Options for Delivering Ecosystem-based Marine Management

The Black Sea: Additional information on status of threatened ecological characteristics relevant to the Marine Strategy Framework Directive

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Regional Sea description

The Black Sea is an almost enclosed basin with large river runoff and bounded exchange with the Mediterranean Sea through the Bosphorus Strait. Covering an area of 436,000 km^2 it presents a large variety of topography with a central flat abyssal plain (maximum depth 2,200 m) and ~200 km wide shelf in the north-west (depth <100 m, constituting 25% of the total area).

The drainage basin is five times larger than the sea area (Ludwig et al., 2009) and operates as a virtually isolated ecosystem, being particularly sensitive to distant anthropogenic activities (Stenseth et al. 2011). The drainage basin delivers industrial, domestic, and agricultural runoff of a population of more than 162 million people, primarily via three major rivers in the northwestern sector (Mee, 1992; Revenga et al., 1998). The riverine inflow is a key driver of ecosystem processes on the shelf, while the deep central sea is mostly isolated from the riverine influence.
The hydrographic regime is characterized by low salinity surface waters of river origin overlying high-salinity deep waters of Mediterranean origin, with a sharp and permanent pycnocline found between. The pynocline restricts the penetration of vertical mixing depth to 100–150 m. As a result a two-layered chemical structure of water is formed with oxygen only in the upper 150-200 m depth (13% of the sea volume) and anoxic conditions in the deep waters. There are sulfate reducing bacteria in the deep sea that lead to the accumulation of hydrogen sulfide and some other sulfur compounds (BSC, 2008).

The flora and fauna of the world's largest meromictic basin, which was formed under the conditions of relatively low salinity and the existence of an anoxic zone beneath the upper oxygen-containing layer, is distinguished by low species diversity within the present taxa. However, high productivity in near-shore regions results in high abundances of key commercial species and rich fish resources. Low species diversity combined with high habitat diversity in the Black Sea provides favourable conditions for the introduction of alien species (Shiganova et al., 2009; BSC 2010).

The Black Sea is bounded by Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine and supports many of the sectors identified by the ODEMM partnership as those exploiting its marine resources. Of the 20 sectors identified in ODEMM as those contributing to the current status of its ecological components, 18 sectors (except desalination operations and carbon sequestration) are operational within the region. Shipping, fishing, tourism, land based industry and infrastructure could be identified as the most important for economic development of all countries surrounding the Black Sea. But several sectors are largely country specific in terms of extent. More than 70 % of the total fisheries landings in the Black Sea belongs to the Turkish fishing fleet (www.seaaroundus.org, 2005).

The Aquaculture sector is developing in all Black sea countries, but it has grown rapidly into an important activity in Turkey and Bulgaria (BSC, 2007, Deniz, 2001). Oil and natural gas still supply main part of countries energy needs. The significant increase in upstream oil production created a midstream challenge of providing proper transportation of oil from the Caspian region to western markets. This required construction of new oil pipelines as well as expanding existing ones (Oral, 2006). Nuclear power plays a significant role in the energy supply of Russia and Ukraine but nuclear stations are located far from coast. Wind farms as a renewable energy sector have been recently developed on the Bulgarian shore.

The Black Sea Region has undergone major socio-economic changes over the past 20 years. The regional economic collapse at the end of the 1980s, and the resultant break-up of the Soviet Union and birth of the CIS2 countries, together with a much less dramatic but still influential economic slow-down in 1997-98 have had major social and environmental implications. Since 2000, personal wealth has increased, but not as rapidly as inflation. Furthermore, this increase in wealth has been concentrated in the hands of a small number of very rich individuals. The size of the middle class remains small (BSC, 2007).

EBM of the Black Sea and in particular, implementation of the MSFD legislation is expected to be complex. Several countries including Russia, Georgia, Turkey and Ukraine are not Member States of the EU, and therefore are under no obligation under EU legislation (e.g., MSFD, HD). As such, effective EBM may not be possible unless non-Member States agree to support the objectives outlined in the EU legislation. If non-Member States choose not to play an active role in this process, transboundary effects are likely to greatly affect the success of marine ecosystem management in the Black Sea (BSC, 2007).

Availability of Information: Regional Summary

The Black Sea Member States are well placed to undertake their Initial Assessment obligations (Article 8, Directive 2008/56/EC) in which they must assess the current environmental status of the Baltic Sea waters and the environmental impact of human activities by 2020. The Commission on the Protection of the Black Sea Against Pollution (Black Sea Commission/BSC) via its permanent secretariat is an intergovernmental body that coordinates implementation of the Bucharest Convention, its protocols and development of the strategic action plan for the environmental protection and rehabilitation of the Black Sea. Research by scientific institutes, universities, governmental bodies and joint international programmes provide descriptions for all ecological characteristics outlined in the MSFD (Annex III, Table 1, Directive 2008/56/ECC) and a summary of this information is presented below (more detailed descriptions of this data are available for download from the ODEMM website (www.liv.ac.uk/odemm/outputs/data).

For those descriptors requiring a pressure assessment approach to evaluate GES, additional information is needed that describes the extent and frequency of the pressure and its impact on ecological characteristic(s) (e.g. Marine Litter and Underwater Noise pressure and impact effects on ecological characteristics). Geographic information was largely unavailable, thus assessment of pressure footprint (extent) and frequency was undertaken by a group of regional experts.

The resilience of habitats and species to a pressure(s) was derived from published literature (i.e. journal articles). When data were unavailable, expert judgement by ODEMM partners in the Regional Sea and wider European partnership was undertaken.

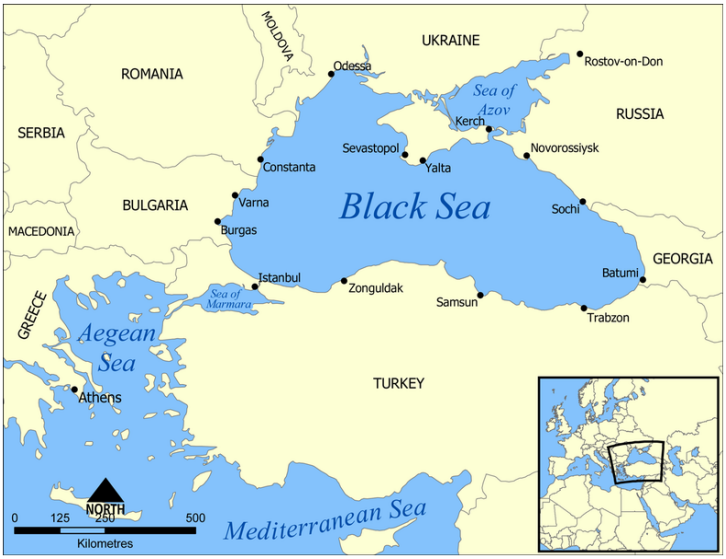

Figure 1. The Black Sea extent and bounding countries.

Table 1. A Summary of Areas of Concern, Risks to GES, and Confidence in Risk Assessment of GES Descriptors in the Black Sea. Each GES Descriptor is described by one or more components: ecological characteristics, pressure and/or impacts information (see Chapter 2 in Deliverable 1). The components used to evaluate each descriptor are shown in more detail in the following summary tables and outline the availability of information and criteria used to assess current status and trends of components in each Regional Sea. * indicates a pressure assessment approach was used, either in part or in its entirety, to evaluate the descriptor. Risk assessment criteria and confidence assessment definitions are described in Chapter 3 and Annex V of Deliverable 1.

GES Descriptor	Problems	Areas of Concern	Risks to GES	Risk Confidence
1a. Plankton	No	Plankton communities are broadly stable throughout the region, but alterations in dissolved nutrient ratios have led to a change in phytoplankton dominant groups	Moderate	Moderate
1b. Fish	Yes	Intense and unregulated fishing has led to over-exploitation of major fish stocks with several commercial and non-commercial species in unfavourable status and/or declining in abundance. Some recovery of populations has been seen since the mid-1990s.	Moderate	Moderate
1c. Marine Mammals	Yes	Several marine mammal species in the Black Sea are endangered in terms of population size and distribution and have the potential to become extinct within the next 10 - 20 yr	Moderate-high	High
1d. Seabirds	Yes	Several seabird species are currently under threat in terms of distribution and population size, several of which are threatened, vulnerable or at endangered status and likely to become extinct in the next 10 yr	High	High
1e. Predominant Habitats	Yes	Much of the coastline has been subject to anthropogenic pressures resulting in a decline in diversity and reduction in status, despite extensive protection of habitats and management plans.	Moderate-high	Moderate
2. Non-indigenous species (NIS)*	Yes	Two NIS species, *Rapana venosa* and *Mnemiopsis leidyi* have historically caused widespread problems in the region. Despite a reduction in *Mnemiopsis leidyi* abundance, the density and distribution of the species continue to cause impacts in the region	High	High
3. Commercial fish and shellfish	Yes	Destructive fishing practices and over-exploitation has led to the decline of many benthic and pelagic fish species with stocks collapsing in the 1980s. Stocks have been slow to recovery with several species under threat	High	Moderate
4. Food webs	Yes	Commercial fishing led to mass destabilisation of the marine food web with removal of important top predator fish species. This was a factor in the rapid expansion of the invasive ctenophore, *Mnemiopsis leidyi* and reductions in native plankton species	High	Moderate
5. Eutrophication*	Yes	Oxygen deficiency frequent and widespread throughout the north-west shelf and summer-autumn hypoxia is an annual phenomena associated with active eutrophication. Historic nutrient discharges from agriculture and industrial sources led to heavy enrichment and widespread eutrophication but discharge control has led to reductions in nutrient concentrations in recent years.	Moderate	High
6. Seafloor Integrity*	Yes	Human activities such as agriculture, coastal infrastructure, fishing, shipping, tourism and recreation, and waste water treatment contribute widespread and persistent pressures that have detrimental effects on several aspects of the Black Sea ecosystem	High	Moderate
7. Hydrographic conditions*	No	Sea surface temperatures are variable and temperature and thickness of cold-intermediate layer (CIL) waters vary with cyclic dynamics (current trends indicate an increase in temperature and decrease in thickness).	Not assessed	Not assessed
8. Contaminants	Yes	Petroleum hydrocarbons and pesticides in sediments are in elevated concentrations and exceed threshold levels in localised areas	Moderate-high	High
9. Fish and Shellfish Contamination	Yes	Chemical concentrations in biota are highly variable and may exceed threshold concentrations, however, there is a great deal of uncertainty in estimates	Moderate	Low-moderate
10. Marine Litter*	Unknown	The amount of litter in the region is not known, however, it is a 'visible' problem along the Black Sea coastline. Several human activities including coastal infrastructure, fishing, land-based industry and shipping introduce commonly introduce litter throughout the region	High	Moderate
11. Energy (Underwater noise)*	Yes	Shipping is widespread and continues to increase throughout the region introducing low-frequency sound throughout the region	High	Moderate
12a. Habitats Directive Habitats	Unknown	The Habitats Directive was adopted by the Black Sea Member States in 2007 and status is yet to be reported under Article 17.	N/A	N/A
12b. Habitats Directive Species	Unknown	The Habitats Directive was adopted by the Black Sea Member States in 2007 and status is yet to be reported under Article 17.	N/A	N/A

Ecosystem Components

Poor or threatened components

Of the 16 components listed in the MSFD as recommended for assessment in the Black Sea, data were recorded for 11. Representatives of 38% of the ecological characteristics (6) are classified as threatened, in terms of either status or indicated by a declining trend. Current threatened components include: predominant habitats, bottom fauna and flora, commercial fish species (including molluscs), marine mammals and reptiles, and seabirds.

Nutrients and Oxygen

The levels of nutrients (N, P, Si) and oxygen have been adequately described for the Black Sea (Konovalov et al. 2005; Yunev et al. 2005; Anon, 2008; Orlova et al, 2007; Zaytcev et al. 2008; Oguz, 2008). Due to Northwestern shelf (NWS) and open deep-waters part of the Black Sea have fundamentally different hydrochemical regimes and mechanisms of nutrient supply. As such, the main hydrochemical components should be considered for separately for these areas.

Oxygen

Oxygen deficiency in the bottom layers most frequently and widely manifests itself with in the NWS, although it can occur locally and in other offshore areas (BSC, 2009). Summer-autumn hypoxia (often followed by anoxia) become an annual phenomenon in the NWS bottom waters since the mid 1970's on the background of active eutrophication of the sub-region and the lowest near-bottom [DO]. To date the overall situation is improving although the area of hypoxia in some years has reached values comparable with the period of 1970's (Orlova et al, 2007; Zaytcev et al. 2008). Near-bottom oxygen concentration is evaluated against a threshold level of 5ml/l. Concentrations tend to be variable, but can often exceed or decline below this threshold, resulting in classification as being of moderate status (Orlova et al, 2007; Zaytcev et al. 2008). This criterion is not applicable for the deep-water parts of the Black Sea due to their natural anoxia.

Nutrients

The shallow region (up to 50-m isobaths) of the NWS (and estuarine areas especially) is the most nutrient enriched region of the Black Sea. Following the early 1990s, economical recession in the former eastern block countries indirectly resulted in closure of ecologically ineffective large animal farms (agricultural sources) and of nutrient discharging (e.g. fertilizer) industries. Phosphate content was also reduced in detergents, and nutrient removal from wastewater was improved in the countries along the Danube River (BSC Report, 2009). This has led to a reduction of river inorganic nutrient loads from maximum levels in the 1970's -1980's. DIP loads have decreased sharply in the Sulina Danube branch since the 1990s and continue to decrease. This trend has been reported for other Danube branches and Northwest shelf rivers and has lead to a decrease in [DIP] in NWS coastal waters (Orlova et al., 2008, BSC SOE report, 2008). DIN times series data have shown marked declines in both DIN loads and [DIN] in the Northwest shelf waters in the late 1990's following maximum concentrations and loads in the 1970's-1980's. More recently, DIN cconcentrations have been stable. In contrast, dissolved organic nitrogen (DON) and phosphorus (DOP) loads and concentrations in NWS waters have increased persistently since 1960s (Orlova et al., 2008). Decreased *Si* loads in riverine run-off have been reported since the mid-1970s (Humborg et al., 1997) caused a significant decrease of [Si] in NWS waters (BSC SOE report, 2008). Both increase in DON and DOP and decreases in [Si] are associated with river barrage construction (Hdb Env Chem., 2008). The change in the ratio of nutrients between organic and inorganic forms of N and P may account for a shift in phytoplankton taxonomic structure in NWS waters (Moncheva et al., 2010; Oguz, Velikova, 2010).

Listed and Predominant Habitat

The Habitats Directive was enlarged to encompass Member States located in the Black Sea in 2007 and status is yet to be reported for those countries. Existing estimates of the Black Sea habitats status are based on regional criteria outlined in TDA (2007). Among the considerable diversity of Black Sea marine and coastal habitats, the following were identified as being of transboundary importance.

- the aquatic coastal margin ecotones including lagoons, estuaries, deltas, wetlands and saltmarshes;

- the pelagic habitat in the NW Black Sea and the open sea in the SE Black Sea;
- benthic habitats including *Mytilus galloprovincialis* beds, *Cystoseira* spp., *Zostera* beds and sublittoral sands dominated by various psamophilic bivalves.

Changes in aquatic coastal habitats vary and are dependent on the intensity of environmental pressures at the sub-regional level. The Danube Delta and the Bulgarian coastal wetlands probably continue to experience diversity decline and impaired ecological status compared to the 1960s, despite the considerable reduction in habitat degradation due to the designation of extensive protected areas and the implementation of management plans aimed at biodiversity and water quality restoration. The Dnipro Delta and the Turkish coastal aquatic habitats have continued to decline due to eutrophication and pollution. Often, habitat degradation can only be inferred from increased anthropogenic pressures rather than systematic studies. A lack of research and knowledge on Georgian coastal habitats and the Dniester Delta, as well as a difficulties in obtaining national data represent have weakened this assessment of changes in the ecological status and diversity of the Black Sea.

Changes in the pelagic ecosystem towards the end of the 1990s reflects healthier conditions, especially in the NW Black Sea area, where decreased nutrient loads were coupled with favourable climatic change. However, despite the signs of recovery (rise of zooplankton and small pelagic fish stocks) the habitat shows a state of ecological instability, as well as sustained significant stock decline of large pelagic fish species. The Turkish Black Sea area is in a poor ecological state and biodiversity has decreased during the last decade. Environmental and biodiversity changes in the SE Black Sea area remain unclear due to insufficient research (Georgia) or a lack of data provision (Russia). Benthic habitats show localised signs of recovery but remain degraded in comparison to the pristine pre-eutrophication state of the Black Sea (TDA, 2007).

From the six predominant habitat types considering in frame of ODEMM in the Black Sea there is no fauna (except of special groups of bacteria) associated with deep-sea habitats, largely due to the anoxic conditions. Status estimations for the remaining predominant habitat types were evaluated based on percentage of critical habitats at national level (Annex 4, TDA, 2007). Condition ratios are: Good <10%; Moderate≤35%; and Bad >35 %. Status of littoral sediment (35%), sublittoral sediment (17%) and Infralittoral rock and other hard substrata status (15%) indicates a “moderate” status based on these criteria based in a pristine condition reference point (evaluated in the 1960s).

Habitats meriting special reference

Several habitats meriting special reference, defined by characteristic species were evaluated for status (TDA, 2007). Of the 5 habitats assessed, all were in moderate, poor or bad condition as defined by TDA criteria.

Table 2. The Black Sea habitats meriting special reference (after TDA, 2007).

Attribute	**Indicator (Characteristic species)**	**Status**	**Trend**
Sublittoral shell gravel	*Phyllophora nervosa*	Bad	Decline
Infralittoral bedrock and boulders	*Cystoseira* spp	Moderate	Increase/stable for different regions
Beds in lower shore or infralittoral clean or muddy sands	*Zostera marina*	Poor	Stable/decline for different regions
Beds in infralittoral and circalittoral mud and on coarse sand with shell gravel	*Mytilus galloprovincialis*	Moderate	Marginal increase
Infralittoral rock	*Mytilus galloprovincialis*	Moderate	Marginal increase

Fish

The current health of fish populations in the Black Sea is well documented in three reports, namely the Scientific, Technical and Economic Committee for Fisheries (STECF) report (SGMED-09-01, 2009, 2010) and the State of the Environment of the Black Sea (2001-2006/7) report (Oguz, 2008). Available data for threatened fish species includes trends of several indicators including: abundance, landings, recruitment, spawning stock biomass (SSB), CPUE, fishing mortality (F), and fish size (length). Trends are described for (9) commercial species (anchovy, sprat , horse

mackerel, pontic shad, whiting, picked dogfish, turbot, striped mullets, golden mullet) and whole assemblages. Status assessments are also available for six species, of which, four are listed under the Habitats Directive (Annex II) namely sturgeon *Acipenser* spp. (3 species) and Pontic shad *Alosa pontica*. Status and trends are shown for threatened species and assemblages in Table 3.

In the Black Sea prior to the 1970s, there were abundant stocks of several valuable species, such as tuna (*Auxis rochei rochei* and *Thunnus thynnus*), swordfish (*Xiphias gladius*), mackerel (*Scomber japonicus, S. scombrus, Trachurus mediterraneus* and *T. trachurus*), turbot (*Psetta maxima*) and sturgeon (*Acipenser* spp.). Intense and unregulated fishing pressure (including illegal fishing) together with destructive fishing practices such as catching of under-sized fish have led to severe overexploitation of most of the major fish stocks, including demersals (Caddy 1993, Black Sea Commission 2002, UNEP 2002). Over the decades, fishing has become a leading anthropogenic stressor, affecting not only fish stocks but also triggered large-scale ecosystem effects such as trophic cascades and regime shifts characterized by sudden, irreversible switches (Llope et. al., 2011, Daskalov et al., 2007; Oguz and Gilbert 2007).

The release from predation pressure, as a result of the decline of large pelagic stocks and eutrophication-related increase of food resources, led to a favourable environment for small pelagics in the early 1980s. High fishing pressure in response to gradually improving Turkish fishing fleet and its technological capability tended to drive fish populations to be smaller and younger and made them more prone to environmental changes in the 1980s (Gucu, 2002; Eremeev and Zuyev, 2007). This process devastated the recruits in 1988, and led to concomitant abrupt declines of total catches of small pelagics at 1989-1990 and medium pelagics one year later.

The overfishing activity had diminished the potential and efficient competition of pelagic ichthyofauna and this was one of the main driving factors contributing to the outburst of invader *ctenophore Mnemiopsis leidyi* in the early 1990s (Kamburska et *al*., 2003; Daskalov et *al*., 2005). A niche was opened by the decline of some commercially important small pelagic fish and it was effectively filled by *M. leidyi* as “compensation”. Introduction *Beroe ovate, which is a predator of M. leidyi gave an* opportunity to plankton fauna to recover (e.g. increased abundance, biomass and diversity) (Kamburska et al., 2006). As a result, bottom-up control small pelagic fish stock partly recovered in the middle of 90s (Gucu 2002). The demersals and medium pelagics remained persistently in the low catch regime in the post-collapse period (1993-2006). As a general rule, recovery of such longer-lived, slowly maturing predator fishes depends on many biological factors and political choices and its examples of recovery in the literature are limited (Caddy and Agnew, 2004; Hutchings and Reynolds, 2004).

Five species of commercial fish are currently under threat (Table 3). All sturgeon species (*Acipenser gueldenstaedtii*, A*cipenser stellatus* and *Huso huso*) were included in the Convention of International Trade of Endangered Species (CITES Appendix II /Notification to the Parties No. 1998/13 *Conservation of Sturgeons*) and since 1998, populations have been classified as in unfavorable state. IUCN experts cite overexploitation of migratory sturgeon in the Lower Danube River as a primary driver of stock collapse (BSC report SOE, 2008).

The horse mackerel stock is estimated to be in a depressed state. Over the last 40 years, highest horse mackerel catches were reported in the years preceding *M. leidyi* outbreak (1988-1990). Quantitative stock assessments showed that the stock was highest in 1984-1988, although large interannual fluctuations in abundance are typical of this species. A drastic decline in the stock abundance occurred after 1990 when the stock diminished by 56%. In 1991 the horse mackerel stock dropped to a minimum of 75 thousand tons and the catch dropped to 4.7 thousand tons, that is a twenty fold reduction compared to the average annual catch in 1985-1989 (JRC report, 2010).

Pontic shad in the Danube River is current in unfavourable condition. Changes in environmental conditions such as low water level, increased water temperature and pollution have affected reproductive success, however, over-fishing is recognised as the primary factor in stock collapse (Radu, 2006) and large fisheries in Turkey rely heavily on Danube stocks (BSC report SOE, 2008).

Table 3. Status and trends of several fish species in the Black Sea.

Characteristic	Failing Indicator(s)	Status	Trend	Reference Point	Region (sub-region)
Species					
Acipenser gueldenstaedtii (sturgeon)	Abundance	Unfavourable	Decline	State in 1981	North-western Shelf
Acipenser stellatus (sturgeon)	Abundance	Unfavourable	Decline	State in 1981	North-western Shelf
Huso huso (sturgeon)	Abundance	Unfavourable	Decline	State in 1981	North-western Shelf
Alosa pontica (Pontic shad)	Abundance	Unfavourable	Stable	State in 1998	Danube River
Alosa pontica (Pontic shad)	Catch size	Unfavourable	Decline	State in 1993	North-western Shelf
Trachurus trachurus (Horse mackerel)	SSB; Recruitment; Catch size; Fishing mortality	Inadequate	Decline	State in 1980	Black Sea
Mytilus galloprovincialis (Mediterranean mussel)	Population size (landings)	Inadequate	Decline	State in 1970s	Turkey and Ukrainian waters
Merlangius merlangus (whiting)	CPUE; Landing; Body size	Not assessed	Decline	State in 1990	Eastern Black Sea
Squalus acanthias (Picked dogfish)	Stock size	Not assessed	Decline	Not specified	Ukrainian EEZ
Mullus barbatus (Striped mullet)	Landings	Not assessed	Decline	Not specified	Black Sea shelf (Turkey EEZ)
Rapana spp. (Sea snail)	Landings	Not assessed	Decline	Not specified	Ukrainian and Bulgarian EEZ
Assemblages					
Anadromous fishes	Total Catch	Unfavourable	Increase/ Decline	State in 1989	North-western Shelf
Pelagic fishes	Total Catch	Inadequate (in recovery)	Fluctuating	State in 1989	Black Sea
Demersal fishes	Total Catch	Unfavourable	Decline	State in 1989	Black Sea
Overall Assemblage	Size Structure	Not assessed	Increase/ Decline	State in 1950	Black Sea

Marine Mammals

Three marine mammal species are currently recorded as threatened in the Black Sea, namely (1) *Phocoena phocoena* harbour porpoise, (2) *Delphinius delphis* short-beaked common dolphin, (3) *Tursiops truncatus* common bottlenose dolphin, and one as critically endangered (4) *Monachus monachus.* Species status was evaluated using the indicator, *population size* (all species) and *species distribution* (monk seal only), and assessed using IUCN Redbook criteria. Trends were evaluated using a baseline of 1930 and 1960 for species 1-3 and 4 respectively.

Black Sea populations of porpoise and dolphin species are all considered as either in endangered or vulnerable (Oguz, 2008; UNEP Redbook). Harbour porpoise have shown a consistent decline in population size (1930-1980). In contrast, dolphin species have demonstrated some signs of recovery by increases in population size over a similar period. The Mediterranean monk seal (*Monachus monachus*) is a rare species found at specific sites on the Turkish coast. The species is critically endangered; both its distributional range and population size has declined from peak abundances in the 1960s (IUCN Redlist; Guclusoy *et al*. 1994).

Seabirds

There are over 450 terrestrial and marine species of seabird in Europe. In the Black Sea, seven of those species are currently under threat, in terms of *species distribution* and *population size*, and supported by trends in those data between 1990-2006 (Birdlife International 2004). Threatened Black Sea seabird species include:

Table 4. Status and trends in threatened seabird species in the Black Sea.

Seabird species (Common name)	Scientific Name(s)	Status	Trend
Slender-billed Curlew	*Numenius tenuirostris*	Critically endangered	Decline
Ferruginous duck	*Aythya nyroca*	Near threatened	Decline
White-headed duck	*Oxyura leucocephala*	Endangered	Decline
Red-breasted goose	*Branta ruficollis*	Endangered	Decline
Dalmatian Pelican	*Pelecanus crispus*	Vulnerable	Fluctuating
Great Bustard	*Otis tarda*	Vulnerable	Decline
Yelkouan shearwater	*Puffinus yelkouan*	Near threatened	Decline

Source: Birdlife International (2004).

References

All references are available for download from the ODEMM metadatabase (www.liv.ac.uk/outputs/data.html)

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