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Northwest Atlantic



Fisheries Organization

Serial No. N517

NAFO SCR Doc. 82/VI/29

SCIENTIFIC COUNCIL MEETING - JUNE 1982

Update for 1981 of the Squid Illex illecebrosus Fishery in Subarea 4

by

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INTRODUCTION

Amaratunga and Roberge (1981) presented information on the international and domestic squid fishery in SA 4 between 1977 and 1980, and Amaratunga (1980) described for 1978 and 1979 some of the biological conditions of the squid during the period of their residency on the Scotian Shelf. It is the intention of this report to update these reports to include data from 1981. In addition to catch data from the FLASH information system (Roberge and Amaratunga, 1980) the international observer program (Waldron, 1979) has provided an important source of biological data as well as good sample coverage of the international squid fishery.

MATERIALS AND METHODS

Statistics compiled on the international offshore fishery were obtained from the FLASH information system (Roberge and Amaratunga, 1980). Information on the area fished, directed squid catch, squid as by-catch, and effort were extracted from FLASH for this study. Inshore statistics are comprised of sales slip data summaries. Statistics from the Canadian offshore fishery were obtained from those reported to quota management.

Standard morphometric measurements (Amaratunga and Durward, 1979) were made on random samples obtained from the international offshore fishery by international observers. Additionally, samples were obtained from squid research cruises. All samples usually constituted 100 animals.

Seasonal changes in squid length/frequencies were studied for squid growth patterns. The technique used to fit the von Bertalanffy growth curve was described by Allen (1966).

RESULTS AND DISCUSSION

The international squid fishery on the Scotian Shelf (SA 4) is subject to Canadian fisheries regulations; and as a result of the small mesh gear line (Waldron, 1979), the fishery operated in a limited area along the Shelf edge. Figures 1 and 2 show the locations where the international observers obtained samples in 1980 and 1981 respectively. Although some of these samples were obtained when squid were being caught as by-catch, the figures serve to illustrate where much of the fishery operated. The gear type reported for these samples were predominantly bottom trawl. However, in 1980 and more so in 1981, the midwater trawl and the off-bottom trawl have also been used.

It is generally accepted that squid distribution on the Shelf is widespread, while they are found in concentrations in the deep ledges. Many research surveys, particularly the annual July groundfish surveys, (Koeller, 1980; Dufour, 1979; and Scott, 1976) document on-the-Shelf mid-summer distributions. Scott (1976) considering surveys between 1970 and 1974 found squid to be widely distributed. However, their concentrations were in the central and western region in the deep water with considerable similarity from year to year. Similarly, Koehler (1980) found distribution widespread, but with high concentrations in LaHave and Emerald Basins and along the Shelf edge. Thus the fishery indeed operates in areas of major squid concentrations, with the exception of deep ledge areas on the Shelf.

1981 Fishery

A total of 13,521 t were landed offshore by the international trawlers fishing in SA 3 & 4 (Table 1), out of which 37.6 t were caught in SA 3. This represented an overall

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decrease of 58% from the 1980 fishery which caught 32,003 t. Figure 3 shows that this represents a downward trend in international catches beginning in 1980. From 1975 to 1979 there was a 135.2% increase in offshore landings. However, between 1979 and 1980 catches decreased by 28% from 44,510 t in 1979 to 32,033 in 1980. In 1980 eight foreign countries participated in the fishery while in 1981 only five countries took part: Cuba, France, Japan, Poland, and the USSR.

Of the 1981 catch, 71% came from the directed squid fishery which opened on July 1, and the balance was being landed as by-catch in other fisheries as early as the first week in May. Until the fishery opened squid was landed as by-catch by Cuba and USSR. During the first week of the fishery non-directed landings accounted for 65.70% of the total catch. By-catch remained as high as 50% or more of the directed catch until the second week in August (Week 33). In Weeks 28, 31, and 32 non-directed landings.

Directed squid landings exhibited three distinct peaks during the season (Table 1 and Fig. 4). During the second week of the fishery 940 t were landed solely by Cuba and USSR. Two additional peaks occurred during Weeks 33 and 37 (mid August and mid September) when directed catches were 1,017 t and 1,367 t respectively. These two later peaks may be attributed to the entry cf Japanese trawlers to the fishery during Week 32 and the relatively large catches they landed. During 1980 "concentrated" fishing (1,000 t/wk) occurred over a 14 week period from August 4 to November 3 (Amaratunga and Roberge, 1981). In 1981 only two small periods of concentrated fishing occurred, Weeks 33 and 37. Similarly in 1980 "intensive" fishing (1,500 t/wk) occurred from August 11 to October 20 (Amaratunga and Roberge, 1981) while a period of "intensive" fishing did not occur in 1981 (Table 1).

The pattern of effort closely resembled that of directed catch (Fig. 4). The highest catch rates occurred in the first three weeks of the fishery followed by peaks during Weeks 33 and 37. In 1980 the highest catch rates were in August and

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September (Amaratunga and Roberge, 1981). It should be noted that although directed catch decreased 66% from 28078.9 in 1980 to 9,621.8 in 1981, effort also decreased 73% from 2,638 days in 1980 to 711 days in 1981. The overall catch rate for 1981 was 13.53 t/day.

Weekly mean weight of squid, weighted according to sex ratios, were used to convert weekly directed catch in t to numbers of squid (Table 2). Weekly catch rates were calculated as number of squid landed per day (Table 2 and Fig. 5). Although weekly catch rates are slightly higher than in 1980, the pattern is similar to that obtained by Mohn (1981).

The Canadian offshore catch extended from August through to November in SA 4 (Table 3). A total of 357 t were caught, a decrease of 75% from 1980 (1,414 t). Effort during the 1981 fishery was not available. However, for comparison, the 1980 catch was removed in 108 days. Only one Canadian vessel was active in the offshore fishery.

The inshore catch (excluding Nfld.) was 599 t. This represents a decrease of 31% from 1980's catch of 872 t (Table 4).

1981 Biological Data

Length frequencies obtained from the fishery by the International Observer Program showed a relatively consistent single modal class progressing through the season. Figure 6 shows the plotted growth curve. However, reports from observers and other research surveys showed the existence of unusual modes throughout the latter part of the summer. Although these modes were not as prevalent as the major size class seen in the present data, they were significant in numbers and they ranged from very small juveniles to mature (relatively small-sized) animals (unpublished data).

The method of fitting the von Bertalanffy growth curve to length/frequency data, as in previous years (Amaratunga, 1980) was not successful in the first attempt with 1980 and 1981 international observer data. We have, however, presented the 1981 data by sex (Fig. 6) for comparison with previous data (Amaratunga, 1980). It is probable that the size and the late date of arrival on the Shelf (compared to 1978 and 1979 in Table 5) influenced the fit. Further analysis of data, particularly with regards to length frequency distributions and modal classes are necessary.

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Figure 6 also shows size frequencies of juvenile squid caught during the 1981 Atlant cruises outside the Shelf area from February to May, before squid immigration to the Shelf. The inclusion of these (somewhat scattered) points did not improve the fit of the curve.

All male maturity stages were represented in the samples studied, while only Stages 2 and 3 of the females were detected. Ogives constructed for each observed stage are projected onto the visually estimated growth curve in Figure 6. Particularly male Stages 2 and 3 and female Stage 3 are comparable to 1978 and 1979 data (Amaratunga, 1980).

The length weight relationships determined were as follows: male log weight (g) = $-3.5257 + 2.5012 \log$ length (mm) female log weight (g) = $-3.2013 + 2.3635 \log$ length (mm)

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VEEK ENDING	SQUID	SOUID CATCH (t)		DIRECTED C/E
	DIRECTED	NON-DIRECTED	(DAYS)	(t/DAY)
May 8 (19)*		0.70	_	
May 15 (20)		2.20	_	
May 22 (21)	en l'andre <mark>La</mark> rense en	1.20	1 - 1 - 1 - 1 - 2 - 1	
May 29 (22)		5.80	-	
June 5 (23)		32.72	a da 🖕 👘 🖓	
June 12 (24)		45.77	-	and a second
June 19 (25)	_	137.11		
Tune 26 (26)		204.08		_
Ju v 3 (27)	and the provide <u>a</u> for the providence of the second s	348,17	- 1	<u> </u>
Tu v 10 (28)	599.61	1,148,46	24	24.98
Tulv 17 (29)	940.81	524.30	42	22.40
Tu v 24 (30)	770.12	487.20	40	19.25
$T_{11}V_{31} (31)$	300.52	494.66	18	16.70
Aug 7 (32)	252.95	299.60	22	11.50
Aug 14 (33)	1,016,89	100.26	52	19.56
Aug 21 (34)	892.42	13.49	51	17.50
Aug 28 (35)	540.89	9.80	43	12.56
Sept 4 (36)	806.50	에 다 나는 그는 것이 같아.	69	11.69
Sept 11 (37)	1,367.08		79	17.30
Sept 18 (38)	895.80	30.14	67	13.37
Sept 25 (39)	587.11	3.20	66	8.94
Oct 2 (40)	245.08	10.27	53	4.62
Oct 9 (41)	195.28	0.20	50	3.91
Oct 16 (42)	158.54		26	6.10
Oct 23 (43)	44.24	e in teacher 💶 die die	5	8,85
Oct 30 (44)	5.11	0.22	3	1.70
Nov 6 (45)	2.83		1	2.83
FOTAL	9,621.78	3,899.55	711	13.53

TABLE 1. WEEKLY INTERNATIONAL CATCH STATISTICS FOR SOUID (ILLEX ILLECEBROSUS) IN SUBAREAS 3 & 4 AS REPORTED TO FLASH FOR 1981.

*Numbers in brackets refer to consecutive week in the year.

in 1981.	Ln (SQUID, LANDED PER DAY)	11 11022033495 11022033495 11022059493 110224033495 110224033495 110224933 110224933 1102249 1102249 110249 1100000000000000000000000000000000000
ected Fishery	NO. OF SQUID LANDED PER DAY (104)	49 69 69 69 60 60 60 60 60 60 60 60 60 60
ternational Dir	NO. OF SOUID LANDED PER WEEK (10,63)	
ved in the In	ESTIMATED MEAN WT (G) OF SQUID	172. 192. 174. 174. 174. 174. 174. 174. 174. 174
Illex Remo	EF FORT (DAXS.)	<u>, , , , , , , , , , , , , , , , , , , </u>
rimated Number of	DIRECTED CATCH (t)	н 1 1 1 1 1 1 1 1 1 1 1 1 1
TABLE 2. Est	DATE OF WEEK ENDING WEEK NUMBER	July 10 (28) July 17 (29) July 24 (30) July 31 (31) Aug 14 (30) Aug 21 (32) Aug 23 (33) Aug 28 (35) Sept 4 (35) Sept 11 (37) Sept 13 (37) Sept 25 (39) Oct 2 (40) Oct 2 (44) Nov 6 (45)

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Month		Squid Directed	Catch (t) Non-Directed
			••••
August		70	
September		114	-
October		163	-
November	· · ·	10	
TOTAL		357	

Canadian offshore squid (Illex illecebrosus catch for 1981 (SA 4). TABLE 3.

Provisional nominal inshore squid catch in the Maritimes (excluding Newfoundland) - 1981. TABLE 4.

	Month	Catch (t)	
	June	10.0	
	July	37.0	
	August	363.4	
	September	177.3	· · · · · · · · · · · · · · · · · · ·
	October	11.8	
TOTAL		599.5	

TABLE 5. Mean squid length at arrival on Shelf.

		Mantle	Length (mm)
Year		Male	Female
			<u>, </u>
1978	145.	29 (17-19)*	148.86 (17-19)
1979	134.	16 (19-21)	140.25 (19-21)
1980	155.	56 (20-22)	164.40 (20-22)
1981	140.	55 (20-22)	149.68 (20-22)

* Numbers in brackets refer to consecutive week within year. Means are obtained by averaging first three weeks of data.

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SQUID CATCHS - INT OBS 1980

Figure 1. Locations sampled by international observers during 1980 squid fishery.



SQUID CATCHS - INT OBS 1981



Fig. 3. Annual catches of *Illex illecebrosus* by the international fishery in SA 4.



Fig. 4. Directed and non-directed squid catches and effort as reported to FLASH for 1981 for Subareas 3 and 4.



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Fig. 5. Natural log of catch per effort by week. Catch per effort is in units of numbers of animals \times 10⁴ landed per day.



Fig. 6. 1981 growth data for male and female *Illex illecebrosus*. Points represent mean lengths of squid by week.