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Preliminary update of *Illex illecebrosus* Morphometrics

in Subarea 4 for 1980

by

Tissa Amaratunga

Fisheries and Oceans Canada
Resource Branch
Invertebrates and Marine Plants Division
P.O. Box 550, Halifax, N.S. B3J 2S7

INTRODUCTION

It is generally accepted that *Illex illecebrosus* found in SA4 live for approximately one year, starting from a single protracted spawning period in late winter (Amaratunga, 1980a; Squires, 1967). In spring recruits immigrate onto the Scotian Shelf presumably from adjacent open ocean water masses (Fedulov and Amaratunga, 1981). Their summer residency on shelf fishing grounds end in late fall, when sexually maturing squid emigrate to unknown spawning grounds. Key growth and maturation data required for elucidating this life cycle were presented for 1977-1979 (Amaratunga, 1980a). This report updates these with 1980 data and considers sizes and maturation conditions at immigration to the shelf and recruitment.

MATERIALS AND METHODS

Standard morphometric analyses (Amaratunga and Durward, 1979) were conducted in a sampling program similar to previous years (Amaratunga, 1980a). Length frequency and maturation data available for this report were taken from squid (representing a major portion of the total data base available for 1980) throughout their residency on the shelf. The von Bertalanffy growth equation $L_t = L (1 - e^{-K(t-t_0)})$ was fitted,

¹ This paper was initially presented as a working paper to the June 1981 Meeting of the Scientific Council.

and maturation patterns were analyzed in the same way as were the 1977-1979 data (Amaratunga, 1980a).

Stomach fullness index was used to obtain Illex seasonal patterns of feeding (Amaratunga, 1980b), while gut contents separated into the major components (crustacea, fish and squid (Amaratunga, 1980b)) were used to determine seasonal predation patterns.

Length/weight relationships were determined for 1977-1980 data.

RESULTS AND DISCUSSIONS

Table 1 gives weekly mean lengths (N.B. data base was not complete at time of this analysis) for males and females through 31-03-80 to 10-11-80, and the seasonal patterns are depicted in Figure 1. Fitted growth curve parameters are presented along with those of 1977-1979 (from Amaratunga, 1980) in Table 2.

Estimated male L_{∞} for 1980 was considerably larger than previous years - larger by 16.3 mm than the previous largest estimate of 1978. The female estimate, however, was 17.6 mm smaller than the 1978. Weekly growth rates (K) of 1980 were comparable to the 1978 estimation, while estimated times of birth (t_0) were two to four weeks later than in 1978.

Figure 2 shows male and female maturation patterns for 1980, by plotting weekly cumulative percentage of each maturity stage. The following summary shows approximate dates when 50% of the squid reached each maturity stage:

Stage	Approximate date	
	Male	Female
1	June 30-July 7	July 14-July 21
2	Aug. 18-Aug. 25	Aug. 18-Aug. 25
3	Sept. 15-Sept. 22	Sept. 15-Sept. 22

Stomach fullness was used as an indication of "recently fed" animals (Amaratunga, 1980b). The same index was used to determine seasonal feeding patterns as shown in Figure 3. Weekly percentages of stomach fullness show general trends of larger percentage of squid having recently fed in May than in June and July. There is a slight increase in late August and early September, followed by another decline until early October; a similar increase and decrease is seen through late October to late November.

Food preference patterns (Figure 4) are similar to previous years (Amaratunga, 1980b), with crustacea forming the main component of the diet, especially early in the season (May to June). There is a subsequent general decrease in crustacean component as squid (cannibalism) component increases. Fish component generally tended to have less importance, although percentages in June and July were relatively low.

Length/weight relationships were determined by plotting natural log of mean weekly mantle lengths (L in mm) against natural log of mean weekly weights (W in gm). Relationships for 1977-1979 were developed for each sex;

$$\begin{array}{ll} 1977 & \text{male} \quad \log W = -6.1744 + 3.6400 \log L \\ & \text{female} \log W = -4.2440 + 2.8030 \log L \end{array}$$

$$\begin{array}{ll} 1978 & \text{male} \quad \log W = -5.0529 + 3.1602 \log L \\ & \text{female} \log W = -4.9375 + 3.1001 \log L \end{array}$$

$$\begin{array}{ll} 1979 & \text{male} \quad \log W = -5.4209 + 3.3185 \log L \\ & \text{female} \log W = -4.8850 + 3.0730 \log L \end{array}$$

and sexes were combined for 1980;

$$\text{combined} \log W = -4.2938 + 2.8196 \log L.$$

In order to interpret growth data and weight relationships developed above, key dates in relation to immigration of Illex onto the shelf and recruitment to the fishery (Fedulov and Amaratunga, 1981) are considered in Table 3.

The type A (Table 3), where squid were first observed on the Scotian Shelf refers to when any squid were reported by offshore commercial vessels. International observers were usually able to obtain samples during the course of that week in each year.

REFERENCES

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- Fedulov and Amaratunga, T. 1981. On Dates of short-finned squid, Illex illecebrosus, immigration onto the Scotian Shelf. NAFO SCR Doc. 81/VI/32, Ser. No. N311.
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Table 1. Weekly mean mantle lengths of Illex from 1980 international fishery in SA 4. (preliminary data)

<u>Date</u>	<u>Week No.</u>	<u>Mean length of males (mm)</u>	<u>Mean length of females (mm)</u>
Apr 28	(18)	136.4	133.0
May 05	(19)	-	-
12	(20)	145.4	151.3
19	(21)	158.5	161.2
26	(22)	152.6	164.1
Jun 02	(23)	151.2	152.2
09	(24)	161.5	167.0
16	(25)	153.6	157.4
23	(26)	172.7	170.0
30	(27)	169.7	175.5
Jul 07	(28)	172.0	180.9
14	(29)	166.4	176.3
21	(30)	166.0	173.7
28	(31)	195.0	201.6
Aug 04	(32)	176.8	184.2
11	(33)	206.1	211.7
18	(34)	211.3	220.4
25	(35)	200.0	208.5
Sep 01	(36)	223.6	235.0
08	(37)	221.8	225.7
15	(38)	221.5	233.5
22	(39)	226.3	242.7
29	(40)	223.4	232.6
Oct 06	(41)	221.4	248.2
13	(42)	228.5	246.0
20	(43)	227.2	248.7
27	(44)	226.8	246.9
Nov 03	(45)	228.8	243.2
10	(46)	206.7	216.1

Table 2. Growth curve parameters for 1977-1980 from the fitted curves of the equation $L_t = L_{\infty}(1 - e^{-Kt})$. (1977-1979 data are from Amaratunga, 1980).

	1977		1978		1979		1980 *	
	M	F	M	F	M	F	M	F
L_{∞} (mm)	231.9	293.2	278.0	346.9	247.9	293.9	294.3	329.3
t (in weeks)	+9.4	+5.4	-0.1	-2.5	+9.2	+8.2	+1.7	+2.2
t (date)	08.03.77	08.02.77	31.12.77	14.12.77	06.03.79	26.02.79	11.01.80	15.01.80
K	0.106	0.052	0.036	0.025	0.074	0.056	0.035	0.031

* Preliminary data, not accounting for all samples studied. Non-linear regression method from an APL program was applied as opposed to transformed data used in previous years. This method is likely to over-estimate L_{∞} , relative to the previous method.

Table 3. Mean lengths and mean weights of unsexed *Illex* when: (A) they were first observed on the Scotian Shelf, (B) weekly catches greater than 4 MT were reported by the international fishery, and (C) the directed fishery opened in SA 4.

<u>Year</u>	<u>Date (week no.)</u>	<u>Unsexed mean length (mm)</u>	<u>Unsexed mean weight (g)</u>
1977:			
(A)	03.04.77 (14)	100-115*	17.9 - 27.7
(B)	02.05.77 (17)	129.6	40.2
(C)	No opening date	-	-
1978:			
(A)	23.04.78 (17)	135.9	48.1
(B)	07.05.78 (19)	152.7	69.3
(C)	15.06.78 (24-25)	160.1	80.4
1979:			
(A)	06.05.79 (19)	136.4	47.0
(B)	20.05.79 (21)	144.1	55.7
(C)	01.07.79 (27)	191.3	137.8
1980:			
(A)	28.04.80 (18)	134.7	51.3
(B)	26.05.80 (22)	158.3	80.9
(C)	01.07.80 (27-28)	172.6	103.2

*Only length range was available for this date in 1977.

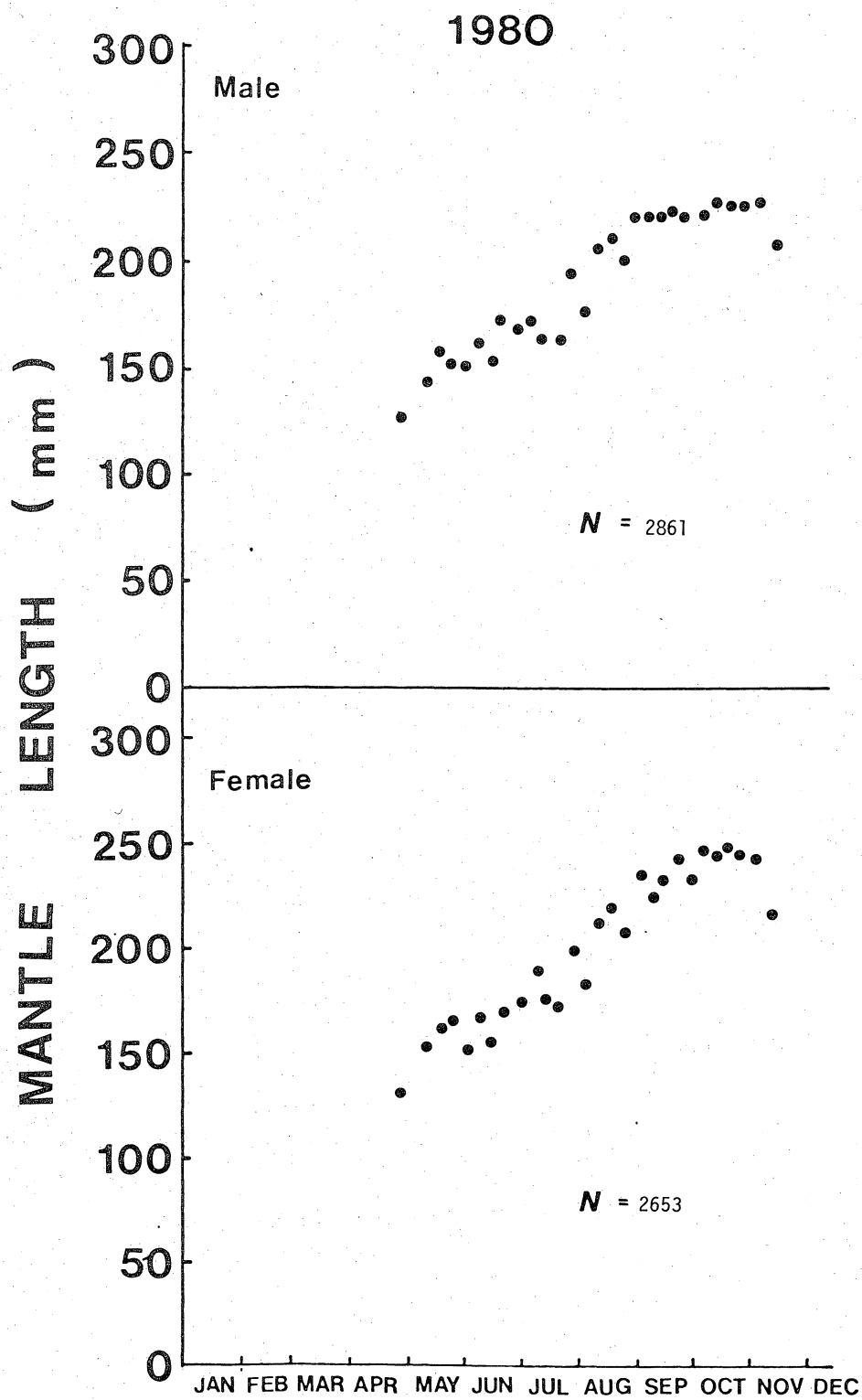


Figure 1. Male and female growth patterns from preliminary length frequency data from 1980.

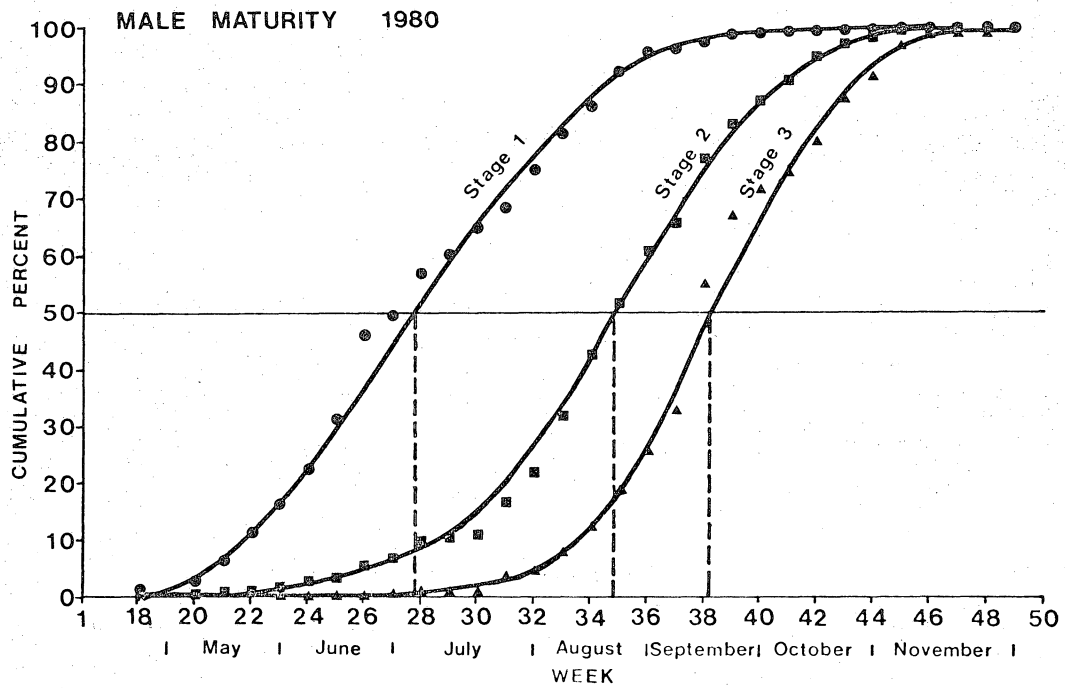
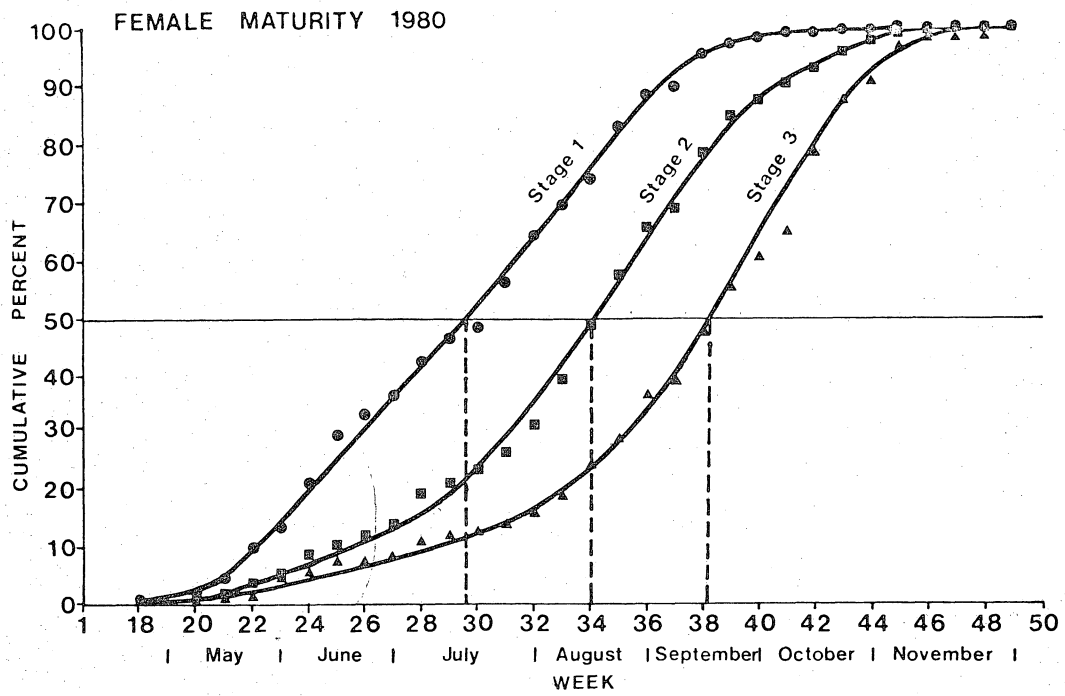


Figure 2. Weekly maturity stage data from 1980 plotted into ogives to show dates at which 50% of the squid reached each stage.

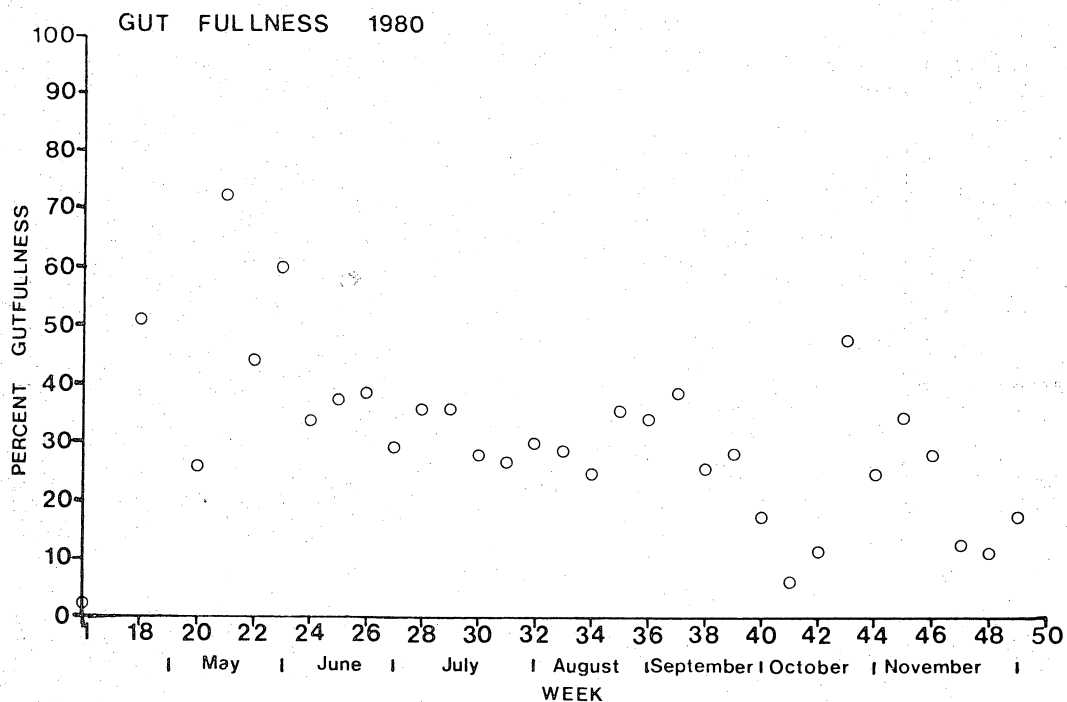


Figure 3. Weekly percentages of "recently fed" squid plotted through the season showing patterns of feeding activity.

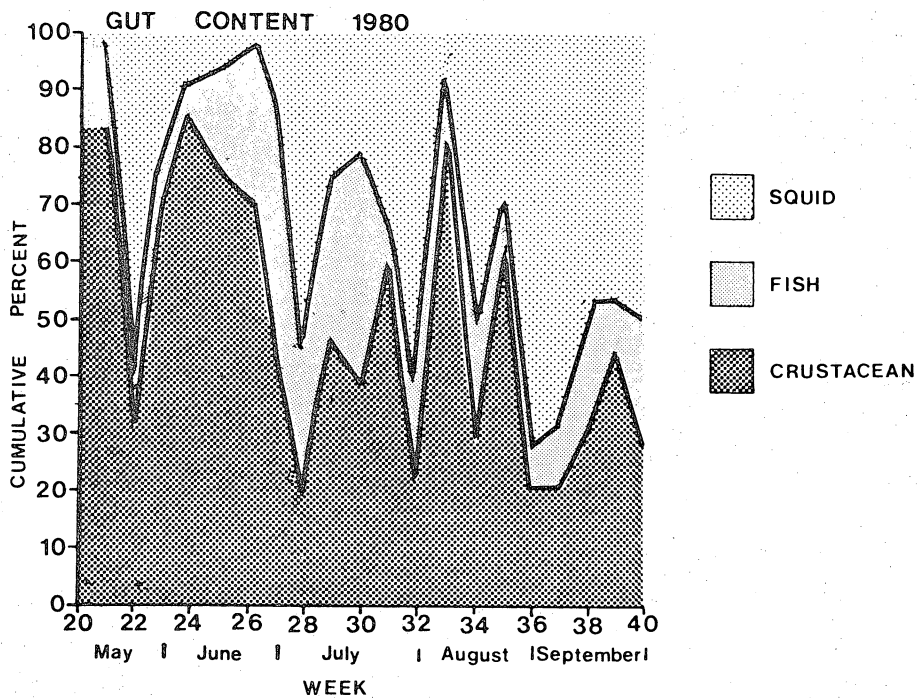


Figure 4. Percent frequency of occurrence of three main gut content components plotted through the season (data after 40 wk are not available at the time this paper was prepared).