



State of the Romanian Black Sea Turbot (<i>Psetta maxima maeotica</i> L.) Resources (Valodia Maximov, Tania Zaharia, Simion Nicolaev, Gheorghe Radu)	“Cercetări Marine” Issue no. 43 Pages 296-306	2013
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STATE OF THE ROMANIAN BLACK SEA TURBOT (*PSETTA MAXIMA MAEOTICA* L.) RESOURCES

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ABSTRACT

The paper presents the current state of turbot fishing at the Romanian Black Sea shore, based on the results obtained in the research made during 2000-2010. The investigations on the turbot populations in the Romanian sector focused on: catch evolution, fishing effort and C.P.U.E. (catch per unit effort), population structure, biological parameters and fishable agglomerations' biomasses. At the same time, the main biological characteristics of the turbot are presented, referring to the length class structure, mass and age. Also, the paper refers to the present trends in the evolution of the exploitable turbot stocks. At the end, the legislative frame in which the fishing activity takes place is presented, focusing on territorial waters and economical exclusive zone, the main regulations being mentioned.

KEYWORDS: catches, turbot, growth parameters, reproducers biomass, stock, management

AIMS AND BACKGROUND

Over the past 50 years, the Black Sea ichthyofauna has undergone major changes concerning either its qualitative and quantitative structure or the behaviour of various species. These changes are consequences of human activities, directly through the fishing pressure and indirectly through the deterioration of the environmental conditions, especially in the Western part of the Black Sea. Demersal marine fish species in Romania enjoys a long tradition, its practice was recorded as an occupation of the fishing settlements in Dobrogea in the eighteenth and nineteenth centuries. The bottom fish species inhabiting the Romanian Black Sea shelf represent the most important part of the regional fishery potential considering the commercial interest, the demand in the home and foreign market^{1,3}.

MATERIAL AND METHODS

The methodology and techniques used for collecting, checking, processing and data analyzing, as well as for the assessment of fish stocks are generally those accepted in the whole Black Sea basin and in compliance with the international ones.

RESULTS AND DISCUSSION

Turbot is a demersal marine species, inhabiting soft bottoms. The juveniles stay close to the shore, on sandy bottoms, and as they grow up they retire to bigger depths. The adults are located in winter at depths of 60-100 m. In spring they come close to the shore, to a depth of 20-40 m (the inferior limit of the *Corbulomya facies*), but not everywhere, only in specific places, where they form big reproduction crowds^{1,3}.

Current status of marine fisheries

During the past years, marine fisheries in the Romanian Black Sea area was restricted to practicing stationary fishing, in the shallow coastal area, using fixed gear such as: *trap nets, gillnets, longlines and beach seines*. This type of small scale fisheries is characterized by activity being carried-out during the first four/seven months of the fishing season (March-October), when the main commercial fish species reach the coastal area for spawning and feeding. Fishing is practiced along the Romanian coast in four fishing ports (Sulina, Cape Midia, Constanța and Mangalia) and other 18 small fishing stations, located between Sulina - Vama Veche, at depths ranging between 2 - 20 m and sometimes up to 60 m, when practicing specialized turbot, shad or dogfish fisheries (Fig. 1). Open sea fisheries, practiced by trawler vessels, was characterized by poor activity, among the 18 vessels registered in the Vessel and Boat Records only 2 were active during brief periods of time, at depths ranging between 20 m and 80 m^{2,3}.

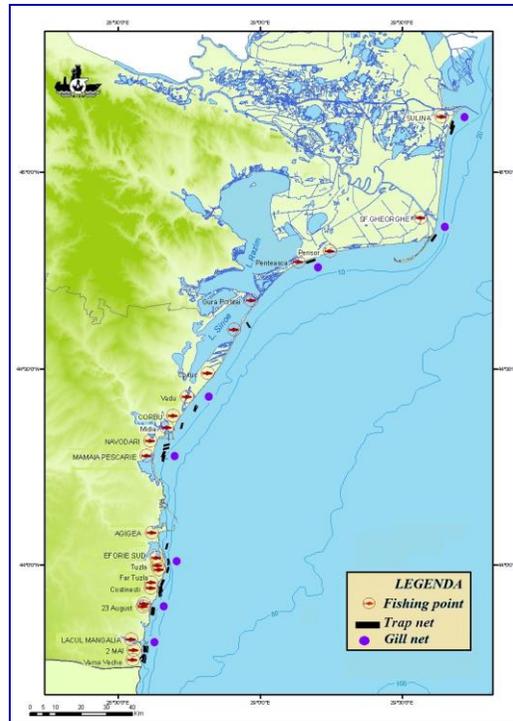


Fig. 1 - Fishing stations and fishery activity sectors

Catch, fishing effort and C.P.U.E.

In the 1980s, by buying the first two type B-410 fishing vessels and the reorganization of the coastal fishing fleet by acquiring new trawlers (Baltica and TCMN), the Romanian catches grew progressively, year by year, from 10.080 t/1981 to 15.835 t/1986. Although the annual catches doubled, the demersal species percentage, especially turbot, reduced, varying from 2 and 10 tones per year (1980-2000), and turbot fishing was declared almost abandoned^{3, 4}. After 2001, the economic operators that activate in the Romanian marine sector changed their options, by fitting their vessels with equipment and fishing gears specialized in turbot fishing. The catches grew easily, year by year, to 12.527 kg/2001 and almost 40.000 kg/year during 2007-2010 (48.064 tons/2007, 47.112 kg/2008 and over 48.000 tons, in the years 2009 -2010) (Fig. 2 and Fig. 3)^{1, 2, 3, 4}.

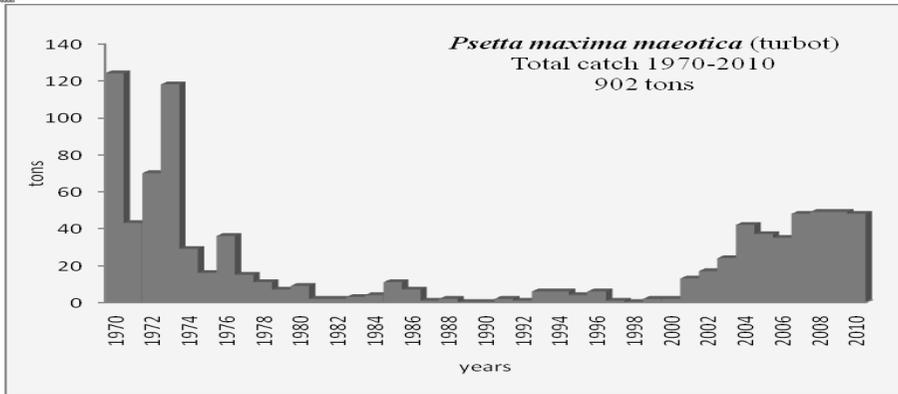


Fig. 2 - Turbot catches during 2000-2010

In the coastal area of the Romanian shallow marine sector, fishing with fixed tools is characterized by concentrating the activity in the first three-four months of the season (April-July), when usually the turbot comes close to the shore for reproduction and feeding. The fishing is practiced along the shore, from Sulina to Vama Veche, in the 18 fishing points. For practicing an industrial demersal fishing (turbot), 120 boats were licensed (71 having motors) and over 150 persons who use 25 trap nets, 3,503 gillnets, 10 beach seines and having about a 515 fishermen staff. The catches and fishing productivity differed from year to year, according to the fishing effort (trap net number, gillnet number and fishing effectiveness), the hydroclimatic conditions evolution and the state of the turbot stock. The best periods for fishing are in the intervals from March to July and from November to December.

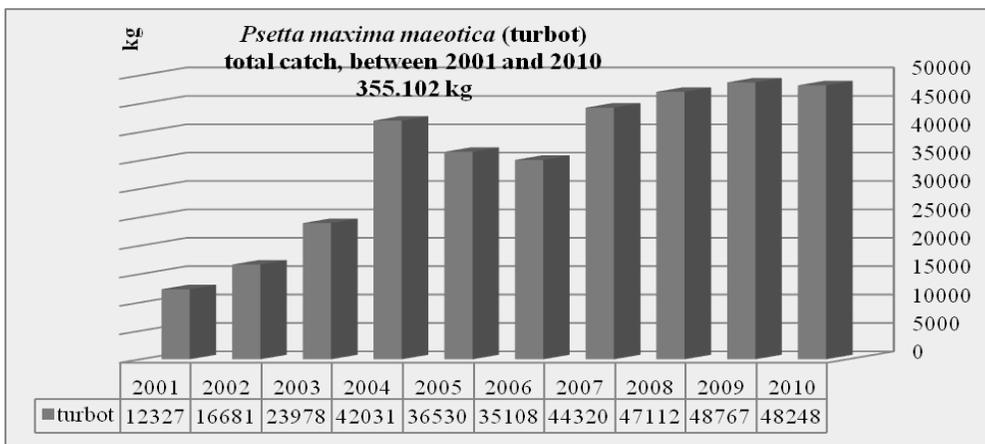


Fig. 3 - Turbot catch evolution during 2000-2010

Those intervals coincide with the formation of turbot agglomerations near the coast for breeding and feeding. For the remaining periods, the species is spreading across the entire continental shelf of the Romanian Black Sea (Fig. 4)^{1, 2, 3, 4}.

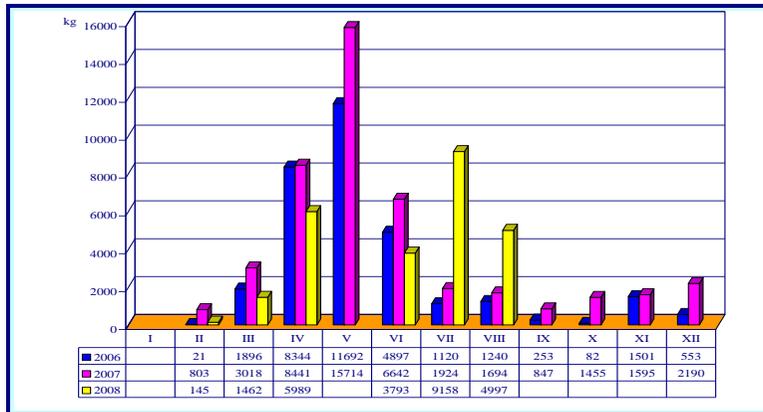


Fig. 4 - Turbot catch during 2006 -2008

Determination of biological parameters

The determination of biological parameters of fish species with economic interest is an important structure in determining the demographic parameters of growth and other parameters needed to study recruitment, mortality, number and biomass by age class.

a. Structure on length, weight and age classes

The study of the turbot's biological parameters, during 2002-2010, was made by biometrical and gravimetrical measurements and age determinations, from April to November, on a number of 1,951 individuals. The analyses of the turbot catches length class and mass structure pointed-out the presence of mature individuals and a high homogeneity of the crowds. The turbot individuals' lengths varied between 22-79 cm/247-7,392 g, the dominant classes being 40-58 cm/1,227-3,457 g (Fig. 5)^{2, 3, 4}. The mean body length was 48.16 cm and the mean mass 2.127 g.

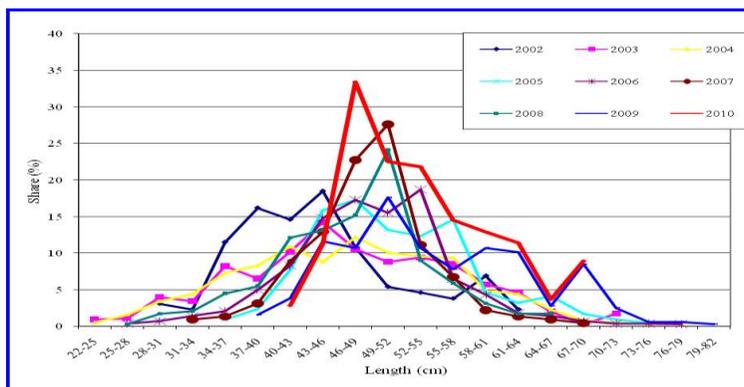


Fig. 5 - The length frequency (%) of turbot catches

The age component of the turbot catches, from all the analysed period, showed the presence of 1 to 7 years old individuals, the basis of the captures being made by the 5 years old individuals (30.6% of all analysed individuals) and 4 years old (28.3%), closely followed by the 3 years old (18.5%) and 6 years old (9.20%) (Fig. 6)^{2, 3, 4}.

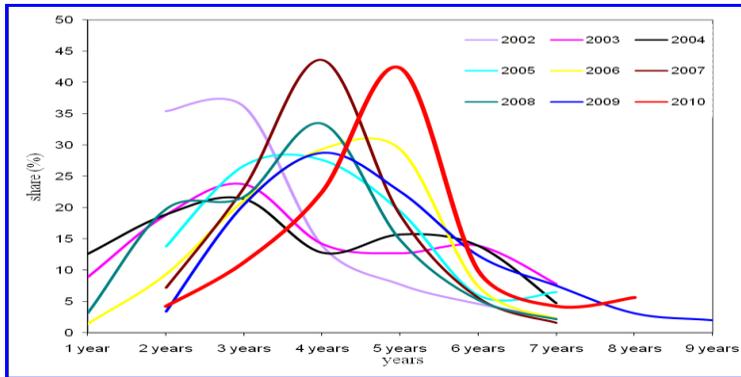


Fig. 6 - Age class structure (%) of turbot catches

b. Determination of vital parameters

* length/weight relationship - the coefficients of the relationship between length/weight were determined annually in the period from 2006 to 2010. It established the following equation for the species turbot (Fig. 7) ^{2, 3, 4}:

$$W_t = 0,0004 \times L_t^{2,565}; \quad r = 0,991;$$

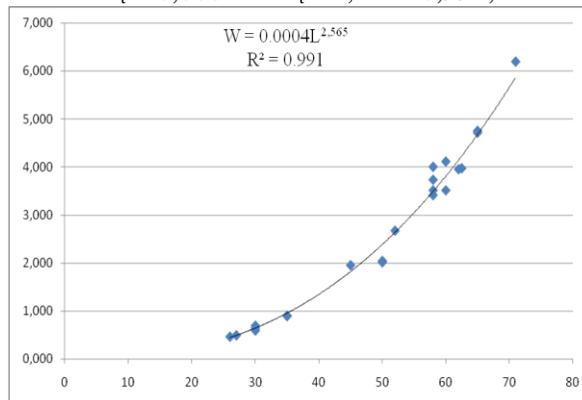


Fig. 7 - The relationship curve between length/weight

* growth parameters - during 2006-2010, these parameters indicated a fast rate of growth for the first years of life, with values of the coefficient of catabolism (k) between 0.117-0.213. Based on the growth parameters, the following Von Bertalanffy equation was established for turbot (Fig. 8) ^{2, 3, 4}:

$$L_t = 76.84 [1 - e^{-0.149(t+3.81)}],$$

$$W_t = 8374.65 [1 - e^{-0.149(t+3.81)}]^3$$

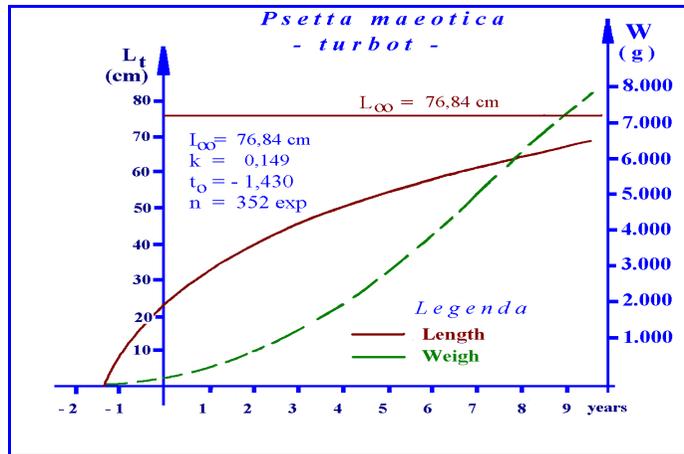


Fig. 8 - The growth curve of turbot

* estimation of mortality rates - using Pauly's relationship and other formulas were determined the values of M , for the year 2008, $Z - 0.297$ and $M - 0.268^{2, 3, 4}$.

Experimental fishing made with the bottom trawl

During 2008 - 2010, research surveys were organized over 200 trawl hauls made, at different depths (10, 20, 30, 40, 50, 60 and 70 meters). The activity sector extended on the whole Romanian continental shelf, between Sulina and Mangalia. For estimating the fishable turbot crowds' biomass, the holistic method of experimental trawling was used (the swept area method) and for sampling the demersal trawl was used. The analysis of the results obtained when the four surveys were made, which covered a big part of the Romanian sector between Mangalia and Sulina, pointed-out the following aspects^{3, 4}:

* during the survey from the spring season (April-May 2008), the swept area method covered a surface of $2,702 \text{ Nm}^2$. The researched area is situated between the 20 and 66 m isobaths, more exactly between Sulina and Mangalia. 28 trawl survey hauls with the demersal trawl were performed. The agglomerations reached an average of 1.340 t/Nm^2 . This value is much higher compared to the values obtained in the previous years, when the maximum value was about 0.322 t/Nm^2 , in addition it is much closer to the value of 2006, when the catch reached about 0.974 t/Nm^2 . The mean values of the turbot catches were contained in the limits between 0.001 kg/Nm^2 and 1.782 t/Mm^2 . Significant catches were recorded between the 35 and 55 m isobaths, in the Cape Midia - Tuzla (the change of abundance $0.535\text{-}0.891 \text{ t/Nm}^2$), Eforie South - Vama Veche ($1.069 - 1.782 \text{ t/Nm}^2$) and Corbu - Sf. Gheorghe ($0.143 - 0.257 \text{ t/Nm}^2$) areas (Fig. 9).

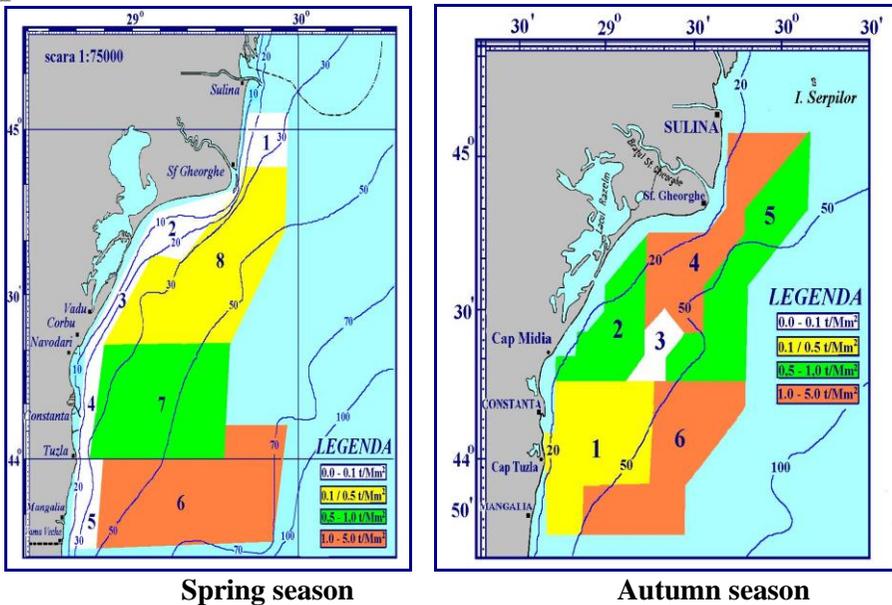


Fig. 9 - Distribution and abundance of turbot agglomerations in 2008

* the scientific research organized during the autumn season (October-November 2008) revealed that turbot had a flat distribution in a large area between Mangalia and Sulina, with a greater density in Vama Veche - Constan'a and Vadu - Sf. Gheorghe, the agglomerations reaching an average of 1.159 t/Nm² and 1.179 t/Mm², respectively. During 32 sweeping area procedures, conducted on an area of 2,702 Nm², the distribution of turbot agglomerations was different. The average values of turbot catches were situated in the limits between 0.185 and 2.224 t/Nm². Some significant catches were recorded between the 30 and 45 m isobaths in Corbu-Sulina (limits of variation of the abundance of 1.112-2.224 t/Nm²) and between the 45 and 65 m isobaths in the area that lies between Constana - Vama Veche (0.927-1.668 t/Nm²) (Fig. 9).

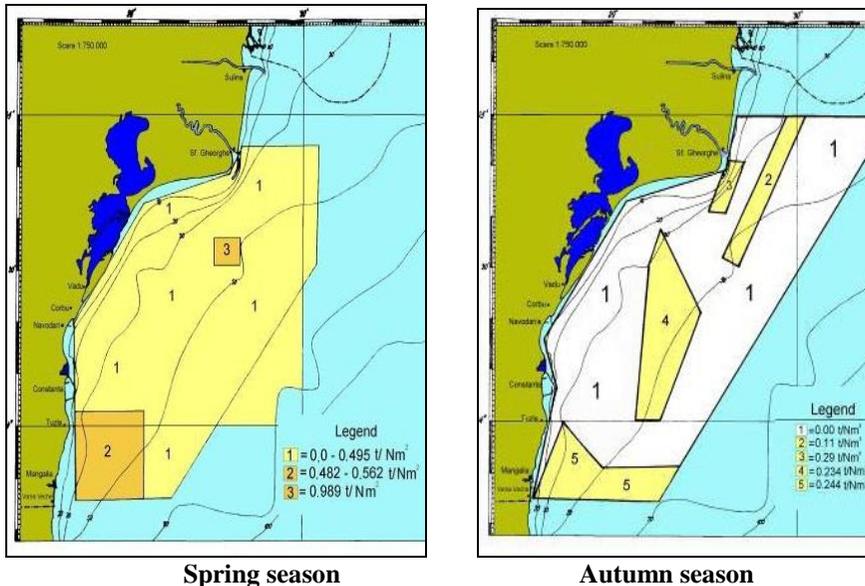


Fig. 10 - Distribution and abundance of turbot agglomerations in 2010

* during the survey from the spring season (May 2010) and autumn season (November 2010), the swept area covered almost 2,624.7 Nm², the turbot being reported mainly at depths greater than 20 m. The distribution was rather homogenous, with a mean of almost 233 kg/Nm². Larger concentrations were reported in the area south of Sf. Gheorghe, at 35-40 m depths (989 kg/Nm²) and south of Tuzla, between the 30 m and 50 m isobaths (517 kg/ Nm²). The turbot crowd biomass for the surveyed area was estimated at around 603.3 tons, being extrapolated for the entire continental shelf up to 50 Nm from the shore, also covering the the new area regained through the Hague trials, at 1,149.27 tons (Fig. 10)^{5,6}.

Measures and recommendations for a sustainable management of resources

According to the current state of the fisheries, the improvement and financial support for the reorganization of the activities also ensuring a sustainable fishing are required, taking into account environment protection, social development and economical welfare aspects. Romania is interested in the protection of the turbot resources and in the preservation of the traditions fishermen communities and in their social and economical development, for the stabilization of the turbot population from the coastal zone.

1. Creating the necessary prerequisites for the development of specialized turbot fishing, along the Romanian coast, is necessary^{3,4}:

- a. vessel renewal and modernization for improving navigation safety and ensuring the preservation of fishery products design;
- b. introduction of vessels for specific marine activities;
- c. equipping the fishermen with boats smaller than 12 m, designed, constructed and adapted to the marine environment;
- d. redesigning and improving fishing gears;

- e. establishing the yarn/thread and gear manufactures;
- f. infrastructure development in order to ensure a long term profitable and competitive fishing industry;
- g. modernization of fish ports and landing points;
- h. development of professional training for fishermen for acquiring knowledge on minimum necessary living marine resources and their place in the ecosystem;
- i. development of landing shelter for coastal fisheries in order to improve working conditions, landings and their conditioning before market capitalization;
- j. establishment of first-sale centers;
- k. implementing the European quality standards;
- l. assuring the financial support to fishermen and producers;
- m. improving the image of the fishery sector;
- n. developing socio-economic measures to help fishermen:
 - ◇ providing bonuses to young fishermen (under 40 years) who are starting for the first time a business in the fishing sector by purchasing a fishing boat/vessel;
 - ◇ developing programs for professional reconversion of fishermen in areas outside fisheries (tourism and ecotourism);
 - ◇ activity diversification in order to promote several occupations for fishermen.

2. Encouraging measures for the reduction of fishing effort with the aim of protecting the resource^{3,4}:

Turbot fishing in the Black Sea is based on special turbot fishing permits issued by NAFA, according to the Romanian legislation. A boat may obtain special authorization for turbot fishing under the following conditions:

- a. to be included in the register of ships and fishing boats;
- b. to hold valid fishing license;
- c. to pay taxes in force;
- d. to be equipped with turbot gillnets, with a side mesh size of at least 400 mm and marked in accordance with legal provisions;
- e. to have global positioning equipment (GPS) to mark the place where it is located and where turbot fishing gear are used;
- f. to assure the vessels greater than 15 meters to hold Black Sea fishing log and ships/boats less than 15 meters hold coastal fishing logbook;
- g. to have VHF communications equipment or GSM, as appropriate;
- h. to have a service contract with a landing or first sale point;
- i. to prove it has not been involved in illegal fishing;
- j. to meet the work program of the landing or first sale point.

The obligations that vessels should have for special turbot fishing permits are:

- a. to comply with the allocated area;
- b. to land the caught fish in the given landing point center and to transport it obligatorily to the subordinated first sale center;
- c. to use gears (gillnets) with side mesh $2a = 400$ mm;
- d. to meet the minimum size for turbot at landing of at least 45 cm;



e. to keep a fishing log to record the date and time of launching and positioning the turbot gillnets, position (latitude, longitude, depth) of the installed gears and the length of gillnets installed and the number of people involved in these activities.

CONCLUSIONS

The present paper outlines the management of turbot resources at the Romanian Black Sea littoral in order to find the ways to protect this valuable resource and to sustain its exploitation. Modern fisheries management is often referred to as a governmental system of appropriate management rules based on defined objectives and a mix of management means to implement the rules, which are put in place by a system of monitoring control and surveillance.

The main objectives of the turbot sustainable management are to: maximize sustainable biomass yield, maximize sustainable economic yield, secure and increase employment in coastal region, secure protein production and food supply, increase income from export etc.

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