W NIDAMENTAL GLANDS AND MATURITY STAGES IN ILLEX COINDETII (MOLLUSCA: CEPHALOPODA) OF THE STRAIT OF SICILY (CENTRAL MEDITERRANEAN)

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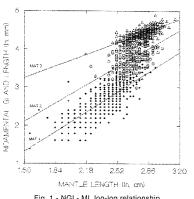Mazara del Vallo, Italia

Nidamental glands play a master role in squid reproduction (O'DOR and BALCH, 1985; ARKHIPKIN, 1992) and their macroscopic condition is used as an additional parameter to characterize different maturity stages (see JUANICO, 1983 for a review of maturity scales). Nidamental gland length (NGL) in particular proved to be a good indicator of maturity in *Illex illecebrosus*, when related with mantle length (ML) (Durward *et al.*, 1979). Nidamental gland index (NGI=NGL/ML) was often used afterwards to characterize maturity stages of several squid species (SANCHEZ, 1981; VILLANUEVA and SANCHEZ, 1989; HATFIELD and RODHOUSE, 1992). Here the relationship between NGL and ML, and the use of NGI and a three-stages macroscopic maturity scale referred to Illex coindetii (VERANY, 1837) of the Strait of Sicily is described.

Data come from two years of experimental trawl surveys carried out with seasonal periodicity in the Strait of Sicily (Central Mediterranean) (Levi. 1990). Within a study on the biology of *Illex coindetii*, a macroscopic maturity scale of three stages (1=immature; 2=maturing; 3=mature) was prepared (JEREB and RAGONESE, 1994). NGL (mm) and ML (cm, 0.5) were then related on a subsample of 1996 squid and the relationship analyzed. NGI (NGL/ML x 100) was computed for each maturity stage.

| Mat | N | Nidamental Gland Index | | | | Log_e linear coefficients | | |
		min	max	mean	s.e.	a	b	MSE
1	1073	5.7	39.2	13.3	0.1	-0.980	1.531	0.067
2	248	13.1	54.9	30.6	0.5	----	1.405	0.067
3	675	31.9	71.5	51	0.2	1.886	0.906	0.012
All	1996	5.7	71.5	28	0.4	-3.906	2.880	0.163

Tab. 1 - Descriptive statistics and regression results

The values of nidamental gland indices for each maturity stage are reported in Tab.1. Although a certain amount of overlapping among the different stages does occur, as expected, the scale seemed to work out rather adequately the separation of immature, maturing and mature females, considering the mean values corresponding to each stage. As for the NGL-ML relationship (Fig.1), this clearly showed differences in NGL increments during the different maturity stages. After an initial phase in which the relationship is positively allometric (b>1; stage 1 and 2), even though at a different rate, NGL increments become negatively allometric (b<1; stage 3). Therefore results of the analysis without considering the three stages separately does not give satisfactory results.

Providing that every classification of sexual maturity into stages imposes artificial discontinuities onto what is a continuous process, it is likely that each macroscopic

Fig. 1 - NGL- ML log-log relationship

maturity stage will include a broad range of body size and indices of maturity. This considered results obtained were satisfactory and NGI proved to be a good indicator of maturity also for *Illex coindetii* of the Strait of Sicily, once a maturity scale is provided and tested. NGI values obtained in the present case are close to those obtained for *Illex coindetii* of the Catalan Sea (SANCHEZ, 1981), thus supporting the possibility to apply results obtained for the same species also in different areas. Considering that all mated females (spermatophores inside the mantle cavity) were mature, spermatophores presence could be an additional factor to better discriminate between stage 2 and 3 and mating could be the trigger responsible for the differences in the nidamental gland develop-ment. NGL in fact increases with maturity, but the rate of the increment proved to be different in different maturation phases and this variation could follow different patterns in different species. In the present case NGL-ML relationship changes twice during the maturation process. The analysis of this relationship on the base of the maturity scale proposed allowed a better interpretation of the maturation process. It seems therefore that the use of the proposed macroscopic maturity scale and NGL, ML and the notation of the presence/absence of spermatophores (all measurements easily obtained in the field) will provide consistent information to discriminate basic maturity stages in *Illex coindetii* of the Strait of Sicily for fisheries managment purposes.

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DISTRIBUTION, GROWTH AND MATURITY OF ELEDONE CIRRHOSA (CEPHALOPODA : OCTOPODA) IN THE THRACIAN SEA (EASTERN MEDITERRANEAN)

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The horned octopus *Eledone cirrhosa* (Lamarck, 1798) is a benthic species quite common throughout the Mediterranean Sea, as also in the coasts of N.E. Atlantic and the North Sea. The population of *Eledone cirrhosa* was sampled over a total of 5862 km, between 22-416 m of depth. Seven seasonal trawl surveys were carried out the summer (June), autumn (September) and winter (late Novemmber - early December) in 1992 and 1993, and in spring (March) 1992. The area under investigation was subdivided into 4 depth strata: 0-50 m, 50-100 m, 100-200 m, >200 m; the hauls were proportionally distributed in the respective areas and positioned randomly.
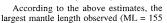
Eledone cirrhosa was captured between 44-315 m and more frequently between 50-200 m. In autumn recruits (ML: 20-60 mm) are most abundant betwween 50-100 m, whilst larger individuals were caught mainly beyond 100 m. Size distribution ranged between 20-155 mm for females and 15-111 mm for males. The seasonal length frequency distribution (Fig 1), showed the presence of two or more cohorts in the catches of summer and autumn whilst in winter and spring it was possible to single out only one cohort to be followed over a period of two more seasons. The progression in modal size indicated growth rates of 10-20 mm per season, slowing down for bigger individuals. The recruits (ML: 20-60 mm) were already present in summer, but represented a higher proportion of the catch in the autumn sample. The low presence of larger animals (ML > 70 mm) in autumn, and their disappearence from the catches in winter,probably is due to high post-spawning mortality (MANGOLD- WIRTZ, 1963; BOYLE, 1983; BELCARI et al. 1990). In summer and autumn 1992, a third cohort, consisted of the largest specimen (ML > 100 mm), is doubtful. These individuals are probably slower-growing ones, which did not mature in the second year but overwintered as immature adults and contributed to the spawning population of he third year. Similar observations have been made in the *Eledone cirrhosa* growth model proposed by BOYLE (1983).

Least square regression equations were calculated from the logarithmically transformed mantle length (ML mm) and body weight (W gr) data, for each sex. The constants a and b in the resulting power functions- $W = aML^b$ - are :

females : a = 0.002615, b = 2.506, r = 0.93
males :   a = 0.003358, b = 2.432, r = 0.91

The mantle length-weight relationship for females and males were not significantly different.

The VON BERTALANFY growth-parameters, estimated according to the SRLCA method (SHEPERD, 1987a), are :

MLinf = 240 mm, K = 0.34, to = 0.27

ML (mm)

According to the above estimates, the largest mantle length observed (ML = 155 mm) corresponds to a three years old individual. However the group of largest individuals (ML > 100 mm), as it seems from the seasonal length frequency distribution, is poorly represented, which means that horned octopus usually matures, spawns and dies before reaching the age of two years (ML : 109 mm), an inference that is in accordance with the available references on the species. The maturity stages of *Eledone cirrhosa* were determined according to LIPINSKY'S scale (1979). The reproduction of *Eledone cirrhosa*, seems to start in early summer and last till mid of autumn,since mature males and females were observed during these seasons. Males were found to reach maturity earlier than females.

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