, which serve as nesting beaches for green and, to a lesser extent, hawksbill turtles. These islands are sometimes visited by islanders in canoes from nearby inhabited islands, or by the crew from a passing fishing vessel. Little is known of the nesting turtle populations or of their capacity to withstand exploitation.

The inhabitants of the Carolines arrived many centuries before the first Europeans. They had already developed cultures allowing exploration of remote parts of the Pacific. Whether voyaging for discovery or due to social pressures, they inhabited the islands and were well established by the arrival of the first Spaniards in the sixteenth century. Serious colonization by Europeans did not take place until the Germans discovered how valuable the islands were for copra and other commodities, including turtle shell. There are, however, no reports in the literature of the early explorers or commercial entrepreneurs that would suggest that the resource ever existed on the scale reported for the Caribbean. While turtles were most certainly seen and occasionally eaten by early visitors and inhabitants alike, we can only speculate on their numbers.

The Carolines had a series of various colonial masters interested in different goals. First the Spanish arrived with soul-saving religion, and guns to back them up. They met with less than resounding success. Two notable events were the slaying of the Spanish Governor and troops in Ponape during the late 1800s, and the supposed eating by natives of a priest and his followers left on Ulithi atoll about the same period. The Germans administered the area from their western Pacific headquarters in Rabaul, but only for a relatively brief time. Their rule was cut short by the first world war and the almost immediate occupation of the major islands by the Japanese in 1914. The area was given to Japan as a mandated area under the League of Nations and remained so until 1945, when the United States occupied the main islands. The United Nations then gave the United States control over the area known as Micronesia as a Strategic Trusteeship, and today it remains the last trusteeship under U.N. control. Political talks are progressing with the United States on the one hand, and the separate delegations from the Marshalls, Palau, and the Federated States of Micronesia on the other.

Turtles are occasionally seen around the main islands of Yap, Koror, Truk, Ponape, and Kosrae, usually in the water, and never for very long. The turtles, mostly *Chelonia mydas*, are to be found in the uninhabited islands far from the dusty streets, bars, and tin shacks of the administrative and population centers. The turtles concentrate their nesting activities on small islands such as Oroluk, Pikelot, West Fayu, Gaferut, and Helens Reef.

Oroluk atoll is located midway between Truk and Ponape. Until the late 1960s it was uninhabited, but today a small band of Polynesians from Kapingamaringi occupy the island with government consent and cause disruption to what once was regarded as one of the largest turtle nesting areas in the Eastern Carolines.

The island of Gaferut, containing 0.111 km², has been used as a resource island for many years by the people of Faraulep, and to a lesser extent by those from Woleai and Ifaluk. Gaferut is now seldom visited, due to the decline in the use of voyaging canoes by those islanders. Another factor was the tragic loss of most of the able-bodied men of Faraulep in their canoes during a typhoon in the 1950s. The island is sometimes visited by the government field-trip ship from Yap, and occasionally passengers from Faraulep, Ifaluk, and Woleai take turtles to be carried to their home islands. The ship's visit is short, and the evening's take is usually never more than 8 or 10 green turtles. The island is visited in this manner perhaps 2 or 3 times a year. A unique feature of Gaferut is a reef extension on the northwest side of the island which contains a large, deep hole big enough to accommodate many large turtles. Turtles often stay in this natural hole during the day or days before nesting. The standard method of capture is to move silently to this depression and capture the turtles resting there. The island itself is heavily wooded and has a large population of sea birds, only 1 coconut tree, and no fresh water. This makes a rather inhospitable place for humans.

One recent visit to Gaferut was made by islanders in a canoe from Satawal who were returning home on a long sea voyage from Saipan in June 1979. The navigator of the canoe reported that the island was covered with tracks and nests. The canoe was heavily laden, and able to carry only 2 or 3 turtles on the continuation of its voyage. This points out the limitations placed on the taking of turtles by the traditional mode of conveyance: the voyaging sailing canoe. These canoes are capable of extended voyages of many hundreds of miles with capable navigators from the islands of Satawal, Puluwat, Pulap, Tamatam, and Elato. But the number of turtles taken is limited by the size of canoe (usually not exceeding 8.2 m in length) and by the winds encountered. This is in stark contrast to the government ship or stray Japanese or Taiwanese fishing vessel, which happen upon an island, with a capacity far exceeding that of the canoes.

The other important nesting areas in the central and western Carolines are the islands of Ulithi atoll. Traditional customs are still strong within the atoll, and the turtles are considered the property of the chiefs of Mogmog, the highest caste island in the atoll. Information about turtles from Ulithi is not readily available, but the relatively large numbers of nesting turtles reported on 2 small islands just outside the atoll war-

rant a close study. A program sponsored jointly by the Peace Corps and the Micronesian Mariculture Center in Palau failed dismally in Ulithi during 1973 due to a number of factors, not the least of which was the personality of the Peace Corps volunteer assigned to the project. The resultant bad feelings have probably lessened the chances for serious investigators to do any work at Ulithi for some time.

Thus, except for the relatively few outer islanders who still possess the skills of their ancestors in bulding and sailing the large voyaging canoes, the great majority of the Micronesian population in the Carolines does not have access to turtle nesting sites. From a conservationist's standpoint this may be desirable, because the number of people exploiting turtles is reduced to manageable numbers (3,000 vs 90,000). Nevertheless, the remoteness of the islands makes the work more difficult than one would first imagine.

The inhabitants of the Caroline Islands are essentially of 1 Micronesian stock. Like other inhabitants of the Pacific, they can be grouped generally into 2 distinct groups: those that inhabit the low coral islands and atolls, and those who farm the higher volcanic islands of the chain. The languages are different from island to island, with the western Yapese and Palauan languages being distinct from the Carolinian dialects spoken from Ulithi to Kosrae. Ethnically and linguistically the outer islands of Palau are linked to Ulithi and the central Carolines, although administratively they are under the control of the administrative center in Koror, Palau. The rest of the islands' inhabitants live within 1 of the 4 states of the Federated States of Micronesia: Yap, Truk, Ponape or Kosrae. In Ponape, 2 outer islands, Kapingamarangi and Nukuoro, are inhabited by Polynesians rather than Micronesians, and make up the only distinctly different ethnic group in the Carolines.

It is important to note the basic differences between the coral atoll inhabitants and those living on volcanic islands. The former are mostly fishermen and "people of the sea," while the latter tend to concentrate their activities in farming and gathering crops on the more fertile high islands. As would be expected, the level of knowledge of the sea and its fauna is greatest in the coral islands.

The people of the coral islands, for the most part referred to as "outer islanders" by expatriates, have the greatest knowledge of turtle behavior, except for the inhabitants of Palau. Palau, in the western Carolines, is unique for many reasons; this uniqueness extends to knowledge of turtles and fishing activities in general. The Palauans have developed relatively exacting bodies of knowledge for much of the reef fauna, turtles included. Scientists studying there have remarked on the level of general knowledge and abilities of Palauans around the reefs of their home islands. But on the

other high islands of Yap, Truk, Ponape, and Kosrae the knowledge of the sea is not on a par with the "outer islanders" of those states.

In the outer islands, knowledge of turtle behavior is wrapped up in traditional beliefs, altered somewhat by the advent of western schooling, the outboard motor, and other introductions. Population pressures in these islands have forced migrations to the administrative centers and, in some instances, colonization of atoll islands not usually used for habitation. In general, however, population pressures are not as extreme today as in the Gilbert Islands during the 1930s when the British Administration forced migrations and resettlement from traditionally inhabited islands to previously uninhabited ones.

These pressures will increase, particularly in the outer islands; and it appears that neither government nor local institutions are aware of or concerned with the problem. For example, the island of Satawal in the central Carolines had approximately 275 inhabitants at the end of the second world war. In 1968 the population of this 350-acre island was about 390. By 1978 it had risen to over 550, or a density of over 1,000 people per square mile. Marriage on other islands, employment in the administrative center and other factors tend to conceal the real growth, but an average of 22 births and only 3 deaths a year is quickly moving the island towards dangerous overpopulation.

These increasing pressures, in the case of Satawal, put increased pressure on traditional sources of protein, including turtles. Voyages in the traditional canoes will be made more often in search of turtles and fish on the nearby nesting islands, and perhaps the not-too-distant future will see the introduction of larger motorboats for this purpose. Indeed, on Lamotrek Island, 64 km west of Satawal, an 8.2 m diesel-powered skiff was recently purchased with funds granted by the District Legislature. The vessel reportedly travels to the atoll of Olimarao in search of turtles, and occasionally to Satawal for trading and social visits.

Turtles have suffered and will continue to suffer under such pressures. The atoll of Oroluk, located in western Ponape and already briefly described, was uninhabited until the late 1960s. When the Kapingamarangi people petitioned the government to allow colonization, a stable population resulted on Oroluk. While the numbers are not great, from 10 to 20 persons at any one time, the effects have been startling. The island itself is the only one in a large atoll enclosing 419 km² of lagoon area. The island has been known as a nesting ground for years during the season from March to September. The inhabitants have built a stone holding-pen, and turtles are placed within the pen to await the government field trip ship which calls about 6 times per year. Until recently turtles were loaded aboard the field trip vessel for return to Ponape, where they were

either sold or eaten in the Polynesian village there. The enforcement of the Endangered Species Act has put a stop to commercialization, but subsistence use is still allowed under Federal law.

While there are no figures available on the numbers of nesting turtles at Oroluk, the inhabitants complain of a decline in numbers, and estimates of nesting females per year range from 40 to 100 individuals. This is not a great number, considering that, at least by reputation, Oroluk is considered one of the better "turtle islands" in the Carolines.

Because the physical environment of the outer islanders consists of coral atolls, and since the turtles prefer the beaches of the atolls and low islands to those found on the higher volcanic islands, they have the most contact with nesting turtles. They also develop the skills necessary for catching turtles in the lagoons and from boats and canoes. In the past 30 to 40 years, outer islanders in the administrative centers on the high volcanic islands, principally Truk, Ponape and Yap, often have shared these skills with friends and relatives there. Thus, techniques for catching turtles have been developed in the high islands which were absent in the past. As travel between islands is made easier by government-subsidized shipping, the chance for such minor technology-transfer increases.

In addition to sharing their own techniques and knowledge of turtles, the Micronesians learned much from the Okinawans who were brought to the islands prior to the second world war. The Okinawans came as laborers in the sea-oriented enterprises run by the Japanese, and many were excellent divers. They showed the Micronesians how to dive for turtles resting under the coral ledges, and how to gaff them with hooks embedded in long lengths of bamboo. The hooks were released from the gaff but remained tied to a long length of fishing line which was in turn tied to a floating log or other float. Some turtles were undoubtedly lost as they struggled to drag the float, and lines became entangled in the coral. But for the most part the method became an effective and successful way to catch green turtles, particularly in Yap.

The knowledge of turtle behavior possessed by outer islanders is limited, however. For example, in 1972 I inquired of the elders of an island their determination of periods between nesting. Some swore that females nest only once a season, others that she nests up to 10 times. Because they captured every nesting female they saw, there was no way for them to be sure. In another instance, a turtle was spotted nesting on a remote atoll away from the inhabited island. I asked the men how long they thought it would take for the eggs to hatch, assuming we left them in the ground. Some ventured 10 days, others 25. Nobody really knew, however, for they always dug up every nest they encountered and had no means of determining the time required. It was

not until work at the West Fayu turtle hatchery showed the local crew that 58 to 60 days were required, that they began to understand some of the basics of turtle behavior.

Pressures on the turtles of the Carolines have been rising at an accelerated pace during the past 10 years. The main reasons for this seem to be the furtherance of the "money economy" in Micronesia, and the relative ease with which fishermen are now able to procure outboard motors, boats, and the gear required to hunt turtles. Amazingly, tangle nets such as are used in some places in the Caribbean are not used in Micronesia, and for that reason I have always hesitated to show the classic movie on the Miskito Indians produced a few years ago. Clarity of the water might be one of the reasons why people have never used nets, but the unavailability of materials might be another. Since most materials are now available, I felt it better not to show the movie and introduce the concept, rather than trust to *Chelonia's* eyesight.

Other factors have combined to increase the pressures on turtles. In the case of West Fayu, it was the island's flora. Until after the second world war, there were no coconuts on the island, which limited the amount of time voyagers could remain to await the turtles. Shortly after the war, a major infestation of an unidentified insect killed many of the bushy trees on the island which had prevented coconuts from receiving enough sunlight to survive. People from Satawal then transported copra nuts to the island and planted much of the island in coconuts. The coconuts have been the single most important change on the island (not counting a wrecked 9,000 ton freighter full of Toyotas in 1971). Man can now increase the length of a stay to hunt turtles.

Another factor that has increased the number of voyages is the improvement in materials used in the manufacture of the traditional canoes. Until the middle 1950s pandanus sails were used exclusively on all canoes on Satawal Island in the central Carolines. The introduction of cotton canvas sails greatly increased the speed and performance of the canoes. Recently, the introduction of dacron sailcloth has lessened the voyage time even more. Other improvements and introductions, such as the magnetic compass, have meant a greater confidence in voyaging and a strong probability that many more voyages are undertaken now than in the past.

Many of these improvements, including introduction of motor boats on other islands, have occurred during the years since 1965. They have greatly increased the pressure on the turtle populations in all of the areas visited by inhabitants of the central Carolines, with the possible exception of Gaferut.

The motorboats, usually under 6.7 m in length and powered by 25 to 40 horsepower outboard motors,

are used mostly in the administrative centers (the high islands). In Truk, for example, motorboats are used to chase the turtles on moonlit nights across the shallows, and harpoons are used to spear and retrieve them. Turtles captured in the higher islands, where varieties of seagrasses are found, tend to be smaller and more variable in size than those in the nesting areas of the outer islands.

In the outer islands, the turtles are most often captured while mating or on the nesting beaches. The people of Satawal Island, and to a lesser extent those of the westernmost islands of Truk, Puluwat, Pulap, Tamatam, and Pulusuk, go to West Fayu to capture turtles. During the day a close watch is kept for mating turtles within the lagoon. If mating turtles are spotted, a canoe races to the position. The men affix large hooks to strong lines and then place the hook in a notch in the end of a piece of bamboo or stick approximately 2-m long. The ends of the lines are then tied to a large boom carried on the canoes, or to the canoe itself. Two men are given the responsibility of swimming up silently behind the mating turtles with the hooks. They then swim under the mating turtles, and each man places a hook into the skin on the turtle's neck. A sharp watch must be kept for sharks which occasionally cruise around mating turtles and take nips out of their flippers. For the most part, the mating turtles are oblivious to what is taking place around them. The swimmers are usually successful in their attempts. Once the turtle is hooked it immediately sounds and a tug-of-war ensues, with the turtle usually losing. Often the equipment for this type of capture is not available when islanders on fishing voyages sight mating turtles. In this case, the men swim up to the unsuspecting turtles and grab them in a "full nelson" hold from the underside. The man's hands are then placed under the chin of the turtle and force its head back, minimizing the chances of being bitten. Other men then jump off the canoes with whatever ropes and lines are available, and attempt to tie the front flippers in a manner that will allow them to drag the turtle aboard. This is obviously a much more dangerous and less successful operation than the hook and bamboo pole method.

During moonlit nights on West Fayu, it is also possible to tether a previously captured female to a tree, and allow her to swim in the shallows around the island. The nesting beach is not more than 15 m wide, and the tether is fairly short. Men then climb into the trees near the water's edge and wait for her to attract males. Once the males are attracted, the men chase them down.

Pikelot Island is perhaps one of the best known and most visited turtle islands in the central Carolines. Canoes from Puluwat, Tamatam, Pulap and Pulusuk in the western part of Truk visit the island during the summer months to capture turtles to take to their home islands for consumption.

Canoes from Satawal also visit Pikelot, as it is traditionally owned by them, and administratively it is the easternmost island in Yap State. In 1978 canoes journeying to Pikelot returned to Satawal carrying 18, 10, and 11 green turtles on 9 March, 8 May, and 16 June, respectively. Another trip by 4 canoes to West Fayu returned on 31 May the same year and brought with them 11 captured turtles from that island. This number of turtles is considered average to good. The yearly fluctuations in the total number harvested varies considerably. These excursions usually last from 1 to 3 weeks, depending upon the winds, weather, and food supply. An important consideration for the voyaging canoes is the weather, for the turtle nesting season coincides with the typhoon season in the central Carolines, and is also the time of the most variable and fickle winds.

Reports from Pikelot in 1977 showed canoes from Puluwat averaging 4 turtles a night (all nesting females) during a week's stay in May of that year. The report, published in Guam, further noted that because of the number of tracks on the beach, the 28 individuals taken could have represented only a portion of the population. What was not understood, however, was that during the good weather experienced on the island, the tracks and nests could have been made over a 1- to 2-month period by a relatively small number of turtles.

The total number of nesting females on the beaches at West Fayu and Pikelot is probably not very large, but their presence provides the incentive for inhabitants of the nearby islands to continue making the large sailing canoes primarily for the purpose of transporting live turtles back to the inhabited islands. There is a good chance that without adequate stocks of turtles, the canoe voyaging tradition would suffer, and with it an important component of local society. Thus, while actual numbers of turtles harvested may not be large, perhaps averaging 30 to 70 a year per island for the 6 major islands involved (Satawal, Puluwat, Pulap, Tamatam, Pulusuk, and Lamotrek-Elato), the turtles contribute much to their overall cultural stability, reinforcing their independence from the outside. The estimated maximum contribution to the protein, perhaps 18 kg a person a year, is not nearly as important as this cultural role.

An important buffer provided for the turtles were the past tabus and ceremonies surrounding the taking and consumption of turtles. Canoe travel provided an additional buffer, and has continued in the face of the lifting of traditional religious tabus. While it cannot be shown quantitatively that many of the tabus formed such a buffer, it is my opinion that a substitute is required to restore the balance and to enable the relationships to continue to exist.

The taking of turtle eggs was not traditionally covered by tabus. The exploitation of this resource has

continued unchecked on almost all islands where there is nesting in the Carolines. The comparison of 25 g of protein to a possible 150 kg needs no elaboration here. However, the local inhabitants' belief must be remembered that the sea has been, and always will be, an adequate provider for all things. In my discussions with various inhabitants, none expressed great concern over the taking of eggs or, when concern was expressed, it was always countered by a bird-in-the-hand philosophy.

In the population centers such as Truk and Yap, the taking of marine turtles is an occurrence best equated with deer hunting in the United States. Often the hunting of turtles is undertaken with a form of sport in mind and, although the turtle is eventually consumed, it does not figure as prominently in the lives of the inhabitants as it does in the outer islands.

It has been my continued belief that efforts at conservation should be made with the people of the area firmly in mind and that assistance should be given to enable them to better understand the resource. This is not an easy task for scientists and others who themselves know so little of the behavior of turtles in the Carolines. Yet, the challenge presented must be met in the very near future if turtles are to remain a viable part of the island ecosystem.

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**Edited by
Karen A. Bjorndal**
University of Florida

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Front cover: Adult female green turtle, *Chelonia mydas*, at French
Frigate Shoals, the major migratory breeding site for this species in
the Hawaiian Islands. Photo by G. H. Balazs.