# VI.6. CONSERVATION OF THE HELLENIC MARINE BIODIVERSITY

The marine and coastal ecosystems of Hellas, characteristic of the Mediterranean Sea, include all the representative Mediterranean habitat types, as its topography and bathymetry is very variable. A main characteristic of the Hellenic marine environment is the high habitat diversity encountered over small distances. Horizontally, rocky shores alternate with small sandy beaches and smaller or larger estuaries, while vertically, shallow waters change abruptly to deep waters.

Apart from specific coastal areas where the concentration of human activities has caused disturbance to the marine environment, the Hellenic Seas retain characteristics of high ecological quality. Measures to minimise human impact such as the application of restrictions on waste disposal or the prevention of overfishing, need to be combined with measures to conserve the most sensitive and important habitats and species.

The creation of protected areas promotes the development of activities that are compatible with nature protection in a broader area. Specific aims are: the protection of coastal and marine ecosystems especially those of European importance; the protection of sustainable fisheries and the marine ecosystems that support them; the protection of the populations and habitats of endangered marine species; the protection of endangered avifauna, especially migratory avifauna; the promotion of public awareness and sustainable tourism; the safeguarding of traditional activities and the conservation of natural and cultural landscapes.

### HISTORICAL PERSPECTIVE

The earliest measures taken to conserve elements of the coastal and marine environment included restrictions on the use of certain fishing gear such as the otter trawl, in enclosed bays and inshore waters, as well as the ban on destructive fishing methods such as the use of dynamite. The first piece of legislation that included measures to

protect marine species was the Presidential Decree 67/1981 that included 8 invertebrates, 12 fishes, 3 reptiles and 5 mammals. Hellas also ratified in 1983 the Bern Convention that included a number of marine species (32 invertebrates, 25 fishes, 3 reptiles, 13 mammals and a large number of waders and marine birds).

The first protected area that was set aside mostly for the protection of the marine environment was the National Marine Park of Alonnisos – Northern Sporades, where a large number of the critically endangered Mediterranean monk seal *Monachus monachus* lives. A second national marine park was later established in Zakynthos, mainly in order to conserve the nesting beaches of the loggerhead turtle *Caretta caretta* (Boxes 1 and 2).

## MARINE AND COASTAL PROTECTED AREAS

A major breakthrough in the protection of marine and coastal areas in Hellas came with the provisions of the EC HABITATS Directive. One hundred and eleven out of the 239 sites (44.6 %) that were proposed by Hellas as Sites of Community Interest (SCI) include marine habitat types. In addition, eight sites that do not include any marine habitat should be taken into account as they contain sea cliffs and sea caves that are important for marine animals such as the Mediterranean monk seal. About a dozen more sites, not included in the SCI list, that are important for marine bird conservation were included in the list of Special Protected Areas (SPA) of the EC Birds Directive.

In most cases, the marine part of the protected sites extends offshore to a depth of 50 m, which is considered as the usual lower limit for the distribution of Mediterranean endemic *Posidonia* beds. In an attempt to evaluate the degree of importance of the marine environment, the sites with a marine component are assigned to nine categories (Figure VI.43) according to the objective of protection as shown in DAFIS *et al.*; (1996). The

### Box 1: The National Marine Park of Alonnisos-Northern Sporades

The park (Figure VI.41), one of the largest protected areas in the Mediterranean Sea, is situated in the northern Aegean Sea and extends to  $2\,200\,\mathrm{km^2}$  with a perimeter of 180 km. It comprises the island of Alonnisos ( $62\,\mathrm{km^2}$ ), the only inhabited island in the park ( $2\,800$  inhabitants), nine smaller non-inhabited islands and a number of rocky islets. The park comprises three protection zones: the core, i.e. Piperi Island and  $3\,\mathrm{nm}$  around it ( $70\,\mathrm{km^2}$ ), and two other zones with different restrictions on human activities ( $1\,480\,\mathrm{and}\,650\,\mathrm{km^2}$ ).

The marine environment includes extended open rocky shores and small coves with pebbles or sand. Extensive *Posidonia* beds cover the shallow sandy bottoms. Nevertheless, the greatest part of the marine environment extends to waters deeper than 200 m (maximum depth surpasses 1 000 m).

In addition to the highly endangered Mediterranean monk seal, *Monachus monachus*, other important species of the park include the Gioura wild goat (*Capra aegagrus dorcas*), Eleonora's falcon (*Falco eleonorae*), Audouin's gull (*Larus audouinii*), the shag (*Phalacrocorax aristotelis*), Bonelli's eagle (*Hieraaetus fasciatus*) and the red coral (*Coralium rubrum*). Also, several species of cetaceans have been reported, such as the striped dolphin (*Stenella coeruleoalba*), the short-beaked common dolphin (*Delphinus delphis*), Cuvier's beaked whale (*Ziphius cavirostris*) and the sperm whale (*Physeter macrocephalus*).



Figure VI.41: The National Marine Park of Alonnisos-Northern Sporades

In spite of the fact that scientific surveys have been conducted only sporadically, the unspoiled marine environment of the park is reflected in its animal diversity: 175 species of megafauna, 407 species or higher taxa of macrofauna and 122 species of fish have been recorded so far (THESSALOU-LEGAKI, 1997).

The park was established in 1992, but the Management Agency was only recently set up (2003). In the meantime, the management gap was covered mainly by the conservation efforts of a Hellenic NGO, Mom (Society for the Study and Protection of the Monk Seal), which, since 1993, has undertaken the implementation of guarding, monitoring and public awareness in collaboration with the Hellenic authorities.

During this period, systematic monitoring of the area resulted in the recording of 36 cave shelters for the Mediterranean monk seal. More than 3 000 visits revealed the existence of continuous reproductive activity over the years, with an average of six newborns per year. Until now about 55 individuals have been identified (in an estimated Mediterranean population of 200-250 animals). Also, in the rehabilitation facilities on the island of Alonnisos 11 newborns that encountered severe life threats were given medical treatment; seven of them were afterwards released in a healthy state into their natural environment.

### Box 2: The National Marine Park of Zakynthos

The Bay of Laganas (Figures VI 42) on the island of Zakynthos hosts the most important known nesting aggregation of the loggerhead sea turtle (Caretta caretta) in the Mediterranean. An average of 1 300 nests per season are recorded on six beaches (Gerakas, Dafni, Sekania, Kalamaki, East Laganas and Marathonisi) having a total of 5.5 km in length, which hold some of the world's highest loggerhead nesting densities as documented by the studies carried out by Archelon, the Sea Turtle Protection Society of Hellas, since 1982. It is worth noting that as the beach of Sekania hosts over 50 % of the nests in the Bay, private land behind the beach was acquired by WWF-Greece in 1994 in order to ensure complete protection.

Due to the significance of Zakynthos as a sea turtle nesting ground and the threats it faces from increasing tourism pressure, the nesting beaches have been protected by law since 1984. In December 1999 the National Marine Park of Zakynthos was established after years of deliberations.

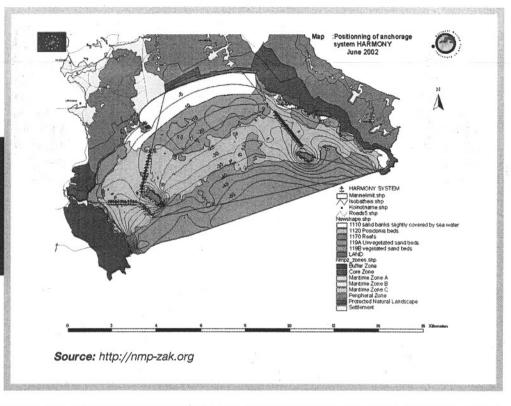


Figure VI.42: Habitat types and bathymetry in the marine area of the National Marine Park of Zakynthos.

Reflecting the complexities of land use and human activities, the park comprises a high number of zones: 7 terrestrial core zones and 4 buffer zones with a total area of 1 471 ha, and 2 maritime zones with a total area of 8 918 ha. There is also a peripheral area with 7 terrestrial zones (with a total area of 3 071 ha), acting as a transition stage to the main area of the park.

The marine protected area of Laganas Bay extends down to about 60 m. Soft bottoms predominate, hosting extensive *Posidonia oceanica* beds. In the bare sandy bottoms, 245 species or higher taxa of macrozoobenthic species have been reported, with increasing diversity and abundance as depth increases (THESSALOU-LEGAKI, unpublished data).

In addition to the Laganas Bay, the islands of Strofadia and the surrounding coastal waters within a radius of 500 m are also part of the National Marine Park of Zakynthos. These small islands are an important stopover for migratory avifauna and are located about 50 nm off the island of Zakynthos.

relative majority (31 %) of the sites with a marine component have been designated primarily because of their terrestrial importance. Thus, the marine area contributes only slightly to their total area. Another significant number of sites (20%) contain all or most of the terrestrial part of small islands of the Aegean and the Ionian seas as well as the surrounding marine environment. Of the remaining sites, lagoons and estuaries are transitional ecosystems leaving, consequently, only a small number of sites designated especially for the protection of the marine environment, i.e. coastal areas (8%), exclusively marine sites (12%),

bays (4%) and extensive marine areas (2%). The latter are represented by the National Marine Park of Alonnisos-northern Sporades in the north Aegean (220 000 ha) and the inner archipelago of the Ionian Sea (88 000 ha). Although the sites with marine components are equally distributed all over continental and insular Hellas, there is a clear geographical differentiation between the above categories: large lagoons and estuaries are mostly found in northern continental Hellas.

Seven habitat types belonging to the Open Sea and Tidal Areas category of the Habitats Directive have been recorded so far in Hellas (Figure VI.44).

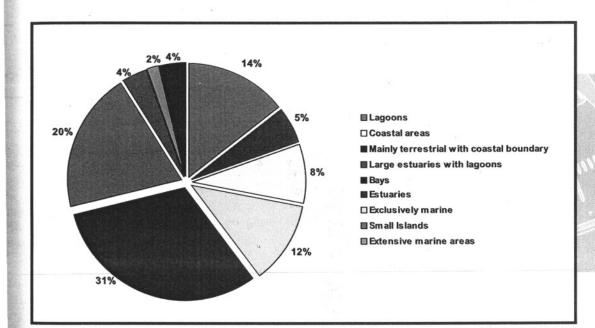


Figure VI.43:
Proposed Sites of
Community Interest
with a marine
component (N = 111)
according to the
objective of protection.
Data from DAFIS et al.,
1996.

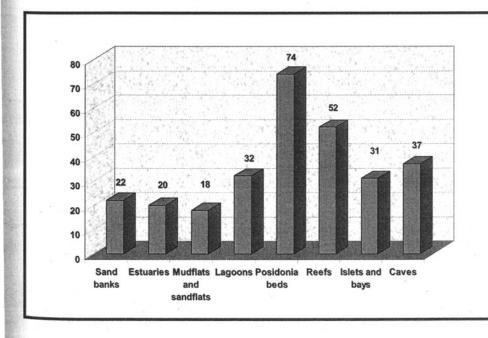


Figure VI.42:
Habitat types belonging to the
Open Sea and Tidal Areas category
of the Habitats Directive recorded
from Hellas. Data from DAFIS et al.,
1996.

To these, we must include the habitat type of submerged or partly submerged sea caves. By far the most frequent habitat type encountered in SCI areas is the *Posidonia* beds followed by reefs.

With the exception of the two above-mentioned national marine parks (Boxes 1 and 2), management measures for the remaining sites are now starting to be implemented. Only recently (mid 2003), the Boards of the Management Agencies, were established by the Ministry of Environment in 27 NATURA 2000 sites, 14 of which are of marine importance. The Boards will work closely with the local authorities, competent Ministries, NGOs and other stakeholders in order to ensure the proper management of the sites. Objectives relevant to the marine environment include the control of visitors on the beaches, eco-tourist activities, public awareness, management of marine natural resources and control of pollution threats, law enforcement, monitoring and promotion of scientific research.

## CONSERVATION OF MARINE SPECIES

The existing legislation for the conservation of marine species includes the Presidential Decree 67/1981, the EC Habitats Directive 92/43, the Bern Convention, the Bonn Convention on Migratory Species and the Convention on International Trade of Endangered Species (CITES). The Protocol of the Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Regions of the Mediterranean) concerning Specially Protected Areas and Biological Diversity in the Mediterranean is also relevant, however, Hellas has not yet ratified it.

The species encountered in Hellenic marine and brackish habitats that are under legal protection are presented in Tables VI.14, VI.15 and VI.16. In general, 261 animal (of which 150 are birds not

included herein) and 11 plant species (Table VI.16) are under some type of legal protection.

In recent years, several assessments of the conservation status of Hellenic marine species have been carried out by international organisations such as IUCN, and by Hellenic and foreign researchers. The results are summed up in Tables VI.14 & VI.15. It is evident that many threatened species are not protected by legislation, a fact that actually applies for all the Hellenic fauna (LEGAKIS, 2005). In addition, the population status for the majority of the protected species is not sufficiently known. The major constraints in applying legislative measures include the lack of public awareness and of appropriate training of the competent authorities.

### Measures and implementation

The Presidential Decree for the establishment of the Park instituted a number of measures for the protection of the monk seal and the marine and terrestrial biodiversity. In zone A (strictly protected, 1584 km²) such measures include the permanent or seasonal prohibition of access on and around certain islands, and a permanent prohibition of middle-sized otter-trawlers and purse seiners as well as amateur fishing. In zone B (protected area, 678 km²), which consists of the inhabited Island of Alonnisos and two nearby islands, there are hardly any restrictions for visiting the area and amateur fishing. However, middle fishing prohibition still applies to this region.

The implementation of fishing regulations seems to be effective mainly due to the fishermen's positive attitude. On the other hand, guarding of the park, although effective when applied especially during the tourist summer season, is not presently carried out on a regular basis due to financial and administrative reasons. The activation of the local Management Agency is expected to enhance the involvement of the local population through cooperation in order to promote the aims of conservation and human welfare.

**Table VI.14:** List of threatened and / or protected marine and brackish-water vertebrate species reported from Hellas and relevant legislation.\*

	Α	В	С	D	Е	F	G	Н	1	J
MAMMALS										
Balaenoptera acutorostrata	IV		- 11		LR		I/A		- 11	
Balaenoptera physalus	IV	+	- 11	R	EN	1/11	I/A	V	- 11	
Delphinus delphis	IV	+	- 11	VU		14	II/A		Ш	
Grampus griseus	IV		- 11	R	DD		II/A		- 11	
Megaptera novaeangliae	IV		H		VU	. 1	· I/A	V	- 11	
Mesoplodon bidens	IV		- 11		DD		II/A			
Monachus monachus	*II/IV	+	- 11	EN	CR	1/11	I/A	E	- 11	
Phocaena phocoena	II/IV	+	- 11	R	VU	- 11	II/A	K	ll .	
Physeter macrocephalus	IV		- 11	R	VU	1/11	I/A		- 11	
Pseudorca crassidens	IV		- II				II/A		П	
Stenella caeruleoalba	IV		- 11	VU	LR		II/A		Ш	
Tursiops truncatus	II/IV	+	- 11		DD		II/A		11	
Ziphius cavirostris	IV		- 11		DD		II/A		- 11	
REPTILES										
Caretta caretta	*II/IV	+	II	EN	VU		I/A	٧	11 -	
Chelonia mydas	IV	+		EN	EN		I/A	Е	- 11	
Dermochelys coriacea	IV	+	- 11	EN	EN	- 1	I/A	Е	11	
FISH										
Acipenser naccari	II/V	+	- 11		EN				- II	
Acipenser stellatus	V		111		EN					
Acipenser sturio	II/IV	+	- 11		CR		I/A	Е	11	
Alosa caspia	II/V			EN	3.1		7.1			х
Alosa fallax	II/V		III	LIV	DD				III	^
Alosa macedonica	II/V				VU					+
Anguilla anguilla	, v	407.5			7.0				III	
Aphanius fasciatus	II		II		DD				- 111	
Atherina boyeri	The state of the s	19800.7	II		DD				- "	
Carcharhinus plumbeus		Table 1			VU					
Carcharias (=Eugomphodus) tau	rue				EN					
Carcharodon carcharias	us		II		VU				II	
Cetorhinus maximus			II		VU				<u>II</u>	
		1.1	II		VU				- 11	
Dalatias licha			111		VU				101	
Epinephelus marginatus	· ·		111	V// EN/	1///				111	
Eudontomyzon hellenicus	11		111	V/ EN	VU					+
Heptranchias perlo		+			\n.					
Hexanchus griseus		+			VU					
Hippocampus hippocampus			- 11		VU				- 11	
Hippocampus ramulosus			- 11		VU					
Huso huso	V				EN					
Isurus oxyrinchus			111						III	
Knipowitschia goerneri				T	DD					+
Knipowitschia milleri		August August I		VU	DD	100.20				+
Knipowitschia panizzae	- 11				DD					
Knipowitschia (=Gobius) thessala	3		III	VU	VU			E		+
Lamna nasus			III		VU				III	
Mobula mobular		+	- 11				\$		II	
Mycteroperca rubra					DD					
Pagrus pagrus					EN					
Petromyzon marinus			III					- 1	III	
Platichthys flesus		+								
Prionace glauca			III						III	
Proterorhinus marmoratus		+	III	L/ EN						
Raja alba			III						III	
Ruvettus pretiosus		+			-					1.5
Salaria (=Blennius) fluviatilis			. III							

(continued)

A	В	С	D	Е	F	G	Н	- 1	J
Sciaena umbra		III						III	No.
Sparisoma cretense	+								
Squatina squatina		III						111	
Syngnathus abaster	Section 1	III		DD					
Thunnus alalunga				DD					
Thunnus thynnus				DD				III	
Torpedo nobiliana	+								
Umbrina cirrosa		111						111	
Xiphias gladius				DD				III	
Xyrichthys novacula	+								
Zosterisessor (=Gobius) ophiocephalus			III		DD				
Zu cristatus	+								

Source: LEGAKIS, 1999.

Note: For explanation of column headings see end of Table VI.15.

**Table VI.15:** List of threatened and / or protected marine and brackish-water invertebrate species reported from Hellas and relevant legislation.

	Α	В	С	Е	G	Н	. 1	K	L	М
PORIFERA										
Aplysina cavernicola			- 11				- 11			
Asbestopluma hypogea			- 11				- 11			
Axinella polypoides			- 11				- II			
Hippospongia communis			III				III			+ 10
Spongia agaricina	a di Naja		III				111			
Spongia officinalis	10,000		111				Ш			+
Spongia zimocca			Ш				111			+
CNIDARIA										
Antipathes subpinnata			111		II/B		111			
Astroides calycularis										+
Balanophyllia europaea					II/B					
Balanophyllia regia					II/B					
Caryophyllia calveri					II/B					
Caryophyllia inornata					II/B					
Caryophyllia schmithii					II/B					
Cladocora caespitosa					II/B					+
Corallium rubrum	V	+	Ш				111	+		+
Dendrophyllia carnigera					II/B					
Desmophyllum cristagalli					II/B					
Echinomuricea klavereni										+
Eunicella cavolinii										+
Eunicella singularis										+
Eunicella verrucosa						K		+		+
Gerardia savaglia			- 11				- 11			
Guynia annulata					II/B					
Hoplangia durothrix					II/B					
Leptopsammia pruvoti					II/B					
Lophelia pertusa					II/B					
Madracis pharensis					II/B					
Madrepora oculata					II/B					
Paracyathus pulchellus					II/B					
Paramuricea clavata										+
Paramuricea macrospina										+
Phyllangia mouchezii					II/B					
Polycyathus muellerae					II/B					
Stenocyathus vermiformis					II/B					
MOLLUSCA										
Acanthocardia aculeata										+
Acanthocardia echinata										+

### (continued)

A	В	С	Е	G	Н	- 1	K	L	М
Acanthocardia tuberculata									+
Anomia ephippium									+
Arca barbata									+
Arca noae									+
Barnea candida									+
Callista chione									+.
Chamelea (=Venus) verrucosa									+
Chlamys glabra									+
Chlamys opercularis									+
Chlamys varia									+
Donax semistriatus									+
Donax trunculus									+
Donax venustus									+
Ensis ensis									+
Ensis arquatus (=siliqua)	latera e s								+
Glossus humanus (=Isocardia cor)	+								+
Laevicardium oblongum	19-5-1								+
Lithophaga lithophaga IV		- 11				- 11	+		+
Mactra corallina									+
Mactra glauca									+
Mytilus galloprovincialis					4.2				+
Ostrea edulis									+
Paphia (=Venerupis) aurea									+
Pecten jacobeus						1.00			+
Pholas dactylus		ll .				- 11			+ "
Pinna nobilis (=P. rudis, P. pernula) IV	+	- 11				- 11	+		+
Pisidium tenuilineatum								+	Ara)
Pteria hirundo A Table 1									+
Solemya togota									+
Solen marginatus (=vagina)								14	+
Spisula subtruncata									+
Spondylus gaederopus									+ "
Tapes (=Venerupis) decussatus									+
Venerupis pullastra									+
Venus gallina									+
Acicula hausdorfi			DD						
Cassidaria echinophora			טט						+
Cerithium vulgatum									+
Charonia rubicunda (=C. lampas, C. nodi	ifor upol	- 11				- 11			
Charonia tritonis (=C. seguenziae)	nerum)	 				<u>II</u> II			
Cypraea lurida (= Luria)	+	- 11				 			
Cypraea pirum	+	Ш				П			
Cypraea spurca									
Dolium galea	+								
Erosaria spurca	+					- 11			
		- 11				- 11			
Gibbula nivosa Haliotis tuberculata		- 11	100000000000000000000000000000000000000						
Littorina littorea				14/4/04/1					+
Mitra zonata						- 11			+
		- 11			N. 5 - 15 -	II			
Monodonta turbinata			277/2022			SESSOES SESSOE			+
Murex brandaris				NAC N		Acces 1	4 (2)		+
Murex trunculus				616.74		1000			+
Ocenebra erinacea				STORY OF					+
Ranella gigantea			HE WAY		100				+
Ranella olearia		- 11		s le					
Tonna galea	- 1	- 11		- 1		11			
Triton nodiferus									+

#### (continued)

	Α	В	С	Е	G	Н	- 1	K	L	М
Vallonia enniensis				DD						
Zonaria pyrum			- 11				II		- December 1	3
CEPHALOPODA										
Argonauta argo		+								Darie
BRYOZOA				A STATE OF THE STA						
Myriapora truncata										+
Sertella beaniana				and the second						+
CRUSTACEA DECAPODA										
Callinectes sapidus			1001-1-							+
Cancer pagurus							lean lea	The State		+
Carcinus aestuarii										+
Homarus gammarus			III				III			+
Macropipus puber										+
Maja squinado			Ш				III			+
Nephrops norvegicus										+
Ocypode cursor			- 11							
Palinurus vulgaris (=P. elephas)			Ш				111			+
Scyllarides latus	V		III				III	+		
Scyllarus arctus	,875.13 10.4		III				III			
Echinodermata	1									
Arbacia lixula										+
Asterina pancerii			Ш				11			
Centrostephanus longispinus	IV		11				- 11	+		
Ophidiaster ophidianus	- 1		II				- 11			
Paracentrotus lividus	- 2-1	y Paris.	III				III	+		+
Sphaerechinus granularis		100								+
TUNICATA			în N							
Microcosmus sulcatus		1.4								+

Source: LEGAKIS, 1999.

### Legend for Tables VI.14 & VI.15:

- A: Council Directive 92/43/EEC.
- B: Presidential Decree 67/1981.
- C: Council of Europe, 1979. Convention on the conservation of European wildlife and natural habitats (Bern Convention)
- D: KARANDEINOS M. (ed.) 1992.
- E: IUCN, Species Survival Commission, 2003.
- F: Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
- G: Convention on International Trade in Endangered Species of Wild fauna and flora (CITES, 1973) Council Regulation EC 338/97.
- H: Economic Commission for Europe, 1991.
- I: Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Protocol of Barcelona Convention), 1995.
- J: Endemic Species or subspecies.
- K: KOOMEN & VAN HELSDINGEN, 1993.
- L: HASLETT, 1997.
- M: HUNNAM, 1980.

I: Annex or Appendix I	T: Threatened species
II: Annex or Appendix II	L: Locally threatened species
III: Annex or Appendix III	CR: Critically endangered species
IV: Annex or Appendix IV	LR: Low Risk species
V: Annex or Appendix V	DD: Data deficient species
E, EN: Endangered species	*: Priority species for the European Union
V, VU: Vulnerable species	A: Species of Appendix A of the regulation applying CITES in the EC
R: Rare species	B: Species of Appendix B of the regulation applying CITES in the EC
K: Insufficiently known species	x: Species with endemic subspecies

Table VI.16: List of Bern and Barcelona Convention marine plant species reported from Hellas.

	Bern Convention	Barcelona Convention
MAGNOLIOPHYTA		
Cymodocea nodosa	+	
Posidonia oceanica	· <b>+</b> .	+
Zostera marina	+	+
Zostera noltii		+
PHAEOPHYTA		
Cystoseira amentacea	+	+
Cystoseira mediterranea	+	+
Cystoseira spinosa (inclus C. adriatica)	· +	+
Cystoseira zosteroides	+	+
RHODOPHYTA		
Goniolithon byssoides	+	+
Lithophyllum lichenoides	+	+
Ptilophora mediterranea	+	+