SEA TURTLE STRANDINGS AND SHRIMPING EFFORT ON COASTS OF SOUTHWESTERN LOUISIANA AND TEXAS

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Strandings of sea turtles increase during commercial shrimping seasons and decrease with closing of the seasons on the Atlantic coast of the United States (Hillestad et al., 1978; Talbert et al., 1980; Ruckdeschel and Zug, 1982; Booker and Ehrhart, 1989; Schroeder and Maley, 1989). Texas and Louisiana produced almost 74% of the offshore (seaward of barrier islands) commercial catch of penaeid shrimp in the southeastern United States during 1986-1989, yet the relationship between turtle strandings and shrimping in the northwestern Gulf of Mexico has received limited attention (Rabalais and Rabalais, 1980; Amos, 1989; Whistler, 1989; Magnuson et al., 1990). We examined the relationship between sea turtle strandings (at sea or on shore) and shrimping effort during 1986-1989, the years in which year-round systematic surveys of strandings were conducted along the coasts of southwestern Louisiana and Texas.

Monthly turtle strandings (all species) and shrimp fishing effort were grouped into two zones, the upper coast (subareas 17-18) and the lower coast (subareas 19-21)(Figure 1). The upper coast has a wider Continental Shelf than the lower, so the distance from shore of a particular depth contour is greater on the upper than on the lower coast. In the upper coast zone we included only those strandings that occurred west of the Mermentau River, Louisiana, because the coastline east of the Mermentau had not been systematically surveyed for strandings. The number of monthly strandings in a zone was standardized by dividing it by distance of shoreline surveyed within the zone to obtain S, the monthly turtle strandings per 100 km of shoreline.

Monthly fishing effort was standardized by dividing it by the surface area (Patella, 1975) of the geographic unit (zone x depth interval) within which the effort occurred. The standardized effort (E) was expressed as days fished per 100 km^2 of surface area within each geographic unit. The surface area within geographic units was usually greatest nearshore and decreased seaward (Fig. 1).

Standardized strandings and fishing effort were normalized by transformation to natural logarithms (after the addition of 1 to each value, because some values were zero). The data sets for each geographic unit contained 48 pairs of observations (12 months x 4 years). Product-moment correlations between $\ln(S + 1)$ and $\ln[E + 1]$ were determined, first for depth interval 0-5 fathoms, then 5-10 fathoms and so on to 25-30 fathoms (45.7-54.9 m), for each of the two zones. We did not extend the analyses beyond 30 fathoms (54.9 m), because only 7% or less of the shrimping effort and shrimp catch within shrimp statistical subareas 17-21 occurred beyond 30 fathoms during 1986-1989.

On the upper coast, three correlation coefficients, r, were significantly different from zero ($P < 0.05$), and also were positive (Fig. 2). They occurred for fishing effort in the 0-5, 5-10 and 10-15 fathom intervals. On the lower coast, r was significantly different from zero ($P < 0.05$) and positive for fishing effort in the 5-10 and 10-15 fathom intervals. These correlations indicated that strandings increased as fishing effort increased. They were detected despite the relatively coarse temporal-spatial scale of the observations. There was no significant ($P > 0.05$) heterogeneity among the five significant correlations. Correlation coefficients for the remaining depth intervals within the two zones did not differ significantly ($P > 0.05$) from zero.

The correlations we observed were circumstantial evidence, and did not demonstrate that the strandings were caused by shrimping. However, our results are consistent with the conclusion by Magnuson et al. (1990) that incidental capture in shrimp trawls is a major cause of sea turtle mortality and it occurs for the most part in depths up to 27 m (15 fathoms).

Loggerhead (Caretta caretta) and Kemp's ridley (Lepidochelys kempi) occurred most frequently in the strandings, followed by hawksbill (Eretmochelys imbricata), green (Chelonia mydas) and leatherback (Dermochelys coriacea). Turtle strandings occurred year-round with peaks in April and May, and with a secondary peak in August.

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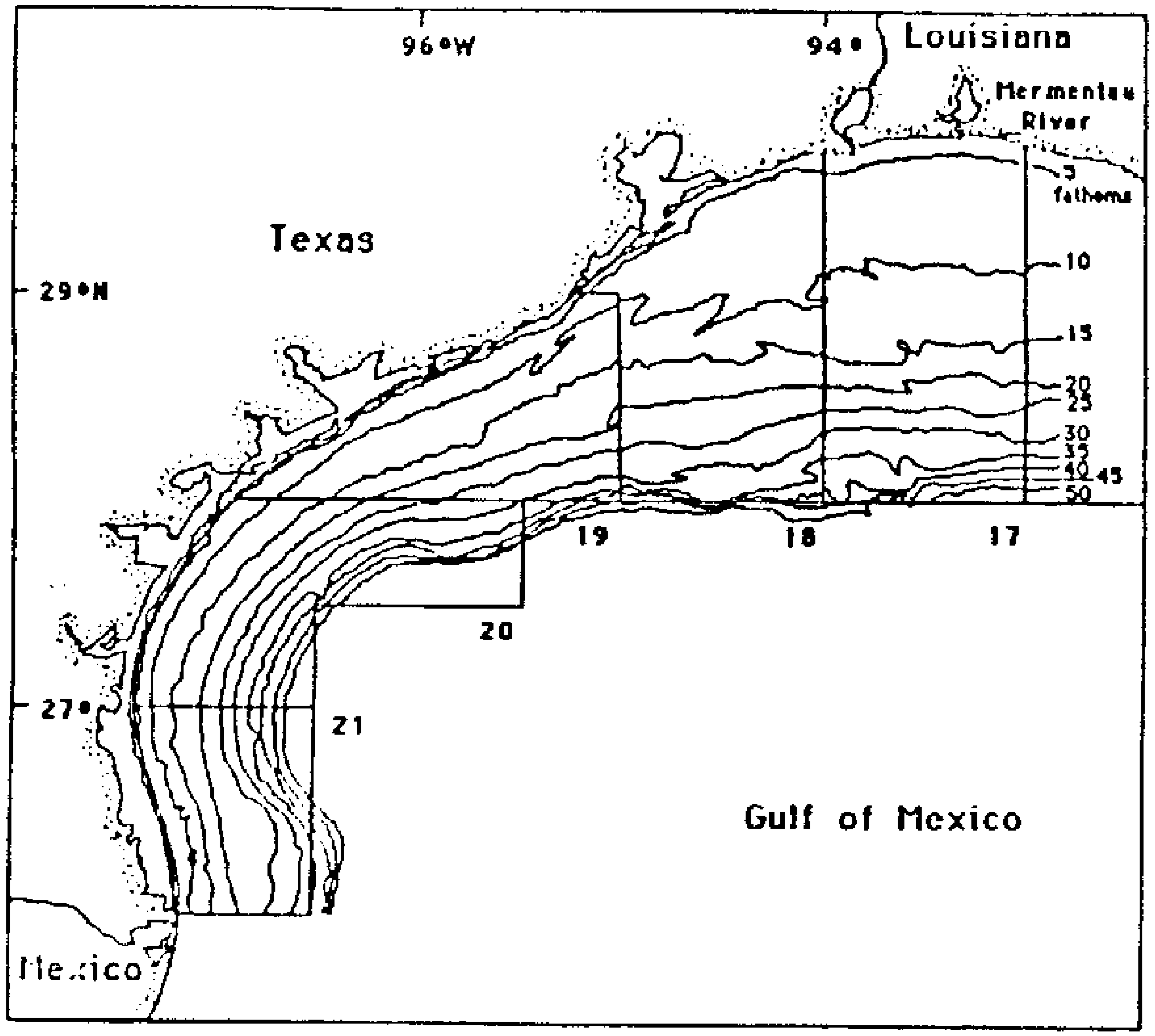

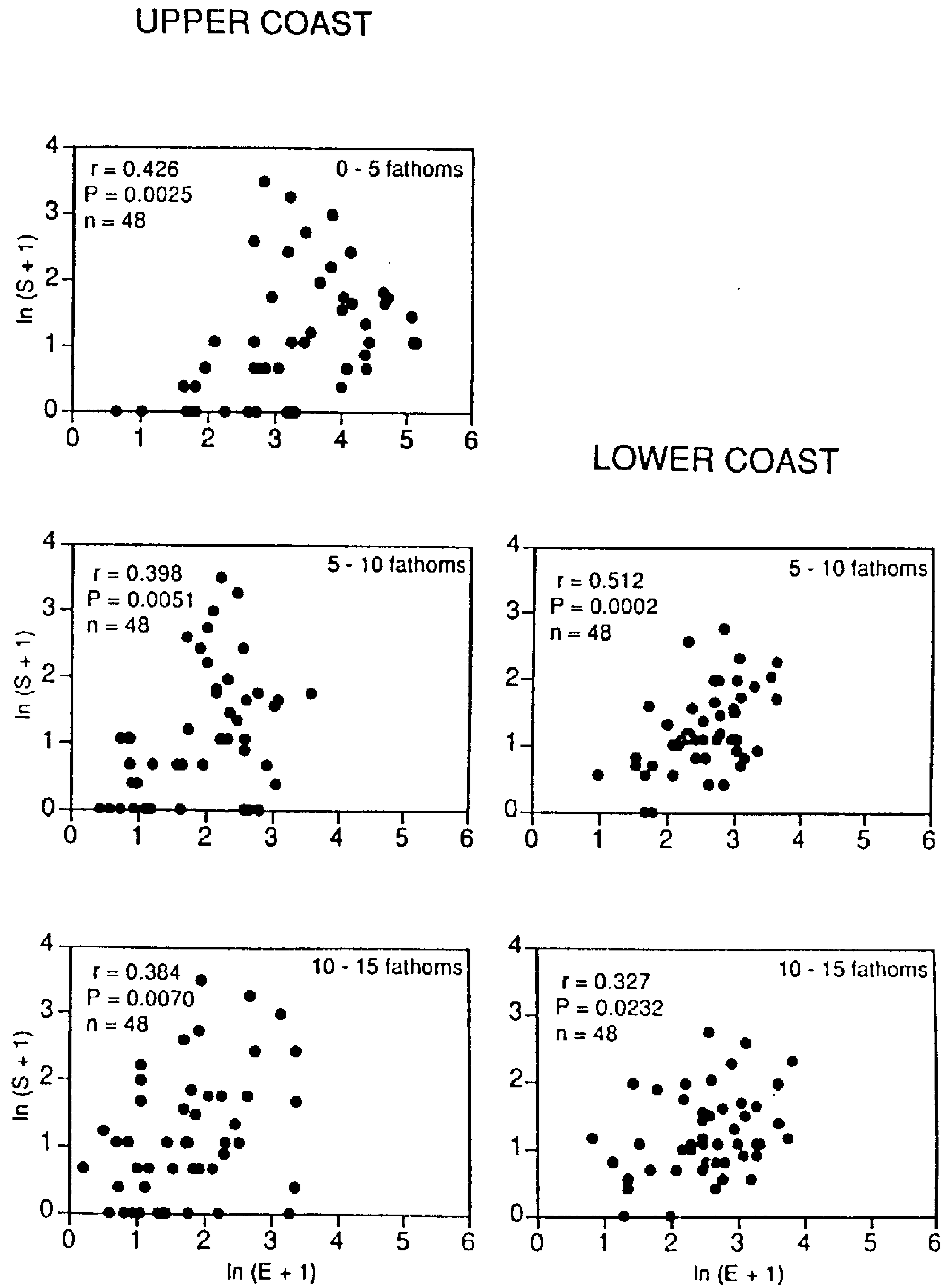

FIGURE CAPTIONS

Figure 1. - Boundaries of shrimp statistical subareas 17-21 and 5-fathom (9.1 m) depth intervals in the northwestern Gulf of Mexico (see Patella, 1975).

Figure 2. - Scatter plots for significant ($P < 0.05$) correlations, r, between transformed monthly sea turtle strandings, $\ln(S + 1)$, and transformed monthly shrimping effort, $\ln(E + 1)$, on the upper coast (shrimp statistical subareas 17-18) and lower coast (subareas 19-21) of the northwestern Gulf of Mexico, 1986-1989.