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PRELIMINARY OBSERVATIONS ON THE GROWTH OF *ENGRAULIS ENCRASICOLUS* (LINNAEUS, 1758) IN THE WESTERN IONIAN SEA

OSSERVAZIONI PRELIMINARI SULLA CRESCITA DI *ENGRAULIS* *ENCRASICOLUS* (LINNAEUS, 1758) NEL MAR IONIO OCCIDENTALE

Abstract – *Sagittae* of European anchovy (*Engraulis encrasicolus*) have been collected from fish sampled in the Western Ionian Sea (GSA 19) and aged to estimate the parameters of the von Bertalanffy growth curve (VBGC). The VBGCs of females and males were not significantly different, thus a combined curve was estimated with the following parameters: $L_{\infty}=174.13$ mm, $k=0.31$; $t_0=-1.76$.

Key-words: European anchovy, von Bertalanffy, otoliths, back-calculation.

Introduction - The European anchovy (*Engraulis encrasicolus*) is a widely distributed fish (North eastern and Central Atlantic, Mediterranean and Black Seas), mostly captured by purse seine and pelagic trawls along the Italian coasts. In the western Ionian Sea (GSA 19), it is also caught by the artisanal fishery using a small net named “*menaide*”. Despite the importance of the European anchovy fishery (Basilone *et al.*, 2003) there is no information available on the length-age key and growth in the study area.

Materials and methods – The sampling has been carried out from the commercial landings in 2007 and 2008. Total length (TL), nearest 0.5 cm, was measured and sex determined for each fish. Unsexed specimens were split according to the sex ratio estimated by length class, using the value of the first fully sexed class (9.0 cm). *Sagittae* were removed from a sub-sample of five specimens for each 0.5 cm length class by sex. The ageing was conducted on 322 pairs of *sagittae*, using the criteria reported in Giannetti & Donato (2003): the birthday was set at June 1st, consequently the age assigned to the fish caught in the first part of year was equal to the observed number of hyaline rings (excluding the edge) plus 0.5, whereas for the fishes caught during the second part of the year the age corresponded to the number of hyaline rings. For the back-calculation the following metrics for each *sagitta* (295 measurements) were registered: total length (AB), length of *antirostrum* (AO) and the distance between the core and each hyaline ring in the *antirostrum* area. Morphometric relationships AO vs AB and AB vs TL were used to back-calculate the length at hyaline ring deposition considered for the aging (Hunt, 1979). The linear relationships were then tested by the analysis of variance of the regression. Length-at-age obtained by the back-calculation were compared with observed age-at-length only of the specimens (n=178) caught during the winter (deposition period of hyaline ring) to corroborate the estimated age (Morales-Nin, 2000). Growth parameters of females and males were estimated using the von Bertalanffy growth function. The growth curves (VBGC) were fitted using length at age pairs and minimizing the sum of the squared residuals between observed and expected values (solver, Microsoft Excel®). The two VBGCs were compared using the Chen test (Chen *et al.*, 1992).

Results - The 322 analyzed *sagittae* were collected from specimens ranged between 7.5 to 16 cm (respectively 0.5-5.5 years old), caught all year round. *Sagitta* growth was proportional and significantly correlated ($p<0.05$) to length. Morphometric

relationships among the sagitta metrics (AB and AO, in mm) and the individual total length (TL, in mm) are: $TL=47.92 \times AB - 12.289$ ($R^2= 0.83$; $F_{\text{observed}}=1477.53 > F_{0.05}=3.87$); $AB=1.8123 \cdot AO + 0.2822$ ($R^2= 0.92$; $F_{\text{observed}}=3486.43 > F_{0.05}=3.87$). The mean length at age obtained by direct age readings and that back-calculated are reported in the Table 1. The growth parameters, estimated for females and males are respectively: $L_{\infty}=177.55$ mm, $k=0.31$, $t_0=-1.69$; $L_{\infty}=171.87$ mm, $k=0.3$, $t_0=-1.83$. According to the Chen test, the two VBGCs were not significantly different ($p>0.05$). A combined curve was thus derived using the pooled data: $L_{\infty}=174.13$ mm, $k=0.31$, $t_0=-1.76$.

Tab. 1 - Mean length, standard deviation (SD) and number of specimens (n) for each age class (observed and back-calculated).

Lunghezza media, deviazione standard (SD) e numero di individui (n) per classe di età in base all'età osservata e alla back-calculation.

Age	Observed			Back-calculated		
	Length (mm)	SD	n	Length (mm)	SD	n
0.5	86.85	10.20	27	86.56	5.22	295
1.5	109.46	8.32	28	106.53	4.85	205
2.5	124.38	9.38	48	121.52	4.96	118
3.5	140.13	6.73	38	130.91	5.93	49
4.5	148.97	6.18	37	135.06	7.20	3

Conclusions – The growth pattern did not show significant differences between sexes. The high value of t_0 is the consequence of the lack of aged 0 fish in our sample. Both the length observed and that obtained by the back-calculation were very close for the ages from 0.5 to 2.5, whilst the differences in length observed in the older individuals might be due to different causes as the low number of measurements, the reading difficulties in order to recognize univocally the rings and finally the divergence between somatic and otolith growth (Panfili & Tomás, 2001) in the older hyaline ring. The growth parameters obtained for sex combined were comparable with those reported by Basilione *et al.* (2004) for the southern Sicilian coasts ($L_{\infty}=18.6$ cm; $k=0.3$; $t_0=-1.81$).

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Data used in this paper were collected in the Data Collection Framework and supported by the Italian Ministry of Agriculture, Food and Forestry Policy (MiPAAF) and the European Commission.