DISTRIBUTION OF SAND LANCE, *AMMODYTES* SP., LARVAE ON THE CONTINENTAL SHELF FROM CAPE COD TO CAPE HATTERAS FROM RV *DOLPHIN* SURVEYS IN 1966

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ABSTRACT

Postlarvae of one species of sand lance, which rasembled *Ammodytes marinus* exactly, were collected along the east coast of the United States between Martha's Vineyard, Mass., and Cape Hatteras, N.C. (lat 41° to 35°N), in January-February, April, May, and December 1966. They were more abundant in tows taken at night than in tows taken during the day. Recently hatched specimens (4-8 mm) were more abundant in shallow water. Diurnal migrations are probably related to feeding in all larger size groups.

The greatest abundance of sand lance larvae occurred in winter off the mouths of the principal estuaries (southern New England, Delaware and Chesapeake Bays). Dispersing rapidly offshore, they were taken all the way to the edge of the continental shelf. As they grew, abundance appeared to be directly related to that of plankton organisms, which in turn were somewhat affected by the presence of estuaries along the coast. By mid-May, larvae were not available to us in this region, probably moving to coastal beaches, up into the estuaries, or onto the bottom.

Sand lances, *Ammodytes* sp., are found in great abundance on offshore banks, along the coast, and in estuaries from Greenland to Virginia (Richards, Perlmutter, and McAneny, 1963; Scott, 1968). They are important as a food item for both commercial and sport fish, yet the biology of the sand lances of North America is not well known. Postlarval sand lances commonly occur along the southern New England coast from early December until April (Wheatland, 1956; Richards, 1959, 1965; Pearcy and Richards, 1962; Herman, 1963; Richards et al., 1963; Williams, Richards, and Farnworth, 1964). In New Jersey (Croker, 1965), Delaware Bay (de Sylva, Kalber, and Shuster, 1962), and in the region of Chesapeake Bay (Norcross, Massman, and Joseph, 1961), postlarvae occur from January through April.

In 1966, postlarvae were abundant in collections from four cruises (January-February, April, May, and December) made over 12 transects between the coast and the edge of the continental shelf from Martha's Vineyard to Cape Hatteras. These collections were made by personnel at the Sandy Hook Marine Laboratory, Highlands, N.J., as part of a program to determine the extent to which migratory fishes are associated with estuaries during their early life histories.

METHODS AND MATERIALS

Details of the design of the RV *Dolphin* surveys, collecting methods, station positions, and physical data are included in Clark et al. (1969). From December 1965 through December 1966, a series of 92 stations on 14 transects, from Martha's Vineyard to Cape Lookout, N.C., were sampled every 6 weeks with two Gulf V plankton nets towed simultaneously for 30 min (Figure 1, Table 1). Where water depth permitted, oblique tows were made at two levels:

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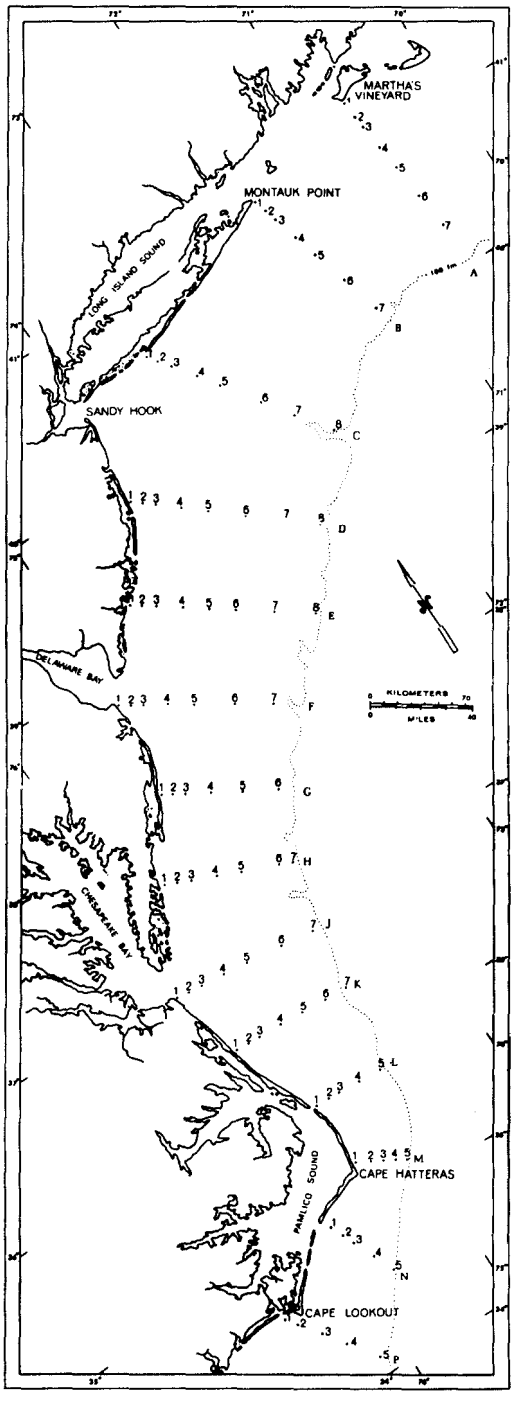

FIGURE 1.—RV *Dolphin* survey, 1965-66. Locations of transects and collecting stations.

TABLE 1.—RV *Dolphin* survey, 1965-66. Transect locations.

Transect	State	Locality
A	Massachusetts	Martha's Vineyard
B	New York	Eastern Long Island
C		Western Long Island
D	New Jersey	Barnegat Inlet
E		Great Egg Inlet
F	Delaware	Cape Henlopen
G	Maryland	Assateague Island
H	Virginia	Eastern Shore
J		Cape Henry
K	North Carolina	Currituck Beach
L		Oregon Inlet
M		Cape Hatteras
N		Ocracoke Inlet
P		Beaufort Inlet

shallow (0 to 15 m) and deep (18 to 33 m). Collections were made during a 24-hr workday on all cruises, so the number of tows by night and by day varied on each transect from cruise to cruise. Cruises were designed to give information on the time and place of occurrence of many species of fish larvae over an extensive geographic area, and sampling was inadequate to estimate mortality or recruitment. For purposes of comparison, numbers of larvae are expressed as the number taken per tow. Zero catches were not included in these computations but are indicated in appropriate figures. A midwater trawl of 6.4-mm cod end mesh used for collecting juvenile fishes did not catch sand lances. This net was not used extensively during the first four cruises in areas where sand lance juveniles would have been expected. Plankton samples were preserved in 5% Formalin,[3] and all fish eggs and larvae were sorted under a microscope. Sand lances were identified, counted, and measured (total length) with an ocular micrometer. No demersal eggs or sand lance larvae with large yolk sacs were collected.

To determine the number of *Ammodytes* species represented in these collections, we checked pigmentation carefully on all specimens. Meristic characters counted were dorsal and anal fin rays and vertebrae. Skeletons of specimens, within the length range of 34 to 60 mm, were prepared by the enzyme presoak method of Ossian (1970). Following 7 to 14

[3] Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

days of soaking in "Biz," the vertebrae of a few specimens could be counted.

RESULTS

Appearance and Meristic Character Counts

According to pigmentation and general appearance, all sand lance larvae in these collections are similar to those described by Richards (1965) and listed as *Ammodytes marinus* by Macer (1967). In this group, Macer included *A. hexapterus* and *A. dubius* of the eastern coast of North America which Richards et al. (1963) previously separated.

The number of larvae examined varied among three cruises; some larvae could not be used because of net damage, and others were too small to have developed fin rays or the total complement of vertebrae. The mean, range, and standard deviation of the meristic counts are listed in Table 2 for specimens from each cruise regardless of locality. Although a slight increase in meristic counts was noticeable as the season progressed, it was not significant.

TABLE 2.—Meristic character counts of larval sand lances from three cruises of the RV *Dolphin*, 1966.

Cruises	Anal fin rays	Dorsal fin rays	Vertebrae
January-February:			
Mean	28.38	57.75	—
Standard deviation	1.10	1.73	—
Range	27-30	56-60	—
Number	16	4	0
April:			
Mean	28.95	59.21	67.43
Standard deviation	1.13	1.76	1.83
Range	27-32	55-63	65-71
Number	86	52	30
May:			
Mean	29.47	58.27	69.40
Standard deviation	1.13	1.00	0.87
Range	27-30	55-60	68-70
Number	19	11	5

There was no evidence from pigment patterns, meristic counts, or seasonal abundance of these larvae that we had more than one species of sand lance between December and May south of Cape Cod, Mass. As Reay (1970) pointed out, the specific definitions of *Ammodytes* in the northwest Atlantic are tenuous, so it is presumptuous to be definite in naming species. Variations in appearance and meristic character counts of these postlarvae appeared to be primarily due to the stage of development. Rate of development fluctuates during the different months because of changes in the physical characteristics of the water at the time of hatching and early growth. As shown previously by Richards (1965), individuals in colder water take longer to develop dorsal and anal fin rays and a full set of vertebrae. Specimens collected in spring were more fully developed than those of an equal length taken in winter.

Numbers of Postlarvae in Night and Day Collections

The time of day during which a particular station was occupied varied between cruises; therefore, the diel time factor must be considered before discussing geographical and seasonal distribution of the sand lance larvae.

The greater catch rate of night tows compared to day tows is apparent from Table 3, in which all night collections are separated from all day collections (including dawn and dusk) regardless of location. In general, there was a higher percentage of positive tows at night than during the day. Roughly 34% of the night tows contained larvae, while only 23% of the day tows were positive. When all tows are considered, larvae were more consistently taken at night throughout all the cruises. The mean number of larvae at night dropped from 16/tow in winter to 5.1 and 5.6/tow in April and May, respectively. During the following spawning season, in December, the mean number of larvae per tow at night was just less than 1. A daylight mean of 5.3 larvae/tow in winter dropped to 1.9/tow in April and 0.1/tow in May. None were taken during the day on the cruise of the following December. Thus, a seasonal change in availability was evident in both day and night tows and was due primarily to dispersion, net avoidance, and mortality. Further analysis of the diurnal distribution of the larvae is not warranted by these

TABLE 3.—The number of sand lance larvae taken at night and during the day from four 1966 RV *Dolphin* cruises.

Item	Night					Day[1]				
	Total	Jan.-Feb.	Apr.	May	Dec.	Total	Jan.-Feb.	Apr.	May	Dec.
Tows										
Total	289	77	71	61	80	250	49	70	83	48
Successful	98	43	40	12	3	57	24	27	6	0
Larvae caught	1,684	1,235	362	34	53	402	258	136	8	0
Larvae per tow (all)	5.8	16.0	5.1	5.6	0.7	1.6	5.3	1.9	0.1	0
Ratio night to day (all tows included)	3.6	3.0	2.7	56.0						

[1] Includes tows taken at dawn and dusk.

data. More precise sampling is necessary before conclusions can be drawn concerning diurnal distribution at different depths.

Geographic Distribution

In general, sand lance larvae were most abundant off southern New England and the region off Delaware Bay (Figure 2). They were less common along the northern New Jersey shore and along the Maryland coast to Chesapeake Bay. South of Chesapeake Bay, they decreased steadily in numbers and were not in samples south of Cape Hatteras. Larval distributions for each cruise are shown in Figures 3, 4, 5, and 6 for shallow and deep tows. Physical data for each cruise are related to larval distribution here.

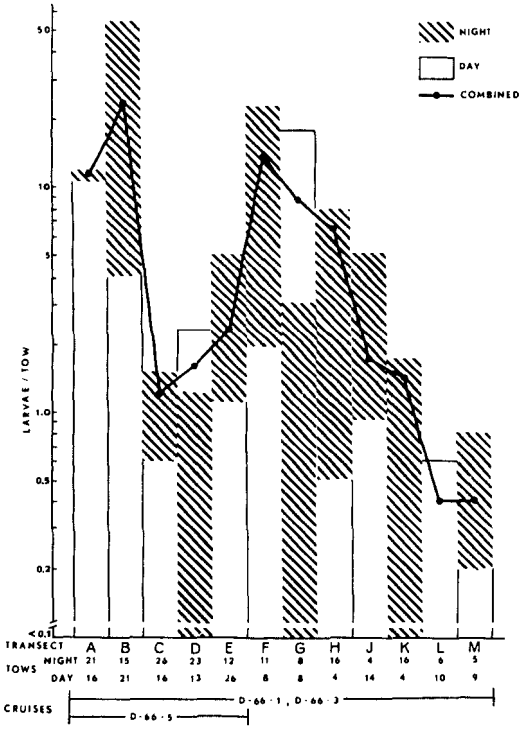

FIGURE 2.—Numbers of sand lance larvae per tow taken in day and night tows by transect.

During the cruise in early December 1965, no larvae occurred in any of the collections. However, during the first week of December 1966, larvae were abundant inshore near Martha's Vineyard and eastern Long Island, N.Y. (Figure 3). They were not found elsewhere in samples from 2 weeks earlier. The catches of larvae in December occurred in water from 8° to 10°C, similar to nearshore temperatures from New Jersey north and offshore of southern New England. Salinity in the area of larval occurrence was 32 to 33‰ over much of the sampling region. Plankton was sparse in the area of capture (<55 to 100 ml/tow).

During the cruise in January-February, larvae occurred in patches throughout the entire area (Figure 4). In shallow tows, none were taken within 15 miles of Long Island (a situation which has occurred before—Richards et al., 1963), off Great Egg Inlet, N.J., at the mouth of Chesapeake Bay, nor off the Oregon Inlet, N.C. Larvae were most abundant 40 miles off Montauk Point, N.Y., eastward to Martha's Vineyard. A second area of abundance occurred within 15 miles of the Maryland coast in the water mass moving southward out of Delaware Bay and extended north 40 miles off the New

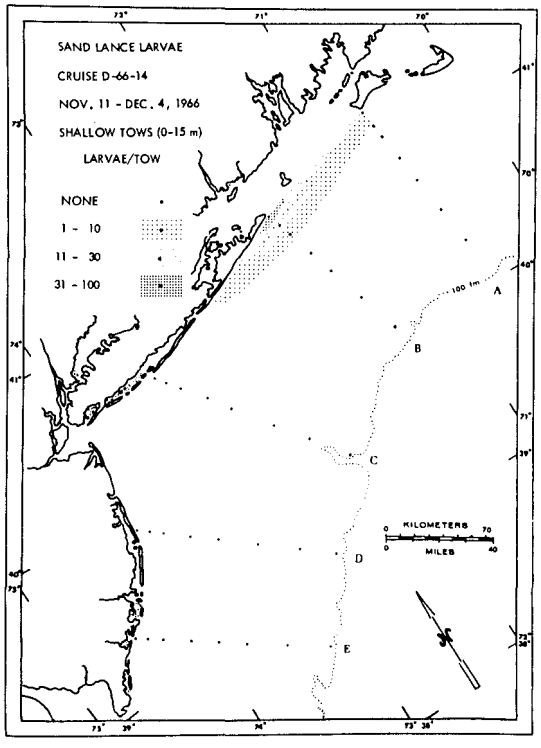

FIGURE 3.—Distribution and abundance of sand lance larvae in the December cruise in shallow tows.

Jersey coast in the latitude of Barnegat Inlet, N.J. Off the mouth of Chesapeake Bay, the greatest numbers occurred during the winter. Norcross et al. (1961) reported a similar seasonal peak in capture rate off Chesapeake Bay during 1960. Data from the deep tows were similar, with the greatest abundance off Montauk Point extending southward offshore. Another group occurred off Delaware Bay, extending in a band to North Carolina (Figure 4). Temperatures in the areas of capture in winter varied from 0° to 6°C and salinities varied from 31 to 33‰. Plankton volumes were less than 100 ml/tow from deep offshore water, but approached 200 ml/tow near the mouths of some estuaries.

During April, sand lances were more widely dispersed and occurred closer to shore from Martha's Vineyard to Assateague Island, Md., than in winter (Figure 5). Similar numbers were taken south to Cape Henry, Va., but further offshore. None occurred farther south, except from a small patch near the surface off Cape Hatteras. As before, larvae were most abundant throughout the water column off the southern New England coast. Only offshore of Maryland were larvae in comparable numbers. Within these same areas, the plankton volumes had increased since winter, providing a good source of food for larvae longer than 5 mm (Covill, 1959). Temperatures had warmed slightly from winter, but most larvae were still taken in water of less than 7°C. The few near Chesapeake Bay and Cape Hatteras were taken in warmer water up to 13°C. Bottom temperature was about 1°C lower than at the surface. Larvae were distributed throughout the salinity range of 31 to 33‰ found in most of the sampled area but were absent in the less saline water off Delaware and Chesapeake Bays. Plankton volumes were similar to those offshore in winter, but those between 10 and 40 miles offshore along Long Island and southern New England showed a slight increase.

By May, larvae occurred only in the northern half of the sampled region, and none were found south of Delaware Bay (Figure 6). In shallow tows, larvae were distributed in two groups—one group within 15 miles of the coast and the other group 5 to 40 miles offshore. Larvae occurred in deep tows only in two areas—inshore off Martha's Vineyard and offshore off western Long Island. Surface temperatures were all above 7°C, and the 10°C isotherm was nearshore off New Jersey and offshore of Maryland. Bottom temperatures were about 3°C cooler than those at the surface. Thus, larvae occurred in waters between 6° and 10°C. Apparently, temperatures south of New Jersey, where larvae were taken earlier in the year, were too warm in May.

Most of the inshore tows from Massachusetts to Delaware were taken at night, which might account for the apparent inshore abundance but not the discontinuous distribution, since intervening stations with no larvae were also sampled at night. Water mass characteristics and plankton distribution may have been important factors in separating these groups. Larval distribution is difficult to relate to salinity distribution. In the past,

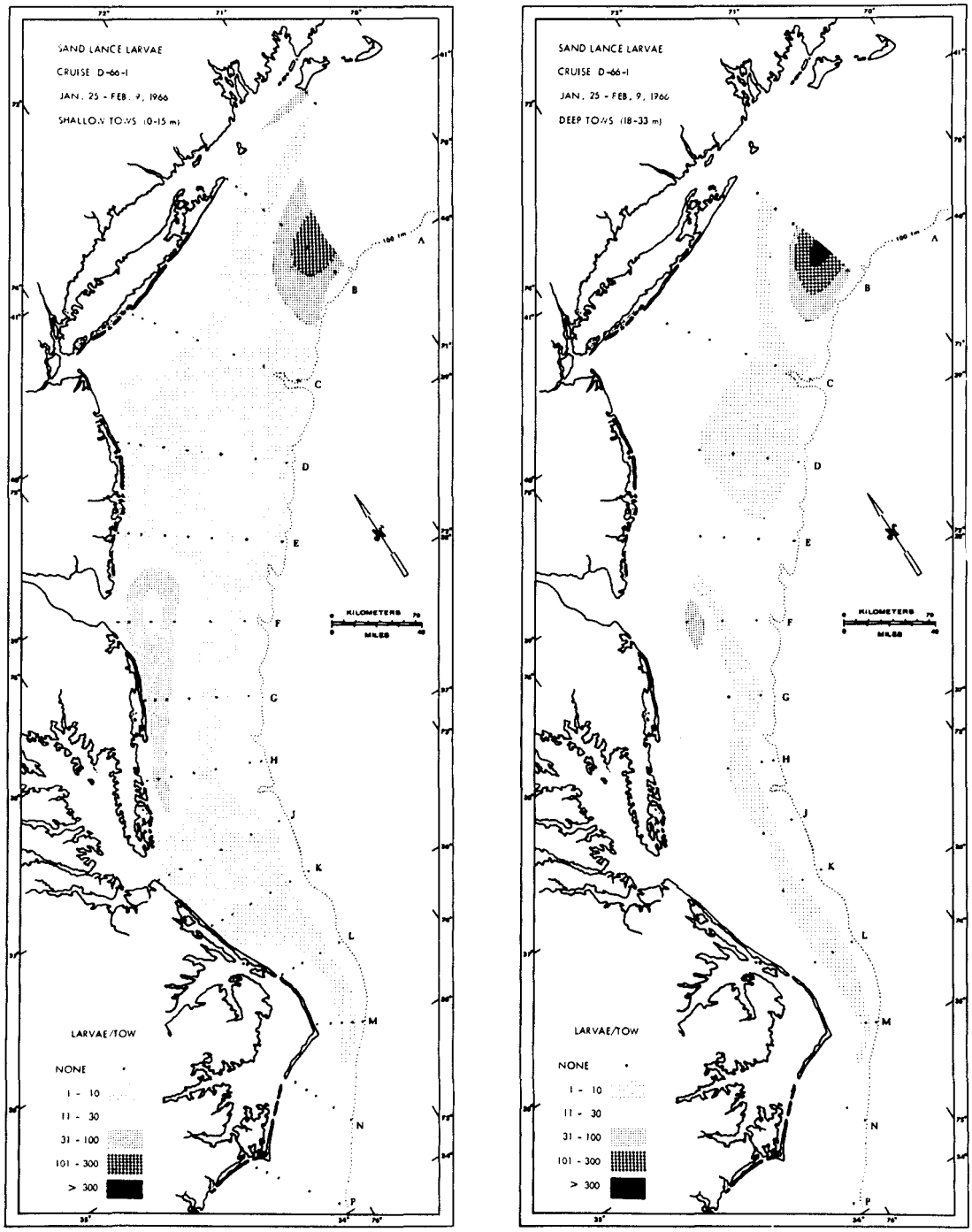

FIGURE 4.—Distribution and abundance of sand lance larvae in the January-February cruise in shallow (left) and deep (right) tows.

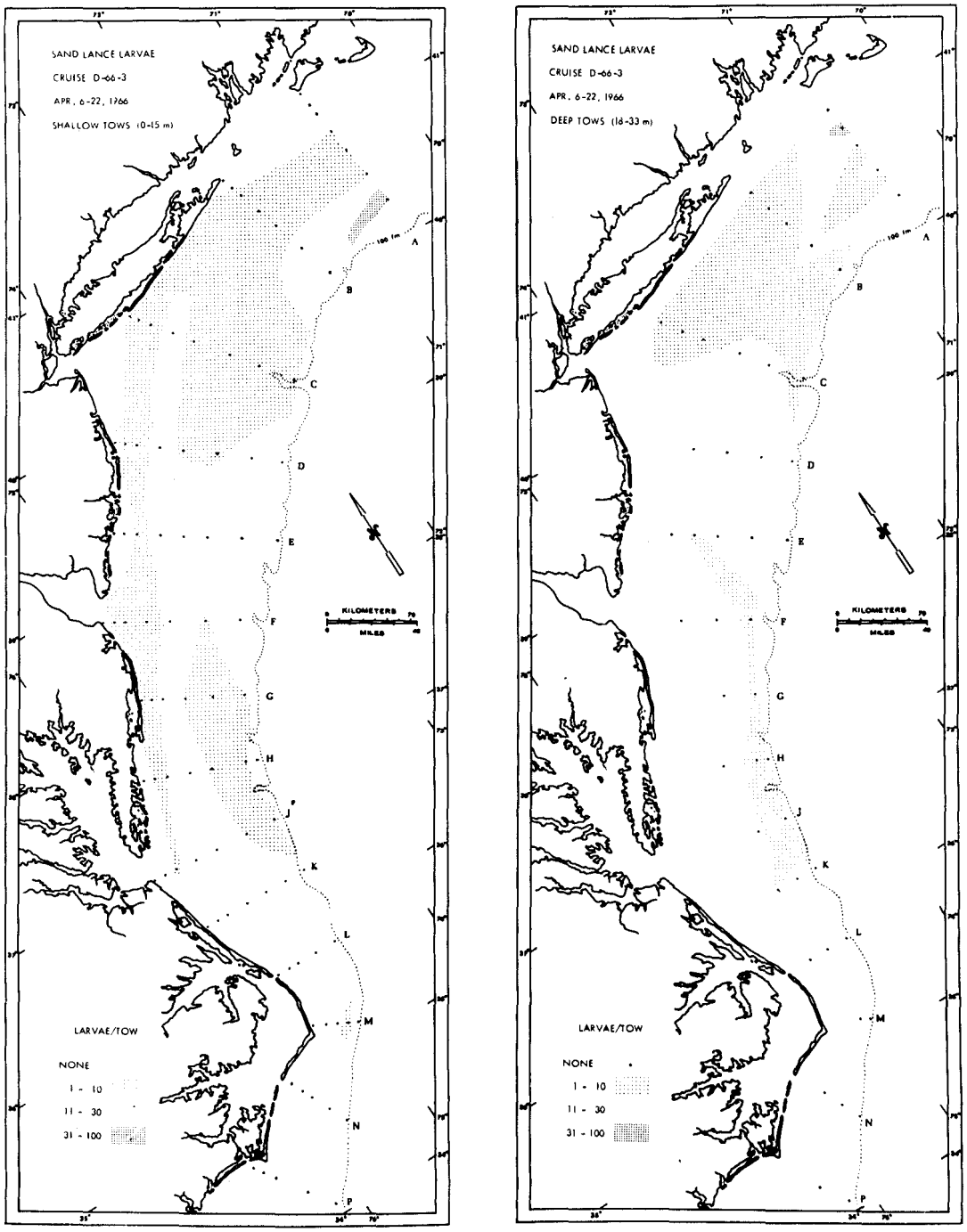

FIGURE 5.—Distribution and abundance of sand lance larvae in the April cruise in shallow (left) and deep (right) tows.

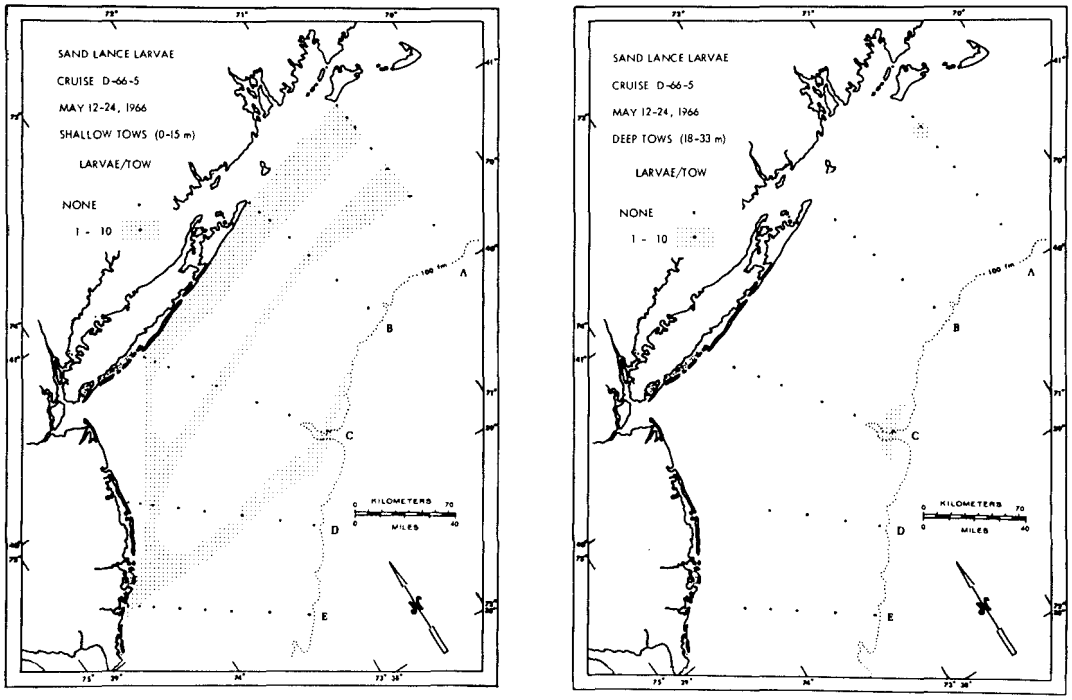

FIGURE 6.—Distribution and abundance of sand lance larvae in the May cruise in shallow (left) and deep (right) tows.

Norcross et al. (1961) found no sand lance larvae off Chesapeake Bay in salinities lower than 30‰, yet Wheatland (1956) found them in Long Island Sound in salinities as low as 24.2‰. Croker (1965) found them in Sandy Hook Bay below 28.6‰, and studies from Delaware Bay indicated larvae occurred in water of 4.3‰ to less than 1.8‰ salinity (Norcross et al., 1961). Plankton distribution was similar to that of the larvae; inshore and offshore volumes of 100 to 200 ml/tow were separated by a low volume strip of 55 to 100 ml/tow. Thus, food was available for both inshore and offshore groups off Long Island and New Jersey. Although plankton abundance was as great off Chesapeake Bay, we found no sand lances in this area.

Distribution and Movements of Larvae of Different Sizes

Figure 7 shows the length frequencies of sand lance larvae for each cruise, and Figures 8, 9, and 10 depict the distributions of five size groups (between 4 and 60 mm). Table 4 gives the depth distribution of these size groups by night and by day. Larvae were seldom taken in deep water tows only, but in many instances they occurred only in tows above 15 m. All larvae collected in December were 4 to 8 mm long.

The total length range generally increased during the spring (Figure 7), and as larvae grew they dispersed away from the coast and decreased in apparent abundance (Figures 8 to 10; Table 4). The greatest number of those of small size occurred inshore at the northern end of the range of these cruises in late fall off Martha's Vineyard and eastern Long Island. Some also appeared in early winter near Delaware Bay. However, lack of many early winter collections, selectivity of the 0.5-mm mesh of the Gulf V sampler, and the hatch from demersal rather than pelagic eggs lowered the chance of sampling the smallest size group in proportion to their abundance. The greatest

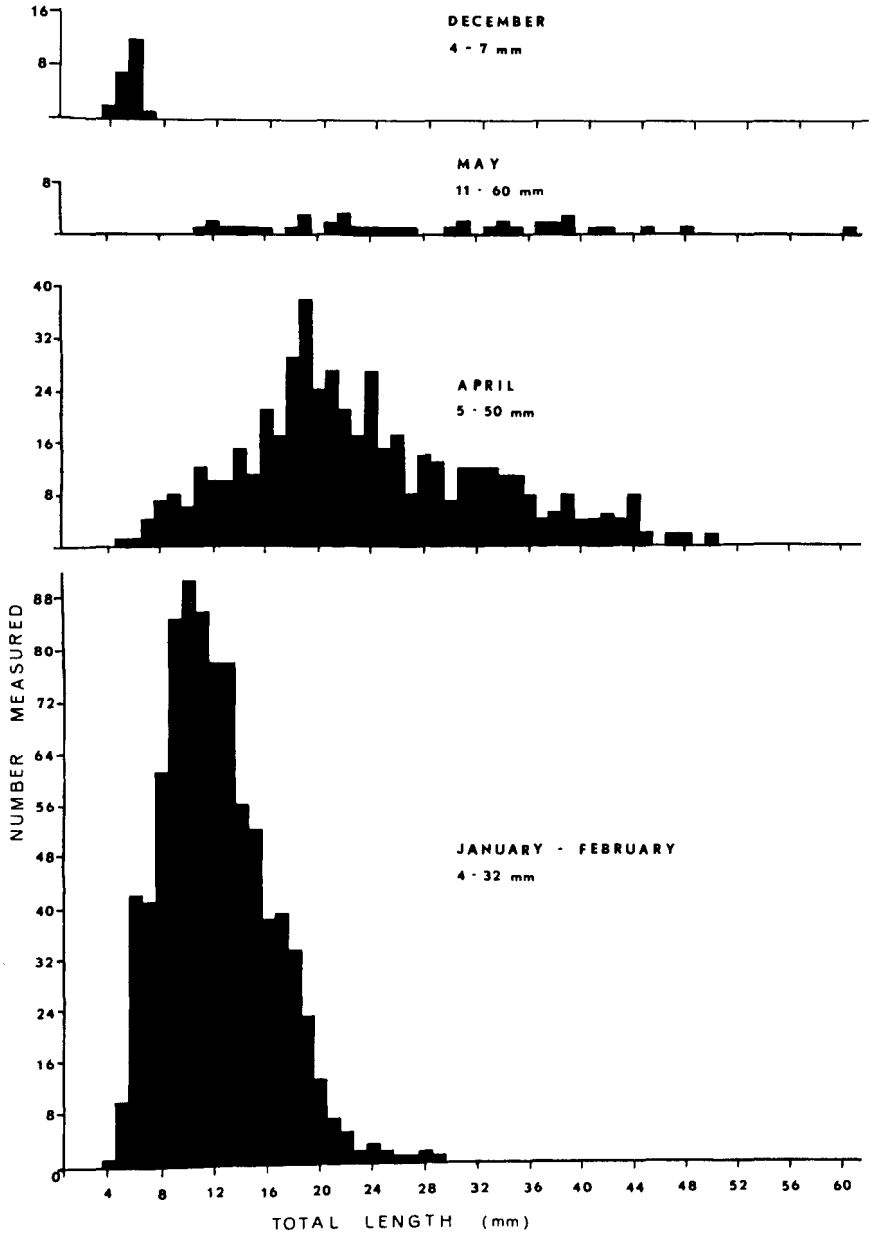

FIGURE 7.—Length frequencies of sand lance larvae from four RV *Dolphin* cruises from January to May and December 1966.

TABLE 4.—Total number of sand lance larvae per positive tow, and the numbers of larvae per tow within five size groups, in shallow and deep tows during the night and during the day, from four 1966 RV *Dolphin* cruises.

	Night							Day					
	Shallow				Deep			Shallow			Deep		
Item	Jan.-Feb.	Apr.	May	Dec.[1]	Jan.-Feb.	Apr.	May	Jan.-Feb.	Apr.	May	Jan.-Feb.	Apr.	May
Number of positive tows	32	27	11	3	11	13	1	18	20	5	6	7	1
Number of larvae:													
Total	697	258	33	53	538	104	1	232	110	7	26	26	1
Per positive tow	21.8	9.6	3.3	17.7	48.9	8.0	1.0	12.9	5.5	1.4	4.3	3.7	1.0
Measured	461	250	33	22	228	103	1	224	109	7	26	26	1
Per tow by size groups:													
4- 7 mm	2.5	—	—	17.7	1.1	0.2	—	3.5	0.2	—	0.2	—	—
8-16	16.4	1.3	0.6	—	40.3	1.6	—	7.2	1.7	—	3.2	1.3	—
17-30	2.9	5.0	1.2	—	7.5	5.3	1.0	2.2	3.0	0.4	1.0	2.1	—
31-50	—	3.2	1.0	—	—	1.0	—	—	0.7	1.0	—	0.3	1.0
>50	—	—	0.2	—	—	—	—	—	—	—	—	—	—

[1] Only category with catches in December.

number of specimens of large size, i.e., above 30 mm, occurred from New Jersey south.

The greatest number of recently hatched larvae—those from 4 to 8 mm—were taken inshore in late fall and early winter off southern New England and in early winter along the Maryland and Virginia coasts (Figure 8). Additional small specimens taken in April off Montauk Point indicate a long spawning season (Figure 9). In winter, they were caught mostly during the day and in shallow water, yet some occurred offshore in deep water south of Montauk Point in winter and off Barnegat Inlet in spring. The absence of this group in May (Figure 10) suggests spawning probably ceased by late March or early April, as previously noted by Norcross et al. (1961) and Wheatland (1956). Distribution of this size group did not seem to be correlated with the distribution of zooplankton organisms. Larvae of this size are still dependent on phytoplankton for food (Covill, 1959).

The size group containing specimens from 8 to 17 mm was most abundant in winter (Figures 7 and 8) and well dispersed along the coast between Montauk Point and south of Chesapeake Bay. By April, larvae in this size group occurred primarily from Martha's Vineyard to Barnegat Inlet. They were still available in that region in May. Larvae of 8 to 17 mm were most abundant at night in deep tows. During the day, they occurred primarily in surface collections, probably because they were feeding there (Table 4). Their horizontal distribution coincided somewhat with that of greatest plankton volumes along the coast during the winter and April cruises. Covill (1959) indicated that sand lances are primarily zooplankton feeders by about 9 mm.

Larvae longer than 17 mm were much less common in midwinter than those of the smaller size groups (Figures 7 and 8). They were primarily offshore off the New Jersey-Delaware Bay area and Chesapeake Bay south to Cape Hatteras, indicating that spawning had begun as early as late November or early December, as previously indicated by Norcross et al. (1961) and Williams et al. (1964). By April, those between 17 and 31 mm were the most abundant group of larvae, being found well offshore off southern New England and inshore off Delaware Bay (Figure 9). None were taken nearshore off Chesapeake Bay; the larvae there were all much larger. In May, a few specimens were taken 10 to 15 miles off southern New England and Long Island (Figure 10).

During winter, there were no specimens larger than 31 mm (Figures 7 and 8). In April, large specimens were common. Off Long Island and New Jersey, they occurred in small

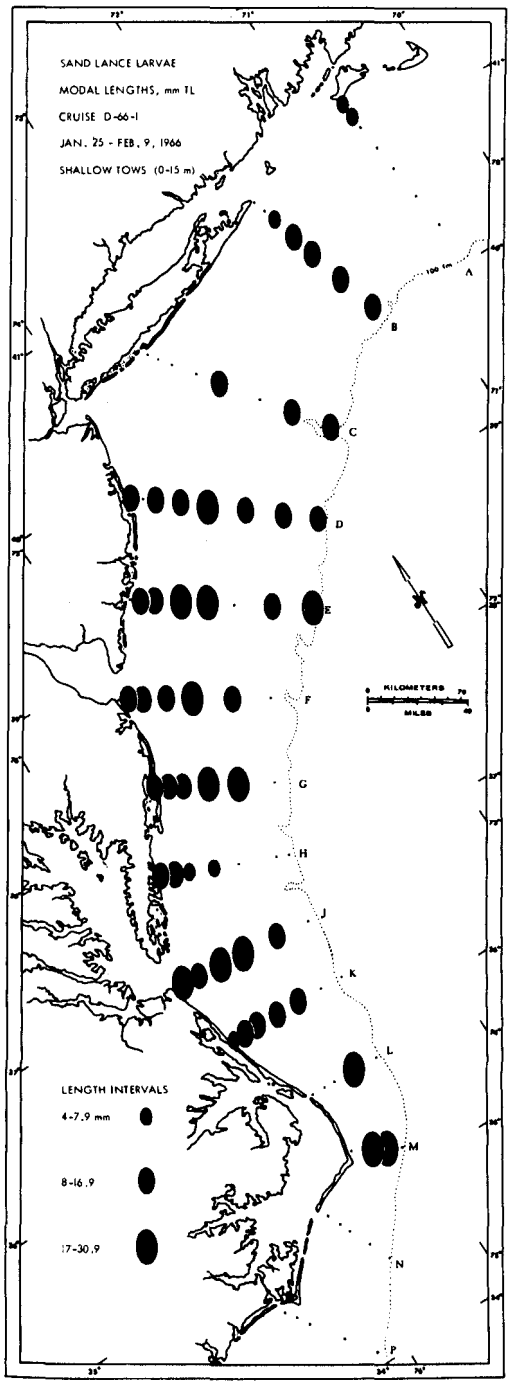

FIGURE 8.—Distribution of sand lance larvae in three length groups from the January-February cruise.

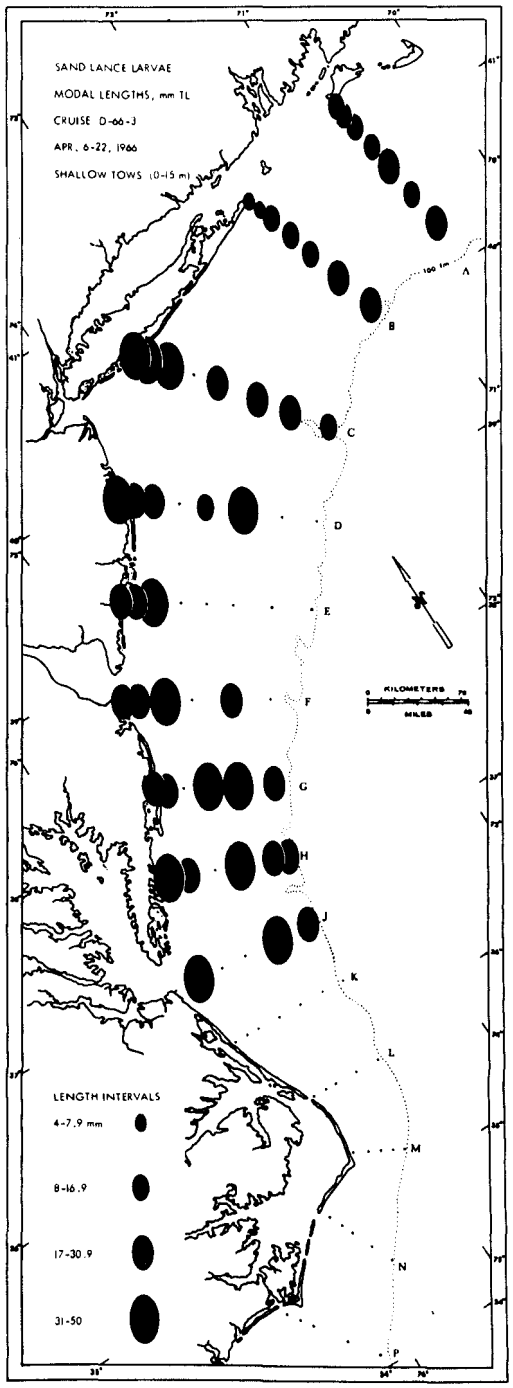

FIGURE 9.—Distribution of sand lance larvae in four length groups from the April cruise.

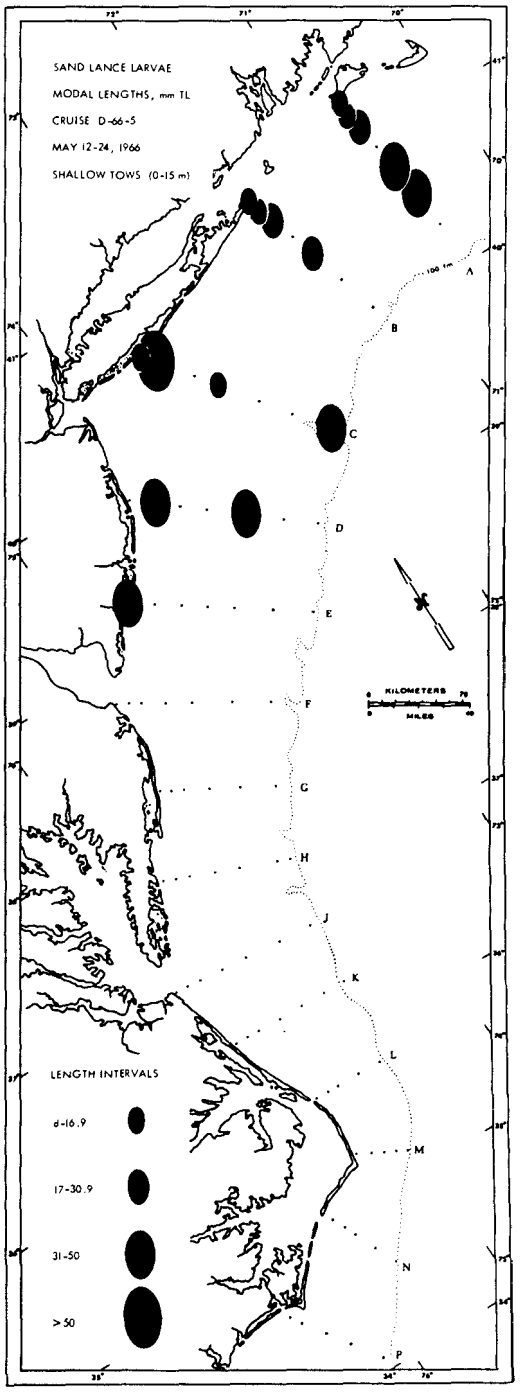

FIGURE 10.—Distribution of sand lance larvae in four length groups from the May cruise.

patches inshore; further south (Figure 9), they extended 20 to 40 miles offshore. During May, specimens larger than 31 mm made up half of those collected (Figure 10). Off southern New England and New York, they were offshore, while along the New Jersey coast they were found close to shore. Their distribution, particularly off Long Island, correlated with that of greatest plankton volumes (Clark et al., 1969). Few larvae larger than 30 mm were collected in deepwater tows either at night or in the daytime. In shallow tows in April and May, the lesser abundance of large larvae by day than at night probably resulted from net avoidance (Table 4).

CONCLUSIONS

Sand lances between lat 35° and 41°N had a long spawning season—from late November to late March. Because larvae became dispersed throughout a large area over a protracted period, the precise location and depth of major spawning areas along the coastal zone were difficult to determine. Nevertheless, it appeared that spawning location was greatly influenced by coastal topography in this region. The greatest numbers of recently hatched individuals occurred in late fall and early winter inshore off southern New England, and Delaware and Chesapeake Bays. In former years within these estuarine regions, spawning occurred in Long Island Sound (Wheatland, 1956; Richards, 1959), Narragansett Bay (Herman, 1963), and Delaware Bay (de Sylva et al., 1962), but apparently neither in Block Island Sound (Merriman and Sclar, 1952) nor inside Chesapeake Bay (Norcross et al., 1961). Judging by our collection of recently hatched individuals in some offshore areas, spawning must occur both offshore and inshore.

Evidence indicated that complicated movements occurred during development of larval sand lances. Hatched from demersal eggs (Williams et al., 1964), eventually larvae were dispersed throughout the water column, where they drifted generally offshore and slightly south. Within this general drift, they tended to move toward the surface during the day for feeding purposes and back into deeper water at night. Their availability to the Gulf V sampler

apparently decreased after they reached 25 mm. During May, larvae and juveniles disappeared from the water column. General migration back to the coast or to the bottom on offshore banks was indicated.

The long spawning season, causing hatching to take place from late November through mid-April, was evidenced by the patchy distribution of small specimens and the multimodal character of length frequencies. Interspersion of groups prevented accurate analysis of growth during the hatching season.

All larvae, regardless of hatching date, had similar melanophore patterns and meristic counts, and resembled postlarval *Ammodytes* previously found from Greenland to Virginia and postlarval *A. marinus* from northern European waters. Differences in meristic character counts probably resulted from temperature effects on development time required to attain adult characteristics.

Data described in this paper show two overlapping areas of larval abundance, indicating that the southern New England sand lances may be separate from those found off Delaware Bay. In addition, earlier evidence suggests that inshore and offshore groups exist (Richards et al., 1963; Scott, 1968). Unfortunately, data from these cruises are not sufficient to determine the definite existence of separate inshore and offshore populations south of Cape Cod. However, it appears that the distribution of all sand lances may be related to estuaries.

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APPENDIX TABLE - R.V. DOLPHIN 1965-66 ICHTHYOPLANKTON SURVEY. DATA ASSOCIATED WITH GULF V CATCHES OF SAND LANCE LARVAE.

CRUISE STAT. D66 1	TOW DEPTH (M)	LARVAE NUMBER TOTAL	LARVAE NUMBER MEAS.	LARVAE LENGTHS MEAN (MM TL)	LARVAE LENGTHS RANGE (MM TL)	DATE 1966 D M	TOW START TIME (EST)	LIGHT COND.	WATER DEPTH (M)	TEMPERATURE (°C) RANGE	TEMPERATURE (°C) MEAN	TEMPERATURE (°C) SURF.	TEMPERATURE (°C) BOT.	THERMOCLINE DEGREE	THERMOCLINE DEPTH (M)	SALINITY (0/00) RANGE	SALINITY (0/00) MEAN
A 1	0- 6	50	50	8.9	5.5 20.8	26 1	1627	DUSK	16	1.1	1.1 1.1	1.1	1.1	NONE	-	32.3	32.3 32.3
A 2	0-15	27	27	10.6	6.3 23.2	26 1	1729	NIGHT	33	0.8	0.9 0.9	0.8	0.9	NONE	-	32.4	32.4 32.4
B 3	0-15	21	21	9.2	5.8 14.5	26 1	0429	NIGHT	48	3.2	3.2 3.2	3.2	3.2	NONE	-	32.3	32.3 32.3
B 4	0-15	1	1	11.8	11.8 11.8	26 1	0254	NIGHT	60	4.1	4.1 4.1	4.1	4.1	NONE	-	32.3	32.3 32.3
B 4	18-33	13	13	10.3	5.5 14.6	26 1	0254	NIGHT	60	4.1	4.1 4.1	4.1	4.1	NONE	-	31.9	32.3 32.2
B 5	0-15	37	36	11.5	7.3 16.3	26 1	0115	NIGHT	73	4.8	4.8 4.8	4.8	4.8	NONE	-	32.3	32.5 32.4
B 5	18-33	25	23	11.5	6.9 15.2	26 1	0115	NIGHT	73	4.8	4.8 4.8	4.8	4.8	NONE	-	32.3	32.4 32.4
B 6	0-15	237	57	10.4	6.5 17.5	25 1	2347	NIGHT	80	4.9	4.9 4.9	4.9	4.9	NONE	-	32.3	32.3 32.3
B 6	18-33	344	73	11.0	7.0 20.6	25 1	2347	NIGHT	80	4.9	4.9 4.9	4.9	4.9	NONE	-	32.3	32.4 32.3
B 7	0-15	68	51	12.1	9.6 16.4	25 1	2144	NIGHT	89	4.8	4.8 4.8	4.8	4.8	NONE	-	32.3	32.4 32.4
B 7	18-33	52	52	11.1	8.5 14.6	25 1	2144	NIGHT	89	4.8	4.8 4.8	4.8	4.8	NONE	-	32.4	32.5 32.4
C 5	0-15	2	2	13.5	13.0 14.0	3 2	2208	NIGHT	48	3.8	3.8 3.8	3.8	3.8	NONE	-	32.4	32.6 32.5
C 7	0-15	4	4	14.4	12.3 17.4	4 2	0220	NIGHT	67	4.7	5.0 4.8	4.7	7.1	WEAK	47-56	32.6	32.7 32.6
C 7	18-33	6	6	12.9	10.0 17.0	4 2	0220	NIGHT	67	5.0	5.0 5.0	4.7	7.1	WEAK	47-56	32.6	32.8 32.7
C 8	0-15	4	4	13.8	12.9 15.3	4 2	0408	NIGHT	110	5.8	5.8 5.8	5.8	7.8	WEAK	83-88	33.1	33.3 33.2
D 1	0- 6	4	3	13.2	11.0 15.6	4 2	1729	NIGHT	16	0.8	0.9 0.9	0.8	0.9	NONE	-	31.8	31.9 31.9
D 3	0-15	1	1	13.0	13.0 13.0	4 2	1910	NIGHT	25	1.9	1.9 1.9	1.9	1.9	NONE	-	32.7	32.8 32.7
D 4	0-15	1	1	12.2	12.2 12.2	4 2	2028	NIGHT	27	2.4	2.4 2.4	2.4	2.4	NONE	-	32.8	33.0 32.9
D 5	0-15	1	1	21.2	21.2 21.2	4 2	2220	NIGHT	37	2.9	2.9 2.9	2.9	2.9	NONE	-	32.9	33.1 32.9
D 5	18-24	1	0	20.0	20.0 20.0	4 2	2220	NIGHT	37	2.9	2.9 2.9	2.9	2.9	NONE	-	33.3	33.5 33.5
D 6	0-15	19	19	14.4	12.0 17.8	4 2	1210	DAY	50	3.2	3.2 3.2	3.2	3.1	NONE	-	32.6	32.7 32.6
D 6	18-33	2	2	14.6	13.0 16.3	4 2	1210	DAY	50	3.1	3.1 3.1	3.2	3.1	NONE	-	32.7	33.1 32.9
D 7	0-15	2	2	13.1	12.2 14.0	4 2	1016	DAY	70	4.8	4.8 4.8	4.8	7.1	WEAK	47-55	32.9	33.3 33.0
D 7	18-33	5	5	14.5	13.4 17.4	4 2	1016	DAY	70	4.8	4.9 4.8	4.8	7.1	WEAK	47-55	33.1	33.3 33.1
D 8	0-15	2	2	16.6	15.5 17.8	4 2	0827	DAY	110	4.8	5.0 4.9	4.8	7.2	WEAK	91-99	33.0	33.2 33.1
E 2	0- 6	2	2	15.3	13.4 17.2	5 2	0415	NIGHT	17	-1.4	-1.3 -1.3	-1.4	-1.2	NONE	-	31.6	31.7 31.7
E 3	0- 6	9	9	14.5	7.3 17.5	5 2	0508	NIGHT	20	-0.5	-0.5 -0.5	-0.5	-0.5	NONE	-	31.0	33.2 32.3
E 4	0-15	1	1	18.0	18.0 18.0	5 2	0635	DAWN	30	1.3	1.3 1.3	1.3	1.3	NONE	-	32.5	33.3 32.9
E 5	0-15	1	1	24.0	24.0 24.0	5 2	0804	DAY	37	2.9	2.9 2.9	2.9	2.9	NONE	-	32.6	33.3 32.8
E 7	0-15	22	22	13.5	5.9 22.0	5 2	1126	DAY	66	4.8	4.9 4.8	4.8	6.4	NONE	-	33.6	34.0 33.9
E 8	0-15	1	1	17.1	17.1 17.1	5 2	1326	DAY	121	5.6	5.6 5.6	5.6	5.6	NONE	-	33.6	33.6 33.6
F 2	0- 6	7	7	13.7	10.8 16.4	6 2	0520	NIGHT	22	-1.6	-1.6 -1.6	-1.6	-1.3	NONE	-	30.7	31.8 31.2
F 3	0-15	90	59	13.5	10.3 20.5	6 2	0359	NIGHT	24	-1.4	-0.6 -1.2	-1.4	0.5	NONE	-	31.1	32.4 31.6
F 4	0-15	25	24	14.5	10.3 20.4	6 2	0242	NIGHT	26	0.7	0.9 0.8	0.8	0.8	NONE	-	32.6	33.2 32.7
F 5	0-15	32	30	16.4	12.5 19.6	6 2	0108	NIGHT	34	1.5	1.8 1.7	1.6	1.5	NONE	-	32.6	33.2 33.0
F 5	18-24	84	47	16.5	12.6 21.8	6 2	0108	NIGHT	34	1.5	1.5 1.5	1.6	1.5	NONE	-	33.2	33.4 33.3
F 6	0-15	3	3	14.5	12.5 16.4	5 2	2246	NIGHT	52	5.1	5.1 5.1	5.1	5.1	NONE	-	33.3	34.3 33.7
F 6	18-33	1	1	17.2	17.2 17.2	5 2	2246	NIGHT	52	5.1	5.1 5.1	5.1	5.1	NONE	-	33.8	34.1 34.0
G 1	0- 6	28	28	9.6	4.9 21.4	6 2	0946	DAY	13	-0.1	-0.1 -0.1	-0.1	-0.1	NONE	-	32.5	32.5 32.5
G 2	0- 6	60	50	11.5	6.9 22.7	6 2	1046	DAY	16	0.8	0.8 0.8	0.8	0.8	NONE	-	33.3	33.3 33.3
G 3	0-15	33	33	12.5	5.4 19.1	6 2	1147	DAY	21	1.1	1.2 1.2	1.1	1.1	NONE	-	33.3	33.5 33.4
G 4	0-15	14	13	15.7	12.2 18.9	6 2	0103	NIGHT	27	2.6	2.7 2.6	2.6	2.8	NONE	-	32.7	33.3 33.0
G 5	0-15	1	1	17.9	17.9 17.9	6 2	1428	DAY	52	3.6	3.7 3.6	3.6	4.3	NONE	-	33.0	33.2 33.1
G 5	18-33	12	12	11.8	9.6 18.0	6 2	1428	DAY	52	3.9	4.1 4.0	3.6	4.3	NONE	-	33.4	33.9 33.7
G 6	18-33	1	1	16.9	16.9 16.9	6 2	1611	DAY	86	5.3	5.5 5.4	5.5	5.3	NONE	-	34.2	34.5 34.3
H 1	0- 3	15	15	10.5	5.6 18.6	7 2	0253	NIGHT	11	-0.2	1.4 -0.2	-0.2	0.2	NONE	-	31.5	31.7 31.6
H 2	0- 6	47	45	10.1	6.0 17.7	7 2	0200	NIGHT	16	0.5	0.7 0.6	0.5	0.7	NONE	-	31.6	32.0 31.8
H 3	0- 6	13	13	14.3	6.9 22.2	7 2	0059	NIGHT	22	1.5	1.6 1.6	1.5	1.6	NONE	-	32.2	32.4 32.3
H 4	0-15	11	11	14.7	5.0 25.5	6 2	2332	NIGHT	27	2.8	2.8 2.8	2.8	2.8	NONE	-	32.7	33.0 32.9
H 5	18-24	3	3	16.5	15.5 18.6	6 2	2206	NIGHT	35	4.7	4.7 4.7	4.5	4.7	NONE	-	33.5	33.5 33.5
J 2	0- 6	1	1	20.2	20.2 20.2	7 2	0812	DAY	12	0.6	0.6 0.6	0.6	0.6	NONE	-	30.0	30.4 30.2
J 3	0- 6	3	3	11.1	7.8 13.6	7 2	0906	DAY	12	1.1	1.2 1.2	1.1	1.2	NONE	-	31.5	31.7 31.6
J 4	0-15	1	1	19.0	19.0 19.0	7 2	1030	DAY	20	2.4	2.6 2.4	2.6	2.4	NONE	-	32.3	32.7 32.6
J 5	0-15	2	2	21.5	20.8 23.1	7 2	1143	DAY	26	3.5	3.6 3.5	3.6	3.5	NONE	-	32.9	33.0 33.0
J 6	0-15	3	3	17.2	14.1 19.0	7 2	1321	DAY	35	5.1	5.4 5.1	5.4	5.3	NONE	-	33.4	33.6 33.5
J 6	18-24	2	2	12.1	5.8 18.4	7 2	1321	DAY	35	5.1	5.3 5.2	5.4	5.3	NONE	-	33.6	33.7 33.6
K 1	0- 6	1	1	6.6	6.6 6.6	8 2	0138	NIGHT	15	1.5	1.6 1.5	1.6	1.6	NONE	-	30.9	31.2 31.1
K 2	0-15	4	4	15.0	11.6 17.8	8 2	0038	NIGHT	25	1.5	1.9 1.6	1.8	2.1	NONE	-	31.2	32.1 31.6
K 3	0-15	3	3	19.7	16.7 24.0	7 2	2332	NIGHT	22	2.4	3.8 3.5	3.8	3.4	NONE	-	32.6	32.6 32.6
K 4	0-15	4	4	22.0	14.0 27.8	7 2	2220	NIGHT	31	4.1	4.1 4.1	4.1	4.1	NONE	-	32.6	32.8 32.7
K 5	0-15	6	6	19.7	16.8 21.9	7 2	2101	NIGHT	34	5.1	5.1 5.1	5.1	5.2	NONE	-	33.3	33.3 33.3
K 5	18-24	8	8	19.8	13.5 29.9	7 2	2101	NIGHT	34	5.1	5.1 5.1	5.1	5.2	NONE	-	33.3	33.3 33.3
L 4	0-15	2	2	25.0	17.6 32.5	8 2	1050	DAY	48	5.0	5.1 5.1	5.1	4.8	NONE	-	32.8	32.9 32.9
L 4	18-33	4	4	22.9	14.6 28.1	8 2	1050	DAY	48	4.8	4.9 4.8	5.1	4.8	NONE	-	33.0	33.0 33.0
M 3	0- 6	1	1	22.1	22.1 22.1	8 2	1822	NIGHT	20	3.9	3.9 3.9	3.9	4.0	NONE	-	32.3	32.3 32.3
M 4	0-15	2	2	22.0	20.0 24.0	8 2	1915	NIGHT	42	5.3	5.4 5.3	5.4	5.3	NONE	-	32.2	33.2 32.7
M 4	18-33	1	1	18.7	18.7 18.7	8 2	1915	NIGHT	42	5.3	5.3 5.3	5.4	5.3	NONE	-	33.0	33.1 33.1

APPENDIX TABLE -- CONTINUED

CRUISE STAT. C66 3	TOW DEPTH (M)	********** LARVAE ********** NUMBER TOTAL	MEAS.	LENGTHS MEAN	RANGE (MM TL)	DATE 1966 D M	TOW START TIME (EST)	LIGHT COND.	WATER DEPTH (M)	*** TEMPERATURE (C) *** RANGE	MEAN	SURF.	BOT.	THERMOCLINE DEGREE	THERMOCLINE DEPTH (M)	SALINITY (0/00) RANGE	MEAN
A 1	0- 6	13	13	15.3	8.2 28.7	6 4	1757	DUSK	22	3.6	3.6	3.6	3.6	3.7	NONE	-	31.6 31.7 31.6
A 2	0-15	18	15	23.8	8.9 47.4	6 4	1911	NIGHT	36	3.3	3.5	3.5	3.5	3.0	NONE	-	31.7 32.1 32.0
A 3	0-15	26	26	17.5	8.4 39.7	6 4	2110	NIGHT	47	3.4	3.5	3.5	3.5	3.0	NONE	-	32.0 32.3 32.1
A 3	18-33	20	19	15.0	5.6 28.7	6 4	2110	NIGHT	47	3.0	3.4	3.1	3.5	3.0	NONE	-	29.1 32.3 30.1
A 4	0-15	10	10	19.4	5.3 29.8	6 4	2238	NIGHT	51	3.4	3.7	3.6	3.6	2.8	NONE	-	31.9 32.5 32.2
A 4	18-33	35	35	21.5	10.9 34.4	6 4	2238	NIGHT	51	2.8	3.3	3.0	3.6	2.8	NONE	-	29.4 32.4 30.5
A 5	0-15	1	1	18.5	18.5 18.5	7 4	0029	NIGHT	62	3.6	3.7	3.7	3.7	2.7	NONE	-	32.0 33.4 33.0
A 5	18-33	2	2	17.5	13.5 21.6	7 4	0029	NIGHT	62	3.0	3.5	3.5	3.7	2.7	NONE	-	33.2 33.6 33.4
A 6	0-15	5	5	22.3	15.5 35.5	7 4	0208	NIGHT	73	3.4	3.7	3.6	3.7	2.7	NONE	-	32.4 33.2 32.7
A 7	0-15	73	70	20.6	12.4 31.3	7 4	0355	NIGHT	111	3.4	3.6	3.5	3.6	3.5	NONE	-	33.1 33.5 33.3
A 7	18-33	23	23	21.6	16.9 40.1	7 4	0355	NIGHT	111	2.9	3.3	3.2	3.6	3.5	NONE	-	33.5 33.8 33.6
B 1	0- 6	11	10	13.9	6.8 26.0	7 4	1650	DAY	24	4.7	4.7	4.7	4.7	4.7	NONE	-	30.3 30.9 30.6
B 2	0-15	10	10	13.5	7.6 22.9	7 4	1556	DAY	39	6.2	6.6	6.4	6.4	6.1	NONE	-	31.7 32.2 32.1
B 3	0-15	4	4	14.2	12.8 15.7	7 4	1435	DAY	52	4.8	5.0	4.9	5.0	4.7	NONE	-	31.4 32.1 32.0
B 3	18-33	1	1	19.6	19.6 19.6	7 4	1455	DAY	52	4.7	4.7	4.7	5.0	4.7	NONE	-	29.6 30.9 30.2
B 4	0-15	6	6	19.6	14.2 23.5	7 4	1324	DAY	62	5.3	5.5	5.4	5.5	4.8	NONE	-	32.8 33.5 33.2
B 4	18-33	3	3	21.2	18.1 25.9	7 4	1324	DAY	62	5.0	5.2	5.2	5.5	4.8	NONE	-	33.7 34.1 33.9
B 5	0-15	9	9	15.5	11.9 18.1	7 4	1156	DAY	77	4.2	4.5	4.5	4.9	3.9	NONE	-	31.0 32.5 31.6
B 5	18-33	3	3	23.6	16.7 36.5	7 4	1156	DAY	77	3.7	4.1	3.9	4.9	3.9	NONE	-	30.4 32.7 31.9
B 6	0-15	11	11	18.4	13.6 22.5	7 4	1005	DAY	87	4.4	4.7	4.6	4.7	2.8	NONE	-	32.2 33.2 32.8
B 6	18-33	12	12	15.5	10.5 20.5	7 4	1005	DAY	87	4.1	4.3	4.3	4.7	2.8	NONE	-	33.2 33.3 33.2
B 7	0-15	19	19	22.4	13.9 34.1	7 4	0801	DAY	95	3.5	3.9	3.8	3.9	3.3	NONE	-	32.4 33.4 33.1
B 7	18-33	4	4	16.3	14.4 19.6	7 4	0801	DAY	95	3.4	3.5	3.5	3.9	3.3	NONE	-	33.4 33.6 33.5
C 1	0-15	1	1	39.0	39.0 39.0	8 4	0005	NIGHT	21	4.5	5.0	4.9	5.0	3.5	NONE	-	31.7 32.4 32.2
C 2	0-15	6	6	37.8	31.5 42.8	8 4	0058	NIGHT	28	4.0	5.2	5.0	5.2	4.0	NONE	-	31.6 32.5 32.1
C 3	0-15	2	2	33.8	33.1 34.6	8 4	0156	NIGHT	33	4.2	4.5	4.8	4.9	3.9	NONE	-	30.6 31.4 30.9
C 3	18-24	4	4	31.6	29.8 34.0	8 4	0156	NIGHT	33	3.9	4.1	4.0	4.9	3.9	NONE	-	31.5 31.7 31.6
C 4	18-33	1	1	35.0	35.0 35.0	8 4	0316	NIGHT	44	4.4	4.4	4.4	5.0	4.4	NONE	-	33.4 33.9 33.7
C 5	0-15	2	2	25.5	22.5 28.5	8 4	0445	NIGHT	50	5.2	5.3	5.3	5.2	5.1	NONE	-	33.6 33.8 33.7
C 5	18-33	2	2	19.8	17.7 21.9	8 4	0445	NIGHT	50	5.0	5.1	5.1	5.2	5.1	NONE	-	33.8 34.3 34.0
C 6	0-15	1	1	19.2	19.2 19.2	8 4	0644	DAY	58	5.7	5.9	5.8	5.9	5.3	NONE	-	32.9 33.8 33.3
C 7	0-15	1	1	23.7	23.7 23.7	8 4	0851	DAY	69	5.4	5.5	5.5	5.5	5.2	NONE	-	33.5 33.7 33.6
C 8	0-15	2	2	17.9	16.3 19.6	8 4	1048	DAY	273	4.6	5.2	5.1	5.2	5.7	NONE	-	32.8 33.5 33.3
C 8	18-33	2	2	25.3	22.3 28.4	8 4	1048	DAY	273	4.4	4.5	4.5	5.2	5.7	NONE	-	33.6 34.0 33.8
D 1	0- 6	4	4	34.3	31.1 41.3	9 4	0213	NIGHT	18	5.9	6.0	5.9	6.0	5.5	NONE	-	30.8 31.6 31.2
D 2	0- 6	6	6	30.9	24.9 38.6	9 4	0125	NIGHT	19	6.0	6.1	6.1	6.1	5.3	NONE	-	31.5 32.0 31.8
D 3	0-15	4	4	31.3	28.6 34.1	9 4	0035	NIGHT	21	6.1	6.1	6.1	6.1	5.6	NONE	-	31.4 32.7 32.1
D 5	0-15	2	2	16.5	9.8 23.3	8 4	2127	NIGHT	40	5.4	6.0	5.7	6.0	5.2	NONE	-	32.0 33.1 32.6
D 6	0-15	1	1	44.1	44.1 44.1	8 4	1930	NIGHT	57	5.6	6.2	6.1	6.2	5.2	NONE	-	33.0 33.9 33.5
E 1	0- 6	20	20	36.7	21.3 45.5	13 4	0056	NIGHT	14	6.7	6.7	6.7	6.7	6.7	NONE	-	30.7 30.9 30.8
E 2	0- 6	26	26	37.5	22.2 48.2	13 4	0228	NIGHT	19	6.4	6.4	6.4	6.4	6.6	NONE	-	30.8 31.0 30.9
E 3	0-15	3	3	41.6	31.8 50.0	22 4	1512	NIGHT	22	7.4	7.6	7.5	7.5	7.4	NONE	-	31.3 31.4 31.3
E 5	18-24	1	1	24.4	24.4 24.4	22 4	1640	DAY	37	6.3	6.4	6.3	7.2	6.3	NONE	-	31.6 31.8 31.7
F 2	0- 6	4	4	29.1	25.8 31.0	14 4	1146	DAY	20	6.5	6.9	6.7	6.9	6.3	NONE	-	30.0 30.3 30.1
F 3	0-15	5	5	24.7	20.9 32.9	14 4	1243	DAY	27	6.3	6.5	6.4	6.5	6.3	NONE	-	31.1 31.4 31.2
F 4	0-15	5	5	37.3	33.7 44.0	14 4	1404	DAY	24	6.2	6.3	6.2	6.3	6.1	NONE	-	31.3 31.7 31.5
F 6	0-15	1	1	18.2	18.2 18.2	14 4	1719	DAY	52	6.2	6.3	6.3	6.3	6.2	NONE	-	32.2 32.3 32.3
F 7	18-33	2	2	31.3	27.8 34.9	14 4	1910	NIGHT	70	4.9	5.2	5.0	5.0	5.4	NONE	-	32.5 32.6 32.6
G 1	0- 6	3	3	33.8	28.5 37.9	15 4	0655	DAY	15	6.9	6.9	6.9	6.9	6.9	NONE	-	29.9 30.1 30.0
G 2	0- 6	4	4	24.4	21.1 31.6	15 4	0454	NIGHT	16	6.7	6.7	6.7	6.7	6.3	NONE	-	30.6 30.8 30.7
G 4	0-15	1	1	43.8	43.8 43.8	15 4	0204	NIGHT	38	6.0	6.1	6.1	6.0	6.1	NONE	-	32.2 32.4 32.3
G 5	0-15	1	1	44.3	44.3 44.3	15 4	0045	NIGHT	57	6.5	6.5	6.5	6.5	6.5	NONE	-	32.4 32.8 32.7
G 6	0-15	1	1	26.0	26.0 26.0	14 4	2245	NIGHT	94	5.0	5.0	5.0	5.0	5.6	NONE	-	32.0 32.3 32.1
G 6	18-33	1	1	32.6	32.6 32.6	14 4	2245	NIGHT	94	5.0	5.1	5.0	5.0	5.6	NONE	-	32.5 32.8 32.7
H 2	0-15	1	1	32.0	32.0 32.0	15 4	1452	DAY	21	8.5	8.6	8.5	8.6	8.5	NONE	-	31.4 31.9 31.7
H 3	0-15	1	1	30.4	30.4 30.4	15 4	1548	DAY	25	7.8	8.2	7.9	8.2	7.0	NONE	-	32.3 32.8 32.6
H 5	0-15	1	1	40.2	40.2 40.2	15 4	1911	NIGHT	37	6.6	6.9	6.7	6.9	6.6	NONE	-	32.3 32.4 32.4
H 6	0-15	7	7	26.1	21.4 37.5	15 4	2210	NIGHT	80	6.2	6.8	6.5	6.8	6.2	NONE	-	32.4 32.7 32.5
H 6	18-33	3	3	33.1	26.9 37.3	15 4	2210	NIGHT	80	6.2	6.2	6.2	6.8	6.2	NONE	-	32.4 32.5 32.5
H 7	0-15	23	21	29.6	22.2 41.3	15 4	2320	NIGHT	129	5.0	5.6	5.4	5.6	5.2	NONE	-	32.1 32.4 32.2
H 7	18-33	2	2	29.0	26.0 32.1	15 4	2320	NIGHT	129	5.0	5.4	5.3	5.6	5.2	NONE	-	32.4 32.6 32.5
J 3	0- 6	1	1	35.5	35.5 35.5	16 4	0825	DAY	19	8.9	8.9	8.9	8.9	8.5	NONE	-	31.8 31.8 31.8
J 6	0-15	4	4	35.6	33.2 39.5	16 4	0406	NIGHT	58	7.0	7.4	7.3	7.4	6.9	NONE	-	32.0 32.6 32.3
J 7	0-15	6	6	28.7	25.9 31.1	16 4	0212	NIGHT	92	6.7	6.8	6.7	6.8	6.4	NONE	-	32.3 32.5 32.4
J 7	18-33	8	8	28.3	24.2 35.8	16 4	0212	NIGHT	92	6.4	6.6	6.5	6.8	6.4	NONE	-	32.5 32.7 32.6
K 5	18-24	1	1	39.6	39.6 39.6	15 4	1953	NIGHT	37	7.7	7.9	7.8	8.8	7.7	NONE	-	32.7 32.8 32.8
M 4	0-15	2	2	30.6	17.1 44.2	20 4	1245	DAY	62	12.4	15.2	13.7	12.4	18.6	STRONG	13-20	30.7 32.2 31.6

APPENDIX TABLE -- CONTINUED

CRUISE STAT.	TOW DEPTH	LARVAE NUMBER TOTAL	LARVAE NUMBER MEAS.	LARVAE LENGTHS (MM TL) MEAN	LARVAE LENGTHS (MM TL) RANGE		DATE 1966 D M	TOW START TIME (EST)	LIGHT COND.	WATER DEPTH (M)	TEMPERATURE (C) RANGE	TEMPERATURE (C) MEAN	TEMPERATURE (C) SURF.	TEMPERATURE (C) BOT.	THERMOCLINE DEGREE	THERMOCLINE DEPTH (M)	SALINITY (O/OO) RANGE		SALINITY (O/OO) MEAN
D66 5	(M)																		
A 1	0- 6	6	6	25.5	11.9	41.6	12 5	2002	NIGHT	19	7.8	7.8	7.8	7.8	7.8	NONE	-	32.5	32.6	32.6
A 2	0-15	1	1	15.2	15.2	15.2	12 5	2109	NIGHT	33	7.3	7.4	7.3	7.4	7.2	NONE	-	32.4	32.6	32.5
A 3	0-15	1	1	21.4	21.4	21.4	13 5	0008	NIGHT	37	7.2	7.2	7.2	7.2	6.6	NONE	-	31.9	32.4	32.3
A 3	18-33	1	1	24.7	24.7	24.7	13 5	0008	NIGHT	37	6.6	7.2	6.8	7.2	6.6	NONE	-	32.2	32.4	32.3
A 5	0-15	1	1	37.8	37.8	37.8	13 5	0325	NIGHT	62	6.3	6.3	6.3	6.3	4.6	STRONG	35-36	32.2	32.6	32.5
A 6	0-15	1	1	39.2	39.2	39.2	13 5	0534	DAY	76	6.5	6.5	6.5	6.5	4.3	WEAK	35-42	32.2	33.3	32.9
B 1	0- 9	7	7	35.7	16.7	60.5	13 5	2133	NIGHT	22	7.7	8.3	8.0	8.3	7.2	NONE	-	30.2	31.2	30.6
B 2	0-15	6	6	19.1	12.7	27.9	13 5	2038	NIGHT	34	7.1	7.7	7.5	7.7	5.0	NONE	-	31.3	31.9	31.7
B 3	0-15	3	3	19.8	18.7	21.2	13 5	1936	NIGHT	52	7.5	7.5	7.5	7.5	4.9	WEAK	17-23	31.7	32.0	31.8
B 5	0-15	1	1	30.0	30.0	30.0	13 5	1641	DAY	72	6.6	7.6	7.4	7.6	4.1	WEAK	12-15	32.6	33.3	32.9
C 1	0-15	4	4	24.3	14.7	38.7	14 5	2124	NIGHT	21	8.0	8.8	8.7	8.8	8.0	WEAK	12-14	30.9	31.8	31.3
C 2	0-15	1	1	57.8	57.8	57.8	14 5	2030	NIGHT	30	8.3	8.7	8.6	8.7	7.4	WEAK	17-20	31.1	31.7	31.5
C 5	0-15	1	1	35.2	35.2	35.2	14 5	1675	DAY	51	7.6	7.8	7.7	7.8	6.4	NONE	-	32.6	32.7	32.7
C 8	0-15	2	2	36.1	33.3	39.0	14 5	0615	DAY	400	6.8	7.3	7.1	7.3	8.3	NONE	-	33.2	33.3	33.2
C 8	18-33	1	1	23.8	23.8	23.8	14 5	0615	DAY	400	6.3	7.0	6.7	7.3	8.3	NONE	-	33.4	33.8	33.5
D 3	0-15	1	1	41.8	41.8	41.8	16 5	2058	NIGHT	26	8.7	9.2	9.0	9.2	7.7	WEAK	20-23	31.5	31.7	31.7
D 6	0-15	2	2	32.5	31.0	34.0	17 5	0155	NIGHT	54	8.0	8.1	8.0	8.1	6.8	NONE	-	30.3	30.9	30.6
E 1	0- 6	2	2	40.4	31.9	48.9	18 5	0414	DAWN	15	11.8	11.8	11.8	11.8	11.8	NONE	-	29.1	29.3	29.3
D6614	(M)			(MM TL)			1966 D M	(EST)		(M)							(M)			
A 1	0- 3	11	11	5.7	5.1	6.2	4 12	1956	NIGHT	17	7.4	7.5	7.5	7.5	8.5	NONE	-	32.9	32.9	32.9
B 1	0- 6	41	41	5.2	4.4	6.9	3 12	1937	NIGHT	20	8.3	8.4	8.4	8.3	8.9	NONE	-	31.8	31.9	31.9
B 3	0-15	1	1	5.1	5.1	5.1	3 12	2210	NIGHT	48	10.0	10.0	10.0	10.0	10.0	NONE	-	33.0	33.0	33.0