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SYNTHESIS REPORT OF THE ECOLOGICAL CHARACTERIZATION OF THE MARINE AREAS OF NAKOURA, TYRE AND SAIDA IN LEBANON

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The MedMPAnet Project is implemented in the framework of the UNEP/MAP-GEF MedPartnership, with the financial support of EC, AECID and FFEM.

SYNTHESIS REPORT OF THE ECOLOGICAL CHARACTERIZATION OF THE MARINE AREAS OF NAKOURA, TYRE AND SAIDA IN LEBANON

MedMPAnet project

Regional Project for the Development of a Mediterranean Marine and Coastal Protected Areas (MPAs) Network through the boosting of MPA creation and management

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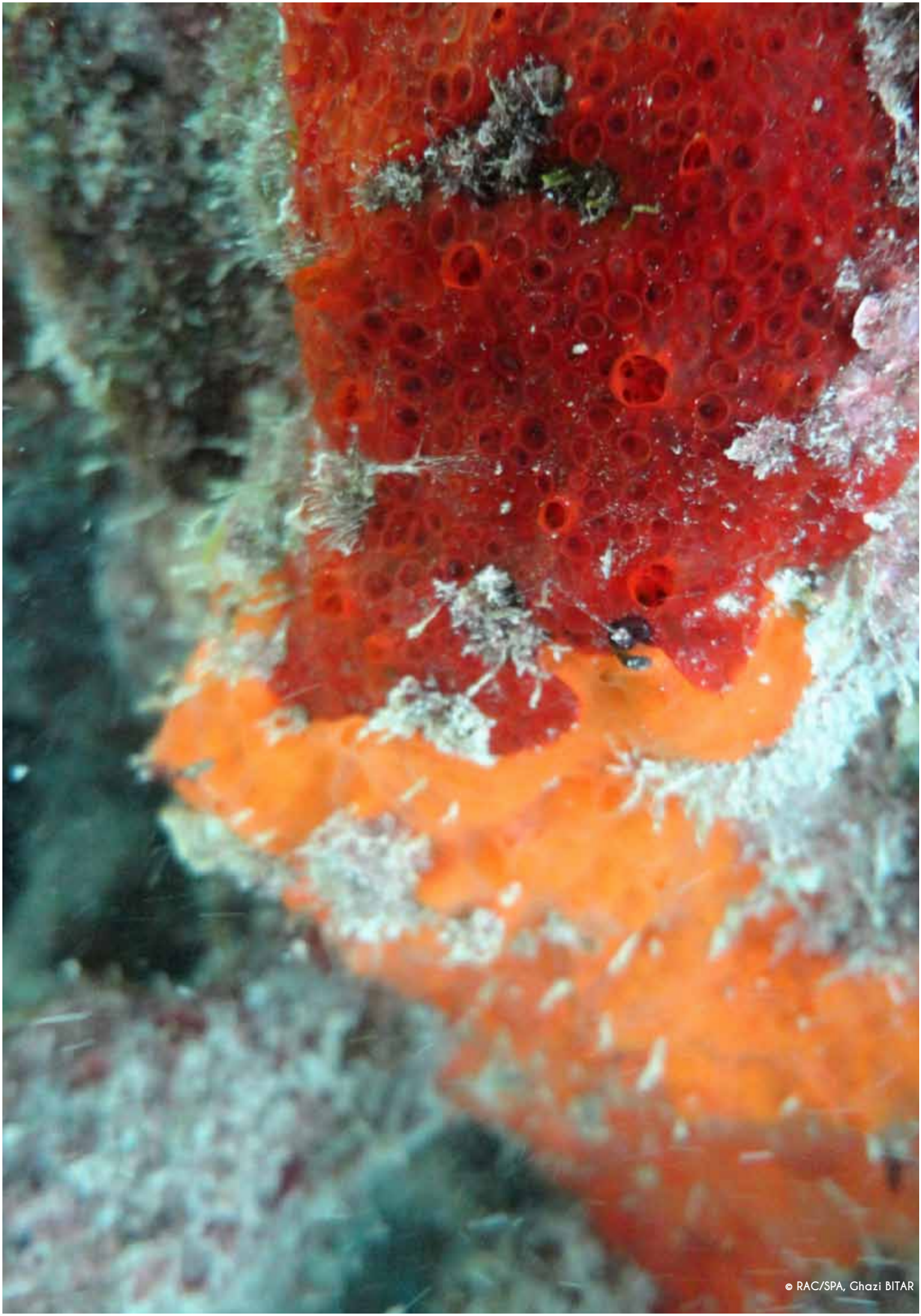
Foreword

The present document is an integral part of the MedMPAnet Project whose general objective is to enhance the effective conservation of regionally important coastal and marine biodiversity features, through the creation of an ecologically coherent MPA network in the Mediterranean region', as required by Barcelona Convention's Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).

The MedPAnet project is part of the MedPartnership GEF full size project "Strategic Partnership for the Mediterranean Sea Large Ecosystem" led by UNEP. It is implemented by the Regional Activity Centre for Specially Protected Areas (UNEP/MAP-RAC/SPA) with financial support of the European Commission (EC), the Spanish Agency for International Cooperation to Development (AECID) and the French Global Environment Facility (FFEM).

The project activities aim at assisting the participating countries to implement the prioritized elements of the Strategic Action Programme for The Conservation of Biological Diversity (SAP BIO) in The Mediterranean Region (SAP-BIO) through the provision of a series of enabling activities at national, sub-regional and regional levels. With regards Lebanon, the project activities were outlined in consultation with the national authorities represented by the Ministry of State for Environment Affairs.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1. INTRODUCTION

The Barcelona Convention and its Protocol on Specially Protected Areas and Biological Diversity (SPA/BD Protocol) in the Mediterranean recommends giving the highest priority to promoting the management of the marine areas that are to be protected and to identifying sites that contain fragile, threatened or rare habitats, in order to set up Marine Protected Areas to protect:

- representative types of coastal and marine ecosystems, of a size that will guarantee their long-term viability and conserve their biodiversity;
- habitats that are endangered within their natural area of distribution in the Mediterranean or that have a reduced natural distribution area as a result of regression or because the area is itself restricted;
- habitats that are critical for the survival, reproduction and restoration of threatened, endangered or endemic species of flora or fauna;
- sites of particular importance because of their scientific, aesthetic, cultural or educational interest.

This is the context of this MedMPAnet project, which is part of the greater Med-GEF 'Strategic Partnership for the Greater Marine Ecosystem of the Mediterranean Sea' Partnership, commissioned by UNEP and carried out by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) with the financial support of the European Commission (EC), the Spanish International Cooperation Agency for Development (AECID), and the French World Environment Fund (FGEF).

The overall aim of the project is to protect important biodiversity at national, Mediterranean and international level and to promote economic development based on the sustainable management of marine and coastal natural resources.

In this project, Lebanon is one of the beneficiary countries. After consultation with the Ministry of the Environment and two visits to Lebanon (February and June 2011), a field assignment (June 2012) was suggested, with the following aims:

- speedy valorization of the marine natural habitats along the coast of the suggested areas (Enfeh, Chekaa and Raoucheh), for better appraisal ;
- characterization of the ecology of threatened habitats with recommendations for possible development.

To supplement and enrich knowledge of this important Mediterranean area, the project's main aims are to discover the distribution of the main marine habitats and set up tools for monitoring the state of heritage species, enabling the effects of those protection and management strategies adopted to be judged. Thus, the assignment's objectives were:

- to explore the suggested areas (between 0 and 50 meters down), locating and generally mapping the habitats
- to craft an updated inventory of the biodiversity of species and habitats, mainly targeting species with heritage value
- to characterise the habitats, mainly those that are to be protected, and define their conservation status.

This information will enable an Action Plan to be elaborated for the Enfeh-Ras Chekaa areas and the cliff-caves of Raoucheh. This Action Plan will include protection measures (Marine Protected Areas, natural monuments), suggestions for the rational management of fisheries (units, periods, areas and depths, fishing methods, species), as well as an awareness and education strategy for users of the marine and coastal area.

The study was done in August-September 2013 with extensive exploration of Nakoura, Tyre and Saida areas. The present report brings together data from the assignment with a first ecological characterization of the area, and makes recommendations for the possible development of the sites being studied.

Another aim is to collect as much information as possible on the marine fauna and flora of these interesting parts of Lebanon's coast, especially about the exotic species that have successfully established themselves here, and to press on with the inventorying of the biodiversity of this very special part of the Mediterranean.

Also, the aim is to spot the specific nature of the associations and facies that are a feature of this sector and to show how they differ from other parts of the Mediterranean. This obviously requires drawing our attention to the absence of certain species and the presence of others, especially on the Levantine coast, due to either natural causes (such as higher temperature and salinity) or to human-origin causes (the Levantine basin's communication with the Red Sea via the Suez Canal, the discharge into the sea of waste water and solid waste).

Becoming aware of the particular forms of harm caused to the coastal environment by human activities (industry, fishing, sewers, human frequentation etc.) should help towards reflection as to what can still be protected in a natural state.


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2. REPORT ON THE MISSION

The present document has been prepared following the schedule for implementation that signals the output of a draft synthetic report of ecological characterization along with recommendations on the management outlines of the study areas, in the "Technical fiche of the mission to be carried out in Lebanon in August-September 2013". This report represents the synthetic information about the mission carried out in the Lebanon on 26 August to 8 September 2013 about the littoral and sublittoral surveys (0-47m depth) as a previous part of the study of the Nakoura, Tyre and Saida as possible marine protected areas. The expected outputs of the mission have been:

- Rapid natural habitat assessment (phytobenthos, zoobenthos and fishes) along all the coastal and marine parts of the concerned areas, for their better assessment.
- Inventory of species (mainly, of patrimonial and fisheries interest), and mapping of benthic habitats.
- Ecological characterization, human impacts and previous evaluation of the zones, with recommendations of the management outlines of the studied areas.

2.1. Prospected areas

The prospected areas (Fig 1) lie all around the Nakoura area (between 0 and 44m depth); along the Tyre coast (between 0 and 4m depth); and the Saida area (0-39m depth), all at the Southern of Lebanon.

2.2. Chronogram

The assignment lasted eleven days (18 to 28 June 2012) as is shown in Table 1. The length of work was a 9- to 10-hour day, from 6.30 to 7 a.m. (leaving the hotel) until 5 to 6 p.m. (return to the hotel). Every day was a working day.

Figure 1. Location of prospected areas

Table 1. Distribution of activities/day during the assignment.

Activities/day (08 and 09 /2013)	26 M	27 Tu	28 W	29 Th	30 F	31 Sa	01 Su	02 M	03 Tu	04 W	05 Th	06 F	07 Sa	08 Su
Travel	X													X
Work Meeting		X										X	X	
Nakoura		X	X	X		X			X					
Tyre				X	X			X	X	X	X			
Saida							X							

Monday 26/08/2013
- Arrival of the Spanish team.

Tuesday 27/08/2013
- Meeting to prepare the mission (team with Lebanon CNRS team).
- Visit the Tyre Coast Nature Reserve.
- Visit Nakoura zone. Sampling in the littoral zone.

Wednesday 28/08/2013
- Meeting with Cana crew.
- Hydroplane: 4 transects (1 diver/transect) in Nakoura area.
- Scuba diving plots: 6 dives (3 dives x 2 sites) in Ras El Bayada.
- Work progress meeting.

Thursday 29/08/2013
- Hydroplane: 3 transects (1 diver/transect) in Ras El Bayada and the Camp El Rachidiye.
- Scuba diving plots: 6 dives (3divers x 2 sites) in the inlets of North Tyre and El Jamal.
- Work progress meeting.

Friday 30/08/2013
- Hydroplane: 3 transects in North and South Tyre.
- Scuba diving plots: 6 dives (3 divers x 2 sites) in inlets of North Tyre, lagoon.
- Work progress meeting.

Saturday 31/08/2013
- Scuba diving plots: 7 dives (3 divers x 1 site + 2 divers x 2 sites) in Nakoura and Ras El Bayada, and 3 dives in Tyre (3 divers x 1 site).
- 4 Fish visual census in Nakoura (2 divers x 2 sites).
- Work progress meeting.

Sunday 01/09/2013
- Hydroplane: 4 transects (1 diver/transect) in Saida.
- Scuba diving plots: 6 dives (3 divers x 2 sites) in Saida.
- Snorkeling: 3 dives (3 divers x 1 site) in Saida.
- Work progress meeting.

Monday 02/09/2013
- Hydroplane: 3 transects in South and North Tyre (1 diver/transect).
- Scuba diving plots: 7 dives (3 divers x 2 sites + 1 diver x 1 site) in North Tyre, lagoon.
- Snorkeling: 1 dive (1 diver x 1 site).
- Work progress meeting.

Tuesday 03/09/2013
- Aitor Forcada departure
- Scuba diving plots: 7 dives (3 divers x 1 site + 2 divers x 2 sites) in Nakoura and Ras El Bayada.
- Fish visual census: 2 dives (1 diver x 2 sites) in Nakoura and Ras el Bayada.
- Snorkeling: 3 dives (3 divers x 1 site) in South Tyre.
- Hydrological profile.
- Work progress meeting.

Wednesday 04/09/2013
- Scuba diving plots: 10 dives (5 divers x 2 sites) in North Tyre on freshwater springs, inlets and lagoon.
- Fish visual census: 2 dives (1 diver x 2 sites) in North Tyre on freshwater springs and lagoon.
- Snorkelling: 3 dives (3 divers x 1site) in inlets of North Tyre.
- Hydrological profile.
- Work progess meeting.

Thursday 05/09/2013
- Scuba diving plots: 6 dives (2 divers x 2 sites + 2 divers x 1 site) in North and South Tyre on warm frshwater springs, El Jamal, and lagoon.
- Fish visual census: 1 dive (1 diver x 1 sites) in North Tyre on warm freshwater springs.
- Bad weather (afternoon).
- Work progress meeting.

Friday 06/09/2013
- Cana broken down.
- Unload of material from the vessel.
- 'Mise au point' of data.
- Coordination meeting.

Saturday 07/09/2013
- Meeting with Lara Samaha (national coordinator of the Lebanon Ministry of the Environment) and Gaby Khalaf (director of National Centre for Marine Sciences, CNRS).
- Lunch with the Mayor of Tyre.

Sunday 08/09/2013
- Departure of Spanish team.

Friday 13/09/2013
- Diving on the aeroplane wreck in the Nakoura area (Hany, Ziad).

2.3. Staff

Seven research divers took part in the assignment (Table 2). For maximum efficiency of safety and time, the team was split up into two groups: coastal habitats (0-20m depth) and deep water habitats (0-50m depth).

We must mention the excellent collaboration of both the staff from the Lebanese National Centre for Marine Research (Gaby Kalaf, Milad Fakhri and Elie Tarek) for logistical and technical back-up, M. Fakand has done the CTD profiles; the crew of the Lebanese CNRS oceanographic vessel 'Cana' (Michel Youssef, Georges Nochal and Georges Touma); and, the efficient help of the sailor, Bilal Istanbouli with his fishing boat support.

Table 2. Affiliation and tasks of participants in the August-September 2013 assignment in Lebanon.

Name	Affiliation	tasks
BITAR, Ghazi	Libanaise University	Benthos, habitats
EL SHAER, Heni	IUCN	GIS, benthos
FORCADA, Aitor	University of d'Alicante	fish, cartography
OCAÑA, Oscar L.	Muséum Mer Ceuta	Benthos, habitats
RAMOS, Alfonso A.	University of Alicante	Benthos, habitats
SAMAHA, Ziad	Purple Reef Assoc.	Habitats, diving supply
SGHAIER, Yassine R.	RAC/SPA	Benthos, habitats
VALLE, Carlos	University of Alicante	fish, cartography


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3. MATERIALS AND METHODS

The material and methods of observation used differ according to type of dive (hydroplane transects, plot dives) and objective (mapping, characterization of habitats, fish counts).

3.1. Stations

Fifty-six stations were prospected (See Annex I, Fig. 2): 21 in Nakoura-El Bayada area, 28 around Tyre and 7 front the Saida area. According to sector, the depths were between 0 and 47 meters (Table 3).

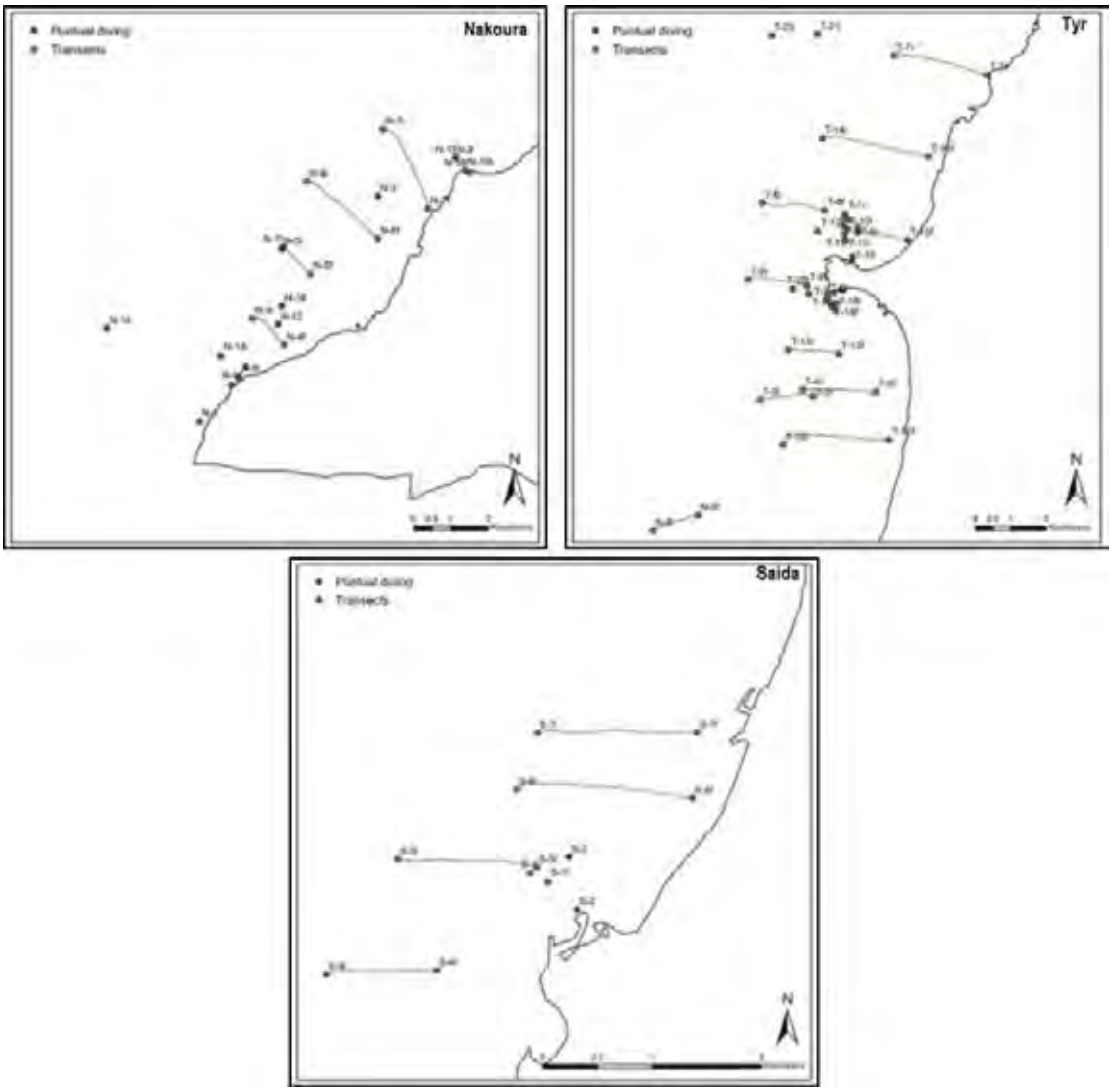

Figure 2. Distribution of the stations in the Nakoura, Tyre and Saida areas

All the stations were prospected by scuba diving, except five stations where snorkeling and sampling by foot were used. In total, 102 dives were made, 4 of these without tanks, which represents about 85 hours of underwater work.

Each researcher brought his own diving material, GPS and underwater cameras; bottles, of 15 and 18 litres, sinkers and a hydroplane were provided by the CNRS. Also, the University of Alicante provided measuring tapes for the visual counting of fishes.

Table 3. Research activities by site and depth ranges. Number of dives (in brackets).

Locality	Nakoura	Tyre	Saida	Total
Depth range (m)	0-44m	0-47m	0-39m	
Hydroplane transects	5	9	4	18
Scuba diving plots	10 (20)	13 (38)	2 (6)	25 (64)
Fish visual census	4 (5)	4 (2)	-	6 (7)
Snorkelling		3 (10)	1 (3)	4 (13)
Littoral	1	-	-	1
CTD Profiles	1	1	-	2
Total stations	21 (30)	28 (59)	7 (13)	56 (102)

The workplace was reached on board the oceanographic vessel 'Cana' (Fig. 3 left.). Once in the area, the researchers moved to the diving site using the inflatable dinghy of the oceanographic vessel and a traditional fishing boat belonging to the fisherman Bilal Istambouli from Tyre (Fig. 3 right.).

Figure 3. The boats used in the mission-2013: 'Cana' with its inflatable dinghy (left) and the traditional fishing boat from Tyre (right)

3.2. Methods

3.2.1. Mapping

The seabed was mapped using a hydroplane (Fig. 4 left) that allowed extensive exploration of the concerned area (Ramos-Esplá, 1984). At the same time, the hydroplane observations permit to have an information about the bathymetric range of the target species.

It had a 100-meter rope and a 3-meter chain and was pulled by the inflatable dinghy. Once the diver was on the bottom, he recorded on a plastic plate his observations as to the habitats encountered; and he take a transect record with the video-camera located on head (fig. 4 right). Aboard the inflatable, one person sailed the boat while two others noted position (using a GPS), depth (a hand-held echo sounder), time check and the diver's safety. The GPS data was downloaded later on a computer.

Figure 4. Diver with hydroplane at the start of a transect (right). Video-camera on the head (left)

3.2.2. Observations and characterization of habitats

Using one-off dives, and taking underwater photographs and noting down depth, type of seabed, fauna and flora species on a plastic plate with polyester paper, and some species were sampled for taxonomical determination (fig. 5). Each station was located using GPS.

To characterize the habitats, we have followed the 'Handbook for interpreting types of marine habitat for the selection of sites to be included in the national inventories of natural sites of conservation interest' (UNEP/MAP-RAC/SPA, 1998, 2002). With regard to the species, only the fraction of the mega-organisms (ø > 10mm) has been considered (visual observation); and three levels of a semi-quatitative value have been done: (3) very common; (2) common, (1) less common.

3.2.3. Visual fish census

Using dives to count fish is an excellent bioindicator to assess and make best use of the protection/exploitation effect (Bayle & Ramos, 1993). The methodology adopted is standardized (Harmelin-Vivien *et al.*, 1985). Indeed, the dives are made at a given depth of between 0 and 15 meters (transects with measuring tape).

The method (Fig. 6) involves using measuring tape to cover a distance (trajectories lying parallel to the coast) 50m long by 1 to 3 m wide (according to visibility) and noting the species of fish encountered, the number of individuals of each species, roughly their size and the type/complexity of the seabed. Usually, the transects were of 200m^2 (50m x 4m) and with five replicates per station.

3.2.4. Processing the samples and data

Some specimens, about whom there were taxonomical doubts or not identified, were collected to be identified on board the 'Cana' (Fig. 7 right). On board, the specimens collected were placed in bowls filled with seawater to be defined, observed using a low power stereo microscope, photographed (Fig. 7 left) and /or anaesthetized and set in 10% formalin in seawater for consideration and study in the laboratory.

At the same time, the underwater observations in the plastic plates were transferred to the note-book, and latterly to the Excel files.

With regard to the bibliography, aside from the Mediterranean bibliography, some papers from Lebanon have been consulted:

- Flora and fauna: Bitar & Kouli-Bitar, 2001.
- Porifera: Perez *et al.* (2004); Vacelet *et al.* (2007, 2008); Vacelet & Perez (2008).
- Hydrozoa: Morri *et al.* (2009).
- Anthozoa: Zibrowius & Bitar (1997)
- Polychaeta: Lakkis & Novel-Lakkis (2005); Aguado & San Martin (2007).
- Cirripedia: Young *et al.* (2003)
- Isopoda: Bariche & Trilles (2005), Castelló (2010).

Figure 5. Observation, sampling and photography during the diving plots

Figure 6. Visual counting of fish per transect using a measuring tape

- Gastropoda: Crocetta *et al.* (2013a)
- Bivalvia: Crocetta *et al.* (2013b)
- Bryozoa: Harmelin *et al*. (2007, 2009, 2011)
- Brachiopoda : Logan *et al.* (2002).
- Ophiuroidea: Stöhr *et al.* (2009)
- Pisces : Harmelin-Vivien *et al.* (2005).
- Non indigenous species: Zibrowius & Bitar (2003), Lakkis & Novel-Lakkis (2005), Bitar (2010); Katsanevakis *et al.* (2011).
- Habitats: Bitar & Bitar-Kouali (1995a, 1995b), Bitar *et al.* (2007), Bitar (2010).

The up-to-date of the species scientific name has been consulted the World Register of Marine Species (www.marinespecies.org).

Figure 7. Work on board (right). Observation and classification of some species (left)

3.2.5 Hydrology

To round off the information on the marine ecosystem, hydrological profiles were made on board the oceanographic boat 'Cana' using a TCD (Fig. 8) and the water transparency was noted using a Secchi disk. Two stations (table 4) were carried out front Nakoura and Kasmiyeh, between 0 and 160-200m depth.

Table 4. Hydrology Stations

Locality	Date	Latitude N	Longitude E	Depth (m)
Nakoura	03.09.13	33º 08,440’	35º 01,762’	0-160
Kasmiyeh	04.09.13	33º 20,349’	35º 08,888’	0-200

Figure 8. Launching the TCD off the stern of the oceanographic boat ‘Cana’


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4. PRELIMINARY RESULTS

4.1. Delimitation of the areas

In order to accomplish the study by a rational planning, and according to topographic and human pressure features, the prospected areas (Saida, Tyre, Nakoura) have been divided in the following zones (Fig. 9):

- Saida (north with the inlets and south with the 'rubbish mountain' and industries).
- Tyre (north with the inlets and lagoon; center with the El Jamal; and south with the Tyre Coast Nature Reserve).
- Nakoura (north with the Ras El Bayada; and south until the frontier).

Figure 9. Studied areas (from North to South): Saida (a), Tyre (b) and Nakoura (c) (images from Google-Earth)

a) Saida Area: Important Lebanese city with a big harbour and small-scale fishery fleet (Fig. 10). The main impacts are the domestic waters, solid wastes (mainly plastics, in some places covering the seabed) and petrol industry; with a high anthropic pressure on the small northern inlets, and marine resources by fishermen (professional and amateurs).

Low sandstone rocky coastal area with a gentle marine topography in inshore waters (< 50m depth).

Figure 10. Saida fishery harbour

b) Tyre Area: Important Lebanese city with a small fishery and sportive harbour. The zone is very populated (local and touristic inhabitants) and no pollutant industries around of the zone, being the tourism the main industry in the area. The impacts are the domestic waters and anthropic pressure on the littoral and marine resources (sportive and professional fishermen, also the use of dynamite).

The coast is low, with sandstone rocky zones in the north and center (Fig. 11), with small inlets and a lagoon; and a large beach in the south, where the Tyre Coast nature Reserve is located, as nesting area for marine turtles (*Chelonia mydas* and *Caretta caretta*).

Figure 11. El Jamal in the Tyre area, with low coastal sandstone rock

c) Nakoura Area: With the Nakoura village and a small fishery harbour. The coast is a high rocky area, with limestone (Ras El Bayada, Fig. 12) and sandstone (Nakoura) with cliffs,
caves and some creeks. Anthropic low pressure (no industries, no tourism), only the impact on marine resources by sportive and professional fishermen (use of dynamite).

Figure 12. Ras El Bayada with limestone rocks

4.2. Hydrology

The temperature profiles in September 2013 (Fig. 13) show a relative homogeneity (28.2-29.4ºC) in the first 40m depth in Nakoura, and more marked from Kasmiyeh (around 29ºC). The main thermocline layer is located between 50-80m depth (20-28ºC); and the temperature from 110-200m is < 18ºC.

The salinity has varied between 38.41-39.15 psu, although the normal range of the salinity has been among 38.80-39.10 psu.

The thermocline depth is interesting because its first depth (-40m) marks a change in the dominance of lessepsian species. With regard to June (2012), where the thermocline was located at 25m depth, we can observed a significant sinking during the summer (about 15m deeper).

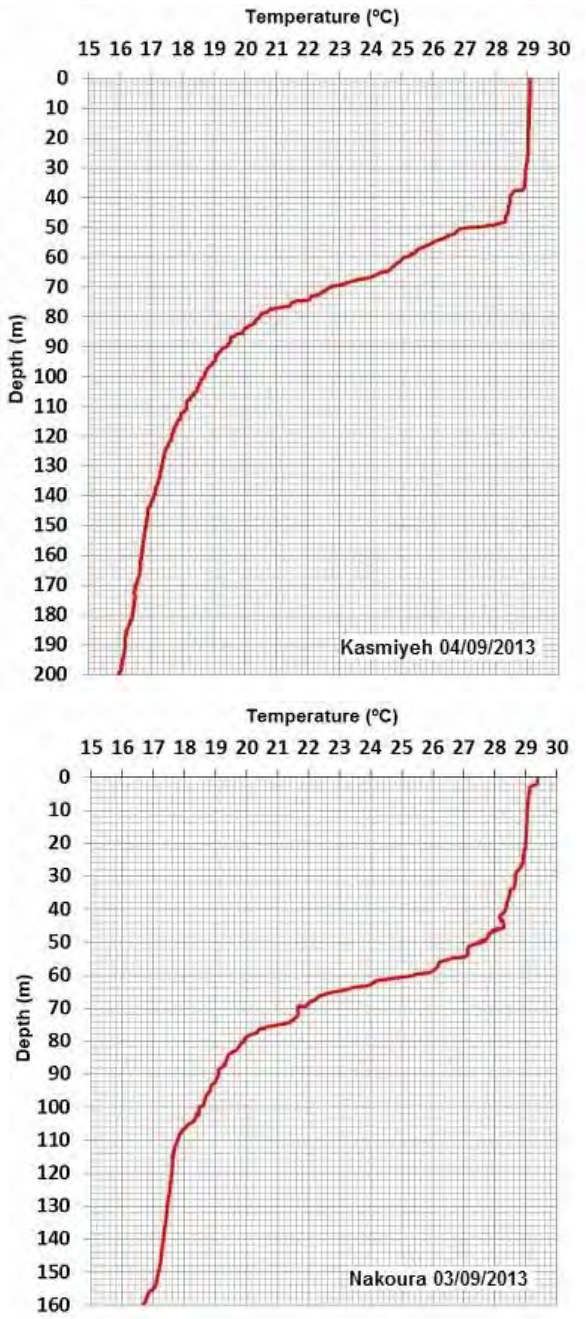

Figure 13. Temperature profiles in Nakoura and Kasmiyeh

4.3. Marine biodiversity

a) Species/taxons: About two hundred sixty eight species, belonning to nineteen high taxons (phyla, classes) have been observed (see Annex II; Fig. 14). The main group has been the Mollusca, with 62 species (22,9%), followed by the Actinopterygii (55 spp., 20,3%) and Porifera (32 spp., 11,8%).

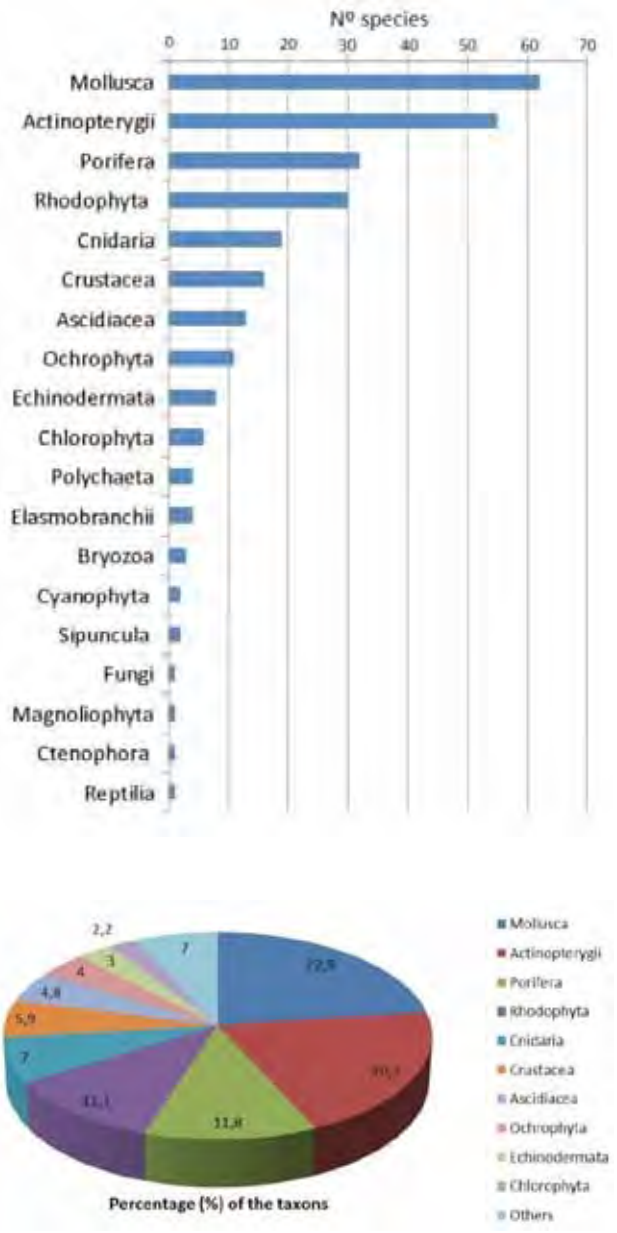

Figure 14. Number of species/taxon (left) and percentage (%) of the main groups (right)

b) Alien species: With regards to the exotic species, 56 spp. are lessepsian and 3 spp. from Atlantic origin (*Oculina patagonica, Echinolittorina punctata* and *Scorpaena maderensis*), that represents about the 22% of the organisms observed. The Figure 15 shows the number of species by groups, standing out the mollusks (23 spp., 40% of the total) and fishes (13 spp, 22%).

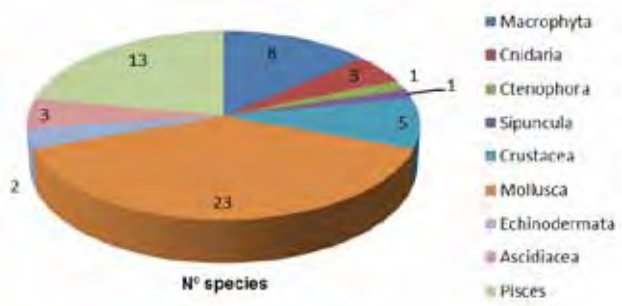

Figure 15. Number of alien species by taxons/groups

c) New records for the Lebanese biodiversity: Probably, four new species have been observed for the Lebanese marine biodiversity (Fig. 16): *Asterosmilia* sp. (Cnidaria: Anthozoa), *Alpheus audouini* (Crustacea: Decapoda), *Venerupis philippinarum* and *Venus casina* (Mollusca: Bivalvia).

Figure 16. Probably, new records for the Lebanese fauna (top to down, left to right) : *Asteromylla* sp., *Alpheus audouini*, *Venus casina* and *Venerupis philippinarum*

4.4. Benthic bionomy and habitats

The biocenosis, habitats and associations (with facies) have followed the classifications of UNEP/MAP-RAC/SPA (1998, 2002) and EUNIS (EEA, 2002), mainly based on the Pérès & Picard (1964), Péres (1967) and Bellan-Santini *et al* (1994), according to the division in stages: supralittoral, middlittoral, infralittoral and circalittoral; and after by substrata (hard and soft).

We have included the more abundant species and/or characteristic of the observed megabenthos (phyto and zoobenthos, fishes) with a subjective appreciation of the abundance: (cc) very common, (c) common, and (r) rare. The species observed in the different communities are included in the Annex II (inventory of species).

4.4.1. Biocenosis of the supralittoral rock

Association with *Enthophysalis deusta* and *Verrucaria* spp. (Fig. 17). With the lichen *Verrucaria amphibia*, the gastropods *Melarhaphe* (= *Littorina*) *neritoides* (cc) and *Echinolittorina* (= *Littorina) punctata* (cc), and the crustaceans *Euraphia depressa* (r) and P*achygrapsus marmoratus* (r).

Figure 17. The supralittoral zone with the littorinids *Melarhaphe neritoides* and *Echinolittorina punctata*. Inlets of northern Tyre (station T-5)

4.4.2. Biocenosis of the upper midlittoral rock

Facies with *Chthamalus depressus* (Fig. 18): The sessile fauna is represented by *Chthamalus depressus* (cc) and *Ch. montagui* (c), with the vagil fauna by the gastropods Melarhaphe neritoides (c), *Echinolittorina punctata* (c) and *Patella rustica* (r) and the crab *Pachygrapsus marmoratus* (c).

Figure 18. Biocenosis of the midlittoral rock (upper and lower horizons) wi*th Chthamalus stellatus*, *Phorcus turbinatus, Patella ulyssiponensis* and *Lithophyllum papillosum*

4.4.3. Biocenosis of the lower midlittoral rock

a) *Dendropoma* and *Neogoniolithon* concretions (Fig, 19): With the vermetid *Dedropoma petraeum* (c) and the calcareous algae *Neogoniolithon brassica-marina* (=*Spongites notarisii*) (cc), that forming small cushion and plate structures. The vermetid formations appear developed in all of the area but they are cover by algae, and many of the vermetids bio-concretions are dead.

Figure 19. Vermetid platforms in the Fanar zone (Tyre)

b) Association with *Lithophyllum papillosum* (Fig. 18). The fauna in the lower mediolittoral rock is represented mainly by the gastropods *Patella ulyssiponensis* (cc) and *Porcus* (= *Monodonta*) *turbinatus* (c), and the crustaceans *Chthamalus depressus* (c) and *Pachygrapsus marmoratus* (r).

c) Littoral pools sometimes associated with vermetids (infralittoral enclave) (Fig. 20): These infralittoral enclaves are frequent in the sandstones and limestones rocks. The macroalgae are abundant,: as chlorophytes (*Cladophora* spp., *Ulva* spp. *Chaetomorpha* spp.), ochrophytes (*Dictyota fasciola, Padina boergesenii*) and rhodophytes (*Jania rubens, Hypnea musciformis, H. spinella*).

Figure 20. Littoral pool with the algae *Dictyota fasciola* and *Padina boergesenii* (Nakoura, station N-1)

d) Association with Ulvales (Fig. 21): In some places, normally subject to some organic pollution, the chlorophyte are dominant with Ulvales, *Bryopsidales* and *Cladophorales* (*Ulva intestinalis, U. compressa, U. rigida, Chaetomorpha* spp., *Bryopsis* spp.). This association has been observed on the Saida inlets.

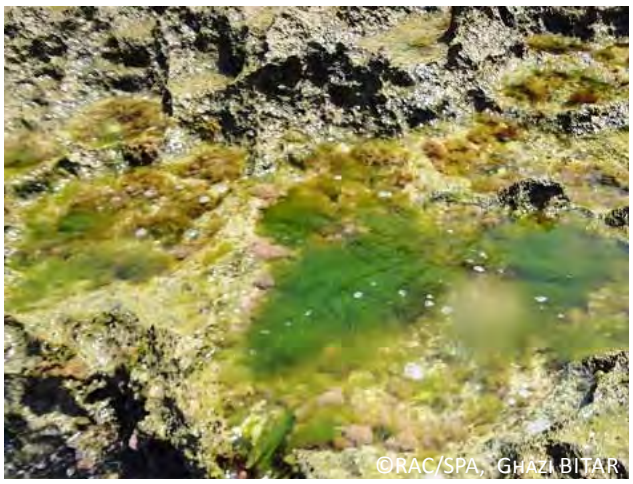

Figure 21. *Ulva* spp. on the lower midlittoral rock (Saida, station S-3)

4.4.4. Biocenosis of the infralittoral algae

The infralittoral rock with macroalgae dominance can reach the 35-40m depth, and the macroalgae can be subdivided in four groups, according the hydrodynamism (exposed/sheltered) and light intensity (photophilic/sciaphilic): i) exposed photophilic macroalgae; ii) exposed sciaphilic macroalgae; iii) sheltered photophilic macroalgae; and iv) sheltered sciaphilic macroalgae.

4.4.4.1. Exposed photophilic macroalgae

The width of this horizon depend of the hydrodynamism, and it can reach about 6-7m depth in very exposed littoral. The light intensity is very high.

a) Association with Jania rubens (Fig. 22)**:** The rhodophyte *Jania rubens* can dominate the littoral fringe (0-1m depth). Usually is accompanied by the rhodophytes *Corallina elongata* (c), *Palisada perforata* (c) and *Laurencia obtusa* (r), and the chorophytes *Cladophora* spp. (c).

Figure 22. *Jania rubens* on the littoral fringe, with *Cladophora* sp. (Tyre northern inlets, station T-17)

b) Associacion with *Sargassum vulgare* and *Cystoseira compressa* (Fig. 23)**:** In calm and unpolluted shallow waters (0-2m depth), the ocrophytes *Sargassum vulgare* and *Cystoseira compressa* can be dominant, joint to *Jania rubens* (Nakoura and northern Tyre); also, the ceramiale *Palisada preforata* can be present.

Figure 23. Association with *Sargassum vulgare* and *Cystoseira compressa,* joint to *Jania rubens* (inlets of northern Tyre, station T-17)

c) Facies with *Brachidontes pharaonis* (Fig. 24): This facies is well developed in the area. The lessepsian mytilid *Brachidontes pharaonis* forms a marked belt (Fig. 24) in the lower part of the midlittoral, with Ulvales (*Ulva* spp.) and *Chaetomorpha* spp. It has been frequent in the inlets of Saida.

Figure 24. Facies with *Brachidontes pharaonis* (Saida, station S-3)

d) Facies with hydroids (Fig. 25). In some exposed surfaces the hydroids *Pennaria disticha* and *Macrorynchia philippina* can be abundant, particularly, in the Nakoura area (Ras El Bayada).

Figure 25. Facies with the hydroid *Pennaria disticha* (Ras El Bayada, station N-10)

Figure 27. Patches of *Stypocaulon scoparium* with *Lithophyllum incrustans* (Tyre northern inlets, station T-17)

4.4.4.2. Exposed sciaphilic macroalgae

a) Association with *Corallina elongata* (Fig. 26)**:** On vertical walls, this corallinacea dominate the substrata, betwenn 0 to 6m depth. Another rhodophyte should be present, *Plocamium cartilagineum* (c). The sessile fauna is not abundant with the poriferans *Chondrosia reniformis* (c), *Crambe crambe* (c) and *Niphates toxifera* (r); the hydrozoans *Aglaophenia* spp. and *Pennaria disticha* (c); the cirriped *Perforatus perforatus*; the bryozoan *Schichoporella errata* (c); and the ascidians *Didemnidae* spp. (c) and *Phallusia nigra* (c).

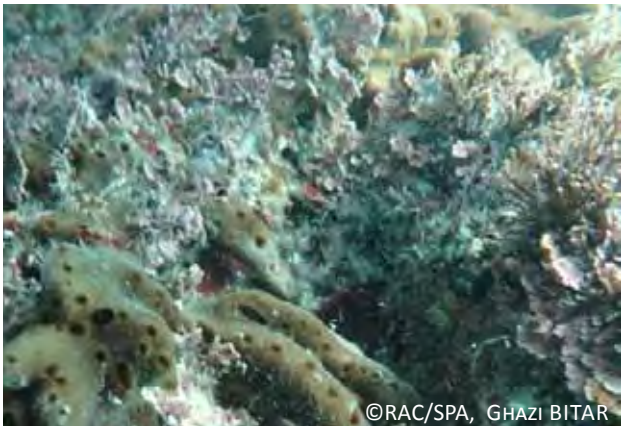

Figure26. Association with *Corallina elongata*; on the left, the poriferan *Niphates toxifera* (front El Fanar, station T-11)

4.4.4.3. Sheltered photophilic macroalgae

The width of this horizon depends of the illumination and may reach 26m depth in the Nakoura and Tyre areas, with a hydrodynamism moderated.

a) Association with *Stypocaulon scoparium* (Fig. 27): This ochrophyte seems to be rare in the studied areas, only on the littoral rocks of the Tyre inlets has been observed.

b) Overgrazing facies (Fig. 28)**:** In some places the rocky substrata is bare and empty of erected macroalgae, only some encrusting corallinales are present (*Lithophyllum incrustans* and *Neogoniolithon* spp.). This overgrazing mainly is due to the herbivorous pressure of the fishes *Siganus rivulatus* (cc) and *S. luridus* (c), because the sea urchins (*Arbacia lixula* and *Paracentrotus lividus*) are very scarce in the studied zones. Another reason could be the erosion by the coarse sand of the rock due to the heavy storms.

The macrofauna is poorly represented, and some encrusting and well anchored animals are present. As the poriferans *Crambe crambe* (c) and the boring sponges *Cliona* spp. (c); the cirripeds *Perforatus perforatus* (r) and *Balanus trigonus* (r), the ascophoran bryozoan *Schyzoporella errata* (c); the ascidian *Phallusia nigra* (r).

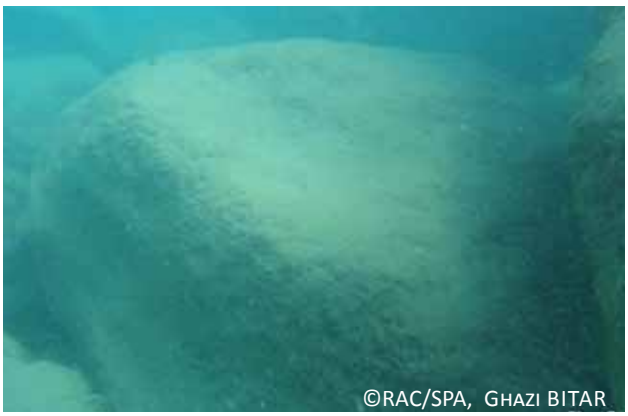

Figure 28. Bare rock in the Ras El Bayada (station N-10)

c) Association with erect Corallinales (Fig. 29): Very extended in the whole area particularly around the inlets, between 4 to 15m depth. The main species are the branched corallinales *Amphiroa rigida* (cc) and *Jania rubens* (cc), both replaced by *A. beauvoisii* and *J. longifurca* with the increase of the depth; also, the encrusting ones *Neogoniolithon* sp. and *Lithophyllum incrustans* are abundant.

As sessile fauna, the sponges *Crambe crambe* and *Ircinia* sp., and the bivalve *Spondylus spinosus* have been the more common in this association. This association could be similar to the overgrazing facies with encrusting corallinales, due to the herbivorous pressure on soft algae by the siganids and *Conomurex persicus.*

Figure 29. Association with corallinales: *Amphiroa* spp., *Jania* spp., and *Lithophyllum incrustans*
(Ras El Bayada, station N-15)

d) Facies with *Chama pacifica* and *Spondylus spinosus* (Fig. 30)**:** Although these lessepsian bivalves can be present from 1 to 30m depth, it between 5 to 25m depth where they could be dominant, forming an original facies (without comparison with another one in the Mediterranean). Another associated lessepsian bivalve is *Malleus regulus* (cc). The valves create a heterogeneous substratum where algae (Ceramiales, Corallinales), poriferans (*Crambe crambe*), hydrozoans (*Aglaophenia* spp., *Macrorhynchia philippina, Pennaria disticha*, serpulids, cirripeds, etc) are fixed on the valves. Another common species are the encrusting bryozoans (*Schizoporella, Reptadeonella*) and ascidians (*Didemnidae* spp.)

Figure 30. An empty shell near to an alive individual (down left) of *Chama pacifica*
(Ras el Bayada, station N-15)

e) Association with *Galaxaura rugosa* and *Laurencia* sp. (Fig. 31)**:** This association is very abundant in the Nakoura area, between 7-23m depth. The exotic ceramiale *Laurencia* sp. is similar to *L. chondrioides* from tropical Atlantic. It is accompanied by the corallinales *Amphiroa* spp. and *Neogoniolithon* sp.; the porifererans *Cymbaxinella* sp. (c), *Crambe crambe* (cc) and *Ircinia* sp. (c); the hydroids *Macrorynchia philippina* (c), *Pennaria disticha* (c) and *Eudendrium* sp. (c); and the ascidian *Phallusia nigra*. With regard to the mobile fauna, the gastropod *Conomurex persicus* and the gobid fish *Gobius buchichi* are common.

Figure 31. Association with *Glaxaura rugosa* and *Laurencia* sp.
(Nakoura, station N-13)

f) Association with *Codium parvulum* (Fig. 32): The lessepsian chlorophyte *Codium parvulum* dominate a poor rocky habitat with fine sediment. As escort species: *Amphiroa rigida* (cc), *Schizoporella errata* (c) and *Phallusia nigra* (c). This association is characteristic of the rocky bottoms around the Saida area, between 5-15m depth.

Figure 32. Association with *Codium parvulum*
(Saida, station S-1)

g) Association with *Cystoseira* sp. (Fig. 33)**:** This interesting association is present in some localities as Nakoura (9-11m depth) and the lagoon located behind the Tyre's northern inlets (7-9m depth). Probably the *Cystoseira* sp. may be *C. foeniculacea* (= *C. discors*) cited by Bitar & Kouli-Bitar (2001). Rarely the thalli present secondary branchs (herbirous pressure?) and the individuals are more or less isolated. Result curious the fixation of the *Cystoseira* on cobbles in the lagoon, where the substrate is moved by the waves. As epiphytes, we mention the paeophyte *Dictyota fasciola* and the hydroid *Pennaria disticha*.

Figure 33. Association with *Cystoseira* sp. in Nakoura (st. N-9, above) and Tyre lagoon (station T-22, below)

4.4.4.4. Sheltered sciaphilic macroalgae

The sheltered sciaphilic algae community is well developed in the area, but with the predominance of the *Peyssonnelia* spp. (*Flabellia petiolata* is very rare and we have not observed *Halimeda tuna*). It appears in shallow infralittoral enclaves (shadow surfaces: crevices, vertical walls, overhangs) and deep infralitoral rocky surfaces (from 26m depth).

a) Association with *Peyssonnelia* spp. (Fig. 34): Well developed on the sciaphilic rock (until 35m depth in horizontal surfaces). The main algae are the rhodophytes *Peyssonnelia* spp. (cc) (*P. squamaria* and *P. rubra*). With regards to the sessile fauna, the poriferans are frequent as *Crambe crambe* (cc), *Chondrosia reniformis* (c), *Petrosia ficiformis* (cc), *Ircinia* sp (c), and the ascidians *Didemnidae* spp. (c) and *Phallusia nigra* (c).

Figure 34. Sciaphilic community with *Peyssonnelia* spp. and the sponge *Crambe crambe* (Tyre northern inlets, station T-20)

b) Association with encrusting corallinales (Fig. 35): In deeper rocky infralittoral habitats (26 to 35m depth) the encrusting rhodophytes are dominant with the species *Mesophyllum* spp. *Neogoniolithon* spp., and *Peyssonnelia* spp. The poriferans are abundant, particularly species of the Axinellidae family (*Axinella polyploides, Cymbaxinella* sp.).

Figure 35. Some macroalgae in deep rock, as *Mesophyllum alternans* (rose patchs) and *Codium parvulum* (green) with the candlestick poriferan *Axinella polyploides* (Nakoura, station N-11)

4.4.5. Biocenosis of the 'coralligenous'

The biocenoses on circalittoral hard substrata are the coralligenous and the semi-dark caves. Both appear in enclaves in shallow waters (overhangs, caves entries, crevices), and from the coralligenous community on horizontal surfaces at 43m depth (max. depth of the present study).

a) Coralligenous in infralittoral enclaves (Fig. 36)**:** In the infralittoral enclaves of this community (overhangs, cave entries, crevices) there is the littoral rocky coralligenous community with encrusting calcareous algae (*Lithophyllum stictaeforme* (r), *Mesophyllum alternans* (c), *Neogoniolithon mamillosum* (c)) and *Peyssonnelia* spp. (cc); also, the chloropyte *Palmophyllum crassum* (r).

The sessile fauna is dominated by the poriferans *Crambe crambe, Chondrosia reniformis, Clathrina* spp…; the hydrozoan *Aglaophenia* spp.; the bryozoans *Schyzoporella* and *Reptadeonella* spp.; and the ascidians *Didemnidae* spp. and *Herdmania momus*. The mobile fauna is represented by the fish: *Sargocentrum rubrum* (cc), *Pempheris vanicolensis* (cc) and *Trypterygion minor* (r).

Figure 36. Coralligenous enclave in the infralittoral rock, with the poriferans *Spongia* sp., *Crambe crambe* and *Clathrina* spp. (Tyre, station T-2)

b) Coralligenous biocenosis (in circalittoral bottoms) (Fig. 37): The macroalgae form the basal stratum is represented by *Lithophyllum stictaeforme* (cc), *Mespohyllum alternans* sp. (c) and *Peyssonnelia* spp. (cc).

The sessile fauna is abundant with the poriferans *Axinella polyploides* (cc), *Crambe crambe* (cc), *Dysidea avara* (r) and some encrusting ones (Mycale?); the hydrozoan *Eudendrium gñomeratum;* the sclerantinians *Phyllangia americana mouchezii* (cc) and *Madracis phaerensis* (c), and the ascidians *Cystodytes dellechiajei* (cc), *Didemnidae* spp. (cc) and *Herdmania momus* (c). At the 42-44m depth these species form concretion blocks (Fig. 38).

Figure 37. Coralligenous community on rocky substratum with the sponges *Axinella polyploides* (yellow) and *Crambe crambe* (red); a colony of *Phyllangia americana mouchezii* (white polyps) (Tyre, station T-21)

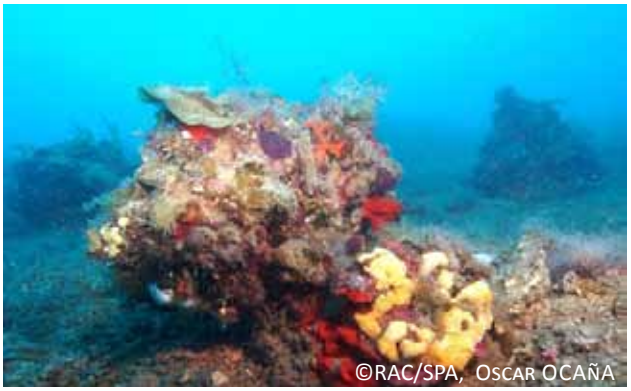

Figure 38. Coralligenous concretion blocks with poriferans (Crambe, Mycale?) and ascidians (Cystodytes, Didemnum) (Nakoura, station N-14)

4.4.6. Biocenosis of the semi-dark caves

The entrance of the caves is colonized by the coralligenous community with incrustant algae *Mesophyllum* sp (c), *Lithophyllum stictaeforme* (c), *Peyssonnelia* spp (cc). In more sciaphylic surfaces the poriferans are abundant (Fig. 39) with *Aplysilla* sp. (cc), *Crambe crambe* (c), *Chondrosia reniformis* (cc); the madreporarian *Phyllangia mouchezii* (cc); and the ascidians *Didemnidae* spp. and *Cystodytes dellechiajei.* The observed fishes have been: *Pempheris vanicolensis* (cc), *Sargocentrum rubrum* (cc) and *Tripterygion minor* (r).

Figure 39. Semi-dark cave habitat with *Actinia equina* (red), *Chondrosia reniformis* (white) and *Aplysilla* sp. (yellow) (Ras El Bayada, station N-10)

4.4.7. Biocenosis of the muddy sand (*Cymodocea nodosa*)

This community is spread in the all areas, between 0 to 31m depth, with *Acanthocardia tuberculata* (cc), *Glycimeris insubrica* (cc), *Mactra stultorum* (c), *Conomurex persicus* (cc) and *Echinocardium mediterraneum* (r). The fish *Xyrichthys novacula* is frequent. Only in one point, *Cymodocea nodosa* have been observed (Fig. 40), forming an small patch with isolate plants (front to Rachidiye, 31m depth).

Figure 40. An small plant of *Cymodocea nodosa* (Rachidiye, station T-3)

4.4.8. Biocenosis of coarse sands and gravels (under the influence of bottom currents)

The gravel and coarse sand biocenosis are widespread in the Nakoura and Tyre zones, both in infralittoral and circalittoral bottoms (mainly, between 7 to 44m depth). It appears in rocky channels and pools, between blocks, around maerl beds and rock ridges.

The fauna is poor in species, with *Conomurex persicus* (alive and dead), the echinoid *Brissus unicolor* (tests) (Fig. 41) and the bivalve *Venus verrucosa* (shells). The more characteristic fish has been *Gobius bucchichi* (cc).

Figure 41. Shell gravel and coarse sand with a test of the echinoid *Brissus unicolor* (Nakoura, N-9)

4.4.9. Maerl beds

a) Association with rhodolithes (infralittoral maerl beds) (Fig. 42)**:** Although this community is enclosed in the biocenosis of coarse sands and gravels under the influence of bottom currents, its originality and rare habitat in the Mediterranean deserves to be considered separately. The substratum is formed by free living rhodoliths (some of them Ø= 7cm) of the Corallinacea (Melobesiae), mainly

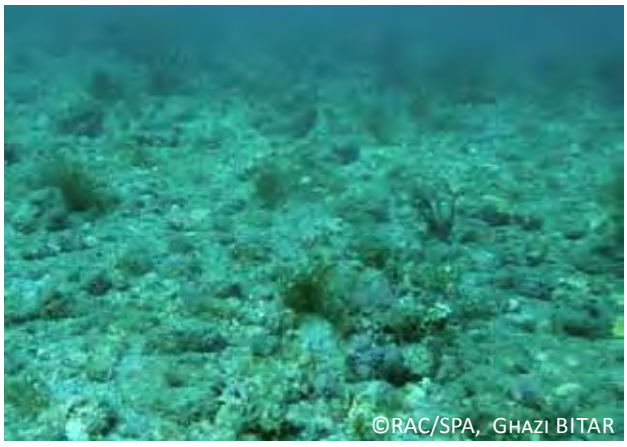

Figure 42. Shallow rhodolithes between cobbles and shell grave (Tyre lagoon, station T- 5)

the species *Neogoniolithon brassica-florida*, with small cobbles, shell gravel and coarse sand.

The maerl bed is located in the lagoon formed by the Tyre northern inlets and beach, between 6 to 9m depth. A complex community is associated with this habitat, mainly sessile fauna as bivalves (*Chama, Spondylus, Malleus, Pictada*), hydroids (*Macrorynchia, Pennaria*), sponges (*Crambe*), ascidians (*Phallusia, Rhodosoma, Styelidae*) and macroalgae (*Cystoseira, Dictyota, Amphiroa, Lobophora, Lithophyllum*…). It is noteworthy, the presence of juvenile fishes (p.e. *Mycteroperca rubra*), as a nursery area.

b) Deep rhodolith beds (circalittoral maerl beds)**:** The deep maërl beds appear in Nakoura and Tyre, between 32-45m depth. The substratum is formed by shell gravel and coarse sand, with the rhodolithes *Lithothamnion corallioides* (c), *Mesophyllum* sp. (c) and *Spongites fruticulosus* (r). The lessepsian chlorophyte *Caulerpa scapelliformis* is present. The epifauna is scarce with the gastropod *Conomurex persicus* (c), and the holothurian *Synaptula reciprocans* (r) (Fig. 43).

Figure 43. Maerl bed with the holothurian *Synaptula reciprocans* (Nakoura, station N-11)

4.4.10. Submarine cold and hot freshwater springs

The submarine cold and hot freshwater springs are very interesting due to their rarity and organisms adaptations around them. We have had the opportunity to diver in these underwater features in Ras El Bayada and Tyre.

a) Cold water springs (Fig. 44)**:** They are located front the Ras El Bayada, between 12 to 15m depth. Around the cold water springs, one deep red Cyanobacteria dominate and cover some organisms as the poriferan *Phorbas topsenti*. Some encrusting species as rhodophytes (*Peyssonnelia* spp. and *Lithophyllum* spp.) and the poriferan *Crambe crambe* and *Chondrilla nucula* are abundant. Also, the hidroids *Macrorynchia philippina* and *Pennaria disticha*, with the ascidian *Phallusia fumigata*.

Figure 44. Cold water sping (top-left) with encrusting rhodophites and poriferans (*Crambe*), some colonies of hydroids (*Pennaria*) are present (Ras El Bayada, station N-15)

b) Hot water springs (Fig. 45)**:** Located at the nortern of Tyre, between 38-42m depth. The colonies of the bacteria *Beggiatoa* are characteristic and they growth quite near of the hot sprint hole. The biodiversity around the hotsprints is poorer that cold water ones, dominating the encrusting rhodophytes.

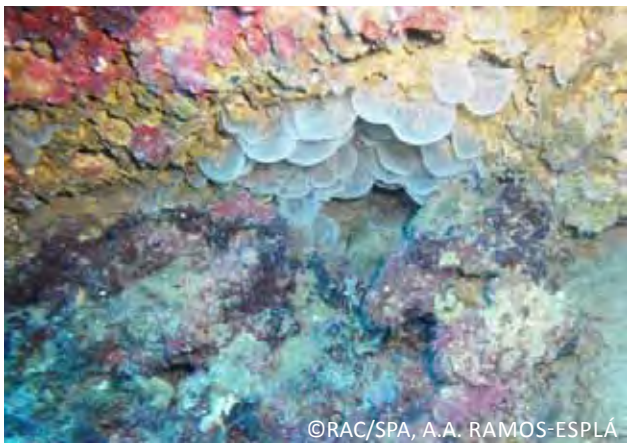

Figure 45. Hot water spring with *Beggiatoa* bacterial colonies (white semicircles). Around some encrusting rhodophytes (Tyre, station T-25)


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5. EVALUATION OF THE HABITATS/ZONES

One of the more important parts to establish MPAs is the inventory, characterization and the mapping of the marine habitats.

5.1. Ecological evaluation of the habitats

According with the types of marine habitat for the selection of sites to be included in the national inventories of natural sites of conservation interest (UNEP/MAP-RAC/SPA, 1998; Bellan-Santini *et al.*, 2002),the observed biocenosis of conservation interest of the studied area (0-47m depth) appear in the table 5.

These habitats – structural and functionally depending on their complexity and heterogeneity, as so as the human impacts - harbour a different diversity of species, some of them with high ecological (key-stone species), patrimonial (vulnerable and endangered species) and/or economic value.

Table 5: Biocenosis (B), associations (A) and facies (F) of the studied area. Zones: (N) Nakoura; (T) Tyre; (S) Saida. Representativeness: (3) high; (2) middle; (1) low; (-) not observed.

BIOCENOSIS/ASSOCIATIONS-FACIES	RAC/SPA code	N	T	S
MEDIOLITTORAL (>0m)	II			
A. *Neogoniolithon brassica-florida* with Vermets	II.4.2.8	2	2	-
Littoral pools sometimes associated with vermetids	II.4.2.10	2	2	1
A. *Phymatolithon lenormandii* and *Hildenbrandia*	II.4.3.1	2	-	-
INFRALITTORAL (0-36m)	III			
A. *Cymodocea nodosa*	III.2.3.4	-	1	-
F. Vermetids	III.6.1.3	2	2	-
A. *Sargassum vulgare* and *Cystoseira compressa*	III.6.1.20	2	3	-
A. *Cystoseira* sp.	III.6.1.15.	3	3	-
Association with rhodolithes (infralittoral)	III.3.1.1.	-	2	-
F-A coralligenous (in enclave)	III.6.1.35	2	2	1
CIRCALITTORAL (0-47m)	IV			
Maerl facies (*Lithothamnion corallioides*)	IV.2.2.2	3	3	-
B. coralligenous (rock)	IV.3.1	2	3	-
B. coralligenous (blocs)	IV.3.1.15.	3	-	-
B. semi-dark caves	IV.3.2	2	-	-
Cold water springs		3	2	-
Hot water springs		-	2	-
EVALUATION		**28**	**27**	**2**

The sum of different habitat values by zones shows that Nakoura represent the hightest score (Σ = 28), and quite near Tyre (Σ = 27).

For the evaluation of the habitats, we have followed the UNEP/MAP (1998) valorization, adapting the values to the observed biocenosis, associations and facies to the studied area (table 6).

Table 6. Classification of the Nakoura, Tyre and Saida species. Criteria: (Ec) economic value; (As) aesthetic value; (PV) patrimonial value; (R) rarity; (S) species richness; (V) vulnerability. Classification (Cl): (P) priority habitat; (AH) another habitats. Evaluation: (3) high value; (2) medium value; (1) low value. (modified of UNEP/MAP, 1998).

HABITAT	S	V	PV	R	As	Ec	Cl
Hard bottoms							
B. supralittoral rock	1	1	1	1	1	1	AH
A. *Nemalion helminthoides*	1	1	1	1	1	1	1
A. *Lithophyllum papillosum*	1	1	1	1	1	1	AH
A. *Enteromorpha compressa*	1	1	1	1	1	1	AH
A. *Neogoniolithon brassica-florida* with Vermets	2	3	3	2	2	1	P
A. *Parviphycus tenuissimus* (Gelidial)	2	1	1	1	1	1	AH
B. mediolittoral caves	3	3	3	3	3	2	P
F. overgrazing with encrusting algae	1	1	1	1	1	1	AH
F. Vermetids	2	3	3	2	2	1	P
F. *Brachidontes pharaonis*	1	1	1	1	1	1	AH
A. Corallinales (*Corallina, Amphiroa, Jania*)	2	1	1	1	1	1	AH
A. *Lobophora variegata*	2	1	1	1	1	1	AH
A. *Sargassum vulgare*	3	2	3	2	3	2	P
A. *Colpomenia sinuosa*	2	1	1	1	2	1	AH
A. *Stypocaulon scoparium*	2	1	1	1	2	1	AH
A. *Cystoseira* sp.	3	2	3	2	3	2	P
A. *Pterocladiella capillace*a and *Ulva* spp.	1	1	1	1	1	1	AH
A. *Schottera nicaeensis*	2	2	2	2	2	1	P
A. *Peyssonnelia* spp.	2	2	2	2	2	1	P
F-A coralligenous (infralittoral enclave)	3	3	3	3	3	2	P
F. *Chama pacifica* with *Spondylus spinosus*	2	1	1	1	1	2	AH
A. *Cymodocea nodosa*	2	3	3	2	2	2	P
A. *Caulerpa prolifera*	1	1	1	2	2	1	AH
A. *Flabellia petiolata* and C*aulerpa scapelliformis*	2	1	2	3	2	2	P
Maerl facies	3	3	3	3	3	2	P
A. *Arthrocladia villosa*	3	2	2	2	2	2	P
B. coarse sands and fine graveles, bottom currents	2	2	1	2	1	1	AH
B. coralligenous	3	3	3	3	3	3	P
A. *Cystoseira dubia*	3	3	3	3	3	3	P
B. semi-dark caves	3	3	3	3	3	2	P
B. caves and ducts in total darkness	3	3	3	3	3	1	P

6. MARINE PROTECTED AREAS, ZONING AND MANAGEMENT

To establish the zoning and management to the future marine protected areas, a part of the habitats and aesthetic values, it is necessary to evaluate the present uses of the zones, with the human impacts and possible threats. That is fundamental, since the success or failure of the MPA depends of the control of the different human pressures, mainly fishing and tourism (Ramos-Esplá, 2009).

6.1. Uses, impacts and/or threats

The studied area is subject to the different uses and activities (industry, commercial, artisanal and sportive fisheries, tourism, littoral urbanization, local population; table 7), that means a variety of impacts and, subsequently, subject to possible threats.

Table 7. Uses and threats of the considered areas. Zones (fig. 46): (N) Nakoura; (T) Tyre; (S) Saida. Impact: (+++) very important; (++) more or less important; (+) not important.

Impacts/Threats	N	T	S
Littoral urbanization	+	+++	+++
Professional fishing	++	+++	+++
Shore angling	++	+++	+++
Spearfishing	+++	+++	+++
Lost nets (ghost fishing)	++	++	++
Trampling	++	+++	+++
Bait and shell-fish collecting	++	+++	+++
Mooring	-	+++	+++
Solid wastes	+	++	+++
Sewage discharge	-	+++	+++
Hyper-sedimentation	+	+	+++

6.2. Evaluation of the zones

Taking in consideration the variety of habitats and aesthetic importance, as to as the human impacts, the table 8 shows the valorization of the different zones.

Table 8. Evaluation of the different zones in function with the habitats, fishery interest, aesthetic value and low human pressure. Evaluation: (3) high; (2) medium; (1) low.

Zone	Habitats	Fishery Interest	Aesthetic Value	Low Human impacts	Evaluation
Nakoura	3	3	3	3	12
Tyre	3	3	2	2	10
Saida	1	1	1	1	4

Nakoura: The evaluation is very high. It woud be necessary to establish a Marine Protected Area with the three different zones: multi-use, buffer and core (integral protection).

Tyre: The evaluation is high. Nevertheless, to declare an integral protected area around a crauded city it is impossible, one possible solution is to create a management area with a multiuse zone and a buffer zone to protect the important habitats that harbours these area.

Saida: The evaluation is low due to the multiple impacts occur in the area (rubbish, hyper-sedimentation, anthropic pressure, industrial wastes). However, it is necessary an integrated coastal zone management, mainly in the interesting northern zone (historical site and inlets); and the southern zone to close the 'rubbish mountain'.

6.3. Possible zoning

Three different levels of protection could be applied to three zones: i) integral protection (core zone); ii) partial protection (buffer zone) with prohibition/regulation of some harmful activities; and iii) resource management area (multiuse zone) with regulation of certain uses.

Saida: A Marine Managed Area is proposed, with one multi-use zone (multi-use) around the village zone and the northern inlets, from shore to a 20m depth (Fig. 46a).

Tyre (city): No core zone due to the proximity of the population. Nevertheless, a Marine Protected Area is proposed with two zones (Fig. 46b):

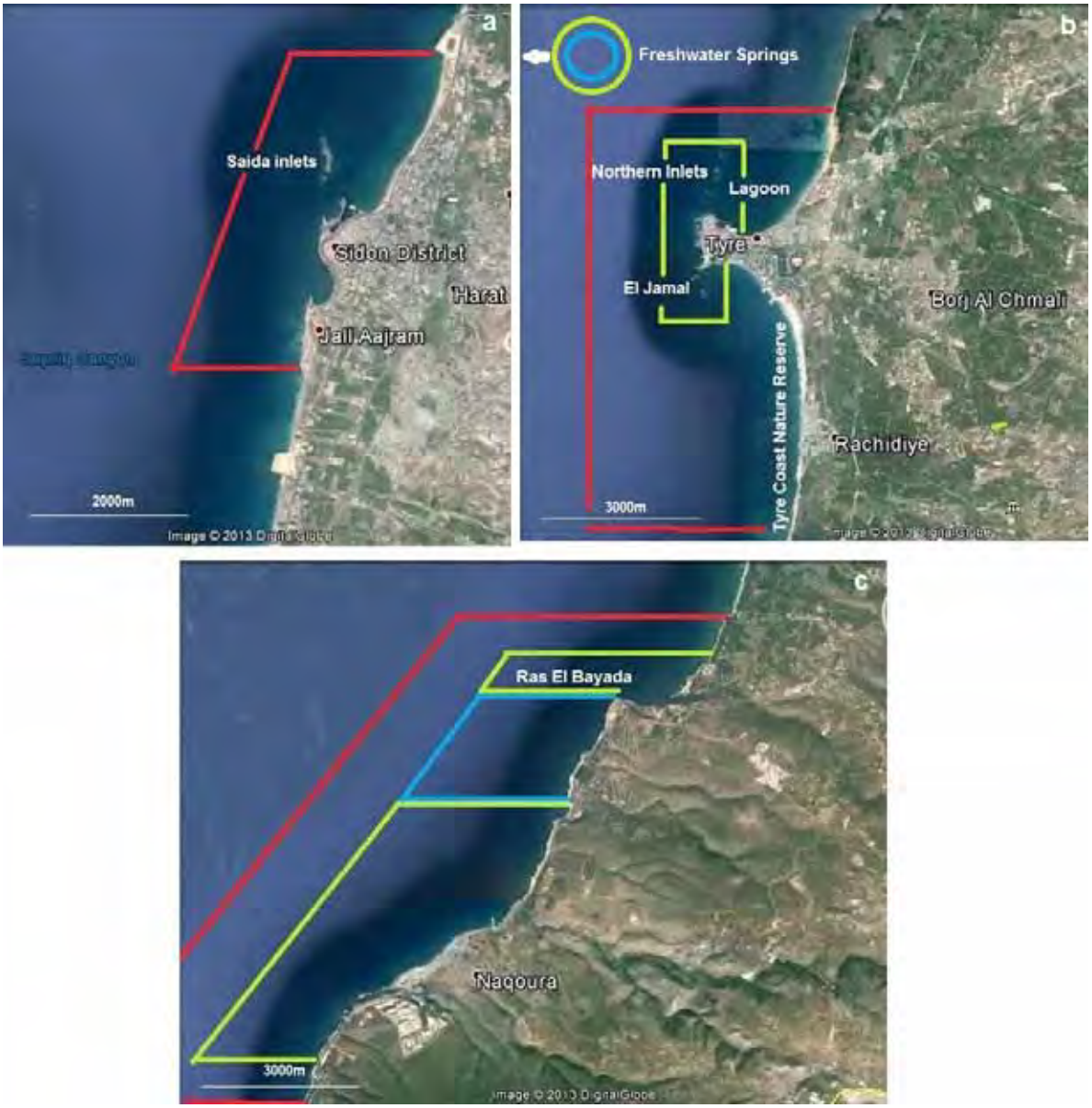

Figure 46. Proposed marine protected and/or managed areas, and zoning: Core zone (blue lines), buffer zone (green lines) and multi-use zone (red lines)

- Buffer zone: Inlets around Tyre and western part of the northern lagoon (maerl and Cystoseira forest).
- Multi-use zone: Around Tyre, from the shore to 20m depth.

Tyre (submarine freshwater spring): Due the high interest of this zone a Marine Protected Area is proposed with two zones (to determine):

- Core zone: Where the springs are present (30-50m depth)
- Buffer zone: Circle with a radius of 500 m around the core zone.

Nakoura: It is proposed a Marine Protected Area with 3 zones (Fig. 46c):

- Core zone: Ras El Bayada, from the shore to 20m depth.
- Buffer zone: Nakoura from the shore to 20m depth, Around the core zone.
- Multi-use zone: Around the core and buffer zones, from the shore to 40m depth.

6.4. Management measures

To avoid as far as possible the human impacts in a marine protected area, it is necessary to consider management planning through the zoning of the protected area. The management and zoning may resolve some conflicts between users of the coastal zone (selective/no selective fishing methods, professional/sportive fishing, Scuba diving / spear-fishing) and to make protection compatible with the rational exploitation of the area. In this sense , the 'Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD Protocol) in the Mediterranean' (Barcelona Convention, 1995) mentions in the article 7-1 that: 'The Parties shall, in accordance with the rules of international law, adopt planning, management, supervision and monitoring measures for the SPAs. Later (art. 7-2), it indicates the measures that should be included for each SPA. The table 9 summarises the possible uses and management measures.

Legend of notes (numbers in brackets):

- (1) Coastal Zone management (more than 100m to shore-line).
- (2) To establish anti-pollution measures and the rigorous control of the discards.
- (3) Only in the actual situation.
- (4) Establishment of mooring zones.
- (5) Permitted with gear restrictions (no monofilament nets).
- (6) With license/permit.
- (7) Sewage treatment by depuration plant (all of the area); control of the ballast waters.

Table 9. Possible uses and management measures of the different zones in the marine protected/managed areas. Zones: (CZ) core zone; (BZ) buffer zone; (MZ) multi-use zone. Uses: (+) permitted; (-) forbidden.

Uses/Zones	CZ	BZ	MZ
Littoral urbanization	-	+ (1)	+ (1)
Industry	-	-	+ (2)
Fishery port	-	+ (3)	+ (3)
Sportive ports	-	+ (3)	+ (3)
Boating	-	+	+
Mooring	-	+ (4)	+
Professional fishing	-	+ (5)	+ (5)
Sportive fishing (nets, traps)	-	-	-
Shore angling	-	+ (6)	+
Spearfishing	-	-	+ (6)
Tourism, visitors	+	+	+
Beaching/swimming	-	+	+
Snorkeling	-	+	+
Scuba diving	+ (6)	+	+
Research/education	+	+	+
Aquaculture (inshore cages)	-	-	+
Sewage dumping	-	-	+ (7)
Dredging	-	-	+ (2)


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ANNEXES

Annex 1. Stations of the Lebanon mission (June 2012). Observers: (AF) Aitor Forcada; (AR) Alfonso Ramos; (C) Carlos Valle; (G) Ghazi Bitar; (H) Hani El-Shaer; (O) Oscar Ocaña; (Y) Yassine Shgaier; (Z) Ziad Samaha. Methodology: (F) by foot; (Hy) hydroplane; (Sc) scuba diving; (Sk) snorkeling.

Annex 2. Species observed in the different stations (N = 48). Semi-quantitative abundance: (1) less abundant; (2) abundant; (3) very abundant.

Annex 1. Stations of the Lebanon mission (June 2012). Latitude/Longitude: (**i**) initial; (**f**) final. Observers: (**AF**) Aitor Forcada; **(AR**) Alfonso Ramos; (**C**) Carlos Valle; (**G**) Ghazi Bitar; (**H**) Hani El-Shaer; (**O**) Oscar Ocaña; (**Y**) Yassine Shgaier; (Z) Ziad Samaha. Methodology: (**B**) benthos: (**FC**) fish visual counts; (**H**) hydroplane; (**Sc**) scuba diving; (**Sk**) snorkelling; (**W**) walking.

Code Stat.	Locality (site)	Date 2013	Depth (m)	Latitude N (i)	Longitude E (i)	Latitude N (f)	Longitude E (f)	Observers	Method	Observations
N-1	Nakoura	27.08	0m	33º06.265'	35º06.288'			AR	W,B	Littoral rock
N-2	Ras El Baiada	28.08	11-14	33º10.087'	35º09.986'			G,H,Y	Sc,B	Hard substrata with small sandy patches
N-3	Ras El Baiada	28.08	0-6	33º09.531'	35º08.869'			G,H,Y	Sc,B	Rocky substrata with boulders, caves
N-4	Naqoura	28.08	13-32	33º07.759	35º07.050'	33º07.377'	35º07.513'	AR	Sc,H	Flat rock with coarse sandy canals
N-5	Naqoura	28.08	26-34	33º08.765'	35º07.480'	33º08.405'	35º07.897'	O	Sc,H	Flat rock with coarse sandy canals
N-6	Naqoura	28.08	18-36	33º09.743'	35º07.844'	33º08.912'	35º08.869'	C	Sc,H	Flat rock and fine sandy patches
N-7	Naqoura	28.08	5-29m	33º10.496'	35º08.944'	33º09.349'	35º09.593	AF	Sc,H	Irregular rocky substrata with boulders and sandy bottoms
N-8	Ras El Baiada	29.08	31-37	33º12.382'	35º08.809'	33º12.619'	35º09.497'	C	Sc,H	Flat rock and sandy bottoms
T-1	Tyr-N (inlets)	29.08	3-11	33º17.215'	35º11.738'	33º17.153'	35º11.738'	G,H,Y	Sc,B	Rocky substrata with boulders and coarse sand patches
T-2	Tyre-C (El Jamal)	29.08	0-5	33º15.898'	35º11.452'	33º16.059'	35º11.687'	G,H,Y	Sc,Sk,B	Rocky substrata with boulders and sand, roman columns
T-3	Tyre-S	29.08	12-31	33º14.380'	35º10.449'	33º14.436'	35º11.258'	AR	Sc,H	Muddy-sand and flat rock with canals
T-4	Tyre-S	29.08	9-22	33º14.535'	35º11.097'	33º14.500'	35º12.217'	O	Sc,H	Flat and irregular rock, coarse and fine sand
T-5	Tyre-N (inlets)	30.08	0-6	33º17.017'	35º11.935'	33º17.126'	35º11.806'	G,H,Y	Sc,B	Coarse sand substrata with boulders and rocky substrata, lagoon
T-6	Tyre-N (inlets)	30.08	0-6	33°15.941'	35°11.476'	33°16.051'	35°11.697'	G,H,Y	Sc,B	Rocky substrata with small sand patches, littoral rock
T-7	Tyre-N	30.08	1-30	33º19.636'	35º12.490'	33º19.333'	35º13.920'	AF	Sc,H	Irregular rock with sandy canals, big boulders
T-8	Tyre-N	30.08	16-28	33º17.387'	35º10.477'	33º17.276'	35º11.434'	C	Sc,H	Flat rock with small boulders and sandy patches
T-9	Tyre-C	30.08	13-26	33º16.216'	35º10.262'	33º16.119'	35º11.162'	AR	Sc,H	Flat rock with sandy canals
T-10	Tyre-S	30.08	5-21	33º13.691'	35º10.797'	33º13.765'	35º10.158'	O	Sc,H	Flat and irregular rock, coarse and fine sand
N-9	Nakoura (barrels)	31.08	8-15	33º06.902'	35º06.850'	33º06.796'	35º06.748'	G,H,Y	Sc,B	Rocky substrata with small and big boulders, with small sandy patches
N-10	Ras El Baiada	31.08	0-8	33º09.895'	35º10.137'	33º09.875'	35º10.205'	G,H,Y	Sc,B	Rocky substrata with boulders and cave, seabed cover by sand
N-11	Nakoura	31.08	33-35	33º08.796'	35º07.497'			O,AR,C,AF	Sc;FC	Flat rock with gravel and rhodolithes
N-12	Nakoura	31.08	21-23	33º07.672'	35º07.422'			O,AR;C,AF	Sc,B,FC	Flat rock with coarse sandy canals
S-1	Saida (inlets)	01.09	4-14	33º34.285'	35º21.917'	33º34.244'	35º22.004'	G,H,Y	Sc,B	Rocky substrata with sand patches and boulders
S-2	Saida (inlets,port)	01.09	0-3	33°34.106'	35°22.148'			G,H,Y	Sc,B	Rocky substrata
S-3	Saida (inlet,platier)	01.09	0-3	33°34.365'	35°22.110'			G,H,Y	Sk,B	Littoral rock, abrassion platform
S-4	Saida-S	01.09	20-39	33º33.786'	35º20.911'	33º33.804'	35º21.457'	O	Sc,H	Muddy-sand bottom
S-5	Saida-C	01.09	10-30	33º34.354'	35º21.266'	33º34.313'	35º21.951'	C	Sc,H	Flat rock with small boulders and sandy bottoms
S-6	Saida-N	01.09	9-17	33º34.697'	35º21.850'	33º34.654'	35º22.718'	AF	Sc,H	Flat rock, coarse and fine sand
S-7	Saida-N	01.09	8-22	33º34.978'	35º21.954'	33º34.979'	35º22.742'	AR	Sc,H	Flat rock and coarse sand
T-11	Tyre-C (El Fanar)	02.09	3-7	33º16.813'	35º11.741'	33º16.911'	35º11.736'	G,H,Y	Sc,B	Coarse sandy rocky bottom with bottom currents, high ripple-marks
T-12	Tyre-C (inlets)	02.09	13-15	33°16.954'	35°11.326'			G,H,Y	Sc,B	Rocky bottom with small sandy patches
T-13	Tyre-S	02.09	7-27	33º15.143'	35º10.877'	33º15.078'	35º11.645'	O	Sc,H	Flat rock with sand
T-14	Tyre-C	02.09	4-26	33º18.371'	35º11.394'	33º18.091'	35º13.017'	C	Sc,H	Flat rock with sandy canals
T-15	Tyre-N	02.09	3-12	33º16.987'	35º11.784'	33º16.819'	35º12.697'	AR	Sc,H	Lagoon, sandy bottom with cobbles and pebbles
T-16	Tyre-N	02.09	7-9	33º16.566'	35º11.858'			Z	Sc,B	Lagoon, sandy bottom with cobbles and pebbles
T-17	Tyre-N	02.09	0-3	33º17.028'	35º11.725'			O	Sk,B	Littoral rocky reefs

Code Stat.	Locality (site)	Date 2013	Depth (m)	Latitude N (i)	Longitude E (i)	Latitude N (f)	Longitude E (f)	Observers	Method	Observations
N-13	Nakoura (barrels)	03.09	12-22	33°07.216'	35°06.595'	33°07.055'	35°06.957'	G,H,Y	Sc,B	Flat rocky bottom
N-14	Nakoura	03.09	43-44	33º07.613'	35º04.948'			O,AR;C	Sc,B,FC	Detritic bottom with boulders
N-15	Ras El Baiada	03.09	12-15	33º10.088'	35º10.000'			O,AR,C	Sc,B,FC	Rocky substrata with cold freshwater springs
T-18	Tyre-S (El Jamal)	03.09	0-3	33°15.748'	35°11.593'	33°15.815'	35°11.537'	G,H,Y	Sk,B	Rocky substrata with boulders and sand
T-19	Tyre-N (inlets)	04.09	12-18	33°15.995'	35°11.187'	33°15.857'	35°11.609'	G,H,Y	Sc,B	Flat rocky substrata with some sandy canals
T-20	Tyre-N (inlets,paltier)	04.09	0-3	33°16.072'	35°10.946'	33°16.016'	35°11.567'	G,H,Y	Sk,B	Rocky substrata
T-21	Tyre-N	04.09	32-47	33º19.965'	35º11.323'			O,AR,C	Sc,B,FC	Rocky substrata with freshwater springs
T-22	Tyre-N (lagoon)	04.09	7-9	33º16.939'	35º11.933'			G,H,Y,O,AR	Sc,B	Lagoon, small boulders-cobbles with *Cystoseira* sp. on sandy bottom
T-23	Tyre-C (El Jamaal)	05.09	16-18	33º15.922'	35º11.076'			G,Y	Sc,B	Flat rocky substrata with some sandy canals
T-24	Tyre-N (port,lagoon)	05.09	6-7m	33º16.939'	35º11.933'			G,Y	Sc,B	Lagoon, small boulders and cobbles on sandy bottom
T-25	Tyre-N	05.09	38-42	33º19.946'	35º10.624'			O,AR,C	Sc,B,FC	Rocky substrata with warm freshwater springs
N-16	Nakoura	13.09	15-18	33º07.937'	35º07.483'			H,Z	Sc,B	Aeroplane wreck

Annex 2. Species observed in the different stations: (N) Nakoura; (S) Saida; (T) Tyre. Semi quantitative abundance: (**1**) less abundant; (**2**) abundant; (**3**) very abundant.

2.1 Nakoura and Saida

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Cyanobacteria																							
Oscillatoria sp.	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Phormidium autumnale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Rivularia atra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Fungi																							
Verrucaria amphibia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
MACROPHYTA																							
Chlorophyta																							
**Caulerpa scalpelliformis*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Chaetomorpha sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
**Codium parvulum*	-	-	-	2	-	-	-	-	1	-	1	2	2	-	-	2	3	3	-	-	-	3	3
Ulva intestinalis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Ochrophyta																							
Cystoseira foeniculacea	-	2	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Dictyota fasciola	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobophora variegata	-	2	-	-	-	-	-	-	-	2	-	-	-	-	2	2	-	1	-	-	-	-	-
Lobophora sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
**Padina boergesenii*	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Padina pavonica	-	-	1	2	-	-	-	-	1	1	-	-	2	-	2	1	2	2	2	-	-	-	2
Ralfsia verrucosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Stypocaulon scoparium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
**Stypopodium schimperi*	-	-	-	2	-	-	-	-	-	-	1	-	2	1	-	-	-	-	-	-	-	-	1
Rhodophyta																							
Amphiroa beauvoisii	-	-	-	-	-	-	-	-	-	-	2	3	3	-	3	3	-	-	-	-	-	-	-
Amphiroa rigida	-	3	-	-	-	-	-	-	-	2	-	-	-	-	2	-	3	3	-	-	-	-	-
Corallina elongata	-	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	2	1	-	-	-	-	-
**Galaxaura rugosa*	-	3	-	3	-	-	-	-	3	3	1	3	3	-	3	3	-	-	-	-	-	-	-
Gelidium bipectinatum	-	2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Halymenia latifolia	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Hildenbrandia rubra	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Jania longifurca	-	3	-	-	-	-	-	-	-	3	-	2	-	-	-	-	2	-	-	-	-	-	-
Jania rubens	-	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	2	3	3	-	-	-	-
Jania rubens var. *corniculata*	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laurencia obtusa	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
**Laurencia* sp.	-	3	-	-	-	-	-	-	3	3	-	3	2	-	3	2	1	2	-	-	-	-	2

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Lithophyllum incrustans	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	-	-
Lithothamnion corallioides	-	-	-	-	-	-	-	-	-	-	2	-	-	3	-	-	-	-	-	-	-	-	-
Lithophyllum papillosum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Lithophyllum stictaeforme	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-	-
Mesophyllum alternans	-	-	-	-	-	-	-	-	-	-	2	2	-	3	-	-	-	-	-	-	-	-	-
Meophyllum sp.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neogoniolithon brassica-florida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neogoniolithon mamillosum	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-
Palisada perforata	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Peyssonnelia rosa-marina	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Peyssonnelia rubra	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Peyssonnelia spp.	-	3	3	3	-	-	-	-	3	2	3	-	-	-	-	3	-	-	-	-	-	-	-
Plocamium cartilagineum	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rodriguezella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Scinaia furcellata	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Spongites fruticulosus	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
INVERTEBRATA																							
Porifera																							
Calcarea																							
Sycetusa, Vosmaeropsis spp.	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sycon sp.	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-
Demospongiae																							
Agelas oroides	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aplysina sp.	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Axinella polypoides	-	-	-	3	3	3	-	3	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-
Axinella sp.	-	1	-	3	-	3	3	-	2	-	-	1	2	-	1	-	-	-	-	-	-	-	-
Chondrilla nucula	-	-	2	-	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-
Chondrosia reniformis	-	3	3	-	-	-	-	-	2	3	-	-	-	-	-	-	2	2	-	-	-	-	-
Cinachyrella levantinensis	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ciocalypta carballoi	-	2	-	1	-	-	-	-	1	-	-	1	3	-	-	2	-	-	-	-	-	-	-
Cliona celata	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cliona parenzani	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Corticium candelabrum	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Crambe crambe	-	3	3	3	-	-	-	-	3	3	3	3	-	3	3	3	3	3	-	-	-	-	1
Cymbaxinella sp.	-	2	-	-	-	-	-	-	1	-	-	2	2	-	1	3	-	-	-	-	-	-	-
Haliclona fulva	-	-	2	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	-	-	-	-	-
Haliclona cf. simulans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Ircinia variabilis	-	3	2	2	-	-	-	-	1	2	-	-	2	-	-	-	2	-	-	-	-	-	-
Ircinia sp.	-	-	-	-	-	-	-	-	2	2	1	2	2	-	-	2	2	-	-	-	-	-	1
Lyosina blastifera	-	1	-	-	-	-	-	-	1	2	-	-	-	-	2	-	-	-	-	-	-	-	-
Myrmekioderma spelaeum	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mycale sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Niphates toxifera	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petrosia ficiformis	-	1	-	2	-	-	-	-	1	1	-	1	2	-	2	1	-	-	-	-	-	-	-
Phorbas tenacior	-	2	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	-	-	-	-	-
Phorbas topsenti	-	2	-	-	-	-	-	-	2	2	-	2	-	-	3	-	2	2	-	-	-	-	-
Sarcotragus fasciculatus	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Sarcotragus cf. *foetidus*	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	1	-	-	-	-	1	-
Sarcotragus spinosulus	-	2	2	1	-	-	-	-	2	2	-	1	1	-	-	1	1	1	-	-	-	-	-
Spirastrella cunctatrix	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Spongia officinalis	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Cnidaria																							
Hydrozoa																							
Aglaophenia elongata	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eudendrium carneum	-	3	-	-	-	-	-	-	2	-	-	2	2	-	-	-	-	-	-	-	-	-	-
Eudendrium glomeratum	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Eudendrium cf. *merulum*	-	-	-	3	-	-	-	-	-	-	-	-	-	1	3	3	-	-	-	-	-	-	1
Eudendrium racemosum	-	-	-	3	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Eudendrium spp.	-	-	-	3	-	-	-	-	2	-	-	-	-	1	3	3	-	-	-	-	-	-	1
Hydrozoa sp.	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
**Macrorhynchia philippina*	-	3	2	-	-	-	-	-	3	2	-	-	3	-	3	1	2	2	-	-	-	-	2
Pennaria disticha	-	3	3	-	-	-	-	-	2	3	-	1	3	-	3	2	2	2	-	-	-	-	2
Sertularia marginata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-
Anthozoa																							
Actinia schmidti	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Cerianthus sp.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
**Oculina patagonica*	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyathus muellerae	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Scyphozoa																							
**Rhopilema nomadica*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Ctenophora																							
**Mnemiopsis leidyi*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychaeta																							
Filograna sp.	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Sabellidae sp.	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Serpulidae spp.	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	3	3	3	-	-	-	-	-
Sipuncula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phascolosoma stephensoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Crustacea																							
Cirripedia																							
**Balanus trigonus*	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	3	3	3	-	-	-	-	-
Chthmalus montagui	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Chthamalus stellatus	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Euraphia depressa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Perforatus perforatus	-	3	3	-	-	-	-	-	-	3	-	-	-	-	-	3	3	3	-	-	-	-	-
Decapoda																							
**Charybdis hellerii*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Clibanarius erythropus	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pachygrapsus marmoratus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Mollusca																							
Gastropoda																							
**Aplysia dactylomela*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bittium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-
**Cellana rota*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
**Cerithium scabricum*	3	3	3	-	-	-	-	-	2	3	-	-	-	-	2	3	3	3	-	-	-	-	-
Cerithium vulgatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Columbella rustica	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Conomurex persicus*	1	2	-	1	-	-	-	-	2	1	-	1	2	-	-	-	2	-	-	-	3	-	-
Conus ventricosus	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dendropoma petraeum	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diodora ruepellii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Echinolittorina punctata	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
**Ergalatax junionae*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-
Erosaria spurca (shells)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1	1	-	-	-	-
Euthria cornea (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
**Flabellina rubrolineata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
**Goniobranchus annulatus*	-	-	1	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexaplex trunculus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
**Hypselodoris infucata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
**Infundibulops erithreus*	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Melarhaphe neritoides	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-
Ocinebrina sp. (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Patella caerulea	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Patella rustica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Patella ulyssiponensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-
Patella sp.	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Phorcus turbinatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-
**Purpuradusta gracilis notata* (shells)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stramonita haemostoma (shells)	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Vermetus triquetus	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Bivalvia																							
Acanthocardia tuberculata (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Barbatia barbata (shells)	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Brachidontes pharaonis*	3	3	3	-	-	-	-	-	3	3	-	-	-	-	-	-	3	3	3	-	-	-	-
**Chama pacifica*	-	2	2	3	-	3	-	2	3	3	1	3	3	-	3	3	3	1	1	-	-	2	1
Ctena decussata (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
**Dendostrea frons*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
**Fulvia fragilis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
**Gafrarium savignyi* (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-
Glycymeris nummaria (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	1	-	-	-	-	-
**Lioberus agglutinans* (shells)	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lioberus sp.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithophaga lithophaga	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Mactra stultorum (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
**Malleus regula*	-	3	3	-	-	-	-	-	3	3	-	-	-	-	2	3	-	2	-	-	-	-	-
Ostreidae sp.	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-
**Pinctada imbricata radiata*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Pinna nobilis (shell rests)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polititapes aureus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-
**Spondylus spinosus*	-	3	-	2	-	3	-	1	1	1	-	3	1	-	2	1	3	-	-	-	-	-	-
Striarca lactea	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Venerupis corrugata	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Venus verrucosa (shells)	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Cephalopoda																							
Loligo vulgaris (eggs)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Bryozoa																							
Caberea sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Crisia sp.	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Frondipora verrucosa	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Margaretta cereoides	-	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Reptadeonella sp.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reteporella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Rhynchozoon neapolitanum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Schizoporella errata	-	-	2	-	-	-	-	-	-	3	-	-	-	-	-	2	3	3	-	-	-	-	3
Echinodermata																							
Ophiuroidea																							
**Ophiactis savignyi*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Echinoidea																							
Arbacia lixula	-	-	1	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
Brissus unicolor	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-
Paracentrotus lividus	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Holothuroidea																							
**Synaptula reciprocans*	-	-	-	1	1	1	1	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
Ascidiacea																							
Botrylloides cf. *leachii*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-
Cystodytes dellechiajei	-	-	1	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-
Didemnidae spp.	-	-	3	-	-	-	-	-	1	3	-	-	-	2	1	-	1	1	-	-	-	-	-
Didemnum coriaceum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Diplosoma sp.	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
**Herdmania momus*	-	2	2	-	-	-	-	-	1	2	2	2	1	1	2	2	1	-	-	-	-	-	-
**Phallusia nigra*	-	3	1	-	-	-	-	-	1	1	-	-	1	-	1	1	3	3	-	-	-	-	2
Styelidae sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-
ICHTHYOFAUNA																							
Elasmobranchii																							
Dasyatis pastinaca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Myliobatis aquila	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pteromylaceus bovinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhinobatos cemiculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Taeniura grabata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Actinopterygii																							
Boops boops	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Cheilodipterus novemstriatus*	-	-	-	-	-	-	-	-	-	-	1	2	-	-	2	-	-	-	-	-	-	-	-
Chromis chromis	-	3	-	3	-	-	2	-	3	3	-	2	3	-	3	3	3	3	-	-	-	3	2
Coris julis	-	2	-	1	2	2	2	2	2	2	3	3	2	-	2	1	2	2	-	-	2	2	2
Diplodus cervinus	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Diplodus puntazzo	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-
Diplodus sargus	-	-	-	-	-	-	2	-	1	2	-	-	-	-	1	-	2	-	-	-	-	1	1
Diplodus vulgaris	-	-	-	-	-	-	3	-	3	-	-	-	3	-	-	1	-	-	-	-	-	2	-
Epinephelus costae	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
Epinephelus marginatus	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
**Fistularia commersonnii*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Gobius bucchichi	-	3	-	3	-	-	-	-	3	3	-	3	3	-	3	2	3	-	-	-	-	2	3
Gobius geniporus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
**Lagocephalus scleratus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Muraena helena	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-
Mycteroperca rubra	-	1	1	-	-	-	1	-	2	2	-	-	1	-	1	-	1	-	-	-	-	-	-
Oblada melanura	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagrus auriga	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parablennius zvonimiri	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
**Pempheris vanicolensis*	-	3	3	-	-	-	-	-	-	3	-	-	2	-	3	3	-	-	-	-	-	-	-
**Plotosus lineatus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Pomadasys incisus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
**Sargocentron rubrum*	-	3	2	2	3	2	3	-	3	2	3	2	2	-	2	3	2	-	-	-	3	-	2
**Scorpaena maderensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Serranus cabrilla	-	-	-	2	2	2	2	2	-	-	-	1	2	1	-	-	-	-	-	-	-	1	2
Serranus hepatus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2
Serranus scriba	-	-	-	1	-	-	-	-	1	-	-	-	2	-	-	1	-	1	-	-	-	-	2
**Siganus luridus*	-	1	-	1	-	-	-	-	-	1	-	-	1	-	3	3	1	1	-	-	-	-	-
**Siganus rivulatus*	-	1	2	-	-	-	3	-	-	2	-	-	2	-	3	-	3	3	-	-	-	2	2
Sparisoma cretense	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1

STATIONS	N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	N-11	N-12	N-13	N-14	N-15	N-16	S-1	S-2	S-3	S-4	S-5	S-6	S-7
Spicara smaris	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Stephanolepis diaspros*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Symphodus tinca	-	-	-	-	-	-	-	-	1	1	-	-	1	-	-	1	-	-	-	-	-	1	-
Thalassoma pavo	-	3	2	-	-	-	2	-	2	2	1	-	2	-	2	2	3	3	-	-	-	2	-
Tripterygion melanurum	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Tripterygion tripteronotus	-	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Xyrichtys novacula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	1

2.2 Tyre. Sectors (N) northern; (C) central; (S) southern.

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
Proteobacteria																									
Beggiatoa sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Cyanobacteria																									
Oscillatoria sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Phormidium autumnale	-	3	-	-	3	3	-	-	-	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Fungi																									
Verrucaria amphibia	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACROPHYTA																									
Chlorophyta																									
Bryopsis plumosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Cladophora sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
**Codium parvulum*	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-
Palmophyllum crassum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ochrophyta																									
Cystoseira compressa	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Cystoseira foeniculacea	-	2	-	-	3	3	-	-	2	-	-	-	-	2	3	-	-	-	-	-	-	3	-	3	-
Dictyota fasciola	-	-	-	-	3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	3	-	3	-
Dictyota linearis	-	-	-	3	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobophora variegata	2	1	-	-	3	2	-	-	-	-	1	1	-	-	3	-	-	-	1	-	-	3	2	3	-
**Padina boergesenii*	-	1	-	-	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Padina pavonica	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-
Ralfsia verrucosa	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sargassum vulgare	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
**Stypopodium schimperi*	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	3
Rhodophyta																									
Amphiroa beauvoisii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	3
Amphiroa rigida	3	3	-	-	3	3	-	-	-	-	-	2	-	-	3	-	-	-	-	-	-	3	-	3	-
Corallina elongata	3	3	-	-	3	3	-	-	-	3	3	-	-	-	-	-	1	3	-	3	-	-	-	-	-
**Galaxaura rugosa*	3	1	-	-	2	3	-	3	3	3	-	3	-	3	-	-	-	-	3	-	-	1	3	-	-
**Ganonema farinosum*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haliptylon virgatum	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Halymenial sp.	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hildenbrandia rubra	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Hypnea spinella*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Jania rubens	3	3	-	-	3	3	-	-	-	-	3	-	-	-	-	-	3	3	-	3	-	3	-	-	-
Jania rubens var. *corniculata*	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laurencia obtusa	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
**Laurencia* sp.	3	3	-	-	3	-	-	-	-	3	2	2	-	-	2	1	2	-	-	-	-	2	3	2	-
Lithophyllum incrustans	3	3	-	-	3	3	-	-	-	-	3	-	-	-	-	-	-	3	-	-	-	3	-	3	-
Lithothamnion corallioides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
Lithophyllum papillosum	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithophyllum stictaeforme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1
Mesophyllum alternans	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	2	-	-	2
Neogoniolithon brassica-florida	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neogoniolithon mamillosum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Palisada perforata	-	1	-	-	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Peyssonnelia coriacea ?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Peyssonnelia rosa-marina	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	2	3
Peyssonnelia rubra	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3	-	-	-	3
Peyssonnelia spp.	-	3	-	2	3	2	-	-	-	-	3	-	-	-	-	-	-	3	3	-	-	2	-	3	3
Spongites fruticulosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Tricleocarpa fragilis	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAGNOLIOPHYTA																									
Cymodocea nodosa	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INVERTEBRATA																									
Porifera																									
Calcarea																									
Sycon sp.	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Homoscleromorpha																									
Oscarella lobularis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Demospongiae																									
Acanthella acuta	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aplysina aerophoba	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Axinella polypoides	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	2
Axinella sp.	-	-	-	-	-	-	-	2	3	2	-	-	2	2	-	-	-	-	1	-	-	-	-	-	-
Chondrilla nucula	3	2	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chondrosia reniformis	-	-	-	-	3	1	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Cinachyrella levantinensis	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	1
Ciocalypta carballoi	1	-	-	1	-	1	-	-	1	1	1	2	-	-	-	-	-	-	2	-	-	-	2	-	-
Cliona viridis	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cliona parenzani	2	3	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corticium candelabrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Crambe crambe	3	3	-	3	3	3	-	-	3	3	2	3	3	-	-	1	-	3	3	-	3	3	3	3	-
Cymbaxinella sp.	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	2	-	-
Dictyonella sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Dysidea avara	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Dysidea tupha?	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ircinia variabilis	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ircinia sp.	2	-	-	2	2	-	-	-	1	2	1	2	-	-	-	-	-	-	2	-	-	-	2	-	-
Lyosina blastifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Niphates toxifera	-	-	-	-	1	-	-	-	-	-	2	2	-	-	-	-	-	1	-	-	-	-	2	-	-
Petrosia ficiformis	-	-	-	2	-	-	-	-	-	-	-	2	2	-	-	-	-	-	2	-	1	-	1	-	1

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
Phorbas tenacior	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phorbas topsenti	2	2	-	-	2	-	-	-	2	-	2	2	-	-	-	-	-	-	2	-	-	-	2	1	-
Sarcotragus cf. *foetidus*	1	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	1	-	-	-	-	-	-
Sarcotragus spinosulus	2	1	-	2	2	-	-	-	1	2	1	2	-	-	-	-	-	1	1	-	-	-	1	-	-
Spirastrella cunctatrix	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Spongia officinalis	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cnidaria																									
Hydrozoa																									
Aglaophenia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Eudendrium carneum	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eudendrium cf. *merulum*	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	2	-	2	-	-
Eudendrium spp.	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	2	-	2	-	2	-	-
Hydrozoa sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
**Macrorhynchia philippina*	2	2	-	-	2	2	-	-	-	2	1	1	-	-	-	-	-	-	2	2	2	-	1	-	-
Pennaria disticha	3	3	-	1	2	3	-	-	-	3	2	1	-	-	-	-	-	-	1	3	3	1	-	-	-
Anthozoa																									
Aiptasia mutabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Asterosmilia sp. (tests)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Cladocora caespitosa	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Madracis pharensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
**Oculina patagonica*	2	2	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	2	-	2	-	-	-	-	-
Phyllangia americana mouchezii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Telmatactis cricoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Polychaeta																									
Hermodice carunculata	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Sabellidae sp.	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Serpulidae spp.	-	-	-	-	1	2	-	-	-	-	2	-	-	-	-	1	-	-	2	-	-	3	-	3	-
Sipuncula																									
Phascolosoma stephensoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Sipunculus nudus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Crustacea																									
Cirripedia																									
**Balanus trigonus*	-	3	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Chthmalus montagui	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chthamalus stellatus	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euraphia depressa	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perforatus perforatus	-	3	-	-	3	-	-	-	-	-	2	-	-	-	-	-	-	-	3	-	-	2	-	-	-
Decapoda																									
**Alpheus audouini*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
**Atergatis roseus*	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcinus tubularis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
**Callinectes sapidus* (carapace)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Charybdis hellerii*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-	1	-
Clibanarius erythropus	3	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Diogenes pugilator	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eriphia verrucosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Pachygrapsus marmoratus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagurus anachoretus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Palaemon serratus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Upogebia pusilla (moult)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Mollusca																									
Gastropoda																									
Bittium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bulla striata (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
**Cerithium scabricum*	3	3	-	-	3	3	-	-	-	-	3	-	-	-	3	-	-	3	3	-	-	3	3	3	-
Cerithium vulgatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
**Conomurex persicus*	1	2	2	-	2	2	-	-	-	-	2	-	-	-	1	-	-	-	2	-	-	2	2	-	1
Echinolittorina punctata	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Elysia grandifolia*	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-
Elysia timida	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Ergalatax junionae*	2	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Erosaria spurca (shells)	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euthria cornea (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
**Goniobranchus annulatus*	1	1	-	-	1	1	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-	1	-	-
Hexaplex trunculus	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
**Hypselodoris infucata*	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
**Infundibulops erithreus*	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melarhaphe neritoides	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nassarius reticulatus (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Phorcus turbinatus	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Purpuradusta gracilis notata* (sh.)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
**Rhinoclavis kochi* (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Serpulorbis arenarius (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
Tonna galea (shells)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vermetus triquetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Bivalvia																									
Acanthocardia tuberculata (shells)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Arca noae (shells)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
**Brachidontes pharaonis*	3	3	-	-	3	3	3	-	-	-	3	-	-	-	-	-	2	3	-	3	-	-	-	-	-
**Chama pacifica*	3	2	-	2	3	2	2	-	1	3	2	3	2	2	3	-	-	-	3	-	2	3	3	-	-

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
**Dendostrea frons*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
**Gafrarium savignyi* (shells)	-	1	-	-	2	1	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	1	-	1	-
Glycymeris nummaria (shells)	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Lima lima (shells)	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Lioberus agglutinans* (shells)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Lioberus sp.	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mactra stultorum (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
**Malleus regula*	3	2	-	-	3	2	-	-	3	-	2	2	-	-	2	-	-	-	-	-	-	3	3	-	-
Mimachlamys varia (shells)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ostreidae sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
**Pinctada imbricata radiata*	1	2	-	-	2	1	-	-	1	-	-	1	-	-	-	-	-	-	1	-	-	2	-	-	1
Pinna nobilis (shell rests)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Polititapes aureus	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
**Spondylus spinosus*	3	2	-	3	2	1	-	2	2	3	2	3	-	-	2	-	-	-	2	-	1	1	2	-	-
Venerupis corrugata	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Venus casina (shells)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
Venus verrucosa (shells)	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Bryozoa																									
Caberea sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Schizoporella errata	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	-	2	-
Echinodermata																									
Echinoidea																									
Brissus unicolor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Echinocardium mediterraneum	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Echinocyamus pusillus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Holothuroidea																									
Holothuria (Thymiosycia) impatiens	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Holothuria (Holothuria) tubulosa	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Synaptula reciprocans*	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Ascidiacea																									
Botrylloides cf. *leachii*	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cystodytes dellechiajei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Didemnidae spp.	1	2	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-	1	1	-	2	1	-	-	2
**Herdmania momus*	1	1	-	-	1	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	2	-	2	1
**Phallusia nigra*	1	-	-	-	2	2	-	-	2	-	-	1	-	-	2	-	-	-	1	-	2	3	2	2	-
Polyclinidae sp. 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
**Rhodosoma turcicum*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Styelidae sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
ICHTHYOFAUNA																									
Elasmobranchii																									
Dasyatis pastinaca	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
Rhinobatos cemiculus	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Actinopterygii																									
**Apogonichthyoides nigripinnis*	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	1	-
**Atherinomorus lacunosus*	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-
Belone belone	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boops boops	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3	-	-	-	-	-
Bothus podas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Caranx crysos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Chromis chromis	3	3	-	3	-	3	3	2	3	3	-	-	-	3	-	-	-	3	2	3	2	-	3	-	-
Coris julis	2	2	-	-	3	2	-	2	2	2	-	2	-	2	-	-	-	-	2	-	3	3	2	-	2
Coryphoblennius galerita	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diplodus cervinus	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Diplodus puntazzo	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diplodus sargus	-	2	-	-	2	2	2	-	-	-	-	2	-	2	1	-	-	-	3	-	-	-	1	-	-
Diplodus vulgaris	-	2	-	-	2	-	-	-	-	-	1	2	-	3	-	-	-	-	3	-	-	-	3	-	-
Epinephelus costae	1	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	2	-	-	-	-	-	-
Epinephelus marginatus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
Gobius bucchichi	3	-	-	-	-	3	-	-	2	-	-	2	-	-	-	-	-	-	3	-	-	3	2	-	2
**Lagocephalus scleratus*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Lipophrys trigloides	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mugilidae spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Mullus surmuletus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Mycteroperca rubra	1	1	-	-	2	2	-	-	-	-	2	2	-	-	-	-	-	1	2	2	-	-	2	1	-
Oblada melanura	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-
Parablennius rouxi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Parablennius sanguinolentus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Pempheris vanicolensis*	2	2	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Plotosus lineatus*	-	-	-	-	2	2	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
**Pteragogus pelycus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
**Sargocentron rubrum*	2	2	-	3	2	2	2	2	-	3	-	2	-	2	-	-	-	-	2	2	3	-	2	-	-
**Scorpaena maderensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Serranus cabrilla	-	-	-	-	-	-	2	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1
Serranus scriba	-	-	-	-	1	1	-	-	-	1	-	2	-	1	-	-	-	-	3	-	-	-	-	-	-
**Siganus luridus*	-	-	-	-	1	1	2	-	-	-	-	-	-	1	-	-	-	-	3	-	-	1	1	-	-
**Siganus rivulatus*	3	3	-	2	3	3	2	3	-	-	-	-	-	2	-	-	-	3	3	3	-	1	-	-	-
Sparisoma cretense	-	-	-	-	-	2	2	2	2	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-
Spicara smaris	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**Stephanolepis diaspros*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-
Symphodus roissali	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

STATIONS	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14	T-15	T-16	T-17	T-18	T-19	T-20	T-21	T-22	T-23	T-24	T-25
Symphodus tinca	1	-	-	1	1	1	-	-	-	1	1	-	-	1	-	-	-	-	1	2	-	-	1	-	-
Synodus saurus ?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Thalassoma pavo	2	2	-	2	3	3	-	-	-	-	2	2	-	3	2	-	-	-	2	2	1	-	-	-	-
**Torquigener flavimaculosus*	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	2	-	1	-
Trachurus sp.	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tripterygion tripteronotus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
**Upeneus pori*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xyrichtys novacula	-	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reptilia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chelonia mydas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-

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