SURVEY OF PELAGIC FISHES OF THE CALIFORNIA CURRENT AREA

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ABSTRACT

The pelagic fishes off central California to central Baja California were surveyed with four kinds of nekton-collecting nets. Construction and operation of one of these nets, the collapsible midwater beam trawl, are described. The survey was made during eight cruises between May 1961 and March 1963. More than 189 fish species and about 52,000 specimens were taken. The number and size range of specimens at each station of capture are listed for all the species; charts of the location of capture are given for most species; and several species are illustrated. The records for many of the species are annotated with remarks and data on taxonomy, range, ecology, and ontogeny.

A survey of the nekton off central California to central Baja California was begun in January 1962 by the Life History and Taxonomy Program of the Bureau of Commercial Fisheries, California Current Resources Laboratory, La Jolla, Calif. The purpose of this survey was twofold: to begin to learn what larger pelagic organisms (primarily fishes) occur in the area sampled and to investigate certain aspects of the life history of the hake (*Merluccius*), a species of potential commercial importance. This report presents a list of the more than 189 species of fishes taken on the survey, with annotations on life history, distribution, and taxonomy for many of the species. A subsequent report will give data obtained on the hake other than records of occurrence. The invertebrates collected were placed in the Marine Invertebrate Collection of Scripps Institution of Oceanography.

Since development of the Isaacs-Kidd midwater trawl (IKMWT) in 1950, a large number of tows have been made in the Pacific with this type of net (Aron, 1960; King and Iversen, 1962; Clarke, 1963). Specimens collected with the IKMWT have been deposited in various museums, but only the collections made by Aron (1960) have been reported comprehensively. Wisner (1962) gave a list of species and numbers of each taken in 14 IKMWT tows during Operation "Wigwam" off Baja California.

In addition to the 10-ft. IKMWT, this survey used a 10- by 14-ft. collapsible midwater beam trawl (CMWBT), to be described in a later section, a 5- by 5-ft. nekton net (Blackburn, 1960: 53–55), and the large *Cobb* Mark–II pelagic trawl of about 70- by 80-ft. mouth opening (McNeely, 1963).

After examining the catches made by the various nets, it seems obvious that none of the nets used is adequate by itself to sample the nekton of the bathypelagic area and that a variety of nets should be used in future surveys. The *Cobb* trawl, because of its large size, is more efficient than other nets used in catching the larger and more elusive organisms. Direct comparisons of the catching efficiencies of these nets are not made in this report, because of the many variables that entered into the survey.

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CRUISES

This report has used the collections from eight cruises made from May 1961 through March 1963 (table 1). Four cruises were made by the Bureau's R/V *Black Douglas* (B6203, B6204, and B6212, and B6303); two by the R/V *John N. Cobb* through cooperation of the Bureau of Commercial Fisheries Exploratory Fishing Base, Seattle, Wash. (C6208 and C6303); and two cruises by the R/V *Horizon* through cooperation of Scripps Institution of Oceanography (H6105 and H6204). The cruises are briefly summarized below. The stations at which no fish were caught are listed below as "negative tows." The depths of tows in meters and the number of tows (in parentheses) follow the information on the types of nets used.

Cruise H6105: R/V *Horizon;* May 27–28, 1961; 135 to 160 km. (85 to 100 miles) west of San Diego, Calif.; 5 tows with IKMWT: 18 (2), 178 (1), 705–1,093 (2).

Cruise B6203: R/V *Black Douglas;* March 2–30, 1962; San Francisco, Calif., to south-central Baja California, up to 970 km. (600 miles) seaward; 29 tows with CMWBT and 2 tows with 5- x 5-ft. nekton net: 9–132 (6), 256–264 (9), 419–423 (15), 622 (1); negative tows, stations 70.80a, 70.130, 80.51, 80.80, 90.150; other cruise work, oblique tows with 1-m. standard plankton nets and 2-m. stramin nets, bottom trawls with 16-ft. otter trawls.

Cruise H6204: R/V *Horizon;* March 16 to April 24, 1962; San Francisco, Calif., to Cedros Island, Baja California, up to 970 km. (600 miles) seaward; 48 tows with IKMWT: 148 (1), 298 (25), 410 (1), 1,490 (1), 1,676 (14), 1,863 (4), 2,234 (2).

Cruise B6204: R/V *Black Douglas;* April 6–7, 1962; 16 to 19 km. (10 to 12 miles) SW. of San Diego, Calif.; 6 tows with CMWBT: 38 (3), 282 (1), 564 (2); other cruise work, oblique tows with 1-m. standard plankton net.

Cruise C6208: R/V *John N. Cobb;* August 6 to September 7, 1962; San Francisco, Calif., to Ensenada, Baja California, up to 970 km. (600 miles) seaward; 61 tows with *Cobb* pelagic trawl Mark II: surface–92 (34), 183–296 (4), 366–403 (23); negative tows, stations 90.49a, 91.39c.

TABLE 1.—*Pelagic survey station data*

[Asterisks indicate that values are approximate]

Station	Vessel and cruise	Sequence occupied	Location of haul				Date	Time of tow (P.s.t.)		Depth of bottom	Towing wire out	Depth fished	Type of haul
			Start		End			Start	End				
			Lat. N.	Long. W.	Lat. N.	Long. W.							
								Hour	*Hour*	*M.*	*M.*	*M.*	
60.55	C6208	91	37°45.5′	123°20.3′	37°42.0′	123°23.8′	6 Aug. 1962	1750	2000	1,189–2,379	1,052	*366	Oblique.
60.60	H6204	39	37°36.6′	123°37.0′			26–27 Mar. 1962	2024	0005	3,331	5,032	*1,863	Horizontal.
60.60	C6208	92	37°37.0′	123°37.0′	37°42.2′	123°34.0′	7 Aug. 1962	0655	0915	3,111–2,928	1,052	*366	Oblique.
60.70	H6204	41	37°07.9′	124°25.0′			27 Mar. 1962	0613	0750	3,843	805	*298	Horizontal.
60.70	C6208	93	37°22.2′	124°12.3′	37°17.8′	124°15.0′	7 Aug. 1962	1440	1657	3,843	1,052	*366	Oblique.
60.80	H6204	42	36°54.0′	125°04.4′			27 Mar. 1962	1250	2000	4,117	6,039	*2,234	Horizontal.
60.80	C6208	94	36°55.5′	125°04.0′	37°03.5′	124°59.0′	7–8 Aug. 1962	2225	0025	4,209	1,052	*366	Oblique.
60.90	H6204	43	36°34.4′	125°46.0′			28 Mar. 1962	0012	0147	4,392	805	*298	Horizontal.
60.90	C6208	95	36°36.0′	125°38.4′	36°38.6′	125°34.0′	8 Aug. 1962	0655	0905	4,484	1,052	*366	Oblique.
60.100	H6204	45	36°17.0′	126°31.0′			28 Mar. 1962	0809	1226	4,502	4,032	*1,803	Horizontal.
60.100	C6208	96	36°15.0′	126°32.0′	36°12.8′	126°25.0′	8 Aug. 1962	1545	1800	4,575	1,052	*366	Oblique.
60.120	B6203	20	35°27.2′	128°00.0′			13 Mar. 1962	0035	0400	4,575	604	*1,419	Do.
60.120	H6204	46	35°35.2′	127°54.0′			28–29 Mar. 1962	2205	0010	3,697	805	*298	Horizontal.
60.140	H6204	48	34°57.0′	129°19.0′			29 Mar. 1962	1022	1511	4,602	5,032	*1,863	Do.
60.160	B6203	21	34°19.0′	130°39.5′			13–14 Mar. 1962	2310	0210	5,124	604	*423	Oblique.
60.160	H6204	50	34°16.0′	130°41.5′			29–30 Mar. 1962	2330	0110	4,868	805	*298	Horizontal.
60.180	B6203	22	33°40.5′	132°00.0′			14 Mar. 1962	1140	1425	5,124	604	*423	Do.
60.180	H6204	51	33°38.0′	131°54.0′			30 Mar. 1962	1300	1650	4,826	4,026	*419	Do.
60.200a	B6203	23	32°56.8′	133°26.8′			15 Mar. 1962	0050	0400	4,941	604	*423	Oblique.
60.200b	B6203	24	32°56.8′	133°26.8′			15 Mar. 1962	0400	0520	4,941	92	*31	Do.
60.200	H6204	52	32°55.0′	133°28.0′			31 Mar. 1962	0255	0425	5,051	805	*298	Horizontal.
65.54	C6208	105	37°05.0′	122°34.0′	36°59.0′	122°32.5′	15 Aug. 1962	0044	0145	110–275	92	24	Do.
66.50a	C6208	102	36°57.0′	122°10.5′	36°55.5′	122°07.0′	11 Aug. 1962	0044	0144	55	47	24	Do.
66.50b	C6208	103	36°58.0′	122°09.8′	36°57.0′	122°07.0′	11 Aug. 1962	0330	0430	31	47	24	Do.
66.100	C6208	97	35°29.0′	125°51.2′	35°23.0′	125°52.4′	8–9 Aug. 1962	2325	0125	4,575	183	*46	Do.
68.50	C6208	104	36°43.0′	121°58.5′	36°42.0′	121°58.0′	13 Aug. 1962	0841	0912	183–92	366	*92	Do.
70.51	C6208	106	36°10.5′	121°48.0′	36°08.0′	121°47.0′	15 Aug. 1962	1432	1532	238–677	686	201	Do.
70.60	C6208	101	35°14.0′	123°52.0′	35°07.5′	123°58.5′	9–10 Aug. 1962	2312	0112	4,118	1,052	*366	Oblique.
70.80a	B6203	17	35°13.5′	123°47.6′			6 Mar. 1962	1930	2300	4,026	604	*256	Do.
70.80b	B6203	18	35°13.5′	123°47.6′			6 Mar. 1962	2300	2400	4,026	121	*29	Horizontal.
70.80–5n	B6203	19	35°18.0′	123°44.0′			7 Mar. 1962	0040	0235	4,026	92	*9	Do.
70.80	C6208	100	35°14.0′	123°52.0′	35°07.5′	123°58.5′	9–10 Aug. 1962	2312	0112	4,118	47	24	Do.
70.90	B6203	16	34°53.0′	124°30.0′			6 Mar. 1962	1050	1455	4,209	604	*256	Oblique.
70.90	C6208	99	34°53.0′	124°33.0′	34°47.0′	124°31.0′	9 Aug. 1962	1520	1720	4,209	47	24	Horizontal.
70.100	C6208	98	34°34.0′	125°15.0′	34°30.0′	125°12.0′	9 Aug. 1962	0810	1020	4,667	1,052	*366	Oblique.
70.130	B6203	15	33°39.0′	127°00.0′			5 Mar. 1962	1200	1520	3,660	604	*423	Do.
70.200	H6204	53	31°15.0′	132°07.8′			31 Mar. 1962	1905	2330	4,694	4,529	*1,676	Horizontal.

TABLE 1.—*Pelagic survey station data*—Continued

Station	Vessel and cruise	Sequence occupied	Location of haul				Date	Time of tow (P.s.t.)		Depth of bottom	Towing wire out	Depth fished	Type of haul
			Start		End			Start	End				
			Lat. N.	Long. W.	Lat. N.	Long. W.		Hour	Hour	M.	M.	M.	
73.200	B6203	25	30°38.0′	131°53.2′			15-16 Mar. 1962	2310	0210	4,758	604	*423	Do.
77.51	C6208	107	35°01.5′	121°00.0′	34°59.4′	120°59.3′	16 Aug. 1962	0033	0133	348–366	110	*13	Do.
79.54	B6303	163	34°32.0′	120°50.5′	34°30.5′	120°53.2′	1 Mar. 1963	1513	1640	503	600	*386	Oblique.
80.51	B6203	6	34°26.5′	120°32.8′			2 Mar. 1962	1750	2110	119	132	*92	Do.
80.52	C6208	112	34°22.3′	120°44.0′	34°18.0′	120°43.5′	20 Aug. 1962	0227	0447	458–686		*34	Horizontal.
80.52	C6303	164	34°31.8′	120°40.2′	34°29.4′	120°37.7′	1 Mar. 1963	1800	1955	77–81	92	*27	Do.
80.55	H6204	26	34°18.6′	120°48.0′			16 Mar. 1962	1927	2135	695	805	*298	Do.
80.60	B6203	7	34°10.0′	121°09.7′			2–3 Mar. 1962	2340	0235	2,196	377	*264	Oblique.
80.60	H6204	28	34°06.6′	121°08.0′			17 Mar. 1962	0100	0236	2,196	805	*298	Horizontal.
80.60	C6208	113	34°09.5′	121°11.0′	34°05.8′	121°08.0′	20 Aug. 1962	0850	1100	2,196	1,052	*366	Oblique.
80.60	C6303	165	34°11.1′	121°10.0′	34°06.1′	121°04.4′	4 Mar. 1963	1550	1830	1,501	648	*201	Horizontal.
80.65	B6303	166	33°59.0′	121°30.5′	33°53.2′	121°27.7′	4 Mar. 1963	2011	2140	3,294	150	*55	Oblique.
80.70	B6203	8	33°49.2′	121°51.8′			3 Mar. 1962	0830	0935	3,660	377	*264	Do.
80.70	H6204	29	33°54.0′	121°50.0′			17 Mar. 1962	0948	1424	4,260	5,032	*1,863	Horizontal.
80.70	C6208	114	33°48.7′	121°51.0′	33°42.5′	121°49.7′	20 Aug. 1962	1600	1813	3,660	1,052	*366	Oblique.
80.70	C6303	167	33°40.0′	121°54.4′	33°44.0′	121°49.7′	4–5 Mar. 1963	2302	0125	3,569	64	22	Horizontal.
80.75	B6303	168	33°39.0′	122°11.5′	33°34.7′	122°29.0′	5 Mar. 1963	0445	0725	3,660			Oblique.
80.80	B6203	9	33°28.7′	122°32.6′			3 Mar. 1962	1405	1635	3,660	377	*264	Do.
80.80	H6204	30	33°33.0′	122°35.0′			17 Mar. 1962	2045	2230	4,209	805	*298	Horizontal.
80.80	C6208	115	33°26.0′	122°30.0′	33°21.0′	122°29.0′	20-21 Aug. 1962	2320	0120	4,392		24	Do.
80.80	C6303	169	33°30.0′	122°38.0′	33°22.3′	122°38.2′	5 Mar. 1963	0605	0850	4,026	640	*183	Do.
80.90	B6203	10	33°09.0′	123°14.0′			3 Mar. 1962	2030	2200	4,392	377	*264	Oblique.
80.90–5m	B6203	11	33°07.0′	123°15.0′			3 Mar. 1962	2300	2400	4,392	92	*9	Horizontal.
80.90	H6204	32	33°13.1′	123°16.0′			18 Mar. 1962	0500	1050	4,172	6,039	*2,234	Do.
80.100	B6203	12	32°49.0′	123°55.0′			4 Mar. 1962	0330	0635	3,660	377	*264	Oblique.
80.100	H6204	33	32°57.0′	123°56.0′			18 Mar. 1962	1512	1654	3,935	805	*298	Horizontal.
80.110	B6203	13	32°28.3′	124°36.2′			4 Mar. 1962	0930	1150	4,392	377	*264	Oblique.
80.120	B6203	14	32°08.7′	125°17.8′			4 Mar. 1962	1630	1915	4,209	377	*264	Do.
80.130	C6208	116	31°55.0′	126°06.0′	31°50.0′	126°07.5′	22 Aug. 1962	0600	0700	4,392	128	24	Horizontal.
80.140	C6208	117	31°26.0′	126°39.0′	31°24.0′	126°40.0′	22 Aug. 1962	1110	1245	4,392	1,200	*403	Oblique.
80.150	C6208	118	31°10.0′	127°17.5′	31°06.0′	127°18.0′	22 Aug. 1962	1750	1925	4,392	1,200	*403	Do.
80.160	C6208	119	30°50.0′	127°57.0′	30°47.0′	127°55.0′	22-23 Aug. 1962	2250	0050	4,026		24	Horizontal.
80.170	C6208	120	30°30.0′	128°36.0′	30°27.0′	128°38.0′	23 Aug. 1962	0652	0825	4,392	1,200	*403	Oblique.
80.180	C6208	121	30°07.0′	129°16.0′	30°05.0′	129°19.0′	23 Aug. 1962	1135	1315	4,392	1,200	*403	Do.
80.190	C6208	122	29°49.0′	129°55.0′	29°46.0′	129°54.0′	23 Aug. 1962	1835	1935	4,392		24	Horizontal.
80.200	H6204	54	29°29.0′	130°36.0′			1 Apr. 1962	1358	1535	4,502	805	*298	Do.
80.210	C6208	123	29°29.0′	130°36.0′	29°26.0′	130°34.0′	23-24 Aug. 1962	2350	0140	4,392	1,200	*403	Oblique.
82.41	C6208	108	34°18.0′	119°55.0′	34°18.0′	119°53.0′	16 Aug. 1962	1951	2051	458		18	Horizontal.
82.60	C6303	191	33°26.3′	121°27.1′	33°23.8′	121°24.0′	13 Mar. 1963	1947	2140	3,660	549	*165	Do.
83.70	C6303	183	33°12.0′	121°26.7′	33°08.5′	121°26.0′	8 Mar. 1963	1810	2130	4,026	686	*183	Do.
83.70a	B6303	184	33°18.0′	121°32.0′	33°13.5′	121°27.5′	8 Mar. 1963	1933	2064	4,026	300	*113	Do.
83.70b	B6303	185	33°12.5′	121°27.5′	33°11.5′	121°25.2′	8 Mar. 1963	2058	2215	4,026	80	18	Do.
83.70c	B6303	186	33°11.5′	121°25.2′	33°09.0′	121°20.2′	8–9 Mar. 1963	2219	0020	4,026	400	*168	Do.
83.72	B6303	188	33°10.7′	121°30.0′	33°04.8′	121°25.0′	9 Mar. 1963	0850	1115	3,660	600	*201	Do.
83.77	C6303	172	33°04.0′	121°58.8′	32°58.0′	121°55.5′	6 Mar. 1963	0800	1015	3,843	1,464	*489	Do.
83.90	C6303	170	32°37.7′	122°47.2′	32°31.4′	122°49.3′	5 Mar. 1963	1400	1700	3,843	1,144	*366	Do.
84.67	C6303	192	33°12.8′	121°11.0′	33°09.5′	121°08.2′	13 Mar. 1963	1517	1710	3,294	961	*238	Oblique.
84.68	C6303	191	33°12.3′	121°12.0′	33°09.3′	121°09.5′	13 Mar. 1963	1243	1420	3,477	824	*247	Horizontal.
84.70	C6303	187	33°06.5′	121°21.5′	33°00.0′	121°19.0′	8–9 Mar. 1963	2350	0300	4,026	824	*220	Do.
84.71	C6303	182	33°09.0′	121°28.0′	33°05.0′	121°26.5′	8 Mar. 1963	1310	1530	4,026	1,098	*311	Oblique.
84.92	B6303	171	32°19.0′	122°52.0′	32°14.0′	122°48.0′	6 Mar. 1963	0305	0525	3,660	700	*311	Do.
85.68	C6303	189	33°05.0′	121°12.0′	33°03.0′	121°07.0′	9 Mar. 1963	1410	1630	2,562	869	*238	Horizontal.
86.92	C6303	175	32°07.3′	122°39.5′	32°00.5′	122°41.4′	6 Mar. 1963	1617	1945	4,209	1,738	*640	Do.
87.70a	B6303	162	32°29.3′	121°09.0′	32°32.0′	121°04.0′	28 Feb. 1963	0645	0845	3,843	650	*274	Oblique.
87.70b	B6303	194	33°14.0′	121°22.0′			18 Mar. 1963	0825	1540	3,843	800		Do.
87.80	C6303	181	32°17.0′	121°44.0′	32°20.8′	121°45.5′	8 Mar. 1963	0525	0755	3,843	1,738	*640	Horizontal.
87.90	C6303	176	31°40.5′	122°03.5′	31°37.0′	122°04.3′	6–7 Mar. 1963	2238	0020	4,026	64	16	Do.
87.200	B6203	27	28°20.0′	130°22.0′			16-17 Mar. 1962	2035	0100	4,758	604	*423	Oblique.
88.105a	B6303	173	31°06.0′	123°12.2′	31°04.6′	123°07.5′	6 Mar. 1963	1313	1525	4,026	800	*311	Do.
88.105b	B6303	174	31°04.6′	123°07.5′	31°03.0′	123°02.0′	6 Mar. 1963	1537	1756	4,026	800	*320	Horizontal.
90.32	B6203	38	33°20.2′	118°05.3′			22 Mar. 1962	0953	1501	769–549	800	*622	Oblique.
90.32	H6204	65	33°19.0′	118°02.7′			6–7 Apr. 1962	2320	0215	787	800	*298	Horizontal.
90.35	B6203	37	33°21.0′	118°18.3′			22 Mar. 1962	0345	0440	86	190	86	Do.
90.45a	H6105	4	32°45.0′	118°48.6′	33°00.1′	119°05.2′	27-28 May 1961	2335	0505	1,391–1,684	1,812	1,093	Do.
90.45b	H6105	5	33°00.9′	119°08.3′	32°48.1′	118°44.1′	28 May 1961	0535	1015	1,510	30	18	Do.
90.45	H6204	63	32°55.5′	118°54.5′			6 Apr. 1962	1605	1735	1,720	800	*298	Do.
90.47	C6208	110	32°49.0′	119°08.0′	32°46.5′	118°57.0′	17 Aug. 1962	1507	1807	1,007–1,373	1,052	*366	Oblique.
90.48a	H6105	1	32°49.6′	119°05.7′	32°53.4′	119°09.5′	27 May 1961	1055	1400	842	1,006	*704	Horizontal.
90.48b	H6105	2	32°46.0′	119°05.4′	32°51.4′	119°10.7′	27 May 1961	1500	1720	842	251	178	Do.
90.48c	H6105	3	32°44.4′	119°05.1′	32°49.0′	119°10.0′	27 May 1961	1845	2100	641	49	18	Do.
90.49a	C6208	109	32°46.0′	119°12.0′	32°44.0′	119°09.0′	17 Aug. 1962			183–55		18	Do.
90.49b	C6208	111	32°46.0′	119°12.0′	32°44.0′	119°09.0′	17 Aug. 1962	2127	2227	183–55		18	Do.
90.60	B6203	36	32°21.0′	119°46.8′			20-21 Mar. 1962	2315	0305	1,007	604	*423	Do.
90.60	H6204	61	32°38.5′	120°06.0′			6 Apr. 1962	0450	0620	1,610	403	*148	Do.
90.60	C6208	134	32°25.0′	119°58.5′	32°22.5′	119°55.0′	28 Aug. 1962	1220	1400	842–915	1,200	*403	Oblique.
90.70	H6204	60	31°57.0′	120°37.0′			5 Apr. 1962	2100	2240	3,697	800	*298	Horizontal.
90.70	C6208	133	32°05.0′	120°41.5′	32°03.0′	120°39.0′	28 Aug. 1962	0345	0540	3,843	1,200	*403	Oblique.
90.80	C6208	132	31°46.5′	121°33.0′	31°42.0′	121°20.0′	27 Aug. 1962	2013	2215	3,843		24	Horizontal.
90.90	C6303	180	31°21.0′	122°01.0′	31°33.2′	121°56.0′	7–8 Mar. 1963	2050	0025	4,118	229	*82	Do.
90.100	C6208	131	31°03.0′	122°32.0′	31°00.0′	122°33.0′	27 Aug. 1962	0945	1140	4,026	1,200	*403	Oblique.
90.110	B6203	35	30°42.5′	123°21.2′			19 Mar. 1962	1820	2105	3,843	600	*423	Horizontal.
90.110	C6303	178	30°47.0′	123°18.8′	30°43.0′	123°20.0′	7 Mar. 1963	0512	0640	4,392	275	*92	Do.
90.120	H6204	59	30°28.8′	124°06.6′			4 Apr. 1962	1045	1600	4,081	4,530	*1,676	Do.
90.120	C6208	130	30°27.0′	123°59.0′	30°22.0′	124°00.0′	26-27 Aug. 1962	2213	0015	4,026		24	Do.
90.140	H6204	58	29°42.1′	125°16.0′			3-4 Apr. 1962	2242	0026	4,264	800	*298	Do.
90.140	C6208	129	29°42.0′	125°21.0′	29°38.0′	125°24.0′	26 Aug. 1962	1030	1230	4,392	1,200	*403	Oblique.
90.150	B6203	34	29°25.0′	125°59.5′			18 Mar. 1962	1715	1945	4,209	600	423	Horizontal.
90.150	C6208	128	29°24.0′	125°57.0′	29°22.0′	126°02.0′	26 Aug. 1962	0245	0445	4,246		24	Do.
90.160	H6204	57	29°03.0′	126°37.5′			3 Apr. 1962	0810	1223	4,365	4,530	*1,676	Do.

TABLE 1.—*Pelagic survey station data*—Continued

Station	Vessel and cruise	Sequence occupied	Location of haul				Date	Time of tow (P.s.t.)		Depth of bottom	Towing wire out	Depth fished	Type of haul
			Start		End								
			Lat. N.	Long. W.	Lat. N.	Long. W.		Start	End				
								Hour	*Hour*	*M.*	*M.*	*M.*	
90.160	C6208	127	29°05.0′	126°38.0′	29°03.0′	126°42.0′	25 Aug. 1962	1930	2110	4,301	1,200	*403	Oblique.
90.180	B6203	31	28°25.0′	127°58.0′			18 Mar. 1962	0020	0200	4,026	600	*423	Horizontal.
90.180	H6204	56	28°22.0′	128°00.0′			2 Apr. 1962	1900	2040	4,484	800	*298	Do.
90.180	C6208	126	28°26.0′	127°57.0′	28°23.0′	128°00.0′	25 Aug. 1962	0600	0740	4,392	1,200	*403	Oblique.
90.190	C6208	125	28°06.5′	128°33.0′	28°03.5′	128°40.0′	24–25 Aug. 1962	2225	0025	4,392		24	Horizontal.
90.300	H6204	55	27°46.0′	129°14.9′			2 Apr. 1962	0534	1006	4,209	4,530	1,676	Do.
90.200	C6208	124	27°46.0′	129°14.0′	27°43.0′	129°16.0′	24 Aug. 1962	1525	1705	4,392	1,200	*403	Oblique.
91.39a	C6208	146	32°53.3′	118°23.8′	32°32.8′	118°23.0′	5 Sept. 1962	2037	2120	732		36	Horizontal.
91.39b	C6208	147	32°52.9′	118°24.0′	32°51.8′	118°22.0′	6 Sept. 1962	0015	0134	366		Surface	Do.
91.39c	C6208	148	32°51.7′	118°22.5′	32°51.5′	118°22.0′	6 Sept. 1962	1005	1030				Do.
92.28	C6208	150	32°59.5′	117°24.0′	33°03.0′	117°24.5′	6 Sept. 1962	2256	2356	458		Surface	Do.
92.115	B6303	177	30°18.8′	123°27.3′	30°12.0′	123°24.0′	7 Mar. 1963	0030	0255	4,026	250	*73	Do.
93.26	C6208	141	33°03.5′	117°19.2′	33°01.5′	117°18.0′	3 Sept. 1962	2017	2130	37–55		36	Do.
93.28	C6208	142	32°58.5′	117°23.0′	33°00.5′	117°24.0′	3–4 Sept. 1962	2315	0015	549		Surface	Do.
93.29	C6208	140	32°53.5′	117°25.0′	32°53.5′	117°27.0′	3 Sept. 1962	0840	1215	549	915	201	Do.
93.31	C6303	190	32°51.1′	117°35.8′	32°49.2′	117°32.3′	12 Mar. 1963	1305	1510	732	915	*274	Do.
93.100	C6303	179	30°31.2′	122°15.7′	30°26.2′	122°09.8′	7 Mar. 1963	1215	1450	4,026	549	*105	Do.
94.28a	C6208	139	32°49.5′	117°20.0′	32°47.5′	117°20.5′	2 Sept. 1962	0115	0215	82		73	Do.
94.28b	C6208	143	32°50.5′	117°20.0′	32°48.0′	117°19.5′	4 Sept. 1962	0230	0400	64		Surface	Do.
94.29a	C6208	135	32°47.0′	117°19.5′	32°45.5′	117°19.0′	31 Aug. 1962	1142	1310	366		296	Do.
94.29b	C6208	136	32°44.0′	117°18.0′	32°46.0′	117°18.5′	1 Sept. 1962	0745	0943	73		*9	Do.
94.29c	C6208	137	32°46.5′	117°18.5′	32°45.0′	117°19.7′	1 Sept. 1962	1913	2022	73–146		*82	Do.
94.29d	C6208	149	32°43.5′	117°17.5′	32°42.0′	117°17.5′	6 Sept. 1962	1715	1820	55		Surface	Do.
94.29e	C6208	151	32°47.0′	117°19.0′	32°44.0′	117°18.0′	7 Sept. 1962	0142		55		Surface	Do.
94.30	C6208	144	32°39.0′	117°24.5′	32°38.0′	117°22.5′	4 Sept. 1962	2025	2131	275		183	Do.
94.32a	B6204	67	32°33.0′	117°27.5′	32°35.4′	117°30.8′	7 Apr. 1962	0218	0350	92	92	*37	Do.
94.32b	B6204	68	32°35.4′	117°30.8′	32°38.6′	117°33.3′	7 Apr. 1962	0400	0545	92	92	*37	Do.
95.30	C6208	145	32°37.0′	117°23.0′	32°35.0′	117°21.5′	4 Sept. 1962	2025	2131	275		Surface	Do.
95.31a	B6204	62	32°29.0′	117°21.5′	32°30.6′	117°23.1′	6 Apr. 1962	1320	1422	549–641	400	*282	Do.
95.31b	B6204	64	32°29.0′	117°21.6′	32°30.7′	117°24.5′	6–7 Apr. 1962	2305	0025	961	800	*563	Oblique.
95.31c	B6204	66	32°31.4′	117°21.6′	32°30.7′	117°24.5′	7 Apr. 1962	0043	0207	137	92	*37	Horizontal.
95.31d	B6204	69	32°30.7′	117°23.4′	32°32.2′	117°25.5′	7 Apr. 1962	1434	1625	686–1098	800	*563	Do.
97.40	C6303	197	31°49.0′	117°53.0′	31°45.2′	117°46.7′	21 Mar. 1963	1822	2115	421–439	732	*274	Oblique.
97.50	B6203	40	31°35.0′	118°30.7′			27 Mar. 1962	0140	0415	2,196	600	*423	Horizontal.
97.65	C6303	195	31°00.0′	119°32.0′	30°54.7′	119°28.4′	19 Mar. 1963	0858	1245	3,477	1,372	*458	Do.
99.31	C6208	138	31°54.4′	116°59.0′	31°51.5′	116°57.5′	1–2 Aug. 1962	2245	0020	732		66	Do.
100.40	H6204	70	31°21.2′	117°26.7′			12 Apr. 1962	0229	0414	1,874	800	*298	Do.
100.40	C6303	198	31°21.0′	117°27.0′	31°18.0′	117°27.3′	22 Mar. 1963	0450	0620	1,995	92	22	Do.
100.50	H6204	71	31°00.0′	118°09.9′			12 Apr. 1962	1020	1155	1,739	800	*298	Do.
100.60	H6204	72	30°39.0′	118°45.5′			12–13 Apr. 1962	2120	0205	2,782	4,530	*1,676	Do.
100.65	C6303	196	30°32.5′	119°09.8′	30°26.4′	119°06.2′	19 Mar. 1963	1530	1930	3,111	1,372	*458	Do.
100.80	H6204	73	29°58.5′	120°07.0′			13 Apr. 1962	1630	2100	3,962	4,530	*1,676	Do.
100.90	H6204	74	29°38.0′	120°46.8′			14 Apr. 1962	0048	0305	3,861	800	*298	Do.
100.100	H6204	75	29°19.0′	121°25.0′			14 Apr. 1962	0941	1347	3,843	4,530	*1,676	Do.
100.120	H6204	76	28°40.5′	122°46.8′			14 Apr. 1962	2230		4,099	800	*298	Do.
100.140	H6204	77	27°59.4′	124°05.8′			15 Apr. 1962	1008	1416	4,209	4,530	*1,676	Do.
100.160	H6204	78	27°22.6′	125°20.0′			6 Apr. 1962	0306	0724	4,145	4,530	*1,676	Do.
103.50	C6303	199	30°18.4′	117°47.0′	30°05.5′	117°45.2′	22 Mar. 1963	1300	1830	2,837	824	220	Do.
107.60	C6303	200	29°30.0′	118°00.0′	29°21.0′	118°00.0′	22–23 Mar. 1963	2230	0200	3,569	46	9	Do.
108.63	C6303	201	29°12.1′	118°09.0′	29°13.8′	118°03.5′	23 Mar. 1963	0328	0620	1,830	1,372	*458	Do.
110.35	H6204	84	29°46.5′	115°58.5′			21 Apr. 1962	0200	0400	1,153	800	*298	Do.
110.35	C6303	203	29°46.3′	116°01.2′	29°42.8′	115°59.0′	23 Mar. 1963	2100	2315	1,153	732	*201	Do.
110.36	C6303	204	29°41.2′	116°41.2′	29°36.2′	115°59.0′	24 Mar. 1963	1225	1624	1,830	1,190	*403	Do.
110.40	H6204	83	29°32.4′	116°15.1′			20 Apr. 1962	2120	2300	2,416	800	*298	Do.
110.46	C6303	202	29°28.4′	116°47.0′	29°25.8′	116°45.0′	23 Mar. 1963	1412	1600	1,830	640	*156	Do.
110.50	B6203	44	29°16.5′	116°59.0′			28 Mar. 1962	0100	0330	3,660	600	*423	Do.
110.100	H6204	82	27°32.1′	120°14.0′			19 Apr. 1962	0520	0700	3,953	800	*298	Do.
110.120	H6204	81	26°56.8′	121°32.4′			18 Apr. 1962	1644	2057	4,269	4,530	*1,676	Do.
110.140	H6204	80	26°16.0′	122°49.2′			18 Apr. 1962	0653	0750	4,108	1,100	*410	Do.
110.160	H6204	79	25°34.7′	124°07.0′			17 Apr. 1962	1530	1930	4,200	4,530	*1,676	Do.
111.36a	C6303	207	29°41.5′	115°59.6′	29°34.7′	115°57.5′	26 Mar. 1963	0200	0550	1,830	686	*165	Do.
111.36b	C6303	208	29°39.1′	116°01.3′	29°32.4′	116°00.6′	26 Mar. 1963	0900	1330	2,196			
111.37a	C6303	205	29°34.7′	116°00.0′	29°32.0′	115°59.0′	25 Mar. 1963	0912	1255	2,196	1,372	*366	Oblique.
111.37b	C6303	206	29°38.9′	116°01.8′	29°31.0′	116°00.4′	25 Mar. 1963	1425	1900	2,196	1,372	*403	Do.
113.34a	C6303	209	29°13.0′	115°30.7′	29°10.8′	115°28.5′	26 Mar. 1963	1700	1840	220	640	150	Horizontal.
113.34b	C6303	210	29°21.0′	115°38.0′	29°14.5′	115°32.4′	27 Mar. 1963	1040	1435	549	686	*192	Oblique.
118.43	B6212	152	28°11.0′	115°41.6′	28°08.0′	115°40.5′	1 Dec. 1962	1257	1434	586	657	*306	Horizontal.
120.45	H6204	85	27°43.2′	115°32.3′			22 Apr. 1962	1634	1813	3,294	800	*298	Do.
120.45	B6212	153	27°44.0′	115°33.0′	27°38.7′	115°30.2′	1 Dec. 1962	1724	1922	2,196	600	*311	Do.
120.50	H6204	86	27°29.1′	115°51.5′			22–23 Apr. 1962	2305	0328	3,916	4,530	*1,676	Do.
120.60	H6204	87	27°00.0′	116°36.3′			23 Apr. 1962	0650	1023	3,660	800	*298	Do.
120.70	H6204	88	26°51.0′	117°09.2′			23 Apr. 1962	1640	2042	3,660	4,530	*1,676	Do.
120.80	H6204	89	26°31.0′	117°47.0′			24 Apr. 1962	0044	0223	3,861	800	*298	Do.
120.90	H6204	90	26°09.0′	118°26.2′			24 Apr. 1962	0715	1135	4,063	4,530	*1,676	Do.
123.45	B6212	154	27°08.0′	115°11.4′	27°01.2′	115°09.4′	1–2 Dec. 1962	2312	0137	4,118	150	*55	Do.
123.50	B6203	47	26°58.0′	115°31.0′			28–29 Mar. 1962	2325	0225	3,660	600	*423	Do.
127.45	B6212	155	26°32.8′	114°54.0′	26°27.5′	114°50.7′	2 Dec. 1962	0520	0752	3,203	600	*320	Do.
130.40	B6212	156	26°12.0′	114°14.5′	26°07.0′	114°14.0′	2 Dec. 1962	1219	1433	2,745	800	*412	Oblique.
133.35	B6212	157	25°45.5′	113°27.0′	25°41.5′	113°31.0′	2 Dec. 1962	1952	2148	366	500	*240	Do.
137.35	B6212	158	25°06.0′	112°56.0′	25°01.0′	112°56.0′	3 Dec. 1962	0309	0510	1,281	400	*176	Do.
137.50	B6203	49	24°40.0′	114°03.0′			29–30 Mar. 1962	2152	0034	3,660	600	*423	Horizontal.
140.35	B6212	159	24°35.5′	112°42.5′	24°29.0′	112°42.0′	3 Dec. 1962	0803	1032	732	800	*426	Oblique.
143.30	B6212	160	24°11.0′	112°03.0′	24°08.0′	112°02.3′	3 Dec. 1962	1457	1612	176–183	390	*152	Do.
147.30	B6212	161	23°42.0′	111°44.0′	23°39.5′	111°36.0′	3 Dec. 1962	1925	2150	275	400	*176	Do.

Cruise B6212: R/V *Black Douglas;* December 1–3, 1962; central to southern Baja California, to about 80 km. (50 miles) seaward; 10 tows with CMWBT: 55–176 (4), 240–311 (3), 386–426 (3); other work, collections at Marquis Point and Magdalena and Santa Maria Bays, Baja California, using seines, rotenone, otter trawls, and dip nets.

Cruise B6303: R/V *Black Douglas;* February 28 to March 18, 1963; Point Conception to off San Diego, Calif., to about 480 km. (300 miles) seaward; 13 tows with CMWBT: 18–73 (3), 113–201 (3), 274–386 (5), unknown (2); negative tows, stations 87.70a, 87.70b; other work, oblique and horizontal tows with 1-m. standard plankton net and 1-m. closing net and bottom trawling with 16-ft. otter trawl.

Cruise C6303: R/V *John N. Cobb;* March 1–27, 1963; Point Conception, Calif. to central Baja California, to about 430 km. (270 miles) seaward; 36 tows with *Cobb* pelagic trawl Mark II: 9–27 (5), 82–192 (10), 201–403 (15), 458–489 (4), 640 (2); negative tows, stations 80.70, 85.68, 111.36b.

STATION DATA

The basic station numbering system in use since 1950 for the California Cooperative Oceanic Fisheries Investigations (CalCOFI) was used for station designation during the pelagic survey (fig. 1). An explanation of this numbering plan was

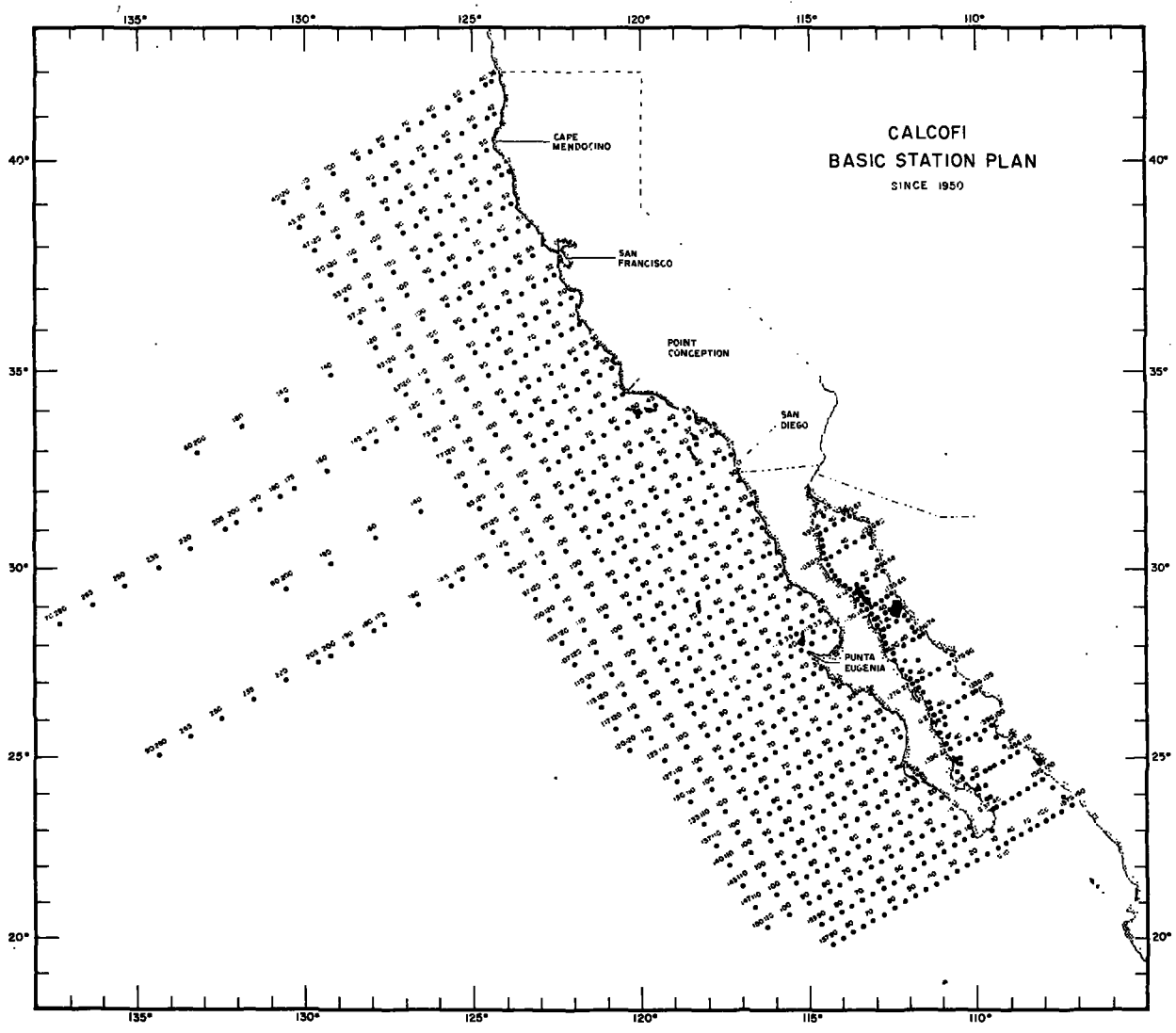

FIGURE 1.—CalCOFI basic station plan since 1950.

given by Scripps Institution of Oceanography and Fish and Wildlife Service (1952). The stations occupied during the eight cruises are shown in figures 2A and 2B.

The station data for the cruises are given in table 1. An asterisk in the table indicates an approximate value. The stations are listed in increasing numerical order by line from north to south and by station number from east to west. When the same station was occupied more than once during a cruise, the earliest occupancy was designated "a", the next "b", . . . The depth fished was determined or estimated in a variety of ways. A depth telemeter with a conducting cable was used for some stations on cruise C6208; the Brown Depth Recorder for several stations on cruises H6105 and H6204; and a bathykymograph for a few stations on cruises B6203, B6204, B6212, and B6303. For some stations on cruise H6204, a factor of 0.37 times the length of the wire out, was used to estimate the depth fished.

The depth of bottom at each station, the amount of wire out, and the depth fished are recorded in meters. This has produced some uneven or irregular numbers that are frequently repeated in table 1. One reason for this is that depth of bottom at each station was originally recorded in fathoms, either from the depth recorder or chart reading, and was subsequently converted to meters to conform to the required style of this report. At a number of stations on some of the cruises, the amount of wire out was set at a particular number of meters, and the calculated or estimated fishing depth was a reflection of amount of wire out (for example, on cruise H6204 most stations were made with either 800 or 4,500 m. of wire out, and the estimated depth of fishing was 298 and 1,676 m., respectively).

The types of tows are listed as horizontal or oblique. For horizontal tows, a selected amount of wire was let out and the trawl was towed within a generally restricted depth range. Obviously, the trawl was fishing in descent to and ascent from this depth, but most of the fishing effort for a horizontal tow was usually near the maximum depth fished. It is recognized that after the selected amount of wire has been let out, the trawl may sink for a time while being towed. Also, if

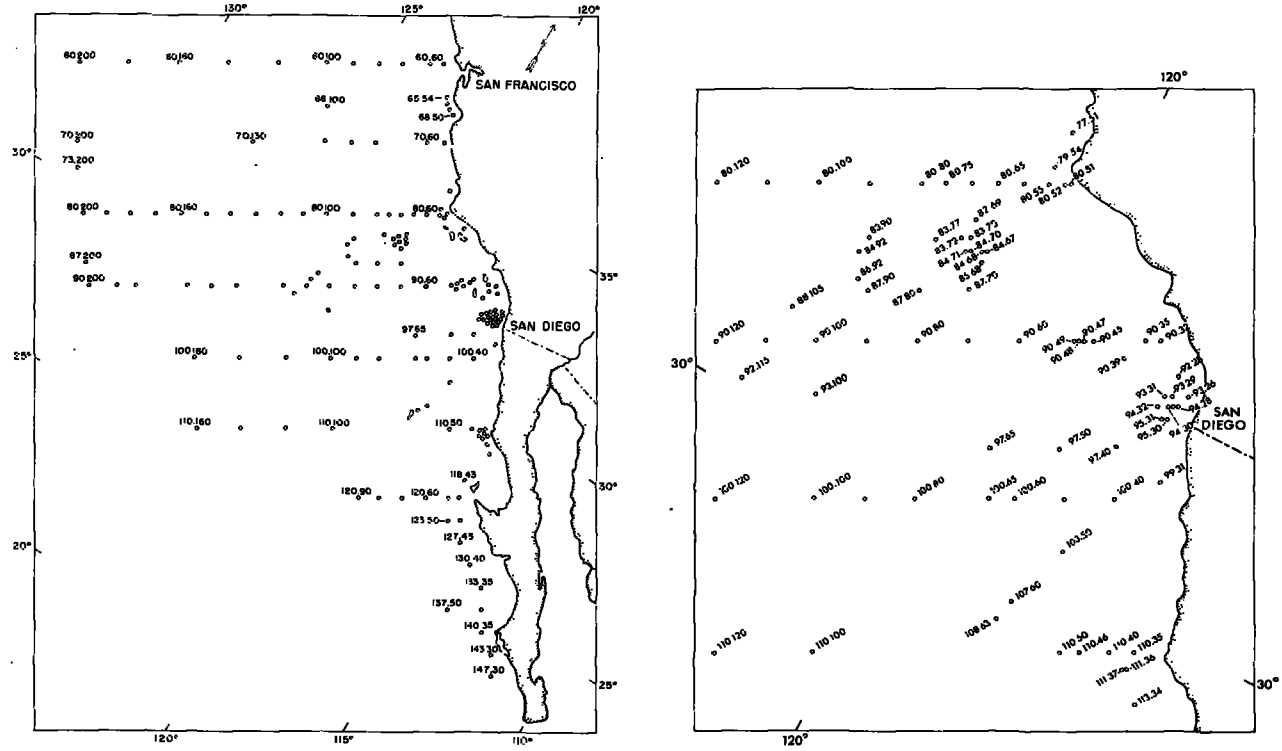

FIGURE 2.—(A) Stations occupied during pelagic survey, (B) Stations occupied in the central and shoreward portion of the pelagic survey.

the ship's speed is reduced when the wire retrieval begins, the trawl may sink and continue fishing deeper than the calculated maximum depth recorded for the horizontal tow. The oblique tows were made in two ways: (1) by letting out a selected length of wire as fast as feasible and retrieving slowly or in stages (as, on a deep tow, taking in 100 m. of wire during about 3 to 5 minutes and towing for 10 minutes before retrieving more wire) and (2) by letting the wire out slowly or in stages and retrieving as fast as possible.

COLLAPSIBLE MIDWATER BEAM TRAWL

On vessels such as the *Black Douglas*, inadequately equipped to operate (most) large nets, it was necessary to have a collapsible net (fig. 3). Views of operation of the net and certain details of construction and the jury-rigged winch and H-frame aboard the *Black Douglas* are shown in figures 4 and 5.

In devising the CMWBT, several features desirable in operating such a net were considered, and attempts were made to incorporate these features into the design and function.

Mouth opening.—This should be large to sample a relatively large area and to reduce escapement. The horizontal opening was fixed at 10 feet by the top and bottom beams. The vertical, nonrigid opening was hung at 14 feet. In towing, the vertical opening was reduced to about 12 feet at 2 knots and to about 10 feet at 4 knots; the latter still left a sampling area of about 100 square feet.

Towing speed.—The CMWBT was strongly constructed. The maximum speed at which it was towed was about 5 knots, but faster speeds could have been used.

Mouth opening obstruction.—There was no obstruction from the top beam bridle, and that from the bottom beam bridle was not great; this could be eliminated by a spreader bar.

Specimen damage.—This was reduced by a specially constructed cod end (figs. 3 and 5D).

The bullet-shaped device attached to the top beam in figure 4 is a bathykymograph. This model functioned sporadically and unsatisfactorily in our experiments.

SUMMARY OF FISHES COLLECTED

More than 189 species of fishes were taken in the survey. The exact number cannot be determined at this time because of the uncertain identification of more than 18 forms. At least one previous-

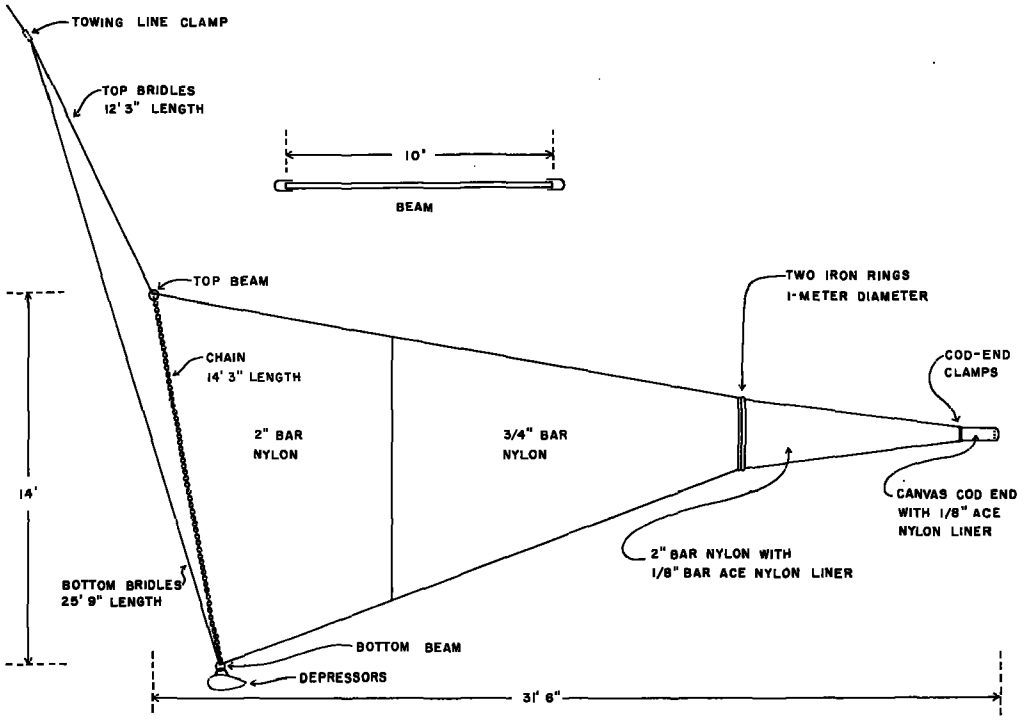

FIGURE 3.—Diagram (lateral view) of 10- by 14-ft. collapsible midwater beam trawl (CMWBT).

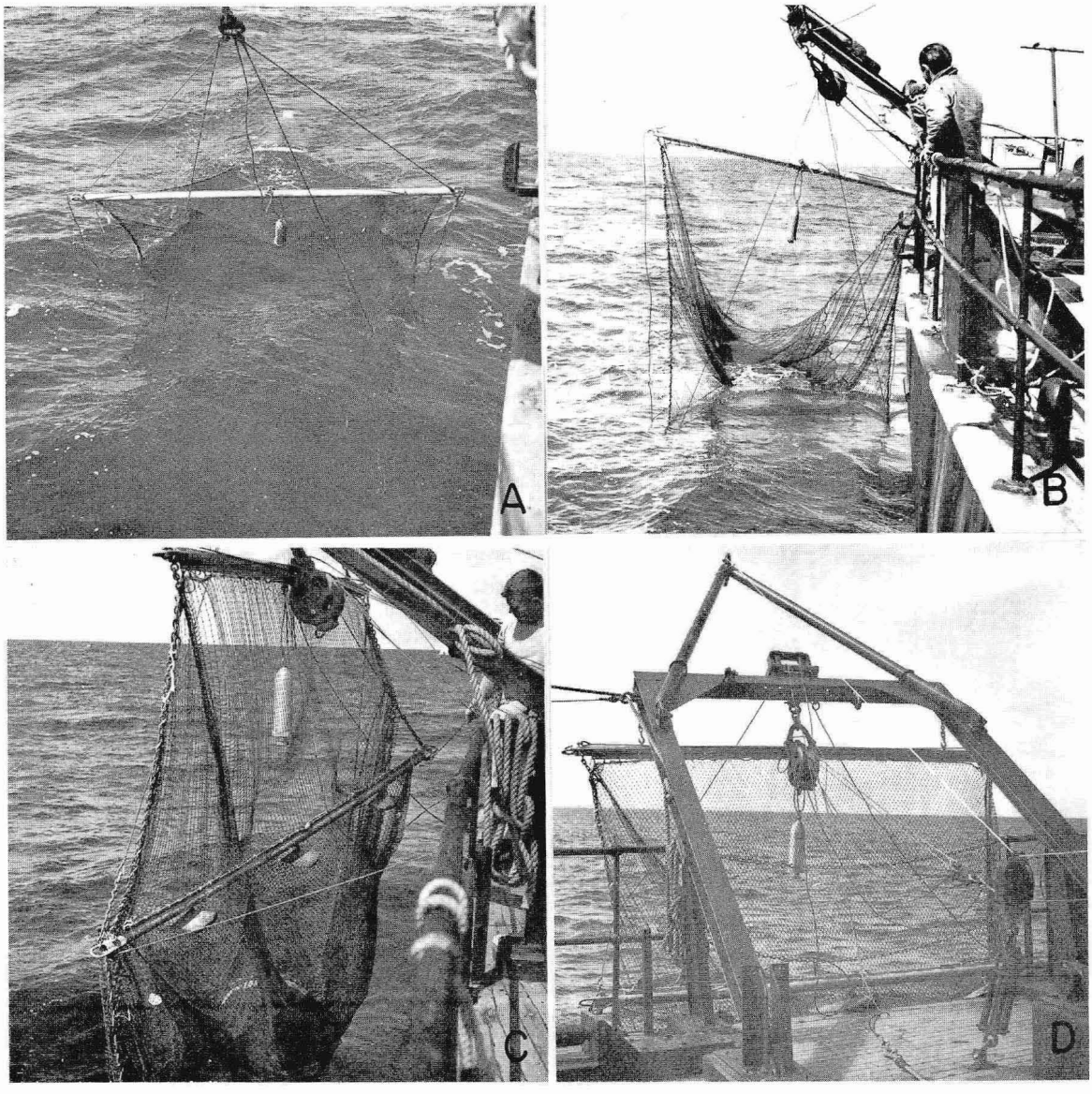

FIGURE 4.—CMWBT. A, emerging. B, boarding. C, top beam secured to H-frame, hauling in bottom beam. D, both beams secured. Cylinder attached to middle of top beam is bathykymograph.

ly unnamed and undescribed genus and at least four undescribed species were taken; these specimens have been made available to specialists working on the groups concerned. Sixteen orders of fish and 71 families are represented, including 52 species of the order Isospondyli, 51 species of Iniomi, and 37 of Percomorphi. The greatest number of species in a single family was 40 in the Myctophidae. The greatest number of species in a single genus was 12 in *Lampanyctus* (Myctophidae); the next greatest was 8 in *Melamphaes* (Melamphaidae).

About 52,000 fish were taken in the pelagic survey. The order Isospondyli comprised about 56 percent of this total, including the numerically most abundant species, *Engraulis mordax*, which itself was 34 percent of the total number. The Iniomi was the second most abundant order, about 38 percent of the total; the family Myctophidae comprised most of this percentage. The myctophid genus *Lampanyctus* (including the subgenus *Triphoturus*), was 21 percent of the total, and *Lampanyctus* (*Triphoturus*) *mexicanus* was the second most abundant species—about 18 percent

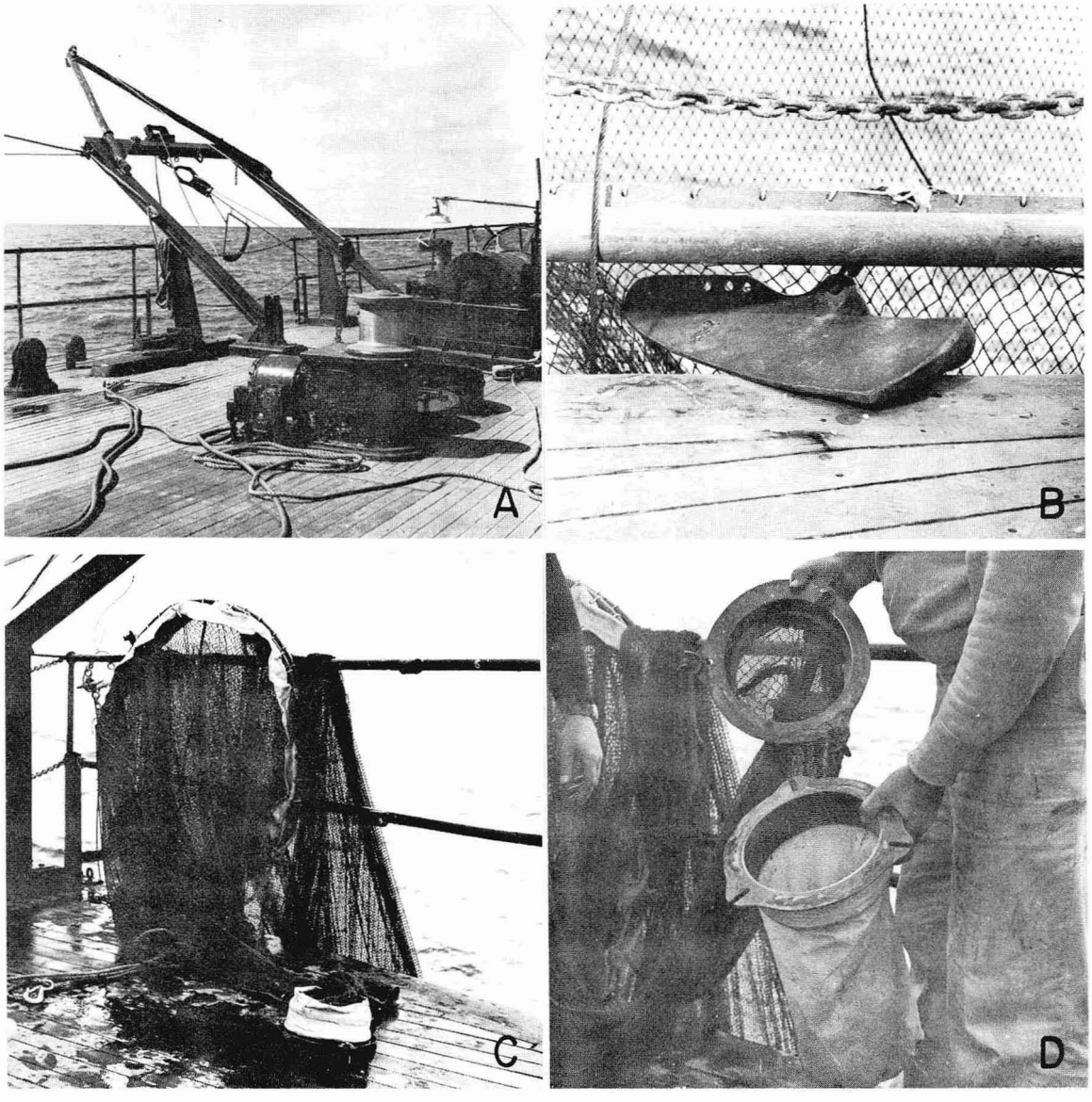

FIGURE 5.—CMWBT. A, towing; note H–frame, slush block, angle indicator, meter wheel, winch, and capstan. B, depressor and rib on back of bottom beam for lashing net. C, afterpart of net with two detachable one-meter rings. D, lined cod end and cod-end clamp.

of the total. Forty-four of the species were represented by a single specimen. The preponderance of anchovies (*Engraulis mordax*) in the above figures does not indicate a high relative abundance of this species over the survey area—as is true for *Lampanyctus* (*T.*) *mexicanus*—because the bulk of the anchovies taken on the survey was from two large catches at stations close to shore.

During the survey, 198 tows caught one or more fish (12 other tows did not catch fish, for various reasons). Species of Myctophidae were taken at more of the "successful stations" than any other family. *Lampanyctus* (*T.*) *mexicanus* was taken at 76 stations—more than any other species. Other myctophids caught at a relatively large number of stations were: *Heirops crockeri* and *Ceratoscopelus townsendi* (66 stations each), *Lampanyctus ritteri* (63 stations), *Diaphus theta* (61), *Symbolophorus californiense* (55), and *Stenobrachius leucopsarus* (54). Of the Gonostomatidae, *Cyclothone signata* was taken at 64 stations, *Cyclothone acclinidens* at 49, and *Danaphos oculatus* at 47.

Three species of Sternoptychidae were captured at a large number of stations—*Argyropelecus hawaiensis* at 54, *A. pacificus* at 49, and *A. intermedius* at 45. Three other species collected at a number of stations were *Idiacanthus antrostomus* and *Scopelogadus mizolepis bispinosus* (50 each) and *Merluccius productus* (42). Sixty of the species recorded were caught at only one station.

The most abundant species in a single tow was *Engraulis mordax*—about 9,000 specimens (450 pounds) taken at a single station. *Lampanyctus* (*T.*) *mexicanus* had the next highest numbers—about 3,000 specimens at one station and 1,857 at another. Other large single collections were *Ceratoscopelus townsendi* (944), *Stenobrachius leucopsarus* (735), *Vinciguerria lucetia* (537), *Merluccius productus* (495), and *Leuroglossus stilbius* (396).

The maximum number of species in a single tow was 44, with the *Cobb* pelagic trawl on cruise C6303 at station 86.92. On the same cruise, relatively large numbers of species per tow were taken at stations 100.65 (41 species), 83.77 (38), and 87.80 (37). Maximum numbers of species per tow with the 10-ft. Isaacs-Kidd midwater trawl (IKMWT) were taken on cruise H6204 at stations 80.90 (34 species) and 60.60 (32). The maximum number of species per tow with the collapsible net was 21 on cruise B6303 at station 84.92.

Many variables affected the numbers and species of fishes caught on the survey including depth of tow, time of year, diurnal migration, speed and length of tow, size of net, size of net webbing, and water mass sampled. Because of these variables, many of the numbers and percentages just cited relate to the survey rather than to the character of the pelagic environment.

For abundant and for more significant species, the locations of capture are shown on distribution charts. These charts bear one symbol for each station at which a species was caught—they do not indicate the capture of a species more than once at a single station.

The specimens preserved from the pelagic survey have been placed in four collections. Some of the larval and juvenile forms are in the Bureau of Commercial Fisheries California Current Resources Laboratory. A small representative series of the bathypelagic species is in the Stanford University Natural History Museum. A large representative series of most species taken is in the Fish Division of the U.S. National Museum. The remainder of the material, comprising the bulk of the collection and representatives of most species taken, is in the Marine Vertebrate Collection of Scripps Institution of Oceanography. The disposition of all the specimens is recorded in the Field Data Books of the Bureau Laboratory at La Jolla and in the collection records at Scripps Institution of Oceanography. Representative type material of any new taxa that are based on these specimens will be placed in the U.S. National Museum.

ANNOTATED LIST OF FISHES

In preparing the data for this report we attempted, with the help of other ichthyologists, to determine specific identifications of the specimens. Many taxonomic problems were not solved; we briefly describe these in the annotations of the species and also include our resolutions of some of the problems.

The fishes listed below are arranged phylogenetically by order and family. Each record of capture is listed under the species in the following abbreviated form, from left to right: the station of capture; the cruise during which the station was occupied; the number of specimens taken at that station, in parentheses; and the length or length range in millimeters of the specimens. For some collections, numbers or lengths of specimens are not available; for others, weight instead of length is given. At a few stations specimens were discarded at sea before accurate records were made.

Lengths of specimens are given in millimeters of standard length (SL), except where otherwise noted. Total length (TL) is used for a few species, and where this designation is given for the initial entry in a species list, all subsequent measurements in that list are in total length. Specimens 100 mm. in length and larger were measured to the nearest millimeter; most specimens smaller than 100 mm. were measured either to the nearest millimeter, or to the nearest half-millimeter. In collections with damaged specimens that were not measured, "dis." (disintegrated) is used instead of a length. A plus sign following the length measurement of some specimens indicates that a portion of the posterior end of the body was missing.

ELASMOBRANCHII

CARCHARHINIDAE

1. *Prionace glauca* (Linnaeus).
Figure 6A.

60.55, C6208, (4) 865–1,785 mm. TL; 65.54, C6208, (3) 1,255–1,365 mm.; 91.39b, C6208, (1) 568 mm.; 107.60, C6303, (1) 1,200 mm.

MYLIOBATIDAE

2. *Holorhinus californicus* (Gill).
Figure 6A.

93.26, C6208, (3) ca. 5 kg., no length recorded.

TORPEDINIDAE

3. *Torpedo californica* Ayres.
Figure 6A.

77.51, C6208, (1) 453 mm. TL; 80.52, C6208, (1) 422 mm.; 94.28b, C6208, (1) ca. 5 kg.; no length recorded.

This species is generally considered to be a benthic inhabitant of moderately deep water. For the first two records above, however, night tows of the *Cobb* pelagic trawl at the surface (trawl fishing no deeper than 24 m.) captured single specimens of *Torpedo* about 24 km. (15 miles) offshore in water about 350 to 690 m. deep.

ISOSPONDYLI

CLUPEIDAE

4. *Sardinops caerulea* (Girard).
Figure 6B.

94.28b, C6208, (9) 225–275 mm.; 94.29b, C6208, (43) 195–235 mm.; 84.29c, C6208, (2) 195 mm.; 94.30, C6208, (1) 225 mm.

ENGRAULIDAE

5. *Engraulis mordax* Girard.
Figures 6B and 7.

65.54, C6208, (ca. 450) 113–150 mm.; 66.50, C6208, (few) ca. 102 mm.; 70.60, C6208, (1) 33 mm.; 70.80, C6208, (2) 29–30 mm.; 70.90, C6208, (17) 21–27 mm.; 77.51, C6208, (ca. 250) 102–143 mm.; 80.52, C6208, (10) 28.5–143 mm.; 80.60, C6208, (1) 37 mm.; 80.65, B6303, (1) 121 mm.; 80.80, H6204, (1) 141 mm.; 82.45, C6208, "10 lbs. (4 kg.) in all," sample (19) 109–150 mm.; 82.69, C6303, (58) 118–144 mm.; 83.70b, B6303, (25) 120–140 mm.; 83.70c, B6303, (1) 131 mm.; 84.70, C6303, (44) 120–137 mm.; 87.90 C6303, (1) 150 mm.; 90.32, H6204, (3) 108–123 mm.; 90.45, H6105, (13) 4–14 mm.; 90.48b, H6105, (193) 4–28 mm.; 92.28, C6208, (50) ca. 125 mm.; 93.28, C6208, (ca. 100) 2 kg. adults; 93.29, C6208, (200 kg.) 100 fish sample, 85–135 mm.; 94.29b, C6208, (4) ca. 100 mm.; 94.29c, C6208, (16) 55–125 mm.; 95.30, C6208, (1) 150 mm.; 97.40, C6303, (1) 121 mm.; 99.31, C6208, (16) ca. 50 mm.; 107.60, C6303, (2) 123–126 mm.; 110.35, C6303, (6) 116–126 mm.; 113.34b, C6303, (ca. 170 kg.) 115–135 mm.; 120.45, H6204, (2) 16–17.5 mm.; 120.50, H6204, (2) 12.5–14 mm.

Anchovies were taken at 33 stations. Nine of these records were of larvae or small juveniles from close inshore to about 260 km. (160 miles) offshore. Three stations produced records of anchovies that add significantly to our knowledge of the biology of this species. (1) At station 89.90, C6303, one adult was taken about 400 km. (250 miles) from nearest landfall. (2) At station 83.70, B6303, in the San Juan Seamount area—where hake eggs were abundant in routine oblique plankton tows (to about 140 m.), and where freshly spent hake were caught in about 121 and 165 m.—anchovy eggs were abundant in a near-surface plankton tow (about 5.5 m.), and running ripe anchovies were caught in a midwater trawl at about 81 m. The *Cobb* echo sounder showed subsurface concentrations at 73 m. and 146 to 220 m. in this area. These concentrations probably represented anchovies spawning above a deeper school of hake that was spawning or had just finished spawning. (3) At station 93.29, C6208, 13 km. (8 miles) off La Jolla over water about 475 m. (260 fathoms) deep, the *Cobb* Simrad registered a dense concentration at about 201 m. (110 fathoms) (fig. 7). With the aid of the depth telemeter, the trawl was towed through this area. The resulting catch was 200 kg. of anchovies. The Simrad was monitored throughout the tow; and the lack of other concentrations indicated that a dense and unusually deep school of anchovies was sampled. A bathythermograph (BT) cast at this station showed a surface temperature of 68° F., a thermocline at about 18 to 82 m., and a temperature of 74° F. at 201 m.

ALEPOCEPHALIDAE

6. *Alepocephalus tenebrosus* Gilbert ?
Figure 6C.

80.90, H6204, (1) 12.5 mm.; 100.60, H6204, (1) 25 mm.; 100.80, H6204, (1) 28 mm.; badly damaged.

The specific identifications are questionable because of the small size of the specimens.

7. *Talismania bifurcata* (Parr).
Figure 6C.

90.120, H6204, (1) 33 mm.; 110.120, H6204, (1) 47 mm.; 120.50, H6204, (1) 44 mm.

SEARSIDAE

8. *Sagamichthys abei* Parr.
Figure 6C.

60.60, H6204, (2) 25.5–41.5 mm.; 60.80, H6204, (1) 45.5 mm.; 60.80, C6208, (2) 106–139 mm.; 60.90, H6204, (1)

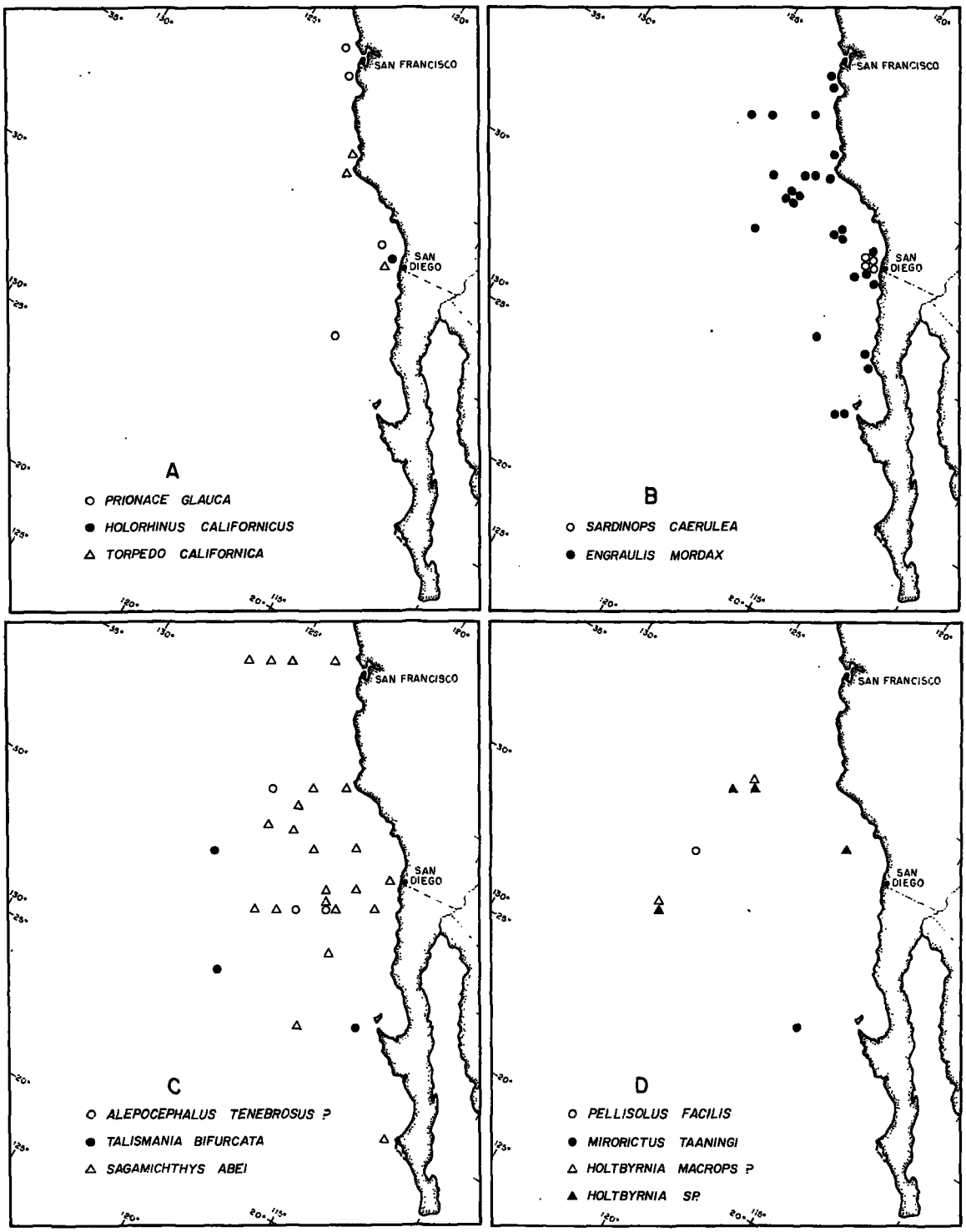

FIGURE 6.—Locations of capture of: A, *Prionace glauca, Holorhinus californicus, Torpedo californica.* B, *Sardinops caerulea, Engraulis mordax.* C, *Alepocephalus tenebrosus?, Talismania bifurcata, Sagamichthys abei.* D, *Pellisolus facilis, Mirorictus taaningi, Holtbyrnia macrops?, Holtbyrnia* sp.

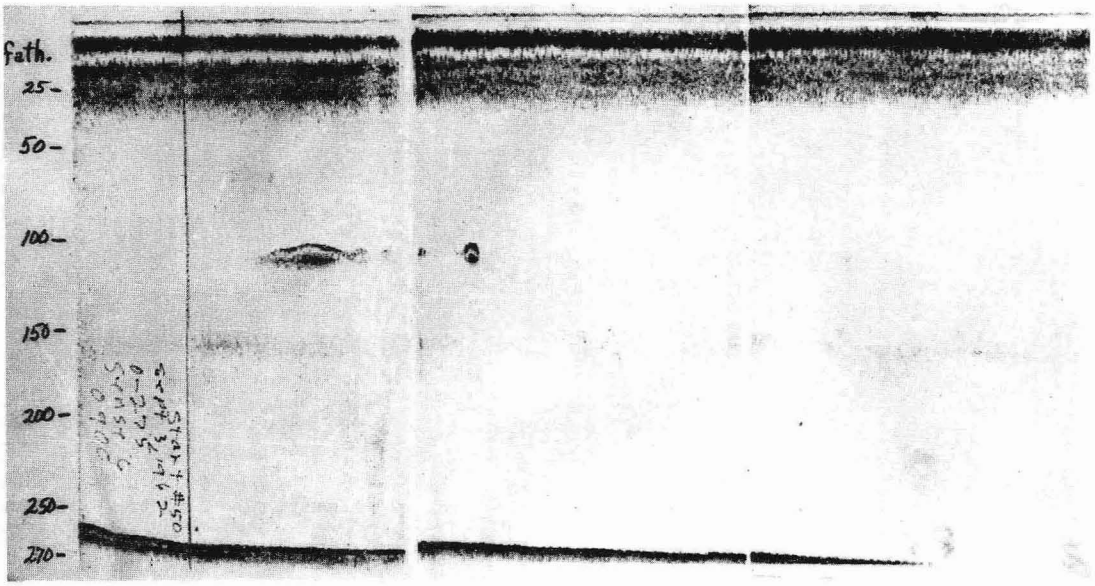

FIGURE 7.—Simrad tracing of a concentration 110 fathoms deep, presumed to be a school of *Engraulis mordax*. The recording, from left to right, is nearly continuous—the two vertical white lines were caused by brief intervals when the machine was not inking the paper. The vertical black line on the left is the reference mark indicating start of the tow at depth. *John N. Cobb* station 93.29, cruise C6208.

77 mm.; 60.100, H6204, (1) 24.5 mm.; 80.55, H6204, (1) 63 mm.; 80.70, H6204, (1) 21 mm.; 83.77, C6303, (4) 53.5–116 mm.; 86.92, C6303, (3) 106–215 mm.; 87.80, C6303, (3) 96–147 mm.; 90.48a, H6105, (5) 26–28.5 mm.; 90.70, H6204, (1) 38.5 mm.; 90.70, C6208, (2) 164–171 mm.; 95.31c, B6204, (4) 18–36.5 mm.; 97.50, B6203, (1) 35.5 mm.; 97.65, C6303, (8) 43–223 mm.; 100.40, H6204, (1) 37 mm.; 100.60, H6204, (1) 118 mm.; 100.65, C6303, (28) 63–252 mm.; 100.90, H6204, (1) 90 mm.; 100.100, H6204, (1) 121 mm.; 108.63, C6303, (52) 128–245 mm.; 120.80, H6204, (1) 58.5 mm.; 140.35, B6212, (1) ca. 18 mm.

These specimens differ in certain respects from the original description of the holotype by Parr (1960: 42), but further study is necessary to evaluate these differences (R. J. Lavenberg, personal communciation). The *Cobb* Mark–II pelagic trawl took this species in relatively large numbers (52 in one tow and 28 in another) and at larger sizes (up to 252 mm.) than were previously recorded.

9. *Pellisolus facilis* Parr.

Figure 6D.

90.120, H6204 (1) 56.5 mm.

This specimen represents an appreciable range extension from the type locality south of Panama given by Parr (1960: 97).

10. *Mirorictus taaningi* Parr.

Figure 6D.

120.70, H6204, (1) 120 mm.

The jaw morphology and mechanism in this and another specimen examined are like that of all other alepocephalids and most other fishes and not like that described for the apparently distorted holotype by Parr (1960: 30). This fish and a specimen in the collection of Scripps Institution of Oceanography from near Guadalupe Island extend the recorded range of the species from the type locality in the Gulf of Panama.

11. *Holtbyrnia macrops* Maul?

Figure 6D.

80.90, H6204, (2) 23–64 mm.; 100.140, H6204, (1) 33 mm.

These specimens are questionably identified, because slight differences suggest that they may be specifically distinct from the species described from off Madeira by Maul (1957: 11) (R. J. Lavenberg, personal communication). This species was placed in a new subgenus, *Krefftia*, by Parr (1960: 71).

12. *Holtbyrnia* sp.

Figure 6D.

80.100, H6204, (1) 22.5 mm.; 90.45a, H6105, (2) 28–29.5 mm.; 90.48a, H6105, (9) 15–33.5 mm.; 120.90, H6204, (1) 31.5 mm.

These specimens are specifically distinct from those listed above as *Holtbyrnia macrops* Maul ? and may represent an undescribed species (R. J. Lavenberg, personal communication).

ARGENTINIDAE

13. *Nansenia* sp.

90.120, H6204, (1) 10.5 mm.

This specimen was taken about 500 km., southeast of Point Conception, Calif. There appear to be two species of *Nansenia* in the eastern North Pacific—a more northern form described as *N. candida* by Cohen (1958: 53) and a more southern form which is apparently undescribed. The above specimen, because of its small size and the intermediate location of its capture between the known ranges of the two species, cannot now be specifically identified (E. H. Ahlstrom, personal communication). The familial classification of this and the six following genera of argentinoid fishes was proposed by D. M. Cohen (personal communication).

14. *Argentina sialis* Gilbert.

95.31b, B6204, (1) 22.5 mm.

This specimen was taken about 25 km. (15 miles) west of San Diego, Calif.

15. *Microstoma microstoma* (Risso).

83.90, C6303, (1) 115 mm.

This specimen was taken about 275 km. (170 miles) southeast of Point Conception, Calif.

BATHYLAGIDAE

16. *Leuroglossus stilbius* Gilbert.

Figure 8A.

70.80–5N, B6203, (1) 31 mm.; 77.51, C6208, (1) 89 mm.; 80.55, H6204, (5) 33.5–107 mm.; 80.60, H6204, (1) 46 mm.; 80.70, H6204, (1) 32 mm.; 80.90–5N, B6203, (4) 28.5–32 mm.; 80.90, H6204, (3) 30.5–69 mm.; 82.45, C6208, (123) 47–94 mm.; 82.69, C6303, (39) 28–109 mm.; 83.70c, B6303, (2) 61.5–74 mm.; 83.70, C6303, (3) 78–90 mm.; 84.70, C6303, (28) 61–110 mm.; 90.32, H6204, (52) 32–99 mm.; 90.45a, H6105, (99) 22–106 mm.; 90.48a, H6105, (339) 5.5–51 mm.; 90.48b, H6105, (396) 5–23 mm.; 90.48c, H6105, (2) 22–25 mm.; 90.60, H6204, (10) 31–74.5 mm.; 90.70, C6208, (1) 28 mm.; 94.32a, B6204, (19) 29.5–55 mm.; 94.32b, B6204, (25) 25.5–54.5 mm.; 95.31a, B6204, (2) 33–34.5 mm.; 95.31b, B6204, (14) 32.5–47 mm.; 95.31c, B6204, (18) 31.5–41 mm.; 97.40, C6303, (239) 35–105 mm.; 100.40, H6204, (1) mm.; 100.40, C6303, (1) 92.5 mm.; 100.65, C6303, (1) 18 mm.; 110.35, C6303, (338) 35–109 mm.; 111.36a, C6303, (ca. 50) adults damaged and discarded at sea; 120.45, H6204, (3) 26.5–44 mm.; 123.45, B6212, (1) 23.5 mm.; 133.35, B6212, (4) 33–40 mm.; 140.35, B6212, (1) 28 mm.

17. *Bathylagus ochotensis* Schmidt.

Figures 8A and 9.

60.60, H6204, (3) 18.5–25 mm.; 60.70, H6204, (1) 13.5 mm.; 60.80, H6204, (4) 18–22 mm.; 60.80, C6208, (1) 37.5 mm.; 60.90, H6204, (4) 24–30 mm.; 60.100, H6204, (3) 17–24 mm.; 60.140, H6204, (1) 23 mm.; 70.80b, B6203, (3) 18–22 mm.; 70.80–5N, B6203, (1) 21 mm.; 80.60, H6204, (2) 49–65 mm.; 80.70, H6204, (1) 25 mm.; 80.90–5N, B6203, (12) 48–80 mm.; 80.100, B6203, (1) 77 mm.; 83.69, C6303, (6) 75.5–119 mm.; 84.70, C6303, (2) 64–86 mm.; 86.92, C6303, (1) 55.5 mm.; 90.70, H6204, (1) 29 mm.; 108.63, C6303, (2) 56–66 mm.

This and the other three species of *Bathylagus* captured were identified with a key prepared by D.M. Cohen.

18. *Bathylagus wesethi* Bolin.

Figures 8B and 10.

60.60, H6204, (2) 68–72 mm.; 60.90, H6204, (6) 22–33.5 mm.; 60.100, H6204, (3) 23.5–46 mm.; 60.120, B6203, (3) 36.5–70 mm.; 60.140, H6204, (3) 28.5–38 mm.; 60.160, B6203, (1) 27 mm.; 60.180, H6204, (1) 25.5 mm.; 80.55, H6204, (6) 28.5–33 mm.; 80.60, B6203, (1) 60.5 mm.; 80.70, B6203, (1) 28 mm.; 80.70, H6204, (3) 33–34 mm.; 80.90–5N, B6203, (9) 32–52 mm.; 80.90, H6204, (11) 23.5–78 mm.; 80.100, H6204, (3) all ca. 27 mm.; 82.69, C6303, (12) 25–69 mm.; 83.70a, B6303, (1) 28 mm.; 86.92, C6303, (2) 39.5–47 mm.; 87.80, C6303, (3) 26.5–83.5 mm.; 90.45a, H6105, (22) 38–75 mm.; 90.60, H6204, (1) 27 mm.; 90.70, H6204, (3) 23–75 mm.; 90.120, H6204, (2) 17–23 mm.; 97.40, C6303, (71) 26.5–89 mm.; 97.50, B6203, (2) 29.5–33 mm.; 100.40, H6204, (5) 28.5–42 mm.; 100.60, H6204, (2) 22.5–25 mm.; 100.65, C6303, (14) 27.5–84 mm.; 100.80, H6204, (3) 21–82.5 mm.; 108.63, C6303, (98) 25–86 mm.; 110.46, C6303, (1) 30 mm.; 110.50, B6203, (27) 23–41.5 mm.; 120.45, H6204, (4) 27–48.5 mm.; 120.50, H6204, (5) 32–42.5 mm.; 120.80, H6204, (1) 44 mm.; 120.90, H6204, (1) 21.5 mm.; 123.45, B6212, (22) 22–42 mm.; 123.50, B6203, (1) 26.5 mm.

19. *Bathylagus pacificus* Gilbert.

Figure 8B.

60.60, H6204, (4) 31–65.5 mm.; 60.80, H6204, (2) 30–51 mm.; 60.100, H6204, (3) 57–92 mm.; 80.90, H6204, (3) 42.5–149 mm.; 90.48a, H6105, (1) 127 mm.

20. *Bathylagus milleri* Jordan and Gilbert.

Figure 8B.

60.80, C6208, (5) 86–128 mm.; 60.120, H6204, (2) 37.5–45.5 mm.; 86.92, C6303, (10) 126–179 mm.; 87.80, C6303, (5) 128–163 mm.; 90.70, C6208, (6) 128–170 mm.

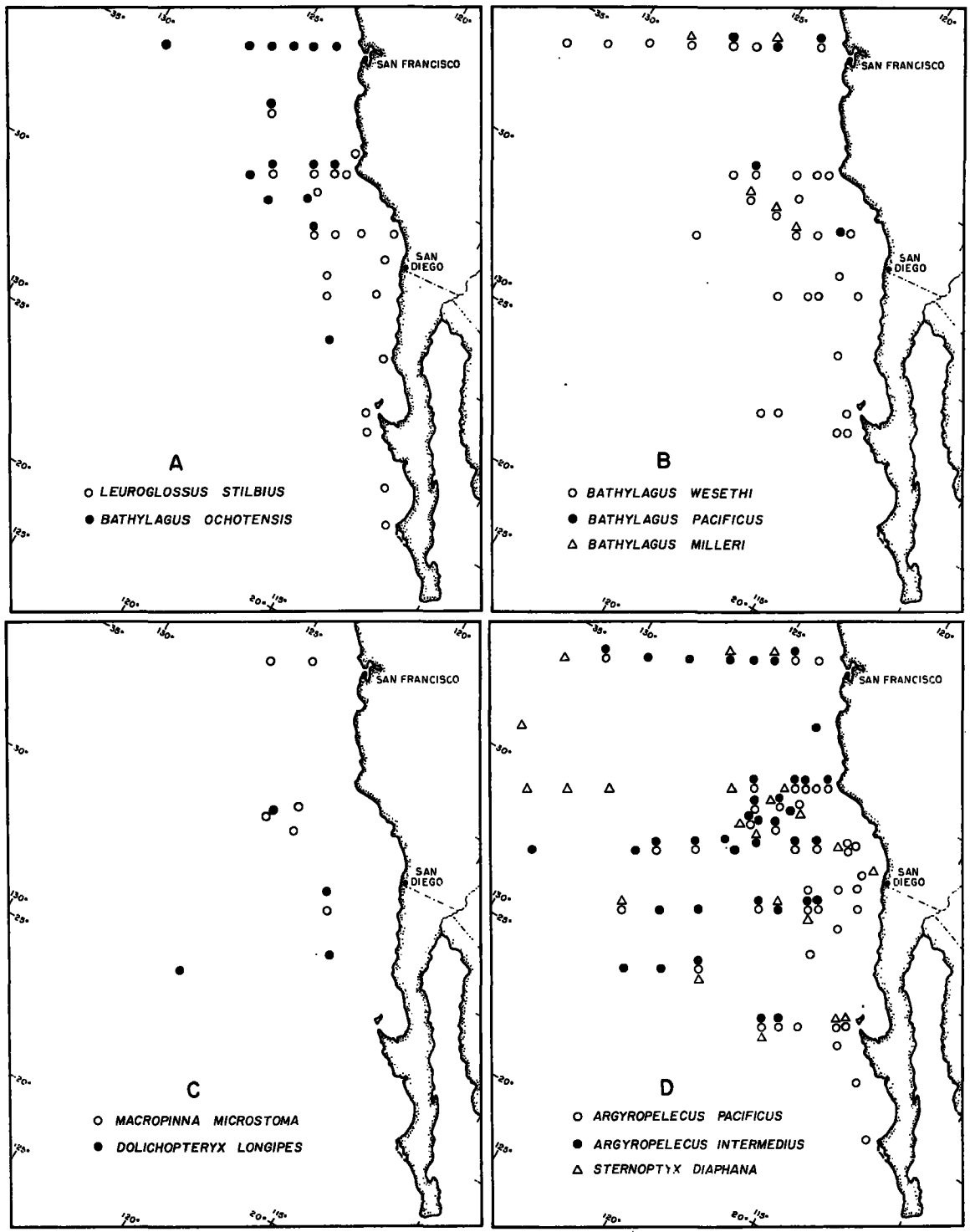

FIGURE 8.—Locations of capture of: A, *Leuroglossus stilbius, Bathylagus ochotensis.* B. *Bathylagus wesethi, Bathylagus pacificus, Bathylagus milleri.* C, *Macropinna microstoma, Dolichopteryx longipes.* D, *Argyropelecus pacificus, Argyropelecus intermedius, Sternoptyx diaphana.*

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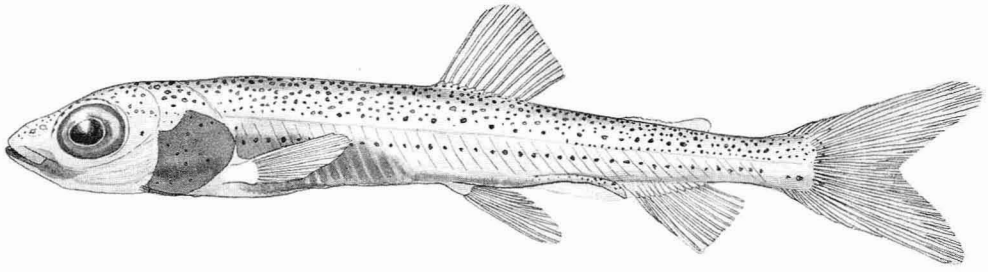

FIGURE 9.—*Bathylagus ochotensis*, juvenile, 25.5 mm. SL, station 73.50, H5204.

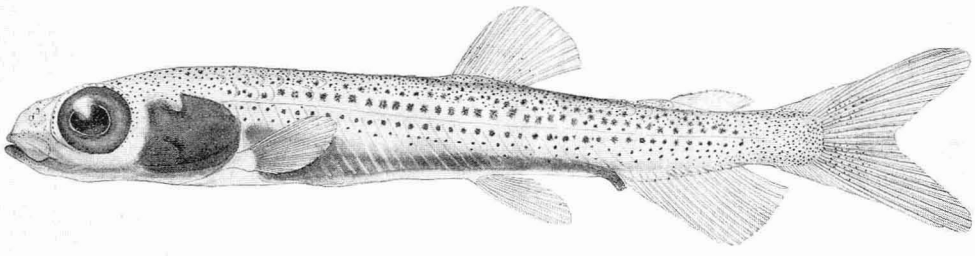

FIGURE 10.—*Bathylagus wesethi*, juvenile, 27 mm. SL, station 92.117, S4903.

This species has at times been referred to by its junior synonyms, *B. alascanus* Chapman and *B. arae* Schmidt (D. M. Cohen, personal communication).

OPISTHOPROCTIDAE

21. *Macropinna microstoma* Chapman.

Figure 8C.

60.70, H6204, (2) 18.5–20.5 mm.; 60.90, H6204, (1) 20.5 mm.; 83.77, C6303, (1) 31 mm.; 86.92, C6303, (11) 89–127 mm.; 87.80, C6303, (2) 120–133 mm.; 100.65, C6303, (1) 24.5 mm.

Previous collections in the eastern North Pacific had indicated this to be a rare and solitary species that did not attain a large size—no more than two specimens had been taken together in the same net, and the largest size reported was 40.7 mm. (Bradbury and Cohen, 1958:59). The large *Cobb* Mark–II pelagic trawl caught 11 specimens up to 133 mm. SL in one tow; such large nets clearly sample the bathypelagic zone more adequately. The 13 larger specimens (89–133 mm.) all appeared sexually mature; the females had large ovarian eggs.

The ovarian eggs showed the following (John S. MacGregor, personal communication). The largest developing eggs had diameters of 2.17 to 2.53 mm.—a 95-mm. SL female had 497 eggs. The largest remnant egg was 3.47 mm. in diameter and had a 0.91-mm. oil drop in a 123-mm. SL female that also contained 669 developing eggs of 0.76 to 1.01 mm. diameter.

22. *Dolichopteryx longipes* (Vaillant).

Figure 8C.

83.90, C6303, (1) 74 mm.; 97.65, C6303, (1) 138 mm.; 108.63, C6303, (4) 51–180 mm.; 110.140, H6204, (1) 53.5 mm.

These specimens were identified with a key prepared by D. M. Cohen.

STERNOPTYCHIDAE

23. *Argyropelecus pacificus* Schultz.

Figure 8D.

60.60, H6204, (2) 25–42 mm.; 60.70, H6204, (1) 30.5 mm.; 60.70, C6208, (1) 15.5 mm.; 60.90, C6208, (1) 56.5 mm.; 60.160, B6203, (2) 62.5–69.5 mm.; 80.55, H6204, (2) 17–18.5 mm.; 80.60, H6204, (6) 15–52.5 mm.; 80.60, C6208, (8) 42–58 mm.; 80.70, H6204, (1) 19 mm.; 80.70, C6208, (2) 47.5–54 mm.; 80.90, H6204, (2) 16.5–39 mm.; 83.74, C6303, (105) 17–80 mm.; 83.90, C6303, (62) 19.5–63 mm.; 84.67, C6303, (9) 18–27.5 mm.; 84.70, C6303, (1) 50 mm.; 86.92, C6303, (5) 19–68 mm.; 87.80, C6303, (3) 27–78.5 mm.; 90.45a, H6105, (1) 48 mm.; 90.45, H6204, (2) 18.5–19 mm.; 90.47, C6208, (37) 18–54 mm.; 90.48a, H6105, (1) 24.5 mm.; 90.60, C6208, (5) 50–59.5 mm.; 90.70, H6204,

(2) 21–45 mm.; 90.70, C6208, (11) 40–62 mm.; 90.120, H6204, (4) 12–37 mm.; 90.140, H6204, (1) 55 mm.; 94.32b, B6204, (2) 17–18 mm.; 97.40, C6303, (17) 36–73 mm.; 97.50, B6203, (2) 45–50 mm.; 97.65, C6303, (39) 22.5–68.5 mm.; 100.40, H6204, (2) 22–35.5 mm.; 100.60, H6204, (11) 24.5–66.5 mm.; 100.65, C6303, (45) 24–67 mm.; 100.90, H6204, (1) 55 mm.; 100.160, H6204, (1) 66.5 mm.; 108.63, C6303, (195) 13–69 mm.; 110.35, C6303, (1) 58 mm.; 110.46, C6303, (40) 21–67.5 mm.; 110.120, H6204, (3) 38–62 mm.; 111.36a, C6303, (ca. 30) adults and juveniles damaged and discarded at sea; 111.37b, C6303, (71) 21–70 mm.; 120.45, H6204, (1) 26 mm.; 120.50, H6204, (3) 15.5–45.5 mm.; 120.70, H6204, (9) 22–56.5 mm.; 120.80, H6204, (3) 51.5–59 mm.; 120.90, H6204, (5) 23.5–50.5 mm.; 123.50, B6203, (5) 15.5–49 mm.; 130.40, B6212, (12) 30.5–55.5 mm.; 140.35, B6212, (8) 21.5–52 mm.

24. *Argyropelecus intermedius* Clarke.

Figure 8D.

60.70, H6204, (17) 9.5–23.5 mm.; 60.80, H6204, (2) 23–27 mm.; 60.90, H6204, (34) 12–34 mm.; 60.90, C6208, (2) 15.5–18 mm.; 60.100, H6204, (3) 14–25 mm.; 60.100, C6208, (2) 18.5–19 mm.; 60.120, B6203, (3) 23–24.5 mm.; 60.120, H6204, (8) 24–34 mm.; 60.140, H6204, (1) 26.5 mm.; 60.160, B6203, (1) 33 mm.; 60.160, H6204, (1) 33 mm.; 70.60, C6208, (1) 12.5 mm.; 80.55, H6204, (2) 16–19 mm.; 80.70, H6204, (1) 16.5 mm.; 80.80, H6204, (4) 22–25 mm.; 80.90, H6204, (4) 12–26 mm.; 80.140, C6208, (5) 18.5–33 mm.; 83.77, C6303, (8) 13.5–24 mm.; 83.90, C6303, (9) 18.5–31.5 mm.; 84.68, C6303, (1) 20 mm.; 84.92, B6303, (8) 20–28 mm.; 84.70, C6303, (1) 22 mm.; 86.92, C6303, (2) 20.5–23.5 mm.; 87.80, C6303, (1) 23 mm.; 87.90, C6303, (1) 24 mm.; 88.105a, B6303, (8) 18–23 mm.; 90.60, C6208, (2) 16.5–19 mm.; 90.70, H6204, (1) 19 mm.; 90.70 C6208, (2) 17 mm.; 90.100, C6208, (15) 15–31.5 mm.; 90.120, H6204, (1) 14 mm.; 90.140, H6204, (1) 28.5 mm.; 90.150, C6208, (1) 21 mm.; 90.200, C6208, (1) 28 mm.; 100.60, H6204, (1) 15 mm.; 100.65, C6303, (3) 21.5–29 mm.; 100.80, H6204, (3) 19.5–28 mm.; 100.90, H6204, (4) 13.5–28.5 mm.; 100.120, H6204, (3) 24–26 mm.; 100.140, H6204, (2) 18.5–26.5 mm.; 110.120, H6204, (1) 20 mm.; 110.140, H6204, (1) 23.5 mm.; 110.160, H6204, (3) 11–26 mm.; 120.80, H6204, (9) 13.5–23.5 mm.; 120.90, H6204, (1) 15 mm.

25. *Argyropelecus lychnus* Garman.

Figures 11 and 13A.

87.80, C6303, (1) 25 mm.; 90.45, H6204, (2) 15–17.5 mm.; 90.47, C6208, (1) 32 mm.; 90.48a, H6105, (2) 17.5–19.5 mm.; 90.120, H6204, (1) 12 mm.; 94.29a, C6208, (2) 30–30.5 mm.; 97.40, C6303, (4) 14–15.5 mm.; 97.50, B6203, (2) 21–39 mm.; 100.60, H6204, (2) 12–46 mm.; 100.90, H6204, (1) 48 mm.; 108.63, C6303, (2) 49–71.5 mm.; 110.35, C6303, (1) 17 mm.; 110.140, H6204, (1) 17.5 mm.; 120.45, H6204, (9) 14.5–27 mm.; 120.60, H6204, (2) 15.5 mm.; 120.80, H6204, (18) 20–61 mm.; 123.50, B6203, (6) 18–44 mm.; 130.40, B6212, (30) 17–58.5 mm.; 133.35, B6212, (1) 24.5 mm.; 137.50, B6203, (8) 19–43.5 mm.; 140.35, B6212, (3) 31–39 mm.

26. *Argyropelecus hawaiensis* Schultz.

Figures 12 and 13A.

60.60, H6204, (1) 12.5 mm.; 60.70, H6204, (3) 11–14.5 mm.; 60.80, H6204, (1) 16 mm.; 60.80, C6208, (2) 27–29 mm.; 60.90, H6204, (1) 13 mm.; 60.90, C6208, (2) 23–27 mm.; 60.100, H6204, (1) 30.5 mm.; 60.100, C6208, (4)

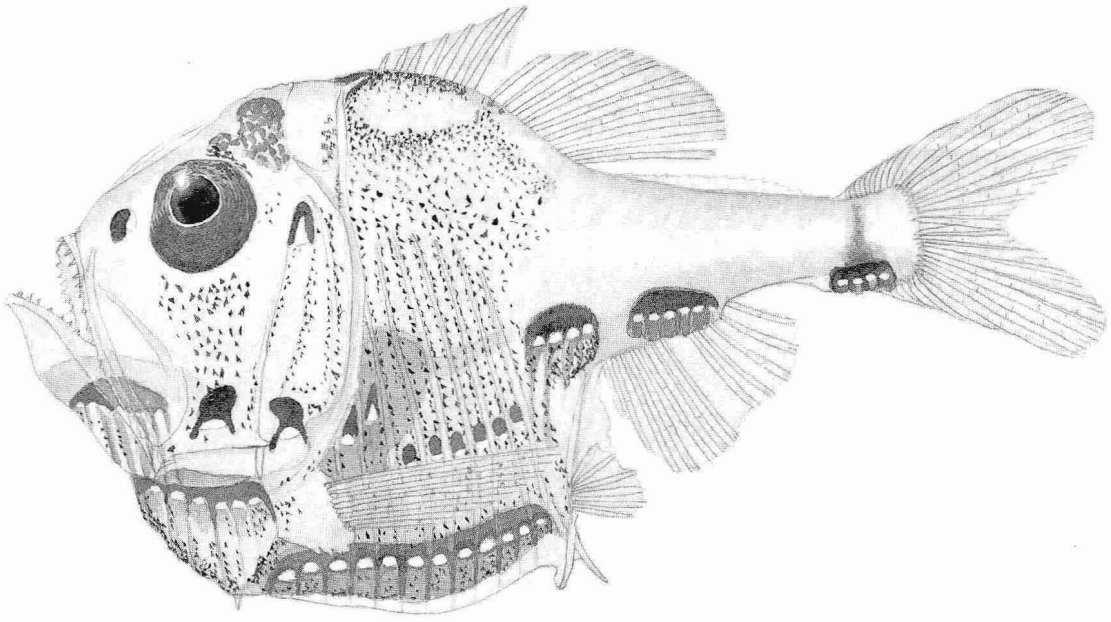

FIGURE 11.—*Argyropelecus lychnus*, juvenile, 17 mm. SL, station 110.140, H6204.

20.5–56 mm.; 60.120, B6203, (4) 36–39 mm.; 60.120, H6204, (1) 43 mm.; 60.140, H6204, (1) 37 mm.; 60.160, B6303, (2) 39.5–44 mm.; 60.160, H6204, (3) 15–51 mm.; 60.200, H6204, (2) 48–53 mm.; 70.60, C6208, (2) 20 mm.; 70.80b, B6203, (2) 14–38 mm.; 70.100, C6208, (1) 38 mm.; 80.55, H6204, (1) 37 mm.; 80.60, C6208, (5) 14.5–21 mm.; 80.70, C6208, (3) 18.5–19.5 mm.; 80.80, H6204, (4) 24–43 mm.; 80.90, B6203, (2) 18.5–44.5 mm.; 80.100, B6203, (5) 36–50 mm.; 80.140, C6208, (2) 44–56 mm.; 80.150, C6208, (1) 50.5 mm.; 83.70c, B6303, (1) 39.5 mm.; 83.77, C6303, (18) 23–40.5 mm.; 83.90, C6303, (16) 18–47.5 mm.; 84.67, C6303, (9) 16–35.5 mm.; 84.68, C6303, (3) 20–35 mm.; 84.70, C6303, (6) 20–37.5 mm.; 84.92, B6303, (9) 19.5–45.5 mm.; 86.92, C6303, (5) 37–43 mm.; 87.80, C6303, (1) 28 mm.; 90.32, B6203, (3) 16–18 mm.; 90.45, H6204, (1) 15.5 mm.; 90.47, C6208, (1) 46.5 mm.; 90.60, C6208, (1) 49.5 mm.; 90.180, C6208, (1) 58 mm.; 93.31, C6303, (4) 25–39 mm.; 94.29a, C6208, (3) 28–29.5 mm.; 97.40, C6303, (17) 18–43.5 mm.; 97.50, B6203, (1) 26.5 mm.; 97.65, C6303, (4) 30.5–43 mm.; 100.40, H6204, (1) 21.5 mm.; 100.40, C6303, (1) 40 mm.; 100.60, H6204, (2) 14.5–39 mm.; 100.65, C6303, (5) 33–43.5 mm.; 100.80, H6204, (1) 20 mm.; 100.90, H6204, (1) 35.5 mm.; 100.120, H6204, (1) 62 mm.; 103.50, C6303, (1) 22 mm.; 108.63, C6303, (2) 25–28 mm.; 110.46, C6303, (1) 26.5 mm.; 110.50, B6203, (2) 23–47.5 mm.; 120.60, H6204, (2) 16–53 mm.; 123.50, B6203, (4) 19.5–60.5 mm.

Argyropelecus hawaiensis was first described as a subspecies of *Argyropelecus lychnus* by Schultz (1961:615). With uncertainty, prompted by the small number of available specimens, Schultz recognized a complex of three subspecies:

A. l. lychnus Garman, eastern Pacific and Atlantic;

A. l. hawaiensis Schultz, around and north of Hawaiian Islands;

A. l. sladeni Regan, western Pacific and Indian Oceans.

In none of our specimens of this type is the body depth of as great a percentage of standard length as that given for *A. sladeni* by Schultz (1961 and 1937:4), and we do not consider *A. sladeni*, if valid, to occur within our area of study.

We conclude that *A. hawaiensis* is a species distinct from *A. lychnus*. In our study area *A. hawaiensis* has the more temperate distribution, and *A. lychnus*, the more subtropical (fig. 13A); but both species, often represented by specimens of similar size, were taken together at 11 stations of the survey. With a comparable size series of juvenile and adult specimens of about 12 to 62 mm. SL, certain character differences readily distinguish the two species.

The upper preopercular spine in juvenile *A. hawaiensis* curves outward and slightly dorsoposteriad in a nearly even arch, while in juvenile *A. lychnus* it curves outward and slightly ventroposteriad at its distal end. With increased body length this spine becomes relatively shorter and thicker in both species, but more strongly hooked upward in *A. hawaiensis* and more strongly hooked downward and backward in *A. lychnus*.

Juvenile specimens of *A. hawaiensis* possess considerably more lateral pigment along the posterior portion of the body (fig. 12). At about 14

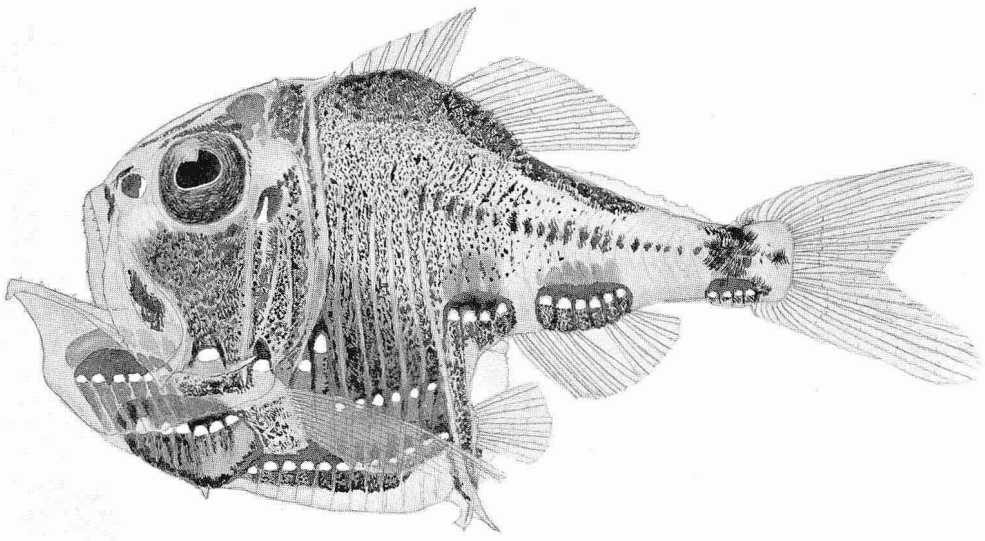

FIGURE 12.—*Argyropelecus hawaiensis*, juvenile, 17 mm. SL, station 84.67, C6303.

mm. SL, *A. hawaiensis* has a vertical band of pigment above the subcaudal photophores, a medial patch over the anal photophores, and a row of pigment spots along the lateral midline anterior to the anal photophores Specimens of *A. lychnus* of the same size possess no pigment on the posterior portion of the body, and pigment in the areas above the subcaudal and anal photophores begins to show only faintly at about 17 mm.

At about 25 mm. SL, body pigment extends backward to the posterior edge of the anal group of photophores on both species. The vertical area between the anal and subcaudal photophores in *A. hawaiensis* bears a row of pigment spots along the lateral midline (a posterior extension of the anterior row mentioned for the 14-mm. size). The area above the subcaudal photophores is strongly pigmented on both species and gives, on gross examination, the impression of a colorless, vertical band between the anal and subcaudal groups of photophores. This "banded" area fills in with pigment dorsoventrally in adults, and in 25-mm. specimens of *A. hawaiensis* the beginning of this process is evident. Specimens of the same size of *A. lychnus* have little or no pigment in this area, and the lower portion of this area immediately between the anal and subcaudal photophores may be void of pigment in specimens of *A. lychnus* as large as 42 mm. SL.

Body depth in relation to standard length overlaps between the two species in the smaller juvenile sizes. At larger sizes *A. lychnus* has the deeper body; above 32 mm. SL the body depth of *A. lychnus* is about 62–71 percent SL and that of *A. hawaiensis* about 54–60 percent SL.

An additional character useful in separating the two forms at sizes of about 45 mm. SL and larger is the formation of small spines along the ventral edges of the scales overlying the subcaudal photophores on specimens of *A. lychnus*. The spines start to develop on specimens between 40 and 45 mm. SL. These spines are absent on all specimens of *A. hawaiensis* examined including the largest in our collections (62 mm. SL) and one of the paratypes at Scripps Institution of Oceanography (SIO H53–372, 52 mm.).

27. *Argyropelecus* sp.

110.50, B6203, (1) 15 mm.

This damaged specimen cannot be specifically identified.

28. *Sternoptyx diaphana* Hermann.

Figure 8D.

60.80, H6204, (1) 43 mm.; 60.100, H6204, (3) 13–18.5 mm.; 60.180, H6204, (5) 8–29 mm.; 70.200, H6204, (6) 11–37 mm.; 80.70, H6204, (2) 14.5–16 mm.; 80.100, H6204, (1) 34 mm.; 83.77, C6303, (1) 25 mm.; 84.67, C6303, (1) 22.5 mm.; 86.92, C6303, (13) 14.5–57 mm.; 87.80, C6303, (3) 19–59 mm.; 87.90, C6303, (1) 54 mm.; 90.45a, H6105, (2) 24–37 mm.; 90.48a, H6105, (1) 27 mm.; 90.160, H6204, (5) 24–42.5 mm.; 90.180, H6204, (1) 19.5 mm.; 90.200, H6204, (4) 7–27.5 mm.; 95.31a, B6204, (1) 15 mm.; 100.65, C6303, (1) 28 mm.; 100.80, H6204, (4) 15–37 mm.; 100.140, H6204, (3) 28.5–36.5 mm.; 100.160, H6204, (3) 13–28.5 mm.; 110.120, H6204, (3) 32–39.5 mm.; 110.160, H6204, (10) 12.5–51 mm.; 120.45, H6204, (1) 32.5 mm.; 120.50, H6204, (1) 26.5 mm.; 120.90, H6204, (1) 31 mm.

GONOSTOMATIDAE

29. *Gonostoma atlanticum* Norman?

Figure 13B.

80.55, H6204, (1) 65 mm.; 80.80, H6204, (1) 45 mm.; 80.90, H6204, (1) 56 mm.; 90.100, C6208, (1) 28.5 mm.; 97.65, C6303, (1) 52 mm.; 100.120, H6204, (1) 63.5 mm.

These specimens appear to represent *G. atlanticum* Norman, but are only tentatively identified because of the arrangement of the maxillary teeth. Grey (1960:107) described the last four enlarged maxillary teeth of *G. atlanticum* as having no interspace teeth. The above specimens possess interspace teeth between the enlarged teeth on the maxillary.

30. *Gonostoma ebelingi* Grey.

Figure 13B.

90.160, C6208, (1) 124 mm.

This specimen represents an appreciable range extension from the original area of its description, the Marshall Island area, by Grey (1960:109):

31. *Cyclothone* Goode and Bean.

This is probably the most abundant deepwater genus of fishes off the coast of California. However, the collection data indicate that hauls made shallower than 550 m. do not adequately sample their population. Of the several thousand specimens taken by the IKMWT (the most efficient device in present use for the consistent capture of these fishes), only about 11 percent were taken where the net was fishing above an estimated depth of 550 m., and nearly all of these fish were *C. signata* and *C. acclinidens*—apparently the two most abundant species in the California-Baja California area at any depth.

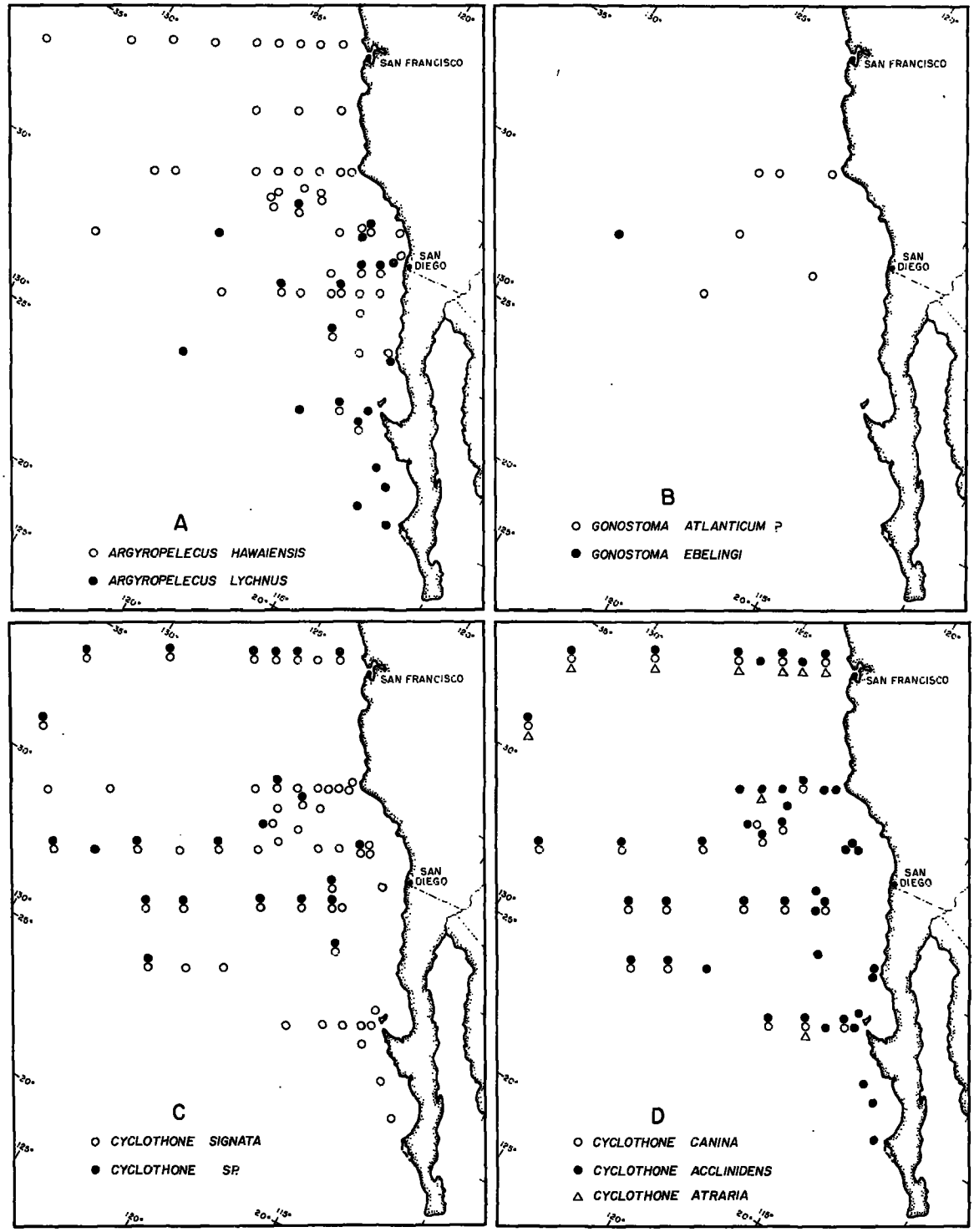

FIGURE 13.—Locations of capture of: A. *Argyropelecus hawaiensis, Argyropelecus lychnus.* B, *Gonostoma atlanticum?, Gonostoma ebelingi.* C, *Cyclothone signata, Cyclothone sp.* D. *Cyclothone canina, Cyclothone acclinidens, Cyclothone atraria.*

Our first attempts to identify the abundant specimens of *Cyclothone* in the survey collections by literature existing at that time were unsatisfactory. A detailed examination was made of this group, and the results and conclusions are summarized below. At least five species of *Cyclothone* are represented in our collections.

Some of the specimens of *C. signata* from the more offshore localities may represent the tersely described and inadequately known *C. alba* Brauer (B. N. Kobayashi, personal communication).

The form we designate as *Cyclothone* sp. (number 33) may be an undescribed species. There is a possibility that it represents *C. pseudopallida*, recently described by Mukhacheva (1964) (B. N. Kobayashi, personal communication).

Although *Cyclothone microdon* (Günther) has been reported from California waters, none of the specimens taken in the survey can be definitely attributed to this species. *C. pallida* Brauer has also been reported off California, but we find that the form here closely resembles Gilbert's description of *C. canina* (1905 :604) ; especially significant is Gilbert's description of the palatine and pterygoid teeth of *C. canina*—"palatine teeth confined to the anterior end, in two small detached groups—pterygoid teeth all small, forming a single, somewhat irregular series." Actually his two small detached groups of palatines were one group (anterior) of palatines and one group (posterior) of pterygoids, as is typical of the genus. The irregular series of pterygoid teeth is thus far unique in this genus. They lie along the upper edge of the bone for nearly its entire length (fig. 14 C) ; however, the size and number of these teeth may be intraspecifically variable. As mentioned, this fact alone separates *C. canina* from other California species, and, unless the type specimens of *C. pallida* are found to contain such an arrangement of teeth (all other characters being equal), the two forms must certainly stand as distinct.

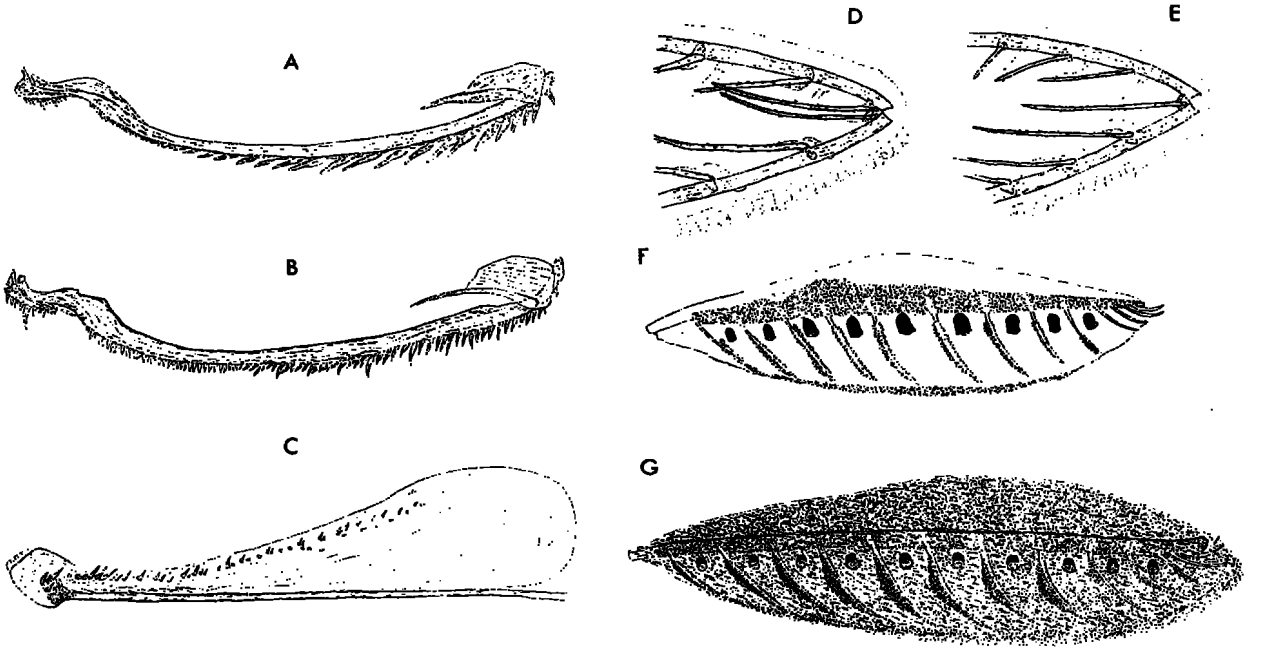

FIGURE 14.—*Cyclothone*. A, upper jaw of *C. acclinidens* showing the arrangement of teeth along the maxillary and premaxillary; the premaxillary is at the extreme left; the long slender bone possessing most of the teeth is the maxillary; and the small bone at upper right is the supramaxillary. B, upper jaw of *C. canina*. C, palatine and pterygoid bones of *C. canina* showing the unique row of teeth on the entopterygoid; the anterior end is at the left. D, posterior part of the first gill arch of *Cyclothone* sp. showing the typical arrangement of two gillrakers at the angle. E, posterior part of the first gill arch of *C. signata* showing the unique arrangement of only one gillraker at the angle of the epibranchial and ceratobranchial bones. F, branchiostegal membrane and rays of *C. signata* showing photophore and pigment arrangement. G, branchiostegal membrane and rays of *C. acclinidens* showing photophore and pigment arrangement.

All California species posses a photophore immediately below the eye and slightly forward of the eye's midline, a photophore above the posterior extremity of the maxillary on a level with the eye, and a photophore immediately behind the angle of the preopercle. Other photophores are mentioned in table 2. The photophores between the bases of the pelvic and anal fins have not been dealt with as a separate unit because an exact dividing line between these and the anal-to-caudal group is difficult to determine in many fish. Generally, *C. signata* has four photophores between the pelvics and anal and the other species have five. The first two pairs in this group are markedly close-set in *Cyclothone* sp., while the interspaces are equal or slightly greater posteriorly in the other species.

KEY TO ADULTS OF THE CALIFORNIA AND BAJA CALIFORNIA SPECIES OF THE GENUS *CYCLOTHONE*

I. Branchiostegal membranes without pigment except for a thin line over all but a few of the most posterior rays and along the upper and lower margins (fig. 14F). Roof of mouth pigmented mainly along its midline. Gill cavities nearly colorless. Gillrakers totaling less than 20 on the lateral side of the first gill arch. One or two gillrakers at angle of first gill arch.

A. Total gillrakers on lateral side of first gill arch not more than 15 (usually 4+10). Only one gillraker at angle of first gill arch (fig. 14E). ---------- *C. signata* Garman.

B. Total gillrakers on lateral side of first arch 17–19 (the position of the medial rakers on the arch accentuated by a thin pigment line). Two gillrakers at angle of first gill arch (fig. 14D). --- *Cyclothone* sp.

II. Entire branchiostegal membranes and most of the oral and gill cavities darkly pigmented (fig. 14G). Gillrakers more than 20 on the lateral side of the first gill arch. Two gillrakers at angle of first gill arch.

A. None of the teeth on the premaxillary directed strongly anterioventrad; generally, every third or fourth of the oblique teeth enlarged; canines conspicuous on premaxillary (fig. 14B). Entopterygoid teeth not confined to an anterior cluster (fig. 14C. ---------- *C. canina Gilbert.*

B. Teeth along posterior three quarters of maxillary directed strongly anterioventrad, generally increasing in obliqueness and decreasing in size anteriorly; no conspicuous canines on the premaxillary (fig. 14A). Entopterygoid teeth confined to an anterior cluster.

1. Branchiostegal photophores 8 or 9. Branchiostegal rays 12. Pigmentation dark brown and usually persistent; photophores relatively small; scale pockets conspicuous. ---- *C. atraria* Gilbert.
2. Branchiostegal photophores 10 or 11. Branchiostegal rays 14. Pigmentation light brown or greyish; photophores of relatively moderate size; scale pockets not conspicuous. ---------- ---------- *C. acclinidens* Garman.

32. *Cyclothone canina* Gilbert.

Figures 13D, 14B, and 14C.

60.60, H6204, (3) 24–61 mm.; 60.80, H6204, (1) 62 mm.; 60.100, H6204, (4) 24–48.5 mm.; 60.140, H6204, (3) 24–49 mm.; 60.180, H6204, (6) 22–70 mm.; 70.200, H6204, (2) 24.5–63.5 mm.; 80.70, H6204, (1) 56 mm.; 86.92, C6303,

TABLE 2.—*Comparative morphological data for the five species of* Cyclothone *occurring off the coasts of California and Baja California*

Morphological character	Species				
	signata	Sp. No. 33	*canina*	*acclinidens*	*atraria*
Dorsal rays	13–14	13–15	14–15	13–15	13–14.
Anal rays	19–20	19–21	18–19	18–20	18–19.
Pectoral rays	8–10	9	11	9–10	9–10.
Pelvic rays	6	6	6	6	6.
Branchiostegal rays	13	14	14	14	12.
Gillrakers	3–4+9–10	6–7+11–12	9–10+14–16	7–8+14–15	8–9+14.
Vertebrae	13+18–19	12–13+19–20	13+18–19	13+18	13+19.
Photophores:					
Branchiostegal	8–9	9–11	9–10	10–11	8–9.
Lateral	7	7+1 or 7+2	7+1 or 7+2	7+2	7+2.
Isthmus to pelvic	13	13	13	13	13.
Pelvic to caudal	18	20–21	20–21	18–19	19–21.
Relative size	Small	Moderate	Large	Large	Moderately large.
Body shape	Moderately slender	Very slender	Slender	Moderately slender	More robust than others.
General body color	Pale—rarely pigment flecks on flanks.	Pale or flanks brown	Flanks brown	Brown flanks or grey cast.	Dark brown.
Pigment visible between interneurals and interhaemals.	Yes	Yes	Yes	Yes	No.
Premaxillary teeth	Slight irregular	Irregular	2–4 distinct canines	Irregular, nearly forming canines.	Irregular, nearly forming canines.
Slope of maxillary teeth	Moderate	Moderate	Moderate	Very strong	Strong.
Vomerine teeth	Usually absent, minute if present.	Present	Present	Present	Present.
Position of anus between pelvics and anal.	Immediately behind pelvic base.	Much nearer pelvics than anal.	Midway	Midway or less	Midway.
Scale pockets conspicuous	No	No	No	No	Yes.
Number of rakers at angle of first gill arch.	1	2	2	2	2.

(4) 31.5–57 mm.; 87.80, C6303, (1) 58.5 mm.; 87.90, C6303, (1) 43.5 mm.; 90.120, H6204, (3) 43–58 mm.; 90.160, H6204, (4) 31–59 mm.; 90.200, H6204, (9) 30.5–58.5 mm.; 100.60, H6204, (6) 52–62 mm.; 100.80, H6204, (2) 41–51.5 mm.; 100.100, H6204, (5) 40–62 mm.; 100.140, H6204, (4) 31–59 mm.; 100.160, H6204, (6) 47–60 mm.; 110.140, H6204, (2) 25–33 mm.; 110.160, H6204, (8) 28–60 mm.; 120.50, H6204, (2) 56–58 mm.; 120.70, H6204, (1) 44 mm.; 120.90, H6204, (4) 42–62 mm.

33. *Cyclothone* sp.

Figures 13C and 14D.

60.60, H6204, (8) 27–42.5 mm.; 60.80, H6204, (16) 18–47 mm.; 60.90, H6204, (6) 19–31.5 mm.; 60.100, H6204, (34) 24–47 mm.; 60.140, H6204, (11) 26–47.5 mm.; 60.180, H6204, (27) 15–46 mm.; 70.200, H6204, (20) 21.5–42 mm.; 80.90, H6204, (2) 35–37.5 mm.; 83.77, C6303, (6) 32–45 mm.; 86.92, C6303, (7) 27–37.5 mm.; 90.48a, H6105, (3) 36.5–41 mm.; 90.120, H6204, (7) 30.5–36 mm.; 90.160, H6204, (4) 12–36 mm.; 90.180, H6204, (1) 28.5 mm.; 90.200, H6204, (11) 20–38 mm.; 97.65, C6303, (2) 27 mm.; 100.65, C6303, (1) 26.5 mm.; 100.80, H6204, (6) 35.5–41.5 mm.; 100.100, H6204, (4) 36–38.5 mm.; 100.140, H6204, (9) 18–40 mm.; 100.160, H6204, (9) 29–38.5 mm.; 108.63, C6303, (1) 27 mm.; 110.160, H6204, (2) 35–40 mm.

34. *Cyclothone signata* Garman.

Figures 13C, 14E, and 14F.

60.60, H6204, (95) 19–36 mm.; 60.60, C6208, (1) 26 mm.; 60.70, H6204, (7) 19–30 mm.; 60.80, H6204, (108) 15–36 mm.; 60.90, H6204, (9) 24–29 mm.; 60.100, H6204, (99) 14–38.5 mm.; 60.140, H6204, (128) 13.5–36 mm.; 60.180, H6204, (97) 16–34 mm.; 70.200, H6204, (83) 18.5–34.5 mm.; 79.54, B6303, (9) 16.5–29.5 mm.; 80.55, H6204, (23) 19–29 mm.; 80.60, H6204, (49) 16–31 mm.; 80.70, H6204, (98) 12.5–34.5 mm.; 80.70, C6208, (1) 22.5 mm.; 80.75, B6303, (1) 20 mm.; 80.80, H6204, (37) 14–32 mm.; 80.90, H6204, (152) 17–34 mm.; 80.100, H6204, (93) 20–30 mm.; 80.170, C6208, (1) 24 mm.; 80.200, H6204, (1) 28.5 mm.; 83.77, C6303, (114) 21.5–33 mm.; 83.90, C6303, (67) 17.5–30 mm.; 84.70, C6303, (1) 28 mm.; 86.92, C6303, (73) 21–34 mm.; 87.80, C6303, (3) 24.5–33.5 mm.; 87.90, C6303, (2) 28–38 mm.; 90.45a, H6105, (16) 23.5–33.5 mm.; 90.48a, H6105, (132) 16–33 mm.; 90.48b, H6105, (9) 20–30 mm.; 90.60, H6204, (2) 24–38 mm.; 90.60, C6208, (21) 16–26 mm.; 90.70, H6204, (1) 21 mm.; 90.70, C6208, (15) 21.5–32.5 mm.; 90.100, C6208, (17) 17–26 mm.; 90.120, H6204, (92) 12.5–36 mm.; 90.140, H6204, (1) 19.5 mm.; 90.140, C6208, (1) 25 mm.; 90.160, H6204, (51) 16–32.5 mm.; 90.160, C6208, (1) 30 mm.; 90.200, H6204, (41) 15–33 mm.; 97.40, C6303, (21) 22–30 mm.; 97.65, C6303, (94) 17.5–38 mm.; 100.60, H6204, (6) 25–33 mm.; 100.65, C6303, (409) 17–35 mm.; 100.80, H6204, (91) 17–36 mm.; 100.100, H6204, (29) 10–34.5 mm.; 100.140, H6204, (22) 18.5–35 mm.; 100.160, H6204, (31) 17.5–35.5 mm.; 108.63, C6303, (149) 19.5–36 mm.; 110.35, C6303, (3) 26–30 mm.; 110.46, C6303, (29) 23–33 mm.; 110.120, H6204, (25) 22–35 mm.; 110.140, H6204, (13) 18–28.5 mm.; 110.160, H6204, (33) 16–32 mm.; 111.37b, C6303, (9) 25–30 mm.; 118.43, B6212, (24) 21.5–33.5 mm.; 120.45, H6204, (12) 20–29 mm.; 120.50, H6204, (2) 27–32 mm.; 120.60, H6204, (4) 25–30 mm.; 120.70, H6204, (8) 22.5–33 mm.; 120.90, H6204, (16) 22.5–32 mm.; 123.50, B6203, (1) 22 mm.; 130.40, B6212, (5) 22.5–26.5 mm.; 140.35, B6212, (14) 23.5–32 mm.

35. *Cyclothone acclinidens* Garman.

Figures 13D, 14A, and 14G.

60.60, H6204, (33) 15–54.5 mm.; 60.70, H6204, (3) 27–42.5 mm.; 60.80, H6204, (13) 26–55.5 mm.; 60.90, H6204, (1) 34 mm.; 60.100, H6204, (10) 28–55 mm.; 60.140, H6204, (37) 27–56.5 mm.; 60.180, H6204, (7) 31.5–58 mm.; 70.200, H6204, (5) 30.5–40 mm.; 80.55, H6204, (41) 20–40 mm.; 80.60, H6204, (4) 21–46 mm.; 80.70, H6204, (23) 22.5–58 mm.; 80.80, H6204, (1) 31 mm.; 80.90, H6204, (66) 20.5–57 mm.; 80.100, H6204, (32) 21–45.5 mm.; 83.77, C6303, (86) 21–37 mm.; 84.70, C6303, (4) 35–53 mm.; 86.92, C6303, (141) 26.5–56 mm.; 87.80, C6303, (57) 30–55 mm.; 87.90, C6303, (6) 32.5–50 mm.; 90.45a, H6105, (71) 23.5–43.5 mm.; 90.48a, H6105, (207) 15.5–43.5 mm.; 90.48b, H6105, (10) 16.5–24.5 mm.; 90.120, H6204 (29) 19–56 mm.; 90.160, H6204, (6) 32.5–50.5 mm.; 90.200, H6204, (16) 23–58 mm.; 95.31a, B6204, (2) 26–31 mm.; 97.65, C6303, (7) 17.5–32 mm.; 100.60, H6204, (98) 20.5–53 mm.; 100.65, C6303, (12) 25–45.5 mm.; 100.80, H6204, (62) 23–58 mm.; 100.100, H6204, (65) 14–56 mm.; 100.140, H6204, (18) 25.5–54 mm.; 100.160, H6204, (16) 24–57 mm.; 108.63, C6303, (12) 18–34 mm.; 110.35, C6303, (1) 26 mm.; 110.46, C6303, (3) 22–27 mm.; 110.120, H6204, (88) 19–56 mm.; 110.140, H6204, (11) 19–35 mm.; 110.160, H6204, (35) 16–56 mm.; 111.37b, C6303, (5) 17–30 mm.; 118.43, B6212, (16) 17.5–31 mm.; 120.45, H6204, (4) 21.5–25.5 mm.; 120.50, H6204, (174) 17–51 mm.; 120.60, H6204, (1) 25 mm.; 120.70, H6204 (152) 14.5–55 mm.; 120.90, H6204, (276) 19.5–63 mm.; 130.40, B6212, (81) 13.5–38.5 mm.; 133.35, B6212, (3) 17–22 mm.; 140.35, B6212, (77) 14–40 mm.

36. *Cyclothone atraria* Gilbert.

Figure 13D.

60.60, H6204, (4) 36.5–50 mm.; 60.70, H6204, (1) 51 mm.; 60.80, H6204, (5) 21–49.5 mm.; 60.100, H6204, (6) 31–56 mm.; 60.140, H6204, (6) 37.5–51.5 mm.; 60.180, H6204, (11) 28–51 mm.; 70.200, H6204, (9) 28–54.5 mm.; 80.90, H6204, (1) 55 mm.; 120.70, H6204, (1) 53.5 mm.

37. *Diplophos* sp.

133.35, B6212, (1) 50 mm.

It is not possible to identify this slightly damaged specimen specifically from the revision by Grey (1960:57–125).

38. *Valenciennellus tripunctulatus* (Esmark)?

Figure 15A.

70.200, H6204, (1) 28 mm.; 73.200, B6203, (2) 25 mm.; 90.120, H6204, (1) dis. adult; 90.160, H6204, (1) ca. 10 mm.; 90.180, H6204, (1) 25 mm.; 90.200, H6204, (1) 25.5 mm.

This specific identification is questioned because most of these specimens have four groups of anal

to caudal (AC) photophores rather than the five groups reportedly characteristic for *V. tripunctulatus;* this difference may indicate that these specimens are actually *V. stellatus* Garman. This problem was discussed by Grey (1960: 68).

39. *Danaphos oculatus* (Garman).

Figure 15A.

60.60, H6204, (1) 19.5 mm.; 60.70, H6204, (7) 20–25 mm.; 60.80, H6204, (4) 22–38 mm.; 60.90, H6204, (7) 20.5–31 mm.; 60.90, C6208, (2) 32 mm.; 60.100, H6204, (2) 22.5–23.5 mm.; 60.120, H6204, (21) 29–40 mm.; 60.160, B6203, (3) 34.5–36 mm.; 60.160, H6204, (1) 31 mm.; 60.180, H6204, (1) 40 mm.; 70.60, C6208, (1) 23 mm.; 70.200, H6204, (1) 44 mm.; 80.55, H6204, (3) 30–30.5 mm.; 80.60, H6204, (1) 27 mm.; 80.70, H6204, (3) 26.5–38.5 mm.; 80.75, B6303, (1) 22.5 mm.; 80.80, H6204, (14) 26–39 mm.; 80.90, H6204, (7) 24–38 mm.; 80.100, H6204, (3) 30–32 mm.; 80.140, C6208, (1) 30 mm.; 83.77, C6303, (44) 27–40 mm.; 83.90, C6303, (61) 23–40.5 mm.; 84.67, C6303, (3) 29–30 mm.; 86.92, C6303, (4) 28–30 mm.; 87.80, C6303, (4) 34.5–40 mm.; 90.32, B6203, (2) 33 mm.; 90.45a, H6105, (1) 32.5 mm.; 90.60, H6204, (1) adult, damaged; 90.70, H6204, (4) 31–37 mm.; 90.110, B6203, (1) 36 mm.; 90.120, H6204, (1) 31 mm.; 90.140, C6208, (2) 24–30.5 mm,; 90.160, H6204, (1) 37.5 mm.; 97.65, C6303, (3) 20.5–39 mm.; 100.60, H6204, (1) 34 mm.; 100.65, C6303, (18) 25.5–39 mm.; 100.80, H6204, (9) 31–35 mm.; 100.90, H6204, (1) 34 mm.; 100.160, H6204, (1) 32.5 mm.; 108.63, C6303, (5) 29–38 mm.; 110.120, H6204, (2) 25–35 mm.; 110.140, H6204, (1) 29 mm.; 110.160, H6204, (2) 32.5–35 mm.; 120.45, H6204, (1) 29 mm.; 120.60, H6204, (1) 32 mm.; 120.70, H6204, (1) 34 mm.; 140.35, B6212, (1) 34 mm.

40. *Vinciguerria nimbaria* (Jordan and Williams).

Figure 15B.

60.200a, B6203, (2) 24.5–38 mm.; 73.200, B6203, (1) 39 mm.; 80.140, C6208, (1) 23.5 mm.; 80.170, C6208, (2) 16–22 mm.; 90.110, C6303, (4) 20–43 mm.; 90.150, C6208, (10) all ca. 26 mm.; 90.160, H6204, (2) 18–19.5 mm.; 90.180, H6204, (1) 39.5 mm.; 93.100, C6303, (1) 21.5 mm.; 100.140, H6204, (1) 20 mm.; 100.160, H6204, (1) 26 mm.

41. *Vinciguerria lucetia* (Garman).

Figure 15B.

83.77, C6303, (1) 34 mm.; 83.90, C6303, (1) 35.5 mm.; 87.80, C6303, (1) 42 mm.; 90.48b, H6105, (1) ca. 10 mm.; 90.120, C6208, (5) 16.5–28 mm.; 90.140, H6204, (1) 49.5 mm.; 90.150, C6208, (7) 17–19 mm.; 100.100, H6204, (3) 32.5–42 mm.; 100.160, H6204, (1) 24 mm.; 110.100, H6204, (1) 24 mm.; 110.120, H6204, (3) 28–44 mm.; 110.140, H6204, (1) 19 mm.; 120.45, B6212, (24) 17–22.5 mm.; 120.60, H6204, (4) 34–36 mm.; 120.70, H6204, (4) 28–41 mm.; 120.80, H6204, (10) 31.5–47 mm.; 120.90, H6204, (19) 27.5–49 mm.; 123.45, B6212, (158) 18–44.5 mm.; 123.50, B6203, (3) 22–27 mm.; 127.45, B6212, (7) 21–32.5 mm.; 130.40, B6212, (142) 15–56.5 mm.; 133.35, B6212, (87) 15.5–53.5 mm.; 137.35, B6212, (536) 12.5–48.5 mm.; 137.50, B6203, (7) 28.5–52 mm.; 140.35, B6212, (388) 14.5–50 mm.

42. *Vinciguerria poweriae* (Cocco).

Figure 15B.

60.120, B6203, (2) 24–28 mm.; 60.160, B6203, (1) 26 mm.; 60.180, B6203, (1) 24.5 mm.; 60.200, H6204, (1) 31 mm.; 70.200, H6204, (1) 18 mm.; 73.200, B6203, (2) 27–30 mm.; 80.140, C6208, (2) 23–23.5 mm.; 80.200, C6208, (1) 34 mm.; 83.77, C6303, (2) 23–28 mm.; 90.110, C6303, (8) 26–33.5 mm.; 90.120, C6208, (2) 17.5 mm.; 90.124, C6208, (2) 16 mm.; 90.160, H6204, (2) 17.5–18 mm.; 90.160, C6208, (1) 27.5 mm.; 90.200, H6204, (1) 17.5 mm.; 92.115, B6303, (1) 18.5 mm.

The specimens from station 83.77 are closer to the continent (about 195 km. (120 miles) offshore) than is usual for this species (see Ahlstrom and Counts 1958, fig. 25).

43. *Vinciguerria* sp.

90.140, C6208, (3) 18–20 mm.

These damaged specimens are unidentifiable to species.

44. *Ichthyococcus elongatus* Imai.

Figure 15C.

80.70, H6204, (1) 65 mm.

This record extends the known range of the species from Japan and lat. 41°42′ N., long. 150° 00′ W. to near the coast of California and also extends its geographical range into that of *I. irregularis* as described by Rechnitzer and Böhlke (1958).

45. *Ichthyococcus irregularis* Rechnitzer and Böhlke.

Figure 15C.

90.47, C6208, (1) 37 mm.; 100.60, H6204, (1) 61.5 mm.; 108.63, C6303, (1) 51 mm.; 120.90, H6204, (1) 41 mm.

STOMIATIDAE

46. *Stomias atriventer* Garman.

Figure 15D.

82.69, C6303, (1) 59 mm.; 84.70, C6303, (1) 209 mm.; 86.92, C6303, (5) 52.5–227 mm.; 87.80, C6303, (2) 195–218 mm.; 87.90, C6303, (1) 74 mm.; 90.45a, H6105, (1) 202 mm.; 90.48a, H6105, (1) 116 mm.; 90.110, C6303, (1) 228 mm.; 95.31a, B6204, (1) 158 mm.; 97.40, C6303, (1) 232 mm.; 97.65, C6303, (1) 45 mm.; 100.40, H6204, (3) 122–204 mm.; 100.40, C6303, (1) 161 mm.; 100.100, H6204, (1) 29 mm.; 108.63, C6303, (24) 128–235 mm.; 110.35, C6303, (3) 123–205 mm.; 110.40, H6204, (1) 142 mm.; 110.46, C6303, (7) 180–226 mm.; 120.45, H6204, (8) 138–214 mm.; 120.45, B6212, (1) 48 mm.; 120.50, H6204, (1) 212 mm.; 120.60, H6204, (1) 131 mm.; 120.80, H6204, (1) 186 mm.;

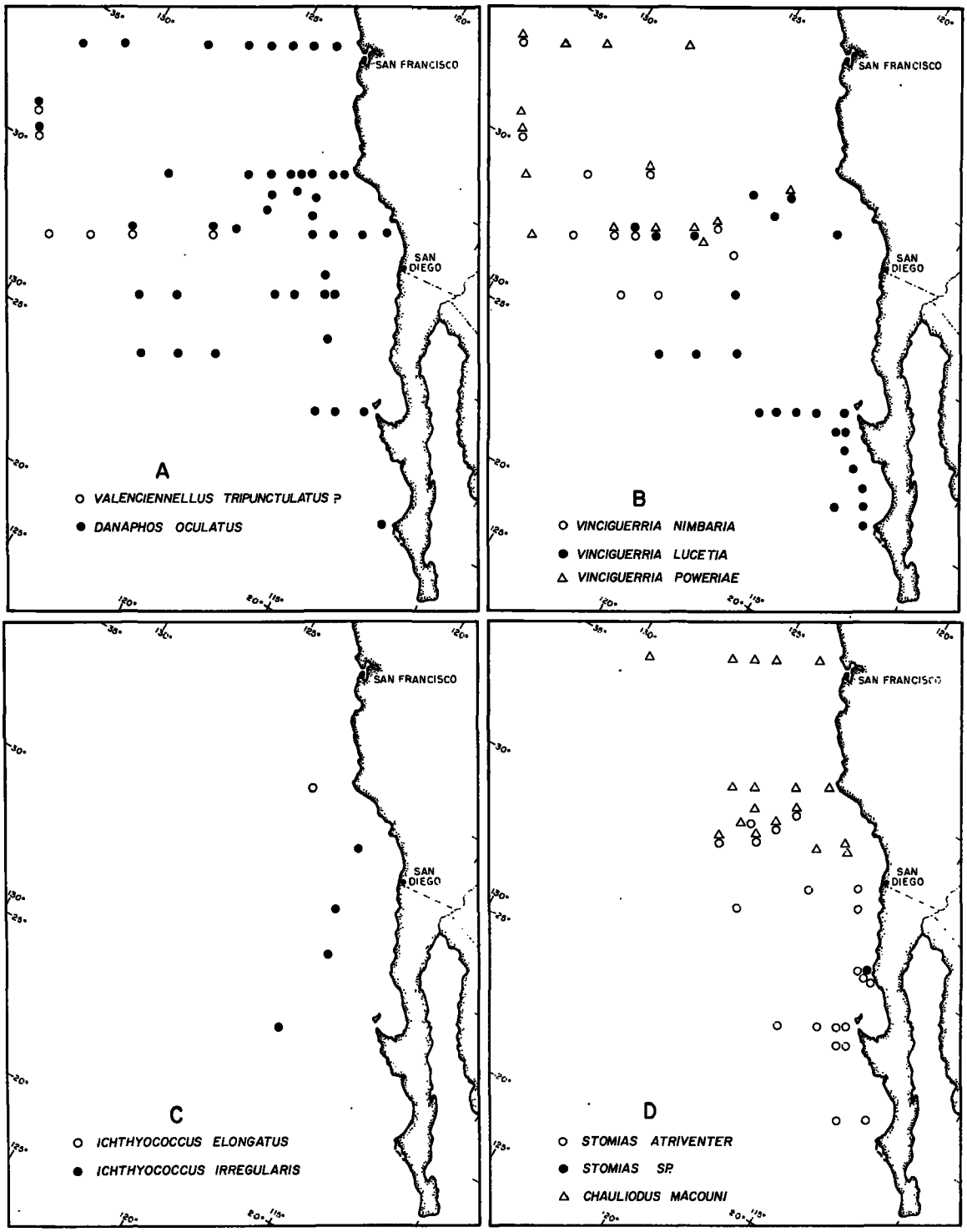

FIGURE 15.—Locations of capture of: A, *Valenciennellus tripunctulatus?*, *Danaphos oculatus*. B, *Vinciguerria nimbaria*, *Vinciguerria lucetia*, *Vinciguerria poweriae*. C, *Ichthyococcus elongatus*, *Ichthyococcus irregularis*. D, *Stomias atriventer*, *Stomias* sp., *Chauliodus macouni*.

123.50, B6203, (7) 83.5–214 mm.: 137.35, B6212, (1) 49 mm.: 137.50, B6203, (2) 127–178 mm.

This species was listed as a subspecies of *Stomias boa* (Risso) by Ege (1934:23) but is now generally regarded as a distinct species. In a few of the 78 specimens collected during the survey, the barbel was broken off, but the normal three equal-sized filaments at the end of the barbel were present in the others, except one. On the exceptional specimen, one of the three filaments was branched to near its base, giving the superficial appearance of four filaments at the end of the barbel.

47. *Stomias* sp.

Figure 15D.

110.35, H6204, (1) 189 mm.

This specimen, occurring within the range of *S. atriventer*, represents either a morphological variant or an undescribed species. It differs in a number of characters from *S. atriventer* and from all known species of *Stomias* in having six equal-sized filaments, each with a separate base, at the end of the barbel.

MELANOSTOMIATIDAE

48. *Leptostomias* sp.

90.200, C6208, (1) 186 mm.

This specimen was taken about 1,000 km. (620 miles) WSW. of Point Conception, Calif. The number and taxonomic limits of the species of this genus are uncertain, and this specimen is not specifically identified, pending needed study of the genus.

49. *Opostomias mitsuii* Imai.

60.80, C6208, (1) 164 mm.; 83.77, C6303, (1) 77 mm.

These specimens, taken about 185 km. (115 miles) west of San Francisco and about 195 km. (120 miles) SE. of Point Conception, Calif., are the first of this species to be reported from waters off California. The three known species of this genus, including *O. micripnus* (Günther) and *O. gibsonpacei* Barnard, appear to be valid, but further comparison is necessary (R. H. Gibbs, personal communication).

50. *Flagellostomias boureei* Zugmayer.

80.80, H6204, (1) 134 mm.; 87.80, C6303, (1) 186 mm.

These specimens, taken about 200 and 240 km. (125 and 150 miles) off Point Conception, Calif., differ only slightly from the detailed description of *F. boureei* from the western Atlantic by Beebe and Crane (1939:179–185). Comparison of other Atlantic and Pacific specimens indicates that they are the same species (R. H. Gibbs, personal communication).

51. *Melanostomias valdiviae* Brauer.

86.92, C6303, (2) 163–175 mm.

These two specimens taken about 305 km. (190 miles) SSW. of Point Conception, and one specimen in the collections of Scripps Institution of Oceanography collected off San Juan Seamount, constitute the first records of this species in this area.

52. *Photonectes margarita* (Goode and Bean).

Figure 16A.

60.120, B6203, (1) 138 mm.; 60.160, H6204, (1) 171 mm.; 60.200, H6204, (2) 118–193 mm.; 80.90, H6204, (1) 135 mm.; 90.160, C6208, (1) 45 mm.; 93.100, C6303, (1) 138 mm.; 100.80, H6204, (1) 50.5 mm.; 100.120, H6204, (1) 91 mm.; 100.140, H6204, (1) 68 mm.

These specimens appear to be this species, redescribed from material from the North Atlantic by Beebe and Crane (1939: 175–179). The above listed specimens vary considerably in several characters, especially barbel structure (at least some of this variation is ontogenetic). Although more than one species may be represented, the variation in barbel structure is thought to be intraspecific.

53. *Tactostoma macropus* Bolin.

Figure 16A.

60.60, H6204, (1) 175 mm.; 60.80, H6204, (1) 85 mm.; 60.80, C6208, (13) 54.5–325 mm.; 60.90, H6204, (3) 143–234 mm.; 60.90, C6208, (9) 135–247 mm.; 60.100, C6208, (1) 231 mm.; 60.120, B6203, (1) 232 mm.; 60.120, H6204, (1) 228 mm.; 66.100, C6208, (1) 200 mm.; 80.55, H6204, (2) 85.5–233 mm.; 80.60, H6204, (2) 91–231 mm.; 80.60, C6208, (2) 156–204 mm.; 80.90–5N, B6203, (2) 91–91.5 mm.; 80.130, C6208, (1) 44 mm.; 82.69, C6303, (1) 81 mm.; 83.77, C6303, (4) 63–163 mm.; 84.92, B6303, (2) 56–66 mm.; 86.92, C6303, (3) 210–293 mm.; 87.80, C6303, (1) 320 mm.; 88.105a, B6303, (1) 76 mm.; 90.60, C6208, (1) 101 mm.

54. *Bathophilus flemingi* Aron and McCrery.

Figure 16A.

60.80, C6208, (1) 64 mm.; 60.120, B6203, (1) 65 mm.; 66.100, C6208, (1) 41.5 mm.; 80.60, C6303, (3) 76–85 mm.; 80.90, H6204, (1) 72.5 mm.; 82.69, C6303, (1) 65 mm.; 84.67, C6303, (1) 84 mm.; 86.92, C6303, (1) 131 mm.; 87.200, B6203, (1) 36 mm.; 88.105b, B6303, (2) 68–82 mm.;

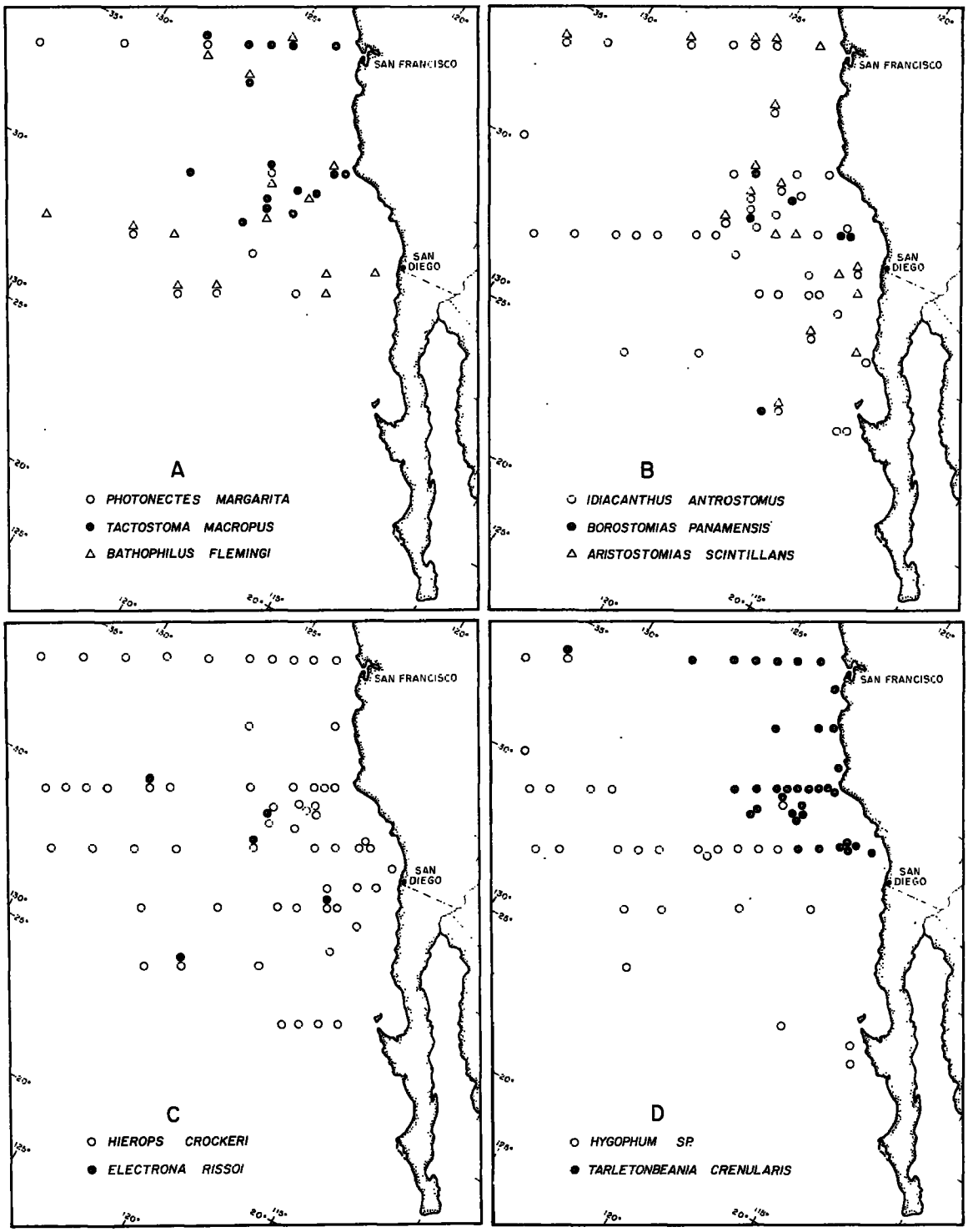

FIGURE 16.—Locations of capture of: A, *Photonectes margarita, Tactostoma macropus, Bathophilus flemingi.* B, *Idiacanthus antrostomus, Borostomias panamensis, Aristostomias scintillans.* C, *Hierops crockeri, Electrona rissoi.* D, *Hygophum* sp., *Tarletonbeania crenularis.*

90.140, H6204, (1) 56.5 mm.; 90.160, H6204, (1) 33 mm.; 97.40, C6303, (1) 97 mm.; 97.65, C6303, (4) 75–120 mm.; 100.65, C6303, (1) 70 mm.; 100.120, H6204, (1) 62 mm.; 100.140, H6204, (1) 67 mm.

B. flemingi was described as a new species from the Eastern North Pacific (Aron and McCrery, 1958:181), although it differed only slightly from the inadequately described *B. indicas* Brauer from the Indian Ocean. Recent evidence indicates that the two species may be synonymous (R. H. Gibbs, personal communication). We found a range in pelvic fin rays of 2 + 2 to 2 + 5 in several specimens counted.

55. Melanostomiatidae, unidentified.

60.180, H6204, (4) 18–30 mm.

These larval specimens have not been identified.

IDIACANTHIDAE

56. *Idiacanthus antrostomus* Gilbert.

Figure 16B.

60.80, H6204, (5) 53–118 mm.; 60.80, C6208, (1) 216 mm.; 60.90, H6204, (1) 207 mm.; 60.90, C6208, (1) 154 mm.; 60.100, H6204, (4) 65–79 mm.; 60.100, C6208, (1) 149 mm.; 60.120, B6208, (3) 168–269 mm.; 60.160, B6203, (1) 160 mm.; 60.180, H6204, (3) 62–124 mm.; 70.80b, B6203, (2) 100–137 mm.; 70.80–5N, B6203, (1) 121 mm.; 73.200, B6203, (1) dis.; 80.55, H6204, (1) 135 mm.; 80.70, H6204, (1) 67 mm. (larva); 80.100, B6208, (1) 241 mm.; 82.69, C6303, (2) 99–252 mm.; 83.77, C6303, (16) 64–348 mm.; 84.70, C6303, (1) 150 mm.; 84.92, B6303, (1) 115 mm.; 86.92, C6303, (17) 61–371 mm.; 87.80, C6303, (4) 66–266 mm.; 87.90, C6303, (4) 123–260 mm.; 88.105a, B6303, (1) 344 mm.; 90.48a, H6105, (2) 69–333 mm.; 90.60, H6204, (1) 73 mm.; 90.110, C6303, (4) 236–300 mm.; 90.120, H6204, (2) dis., 70 mm.; 90.140, H6204, (1) 95 mm.; 90.140, C6208, (2) 58–84 mm.; 90.150, C6208, (1) 125 mm.; 90.160, H6204, (1) 65 mm.; 90.160, C6208, (1) 73 mm.; 90.180, H6204, (1) 104 mm.; 90.200, H6204, (1) 42 mm.; 93.100, C6303, (4) 60–342 mm.; 97.40, C6303, (10) 66–320 mm.; 97.65, C6303, (1) 210 mm.; 100.60, H6204, (1) 249 mm.; 100.65, C6303, (8) 60.5–274 mm.; 100.80, H6204, (2) dis., 59 mm.; 100.90, H6204, (1) 233 mm.; 103.50, C6303, (1) 259 mm.; 108.63, C6303, (9) 134–343 mm.; 110.46, C6303, (3) 209–348 mm.; 110.35, C6303, (8) 156–212 mm.; 110.120, H6204, (1) 98 mm.; 110.160, H6204, (2) 77–115 mm.; 120.80, H6204, (1) 292 mm.; 123.45, B6212, (1) 144 mm.; 123.50, B6203, (7) 178–292 mm.

This is probably the only species of this genus that occurs in the eastern Pacific; as *I. panamensis* Regan and Trewavas, described from the Gulf of Panama, may be a junior synonym of *I. antrostomus* (R. H. Gibbs, personal communication). An adult male of 70 mm. SL from station 60.80, H6204 is larger than maximum sizes of males reported as 44 mm. (adult) and 48 mm. (postlarva) by Beebe (1934:234–236). This was the most abundant and ubiquitous of the 12 species of the suborder Stomiatoidei taken on the survey.

ASTRONESTHIDAE

57. *Borostomias panamensis* Regan and Trewavas.

Figure 16B.

80.90, H6204, (1) 244 mm.; 84.70, C6303, (1) 195 mm.; 86.92, C6303, (4) 85–270 mm.; 90.45, H6105, (1) 218 mm.; 90.48a, H6105, (1) 111 mm.; 120.90, H6204, (1) 186 mm.

B. macristius and *B. panamensis*, both described as new species from the Gulf of Panama by Regan and Trewavas (1929: 26–27), are synonymous (R. H. Gibbs, personal communication). According to specimens taken by this survey and in the collections of Scripps Institution of Oceanography, *B. panamensis* ranges at least from the Gulf of Panama to SSE. of Point Conception, Calif.

CHAULIODONTIDAE

58. *Chauliodus macouni* Bean.

Figures 15D and 17.

60.60, H6204, (5) 27.5–184 mm.; 60.80, H6204, (1) 39 mm.; 60.80, C6208, (1) 120 mm.; 60.90, C6208, (1) 68 mm.; 60.100, H6204, (2) 36–53 mm.; 60.140, H6204, (1) 36 mm.; 80.55, H6204, (3) 32–127 mm.; 80.70, H6204, (1) 26 mm.; 80.70, C6208, (1) dis.; 80.90, H6204, (2) 35.5–36 mm.; 80.100, H6204, (1) 61 mm.; 83.77, C6303, (3) 32–36 mm.; 83.90, C6303, (4) 51–64 mm.; 84.67, C6303, (1) 32.5 mm.; 84.70, C6303, (3) 33–198 mm.; 86.92, C6303, (5) 162–213 mm.; 87.80, C6303, (7) 169–204 mm.; 87.90, C6303, (5) 184–207 mm.; 90.60, H6204, (1) 40 mm.; 90.110, C6303, (2) 162–171 mm.

The genus *Chauliodus* has been revised by Regan and Trewavas (1929), Ege (1948), and Morrow (1961). Only two species of *Chauliodus* are known in the eastern Pacific. *C. barbatus* Garman ranges from Peru (Morrow, 1961: 270) northward to about 1,770 km. (1,100 miles) SE. of southern Baja California (lat. 13°01′ N., long 127°11′ W., SIO 60–215). *C. macouni* ranges from Japan, the southern part of the Bering Sea, and through the Gulf of Alaska (Morrow, 1961: 275–276) southward to the offshore waters of northern Baja California (station 90.110, C6303). With one exception, all evidence points to a geographic separation of these two species, about 1,770 km. (1,100 miles) separating their known ranges.

The one exception is a single specimen recorded by Ege (1948: 108) as *C. macouni* from lat. 0°18′

S., long. 99°07′ W., near the Galapagos Island. Ege also reported three specimens of *C. barbatus* from the same station (3558). Morrow (1961: 256), on the basis of a partial reexamination of the excepted specimen, stated that "the Dana specimen of *C. macouni* does not appear to have been mis-identified." Yet nowhere is this specimen so adequately described, or compared with specimens from the usual range of *C. macouni*, that it can confidently be considered to be *C. macouni*, in view of the known occurrence of all other specimens of *C. macouni*.

Regan and Trewavas (1929: 32 and 34) stated that in *C. sloani* Bloch and Schneider and in *C. danae* Regan and Trewavas the proportion of the eye diameter into the length of the lower jaw is "larger in male than female." We have determined that external morphological sexual dimorphism exists in *C. macouni*. Of 20 of the larger specimens taken on cruise C6303 (stations 84.70, 86.92, 87.80, 89.90, and 90.110), 8 are females with large ovarian eggs, ranging from 183–207 mm. SL (mean size 197), and 12 are males, 162–202 mm. (mean 177). The males have larger eyes than the females (eye into head 3.3 to 3.8 in the males, 4.0 to 4.6 in the females). One of the most pronounced differences between the sexes is the relative size and shape of the postocular organ. Morrow (1961:273) found that in *C. macouni* the postocular organ was generally elongate and triangular; the exposed luminous portion was triangular or at least pointed behind, while in other species of *Chauliodus* the postocular photophore was round or nearly so. His characterization is descriptive of the postocular organ of male specimens of *C. macouni*, especially of the exposed luminous portion, but in the females the organ is different and more variable than in the males. The organ is always smaller in the adult females. In some females the exposed luminous portion is reduced to a small rounded area, less than one-quarter of the area of that in the adult males; in others it is elongated, probably owing to a differential contraction following preservation of the surrounding tissue (fig. 17).

MALACOSTEIDAE

59. *Aristostomias scintillans* Gilbert.

Figures 16B and 18.

60.60, H6204, (1) 56 mm.; 60.80, C6208, (8) 73–214 mm.; 60.90, C6208, (2) 62–168 mm.; 60.120, H6204, (1) 189 mm.; 60.180, H6204, (1) 55.5 mm.; 70.80b, B6203, (4) 52–64 mm.; 70.80–5N, B6203, (6) 55–70 mm.; 80.90, B6203, (1) 78.5 mm.; 80.90–5N, B6203, (2) 64–67 mm.; 83.77, C6303, (1) 92 mm.; 86.92, C6303, (1) 54 mm.; 88.105a, B6303, (1) 58 mm.; 90.70, C6208, (1) 148 mm.; 90.80, C6208, (1) 51.5 mm.; 97.40, C6303, (4) 44–140 mm.; 97.50, B6203, (2) 82–129 mm.; 100.40, H6204, (1) 114 mm.; 108.63, C6303, (2) 46–109 mm.; 110.40, H6204, (1) 123 mm.; 120.80, H6204, (1) 101 mm.

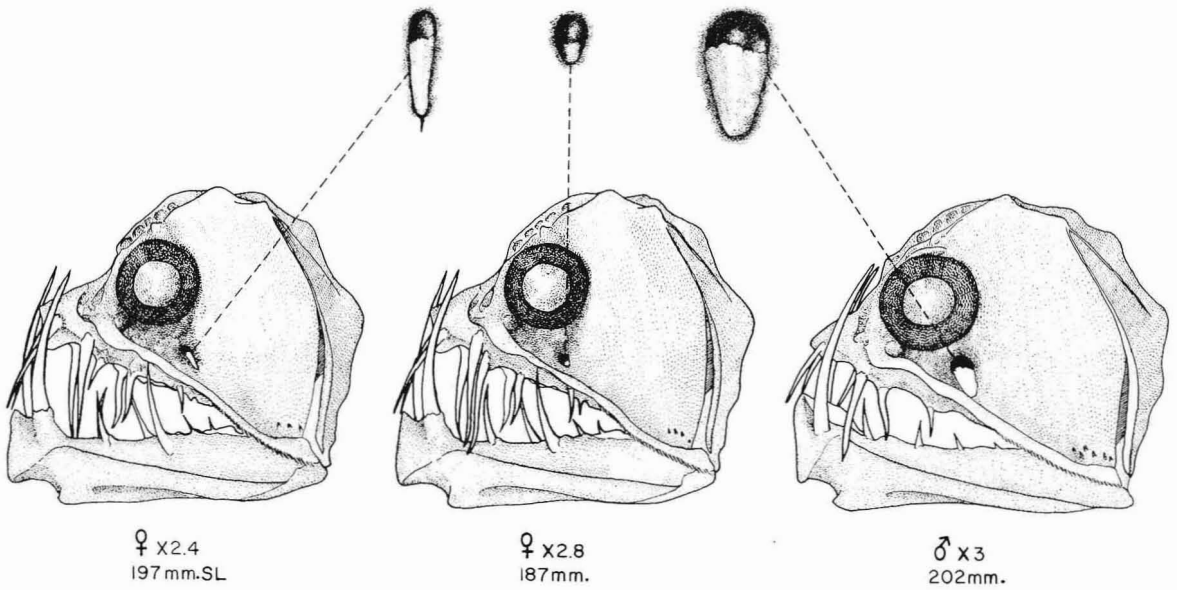

FIGURE 17.—*Chauliodus macouni*, postocular organs, showing the typical triangular shape in juveniles and adult males (right) and the variable and frequently elongated shape in adult females (left and middle).

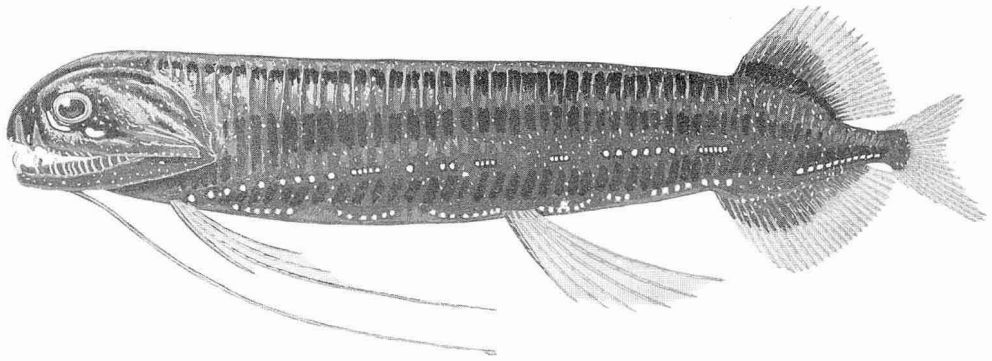

FIGURE 18.—*Aristostomias scintillans*, adult, ca. 280 mm. SL, station 20.40, B5003.

BATHYLACONIDAE

60. *Bathylaco nigricans* Goode and Bean.

Figure 19.

86.92, C6303, (1) 244 mm.

The four previously known specimens of this rare isospondylid (including *Macromastax gymnus* Beebe) were compared by Maul (1959: 1–8). G. E. Maul has lent us another specimen taken off Madeira. Of the six specimens known to us, four are from the North Atlantic, and the other Eastern Pacific specimen is from off Colombia. The two Pacific specimens differ slightly from the Atlantic specimens, but all appear to be conspecific. The specimen taken with the *Cobb* trawl from about 305 km. (190 miles) SSW. off Point Conception, Calif., is the largest known.

GIGANTUROIDEA

GIGANTURIDAE

61. *Bathyleptus lisae* Walters.

Figures 20 and 25C.

86.92, C6303, (1) 182 mm.

This is one of the larger and better preserved specimens of this species that has been taken (V. Walters, personal communication). Alive when it came on deck in the trawl, it bit the junior author on the finger. Despite a number of trenchant morphological differences (that may have an ontogenetic basis), there are certain similarities between this species and *Rosaura rotunda* Tucker that suggest that they may have at least an intrasubordinal relationship.

LYOMERI

MONOGNATHIDAE

62. *Monognathus* sp.

60.140, H6204, (1) 51.5 mm.

This specimen, from about 630 km. (390 miles) WSW. of San Francisco, Calif., is probably one of the largest specimens of this little known group to be recorded; the intrageneric relationships are uncertain, and this specimen is therefore best not identified to species (G. L. Orton and R. H. Rosenblatt, personal communications).

FIGURE 19.—*Bathylaco nigricans*, 244 mm. SL, station 86.92, C6303.

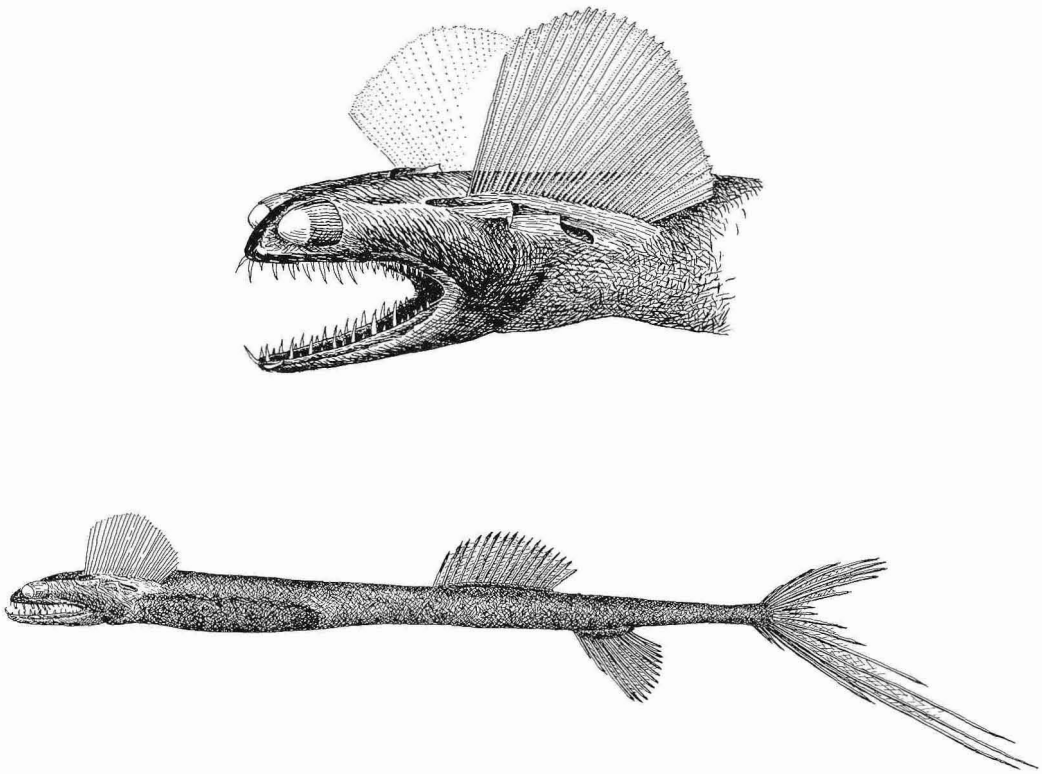

FIGURE 20.—*Bathyleptus lisae* (head and lateral views), 182 mm. SL, station 86.92, C6303.

CETUNCULI

CETOMIMIDAE

63. *Ditropichthys* sp.

90.200, H6204, (1) 38.5 mm.

This specimen, from about 1,000 km. (620 miles) WSW. off Point Conception, Calif., is identified as an undescribed species of *Ditropichthys* by R. R. Rofen (personal communication), who is preparing a detailed description for publication.

INIOMI

NEOSCOPELIDAE

64. *Scopelengys tristis* Alcock.

86.92, C6303, (1) 182 mm.; 90.45a, H6105, (2) 115–143 mm.; 120.50, H6204, (1) 103 mm.

These specimens were taken about 305 km. (190 miles) SE. of Point Conception, about 95 km. (60 miles) SE. of San Pedro, Calif., and about 70 km. (45 miles) W. of Punta Eugenia, Baja California.

MYCTOPHIDAE

65. *Hierops crockeri* (Bolin).

Figure 16C.

60.60, H6204, (1) 29 mm.; 60.70, H6204, (11) 24–35 mm.; 60.70, C6208, (7) 30–36.5 mm.; 60.80, H6204, (8) 22–39 mm.; 60.80, C6208, (2) 35–36 mm.; 60.90, H6204, (16) 15–40 mm.; 60.100, H6204, (3) 23–27 mm.; 60.100, C6208, (1) 38 mm.; 60.120, B6203, (4) 22–38 mm.; 60.120, H6204, (5) 34–38 mm.; 60.140, H6204, (3) 21.5–37 mm.; 60.160, H6204, (4) 34–39 mm.; 60.180, H6204, (1) 24 mm.; 60.200, B6203, (1) 30 mm.; 60.200, H6204, (1) 22 mm.; 70.60, C6208, (2) 22–37 mm.; 70.100, C6208, (2) 36–39 mm.; 80.60, C6208, (2) 23.5–38 mm.; 80.70, B6203, (1) 27 mm.; 80.70, H6204, (3) 10–27 mm.; 80.70, C6208, (1) 19 mm.; 80.75, B6303, (1) 15.3 mm.; 80.80, H6204, (6) 26–42 mm.; 80.100, H6204, (2) 15–16 mm.; 80.140, C6208, (4) 27–46 mm.; 80.150, C6208, (6) 30–52 mm.; 80.170, C6208, (2) 39–45 mm.; 80.180, C6208, (2) 39 mm.; 80.190, C6208, (1) 24 mm.; 80.200, C6208, (1) 45 mm.; 83.77, C6303, (26) 25–36 mm.; 83.90, C6303, (79) 25–39 mm.; 84.67, C6303, (11) 15–36 mm.; 84.68, C6303, (6) 26–35.5 mm.; 86.92, C6303, (4) 27.8–34.5 mm.; 87.80, C6303, (2) 19–28 mm.; 90.45, H6204, (1) 35.5 mm.; 90.48a, H6105, (1) 18.5 mm.; 90.48b, H6105, (5) 12.5–14 mm.; 90.60, C6208, (2) 26–28 mm.; 90.70, H6204, (2) 35–42 mm.; 90.100, C6208, (2) 19–23.5 mm.; 90.140, C6208, (2) 20–46 mm.;

90.160, C6208, (3) 31–40 mm.; 90.180, C6208, (3) 34–43 mm.; 90.200, C6208, (3) 33–40 mm.; 93.31, C6303, (1) 18.5 mm.; 94.32a, B6204, (1) 26 mm.; 97.40, C6303, (2) 17.5–21 mm.; 97.50, B6203, (2) 29–dis., mm.; 97.65, C6303, (4) 31–45 mm.; 100.60, H6204, (1) 25 mm.; 100.65, C6303, (6) 26.5–32.5 mm.; 100.80, H6204, (1) 17.5 mm.; 100.90, H6204, (1) 27.5 mm.; 100.120, H6204, (1) 49 mm.; 100.160, H6204, (1) 45 mm.; 103.50, C6303, (4) 20–23 mm.; 108.63, C6303, (2) 23–43.5 mm.; 110.100, H6204, (1) 15 mm.; 110.140, H6204, (2) 31–44 mm.; 110.160, H6204, (1) 45 mm.; 120.60, H6204, (5) 18.5–26 mm.; 120.70, H6204, (1) 43 mm.; 120.80, H6204, (12) 20–46 mm.; 120.90, M6204, (3) 29–32 mm.

66. *Electrona rissoi* (Cocco).

Figure 16C.

80.150, C6208, (1) 30 mm.; 84.92, B6303, (1) 43.5 mm.; 90.100, C6208, (1) 58.5 mm.; 100.65, C6303, (3) 44.5–45.5 mm.; 110.140, H6204, (1) 48 mm.

67. *Hygophum* sp.

Figure 16D.

60.180, H6204, (1) 43 mm.; 60.200a, B6203, (5) 33–44 mm.; 73.200, B6203, (1) 45 mm.; 80.160, C6208, (246) 19–52.5 mm.; 80.170, C6208, (11) 30–47 mm.; 80.190, C6208, (28) 43–52 mm.; 80.200, C6208, (8) 39–53 mm.; 83.77, C6303, (1) 34 mm.; 86.92, C6303, (1) 36 mm.; 90.80, C6208, (3) 41–44 mm.; 90.90, C6303, (2) 37.5–39.5 mm.; 90.100, C6208, (2) 42 mm.; 90.110, B6203, (1) 42 mm.; 90.120, C6208, (86) 32–51 mm.; 90.140, C6208, (1) 40 mm.; 90.150, C6208, (40) 35–49 mm.; 90.160, H6204, (1) 26 mm.; 90.160, C6208, (10) 33.5–52 mm.; 90.190, C6208, (26) 41–55 mm.; 90.200, H6204, (3) 16–32 mm.; 92.115, B6303, (6) 24.5–40 mm.; 100.65, C6303, (1) 21.5 mm.; 100.100, H6204, (2) 37–43 mm.; 100.140, H6204, (3) 27–43 mm.; 100.160, H6204, (1) 13 mm.; 120.80, H6204, (1) 59 mm.; 123.45, B6212, (1) 45 mm.; 127.45, B6212, (1) 31.5 mm.

Taxonomic differentiation of the species in this genus is not definitive or convincing. Fraser-Brunner (1949:1050) synonymized *H. atratum* (Garman) with *H. reinhardti* (Lütken). There are indications, from other studies, that these two species are distinct (E. H. Ahlstrom, personal communication). The above specimens appear to represent either one or both of the cited nominal species.

68. *Benthosema suborbitale* (Gilbert).

90.160, H6204, (1) 31 mm.

This specimen was taken about 740 km. (460 miles) SE. of Point Conception, Calif.

69. *Diogenichthys atlanticus* (Tåning).

Figure 21A.

60.80, H6204, (1) 19 mm.; 60.160, B6203, (2) 27 mm.; 60.180, H6204, (6) 15–24 mm.; 60.200a, B6203, (3) 19–26 mm.; 60.200b, B6203, (4) 19.5–23.5 mm.; 70.80b, B6203, (1) 20 mm.; 70.80–5N, B6203, (8) 15–25 mm.; 70.200, H6204, (6) 9–22 mm.; 73.200, B6203, (2) 23–26 mm.; 80.80, C6208, (1) 18 mm.; 80.90, B6203, (1) 23 mm.; 80.90–5N, B6203, (55) 18–25 mm.; 80.90, H6204, (4) 13–22 mm.; 80.160, C6208, (7) all ca. 16 mm.; 80.190, C6208, (4) 16.5–20.5 mm.; 84.92, C6303, (1) 22.5 mm.; 90.48a, H6105, (1) 23 mm.; 90.80, C6208, (5) 20–23 mm.; 90.110, C6303, (3) 21–23.5 mm.; 90.120, H6204, (2) 22 mm.; 90.150, C6208, (1) 23 mm.; 90.160, H6204, (3) all 15 mm.; 90.190, C6208, (1) 20 mm.; 90.200, H6204, (5) 12–16.5 mm.; 100.60, H6204, (2) 22.5–25 mm.; 100.65, C6303, (4) 19.6–23.6 mm.; 100.80, H6204, (3) all 20 mm.; 100.100, H6204, (4) 22–24.5 mm.; 100.140, H6204 (10) 15–23 mm.; 100.160, H6204, (3) all 13 mm.; 110.120, H6204; (1) 16 mm.; 110.160, H6204, (1) 14.5 mm.

The records of capture shown on the chart suggest that *D. atlanticus* is a northern species in this area and *D. laternatus* is a southern species. Records from other collections show that in waters farther offshore than sampled by the survey, the distribution of *D. atlanticus* extends southward at least to lat. 20° N.

70. *Diogenichthys laternatus* (Garman).

Figure 21A.

120.70, H6204, (3) 23.5–24 mm.; 120.80, H6204, (2) 22.5–25 mm.; 120.90, H6204, (6) 22–25 mm.; 127.45, B6212, (1) 14 mm.; 130.40, B6212, (5) 16–25 mm.; 133.35, B6212, (1) 18.5 mm.; 137.35, B6212, (2) 13–18 mm.; 137.50, B6203, (6) 14.5–26 mm.; 140.35, B6212, (16) 12.1–24 mm.

71. *Symbolophorus californiense* (Eigenmann and Eigenmann).

Figure 21B.

60.80, C6208, (4) 60–95 mm.; 60.120, B6203, (4) 29–90 mm.; 60.160, B6203, (1) 32 mm.; 60.160, H6204, (1) 95 mm.; 66.100, C6208, (12) 48–71 mm.; 70.60, C6208, (4) 55–74 mm.; 70.80–5N, B6203, (9) 45–67 mm.; 70.80, C6208, (167) 39–91 mm.; 70.100, C6208, (1) 70 mm.; 80.52, C6208, (1) 75 mm.; 80.55, H6204, (1) 90 mm.; 80.60, H6204, (1) 73 mm.; 80.60, C6208, (7) 71–86 mm.; 80.65, B6303, (12) 42–94 mm.; 80.70, C6208, (2) 78–81 mm.; 80.75, B6203, (6) 27–59 mm.; 80.80, H6204, (2) 52–67 mm.; 80.80, C6208, (6) 53–73 mm.; 80.90, B6203, (4) 43–76 mm.; 80.90–5N, B6203, (5) 25–59 mm.; 80.90, H6204, (4) 32–67 mm.; 80.100, B6203, (34) 44–94 mm.; 80.200, C6208, (1) 30.5 mm.; 82.69, C6303, (24) 37.5–90 mm.; 83.77, C6303, (124) 32.5–85 mm.; 83.70b, B6303, (16) 51–95 mm.; 83.90, C6303, (2) 56–66 mm.; 83.70, C6303, (7) 53–70.5 mm.; 84.67, C6303, (3) 56.5–65.5 mm.; 84.92, B6303, (10) 39.5–90 mm.; 84.70, C6303, (28) 48–75 mm.; 86.92, C6303, (1) 57 mm.; 87.80, C6303, (2) 52.5–55.5 mm.; 87.90, C6303, (5) 46.5–64.5 mm.; 90.48a, H6105, (3) 57–77 mm.; 90.60, H6204, (1) 65 mm.; 90.70, C6208, (2) 66–70 mm.; 90.80, C6208, (5) 40–63 mm.; 90.90, C6303, (1) 73 mm.; 90.120, C6208, (5) 28–29.5 mm.; 90.190, C6208, (1) 27 mm.; 91.39a,

C6208, (4) 37.5–67 mm.; 91.39b, C6208, (3) 65–77.5 mm.; 97.40, C6303, (11) 48–86 mm.; 97.50, B6203, (4) 54–70 mm.; 97.65, C6303, (24) 32.5–51.5 mm.; 100.40, H6204, (1) 51 mm.: 100.60, H6204, (2) 24–60 mm.; 100.65, C6303, (86) 28–87.5 mm.; 100.90, H6204, (1) 28 mm.; 100.120, H6204, (1) 24 mm.; 103.50, C6303, (1) 54 mm.; 107.60, C6303, (21) 47–66 mm.; 108.63, C6303, (6) 49.5–62.5 mm.; 110.50, B6203, (1) 46 mm.

This species has generally been known as *Myctophum californiense*. It was designated as the type species of the new genus *Symbolophorus* by Bolin and Wisner in Bolin (1959:11).

72. *Myctophum nitidulum* Garman.

Figure 21B.

60.200a, B6203, (1) 65 mm.; 90.150, C6208, (2) 50–68 mm.; 90.200, H6204, (1) 19 mm.; 100.65, C6303, (13) 48–63 mm.; 108.63, C6303, (1) 70 mm.; 110.120, H6204, (2) 25 mm.; 123.50, B6203, (2) 26–36 mm.

This species was recently synonymized with *M. margaritatum* Gilbert, the name by which it has been more commonly known, and was distinguished from *M. affine* (Lütken) by Bolin (1959:14).

73. *Gonichthys tenuiculus* (Garman).

130.40, B6212, (1) 28 mm.; 137.50, B6203, (1) 44 mm.

These specimens were taken about 70 km. (45 miles) SW. of Ballenas Bay and about 160 km. (100 miles) W. of Santa Maria Bay, Baja California.

74. *Tarletonbeania crenularis* (Jordan and Gilbert).

Figure 16D.

60.60, H6204, (8) 12–62 mm.; 60.60, C6208, (7) 38–59 mm.; 60.70, H6204, (6) 22–35 mm.; 60.70, C6208, (3) 43–64 mm.; 60.80, H6204, (8) 12.5–32 mm.; 60.80, C6208, (9) 29–54 mm.; 60.90, H6204, (4) 23–31 mm.; 60.90, C6208, (2) 17–36 mm.; 60.100, H6204, (4) 13–31 mm.; 60.100, C6208, (3) 15–29 mm.; 60.120, B6203, (2) 26–30 mm.; 60.180, H6204, (3) all 15 mm.; 65.54, C6208, (8) 37–74 mm.; 70.51, C6208, (1) 44 mm.; 70.60, C6208, (1) 17 mm.; 70.80–5N, B6203, (1) 24 mm.; 77.51, C6208, (3) 34.5–45 mm.; 80.52, C6208, (77) 34–80 mm.; 80.55, H6204, (1) 32 mm.; 80.60, B6203, (1) 31 mm.; 80.60, H6204, (2) 30–31 mm.; 80.60, C6208, (8) 34–60 mm.; 80.65, B6303, (7) 28–36.5 mm.; 80.70, C6208, (2) 19 mm.; 80.75, B6303, (1) 27 mm.; 80.80, C6208, (1) 26 mm.; 80.90–5N, B6203, (3) 27–29 mm.; 80.90, H6204, (3) 17–34 mm.; 80.100, B6203, (1) 36 mm.; 80.100, H6204, (1) 16.5 mm.; 83.69, C6303, (43) 32.5–68 mm.; 83.70a, B6303, (2) 23–28 mm.; 83.70b, B6303, (3) 30.5–32.5 mm.; 83.77, C6303, (2) 18–50 mm.; 83.90, C6303, (15) 19.5–30.5 mm.; 84.67, C6303, (29) 37.5–61 mm.; 84.70, C6303, (16) 37.5–66.5 mm.; 84.92, B6303, (3) 14–26 mm.; 90.35, B6203, (1) 43 mm.; 90.45a, H6105, (1) 14.5 mm.; 90.45, H6204, (1) 29 mm.; 90.48a, H6105, (7) 16–32.5 mm.; 90.48b, H6105, (1) 14.5 mm.; 90.60, H6204, (8) 33–48 mm.; 90.70, C6208, (1) 28 mm.

75. *Lobianchia gemellari* (Cocco).

Fig 21D.

90.160, C6208, (5) 50–53 mm.; 90.200, C6208, (1) 31 mm.; 100.160, H6204, (1) 57 mm.

This species was listed as *Diaphus* (*Hyperphotops*) *gemellari* (Cocco) by Fraser-Brunner (1949:1066). It was reestablished as the type species of the genus *Lobianchia* Gatti by Bolin (1959:18). Taken some 800 km. (500 miles) WSW. of San Diego, these records would appear to approach the limit of its eastward distribution in this latitude.

76. *Diaphus theta* Eigenmann and Eigenmann.

Figure 21C.

60.60, H6204, (27) 24–53 mm.; 60.60, C6208, (13) 37–42 mm.; 60.70, H6204, (251) 28–40 mm.; 60.70, C6208, (8) 34–45 mm.; 60.80, H6204, (11) 25–71 mm.; 60.80, C6208, (34) 34–54 mm.; 60.90, H6204, (9) 29–63 mm.; 60.90, C6208, (8) 37–41 mm.; 60.100, H6204, (6) 30–63 mm.; 60.100, C6208, (1) 41 mm.; 60.120, B6203, (5) 32–66 mm.; 60.120, H6204, (2) 30–47 mm.; 60.160, H6204, (1) 56 mm.; 70.51, C6208, (12) 37.5–57 mm.; 70.80b, B6203, (4) 33–64 mm.; 70.80–5N, B6203, (38) 24–41 mm.; 70.80, C6208, (15) 32–48 mm.; 70.90, B6203, (1) 32 mm.; 79.54, B6303, (3) 30–52 mm.; 80.52, C6208, (2) 36–40 mm.; 80.55, H6204, (2) 29–31 mm.; 80.60, B6203, (2) 32–34 mm.; 80.60, H6204, (5) 25–34 mm.; 80.60, C6208, (16) 33–54 mm.; 80.70, B6203, (1) 26 mm.; 80.70, H6204, (1) 33 mm.; 80.70, C6208, (5) 37–44 mm.; 80.75, B6303, (8) 26–59 mm.; 80.80, H6204, (5) 27–67 mm.; 80.80, C6208, (22) 15–60 mm.; 80.90, B6203, (1) 55 mm.; 80.90–5N, B6203, (6) 22–39 mm.; 80.90, H6204, (3) 26–50 mm.; 82.69, C6303, (15) 26–57.5 mm.; 83.70a, B6303, (17) 29–60 mm.; 83.70b, B6303, (2) 135–53 mm.; 83.77, C6303, (45) 24–51 mm.; 83.90, C6303, (63) 22–56.5 mm.; 83.70, C6303, (11) 27–57.5 mm.; 84.67, C6303, (206) 24–50 mm.; 84.68, C6303, (70) 26.5–41.5 mm.; 84.70, C6303, (74) 23–50 mm.; 84.92, B6303, (1) 30 mm.; 87.80, C6303, (1) 26.5 mm.; 88.105b, B6303, (6) 21–24.5 mm.; 90.32, B6203, (16) 24–34 mm.; 90.32, H6204, (2) 27–31 mm.; 90.45, H6204, (3) 35–53 mm.; 90.47, C6208, (13) 35–40 mm.; 90.48a, H6105, (3) 34–39 mm.; 93.31, C6303, (5) 21–28.5 mm.; 97.40, C6303, (6) 23–29 mm.; 97.50, B6203, (2) 26–58 mm.; 97.65, C6303, (1) 29 mm.; 100.65, C6303, (1) 23 mm.; 100.120, H6204, (1) 33 mm.; 100.160, H6204, (1) 30 mm. (specimen damaged, identification questionable).

77. *Diaphus fulgens* Brauer.

Figure 21C.

60.200a, B6203, (1) 36 mm.; 87.200, B6203, (1) 30 mm.; 90.150, C6208, (2) 42 mm.; 90.200, C6208, (1) 38 mm.; 110.160, H6204, (3) 28.5—43 mm.

795-358 O—66——10

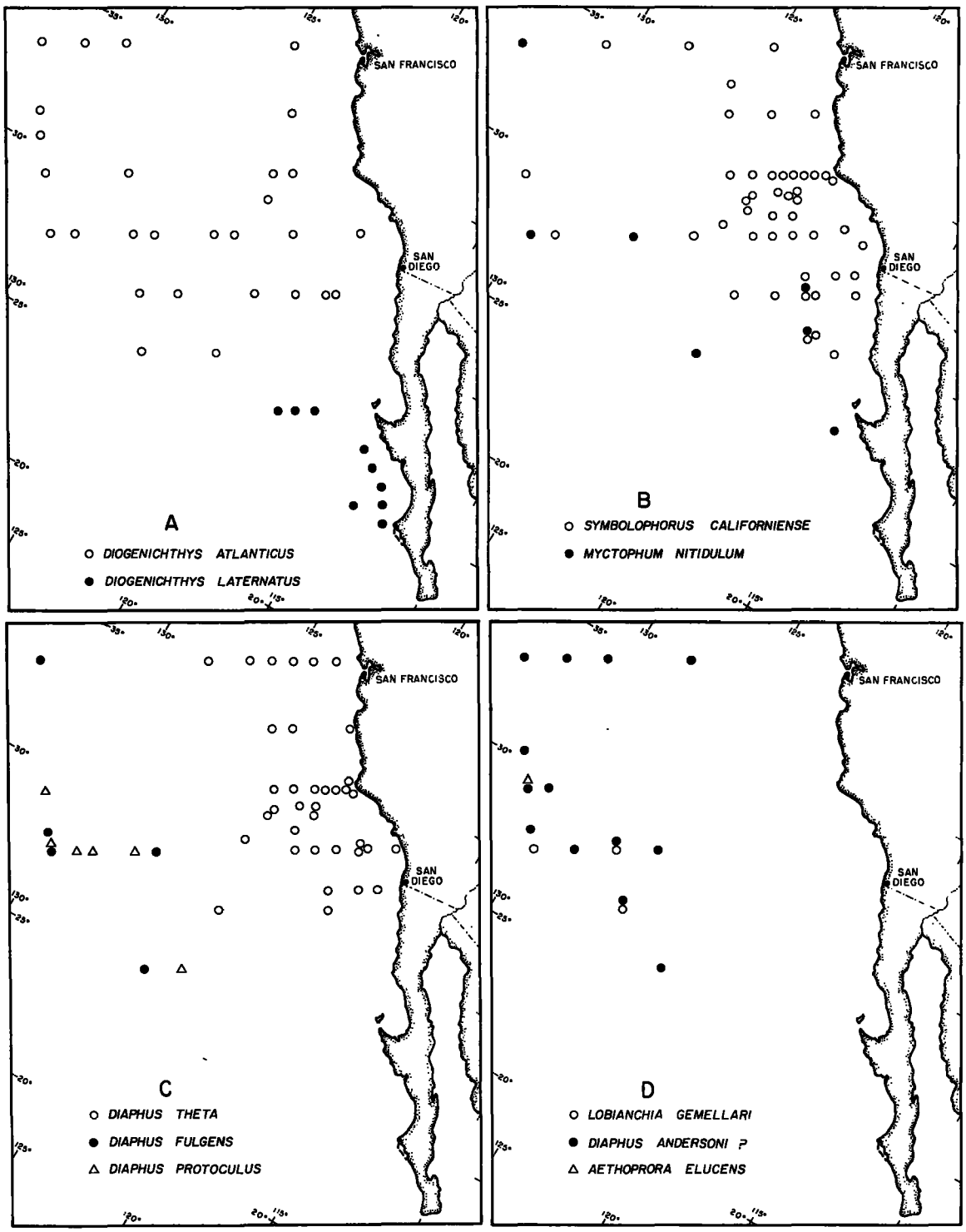

FIGURE 21.—Locations of capture of: A, *Diogenichthys atlanticus, Diogenichthys laternatus.* B, *Symbolophorus californiense, Myctophum nitidulum.* C. *Diaphus theta, Diaphus fulgens, Diaphus protoculus.* D. *Lobianchia gemellari, Diaphus andersoni?, Aethoprora elucens.*

These specimens and those of *D. protoculus* (following) were identified according to Fraser-Brunner (1949:1075). The differences between the two forms are slight, however, and *D. fulgens* may be a junior synonym of *D. protoculus*.

78. *Diaphus protoculus* Gilbert.

Figure 21C.

80.200, C6208, (1) 36.5 mm.: 90.160, C6208, (8) 31.5–43 mm.; 90.180, B6203, (1) 24 mm.: 90.190, C6208, (1) 37 mm.; 90.200, H6204, (1) 27 mm.; 110.140, H6204, (2) 43 mm.

79. *Diaphus andersoni* Tåning?

Figure 21D.

60.120, B6203, (21) 23–33 mm.; 60.120, H6204, (1) 30 mm.; 60.160, B6203, (1) 35 mm.; 60.180, H6204, (1) 25 mm.; 60.200, H6204, (1) 28 mm.; 73.200, B6203, (2) 25–28 mm.; 80.190, C6208, (1) 32 mm.; 80.200, C6208, (2) 26–29 mm.; 87.200, B6203, (1) 27 mm.; 90.140, C6208, (1) 27.5 mm.; 90.160, H6204, (1) 27 mm.; 90.160, C6208, (3) 26–30.5 mm.; 90.180, B6203, (3) 25–27 mm.; 90.180, H6204, (2) 29 mm.; 100.160, H6204, (3) 26.5–30.5 mm.; 110.140, H6204, (1) 30 mm.

D. andersoni had previously been recorded only from the South Pacific. The above specimens are obviously closely related to *D. andersoni*, but certain slight differences, especially the relative length of the luminous patch of tissue extending back from the lateral pectoral photophore (PLO), suggest that they may be distinct (R. L. Wisner, personal communication). If these differences warrant specific distinction of the above specimens from *D. andersoni*, then these specimens represent an undescribed species.

80. *Aethoprora elucens* (Brauer).

Figure 21D.

80.200, C6208, (1) 51 mm.

This species was listed as *Diaphus* (*Lamprossa*) *elucens* Brauer by Fraser-Brunner (1949: 1073). It was later placed in the genus *Aethoprora* Goode and Bean by Bolin (1959:22). This single record from about 970 km. (600 miles) off Point Conception undoubtedly represents a rare occurrence of the species off California.

81. *Notolychnus valdiviae* (Brauer).

Figure 22A.

60.180, H6204, (4) 20–24 mm.; 60.200a, B6203, (14) all ca. 14 mm.; 60.200, H6204, (3) 22–24 mm.; 70.200, H6204, (11) 17–25 mm.; 73.200, B6203, (67) 14–26 mm.; 80.200, C6208, (1) 22.5 mm.: 84.92, B6303, (2) 22–25 mm.; 87.200, B6203, (9) 18–26 mm.; 90.120, C6208, (2) 14.5–18.5 mm.; 90.160, H6204, (9) 18–25 mm.; 90.180, H6204, (2) 24–26 mm.; 90.200, H6204, (7) 20–24 mm.; 100.60, H6204, (1) 19 mm.; 100.80, H6204, (2) 23 mm.; 100.100, H6204, (1) 22 mm.; 100.140, H6204, (20) 19.5–24.5 mm.; 100.160, H6204, (24) 13–24 mm.; 110.160, H6204, (16) 20–30 mm.

82. *Lampadena urophaos* Paxton.

Figure 22B.

60.160, H6204, (1) 57 mm.; 86.92, C6303, (1) 50 mm.; 100.40, H6204, (1) 103 mm.

These specimens extend northward and seaward, the known range of this species recently described by Paxton (1963:29–33).

83. *Taaningichthys bathyphilus* (Tåning).

Figure 22B.

120.70, H6204, (1) 66.5 mm.

This species, previously known as *Lampadena bathyphila*, was designated as the type species of the new genus *Taaningichthys* by Bolin (1959: 25).

84. *Taaningichthys minimus* (Tåning).

Figure 22B.

80.200, C6208, (1) 52 mm.; 100.140, H6204, (1) 55 mm.

This species, formerly known as *Lampadena minima*, was one of the two species included in the new genus *Taaningichthys* described by Bolin (1959: 25). *T. minimus* was described from the North Atlantic Ocean—we know of no previous records of it from the Pacific Ocean.

85. *Taaningichthys* spp.

Figure 22B.

60.60, H6204, (1) 90 mm.; 60.140, H6204, (2) 80–85 mm.; 80.90, H6204, (1) 30 mm.; 100.60, H6204, (1) 70 mm.; 100.80, H6204, (1) 83 mm.; 110.160, H6204, (1) 51 mm.

The above six station records include more than one species of *Taaningichthys*. They are not, so far as known, *T. bathyphilus* or *T. minimus*, the only two species ascribed to this genus by Bolin (1959:25). Some of the above specimens lack photophores, and all of them may represent undescribed species.

86. *Stenobrachius leucopsarus* (Eigenmann and Eigenmann).

Figure 22A.

60.60, H6204, (95) 19–70 mm.; 60.70, H6204, (4) 20–26 mm.: 60.80, H6204, (20) 15.5–82 mm.; 60.80, C6208; (26) 25–63 mm.; 60.90, H6204, (10) 29–56 mm.; 60.90, C6208, (1) 51 mm.; 60.100, H6204, (1) 35 mm.; 60.120, H6204, (1) 38 mm.; 70.80b, B6203, (4) 33–64 mm.; 70.80–5N, B6203, (57) 26–60 mm.; 77.51, C6208, (6) 50–66 mm.; 79.54, B6303,

(8) 35.5–53 mm.; 80.52, C6208, (3) 49–52 mm.; 80.55, H6204, (117) 32–82 mm.; 80.60, B6203, (13) 33–57 mm.; 80.60, H6204, (154) 30–75 mm.; 80.60, C6208, (735) 22.5–78 mm.; 80.65, B6303, (4) 28–69 mm.; 80.70, H6204, (3) 36–71 mm.; 80.70, C6208, (24) 43–70 mm.; 80.75, B6303, (4) 34.5–71.5 mm.; 80.80, H6204, (8) 34–78 mm.; 80.90, B6203, (5) 38–60 mm.; 80.90–5N, B6203, (11) 31–51 mm.; 80.90, H6204, (4) 17–35 mm.; 80.100, B6203, (2) 32–36 mm.; 82.69, C6303, (38) 29–68.5 mm.; 83.70, C6303, (44) 49–72 mm.; 83.70a, B6303, (4) 57–59 mm.; 83.70b, B6303, (1) 29 mm.; 83.77, C6303, (29) 31–73 mm.; 83.90, C6303, (3) 38–62.5 mm.; 84.67, C6303, (43) 44–71 mm.; 84.70, C6303, (143) 31–74 mm.; 84.92, B6303, (4) 55–70 mm.; 90.32, B6203, (27) 29–72 mm.; 90.32, H6204, (21) 32–80 mm.; 90.45, H6105, (51) 37–78 mm.; 90.47, C6208, (74) 44–72 mm.; 90.48a, H6105, (135) 10.5–74 mm.; 90.48b, H6105, (4) 10–17.5 mm., 90.60, H6204, (257) 30–65 mm.; 90.70, H6204, (1) 38 mm.; 90.70, C6208, (10) 42–63 mm.; 93.29, C6208, (1) adult; 94.32a, B6204, (4) 36–69 mm.; 94.32b, B6204, (7) 52–67 mm.; 95.31a, B6204, (8) 33–49 mm.; 95.31b, B6204, (11) 35–66 mm.; 95.31c, B6204, (20) 34–59 mm.; 97.40, C6303, (67) 32–76 mm.; 97.50, B6203, (1) 51 mm.; 97.65, C6303, (3) 50–63 mm.; 100.40, H6204, (12) 39–72 mm.; 100.65, C6303, (12) 49.5–62 mm.

This species has usually been recorded as *Lampanyctus leucopsarus*, although it was recorded as *Lampanyctus* (*Stenobrachius*) *leucopsarus* by Fraser-Brunner (1949:1082). *Stenobrachius* is distinctive enough to warrant full generic status (R. L. Wisner, personal communication).

87. *Lampanyctus* (*Triphoturus*) *mexicanus* (Gilbert).

Figure 22C.

60.60, H6204, (1) 35 mm.; 80.55, H6204, (2) 34–55 mm.; 80.60, H6204, (3) 35–47 mm.; 80.65, B6303, (1) 23 mm.; 80.70, H6204, (4) 28–57 mm.; 80.75, B6303, (1) 24.5 mm.; 80.80, H6204, (3) 27–62 mm.; 80.80, C6208, (2) 37–43 mm.; 80.90–5N, B6203, (13) 26–58 mm.; 80.90, H6204, (12) 24–60 mm.; 80.100, B6203, (1) 48 mm.; 82.69, C6303, (29) 22–61.5 mm.; 83.70a, B6303, (1) 23.5 mm.; 83.70b, B6303, (3) 28–29 mm.; 83.77, C6303, (84) 24–67.5 mm.; 84.67, C6303, (1) 44 mm.; 84.92, B6303, (1) 50 mm.; 86.92, C6303, (93) 44–67 mm.; 87.80, C6303, (58) 38.5–66.5 mm.; 87.90, C6303, (1) 43.5 mm.; 90.32, B6203, (10) 32–58 mm.; 90.32, H6204, (11) 28–49 mm.; 90.45, H6105, (35) 29–54 mm.; 90.45, H6204, (1) 29 mm.; 90.47, C6208, (3) 42–60 mm.; 90.48a, H6105, (79) 14–66 mm.; 90.60, B6203, (1) 24 mm.; 90.60, H6204, (10) 30–59 mm.; 90.70, C6208, (2) 47–54 mm.; 90.120, H6204, (1) 27 mm.; 90.160, H6204, (1) 56 mm.; 91.39a, C6208, (1) 43 mm.; 93.100, C6303, (3000) 25–70 mm.; 94.32a, B6204, (14) 30–57 mm.; 95.31b, B6204, (2) 31–34 mm.; 97.40, C6303, (715) 23–66 mm.; 97.50, B6203, (5) 29–57 mm.; 97.65, C6303, (20) 26–66 mm.; 100.40, H6204, (20) 38–65 mm.; 100.40, C6303, (2) 54 mm.; 100.50, H6204, (1) 60 mm.; 100.60, H6204, (22) 30–66 mm.; 100.65, C6303, (461) 22.5–67 mm.; 100.80, H6204, (3) 27–60 mm.; 100.90, H6204, (17) 52–71 mm.; 100.100, H6204, (7) 23–63 mm.; 100.120, H6204, (1) 58 mm.; 100.140, H6204, (5) 31.5–58.5 mm.; 107.60, C6303, (1) 37 mm.; 108.63, C6303, (1857) 24–72 mm.; 110.35, H6204, (11) 35–66 mm.; 110.40, H6204, (83) 28.5–70 mm.; 110.46, C6303, (2) 47.5 mm.; 110.50, B6203, (22) 23–69 mm.; 110.120, H6204, (13) 24–67 mm.; 110.160, H6204, (1) 28 mm.; 111.36a, C6303, (ca. 600) adults and juveniles; 111.37b, C6303, (101) 32–62 mm.; 113.34a, C6303, (29) 25–60 mm.; 118.43, B6212, (613) 16.5–43 mm.; 120.45, H6204, (307) 22–69 mm.; 120.45, B6212, (22) 16.5–56 mm.; 120.50, H6204, (299) 26–68 mm.; 120.60, H6204, (2) 23.5–24 mm.; 120.70, H6204, (33) 25.5–64 mm.; 120.80, H6204, (83) 26.5–66 mm.; 120.90, H6204, (28) 27–65 mm.; 123.45, B6212, (98) 15.5–56 mm.; 123.50, B6203, (135) 23–70 mm.; 127.45, B6212, (48) 17.5–60.5 mm.; 130.40, B6212, (40) 18–56.5 mm.; 133.35, B6212, (20) 17.5–40 mm.; 137.35, B6212, (6) all 20 mm.; 137.50, B6203, (5) 25–59 mm.; 140.35, B6212, (183) 16.5–53 mm.

88. *Lampanyctus* (*Triphoturus*) *nigrescens* Brauer.

Figure 22C.

60.180, H6204, (1) 25 mm.; 60.200, H6204, (1) 28 mm.; 70.200, H6204, (2) 26 mm. and damaged adult; 80.160, C6208, (3) 30–33 mm.; 87.200, C6208, (2) 32–38 mm.; 90.160, C6208, (1) 31 mm.

89. *Lampanyctus* (*Triphoturus*) *microchir* Gilbert.

Figure 22C.

80.200, C6208, (1) 35 mm.

90. *Lampanyctus ritteri* Gilbert.

Figure 22D.

60.60, H6204, (6) 38–84 mm.; 60.80, H6204, (9) 30–83 mm.; 60.80, C6208, (35) 43–88 mm.; 60.90, H6204, (5) 35–98mm.; 60.90, C6208, (2) 42–51 mm.; 60.100, H6204, (6) 29–67 mm.; 60.120, B6203, (13) 28–92 mm.; 60.120, H6204, (12) 43–115 mm.; 60.140, H6204, (8) 20–105 mm.; 60.160, H6204, (4) 36–118 mm.; 70.80b, B6203, (7) 39–44 mm.; 70.80–5N, B6203, (120) 28–57 mm.; 73.200, B6203, (1) 25 mm.; 80.55, H6204, (8) 40–104 mm.; 80.60, B6203, (7) 22–64 mm.; 80.60, H6204, (20) 36–105 mm.; 80.60, C6208, (42) 33–80 mm.; 80.70, H6204, (10) 44–115 mm.; 80.75, B6303, (8) 34–76.5 mm.; 80.80, H6204, (35) 35–109 mm.; 80.90, B6203, (5) 38–60 mm.; 80.90–5N, B6203, (4) 37–44 mm.; 80.90, H6204, (27) 26–96 mm.; 80.100, B6203, (14) 28–70 mm.; 82.69, C6303, (121) 30–84 mm.; 83.70, C6303, (3) 49–72.5 mm.; 83.70a, B6303, (5) 43.5–70 mm.; 83.77, C6303, (259) 28.5–90 mm.; 83.90, C6303, (1) 66 mm.; 84.67, C6303, (36) 31–65.5 mm.; 84.70, C6303, (6) 37–95 mm.; 84.92, B6303, (31) 23–93 mm.; 86.92, C6303, (31) 38–110 mm.; 87.80, C6303, (8) 34–78 mm.; 90.32, B6203, (8) 36–60 mm.; 90.32, H6204, (1) 47 mm.; 90.45a, H6105, (2) 47–107 mm.; 90.47, C6208, (2) 51–73 mm.; 90.48a, H6105, (120) 23.5–97 mm.; 90.60, B6203, (2) 48 mm.; 90.60, H6204, (60) 35–106 mm.; 90.70, H6204, (20) 39–112 mm.; 90.70, C6208, (14) 27.5–70 mm.; 91.39a, C6208, (1) 54 mm.; 93.100, C6303, (8) 82–93 mm.; 94.32a, B6204, (1) 95 mm.; 94.32b, B6204, (2) 66–82 mm.; 97.40, C6303, (88)

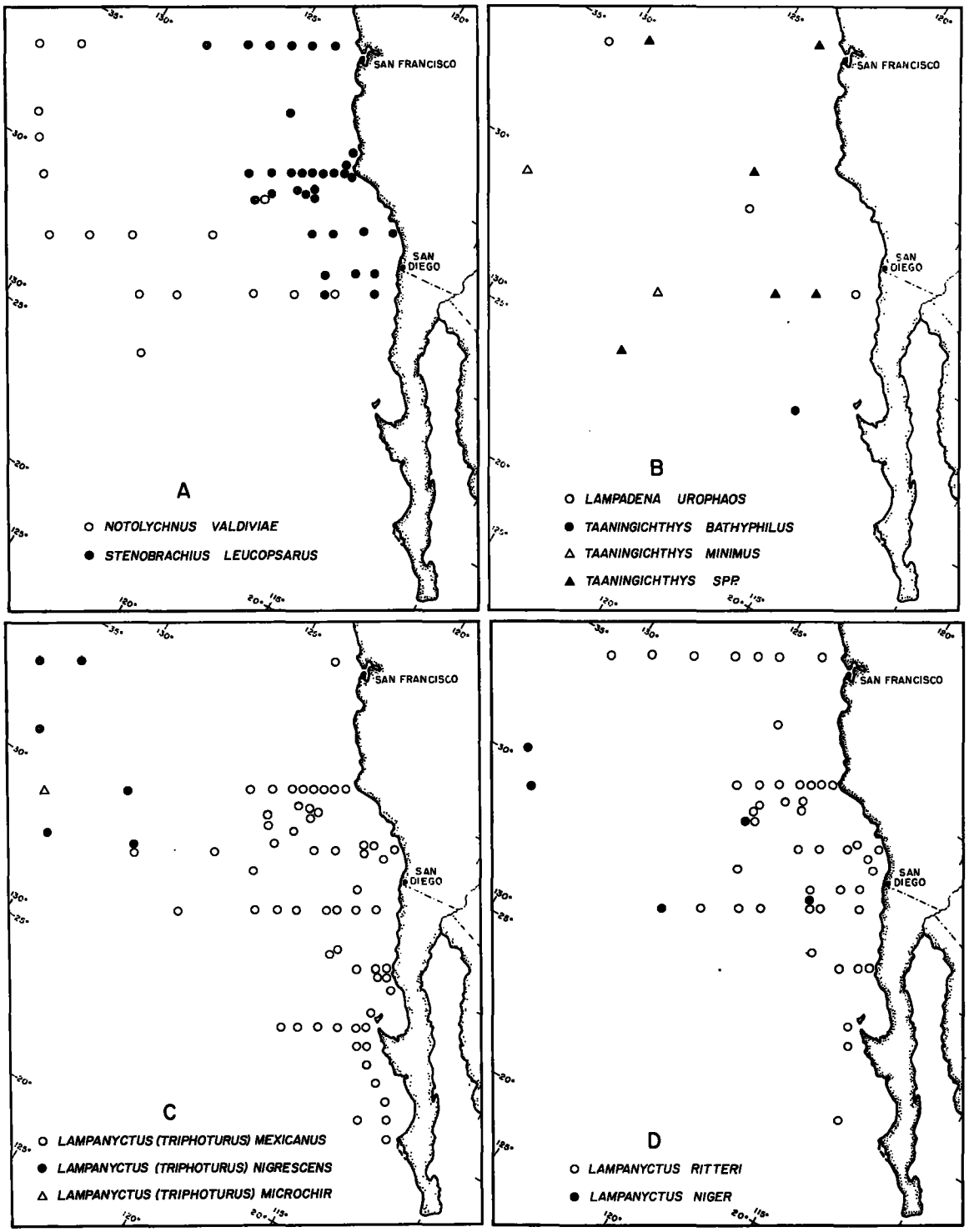

FIGURE 22.—Locations of capture of: A, *Notolychnus valdiviae, Stenobrachius leucopsarus.* B, *Lampadena urophaos, Taaningichthys bathyphilus, Taaningichthy sminimus, Taaningichthys spp,* C. *Lampanyctus (Triphoturus) mexicanus, Lampanyctus (Triphoturus) nigrescens, Lampanyctus (Triphoturus) microchir.* D, *Lampanyctus ritteri, Lampanyctus niger.*

28–108 mm.; 97.50, B6203, (7) 32–97 mm.; 97.65, C6303, (2) 46 mm.; 100.40, H6204, (12) 48–97 mm.; 100.60, H6204, (6) 28–110 mm.; 100.65, C6303, (47) 27.5–99.5 mm.; 100.90, H6204, (1) 107 mm.; 100.100, H6204, (1) 24.5 mm.; 100.120, H6204; (1) 84 mm.; 108.63, C6303, (15) 28–99 mm.; 110.35, H6204, (1) 30 mm.; 110.40, H6204, (3) 88–105 mm.; 110.50, B6203, (2) 46–90 mm.; 120.45, H6204, (2) 35–115 mm.; 123.50, B6203, (1) 27 mm.; 137.50, B6203, (2) 43 mm.

91. *Lampanyctus regalis* (Gilbert).

Figure 23A.

60.60, H6204, (3) 57–76 mm.; 60.80, C6208, (1) 64 mm.; 60.90, H6204, (2) 50–58 mm.; 60.100, H6204, (1) 36 mm.: 60.120, B6203, (1) 38 mm.; 60.180, H6204, (2) 24–25 mm.; 70.200, H6204, (1) 4.5 mm.; 80.55, H6204, (3) 41–53 mm.; 80.60, B6203, (1) 40 mm.; 80.60, H6204, (2) 42–44 mm.; 80.75, B6303, (2) 27.5–39.5 mm.; 83.69, C6303, (1) 36 mm.; 83.77, C6303, (1) 39 mm.; 84.67, C6203, (1) 43 mm.; 87.200, B6203, (2) 34–35 mm.; 90.32, H6204, (1) 43 mm.; 90.45a, H6105, (2) 48–52 mm.; 90.60, H6203, (1) 35 mm.; 90.160, H6204, (3) 38–49 mm.; 97.50, B6203, (2) 44 mm.; 100.65, C6303, (2) 36–48 mm.; 100.120, H6204, (1) 39 mm.

92. *Lampanyctus idostigma* Parr.

Figure 23A.

120.80, H6204, (1) 44 mm.; 120.90, H6204, (3) 30–59 mm.

93. *Lampanyctus niger* Günther.

Figure 22D.

73.200, B6203, (1) 36 mm.; 80.200, C6208, (1) 42 mm.; 86.92, C6303, (7) 51–88 mm.; 100.65, C6303, (1) 62 mm.; 100.140, H6204, (2) 111 mm.

94. *Lampanyctus niger* Günther?

60.180, H6204, (1) 64 mm.; 87.80, C6303, (2) 72–89 mm.; 100.100, H6204, (1) 44.5 mm.; 100.160, H6204, (1) 102 mm.

These damaged specimens appear to represent this species, but their identity is uncertain.

95. *Lampanyctus steinbecki* Bolin.

Figure 23B.

60.140, H6204, (1) 54 mm.; 60.160, H6204, (1) 77 mm.; 60.180, H6204, (3) 37.5–47.5 mm.; 60.200a, B6203, (2) 39 mm.;60.200, H6204, (3) 28–112 mm.; 70.200, H6204, (7) 26–53 mm.; 73.200, B6203, (6) 25–42 mm.; 80.200, C6208, (1) 40 mm.; 83.77, C6303, (1) 30.5 mm.; 87.80, C6303, (1) 35.2 mm.; 90.160, H6204, (1) 43.5 mm.; 90.160, C6208, (2) 35–41 mm.; 90.180, B6203, (1) 39 mm.; 90.180, H6204, (12) 35–47 mm.; 90.200, H6204, (3) 28–33 mm.; 100.140, H6204, (3) 25–37 mm.; 110.160, H6204, (6) 23–51 mm.

96. *Lampanyctus tenuiformes* (Brauer).

Figure 23B.

83.77, C6303, (1) 38 mm.; 100.65, C6303, (2) 34–35 mm.

97. *Lampanyctus parvicauda* Parr.

Figure 23B.

137.50, B6203, (1) 60 mm.

This species was distinguished from the closely related *L. omostigma* Gilbert by Wisner (1963: 16–23.)

98. *Lampanyctus* sp. (no pectorals).

Figure 23B.

60.180, H6204, (1) 63 mm.; 60.200, B6203, (3) 30–65 mm.; 60.200, H6204, (3) 56–60 mm.; 70.200, H6204, (2) 23–39 mm.; 73.200, B6203, (3) 57–66 mm.; 80.80, H6204, (1) 61 mm.; 80.100, B6203, (1) 62 mm.; 80.200, C6208, (4) 31.5–62 mm.; 83.77, C6303, (1) 32 mm.; 86.92, C6303, (10) 47.5–60 mm.; 87.80, C6303, (1) damaged adult; 90.32, H6204, (1) 46 mm.; 90.48a, H6105, (1) 30 mm.; 90.70, C6208, (1) 48 mm.; 90.160, H6204, (4) 26–64 mm.; 90.160, C6208, (12) 45–58 mm.; 90.180, H6204, (10) 27–68 mm.; 90.200, H6204, (2) 59–63 mm.; 100.60, H6204, (2) 25–32 mm.; 100.90, H6204, (1) 35 mm.; 100.120, H6204, (1) 55 mm.; 100.140, H6204, (7) 25.5–59 mm.; 100.160, H6204, (4) 49–60 mm.; 110.120, H6204, (1) 50 mm.; 120.90, H6204, (1) 47 mm.

These specimens probably represent an undescribed species. None of them possesses visible pectoral fins, and cleared and stained specimens have no pectoral fin ray bases or actinosts and fewer vertebrae than are usually found in the genus *Lampanyctus*. Pattern and numbers of photophores also reveal certain differences between this form and other members of the genus. They are specifically distinct from the pectoral-less *Lampanyctus achirus* described as a new species by Andriashev (1962: 257–259).

99. *Lampanyctus* sp.

110.160, H6204, (1) 22 mm.

This single specimen, from about 800 km. (500 miles) westward of Punta Eugenia, Baja California, probably represents an undescribed species (R.L. Wisner, personal comunication).

100. *Lampanyctus* spp., unidentified.

60.100, H6204, (1) head only; 84.68, C6303, (1) juvenile; 84.92, B6303, (2) juvenile and adult; 90.70, H6204, (3) 52–90 mm.; 90.160, H6204, (1) 20 mm.; 90.190, C6208, (1) 40 mm.; 90.200, H6204, (2) larva and juvenile; 100.50, H6204, (1) 67 mm.; 100.160, H6204, (3) juveniles; 110.35, H6204, (1) 37 mm.; 110.140, H6204, (5) juveniles; 137.50, B6203, (4) 30–35 mm.

These specimens probably represent several species, but they are either too damaged or too immature to allow specific identification without adequate comparative material.

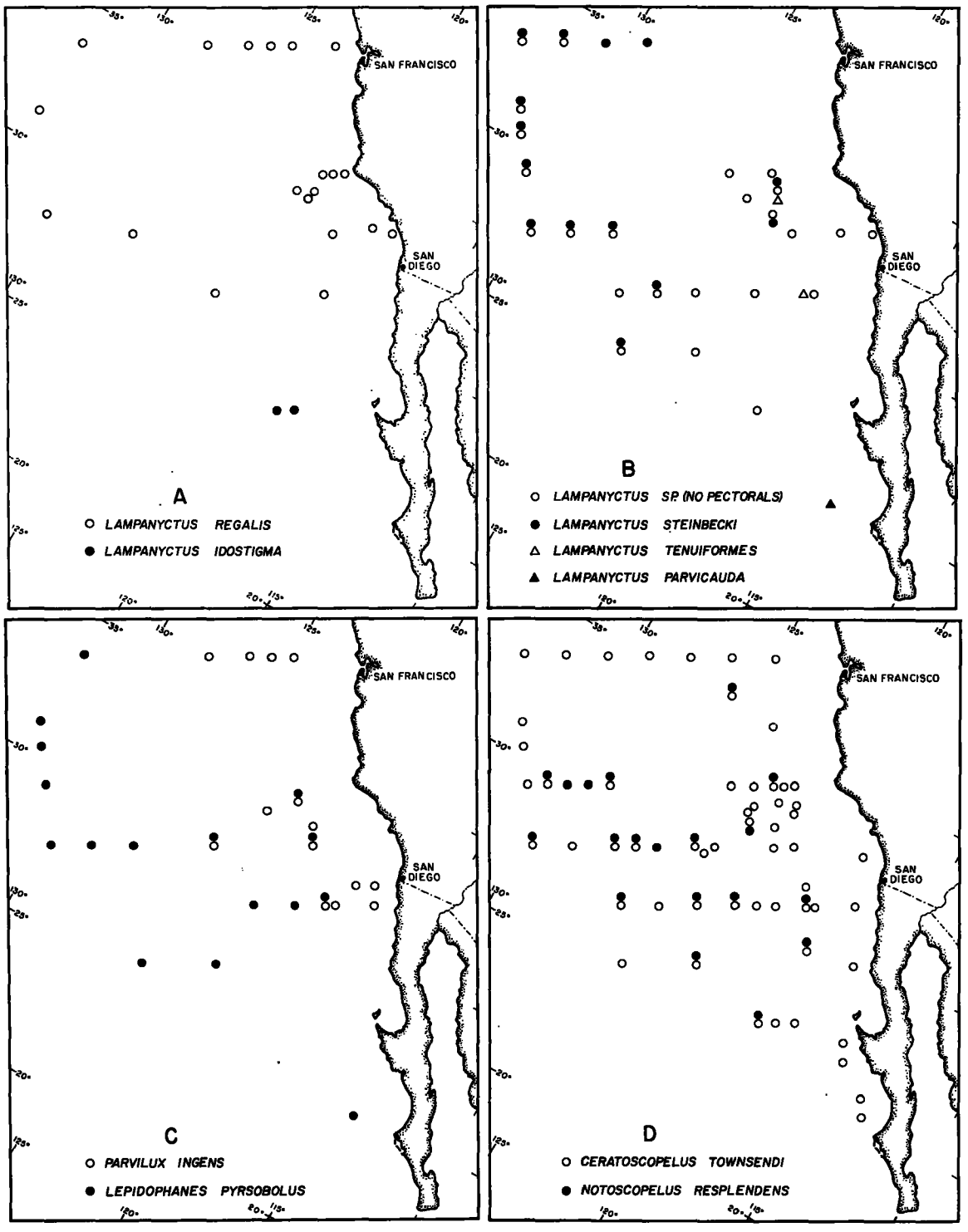

FIGURE 23.—Locations of capture of: A, *Lampanyctus regalis, Lampanyctus idostigma.* B, *Lampanyctus* sp. (no pectorals), *Lampanyctus steinbecki, Lampanyctus tenuiformes, Lampanyctus parvicauda.* C, *Parvilux ingens, Lepidophanes pyrsobolus.* D, *Ceratoscopelus townsendi, Notoscopelus resplendens.*

101. *Parvilux ingens* Hubbs and Wisner.

Figure 23C.

60.80, C6208, (3) 108–128 mm.; 60.90, H6204, (1) 95 mm.; 60.100, H6204, (1) 74 mm.; 60.120, H6204, (2) 56–96 mm.; 83.77, C6303, (1) 51.5 mm.; 86.92, C6303, (6) 93–178 mm.; 87.80, C6303, (1) 174 mm.; 90.70, C6208, (2) 134–157 mm.; 90.120, H6204, (1) 121 mm.; 97.40, C6303, (2) 52 mm.; 97.50, B6203, (2) 74–76 mm.; 100.40, H6204, (1) 72 mm.; 100.60, H6204, (1) 76 mm.; 100.65, C6303, (4) 139–192 mm.; 110.46, C6303, (1) 166 mm.

102. *Lepidophanes pyrsobolus* (Alcock).

Figure 23C.

60.180, H6204, (1) 25 mm.; 70.200, H6204, (1) 42 mm.; 73.200, B6203, (4) 21–30 mm.; 80.200, C6208, (1) 33.5 mm.; 83.77, C6303, (6) 29.5–42 mm.; 90.70, C6208, (2) 36 mm.; 90.120, H6204, (2) 31–37 mm.; 90.160, H6204, (3) 22–38 mm.; 90.160, C6208, (8) 29–40 mm.; 90.180, H6204, (1) 38 mm.; 90.200, H6204, (2) 30–34 mm.; 100.65, C6303, (6) 30.5–45.5 mm.; 100.80, H6204, (1) 30 mm.; 100.100, H6204, (3) 29.5–31.5 mm.; 100.140, H6204, (5) 22.5–46 mm.; 110.120, H6204, (2) 24–28 mm.; 110.160, H6204, (5) 23–44 mm.; 137.50, B6203, (1) 27 mm.

103. *Ceratoscopelus townsendi* (Eigenmann and Eigenmann).

Figure 23D.

60.80, H6204, (3) 33–55 mm.; 60.100, H6204, (6) 35–60 mm.; 60.120, B6203, (2) 40–56 mm.; 60.120, H6204, (1) 43 mm.; 60.140, H6204, (2) 53 mm.; 60.160, H6204, (2) 72–83 mm.; 60.180, H6204, (2) 31–32 mm.; 60.200, B6203, (1) 25 mm.; 66.100, C6208, (7) 23–35 mm.; 70.80b, B6203, (2) 29–38 mm.; 70.80–5N, B6203, (35) 22–52 mm.; 70.200, H6204, (3) 13–44 mm.; 73.200, B6203, (1) 52 mm.; 80.70, H6204, (1) 52 mm.; 80.75, B6303, (1) 52 mm.; 80.80, H6204, (3) 22–52 mm.; 80.90–5N, B6203, (66) 29–55 mm.; 80.90, H6204, (15) 40–59 mm.; 80.100, B6203, (1) 54 mm.; 80.160, C6208, (1) 22.5 mm.; 80.190, C6208, (1) 24 mm.; 80.200, C6208, (11) 19–56 mm.; 82.69, C6303, (24) 33.5–57.5 mm.; 83.77, C6303, (716) 33.5–61 mm.; 83.90, C6303, (142) 33–51 mm.; 84.67, C6303, (11) 40–50 mm.; 84.70, C6303, (1) 44 mm.; 84.92, B6303, (4) 29.5–57 mm.; 86.92, C6303, (11) 33.5–52.5 mm.; 87.80, C6303, (6) 36–47.5 mm.; 90.48a, H6105, (1) 42 mm.; 90.70, H6204, (2) 45–48 mm.; 90.80, C6208, (5) 23–32 mm.; 90.110, C6303, (1) 25.5 mm.; 90.120, H6204, (4) 18–49 mm.; 90.120, C6208, (64) 19–26.5 mm.; 90.150, C6208, (73) 15–27 mm.; 90.160, H6204, (5) 19–50 mm.; 90.160, C6208, (6) 48–53 mm.; 90.180, B6203, (1) 21 mm.; 90.180, H6204, (6) 29–57 mm.; 90.180, C6208, (1) 21 mm.; 90.200, H6204, (9) 15–53 mm.; 91.39a, C6208, (1) 52 mm.; 92.115, B6303, (1) 24 mm.; 97.40, C6303, (7) 38–51 mm.; 97.65, C6303, (85) 28.5–44 mm.; 100.60, H6204, (9) 38–51 mm.; 100.65, C6303, (944) 20–52 mm.; 100.80, H6204, (2) 36–40 mm.; 100.90, H6204, (1) 38 mm.; 100.100, H6204, (9) 22.5–59 mm.; 100.120, H6204, (3) 47–50 mm.; 100.140, H6204, (9) 20–29 mm.; 100.160, H6204, (2) 21–39 mm.; 108.63, C6303, (118) 29.5–46.5 mm.; 110.40, H6204, (1) 40 mm.; 110.120, H6204, (3) 24–30 mm.; 110.160, H6204, (13) 17–54 mm.; 120.70, H6204, (8) 30–41 mm.; 120.80, H6204, (9) 26.5–46 mm.; 120.90, H6204, (9) 25–39 mm.; 123.45, B6212, (6) 24–29.5 mm.; 127.45, B6212, (1) 22.5 mm.; 133.35, B6212, (1) 20.5 mm.; 140.35, B6212, (1) 32.5 mm.

104. *Notoscopelus resplendens* Richardson.

Figure 23D.

66.100, C6208, (3) 29–37 mm.; 80.80, H6204, (1) 58 mm.; 80.160, C6208, (2) 27 mm.; 80.170, C6208, (1) 31 mm.; 80.190, C6208, (3) 27.5–31 mm.; 86.92, C6303, (3) 56.2–60.5 mm.; 90.120, C6208, (15) 26–31 mm.; 90.140, C6208, (1) 27 mm.; 90.150, C6208, (12) 22.5–32.5 mm.; 90.160, H6204, (1) 64 mm.; 90.200, H6204, (1) 15 mm.; 100.65, C6303, (18) 43–64 mm.; 100.100, H6204, (1) 34.5 mm.; 100.120, H6204, (1) 70 mm.; 100.160, H6204, (1) 26 mm.; 108.63, C6303, (2) 44–60 mm.; 110.120, H6204, (1) 61 mm.; 120.90, H6204, (1) 67 mm.

105. Myctophidae, unidentified.

60.55, C6280, (1) discarded at sea; 70.80–5N, B6203, (1) adult; 70.200, H6204, (1) juvenile; 80.80, C6303, (2) discarded at sea; 80.90, B6203, (4) adults; 90.140, C6208, (2) juveniles; 90.150, C6208, (1) adult; 90.160, H6204, (2) juveniles; 90.200, H6204, (2) larvae, may be *Lepidophanes pyrosobolus*.

These specimens are badly damaged or otherwise unidentifiable and probably represent several species.

PARALEPIDIDAE

106. *Sudis atrox* Rofen.

Figures 24 and 25A.

80.160, C6208, (1) 21.5 mm.

The genus *Sudis* of the monotypic subfamily Sudinae was for many years known only from the eastern Atlantic off Madeira and the Mediterranean as *Sudis hyalina* Rafinesque. The larval stages of this species were described and illustrated by Sanzo (1918). A review of the genus *Sudis* was presented by Harry (1951 :33–35). A new species from the eastern Pacific, *Sudis atrox*, was recently described by Rofen (1963: 5, fig.1). *S. atrox* was based on a 75-mm. SL holotype and "35 identifiable remains" taken from stomach contents of *Alepisaurus* and *Parethunnus sibi* at two stations several hundred kilometers west of Baja California. Fourteen specimens of *S. atrox*, 3.4 mm. Notochord Length to 12.5 mm. SL had been sorted from 13 stations of Norpac Expedition between Hawaii and the American mainland (E.H. Ahlstrom, personal communication).

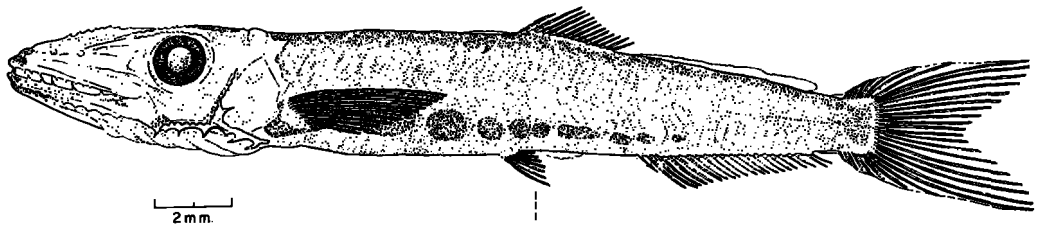

FIGURE 24.—*Sudis atrox*. 21.5 mm. SL station 80.160, C6208.

107. *Lestidium ringens* (Jordan and Gilbert).

Figure 25A.

60.80, C6208, (1) 60 mm.; 60.120, B6203, (1) 72 mm.; 70.80, B6203, (1) 39 mm.; 80.80, H6204, (1) 53 mm.; 80.90, H6204, (2) 20–71 mm.; 80.100, H6204, (1) 78 mm.; 90.90, C6203, (35) 42–64 mm.; 90.120, H6204, (1) 28 mm.; 100.40, H6204, (1) 150 mm.

The 35 specimens taken in the *Cobb* pelagic trawl at station 90.90 indicate that this species may occur in large schools at least in certain areas. It has been identified from a large number of routine CalCOFI plankton-tow stations, but only one or a few specimens had been taken in a single tow. *Lestidium elongatum* Ege is undoubtedly a junior synonym of this species (E. H. Ahlstrom and R. R. Rofen, personal communications). The specimen reported as *Macroparalepis* sp. by Harry (1953: 186, fig. 5) is a young stage of *L. ringens*.

108. *Notolepis rissoi* (Bonaparte).

Figure 25A.

70.200, H6204, (1) 59 mm.; 80.160, C6208, (2) ca. 37–ca. 65 mm.; 80.200, C6208, (1) ca. 30 mm.; 90.120, C6208, (10) 32–49 mm.

This species has generally been designated under the name of *Notolepis coruscans* (Jordan and Gilbert) (R. R. Rofen, personal communication). Our relatively small and mostly damaged specimens have lower numbers of anal fin rays (a maximum of 26 or 27) than other eastern Pacific specimens that have been reported (A. 29 to 33) (Harry, 1953: 210).

109. *Macroparalepis macrurus* Ege.

Figure 25A.

70.200, H6204, (1) 41.5 mm.; 80.160, C6208, (1) ca. 59 mm.; 80.170, C6208, (1) ca. 73 mm.; 80.180, H6204, (1) 135 mm.; 80.200, C6208, (4) ca. 42–ca. 74 mm.; 90.80, C6208, (1) ca. 70 mm.; 90.100, C6208, (1) ca. 62 mm.; 90.120, C6208, (13) 67–77 mm.; 90.140, C6208, (1) ca. 72 mm.; 90.150, C6208, (73) ca. 61–82 mm.; 90.200, H6204, (1) ca. 27 mm.

This species is more widespread in the eastern Pacific, and perhaps more gregarious, than previously shown. The larvae have been taken in offshore plankton-net collections, but most catches had only one or two individuals. Most of the records reported by Ege (1957: 94–95) are of single specimens; the maximum at one station was nine. The 73 specimens taken at station 90.150 in September by the *Cobb* pelagic trawl indicate that the species is at times locally abundant.

The above records extend the known range of the species. Previously Ege (1957: 68) had recorded it from northeast of the Galapagos Islands. Harry (1953: 231) placed this species in the genus *Stemnosudis* Harry, but our specimens, and apparently those of Ege, possess characters more like those of *Macroparalepis*. The 135-mm. specimen, one of the largest specimens of the species to be recorded, has the anterior lateral line scales only slightly higher than long (1.17X), the nostrils well in advance of a vertical line through the posterior end of the maxillary, D. 8, A. 38, vertebrae 96 total and 33 prehaemal, and the anterior peritoneal pigment spots coalesced (about 14 were present).

SCOPELARCHIDAE

110. *Benthalbella dentata* (Chapman).

Figure 25B.

83.90, C6303, (1) 43.5 mm.; 83.77, C6303, (1) 42 mm.; 87.80, C6303, (1) 118 mm.; 100.65, C6303, (1) 200 mm.; 108.63, C6303, (1) 167 mm.

Chapman (1939: 530) described this species in the new genus he proposed, *Neoscopelarchoides*. Marshall (1955: 314) used this generic name rather than *Benthalbella* Zugmayer 1911. These two generic names, however, are synonymous, and under the current International Rules of Zoological Nomenclature, *Benthalbella* has priority (E. H. Ahlstrom, personal communication).

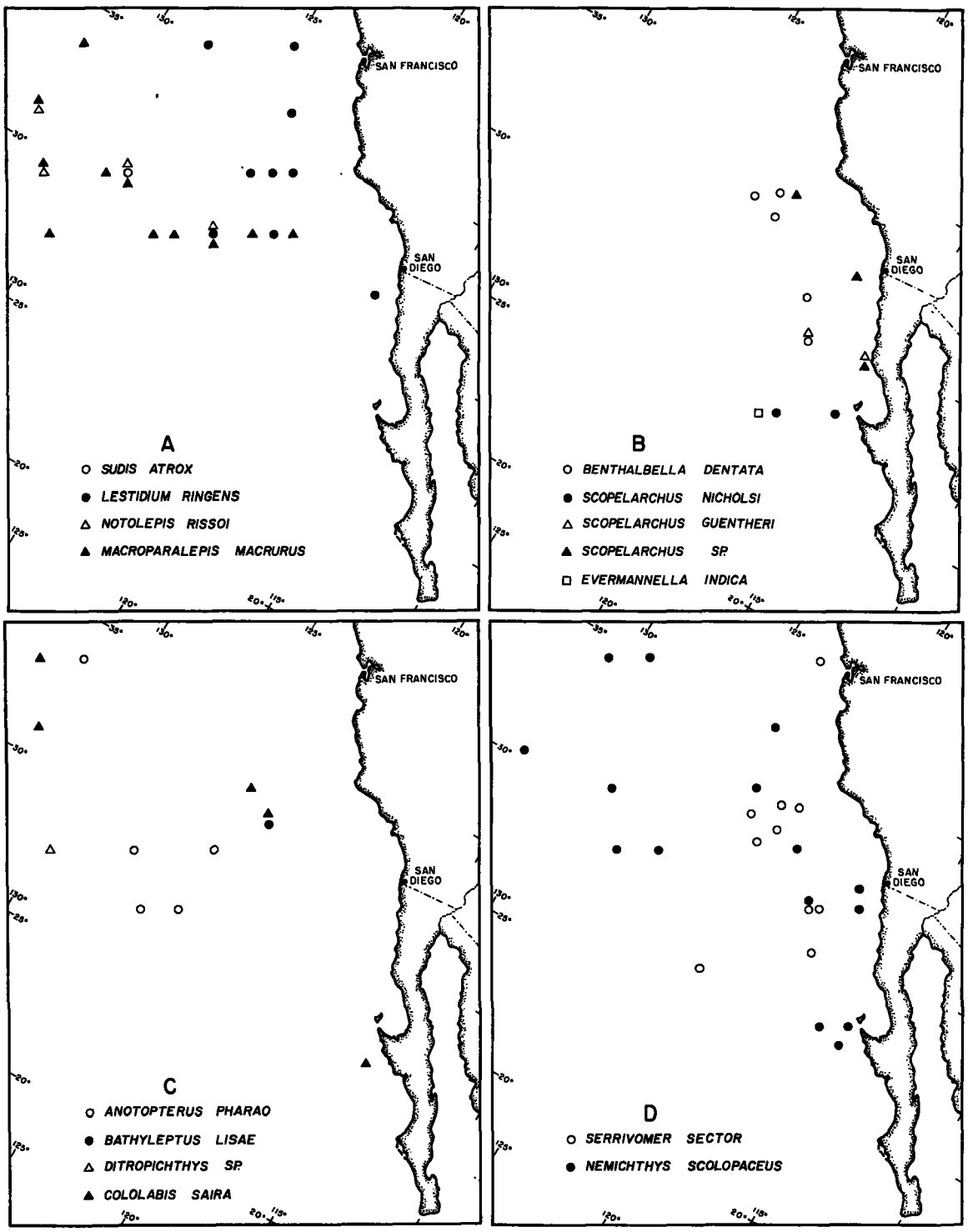

FIGURE 25.—Locations of capture of: A, *Sudis atrox, Lestidium ringens, Notolepis rissoi, Macroparalepis macrurus.* B, *Benthalbella dentata, Scopelarchus nicholsi, Scopelarchus guentheri, Scopelarchus* sp., *Evermannella indica.* C, *Anotopterus pharao, Bathyleptus lisae, Ditropichthys* sp., *Cololabis saira.* D, *Serrivomer sector, Nemichthys scolopaceus.*

111. *Scopelarchus nicholsi* (Parr).

Figure 25B.

120.50, H6204, (1) 42.5 mm.; 120.80, H6204, (1) 62 mm.

112. *Scopelarchus guentheri* Alcock.

Figure 25B.

108.63, C6303, (1) 50 mm.; 110.35, C6303, (1) 46 mm.

113. *Scopelarchus* sp.

Figure 25B.

84.70, C6303, (1) 28 mm.; 90.47, C6208, (1) 26 mm.; 97.40, C6303, (2) 37 mm.; 110.46, C6303, (1) 28 mm.

There is a very good possibility that these specimens represent an undescribed species.

EVERMANNELLIDAE

114. *Evermannella indica* Brauer.

Figure 25B.

120.90, H6204, (1) 55.5 mm.

ANOTOPTERIDAE

115. *Anotopterus pharao* Zugmayer.

Figure 25C.

60.180, H6204, (1) 173 mm.; 90.120, H6204, (1) 80.5 mm.; 90.160, H6204, (1) 59 mm.; 100.140, H6204, (1) ca. 179 mm.; 100.160, H6204, (2) 96–103 mm.

APODES

DERICHTHYIDAE

116. *Derichthys serpentinus* Gill.

Figure 26A.

108.63, C6303, (1) 200 mm.

This specimen and one in the collections of Scripps Institution of Oceanography from about 215 km. (135 miles) southward of Punta Eugenia are the first records of this species from this area.

CYEMIDAE

117. *Cyema atrum* Günther.

Figure 26A.

60.70, H6204, (1) 101+ mm.; 60.100, H6204, (1) 145+ mm.; 60.140, H6204, (1) 126+ mm.; 60.180, H6204, (1) 131+ mm.; 70.200, H6204, (1) 106+ mm.; 80.100, H6204, (1) 96+ mm.; 83.90, C6203, (1) 50 mm.; 90.120, H6204, (1) 107+ mm.; 100.60, H6204, (1) 115+ mm.; 100.80, H6204, (1) 100+ mm.; 100.160, H6204, (3) 125–134+ mm.; 110.160, H6204, (1) 147+ mm.; 120.50, H6204, (1) 110+ mm.

SERRIVOMERIDAE

118. *Serrivomer sector* Garman.

Figure 25D.

60.60, H6204, (1) 557+ mm.; 83.77, C6303, (1) 582 mm.; 84.70, C6303, (1) 461 mm.; 86.92, C6303, (15) 312–645 mm.; 87.80, C6303, (4) 500–541 mm.; 87.90, C6303, (2) 436–537 mm.; 100.60, H6204, (1) 461+ mm.; 100.65, C6303, (1) 386 mm.; 108.63, C6303, (2) 532–574 mm.; 110.120, H6204, (1) 490+ mm.; 120.70, H6204, (1) 562+ mm.

NEMICHTHYIDAE

119. *Avocettina bowersi* (Garman).

Figure 26A.

60.100, H6204, (1) 551 mm.; 84.67, C6303, (1) 320 mm.; 86.92, C6303, (8) 395–675 mm.; 87.80, C6303, (5) 319–550 mm.; 87.90, C6303, (2) 460–462 mm.; 90.110, C6303, (1) 229 mm.; 90.160, H6204, (1) 445+ mm.; 93.100, C6303, (2) 395–485 mm.; 100.100, H6204, (1) 612 mm.; 110.120, H6204, (1) 541 mm.; 120.70, H6204, (1) 532 mm.; 120.80, H6204, (1) 499+ mm.; 123.50, B6203, (5) ca. 364–510 mm.

120. *Nemichthys scolopaceus* Richardson.

Figure 25D.

60.140, H6204, (1) 453 mm.; 60.160, B6203, (1) 477 mm.; 60.200, H6204, (1) 621 mm.; 70.80b, B6203, (1) 545+ mm.; 70.80, C6208, (1) 500+ mm.; 73.200, B6203, (1) 392 mm.; 80.90, H6204, (1) 561 mm.; 80.160, C6208, (5) 108–252 mm.; 90.70, H6204, (1) 273 mm.; 90.140, H6204, (1) 442 mm.; 90.160, C6208, (17) 118–220 mm.; 97.40, C6303, (2) 300–350 mm.; 100.40, C6303, (1) 406 mm.; 100.65, C6303, (1) 525 mm.; 120.45, H6204, (1) 761 mm.; 120.60, H6204, (1) 607 mm.; 123.50, B6203, (1) 761 mm.

121. Nemichthyidae, unidentified.

120.70, H6204, (1) 327+ mm.

This specimen is badly damaged.

CONGRIDAE

122. *Ariosoma gilberti* (Ogilby).

Figure 26A.

137.35, B6212, (3) 135–223 mm.; 140.35, B6212, (1) 145 mm.; 147.30, B6212, (1) 155 mm.

123. Congridae, unidentified.

133.35, B6212, (1) 144 mm.

This *Congrina* "like" specimen is damaged.

OPHICHTHYIDAE

124. Ophichthyidae, unidentified.

137.35, B6212, (1) 71 mm.; 143.30, B6212, (1) 121 mm.

These leptocephali have not been otherwise identified.

SYNENTOGNATHI

SCOMBERESOCIDAE

125. *Cololabis saira* (Brevoort).

Figure 25C.

60.200, B6203, (1) 66 mm.; 70.200, H6204, (1) 57 mm.; 80.100, B6203, (1) 69 mm.; 84.92, B6303, (1) 31.5 mm.; 127.45, B6212, (1) 25 mm.

ANACANTHINI

MORIDAE

126. *Melanonus zugmayeri* Norman?

Figure 26B.

60.90, H6204, (1) 112 mm.; 60.160, H6204, (1) 120 mm.; 86.92, C6303, (1) 214 mm.; 87.80, C6303, (1) 115 mm.; 108.63, C6303, (2) 148–209 mm.

These specimens are tentatively identified as this species pending further study (D. M. Cohen, personal communication).

GADIDAE

127. *Merluccius productus* (Ayres).

Figure 26B.

60.55, C6208, (7) 179–414 mm.; 65.54, C6208, (1) 265 mm.; 70.51, C6208, (186) 150–244 mm.; 80.55, H6204, (1) 166 mm.; 80.60, C6208, (4) 375–415 mm.; 80.70, H6204, (1) 10.5 mm.; 80.80, H6204, (2) 9–10 mm.; 80.90, H6204, (9) 7.5–10 mm.; 80.100, H6204, (12) 6–11 mm.; 82.45, C6208, (38) 80–220 mm.; 82.69, C6303, (38) 285–518 mm.; 83.70a, B6303, (1) 471 mm.; 83.70, C6303, (9) 327–505 mm.; 83.77, C6303, (5) 299–361 mm.; 84.67, C6303, (4) 396–504 mm.; 84.70, C6303, (2) 374–478 mm.; 84.71, C6303, (1) 492 mm.; 90.45a, H6105, (1) juvenile, damaged; 90.47, C6208, (3) 192–345 mm.; 90.48a, H6105, (3) 16–25.5 mm.; 90.48b, H6105, (33) 17–31.5 mm.; 90.48c, H6105, (6) 20.5–36 mm.; 94.28b, C6208, (1) 430 mm.; 94.30, C6208, (7) 162–420 mm.; 94.32b, B6204, (1) 17 mm.; 95.31d, B6204, (3) 19.5–36.5 mm.; 97.40, C6303, (29) 327–688 mm.; 99.31, C6208, (2) 192–370 mm.; 100.40, H6204, (4) 20–22 mm.; 100.40, C6203, (1) 398 mm.; 110.35, H6204, (1) 23 mm.; 110.35, C6303, (131) 244–577 mm.; 110.36, C6303, (3) 376–496 mm.; 111.36a, C6303, (495) ca. 258–598 mm.; 111.36b, C6303, (ca. 300) ca. 239–515 mm.; 111.37a, C6303, (65) 282–479 mm.; 113.34a, C6303, (8) 20.5–392 mm.; 120.45, H6204, (2) 19–23 mm.; 120.45, B6212, (1) 266 mm.; 120.50, H6204, (2) 31–34.5 mm.; 120.60, H6204, (1) 23.5 mm.; 147.30, B6212, (8) 105–150 mm.

MACROURIDAE

128. *Coryphaenoides acrolepis* (Bean)?

Figure 26B.

60.60, H6204, (1) 515 mm.

The species of this genus in this area are confused, and this identification must be tentative until the problems are resolved.

129. Macrouridae, unidentified.

86.92, C6303, (2) 333–347 mm.

These two specimens from about 305 km. (190 miles) SW. of Point Conception, Calif., represent an undescribed genus and species of bathypelagic macrouroid (C. L. Hubbs, personal communication).

130. Macrouridae, unidentified.

100.40, H6204, (1) 32 mm.

This specimen is too small to identify without comparative material.

LOPHOBRANCHII

SYNGNATHIDAE

131. *Syngnathus arcta* (Jenkins and Evermann).

90.45, H6105, (1) 166 mm.; 95.31b, B6204, (1) 72 mm.

ALLOTRIOGNATHI

TRACHIPTERIDAE

132. *Desmodema polystictum* (Ogilby).

Figure 26C.

89.90, C6303, (1) 614 mm.; 90.160, C6208, (1) 1,106 mm.; 100.80, H6204, (1) 455+ mm.

133. *Trachipterus t. altivelis* Kner.

Figure 26C.

60.90, C6208, (2) 49.5–1,435 mm.; 70.60, C6208, (1) 1,014 mm.; 80.52, C6208, (2) 177–297 mm.; 82.45, C6208, (2) 187–275 mm.; 85.68, C6303, (1) 133 mm.; 86.92, C6303, (1) 605 mm.; 90.47, C6208, (1) 1,000 mm.; 93.29, C6208, (1) 445 mm.

LOPHOTIDAE

134. *Lophotus* sp.

Figure 26C.

80.170, C6208, (1) 46.5 mm.

This specimen is too small to allow specific identification (J. E. Fitch, personal communication).

BERYCOMORPHI

MELAMPHAIDAE

135. *Scopelogadus mizolepis bispinosus* (Gilbert).

Figure 26D.

60.60, H6204, (2) 24–72 mm.; 60.80, C6208, (1) 33 mm.; 60.90, H6204, (3) 18–51 mm.; 60.100, H6204, (2) 13–75

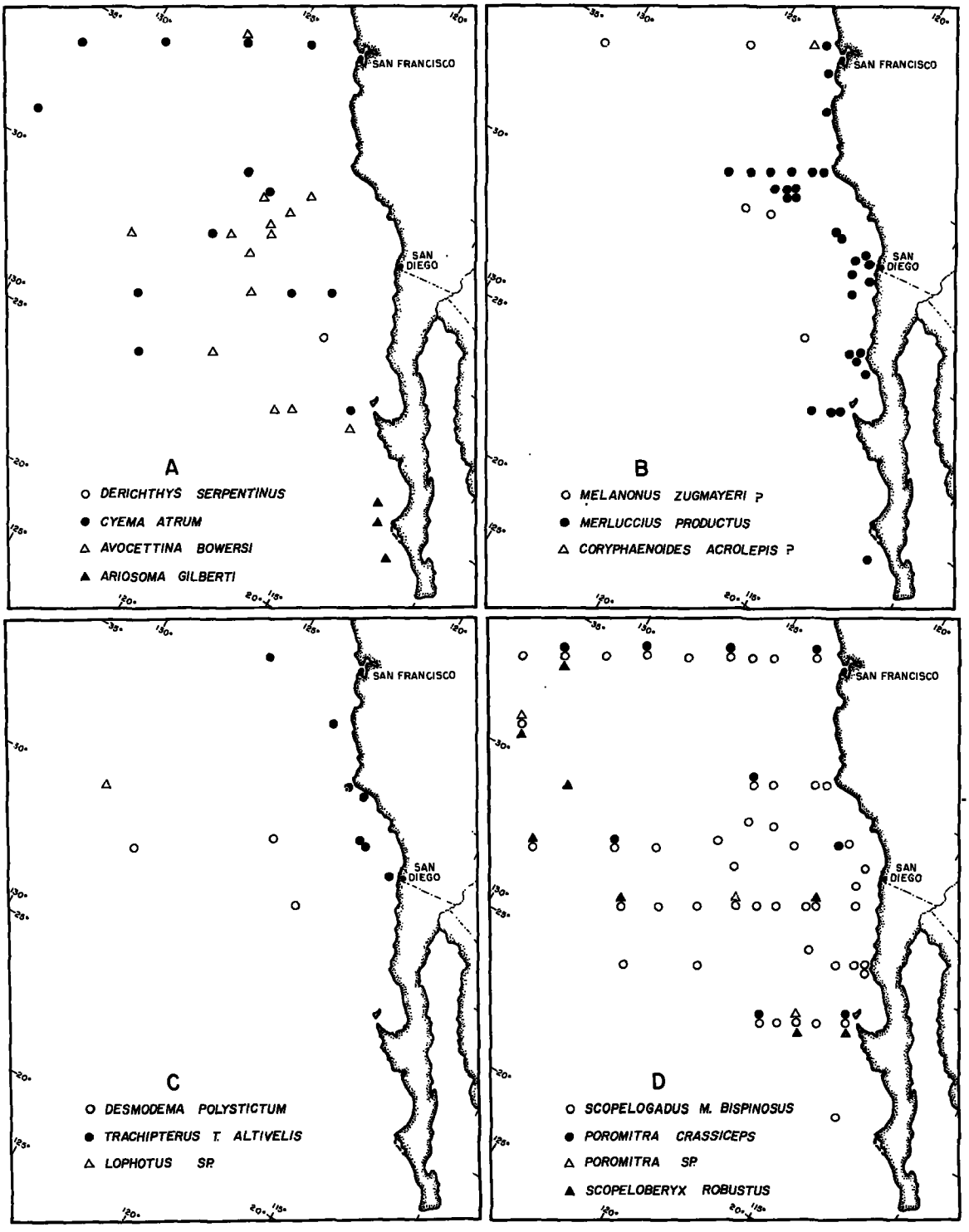

FIGURE 26.—Locations of capture of: A, *Derichthys serpentinus, Cyema atrum, Avocettina bowersi, Ariosoma gilberti.* B, *Melanonus zugmayeri?, Merluccius productus, Coryphaenoides acrolepsis?,* C, *Desmodema polystictum, Trachipterus trachipterus altivelis, Lophotus* sp. D, *Scopelogadus mizolepis bispinosus, Poromitra crassiceps, Poromitra* sp., *Scopeloberyx robustus.*

mm.; 60.120, H6204, (10) 63–75 mm.; 60.140, H6204, (1) 67 mm.; 60.160, H6204, (2) 64–75 mm.; 60.180, H6204, (2) 30–43 mm.; 60.200, B6203, (1) 53 mm.; 70.200, H6204, (1) 28 mm.; 80.55, H6204, (1) 63 mm.; 80.60, H6204, (2) 18–68 mm.; 80.80, H6204, (7) 45–60 mm.; 80.90, B6203, (2) 41–47 mm.; 80.90, H6204, (3) 65–79 mm.; 86.92, C6303, (13) 25–90 mm.; 87.90, C6303, (8) 29–90 mm.; 90.45a, H6105, (1) 47 mm.; 90.70, H6204, (11) 45–68 mm.; 90.70, C6208, (3) 61–70 mm.; 90.110, B6203, (1) 70 mm.; 90.140, H6204, (2) 66–74 mm.; 90.160, H6204, (2) 21–44 mm.; 90.160, C6208, (2) 56–58 mm.; 93.100, C6303, (1) 35 mm.; 94.32a, B6204, (2) 56–58 mm.; 97.40, C6303, (12) 36–45 mm.; 100.40, H6204, (2) 54–55 mm.; 100.40, C6303, (1) 49 mm.; 100.60, H6204, (5) 56–82 mm.; 100.65, C6303, (17) 43–76 mm.; 100.80, H6204, (4) 20–52 mm.; 100.90, H6204, (5) 34–74 mm.; 100.100, H6204, (3) 35–54 mm.; 100.120, H6204, (1) 56 mm.; 100.140, H6204, (1) 53 mm.; 100.160, H6204, (3) 25–64 mm.; 108.63, C6303, (26) 45–87 mm.; 110.35, H6204, (1) 62 mm.; 110.35, C6303, (2) 30–43 mm.; 110.40, H6204, (1) 45 mm.; 110.50, B6203, (2) 55.5 mm.; 110.120, H6204, (3) 18–79 mm.; 110.160, H6204, (5) 10–83 mm.; 120.45, H6204, (1) 54 mm.; 120.60, H6204, (1) 55 mm.; 120.70, H6204, (6) 45–62 mm.; 120.80, H6204, (3) 28–51 mm.; 120.90, H6204, (3) 46–83 mm.; 137.50, B6203, (5) 26–58 mm.

This species, previously known as *Melamphaes bispinosus* or *Scopelogadus bispinosus*, has recently been shown to be a subspecies of *Scopelogadus mizolepis* (Günther) by Ebeling (1963:19).

136. *Poromitra crassiceps* (Günther).

Figure 26D.

60.60, H6204, (1) 127 mm.; 60.100, H6204, (1) 117 mm.; 60.140, H6204, (1) 30 mm.; 60.180, H6204, (2) 22–45.5 mm.; 80.90, H6204, (1) 24 mm.; 90.48b, H6105, (1) 25 mm.; 90.160, C6208, (2) 91–96 mm.; 120.45, H6204, (1) 89 mm.; 120.90, H6204, (2) 92–97 mm.

This species has been listed under the name of its junior synonym, *Poromitra cristiceps* (Gilbert).

137. *Poromitra* sp.

Figure 26D.

70.200, H6204, (2) 51–64 mm.; 100.100, H6204, (1) 70 mm.; 120.70, H6204, (1) 75 mm.

These specimens, with relatively small eyes and a low number of dorsal fin rays (III, 10 or 11) are representative of a new species. This was called to our attention by A. W. Ebeling (personal communication), who is preparing a detailed description for publication.

138. *Scopeloberyx robutus* (Günther).

Figure 26D.

60.180, H6204, (1) 31 mm.; 70.200, H6204, (2) 18–21 mm.; 80.180, C6208, (1) 12 mm.; 90.200, H6204, (2) 31.5–32 mm.; 100.60, H6204, (1) 71.5 mm.; 100.160, H6204, (6) 18–32 mm.; 120.45, H6204, (3) 57–59 mm.; 120.70, H6204, (1) 60 mm.

This species has generally been known in this area as *Scopeloberyx nycterinus* (Gilbert). The synonymy of *S. nycterinus* with *S. robustus* has recently been determined by A. W. Ebeling (personal communication).

139. *Melamphaes acanthomus* Ebeling.

Figure 27A.

90.45a, H6105, (2) 83–92 mm.; 100.65, C6303, (1) 81 mm.

140. *Melamphaes indicus* Ebeling.

Figure 27A.

90.160, H6204, (1) 35.5 mm.

This record extends the known range of this species eastward from west of the Hawaiian Islands, as delimited by Ebeling (1962, fig. 47).

141. *Melamphaes laeviceps* Ebeling.

Figure 27B.

60.200a, B6203, (2) 28–29 mm.; 60.200, H6204, (1) 27 mm.; 73.200, B6203, (4) 24–29 mm.; 80.200, C6208, (3) 27–28 mm.; 87.200, B6203, (1) 27 mm.; 90.150, C6208, (1) 26 mm.; 90.160, H6204, (1) 28 mm.; 100.140, H6204, (1) 28 mm.

This species previously has only been reported from the tropical eastern and central Pacific (Ebeling, 1962, fig. 53).

142. *Melamphaes longivelis* Parr.

Figure 27B.

90.120, H6204, (1) 33 mm.

This specimen represents a range extension for the species of about 260 km. (160 miles) northeast from that shown by Ebeling (1962:77, not fig. 44).

143. *Melamphaes lugubris* Gilbert.

Figure 27B.

60.60, H6204, (2) 30–84 mm.; 60.80, H6204, (1) 55 mm.; 60.80, C6208, (1) 19 mm.; 60.90, H6204, (3) 22–79 mm.; 60.120, B6203, (2) 38 mm.; 70.80b, B6203, (1) 37 mm.; 80.55, H6204, (3) 38–41 mm.; 80.60, H6204, (1) 44 mm.; 80.75, B6303, (1) 17 mm.; 80.80, H6204, (3) all ca. 40 mm.; 80.90, H6204, (5) 37–43 mm.; 80.100, B6203, (1) 37 mm.; 80.100, H6204, (2) 20–22 mm.; 80.110, B6203, (1) 13 mm.; 83.77, C6303, (1) 22 mm.; 84.92, B6303, (7) 36–39 mm.; 86.92, C6303, (5) 36–52 mm.; 87.80, C6303, (4) 35–38 mm.; 90.45a, H6105, (4) 51–77 mm.; 90.70, H6204, (2) 40–43 mm.; 90.70, C6208, (7) 25.5–50 mm.; 97.40, C6303, (7) 31–36 mm.; 97.50, B6203, (1) 38 mm.; 100.60, H6204, (1) 21 mm.; 100.65, C6303, (1) 38 mm.; 108.63, C6303, (2) 32–37 mm.

144. *Melamphaes macrocephalus* Parr.

Figure 27A.

120.90, H6204, (1) 116 mm.

145. *Melamphaes parvus* Ebeling.

Figure 27A.

60.120, B6203, (1) 25.5 mm.; 60.120, H6204, (2) 35–37.5 mm.; 60.140, H6204, (4) 36–45 mm.; 60.160, B6203, (3) 36–48 mm.; 60.180, H6204, (1) 27 mm.; 80.80, H6204, (3) 37–38 mm.; 80.90, B6203, (1) 36 mm.; 80.90, H6204, (1) 45 mm.; 80.200, C6208, (1) 18 mm.; 82.69, C6303, (2) 33–38 mm.; 84.92, B6303, (3) 43–47 mm.; 86.92, C6303, (5) 33–44 mm.; 87.80, C6303, (2) 38–43 mm.; 90.70, H6204, (2) ca. 38 mm.; 97.40, C6303, (1) 39 mm.; 100.60, H6204, (1) 41 mm.; 100.65, C6303, (20) 31–48 mm.; 100.160, H6204, (1) 18 mm.; 108.63, C6303, (6) 30–43 mm.

146. *Melamphaes suborbitalis* (Gill).

Figure 27B.

60.180, H6204, (1) 37 mm.

147. *Melamphaes* spp.

60.200, H6204, (1) 15 mm.; 80.80, H6204, (1) 17 mm.; 133.35, B6212, (1) 15 mm.

These damaged specimens probably represent more than one species.

ANOPLOGASTERIDAE

148. *Anoplogaster cornuta* (Valenciennes).

Figure 27A.

80.200, C6208, (1) 94 mm.; 86.92, C6303, (7) 86–121 mm.; 87.80, C6303, (1) 94.5 mm.; 90.45a, H6105, (1) 94 mm.; 108.63, C6303, (1) 88 mm.

As pointed out by Grey (1955:293), *Caulolepis longidens* Gill is a junior synonym of this species.

PERCOMORPHI

CARISTIIDAE

149. *Caristius macropus* (Bellotti).

Figure 29A.

83.77, C6303, (1) 165 mm.

150. *Caristius maderenis* Maul?

Figures 28 and 29A.

108.63, C6303, (2) 148–160 mm.

The phylogenetic position of the Caristiidae and the true identity of these specimens are under study (C. L. Hubbs, personal communication).

SERRANIDAE

151. Serranidae, unidentified.

140.30, B6212, (6) 9–12 mm.

These specimens are too small to identify without comparative material.

CHEILODIPTERIDAE

152. *Howella brodiei* (Ogilby)?

Figure 29A.

60.120, B6203, (2) 52.5–70.5 mm.; 60.160, H6204, (1) 71 mm.; 80.80, H6204, (1) 29.5 mm.; 80.90, H6204, (3) 30.5–34 mm.; 100.80, H6204, (1) 36 mm.

The generic limits and the intrageneric components of *Howella* Ogilby 1898 are not definitive at this time. It apparently contains as synonyms the genera *Galeagra* Heller and Snodgrass 1903 and *Rhectogramma* Norman 1930; and, also apparently, these genera should be included in the family Cheilodipteridae (rather than Serranidae). The above specimens may represent a new species, but their characters are close to the descriptions given by Ogilby (1898:734) for *H. brodiei* from Lord Howe Island, and are similar to the accounts of this species from the Philippines given by Herre and Herald (1951:330) and from the North Atlantic Ocean by Koefoed (1952:5). Other specimens of *Howella* from the equatorial eastern Pacific that we have examined are specifically distinct from these tentatively designated as *H. brodiei*, and appear to be the *Galeagra pammelas* of Heller and Snodgrass. The monotypic *Sphyraenops bairdianus* Poey that has at times been placed in this complex apparently is generically distinct.

CARANGIDAE

153. *Trachurus symmetricus* (Ayres).

Figure 29A.

68.50, C6208, (1) 180 mm.; 70.80, C6208, (25) 64.5–503 mm.; 70.90, C6208, (1) 61 mm.; 70.100, C6208, (1) 60 mm.; 80.70, C6208, (1) 65 mm.; 80.80, C6208, (9) 28–69 mm.; 90.48b, H6105, (1) ca. 5 mm.; 90.49b, C6208, (12) 51–224 mm.; 90.80, C6208, (5) 23.5–64.5 mm.; 90.150, C6208, (1) 40 mm.; 91.39a, C6208, (1) 190 mm.; 91.39b, C6208, (3) 100–240 mm.; 93.26, C6208, (2) 100–125 mm.; 94.28b, C6208, (1) 435 mm.; 94.29b, C6208, (3) 335 mm.; 94.29c, C6208, (12) ca. 125 mm.; 99.31, C6208, size and number not recorded, discarded at sea; 113.34a, C6303, (1) 63 mm.; 120.50, H6204, (1) 23 mm.

Nine of the above records of jack mackerel were based on larvae or small juveniles. One of these was taken about 420 miles offshore (90.150, C6208). At station 70.80, C6208, about 185 km. (115 miles) offshore, a night surface drag with the *Cobb* trawl caught 1 small juvenile and 24 spawning and spent males and females.

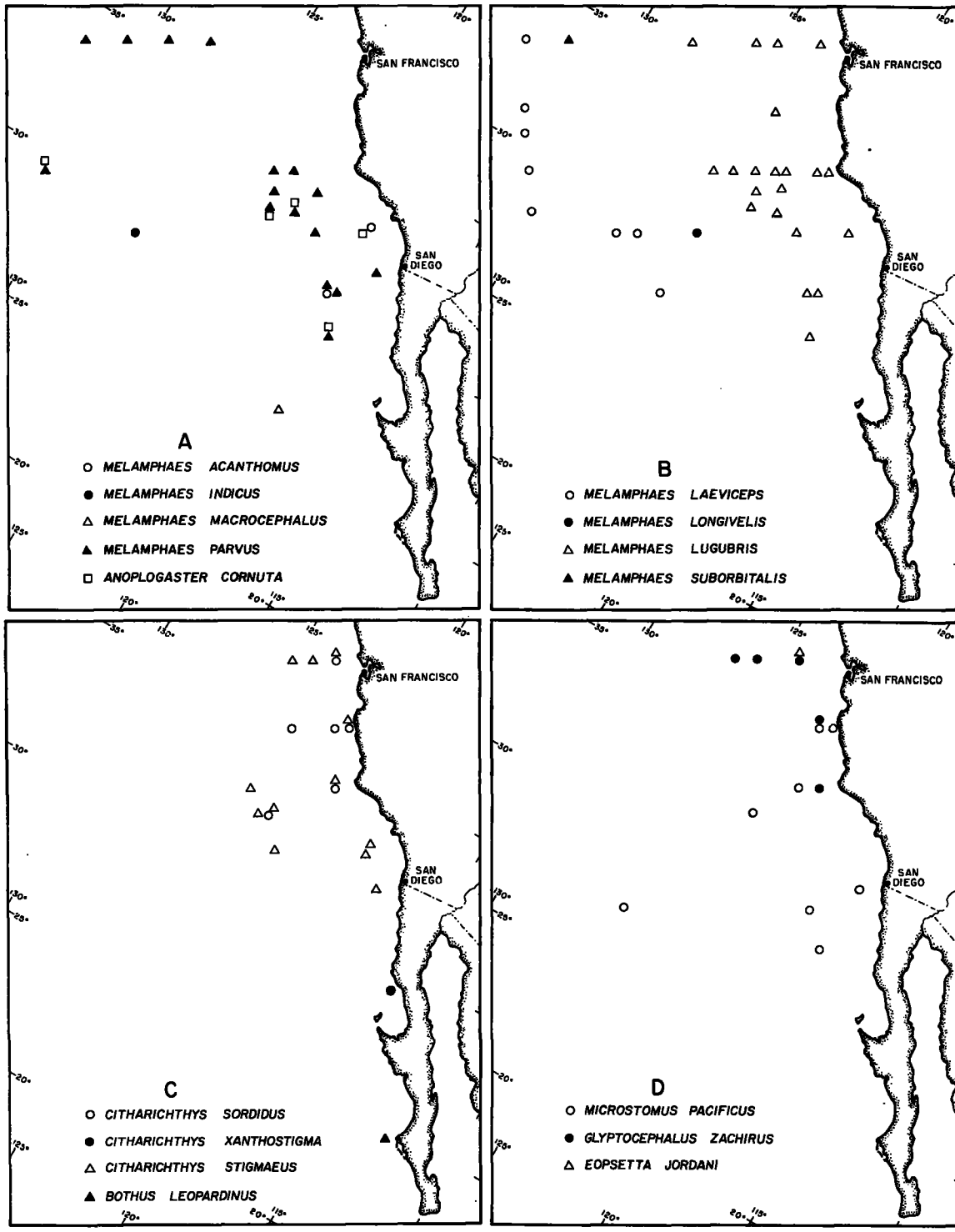

FIGURE 27.—Locations of capture of: A, *Melamphaes acanthomus, Melamphaes indicus, Melamphaes macrocephalus, Melamphaes parvus, Anoplogaster cornuta.* B, *Melamphaes laeviceps, Melamphaes longivelis, Melamphaes lugubris, Melamphaes suborbitalis.* C, *Citharichthys sordidus, Citharichthys xanthostigma, Citharichthys stigmaeus, Bothus leopardinus.* D, *Microstomus pacificus, Glyptocephalus zachirus, Eopsetta jordani.*

CORYPHAENIDAE

154. *Coryphaena hippurus* Linnaeus.

147.30, B6212, (1) ca. 24 mm. damaged.

This specimen was taken about 80 km. (50 miles) offshore, south of Almejas Bay, Baja California.

STROMATEIDAE

155. *Cubiceps gracilis* (Lowe).

Figure 29B.

80.180, C6208, (2) 32.5–47 mm.; 80.190, C6208, (2) 31–40.5 mm.

Two recognized species of *Cubiceps* occur in the eastern Pacific, and *C. gracilis* appears to be the most suitable name to apply to the above specimens. The other species, *C. carinatus* Nichols and Murphy (1944:245), has fewer dorsal and anal fin softrays, fewer lateral line scales, and a more tropical distribution.

156. *Icichthys lockingtoni* Jordan and Gilbert.

Figure 29B.

60.80, H6204, (3) 11–15 mm.; 60.140, H6204, (2) 98–193 mm.; 70.80, B6203, (6) 20.5–27 mm.; 80.60, H6204, (1) 19 mm.; 80.90, B6203, (4) 20–46 mm.; 80.90, H6204, (13) 11–44.5 mm.; 80.100, B6203, (1) 19.5 mm.; 80.100, H6204, (2) 9–10.5 mm.; 80.120, B6203, (1) 14.5 mm.; 83.70a, B6303, (5) 27–42.5 mm.; 83.70c, B6303, (1) 32.5 mm.; 83.77, C6303, (1) 29.5 mm.; 90.45b, H6105, (1) 26 mm.; 90.48c, H6105, (1) 57.5 mm.; 90.80, C6208, (1) 40 mm.; 90.120, H6204, (1) 8 mm.; 94.29d, C6208, (3) 81–95 mm.; 100.65, C6303, (1) 39 mm.

157. *Palometa simillima* (Ayres).

Figure 29B.

80.52, C6208, (3) 51.5–61 mm.; 82.45, C6208, (1) 48 mm.; 93.26, C6208, (83) ca. 50–75 mm.; 94.28a, C6208, (2) small, size not recorded, discarded at sea; 94.28b, C6208, (4) ca. 50–75 mm.; 94.29b, C6208, (37) 78–147 mm.; 94.29c, C6208, (3) ca. 50 mm.; 99.31, C6208, (32) 85–165 mm.; 120.50, H6204, (7) 12–20 mm.

TETRAGONURIDAE

158. *Tetragonurus cuvieri* Risso.

Figure 29B.

100.65, C6303, (1) 51 mm.; 88.105a, B6303, (1) 37 mm.

When first seen in the cod end of the collapsible net, the 37-mm. specimen was alive within the cavity of a pyrosome. A few records of association of *T. atlanticus* Lowe and *T. cuvieri* with medusae were summarized by Mansueti (1963:59–60).

BRAMIDAE

159. *Brama japonica* Hilegendorf.

Figure 29C.

70.80, C6208, (3) 215–220 mm.; 70.200, H6204, (1) 15.5 mm.; 80.180, C6208, (1) 52.5 mm.

Two names previously used for pomfrets from the North Pacific, *B. brama* (Bonnaterre) and *B. raii* (Bloch), do not apply to this species (G. W. Mead, personal communication).

160. *Pteraclis velifera* (Pallas)?

Figure 29C.

110.160, H6204, (1) 9.5 mm.

This small specimen can be identified only tentatively at this time (G. W. Mead, personal communication).

GEMPYLIDAE

161. *Gempylus serpens* Cuvier.

Figure 29C.

70.200, H6204, (1) 28 mm.; 80.180, C6208, (1) 52 mm.; 90.180, C6208, (1) 105 mm.

TRICHIURIDAE

162. *Lepidopus xantusi* Goode and Bean.

Figure 29C.

113.34a, C6303, (2) 230–249 mm.

SCOMBRIDAE

163. *Sarda lineolata* (Girard).

92.28, C6208, (3) 2–3 kg., discarded at sea, no length record taken; 93.26, C6208, (8) 2–4 kg., no length record; 93.28, C6208, (60) 340–490 mm.; 94.28b, C6208, (18) all ca. 300 mm.; 94.29b, C6208 (1) 335 mm.; 94.29c, C6208, (1) 4 kg., no length record; 94.30, C6208, (20) 2–4 kg., no length record; 95.30, C6208, (11) 2–4 kg., no length record; 113.34b, C6303, (1) adult, no size record.

These records are of adult fish taken close inshore and generally near the surface.

164. *Scomber japonicus* Houttuyn.

90.49b, C6208, (1) 288 mm.; 99.31, C6208, (16) 300–340 mm.

This species has also been referred to as *Scomber diego* Ayres, *Pneumatophorus japonicus*, and *Pneumatophorus diego*. This complex apparently also includes *Scomber colias* Gmelin of the Atlantic, and has previously been cited as such by various authors (B. B. Collette, personal communication).

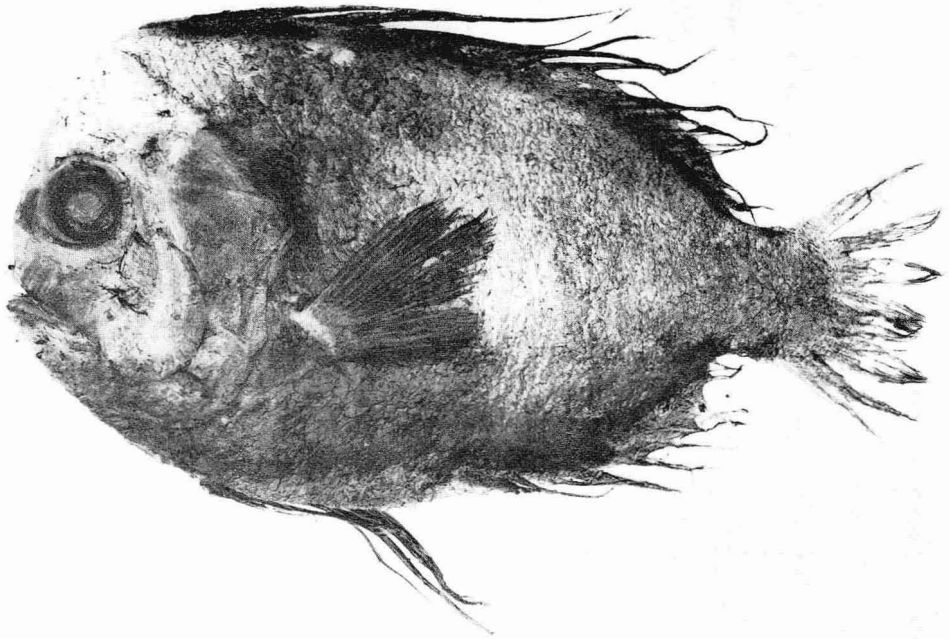

FIGURE 28.—*Caristius maderensis?*, 160 mm. SL, station 108.63, C6303.

SCIAENIDAE

165. *Seriphus politus* Ayres.

93.25, C6208, (1) 175 mm.; 94.29c, C6208, (3) 165–186 mm.

166. *Roncador stearnsi* (Steindachner).

93.26, C6208, (131) ca. 150–175 mm.

SPHYRAENIDAE

167. *Sphyraena argentea* Girard.

93.26, C6208, (4) 260–325 mm.

CHIASMODONTIDAE

168. *Chiasmodon niger* Johnson.

120.90, H6204, (1) 47.5 mm.

This specimen was taken about 320 km. (200 miles) west of Punta Eugenia, Baja California.

169. *Kali* sp.

100.100, H6204, (1) 172 mm.

This specimen was taken about 480 km. (300 miles) west of Rosario Bay, Baja California. It cannot be specifically identified from current references, and the generic limits of *Kali* are confused—two genera appear to be included under this one name (D. M. Cohen, personal communication). Compared to specimens identified as *K. indica* (Lloyd) and *K. normani* (Parr) in the collections of Scripps Institution of Oceanography, this specimen is unique in having a reduced number of broad-based, short, blunt teeth in both jaws.

170. *Pseudoscopelus scriptus* Lütken.

137.50, B6203, (1) 83.5 mm.

This specimen was taken about 160 km. (100 miles) west of Santa Maria Bay, Baja California. Parr (1933 : 36–42) considered *P. scriptus* to consist of two subspecies and also described a new species, *P. altipinnis*. The above specimen is closer to the description Parr gave for *P. scriptus*, but it is possible that the two species are synonymous (R. J. Lavenberg, personal communication).

SCORPAENIDAE

171. *Sebastolobus alascanus* Bean.

Figure 29D.

60.60, H6204, (1) 26 mm.

172. *Sebastolobus altivelis* Gilbert.

Figure 29D.

60.120, H6204, (1) 40.5 mm.; 80.55, H6204, (5) 30.5–39.5 mm.; 80.60, B6203, (1) 31 mm.; 80.60, H6204, (1) 29.5 mm.; 80.70, C6208, (1) 14.5 mm.; 80.80, H6204, (2) 33 mm.; 80.90, H6204, (1) 36 mm.; 84.92, B6303, (2)

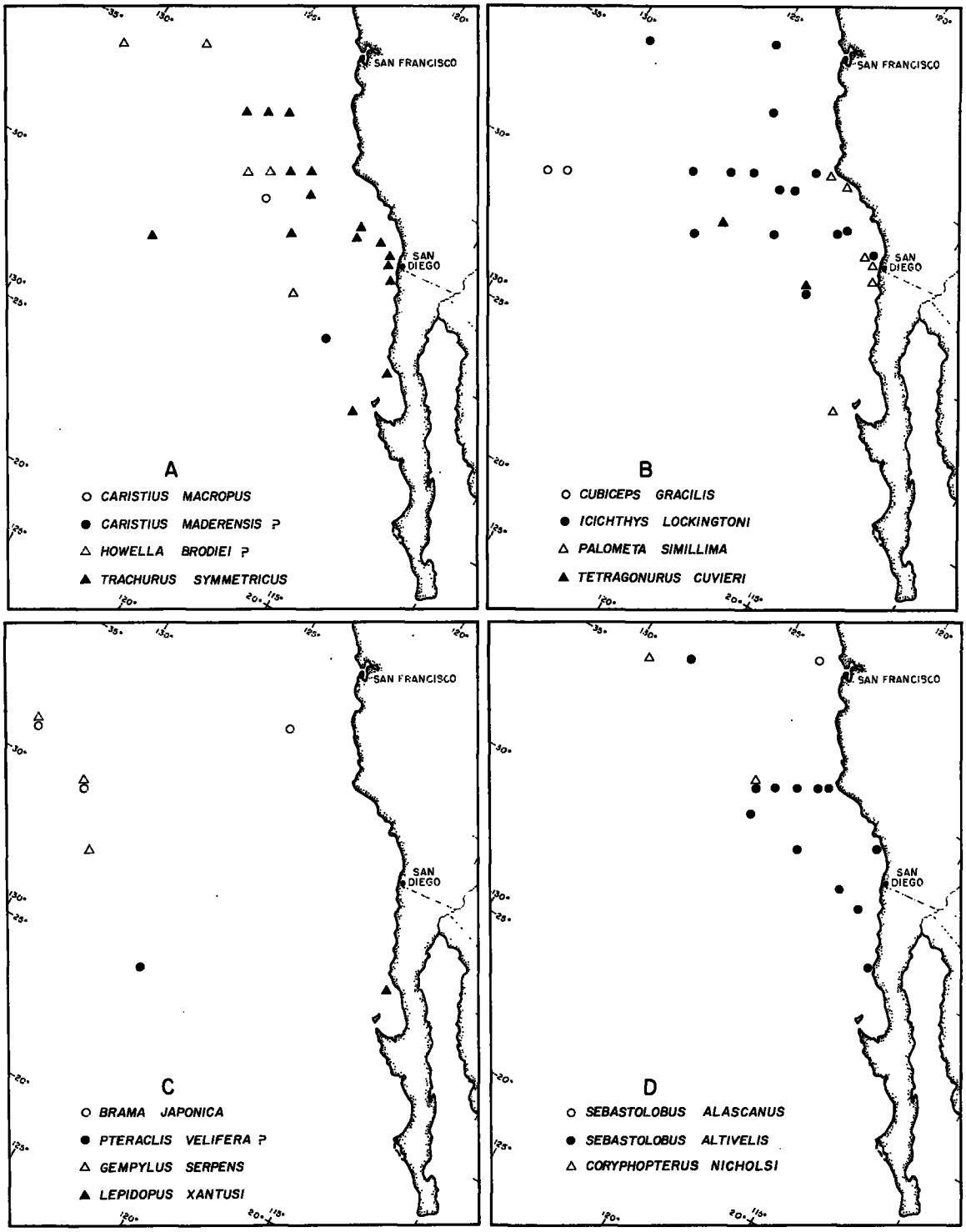

FIGURE 29.—Locations of capture of: A, *Caristius macropus*, *Caristius maderensis?*, *Howella brodiei?*, *Trachurus symmetricus*. B, *Cubiceps gracilis*, *Icichthys lockingtoni*, *Palometa simillima*, *Tetragonurus cuvieri*. C, *Brama japonica*, *Pteraclis velifera?*, *Gempylus serpens*, *Lepidopus xantusi*. D, *Sebastolobus alascanus*, *Sebastolobus altivelis*, *Coryphopterus nicholsi*.

30–35 mm.; 90.32, H6204, (3) 34–47.5 mm.; 90.70, H6204, (1) 41.5 mm.; 90.70, C6208, (3) 13–15.5 mm.; 97.50, B6203, (3) 35.5–42 mm.; 100.40, H6204, (4) 39.5–45.5 mm.; 110.35, C6303, (4) 28–36.5 mm.

All these specimens are pelagic, prejuvenile specimens, taken from close inshore to 480 km. (300 miles) at sea.

173. *Sebastodes diploproa* (Gilbert).

91.39b, C6208, (100+) ca. 31–41 mm.

174. *Sebastodes saxicola* (Gilbert).

60.60, H6204, (5) 16–23 mm.

175. *Sebastodes proriger* (Jordan and Gilbert)?

60.60, H6204, (2) both 26.5 mm.

This identification is uncertain because of the small size of the specimens.

176. *Sebastodes goodei* Eigenmann and Eigenmann.

68.50, C6208, (8) 197–231 mm.

177. *Sebastodes jordani* (Gilbert).

94.30, C6208, (2) 188–192 mm.

178. *Sebastodes* spp.

60.60, H6204, (2) 10–13 mm.; 60.70, H6204, (1) 5.5 mm.; 70.80–5N, B6203, (1) 15 mm.; 80.90, B6203, (1) 15.5 mm.; 90.48a, H6105, (1) 4.5 mm.; 90.48b, H6105, (1) 21.5 mm.

Specific identifications were not made because of the small size of these specimens.

ANOPLOPOMATIDAE

179. *Anoplopoma fimbria* (Pallas).

68.50, C6208, (1) 182 mm.

ZANIOLEPIDAE

180. *Zaniolepis frenata* Eigenmann?

90.32, B6203, (1) 22 mm.; 113.34a, C6303, (1) 39.5 mm.

These two small specimens may represent the sympatric *Z. latipinnis* Girard—adequate comparable material is not available to confirm our identification. The larger specimen appears, however, to be *Z. frenata*, because its third anal spine is shorter than the second.

AGONIDAE

181. Agonidae, unidentified.

90.48a, H6105, (1) 20.5 mm.; 90.48b, H6105, (2) 24.5–24.5 mm.; 90.60, B6203, (1) 19 mm.; 113.34a, C6303, (1) 15.5 mm.

Comparative material is not available that will allow identification of these small specimens (J. E. Fitch, personal communication).

GOBIIDAE

182. *Coryphopterus nicholsi* (Bean).

Figure 29D.

60.140, H6204, (2) 20–29 mm.; 80.90, H6204, (1) 15.5 mm.

These specimens, taken about 560 and 260 km. (350 and 160 miles) offshore, appear to be pelagic, oceanic, protracted prejuvenile stages of this species, which is generally known as an inshore, shallow-water, benthic inhabitant. Other specimens of this form have been taken in offshore waters at various times in CalCOFI routine, 140-m.-deep plankton tows.

183. Gobiidae, unidentified.

90.48a, H6105, (2) 7–8 mm.

BATRACHOIDIDAE

184. *Porichthys notatus* Girard.

94.29c, C6208, (2) 98–133 mm.

185. *Porichthys* sp.

65.54, C6208, (1) 125 mm.

This specimen was not identified to species and was discarded at sea.

BLENNIIDAE

186. *Hypsoblennius gentilis* (Girard).

123.45, B6212, (1) 15 mm.

ZOARCIDAE

187. *Melanostigma pammelas* Gilbert.

90.45a, H6105, (1) 108 mm.

HETEROSTOMATA

BOTHIDAE

188. *Citharichthys sordidus* (Girard).

Figure 27C.

60.60, C6208, (1) 25 mm.; 70.51, C6208, (6) 27–36 mm.; 70.60, C6208, (1) 32 mm.; 70.80–5N, B6203, (1) 27 mm.; 80.60, B6203, (1) 25.5 mm.; 80.60, C6208, (3) 28–32 mm.; 84.92, B6303, (1) 16 mm.

These are all pelagic larval and juvenile specimens taken from close inshore to about 290 km. (180 miles) at sea.

189. *Citharichthys xanthostigma* Gilbert.

Figure 27C.

113.34a, C6303, (a) all ca. 22 mm.

190. *Citharichthys stigmaeus* Jordan and Gilbert.

Figure 27C.

60.60, H6204, (2) 32.5–38.5 mm.; 60.60, C6208, (1) 26.5 mm; 60.70, C6208, (1) 28.5 mm.; 60.80, C6208, (1) 32.5 mm.; 70.51, C6208, (6) 29.5–34 mm.; 80.60, C6208, (8) 24.5–30 mm.; 80.100, H6204, (2) 26.5–28 mm.; 83.70c, B6303, (1) 21 mm.; 83.90, C6303, (1) 22 mm.; 84.92, B6303, (1) 22 mm.; 90.45, H6105, (1) 29.5 mm.; 90.45a, H6105, (1) 29 mm.; 90.90, C6303, (14) 13–21.5 mm.; 90.48c, H6105, (2) 31 mm.; 97.40, C6303, (3) 23.5–26.5 mm.

These are all pelagic larval and juvenile specimens taken from close inshore to about 320 km. (200 miles) at sea.

191. *Citharichthys* sp.

67.50, C6208, (1) 150 mm.

This specimen was discarded at sea and not specifically identified.

192. *Bothus leopardinus* (Günther).

Figure 27C.

140.35, B6212, (2) 13–20 mm.

These specimens may be *B. constellatus* (Jordan), if *B. constellatus* is a distant species. Until distinction or synonymy can be established, we choose to use the earlier name.

PLEURONECTIDAE

193. *Microstomus pacificus* (Lockington).

Figure 27D.

70.51, C6208, (1) 28.5 mm.; 70.60, C6208, (1) 26.5 mm.; 80.70, H6204, (1) 21.5 mm.; 84.92, B6303, (1) 24 mm.; 97.40, C6303, (1) 30 mm.; 100.65, C6303, (2) 26–34 mm.; 100.160, H6204, (1) 42 mm.; 107.60, C6303, (1) 28.5 mm.

These larval specimens were taken from close inshore to about 840 km. (520 miles) off northern Baja California.

194. *Glyptocephalus zachirus* Lockington.

Figure 27D.

60.70, C6208, (1) 55.5 mm.; 60.90, C6208, (3) 36–62 mm.; 60.100, C6208, (1) 33 mm.; 70.60, C6208, (3) 39–45 mm.; 80.60, C6208, (1) 51 mm.

These larval specimens were taken about 55 to 315 km. (35 to 195 miles) offshore.

195. *Eopsetta jordani* (Lockington).

Figure 27D.

60.70, H6204, (1) 20 mm.

CYNOGLOSSIDAE

196. *Symphurus atricauda* (Jordan and Gilbert).

94.30, C6208, (1) 130 mm.

PLECTOGNATHI

MOLIDAE

197. *Mola mola* (Linnaeus).

94.28a, C6208, (13) "moderate size"; 94.28b, C6208, (4) 500–750 mm.; 94.29b, C6208, (3) all 380 mm.; 94.29c, C6208, 94.29d, C6208, (12) 378–1,460 mm.; (3) all ca. 450 mm.

PEDICULATI

ONEIRODIDAE

198. *Oneirodes eschrichtii* Lütken.

Figure 30.

80.80, H6204, (1) 52 mm.; 90.160, H6204, (1) 98 mm.; 100.140, H6204, (1) 25 mm.; 110.35, C6203, (1) 29 mm.; 120.45, H6204, (1) 26 mm.

These specimens fit the *O. eschrichtii* group as defined by Bertelsen (1951: 77–84), and further compare well with *O. eschrichtii s.s.* (R. H. Rosenblatt, personal communication).

199. *Oneirodes eschrichtii* Lütken?

Figure 30.

120.70, H6204, (2) 13.5–29.5 mm.

These two small specimens appear to represent this species (P. Struhsaker, personal communication).

200. *Oneirodes acanthias* (Gilbert)?

Figure 30.

123.50, B6203, (1) 24 mm.

This small specimen appears to represent this species (P. Struhsaker, personal communication).

201. *Chaenophryne parviconus* Regan and Trewavas.

Figure 30.

108.63, C6303, (1) 52 mm.

202. Oneirodidae, unidentified.

110.140, H6204, (1) 14 mm.

The identity of this free-living male is uncertain.

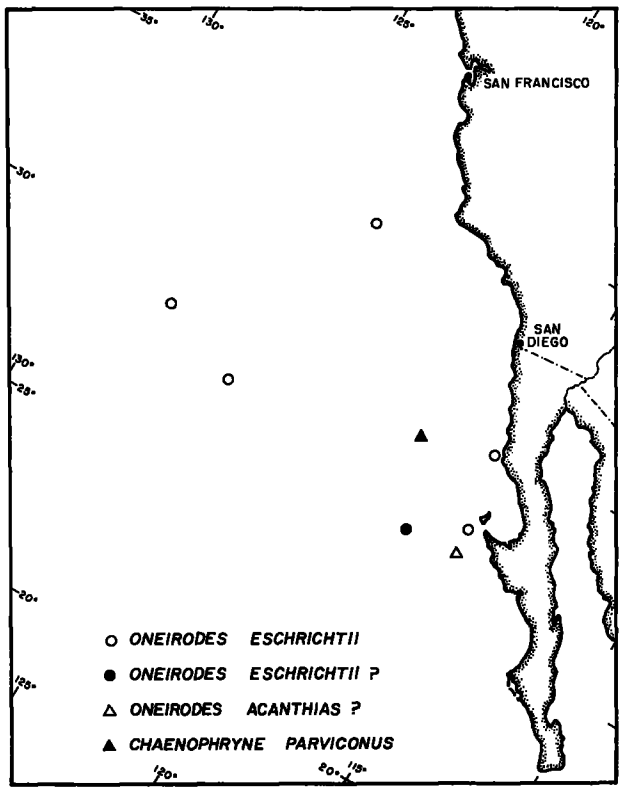

FIGURE 30.—Locations of capture of: *Oneirodes eschrichtii, Oneirodes eschrichtii?, Oneirodes acanthias?, Chaenophryne parviconus.*

ALPHABETICAL LIST OF FISHES

The species, genera, families, and orders of fishes taken on the pelagic survey are listed alphabetically. Each entry is followed by the phylogenetic sequence number assigned to that name.

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