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Breakdown of short-finned squid catches in NAFO Subarea 3 and Division 4R for 1980
and biological characteristics for Newfoundland inshore commercial samples
and early season offshore samples

by

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INTRODUCTION

Inshore Newfoundland squid catches have been described by Mercer (MS 1973a) for the period 1955-72. For the years 1975-80 NAFO Subarea 3 catches have been broken down by time of season and inshore regions. Also for these years, biological characteristics of the catch have been described (Collins and Ennis MS 1978, Hurley et al. MS 1979, Beck et al. MS 1980, 1981). Annual documentation of catches and biological characteristics can provide information regarding yearly variations in availability of squid, size, growth, and distribution patterns, which are useful in managing the fishery.

This paper presents 1981 commercial catches of squid (*Illex illecebrosus*) broken down by month and NAFO Division. Length frequency distributions, maturity stages, and sex composition are also described for commercial samples and samples from an offshore research cruise in June within NAFO Divisions 3N, 3O, and 3Ps.

MATERIALS AND METHODS

Monthly squid catches by NAFO Division (Fig. 1) were obtained from the Economics and Intelligence Branch, Department of Fisheries and Oceans, Newfoundland Region. Inshore samples were collected from the commercial fishery which employs Japanese mechanical jigging devices at Holyrood (NAFO Div. 3K), Twillingate and La Scie (NAFO Div. 3K), and the Hermitage-Sandyville area (NAFO Div. 3Ps) (Fig. 1). Offshore samples for June were collected during a research survey during June 13-22 on the A.T. CAMERON (Fig. 2). Samples were collected using a Yankee 41.5 otter-trawl with a small mesh nylon codend liner.

Dorsal mantle lengths were measured to the nearest 0.5 centimeter and later grouped into 1 cm intervals. Length frequency distributions were summarized biweekly for those periods when samples were taken. During analysis in 1982, an error was found in the program which has been used to summarize length frequency distributions for 1978-80. Thus length frequency distributions previously presented (Hurley et al. MS 1979, Beck et al. MS 1980, MS 1981) were shifted by 1 cm to the right of their true distribution. Corrected mean lengths for 1978-80 are presented in Appendix I. Maturities were classified based on a scale proposed by Mercer (MS 1973b).

RESULTS AND DISCUSSION

Reported Catches

The total inshore squid catch at Newfoundland for 1981 was only 17,303 t (Table 1), the lowest level since 1976 (Fig. 3). It is believed however that actual squid abundance or inshore availability may have been at its lowest level since 1974, at least for the period September-December. This is based on the fact that there was considerable effort exerted in this fishery in 1981 due to availability of markets. The reported catch closely approximates the true catch since industry purchased almost all squid caught and there was no dumping of unreported catches as in earlier years (Hurley et al. MS 1979, Beck et al. MS 1980). Further, capacity for storage was not as limiting as it had been in

earlier years (Collins and Ennis MS 1978). There was virtually no catch from the offshore fishery in Subarea 3, due in part to the lack of effort expended in this area.

Reported catches for 1982 are shown in Table 1, broken down by month and NAFO Division (Fig. 1). As in other years, most of the catch came from the Avalon Peninsula and Northeast Coast (Mercer MS 1973a, Collins and Ennis MS 1978, Hurley et al. MS 1979, Beck et al. MS 1980, MS 1981). Catches were highest during July and August, declining sharply thereafter (Table 1). This was unusual, as during most years high catches were reported during the period August to October (Mercer MS 1973a, Collins and Ennis MS 1978, Hurley et al. MS 1979, Beck et al. MS 1980, MS 1981). This decline in catch was due to low availability of squid to the inshore fishery after the month of August, especially in 3L. It is felt that the July-August catch could have been higher but little effort was expended in the fishery at that time due to the small size and low market value of squid early in the fishing season. This decline after August coincided with a decline in catch rates from the international squid fishery on the Scotian Shelf (unpublished data, FLASH information system).

Reasons for such a decline in catch after August are unclear. Inshore daily temperature data are available throughout the season for Holyrood (Fig. 4) in NAFO Div. 3L, where this decline was most pronounced (Table 1). Daily temperatures reached 5°C in mid June and generally remained higher from mid July to mid December. It peaked in early September and then dropped sharply to below 5°C on September 21, only to increase sharply thereafter.

Biological Characteristics

Length frequency distributions and sexual maturity for Holyrood, Twillingate, La Scie, and Hermitage plus Sandyville are presented in Figures 5, 6, 7, and 8, respectively. Length frequency distributions for June research samples from the St. Pierre Bank and Grand Bank are shown in Fig. 9. Squid were smallest offshore in June (Fig. 9) and there was generally an increase in length throughout the inshore season (Fig. 5, 7, and 8). For all areas, females were immature and larger than males. For Holyrood and Hermitage plus Sandyville where sampling throughout the season was most frequent males displayed an increase in sexual maturity as the season progressed. Comparison of size among localities is rendered difficult due to difference in seasonal coverage and the fact that some samples are not normally distributed. However, general impressions indicate that for periods ending August 15 and August 31 sizes were similar between Holyrood (Fig. 5) and Twillingate (Fig. 6). Throughout the season, except for the latest samples (the period ending September 15) squid were larger at Hermitage and Sandyville (Fig. 8) than at Holyrood. This was especially true for females (Fig. 10).

Since length frequencies previously described for 1978-80 were in error, 1981 mean lengths can be compared to those of 1978-80 by referring to corrected values given in Appendix I. Growth in length at Holyrood until September 15 for 1981 (Fig. 5) was much smaller than for all years 1978-80 (Appendix I). In 1981 at Holyrood squid ranged in mean length for males and females respectively from 18.6 cm and 19.0 cm for July 15 to 21.0 cm and 22.3 cm for September 15. For 1978-80, squid overall were largest in 1979 and smallest in 1978. However, for 1981 record large squid were sampled during the full month of July whereas for later periods up to September 15, 1981 squid were the smallest of all four years. Large size of squid inshore early in the season during 1981 may be related to earlier time of spawning or faster growth during early stages of the life history. This is seen in that during June on the Grand Bank and St. Pierre Bank squid mean length was much larger in 1981 (ranging 16.4-16.8 cm, Fig. 9) than it was in both 1979 and 1980 (ranging 13.3-15.1 cm, Appendix I).

For 1981 sexes were approximately equal for all samples except those from Hermitage and Sandyville, where females were more common (Fig. 11). Since females are larger than males, this accounts for the larger mean size of Hermitage-Sandyville samples. Decline in the proportion of males at Holyrood throughout the season was slight, probably due to the small size of males late in the season. Such a decline in the proportion of males has been related to an offshore migration of the larger males as they became sexually mature (Hurley et al. MS 1979, Beck et al. MS 1980, MS 1981). The low proportion of males at Hermitage-Sandyville is an unexplained phenomenon which has been consistently described in other years for inshore areas of the south coast of Newfoundland (Hurley et al. MS 1979, Beck et al. MS 1980). However, during 1981 the proportion of males at this locality increased sharply between July 31 and September 15. The reason for this unusual phenomenon is unknown.

ACKNOWLEDGEMENTS

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Table 1. Squid landings (metric tons) at Newfoundland by NAFO Division, 1981.

				Month				
Div.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
2J								
3K	5	268	2,306	1,756	243	28	1	4,607
3L	24	5,427	4,919	226	117	32	3	10,748
3M								
3N								
3O								
3Ps		554	764	258	35			1,611
3PN		7	216	55	7			285
4R		3	38	11				52
Total	29	6,259	8,243	2,306	402	60	4	17,303

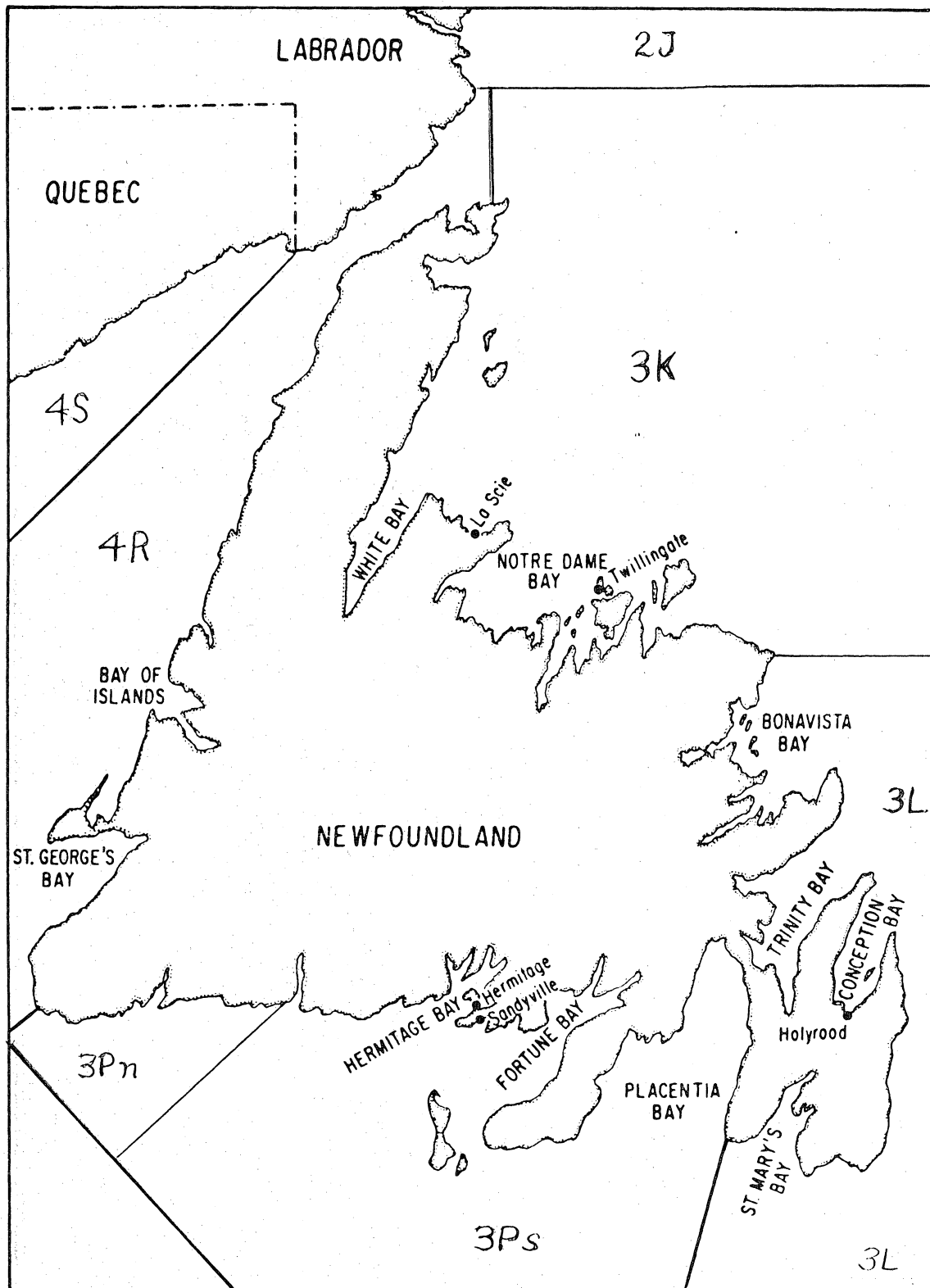


Fig. 1. Map of Newfoundland inshore sampling locations.

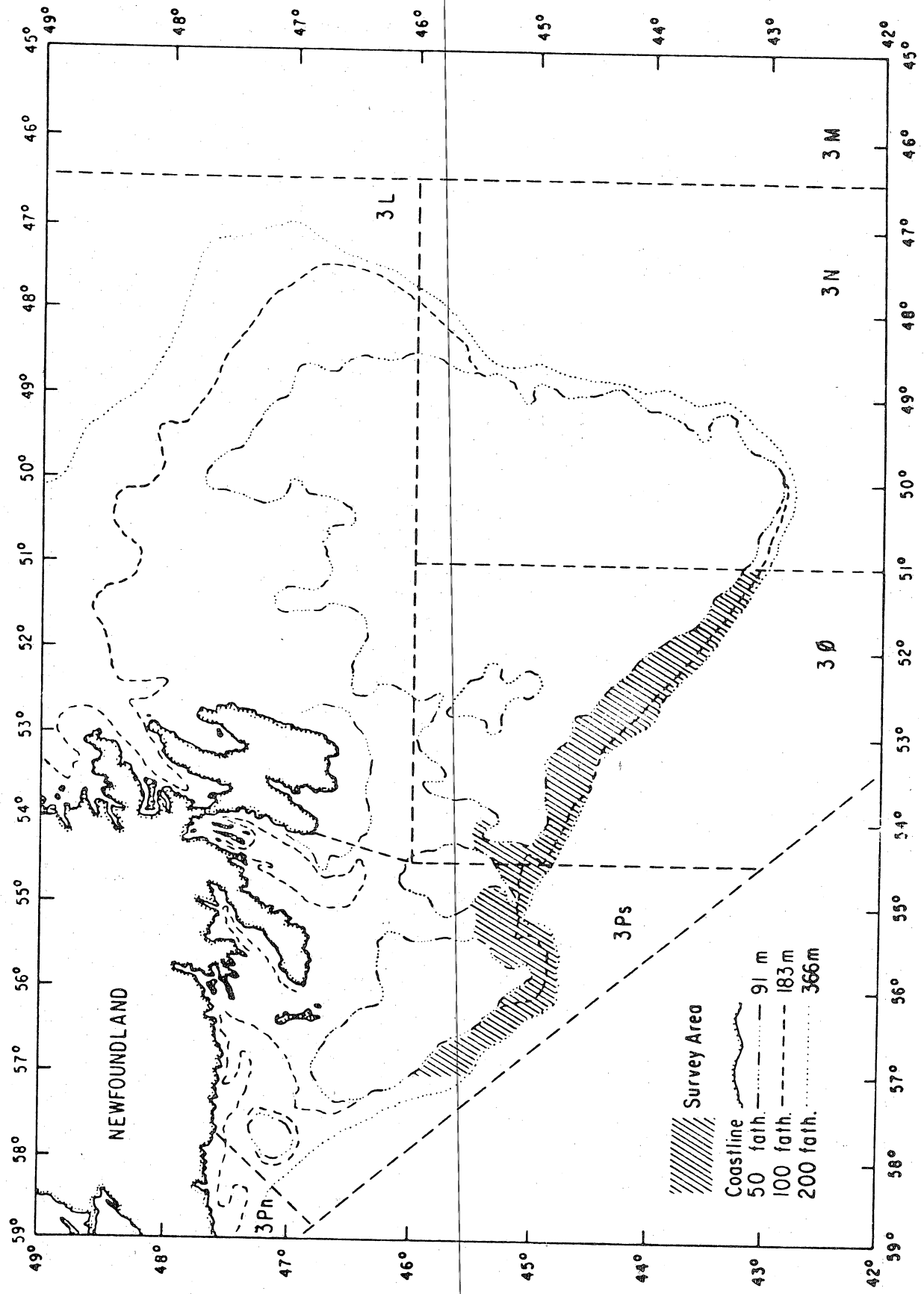


Fig. 2. Area surveyed on A.T. Cameron Trip 320, June 13-22, 1981.

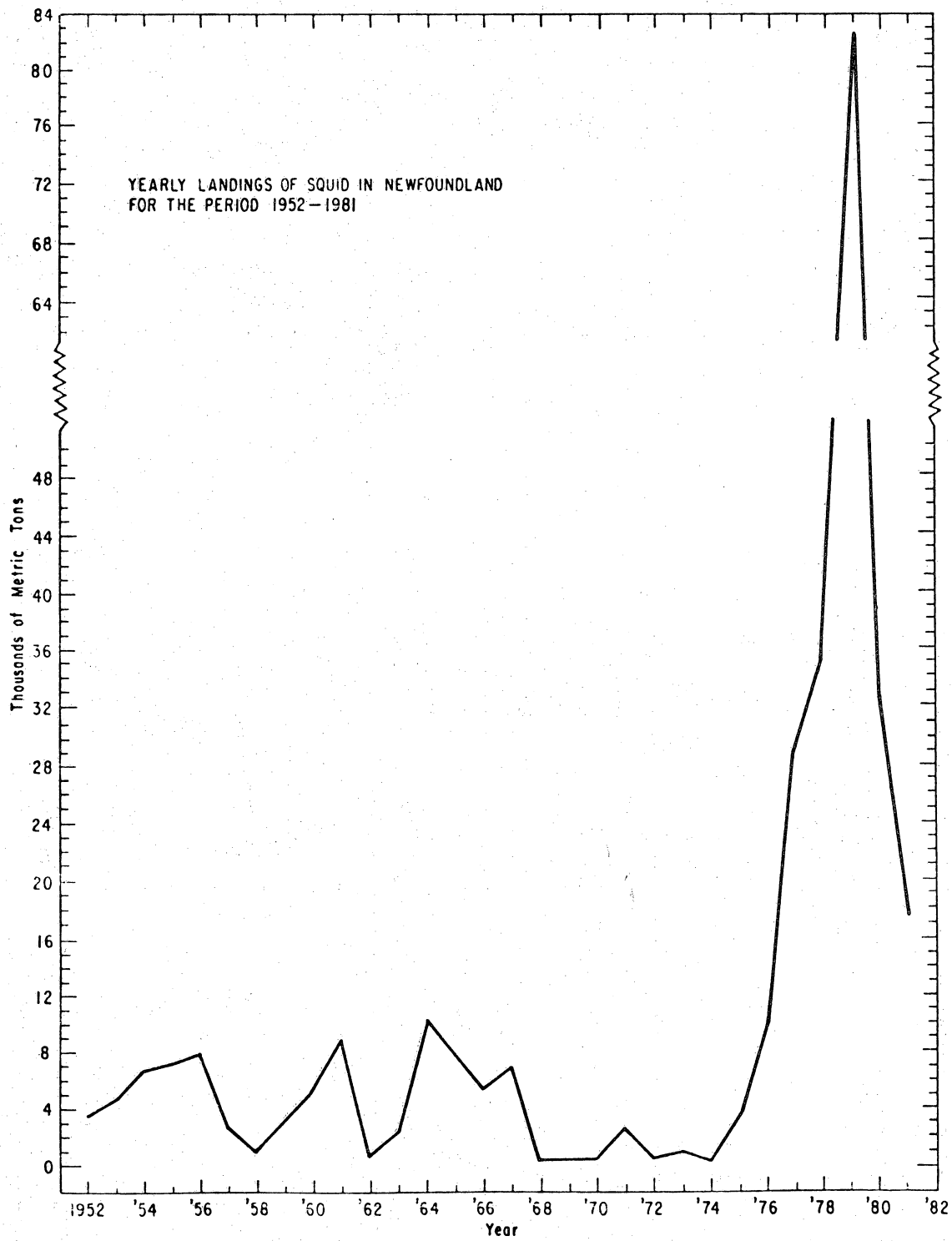


Fig. 3. Yearly landings of squid in Newfoundland for the period 1952-81.

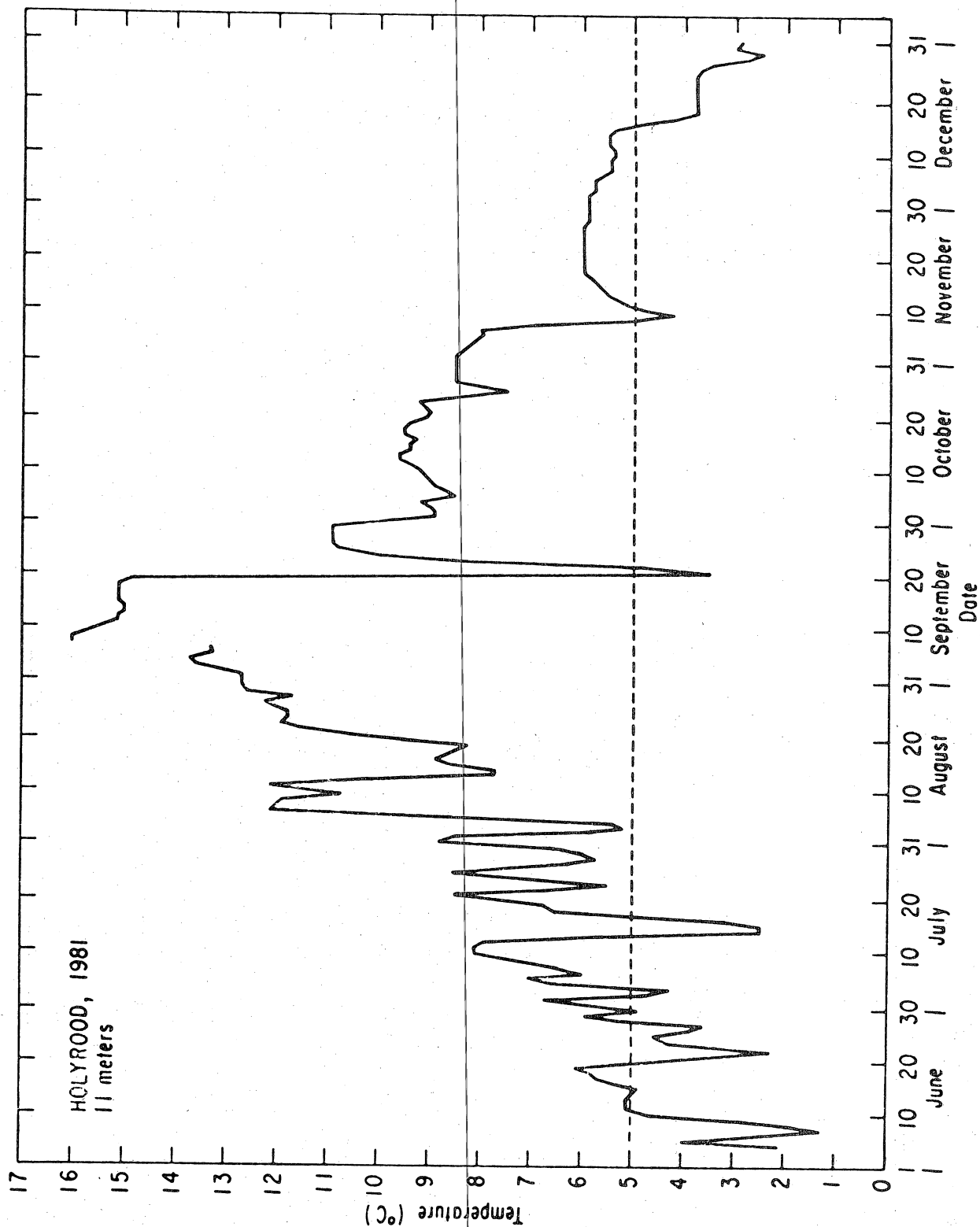


Fig. 4. Average daily temperatures at Holyrood for June-December, 1981.

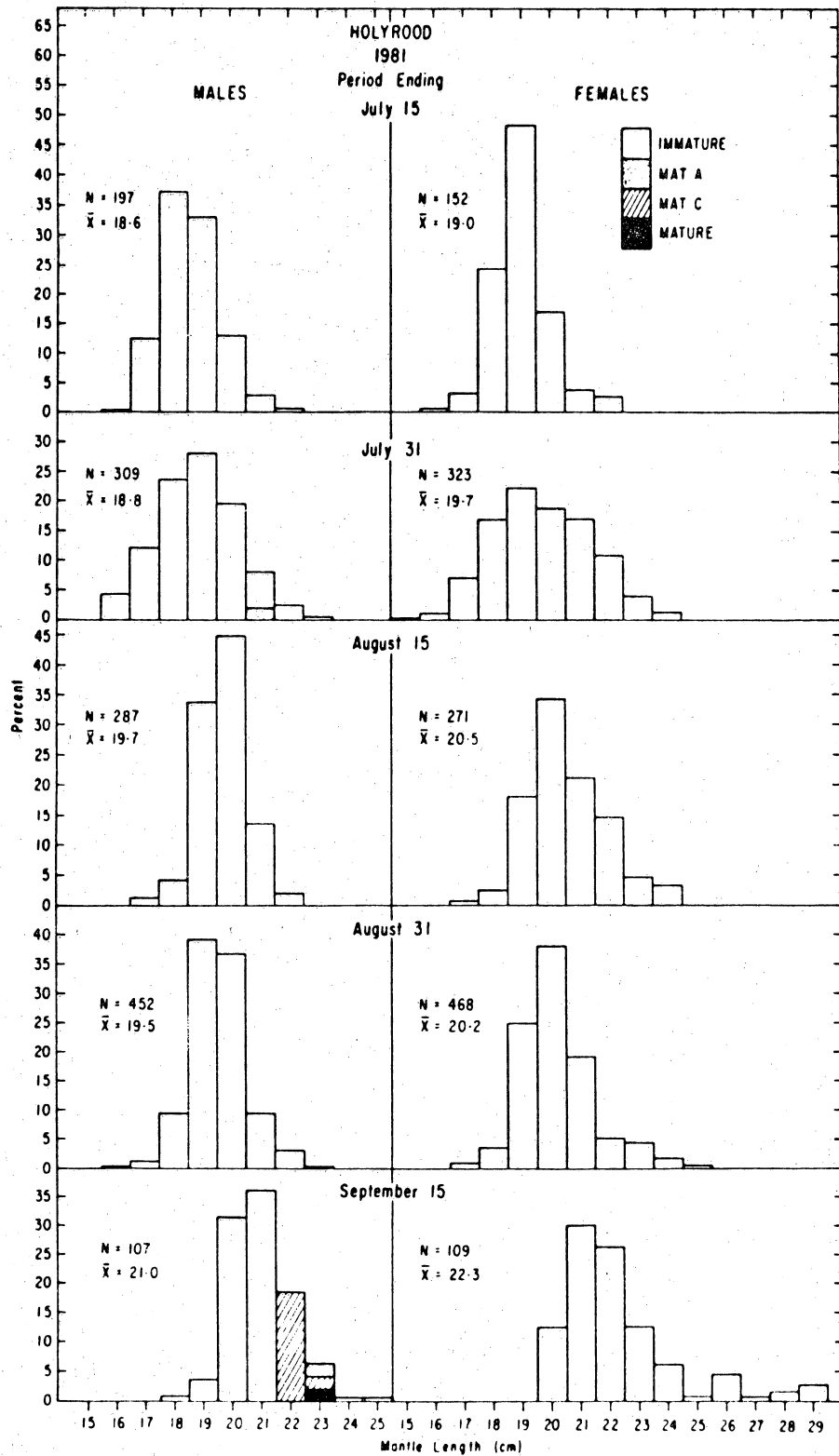


Fig. 5. Length frequencies and maturity stages by sex for bi-weekly periods in 1981 at Holyrood.

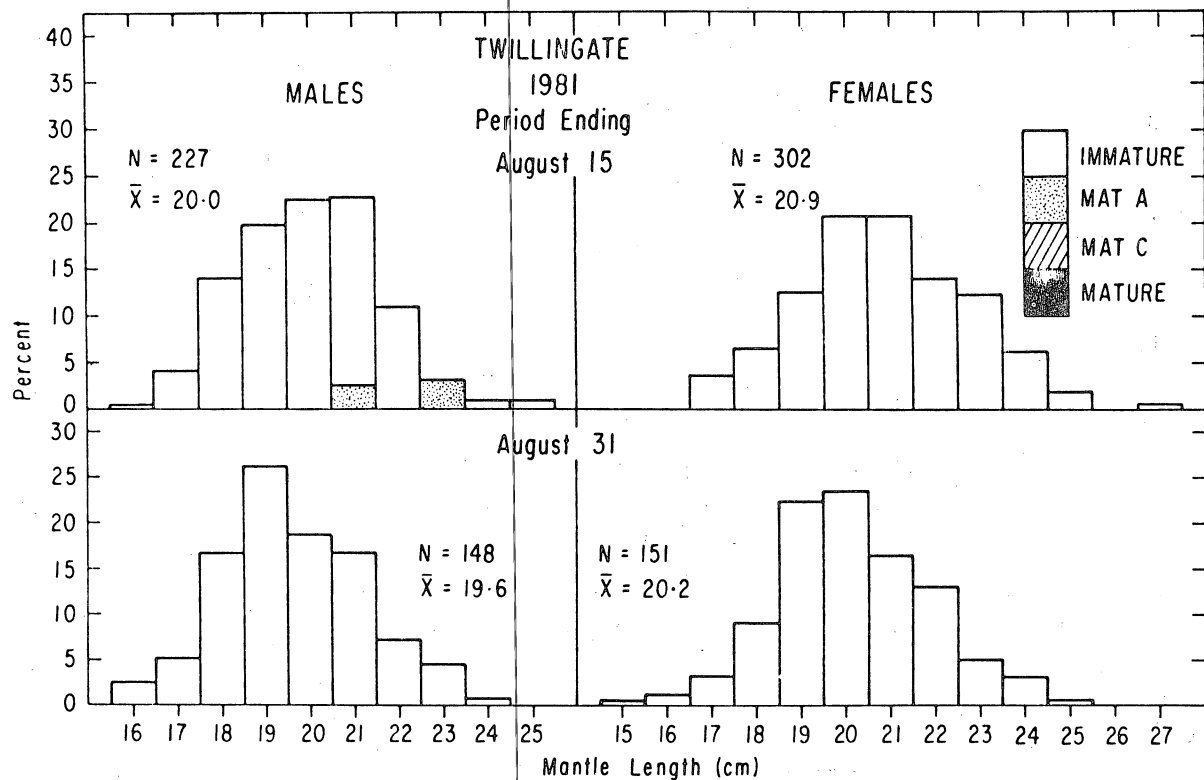


Fig. 6. Length frequencies and maturity stages by sex for bi-weekly periods in 1981 at Twillingate.

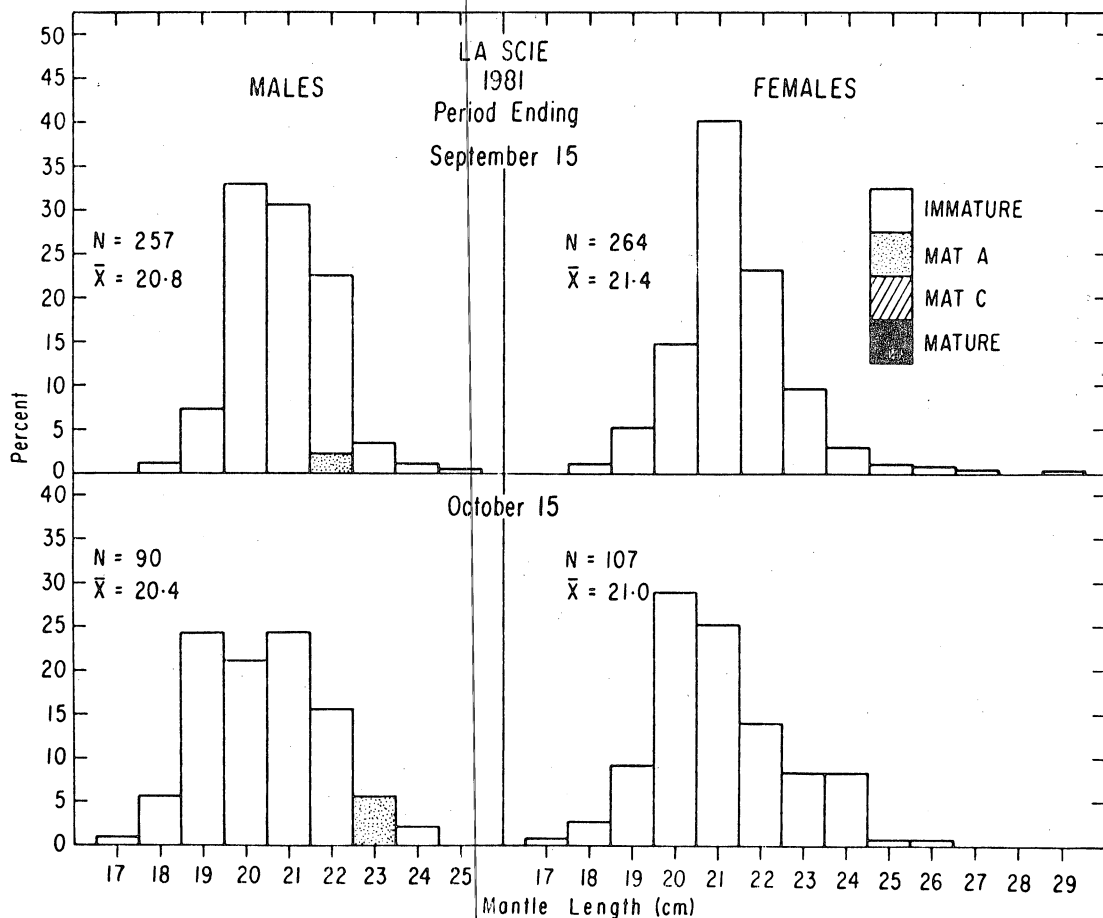


Fig. 7. Length frequencies and maturity stages by sex for bi-weekly periods in 1981 at La Scie.

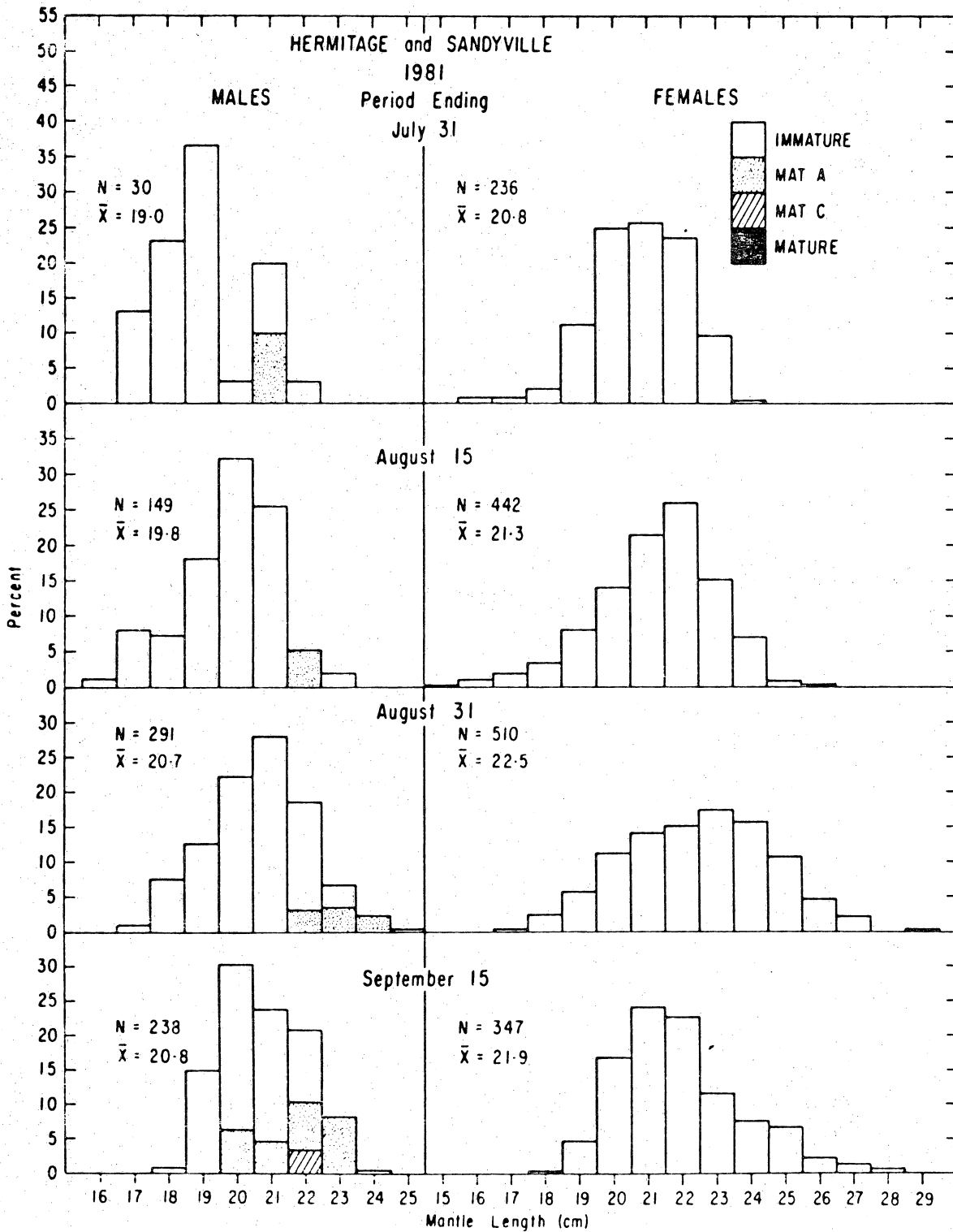


Fig. 8. Length frequencies and maturity stages by sex for bi-weekly period in 1981 at Hermitage and Sandyville.

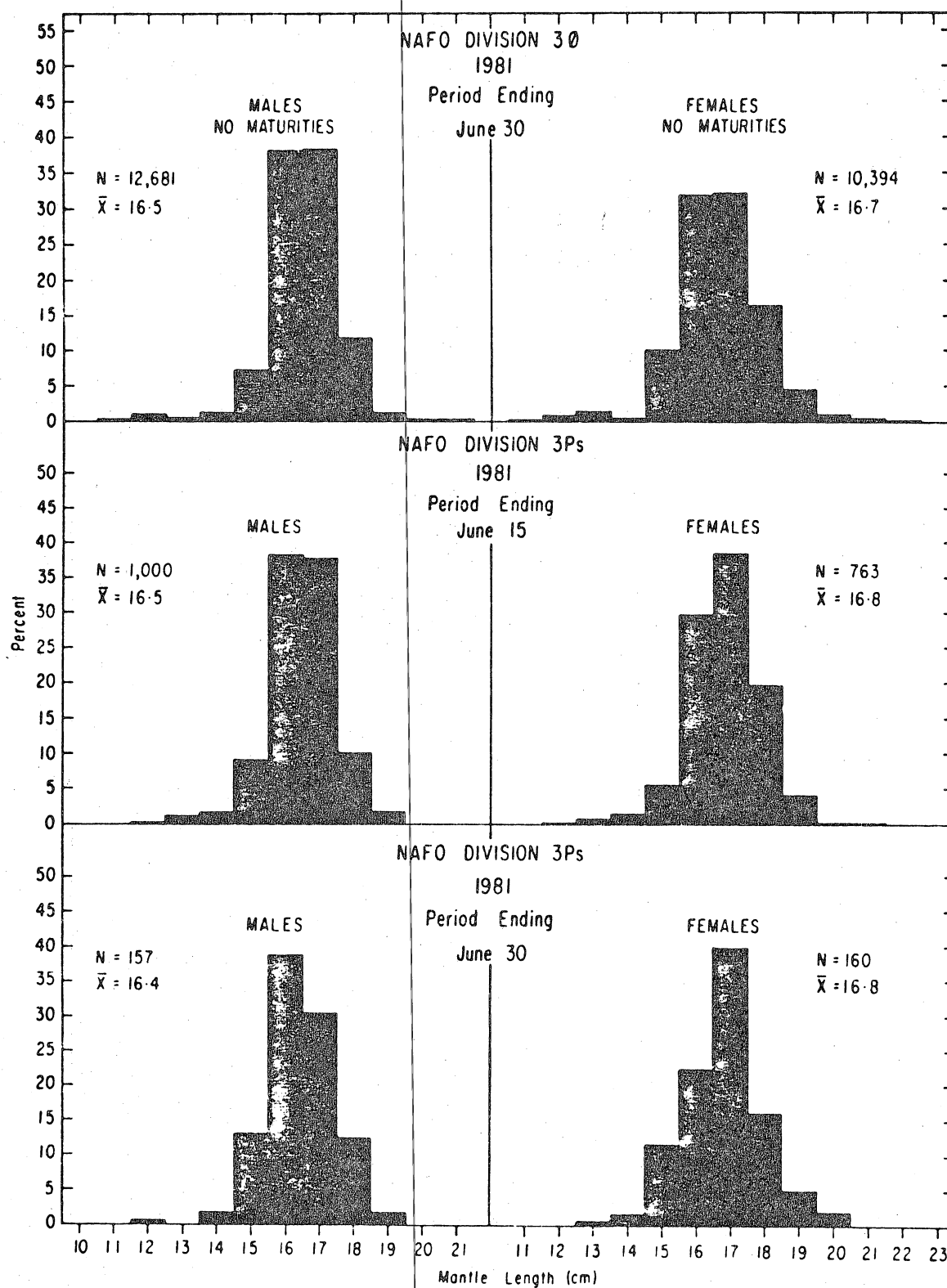


Fig. 9. Length frequencies by sex for bi-weekly period in 1981 for offshore NAFO Divisions 30 and 3Ps.

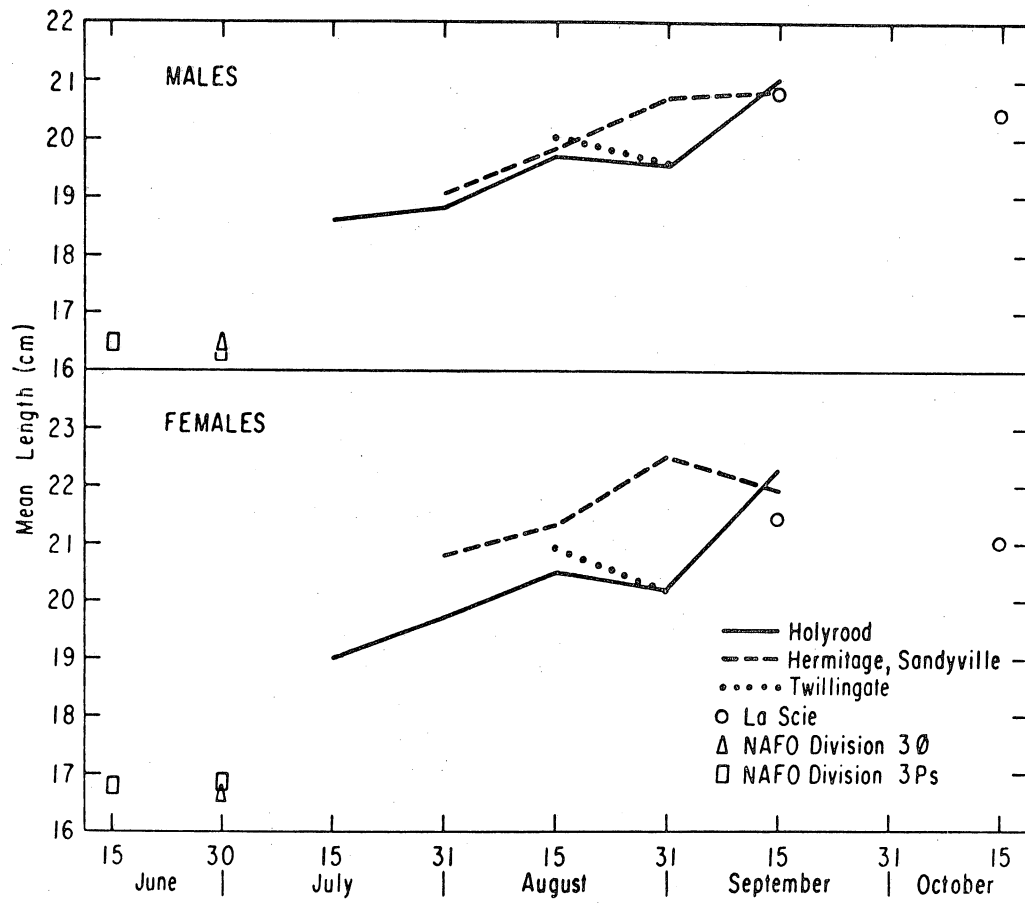


Fig. 10. Seasonal change in mean length by sex and sampling area.

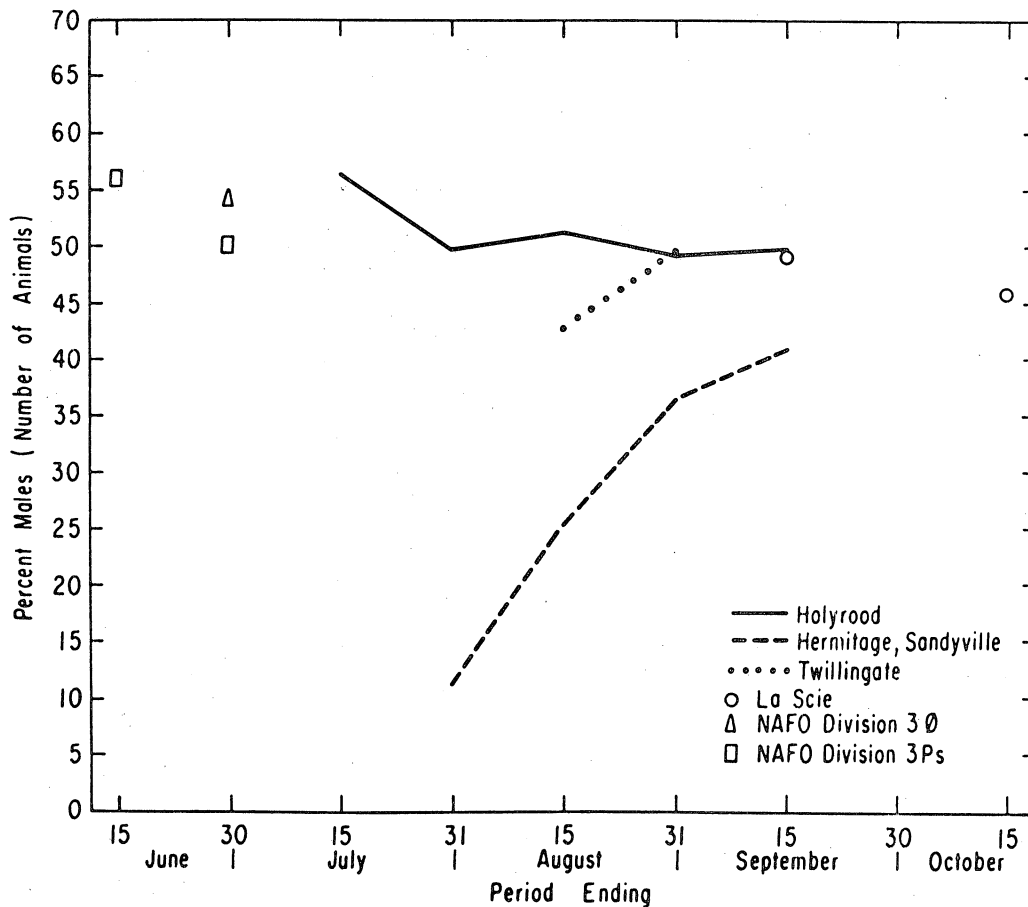


Fig. 11. Percent males over the fishing season by sampling area.

APPENDIX 1

Average Lengths and % Males and % Females for Various Inshore
and Offshore Locations for the Years 1978-1980

INSHORE	Two-week period ending											
	Jun. 31	Jul. 15	Jul. 31	Aug. 15	Aug. 31	Sept. 15	Sept. 30	Oct. 15	Oct. 31	Nov. 15	Nov. 30	Dec. 15
<u>1978 - Holyrood</u>												
Males - Total		115	292	129	205	255	257	260	293	224	188	
- Av. length		17.4	18.4	20.4	20.0	21.5	21.9	22.2	22.3	22.2	21.7	
- % males		58.1	56.9	51.6	49.0	46.7	48.7	45.4	43.1	44.3	41.5	
Females - Total		83	221	121	213	291	271	313	387	282	265	
- Av. length		17.6	19.0	21.1	21.1	22.7	23.0	23.6	23.8	23.7	23.2	
- % females		41.9	43.1	48.4	51.0	53.3	51.3	54.6	56.9	55.7	58.5	
<u>1979 - Holyrood</u>												
Males - Total		163	122	160	162	123	181	192	191		144	
- Av. length		18.2	18.5	20.4	21.4	22.6	22.9	22.7	22.5		23.1	
- % males		64.9	58.4	62.3	62.3	34.4	54.0	54.4	55.2		44.0	
Females - Total		88	87	97	98	235	154	161	155		183	
- Av. length		18.7	19.2	21.3	22.4	24.1	24.8	24.4	24.4		24.8	
- % females		35.1	41.6	37.7	37.7	65.6	46.0	45.6	44.8		56.0	
<u>1980 - Holyrood</u>												
Males - Total		180		231	260	159	163	87				
- Av. length		17.9		19.9	20.3	21.0	21.8	21.9				
- % males		74.7		69.4	57.3	43.9	31.8	21.1				
Females - Total		61		102	194	203	350	326				
- Av. length		18.6		20.8	21.6	23.5	23.9	25.0				
- % females		25.3		30.6	42.7	56.1	68.2	78.9				
<u>1978 - Herring Neck</u>												
Males - Total							65					
- Av. length							21.4					
- % males							39.4					
Females - Total							100					
- Av. length							22.7					
- % females							60.6					
<u>1980 - La Scie</u>												
Males - Total					92	110	232					
- Av. length					21.3	21.2	21.4					
- % males					38.5	44.5	39.2					
Females - Total					147	137	360					
- Av. length					22.5	22.5	22.8					
- % females					61.5	55.5	60.8					

INSHORE	Two-week period ending											
	Jun. 31	Jul. 15	Jul. 31	Aug. 15	Aug. 31	Sept. 15	Sept. 30	Oct. 15	Oct. 31	Nov. 15	Nov. 30	Dec. 15
<u>1978 - Bonavista</u>												
Males - Total			242									
- Av. length			18.4									
- % males			52.0									
Females - Total			223									
- Av. length			19.2									
- % females			48.0									
<u>1978 - St. John's (Freshwater Bay)</u>												
Males - Total				169	279	148	250	111				
- Av. length				19.8	20.6	21.5	21.7	22.5				
- % males				56.1	28.1	46.7	40.4	39.8				
Females - Total				132	715	169	369	168				
- Av. length				20.4	21.9	22.5	23.0	23.5				
- % females				43.9	71.9	53.3	59.6	60.2				
<u>1979 - St. John's (Freshwater Bay)</u>												
Males - Total	242	117										
- Av. length	18.1	18.3										
- % males	59.9	53.7										
Females - Total	162	101										
- Av. length	18.5	19.0										
- % females	40.1	46.3										
<u>1980 - Cox's Cove</u>												
Males - Total							89	111	74			
- Av. length							22.5	23.1	23.7			
- % males							37.9	35.2	33.3			
Females - Total							146	204	148			
- Av. length							24.2	24.6	25.3			
- % females							62.1	64.8	66.7			
<u>1978 - Hermitage</u>												
Males - Total			143		104		93					
- Av. length			18.0		20.4		21.0					
- % males			24.9		23.5		23.8					
Females - Total			431		339		297					
- Av. length			19.7		22.2		23.2					
- % females			75.1		76.5		76.2					
<u>1979 - Hermitage</u>												
Males - Total				117	25			94				
- Av. length				18.8	20.8			21.3				
- % males				34.2	22.1			31.8				

INSHORE	Two-week period ending											
	Jun. 30	Jul. 15	Jul. 31	Aug. 15	Aug. 31	Sept. 15	Sept. 30	Oct. 15	Oct. 31	Nov. 15	Nov. 30	Dec. 15
<u>1979 - Hermitage</u>												
Females - Total				225	88			202				
- Av. length				21.1	22.4			23.2				
- % females				65.8	77.9			68.2				
<u>1979 - Harbour Breton</u>												
Males - Total			70		37	82	43					
- Av. length			19.7		21.1	20.6	21.9					
- % males			27.8		17.8	24.3	16.7					
Females - Total			182		171	255	215					
- Av. length			20.9		22.6	22.4	24.0					
- % females			72.2		82.2	75.7	83.3					
<u>1978 - Twillingate</u>												
Males - Total			70	52	55	66	163					
- Av. length			17.3	19.8	19.1	19.4	21.4					
- % males			44.0	40.3	41.0	48.7	42.2					
Females - Total			89	77	79	175	223					
- Av. length			18.2	20.9	19.8	21.0	22.4					
- % females			56.0	59.7	59.0	51.3	57.8					
<u>1979 - Twillingate</u>												
Males - Total						250	145	88				
- Av. length						22.7	22.5	23.1				
- % males						48.4	49.2	40.6				
Females - Total						266	150	129				
- Av. length						24.4	24.4	24.8				
- % females						51.6	50.8	59.4				
<u>1980 - Twillingate</u>												
Males - Total				157	145	54		82				
- Av. length				20.0	21.1	21.8		21.9				
- % males				40.7	34.2	29.3		33.7				
Females - Total				229	279	130		161				
- Av. length				20.9	22.4	23.5		23.9				
- % females				59.3	65.8	70.7		66.3				

