United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

GULF OF MEXICO PLANKTON INVESTIGATIONS: 1951-53

by

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Special Scientific Report--Fisheries No. 269

Washington, D. C.
November 1958

The Library of Congress has cataloged this publication as follows:

Arnold, Edgar L
Gulf of Mexico plankton investigations: 1951-53. Washington, U. S. Dept. of the Interior, Fish and Wildlife Service, 1958.

53 p. maps, diagr., tables. 27 cm. (U. S. Fish and Wildlife Service. Special scientific report: fisheries, no. 269)

1. Plankton—Mexico, Gulf of. I. Title. (Series)

SH11.A335 no. 269 574.923 59-60424

Library of Congress

The Fish and Wildlife Service series, Special Scientific Report--Fisheries, is cataloged as follows:

U. S. *Fish and Wildlife Service.*
Special scientific report: fisheries. no. 1-
[Washington,] 1949-

no. illus., maps, diagrs. 27 cm.

Supersedes in part the Service's Special scientific report.

1. Fisheries—Research.

SH11.A335 639.2072 59-60217

Library of Congress [2]

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GULF OF MEXICO PLANKTON INVESTIGATIONS: 1951-53

The Gulf of Mexico, despite its economic importance, is one of the world's least known major bodies of water, in regard both to mass water movements and to the abundance, distribution, ranges, and life histories of many species of fishes found within its boundaries. With the exception of several cruises of the Blake and Mabel Taylor in the late 1880's, the relatively small accumulation of scientific knowledge was confined largely to inshore areas. Although supporting a number of fisheries for many years, notably those for shrimp, snappers, oysters, and menhaden, the total fishery production of the Gulf has been considerably less than would normally be expected from an area of approximately 700,000 square miles. Recognizing the need for a more comprehensive general knowledge, it was decided to make a general oceanographic survey when the Gulf Fishery Investigations was established in the summer of 1950 at Galveston, Texas, by the Fish and Wildlife Service. The primary objective was to determine the spawning areas of various fishes. Studying the distribution of their eggs and larvae by means of plankton tows offered the best method for attaining this objective.

Data are presented in this report on the offshore plankton collections made in the Gulf from the M/V Alaska, research vessel of the Gulf Fishery Investigations. To aid in the comparison of data, the Gulf was divided arbitrarily into the eight subareas shown in figure 1 (see page 2). Ten cruises were made from March 1951 to July 1953. Originally it was planned to cover the entire Gulf annually in a series of three cruises, repeated each year. Unfortunately, the requisitioning of the Alaska for 24 weeks of sea-time disrupted the planned continuity.

As the distance between stations in the basic pattern (approximately 40 miles north and south, 100 miles east and west) seemed too great for obtaining representative plankton collections, I designed a sampler that could be towed at cruising speed between stations. It consisted essentially of a removable "Monel" wire-cloth mesh net housed within a "Monel" tube. Details of construction are given in Fish and Wildlife Service Special Scientific Report--Fisheries No. 88. Designated as model G-IA, the sampler was fabricated and ready for use prior to the start of the second coverage of the Gulf (cruise 4-2A) in January 1952, and was operated successfully until inactivation of the Alaska in June 1953.

Continuing with the wire-cloth mesh principle, an all-metal net was designed and fabricated for making tows on station. Fundamentally a modified larger version of the G-IA model, this net was designated as model G-III, and is described in detail in the Special Scientific Report already cited.

It seemed logical to assume that the G-III sampler, towed for the same period of time at 4 to 5 knots, and with the same net opening, would catch substantially more plankton than a half-meter silk net, towed at one-fourth the speed. Moreover, we hoped that the increased speed, plus an opening unobstructed by a towing bridle, would result in the capture of the more agile planktonic forms.

Collecting operations in January 1952, during cruise 4-2A, afforded the first opportunity to compare the catching abilities of the G-III sampler and a conventional half-meter silk net. I used numbers and sizes of fish larvae [1/] as a basis for comparison.

Ten tows at 4 to 5 knots were made with the G-III sampler, 23 tows at approximately 1 knot were made with the half-meter net. All tows were of 30-minute duration. Both nets were fished horizontally, either at or within 10 meters of the surface. One G-III tow that yielded 959 larvae was considered atypical and was not used in the comparison. In the 9 remaining tows, the G-III net captured 1,334 fish larvae as

1/ The term "larvae", used in this paper, includes all immature forms.

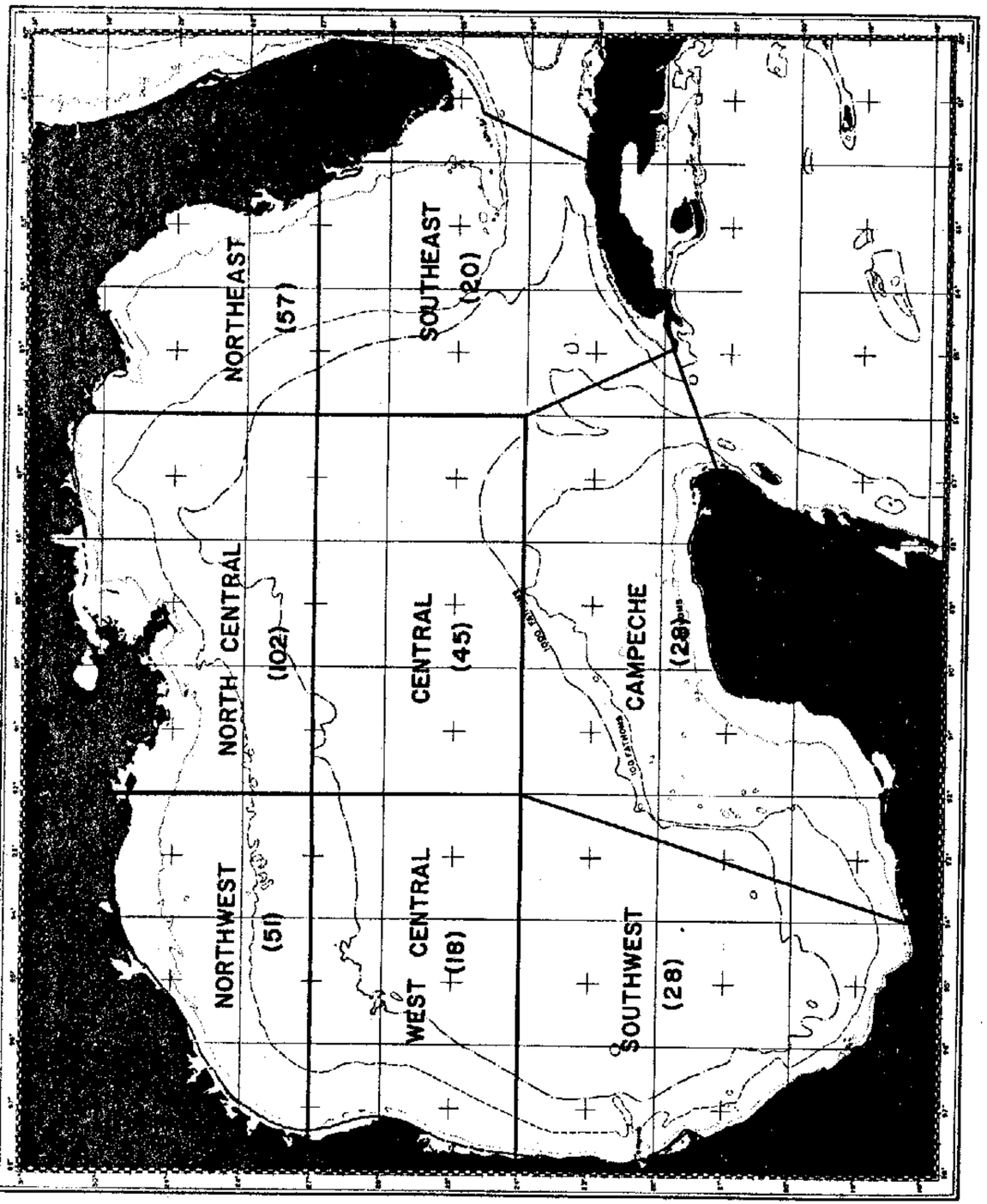

Figure 1.--Subareas into which the Gulf of Mexico was divided for comparison of offshore plankton data. Numbers in parenthesis represent the number of plankton tows made in each area.

compared to 414 larvae taken in 23 tows of the silk net. As shown in figure 2, the G-III samples contained larger specimens, as well as over three times the number of larvae. Contrary to what might be expected from the much greater towing speed and metal meshes of the G-III net, I found no difference in the condition of the catches of the two nets.

As a result of these findings and because of its other advantages (durability and ease of cleaning), the G-III sampler was used exclusively on subsequent cruises.

During the period of field work aboard the Alaska, a total of 449 tows were made with different types of gear, as follows:

Half-meter No. 10 silk net	94 tows
One-meter No. 10 silk net. .	9 tows
G-III Monel net No. 1 mesh	131 tows
G-IA Monel net No. 1 mesh. .	215 tows

Samples were first sorted for fish eggs and larvae. Prior to volume determination all gross forms (medusae, sargassum weed, etc.) were removed.

Volumes were obtained after the first four cruises by the following procedure:

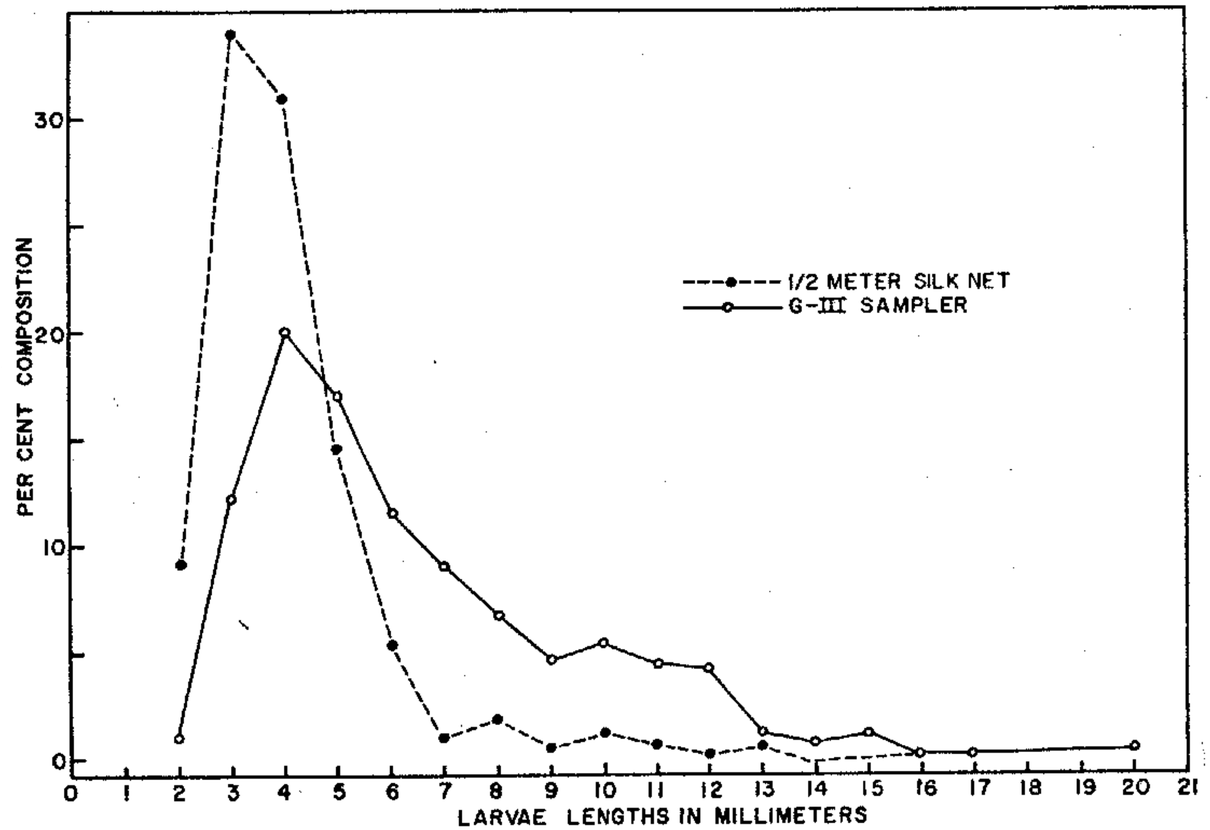

Figure 2.--Length frequencies by percent of larvae taken by a conventional half-meter silk net towed at one knot compared with those taken by the G-III sampler towed at 4 to 5 knots during Cruise 4-2A in January 1952.

1. Sample poured into graduate cylinder and reading noted to nearest milliliter.

2. Solution separated from plankton by force-filtering solution through a No. 1 Wratten disc filter by means of a vacuum-pump attachment.

3. Filtrate poured back into graduate and reading noted.

4. Volume is difference between the two readings.

For the first four cruises, however, we determined volumes by fractioning and centrifuging. To adjust these values to conform with those obtained by filtration, we ran, in duplicate, a series of plankton samples of different volume ranges through both methods to obtain the necessary conversion factors. All plankton volumes given in the tables are based on the first method described.

The volumes of water strained, as tabulated, were calculated from readings of the four Atlas current meters which were used throughout the Alaska cruises. As two meters were used with the G-III net on only one cruise, the readings for all quantitative hauls of this net were based on readings from the rear meter. Calibrations of the meters were obtained upon completion of field work by making duplicate tows in opposite directions at different speeds over a 4,500-foot course in calm water. The results of these calibrating runs which were used in the present report are as follows:

Meter No.	Liters per revolution
109	3.604
112	3.190
175	2.821
176	2.575

The following tables of data and their accompanying charts are tabulated according to gear and cruise. G-III hauls are numbered according to station. The results of G-III oblique hauls during cruise 5-2C (table 8) are in the same order of magnitude as those of horizontal tows, and thus received no special treatment.

In spite of the diversity of towing techniques and gear, the distribution of plankton by volume revealed a distinct pattern (tables 16 and 17), with the greater abundance appearing in catches made over the Continental Shelf.

In table 18 the catches of the two metal nets are compared on a quantitative basis. The G-III net, with its half-meter opening, caught substantially more of the active swimmers, but both models captured inactive forms (eggs) in nearly the same ratio. The table also points out the abrupt decrease in plankton abundance as the vessel moved seaward from waters over the Continental Shelf.

In considering the data presented in this report, it should be kept in mind that because of the emphasis placed on hydrography during the survey, and the relatively deep draft of the Alaska, few stations were taken in shallow water. Limited plankton collections subsequently made in shallow waters from smaller vessels in the vicinity of Galveston Island revealed a much higher concentration of plankton, especially in numbers of fish larvae, than appeared in the Alaska catches from farther offshore. It is probable, therefore, that intensive shallow-water collecting would reveal a higher potential of biological productivity for the inshore area of the Gulf than may be inferred from these tables.

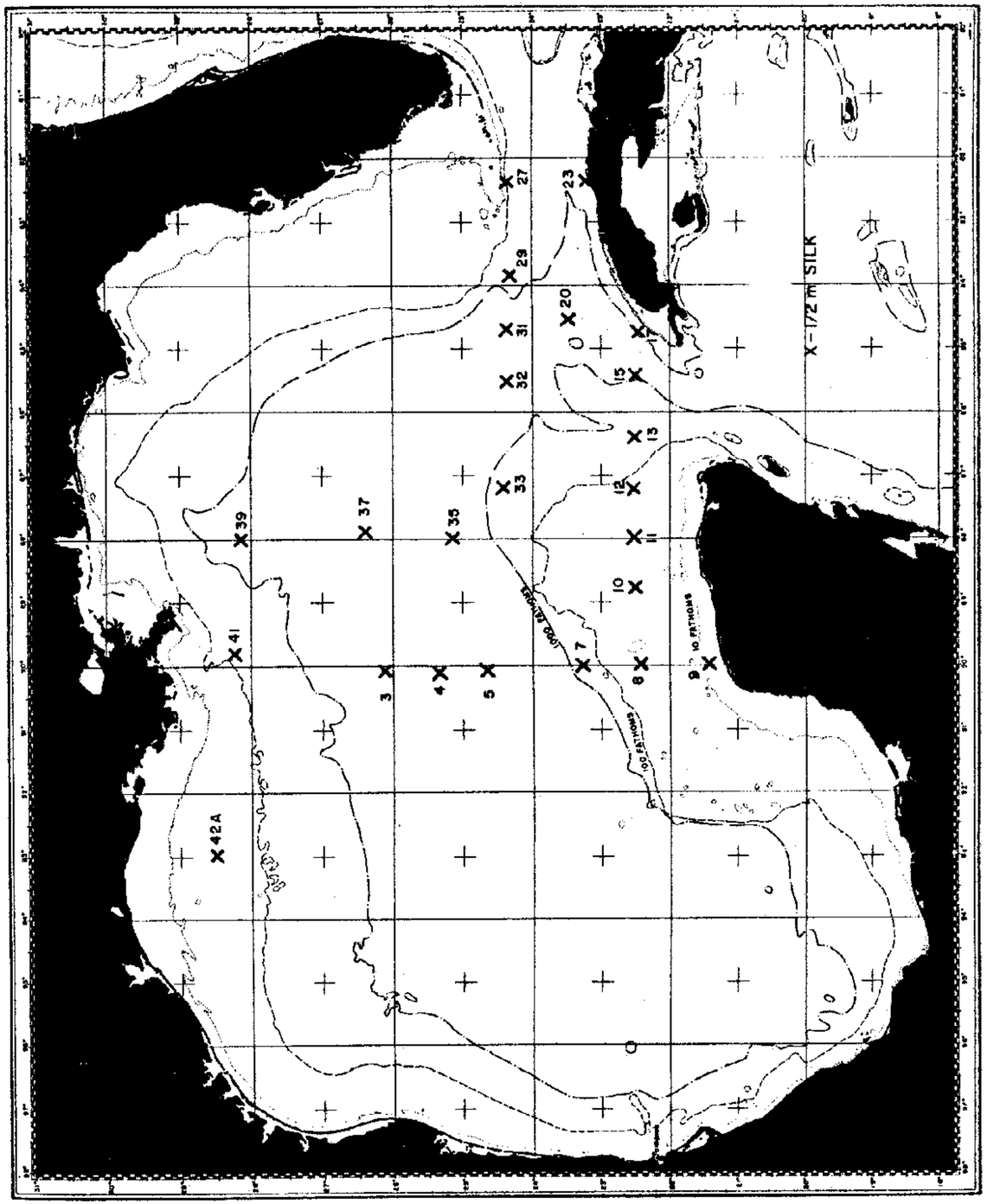

Figure 3.--Location of plankton tows made during Cruise 1-1A, April-May, 1951. Numbers identify stations.

Table 1.--Station data, plankton volumes and numbers, Cruise 1-1A.
(Half-meter net, half-hour surface tows)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1951	Time (start) G. S. T.	Plankton Volume (ml)	Plankton Fish larvae	Plankton Fish eggs
3	26-08	90-05	C	IV-22	0100	5.0	26	0
4	25-20	90-07	C	IV-22	2000	8.0	0	7
5	24-40	90-07	C	IV-23	1110	14.5	27	6
7	23-15	90-00	Ca	IV-24	0345	14.0	67	7
8	22-25	90-00	Ca	IV-24	1032	17.0	136	19
9	21-25	90-00	Ca	IV-24	1920	4.5	32	68
10	22-30	88-46	Ca	IV-25	1300	9.0	69	42
11	22-30	88-00	Ca	IV-25	2145	15.0	155	78
12	22-30	87-14	Ca	IV-26	0600	4.0	60	97
13	22-30	86-25	Ca	IV-26	1429	2.5	6	9
15	22-30	85-25	Ca	IV-27	0830	3.0	4	5
17	22-28	84-45	SE	IV-27	1945	1.5	2	1
20	23-28	84-32	SE	IV-28	0940	<1.0	2	0
23	23-11	82-24	SE	IV-29	0855	2.5	5	13
27	24-22	82-24	SE	V-3	1910	26.4	30	2
29	24-18	83-53	SE	V-4	1000	11.5	4	6
31	24-22	84-44	SE	V-4	2200	10.0	1	0
32	24-22	85-31	SE	V-5	0840	4.5	1	0
33	24-25	87-14	C	V-6	0020	11.5	42	8
35	25-09	88-00	C	V-6	1340	9.0	15	127
37	26-22	87-55	C	V-7	0355	23.5	18	5
39	28-09	88-00	NC	V-7	2220	21.0	56	0
41	28-13	89-49	NC	V-8/9	2350	18.0	75	7
42A	28-30	93-00	NW	V-10	0815	31.6	52	8

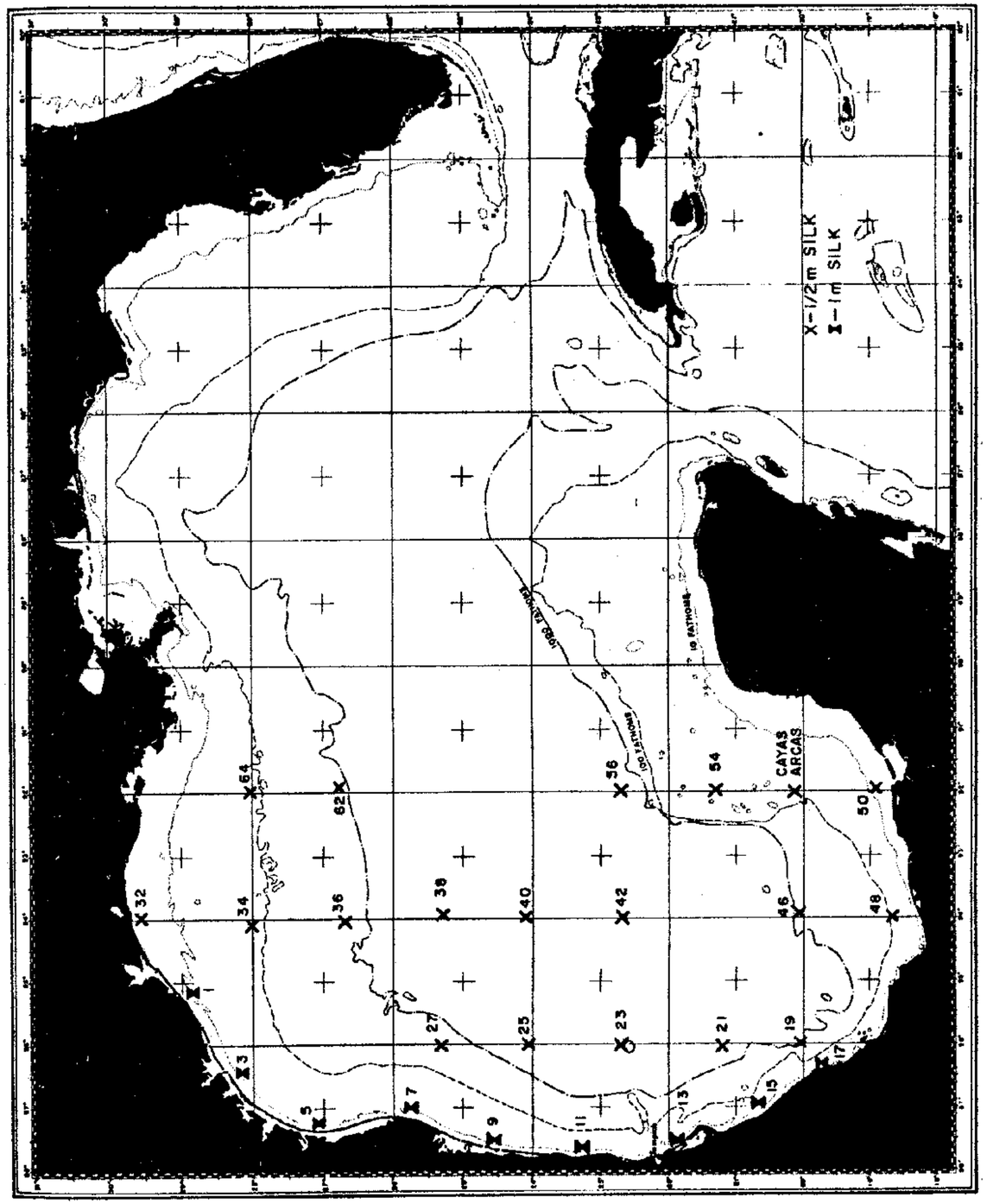

Figure 4.--Location of plankton tows made during Cruise 2-1B, June 1951. Numbers identify stations.

Table 2.--Station data, plankton volumes and numbers, Cruise 2-1B.
(Half-meter net, 15-minute and half-hour surface tows)

Half-meter net, 15-minute surface tows.

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1951	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
1	28-51	95-12	NW	VI-4	2245*	576.0	0	725
3	28-09	96-26	NW	VI-5	0932	32.4	4	105
5	27-04	97-16	NW	VI-5	1940	94.7	2178	414
7	25-45	97-00	WC	VI-6	0635	77.0	43	87
9	24-33	97-31	WC	VI-6	1755	57.4	596	3368
11	23-18	97-38	SW	VI-7	0505	49.7	213	458
13	21-53	97-34	SW	VI-7	1840	59.5	185	945
15	20-41	96-58	SW	VI-8	0726	575.0	24	86
17	19-43	96-20	SW	VI-8	1756	59.5	143	202

* 30 minutes

Half-meter net, half-hour surface tows.

19	20-02	96-00	SW	VI-9	0810	5.5	11	58
21	21-15	96-01	SW	VI-9	2345	25.9	10	8
23	22-42	96-00	SW	VI-10	1700	25.9	9	28
25	24-03	96-01	WC	VI-11	0800	3.5	12	14
27	25-20	96-00	WC	VI-11	2255*	25.5	10	25
32	29-34	94-00	NW	VI-19	0200*	92.3	588	39
34	28-00	94-07	NW	VI-19	1515	21.0	10	34

TABLE 2 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1951	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
36	26-41	94-04	WC	VI-20	0630	15.0	14	5
38	25-17	93-58	WC	VI-21	0625	15.5	11	1
40	24-05	94-00	WC	VI-22	0405*	25.9	31	0
42	22-40	94-00	SW	VI-22	2220	31.6	42	14
46	20-04	93-57	SW	VI-24	2020	25.5	22	0
48	18-40	94-00	SW	VI-25	0830	3.0	18	32
50	18-55	91-57	Ca	VI-26	0855	72.1	101	65
Cayas Arcas	20-10	92-00	Ca	VI-27	0720	32.8	133	980
54	21-20	91-58	Ca	VI-27	1710	313.0	21	218
56	22-40	92-00	Ca	VI-28	0640	15.0	9	9
62	26-46	91-55	C	VI-29	1340	20.0	27	14
64	28-00	92-00	NW	VI-30	0030	66.2	51	138

*15 minutes

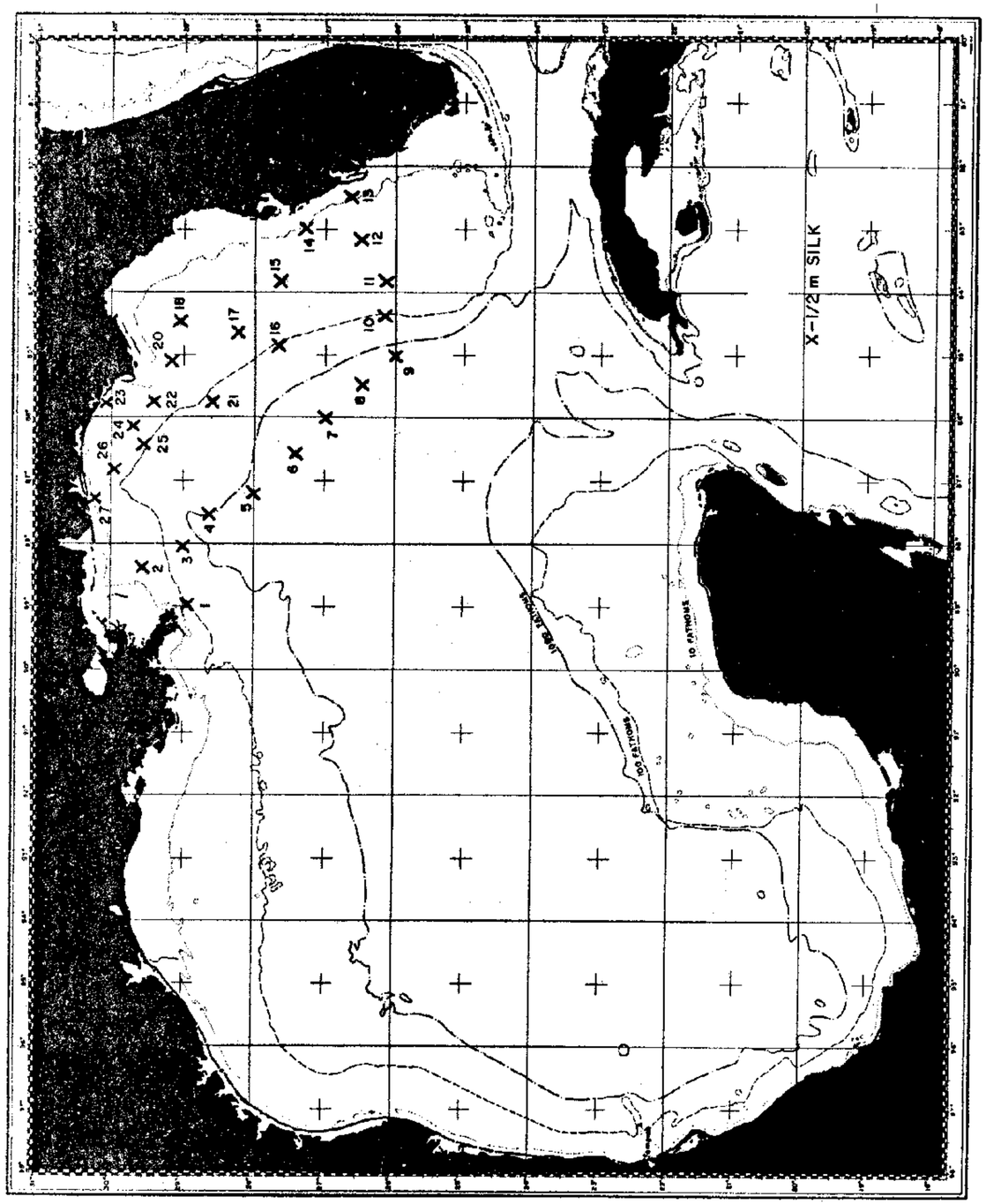

Figure 5.--Location of plankton tows made during Cruise 3-1C, August 1951. Numbers identify stations.

Table 3.--Station data, plankton volumes and numbers, Cruise 3-1C.
(Half-meter net, half-hour surface tows)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1951	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
1	28-53	89-00	NC	VIII-10	0300	68.6	21	4
2	29-33	88-23	NC	VIII-10	0945	91.6	3	10
3	29-00	88-01	NC	VIII-11	2213	314.0	0	0
4	28-41	87-30	NC	VIII-12	0805	57.4	15	62
5	28-00	87-12	NC	VIII-12	1810	33.3	2	0
6	27-27	86-33	NC	VIII-13	0720	52.5	8	18
7	26-59	86-01	SE	VIII-13	2135	45.6	12	1
8	26-29	85-29	SE	VIII-14	0940	47.1	12	4
9	26-00	85-00	SE	VIII-15	0225	36.5	15	1
10	26-10	84-22	SE	VIII-15	0755	29.6	19	88
11	26-09	83-50	SE	VIII-15	1340	28.7	7	49
12	26-31	83-10	SE	VIII-16	2045	28.5	52	471
13	26-39	82-31	SE	VIII-17	0240	59.4	78	38
14	27-18	82-58	NE	VIII-17	1050	20.0	30	83
15	27-38	83-51	NE	VIII-17	1755	34.2	15	13
16	27-42	84-51	NE	VIII-18	0100	32.0	11	20
17	28-15	84-41	NE	VIII-18	0635	36.5	19	38
18	29-03	84-27	NE	VIII-18	1350	2.5	5	6
20	29-11	85-07	NE	VIII-18	1855	22.0	20	115

TABLE 3 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1951	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
21	28-46	85-46	NE	VIII-19	0210	58.0	5	12
22	29-26	85-45	NE	VIII-19	0750	75.1	4	87
23	30-06	85-45	NE	VIII-19	1240	12.5	60	42
24	29-43	86-10	NC	VIII-20	1230	143.0	5	8
25	29-30	86-28	NC	VIII-20	1558	31.9	0	0
26	29-57	86-50	NC	VIII-20	1930	360.0	1	0
27	30-15	87-17	NC	VIII-21	0055	294.5	31	16

Table 4.--Station data, plankton volumes and numbers, Cruise 4-2A.
(Half-meter net, half-hour surface tows)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1952	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
1	26-46	92-00	WC	I-9	1800	6.0	0	1
6	24-48	90-06	C	I-11	0900	2.4	1	2
7	24-17	89-37	C	I-11	2200	4.8	10	3
8	23-46	88-55	Ca	I-12	0635	5.0	29	3
9	23-20	88-23	Ca	I-12	1355	7.2	32	2
10	22-47	88-00	Ca	I-12	1945	3.5	13	8
11	22-20	87-31	Ca	I-13	0135	7.0	7	40
12	21-52	87-05	Ca	I-13	0815	2.4	11	0
14	21-35	86-27	Ca	I-13	2055	10.0	18	1
15	21-45	86-05	Ca	I-14	0245	2.6	16	0
16	21-52	85-36	Ca	I-14	0915	2.0	3	1
17	21-54	85-23	Ca	I-14	1435	2.4	0	0
18A	22-01	85-00	SE	I-15	1130	4.0	2	1
19	22-16	84-54	SE	I-15	1945	9.0	3	1
22	24-10	84-11	SE	I-16	2250	9.0	18	0
23	24-40	83-52	SE	I-17	0450	10.0	11	2
30	23-13	82-22	SE	I-20	0530	8.0	44	10
31	23-16	83-11	SE	I-22	1330	5.4	0	0

TABLE 4 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1952	Time (start) C. S. T.	Plankton Volume (ml)	Plankton Fish Larvae	Plankton Fish Eggs
33	23-32	84-33	SE	I-23	0248	12.0	32	6
39	25-37	86-14	C	I-25	0610	12.0	73	3
40	26-07	86-06	C	I-25	1500	4.0	2	0
41	27-01	85-58	NE	I-26	0000	12.0	87	3
43	28-11	86-00	NE	I-26	1515	7.0	0	6
44	28-12	86-45	NC	I-26	2318	12.1	25	7
45	28-03	87-27	NC	I-27	0638	8.0	31	5

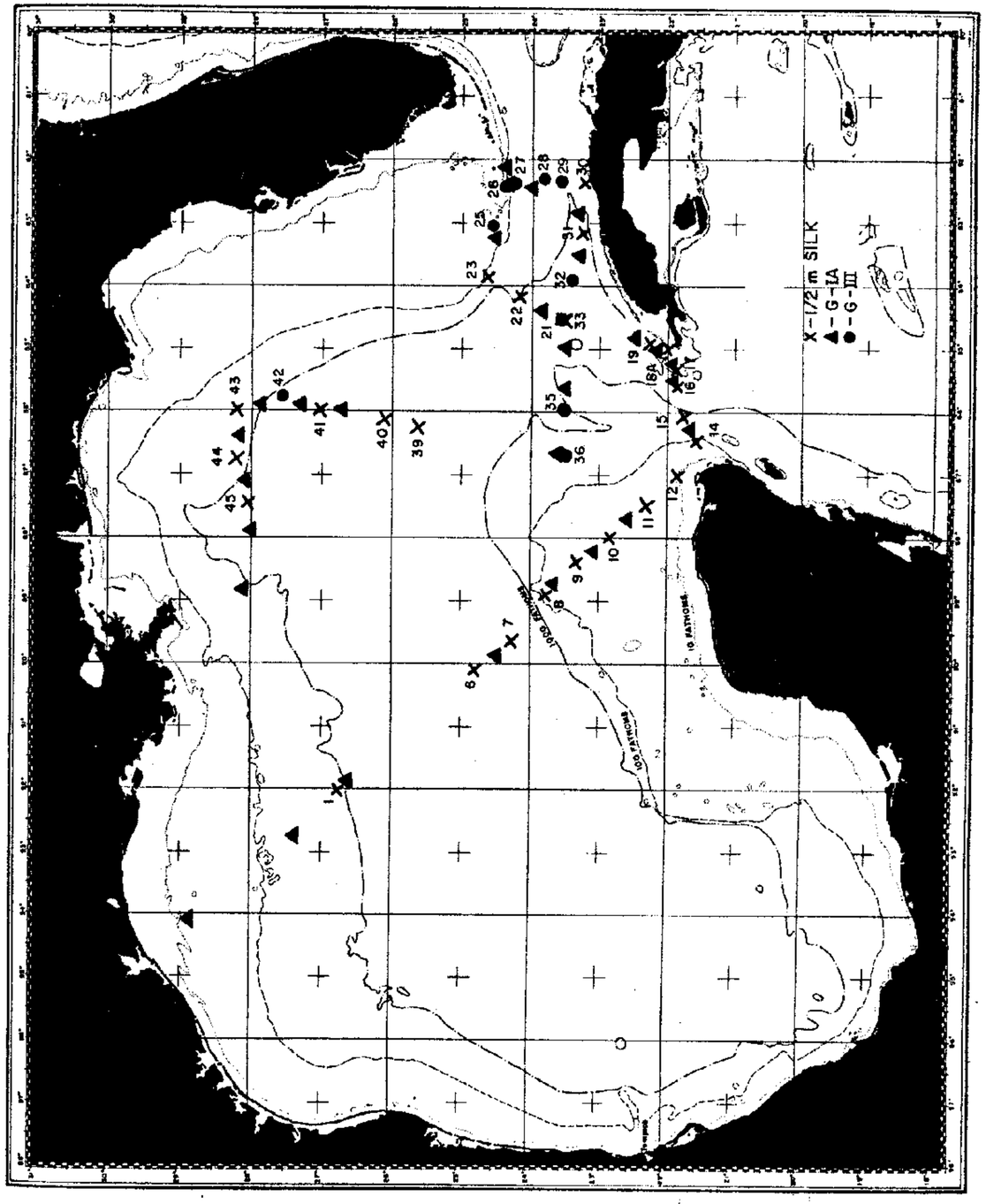

Figure 6.--Location of plankton tows made during Cruise 4-2A, January 1952. Numbers identify stations.

Table 5.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 4-2A.

(G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
1	27-22	92-43	NW	I-9	0950-1250	5-6	88.95	0.2	.002	.022	.000
2	26-37	91-50	NW	I-9	1825-2225	3-4	123.83	2.0	.016	.000	.000
3	24-30	89-52	C	I-11	0910-1410	5	151.00	1.0	.007	.040	.026
4	23-38	88-44	Ca	I-12	0630-0920	6	89.81	0.9	.010	.022	.089
5	23-03	88-13	Ca	I-12	1355-1805	6	122.45	2.0	.016	.073	.098
6	22-33	87-44	Ca	I-12	1955-0000	5-6	125.65	2.0	.016	.000	.000
10	21-40	86-15	Ca	I-13	2050-2330	3	65.49	1.0	.012	.031	.000
11	21-53	85-30	Ca	I-14	0925-1115	6	51.81	0.8	.015	.000	.000
12	21-54	85-13	Ca	I-14	1435-1640	6	55.83	1.0	.018	.000	.000
13	22-06	84-59	SE	I-15	1438-1710	7	59.68	0.8	.013	.000	.000
14	22-29	84-50	SE	I-15	2005-2245	2-3	60.19	1.0	.017	.000	.000
15	23-50	84-24	SE	I-16	1520-1950	3	90.76	0.8	.009	.000	.000
16	24-32	83-15	SE	I-17	0820-1005	6	36.11	0.8	.022	.000	.000
17	24-20	82-23	SE	I-17	1320-1740	7	87.65	3.0	.034	.103	.000
18	24-24	82-10	SE	I-19	0620-0920	4	53.38	4.2	.079	.225	.094

TABLE 5 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
19	24-00	82-23	SE	I-19	1500-1700	10	37.42	2.0	.053	.134	.000
20	23-17	82-50	SE	I-22	0728-1100	10	50.09	2.0	.040	.040	.000
21	23-20	83-32	SE	I-22	1435-1735	9	61.70	1.2	.194	.000	.000
22	23-30	84-58	SE	I-23	0247-0647	2-3	63.77	4.0	.063	.078	.000
23	23-30	85-38	SE	I-23	1020-1420	9	58.89	2.5	.042	.034	.000
25	23-36	86-40	Ca	I-24	0135-0345	2	45.83	6.0	.131	.567	.087
27	26-42	86-00	C	I-25	1720-2120	2	90.17	2.4	.027	.055	.000
28	27-18	85-55	NE	I-26	0025-0430	2	88.66	5.0	.056	.034	.011
29	27-54	85-55	NE	I-26	0940-1315	7-8	79.40	2.0	.025	.025	.025
30	28-11	86-25	NC	I-26	1550-1925	6	80.01	2.5	.031	.137	.000
31	28-06	87-05	NC	I-27	2345-0400	6	88.49	12.0	.136	.057	.011
32	28-00	87-55	NC	I-27	0708-1120	9-10	90.58	4.2	.046	.132	.022
33	28-09	88-50	NC	I-27	1745-1935	3-4	36.15	4.5	.124	.221	.083
34	28-51	94-04	NW	I-29	0745-1130	8	101.18	4.2	.042	.208	.283

Table 6.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 4-2A.
(G-III sampler; speed of tows: 4-5 knots)

Station	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae no./m^3 water	Fish Eggs no./m^3 water
21	23-33	84-31	SE	I-16	1425-1455	3	271.43	14.0	.052	.181	.007
25	24-33	83-04	SE	I-17	1105-1135	10	240.71	34.7	.144	3.984	1.998
26	24-25	82-25	SE	I-19	1100-1130	10	187.20	35.7	.190	1.661	.000
27	24-15	82-24	SE	I-19	1415-1445	10	181.55	55.1	.304	1.636	.005
28	23-49	82-19	SE	I-19	1920-1950	1	276.38	27.2	.098	.586	.003
29	23-34	82-21	SE	I-19	2320-2350	1	256.60	28.6	.112	.203	.003
32	23-25	83-54	SE	I-22	1943-2013	1	276.60	24.0	.087	.127	.000
35	23-31	85-59	Ca	I-23	1712-1742	3	215.45	30.4	.141	.427	.042
36	23-30	86-42	Ca	I-24	0058-0128	1	140.04	47.9	.341	2.056	.021
42	27-36	85-46	NE	I-26	0855-0925	3	277.04	28.0	.101	.220	.036

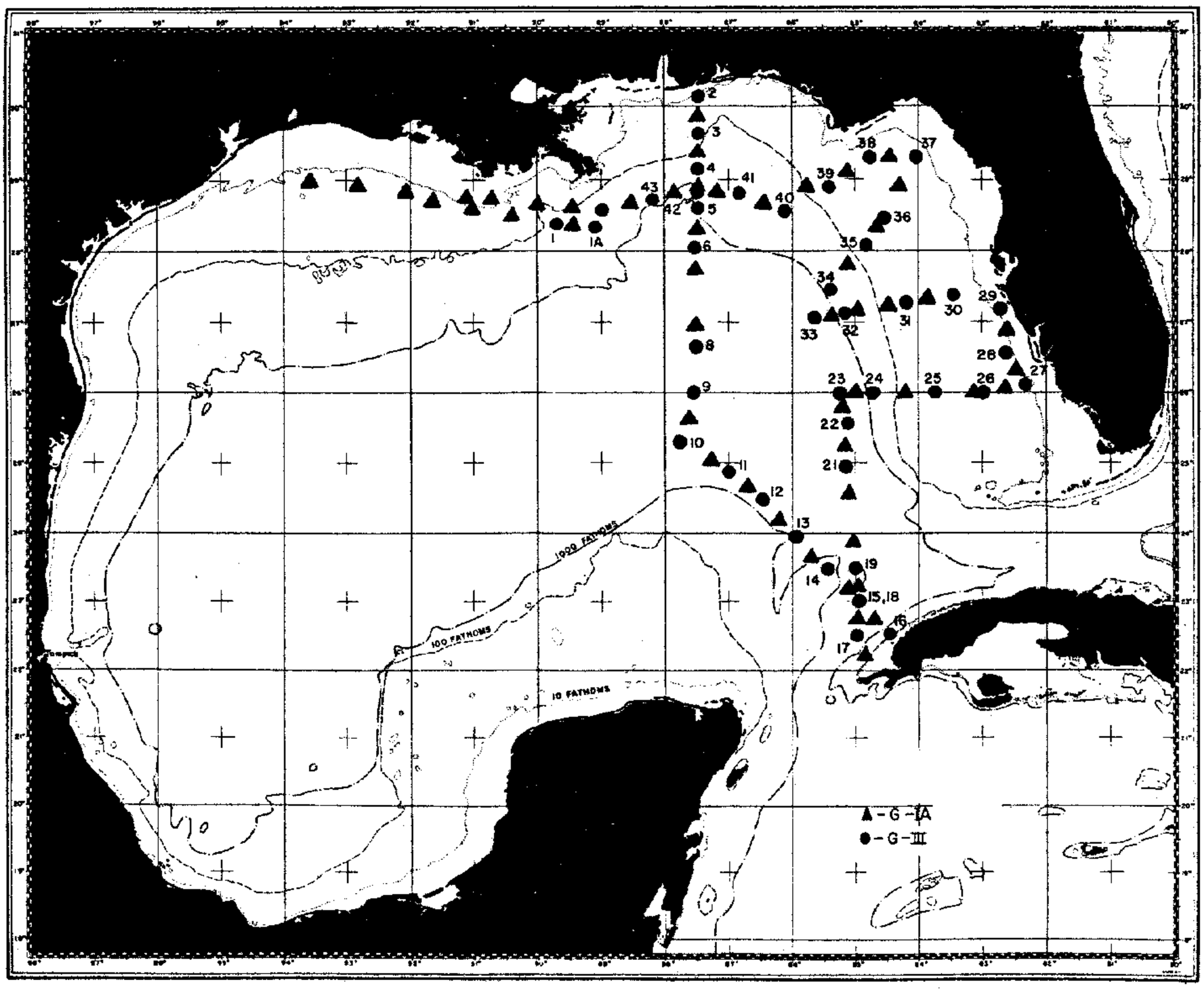

Figure 7.--Location of plankton tows made during Cruise 5-2C, May-June 1952. Numbers identify stations.

Table 7.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 5-2C.
(G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
1	28-42	91-40	NC	V-21	0625-1025	8	138.66	3.7	.027	.195	.007
2	28-35	91-01	NC	V-21	1038-1538	8	105.13	6.4	.061	.504	.304
3	28-29	90-24	NC	V-21	1605-1808	8	50.10	22.5	.449	.858	.279
4	28-22	89-26	NC	V-22	0140-0525	4	81.64	2.8	.034	.061	.000
5	29-52	87-29	NC	V-24	0220-0520	3	65.38	15.0	.229	.811	.000
6	29-23	87-29	NC	V-24	0641-0921	10	57.29	6.4	.112	.733	.017
7	28-53	87-29	NC	V-24	1220-1503	10	118.15	5.6	.047	.195	.000
8	28-20	87-30	NC	V-24	1800-2100	8	101.05	6.4	.063	.020	.049
9	27-46	87-31	NC	V-25	0210-0610	8	133.99	14.9	.111	.530	.030
10	26-58	87-31	NC	V-25	1100-1400	12	100.75	2.4	.024	.109	.010
12	25-38	87-39	C	V-26	0210-0605	7	145.39	4.8	.033	.172	.000
13	25-03	87-18	C	V-26	0955-1355	12	139.13	1.6	.012	.165	.000
14	24-40	86-42	C	V-26	1725-2115	12	148.16	16.0	.108	.162	.074
15	24-12	86-12	C	V-27	0040-0500	5	155.04	20.8	.134	.310	.032

TABLE 7 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
16	23-41	85-42	SE	V-27	0830-1320	12	168.24	1.2	.007	.065	.006
17	23-11	85-08	SE	V-27	1725-2030	13	145.92	4.0	.027	.144	.000
18	22-45	84-42	SE	V-27/28	2315-0400	5	172.63	1.6	.009	.075	.041
19	22-13	84-48	SE	V-28	0645-1115	13	161.10	2.4	.015	.068	.012
20	22-45	84-57	SE	V-28	1600-1800	13	90.50	0.5	.006	.000	.000
21	23-13	84-58	SE	V-28	2037-2330	5	102.03	5.6	.055	.059	.069
22	23-52	85-02	SE	V-29	0210-0553	5	131.19	4.0	.030	.053	.030
23	24-35	85-07	SE	V-29	0805-1145	15	134.43	4.0	.030	.171	.015
24	25-15	85-08	SE	V-29	1423-1715	15	104.88	4.2	.040	.400	.019
25	25-47	85-12	SE	V-29	1920-2155	5	88.33	24.5	.291	.249	.130
26	26-00	84-58	SE	V-30	0120-0430	5	110.75	11.2	.101	.190	.099
27	26-00	84-11	SE	V-30	0718-1220	13	181.28	5.6	.031	.199	.204
28	26-00	83-08	SE	V-30	1635-1730	18	26.67	11.2	.420	1.087	1.012
29	26-04	82-38	SE	V-30	1835-2250	8	108.30	16.0	.148	1.542	.139
30	26-18	82-28	SE	V-30/31	2300-0135	3	119.26	8.0	.067	.268	2.440

TABLE 7 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
31	26-53	82-36	SE	V-31	0250-0605	3	98.71	14.4	.146	1.996	.263
32	27-20	83-50	NE	VI-1	0502-0855	12	149.93	25.6	.171	1.000	.147
33	27-14	84-28	NE	VI-1	1015-1300	15	83.07	4.0	.048	.313	.036
34	27-10	84-56	NE	VI-1	1315-1535	15	87.18	2.4	.028	.161	.000
35	27-06	85-21	NE	VI-1	1800-2020	17	84.15	4.8	.057	.261	.000
37	27-48	85-06	NE	VI-2	0410-0800	5	150.27	9.6	.064	.213	.293
38	28-20	84-40	NE	VI-2	0925-1210	13	93.56	20.8	.222	.043	.620
39	28-54	84-16	NE	VI-2	1530-2040	10	158.50	17.6	.111	.719	.271
40	29-19	84-25	NE	VI-2/3	2225-0215	5	129.02	25.6	.198	1.310	1.139
41	29-06	85-06	NE	VI-3	0310-0635	7	117.49	12.8	.109	.128	2.017
42	28-53	85-46	NE	VI-3	0816-1153	20	143.98	14.4	.100	.111	.014
43	28-40	86-26	NC	VI-3	1320-1605	20	95.58	4.0	.042	.084	.000
44	28-49	87-12	NC	VI-3	1850-2200	12	115.98	6.4	.055	.207	.017
45	28-47	87-51	NC	VI-4	0105-0500	12	123.44	19.2	.156	.251	.000
46	28-40	88-31	NC	VI-4	0730-1145	12	156.63	2.4	.015	.115	.000

TABLE 7 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
47	28-37	89-26	NC	VI-4	1330-1835	12	183.80	6.4	.035	.147	.016
48	28-40	90-00	NC	VI-4	1845-2030	5	57.02	1.6	.028	1.333	.053
49	28-42	90-43	NC	VI-4/5	2112-0030	5	101.27	3.6	.035	.444	.148
50	28-45	91-07	NC	VI-5	0045-0615	5	183.52	4.5	.025	.501	5.591
51	28-50	92-04	NC	VI-5	0700-1155	6	151.37	51.2	.338	1.090	.370
52	28-54	92-48	NW	VI-5	1210-1730	6	150.47	11.2	.074	.146	1.402
53	28-59	93-36	NW	VI-5	1738-2105	6	97.13	8.0	.082	.154	1.843

Table 8.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 5-3C.
(G-III sampler; speed of tows: 4-5 knots)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1952	30-minute tows Time (start) (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
1	28-24	89-42	NC	V-21	2205	200→0	289.18	46.1	.159	1.311	.785
1A	28-20	89-06	NC	V-22	0545	200→0	349.76	34.1	.097	.326	.066
2	30-08	87-30	NC	V-24	0144	5	181.94	46.0	.253	1.215	7.002
3	29-38	87-29	NC	V-24	0600	15	196.25	96.7	.493	1.900	.825
4	29-10	87-29	NC	V-24	1136	200→0	277.66	34.1	.123	.447	.025
5	28-37	87-29	NC	V-24	1720	200→0	219.03	24.0	.110	.110	.000
6	28-04	87-32	NC	V-25	0135	100→0	209.85	31.4	.150	.129	.009
8	26-40	87-32	C	V-25	1720	200→0	286.22	25.6	.089	.280	.028
9	26-00	87-32	C	V-26	0130	100→0	280.79	32.0	.114	.556	.007
10	25-19	87-46	C	V-26	0820	200→0	245.57	25.4	.103	.269	.033
11	24-53	87-00	C	V-26	1645	200→0	221.19	20.8	.094	.511	.059
12	24-28	86-28	C	V-27	0005	100→0	204.42	31.4	.154	.333	.025
13	23-57	85-57	SE	V-27	0755	200→0	213.07	16.0	.075	.146	.009
14	23-28	85-26	SE	V-27	1545	200→0	201.90	7.2	.036	.218	.025
15	23-00	84-57	SE	V-27	2240	100→0	218.98	12.8	.058	.173	.014

TABLE 8 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1952	30-minute tows Time (start) (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
16	22-33	84-28	SE	V-28	0600	200→0	243.27	8.3	.034	.243	.288
17	22-32	84-57	SE	V-28	1525	200→0	269.32	16.1	.060	.260	.007
18	23-00	84-57	SE	V-28	2000	100→0	275.06	15.5	.056	.222	.014
19	23-30	85-00	SE	V-29	0135	100→0	290.95	14.4	.049	.193	.010
21	24-56	85-09	SE	V-29	1345	200→0	290.95	45.3	.156	.203	.007
22	25-34	85-07	SE	V-29	1845	100→0	216.34	36.5	.169	.596	.014
23	26-00	85-15	SE	V-30	0045	100→0	351.43	36.4	.104	.231	.151
24	26-00	84-44	SE	V-30	0645	250→0	353.20	49.9	.141	.252	.006
25	26-00	83-43	SE	V-30	1330	75→0	380.13	32.0	.084	.295	.200
26	26-00	83-00	SE	V-30	1800	30	167.77	46.0	.274	.530	.524
27	26-07	82-20	SE	V-30	2225	10	154.33	22.4	.145	.569	.265
28	26-34	82-36	SE	V-31	0215	10	181.46	34.5	.190	1.350	5.632
29	27-12	82-43	NE	V-31	0645	5	150.11	63.2	.421	.966	1.093
30	27-24	83-26	NE	VI-1	0425	25	265.78	31.4	.118	.384	.192
31	27-17	84-11	NE	VI-1	0940	10	295.81	45.3	.153	.240	.105
32	27-08	85-07	NE	VI-1	1720	200→0	379.69	31.4	.083	.208	.008

TABLE 8 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1952	30-minute tows Time (start) (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
33	27-05	85-40	NE	VI-1	2317	50→0	311.26	40.4	.130	.467	.029
34	27-28	85-23	NE	VI-2	0330	50→0	362.03	46.0	.127	.356	.008
35	28-07	84-50	NE	VI-2	0850	75→0	211.92	17.6	.083	.245	.193
36	28-30	84-32	NE	VI-2	1450	40→0	255.63	49.1	.192	1.909	.509
37	29-19	84-02	NE	VI-2	2150	15	251.66	46.0	.183	17.787	.787
38	29-19	84-46	NE	VI-3	0235	20	203.09	36.3	.179	2.432	1.659
39	28-54	85-25	NE	VI-3	0737	100→0	325.83	22.8	.070	.295	.110
40	28-33	86-06	NC	VI-3	1245	100→0	184.55	22.4	.121	.694	.043
41	28-48	86-51	NC	VI-3	1815	100→0	373.95	19.2	.051	.198	.005
42	28-50	87-30	NC	VI-4	0030	100→0	328.92	19.2	.058	.760	.024
43	28-44	88-12	NC	VI-4	0650	200→0	333.33	16.0	.048	.100	.006
44	28-35	89-00	NC	VI-4	1300	200→0	313.46	19.2	.061	.175	.006

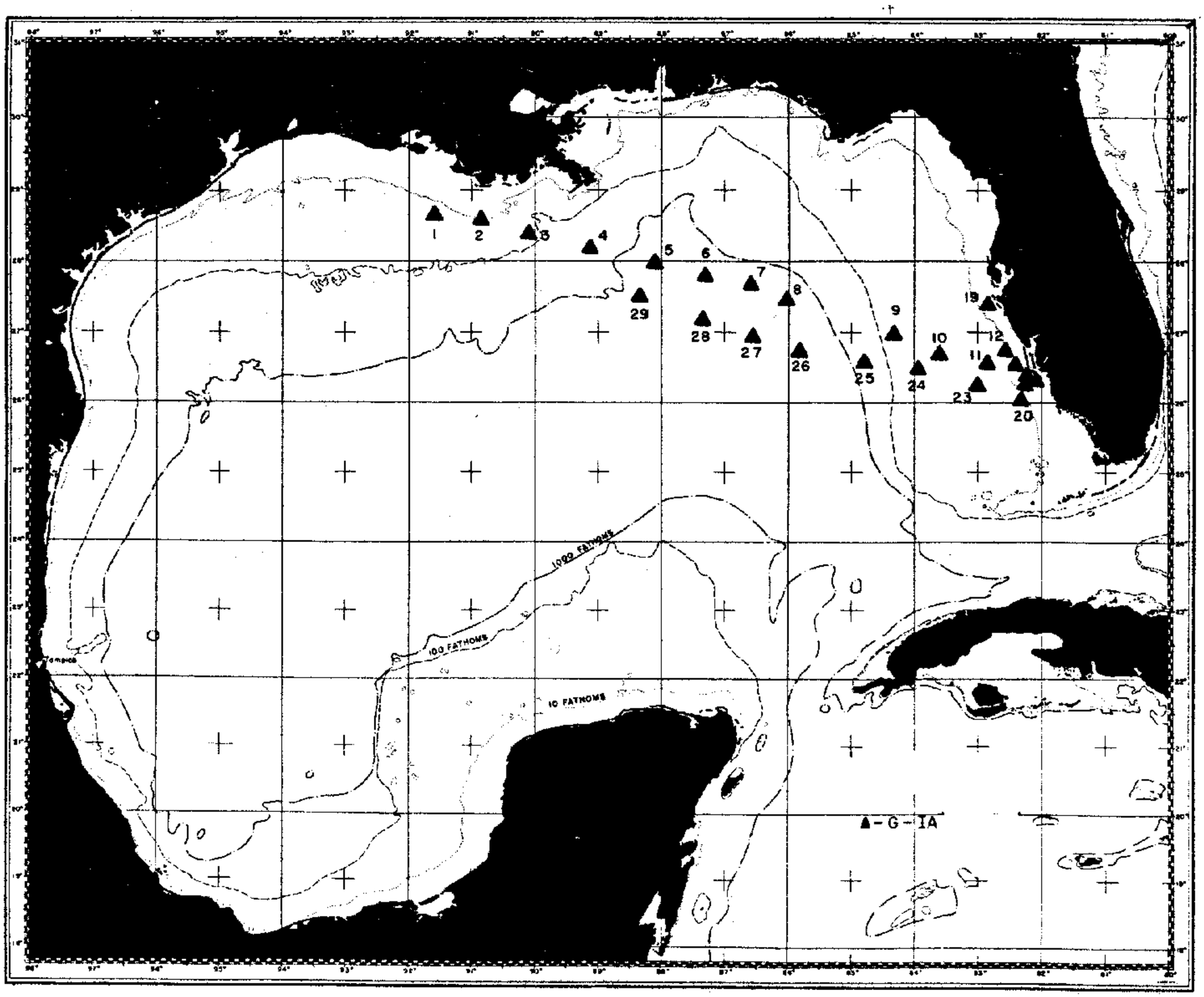

Figure 8.--Location of plankton tows made during Cruise 7 (Special), November 1952. Numbers identify stations.

Table 9.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 7 (Special).

(G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
1	28-40	91-35	NC	XI-14	1017-1417	15	118.50	26	.219	.945	.270
2	28-36	90-52	NC	XI-14	1435-1835	15	118.57	19	.160	.953	.759
3	28-22	90-06	NC	XI-14	1850-2315	8-10	131.84	10	.076	.348	.182
4	28-11	89-13	NC	XI-15	2330-0550	7	148.85	11	.074	.080	.006
5	27-58	88-06	NC	XI-15	0615-1115	15	144.60	11	.076	.034	.006
6	27-49	87-18	NC	XI-15	1122-1622	15	146.08	10	.068	.068	.000
7	27-40	86-37	NC	XI-15	1635-2035	10	121.38	14	.115	.041	.000
8	27-28	86-01	NC	XI-15/16	2048-0048	6	122.65	7	.057	.008	.000
9	26-58	84-20	SE	XI-16	0620-1040	15	137.35	6	.044	.116	.058
10	26-42	83-36	SE	XI-16	1052-1452	15	120.30	6	.050	.091	.091
11	26-35	82-52	SE	XI-16	1505-1905	15	118.25	21	.178	.084	.025
12	26-34	82-25	SE	XI-16	1915-2115	8	59.39	24	.404	.067	.084
*13	26-25	82-15	SE	XI-16/17	2125-0217	6	75.97	26	.342	.052	.000
*14	26-20	82-05	SE	XI-17	0230-0628	6	89.53	8	.089	.011	.000
15	off Sanibel Island		SE	XI-17	0636-0940	6	95.79	3	.031	.010	.020

TABLE 9 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1952	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
16	off Sanibel Island		SE	XI-17	1530-1700	6	34.17	5	.146	.000	.000
17	" "	"	SE	XI-18	0930-1125	5	42.49	29	.683	.000	.000
18	26-45	82-35	SE	XI-19	0830-1230	3-10	124.71	29	.233	.160	.890
19	27-25	82-50	SE	XI-19	1245-1620	10	106.07	20	.189	.056	1.055
20	26-04	82-21	SE	XI-23	0615-0715	10	28.57	4	.140	.105	.105
21	26-15	82-15	SE	XI-23	0755-1130	10	100.30	16	.160	.009	.119
22	26-20	82-05	SE	XI-23	1220-1320	4	30.85	4	.130	.032	.000
23	26-15	83-00	SE	XI-23	1515-2330	5	239.92	32	.133	.062	.004
24	26-28	83-56	SE	XI-23/24	2340-0545	6-8	194.59	20	.103	.298	.210
25	26-35	84-48	SE	XI-24	0600-1000	10	170.69	8	.047	.076	.017
26	26-45	85-50	SE	XI-24	1020-1615	10-12	193.75	5	.026	.020	.020
27	26-57	86-35	C	XI-24	1630-2030	8	126.54	8	.063	.110	.007
28	27-11	87-22	NC	XI-24/25	2040-0240	5	184.89	14	.076	.081	.016
29	27-30	88-21	NC	XI-25	0400-0600	3	59.75	11	.184	.083	.000

*Half-speed

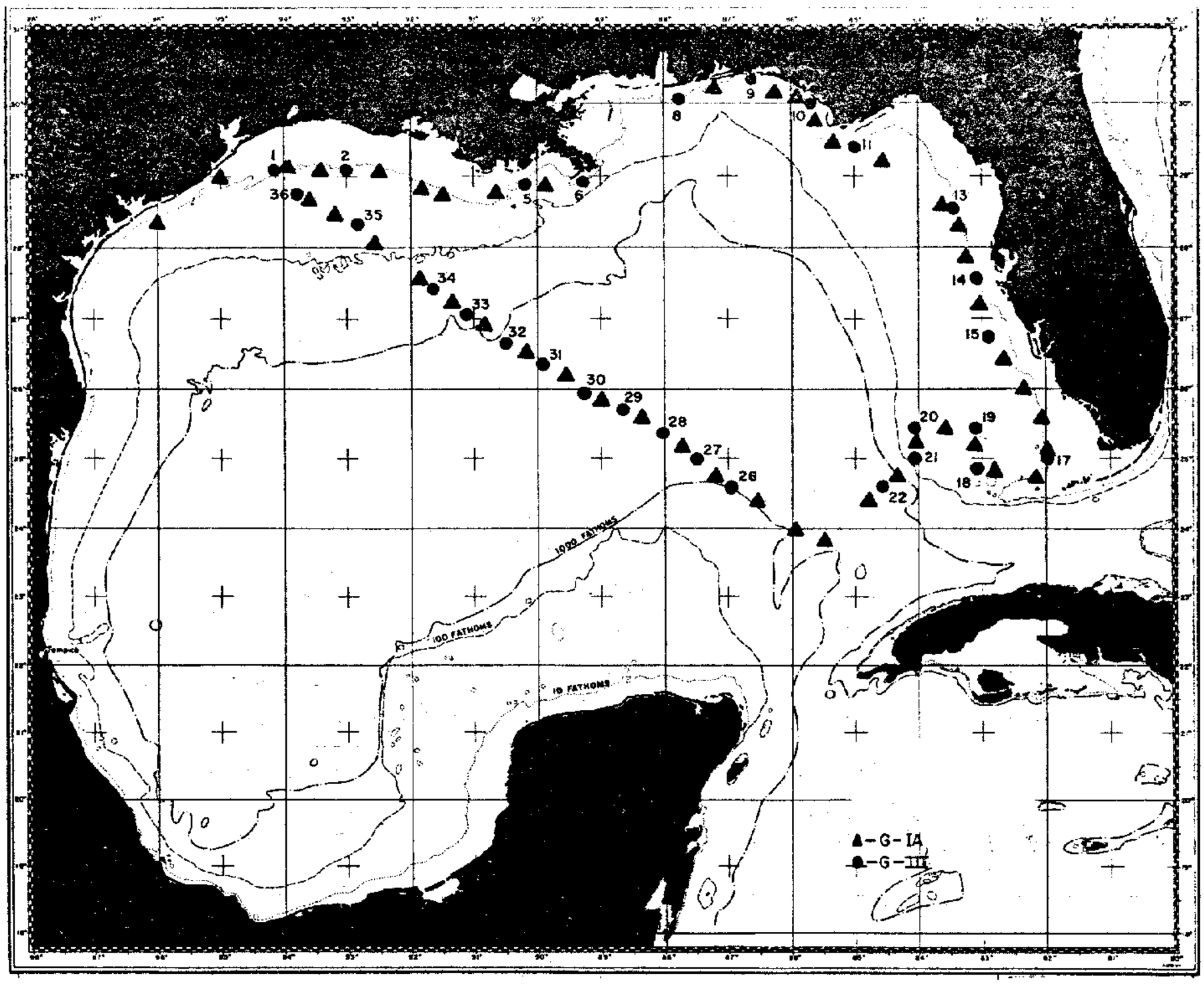

Figure 9.--Location of plankton tows made during Cruise 8, February 1953, and Cruise 9 (Special), March 1953. Numbers identify stations.

Table 10.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 8. (G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. lat.	W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae no./m^3 water	Fish Eggs no./m^3 water
1	29-06	93-55	NW	II-12	1315-1715	7	116.41	4.8	.041	.163	.722
2	29-05	93-25	NW	II-12	1725-2055	6	135.31	4.0	.030	.103	.177
3	29-03	92-30	NW	II-12/13	2235-0405	6	150.47	4.5	.030	.047	.465
4	28-50	91-50	NC	II-13	0530-0830	8	84.98	4.5	.053	.094	.141
5	28-44	91-30	NC	II-13	0850-1050	8	57.87	3.0	.052	.380	.017
6	28-45	90-38	NC	II-13	1400-2040	10	183.95	10.0	.054	.125	.419
7	28-51	89-53	NC	II-13/14	2212-0245	3	129.42	26.0	.201	1.035	.703
8	30-13	87-13	NC	II-14/15	2355-0555	5	179.37	18.0	.100	.033	.151
9	30-10	86-15	NC	II-17	0722-1052	8	105.60	11.0	.104	.227	.038
10	30-06	85-55	NE	II-17	1105-1255	8	53.12	3.0	.056	.075	.264
11	29-47	85-38	NE	II-18	0950-1250	5-10	86.77	4.5	.052	.519	.046
12	29-27	85-21	NE	II-18	1300-1700	10	110.44	8.5	.077	.181	1.693
13	29-12	84-32	NE	II-18/19	1825-0115	6-8	145.65	5.0	.034	.027	7.271
14	28-36	83-36	NE	II-19	0725-1025	10	99.87	5.0	.050	.280	1.071
15	28-20	83-22	NE	II-19	1225-1525	10	93.69	0.3	.003	.032	.320

TABLE 10 (Continued)

Tow	Position (mid-point of tow) N. Lat.	Position (mid-point of tow) W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
16	27-53	83-15	NE	II-19	1531-1931	10	101.29	0.5	.005	.079	2.468
17	27-13	83-02	NE	II-19/20	2130-0330	5	175.33	8.0	.046	.211	.359
18	26-26	82-40	SE	II-20	0515-0930	6	102.53	10.0	.098	.205	.790
19	26-00	82-20	SE	II-20	0940-1220	8	71.72	4.0	.056	.098	1.004
20	25-35	82-04	SE	II-20	1305-1705	10	118.61	9.5	.080	.084	.430
21	25-06	82-00	SE	II-20	1720-1950	5	70.35	9.0	.128	.128	4.733
22	24-43	82-10	SE	II-22	1030-1515	5	144.16	9.0	.062	.076	.923
23	24-50	82-48	SE	II-22	1525-1815	10	85.56	6.0	.070	.281	2.606
24	25-12	83-08	SE	II-22/23	1955-0025	5	134.89	13.0	.096	.082	2.098
25	25-27	83-35	SE	II-23	0145-0615	5	133.42	12.5	.094	.112	.757
26	25-14	84-02	SE	II-23	0850-1150	12	97.60	3.0	.031	.010	.061
27	24-46	84-18	SE	II-23	1345-1655	10	87.15	1.0	.011	.023	.000
28	24-23	84-47	SE	II-23/24	2300-0310	4	140.56	2.0	.014	.014	.007
29	23-50	85-28	SE	II-24	0635-1145	12	144.61	3.0	.021	.048	.028
30	23-57	85-59	SE	II-24	1340-1750	12	123.89	3.0	.024	.032	.000

TABLE 10 (Continued)

Tow	Position (mid-point of tow) N. Lat.	Position (mid-point of tow) W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
31	24-25	86-34	C	II-24/25	2125-0035	12	85.38	3.0	.035	.047	.012
32	24-45	87-14	C	II-25	0350-0810	5	130.47	3.0	.023	.069	.046
33	25-10	87-44	C	II-25	1145-1350	12	61.09	1.0	.017	.098	.016
34	25-34	88-22	C	II-25	1640-1940	12	83.53	6.0	.072	.539	.012
35	25-50	89-00	C	II-25/26	2205-0120	5	97.24	7.0	.072	.031	.041
36	26-11	89-35	C	II-26	0320-0800	5	123.51	7.0	.057	.138	.000
37	26-31	90-11	C	II-26	1035-1345	10	84.95	2.0	.024	.024	.012
39	27-15	91-20	NC	II-26/27	2245-0400	3	143.55	24.0	.167	.007	.017
40	27-35	91-50	NC	II-27	0631-1001	10	98.75	12.5	.127	.041	.020
41	28-04	92-26	NW	II-27	1010-1400	10	115.33	9.0	.078	.139	.139
42	28-29	93-10	NW	II-27	1516-1834	10	135.69	12.0	.088	.560	.766
43	28-40	93-37	NW	II-27	1838-2038	5	59.11	4.0	.068	.186	2.555
44	29-07	93-56	NW	II-27/28	2255-0120	3	107.33	2.0	.019	.075	.391

Table 11.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 8.
(G-III sampler; speed of tows: 4-5 knots)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1953	30-minute tows Time (start) (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
*1	29-05	94-10	NW	II-28	0200	3	336.42	30.0	.089	.699	.012
13	28-33	83-26	NE	II-19	1150	10	245.33	95.0	.387	.183	.289
14	27-35	83-05	NE	II-19	2040	3	309.69	49.0	.158	.297	1.724
15	26-45	82-55	SE	II-20	0430	5	353.89	60.0	.170	.240	.430
17	25-00	81-58	SE	II-20	2100	5	201.00	41.0	.204	.294	1.065
18	24-52	83-03	SE	II-22	1915	5	294.19	41.5	.141	.122	.619
19	25-27	83-05	SE	II-23	0110	3	386.67	62.0	.160	.316	.978
20	25-27	84-02	SE	II-23	0815	10-12	289.63	23.0	.079	.193	.021
21	25-00	84-02	SE	II-23	1245	10	369.92	26.5	.072	.027	.011
22	24-36	84-32	SE	II-23	2210	6	265.50	26.5	.100	.045	.030
26	24-35	86-52	C	II-25	0315	5	286.53	32.0	.112	.171	.063
27	25-00	87-31	C	II-25	1010	10	281.18	10.0	.036	.235	.011
28	25-21	88-01	C	II-25	1605	10	407.16	20.0	.049	.260	.017
29	25-43	88-40	C	II-25	2130	3	405.77	81.5	.201	.113	.190

TABLE 11 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1953	30-minute tows Time (start) (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
30	25-56	89-17	C	II-26	0315	3	305.00	60.0	.197	.623	.010
31	26-21	89-54	C	II-26	1000	8-10	261.23	20.0	.077	.161	.004
32	26-40	90-30	C	II-26	1555	10	258.02	60.0	.233	.012	.004
33	27-05	91-06	NC	II-26	2210	3	226.30	35.0	.155	.009	.000
34	27-26	91-40	NC	II-27	0600	10	264.43	113.5	.429	.284	.015
35	28-21	92-50	NW	II-27	1445	10	349.25	45.0	.129	.598	3.926
36	28-45	93-48	NW	II-27	2120	3	394.16	19.0	.048	.066	2.763

*Station 1 occupied last due to adverse weather.

						Qualitative tows	Volume (ml)	No. of Larvae	No. of Eggs
2	29-06	93-00	NW	II-12	2155	6	19.0	16	530
5	28-54	90-11	NC	II-13	2140	3	33.0	39	18
6	28-55	89-18	NC	II-14	0705	10	44.5	25	21
8	30-95	87-47	NC	II-16	2315	3	22.0	1	25
9	30-20	86-38	NC	II-17	0650	6	117.0	46	27
10	30-00	85-40	NE	II-17	1330	6	36.0	31	36
11	29-25	85-00	NE	II-18	1745	5	24.0	34	412

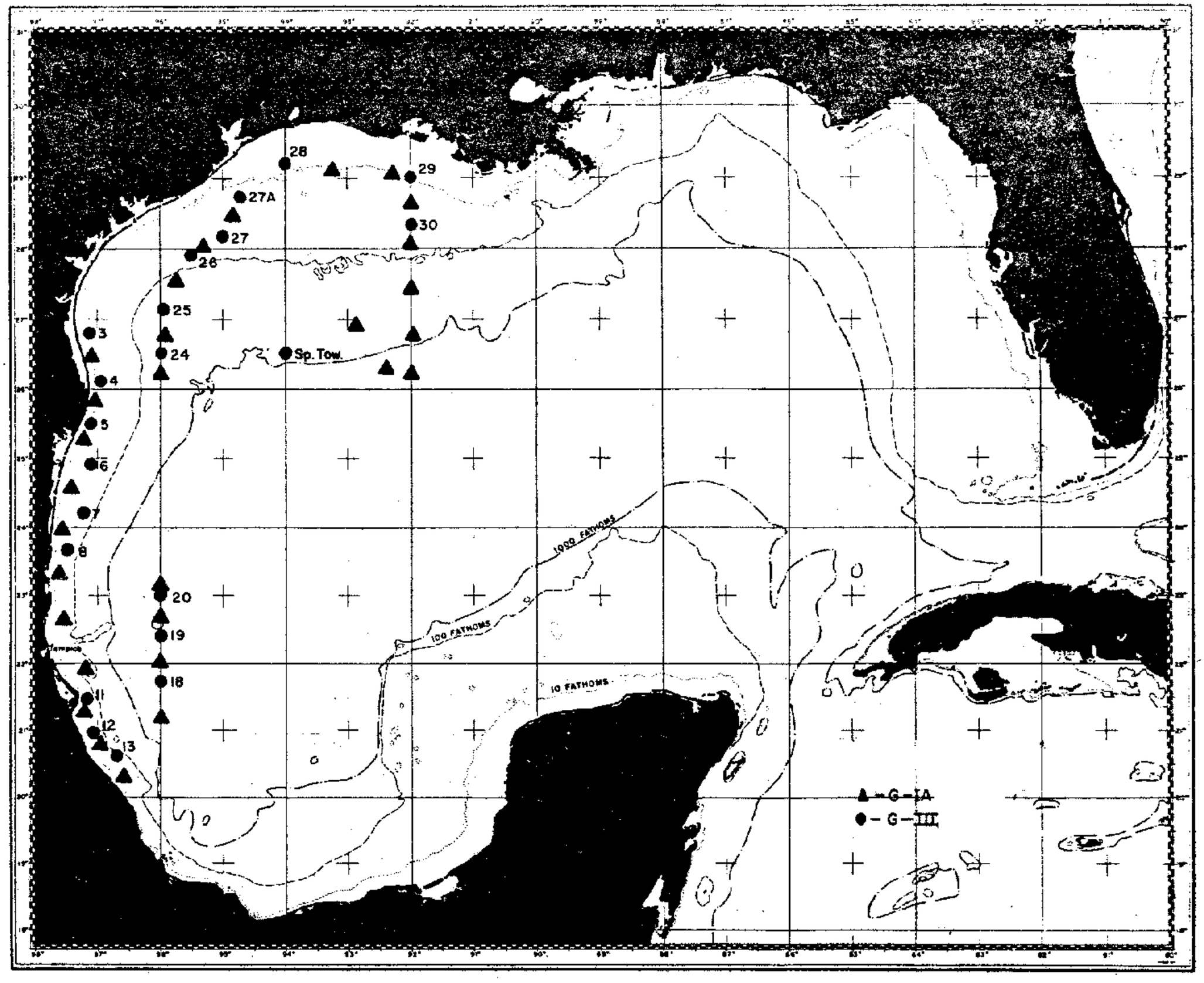

Figure 10.--Location of plankton tows made during Cruise 10-2B, April 1953. Numbers identify stations.

Table 12.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruises 9 and 10-2B. (G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae $no./m^3$ water	Fish Eggs $no./m^3$ water
						Cruise 9					
1	29-00	95-00	NW	III-9	1740-2110	8	110.10	6.0	.054	.282	.345
2	28-20	96-00	NW	III-10	0540-0710	8	59.36	6.0	.101	.118	.084
						Cruise 10-2B					
2	26-28	97-06	WC	IV-15	1735-2055	8	103.47	7.0	.073	.213	7.123
3	25-50	97-02	WC	IV-15/16	2205-0220	3	150.58	12.0	.080	.418	2.006
4	25-16	97-14	WC	IV-16	0335-0635	3	98.79	12.5	.127	1.994	.364
5	24-34	97-25	WC	IV-16	0800-1100	8	99.80	2.5	.025	.741	.381
6	23-58	97-32	SW	IV-16	1220-1515	8	99.72	3.5	.035	.632	.391
7	23-20	97-37	SW	IV-16	1635-1955	8	113.63	4.0	.035	.651	.766
8	22-38	97-31	SW	IV-16/17	2120-0050	5	113.08	3.5	.031	.265	.460
9	21-55	97-11	SW	IV-17	0140-0810	5	181.54	3.0	.017	.424	.380
10	21-17	97-13	SW	IV-17	0920-1220	10	97.63	4.0	.041	.410	.543
11	20-48	96-57	SW	IV-17	1335-1800	10	122.68	6.0	.049	.758	.310
12	20-17	96-35	SW	IV-17	1925-2210	5	93.57	2.5	.027	.235	.524

TABLE 12 (Continued)

Tow	Position (mid-point of tow) N. Lat.	Position (mid-point of tow) W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
13	21-10	96-00	SW	IV-18	0830-1245	10	129.89	2.5	.019	.077	.000
14	22-00	96-00	SW	IV-18	1525-1825	10	104.16	.9	.009	.029	.058
15	22-41	96-00	SW	IV-18/19	2135-0105	8	118.19	2.5	.021	.059	.042
16	23-10	96-00	SW	IV-19	0345-0618	5	81.96	3.5	.043	.098	.110
17	26-13	96-00	WC	IV-20	1435-1820	10	105.99	3.0	.028	.113	.038
18	26-46	95-55	WC	IV-20	2100-0000	5	99.47	3.0	.030	.030	.020
19	27-34	95-44	WC	IV-21	0225-0605	5	121.33	5.5	.045	.025	.058
20	28-02	95-20	NW	IV-21	0805-1125	10	106.25	4.0	.038	.527	.602
21	28-28	94-50	NW	IV-21	1248-1702	10	144.42	8.5	.059	1.115	3.005
22	29-07	93-15	NW	IV-30/V-1	2200-0600	5	242.62	21.6	.089	1.884	2.180
23	29-05	92-15	NW	V-1	0610-0920	10	109.74	12.5	.114	.301	6.288
24	28-40	92-00	NW	V-1	1055-1435	10	108.12	7.5	.069	.435	.953
25	28-05	92-00	WC	V-1	1445-2025	10	157.64	3.0	.019	.114	.159
26	27-24	91-59	NC	V-1/2	2215-0345	10	142.17	8.0	.056	.007	.091

TABLE 12 (Continued)

Tow	Position (mid-point of tow) N. Lat.	Position (mid-point of tow) W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish Larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
27	26-46	91-58	NC	V-2	0605-1005	10	105.06	1.5	.014	.086	.124
28	26-15	92-00	C	V-2	1330-1720	10	113.24	1.5	.013	.044	.097
29	26-18	92-23	WC	V-3	0810-1155	10	124.16	1.0	.008	.032	.040
30	26-55	92-52	WC	V-3	1250-1800	10	168.60	2.5	.015	.030	.042

Table 13.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 10-2B. (G-III sampler; speed of tows: 4-5 knots)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1953	Time (start) (C.S.T.)	Depth of tow (m.)	Plankton Volume in (ml)	Plankton No. of Fish Larvae	Plankton No. of Fish Eggs
3	26-48	97-07	WC	IV-15	1700	8	111.0	137	677
4	26-08	96-58	WC	IV-15	2130	3	42.5	368	349
5	25-30	97-06	WC	IV-16	0300	3	50.5	509	2668
6	24-55	97-08	WC	IV-16	0730	8	35.0	498	384
7	24-13	97-21	WC	IV-16	1145	8	15.5	422	249
8	23-40	97-30	SW	IV-16	1600	8	17.0	469	323
11	21-28	97-10	SW	IV-17	0845	10	15.0	228	337
12	20-58	97-03	SW	IV-17	1300	10	28.0	149	435
13	20-37	96-41	SW	IV-17	1850	8	20.0	1669	137
16	21-42	96-00	SW	IV-18	1450	10	11.0	128	33
17	22-23	96-00	SW	IV-18	2105	10	23.0	52	11
18	23-00	96-00	SW	IV-19	0313	3	23.5	16	37
24	26-31	96-00	WC	IV-20	2030	3	20.0	31	26
25	27-08	95-58	NW	IV-21	0150	3	12.5	8	53

TABLE 13 (Continued)

Station	Position N. Lat.	Position W. Long.	Sub-Area	Date 1953	Time (start) (C.S.T.)	Depth of tow (m.)	Plankton Volume in (ml)	Plankton No. of Fish Larvae	Plankton No. of Fish Eggs
26	27-55	95-30	NW	IV-21	0800	10	13.0	154	402
27	28-10	95-00	NW	IV-21	1215	10	19.0	526	1087
27A	28-44	94-44	NW	IV-21	1710	10	36.5	774	1217
28	29-12	94-00	NW	IV-30	2127	3	177.0	381	428
29	29-01	92-00	NW	IV-31	1005	10	110.0	8	415
30	28-20	92-00	NW	IV-31	1520	10	20.0	89	138
Special tow	26-32	92-29	WC	V-3	1200	10	20.0	35	29

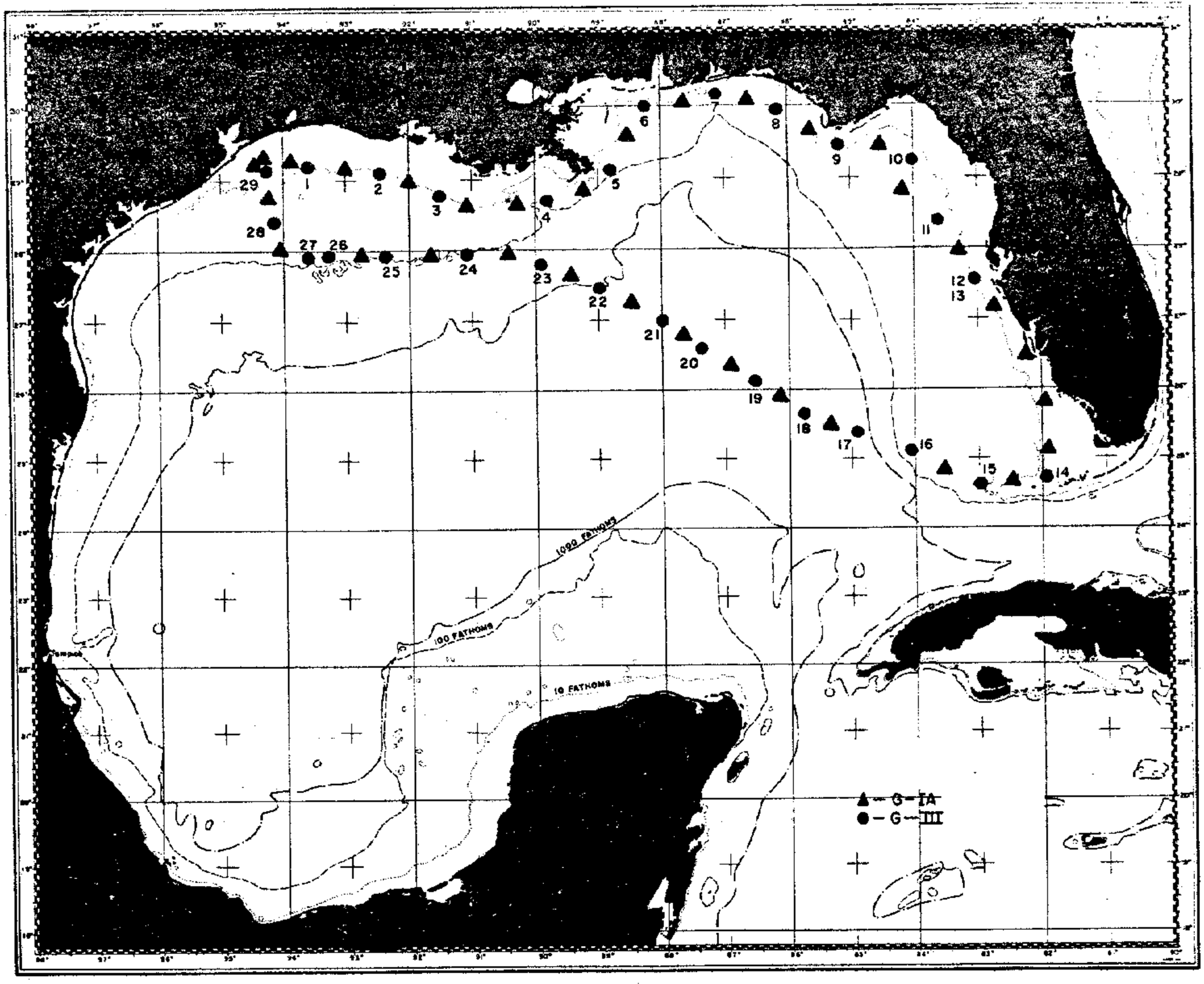

Figure 11.--Location of plankton tows made during Cruise 11, May-June 1953. Numbers identify stations.

Table 14.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 11. (G-IA sampler; speed of tows: 9-10 knots)

Tow	Position (mid-point of tow) N. Lat.	Position (mid-point of tow) W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Plankton Volume ml/m^3 water	Plankton Fish larvae $no./m^3$ water	Plankton Fish Eggs $no./m^3$ water
1	29-19	94-19	NW	V-27	1510-2010	15	124.42	30.0	.241	.121	5.176
2	29-14	93-53	NW	V-28/29	2225-0420	5	169.03	55.0	.325	.544	.935
3	29-10	93-01	NW	V-29	0500-1050	15	180.74	27.0	.149	.155	5.234
4	28-56	92-00	NC	V-29	1135-1735	15	184.07	21.0	.114	.054	.255
5	28-36	91-04	NC	V-29	1815-2355	15	228.92	10.0	.044	.039	.297
6	28-37	90-17	NC	V-30	0030-0605	15	187.41	23.0	.123	.320	.651
7	28-50	89-14	NC	V-30	0645-1300	15	164.27	18.0	.110	.262	55.719
8	29-35	88-32	NC	V-30	1346-1944	15	158.29	82.5	.521	.505	1.826
9	30-04	87-40	NC	V-30/31	2018-0213	5	165.69	20.0	.121	.109	1.183
10	30-07	86-38	NC	V-31	0245-0850	5	196.22	25.0	.127	.194	.683
11	29-41	85-39	NE	V-31	0928-1528	15	162.43	28.0	.172	.215	.738
12	29-27	84-34	NE	V-31	1710-2319	10	194.06	28.0	.144	.361	2.303
13	28-49	84-12	NE	V-31/VI-1	2352-0550	5	181.38	20.0	.110	.402	4.571
14	27-58	83-16	NE	VI-1	0628-1220	15	168.04	28.0	.167	.179	1.160

TABLE 14 (Continued)

Tow	Position (mid-point of tow) N. Lat.	W. Long.	Sub-Area	Date 1953	Time (C.S.T.)	Depth of tow (m.)	Volume water strained in m^3	Plankton Volume (ml)	Volume ml/m^3 water	Fish Larvae no./m^3 water	Fish Eggs no./m^3 water
15	27-12	82-44	NE	VI-4	1046-1646	5	162.18	25.0	.154	.080	1.085
16	26-30	82-15	SE	VI-4	1707-2308	5	157.56	22.0	.139	.824	1.761
17	25-50	81-58	SE	VI-4/5	2319-0519	5	146.05	21.0	.144	3.923	6.429
18	25-08	81-54	SE	VI-5	0541-1053	5	146.25	26.0	.178	1.415	3.323
19	24-42	82-30	SE	VI-7	0750-1350	5	186.87	5.0	.027	.043	3.462
20	24-52	83-33	SE	VI-7	1745-2340	5	150.94	7.0	.046	.126	.815
22	25-31	85-21	SE	VI-8	0654-1254	10	191.12	1.5	.008	.084	.078
23	25-55	86-09	C	VI-8	1330-1930	10	191.15	3.5	.018	.251	.026
24	26-22	86-57	C	VI-8/9	2007-0207	5	189.43	11.0	.058	.121	.053
25	26-47	87-41	C	VI-9	0241-0841	5	184.93	5.0	.027	.103	.103
26	27-15	88-29	NC	VI-9	0928-1543	10	194.83	3.5	.018	.103	.041
27	27-38	89-26	NC	VI-9	1620-2220	10	185.32	13.0	.070	.086	.005
28	27-57	90-27	NC	VI-9/10	2252-0452	5	193.51	13.0	.067	.171	1.411
29	27-57	91-40	NC	VI-10	0527-1127	10	195.63	4.0	.020	.169	.654
30	27-57	92-45	NW	VI-10	1200-1700	10	167.18	4.0	.024	.233	.185
31	28-02	94-04	NW	VI-10/11	2111-0311	5	168.38	8.0	.047	.290	.468
32	28-45	94-14	NW	VI-11	0315-0715	5	105.49	9.0	.085	.683	2.104
33	29-13	94-26	NW	VI-11	0931-1201	5	77.52	5.0	.064	.310	3.070

Table 15.--Station data, total volumes of plankton and volume of fish larvae and eggs, Cruise 11.
(G-III sampler; speed of tows: 4-5 knots)

Tow	Position N. Lat.	W. Long.	Sub-area	30-minute tows Date 1953	Time (start) (C.S.T.)	Depth of tow (m.)	Plankton Volume in (ml)	No. of Fish Larvae	No. o Fish Eggs
1	29-12	93-35	NW	V-29	0430	5	44.0	32	265
2	29-07	92-26	NW	V-29	1100	15	38.0	31	2850
3	28-46	91-31	NC	V-29	1742	15	28.0	33	34
4	28-42	89-48	NC	V-30	0608	10	63.5	1043	99
5	29-07	88-47	NC	V-30	1315	15	18.0	52	26
6	29-59	88-14	NC	V-30	1945	5	159.0	115	117
7	30-09	87-07	NC	V-31	0215	5	36.0	22	4
8	29-57	86-09	NC	V-31	0855	15	40.0	83	145
9	29-27	85-10	NE	V-31	1529	10	37.5	27	168
10	29-15	84-01	NE	V-31	2320	5	60.0	159	623
11	28-23	83-37	NE	VI-1	0555	15	40.0	206	2063
12	27-33	83-03	NE	VI-1	1222	10	80.0	350	395
13	27-33	83-03	NE	VI-4	1013	10	110.0	94	353
14	24-43	81-57	SE	VI-5	1055	10	86.0	63	233
15	24-37	83-00	SE	VI-7	1353	5	7.0	123	352

TABLE 15 (Continued)

Tow	Position N. lat.	Position W. Long.	Sub-area	30-minute tows Date 1953	Time (start) (G.S.T.)	Depth of tow (m.)	Plankton Volume in (ml)	Plankton No. of Fish Larvae	Plankton No. of Fish Eggs
16	25-07	84-03	SE	VI-7/8	2344	5	30.0	32	184
17	25-25	84-55	SE	VI-8	0622	10	31.5	66	204
18	25-41	85-45	SE	VI-8	1257	10	13.5	182	39
19	26-08	86-34	C	VI-8	1934	5	40.0	175	17
20	26-36	87-23	C	VI-9	0209	5	51.0	68	22
21	27-00	88-00	C	VI-9	0843	10	10.0	60	77
22	27-27	89-00	NC	VI-9	1546	10	29.5	45	29
23	27-48	89-55	NC	VI-9	2221	5	48.0	84	102
24	27-56	91-06	NC	VI-10	0455	10	41.0	323	95
25	27-56	92-16	NW	VI-10	1128	10	20.0	300	167
26	27-56	93-16	NW	VI-10	1722	10	33.0	183	102
27	27-55	93-35	NW	VI-10	2040	5	28.0	441	3795
28	28-24	94-09	NW	VI-11	0313	5	65.0	374	118
29	29-07	94-16	NW	VI-11	0858	5	51.0	288	199

TABLE 16 (A)

G-IA Net (Quantitative)

Plankton Volumes (ml./m^3)

Sub-area	0-100 fms. Winter	0-100 fms. Spring	0-100 fms. Fall	100-1000 fms. Winter	100-1000 fms. Spring	100-1000 fms. Fall	over 1000 fms. Winter	over 1000 fms. Spring	over 1000 fms. Fall
NW	.055 (10)	.104 (14)		.009 (2)					
NC	.094 (6)	.142 (17)	.152 (3)	.113 (4)	.061 (11)	.074 (1)	.091 (2)	.054 (4)	.096 (6)
NE	.040 (8)	.146 (11)		.025 (1)	.063 (4)		.056 (1)		
WC		.065 (5)			.029 (4)			.008 (1)	
C							.038 (9)	.050 (8)	.063 (1)
Ca	.014 (3)			.054 (3)			.015 (1)		
SW		.034 (7)						.023 (4)	
SE	.074 (12)	.135 (10)	.191 (16)	.032 (5)	.015 (1)	.047 (1)	.049 (7)	.055 (11)	.026 (1)
Means	.060 (39)	.115 (64)	.185 (19)	.054 (15)	.053 (20)	.061 (2)	.047 (20)	.047 (28)	.083 (8)
All Seasons		.109 (122)			.054 (37)			.052 (56)	

() No. of tows

Winter--12/21-3/20

Spring--3/21-6/20

Fall--9/21-12/20

ABLE 16 (B)

Fish Larvae (no./m^3)

ub-area	0-100 fms. Winter	0-100 fms. Spring	0-100 fms. Fall	100-1000 fms. Winter	100-1000 fms. Spring	100-1000 fms. Fall	over 1000 fms. Winter	over 1000 fms. Spring	over 1000 fms. Fall
NW	.188 (10)	.493 (14)		.011 (2)					
NC	.316 (6)	.443 (17)	.749 (3)	.102 (4)	.181 (11)	.080 (1)	.095 (2)	.191 (4)	.052 (6)
NE	.176 (8)	.429 (11)		.025 (1)	.187 (4)		.034 (1)		
WC		.696 (5)			.025 (4)			.032 (1)	
C							.115 (9)	.166 (8)	.110 (1)
Ca	.032 (3)			.199 (3)			.000 (1)		
SW		.482 (7)						.066 (4)	
SE	.127 (12)	1.142 (10)	.072 (16)	.046 (5)	.068 (1)	.076 (1)	.025 (7)	.135 (11)	.020 (1)
Means	.174 (39)	.585 (64)	.182 (19)	.085 (15)	.145 (20)	.078 (2)	.072 (20)	.138 (28)	.055 (8)
l Seasons		.391 (122)			.117 (37)			.102 (56)	

inter--12/21-3/20

pring--3/21-6/20

all--9/21-12/20

) No. of tows

TABLE 16 (C)

Fish Eggs (no./m^3)

Sub-area	0-100 fms. Winter	0-100 fms. Spring	0-100 fms. Fall	100-1000 fms. Winter	100-1000 fms. Spring	100-1000 fms. Fall	over 1000 fms. Winter	over 1000 fms. Spring	over 1000 fms. Fall
NW	.593 (10)	2.389 (14)		.000 (2)					
NC	.245 (6)	4.002 (17)	.404 (3)	.030 (4)	.151 (11)	.006 (1)	.016 (2)	.033 (4)	.004 (6)
NE	1.686 (8)	1.285 (11)		.025 (1)	.077 (4)		.011 (1)		
WC		2.006 (5)			.040 (4)			.040 (1)	
C							.017 (9)	.048 (8)	.007 (1)
Ca	.062 (3)			.029 (3)			.000 (1)		
SW		.482 (7)						.052 (4)	
SE	1.125 (12)	1.916 (10)	.166 (16)	.000 (5)	.012 (1)	.017 (1)	.005 (7)	.043 (11)	.020 (1)
Means	.886 (39)	2.301 (64)	.204 (19)	.015 (15)	.107 (20)	.012 (2)	.012 (20)	.044 (28)	.006 (6)
All Seasons		1.522 (122)			.065 (37)			.027 (56)	

Winter--12/21-3/20

Spring--3/21-6/20

Fall--9/21-12/20

() No. of tows

TABLE 17 (A) G-III Net (Quantitative)

Plankton Volumes (ml./m^3)

Sub-area	0-100 fms. Winter	0-100 fms. Spring	100-1000 fms. Winter	100-1000 fms. Spring	over 1000 fms. Winter	over 1000 fms. Spring
NW	.089 (3)					
NC		.373 (2)	.292 (2)	.092 (9)		.150 (1)
NE	.272 (2)	.175 (8)		.105 (2)	.101 (1)	.130 (1)
C					.129 (7)	.111 (5)
Ca			.341 (1)		.141 (1)	
SE	.154 (8)	.173 (4)	.173 (3)	.070 (3)	.079 (3)	.091 (8)
Means	.157 (13)	.203 (14)	.241 (6)	.089 (14)	.114 (12)	.104 (15)
Both Seasons	.171 (27)		.135 (20)		.109 (27)	

() No. of tows

Winter--12/21-3/20

Spring--3/21-6/20

TABLE 17 (B)

Fish Larvae (no./m^3)

Sub-area	0-100 fms. Winter	0-100 fms. Spring	100-1000 fms. Winter	100-1000 fms. Spring	over 1000 fms. Winter	over 1000 fms. Spring
NW	.454 (3)					
NC		1.558 (2)	.146 (2)	.458 (9)		.129 (1)
NE	.240 (2)	3.032 (8)		.282 (2)	.220 (1)	.467 (1)
C					.239 (7)	.390 (5)
Ca			2.056 (1)		.427 (1)	
SE	.854 (8)	.686 (4)	.808 (3)	.238 (3)	.118 (3)	.253 (8)
Means	.667 (13)	2.151 (14)	.795 (6)	.386 (14)	.221 (12)	.305 (15)
Both Seasons	1.436 (27)		.509 (20)		.268 (27)	

Winter--12/21-3/20

Spring--3/21-6/20

() No. of tows

TABLE 17 (C)

Fish Eggs (no./m^3)

Sub-area	0-100 fms. Winter	0-100 fms. Spring	100-1000 fms. Winter	100-1000 fms. Spring	over 1000 fms. Winter	over 1000 fms. Spring
NW	2.234 (3)					
NC		3.913 (2)	.008 (2)	.107 (9)		.009 (1)
NE	1.007 (2)	.581 (8)		.008 (2)	.036 (1)	.029 (1)
C					.043 (7)	.031 (5)
Ca			.021 (1)		.042 (1)	
SE	.641 (8)	1.655 (4)	.004 (3)	.106 (3)	.012 (3)	.028 (8)
Means	.988 (13)	1.364 (14)	.008 (6)	.093 (14)	.034 (12)	.028 (15)
Both Seasons	1.183 (27)		.067 (20)		.031 (27)	

Winter--12/21-3/20

Spring--3/21-6/20

() No. of tows

Table 18.--Catches of G-IA and G-III nets compared, all seasons, all subareas.

Depth Zone	Plankton (ml./m^3) G-IA	Plankton (ml./m^3) G-III	Fish Larvae (no./m^3) G-IA	Fish Larvae (no./m^3) G-III	Fish Eggs (no./m^3) G-IA	Fish Eggs (no./m^3) G-III
0-100 fms. Tows	.109 (122)	.171 (27)	.391	1.436	1.522	1.183
100-1000 fms. Tows	.054 (37)	.135 (20)	.117	.509	.065	.067
over 1000 fms. Tows	.052 (56)	.109 (27)	.102	.268	.027	.031

() No. of tows

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