STRUCTURAL ASPECTS OF *ANEMONIA VIRIDIS* (FÖRSKAL, 1775) (CNIDARIA, ANTHOZOA) POPULATIONS IN THE NORTH AEGEAN SEA

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Abstract

This paper is concerned with the structural aspects of the *Anemonia viridis* populations found in the North Aegean Sea. It was found that the mean wet weight of anemone individuals and the density of the populations increases with depth and distance from the shore. The differences in the structure exhibited by *Anemonia viridis* populations, were attributed both to the specific hydrodynamic characteristics of the biotope and to several biotic interactions.

Key-words : Infralittoral, Population dynamics, Aegean sea, Cnidaria, Zoobenthos

Introduction

For a long time *Anemonia viridis* has been regarded as one of the most common representatives of the sea anemone populations of the Mediterranean and NE European shores (1,2,3,4). Chintiroglou & Koukouras (5) have described the seasonal structural (size classes) variations of the populations, while Schlichter (6), Janssen & Möller (7) and Chintiroglou & Koukouras Chintiroglou *et al.* (8) have reported on its feeding habits. The aim goal of the present study-work is to determine whether there is any structural (size classes) variation in the population which may be related to vertical distribution.

Material and methods

Sampling was carried out in Nea Plagia in Chalkidiki peninsula, along a straight, gently shelving transect line (off shore -150 m) on a shore fully exposed to Southern winds. Three distinct biotopes (zones A, B and C) were observed and discribed by Chintiroglou *et al.* (8). The number of samples collected from each zones was arbitrary with a minimum of 5 samples, and was influenced by the homogeneity of the biotope. 42 samples were collected using 50x50 cm quadrats. Among these, 24 samples were collected from zone A, 13 from zone B and 5 from zone C. All samples were preserved in 7% formalin solution. Size classes of anemones were defined according to wet weight according to Chintiroglou *et al.* (5).

All data were tested for normality (chi-square test) and when normal distribution was observed, examination of the distribution of the frequencies was also carried out. One-way analysis of variance (ANOVA) and Fischer LSD testing were used to test the differences between the means of wet weight and number of individuals of *A. viridis* populations. Multiple regression analysis was used to determine any correlation between the parameters of the sampling locations (depth and distance from shore) and the anemones' wet weights (9). To compare the densities of the populations in the three zones, non-parametric Kruskal-Wallis ANOVA and Mann-Whitney test was used. All statistics tests were carried out by using the Statistica and Stat View software.

Results

The size classes frequency distribution of wet weight of *A. viridis* exhibited a normal distribution in zones A (X^2=0.13, p=0.029) and B (X^2=0.09, p=0.033). However, in zone C the size classes were not normally distributed (X^2=0.09, p=0.18), although their distribution was were very close to a normal one (68.27% of individuals followed normal distribution; see Fig.1a-c). Differences also existed between mean wet biomass from zone to zone (F=46.131, df=4, p=0.0001). Individual mean biomass was at its lowest in zone A and in its highest in zone C. Differences existed between all populations (A-B, A-C and B-C; Fisher LSD values, 0.096, 0.144 and 0.133 respectively).

Results on density of populations also differed from zone to zone (Kruskal-Wallis anova, z=24.45, p=0.0001). Although differences existed for the mean number of individuals between zones A / B, and zones A / C (Mann-Witney, z=4.45 p=0.0001, and z= 3.19, p=0.0014, respectively), no significant difference appeared between individuals of zones B / C (z =1.43, p=0.154).

Results of multiple regression analysis between mean wet weight, depth and distance from the shore indicated that the weight of the individuals was positively correlated with depth as well as with distance (r = 0.80, df=2/27, p.=0.0001; r=0.90, df=2/27, p.=0.0001).

It is thus obvious from all the above results, that size class composition of *A. viridis* populations in the three infralittoral zones, differed with respect to mean individual biomass and in density of populations. More specifically, as we moved from zone A to zone C, we observed

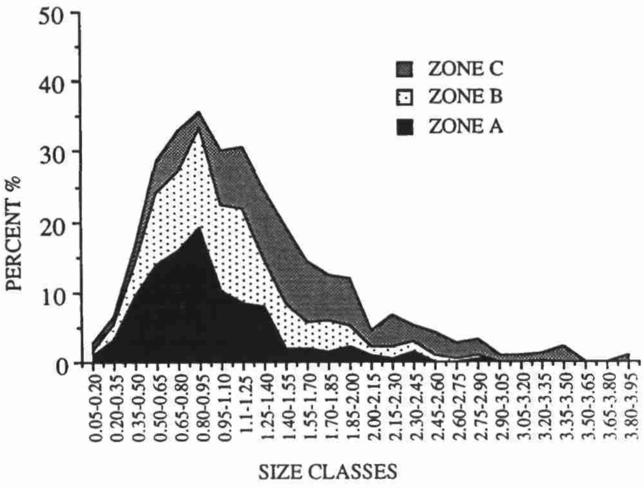

Figure 1 : Frequency distribution of size classes (based on wet weights).

a right shift in the distribution of size classes, towards larger individuals. This tendency was evident by the increase in the frequency of larger size classes, as we moved deeper. In zone A larger size classes (10 and over) made up 10.72% of the population. In zone B this percent increased to 24.65%, reaching a final value of 56.54% in zone C.

Discussion

Since several years it is well known that larger *A. viridis* specimens are more commonly found than smaller ones with increasing depth (2,3). The present study provides for the first time clear statistical results to support this point. Similar observations have been made by Gosse (10) for the genus *Metridium senile*, and for *Anthopleura elegantissima* and *A. xanthogrammica* by various authors (11, 12, 13, 14, 15). Besides this more or less general remark about the distribution of *A. viridis*, nothing is known precisely about its bathymetric distribution and its size classes range. Some information on the seasonal variations of the structure of the *A. viridis* populations was given by Chintiroglou *et al.* (5), who found significant differences in both populations density and mean wet biomass of the individuals.

The limited participation of the large size classes in shallow waters could be a result of increased hydrodynamism in zone A and B, as their biotope is frequently exposed to strong winds from various directions (S, SW, N, and NW), whose frequency (year round) ranges from 20 to 34% (16). This observation is further indicated by the positive correlation of biomass with both depth and distance from shore. This observation is also supported by the fact that, while the population density in the two zones (B and C) did not differ significantly, mean wet biomass in the two zones was significantly different. This difference could be attributed to a number of biotic factors, such as intraspecific competition between smaller and larger members of the colony, predation, feeding abilities and changes in migratory behaviour by larger individuals. Examples of such behaviour are given for *Anthopleura elegantissima* (11, 12) and for *A. xanthogrammica* (13, 14, 15). Recently, Williams (17) noted two separate forms of behaviour in response to mutual tentacular contact between individuals of the sea anemone *A. viridis*: acrorhagial aggression and pedal disk detachment. During previous laboratory and field observations by our team, it has been noted that when two individuals of *Anemonia viridis* are compe-