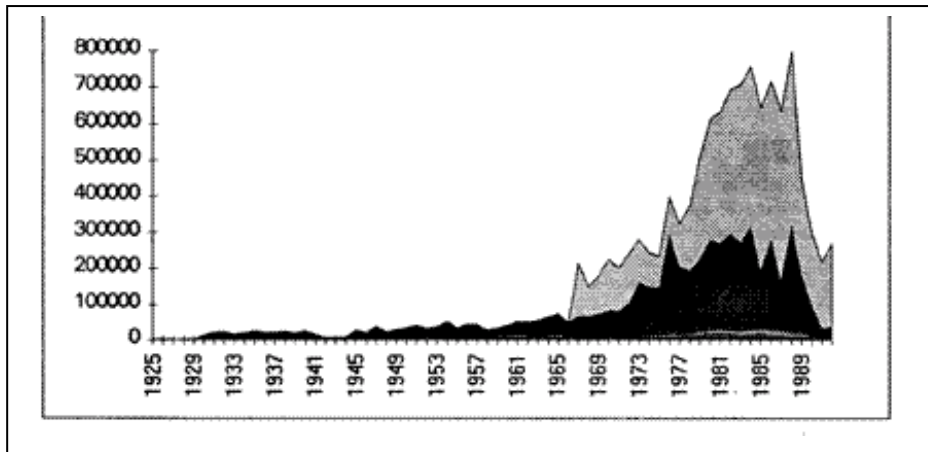


I. INTRODUCTION

During the last 30-35 years the Black Sea ecosystem has been subjected to dramatic changes due to the increased pollution of the basin and the over-exploitation of some commercial fish species. The period of "eutrophicated sea" dates back to the early 1970s and is characterized by structural and functional alterations in the ecosystem as a result of the intensification and spreading of both local and regional phytoplankton blooms. These blooms over the last decade attained their maximum intensity in late spring-summer, an abnormal period for the Black Sea where peak production normally occurs in early spring and autumn. Changes have also been registered in the taxonomic composition of blooms - since 1989 producing phytoplankton species with succession shifted towards the predominance of *Dynophyta* - towards an increasing importance of *Crysochyta* species - *Emiliania huxley* and *Phaeocystis pouchettii* (Moncheva, 1991a and b). Recently some phyto- and zooplankton species new to the Black Sea ecosystem have invaded the basin resulting in dramatic alterations in the food web (Moncheva *et al.*, 1993). During the period under consideration the abundance of the most commercial carnivores has sharply decreased - bonito (*Sarda sarda* Bloch), blue fish (*Pomatomus saltator* Linnaeus) and mackerel (*Scomber scombrus* Linnaeus). The last species has nearly disappeared in the Black Sea since 1968. This has been the period of rapid intensification of fishing particularly of sprat (*Sprattus sprattus phalericus* Risso), horse mackerel (*Trachurus mediterraneus ponticus* Aleev) and anchovy (*Engraulis encrasicolus ponticus* Aleksandrov) for which catches have been extended from 3.1, 4.9 and 128.3 thousand tonnes (1970) up to 105.2 (1989), 147.7 (1985) and 485.5 (1984) thousand tonnes, respectively. Shlyakhov *et al.* (1990) claim that the rapid decline of anchovy stock could be related both to the deteriorated environmental conditions and the overfishing during some years. In the early 1980s (1982) the ctenophore *Mnemiopsis leidyi* = *Mnemia mccradyi* invaded the Black Sea (Zaitsev, 1993; Konsulov, Konsulova, 1993) with a biomass resulting in several-fold reduction of the zooplankton biomass; copepod species in particular (Vinogradov *et al.*, 1989; Zaika and Sergeeva, 1991; Schushkina, Nikolaeva and Lukashova, 1990). Taking into account the fact that *Mnemiopsis leidyi* is feeding on eggs and larvae of spawning fish although at a less significant rate (Eremeev and Chudinovski, 1990), it is reasonable to assert that the sharp reduction in sprat, anchovy and horse mackerel stocks could be related mainly to the complex impact of the four above-mentioned factors - pollution, eutrophication, structural alteration in the ecosystem and intensification of fishery. **Figure 1** gives an estimation of the total Black Sea catches. It can be seen that after 1988 the catches sharply decreased for the mentioned species.

The four factors are of anthropogenic origin and should be discriminated from the natural factors such as global climatic changes in particular and their impact on hydrology and hydrochemistry of the basin and its primary production (Brjantzev, 1989). A typical example in this sense is the established periodicity in qualitative and quantitative composition of phytoplankton in the Black Sea in respect to the solar activity variability (Petrova-Karadjova and Apostolov, 1988; Petrova-Karadjova, 1993). Another natural and anthropogenic factor is the registered decline of water exchange of the Black Sea. This was related to the lower river inflow. Hence, the global climatic changes through the overall amount of rainfall also exerts an influence on the river inflow. As is well-known the water exchange is one of the main factors conducive to water cleaning by oxidation of organic matter. According to Rass (1987) this is the reason why bonito and blue fish avoid Black Sea waters, although their stocks in the Sea of Marmara have not decreased. Berenheim (1960) estimated that the outflow of the Black Sea waters through the Bosphorus during the 1960s and earlier, ranged within 397-400 thousand cubic kilometres, and the inflow from the Sea of Marmara - within 175-193 thousand cubic kilometres. During the 1980s the respective values were 340 and 176 thousand cubic kilometres (Sorokin, 1982), i.e. the outflow of the Black Sea waters has dropped by 57-60 thousand cubic kilometres. That is why the expected decline of rainfall at the end of 20th century will increase the effect of pollution of the Black Sea waters. All this calls for annually revised stock assessments and catch projections of commercial fish species in relation to the environmental conditions.



* Without Turkish catches for the period 1925-1966

Figure 1a. Total catches (in tonnes) by countries in the Black Sea

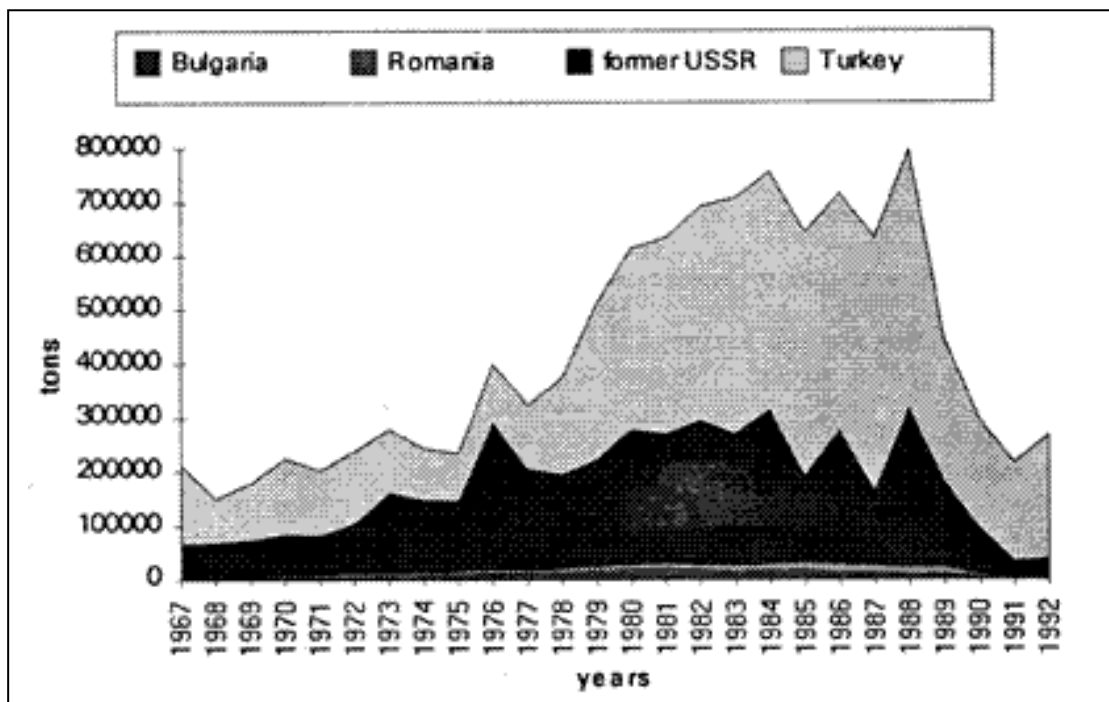


Figure 1b. Total catches (in tonnes) by countries in the Black Sea