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Hatching Dates of Walleye Pollock *(Theragra chalcogramma)* and Vertical Distribution of Ichthyoplankton from the Eastern Bering Sea, June–July 1979

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Hatching dates of walleye pollock (*Theragra chalcogramma*) and vertical distribution of ichthyoplankton from the eastern Bering Sea, June-July 1979

by

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INTRODUCTION

It has been suggested that larval fish survival depends on the availability of adequate food when larval yolk supply has been exhausted. To evaluate food availability, the spatial distribution of both food and larvae must be determined. In the Bering Sea quite a few cruises of varying quality have been made to determine seasonal and areal distribution of ichthyoplankton (Waldron 1979), but closing nets were almost never used, so, with the exception of walleye pollock, information on the vertical distribution of fish larvae is lacking.

The vertical distribution of walleye pollock larvae and eggs is somewhat better known. The maximum numbers of eggs are usually found subsurface (Gorbunova 1954; Nishiyama 1979), although a few authors found the maximum at the surface (Kamba 1974; Takeuchi 1972). Sometimes some eggs are found as deep as 500 m (Gorbunova 1954).

Although Serobaba (1968) found the distribution of larval walleye pollock to extend to depths of 1000 m, maximum numbers are usually found in the upper 40 m (Nishiyama 1979; Kamba 1974). Kamba (1974) sampled over 24 hours and found that although there was always a subsurface maximum between 10 and 30 m, the upper extent of the distribution rose at night. He does not discuss the problem of net avoidance indicated by the larger catches at night. Cooney et al. (1978) show that at night the vertical distribution of walleye pollock expands both upward and downward from the mid-day subsurface maximum.

The only information about the vertical distribution of other species of fish larvae in the Bering Sea comes from studies made in other areas or is restricted to whether the species was found primarily in vertical or in surface net tows.

The present study is a report on the vertical distribution of larval fish caught at two stations in the eastern Bering Sea occupied for 48-h each during an ichthyoplankton survey designed primarily to determine the growth rates of field caught larval pollock (Walline 1980). In addition, the birthdate distribution of larval pollock at these two stations is analyzed and compared to that determined for larvae caught at other stations on the cruise.

METHODS

Ichthyoplankton was collected from the eastern Bering Sea on a cruise of the NOAA research vessel *Miller Freeman*. The first 48-h diel station was occupied 2-3 June 1979 and the second 4-6 June 1979. The stations were located in areas where preliminary net hauls showed suitable concentrations of larval walleye pollock (Fig. 1).

Samples were collected with three types of nets: a neuston net, a bongo net, and a Tucker trawl. Surface samples were collected using a modified Sameoto neuston sampler with a mouth opening of 30 x 50 cm and a net mesh of 505 um towed for 10 min at 2-3 knots. Plankton from deeper layers was collected with paired 0.6 m open bongo nets, one with 505 um mesh and the other with 333 um mesh. Double oblique tows were made from the surface to slightly more than 200 m depth, or to within 5-10 m of the bottom in shallower water. Both of these tows and at least one CTD cast for temperature, depth, and salinity were made every 6 h. Each 6 h time period was regarded as a separate station, VØ1A through V16A. A 1.Ø m square mechanical opening-closing Tucker trawl (Clarke 1969) with three nets of 5Ø5 um mesh was fished to sample discrete depth intervals: 1ØØ, 6Ø, 4Ø, 25, 15, and 5. The 1ØØ m sample was omitted at the inner diel station where the bottom depth was 64 m.

Some walleye pollock larvae were removed from the bongo and Tucker trawl samples at sea and preserved in alcohol for otolith analysis. The remaining sample and all neuston samples were preserved in 5% Formalin[1/] (2% formaldehyde) buffered with sodium tetraborate.

All nets were equipped with calibrated mechanical flowmeters with digital readout. The data from the flowmeters was used to standardize the catches using procedures adapted from Kramer et al. (1972). For each haul a standard haul factor was calculated to convert catch to catch per 1Ø m^2 surface area and another to convert catch to catch per 1ØØØ m^3 (Table 1).

Sorting of fish eggs and larvae from samples was done through a contract with Texas Instruments, Inc., Dallas, Texas. The quality of sorting by this contractor had been evaluated previously and found to be acceptable (Waldron and Vinter 1978). No samples were pre-sorted to check thoroughness of sorting.

Eggs and larvae were identified at the NWAFC. Common and

1/ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

scientific names used are those recommended by the American Fisheries Society.

Birthdate, that is the date the larvae hatched, was calculated for each walleye pollock larva using growth rates presented in Walline (1980). The length (less the 4 mm estimated to be the average size at hatching) was divided by the growth rate. This age in days was used to back calculate the date of hatching. This was done for all the larvae at the two diel stations discussed in this report, as well as for all the walleye pollock caught at the other stations during this cruise (Walline 1981).

RESULTS

The first 48-h station was located in water 125 m deep in the Outer Shelf Domain described by Coachman and Charnell (1979). The upper wind-mixed layer is separated from a bottom tide-mixed layer by a layer lacking in mixing energy (Fig. 2). In this depth range interleaving of layers of water a few meters thick (finestructure) is observed.

The second 48-h station was located farther inshore in water only 64 m deep. The two-layer structure observed here is characteristic of the Central Shelf Domain (Fig. 3). The temperature and salinity of the surface layers are much the same at the two stations. Exact station locations are given in Table 1 of Walline (1981).

As might be expected, walleye pollock larvae were the most abundant larvae at both locations. In all, 29 taxa of larvae and

6 egg taxa were identified (Table 2). Two larvae and 6 eggs could not be identified. Twenty taxa of larvae were taken in the Tucker trawl, 14 in the bongo, and 16 in the neuston net. Seven of the 16 taxa taken in the neuston net were not taken in the other nets (Tables 2, 3, 4).

Walleye pollock were almost the only larval fish taken at the inner location in Tucker trawl hauls. Only 8 other larval fish from 4 taxa were caught. Bongo samples show the same trends as the Tucker trawl hauls: more taxa of larval fish at the outer station and greater abundance of eggs at the inner station. Walleye pollock and yellowfin sole eggs are abundant in neuston samples from the inner location, while larvae of searchers and dwarf wrymouth, and flathead sole eggs are abundant in neuston samples from the outer location. Larval taxa which Waldron (1979) found to be caught predominantly in surface tows occurred frequently at both locations.

Walleye pollock at both stations and searchers at the first station are abundant enough to allow plots of vertical distribution with time to be made (Fig. 4). The length frequency distribution and numbers of walleye pollock larvae caught differed for hauls made at night compared to hauls made during the day at the outer location (Fig. 5). Approximately three times as many hauls were made during periods considered daytime, so on a per haul basis twice as many larvae were caught at the outer station during the night as were caught during the day ($3x196/279 \approx 2$). At the inner location only slightly more larvae were caught at night than during the day.

A length frequency distribution for searchers is plotted only for the outer location, since none were caught at the inner location (Fig. 5). The standard lengths ranged from 5-11 mm.

At the outer location, rockfishes occurred frequently (in 13 of 48 samples). Most were caught in the upper 25 m although at one station (VØ7A), 25 larvae were taken in the 1ØØ m haul. No diel differences in vertical distribution of rockfishes were noted, although more were taken at night than during the day.

Because walleye pollock growth rates are constant with lengths over the length range of these larvae, the distribution of birthdates is the mirror image of the length frequency distribution (Fig. 6). The distribution of birthdates for all walleye pollock taken on the cruise in all nets at all stations (Fig. 1) is heavily influenced by the large number of hauls made at the two diel stations (Fig. 7). There is a one-to-one correspondence between the main peaks in the distributions. When each station on the cruise is represented by a single bongo haul, a better representation of the distribution of birthdates is obtained (Fig. 7).

DISCUSSION

The large difference in species composition between the two locations is not explained by differences in hydrographic conditions present at the time of sampling as the temperature and salinity were nearly identical at the two stations. It is more likely the result of differences in the timing of events, the differing zooplankton species composition at the two locations, and the location of spawning. The greater number of walleye pollock eggs inshore is consistent with the observation of Serobaba (1968) that pollock tend to spawn farther inshore as the season progresses. This is probably not the case for the yellowfin sole and the flathead sole, however. The spawning populations of these species are found further inshore than walleye pollock, and as a result the largest egg concentrations are found there also.

It appears that the frontal system present in this part of the eastern Bering Sea does not have a marked effect on the distribution of larvae of species usually found only in the surface layers. Greenling, sand lance, and Irish lord larvae occur in the neuston at both locations.

The vertical distribution of walleye pollock was similar at both locations. The subsurface maximum in numbers, usually in the 10-20 m layer, is more pronounced during the day than at night. If any vertical migration occurs, it is only over a limited depth range of about 10 m. Searchers seem to have a stronger vertical migration pattern than walleye pollock, migrating downward at night. The apparent increase in numbers in the 60-100 m layer during the day (shown in Figure 4) is caused by a single large haul and is unexplained.

Larger walleye pollock larvae are able to avoid the plankton nets used in this study. At the outer location, where many larvae about 20 mm in standard length were caught, not only are more larvae caught at night, but the length frequency distribution changes. During the day, proportionately fewer of the larger size class of larvae are taken in the nets. At the inner location, where most of the larvae are less than 1Ø mm in length, this pattern is not observed.

From the distribution of birthdates it can be inferred that two time periods were especially favorable for the successful first feeding of larval pollock in 1979: the last two weeks in April and the last two weeks in May (Fig. 6). As previously mentioned the birthdate distribution for all larval pollock caught on this cruise is dominated by samples taken at the two diel stations. When each location on the cruise is represented by a single bongo haul (for the two diel stations, bongo hauls from VØ1A and VØ9A were used), the importance of the later time period is reduced. The use of oblique bongo hauls allows each station to be equally represented, even though water depths differed, because the tows were made at the same speed and angle. However, the horizontal distribution of pollock larvae was not completely sampled. Most of the stations were made between the 9Ø and 46Ø m isobaths. Therefore, the inshore area, where the younger larvae were encountered, is underrepresented in Figure 8. The inner diel station can tentatively be considered representative of the interfrontal area in which it is located, just as the outer diel station is similar to many of the other stations located in the Outer Shelf Domain. The occurrence of young larvae in the Central Shelf Domain in June may be the result of the unusually warm spring and summer in the Bering Sea in 1979. During colder years walleye pollock may not penetrate as far inshore during spawning.

A complication in the interpretation of birthdate distributions is that they do not take mortality into account. The distributions are skewed to favor birthdates of larvae hatching nearest the sampling dates, because they have a better chance of being sampled before they are eaten or starve. In the present case this would tend to emphasize the importance of the earlier time period of successful hatching, that is the last two weeks in April. This is also the time when the spring phytoplankton bloom begins. However, the rather wide peak in the distribution, and the occurrence of hatching times throughout a 2 to 3 month period implies that conditions suitable for first feeding larvae occur frequently, and are not restricted to narrow time frames.

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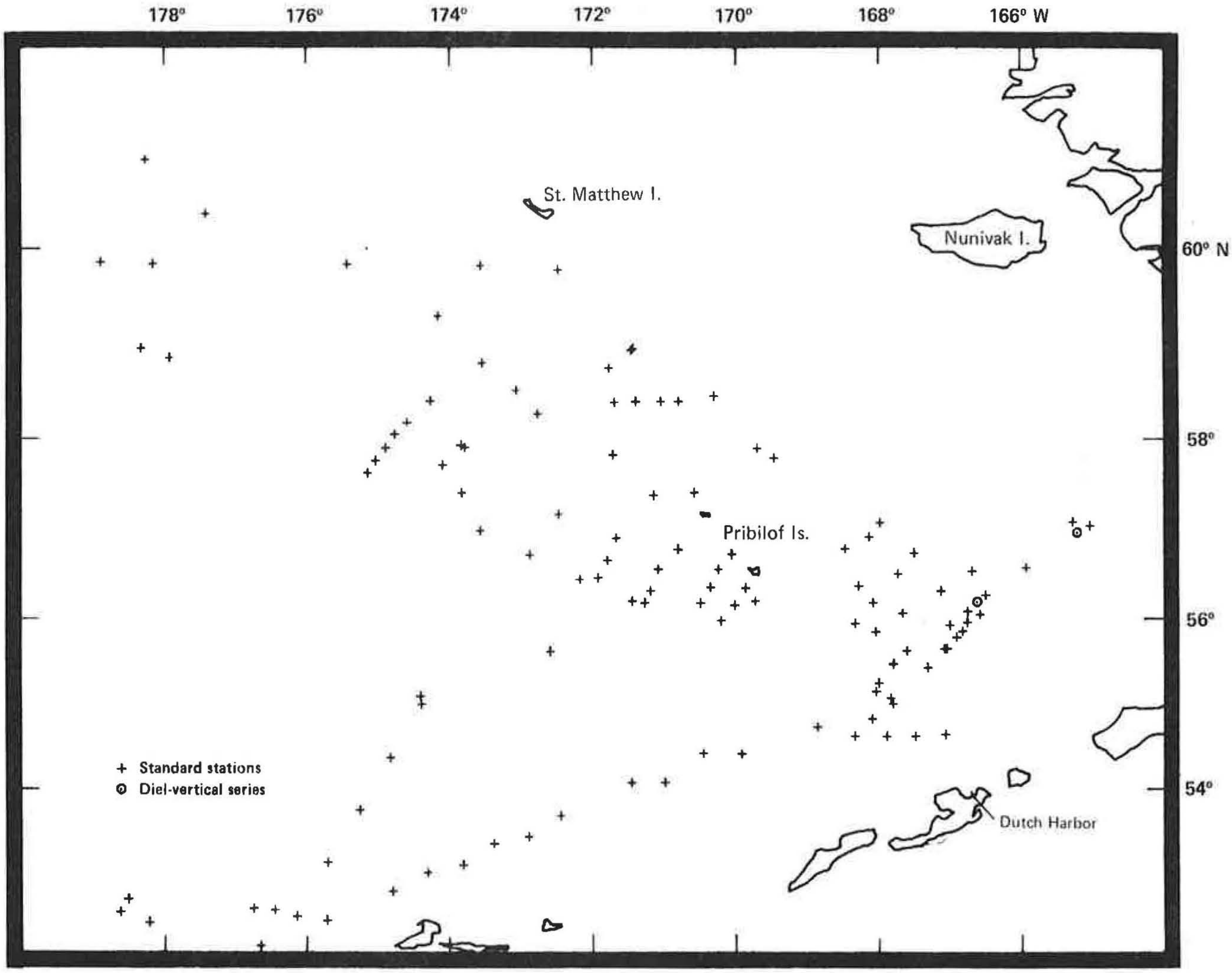

Figure 1. Distribution of sampling stations for ichthyoplankton, RV *Miller Freeman*, Cruise 3MF79, 1 Jun-23 Jul 1979.

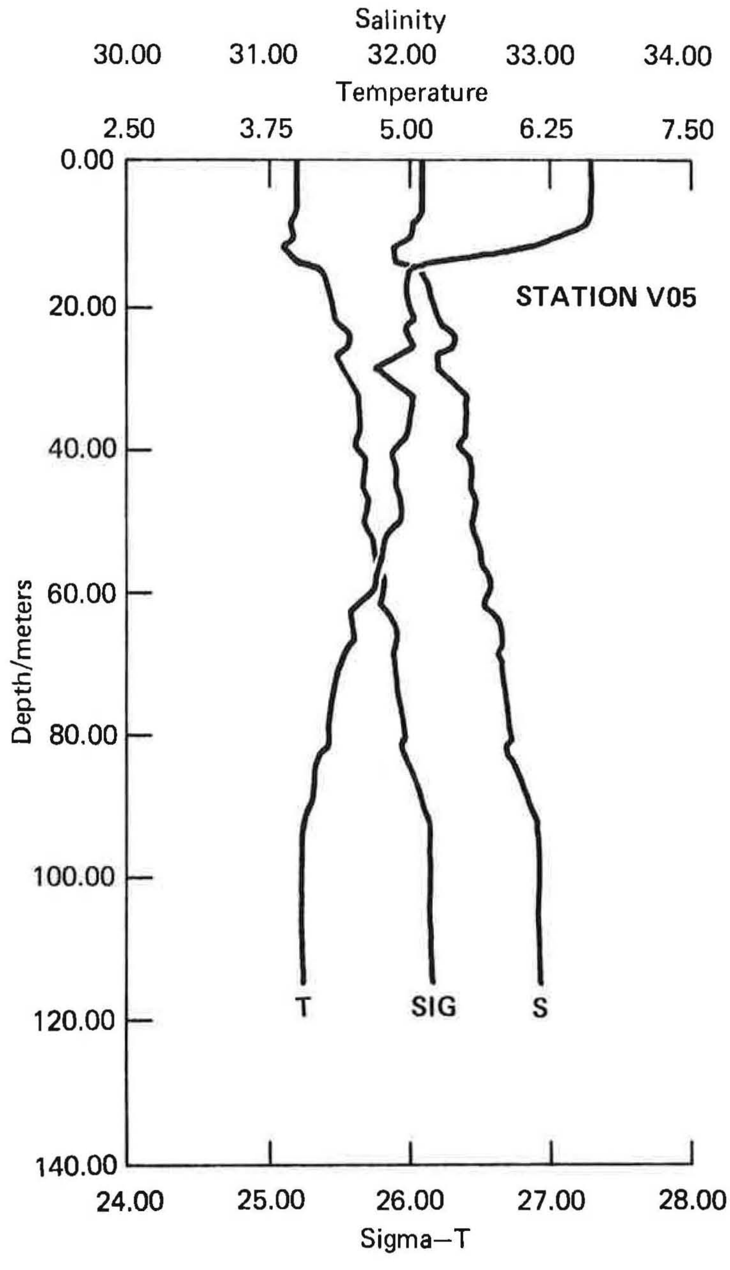

Figure 2. Temperature, salinity, and density profile at Station VØ5.

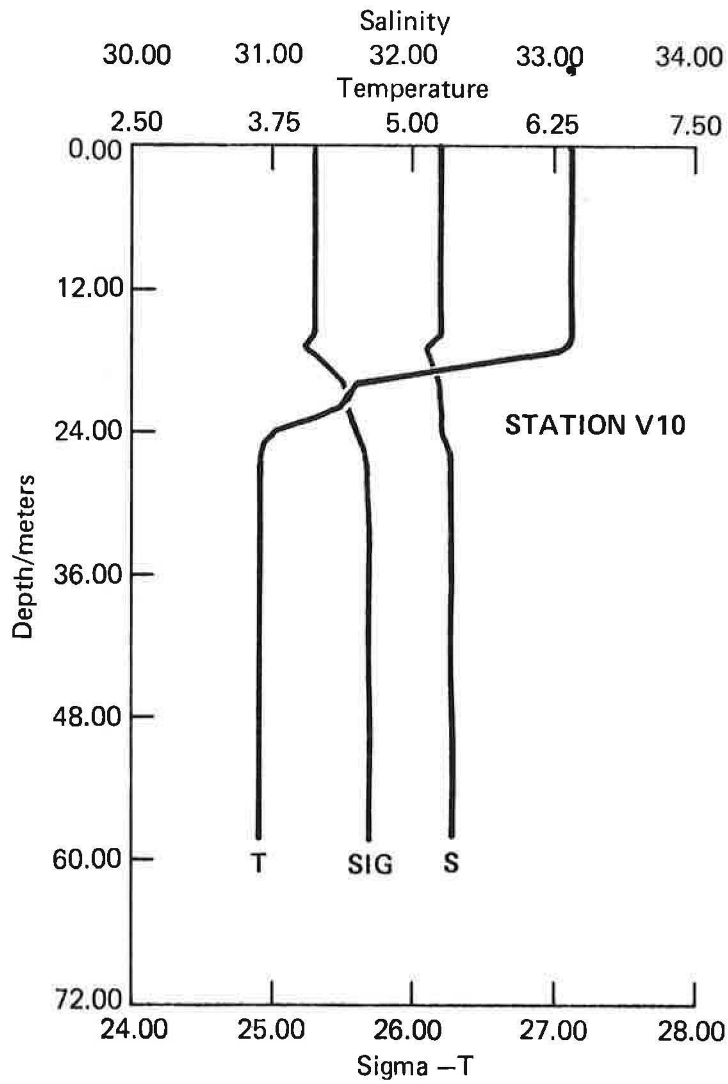

Figure 3. Temperature, salinity, and density profile at Station V1Ø.

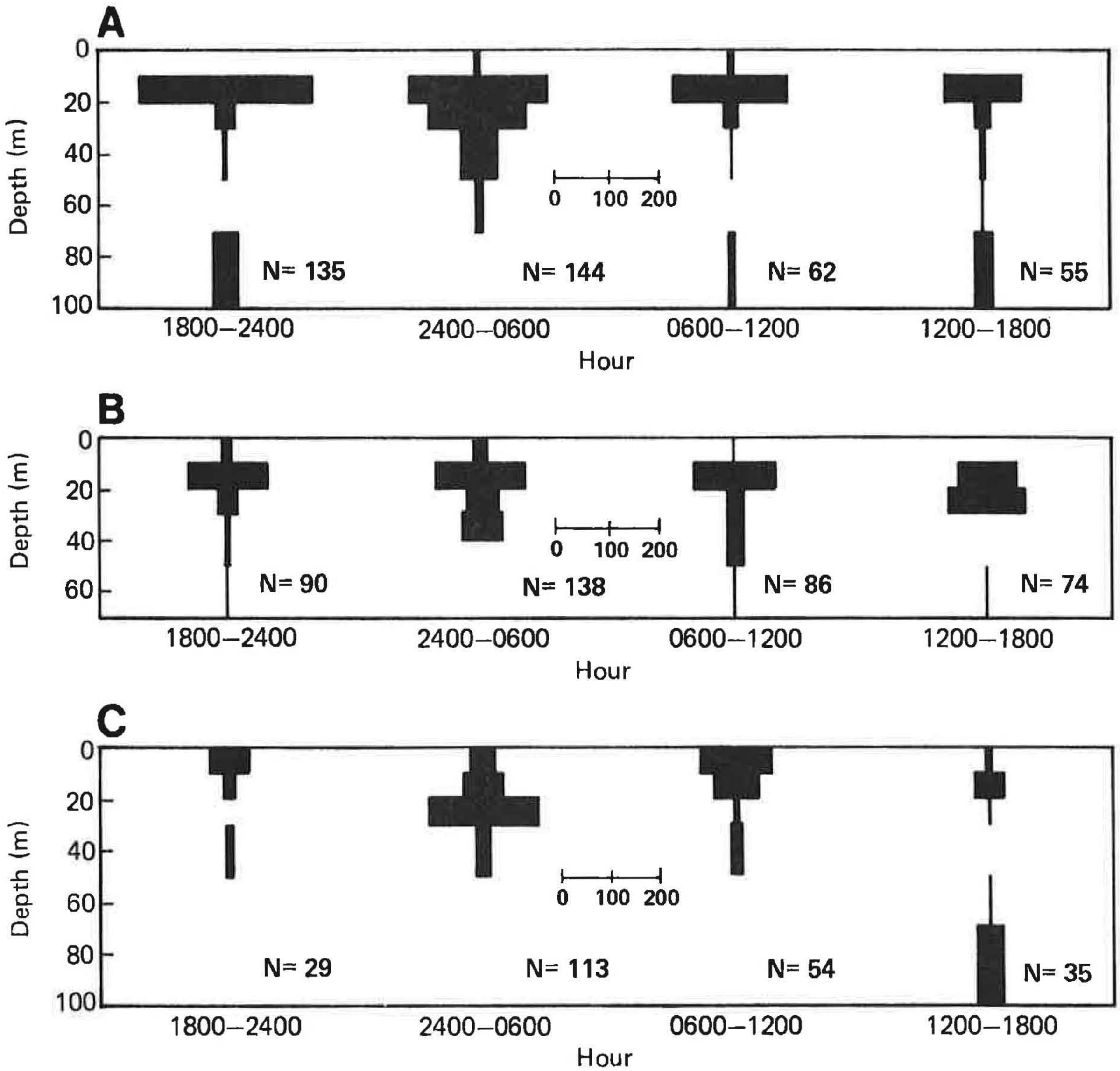

Figure 4. Vertical distribution at different times of day for a) walleye pollock at the outer diel station, b) walleye pollock at the inner diel station, and c) searchers at the outer diel station. Width of bar is proportional to abundance in numbers per 1000 m^3.

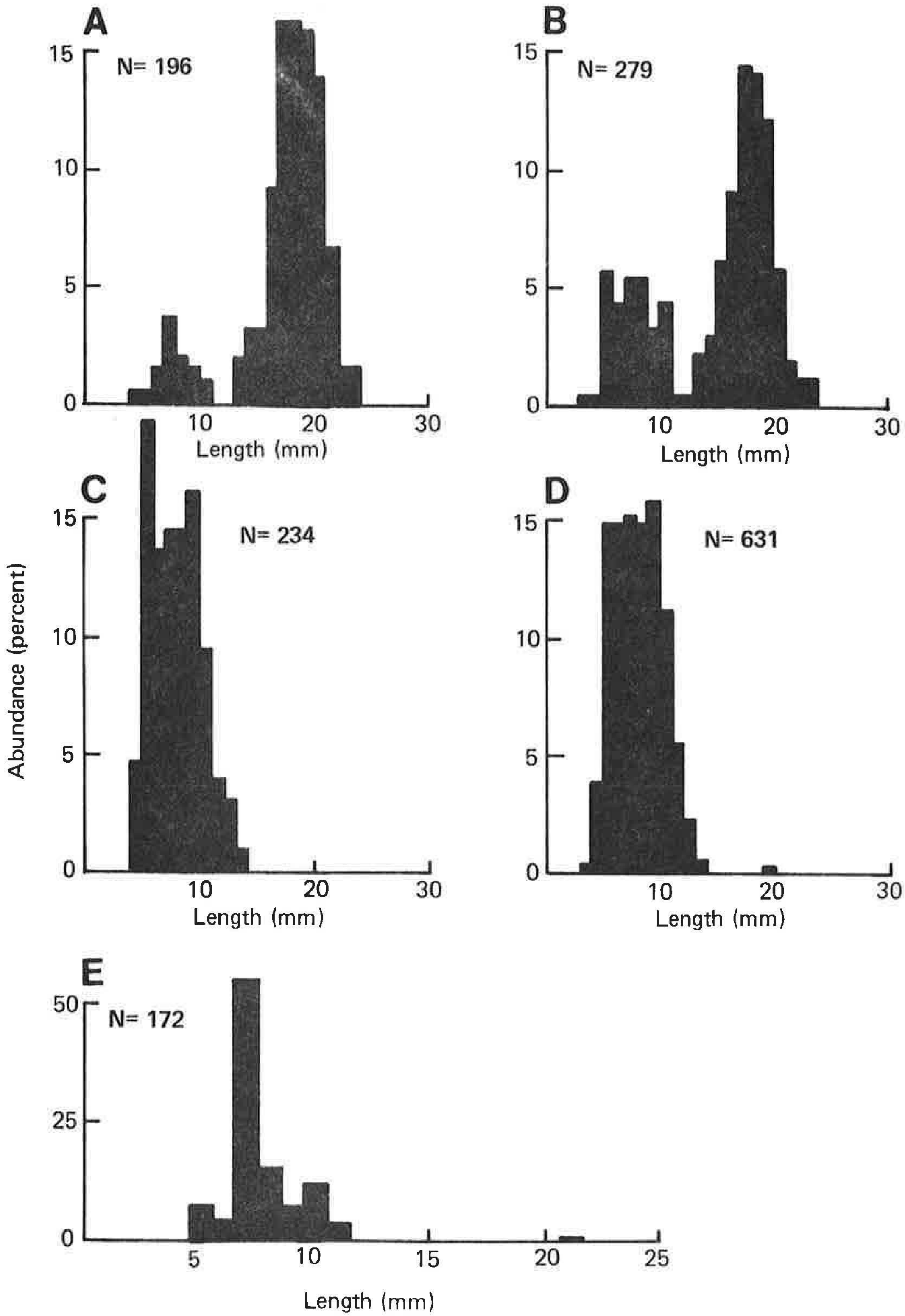

Figure 5. Length frequency distribution for a) night-caught walleye pollock at the outer diel station, b) day-caught walleye pollock at the outer diel station, c) night-caught walleye pollock at the inner diel station, d) day-caught walleye pollock at the inner diel station, and e) searchers at the outer diel station. Abundance is expressed as a percentage of the total catch for each time and location.

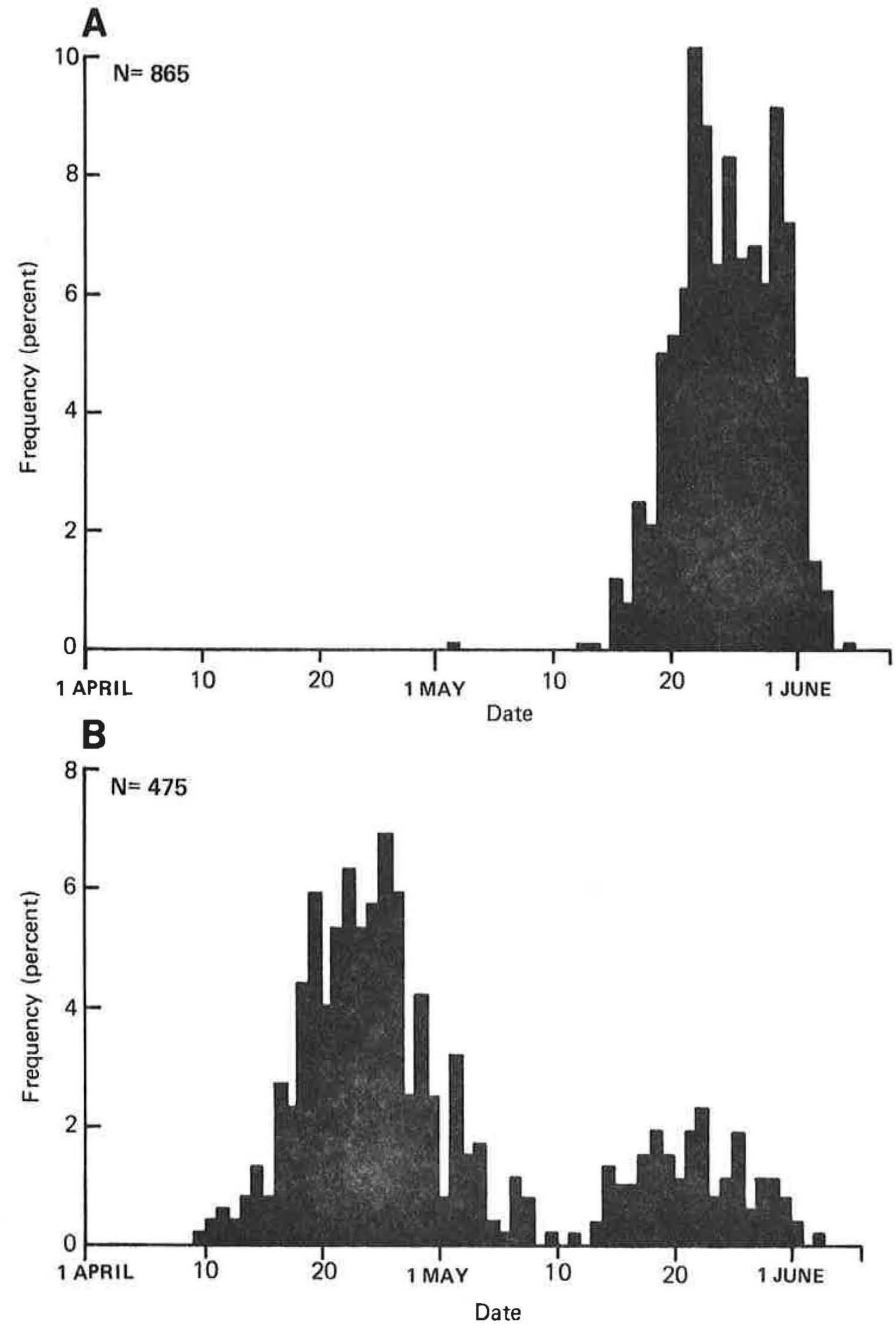

Figure 6. Date of hatching of walleye pollock at a) the inner diel station and b) the outer diel station. Abundance is expressed as a percentage of the total catch for each location.

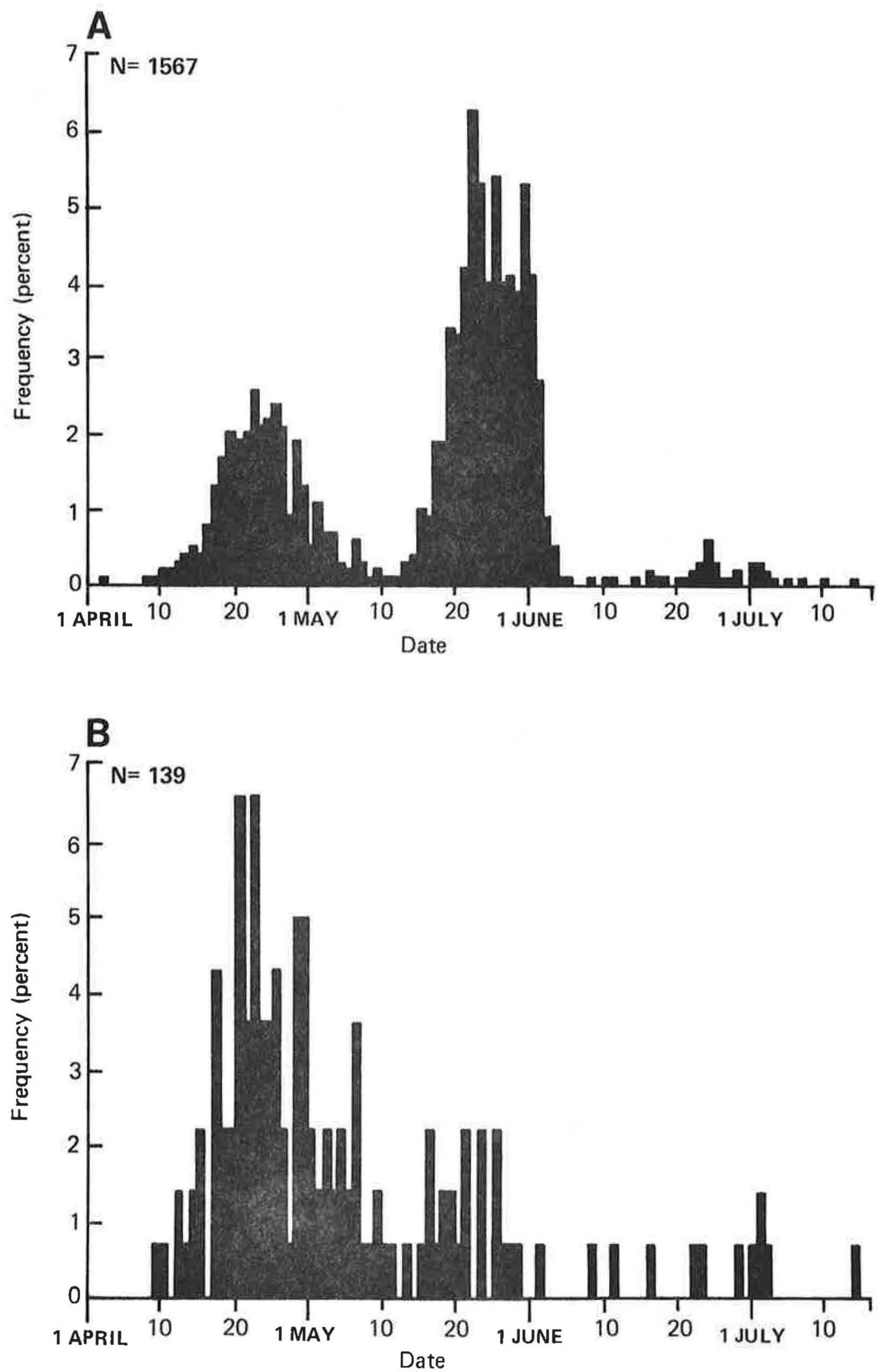

Figure 7. Date of hatching of a) all walleye pollock caught on Miller Freeman Cruise 3MF79 and b) walleye pollock caught in the first 505-mesh bongo net haul made at each location on Miller Freeman Cruise 3MF79. Abundance is expressed as percentage of total for all stations and gears in a) and for all stations in b).

Table 1. Station data for Tucker trawl from cruise 3MF79, Miller Freeman, 1 June–23 July 1979.

Sta. No.1/	Date Time	Net Depth	Haul Factor2/	Sta. No.1/	Date Time	Net Depth	Haul Factor2/
	June						
V01A	2/0441	100	4.858		4/1710	25	6.231
	2/0441	100-0	3.266		4/1758	15	5.255
	2/0530	60	4.675		4/1820	5	4.829
	2/0604	40	5.278		4/1840	10	4.590
	2/0631	25	5.227	V11A	4/2255	60	4.590
	2/0701	15	6.273		4/2318	40	3.725
	2/0737	5	7.345		4/2343	25	8.272
V02A	2/1052	100	4.434		5/0006	15	4.710
	2/1052	100-0	2.743		5/0026	5	4.601
	2/1129	60	5.071		5/0041	29	4.704
	2/1149	40	5.106		5/0100	60-0	2.496
	2/1223	25	7.105	V12A	5/0424	60	5.520
	2/1302	15	8.542		5/0455	40	5.031
	2/1322	5	5.504		5/0520	25	5.354
V03A	2/1733	100	5.486		5/0545	15	5.085
	2/1733	100-0	2.962		5/0607	5	4.686
	2/1810	60	4.340		5/0623	15	5.419
	2/1835	40	5.662		5/0649	60-0	2.571
	2/1858	25	6.078	V13A	5/1004	60	5.169
	2/1927	15	10.390		5/1028	40	5.051
	2/1954	5	6.516		5/1055	25	4.310
V04A	2/2302	100	5.247		5/1117	15	5.346
	2/2302	100-0	2.514		5/1135	5	4.187
	2/2338	60	5.017		5/1157	15	4.925
	2/2359	40	5.205		5/1217	60-0	2.357
	3/0026	25	5.971	V14A	5/1612	60	5.362
	3/0056	15	10.954		5/1644	40	4.728
	3/0140	5	6.749		5/1755	25	10.215
V05A	3/0436	100	5.646		5/1817	15	5.044
	3/0436	100-0	2.614		5/1840	5	4.431
	3/0516	60	4.991		5/1855	60-0	2.674
	3/0542	40	5.205	V15A	5/2250	60	6.029
	3/0607	25	5.603		5/2316	40	5.645
	3/0635	15	8.001		5/2333	25	7.390
	3/0712	5	6.633		5/2355	15	5.148
V06A	3/1033	100	5.286		6/0011	5	4.900
	3/1101	60	4.608		6/0024	60-0	2.588
	3/1122	40	5.732	V16A	6/0412	60	4.303
	3/1150	25	6.029		6/0441	40	4.767
	3/1215	15	12.045		6/0507	25	5.205
	3/1236	5	8.895		6/0532	15	4.763
V07A	3/1644	100	4.946		6/0554	5	4.060
	3/1644	100-0	2.933		6/0618	60-0	2.420
	3/1751	60	5.278	S08B	6/1830	112-0	2.728
	3/1808	40	5.645	S44A	23/0859	126-0	2.701
	3/1828	25	6.252		July		
	3/1850	15	8.561	S85A	11/1124	25	1.353
	3/1914	5	8.424	S86A	12/0403	25	1.607
V08A	3/2303	100	5.263	S95A	15/0526	25	1.401
	3/2303	100-0	2.729	S101A	16/0534	25	1.725
	3/2337	60	2.696	S103A	16/0914	25	1.198
	3/2358	40	5.512	S104A	16/1201	25	1.228
	4/0022	25	5.369		16/1241	50	1.400
	4/0048	15	9.302	S107A	17/1057	0	1.218
V09A	4/0917	60	5.242		17/1130	25	3.567
	4/0954	40	4.978	S111A	19/2336	40	1.154
	4/1017	25	4.601	S112A	20/0415	40	1.257
	4/1054	15	4.489	S115A	21/1156	25	1.465
	4/1115	5	4.964	S116A	22/0154	40	1.196
V10A	4/1552	60	5.496	S117A	23/0128	40	1.144
	4/1617	40	5.512				

1/ Station locations in Walline (1981).

2/ For hauls with single depth given, the haul factor converts observed catch to catch per 1000 m^3. For hauls with depth range, haul factor given converts observed catch to catch per 10 m^2.

Table 2. Tucker trawl, catch by haul and taxa.

Station	Haul-Net	Depth	Total larvae	Theragra chalcogramma	Gadidae-Unidentified	Sebastes spp.	Bathymaster spp.	Hippoglossoides elassodon	Lepidopsetta bilineata	Lyconectes aleutensis	Total eggs	Theragra chalcogramma	Limanda aspera	Hippoglossoides elassodon	Other larvae and eggs 1/
V01	3-1	100	3	-	1	-	-	-	-	1	-	-	-	-	A. stomias-1
	3-2	0-100	24	7	-	3	14	-	-	-	-	-	-	-	
	4	60	1	-	-	-	-	-	-	-	1	1	-	-	A. stomias-1
	5	40	3	2	-	-	1	-	-	-	10	9	-	1	
	6	25	2	1	-	-	-	-	-	-	9	9	-	-	R. hippoglossoides-1
	7	15	107	69	2	13	8	-	6	-	4	2	-	1	A. stomias-9, G. zachirus-1E
	8	5	13	-	-	3	9	-	-	1	1	-	-	1	
V02	3-1	100	2	-	-	-	-	-	-	1	2	-	-	1	UFE-1, Zoarcidae-1
	3-2	0-100	57	20	-	15	11	1	1	6	2	-	-	2	Stichaeidae-2, R. hippoglossoides-1
	4	60	4	3	-	-	-	-	-	1	-	-	-	-	
	5	40	21	10	-	1	9	-	-	-	-	-	-	-	R. hippoglossoides-1
	6	25	82	18	2	-	54	3	1	3	6	5	-	-	UFE-1, R. hippoglossoides-1
	7	15	111	39	3	38	18	1	1	7	2	1	-	1	H. decagrammus-1, A. stomias-2, R. hippoglossoides-1
	8	5	39	-	-	15	18	-	-	6	7	1	-	6	
V03	3-1	100	5	5	-	-	-	-	-	-	3	1	-	1	UFE-1
	3-2	0-100	31	1	2	5	13	8	1	1	9	4	-	1	Stichaeidae-1, Teleost Type M-4E
	4	60	-	-	-	-	-	-	-	-	2	1	-	1	
	5	40	2	-	-	-	1	-	-	-	5	4	-	1	Stichaeidae-1
	6	25	13	3	2	-	1	-	6	-	10	5	-	4	A. stomias-1, G. zachirus-1E
	7	15	50	21	-	19	8	-	-	-	2	1	-	1	UFL-1, A. stomias-1
	8	5	-	-	-	-	-	-	-	-	4	1	-	3	
V04	3-1	100	6	6	-	-	-	-	-	-	2	2	-	-	
	3-2	0-100	10	1	-	2	6	-	1	-	10	7	-	3	
	4	60	-	-	-	-	-	-	-	-	2	1	-	1	
	5	40	3	2	-	-	-	-	-	-	16	13	-	3	R. hippoglossoides-1
	6	25	16	7	-	-	1	2	5	-	5	1	-	4	A. stomias-1
	7	15	56	20	3	7	10	7	-	-	2	1	-	1	A. stomias-9
	8	5	14	-	1	-	4	-	-	9	3	2	-	-	G. zachirus-1E
V05	3-1	100	19	18	-	-	1	-	-	-	1	1	-	-	
	3-2	0-100	50	1	2	2	39	-	1	4	2	2	-	-	Agonidae-1
	4	60	1	-	-	-	1	-	-	-	1	1	-	-	
	5	40	3	-	-	-	-	-	-	-	4	1	-	2	UFL-1, R. hippoglossoides-2, Teleost Type M-1E
	6	25	15	13	-	-	1	-	1	-	2	1	-	1	
	7	15	60	32	12	3	-	-	7	-	2	2	-	-	Cottidae-2, Agonidae-1, Z. silenus-2, A. stomias-1
	8	5	10	-	-	-	10	-	-	-	-	-	-	-	
V06	3-1	100	1	-	-	-	-	-	-	-	-	-	-	-	Zoarcidae-1
	4	60	1	1	-	-	-	-	-	-	1	-	-	1	
	5	40	14	11	-	-	3	-	-	-	2	1	-	1	
	6	25	57	42	-	-	11	1	1	-	10	9	-	1	Cyclopteridae-1, P. rothrocki-1
	7	15	25	18	7	-	-	-	-	-	1	1	-	-	
	8	5	9	2	-	1	-	-	1	4	1	-	-	1	R. hippoglossoides-1
V07	3-1	100	57	-	2	29	16	3	5	-	3	3	-	-	A. hexapterus-1, A. stomias-1
	3-2	100-0	77	17	-	2	53	-	4	-	8	3	-	5	H. stenolepis-1
	4	60	-	-	-	-	-	-	-	-	20	20	-	-	
	5	40	4	1	-	-	2	-	-	-	3	1	-	2	R. hippoglossoides-1
	6	25	16	7	-	-	1	-	1	1	7	5	-	2	A. stomias-6
	7	15	60	27	7	6	9	3	-	-	1	-	-	1	A. stomias-8
	8	5	38	3	1	-	32	-	-	2	5	2	-	3	
V08	3-1	100	36	7	1	3	19	-	3	3	1	1	-	-	
	3-2	100-0	8	5	3	-	-	-	-	-	-	-	-	-	
	4	60	2	1	-	-	1	-	-	-	1	-	-	1	
	6	25	3	3	-	-	-	-	-	-	-	-	-	-	
	7	15	9	9	-	-	-	-	-	-	-	-	-	-	
V09	4	40	11	11	-	-	-	-	-	-	-	-	-	-	
	5	25	15	15	-	-	-	-	-	-	-	-	-	-	
	6	15	30	30	-	-	-	-	-	-	-	-	-	-	
	7	5	4	4	-	-	-	-	-	-	-	-	-	-	
V10	4	40	7	7	-	-	-	-	-	-	-	-	-	-	
	5	25	11	11	-	-	-	-	-	-	-	-	-	-	
	6	15	37	37	-	-	-	-	-	-	-	-	-	-	
	7	5	1	1	-	-	-	-	-	-	-	-	-	-	
V11	6	15	23	23	-	-	-	-	-	-	-	-	-	-	
	8	30	22	22	-	-	-	-	-	-	-	-	-	-	
	9-1	0-60	51	48	-	-	-	-	2	-	9	4	4	-	P. quadrituberculatus-1,1E
V12	3-1	60	1	1	-	-	-	-	-	-	-	-	-	-	
	4	40	2	2	-	-	-	-	-	-	-	-	-	-	
	5	25	12	12	-	-	-	-	-	-	-	-	-	-	
	6	15	31	31	-	-	-	-	-	-	-	-	-	-	
	8	15	27	27	-	-	-	-	-	-	-	-	-	-	
	9-2	0-60	34	34	-	-	-	-	-	-	-	-	-	-	
V13	4	40	20	20	-	-	-	-	-	-	-	-	-	-	
	5	25	13	13	-	-	-	-	-	-	-	-	-	-	
	6	15	39	39	-	-	-	-	-	-	-	-	-	-	
	7	5	6	6	-	-	-	-	-	-	-	-	-	-	
	8	15	38	38	-	-	-	-	-	-	-	-	-	-	
	9-2	0-60	26	26	-	-	-	-	-	-	-	-	-	-	
V14	3-1	60	1	1	-	-	-	-	-	-	-	-	-	-	
	4	40	3	3	-	-	-	-	-	-	-	-	-	-	
	6	15	25	25	-	-	-	-	-	-	-	-	-	-	
V15	3-1	60	1	1	-	-	-	-	-	-	-	-	-	-	
	5	25	26	26	-	-	-	-	-	-	-	-	-	-	
	6	15	25	25	-	-	-	-	-	-	-	-	-	-	
V16	4	40	1	1	-	-	-	-	-	-	-	-	-	-	
	5	25	3	3	-	-	-	-	-	-	-	-	-	-	
	6	15	34	34	-	-	-	-	-	-	-	-	-	-	
	7	5	6	6	-	-	-	-	-	-	-	-	-	-	
	8-1	0-60	78	73	-	-	-	1	2	-	13	9	4	-	Stichaeidae-1, P. quadrituberculatus-1

1/ Eggs are indicated by the letter "E" after the number, UFE is an unidentified egg, UFL is an unidentified larvae.

Table 3. 5Ø5-mesh Bongo net, catch by haul and taxa.

Station-Haul	Total larvae	*Theragra chalcogramma*	*Gadidae*-Unidentified	*Sebastes* spp.	*Bathymaster* spp.	*Hippoglossoides elassodon*	*Lepidopsetta bilineata*	*Lyconectes aleutensis*	Total eggs	*Theragra chalcogramma*	*Limanda aspera*	*Hippoglossoides elassodon*	Other eggs and larvae
VØ1-2	23	8	1	3	11	-	-	-	1	1	-	-	
VØ2-2	27	1Ø	-	4	8	-	-	2	Ø	-	-	-	A. stomias-2, R. hippoglossoides-1
VØ3-2	15	2	-	5	4	2	-	1	Ø	-	-	-	Gadidae-1
VØ4-2	17	4	1	5	5	1	-	-	1	1	-	-	R. hippoglossoides-1
VØ5-2	7	1	1	1	-	1	1	-	2	2	-	-	A. stomias-2
VØ6-2	42	25	1	-	13	-	1	1	1	1	-	-	R. hippoglossoides-1
VØ7-2	38	8	1	4	23	-	-	1	1	-	-	1	A. stomias-1
VØ8-2	9	1	1	1	3	1	1	-	Ø	-	-	-	A. stomias-1
VØ9-2	11	11	-	-	-	-	-	-	1	1	-	-	
V1Ø-2	3	2	-	-	-	-	-	-	3	3	-	-	R. hippoglossoides-1
V1Ø-11	25	24	-	-	-	-	-	-	3	-	-	-	UFE-3, Stichaeidae-1
V11-2	4	4	-	-	-	-	-	-	12	8	4	-	
V11-1Ø	3Ø	3Ø	-	-	-	-	-	-	1Ø	7	3	-	
V12-2	19	17	-	-	-	-	2	-	4	4	-	-	
V12-1Ø	44	21	-	-	-	21	1	-	8	1	7	-	P. quadrituberculatus-1
V13-2	1Ø	9	-	-	-	-	-	-	4	4	-	-	H. stelleri-1
V13-1Ø	2Ø	19	-	-	-	-	-	-	11	8	3	-	P. quadrituberculatus-1
V14-2	33	3Ø	-	-	-	-	2	-	Ø	-	-	-	P. quadrituberculatus-1
V14-9	66	65	-	-	-	-	-	-	9	8	1	-	P. quadrituberculatus-1
V15-2	11	9	-	-	-	1	-	-	5	1	4	-	P. quadrituberculatus-1
V15-9	3Ø	28	-	-	-	-	1	-	1Ø	8	2	-	Cyclopteridae-1
V16-2	22	21	-	-	-	-	1	-	1Ø	9	1	-	
V16-9	14	14	-	-	-	-	-	-	1Ø	8	2	-	

Table 4. Neuston net, catch by haul and taxa.

Station-Haul	Total larvae	*Bathymaster* spp.	*Hexagrammos decagrammus*	*Hexagrammos stelleri*	*Lycodes aleutensis*	*Ammodytes hexapterus*	*Hemilepidotus hemilepidotus*	*Myoxcephalus* spp.	Total eggs	*Theragra chalcogramma*	*Hippoglossoides elassodon*	*Limanda aspera*	Other eggs and larvae
VØ1-1	4	-	4	-	-	-	-	-	3	-	3	-	
VØ2-1	438	72	8	2	339	5	4	1	11	1	9	-	Sebastes-1, A. fimbria-1, H. jordani-1, Stichaeidae-2, G. zachirus-1E, B. bilobus-1, A. orientalis-1
VØ3-1	1Ø	-	6	-	3	-	1	-	6	-	6	-	
VØ4-1	7	-	5	-	-	-	-	-	8	-	8	-	Hexagrammos spp.-1, G. zachirus-1
VØ5-1	Ø	-	-	-	-	-	-	-	6	-	6	-	
VØ6-1	341	95	6	2	2Ø1	17	12	6	1	-	1	-	H. jordani-1, B. bilobus-1
VØ7-1	33	5	-	17	9	1	1	-	5	1	4	-	
VØ8-1	1	-	-	-	1	-	-	-	5	-	5	-	
VØ9-1	48	-	-	1	-	35	6	2	15	12	-	3	T. chalcogramma-4
V1Ø-1	3	-	2	-	-	-	1	-	12	7	1	4	
V11-1	Ø	-	-	-	-	-	-	-	12	1Ø	-	2	
V12-1	Ø	-	-	-	-	-	-	-	37	23	-	14	
V13-1	21	-	-	1	-	12	2	6	164	1ØØ	-	64	
V14-1	2	-	2	-	-	-	-	-	323	213	-	11Ø	
V15-1	1	-	1	-	-	-	-	-	11Ø	45	-	65	
V16-1	2	-	1	1	-	-	-	-	4Ø	21	-	19	

1/ Eggs are indicated by the letter "E" after the number.