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Mediterranean Marine Species in Possible Need of Protection

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MEDITERRANEAN MARINE SPECIES IN POSSIBLE NEED OF PROTECTION

BY

PETER J. HUNNAM

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CONTENTS

1. GENERAL NOTES

1.1 The hydrology of the Mediterranean Sea is one of its most significant, peculiar features. The shapes and orientation of the several basins cause tidal oscillations to be small. Tide-generated horizontal water currents are relatively slow. Water exchange with the adjoining Atlantic, and circulation generally, are poor.

Strong solar heating of the surface layers produces marked, vertical temperature stratification. The return of mineral nutrients to surface waters is restricted and limited generally to coastal upwelling during windy conditions. Nutrients are usually limiting, and offshore waters are very oligotrophic. Biological productivity is low compared to most other seas.

1.2 Mediterranean ecosystems, particularly in the coastal zone, are subjected to numerous major pressures by Man. These include :

- spreading urban, industrial and agricultural developments;
- coastal water pollution by industrial and urban wastes;
- oil pollution problems around ports, along the coasts, and in the open sea;
- tourism and mass recreation developments; leading to severe disturbance of wildlife of remote areas, beaches, islands, etc;
- overfishing, and underwater sport fishing;

The shallow water/ coastal benthic ecosystems are highly vulnerable to many of these pressures. At present it is not possible to relate pollution effects to the threatened survival of any species, but there is no doubt that there is a threat to the general health of the shallow sea communities and biotopes, and to the existence of specific local populations. In contrast to pollution effects, the impacts of disturbance of wildlife, and of commercial or sport fishing, can be highly specific.

1.3 The extent of certain operations which destroy completely particular habitats, is remarkable. One example was recorded by Meinesz in 1977 (*73*), when almost 700 ha of infralittoral zone, which occupied originally 5000 ha, had been destroyed completely in one district, by the construction of harbours, beaches, etc. See also Bourcier (1976, *25*).

1.4 Posidinia oceanica, a Phanerogam, occupies enormous areas of the Mediterranean infralittoral zone, from 2-3 m down to 35 m depth range. It is an extremely important species, a) as a primary producer, b) as a sediment trap and stabiliser, and c) because of

the lushness and diversity of its floral and faunal associates, and the niches it provides. For both temporary and permanent inhabitants, the grass's dense stands provide shelter, food, spawning and nursery grounds.

The conservation and vitality of the Posidinia beds are critical to the equilibreum of the various benthic ecosystems of the entire continental shelf. The effects of pollution by urban and industrial effluents are recorded in various studies (*15,17,53, 67,72,83,85,86,*). There is no doubt that its distribution and depth range become markedly restricted, the plants become unhealthy in various ways, and the associated biota become impoverished.

1.5 Another important and characteristic Mediterranean benthic community that is particularly vulnerable to pollution, and is best known and best developed off the coasts of France and Spain, is the Coralligenous biocoenose. It is a rocky substrate community, composed of coralline algae, and colonial, sessile suspension feeders: Sponges, Hydroids, Gorgonians, Alcyonarians, and Bryozoans.

1.6 Aquaculture : The commercial culture of a species influences not only its status in a locality, but also the fauna, flora and ecology generally of the local, naturally-occurring communities.

There is considerable potential for aquaculture in the Mediterranean, based upon a long experience of breeding fish and shellfish; a suitable climate, and a large local market for consumption. Brackish-water culture is particularly important, and there are large bodies of suitable water around the Mediterranean coastline. Charbonnier (*32*) tabulates 98 brackish-water basins, enclosing a total of over 1×10^6 ha.

A 1974 review by FAO (*64*) lists species being cultivated, by country or region. The Mediterranean list includes 6 species of Molluscs, 13 species of Fishes, and the 3 main Sponge species.

1.7 Protected areas: The establishment of an adequate network of protected areas would be a significant contribution to the maintenance of adequate populations of most species covered in the present study. More data on the distribution, and life history of the species involved are needed however to provide a suitable base for the selection of the best areas for protection.

1.8 Information needs: This study concentrates on species subject to some form of exploitation. On the one hand they are those most likely to require specific conservation measures. On the other, very limited information unfortunately exists on the status of marine species which are not exploited.

2a. SPONGES, COMMERCIAL/ HORNY

1. SPECIES/ TAXA INVOLVED

Spongiidae

Hippospongia communis (= Spongia equina = H. e. elastica)	Honeycomb, Horse, Eponge Commune, Equine, Venetian
Spongia (=Euspongia) officinalis (= S. agaracina = S. o. agaracina = S. o. lamella = S. o. adriatica = S. o. mollissima)	Bath, Elephant Ear, Flat Potter's, Wash Rag Turkey Toilet Turkey Cup, Solid
Spongia zimocca	Zomocca, Chimousse, Fine Hard, Achmar

2. NOTE ON NOMENCLATURE

Two genera, Spongia and Hippospongia, both in the Family Spongiidae, form the basis of the commercial sponge fisheries of the world. Within Spongia, and possibly within Hippospongia also, are zoologically-recognised, distinct species and varieties: the main ones occurring in the Mediterranean are listed above.

Confusion arises a) because, within a "good species", specimens are separated by commerce into different types, and well as grades, price groups and other categories; and b) because zoologically-distinct species or varieties are sometimes grouped under the same commercial name.

(Good plates of the various varieties of Spongiid Sponges from the Mediterranean and the Caribbean are in Moore (1908) (*76*) and Dracos (1969) (*37*).

3. BIOLOGY

The Spongiid or Horny Sponges form massive colonies, with a basal attachment to a firm anchorage on the substratum. Water is pumped slowly through the mass; supplying suspended food particles and facilitating respiratory gas exchange.

The above species occur throughout most of the Mediterranean sub-littoral, and in commercial quantities and qualities east from the Gulf of Lyons on the northern coast and from Algeria on the southern.

Beds of Spongiid Sponges occur on rock outcrops and on sediments in which hard fragments are available for attachment. They apparently flourish in shallower, warmer water, but away from wave action damage. If restricted at depth, this is due presumably to cold and/ or dark conditions. During the present study, no details of depth distribution limits were found. The commercial fishery is recorded as operating in depths of 80 -90 metres, with sponges "too large and flabby to be of commercial value below 80 m or so" (*37*).

On the Algerian and Moroccan coasts, the above species' growths are restricted, apparently by cold water flowing in from the Atlantic. No commercial collection is recorded.

In Tunisian waters the preferred or typical habitat is on shallow, well-lit, rock outcrops amongst sand which is stabilized by sea-grass and algae. H. communis occasionally attaches to or grows around roots and rhizomes of the sea grass (Posidinia oceanica), which alters the sponge's growth form (and its value). (*96*).

In the Marseilles region, Spongia spp. are found especially on rock and in caves and crevices where there is some light (*107*). They are described as important elements of the Coralligenous community, of sessile, suspension feeders. This community has a "particularly high and significant diversity" of all sponges: Sara (1973) (*98*) described an incomplete list of about 100 species. The Coralligenous community is fragile and vulnerable to pollution (*85*). Sponges harvested commercially in the Marseilles region were listed as S. officinalis, S. zimocca, S. agaracina, and, as fairly uncommon, H. equina (*107*).

No figures on growth rates in the wild were found during the present study, but in culture, H. gossypina, a Caribbean species, was found to double or treble in volume in a year (*76*).

H. commmunis grows up to 50 -60 cm in diameter in the sub-tropical parts of the Mediterranean, whilst 10 cm was recorded as normal in the Provencal region (*107*). In large specimens, a central necrosis is often seen; due probably to inefficient respiration and excretion, related to the reduced surface area : volume ratio. S. officinalis is smaller, up to 20 cm in diameter usually, but occasionally to 50 cm.

A total wet weight of 9732 g was recorded for 40 specimens of H. communis, and of 112 g for 2 specimens of S. zimocca (*96*). In the same study, a "representative, unharvested bed" on the Tunisian coast held 9 large specimens of H. communis in the main 200 m^2 quadrat, and between 3 and 25 specimens per 100 m^2 surveyed in similar areas nearby.

4. USE

Horny Sponges are harvested from the sea-bed; processed by decomposition in air, kneading, washing and sometimes bleaching and cutting; and used in a variety of trades.

Mediterranean Sponges have been used since Greek times at least for personal and household purposes. Today, they are still important in the pottery, jewellery and leather industries for polishing, as surgical sponges, and also as toilet sponges, art materials, desk sponges, etc..

The Spongiid Sponges form the basis of fisheries in several parts of the world. They are characterised by branching, elastic fibres of spongin, in a well-developed network. Spongin is a horny, proteinaceous substance, chemically similar to silk. The quality of the processed sponge product is determined by its softness, fineness , compactness and water-absorbing power.

The finest and most valuable commercial Sponges come from the Mediterranean. The best of all are reputed to be those from Mandruka (Egypt), and a few other, more-easterly sites. Sponges are harvested commercially in/around Marseilles, Corsica, the Adriatic, the Greek Islands, Turkey, Syria, Lebanon, Egypt, Libya, Tunisia, Crete, Cyprus, Lampedusa, and the Dardanelles.

H. communis is the principal, most common species collected in the Mediterranean, but does not fetch the highest prices; being relatively coarse and hard.

5. METHODS OF COLLECTION

Nowadays, Sponges are collected by hand, by divers using a variety of types of equipment. Dracos (1969) (*37*) tabulates changes in relative numbers of divers using the Scaphander, Fernez and Nargille,(3 outfits using surface air supply and weighted divers), and SCUBA (aqualung) and those free, breath-hold diving, from Kalymnos (Greece).

In the same paper, the depth capabilities of the different gears are described : hard-hat (Scaphander) in depths from 60 to 80 m; Fernez and Nargille from 30 to 60 m; SCUBA down to 30 m.

Bottom trawling is used still for Sponge collection in some areas, particularly to reach deep beds, and mainly by Turkish and Tunisian Sponge-fishermen (*37).*

No recent study was located of the comparative effectiveness and impact upon the Sponge bed and the benthos generally, of the various methods of harvesting. Presumably the bottom trawl does great damage to the biologically-stabilised, mixed, sediment-rock sea bottom over which it is dragged, and to the biota generally, as well as to the specimens of Sponge gathered. It is of course unselective with regards to what is scraped up; including the variety, quality and size of Sponge.

Diving methods are highly selective. They cause little or no damage to non-target species and sea-bed. Sponge specimens can be chosen individually, visually. Diving is an expensive way of fishing, with severely-limited bottom time. The surface air umbilical of the hard-hat diver restricts mobility greatly in comparison to the SCUBA-equipped diver, who is thus able to explore and collect from awkward places : caves, crevices, overhangs.

6. COLLECTION HISTORICALLY

The Horny Sponges must have been known originally from specimens torn off the sea-bed during severe wave action, and cast up on the strandline.

Two good papers describe the history of the Sponge industry (*37,76*) "In ancient times...a race of bold and hardy fishermen", centred upon the Aegean (The Cyclades and Sporades : Rhodes, Cos, Symi, Kalymnos, Samos, Patmos, Hydra, Kharki, Crete), operated in all parts of the Mediterranean and in the Caribbean and Gulf of Mexico

Wading-and-grabbing-with-a-toe; breath-hold diving, and harpooning from small boats are the oldest methods. It is remarkable that breath-hold divers were able to collect from depths down to a recorded 240 to 250 feet (80 m) (*37*), although for a very short bottom time.

Dredges and the Scaphander became important methods at the end of the 1800s, but have always been criticised on the grounds of excessive damage caused to the sea-bed and Sponge stocks, and of excessive numbers of Scaphander deaths. 25 % of the Sponges collected by trawling/ dredging may be damaged (*37*).

In the early 1900s, the Sponge fishery was the most important and profitable of the Aegean fisheries : in 1903, 318 boats and 4 000 to 5 000 men were employed (diving : 134 boats, 600 divers and 1255 support men; harpooning : 122 boats and 443 men; dredging : 36 boats and 173 men (*37*)

7. EXPLOITATION AND CONSERVATION

Generally, statistics on the Sponge fishery and trade do not distinguish between the several species involved. However, a breakdown of the "total annual catch" of Egyptian Sponges is as follows, (of 25 tons total dry weight): (*2*)

Honeycomb, "S. officinalis" (presume H. communis)	- 15 tons
Turkey Cup, S. officinalis	- 6
Zimocca, S. zimmoca	- 4

In general terms, the level of exploitation of Mediterranean sponge beds has been determined by the market demand and value, by the discovery of un-worked, or sufficiently recovered/ re-grown beds each season, by the introduction and improvement of the various items of diving hardware.

The following countries have currently active commercial Sponge fisheries within their sea areas : in probable order of importance, Greece, Turkey, Tunisia, Egypt, and possibly Syria, Libya, France, Spain, Albania.

The Egyptian Sponge fishery was described in 1969 (*2)* as exploiting a strip of sea-bed parallel to the coast between Alexandria and Sallum : some 500 km distance and about 6 km wide to cover the depth contours 15 to 50 m. "Skin diving" (breath-holding ?), trident harpoon and hard-hat equipment were employed at that time. Sponge beds below 50 m or so are relatively un-worked apparently.

Recent figures for production and for import-exports are collected by FAO and IUCN-Traffic. A selection are reproduced as Tables 2.1&2. Moore's thorough 1908 account (*37*) quotes prices and catch values and some weights for different areas and countries for the second half of the 19th Century.

In 1908, Moore considered that all exploited Sponge beds were showing signs of depletion - in some cases, conspicuously - due to the intensity of the fisheries over the preceding years. He recorded that throughout the Aegean, good Sponges had become scarce, outside caves, overhangs etc, following the increased use of hard-hat diving. For the Adriatic, he noted that 'severe overfishing' had reduced local production to an unimportant level. Decreases in catch per effort were compensated for, by increases in unit value. Demand increased steadily, until artificial sponges became abundantly available, in the 1940s.

Underwater scientific study in 1976 in Tunisian waters (*96)* revealed that usable Sponges (H. communis) were common outside the normal fishing grounds. From his observations, Rutzler considers that overfishing is widespread in Tunisia, and that the commercial quality of Sponges harvested is decreasing.*(97)*

No field studies or reports on the rate of regeneration of Sponge beds following harvesting were found, nor any indication of whether a Sponge colony grows again, in a usable form, from the base left on the substrate after tearing off the main mass, and, if so, how important a process this is in the wild.

The official statistics found are inadequate, in terms of incompleteness, absence of fishing effort data and of harvested quantities in relation to natural populations, so that it is not possible to assess what is happening to the Mediterranean stocks of the 3 species involved.

The nature of the Sponge fishery - finding an unworked bed and clearing it - makes it an efficient way of removing all large specimens from that area. On the other hand, small colonies are not taken; sexual reproduction commences, probably whilst the size is still very small; deep populations are not exploited intensively; the species are distributed widely.

Moore (*37*) urged stock conservation measures in 1908; stressing that many of the beds could be fished profitably only because of increases in trade prices for Sponges. He recommended :

- increase in minimum size taken, to 5 inches (13 cm);
- banning hard-hat diving below 20 fathoms (37 m);
- banning dredges above 30 fathoms (55 m);
- encouraging Sponge culture;
- set close seasons.

TABLE 2.1 **Sponge production in the eastern Mediterranean, 1854- 1978 (metric tons)**

YEAR	GREECE	TURKEY	CYPRUS	SYRIA	EGYPT	LIBYA
1854	?	?	?	?	?	0
1884	?	?	?	100*	?	0
1885	?	?	?	100*	?	0
1889	?	?	?	100*	?	1st yr
1890	?	?	?	?	?	32
1892	?	?	?	?	?	68*
1894	?	?	?	?	?	68*
1896	?	?	?	?	?	68*
1900	120	?	?	?	?	68*
1901	190	?	?	?	?	?
1902	?	?	?	?	?	?
1903	?	?	?	?	?	?
1904	?	?	?	?	?	102
1905	?	?	?	?	?	60
1906	?	?	?	?	?	62
1907	?	?	?	?	?	57
1908	?	?	?	?	?	45
1938	?	?	?	?	?	+
1940	?	?	?	?	?	?
1941	?	?	?	?	?	?
1942	?	?	?	?	?	?
1943	?	?	?	?	?	?
1944	?	?	?	?	?	?
1945	?	?	?	?	?	?
1946	?	?	?	?	?	?
1947	?	?	?	?	?	?
1948	?	?	?	?	?	+
1958	*100*	*100*	?	?	?	+
1959	?	?	?	?	?	+
1960	?	?	?	?	?	+
1961	*100*	*100*	?	?	?	+
1962	*100*	+	?	?	?	+
1963	*100*	*100*	*100*	?	?	*0*
1964	*100*	+	?	?	?	*0*
1965	*100*	+	+	?	?	?
1966	*100*	+	*0*	?	?	?
1967	*100*	+	*0*	?	?	?
1968	*100*	+	*0*	?	?	?
1969	*100*	+	*0*	?	?	?
1970	*100*	+	*0*	?	*0*	?
1971	?	*100*	*0*	?	*0*	?
1972	?*(37)*	*100(19)*	*0*	?	*0*	?
1973	?*(53)*	*100(21)*	*0*	?	*0*	?*(6)*
1974	?*(30)*	*100*	*0*	?	*0*	?*(17)*
1975	?*(52)*	*30*	*0*	?	*4*	?*(3)*
1976	?*(58)*	*7*	*0*	?	*6*	?
1977	?	*7*	*0*	?	*5*	?
1978	?	*7*	*0*	?	*5*	?

Sources :

FAO (*41*) = *italics*

IUCN (*62*) = *(italics)*

(*27*) = Turkey 1940- 45

(*37*) = pre-1938

\+ = under 100 mt

* = estimates

? = no data found

TABLE 2.2 Sponge production in the central Mediterranean, 1854- 1978 (metric tons)

YEAR	YUGOSL.	ITALY (Sicily)	FRANCE	SPAIN	TUNISIA
1854	?	?	?	?	120
1884	?	?	?	?	90
1885	?	?	?	?	90
1889	?	?	?	?	?
1890	?	?	?	?	110
1892	?	?	?	?	90
1894	?	?	?	?	115
1896	?	?	?	?	100
1900	?	?	?	?	96
1901	?	?	?	?	?
1902	?	31	?	?	?
1903	?	45	?	?	?
1904	?	37	?	?	106
1905	?	?	?	?	?
1906	?	?	?	?	?
1907	?	?	?	?	?
1908	?	?	15		?
1938	?	?	+	?	*100*
1940	?	?	?	?	?
1941	?	?	?	?	?
1942	?	?	?	?	?
1943	?	?	?	?	?
1944	?	?	?	?	?
1945	?	?	?	?	?
1946	?	?	?	?	?
1947	?	?	?	?	?
1948	?	?	+	?	*100*
1958	?	?	*0*	?	*200*
1959	?	?	?	?	?
1960	?	?	?	?	?
1961	?	?	*0*	?	?
1962	?	?	*0*	?	?
1963	?	?	*0*	+	?
1964	?	?	*0*	+	?
1965	?	?	*0*	?	?
1966	?	?	*0*	?	*100*
1967	?	?	*0*	?	*100*
1968	?	?	*0*	?	*100*
1969	?	?	*0*	?	*100*
1970	?	?	*0*	?	*100*
1971	?	?	*0*	?	*100*
1972	*?(2.5)*	?	*0*	?	*100(76)*
1973	*?(0.3)*	?	*0*	?	*100(68)*
1974	*?(4.7)*	?	*0*	?	*43(72)*
1975	*?(2.0)*	?	*0*	?	*+(60)*
1976	*?(3.0)*	?	*0*	?	?
1977	?	?	*0*	?	?
1978	?	?	*0*	?	?

Sources :

FAO (*41*) = *italics*

IUCN (*62)* =*(italics)*

(*37)* = pre-1938

\+ = under 100 mt

? = no data found

2b. SPONGES (excluding commercial, Spongiid sponges)

1. SPECIES INVOLVED

Chondrosia reniformis	Chondrosiidae	Leather Sponge

2. EXPLOITATION

On the Adriatic coast of Yugoslavia (and Albania ?), the Leather Sponge is collected and eaten locally. No details of its distribution or extent of harvesting were obtained.

2c. SPONGES (exotics)

1. NOTE

In 1969, 4 species of Red Sea Sponges were reported to have migrated in to the Mediterranean, presumably through the Suez Canal (*106)*.

3a. PRECIOUS CORAL and BLACK CORALS

1. SPECIES/ TAXA INVOLVED

Coelenterata : Gorgonacea

Corallium rubrum	Coralliidae	- Precious, Red, Noble Coral
?	Antipathidae	- Black Corals
?	Leiopathidae	
?	Dendrotrachiidae	

2. BIOLOGY

These Corals are more-or-less branched, tree-like colonies, supported on an axial skeleton of calcareous sclerites bound into a hard, compact mass. The skeleton colour is usually red to pink, but also white, brown or black.

The colony is attached permanently to a hard (rock) surface by a spreading, basal plate, to stand proud of the rock face. C. rubrum grows to 25 cm to 50 cm in height. Polyps in the softer covering use tentacles to trap water-borne food particles drifting past in water current.

These species are found on bedrock in places with low light, including caves, at depths below 50 m to 200 m (but able to live from 15 m downwards).

Details of the geographical distribution limits of these species within the Mediterranean were not found during this study. C. rubrum is recorded also in the Pacific/ Japanese seas, but is probably a distinct species

3. USE

Precious Coral and Black Corals have been collected in the Mediterranean "from antiquity", mainly to be worked into Jewellery. Romans used Corallium powder as a medicine. Today there is a flourishing Coral jewellery trade; in Holland carved pieces are still valued as heirlooms; in several countries it is a bankable asset.

The thickened skeleton and branches of larger colonies are cut and polished, by tumbling in abrasive after brushing.

The colour, size, section and degree of "porosity" determine a piece's value. White, dark red and good pink (all Corallium spp.) fetch the highest prices, while black is less expensive. Pieces dredged up are relatively small - 2 to 10 cms long - and less valuable. 1980 prices for this "rough" quality seem to be around US Dollars (USD) 300 per kilo, compared to a 1970 price of USD 40 per kilo. Larger pieces will have been brought up by divers, may be 2 cms thick and 15 cms or more long, and would fetch USD 400 to 600 per kilo. Large pieces of good colour, which have been cut from the central section, fetch the highest prices : up to USD 2,000 per kilo, to the jewellery manufacturer.

4. EXPLOITATION

Apparently, most of the Black Corals used nowadays comes from the Phillipines, and no details of their exploitation in the Mediterranean - historically or recently - were found during the present study. The following discussion is based upon C. rubrum exploitation.

Collection of these Corals is by diving or dredging. Most diving is done on compressed air with SCUBA, but in the past few years several divers have been using oxygen-helium breathing mixtures. Compressed air divers work down to 60 - 70 m; oxy-helium divers down to 90 - 100 m. Presumably, hard-hat equipment, with surface air pump, was used previously, and breath-holding, free diving originally. The diver is able to search thoroughly, select visually and pick off individual colonies.

Dredges have been used,apparently sporadically throughout the history of Precious Coral collecting. The gear, known as the "Ingegno", consists of a heavy iron cross, to which are attached small baskets to catch the coral fragments. As mentioned above, the coral is badly broken up and therefore less valuable, but presumably, the conditions - excessive depth, bad weather, strong currents, extensive area, or perhaps urgency - make it worth-while occasionally.

The style of the fishery seems to be as follows : discovery of an un-worked site, followed by a "gold-rush"level and type of collection, until the site is stripped of all sufficiently-large specimens which were accessible. It is an opportunistic business : standard fishing boats and fishermen are easily converted to coral-diving or dredging, and a newly-discovered rich site might be invaded by several hundred "corailleurs" boats and crews.

One particular community close to Naples has a tradition of coral fishing and trade control going back over hundreds of years. The industry is reported to be Italian-dominated, and controlled by a skilled, select and apparently, fairly secretive group.

Specific cases demonstrate the pattern of Precious Coral exploitation : A few years ago, an important ground off southern Sicily was being "worked" in a tight, "closed-shop" manner by several groups of Italian divers. The locality's C. rubrum was a distinct orange-red which fetched very high prices. Today that ground has been largely cleared. Most of the Mediterranean supply is coming now from the west and north coasts of Sardinia and Bolsa; an area which has been "producing" for the past 10 years or so.

An area off Corsica is reported to have been designated as "open" and is being worked by French divers and dredgers. A small amount of C. rubrum is collected in Spanish waters.

Whilst C. rubrum does occur in other countries, the fact that its exploitation is largely an Italian preserve restricts catches. For example, in Algeria, Morocco and Yugoslavia (and Albania ?), there has been little or no collection, apparently due to the lack of knowledge and trained individuals locally, and the legal exclusion of foreign Corailleurs.

No details were obtained on the Tunisian fishery. FAO statistics (*41*) record large hauls of C. rubrum there, as well as from France. FAO statistics record no Precious Coral catch for Italy, and none since 1965 for Spain.

Many Coral jewellery manufacturers are based in Naples, and it is believed that their supplies of Corallium spp. are augmented by imports from the Far East, and from Japan in particular. It seems that about 90 % of Precious Coral exported from Italy is in the form of a finished product. Some 30 % of a coral branch's weight is probably wasted in cleaning, cutting and polishing.

5. STATISTICS

The accompanying Tables are extracts from FAO fisheries statistics (*41*), Table 3.1, and IUCN-Traffic records (*62*), Table 3.2

The FAO figures are useful in that they relate to quantities produced within a country's sea area and not an exported fraction. However, the absence of data from some countries, and the apparent inconsistency with which reporting is carried out, combined with doubts that the style of the fishery lends itself to being monitored by voluntarily-reported catches, tend to outweigh that usefulness.

The figures from IUCN Traffic provide no indication of the level of exploitation of Mediterranean Precious Corals, due to the inextricable inclusion of all coral imports and exports to and from these countries. The great bulk of these quantities will consist of Stony Corals.

6. CONSERVATION

It is believed that large specimens of Corallium rubrum are now "extremely scarce in diveable depths" throughout many parts of the Mediterranean, but that there are a few, isolated sites which have never been worked.
This state of depletion is due entirely to collection by divers and dredging.

It seems likely that C. rubrum and the Black Corals are naturally present in low densities and have slow growth rates; such that even a low level of exploitation would probably cause significant damage to a population.

No data on colony densities nor on growth rates were obtained.

The depths to which divers have needed to descend to obtain large specimens has increased steadily presumably, as shallow beds have been discovered and stripped. Great improvements in diving equipment and skills have occurred over the past 30 years; facilitating this extension to the fishable grounds. It is now normal apparently for divers to work down to 60, 80 and 100 m depths.

It can be assumed that none of the species involved is in danger of extinction. The following factors are relevant :

- Colonies which are too small for trade are not collected; diver collection being highly selective; although dredges will smash small and large specimens. (and all other benthic organisms).
- The corals are reproductively mature before they are sufficiently large to be of use.
- Colonies below 80 - 100 m are not heavily exploited.
- A few colonies remain in a worked area, even in shallow water, hidden or inaccessible within crevices

Protection by depth is probably the most important, but it should be noted that in some areas, outcropping rock will be absent below a certain depth; preventing the possibility of a local deep reserve.

Diver-based fisheries of many benthic species are self-regulating, to the extent that below a certain population density it becomes uneconomical to dive on a site. With Precious Coral, the situation is unusual because of the high single specimen value and because of the search-and-strip method of fishery. There may be also an impact from sport-divers, whose activities are not regulated by economics.

Possible measures for conservation of Corallium rubrum and species of Black Coral in the Mediterranean, include :

- restricting participation in the fishery :

  Spain practices a system of permits which requires each collector to be registered, and which may extend to restricting the numbers of participants;

- imposing size limits and catch quotas;

- establishing and managing reserve areas :

  The Meda Islands marine conservation area (Spain) was proposed "in order to preserve and possibly re-introduce Red (Precious) Corals and... Gorgonians" *(9)*

- restricting trade, creating market rejection.

In Hawaii, there is a well-established fishery for closely-related species, Corallium secundum and Antipathes dichotoma. Grigg *(57)* used standard fisheries analysis methods on field and catch data, and concluded that the local populations are in possible jeopardy, due to the absence of any regulation or management. He made recommendations based on restricted entry and on size limits and catch quotas, which were adopted by the State Authorities.

TABLE 3.1 Precious Coral, Corallium rubrum, production figures for Mediterranean countries (kilograms) (Source : *41)*

YEAR	SPAIN	FRANCE	TUNISIA	Totals
1958	0	0	?	?
1961	0	0	?	?
1962	0	0	?	?
1963	+	0	?	+
1964	+	0	?	+
1965	+	0	?	+
1966	0	0	?	?
1967	0	0	?	?
1968	0	0	?	?
1969	0	0	?	?
1970	0	0	+	+
1971	0	0	+	+
1972	0	0	+	+
1973	0	0	+	+
1974	0	0	8 000	8 000
1975	0	0	8 000*	8 000*
1976	0	0	?	?
1977	0	0	?	?
1978	0	4 000	?	4 000

TABLE 3.2 Coral exports (all"corals") from Mediterranean countries (kilograms) (Source : *62)*

YEAR	SPAIN	FRANCE	TUNISIA	ITALY	YUGOSL	Totals
1976	3 000	25 000	?	11 241	108	39 350
1977	2 000	5 000	?	9 890	?	16 890
1978	7 000	76 000	(38)	12 322	?	95 360

? = no figures available

+ = less than 1 000 kilograms

* = estimated (previous year's)

3b. OTHER CORALS and "FALSE CORALS"

1. SPECIES/ TAXA INVOLVED

M = Medit. only

Coelenterata : Gorgonacea, Madreporaria

M	Eunicella cavolinii	Sea Fan, Gorgonian
M	E. singularis	"
	E. verrucosa	"
	Echinomuricea klavereni	"
M	Paramuricea clavata	"
M	P. macrospina	"
M	Cladocora cespitosa	colonial coral
M	Astroides calycularis	"
M	Dendrophyllia ramea	"

Bryozoa

	Sertella beaniana	Mermaid's Veil
M	Myriapora truncata	False Coral

2. NOTES

Various species of Stony and Horny Corals, and also several calcareous Bryozoans ("False Corals") are collected non-commercially or, for some species possibly, semi-commercially, by sport-divers as souvenirs or curios.

Like Precious Coral and Black Corals, these species form delicate, attractive, easily-preserved,structures. They are conspicuous underwater. Several of the species are probably slow-growing; occur in low densities, and possibly have poor recruitment.

Even a low-level, incidental exploitation would probably cause significant damage to a local population.

No data were obtained on population densities, distribution or numbers collected. Some information is probably available at local scientific institutes and diving clubs.

Possible protective measures include :

- voluntary self-control by sport-divers;
- discouragement of trade in curio species;
- establishment of marine reserve areas *(9)*.

Bivalvia (continued)

	Venus gallina	Veneridae	Striped Venus
	V. ovata	"	Oval "
C	V. verrucosa	"	Warty "
C	Venerupis decussata	"	Carpet Shell
	V. pullastra	"	
	V. aurea	"	Golden Venus
M	V. texturatus	"	
	Pitaria chione	"	Brown Venus
	Donax vittatus	Donacidae	Banded Wedge Shell
M	D. venustus	"	
M	D. semistriatus	"	
	D. denticulata	"	
M	D. trunculus	"	
	Ensis siliqua	Solenidae	Razor Shell
	E. ensis	"	"
	Solen vagina	"	"
	S. legumen	"	"
	Mactra corallina	Mactridae	Trough Shell
	M. glauca	"	"
	M. subtrincata	"	"
	Lutraria elliptica	Lutrariidae	Otter Shell
	Pholas candida	Pholadidae	Piddock
	P. dactylus	"	"

M = restricted to Mediterranean

C = cultured in Mediterranean

2. EXPLOITATION

The species listed above are those which are exploited in the Mediterranean. The majority are harvested to be eaten, either for personal consumption or commercially. There is in addition some trade in Mother-of-Pearl and shell. The two Conch Shells are collected, probably in low numbers as an incidental catch, and by sport-divers, and sold as curios, and the Ormers may also be sold as curios.

The distribution limits of those species which are restricted to the Mediterranean were not examined in the present study, but it is probable that there are quite large differences in the Molluscan faunas between east and west, and north and south. For these Mediterranean species, no figures were obtained on specific levels of exploitation, nor on population densities.

Little information on species rarity was found. The Rough Pen Shell, Pinna nobilis, is referred to as a rare species present within the boundaries of Port-Cros National Park, France (*9*)
Pen Shells of this species grow to 50 cm in length, and occur in shallow sandy-mud at sheltered sites, half-buried vertically in a permanent position in the substrate. Specimens which reach this size are undoubtedly many years old. The adductor muscle is a highly-prized food.

4a. MOLLUSCA (excluding Cephalopods)

1. SPECIES/ TAXA INVOLVED

Gastropoda

M	Haliotis lamellosa	Haliotidae	Common Ormer
	H. tuberculata	"	Green Ormer
M	Patella safiana	Patellidae	Limpet
M	Monodonta turbinata	Trochidae	Topshell
	Littorina littorea	Littorinacae	Edible Periwinkle
M	Cerithium vulgatum	Cerithidae	Common Cerith
	Cassidaria echinohora	Cassididae	Helmet Shell
	Tritonalia nodifer	Cymatiidae	Conch Shell
M	Ranella gigantea	"	"
M	Murex brandaris	Muricidae	
M	M. trunculus	"	
	Ocenebra erinacea	"	Sting Winkle

Bivalvia

M	Solenomya togota	Solenomyidae	Awning Clam
M	S. mediterranea	"	"
	Arca noae	Arcidae	Noah's Ark
M	A. barbata	"	Bearded Ark
	Mytilus edulis	Mytilidae	Common Mussel
MC	M. galloprovincialis	"	Mediterranean Mussel
M	Lithophaga lithophaga	"	Date Mussel
M	Avicula hirundo	Pteriidae	Wing Oyster
	Pinna squamosa	Pinnidae	Common Pen Shell
	P. nobilis	"	Rough "
M	P. rudis	"	
M	Pecten jacobeus	Pectenidae	Fan Shell
	P. maximus	"	Common Scallop
	Chlamys opercularis	"	Queen "
	C. varia	"	Variegated "
M	C. glabra	"	Smooth "
M	Spondylus gaederopus	Spondylidae	Thorny Oyster
	Anomia ephippium	Anomiidae	Saddle Oyster
C	Ostrea edulis	Ostreidae	Flat Oyster
	O. plicata	"	Mediterranean "
C	Crassostrea angulata	"	
	Isocardia cor	Isocardiidae	Heart Shell
	Cerastoderma aculeatum	Cardiidae	Spiny Cockle
	C. echinatum	"	Prickly "
	C. tuberculatum	"	Rough "
	C. edule	"	Common "
M	Laevicardium oblongum	"	Oblong "

The Date Mussel Lithophaga lithophaga, and the Piddock, Pholas dactylus, bore into limestone rocks in the intertidal. Substantial damage is caused by their collection. Available habitat is permanently destroyed, and all individuals animals are killed.

Bottom dredging, beam trawling etc. are other collecting methods which cause unjustifiable damage to the habitat and local community as well as the target species.

Many of the Molluscs listed occur intertidally or in the shallow sublittoral: Gastropods are particularly important members of intertidal faunas. These populations are very readily accessible to collection, and are most vulnerable to various prevalent forms of pollution, including oil and sewage discharge.

3 STATISTICS

Table 4a.1 records the recent production of the principal commercial species or groups of species of Gastropod and Bivalve Molluscs. Table 4a.2 records recent production of "Pearl, Mother-of-Pearl, Shell, etc". No information was found on which species form the basis for this latter production. Figures for both Tables are extracted from FAO statistics (*41)* covering the whole Mediterranean.

The only Gastropod species collected in sufficient quantities to be recorded separately in FAO statistics is the Periwinkle, Littorina littorea. Any other Gastropods are amalgamated with minor Bivalve and Cephalopod Molluscs as "Other marine Molluscs" in the accompanying Table 4a.1

An intensive fishery for Donax trunculus is reported (*2*) to yield 3 000 - 5 000 tonnes per year from the littoral sand along the Nile Delta coast of Egypt. The small dredges are dragged through the shallows by a man or an ox.

4 CULTURE

Several Bivalve species are now cultivated in the Mediterranean, mostly in coastal lagoons and brackish-water lakes (*32,64)* These are marked "C" in the above list. For some species, for example Crassostrea angulata, introductions for cultivation increase the species distribution range. Small beds of C. angulata in the Po delta region were reported to be recovering from "undisciplined overfishing that had recently almost depleted them" (*33*).

TABLE 4a.1 Gastropod and Bivalve Molluscs production by the Mediterranean countries as a whole, 1971 - 1978 (metric tons) (Source : *41)*

SP./ GROUP	1971	1972	1973	1974	1975	1976	1977	1978
L.littorea	100*	0	?	40	11	35	341	150
O.edulis	300	200	400	288	295	266	157	214
C.angulata	800	900	1 000	2 047	2 406	4 700	5 258	3 574
M.edulis	10 000*	12 500	16 800	10 332	7 159	8 424	6 773	5 756
M.galloprov.	19 600	18 100*	14 500*	6 247*	4 898*	5 377	4 803*	5 067*
P.maximus	200	200*	200*	227*	230*	218*	214*	202*
C.edule	900*	800	800	2 500	998	1 631	510	515
V.gallina	500*	600	400	200	174	?	1 629	1 316
V.decussata	+	+	100	200	228	190	96	3
V.pullastra	500*	600	1 000	1 082	983	659	1 349	1 767
Solen spp.	+	0	0	0	1	4	0	0
Other marine Molluscs	21 300*	27 700*	19 000*	38 056	62 273	51 763	24 381	22 001*

S

* = estimated
\+ = less than 100 mt
? = no figures available

TABLE 4a.2 "Pearl, Mother-of-Pearl,& Shell" production by Mediterranean countries, 1970 - 1978 (metric tons) (Source : *41)*

YEAR	BULGARIA	YUGOSLAVIA
1970	700	100
1971	300	100
1972	0	100
1973	0	100
1974	0	58
1975	0	61
1976	0	176
1977	0	193
1978	0	92

Catches for the Mediterranean as a whole are recorded by FAO *(41)*. The main commercial species are caught in sufficiently large quantities to be reported separately, and these are shown by country and by year in Tables 5.1 to 5.12., indicating, to an extent, the distribution of fishing effort for each species, and any trends in catches.

The Norway Lobster, Nephrops, is a highly-prized food species, bottom-trawled in very large quantities (see Table 5.8) on silt and muddy sand bottoms in deep water. The fishery damages large areas of this fragile biotope, which supports a variety of sessile and burrowing benthic animals. Damage to non-target species and habitat recovery processes and rates are not documented.

The Mole Lobsters, Palinurus, Homarus, and Cancer are large (respective lengths up to 35, 50, 50 and 25 cms) Lobsters and Crabs found on rocky and mixed ground and sometimes on sand, in holes, crevices, caves. They are caught commercially in the Mediterranean, as main target species using portable, baited traps, tangle nets, and SCUBA divers. Commercial quantities are taken also as incidental catches - ie during fishing for other species - and this may account for the bulk of the production of some species.

For example, both Palinurus and Homarus are caught throughout the Aegean and Greek Ionian Seas, in gill nets, set nets, long-lines, fyke nets, etc, fishing in 30 to 400 m water depths for species of fish (*78*). The fishery is seasonal; peaking in July to October. There is a minimum legal length for both species of 20 cms.

Spider Crabs, Maja squinado, migrate and aggregate in shallow water. Local stocks may be particularly vulnerable to over-fishing during this period. Maja squinado has been re-introduced to the Gulf of Trieste, following depletion by over-fishing (*(30)*).

Quantities of Palinurus, and, to a lesser extent, Homarus, Cancer and Maia, may be taken non- or semi-commercially by sport-divers.

FAO statistics record catches of "Palinurus spp." and Homarus gammarus, Cancer pagurus and Maja squinado throughout the Mediterranean and extracted figures on production for these species by country and by year are shown in Tables 5.7,5.9 to 5.11.

Carcinus spp., Macropipus puber, Callinectes sapidus are smaller crabs which are found, locally in large numbers, on the shore and in shallow water on various substrates. They are caught by hand, nets, harpoon, and small trawl. Carcinus mediterranea is recorded specifically in FAO statistics. See Table 5.12. Callinectes sapidus is an important food species on the eastern seaboard of North America. No details of its introduction to, or distribution within the Mediterranean were obtained during the present study.

6. SEA URCHINS

1. SPECIES INVOLVED

M = Medit. only

Echinodermata : Echinacea

M	Arbacia lixula	Arbaciidae	Black Urchin
M	Sphaerechinus granularis	Toxopneustidae	Violet Urchin
	Echinus acutus	Echinidae	
	Paracentrotus lividus	"	Purple Urchin

2. BIOLOGY

Sea Urchins are mobile grazers on algae, encrusting animals and detritus. A. lixula is common in shallow, rocky areas, whereas E. acutus occurs in deep water (below 20 m) on rocky and silty bottoms. Both grow to a maximum diameter of about 15 cm. S. granularis and P. lividus are found on algae-covered rocks and amongst sea grass and on sand in shallow coastal waters, and also down to around 100 m and 30 m respectively. Both reach maximum diameter at 10 - 12 cm.

A. lixula and P.lividus are sometimes confused with one another.

3. EXPLOITATION

Large numbers of Urchins are gathered in the Mediterranean for their edible roes. Paracentrotus (= Strongylocentrotus) lividus is the only Urchin recorded in FAO fishery statistics and France is the only country recording any commercial exploitation. See the accompanying Table 6.1 *(41)*.

It is not known whether the figures are based upon whole animal weights or on extracted, eaten portions. No details of the fishery distribution, methods or intensity were obtained. Presumably, the fishery has two bases :
a) collection in shallow water by hand and, possibly, small trawl; undertaken specifically for the Urchins as a long-established artisan fishery; and
b) a deeper-water, boat-based fishery; taking Urchins in bottom trawls either as main target species or as incidental catches in a fishery for Prawns, Scallop, etc..

The exploitation of Sea Urchins has repercussions beyond the direct impact upon local populations of the species, although this may well cause severe depletion in some areas. Urchins are important omnivores whose selective and great grazing powers may play an important part in determining the balance between stands of different sessile species.

TABLE 6.1 Purple Sea Urchin, Paracentrotus lividus, production figures for the Mediterranean, 1971 - 1978 (metric tons) (Source : *41)*

YEAR	FRANCE & Totals
1971	0
1972	0
1973	0
1974	470
1975	385
1976	311
1977	216
1978	304

7. ASCIDIANS

1. SPECIES INVOLVED

M = Medit. only

M Microcosmus sulcatus Pyuridae Grooved Sea Squirt

2. BIOLOGY

Microcosmus sulcatus is a large (up to 20 cm long), leathery-bodied, solitary ascidian. It grows in deep water (20 m and below), attached permanently to stony, shelly, and mixed silt-gravel substrates. It often occurs in dense, large groups.

3. USE and EXPLOITATION

M. sulcatus is an edible sea squirt which is collected in great quantities in the Mediterranean. FAO statistics (*41*) record exploitation only by France (see accompanying Table 7.1)

The fishery is presumably by bottom dredging, although no details were obtained. No data on fishing effort or trends were obtained, so it is not known whether the reduction in catch totals shown by the figures in Table 7.1 is due to a diminishing resource.

The quantities gathered in the early 1970s and possibly through the late 1960s also, indicate that extensive areas of sea-bed were probably being scoured for their M. sulcatus populations.

It is possible that damage to the benthic habitat and community may be caused by dredging, to the extent that regeneration is slow or halted. If this is the case, the sea squirt fishery will have been dependent upon discovering and exploiting new grounds each season.

More information is required on the species' biology, distribution and ecology, and on the fishery techniques, distribution, intensity and effects on the benthos.

TABLE 7.1 *Microcosmus sulcatus* production figures for the Mediterranean, 1964 - 1978 (metric tonnes) (Source : *41)*

YEAR	FRANCE & Totals
1964	500
1965	200
1966	200
1967	600
1968	500*
1969	400*
1970	800*
1971	600
1972	600
1973	500
1974	155
1975	141
1976	124
1977	114
1978	105

* = estimated from previous year's

8. FISHES

1. CHARACTERISTICS OF THE MEDITERRANEAN FISH FAUNA

The peculiar aspects of the Mediterranean fish fauna include :

- a high degree of endemism;
- boreal affinities, and tropical and sub-tropical affinities, including immigrants from the Red Sea;
- Atlantic species, decreasing from west to east;
- a very rich continental shelf fauna, contrasting with a species-poor bathyal fauna. (*71)*

There are some 500 species of fishes in the Mediterranean. Of these, 77 are probably endemic (including 6 Chondrichthyes species and 71 Osteichthyes), plus another 20 which are essentially Mediterranean, gives a total figure of around 100 species. There are also some 20 sub-species which are endemic.

This is considered to be "a remarkable degree of endemism".... "The ecological and ethological features of these forms are very different" (*105*). The danger is stressed as follows : "increasing pollution of many coastal areas is now a serious danger for the Mediterranean fauna. More than one endemic fish species is likely to become scarce, if not disappear.....Small, euryhaline forms like the Gobiidae, are most endangered. Changes of habitat have already reduced several populations of Aphenius fasciatus and other small fish found only in the Mediterranean."(*105)*

The Mediterranean fish fauna is relatively heterogenous. (This applies probably to other taxa also). Differences in biota between the different basins and sub-regions of the Mediterranean reflect differences in prevailing ecological conditions. The continental shelf fauna is extremely varied, whilst the deeper slope and bathyal areas are species-poor. Most of the endemic species are of the littoral or benthos, and some are limited to particular localities, such as Syngnathus taenionotus, to the Adriatic (*105)*.

2. CHARACTERISTICS OF COMMERCIAL FISHERIES (*6,32,38,42,43,44,46,48,52 58,66,110)*

2.1 The biological productivity of the Mediterranean as a whole is lower than that of most other sea areas. This is due to the peculiar hydrology of the basin : slow water exchange and marked vertical stratification lead to restrictions in supplies of nutrients, a) generally, and b) to surface layers. The densities of fish stocks and their fisheries potential are naturally rather low.

2.2 Exploitation of fish species in the Mediterranean has been characterised by local fisheries, which have been operating intensively, often for long times. Until the late 1960s, "Mediterranean fisheries still adhered to traditional patterns, and the gear in use had remained virtually unchanged." (*48*)

Mediterranean fisheries still include a significant artisanal component: a considerable number of fishermen exploit a wide range of animal species by methods which are diverse in nature and in scale. These fisheries tend to be concentrated in shallow, coastal waters and the littoral zone, and include those of the "gathering" type, using very simple, hand-operated equipment.

2.3 In the last 10 to 15 years, there have been many instances of industrial-scale operations being adopted; employing large-tonnage vessels, working offshore, with deep bottom trawls, purse seines, power blocks, etc.. (For instance, for the development of Maltese fisheries, trawlers and the "trawlability" of the sea-bed are emphasised (*47*)

2.4 The total Mediterranean production is low, and represents only one-sixtieth of the total world catch. However, the economic value of the Mediterranean catch is greater than that of the N.W.Atlantic or S.E.Pacific. This is due to the luxury value of fresh fish, especially some species of shrimp, shellfish, and demersal fishes. The unit price of demersal species is, on average, seven times higher than in other parts of the world. Demand often exceeds production, especially when tourism demand is high.

2.5 Most demersal stocks along the northern coasts are heavily overfished. Increases in effort would have little benefit to catches. Regulatory measures (on mesh sizes, closed areas and periods, gear employed, etc) are needed in order to maintain catch rates.

Overfishing is exemplified by Italian fisheries, in the Ionian, Adriatic and around Sardinia. In the latter area, yield of demersal catches decreased from 68,000 metric tons in 1972, to 31,000 mt in 1973 and 1974. "For some time, catches have exceeded the maximum sustainable yield of some stocks"in this area (*110*). There is definite evidence of a general decrease in catch per unit of effort, and reduction in size composition of the catch. The Hake, Merluccius merluccius, in the Adriatic and Red Mullet, Mullus spp. in the eastern Mediterranean are cited as examples (*42*)

2.6 Commercial catches for over 100 marine species and species-groups are recorded in FAO fishery statistics for the Mediterranean. Production statistics are not related to fishing effort, so that the figures on catches of some species, as in the accompanying Table 8.1, are difficult to interpret in terms of "healthiness" of stocks.

2.7 Along the southern coast, and particularly the western half, experts consider that increased demersal efforts would produce modest increases in catches.

2.8 Coastal pelagic fish stocks are seen as offering the best prospects for commercial fisheries development; experts considering that fishing intensity can be increased, except on some local stocks.

3. THE ASWAN HIGH DAM AND EGYPTIAN FISHERIES (*2,28*)

Before 1965-66, the total Egyptian fisheries catch was regularly over 25,000 tons per annum. After that time, catches decreased, to stabilise around 12,000 tpa. This is attributed to the Aswan High Dam's prevention of Nile floodwater plus minerals from reaching the Mediterranean. Most reduction in catch has been in Sardine and Sardinellas, which have decreased from 15,-20,000 to less than 3,000 tpa in ten years (1964 to 1974), and in Prawns.

The drastic decrease in flood water was probably a factor contributing to the sudden growth in numbers and distribution of some Red Sea immi grant species, eg. Siganus luridus (see below) (*18,71*).

Aleem (1969, *2*) considers that increased pollution from industrial effluent discharges and refuse oil dumping by tankers, and local overfishing, using illegal gears and net mesh sizes, have also contributed to decreasing catches by the Egyptian fishermen.

4. THE SUEZ CANAL (*1,18,40,81,88,89,91,104*)

There have been several descriptions and discussions of the migrations of marine animals through the Suez Canal, from the Red Sea to the Mediterranean, and vice versa (although the traffic is essentially one-way, from the Red Sea).

With regard to fishes for example, 36 species of Red Sea fishes had been recorded in the eastern Mediterranean by 1978 (*18*). For two species - Saurida undosquamis and Siganus luridus, the sudden appearances, rapid increases in population numbers and geographical spread to the west and north, and the subsequent commercial quantities caught, are fairly well documented.

The impact of these aliens upon the resident species and the local ecology generally, does not appear to have been assessed to any great extent.

5. LEBANESE FISHERIES

A 1978 study, involving 42 common teleost fish species, concluded that fisheries in Lebanese waters were "not industrial", but also that overfishing was evident, with too high a proportion of young fishes in the catch. Regulatory measures were recommended (*79*).

6. TUNISIAN FISHERIES

A 1978 study assessed fish stocks on the Tunisian continental shelf. Bottom trawling was identified as a problem, especially in depths of less than 50 m; the shallower areas being fished also by smaller boats using pots and trammel nets for"Shrimp". A ban on bottom trawling in inshore and shallow areas was proposed. *(23)*

7. ADDITIONAL NOTES

Most information about the fishes of the Mediterranean is concerned with the commercial harvesting. There are cases of catches exceeding a sustainable level, so that the numbers or distribution of certain species are being reduced.

Generally, a species or stock is exploited commercially because it is present in sufficiently-large numbers. Damage from a fishery is often to those species which are not the main target but are caught incidentally during a fishing operation, and also to the biotope, and hence to the biota indirectly. An example here is the disruption of substrata and bethic community by Scallop dredging or beam-trawling.

An important characteristic of the Mediterranean fish fauna is the number of endemic species, as discussed above. Some species are restricted in their distribution within the Mediterranean to a few localities or specific habitats, and are thus at risk if those localities or habitats are threatened. An example here is the fairly-fragile brackish-water coastal lagoon habitat, and the restricted occurrence of various species of Gobiidae.

The Sturgeon, Acipenser sturio, is a euryhaline species also; the mature fish migrating from deep-sea soft bottoms to breed in certain of the larger European rivers; the young being found at river mouths. Large numbers are still caught (see accompanying Table 8.1), but the species must have suffered from the major degradations of its estuarine haunts. No data on local distribution or decreases in catch were found in the present study.

The Groupers or Rock Cods, Epinephelus spp, are fished for commercially (see Table 8.1); presumably being an important component of the trawled demersal catch. Those which frequent rocky and mixed substrate sites are taken also for sport, by spearfishing : E. guaza and E. aeneus for example. The Groupers and their relatives are considered generally to be territorial or solitary in habit, and hence susceptible to local depletion by overfishing. Data on the impact of spearfishing activities was not found in the present study, for these or any other species.

Table 8.1, below, shows commercial catches for the whole Mediterranean (and Black Sea), as reported to FAO, for a variety of species and species-groups; the production of which has shown a decrease, or which are mentioned in the above discussion.

TABLE 8.1 Catches by species or species-groups of fishes, from the Mediterranean and Black Sea, 1971- 78 (in metric tons)
Source : *41*

SP./SP.GP YEAR	A	B	C	D	E	F	G	H
1971	800	1 100	100	1 400	1 600	300	+	100
1972	1 000	1 000	100	1 400	1 400	200	+	100
1973	1 200	1 700	100	1 200	500	200	+	+
1974	1 142	2 778	69	700	605	229	9	26
1975	1 232	3 742	67	836	462	200	10	37
1976	1 506	1 116	53	789	541	300	21	36
1977	1 310	709	41	629	427	200	38	108
1978	905	333	11	441	938	300	20	107

continuation :

YEAR	J	K	L	M	N
1971	300	18 200	5 900	2 500	2 100
1972	1 200	18 100	5 400	2 700	2 100*
1973	200	19 800	4 900	3 100	1 100*
1974	201	22 061	4 245	3 343	1 100*
1975	200	19 703	3 779	3 601	1 100*
1976	200	21 920	3 683	3 886	1 100*
1977	200	21 033	3 562	3 809	1 100*
1978	200	18 789	3 384	3 335	1 100*

* = estimate

\+ = less than 100 mt

A =	*Acipenser* spp	Sturgeon Fish
B =	*Caspialosa pontica*	Black Sea Shad
C =	*Pleuronectes platessa*	European Plaice
D =	*Trisopterus luscus*	Pouting
E =	*Epinephelus guaza*	Dusky Grouper
F =	*E. aeneus*	White Grouper
G =	*Umbrina cirrosa*	Corb
H =	*Argyrosomus regius*	Meagre
J =	*Saurida undosquamis*	BrushTooth Lizardfish
K =	*Mullus* spp-	Red Mullets
L =	(Atherinidae)	Sand Smelts
M =	*Mustelus* spp (excl.N)	SmoothHounds
N =	*M. asterias*	Stellate SmoothHound

9 MARINE MAMMALS : Monachus monachus

1. SPECIES/ TAXA INVOLVED

Monachus monachus — Mediterranean Monk Seal

2. NOTES

The most urgent and important species conservation issue in the Mediterranean is to save the Monk Seal, perhaps from extinction.

A thorough discussion of present knowledge of the species took place in Rhodes, Greece in 1978 *(93)*, and a summary of the current status, conservation efforts and needs was prepared recently by IUCN Species Conservation Unit *(61)*.

Thus the following account has been limited to providing a summary of figures obtained on the dangerously-low total numbers of individuals, and re-stating the case briefly for urgent protective action.

3. FACTORS

Factors relevant to the critical status of Monachus monachus include :

1. Decrease in numbers started a long time ago, and continues at a current rate of 13 % per annum.
2. There are very few young seals in the population, compared to even a few years ago.
3. The causes of decline are all linked to Man, and include :
   - severe, extensive disturbance/ interference, by fishermen, boats, coastal recreation, etc, to the extent that haul-out, breeding and pupping are seriously affected, and sites suitable for these activities are restricted to a small number.
   - killing : by fishermen - by drowning in nets, and deliberate shooting. Fishermen regard the seal as competition (consumption of fishes and cephalopods by Monachus recorded at 5 % of its body weight per day), and as pests, damaging nets.
   - pollution : no specific details were obtained. (Bernhard (*19*) presents and discusses data on heavy metals and chlorinated hydrocarbons in Mediterranean marine mammals, but not Monachus)

3. Population numbers are now so low, and groups so dispersed, that ultimate failure may be due to restricted genetic diversity, or sudden breeding failure.

4. CONSERVATION MEASURES

All recent papers seen (*4,24,62,68,69,70,94,99*) stress that the species' survival may well depend upon the immediate adoption and strong enforcement of measures for its total protection.

Several marine conservation areas which are established or proposed as Parks or Reserves, refer specifically to the local Monk Seals and their protection (*9*). The relevant information is summarised below : (P = proposed/ potential)

COUNTRY, SITE/ AREA	
Spain, Cabrera Archipelago (P)	"M. monachus exterminated by hunting..... but 2 seen in 1975"
France, Corsica, Scandola NR	"M. monachus elimated "
Italy, Montecristo MP (P)	Former haunt of M. monachus
Tunisia, Isle of Zembra MP	"protects M monachus" "25 couples reported recently"
Tunisia & Algeria, La Calle to Oum Teboul (P)	contains Monachus
Yugoslavia, Mljet Island (P)	"M. albiventor reported 1974"

9. Marine mammals

Information on Phocoena phocoena, Balenaoptera physalus and Monachus monachus can be found in the document "Threatened Mammals of the Mediterranean".

10. Marine turtles

Information on Chelonia mydas, Eretmochelys imbricata and Caretta caretta can be found in the document "Preliminary list of Amphibians and Reptiles of the Mediterranean Region, known of considered to be threatened". Only catch statistics are provided below:

TABLE 10.1 Marine Turtles, "CHELONIA SPP", production figures for all Mediterranean countries, 1958- 1978 (in metric tons)
Source : *41*

YEAR	TURKEY	EGYPT
1958	+	?
1959	+	?
1960	+	?
1961	+	?
1962	100*	?
1963	+	?
1964	100	?
1965	100*	?
1966	+	?
1967	+	?
1968	300	?
1969	100	?
1970	100*	+
1971	+	+
1972	+	+
1973	+	+
1974	?	5
1975	?	8
1976	?	10
1977	?	9
1978	?	5

11. ALGAE and HIGHER PLANTS

1. NOTES

Only two reports of direct exploitation of Mediterranean algae or higher plants were found during the present study. (2, 44a)

In Egypt, brown and red seaweeds which are washed up onto the shore by wave action, are collected. A proportion is dried and exported to Japan as food. Some is processed and agar is extracted, whilst some is used also as manure or fodder. (*2*)

FAO statistics for Mediterranean production show no record of exploitation until 1978, when a figure of 8,896 metric tons of "ALGAE AND PLANTS" is reported (*41*). No further details were obtained.

There is undoubtedly significant impact from coastal discharge of urban and industrial effluents upon plants of the shallow sublittoral (infralittoral). See Section 1.4.

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