



PRELIMINARY STUDY ON IONIC COMPOSITION IN ENDOLYMPHATIC SAC OF *HOPLOSTETHUS MEDITERRANEUS*

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Abstract: Silver Roughy, *Hoplostethus mediterraneus* (Cuvier, 1829) (Pisces; Thachichthyidae), is a benthopelagic cosmopolite fish. The samples of endolymph were collected from ten specimens with total length ranging between 14,7 cm and 22,2 cm, grouped in classes of 2 centimetres. Inductively Coupled Plasma - Atomic Emission Spectrometry (ICP-AES) Perkin-Elmer OPTIMA 3100 XL was used for the investigation of the ionic composition. A decreasing gradient in the ionic concentration [$\mu\text{g/l}$] among (versus) the smallest and biggest length classes was recorded for Ba, Cd, Mg, Na, Mn, B and Al.

Key words: *Hoplostethus mediterraneus*, endolymph, ionic composition, Central Mediterranean Sea

Introduction

Silver Roughy, *Hoplostethus mediterraneus* (Cuvier, 1829) (Pisces; Thachichthyidae), is a benthopelagic cosmopolite fish. It is a deep water species with a slow growth rate, Vitale *et al.* (2003). The lack of an accepted age validation technique suggests other investigations, such as this preliminary study on ionic composition in endolymphatic sac useful for a future comparison with the otolith microchemistry. Like all teleost fishes the endolymph resides in three semicircular canals: sacculus, utricle and lagena. In each of these canals it is possible to find an otolith called sagitta, asteriscus and lapillus, respectively. The otoliths participate in fish auditory and vestibular function, and the composition of endolymph is an important factor for otolith growth. Actually, data on the level of Sr present in the saccular endolymph and the sagittae of 12 fish species show that there is a very strong relationship between the composition of the endolymph and the otoliths, Kalish (1989).

Materials and methods

These data were collected during the research program “Age, growth and biology of *Coelorhynchus coelorhynchus*, *Helicolenus*

dactylopterus and *Hoplostethus mediterraneus*, mesopelagic fish discarded from trawl fishery catches in the Strait of Sicily” carried out by the University of Palermo and CNR-IAMC, during the year 2004. The samples of endolymph were collected from ten specimens caught in the Strait of Sicily with total length ranging between 14,7cm and 22,2cm, grouped in classes of 2 centimetres. The needle of a hypodermic syringe was inserted in the sacculus and the endolymph was carefully withdrawn. The sagittae were collected for future investigations and the endolymphs were immediately frozen and stored. Volumes ranging between 0,1 and 0,24 ml were extracted from the sacculus, acidified and diluted to 5 ml with a nitric acid solution (1% in volume). The liquid samples were filtered on 0,4 μ paper-filter in order to eliminate their corpuscular portions. Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES) Perkin-Elmer OPTIMA 3100 XL was used for investigation of the ionic composition. In ICP-AES, a multi-element technique, the sample being analysed is introduced as a fine droplet aerosol into the plasma generated with an Argon alimanted torch. The instrument adopted permitted a

Ionic ug/l	Length class 1 (14,1-16 cm)	Length class 2 (16,1 -18 cm)	Length class 3 (18,1 -20 cm)	Length class 4 (20,1 -22 cm)	Length class 5 (22,1 -24 cm)	Standard Error	Standard Error %
Ba	18,40	33,11	17,11	9,30	6,57	4,63	27,41
Ca	0,04	0,05	0,03	0,03	0,03	0,00	12,18
Cd	90,30	86,54	26,77	56,54	35,81	12,89	21,77
Cu	146,46	158,13	127,29	69,50	118,51	15,30	12,34
Mg	0,05	0,04	0,02	0,02	0,01	0,01	27,39
Na	1,64	1,69	1,02	0,97	1,11	0,16	12,23
Fe	394,23	576,87	457,26	277,93	558,94	55,09	12,16
Mn	7,96	14,21	4,73	3,97	3,55	1,99	28,88
B	835,60	530,73	20,21	11,14	51,86	167,76	57,87
Al	98,35	72,75	18,97	13,84	45,30	16,04	32,19
Sr	569,26	533,90	328,46	322,10	324,44	55,79	13,42
S	0,24	0,19	0,13	0,11	0,13	0,02	14,66
P	0,34	0,20	0,14	0,17	0,16	0,04	17,92

Table 1: Concentration [$\mu\text{g/l}$] of the elements among the various class groups.

simultaneous analysis up to 40 elements with sensitivity detection limits of $\mu\text{g/L}$ in aqueous solutions. The following elements were examined in samples of 2 millilitres : Ba, Ca , Cd , Mg , Na , Fe . Mn , B , Al , Sr , S and P.

Results

A decreasing gradient in the concentration [$\mu\text{g/l}$] of the elements among the smallest and biggest length classes was recorded for Ba, Cd, Mg, Na, Mn, B and Al (Table 1). The concentration of these elements in the length classes 1 (14,1cm to 16cm) and 2 (16,1cm to 18cm) is higher than the length classes 3 (18,1cm to 20cm), 4 (20,1cm to 22cm) and 5 (22,1cm to 24cm). Particularly, the mean values recorded between the length classes 1 and 2, for Ba, Cd, Mg, Na, Mn, B and Al, were more of the double than the mean values among the length classes 3, 4 and 5. The standard error percentage ranged between 12,16 and 14,65 for Ca, Cu, Na, Fe, Sr; S and P while for Ba , Ca , Cd , Mg , Na , Fe . Mn, B, Al, Sr, S and P. ranged between 17,92 and 57,87.

Discussion and Conclusion

The interest in deep-water species has increased considerably during the last years, mainly as a result of the trawl fishery in the Mediterranean Sea. For the first time, in the year 2001, the European Commission proposed to introduce conservation measures for deep water fish stocks in accordance with scientific advice and the lack of knowledge on the biology of deep water species. The size distribution of Silver Roughy increases with depth; small individuals were caught at the shallower depths and big individuals almost exclusively at depths $>500\text{m}$, D'Onchia *et al.* (1998). Actually, the specimens of Silver Roughy caught by commercial trawl fishery belong to the length classes 1 and 2, D'Onchia *et al.* (1998), seen that the maximum depth investigated by trawl is 800 m. The mean age of Silver Roughy specimens with total length ranging between 14cm and 17,3cm is 8years and 11years respectively, Vitale *et al.* (2003). As described in the results, ionic concentration of Ba, Cd, Mg, Na, Mn, B and Al is higher in the length classes 1 and 2 and decrease in the length classes 3, 4 and 5; so this gradient could be due to: (1) the different distribution in depths

(the youngest up, the oldest down); (2) the senescence, since the deepest water species, Silver Roughy is a long lived species with slow growth.

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