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ICHTHYOPLANKTON AND STATION DATA FOR SURFACE TOWS TAKEN DURING THE 1990 EASTERN TROPICAL PACIFIC DOLPHIN SURVEY ON THE RESEARCH VESSELS *DAVID STARR JORDAN* AND *McARTHUR*

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ABSTRACT

This report provides ichthyoplankton, juvenile/adult fish, and associated station and tow data from the surface plankton samples collected during the 1990 Southwest Fisheries Science Center eastern tropical Pacific dolphin survey. It is the fourth in a series of reports that presents these data for all SWFSC ETP dophin surveys from 1987 to the present. In total, 175 stations were sampled with Manta nets between 28 July and 6 December, 1990, during which two research vessels surveyed within an area extending from about 26° N to 9° S, and from the Gulf of Panama westward to about 142° W. The data are presented in six tables, and distributions of the 20 most frequently occurring larval fish taxa are shown in a series of figures. The background, methodology, and necessary interpretive information are given in an accompanying text.

INTRODUCTION

In 1986 the Southwest Fisheries Science Center (SWFSC) conducted the first of a series of dolphin surveys in the eastern tropical Pacific (ETP). The purpose of these multi-ship surveys was to monitor abundance and distribution of ETP dolphin stocks and concurrently to monitor physical and biological variables in their habitat (Holt. et al. 1987; Holt and Jackson 1987). A primary objective was to determine the relation between environmental variables and population trends in ETP dolphin stocks. The physical oceanography was conducted jointly with NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML). On the 1990 survey and all surveys conducted since 1987 (Thayer et al. 1988a, b), Manta (surface) net tows were taken at night in conjunction with the oceanographic operations (1987 survey, Moser et al. 2000; 1988 survey, Ambrose et al. 2000; 1989 survey, Charter et al. 2000; 1990 survey, this report; 1992 survey, Watson et al. 2000).The purpose of this was to study the distribution and abundance of ETP fish larvae and extend the ichthyoplankton time series begun during the Eastropac Expedition (Ahlstrom 1971, 1972). This report provides ichthyoplankton and associated station and tow data from the 1990 eastern tropical Pacific dolphin survey conducted from July 28 to December 6, 1990.

The survey was conducted aboard the NOAA research vessels *David Starr Jordan* and *McArthur*. Hydrographic and biological data for *Jordan* and *McArthur* cruises, other than Manta tow data, are reported in Philbrick et al. (1991a, b) and analyzed further in Fiedler (1992), Fiedler and Philbrick (1991), and Fiedler et al. (1990, 1992). Usually two conductivity-temperature-depth instrument (CTD) casts were made each night to 1000 m to measure temperature, salinity, oxygen, chlorophyll, phaeophytin, and nutrients, and to collect water samples for productivity measurements. Sea surface temperature, salinity, and fluorescence were measured continuously while the ship was underway. Four expendable bathythermograph (XBT) casts were made each day. In addition to marine mammal observations, data on bird and turtle sightings were made throughout the survey. Robert Pitman made observations on surface organisms and associated environmental variables at night light stations throughout the survey and made extensive collections of fishes, squids, and other surface-living organisms. Data on fish stomach contents were recorded from fishes caught incidentally by trolling and rod-and-reel; unidentifiable stomach contents were preserved for subsequent laboratory analysis. Surface plankton samples were collected with a Manta net after dark at most stations.

SAMPLING AREA AND PATTERN

A total of 175 Manta tows was made on the survey, 85 aboard the *Jordan* and 90 aboard the *McArthur* (Figure 1). The survey was conducted in four legs for both vessels:

Jordan Leg 1	28–26 August	San Diego, California to Puerto Quetzal, Guatemala
Jordan Leg 2	31 August–29 September	Puerto Quetzal, Guatemala to Puerto Caldera, Costa Rica
Jordan Leg 3	4 October–2 November	Puerto Caldera, Costa Rica to Manzanillo, Mexico

Jordan Leg 4	8 November–6 December	Manzanillo, Mexico to San Diego, California

McArthur Leg 128 July–26 August	San Diego, California to Hilo, Hawaii
McArthur Leg 230 August–29 September	Hilo, Hawaii to Puerto Caldera, Costa Rica
McArthur Leg 34 October–2 November	Puerto Caldera, Costa Rica to Guayaquil, Ecuador
McArthur Leg 47 November–6 December	Guayaquil, Ecuador to San Diego, California

ICHTHYOPLANKTON SAMPLING GEAR AND METHODS

Plankton tows were made with a Manta net (Brown and Cheng 1981) identical to that used on California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises. It consists of a rectangular mouth 15.5 cm deep and 86 cm wide attached to a frame that supports square lateral extensions covered with plywood and urethane foam. These extensions stabilize the net when it is towed and keep the top of the net at the sea surface. The net material is constructed of 0.505 mm nylon mesh. The towing bridle is asymmetrical with one side longer than the other; when the net is towed this bridle arrangement forces the mouth away from the ship at a slight angle. A General Oceanics flowmeter was suspended across the center of the net mouth to measure the amount of water filtered during each tow. Two towing procedures were used on this survey. On the *Jordan* the tow line attached to the bridle was attached to the hydrographic wire and then lowered to slightly below the surface of the water before the net was deployed. On the *McArthur* the net was towed from a boom on the starboard side of the ship. A weight attached to the tow line in front of the bridle kept the top of the net mouth at the surface and the tow line below the mouth of the net. Hauls were made at a ship speed of 1.0–2.0 knots for 15 minutes. Samples were preserved in 5% buffered formalin and returned to the plankton sorting laboratory at the SWFSC at the end of the cruise.

LABORATORY PROCEDURES

The ichthyoplankton was removed from the invertebrate portion of each sample and bottled separately in 3% buffered formalin. In addition to fish eggs and larvae the samples contained limited numbers of surface-living juvenile, and occasionally adult, stages of fishes; these also were removed and bottled separately in 3% formalin. The volume of water filtered by each net was computed from the flowmeter readings. Constituent taxa in the samples were identified by David Ambrose and Sharon Charter in the ichthyoplankton ecology laboratory of the La Jolla Fisheries Resources Division. Early ontogenetic stages of fishes are difficult to identify and this is further complicated by the large number and diversity of species which contribute to the ichthyoplankton in the ETP. Most identifications were based on descriptions of ontogenetic series of fishes in an identification guide to early stages of fishes in the California Current and adjacent regions (Moser 1996). Larval specimens that could not be identified with the guide were identified by establishing ontogenetic series on the basis of morphology, meristics, and pigmentation, and then linking these series through overlapping features to known metamorphic, juvenile, or adult stages (Powles and Markle 1984). Fischer et al. (1995) was a primary source of information on taxonomy of adult fishes of the ETP. Except for damaged specimens, a large proportion of the larvae and most juvenile/adults taken in the surface tows could be identified to species. The types of larvae most difficult to identify were those of tropical shorefishes (e.g., Sciaenidae, Gerreidae) but most oceanic fishes could be identified to species or at least to genus. A total of 102 larval fish categories (including unidentified and disintegrated) was identified: 53 to species, 26 to genus, 20 to family, and 1 to order.

The following taxonomic categories in Tables 2–5 require special explanation:

Bothus spp. – Larvae represent a single species for which two names are available, *B. constellatus* and *B. leopardinus* (see discussion in Moser 1996).

Cyclothone spp. – Small or damaged larvae lacking diagnostic characters.

Cyclothone acclinidens, *C. pseudopallida* – Postflexion stage larvae having diagnostic pigmentation characters.

Disintegrated fish larvae – larvae that could not be identified because of their poor condition; separated from the "unidentified" category to monitor the general condition of the ichthyoplankton samples through the time series.

Exocoetus spp. – *E. monocirrhus* and *E. volitans* occur in the study area and their larvae smaller than about 10 mm cannot be reliably distinguished.

Hirundichthys spp. – Small or damaged larvae lacking diagnostic characters, probably most are *H. marginatus*.

Lestidium spp. – Larvae are a single species, *Lestidium* sp. Ege 1953. Adults collected during other studies of the ETP resemble *Lestidium bigelowi* Graae 1967, known from the Indian Ocean.

Mugil spp. – Mugilid larvae lacking the full complement of anal fin elements (larvae < ~ 5–6 mm) and those with 12 total anal fin elements could not be identified to species; *Mugil cephalus* has 11 (rarely 10) total anal fin elements.

Prognichthys spp. – *P. sealei* and *P. tringa* occur in the study area and their larvae cannot be reliably distinguished. The former species has a primarily oceanic distribution whereas the latter is coastal; the larvae collected during the 1990 survey probably are prodominantly (perhaps entirely) *P. tringa*.

Scomberesocidae – *Cololabis saira* and *Elassichthys adocetus* co-occur in much of the study area and their larvae smaller than about 11-12 mm cannot be reliably distinguished. *Scomberesox saurus* and *E. adocetus* co-occur south of the equator and small larvae of these two species cannot be distinguished. All larval records of this family are listed as Scomberesocidae; all were collected south of the equator where *C. saira* does not occur.

Unidentified fish larvae – Larvae that were generally in good condition but could not be identified because of their small size or early stage of development.

Vinciguerria lucetia – *V. lucetia* is the most common *Vinciguerria* species in the study area, but *V. nimbaria* and *V. poweriae* also occur in the eastern Pacific, primarily west of about 130° W; larvae of the three species are very difficult to distinguish and it is possible that some *V. nimbaria* and *V. poweriae* were included within *V. lucetia.*

SPECIES SUMMARY

Of the five most abundant taxa for the entire 1990 survey, the Panama lightfish *Vinciguerria lucetia* ranked first in abundance and occurrence with 36.4% of the total larvae and 51.4% positive tows (Tables 2 and 3). The shortwing flying fish *Oxyporhamphus micropterus* ranked second in abundance and occurrence with 9.7% of the total larvae and 37.4% positive tows. The thread herring genus *Opisthonema* ranked third in abundance and tied for 23rd in occurrence with 8.7 % of the total larvae and 2.3% positive tows. The scombrid genus *Auxis* ranked fourth in abundance and third in occurrence with 8.3% of the total larvae and 18.9% positive tows. The saury family Scomberesocidae ranked fifth in abundance and occurrence with 8.1% of the larvae with 13.7% positive tows. The next five most abundant taxa were the the flyingfish genus *Hirundichthys* (3.8% of total larvae), the flyingfish genus *Prognichthys* (3.6%), the anchovy family Engraulidae (2.9%), the pompano dolphinfish *Coryphaena equiselis* (2.85%), and the bigeye cigarfish *Cubiceps pauciradiatus* (2.7%). These species rankings for occurrence were: tied for 13th, 7th, tied for 18th,

4th, and 6th, respectively. The ten most abundant taxa comprised 87% of all the larvae collected on ETP survey cruises in 1990. The remaining 13 % was distributed among 92 other taxa (including the "disintegrated" and "unidentified" categories). Of the ten most abundant taxa, five are epipelagic, three are coastal pelagic, one is both epipelagic and coastal pelagic, and one (*V. lucetia*) is a mesopelagic species that migrates to the epipelagic zone at night.

EXPLANATION OF FIGURES AND TABLES

Figures 4–23. Lengths of vertical bars are proportional to total larval counts for each station.

Table 1. This table lists for each tow the pertinent station and tow data for ichthyoplankton stations occupied during *Jordan* cruise 9010JD and *McArthur* cruise 9010M4. Cruises are designated by a six character alphanumeric code; the first two digits indicate the year and the second two the month, followed by the ship code, JD (*David Starr Jordan*) or M4 (*McArthur)*. Data are listed sequentially by tow number. Regions are based on 15° latitude H 15° longitude squares (Figure 3). Time is listed as local time at the start of each tow in 24-hour designation. The values for total fish eggs and larvae are raw counts (unadjusted for volume of water filtered).

Table 2. Pooled occurrences of all larval fish taxa taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4. Taxa are listed in rank order.

Table 3. Pooled counts (unadjusted for volume of water filtered) of all larval fish taxa taken in Manta net tows on *Jordan* 9010JD the *McArthur* cruise 9010M4. Taxa are listed in rank order.

Table 4. Numbers of fish larvae for each taxon taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4, listed by tow number (Figures 1and 2). Numbers of larvae are listed as raw counts and number per 100 m^3 of water filtered. Fish orders and families are listed in phylogenetic sequence (Eschmeyer 1998); other taxa are listed alphabetically.

Table 5. Average number of larvae (per 100 m^3 of water filtered) for each taxon taken in Manta net tows in the regions (see Figure 3) occupied on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

Table 6. Numbers (raw counts) and size ranges of juvenile fishes taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4. Fish orders and families are listed in phylogenetic sequence (Eschmeyer 1998), genera and species are listed in alphabetical order. For each entry, the tow number is given first in bold type, the count is next in parentheses, and size range is given last.

ACKNOWLEDGMENTS

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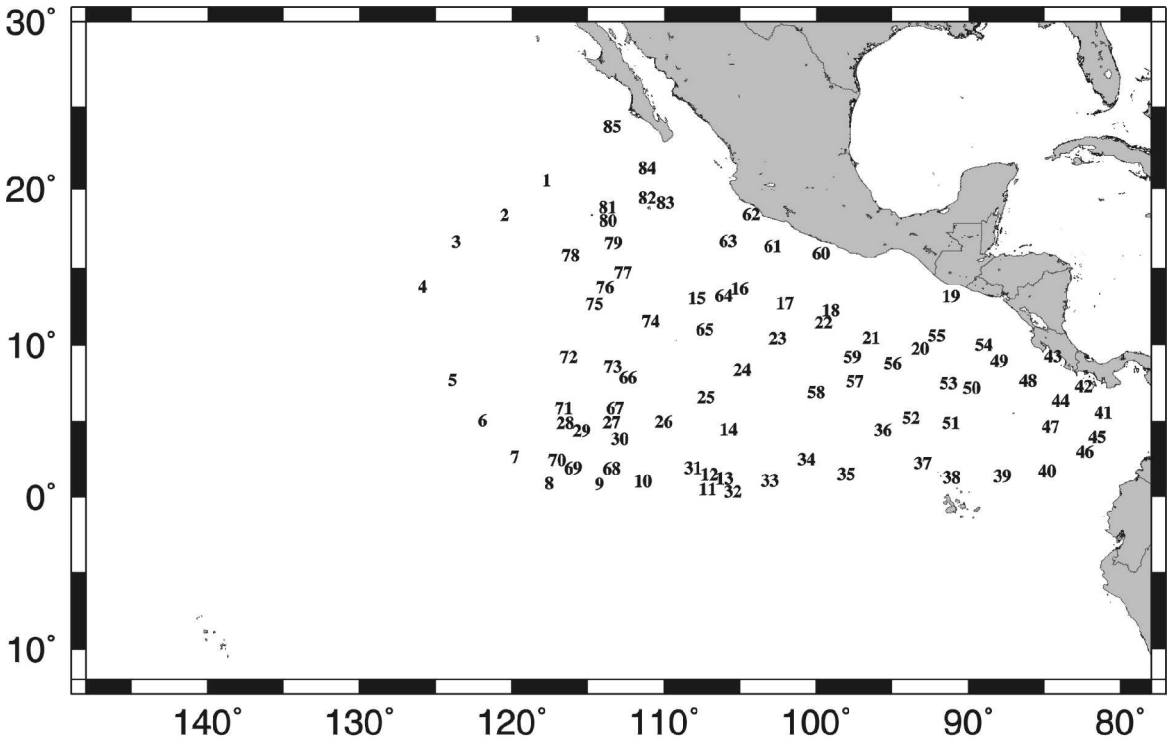

Figure 1. Manta net tow stations for *Jordan* cruise 9010JD.

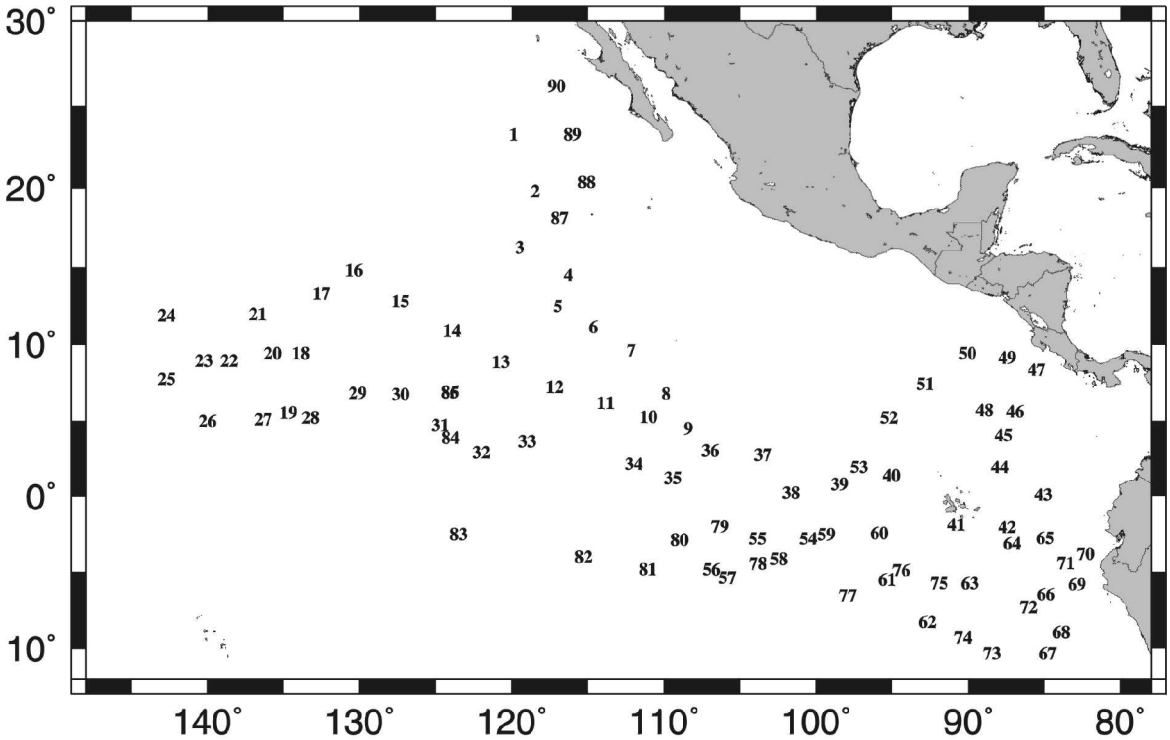

Figure 2. Manta net tow stations for *McArthur* cruise 9010M4.

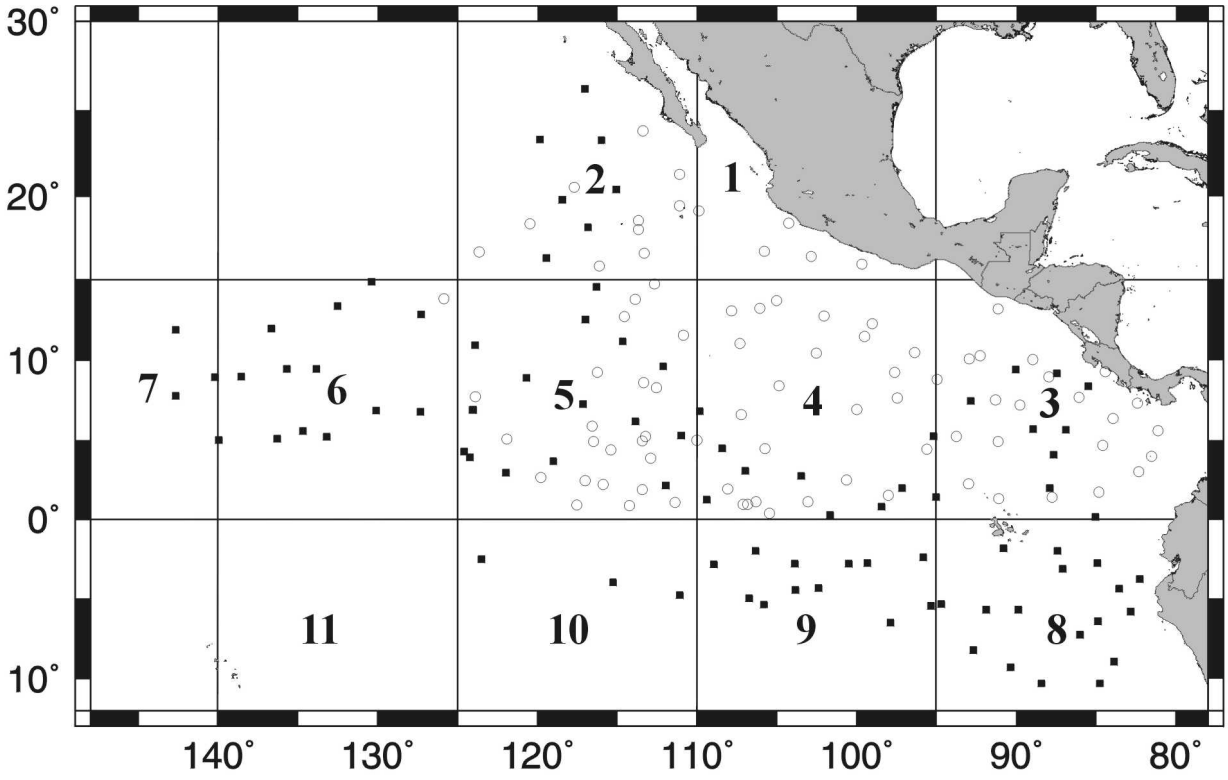

Figure 3. Sampling regions for 1990 eastern tropical Pacific dolphin survey indicated by numbers 1 to 11; Manta net tow stations for *Jordan* cruise 9010JD are indicated by circles and for *McArthur* cruise 9010M4 by solid squares.

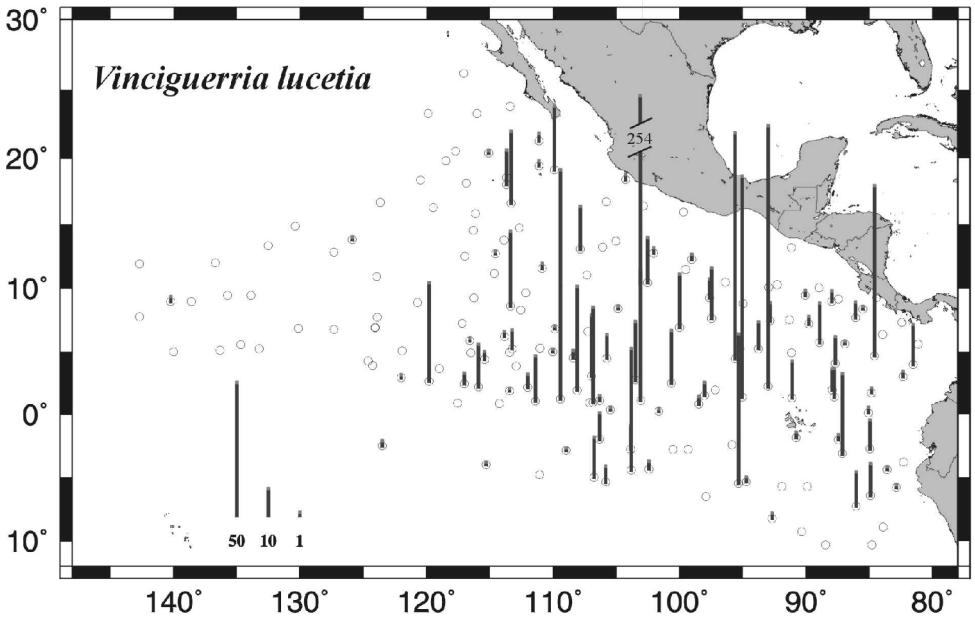

Figure 4. Distribution of *Vinciguerria lucetia* larvae from Manta net tows: 9010JD & 9010M4. Lengths of vertical bars are proportional to total larval counts for each station.

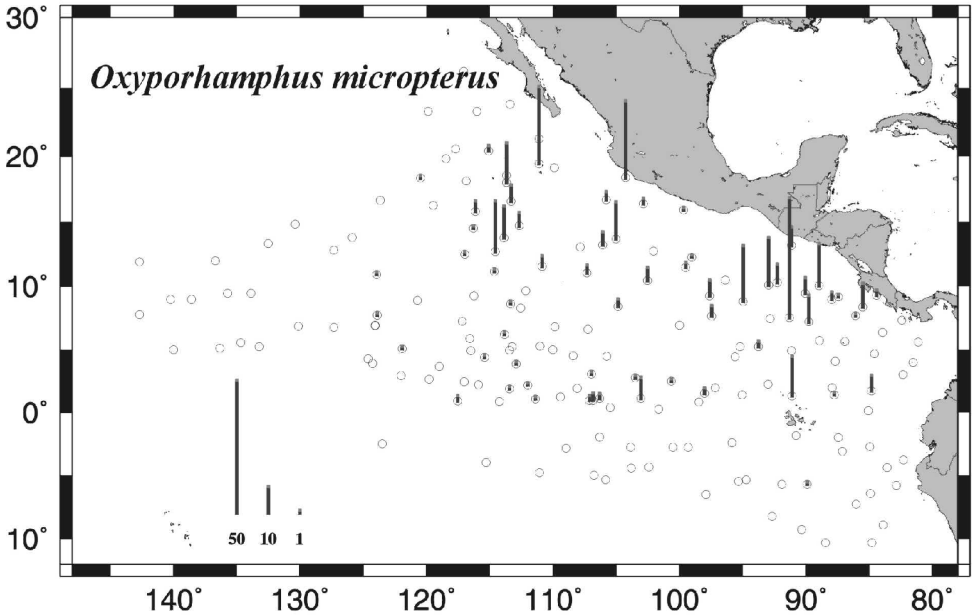

Figure 5. Distribution of *Oxyporhamphus micropterus* larvae from Manta net tows: 9010JD & 9010M4.

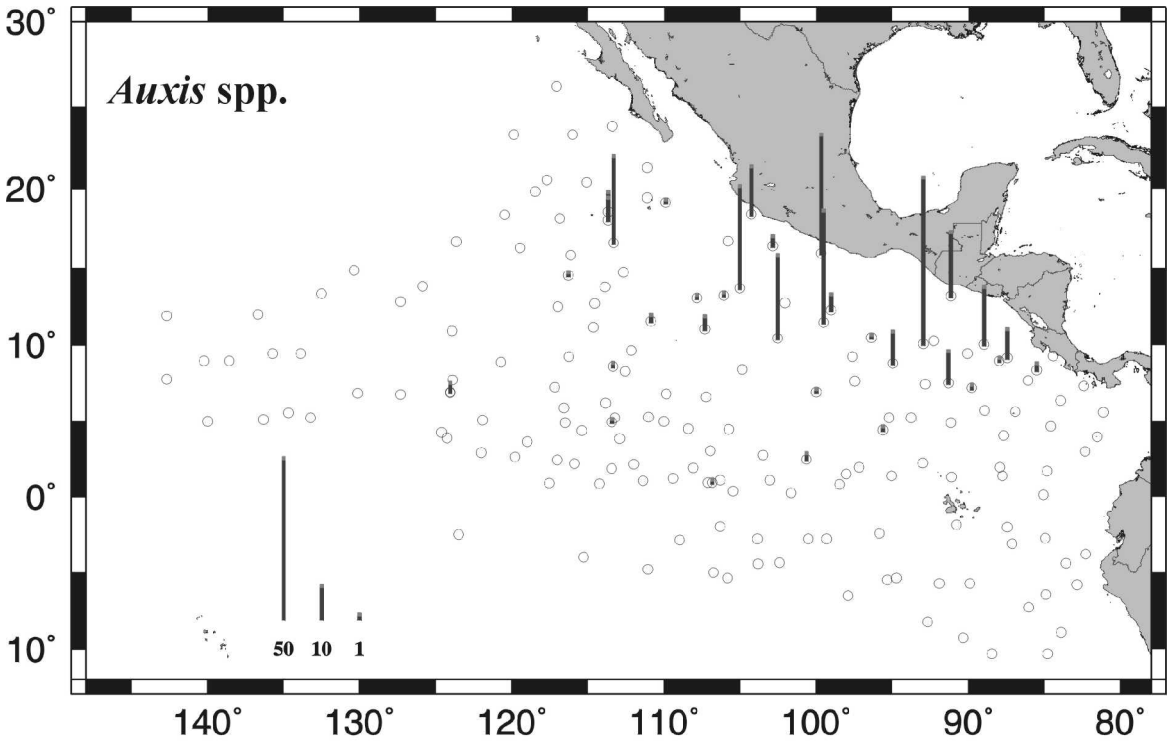

Figure 6. Distribution of *Auxis* spp. larvae from Manta net tows: 9010JD & 9010M4.

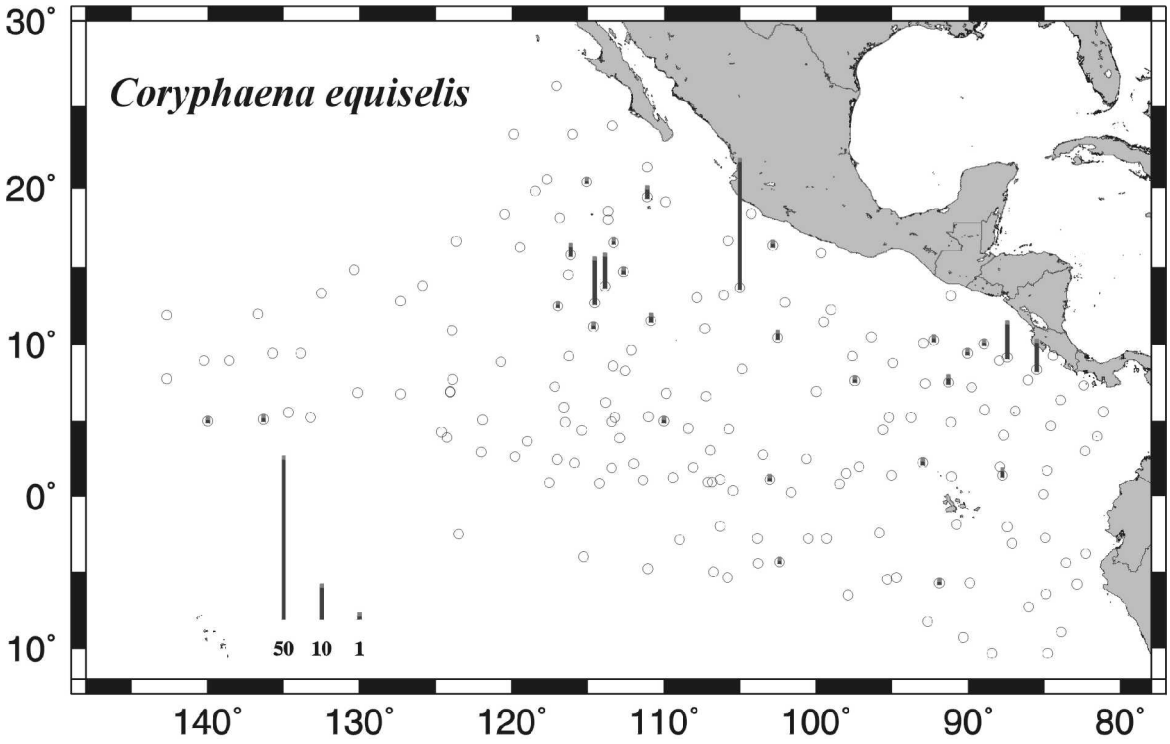

Figure 7. Distribution of *Coryphaena equiselis* larvae from Manta net tows: 9010JD & 9010M4.

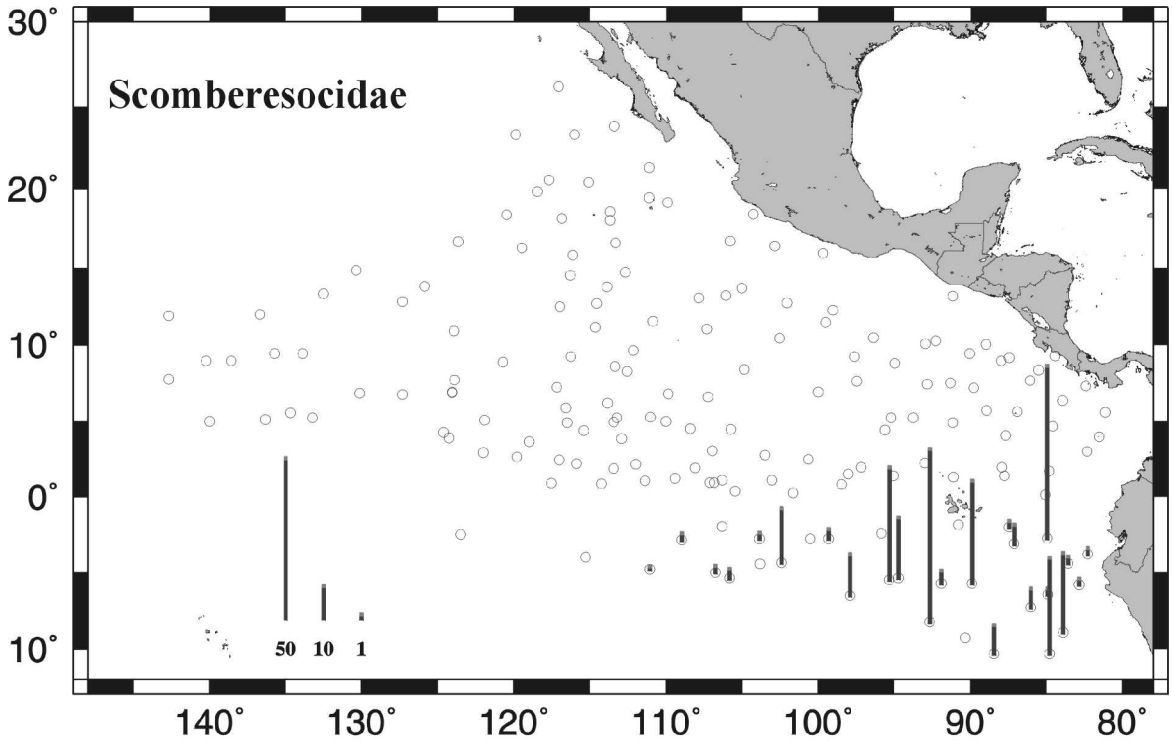

Figure 8. Distribution of Scomberesocidae larvae from Manta net tows: 9010JD & 9010M4.

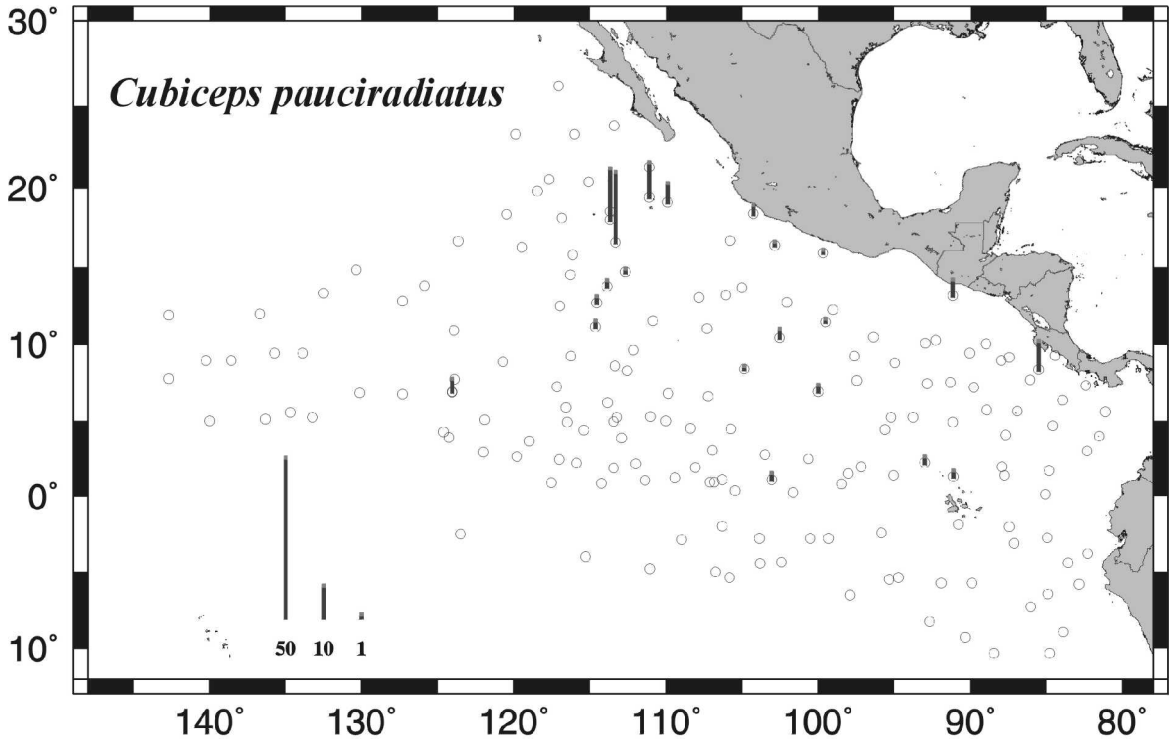

Figure 9. Distribution of *Cubiceps pauciradiatus* larvae from Manta net tows: 9010JD & 9010M4.

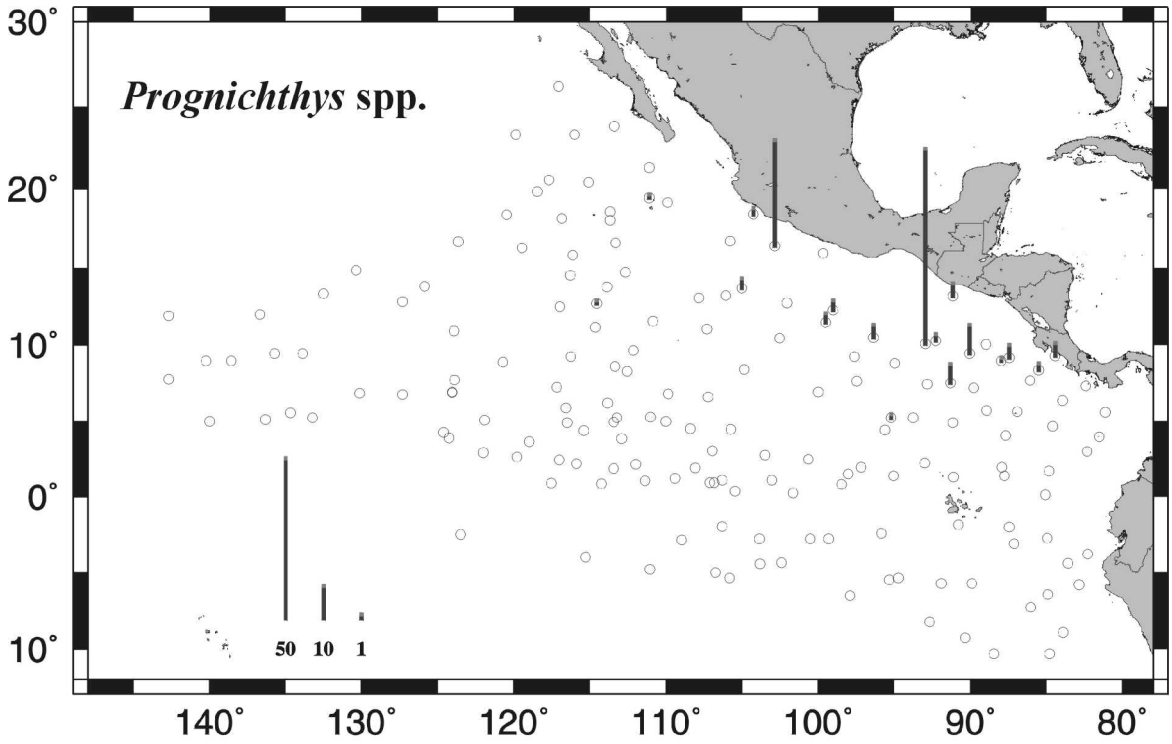

Figure 10. Distribution of *Prognichthys* spp. larvae from Manta net tows: 9010JD & 9010M4.

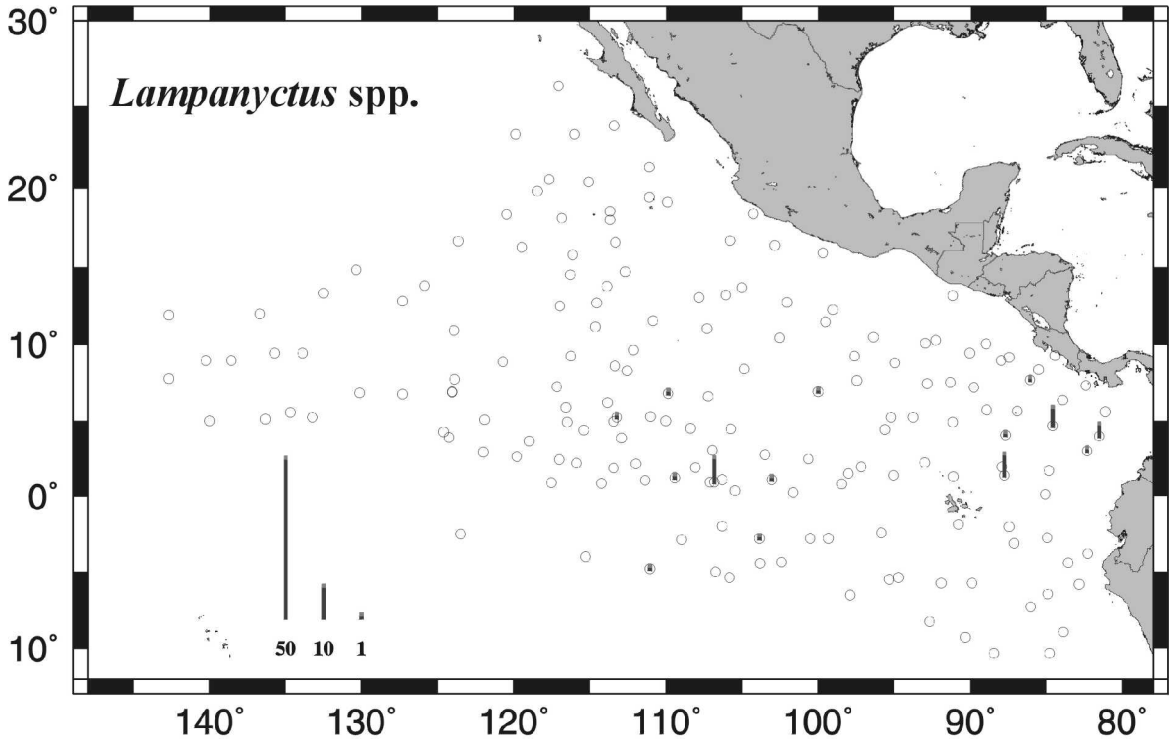

Figure 11. Distribution of *Lampanyctus* spp. larvae from Manta net tows: 9010JD & 9010M4.

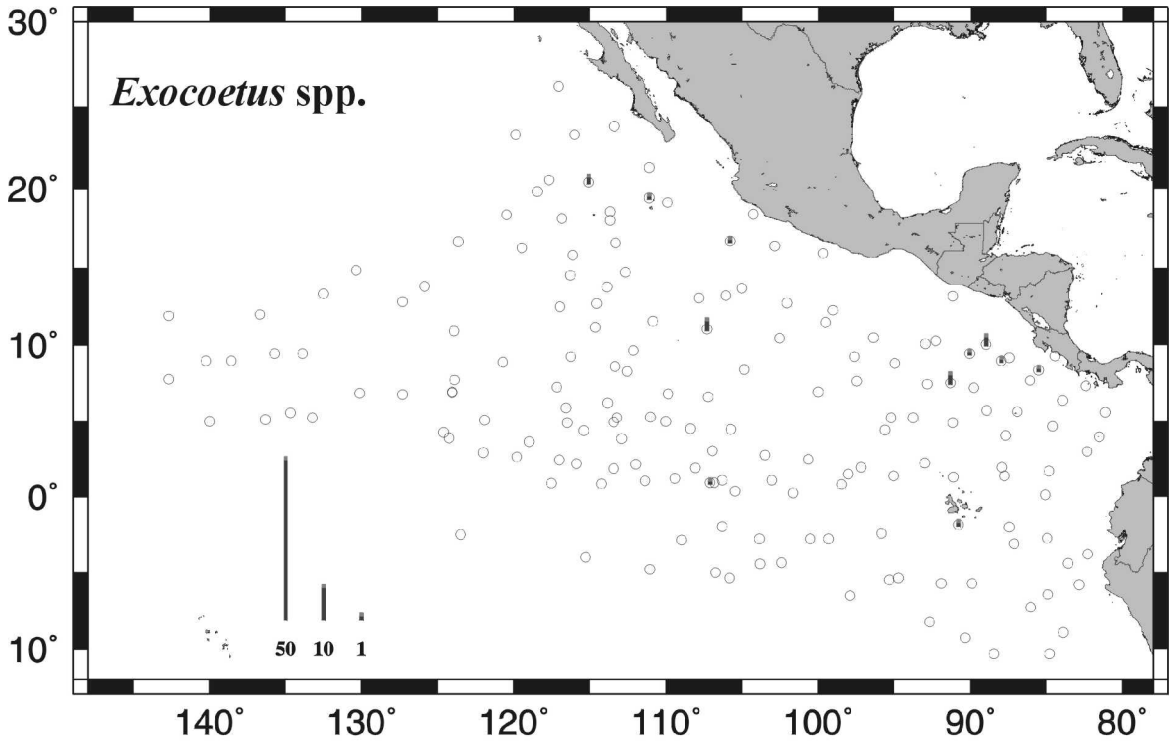

Figure 12. Distribution of *Exocoetus* spp. larvae from Manta net tows: 9010JD & 9010M4.

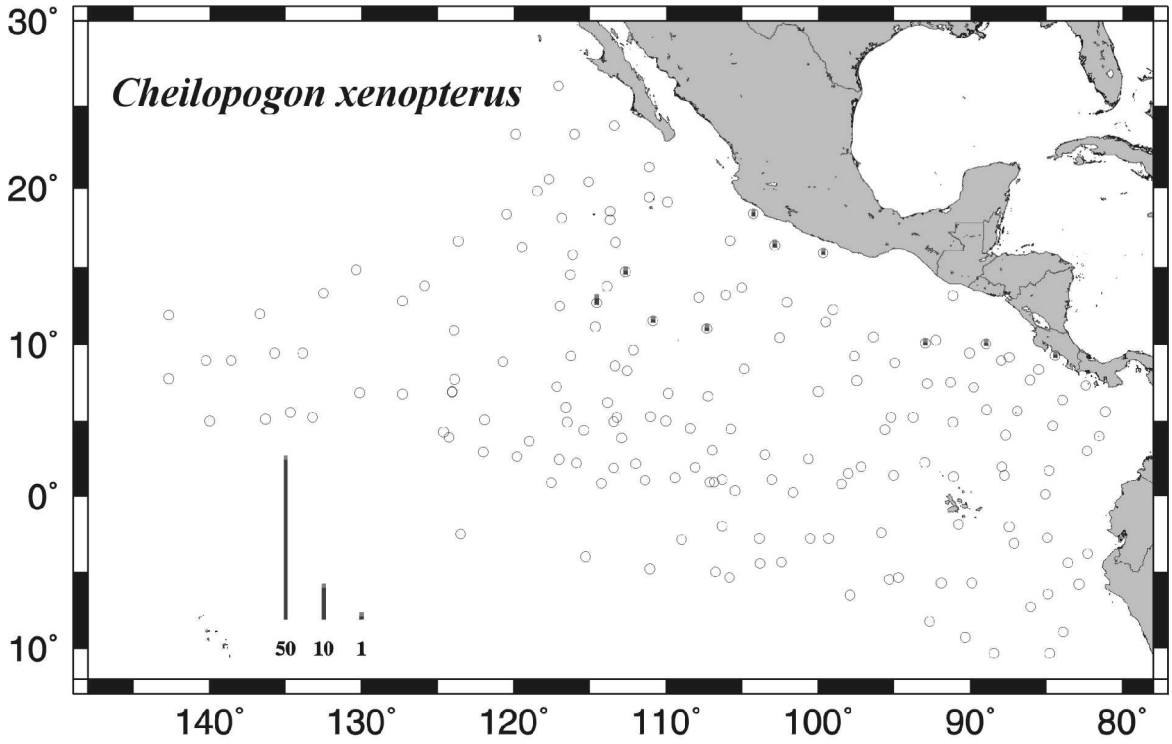

Figure 13. Distribution of *Cheilopogon xenopterus* larvae from Manta net tows: 9010JD & 9010M4.

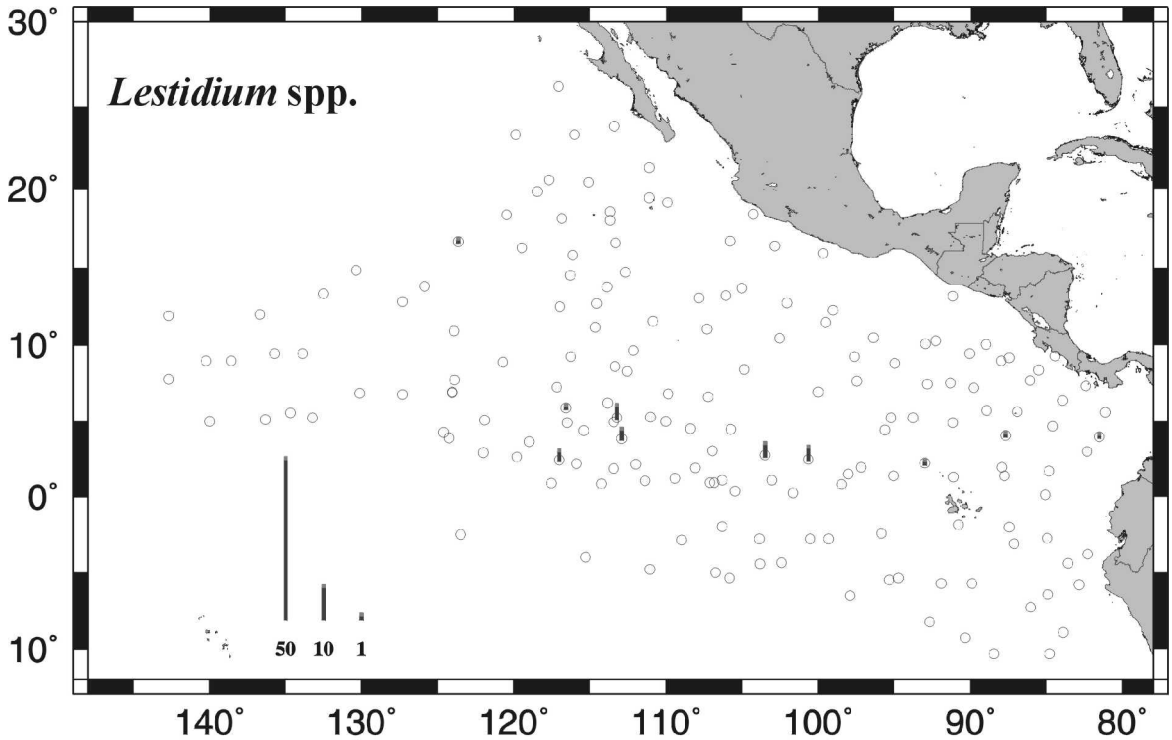

Figure 14. Distribution of *Lestidium* spp. larvae from Manta net tows: 9010JD & 9010M4.

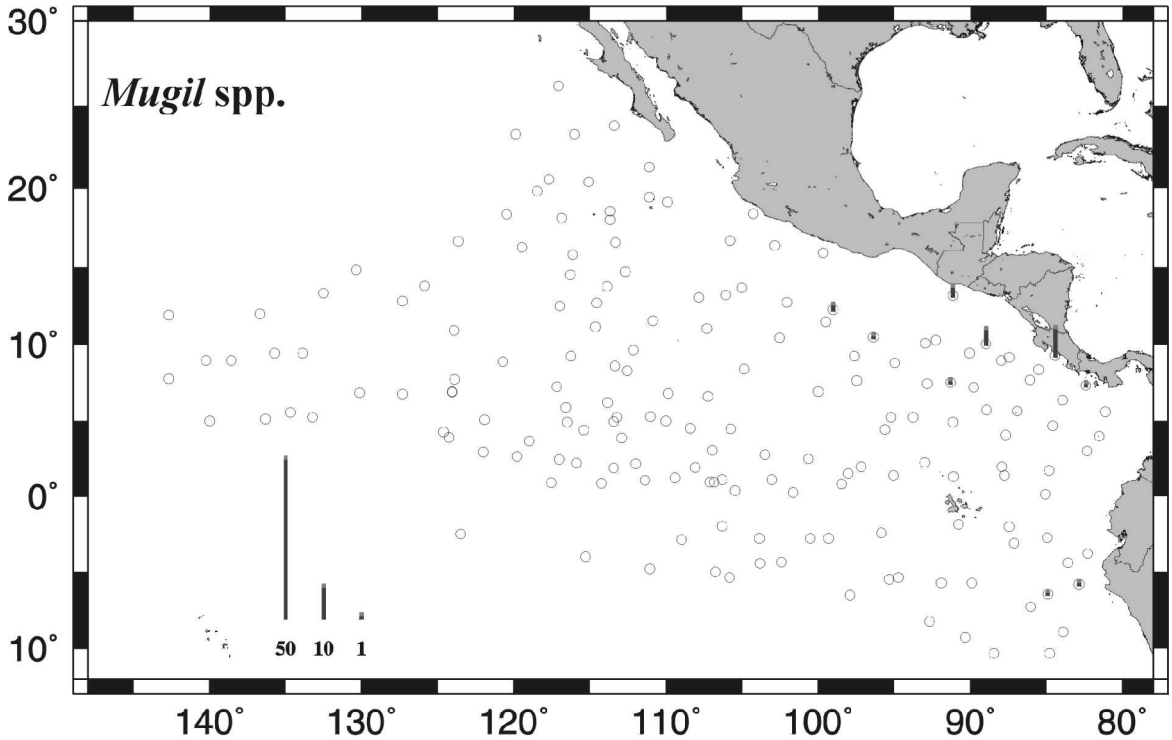

Figure 15. Distribution of *Mugil* spp. larvae from Manta net tows: 9010JD & 9010M4.

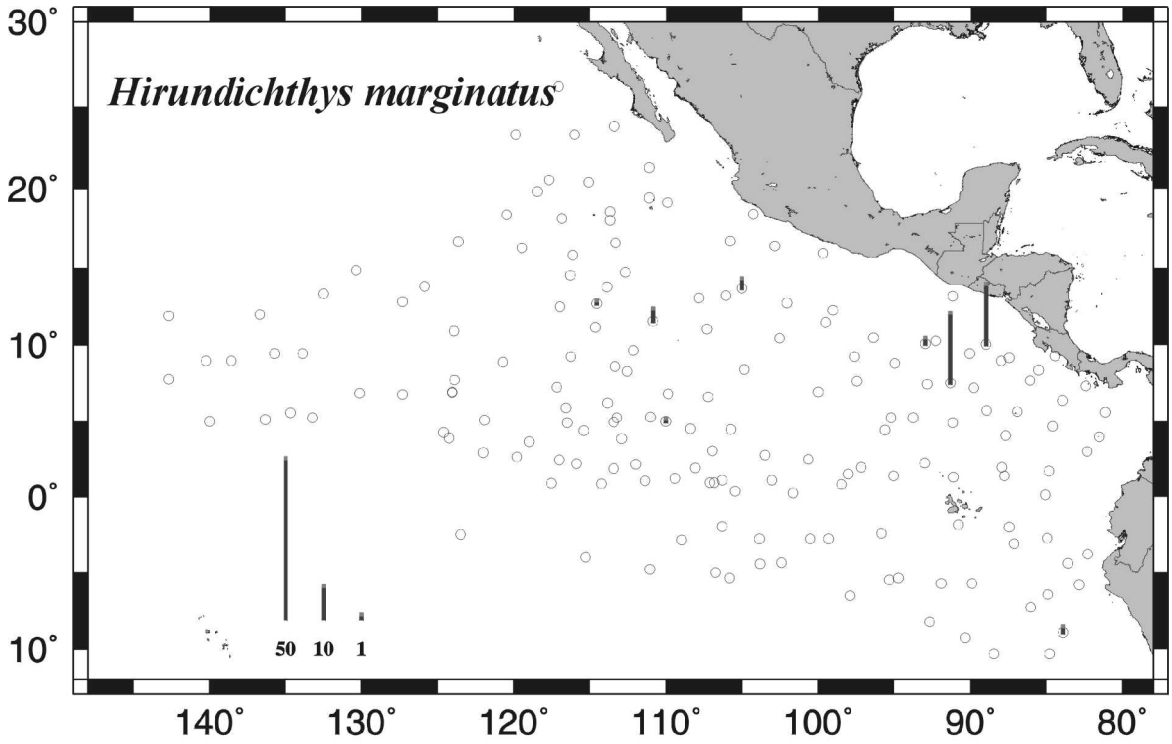

Figure 16. Distribution of *Hirundichthys marginatus* larvae from Manta net tows: 9010JD & 9010M4.

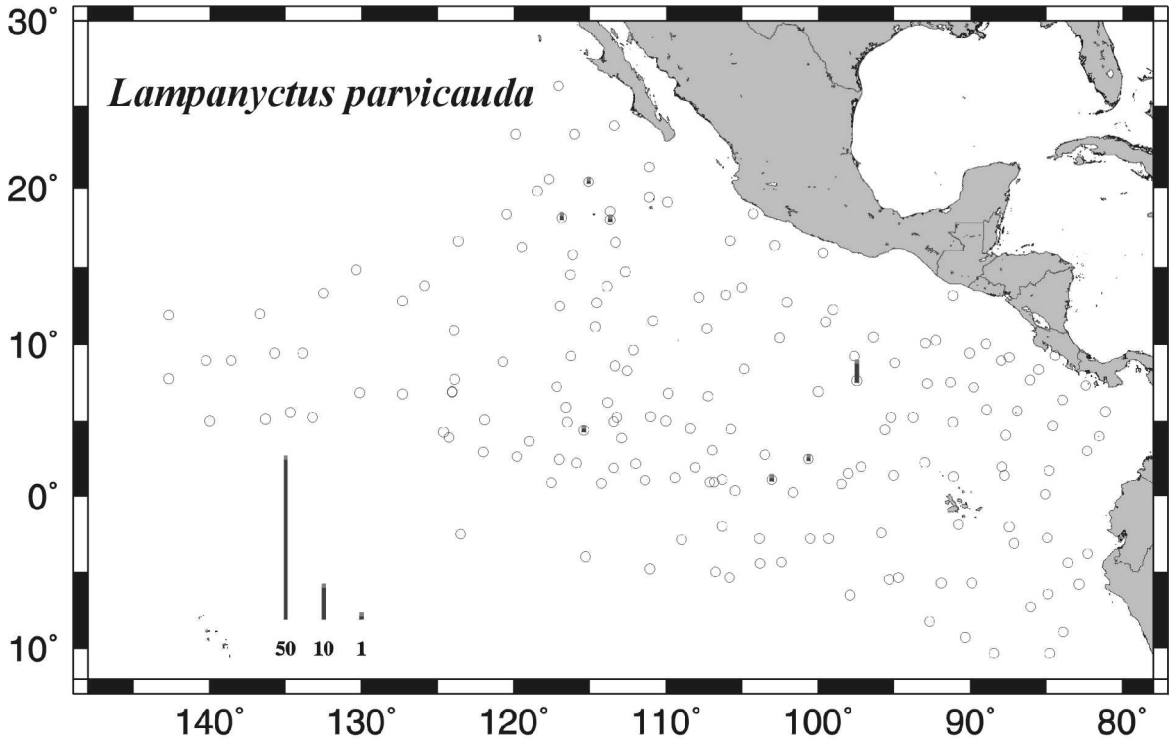

Figure 17. Distribution of *Lampanyctus parvicauda* larvae from Manta net tows: 9010JD & 9010M4.

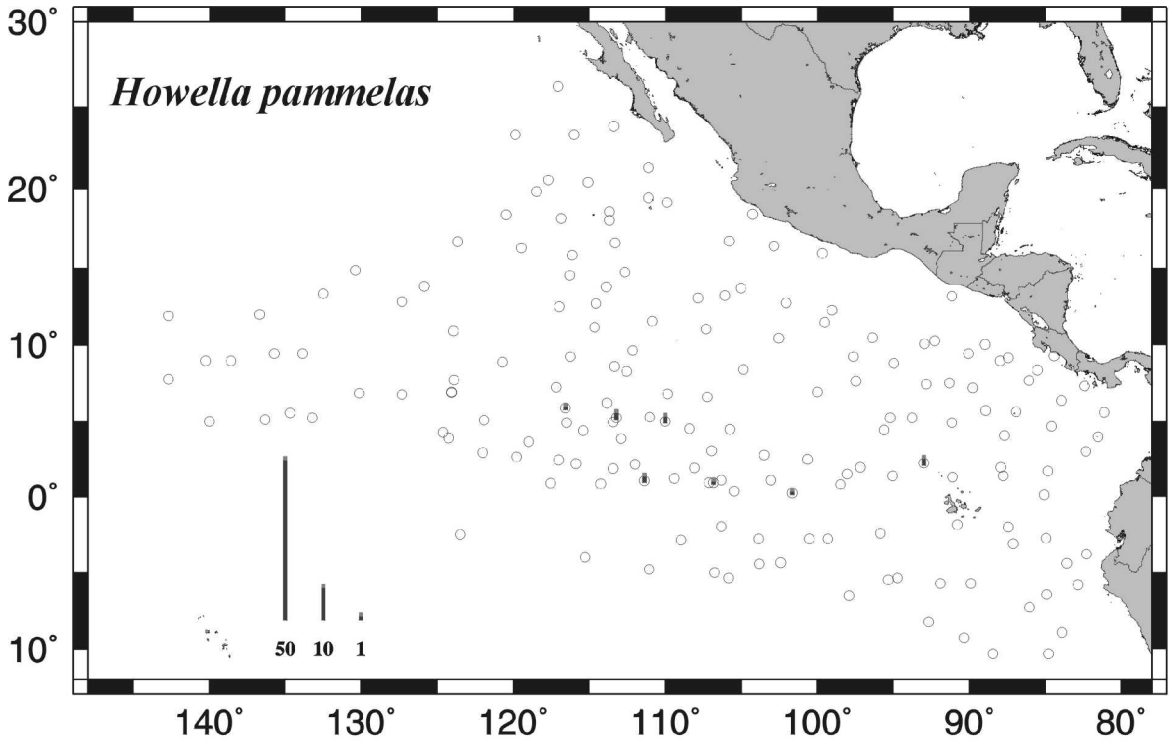

Figure 18. Distribution of *Howella pammelas* larvae from Manta net tows: 9010JD & 9010M4.

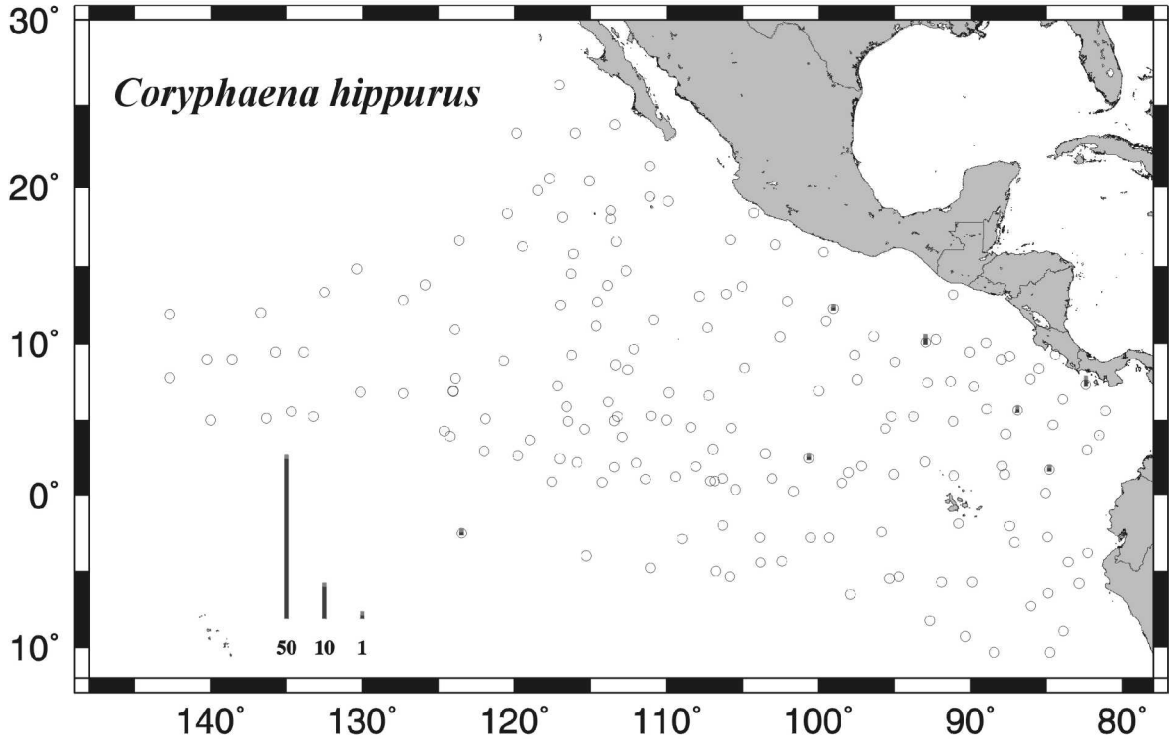

Figure 19. Distribution of *Coryphaena hippurus* larvae from Manta net tows: 9010JD & 9010M4.

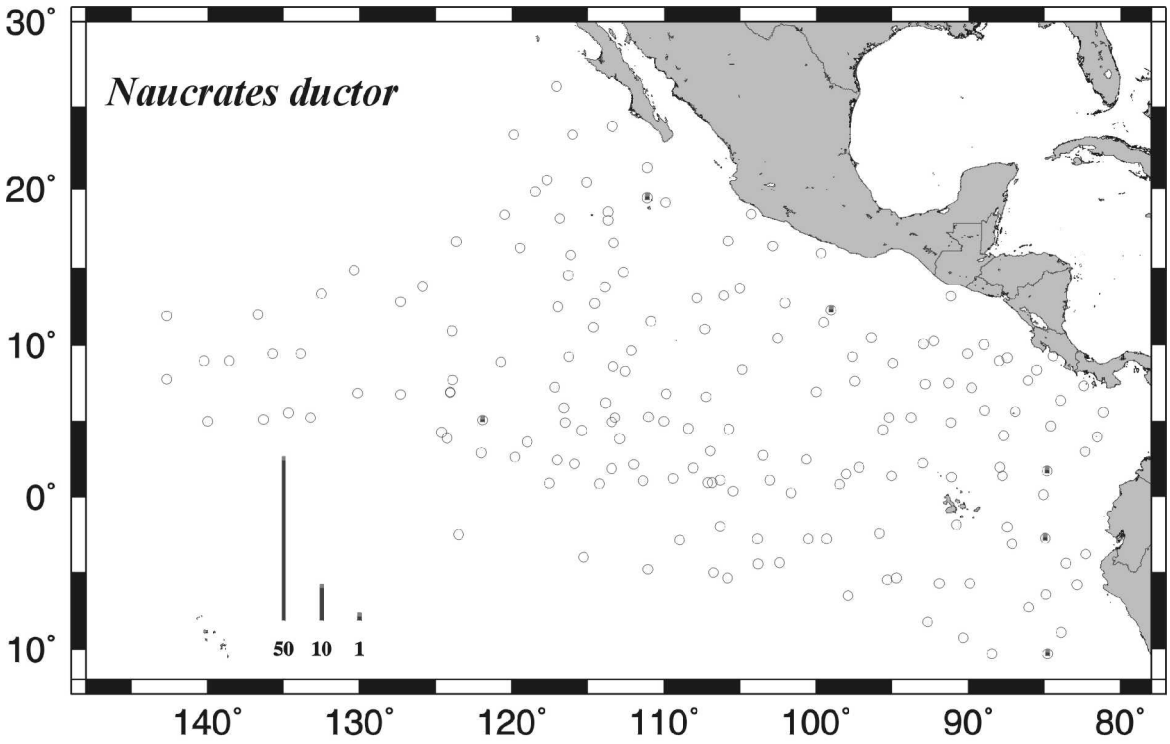

Figure 20. Distribution of *Naucrates ductor* larvae from Manta net tows: 9010JD & 9010M4.

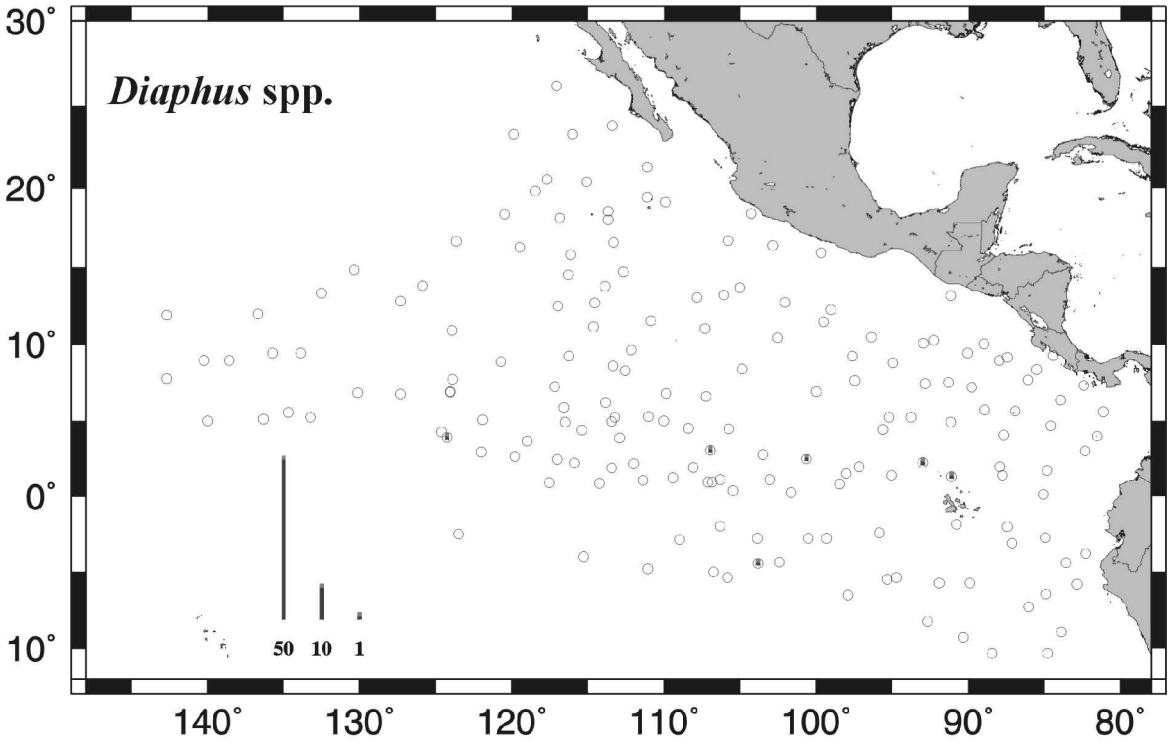

Figure 21. Distribution of *Diaphus* spp. larvae from Manta net tows: 9010JD & 9010M4.

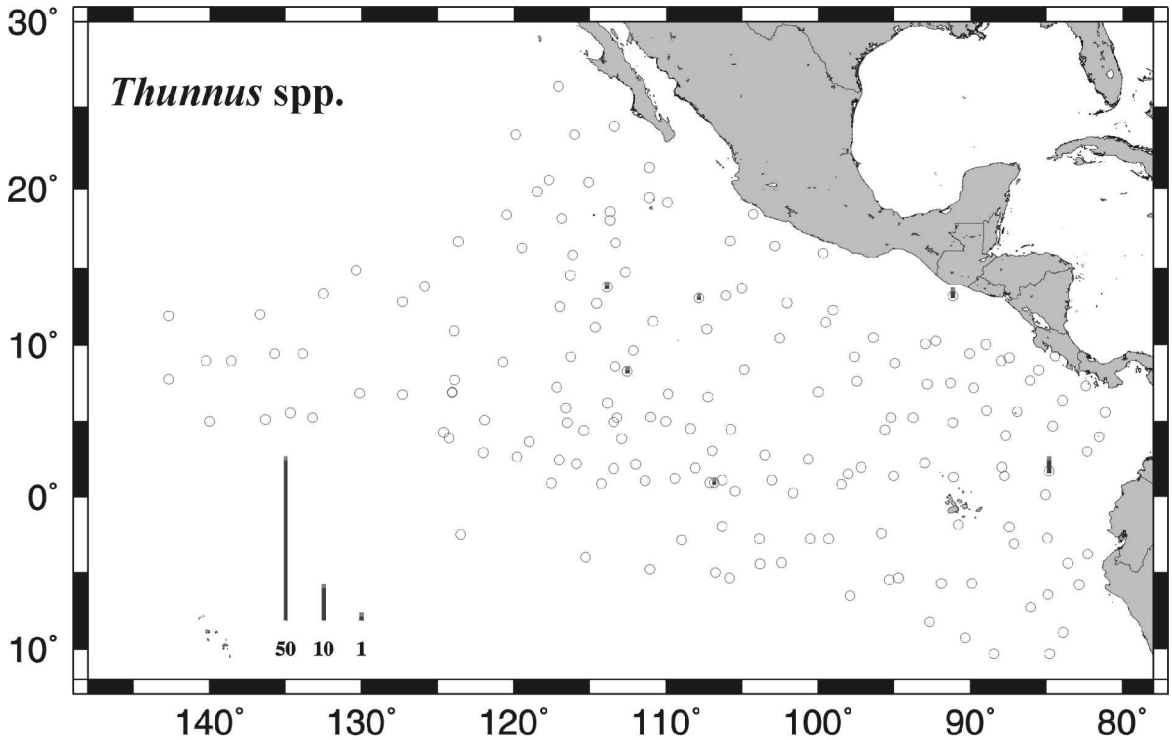

Figure 22. Distribution of *Thunnus* spp. larvae from Manta net tows: 9010JD & 9010M4.

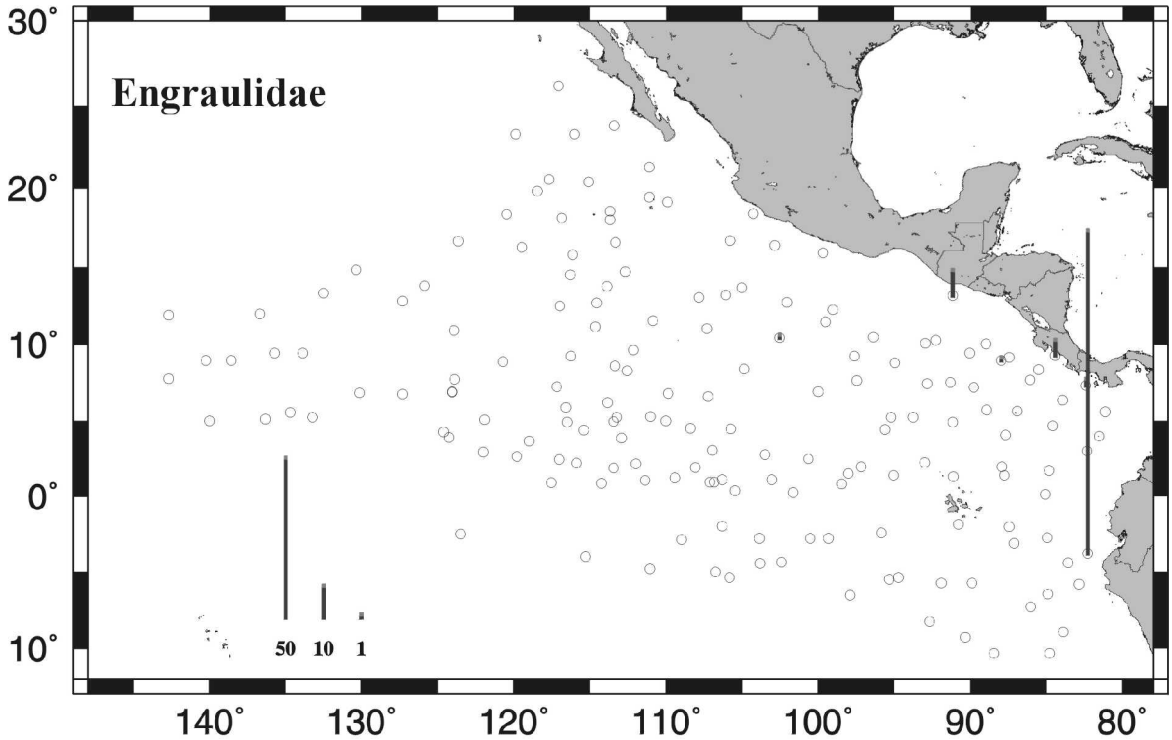

Figure 23. Distribution of Engraulidae larvae from Manta net tows: 9010JD & 9010M4.

Table 1. Station and Manta net tow data for *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

Tow Number	CTD Station	Lat. deg.	Lat. min.		Long.(W) deg	Long.(W) min.	Region	Ship Code	Tow Date yymmdd	Time (Loc.)	Vol.(m^3) Water Strained	Total Larvae	Total Eggs
1	1-003	20	31.6	N	117	41.3	2	JD	900804	2124	114.8	0	13
2	1-005	18	20.8	N	120	28.6	2	JD	900805	2120	84.2	1	68
3	1-007	16	39.2	N	123	39.7	2	JD	900806	2135	83.7	9	1
4	1-009	13	48.0	N	125	52.0	6	JD	900807	2135	89.3	2	1000
5	1-010	7	44.3	N	123	54.0	5	JD	900809	2127	101.8	2	0
6	1-012	5	04.5	N	121	56.6	5	JD	900810	2105	94.4	2	14
7	1-014	2	39.3	N	119	48.8	5	JD	900811	2103	94.8	38	3
8	1-016	0	54.9	N	117	32.0	5	JD	900812	2058	83.1	2	7
9	1-018	0	53.1	N	114	14.4	5	JD	900813	2031	91.1	0	48
10	1-020	1	03.7	N	111	23.6	5	JD	900814	2036	79.4	20	1
11	1-022	0	56.0	N	106	51.5	4	JD	900815	2032	90.2	50	34
12		0	56.1	N	107	08.3	4	JD	900816	1216	91.2	3	84
13	1-024	1	05.9	N	106	20.3	4	JD	900816	2009	84.8	4	64
14	1-026	4	29.0	N	105	45.6	4	JD	900817	2024	76.0	11	18
15	1-029	13	03.8	N	107	51.8	4	JD	900820	2005	61.6	18	5
16	1-031	13	41.9	N	105	02.6	4	JD	900821	2004	124.2	92	527
17	1-033	12	45.9	N	102	03.7	4	JD	900822	2011	72.5	2	2
18	1-035	12	16.7	N	99	02.8	4	JD	900823	1940	109.0	280	6
19		13	11.8	N	91	09.8	3	JD	900831	2016	120.6	73	26
20	2-038	10	05.0	N	92	58.7	3	JD	900901	2020	102.5	161	82
21	2-040	10	29.8	N	96	22.8	4	JD	900902	2019	131.1	6	63
22	2-042	11	28.3	N	99	31.0	4	JD	900903	2113	92.4	44	2617
23	2-044	10	26.5	N	102	33.6	4	JD	900904	2104	89.7	54	2209
24	2-046	8	23.8	N	104	53.4	4	JD	900905	2104	83.7	5	180
25	2-048	6	35.8	N	107	14.5	4	JD	900906	2034	84.7	0	16
26	2-050	5	00.5	N	110	00.9	5	JD	900907	2126	108.3	6	18
27	2-051	4	57.2	N	113	26.6	5	JD	900908	2034	91.2	1	1
28	2-053	4	55.0	N	116	28.9	5	JD	900909	2034	101.2	0	9
29	2-055	4	23.8	N	115	26.0	5	JD	900910	2034	95.3	5	6
30	2-057	3	51.8	N	112	54.5	5	JD	900911	2033	105.0	4	21
31	2-066	1	56.6	N	108	05.1	4	JD	900915	2008	65.7	41	160
32	2-068	0	23.3	N	105	28.3	4	JD	900916	1948	73.5	1	187
33	2-070	1	07.7	N	103	04.9	4	JD	900917	1940	62.6	269	31
34	2-071	2	28.5	N	100	38.9	4	JD	900918	1930	75.9	30	0
35	2-073	1	31.5	N	98	03.2	4	JD	900919	1908	59.3	9	6
36	2-075	4	26.6	N	95	36.1	4	JD	900920	2005	90.4	87	13
37	2-077	2	13.7	N	93	01.0	3	JD	900921	1954	71.4	105	25
38	2-078	1	18.6	N	91	06.4	3	JD	900922	1953	88.5	34	246
39	2-080	1	23.4	N	87	46.2	3	JD	900923	1937	68.2	24	100
40	2-082	1	43.0	N	84	50.5	3	JD	900924	1929	66.1	14	17
41	2-085	5	34.9	N	81	07.3	3	JD	900926	1959	80.1	2	29
42	2-086	7	20.7	N	82	25.0	3	JD	900927	2004	67.1	6	7
43		9	18.2	N	84	27.0	3	JD	900928	2350	98.3	34	533
44		6	22.5	N	83	56.3	3	JD	901005	1949	87.8	0	117
45		3	59.9	N	81	33.6	3	JD	901006	2115	34.3	28	588
46	3-088	3	02.1	N	82	20.1	3	JD	901007	1926	66.2	3	121
47	3-090	4	39.6	N	84	36.6	3	JD	901008	1928	81.4	75	11
48	3-092	7	40.8	N	86	06.1	3	JD	901009	1923	75.1	8	2

Tow Number	CTD Station	Lat. deg.	Lat. min.		Long.(W) deg	Long.(W) min.	Region	Ship Code	Tow Date yymmdd	Time (Loc.)	Vol.(m³) Water Strained	Total Larvae	Total Eggs
49	3-094	8	57.9	N	87	58.5	3	JD	901010	1928	97.6	11	7
50	3-096	7	11.4	N	89	47.5	3	JD	901011	1941	105.0	19	37
51	3-098	4	54.6	N	91	09.2	3	JD	901012	1952	99.0	1	14
52	3-100	5	15.3	N	93	46.1	3	JD	901013	1952	99.1	13	37
53	3-102	7	32.1	N	91	20.1	3	JD	901014	1951	96.6	93	4
54	3-104	10	02.2	N	88	58.8	3	JD	901015	1940	107.9	64	4
55	3-107	10	18.5	N	92	16.9	3	JD	901017	1936	89.4	31	11
56		8	48.0	N	94	57.6	3	JD	901018	1951	67.5	31	26
57	3-109	7	39.1	N	97	28.1	4	JD	901019	2007	70.6	33	172
58	3-111	6	56.4	N	100	00.4	4	JD	901020	2016	79.3	25	13
59	3-113	9	15.1	N	97	38.9	4	JD	901021	2002	85.7	13	1
60	3-115	15	56.0	N	99	42.1	1	JD	901030	1927	81.1	44	1553
61	3-117	16	24.6	N	102	51.8	1	JD	901031	1924	117.1	42	965
62		18	23.2	N	104	15.6	1	JD	901101	2048	127.0	53	432
63	4-119	16	43.0	N	105	48.0	1	JD	901108	1940	58.0	4	18
64	4-121	13	14.0	N	106	05.0	4	JD	901109	1928	65.4	6	97
65	4-123	11	03.0	N	107	19.0	4	JD	901110	1937	80.0	12	113
66	4-126	8	18.4	N	112	32.9	5	JD	901112	1957	122.1	1	7
67	4-128	5	15.2	N	113	15.5	5	JD	901113	2025	68.3	16	7
68	4-130	1	53.0	N	113	27.0	5	JD	901114	2025	92.6	2	30
69	4-132	2	12.0	N	115	53.0	5	JD	901115	2035	86.2	16	1056
70	4-134	2	27.0	N	117	02.0	5	JD	901116	2035	99.2	7	30
71	4-136	5	52.0	N	116	34.0	5	JD	901117	2021	108.7	3	7
72	4-138	9	15.0	N	116	16.0	5	JD	901118	2019	125.1	0	7
73	4-140	8	38.0	N	113	21.0	5	JD	901119	1959	87.1	30	6
74	4-142	11	34.0	N	110	53.0	5	JD	901120	2007	73.1	15	94
75	4-144	12	43.0	N	114	33.0	5	JD	901121	2006	120.8	40	348
76	4-146	13	46.0	N	113	53.0	5	JD	901122	1954	121.9	28	9
77	4-148	14	42.0	N	112	40.0	5	JD	901123	1952	116.5	8	670
78	4-150	15	49.0	N	116	08.0	2	JD	901124	2000	112.2	9	56
79	4-152	16	36.0	N	113	19.0	2	JD	901125	1913	89.6	83	83
80	4-156	18	01.0	N	113	42.0	2	JD	901127	1907	107.4	54	288
81	4-158	18	34.0	N	113	40.0	2	JD	901128	1913	108.2	32	241
82	4-160	19	26.0	N	111	06.0	2	JD	901129	1906	98.8	50	232
83	4-161	19	08.0	N	109	53.0	1	JD	901130	1905	123.2	33	101
84	4-163	21	17.0	N	111	07.0	2	JD	901201	1917	139.1	7	51
85		23	51.0	N	113	24.0	2	JD	901202	1905	112.9	0	44
1	1-002	23	18.7	N	119	53.2	2	M4	900730	2137	69.9	1	116
2	1-004	19	48.5	N	118	27.8	2	M4	900731	2140	149.6	0	111
3	1-006	16	16.4	N	119	28.4	2	M4	900801	2130	131.7	0	23
4	1-008	14	31.4	N	116	18.8	5	M4	900802	2058	124.5	2	77
5	1-010	12	31.5	N	116	59.9	5	M4	900803	2107	104.8	2	18
6	1-012	11	10.0	N	114	40.1	5	M4	900804	2048	116.7	4	87
7	1-014	9	38.2	N	112	09.4	5	M4	900805	2021	117.0	1	506
8	1-016	6	49.4	N	109	52.0	4	M4	900806	2030	148.1	3	28
9	1-018	4	29.8	N	108	25.5	4	M4	900807	2037	107.6	3	16
10	1-020	5	16.6	N	111	01.2	5	M4	900808	2030	93.0	0	6
11	1-022	6	11.4	N	113	51.4	5	M4	900809	2046	121.6	3	5
12	1-024	7	14.6	N	117	10.7	5	M4	900810	2028	103.4	0	4
13	1-026	8	54.6	N	120	42.8	5	M4	900811	2058	90.1	0	14

Tow Number	CTD Station	Lat. deg.	Lat. min.		Long.(W) deg	Long.(W) min.	Region	Ship Code	Tow Date yymmdd	Time (Loc.)	Vol.(m³) Water Strained	Total Larvae	Total Eggs
14	1-028	10	55.7	N	123	56.2	5	M4	900812	2101	116.0	1	6
15	1-030	12	50.7	N	127	19.0	6	M4	900813	2142	138.1	0	4
16	1-032	14	50.9	N	130	23.6	6	M4	900814	2103	113.0	0	298
17	1-034	13	20.5	N	132	31.7	6	M4	900815	2105	134.3	0	0
18	1-036	9	27.9	N	133	52.3	6	M4	900816	2105	148.5	0	19
19	1-038	5	33.6	N	134	41.6	6	M4	900817	2103	85.2	0	3
20	1-040	9	28.0	N	135	42.9	6	M4	900818	2100	57.3	0	0
21	1-042	11	58.8	N	136	41.4	6	M4	900819	2103	112.4	0	2
22	1-044	8	58.2	N	138	34.7	6	M4	900820	2028	81.9	0	6
23	1-046	8	57.9	N	140	14.6	7	M4	900821	2028	78.0	2	2
24	1-048	11	54.5	N	142	40.6	7	M4	900822	2034	140.2	0	3
25	2-053	7	46.2	N	142	41.6	7	M4	900904	2034	113.2	0	3
26	2-055	4	59.3	N	139	59.7	6	M4	900905	2028	122.3	1	4
27	2-057	5	05.9	N	136	19.6	6	M4	900906	2004	114.1	1	16
28	2-059	5	13.2	N	133	14.3	6	M4	900907	2003	109.2	0	1
29	2-061	6	51.9	N	130	08.7	6	M4	900908	2033	72.8	1	0
30	2-063	6	46.9	N	127	20.3	6	M4	900909	2033	101.5	0	7
31	2-065	4	17.0	N	124	37.7	5	M4	900910	2036	95.0	0	0
32	2-067	2	57.0	N	122	01.0	5	M4	900911	2002	172.3	1	16
33	2-069	3	40.2	N	119	00.4	5	M4	900912	2004	109.9	11	0
34	2-073	2	09.2	N	112	00.1	5	M4	900914	2033	99.1	6	2
35	2-075	1	15.0	N	109	25.0	4	M4	900915	2001	93.1	87	1083
36	2-077	3	03.0	N	106	59.0	4	M4	900916	1957	83.8	25	8
37	2-079	2	45.2	N	103	29.3	4	M4	900917	2104	120.0	27	182
38	2-081	0	15.9	N	101	40.0	4	M4	900918	2103	129.8	3	110
39	2-083	0	49.0	N	98	29.0	4	M4	900919	2030	132.3	3	3
40	2-085	1	24.6	N	95	03.4	4	M4	900920	2031	127.2	85	28
41	2-088	1	49.4	S	90	48.7	8	M4	900922	2000	134.3	21	16
42	2-090	2	00.6	S	87	26.4	8	M4	900923	1956	124.7	6	62
43	2-092	0	09.5	N	85	04.0	3	M4	900924	1959	113.7	3	47
44	2-094	1	57.9	N	87	56.6	3	M4	900925	1958	96.1	9	19
45	2-096	4	04.5	N	87	41.7	3	M4	900926	1959	100.9	13	211
46	2-098	5	38.0	N	86	55.0	3	M4	900927	2018	93.1	2	20
47	2-100	8	23.0	N	85	31.0	3	M4	900928	1930	130.4	34	80
48	3-108	5	42.4	N	88	57.1	3	M4	901008	2035	73.1	16	6
49	3-110	9	10.0	N	87	28.2	3	M4	901009	2031	144.6	26	77
50	3-112	9	26.3	N	90	03.1	3	M4	901010	2103	107.6	142	19
51	3-114	7	26.7	N	92	51.2	3	M4	901011	2102	60.3	7	4
52	3-116	5	15.3	N	95	13.2	4	M4	901012	2104	106.6	4	11
53	3-118	1	58.0	N	97	11.0	4	M4	901013	2107	98.0	0	5
54	3-120	2	47.6	S	100	31.9	9	M4	901014	2037	129.1	0	2
55		2	47.0	S	103	53.0	9	M4	901015	2031	99.2	12	15
56	3-123	4	58.7	S	106	45.2	9	M4	901016	2103	87.8	17	8
57	3-125	5	22.7	S	105	50.0	9	M4	901017	2103	92.4	9	10
58	3-127	4	20.0	S	102	25.0	9	M4	901018	2104	105.1	21	74
59	3-129	2	46.0	S	99	20.0	9	M4	901019	2035	105.5	3	66
60	3-131	2	24.0	S	95	52.0	9	M4	901020	2034	107.6	0	9
61	3-133	5	27.9	S	95	21.0	9	M4	901021	2100	83.2	91	27
62	3-137	8	15.0	S	92	42.0	8	M4	901023	2103	103.4	56	13
63	3-139	5	43.0	S	89	54.0	8	M4	901024	2105	120.1	33	55

Tow Number	CTD Station	Lat. deg.	Lat. min.		Long.(W) deg	Long.(W) min.	Region	Ship Code	Tow Date yymmdd	Time (Loc.)	Vol.(m³) Water Strained	Total Larvae	Total Eggs
64	3-141	3	07.0	S	87	07.7	8	M4	901025	2104	104.9	37	274
65	3-143	2	45.0	S	84	58.0	8	M4	901026	2035	97.2	66	125
66	3-145	6	27.0	S	84	55.0	8	M4	901027	2023	89.4	17	1370
67	3-147	10	20.0	S	84	47.0	8	M4	901028	2030	103.2	31	14
68	3-149	8	57.0	S	83	54.0	8	M4	901029	2031	106.8	29	14
69	3-151	5	49.0	S	82	52.0	8	M4	901030	2034	93.6	4	63
70	3-153	3	47.0	S	82	18.0	8	M4	901031	2033	102.7	315	92
71	4-156	4	22.3	S	83	34.7	8	M4	901108	2035	87.9	4	1408
72	4-158	7	17.6	S	86	02.1	8	M4	901109	2103	103.9	19	29
73	4-160	10	20.0	S	88	27.0	8	M4	901110	2103	92.3	11	30
74	4-162	9	18.6	S	90	21.8	8	M4	901111	2103	84.9	0	0
75	4-164	5	42.6	S	91	54.0	8	M4	901112	2105	89.7	5	191
76	4-166	5	22.0	S	94	43.0	8	M4	901113	2034	92.3	21	231
77	4-168	6	31.0	S	97	55.0	9	M4	901114	2035	68.1	13	12
78	4-170	4	26.8	S	103	50.8	9	M4	901116	2106	108.8	47	19
79	4-172	1	59.0	S	106	20.0	9	M4	901117	2106	107.5	10	150
80	4-174	2	51.0	S	108	59.0	9	M4	901118	2103	104.6	3	358
81	4-176	4	47.0	S	111	05.0	10	M4	901119	2034	89.2	2	3
82	4-178	3	59.0	S	115	18.0	10	M4	901120	2035	113.3	2	298
83	4-182	2	30.0	S	123	31.0	10	M4	901122	2102	105.3	3	28
84	4-189	3	54.0	N	124	15.0	5	M4	901125	2004	110.0	1	6
85	4-191	6	53.0	N	124	03.0	5	M4	901126	2006	136.2	0	23
86	4-193	6	55.0	N	124	04.5	5	M4	901127	2007	26.1	7	67
87	4-198	18	09.0	N	116	52.0	2	M4	901130	2004	126.2	2	573
88	4-200	20	24.0	N	115	05.0	2	M4	901201	2003	119.1	8	122
89	4-202	23	18.0	N	116	00.0	2	M4	901202	2001	93.2	1	1
90	4-204	26	13.0	N	117	03.0	2	M4	901203	2004	102.8	0	9

Table 2. Pooled occurrences of fish larvae taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

Rank	Taxon	Occurrences
1	*Vinciguerria lucetia*	90
2	*Oxyporhamphus micropterus*	65
3	*Auxis* spp.	33
4	*Coryphaena equiselis*	28
5	Scomberesocidae	24
6	*Cubiceps pauciradiatus*	22
7	*Prognichthys* spp.	18
8	*Lampanyctus* spp.	14
9	*Exocoetus* spp.	11
10	*Cheilopogon xenopterus*	10
10	*Lestidium* spp.	10
12	*Mugil* spp.	9
13	*Hirundichthys marginatus*	8
13	*Hirundichthys* spp.	8
15	*Lampanyctus parvicauda*	7
15	*Howella pammelas*	7
15	*Coryphaena hippurus*	7
18	*Naucrates ductor*	6
18	*Diaphus* spp.	6
18	*Thunnus* spp.	6
18	Engraulidae	6
22	*Cyclothone* spp.	5
23	*Cyclothone signata*	4
23	*Opisthonema* spp.	4
23	*Nomeus gronovii*	4
23	*Diplophos proximus*	4
27	*Bathophilus filifer*	3
27	*Polydactylus approximans*	3
27	*Bothus* spp.	3
27	Gerreidae	3
27	*Bregmaceros* spp.	3
27	*Nealotus tripes*	3
27	*Euthynnus lineatus*	3
27	*Myctophum aurolaternatum*	3
35	*Trachipterus fukuzakii*	2
35	*Zu cristatus*	2
35	*Cheilopogon* spp.	2
35	Haemulidae	2
35	Sciaenidae	2
35	*Sternoptyx* spp.	2
35	*Chiasmodon niger*	2
35	Scombridae	2
35	Gobiidae	2
35	*Stemonosudis macrura*	2
45	*Stomias* spp.	1
45	*Ophichthus zophochir*	1
45	*Ariosoma gilberti*	1
45	Clupeiformes	1
45	Clupeidae	1
45	*Synodus sechurae*	1

Table 2. (cont.)

Rank	Taxon	Occurrences
45	Atherinidae	1
45	*Gigantactis* spp.	1
45	*Hygophum proximum*	1
45	Ophidiidae	1
45	*Diogenichthys atlanticus*	1
45	Myctophidae	1
45	*Symbolophorus evermanni*	1
45	*Ceratoscopelus* spp.	1
45	*Cyclothone acclinidens*	1
45	*Diaphus pacificus*	1
45	*Cyclothone pseudopallida*	1
45	*Benthosema panamense*	1
45	*Melanocetus* spp.	1
45	*Psenes sio*	1
45	*Luvarus imperialis*	1
45	Trichiuridae	1
45	*Katsuwonus pelamis*	1
45	*Sarda chiliensis*	1
45	*Sarda orientalis*	1
45	*Scomberomorus sierra*	1
45	*Amarsipus carlsbergi*	1
45	*Pristigenys serrula*	1
45	*Psenes pellucidus*	1
45	*Synchiropus atrilabiatus*	1
45	*Citharichthys* spp.	1
45	Cynoglossidae	1
45	*Canthidermis maculatus*	1
45	*Lactoria diaphana*	1
45	*Diodon holocanthus*	1
45	*Diodon hystrix*	1
45	Disintegrated fish larvae	1
45	*Psenes cyanophrys*	1
45	*Coryphaena* spp.	1
45	Scorpaenidae	1
45	*Sebastes* spp.	1
45	Serranidae	1
45	*Gymnothorax mordax*	1
45	Carangidae	1
45	Unidentified fish larvae	1
45	*Alectis ciliaris*	1
45	*Ptereleotris* spp.	1
45	*Oligoplites* spp.	1
45	*Lythrypnus* spp.	1
45	*Calamus brachysomus*	1
45	Mullidae	1
45	Kyphosidae	1
45	*Microspathodon* spp.	1
45	Labrisomidae	1
45	*Chloroscombrus orqueta*	1
45	*Hypsoblennius proteus*	1
45	Exocoetidae	1
45	*Caranx* spp.	1
	Total	518

Table 3. Pooled counts of fish larvae taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

Rank	Taxon	Count
1	*Vinciguerria lucetia*	1468
2	*Oxyporhamphus micropterus*	390
3	*Opisthonema* spp.	352
4	*Auxis* spp.	337
5	Scomberesocidae	327
6	*Hirundichthys* spp.	154
7	*Prognichthys* spp.	144
8	Engraulidae	118
9	*Coryphaena equiselis*	115
10	*Cubiceps pauciradiatus*	108
11	*Hirundichthys marginatus*	54
12	*Benthosema panamense*	48
13	*Lampanyctus* spp.	35
14	*Polydactylus approximans*	28
14	Sciaenidae	28
16	*Mugil* spp.	24
17	*Lestidium* spp.	23
18	Mullidae	20
18	Haemulidae	20
20	*Exocoetus* spp.	18
21	Clupeiformes	14
22	*Lampanyctus parvicauda*	12
23	*Cheilopogon xenopterus*	11
23	*Howella pammelas*	11
25	*Thunnus* spp.	10
26	*Coryphaena hippurus*	9
26	Gerreidae	9
28	Atherinidae	7
29	*Naucrates ductor*	6
29	*Diplophos proximus*	6
29	*Euthynnus lineatus*	6
29	*Cyclothone signata*	6
29	*Diaphus* spp.	6
34	*Nomeus gronovii*	5
34	*Cyclothone* spp.	5
36	*Bothus* spp.	4
36	*Bregmaceros* spp.	4
36	*Nealotus tripes*	4
36	*Myctophum aurolaternatum*	4
40	*Diodon hystrix*	3
40	*Bathophilus filifer*	3
40	*Sternoptyx* spp.	3
40	*Chiasmodon niger*	3
40	Gobiidae	3
40	*Diodon holocanthus*	3
40	*Citharichthys* spp.	3
40	*Chloroscombrus orqueta*	3
48	*Lactoria diaphana*	2
48	*Sarda chiliensis*	2
48	*Stemonosudis macrura*	2
48	*Katsuwonus pelamis*	2

Table 3. (cont.)

Rank	Taxon	Count
48	*Cheilopogon* spp.	2
48	*Zu cristatus*	2
48	Scombridae	2
48	Kyphosidae	2
48	Carangidae	2
48	*Trachipterus fukuzakii*	2
58	*Synchiropus atrilabiatus*	1
58	*Lythrypnus* spp.	1
58	Myctophidae	1
58	*Synodus sechurae*	1
58	Disintegrated fish larvae	1
58	*Ptereleotris* spp.	1
58	*Melanocetus* spp.	1
58	*Gymnothorax mordax*	1
58	*Hypsoblennius proteus*	1
58	*Cyclothone acclinidens*	1
58	Labrisomidae	1
58	*Stomias* spp.	1
58	Cynoglossidae	1
58	Exocoetidae	1
58	Ophidiidae	1
58	Clupeidae	1
58	*Cyclothone pseudopallida*	1
58	*Gigantactis* spp.	1
58	*Scomberomorus sierra*	1
58	*Sarda orientalis*	1
58	Trichiuridae	1
58	*Coryphaena* spp.	1
58	*Amarsipus carlsbergi*	1
58	*Psenes cyanophrys*	1
58	*Calamus brachysomus*	1
58	*Psenes pellucidus*	1
58	*Psenes sio*	1
58	*Oligoplites* spp.	1
58	*Caranx* spp.	1
58	Scorpaenidae	1
58	*Microspathodon* spp.	1
58	*Ceratoscopelus* spp.	1
58	Unidentified fish larvae	1
58	*Pristigenys serrula*	1
58	Serranidae	1
58	*Canthidermis maculatus*	1
58	*Ophichthus zophochir*	1
58	*Luvarus imperialis*	1
58	*Ariosoma gilberti*	1
58	*Symbolophorus evermanni*	1
58	*Sebastes* spp.	1
58	*Hygophum proximum*	1
58	*Diogenichthys atlanticus*	1
58	*Diaphus pacificus*	1
58	*Alectis ciliaris*	1
	Total	4039

Table 4. Numbers of fish larvae taken in Manta net tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

Gymnothorax mordax

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
49	M4	3-110	3	1	0.69

Ophichthus zophochir

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
54	JD	3-104	3	1	0.93

Ariosoma gilberti

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
47	JD	3-090	3	1	1.23

Clupeiformes

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	14	13.63

Clupeidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
66	M4	3-145	8	1	1.12

Opisthonema spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	208	190.83
19	JD		3	21	17.41
41	M4	2-088	8	18	13.40
70	M4	3-153	8	105	102.24

Engraulidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
19	JD		3	8	6.63
23	JD	2-044	4	1	1.11
42	JD	2-086	3	2	2.98
43	JD		3	5	5.09
49	JD	3-094	3	1	1.02
70	M4	3-153	8	101	98.34

Cyclothone spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
36	JD	2-075	4	1	1.11
42	M4	2-090	8	1	0.80

Cyclothone spp. (cont).

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
45	JD		3	1	2.92
89	M4	4-202	2	1	1.07

Cyclothone acclinidens

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
14	JD	1-026	4	1	1.32

Cyclothone pseudopallida

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
40	M4	2-085	4	1	0.79

Cyclothone signata

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	3	3.58
31	JD	2-066	4	1	1.52
33	JD	2-070	4	1	1.60
47	JD	3-090	3	1	1.23

Diplophos proximus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
62	JD		1	1	0.79
80	JD	4-156	2	1	0.93
83	JD	4-161	1	2	1.62
84	JD	4-163	2	2	1.44

Sternoptyx spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	2	1.95
82	M4	4-178	10	1	0.88

Vinciguerria lucetia

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
4	JD	1-009	6	1	1.12
7	JD	1-014	5	37	39.03
8	M4	1-016	4	1	0.68
9	M4	1-018	4	3	2.79
10	JD	1-020	5	17	21.41
11	JD	1-022	4	36	39.91

Vinciguerria lucetia (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
11	M4	1-022	5	2	1.64
13	JD	1-024	4	2	2.36
14	JD	1-026	4	9	11.84
15	JD	1-029	4	16	25.97
17	JD	1-033	4	2	2.76
18	JD	1-035	4	2	1.83
23	JD	2-044	4	17	18.95
23	M4	1-046	7	2	2.56
24	JD	2-046	4	1	1.19
26	JD	2-050	5	1	0.92
29	JD	2-055	5	3	3.15
31	JD	2-066	4	39	59.36
32	JD	2-068	4	1	1.36
32	M4	2-067	5	1	0.58
33	JD	2-070	4	254	405.75
34	M4	2-073	5	5	5.05
34	JD	2-071	4	20	26.35
35	JD	2-073	4	5	8.43
35	M4	2-075	4	86	92.37
36	JD	2-075	4	85	94.03
36	M4	2-077	4	23	27.45
37	JD	2-077	3	98	137.25
37	M4	2-079	4	22	18.33
38	M4	2-081	4	1	0.77
38	JD	2-078	3	14	15.82
39	M4	2-083	4	3	2.27
39	JD	2-080	3	11	16.13
40	M4	2-085	4	83	65.25
40	JD	2-082	3	2	3.03
41	M4	2-088	8	2	1.49
42	M4	2-090	8	2	1.60
43	M4	2-092	3	2	1.76
44	M4	2-094	3	8	8.32
45	M4	2-096	3	10	9.91
45	JD		3	15	43.73
46	M4	2-098	3	1	1.07
46	JD	3-088	3	2	3.02
47	M4	2-100	3	1	0.77
47	JD	3-090	3	64	78.62
48	JD	3-092	3	6	7.99

Vinciguerria lucetia (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
48	M4	3-108	3	15	20.52
49	JD	3-094	3	4	4.10
50	M4	3-112	3	2	1.86
50	JD	3-096	3	3	2.86
51	M4	3-114	3	7	11.61
52	M4	3-116	4	2	1.88
52	JD	3-100	3	10	10.09
55	M4		9	9	9.07
56	M4	3-123	9	15	17.08
57	JD	3-109	4	19	26.91
57	M4	3-125	9	6	6.49
58	M4	3-127	9	3	2.85
58	JD	3-111	4	20	25.22
59	JD	3-113	4	7	8.17
61	M4	3-133	9	56	67.31
62	M4	3-137	8	2	1.93
62	JD		1	2	1.57
64	M4	3-141	8	30	28.60
65	M4	3-143	8	11	11.32
66	M4	3-145	8	12	13.42
67	JD	4-128	5	7	10.25
68	JD	4-130	5	1	1.08
69	JD	4-132	5	16	18.56
69	M4	3-151	8	1	1.07
70	JD	4-134	5	4	4.03
71	JD	4-136	5	1	0.92
71	M4	4-156	8	1	1.14
72	M4	4-158	8	13	12.51
73	JD	4-140	5	28	32.15
74	JD	4-142	5	2	2.74
75	JD	4-144	5	1	0.83
76	M4	4-166	8	2	2.17
78	M4	4-170	9	46	42.28
79	M4	4-172	9	10	9.30
79	JD	4-152	2	27	30.13
80	JD	4-156	2	13	12.10
80	M4	4-174	9	1	0.96
81	JD	4-158	2	8	7.39
82	JD	4-160	2	2	2.02
82	M4	4-178	10	1	0.88

Vinciguerria lucetia (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
83	JD	4-161	1	24	19.48
83	M4	4-182	10	2	1.90
84	JD	4-163	2	3	2.16
88	M4	4-200	2	1	0.84

Stomias spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
38	JD	2-078	3	1	1.13

Bathophilus filifer

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
31	JD	2-066	4	1	1.52
39	JD	2-080	3	1	1.47
67	JD	4-128	5	1	1.46

Synodus sechurae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	1	0.92

Lestidium spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	1	1.19
30	JD	2-057	5	3	2.86
34	JD	2-071	4	4	5.27
37	JD	2-077	3	1	1.40
37	M4	2-079	4	4	3.33
45	M4	2-096	3	1	0.99
45	JD		3	1	2.92
67	JD	4-128	5	4	5.86
70	JD	4-134	5	3	3.02
71	JD	4-136	5	1	0.92

Stemonosudis macrura

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
44	M4	2-094	3	1	1.04
45	JD		3	1	2.92

Myctophidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	1	0.97

Ceratoscopelus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	1	1.19

Diaphus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
34	JD	2-071	4	1	1.32
36	M4	2-077	4	1	1.19
37	JD	2-077	3	1	1.40
38	JD	2-078	3	1	1.13
78	M4	4-170	9	1	0.92
84	M4	4-189	5	1	0.91

Diaphus pacificus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
38	M4	2-081	4	1	0.77

Lampanyctus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
8	M4	1-016	4	1	0.68
11	JD	1-022	4	8	8.87
33	JD	2-070	4	1	1.60
35	M4	2-075	4	1	1.07
39	JD	2-080	3	7	10.26
45	JD		3	4	11.66
45	M4	2-096	3	1	0.99
46	JD	3-088	3	1	1.51
47	JD	3-090	3	6	7.37
48	JD	3-092	3	1	1.33
55	M4		9	1	1.01
58	JD	3-111	4	1	1.26
67	JD	4-128	5	1	1.46
81	M4	4-176	10	1	1.12

Lampanyctus parvicauda

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
29	JD	2-055	5	1	1.05
33	JD	2-070	4	1	1.60
34	JD	2-071	4	1	1.32
57	JD	3-109	4	6	8.50
80	JD	4-156	2	1	0.93
87	M4	4-198	2	1	0.79
88	M4	4-200	2	1	0.84

Benthosema panamense

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	48	44.04

Diogenichthys atlanticus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
7	JD	1-014	5	1	1.05

Hygophum proximum

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
87	M4	4-198	2	1	0.79

Myctophum aurolaternatum

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
39	JD	2-080	3	1	1.47
45	JD		3	1	2.92
47	JD	3-090	3	2	2.46

Symbolophorus evermanni

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
73	M4	4-160	8	1	1.08

Trachipterus fukuzakii

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
45	JD		3	1	2.92
58	JD	3-111	4	1	1.26

Zu cristatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
29	M4	2-061	6	1	1.37
52	M4	3-116	4	1	0.94

Bregmaceros spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
5	JD	1-010	5	1	0.98
43	JD		3	1	1.02
70	M4	3-153	8	2	1.95

Ophidiidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
81	JD	4-158	2	1	0.92

Melanocetus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
33	JD	2-070	4	1	1.60

Gigantactis spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
73	M4	4-160	8	1	1.08

Atherinidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	7	6.82

Scomberesocidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
42	M4	2-090	8	2	1.60
55	M4		9	2	2.02
56	M4	3-123	9	2	2.28
57	M4	3-125	9	3	3.25
58	M4	3-127	9	17	16.18
59	M4	3-129	9	3	2.84
61	M4	3-133	9	35	42.07
62	M4	3-137	8	54	52.22
63	M4	3-139	8	32	26.64
64	M4	3-141	8	6	5.72
65	M4	3-143	8	54	55.56
66	M4	3-145	8	2	2.24
67	M4	3-147	8	30	29.07
68	M4	3-149	8	25	23.41
69	M4	3-151	8	2	2.14
70	M4	3-153	8	2	1.95
71	M4	4-156	8	2	2.28
72	M4	4-158	8	6	5.77
73	M4	4-160	8	9	9.75
75	M4	4-164	8	4	4.46
76	M4	4-166	8	19	20.59
77	M4	4-168	9	13	19.09
80	M4	4-174	9	2	1.91
81	M4	4-176	10	1	1.12

Exocoetidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
1	M4	1-002	2	1	1.43

Cheilopogon spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
51	JD	3-098	3	1	1.01
88	M4	4-200	2	1	0.84

Cheilopogon xenopterus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
20	JD	2-038	3	1	0.98
43	JD		3	1	1.02
54	JD	3-104	3	1	0.93
60	JD	3-115	1	1	1.23
61	JD	3-117	1	1	0.85
62	JD		1	1	0.79
65	JD	4-123	4	1	1.25
74	JD	4-142	5	1	1.37
75	JD	4-144	5	2	1.66
77	JD	4-148	5	1	0.86

Exocoetus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
12	JD		4	1	1.10
41	M4	2-088	8	1	0.74
47	M4	2-100	3	1	0.77
49	JD	3-094	3	1	1.02
50	M4	3-112	3	1	0.93
53	JD	3-102	3	3	3.11
54	JD	3-104	3	3	2.78
63	JD	4-119	1	1	1.72
65	JD	4-123	4	3	3.75
82	JD	4-160	2	1	1.01
88	M4	4-200	2	2	1.68

Hirundichthys spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
47	M4	2-100	3	1	0.77
50	JD	3-096	3	3	2.86
50	M4	3-112	3	121	112.45
53	JD	3-102	3	3	3.11
55	JD	3-107	3	21	23.49
57	JD	3-109	4	2	2.83
65	JD	4-123	4	1	1.25
82	JD	4-160	2	2	2.02

Hirundichthys marginatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
16	JD	1-031	4	3	2.42
20	JD	2-038	3	2	1.95
26	JD	2-050	5	1	0.92
53	JD	3-102	3	22	22.77
54	JD	3-104	3	19	17.61
68	M4	3-149	8	2	1.87
74	JD	4-142	5	4	5.47
75	JD	4-144	5	1	0.83

Oxyporhamphus micropterus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
2	JD	1-005	2	1	1.19
4	M4	1-008	5	1	0.80
5	M4	1-010	5	1	0.95
5	JD	1-010	5	1	0.98
6	M4	1-012	5	1	0.86
6	JD	1-012	5	1	1.06
8	JD	1-016	5	2	2.41
10	JD	1-020	5	1	1.26
11	JD	1-022	4	3	3.33
11	M4	1-022	5	1	0.82
12	JD		4	2	2.19
13	JD	1-024	4	2	2.36
14	M4	1-028	5	1	0.86
16	JD	1-031	4	14	11.27
18	JD	1-035	4	1	0.92
19	JD		3	7	5.80
20	JD	2-038	3	18	17.56
22	JD	2-042	4	2	2.16
23	JD	2-044	4	5	5.57
24	JD	2-046	4	3	3.58
29	JD	2-055	5	1	1.05
30	JD	2-057	5	1	0.95
33	JD	2-070	4	8	12.78
34	M4	2-073	5	1	1.01
34	JD	2-071	4	1	1.32
35	JD	2-073	4	2	3.37
36	M4	2-077	4	1	1.19
37	M4	2-079	4	1	0.83
38	JD	2-078	3	15	16.95
39	JD	2-080	3	1	1.47

Oxyporhamphus micropterus (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
40	JD	2-082	3	6	9.08
43	JD		3	2	2.03
47	M4	2-100	3	9	6.90
48	JD	3-092	3	1	1.33
49	JD	3-094	3	3	3.07
49	M4	3-110	3	1	0.69
50	M4	3-112	3	6	5.58
50	JD	3-096	3	10	9.52
52	JD	3-100	3	2	2.02
53	JD	3-102	3	45	46.58
54	JD	3-104	3	16	14.83
55	JD	3-107	3	7	7.83
56	JD		3	21	31.11
57	JD	3-109	4	4	5.67
59	JD	3-113	4	6	7.00
60	JD	3-115	1	1	1.23
61	JD	3-117	1	2	1.71
62	JD		1	29	22.83
63	M4	3-139	8	1	0.83
63	JD	4-119	1	3	5.17
64	JD	4-121	4	5	7.65
65	JD	4-123	4	3	3.75
68	JD	4-130	5	1	1.08
73	JD	4-140	5	1	1.15
74	JD	4-142	5	4	5.47
75	JD	4-144	5	19	15.73
76	JD	4-146	5	12	9.84
77	JD	4-148	5	5	4.29
78	JD	4-150	2	4	3.57
79	JD	4-152	2	6	6.70
80	JD	4-156	2	15	13.97
81	JD	4-158	2	7	6.47
82	JD	4-160	2	29	29.35
84	JD	4-163	2	2	1.44
88	M4	4-200	2	2	1.68

Prognichthys spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
16	JD	1-031	4	3	2.42
18	JD	1-035	4	3	2.75
19	JD		3	4	3.32

Prognichthys spp. (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
20	JD	2-038	3	61	59.51
21	JD	2-040	4	4	3.05
22	JD	2-042	4	3	3.25
43	JD		3	4	4.07
47	M4	2-100	3	2	1.53
49	M4	3-110	3	4	2.77
49	JD	3-094	3	1	1.02
50	M4	3-112	3	9	8.36
52	M4	3-116	4	1	0.94
53	JD	3-102	3	6	6.21
55	JD	3-107	3	2	2.24
61	JD	3-117	1	33	28.18
62	JD		1	2	1.57
75	JD	4-144	5	1	0.83
82	JD	4-160	2	1	1.01

Scorpaenidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
52	JD	3-100	3	1	1.01

Sebastes spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
4	JD	1-009	6	1	1.12

Serranidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	1	0.97

Pristigenys serrula

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	JD		3	1	1.02

Howella pammelas

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
10	JD	1-020	5	2	2.52
11	JD	1-022	4	1	1.11
26	JD	2-050	5	2	1.85
37	JD	2-077	3	2	2.80
38	M4	2-081	4	1	0.77
67	JD	4-128	5	2	2.93
71	JD	4-136	5	1	0.92

Carangidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	2	1.95

Alectis ciliaris

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	1	0.92

Caranx spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	JD		3	1	1.02

Chloroscombrus orqueta

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	3	2.92

Naucrates ductor

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
6	JD	1-012	5	1	1.06
18	JD	1-035	4	1	0.92
40	JD	2-082	3	1	1.51
65	M4	3-143	8	1	1.03
67	M4	3-147	8	1	0.97
82	JD	4-160	2	1	1.01

Oligoplites spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	JD		3	1	1.02

Coryphaena spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
60	JD	3-115	1	1	1.23

Coryphaena equiselis

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
5	M4	1-010	5	1	0.95
6	M4	1-012	5	1	0.86
16	JD	1-031	4	40	32.21
23	JD	2-044	4	2	2.23
26	JD	2-050	5	1	0.92
26	M4	2-055	6	1	0.82
27	M4	2-057	6	1	0.88
33	JD	2-070	4	1	1.60

Coryphaena equiselis (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
37	JD	2-077	3	1	1.40
39	JD	2-080	3	2	2.93
47	M4	2-100	3	9	6.90
49	M4	3-110	3	11	7.61
50	M4	3-112	3	1	0.93
53	JD	3-102	3	2	2.07
54	JD	3-104	3	1	0.93
55	JD	3-107	3	1	1.12
57	JD	3-109	4	1	1.42
58	M4	3-127	9	1	0.95
61	JD	3-117	1	1	0.85
74	JD	4-142	5	2	2.74
75	JD	4-144	5	14	11.59
75	M4	4-164	8	1	1.11
76	JD	4-146	5	10	8.20
77	JD	4-148	5	1	0.86
78	JD	4-150	2	3	2.67
79	JD	4-152	2	1	1.12
82	JD	4-160	2	3	3.04
88	M4	4-200	2	1	0.84

Coryphaena hippurus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	1	0.92
20	JD	2-038	3	2	1.95
34	JD	2-071	4	1	1.32
40	JD	2-082	3	1	1.51
42	JD	2-086	3	2	2.98
46	M4	2-098	3	1	1.07
83	M4	4-182	10	1	0.95

Gerreidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	5	4.59
19	JD		3	2	1.66
43	JD		3	2	2.03

Haemulidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	1	0.92
70	M4	3-153	8	19	18.50

Calamus brachysomus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	1	0.97

Sciaenidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	27	26.29
71	M4	4-156	8	1	1.14

Polydactylus approximans

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
20	JD	2-038	3	24	23.41
22	JD	2-042	4	2	2.16
41	JD	2-085	3	2	2.50

Mullidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	20	19.47

Kyphosidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	JD		3	2	2.03

Mugil spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	2	1.83
19	JD		3	3	2.49
21	JD	2-040	4	1	0.76
42	JD	2-086	3	1	1.49
43	JD		3	9	9.16
53	JD	3-102	3	1	1.04
54	JD	3-104	3	5	4.63
66	M4	3-145	8	1	1.12
69	M4	3-151	8	1	1.07

Microspathodon spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
22	JD	2-042	4	1	1.08

Chiasmodon niger

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	2	2.39
45	M4	2-096	3	1	0.99

Labrisomidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
45	JD		3	1	2.92

Hypsoblennius proteus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
80	JD	4-156	2	1	0.93

Synchiropus atrilabiatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
64	M4	3-141	8	1	0.95

Gobiidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	JD		3	1	1.02
50	JD	3-096	3	2	1.90

Lythrypnus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
20	JD	2-038	3	1	0.98

Ptereleotris spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
42	JD	2-086	3	1	1.49

Luvarus imperialis

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
40	M4	2-085	4	1	0.79

Nealotus tripes

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
43	M4	2-092	3	1	0.88
45	JD		3	2	5.83
57	JD	3-109	4	1	1.42

Trichiuridae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	1	0.97

Scombridae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	1	1.19
70	M4	3-153	8	1	0.97

Auxis spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
4	M4	1-008	5	1	0.80
11	JD	1-022	4	1	1.11
15	JD	1-029	4	1	1.62
16	JD	1-031	4	32	25.76
18	JD	1-035	4	5	4.59
19	JD		3	20	16.58
20	JD	2-038	3	52	50.73
21	JD	2-040	4	1	0.76
22	JD	2-042	4	35	37.88
23	JD	2-044	4	26	28.99
27	JD	2-051	5	1	1.10
34	JD	2-071	4	2	2.64
36	JD	2-075	4	1	1.11
47	M4	2-100	3	2	1.53
49	JD	3-094	3	1	1.02
49	M4	3-110	3	9	6.22
50	JD	3-096	3	1	0.95
53	JD	3-102	3	10	10.35
54	JD	3-104	3	18	16.68
56	JD		3	10	14.81
58	JD	3-111	4	1	1.26
60	JD	3-115	1	37	45.62
61	JD	3-117	1	3	2.56
62	JD		1	15	11.81
64	JD	4-121	4	1	1.53
65	JD	4-123	4	4	5.00
73	JD	4-140	5	1	1.15
74	JD	4-142	5	2	2.74
79	JD	4-152	2	27	30.13
80	JD	4-156	2	7	6.52
81	JD	4-158	2	6	5.55
83	JD	4-161	1	1	0.81
86	M4	4-193	5	3	11.49

Euthynnus lineatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
3	JD	1-007	2	1	1.19
43	JD		3	4	4.07
45	JD		3	1	2.92

Katsuwonus pelamis

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
68	M4	3-149	8	2	1.87

Sarda chiliensis

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	2	1.95

Sarda orientalis

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
47	JD	3-090	3	1	1.23

Scomberomorus sierra

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
19	JD		3	1	0.83

Thunnus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
11	JD	1-022	4	1	1.11
15	JD	1-029	4	1	1.62
19	JD		3	2	1.66
40	JD	2-082	3	4	6.05
66	JD	4-126	5	1	0.82
76	JD	4-146	5	1	0.82

Amarsipus carlsbergi

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
7	M4	1-014	5	1	0.85

Cubiceps pauciradiatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
6	M4	1-012	5	2	1.71
19	JD		3	5	4.15
22	JD	2-042	4	1	1.08
23	JD	2-044	4	3	3.34
24	JD	2-046	4	1	1.19
33	JD	2-070	4	2	3.19
37	JD	2-077	3	2	2.80
38	JD	2-078	3	2	2.26
47	M4	2-100	3	9	6.90
58	JD	3-111	4	2	2.52
60	JD	3-115	1	1	1.23
61	JD	3-117	1	1	0.85

Cubiceps pauciradiatus (cont.)

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
62	JD		1	3	2.36
75	JD	4-144	5	2	1.66
76	JD	4-146	5	2	1.64
77	JD	4-148	5	1	0.86
79	JD	4-152	2	22	24.55
80	JD	4-156	2	16	14.90
81	JD	4-158	2	10	9.24
82	JD	4-160	2	11	11.13
83	JD	4-161	1	6	4.87
86	M4	4-193	5	4	15.33

Nomeus gronovii

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
8	M4	1-016	4	1	0.68
35	JD	2-073	4	2	3.37
38	JD	2-078	3	1	1.13
48	M4	3-108	3	1	1.37

Psenes cyanophrys

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
26	JD	2-050	5	1	0.92

Psenes pellucidus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
67	JD	4-128	5	1	1.46

Psenes sio

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
61	JD	3-117	1	1	0.85

Citharichthys spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	3	2.92

Bothus spp.

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
42	M4	2-090	8	1	0.80
50	M4	3-112	3	2	1.86
53	JD	3-102	3	1	1.04

Cynoglossidae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
70	M4	3-153	8	1	0.97

Canthidermis maculatus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
18	JD	1-035	4	1	0.92

Lactoria diaphana

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
78	JD	4-150	2	2	1.78

Diodon holocanthus

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
60	JD	3-115	1	3	3.70

Diodon hystrix

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
76	JD	4-146	5	3	2.46

Disintegrated fish larvae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
66	M4	3-145	8	1	1.12

Unidentified fish larvae

Tow Number	Ship Code	CTD Number	Region	Count	Count per 100m³
14	JD	1-026	4	1	1.32

Table 5. Average numbers of larvae (per 100 m³ of water filtered) for each taxon taken in Manta net tows in the regions (Figure 3) occupied on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4.

	Region									
Taxon	1	2	3	4	5	6	7	8	9	10
Gymnothorax mordax	-	-	1.4	-	-	-	-	-	-	-
Ophichthus zophochir	-	-	1.1	-	-	-	-	-	-	-
Ariosoma gilberti	-	-	0.8	-	-	-	-	-	-	-
Clupeiformes	-	-	-	-	-	-	-	14.4	-	-
Clupeidae	-	-	-	-	-	-	-	0.9	-	-
Opisthonema spp.	-	-	25.3	226.7	-	-	-	66.0	-	-
Engraulidae	-	-	4.2	0.9	-	-	-	103.7	-	-
Cyclothone spp.	-	0.9	0.5	0.9	-	-	-	1.2	-	-
Cyclothone acclinidens	-	-	-	0.8	-	-	-	-	-	-
Cyclothone pseudopallida	-	-	-	1.3	-	-	-	-	-	-
Cyclothone signata	-	2.5	0.8	0.6	-	-	-	-	-	-
Diplophos proximus	1.9	1.9	-	-	-	-	-	-	-	-
Sternoptyx spp.	-	-	-	-	-	-	-	2.1	-	1.1
Vinciguerria lucetia	16.1	9.0	11.1	24.2	7.5	0.9	1.6	7.7	17.4	1.6
Stomias spp.	-	-	0.9	-	-	-	-	-	-	-
Bathophilus filifer	-	-	0.7	0.7	0.7	-	-	-	-	-
Synodus sechurae	-	-	-	1.1	-	-	-	-	-	-
Lestidium spp.	-	0.8	0.7	3.9	2.5	-	-	-	-	-
Stemonosudis macrura	-	-	0.7	-	-	-	-	-	-	-
Myctophidae	-	-	-	-	-	-	-	1.0	-	-
Ceratoscopelus spp.	-	0.8	-	-	-	-	-	-	-	-
Diaphus spp.	-	-	0.8	0.8	1.1	-	-	-	1.1	-
Diaphus pacificus	-	-	-	1.3	-	-	-	-	-	-
Lampanyctus spp.	-	-	2.2	2.2	0.7	-	-	-	1.0	0.9
Lampanyctus parvicauda	-	1.2	-	1.9	1.0	-	-	-	-	-
Benthosema panamense	-	-	-	52.3	-	-	-	-	-	-
Diogenichthys atlanticus	-	-	-	-	0.9	-	-	-	-	-
Hygophum proximum	-	1.3	-	-	-	-	-	-	-	-
Myctophum aurolaternatum	-	-	0.9	-	-	-	-	-	-	-
Symbolophorus evermanni	-	-	-	-	-	-	-	0.9	-	-
Trachipterus fukuzakii	-	-	0.3	0.8	-	-	-	-	-	-
Zu cristatus	-	-	-	1.1	-	0.7	-	-	-	-
Bregmaceros spp.	-	-	1.0	-	1.0	-	-	2.1	-	-
Ophidiidae	-	1.1	-	-	-	-	-	-	-	-
Melanocetus spp.	-	-	-	0.6	-	-	-	-	-	-
Gigantactis spp.	-	-	-	-	-	-	-	0.9	-	-
Atherinidae	-	-	-	-	-	-	-	7.2	-	-
Scomberesocidae	-	-	-	-	-	-	-	17.1	8.5	0.9
Exocoetidae	-	0.7	-	-	-	-	-	-	-	-
Cheilopogon spp.	-	1.2	1.0	-	-	-	-	-	-	-
Cheilopogon xenopterus	1.1	-	1.0	0.8	1.4	-	-	-	-	-
Exocoetus spp.	0.6	1.7	1.9	1.7	-	-	-	1.3	-	-
Hirundichthys spp.	-	2.0	31.3	1.1	-	-	-	-	-	-
Hirundichthys marginatus	-	-	14.6	3.7	1.7	-	-	2.1	-	-

Taxon	Region 1	2	3	4	5	6	7	8	9	10
Oxyporhamphus micropterus	10.4	8.5	9.6	3.3	3.4	-	-	1.2	-	-
Prognichthys spp.	20.6	1.0	10.9	3.2	1.2	-	-	-	-	-
Scorpaenidae	-	-	1.0	-	-	-	-	-	-	-
Sebastes spp.	-	-	-	-	-	0.9	-	-	-	-
Serranidae	-	-	-	-	-	-	-	1.0	-	-
Pristigenys serrula	-	-	1.0	-	-	-	-	-	-	-
Howella pammelas	-	-	1.4	1.1	1.6	-	-	-	-	-
Carangidae	-	-	-	-	-	-	-	2.1	-	-
Alectis ciliaris	-	-	-	1.1	-	-	-	-	-	-
Caranx spp.	-	-	1.0	-	-	-	-	-	-	-
Chloroscombrus orqueta	-	-	-	-	-	-	-	3.1	-	-
Naucrates ductor	-	1.0	0.7	1.1	0.9	-	-	1.0	-	-
Oligoplites spp.	-	-	1.0	-	-	-	-	-	-	-
Coryphaena spp.	0.8	-	-	-	-	-	-	-	-	-
Coryphaena equiselis	1.2	2.1	4.3	13.2	5.0	1.2	-	0.9	1.1	-
Coryphaena hippurus	-	-	1.2	0.9	-	-	-	-	-	1.1
Gerreidae	-	-	2.2	5.5	-	-	-	-	-	-
Haemulidae	-	-	-	1.1	-	-	-	19.5	-	-
Calamus brachysomus	-	-	-	-	-	-	-	1.0	-	-
Sciaenidae	-	-	-	-	-	-	-	14.3	-	-
Polydactylus approximans	-	-	13.1	1.8	-	-	-	-	-	-
Mullidae	-	-	-	-	-	-	-	20.5	-	-
Kyphosidae	-	-	2.0	-	-	-	-	-	-	-
Mugil spp.	-	-	3.9	1.7	-	-	-	0.9	-	-
Microspathodon spp.	-	-	-	0.9	-	-	-	-	-	-
Chiasmodon niger	-	1.7	1.0	-	-	-	-	-	-	-
Labrisomidae	-	-	0.3	-	-	-	-	-	-	-
Hypsoblennius proteus	-	1.1	-	-	-	-	-	-	-	-
Synchiropus atrilabiatus	-	-	-	-	-	-	-	1.0	-	-
Gobiidae	-	-	1.5	-	-	-	-	-	-	-
Lythrypnus spp.	-	-	1.0	-	-	-	-	-	-	-
Ptereleotris spp.	-	-	0.7	-	-	-	-	-	-	-
Luvarus imperialis	-	-	-	1.3	-	-	-	-	-	-
Nealotus tripes	-	-	0.9	0.7	-	-	-	-	-	-
Trichiuridae	-	-	-	-	-	-	-	1.0	-	-
Scombridae	-	0.8	-	-	-	-	-	1.0	-	-
Auxis spp.	13.5	12.7	14.5	9.2	1.1	-	-	-	-	-
Euthynnus lineatus	-	0.8	2.1	-	-	-	-	-	-	-
Katsuwonus pelamis	-	-	-	-	-	-	-	2.1	-	-
Sarda chiliensis	-	-	-	-	-	-	-	2.1	-	-
Sarda orientalis	-	-	0.8	-	-	-	-	-	-	-
Scomberomorus sierra	-	-	1.2	-	-	-	-	-	-	-
Thunnus spp.	-	-	2.5	0.8	1.2	-	-	-	-	-
Amarsipus carlsbergi	-	-	-	-	1.2	-	-	-	-	-
Cubiceps pauciradiatus	3.3	14.6	5.2	1.5	1.9	-	-	-	-	-
Nomeus gronovii	-	-	0.8	1.3	-	-	-	-	-	-
Psenes cyanophrys	-	-	-	-	1.1	-	-	-	-	-

Taxon	Region 1	2	3	4	5	6	7	8	9	10
Psenes pellucidus	-	-	-	-	0.7	-	-	-	-	-
Psenes sio	1.2	-	-	-	-	-	-	-	-	-
Citharichthys spp.	-	-	-	-	-	-	-	3.1	-	-
Bothus spp.	-	-	1.6	-	-	-	-	1.2	-	-
Cynoglossidae	-	-	-	-	-	-	-	1.0	-	-
Canthidermis maculatus	-	-	-	1.1	-	-	-	-	-	-
Lactoria diaphana	-	2.2	-	-	-	-	-	-	-	-
Diodon holocanthus	2.4	-	-	-	-	-	-	-	-	-
Diodon hystrix	-	-	-	-	3.7	-	-	-	-	-
Disintegrated fish larvae	-	-	-	-	-	-	-	0.9	-	-
Unidentified fish larvae	-	-	-	0.8	-	-	-	-	-	-

Table 6. Numbers (raw counts) and size ranges of juvenile fishes taken in Manta tows on *Jordan* cruise 9010JD and *McArthur* cruise 9010M4. Some larger specimens (e.g., myctophids) may be adults.

STOMIIFORMES
Astronesthidae

Astronesthes gibbsi
M4 16 (1) 29 mm; **M4 18** (1) 34 mm; **M4 21** (1) 37 mm; **M4 24** (1) 77 mm; **M4 76** (1) 33 mm.

MYCTOPHIFORMES
Myctophidae

Lampanyctus omostigma
JD 58 (1) 47; **JD 72** (1) 48.
M4 14 (1) 54 mm; **M4 16** (1) 46 mm; **M4 24** (2) 43-46 mm.

Gonichthys tenuiculus
JD 4 (1) 18 mm; **JD 6** (1) 22 mm; **JD 32** (3) 19-21 mm; **JD 35** (1) 24 mm; **JD 37** (1) 18 mm; **JD 39** (1) 17 mm; **JD 44** (3) 22-24 mm; **JD 46** (1) 21 mm; **JD 47** (1) 15 mm; **JD 51** (2) 15-18 mm; **JD 53** (5) 16-38 mm; **JD 66** (2) 16-42 mm; **JD 68** (2) 16-24 mm; **JD 69** (5) 17-20 mm; **JD 72** (4) 16-17 mm; **JD 73** (2) 18-19 mm; **JD 78** (1) 18 mm.

M4 1 (1) 17 mm; **M4 3** (1) 18 mm; **M4 7** (3) 19-29 mm; **M4 8** (1) 38 mm; **M4 9** (2) 18 mm; **M4 13** (3) 32-36 mm; **M4 14** (12) 15-38 mm; **M4 15** (8) 15-28 mm; **M4 16** (1) 35 mm; **M4 17** (4) 23-41 mm; **M4 18** (20) 16-43 mm; **M4 20** (6) 16-40 mm; **M4 21** (8) 17-45 mm; **M4 22** (4) 17-34 mm; **M4 23** (3) 17-44 mm; **M4 24** (7) 18-42 mm; **M4 25** (4) 34-44 mm; **M4 31** (1) 43 mm; **M4 32** (12) 16-41 mm; **M4 33** (1) 23 mm; **M4 34** (4) 17-42 mm; **M4 37** (10) 16-39 mm; **M4 38** (11) 18-36 mm; **M4 39** (72) 14-42 mm; **M4 40** (5) 18-41 mm; **M4 41** (17) 19-46 mm; **M4 42** (62) 15-45 mm; **M4 43** (23) 16-42 mm; **M4 44** (2) 18 mm; **M4 46** (1) 20 mm; **M4 47** (9) 19-40 mm; **M4 49** (41) 15-46 mm; **M4 52** (7) 16-40 mm; **M4 53** (13) 16-38 mm; **M4 54** (6) 17-44 mm; **M4 55** (9) 17-33 mm; **M4 56** (2) 17-23 mm; **M4 57** (3) 19-46 mm; **M4 58** (1) 17 mm; **M4 59** (8) 17-45 mm; **M4 60** (51) 16-41 mm; **M4 61** (28) 12-44 mm; **M4 62** (6) 19-21 mm; **M4 63** (22) 16-47 mm; **M4 64** (32) 17-40 mm; **M4 65** (12) 19-46 mm; **M4 66** (3) 17-23 mm; **M4 68** (2) 19 mm; **M4 70** (6) 37-45 mm; **M4 71** (5) 22-44 mm; **M4 72** (36) 12-25 mm; **M4 73** (5) 15-49 mm; **M4 75** (30) 17-44 mm; **M4 76** (14) 17-47 mm; **M4 77** (4) 19-37 mm; **M4 78** (11) 18-23 mm; **M4 79** (8) 17-23 mm; **M4 80** (3) 16-18 mm; **M4 86** (1) 41 mm; **M4 89** (1) 20 mm.

Hygophum proximum
JD 76 (1) 23 mm; **JD77** (1) 23 mm; **JD 78** (4) 11-12 mm.

M4 1 (1) 29 mm; **M4 2** (2) 15 mm; **M4 24** (1) 40 mm; **M4 31** (1) 43 mm; **M4 38** (3) 20-49 mm; **M4 42** (1) 30 mm; **M4 79** (1) 22 mm; **M4 87** (1) 19 mm; **M4 88** (56) 13-32 mm; **M4 90** (1) 14 mm.

Hygophum reinhardtii
M4 56 (1) 48 mm.

Myctophum asperum
JD6 (4) 48-55; **JD 7** (1) 19 mm; **JD 30** (1) 17 mm; **JD 68** (5) 14-21 mm; **JD70** (7) 14-15 mm.

M4 31 (4)19-54 mm; **M4 32** (4) 16-20 mm; **M4 33** (1) 15 mm; **M4 35** (1) 13 mm; **M4 36** (1) 29 mm; **M4 37** (7) 14-15 mm; **M4 54** (3) 13-14 mm.

Myctophum aurolaternatum

JD 15 (1) 34 mm; **JD 16** (3) 23-25 mm; **JD 18** (1) 39 mm; **JD 57** (1) 39 mm.

M4 41 (1) 29 mm; **M4 58** (1) 85 mm; **M4 80** (1) 46 mm.

Myctophum lychnobium
JD 6 (2) 66-73 mm; **JD 28** (5) 20-74 mm; **JD 29** (2) 25-74 mm **JD 30** (1) 72 mm; **JD 67** (1) 76 mm; **JD 71** (4) 16-17 mm.

M4 27 (6) 16-33 mm; **M4 28** (4) 18-24 mm; **M4 31** (3) 21-26 mm; **M4 32** (1) 70 mm; **M4 33** (4) 15-24 mm; **M4 78** (1) 70 mm; **M4 82** (1) 32 mm.

Myctophum nitidulum
JD 6 (1) 57 mm; **JD 8** (3) 17-45 mm; **JD 9** (11) 16-51 mm; **JD 10** (10) 17-51 mm; **JD 11** (1) 16 mm; **JD 13** (1) 44 mm; **JD 14** (1) 25 mm; **JD 30** (3) 14-24 mm; **JD 31** (3) 17-18 mm; **JD 32** (13) 15-38 mm; **JD 33** (1) 48 mm; **JD 34** (2) 17-25 mm; **JD 35** (3) 17-18 mm; **JD 41** (1) 18 mm; **JD 51** (3) 15-21 mm; **JD 52** (1) 16; **JD 68** (13) 16-28 mm; **JD 70** (11) 16-18.

M4 9 (3) 22-23 mm; **M4 16** (2) 16-17 mm; **M4 17** (11) 16-25 mm; **M4 18** (3) 20-34 mm; **M4 23** (1) 20 mm; **M4 25** (1) 21 mm; **M4 26** (1) 19 mm; **M4 31** (1) 17 mm; **M4 32** (16) 16-39 mm; **M4 33** (2) 15-17 mm; **M4 34** (14) 15-29 mm; **M4 35** (11) 15-34 mm; **M4 37** (10) 16-28 mm; **M4 38** (15) 16-62 mm; **M4 39** (23) 16-28 mm; **M4 40** (5) 17-37 mm; **M4 41** (22) 16-46 mm; **M4 42** (1) 18 mm; **M4 43** (2) 17-24 mm; **M4 52** (2) 15-35 mm; **M4 53** (8) 15-57 mm; **M4 54** (5) 17-37 mm; **M4 55** (10) 16-18 mm; **M4 57** (1) 16 mm; **M4 58** (10) 17-57 mm; **M4 59** (1) 17 mm; **M4 60** (8) 16-30 mm; **M4 61** (2) 16-27 mm; **M4 63** (1) 17 mm; **M4 64** (13) 16-51 mm; **M4 65** (1) 25 mm; **M4 70** (1) 41 mm; **M4 71** (3) 19-22 mm; **M4 72** (1) 18 mm; **M4 77** (1) 18 mm; **M4 78** (7) 16-19 mm; **M4 79** (27) 16-20 mm; **M4 80** (5) 17-25 mm; **M4 83** (8) 18-21 mm; **M4 84** (4) 17-20 mm; **M4 85** (1) 19 mm.

Myctophum obtusirostrum
JD 10 (1) 14 mm; **JD 35** (4) 13-15 mm; **JD 67** (1) 14 mm.

Symbolophorus evermanni
JD 29 (1) 19 mm; **JD 32** (1) 21 mm; **JD 35** (3) 19-21 mm; **JD 36** (1) 22 mm; **JD 41** (1) 62 mm; **JD 51** (2) 20-21 mm; **JD 52** (1) 20 mm; **JD 67** (5) 17-21 mm; **JD 70** (2) 21-22 mm; **JD 71** (3) 20-22 mm.

M4 12 (1) 61 mm; **M4 16** (1) 20 mm; **M4 17** (24) 20-23 mm; **M4 31** (2) 19 mm; **M4 32** (2) 19-21 mm; **M4 33** (3) 20-22 mm; **M4 34** (1) 22 mm; **M4 36** (1) 18 mm; **M4 52** (1) 19 mm; **M4 66** (2) 64-65 mm; **M4 75** (1) 42 mm; **M4 78** (1) 23 mm.

BELONIFORMES

Scomberesocidae

Elassichthys adocetus
M4 58 (4) 34-44 mm; **M4 61** (1) 32 mm; **M4 63** (1) 45 mm; **M4 67** (3) 41-45 mm; **M4 72** (2) 40-43 mm; **M4 75** (1) 28 mm.

Scomberesox saurus
M4 67 (2) 31-39 mm; **M4 68** (1) 35 mm.

Exocoetidae

Exocoetus monocirrhus

JD 54 (2) 16-25 mm; **JD 79** (1) 19 mm.
M4 17 (1) 32 mm; **M4 39** (1) 22 mm.

Exocoetus volitans
JD 68 (1) 35.
M4 83 (1) 31 mm.

Oxyporhamphus micropterus
JD 19 (1) 26 mm.

PERCIFORMES

Carangidae

Naucrates ductor
M4 63 (1) 32 mm.

Coryphaenidae

Coryphaena equiselis
JD 16 (1) 105 mm.
M4 49 (1) 14 mm; **JD 58** (1) 40 mm.

Bramidae

Brama dussumieri
M4 18 (1) 10 mm.

Polynemidae

Polydactylus approximans
JD 18 (1) 30 mm; **JD 19** (1) 21 mm; **JD 20** (1) 14 mm; **JD 55** (1) 14 mm.
M4 71 (2) 20-26 mm.

Scombridae

Auxis spp.
M4 49 (1) 23 mm.

Nomeidae

Nomeus gronovii
M4 55 (1) 31 mm.

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