



Characterization of the Populations of the Main Demersal Commercial Fish Species in the Romanian Black Sea Area <i>(Aurelia Țotoiu, Mădălina Galațchi, Gheorghe Radu, Alina Daiana Spînu)</i>	“Cercetări Marine” Issue no. 46 Pages 109-127	2016
---	--	-------------

CHARACTERIZATION OF THE POPULATIONS OF THE MAIN DEMERSAL COMMERCIAL FISH SPECIES IN THE ROMANIAN BLACK SEA AREA

Aurelia Țotoiu*, Mădălina Galațchi, Gheorghe Radu, Alina Daiana Spînu

National Institute for Marine Research and Development „Grigore Antipa”, 300 Mamaia Blvd., Constanta, Romania

**atotoiu@alpha.rmri.ro*

ABSTRACT

Romanian marine fishing of demersal species is a segment of special economic importance, the most valuable species being mainly turbot.

In this paper are presented data on the demersal species turbot, whiting and dogfish, related to:

- Distribution and migration routes;
- State of exploitation at Black Sea level;
- The catch dynamics at Romanian littoral;
- Structure of fish populations on size classes;
- Growth parameters and mortality rates;
- Establish environmental health through the descriptor 3 (D3/MSFD);
- Conclusions and recommendations;

Key words: *Black Sea, Romanian marine waters, catches, turbot, whiting, dogfish, distribution, growth parameters, mortality rates*

AIMS

This paper aims at presenting the evolution of the populations of three important demersal species in the Black Sea area.



INTRODUCTION

In time, the evolution of the three species analysed is different. During the period 1950-1979 the contribution of demersal species to the total catch on the Romanian coast was represented especially by sturgeon and turbot catches.

The period 1980-2009 is distinguished by significant changes in terms of the qualitative and quantitative structure of catches on the Romanian coast. Very important fish species for Romania, such as the blue mackerel and bonito, withered their volume of biomass and gave way to species of lower economic value. The drastic reduction or disappearance of traditional predators from the Black Sea ecosystem (blue fish, blue mackerel, bonito, dolphins) determined, on the one hand, the increase of pelagic fish stocks with small size like sprat, that were the food of these predators, and, on the other hand, the increase in abundance of predators such as whiting and dogfish.

Catches of whiting and dogfish increased after 1980 being mainly by-catch in the specialized sprat fishery.

After 1990, because of socio-economic changes, the small-size pelagic species lost its importance, giving again special attention to the economically valuable demersal species like turbot. Decreasing sprat fishery, have decreased also the catches of the auxiliary species like whiting and dogfish.

MATERIAL AND METHODS

The papers presents mainly the evolution and state of three main Black Sea demersal fish species: turbot - *Psetta maxima maeotica* (Pallas, 1814), whiting - *Merlangius merlangus euxinus* (Nordmann, 1840) and spiny dogfish - *Squalus acanthias* Linnaeus, 1758. Are included data about distribution and migration routes, state of exploitation, catch dynamics, structure of fish populations on size classes, growth parameters and mortality rates, some data regarding descriptor D3 from Marine Strategy Framework Directive (MSFD) and, conclusions and recommendations.

Most of data come from Fisheries Reports of the National Institute for Marine Research "Grigore Antipa" (NIMRD). After EU accession of Romania, data are obtained from Annual Reports realised also by the NIMRD in the frame of National Program for Collection of Fisheries Data 2008-2010 and 2011-2014 and STECF/EWG – BS stock assessment Reports (2009-2014).

RESULTS AND DISCUSSIONS

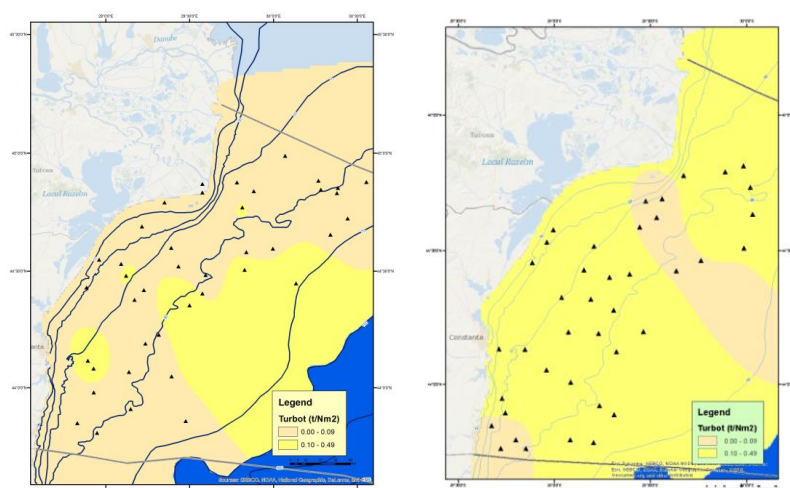
Turbot - *Psetta maxima maeotica* (Pallas, 1814)

Distribution and migration routes

Marine demersal species, specific of the sandy, rocky or mixed bottoms.

In winter, adults are encountered at depths of 70-100m; in spring (March - April) are nearing of shore until 18 - 30m for reproduction. After spawning, adults are spreading and retiring again towards deeper water. Turbot migrations are relative shorts and perpendicular on shore ^[1, 2, 3, 4, 5, 6, 7] (Fig. 1).

In Fig. 2 and 3 is presented the distribution of the turbot in the spring and autumn of the period of 2013-2014. Turbot is present over the entire shelf, but the concentration of fishing agglomerations decreasing from year to year ^[8, 9].



111

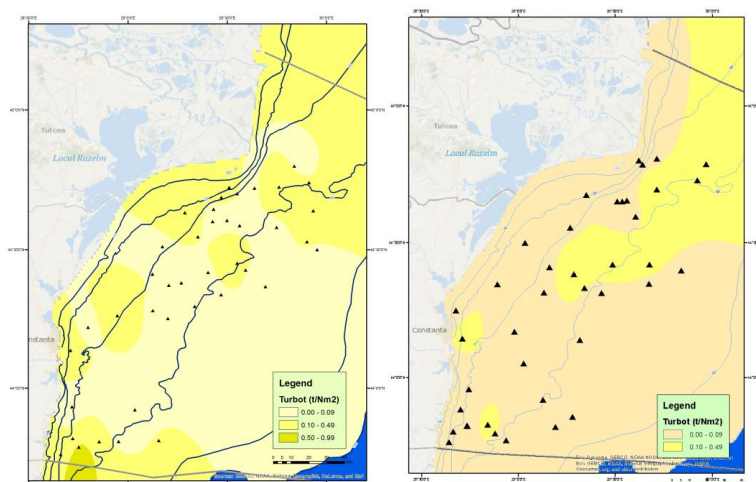


Fig. 3. Distribution of the turbot agglomerations in the Romanian marine area in autumn 2013-2014

State of exploitation

Fishing mortality in 2013 is estimated to be $F = 1.33$, which is more than five times the FMSY ($F = 0.26$). The stock has been exploited at rates exceeding FMSY for many years and is severely depleted. SSB in 2013 (1,634 t) is estimated to be less than half of Blim (3,535 t) ^[10].

Catch dynamics

At the Black Sea level the turbot catch in the period 1989-2013 ranged between 486t in 2011 and 2943t in 1995^[10] (Fig. 4). Most of the reported landings of turbot for the Black Sea were taken by Turkey^[10].

At national level turbot was and remain one of the most valuable species. The catches increased from 9-10t in the period 1980-2000, to almost 50t established by TAC by European Commission ^[5, 8, 9] (Fig. 4,5).

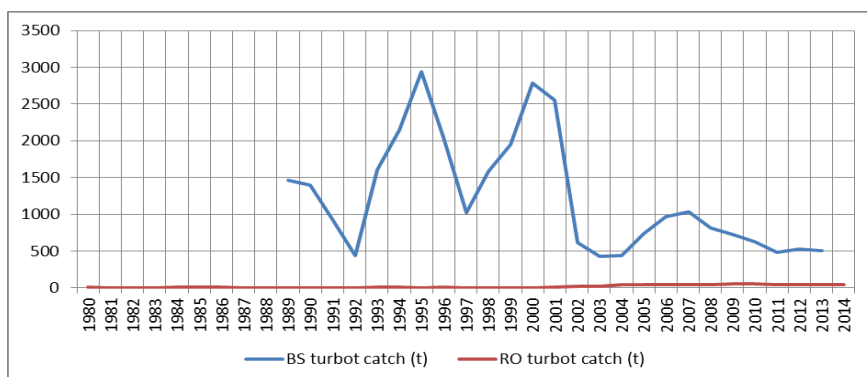


Fig. 4. Romanian catch of turbot compared with the catch for the entire Black Sea

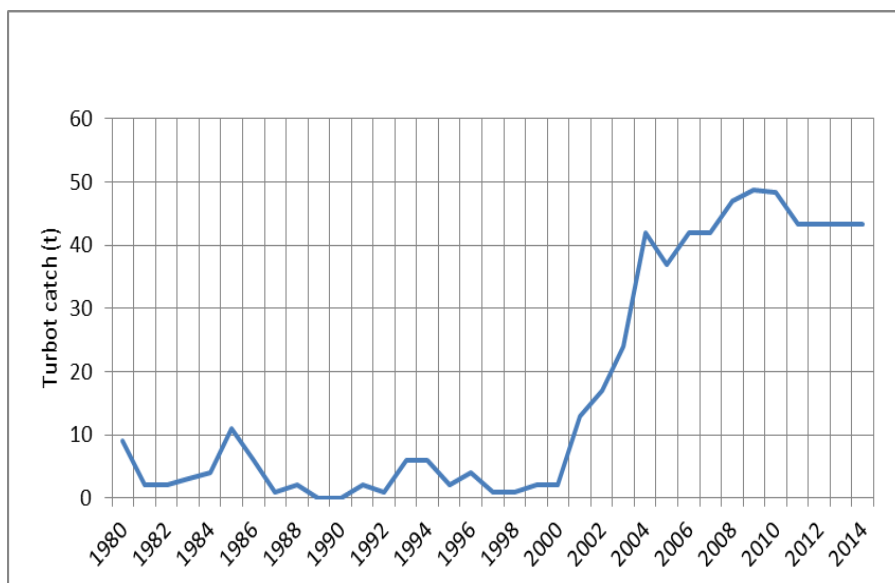


Fig. 5. Dynamics of the turbot catches at the Romanian littoral

Structure of fish population

The length spectrum of the turbot individuals ranged between 19-82 cm, dominant being the class of 49-52 cm (Fig. 6).

The structure on age of the turbot catches indicates the presence of the individuals of 1-9 years, the catch basis is formed by the individuals of 3 years, 4 years and 5 years^[3, 4, 5, 6, 7, 8, 9] (Fig. 7).

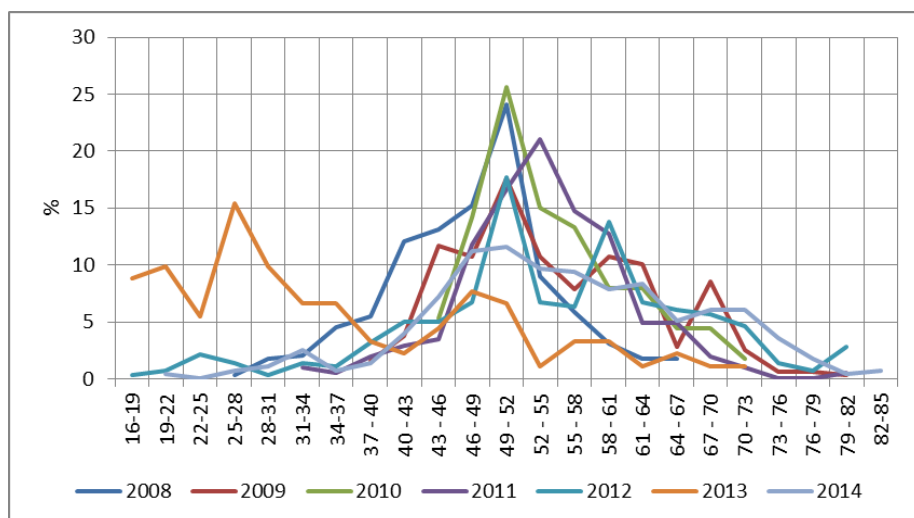


Fig. 6. Percentage of total number of specimens on length classes for turbot

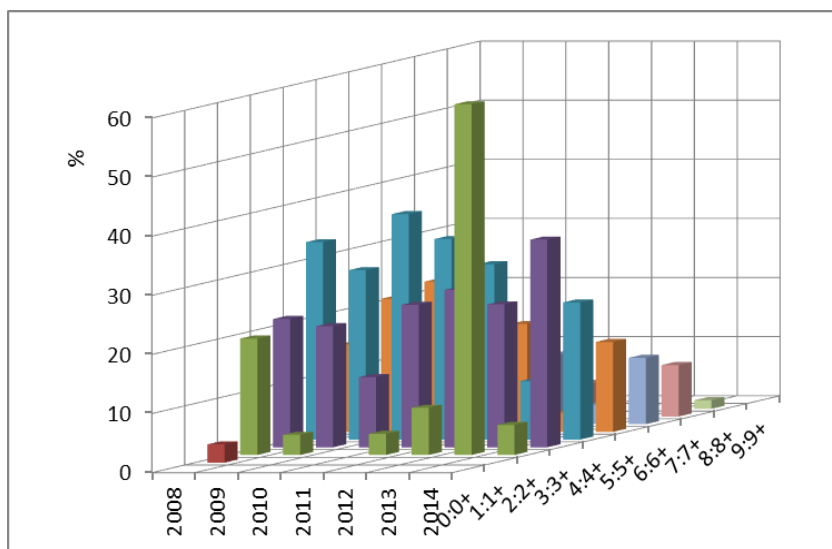


Fig. 7. Percentage of total number of specimens on age classes for turbot

Growth parameters and mortality rates

Table 1. Growth parameters and natural mortality for turbot in the Romanian Black Sea area

Year/Parameters	a	q	b	L_{∞}	k	to	M
2013	0.009218	- 2.03538	3.14613	76.842	0.390	- 0.476	0.558
2014	0.01332	- 1.87538	3.051607	89.47	0.196	- 1.112	0.339

Descriptor D3/MSFD

Trend analysis resulting from next two graphs for the D3.3.1 and D3.3.2 indicators (MSFD) show that the turbot stock level is strongly affected by high pressure conducted by fishing (Fig. 8, 9).

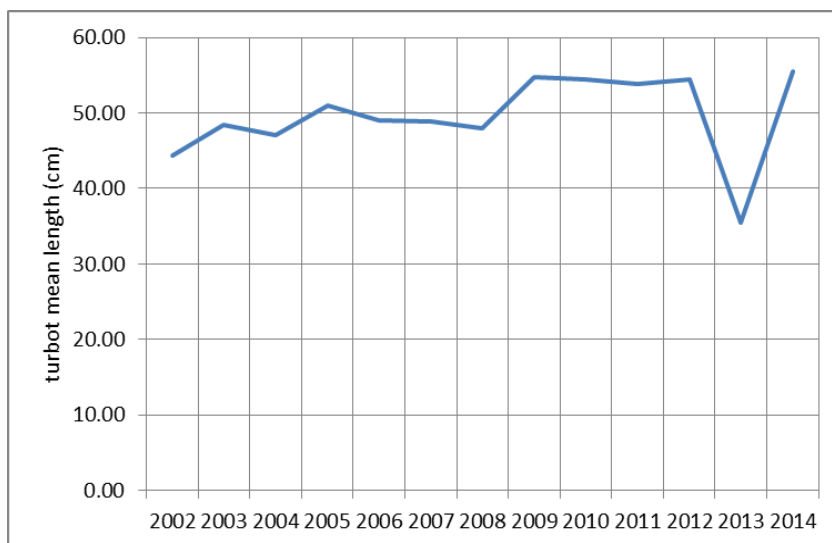


Fig. 8. The average length of turbot in the period 2002 to 2014

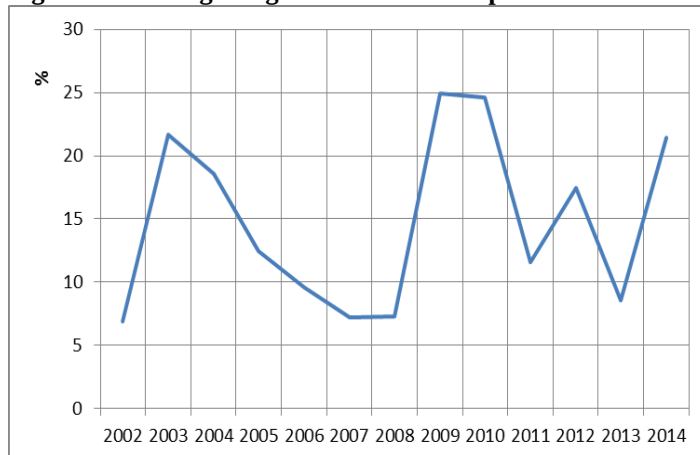


Fig. 9. Percentage of turbot specimens larger than the average size at first sexual maturation

Whiting - *Merlangius merlangus* (Linnaeus, 1758)

Distribution and migration routes

Marine benthopelagic species, in cold water, mostly is encountered in coastal waters until 200 m depth, on continental shelf from 10 to 130 m, on mud and gravel bottoms, but also on sand and rock. In spring and autumn found near shore while in summer when the temperature increases it gives way offing and is nearing of coast only with cold-water streams. Juveniles found closer of shore, from 5 m to 30 m depth^[1, 2, 3, 4, 5, 6, 7] (Fig. 10).

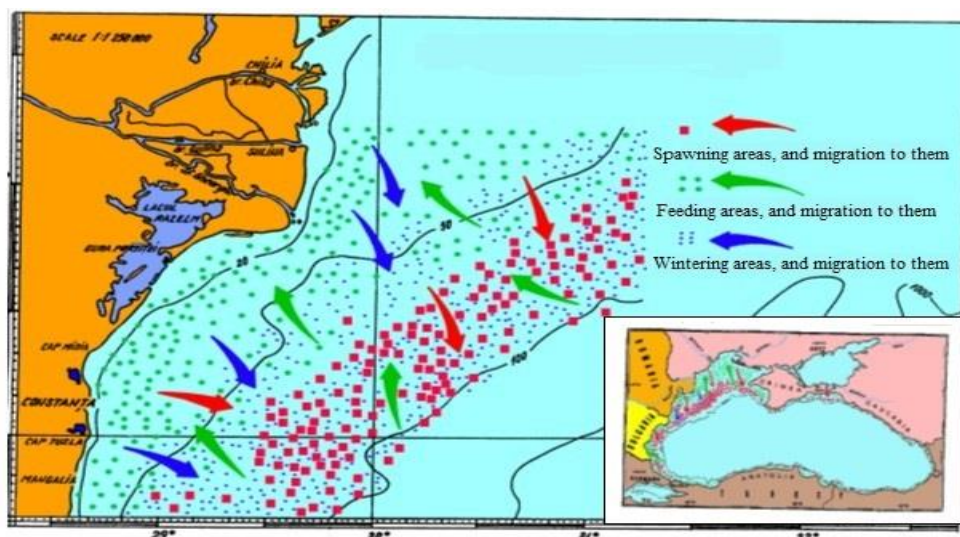


Fig. 10. Migration routes, spawning, feeding and wintering areas for whiting

Whiting is present over the entire shelf, but the concentration of fishing agglomerations is highly influenced by environmental conditions, especially the direction and intensity of wind and water temperature^[8, 9] (Fig. 11, 12).

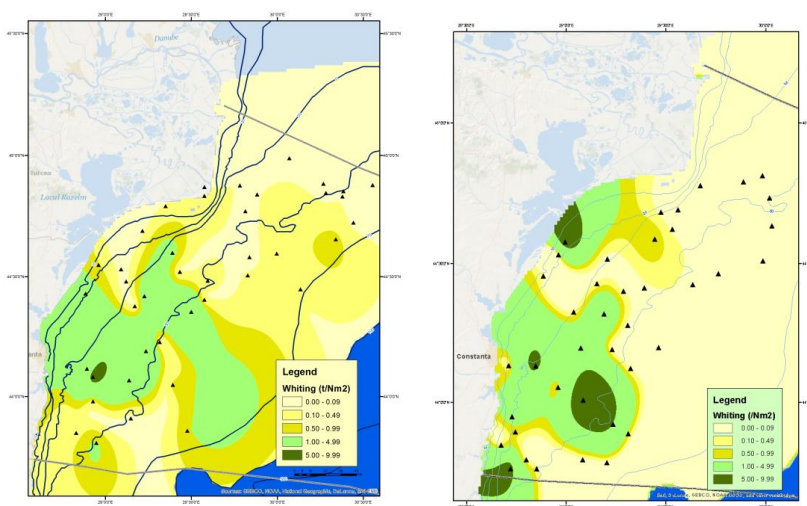


Fig. 11. Distribution of the whiting agglomerations in the Romanian marine area in spring 2013-2014

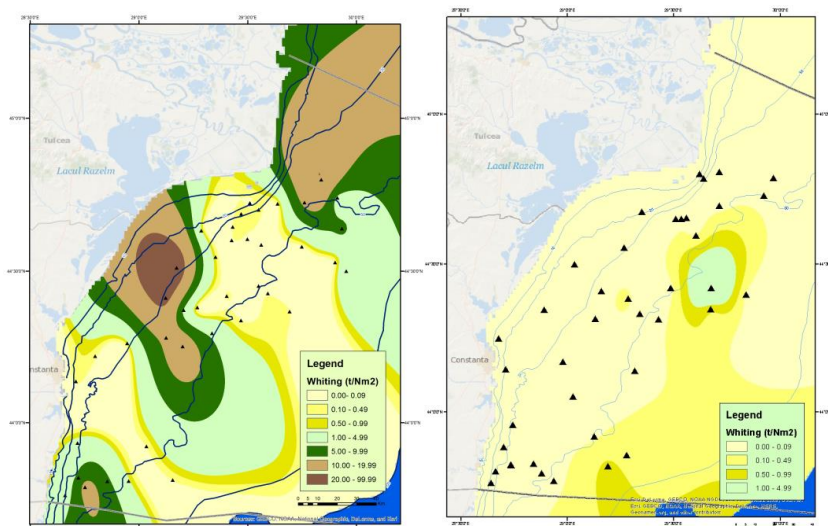


Fig. 12. Distribution of the whiting agglomerations in the Romanian marine area in autumn 2013-2014

State of exploitation

The fishing mortality in 2013 is estimated to be $F = 1.15$, which is almost three times the F_{MSY} ($F = 0.4$). The stock has been exploited at rates exceeding F_{MSY} for several years^[10].

Catch dynamics

At the Black Sea level the whiting catches decreased from 22618t (1989) at 6332t (2012) (Fig. 13).

At national level, whiting is not a target species in fishing, remaining only as by-catch in sprat fishery. The catches ranged from 2739t (1989) to 11t (2014) ^[5, 8, 9] (Fig. 13, 14)

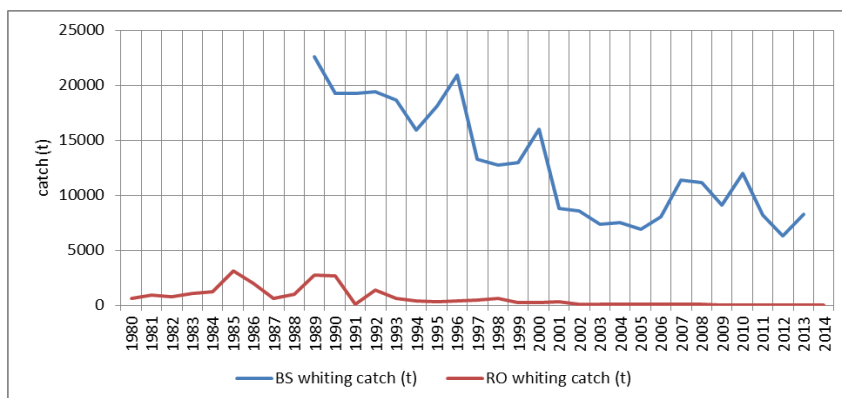


Fig. 13. Romanian catch of whiting compared with the catch for the entire Black Sea

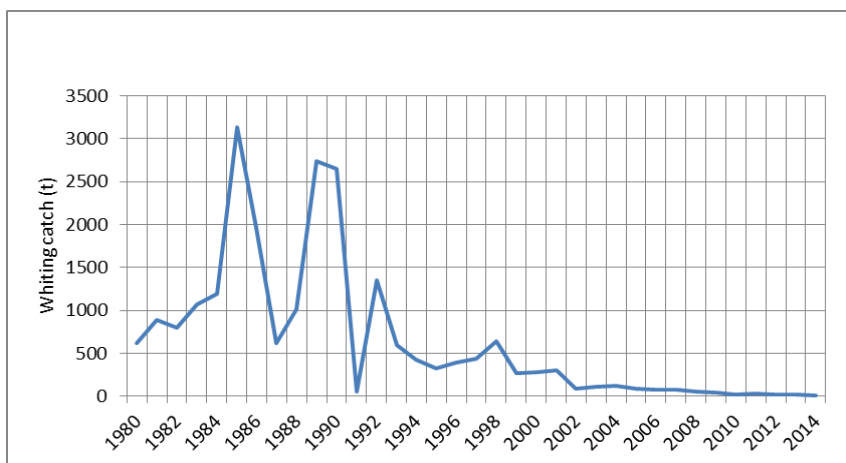


Fig. 14. Dynamics of the whiting catches at the Romanian littoral

Structure of fish population

The length spectrum of the whiting individuals ranged between 5-22 cm, dominant being the class of 10-15 cm (Fig.15).

The structure on age of the whiting catches indicates the presence of the individuals of 0-5 years, the catch basis is formed by the individuals of 1 year, 2 years and 3 years^[3, 4, 5, 6, 7, 8, 9] (Fig.16).

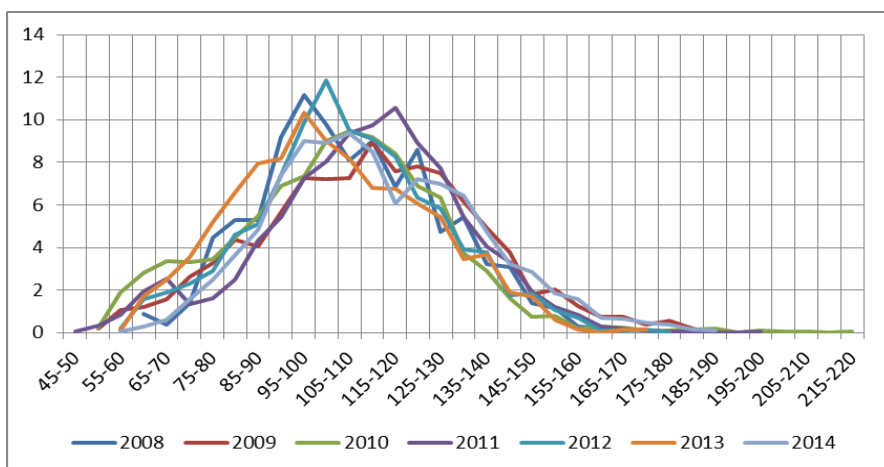


Fig. 15. Percentage of total number of specimens on length classes for whiting

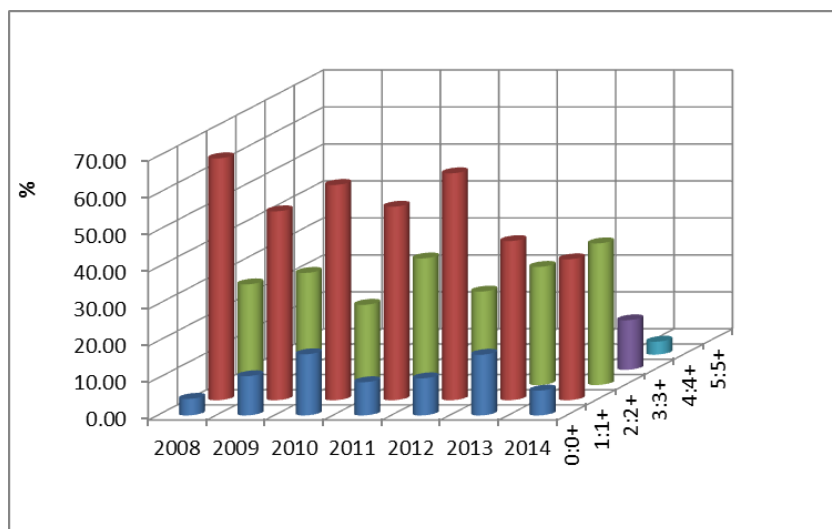


Fig. 16. Percentage of total number of specimens on age classes for whiting

Growth parameters and mortality rates

Table 2. Growth parameters and natural mortality for whiting in the Romanian Black Sea area

Year/Parameters	a	q	b	L_{∞}	k	to	M
2013	0.012676	- 1.89702	2.772582	18,421	0.289	-1.0846	0.574
2014	0.00494	- 2.30546	3.1018	20.00	0.238	- 1.33269	0.584

Descriptor D3/MSFD

The indicators D3.3.1 and D3.3.2 (MSFD) show that the whiting stock is overexploited (Fig. 17, 18).

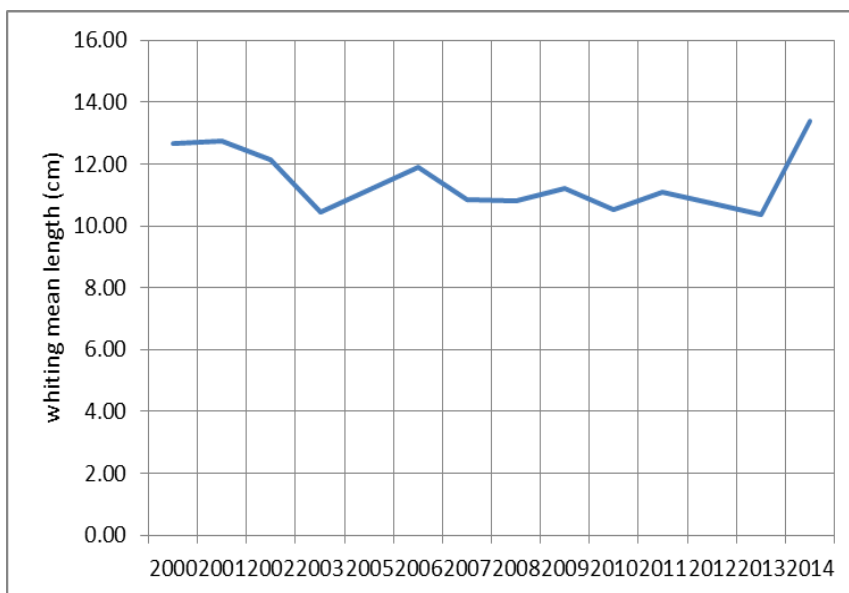


Fig. 17. The average length of whiting in the period 2000 to 2014

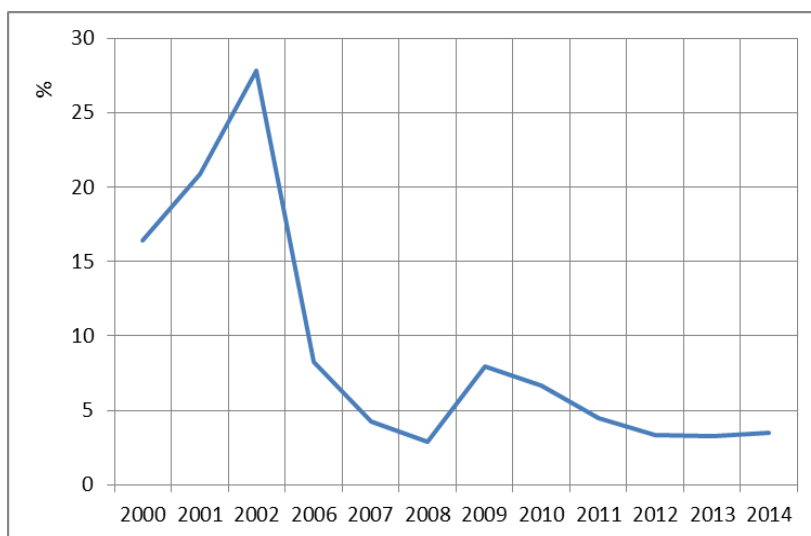


Fig. 18. Percentage of whiting specimens larger than the average size at first sexual maturation

Spiny dogfish *Squalus acanthias* Linnaeus, 1758

Distribution and migration routes

Migratory species which lives in cold water. Concerning spatial and temporal distribution at Romanian littoral of this species, researches have demonstrated that dogfish has two seasons to approaching of the shore: first in April - June and second in October - November at a depth ranged between 20-50 m. In the winter and spring time, dogfish inhabiting the marine areas with depths over 65 m until 120 m, while in June - August is encountered at depths until 60m being disperse in water mass^[1, 2, 3, 4, 5, 6, 7] (Fig. 19).

Dogfish being a predatory species, agglomerate especially in the places where it found prey species and environmental conditions favourable for breeding and feeding^[8, 9] (Fig. 20, 21).

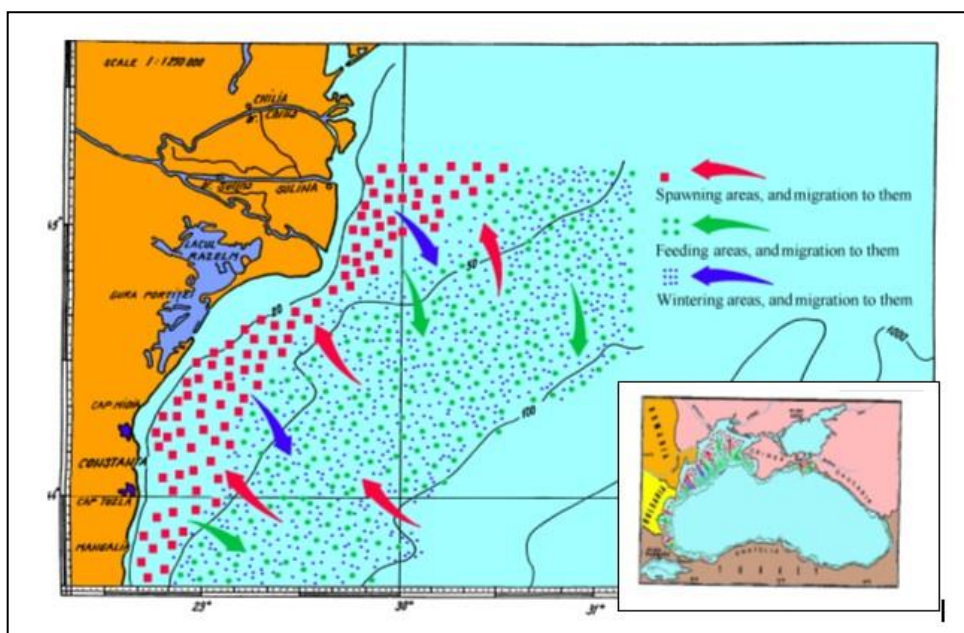


Fig. 19. Migration routes, spawning, feeding and wintering areas for spiny dogfish

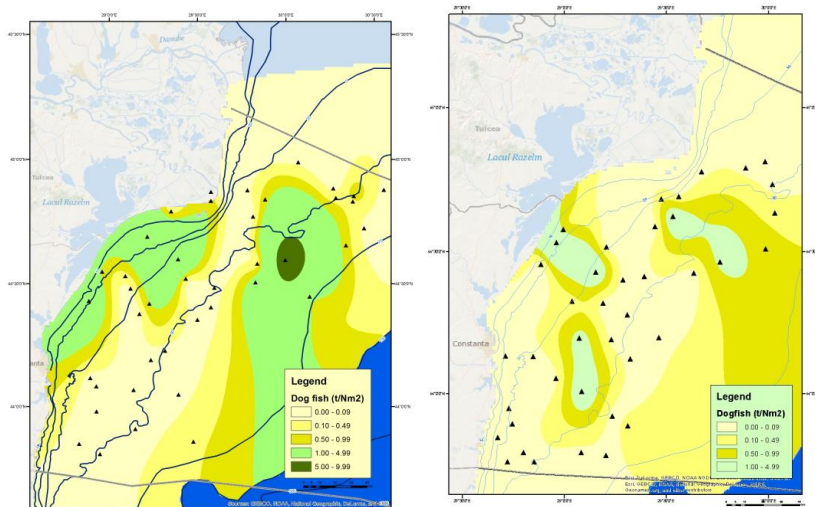


Fig. 20. Distribution of the dogfish agglomerations in the Romanian marine area in spring 2013-2014

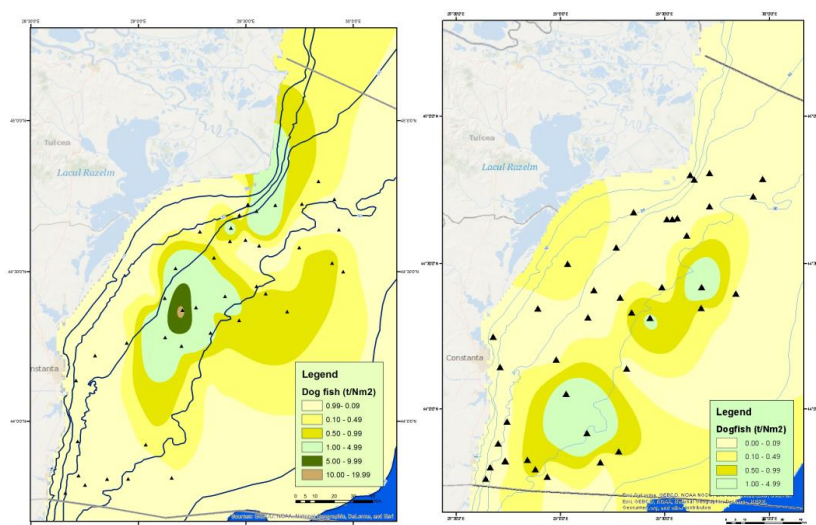


Fig. 21. Distribution of the dogfish agglomerations in the Romanian marine area in autumn 2013-2014

State of exploitation

The fishing mortality rate during 2013 is estimated to be $F = 0.112$, which is more than 3.5 times the F_{MSY} exploitation rate of $F = 0.03$. Recent catches of this



long-lived and relatively unproductive species are very low compared to the past and the stock appears to be severely depleted^[10].

Catch dynamics

Dogfish being mainly by-catch in the specialized sprat fishery, at Black Sea level its catch decreased from 6159t (1989 to 70t in 2012^[10]. (Fig. 22). At national level, dogfish catches decreased from 135t in 1984 to 2.1t in 2014^[5, 8, 9] (Fig.. 22, 23).

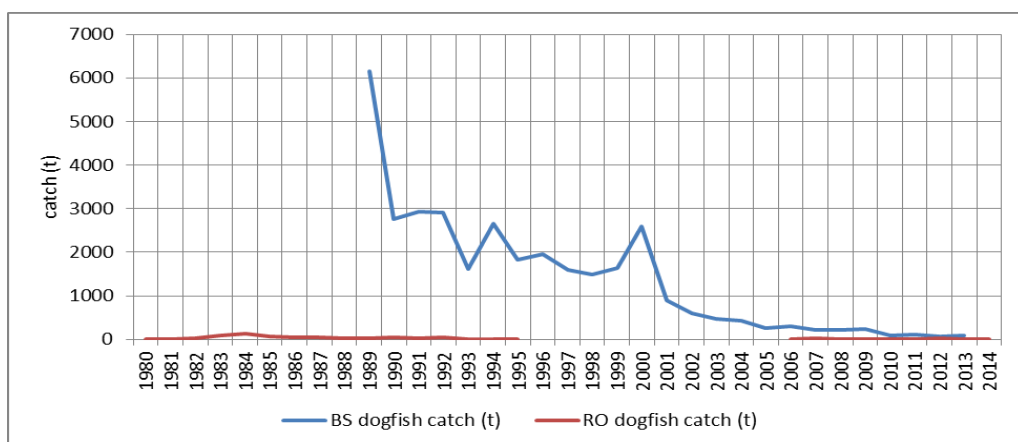


Fig. 22. Romanian catch of dogfish compared with the catch of for the entire Black Sea

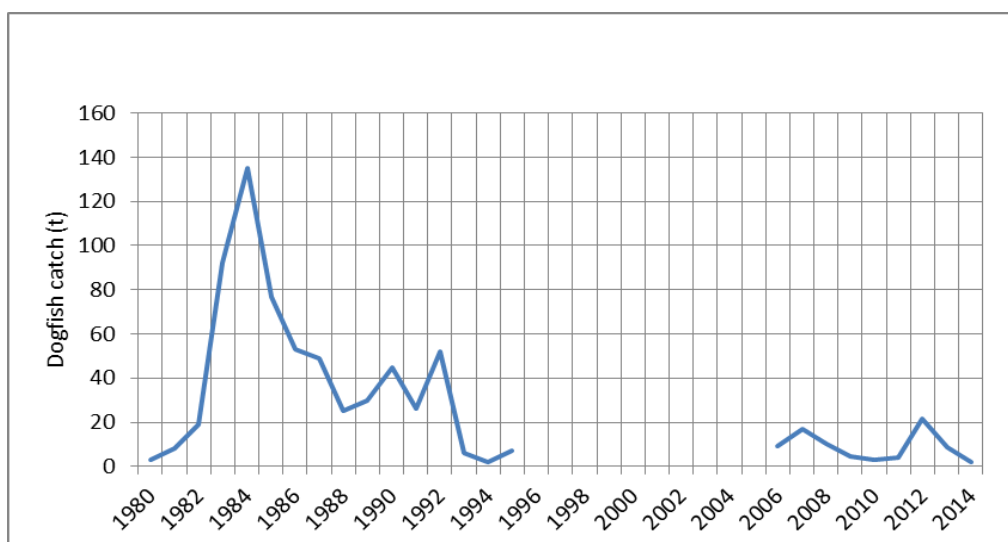


Fig. 23. Dynamics of the dogfish catches at the Romanian littoral



Structure of fish population

Structure analysis on length classes of the dogfish in the period 2010-2014, evidenced the presence of the individuals of medium size, the length spectrum ranged between 89-134 cm, dominant being the classes 107-122 cm^[3, 4, 5, 6, 7, 8, 9] (Fig. 24).

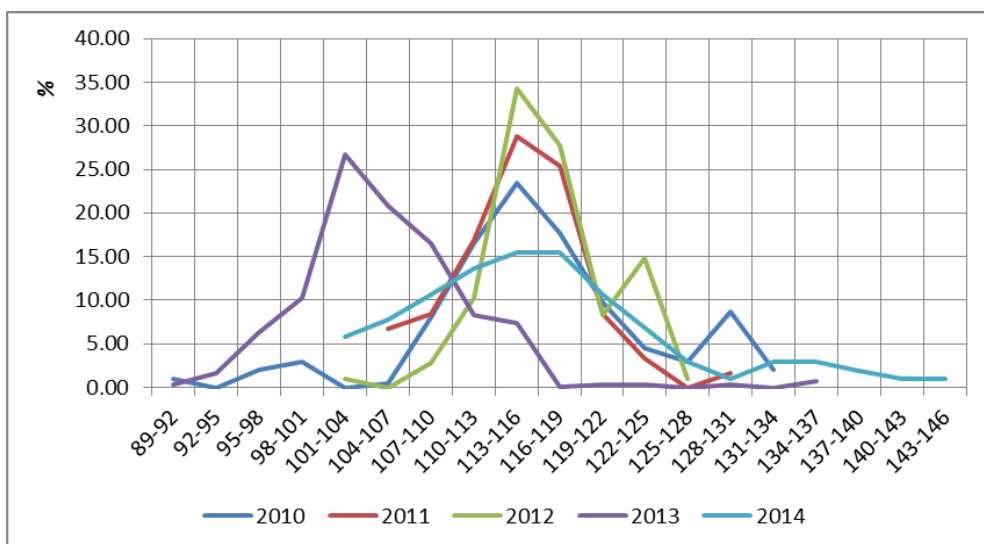


Fig. 24. Percentage of total number of specimens on length classes for dogfish

Growth parameters and mortality rates

Table 3. Growth parameters and natural mortality for dogfish in the Romanian Black Sea area

Year/Parameters	a	q	b	L_{∞}	k	t_0	M
2013	0.061086	- 1.21406	2.413685	155.789	0.134	- 0.9304	0.2265
2014	0.0185	-1.7328	2.672849	152.63	0.1343	-0.975	0.228

Descriptor D3/MSFD

Also in the case of the dogfish, the analysis of indicators D3.3.1 and D3.3.2 (MSFD) show that stock is seriously affected.

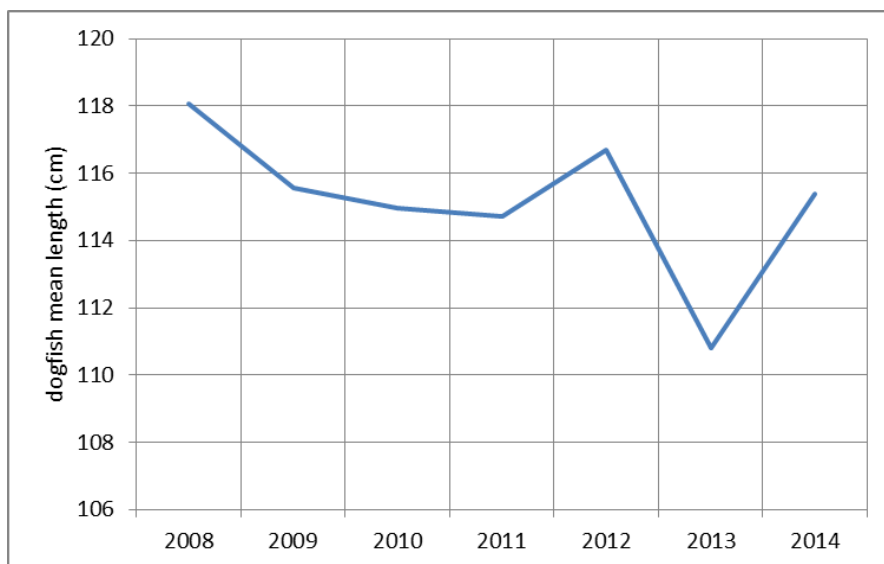


Fig. 25. The average length of dogfish in the period 2008 to 2014

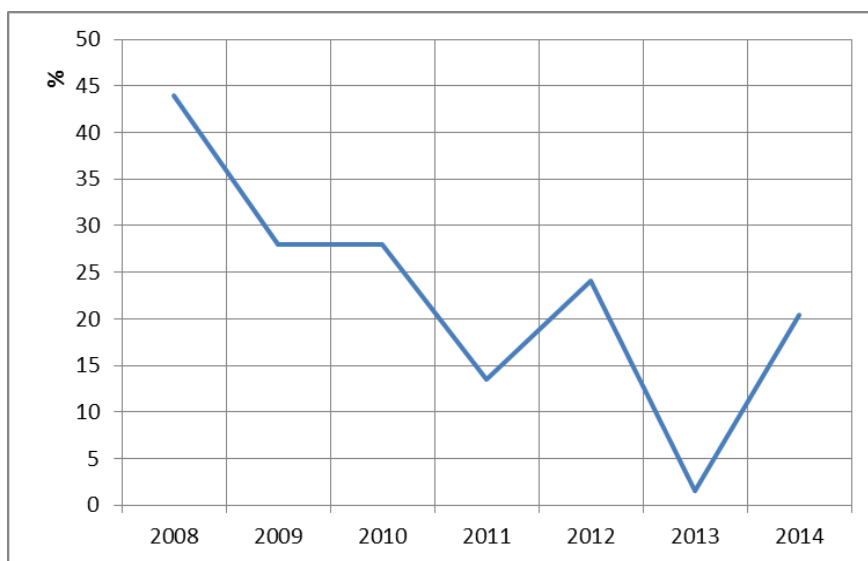


Fig. 26. Percentage of dogfish specimens larger than the average size at first sexual maturation



CONCLUSIONS

- The contribution of the three species at the catches from Romanian marine area is different depending on the time and socioeconomic situation.
- At national level turbot was and remain one of the most valuable species
- Catches of whiting and dogfish increased after 1980 being mainly by-catch in the specialized sprat fishery.
- Decreasing sprat fishery, have decreased also the catches of the auxiliary species.
- Stocks of the three species considered are overfished.
- The Romanian catches of the three species are insignificant at regional level, having a very low contribution at depletion of the stocks.
- Management of the living resources from Black Sea must be realized on the basis of an adequate legal and institutional framework both at national and regional level.



REFERENCES

1. I. Staicu , G. Radu, Elena Radu: Situatia actuala a pescuitului romanesc la litoralul romanesc al Marii Negre. Marea noastra. LNR Constanta, 2 (35):23-25 (2000).
2. E. Radu et al: Structure qualitative et quantitative des captures de poissons du littoral roumain pendant la période 1980-2002. Cercetari Marine. Recherches Marines. INCDM Constanta. ISSN: 0250-3069, (2002).
3. G. Radu et al: Sprat and turbot fisheries in the Bulgarian and Romanian Black Sea areas. International Multidisciplinary Scientific Geoconference & Expo SGEM. 20 . 26 June 2010. Albena, Bulgaria. ISBN 10: 954-91818-1-2. ISBN 13: 978-954-91818-1-4 (2010).
4. G. Radu et al: Evolution and state of the main Black Sea commercial fish species correlated with ecological conditions and fishing effort. Journal of Ecology and Environmental Protection – JEPE, vol. 12, No. 2, p. 549-558, ISSN1311-5065 (2011).
5. G. Radu et al: The Dynamics of Marine Fisheries at the Romanian Coast During 1950-2009. The joint 3rd biannual Black Sea Scientific Conference and up-grade BS-Scene Project, Joint Conference. “Black Sea Outlook”, 31 October – 4 November, 2011.
6. G. Radu et al: State of the Fishery Resources in the Romanian Marine Area”. Cercetari Marine/Recherches Marines, no. 43: 268-295, ISSN: 0250-3069 (2013).
7. V. Maximov et al: Contributions to the knowledge of the biological characteristics of main marketable fish species from the Black sea romanian area, between 2005-2009. Journal of Environmental Protection and Ecology (JEPE), vol. 3, p. 990-999, ISSN 1311-5065 (2011).
8. ***: NIMRD Constanta Reports (2000 - 2013).
9. ***: Romania Technical Reports of National Programme for Collection of Fisheries Data 2008-2014, NAFA - NIMRD “Grigore Antipa” Constanta, May 2009-2015
10. ***: Scientific, Technical and Economic Committee for Fisheries /Black Sea Expert Working Group for Stock Assessment (STECF/BS-EWG) Reports (2009-2014).