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An Update of the Fishery for Short-finned Squid (Illex illecebrosus) in the Newfoundland Area During 1986-88 With Descriptions of Some Biological Characteristics and Temperature Trends

by

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Introduction

This paper provides a description of the fishery for Illex illecebrosus in the Newfoundland area (NAFO Subarea 3) during 1986-88. Commercial catches are broken down by month, NAFO Division, and processing category. Length composition and (for males) maturity are described for those biological samples which could be obtained. Seasonal trends in nearshore temperature are described for all three years at one sampling site. Yearly catches and biological characteristics have been described for most years between 1965 and 1985 (Mercer MS 1975; Collins and Ennis MS 1978; Hurley et al. MS 1979; Beck et al. MS 1980, MS 1981, MS 1982, MS 1983, MS 1986; Drew et al. MS 1984, MS 1985).

Materials and Methods

Monthly inshore squid catches by NAFO Division (Fig. 1) were obtained from the Fisheries Systems and Statistics Branch, Department of Fisheries and Oceans, Newfoundland Region. No samples could be acquired in 1986, but in 1987 and 1988 biological samples were taken when obtainable at Holyrood, NAFO Division 3L (Fig. 2). Samples were also acquired from Leading Tickles, NAFO Division 3K (Fig. 2) in 1987. Samples for Leading Tickles were taken from the commercial jigger fishery. Commercial samples from Holyrood were collected using either jiggers or squid traps. Research samples were also collected at Holyrood using a squid trap which was hauled daily by Department of Fisheries and Oceans personnel. Offshore samples were collected from the Canadian research vessel WILDFRED TEMPLEMAN during surveys on the southwest slope of the Grand Bank and St. Pierre Bank in the spring of 1987 (June 4-18, Fig. 3) and 1988 (May 27-June 9, Fig. 4). Sampling was carried out using an Engels Hi-rise otter trawl with a 2.5 cm knotless nylon codend

liner. No squid specimens were caught within the same area during a May 30-June 9, 1986 survey, using the same vessel and trawl.

All squid samples were dissected, sexed, and measured in dorsal mantle length (DML) to the nearest 0.5 cm. Maturity stages for males were assigned according to Mercer (MS 1973a). Samples were pooled over biweekly periods for descriptions of length, sex, and maturity composition.

Temperature data were collected at Holyrood using Ryan thermographs, moored near bottom at a depth of 11 m. Thermographs were maintained throughout May 29-December 3 in 1986, June 4-October 10 in 1987, and June 16-December 9 in 1988.

Results and Discussion

Reported Catches

The Newfoundland squid fishery continued to be poor during 1986-88. Annual catches remained below 300 t consistent with a trend for such low catches since 1982 (Fig. 5). Indeed, the fishery was virtually non-existent in 1986 when a catch of only 1 t was reported, the lowest recorded catch in the history of this fishery. The annual catch increased to 188 t in 1987 and 272 t in 1988 (Table 1).

The poor fishery in 1986 was anticipated. No squid catches were realized from 98 daylight bottom trawl sets executed during the spring 1986 survey on the southwest slope of the Grand Bank. However, the poor fishery in 1987 was surprising. During the spring 1987 survey a total of 12,328 squid was caught in 64% of the 86 daylight sets. Based on historical spring surveys that suggested at least a moderate abundance level for the 1987 inshore fishery. No reason for the subsequent low inshore abundance level was apparent. The spring 1988 survey resulted in a total catch of 7,336 squid in 30% of the 105 daylight sets. Such a moderate catch level during spring surveys may relate to a wide range of subsequent inshore squid abundance levels.

The temporal distribution of catches was shifted toward earlier months in 1987 than in 1988 (Table 1). In 1987 the greatest portion of the catch (60 t or 32%) was taken in August whereas in 1988 maximum monthly catches (105 t or 39%) occurred during both August and September. Furthermore, in 1987 23% of the annual catch (43 t) was taken in July, contrasting with only 2% of the catch (6 t) taken in July of 1988.

In both 1987 and 1988 most of the reported catch (77% and 76%, respectively) was from

NAFO Division 3L, as is usual (Mercer MS 1973b; Ennis and Collins MS 1978; Hurley et al. MS 1979; Beck et al. MS 1980, MS 1981, MS 1986; Drew et al. MS 1985). In 1987 24% of the catch (45 t) was from the Northeast Coast (Div. 3K) and no catch was reported from the South Coast (Div. 3Ps). In contrast, in 1988, only 1% of the catch (3 t) was from Division 3K, whereas 22% (59 t) was taken in Division 3Ps.

Biological Characteristics

Length frequency distributions for squid sampled during June on the Southwest Slope of the Grand Bank in 1987 and 1988 are shown in Figure 6. All distributions were unimodal except for June 16-30 females in 1987 where a secondary group of 9-11 cm females was represented by only a few specimens. Generally however a single cohort was represented within all distributions. During June 1-15 squid length differed remarkably between the two years. Mean lengths in 1987 exceeded those of 1988 by 2.04 cm for males and 2.40 cm for females. Offshore mean lengths for June of 1988, 13.7 cm and 13.8 cm for males and females respectively, were similar to those from five of the six June surveys carried out between 1980 and 1988 (Beck et al. MS 1981, MS 1982, MS 1983; Drew et al. MS 1984, MS 1985). Only squid sampled in June during the 1981 survey, with mean lengths of 16.5 cm for males and 16.8 cm for females (Beck et al. MS 1982) were larger than those collected during 1987, when mean lengths were 15.8 cm for males and 16.2 cm for females (Fig. 6).

Squid sampled at Holyrood during 1987 were unusually large (Fig. 7), as was also shown for June offshore squid of that year. In fact, for all sampling periods (except September 16-30), mean lengths for Holyrood in 1987 were considerably greater than during any of the nine other years when Holyrood samples were available within the 1975-88 period (Collins and Ennis MS 1978; Beck et al. MS 1982, MS 1983, MS 1986). The large size of 1987 Holyrood squid is clearly not an artifact due to collection of samples using traps. Mean lengths for samples taken from the Holyrood commercial jigger fishery during November 1-15, 1987 were 26.2 cm for males and 30.1 cm for females, considerably greater than November mean lengths during 1976-79 which ranged 22.2-23.1 cm for males and 23.9-25.8 cm for females (Ennis and Collins MS 1978; Beck et al. MS 1982). Sexual maturation was quite advanced in male squid at Holyrood during 1987. In the earliest samples (August 16-31) some of the largest males were fully mature and by October 1-15 almost all males were mature (Fig. 7).

Although most samples from Holyrood in 1987 comprised a single cohort of large squid, a secondary group of smaller squid was represented during September 16-30 (Fig. 7). Males of this group were mostly sexually immature. Such small squid are rarely sampled in

Newfoundland inshore waters, although a group of even smaller squid, with modal lengths of 16 cm for both sexes, was represented in a Holyrood sample in 1985 (Beck et al. MS 1986). In 1987 at Leading Tickles, on the northeast coast of Newfoundland (Fig. 2), the group of small squid represented the entire sample (collected during October 16-31, Fig. 8). Even during late October most of these small males were sexually immature. The presence of this small cohort in only one Holyrood sample and its prominence at Leading Tickles demonstrate the existence of size-dependent schooling and migration in Newfoundland waters.

Length-frequency distributions of squid sampled at Holyrood in 1988 reflect the presence of a single cohort throughout August and September (Fig. 9). At Holyrood, squid were overall considerably smaller during 1988 than during the previous year. For example, during September 1-15 mean lengths in 1987 and 1988 were 21.9 cm and 19.5 cm respectively for males and 25.2 cm and 20.5 cm respectively for males. In fact, whereas Holyrood mean lengths within the 1975-88 period were greatest during 1987, they were smallest during 1988 (Collins and Ennis MS 1978; Beck et al. MS 1982, MS 1983, MS 1986). Sexual maturation in these relatively small 1988 males was not nearly as advanced as in the larger 1987 males for any time period. In 1988, almost all males were immature during August and only a few of the largest males were mature during September 16-30 (Fig. 9).

Inshore Temperature Trends

Seasonal trends in local water temperature at the Holyrood sampling site were somewhat similar among the three years 1986-88 (Fig. 10). Temperature increased rapidly during June-July and peaked during August at about 14°C. However, it reached 5°C earlier in 1987 (June 18) than in 1986 (July 2) or 1988 (July 8). Any possible relationships between local temperature trends and squid catch, distribution, size or maturation however require more extensive investigation.

Acknowledgments

The authors would like to thank M. Y. Hynes who assisted in the preparation of the manuscript.

References

Beck, P. C., E. G. Dawe, and J. Drew. MS 1980. Breakdown of squid catches in NAFO Subarea 3 and Div. 4R, 1979 with length and sex composition from offshore and Newfoundland inshore commercial samples. NAFO SCR Doc. 80/II/17, Ser. No. 65, 15 p.

MS 1981. Breakdown of squid (Illex illecebrosus) catches in NAFO Subarea 3 and Division 4R, with length and sex composition from Newfoundland inshore commercial samples and early season offshore area. NAFO SCR Doc. 81/VI/27, Ser. No. 36, 17 p.

MS 1982. Breakdown of short finned squid catches in NAFO Subarea 3 and Division 4R 1981 and biological characteristics for Newfoundland inshore commercial samples and early season offshore areas. NAFO SCR Doc. 82/VI/27, Ser. No. 515, 16 p.

MS 1983. Breakdown for 1982 squid (Illex illecebrosus) catches in NAFO Subarea 3 and Division 2J and 4R, with length and sex composition from Newfoundland inshore samples and early season offshore samples. NAFO SCR Doc. 83/VI/21, Ser. No. N670, 15 p.

MS 1986. The 1985 fishery for squid (Illex illecebrosus) in the Newfoundland area, with length, sex and maturity composition from inshore commercial samples. NAFO SCR Doc. 86/17, Ser. No. N1129, 6 p.

Collins, P. W., and G. P. Ennis. MS 1978. Breakdown of inshore Newfoundland squid catches, 1975-1977 with length and sex composition from commercial samples. ICNAF Res. Doc. 78/II/16, Ser. No. 5158, 13 p.

Drew, H. J., E. G. Dawe, and P. C. Beck. MS 1984. The 1983 fishery for short-finned squid (Illex illecebrosus) in the Newfoundland area. NAFO SCR Doc. 84/VI/68, Ser. No. N857, 7 p.

MS 1985. The 1984 fishery for short-finned squid (Illex illecebrosus) in the Newfoundland area. NAFO SCR Doc. 85/25, Ser. No. N975, 7 p.

Hurley, G. V., P. C. Beck, and J. Drew. MS 1979. Breakdown of squid catches in ICNAF Subarea 3, 1978, with length and sex composition from offshore and Newfoundland inshore samples. ICNAF Res. Doc. 79/II/27, Ser. No. 5353, 13 p.

Mercer, M. C. MS 1973a. Sexual maturity and sex ratios of the ommastrephid squid, Illex illecebrosus (Lesueur) at Newfoundland (Subarea 3). ICNAF Res. Doc. 73/71, Ser. No. 3023, 14 p.

MS 1973b. Nominal catch of squid in Canadian Atlantic waters (Subareas 2-4) 1920-68. ICNAF Redbook 1973, Part III: 154-161.

MS 1975. Size and maturity of the ommastrephid squid, Illex illecebrosus (LeSueur) at Newfoundland. ICES C.M.1975/K:50, 28 p.

Table 1. Squid catch (t) by NAFO Division, month and processing category at Newfoundland for 1987 and 1988.

Year	Div.	Processing category	July	Aug.	Sept.	Oct.	Nov.	Total
1987	3K	Round			6	30	3	39
		Dry			-	1	5	6
		Total			6	31	8	45
	3L	Round	32	43	30	3	1	109
		Dry	11	17	6			34
		Total	43	60	36	3	1	143
	Combined	Round	32	43	36	33	4	148
		Dry	11	17	6	1	5	40
		Total	43	60	42	34	9	188
1988	3K	Round		1	-	1		2
		Dry		-	1	-		1
		Total		1	1	1		3
	3L	Round	-	80	80	42	-	202
		Dry	1	-	-	-	7	8
		Total	1	80	80	42	7	210
	3Ps	Round	5	24	24	6		59
		Dry	-	-	-	-		-
		Total	5	24	24	6		59
	Combined	Round	5	105	104	49		263
		Dry	1	-	1	-	7	9
		Total	6	105	105	49	7	272

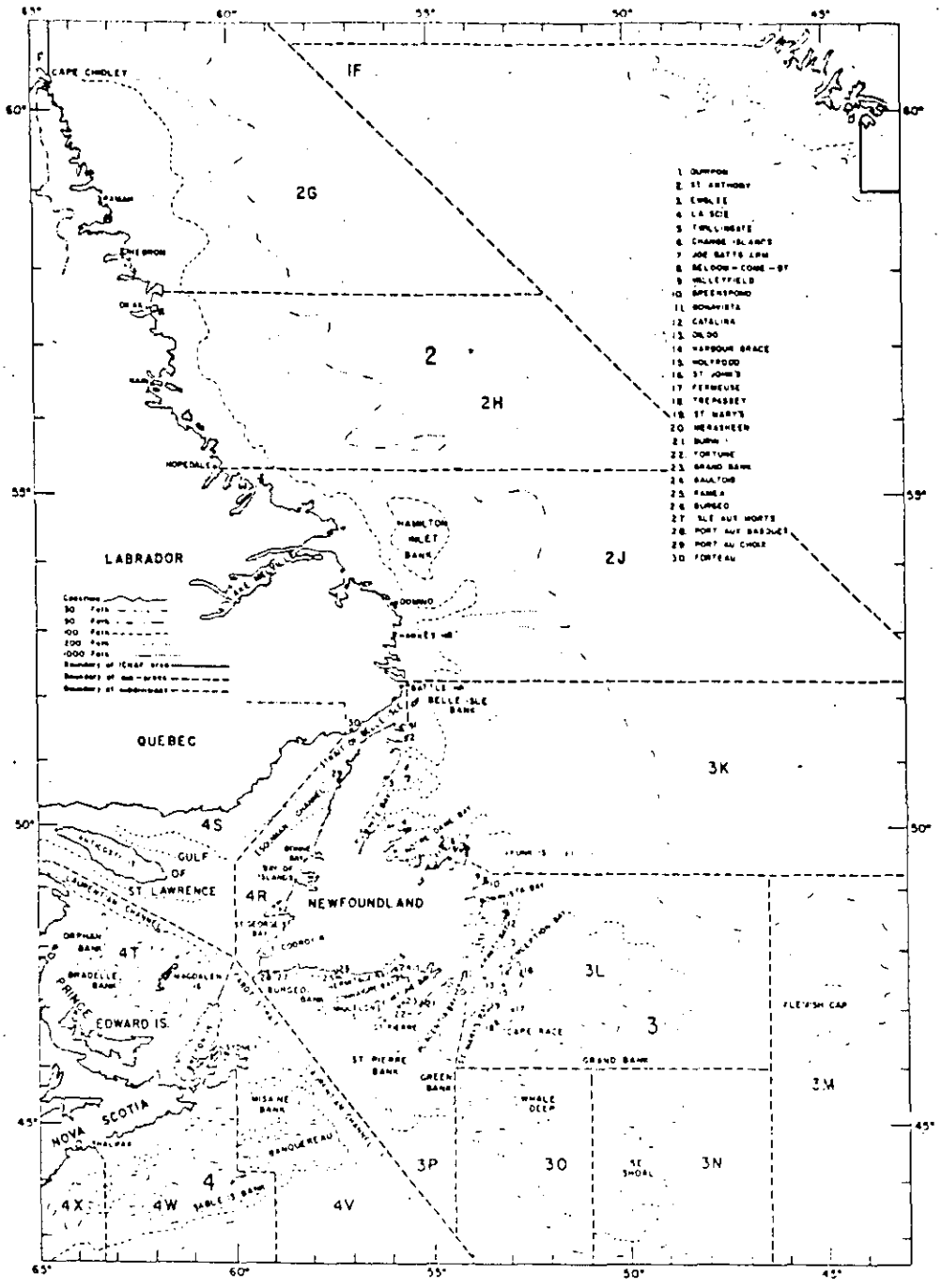
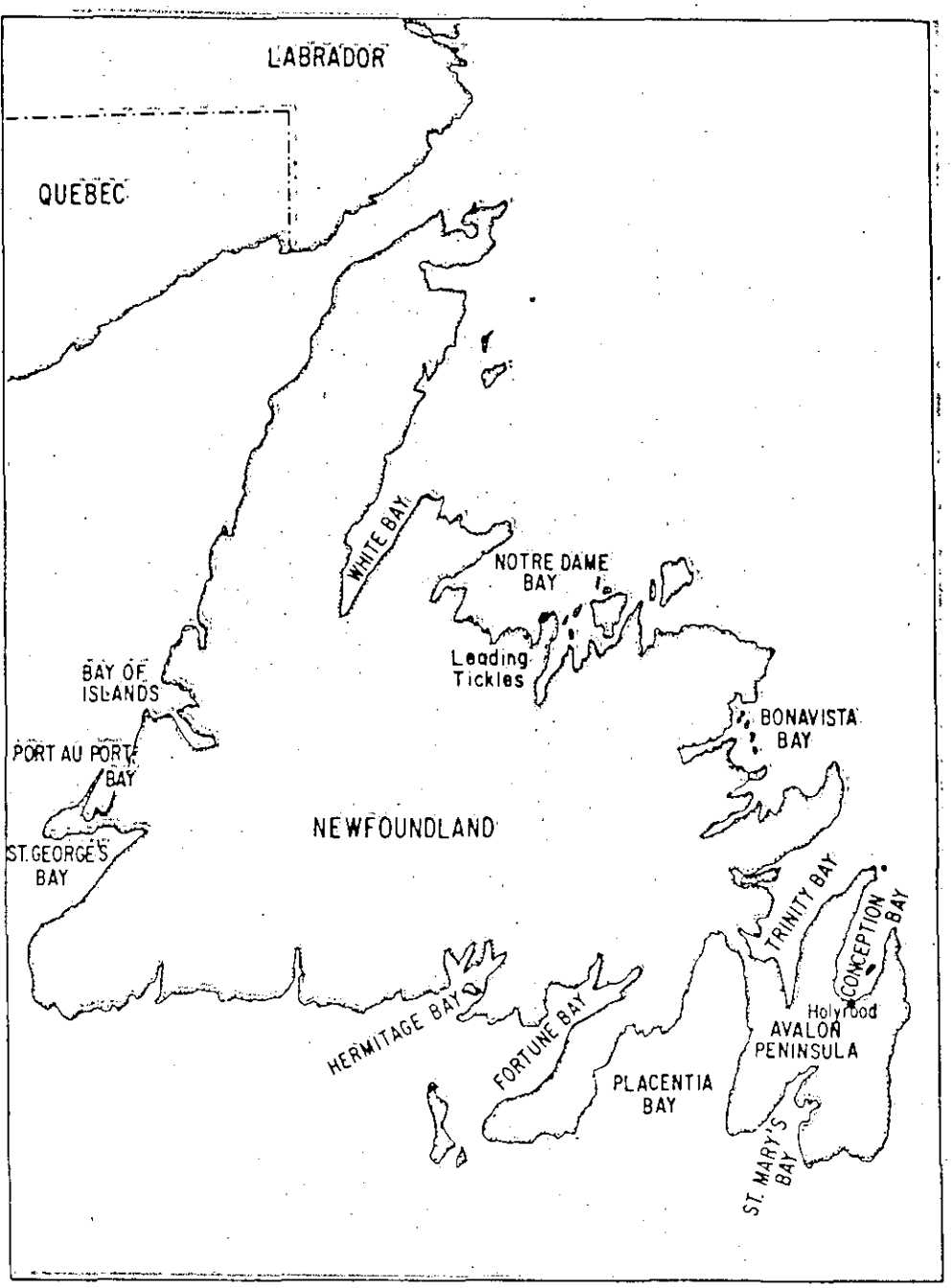


Fig. 1. Distribution of NAFO Divisions within Canadian Atlantic waters.



p of insular Newfoundland showing place names referred to in the

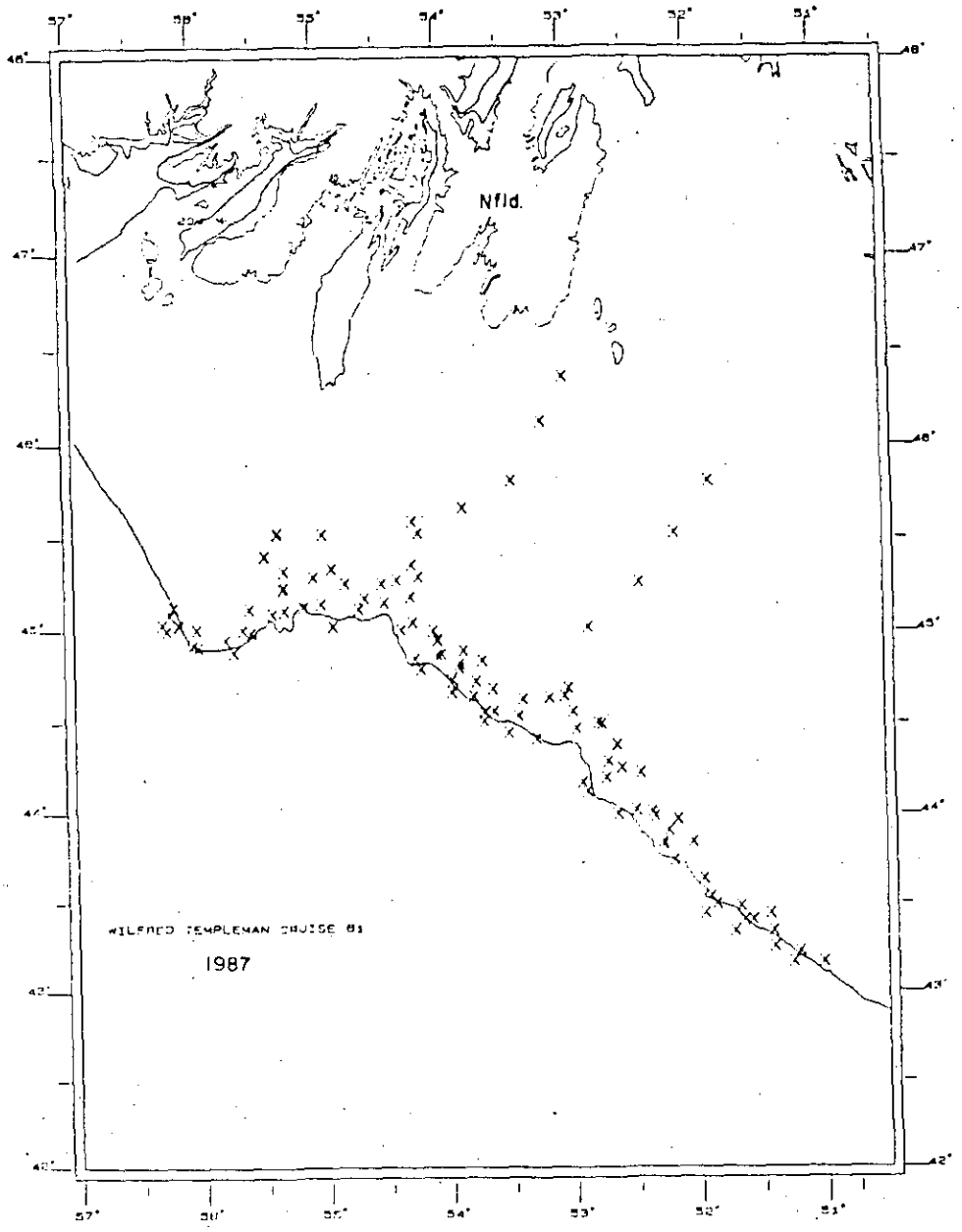


Fig. 3. Distribution of bottom trawl sets during the June 4-18, 1987 survey.

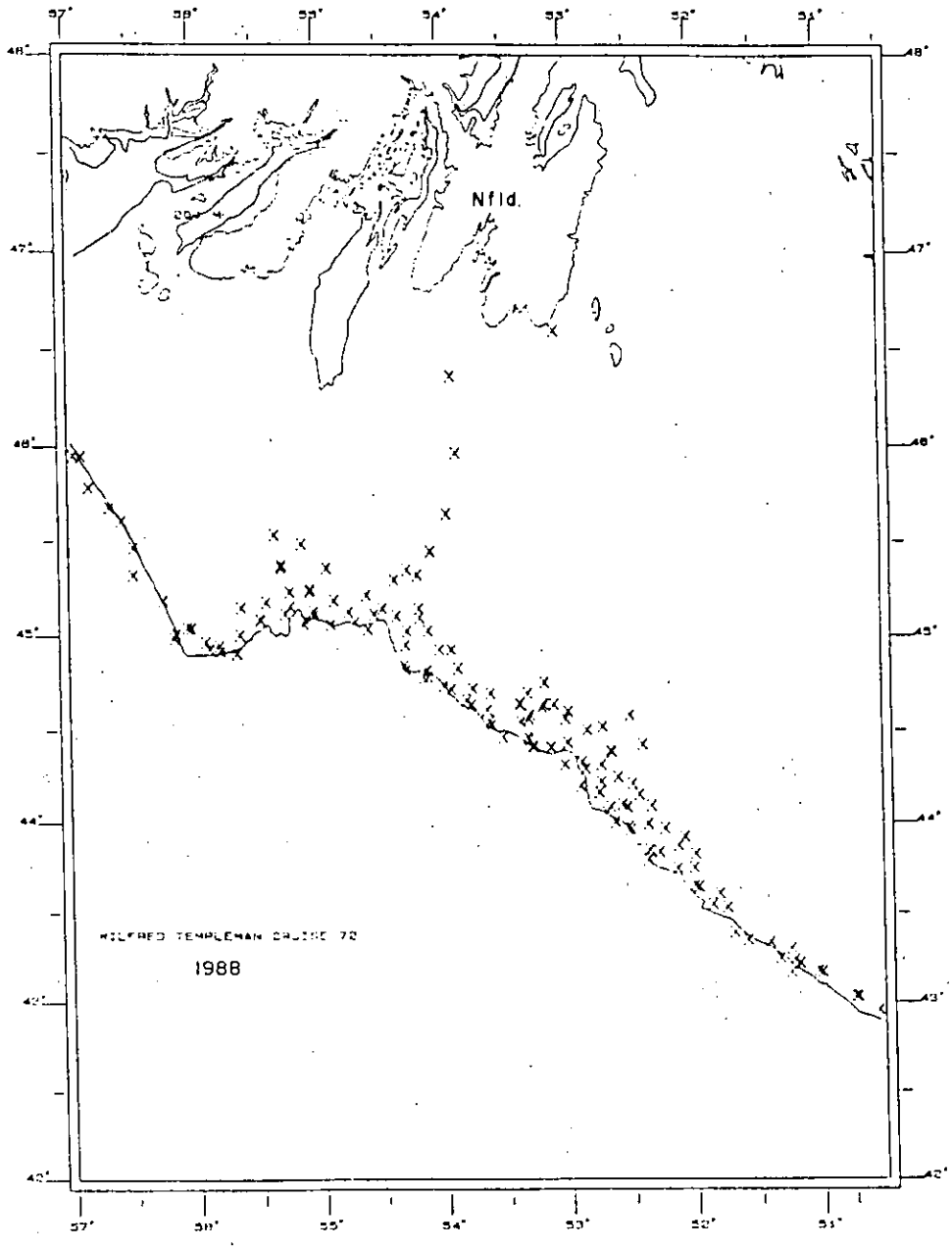


Fig. 4. Distribution of bottom trawl sets during the May 27-June 9, 1988 survey.

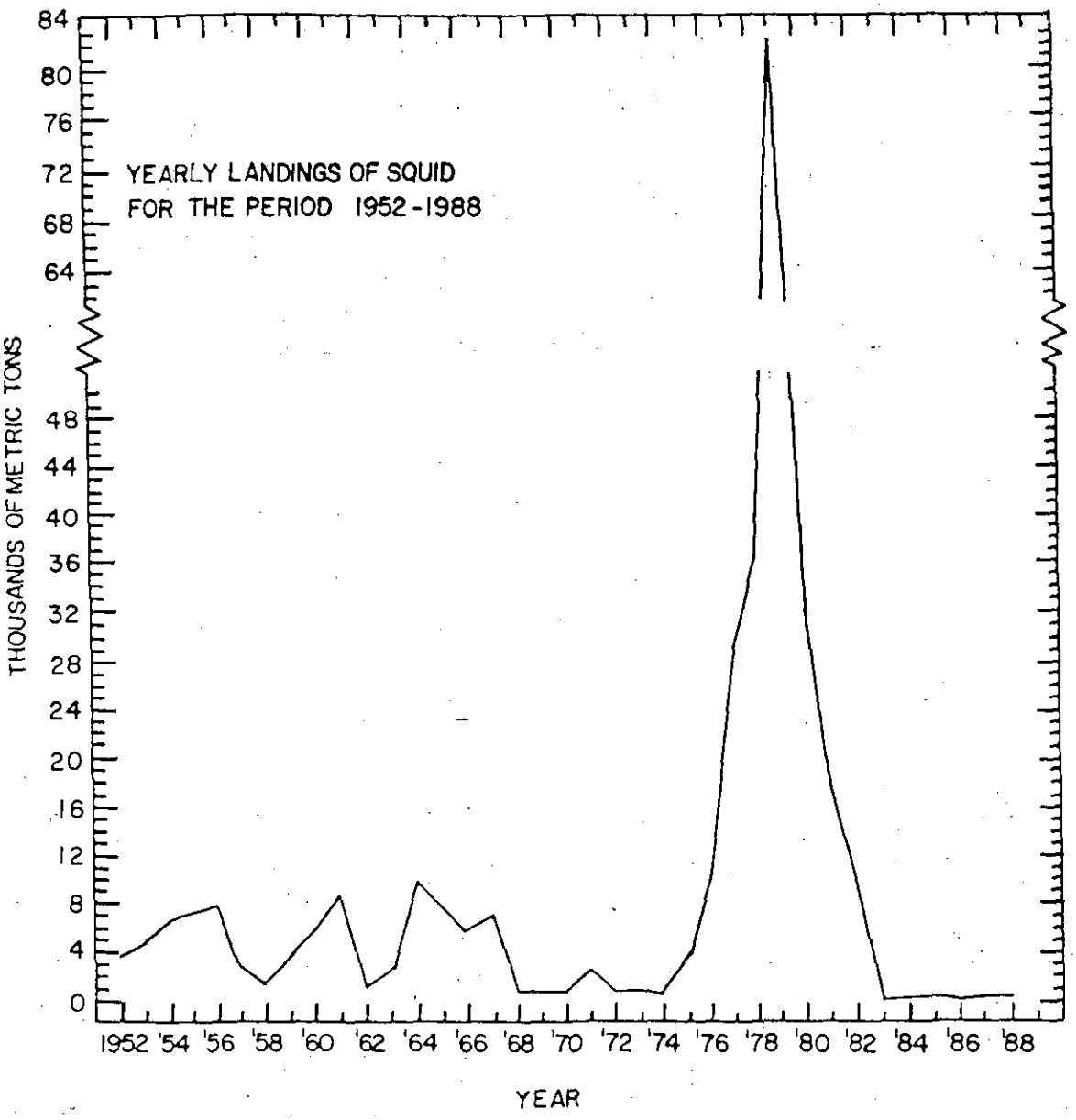


Fig. 5. Annual squid catches at Newfoundland for the period 1952-88.

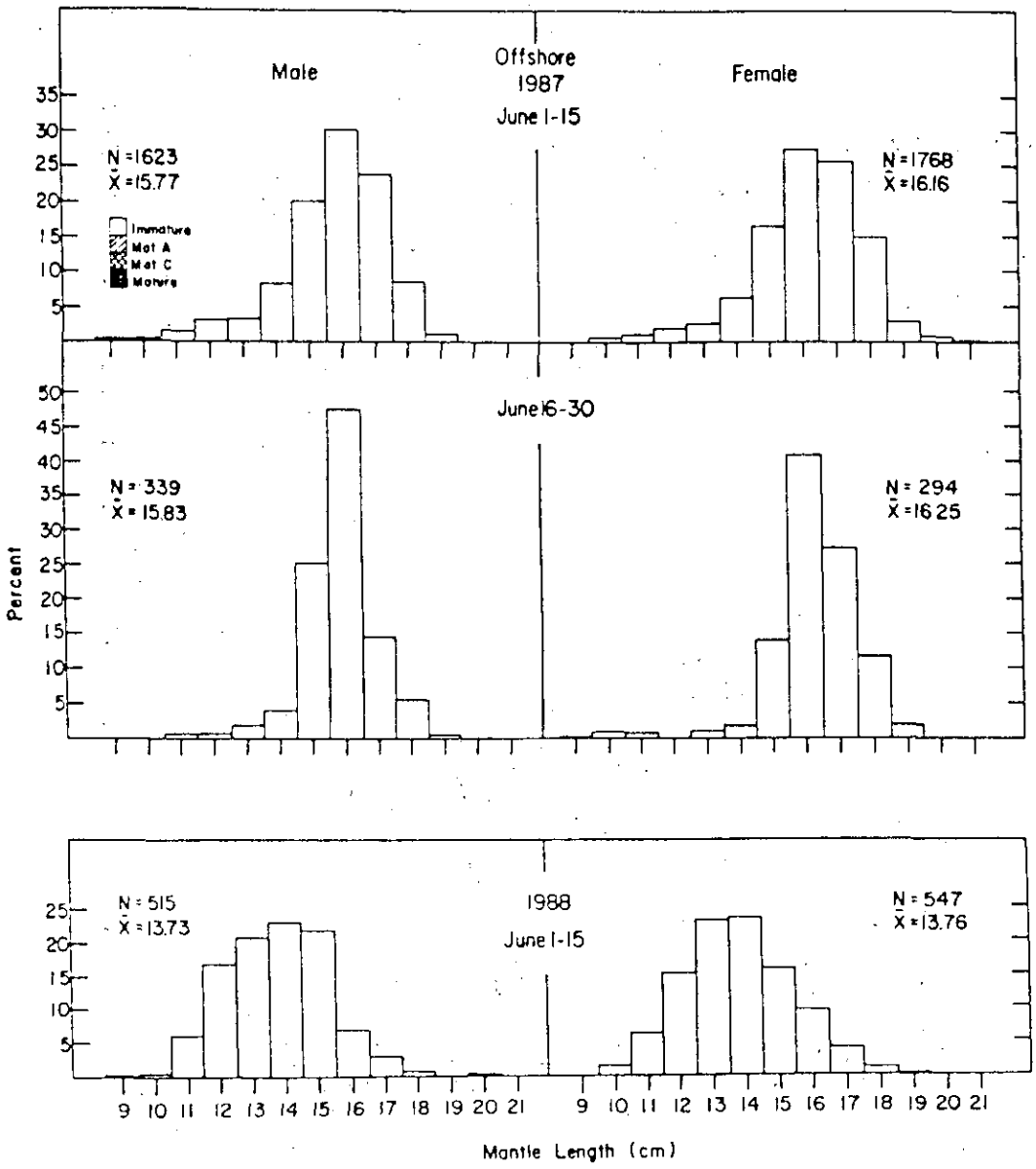


Fig. 6. Length-frequency distributions and, for males, maturity by bi-weekly periods for squid sampled during spring surveys on the southwest slope of the Grand Bank and St. Pierre Bank in 1987 (top) and 1988 (bottom).

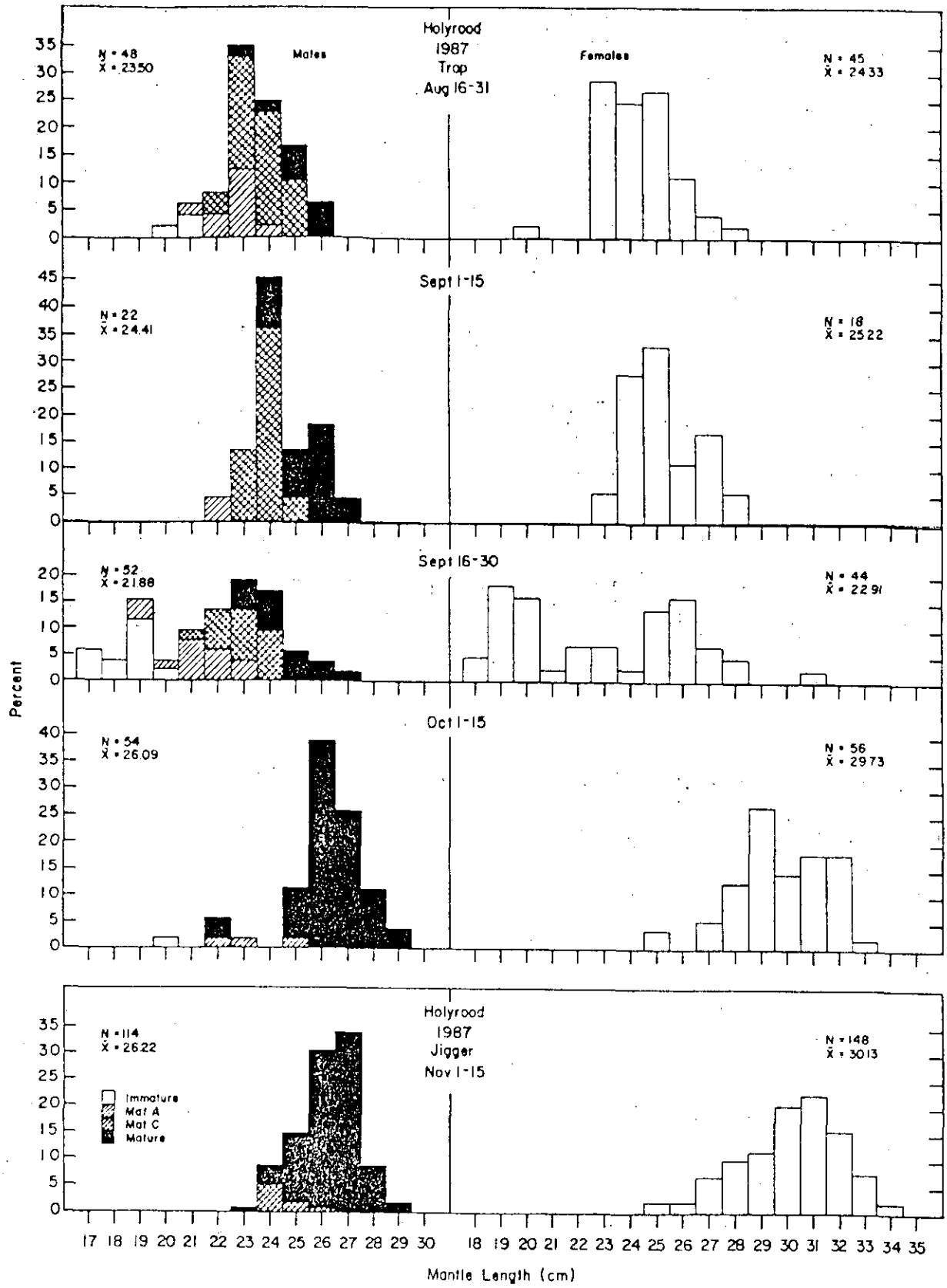


Fig. 7. Length-frequency distributions and, for males, maturity by bi-weekly periods for squid sampled at Holyrood in 1987 using traps (top) and jiggers (bottom).

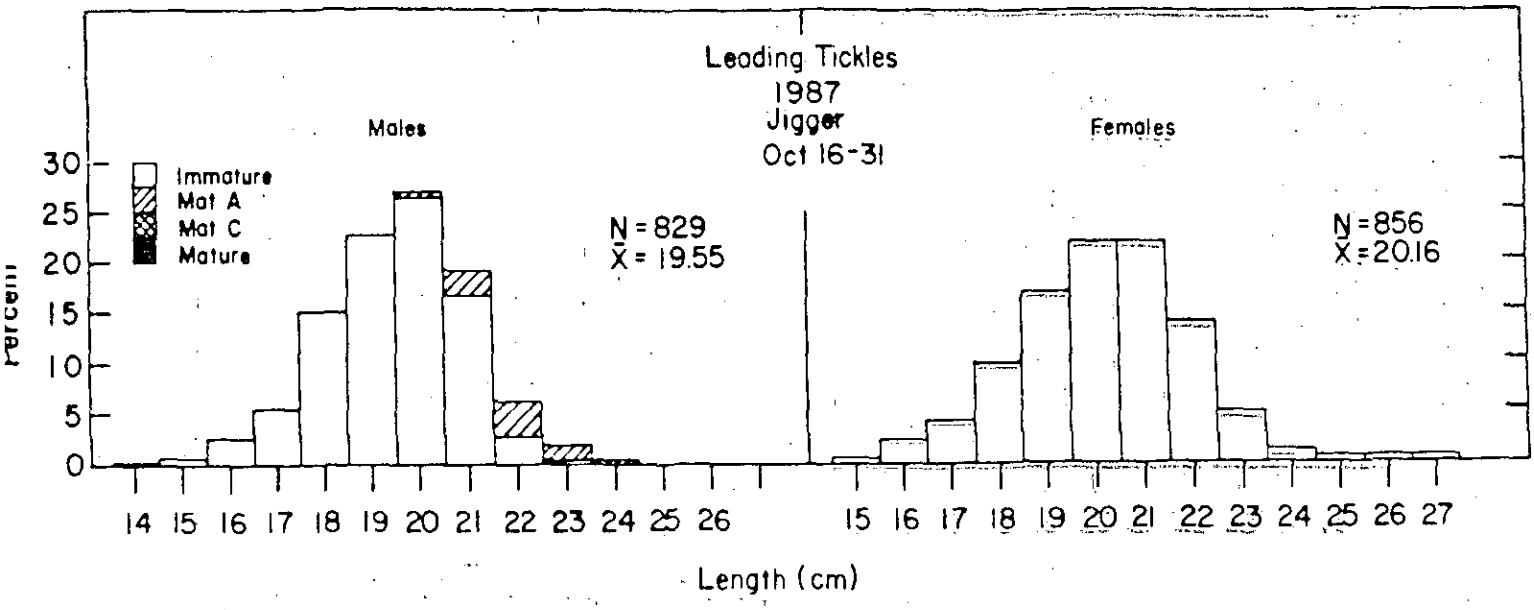


Fig. 8. Length-frequency distributions and, for males, maturity for squid sampled at Leading Tickles during October 16-31, 1987.

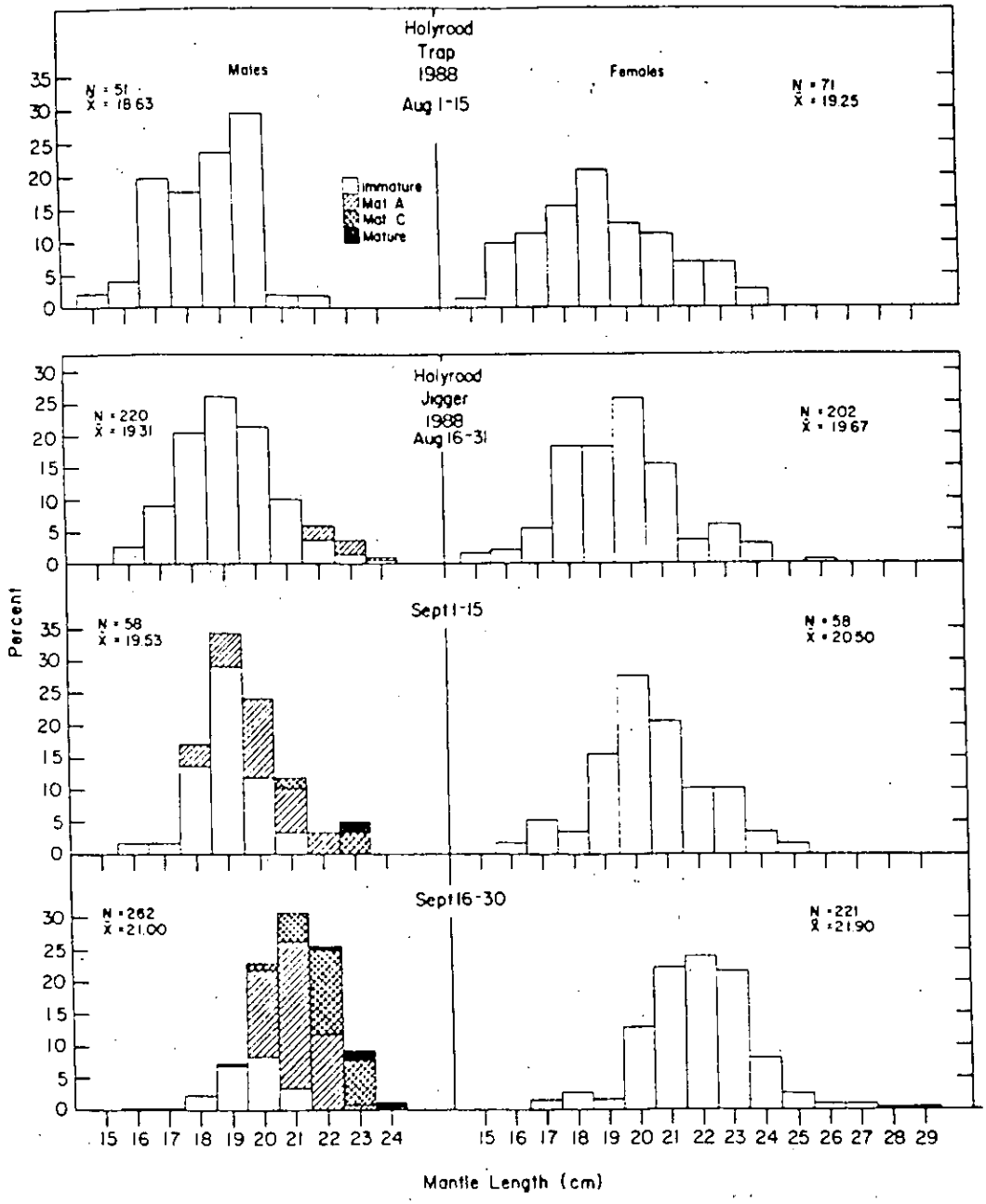


Fig. 9. Length-frequency distributions and, for males, maturity by bi-weekly periods for squid sampled at Holyrood in 1988 using traps (top) and jiggers (bottom).

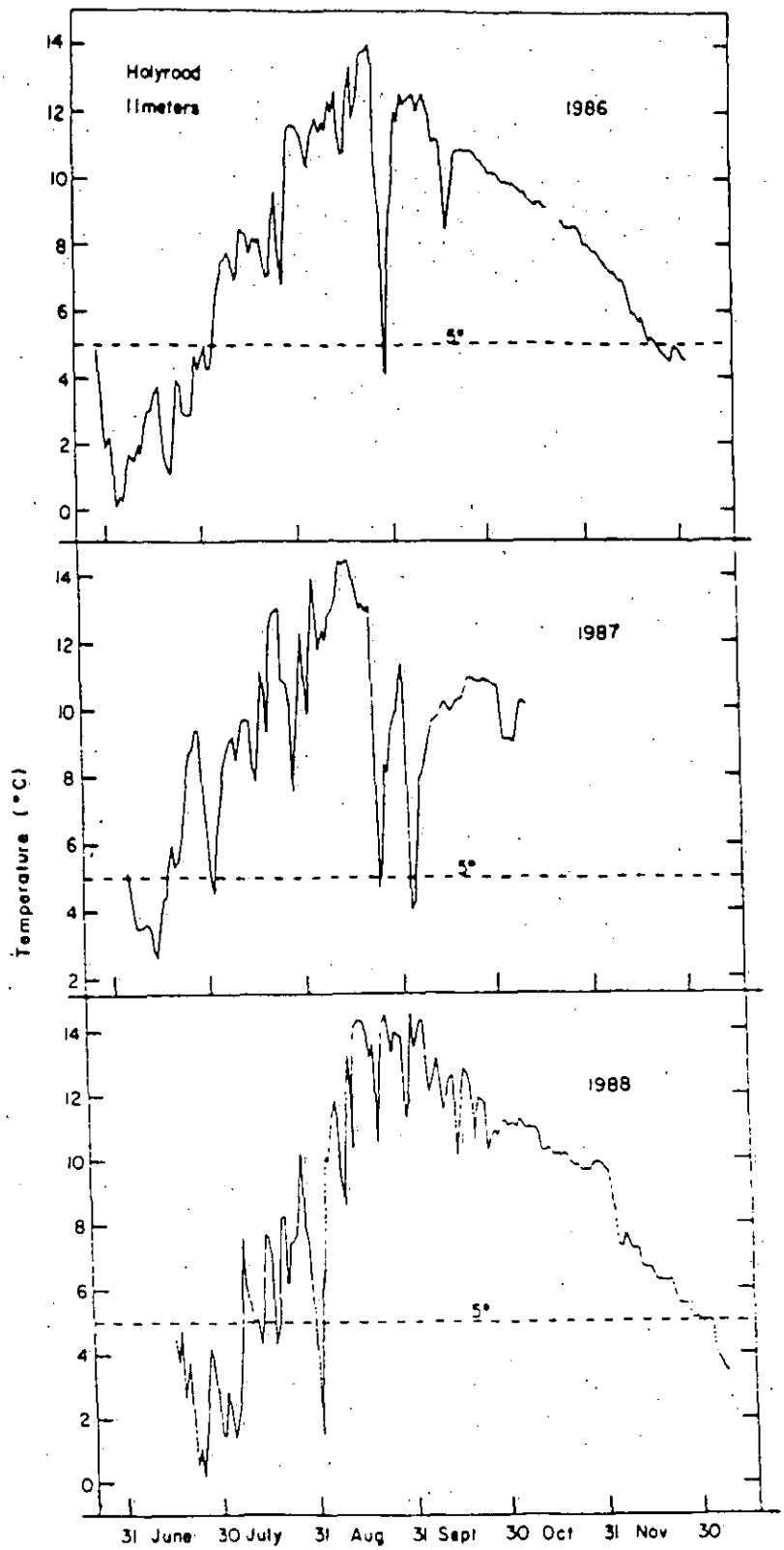


Fig. 10. Mean daily bottom (11 m) temperatures at Holyrood throughout spring-autumn of 1986-88.