Acta Adriat., 28 (1—2): 85—101 (1987)

YU ISSN: 0001 - 5113
AADRAY

Original scientific paper
UDC 589.3 (262)

MARINE ALGAE OF THE WEST GREEK COASTS

MORSKE ALGE ZAPADNIH OBALA GRČKE

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Systematic classification, geographical as well as seasonal distribution of marine macrophyceae developing in photophile and sublittoral regions of hard substrates have been studied as regards the West Greek coasts. A total of which 170 taxa of algae have been recognized, 33 of which belong to Phaephyceae, 9 to Chlorophyceae, 25 to Bryopsidophyceae, 5 to Bangiophyceae, 104 to Florideophyceae and 3 to marine Phanerogams. According to Feldmann range (1937) the R/P = 3.3 ratio displavys an Atlantic subtropical character of flora. Cheney (1977) however, reports that the R+C+B/P = 4.33 value is indicative of a rather tropical nature of flora.

INTRODUCTION

Studies on the marine flora of the West Creek coasts have been occassionally conducted in the wake of more general exploratory and scientific expeditions Bory de Saint Vincent 1832, 1838, Giaccone 1968). Tsekos and Haritonidis (1977), have also contributed with a relative research work on marine flora of the islands of the Ionian Sea. More closely Haritonidis and Tsekos (1976) studied the marine flora of the west coasts in 11 biotopes. Similar researches are also encouraged by a general program of N.C.M.R. concerning the marine ecological survey of the area and cover 14 stations (Fig. 1).

Apart from its systematic and phytogeographical character this study also aims at the classification of marine plant taxa into ecological groups and biogeographical elements. Finally the percentage participation of each element in the biotope are noted.

MATERIALS AND METHODS

Samples were taken from an area of 400 cm^2 (20 cm × 20 cm) and from depths ranging between —50 cm and —1 meter. All marine plant organisms were extracted by means of a hammer and chisel in the frame.

Determination of the species took place in the laboratory, after all samples have been placed in a 4% formole solution to be preserved.

The following parameters were used for a more detailed study of the phytobenthos.

a. Ri coverage denoting the precentage cover of the selected surface by the specific species.
b. Quantitative dominance DRi making up the total cover of all species in one group (e. g. Rhodophyceae), by the total number of those species, found on the investigated surface, $DRi = \Sigma Ri \times 100/Rt$.
c. Qualitative dominance DQ, which is the number of species in one group by the total of those, found in the surface, $DQ = Qi \times 100/T$.

STUDY AREA

Etoliko (AT)

Results of the sample collection performed in the lagoon of Etoliko have yielded a small number of species (5 algal species and 1 marine Spermatophyte). Such an outcome is due to the muddy substrate, tho slow water revival and the low salinity, somewhere at 12‰ which is caused by the inflows of waters from many pump-houses in the area and from the tube discarding fresh water from lake Lysimahia for 10 years now (see Fig. 1).

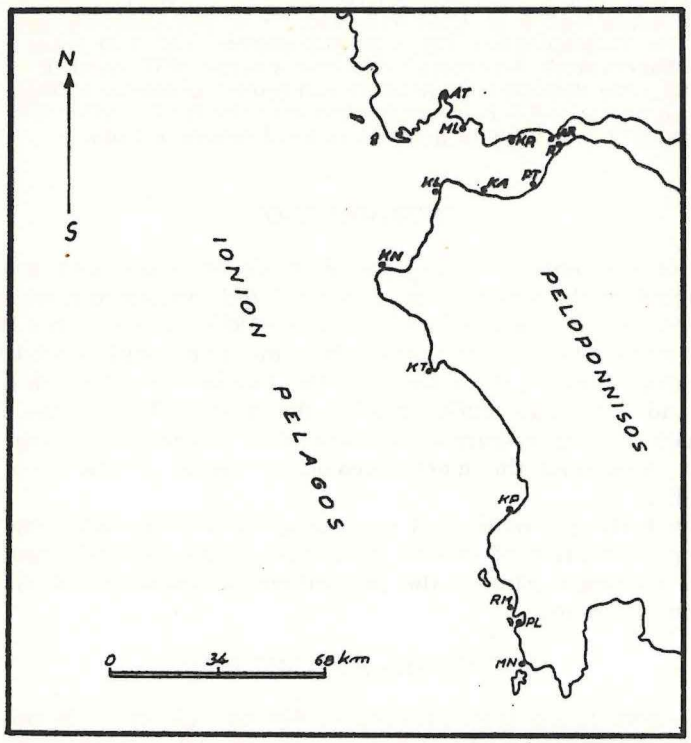

Fig. 1.

Mesologgi (ML)

In the Mesologgi lagoon one sample collection was carried out in June 1983. A total of 17 algal species and 3 Spermatophytes were determined. The small number of species may be due to a relatively high salinity (40‰), stagnant water and sandy substrate (Fig. 1).

Kryoneri (KR)

This biotope is situated 15 Km south of Mesologgi. There are a lot of submarine springs of fresh water in the area which reduce salinity to levels below 30‰. (Fig. 1).

Pylos (PL)

The marine biotope of this area is the richest as far as both the number of species and the coverage of selected surface are concerned. Two sample collections were carried out in this biotope, one in June 1983 (PL_1) and the other in February 1984 (PL_2). In 1981 an oil-tanker (IRENE SERENATE) sank in the area causing subsequent pollution problems. Not knowing the extent of destruction there, it seems that today the biotope has been completely restored (H a r i t o m i d i s et al., 1982, unpublished data).

RESULTS AND DISCUSSION

Sample collections were done at 14 stations along the coasts of west Peloponnese and Central Greece (Fig. 1) in the summer of 1983. Station AT in the lagoon of Etoliko presented some peculiarities; here the slow water revival, the muddy substrate along with the inflow of a river make water salinity rise up to 12‰. Station ML in the Mesologgi lagoon with about 40‰ salinity, small depths (from 0.5—1 meter) and slow water revival also demonstrated a rather unique character. The number of species and the values of coverage are very small at both stations.

During sample determination, 176 algal species were found to belong to the following large systematic groups: 33 species to Phaephyceae, 9 to Chlorophyceae, 25 to Bryopsidophyceae, 5 to Bangiophyceae and 104 to Rhodophyceae. 3 Spermatophytes have also been defined (Table 1).

Population parameters

Disregarding the first two stations (AT, ML) which owing to some bizarre traits yield low values both in cover and in the number of species, we observe that in the remaining stations the number of species generally ranges between 21 to 76 with a mean value of 45.3 species. This number is smaller than the mean value of the species found in the same season and that is 76.3 species in the Saronikos Gulf (D i a p o u l i s, 1983).

Marine algae are more abundant at stations PL, KP and KT, while the smallest value is observed in PT where the city of Patra creates unfavourable ecological conditions for the development of marine phytobenthos. PT station presents the highest values of quantitative and qualitative dominance of Bryopsidophyceae+Chlorophyceae with 23.8% and 32.5% respectively. On the other hand the above parameters in Phaephyceae are considerably low with respect to the values yielded in other stations (Tables 2, 3).

Table 1. The distribution of marine algae along the West Greek coasts.

Species	Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
PHAEOPHYCEAE																		
Acinetospora vidovicii (Meneg.) Sauv.	D		PhIsl								0.2							
Aglaozonia parvula (Greville) Zanardini	B		PhIsl					1										
Asperococcus bullosus Lamouroux	C		SsI					1										
Cladostephus verticillatus (Lightf.) Lyngb.	AS		PhIsl										3					
Cutleria multifida (Smith) Greville	AB		ETNsl												5		10	
Cystoseira barbata (Good. et Wood.) J. Ag.	M		PhIsl														30	
Cystoseira compressa (Esper.) Gerl. et Niz.	AS		PhIsl			20	20	18		20	20					30		
Cystoseira crinita (Desf.) Bory	M		PhIsl							20			25	25	20			
Cystoseira mediterranea Sauvageau	M		PhIsl												25			
Cystoseira stricta var. *spicata* (Erc.) Giaccone	D		D												15			8
Dictyopteris membranacea (Stack.) Batters	C		SsI						10							10		
Dictyata dichotoma (Hudson) Lamouroux	C		PhIsl						10							15		7
Dictyata dichotoma var. intricata (C. Ag.) Greville	C		PhIsl				10	12	10					10		10	5	
Dictyata linearis (Agardh) Greville	AS		SsI				8								5	8	8	
Dilophus fasciola (Roth) Howe	AS		PhIsl				3					10						5
Dilophus mediterraneus Schiffner	M		PhIsl				10				10	15	15	12	10	10	10	
Dilophus spiralis (Montagne) Hamel	AS		PhIsl								8	8						9
Ectocarpus confervoides																		

Species	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
(Roth) Kjellman	AB	ETNsl				0.2			0.3	0.5					0.2		0.2
Feldmannia globifera (Kützing) Hamel	P	D	0.2														0.2
Feldmannia irregularis (Kützing) Hamel	D	D					0.5										
Feldmannia sp	D	D				+											
Giffordia mitchellae (Harvey) Hamel	AS	ETNsl				0.1											
Kuckuckia spinosa (Kützing) Kornmann	D	PhIsl					0.5		0.5	0.2							0.2
Padina pavonica (Linné) Thivy	P	PhIsl			20		15		10	15	20	15	20		18	15	1
Sargassum vulgare C. Agardh	AT	PhIsl								10							6
Scytosiphon lomentaria (Lyngbye) J. Agardh	C	RMsl														2	
Sphacelaria cirrosa (Roth) Agardh	C	PhIsl			11	6			5	5		8	8	10	8	10	2
Sphacelaria furcigera Kützing	P	SSBc							3								
Sphacelaria tribuloides Meneghini	P	D				1			3	2					5		
Stilophora rhizodes (Ehr.) J. Agardh	AB	PhIsl														1	
Stypocaulon scoparium (Linné) Kützing	AS	PhIsl				10	12		5			10					
Taonia atomaria (Woodward) J. Agardh	AS	PhIsl					3						5		8	5	10
Elachistaceae ind.	D	D															0.1
CHLOROPHYCEAE																	
Enteromorpha clathrata (Roth) J. Agardh	AS	D								1							
Enteromorpha compressa (Linné) Greville	C	RMsl						10									
Enteromorpha intestinalis (Linné) Link	C	D	20	20			15	15	8	10							
Enteromorpha linza (Linné) J. Agardh	C	D		20					6								

Species	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Enteromorpha multiramosa Bliding	M	D				1											
Enteromorpha prolifera (Müller) J. Agardh	AS	ETNsl				2	5										
Enteromorpha ramulosa J. E. Smith) Hooker	AS	PhIsl				0.5											
Ulothrix flacca (Dillwyn) Thuret in Jolis	B	D						0.2							0.1		
Ulva rigida C. Agardh	AS	ETNsl	40				10										
BRYOPSIDOPHYCEAE																	
Acetabularia acetabulum (Linné) Silva	AT	PhIsl		0.5					5		6	5	3			3	
Anadyomene stellata (Wulfen) Agardh	P	PhIsl									2	2	2	3	2	3	3
Bryopsis adriatica (J. Agardh) Meneghini	M	D															0.2
Bryopsis hypnoides Lamouroux	M	D															2
Bryopsis muscosa Lamouroux	M	RMsl				0.5											
Bryopsis sp	D	D													0.5		
Caulerpa prolifera (Forsskal) Lamouroux	AT	D												5		5	
Chaetomorpha aerea (Dillwyn) Kützing	AT	RMsl			1				0.5								
Chaetomorpha capillaris (Kütz.) Börgesen	AT	RMsl	1		1	0.1	0.3		1		1	0.5	0.5				
Cladophora dalmatica Kützing	AB	RMsl					0.3		2	2			1		2		
Cladophora coelothrix Kützing	C	Ssl									4						
Cladophora echinus (Biasoletto) Kützing	AS	PhIsl	1						2					2			
Cladophora prolifera (Roth) Kützing	AT	Ssl			5	2	2	5	5	6		6	4		4		
Cladophora sericea (Hudson) Kützing	AB	ETNsl			2					2		4	2				
Cladophora sp	D	D		0.5	2	1	1		1				2				
Cladophoropsis modonensis (Kütz.) Börgesen	AS	D		0.1	0.5			0.2					0.2		0.2		

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Codium bursa (Linné) Agardh	AS	PhIsl			4												
Dasycladus clavaeformis (Roth) Agardh	AT	PhIsl									5	3		2	3	4	
Entocladia viridis Reinke	C	D							0.1			0.1			0.1		
Halimeda tuna (Ellis et Solander) Lamour.	P	Ssl									3	2			3	4	2
Pseudochlorodesmis furcellata (Zan.) Börg.	AT	Ssl									1	2	0.5	0.5	2		2
Siphonocladus pussilus (Kützing) Hauck	M	PhIsl										1					1
Rhizoclonium riparium (Roth) Harvey	AB	D			0.5										0.2		
Udotea petiolata (Turra) Börgesen	AT	Ssl										2	4	8			
Valonia utricularis (Roth) Agardh	AT	Ssl								3	3				0.3	3	3
BANGIOPHYCEAE																	
Chroodactylon ornatum (Agardh) Drew et Ross	C	D		+	+	+	+		+	0.1		0.1	+	+	0.1	+	+
Erythrocladia subitengra Rosenvinge	C	D													+	+	
Erythrotrichia carnea (Dillwyn) J. Agardh	C	ETNsl			0.1	+	+		0.1	0.1					0.1		+
Goniotrichum alsidii (Zanardini) Howe	C	ISR			+	+			0.1		0.1	0.1	+	+	+	+	0.1
Goniotrichum cornu cervi (Reinsch) Hauck	C	D										+	+				
FLORIDEOPHYCEAE																	
Acrochaetium crassipes Börgesen	AT	D				+			+								
Acrochaetium daviesii (Dillwyn) Nägeli	D	ISR							+	+						+	+
Acrochaetium mediterraneum Levring	AT	RMsl							+								
Rhodochorton purpureum (Lightfoot) Rosen.	AS	D									+				+		+
Liagora viscida (Forsskal)																	

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Gigartina acicularis (Wulfen) C. Agardh	D	D				3						5					
Scinaia furcellata (Turn.) J. Agardh	D	D						4									
Gelidiella pannosa (Feldmann) Feld. et Ham.	M	PhIsl													1		
Gelidium crinale (Turner) Lamouroux	AS	RMsl			2		1			2	4						
Gelidium latifolium var *hystrix* (C. Ag.) Hauck	M	SSBc													2		5
Gelidium melanoideum (Shousboe) Bornet	M	Ssl								1					1		1
Wurdemannia miniata (Lam.) Feld. et Hamel	M	D					0.5										
Bonnemaisoniales																	
Falkenbegia rufolanosa (Harvey) Schmitz	B	ISR													+		+
Lamouroux	C	ETNsl								1			1				
Hypnea esperi Bory	D	D				2			2								
Hypnea musciformis (Wulfen) Lamouroux	AS	D		5				5		3							
Hypnea valentiae (Turner) Montagne	D	D		5				3									
Rhodophyllis divaricata (Stack.) Papenfuss	B	Ssl							0.5							0.5	0.5
Gigartinales ind.	D	D						1									
Botryocladia botryoides (Wulfen) Feldmann	M	SSBc													1		2
Champia parvula (C. Agardh) Harvey	AB	Ssl				0.5	2				2	1	1		1	0.5	4
Chylocladia verticillata (Lightf.) Bliding	D	PhIsl					1	1							0.5		
Gastroclonium clavatum (Roth) Ardissone	M	RMsl					1										
Lomentaria clavellosa (Turner) Gaillon	D	D															1
Rhodymenia ardissonei (Ardissone) Feldmann	M	Ssl			0.5								0.5				0.2

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Amphiroa beauvoisii Lamouroux	D	D															3
Amphiroa rigida Lamouroux	M	PhIsl								2	1			5	10	5	20
Corallina granifera Ellis et Solander	M	PhIsl			8	10	8		10	5	10	10	15		5	10	10
Corallina elongata Ellis et Solander	AB	ISR						10		6			6		5		8
Corallina officinalis Linné	M	D										15					
Dermatolithon pustulatum (Lam.) Foslie	M	ISR			1.5	1	1		1	0.5	0.5	1		0.5	1	0.5	1
Fosliella farinosa (Lamouroux) Howe	C	Ssl		0.1	0.2	0.3	0.5	0.3	0.2	0.2	0.3	1	0.5	0.2	0.5	0.5	1
Fosliella lejolisii (Rosanoff) Howe	AS	HP													0.3		
Jania rubens (Linné) Lamouroux	C	PhIsl			5	10	5		10	10	10	10	10		8		10
Jania corniculata (Linné) Lamouroux	D	PhIsl												10			
Lithophyllum incrustans Philippi	AS	ISR								10	20			15	15	20	20
Phymatolithon. lenormandii (Aresch.) Adey	AS	D										25			10		8
Melobesia membranacea (Esper) Lamouroux	B	Ssl				0.5				0.1	0.1						
Peyssonnelia harveyana (Crouan) Börgesen	D	Ssl									1						4
Peyssonnelia rubra (Greville) J. Agardh	M	Ssl								1					6		4
Peyssonnelia squamaria (Gmelin) Decaisne	AT	Ssl													3		3
Pseudolithophyllum expansum (Phil.) Lem.	P	Ssl									8						3
Aglaothamnion tenuissimum (Bonnem.) F.-Maz.	M	Ssl											0.1	0.1			1
Aglaothamnion tripinnatum (Grat.) G. Feld.	D	Ssl				+	0.1		0.1							0.1	0.5
Antithamnion cruciatum (C. Ag.) Nägeli	AS	ISR			0.1	0.1			0.1				0.3		0.2		0.5
Antithamnion plumula																	

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
(Ellis thuret)	AB	Ssl														0.1	
Antithamnion spirographidis Schiffner	D	Ssl											0.2				
Antithamnion sp	D	D								0.1		0.1					
Borgeseniella fruticulosa (Wulfen) Kylin	AS	PhIsl			3					1	2	2		2		1	
Callithamnion corymbosum (Smith) Lyngbye	AS	Ssl										0.2					
Ceramium byssoideum Harvey	P	ISR			0.5	0.5	0.5	0.5	0.2	0.1	0.5	0.2	0.5	0.1	0.2	0.2	0.5
Ceramium ciliatum (Ellis) Ducluzeau	P	RMsl				0.5	1		0.2		0.3						
Ceramium circinatum J. Agardh	M	D					0.5		0.5		0.2	0.5	0.5		0.5	0.5	2
Ceramium codii (Rich.) G. Mazoyer	AB	Ssl		0.5	0.1		0.1	0.2		0.2	0.1	0.3			0.2		0.1
Ceramium diaphanum (Lightf.) Roth	AS	ISR		0.5			0.2	0.2		0.3		0.2			0.3		0.5
Ceramium fastigiatum (Roth) Harvey	P	PhIsl		0.2													0.2
Ceramium rubrum (Hudson) C. Agardh	M	PhIsl				0.2	0.2										
Ceramium tenerrimum (Martens) Okamura	P	D												0.2			
Ceramium tenuissimum (Lyngbye) J. Agardh	M	PhIsl		0.2					0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.1	
Centroceras cinnabarinum (Gratel.) J. Ag.	M	D							0.2						0.5		
Chondria dasyphylla (Wood.) C. Agardh	AB	PhIs?									1	0.5	0.5				
Chondria tenuissima (Good. et Wood.) C. Ag.	AS	PhIsl		0.2						0.5	1	0.5	0.5	0.5	0.5	0.2	
Compsothaunion thyoides (Smith) Schmitz	D	Ssl															0.3
Crouania attenuata (Bonnem.) C. Agardh	AT	PhIsl				0.5	0.5						0.5	0.5			
Dasya bailluviana (Gmelin) Montagne	AS	D			1	1				0.5							0.2
Dasya corymbifera J. Agardh	AS	D												0.5	0.5		

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Dasya ocellata (Grat.) Harvey	AS	Ssl												1	0.2	0.2	
Dasya rigidula (Kützing) Ardissone	AT	D							0.2							0.3	
Dasya sp_1	D	D			1		0.5										
Dasya sp_2	D	D				1	0.5					0.5					2
Dasyopsis cervicornis (J. Ag.) Schmitz	M	Ssl													0.3		
Dipterosiphonia rigens (Schous.) Falken.	M	PhIsl			3	1					1.5	0.5	1	1	0.2	0.5	
Griffithsia barbata (Smith) C. Agardh	M	D										0.2			0.5	0.3	1
Griffithsia flosculosa (Ellis) Batters	AS	Ssl									0.5			0.5			
Griffithsia opuntioides J. Agardh	M	Ssl													0.5		
Griffithsia schousboei Montagne	D	Ssl															0.5
Griffithsia tenuis C. Agardh	AT	Ssl					1			0.3	0.5	1	0.5	0.5	0.3	0.3	0.5
Halopitys incurvus (Hudson) Batters	AS	D									5	5	3				
Herposiphonia tenella (C. Agardh) Ambronn	P	PhIsl		0.5	2	1	1	2	0.5	1	1	0.5		1	0.5	0.5	0.5
Heterosiphonia wurdemanii (Bailey) Falken.	AT	Ssl							0.3				0.5				0.5
Hypoglossum woodwardii Kützing	AS	Ssl									0.5				0.2		0.5
Laurencia obtusa (Hudson) Lamouroux	P	PhIsl		8	8	5			10	5	5	5	5	15	3	10	5
Laurencia paniculata (C. Agardh) Agardh	AT	D					4										
Laurencia papillosa (Forsskal) Greville	P	D			5	8				5			3			10	
Laurencia pinnatifida (Hudson) Lamouroux	AS	PhIsl		5												8	5
Lejdisia mediterranea Born.	M	Ssl			0.1						0.1						
Lophosiphonia cristata Falkenberg	D	D						3	1			0.2		1	0.5		
Lophosiphonia scopulorum (Harvey) Womersl.	C	Ssl			0.5	1				1			0.5		0.5		

Species / Biotopes	Biogeogr. elements	Ecolog. groups	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
Lophosiphonia subadunca (Külzing) Falken.	AT	D				1					0.5	0.5	0.5		0.5	1	
Myriogramme minuta Kylin	AS	Ssl															0.5
Monosporus pedicellata (Smith) Solier	AS	Ssl				0.3	0.3						0.1	0.2	0.1		1
Nitophyllum punctatum (Stack.) Greville	B	ETNsl										0.3	0.3		0.2		
Pleonosporium borreri (Smith) Nägeli	AB	Ssl			0.1		0.2										
Polysiphonia nigrescens (Hudson) Greville	D	D				1						0.3			0.3	0.5	
Polysiphonia sp_1	D	D			0.5										0.1		0.3
Polysiphonia sp_2	D	D					0.5				0.5	0.5	0.5	0.5	0.2	0.3	0.3
Pterosiphonia pennata (Roth) Falkenberg	AS	D						5									
Ptilothamnion pluma (Dillwyn) Thuret	AS	Ssl													0.1		0.5
Rytifloea tinctoria (Clemente) C. Agardh	AT	PhIsl									2	1.5	2	2	2		
Seirospora interrupta (Sm.) Schmitz	AS	Ssl				0.5									0.2		
Spermothamnion flabellatum Bornet	M	Ssl															0.5
Spermothamnion repens (Dill.) Rosenvinge	AB	PhIsl								0.3			0.2				
Sphondylotwhamnion multifidu (Huds.) Nägeli	AS	Ssl													0.2		
Spyridia filamentosa (Wulfen) Harvey	P	PhIsl				2			2								
Wrangelia penicillata C. Agardh	AS	PhIsl					0.2					0.3	0.2	0.5		0.5	2
SPERMATOPHYTES																	
Posidonia oceanica (Linné) Delile				+											+		
Cymodocea nodosa (Ucria) Archers.			+	+											+		
Zostera noltii Hornemann				+													

Table 2. Qualitative dominance of major groups

Classes	Biotopes	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
	Q	1	—	3	11	9	3	9	10	4	6	6	7	11	10	12
Phaeophyceae	DQ %	20	—	8.8	22.9	20.5	14.3	20.4	21.7	9.1	11.5	12.2	17.9	14.5	21.3	16.9
		2	2	—	3	3	3	2	2	—	—	—	—	1	—	—
Chlorophyceae		40	11.8	—	6.2	6.8	14.3	4.5	4.3	—	—	—	—	1.3	—	—
		2	3	8	4	4	2	8	4	8	11	10	6	11	6	7
Bryopsidophyceae		40	17.6	23.5	8.3	9.1	9.5	18.2	8.7	18.2	21.1	20.4	15.4	14.5	12.8	9.8
		—	12	23	30	28	13	25	30	32	35	33	26	53	31	52
Rhodophyceae		—	70.6	67.6	62.5	63.6	61.9	56.3	65.2	72.7	67.3	67.3	66.7	69.7	65.9	73.2
	ΣQ	5	17	34	48	44	21	44	46	44	52	49	39	76	47	71
	ΣDQ %	100	100	99.9	99.9	100	100	99.9	99.9	100	99.9	99.9	100	100	100	99.9

Table 3. Quantitative dominance of major groups

Classes	Biotopes	AT	ML	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL_1	MN	PL_2
	ΣRi	0.2	—	51	68.3	63	30	66.8	70.9	53	76	80	90	122.2	96	48.7
Phaeophyceae	DRi	0.3	—	46.7	53.6	49.2	31.1	48.9	47.4	33.7	39.4	52	53.4	54.6	50.6	24.7
		60	40	—	3.5	30	25.2	14	11	—	—	—	—	0.1	—	—
Chlorophyceae		93.4	60.3	—	2.7	23.5	26.1	10.2	7.3	—	—	—	—	0	—	—
		4	1.1	16	3.6	3.6	6.2	16.6	10	25	27.6	19.2	20.5	17.3	22	13.2
Bryopsidophyceae		6.2	1.7	14.6	2.8	2.8	6.4	12.1	6.7	15.9	14.3	12.5	12.1	7.7	11.6	6.7
		—	25.2	42.2	51.9	31.2	35.2	39.3	57.5	79.3	89.1	54.6	58	84.1	71.6	135.2
Rhodophyceae		—	38	38.6	40.8	24.4	36.4	28.7	38.4	50.4	46.2	35.5	34.4	37.6	37.8	68.6
	ΣRi	64.2	66.3	109.2	127.3	127.8	96.6	136.7	149.4	157.3	192.7	153.8	168.6	223.7	189.6	197.1
	ΣDRi %	99.9	100	99.9	99.9	999.9	100	99.9	99.8	100	99.9	100	99.9	99.9	100	100

The total coverage (ΣRi) ranges from 96.6% to 223.7% with a mean value 153.1%. The corresponding mean value in the same season in the Saronikos Gulf is 213.2%. The highest values are given by West Peloponnese, and stations KN, KT, KP, RM, PL and MN. These range from 153.8% to 223.7% with mean value 180.9%. PT station indicates the lowest value of total cover (96.6%).

Biogeographical study

Distribution of different algae to biogeographical elements is approximately done since bibliography is considerably poor as to the geographical distribution of numerous algae.

Having compared many phycological papers, we classified the defined algae to 7 biogeographical elements. Any alga, which due to lack of bibliography, could not take place in some floristic element, was characterized as different (D), (Table 1).

From the 141 algal species classified in some biogeographical chloridic element, most belonged to the Atlantic subtropical chloridic element (AS) (40 species), to the Mediteranean area (M) (32 species), to the Atlantic tropical (AT) (20 species), and less to the North chloridic element (B) with 6 species.

R/P ratio

If we leave out stations AT and ML with those distinct peculiarities, the remaining 12 ones share a ratio R/P which changes from 2.73 at station AR to that of 8.00 at station KN (Tab. 4). The mean ratio value is R/P = 4.54.

Feldmann (1937) employes the ratio R/P to characterize the flora of an area. In the region of our interest the ratio value R/P = 109/33 = 3.30 shows its subtropical character, while that used by Cheney (1977) R+C+B/P = 4.33 indicates its tropical one.

Table 4. R/P ratio in different biotopes studied

Biotopes	KR	AR	R	PT	KA	KL	KN	KT	KP	RM	PL	MN
Phaeophyceae	3	11	9	3	9	10	4	6	6	7	11	10
Rhodophyceae	23	30	28	13	25	30	32	35	33	26	53	31
R/P	7.66	2.73	3.11	4.33	2.78	3.00	8.00	5.83	5.50	3.71	4.82	3.10

These results are in agreement with the study on the biogeographical affinity between species of the area where the largest number of them belongs to the Atlantic tropical, Atlantic subtropical and Mediterranean chloristic element.

Ecological groups

Based on a good deal of papers with those of Boudouresque (1970, 1971, 1973, 1974), Boudouresque and Cinelli (1971, 1976), Boudouresque and Passelaiqne (1972), Boudouresque *et al.* (1977), Augier and Boudouresque (1978), being the most essential ones, we were able to find the ecological groups the most of determined algae belonged to. Those which could not fall into an ecological group on account of missing evidence were considered as different (D). Seven (7) ecological groups or supergroups have been observed to which species belonged and they are the following:

1. Group of superficial skiophilic thermophilic with 3 species (1.8%), (Table 1).

2. Supergroup of skiophilic of broad sense (Ssl) with 43 species od 24.4% of the total of the species determined. Skiophilic ecological groups SSB, SCI, CC, CCI, SCII and SI also belong to this supergroup (superficial skiophilic wavely, skiophilic-sublittoral with calm water, concrete deeplittoral (circa-littoral), concrete deeplittoral tolerant, skiophyle sublittoral).

3. Mediolittoral of broad sense (sens large), (RMsl) with 10 species or 5.7% of the species total.

4. Sublittoral of hard substrate (ISR) with 9 species or 5.1%.

5. Thionitrophilic group (ETNsl) with 9 species or 5.1%.

6. Photophilic supergroup of broad sense (PhIsl) with 48 species or 27.3%.

7. Epiphyte group in *P. oceanica* (HP) with only one species.

8. Finally 53 species or 30.1% were characterized as different (D).

CONCLUSIONS

A total of 176 species of algae were identified, 33 of which belong to Phaephyceae, 9 to Chlorophyceae, 25 to Bryopsidophyceae, 0 to Bangiophyceae and 104 to Florideophyceae.

In the study area with the exception of stations AT (low salinity = 12‰) and ML (high salinity = 40‰), characterized by variable algal diversity and total coverage, the diversity and the total coverage range between 21 and 76 species (mean 45 species) and between 96.6% and 223.7% (mean 153.1%) respectively.

Seven biogeographical groups were defined. Most of the species, however, belong to the Atlantic subtropical chloridic element (40 species) and to the Mediterranean (32 species).

The R/P ratio was found to equal 3.30 indicating the subtropical nature of the area.

Seven ecological groups were identified with the Photophyle supergroup in broad sense (48 species, 27.3% of the total) and the Suprergroup of skiophilic in broad sense (43 species, 24.4% of the total) being the most important ones.

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Accepted: 26. July 1987.

MORSKE ALGE ZAPADNIH OBALA GRČKE

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KRATKI SADRŽAJ

U osvijetljenom dijelu čvrstog dna sublitorala na obalama Zapadne Grčke izučavani su sistematska klasifikacija, biogeografska i sezonska distribucija morskih makrofita.

Osim sistematskog i fitogeografskog studija ovaj je rad imao za cilj da determinirane florističke taksone svrsta u ekološke grupe i biogreografske elemente.

Sa površina 400 cm^2 skidani su pomoću čekića i dlijeta svi biljni organizmi. Uzorci su sakupljani na 14 postaja raspoređenih uzduž obala zapadnog Peloponeza i centralnog dijela Grčke tijekom ljeta 1983. Ukupno je determinirano 176 vrsta algi koje pripadaju slijedećim velikim sistematskim skupinama: Phaeophyceae 33, Chlorophyceae 9, Bryopsidophyseae 25, Bangiophyceae 5 i Florideophyceae 104. Determinirane su i 3 vrste morskih cvjetnica.

Na temelju konzultiranja brojnih fikoloških radova većinu determiniranih algi svrstali smo u 7 biogeografskih elemenata. Alge, koje se radi nedostatka podataka nisu mogle svrstati raspoređene su kao »ostale«.

Odnos R/P koji za istraženo područje iznosi 3,30, ukazuje na suptropski karakter tog područja. Ti rezultati su u skladu s rezultatima studija biogeografskog afiniteta pojedinih vrsta ispitanog područja među kojima većina pripada atlantsko-tropskom, atlantsko-subtropskom i mediteranskom florističkom elementu.

Na temelju literaturnih podataka svrstali smo većinu determiniranih vrsta alga u 7 ekoloških skupina ili nadskupina. Jedan manji broj vrsta, radi nedostatka podataka, nismo mogli svrstati u neku od definiranih ekoloških skupina, te su obuhvaćene u posebnoj skupini »ostale«.

Table 1. The distribution of marine algae along the West Greek coasts