BENTHIC BIONOMY OF THE NORTH AEGEAN SEA

III. A COMPARISON OF THE MACROBENTHIC ANIMAL ASSEMBLAGES ASSOCIATED WITH SEVEN SPONGE SPECIES

by

Ath. Koukouras, E. Voultsiadou-Koukoura,
H. Chintiroglou and C. Dounas

Department of Zoology, University of Thessaloniki, Thessaloniki, Greece

Résumé

Quelques aspects de la composition des peuplements que constituent les animaux habitant les espèces d'éponges *Ircinia fasciculata*, *Ircinia muscarum*, *Spongia officinalis*, *Verongia aerophoba*, *Petrosia ficiformis*, *Agelas oroides* et *Geodia cydonium*, des côtes de la péninsule de Chalkidiki à la mer du Nord Egée, sont analysés et représentés par des méthodes biocénotiques. Les différences entre les peuplements sont indiquées et discutées du point de vue écologique.

Introduction

Sponges are known to consist a host for many organisms that live in epi-or endobiotic relation with them. Relations of this kind have been reported in the past by various workers and the related bibliography has been reviewed, as a whole or partly, by Arndt (1933), Bacescu (1971), Sara et Vacelet (1973), Rützler (1975) and Lauckner (1980). However, very few of these works analyze and examine extensively the existing relationships between sponges and their inhabitants.

This paper includes a part of the results coming out from a more general effort aiming mainly to record the differences and similarities that may exist between the macroorganismic assemblages inhabiting seven sponge species found in the same ecological zone at the coasts of Chalkidiki Peninsula in the North Aegean Sea. Therefore, the assemblages under examination are being compared, in order to find out whether and to what extend the structure of the sponge influences the composition of the associated assemblage.

In the present paper, particularly, some aspects of the composition of the assemblages inhabiting the seven sponge species are given and compared. Some observations on the preferential species of the assemblages are also discussed.

Cahiers de Biologie Marine
Tome XXVI - 1985 - *pp.* 301-319.

Materials and methods

The sponge samples were collected by SCUBA or free diving in depths between 3 and 6 m from 21 sampling stations along the coasts of Chalkidiki Peninsula in the North Aegean Sea (fig. 1). The sponge samples were covered with a plastic bag and then carefully detached from the substrate with a knife. The plastic bag was immediately closed. Animals attached at the base of the sponge were not collected.

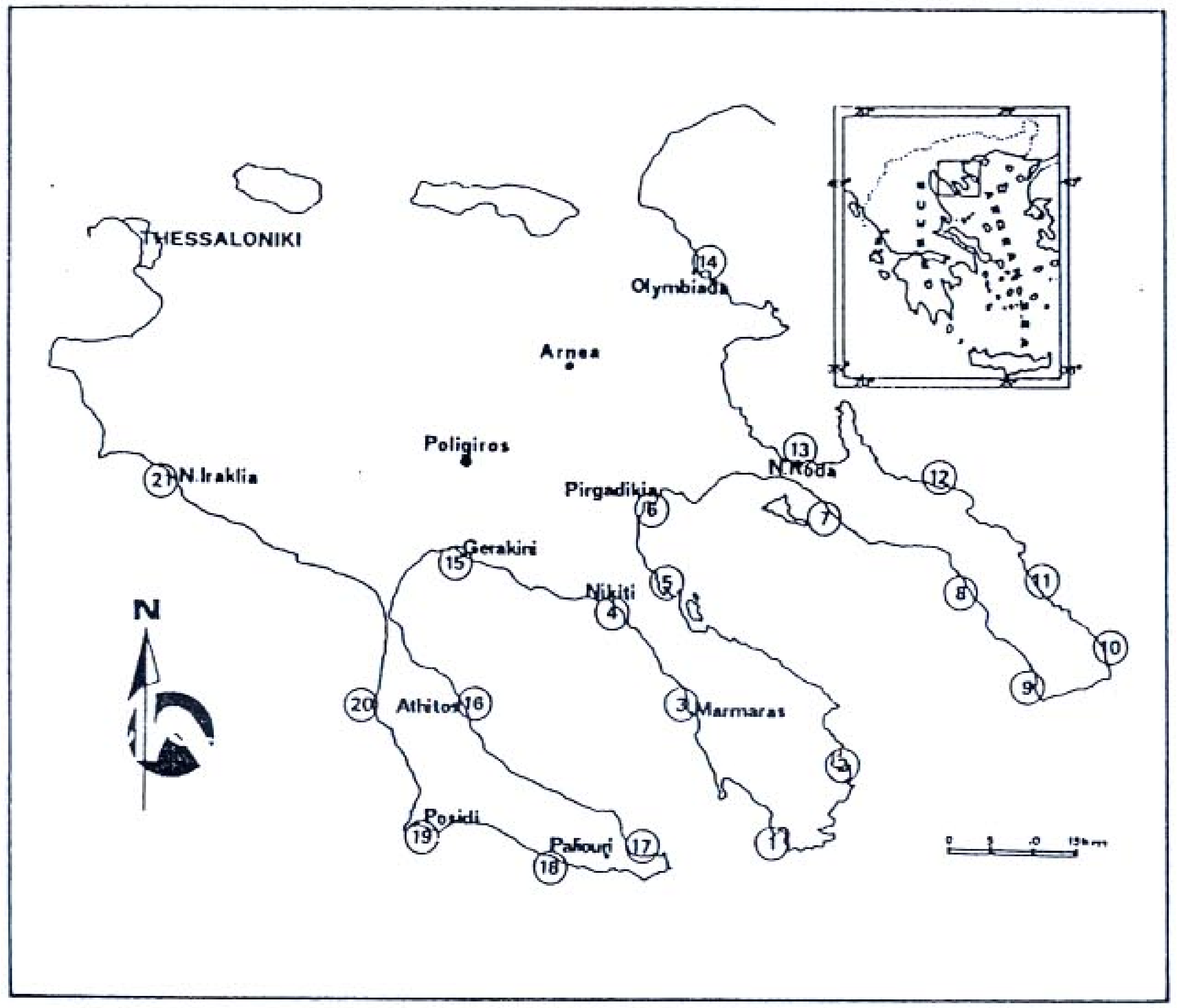

FIG. 1
Map of Chalkidiki Peninsula, indicating the sampling stations.

The volume of the sponge was measured by means of sea-water displacement. The samples were afterwards cut in small pieces (1-2 cm)—mainly along the sponge canals—and were firstly placed in vesels full of water where they were rinsed so that the animals were geting out of the sponge. They were then put under a stereoscope for a further examination of possibly remaining animals. Finally, all the water from the plastic bag, the vessel and the tissue of each sponge-sample separately was sieved in a sieve with a mesh of 1 mm where all the macroorganisms of the sample were gathered.

The animals were afterwards identified, counted and weighted (crude units of biomass) having been dried before on a filter paper.

The presentation of the macrofaunal assemblages of the sponges estimation of biological indices, crmulative dominance, etc.) was made by the methods proposed and used by Guille (1970).

According to these methods, the biological index of a species in an assemblage is the total of the ranges it occupies, in all the samples taken from the assemblage. The range of a species in a sample is a result of its value of dominance in relation to the values of dominance of the remaining species of the assemblage. The species collected in each sample are classified according to their value of dominance. The first species —this with the higher value of dominance— in a certain sample takes 10 points. The second one takes 9 points, the third 8 points e.t.c. and finally the tenth species takes 1 point. In this way ten species are classified in each sample. The points taken by each classified species in all the samples of a certain assemblage are added up and their total is the «biological index» of the species in this assemblage. The species classified in the ten first ranges of an assemblage according to their biological index, are called preferential species of the assemblage, while those classifed below the ten first ranges companion species. That means that only the preferential and the companion species of an assemblage have a biological index.

The total of the samples were collected from areas belonging to the assemblage of the Photophilic Soft Algae (Pérès 1982).

Finally, it should be clarified that the examination of the intra- and episponge fauna as a whole has been prefered (although they could be examined separately), because each sponge inhabitants' assemblage was considered to be a unity and with the presupposition that one or more sponge individuals-always from the same station-consist a sponge-sample.

RESULTS AND DISCUSSION

87 Sponge samples belonging to the following species were examined: *Geodia cydonium* (Jameson, 1811); *Agelas oroides* (Schmidt, 1864); *Petrosia ficiformis* (Poirel, 1789); *Spongia officinalis* (Linnaeus, 1759); *Ircinia fasciculata* (Pallas, 1766); *Ircinia muscarum* (Schmidt, 1864) and *Verongia aerophoba* (Schmidt, 1862).

In the plate I are given separately for each sponge-sample, taken from every station, its volume (V) and the numbers of the species (NS), the individuals (NI) and the biomass values (B) of its inhabitants. The values of the volume and biomass are given in litres and grammars correspondingly.

It has been accepted that the animals inhabiting each one of the above sponge species consist a macrofaunal «assemblage»—according to the meaning given to this term by Pérès (1982)—and consequently the method of description proposed by Guille (1970) could be used. The sponge-samples have been considered to be equivalent although they differ in size (expressed as volume). We have accepted that, because even if they had the same volume their equivalence shouldn't be guaranteed. This is because the internal and external space, available to be occupied by the various organisms, may be different among sponge samples, especially if they come from different re-

TABLE I

For explanations see in the text.

Stations		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I.f.	V (l)	5.01	1.64		1.13		3.06	0.63	1.37	1.85	0.82	3.64	1.58	0.76	1.66	4.21	2.75	2.65	2.28	0.95	2.23	1.58
	NS	47	22		22		20	7	33	6	16	47	43	17	38	72	40	66	44	27	52	55
	NI	197	47		55		54	12	145	13	30	250	157	66	193	692	364	464	184	121	460	334
	B (g)	6.58	2.65		3.81		2.15	0.22	18.57	0.13	10.66	5.40	11.40	2.85	16.24	13.30	14.69	9.31	8.58	1.40	5.41	3.74
I.m.	V (l)	1.22	3.29					1.26	2.65	4.57	1.43	1.56	2.20	0.56	0.25	2.14	0.27	0.54	2.50			
	NS	20	22					17	20	15	9	28	25	10	9	37	15	16	47			
	NI	87	113					34	80	47	20	64	105	19	44	180	34	27	332			
	B (g)	5.75	17.68					1.91	18.49	1.77	0.42	2.19	6.83	1.43	2.11	5.54	8.73	0.73	4.88			
S.o.	V (l)		0.42	0.89	3.10		3.42	0.36								0.78				4.31	1.02	2.45
	NS		10	7	26		13	2								15				59	20	17
	NI		13	11	187		53	20								37				383	37	208
	B (g)		0.36	0.83	14.15		3.36	0.88								0.96				27.09	2.94	14.53
V.a.	V (l)	0.58		5.55	0.23	2.08	3.96	0.70	0.41					4.33	1.75			0.29				0.45
	NS	33		29	18	28	28	12	13					54	38			9				11
	NI	150		127	80	130	403	86	37					555	242			21				26
	B (g)	3.56		2.20	5.77	3.48	12.53	11.94	0.81					11.85	7.58			0.69				1.58
P.f.	V (l)	2.00	1.26	8.40	7.67	0.64	2.29	2.12	1.09	2.64	1.65	5.04	2.84		1.92			1.43	3.10		0.75	
	NS	22	9	24	35	4	11	19	10	17	18	28	30		18			21	21		15	
	NI	57	12	65	127	4	37	32	18	71	39	49	70		52			43	48		32	
	B (g)	2.08	17.71	14.65	16.81	0.06	4.89	0.73	0.47	0.99	1.93	4.52	31.78		1.29			1.24	1.47		0.13	
A.o.	V (l)	5.48			1.25	2.59	2.58		0.13	3.06	1.06	1.15	0.57						0.85			
	NS	26			11	24	13		3	13	6	19	8						16			
	NI	69			15	54	35		5	39	13	40	19						23			
	B (g)	2.54			0.87	12.01	0.25		0.15	1.28	4.73	1.62	1.03						1.76			
G.c.	V (l)		2.20	0.30		7.79			0.43			3.46	4.78					2.50		1.26		
	NS		21	16		34			6			34	39					32		26		
	NI		63	30		120			6			142	151					211		69		
	B (g)		6.01	1.59		25.04			1.16			10.83	6.09					0.78		4.96		

gions. The fact that no relation between the sponge volume and the number of the species or individuals of its inhabitants has been found, could be attributed to the same reason. Such a relation was not also found by Sube (1970) for the species he studied. Pansini (1970) didn'y find a direct relationship between the volume of the sponges examined (*I. fasciculata*, *S. officinalis* and *P. ficiformis*) and the number of their inquilines, although all his data were statistically analyzed. On the other hand, Westinga and Hoetjes (1981) and Labate et D'Addabbo Gallo (1974) found a relation between the volume of the sponge samples they examined, and the density of their inhabitants.

For every one of the 7 sponge species separately, the qualitative distribution of the various taxonomic groups of its inhabitants, regarding a) the number of individuals and b) their wet weight biomass, is given in pie diagrams (Fig. 2-5).

In these diagrams it is obviously seen that the Crustaceans are the dominant group, as far as their abundance is concerned, in the six of the seven sponge species. In some cases particularly, their dominance is very high compared to that of the other taxa, as in *V. aerophoba* and *P. ficiformis* where it has a value of 78.5 p. cent

and 66.4 p. cent correspondingly. In the seventh species, *A. oroides*, crustaceans and polychaetes are present with almost the same dominance value.

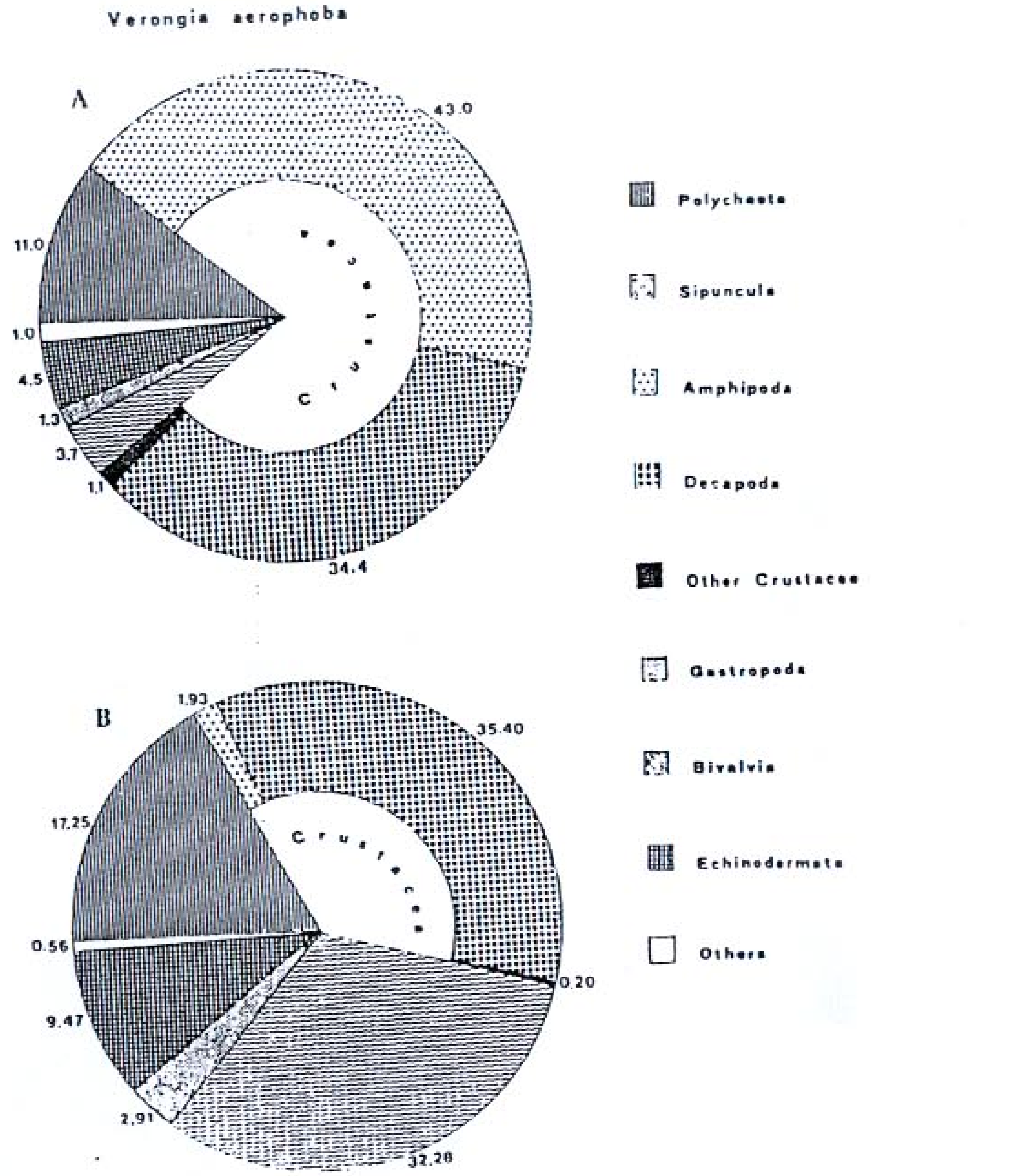

FIG. 2

Pie diagrams showing the qualitative distribution of the various taxonomic groups, in the assemblage associated with the sponge *Verongia aerophoba* : A, number of individuals; B, wet weight biomass.

In the group of the crustaceans, the decapods or the amphipods are always the most numerous. This can be attributed primarily to the structure of the sponge. So, in *V. aerophoba* for example, amphipods are the dominant group (43.0 p. cent), probably due to the small openings of the sponge canals, which don't permit the entering of large individuals in them. The percentage of decapods is also high in this sponge (34.4 p. cent), possibly because their settlement on the sponge is favoured by the existence of many depressions on its surface. In *P. ficiformis* episponge decapods is the most dominant group (50.0 p. cent) because their settlement on the surface of the sponge is especially favoured by its structure (small canals and large—in relation to the volume—surface with many depressions). Regarding their biomass, crustaceans are not always in the first position, because in some cases they are substituted by large polychaetes and molluses. So, in *G. cydonium* although crustaceans comprise the 57.8 p. cent of the total number of individuals, and polychaetes only the 32.1 p. cent, the opposite relation exists as far as their biomass

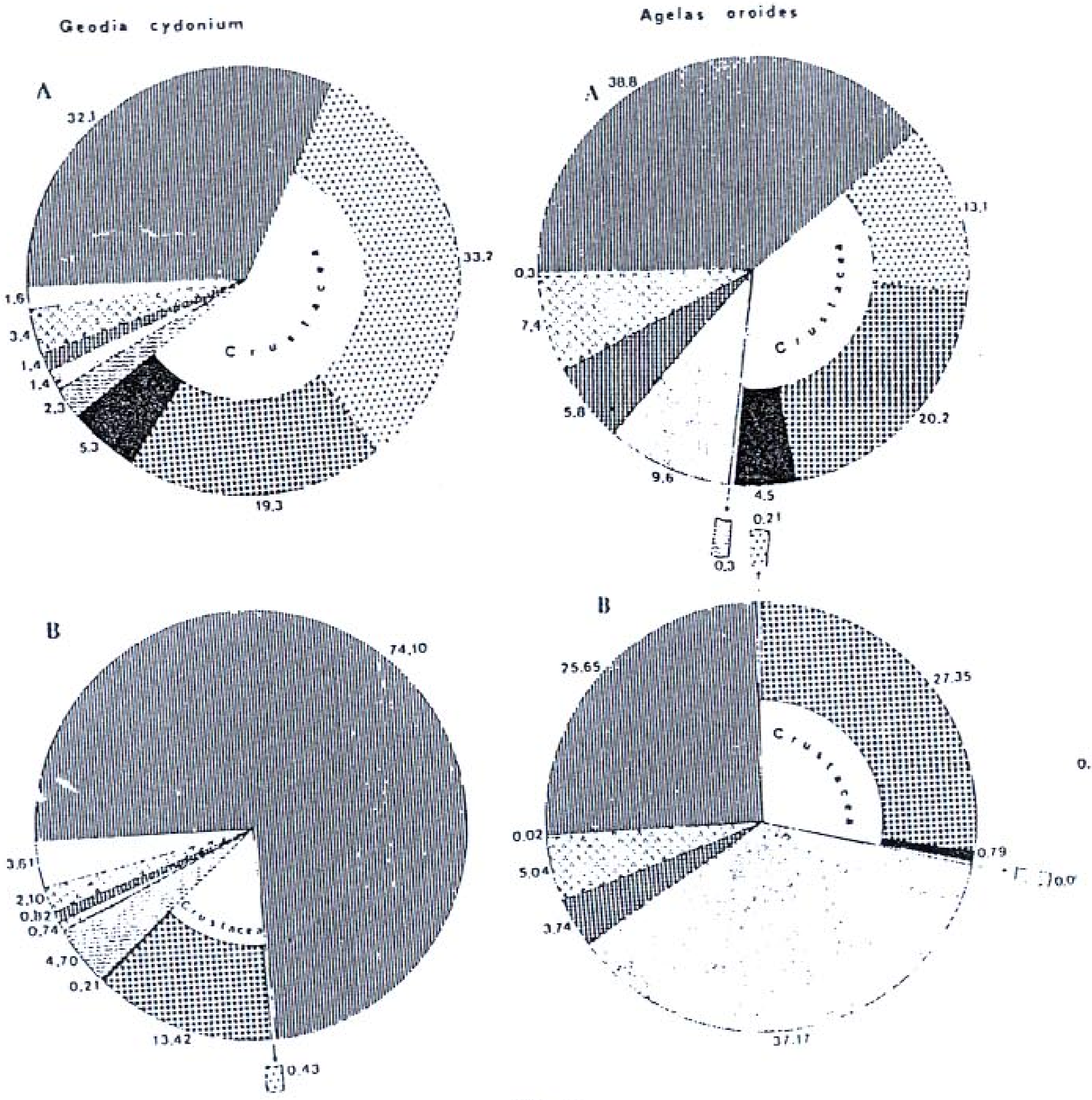

FIG. 3

As in figure 2, for the sponge species *Geodia cydonium* and *Agelas oroides*.

is concerned (polychaetes 74.1 p. cent and crustaceans only 14.06 p. cent). This can be also attributed to the structure of this sponge, the wide canals of which permit the settlement of the large polychaete individuals. The differences in the dominance and biomass percentage of the various taxa in the sponges *I. fasciculata* and *I. muscarum* can be attributed to the same reason. Although in both species of *Ircinia*, crustaceans have the highest dominance and

in the former they also have a higher value of biomass, in the latter polychaetes have a higher value of biomass due to the comparatively larger canals of this sponge species.

In *S. officinalis*, crustaceans are dominant both in the number of individuals (57.1 p. cent) and biomass (41.82 p. cent), a fact that can be attributed to the numerous and large individuals of the

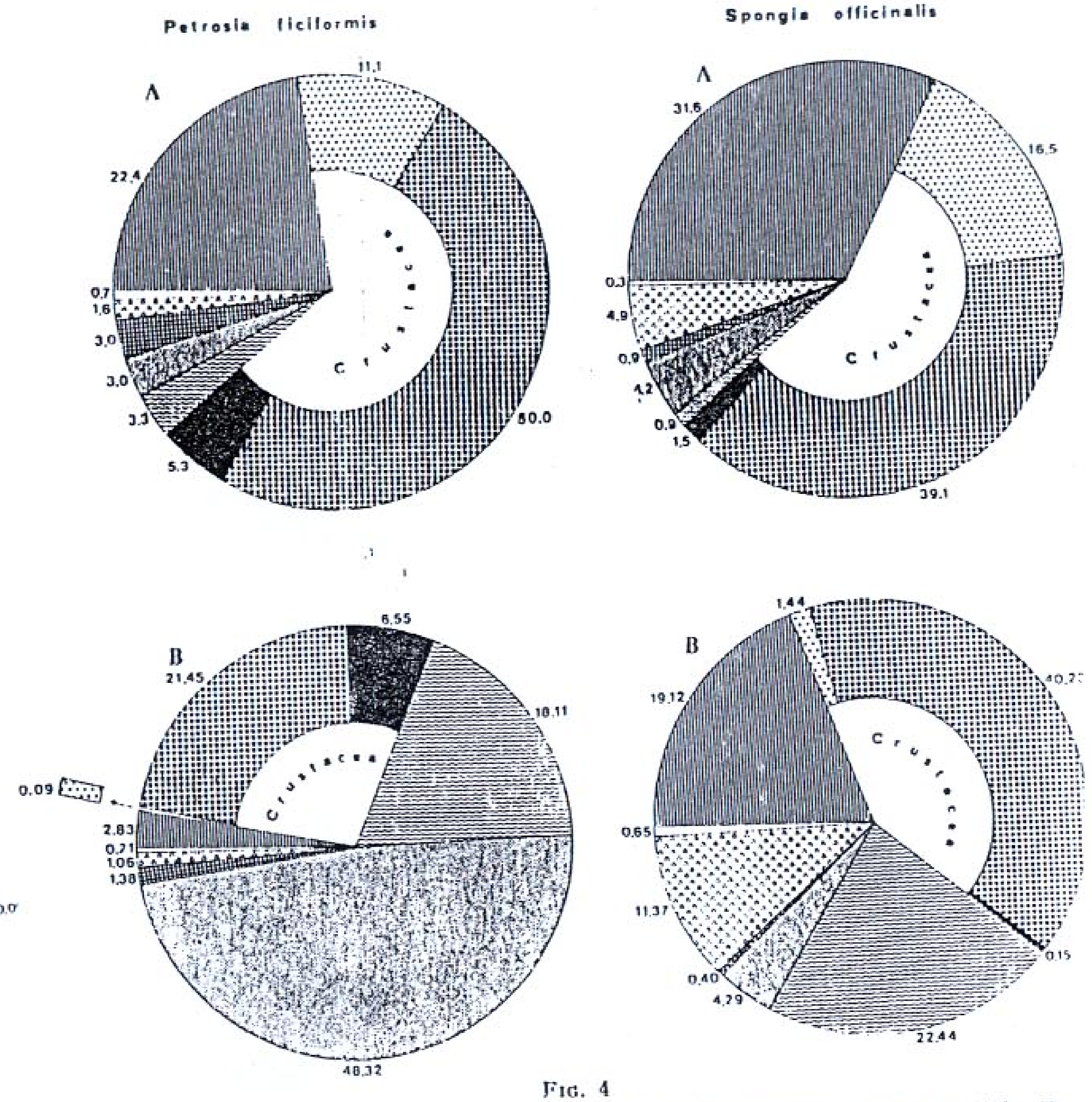

FIG. 4

As in figure 2, for the sponge species *Petrosia ficiformis* and *Spongia officinalis*.

species *Synalpheus gambareloides* that shows a selective preference for settlement in this sponge, obviously due to the numerous and large canals of this sponge.

In the sponge species examined, Molluscs is generally the third group regarding abundance and biomass, after crustaceans and polychaetes. In some cases, however, they occur with especially high values of biomass, as in *P. ficiformis* (66.43 p. cent) and *A. oroides* (37.24 p. cent) where, as it was said before, the settlement of large episponge species (such as molluscs) is favoured by the sponge structure.

The remaining taxa participate generally with much smaller percentages. Sipunculans among them, have the greater dominance values, ranging between 0.7 p. cent and 7.3 p. cent, and the greater biomass values, ranging from 0.2 p. cent to 11.4 p. cent.

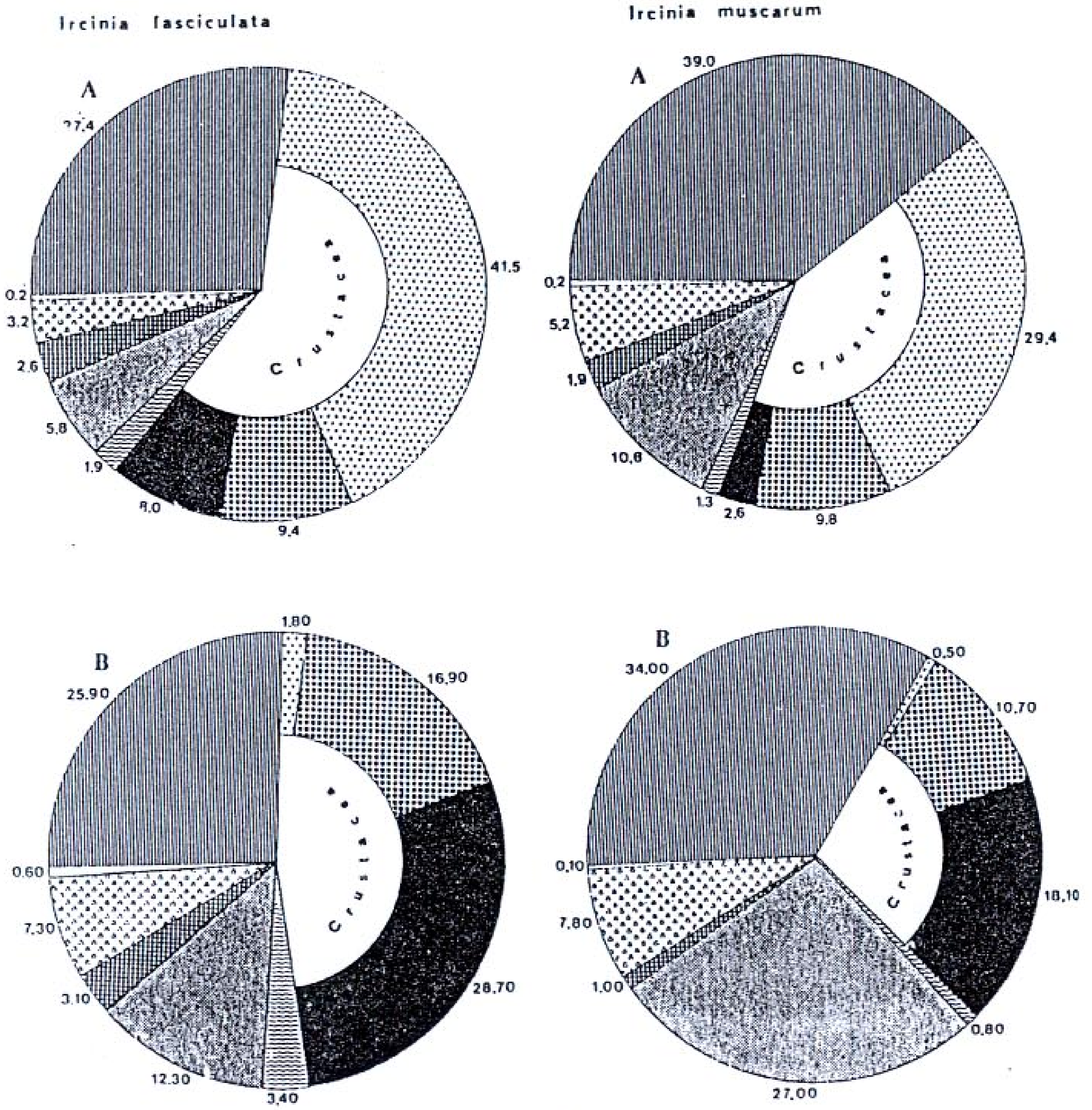

FIG. 5

As in figure 2, for the sponge species *Ircinia fasciculata* and *Ircinia muscarum*.

The 10 preferential species of the assemblages formed by the inhabitants of each sponge species, as well as their classification (according to their Biological Index) in each assemblage, are given in figure 6. As it can be seen, some species take a high biological index value in almost all sponge species. The most characteristic of

them is the decapod *Alpheus dentipes* which has been found among the first ten species in all the seven sponge species. This decapod has been also found to live in crevices (Ledoyer 1968, 1969), as well as in *Posidonia* meadows (Peres et Picard 1964). As it is a sciaphilic species, it finds a suitable host in sponges as other species of the family Alpheidae that are aslo well known sponge inhabitants (Heller 1863, Arndt 1933, Bacescu 1971, Rützler 1975, etc.). The anomure *Cestopagurus timidus* has also high biological index values, in six of the seven sponge species. This decapod has been reported as a sponge inhabitant, for the firt time, by Koukouras *et al.* (1979).

	← Assemblages →						
Species	I.f.	I.m.	V.a.	P.f.	G.c.	A.o.	S.o.
Leucothoe spinicarpa	1	3	3	12	33	10	7
Hiatella arctica	2	2	30	27	27	1	5
Nereis costae	3	1	9	19	2	6	2
Dynamene torelllae	4			36			
Alpheus dentipes	5	7	2	2	1	2	1
Potamilla torelli	6	4	24	24		7	6
Phascolosoma granulatum	7	6		15		5	3
Amphithoe ramondi	8	20	17	26	5		25
Cestopagurus timidus	9	11	4	1	4	11	8
Nereis zonata	10	8	11		3		11
Dasychone bombyx	11	5	15	9	7	15	9
Ophiothrix fragilis	13	9	5	8	25	4	16
Harmothoe spinifera	17	10	14			18	
Colomastix pusilla		41	1	7	10	3	23
Thoralus cranchii	30		6	5	9		28
Athanas nitescens	19		7	6	12	8	10
Galathea bolivari	34		8	37			27
Pisidia bluteli			10	3			31
Lysmata seticaudata			33	4			
Trypanosyllis zebra				10	41	23	
Pilumnus spinifer			20	14	6	22	22
Microdeutopus stationis	22				8		19
Serpula vermicularis		27	27			9	18
Synalpheus gambarelloides		18		37			4

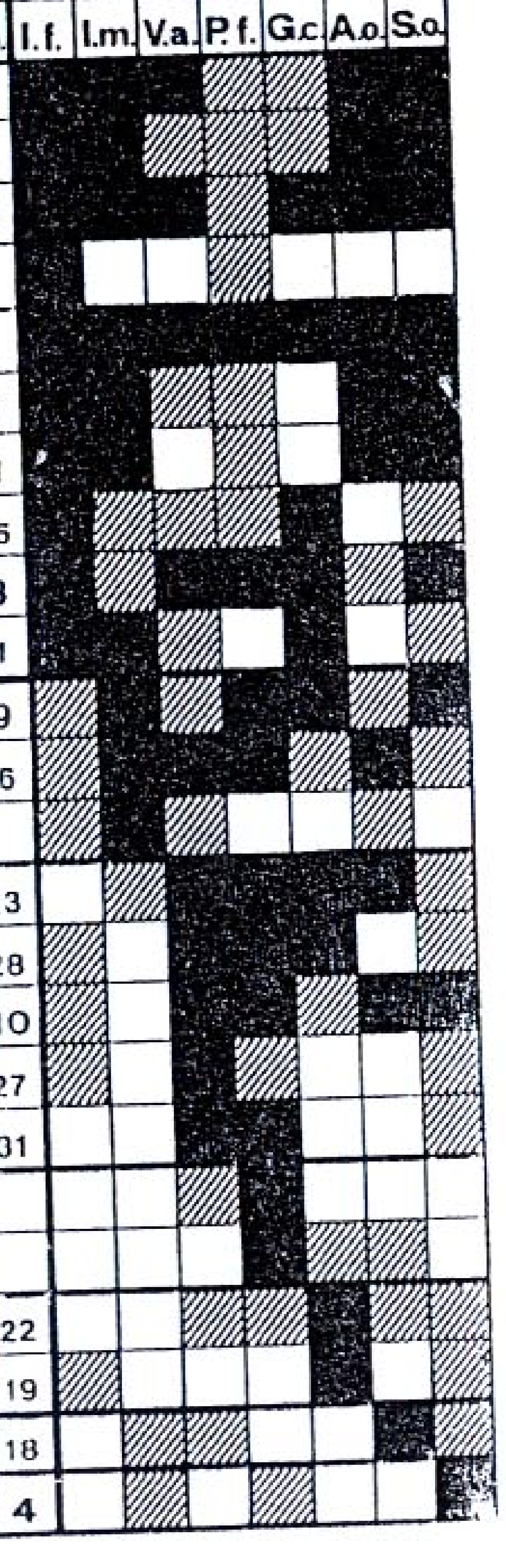

FIG. 6

The ten preferential species of the assemblages associated with each of the seven sponge species, and their classification (according to their Biological Index) in each assemblage separately. Each black square shows that a certain species is a preferential species of the corresponding assemblage, while each square covered with oblique lines corresponds to a companion species. Each empty square shows that a certain species has not a biological index value in a certain assemblage.

Among the four amphipod species included in figure 6, the species *Leucothoe spinicarpa* and *Colomastix pusilla* have the higher biological indices. The former is one of the species that have been frequently found in sponges (Pearse 1932, Arndt 1933, Fishelson 1966, Connes 1967, Koukouras *et al.* 1979, Westinga and Hoetjes 1981, Biernbaum, 1981). According to Ledoyer (1969) it is a nocturnal species living on hard substrates, a fact that justifies its preference for settlement in sponges. This amphipod has been also reported as a parasite of sponges (Arndt 1933, Connes 1967), as well as an inhabitant of certain simple ascidians (Koukouras and Siamidou-Efremidou 1978-1979). The latter has been also frequently reported to be in association with sponges (Pearse 1932, Bacescu et Mayer 1960, Sube, 1970, Peattie and Hoare 1981, etc.). Ledoyer (1968) has found this species in the region of Marseille only in places rich in sponges.

From the Polychaetes, *Nereis* costae is one of the first ten species in six of the seven sponge species, in the seventh being also in a good order. It has been found in sponges by Santucci (1922), Rützler (1975) and others.

Echinoderms are represented only by the ophiuroid *Ophiothrix fragilis* which is also a well known inhabitant of various sponges (Vidal 1967, Sube 1970, Frith 1976, Zavodnik 1976). It is present with high biological indices in all the seven sponge species, especially in those favouring its settlement due to the numerous depressions on their surface; these species are *A. oroides, V. aerophoba* and *P. ficiformis*.

Bivalves are represented only by *Hiatella arctica* which is also a known sponge dwelling animal (Santucci 1922, Riedl 1963, Koukouras *et al.* 1979, etc.). This species has been found with especially high biological indices in four of the seven sponges. It has been usually found covered entirely by the sponge as a result of its growth process.

As far as the remaing species of figure 6 are concerned, we can see that every one of them is present with high biological index values in one or only a few sponge species. However it is difficult to accept that they saw a special preference to these sponges because there is little information on the composition of the assemblages associated with sponges, which sometimes seems to be contradictory and not clarifing.

Among the species of the assemblages associated with the studied sponges, no sponge specific species were found. In the literature, very few such species have been reported (Bacescu 1968, Berguist 1978, Lauckner 1980).

The case of the gastropod *Peltodoris atromaculata* should be rementioned. We found it also, only on the sponge *P. ficiformis* on which it was feeding, but it couldn't have a biological index value —and so it was not considered as a preferential species—because it was always represented only by a few large individuals.

In table II the following data for each sponge species are given: the total number of species (NS); the number of species that have a biological index (NS_{IB}), namely the 10 preferential species and the companion species; the cumulative dominance of the species having a biological index (DC); and the cumulative dominance of the 10 preferential species (DC_{PS}).

TABLE II

For explanations see in the text.

	I. f.	I. m.	S. o.	V. a.	P. f.	A. o.	G. c.
NS	151	90	89	104	91	61	98
NS_{IB}	44	48	21	35	41	31	41
DC	86.56 %	89.70 %	85.80 %	89.31 %	88.39 %	88.42 %	84.07%
DC_{PS}	58.89 %	47.78 %	72.90 %	74.48 %	51.56 %	63.45 %	47.46 %

From the data given in this table, the stability of the assemblages associated with the studied sponges can be evaluated. This seems to be great enough, so that the assemblages may be considered to constitute ecological communities. This is especially true for *V. aerophoba* and *S. officinalis* where the cumulative dominance of the 10 preferential species is 74.78 p. cent and 72.90 p. cent respectively, namely greater enough than that of the other species. The same can be seen-not so obviously of course-by comparison of the NS and NS_{IB} values. However, the cumulative dominances of the preferential species (as well as of all the species with a biological index) are very satisfactory compared to that given by Guille (1970) for the benthic communities of the soft substratum he studied. It's also remarkable, that the cumulative dominances of the total of species with a biological index (DC), in each sponge species don't differ much between them (84.07 p. cent-89.7 p. cent).

In the following list the 223 animal species inhabiting the seven sponge species studied are presented. The number of individuals of each species in every sponge is given. In the end of the list the total number of species and individuals found in every sponge as well as the total volume (in litres) of the sponge samples examined from each sponge species are presented.

As it can be seen in the list, in 31 cases the identification has stopped in the genus level, either because the individuals were in a bad condition or because they were juvenils. The bad condition of the Nemertina due to their preservation in formalin didn't permit a further identification, too.

From the total of 223 species, 25 species (12 polychaetes, 5 decapods, 3 amphipods, 2 sipunculans, 1 isopod, 1 mollusc and 1 echinoderm), that correspond to a percentage of 11.21 p. cent have been found in all the seven sponge species studied. 82 species (mainly polychaetes, gastropods and amphipods), that correspond to a percentage of 36.77 p. cent, were found in only one of the 7 sponge species. The remaining 116 species, namely a percentage of 52.02 p. cent, were found in 2-6 of the seven sponge species.

According to the related literature—Heller (1863), Santucci (1922), Fage (1928), Pearse (1932, 1950), Arndt (1933), Dauer (1936), Bacescu et Mayer (1960), Fishelson (1966), Connes (1967), Vidal (1967), Bacescu 1968), Sube (1970), Connes *et al.* (1971), Rullier (1974), Frith (1976), Rützler (1975), Zavodnik (1976), Koukouras *et al.* (1979), Amoureux *et al.* (1980), Lauckner (1980), Pansini e Daglio (1980-1981), Biernbaum (1981), Peattie and Hoare (1981) and Westinga and Hoetjes (1981)—69 of the species included in this list (a percentage of 30.00 p. cent) have been previously reported as sponge inhabitants, while the other 161 are reported here for the first time.

As far as we able to know, the only faunal information concerning the littoral area of Chalkidiki Peninsula is that given by Bellan (1964) on the polychaetes, by Zibrowius (1979) on the scleractinian corals, by Koukouras and Siamidou-Efremidou (1978-1979) on the ascidians, by Koukouras and Sinis (1981) on crinoids and holothurians and by Koukouras *et al.* (1979). From these, only the papers of Bellan (1964) and Koukouras *et al.* (1979) include some (16) of the species presented in the list. So, all the other inhabitants of the seven sponge species should be considered as new for the local fauna, on which there is very little information.

CONCLUSIONS

1. In the seven sponge species studied, a rich in species associated macrofauna has been found.
2. No relations between the volume of the sponge samples on one hand and the number of species and individuals inhabiting them or their biomass on the other, has been found for any of the 7 sponge species examined.
3. The macrofauna associated with each of the seven sponge species, constitutes an assemblage with a more or less stable composition—regarding at least the preferential species—a fact that permits its characterization as an ecological community.
4. With the exception of *A. oroides* (in which polychaetes and crustaceans participate with almost the same percentages), crusaceans have always the greatest dominance and the other taxa follow always in the same order: polychaetes, molluscs, sipunculans, echinoderms and, with very small percentage, all the other taxonomical groups together.
5. In all the examined sponge species, no member of the corresponding assemblage could be considered as an obligate inhabitant.
6. The qualitative composition of each assemblage seems to be connected mainly with the internal and external morphology of the sponge associated to, obviously because the various animals show a selective preference for settlement in that sponge species that meets with their special needs. This seems to be true especially for the preferential species of each assemblage.

List of the fauna associated with the seven examined sponge species (1)

	G.c.	A.o.	P.f.	S.o.	I.f.	I,m.	V.a.
NEMERTINA							
Nemertina	1			2	3	2	
POLYCHEATA							
Acanthicolepis sp.		1					
Amphiglena sp.		1			4		
· *Amphitrite johnstoni* Malmgren	1			3	14	4	14
· *Amphitrite variabilis* (Risso)	5	6	2	6	10	10	4
Amphitritides gracilis (Grube)					1		
Autolytus cf. brachycephalus (Marenzeller)	1						
Branchioma vesiculosum (Montagu)		1			1		
· *Ceratonereis costae* Grube	53	23	15	43	173	115	23
Chone collaris Langerhans					1		
· *Chrysopetalum debile* (Grube)					1		
· *Cirriformia tentaculata* (Montagu)	1				1	3	
Dasybranchus gajolae Eisig	1			1	4	5	2
Dasychone bombyx (Dalyell)	18	4	20	63	92	57	11
· *Dasychone lucullana* (Delle Chiaje)				1			
Dodecaceria concharum Oersted			1				
Dorvillea rubrovittata (Grube)					2		2
· *Eulalia (Pterocirrus) macrocerros* Grube				1	1		
· *Eulalia sanguinea* (Oersted)				6	7	5	
· *Eulalia viridis* (Linnaeus)				1	6	3	
Eulalia sp.					1		
· *Eunice siciliensis* Grube	5	2	1	2	13	4	9
· *Eunice torquata* Quatrefages			1				
Eunice sp.							1
· *Eupolymnia nesidensis* (Delle Chiaje)					5		
Glycera lapidum Quatrefages		1	1	1	2		
· *Haplosyllis spongicola* (Grube)	2	1		1			
Harmothoe areolata (Grube)		1					1
· *Harmothoe spinifera* (Ehlers)	5	4	1	6	52	18	15
Harmothoe sp.					1		
· *Hydroides pseudouncinata pseudouncinata* Zibrowius	1	5	8	3	9	4	1
Jasmineira sp.				1			
· *Langerhansia cornuta* (Rathke)					1		
· *Lepidasthenia elegans* (Grube)	2	1		2	7	12	1
Lepidasthenia sp.					1		
Lepidonotus clava (Montagu)	2	2	1	12	41	9	
Lumbrinereis funchalensis (Kinberg)	11	1	4	2	23	7	4
Lysidice collaris Grube			1	7	19	5	2
· *Lysidice ninetta* Audouin & Milne Edwards	9		5	12	42	7	12
Marphysa fallax Marion & Bobretzky					2	1	
· *Nematonereis unicornis* (Grube)				1			1
Nereis rava Ehlers	1			2	4	1	
· *Nereis zonata* Malmgren	52			32	119	31	29
Nicolea venustula (Montagu)	3			3	4	3	2
Odontosyllis ctenostoma Claparède						1	
Odontosyllis sp.		1					
Perinereis oliveirae Horst	4		1		25	1	
Phyllodoce laminosa Savigny					2		

(1) The species marked with a · have been previously reported as sponge inhabitants.

	G.c.	A.o.	P.I.	S.o.	I.f.	I.m.	V.s.
Phyllodoce madeirensis Langerhans					1	1	
Phyllodoce sp.		1					
· *Platynereis dumerilii* (Audouin & Milne Edwards)	8		1	2	29	20	5
Pista cretacea (Grube)	1						
Pista cristata (Müller)		1			4		2
· *Polycirrus aurantiacus* Grube	3			9	11	5	
Polydora caeca (Oersted)					1		
· *Polyophthalmus pictus* (Düjardin)	9				2		
Pomatoceros triqueter (Linnaeus)							1
· *Pontogenia chrysocoma* (Baird)	3						
Potamilla reniformis (Müller)	1	5	12	1	31	11	
· *Potamilla torelli* Malmgren	5	29	9	55	126	45	11
Protula intestinum (Savigny)			1				
Protula tubularia (Montagu)					1		
· *Sabellaria spinulosa* Leuckart			3		1		
Scaliselosus pellucidus (Ehlers)		1			5		
Serpula concharum Langerhans		1	3		2		1
· *Serpula vermicularis* Linnaeus	1	9	16	5	10	6	8
Spirobranchus polytrema (Philippi)	3	2	12	2	6	3	4
· *Syllidia armata* Quatrefages					1		
· *Syllis gracilis* Grube	13	3	7	1	32	37	1
Syllis sp.						2	
· *Terebella lapidaria* Linnaeus	2	1	2		4	2	1
Thelepus cincinnatus (Fabricius)					1		
· *Thelepus setosus* (Quatrefages)				1	2		
Thelepus triserialis (Grube)					1		
· *Trypanosyllis zebra* (Grube)	4	4	19		21	9	15
· *Typosyllis armillaris* (Müller)		1					
· *Typosyllis hyalina* (Grube)	6	2	3	4	12	5	2
Typosyllis krohnii (Ehlers)	4				11	2	1
· *Typosyllis prolifera* (Krohn)	7			4	23	1	3
· *Typosyllis variegata* (Grube)	4	1		1	16	7	1
Vermiliopsis infundibulum Philippi	1	1	2				
Vermiliopsis striaticeps (Grube)	2	4	17	3	6		
SIPUNCULIDA							
Aspidosiphon mülleri Diesing	15	3	1	7	56	16	7
Golfingia vulgaris (Blainville)	1						1
· *Phascolosoma granulatum* (Leucart)	11	20	13	40	68	46	5
CRUSTACEA, CIRRIPEDIA							
· *Balanus perforatus* Bruguiere			8		17	7	
CRUSTACEA, TANAIDACEA							
Apseudes sp.₁			1		1	2	
Apseudes sp.₂	4						
Leptochelia savignyi (Kroyer)	26		3	3	16	5	7
Tanais dulongii (Audouin)	1			1	3	1	
CRUSTACEA, ISOPODA							
Bagatus cf. *stebbingi* Monod	2			1	7	2	
Cymodoce erythraea Nobili					1		
Cymodoce (truncata) pilosa Milne Edwards	2	7	10	1	19		2
Cymodoce tattersalli Torelli		2	2				
Cymodoce truncata (Montagu)			3	1		4	2
Cymodoce tuberculata Costa			1		2		

	G.c.	A.o.	P.I.	S.o.	I.f.
Lysmata seticaudata (Risso)		1	24		
· *Pagurus anachoretus* Risso	1		3	1	2
· *Pilumnus hirtellus* (Linnaeus)	5	1		2	18
Pilumnus spinifer Milne Edwards	15	4	16	5	25
Pilumnus villosissimus (Rafinesque)	1		1		
Pisidia bluteli (Risso)		1	22	1	4
Pisidia longimana (Risso)		1	3	2	6
· *Porcellana platycheles* (Pennant)			1		
Processa edulis edulis (Risso)					
Sirpus zariquieyi Gordon	4				
· *Synalpheus gambarelloides* (Nardo)		2	2	274	
Synalpheus hululensis Goutiere	1		5		4
· *Thoralus cranchii* Leach	11	1	50	5	39
Xantho granulicarpus Forest	1				1
Xantho pilipes Milne Edwards	1				
Xantho poressa (Olivi)			1		
MOLLUSCA, POLYPLACOPHORA					
Acanthochitona fascicularis (Linnaeus)					
Callochiton septemvalvis euplacae (Costa)			1		
Chiton olivaceus Spengler		1		1	2
Lepidopleurus cajetanus (Poli)	11		1		1
MOLLUSCA, GASTROPODA					
Acinopsis cancellata (Da Costa)				1	
· *Bittium reticulatum* (Da Costa)	1	1	1		7
Calliostoma zizyphinus (Linnaeus)					
Calliostoma sp.					1
Cantharus dorbignyi (Payraudeau)				1	
Cerithiella sp.					1
Chauvetia sp.					
Clanculus cruciatus (Linnaeus)			3		2
· *Columbella rustica* (Linnaeus)	2			1	1
Columbella sp.					3
Dendrodoris limbata (Cuvier)				1	
Diodora gibberula (Lamark)					6
Diodora graeca (Linnaeus)	1				
Discodoris sp.	1			1	13
· *Emarginula elongata* (Da Costa)			1		
Emarginula papillosa (Risso)	1				
Gibbula sp.₁	1				
Gibbula sp.₂					
Goniostoma paradoxa (Monterosato)					1
Hinia incrassata (Ström)			1	2	
Luria lurida (Linnaeus)			1		
Mitra sp.	1				
Muricopsis cristatus (Brocchi)	2		1		2
Muricopsis diadema (Aradas & Benoit)					2
Pellodoris atromaculata Bergh			16		1
Puncturella noachina (Linnaeus)	3		1	1	29
Rissoa sp.					1
Triphora sp.	1			1	1
Trophonopsis sp.					
Turbona cimex (Linnaeus)	1				
Turbona sp.	1				
Tylodina perversa (Gmelin)	2				
Weinkauffia sp.					

	G.c.	A.o.	P.f.	S.o.	I.f.	I.m.	V.a.
• *Dynamene torelliae* Holdich			5	2	198	5	
Gnathia vorax (Lucas)		1	2				
Gnathia sp.		1			1		
• *Janira maculosa* Leach	6	3	4	5	9	5	8
Janiropsis sp.			1		2		
Paranthura sp.					34		
CRUSTACEA, AMPHIPODA							
Ampelisca rubella Costa					1		
Amphilochus neapolitanus Della Valle	1				1	2	
• *Amphithoe ramondi* Audouin	76		5	12	201	20	6
Aora allandidea Reid				1	1		
Apherusa bisbinosa (Bate)					2		
Caprella acanthifera Leach	2				6	1	
• *Colomastix pusilla* Grube	14	30	26	2	9	4	567
• *Corophium acutum* Chevreux			5		6		40
Dexamine spiniventris Costa	5		2	2	21	1	12
Dexamine spinosa (Montagu)	5						
Elasmopus pocillimanus (Bate)	26			13	63	56	6
• *Elasmopus rapax* Costa	16		3	4	44	35	8
• *Ericthonius brasiliensis* (Dana)	1			2	33	6	2?
Eusiroides dellavallei Chevreux	5		3				
Gammaropsis maculata (Johnston)	13	1	3	9	47	63	7
Hyale camptonyx (Heller)	21				16		
Hyale dollfusi Chevreux	8		1		1		1
Jassa ocia (Bate)					2		
• *Lembos websteri* Bate	2		4	2	11	2	3
• *Leucothoe spinicarpa* (Abildgaard)	6	9	21	98	1024	85	106
Lilljeborgia dellavallei Stebbing	3	1			15	3	
Lysianassa bispinosa (Della Valle)					2		
Lysianassa ceratina (Walker)	7		1	1	1		3
Macra inaequipes (Costa)	1		11	4	35	28	6
Metaphoxus fultoni (Scott)				1	1		
Microdeutopus obtusatus Myers	11						
Microdeutopus stationis Della Valle	39			5	36	4	9
Panoploea minuta (Sars)							1
Percionotus testudo (Montagu)					2		
Pleonexes gammaroides Bate	2				1		
Podocerus variegatus Leach					3	5	1
Stenothoe cattai Stebbing						7	
Stenothoe cavimana Chevreux					5		
Stenothoe spinimana Chevreux					1	30	
• *Tritaeta gibbosa* (Bate)							1
CRUSTACEA, DECAPODA							
Acanthonyx lunulatus (Risso)					9		
• *Alpheus dentipes* Guérin	59	18	71	58	134	32	143
• *Athanas nitescens* (Leach)	14	19	30	12	27	16	54
Calcinus ornatus (Roux)			1		1		5
• *Cestopagurus timidus* (Roux)	39	12	104	7	65	24	139
Clibanarius erythropus (Latreille)	1		2	1	3	1	1
• *Dromia personata* (Linnaeus)							1
• *Eualus occultus* (Lebour)		1	26		4		5
Galathea bolivari Zariquiey Alvarez		1	4	1	16	5	45
Galathea squamifera Leach			7				
Herbstia condyliata (Fabricius)		1	3	1			1

	G.c.	A.o.	P.f.	S.o.	I.f.	I.m.	V.a.
MOLLUSCA, BIVALVIA							
• *Arca noae* Linnaeus			1		1	1	
• *Barbatia barbata* (Linnaeus)		2	1		1	1	1
Chlamys multistriata (Poli)							1
Galeomma turtoni (Sowerby)					4		1
• *Hiatella arctica* (Linnaeus)	3	28	10	33	180	117	15
• *Lima (Mantellum) inflata* (Chemnitz)				1	1		2
Lima lima (Linnaeus)			5			1	
Lithophaga lithophaga (Linnaeus)				1			
Modiolus barbatus (Linnaeus)					1	1	
Montacula sp.				1			
Musculus costulatus (Risso)	8			3	24	4	1
• *Mytilus galloprovincialis* Lamark					2		
Notirus irus (Linnaeus)							1
Pitar rude (Poli)				1			
Striarca lactea (Linnaeus)			2		8	1	1
Thracia sp.							1
ECHINODERMATA							
• *Amphipholis squamata* (Delle Chiaje)					3		
• *Ophiothrix fragilis* (Abildgaard)	11	18	23	9	98	22	84
PISCES							
Chromogobius quadrivittatus (Steindachner)	1						
Knipowitschia caucasica (Kawrajky)			2		2		3
Knipowitschia sp.			1				
Odondobuenia balearica (Pellegrin & Fage)					1		
Total number of individuals :	792	312	756	949	3838	1186	1857
Total number of species :	98	61	91	89	151	90	104
Total volume of the sponge samples (1) :	22.7	18.7	44.8	16.7	39.8	24.4	20.3

Summary

Some aspects of the composition of the assemblages inhabiting the sponge species *Geodia cydonium*, *Agelas oroides*, *Petrosia ficiformis*, *Spongia officinalis*, *Ircinia fasciculata*, *Ircinia muscarum* and *Verongia aerophoba* in Chalkidiki Peninsula, North Aegean Sea, are analyzed and presented by biocoenotic methods. The differences among the assemblages from an ecological point of view are also given and discussed.

A list is also given presenting the 223 species inhabiting the above 7 sponge species as well as their abundance in each one of them. The species previously reported as sponge inhabitants are also mentioned.

REFERENCES

AMOUREUX, L., JOSEF, G. et O'CONNOR, B., 1980. — Annélides polychètes de l'éponge *Fasciospongia cavernosa* Schmidt. *Cah. Biol. Mar.*, 21, *pp.* 387-392.

ARNDT, W., 1933. — Die Biologischen Beziehungen zwischen Schwämmen und Krebsen. *Mitt. Zool. Mus. Berlin*, 19, *pp.* 221-305.

BACESCU, M., 1968. — Heteromysini nouveaux des eaux cubaines : trois espèces nouvelles de *Heteromysis* et *Heteromysoides spongicola* n.g.n.sp. *Rev. Roumaine Biol., Zool.*, 13 (4), *pp.* 221-237.

BACESCU, M., 1971. — Les Spongiaires; un des plus intéressants biotopes benthiques marins. *Rapp. Comm. int. Mer. Médit.*, 20 (3), *pp.* 239-241.

BACESCU, M. et MAYER, R., 1960. — Nouveaux cas de commensalisme (*Colomastix* et *Tritaeta*) et de parasitisme (*Rhizorhina*) pour la mer Noire et quelque observation sur l'Ampelisca des eaux prébosphoriques. *Trav. Mus. Hist. nat. « Gr. Antipa »*, 2, *pp.* 87-96.

BELLAN, G., 1964. — 6. Annélides polychètes. Campagne de la *Calypso*, 1960 : Méditerranée nord-orientale. *Ann. Inst. océanogr., Paris*, 41, *pp.* 271-288 — (= *Rés. Sci. Camp. Calypso*, fasc. VI).

BERGQUIST, P., 1978. — Sponges. *Hutchinson and Co, London, pp.* 1-278.

BIERNBAUM, C., 1981. — Seasonal Changes in the Amphipod Fauna of *Microciona prolifera* (Ellis and Solander) (Porifera : Demospongia) and Associated Sponges in a Shallow Salt-Marsh Creek. *Estuaries*, 4 (2), *pp.* 85-96.

CONNES, R., 1967. — Réaction de défense de l'éponge *Tethya lyncursium* Lamarck, vis-à-vis des micro-organismes et de l'amphipode *Leucothoe spinicarpa* Abildg. *Vie Milieu*, 18 (2-A), *pp.* 281-289.

CONNES, R., PARIS, J. et SUBE, J., 1971. — Réactions tissulaires de quelques démosponges vis-à-vis de leurs commensaux et parasites. *Naturaliste Can.*, 98, *pp.* 923-935.

DAUER, D., 1936. — Polychaete fauna associated with Gulf of Mexico sponges. *Florida Sci.*, 36 (2-4), *pp.* 192-195.

FAGE, L., 1928. — Remarques sur le comportement du *Tritaeta gibbosa* (Bate) crustacé amphipode, commensal des éponges. *Bull. Soc. Zool. France*, 53 (4), *pp.* 285-291.

FISHELSON, L., 1966. — *Spirastrella inconstans* Dendy (Porifera) as an ecological niche in the littoral zone of the Dahlak Archipelago (Eritrea). *Bull. Sea Fish. Res. Stn. Israel*, 41, *pp.* 17-25.

FRITH, W., 1976. — Animals associated with sponges at North Hayling, Hampshire. *Zool. J. Linn. Soc. Lond.*, 58, *pp.* 353-362.

GUILLE, A., 1970. — Bionomie benthique du plateau continental de la côte Catalane Française. II. Les communautés de la macrofaune. *Vie Milieu*, 21 (1-B), *pp.* 149-280.

HELLER, C., 1863. — Die Crustaceen des südlichen Europa. Crustacea Podophthalmia. *Wien, pp.* 1-357.

KOUKOURAS, A. and SIAMIDOU-EFREMIDOU, O., 1978-1979. — Benthic fauna of the North Aegean Sea. I. Cionidae and Ascidiidae (Tunicata, Ascidiacea). *Vie Milieu*, 28-29 (4-AB), *pp.* 635-646.

KOUKOURAS, A. and SINIS, A., 1981. — Benthic fauna of the North Aegean Sea. II. Crinoidea and Holothurioidea (Echinodermata). *Vie Milieu*, 31 (3-4), *pp.* 271-281.

KOUKOURAS, A., VOULTSIADOU, H., DOUNAS, C., GOGOU, A. and CHINTIROGLOU, H., 1979. — Preliminary results on the qualitative and quantitative composition of the fauna associated with littoral sponges at Chalkidiki Peninsula (1er *Symposium international sur la zoogéographie et l'écologie de la Grèce et des régions avoisinantes, Athènes, Avril* 1978). *Biologia Gallo-Hellenica*, 8, *pp.* 41-47.

LABATE, M. et D'ADDABBO GALLO, M., 1974. — Sur l'inquilinisme chez *Petrosia ficiformis* Poiret et chez *Stelletta grubii Schmidt* (Porifera, Demospongia) de la côte adriatique de la Pouille. Analyses quantitatives et qualitatives. Rapp. *Comm. int. Mer. Médit.*, 22 (6), *pp.* 49.

LAUCKNER, G., 1980. — 5. Diseases of Porifera. In : O. Kinne (Ed.), Diseases of Marine Animals. Vol. I. General aspects. Protozoa to Gastropoda. *John Wiley and Sons, New York, pp.* 139-165.

LEDOYER, M., 1968. — Ecologie de la faune vagile des biotopes méditerranéens accessibles en scaphandre autonome (région de Marseille principalement). IV. Synthèse de l'étude écologique. *Rc. Trav. St. Mar. Endoume*, 44 (60), *pp.* 125-295.

LEDOYER, M., 1969. — Aperçu sur la faune vagile de quelques biotopes de substrat dur de Méditerranée orientale comparaison avec les mêmes biotopes en Méditerranée occidentale. *Tethys*, 1 (2), *pp.* 281-289.

PANSINI, M., 1970. — Inquilinismo in *Spongia officinalis, Ircina fasciculata* e *Petrosia ficiformis* della Riviera Ligure di Levante. *Boll. Mus. Ist. Biol. Univ. Genova*, 38 (258), *pp.* 5-17.

PANSINI, M. e DAGLIO, S., 1980-1981. — Osservazioni sull'inquilinismo di Policheti erranti in alcune Demospongie del litorale ligure. *Boll. Mus. Ist. Biol. Univ. Genova*, 48-49, *pp.* 55-60.

PEARSE, A., 1932. — Inhabitants of certain sponges at Dry Tortugas. *Pap. Tortugas Lab. Carnegie Inst.*, 28, *pp.* 117-124.

PEARSE, A., 1950. — Notes on the inhabitants of certain sponges at Bimini. *Ecology*, 31 (1), *pp.* 140-151.

PEATTIE, M. and HOARE, R., 1981. — The Sublittoral Ecology of the Menai Strait. II. The Sponge *Halichondria panicea* Pallas and its Associated Fauna. *Estuar. Coast. Shelf S.*, 13, *pp.* 621-635.

PÉRÈS, J.M., 1982. — General features of organismic assemblages in Pelagial and Benthal. In : O. Kinne (Ed.), Marine Ecology Vol. V. Ocean Management, Part. I. *Wiley and Sons, Chichester, pp.* 47-117.

PÉRÈS, J.M. et PICARD, J., 1964. — Nouveau manuel de bionomie benthique de la Méditerranée. *Rec. Trav. St. Mar. Endoume*, 31 (47), *pp.* 1-137.

RIEDL, R. (Ed.), 1963. — Fauna und Flora der Adria. *Verl. P. Parey, Hamburg und Berlin, pp.* 1-640.

RULLIER, F., 1974. — Quelques annélides polychètes de Cuba recueillies dans les Eponges. *Trav. Mus. Hist. Nat. « Gr. Antipa »*, 14, *pp.* 9-77.

RÜTZLER, K, 1975. — Ecology of Tunisian commercial sponges. *Tethys*, 7 (2-3), *pp.* 249-264.

SANTUCCI, R., 1922. — La *Geodia cydonium* come centro di associazione biologica. *R. Comitato Thalassogr. Ital.*, 103, *pp.* 5-19.

SARA, M. et VACELET, J., 1973. — Ecologie des démosponges. In : P. Grassé (Ed.), Traité de Zoologie, Vol. VIII Fasc. I. Spongiaires. *Masson et Cie, Paris, pp.* 462-576.

SUBE, J., 1970. — Etude des associés à quelques spongiaires de la Région Sétoise. Réactions tissulaires des hôtes vis-à-vis de leurs commensaux et parasites. *Thèse Fac. Sc. Univ. Montpellier, pp.* 1-90.

VIDAL, A., 1967. — Etude des fonds rocheux circalittoraux le long de la côte du Roussillon. *Vie Milieu*, 18 (1-B), *pp.* 167-219.

WESTINGA, E. and HOETJES, P., 1981. — The Intrasponge Fauna of *Spheciospongia vesparia* (Porifera, Demospongiae) at Curacao and Bonaire. *Mar. Biol.*, 62, *pp.* 139-150.

ZAVODNIK, D., 1976. — Adriatic echinoderms inhabiting benthic organisms. *Thalassia Jugosl.*, 12 (1), *pp.* 275-380.

ZIBROWIUS, H., 1979. — 7. Scléractiniaires. Campagne de la *Calypso*, 1955, 1956, 1960, 1964 : Méditerranée nord-orientale. *Ann. Inst. océanogr., Paris*, 55, *fasc. suppl., pp.* 7-28 (= *Rés. sci. Camp. Calypso, fasc. XI*).