

1954

The Passing of the Fleet

LIBRARY OF
GEORGE H. BALAZS

A. F. CARR, JR., *University of Florida*

EDITOR'S NOTE: Dr. Carr was the principal speaker at the General Meeting (September 6th) of the recent AIBS convention. The following is an editorial condensation of his address. We regret that limited space in the Bulletin forces us to print only an abbreviated version of Dr. Carr's fascinating narrative.

IT was the first of May, 1503. It was the homeward leg of the fourth voyage, and the blue line of the isthmus fading stern was the last Columbus would ever see of the New World mainland. At odds with his pilots over the course, beleaguered by fickle winds and a strong westerly current, he missed his goal by 300 miles. But on the tenth day he raised two low islands and ran down the channel between them. His grumbling crews were cheered by the sight of great numbers of turtles about the shores and cluttering the seaways, the double says, like little rocks. Columbus named the islands Las Tortugas.

The Turtle Islands, however, did not keep the name Columbus gave them. Fifteen years later Ponce de Leon gave it to a group of keys off Florida. The Tortugas of Columbus became the Caymans—the Cayman Islands—and for three hundred years the vast "flotas" there—the fleets of breeding green turtles—were a prime factor in the growth of the Caribbean. As the settlements grew and got hungry, ships of half a dozen tons converged on the unattended islands in June. They took away as many as their holds and decks would carry. The turtle flotas were as infinite as herring schools. Or so it seemed.

The vitamin hunger of sailors, which came from nowhere and made men's gums grow over their teeth, and could send a corpse a day sliding over the rail, practically disappeared in the Caribbean after the discovery of *Chelonia*, the green turtle. No other edible creature could be carried away and kept so long alive. Only the turtle could take the place of spoiled kegs of beef and send a ship on for a second year of wandering or marauding. All early activity in the new world—exploration, colonization, buccaneering and the manœuvres of naval squadrons—was in some way dependent on the turtle. Salted or dried it everywhere fed the seaboar. It was at once a staple and a luxury—a slave ration, and in soup and curries the pride of the menus of the big plantation houses. More than any other dietary factor the green turtle supported the opening up of the Caribbean.

Chelonia had all the qualities needed for a role in history. It was big, abundant, available, savory and remarkably tenacious of life. It was almost unique in being a marine herbivore—an air-breathing vertebrate that grazed submarine beds of seed plants. It was easy to catch with simple equipment because its pasture lay under clear shallow water. Moreover, each June the females came ashore wherever there was sand to lay their eggs and you had only to walk the beaches and turn them on their backs. *Chelonia*'s abundance expressed its straightforward ecology. It ate one kind of plant that spread continuously over great areas and knew no season. Grown-up greens were too big and hard for most predators and too fast and wary for the rest. The other turtles of these seas had gummed up their energy cycles by eating animals, which of course had their own complex problems and uncertainties. So the carnivorous turtles led a solitary, scattered life while the greens stayed in one place and grazed all day, only one link down the feeding chain from the sun itself. They grew fat and numerous and succulent, and in every way a blessing.

Today, the Atlantic green turtle can no longer be reckoned a major asset. And worse, I believe that if it is not effec-

tively protected it may soon be extirpated as a breeding resident of American waters.

The documentation of the decline of *Chelonia* is voluminous and clear. One by one the famous old rookeries were destroyed. The first to go was Bermuda and next were the shores of the Greater Antilles. The Bahamas were blanked out not long after, and boats from there began to cross the Gulf Stream to abet the decimation in Florida, where vast herds foraged in the East Coast estuaries and on the Gulf flats of the Upper Peninsula and a great breeding school came each year to Dry Tortugas.

One nesting ground stood apart from all the rest in its fecundity and stirred the wonder of all who saw it. This was the Cayman Islands. The breeding aggregation there supported the biggest turtle fishery in America. The history of this fishery—its burgeoning and slow exhaustion, the wrecking of the rookery by heedless killing of the females that came ashore to lay, the plight of the people who had no other way to live and their tenacity in following the declining schools from one remote shore to another—is an extraordinary from the standpoint of human ecology as from that of resource depletion. At first the Cayman sloops worked off the south coast of Cuba, but the schools there soon dwindled. They then built bigger boats and scouted more distant shores, and finally stumbled upon a vast new turtle ground on Mosquito Bank just off the coast of Nicaragua, some 350 miles over open seas from Grand Cayman. There lay a cluster of keys where fresh water could be had, a shallow sea set with bars and rocks, miles and miles of blade grass flats and turtle herds that looked to the Cayman captains like home in their grandfather's day.

That was more than a hundred years ago. The Caymanians are still the only important export turtle hunters in the Caribbean and the Mosquito Banks are still the main source of green turtles for the American market. These people feel no alarm over the future of *Chelonia* because they have seen no reduction in the turtle population of their time. The young men of today catch about as many turtles in a season as their fathers did. They are most concerned over unstable markets, since except on the home shores where it is a staple, green turtle is in demand only among gourmets. They are plagued by lack of transportation for their catch and over England's disinclination to squander dollar credits for the makings of aldermanic soups.

However, it is very doubtful if the Cayman people will be the ones to deliver the last blow from which *Chelonia* will not recover. They, and the harpooners, who take the turtles on the grazing banks, are attacking the species where it is most resilient. It could almost surely stand many times more of that kind of pressure. But what it cannot stand is being deprived of the benefits of reproduction. That much of the course of conservation is self-evident. But at this point our procedure is blocked by an astonishing ignorance of the biology of the animal. Most of the countries and peoples with a stake in the Caribbean littoral would be in sympathy with the idea of saving the green turtle. But once persuaded of the necessity of doing something they embarrass you by insisting that you tell them exactly what to do.

Until quite recently the problem was not critical. There were hundreds of islands and keys and mainland beaches where nobody lived and where one could imagine thousands of safe nests erupting yearly multitudes of little turtles. But since the war the wild beaches have begun to disappear. Population pressures, outboard motors and planes have ac-

ites
30;
ous
the
esi-
du-
well

of
the
mb
was
not
nds
are
r, a
ini-
tal-
ven
lies.

one
ure,
the
ard
seld

154

6014 NO. 5

GH 301
B 57

counted for thousands of aluminum roofs shining in clearings in the seaside scrub. The elimination of the nesting grounds continues and it is this that will finish Chelonia.

The most serious handicaps in any effort to save the green turtle is our ignorance of its migratory movements. Fishermen everywhere believe that the green turtle migrates. Such a belief can also be found in the writings of naturalists. But nowhere in the canons of zoology is there a shred of what could be called scientific evidence to prove it.

The best way to answer the questions about Chelonia's supposed migratory habits would be an extensive program of tagging and this is what I hope to get under way. Meanwhile, however, I have wandered all about the Caribbean, sifting the hearsay, comparing it with the old writings and corroborating by direct observation wherever I could, trying to see how a marking campaign should be organized. The best source of word-of-mouth information is the Cayman Islanders. They are a cooperative and articulate race, with a flair for natural history and a heavy stake in turtles. To assess the quality of their contribution it is necessary to know something of the way they operate their fishery.

The turtle schooners leave for the banks in the Fall. There they establish local headquarters on one of the islands with freshwater wells, where a crawl is built to hold the accumulating catch of the season. The schooners go out on the banks Monday morning and return to the Cays on Saturday. The turtle ground is an extensive tableland of sandy bottom covered with grass (*Thalassia*) and set with scattered rocks and coral heads. The turtles feed all day on the flats and move to the rocks at night to sleep. The schooners divide up the good turtling areas and send out catboats—17-foot dories with three-man crews—to set nets over marked rocks. When the turtles surface to blow they are entangled in the nets. The night's catch for each catboat is transferred to the schooner and on Saturday the week's turtles are taken to the crawls on the keys.

This bank turtling is carried on only from August to April. From May to August a recess is compulsory—because there are no turtles to catch. All turtle men believe that the turtles leave Mosquito Bank in May and June and congregate to mate and lay on a section of the Costa Rican coast called Tortuguero—Turtle Bogue. This is no idly devised story but an interpretation essential to the operation of the fishery.

All you actually see is that the turtles go away. The females go full of eggs and come back spent. During the time they are away huge fleets of turtles appear at Turtle Bogue, mate there off shore and lay their eggs on the beach. These schools are far bigger than the year-round Costa Rican population, and local feeding grounds are inadequate to support them. They clearly come from elsewhere. Obviously some sort of migration has occurred but it does not prove that any part of the Costa Rican flota came from the Mosquito Bank. The Cayman turtle men, however, have indirect evidence to support their belief. If the Bank season has been unsatisfactory some of the boats go down the coast to a point between Prinaxpolka and Pearl Key Point where they set their nets on the shallow mud flats. Here they may find large, transient schools grazing and moving southward. The captains all believe that these schools are migrants from the Banks, heading for Tortuguero. Good turtling on the mud flats comes in April and August, which is just what you would expect if you were intercepting the coming and going of migrants from the north. By September the turtles are back on the Mosquito Bank feeding grounds.

I have lately talked with deepwater captains who have seen schools of greens on the move in open water off Panama, heading west, and in the opinion of these observers, toward Turtle Bogue. All the way from Venezuela to Chiriqui Lagoon fishermen say their local green turtles go west to breed. The people at Tortuguero believe that the nesting congress is a mixture of arrivals from north and south. They say that the

two arrive separately, with the southern fleet usually ahead of the northern. This last is one of the points for which I found slight direct corroboration. In both walking the beach at the beginning of the nesting season for two Junes and flying low over it another year, it was apparent that the southern beaches were reached first and occupied by nesting turtles.

Among the stray observations that seem to strengthen the argument for turtle migration are the anecdotes about Chelonia's strong homing instinct. The stories are widespread and in the Cayman Islands the homing abilities of the green turtle are a matter of common knowledge. The Caymanians are all brought up knowing this. When they hold a turtle derby to celebrate the end of a good season, and tie colored balloons on lines to the flippers of culs left in the crawls and let them go in Great Sound, and they all move away due south without a hitch, nobody is surprised. South is the course to Mosquito Bank, and that is where they came from. You may call it folklore but it's the kind that has to be mostly right or somebody will starve. The captains, through years of association with the movements of turtles on the banks, are positive that the homing urge brings individuals back to a particular rock to sleep after a day of foraging several miles away. Even more significant are the stories of turtles returning over a distance through which they were carried on a ship's deck. I have accumulated six such anecdotes that seem to demand consideration. They were told by Cayman captains, experienced professionals who understood the nature of evidence, and knew that I was not looking for entertainment. One in particular was told by Captain Charles Bush of Georgetown, Grand Cayman, who at one time or another was captain of nearly every schooner that sailed out of the islands. During the 1924 season Captain Bush, on Mosquito Bank, caught an unusually large male green turtle that attracted attention both because of its size and because all four flippers had been notched by the bites of small sharks or other fish. The turtle was branded and almost immediately sent to Key West with the rest of the catch. There it was received and paid for. The following season Captain Bush was back on the banks, having heard meantime that the October hurricane had hit Key West and wrecked the turtle crawl. He was working the same territory as the season before and one evening, through his water glass saw the big male turtle with scalloped flippers. The old boy should by now have been soup but he wasn't; and the only thing to do was catch him again. They set a net on the rock and three hours later the old turtle was in it and the brand put on him five months before clearly visible on his belly. The following month they sent him back to Key West and the same merchant bought him for the second time. That Captain Bush showed himself to be a practical man with no sentimentality enhances the credibility of his story.

All such evidence lends support to the tales of Chelonia's long-haul migrations. What is there, then, about the strip of beach at Turtle Bogue that attracts the fleets from such distances around the Caribbean? Perhaps Tortuguero lies along the pathways of certain routes that are most feasible for migration. Or, perhaps the convergence here expresses ingrained patterns of response that once made sense but now are adhered to through evolutionary inertia. Certainly there is nothing evident in the lay or structure of the beach itself that could account for the appeal. It is just twenty-four miles of black sand swept by heavy surf and with no protecting banks or reefs off-shore. The unimposing shore of low dunes is covered with sea oats, sea grape and cocoplum and back of it stands scrub grading into swamp along a slow river. Coons and pisotes make a business of egg hunting, and when the fleet is in, ocelots, snakes and even jaguars may come over from the inland forests. In late June the dogs of the towns along the railroad, miles back inland, come over in packs, across all kinds of rough terrain, called by who knows what insight to the migration of the turtle schools. Even the nests overlooked by the dogs and coons and concealed by

hard rain are not entirely spared. If the little turtles emerge by day the buzzards learn of it and struggle among themselves over the stream of hatchlings. At night, when most of the nests hatch, the buzzards are asleep but out beyond the breakers a slashing line shows where the jackfish scoop and eat at the paddling hatchlings. It is clearly no lack of enemies that explains the pilgrimage to Turtle Bogue.

However, the enemy that will probably deal the death blow to *Chelonia* is man. Reproduction of the Tortuguero schools can at any time be cut off by the existing commercial operation which is so organized that every female that comes ashore can be turned and taken away without ever laying her eggs. All along the Central American coast the governments own a strip of the land-edge, extending inland for a mile from the breakers. There are two possible sources of revenue in this strip, the extensive coconut fringe and the tortuguero—the turtle rookeries. Every year the Tortuguero beach, the most valuable on the coast, is rented like all the rest at public auction. The highest bidder, the *contratista*, appoints a manager or *capataz*, who is in direct charge of a corps of *veladores*, the "stayers-awake," who each patrol one mile of shore and turn the turtles on their backs as they arrive. By Costa Rican law the *veladore* must wait and let each turtle dig her nest and lay, but this would cost him time and since there is no one to know, he turns the turtle where and when he finds her and hurries on to find another. Each female is dragged just behind the reach of hightide waves and because the sun on her belly would kill her in a few hours, the *veladore* builds over each turtle a little shelter of coco thatch. During the height of the season in July he may turn thirty or forty turtles between sunset and dawn. For each he receives about thirty-eight cents. Since this is a remote and dangerous coast, blocked behind by swamp and rivers, the *veladore* has no way of delivering his turtles to market except by launch. There is a law that says the launch must pick up turned turtles every two days but since there is only one launch and often a continuous string of squalls along the coast there are times

when no launch comes for days or perhaps a week. Then the turtles die each day by the dozens. When the launch does appear, the *veladore*, usually with the help of his numerous children, ties chunks of balsa to each turtle's fin and sets them to sea where dugouts from the launch chase and gather them in.

It is a deadly system. Operated at capacity it could destroy the entire rookery. The reason it has not done so is the failure of the *veladores* to work full time. The apathy of the hunters is due to the irregular arrival of the launch—to the fact that any time spent on the beaches is gambled because their catch may never be picked up. And the unreliability of the launch is only a sign of the erratic post-war market. Should this improve, the launch will come on schedule in spite of the squalls. Meanwhile, the shore is settling up, the local demand is growing, and the chance for *Chelonia* to establish rookeries elsewhere has gone. From this angle the picture is dark.

Viewed from the standpoint of the opportunities for intervention the situation looks different. Territorially, *Chelonia's* interests and ours overlap only on the sea beach, and even there it comes when we're asleep. And because the creature congregates to breed, real protection for a few beaches might be all we need to bring back the fleets Columbus found.

It is not often that we are offered a set of circumstances so promising; a one-item feeder with its pastures undamaged, vast in extent and used by no other animal; a species attuned to building and thriving in dense populations and yet flexible enough to proliferate and scatter in dilute colonies; above all, a depleted species, the cause of whose depletion is clear and surely possible to remedy. There is still a skeleton breeding stock and the best of the remaining nesting shores are the least cluttered by man. Group action by the governments concerned would surely save *Chelonia* and build unity and strength in the Caribbean by raising the yield of the sea to the people around it.

In the field of live-resource management, it is not often you can hope for so much.

The Role of the National Science Foundation in Biological Science

LOUIS LEVIN, *National Science Foundation*

THREE years have elapsed since the Director of the then newly created National Science Foundation discussed before the A.I.B.S. the plans and hopes of the Foundation. (A.I.B.S. Bulletin, Vol. 1, No. 5, October 1951). Now, after three full years of operation, it is appropriate that a further report be made on the role of the Foundation in relation to the biological sciences.

Although the functions assigned to the Foundation by the legislation which created it are widely known, it may be worthwhile to mention briefly here those which are of interest to biological scientists. These functions are directed towards the promotion of basic research and education in the sciences by (a) assisting in the development of a national policy for the promotion of basic research and education in the biological sciences, (b) financial support of basic research, (c) awarding of graduate fellowships, (d) fostering of the interchange of scientific information.

What is the Foundation doing to discharge these obligations? The general operating policy of the Foundation is based on the philosophy that its primary mission is to en-

courage science. Science is now a large and very important component of our national culture, economy, and defense. This increasingly important role of science has led to a rapid rise in the level of expenditures in this area. Many federal and private agencies are engaged in the conduct or support of research. Most of these programs are aimed at specific objectives such as the improvement of health, agricultural practice, military defense, etc. Many of these operations overlap, but certainly all have a direct influence on the wellspring of our scientific resources—the colleges and universities of the nation.

The unprecedented growth of science and its increasing importance as a component of our social structure make it necessary that serious attention be given to the creation of policies for the safeguarding of this activity. The National Science Foundation considers that the "policy function" is one of its primary responsibilities. It is to be noted that basic research is specifically identified as the special area of consideration.

In recognition of this responsibility, recently reaffirmed in