

# CONSERVATION AND MANAGEMENT OF DEMERSAL FISHERY: ADDRESSING DEMERSAL FISH SPECIES IN TURKEY

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**Abstract:** Marine capture fisheries have an important issue in the total fisheries for Turkey with its favourable geographic position and surrounded by four seas. The depletion of fish stocks from global fisheries has been a long-standing concern. Incidental catch of non-target (termed by-catch and discard) species also has been drawing great interest in proposed conservation issue. Effects of fisheries, especially demersal fisheries for economically important fish species, on the ecosystem have also been monitored for a long time. Due to the nature of commercial fishing operations it needs to be a reasonable management. In this study, demersal fisheries of Turkey are tried to be evaluated in terms of demersal fish species.

**Keywords:** Fisheries management, demersal fisheries, demersal fish species, Mediterranean basin, Turkey.

## I. INTRODUCTION

Turkey is surrounded by four seas having different characteristic with high biodiversity and has also important fishing grounds. These are the Black Sea, Sea of Marmara, Aegean Sea and Mediterranean Sea from north to south (Fig. 1). Fishery activities, carried out on Turkish coastline fishing grounds of these seas having different oceanographic features from each other, and fisheries of commercial species, especially demersal species, shows a significant variation, naturally, in terms of caught species and landings based on regions. Demersal fish species which are caught in Turkey are European hake, red mullet, golden banded goat-fish, common sole, John Dory, angler fish, shore rockling, black scorpion fish, turbot, gobies, red gurnard, trigla lineate, small-scalled, whiting, European conger, piper, striped red and thornback ray. These species are important for small and large scale fishery in Turkey. Trawl, beam trawl, beach seine and gillnets having different properties are used for harvesting of this demersal fish stocks from marine ecosystems.



Fig. 1. The map of Turkish coasts.

Fishery is an activity that has been carried out since ancient times in the history of mankind as a basic

food source. Total marine landings have been reported as 81.5 million tonnes in the world obtaining from fisheries sources in 2014 [1]. The protection and sustainability of these important food resources can only be ensured by optimum fisheries management practises. The interest in demersal stocks having high commercial value in the international food market and their protection have been discussed for many years, while the negative effects of fishing gears such as trawl and beam trawl used in the catching of these species on the ecosystem and the reduction of these effects are seen as another important issue. Especially, trawl fisheries for shrimp and demersal finfish account for over 50 percent of total estimated discards while representing approximately 22 percent of total landings was recorded [2]. In the Mediterranean basin, demersal trawl and beam trawl fisheries are noteworthy for the large number and variety of commercially important species caught as by-catch while the target species is shrimps. [3-8]. For example, flatfish are generally exploited by demersal trawl fisheries targeting a mixed bag of species [9-11]. It is difficult to solve the problem of non-target (by-catch and discard) species in fisheries types which contains a large number of various species in catch composition i.e. mixed fisheries. Thus, except for target species, fisheries of non-target species have been continued to be intensively. In this context, the situation of demersal fisheries was tried to be summarized by evaluating the official records of demersal fish species in Turkey, and effects of the fishing operations used in harvesting of these species on the ecosystem and the precautions to be taken are discussed in the present study.

## II. DETAILS EXPERIMENTAL

The data of commercial demersal fish species which were discussed and evaluated in this study was obtained from Republic of Turkey Ministry of Food, Agriculture and Livestock, Turkish Statistical

Institute and FAO (Food and Agriculture Organization of the United Nations) statistics including some reported studies about demersal fisheries in Turkey. The name of fish species have been cited based on Turkish Statistical Institute records, in this study. However, the scientific names have been tried to be given for the certain species to identify in clear. Because Turkish Statistical Institute has recorded the data including fish names as used by fishermen.

### III. RESULTS AND DISCUSSION

#### 3.1. General portrait of demersal fish landings in Turkey

In the last 15 years, the most captured demersal fish species, by volume, are whiting (*Merlangius merlangus*, Linnaeus, 1758), European hake (*Merluccius merluccius*, Linnaeus, 1758), Striped red (*Mullus surmuletus*, Linnaeus, 1758), red mullet (*Mullus barbatus*, Linnaeus, 1758), turbot (*Scophthalmus sp.*) and common sole (*Solea solea*, Linnaeus, 1758) (Fig. 1) Apart from these species, John Dory (*Zeus faber*, Linnaeus, 1758), shore rockling, black scorpion fish (*Scorpaena porcus*, Linnaeus, 1758), gobies, red gurnard (*Chelidonichthys cuculus*, Linnaeus, 1758), small-scalled (*Scorpaena sp.*) and angel shark (*Aquatina sp.*), which are caught, are shown in Fig. 2. In addition, the species that have been classified previously and kept records in detail since 2007 are golden banded goat-fish (*Upeneus sp.*), angler fish (*Lophius sp.*), *Trigla lineata*, European conger (*Conger conger*, Linnaeus, 1758) and piper (Triglidae spp.) also shown in Fig. 3.

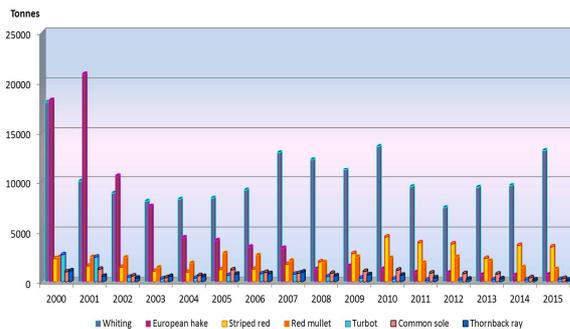


Fig.2. Landings of the most captured demersal fish species between 2000 and 2015.

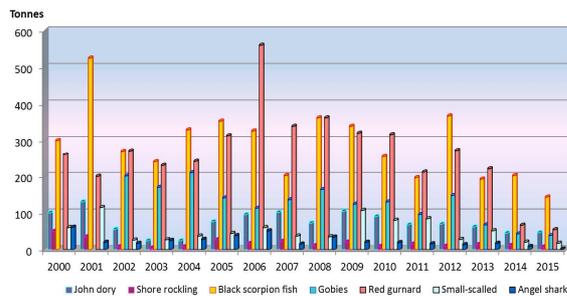


Fig.3. Landings of other demersal fish species between 2000 and 2015.

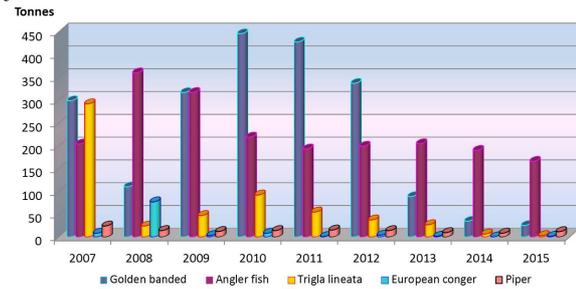
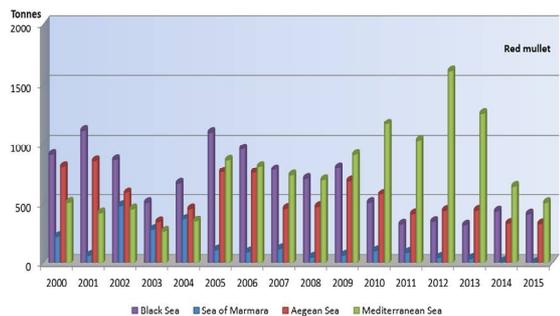
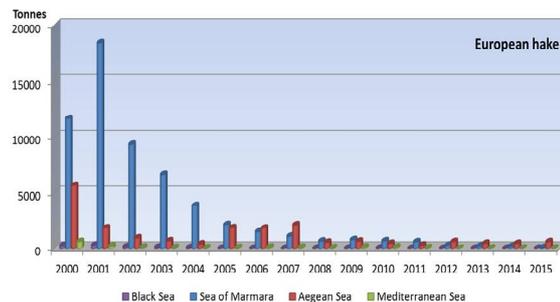
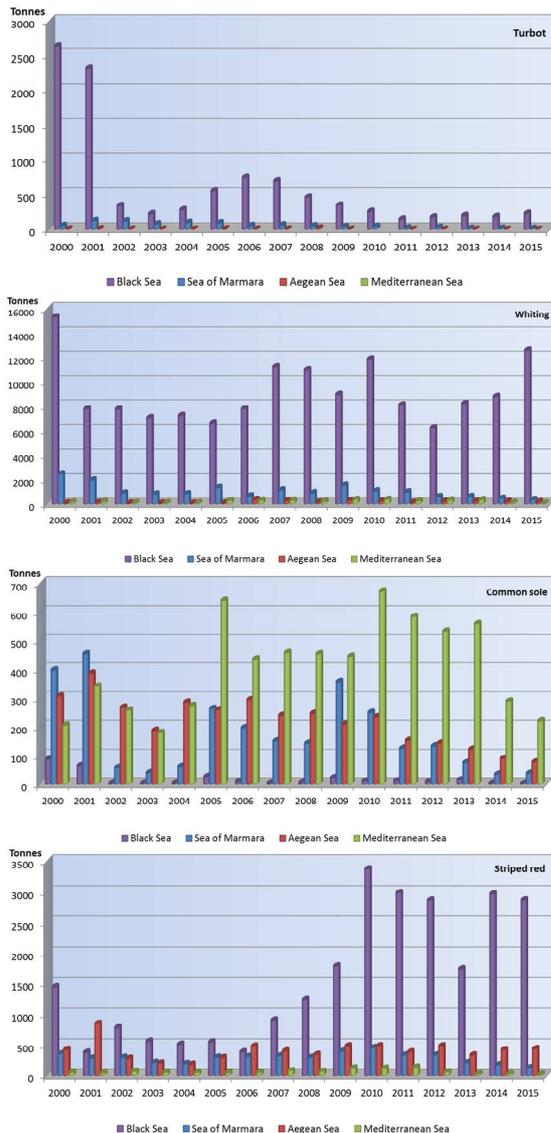


Fig.3. Landings of recorded demersal fish species since 2007 by volume.

#### 3.2. Profile of fishing grounds and gears

Catch amount of whiting, European hake, Striped red, common sole, turbot and red mullet which are the most fished demersal species having the highest economic value are shown in Fig. 5 according to the seas. Among them European hake is the main commercially important species for all type of demersal fisheries in Turkey and extensively caught in the Sea of Marmara, especially; it is the main target species of deep sea gillnet fishery and by-catch species of beam trawl [12, 13]. In the last decade, according to official records, it was clearly seen that the total of European hake landing of Turkey dramatically decreased day by day (20810 tonnes in 2001 and 706 tonnes in 2015). It is also one of the most economically important exploited demersal fish species in Europe. Nevertheless, turbot fishery that has an important economic value like European Hake, showed a sharp decrease from 2300 to 239 tonnes. Generally gillnets are used for fisheries of this species and these nets are also managed for both small and large scale fisheries while fishing operation is performed. Considering catch amount of other demersal species having an important economic value mentioned here and illustrated in Fig. 2, 3 and 4 it can be clearly seen that they show an undulate variation.





**Fig.5. Landings of the most captured demersal fish species between 2000 and 2015 for the seas.**

In comparison to the Black Sea and Sea of Marmara, a large number of species are caught in Mediterranean as by-catch due to the rich biological diversity regarding demersal fishery. It has been tried to be summarized the fishing gear used and economically important demersal species captured according to the seas in Table 1. Because of the ecological diversity of species turbot is not caught in Mediterranean while golden banded goat-fish is captured only in Aegean and Mediterranean Seas. However, demersal fish species caught in the Mediterranean and the Aegean Sea are more diversified, but in number of species, and these species have been abbreviated as mixed in the current study.

European hake, whiting, striped red, angler fish, red mullet and red gurnard are the main demersal fish species that are caught in Sea of Marmara. Apart from gillnets in the fisheries of demersal species, beam trawl and beach seine are widely used in this

region. There are no legal restrictions in the Sea of Marmara except for the prohibition of time and area in the fisheries of the beam trawl and beach seine. On the other hand, it is known that the trawler, which is forbidden to use in this sea for the whole period, continues to run illegally. In the Black Sea, the target species consist of whiting, striped red/red mullet and turbot, but these species are also caught as by-catch of each other. In the Aegean Sea and Mediterranean although the main target species are shrimp species, golden banded goat-fish, striped red/red mullet and common sole there are large amount of demersal species are caught. However some of benthopelagic and mesopelagic fish species such as croaker, conger eel, dusky grouper, striped bream, picarel, bogue, horse mackerel and sharks are also caught by demersal fishing gears.

### 3.2. Conservation and management situation and strategies

Turkish coasts are an important spawning ground for demersal fish species and some migratory pelagic fish such as Atlantic bonito, anchovy, bluefish and herring. However, the coastal and marine biodiversity also fish stocks of the Turkey was already under stress through a combination of heavy fishing, pollution, eutrophication, climatic fluctuations and the invasion of alien species due to the pressures exerted by mankind [14]. Republic of Turkey Ministry of Food, Agriculture and Livestock is the main state organisation responsible for fisheries administration, regulation, protection, promotion and technical assistance and all fisheries activities are based on the Fisheries Law No. 1380, enacted in 1971. Fishing regulations are based on minimum mesh size, minimum landing size or weight, closed area and terms for specified fishing gears and vessels, closed season, ban on catch to some species, gear restriction for identified species, gear or fishing method restrictions and some restrictions concerning pollutants [15].

**Table 1. Summary of demersal fishery for fishing methods, regions and species**

Fishing gear	Region	Species
Trawl	Black Sea	Whiting, red mullet, striped red, common sole, turbot (target and by-catch)
	Sea of Marmara	Forbidden
	Aegean Sea	Mixed
	Mediterranean Sea	Mixed
Beam trawl	Sea of Marmara	European hake, whiting, red mullet, striped red, common sole (as by-catch species)
	Black Sea, Aegean Sea and Mediterranean Sea	Forbidden

Beach seine	Sea of Marmara	European hake, whiting, red mullet, striped red, common sole (as by-catch species)
	Black Sea, Aegean Sea and Mediterranean Sea	Forbidden
Gillnets, trammel nets, longline and traps	Black Sea, Sea of Marmara, Aegean Sea and Mediterranean Sea	Mixed

turbot fishery concerning on sustainable development of fisheries regarding fisheries management.

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Fishing operations, based on harvesting of economically important species from populations, have significantly direct and indirect effects on habitat, biodiversity, efficiency and productivity of marine communities. In all types of fishing operations, caught as by-catch and discard species is encountered as a general problem; leads to an increase in mortality caused by fisheries and thus to negative impacts of stocks [7, 16-18]. Especially fisheries of demersal species caught by trawl, beam trawl and beach seines are higher than that of caught as by-catch and discard ratio using other fishing gears. Stocks are managed and conserved by regulations defining closed areas and seasons, minimum landing sizes (MLS) and minimum mesh sizes (MMS). It is recognised that in multi-species fisheries, there is rarely a single MMS in the codend of towed nets which is appropriate for all the species caught in an area, due to differences in body shape and size at maturity. A mesh size appropriate for one species will be unsuitable for many others [19, 20]. For example, commercial beam trawl nets used in the northern Sea of Marmara are not selective in terms of size and species [8]. In order to solve this problem at least, some technical regulations have to be made in order to increase selectivity of fishing gears used.

## CONCLUSIONS

Fisheries management is the most important issue concerning on sustainable development of fisheries. Regarding the selection of fishing gears, regional and species-based studies reflects on the regulations so the legislations need to be revisited. In addition to these regulations, it may be useful to record the statistical data in detail based on species, instead of the data held by fishermen using general names, to provide sheets identifying the species introducing fishermen and to elaborate the data obtaining from the fishermen. Especially the types and daily catch amounts by the boats should be recorded as logbooks and must be also kept in discard and by-catch data. Furthermore, it should be provided persistence of fish stocks by-catch and discard ratio should also be recorded statistically. Besides as seen the data presented here there is needed to make new regulation for management of European hake and

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