The Incidental Capture of Sea Turtles in the Atlantic U.S. Fishery Conservation Zone by the Japanese Tuna Longline Fleet, 1978-81

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Introduction

The incidental capture of threatened or endangered species of sea turtles by commercial fishing fleets in U.S. waters needs to be adequately addressed. Although several studies have been conducted concerning the incidental trawl catch of turtles by the shrimping fleet, the published information is limited (Hillestad et al., 1978; 1981). The quantification of the incidental capture rate of turtles by each fishery is necessary when formulating conservation and management strategies as mandated by the Endangered Species Act of 1973 and the Magnuson Fishery Conservation and Management Act of 1976. Analyzed in this paper is the incidental capture of sea turtles by the Japanese tuna longline fleet inside the Atlantic U.S. Fishery Conservation Zone.

ABSTRACT—The incidental capture of sea turtles by the Japanese tuna longline fleet in the Atlantic U.S. Fishery Conservation Zone is assessed for the years 1978 through 1981. The total estimated turtle catch is derived by multiplying the observed catch-per-unit-effort and the total reported effort from the Japanese fishing logbooks. The observed catch-per-unit-effort, survivability, and estimated total turtle captures varied considerably between the Atlantic Ocean and Gulf of Mexico. An estimated 330 turtles were captured, 126 in the Atlantic and 204 in the Gulf of Mexico. The central Gulf of Mexico may be major habitat for leatherback turtles in the western central Atlantic Ocean.

Materials and Methods

All foreign vessels wishing to fish inside the U.S. 200 n.mi. Fishery Conservation Zone (FCZ) must obtain a permit, maintain accurate fishing records showing amount and location of catch and fishing effort, release all nontarget species whether alive or dead, and allow U.S. observers on board vessels.

The Japanese tuna longline is fished from vessels ranging in length from 50 to 70 m. A mainline, 100-135 km long, is suspended horizontally from the surface by a series of floats (Fig. 1). Suspended vertically from the mainline is a series of branchlines, 15-25 m long, each line terminating with a hook baited with mackerel, saury, or squid. The longline is set between 0000 h and 0800 h from a moving vessel and hauled back from 1200 h to 0000 h. The fishery is dynamic, and changes in gear and methods frequently occur, depending on geographic location and target species fished. The Japanese tuna

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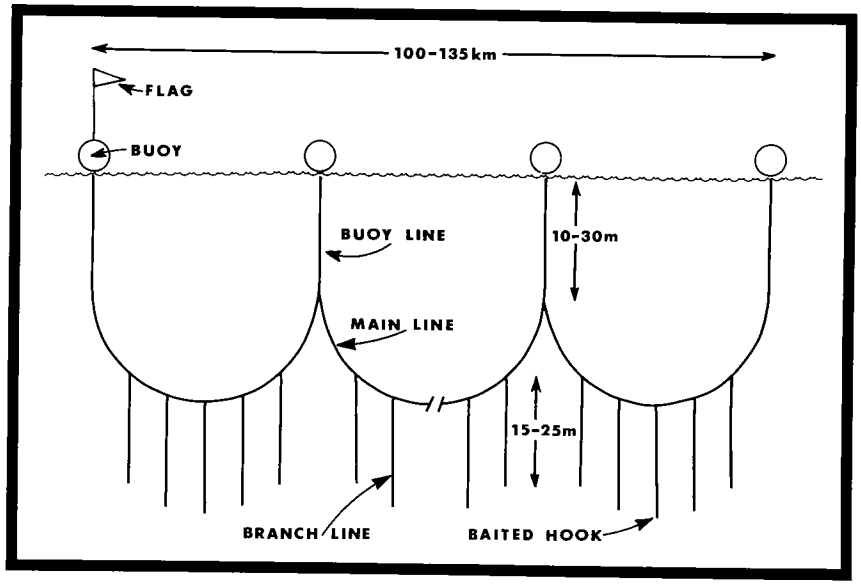

Figure 1.—Schematic diagram of a Japanese tuna longline in the fishing position, illustrating major structural components.

Table 1.—Total number of sea turtles observed captured in the Atlantic U.S. Fishery Conservation Zone by the Japanese tuna longline fleet, 1978-81.

Area and species	Total turtles	No. of live turtles	Percent alive
Atlantic			
Unknown turtles	25	17	68.0
Leatherback turtles	2	2	100.0
Total	27	19	70.4
Gulf of Mexico			
Unknown turtles	18	17	94.4
Leatherback turtles	12	11	91.6
Total	30	28	93.3

Table 2.—The observed and estimated total numbers of sea turtles incidentally captured in the Atlantic U.S. Fishery Conservation Zone by the Japanese tuna longline fleet, 1978-81.

Area	Total observed hooks	Total observed turtles	Number turtles per 10,000 hooks	Total reported hooks	Estimated number turtles captured
Atlantic	3,651,434	27	0.07388	17,031,122	126
Gulf of Mexico	1,662,273	30	0.18047	11,329,069	204
Total	5,313,707	57		28,360,191	330

longline fishery in the Gulf of Mexico has been described in detail by Lopez et al. (1979).

The data used to calculate the incidental catch of sea turtles are from the U.S. observer files and from the reported Japanese fishing logbooks; both data bases are maintained by the National Marine Fisheries Service's Southeast Fisheries Center. The incidental catch information was opportunistically collected during a tuna survey and therefore does not provide a comprehensive data base, temporally or spatially. It is felt that rigorous statistical analysis of the data would not be possible. Because observers were not on board all the Japanese tuna vessels, the total incidental turtle catch is derived by multiplying the observed turtle catch-per-unit-effort and the total reported effort from the Japanese fishing logbooks. Effort is expressed as 10,000 hooks fished. For this report, the U.S. Atlantic Ocean FCZ is divided into two subareas: Atlantic (off the eastern U.S. coast) and the Gulf of Mexico.

The turtles are arranged into two species groups, 1) unidentified and 2) leatherback, *Dermochelys coriacea*. Observers were often unable to identify turtles in the water from the deck of a moving vessel; the unidentified turtles are either green, *Chelonia mydas*; Kemp's ridley, *Lepidochelys kempi*; or loggerhead, *Caretta caretta*. Most unidentified turtles are probably loggerheads, however, because they are the most abundant species inhabiting the U.S. Atlantic Ocean FCZ (Carr, 1952; Ernst and Barbour, 1972; Rebel, 1974; Bacon, 1981; Carr et al., 1982).

Results and Discussions

The turtles incidentally captured on tuna longlines were either hooked in the mouth, hooked in the flipper-shoulder area, or tangled in the branchline. The often piscivorous loggerhead turtles are more likely than the other species to eat the bait and become hooked in the mouth. The leatherback feeds almost exclusively on Scyphomedusidae (Pritchard, 1971), probably will not take a baited hook, but is likely to become hooked in the flipper-shoulder area or tangled in the branchline. The large flipper span causes the leatherback to become easily entangled in branchlines and individuals have been known to continue swimming while hopelessly tangled in crab pot lines (Rudloe, 1979). The turtles could be captured while feeding or cruising at the surface when the longline is being set or hauled, or even when the longline is fishing between 25 and 55 m depth.

The total number of turtles observed captured in the Atlantic and Gulf of Mexico were evenly distributed—Atlantic, 27; Gulf, 30 (Table 1)—but the total percentage of turtles observed alive varied between these areas, 70.4 and 93.3 percent, respectively. This is reflected by the survivorship of the unknown turtles in the Atlantic, 68.0 percent, as opposed to 94.3 percent for those unknown turtles in the Gulf of Mexico. This difference in survival possibly reflects different fishing strategies used in the Atlantic Ocean and Gulf of Mexico. Also, the Atlantic longline fishery is frequently a winter fishery, and possibly the captured turtles may experience detrimental thermal shock.

The observed catch-per-unit-effort of sea turtles (Table 2) also varies between the Atlantic and Gulf of Mexico, 0.7388 and 0.18047, respectively. Despite a lower total fishing effort, there is a much greater chance of incidentally capturing sea turtles on a tuna longline in the Gulf of Mexico than in the Atlantic. However, the total estimated number of turtles incidentally captured is fairly small, 330, considering the enormity of the total fishing effort. Most of the turtles were captured in January through March in the Gulf of Mexico, and September through January in the Atlantic. These are months with the greatest fishing effort, and therefore, the data do not accurately reflect seasonal turtle abundance.

The geographic distribution of the majority of incidentally captured turtles (Fig. 2) indicates the concentration of fishing effort. The Atlantic longline effort is generally farther offshore in winter than where the usually large summer concentrations of sea turtles are normally found[1].

An interesting aspect of the Japanese longline data is the relatively

[1]Witzell, W. N., and T. Azarovitz. Relative abundance, thermal, and geographic distribution of sea turtles and hammerhead sharks off the Atlantic coast of the United States. Manuscr. in prep.

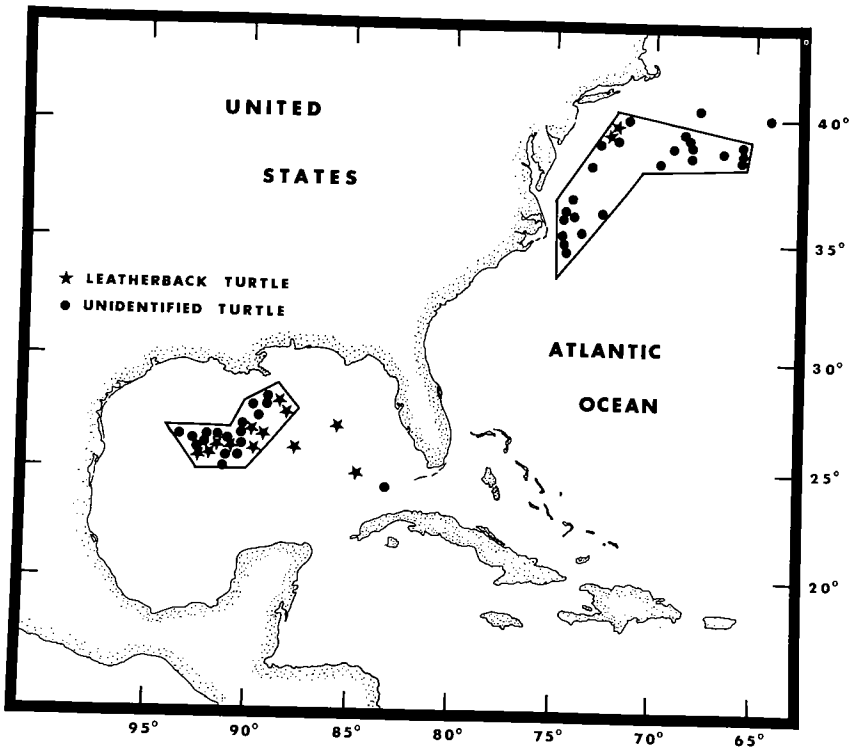

Figure 2.—Locations of incidentally captured sea turtles by the Japanese tuna longline fleet in the Atlantic U.S. Fishery Conservation Zone from 1978 through 1981: The total Japanese longline effort inside the polygons by Atlantic (56.1 percent) and Gulf of Mexico. (59.8 percent).

large numbers of leatherback turtles captured in the Gulf of Mexico. Concentrations of leatherbacks have previously been reported in the Gulf (Leary, 1957; Marquez, 1976), and post-nesting leatherbacks tagged in the Guianas (northeastern South America) have been recovered in the Gulf (Pritchard, 1976). This indicates that the central Gulf of Mexico may be a major habitat for leatherbacks in the western central Atlantic Ocean.

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