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Marine protected areas in the high seas of the Aegean and Eastern Mediterranean Seas, some proposals

Ege ve Doğu Akdeniz'de açık deniz koruma alanları, bazı öneriler

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Abstract

Marine living resources are diminishing in the Aegean and Eastern Mediterranean Sea and marine biological diversity is facing various threats such as overfishing, ship originated pollution, exotic species and by-catch.

Designation of High Sea Marine Protected Areas [HSMPA] is believed will improve protection of the marine biodiversity in the Eastern Mediterranean including the Aegean Sea. Concerted action and international cooperation is needed for the joint management effort in the Eastern Mediterranean Sea.

Designation of HSMPA in the Aegean and Eastern Mediterranean Seas will be examined. Five HSMPA in the Aegean Sea and three in the Eastern Mediterranean Sea are proposed following the criteria in the Convention of Biological Diversity (CBD), which include uniqueness, life history stages of species, importance for threatened, endangered species and or habitats, vulnerability, fragility, sensitivity or slow recovery and biological productivity.

Key words: Aegean Sea, high seas, marine protected areas, Eastern Mediterranean Sea, Turkey

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1. Introduction

In the years between 2006-2007 and 2008, surveys were conducted in the Aegean and Eastern Mediterranean Seas to better understand ecosystems in the coastal areas, as well as in the deep and high sea areas of which there is very little scientific data. Findings and proposals in this article are primarily based on these surveys. In the Aegean Sea, the width of the Turkish territorial water is six nautical miles and in the Mediterranean Sea 12 nautical miles as admitted for the proposed areas.

The Aegean and Mediterranean Seas face several problems, such as overfishing, by-catch, ship-originated pollution like oil spills and bilge water, introduction of exotic species by ship ballast water, eutrophication, marine litter, habitat destruction and modification and climate change. All these problems have serious impact on the coastal and marine life in the Aegean and Mediterranean Seas. The Aegean Sea has strong interaction with the Marmara and Black Seas. Moreover, the Northern Aegean is also one of the more productive areas due to the surface Black Sea current and because it is on the migratory path for the Mediterranean - Black Sea faunal exchange. Ulutürk (1987) reported species diversity and richness in the Aegean Sea and found 144 fish species around Gökçeada. Benli et al. (2001) reported a decrease in some commercial fish species in the Aegean Sea. Fish stocks are diminishing due to overfishing and illegal, unreported, unregulated (IUU) fisheries and mismanagement in recent years mostly for migratory pelagic fish species such as swordfish, bluefin tuna, bonito, and bluefish. Actually, some of the pelagic fish stocks are shared by Turkey and Greece (Öztürk et al. 2002). Besides that, the Aegean Sea is a breeding and nursery ground for small pelagic fish species such as sardine and anchovy. Keskin and Karakulak (2004) reported that some shark species are also found very rarely in the northern Aegean Sea. These shark species require a long time to reach sexual maturity.

Cetaceans are also found in Saros Bay, Gökçeada, Samotraki, Limni and around other islands in the northern Aegean Sea where Öztürk et al. (2009) reported three species namely bottlenose dolphin (*Tursiops truncatus),* striped dolphin *(Stenella coeruleoalba)* and common dolphin (*Delphinus delphis).* These species also migrate to the Marmara Sea vice versa. Rosel et al. (2003) also reported back and forth migration of that harbour porpoise, *Phocoena phocoena,* between the Black and Mediterranean Seas.

The Mediterranean monk seal is one of the critically endangered species in the world with a small population surviving among the Aegean islands and islets. In the Northern Aegean there is an overlap zone between Turkey and Greece. Several islands and islets are very close to both countries. A population of seals lives on Gökçeada, Bozcaada, Baba Cape, Limnos and Semotraki. The latter two are known seal habitats in the Greece (Öztürk 1998).

The Aegean Sea is also on the route of oil transportation between the Mediterranean and Black Seas. The number of vessels passing through the Çanakkale Strait (Dardanelles) was 55,000 in 2005. Besides international traffic, there is significant local maritime traffic in the Aegean Sea from cruise ships, yachting and other commuter vessels. The implementation of Marpol 73/78 is very weak due to luck of coordination among riparian countries. Oil contamination is high in some of the areas and may be harmful to marine life and biodiversity if this trend continues Öztürk et al. 2007).

Oil enters into the Aegean Sea through the water exchange with the Mediterranean Sea via the Cretan Sea in the south, and with the Black Sea via the Istanbul and Çanakkale Straits in the north. Oil also enters into the Aegean Sea through bilge water, leakage and from land-based sources. Marine litter is also important for the Aegean Sea. Most of high sea areas are also exposed to marine litter (Öztürk et al. in preparation). Exotic species is also one of the growing threats for the Aegean Sea due to heavy marine traffic and ballast water exchange (Zaitsev and Öztürk 2001).

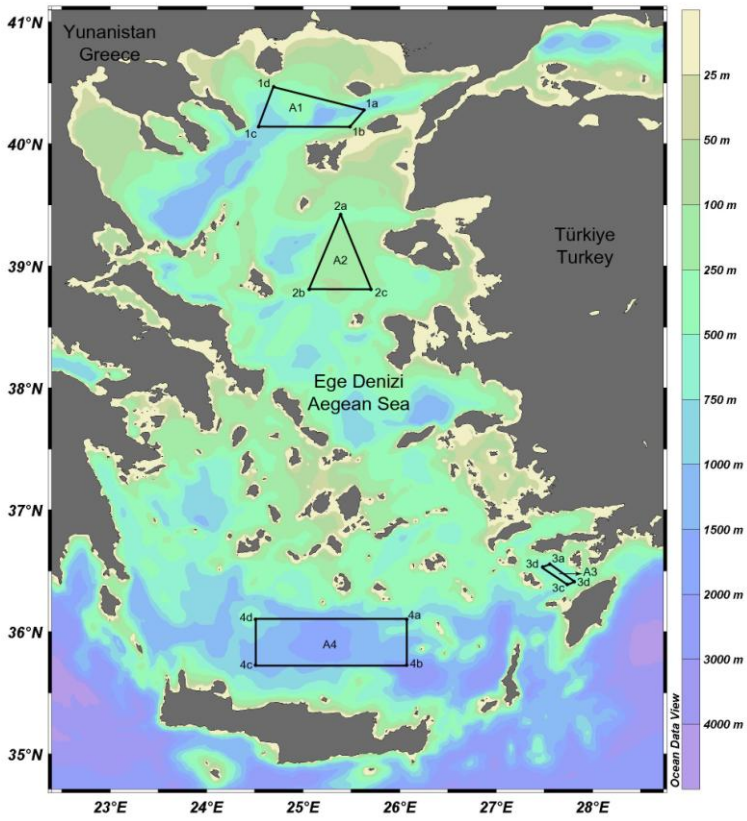
Continuing marine environmental degradation and the collapse of many fish stocks in the Aegean and Eastern Mediterranean needs urgent actions to be taken to stop these processes. One of the solutions for recovery of the ecosystem is to designate high seas marine protected areas in certain areas of ecologically or biologically significance in the Aegean and Mediterranean beyond national jurisdiction according to the Convention of the Biological Diversity. Polygons and coordinates of the proposed HSMPA's in the Aegean and Eastern Mediterranean Seas are provided in annex1.

2. Proposed HSMP regions

2.1. Aegean Sea Proposal

The area beyond 6 nm of the territorial waters between Gökçeada, Limnos, Samotraki and Tasos islands (A1, Map1) is suggested as a suitable area for designation of a HSMPA in the Aegean Sea. While establishing HSMPA is one of the important legal instruments for the protection of the marine environment in the Aegean Sea. Proposed areas all shown in Fig 1 are satisfying all necessary criteria given in CBD.

Figure 1. Proposed areas for high sea marine protected areas (HSMPA) in the Aegean Sea.



Another suggested area for designation of a HSMP is around some of the banks in the northern Aegean Sea (A2). These banks are namely, Stok, Johnston, and Bruker, and are ecologically significant in many ways. These banks have a large quantity of coralligenous assemblages and probably unique habitats in the Aegean Sea in terms of size and species richness (Öztürk et al. 2009 in press). Bruker Bank has already been studied by Kisseleve (1983) and 42 benthic species were identified. These sensitive areas are also under the threat due to bottom trawling, purse seining, marine litter and marine transportation. Kara et al. (2000) mentioned heavy fishing pressure there. Furthermore, this area is also one of the feeding and breeding areas for cetaceans.

The third area to be proposed is the southern Aegean Sea (A3) is also is one of the areas for illegal driftnet and long lining fishing for swordfish. Öztürk et al. (2001) also mentioned cetacean by-catch in the Aegean Sea due to driftnet and the entanglement in nets of some cetaceans. Sea birds and sea turtles are also occasionally entangled in fishing nets. The area marked as A3 in Figure 1 above is where some of the most frequent sightings of striped dolphins have been observed.

The fourth area to be proposed is off Crete Island (A4), where swordfish, bluefin tuna and albacore are caught by some fishing fleet of non-Mediterranean countries. It is also breeding and nursery areas for small and migratory pelagic species.

The deep sea area of the Rhodes is also an important habitat for sperm whales as a calving and breeding ground (5A). Rhodos cylonic circulation is essential for the distribution of nutrients to the Levantin Basin due to upwelling and this makes it the most productive area as well as an important spawning ground for some fish such as swordfish. The area adjacent to the Turkish coast around Patara, Kalkan and Finike provides important grounds for turtle nesting. Pulse fishing is also a common fisheries practice. Fishing fleets move into previously unfished areas, overfish in that area until those species are no longer commercially viable, then move on to a new un-exploited area. This type of fishing operation is very often practiced around Rhodes and near the Turkish mainland in the eastern Mediterranean Sea. IUU fisheries are also one of the severe threats to marine life and biodiversity.

2.2. Eastern Mediterranean Sea

The Eastern Mediterranean Sea consists of two major basins: the Levant and the Ionian Sea. The former connects to the Aegean Sea in the north

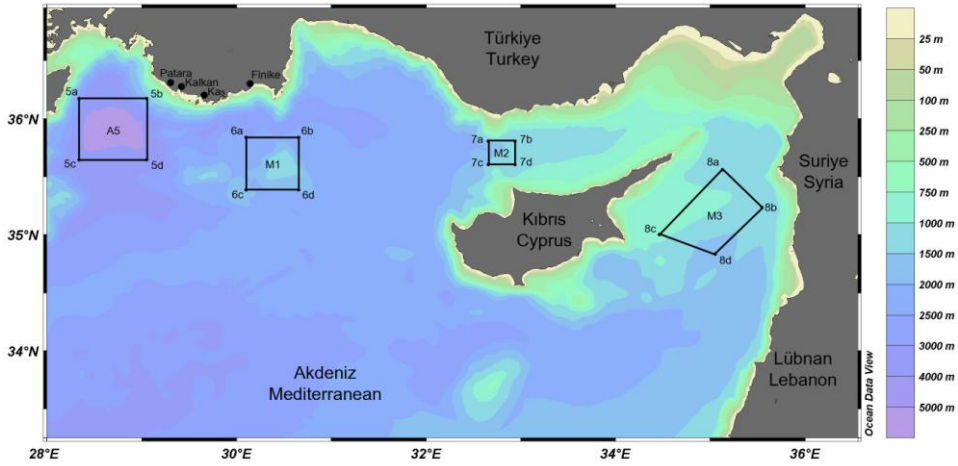
and the latter to the Adriatic Sea. The water mass in the eastern Mediterranean Sea is warmer and more saline than that in the western Mediterranean. Levantine water is identified as a layer of greater salinity, 38-39‰. The Mediterranean Sea is one of the world's most oligotrophic seas with the eastern deep Levantine basin. The Eastern Mediterranean Sea has also become a Lessepsian province because of numerous invasive species which have colonized and this makes serious threat for the native species and fisheries. Öztürk and Başeren (2008) mentioned that IUU fisheries practices in the high sea part of the Eastern Mediterranean Sea and should be controlled.

Three areas are suggested for the HSMPA in the Eastern Mediterranean Sea (Figure 2). One of them falls between the Rhodes and Finike.

The most distinguishing feature of the region (M1) is the Finike Sea Mount (Anaximander Mountains) that is characterized by a unique habitat created by sea mounts, mud volcanoes and methane cold seeps. This fragile ecosystem is under the threat primarily from bottom trawling. Swordfish nets also cause severe cetacean by-catch. This area is also habitat to some of the deep sea fish such as *Hoplostethus mediterraneanus, Rhynchoconger trewa*vasae and deep sea shark *Etmopterus spinax* (Öztürk et al. 2009 in press). Medioni (2003) mentioned that there are mud volcanoes with a cold seep community and this community is quite different from all other known cold seep communities. Small bivalves and vestimentiferan tube worms were discovered in the same area. Bottom trawling should be banned or controlled due to ecological peculiarities of the area.

Another proposed spot is a channel between Turkey and Cyprus islands (M2). This area is also on migratory routes of highly migratory, large and small pelagic fish in the Levantine Basin. Besides, it is a spawning ground of bullet tuna (*Auxis rochei*) and Atlantic skipjack (*Euthynnus alleteratus)*. There are also close to nestling beaches of the endangered loggerhead turtle (*Caretta caretta)* and green turtle (*Chelonia mydas*) in the Turkish coasts (www.oceans.greenpeace.org). Bluefin tuna spawning area has been determined between Turkey and Cyprus islands (Karakulak et al. 2004).

Figure 2. Proposed areas for high sea marine protected areas (HSMPA) in the Mediterranean Sea. A: Aegan Sea, M: Mediterranean Sea.



Last suggested area between Turkey, Syria, Lebanon and Cyprus (M3) where there are virgin stocks of deep sea shrimps such as *Parapenaeus longirostris, Plesionika marta, Aristaeomorpha foliacea* and *Aristeus antennatus*. In addition, this is area that is on the migration routes of the bluefin tuna, albacore and little tunny and bullet tuna between Iskenderun and Cyprus from north to south. Common dolphins were also sighted in this area, which is rare in the eastern Mediterranean Sea. These pristine habitats should be protected from international fishing fleets, IUU fisheries and ship originated pollution.

3. Discussion

Table 1. Below shows the main characteristics of the proposed areas in the Aegean and Eastern Mediterranean Sea.

Area and water column features	Action of Protection and	Expected outcome
A1 High biological production	Protection of endangered species, such as Cetacean, Monk seal and protection of the juvenile pelagic fish pop.	Banning of trawling, restriction of the purseining
A2 Coralligenous habitat, Coralligenous areas	Protection of the vulnerable habitats and threatened species	Banning of trawling
A3 Spawning and Fish migration route	Protection of the juvenile and young fish spawning area	Stopping IUU Fisheries, restriction of the trawling
A4 Deep Sea habitat	Small pelagic and Highly migratory fishes nursery grounds, Cetaceans, Deep Sea life.	Stopping IUU Fisheries
A5 Deep Sea habitat, Upwelling area	Gyres, Sperm whale calving and breeding area	Stopping IUU Fisheries Banning trawling
M1 Underwater Sea mounts	Hyrotermal vents, Chimnies.	Banning trawling
M2 Spawning areas of the highly migratory fish species	*Scombridae* protection (juvenile fish assemblages) Spawning and nursery grounds of migratory fishes	Stopping IUU Fisheries
M3 Deep sea shrimps	Protection of deep sea shrimp population	Banning of Trawling

For various reasons beyond the scope of this article, there is no high sea legal regulatory regime enforced in the international waters of the Aegean and Mediterranean Seas. This has recently caused several management problems in the region, such as illegal, unreported and unregulated fisheries of the bluefin tuna (*Thunnus thynnus),* albacore (*Thunnus alalunga*), bullet tuna (*Auxis rochei*) and swordfish (*Xphias gladius*). The stocks of these species are depleted and cetaceans are entangled in offshore driftnets even though this kind of fisheries is forbidden in the Mediterranean Sea. There is no appropriate management tool for sustainable fisheries of highly migratory and large pelagic species in the area. Although regional organizations, such as GFCM and ICCAT, responsible for the fisheries management exist, an assessment study (Tudela 2003) shows a strong decline of the spawning stocks since

1993 as well as an increase in fishing mortality for blue fin tuna in the Mediterranean Sea.

Öztürk (2004) proposed identification of pilot sites for high seas marine protected areas and establishing a working group in the Barcelona System. However, due to political and legal impediments, these proposals were not considered. Mismanagement, illegal, unreported and unregulated fisheries activities, however, still continues in the eastern Mediterranean Sea.

For protection of the Mediterranean marine environment, there are several international and inter-governmental organizations, such as ACCOBAMS, ICCAT, GFCM, IUCN, RAC/SPA and others. ACCOBAMS has eight proposals for the marine protected areas for the protection of the cetaceans in the Mediterranean and Black Seas (see www.accobams.org). Marine protected areas recommended by the ACCOBAMS Scientific Committee as a part of the Mediterranean common dolphin conservation plan is overlapping or consistent with two areas proposed in this paper (A1 and A3 in Figure 1). One is in the northern Aegean Sea and the other one is in southern part of the Aegean Sea.

Greenpeace has already suggested some proposals for the Aegean and Mediterranean marine reserves sites and urges coastal states to designate marine reserves in certain areas **(**see www.oceans.greenpeace.org). GFCM also has issued recommendations for the Eratosthenes Seamount (Mediterranean Seamount) in the eastern Mediterranean and fisheries has been already banned according to the GFCM recommendation number 2006/3 on the establishment of fisheries restricted areas in order to protect the deep sea sensitive ecosystem. RAC/SPA/UNEP/MAP has produced several action plans for the Mediterranean monk seals, cetaceans, sea turtles, marine vegetation, marine and coastal birds, cartilaginous fishes, and invasive species and coralligenous assemblages. In addition, a SPAMI list also exists and is implemented by some coastal states for protecting marine biodiversity, such as international sanctuary for cetaceans in the Ligurian Sea. All these international initiatives are important to urge decision makers and politicians when decisions are to be made regarding the marine environment. Establishing HSMPA will be an important step towards implementing the ecosystem approach to management of the eastern Mediterranean Sea. This proposal may be beneficial and provide better management methods to sustainable fisheries as well as to the coastal states if they desire. Designation of HSMPAs in the proposed areas will help to protect vulnerable habitats

and threatened species, protect breeding population which can provide recruiting stocks and restore overexploited zones, increase fisheries productivity in a long term, reduce by-catch of seabirds, cetaceans and sea turtles, and reduce overfishing of highly migratory fish.

Scovazzi (2002) stated that the Mediterranean Sea should be considered a primary heritage and concern for bordering states. This message indicated that more responsibility should be adopted by each State to protect and cooperate for the protection of the Mediterranean Sea. In addition, the Mediterranean and the Black Seas form an integral unit and the protection of the biodiversity of the Black Sea is also closely linked to that of the Marmara and Aegean Seas given that it is the only water renewal system to and from the Mediterranean Sea.

Designation of HSMPA is also one of the objectives of the Convention on Biological Diversity and the associated Jakarta Mandate. Furthermore, the IUCN Amman Resolution on High-Seas MPA's adopted in October 2000, called for national governments, NGO's and international agencies to better integrate established multilateral agencies and existing legal mechanisms to identify areas of the high-seas suitable for collaborative management action and to reach agreement by consensus on regimes for the conservation and management. Thus, collaborative management action in the Aegean Sea between Turkey and Greece can develop joint management processes. Acer (2006) suggested that joint maritime regime and cooperation between Turkey and Greece needs to be comprehensive and Oral (2009) stated that the peaceful delimitation and the establishment of uncontested maritime zones is prerequisite to ensuring the future sustainability of the marine environment in the Aegean Sea. Equitable and reasonable solutions are needed to solve maritime disputes with the guidance of customary international law which may then help to improve the recovery of Aegean marine environment. In the eastern Mediterranean Sea, an area shown in Figure2 as M3, there may be a chance for peace and cooperation for Turkey, Syria, Lebanon and Northern and Southern Cyprus Republics. There has already been a success story among Israel, Jordon and Egypt, where they designated in Aqabe a "peace park"; this area is protected from severe ecological threats in the Red Sea. There are several examples in the world ocean of particularly sensitive sea areas (PSSA), which is designated by International Maritime Organization (IMO). The aim of the PSSA is to protect vulnerable habitats in marine area, yet there is no PSSA area in the Mediterranean Sea. A HSMPA could substitute for this as an alternative protection instrument.

Therefore, special and long term research programmes and special funds are needed on the conservation of the marine biological diversity resources beyond marine and coastal protected areas, with a view to establishing protected area networks. These proposals also help to create a discussion forum and exchange of information among scientists, marine conservationist, fisherman and decision makers in the Mediterranean region.

Nevertheless, it is clear that there are increasing risks to biodiversity in areas beyond national jurisdiction in the eastern Mediterranean Sea in benthic features such as seamount communities, cold seeps, hydrothermal vents and others peculiar habitats. For pelagic habitats, upwelling areas and gyres such as Rhodos also play important roles in fuelling ecosystems in the entire Levantine area.

Finally, there is an immediate need for taking concerted actions in order to conserve high seas benthic and pelagic boundaries in the eastern Mediterranean Sea. Even these boundaries are uncertain due to lack of detailed scientific information and simply poor knowledge.

Özet

Ege ve Akdeniz'de canlı kaynaklar her gün azalmaktadır. Ayrıca denizel biyolojik çeşitlilik aşırı avcılık, gemi kökenli kirlenme, yabancı türler ve hedef dışı av gibi nedenlerle tehdit altındadır.

Ege Denizi ve Doğu Akdeniz'de Açık Deniz Koruma Alanları (ADKA) ilan edilmesi konusu incelenmiştir. Ege Denizi'nde 5, Doğu Akdeniz'de ise 3 alanın Biyolojik Çeşitlilik sözleşmesi kriterlerinden 5 temel öğe olan özgünlük, nesli azalan, tehlike altında olan türlerin yaşam devrelerini geçirdiği habitatların bulunduğu alanlar, nadir, hassas veya kendini yavaş yenileyen türler ve bulunduğu yaşam alanları ile biyolojik üretimin yüksek olduğu alanlar dikkate alınarak (ADKA) ilan edilmesi önerilmektedir. Böylece Doğu Akdeniz'de ve Ege Denizi'nde biyolojik çeşitliliğin korunmasına katkıda bulunulacaktır. Bunun yanında, ortak eylem ve uluslararası işbirliği zorunluluğu bulunmaktadır.

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Annex1. Polygons and Coordinates for the HSMPA's in the Aegean and Eastern Mediterranean Seas.

	Coordinates
1a	N40 16.610 E25 37.923
1b	N40 08.494 E25 29.222
1c	N40 08.444 E24 32.366
1d	N40 28.059 E24 41.692
2a	N39 25.231 E25 23.252
2b	N38 48.390 E25 03.769
2c	N38 48.390 E25 42.224
3a	N36 33.276 E27 33.361
3b	N36 24.648 E27 48.676
3c	N36 23.276 E27 44.340
3d	N36 31.853 E27 28.917
4a	N36 06.191 E26 04.324
4b	N35 43.552 E26 04.324
4c	N35 43.552 E24 30.322
4d	N36 06.191 E24 30.322
5a	N36 10.305 E28 20.184
5b	N36 10.305 E29 03.000
5c	N35 38.737 E28 20.184
5d	N35 38.737 E29 03.000
6a	N35 50.343 E30 06.000
6b	N35 50.343 E30 39.423
6c	N35 23.165 E30 06.000
6d	N35 23.165 E30 39.422
7a	N35 48.325 E32 39.390
7b	N35 48.325 E32 56.325
7c	N35 36.194 E32 39.390
7d	N35 36.194 E32 56.325
8a	N35 33.645 E35 07.769
8b	N35 14.071 E35 32.861
8c	N34 59.954 E34 27.855
8d	N34 49.923 E35 03.138

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