

# Turtle trek tackles winds, open ocean

□ Transmitters  
attached to their  
shells track routes

By Helen Alfonn

Star-Bulletin

Did you ever wonder how fast and how far turtles travel at sea, or how they find their way through the open ocean from one speck of land to another?

Well, scientists in Hawaii did, so in August they decided to find the answers by tracking a pair of adult green sea turtles with small transmitters attached to their shells and linked to the Argos satellite system.

The two turtles traveled at a speed of about 1 mph for a month or more to reach Hawaii from French Frigate Shoals.

One swam 610 miles in 23 days; the other 680 miles in 26 days, both against prevailing winds and ocean currents.

The two turtles swam home to Kaneohe Bay, about 556 miles from their nesting area at French Frigate Shoals in the Northwestern Hawaiian Islands.

George Balazs, turtle specialist at the National Marine Fisheries Service Honolulu Laboratory, conducted the research assisted by personnel of the U.S. Fish and Wildlife Service, which has charge of the French Frigate Shoals National Wildlife Refuge.

The Argos system, sponsored by the United States and France, has two polar-orbiting satellites circling the Earth every 100 minutes. They track wildlife and drifting buoys that provide information on currents and other ocean features.

Honolulu Laboratory Director George Boehlert said Balazs was somewhat surprised that the two turtles here swam

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# TURTLES: Trek theory linked to magnetic field

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south of the island chain over open ocean.

Balazs had thought they might travel from island to island, using landmarks between French Frigate Shoals and the main Hawaiian Islands, Boehlert said.

However, the turtles followed the same route over deep water where there are no known navigational guideposts, he said.

Turtles are known to make long-distance migrations because of a tagging program Balazs has conducted here and at Johnston Atoll for many years, Boehlert said.

He has tagged thousands of male and female turtles at French Frigate Shoals, showing they migrate to breed there from seaweed foraging pastures scattered throughout the main Hawaiian Islands.

Some locations are as far as 800 miles apart.

But Boehlert said, "This is really

one of the first times we've got a good idea that there is some integrity to the movement pattern. We have never known the paths they've taken from one place to another."

Questions remain about their routes, travel speed and time, navigation method and whether they return to the exact foraging pastures.

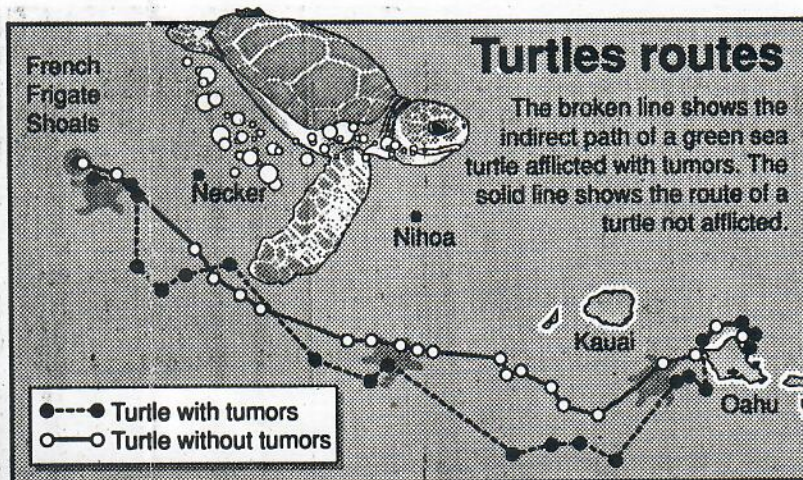
"With such few numbers, we don't have good ideas what mechanisms they use (to navigate)," Boehlert said.

One theory is they may use the Earth's magnetic field, he said. "It's even possible they might use celestial cues, the structure of stars."

The scientists hope to continue tracking the sea turtles by satellite to glean information needed to manage and conserve them as an endangered species, Boehlert said.

The scientists also are questioning if turtle migrations are affected by a disease afflicting many Hawaiian green turtles with tumors.

One turtle moderately affected by the disease, fibropapillomas, took a less-direct route and a longer time to reach Kaneohe Bay, Boehlert said.



Source: National Marine Fisheries Service

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He said the transmitter batteries are expected to last until December and scientists will keep tabs on the three turtles until then via the satellites.

They also will be on the lookout for the turtles to try to retrieve the transmission packages, which look like little backpacks with antennas coming out of them, Boehlert said.

Batteries could be replaced to reuse the transmitters, which would be ideal because each package costs about \$2,500, he said.

"Obviously, there is very high value in terms of the data that comes out of it. There is no other way (of getting the information, short of following the turtle, which would be virtually impossible."

Some transmitters also have been attached to monk seals in a Honolulu laboratory program at French Frigate Shoals to see how far offshore the animals go to get food, Boehlert said.

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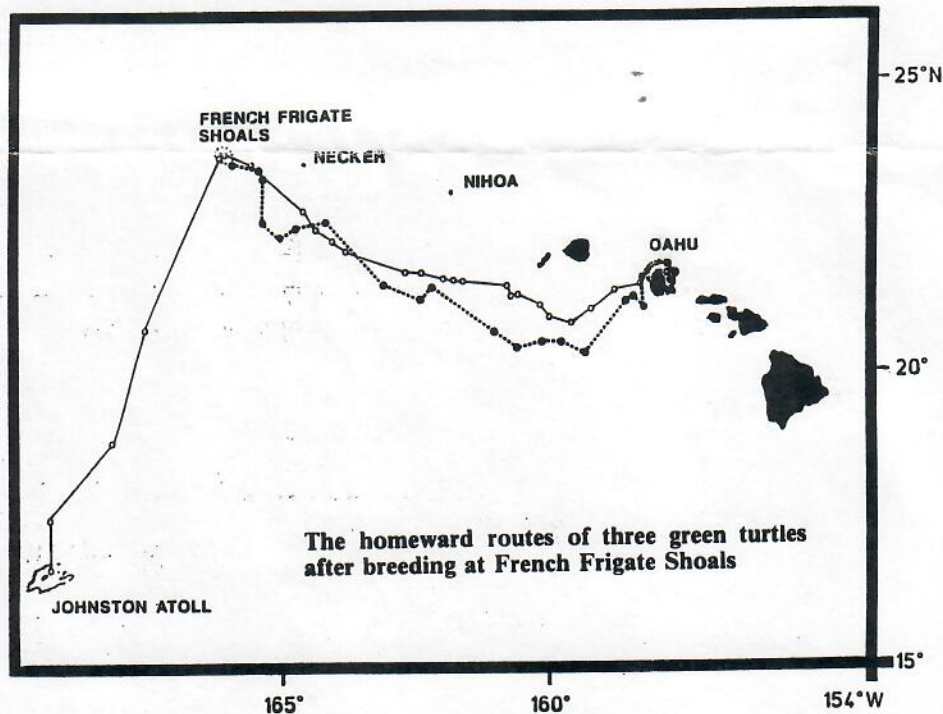
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NOV 1 1992

# turtles tracked on homeward voyages

In August 1992 scientists of the National Marine Fisheries Service Honolulu Laboratory attached small, satellite-linked transmitters to the shells of three adult green turtles nesting at French Frigate Shoals in the Northwestern Hawaiian Islands. The research was directed by George Balazs of the Honolulu Laboratory; personnel of the U.S. Fish and Wildlife Service, the agency responsible for the French Frigate Shoals National Wildlife Refuge, also assisted with the research project.

The Argos satellite system to which these transmitters are linked is jointly sponsored by the United States and France. Currently, two satellites in polar orbits circle the earth about every 100 minutes and receive signals from Argos-approved transmitters. The transmissions are initially relayed to France where the exact location of each signal is computed and forwarded with other data to an Argos facility in Maryland. These data are made available to researchers throughout North America. Argos satel-



lites are used to track a wide variety of wildlife. They are also used to track drifting buoys that provide information on currents and other oceanographic features.

Over a 4-week period all three turtles were successfully tracked during their homeward migrations across the high seas. Two of the turtles traveled to Kaneohe Bay on Oahu, and the third turtle swam directly to Johnston Atoll, located about 500 miles south of French Frigate Shoals. Both of the Kaneohe Bay-bound turtles followed approximately the same route, swimming well south of the island chain over open ocean. Scientists were surprised to find that the turtles did not travel from island to island, a route which offers short stepping stones and "landmarks" between French Frigate Shoals and the main Hawaiian Islands.

Instead, the turtles' chosen routes took them over exceedingly deep water where no known navigation guideposts exist.

The turtles traveled at an average speed of about 1 mile per hour, generally against prevailing winds and ocean currents. One turtle traveled 610 miles in 23 days and the other 680 miles in 26 days.

The transmitter batteries are expected to last until December and the whereabouts of all three turtles will be relayed by satellite until then. Sometime between now and December efforts will be made to recapture the turtles in Kaneohe Bay and retrieve the transmitters for reuse.

In the past, the use of metal flipper tags at French Frigate Shoals has demonstrated that adult green turtles, both male and female, migrate to breed at this remote location from

seaweed foraging pastures scattered throughout the main Hawaiian Islands. Some of these locations are as far away as 800 miles. However, there are many unanswered questions about these ocean voyages, including routes followed, travel speed, trip duration, method of navigation, and whether or not the turtles return to the exact foraging pastures.

The fibropapilloma disease currently affecting many green turtles in Hawaii also raises a question as to how this disease affects a turtle's ability to successfully accomplish these lengthy migrations. Long-distance tracking of sea turtles by satellite offers the potential to provide answers which are vital in the long-term management and conservation of Hawaiian green turtles as a protected species under the U.S. Endangered Species Act.