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REMARKS ON THE AGE AND GROWTH OF THE SQUID *Illex illecebrosus* (LE SUER, 1821)

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ABSTRACT:

This work presents the observations concerning the age and growth of the squid Illex caught in July-August 1979 in the Northwest Atlantic. There are calculated some elements of correlation between the hypothetic age of the squid, length of mantle and statolith, by length and sex classes.

The studies on the interpretation of age reading of squids have recently intensified, despite of the difficulties in collecting and preparing the statoliths samples.

The rings noted on the squid statoliths seem to really represent growing rings and have been made evident by various research workers (1, 3, 4, 6).

The main effort is actually directed either to the interpretation of the age reading on statoliths and to the establishing of some relations between the age expressed by daily rings and various body components such as the mantle lengths, pen length, beak marking length, statolith length etc. Thus SPRATT (7) has given an interpretation of the rings on the statolith of Loligo opalescens BERRY, collected in Monterey Bay, California, and

having daily and monthly growing markings.The same interpretation was given by LIPINSKI (4), who has also tried to read the age of squids on the basis of some complete studies on some species such as Illex illecebrosus, Illex argentinus, Martiala hyadesi, Ommastrephes bartrami and Loligo pealei,showing there are no significant differencies between the growing rings by species and sexes.

There is still a beginning stage for the technique of collecting statoliths as well as the technique of preparing and reading the statoliths.

This work belongs to the general efforts of determining the cephalopods age, trying to make a contribution to the clarification of some aspects concerning the age and growth of the squid Illex illecebrosus.

MATERIAL AND METHOD

The specimens of Illex which were analysed have been collected in the squid fishery in the Northwest Atlantic, within the division 4W, between the 1st of July and the 7th of August 1979. Most of hauls were carried out South to Sable Island, West to the canions Verril and Dawson,at depths between 135 and 190 m. The pelagic trawl was used, having the mesh size 2 a = 60 mm.

At the beginning of the studies, the frequencies by length and weight classes were aimed at, for which samples were taken from all the hauls with catch exceeding 1000 kgs.

The measurements and centralisations of the mantle lengths were made at next half-centimeter and the total body weights - in grams.

In view of establishing some elements of correlation between the distribution of the frequency by length classes and hypothetic age of the analysed squid individuals, the statolith have been collected from the mean length classes,for each week of activity, by sexes and maturation stages (Fig. 1).

They were collected under a binocular microscope with an increasing power of 6ox, by cutting the ventral side of the cartilaginous part of the head in thin slices. After extraction the statoliths have been introduced and kept in paper envelopes.

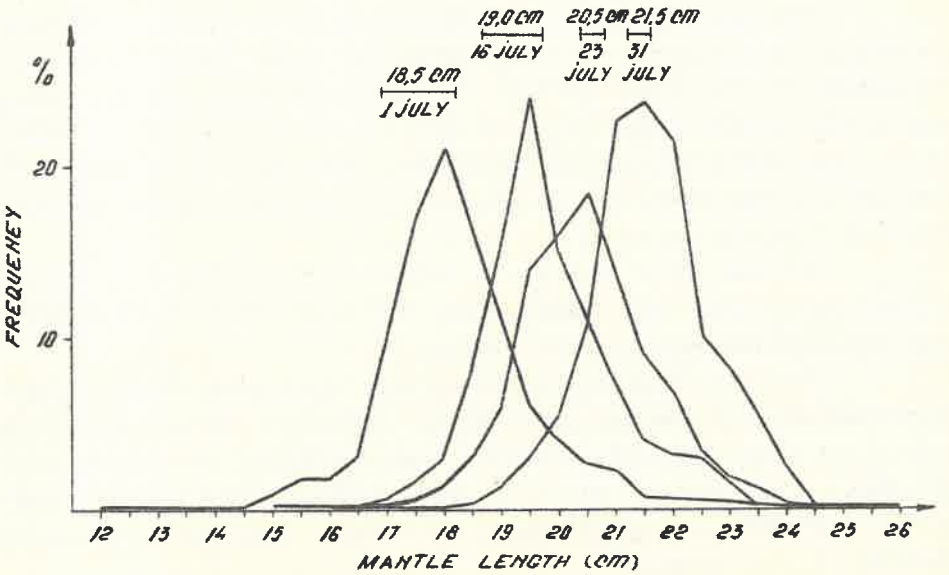

Fig. 1 - The age sample collecting, by weeks, in accordance with the maximum mantle length frequency

In order to obtain the preparates, the statoliths were fixed on a microscope blade in Canada balsam and then polished under the binocular, on both sides, first on glass papier and then on mat glass, until they became transparent.

The growing rings were read on the microscope having an increasing power of 39ox. The statolith length was determined with ocular micrometer, measuring it on the longest distance from the nucleus up to its dorsal edge. Two readings were made on an average.

The relation between the mantle length and number of rings and statolith length respectively have been obtained by the least squares method:

$$L = a.l^b$$

were L = statolith length or ring number
l = mantle length
a,b = coefficients.

RESULTS

The squid Illex statoliths reveals the presence of some concentric alternative zones, white and dark, which are better delimited on the edge of the statolith. A dark coloured ring limits the nucleus zone, which is much more transparent and where it is more difficult to see the belts. Sometimes these belts are very well marked even in the nucleus region, which always remains very well limited as well.

It has been noted the female statoliths have better limited belts than the males ones, which is possible to have a less intense metabolism in all stages.

Besides these belts, there are also some wider zones, separated by dark belts, immediately followed by a transparent zone a bit wider than the ordinary ones.According to some authors (7),these zones are delimited by monthly or weekly growing rings. On the statoliths of Illex which have been examined these zones include 12 - 15 rings.

For each specimen of the analysed sample,the total mean number of rings increased proportionally with the mantle length, thus corroborating the hypothesis of LIPINSKI (4) and HURLEY (2), according to which the rings represent the body daily growing. This being the situation,the difference between the first and the second sample is 16 days and the number of rings is 18. A non-significant difference is noted between the other samples too, respectively between the number of rings and collecting days, which is supporting the idea that there are rings indicating the daily growing.

Assuming that these rings really represent daily growing and the mean number of rings at the beginning of June was of 121 for females, one can estimate that the spawning took place at the end of February and beginning of March. The same spawning moment can be fixed for the females examined in August which, having a total mean number of 155 day-rings, belong to the same generation (Table 1).

Although the number of rings at the beginning and end of the observation period is different by sexes, there are almost the same differencies for males (Table 1). The relation between

the number of rings and days can be accepted in this case too, the males belonging to the same population, as it can be seen when analysing the length distribution (Fig.2).

Table 1

The dorsal mantle length and body weight by sexes and number of rings on the examined statoliths for each sample

Date	Females			Males	
	L_m (cm)	Variation amplitude of ring number	L_s (cm)	Variation amplitude of ring number	L_s (cm)
1st July	18.0	97 - 180 / 121	0.46	74 - 120 / 94	0.45
16th July	19.0	118 - 153 / 139	0.57	111 - 135 / 114	0.50
23rd July	20.5	137 - 203 / 147	0.60	147 - 187 / 119	0.58
31st July - 9th August	21.5	119 - 174 / 155	0.70	106 - 192 / 138	0.53

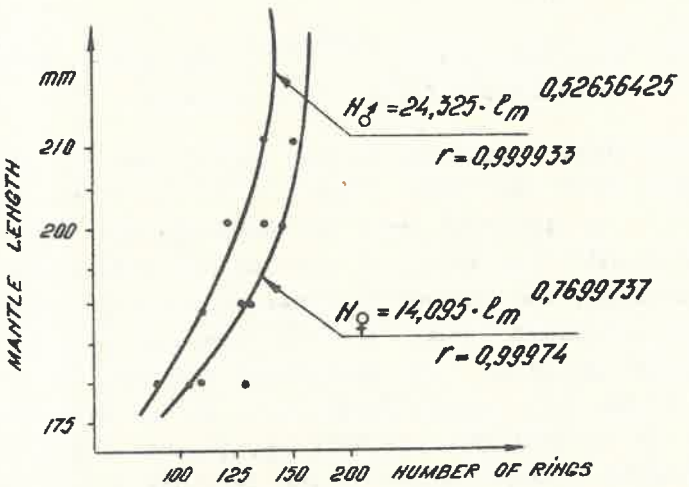

Fig.2 - The ring numbers - mantle length relation, by sexes for the squid Illex illecebrosus

On the basis of the least squares method, there were calculated, by sexes, the equations relating mantle length/ring

number/day (1 and 2) and mantle length/statolith length (3and 4).

The results obtained in the relations mantle length/ring number/day were as follows:

(1) $L_N = 14.095 \times l_m^{0.7699737}$, for females,

where:

L_N = number of rings

l_m = mantle length in cm; with a correlation coefficient r = 0.99974

and

(2) $L_N = 24.325 \times l_m^{0.521656125}$, for males, with a correlation coefficient r = 0.999933.

The relation mantle length/statolith length (Fig.3) was determined as follows:

(3) $L_S = 0.0080613 \times l_m^{0.783046}$, for females,

where:

L_S = statolith length in mm;

l_m = mantle length in mm; with a correlation coefficient r = 0.995279

and

(4) $L_S = 0.000639805 \times l_m^{1.27824861}$, for males, with a correlation coefficient r = 0.982329.

From these equations, it is easy to see the difference between sexes, which was also noted in the direct readings. The equation (1) is different from LIPINSKI (5) who got for the coefficients a and b the values of 2.9 and 0.8 respectively.

As shown, the number of rings read for the squid Illex caught on the continental shelf of Nova Scotia in June is 121 for a mantle length of 18 mm and approximatively 155 for a mantle length of 21.5 mm for August. These data are in accordance with the theory of SPRATT (7), LIPINSKI (4, 5) and HURLEY (2), who recommend a daily interpretation of the markings on the statolith.

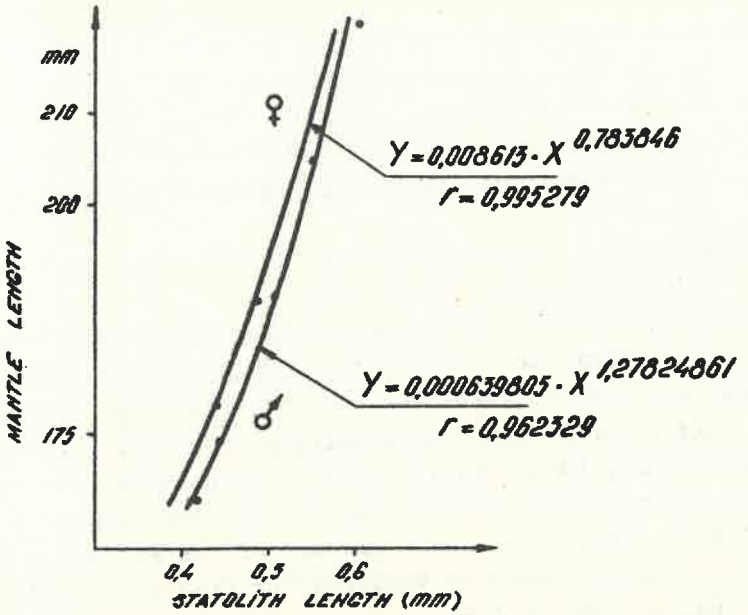

Fig.3 - The statolith length-mantle length relation, by sexes for the squid Illex illecebrosus

Although our results support this theory, we think the problem of interpreting age reading on statoliths must be further tested by deeper studies on the feeding and the degree of using the food, on the metabolism and chemical structure of squid statoliths.

CONCLUSIONS

- The interpretation of the statolith markings as daily rings agree with the SQUIRES hypothesis (8) concerning the 12 months life cycle of squid Illex.

- There are no significant differences between sexes for mantle length and statolith length of the squid Illex, as well as between the number of rings on the statolith and mantle length.

- Supposing one ring=one day, the specimens examined belonging to the Northwestern Atlantic population of Illex, July - August, had the age of five months.

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