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STATUS OF THE SEA TURTLE FISHERY IN FLORIDA[1]

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Although all of the species of sea turtles of the western Atlantic[2] occur in the waters of Florida, and are thus available to the sea turtle fishery of that state, only the green turtle, ridley, and loggerhead have any commercial value there today.

With respect to food-resource value, the most important of the sea turtles is the green turtle. Though Florida once provided the bulk of the green turtles sent to the markets of the northern United States (Carr, 1952: 353), there are today only a few local fisheries, the pro-

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[2]Atlantic Green turtle, *Chelonia m. mydas* (L.); Atlantic Loggerhead turtle, *Caretta c. caretta* (L.); Atlantic Ridley turtle, *Lepidochelys kempi* (Garman); Atlantic Hawksbill turtle, *Eretmochelys i. imbricata* (L.); and Atlantic Leatherback turtle, *Dermochelys c. coriacea* (L.).

duction of which goes mostly to local markets, or at least to markets within the state. In past times, great numbers of large, presumably sexually mature, green turtles were caught in the state, but today the greatly reduced fishery takes only small, immature individuals. This fishery is confined to the Gulf coast of Florida from Cape San Blas to the Florida Keys, and actually it is largely restricted to the stretch of shallow coastal grass-flats from St. Marks to Crystal River. The breeding population of the species has apparently abandoned the shores of Florida, and an adult individual is rarely if ever seen from the West Coast fishery. The present seasonal (spring and summer) Gulf-coast industry, carried on by a handful of turtlemen, depends entirely on a population which, since it comprises only juveniles (10 to 115 pounds), is probably hatched somewhere outside Florida, perhaps in the Caribbean (Carr and Caldwell, 1956a). No other organized exploitation of this species goes on in Florida now, though in the 19th Century there were productive operations in the Indian River on the Atlantic coast and among the lower Florida Keys (Carr, *loc. cit.;* Carr and Caldwell, 1956b; and Ingle and Smith, 1949: 46). As indicated by Ingle and Smith (*op. cit.*: 48), much of the sea turtle poundage reported in statistical summaries for Florida has been based on imports. This is particularly true today for the present role of Florida in the turtle trade is primarily as a landing point for large green turtles brought in alive through the ports of Tampa and Key West from the Caribbean countries of Costa Rica and Nicaragua; often via Grand Cayman, where they are kept in pens for varying lengths of time.

In Florida the ridley is of importance nearly equal to that of the green turtle as a commercial species, though it does not usually appear on landing reports. As in the case of the green, the only organized fishery draws from a population of immature individuals (5 to 60 pounds) and is restricted to the Gulf Coast grounds (Carr and Caldwell, 1956a). In this seasonal fishery, ridleys are taken in the same nets with the greens and are marketed with them, bringing a slightly lower price, because they are considered somewhat inferior in flavor. Almost all are consumed locally, and few, in fact, ever leave the fishing town at which they are landed, except when removed by private consumers who purchase them retail in the fish houses. The species is unknown in the Caribbean and is not imported into Florida. Unlike the case of the green turtle, the origin of this population of immature ridleys is unknown, and in fact the species is not at present known to nest anywhere (Carr, 1952, 1955, 1956, and *in press;* Carr and Caldwell, 1956a: 18).

The loggerhead, although occurring regularly in all coastal waters of the state, and the only species nesting regularly on Florida beaches, is of much less commercial importance there than the two previously mentioned turtles, and there is no organized fishery for it. The flesh of the loggerhead is considered poor by most judges, and it is almost completely ignored by the commercial turtlemen of the Florida Gulf coast. There is no steady sale for the loggerhead, and it is landed only when the greens and ridleys are scarce and the craving of local consumers for a "piece of turtle" results sporadically in a feebly profitable home-town market. It is much more popular among people of the Atlantic coast and Keys, although even there it is used mainly when green turtle is not available from some local source or from an importer. In these areas it is often served to unsuspecting tourists as "green turtle," or passed under the disgusting label "turtleburger," a word devised to replace the old conch term "turtle balls." Selling loggerhead for green turtle is all right, but suggestive language must be avoided. Since loggerheads nest in Florida, in the spring and summer, a great many are taken illegally when they emerge to lay on the beaches, and many of these may find their way to markets. The eggs of the loggerhead are also in great demand in some places, primarily for use in baking, for baked goods made with them are said to stay fresh longer.

The Hawksbill, while of some (though diminished) importance in the West Indies as the source of commercial tortoise shell, has practically no economic importance in Florida. A few individuals reach the food markets in the Keys (the only place in the state where this turtle is found in any numbers), but their principal value in Florida, and this a very small one, lies in their popular use as colorful exhibits in public and private aquariums. The green, ridley, and loggerhead are put to similar small-scale use.

The leatherback, in view of its rarity in Florida waters, of its pelagic habits, and of the lack of esteem in which its meat is held, is of no commercial value in the state. It is not even suitable for aquarium use, since it does not live well in even the largest tanks.

As was mentioned in the discussion of the loggerhead, many turtles are brought in by other than commercial turtlemen. Many of these are taken legally, while in the water, and most are consumed by their captors, though many do reach the markets. Although there are no records available as to the numbers of such turtles brought in, they are probably considerable and doubtless primarily include the three commercial species, since these are not only the ones most commonly en-

countered, but the most desirable for food. These sporadic landings, although in the aggregate of some economic significance, cannot be considered as representing an organized fishery for any of these species.

Since we have no definite quantitative data on the constitution or extent of the indigenous resident turtle fauna of Florida, it is not possible to evaluate with any accuracy the depletion that has occurred. It seems probable that extensive breeding colonies of green turtles have been lost. Hawksbills also once nested in Florida, and no longer do so to any appreciable extent. Moreover, it is possible that the rookeries or turtles referred to by early travelers in the state included nesting Ridleys, although even if this were demonstrable it would not constitute a solution of the problems presented by current ridley populations. For various reasons, to be discussed elsewhere, the "Big Freeze" of 1898 should be examined carefully as a possible factor in the reduction of turtle populations, and projected studies in temperature tolerance by the various species may shed some light on this. But whether or not the freeze (and its successors) was involved, the depletion would by now have been brought about by the turtle turners, as it has in Honduras, Trinidad, and Grand Cayman; and even though we are not able to give a statistical picture of their depredations, there is no reason for them to continue, legally or illegally. There is no reason, except political expediency, half-hearted action, or lack of foresight, why anyone should be allowed to kill a nesting turtle or rob a nest anywhere on the shores of the United States. It is a poor way to make a living, and in fact no real living is made that way. This activity has not only lost us a once valuable and potentially even more valuable resource, but it must necessarily prevent any natural resurgence of that resource. An effort has been made recently by the Florida State Board of Conservation to achieve real enforcement of the laws prohibiting the taking of nesting females or their eggs. However, the fact that females in the water, although they may be ready to lay, are unprotected even in nesting season presents a problem to the enforcement of the law, since possession of a turtle away from the beaches is not proof that it was taken illegally. Turtle poachers operate almost unhindered on some long extents of beach, and in many other places they are so numerous that effective policing is impossible. The poacher must be caught on the beach while actually taking the turtle. This is not easy, since wardens are few and there are many miles of deserted beach. Because the nesting takes place at night, and the violators work without lights, spotting them with planes is not practical. Cases of violence and intimidation against wardens are frequent. What is

clearly needed in Florida is an increase in the number of conservation officers, and equipment for them that includes sand buggies faster and quieter and more surefooted than those of the poachers. Then it will be the beaches that are patrolled and not the roads back of the beaches. The operation of finding, butchering, and hauling off a turtle will become more hazardous than it is at present, and the unreliable element in our seaside population will have to look for a less fly-by-night way of life.

Considering sea turtles collectively, their conservation is far more than a local problem. The state of our understanding of the biology of the several species is still inadequate as a basis for the international programs that will probably be the only effective means of reestablishing turtle populations of western Atlantic and Caribbean waters. But as a temporary expediency, the stopping of all egg-collecting and of the killing of nesting females, from North Carolina to Texas, would mean a sure future for the Atlantic loggerhead and just possibly might bring back green turtle, hawksbill, and leatherback strains still represented by an occasional female emerging to lay in southern Florida.

Besides the elementary move of providing sanctuary for reproduction, there is one other thing that might, and eventually probably will, be done. Preliminary evidence suggests that, while turtle eggs are not easy to transport, hatchlings are extremely hardy, tolerating long periods without food (although feeding readily at any opportunity), and thriving for weeks crowded together in water barely deep enough to keep them afloat. They thus can be shipped by any means of transportation in light, tiered tank trays, a thousand or more hatchlings in a crate. When this ease of handling is considered in the light of the astonishing growth rates that aquarists are finding for young sea turtles, the possibility of some sort of management or restocking, or even farming, program suggests itself.

The homing-orientation tendencies and capacities of sea turtles are not understood. If a female turtle nesting for the first time is instinctively guided to seek out the shore she hatched on, in some pattern comparable to that guiding salmon, the bringing in of hatchlings from tropical centers of heavy hatch would probably be futile. But there is a good chance that such baby turtles, flown to South Florida, say, and held there in inclosures until they reached weights of a pound or two and then released in the congenial warmth of middle summer wherever ungrazed flats of turtle grass occur, might somehow fit into the environment and exploit for us our vast expanses of fallow turtle pasturage. While such a project involves too many uncertainties to be

justifiable on a big scale, it is certainly worth trying experimentally, and we venture to suggest that it is very likely the model for important moves to come.

In summary, then: while the commercial turtle fishery of Florida is at a low ebb, it has once been an important source of income for the state, and prospects for success in, and profit from, an energetic restoration program seem good. As things are going now, some of the species themselves are threatened, and whatever the economic fate of the turtle fishery, we owe it to posterity to intervene in time to prevent the loss of any more of the irreplaceable animals now so completely at our mercy.

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DISCUSSION

DR. MCHUGH: Thank you, Mr. Caldwell.

I am not familiar with the experts in herpetology. The only one I know for sure is a member of my own staff, Bill Massmann, who in addition to being an ichthyologist is a competent herpetologist. There have been turtle fisheries in our area for some time, in the Chesapeake Bay; and, at one time, the U. S. Fish and Wildlife Service operated a turtle hatchery at Beaufort, South Carolina; as a matter of fact, it is still going in a limited way.

DR. EUGENE CRONIN [Maryland Laboratory]: The sequence in Maryland has been quite different. There was very heavy exploitation, to a point where the diamond-backed terrapin became such a luxury that it priced itself very nearly off the market. Then, with the advent of prohibition, which seemed to prohibit the kind of meals which went with diamond-backed terrapin, the public lost interest.

Possibly because of that, certainly in coincidence with it, we have had a resurgence of the terrapin population. There are plenty of diamond-backed terrapin; and nobody buys them. There is a very limited market for them.

That is about all I can say about the Maryland fishery; it is quite different from this coastal fishery, though.

DR. HAROLD COOLIDGE [Pacific Science Board, National Academy of Sciences]: We are very concerned about the turtle-conservation problem in the South Pacific islands; and I have had some correspondence with Archie Carr and others, who have similar concern about the Caribbean area.

One of the questions which I wanted to ask, from complete ignorance, is to what extent is an effort being made to farm turtles on a commercial scale in Florida? I do not know whether this turtle fishery consists of just taking turtles or whether it consists in raising them and releasing them, then recapturing them.

MR. CALDWELL: No; there is no effort at all being made now to raise them. That is just an idea we hit upon.

They do some of that in the Pacific, in the East Indian islands. As I understand it, it has something to do with the religion of some of the people there, in

that they can eat turtle eggs but not the turtle itself. So they mark the nests when the turtle is laying, then come back after she has gone and take all the eggs.

The Government has established certain beaches which are their own private beaches. They too take the eggs; but they hatch the eggs, then raise the turtles to one- or two-pound size, then release them. Apparently, they have been successful. Before they started doing that, they felt sure that the whole population of that area would be depleted.

DR. COOLIDGE: Do you know what government that is?

MR. CALDWELL: No, sir; I do not, off-hand. I could find out.

DR. COOLIDGE: Dr. Hendrickson, at the University of Malaya, has been doing some important turtle research, particularly in the islands off Sarawak. Sarawak depends for quite a source of revenue on its turtle eggs and turtles. He has recommended some such program; but it has not yet been adopted.

He told me that his findings seemed to indicate that the productivity, or rather the chance of survival, of turtles can be enormously increased, even if you protect them for the first three months after they are hatched. If that is the case, according to some figures which he mentioned informally (and which I do not want quoted officially), the chance of survival of a freshly-hatched turtle is about 1 per cent. But, if you can protect it for a period of three months, then let it go back to sea, it may have as much as a 60 to 70 per cent chance of survival.

When you have a differential rate like that, say it is only 50 per cent, you can see how easy it would be to establish a turtle-conservation program because, if you can protect them in this most vulnerable period during the first few months, provided they can always find food, once they get back to sea, you can immediately increase this resource very materially.

We are looking further into this matter; and I hope there may be a unified international program developed through the South Pacific Commission and Research Council for turtle conservation in the Pacific islands. I hope that, in the Caribbean area, a similar program may be developed as time goes on.

MR. MASSMANN: One interesting thing about sea turtles in the Chesapeake Bay area—I think it is primarily the green turtle—is that there seems to be considerable mortality there during the summer. We see large numbers of dead turtles every summer and fall around there; and, of course, the commercial fishermen often get green turtles, which they very rarely sell. Apparently, they are not worth as much in the Chesapeake Bay area as they are in Florida.

But I think there must be a considerable mortality even during the summer. It is one thing we do not understand. We do not have any idea what it is. It certainly could not be connected with cold weather, because it has generally occurred during the hottest part of the year.

I wonder if you might give us any indication of the cause.

MR. CALDWELL: No; we do not seem to have that problem in Florida. Occasionally, you will find one washed up; but it is so rare that you do not really worry about it.

DR. COOLIDGE: Might it not be pollution which causes that? I mean, is this off Chesapeake Bay or is Chesapeake Bay?

MR. MASSMANN: This is in Chesapeake Bay itself; I do not think pollution is much of a problem in the Bay.

DR. MCHUGH: Our pollution problem is really not serious enough yet to make that a real explanation.