



**United Nations
Environment
Programme**



UNEP(OCA)/MED WG.146/4
11 September 1998

Original: ENGLISH

MEDITERRANEAN ACTION PLAN

Meeting of Experts on the implementation of
the Action Plans for marine mammals (monk
seal and cetaceans) adopted within MAP

Arta, Greece, 29-31 October 1998

**CURRENT STATUS OF MEDITERRANEAN
MONK SEAL (*Monachus monachus*) POPULATIONS**

Note: The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of SPA/RAC and UNEP concerning the legal status of any State, Territory, city or area, or of its authorities, or concerning the delimitation of their frontiers or boundaries. The views expressed in the document are those of the author and do not necessarily represent the views of SPA/RAC and UNEP.

Document prepared under consultancy for the Regional Activity Centre for Specially Protected Areas (SPA/RAC), by:

Alex AGUILAR

Department of Animal Biology, University of Barcelona, 08071 Barcelona, Spain

INDEX

1.- INTRODUCTION	2
1.1. Organization of the review	3
2.- BLACK SEA	
2.1. Turkey	4
2.2. Bulgaria	4
2.3. Romania	4
2.4. Overall status in the region	5
3.- EASTERN MEDITERRANEAN	
3.1. Western and southern Turkey	6
3.2. Syria	7
3.3. Lebanon	7
3.4. Cyprus	7
3.5. Israel	8
3.6. Egypt	8
3.7. Libya	8
3.8. Greece	9
3.9. Albania	10
3.10. Yugoslavia	10
3.11. Croatia	11
3.12. Overall status in the region	11
4.- WESTERN MEDITERRANEAN	
4.1. Spain	13
4.2. France	14
4.3. Western Italy	14
4.4. Malta	15
4.5. Tunisia	15
4.6. Algeria	16
4.7. Morocco	16
4.8. Overall status in the region	17
5.- ATLANTIC	
5.1. Spain - Canary Islands	19
5.2. Portugal - Madeira	19
5.3. Morocco	20
5.4. Western Sahara	21
5.5. Mauritania	23
5.6. Senegal	24
5.7. Gambia	24
5.8. Overall status in the region	25
6.- ACKNOWLEDGEMENTS	26
7.- REFERENCES	27

1.- INTRODUCTION

The Mediterranean monk seal (*Monachus monachus*) is one of the most endangered mammal species worldwide. The causes of this situation appear to be all human-related and range from culls in the past for fur and oil to present-day incidental or intentional mortality associated with fishing. In many areas, habitat destruction or alteration is the main threat. This is largely due to the development of tourism, industrial activity and population growth in the Mediterranean region in recent decades. This has led to significant increases in chemical pollution, physical alteration of the shore line, human presence on the coastal fringe, noise pollution and maritime traffic; all of these effects are likely to be detrimental to Mediterranean monk seal populations.

Since 1966 the Mediterranean monk seal has been classified by the Species Survival Commission of the World Conservation Union (IUCN) as "endangered". Moreover, it enjoys the highest priority in most conservation strategies and is currently protected by all available national and international legal instruments. However, despite its early recognition as a threatened species and the numerous meetings, action plans and conservation-oriented initiatives undertaken since the seventies, population numbers have continued to decline and the distribution range has contracted. It is likely that today no more than about 300-400 individuals are left, in contrast to the 600-1,000 believed to survive in the seventies (e.g. Sergeant *et al.*, 1978; Marchessaux, 1989a). The current metapopulation is severely fragmented and, with the exception of the very few subpopulations that remain stable or show extremely timid signs of increase, overall numbers fall steadily.

The aim of this document is to bring together the latest information on the current status of the Mediterranean monk seal populations. It is intended as an update of the document "*Present status and trend of the Mediterranean monk seal (Monachus monachus) populations*" edited by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) in Tunis and published in 1995. That document was produced after the meeting of experts held in Rabat on 7-9 October 1994 and was based on the data presented at that meeting as well as on previous publications and reports, in particular the documents "*Present status and trend of the Mediterranean monk seal*" (doc. UNEP(OCA)/MED WG.87/3), compiled by the Parc National du Port Cros (France) and reviewed and edited by the RAC/SPA, Tunis, in 1994; "*The Mediterranean Monk Seal*" by A. Caltagirone, published by RAC/SPA, Tunis, in 1995; and "*The Biology, status and conservation of the monk seal (Monachus monachus)*" written by the late Didier Marchessaux and published by the Council of Europe in 1989 as Nature and Environment Series No. 41. In addition, the description of the current situation of the species in Greece and Turkey is based on information from the following documents: Öztürk, B. (1998): *Present status and conservation of the Mediterranean monk seal (Monachus monachus) population in Turkey*. Report of contract 16/97, Regional Activity Centre for Specially Protected Areas, Tunis, 27pp; and Dendrinou, P. (1998): *Status of the populations and implementation of the Action Plan for the Management of the Mediterranean monk seal (Monachus monachus) in Greece*. Report of contract 22/97, Regional Activity Centre for Specially Protected Areas, Tunis, 27pp. The structure of the present review is based on that already established in these documents and the author acknowledges his debt for the information contained therein.

It is expected that the present review will provide an updated picture of the current situation of the species and the most immediate threats it faces, and thus assist in identifying the most appropriate action to ensure its survival.

1.1. Organization of the review

The distribution range of the species is divided into four geographical regions: the Black Sea, the eastern Mediterranean, the western Mediterranean, and the Atlantic ocean. As in the documents referred to above, the information available on the species' status is presented country by country. This approach is certainly not sound on zoogeographical grounds because Mediterranean monk seals show a moderate degree of mobility and the range of seal aggregations often crosses the borders between countries. Examples of this are the seals inhabiting eastern Greece and western Turkey, or those living on the Morocco/western Sahara/Mauritania shores. This creates some difficulties in the assessment of the population status and numbers, for which cross-referencing is inevitable. However, the country-by-country approach has been maintained because in many cases both the nature of the threats and the conservation actions are specific to, and limited by, national borders.

For each geographical region and country, the information compiled focused on the following items: original and current distribution, present number of individuals, habitat availability, reproduction and migration patterns, and threats. When relevant information on other subjects was also available, the appropriate references are given. As mentioned above, this review is an update of the previous document "*Present status and trend of the Mediterranean monk seal (Monachus monachus) populations*", edited by the Regional Activity Centre for Specially Protected Areas of Tunis (RAC/SPA) and published in 1995. The information in that paper is not repeated here, but summarized briefly. Only when new relevant information is available is this specifically detailed and the appropriate references given.

2.- BLACK SEA

2.1. Turkey

**Distribution and population trends.-* Information on original distribution and abundance of monk seals on the Black Sea's Turkish shoreline is extremely scarce. Population numbers estimated during the seventies were very imprecise and ranged from 15 to 50 (Sergeant *et al.*, 1978; Berkes *et al.*, 1979). There were very few reports of sightings during the eighties and nineties and most surveys resulted in no observations (Zaitsev, 1993; Kyraç and Savas, 1996; Öztürk, 1996). The recent report of two individuals in the western part of the Turkish shoreline (Öztürk, 1996) indicates that at least some individuals still survive in the region. During the last two decades no pups have been seen in the region.

**Current number of individuals.-* Unknown but undoubtedly very few.

**Habitat availability.-* The coastline does not appear suitable for sustaining a large population of monk seals. There are few beaches and caves of the type commonly used by the species. Unlike the Turkish Aegean and Mediterranean coasts, there is little tourist development or resort building (Öztürk, *pers. comm.*).

**Reproduction and migration patterns.-* No information on reproduction is available, although no pups have been seen during the last two decades.

**Threats.-* The reason for the decline of the monk seal on the Turkish coastline of the Black sea is unclear. Fishing interactions appear to be limited or non-existent and habitat is well preserved. During the sixties and seventies several animals, probably pups and juveniles, were collected for display in circuses and zoos. Öztürk (1996) estimated that up to 20 seals were captured for these purposes and considered this to be the main cause of population decline. But other non-identified factors may also have hastened the extinction of the species.

2.2. Bulgaria

**Distribution and population trends.-* Little information is available on the distribution of monk seals in Bulgaria, although it is known that they were originally found south of Nos Shabla (Borcea, 1927).

**Current number of individuals.-* Probably none.

**Habitat availability.-* No information is available.

**Reproduction and migration patterns.-* No information is available.

**Threats.-* No information is available.

2.3. Romania

**Distribution and population trends.-* The information on the original distribution of the species in Rumanian waters is extremely limited. Most records until the sixties were for the Danube Delta area or north of it (Borcea, 1927; Schnapp *et al.*, 1962). A record was made in this area in 1976 (Sergeant *et al.*, 1978).

**Current number of individuals.*- A few may survive.

**Habitat availability.*- No information is available.

**Reproduction and migration patterns.*- No information is available.

**Threats.*- No information is available.

2.4. Overall status in the region

The Black Sea is probably the region with the least information on monk seals available. Neither the causes for the decline of the species nor their original distribution and abundance are documented. Current information is not better. The only country in which some thorough surveys have been carried out is Turkey, from which the only definite fact is that at least a few individuals still survive today. However, no pups have been detected in the last two decades in any area. For Bulgaria and Romania there is a complete lack of recent information on the presence of seals or conservation problems, although in the seventies population numbers were already extremely low. Exchange with the Mediterranean populations appears not to occur, for which reason genetic isolation is likely to exacerbate the effects of genetic drift and consanguinity. Moreover, the extremely low population numbers are unlikely to be enough to overcome demographic or environmental stochasticity. It is probable that the species is currently on the brink of extinction in the Black Sea and may vanish definitively in the near future.

3.- EASTERN MEDITERRANEAN

3.1. Western and southern Turkey (including the Sea of Marmara)

**Distribution and population trends.-* At the beginning of the present century, monk seals appeared to be frequent along the Turkish coasts of the Mediterranean sea and the sea of Marmara. In the early seventies, when the first surveys were conducted, the surviving population was estimated at about 50-100, although these figures often included animals commuting with Greece, Cyprus and Lebanon (Sergeant *et al.*, 1978; Berkes *et al.*, 1979; Boulva, 1979). Information on the current distribution and status of the various regions is fragmentary because of variations in surveying effort. The Sea of Marmara population was assumed to be extinct, but a recent survey indicated the presence of at least two individuals (Öztürk, 1994). The Aegean Sea and the southern shoreline still shelter significant populations which are considered viable. In both areas pups have been recorded in recent years. However, unless effective protection measures are implemented urgently, the remaining individuals may be depleted in the near future (Öztürk, 1998). This is particularly true for the southern Turkish coasts, where intentional kills appear to be frequent (Gücu, 1998).

**Current number of individuals.-* Total estimated at about 49-54 individuals: 2 in the Sea of Marmara, about 31-35 in the Aegean Sea, and about 16-17 in southern Turkey (Öztürk, 1994; 1998; Öztürk and Dede, 1995; Güçlüsoy *et al.*, 1998; Gücu, 1998; Kıyraç *et al.*, 1998).

**Habitat availability.-* A lot of the habitat used by monk seals in the past has been altered or destroyed by urban development and tourism, but several locations remain in a reasonable state of preservation. In the Aegean, the Foca Pilot Project Area allows protects seals from tourism, divers and fishermen, and several caves are regularly in use (Güçlüsoy *et al.*, 1998; Öztürk, 1998). The Mordogan and Karaburun area is relatively well preserved and is affected by humans less than other locations on the Aegean Sea. It may become a reservoir for seals in the future (Öztürk and Dede, 1995; Öztürk, 1998).

**Reproduction and migration patterns.-* Although there is no precise information on movements of seals, it is known that some individuals commute between islands. This poses problems of management in the northern Aegean, where seals travel freely between Greece and Turkey (e.g. Berkes, 1978).

**Threats.-* In the Sea of Marmara, where traditional seal locations have become tourist areas, loss of habitat is thought to be the main cause of population decline (Öztürk, 1994). At present, genetic isolation from the other monk seal aggregation may eventually cause extinction. In the Aegean and Mediterranean seas, increasing pressure from tourism and urban development is the main threat to the surviving populations, but a number of fishing operations may also be significant. These include certain types of illegal fishing (for example with dynamite or spears) and fishing using legal but dangerous gear, like trammel nets. To this we have to add deliberate killing by fishermen, often with guns, to stop seals destroying fishing gear and fish farms. This continues to be a frequent source of mortality for seals in Turkey (Öztürk, 1998). Indeed, on the southern shoreline this may be the main cause of population decline. For example, Gücu (1998) reported the killing by gunfire of ten seals, including a pup, in the Cilician basin during 1994-1996. At present, deliberate killing is probably the main threat to monk seals on the Aegean and Mediterranean coasts of Turkey (Öztürk, *pers. comm.*).

3.2. Syria

**Distribution and population trends.*- There is almost no information on the occurrence of monk seals in Syrian waters. It is unclear whether this is the consequence of lack of appropriate habitat, early extinction of the species in the area, or lack of thorough surveys. The few reports from Syria in modern times (RAC/SPA, 1995) may be of individuals originating either from south-east Turkey or from eastern Cyprus.

**Current number of individuals.*- None.

**Habitat availability.*- No information is available.

**Reproduction and migration patterns.*- No information is available.

**Threats.*- No information is available.

3.3. Lebanon

**Distribution and population trends.*- In the past, monk seals were apparently distributed all along the coast of Lebanon, although they seemed to have been more abundant in the region north of Beirut. There is no precise information on their abundance (Tohmé and Tohmé, 1985; Marchessaux, 1989a). The species appears to have become extinct in the early or mid-seventies, although information for the last two decades has been extremely limited.

**Current number of individuals.*- Apparently none.

**Habitat availability.*- No information available.

**Reproduction and migration patterns.*- No information available.

**Threats.*- Limited information available. Urban development and associated sewage pollution, as well as occasional incidental captures, have been reported as potential detrimental factors for certain seal aggregations (RAC/SPA, 1995).

3.4. Cyprus

**Distribution and population trends.*- The original distribution of the monk seal in Cyprus extended along practically the entire coastline of the island. The number of reported sightings has decreased a lot in recent years and the observations are clustered in just a few locations, which suggests that the same few individuals were sighted repeatedly (Marchessaux, 1989a; RAC/SPA, 1995).

**Current number of individuals.*- Probably a very small group (4-5).

**Habitat availability.*- With the exception of some areas (e.g. Ayia Napa), there is little or no urban or tourist development in most of the locations where monk seals were recorded in the past. However, heavy boat traffic (sport and fishing boats) and fishing and the ensuing reduction of fish stocks affect many areas (Demetropoulos, *pers. comm.*), including those where the presence of seals was still reported recently.

**Reproduction and migration patterns.*- No information available.

**Threats.*- In the past, intentional killing or captures. At present, boat traffic and overfishing of species that constitute the diet of monk seals.

3.5. Israel

**Distribution and population trends.*- Although information is limited, the monk seal probably extended along the entire coast of Israel. The population appears to have become extinct before the Second World War (Bertram, 1943; IUCN, 1987). Some exceptional sightings were reported during the sixties and seventies, probably of the population inhabiting Lebanese waters (Marchessaux, 1989a; RAC/SPA, 1995).

**Current number of individuals.*- None.

**Habitat availability.*- In Dor and Rosh Hanikrah (near the border with Lebanon) there are caves which would potentially provide suitable habitat for monk seals (Kerem, *pers. comm.*)

**Reproduction and migration patterns.*- No information is available.

**Threats.*- No information available.

3.6. Egypt

**Distribution and population trends.*- Very little information is available on the occurrence of the species in Egyptian waters, where it appears to have become extinct before the Second World War. No population currently inhabits the region, although one sighting was reported in 1981 (Marchessaux, 1989a).

**Current number of individuals.*- None.

**Habitat availability.*- No information available.

**Reproduction and migration patterns.*- No information available.

**Threats.*- No information available.

3.7. Libya

**Distribution and population trends.*- Information is extremely limited. Most reported sightings were in the Al Jabal al Akhdar region, in the eastern third of the country (Norris, 1972). In this area a small population may still survive.

**Current number of individuals.*- No current information available. Estimated at about 20 in the mid-seventies (Sergeant *et al.*, 1978).

**Habitat availability.*- Because of the limited development on most of the Lybian coastline and the low intensity of fishing (IUCN, 1987), it is likely that much of the habitat originally occupied by monk seals is still in good condition.

**Reproduction and migration patterns.*- No information available.

**Threats.*- No information available.

3.8. Greece

**Distribution and population trends.-* Greece shelters the largest population of monk seals in the Mediterranean. The species was originally spread throughout the Greek mainland and islands (Marchessaux and Duguy, 1979; Sergeant *et al.*, 1978; Vamvakas *et al.*, 1979; Verriopoulos and Kiortsis, 1985). At present the species still remains widely distributed in Greece, mainland and islands, and is not concentrated only in the Northern Sporades and in the Ionian Sea, as it often appears to be because collection of data and monitoring there has been more thorough (Panou *et al.*, 1996). A survey conducted during 1990-1996 reported 711 live seal observations, which included 49 sightings of new-born pups (Adamantopoulou *et al.*, 1988; Dendrinis, 1998). Observations are scattered along the coasts of the Aegean and Ionian Seas, with breeding reported from the Dodekanese and Cyclades archipelagos, North-East Aegean, Kythira, Myrtoon, Crete, the Ionian and the northern Sporades. As in other areas in the Mediterranean, monk seal populations had dropped substantially from numbers at the beginning of the century and were still decreasing when the first monitoring surveys were undertaken in the seventies and eighties (Boulva, 1979; Marchessaux, 1979; Vamvakas *et al.*, 1979; Panou *et al.*, 1993). Strict conservation measures and education programs aimed at fishermen have been instrumental in stopping, or at least attenuating, this declining trend in certain areas, but it is probable that overall population numbers in Greece currently continue to dwindle.

**Current number of individuals.-* Population estimates are imprecise because of the wide scattering of individuals. Recent estimates are usually of an overall population of 200-250 individuals (*e.g.* Reijnders *et al.*, 1993; RAC/SPA, 1995; Brasseur *et al.*, 1997).

**Habitat availability.-* In some regions there appears to be no change from areas used in the past despite present proximity of roads and human settlements, indicating that presence of humans *per se* is not a significant cause of population decline (Akriotis *et al.*, 1998). However, human presence often brings with it fishing activity, destruction of the shoreline, pollution and maritime traffic, all factors adversely affecting seals. While many parts of the Greek coastline have been greatly altered by different combinations of these factors, others remain reasonably well preserved (Jacobs and Panou, 1996; Cebrián, 1997; MOm, 1997; Dendrinis, 1998). In areas with active protection, like the National Marine Park of Alonnisos - Northern Sporades, reproductive rates have apparently risen and killings by humans stopped. In other areas, like the island of Zakynthos, Cephalonia, Ithaca and others, active educational programs among fishermen and seafarers have reduced appreciably or eliminated intentional kills (Jacobs and Panou, 1996). The EU-LIFE project currently in operation considers four critical areas for the conservation of Greek monk seals: i) the islands of Milos, Antimilos and Polyegos in the central Aegean sea, ii) the islands of Karpathos and Kasos between Rhodes and Crete, iii) the islands of Samos, Icaria and Fourni in the central east Aegean, and iv) the island of Zakynthos in the Ionian sea. In all of them, a strategy for the conservation of the surviving monk seals is being implemented (Archipelagos and MOm, 1996). This strategy focuses primarily on reducing conflict between seals and fishermen, but also includes monitoring of the population and studies on causes of mortality.

**Reproduction and migration patterns.-* New-born seals have been reported from a number of different areas in Greece, which indicates that several distinct breeding populations exist (Adamantopoulou *et al.*, 1998). Information on movement of animals between locations is fragmentary but suggests that there is no definite seasonal pattern of movement. However, seals may cover distances of up to 50 nautical miles in a few days (Dendrinis, 1998).

**Threats.-* The decline in numbers is mainly attributed to deliberate persecution and killing, although encroachment on the coastal habitat by tourism and urban development, increased maritime traffic, overfishing of marine resources and pollution are also thought significant, particularly in recent years (Sergeant *et al.*, 1978; Vamvakas *et al.*, 1979; Verriopoulos and Kiortsis, 1985; Jacobs and Panou, 1996; Dendrinou, 1998). Most kills are made by fishermen attempting to reduce damage to gear caused by seals and competition for fish. However, loss of income in coastal fisheries is not only caused by seals but also by amateur and illegal fishing (Archipelagos, 1998). A survey on the causes of death of 92 monk seals during the period 1973-1996 indicated that, in juveniles and adults, deliberate killing was the most frequent cause. It caused 43% of deaths, while accidental captures in fishing nets accounted for 13%. Therefore, more than half of the deaths could be attributed to direct human intervention. But, in the case of pups, 92% of deaths were attributed to natural causes (Androukaki *et al.*, 1998). Information on pollution levels is fragmentary and limited to a few analyses of heavy metals in hair samples from monk seals, and of organochlorines and heavy metals in sea water and monk seal food items (Yediler *et al.*, 1993; Jacobs and Panou, 1996). The source of all this information is the Ionian Sea. Results suggest that exposure to certain pollutants, particularly mercury, may be in some cases moderate to high, but no evidence of reproductive impairment in the Ionian monk seal population has been found so far. The most likely cause of the recent population decline in Greece is the mortality of pups because of use of suboptimal habitat and of adults because of conflicts with humans, mainly fishermen, rather than a decline in birth rates (Jacobs and Panou, 1996).

3.9. Albania

**Distribution and population trends.-* There is almost no information on monk seals in Albanian waters. It is unclear whether this is the consequence of lack of appropriate habitat, early extinction of the species in the area, or lack of thorough surveys. The few unconfirmed reports of seals may correspond to individuals either from the Ionian Sea in Greece or from the Dalmatian archipelago in Croatia (Marchessaux, 1989a).

**Current number of individuals.-* None.

**Habitat availability.-* No information is available.

**Reproduction and migration patterns.-* No information is available.

**Threats.-* Large-scale fishing and tourism are much less developed than in other countries in the region. Artisanal fishing is however relatively extended. No information on pollution is available.

3.10. Yugoslavia

**Distribution and population trends.-* There are apparently no records on monk seals in Yugoslavian waters. It is unclear whether this is the consequence of lack of appropriate habitat, early extinction of the species in the area, or lack of appropriate surveys. Given the proximity of the Dalmatian archipelago in Croatia, it is likely that some seals originating from this area frequent Yugoslavian waters.

**Current number of individuals.-* None.

**Habitat availability.-* No information is available.

**Reproduction and migration patterns.*- No information is available.

**Threats.*- No information is available.

3.11. Croatia

**Distribution and population trends.*- Information on the original distribution of the species is fragmentary but suggests that the coastline, particularly the islands, was quite highly populated. The total population may not have been very large because the habitat available, particularly caves for breeding, is limited. The population fell in the middle ages, and was already low in the XVIII century. During the present century, sightings almost invariably referred to single individuals or, at most, couples. In the seventies and eighties, monk seals were only found in the Dalmatian archipelago in the south and the island of Pag in the north (Gamulin-Brida, 1979; Gomercic *et al.*, 1984; IUCN, 1987; Marchessaux, 1989a; Antica *et al.*, 1990; Draganovic, 1992; Cebrián, 1995). Jardas and Draganovic (1987) estimated the number of remaining individuals at that time at about 20. In the nineties the population appears to have become extinct; the last resident individuals were two seals on the island of Pag, which were last seen alive in 1991 (Gomercic, *pers. comm.*). Apart from these, the only recent sightings reported refer to two juveniles, one in Mljet and one in Palagruzza, which had probably come from the Ionian Sea (Antica *et al.*, 1990; Cebrián, 1995).

**Current number of individuals.*- Probably none, although some stragglers from the Ionian sea population may occasionally visit the Dalmatian Islands.

**Habitat availability.*- The coastal habitat on the islands is in general quite well preserved because since the Second World War it has been mostly under military jurisdiction which prevented urban or industrial development. After the Yugoslavian war the region was demilitarized and the human population decreased because of lack of jobs associated to the military presence. There has been no tourism development because of the war. Caves apparently suitable for breeding, although limited in number, are available and well preserved, particularly on the southern islands and coastline. Details on availability of caves and habitat in the different islands can be found in Cebrián (1995). Given the good state of preservation of the habitat in the islands, this is a potentially suitable place for reintroduction/recolonization projects.

**Reproduction and migration patterns.*- No information is available.

**Threats.*- In the past, conflicts with fishermen and, in some cases, destruction of caves by shoreline developments or military operations were the main causes of population decrease. Some occasional kills both by soldiers and civilians were also recorded. At present, fishing, although little developed, may still cause mortality. Overfishing and pollution may be secondary impediments to the resettling of seals in the area. Tourism may become a serious threat when peace in the region is finally established.

3.12. Overall status in the region

The monk seal population in the eastern Mediterranean has continued its decline in recent years. By the seventies seals were extinct in Syria, Israel, Egypt, Albania and Yugoslavia, and the total number of individuals was estimated at about 335 (Sergeant *et al.*, 1978). At present, total numbers do not exceed 220-270. However, population decline has probably been more dramatic than the variation in overall figures may suggest because more

monitoring effort has led to the discovery of small colonies in Greece and Turkey overlooked before. During the last two decades the monk seal has vanished from Lebanon, and also probably from Croatia and Cyprus. There is no information from Libya, where a colony estimated in the seventies at about 20 individuals may still survive. The largest, and probably the only viable, populations are those from Greece, with an estimated 200-250 seals, and northwestern Turkey, which shelters about 50 individuals.

The pace of demographic change observed in many of these subpopulations allows little room for optimism. Apart from some notable examples in Greece, where the situation has improved and seals and their habitat seem reasonably secure, conflict between seals and humans continues to occur. Deliberate killing by fishermen trying to avoid damage to nets or fish farms or who just want to eliminate a potential competitor, is still a major problem. In some areas fishermen's attitudes continue to overwhelm the legal instruments and managerial organisations that states have established to protect seals. For example, despite the fact that the Mediterranean monk seal has been legally protected in Turkey since 1977, at least 10 individuals were killed by gunfire during 1994-1996 only on the Cilician basin shoreline (Gücu, 1998). Unfortunately these are not isolated cases; with varying intensity, such destructive attitudes persist in many areas.

In addition, fragmentation has become a big problem. The size of some of the subpopulations is so small and they are located so far from other seal aggregations that genetic drift, consanguinity and environmental and demographic stochasticity are likely to cause their definitive extinction in the short term. This is the case of the seal groups barely hanging on in Croatia and the Sea of Marmara.

4.- WESTERN MEDITERRANEAN

4.1. Spain

**Distribution and population trends.-* Originally the species was found along the whole coast of Mediterranean Spain. During the first half of this century it was still relatively abundant in the Balearic Islands, Murcia and Almeria. It finally became extinct in mainland Spain and the Balearic Islands (Majorca and Minorca) during the sixties (González and Avella, 1989); although there were a few occasional later sightings in the Balearic Islands and on southern coasts of Spain (the last confirmed sighting was in 1977 at the island of Cabrera); it is unclear whether the seals seen were isolated remnants of the original population or stray individuals from the North African coast (Avella, 1979; 1986; RAC/SPA, 1995). The Chafarinas Islands, off the Moroccan coast, is the only place where monk seals can currently be observed on a semi-permanent basis (González, 1989).

**Current number of individuals.-* During the eighties and early nineties only one male (named *Peluso* by the locals), apparently adult, was observed inhabiting permanently the Chafarinas Islands. A female was also seen there occasionally. Since about 1994, *Peluso* disappeared and has not been seen elsewhere nor has his corpse been found. Since 1995 another seal, apparently a female, has replaced *Peluso* and regularly uses the same haul-out sites. On some occasions this individual has been seen in the company of at least two other seals, which probably commute to the island from the northern African coast (González, *pers. comm.*).

**Habitat availability.-* Most of the seal's potential habitat is profoundly degraded by human settlements, harbours and industrial development. However, certain biotopes have been protected by national or regional (autonomous) laws and still preserve moderately good conditions for the species. However, they are usually too small and too close to active fishing locations or large human settlements to ensure complete protection for the seals. Exceptions to this appear to be the Chafarinas Islands and the Isle of Alboran, which is uninhabited and a long way from the continent. These are probably the most appropriate remaining habitats for the species.

**Reproduction and migration patterns.-* Individuals in the Chafarinas Islands appear to commute to the northern African coast and undoubtedly belong to the same population as seals from Algeria and Mediterranean Morocco. No information is available from the other areas.

**Threats.-* In the continent and the Balearic Islands, the initial cause of extinction was conflict with fishing activities, often through intentional kills, although habitat degradation probably played a major role in recent decades (González and Avella, 1989). The species is now strictly protected, so fishing conflicts are likely to be fewer. However, lack of appropriate habitat continues to be the main and increasing threat and is undoubtedly the main cause preventing recolonization. The habitat of the Chafarinas Islands is very well preserved because it was first a military base and is now a protected area; seal deaths there were mostly caused by intentional kills, incidental captures by fishing nets and collisions with boats. Recent analyses of tissues of one seal from the Chafarinas Islands and another from the neighbouring northern Africa coast revealed levels of polychlorinated biphenyls (PCBs) and other organochlorine pollutants which are high enough to potentially cause reproductive disorders and alterations in the immune system (Borrell *et al.*, 1997).

4.2. France

**Distribution and population trends.-* The species was originally distributed along the whole coast of continental France, including some coastal islands like the Hyères, and Corsica. The recession of the species started by the mid-1800s. It vanished from the continent shortly after the Second World War, although there were some records of seals (possibly monk seals) along the Côte d'Azur during the eighties, which were attributed to stragglers from Corsica (Duguy and Cheylan, 1980; Maigret, 1990). In Corsica the species had reached a critical situation already by mid-seventies and probably became extinct in the eighties (IUCN, 1987; Boulva, 1975). There were a few occasional sightings in Corsica during the eighties -the last in 1982- (Cheylan, 1987), but it is unclear whether these corresponded to isolated remnants of the original population or to individuals straying from Sardinia, where a small population survived until the late eighties.

**Current number of individuals.-* None.

**Habitat availability.-* Most of the seal's potential habitat has been severely degraded. Certain biotopes have been quite well preserved although they are usually too small and too close to active fishing locations or large human settlements to ensure complete protection for seals.

**Reproduction and migration patterns.-* No information available.

**Threats.-* In both the continent and Corsica the initial cause of extinction was conflict with fishing activities, often through intentional culls, although habitat degradation probably played a major role in the final period (Marchessaux, 1988). The species is now strictly protected, so fishing conflicts are likely to be fewer. However, lack of appropriate habitat continues to be the main threat, and increasingly so, and is undoubtedly the main factor preventing recolonization. Chemical pollution, particularly by organochlorine compounds, which is known to be high in other marine mammals in the area, is also a threat.

4.3. Western Italy

**Distribution and population trends.-* In the past, monk seals ranged along the whole of continental Italy and its islands, as well as Sardinia and Sicily. There is evidence that recession in the continent started at least in the last century. Resident individuals probably disappeared during the early 1960s. The population living on the islands survived somewhat longer but became extinct during the last two decades (Massa, 1972; Boitani, 1975; Marchessaux, 1989a; Argano, 1990). Thus, some animals appear to have survived until the mid-seventies in south-west Sicily and the Egadi, until the early eighties in the Tuscan Archipelago and until the early nineties in eastern Sardinia (Argano, 1990; Notarbartolo di Sciara, 1986; WWF-Italy, 1995; RAC/SPA, 1995). Single individual sightings have been reported recently in south-eastern Italy, along the north-eastern and south-western coast of Sardinia, and in the islands south-west of Sicily (Mo and Notarbartolo di Sciara, *pers. comm.*). The origin of these seals is unclear, but they do not appear to belong to local resident populations.

**Current number of individuals.-* Probably none.

**Habitat availability.-* Most of the seal's potential habitat is severely degraded. Certain biotopes, mainly in Sardinia and Sicily, are still quite well preserved, although they are usually too small and too close to active fishing locations or large human settlements to ensure complete protection for seals.

**Reproduction and migration patterns.-* No information available.

**Threats.-* The initial cause of extinction was conflict with fishing activities, often involving intentional kills. In the final period habitat degradation probably also played a major role (Argano, 1990; RAC/SPA, 1995). The species is now strictly protected, but enforcement appears to be poor and lack of appropriate habitat is the main cause preventing recolonization. Chemical pollution, particularly by organochlorine compounds, which is known to be high in other marine mammals in the area, is also a threat, particularly in the northern region.

4.4. Malta

**Distribution and population trends.-* Information on the presence of Mediterranean monk seals in Malta is very limited and does not suggest that the species has ever been common in the Islands (Marchessaux, 1989a).

**Current number of individuals.-* None.

**Habitat availability.-* Although the coastal habitat of certain areas of the Islands has changed drastically, moderately well-preserved shorelines do still exist. However, given that the species does not appear to have ever been common in Malta, it is unlikely that even this well-preserved habitat is suitable for monk seals.

**Reproduction and migration patterns.-* No information available.

**Threats.-* Fishing is likely to be the main threat to the species.

4.5. Tunisia

**Distribution and population trends.-* In the past, the species inhabited both the continent and the islands. The continental population disappeared at an unknown date, but certainly before the mid-1970s. Small groups inhabited the archipelago of Zembra until the end of the seventies and in La Galite at least until the mid-eighties. It is possible that some individuals still survive in the latter location (Ktari-Chakroun, 1979; Marchessaux, 1987; 1989a; Rosser *et al.*, 1978). It is unclear whether the few reports of isolated sightings or strandings of seals in the last decade are of remnants of the original population or of stray individuals from other areas.

**Current number of individuals.-* Probably none, although a few individuals may still survive in the La Galite archipelago.

**Habitat availability.-* On the coast there is still a lot of suitable habitat for seals. Some of these areas, like the La Galite archipelago, enjoy a partial protected status. However, illegal fishing practices and uncontrolled frequentation of these islands by leisure craft during summer have certainly resulted in a serious disturbance of this habitat (RAC/SPA, 1995).

**Reproduction and migration patterns.-* No information available.

**Threats.-* Increasing urban development, lack of appropriate control of tourism, including underwater fishing for sport, and increasing fishing pressure all threaten the few seals that may still survive.

4.6. Algeria

**Distribution and population trends.*- The species originally inhabited the whole shoreline but it is now fragmented into at least two subpopulations: one in the east and another in the west. Some individuals may still show up in the central segment of the coastline (Alger region), although reported observations there are extremely limited (Boutiba, 1990) and may be individuals from the eastern or western populations. Avella (1994) suggested that a very small resident population may still survive near Skikda, midway between the Algiers region and the eastern frontier. The information available on the status of the eastern subpopulation is scant but suggests that seals probably disappeared during the mid-seventies. Some occasional later reports are probably of stray individuals from the La Galite archipelago in Tunisia. The only current resident population appears to be on the west coast (from Cap Ténès to the Moroccan border), which undoubtedly merges with the eastern Moroccan population. This population's numbers continue the downward trend observed since the sixties (Boulva, 1979; Avella, 1987; Boutiba *et al.*, 1987; 1988; Marchessaux, 1988; 1989a; RAC/SPA, 1995).

**Current number of individuals.*- Probably none in the East. Undetermined but probably fewer than 10 individuals in the western population.

**Habitat availability.*- The coast still has some habitat suitable for seals. However, poor law enforcement, urban development, and increasing fishing pressure cast doubt on the real availability of this habitat (Boutiba, 1990).

**Reproduction and migration patterns.*- Reproduction has been observed between May and August (Bouduresque and Lefevre, 1988). No information is available on the reproductive rates of the population.

**Threats.*- The continuing invasion of the shoreline by human development and overexploitation of the fishes and cephalopods that constitute the diet of the seals. Intentional kills by fishermen continue to be a significant cause of mortality (Avella, 1987; Boutiba *et al.*, 1988; Boutiba, 1990); Avella (1994) recorded almost 40 seals killed, captured (and not released), or simply found dead between 1983 and 1993.

4.7. Morocco

**Distribution and population trends.*- Information on the original distribution of the species is unclear, although it probably used to inhabit the whole Mediterranean coast. Data from the last two decades suggest greater use of the eastern coastline, particularly from Al Hoceima eastwards. Some individuals appear to visit occasionally the nearby Chafarinas Islands (belonging to Spain) and exchange of individuals with the western Algerian population is likely (Avella and González, 1984; Bayed and Beaubrun, 1987).

**Current number of individuals.*- Fewer than ten, mostly located east of Al Hoceima, in the Cap des Trois Fourches region (Avella and Bayed, *pers. comm.*).

**Habitat availability.*- The coast still has some habitat suitable for seals. However, poor law enforcement and increasing fishing pressure bring into question the real availability of this habitat.

**Reproduction and migration patterns.*- No information available.

**Threats.-* The main cause of population reduction is conflict with fishing activities, often involving intentional kills (Bayed and Beaubrun, 1987). In particular, use of dynamite and driftnets, both common practices in the region, are known to have been a major cause of monk seal mortality. At present, use of dynamite appears to have decreased but new sources of aggression have arisen; in recent years there have been at least two cases of seals killed by divers fishing with spearguns (Bayed, *pers. comm.*). Some deaths associated with collisions with boats have also been reported (Bayed and Beaubrun, 1987). In recent years habitat degradation has undoubtedly also played a major role and probably combines with fishing interactions to prevent population recovery. Recent analysis of tissues from one seal from the Chafarinas Islands and one from Arkemane (near Melilla) showed levels of polychlorinated biphenyls (PCB) and other organochlorine pollutants high enough to potentially cause reproductive and immune-system disorders (Borrell *et al.*, 1997).

4.8. Overall status of the species in the region

The status of monk seals in the western Mediterranean was extremely poor when the first comprehensive surveys were carried out in the sixties and the seventies (e.g. Marchessaux, 1977), and has continued to deteriorate since then.

On the northern side of the Sea the species appears to be definitely extinct and, although legal instruments are available and would probably be properly enforced if a seal appeared, habitat has been so irreversibly altered that little hope of recolonization remains (IUCN, 1987). Urban development, tourist infrastructures and harbours occupy a large part of the continental coast. In the islands (Balearic, Corsica) change has generally been more moderate, but they share the same human-altered pattern as the continent. Moreover, general environmental conditions on the northern side have deteriorated greatly. Overexploitation of fish and other marine resources that make up the usual or potential diet of monk seals is widespread in the region and would clearly hinder any hypothetical recovery. Pollution levels, particularly of organochlorine compounds (polychlorinated biphenyls or PCBs, DDTs, etc.) and heavy metals (mercury, lead, etc.), are extremely high. Their concentrations in tissues of both the monk seal and other marine mammal species exceed the threshold at which effects on reproduction and the immune system are likely to occur (Borrell *et al.*, 1997). Indeed, pollution levels were suggested to have acted as triggers of the morbillivirus epizootic that caused thousands of deaths in the western Mediterranean striped dolphin population in 1990-1992 (Aguilar and Raga, 1993; Aguilar and Borrell, 1994), an event that apparently did not affect monk seals. The few remaining coastal biotopes in acceptable condition are too small to ensure the effective protection of a seal population and would be unavoidably affected by general changes like overfishing and pollution.

Conditions on the southern side are somewhat better, although the trends observed in the last two decades indicate that the region is following the same path as the north (IUCN, 1987). The north African population, which about two decades ago formed a continuum along the coast, is now fragmented into two or (optimistically) three subpopulations: eastern Morocco-western Algeria, eastern Algeria and western Tunisia. The first two subpopulations probably have no more than a dozen individuals each. The third is either extinct or comprises a handful of individuals. Threats in this region are fishing interactions (mainly in Morocco but also to a lesser degree in the other countries), impact of tourism (mainly in Tunisia) and overall habitat degradation, including increasing pollution and overfishing of food resources (in all three areas). Although some limited legal instruments, including the regulation of fishing and the protection of some areas for the species, are available, law enforcement is poor and seals continue to be killed, quite often illegally. All this means that prospects for recovery of the local populations are slight. The downward trend of some subpopulations was

estimated during the seventies and early eighties at over 10% per year (RAC/SPA, 1995). This downward trend appears to have continued in recent years and, if this estimation proves correct, the western Mediterranean monk seal population is likely to become totally extinct at the end of the coming decade.

5.- ATLANTIC

5.1. Spain - Canary Islands

**Distribution and population trends.-* Information available on original distribution is extremely fragmentary because the species was ravaged by sealers from the 14th to the 17th centuries. However, old toponymies (Isla de Lobos, Cueva de Lobos, etc.) suggest that the species was common and inhabited several islands of the archipelago. Early reports indicate that the island of Lobos colony was very large, probably a few thousand individuals (González, *pers. comm.*). The species became extinct in the middle ages (the colony on the island of Lobos in the XVIth century). Early information on presence and distribution of monk seals in the Canary Islands was reviewed by Monod (1948) and Hernández (1986). During the eighties and nineties there have been about eight confirmed reports of monk seals in the area, the last one in 1983 (Hernández, 1986). In 1993 another small seal (measuring about 1m long) reached the islands but its coloration pattern casts doubt on whether it was actually a monk seal (González, *pers. comm.*). In most cases these sightings were of juveniles which might have come from the Madeira colony or from the northern groups of the western Sahara population.

**Current number of individuals.-* None. Occasional juvenile stragglers from the Madeira or the western Sahara populations.

**Habitat availability.-* Some areas originally occupied by the species (e.g. Isla de Lobos) are now unsuitable due to urban or tourist development. The western coast of Fuerteventura and the Chinijo archipelago, located north of Lanzarote island, are well preserved and located far away from the main human-impacted areas (Herrera *et al.*, 1996). The Chinijo archipelago is a natural park and a marine reserve. This, and the western coast of Fuerteventura are locations targeted for the possible reintroduction of the monk seal in the Canary Islands under a CE/Life project (Anonymous, 1997).

**Reproduction and migration patterns.-* No information available. The southward current reaching the islands is likely to facilitate arrival of juveniles dispersing from the Desertas colony in the Madeira archipelago.

**Threats.-* In some populated areas, encroachment by urban development, ports and tourism prevent recolonization by seals. Except in protected areas, fishing interactions and associated intentional kills by fishermen are a potential risk if the area is recolonized by seals. However, trammel nets are not in current use in the eastern Canary Islands, which reduces potential conflict in this area. Fishermen from the Canary Islands frequently fish off the Sahara coast, where they interact negatively with monk seals: seals often parasitize long-lines and cause damage to both gear and fish. Because of this interactions, Canaries fishermen express explicit hostility to the species.

5.2. Portugal - Madeira

**Distribution and population trends.-* In the XVth century, when the Madeira archipelago was discovered, there were Mediterranean monk seals in the islands; the population was probably a few hundred individuals strong (Costa-Neves, *pers. comm.*). A significant concentration of seals was found on the southern coast of the island of Madeira (Câmara de Lobos) and sparse records indicate their presence in the past in the Desertas Islands, too. Direct exploitation in the Middle Ages and human encroachment and the consequent loss of habitat decimated the seal population and pushed the survivors into remote and uninhabited areas.

Since at least the forties, the only surviving colony is located in the Desertas Islands, although a few seals may also inhabit the northern part of Madeira Island (Ponta de Sao Lourenço). Population numbers in the Desertas decreased from about 50 seals in the seventies to about 8 at the end of the eighties. From 1990 on, when the Nature Reserve of the Desertas Islands was created to ensure adequate protection of the seals, this trend reversed and population numbers increased to reach an estimated 16-18 individuals in 1997 (Sergeant *et al.*, 1978; Machado, 1979; Reiner, 1981; Reiner and dos Santos, 1984; RAC/SPA, 1995; Freitas, 1996; Costa-Neves, 1997).

**Current number of individuals.-* 16-18 individuals.

**Habitat availability.-* The coastal habitat of the island of Madeira has changed a lot now and it is generally not suitable for monk seals. However, the shoreline of the Desertas and Selvagens Islands is very well preserved. Both areas have been protected for the last decade and fishing activities restricted or eliminated. This has permitted halieutic resources to recover considerably, particularly in the areas of strict protection (Costa-Neves, 1987). In both areas food availability seems sufficient to sustain a limited population of monk seals, although the absence of caves in the Selvagens may be an limiting factor for the expansion of the population to these islands.

**Reproduction and migration patterns.-* Seals inhabiting the Desertas are resident and do not usually move to other areas. However, some juveniles, probably from this colony, visit the Canary Islands from time to time. During the eighties and early nineties, one pup was born every year on the Desertas Islands; this number increased to 2 pups in 1995 and to 3 in 1996 and 1997. In 1997 two of the pups were born and reared on an open beach in Deserta Grande (Freitas, 1996; Costa-Neves, 1997 and Costa-Neves, *pers. comm.*).

**Threats.-* Habitat encroachment, conflicts with fishermen and reduction of halieutic resources were the main causes of the disappearance of seals from Madeira and continue to be factors impeding recolonization. These problems have been solved in Desertas and Selvagens, where strict protection and the redirection of fishermen towards using non-harmful gear have greatly improved availability of food and ensured a safe environment for the seals. The last intentional kill of a seal in the archipelago was in 1985. Pollution, particularly from debris, could be a marginal cause of mortality. The small size of the surviving population and its isolation from other groups make environmental and demographic stochasticity a potential threat for the long-term survival of the colony. Genetic variability, undoubtedly limited, is also a potential threat (Freitas, 1996; Costa-Neves, 1997). Freitas (1996) modelled the probability of extinction of the population under various scenarios, but lack of sound demographic and biological data impeded definitive projections.

5.3. Morocco

**Distribution and population trends.-* The monk seal does not appear to have ever inhabited the northern segment of the Atlantic Moroccan coast (from the Gibraltar Straits to Agadir). The absence of the species along this coastline is probably caused by the lack of appropriate habitat (islands, sand banks or caves suitable for reproduction). Some individuals were recorded in Agadir during the last century (Dieuzeide, 1927) but the presence of the species has never been reported since.

**Current number of individuals.-* None.

**Habitat availability.-* The habitat is probably not suitable for the species.

**Reproduction and migration patterns.*- No information is available.

**Threats.*- Fishing activities, both artisanal and large-scale, are well developed, representing a potential source of mortality and reduction of food resources for the species.

5.4. Western Sahara

**Distribution and population trends.*- Mediterranean monk seals appear to have always been abundant in the area. Neolithic deposits contained seal bones that had been burnt, indicating human consumption of seals at that time (RAC/SPA, 1995). During the middle ages and probably until the XVIth century, Spanish and Portuguese sealing expeditions decimated the local colonies for fur and oil. Some of these colonies, like that inhabiting the sand bank in Dakhla Bay (Ile des Herons), appeared to have several hundred individuals (Monod, 1923). Apart from the sealing episode, the area has been thinly populated by humans for several centuries, which limits possible adverse interactions with seals. Until the sixties, the presence of monk seals along the coast was recorded by a number of researchers (Monod, 1923; Gruvel, 1923; Morales-Agacino, 1945; 1950; Valverde, 1957). They were relatively abundant around Cabo Bojador, near Dakhla Bay, between Cabo Barbas and Cabo Corbeiro and, particularly, on the Cabo Blanco peninsula. Along this coastline monk seals hauled-out on open beaches when living on islands or sand banks, but mostly aggregated in caves when living on the continent. This variation in habitat use is undoubtedly related to the search for shelter from predators. At present the species appears to have completely disappeared north of Cabo Bojador. Some occasional sightings during the last twenty years have been made in the segment of coastline between Cabo Bojador and Cap Barbas, but recent surveys in that region demonstrate that there is not a permanent colony there, so reports are probably of strays from populations located further south. The political instability in the region has prevented detailed surveys of the shore between Cap Barbas and the Aguerguer (Guerguerat), but sightings in open waters off the area as well as reports from fishermen and seafarers indicate that at least some individuals inhabit the region (Marchessaux, 1989b; Bayed, 1994; RAC/SPA, 1995; University of Barcelona, unpubl. data). The largest colony in the area is undoubtedly the one inhabiting the Peninsula of Cabo Blanco (Trotignon, 1979; Marchessaux, 1989b; González *et al.*, 1997). The reproductive component of the populations (some adult males, adult females, juveniles and pups) aggregate in a few caves (usually in two of them) located in the "Las Cuevecillas" area, in a region known as the *Seals' Coast*. Some adult males spread out around this central core and may be found at considerable distances, reaching at least the Aguerguer region in the north and the tip of Cabo Blanco in the south. Movement of these adult males between the breeding caves and the peripheral regions has been confirmed by photoidentification studies (University of Barcelona, unpublished data). González *et al.* (1997) described in detail the characteristics and location of the caves and segments of shoreline currently used by the seals.

**Current number of individuals.*- There are no population estimates for the region located north of the Cabo Blanco Peninsula, although numbers are probably low. In 1996 the population of the Cabo Blanco Peninsula was estimated at 317 (CV:16.6; 95% C:236-449) by capture-recapture methods applied to photoidentification data collected during the period 1993-1996 (Forcada *et al.*, 1998). In spring 1997 this population suffered a mass mortality that decimated the population, particularly the adult and subadult segments. At least 117 seal corpses were examined by researchers, although it is known that many more died (Aguilar, 1997; Anonymous, 1998). Capture-recapture calculations were again based on photoidentification data, but this time collected after the event. Although figures are not yet definitive, it is probable that only 106 individuals survived (CV:29.1; 95% C: 66-195) (Forcada *et al.*, 1998).

**Habitat availability.-* North of Cabo Barbas some of the shoreline has been altered by human activity (e.g. Dakhla bay), but a lot remains in reasonably good condition. However, fishing in the area has reduced fish and cephalopod resources considerably. This, combined with the probable occurrence of frequent incidental captures in fishing nets, has been suggested as responsible for the currently low local population of cetaceans (Notarbartolo di Sciara *et al.*, 1997) and is likely to prevent recolonization by seals. South of Cabo Barbas, including the Peninsula of Cabo Blanco, the situation seems much better. The shoreline is practically in a virgin state and almost totally devoid of human population because of the unfinished military conflict that affects the region. Fishing has been sparse since the early seventies. However, the lack of active fighting in recent years has led to an increase in fishing, initially by artisanal Mauritanian fishermen, but more recently by open water trawlers, longliners and purse-seiners, too. Some components of monk seal diet, like lobsters, octopuses or some bottom fish, are currently overexploited. For example, lobsters, a frequent prey of monk seals in the eighties (Marchessaux, 1989b) are never found in the stomach contents or faeces of seals today (unpubl. data).

**Reproduction and migration patterns.-* A Spanish project under way in the Peninsula of Cabo Blanco since 1992 (since 1994 under the umbrella of the EU-LIFE program) has supplied extensive information on the reproductive biology, social organisation and behaviour of the seals in this colony. This is undoubtedly the largest and most comprehensive body of data on the species in its range of distribution. Neither breeding nor pupping show a seasonal pattern and births occur throughout the year. Before the massive mortality in spring 1997, the productivity of the colony averaged 50 pups per year. Lactation is protracted, up to about 120 days, and ends gradually. Pup mortality is relatively high (some years reaching almost 50% during the first two months) and is mostly due to storms. All individuals except adult males aggregate inside a few caves and do not disperse except for short feeding trips (although some juveniles may disappear to unknown destinations for longer periods). Adult males spread out peripherally from the breeding caves (see above) and are mobile along the coastline, although they do not undertake proper migrations (Gazo *et al.*, 1988; Pastor *et al.*, 1998).

**Threats.-* Overfishing throughout the area is a potential threat likely to increase in the future given the fast development of fisheries. Incidental captures in nets set by artisanal fishermen are known to occur from time to time, but do not appear to be frequent. However, incidental captures and intentional aggressions by fishermen from international fleets are more common and cause the death of an indeterminate but probably significant number of seals each year (University of Barcelona, unpublished information). Pollutant analyses of tissues from seal corpses found in the Peninsula of Cabo Blanco have shown that levels of PCBs and DDTs are far too low to cause deleterious effects (Borrell *et al.*, 1997).

The main cause of concern for the Cabo Blanco colony is the event that killed about two-thirds of the population in spring 1997 (see above) (Aguilar, 1997). Two possible explanations have been suggested (Anonymous, 1988). First, a virus closely related to the Dolphin Morbillivirus was isolated from organ samples from three dead seals and an ELISA test for detecting serum antibodies to canine distemper virus showed positive results in four individuals (Osterhaus *et al.*, 1997). However, the clinical signs shown by the affected individuals, the macroscopic examination of seal corpses, the histopathological examination of the tissues of the dead seals, and the pattern of mortality (with pups and juveniles generally not being affected) were all factors inconsistent with previous morbillivirus epizootics (Anonymous, 1998). Second, analyses of tissues from seven dead seals all indicated the presence of low concentrations of paralytic shellfish poison (PSP) toxins. These toxins were also detected in the viscera of some fish species collected in the area at the time of the seal deaths. Sea water samples revealed moderately high concentrations of at least

one, and probably three, species of dinoflagellates producing PSP toxins (Hernández *et al.*, 1988). Monitoring of the region by satellite showed images consistent with a bloom of dinoflagellates coinciding with the event (González-Ramos *et al.*, 1998). The clinical signs shown by affected seals, mostly involving flaccid paralysis and lack of motor control, and the gross pathology of corpses, with severe and extensive congestion of lungs, no evidence of oedema and only slight signs of subpleural emphysema, were all consistent with PSP poisoning, but not with typical morbillivirus infections (Robinson and Hernández, 1998). The fact that the event mostly affected adults and subadults, while most pups and juveniles survived (University of Barcelona, unpublished information), could be explained by variation in diet and foraging areas between the different population groups leading to a differential exposure to the toxin. It is generally accepted that there is strong evidence for the presence of toxic algae in the region at the time of the mass mortality and that this was its most likely cause. However, the lack of toxicological information on the effects of PSP toxins on pinnipeds has precluded reaching a definitive conclusion on the identity of the causative agent of the die-off (Anonymous, 1998).

As well as the importance of correctly identifying the causative agent for management purposes, the short and medium-term consequences for the population vary. If the morbillivirus was the cause, no further significant mortality should be expected in the near future. The morbillivirus is highly infectious and, since almost the entire population would have been exposed (especially likely since the Cabo Blanco seals form a cohesive colony), the survivors would have developed long-term immunity. A new generation of non-exposed, vulnerable seals would have to grow up for there to be the necessary critical mass to allow a new outbreak. Vaccination is thought unlikely to have a significant effect on improving the viability of the population and would require the undesirable invasive presence of researchers in the colony (Anonymous, 1998). But, if as it appears, the dinoflagellate PSP toxin was the cause of the deaths, the recurrence of the event is unpredictable. There is some evidence of cetacean mortalities of this type in the area in the past (Maigret, 1979), so it is likely that the Cabo Blanco colony may be exposed again to the toxin in the future. The effects on the population will of course depend on the frequency of these events and the capacity of the colony to overcome the losses, which are both unpredictable factors at present.

As the colony appears able to recover, the event does not in itself determine the disappearance of the population. But it is clear that a repetition would bring the population to an extremely critical situation. Population modelling has indicated that for a stable or expanding population, the probability of extinction is low and unlikely to be affected by mass mortalities unless the population falls below 20 seals. However, losses of individuals cause a moderate but significant reduction in genetic variability; it has been proposed that the 1997 mass mortality caused a 12.5% reduction in allele diversity in the population (Anonymous, 1997).

5.5. Mauritania

**Distribution and population trends.*- Some of the individuals from the Cabo Blanco colony (see section 5.4.) are found on the Mauritanian side of the cape (Marchessaux, 1989a). In most cases these are males. There have been isolated records of the species further south. Seal corpses have been found all along the coast to the border with Senegal (Marchessaux, 1989a), but it is unclear whether these were occasional local residents or carcasses of individuals from Cabo Blanco that had drifted on the southward current. Local fishermen and officers of the Parc National du Banc d'Arguin have repeatedly reported seals (some very recent) off the Isle of Arguin, the Kiaones Islands and Cape Tarfarit, locations all within the limits of the Park, in the northern third of the country (RAC/SPA, 1995; University of

Barcelona, unpublished information). Undoubtedly, all these seals belong, or are closely related, to the Cabo Blanco colony. The mass mortality that ravaged Cabo Blanco in spring 1997 (see section 5.4.) also affected the seals in Mauritania.

**Current number of individuals.-* 2-3 on the Mauritanian side of the Cabo Blanco peninsula and about 2 currently in the Parc National du Banc d'Arguin.

**Habitat availability.-* It is questionable whether the habitat along the Mauritanian coastline and south of Cabo Blanco is suitable for monk seals. Since the area has been thinly populated by humans, lack of past records may reflect either avoidance by the seals because of inappropriateness of habitat or absence of reporting of seal presence. Although the Banc d'Arguin has been protected since 1976, no recolonization of the area has occurred.

**Reproduction and migration patterns.-* For the animals from the Cabo Blanco peninsula, see section 5.4. There is no information available for individuals from other areas.

**Threats.-* See section 5.4. for detailed discussion of the general population. Provided that habitat is suitable, the Parc National du Banc d'Arguin enjoys a high degree of protection. Habitat is preserved, navigation of motor boats is forbidden, and fishing is limited, small scale and non-harmful (PNBA, 1995).

5.6. Senegal

**Distribution and population trends.-* From records available, there appears to have never been a resident population of monk seals in Senegalese waters. Seal corpses have occasionally been found in the northern half of the country (Marchessaux, 1989a), but it is unclear whether these were of occasional visitors or carcasses of individuals from the Cabo Blanco colony or Mauritanian waters that had drifted on the southward current.

**Current number of individuals.-* None.

**Habitat availability.-* The habitat is well preserved in many areas, but it is probably not suitable for monk seals.

**Reproduction and migration patterns.-* No information is available.

**Threats.-* Fishing and overexploitation of fish and cephalopod resources are undoubtedly the main potential threat to seals.

5.7. The Gambia

**Distribution and population trends.-* Historically, monk seals have been considered absent from Gambian waters. Holt (1984) suggested their presence based on supposed observations of seals, but these observations were dismissed as misidentified sightings of West African manatees. However, Murphy and Jallow (1998) recently confirmed their presence on the Bijol Islands, on the southern coast of Gambia, where up to 4 seals, apparently juveniles, were repeatedly sighted during November 1995-October 1997. It is likely that these individuals are from the colony of Cabo Blanco, located about 800 km further north (see section 5.4.).

**Current number of individuals.-* At least 4.

**Habitat availability.*- The fact that the seals have survived in the Bijol Islands for over two years indicates that enough food is available to sustain at least a small population.

**Reproduction and migration patterns.*- No information is available. The seals observed are likely to be juveniles dispersing from the Cabo Blanco colony.

**Threats.*- No information is available. The area is a natural reserve and therefore human presence and fishing activities are restricted. Conflict with fishing activity is likely to be a threat outside the reserve.

5.8. Overall status in the region

Two monk seal colonies survive in the Atlantic: one on the Desertas Islands, in the Archipelago of Madeira, and one on the western Sahara-Cabo Blanco Peninsula. Stragglers from these two colonies have occasionally been sighted in the Canary Islands, Morocco, Mauritania, Senegal and the Gambia. In this last location a small group of apparently resident seals has been recently confirmed (Murphy and Jallow, 1998).

During the eighties and early nineties there were indications that the situation of the species was improving. In Madeira the strict conservation measures led to a timid, but apparently consistent, recovery of the small local population. In Cabo Blanco, estimations of population size skyrocketed from the 75-100 individuals estimated in the eighties (Marchessaux, 1989a) to over 300 in 1996 (Forcada *et al.*, 1998). Most of this difference was clearly related to greater monitoring effort and improvement of surveying techniques, but unpublished data from the University of Barcelona on seal counts in Cabo Blanco suggest that some increase in numbers had actually taken place since the studies by Marchessaux in the mid-eighties and their observations in 1992-1996. It is also unclear whether the discovery of a small but permanent group of seals in The Gambia is the result of better monitoring or indicates recent colonization (or re-colonization) of the area.

These good prospects were reversed when the spring 1997 mass mortality took place (see section 5.4.). This event reduced the Cabo Blanco population from about 300 to slightly over 100 individuals, profoundly altered the age-composition of the surviving population and reduced genetic diversity by an estimated 12.5%. Until this happened, many of the hopes for the recovery of the species were based on the Cabo Blanco colony. It was considered the only aggregation still maintaining the original social and demographic structure of the species and the one having the highest chances of survival in the long term. Therefore, the 1997 deaths are a major cause of concern, not only for the status of the population but also, and very importantly, for the survival of the species as a whole. The colony appears to be able to recover from the mortality and the event does not in itself represent a threat to its survival. But it is clear that a repetition would bring the population to an extremely critical situation. It is unclear what the chances are of this re-occurring in the near future. If the causative agent was a morbillivirus, as has been suggested, the surviving population would have acquired immunity and therefore several years will pass before there are enough unexposed individuals for such a large-scale mortality to recur. However, if the deaths were caused by PSP dinoflagellate toxins, which unfortunately appears to be the most likely case, the reproducibility of the event is unpredictable.

ACKNOWLEDGEMENTS

The following people contributed useful suggestions, updated information, supplied unpublished data, directed me to hidden references and/or revised draft versions of the manuscript: Francisco Avella (Fondo para la Foca del Mediterráneo/FFM, Spain), Marco Barbieri (RAC/SPA office, Tunis), Abdellatif Bayed (Institute Scientific, Rabat, Morocco), Daniel Cebrián (Environmental Research Bureau, Greece), Henrique Costa Neves (Parque Natural da Madeira (Madeira, Portugal), Andreas Demetropoulos (Cyprus), Panos Dendrinis (MOM, Greece), William Gilmartin (Hawaii Wildlife Fund, USA), Hrvoje Gomercic (University of Zagreb, Croatia), Esteve Grau (University of Barcelona, Spain), Dan Kerem (Marine Mammal Research & Assistance Center, Israel), Luis Mariano González (General Directorate for Nature Conservation, Ministry of the Environment, Spain), Spyros Kotomatas (MOM, Greece), Giulia Mo (Acquario di Genova, Italy), Paul Murphy (Department of Parks and Wildlife Management, The Gambia), Sarah Muscat (Marine Life Care Group, Malta), Giuseppe Notarbartolo di Sciara (Istituto Centrale per la Ricerca Applicata al Mare, Rome, Italy), Bayram Öztürk (University of Istanbul, Turkey), Aiki Panou (Archipelagos, Greece), Michela Podestà (Museo di Storia Naturale di Milano, Italy), Tim Ragen (Hawaiian Monk Seal Recovery Program, USA), Peter J. H. Reijnders (Institute for Forestry and Nature Research IBN-DLO, The Netherlands), and Denise Viale (Université de Corse, France). Their assistance is much acknowledged. Any error or omission found in the report is the sole responsibility of the author.

REFERENCES

- Adamantopoulou, S.; Androukaki, E. and Kotomatas, S. (1998): The distribution of the Mediterranean monk seal, *Monachus monachus*, in Greece. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Aguilar, A. and Raga, J.A. (1993): The striped dolphin epizootic in the Mediterranean Sea. *Ambio*, 22(8): 524-528.
- Aguilar, A. and Borrell, A. (1994): Abnormally high polychlorinated biphenyl levels in striped dolphins (*Stenella coeruleoalba*) affected by the 1990-1992 Mediterranean epizootic. *Sci. Total Environ.*, 154(2-3): 237-247.
- Aguilar, A. (1997): A die-off strikes the western Sahara population of monk seals. *Monachus News*, 3:1.
- Akriotis, T.; Kontogianni, A. and Tsiokanos, K. (1998): Preliminary analysis of factors affecting the distribution of Mediterranean monk seal, *Monachus monachus*, in the East Aegean. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Anonymous (1997): Two new marine reserves created in the Canary Islands. *Monachus News*, 1:4.
- Anonymous (1998): Workshop on the causes and consequences of the 1997 mass mortality of Mediterranean monk seals in the western Sahara. Harwood, H.; Lavigne, D. and Reijnders, P. J. H. (eds). *IBN Sci. Contr.*, 11: 1-32.
- Antica, G.; Huber, D. and Gomercic, H. (1994): Public survey on the state of Mediterranean monk seal (*Monachus monachus* Hermann) in teh Croatian part of the Adriatic Sea. *Proc. 5th Congress of Croatian Biologists. Zagreb*, 398-399.
- Archipelagos (1988): Technical-economical investigation of the effects of the Mediterranean monk seal on coastal fisheries on the western coast of Zakynthos Island. Final Report, EU-LIFE contract B4-3200/96/500. 112 pp.
- Archipelagos and MOm (1996): Strategy for the Protection of the Mediterranean monk Sea *Monachus monachus*, in Greece. Archipelagos and MOm/Hellenic Society for the Study and Protection of the Monk Seal. Athens, 10pp.
- Argano, R. (1990): Tartarughe marine e foca monaca nei mari italiani: salvaguardia e prospettive. *Boll. Mus. Ist. Biol. Univ. Genova*, 56-57: 113-135.
- Avella F.J. (1979): The status of the monk seal on the Spanish Mediterranean coast. *In: The Mediterranean Monk Seal, Proceeding of the First Internacional Conference Rhodes, Greece, 2-5 May 1978. U.N.E.P. Technical Series, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1:95-98.*
- Avella F. J. (1986): Las últimas focas del Mediterráneo. *Quercus*, 22:4-16.
- Avella F. J. (1987): Man versus monk seal in North Africa: a preliminary report. Third International Conference on the Mediterranean Monk seal, Antalya, November 1987, 1-11.

- Avella, F. J. (1994): A brief description of the Mediterranean seal conservation project carried out in North Africa by the FFM. Mimeo, 5pp.
- Avella F. J. and González, L. M. (1984): Monk Seal (*Monachus*): A survey along the Mediterranean coast of Morocco. *In: The Monk Seals, Proceedings of the Second International Conference on Monk Seals, La Rochelle, France, 5-6 October 1984.* K. Ronald and R. Duguay (Eds.). *Ann. Soc. Sci. nat. Charente-Maritime*, Suppl.: 60-78.
- Bayed A. and Beaubrun, P. C. (1987): Les mammifères marins du Maroc: Inventaire préliminaire. *Mammalia*, 51:437-446.
- Bayed, A. (1994): Presentation succincte de la population de phoque moine du Sahara Marocain. *In: Parc National de Dakhla. Plan d'aménagement . Secteur N°2. Côte des Phoques.* Document presented at the *Meeting of Experts on the Evaluation of the Implementation of the Action Plan for the Management of the Mediterranean Monk Seal.* Rabat, 7-9 October 1994. Mimeo.
- Berkes, F. (1978): The possibility of movement of *Monachus monachus* between the coastal waters of Greece and Turkey. Brock University, St. Catherines, Ontario, 14pp (in Öztürk, 1998).
- Berkes F., Anat H., Kislalioglu M. and Esenel M. (1979): Distribution and ecology of *Monachus monachus* on Turkish coasts. *In: The Mediterranean Monk Seal, Proceeding of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978.* U.N.E.P. Technical Series, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1:113-127.
- Bertram G. C. L. (1943): Notes on the present states of the monk seal in Palestine. *J. Soc. Preserv. Fauna Emp.*, 47:20-21.
- Boitani, L. (1979): Monk seal, *Monachus monachus*, in Italy: Status and conservation perspectives in relation to the condition of the species in the western Mediterranean. *In: The Mediterranean Monk Seal, Ronald, K. and Duguay, R. (eds). Proceedings of the First International Conference on Monk Seals. Rhodes, Greece, 2-5 May 1978.* UNEP Technical Series, Pergamon Press Publ., Oxford: 61-62.
- Boudouresque C. F. and Lefevre J. R. (1988): Nouvelles données sur le statut du phoque moine *Monachus monachus* dans la région d'Oran (Algérie). *GIS Posidonie Publ.*: 1-30.
- Boulva J. (1975): Survey of the Mediterranean Monk Seal, *Monachus monachus*, in the western Mediterranean and eastern Atlantic. Report to the International Fund for Animal Welfare and to the International Union for the Conservation of Nature, Switzerland: 1-26.
- Boulva J. (1979): Perspectives d'avenir du phoque moine de Méditerranée, *Monachus monachus*. *In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978.* U.N.E.P. Technical Series, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1: 85-94.
- Borcea, I. (1927): Données sommaires sur la faune de la Mer Noire. *Ann. Soc. Univ. Jassy*, 14:536-581.

- Borrell, A.; Aguilar, A. and Pastor, T. (1997): Organochlorine pollutant levels in Mediterranean monk seals from the western Mediterranean and the Sahara coast. *Mar. Poll. Bull.*, 34(7):505-510.
- Boutiba, Z (1990): Observations récentes de phoques-moines (*Monachus monachus*) sur le littoral algérien (région d'Alger). *Mammalia*, 54(4): 663-664.
- Boutiba, Z., Squabria, B. and Robineau, D. (1988): Etat actuel de la population du phoque moine (*Monachus monachus*) sur le littoral Ouest Algérien (Région d'Oran). *Mammalia*, 52(4): 549-555.
- Brasseur, S. M. J. M.; de Jong, G. D. C. and Reijnders, P. J. H. (1997): Mediterranean monk seal, *Monachus monachus*. In: Reijnders, P. J. H.; Verriopoulos, G. and Brasseur, S. M. J. M. (eds), *Status of pinnipeds relevant to the European Union*. DLO Inst. Forest. Nat. Res. (IBN-DLO), pp. 12-26.
- Caltagirone, A. (1995): The Mediterranean monk seal. UNEP Regional Activity Centre for Specially Protected Areas, Tunis, 71pp.
- Cebrián, D. (1995): The Mediterranean monk seal (*Monachus monachus*) in Croatia. Evaluation of habitat and eventual presence in the Dalmatian coast of the Adriatic Sea. SPA/RAC (UNEP-MAP)/ Elliniki Etairia, 21pp.
- Cebrián, D. (1997): Catalogue of important areas for the conservation of the Mediterranean monk seal in the Aegean Sea, Greece. Report to Euronature. Environmental Research Bureau, 61pp.
- Costa-Neves, H. (1997): The monk seal (*Monachus monachus*) on the Desertas Islands. Past, present and future. *Monachus News*, 3: 3-4.
- Cheyland, G. (1987): Le phoque moine, *Monachus monachus*. In : Les Mammifères en Corse. *Parc nat. région. Rés. nat. Corse Publ.*: 88-95.
- Dendrinou, P. (1998): Status of the populations and implementation of the Action Plan for the Management of the Mediterranean Monk Seal (*Monachus monachus*) in Greece. Report to UNEP RAC/SPA by MOM/Hellenic Society for the Study and Protection of the Monk Seal. Mimeo, 13pp.
- Dieuzeide, R. (1927): Sur quelques points d'anatomie du phoque moine de la Méditerranée (*Monachus albiventer* Bodd.). *Bull. Sta. Aquic. Pêches Castiglione*, 2:215-249.
- Draganovic, E. (1992): Distribution and legal protection of monk seals along the eastern Adriatic coast of Yugoslavia: Protection du phoque moine de Méditerranée - Aspects scientifiques et techniques, Council Europe Press, *Rencont. Environ.*, 13 : 32.
- Duguy, R. and Cheyland, G. (1980): Les phoques des côtes de France. I. Le phoque moine *Monachus monachus* (Hermann, 1779). *Mammalia*, 44:203-209.
- Forcada, J.; Hammond, P. and Aguilar, A. (1998): Population size and composition of the monk seal colony of Cabo Blanco, before and after the die-off. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.

- Freitas, L. A. (1996): O lobo marinho nas ilhas Desertas: Estado actual, conservação e perspectivas futuras da colónia do lobo marinho (*Monachus monachus*) nas Ilhas Desertas. University of Aberdeen and Secretaria Regional de Educação, Funchal, 66pp.
- Gamulin-Brida, H. (1979): Protection du phoque moine de l'Adriatique. *In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978. U.N.E.P. Technical Series*, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1:163-166.
- Gazo, M.; Pastor, T.; González, L. M.; Aparicio, F.; Layna, J. F.; Cedenilla, M. A.; Cappozzo, H. L. and Aguilar, A. (1998): From birth to independence: a compromising period for Mediterranean monk seal pups in the western Sahara colony. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Gomercic, H., Huber, D. and Ronald K. (1984): A note on the presence of the Mediterranean monk seal (*Monachus monachus*) Herman 1779 in the eastern part of the Adriatic sea. *In: The Monk Seals, Proceedings of the Second International Conference, La Rochelle, France, 5-6 October 1984. K. Ronald and R. Duguay (Eds.). Ann. Soc. Sci. nat. Charente-Maritime, Suppl.:* p.51.
- González, L. M. (1989): La foca monje en las Islas Chafarinas. *Vida Silvestre*, 66(2): 6-15.
- González, L. M. and Avella, F. J. (1989): La extinción de la foca monje (*Monachus monachus*) en las costas mediterráneas de la Península Ibérica y propuesta de una estrategia de actuación. *Ecología*, 3:157-177.
- González, L. M.; Aguilar, A.; López-Jurado, L. F. and Grau, E. (1997): Status and distribution of the Mediterranean monk seal *Monachus monachus* on the Cabo Blanco Peninsula (Western Sahara-Mauritania) in 1993-1994. *Biol. Conserv.*, 80:225-233.
- González-Ramos, A.; Coca, P.; Del Campo, A.; Carrillo, M. and López-Jurado, L. F. (1998): Red tide monitoring using AVHRR imagery in the northeast Atlantic. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Gruvel M.A. (1924): Quelques observations zoologiques faites au cours d'un voyage en Mauritanie. *Bull. Soc. nat. Acclim. France*, 71:13-14.
- Güclüsoy, H.; Theunissen, M. and Savas, Y. (1988): The conservation of the Mediterranean monk seal in Turkey: Foca Pilot Project. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Gücü, A. C. (1998): Mediterranean monk seal of the Cilician basin, northeastern Mediterranean. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Hernández, E. (1986): Le phoque moine dans les îles Canaries: Données historiques et notes relatives à sa réintroduction. Conseil d'Europe, Convention relative à la conservation de la vie sauvage et du milieu naturel de l'Europe, 1ère réunion du groupe d'experts sur le phoque moine de Méditerranée, Strasbourg, 15-16 septembre 1986; Mimeo : 1-9.

- Hernández, M.; Robinson, I.; Aguilar, A.; González, L. M.; López-Jurado, L. F.; Reyero, M. I.; Cacho, E.; Franco, J.; López-Rodas, V.; Costas, E. (1998): Did algal toxins cause monk seal mortality? *Nature (London)*, 393:28-29.
- Herrera, R.; Espino, F. and Herrera, R. (1996): Research on coastal habitats availability in order to stand monk seals in the eastern Canary Islands. *Monachus News*, 2: 2-3.
- Holt, S. J. (1984): News from West Africa. Newsletter of the League for the Conservation of the Monk Seal, College of Biological Sciences, University of Guelph, Ontario, Canada 7:12.
- IUCN (1987): Report on the status of the Mediterranean monk seal. Joint expert consultation on the management of the Mediterranean Monk Seal, Athens, 11-12 January 1988. Document IUCN/UNEP/MM-IC/1.3: 1-35.
- Jacobs, J. and Panou, A. (1996): Conservation of the Mediterranean monk seal, *Monachus monachus*, in Kefalonia, Ithaca and Lefkada Isl., Ionian Sea, Greece. Report to the Institut Royal des Sciences Naturelles de Belgique, 221pp.
- Jardas, I. and Draganovic, E. (1987): Geographic distribution, number and protection of the Mediterranean monk seal, *Monachus monachus* (Hermann, 1779), with particular reference to the Adriatic sea. In: Symposium on Protection of Endemics in the Living World of Yugoslavia (Sarajevo, May 15-16, 1986). *Spec. Publ. Acad. Sci. Arts Bosnia-Herzegovina*, 83: 79-94.
- Ktari-Chakroun, F. (1979): Le phoque moine *Monachus monachus* (Hermann, 1779) en Tunisie. In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978. *U.N.E.P. Technical Series*, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1: 179-180.
- Kýraç, C. and Savas, Y. (1996): Status of the monk seal (*Monachus monachus*) in the neighbourhood of Eregli, Black Sea coast of Turkey. *Zoology in the Middle East, Mammalia*, 12:5-12. (in Öztürk, 1998).
- Kýraç, C. O.; Savas, Y.; Güçlüsoy, H. and Veryeri, N. O. (1998): Distribution and status of monk seal *Monachus monachus* (Hermann, 1779) along Turkish coasts. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Machado, A. J. (1979): Os lobos marinhos (Género *Monachus*, Fleming, 1822) (contribuição para o seu conhecimento e protecção). *Mus. Mar Cascais*, 234 pp.
- Maigret, J. (1979): Les échouages massifs des cétacés dans la région du Cap-Vert (Sénégal). *Notes Africaines (Université de Dakar)*, 161: 23-28.
- Maigret, J. (1990): Le phoque moine: hôte occasionel des côtes françaises? *Mammalia*, 54(2): 300-301.
- Marchessaux, D. (1977): Will the Mediterranean monk seal survive? *Aquatic Mammals*, 5: 87.

- Marchessaux, D. (1979): Nouvelles données sur le phoque moine de Méditerranée, *Monachus monachus*, dans le golfe de Corinthe, Grèce. *Rapp. p.-v. Réun. Commiss. int. Explor. sci. Médit.*, 25/26:143-145.
- Marchessaux, D. (1987): Etude de l'évolution du statut du phoque moine en Tunisie et dans l'archipel de La Galite. Propositions pour une gestion régionale. UNEP-IUCN-RAC/SPA, *GIS Posidonie Publ.*, 1-33.
- Marchessaux, D. (1988): Biologie, statut et conservation du phoque moine, *Monachus monachus*. *Rapp. Conseil de l'Europe; Parc National Port-Cros Publ.*: 1-44.
- Marchessaux, D. (1989a): Recherches sur la biologie, l'écologie et le statut du phoque moine, *Monachus monachus*. Thèse de l'Université d'Aix-Marseille II, 285 pp. *GIS Posidonie Publ.*, 280pp.
- Marchessaux, D. (1989b): Distribution et statut des populations de phoque moine *Monachus monachus* (Hermann, 1779). *Mammalia*, 53(4): 621-642.
- Marchessaux, D. and Duguay, R. (1979): Le phoque moine, *Monachus monachus*, en Grèce. *In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978. U.N.E.P. Technical Series*, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1: 65-84.
- Massa, B. (1972): La foca monaca (*Monachus monachus*) esiste ancora in Sicilia. *Atti. Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*, 113:385-390.
- MOm (1997): National strategy for the protection of the monk seal. *MOm Newsletter* (MOM/Hellenic Society for the Study and Protection of the Monk Seal), 2:2-3.
- Monod T. (1923): Note sur la présence de *Monachus albiventer* Bodd. sur la côte saharienne. *Bull. Mus. nat. Hist. Nat. Paris.*, 29:555-557.
- Monod T. (1948): Le phoque moine dans l'Atlantique. *Publ. Inst. Zool. Augusto Nobre, Fac. Cien. Porto*, 34 : 1-19.
- Morales-Agacino, E. (1945): Algunos datos sobre ciertos mamíferos del Sáhara occidental. *Bol. Real Soc. Esp. Hist. Nat.*, 43: 199-212.
- Morales-Agacino, E. (1950): Notes sur le phoque moine (*Monachus monachus* Herm.) du littoral saharien espagnol. *Mammalia*, 14:1-6.
- Murphy, P. F. and Jallow, A. (1998): Sightings of the Mediterranean monk seal (*Monachus monachus*) in Gambian waters. Mimeo, 4pp.
- Norris, W. J. T. (1972): Monk seals in Lybia. *Oryx*, 11: 328-330.
- Notarbartolo di Sciara, G. (1986): La foca monaca in Italia c'è ancora? *Aqua*, 6 : 12-13.
- Notarbartolo di Sciara, G.; Politi, E.; Bayed, A.; Beaubrun, P.-C. and Knowlton, A. (1997): A winter cetacean survey off southern Morocco, with a special emphasis on suitable habitats for wintering right whales. International Whaling Commission Doc. SC/49/03, 16pp.

- Osterhaus, A.; Groen, J.; Niesters, H.; van de Bildt, M.; Martina, B.; Vedder, L.; Vos, J.; van Egmond, H.; Sidi, B. A. and Barham, M. E. O. (1997): Morbillivirus in monk seal mass mortality? *Nature (London)*, 388: 838-839.
- Öztürk, B. (1994): Investigations on the distribution of the population of the Mediterranean monk seal *Monachus monachus* (Hermann, 1779) in the Marmara Sea. Aegean University, Science Faculty, Izmir, Serie B.16/1: pp. 845-851.
- Öztürk, B. (1996): Past, present and future of the Mediterranean monk seal *Monachus monachus* (Hermann, 1779) in the Black Sea. In: Öztürk, B. (ed.): Proceedings of the First International Symposium on the Marine Mammals of the Black sea, Istanbul, UNEP, GEF/BSEP and Istanbul University, pp: 96-104.
- Öztürk, B. (1998): Present status and conservation of the Mediterranean monk seal (*Monachus monachus*) population in Turkey. Report to the Regional Activity center for Specially protected Areas in Tunis, contract 16/97, 12pp.
- Öztürk, B. and Dede, A. (1995): Present status of the Mediterranean monk seal (*Monachus monachus* Hermann, 1779) on the coasts of Foca in the Bay of Izmir (the Aegean Sea). *Turkish J. Mar. Sci.*, 1(2/3):95-107.
- Panou, A., Jacobs, J. and Panos, D. (1993): The endangered Mediterranean monk seal *Monachus monachus* in the Ionian Sea, Greece. *Biol. Cons.*, 64: 129-140
- Pastor, T.; Gazo, M.; Aramburu, M. J.; Cedenilla, M. A.; Aparicio, F.; Layna, J. F.; Grau, E.; González, L. M. and Aguilar, A. (1998): Reproductive parameters of the Mediterranean monk seal: new data for an old species. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Panou, A.; Verriopoulos, G.; Alimantiri, L. and Aravantinos, P. (1996): Distribution of the Mediterranean monk seal (*Monachus monachus*), in Greece: results of a panhellenic questionnaire action. 7th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions. Book of Abstracts, pp 49-50.
- PNBA (1995): Plan Directeur pour le Parc National du Banc d'Arguin 1994-2003. FIBA. La Tour du Valat, Le Sambuc 13200 Arles, France, 67pp.
- RAC/SPA (1995): Present status and trends of the Mediterranean monk seal (*Monachus monachus*) populations. UNEP Regional Activity Centre for Specially Protected Areas, Tunis, 69pp.
- Reijnders, P.; Brasseur, S.; van Der Torn, J.; van Der Wolf, P.; Boyd, J.; Harwood, J.; Lavigne, D. and Lowry, L. (1993): Seals, fur seals, sea lions and walrus. Status survey and conservation plan. IUCN/SSC Seal Specialist Group, 88pp.
- Reiner, F. (1981): Contribução para o estudo e problemática da conservação do lobo-marinho *Monachus monachus*, Hermann 1779 no arquipélago da Madeira. *Mem. Mus. Mar Cascais*, 2(13): 1-14.
- Reiner, F. and Dos Santos, M. (1984) L'extinction imminente du phoque moine à Madère. In: The Monk Seals. K. Ronald and R. Duguay (Eds.). Proceedings of the Second International Conference on Monk Seals, La Rochelle, France, 5-6 October 1984. *Ann. Soc. Sci. nat. Charente-Maritime, Suppl.*:79-87.

- Robinson, I. and Hernández, M. (1998): Field investigations into the 1997 mortality of the Mauritanian colony of Mediterranean monk seals. Workshop on the Biology and Conservation of the World's Endangered Monk Seals. Abstracts. Monaco, 19-20 January 1998, 50pp.
- Rosser, A.; Ritchie, R.; Proby, C.; Miles, D.; Gordon, J.; Cronk, Q.; Compton-Bishop, Q. and Astill, D. (1978): Status of the Mediterranean monk seal (*Monachus monachus*) in Tunisia. *Environ. Conserv.*, 5(4): 298.
- Schnapp, B.; Hellwing, S. and Ghizelea, G. (1962): Contributions to the knowledge of the Black Sea seal (*Monachus monachus*) Herm. *Trav. Bucharest Muz. Natl. Istor. Nat. Grigori Antipa*, 3: 383-400.
- Sergeant, D. E.; Ronald, K.; Boulva, J. and Berkes, F. (1978): The recent status of *Monachus monachus*, the Mediterranean Monk Seal. *Biol. Conserv.*, 14:259-287.
- Tohmé, G. and Tohmé, H. (1985): Les mammifères sauvages du Liban. *Publ. Univ. Liban. Sect. Sci. Nat.*, 16, 189pp.
- Trotignon, J. (1979): Le phoque moine (*Monachus monachus*) en Mauritanie: Données récentes. *In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978. U.N.E.P. Technical Series*, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1: 133-140.
- Valverde, J. A. (1957): Aves del Sáhara español. Instituto de Estudios Africanos, Madrid, Spain.
- Vamvakas, C.E.; Tsimenidis, N. and Kainadas, H. (1979): Contribution to the knowledge of the distribution pattern of the monk seal, *Monachus monachus*, in Greek seas. Conservation plan by the establishment of Marine parks. *In: The Mediterranean Monk Seal, Proceedings of the First International Conference on Monk Seals, Rhodes, Greece, 2-5 May 1978. U.N.E.P. Technical Series*, K. Ronald and R. Duguay (Eds.), Pergamon Press Publ., Oxford & New York, 1 : 147-150.
- Verriopoulos, G. and Kiortsis, V. (1985): Fréquence et répartition du phoque moine (*Monachus monachus*) en Grèce: résultats d'une enquête (1982-1984). *Rapp. p.-v. Comm. int. Explor. Sci. Médit.*, 29(8):169-170.
- WWF-Italy (1995): Monk seals in Sardinia. *Oryx*, 29(1):8.
- Yediler, A.; Panou, A. and Schramel, P. (1993): Heavy metals in hair samples of the Mediterranean monk seal (*Monachus monachus*). *Mar. Poll. Bull.*, 26(3): 156-159.
- Zaitsev, Y. U. (1993): Impacts of eutrophication on the Black Sea fauna. *FAO Studies and Reviews*, 64:59-84.