CAFSAC Res. Doc. 77/31

Lobster Larvae on the Scotian Shelf

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Lobster larvae in offshore Atlantic waters are generally scarce. Previously published reports on lobster larvae, both inshore and offshore, from the southern New England states to the Laurentian Channel east of Nova Scotia, are summarized in Table 1. In offshore waters larvae appear to be more abundant on the relatively narrow section of the continental shelf south of Georges Bank and least abundant along the edge of the shelf east of LaHave Bank. In inshore waters, larvae were abundant in Long Island Sound, less abundant in Maine. Lobster larvae were caught from mid June to mid September; in southern New England none were caught in tows during May and October.

In waters off Nova Scotia few lobster larvae have been caught. In 397 tows with a Neuston net, made during a number of cruises up to 1976 (Table 1), only 12 have been collected, 8 on Georges Bank (98 tows) and 4 in the Browns Bank area (62 tows). None were found in 217 tows east of LaHave Bank, nor in 20 tows from waters seaward from the inshore fishing grounds off southwest Nova Scotia and Grand Manan.

I have found no other data prior to 1976 on lobster larvae in Atlantic waters off Nova Scotia or in the Bay of Fundy. Herring larval sampling has generally been done at the wrong time of year for lobster larvae.

In 1976, a fish egg and larval survey was carried out at 76 stations (Fig. 1) on the Scotian Shelf in mid August (Fisheries and Marine Service, Cruise P-170; see Appendix). Samples were sorted for lobster larvae. A total of 142 larvae were found (12 stage I, 12 stage II, 28 stage III, and 90 stage IV). Most (77%) were taken in a Neuston net 1-m wide, with 1.18 mm mesh, towed at 5 knots at the surface. A meter net, towed just below surface at 2.5 knots, caught 20% of the total, while the two subsurface nets towed in a stepwise oblique pattern caught only 3 larvae altogether. The capture of larvae only at the surface of the water agrees with earlier results of Templeman (1936), Templeman and Tibbo (1945), Sherman and Lewis (1967), Scarratt (1973) and Ennis (1975), while close to shore there may be more extensive vertical movements possibly in response to turbulence (Squires 1970).

Distribution of larvae in 1976 reflects the distribution of lobster fishing areas. However, since the stage IV larvae have probably spent more than a month in surface waters from the time of hatching (Fig. 2), their origin is a matter of speculation. Surface currents off southwest Nova Scotia in July-August (Bumpus and Lauzier 1965) move eastward along the north edge of Georges Bank and thence across the Fundian Channel and Browns Bank at 2-4 miles per day towards the tip of Nova Scotia where the inshore residual currents tend to move along shore into the Bay of Fundy. Thus, in one month, larvae passively drifting could be a hundred miles from where they were hatched. Fourth stage larvae on Browns Bank could have originated on Georges Bank and larvae hatched on Browns Bank could have reached the inshore water of Nova Scotia.

Passive drift, however, may not be the only force at work to regulate larval distribution. The patchy nature of zooplankton distribution in open water, with some patches having a semi-permanent location despite residual currents (Iles 1975), is generally attributed to vertical migrations between water masses with different current patterns (Kulka 1977). Since lobster larvae are mostly found in surface waters, it is difficult to conceive of counter currents as effective means for lobster larvae to remain in one location. Nevertheless, Caddy (1976) postulates that lobster larvae in Northumberland Strait can maintain position or even move against prevailing winds. Data from southwest Nova Scotia are as yet inadequate to determine the origin of larvae found on Browns Bank or to know whether lobster larvae occur in singificant numbers in inshore waters.

Acknowledgments

I thank Dr. C. Kohler for providing the larval samples and P. Gorman for sorting the lobster larvae.

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Table 1. Summary of published data on distribution of lobster larvae in Atlantic waters from southern New England to Nova Scotia. Towing was done at surface with part of the net opening above surface, except for the meter net of Sherman and Lewis when towed at 2 knots. There is some uncertainty about number of tows marked with asterisk.

Reference and location	Tows: Gear	Speed (knots)	Duration min.	Dates	No.	No. of larvae caught: Stage I	II	III	IV	Total (per tow)
Lund and Stewart (1970). Long Island Sound	1.5 m round	3-3.5	30	May-Sept. 1966-69	*136	-	-	-	-	1642 (12.1)
Sherman and Lewis (1967). Coastal waters near Boothbay Harbor, Maine	1 m round	2	10	May-Oct. 1963-65	409	-	-	-	-	31 (0.1)
Sherman and Lewis (1967). Coastal waters from Cape Ann, Mass., to Machias Bay, Maine	1 m round	4-6	10-30	May-Sept. 1965-66	257	296	7	1	64	368 (1.4)
	1.5 x 0.5 m									
	2 x 1 m									
			Inshore,	New England	802					2041 (2.5)
Lund and Stewart (1970). Southeast of Long Island to edge of continental shelf	1.5 m round	3-3.5	30	June-Sept. 1966-69	* 99+	57	17	34	13	121 (<1.2)
			Offshore,	south of Georges Bank	99+					121 (<1.2)
				NEW ENGLAND TOTAL	901+					2162
McKenzie (1966a). Georges Bank northern edge to Lydonia Canyon, along slope	1.0 m Neuston	3-4	30	July 1965	9	0	0	0	0	0 (0)
McKenzie (1966a). Eastern Georges Bank along edge and on peak	" " "	"	"	August 1965	47	0	2	0	0	2 (0.1)
Wilson and Wilder (1967). Top of Georges Bank plus 2 tows off Seal Island	" " "	2-3	"	Aug.-Sept. 1967	22	0	0	0	0	0 (0)
McKenzie (1966b). Edge of continental shelf on northeast Georges	" " "	3-4	<60	July 1966	14	0	0	0	0	0 (0)
Wilder and Graham (1973). Northern edge of Georges Bank	1.4 m Neuston	2-3	30	July 1972	6	0	0	6	0	6 (1.0)
				Georges Bank	98					8 (0.1)
McKenzie (1966a). Truxton Swell to east of Browns Bank	1.0 m Neuston	3-4	"	August 1965	13	0	0	0	2	2 (0.2)
McKenzie (1966b). Edge of continental shelf Browns Bank to Emerald Bank	" " "	"	<60	July 1966	42	0	0	0	0	0 (0)
Wilder and Graham (1973). South of Browns and Baccaro Banks	1.4 m Neuston	2-3	30	July 1972	7	0	0	2	0	2 (0.3)
				Browns Bank area	62					4 (0.1)
McKenzie (1966a). Edge of continental shelf LaHave Bank to Sable Island	1.0 m Neuston	3-4	30	July-Aug. 1965	43	0	0	0	0	0 (0)
McKenzie (1966b). Edge of continental shelf from Sable Island to Laurentian Channel	" " "	5	<30	June-July 1966	65	0	0	0	0	0 (0)
McKenzie (1966b). Across Sable Island Bank	" " "	"	"	July 1966	90	0	0	0	0	0 (0)
Wilder and Graham (1973). Edge of continental shelf, LaHave Bank to Sable Island	1.4 m Neuston	2-3	30	July-Aug. 1972	19	0	0	0	0	0 (0)
				LaHave Bank to Sable Island	217					0 (0)
Graham and Wilder (1966). Grand Manan to Seal Island, outside the inshore grounds	1.0 m Neuston	2-3	30	July-Aug. 1966	20	0	0	0	0	0 (0)
				S.W. Nova Scotia and Grand Manan	20					0 (0)
				OFFSHORE, N.E. GEORGES BANK TO LAURENTIAN CHANNEL TOTAL	397					12

Table 2. Number of lobster larvae collected by Neuston net and a round meter net at 76 stations on the Scotian Shelf August 12-24. Only stations with larvae are included. Locations of the 76 stations are shown in Fig. 1. At each station the Neuston net and a 1.2 m wide Isaacs-Kidd trawl were towed simultaneously at 5 knots. Similarly, the meter and paired 61-cm-diameter bongo nets were towed simultaneously at 2.5 knots.

Station	Date	Depth (m)	Neuston net: Time at start of tow	Neuston net: Larval stage 1	2	3	4	1-4	Meter net: Time at start of tow	Meter net: Larval stage 1	2	3	4	1-4	a) Total
5	13-8-76	97-128	0307	0	0	0	3	3	0230	0	0	0	0	0	3
9	13-8-76	113-124	1535	0	0	0	0	0	1450	0	0	0	3	3	3
10	13-8-76	112-137	1910	0	0	0	1	1	1830	0	0	1	2	3	4
11	13-8-76	115-130	2235	0	0	0	10	10	2150	0	0	0	0	0	10
12	14-8-76	172-177	0225	2	1	0	3	6	0135	0	2	0	1	3	9
13	14-8-76	75-82	0530	3	4	0	6	13	0450	0*	0*	0*	6*	6	19
14	14-8-76	112-130	0710	0	0	0	36	36	0640	0*	0*	0*	3*	3	39
15	14-8-76	95-99	1010	0	0	0	3	3	0935	0	0	0	0	0	3
16	14-8-76	247-614	1410	0	0	0	0	0	1325	0	0	1	0	1	1
18	14-8-76	150-183	2135	5	2	5	1	13	2100	1*	0*	4*	0*	5	18
19	15-8-76	113-159	0055	0	2	12	3	17	0015	0	0	2	1	3	20
20	15-8-76	91-93	0420	0	0	0	1	1	0345	0	0	0	0	0	1
22	15-8-76	163-168	1110	0	0	0	1	1	1025	0	0	0	0	0	1
32	16-8-76	112-128	1910	0	0	1	0	1	1835	0	0	0	0	0	1
33	16-8-76	97-101	2140	0	0	1	1	2	2100	0	1	1	0	2	4
54	20-8-76	143-155	0250	0	0	0	1	1	0210	0	0	0	0	0	1
55	20-8-76	110-113	2135	0	0	0	1	1	2155	0	0	0	0	0	1
74	23-8-76	79-102	2050	0	0	0	1	1	2015	0	0	0	0	0	1
Total				10	9	19	72	110		1	3	9	16	29	139

a) Three additional larvae were caught in the subsurface gear: 2 larvae in Isaacs-Kidd trawl (stage 4 at station 10; stage 1 at station 13) and 1 in bongo net (stage 4 at station 14)

*These were only 15-minute tows. All others were 30 minutes.

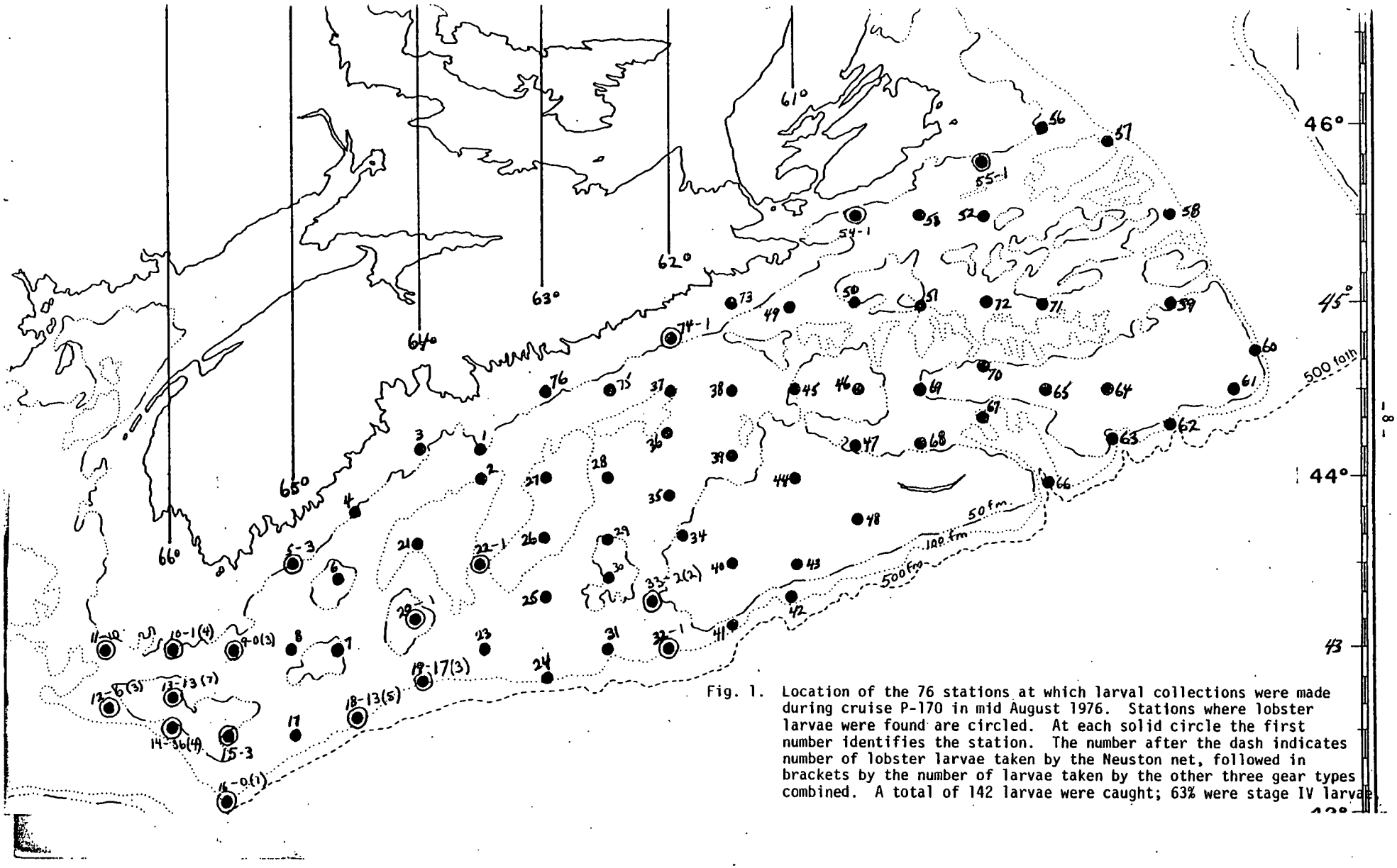

Fig. 1. Location of the 76 stations at which larval collections were made during cruise P-170 in mid August 1976. Stations where lobster larvae were found are circled. At each solid circle the first number identifies the station. The number after the dash indicates number of lobster larvae taken by the Neuston net, followed in brackets by the number of larvae taken by the other three gear types combined. A total of 142 larvae were caught; 63% were stage IV larvae.

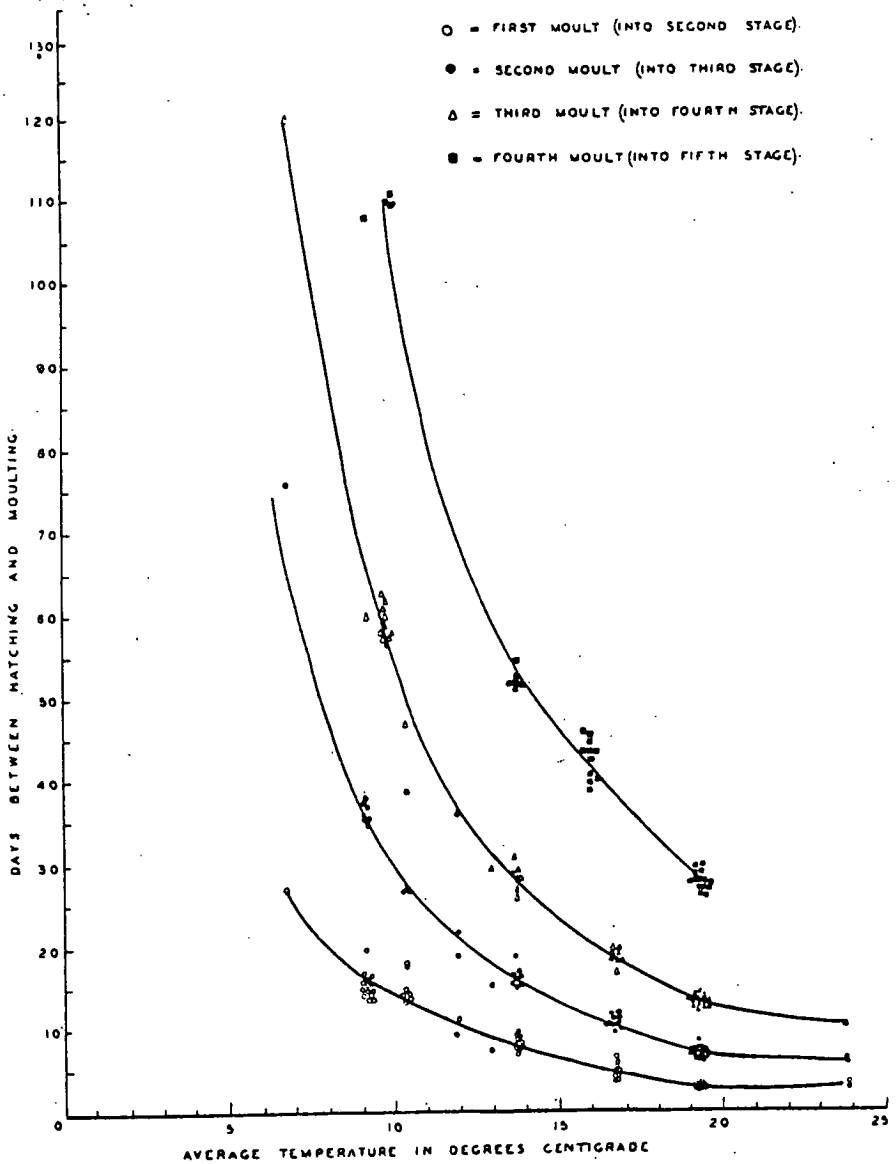

Fig. 2. Length of time between hatching and the moulting of lobster larvae into second, third, fourth and fifth stages at different temperatures (from Templeman 1936).

APPENDIX

DEPARTMENT OF THE ENVIRONMENT
FISHERIES AND MARINE SERVICE
BIOLOGICAL STATION
ST. ANDREWS, N.B.

Vessel: *E.E. PRINCE* Cruise Report No.: P-170

Sailed from: Halifax, N.S. Date: August 12, 1976

Returned to: " " Date: August 24, 1976

Area of Operations: The Scotian Shelf

Personnel: A.C. Kohler
N.J. McFarlane
D.J. Faber (CAIC)
L. Marhue (CAIC)

Purpose: To establish a series of baseline sampling stations for fish eggs and larvae on the Scotian Shelf

Operations: Seventy-six stations spread between the 20-fathom line inshore and the 150-fathom line offshore were occupied from Browns Bank to Banquereau Bank. A BT and surface temperature were taken on each station. Half-hour plankton net tows were made as follows:

Type of Gear	Depth	Vessel Speed
#0.1 Meter (471 Nitex)	Surface	2.5 knots
24" Bongos (471 Nitex)	Oblique	2.5 "
Neuston (1179 Nitex)	Surface	5 "
Isaacs-Kidd (471 Nitex codend)	Oblique	5 "

Results: There were very obvious differences in larval fish species and sizes by area and depth as the catches were "eye-balled" when being preserved. Detailed examinations will be carried out in the lab.

A. C. Kohler