IS THE DESTINY OF THE 'BLACK SEA' BLACK ?

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Summary: Despite natural deficiencies, the Black Sea served well to the adjacent countries as a food source, transportation route, recreational facility, and even disposal site. As a result of these activities, it is subjected to many impacts such as pollution, habitat degradation, and overexploitation in the last decades. The contamination of oxygenated water layer by the pollutants is considered as a major threat to the Black Sea environment. Not only the adjacent countries but also the ones in the drainage basin (a total of 22 countries) are contributors to pollution transported by the rivers. These rivers are highly contaminated with industrial and mining wastes and nutrients from agriculture. The Black Sea is also an important source for the fisheries. As a result of intensive fishing activities, most stocks especially small pelagic fishes are continuing to be fished outside biologically sustainable limits. Habitat losses limiting the reproduction and foraging areas as the result of fishing should be considered as a side effect as well. For the sustainable management of natural resources, we need to understand how long the Black Sea can carry such a burden.
In this article we focus on the Black Sea in needs for a sustainable ecosystem management for the future.
Key words: Overfishing, pollution, sustainable management.

1. Introduction

The Black Sea is the largest inland sea in the world, surrounded by six countries. Despite natural deficiencies, it served well as a food source, transportation route, recreational facility, and even disposal site. As a result of these activities, it is subjected to many impacts such as pollution, habitat degradation, and overexploitation in the last decades. The need for international actions for reducing these impacts to sustain the benefits derived is widely discussed in the past (Mee 1992), however, the topic is still up to date. For the sustainable management of natural resources, we need to understand how long the Black Sea can carry such a burden. In this article, we focus on the Black Sea in need of sustainable ecosystem management for the future.

2. Pollutants in the Black Sea environment

The contamination of the limited oxygenated surface water layer by the pollutants is considered as a major threat to the Black Sea environment (Mee and Topping 1999; BSC 2007). Not only the adjacent countries but also the ones in the drainage basin (a total of 22 countries) are contributors to pollution transported by the rivers (Figure 1A). There are more than 300 rivers and ~300 million people (Figure 1B) in the Black Sea drainage basin including second (Danube), third (Dnieper), and fourth (Don) largest rivers in Europe. These rivers are highly contaminated with domestic wastes, industrial and mining wastes and nutrients from agriculture (Vespremeanu and Golumbeanu 2017; Bat et al. 2018).

The contamination of the Black Sea environment including water column (Baltas et al. 2017), sediment (Alkan et al. 2015; Bat and Özkan 2019) and aquatic organisms (Stancheva et al. 2014; Makedonski et al. 2017) with heavy metals is well documented in recent studies. Heavy metals in the marine ecosystem have many effects on aquatic organisms. They can be transferred one to another through the food chain and this results in biomagnification. In this context, the consumption of apex predators can be hazardous for human health. Another pollution source for the Black Sea is the high nutrient load transported by the rivers from the land-based sources. As the result of high concentrations of ammonium and phosphate, phytoplankton blooms including red-tide cause a decrease in oxygen concentration, reduced transparency in the water column, decrease in zooplanktons and mass mortality among benthic and pelagic fish populations.
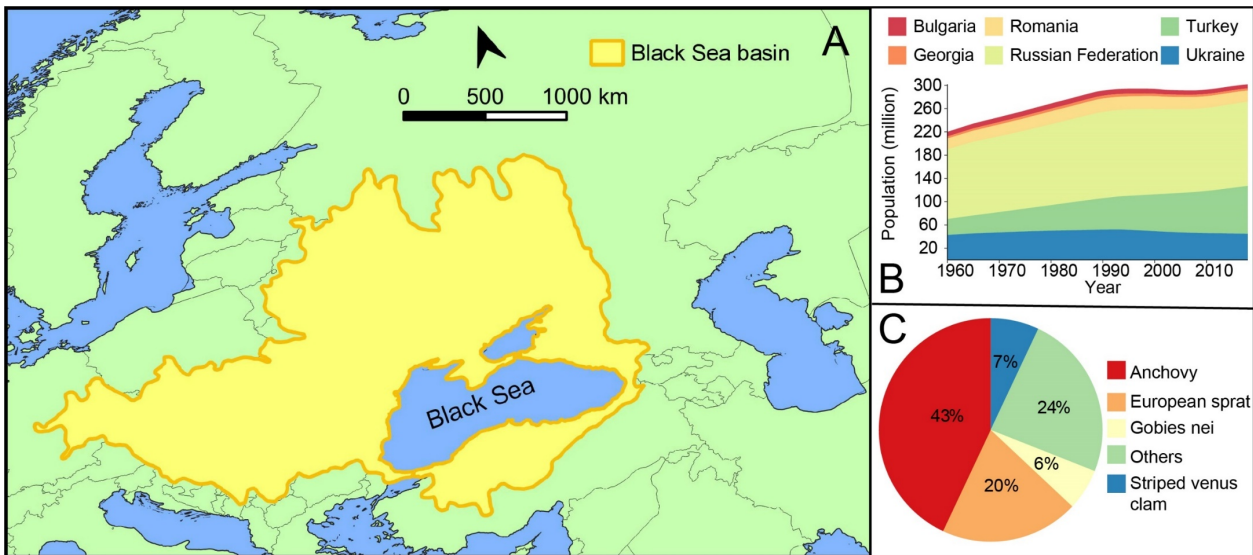
Figure 1. The Black Sea basin (A), population of countries adjacent to the Black Sea (B) (data from World Bank (2019)), proportion of the total catch in the Black Sea by species (C) (data from FAO (2018)).

In addition to the mentioned pollutants, marine litter and microplastics are gained attention in the last decade. The litter items have direct and indirect effects on aquatic organisms, fisheries, economy, and tourism.

3. Fisheries and impacts on the Black Sea ecosystem

The Black Sea is an important source for the fisheries. As a result of intensive fishing activities, most stocks especially small pelagic fishes (Figure 1C) are continuing to be fished outside the biologically sustainable limits. The total landing of commercial fishes showed a significant decrease in the 1990s, and since the trend is horizontal in the last decades (Figure 2).
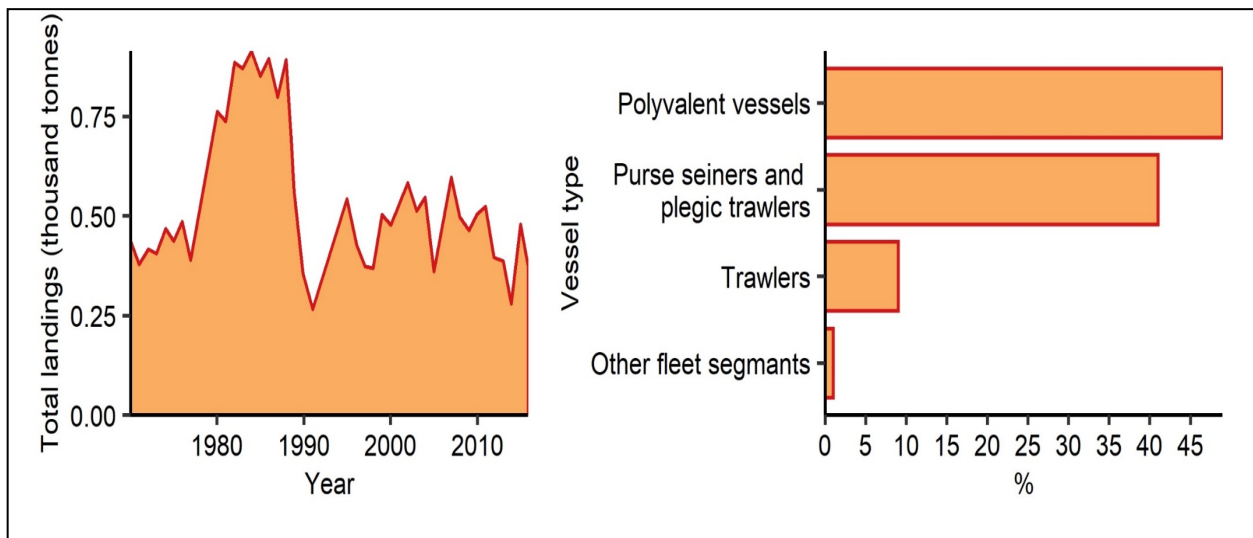

Figure 2. Trend in the landing in the Black Sea by year (left), landings by vessel type (right) (data from FAO (2018))

Habitat losses especially caused by trawl and dredge, limiting the reproduction and foraging areas should be considered as a side effect as well. Discard is another face of the fishing activity which results in a decrease in the non-target species populations. The discard rate is reported 10-15 percent of the total catch in

the Black Sea. The discard rates by the fishing gear are 25-45% for trawl fishery, 15% for small scale fisheries, 5% for midwater trawl, 1-5% for purse seiners and 11% for sea snail dredge fisheries (FAO 2018).

4. Conclusion

The Black Sea ecosystem is under the pressure from a large variety of sources. Reducing impacts can be only achieved through strict national and international measures. International organizations such as The Commission on the Protection of the Black Sea Against Pollution and The General Fisheries Commission for the Mediterranean have a key role in achieving sustainable management. If we fail to manage this fragile ecosystem black days for the Black Sea are not so far.

References

Alkan N, Alkan A, Akbaş U, Fisher A (2015) Metal Pollution Assessment in Sediments of the Southeastern Black Sea Coast of Turkey. Soil Sediment Contam 24:290–305. doi: 10.1080/15320383.2015.950723

Baltas H, Kiris E, Sirin M (2017) Determination of radioactivity levels and heavy metal concentrations in seawater, sediment and anchovy (*Engraulis encrasicolus*) from the Black Sea in Rize, Turkey. Mar Pollut Bull 116:528–533

Bat L, Özkan EY (2019) Heavy metal levels in sediment of the Turkish Black Sea coast. In: Oceanography and Coastal Informatics: Breakthroughs in Research and Practice. IGI Global, pp 86–107

Bat L, Öztekin A, Şahin F, Arıcı E, Özsandıkçı U (2018) An overview of the Black Sea pollution in Turkey. Meditarrenean Fish Aquac Res 1:67–86

BSC (2007) Marine litter in the Black Sea Region: A review of the problem. Black Sea Commission Publications 2007-1, Istanbul, Turkey, 148 pp.

FAO (2018) The State of Mediterranean and Black Sea Fisheries. General Fisheries Commission for the Mediterranean. Rome. 172 pp.

Makedonski L, Peycheva K, Stancheva M (2017) Determination of heavy metals in selected black sea fish species. Food Control 72:313–318

Mee LD (1992) The Black Sea in Crisis: A Need for Concerted International Action. Ambio 278–286. doi: 10.2307/4313943

Mee LD, Topping G (1999) Black Sea Pollution Assessment. United Nations Publications, New York

Stancheva M, Makedonski L, Peycheva K (2014) Determination of heavy metal concentrations of most consumed fish species from Bulgarian Black Sea coast. Bulg Chem Commun 46:195–203

Vespremeanu E, Golumbeanu M (2017) The Black Sea: Physical, Environmental and Historical Perspectives. Springer

World Bank (2019) World Bank Open Data. URL = https://data.worldbank.org/indicator/SP.POP.TOTL