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*Expedition 2014 Balearic Islands*  
**Cabrera National Park and Mallorca Channel Seamounts**

*August 2015*



## INTRODUCTION

This study details the results of the oceanographic campaign undertaken by Oceana in waters off the Balearic Islands in August 2014, to investigate the marine areas of Fort d'en Moreu and the seamounts in the Mallorca Channel. After several expeditions in this area by Oceana over the past few years, there is a wealth of scientific information available. We have combined important knowledge about the habitats and species present on the sea floor, and have drawn up long lists of species and habitats that are, among other things, protected, threatened or of commercial interest. As this involves the protection of a large marine area, the more knowledge we have about the ecosystems present the better, as this will enable us to develop a more comprehensive, accurate and appropriate protection proposal.

For this reason, in August 2014 Oceana undertook its sixth oceanographic expedition to the waters off the Balearic Archipelago, with the aim of increasing our knowledge of the biodiversity of the two zones proposed for protection: the surroundings of the Cabrera National Park and the seamounts in the Mallorca Channel (*Figure 1*). The research carried out has resulted in a considerable increase in the surface area investigated and the information available on the ecosystems and communities present.

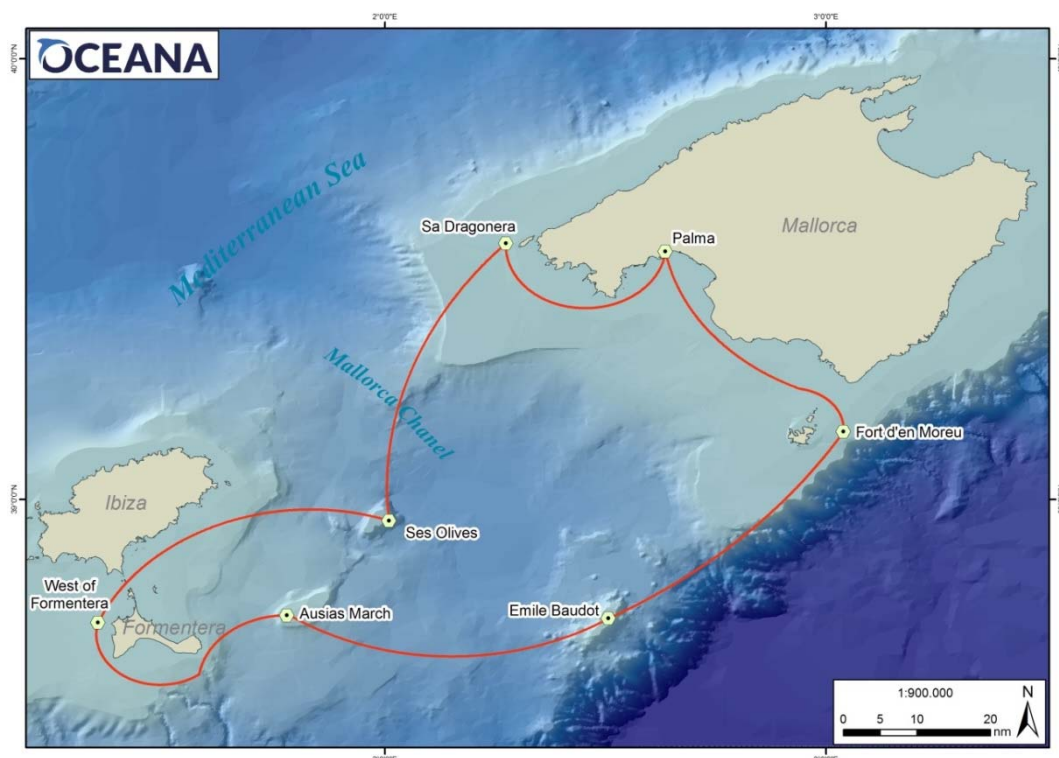


Figure 1. Surveyed areas at Expedition 2014 Balearic Islands

In the area studied to the east of the Cabrera National Park, in the neighbourhood of the coralligenous reef known as Fort d'en Moreu, within the limits of the area proposed for the extension of the National Park, it has been demonstrated that the rhodolith beds are more widely distributed than was previously thought, particularly to north and northwest of this reef. These sea floors are of enormous ecological importance, given the diversity of species that live there. The habitats are protected by various fishery and environmental legislation at national and international levels. Their conservation requires detailed studies and description,

and is obligatory for Member States and all the signatory States of the Barcelona Convention, Spain being among these.

In the seamounts of the Mallorca Channel, named Emile Baudot, Ausiàs March and Ses Olives, new deep areas have been studied, resulting in several interesting findings. On the one hand, habitats have been documented whose presence was previously unknown in this area, including extensive fields of crustaceans from the Ampeliscidae family. On the other, we have gathered new data on the presence and distribution of black coral gardens (*Leiopathes glaberrima*), fields of bamboo coral (*Isidella elongata*), ancient coral reefs (possibly *Madrepora oculata* and *Lophelia pertusa*), and fields of rare lithistid sponges (*Leiodermatium pfeifferae*), all of which are habitats of enormous scientific and ecological interest. A further highlight was the discovery of four amphorae and, observed via a radar system, what seems to be a set of at least 33 further amphorae, at a depth of 500 m on one of the slopes of Ses Olives.

## METHODS

The campaign was carried out on board the research catamaran B/O SOCIB, from the 4<sup>th</sup>-12<sup>th</sup> August, in two principal areas: the coralligenous reef Fort d' in Moreu and its surroundings (north and west), located to the east of the Cabrera National Park; and the Emile Baudot, Ausiàs March, and Ses Olives seamounts in the Mallorca Channel. When bad weather prevented work in these zones, studies were carried out in more protected spots near the coast, including West Formentera Island and the marine zone off Sa Dragonera Island. These zones have been investigated by Oceana in earlier expeditions and also proposed as protected areas because of their high ecological value.

### Activities carried out

- **Visual documentation of the water column and the sea floor.** Using a Remotely Operated Vehicle (ROV) Seaeye Falcon DR, photos and videos were taken of the water column and the sea floor. These images are displayed directly and recorded for later viewing and analysis. A total of 55 ROV transects were made, 49 in the main study areas (36 in the Fort d'en Moreu zone and 13 in the Mallorca Channel seamount area), and 6 more in the two secondary areas, the marine area of Sa Dragonera Island and West Formentera Island (*Table 1*).
- **Collection of sediment samples and benthic organisms.** Using the ROV's articulated arm, benthic organisms not visually identified were collected, for their later identification in the lab. Two Van Veen grab samples were also taken, from the sea floors of Fort d'en Moreu and Ausiàs March, to collect sediment and benthic organisms. (*Table 2*).
- **Surface sightings of cetaceans and other species.** During the cruises, Oceana personnel recorded surface sightings of cetaceans, turtles, fish, birds and other species. This information is included in the description of zones for protection, and is especially relevant if it includes protected species or those of commercial value (*Table 3*).

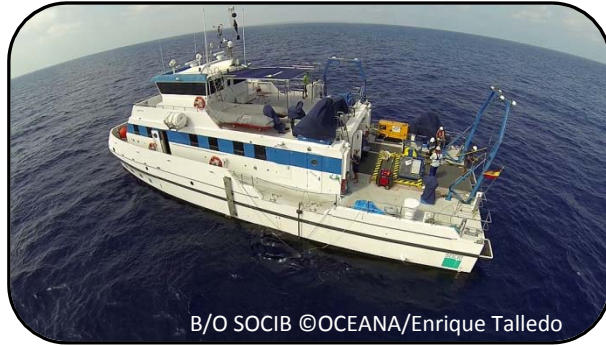


Table 1. Dives carried out

N	DATES	ROV	POSITION (LAT. LON)		ZM (m)	HABITAT
1	04/08/14	FM01	39°10.5405'N	03°05.0371'E	77	<i>Posidonia oceanica</i> dead leaves
2	04/08/14	FM02	39°10.5901'N	03°04.3059'E	71	<i>Posidonia oceanica</i> dead leaves
3	04/08/14	FM03	39°11.1618'N	03°03.6914'E	61	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
4	04/08/14	FM04	39°10.8255'N	03°04.4749'E	63	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
5	04/08/14	FM05	39°10.7282'N	03°03.0187'E	63	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
6	04/08/14	FM06	39°10.6007'N	03°02.6233'E	65	Rhodolith bed
7	04/08/14	FM07	39°10.4445'N	03°01.5563'E	65	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
8	04/08/14	FM08	39°11.0793'N	03°01.0496'E	54	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
9	04/08/14	FM09	39°10.7980'N	03°00.5083'E	50	Rhodolith bed
10	05/08/14	FM10	39°10.3777'N	03°00.5484'E	58	Live and dead rhodoliths
11	05/08/14	FM11	39°10.3306'N	03°00.0127'E	50	Live and dead rhodoliths
12	05/08/14	FM12	39°09.7300'N	03°00.7933'E	75	Rhodolith bed
13	05/08/14	FM13	39°09.0468'N	03°00.4738'E	86	Dead rhodoliths
14	05/08/14	FM14	39°08.7340'N	03°00.7555'E	90	Sandy bottom, Ophiuroidea
15	05/08/14	FM15	39°08.5137'N	03°00.7597'E	95	Sandy bottom
16	05/08/14	FM16	39°07.9667'N	03°00.9186'E	102	Sandy-muddy bottom
17	05/08/14	FM24	39°07.9912'N	03°00.2585'E	101	Sandy-muddy bottom, Echinoidea
18	05/08/14	FM23	39°08.7437'N	03°00.1979'E	89	Sandy-muddy bottom
19	05/08/14	FM22	39°09.9312'N	03°00.1149'E	63	Rhodolith bed
20	05/08/14	FM21	39°11.0326'N	03°00.0299'E	44	Rhodolith bed
21	05/08/14	FM20	39°10.6262'N	03°01.7644'E	64	Rhodolith bed, <i>Posidonia oceanica</i> dead
22	06/08/14	FM19	39°10.4151'N	03°02.0289'E	65	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
23	06/08/14	FM18	39°10.3545'N	03°04.0520'E	71	<i>Posidonia oceanica</i> dead leaves
24	06/08/14	FM17	39°10.4429'N	03°04.7889'E	76	Live and dead rhodoliths, <i>Posidonia oceanica</i> dead leaves
25	06/08/14	FM25	39°10.2170'N	03°00.2184'E	65	Rhodolith bed
26	06/08/14	FM26	39°10.0085'N	02°59.9982'E	58	Rhodolith bed
27	06/08/14	FM27	39°09.5501'N	02°59.9955'E	72	Dead rhodoliths
28	06/08/14	FM28	39°09.3892'N	03°00.8772'E	80	Dead rhodoliths
29	06/08/14	FM29	39°08.3317'N	03°00.0973'E	95	<i>Posidonia oceanica</i> dead leaves
30	06/08/14	FM30	39°08.1734'N	03°00.5689'E	95	Sandy-muddy bottom, Ophiuroidea
31	06/08/14	FM31	39°09.9486'N	03°00.5791'E	64	Rhodolith bed
32	07/08/14	FMT1	39°08.5650'N	03°03.1076'E	90	Rhodolith bed, coralligenous
33	07/08/14	FM32	39°09.8200'N	03°02.1169'E	69	Rhodolith bed
34	07/08/14	FM33	39°10.0582'N	03°03.8567'E	63	Coralligenous, Alcyonacea
35	07/08/14	FM34	39°09.2036'N	03°04.2458'E	65	Coralligenous, Phaeophyceae
36	07/08/14	FMT2	39°08.8725'N	03°02.5134'E	83	Coralligenous

37	08/08/14	EB01	38°45.8550'N	02°28.3560'E	542	Overhangs with <i>Neopycnodonte zibrowii</i> , coral framework
38	08/08/14	EB02	38°41.1400'N	02°22.3670'E	832	Mud with burrows, coral framework
39	08/08/14	EB03	38°37.2190'N	02°26.4510'E	695	Mud with burrows, coral framework, gorgonian forest, stone sponges field
40	09/08/14	EB04	38°38.5170'N	02°32'8710'E	756	Mud with burrows
41	09/08/14	WF01	38°44.0710'N	01°19.3240'E	89	Sandy bottom, Echinodermata
42	09/08/14	WF02	38°48.4310'N	01°17.4830'E	104	<i>Spinimuricea</i> cf. <i>klavereni</i> field and sea pens
43	10/08/14	AM01	38°42.6050'N	01°49.2610'E	929	Mud, Crinoidea
44	10/08/14	AM02	38°43.9510'N	01°47.7460'E	94	Rhodolith bed and coralligenous concretions
45	10/08/14	AM03	38°43.9790'N	01°50.4320'E	128	Ampeliscidae bed
46	10/08/14	AM04	38°49.5810'N	01°53.9550'E	559	Mud with burrows, <i>Isidella elongata</i> bed
47	11/08/14	SO01	38°54.9160'N	01°59.3880'E	658	Mud with burrows, overhangs with <i>Neopycnodonte zibrowii</i> , coral framework
48	12/08/14	SO02	38°59.1190'N	02°00.8970'E	879	Gorgonian forest, coral framework, black coral garden
49	12/08/14	SO03	38°57.2410'N	01°56.5430'E	619	Mud with burrows, dead <i>Isidella elongata</i>
50	12/08/14	SO04	38°55.8630'N	01°54.5990'E	641	Mud with burrows, coral framework
51	12/08/14	SO05	38°56.2370'N	01°59.3330'E	452	Coral framework, overhangs with <i>Neopycnodonte zibrowii</i>
52	13/08/14	SD01	39°35.9570'N	02°19.8400'E	68	Live and dead rhodolites
53	13/08/14	SD02	39°36.4600'N	02°19.2950'E	88	<i>Posidonia oceanica</i> dead leaves
54	13/08/14	SD03	39°35.6660'N	02°18.9650'E	74	Rhodolith bed, <i>Posidonia oceanica</i> dead leaves
55	13/08/14	SD04	39°35.2660'N	02°11.6920'E	120	Rocks with coralligenous and sponges communities

FM: Fort d'en Moreu; EB: Emile Baudot Seamount; WF: West Formentera Island; AM: Ausiàs March Seamount; SO: Ses Olives Seamount; SD: Sa Dragonera Island; ZM (m): Maximum depth (in meters).

Table 2. Samples collected

N	ID	ROV	DATE	POSITION (LAT, LONG)		ZM (m)	SPECIES	PHYLUM
1	M001	FM05	04/08/14	39°10.7240'N	03°03.0442'E	63	<i>Tethya</i> sp.	Porifera
2	M002	FM05	04/08/14	39°10.7240'N	03°03.0442'E	63	Corallinaceae sp. ind.	Rhodophyta
3	DV01	FM13	05/08/14	39°09.0950'N	03°00.4250'E	81	Corallinaceae sp. ind.	Rhodophyta
4	M003	FM15	05/08/14	39°08.5111'N	03°00.7577'E	94	Corallinaceae sp. ind.	Rhodophyta
5	M004	FM16	05/08/14	39°07.9618'N	03°00.7577'E	102	<i>Funiculina quadrangularis</i>	Cnidaria
6	M006	AM02	10/08/14	38°43.9507'N	01°47.7509'E	94	Demospongiae sp. ind.	Porifera
7	DV02	AM03	10/08/14	38°44.0570'N	01°47.7570'E	130	Ampeliscidae sp. ind.	Crustacea
8	M007	AM04	10/08/14	38°49.6096'N	01°53.9675'E	546	<i>Isidella elongata</i>	Cnidaria
9	M008	SO01	11/08/14	38°55.3870'N	01°58.2968'E	318	Hexactinellida sp. ind.	Porifera
10	M009	SO02	12/08/14	38°59.1908'N	02°00.7577'E	823	Alcyonacea sp. ind.	Cnidaria
11	M010	SO02	12/08/14	38°59.1908'N	02°00.7577'E	823	Solenogastres sp. ind.	Mollusca
12	M011	SO02	12/08/14	38°59.1908'N	02°00.7577'E	823	Alcyonacea sp. ind.	Cnidaria
13	M012	SO02	12/08/14	38°59.0892'N	02°00.7616'E	804	Hexactinellida sp. ind.	Porifera
14	M013	SD04	13/08/14	39°35.3434'N	02°11.7780'E	120	Demospongiae sp. ind.	Porifera

FM: Fort d'en Moreu. AM: Ausiàs March Seamount. SO: Ses Olives Seamount. SD: Sa Dragonera Island. M: Sample collected by ROV's articulated arm. DV: Sample collected by Van Veen grab. ZM(m): Maximum depth (in meters). Sp. ind.: Undetermined species.

Table 3. Surface sightings

N	DATE	POSITION (LAT, LON)		ZONE	SPECIES
1	04/08/14	39°10.5141'N	03°04.9822'E	FM	<i>Calonectris diomedea diomedea</i>
2	05/08/14	39°07.9870'N	03°00.2350'E	FM	<i>Xiphias gladius</i>
3	05/08/14	39°09.9400'N	03°00.0950'E	FM	<i>Xiphias gladius</i>
4	07/08/14	39°13.9820'N	03°07.4680'E	FM	cf. <i>Tursiops truncatus</i>
5	07/08/14	39°08.9750'N	03°06.6890'E	FM	cf. <i>Auxis rochei rochei</i> , <i>Calonectris diomedea</i>
6	08/08/14	38°37.3240'N	02°26.3270'E	EB	<i>Mobula mobular</i>

7	08/08/14	39°07.6800'N	03° 05.2800'E	EB	Delphinidae sp. ind.
8	11/08/14	38°55.4916'N	01°58.5191'E	SO	<i>Mobula mobular</i>
9	11/08/14	38°55.6173'N	01°58.3597'E	SO	<i>Xiphias gladius</i>

## DESCRIPTION OF DOCUMENTED HABITATS

During the transects made, an enormous variety of marine communities was documented, from rocky bottoms and muddy to sandy sediment bottoms. Distinct communities develop on these sea floors, depending on the depth at which they occur. When they are shallow, and light penetrates to the bottom, we found communities dominated by calcareous red algae. At greater depths, the algae disappear as there is no light and it gives way to communities principally dominated by anthozoans and sponges. The variety of habitats found during the dives is described below, organised according to the various zones studied:

- East of Cabrera National Park: Fort d'en Moreu and surrounding area
- Mallorca Channel Seamounts: Emile Baudot, Ausiàs March and Ses Olives
- Other areas studied: island of Sa Dragonera and West Formentera Island

### **East of Cabrera National Park: Fort d'en Moreu and surrounding area**

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Within the limits of Oceana's proposal for the extension of the Cabrera National Park, towards the east of the park, is Fort d'en Moreu. This comprises an imposing coralligenous reef, with a very well-developed three-dimensional structure. On this, gardens of the red gorgonian (*Paramuricea clavata*) and kelp forests (*Laminaria rodriguezii*) have developed, both habitats listed for protection by the Barcelona Convention.

To the east of the Cabrera National Park, around the coralligenous reef of Fort d'en Moreu, 36 ROV dives were made in 2014: 31 to the north and west of the reef; and 5 on the reef itself (Figure 2). This complemented the information collected by Oceana during other campaigns in this zone undertaken between 2006 and 2013. Rhodolith beds were observed in the surroundings of the reef during almost all the dives. The rhodoliths were accompanied by other species of red and green algae, as well as facies of dead *Posidonia oceanica* leaves, also essential habitat for numerous species and which have associated a high biodiversity. Many fish species were recorded here, including combers, gobies, weever fish and hake, together with tens of species of invertebrates, such as sponges, ascidians, bryozoans, hydrozoans and crustaceans. Surface sightings included a group of dolphins, possibly common bottlenose dolphins (cf. *Tursiops truncatus*), as well as several specimens of swordfish (*Xiphias gladius*).

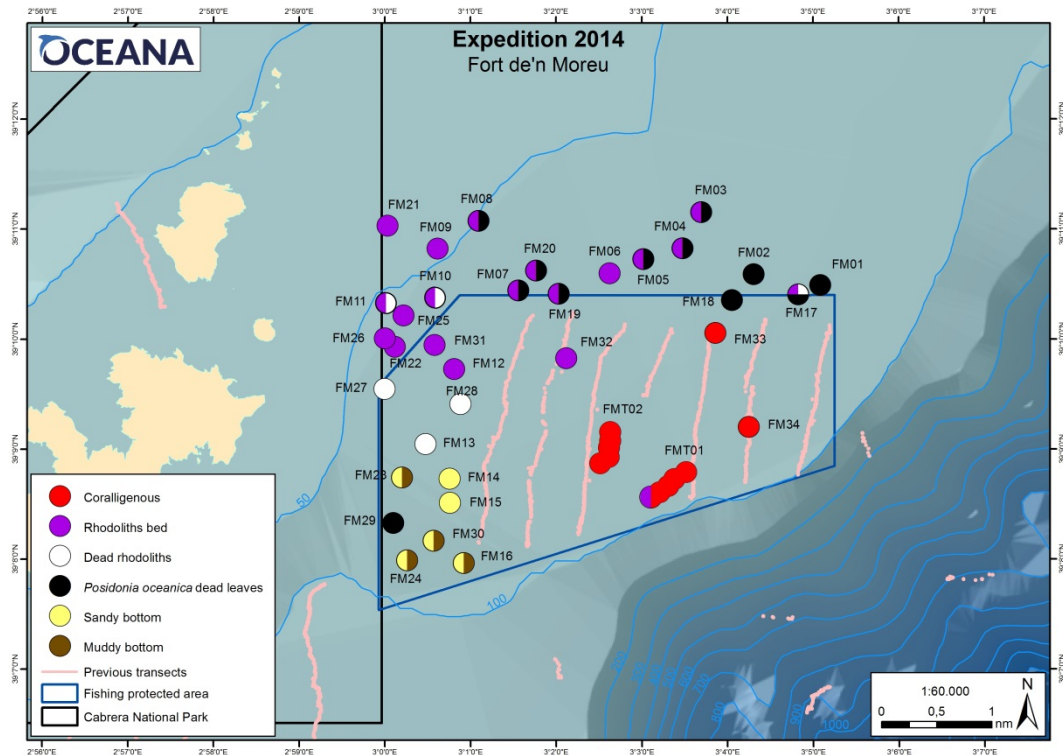


Figure 2. Fort d'en Moreu

### Habitats and species documented

**Rhodolith beds.** Rhodolith beds were observed in the sectors to the north and northwest of the reef, as well as during the dives made in the central-southern area of the reef. Trawling marks on the rhodolith beds were detected in some dives. On these sea floors we recorded species of commercial interest, including scorpionfish and flat fish, as well as protected species included in Annex II of the Barcelona Convention and the *Listado de*



*Especies Silvestres en Régimen de Protección Especial* (Spanish list of wild species under special protection), like the sponges *Tethya* sp. and *Axinella polypoides*. Also, numerous clutches of mollusc eggs were observed.

**Degraded rhodolith beds.** In the zone to the west of the reef, between this structure and the Cabrera National Park, rhodolith beds in a poor condition were detected, presumably degraded due to the impact of bottom trawling in the area. These zones contained a low density of rhodoliths, many of them in a poor condition or dead, and the images showed that the sediment is composed of rhodolith remains. A Van Veen grab sample was taken of the sediment, which corroborated the presence of degraded and dead rhodoliths.



**Coralligenous bottoms.** The dives made on Fort d'en Moreu itself allowed the reef to be documented in areas inhabited by kelp (*Laminaria rodriguezii*) and the red gorgonian (*Paramuricea clavata*); during one of the dives, a trawling net was found caught on the coralligenous reef.



**Sandy and muddy bottoms.** To the southwest of Fort d'en Moreu, still between this structure and the Cabrera National Park, the bottom is sandier, detrital or muddy, and no reefal or rhodolith formations are visibly present. Here we found species typical of this kind of substrate, such as echinoderms and flat fish. Rhodoliths cannot be seen at first glance, but it is possible that these sea floors are composed of rhodoliths that are highly deteriorated due to the intense bottom trawling that took place in the area until it was (theoretically) banned in August 2014.

**Facies with dead *Posidonia oceanica* leaves.** Listed in the Barcelona Convention as a natural habitat of protection interest, this habitat is formed by accumulated leaves from the coastal seagrass meadows of *P. oceanica*. These accumulations of leaves and other parts of the plant, like the rhizomes, provide a refuge and food for juveniles of commercially valuable species,



like goatfish (*Mullus* sp.), scorpionfish (*Scorpaena* sp.), hake (*M. merluccius*) and sea cucumber (*Parastichopus regalis*). Together with these, we found many other species of fish, crustaceans and echinoderms, as well as sessile organisms that use these accumulations as a substrate on which to be become established, including bryozoans, sea squirts and sponges.



**Feeding area for birds, tunids and other pelagic species.** During one of cruises towards Fort d'en Moreu, we were lucky enough to witness the feeding of a large and agitated shoal of tunids (possibly bullet tuna, *Auxis rochei rochei*) as well as Scopoli's shearwater (*Calonectris diomedea diomedea*), just above the coralligenous reef. As established by the FAO, feeding zones must be protected as they are Essential Fish Habitats<sup>1</sup>. In this case, not only does this represent a feeding zone for highly valuable commercial species, like tunids, but also for a protected species of bird, the Scopoli's shearwater. It should also be noted that during the time spent investigating the area, there were sightings of two swordfish (*Xiphias gladius*), as well as a group of dolphins (cf. *Tursiops truncatus*).



## Mallorca Channel Seamounts: Emile Baudot, Ausiàs March and Ses Olives

The seamounts in the Mallorca Channel are three of the most significant submerged elevations present in the Balearic Sea and surrounding areas. A great wealth and abundance of species has been described on these seamounts, as well as tens of protected and protection-interest habitats. The zone fulfils the ecological requirements for natural systems established by the *Ley de Parques Nacionales de España* (Spanish Law on National Parks), by containing 11 of the 13 natural systems to be included within the Network of National Parks, some of which are not yet included in the network, or very poorly represented.

During the 2014 campaign, new dives were made in the area: 4 on Emile Baudot, 4 on Ausiàs March and 5 on Ses Olives, always in zones never before explored with a ROV (Figures 3-5). These dives allowed us to document habitats whose presence was previously unknown in the area, including **fields of lithistid sponges** and an **Ampeliscidae bed**. They also enabled us to improve our knowledge about habitats relevant for marine conservation, like **forests of black corals** (*Leiopathes glaberrima*), and **deep water gorgonian gardens** (e.g., *Callorgorgia verticillata*), which are protected in the Mediterranean; as well as **fields of bamboo coral** (*I. elongata*), crucial for highly valuable commercial species like hake and Norway lobster. Surface sightings were also made of devil fish (*Mobula mobular*), a species protected in the Mediterranean and already documented, during the expedition made in 2013, on the Emile Baudot Escarpment.

On top of this came the unusual discovery of a **set of amphorae** on the southeast slope of Ses Olives, possibly dating back 2000 years. We managed to obtain high resolution images of four amphorae. A 50 m radius radar sweep seemed to indicate the presence of 33 further amphorae in the zone studied, suggesting there could be many more in the wider area. The data obtained, including location and images, has been properly submitted to the authorities and various experts in the field. During the most recent analysis of the images obtained from

<sup>1</sup> FAO (2009). International guidelines for the management of deep-sea fisheries in the high seas. Food and Agriculture Organization of the United Nations. 73 pp.

the expedition, the presence of another small fragment of amphora has been noted in the area of Emile Baudot.



### Habitats and species documented

**Coral framework.** New zones with coral framework have been discovered, both on Ses Olives (dives SO02, SO04 and SO05), and Emile Baudot (dives EB01, EB02 and EB03). This represents a habitat of enormous ecological interest, as it is home to a high diversity of species. The habitat is made up of the remains of corals that formed ancient reefs. When



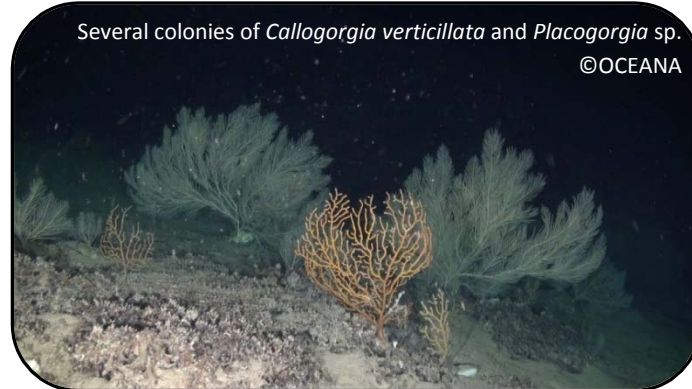
these corals die, their skeletons form accumulations on which, given their complex three-dimensional structure, innumerable species settle. On them we found a multitude of sessile species, like sponges, bryozoans, ascidians and corals; as well as fish, crustaceans, echinoderms and molluscs that find refuge and food in the nooks and crannies. For example, during the expedition, large concentrations of crinoids (*Leptometra phallangium*) were observed on the coral framework.

**Black coral garden.** On the northern slope of the Ses Olives seamount (SO02), we found a new area of black corals. This type of habitat is scarce in the Mediterranean. The slow-growing black corals are very long-lived and highly vulnerable to impacts, such as fishing with bottom gears, as well as contamination by rubbish and abandoned fishing



gear. They are, therefore, protected by the Barcelona Convention and Spanish legislation, as well as from the point of view of scientists and managers. The most abundant species in this zone is *Leiopathes glaberrima*, in its orange variety. Next to these corals, we found other smaller black corals, like *Antipathes dichotoma* and *Parantipathes larix* (this being the first record of this species in these seamounts). In this zone we observed the remains of corals, or the *coral framework*, on which black corals settle, along with many other species.

**Gorgonian forests.** Also on the northern slope of Ses Olives (SO02), we documented an impressive gorgonian forest, dominated by *Callogorgia verticillata*, together with numerous large specimens of the yellow gorgonian *Placogorgia sp.*, which is very rare in the Mediterranean. On the southwest slope of Emile Baudot (EB03), we recorded a small forest of the gorgonian *Nicella granifera*. This species of anthozoans is smaller than the previously mentioned *C. verticillata* and *Placogorgia sp.*, but its presence is also associated with a great diversity of species. The forest is developed on a coral framework composed of ancient corals that favour the presence of many other invertebrate species.



Several colonies of *Callogorgia verticillata* and *Placogorgia sp.*  
©OCEANA

**Walls and overhangs with *Neopycnodonte zibrowii*.** On the Emile Baudot (EB01) and Ses Olives (SO01 and SO05) seamounts, another new habitat was documented which is rarely recorded on these seamounts. These are walls with concretions of the giant oyster *Neopycnodonte zibrowii*. The presence of living individuals cannot be determined from the images, although there



Aggregation of *Neopycnodonte zibrowii*  
and soldier striped shrimps (*Plesionika edwardsii*) ©OCEANA

may be some. This type of habitat, whether comprising living individuals or, as in this case, concretions of dead specimens (*thanatocoenosis*), is associated with several species of prawns, like *Plesionika giglioli*, *P. edwardsii*, and *Aristeus antennatus*, the first two of which were also documented during some of the dives carried out.

***Isidella elongata* bed.** Sea floors covered in *I. elongata* are considered to be sensitive habitats, as well as being important ecologically and economically. Their high value is due to them being a key habitat for deep water shrimp (*A. antennatus* and *Aristaeomorpha foliacea*), Norway lobsters (*Nephrops*

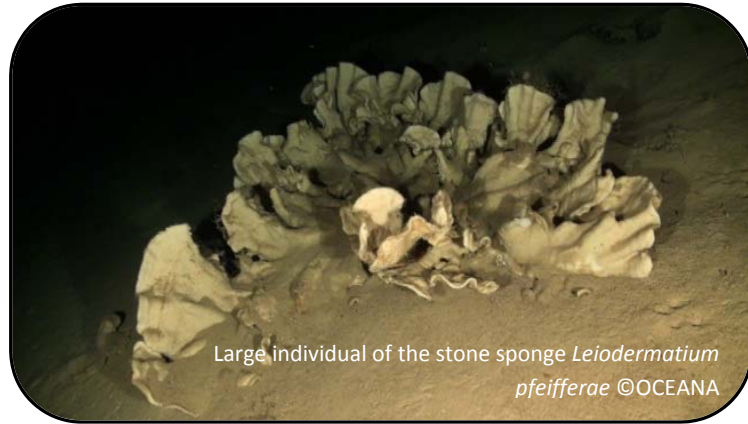


Bamboo coral (*Isidella elongata*) ©OCEANA

*norvegicus*), and fish such as hake (*Merluccius merluccius*). For this reason, these sea floors have almost entirely disappeared in the Mediterranean, their main threat being from bottom trawling. On previous expeditions Oceana documented the presence of these habitats in deep muddy areas, below -400 m, between the seamounts Ausiàs March and Ses Olives. During the 2014 expedition, an impressive bamboo coral field was discovered to the north of Ausiàs March (AM04), in good condition, with extraordinarily well-developed and healthy colonies. A very high density of these gorgonians was observed at some points during the dive, as was

the presence of hake (*M. merluccius*) and Norway lobsters (*N. norvegicus*). On the other hand, a significant number of bamboo coral colonies either in very bad condition or dead was also documented, on the muddy bottom bordering Ses Olives (SO03).

**Lithistid sponge field.** In 2013, Oceana documented, for the first time in the Mediterranean, the presence of a lithistid sponge reef, of the species *Leiodermatium pfeifferae*. The discovery took place on a seamount 30 NM to the northwest of the island of Ibiza, located in the Ibiza Channel. During the 2014 campaign, Oceana once again



Large individual of the stone sponge *Leiodermatium pfeifferae* ©OCEANA

found large specimens of this species, during the dives made on the southern slope of the Emile Baudot seamount (EB03). Although they are not reef-forming, the development of the colonies and their abundance is remarkable. Both findings have recently been published in one of the top scientific journals, Plos One<sup>2</sup>.

**Mud with galleries and mounds.** These are muddy bottoms where species like the Norway lobster (*N. norvegicus*), crabs (*Goneplax rhomboides*) and prawns (*A. antennatus*, *A. foliacea*, and *Plesionika* spp.), construct a system of galleries and mounds in the mud, making them important habitats for commercially interesting



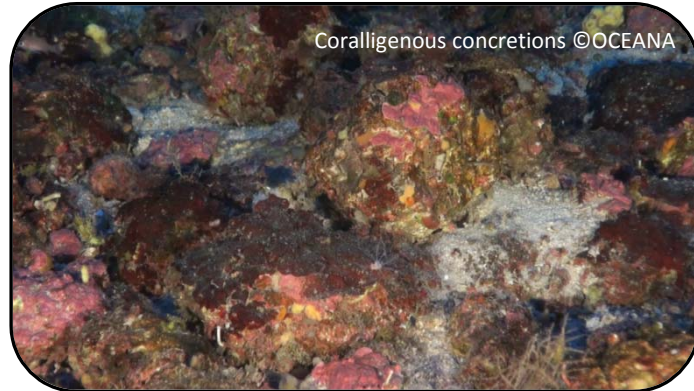
Norway lobster (*Nephrops norvegicus*) ©OCEANA

species. This system of galleries oxygenates the substrate, increasing the complexity of the habitat. In this way, it facilitates the settling and presence of other species, such as crinoids, like *L. phallangium*, brachiopods, like *Gryphus vitreus*, and anthozoans, like sea pens (*Funiculina quadrangularis*, *Pennatula phosphorea*, and *P. rubra*), bamboo coral (*I. elongata*), and bryozoans (*Kinetoskias* sp.), all components of ecologically important communities. All these organisms are vulnerable to fishing techniques that penetrate or trawl the bottom. In some cases, the species involved are already proposed for protection, like the anthozoans *F. quadrangularis* and *I. elongata*. Some types of muddy habitats listed to be protected in the OSPAR and Barcelona conventions for the protection of the marine environment in the northeast Atlantic and Mediterranean Sea, respectively. Therefore, managing the human activities that are harmful to these sensitive habitats, like bottom trawling, is necessary to protect both them and the fishery resources. During the 2014 expedition, this bottom type was documented on the three seamounts (AM04, EB02, EB03, EB04, SO01, SO02 and SO04), as well as in other areas investigated on these seamounts in previous campaigns.

<sup>2</sup> Maldonado, M., Aguilar, R., Blanco, J., García, S., Serrano, A., & Punzón, A. (2015). Aggregated clumps of lithistid sponges: a singular, reef-like bathyal habitat with relevant paleontological connections.

**Rhodolith beds and coralligenous concretions.**

A shallow dive (-95 m) was made on the summit of Ausiàs March (AM02) to document the hitherto unexplored areas of the summit and determine, using new data, the extent of the protected coralligenous and maërl habitats present there. On this occasion we recorded an extraordinarily



Coralligenous concretions ©OCEANA

dense rhodolith bed, in some cases forming coralligenous concretions. As they increase in size these concretions may give rise to the formation of a coralligenous reef, and various successively larger sessile species, such as kelp, algae, gorgonians, and sponges, settle and establish a new and diverse ecosystem.

**Ampeliscidae bed.**

This year a new habitat was discovered on the Mallorca Channel seamounts. Specifically, on Ausiàs March (AM03) we documented an Ampeliscidae field. It is a muddy detrital sea floor at -130m water depth, covered with small half-buried tubes constructed by crustacean amphipods, from which they feed by extending



*Raja clavata* at Ampeliscidae bed ©OCEANA

their tentacles. These constructions have been found along a 350m trajectory, the entire transect, and in remarkable densities of up to hundreds of tubes per m<sup>2</sup>. This type of habitat is protected in the Baltic Sea, but both its presence and diversity in the Mediterranean are little known, having been documented only rarely, particularly in such high densities as on this occasion. At one of the GPS points along the transect with the greatest density of tubes, a Van Veen grab sample of the sediment was taken, in order to collect Ampeliscidae specimens. Some of the collected tubes were dissected and the presence of individuals was verified within several of them. These will be sent to a specialist in order to identify the species.

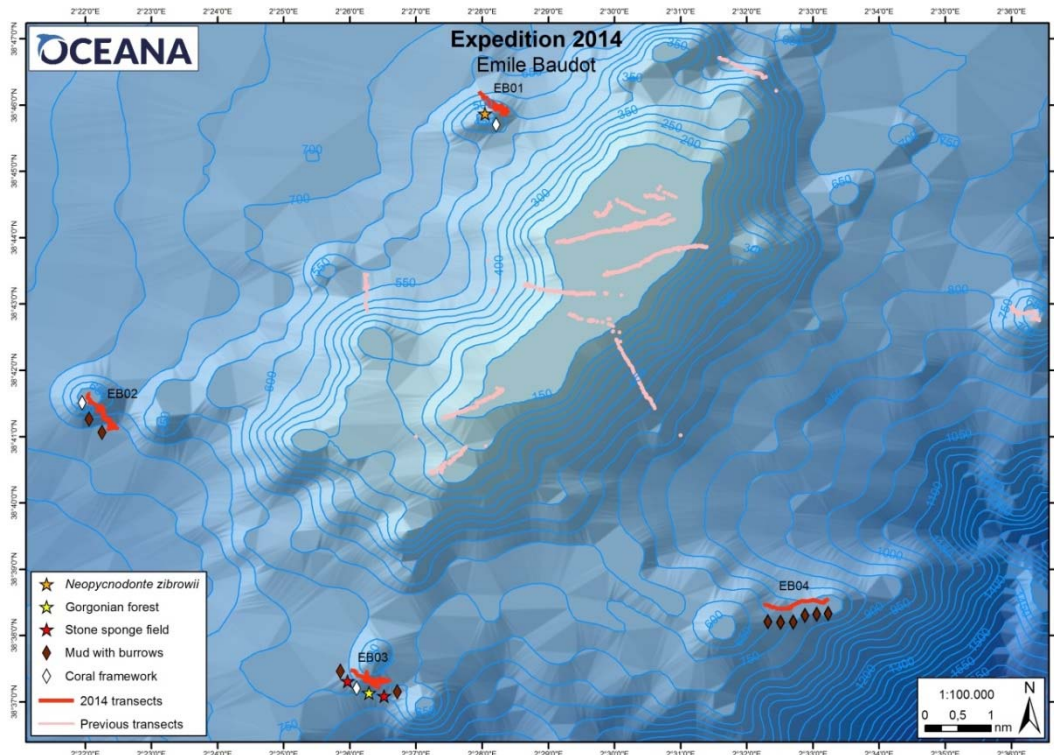


Figure 3. Emile Baudot dives and habitats found at Expedition 2014 Balearic Islands

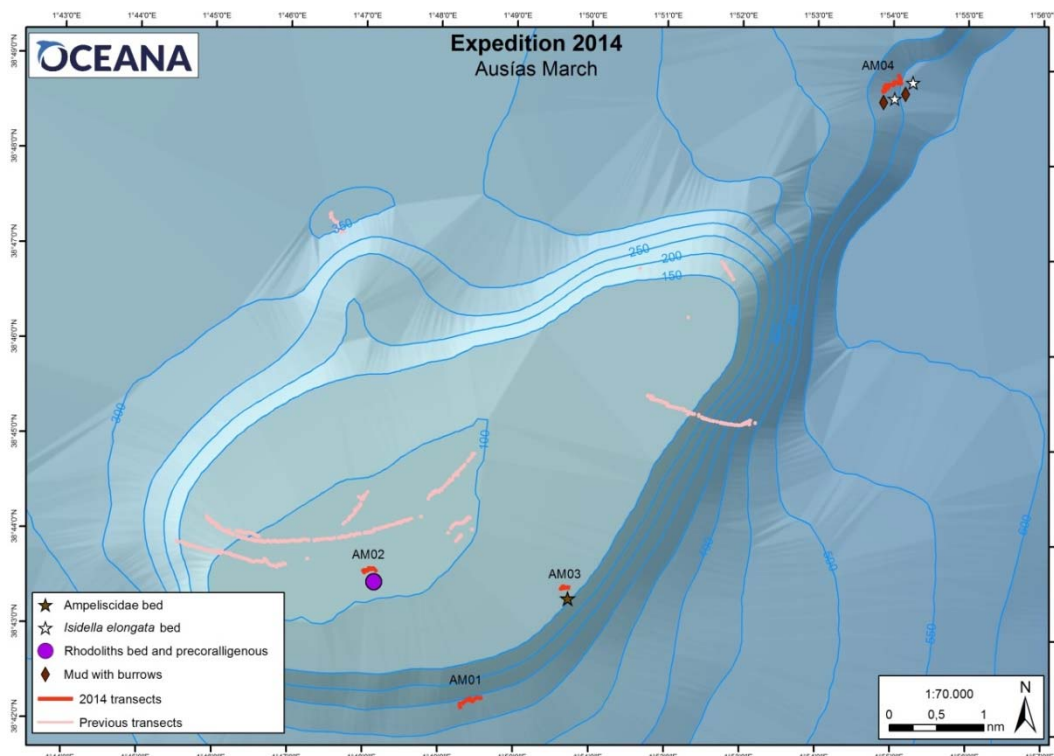


Figure 4. Ausias March dives and habitats found at Expedition 2014 Balearic Islands

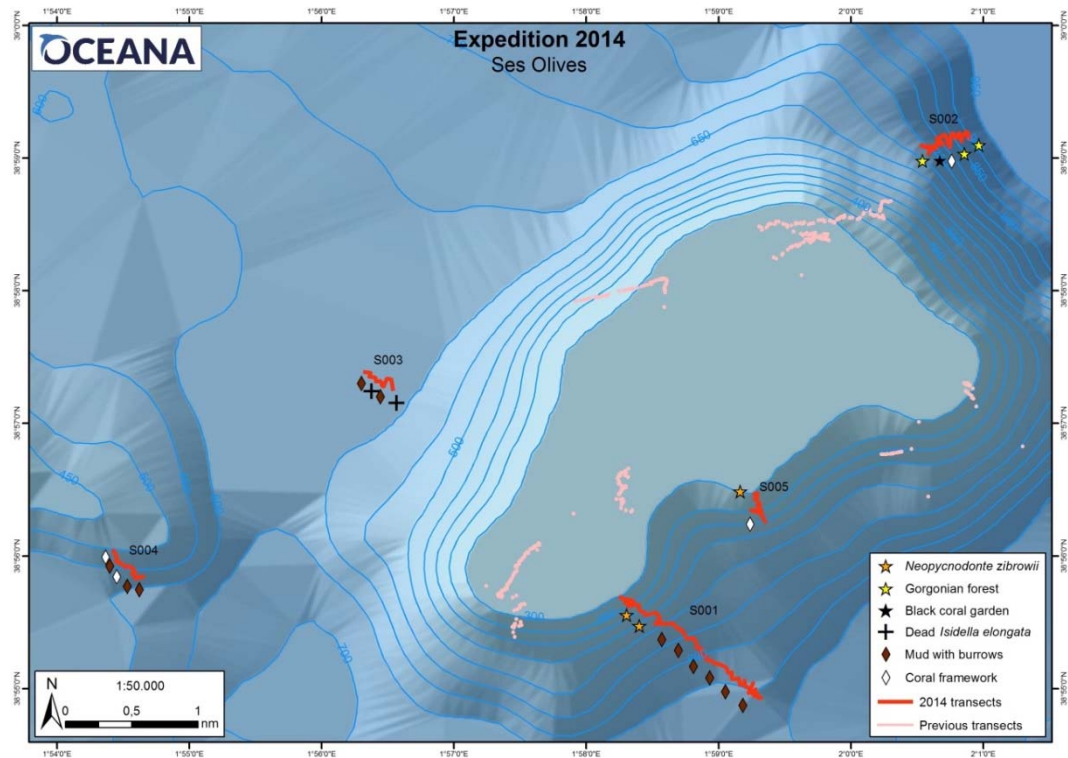


Figure 5. Ses Olives dives and habitats found at Expedition 2014 Balearic Islands

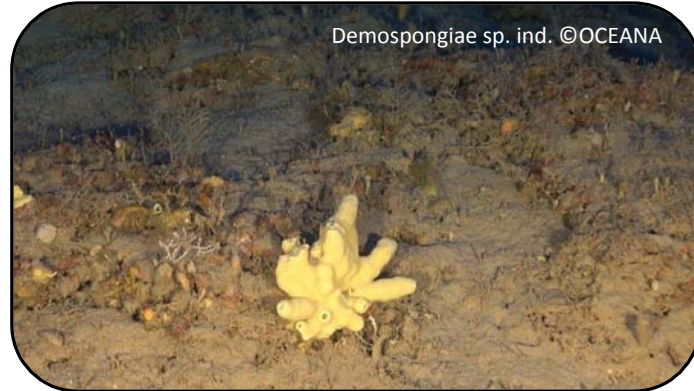
## Other areas studied: island of Sa Dragonera and West Formentera Island

### Island of Sa Dragonera

Between 2007 and 2014, Oceana made several dives to the sea bed near the island of Sa Dragonera, to document the marine diversity present at the bottom. A total of 5 dives were made using an underwater robot (ROV) to the deep sea floor bordering the island, 4 of them during the 2014 campaign. In previous years, divers have also gone down the submerged slopes of this island. The dives made during the 2014 campaign significantly increased the quantity of information Oceana has on this area, documenting new habitats, different from those found some years ago. We knew about the existence of cylinder anemone (*Cerianthus membranaceus*) and brachiopod (*Gryphus vitreus*) fields, along with sea pens (*F. quadrangularis*) and crinoids (*L. phallangium*), at the edge of platform slope, to the north of the island. However, in this latest campaign we also discovered the following habitats of interest:

**Rocky outcrops with coralligenous concretions and sponge communities.**

These are habitats to be protected according to the Habitats Directive, coming under habitat type 1170, with interesting aggregations of unidentified demosponges, and some colonies of the yellow coral *Dendrophyllia cornigera*. The presence of coralligenous



Demospongiae sp. ind. ©OCEANA

concretions on these rocky bottoms, together with the rich community of invertebrates that lives there, means this zone is also of protection interest under the Barcelona Convention, which establishes the protection of these coralligenous formations. In addition, the Mediterranean Regulation<sup>3</sup> prohibits bottom trawling on this kind of sea floor, which means a fishery protection zone must be established here to prevent it being deteriorated by bottom trawling activity, which does take place in nearby areas

**Rhodolith beds.** On part of the sedimentary sea floor studied we observed the presence of rhodoliths and other algae species, along with numerous species of echinoderms, crustaceans and fish. This, just as in the previous case, is a habitat for which a protected zone must be established to prohibit bottom trawling and therefore prevent its deterioration.



Seven armed starfish (*Luidia ciliaris*) in a rhodolith bed ©OCEANA

**Accumulations of leaves and rhizomes of *Posidonia oceanica*.**

This habitat, of interest for the Mediterranean and protected by the Barcelona Convention, is also present on the sea bed around the island of Sa Dragonera. It is home to a multitude of commercially interesting species, like scorpionfish (*Scorpaena* sp.), piper gurnards (*Trigla lyra*), weever fish



Scorpion fish (*Scorpaena* sp.) hidden at dead leaves of *Posidonia oceanica* ©OCEANA

(*Trachinus draco*), and sea cucumbers (*Parastichopus regalis*), that find refuge here and are camouflaged from predators. This type of sea bottom is also home to sensitive species like sea pens (*Pennatula* sp.) and soft corals such as *Alcyonium palmatum* and *Paralcyonium spinulosum*, which we found fairly frequently. Purple heart urchins (*Spatangus purpureus*) are very numerous and occur in remarkable concentrations.

<sup>3</sup> Council Regulation EC 1967/2006, 21st December, 2006, relating to management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea.



## West Formentera Island

Two dives (WF01 and WF02) were undertaken in the west area of Formentera Island, when the weather conditions prevented work on the high seas. In this area our aim was to determine the presence or absence of rhodolith beds. Therefore the dives were shallow, on sandy or muddy bottoms where sunlight still penetrates, down to a depth approximately 100 m on both occasions. Rhodoliths were not found, but interesting aggregations of anthozoans were observed, which were previously not known to be present in this area:

**Fields of *Spinimuricea* cf. *klavereni*, sea pens, and red dead man's fingers.** *S. klavereni* is a species of soft coral endemic to the Mediterranean. Its presence has been recorded in various places in the Western Mediterranean, but it is practically unknown from the Eastern Mediterranean. This species is still pending confirmation. If it is



*Spinimuricea* cf. *klavereni*, bryozoan and annelid ©OCEANA

confirmed, it will be the first time this species has been reported in the Balearics and only the third recorded instance in Spain, together with Columbretes and Palos Bank, the latter also observed by Oceana. The species was documented all along one 630 m transect (WF02), where there were also abundant sea pens, mainly *F. quadrangularis*, as well as several specimens of *Pennatula rubra*. The bottom is muddy with a well-developed structure of galleries, indicating the abundance of burrowing species in the area, such as Fries's goby (*Lesueurigobius friesii*), normally associated with *S. klavereni*. Scattered groups of the oyster *Neopycnodonte cochlear* were also observed.

## THREATENED AND PROTECTED SPECIES AND HABITATS

During the expedition, the presence of protected, high-priority, and threatened species was documented (Table 4). Some species had already been recorded in previous expeditions in the study areas, but other species not previously documented were also recorded, therefore extending the list of important species present in the zone. New distribution data has been compiled for all of the species. This reinforces the importance and relevance of creating new protected marine areas to comply with various in force legislation.

Table 4. Protected, high-priority, and threatened species. The entries in bold are the species observed for the first time in the study areas.

N	SPECIES	PHYLUM	SLPS	HD	BD	BARCON	GFCM	IUCN	BILPS
1	<b>cf. Auxias rochei rochei</b>	Chordata					x		
2	<b>Centrophorus cf. uyato</b>	Chordata						x	x
3	Delphinidae	Chordata	x	x		x			
4	<b>Etmopterus spinax</b>	Chordata						x	
5	<b>Lophius budegassa</b>	Chordata					x		
6	<i>Merluccius merluccius</i>	Chordata					x	x	
7	<i>Mobula mobular</i>	Chordata	x	x				x	x
8	<b>Molva dypterigia</b>	Chordata						x	
9	<i>Mullus barbatus</i>	Chordata					x		
10	<i>Mullus surmuletus</i>	Chordata					x		
11	<b>Pagellus bogaraveo</b>	Chordata					x		
12	<i>Scorpaena scrofa</i>	Chordata							x
13	<i>Xiphias gladius</i>	Chordata				x	x		x
14	<i>Calonectris diomedea diomedea</i>	Chordata	x		x				
15	<i>Antipathes dichotoma</i>	Cnidaria	x			x		**	
16	<i>Callogorgia verticillata</i>	Cnidaria	x			x			
17	<i>Dendrophyllia cornigera</i>	Cnidaria				*		**	
18	<i>Desmophyllum dianthus</i>	Cnidaria				*		**	
19	<i>Funiculina quadrangularis</i>	Cnidaria				*		**	
20	<i>Isidella elongata</i>	Cnidaria				*		**	
21	<i>Leiopathes glaberrima</i>	Cnidaria	x			x		**	
22	<i>Paramuricea clavata</i>	Cnidaria				*		**	
23	<b>Parantipathes larix</b>	Cnidaria	x			x		**	
24	<i>Pennatula phosphorea</i>	Cnidaria				*		**	
25	<b>Pennatula rubra</b>	Cnidaria				*		**	
26	<i>Savalia savaglia</i>	Cnidaria	x			x		**	
27	<i>Aristeus antennatus</i>	Crustacea					x		
28	<i>Nephrops norvegicus</i>	Crustacea					x		
29	<i>Palinurus elephas</i>	Crustacea				x	x		
30	<i>Palinurus mauritanicus</i>	Crustacea					x		
31	<i>Ranella olearia</i>	Mollusca	x			x			
32	<i>Laminaria rodriguezii</i>	Ochrophyta	x			x			
33	<i>Axinella polypoides</i>	Porifera	x			x			
34	<i>Tethya</i> sp.	Porifera	x			x			

SLPS: Spanish List of Protected Species; HD: Habitats Directive; BD: Birds Directive. BARCON: Barcelona Convention; GFCM: General Fisheries Commission for the Mediterranean; IUCN: IUCN Red Lists of Threatened Species; RLB: Balearic Islands List of Threatened Species; \* Proposal pending of approval by the Spanish Government. \*\* Red List of Mediterranean Anthozoans (to be published before end of 2015).



Several of the described habitats are protected or recommended for protection:

- **The Mediterranean Regulation** establishes the need of conservation of protected habitats, as coralligenous habitats and maërl beds, banning any damaging fishing activity that threatens these habitats. Also, the Regulation requests Member States to conserve and manage living aquatic resources, and maintain or improve the conservation status of marine ecosystems, through the declaration of fishing protected areas.
- **The Habitats Directive** establishes the need of protection of habitats of community interest, as the habitat type 1170 Reefs, among other marine habitats. This is a type of habitat found in every area surveyed during the expedition, i.e. overhangs with *Neopycnodonte zibrowii*, coralligenous concretions, rocky areas with sponge-dominated communities, coral framework and black coral forests and gorgonian gardens.
- **The Barcelona Convention** establishes the need of conserving threatened habitats, as marine vegetation, coralligenous and other bio-concretions and dark habitats (habitats associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena). Parties of the Convention are also requested to protect benthic habitats of natural interest for their conservation, many of those found at the surveyed areas, as rhodolith beds, coralligenous biocenosis, aggregations of dead *Posidonia oceanica* leaves, muds with sea-pens, soft corals and bamboo corals.
- **The Food and Agriculture Organization of the United Nations (FAO)** establishes the need of protection of Vulnerable Marine Ecosystems, defined as any deep-sea ecosystem highly vulnerable to one or more kinds of fishing activity. Gorgonians, soft corals, black corals and sponge dominated communities are among them.
- **The General Fisheries Commission for the Mediterranean (GFCM)** focuses on the conservation of sensitive habitats, as these are relevant habitats for the management of priority species. Among them, coralligenous, rhodoliths, *Leptometra phallangium*, *Funiculina quadrangularis* and *Isidella elongata* beds are listed. GFCM is also listing as priority habitats all those habitats with significant value due to their high presence of endangered, threatened or vulnerable species in the Mediterranean Sea.
- **The Scientific, Technical and Economic Committee for Fisheries** of the European Commission highlights the need of conservation of Essential Fish Habitats and Sensitive Habitats, as maërl and coralligenous biocenosis or *Isidella elongata*, *Funiculina quadrangularis*, *Leptometra phallangium* and *Gryphus vitreus* beds.

## CONCLUSIONS AND RECOMMENDATIONS

The expedition enabled new and valuable data to be collected on the habitats and species present in the marine areas for which Oceana is requesting protection, with notable new information on **protected species and others of commercial interest**, as well as their relationship with the ecosystem, including the protected sponges *Axinella polypoides* and *Tethya* sp., and the commercial species present on the rhodolith beds and posidonia dead leaf accumulations; on **essential habitats**, listed for protection, like the muddy bottoms with crinoids, sea pens and brachiopods; on the presence of **sensitive habitats**, threatened by bottom trawling and which are disappearing in the Mediterranean, such as the fields of *I. elongata*; on **habitats little known** in the Mediterranean, important from an ecological point of view, like the fields of Ampeliscidae; and, even, on **culturally valuable assets** present on the sea floor. The marine surface area explored by Oceana has grown considerably, improving the qualitative and quantitative consistency of the information available on the areas studied. This improved knowledge of the ecosystems present, their condition and distribution, allows Oceana to strengthen the already solid proposal for protecting the surroundings of the Cabrera National Park and seamounds in the Mallorca Channel, as for Sa Dragonera and W Formentera Islands.

It is significant that part of the data compiled is included in various **scientific publications**, as already mentioned for the lithistid sponges found on Emile Baudot. In addition, a poster was prepared on the coralligenous and maërl bottoms of the Balearic Islands<sup>4</sup>, which was presented at the *2nd Mediterranean Symposium on the conservation of coralligenous and other calcareous bio-concretions* (Slovenia, data on these protected habitats, obtained during different Oceana campaigns, including the latest one. Also, work is continuing on new publications, in collaboration with various research organisations. This is true for the threatened bamboo coral beds (*I. elongata*), the subject of an upcoming publication by Oceana in collaboration with the University of Bari, looking at the presence and distribution of this species the W Mediterranean.

After analysing all the information compiled, Oceana recommends **extending the Fort d'en Moreu fishing-protected zone towards the north**, since rhodolith beds have been detected beyond the limits of the zone where bottom trawling was prohibited in August 2014<sup>5</sup>. It is also recommended that an **effective monitoring system be implemented** in the protected zone to prevent the ingress of illegal bottom trawlers to the area. In any case, the fishery protection, covering the summits of Ausiàs March and Emile Baudot, as well as Fort d'en Moreu, does not provide sufficient coverage for the habitats that must be protected, and which are endangered. For this reason, we strongly recommend the **creation of a large MPA that protects the Mallorca Channel seamounds and the extension of the Cabrera National Park**. To this end, we are drafting a report which will bring together both the data compiled during the 2014 expedition and all the previously available information. This new report, which we hope

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<sup>4</sup> García, S., Blanco, J., Álvarez, H., Aguilar, R. & X. Pastor. *The need of cartography for coralligenous and rhodoliths beds along the Mediterranean Sea: The Balearic Islands case.* [http://www.rac-spa.org/sites/default/files/symposium/proc2symp\\_msc\\_cbc\\_final.pdf](http://www.rac-spa.org/sites/default/files/symposium/proc2symp_msc_cbc_final.pdf)

<sup>5</sup> Order AAA/1504/2014, of 30<sup>th</sup> July, which establishes zones protected from fishing on certain seamounds on the sea floor of the Mallorca Channel and to the east of the Cabrera Archipelago Marine-Terrestrial National Park. <http://www.boe.es/boe/dias/2014/08/11/pdfs/BOE-A-2014-8645.pdf>

to complete this year, will combine both the above proposals and others by Oceana for improving the Spanish Network of Marine National Parks.

Finally, after confirming the presence of habitats of high ecological value listed as to be protected by various national and international regulations, and given the presence of species that are protected as well as of enormous scientific and ecological interest, we also recommend **protecting the marine zones off the island of Sa Dragonera and West Formentera Island.**



Oceana crew working on deck  
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