CALIFORNIA STATE UNIVERSITY, NORTHridge

GREEN TURTLE FISHERY IN BAJA CALIFORNIA
WATERS: HISTORY AND PROSPECT

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in Geography

by

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ABSTRACT

GREEN TURTLE FISHERY IN BAJA CALIFORNIA WATERS: HISTORY AND PROSPECT

by

Dennis Joseph O'Donnell

Master of Arts in Geography

January, 1974

Green turtles (Chelonia mydas carrinera) have been caught by man for food in waters bordering the peninsula of Baja California, Mexico since aboriginal times. Green turtles were reported abundant in many areas of these waters by early explorers, buccaneers, and missionaries. Later, the sealers and whalers who frequented Baja California shores readily utilized green turtles for food, stocking up with numbers of them to be kept alive until ready to be eaten at sea.

The principal turtling sites mentioned are Pacific coast bays and lagoons: Scammon's Lagoon, Turtle Bay, San Ignacio Lagoon, and Magdalena Bay. After whaling and sealing became unprofitable in these waters a commercial trade in green turtles flourished for some sixty years
between Baja California and Alta (U. S.) California. By 1925 turtles were significantly reduced in numbers and this trade became defunct. Turtling continued on a limited scale for local consumption until the 1950s when it began to be intensified to meet demands from larger Baja California towns. By the 1960s conservation was perceived to be necessary and measures such as closed seasons and tagging were implemented. Today turtle supply is not likely to meet increasing demand on a sustained basis. Therefore, the construction of turtle "farms" is proposed. These should be self-sufficient enterprises, independent of stock from wild populations. They can be developed to meet all demands, and with proper protection wild populations can be saved.
CHAPTER I

INTRODUCTION AND BACKGROUND

The green turtle, *Chelonia mydas* (Linnaeus) 1758, a pan-tropical marine reptile, has been found and fished for its flesh in Baja California waters for centuries, just as it has been in almost every area of the world where it is, or once was, found in numbers. In a great many of these areas green turtles have been over-exploited, and many local populations are near extinction. In other places only a vestige of former great populations remains.

During aboriginal times, turtles were important in the economies of many peoples throughout the tropics. But the relatively smaller human populations at that time, and the lack of a more efficient technology, were probably responsible for allowing the existence of the large turtle populations seen by the Europeans in their early days of exploration.

In most areas of the world green turtle stocks have steadily, sometimes precipitously, declined since the beginning of European trade and settlement in tropical lands. Where turtle eggs alone have been exploited, as in
much of Southeast Asia, the decline in turtle numbers has been slower in coming, but even in these areas today there is clear evidence that a valuable resource is vanishing.

In the Atlantic and Caribbean, where settlement has been highest, green turtles have been virtually exterminated as far as commercial prospects are concerned. Only in the more inaccessible areas of these seas are there green turtles in appreciable numbers today. The same story is true of the Indian Ocean, where large populations of green turtles were severely reduced during the period of European exploration and trade, and through subsequent over-exploitation never allowed to recover. Only in Australia, where the history of exploitation has not been so intense, and where effective protective legislation exists, does the prospect for turtle survival seem reasonably secure today.

As seaside populations expand in the tropics, and as the mobility of fishermen increases, with motorized boats and better, faster methods of distributing their catch, the prospect for many of the remaining turtle areas seems dim. As a species, the green turtle may survive, nesting singly or in small bands on the remotest beaches, with numbers too small to make fishing or egg harvest profitable. However, many local populations may be reduced
to the point that they are no longer able to withstand natural attrition, as apparently has been the case in a considerable number of the world's nesting beaches and feeding grounds.

In Baja California waters (here specified as the waters of the Pacific Ocean and Gulf of California adjacent to the Baja California peninsula) (Fig. 1) green turtles have been notably abundant and important for centuries as food to the human economy of the nearby arid shores. All reports indicate that there are fewer green turtles here today than in past times. But here fishing pressure has been moderate compared with many other areas in the world, and although turtle numbers have significantly dwindled in the present century, enough remain today to form the base for at least a limited local fishery. Recently, however, turtle fishing activity has been periodically curtailed by the Mexican government, with the expectation of developing a more manageable and sustained turtle fishery for the future.

The green turtle's economic importance is based not only on the esteemed flavor of its meat and the gourmet-quality soup made from it, but also from its availability.

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1See the following chapters.
TURTLE GROUNDS & MARKETS--BAJA CALIFORNIA WATERS

Cape San Lucas
San José del Cabo

Cape San Eugenio
Turtle Bay

Cedros Island

Scale 1: 3,500,000

Figure 1
In contrast with the other four genera of marine turtles, the green turtle is almost exclusively vegetarian in diet. It is therefore restricted to and may concentrate in numbers around shallow underwater pastures of marine grasses or algae where it can be relatively easily caught with harpoon or net. Because photosynthetic activity in marine plants limits their growth to relatively shallow depths, turtle-feeding pastures are close to coasts and islands, often easily accessible to fishermen from seaside villages or towns. A green turtle fishery can provide important animal protein often deficient in the diets of coastal peoples in tropical and subtropical areas of the world.

Taking of marine turtle eggs for food has also been a common practice throughout the world. Marine turtles lay eggs in the sand above the high water line, usually concentrating nesting activity in a few specific beaches to which they return at each nesting season. The eggs are eagerly sought by man and animals, and few nests may go overlooked. Nesting females, extremely ponderous of movement on land, are usually as readily taken by man as the eggs, and the concentrations of mating males and females offshore are subject to heavy hunting pressure from boats. Turtle populations in these nesting areas have suffered the greatest decline from over-exploitation. Today green
turtles no longer lay on most of the world's former great nesting beaches.

In Baja California waters no large green turtle nesting concentrations have been found. Thus, only the catch of free-swimming turtles is significant, and this, together with the low human population pressure on the Baja California peninsula and much of the eastern shore of the Gulf of California has allowed the green turtle population to continue to exist in exploitable numbers today.

Purpose

The purpose of this thesis is to describe the green turtle fishery in the waters surrounding the peninsula of Baja California, Mexico, with reference to the past, present, and future use of the green turtle as a human food resource.

The principal subjects under consideration will be: a) the historical development of the fishery, including how turtles have been utilized, and the practices which have led to the diminished turtle numbers of today; b) the regulation of the turtle fishery today, and attempts and attitudes toward conservation of the resource; c) the possibilities for the future of the fishery as a
significant food source, based on present and projected regulatory measures and on turtle "farming" practices.

Previous Studies

Little work has been done on marine turtles in the eastern Pacific. A few publications by Caldwell\(^1\) in the early 1960s dealt with marine turtles, especially the green turtle, in Baja California waters. As a result of field work in Baja California, chiefly at Bahía de los Angeles (Fig. 1), one of the most important present day turtle fishing areas in the Gulf of California, Caldwell published a taxonomic study of the green turtle in these waters and a brief account of the marine turtle fishery there.\(^2\) His work revealed the paucity of information on marine turtles in this area and laid a basis for further

\(^1\)David K. Caldwell, "Carapace Length--Body Weight Relationship and Size and Sex Ratio of the Northeastern Pacific Green Turtle, \textit{Chelonia mydas carrinegra}"; "Sea Turtles in Baja California Waters..."; "The Sea Turtle Fishery of Baja California, Mexico"; and with Melba C. Caldwell, "The Black 'Steer' of the Gulf of California." See bibliography for complete publication information.

\(^2\)Caldwell, "Sea Turtles in Baja Californian Waters (with Special Reference to those of the Gulf of California), and the Description of a New Subspecies of Northeastern Pacific Green Turtle"; "The Sea Turtle Fishery of Baja California, Mexico." See bibliography.
studies. But there have been no subsequent publications of a similar nature in English. Brief studies have been made by the Mexican government which include information on turtles in the Baja California area, but although Baja California is the most productive turtle fishing area in Mexico, more attention has been paid to sea turtle research on the Mexican east coast bordering the Gulf of Mexico and the Caribbean.

Parsons has given a good overview of green turtle use in the Baja California area in his book The Green Turtle and Man. A few earlier short articles of a popular nature on green turtle fishing have appeared, and there are occasional references to marine turtles in the reports of scientific voyages in the area.

Methodology

All pertinent biological and historical information from the above-mentioned literature has been incorporated

1 These include, A. B. Montoya, "Programa Nacional de Marcada de Tortugas Marinas"; René Márquez Millán, "Algunas Observaciones sobre las Tortugas Marinas de Importancia Comercial en México." See bibliography.

into this thesis. Much important and interesting information on the former abundance of turtles and on early turtle fishing activities was taken from unpublished journals of whaling voyages, furnished by Dr. David A. Henderson, and from old published accounts of voyages to Baja California shores and of missionary and exploratory work done on the peninsula. Several field trips to talk with Mexican fisheries biologists in Baja California, at El Sausal, Ensenada, and La Paz, along with correspondence with other Mexican and American biologists have been the basis for information on the current and projected turtle fishing and conservation practices. Information on worldwide green turtle exploitation came largely from biological and natural history journals.

Biology of the Green Turtle

The green turtle is a member of the genus *Chelonia*, one of four genera in the family *Cheloniidae*. The other genera in this family are *Eretmochelys*, the hawksbills; *Caretta*, the loggerheads; *Lepidochelys*, the ridleys. The only other family of marine turtles, *Dermochelidae*, contains but one living genus, *Dermochelys*, the leatherbacks.¹

Comparatively little is known about marine turtle specific and subspecific relationships, and the existing divisions are based more on distribution and coloration than on other characteristics.¹

Pointing out the rudimentary state of sea turtle classification, Carr recently tentatively recognized three species of green turtle in the world: Chelonia agassizi, the black turtle of the Pacific; Chelonia mydas, the green turtle of the Atlantic and Caribbean; and Chelonia depressa, the Australian flatback.²

Carr would therefore refer to the green turtle of Baja California waters as Chelonia agassizi. However, most previous writers, including Carr,³ have considered the Atlantic and Pacific green turtles to be of the same species—Chelonia mydas—denoting the Atlantic form the subspecific epithet, mydas, and the Pacific (at least the eastern Pacific) form, agassizi.


Caldwell, after careful study of large numbers of
turtles chiefly from the Gulf of California and landed at
Bahía de los Angeles on the east coast of the peninsula,
considered green turtles from Baja California waters to be
consistently morphologically distinct from other Pacific
green turtles and named a new subspecies, *Chelonia mydas
carrinęera*, for the Baja California area.¹

Therefore the green turtle of Baja California waters
is almost as variously named in taxonomic as in common
language. Its common names include *caquama*, *caquama negra*,
tortuga prieta, green turtle, and black turtle. The com-
mon name "green turtle" will be used in this thesis.

Size, Weight, and Growth

Green turtles reach a respectable size among sea
turtles. In the early days of large-scale turtling, the
very largest green turtles may have reached a thousand
pounds in weight, but today a five hundred pound specimen
with a carapace (upper shell) about four feet long is

¹David K. Caldwell, "Sea Turtles in Baja Californian
Waters (with Special Reference to those of the Gulf of
California), and the Description of a New Subspecies of
Northeastern Pacific Green Turtle," *Los Angeles County
Museum, Contributions in Science*, No. 61, (December, 1962),
p. 21.
extremely unusual.  

Parsons wrote that a mature female green turtle usually weighs about 250 pounds, although the twenty-five to fifty pound ones are said to make the best steaks.  

Apparently there is considerable variation in size and weight of adult populations throughout the world. The mean carapace length of captured green turtles from the Gulf of California was about twenty-six inches, but in south Arabia, where the history of turtle exploitation may not have been as long or as intense as in most other places, the average length of the green turtles taken was about forty inches, with weights ranging from three hundred to four hundred pounds—about fifty per cent of which is edible flesh.  

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1 Carr, *Handbook of Turtles*, p. 348.  
3 David K. Caldwell, "The Sea Turtle Fishery of Baja California, Mexico," *California Fish and Game*, 49 (3) (1963), p. 147.  
Captive hatchlings have been found to grow almost two inches the first year, the shell doubling in length.\(^1\) Green turtles may reach maturity or breeding age from five to thirteen years of age, and with a shell length of about thirty-five inches.\(^2\)

**Feeding Habits**

Adult green turtles are primarily herbivorous and utilize relatively shallow stands of marine grasses or algae. The young are apparently carnivorous until, after about a year's growth, they have developed strong enough jaws to crop marine grasses.\(^3\)

Carr's sample of stomach contents of butchered Gulf of California green turtles at Kino Bay on the Sonoran coast of Mexico (Fig. 1) was composed entirely of two kinds of marine algae; at La Paz on the peninsula in the southern Gulf he found that green turtles were also grazing on marine algae.\(^4\)

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2. Ibid.


At Magdalena Bay, on the Pacific coast of Baja California, green turtles have been observed feeding principally on *Zostera marina* (eel grass) inside the bay, and *Phyllos scouleri* (sic, probably refers to *Phyllospadix scouleri*, surf grass) growing on the rocky bottoms of the open ocean outside the bay.¹

**Enemies**

By far the most significant enemy of the green turtle is man. Adult turtles are at least occasionally eaten or mutilated by sharks.² The hatchlings and young are prey to nearly any predator larger than themselves.

**Breeding Habits and Migration**

The breeding habits of green turtles have contributed in large measure to their vulnerability to man. At breeding time the sexes congregate offshore to mate, and the females come ashore to lay eggs in the beach sand

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well above the high water line.

The coming ashore to nest is the facet of green turtle behavior which places the species in double jeopardy, for at this time both the female turtle and her eggs are easily taken. Where the meat alone is desired, the turtle is usually turned or killed regardless of whether or not egg laying has occurred.

One hundred fifteen eggs form the average complement laid by female green turtles. They probably lay at least four and may lay as many as seven or more clutches during a breeding season of several months. The eggs hatch in about sixty days. Upon eruption from the nest the hatchlings orient immediately towards the sea and make their way there energetically, usually through a gauntlet of predators which may include vultures, dogs, and beach crabs.

A remarkable homing instinct brings the turtles back to the same breeding area at each nesting period,


3 Carr, "Caribbean Green Turtle...," p. 886.
which for the females is once every two or three years. Feeding and breeding areas are usually far separated, the turtles apparently using some unknown navigation mechanism to find their ways across what often is a considerable expanse of open ocean.

No green turtle nesting grounds have been found on the shores of Baja California waters. Because green turtle populations in other areas of the world usually nest in large numbers on a few well-defined beaches, it may be assumed that the Baja California population has a similar nesting ground, but such a site has not yet been discovered.

McGee, who studied the Seri Indians of the Gulf of California and their turtle fishing methods at the end of the nineteenth century, thought that the optimum habitat and breeding grounds for green turtles was on and around the sandy beaches of El Infiernillo, the strait between the coast of Sonora and Tiburón Island. (Fig. 1).

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2Parsons, The Green Turtle and Man, end maps.
Although McGee thought that the eggs and hatchlings were probably eaten and the females caught on the laying ground, he saw only the turtles being taken at sea with harpoons. No green turtle nesting in this area has been verified by any modern herpetologist.

There are other unverified reports of green turtle nesting in the Gulf, and at least occasional nesting probably does take place on various secluded beaches along its long and thinly populated shores. There is evidence of some nesting by green turtles on the southern Pacific coast of Baja California, but here also, there are no recent verifications.

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1 Ibid., p. 187.
2 Caldwell, "The Sea Turtle Fishery of Baja California, Mexico," p. 141.
3 Caldwell, "Sea Turtles in Baja Californian Waters..." pp. 22, 25, 26.
The inaccessibility of much of the coast of Baja California and of Sonora and Sinaloa and the scarcity of biological investigations in the area may be the reasons why no green turtle nesting grounds have been located in Baja California waters. Quite possibly, however, as is true in other areas of the world, the nesting grounds of the Baja California population may be located a considerable distance away.

Green turtles are reported to nest in numbers along the Michoacán coast of the mainland and in the Revilla Gigedo Islands (Fig. 2), but it has not been determined if these turtles are of the same subspecies which inhabits Baja California waters. Revilla Gigedo Islands are located about two hundred miles southwest of the tip of Colima. The islands (Roca Partida, San Benedicto, Clarión, and Socorro) are extremely isolated, uninhabited,

1Caldwell, "Sea Turtles in Baja Californian Waters," p. 22.

2Caldwell, "Sea Turtles in Baja Californian Waters...," p. 21.

MEXICAN COASTAL STATES AND NESTING SITES MENTIONED

PACIFIC OCEAN

GULF OF MEXICO

Figure 2
and probably rarely visited. Very little information has been gathered on the turtles which are occasionally mentioned in the literature as nesting on the beaches there.

One of the earliest reports of turtles on the Revilla Gigedos came from an observer on the sealing brig Rob Roy who mentioned turning turtles on the beach at Clouds Island (the early name for San Benedicto) in June of 1830.\(^1\) Captain Sir Edward Belcher on H.M.S. Sulphur, observed that turtles were plentiful around Socorro in 1843,\(^2\) and a landing party from the schooner Maria, at Clarión in 1861, reported "the sand was furrowed by the paths of turtle. To judge by the signs there had been hundreds on the beach during the night."\(^3\)

There are a few twentieth century reports of sea turtles, including green turtles, nesting on the Revilla Gigedo Islands. Parsons cited five such accounts,\(^4\) one of which stated that the green turtle "breeds in

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\(^1\)Rob Roy, G. W. Blunt White Library, Mystic Seaport, Connecticut, Log 029.


\(^3\)Maria, G. W. Blunt White Library, Mystic Seaport, Connecticut, Log 265, p. 13.

\(^4\)Parsons, op. cit., p. 73.
considerable numbers on Socorro Island..."¹ But the nesting on the islands has not been carefully studied by biologists, and the extent of nesting and all of the species or subspecies concerned are not known.

Green turtles which nest on the coast of Michoacán may be from Baja California waters, but here also a definitive description of the kind of green turtle involved has not been made. Caldwell, however, is of the opinion that since this location lies more than three hundred miles south of the mouth of the Gulf of California, with water current patterns not favorable to the dispersal of young turtles northward, the likelihood is not great that this represents the breeding effort of the Baja California population.²

There are a few very old references to turtles nesting on the Tres Marías Islands, about sixty miles off of the Nayarit coast of Mexico (Fig. 2). English buccaneers Edward Cooke and Woodes Rogers, about 1709, loaded their boats with what Cooke referred to as "green tortoises." The turtles they took were all females,

¹Van Denburgh, op. cit., p. 997.

²Caldwell, "Sea Turtles in Baja Californian Waters...," p. 21.
turned on the beach at night where they had come to nest. On the "Middle Island" Cooke saw "such abundance of green Tortoises, that two Men may turn 100 some Nights...."¹ Cooke reported two hundred eggs in the belly of one of the turtles they killed,² and one of Rogers' turtles "had at least 800 Eggs in its Belly, 150 of which were skin'd, and ready for laying at once."³

Apparently turtles no longer nest in numbers on the Tres Marías, for there are no modern references to such an occurrence. Dispersal of young turtles northward from these Islands would be similar in difficulty to dispersal northward from the known green turtle rookery on the coast of Michoacán.

The discovery of a concentrated breeding area for Baja California green turtles would be a fortuitous event if the area were then immediately protected by enforceable legislation. Large-scale tagging of adult turtles from Baja California waters would shed some much-needed light

²Ibid., p. 325.
on migration patterns, and might point the way toward discovering nesting colonies. But most important would be the implementation of a tagging program on hatchlings in the Revilla Gigedos and on the coast of Michoacán.

Techniques of Capture

One of the first methods of capturing turtles must have been the turning of nesting turtles on the beach. A mature turtle when placed on its back cannot right itself, and if shaded from sun can be kept live for several days until ready to be eaten. With the use of rafts or small boats, turtles can be caught on feeding grounds, either by swimmers who seize them and wrest them into a boat, or by striking them with harpoon or spear.

The use of entangling nets, common today, may have an ancient heritage. These nets are floated over turtle feeding or sleeping areas so that the turtles may become caught in the mesh when surfacing to breathe.

Another method of capture, probably used for thousands of years, and found only in a few widely separated places in the world, entails the use of a remora, or suckerfish, tied to a line. Released in a turtle area the remora seeks out a turtle and attaches itself to the shell
by means of a sucking disc. The fish and turtle are then
pulled to the boat by the waiting fisherman. This rare
technique has been described from the Caribbean, the east
coast of Africa, northern Australia, and the South China
Sea.¹

Turtle fishing of today, in nearly all cases, is
very little changed from aboriginal times. The boats are
now sturdier and often motor propelled, but techniques and
equipment are basically unchanged.

At Bahía de los Angeles, which has been the
principal turtle fishing base in Baja California for many
years, green turtles are taken with harpoon or entangling
net, usually at night, from small open boats typically
about eighteen feet long.² The green turtle is the most
common species captured, those caught ranging from eighteen
to forty inches in length. Harpoons used are usually of
heavy pipe, as long as ten feet, with rubber or leather
washers behind the head to prevent deep penetration and
serious injury. When a turtle is caught the flippers are

¹Parsons, op. cit., p. 84.
²Caldwell, "The Sea Turtle Fishery of Baja California,"
pp. 142-145. The following description of turtling at
Bahía de los Angeles is from this reference.
tied, the hole made by the harpoon is filled with cloth or mud, and the turtle is left on the floor of the boat while hunting continues. After a typical week-long fishing trip the turtles are unloaded at home base into a shaded corral near the water. In winter they can be kept about two weeks with few losses; in the summer heat three or four days is the maximum. In the southern Gulf they are often kept in flooded corrals, which probably prolongs the holding period.

Turtle fishing techniques in Scammon's Lagoon on the Pacific side of the Baja California peninsula were described by biologists Williams and Kenyon. The hunters waited for a calm day when turtles could be easily seen swimming along the bottom. They then went out in small boats big enough for three men, two of whom rowed. The third stood in the bow with two or more eight-foot turtle spears at hand and scanned the lagoon for "the telltale bob of a turtle's head, or the concentric ring of wavelets left by the submergence of the wary reptile." The turtles

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2 Ibid., p. 9.
when closed upon were speared, the shaft prevented from
great penetration by a collar behind the point. The shaft
separated from the head which was attached to a strong
rope. After the turtle was speared a second time the two
lines were hauled in by the three men. The turtles com-
monly weighed one hundred or more pounds. Turtle-catching
was difficult and laborious, and calm days were rare.
Turtles were kept alive in a makeshift pen until a boat
came to take them to the cannery.

The history of green turtle use in Baja California
waters is a long one, dating from some of the earliest
available records to the present. The reasons for the
decline in turtle numbers can be seen from an account of
this history, which in the following chapter begins with
what is known of the native Indians regarding their fish-
ing economies and follows through the turtling of the
early Europeans, the sealers and whalers, and the com-
mmercial turtlers of the early part of this century.
CHAPTER II

HISTORY OF THE USE OF THE GREEN TURTLE ON TURTLING GROUNDS IN BAJA CALIFORNIA WATERS FROM ABORIGINAL TIMES TO THE MID-TWENTIETH CENTURY

Although most aboriginal use of sea turtles was probably not extensive in Baja California waters, certain groups such as the Seri Indians were able to develop effective means of turtle fishing. Jesuit missionaries on the Baja California peninsula in the seventeenth and eighteenth centuries mentioned some Indian use of the big reptiles. Early European sailing ships, accustomed to stocking up with turtles in the Atlantic and Caribbean, often found a ready source of the same kind of turtles in the warm waters of the Pacific and Gulf of California. As in the Caribbean, seventeenth century pirates depended upon turtle meat while laying in ambush or refitting ships in sheltered coves and bays along Baja California and adjacent areas. Explorers, sealers, and whalers in the

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following centuries wrote of sea turtle abundance along the Baja California coast and often relied heavily for fresh meat on the relatively easily caught turtles.

Most of these early accounts attest to the abundance of edible turtles in Baja California waters. Few are specific in describing the kinds of turtles that were taken or the methods used to catch them. Some of the writings do specify that green turtles were the species captured, and since modern biologists have written of the predominance of the green turtle (*Chelonia mydas*) in these waters, it may be assumed that this species did make up the majority of the catch in the early history of turtling in Baja California, as well as that of a later day.

**Use of Sea Turtles by the Indians**

The extent of aboriginal uses of sea turtles is not well documented. Writings of missionaries in Baja California, the first Europeans to live close to the Indians of the peninsula, contain few references to sea turtle use by the Indians, although some writings contain lengthy descriptions of other wildlife. It might be guessed, therefore, that such use was minimal among most Indian groups, only a few groups having developed sufficient fishing methods to seek out and capture large
turtles.

Aschmann estimated that the Indians of the Central Desert (Fig. 1) of Baja California obtained twenty-five per cent of their annual food intake from marine animals, shell fish making up the greater part of this (eleven per cent), while turtles accounted for only two per cent.\(^1\)

But in the spring months, when land food was scarce, he estimated that marine animals in general comprised forty per cent of the diet.\(^2\)

Shell middens have been found the length of both coasts of the peninsula, indicating at least occasional sea-side activity, but extensive utilization of the shore was probably only at areas which, besides offering marine food, had a reliable source of fresh water.\(^3\) Bahía de los Angeles was one of these. The site of one of the largest green turtle fisheries in recent times in Baja California, Bahia de los Angeles was undoubtedly the scene of at least


\(^3\) *Ibid.*, p. 43.
some turtle fishing in aboriginal times, and it also
served this function in the missionary period.

But the missionaries wrote conflicting reports on
the extent of sea food use by the Indians. Some indicated
easy availability of sea food, and others wrote of extreme
depprivation and dependence on vegetable sources. Aschmann
wrote that some Indian "bands were strictly oriented toward
a land economy and 'could not catch a sardine' even if they
got to the coast."¹ These bands were found mainly in the
interior highlands south of San Ignacio, and in the northwest where there was some organized food trade between
interior and coastal peoples.² Indians of the Central
Desert, however, were apt to move seasonally between sea
coast and interior, according to availability of food and
water.³

Jesuit historian Clavigero, who compiled his information from manuscripts and letters of missionaries, was
led to write that the Indians catch the sea turtles

¹Aschmann, The Central Desert of Baja California, p. 101, here citing Miguel Venegas, Ms. par. 1671.
²Ibid., p. 101.
³Ibid.
"easily" by diving in after them and wresting them into a boat. He added, however, that "much precaution is needed in catching them, because they bite severely."¹

One missionary report that "There are turtles in abundance in both seas..."² implies familiarity with them and perhaps frequency of use by the Indians. Padre Linck wrote that the Indians at San Borja, inland midway between Bahía de los Angeles on the Gulf and the Pacific Ocean, had a "considerable source" of food "at hand," living on sea food, and mescal.³ In speaking of the Indians of Santa María Mission, the last-established and northernmost mission on the Peninsula in Jesuit times, Linck in 1767 wrote: "Had not the Gulf of California and the Pacific Ocean--some twenty hours distant from each other--furnished them with fish, mollusks, oysters, turtles, and other sea food, both they and the missionary would have starved--so


little did the land produce."  

Although the Gulf "teems" with fish, he said, the natives fare poorly if a storm lasts for several days, for they do not store provisions.  

Padre Baegert, at San Luis Gonzaga Mission for seventeen years, as Superior visited every mission on the peninsula. Writing more sardonically than most, he averred that the reports previously written that California is rich in sea life were misleading: "Most natives never see fish soup all year, and others who live among them [referring to the difficulty he had in obtaining fish or any other food from the Indians] never choke on fish bones because on days of fasting they have to be satisfied with dried beans.  

Turtling by the Serí Indians of Tiburón Island in the Gulf of California and of the Sonora coast probably represented the maximum use of sea turtles in Baja California waters. Occupying a land extremely inhospitable to the Spaniard and largely bypassed by the Spanish mission

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1 Ibid., p. 66.  
2 Ibid., p. 67.  
system which could not harness their strong character and nomadic life, the Seris were still heir to ancient modes of living when McGee made an extensive report on their culture in 1898.¹

At that time the Seri culture was based largely on turtles and pelicans, both animals being used as principal items of food and clothing as well as serving many other functions. "The Pelican, Turtle, Moon, and Sun seem to lead their thearchy...," wrote McGee,² and he noted the many uses to which turtle products were put:

The flesh of the turtle yields food; some of its bones yield implements; its carapace yields a house covering, a convenient substitute for umbrella or dog-tent, a temporary buckler, and an emergency tray or cistern, as well as a comfortable cradle at the beginning of life and the conventional coffin at its end; while the only native foot-gear known is a sandal made from the integument of a turtle-flipper.³

In burial, the dead were covered with turtle shells in shallow graves before being blanketed with dirt.


²Ibid., p. 11.

³Ibid., p. 187.
Green turtles were apparently remarkably abundant throughout the Gulf of California, and the shores of Seriland (Tiburón Island and the coast of Sonora) had an "especially abundant" supply of large green turtles, the most conspicuous item in the Seri diet.

Seri fishing methods may have been representative of those used by Baja California Indians. Most of today's turtle fishermen in Baja California use much the same methods. The Seri took both turtles and fish with cane-shafted harpoons which were tipped with bone, charred wood, or whatever pieces of stray metal could be found. The harpoon was ten or twelve feet long, and was thrown while sitting or standing on the balsa, or small reed boat. The Seri fisherman quietly approached a turtle, and when the harpoon point was close to the shell made a quick thrust to impale the animal. The foreshaft was jerked out; the point, with cord attached remained in the turtle, and after tiring the turtle was lifted aboard or driven ashore.

Once a turtle was landed it was torn open and devoured at once, most of it raw, including the blood and entrails. Parts not eaten at once were often left in the sun on a roof top to soften for days, to be eventually eaten. The plastron, or lower shell, was eaten, but the carapace and longer flipper bones were saved for other uses.
Like the Seri, at least some of the Indians of the Baja California peninsula had reed balsas from which they probably caught turtles. Francisco de Ulloa, at Bahía San Luis Gonzaga in 1539, inspected an Indian dwelling in which he found fish which he said were caught with well-twisted cords, "and with some thick hooks made of tortoise shell bent in fire...."\(^1\) This may have been sea turtle shell.\(^2\) There was a little balsas there which he thought must have been used for fishing. "It was made of canes tied in three bundles, each part tied up separately, and then all tied together, the middle section being larger than the laterals. They rowed it with a slender oar, little more than a fathom..."


\(^2\)Other than sea turtles, only one land and two freshwater species of turtle have been reported from Baja California: the Desert Tortoise, *Cophurus agassizii* (Cooper) whose distribution and abundance there is not well known; a pseudemyd freshwater turtle, *Pseudemys scripta nebulosa* (Van Denburgh) found from San Ignacio south to San José del Cabo, and which the local people are said to catch in lagoons of the San Ignacio River; and another freshwater turtle, *Clemmys marmorata pallida* Seeliger, reported only from northwest Baja California (from Carr, *Handbook of Turtles*, pp. 264-266, 321; Smith and Taylor, "An Annotated Checklist and Key to the Reptiles of Mexico Exclusive of the Snakes," *U. S. National Museum Bulletin* 199 (1950), pp. 32, 28).
long, and two small paddles, badly made, one at each end."¹
South of here Ulloa saw Indians with similar reed rafts, but somewhat larger.² On the Pacific coast, in the Almejas Bay section of Magdalena Bay, he saw very large rafts of canes, bigger than the boat in which he was reconnoitering.³ By Cedros Island he reported rafts of "pine or cedar timbers, as long as twelve or fifteen feet, and so big that a man could hardly reach around them."⁴

The larger wooden craft of the more advanced Cedros Island Indians were certainly adequate for catching turtles, but the reed balsas used elsewhere must have been unstable and difficult to handle in any but calm waters. Fishing success was probably sporadic even in areas where turtles were abundant.

The Indians had harpoons and forked spears, which must have been used more often on turtles than on the even more elusive fish.⁵

²Ibid., pp. 29, 30.
³Ibid., p. 40.
⁴Ibid., p. 53.
⁵Aschmann, The Central Desert of Baja California, p. 75.
Turtle Use by the Early Explorers and Buccaneers

The earliest Spanish explorers in the sixteenth century, the first Europeans to these shores, such as Ulloa, Alarcón, and Bolaños, seemed to take little notice of turtles, and left practically no record of their use, either by the Spaniards themselves or by the Indians they encountered. But the French and English, who came later, often relied heavily on turtles for food.

In 1688 a band of pirates or buccaneers, mostly French, who had been working the mainland coast of Mexico for plunder, anticipating the winter hurricane season laid in stores of salt and turtles at the Tres Marías Islands and headed for the Bay of La Paz. They put up in Pichilingue Bay for three months, repairing their ship and catching turtles from this lagoon at the end of La Paz Bay. Later that year, after a cruise along the shores of Sinaloa and Sonora, they returned to Pichilingue Bay where they rested for several weeks "catching the sea turtles that swarmed about."¹

¹Peter Gerhard, Pirates in Baja California (Mexico: Editorial Tlilán Tlapalan, 1963), pp. 5-6.
The attention English privateers Woodes Rogers and Edward Cooke gave to sea turtles illustrates well their probable importance to most of the early navigators in these waters. About 1709 Rogers and Cooke, bound for the shores of Baja California to lay in wait for the Spanish Manila galleons en route to Acapulco, anchored their ships at the Tres Marías Islands to stock up on sea turtles, wood, and water.

On their entire passage from the Galapagos Islands they had eaten little besides turtles and tortoises obtained there. Having to ration the scant bread and meal they had, Rogers complained: "Tho' our Men have their Fill of Land and Sea Turtle, which keeps them from the Scurvy, yet I find them weak, it being but a faintly Food, except they had sufficient Bread or Flower with it..."  

Yet Cooke seemed more thankful for his turtles, observing that they were "good Meat at Sea, Bread and Meal being so scarce, that we could allow only a Pound and an half a Day for five Men."  

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the "sweetest and best" of the several sorts of sea turtles. "The Lean of the green Tortoise tastes and looks like Veal, without any Fishy Savour; the Fat is as green as Grass, and very sweet; the Belly, either bak'd or roasted, is excellent Food."¹ Second best was the logger-head and "another Sort we found at the Islands Galapagos, very large and excellent Food, between the Logger-head and the Green..."² The hawksbill tasted "very strong, and consequently not so agreeable or wholsom (sic) as the others...."³

Besides turning turtles on nesting beaches, the buccaneers sometimes caught sleeping turtles at sea. Cooke told of taking turtles easily at sea during the breeding season, when "the Male gets on the Female's Back, and continues there several Days, sticking so fast, that if the Female be struck and taken, he is also carry'd off."⁴

Rogers took on more than one hundred large turtles at the Tres Marías, but they did not keep very long, for by

¹Ibid., p. 328.
²Ibid., p. 327.
³Ibid.
⁴Ibid., p. 328.
the time he reached Cape San Lucas, at the tip of Baja California, he wrote: "We have for some Days thrown more dead Turtle overboard than we kill'd for eating."¹

To Captain James Colnett, off Cape San Lucas near the end of the eighteenth century, turtles were also of special interest and importance. On October 12, 1793, he observed: "The sea, at this time, was almost covered with turtles, and other tropical fish."² Highly regarding the availability and food value of sea turtles, Colnett wrote: "To this food, we may be said to owe the preservation of our healths, and the crew, in general, grew fat upon it."³

The trouble others had had eating sea turtles, said Cooke, probably was due to the insufficient boiling of the meat, or to cooking it in unclean utensils, or from the unaccustomed change in diet from the usual sea or salt diet to an entirely fresh one. To prevent such ill effects he allowed his crew as much vinegar as they needed and

¹ Rogers, *op. cit.*, p. 205.

² James Colnett, *A Voyage to the South Atlantic and Round Cape Horn into the Pacific Ocean* (London: W. Bennett, 1798), p. 94.

personally supervised the preparation of the crew's meals. When they were tired of soup he "gave them flour to make their turtle-meat pies, and at other times, fat pork to chop up with it, and make sausages. But in most of their messes," he wrote, "I took care that so powerful an anti-Septic, as sour crout, should not be forgotten." 1

Whaling and Sealing Days

At the beginning of the nineteenth century the whales, seals and sea otters that abounded along the shores of the Baja California peninsula began to be commercially exploited. Turtles are almost invariably mentioned in the journals of these hunting voyages, and their abundance is noted in the writings of the exploring and scientific expeditions to this coast in the same century. Their turtling activities on the principal turtling grounds are considered below.

Magdalena Bay

The area around Magdalena Bay on the lower Pacific coast of Baja California had one of the more abundant turtle populations, and a great many references to the

1 Ibid., pp. 83-84.
of turtles there and to the degree of dependence on them by visiting ships can be found.

Duflot de Mofras, at Magdalena Bay in 1842, wrote of Margarita Island which shields the bay from the sea: "This island is frequented by two species of tortoises. One of these provided excellent meat, but the shell has no value. Although the flesh of the other is unpalatable, yet the shell has a commercial value." The former probably refers to the green turtle, the latter to the hawksbill. Again, he wrote: "Land and water tortoises are numerous along this shore."2

Abel du Petit-Thouars in Magdalena Bay on the Venus in the middle 1800s saw the area as being devoid of resources, but added that whaling ships "go there to try out their whale oil, to rest, to make repairs or to fish for turtles." He says that there are "a great many turtles"

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1 Eugene Duflot de Mofras, Duflot de Mofras' Travels on the Pacific Coast, I, trans. and ed. Marguerite Eyer Wilbur (Santa Ana, California: The Fine Arts Press, 1937), p. 120.

2 Ibid., p. 125.

found there, but confuses the two species, claiming that the hawksbill is good to eat and the shell of the other has commercial value.  

Magdalena Bay was a favorite site for hunting the California gray whale. Each winter the whalers were there to take the whales on their calving grounds in and around the calm waters of the bay. Turtles were abundant and variously utilized at the mess tables.

In the winter of 1853-1854 the bark Rajah, primarily after sperm whales off Cape San Lucas, went into Magdalena Bay only for wood and turtles. A journal of the voyage reports seven turtles caught on January 9, nine each on January 14 and 16, and ten on January 18. The Rajah left the bay well stocked with wood, clams and turtles.  

In the winter of 1855-1856 a journal keeper on the bark Arab observed three kinds of turtles in the bay, hawksbill, green, and loggerhead.  

Prentice Mulford, an early California journalist, serving as cook on the San Francisco whaling schooner

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1 Ibid.  
Henry, on leaving Magdalena Bay in 1857 reported the state of the vessel: "Firewood and fresh water were laid in, the decks were cumbered with turtle..." for the journey home to San Francisco.¹

Washington Fosdick on the whaler Saratoga, anchored outside of Magdalena Bay in 1857, noted the comings and goings of turtle procurement on his vessel, which culminated in a very large take. December 22: "At 10 a.m. the larboard boat proceeded to the shore after turtle." December 25: "After breakfast the waist and bow boats went to the eastern shore after turtle, the starboard and larboard boats to the heads for the same purpose..." At sundown the starboard and larboard boats returned "with 8 noble large turtle." The waist and bow boats, having camped out overnight, returned at 2 p.m. the next day with fifty-five turtles.²

Captain C. P. Holcomb on the whaler Chandler Price in Magdalena Bay in 1861, the day before leaving the bay wrote of a very lucrative catch: "3 boats of (sic) after

turtle and fish caught 47 turtle and some fish... This was the usual procedure, the stocking up on turtles before leaving the whaling grounds at the close of the whaling season.

The whaler Josephine, February 24 of the same year did even better. Just before leaving Magdalena for the Sandwich Islands the report read: "Got 65 Turtle yesterday and to day."^2

A puzzling entry was made by the log keeper on the Josephine, back in Magdalena Bay in 1866: "Had a boat capsized while after Turtle and lost a Portuguese Boy named Frank. Came near loosing (sic) the whole Boats Crew."^3 One does not know if this was a statement on the hazards of turtle fishing, or of careless practices in a whale nursery where disturbed whales frequently caused such calamities.

There were other ships that did not fare so well, either in the pursuit of whales or of turtles. John F. Peabody, crewman aboard the Robin Hood, in Magdalena Bay

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^1 Chandler Price, Kendall Whaling Museum, Log 303, March 5, 1861.

^2 Josephine, Kendall Whaling Museum, Log 122.

^3 Ibid., January 20, 1866.
in 1961, lamented over the incompetency of a captain who could not even catch turtles, let alone whales: "...here we are trying from daylight till dark to catch a whale and can't, and if we want a miserable damned Turtle to eat we have to get the Onward's folks to catch him for us."¹

Turtle Bay (San Bartolomé)

In 1856-57 the schooner Henry from San Francisco undertook a "pick up" voyage along the coast of Baja California to hunt whales, seals, abalones, and "anything else which might come our way...," wrote Prentice Mulford, the ship's cook.² While they lay for five months in Turtle Bay curing abalone, Mulford noted the abundance of turtles, the ease with which they could be caught from whaleboats, and their fate once they reached the galley:

[The] food was chiefly turtle. This little harbor swarmed with them. After a few hours' hunt one of our whaleboats would return with five or six of these unwieldy creatures in the bottom, some so large and heavy as to require hoisting over the side. Often the green fat under the callipee, or under shell, lay three inches in thickness. I served up turtle fried, turtle stewed, quarters of turtle roasted and stuffed like loins of veal, turtle plain boiled and turtles' flippers, boiled to

¹Robin Hood, G. W. Blunt White Library, Log 49, January 30, 1861.

a jelly and pickled. A turtle is a variously flavored being. Almost every portion has a distinct and individual taste. After all, old Jake, our black boatsteerer, showed us the most delicate part of the turtle, and one previously thrown away. This was the tripe, cleansed of a thin inner skin. When the cabin table had once feasted on stewed turtle tripe they called for it continuously.¹

Charles M. Scammon, one of the early whalers to these waters, and the first to enter what is now called Scammon's Lagoon (Laguna Ojo de Liebre), also attested to the abundance of turtles in Turtle Bay. He described the bay as a fine harbor, a favorite of the whale men who used it to "'break out and cooper their oil,' refit ship, and change the routine of the whale-ship by catching turtle and crawfish, with which the waters of the bay swarmed."²

This southern Pacific shore of the peninsula was notably rich in marine life, and much the same story could be told of each of its protected bays and lagoons. Scammon recorded that when Ballenas Lagoon (San Ignacio Lagoon), just south of Turtle Bay, was first entered


commercially in 1859, on an island in one of the southern branches of the lagoon gulls, pelicans, cormorants, and hawks, cow-fish and porpoise were abundant, and "around the shores huge turtle in large numbers lay sleeping...."  

Scammon's Lagoon  

When in the winter of 1857-58 Scammon discovered the untouched gray whale nursery in the lagoon that came to bear his name, reports of his easy and prodigious whale catch soon brought many more whalers to contribute to a slaughter which nearly emptied the lagoon of whales within ten winters. But in the beginning, along with an abundance of whales in the waters of the lagoon, "turtle and seal basked upon the shores of low islands studding the lagoon...." Scammon's whaling journal of 1859 occasionally reported turtle catches in the lagoon. He mentioned four turtles caught on November 24, one large turtle on December 2, and, in preparing to leave at the close of the season, seventeen large turtles on March 25. 

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1 Ibid.  
2 Scammon, op. cit., p. 123.  
As the whaling continued, so did the turtling. An entry in a journal from the whaler Charles W. Morgan in Scammon's Lagoon in 1862 listed three turtles and five curlew taken while the boats were off after whales.¹ The abundance of turtles in this area was even considered sufficiently noteworthy to reach the printed page, for in 1863 an anonymous article appeared in The California Nautical Magazine stating that green turtles are found in Scammon's Lagoon "in great numbers, appearing on the flats at half-tide, usually in a foot or two of water, and feeding on a floating spongy substance. These turtle weigh from 50 to 150 pounds, and are both excellent eating and numerous."²

In 1870, near the end of profitable whaling in Scammon's Lagoon, the captain's wife on the bark Hercules, on March 9 entered in her journal: "the boats have gone for turtles to eat on our passage over to the [Hawaiian] islands."³

¹Charles W. Morgan, G. W. Blunt White Library, Mystic, Connecticut, Log 16.


Cedros Island

Turtles were also available around Cedros (Cerros) Island. Mulford, on the Henry in 1854, found two men on the island, left to hunt seals and then abandoned. They "were living entirely on shell-fish, turtle, and venison."1

The Gulf of California

Whaling was not so profitable in the Gulf of California, and fewer reports exist of whalers there. Turtles were found in the Gulf in quantity, but it is more difficult to pinpoint specific turtle areas and the history of turtling activity. In the bay at the northeast end of Carmen Island in 1857, the whaler Saratoga "sent two boats on shore, to get turtles, as we had seen several in the bay...."2

Joseph Warren Revere, lieutenant on the U. S. S. Portsmouth which, claiming possession of the Baja California peninsula for the United States, hoisted the American flag at Cape San Lucas and San José in March 1847, and soon after at La Paz, attested to the abundance of

2 Saratoga, Kendall Whaling Museum, Log 180, Tuesday, December 15.
turtles in the Gulf, and wrote eloquently of the local turtle soup:

Vast numbers of the same race as those wretched victims, which are helplessly turned upon their backs at the doors of the New York eating-houses, and exposed to the gaze of thoughtless and unpitying wayfarers, are found in the Gulf of California. But what is the sickly, tortured trash of those bolting machines, compared with the luscious calipash and calipee fresh from the briny sea? And mind you, green-turtle-soup is green-turtle-soup, in the Gulf of California, and nothing else. Whether there ever were such a thing as genuine turtle-soup served up at a restaurant, is a grave question to the conscience of the cook. I forbear to press it. But I must express the opinion, that a mixture composed of the gelatinous parts of young veal, mixed with a black sticky paste, and so seasoned as to taste of nothing but cheap port and pepper, goes down many an unscientific throat for the real "green-turtle"—the verdant quality being in fact out side of the bowl, and getting into it only by imputation. But at La Paz there is no deception, and the place is probably haunted by the ghosts of defunct aldermen.  

The Early Period of Commercial Turtling

There was an increasing number of settlers in Baja California in the latter half of the nineteenth century, replacing the Indian population which had almost entirely succumbed to European diseases during the mission period.  

Coastal villages in areas where turtles were abundant probably began to catch them for food and, eventually, trade.

Alexander S. Taylor writing in 1869 of the marine resources of the peninsula affirmed that turtles were still available in large numbers and indicated the presence of an Alta California market for them: "...the different species of edible turtle are particularly abundant, and, in many places, so easy of access as to be had for the trouble of capture, and are frequently brought to San Francisco."¹ He specifically cited Turtle Bay as a valuable source of supply for this market.²

The large numbers of turtles present in Turtle Bay was affirmed in many reports. The Albatross in 1889, on a biological collecting expedition, made an impressive catch of turtles in the bay, albeit by a method certainly not used there before. On April 11, the Albatross and the U. S. S. Ranger, in the bay at the same time, cooperated in a seining party that brought in 162 green turtles, many

¹Alexander S. Taylor, "Historical Summary of Lower California, from its Discovery in 1532 to 1867," in Browne, op. cit., p. 49.
²Ibid., p. 10.
of large size, in a single haul of a six hundred foot long seine. They estimated that about half as many more turtles crawled over the cork lines of the net and escaped while the seine was being beached. The purpose of the haul and the fate of the turtles caught was not mentioned.

Commercial turtling also succeeded whaling at Scammon's Lagoon, although whalers probably had been bringing turtles from the lagoon to Alta California for some time, as indicated by the following note which appeared in the newspaper San Francisco Alta California of March 25, 1860: "On March 24, 1860, the sloop Olive, Capt. Hatch, arrived in San Francisco from Scammon's Lagoon with 40 bbls. of whale oil and 25 turtle." Some of the turtles brought to Alta California were shipped elsewhere. For instance, forty of one hundred turtles from Scammon's Lagoon brought to San Diego in 1871 on the schooner Cygnet were sent directly to Chicago.


Turtle fishing at this time apparently was a profitable enterprise, at least for some. Evidence of a more organized exploitation procedure can be seen from the late 1880s, when a six-year concession on the fish, seal, whale, shell-fish, pearl, and turtle fisheries of Baja California, from Magdalena Bay northward, was obtained by an S. Z. Salario of Ensenada.¹

By the early 1900s no serious inroads on the Baja California sea turtle population were apparent. E. W. Nelson, reporting on a 1905 biological survey of the peninsula, observed that "Green sea turtles are plentiful about the southern coast, especially from Cape San Eugenio south to beyond Santa Margarita Island and also along most of the Gulf shore."²

At Scammon's Lagoon the turtling activities must have been prodigious, for it was estimated that about one thousand a month were being sent to San Diego by a weekly schooner.³ This is an amazing number of turtles to be


³Ibid., caption of photograph opposite p. 33.
taken from any single area, but if it is anywhere near the correct figure it is likely to have been what prompted Nelson to predict that continued unrestricted exploitation of the turtle resource along the Baja California coast would lead to its destruction, as it already had with the marine mammals.¹

Commercial turtling had been proceeding at Magdalena Bay as well as at Turtle Bay and Scammon's Lagoon. In 1905 the main export from this bay, once the scene of so much whaling activity, was a monthly shipment of turtles to San Francisco on a Pacific Coast Steamship Company boat.² An unsuccessful attempt was made to can some of the turtles caught in Magdalena Bay. The cannery was set up on Margarita Island, on the shores of the Almejas Bay section of Magdalena Bay, but it was no longer operating by 1905.³

By 1911 Turtle Bay still had one of the largest turtle populations on the west coast, but commercial traffic in the turtles was surprisingly absent, at least during the visit of the Albatross. In that year the Albatross, on a biological collecting cruise, reported green turtles

¹Nelson, op. cit., p. 113.
²Ibid., p. 40.
³Ibid.
abundant on both sides of the peninsula, but that there was probably no better place to obtain them than at Turtle Bay.¹ To illustrate this, and probably the principal species present, two entries made while in the bay read: March 13, "Green turtles are very abundant here..."; April 23, "The Bay was full of turtles...."² The Albatross found two camps of lobster fishermen in the bay who exchanged a liberal supply of green turtles and lobsters for a barrel of fresh water. The fishermen told them that turtles were in the area during most of the year, but were inside the bay chiefly in the winter. Turtles were said to nest on the beaches in April and May. Although a few were being sent to market, there seemed to be little demand for them.³

In 1912-1913 a survey was made of the biological resources of Magdalena Bay by a Japanese biologist, apparently on behalf of a Japanese company which had obtained

²Ibid., p. 431.
³Townsend, op. cit., p. 445.
a concession on use of the bay. He reported that Chelonia mydas was fished the entire year; the months of December, January, and February outside of the bay, the rest of the year inside. (That turtles are outside the bay in winter runs contrary to the information in whaling journals and other reports, and contrary to the above report on turtles in Turtle Bay.) The turtles fed on marine pastures, over which they could be easily caught with nets.

The "company," wrote Takasaki, has allowed the natives to catch the turtles for foreign export. The turtles were caught with harpoons, in what he called a cruel manner, resulting in large wounds. They were kept for up to ten days on their backs on the sand, to be sold to the first boat that came by bound for the United States.

Takasaki thought that the turtles deteriorated in quality during the holding period on the sand, and that they might even be harmful to eat. He heard that the turtles from Magdalena Bay did have a bad reputation in the marketplace, and that a company which began to can turtle

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1 Takasaki, Los Recursos Pesqueros de Bahía Magdalena, B. C., Trabajos de Divulgación de la Secretaría de Industria y Comercio (México, D. F.: Dir. Gral. de Pesca, 1962), 3 (23). This and the following two paragraphs are based on this work.
meat in the area had to close down because the quality of the meat was so bad that it could not be sold. Presumably the inferior quality of this turtle meat was due to poor handling and storage rather than to the habits of the turtles, for Takasaki went on to say that the meat from the turtles is usually very good and nutritious, the gelatin extracted from the turtle shell is of a very good quality, and the oil is useful for medicinal and industrial purposes. Takasaki recommended the bay as a good site for a cannery which would handle many kinds of seafood besides turtles.

In the Gulf of California at this time commercial activity in turtle fishing involving transshipment for long distances seems to have been considerably less than on the Pacific shore of Baja California. Turtles were plentiful, and were undoubtedly sought for local consumption, but the distance and time required to truck or ship them to large cities such as San Diego and San Francisco were probably too great to be profitable.

The Albatross in 1911 affirmed the abundance of turtles in the Gulf.¹ The crew found deserted turtle camps

¹Townsend, "Voyage of the Albatross...," p. 445.
with large quantities of turtle shells at Tiburón and other Gulf Islands. A photograph of Seal Rock near San Josef Island (Isla San José) (Fig. 1) in the Gulf shows many green turtle shells left on the beach by fishermen.¹

By at least 1926 turtles landed at San Felipe in the northern Gulf were being shipped live to Los Angeles or San Diego over newly developed automobile roads.² The principal object, however, of what was apparently a substantial fishery in large harpoon-caught green turtles at San Felipe, as reported by Craig, was to secure oil from the boiled fat of the turtles. The light yellow oil obtained, of a soft lard-like consistency, was packed in five-gallon oil cans and sold quite profitably to druggists, presumably for medicinal and cosmetic purposes. The remaining turtle meat was salted and sun-dried for food.

The 1920s marked the turning point in turtle fishing on the west coast of Baja California. Although sizeable numbers of turtles were being delivered regularly to California markets, W. E. Averett, in *Pacific Fisherman*,

¹Ibid., p. 446.

called it only a "desultory business" and predicted it would undergo a much larger and systematic development, "now that several enterprising concerns have taken to canning turtles...."¹ Averett described the turtle fishing operations of a San Diego schooner, the Catarina, built expressly for this purpose, on which he was an observer.² Three hundred miles south of San Diego—which would have put them in the Scammon's Lagoon area—the fifty ton vessel, with a crew of seven men, rendezvoused with a launch also used in the fishery. The turtles were caught with huge nets of eighteen inch mesh, from 300 to 1200 feet long, and 12 to 40 feet deep, which were spread across the entrances to bays and lagoons after the flood tide. The turtles, which move in and out with the tide, were subsequently entangled in the nets as they drifted out with the ebbing tide. Averett described the catch as follows:

By the time our last net was set the tide was turning, and we began to see results around the first nets set, as in several places the cork floats were snapping and jumping, first under then out of the water, and a general turmoil seemed to be in

²Ibid., pp. 24-25.
progress. The row boats were now shoved off from the launch and the fishermen began the task of untangling the turtles from the nets and hauling them aboard. In most cases this is no child's play, as many turtles are great fighters, and sometimes weigh as high as 1,000 lbs.\footnote{Averett, \textit{op. cit.}, p. 24.}

But the average weight of the turtles they caught was 150 to 250 pounds. When the row boats were full of turtles they would discharge their loads on the launch, and the launch when full went to the schooner to do the same. The turtles were hoisted in the schooner by a rope tied around their flippers, and then were placed onto racks in a special compartment in the forward end.

The first day's fishing brought them seventy-six green turtles. After three days the schooner was full with 350 turtles, the largest about 400 pounds, and headed back to the cannery in San Diego, the National City Commercial Company, then the largest producer of green turtle products in the United States. Here the turtles were kept in a large pond, three to five feet deep, until butchered. The average slaughter was about two tons a day. Almost the entire turtle was utilized, and the canned products included thick and clear soups, white meat, green meat, and
a combination of white and green meats. The fat was rendered to oil which brought as much as ten dollars per gallon in Mexico.

In spite of Averett's prediction of more prosperous and organized turtle fishing to supply several new canneries, fishing statistics show a precipitous decline in numbers of turtles received in southern California ports following 1920. The California Fish and Game Commission listed 76,983 pounds of turtle from United States boats received in San Diego from Baja California in 1920, while the combined figure for the same year from the Mexican Fisheries Agency for turtles received in San Diego and San Pedro was 19,147 kilograms (42,211 pounds). But a year later, 1921, only 2,896 kilograms (6,390 pounds) of turtles were reported received in San Diego and San Pedro by the Mexican Fisheries Agency. By 1923, 1,547 pounds


3 Ibid.
of turtle were reported brought into Los Angeles and 1,500 pounds brought into San Diego; in 1925, 21 pounds of turtles were received in Los Angeles, none in San Diego.  

A decreasing availability of turtles was no doubt partly responsible for the drastic decline in numbers of sea turtles brought into California, but apparently a change in consumer taste was just as important in curbing the once flourishing market.

In 1929 an article in The West Coast Fisheries indicated that the turtle populations of the west coast of Baja California were much reduced from former numbers in the early days of colonization: "Today even Turtle Bay, Lower California, is fairly barren of the animals." The article remarked that it was noteworthy even to see turtles in the bay, and that increased wariness had made them very difficult to catch.

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1 Leighton Hope, "Report, American Fisheries of Lower California, 1923," Typewritten copy at California Fish and Game Library, Long Beach, Calif., p. 2.

2 Hope, "Report, American Fisheries of Lower California, 1925," Typewritten copy at California Fish and Game Library, Long Beach, p. 5.

The same publication two years later reported that very few turtles were to be found in Magdalena Bay, and only limited numbers in the esteros (lagoons) of the bay. According to the article a few carey (hawksbills) were harpooned, "but neither these nor the big 'tortuga cahuama' [green turtle] abound sufficiently to form the basis for canning...," although a cannery was in operation at the time on Margarita Island to can various other sea products.

An attempt in 1931 to sell turtles from Scammon's Lagoon in San Diego was described in The West Coast Fisheries. On May 1 a ship arrived in San Diego with fifty of these turtles tied up on deck. For twenty days attempts were made to find buyers for the turtles. One each was sold to two "select dining resorts" in San Diego; forty-one were trucked back to Mexico and sold in Tijuana and Agua Caliente "at low rates." The remainder was butchered on deck and sold to "Mexicans who came down for

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1 Anon., "'Cahuama' Quamma of Magdalena," The West Coast Fisheries, (1931), p. 66.
2 Ibid.
3 Anon., "La Tortuga Cahuama," The West Coast Fisheries, (July, 1931), p. 70.
a piece of their favorite sea food." The venture was reported to have been a financial failure which would not be repeated. "Thus," lamented the writer, "the possibility of enjoying genuine and fresh tortuga cahuama soup goes glimmering in California."

That Scammon's Lagoon was not as heavily over-fished of its turtles as the other west coast bays was suggested by Griffing Bancroft's observations while in the lagoon on the Least Petrel in 1932. He wrote that 300 pound turtles "abound" in the lagoon. ¹ This is a much larger weight than that of the 50 to 150 pound turtles reported from the lagoon in 1863. ² The mere estimation of weight is difficult, however, and the designation of abundancy is of course entirely subjective, dependent on the criteria of the observer.

After the 1930s, commercial traffic in turtles from the west coast of Baja California, and probably from the Gulf shore as well, was limited to the towns of the peninsula itself.


In 1946, biologists Williams and Kenyon visited Scammon's Lagoon and observed a small group of Mexican fishermen catching turtles for shipment by boat to a cannery in Ensenada. 1 On entering the area, Williams and Kenyon noted turtles and seals basking "on the shores of the low islands studding the lagoon," the same thing seen, and in the same words used, by Scammon to describe what he saw in the winter of 1857-1858 on first entering the lagoon. 2 The number of turtles present was certainly greatly reduced, however, for the authors saw no more than seven caught in a day, considerably fewer than in some of the catches made by whalers in an earlier era.

Turtle fishermen were the only human inhabitants of the San Ignacio Lagoon area when the Hubbs-Flynn expedition from Scripps visited the lagoon in 1947. 3 The fishermen were using small boats to set nets for green turtles which were probably destined for the Ensenada market, either to

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2 Ibid., p. 23.

be canned or sold fresh. No mention was made of turtle abundance.

Conclusion

There has been a long history of turtling in Baja California waters, but it is a history not well documented, with room for a great deal of speculation.

It is quite apparent that green turtles were noticeably abundant, throughout most of the Gulf of California and in the bays and lagoons of the southern half of the Pacific coast of the Baja California peninsula, from the seventeenth century through the 1920s.

The turtling activity of the Indians, the early Europeans, and the American whalers, even though the latter often made sizeable catches, does not seem to have been significant in reducing the turtle populations.

The rise in settlement in the latter half of the nineteenth century, which must have created numerous local markets for all kinds of sea food, and the Alta California (U. S. California) trade in turtles which arose at this time and continued into the early twentieth century, seem to have been the contributing causes for a marked decline in turtle numbers, at least on the west coast of the peninsula.
Just a few years of concentrated turtle fishing activities in these protected bays, such as the estimated one thousand turtles a month sent to San Diego from Scammon's Lagoon around the turn of the twentieth century, and the large-scale netting of turtles in Scammon's by a San Diego cannery schooner in 1920, in which 350 turtles were taken in three days, were apparently enough to reduce the turtle populations, at least for a number of years, to a vestige of former numbers.

The California demand for turtles dropped, it seems, at about the same time as the turtle populations decreased significantly. On the evidence presented, it is difficult to determine whether a change in consumer preference, or an inadequate supply of turtles, was chiefly responsible for the falling market.

Turtling activity in Baja California, after the demise of the California turtle market, remained local, with the greatest demand coming from the larger towns, such as Ensenada, Tijuana, and Mexicali.

And so, in Baja California as in most of the green turtle's range, uncontrolled exploitation of turtles led to over-fishing and a significant decline in turtle numbers. But at this point, with the termination of the
California market for turtles, the fishing pressure was abated. The Mexican people have not traditionally looked to the sea for food, and it took several decades before the country began to utilize its marine turtle resource extensively and rise to become the world's leading turtling nation.
CHAPTER III

THE RECENT HISTORY OF TURTLING IN BAJA CALIFORNIA WATERS FROM MID-TWENTIETH CENTURY TO PRESENT

From 1940 to 1960 turtle fishing in Mexico, as a whole, was comparatively small-scale. Fresh meat and eggs, for local consumption, were the principal products of the fishery, although calipee was exported from some places on the Caribbean coast.¹

The available data on turtle catches—probably somewhat unreliable for absolute values, but useful in revealing changes—indicates that the marine turtle catch in Mexico rose and fell but remained generally under five hundred metric tons per year from 1940 to 1959.²


Among the states and territories, Baja California has been the leading turtling area in Mexico in total weight landed since 1956, having been second only to Quintana Roo on the Caribbean since 1940 (Fig. 2).  

In 1959 the turtle industry in Baja California as in Mexico as a whole began an important and significant increase in activity. From 1959 through 1963 the average annual harvest of marine turtles in all of Mexico increased sixty per cent over the previous five years (1954-1958).  

From an average of less than five hundred tons per year from 1940 to 1960, Mexico's catch after 1960 began to soar until it exceeded slightly 1,400 tons in 1962, briefly declined to 1,000 tons, but quickly recovered and climbed to more than 2,200 tons in 1965 (Fig. 3).  

Intensification of the fishery may be attributed to an increased interest by the government in promoting all fishery resources and to a greatly increased value of turtle products in the marketplace. By 1964 new processing

1 Ibid.  
3 Montoya, op. cit., p. 2.
Figure 3

MEXICO'S MARINE TURTLE CATCH, 1940 - 1971

(Source: Oficina de Pesca, Ensenada, B.C.)

MARINE TURTLE CATCH BY ZONES
(1955 - 1961)

BAJA CALIFORNIA 39%
PACIFIC 29%
CARIBBEAN 23%
GULF OF MEXICO 9%

Total Mexican Catch

1971 est.

Figure 3
plants along the coasts were being supplied with turtles by sixty-nine licensed cooperative associations of turtle fishermen and twenty-five independent operators (permisionarios libres).¹

By 1967 the marine turtle catch in Mexico had risen to 10,540 tons, an increment of 633 per cent since 1962. Mexico at this time was far and away the world's leading turtling nation,² and conservationists there and abroad must have been seriously concerned for the future of the country's turtles which was subject to an essentially unregulated exploitation.

Conservation

By 1959 little attention had been paid to scientific study of the country's turtle resource. Of the marine fisheries of the country, only the more important shrimp, sardine, and large oyster (ostión) industries had merited the attention of scientific study.³ It was

¹Márquez, op. cit., p. 2.
thought that the turtle resource could stand increased exploitation, while at the same time it was admitted that no proper management was possible without more knowledge of the species involved.  

In fact, at that time, very little was known about marine turtles anywhere in the New World tropics or subtropics. The extensive migration patterns and breeding behavior of Caribbean green turtles were just beginning to come to light, due to the efforts of the Caribbean Conservation Corporation at Tortuguero Beach, Costa Rica. The extreme vulnerability of the remaining Caribbean green turtle stocks was also being discovered, with the realization that unless protective measures were soon taken the existing fisheries in that area would bring the turtles dangerously near extinction.  

About this time, the Mexican government's awakened interest in developing and protecting its marine resources led to the creation of a National Fisheries Advisory Commission (Comisión Nacional Consultiva de Pesca) which was to engage in nationwide technical and practical fisheries research. By 1963 ecological explorations were being

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1Ramírez Granados, op. cit., p. 5.

made in all fishery zones, and attempts were being made
to improve equipment and methods of fishing and proces-
sing.

Because of the boom in turtle fishing and its prob-
able effect on turtle populations a nationwide closed
season on turtles was initiated in 1963. The objectives
of this closure were to prohibit the capture of turtles
from the first of May to the end of August, and to estab-
lish minimum and maximum size limits on both coasts.² It
was now recognized that continued, unregulated exploita-
tion of the country's turtles would lead to the demise of
the industry.

The goal of the protection program was to obtain
coordination between measures to ensure a recuperation of
the turtle populations and the optimum level of exploita-
tion.³ Besides the closed season on the capture of free-
swimming turtles, known nesting beaches also were to be
protected, with a prohibition on the taking of both nesting
turtles and eggs.⁴

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¹ Ibid.
² Márquez, op. cit., p. 11.
³ Ibid., p. 12.
⁴ Ibid., p. 11.
Plans for the establishment of a series of artificial breeding camps were drawn, and the first of these was begun at this time on Isla Mujeres, Quintana Roo (Fig. 2). To familiarize the fishermen of the island with the purpose of the breeding camp, it was suggested by the Dirección General de Pesca that they take a certain number of eggs from nests and hatch them in containers. This was accordingly done, the hatchlings were kept for fifteen days and then released into the sea. \(^1\) Apparently this personal involvement paid off, for the fishermen are said to have welcomed enthusiastically the building of the hatchery. \(^2\)

Since 1966 two major programs have been instituted in Mexico to help maintain and develop its turtle industry: (1) El Programa Nacional Pro-Recuperación y Cultivo de Tortugas Marinas (National Program for the Recovery and Cultivation of Marine Turtles), and (2) El Programa Nacional de Marcado de Tortugas Marinas (National Program for Tagging Marine Turtles). \(^3\) The former is directed

\(^1\) Ibid.
\(^2\) Ibid.

towards protection of nesting and establishment of hatcheries, the latter toward tagging. The programs have been created primarily with two species in mind, Atlantic ridley (Lepidochelys kempi) and Pacific ridley (Lepidochelys olivacea), or tortuga lora and tortuga golfina, respectively. Concern for the former is based on its extreme vulnerability to extinction, for it apparently only nests en masse on one beach, near Rancho Nuevo on the coast of Tamaulipas (Gulf of Mexico) (Fig. 2).

The importance of the Pacific ridley is in the quality of its skin, for the current demand for its hide as leather (intensified recently, due to the restrictions on alligator imports into the U.S.) has made it the most important species in Mexico's turtle industry. Protection and attention given to these two species is extended to the green turtle, particularly on its Pacific coast breeding grounds, but also to a limited degree in Baja California chiefly in the form of tagging and ecological interest.

The Programa Nacional Pro-Recuperación y Cultivo de Tortugas Marinas established experimental camps at known ridley nesting beaches on the coasts of Tamaulipas, Colima,
Michoacán, and Guerrero. By 1968 locations for four continuing camps had been agreed upon, and these were established during the breeding season at: (1) Barra Coma, Municipio de Villa Aldama, Tamaulipas, attending exclusively to the Atlantic ridley, (2) Playón de Mismalaya, Municipio de Tomatlán, Jalisco, attending to the Pacific ridley, the green turtle, and the leatherback turtle (*Dermochelys*), (3) La Piedra de Tlacoynque, Municipio de San Luis de la Loma, Guerrero, attending to the ridley and the leatherback, and (4) Playa de Escobilla, Municipio de Cozoaltepec, Oaxaca, attending to the ridley and the leatherback.¹

Each of these turtle camps was charged with providing protection for nesting females and transfer of eggs to protected zones for incubation, leading to short-term care of hatchlings before releasing them. The camps also were to gather data on size and number of nesting females, nest characteristics, meteorological conditions and phases of the moon under which nesting occurred.

Under the *Programa Nacional de Marcado de Tortugas Marinas* tagging has been carried out in all of the above-

¹Casas Andreu, *op. cit.*, p. 4.
mentioned camps, and tagging expeditions have been organized from the Estaciones de Biología-Pesquera throughout the country.

The tagging operations were intended to provide information on the distribution and abundance, migration patterns and reproductive habits of the different species. Tagging is most useful when done on a large-scale basis using considerable numbers of turtles. Tag returns may be few, and quantity is necessary for statistical significance. So the most profitable tagging sites are, of course, nesting beaches, where large numbers of females and hatchlings are easily available.

Tagging in Baja California has been limited by the amounts of turtles available for tagging and release, for no large nesting areas have been found. However, some tagging has been done on turtles obtained from fishermen by the Estación de Biología-Pesquera at El Sauzal, near Ensenada. Twenty turtles were tagged by this station at Bahía de los Ángeles and Santa Rosalía on the Gulf of California, eighteen listed as Chelonia mydas carrinegra, the northeastern Pacific green turtle, one as Chelonia mydas agassizii, the eastern Pacific green turtle, and one
as Caretta caretta gigas, the loggerhead.¹

In November and December of 1966, forty-six ridleys and one green turtle were tagged on the west coast of Baja California, seven miles to the south-southeast of Cabo Tosco, at the extreme south end of Margarita Island (Fig. 1).² No mention was made of how the turtles were obtained, but presumably they were caught by fishermen. Significant results probably will come only from a great many of such small-scale tagging attempts. However, the budget available for such activities may not be able to support the cost of paying fishermen for the turtles obtained, if indeed they are so paid. Another consideration involved in assessing the feasibility of such tagging might be the uncertainty of how well a harpoon-caught turtle can survive in the sea with a large wound in its carapace which would presumably expose it to infection. Further information on tagging attempts in Baja California has not been available.


By 1971 the following measures had been effected to protect the turtle fishery in Mexico: (1) hatcheries had been established in various nesting areas; (2) the taking of eggs from nesting beaches had been prohibited; (3) minimum size limits had been set on catches; (4) the commerce in ovarian eggs—which necessitates the sacrifice of female turtles—had been made illegal; (5) closed seasons had been effected in the Pacific and Caribbean; (6) information campaigns had been launched explaining the necessity for protecting the resource, and directed principally toward those involved in the industry.

In spite of these measures the turtle catch in Mexico as a whole, after peaking in 1968, fell precipitously thereafter (Fig. 3). In the state of Baja California the peak of the catch had been in 1967, falling significantly in 1968 and 1969, and recuperating somewhat in 1970 (Fig. 4).

Apparently it was recognized by the fisheries authorities that something more had to be done if the turtle fishery was to be sustained profitably in the future. As an interim measure, in 1971 a total ban on turtle fishing was initiated throughout the country. It was expected to be in effect for from two to five years, to give time for proper managerial techniques to be worked out.
MARINE TURTLES LANDED IN THE STATE OF BAJA CALIFORNIA FROM 1966 TO 1971

<table>
<thead>
<tr>
<th>Year</th>
<th>Metric Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>141,466 Kg.</td>
</tr>
<tr>
<td>1967</td>
<td>183,424 Kg.</td>
</tr>
<tr>
<td>1968</td>
<td>151,253 Kg.</td>
</tr>
<tr>
<td>1969</td>
<td>122,268 Kg.</td>
</tr>
<tr>
<td>1970</td>
<td>150,005 Kg.</td>
</tr>
<tr>
<td>1971</td>
<td>47,277 Kg.</td>
</tr>
</tbody>
</table>

(reflects ban beginning this year)

SOURCE: OFICINA DE PESCA, ENSENADA, B.C.
J. R. Hendrickson, who has worked extensively on green turtle research in Malaya and Sarawak, now at the University of Arizona and currently working on aspects of green turtle captive culture through the marine biological station at Puerto Peñasco, Mexico, ventured the following opinion on the reasons behind the turtle fishing ban:

So far as I am aware, the thing which led to the total ban on turtle fishing in Mexico was the desperate drop in catch as recorded in the central statistics office in Mexico City. Despite what I suspect was increased fishing effort in the country as a whole, the recorded product dropped alarmingly, and the Mexicans finally began to fear the dire predictions which conservationists in other countries had been making—that Mexico would exterminate her sea turtles, so far as commercial numbers are concerned.1

It was expected that when the ban was lifted, turtle fishing rights, in the past open to anyone, would be reserved exclusively for fishing cooperatives, licensed by the government, and that quotas would be imposed to limit the catch in each zone according to the abundance of turtles found there.2 The cooperatives would be responsible,

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2 Ignacio Félix Cota, Jefe del Centro de Promoción Pesquera, El Sauzal, B. C.; Manuel Flores Villegas, Jefe del Centro de Promoción Pesquera, La Paz, B. C., pers. comm., 1972.
according to the financial capacity of each, for maintaining cultivation and protection programs; the quotas for capture would be influenced by the effectiveness of these programs. ¹

One area in Mexico escaped the total restrictions of the ban. The Territoria Sur de Baja California was given special permission to supervise the landing of two hundred green turtles (the most abundant species there) each month, fifty each from four of its six municipios (counties).² The turtles were taken to a special distributing place where they were ostensibly available to any purchaser, in large or small quantities. The reason given for this special permission was that it was necessary to compensate for a shortage of red meat in the territory.³ The territory is, however, a surplus cattle area, many people being too poor to pay for meat. The turtle meat probably went principally to restaurants. Thus,


² Manuel Flores Villegas, Chief Fisheries Officer, La Paz, Baja California, pers. comm., 1972.

³ Ibid.
the underlying reason for an exception to the ban in this one area only remains obscure.

In March 1973 the ban on green turtle fishing was lifted, due, purportedly, to the repopulation of turtles that has occurred.\(^1\) It is probable that at least limited fishing is now permitted for all species of marine turtles. Proper vigilance is expected to prevent any significant decline in turtle numbers through overfishing.\(^2\)

That the ban on turtle fishing was responsible in three years for a significant increase in turtle numbers is problematical. A country as large and undeveloped as Mexico is difficult to police. But it does seem certain that the commercial use of turtles was drastically curtailed, for adequate controls of turtle traffic are likely to exist in the larger cities where most commercial activity needs to take place.

The appearance of turtle products in a sizeable town is bound to attract enough attention during a turtle fishing ban that the source will sooner or later be made known to the authorities. Whether or not the authorities

\(^1\) Luis García Cacho, Chief Fisheries Officer, Ensenada, Baja California, pers. comm., May 1973.

\(^2\) Ibid.
will act on infractions may, of course, depend on many factors. But the heads of the fishery offices in most large towns are now mainly scientists who are less likely to be persuaded to overlook infractions of important laws than were perhaps the local officials of a previous day.

The opinion of a long-time resident of La Paz, Baja California, who is not connected with the government, was that at least seventy-five per cent of the former catch in the Territorio Sur de Baja California was curtailed by the restriction, and that it would have been extremely difficult to market any quantity of illegally caught turtles in the towns.¹

Luis García Cacho, chief of the fisheries office in Ensenada, and the principal fisheries administrator for the state of Baja California, maintains that although his office is responsible for enforcement of the laws, his main function is to promote and encourage proper fishing, rather than to police.² Reflecting this new attitude in fisheries regulations in Mexico, García's inspectors concentrate more on seeing that the spirit rather than the


²Luis García Cacho, pers. comm., September, 1972.
letter of the law is followed. Private catches of one or two turtles are overlooked. Every effort is made, instead, to make the fishermen aware of the purpose of prohibitions and closed seasons. To this purpose various posters, some with amusing drawings depicting the conservation problems and listing the regulations have been displayed in fishing areas.

How difficult a regulation is to impose on a people depends on the impact it has on those affected by it. A fisherfolk totally dependent on the catch of a certain species will not easily submit to new regulations limiting --not to say completely proscribing--their rights to pursue this catch.

The effect on the fishermen of the closed seasons on turtling in Mexico and the complete ban of 1971-1973 has been difficult to discover. One researcher had written of Bahía de los Angeles that the turtling industry there, along with tourism, formed the economic base of the area; in other villages turtles were the sole source of income.¹ "The loss of the green turtle in Baja California," he

wrote, "would constitute a serious hardship to the people of this economically poor area."\textsuperscript{1} But this opinion was not seconded by García Cacho who said that the Gulf turtle fishermen had not depended entirely on turtle fishing, and that they had been able, during the ban, to switch easily to the fishing of shark, whitefish, and scallop, among others.\textsuperscript{2}

A new road will soon be completed the length of the Baja California peninsula, linking the northern and southern commercial towns with the intervening hinterland. Its effects are certain to be seen in increased development and trade throughout the peninsula, which will give increased value to the area's marine resources.

Recent Turtling Activity in Baja California Waters

The Gulf Coast

Green turtles currently are found and fished (except during closed seasons) throughout the waters of the Gulf of California the year round, but the majority of the

\textsuperscript{1}\textit{Ibid.}, p. 149.\textsuperscript{2}

\textsuperscript{2}Luis García Cacho, pers. comm., September, 1972.
catch comes from the central and southern Gulf.¹

Bahía de los Angeles is probably the principal turtle fishing center in Baja California today. Most of the turtles landed at Bahía de los Angeles are harpooned from the vicinity of Isla Angel de la Guarda. Caldwell saw more than five hundred turtles landed there during a three-week period in the summer of 1962. Turtles are also landed there regularly in winter, but in smaller numbers, for they are more difficult to find in colder weather when they are less active and frequent deeper water. Another factor which limits the turtle catch in winter is that calm days, when the surface of the water is smooth, are fewer. Rippled or choppy water restricts the harpooner's view of turtles swimming below the surface.²

Most turtles landed at Bahía de los Angeles are sent to Ensenada or other large towns on the peninsula; some are consumed locally. The means of transportation is usually by truck, in which the turtles are either shipped live or as salted, air-dried meat. In summer, especially, 

¹Caldwell, "The Sea Turtle Fishery of Baja California, Mexico," p. 147. The material in the following two paragraphs is from this source, pp. 146-148.

²The method of catching turtles used by the Bahia de los Angeles fishermen is described in Chapter I.
many of the turtles shipped live do not survive the long, hot trip over rough roads.

Recent Turtling by the Seri Indians

The Seri Indians have continued turtling in the Gulf of California, but since the 1920s have been doing so commercially, selling turtles and fish to the Mexican fish buyers.¹ No longer, of course, using traditional reed craft (balsas), the Seri have adopted flat-bottomed plank boats, which are oar or motor driven.²

During the 1950s green turtles were still of prime importance to the Seris, much more so than any other animal resource.³ The turtle shell was used extensively: propped up around the bases of brush houses; fashioned into rings worn by the women; variously used as receptacles; chopped up and boiled to obtain an oil which was mixed with other foods.⁴ However, by 1962 the turtle population of Seriland


⁴Ibid., pp. 8, 12.
had been depleted, fish had replaced turtles as the primary food of the Seris, and turtles comprised not more than ten per cent of the Seri total diet, a considerably smaller percentage than in past days.

Seri turtle fishing is possible only during dark and calm nights when the Gulf is unrippled by wind. The fishermen use harpoons, identical with those described by McGee in 1898 (see Chapter I), and illumine their prey with torch lights or Coleman lanterns. Some turtles are caught from as far away from the Sonora coast as the islands San Estéban and San Lorenzo (Fig. 1).

Turtles which are not to be sold are killed with club or oar and either eaten immediately or dried and salted for future use. The distribution of the turtles, once they are sold to Mexican fish traders, may be quite wide. Some turtles are trucked to Tijuana, Mexicali, and

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1 Malkin, op. cit., p. 22.
2 Ibid., p. 23.
3 Ibid.
4 Ibid.
5 Ibid.
San Diego; others have been taken as far as Phoenix and Tucson. An apparently fine economic balance between the Seri and the Mexican fish buyers was upset beginning in 1951 by the coming to Seriland of various outside influences, particularly the fundamentalist Protestant missionaries and representatives from the Mexican National Indian Institute. Of these influences, anthropologist Smith wrote: "By 1965 through concerted action and total conversion of the people, they had accomplished the virtual 'destruction' of Seri native culture, together with the complete legal absorption of all the Indians' territory." As a result of this, the equilibrium between the fishermen and the fish merchants was upset, and this, together with the increasing scarcity of fish and turtles in Seri waters since the 1960s, has lessened the Indians' productivity and consequently their income.

2 Malkin, op. cit., p. 23.
3 Smith, op. cit., p. 7.
4 Ibid., p. 12.
5 Ibid., p. 13.
In 1965 Tiburón Island was made a game preserve by the Mexican government, and the Seris have been prohibited from any use of the island which until that time had been almost exclusively theirs since prehistorical times.¹

The Pacific Coast

On the Pacific shores of Baja California green turtles have been taken commercially as far north as San Quintín, but the more important fishing areas have been farther south at Scammon's Lagoon, San Bartolomé (Turtle Bay), and Magdalena Bay.

Green turtle fishing is apparently not as important on the Pacific coast of Baja California as it once was. At least, it is difficult to find reference to such activity today. This may be the result of reduced numbers of turtles or may simply be due to greater effort from the Gulf fisheries which fulfill most of the peninsula's needs.

The once-flourishing trade in green turtles between the Pacific coast bays and Alta California ports is definitely past. In recent years the turtles have been either consumed locally or trucked to the larger towns on the peninsula. Although turtle soup is occasionally encountered

¹Ibid., p. 12.
in California seafood restaurants, it seems evident that very few turtles are now shipped out of Baja California to the United States. Caldwell reported that in the summer of 1962 trucks with turtles, unable to find buyers in Ensenada, Tijuana, or Mexicali, turned back rather than enter the United States.  

Conclusion

The explosive rise in turtling activity in Mexico in the late 1960s led to a precipitous fall in the turtle catch by the end of the decade. Many attempts directed toward turtle conservation, while at the same time allowing extensive exploitation, were either inefficient or adopted too late to be of any immediate benefit. The total ban on turtle fishing, effected in 1971, seems to have been the only appropriate course, to allow sufficient time to organize a proper sustained-yield turtling program.

However, in spite of the programs which have been established to tag turtles, to protect nesting sites and maintain hatcheries, it seems, based on the difficulty of obtaining concrete information on existing turtle research

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1 Caldwell, "The Sea Turtle Fishery of Baja California, Mexico," California Fish and Game, 49 (3) (1963), p. 146.
in Mexico, that very little scientific investigation is actually being done. Hendrickson wrote:

There is for all intents and purposes, no real turtle research going on in Mexico. At least, I know of none. All I am doing is working on nutrition and other aspects of captive culture—almost entirely based on animals [green turtles] imported from other countries, but kept at my pools in Puerto Peñasco for the sake of convenience.¹

Now turtle fishing has been resumed, ostensibly because the turtles have repopulated their habitats. Presumably there are now quotas under enforcement which will safely limit the catch. The cooperatives will be undertaking their own protection and, where applicable, hatching programs. Hendrickson, who has been lending jeeps to the Instituto de Pesca (Fisheries Institute) for the support of turtle conservation camps in Tamaulipas, Oaxaca, and Jalisco, is hesitant about arranging the loan in 1973 when the camps are to be run by the fishing cooperatives rather than the Instituto de Pesca. "My donors do not relish the idea," he writes, "of loaning the vehicles to the fishermen themselves, fearing that they might increase, rather than decrease the depredations on the turtles."²

Recorded catches in the next few years should indicate the success or failure of the conservation programs being implemented.

The green turtle has been the principal turtle caught in Baja California which is used primarily as food on the peninsula itself. It seems probable that turtle fishing activity in these waters will increase as the new highway is completed the length of the peninsula. This road link will greatly facilitate transportation and foment an increase in tourist-based development.

In light of this probable expansion of turtle markets on the peninsula, it seems likely that existing turtle stocks will not be able to withstand safely the increased exploitation that will be attempted.

If a quota system on the catch which allows a sustained yield is maintained, there may not be enough turtles to supply the increasing market demand. There is certain to be a great deal of pressure from commercial interests to allow ever-expanding exploitation. The solution to the projected dilemma would be to develop successfully a captive culture program, or turtle "farms." The possibilities of this have been discussed in Chapter IV.
CHAPTER IV

PROSPECTS FOR THE FUTURE OF THE GREEN TURTLE FISHERY IN BAJA CALIFORNIA

Factors Threatening the Future of the Fishery

Overfishing is the most obvious factor which threatens the future of the green turtle fishery in Baja California. The demand for turtle products is increasing, and Mexico is promoting greater utilization of its marine resources. There is, therefore, very little likelihood that the present supply of turtles, depleted by overfishing in the past, will be able to withstand a fishing pressure aimed at fulfilling rising demands.

If adequate fishing regulations are implemented and properly enforced, a turtling industry could be sustained indefinitely, but it necessarily would be of limited benefit and value.

A limited supply of turtles might tend to reduce the demand for them, as would-be markets turned to more easily available products. Any such tendency is likely to be counteracted by the stimulation of the market by
products from commercial turtle farms which in the early years of their development will not be able to meet all demands.

Any expansion of the market for turtles will increase the fishing pressure on wild populations of turtles. The drain on wild populations would therefore continue until an adequate amount of captive stock became available.

It seems inevitable that the demand for turtle products will continue to rise. To avoid over-exploitation, turtle fishing regulations will have to be carefully formulated, adequately enforced, and sufficiently flexible to fit fluctuating conditions.

Measures Required to Prevent Overfishing

Before optimum regulations for turtle fishing can be established, much research into turtle life history needs to be done. Little is known of the habits, habitats, migrations and breeding behavior of Baja California turtles.

Habitat destruction must be guarded against. The opening of the shores of Baja California to tourism and industry could cause turtles to abandon some feeding grounds as a result of water pollution or other alterations of habitat.
Patterns of turtle migration need to be discovered, and measures established to protect turtles throughout their travels. Benefits from a closed season on turtles in one area could be negated by practices in other areas where turtles are caught without restriction, or where eggs and females are taken on nesting beaches. If adequate laws were to exist, their enforcement in all areas of migration routes might not be uniform.

Law enforcement in a large, predominantly rural country is often difficult, especially in matters of conservation, which usually are not recognized by the rural people as being important. Violations of turtling restrictions may go unnoticed or unreported in some areas as long as the catch is for local use only. Such violations would probably not be significantly damaging to a turtle protection program, unless they took place on major nesting beaches. Large-scale commercial traffic in illegally acquired turtle products would be easier to detect and prosecute, and less justifiable on the basis of need.

Many of the migration and breeding habits of Baja California green turtles may soon be discovered, as Mexican tagging programs begin to bring significant results. When much of the information on turtle ecology in Baja
California waters is learned, the basis for a sound management program will exist. Until such time arrives, however, stringent controls should be exercised on turtle fishing, and any evidence of a decline in turtle numbers should elicit longer closed seasons or a complete ban on turtle fishing.

Possibilities of Increasing Turtle Products

Managed Hatching and Pen-Rearing

Because it is often difficult to protect turtle nesting beaches from all predators on eggs and hatchlings, managed hatcheries are frequently set up to afford greater protection and control. The usual method employs the removal of eggs from the natural nest and re-burying in fenced areas which afford protection and which contain hatchlings after they emerge from the nest.

Hatchling turtles may be taken directly to sea and released or may be kept in tanks for as much as a year before release. Release directly into the sea protects them from beach predators after hatching but does not control the many hazards the sea presents to small "bite-size" animals. The larger turtles have grown before release, the greater the probability that they will survive in the open sea.
Managed hatching and pen-rearing have been carried out, to some extent, on the nesting beaches of Mexico (see Chapter 3). Not enough research has been done to assess the results. The nesting source of Baja California green turtles is still unknown, but when it is discovered managed hatching and pen-rearing could significantly increase the adult turtle populations in Baja California waters.

Green Turtle Farming or Ranching

Any increase in wild green turtle numbers brought about by managed hatching and pen-rearing will undoubtedly result in greater fishing efforts and larger catches. Judging from the increasing interest in turtle products in recent years, and the burgeoning Mexican population, the available turtles would still very likely fall short of the demand for them in the marketplace.

The best alternative to continued restrictive legislation for turtle fishing, which would also fulfill most if not all market needs, is turtle farming or ranching,¹

¹The International Union for the Conservation of Nature sea turtle specialists' meeting in 1971 designated the term "turtle farm" as a self-sufficient operation independent of eggs or turtles from wild populations; "turtle ranch" was the term applied to operations which depend on wild populations to any extent. (H. R. Bustard, Sea Turtles: Their Natural History and Conservation (New York: Taplinger, 1973), p. 179.)
a practice which is already underway in several areas of
the world.

Turtle farming may be practiced by keeping turtles
in artificially enclosed natural feeding areas which supply
an abundance of marine grasses or algae, or turtles may be
raised in man-made tanks and fed on natural cut vegetation
or artificially prepared food. But the problems to be
overcome in turtle farming are legion. In enclosed natural
feeding grounds turtles must be kept in balance with the
vegetation and protected from violent tropical storms. In
artificial tanks water must be maintained at the proper
temperature and kept free from fouling. Little is known
about turtle diseases and parasites.

When turtle farms are going concerns, the need for
a continual supply of eggs or hatchlings will necessitate
breeding and nesting operations from captive stock to pre-
vent increasing drains on wild stock. Until the processes
of breeding turtles in captivity are worked out there will
be a continual drain on eggs from the natural breeding
sanctuaries. No one yet has been able even to approach
captive breeding in volume.¹

¹Archie Carr, "Great Reptiles, Great Enigmas,"
Audubon, 74 (2) (1972), p. 34.
Use of artificial tanks rather than natural sea habitats may be the best method for a complete, closed-system turtle farm. One such farm is Mariculture Ltd., on Grand Cayman Island in the Caribbean Sea. This is a commercial concern financed by British and American investors, which offers shares to the public, and actively promotes the sale of its turtle products.

Mariculture's ten-acre farm contains forty-one tanks and two ponds, holding over 70,000 green turtles ranging from hatchlings to large breeding stock.\(^1\) At present eggs are obtained from natural turtle breeding grounds, but Mariculture's turtles are beginning to lay on its artificial beaches, and if a large volume of hatchlings can be so obtained the company may soon be a self-sufficient enterprise.

Sales of Mariculture products—which include various grades of turtle meat, turtle oil, and polished turtle shells—are good, and substantial profits are expected in the next year.\(^2\) The company plans to develop a second

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turtle farm on the island.  

Advocates of immediate turtle farming on a commercial basis are currently at odds with those who think that the increase in turtle products from farms will serve only to stimulate a market which is already demanding more than can be supplied from natural grounds on a sustained yield basis. They think that there are not now, and will not be for many years, enough turtle farms to keep the market supplied without a continued drain on the world turtle populations. But the proponents of commercial farming contend that these farms will take the pressure off the world populations by making commercial turtle hunting and poaching unprofitable, provided the market for turtle products is not suppressed by conservationists. Carr, an opponent of immediate commercial turtle farming, wrote:

I have yet to see or hear of a work plan for any reptile ranch that shows in realistic detail how it expects to achieve a volume of production so great that it will do anything other than increase both demand and prices. If the enterprise is a commercial one, it will not be able to satisfy these, and so will exacerbate, rather than relieve, the predicament of the natural populations.  

\[\text{Carr, "Great Reptiles, Great Enigmas," p. 34.}\]
Carr endorsed only one kind of turtle farming project at present. ¹ This kind would be non-profit, government sponsored, and purely experimental. There should be many small, widespread stations which are dedicated to discovering the best means of nutrition, disease control and captive breeding, and which freely share information. The positive findings of these projects could be the basis for the establishment of a pantropical turtle farm industry that could be rapidly set up and which would be able to supply every demand that arose. In the meantime the only course is to discourage the international traffic in sea turtle products; the demand can be re-established when the supply is prepared to meet it. ²

Baja California seems eminently suitable for the establishment of turtle farms, especially on the warmer southern third of the peninsula. Extensive feeding grounds are located around the southern coasts, particularly in the protected bays of the Pacific side.

The Scammon's Lagoon area, Turtle Bay, San Ignacio Lagoon, and Magdalena Bay are prime turtle habitat, judging from the numbers of turtles found in these areas today

¹Ibid.

²Carr, "Great Reptiles, Great Enigmas," p. 34.
or in past times. Portions of these and other coastal feeding grounds on the Gulf side can be fenced to form the basis for a farming operation on sites with suitable beaches for breeding stock to nest. If it proves to be more desirable to raise turtles in man-made tanks on the shore, perhaps many other seaside sites would be suitable, and if as at Mariculture the turtles were being fed a commercially prepared feed, proximity to natural feeding grounds would not be important.

Access to markets is probably no more a problem in Baja California than it is on Grand Cayman. Distribution of turtle products and acquisition of needed turtle feed can be accomplished by light aircraft, boats, or by trucks. Access roads can be more easily built to remote sites now that the peninsular highway is nearly completed.

Pilot farms set up by the Mexican government, possibly with outside financial support, could be turned into commercial enterprises once they reached self-sufficiency or independence from natural nesting grounds.

Conclusion

The threat of an endangered turtle fishery in Baja California through overfishing can be eliminated by proper enforced legislation; stringent until sufficient
information on turtle ecology is obtained, perhaps more lenient afterwards.

Protection of turtles in the early stages of their life cycle—when the greatest mortality occurs—by means of managed hatcheries and pen-rearing should significantly increase mature populations. However, any increase in turtle numbers would also increase fishing and would certainly result in the same precarious balance between exploitation and protection.

It is likely that only turtle farming can produce enough turtle products to both fulfill human needs and save wild populations. But turtle farms, to avoid increasing the pressure on wild populations, must be self-sufficient and able to produce large numbers of turtles. No totally self-sufficient turtle farm is in operation yet, but the success and effects of Mariculture Ltd. will be carefully watched.

Baja California appears to be well-suited to turtle farming. The establishment and success of turtle farms could be beneficial economically, nutritionally, and gastronomically to the people of this undeveloped land.
CHAPTER V

CONCLUSION

Green turtles probably have been a valuable food resource in Baja California since man first developed the primitive technology required to catch them. The Seri Indians had the most highly developed turtle fishing economy, but other groups had seaworthy craft from which they certainly caught turtles. Some Indians without sea craft also made use of sea resources, obtained through seasonal migrations to the coast. Turtles at that time, as well as today, were most often caught with harpoons, but the use of entangling nets, common today, may have a long history as well.

The early explorers and buccaneers found turtles abundant and made considerable use of them. Nineteenth century sealers and whalers continued the practice, often reporting very large catches from the bays and lagoons of the southern Pacific shores of the peninsula.

Commercial turtling followed the demise of whaling, and a regular trade in live turtles became established
between Baja California and canneries and restaurants in Alta California port cities. This trade, flourishing in the early twentieth century, removed many thousands of green turtles from the Pacific side of the peninsula. Consequently by 1925 the turtle bays and lagoons were seriously over-fished, turtles were scarce, and the California market drew to a close.

It was many years before turtling again became significant in Baja California. In the 1950s the catch began to rise, and by the mid-1960s conservation of the resource became a recognized necessity.

Information on green turtle habits and habitat in Baja California waters is still sketchy. Migration patterns may soon be understood and nesting grounds discovered as a result of large-scale tagging efforts on the mainland nesting beaches, but a great deal of investigation still needs to be done regarding localized turtle ecology, including the assessment of carrying capacity of feeding grounds to be used later in management and farming practices.

The Gulf shores supply most of the green turtle catch in Baja California today. Indeed, the warmer waters of the Gulf may have always supported a much larger turtle
concentration than the Pacific shore where green turtles have been confined largely to the southern half of the peninsula.

Today's intense fishing practices have continued the detrimental inroads on the green turtle populations around Baja California. Official statistics have shown turtle catches to be declining rapidly in spite of an increase in fishing effort.

Various conservation measures have been implemented by the Mexican government, including catch restrictions and closed seasons, nesting protection and managed hatching and rearing. The outcome of these conservation practices, in light of the continued pressures to increase fishing, is of course as uncertain in regard to Mexico as it is the world over. The problems in balancing preservation against exploitation of natural resources are well known to most governments.

Turtle farming may be the solution to these problems, but first the will must be found in government agencies or private concerns to initiate the projects and carry them out safely and profitably. The effect of Mariculture Ltd., on Grand Cayman Island in the Caribbean, the world's first commercial green turtle farm, and of the various pilot turtle farms being established in different
countries is important. Wild green turtle populations will not be able to support unlimited fishing, and if present intensity of exploitation continues, both turtles and market will be short-lived. If profitable self-sufficient farming operations independent of wild turtle populations can be devised, Mexico, Baja California, and the green turtle stand to benefit greatly.
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