

RELATIONSHIP BETWEEN NIDAMENTAL GLAND LENGHT  
AND MANTLE LENGHT IN FEMALE *Ommastrephes*  
*bartramii* (LE SUER, 1821) FROM THE SOUTHWESTERN  
AREA OF THE ATLANTIC OCEAN

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ABSTRACT:

The paper presents the results of the observation on the maturation stage in the species *Ommastrephes bartramii* caught in January-April, 1976, in the southwestern area of the Atlantic Ocean, on the high seas. The ratio of nidamental gland length to mantle length was determined by measurements, as well as the relationship between these parameters at different maturation stages. The maturation ratio ( $m$ ) is a significant index for a more precise determination stage in female *Ommastrephes bartramii* both in field and laboratory conditions.

Research work concerning the knowledge of the stages and conditions of maturation in squids has been lately intensified and different methods have been utilized for describing gonad maturation. The maturation is especially determined as a function of the body weight and length and the colour of the gonads and accessory glands (1, 2, 4) or on the basis of hystological analysis of the ovaries (2). Hystological analyses are the most adequate methods in laboratory determination of the maturation stage, but they cannot be applied in sea work conditions.

It is known that in squid females there is a close

interdependence between gonadal development and growth of nidamental glands, which reach a maximum at the spawning time. In this respect, this paper presents the characteristics of gonadal maturation stages in female Ommastrephes bartramii (LE SUER 1821) from the Southwestern area of the Atlantic Ocean, using the ratio of nidamental gland to mantle length.

#### MATERIAL AND METHOD

During the period of January-April 1978, Ommastrephes bartramii appeared in all light stations and trawlings on the high seas in the Atlantic Ocean between 30°-45°S and 40°-58°45'W, showing a uniform distribution all over the area.

The fishing was carried out with a pelagic trawl and with angling lines, at light stations; trawling was performed usually at night, at water surface, at the ship's speed of 3.6-3.8K. The water temperature ranged between 11° and 32°C and the winds blew from the SW and NW sectors with a force of 2°-3° Beaufort.

The results concerning the characteristics of the maturation stage in Ommastrephes bartramii are based on the analysis of 943 females, having utilized the I-V maturation scale of gonads. Length measurements were performed with a drawing compass for both mantle and nidamental gland lengths with a precision of 1 mm; centralizations were operated by approximation of 1 cm for mantle length and 1 mm for nidamental gland length.

For calculation of the nidamental gland length / mantle length relationship, the root mean square method was used, starting from the linear equation

$$L_{ng} = aL_m + b$$

where:  $L_{ng}$  = nidamental gland length, in mm;  
 $L_m$  = mantle length, in cm, and  
a and b are coefficients.

The small number of female Ommastrephes bartramii (22 specimens) with the gonads in stage IV has not permitted drawing of a regression curve for this stage.

In these conditions the correlation curves were drawn for 921 specimens with the gonads in stages I to III inclusively.

## RESULTS

The analysed individuals showed a rather wide range of gonad maturation, including stages from I to IV for mantle lengths between 7 and 48 cm and nidamental gland lengths between 0.7 and 7.2 cm. (Table 1).

Table 1  
Characteristics of the maturation stages  
in female Ommastrephes bartramii

Maturation stage	$L_{ng}$ (mm)	$L_{ng}/L_m$	External morphological feature
I	3 - 17	$m \leq 0.07$	NG thin and transparent.
II	16 - 36	$0.07 \leq m \leq 0.143$	NG transparent to translucent. Ovary - granular.
III	23 - 48	$0.143 \leq m \leq 0.160$	NG translucent to opaque.
IV	35 - 72	$0.160 \leq m \leq 0.20$	NG white. Oviducts formed.

In stage I of gonad maturation, the nidamental gland length ranged between 3 and 17 mm, with an average value of 9.67 mm for mantle lengths between 7 and 29 cm (average value: 17.16). The ratio ( $m$ ) of nidamental gland length to mantle length was smaller than or equal to 0.07.

In stage II, the nidamental gland length varied between 16 and 36 mm, with an average of 20.28 mm and the mantle length between 23 and 48 mm, with an average of 25.08 cm (Fig.1). The ratio ( $m$ ) varied between 0.07 and 0.143.

The nidamental gland length in stage III ranged within 23 - 48 mm, with an average of 32.82 mm, while mantle length varied between 25 and 41 cm, with an average of 31.85 cm. The ratio ( $m$ ) of nidamental gland length to mantle length ranged between 0.143 and 0.160.

With the 22 specimens in stage IV, the nidamental gland length varied between 35 and 72 mm, with an average of 43.81 mm, and the mantle length, between 33 and 48 cm, with an average of 37.23 cm (Fig.1). The ratio ( $m$ ) varied between 0.16 and 0.20.

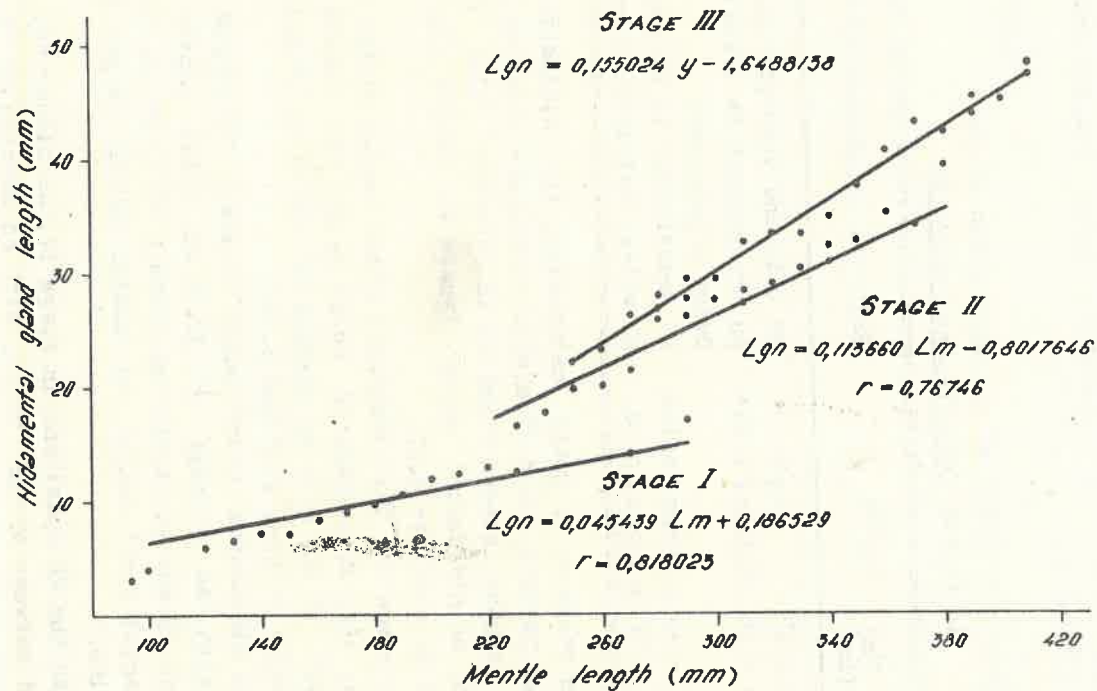


Fig. 1 - Relationship between nidamental gland length and mantle length for different maturation stages

For the 921 specimens - 555 in stage I, 277 in stage II and 98 in stage III - the relationships between nidamental gland length and mantle length for each determined stage were computed to following equation:

$$\text{Stage I} \quad L_{ng} = 0.045439 L_m + 0.186529$$

$$\text{Stage II} \quad L_{ng} = 0.113660 L_m - 0.8017646$$

$$\text{Stage III} \quad L_{ng} = 0.155024 L_m - 1.6488138$$

The relationships obtained for each maturation stage between nidamental gland length and mantle length outline the interdependence of the values of these parameters, the ratios of which are to be utilized in ascertaining the maturation stages. For the analysed specimens, the obtained equations can be correlated with the ratio of ovarian weight to total weight of the female body for each maturation stage.

#### CONCLUSIONS

1. The females captured by both trawling and angling in the southwestern Atlantic in January - April 1978 were found in maturation stages ranging between I and IV.
2. The ratio of nidamental gland length to mantle length for each maturation stage in female Ommastrephes bartramii ascertains correctly the maturation stage and proves to be a practical method which can be utilized on board the ships, in sea working conditions.
3. As the gonads are developing, a decrease is noticed in the variation amplitude of mantle length as well as an increase in the variation amplitude of nidamental glands.
4. The gradient of the regression curve rises for each maturation stage, tending to reach a maximum concurrently with approaching of the spawning moment.

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