

MEDITERRANEAN NON-ENERGY RESOURCES, SCOPE  
FOR COOPERATION AND DANGERS OF CONFLICT

by

Gerald Blake

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## Mediterranean non-energy resources: scope for cooperation and dangers of conflict

G.H. BLAKE

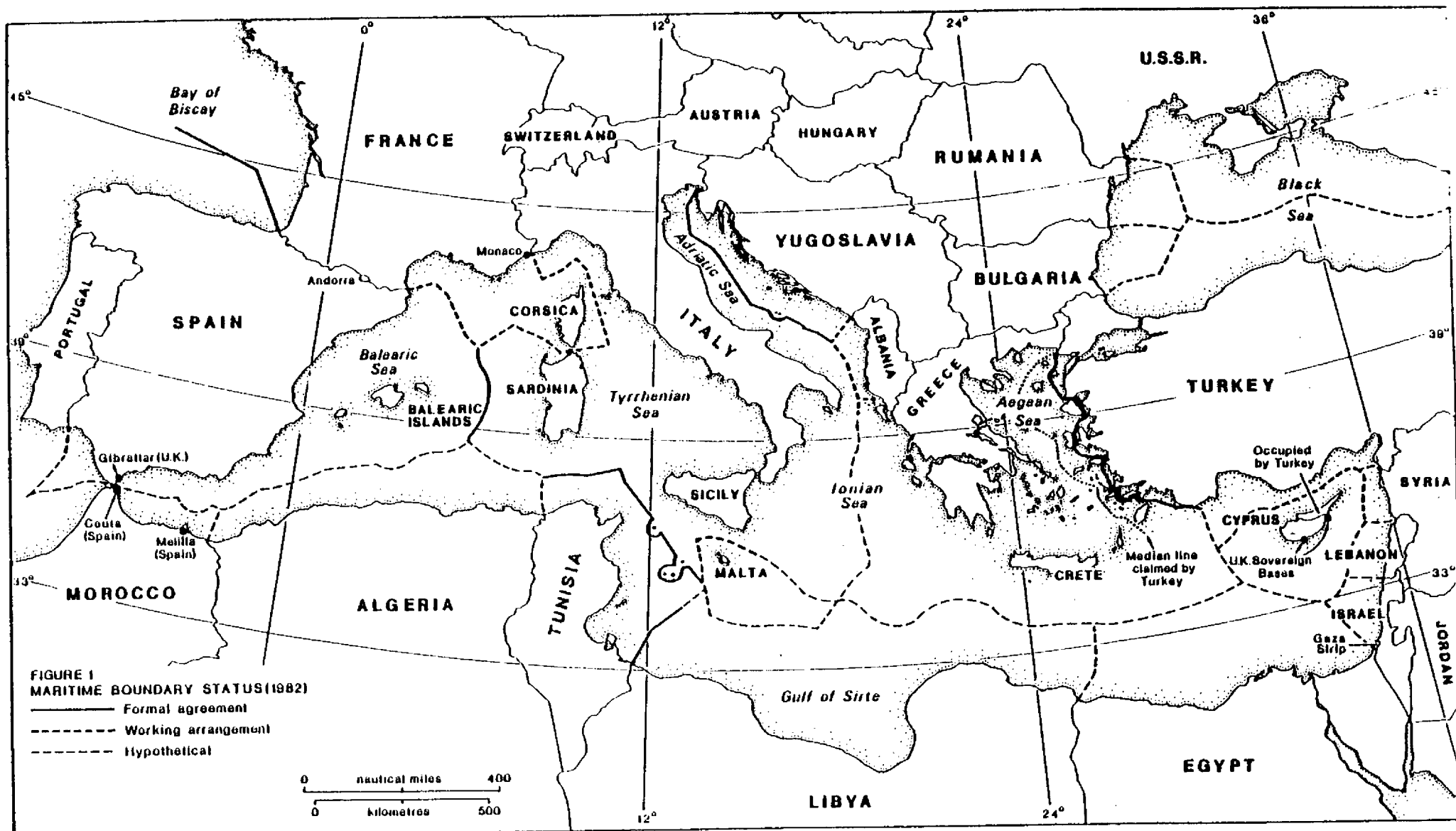
University of Durham, England.

### INTRODUCTION

For the purpose of this paper the Mediterranean sea is taken to include the Aegean and Adriatic seas, but not the Black sea, (which the United Nations F.A.O. combines with the Mediterranean<sup>2</sup> for fishing statistics). Thus defined, the Mediterranean occupies 2,511,000 Km<sup>2</sup>, or 0.7 per cent of the world's oceans. In spite of its small size, the Mediterranean sea is uniquely important in the modern world, not only to the economic and cultural life of its 18 coastal states, but as a contact zone between Europe, Africa, and Asia, and as a prime artery for world trade via the Suez Canal. The states of the Mediterranean are characterised by immense ethnic, cultural and religious diversity, and it is a region where historically, violence has been endemic. On the face of it, the forces for division are far stronger than those for harmony, and it is therefore astonishing that in the past decade there has been considerable progress towards cooperation over certain environmental concerns.

This paper explores the potential for cooperation and the possibilities of conflict in the Mediterranean in three important areas: (a) fishing, (b) seabed mining, and (c) pollution control. Offshore oil and natural gas are considered in a separate paper, but it is worth remembering that there are differences between energy resources and the activities being considered in this paper because oil concession areas have to be precisely located and the gain or loss of a few square kilometres of seabed can be quantified in terms of potential revenue. The activities considered in this paper are of interest to states over a longer period of time, and the dangers of conflict are less likely to be over boundary lines, than matters of principle and law.

Not all "Mediterranean" states have the same degree of interest in the Mediterranean sea. There is a temptation to expect uniform commitment from all coastal states of the Mediterranean to matters concerned with the sea, but this is not realistic. Table 1 for example gives some crude indication of the importance of a Mediterranean coastline to 18 states, by calculating the number of square kilometres to every kilometer of coastline. A more interesting calculation (which was not attempted) would be the proportion of the population of each state resident within 50 km (or any other convenient distance) of the sea. This would undoubtedly show some surprising results, quite unlike the results in Table 1 with Malta, Cyprus, Monaco and Libya high in the ranking and France, Spain, Turkey, and Yugoslavia low. Table 2 is another useful measure, based on the hypothetical maritime boundaries shown in Figure 1, indicating approximate areas of seabed allocated to each coastal state. The actual delimitation, when it occurs, will doubtless differ from Figure 1 in a number of respects, but the ranking of states is probably reasonable.



**Table 1 The importance of Mediterranean coastlines to Mediterranean states**

		Length of coastline (km)	Land area (km <sup>2</sup> ) per km of Mediterranean coast	Mediterranean coast as percentage of all coasts
1	Monaco	5	0.40	100
2	Malta	93	3.36	100
3	Cyprus	537	17.23	100
4	Greece	3,048	43.50	100
5	Lebanon	195	53.13	100
6	Italy (1)	4,539	66.36	100
7	Israel	222	93.33	96
8	Albania	284	101.22	100
9	Tunisia	1,028	159.73	100
10	Yugoslavia	789	324.32	100
11	Turkey	1,804	424.96	51
12	Spain (2)	1,146	440.71	54
13	France (3)	910	606.23	36
14	Egypt	996	1,004.27	41
15	Libya	1,685	1,043.68	100
16	Morocco	352	1,162.50	21
17	Syria	152	1,226.84	100
18	Algeria	1,104	2,228.71	100

(1) includes Sardinia and Sicily

(2) includes Balearics

(3) includes Corsica

Sources: Various

Discussion in this paper is confined to the coastal states, but it should be noted that non-coastal states have significant interests in the Mediterranean. It is a vitally important shipping route for Suez Canal traffic, and for the Black sea states (including the Soviet navy). The United Kingdom has relic colonial interests in Gibraltar and Cyprus (where the Sovereign Bases could - perhaps - be considered eligible for a share of the seabed). Moreover, several landlocked states will "have the right to participate on an equitable basis in the exploitation of an appropriate part of the surplus of the living resources of the exclusive economic zones of adjoining coastal states" (1), if the Treaty on the Law of the Sea is finally ratified. This could happen in four years time. Although Article 69 of the treaty stipulates that "the relevant economic and geographical circumstances of all the states concerned" would be taken into account, and that developed landlocked states may only exercise their rights in the waters of adjoining developed states, there is some possibility of hard bargaining on this issue in the future.

#### (A) FISHING

##### Importance of Mediterranean fisheries

By world standards, Mediterranean fish stocks are small largely because of the relatively unfavourable conditions for the development of fish food. The rate of phytoplankton production is a major factor in determining the abundance of fish since plankton is the basis of the fish food chain. Plankton production in the Mediterranean is inhibited by scarcity of phosphates, nitrates, and nitrites which are essential nutrients (2). There are few major rivers to bring down nutrients, and the building of the Aswan dam has greatly reduced the input of nutrients from the Nile. Mediterranean water is also relatively stable and little mixing occurs between the surface and nutrients found at depth. Phytoplankton is most abundant in the north and west of the Mediterranean and in the Adriatic sea, and declines towards the south and east (3).

Environmental limitations mean that the Mediterranean will never sustain a large-scale fishing industry. Fish catches in the Mediterranean in 1978 totalled 786,535 tonnes, or about one per cent of the world catch, (Table 3). On the other hand Mediterranean fisheries are notable for the great variety of species fished commercially (about 120 out of a total of 500 species), and for the unusually high value of the catch. The reasons for this are high demand related to culture and tradition, and reinforced by the demands of the tourist trade. Fish prices are probably still among the highest in the world, as was the case in 1970 (Table 4). Locally, coastal fishing is an extremely important contribution to the economy of coastal communities, with small boats using traditional techniques being responsible for a high proportion of the catch. Many fishermen in the Mediterranean are part-time. Scores of colourful fishing boats add greatly to the scenery in the small ports and harbours and perhaps reinforce to the illusion of the importance of fishing to the national economy.

Mediterranean fish catches are already insufficient to meet local demand. Between 60 and 70 per cent of fish consumed in the region comes from other seas. France, Morocco, and Spain obtain a high proportion of the fish from the Atlantic, while Turkey obtains a high proportion from the Black sea. In addition Egypt, Greece, Israel and Italy, have ocean-going

**Table 2. Allocations of Mediterranean seabed according to hypothetical boundaries in Figure 1**

		Seabed area (Km <sup>2</sup> )
1	Italy	532.500
2	Greece	460.500
3	Libya	320.500
4	Spain	252.500
5	Egypt	176.500
6	Algeria	111.500
7	Tunisia	97.500
8	Cyprus	89.500
9	France and Monaco	88.570
10	Yugoslavia	70.250
11	Malta	61.190
12	Turkey	59.500
13	Morocco	21.750
14	Albania	21.000
15	Israel	20.500
16	Lebanon	15.750
17	Syria	10.250

Source: Calculated from Figure 1

**Table 3. Mediterranean Fish Catches by Country (tonnes)**

	1968	1978
Albania	4000	4000
Algeria	18200	34143
Bulgaria	1015	11
Cyprus	1354	1245
Egypt	13560	11636
France	39587	42400
Gaza Strip	3676	4700
Greece	55815	69753
Israel	3288	3550
Italy	296952	336699
Japan	-	86
Lebanon	2500	2400
Libya	5000	4803
Malta	1300	1044
Monaco	-	-
Morocco	10578	31410
Romania	1	-
Spain	83197	153876
Syria	800	1361
Tunisia	14537	35665
Turkey	33287	9290
USSR	100	-
Yugoslavia	<u>30061</u>	<u>37464</u>
TOTAL	618.809	786.535

Source: General Fisheries Council for the Mediterranean, Statistical Bulletin No. 3, Nominal Catches 1968-78, F.A.O., Rome, 1980, pp.1-9.

their fish from the Atlantic, while Turkey obtains a high proportion from the Black sea. In addition Egypt, Greece, Israel and Italy, have ocean-going fleets while there are plans in several other countries to develop ocean-going fleets including Libya and Tunisia. By 1985 the demand for fish could reach anything from 4,350,000 to 6,100,000 tonnes. (4) but only a fraction of the extra demand is likely to come from the Mediterranean. The exact size of the unexploited surplus stocks in the Mediterranean is debatable. Certain species are probably overfished already. There appears to be some potential for increasing pelagic (surface swimming) catches in the eastern Mediterranean (5), and demersal (bottom dwelling) catches along the southern and eastern coasts of the eastern Mediterranean. There are unlikely to be surplus stocks in the heavily fished northern waters of the Mediterranean, where demersal species are already over-exploited (6). As a rule of thumb, the best forecasts are that present catches could be doubled in volume, though the make-up of the catch will change (7). This is sufficiently attractive to make investment in the fishing industry worthwhile for several countries. At the same time rising demand will create higher prices and more powerful incentives to over-fish. Competition between fishermen is bound to increase. A factor to be borne in mind is that some Mediterranean ocean-going vessels are going to be denied access to distant non-Mediterranean grounds with the likely introduction of exclusive economic zones to 200 nautical miles worldwide.

Some pressure could be taken off marine fisheries by the adoption of aquaculture at various inland locations. The potential for production of fish, shellfish, and molluscs by this method is high (8). On the other hand pollution is already causing a decline in fish stocks in certain locations and this could more than offset new developments in aquaculture if unchecked. Near the sewage outfalls of many large cities the presence of excess nutrients in the water has resulted in a phenomenon known as "phytoplankton bloom" in which unconsumed phytoplankton decays and causes oxygen depletion in the water and the destruction of other forms of marine life. Elsewhere fish stocks have declined due to the pollution of coastal posidonia seagrass beds which are important for fish spawning and feeding. The effects of pollution on fish stocks at the regional level is not known, but it may not yet be very significant.

The marine fauna of the Mediterranean is closely related to the subtropical Atlantic, though certain Red sea species have migrated to the eastern Mediterranean since the opening of the Suez Canal in 1869. Many Mediterranean fish are shallow water dwellers which tend to be caught close to the shore, including some of the demersal species. Pelagic fish congregate in shallow waters where plankton is abundant. Moreover, in summer they migrate inshore in response to coastal upwelling and their fishing tends to be seasonal. As a rule, much Mediterranean fishing is conducted within areas where the continental shelf is less than 200 metres deep. Thus disputed fishing grounds have tended to be in continental shelf areas not far from the coast. Table 5 shows some of the largest catches by species for the Black Sea and Mediterranean seas in 1977.



**Table 4. Average unit value of fish landings 1970**  
(\$U.S. per tonne).

Mediterranean Sea	561
Indian Ocean	250
Pacific Ocean	94
Atlantic Ocean	126

Source: United Nations F.A.O., Consultation on the Protection of Living Resources and Fisheries from Pollution in the Mediterranean. "Fish resources in the Mediterranean and Black seas", pp.1-22, Rome, 1974.

**Table 5. The most important species by volume in Mediterranean and Black sea catches in 1977**

<u>Species or groups of species</u>	<u>Catches in tonnes</u>
<u>Pelagic Finfish</u>	
Anchovy ( <i>Engraulis encrasicolus</i> )	352.736
Sardine ( <i>Sardina pilchardus</i> )	184.243
Horse Mackerels ( <i>Trachurus</i> spp)	56.937
<u>Demersal Finfish</u>	
Red mullets ( <i>Mullus</i> spp)	21.100
Bogue ( <i>Boops boops</i> )	27.301
Hake ( <i>Merluccius merluccius</i> )	24.346
Picarels ( <i>Maena</i> spp)	16.350
Grey mullets ( <i>Mugilidae</i> spp)	14.237
<u>Molluscs and crustaceans</u>	
Mussels ( <i>Mytilus</i> spp)	11.200
Cuttlefish ( <i>Sepia officinalis</i> )	10.699
Shrimps, prawns	13.800
Common octopus ( <i>Octopus vulgaris</i> )	10.033

Source: United Nations F.A.O., Yearbook of Fishery Statistics, Vol 44 1977, Rome 1978, pp 205-206.

**Table 6. Mediterranean Sea: Territorial water claims and exclusive fishery claims (nautical miles)**

State	<u>Territorial water claim</u>		<u>Exclusive fishing claim</u>	
	Distance	Year	Distance	Year
Albania	15	1976	Same as T.W.	
Algeria	12	1963	Same as T.W.	
Cyprus	12	1964	Same as T.W.	
Egypt	12	1958	Same as T.W.	
France	12	1971	Same as T.W.	
Greece	6	1936	Same as T.W.	
Israel	6	1956	Same as T.W.	
Italy	12	1974	Same as T.W.	
Lebanon	Undeclared	-	6	1921
Libya	12	1959	Same as T.W.	
Malta	12	1978	24	1978
Morocco	12	1973	200 <sup>(1)</sup>	1976
Monaco	12	?	Same as T.W.	
Spain	12	1977	Same as T.W.	
Syria	12	1964	Same as T.W.	
Tunisia	12	1973	Same as T.W.	
Turkey	6	1964	12	1964
Yugoslavia	12	1979	Same as T.W.	

(1) 6 miles in the Strait of Gibraltar.

Source: The Statesman's Yearbook 1981-82 (J. Paxton, ed)., Macmillan 1981, xxv-xxvii.

### Exclusive fishing claims and disputes

As in other oceans of the world where fishing is important Mediterranean states have made varying claims to exclusive fishing zones in recent years, though only four are beyond the limits of territorial waters (Table 6). International disputes arising directly as a result of national claims to exclusive fisheries have been rare in the past. A high proportion of fish catches are obtained within sight of the shore, or close to it, and few fishing vessels made their way to foreign grounds except by consent (the Greek and Italian sponge fishermen off Libya for example). In recent years however some international disputes have occurred between Mediterranean states, by far the most serious being that between Spain and Morocco over Atlantic fisheries. Faced with declining catches in 1973 Morocco declared an extension of exclusive fisheries from 12 to 70 nautical miles. Spain objected, and in spite of various efforts to reach agreement differences have not been resolved. The situation is complicated by the activities of Polisario guerillas who arrested Spanish and Portuguese vessels in 1981, and the subsequent recognition of Polisario by Spain and Portugal (9). Though the Spain - Morocco dispute concerns the Atlantic it could affect the Mediterranean particularly in view of Spain's retention of the enclaves of Ceuta and Melilla. In February 1979 for example, two Spanish fishing boats were arrested by the Moroccans off Melilla at a time when the Atlantic fishing dispute was erupting once again (10).

The introduction of a 200 nautical mile E.E.Z., as proposed in the U.N. Treaty on the Law of the Sea, could create friction between Mediterranean states, though the implications of the E.E.Z. have been foreseen for many years and it would be surprising if matters cannot be resolved peacefully. Only about 4% of Mediterranean fish catches come from the waters of other states. The introduction of the E.E.Z. would deprive Spain, Greece, and Italy of the right to fish in the waters off Algeria, Morocco, and Tunisia, though the loss would be "minor" (11). Japan would also lose access to certain tuna fisheries. Agreements could be reached between the parties for continued access to traditional fishing grounds, but it is a reasonable guess that the Maghreb countries will be in no hurry to negotiate such arrangements. A "stress zone" could therefore emerge in the western Mediterranean along the median line between southern and northern. In the absence of adjudication by the International Court of Justice on the disputed boundary between Malta and Libya this "stress zone" may be considered to extend further east.

Fishery disputes, rather like boundary disputes, are often symbolic of poor political relationships between states. This being so, the eastern Mediterranean might be expected to see many fishing quarrels in the future. Fishing is however relatively unimportant in the eastern Mediterranean and international conflict is unlikely over a matter which features so little in the national economies (Table 7). The catch for the Levant is about three per cent of the Mediterranean total, while that for the Aegean is over seven per cent. The Aegean could become the scene of a dispute if Greece chose to implement a 200 mile E.E.Z. too hastily. A proportion of Turkey's modest Aegean catch undoubtedly comes from waters round the Greek Islands, and there are surplus stocks of pelagic fish still to be had. Matters could be complicated with the extension of E.E.C. common fisheries policies to Greek waters. The exact shape of this policy is still unclear.

but it could mean a 200 mile exclusive fishing limit as elsewhere. In which other community members might seek to acquire the right to extract a quota of fish. In practice this is improbable because the Aegean is not a traditional ground for any other member state.

E.E.C. waters already extend over the coastal waters of France and Italy and will extend still further when Spain joins in 1984. The application of the 200 mile E.E.C. fisheries policy would place much of the western Mediterranean in Community hands. France, Italy and Spain are likely to retain exclusive control over six nautical miles, and partial control over the six to twelve mile zone, beyond which Community states would have free access. There is clearly considerable scope for argument and litigation between Community members in the western Mediterranean, but such disputes are likely to be confined to verbal exchanges. In a recent case for example, the European Court of Justice ruled that a Spanish fisherman was within his rights to fish in France's six to twelve mile zone (off Bayonne in the Bay of Biscay) on the grounds that E.E.C. regulations cannot supercede an earlier (1967) Franco-Spanish agreement (12).

Conclusion There will undoubtedly be disagreements between Mediterranean states over fishing rights in the next few years. Declining stocks of certain species and rising prices will ensure a high level of government concern over fisheries. With the introduction of new maritime boundaries and the growth of complex E.E.C. regulations many of the disputes will simply be wrangles over quotas and legal matters. The delimitation of new boundaries could equally give rise to disputes which, given a poor political environment, could deteriorate rapidly. Such disputes are however unlikely to erupt into the kind of armed conflict which might destabilise the whole region. Apart from Spain and Morocco (in the Atlantic) only two fishing disputes in recent years appear to have involved shooting (Italy and Tunisia in 1975 and Albania and Yugoslavia in 1976). While fishing is of considerable importance to local communities it is not an activity which governments would be wise to defend at all costs (Table 8).

The work of the General Fisheries Council for the Mediterranean (G.F.C.M.) is encouraging evidence of the desire for cooperation rather than conflict. The G.F.C.M. is an intergovernmental body set up within the framework of the F.A.O. in 1952. In the past 30 years the work of G.F.C.M. has greatly increased, and membership has grown to include all Mediterranean states (except Albania) with Bulgaria and Rumania. Reports of the G.F.C.M. sessions (held every two years) give an indication of a high level of cooperation between states, and a wide range of practical activity engaged in by G.F.C.M. There is now widespread recognition that the problem of Mediterranean fisheries must be tackled regionally, and at government level.

Examples of the activities of the G.F.C.M. are:

- (1) Collection and analysis of data on the present condition of stocks;
- (2) Recommending and implementing measures for the conservation and rational management of resources (e.g. by regulating methods).

periods and areas where fishing is permitted, regulating catch sizes, fishing efforts etc.) (13)

- (3) Research into the effects of pollution on marine life
- (4) Encouragement of alternative forms of fish production e.g. through aquaculture, and use of brackish water.
- (5) Training of fisheries personnel.
- (6) Promotion of advances in fisheries technology in a variety of fields.

While it would be easy to find many defects in the work of the G.F.C.M. particularly with respect to enforcement, the significant point is that it has survived and grown, and most Mediterranean states have demonstrated their desire for practical cooperation through the G.F.C.M. International cooperation of this kind is no insurance against disagreements, but as such work progresses the less likely conflict becomes. The G.F.C.M. has for example, sought to limit the fishing effort of member states to avoid overfishing. France and Spain have introduced a licensing system limiting the number and type of new trawlers while Greece, Italy, Tunisia, and Yugoslavia have curtailed credit for building new trawlers (14).

**Table 7. 1978 Fish catches in the eastern Mediterranean (tonnes)**

<u>Levant</u>		<u>Aegean</u>	
Cyprus	1,143	Turkey	5,555
Egypt	11,619	Greece	62,965
Gaza strip	4,700	Total:	68,520
Israel	3,350		
Lebanon	2,200		
Syria	1,252		
Turkey	1,788		
Total	26,052		

Source: United Nations F.A.O. General Fisheries Council for the Mediterranean, Nominal catches 1968-78. Rome, 1980, pp. 7-8.

**Table 8. Fish and fish products by value 1979**  
(000 s)

	<u>Value</u>	<u>Percent total exports</u>
Egypt	750	0.04
France	26,103	0.26
Greece	13,445	0.34
Israel	30,805	0.67
Italy	12,125	0.16
Lebanon	440	0.05
Turkey	18,500	0.81
Tunisia	17,046	0.95
Spain	410,390	2.29
Yugoslavia	30,298	0.44
Others	Negligible	Negligible

Source: F.A.O. Trade Yearbook, Vol 34 1980.

## **(B) SEABED MINING**

### **Introduction**

A great deal of publicity has been given to the prospects for the recovery of minerals from the seabed. There is a growing volume of scientific literature on the subject, and the necessary technology has already been developed. It is an assumption in the United Nations draft Treaty on the Law of the Sea in which 50 articles are devoted to seabed mining that it is desirable and inevitable. During the latter sessions of the Third U.N. Conference on the Law of the Sea which evolved the proposed treaty, arrangements for mining the seabed beyond the 200 mile limit were hotly debated. In April 1982 the United States finally voted against the treaty on the grounds that it would restrict freedom of access to seabed minerals by United States companies. Opinions differ concerning the economics of mining the seabed, but the probability is that land-based sources will be cheaper at least until they near exhaustion. In a world where economics had the final say, seabed minerals would probably be left alone for another 20 years, but there is a desire to extract urgently for strategic reasons. The United States and NATO depend very heavily on imported supplies of certain key minerals which could be obtained from offshore sources.

The argument in the Third U.N.C.L.O.S. has been over control of seabed minerals beyond the 200 mile limits. Broadly speaking the Third World states want maximum international control so that this new source of wealth will benefit the poor countries. They also fear the effect on the price of land-based minerals if the advanced industrial countries were able to supply themselves from the oceans. The draft treaty proposes an International Seabed Authority to administer seabed minerals. The headquarters of the I.S.B.A. are to be in Jamaica, though Malta was very nearly chosen. In some ways Malta would have been an inappropriate location since the Mediterranean sea is unlikely to have any seabed left as "the common heritage of mankind" once the 200 mile limits have been drawn up (Figure 1). The management and exploitation of Mediterranean seabed minerals will thus be the exclusive right of the coastal states, if exploitation proves desirable. The Mediterranean can be regarded as a microcosm however, of certain aspects of the global debate about minerals, notably the strategic argument for exploitation, and the conflict of interest between Third world mineral producers and the industrial world consumers.

### **Mediterranean seabed resources**

Offshore mineral resources in the Mediterranean fall into three categories - evaporites, placers, and aggregates.

(a) Evaporites Deep drilling in the Mediterranean seabed in 1970 revealed an extensive layer of evaporites reaching up to 3,000 feet thick in places, probably some five million years old. They were formed by the drying out and flooding of a former Mediterranean sea on many times over long periods. These evaporites consist of rock salt, sulfur, and potash salts in huge quantities; in Sicily and certain other Mediterranean islands they reach the surface and are mined as the basic raw materials of the

chemical industry. The commercial exploitation of seabed evaporites however is not regarded as currently feasible. Apart from the problems of working in an underwater environment the deposits are overlain by thick marine sediments. At the same time reserves of most of the constituents of the evaporites are in plentiful supply on land and readily accessible. Their relevance to the discussion of offshore resources lies largely in their very long-term potential. When maritime boundaries are being drawn up which could last for many decades, statesmen and lawyers have to bear in mind unforeseen advances in technology which could turn a reserve into a resource. Evaporites will not cause conflict between states, even though they tend to be located in central areas of the seabed (15) where international boundaries will run, but they could be one reason among many why coastal states may seek to negotiate maximum allocations of the seabed. Evaporites in the shallower coastal waters could conceivably be of some economic value in the distant future.

(b) Placer deposits. Placer deposits are found in certain coastal locations when metal-bearing rocks on land have been weathered and the debris washed out to sea by rivers. The heavy metal particles accumulate as the action of waves, currents and tides removes lighter materials. Placers may be found either on beaches above water level, on submerged ancient beaches, or in buried river valleys and depressions on the sea floor. In all cases they tend to be close to the coast, on the continental shelf. The only possible disputes might be on the boundary between adjacent states, but these are considered highly improbable. Placer deposits are neither sufficiently extensive nor of sufficient commercial value to be of political importance. If exploited, the returns are likely to be rather small (16). The only known mining of placers in the Mediterranean occurs along the Egyptian Nile delta coast where iron, tin, zirconium, titanium, and monazite are obtained from extensive mineral sands washed down by the Nile. The dredging of these minerals is clearly not a source of international conflict. Placers have been reported quite widely elsewhere in the Mediterranean, though their economic potential is not clear. The most important are iron (Italy west coast; Greece, north east coast; Tunisia north coast; Algeria), titanium (Corsica east coast; Greece, north east coast;) and chromite (Yugoslavia; Turkey west coast; Cyprus north-east coast). There are also deposits of titanium and valuable phosphorite on Morocco's Atlantic coast. At some future date it could prove attractive to exploit some of the richer coastal deposits of chromite and titanium, but it is difficult to imagine circumstances in which their exploitation would lead to serious conflict between states. Greece or Cyprus might conceivably object to any possible Turkish move to dredge chromite from the north east coast of Turkish-occupied Cyprus, but there is no evidence that such exploitation has ever been contemplated. According to one authority, titanium is likely to be one of the earliest placer deposits worth exploiting on the continental shelf (17).

(c) Metal-bearing aggregates and crusts The Mediterranean sea has no major seabed deposits, largely because rates of sedimentation are too great to permit the formation of manganese nodules, as found in all the other oceans of the world, the most notable concentrations being in the Pacific and Atlantic oceans. There are however more than 40 active volcanoes in the Mediterranean, and in recent years geologists have become interested in the metal - bearing crusts found associated with them. Since they lie in

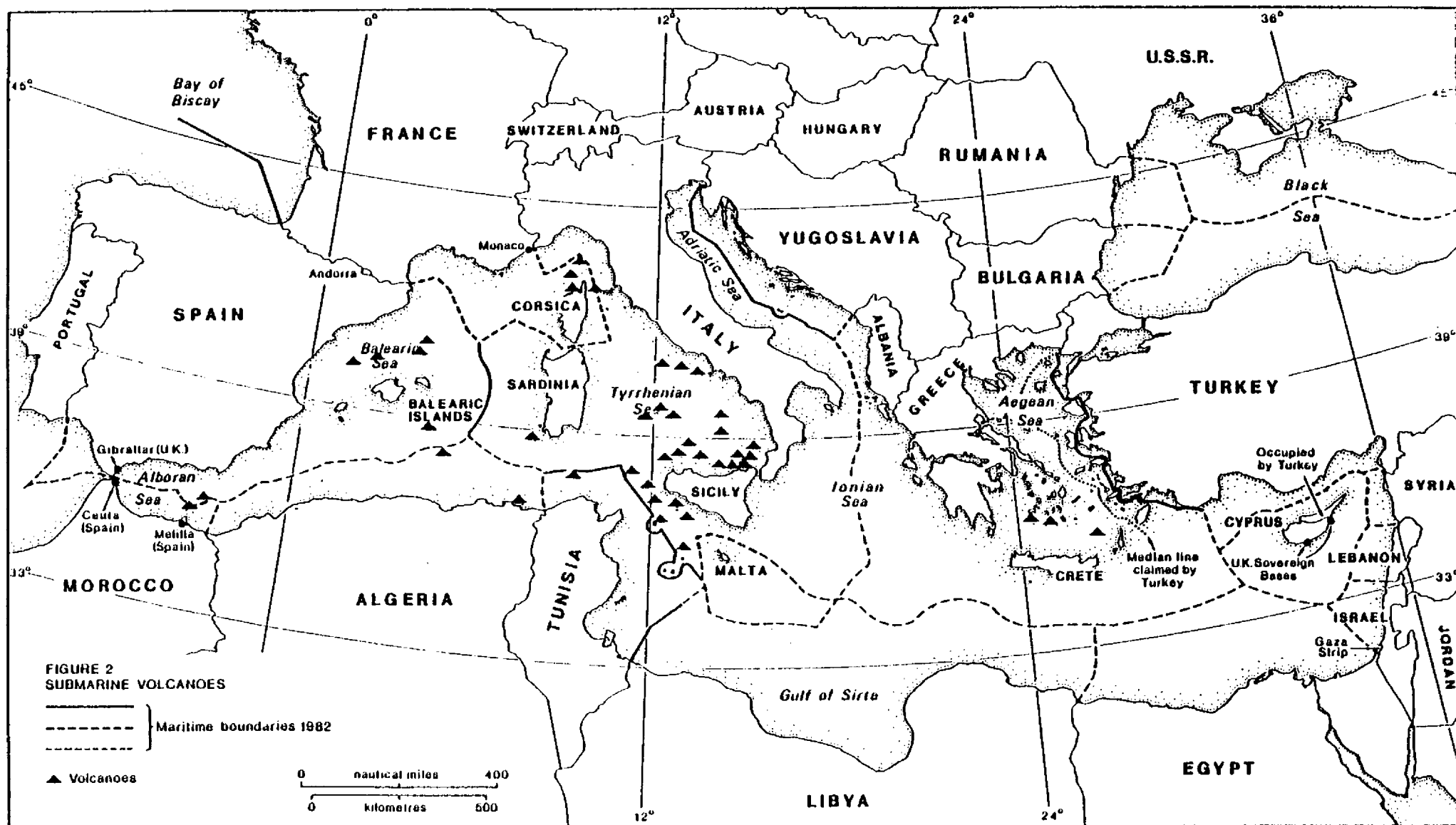


relatively shallow water (500-1500 metres), many of them close to the shore, they have been regarded as a potential source of "industrially interesting" raw materials (18). Mineralisation which forms veins and pockets within a silty - clayey material consists chiefly of manganese and iron. In the Tyrrhenian sea the manganese content is around 48 per cent, but in the Aegean more iron (20-40 per cent) is present (20). Much thought has been given to the origins of these mineral deposits, particularly by Italian scientists, the suggestion being that they were derived as hydrothermal solutions emanating from current-swept volcanic crests. More work will be necessary before all the Mediterranean volcanoes have been investigated, but it seems likely that under present world economic conditions, the relatively small amounts of manganese would not be commercially worth recovering. In time of war, or in the distant future when manganese nodules have become unobtainable (for example because of quarrels within the I.S.B.A.) Mediterranean countries might turn to their own more costly local resources. It is not known which are the most promising sites, but a preliminary attempt to plot volcanoes and maritime boundaries (actual and possible) reveals surprisingly few potential disputes (Figure 2). The most obvious difficulty could be in the Alboran sea between Morocco and Spain, where disputes over fishing, the status of Ceuta and Melilla, and the effect of Alboran on maritime boundaries, already create a zone of potential conflict. On the other hand, the volcanic aggregates are not regarded as a probable source of conflict, except in conjunction with other disputes. It will be noted in Figure 2 that almost all the volcanoes fall within the jurisdiction of the industrial countries of the northern Mediterranean.

### Conclusion

If Mediterranean placers or aggregates are exploited in future it is likely to be for strategic reasons, with the industrial north taking the lead. Two minerals which might be sought are manganese from volcanic sites and chromite from placer deposits. Manganese is an essential ingredient in alloy steels and is used in producing dry cell batteries. Present world production and reserves are dominated by South Africa and the Communist bloc. Since manganese is regarded as a strategic mineral, United States and NATO dependence on imports is regarded as undesirable by defence experts. Chrome is even more important strategically, for use in the production of high technology alloys, armour plate, and other defence needs. It is resistant to corrosion and oxidation. N.A.T.O. is heavily dependent upon imports with South Africa, Turkey, Zimbabwe the chief sources. South Africa and Zimbabwe together hold 95 per cent of reserves. In these circumstances local sources of manganese and chrome will be seriously investigated. As physical depletion of land based supplies draws near in the next century there could be an economic case for exploitation.

Any moves to exploit Mediterranean offshore minerals could meet with resistance from the Mediterranean countries which are currently exporters of the same minerals. This is more likely to be a source of regional friction than questions of boundaries and ownership. In particular Turkey has an interest in the world chrome market (293,000 tonnes in 1978) and Morocco in manganese (135,700 tonnes in 1979) and iron ore (61,700 tonnes in 1979). Tunisia is also an exporter of iron ore (1977 production - 343,000 tonnes) (21). As a footnote, it may be that offshore mineral



exploitation will create unacceptable environmental problems through turbulence and the deposition of tailings etc. This could be a further source of friction between states.

### **(C) ENVIRONMENTAL PROTECTION**

#### **Introduction**

The physical characteristics of the Mediterranean sea render it particularly vulnerable to environmental damage through pollution. To summarise these characteristics very briefly:

- (a) The surface area and volume of water are not great in relation to the coastal population densities;
- (b) The seawater is relatively stable. The only major exchange of water occurs via the narrow strait of Gibraltar. It takes some 80 years to change the water completely;
- (c) Evaporation rates are high and exceeds the input of freshwater by rainfall and river flow about three times;
- (d) There are numerous islands and long coastlines (about 20,000 km).
- (e) Tidal regimes and coastal currents are often weak and their "scouring" effect is limited. Tides are generally from two to four metres.

Human activity during the past two or three decades has brought the Mediterranean marine environment to a point of crisis. The fundamental causes of this growth of pollution may be summarised briefly as follows:

- (a) Rapid growth of coastal populations by migration and natural increase, with a high proportion concentrated in a few large cities. Coastal populations number over 50 million;
- (b) Massive seasonal tourism generated largely in Europe which doubles the resident coastal population;
- (c) High rates of industrial growth, notably in the countries of the north with emphasis on coastal locations for such polluting industries as oil refining, iron and steel, petrochemicals and cement;
- (d) The use of the Mediterranean for the transportation of petroleum and petroleum products and other seaborne cargoes.

In the following paragraphs it is assumed that all these activities will grow in volume over the next few years, some of them very substantially. The need to exercise increasing controls to protect the environment from further damage is well recognised, but the implementation of these controls offers considerable potential for disagreement as well as cooperation between states.

### Types of pollution

The nature of Mediterranean pollution has been admirably diagnosed elsewhere, and is only discussed in this paper to identify likely causes of conflict.

(a) Industrial and chemical waste Industrial and chemical pollution reaches Mediterranean waters through river flow, in the air, and directly from coastal industrial activities. It was only 10 years ago that the first authoritative investigation of land-based pollution in the Mediterranean was completed (22). Much research has been conducted since, and the problem clearly remains serious. This category of pollution is largely the product of coastal iron and steel making, oil refining, petrochemicals, and other chemical industries. It also includes certain pollutants such as pesticides derived from agricultural activity. The distribution of industrial pollution is uneven, with France, Italy, and Spain being responsible for the largest quantities, the Po and the Rhone being the most offending rivers. At one time the Rhone was alleged to release each year "30,000 tons of petroleum hydrocarbons, 500 tons of pesticides, 700 tons of phenols, 1,250 tons of detergents, and 24,000 tons of organic pollution" (23). Parts of the Mediterranean far from the shore are still relatively free from this kind of pollution. The worst concentrations are found locally, usually near the outfalls of major industrial plants. Industrial pollution however, must be the concern of all the coastal states of the region since its major effect is upon marine life which recognises no international boundaries. Marine organisms can concentrate metals (e.g. mercury, cadmium, copper, zinc, lead) from the water and these endanger human health when contaminated sea food is eaten. Many cases have been reported in the Mediterranean.

(b) Domestic sewage. The quantity of sewage reaching the Mediterranean is colossal on account of the dense coastal populations of residents and visitors. According to one report at least 120 coastal towns and cities still pump 90 per cent of their sewage into the sea untreated or poorly treated (24), which seems little better than 10 years ago. Treatment plants are being constructed urgently, but in many cases the need to cope with seasonal influences of tourists has led to unexpectedly high costs. Sewage in coastal waters is aesthetically unpleasant and a threat to the tourist trade, but it is also a serious hazard to health. There are numerous cases all round the Mediterranean of beaches having to be closed for a time because of sewage pollution. In Spain for example, 37 per cent of all beaches were found to fall below the minimum standards set by the W.H.O. in 1981 (25). Illnesses associated with infection resulting from bathing in contaminated water or eating contaminated seafood (e.g. oysters, mussels) are common in the Mediterranean. Cholera, dysentery, typhoid, and hepatitis have been associated with marine pollution resulting from sewage carrying pathogenic bacteria and viruses. The claim that someone swimming in the Mediterranean has a "one in seven chance" of catching a disease dramatised the dangers a few years ago, but the risks are still much the same (26).

Sewage pollution tends to be confined to coastal locations and to the vicinity of major towns. It does not have great political significance, though it is almost certain that somewhere in the Mediterranean there are

beaches allegedly polluted by the sewage from a neighbouring town the other side of an international boundary.

(c) Oil pollution The Mediterranean is more seriously polluted by oil than any other ocean: about half the floating oil in the world is in the Mediterranean sea, and in places 500 litres per km<sup>2</sup> have been found (27). The total quantity entering the sea in a year has been calculated from 0.5 to one million tonnes (28), compared with six million tonnes for the world. This astonishing quantity is likely to increase in future very substantially unless conservation measures implemented internationally are highly successful. The achievement of effective oil pollution control could prove to be a serious source of international controversy. The danger of increased oil pollution is likely for several reasons:

(i) Increased volumes of oil moving across the Mediterranean to western markets as a result of increased pipeline capacity, and a possible further widening of the Suez Canal. Table 9 indicates the sources of this oil, even without a widening of the Suez Canal.

(ii) More spills resulting from increasing oil-refining activities in coastal locations, above all in the north. The total quantity could rise, at worst, from 10,000 tonnes in 1978 to 13,200 tonnes in 1985 per annum (29).

(iii) The likelihood of a larger number of accidents which have been remarkably few in the Mediterranean hitherto, as a direct result of heavier tanker traffic (30).

Detailed statistics are unavailable as to sources of oil pollution in the Mediterranean but estimates for the world as a whole give some useful indicators (Table 10). More than 40 per cent is associated with the transportation of oil. This is highly relevant to the Mediterranean where much oil is in transit from and to countries outside the region. Apart from the obvious threat to tourism posed by oil pollution, oil also constitutes a serious threat to marine life. It is clear that certain parts of the Mediterranean are more at risk than others, with coasts in the vicinity of the main tanker routes being particularly vulnerable.

(d) Radioactive waste. Radioactive discharge into the Mediterranean does not appear to be important. France, Italy, and Spain have nuclear power plants which can be a source of tritium and other radio nuclides, but so far there is no evidence of major political controversy. Several other Mediterranean states are contemplating nuclear power, and regional monitoring and controls are on the agenda.

#### International cooperation to combat Mediterranean pollution

The appalling implications of the growing pollution in the Mediterranean became clear in the early 1970's. There had previously been a number of measures taken by individual countries affecting their own waters, and various international agreements which involved the Mediterranean to some degree, but concerted international action by Mediterranean states only began with the signing of the Barcelona Convention in 1976. This historic Convention arose out of the 1972 United

Table 9. Estimate of crude oil Mediterranean shipments  
in 1985

	in million b/d
Sumed	2.3
Suez Canal	2.7
Iraq-Turkey	0.9
Iraq-Banias	1.4
Iraq-Tripoli	
Libya <sup>1</sup>	1.0
Algeria <sup>1</sup>	0.8
Tunisia	0.3
Egypt	1.0
TOTAL	10.4

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Maximum sustainable output is estimated today at 2.1 million b/d for Libya and 1.2 million b/d for Algeria.

Source: G. Luciani "The Mediterranean and the energy picture", paper submitted to this conference.

Table 10. Sources of oil in the world's oceans (Per cent)

Operational sources (cleaning, ballasting etc.)	32.5
Accidents to tankers and pipelines	9.0
Offshore oilfield spillage	4.0
Land-based discharges	32.5
Natural seepage	15.0
Atmospheric rain-out	7.0

Source: P. Le Lourd, "Oil pollution in the Mediterranean", Ambio  
Vol VI No. 6 1977, p.319.

Nations Conference on the Human Environment at Stockholm, which gave birth to the U.N. Environment Program (U.N.E.P.). In 1974 U.N.E.P. selected the Mediterranean for special action to protect the marine environment, no doubt partly as a result of an F.A.O. consultation early in the year (31). An Intergovernmental Meeting on the Protection of the Mediterranean was convened by U.N.E.P. in Barcelona in 1975. Cyprus and Albania were the only absentees. A Mediterranean Action Plan (M.A.P.) was approved at Barcelona (32) and its implementation was formally agreed in the Barcelona Convention of 1976 which only Albania did not sign.

The Barcelona Convention. This timely agreement was an encouraging start to regional cooperation to combat pollution in the Mediterranean. It was basically an agreement to encourage national legislation, initiate regional planning and research, and make certain practical institutional and financial arrangements. It included a proposal to set up a Regional Oil Combatting Centre in Malta which is now operational. The Convention contains no sanctions and has no supranational authority. It has been followed by three important Protocols: (33)

- (i) For the prevention of pollution by dumping from ships and aircraft
- (ii) Concerning cooperation in combating pollution by oil and other harmful substances in an emergency
- (iii) Concerning land-based pollutants (34)

By 1981 Protocols (i) and (ii) had been ratified by all Mediterranean states except Albania. Protocol (iii) which was agreed in Athens in May 1980 is apparently still in the process of ratification.

The Athens Protocol on land-based pollutants took over two years to negotiate partly because the E.E.C. sought to ensure that it did not conflict with other Community legislation and agreements. The Protocol was approved by the E.E.C. and all except Albania, Syria, and Egypt. Since about four-fifths of Mediterranean pollution is land-based, such an agreement was an extremely important step forward. The parties agreed to eliminate or strictly limit pollution reaching the sea directly, or through rivers, canals, or other watercourses, or in the atmosphere. A list of substances to be controlled is given in the form of a "Black list" (e.g. mercury, cadmium, persistent synthetic materials, radioactive substances) and a "Grey list" (e.g. zinc, copper, chrome, lead, pesticides, crude oils). Black list substances are to be eliminated and Grey list substances strictly controlled.

The Athens Protocol highlights some of the difficulties of pollution control. First, the riparian states of certain international rivers may have no direct interest in preventing pollution in the Mediterranean: for example the Evros, Nestos, and Strimon rivers which rise in Bulgaria and reach the Aegean through Greece. Similarly, Uganda, the Central African Republic, and Ethiopia are unlikely to exercise stringent controls on the upper stretches of the Nile (35). Secondly, enforcement is left to the states themselves. Thirdly, there is the familiar conflict in the Mediterranean between environmental control, which is costly, and economic development. The major pollutants are the developed countries of the

north, while the developing states of North Africa create relatively little pollution. While this fact is partially recognised by the fact that France, Spain, and Italy are likely to supply 85 per cent of the necessary funds (\$15 billion over the next 15 years) (36), there are inevitably going to be some difficulties over deciding upon standards and guidelines agreeable to both north and south.

It is far too early to assess the effectiveness of the Athens Protocol. For some countries like France and Spain it will simply reinforce legislation already in existence. In other countries the effects can be expected to be rather slow. As with so much anti-pollution activity since the Barcelona conference of 1975 one positive result will be the exchange of information and the production of large quantities of research data. The implementation of anti-pollution agreements will no doubt cause strains and stresses between states but they at least have a common goal in sight from which everybody will benefit - a cleaner and safer Mediterranean.

The Blue Plan. The Blue Plan was proposed at a U.N.E.P. meeting in Nairobi in 1975, and after a series of consultations it was finally launched in September 1980. It is an attempt to balance the emphasis on pollution control with economic development. Its aim is to reconcile future development with environmental protection. There is no plan as such, but as emphasis on encouraging cooperation between states over common problems not just associated with the sea. Phase 1 involves the preparation of a series of expert studies on aspects of the Mediterranean region, (e.g. industry, agriculture, migrations, energy, resources), each study being the responsibility of a joint north/south team. Phase 2 involves analysis of the Mediterranean as an integrated region, identifying common problems over the next three or four decades. Phase 3 will be the communication of recommendations to assist governments to achieve rational development plans from an environmental viewpoint. It would be a mistake to expect too much of the Blue Plan. Much will depend on the quality of the ideas it produces, which have yet to be seen. So far, there has been good commitment to the concept, and only Cyprus, Albania and Libya have not participated in any meetings. It is a cautious but significant move towards practical cooperation, emphasising the one common concern which cuts across political differences - environmental protection.

### Conclusion

Environmental protection has done much for inter-state cooperation in the Mediterranean since the early 1970's. In the next few years a reasonable degree of cooperation can be expected as more rigorous controls are exercised. The most likely cause of serious disputes between states will be oil tanker traffic. As the volume of oil transported increases, and awareness of the associated risks grows (possibly as a result of a major tanker disaster), states will be increasingly keen to protect their waters from pollution. The proposed E.E.Z. bestows on the coastal state the right to exercise jurisdiction for "the preservation of the marine environment" (37), although other states are to enjoy the right of freedom of navigation. Thus the re-routing of tankers, or some control on their movement could be in the interests of the coastal state. There could also be some resentment over the growing number of tankers in transit from the



Suez Canal to non-Mediterranean locations. Egypt is the only Mediterranean state to benefit from this traffic in the form of canal dues. Malta, Tunisia, Algeria, Morocco and Spain on the other hand, all with coastal tourist resorts, could experience serious oil pollution in the event of a major accident. The Suez Canal was widened considerably between 1975 and 1980, enabling loaded tankers of up to 150,000 tonnes to transit, compared with the previous maximum of 60,000 tonnes. The average size of tankers has thus already increased. But the Suez Canal could be widened still further to accommodate loaded supertankers of up to 250,000 tonnes. The project is still under discussion and a decision is expected shortly, but the implications for the Mediterranean are obvious if the scheme goes ahead. Table 10 indicates that a number of non-Mediterranean states have an interest in Suez Canal tanker traffic, and would no doubt welcome its widening still further.

## SUMMARY AND CONCLUSION

### (a) Fishing

General prognosis. Increasing demands for Mediterranean fish will create dangers of over-exploitation, and lead to more national claims to exclusive fishing beyond present limits. Local disputes over fishing rights, and over levels of catches of threatened species can be expected, but are unlikely to be very serious. Meanwhile practical steps to manage Mediterranean stocks will be extended through the G.F.C.M.

#### Potential trouble spots

Alboran sea (Spain/Morocco)?

North African waters (Italy/Algeria-Tunisia)?

Malta Channel (Italy/Malta)?

Libya/Egypt boundary zone?

Aegean Sea (Greece/Turkey)?

Timescale. The 1980's could be difficult with the introduction of E.E.Z's, the accession of Spain and Greece to the E.E.C., declining stocks of certain species, and attempts by G.F.C.M. to exercise more control. Alternatives (e.g. aquaculture) will not yet be effective.

Strategic implications. There is a north/south element in potential disputes but these disputes are likely to be short-lived or seasonal. Superpower intervention is out of the question. Fishing disputes can however be used to exacerbate deteriorating inter-state relations.

### (b) Seabed mining

General prognosis. Apart from submarine volcanoes and perhaps some placers, seabed mining sites in the Mediterranean are unimportant. The prospects for mining manganese and iron from volcanoes and chrome from placers are uncertain. They could possibly be used in an emergency; there are enough sites away from maritime boundaries to avoid conflict.

Potential trouble spots. In the highly unlikely event of widespread exploitation, sites near boundaries (Figure 2) could be disputed, and there could be arguments over possible environmental effects on nearby coasts. (e.g. Spain/Morocco, Italy/Tunisia, Greece/Turkey). There could also be resistance from mineral producers in the region to offshore production.

**Table 10. Suez Canal: Northbound Petroleum and Products by unloading  
countries in 1981**

	('000 tonnes)
Italy	12,939
Rumania	5,154
Holland	2,117
Spain	1,845
Turkey	1,748
Morocco	1,587
U.S.A.	1,448
France	1,433
Greece	1,110
Egypt	1,065
Syria	884
United Kingdom	861
Portugal	743
Yugoslavia	497
Belgium	403
Denmark	247
Germany (Fed.)	239
Lebanon	194
Sweden	93
U.S.S.R.	87
Canada	59
Gibraltar	50
Finland	47
Malta	30
Poland	30
Cyprus	28
Algeria	18
Others	1,610
<b>TOTAL</b>	<b>36,566</b>

Source: Suez Canal Authority, Monthly Report, Ismailia, December 1981 p.66.

Timescale. The most favourable seabed mining locations (e.g. Pacific, Red Sea) are unlikely to yield minerals for at least five years. Mediterranean sites are unlikely to be used for many years, if at all.

Strategic implications. Manganese and chrome are strategic minerals which France and Italy might find valuable if other sources were denied.

#### (c) Environmental protection

General prognosis. The willingness of 17 out of 18 coastal states to cooperate over environmental protection from 1975 is encouraging. The first decade will be relatively easy (fact-finding, preliminary planning, combating oil pollution etc.) but the next decade could reveal strains and stresses between the industrial north and developing south. There could also be differences over attitudes to oil tanker transit traffic between those who benefit (major exporters and importers) and those whose coasts are at risk. Danger areas are along the main Suez Canal to Strait of Gibraltar route. A major disaster (e.g. in Strait of Gibraltar, off Malta, or in the approaches to Suez) could change attitudes radically.

Timescale. The next five years could reveal contrasts in real progress towards checking land-based pollution followed by some disillusionment. Tanker traffic will steadily increase in the same period. If the Suez Canal is widened further it could be complete by the early 1990's.

Strategic implications. Several non-Mediterranean countries including U.S.A. and the U.S.S.R. receive oil imports via the Mediterranean and would resist attempts to reduce quantities, or re-route tankers for environmental reasons. Most importers would welcome a wider Suez Canal.

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