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Polychaete fauna associated with the coral *Cladocora caespitosa* (L.) in the eastern Mediterranean

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ABSTRACT

Analysis of the polychaete fauna in 14 colonies of *Cladocora caespitosa* at two localities of Chalkidiki Peninsula, N. Aegean Sea, revealed 87 species, 58 of which are recorded for the first time as associated with this scleractinian coral. Larger colonies (up to 7 kg) contained more species, more individuals and a greater biomass. In one location, depth 3-5 m, Serpulidae were dominant (*Vermiliopsis infundibulum, Hydroides pseudouncinata pseudouncinata, Vermiliopsis striaticeps, Spirobranchus polytrema* and *Serpula vermicularis*) but at 16-19 m these were rivaled in abundance by errant species, especially *Ceratonereis costae*.

RÉSUMÉ

Faune de polychètes associée au scléractiniaire *Cladocora caespitosa* (L.) en Méditerranée orientale

L'analyse de la faune annélidienne trouvée dans 14 colonies de *Cladocora caespitosa* provenant de deux stations de profondeur 3-5 m et 16-19 m sur la péninsule de Chalkidiki, mer Egée, Nord de la Grèce, a montré qu'une faune diversifiée de polychètes est associée. Des 87 espèces récoltées, 58 sont reconnues pour la première fois comme hôtes de ce scléractiniaire. Dans la station à 3-5 m, les Serpulidae étaient dominants (*Vermiliopsis infundibulum, Hydroides pseudouncinata pseudouncinata, Vermiliopsis striaticeps, Spirobranchus polytrema* et *Serpula vermicularis*), alors qu'à 16-19 m ils étaient surpassés en abondance par des espèces errantes, en particulier *Ceratonereis costae*.

INTRODUCTION

The coral *Cladocora caespitosa* (L., 1767), is unique among the scleractinian species living in the Mediterranean due to the presence of large zooxanthellate colonies. The diameter of its colonies may exceed 1m (ZIBROWIUS, 1980). The base and dead parts as well as the living parts of *C. caespitosa* provide suitable sites for attachment of many animal species. They may attach themselves to the surface, bore into the skeleton, or may be sheltered or confined within the interlacing branches. As a result, the associated fauna is highly diversified (VAUGHAN & WELLS, 1943; VAFIDIS, 1993).

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In the North Aegean Sea, *C. caespitosa* colonies may contribute significantly to the formation of submarine banks, together with other organisms, such as calcareous algae, sponges, polychaetes, etc. (KOUKOURAS & KÜHLMANN, 1991; KÜHLMANN *et al.*, 1991). Although it is well known that the fauna and flora in these banks are especially rich, information concerning the organisms associated is limited (LABOREL, 1961; LUMARE, 1967; SPADA, 1968; ZIBROWIUS, 1980 and VAFIDIS, 1993). Some data has been given by ZIBROWIUS (1968, 1969, 1979) and SCISCIOLI & NUZACCI (1970), concerning polychaetes living within these colonies. The present study provides additional information on the composition and the relationships of the macrobenthic communities associated with *C. caespitosa* colonies.

MATERIALS AND METHODS

Sampling was carried out in autumn 1987 at two stations on Chalkidiki Peninsula (Fig. 1). At station 1 (Pirgadikia) the depth was 3 to 5 m and at station 2 (Vourvourou) it was 15 to 19 m. The colonies were detached from the substrate according to the method of McCLOSKEY (1970) and KOUKOURAS *et al.* (1985).

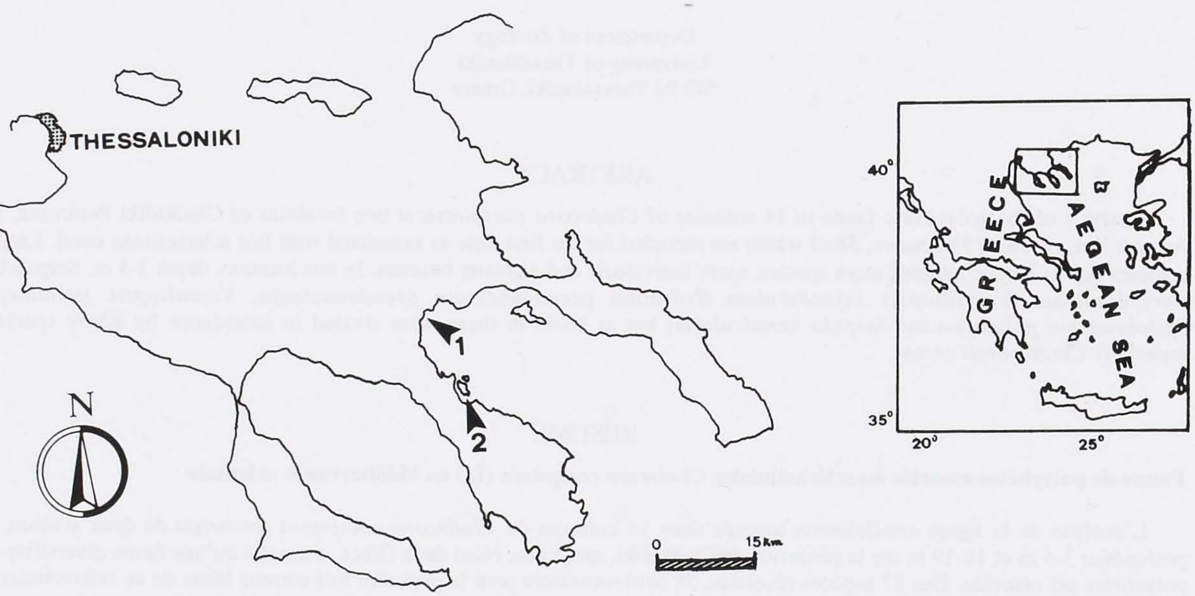

FIG. 1. — Map indicating the two sampling areas: 1, Pirgadikia (depth 3-5 m); 2, Vourvourou (depth 15-19 m).

Each colony was weighed and its volume measured by means of water displacement. The polychaetes present were identified to species and their dry biomass measured. The correlation between the volume and weight of colonies, on one hand, and the number of species, number of individuals and biomass of polychaetes, on the other, was based on the "rank correlation coefficient" or Spearman test (SCHWARTZ, 1963) since none of the above parameters was normally distributed. To estimate the faunal affinity between colonies, based on the polychaete composition, the quantitative coefficient given by CZEKANOWSKI (BRAY & CURTIS, 1957) was used, and the relevant dendrogram constructed as described by LANCE & WILLIAMS (DAGET, 1976). In order to quantify the contribution of the various species, the biological index, the frequency of appearance, the mean and cumulative dominance were estimated according to the methods proposed by GUILLE (1970).

RESULTS

Table 1 lists the 87 polychaete species present in the 14 colonies examined. In figure 2, the positive correlation between the volume and weight of the colonies, on the one hand, and the number of species, individuals and biomass of the polychaetes on the other hand, can be seen.

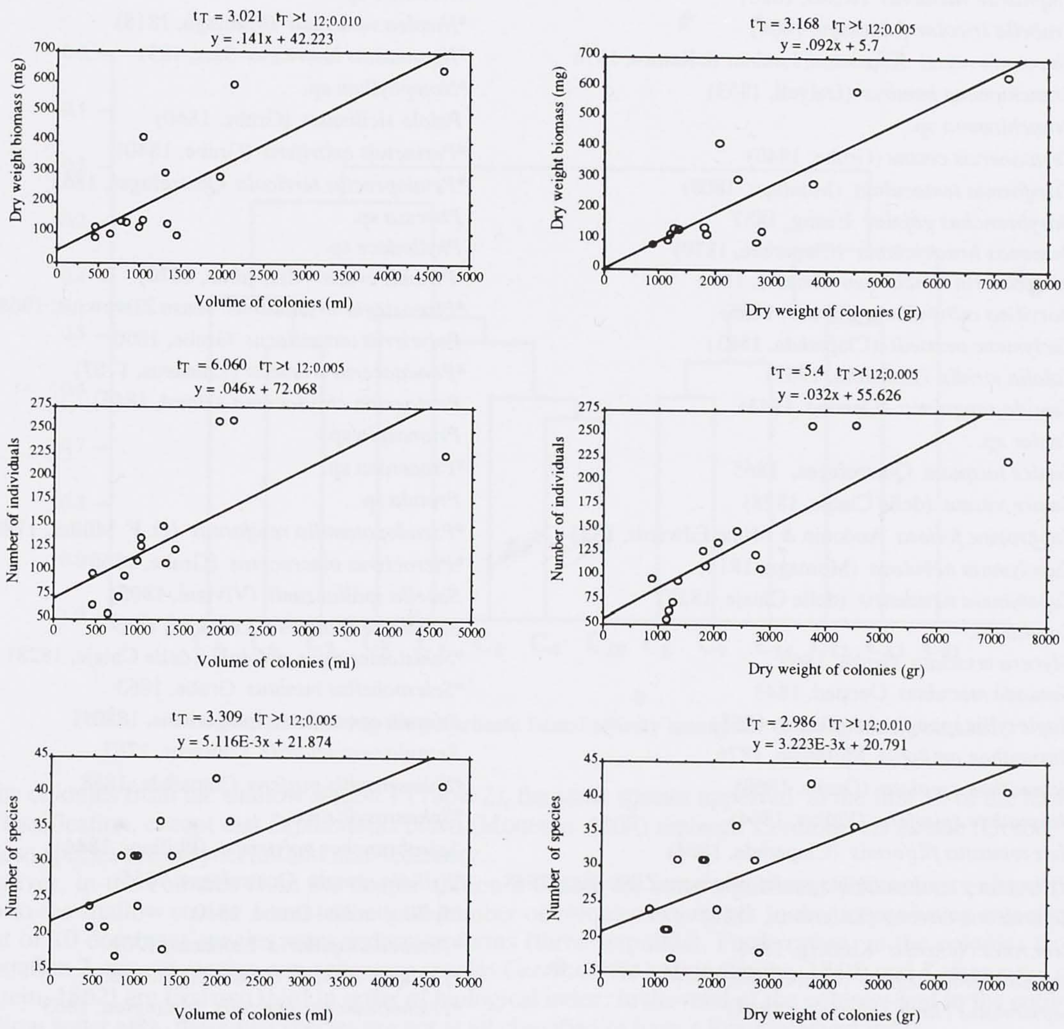

FIG. 2. — Correlations between volume and weight of the examined colonies and the number of species, individuals and dry weight biomass of polychaetes. Note: $t_{12;\,0.010} = 2.681$, $t_{12;\,0.005} = 3.055$.

A dendrogram groups the colonies according to the polychaete faunal affinity (Fig. 3). Symbols C_1-C_7 represent the colonies from the shallow station 1, C_8-C_{14} the colonies from the deeper station 2 (Fig. 1). The colonies are divided into two groups corresponding to the two sampling stations with the exception of C_{10}. The highest affinity between colonies C_{10} and C_4 could be attributed to these two colonies were among the most voluminous and heaviest and were the richest in number of individuals (262 in C_4 and 260 in C_{10}).

The 10 most abundant species are presented in Table 2 according to their biological indices a) for the total of the colonies (values marked with t), b) for the colonies coming from the shallow station 1 (values marked with s), and c) for the colonies coming from the deeper station 2 (values marked with d).

TABLE 1. — List of polychaete species found associated with C. caespitosa colonies. The species marked with a star are reported for the first time as inhabitants of this coral.

*Acrocirrus frontifilis (Grube, 1860)
*Amphiglena mediterranea (Leydig, 1851)
*Amphitrite variabilis (Risso, 1826)
*Arabella iricolor (Montagu, 1804)
*Bhawania reyssi Katzmann, Laubier & Ramos, 1974
*Branchiomma bombyx (Dalyell, 1853)
Branchiomma sp.
Ceratonereis costae (Grube, 1840)
*Cirriformia tentaculata (Montagu, 1808)
*Dasybranchus gajolae Eising, 1887
*Demonax brachychona (Claparède, 1870)
*Dodecaceria concharum Oersted, 1843
*Dorvillea rubrovittata (Grube, 1855)
*Euclymene oerstedi (Claparède, 1863)
Eulalia viridis (Linnaeus, 1767)
*Eumida sanguinea (Oersted, 1843)
Eunice sp.
Eunice torquata Quatrefages, 1865
Eunice vittata (delle Chiaje, 1828)
Euphrosine foliosa Audouin & Milne Edwards, 1833
*Eupolymnia nebulosa (Montagu, 1818)
*Eupolymnia nesidensis (delle Chiaje, 1828)
Eusyllis sp.
*Glycera tesselata Grube, 1863
*Goniada maculata Oersted, 1843
*Haplosyllis spongicola (Grube, 1855)
*Harmothoe antilopis McIntosh, 1876
*Harmothoe areolata (Grube, 1860)
*Harmothoe spinifera (Ehlers, 1864)
*Heteromastus filiformis (Claparède, 1864)
Hydroides pseudouncinata pseudouncinata Zibrowius, 1968
*Kefersteinia cirrata (Keferstein, 1862)
Leocrates chinensis Kinberg, 1866
Lepidasthenia elegans (Grube, 1840)
*Lepidonotus clava (Montagu, 1808)
*Lumbrineris coccinea (Renier, 1804)
*Lumbrineris fragilis (O. F. Müller, 1776)
*Lumbrineris funchalensis (Kinberg, 1865)
*Lumbrineris latreilli Audouin & Milne Edwards, 1834
Lysidice ninetta Audouin & Milne Edwards, 1833
*Marphysa fallax (Marion & Bobretzky, 1875)
*Nainereis laevigata (Grube, 1855)
*Nematonereis unicornis (Grube, 1840)
Nephtys sp.
Nereis rava Ehlers, 1868
*Nereis zonata Malmgren, 1867
Nerinides sp.
*Nicolea venustula (Montagu, 1818)
*Notomastus latericeus Sars, 1851
*Notophyllum sp.
Palolo siciliensis (Grube, 1840)
*Perinereis cultrifera (Grube, 1840)
*Petaloproctus terricola Quatrefages, 1865
Pherusa sp.
Phyllodoce sp.
*Piromis eruca (Claparède, 1870)
*Placostegus crystallinus sensu Zibrowius, 1968
Polycirrus aurantiacus Grube, 1860
*Pomatoceros triqueter (Linnaeus, 1767)
Pontogenia chrysocoma (Baird, 1865)
Prionospio sp.
*Proceraea sp.
Protula sp.
*Pseudopotamilla reniformis (O. F. Müller, 1788)
*Pterocirrus macroceros (Grube, 1860)
Sabella spallanzanii (Viviani, 1805)
Sabellaria spinulosa Leuckart, 1849
*Schistomeringos rudolphi (delle Chiaje, 1828)
*Sclerocheilus minutus Grube, 1863
Serpula concharum Langerhans, 1880
Serpula vermicularis Linnaeus, 1767
*Sphaerosyllis pirifera Claparède, 1868
*Sphaerosyllis sp.
Spirobranchus polytrema (Philippi, 1844)
*Syllidia armata Quatrefages, 1865
*Syllis gracilis Grube, 1840
*Terebella lapidaria Linnaeus, 1761
*Thelepus setosus (Quatrefages, 1865)
*Trichobranchus glacialis Malmgren, 1865
*Trypanosyllis zebra (Grube, 1860)
*Typosyllis hyalina (Grube, 1863)
*Typosyllis krohni (Ehlers, 1864)
*Typosyllis prolifera (Krohn, 1852)
*Typosyllis variegata (Grube, 1860)
Vermiliopsis infundibulum (Gmelin, 1788)
*Vermiliopsis labiata (Costa, 1861)
Vermiliopsis striaticeps (Grube, 1862)

Among the 10 abundant species (Table 2), six are sedentary forms, including five Serpulidae. The 10 abundant species comprise 63 % of the cumulative dominance (Table 2). The serpulid *Hydroides pseudouncinata pseudouncinata* Zibrowius, 1968 had the highest biological index and mean dominance. The serpulids *Vermiliopsis infundibulum* (L., 1788) and *Vermiliopsis striaticeps* (Grube, 1862) were next with significant difference in values of biological index and mean dominance. These three species showed a high value of cumulative dominance (28.24 %).

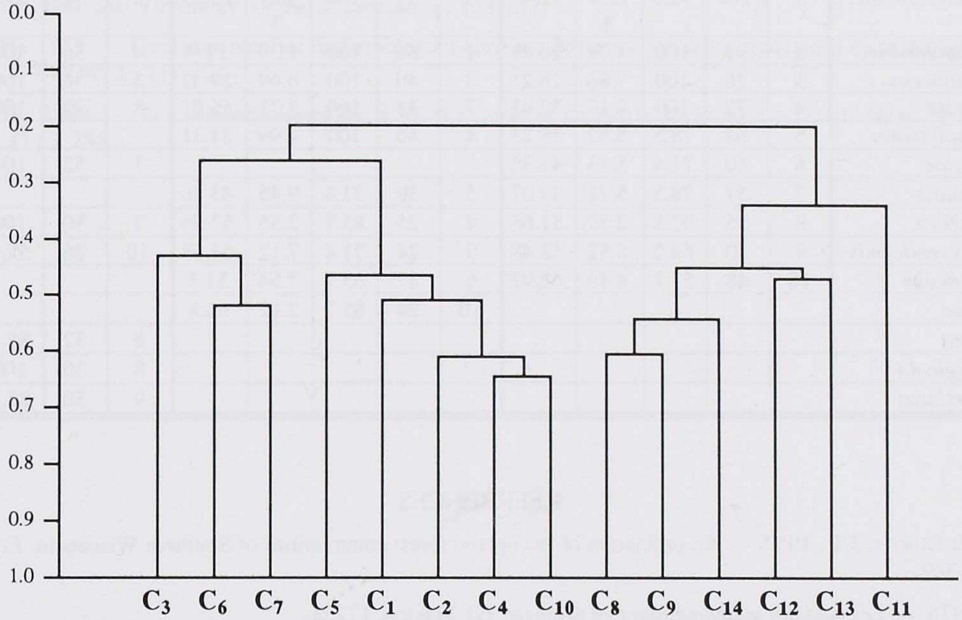

FIG. 3. — Dendrogram showing the polychaete faunal affinity among the *C. caespitosa* colonies.

In the colonies from the shallow station 1 (Table 2), the same species appeared in the first 10 of the biological index classification, except that *Lepidonotus clava* (Montagu, 1808) replaced *Ceratonereis costae* (Grube, 1840). Both these species are euryoecius and non-sedentary.

However, in the colonies from the deeper station 2 (Table 2), more significant differences existed both in relation to the shallow station 1 and to the total number of colonies examined. In the deeper water colonies, only four out of 10 dominant species were sedentary forms (three serpulids). Furthermore, in the colonies from the deeper station 2, the euryoecius non-sedentary species *Ceratonereis costae* (Grube, 1840) and *Kefersteinia cirrata* (Keferstein, 1862) are first and third in order of biological index; in the total of the colonies and in the colonies of the shallow water area, these two species are not at all classified or have a low biological index.

DISCUSSION

Of the 87 polychaete species associated with the *C. caespitosa* colonies 58 are here reported for the first time as inhabitants of this coral where previously only 40 associated had been reported. The total number has been raised to 98, considering the species added by the present study.

The fact that serpulids were dominant in the colonies from the shallow station 1, whereas errant polychaetes were dominant in those from the deeper station 2, could be attributed to the different feeding opportunities offered by the different environment. Serpulids are filter feeders (FAUCHALD & JUMARS, 1979) and would benefit from water movement and from being near the source of primary production, whereas errant polychaetes being further up the food pyramid would mostly benefit from the sedimentation of material raining down from above and from other organisms living in the colonies.

TABLE 2. — Table of biological indices (Ib), frequency of appearance (F), mean dominance (Dm) and cumulative dominance (Dc) of polychaetes: a) in the total of the colonies (values marked with t), b) in the colonies from the shallow station 1 (values marked with s), c) in the colonies from the deeper station 2 (values marked with d).

Species	Site (t)	Ib (t)	F (t)	Dm (t)	Dc (t)	Site (s)	Ib (s)	F (s)	Dm (s)	Dc (s)	Site (d)	Ib (d)	F (d)	Dm (d)	Dc (d)
Hydroides pseudouncinata	1	102	92.8	12.43	12.43	2	51	100	10.73	22.63	2	51	85.7	14.12	23.49
Vermiliopsis infundibulum	2	92	100	7.98	20.41	1	56	100	11.9	11.9	4	36	100	4.1	32.22
Vermiliopsis striaticeps	3	76	100	7.83	28.24	3	40	100	6.69	29.32	5	36	100	8.95	41.17
Kefersteinia cirrata	4	72	100	4.17	32.41	7	33	100	3.71	55.01	3	39	100	4.63	28.12
Spirobranchus polytrema	5	64	78.5	5.82	38.23	4	40	100	4.99	34.31					
Ceratonereis costae	6	60	71.4	5.13	43.36						1	52	100	9.37	9.37
Serpula vermicularis	7	57	78.5	5.71	49.07	5	39	71.4	9.45	43.76					
Harmothoe spinifera	8	55	92.8	2.59	51.66	8	25	85.7	2.55	57.56	7	30	100	2.63	49.59
Pseudopotamilla reniformis	9	50	64.2	6.82	58.48	9	24	71.4	7.12	64.68	10	26	57.1	6.53	61.91
Notomastus latericeus	10	48	57.1	4.49	62.97	6	37	85.7	7.54	51.3					
Lepidonotus clava						10	24	85.7	2.12	66.8					
Typosyllis hyalina											6	32	85.7	5.79	46.96
Haplosyllis spongicola											8	30	100	2.84	52.43
Polycirrus aurantiacus											9	30	85.7	2.95	55.38

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