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MONITORING AND PROTECTION APPROACHES FOR COASTAL WATERS IN TURKEY

B. Sen¹, M. T. Alp², F. Sönmez¹, M. A. T. Kocer³, K. Alpaslan⁴, G. Karakaya⁴

¹Firat University Faculty of Fisheries, Turkey, bulentsen23@gmail.com

²Mersin University Faculty of Fisheries, Turkey

³Antalya Water Research Center, Turkey

⁴Elazığ Water Research Center, Turkey

Coastal waters are important as they provide habitats for various plants and animals. However they are facing serious problems such as habitat loss, degradation, overfishing, land-based pollution, invasive species, shoreline erosion, mariculture facilities, intensive and shipping accidents. Mediterranean coast of Turkey are of great importance as the nesting and breeding grounds of the two endangered marine turtle species: the loggerhead (*Caretta caretta* Linnaeus, 1758) and the green (*Chelonia mydas* Linnaeus, 1758). Protection and management measures of coastal waters in Turkey are discussed.

Keywords: coastal waters, monitoring, protection, management, Turkey

Turkey is a country well endowed with a wealth of coastal areas and an abundance of their coastal resources. The total length of the Turkish coastline including the islands is 8333 km of which 1067 km are island shores (fig. 1). This includes the Black Sea: 1701 km (20.4%), the Marmara Sea: 1441 km (17.3%), the Aegean Sea: 3484 km (41.8%), and the Mediterranean: 1707 km (20.5%) [1]. These four coastal regions show distinct geographical features. Turkey is a mountainous country and mountain ranges limit the size of the coastal areas even to extreme minimums in some regions. On the other hand they bring a marked influence on the climatology of the region. Turkey has 72 lagoons of various sizes, distributed along her long coastline. The Aegean coast is the richest in terms of the number of lagoons, total lagoon area (about 20000 ha) and fish production (about 562 tons per year). The lagoons along Turkey's Black Sea and Mediterranean coast are found mainly as parts of the deltaic systems [2].

The following threats /issues are the key issues facing all coastlines and coastal waters all over the World including Turkey.

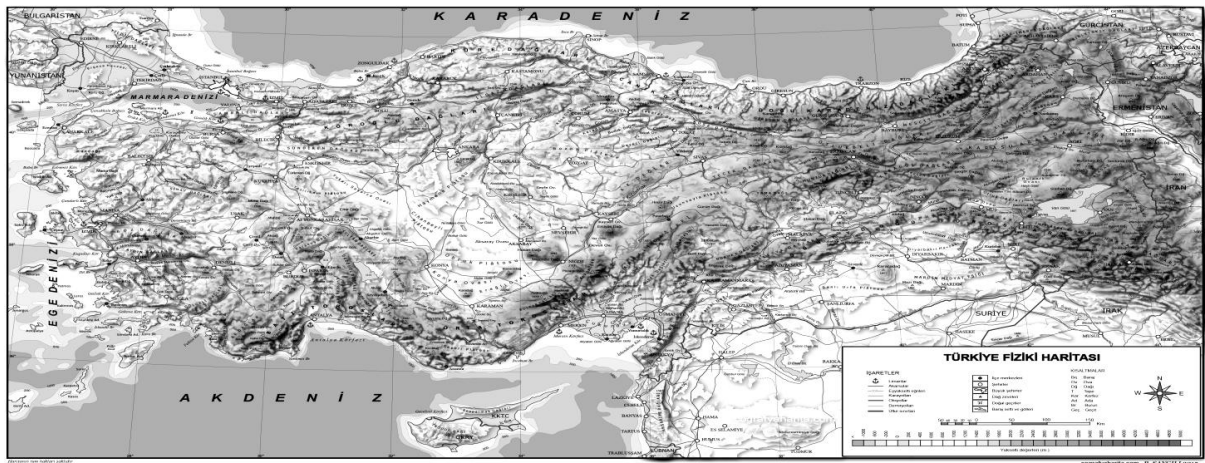


Fig. 1 Map of Turkey

Problems and threats for coastal regions and coastal waters in Turkey

Substantial part of the coastal areas of Turkey, including almost all forests and woodlands, are still state owned in the year of 2003. However the illegal occupation of state-owned coastal lands (and forests) by villagers and the use of these lands for agriculture and farming is a long-lasting issue that still needs to be solved. This is important in order to prevent pollution of coastal waters caused by uncontrolled agricultural activities and deforestation.

Several new sectors, such as tourism and recreation, mariculture facilities, technical agriculture (including greenhouse farming / horticulture / intensive farming) are gained great importance in coastal areas which are also constituting serious pollution sources over the last two decades.

Rapidly increasing population in coastal cities/areas is a serious pollution threat for coastal waters in Turkey. This problem gained a new dimension when the inhabitants of large cities flooded the coastal areas in large numbers starting in the 1980s, in search of an attractive new home for their retirement. Antalya and Alanya in the Mediterranean, and Kusadasi, Marmaris, Fethiye and Bodrum in the Aegean are well known examples for rapid urbanization of coastal resorts.

Coastal industry and marine facilities that have been developed following a leasing agreement with the government are another serious pollution sources for coastal waters. Refineries on the coasts are also considered to be potential dangerous threat for coastal areas and coastal waters.

Intensive transportation and shipping accidents are real threats to the maritime environment and to human life in the highly populated areas particularly around the straits. Bosphorus and Dardanelles Straits and Marmara Sea are among the busiest and most critical seaways in the world. In 1936, when the Montreux Convention was signed to regulate transit and navigation in the Straits, to an average of 48000 vessels per year recently with 132 vessel transits daily, not including local traffic. Today, in every 10 minutes a ship and in every 63 minutes a tanker are passing from Bosphorus and Dardanelles straits. This intensive transportation gave rise to many maritime accidents some of which cause serious damage to coastal waters and Marmara Sea due to their hazardous materials and crude oils. In fact, during the period from 1953 to 2002 a total of 461 maritime incidents occurred in the Istanbul Strait or in its southern entrance at the Marmara Sea. The majority were collisions and most of these collisions caused severe pollution in Marmara Sea since tons of ammonia, crude oil and other hazardous materials spilled to the sea. It is apparent that shipping accidents are really a serious threat for marine environments in Turkey [3].

Fish farms in Turkey are spreading rapidly and cultured fish production (aquaculture & mariculture) has been steadily increasing. The coastal zone of the Aegean Sea is the leading region for cultured production of marine fish species (sea bass and sea bream), providing 43% of the total production in 1998 [2]. Sea bream and sea bass mariculture facilities are located along the southern Aegean coast. These are almost always located in sheltered sites and use simple floating net cages. In 2000, 94% of the total sea bass and sea bream production was from the Aegean fish farms. There are already one or two blue fin tuna farms along the Turkish Mediterranean and the Aegean coasts. Fish farms should be considered and controlled as a source for organic pollution in particularly Aegean Sea. Mariculture facilities located along the Aegean shores have often constituted a case of use conflict with recreation, tourism and urban development sectors as well as nature conservation. Relatively recent tuna

farms have also been a controversial development disputed by conservationists through various media.

Biodiversity loss: land-based pollution, deforestation, uncontrolled fisheries, rapid (and sometimes uncontrolled) tourism development and associated coastal habitat degradation caused by land speculation (especially along the Mediterranean, Aegean and Marmara coasts) are main factors for diversity loss in the coastal regions in Turkey. It is worthwhile to mention that there are 472 fish species in Turkey and 50 of these are at risk of extinction due to excess catch and pollution [4]. Several commercial fish species that were once caught in abundance in the 1960s and '70s were re-classified as threatened in the 1990s due to various factors including over and illegal fishing, the presence of alien species, water pollution and habitat loss. The rapid expansion of tourism facilities and activities along the coast has resulted in serious conflicts with the integrity of marine ecosystems. Tourism activities in vital habitats of marine turtles and monk seals (such as their breeding beaches and caves) have caused damage to these animals. In addition, coastal tourism activities, especially yachting, have negatively impacted upon *Posidonia* meadows in sheltered bays due to increased water pollution and direct damage by anchor operations.

Turkey signed the “Convention on Biological Diversity (CBD)” in Rio, and thus committed itself to carrying full responsibility for the conservation of the biodiversity of plants, animals and microbiological life [4].

The loggerhead and the green turtles: The pristine coastal dunes and beaches on the Mediterranean coast of Turkey are great importance as the breeding grounds of the two endangered marine turtle species: the loggerhead (*Caretta caretta* Linnaeus, 1758) and the green (*Chelonia mydas* Linnaeus, 1758). In a monitoring study carried out in 1989, 17 beaches along the southern Aegean and the Mediterranean coast have been identified as important nesting grounds and breeding habitats for marine turtles. The loggerhead turtle (*Caretta caretta*) is classified as endangered on the International Union for the Conservation of Nature’s (IUCN) Red List. Turkey has accepted the Action Plan (1989 and 1999) for the conservation of Mediterranean marine turtles within the framework of the Barcelona Convention. Several breeding habitats of marine turtles were declared as Specially Protected Areas in 1988 and 1990. The Ministry of Environment established the Marine Turtles National Commission and the Marine Turtles Scientific Commission for the coordination of activities towards the protection of the two species (fig. 2).



Fig. 2 The loggerhead (*Chelonia mydas*) and the green turtles (*Caretta caretta*)

Turkey also accepted the action plan for the conservation of the Mediterranean **monk seal** living along the Marmara, the Aegean and the Mediterranean coasts, again developed in the framework of the Barcelona Convention [4].

Marine pollution: Marine pollution along the Turkish shoreline is mainly due to major land-based sources such as untreated wastewater from domestic and industrial settlements, pollutants brought from inland areas by rivers, coastal agricultural practices, tourism activities, extensive concentrations of secondary, holiday homes, port and marina establishments, and to some extent, mariculture facilities. Additionally, trans-boundary pollution sources from neighbouring countries, maritime transport and yachting are also important marine sources of pollution. The amount of treated wastewater has been steadily increasing and percentage of treated wastewater in 1998 (28.8%) is still very low [5]. A number of early industrial facilities that were developed in the 1960s and '70s along the shores of relatively sheltered sea areas such as the northern Marmara coast, Izmit Bay, Izmir, Aliaga and Nemrut Bays, and Iskenderun Bay (Fig. 1), are responsible for the major coastal "hot spots". These areas still suffer from the impacts of water pollution from industries. Discharge of domestic wastewater through running waters could be a major contributor to marine pollution along the Turkish coast. Although industrial wastewater constitutes a very small percentage of the total discharge, it contains highly toxic substances such as mercury, lead, chromium, and zinc [6]. Maritime transport is an additional source of marine pollution originating from accidents in areas with heavy traffic, particularly involving petroleum transports, and the improper disposal of ballast and bilge waters and solid waste. Major nonpoint pollution sources in coastal waters include agriculture and urban runoff. Other significant sources include faulty septic systems, forestry, marinas and recreational boating, physical changes in stream channels and habitat degradation, especially the destruction of wetlands and vegetated areas near streams.

It is worthwhile to emphasize that management measures are necessary to implement both nonpoint and point source pollution controls. Management programs should be updated in accordance with the changing circumstances in coastal areas. Furthermore the "Coastal Zone Act Reauthorization" should be necessary to tackle the nonpoint source pollution problems to occur in coastal waters. This will enhance efforts to manage land management activities that degrade coastal waters and coastal habitats.

Protection of coastal waters (Monitoring, Assessment)

Coastal waters should be protected, preserved and restored. To protect the coastal waters the followings are significant.

All partners should work together. The challenge is to meld the capabilities and expertise of all the partners to solve local coastal problems. This can be accomplished by sharing information, pooling resources, and combining management skills and the technical expertise.

"Coastal and Estuarine Land Conservation Program (CELCP)" should be prepared: This Program is necessary to protect coastal and estuarine lands and considered important for their ecological, conservation, recreational, historical or aesthetic values. Lands or conservation easements acquired with funds are protected in perpetuity so that they may be enjoyed by future generations.

"Coastal Resources management" together with "Deep Sea Resources Management Divisions" should be established in the main body of relative ministry. In addition "Bureau of Environmental and Coastal Quality" should be designed in order to promote conservation and wise development around the coastal resources.

“Climate Change Adaptation Program” should be prepared. It is important to understand how climate change would affect the coastal waters and anticipate vulnerabilities.

Coastal Resources Planning is necessary for Coastal Zone Management. This section should provide resources for the planners to conduct special projects (e.g. Wetland management; Marine debris – removal and reduction of litter and abandoned vessels; Shoreline monitoring – Observing shoreline erosion and accretion patterns).

Impaired coastal waters should be determined and listed. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by countries and/or environmental associations like EPA. Priority rankings and estimation of "Total Maximum Daily Loads" (TMDLs) for these waters are essential. It may be important to know TMDL is a calculation of the maximum amount of a pollutant that a body of water can receive and still safely meet water quality standards.

Ship Waste Monitoring System (SWMS) should be established. Wastes from ships in Turkish seas are regularly (7/24) monitored with special blue cards supported by a digital system.

Waste collecting stations are important to collect wastes directly from ships. Over a hundred waste collecting stations were established in Turkey.

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МОНИТОРИНГ И ОХРАНА СРЕДЫ В ПРИБРЕЖНЫХ ВОДАХ ТУРЦИИ

Б. Сен¹, М. Т. Алп², Ф. Сынмез¹, М. А. Т. Косер³, К. Алпаслан⁴, Г. Каракая⁴

¹Университет Фират, факультет рыболовства, Элязыг, Турция, bulentsen23@gmail.com

²Университет Мерсин, факультет рыболовства, Мерсин, Турция,

³Центр водных исследований, Анталия, Турция,

⁴Центр водных исследований, Элязыг, Турция

Важность прибрежных вод обусловлена тем, что они предоставляют местообитание для множества растений и животных. Однако их состояние может ухудшаться вследствие потери среды обитания, деградации, перелова, берегового загрязнения, внедрения видов-вселенцев, эрозии береговой линии, функционирования марикультуры, деятельности флота и его аварий. Средиземноморское побережье Турции играет важную роль при гнездовании и размножении двух угрожаемых видов морских черепах – черепахи Логгерхеда (*Caretta caretta* Linnaeus, 1758) и зеленой черепахи (*Chelonia mydas* Linnaeus, 1758). Обсуждены меры сохранения и бережного отношения к данным видам черепах в прибрежных водах Турции.

Ключевые слова: прибрежные воды, мониторинг, сохранение, бережное отношение, Турция

<i>Kreneva S. V., Kreneva K. V.</i> Assessment of the biocenoses' state in the Mius liman of the Sea of Azov	327
<i>Kutlakhmedov Yu., Matveeva I., Davydenko V.</i> Principles of realization reliability of ecological systems on different levels of hierarchy	331
<i>Lange E. K., Eremina, T. R. Ershova A. A., Isaev A. V.</i> Influence of thermohaline regime at late summer phytoplankton structure in the eastern gulf of Finland (Baltic Sea)	335
<i>Lepskaya E. V., Tepnin O. B., Polyakova A. A.</i> Plankton of Avachinskaya Bay (Kamchatka), as an indicator of complex native and man-made impacts	339
<i>Lyubin P. A., Berdnik S. V.</i> Size structure of zooplankton communities of Tatarstan reservoirs	343
<i>Maximova O. B.</i> use of functional characteristics of phytoplankton as a rapid method for the determination of anthropogenic impact of hydraulic engineering on water bodies.....	347
<i>Maximovich N. V., Gerasimova A. V., Filippova N. A.</i> Biocenosis as a unit of description of organization of tide flat macrobenthic communities at the White Sea.....	351
<i>Mansurova M., Stelmakh L. V.</i> Organic carbon and nitrogen content in the cultures of the Black Sea dinoflagellates	355
<i>Mankovsky V. I., Mankovskaya E. V.</i> Relations of the optical characteristics with chlorophyll concentration in the tropical waters of Atlantic Ocean	358
<i>Mineeva N. M.</i> Temporal and spatial dynamics of chlorophyll in plankton of the large plains reservoir	362
<i>Mineyeva O. V., Umirzakov A. N.</i> Macrozoobenthos structure of the coastal area of the north Caspian Sea	366
<i>Moroz V. V., Rudykh N. I., Shatilina T. A.</i> The reasons of the summer short cold snaps of Japan Sea water adjoining La Perous Strait and the hydrobionts existence condition change.....	370
<i>Nekhoroshkov P. S.</i> The special aspects of assessing of elemental content of coastal communities of phytoplankton in consideration of its biophysical parameters	374
<i>Nikitina L. I., Ulozhenko O. I.</i> Assessment of the ecological fortune of the coastal zone of the Amur River near the city of Khabarovsk with use of specific structure of infusorians.....	378
<i>Ostrovskaya E. V., Monakhov S. K.</i> Quality of the marine environment in the north-western part of the Caspian Sea	381
<i>Petrov A. N., Nevrova E. L.</i> Species richness estimation of benthos assemblages at different sediment pollution level and sampling efforts	385
<i>Popov S. V., Golovina L. A., Radionova E. P., Pinchuk T. N.</i> To problems of eastern Paratethys ecosystem restorations during neogene	390
<i>Radchenko I. G., Ilyash L. V., Shevchenko V. P.</i> Summer phytoplankton of the Kem River estuary (Onega Bay of the White Sea) – the results of four years of research	394
<i>Revkova T. N.</i> Vertical distribution of the free-living nematodes in the deep-sea sediments of the Black Sea	398
<i>Remizova N. P.</i> The state of the zooplankton community of the Tuapse port in the autumn season 2015	402
<i>Rusanova V. A., Pohodina M. A., Sviridenko V. D.</i> Research of content of biogenic elements in Avacha Bay in 2013-2015 year	406
<i>Ryabinina Z. N., Isabayev B. M., Ichkildin A. B.</i> The arrangement of the phytomonitoring in the oil and gas production region of the North-Eastern Caspian.....	410
<i>Samyshev E. Z., Minkina N. I., Kopytov Yu. P., Chudinovskikh E. S., Igantsev S. M.</i> About biological and toxicological predictors of warming in the Antarctic	413
<i>Safronova L. M., Luzhnyak O. L.</i> Changes in the Azov Sea phytoplankton under present-day conditions of salinization	417
<i>Sen B., Alp M. T., Sönmez F., Kocer M. A. T., Alpaslan K., Karakaya G.</i> Monitoring and protection approaches for coastal waters in Turkey	421
<i>Seregin S. A., Popova E. V.</i> Micrometazooplankton of the Crimean Black Sea waters: abundance, species diversity, tendencies	426
<i>Serikova I. M., Tokarev Yu. N.</i> Biophysical monitoring in the Sevastopol coastal zone.....	430
<i>Slepchuk K. A., Khmara T. V.</i> Assessment of the Sevastopol Bay (the Black Sea) eutrophication level using E-TRIX index.....	434
<i>Smirnova M. M., Ezhova E. E., Voyakina E. J.</i> Environmental factors and development of cyanobacteria in the littoral of shallow hypertrophic lagoon (the Curonian Lagoon, Baltic Sea).....	438