

Defining Mediterranean VMEs (II)

DRAFT LIST REVIEW & KEY CONCEPTS

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VME Key Concepts

Vulnerable Marine Ecosystem (VME)*

According to FAO, a marine ecosystem should be classified as vulnerable based on the following characteristics: uniqueness or rarity, functional significance, fragility, life-history traits of species that make its recovery difficult and structural complexity. However, a VME is also described by its vulnerability, which is dependent upon the nature of the fishery and hence region dependent.

Vulnerability*

It is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. These are, in turn, related to the characteristics of the ecosystems themselves, especially biological and structural aspects. VME features may be physically or functionally fragile. The most vulnerable ecosystems are those that are both easily disturbed and very slow to recover, or may never recover.

VME elements/features*

They are topographical, hydrophysical or geological features (e.g. seamounts, submarine canyons, edge and slopes, hydrothermal vents, cold seeps) that potentially support the species groups or communities referred in the list of VMEs. VME features may be physically or functionally fragile. The most vulnerable ecosystems are those that are both easily disturbed and very slow to recover, or may never recover.

VME Indicator taxa/species**

They are species or group of species (or habitat type) used as signal of VME occurrence. VME indicator taxa and their correspondent habitat types shall be defined under a legally binding Recommendation adopted by GFCM. They need to be reported in case of incidental catch during fishing operations aiming at proper protection of VME integrity and mitigate for potential VME encounters.

Deep-sea fisheries*

Various depth limits have been used to define what constitutes deep-sea fisheries. The Deep-sea Fisheries Guidelines do not define deep-sea fisheries, but characterize deep-sea fisheries as fisheries in which the total catch includes species that can only sustain low exploitation rates and where the gear is likely to contact the sea floor during the normal course of fishing. FAO in a global review has included for review deep-sea fisheries that target demersal and benthic species and are likely to contact the sea floor during the course of the fishing operation. Fishing depth was not considered a major criterion, but the review generally included fisheries conducted below 200 meters on the continental shelf or isolated topographical features such as seamounts, ridge systems and banks.

Significant Adverse impacts (SAIs)*

Adverse impacts are negative effects on a VME resulting from damage caused during the operation of bottom-contact fishing gear. The scale and significance of the impact determines whether the impact can be considered an SAI. This occurs when the ecosystem function is impaired and the long-term natural productivity degraded on more than a temporary basis. Ecosystem recovery following impacts is case-by-case dependent, but is considered more than temporary if recovery takes more than 5 – 20 years. Impacts should be evaluated individually, in combination and cumulatively. SAI compromises the long term integrity and function of VMEs as structurally complex communities and habitats. Merely detecting impacts is not sufficient, the scale and character of the impact must also be evaluated to determine whether an impact is to be regarded as significant.

(* based on FAO (2009); (**) as proposed by Oceana

DRAFT LIST OF MEDITERRANEAN VME INDICATOR SPECIES

PROPOSED VME HABITAT TYPE	Representative Taxa	IUCN Red List*	References
COLD-WATER CORAL REEFS			
A. <i>Lophelia pertusa</i> reefs	<i>Lophelia pertusa</i>	EN	7, 8, 19, 28, 30, 31, 32, 38, 47, 57, 72, 73, 76, 90, 91, 101, 111
B. <i>Madrepora oculata</i> reefs	<i>Madrepora oculata</i>	EN	7, 8, 19, 28, 30, 31, 32, 38, 47, 57, 72, 76, 90, 101, 111
C. <i>Desmophyllum dianthus</i> reefs	<i>Desmophyllum dianthus</i>	EN	M. Fourt, pers. comm.
CORAL GARDENS			
A. Hard-bottom coral garden			
A.1. Hard-bottom gorgonians, black coral gardens and other corals			
A.1.1. GORGONIANS (Order Alcyonacea)			
ACANTHOGORGIIDAE	<i>Acanthogorgia hirsuta</i>		51, 76, 83, 81
CORALLIIDAE	<i>Corallium rubrum</i>	EN	19, 17, 30, 57, 84, 88, 101
DENDROBRACIIDAE	<i>Dendrobrachia bonsai</i>		89
ELLISELLIDAE	<i>Ellisella paraplexauroides</i> <i>Viminella flagellum</i>	VU	4, 11, 51, 65, 101 45, 81
GORGONIIDAE	<i>Eunicella verrucosa</i>		11, 76
PLEXAURIDAE	<i>Bebryce mollis</i> <i>Paramuricea macrospina</i> <i>Swiftia pallida</i> <i>Villogorgia bebrycoides</i>		11, 17, 51, 81, 85 7, 19, 51 51, 71 17
PRIMNOIDAE	<i>Callogorgia verticillata</i>		7, 17, 29, 38, 45, 76, 81, 101
A.1.2. BLACK CORALS (Order Antipatharia)			
ANTIPATHIDAE	<i>Antipathes dichotoma</i> <i>Antipathes fragilis</i>		71, 76
APHANIPATHIDAE			M. Bo, pers. comm.
MYRIOPATHIDAE	<i>Antipathella subpinnata</i>		13, 18, 17, 29
LEIOPATHIDAE	<i>Leiopathes glaberrima</i>	EN	7, 15, 19, 30, 71, 76, 81, 83, 90
SCHIZOPATHIDAE	<i>Parantipathes larix</i>		17, 76, 81, 83
A.1.3. HEXACORALS (Subclass Hexacorallia)			
CARYOPHYLLIIDAE - Solitary corals			
	<i>Caryophyllia calveri</i> <i>Desmophyllum dianthus</i>	EN	30, 71, 90, 76
PARAZOANTHIDAE	<i>Savalia savaglia</i>		26, 76
A.1.4. SCLERACTINIANS (Order Scleractinia)			
DENDROPHYLLIIDAE	<i>Dendrophyllia cornigera</i>	EN	28, 57, 61, 74, 101
A.2. Colonial scleractinians on hard rock outcrops and non-reefal scleractinian aggregations			
CARYOPHYLLIIDAE	<i>Lophelia pertusa</i> <i>Anomocora fecunda</i>	EN	76
DENDROPHYLLIIDAE	<i>Dendrophyllia cornigera</i>	EN	7, 31, 47, 57, 72, 76, 90, 101
OCULINIDAE	<i>Madrepora oculata</i>	EN	
A.3. Soft corals			
ALCYONIIDAE	<i>Alcyonium palmatum</i>		5
NIDALIIDAE	<i>Chironophthya mediterranea</i> <i>Nidalia studeri</i>		62 63, M. Fourt, pers. comm.
PARALCYONIIDAE	<i>Paralcyonium spinulosum</i>		11, 40
A.4. Hydrocorals			
STYLASTERIDAE	<i>Errina aspera</i>		4, 87
B. Soft-bottom coral gardens			
B.1. Soft-bottom gorgonian and other coral gardens			
GORGONIIDAE	<i>Eunicella filiformis</i>		
ISIDIDAE	<i>Isidella elongata</i>	CR	8, 12, 15, 23, 38, 64, 70, 71, 76, 79, 90
PLEXAURIDAE	<i>Spinimuricea atlantica</i> <i>Spinimuricea klavereni</i>		24 24
B.2. Cup-coral fields			
CARYOPHYLLIIDAE	<i>Caryophyllia smithii</i> f. <i>clavus</i>		29
B.3. Cauliflower coral fields			
NIDALIIDAE	<i>Nidalia studeri</i>		63, 81

(*) IUCN Red List Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable;

PROPOSED VME HABITAT TYPE (cont.)	Representative Taxa	IUCN Red List*	References
DEEP-SEA SPONGE AGGREGATIONS			
A. <i>Ostur</i> sponge aggregations			
GEODIIDAE	<i>Geodia conchilega</i> <i>Geodia nodastrella</i> <i>Geodia barretti</i>		23
PACHASTRELLIDAE	<i>Pachastrella monilifera</i>		7, 16, 31
B. Hard-bottom sponge gardens			
AXINELLIDAE	<i>Phakellia ventilabrum</i> <i>Phakellia robusta</i> <i>Phakellia hironellei</i>		31, 81 M. Fourt, pers. comm.
AZORICIDAE – Stone sponge reefs	<i>Leiodermatium lynceus</i> <i>Leiodermatium pfeifferae</i>		64
CHALINIDAE	<i>Haliclona</i> spp.		21, 103
STYLOCORDYLIDAE	<i>Stylocordyla pellita</i>		
TETHYIDAE	<i>Tethya aurantium</i> <i>Tethya citrina</i>		M. Bo, pers. comm.
VULCANELLIDAE	<i>Poecillastra compressa</i> <i>Vulcanella gracilis</i>		16, 31
C. Glass sponge communities			
PERONEMATIDAE	<i>Pheronema carpenteri</i>		
ROSSELLIDAE	<i>Asconema setubalense</i>		2, 76
D. Sponge aggregations on soft bottoms			
THENEIDAE	<i>Thenea muricata</i>		
CLADORHIZIDAE – Carnivorous sponges	<i>Cladorhiza abyssicola</i> <i>Lycopodina hypogea</i>		2
STYLOCORDYLIDAE	<i>Stylocordyla pellita</i>		
SUBERITIDAE	<i>Rhizaxinella</i> spp. <i>Suberites</i> spp.		55, 77 77
SEA PEN FIELDS			
PENNATULIDAE	<i>Pennatula</i> spp. (e.g. <i>P. phosphorea</i> , <i>P. rubra</i> , <i>P. aculeata</i>) <i>Pteroeides</i> spp.	VU (<i>P. phosphorea</i> , <i>P. rubra</i> , <i>Pteroeides spinosum</i>)	71, 76, 102
FUNICULINIDAE	<i>Funiculina quadrangularis</i>	VU	8, 38, 76, 79, 81, 90, 102
KOPHOBELEMNIDAE	<i>Kophobelemnion stelliferum</i>		69, 76, 79
PROTOPTILIDAE	<i>Protoptilum carpenteri</i>		68
VERETILLIDAE	<i>Veretillum cynomorium</i>		
VIRGULARIIDAE	<i>Virgularia mirabilis</i>		81, 102
TUBE-DWELLING ANEMONE PATCHES			
CERIANTHIDAE	<i>Cerianthus membranaceus</i> <i>Arachnanthus</i> spp.		
MUD- AND SAND-EMERGENT FAUNA			
Echinodermata - Crinoidea			
ANTEDONIDAE	<i>Leptometra celtica</i> <i>Leptometra phalangium</i>		10, 101 1, 8, 27, 39, 46, 76, 81, 93
Brachiopoda			
TEREBRATULIDAE	<i>Gryphus vitreus</i>		8, 83, 81, 105
BRYOZOAN PATCHES			
BITECTIPORIDAE	<i>Pentapora fascialis</i>		19, 57, 91, 95
BUGULIDAE	<i>Kinetoskias</i> spp.		101, M. Bo, pers. comm.
HORNERIDAE	<i>Hornera lichenoides</i>		
MOLLUSCS (habitat forming)			
GRYPHAEIDAE	<i>Neopycnodonte cochlear</i> <i>Neopycnodonte zibrowii</i>		28, 101
LUCINIDAE (cold seep communities)	<i>Lucinoma kazani</i>		86
MYTILIDAE (cold seep communities)	<i>Idas modiolaeformis</i>		75
PINNIDAE	<i>Atrina fragilis</i>		43
ANNELIDS			
SABELLIDAE			
SIBOGLINIDAE (cold seep communities)	<i>Lamellibrachia anaximandri</i> <i>Siboglinum</i> spp.		74, 81, 96 74
TEREBELLIDAE	<i>Lanice conchilega</i>		76, 81
CRUSTACEANS			
AMPELISCIDAE	<i>Haploops</i> spp.		
CALLIANASSIDAE (cold seep communities)	<i>Calliax</i> sp.		96

(*) IUCN Red List Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable;

FAO criteria for VME identification

Marine ecosystems are typically classified as VMEs according to a set of characteristics laid out in the FAO “*International Guidelines for the Management of Deep-sea Fisheries in the High Seas*” (2009). VMEs are designated according to one or a combination of these criteria, based on the best available scientific information.

CHARACTERISTIC	DESCRIPTION OF AREA, ECOSYSTEM, OR HABITAT
UNIQUENESS OR RARITY	Unique or containing rare species whose loss could not be compensated for by similar areas or ecosystems. These include: <ul style="list-style-type: none"> – habitats that contain endemic species; – habitats of rare, threatened or endangered species that occur only in discrete areas; or – nurseries or discrete feeding, breeding, or spawning areas.
FUNCTIONAL SIGNIFICANCE OF THE HABITAT	Discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of: <ul style="list-style-type: none"> – fish stocks; – particular life-history stages (e.g., nursery grounds or rearing areas); or – rare, threatened or endangered marine species.
FRAGILITY	Highly susceptible to degradation by anthropogenic activities.
LIFE-HISTORY TRAITS OF COMPONENT SPECIES THAT MAKE RECOVERY DIFFICULT	Characterised by populations or assemblages of species with one or more of the following characteristics: <ul style="list-style-type: none"> – slow growth rates; – late age of maturity; – low or unpredictable recruitment; or – long-lived.
STRUCTURAL COMPLEXITY	Characterised by complex physical structures created by significant concentrations of biotic and abiotic features. Often associated with high diversity. Both diversity and ecological processes are usually highly dependent on the structuring organisms.

Adapted from FAO (2009)

VMEs are frequently found in association with particular features of the seabed. Thus, the FAO guidelines also provide examples of geological features that potentially support VMEs: submerged edges and slopes; summits and flanks of **seamounts**, guyots, banks, knolls, and hills; **canyons** and trenches; **hydrothermal vents**; and **cold seeps**.

In the Mediterranean Sea, seamounts and submarine canyons are among the most common geological features. Scientific studies in recent years have gathered a large body of data regarding the biological communities that inhabit these areas. Such studies have confirmed their importance as biodiversity hotspots, and highlighted the importance of their protection (Bo et al, 2011; Würtz, 2012; Watremez *et al.*, 2012; Würtz and Rovere, 2015), in order to conserve VMEs and associated species, including commercial fishes.

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