

TIME SCALE OF APPENDICULARIAN ABUNDANCES IN THE OFFSHORE SOUTHERN ADRIATIC

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Abstract

Appendicularians were collected during 44 cruises, May 1996-1997. High abundances, especially for the juvenile specimens, were registered. Results show their importance in the secondary production at the oligotrophic waters. Appendicularians assemblages and vertical distribution respond to the influence of coastal and southern Adriatic oceanic features and changes of temperature.

Keywords : mesozooplankton, vertical distribution, Adriatic Sea

In spite of the unquestionable importance of appendicularians to marine ecosystem (1, 2, 3), their populations is poorly known in many regions of Mediterranean Sea. Objective of the present paper is contribution to understanding of seasonal populations density and vertical distribution of appendicularians community at the oligotrophic offshore station (100-m depth) in the Southern Adriatic (42°38'N, 18°03'E).

Plankton material was collected during 44 daytime cruises from May 1996 to May 1997. Appendicularians were sampled with 200 µm (54 cm in diameter) and 53 µm (45 cm in diameter for juvenile specimens) Nansen nets, equipped with a closing system, and in the following depth layers : 0-25 m, 25-50 m, 50-90 m. Temperature was measured using inverted thermometer at 0, 10, 20, 25, 50, 75 and 90 m depth. Chlorophyll *a* concentration (Chl *a*) was analysed fluorometrically by standard methods.

During warmer months a typical thermocline was formed in the surface layer until 20 m depth. Vertical gradient weakened during autumn and isotherm (19.1°C) was noted till 75 m depth. Salinity values are typically oceanic with a moderately influence of coastal waters (range 36.9-38.9 psu). Mean Chl *a* concentrations in the 25-50 m and 50-90 m layers were significantly higher than in the 0-25 m ($p < 0.001$; one-way ANOVA). Annual range per water column was 0.004-0.680 µg l⁻¹, average 0.085±0.096. The highest concentrations were noted during spring.

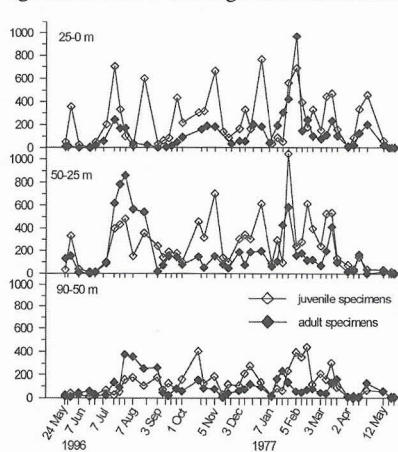


FIGURE 1. Seasonal and vertical variations of appendicularians population densities during 1996-1997 in the offshore southern Adriatic.

similar (Pearson coefficient correlation, $r=0.52$, $p < 0.001$). Increased adult values were recorded at the 25-50 m in July with maximum of 861 ind.m⁻³, and from the end of January to the beginning of February with maximum of 972 ind.m⁻³ at surface layer (Fig. 1). Species *Oikopleura longicauda* and *O. fusiformis* dominated during summer high values, while *O. longicauda* and *Fritillaria pellucida* in winter. In general, *O. longicauda* was the most abundant species with an annual average of 39% to total appendicularians populations densities, followed by *O. fusiformis* (22%), *F. pellucida* (18%), *F. borealis* (10%), *F. haplostoma* (3%), *O. dioica* (3%), *F. megachile* (2%), *O. parva* (1%). Species, *Pelagopleura haranti*, *O. albicans*, *O. graciloides*, *O. mediterranea*, *Appendicularia sicula*, *F. formica*, *F. tenella*, *F. venusta*, were present sporadically, mostly below 50 m depth, indicating a high influence of open water currents. Among rare species, *Kowalewska tenuis* was present in the surface layer only during summer.

Significantly higher densities of *Oikopleura juvenile* and adult specimens were found in the layers above the 50 m depth, while a marked aggregations of *Fritillaria* specimens were found at the 25-50 m and 50-90 m layers (Table 1). The temperature influenced adult vertical distribution during strong thermal stratification (6-8°C), most specimens were noted below the thermocline. Appendicularian communities exhibit characteristic shifts of species composition with depth (2) and was almost identical to those described off Villefranche-sur-Mer (4). Whether this feature is a consequence of physiological adaptations to temperature or something else is still uncertain.

Table 1. Comparison of the vertical distribution of abundant appendicularian species and their juvenile between 0-25 m (A), 25-50 (B) and 50-90 m (C) layers (Kendall's coefficient of concordance).

taxon	Probability	Sequences of abundances
<i>Oikopleura</i> juv.	<0.001	A=B>C
<i>Fritillaria</i> juv.	0.001	B>C>A
<i>Oikopleura</i> <i>cophocerca</i>	0.26	
<i>Oikopleura</i> <i>dioica</i>	0.05	A=B>C
<i>Oikopleura</i> <i>fusiformis</i>	<0.001	A=B>C
<i>Oikopleura</i> <i>longicauda</i>	0.01	A=B>C
<i>Oikopleura</i> <i>parva</i>	0.05	
<i>Fritillaria</i> <i>borealis</i>	0.02	B=C>A
<i>Fritillaria</i> <i>haplostoma</i>	0.01	B=C>A
<i>Fritillaria</i> <i>megachile</i>	0.25	
<i>Fritillaria</i> <i>pellucida</i>	0.01	B>C>A

When compared with other numerous mesozooplankton groups in the same samples collected with 200 µm net (Lucic, unpublished), calanoid copepods were 3.4 times more abundant than appendicularians, while appendicularian abundances were 2.1 times higher than that of cladocerans. Appendicularians growth rates are typically much greater than those of copepods at the same temperature (3) and our results appeared to an inevitable appendicularians importance in the secondary production at the oligotrophic waters. There were no meaningful relationship between Chl *a* estimates and appendicularian abundances. The lack of any significant temporal and spatial Chl *a*-appendicularians relationship and appendicularians specific feeding rate (3) suggest that phytoplankton must not be the factor modulating their production and vertical distribution. Presumably, it is regulated by its predators. A high positive correlations between total appendicularian specimens and planktonic cnidarians were noted (Pearson coefficient correlation, $r=0.36$, $p < 0.01$). However, the observed appendicularian assemblages, their changes towards the seasonal species succession and vertical distribution, responded to the progressive influence of coastal and southern Adriatic oceanic features and annual changes of temperature.

References

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