



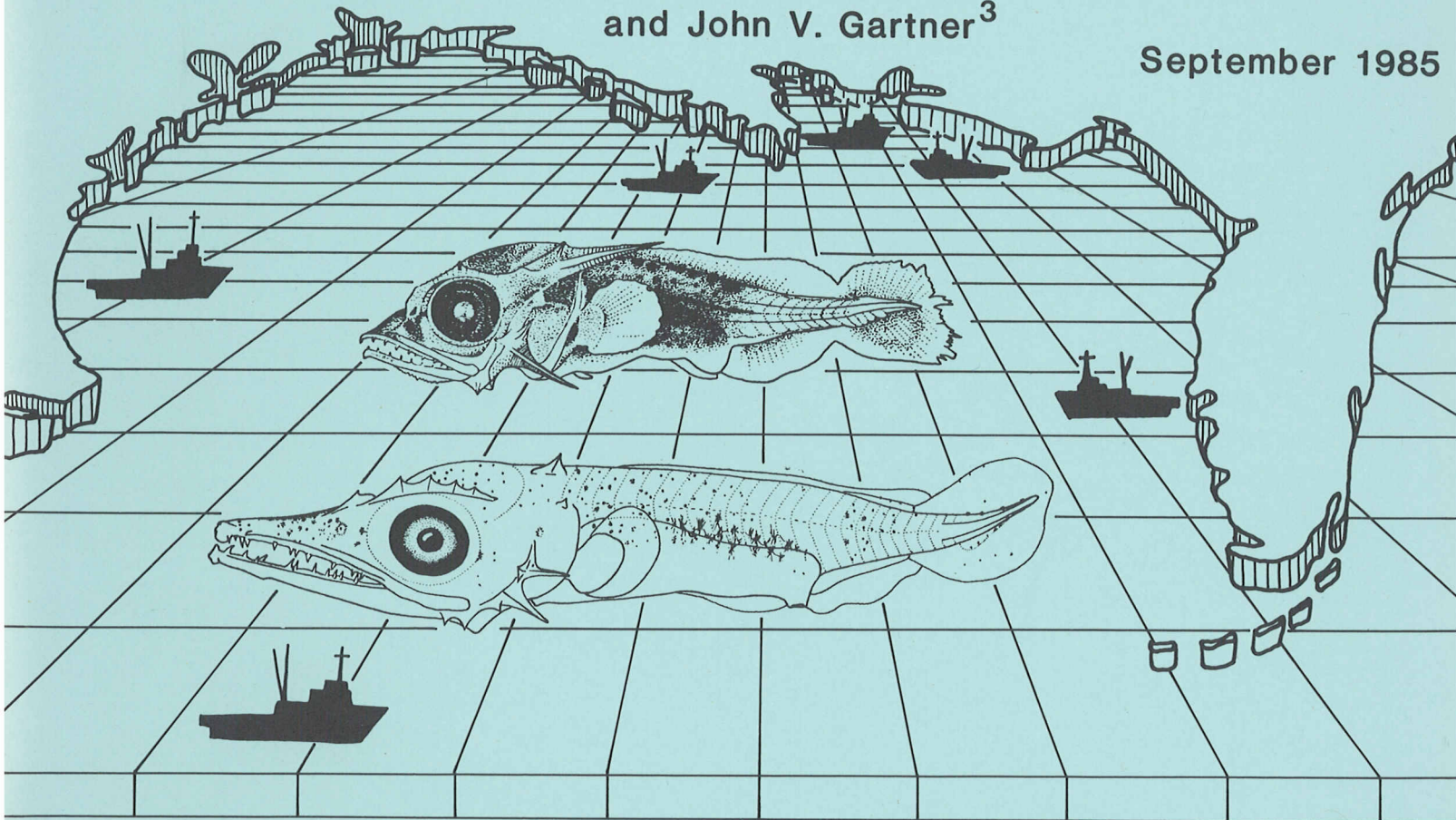
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SEAMAP 1983- ICHTHYOPLANKTON

Larval Distribution and Abundance of Engraulidae, Carangidae,
Clupeidae, Lutjanidae, Serranidae, Sciaenidae, Coryphaenidae, Istiophoridae,
Xiphiidae, and Scombridae in the Gulf of Mexico

Sharon Kelley¹, Thomas Potthoff¹, William J. Richards¹, Leonard Ejsymont,²
and John V. Gartner³

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¹U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Center
Miami Laboratory
75 Virginia Beach Drive
Miami, Florida 33149

²Sea Fisheries Institute
Plankton Sorting and Identification Center
ul. Kazimierza Krolewicz 4 - Pawilon E
Fl-550 Szczecin, Poland

³Seamap Archiving Center
Florida Department of Natural Resources
Marine Research Lab.
100 - 8th Avenue, S.E.
St. Petersburg, Florida 33701

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January 1986

U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Anthony J. Calio, Acting Administrator
NATIONAL MARINE FISHERIES SERVICE
William G. Gordon, Assistant Administrator for
Fisheries

The second area-wide ichthyoplankton survey under the Southeast Area Monitoring and Assessment Program (SEAMAP) was conducted throughout 1983, except during January, February and August in U.S. waters of the Gulf of Mexico. The first survey was in 1982 (see "SEAMAP-Ichthyoplankton", NOAA Technical Memorandum NMFS-SEFC-144). Participating vessels were from the National Marine Fisheries Service, the States of Florida, Alabama, Mississippi, and Louisiana, University of Miami and Florida Institute of Oceanography (Fig. 1, Table 1). A 60 cm bongo net was sent to 200 m and towed to the surface (oblique tow) or it was sent to within 5 m of the bottom in depths less than 200 m; a 20 cm bongo net was used for oblique tows by the States of Alabama and Louisiana in shallow coastal waters; a 1/2 m ring net was used by the State of Louisiana for surface tows in shallow coastal waters; and a 1x2 m neuston net was towed at the surface for 10 minutes by most vessels in conjunction with the oblique 60 cm bongo net tow. The number of samples collected in 1983 is shown in Table 2 where the numbers can be compared to those samples collected in 1982. All neuston tow samples and one sample from each bongo tow collected in 1983 were sorted for fish larvae at the Polish Plankton Sorting and Identification Center in Szczecin, Poland. The other sample from each bongo tow will be deposited at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi for archiving. The sorted larvae were identified to lowest taxon possible, counted and measured under the supervision of Ejsymont. Then the ichthyoplankton samples were returned to the National Marine Fisheries Service's Southeast Fisheries Center laboratory in Miami. Here Richards, Potthoff and Kelley verified Polish identifications of scombrids. Kelley verified identifications of chaetodontids and pomacanthids. Potthoff and Richards verified gempylid identifications. A data base had been developed for the 1982 SEAMAP samples (NOAA Technical Memorandum NMFS-SEFC-144). The fish larvae

during the 1983 SEAMAP survey were added to that data base on the computer at the Southeast Fisheries Center, Miami, Florida. The larvae were transferred to the SEAMAP Ichthyoplankton Archiving Center (SAC), Florida Department of Natural Resources, Marine Resource Laboratory, 100 Eighth Avenue, S.E., St. Petersburg, FL 33701-5095, where they are archived by Gartner. Additionally, anguilliform larval identifications were updated by M.M. Leiby and post-metamorphic myctophids were updated by J.V. Gartner of SAC. Taxa of larval fishes are loaned to qualified researchers upon request. The identifications made by the Polish Plankton Sorting Center will be updated by these scientists who borrow individual larval fish groups.

In this paper, charts of selected fish taxa show distribution and abundance. For tows that had flow meters attached to the frame (20 and 60 cm bongo tows) the number of larvae under 10 square meters of sea surface was estimated and plotted. For 1x2 m neuston net tows, which did not have flow meters, the actual number of larvae was plotted. The center of the circle on the plots determines the position of capture, the diameter of the circle determines either the estimated number under 10 square meters of sea surface or the actual number of larvae caught. The radius in the circle determines the date: the full 360° circle represents one year, thus each clockwise degree approximately equals one day. The small crosses signify presence of larvae from tows where abundance estimates could not be made because of absence of flow meters (1/2 m ring net tows) or erroneous flow meter readings. The plots of families only include larvae that could not be identified to genus and species. For example, the taxon "Carangidae" contains larvae that could not be identified by the Polish Plankton Sorting Center to a lower taxon such as Caranx sp. or Caranx hippos. The same is true for the following families: Engraulidae, Sciaenidae, Clupeidae, Lutjanidae, Serranidae, Istiophoridae. The numbers of specimens caught in these families is great compared to the numbers identified to lower taxa (Table 3). However, the number of identifications to lower taxa was much greater in 1983 than in 1982.

In Table 3 the taxa and number of individuals caught during SEAMAP 1983 are listed phylogenetically. In Table 4 are listed the 20 most numerous taxa from SEAMAP 1982 and 1983, and their actual number captured. Twelve taxa from the 1982 list were present on the 1983 list, but ranked differently for each year.

The following ichthyoplankton data are available upon request:

1. List of SEAMAP 1983 participants, vessel, cruise, number of stations, SEAMAP sample numbers, gear and mesh size, cruise dates and affiliation (Table 1).
2. List of stations for participating vessels containing SEAMAP sample numbers, position, sampling date and time, gear, maximum sampling depth, volume of water filtered by net, and zooplankton displacement volumes for bongo net tows. Table 5 is an example of the printout.
3. List of all larval fish taxa caught during SEAMAP 1983 arranged alphabetically containing vessel, cruise, station, SEAMAP sample number, gear, mesh, capture position, date and time of capture, number captured, length measurement and computed number of larvae under 10 square meters of sea surface for bongo tows with flow meters. Table 6 is an example of the printout.
4. List of all plankton tows during SEAMAP 1983 arranged by cruise containing the following information for each tow: SEAMAP sample number, position, time and date of sampling, gear and mesh size, zooplankton displacement volume, maximum sampling depth, volume of water filtered by bongo net, standard haul factor of bongo tow, distance traveled by bongo net, ichthyoplankton taxa present in tow, their number and lengths and computed number of larvae under 10 square meters of sea surface for bongo tows with flow meters. Table 7 is an example of the printout.

5. Phylogenetically arranged list of taxa and their numbers captured during SEAMAP 1983 (Table 3).

Research on larvae caught during SEAMAP 82, 83 has started. The groups of fish larvae that are being worked on and the number of loan requests are shown in Table 8. Following is a list of manuscripts, reports and accepted publications that resulted from loaned SEAMAP 1982, 1983 material.

Fahay, M.P. MS. Relationships and systematics of Steindachneria based on its ontogeny. Workshop on Gadiform Systematics, Los Angeles County Museum, January 1986.

McGowan, M.F., and W.J. Richards. MS. Distribution and abundance of bluefin tuna (Thunnus thynnus) larvae in the Gulf of Mexico in 1982 and 1983 with estimates of the biomass and population size of the spawning stock for 1977, 1978, and 1981-83. International Commission for the Conservation of Atlantic Tunas.

Shaw, R.F., and D.L. Drullinger. 1985. Early life history of coastal pelagic finfish off Louisiana. Report to Louisiana Board of Regents.

Potthoff, T., S. Kelley and J.C. Javech. MS accepted. Cartilage and bone development in scombroid fishes. Fish. Bull., U.S.

The following are brief accounts for the 46 plots of 1983 abundance and distribution of larval fishes and brief comparisons with the 1982 plots (see SEAMAP 1982 - Ichthyoplankton, NOAA Tech. Mem. NMFS-SEFC-144).

Carangidae, Figures 3-5. Jack larvae were captured in the northern half of the Gulf of Mexico during all months sampled, but most of them occurred during May and June. The distribution of jack larvae captured in 1982 was similar to 1983.

Clupeidae, Figures 6-8. Herring larvae were mostly captured in the shallow water shelf areas from Texas to Florida. The largest concentrations were found in June along the west coast of Florida, although larvae were present during most months sampled. The occurrence and abundance of herring larvae in 1982 was similar to 1983.

Coryphaena sp., Figure 9. This taxon represents those small dolphin fish larvae less than 5.0 mm NL, which could not be identified to species. All were captured in May 1983, mostly over deep water in the central Gulf of Mexico. In 1982 the occurrence and abundance of dolphin fish larvae was similar, except in 1982 we reported neuston tow captures of Coryphaena sp. In 1983 all dolphin fish from neuston net tows were identified to species.

Coryphaena hippurus, Figures 10, 11. Few common dolphin larvae were captured in bongo tows and more were caught in neuston nets, indicating their predominant occurrence at the sea surface. The larvae are distributed in the northern Gulf of Mexico shelf waters and above all deep water where sampling took place in 1983. Most common dolphin larvae were captured in May and June, but a few captures were in September and October. In 1982 the abundance and distribution for common dolphin was similar for neuston tows, but more larvae were caught in 1982 in bongo net tows than in 1983.

Coryphaena equisetis, Figures 12, 13. Only a few pompano dolphin larvae were caught in 1983 in bongo and neuston net tows in the northern Gulf of Mexico, both over shallow shelf and deep oceanic waters. Almost all pompano dolphin larvae were caught in April, May and June. In 1982, pompano dolphin larvae were not captured in bongo nets. Their distribution from neuston tows was more oceanic in 1982 than in 1983.

Engraulidae, Figures 14-17. Anchovy larvae were the most abundant taxon captured in 1983. They were most widely and numerous distributed adjacent to and in shelf waters from Texas to Alabama both in neuston and bongo net tows. Fewer larvae were captured in Florida waters. Most captures of anchovies were in April, May and June with some captures in March, October, November and December. A similar distribution and abundance was reported for anchovy larvae in 1982.

Istiophoridae, Figures 18, 19. Sailfish and marlin larvae are difficult to separate in the larval stage. Most larvae captured are probably sailfish, judging from adult abundances. In 1983, sailfish larvae were distributed adjacent to northern shelf waters and in the oceanic realm of the Gulf of Mexico from both bongo and neuston net tows. All were captured in April, May and June, except a bongo tow capture in the Gulf Stream off Palm Beach, Florida in the middle of September. The distribution and abundance of sailfish in 1982 was similar to that of 1983.

Lutjanidae, Figures 20-22. Snapper larvae were distributed over shelf and adjacent waters along the coasts of the Gulf of Mexico from Texas to Florida during 1983. More captures of snapper larvae were done by bongo nets than by neuston nets. This may indicate that snapper larvae are distributed from the surface down to deeper water. Most captures were in June and October, but a few were in May, September and November. The distribution of snapper larvae in 1982 was similar in 1983, but more were caught in neuston tows in 1982 than in 1983.

Sciaenidae, Figures 23-25. During SEAMAP 1983 drum and croaker larvae were captured from both bongo and neuston net tows mostly in shelf waters from Texas to Florida, with a few oceanic occurrences. There was a greater number of occurrences of drum and croaker larvae from bongo net tows when

compared to neuston net tows, indicating a subsurface distribution. The larvae occurred during all months sampled. In 1982 the distribution and abundance of drum and croaker larvae was similar to 1983. In 1982, as in 1983, there was a greater occurrence of the larvae from bongo net tows than from neuston net tows.

Auxis sp., Figures 26, 27. Frigate and bullet mackerel larvae cannot be separated to species. They occurred frequently in both bongo and neuston net tows mostly in oceanic waters and in a few places over the shelf. Of all scombrids, the frigate and bullet mackerels were the most frequently captured in 1983 followed by Thunnus atlanticus (Figs. 34, 35). Bullet and frigate mackerel larvae were captured from April to November, but mostly during May and June. Their distribution and abundance in 1982 was very similar to that of 1983.

Euthynnus alletteratus, Figures 28, 29. Little tunny larvae were of low abundance in 1983, both in neuston and bongo net tows. Most were caught in shelf waters, but some were oceanic. The majority was captured in May and June, but one capture was in April and another in November. In 1982 many more little tunny were captured in bongo tows than in 1983. In 1982 there were more frequent captures of little tunny from neuston tows in 1982 than in 1983.

Katsuwonus pelamis, Figures 30, 31. Skipjack tuna larvae from both bongo and neuston net tows occurred predominantly in oceanic waters in the eastern Gulf of Mexico in 1983. A few occurrences were in the western Gulf. The larvae were captured during April, May, June and October. In contrast to 1983's low abundance and limited eastern distribution, skipjack tuna larvae were abundantly distributed over the entire oceanic northern half of the Gulf of Mexico in 1982.

Thunnus sp., Figures 32, 33. These small tuna larvae could not be identified to species and probably are mostly yellowfin tuna (T. albacares). Most captures of Thunnus sp. larvae in 1983 were in the eastern Gulf of Mexico, predominantly in oceanic waters. A few occurrences were in the western Gulf and a few were over the shelf. The distribution of Thunnus sp. in 1983 was similar to that of skipjack tuna, but for bongo net tows only. In neuston tows, only four Thunnus sp. larvae were captured at four stations in 1983. Thunnus sp. larvae were mostly captured in May and June. Three occurrences were in September and December. In 1982, Thunnus sp. larvae were distributed over the entire oceanic northern half of the Gulf of Mexico and in greater abundance than in 1983.

Thunnus atlanticus, Figures 34, 35. In 1983, blackfin tuna larvae from bongo and neuston net tows occurred predominantly in the oceanic waters of the eastern Gulf of Mexico, with a few occurrences in the western Gulf. Most captures were in May and June, a few were in April and December. In 1982 blackfin tuna larvae were distributed more or less evenly in oceanic waters across the entire northern half of the Gulf of Mexico.

Thunnus thynnus, Figures 36, 37. In 1983, bluefin tuna larvae were entirely absent in the northern half of the western Gulf of Mexico, but occurred in oceanic waters of the eastern Gulf of Mexico in moderate abundance during May only. Bluefin tuna larvae were much more widely distributed in 1982 than in 1983 and covered the oceanic waters of the northern half of the Gulf of Mexico.

Scomberomorus sp., Figures 38, 39. Three species of this mackerel genus are found in the Gulf of Mexico: S. maculatus, S. cavalla and S. regalis. At times, smaller mackerel larvae cannot be identified to species with certainty. These unidentified mackerel species occurred in 1983 over the

shelf of the northern Gulf of Mexico both from bongo and neuston net tows during May and June.

Scomberomorus maculatus, Figures 40, 41. In 1983, Spanish mackerel were caught by bongo and neuston net tows over shelf waters in the northern Gulf of Mexico from Alabama to Texas with one occurrence in Florida waters. All captures were from May and June. The distribution and abundance of Spanish mackerel larvae was very similar in 1982.

Scomberomorus cavalla, Figure 42. We can only report two occurrences of king mackerel larvae in May and June of 1983, one on the shelf, the other in oceanic waters. The king mackerel were caught in bongo net tows, none were present in neuston tows. In 1982, more king mackerel larvae were caught than in 1983, and in 1982 they only occurred in the northeast half of the Gulf both from bongo and neuston net tows.

Acanthocybium solanderi, Figure 43. Wahoo larvae were captured during May and June 1983 near the edge of the Florida shelf on three locations in the southwestern Gulf of Mexico. In 1982, wahoo larvae were caught on two locations in the vicinity of the 1983 capture sites.

Serranidae, Figures 44-46. Sea bass or grouper larvae were very abundant in 1983 over the entire sampling area of the northern half of the Gulf of Mexico, both from bongo and neuston net tows. The larvae were captured during all seasons, but most occurrences were in May and June. The 1982 abundances and distributions for sea bass larvae were similar to those in 1983.

Xiphias gladius, Figures 47, 48. In 1983, swordfish larvae occurred in low abundance in the oceanic waters of the central Gulf of Mexico during May only. Bongo nets caught swordfish only at one location, neuston nets caught them at five locations. This supports the concept that swordfish

larvae only occur at the surface of the ocean. In 1982, numerous swordfish larvae were captured in neuston tows over a wide oceanic area of the Gulf, but there were only four occurrences from bongo net tows.

Acknowledgments

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Figure 47. Estimated number of Xiphias gladius under 10 square meters of sea surface from bongo and ring net tows.

Figure 48. Actual number of Xiphias gladius caught by 1x2 m neuston net tows.

Table 1. SEAMAP 1983 Participants

Vessel	Cruise Number	Station Numbers	Seamap Numbers	Gear	Mesh, mm	Dates, 1983	Affiliation
Oregon-II	134	39065-39198	1139-1471	60cm Bongo 1x2m Neuston	.333 .947	4/22 - 5/23	National Marine Fisheries Service, NOAA
Alabama-23	135	7 Stations	1472-1485	20cm Bongo	.333	6/9 - 6/30	Alabama Dept. of Conservation and Natural Resources
Hernan Cortez	01	8301-8316	1486-1533	60cm Bongo 1x2m Neuston	.333 1.000	6/26 - 6/29	Florida Dept. of Natural Resources
Hernan Cortez	02	8317-8335	1534-1590	60cm Bongo 1x2m Neuston	.333 1.000	7/12 - 7/19	Florida Dept. of Natural Resources
Delaware-II ¹	37	333-620	1591-1638	60cm Bongo 1x2m Neuston	.333 .947	5/29 - 6/20	National Marine Fisheries Service, NC
Tommy Munro	135	B178 - A7	1639-1673	60cm Bongo 1x2m Neuston	.333 .947	6/7 - 6/14	Gulf Coast Research Laboratory, Mississippi
Calanus ¹	12	10 Stations	1675-1684	1x2m Neuston	.947	9/14 - 9/18	University of Miami
Suncoaster	01	B183- B172	1685-1701	60cm Bongo 1x2m Neuston	.333 .947	6/28 - 7/18	Florida Institute of Oceanography
Small Boat	02	04023-06001	1703-1735	1/2m Ring	.333	6/13 - 6/16	Louisiana Dept. of Wildlife and Fisheries
Small Boat	03	07005-06001	1736-1765	1/2m Ring	.333	6/21 - 6/23	Louisiana Dept. of Wildlife and Fisheries
Small Boat	04	03101-03103	1766-1771	20cm Bongo	.333	7/5	Louisiana Dept. of Wildlife and Fisheries
Oregon-II	140	40163-40195	1772-1841	60cm Bongo 1x2m Neuston	.333 .947	12/7 - 12/21	National Marine Fisheries Service, NOAA
Small Boat	05	01001-07005	1842-1883	20cm Bongo	.333	10/17 - 11/17	Louisiana Dept. of Wildlife and Fisheries
Tommy Munro	RD83	1-3	1884-1889	60cm Bongo	.333	10/18 - 10/19	Gulf Coast Research Laboratory, Mississippi
Oregon-II	135	39199-39443	1890-2033	60cm Bongo 1x2m Neuston	.333 .947	6/01 - 7/13	National Marine Fisheries Service, NOAA
Oregon-II	133	38604-38617	2133-2162 3339-3351	60cm Bongo 1x2m Neuston	.333 .947	3/13 - 3/15	National Marine Fisheries Service, NOAA
Oregon-II	138	39580-39859	3352-3454	60cm Bongo 1x2m Neuston	.333 .947	10/12 - 10/31	National Marine Fisheries Service, NOAA

¹Surveyed: not a SEAMAP cruise, but SEAMAP numbers were assigned to the samples.

Table 2. Number of samples taken during SEAMAP 1982 and 1983.

	1982		1983	
	Number processed	Number missing or destroyed**	Number processed	Number missing or destroyed**
1x2 m neuston tow samples (sorted)	270	25	292	29
60 cm bongo tow samples (sorted)	527*	13	366	64
60 cm bongo tow samples (not sorted)	261	--	302	--
1/2 m ring net samples (sorted)	43	0	63	0
20 cm bongo tow samples (sorted)	0	0	3	0
20 cm bongo tow samples (not sorted)	0	0	3	0
Total	<u>1,101</u>	<u>38</u>	<u>1,029</u>	<u>93</u>
Grand Total	1,139		1,122	

*Only one sample per bongo tow was received from Mexico.

**These samples were not received in Miami and therefore not shipped to Poland, or they were broken during shipment from ship to Miami or Miami to Poland.

Table 3. Ichthyoplankton taxa, number of lots, and total number of individuals for SEAMAP 1983, arranged phylogenetically.

TAXA	LOTS	TOTAL
CLUPEIFORMES	23	8256
CLUPEIDAE	142	7044
<u>Brevoortia</u> sp.	2	80
<u>Etrumeus</u> sp.	6	225
<u>Etrumeus teres</u>	10	1157
<u>Harengula jaguana</u>	4	49
<u>Jenkinsia lamprotaenia</u>	2	3
<u>Opisthonema oglinum</u>	2	2
<u>Sardinella</u> sp.	1	10
ENGRAULIDIDAE	166	11904
<u>Anchoa</u> sp.	7	279
<u>Anchoa hepsetus</u>	24	537
<u>Anchoa mitchilli</u>	14	426
<u>Engraulis eurystole</u>	35	322
ELOPIFORMES		
ELOPIDAE		
<u>Elops saurus</u>	2	2
MEGALOPIDAE		
<u>Megalops atlanticus</u>	1	3
ANGUILLIFORMES	53	208
ANGUILLIDAE		
<u>Anguilla rostrata</u>	1	1
MORINGUIDAE	7	15
NEMICHTHYIDAE	1	1
MURAENIDAE	18	25
MURAENIDAE		
<u>Gymnothorax</u> sp.	1	1
<u>Anarchias yoshiae</u>	1	1
SYNAPHOBRANCHIDAE	1	1
CONGRIDAE	87	258
<u>Ariosoma balearicum</u>	1	2
MURAENESOCIDAE	5	5
NETTASTOMATIDAE	30	73
OPHICHTHIDAE	83	271
<u>Ophichthus</u> sp.	18	23
<u>Ophichthus puncticeps</u>	1	1
<u>Myrophis punctatus</u>	18	45
<u>Pseudomyrophis</u> sp.	1	3
SALMONIFORMES		
ARGENTINIDAE	21	33
<u>Microstoma</u> sp.	3	3
<u>Microstoma microstoma</u>	2	2
BATHYLAGIDAE	22	32
<u>Bathylagus</u> sp.	14	21

Table 3 - Continued

TAXA	LOTS	TOTAL
GONOSTOMATIDAE	104	476
<u>Cyclothone</u> sp.	163	564
<u>Gonostoma</u> sp.	10	15
<u>Gonostoma atlanticum</u>	5	5
<u>Gonostoma elongatum</u>	3	3
<u>Vinciguerria</u> sp.	53	116
<u>Vinciguerria attenuata</u>	53	133
<u>Vinciguerria nimbaria</u>	81	179
<u>Vinciguerria poweriae</u>	41	95
<u>Diplophos taenia</u>	2	2
<u>Margrethia obtusirostre</u>	1	1
<u>Pollichthys maui</u>	23	49
<u>Bonapartia</u> sp.	1	1
<u>Bonapartia pedalotia</u>	2	2
<u>Valenciennellus</u> sp.	1	3
<u>Valenciennellus tripunctulatus</u>	13	27
<u>Maurolicus muelleri</u>	98	1192
STERNOPTYCHIDAE	16	33
<u>Argyropelecus</u> sp.	5	7
<u>Argyropelecus hemigymnus</u>	1	1
<u>Argyropelecus aculeatus</u>	1	1
<u>Sternoptyx</u> sp.	47	104
CHAULIODONTIDAE	11	18
<u>Chauliodus</u> sp.	29	41
<u>Chauliodus sloani</u>	1	1
STOMIIDAE	5	7
<u>Stomias</u> sp.	17	19
ASTRONESTHIDAE	2	3
<u>Astronesthes</u> sp.	1	1
MELANOSTOMIIDAE	26	41
<u>Eustomias</u> sp.	2	2
<u>Bathophilus</u> sp.	1	1
IDIACANTHIDAE	2	2
MYCTOPHIFORMES		
SYNODONTIDAE	111	1398
<u>Synodus</u> sp.	1	1
<u>Synodus foetens</u>	71	741
<u>Trachinocephalus myops</u>	4	7
CHLOROPHTHALMIDAE	10	25
SCOPELOSAURIDAE	3	6
MYCTOPHIDAE	195	2360
<u>Myctophum</u> sp.	155	1238
<u>Myctophum nitidulum</u>	11	156
<u>Myctophum affine</u>	37	1124
<u>Myctophum asperum</u>	2	4
<u>Myctophum obtusirostre</u>	1	1
<u>Hygophum</u> sp.	138	1159
<u>Hygophum reinhardtii</u>	9	19

Table 3 - Continued

TAXA	LOTS	TOTAL
<u>Hygophum benoiti</u>	1	2
<u>Hygophum macrochir</u>	3	3
<u>Hygophum hygomi</u>	1	71
<u>Notolychnus</u> sp.	1	2
<u>Notolychnus valdiviae</u>	72	180
<u>Centrobranchus nigroocellatus</u>	51	174
<u>Diaphus</u> sp.	183	2485
<u>Diaphus dumerilii</u>	6	7
<u>Diaphus mollis</u>	2	2
<u>Diaphus splendidus</u>	1	2
<u>Ceratoscopelus</u> sp.	77	241
<u>Benthoosema</u> sp.	98	302
<u>Benthoosema suborbitale</u>	5	12
<u>Diogenichthys</u> sp.	10	16
<u>Diogenichthys atlanticus</u>	71	163
<u>Gonichthys</u> sp.	2	2
<u>Gonichthys cocco</u>	28	67
<u>Lobianchia</u> sp.	1	1
<u>Bolinichthys photothorax</u>	1	1
<u>Taaningichthys</u> sp.	1	1
<u>Lampanyctus</u> sp.	106	315
<u>Lampanyctus alatus</u>	2	3
<u>Lepidophanes</u> sp.	3	3
<u>Lepidophanes guentheri</u>	2	2
<u>Notoscopelus</u> sp.	12	26
<u>Notoscopelus resplendens</u>	6	7
PARALEPIDIDAE	99	283
<u>Paralepis</u> sp.	2	2
<u>Paralepis atlantica</u>	2	2
<u>Lestidium</u> sp.	2	6
<u>Lestidium atlanticum</u>	42	85
<u>Stemonosudis intermedia</u>	1	1
<u>Sudis</u> sp.	14	19
<u>Sudis atrox</u>	1	1
<u>Lestidiops</u> sp.	4	14
OMOSUDIDAE	2	2
ALEPISAUROIDAE		
<u>Alepisaurus</u> sp.	1	1
EVERMANNELLIDAE	11	17
<u>Evermannella</u> sp.	2	2
SCOPELARCHIDAE	39	68
<u>Scopelarchus</u> sp.	2	2
MORIDAE	11	13
GADIFORMES		
BREGMACEROTIDAE	7	152
<u>Bregmaceros</u> sp.	231	4764
<u>Bregmaceros atlanticus</u>	1	1

Table 3 - Continued

TAXA	LOTS	TOTAL
GADIDAE	9	16
<u>Urophycis</u> sp.	22	83
MERLUCCIIDAE		
<u>Merluccius</u> sp.	4	11
MACROURIDAE	27	39
OPHIDIIDAE	146	2034
CARAPIDAE	23	33
LOPHIIFORMES	15	27
CERATIOIDEI	64	119
ANTENNARIIDAE	19	28
<u>Histrion</u> <u>histrion</u>	1	1
CAULOPHYRIDAE	5	12
HIMANTOLOPHIDAE		
<u>Himantolophus</u> sp.	1	1
ATHERINIFORMES		
EXOCOETIDAE	198	884
<u>Hemirhamphus</u> sp.	3	7
<u>Exocoetus</u> sp.	9	18
<u>Cypselurus</u> sp.	17	27
<u>Hirundichthys</u> sp.	5	9
<u>Cheilopogon</u> sp.	4	9
<u>Cheilopogon</u> <u>heturus</u>	1	1
<u>Paraexocoetus</u> <u>brachypterus</u>	3	7
<u>Oxyporhamphus</u> <u>micropterus</u>	1	3
BELONIDAE	3	4
SCOMBERESOCIDAE		
<u>Scomberesox</u> <u>saurus</u>	2	2
ATHERINIDAE	39	590
LAMPRIDIFORMES		
TRACHIPTERIDAE	6	6
<u>Trachipterus</u> sp.	1	1
BERYCIFORMES		
MELAMPHAEIDAE	41	67
HOLOCENTRIDAE	31	126
ZEIFORMES		
CAPROIDAE	4	9
SYNGNATHIFORMES		
MACRORHAMPHOSIDAE	1	1
<u>Macrorhamphosus</u> <u>scolopax</u>	3	8
SYNGNATHIDAE	29	46
<u>Syngnathus</u> sp.	4	9
<u>Hippocampus</u> sp.	1	1
<u>Hippocampus</u> <u>erectus</u>	7	11
SCORPAENIFORMES		
SCORPAENIDAE	96	338
<u>Scorpaena</u> sp.	3	3
<u>Pontinus</u> sp.	1	1
TRIGLIDAE	54	208
<u>Prionotus</u> sp.	62	197

Table 3 - Continued

TAXA	LOTS	TOTAL
DACTYLOPTERIFORMES		
DACTYLOPTERIDAE		
<u>Dactylopterus volitans</u>	1	5
PERCIFORMES	3	3
SERRANIDAE	203	1421
<u>Diplectrum</u> sp.	5	58
<u>Serranus</u> sp.	11	22
<u>Serraniculus</u> sp.	1	1
<u>Anthias</u> sp.	23	130
<u>Centropristis</u> sp.	12	35
<u>Epinephelus</u> sp.	4	5
<u>Hemanthias</u> sp.	2	2
<u>Hemanthias vivanus</u>	26	62
<u>Hemanthias aureorubens</u>	1	1
<u>Liopropoma</u> sp.	2	3
<u>Mycteroperca</u> sp.	4	6
<u>Plectranthias</u> sp.	2	3
GRAMMISTIDAE	14	17
<u>Rypticus</u> sp.	1	1
PRIACANTHIDAE	26	72
<u>Pristigenys alta</u>	1	1
APOGONIDAE	13	22
<u>Apogon</u> sp.	29	50
<u>Howella</u> sp.	38	55
BRANCHIOSTEGIDAE	14	23
MALACANTHIDAE		
<u>Malacanthus plumieri</u>	1	1
POMATOMIDAE		
<u>Pomatomus saltatrix</u>	6	8
CARANGIDAE	222	3026
<u>Decapterus</u> sp.	21	117
<u>Decapterus punctatus</u>	15	32
<u>Caranx</u> sp.	67	303
<u>Caranx bartholomaei</u>	2	3
<u>Caranx hippos</u>	3	5
<u>Caranx latus</u>	1	1
<u>Oligoplites saurus</u>	2	4
<u>Seriola</u> sp.	24	42
<u>Trachinotus</u> sp.	7	9
<u>Trachinotus carolinus</u>	2	3
<u>Trachinotus goodei</u>	3	3
<u>Chloroscombrus chrysurus</u>	8	31
<u>Selene vomer</u>	5	6
<u>Elagatis bipinnulatus</u>	3	4
<u>Naucrates ductor</u>	3	4

Table 3 - Continued

TAXA	LOTS	TOTAL
CORYPHAENIDAE	2	2
<u>Coryphaena</u> sp.	24	33
<u>Coryphaena hippurus</u>	34	57
<u>Coryphaena equiselis</u>	12	16
PERCIFORMES		
BRAMIDAE	14	18
LUTJANIDAE	59	237
<u>Rhomboplites aureorubens</u>	1	1
LOBOTIDAE	1	1
SPARIDAE	65	267
<u>Archosargus probatocephalus</u>	1	4
<u>Lagodon rhomboides</u>	1	2
SCIAENIDAE	113	2970
<u>Cynoscion nebulosus</u>	1	2
MULLIDAE	80	1005
KYPHOSIDAE	1	1
EPHIPPIDAE	6	9
CHAETODONTIDAE	6	6
POMACANTHIDAE	2	3
<u>Holacanthus tricolor</u>	1	1
POMACENTRIDAE	7	7
<u>Microspathodon chrysurus</u>	3	5
MUGILIDAE	11	26
<u>Mugil</u> sp.	34	881
<u>Mugil curema</u>	2	3
<u>Mugil cephalus</u>	21	1361
SPHYRAENIDAE	15	22
<u>Sphyraena</u> sp.	29	46
LABRIDAE	139	546
SCARIDAE	81	221
CPISTHOGNATHIDAE	3	3
CHIASMODONTIDAE	4	4
URANOSCOPIDAE	3	3
CLINIDAE	1	3
BLENNIIDAE	78	562
GOBIIDAE	274	5354
MICRODESMIDAE	1	1
ACANTHURIDAE	13	20
GEMPYLIDAE	9	10
<u>Diplospinus multistriatus</u>	70	107
<u>Gempylus serpens</u>	18	26
<u>Nesiarchus nasutus</u>	14	19
TRICHIURIDAE	3	6
<u>Benthodesmus</u> sp.	2	2
<u>Trichiurus lepturus</u>	17	66

Table 3 - Continued

TAXA	LOTS	TOTAL
SCOMBRIDAE	13	89
<u>Katsuwonus pelamis</u>	38	65
<u>Thunnus</u> sp.	20	30
<u>Thunnus thynnus</u>	38	197
<u>Thunnus atlanticus</u>	56	181
<u>Auxis</u> sp.	55	170
<u>Euthynnus alletteratus</u>	23	45
<u>Scomberomorus</u> sp.	7	25
<u>Scomberomorus maculatus</u>	27	181
<u>Scomberomorus cavalla</u>	2	5
<u>Scomberomorus regalis</u>	1	1
<u>Acanthocybium solanderi</u>	3	4
<u>Scomber japonicus</u>	1	4
SCOMBROLABRACIDAE		
<u>Scombrolabrax heterolepsis</u>	8	11
XIPHIIDAE		
<u>Xiphias gladius</u>	7	13
ISTIOPHORIDAE	15	27
<u>Istiophorus platypterus</u>	1	2
CENTROLOPHIDAE	1	4
<u>Schedophilus</u> sp.	2	4
NOMEIDAE		
<u>Nomeus gronovii</u>	8	13
<u>Cubiceps</u> sp.	8	15
<u>Psenes</u> sp.	23	44
ARIOMMIDAE		
<u>Ariomma</u> sp.	2	12
TETRAGONURIDAE	1	1
STROMATEIDAE	244	1532
<u>Peprilus</u> sp.	8	12
<u>Peprilus paru</u>	2	16
<u>Peprilus triacanthus</u>	1	2
GOBIESOCIFORMES		
CALLIONYMIDAE	78	221
PLEURONECTIFORMES		
BOTHIDAE	111	1112
<u>Citharichthys</u> sp.	84	981
<u>Syacium</u> sp.	99	966
<u>Syacium papillosum</u>	30	216
<u>Bothus</u> sp.	191	670
<u>Bothus ocellatus</u>	1	2
<u>Monolene sessilicauda</u>	1	1
<u>Etropus</u> sp.	3	3
<u>Etropus microstomus</u>	7	28
<u>Cyclopsetta</u> sp.	13	42
<u>Cyclopsetta fimbriata</u>	3	4
PLEURONECTIDAE	2	5
SOLEIDAE	13	22

Table 3 - Continued

TAXA	LOTS	TOTAL
CYNOGLOSSIDAE	4	9
<u>Symphurus</u> sp.	96	1030
<u>Symphurus plagiusa</u>	45	161
TETRAODONTIFORMES		
BALISTIDAE	37	121
<u>Stephanolepis</u> sp.	2	2
<u>Stephanolepis hispidus</u>	42	220
<u>Stephanolepis setifer</u>	2	5
<u>Monacanthus ciliatus</u>	28	150
<u>Aluterus</u> sp.	3	3
<u>Aluterus schoepfi</u>	2	6
<u>Aluterus heudelotii</u>	2	3
<u>Aluterus monoceros</u>	1	1
<u>Balistes</u> sp.	7	7
<u>Balistes capriscus</u>	1	2
TETRAODONTIDAE	56	138
<u>Sphoeroides</u> sp.	59	428
<u>Sphoeroides maculatus</u>	11	38
DIODONTIDAE	5	6
<u>Chilomycterus schoepfi</u>	1	1
MOLIDAE		
<u>Mola mola</u>	1	1

Table 4. Twenty most numerous taxa captured during SEAMAP 1982 and 1983, arranged in descending order.

1982			1983		
TAXA	LOTS	NUMBER	TAXA	LOTS	NUMBER
Clupeidae	236	42,485	Engraulidae	166	11,904
Myctophidae	341	12,712	Clupeiformes	23	8,256
Engraulidae	154	8,678	Clupeidae	142	7,044
Gobiidae	298	7,187	Gobiidae	274	5,354
Carangidae	283	6,756	<u>Bregmaceros</u> sp.	231	4,764
Gonostomatidae	263	5,726	Carangidae	222	3,026
Bothidae	297	5,406	Sciaenidae	113	2,970
Clupeiformes	26	3,746	<u>Diaphus</u> sp.	183	2,485
Bregmacerotidae	230	3,429	Myctophidae	195	2,360
<u>Chloroscombrus</u>					
<u>chrysurus</u>	14	2,865	Ophidiidae	146	2,034
Synodontidae	164	2,507	Stromateidae	244	1,532
Sciaenidae	116	2,417	Serranidae	203	1,421
Serranidae	256	2,228	Synodontidae	111	1,398
<u>Symphurus plagiusa</u>	203	1,662	<u>Mugil cephalus</u>	21	1,361
Stromateidae	299	1,614	<u>Myctophum</u> sp.	155	1,238
Tetraodontidae	144	1,418	<u>Maurolicus muelleri</u>	98	1,192
Exocoetidae	222	1,201	<u>Hygophum</u> sp.	138	1,159
<u>Caranx</u> sp.	90	1,045	<u>Etrumeus teres</u>	10	1,157
<u>Anchoviella perfasciata</u>	3	976	<u>Myctophum affine</u>	37	1,124
Ophidiidae	110	680	Bothidae	111	1,112

TABLE 5. Example of data printout for "List of stations for participating vessels" SEAMAP 1983.

OREGON-II		Cruise		134		NMFS					
Station	Seamap Sample Number	Latitude		Longitude		Date	Time	Gear	Maximum Tow Depth, m	Cubic Meters Water Filtered	Wet Zooplankton Displacement Volume, ml
		Degrees	Minutes	Degrees	Minutes	1983	GMT				
39065	1139-1141	29	00.00N	088	00.00W	4/22	1041	Bongo Neuston	199 1	488 -	65 -*
39066	1142-1144	28	30.20N	088	00.10W	4/22	1527	Bongo Neuston	201 1	383 -	25 -
39067	1145-1147	28	30.00N	087	30.00W	4/22	2106	Bongo Neuston	200 1	296 -	20 -
39068	1148-1150	28	59.90N	087	29.50W	4/23	0040	Bongo Neuston	202 1	407 -	40 -
39069	1151-1153	29	00.00N	087	00.00W	4/23	0359	Bongo Neuston	195 1	379 -	40 -
39070	1154-1156	28	30.00N	086	59.60W	4/23	0815	Bongo Neuston	200 1	482 -	- -
39071	1157-1159	28	00.40N	087	00.00W	4/23	1912	Bongo Neuston	202 1	377 -	25 -

*No information is
available where
dashes occur.

TABLE 6. Example of data printout for "List of larval fish taxa caught during SEAMAP 1983".

BATHYLAGUS SP.

Vessel	Cruise	Station	Sample	Gear	Mesh, mm	Latitude, North	Longitude West	Date 1983	Time GMT	Number Larvae	Lengths, mm SL	Number Under 10MSQ
Oregon-II	134	39065	1140	Bongo	.333	29 00.00	088 00.00	4/22	1030	1	9.8	4
Oregon-II	134	39066	1143	Bongo	.333	28 30.20	088 00.10	4/22	1518	1	13.0	5
Oregon-II	134	39068	1149	Bongo	.333	28 59.90	087 29.50	4/23	0030	2	7.5 4.5	9
Oregon-II	134	39073	1164	Bongo	.333	28 00.00	089 00.00	4/25	0545	2	6.0 10.0	13
Oregon-II	134	39113	1226	Bongo	.333	27 00.00	091 00.00	5/01	2311	1	10.0	6
Oregon-II	134	39127	1257	Bongo	.333	28 30.00	088 30.00	5/07	0804	2	8.6 7.0	11
Oregon-II	134	39130	1266	Bongo	.333	28 00.00	086 30.00	5/08	0408	1	5.8	6
Oregon-II	134	39144	1308	Bongo	.333	28 00.00	086 00.00	5/10	1038	1	18.0	7
Oregon-II	134	39153	1335	Bongo	.333	27 30.00	088 00.00	5/11	2233	2	6.0 11.0	12
Oregon-II	134	39174	1398	Bongo	.333	26 30.00	085 30.00	5/19	2003	2	6.0 11.0	10
Hernan Cortez	02	8324	1555	Bongo	.333	25 30.00	084 30.00	7/14		2	7.2 7.0	8
Oregon-II	140	40173	1787	Bongo	.333	28 00.00	086 00.00	12/10	2155	1	10.5	7
Oregon-II	135	39340	1959	Bongo	.333	28 00.20	092 30.10	6/24	1255	1	7.2	4
Oregon-II	130	38275	2108	Neuston	.946	28 00 00	090 00.40	11/23	0555	3	17.0 13.0 7.5	0
Oregon-II	133	38607	2137	Bongo	.333	28 30.30	088 00.30	3/13	1644	1	4.6	2

TABLE 7. Example of data printout for "Tow and ichthyoplankton data SEAMAP 83".

STATION

39065 OREGON-II CRUISE 134 NMFS

Seamap Sample Number	Latitude, North	Longitude, West	Date, 1983	Time, GMT	Gear	Mesh, mm	Zooplankton Displ. Vol., ml	Maximum Tow Depth m	Cubic Meters Water Filtered	Standard Haul Factor	Dist. Net Traveled, m
1140	29 00.00N	088 00.00W	4/22	1030	Bongo	.333	65	199	488	0.41	1672

Family Genus Species	Number	Length,mm SL	No. Under 10MSQ Sea Surface
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<u>Bathylagus</u> sp.	1	9.8	4
<u>Benthosema</u> sp.	4	4.5 - 6.5	16
<u>Bothus</u> sp.	1	9.0	4
<u>Branchiostegidae</u>	1		4
<u>Bregmaceros</u> sp.	1	3.0	4
<u>Chauliodus</u> sp.	2	3.0 - 18.0	8
<u>Congridae</u>	2	80.0 - 92.0	8
<u>Cyclothone</u> sp.	7	5.0 - 9.5	28
<u>Diaphus</u> sp.	18	4.0 - 11.0	73
<u>Diogenichthys atlanticus</u>	7	4.0 - 8.5	28
<u>Diplospinus multistriatus</u>	1	20.0	4
<u>Gobiidae</u>	1	9.8	4
<u>Gonostomatidae</u>	2	4.2 - 7.0	8
<u>Hygophum</u> sp.	94	3.0 - 8.2	383
<u>Lampanyctus</u> sp.	18	2.8 - 8.2	73
<u>Lestidium atlanticum</u>	2	23.0 - 24.0	8
<u>Maurollicus muelleri</u>	1	11.0	4
<u>Myctophidae</u>	10	3.0 - 4.2	40
<u>Myctophum</u> sp.	10	3.5 - 5.2	40
<u>Notolychnus valdiviae</u>	2	5.0 - 7.0	8
<u>Notoscopelus resplendens</u>	2	5.5 - 6.5	8
<u>Sternoptyx</u> sp.	3	4.5 - 6.5	12
<u>Stromateidae</u>	1	3.0	4
<u>Syacium</u> sp.	1	5.5	4
Unidentified Fish Larvae	1		4
<u>Valenciennellus tripunctulatus</u>	1	14.0	4
<u>Vinciguerrria attenuata</u>	3	9.2 - 13.2	12
<u>Vinciguerrria nimbaria</u>	2	9.0 - 11.0	8
<u>Vinciguerrria poweriae</u>	2	6.5 - 7.0	8

Total larvae count for sample

201

Table 8. List of loan requests to the "SEAMAP" Ichthyoplankton Archiving Center (SAC) for 1982 and 1983 material as of December 1985

<u>Requestor</u>	<u>Priority</u>	<u>Shipped</u>	<u>Families</u>	<u>No. Lots</u>	<u>Status</u>
Sharon Kelly	2	Yes	'82, '83 Chaetodontidae, Pomacanthidae	13	Out
Ken Lindeman (via Bill Richards)	1	Yes	'82, '83 Lutjanidae, '82 Atherinidae, Ephippidae, Gadidae, Haemulidae, Perciformes, Pomacentridae, Pomatomidae, Scorpaeniformes, Scaridae, Sparidae	293	Out
Thomas Potthoff	2	Yes	'83 <u>Scomberomorus</u> spp.	35	Return Pending
Bill Richards	1	Yes	'82 selected <u>Thunnus</u> <u>thynnus</u> , Labridae, Nomeidae*, Serranidae, Stromateidae*, Trachipteridae*, Triglidae, Uncatalogued*	703	Asterisked material returned; others out.
Rick Shaw	2	No	'83 Carangidae, Clupeidae, Scombridae	259	Clupeids shipped, Carangids to be shipped 12/85.
Mark Leiby	2	Yes	Anguilliformes		
Jim Ditty	2	Yes	Bothidae	69	Returned
Jim Cowan	2	Yes	Sciaenidae	14	Returned
Mike Fahay	4	Yes Yes	Macrouridae, Moridae, Fish eggs	30	Out
Bruce Thompson	4	Yes	Polynemidae	4	Out
Eugene Nakamura	4	No	'82 and '83 Scomberomorus spp.	---	Pending
Bill Richards	1	No	'83 Scombridae, Istiophoridae, Xiphiidae, Gempylidae, Trichiuridae, Labridae, Scaridae, Serranidae, Nomeidae, Ariommidae, Centrolophidae, Stromateidae, Triglidae, Agonidae, Unidentified.	---	Pending

▣ ALABAMA

+ CALANUS

⬆ DELAWARE II

Y HERNAN CORTEZ 1

X HERNAN CORTEZ 2

- LOUISIANA 2

⊙ LOUISIANA 3

X LOUISIANA 4

X LOUISIANA 5

X OREGON II 134

| OREGON II 135

< OREGON-II 138

△ OREGON II 140

◇ OREGON II 138

Z SUNCOASTER

* TOMMY MMRO 135

☆ TOMMY MMRO RD83

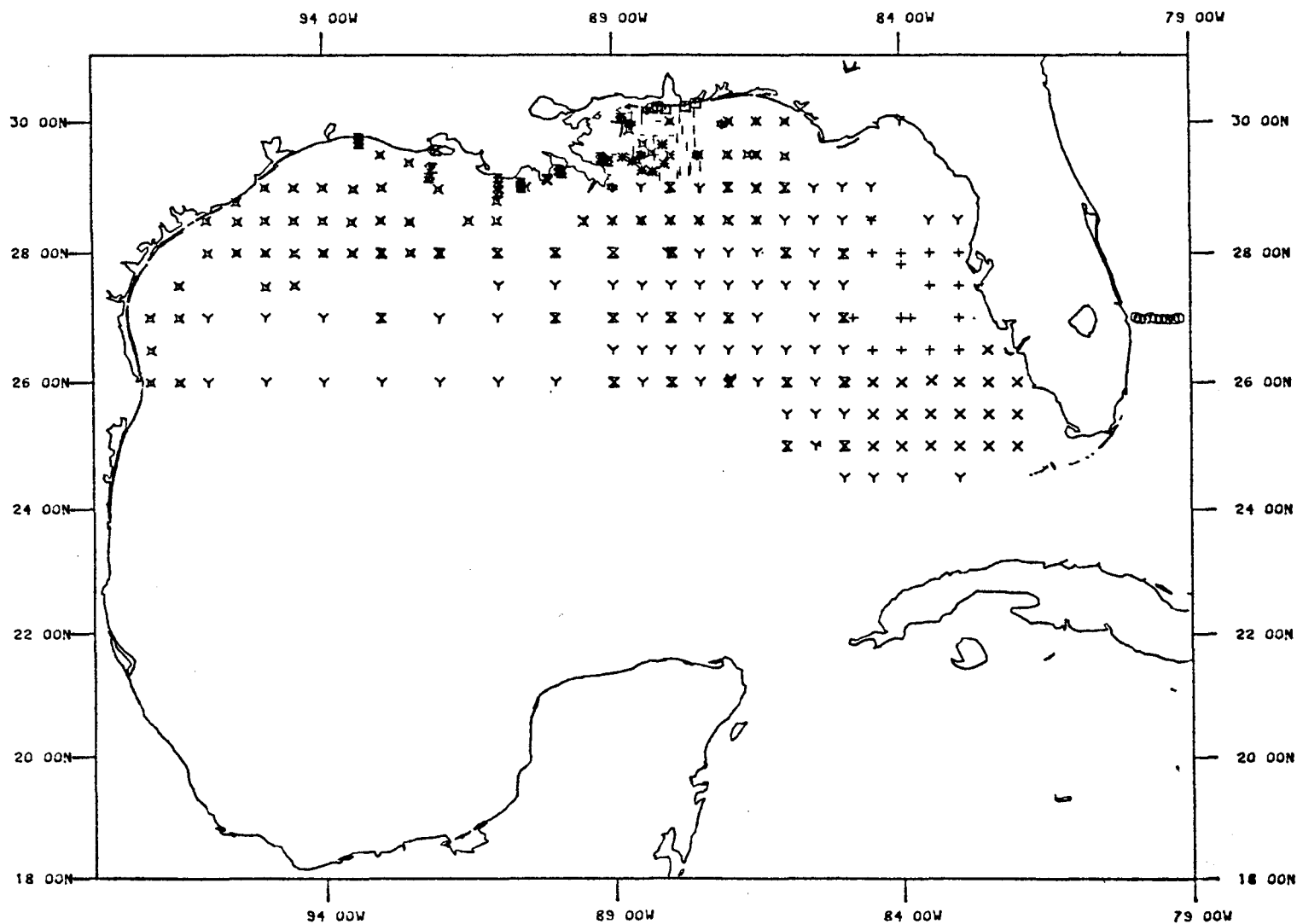


FIGURE 1

□ ALABAMA	○ LOUISIANA 3	△ OREGON II 140
+ CALANUS	× LOUISIANA 4	◇ OREGON II 138
⬆ DELAWARE II	× LOUISIANA 5	Σ SUNCOASTER
Y HERNAN CORTEZ 1	× OREGON II 134	* TOMMY MMRO 135
⊗ HERNAN CORTEZ 2	OREGON II 135	☆ TOMMY MMRO RD83
- LOUISIANA 2	< OREGON-II 138	

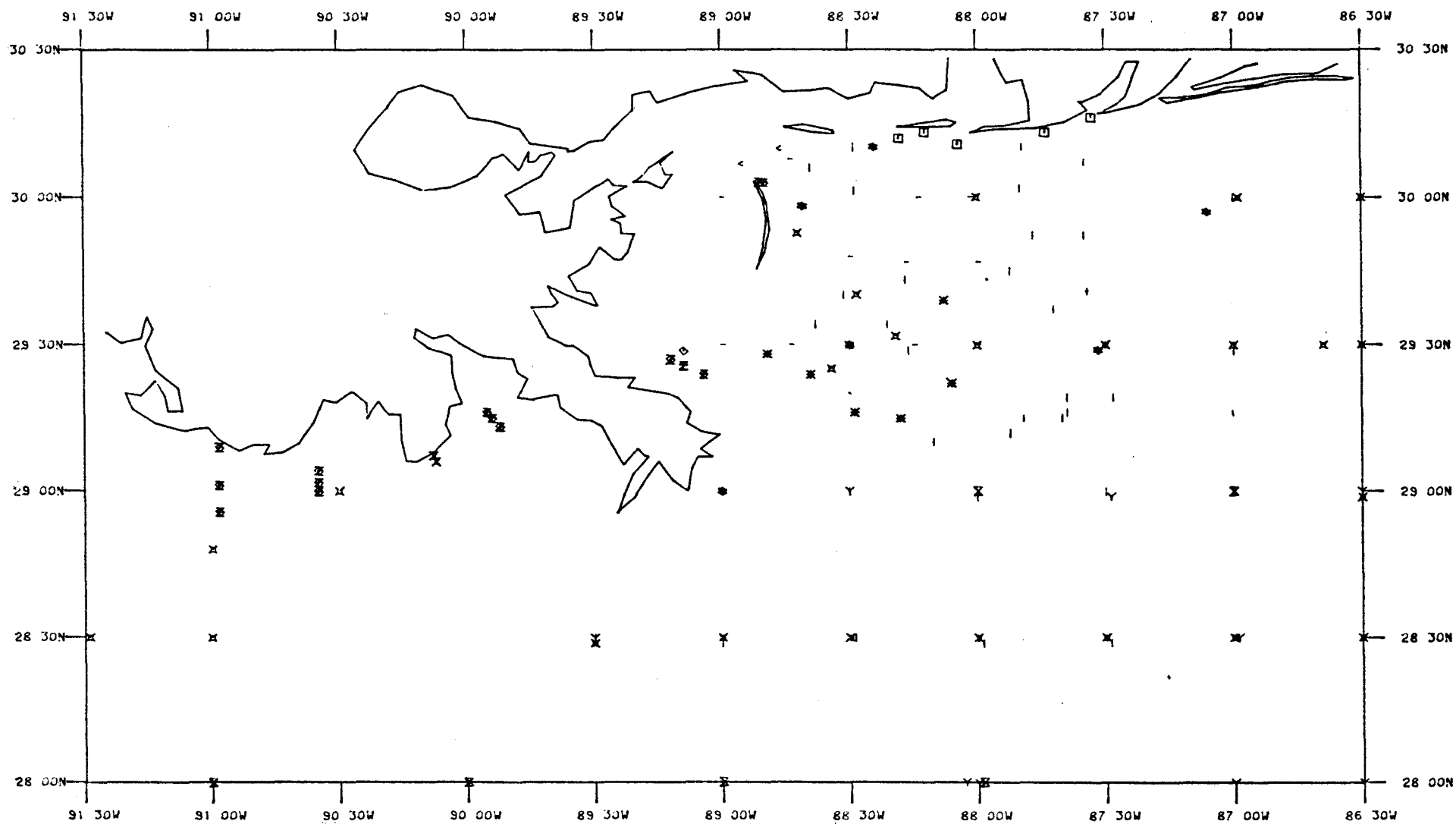


FIGURE 2

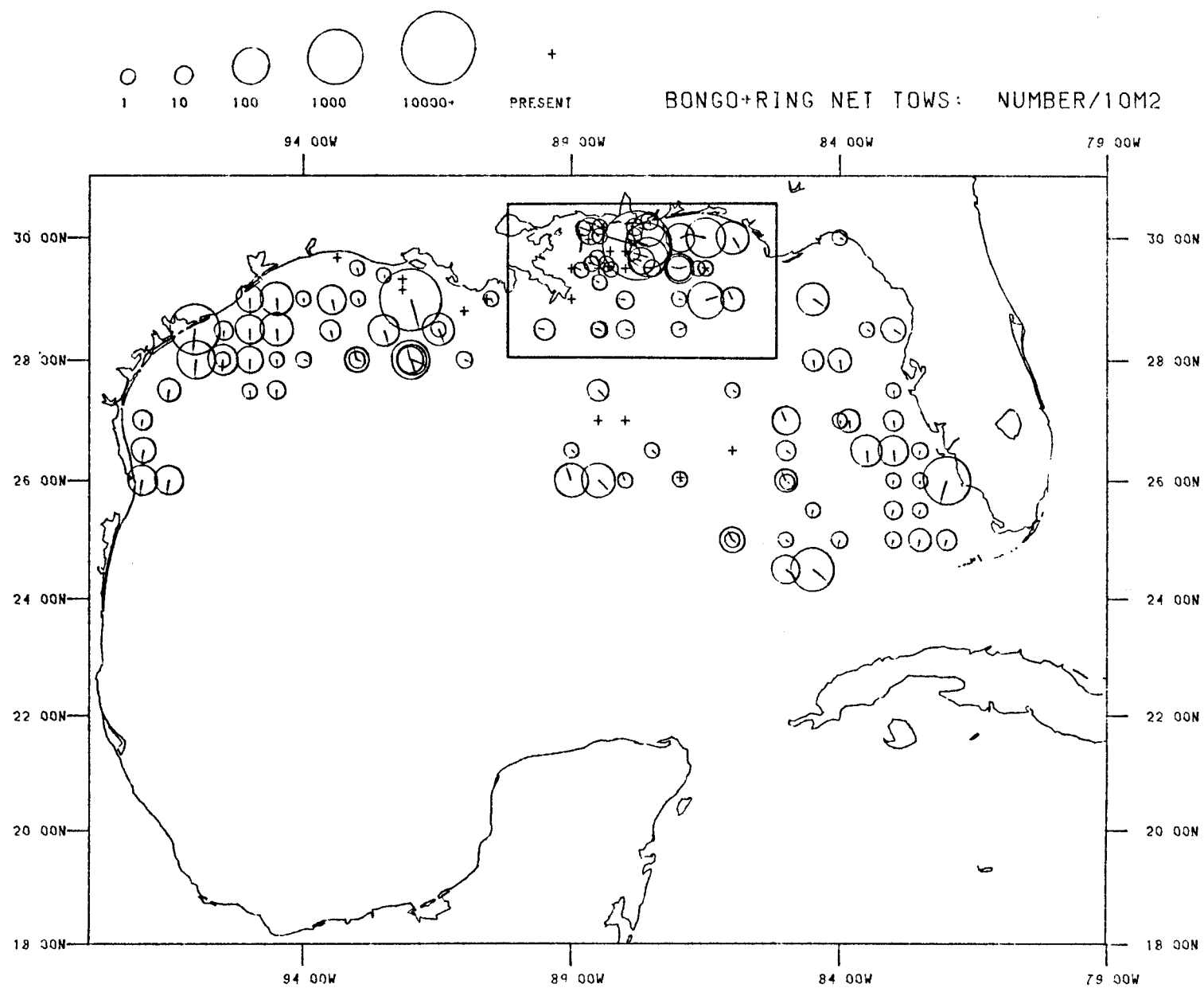
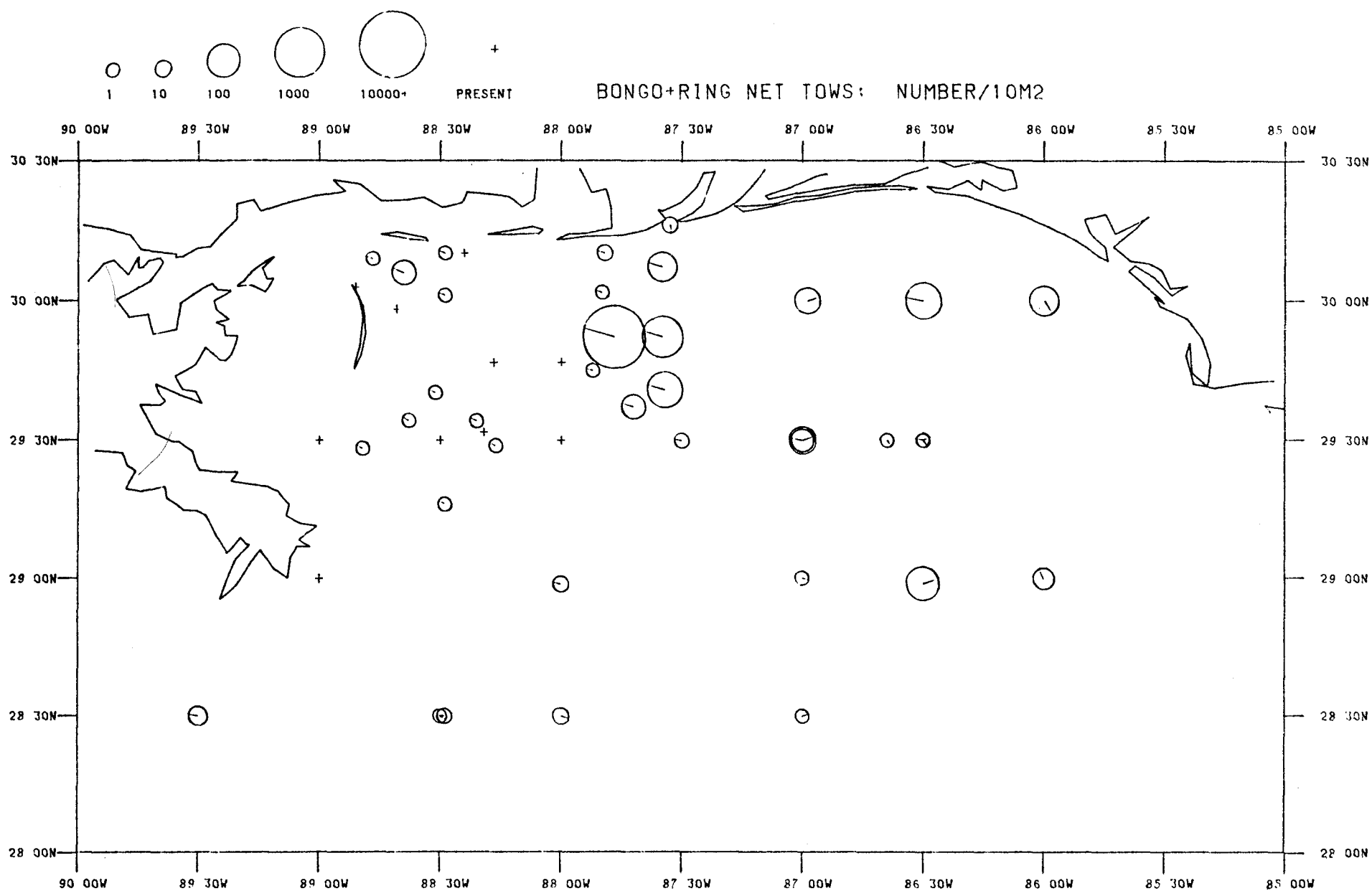


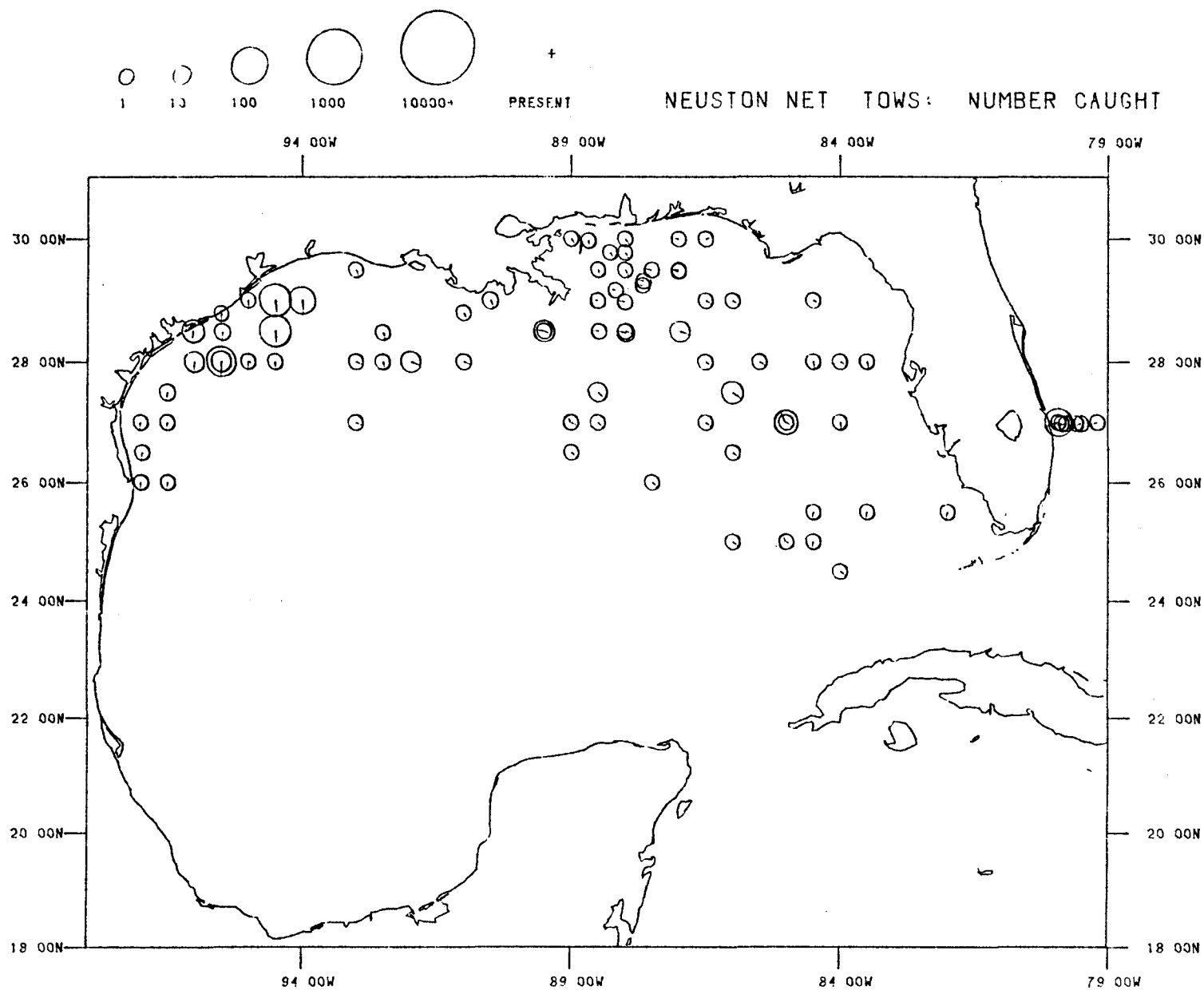
FIGURE 3



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CARANGIDAE

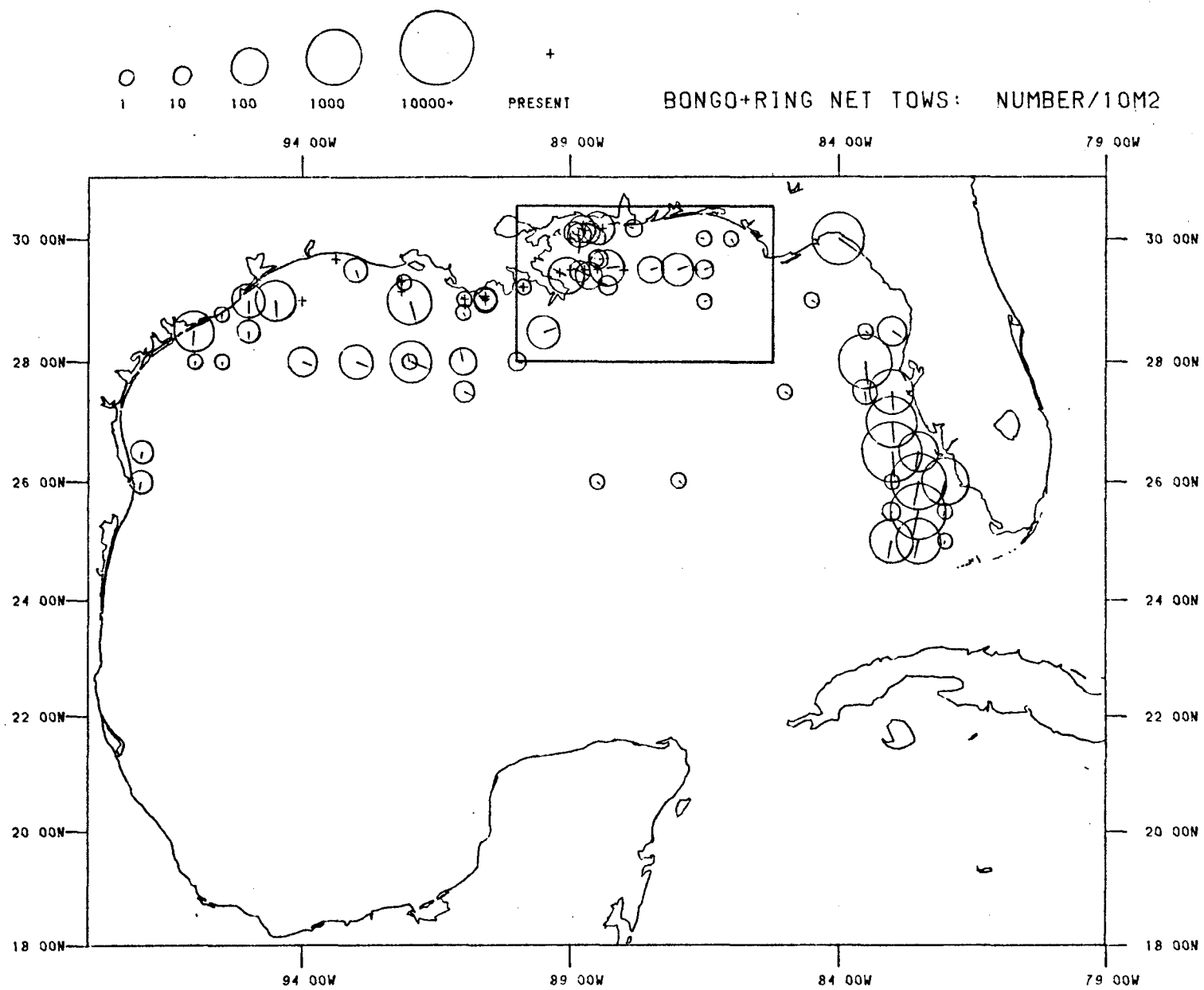
FIGURE 4



SEAMAP 1983

CARANGIDAE

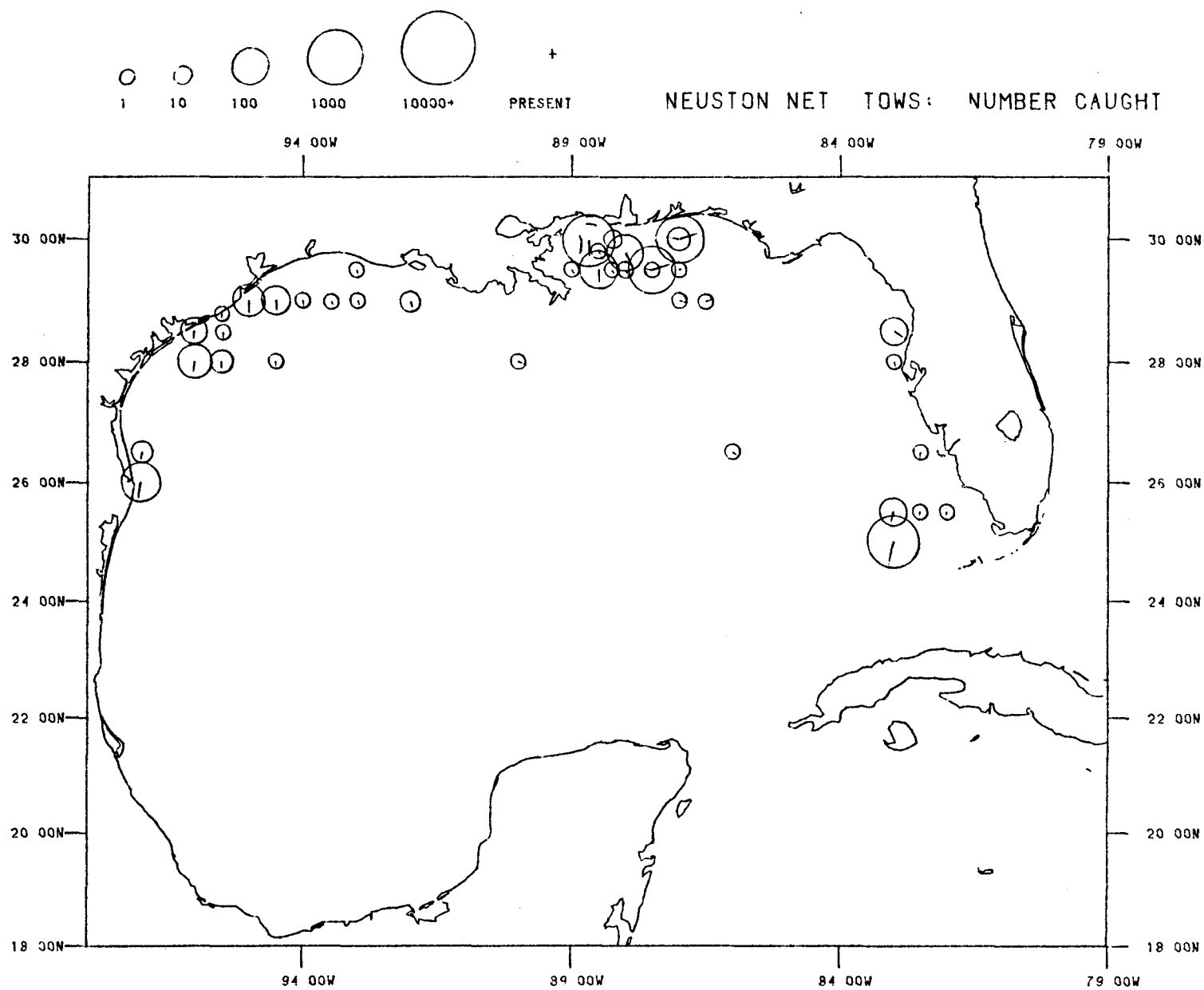
FIGURE 5



SEAMAP 1983

CLUPEIDAE

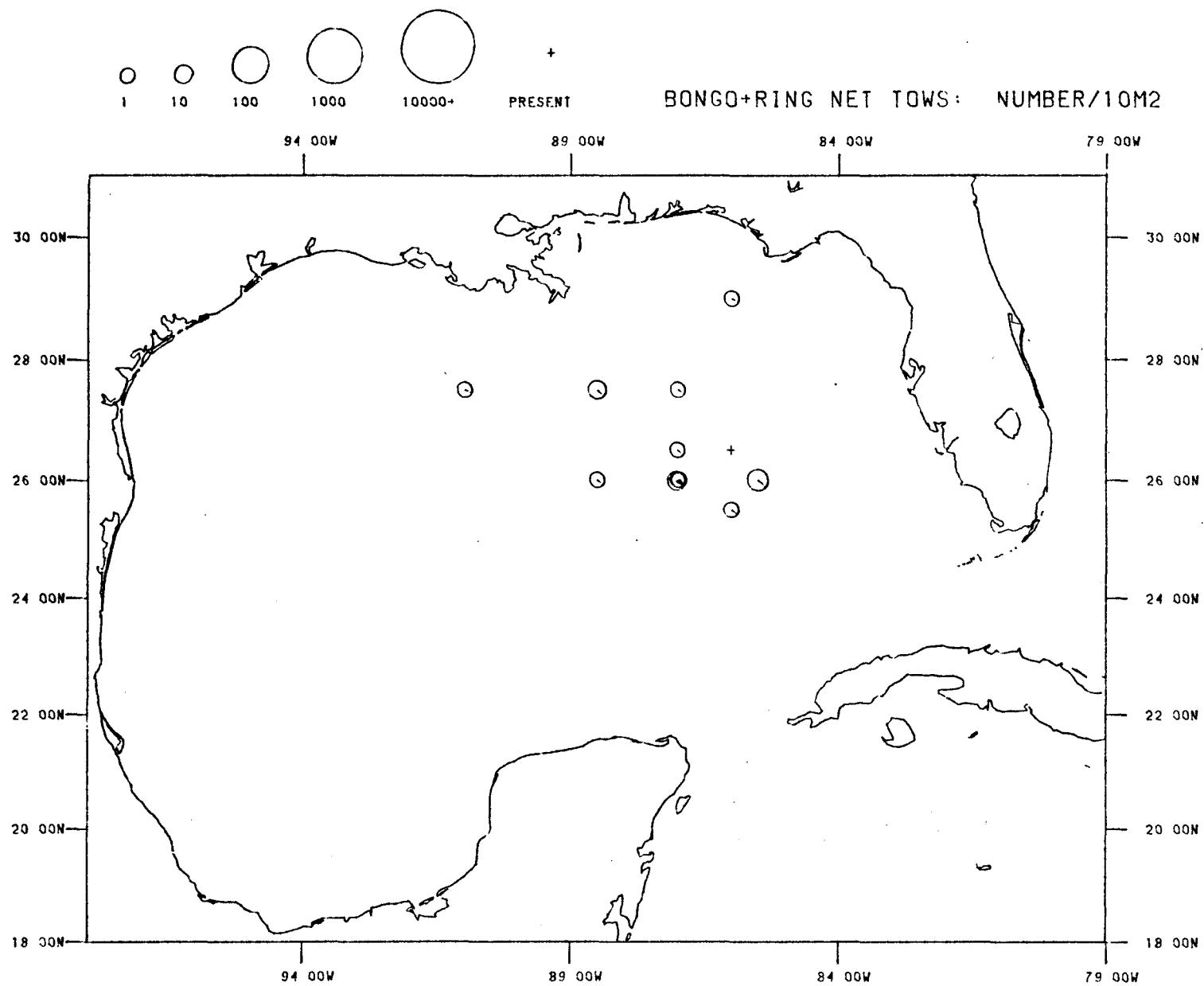
FIGURE 6

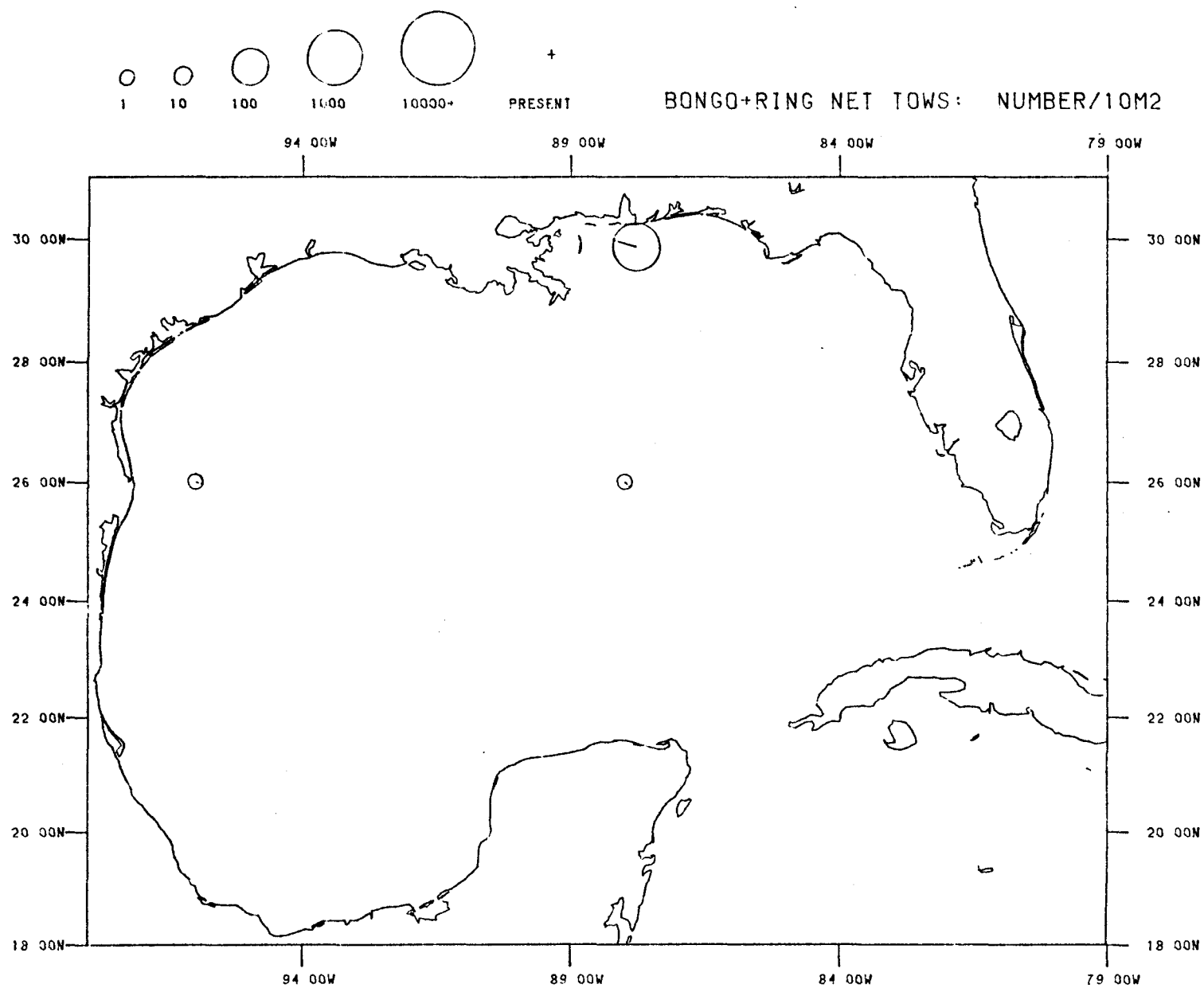


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CLUPEIDAE

FIGURE 8

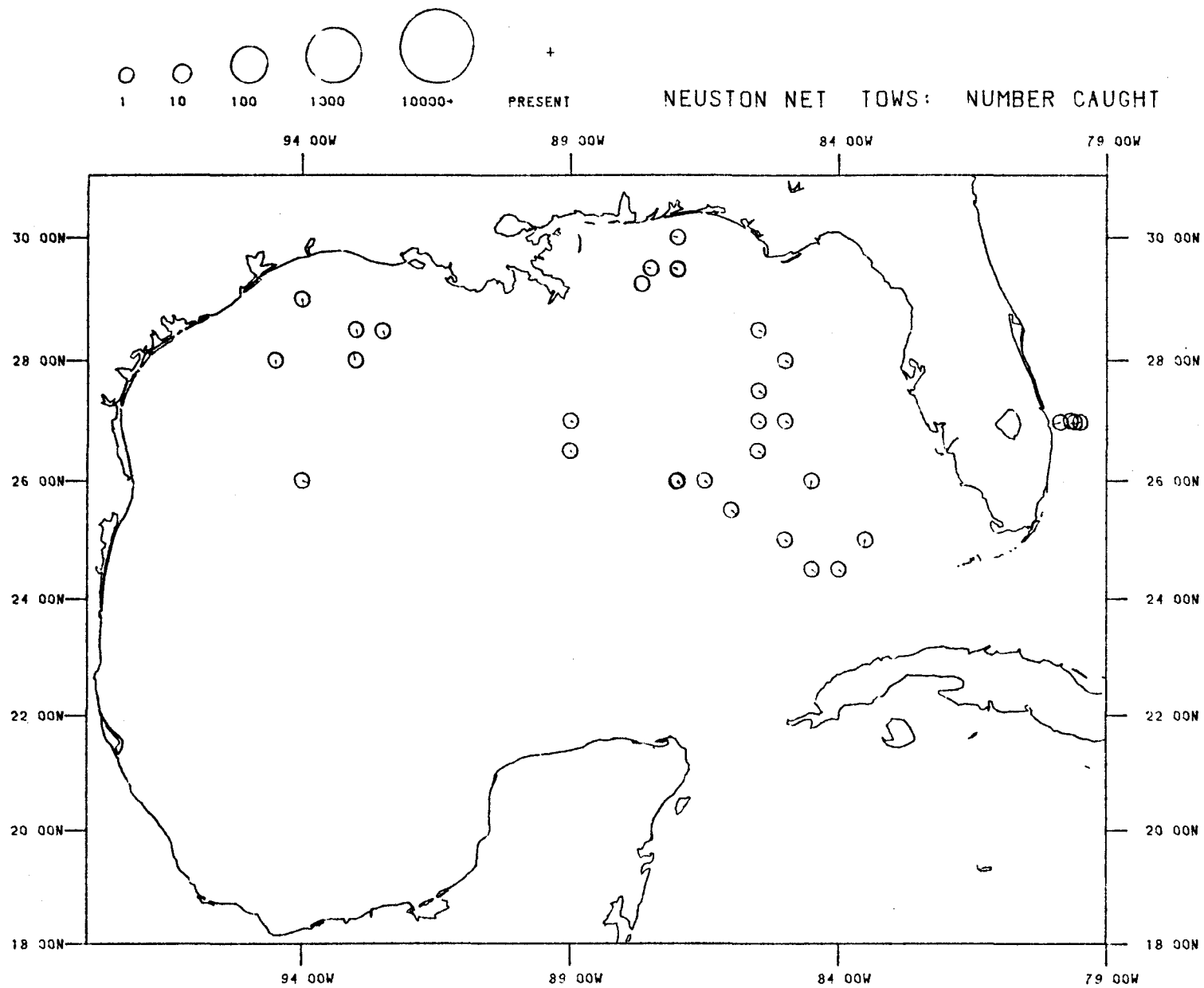




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CORYPHAENA HIPPURUS

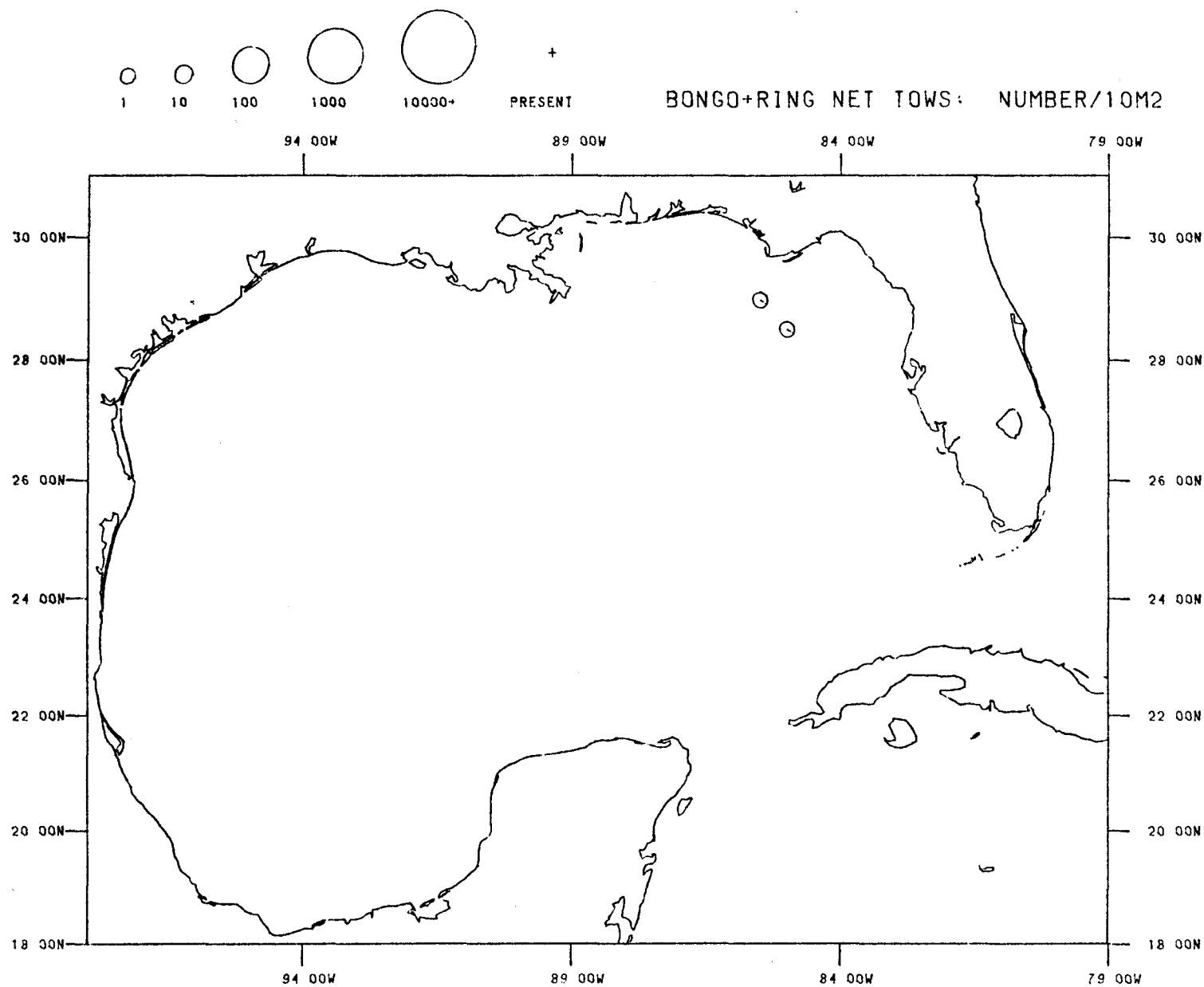
FIGURE 10



SEAMAP 1983

CORYPHAENA HIPPURUS

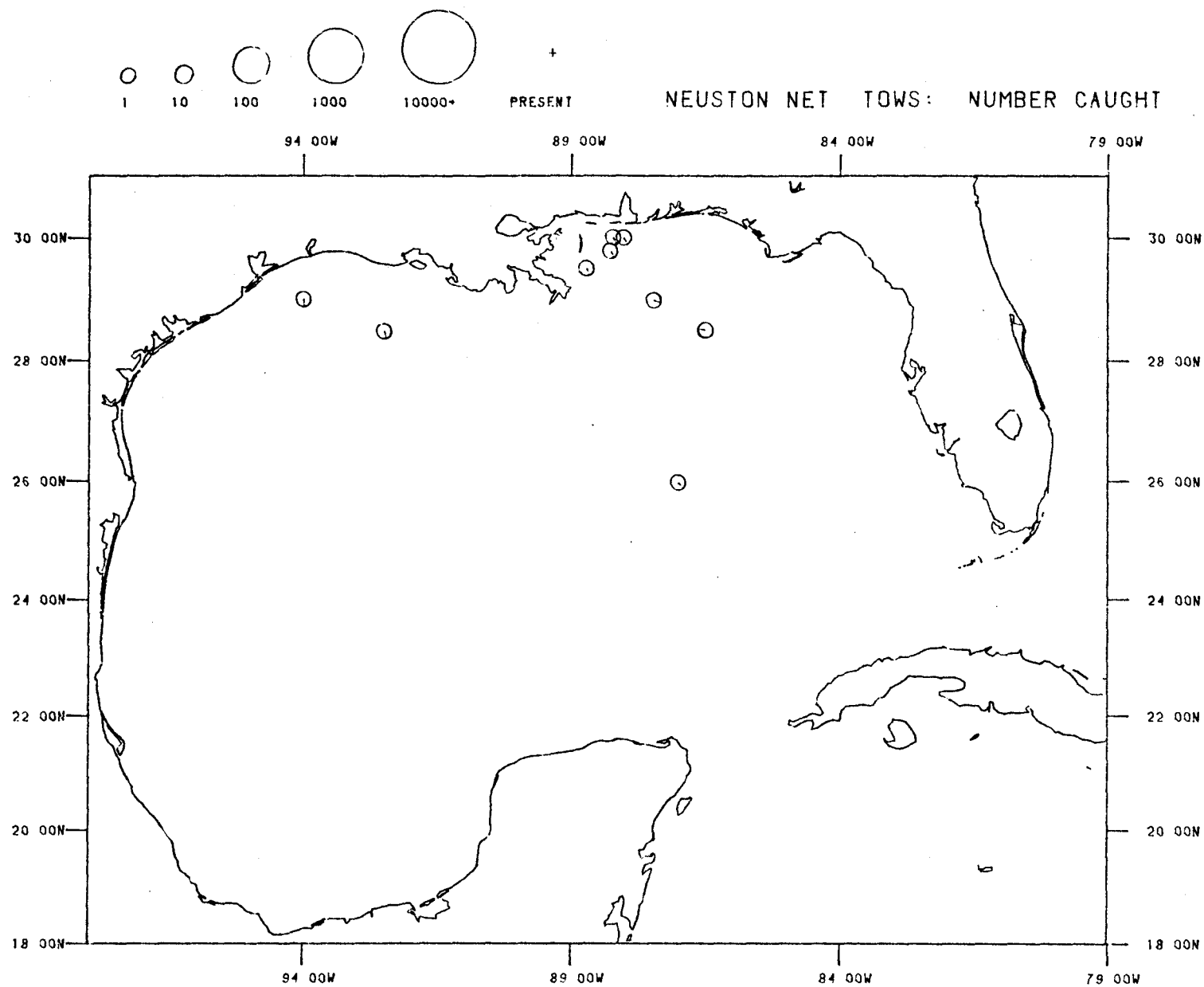
FIGURE 11



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CORYPHAENA EQUISETIS

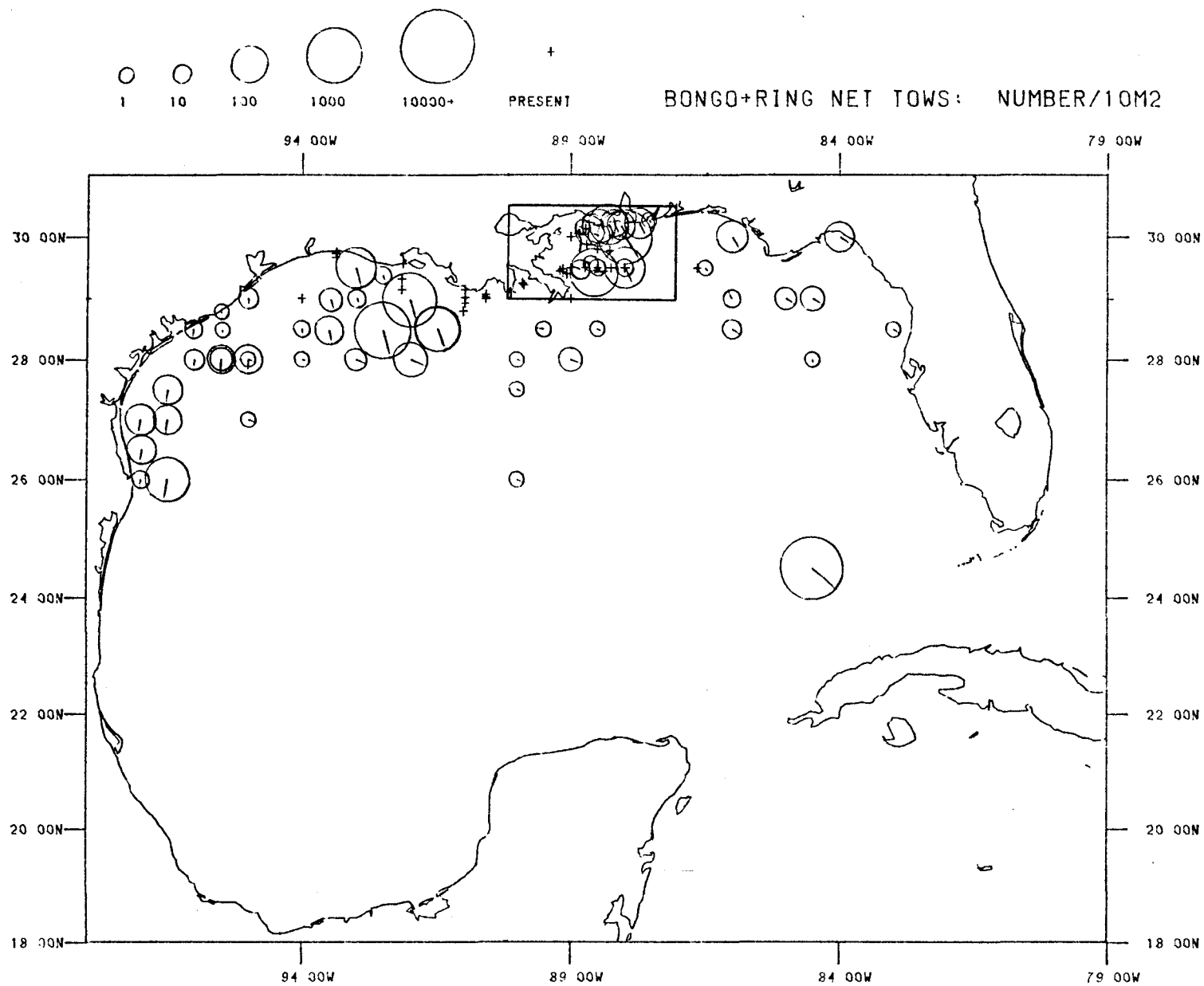
FIGURE 12



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CORYPHAENA EQUISETIS

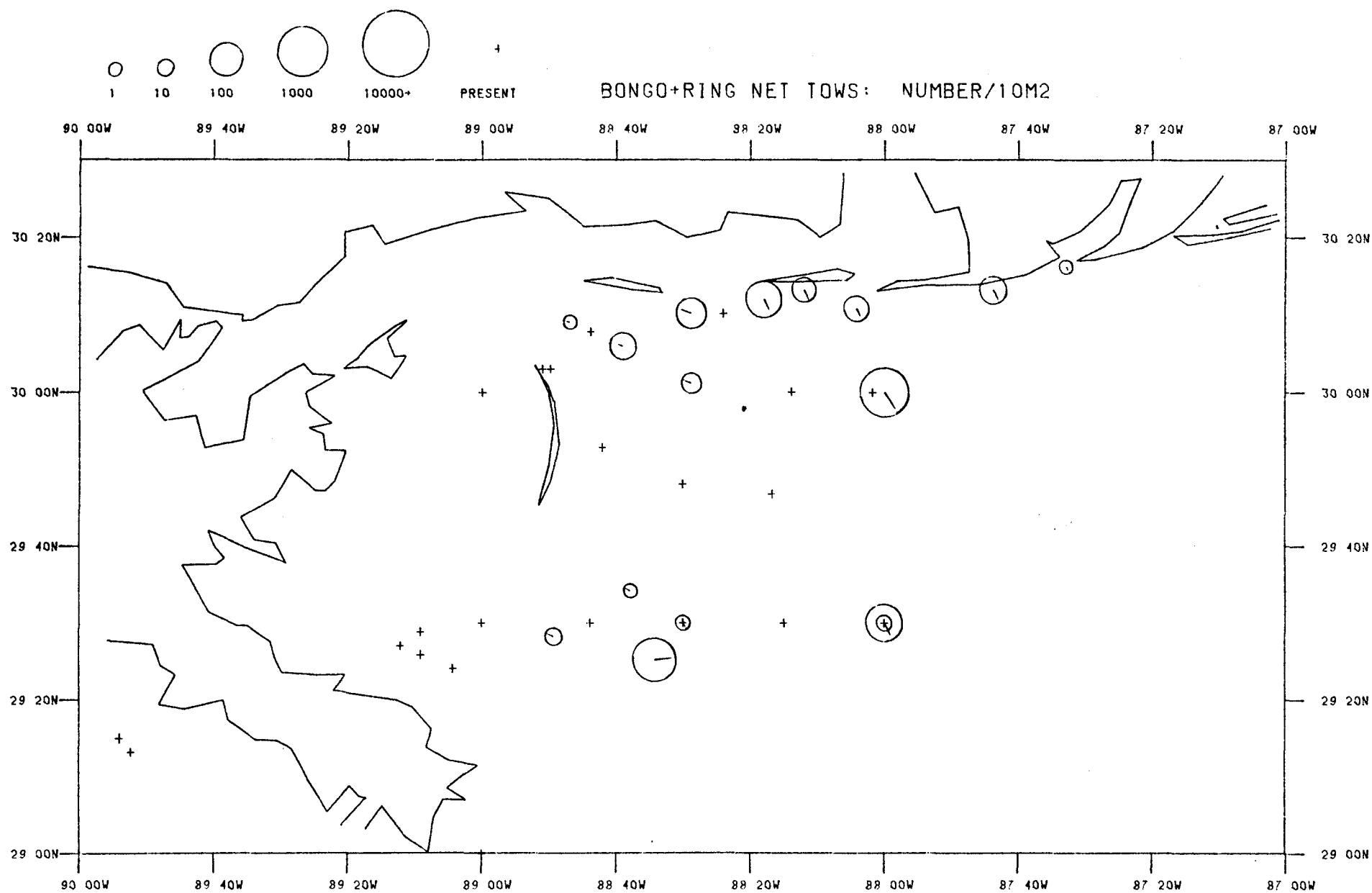
FIGURE 13



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ENGRAULIDAE

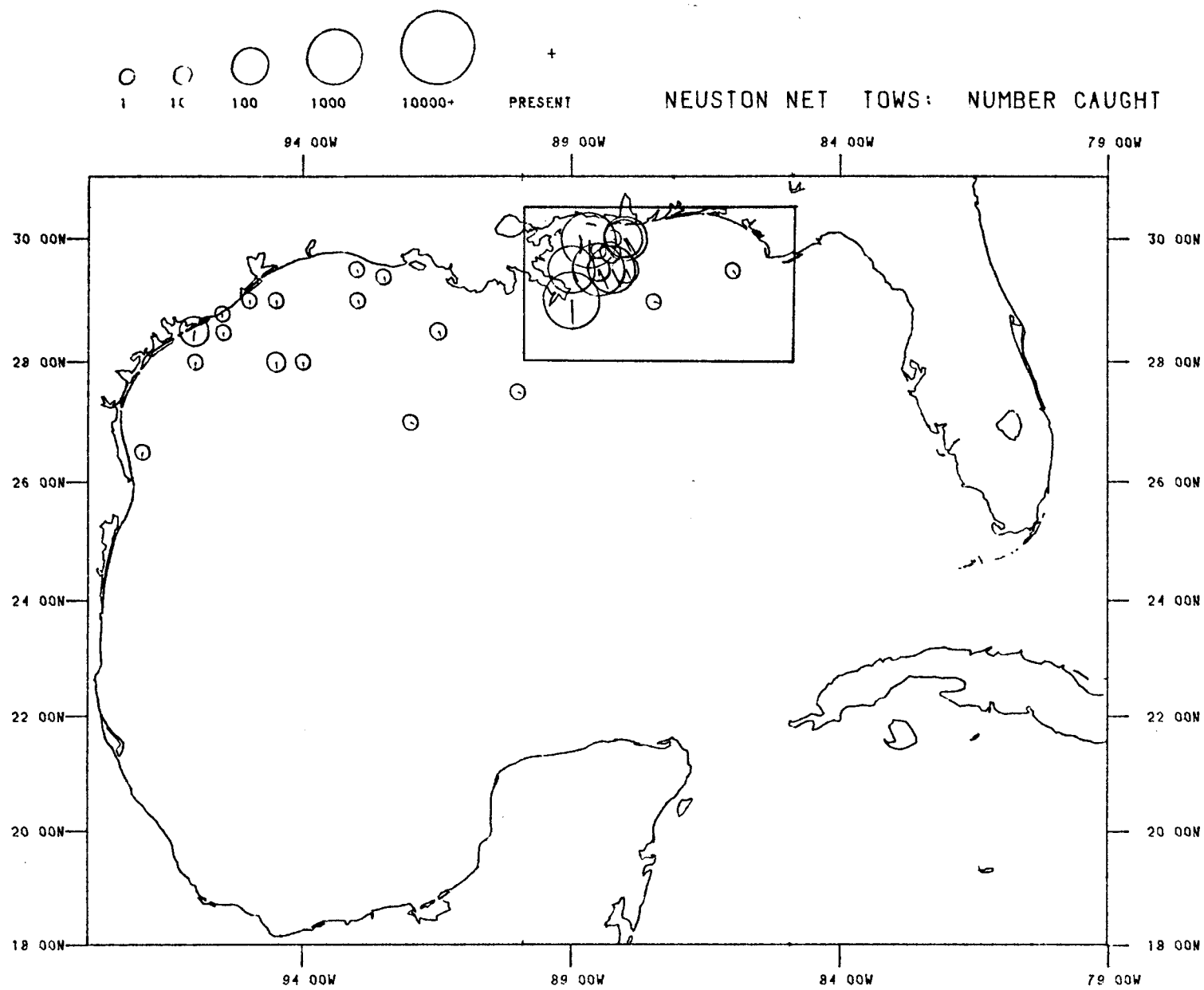
FIGURE 14



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ENGRAULIDAE

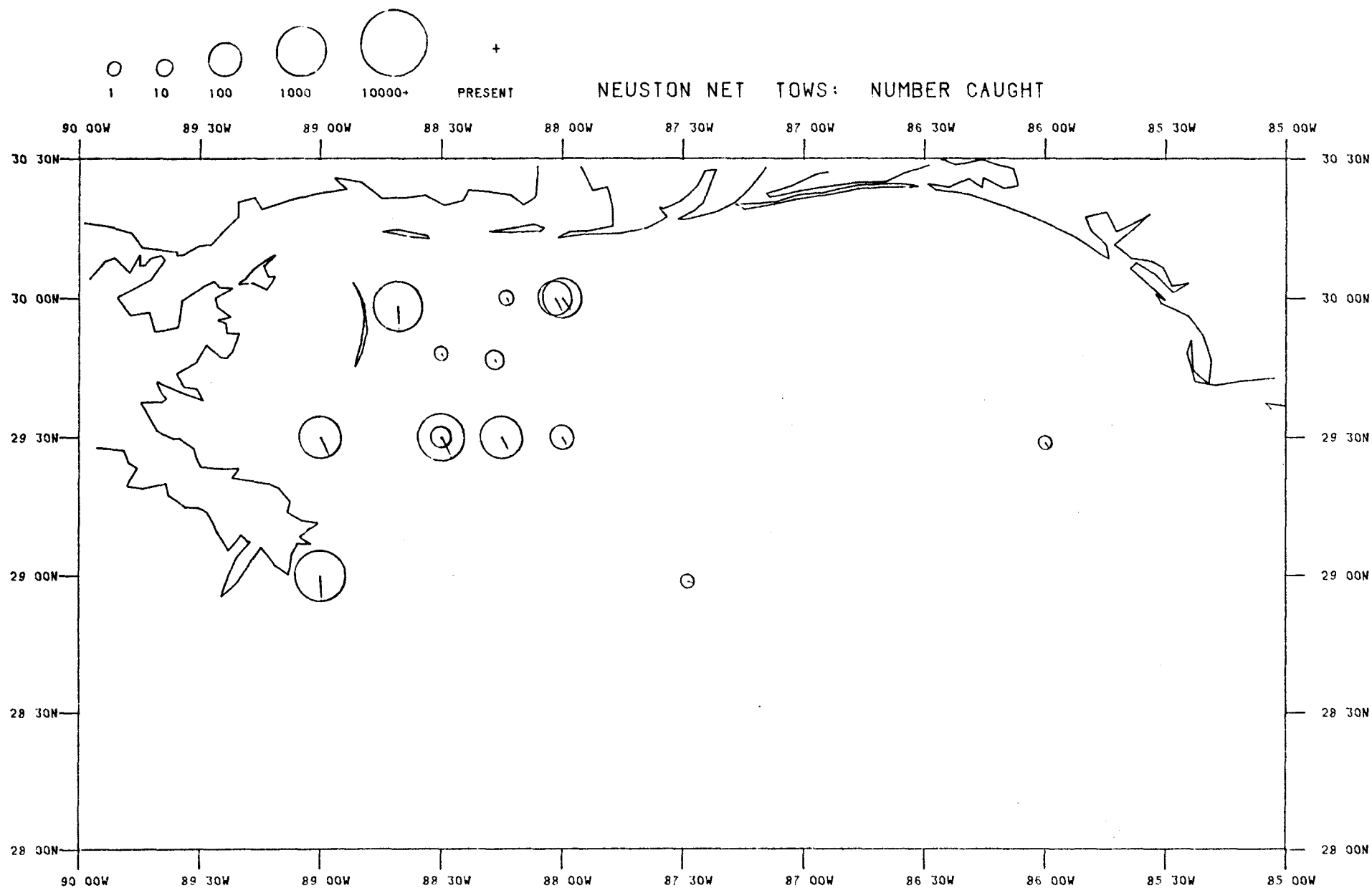
FIGURE 15



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ENGRAULIDAE

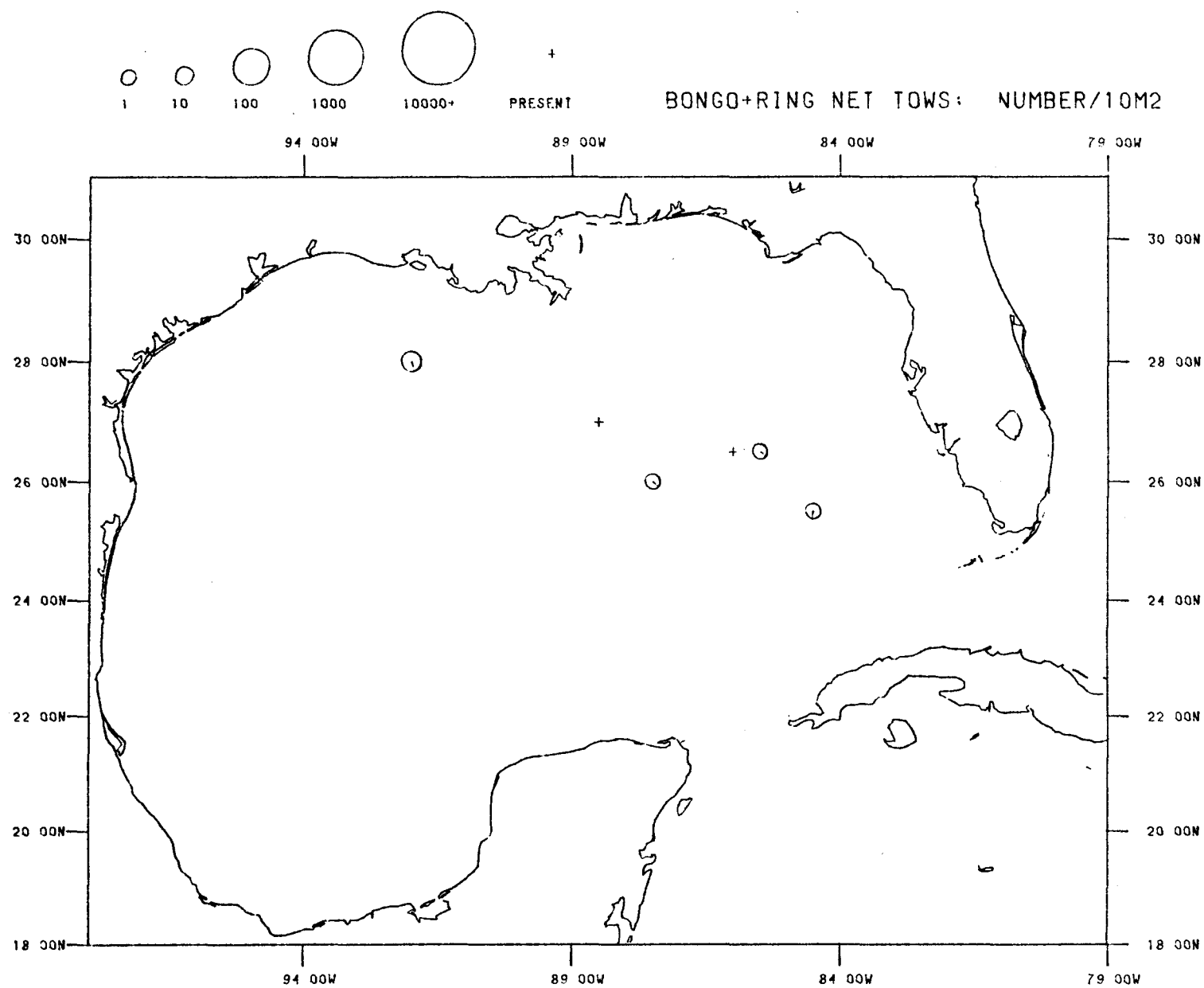
FIGURE 16



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ENGRAULIDAE

FIGURE 17



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ISTIOPHORIDAE

FIGURE 18

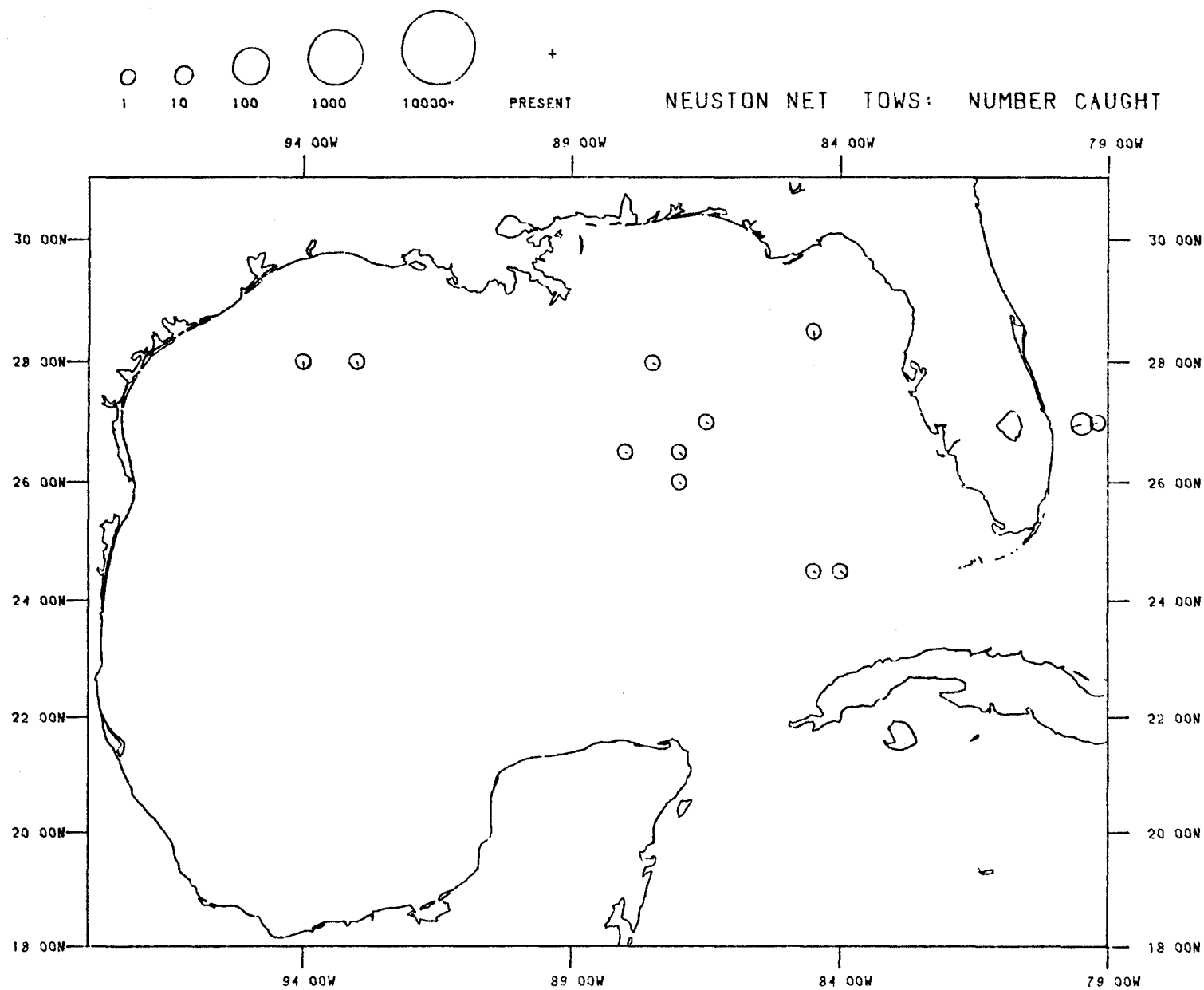
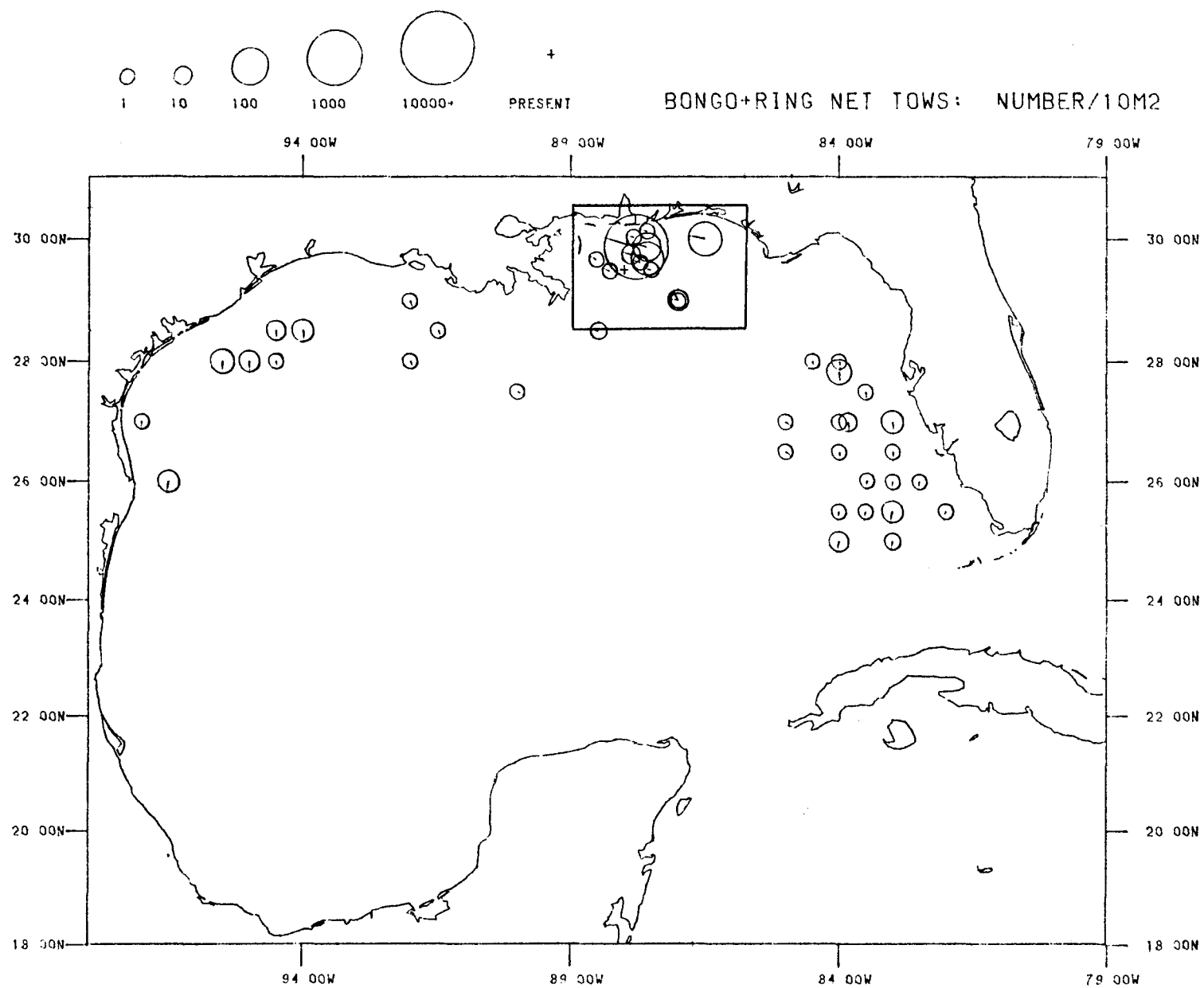


FIGURE 19



SEAMAP 1983

LUTJANIDAE

FIGURE 20

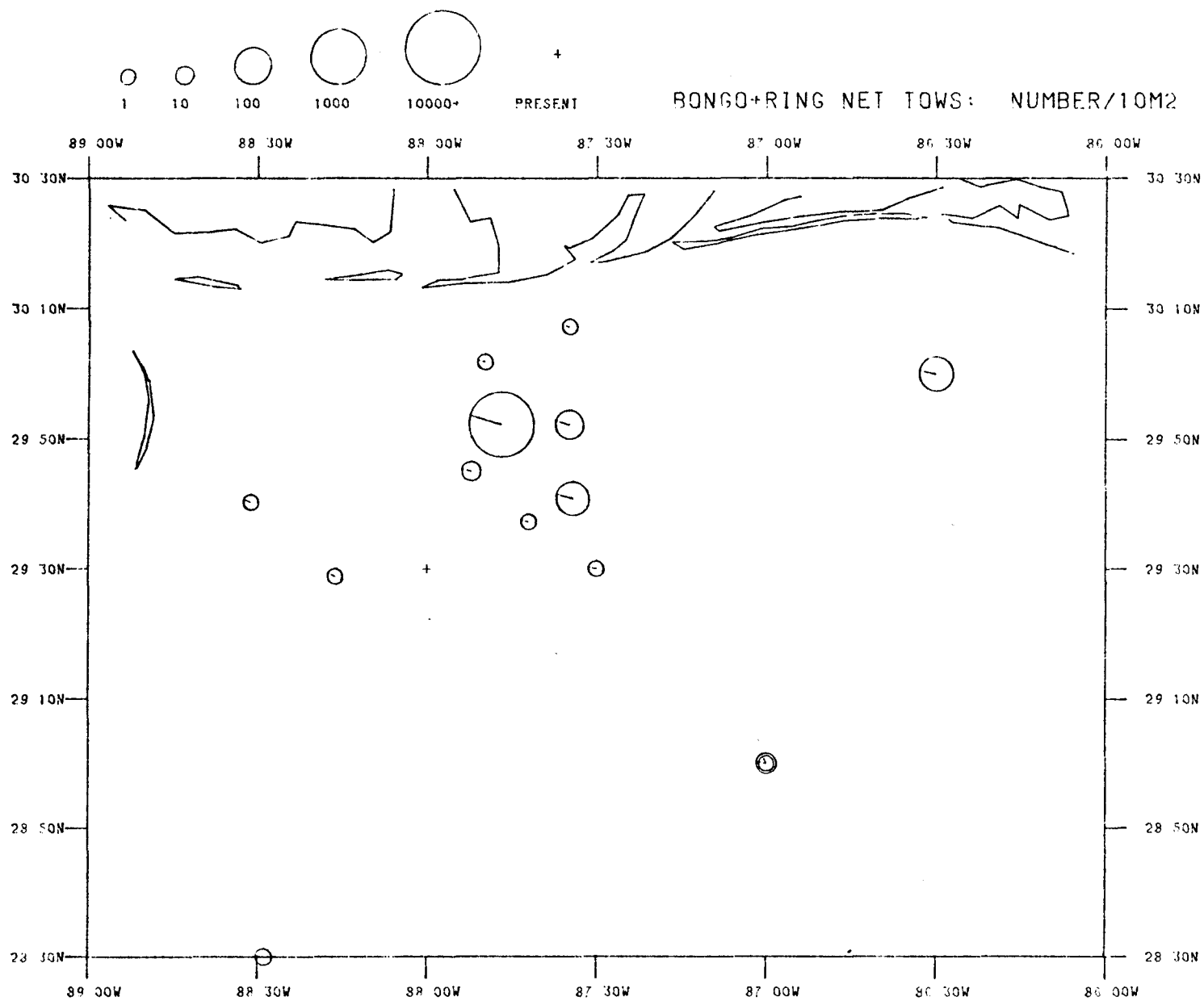
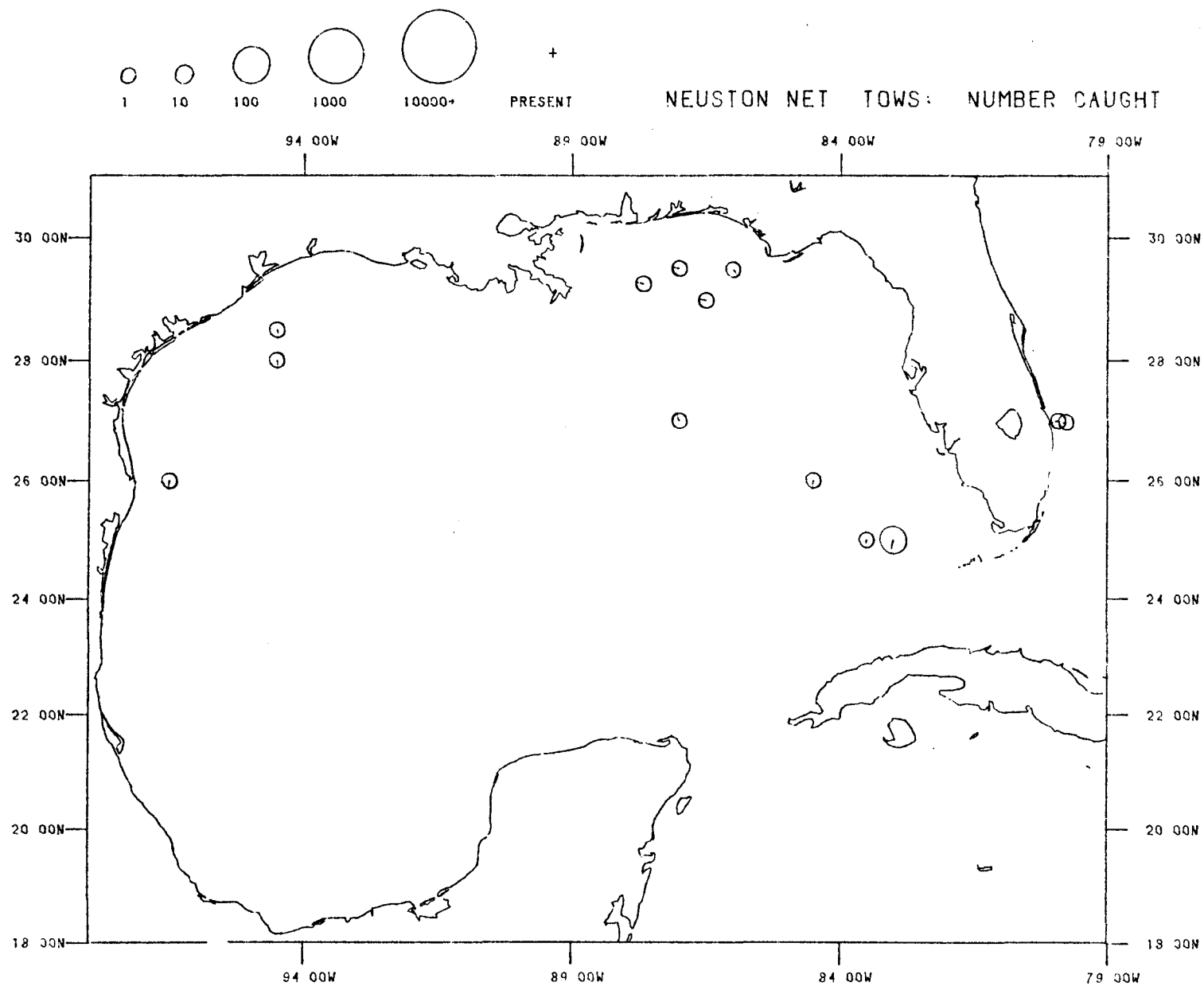


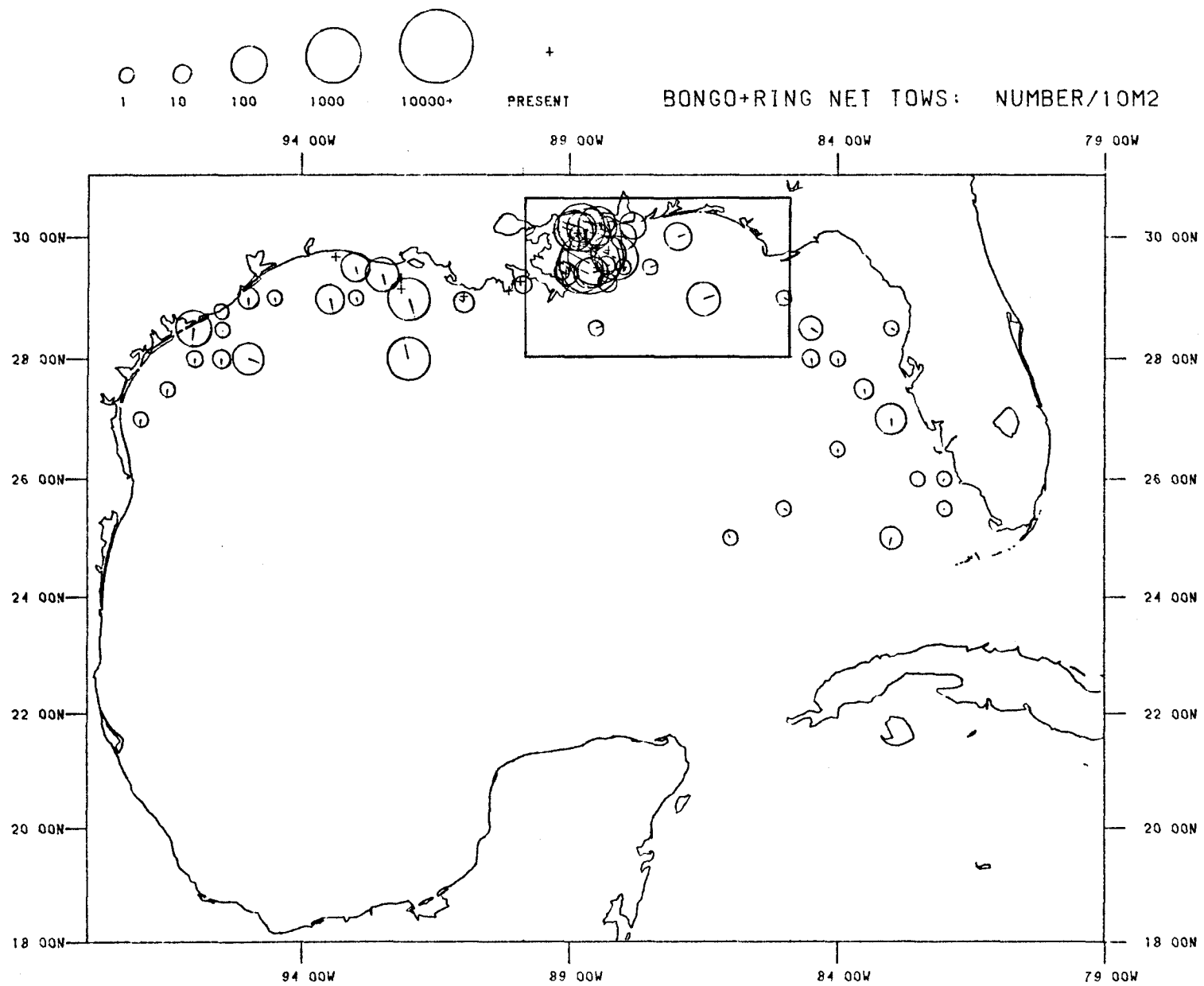
FIGURE 21



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LUTJANIDAE

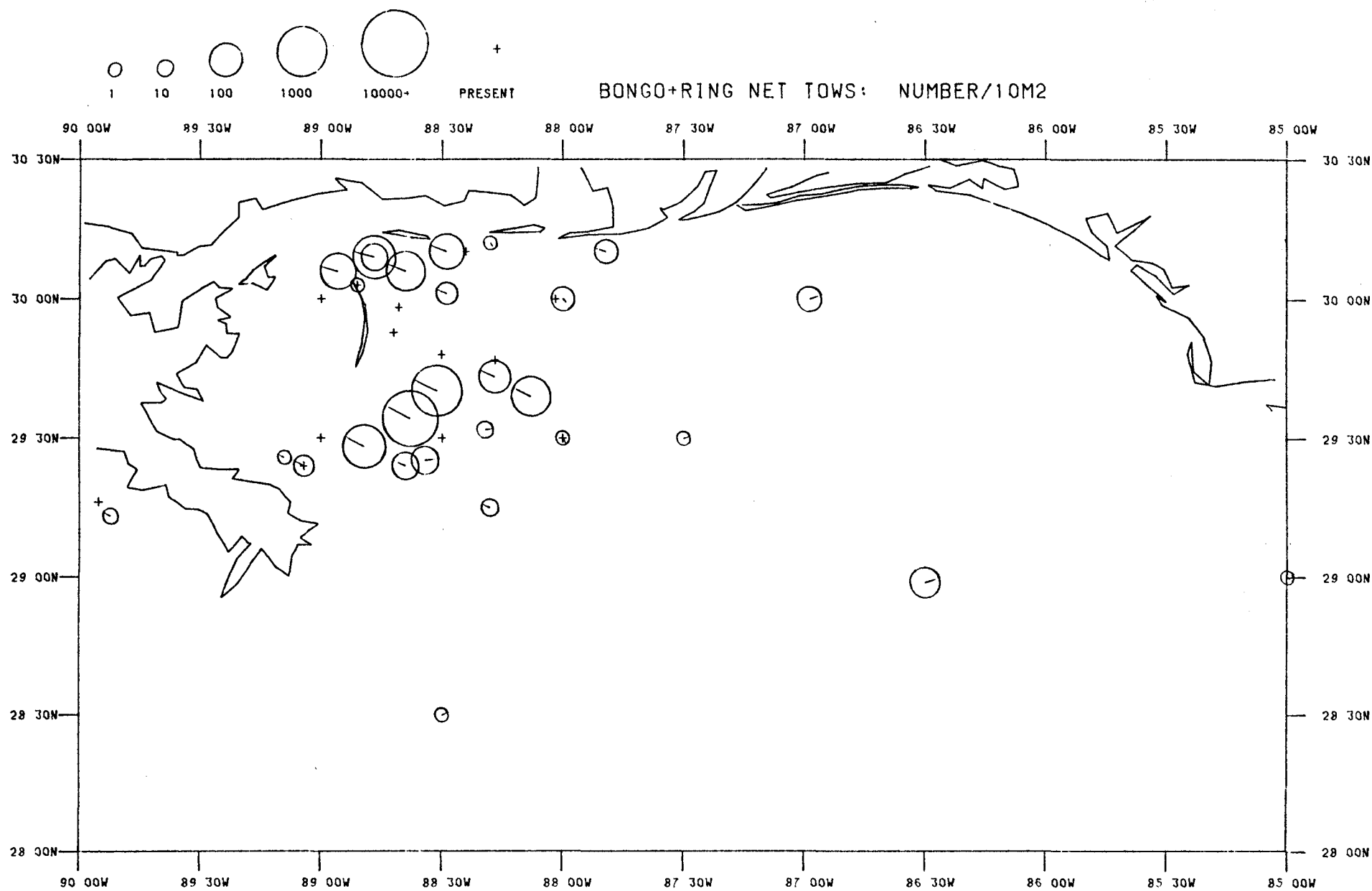
FIGURE 22



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SCIAENIDAE

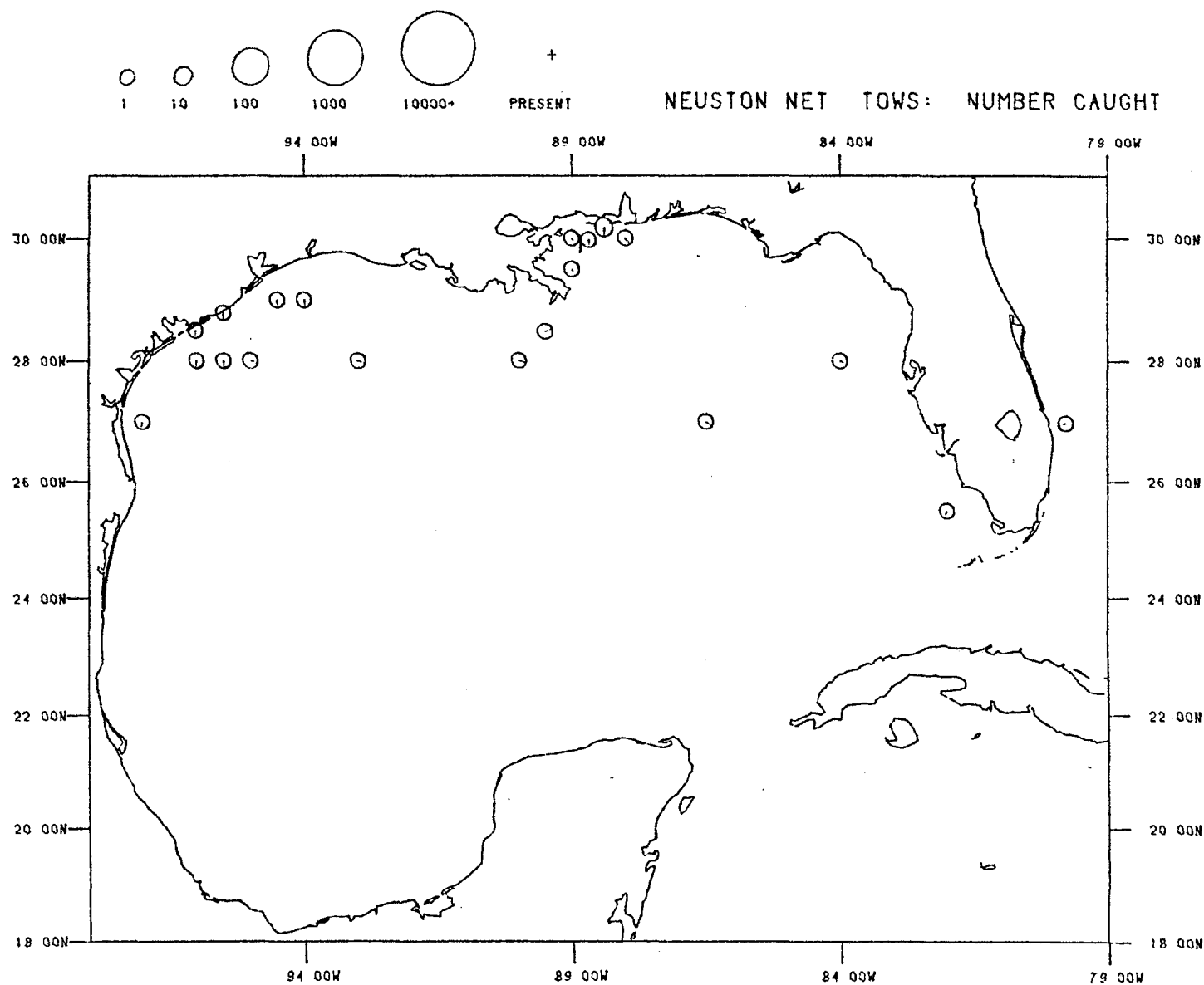
FIGURE 23



SEAMAP 1983

SCIAENIDAE

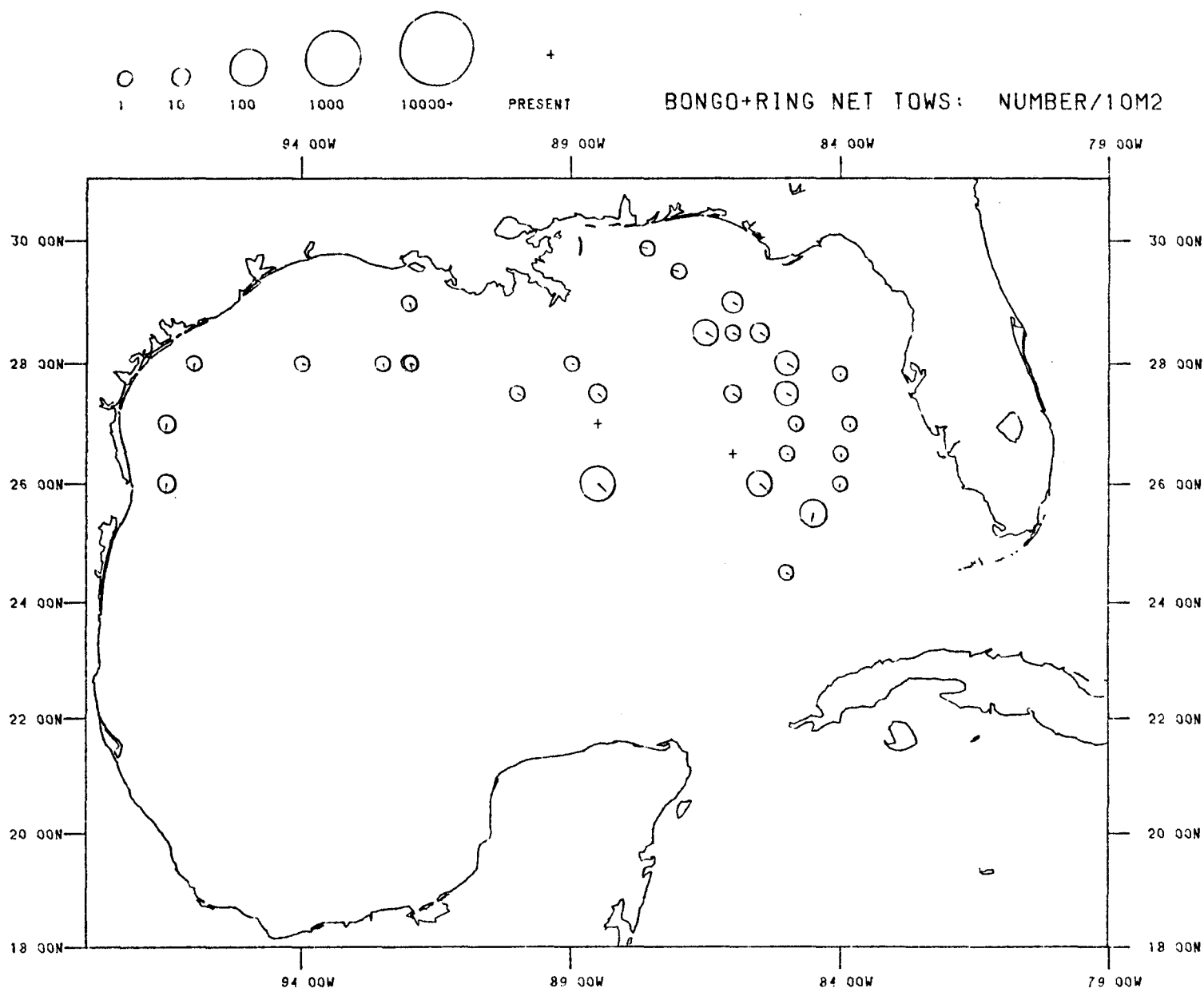
FIGURE 24



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SCIAENIDAE

FIGURE 25



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AUXIS SP

FIGURE 26

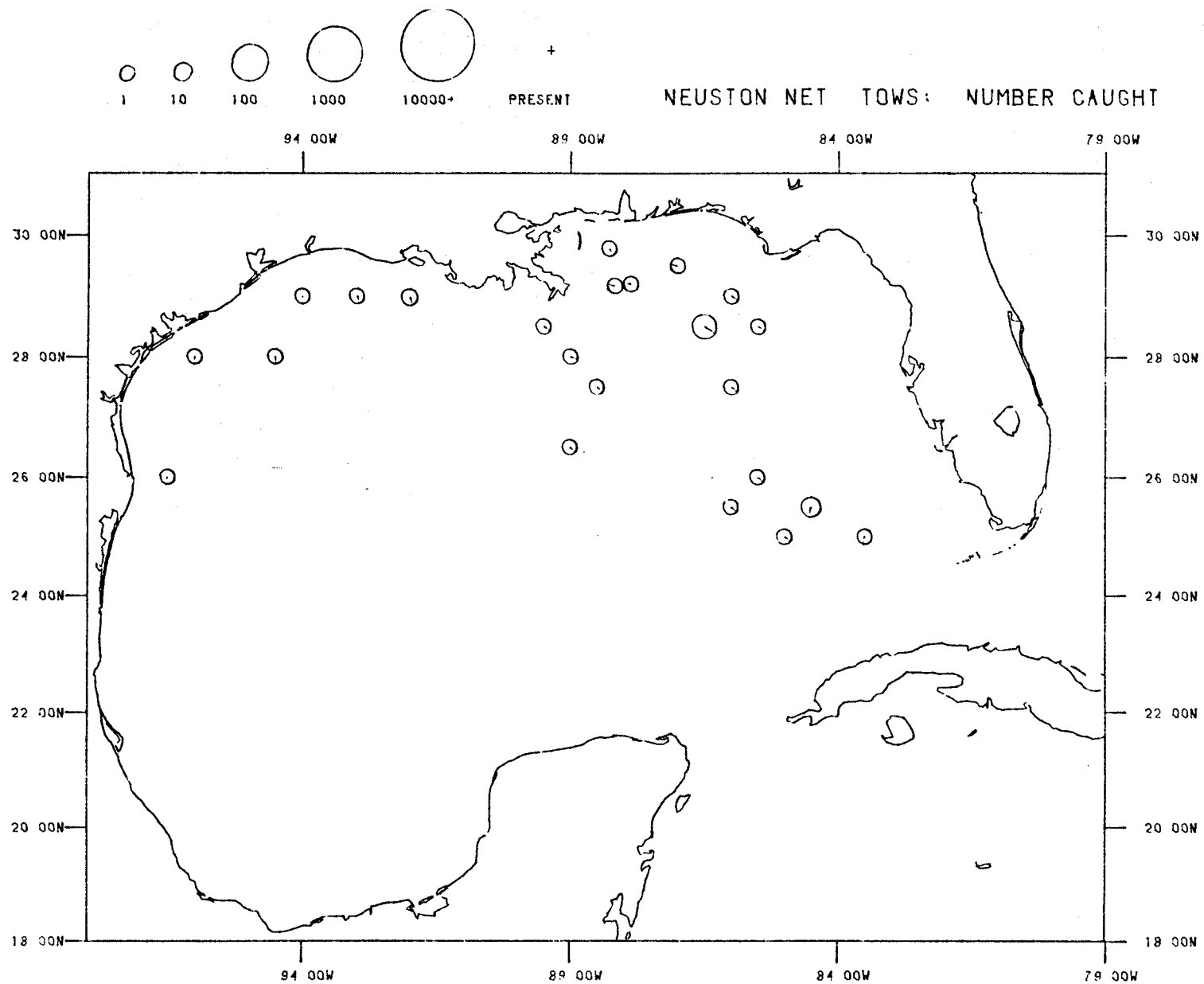
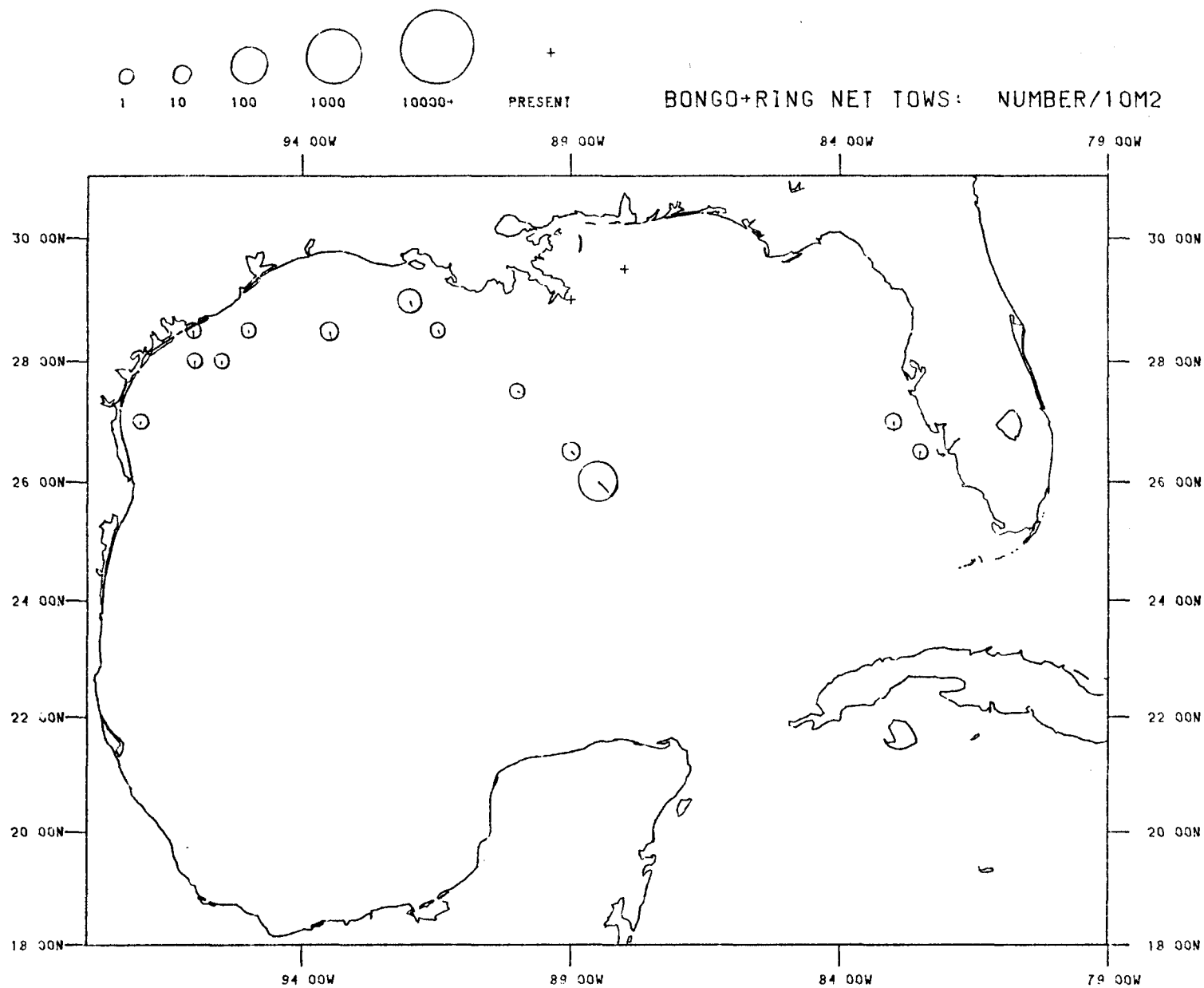


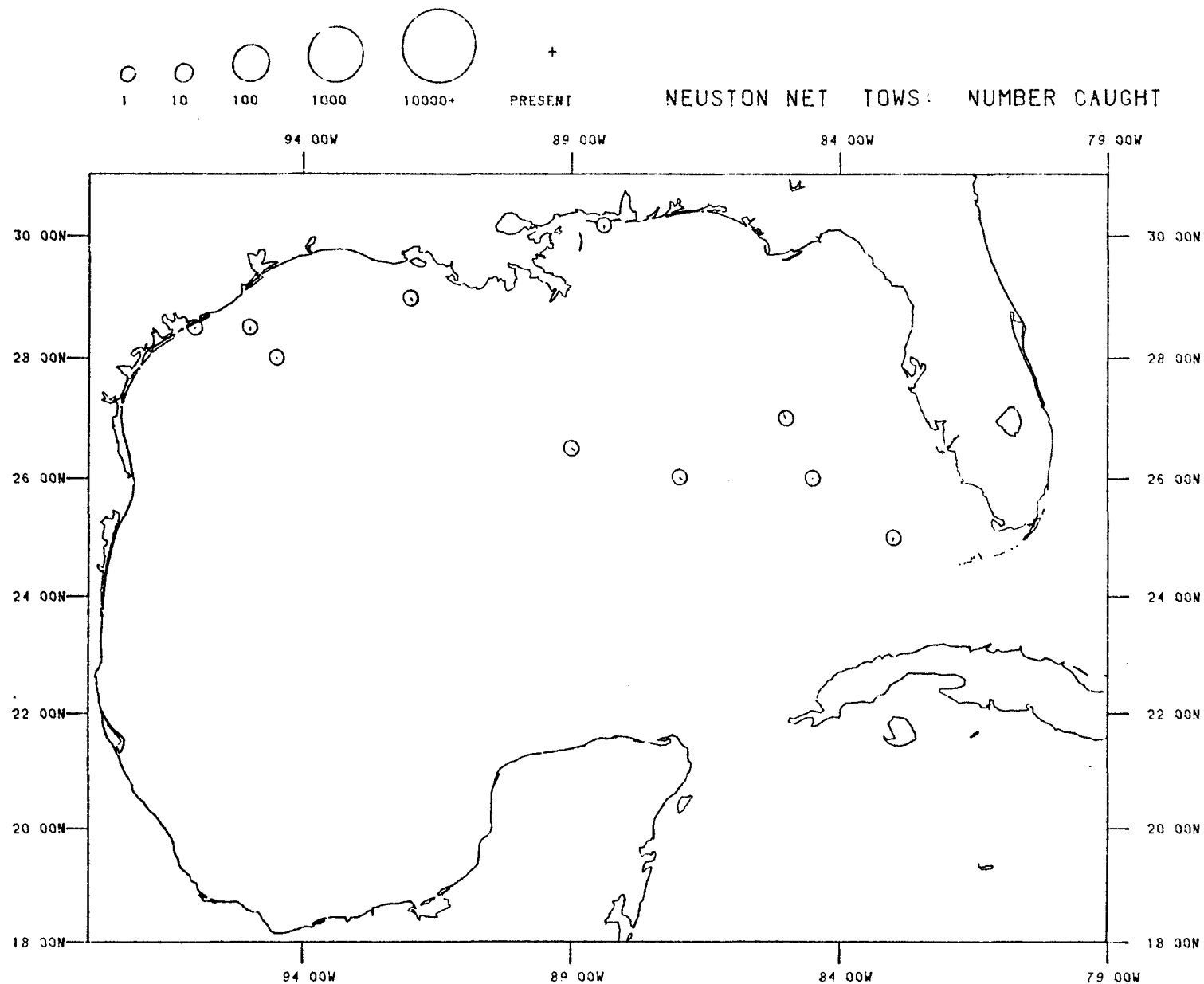
FIGURE 27



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EUTHYNNUS ALLETTERATUS

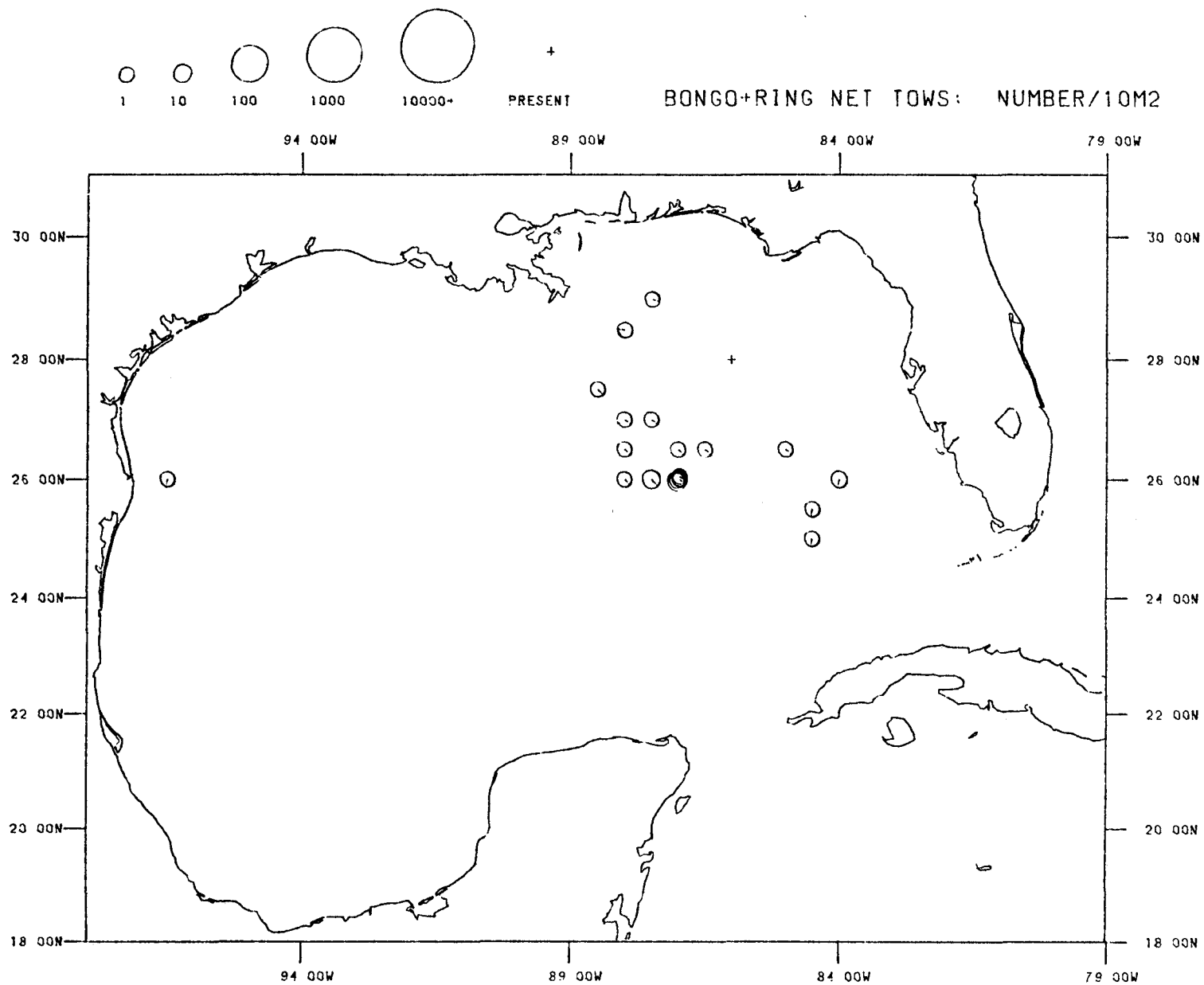
FIGURE 28



SEAMAP 1983

EUTHYNNUS ALLETTERATUS

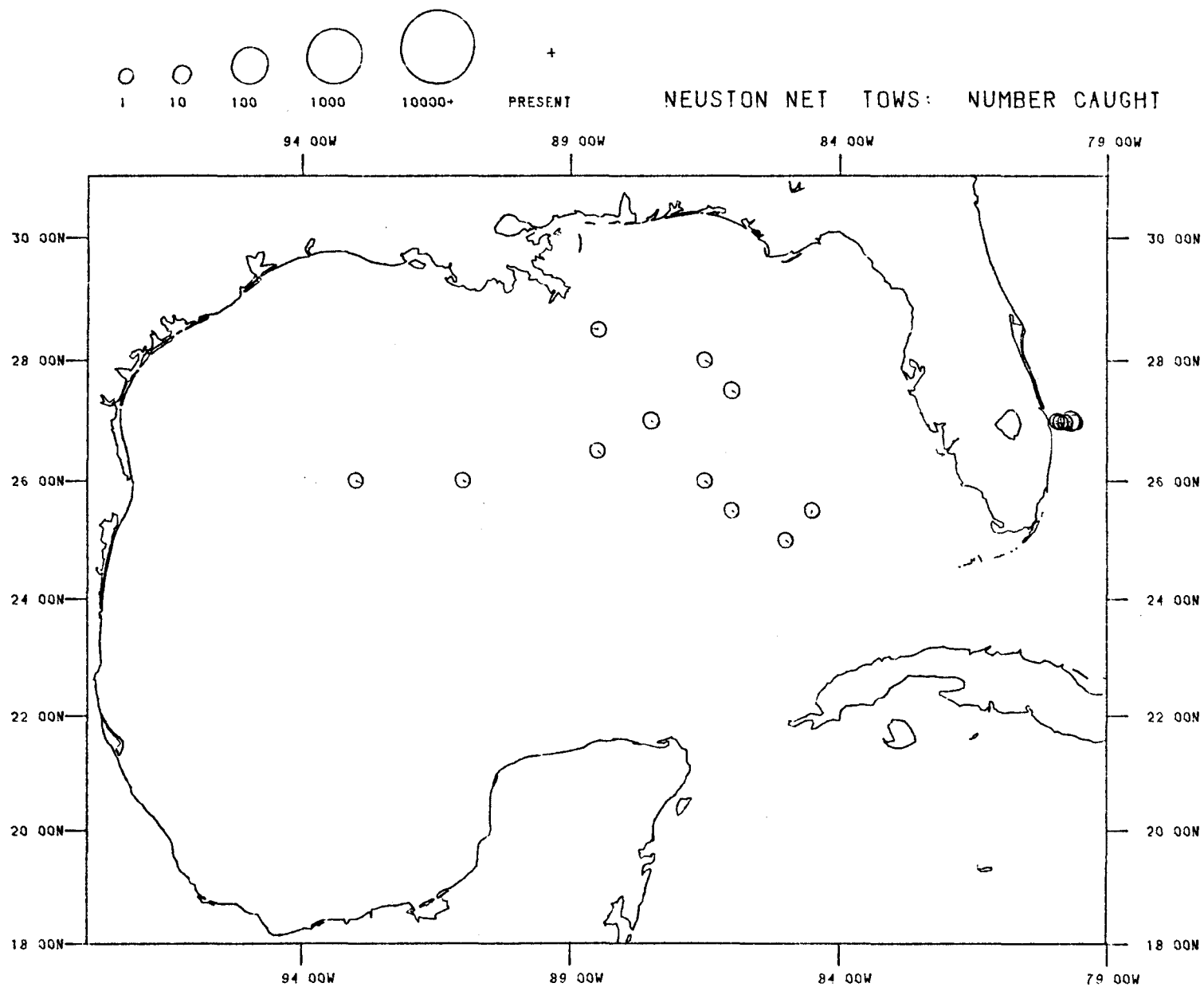
FIGURE 29



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KATSUWONUS PELAMIS

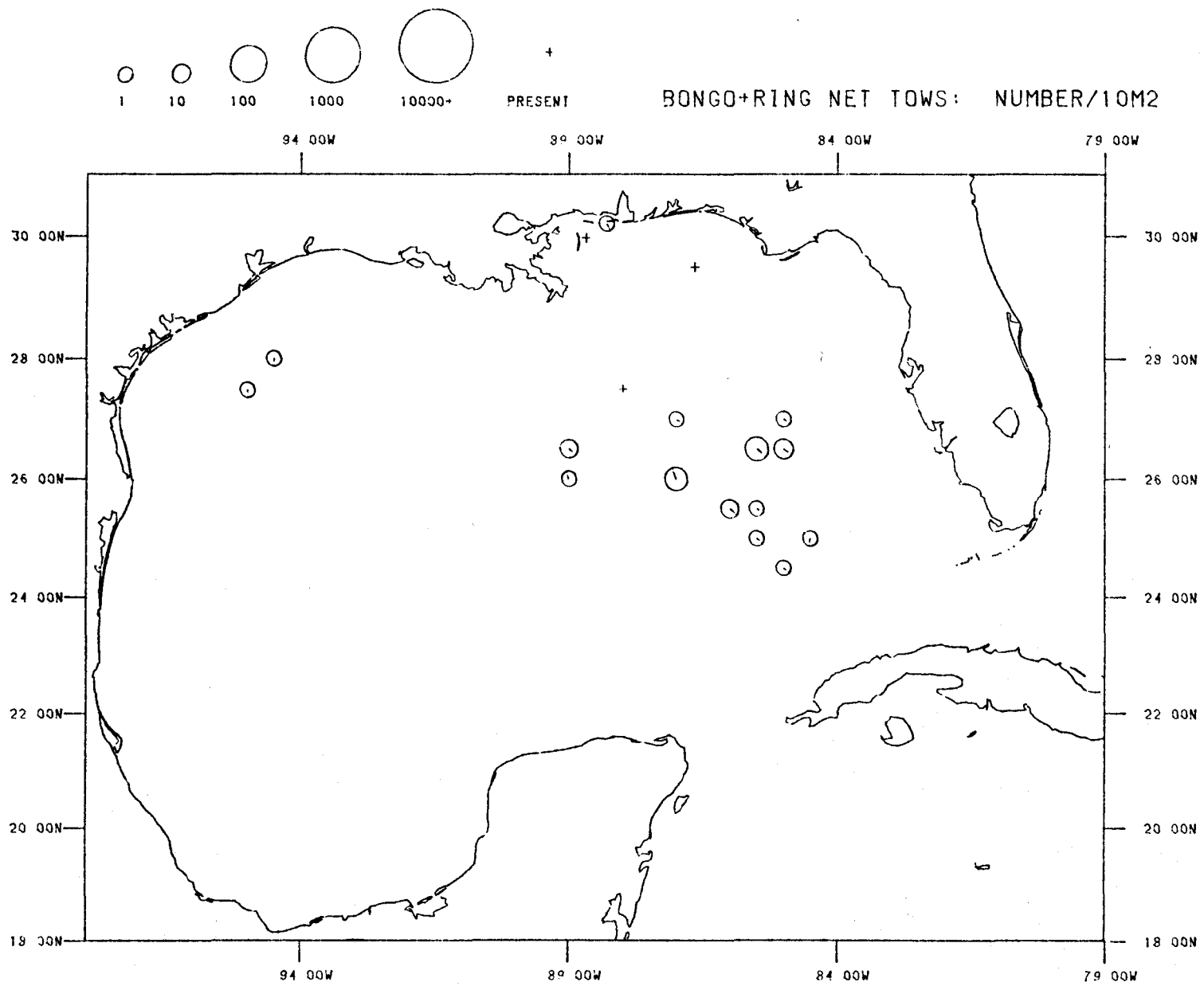
FIGURE 30



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KATSUWONUS PELAMIS

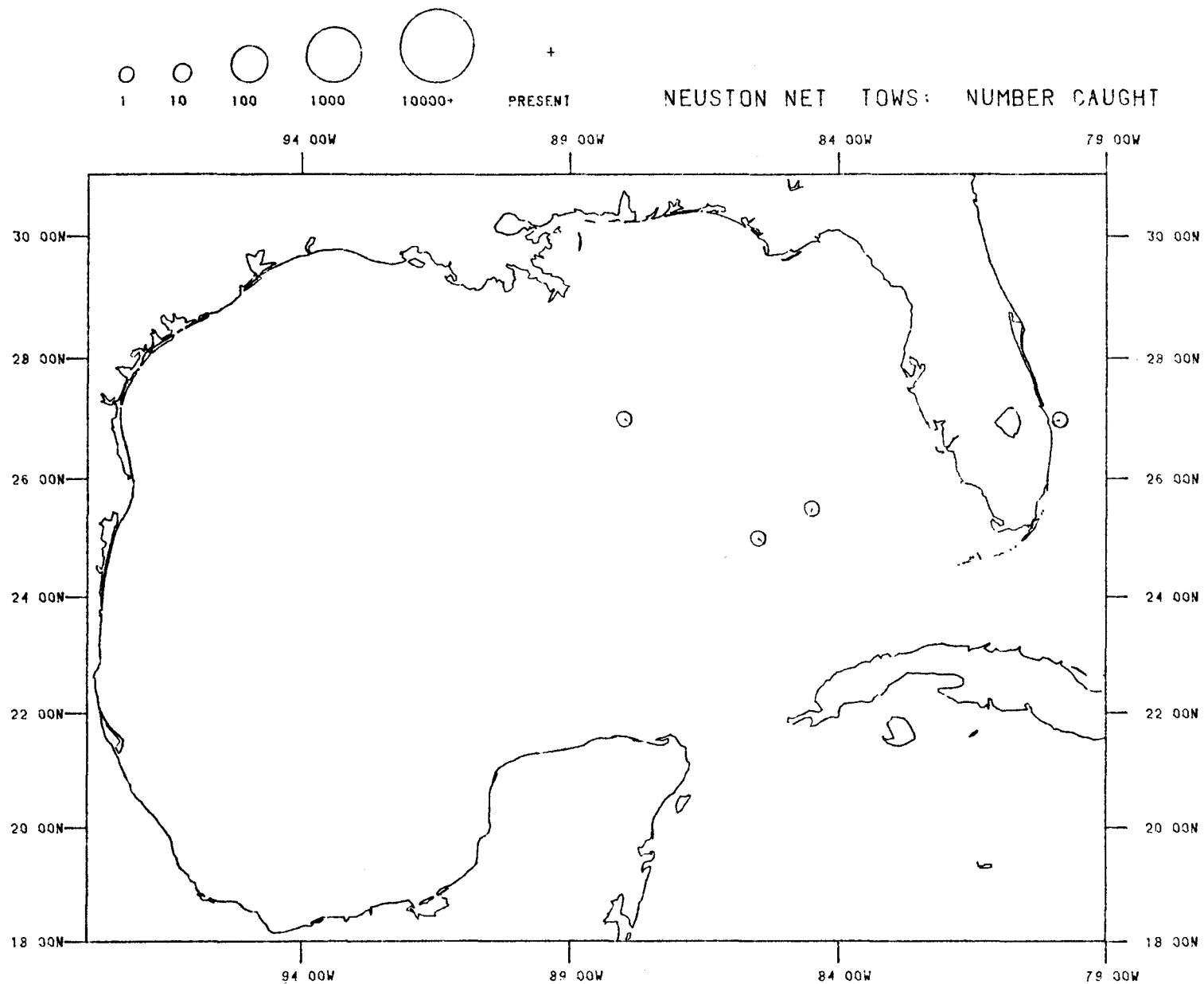
FIGURE 31



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THUNNUS SP

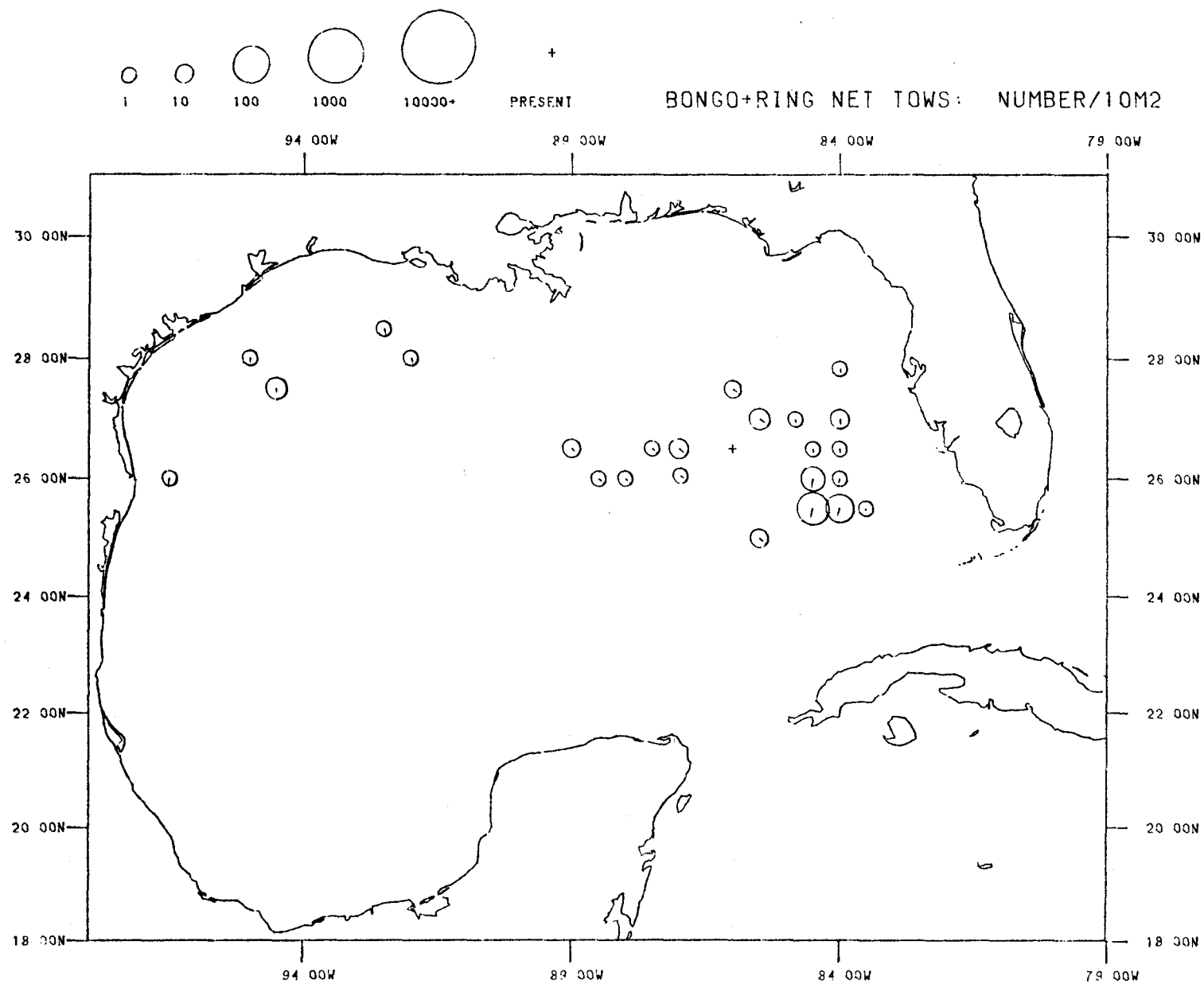
FIGURE 32



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THUNNUS SP

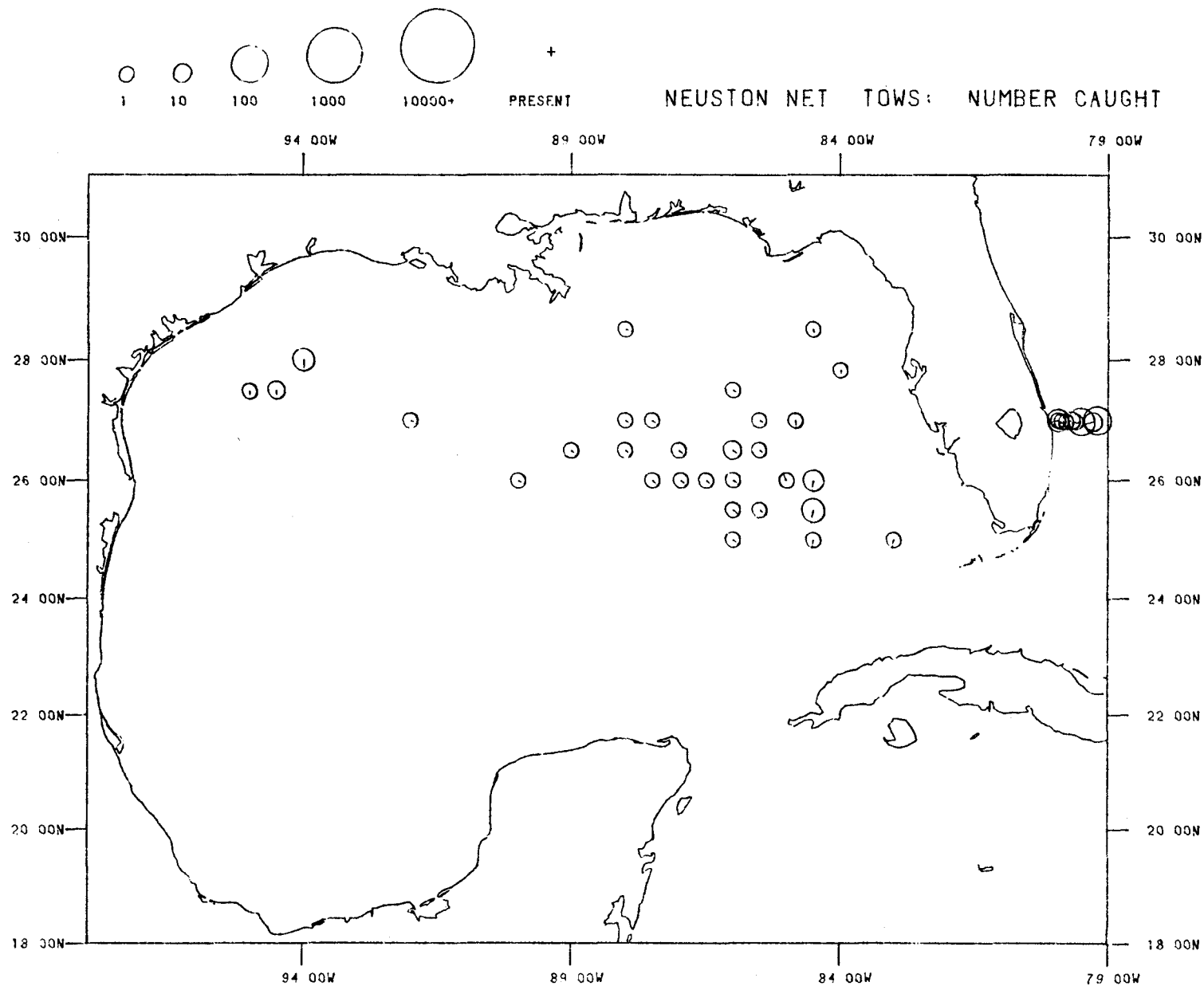
FIGURE 33



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THUNNUS ATLANTICUS

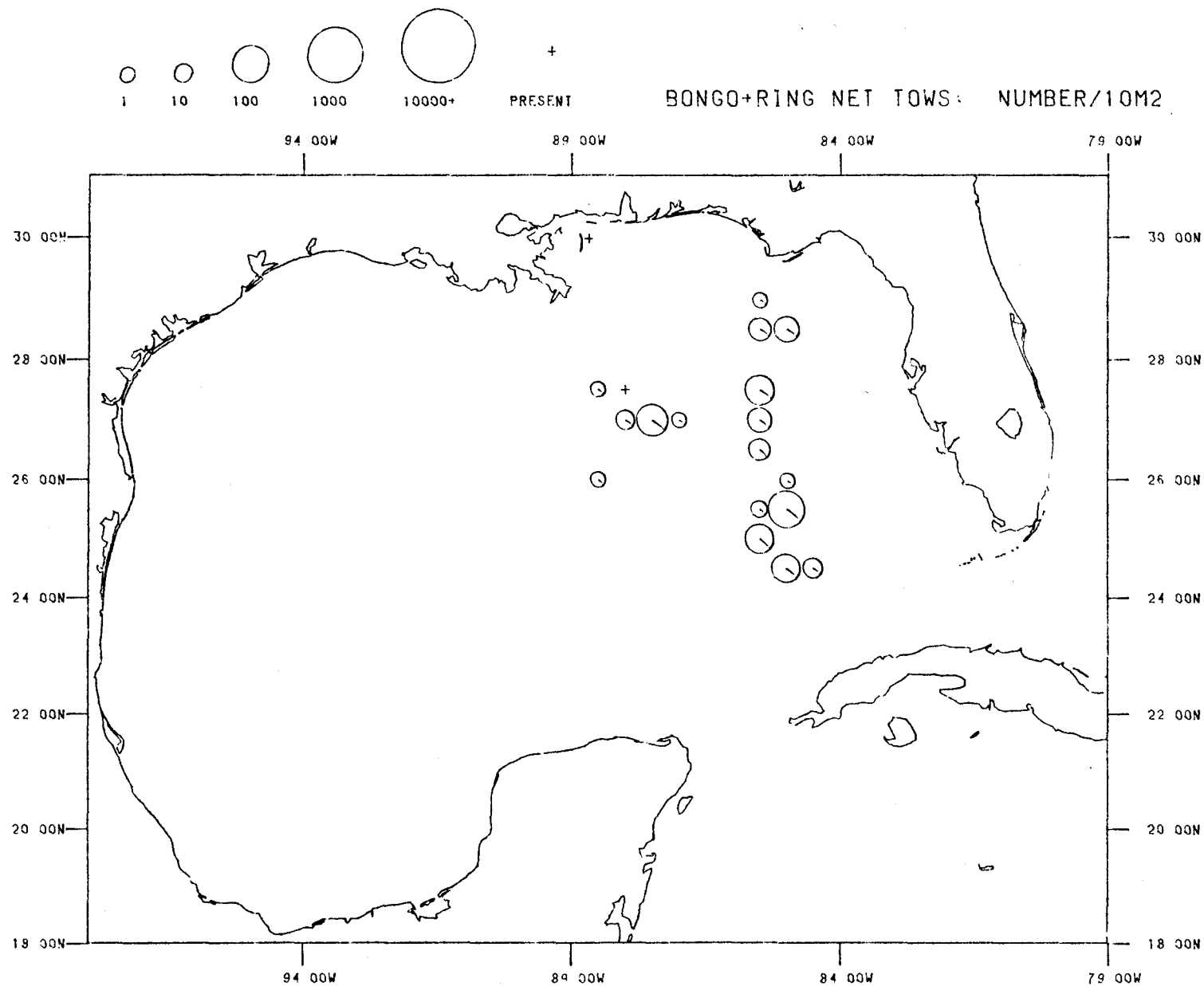
FIGURE 34



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THUNNUS ATLANTICUS

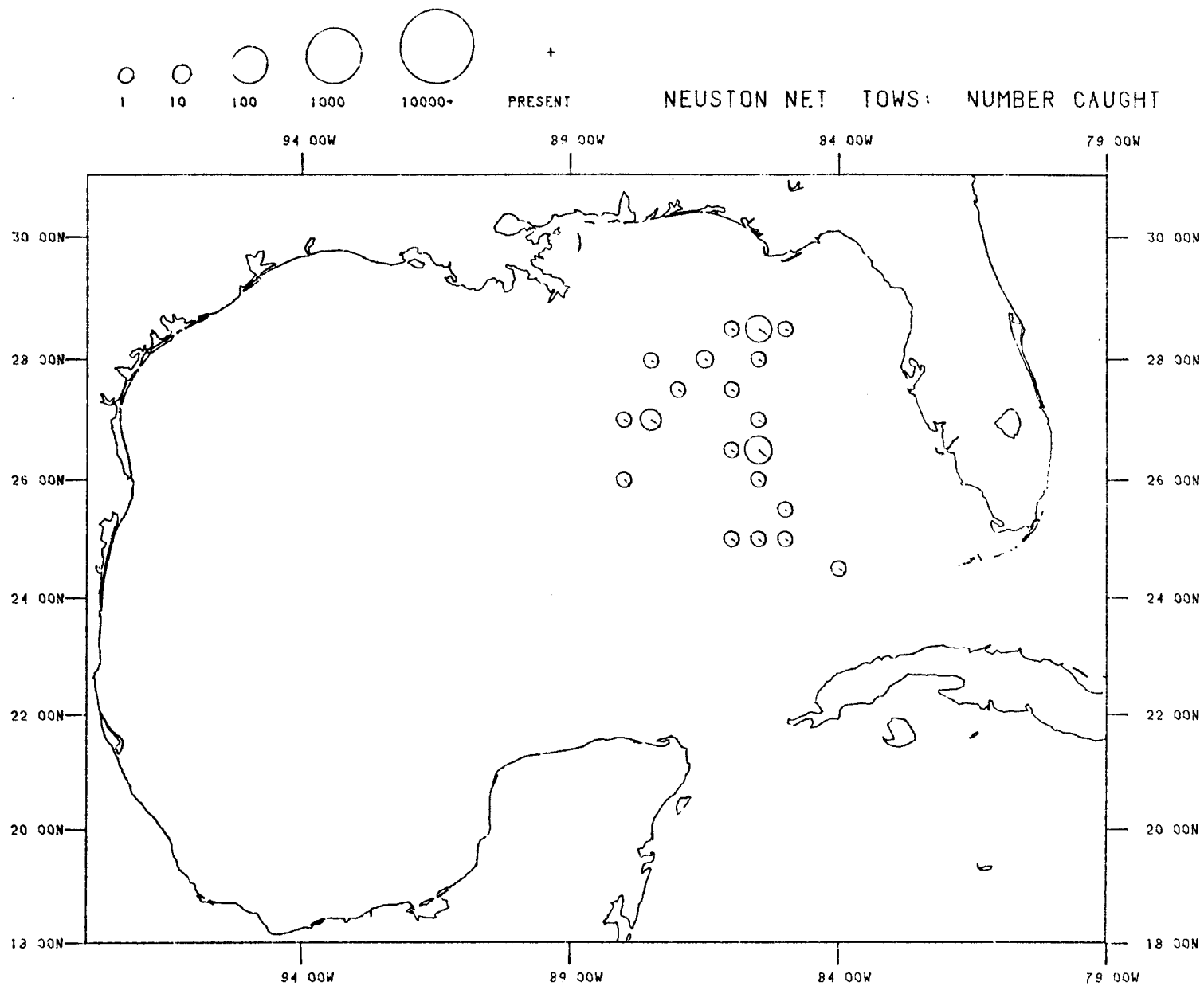
FIGURE 35

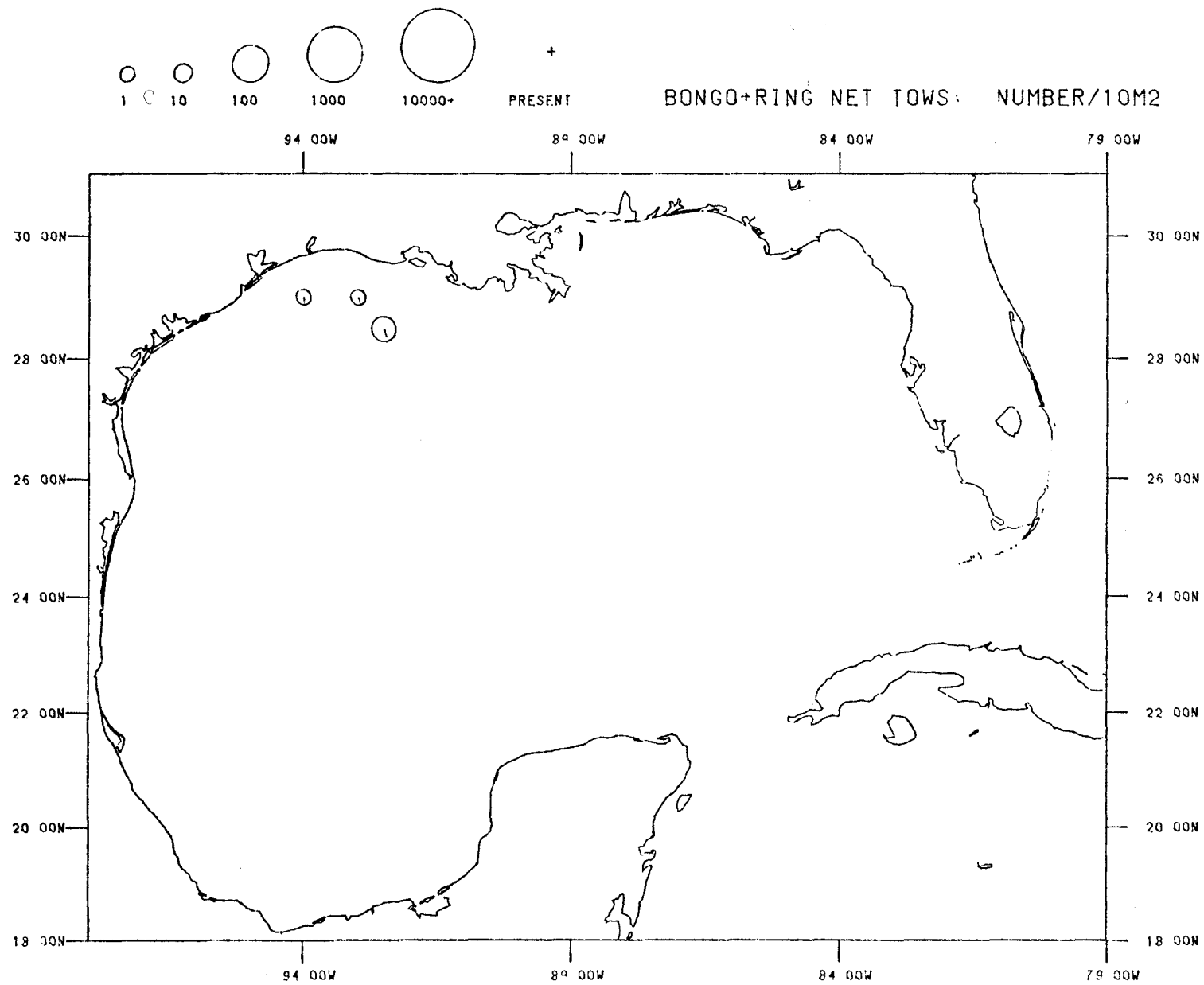


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THUNNUS THYNNUS

FIGURE 36

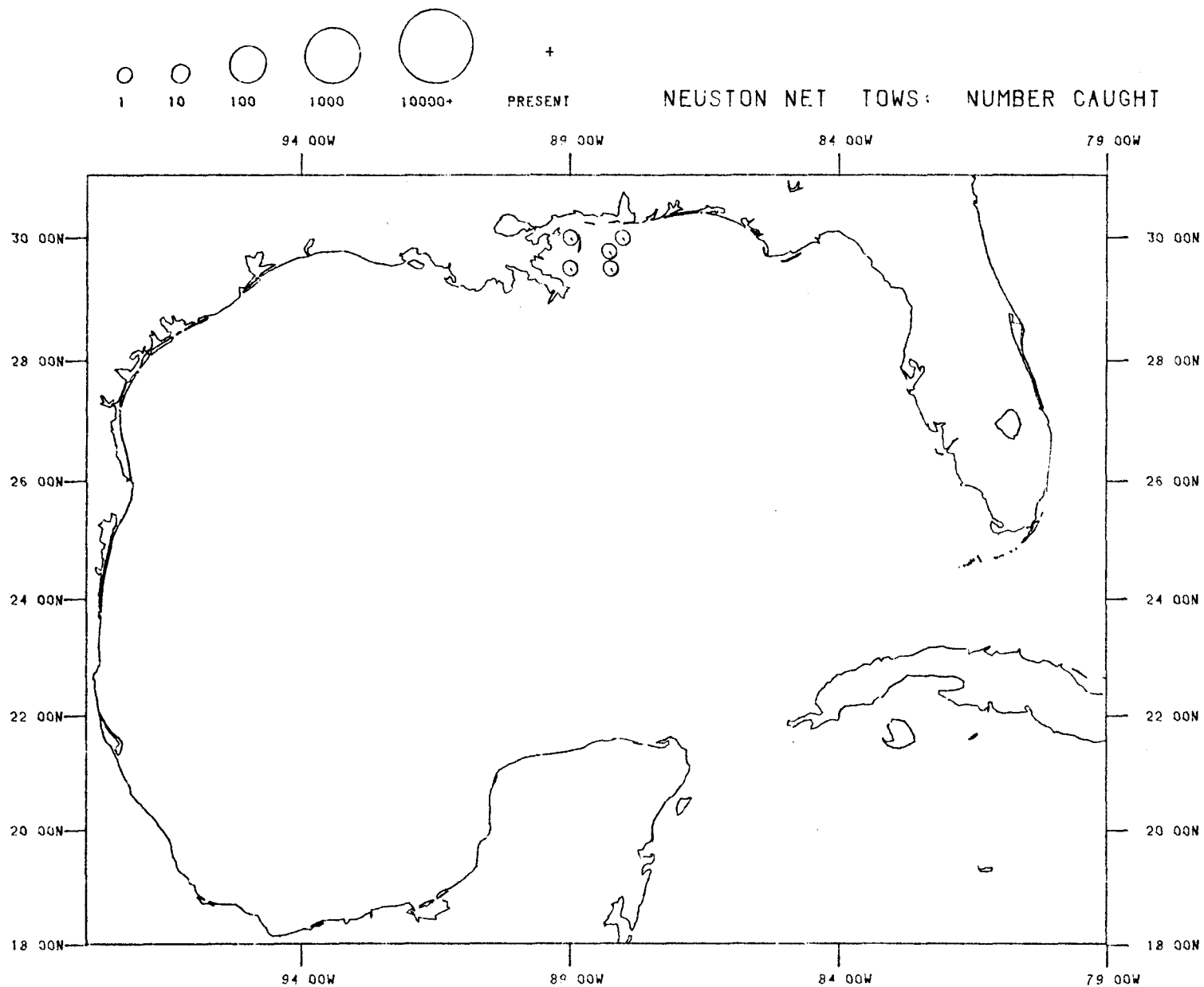




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SCOMBEROMORUS SP

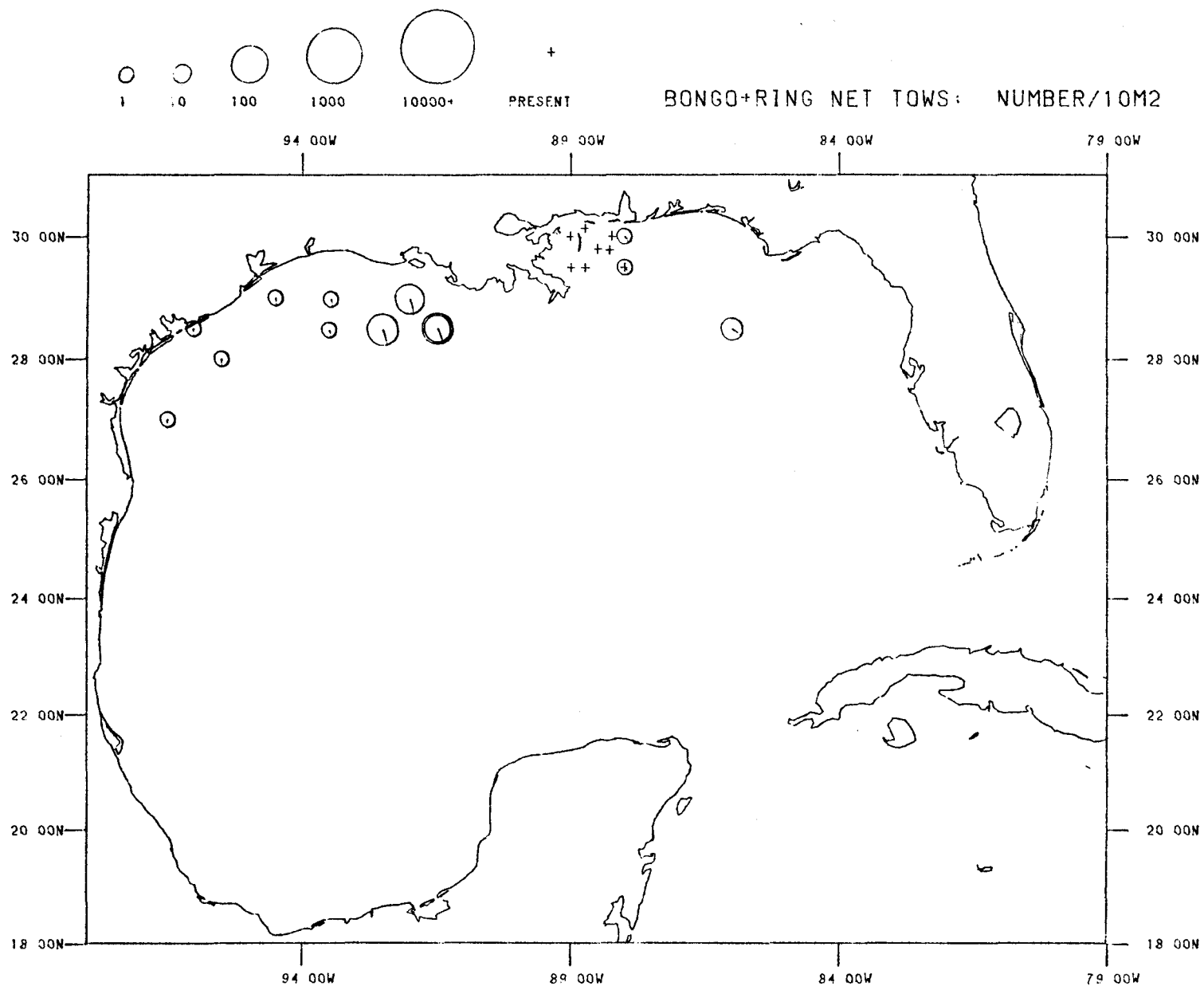
FIGURE 38



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SCOMBEROMORUS SP

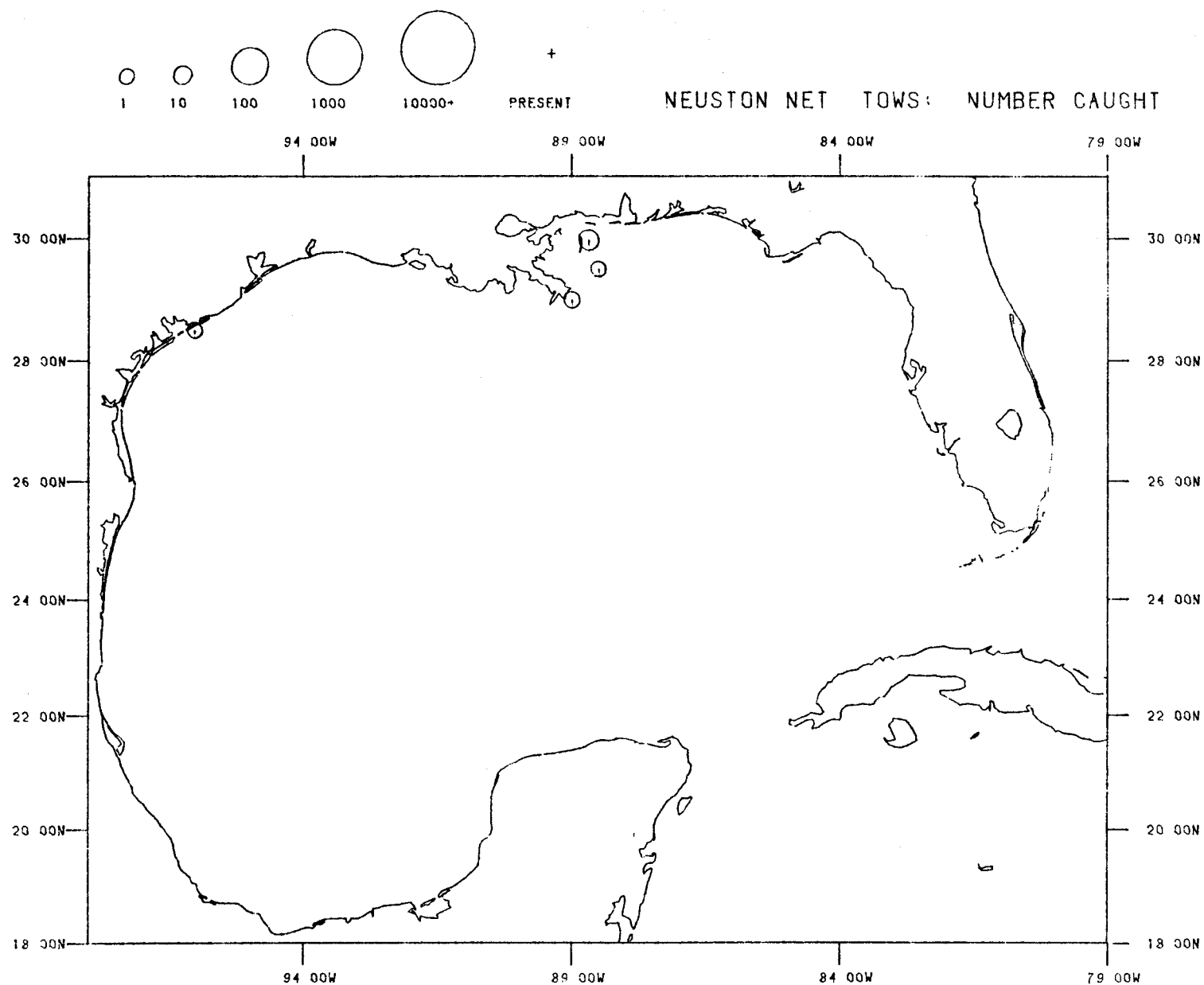
FIGURE 39



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SCOMBEROMORUS MACULATUS

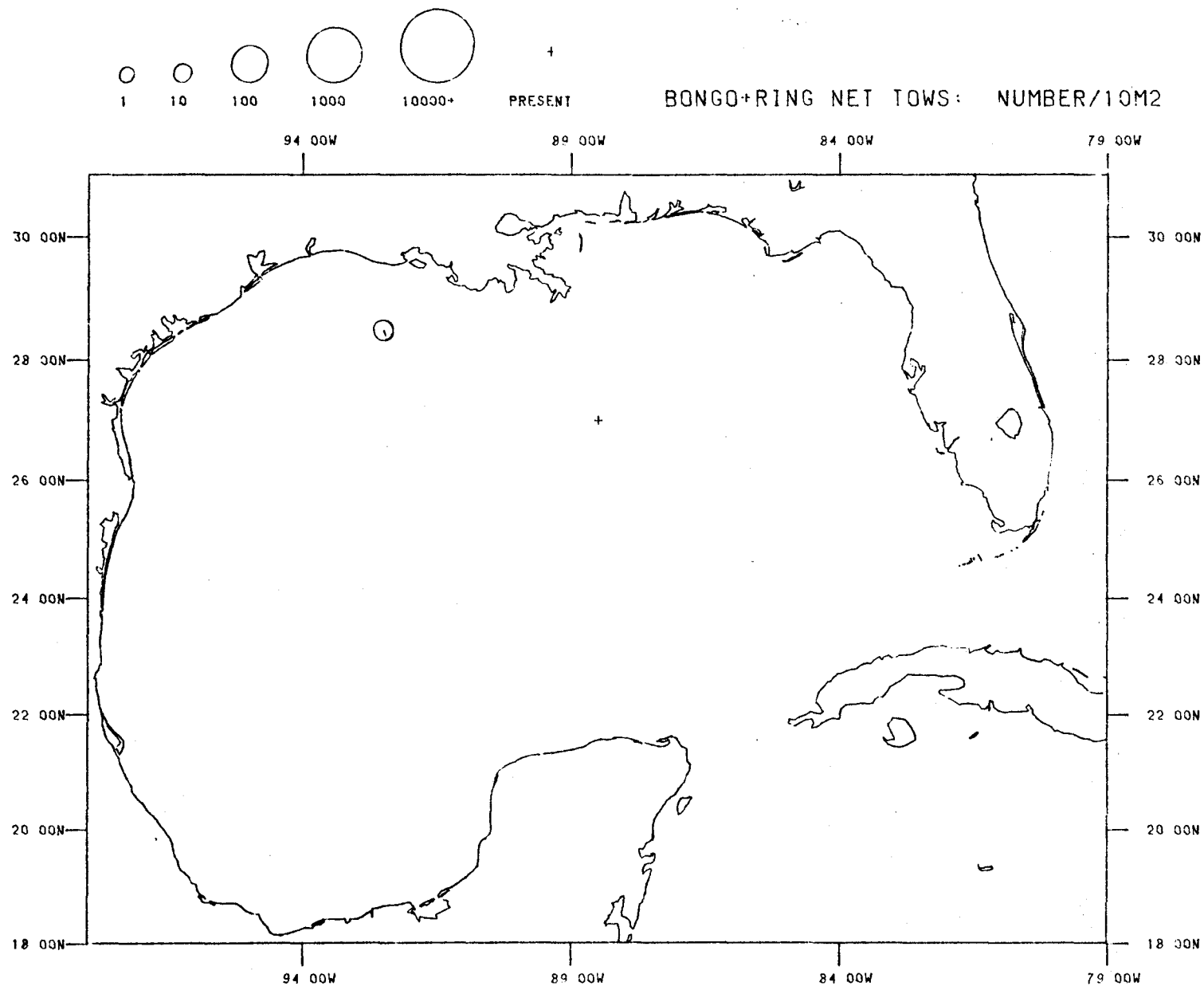
FIGURE 40



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SCOMBEROMORUS MACULATUS

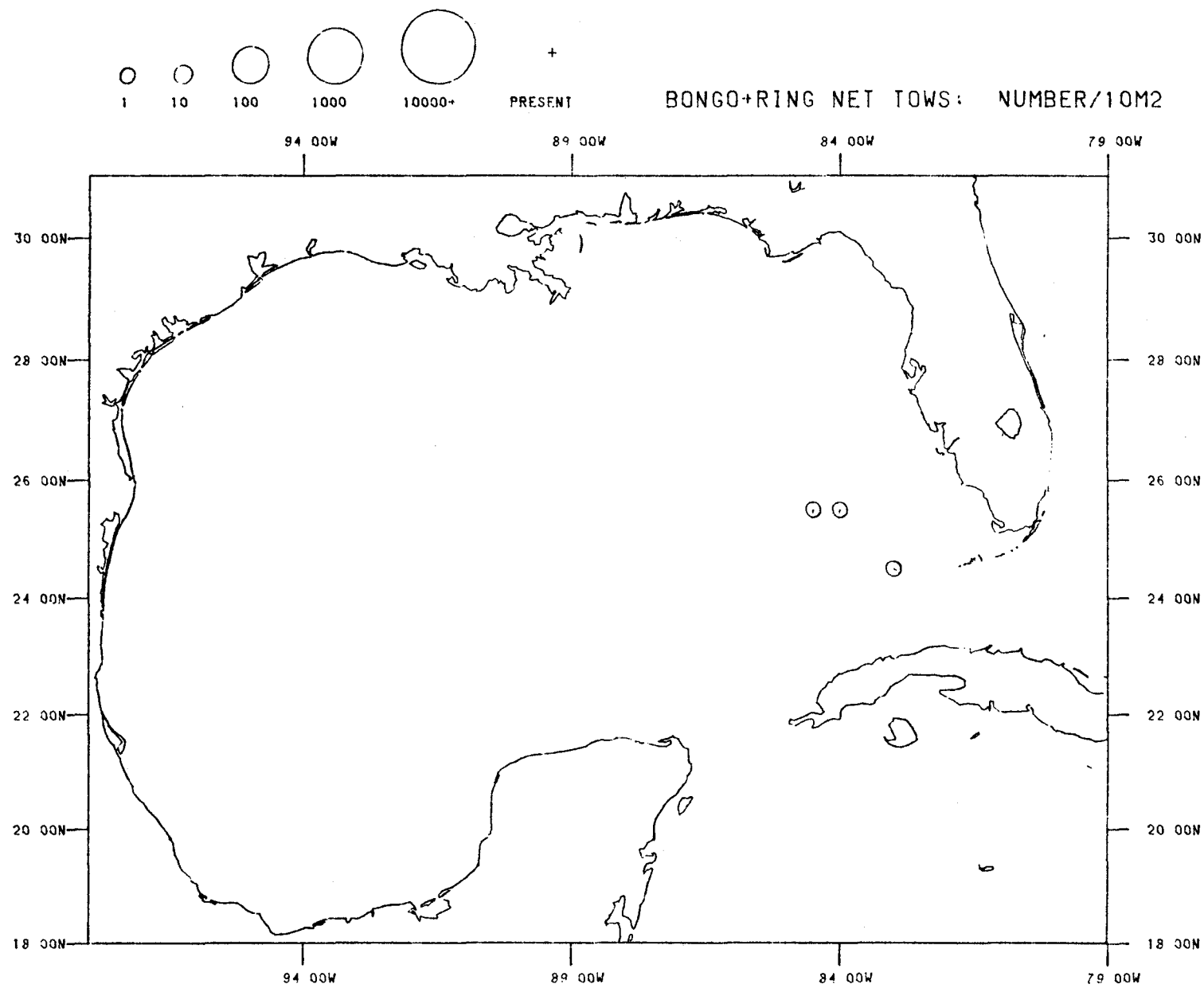
FIGURE 41



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SCOMBEROMORUS CAVALLA

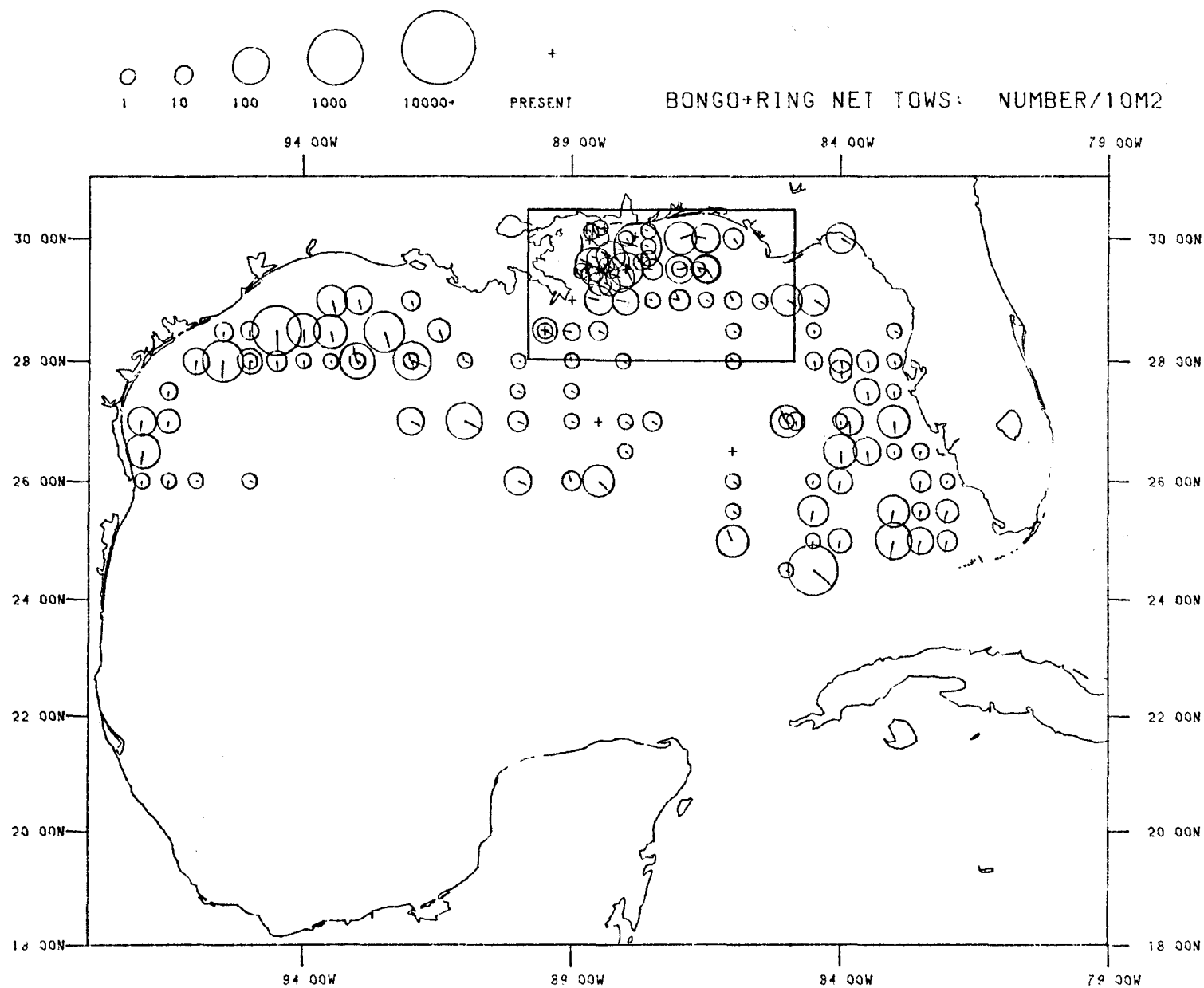
FIGURE 42



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ACANTHOCYBIUM SOLANDERI

FIGURE 43



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SERRANIDAE

FIGURE 44

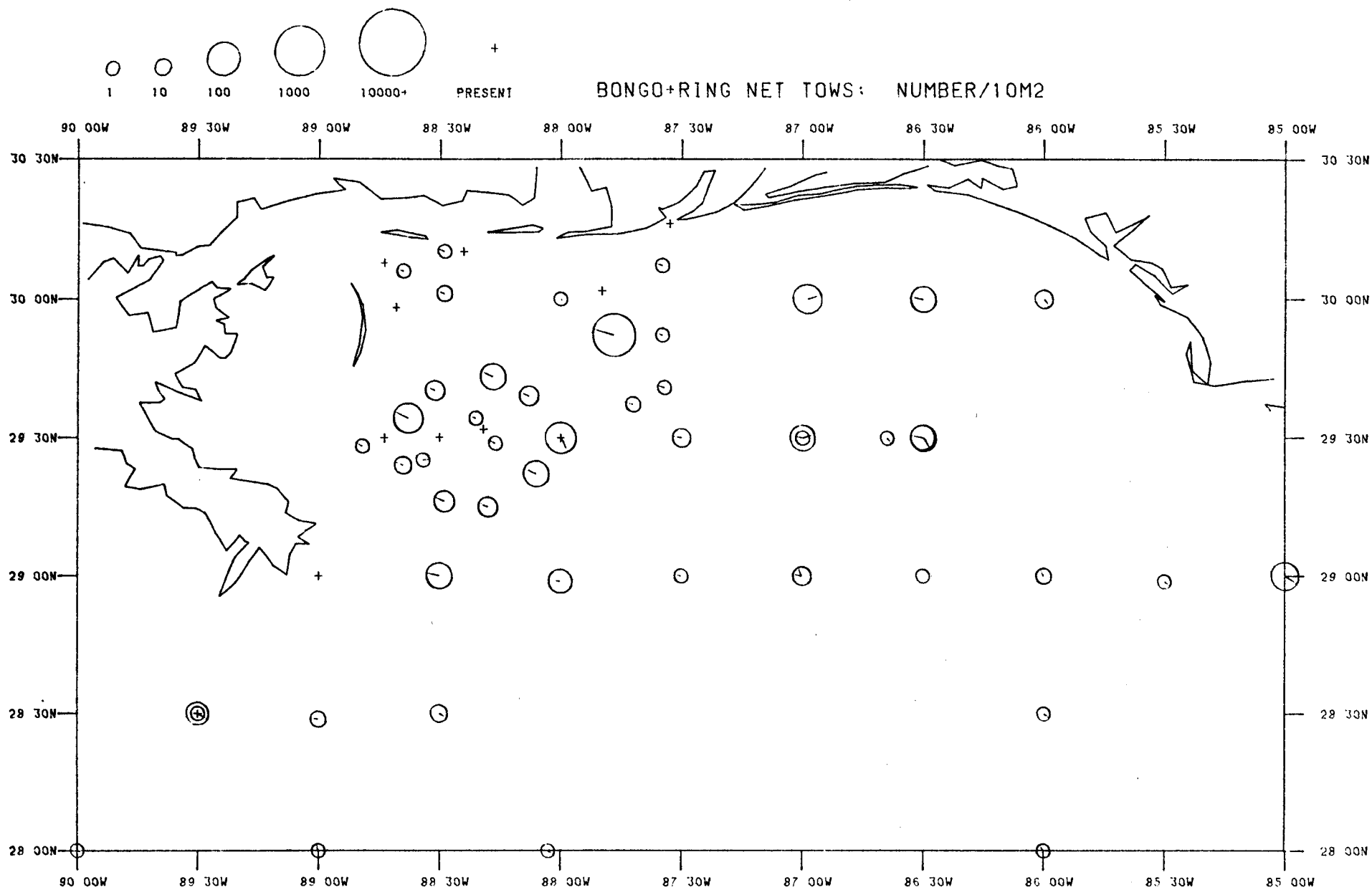
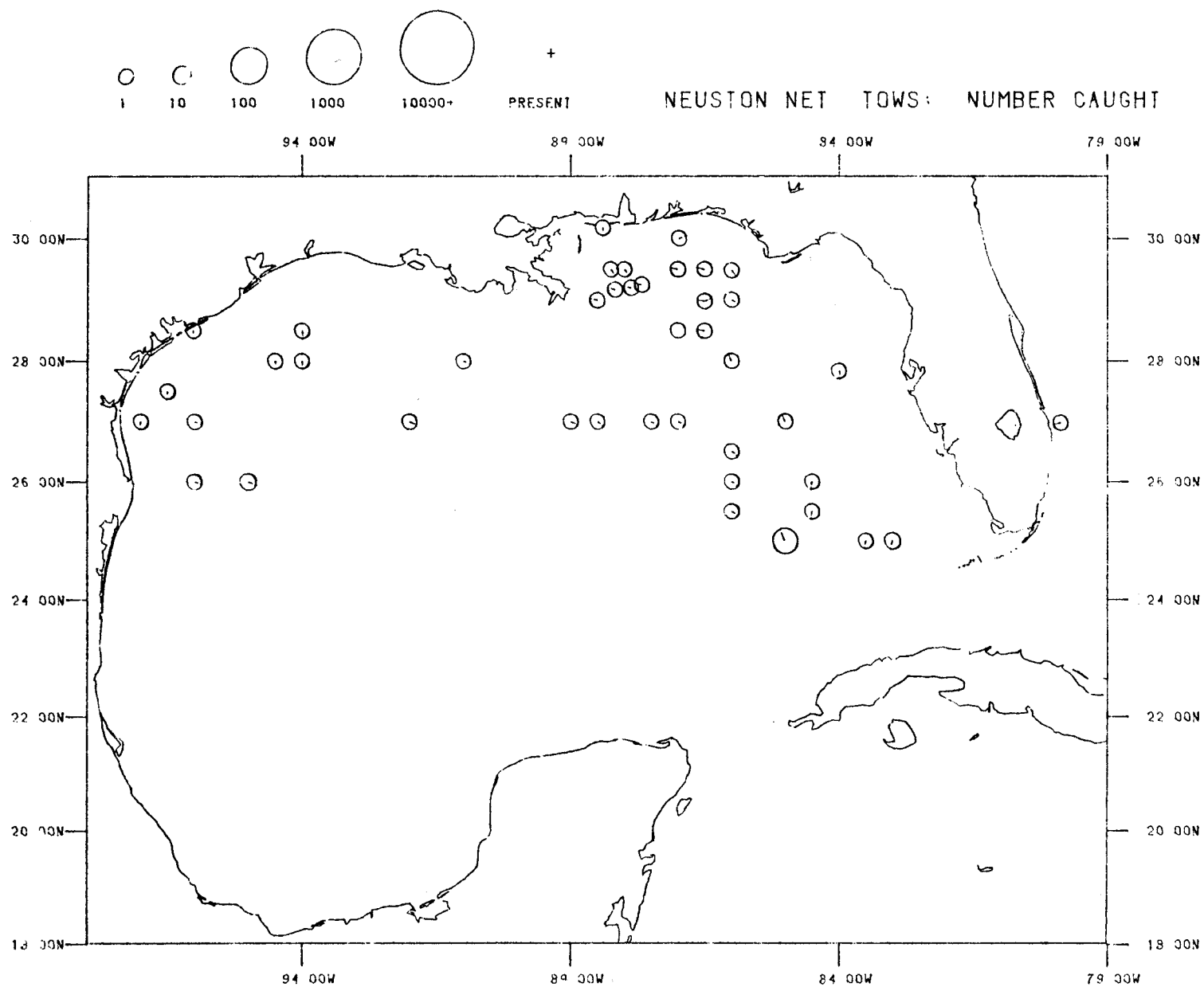
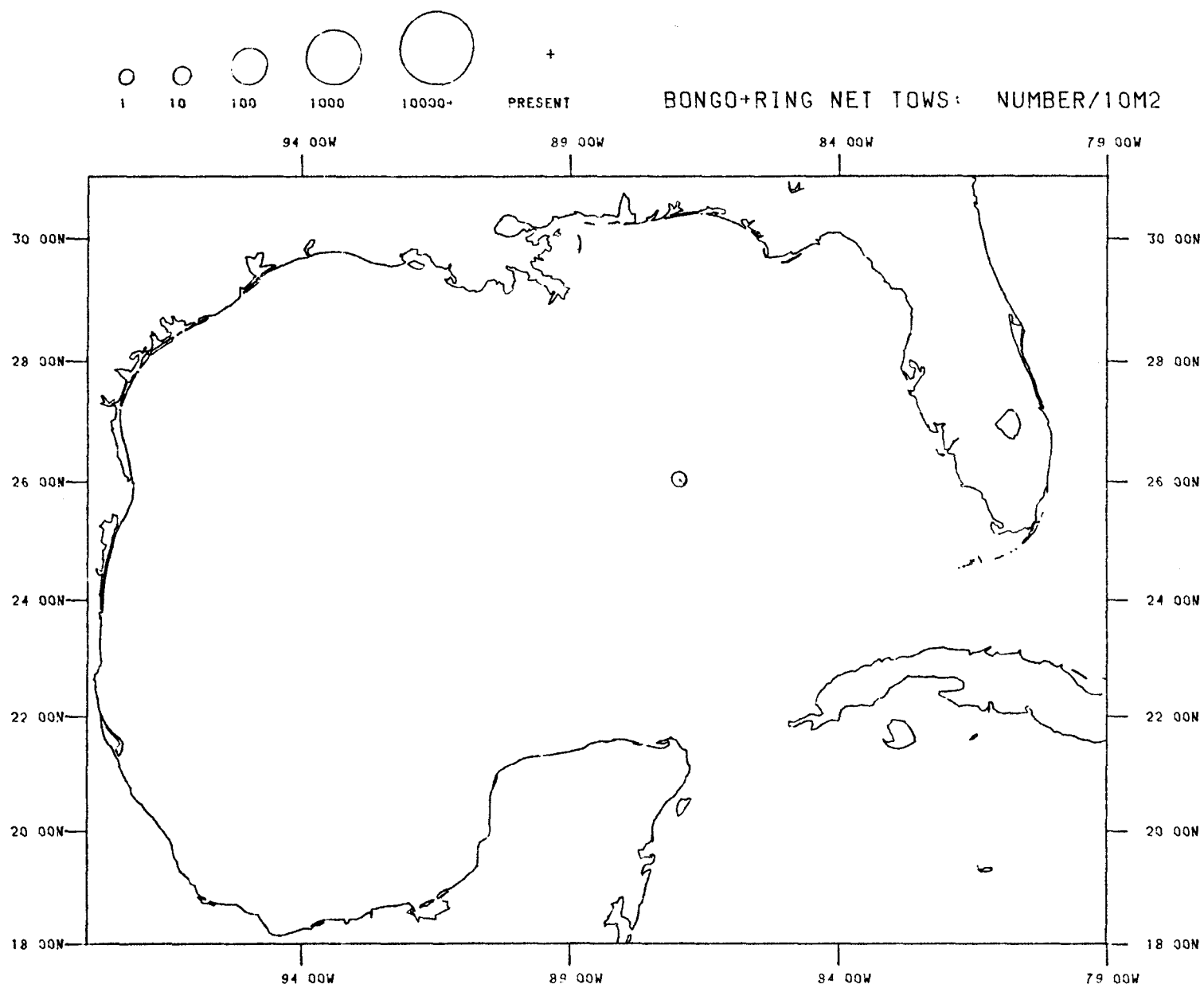


FIGURE 45



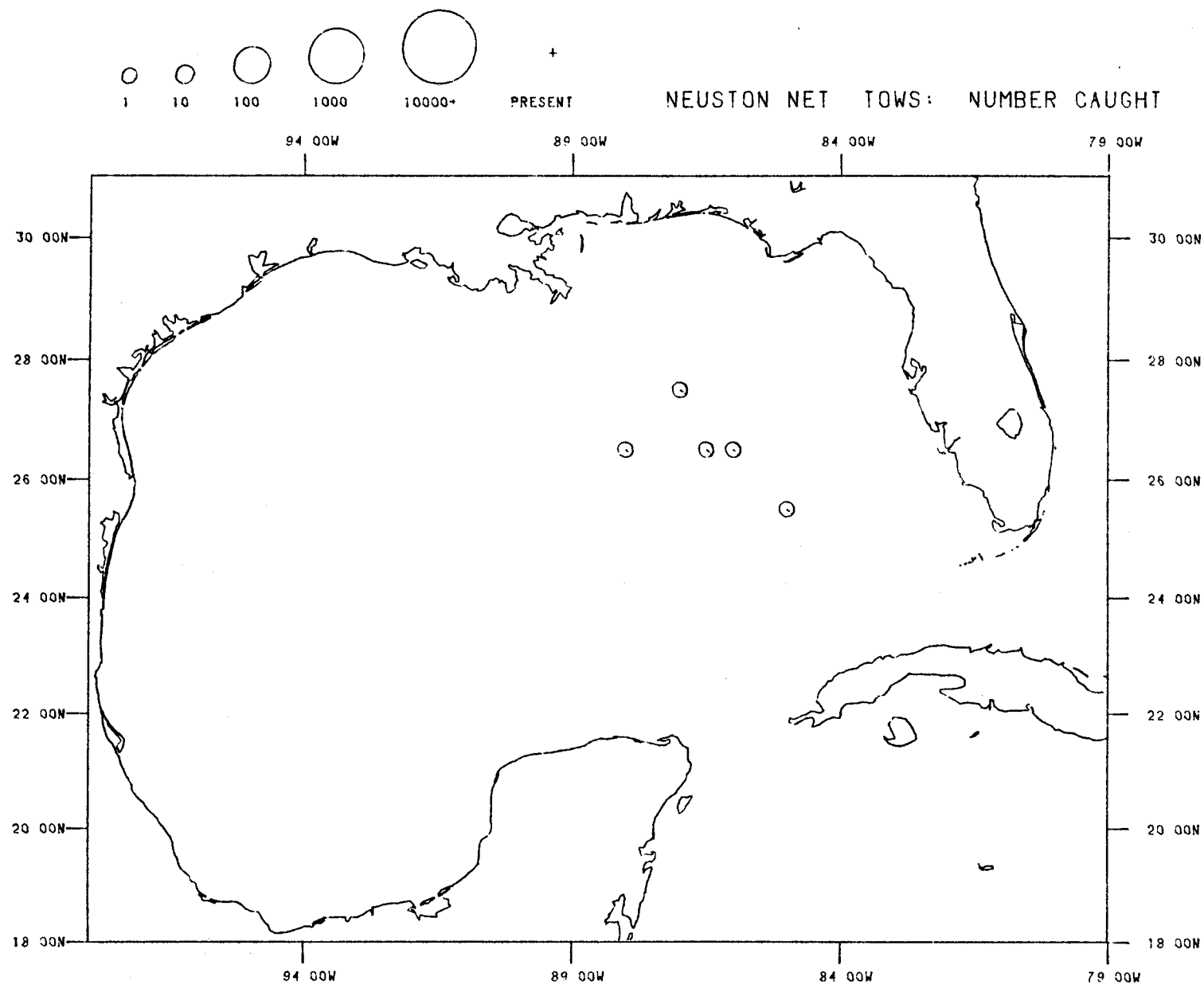


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XIPHIAS GLADIUS

FIGURE 47

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FIGURE 48