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DISTRIBUTION OF THE MAIN FISHING AGGLOMERATIONS IN THE ROMANIAN MARINE AREA IN THE PERIOD 2009-2010

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ABSTRACT

In the frame of the Romanian National Program for Collection of Fisheries Data 2009-2010, to evaluate the abundance and distribution of fish stocks independently of the data obtained from the commercial fisheries, Romania had the liability to undertake scientific research at sea.

During the period 2009-2010 four surveys were undertaken annually in the Black Sea for turbot and sprat.

The adopted methodology for collection, processing and evaluation of data at national level is similar to that used in the Black Sea area. The first two surveys were programmed in May/June by the swept area method, using demersal and mid-water trawls. In September/October were foreseen the next two surveys, using the same methodology. The main aim of the surveys was to obtain the abundance index for sprat and turbot. Each survey included 30-40 mid-water and demersal trawl hauls, in 8-10 working days.

The assessment of the biomass of fishing agglomerations was made taking into account the surveyed area, the range of catch per surface unit and average catch per unit area. The obtained data was placed on distribution maps, bounding the areas with values ranging between some limits, each range of value having assigned a type of color function of t/Nm^2.

In summary, the results are:

✓ Unlike previous years, during the survey time, the jelly fish were less present at the Romanian littoral.

✓ The sprat was signaled on the entire surveyed area, both in the 2^{nd} quarter and 4^{th} quarter surveys, the biomass being assessed at values between 30,000 tons in spring and 60,000 tons in autumn.

✓ Turbot, target species in the surveys with demersal trawl, was signaled mainly at depths bigger than 20-30 m. The biomass was estimated at 1,378 tons in spring and 1,037 tons in autumn.

✓ Because both surveys (with pelagic trawl and demersal trawl) were carried out in the adjacent areas, the catches were composed by whiting and dogfish too, species which live near the bottom.

✓ The whiting biomass was assessed at about 11,800 tons in the spring period and 7,000 tons in the autumn period.

✓ Dogfish was signaled especially at bigger depths, its biomass ranging between 1,000 tons in spring and 2,500 tons in the autumn period.

✓ Taking into account the biomasses, the state of the main commercial species is relatively good, being at the level of the past 5-6 years.

KEY-WORDS: Black Sea, agglomerations biomass, sprat, turbot, dogfish, whiting, distribution maps

INTRODUCTION

In the frame of the Romanian National Program for Collection of Fisheries Data, 2009-2010 (NP), to evaluate the abundance and distribution of fish stocks independently of the data obtained from the commercial fisheries, Romania had the liability to undertake scientific research at sea.

During the period 2009-2010, four surveys were undertaken annually in the Black Sea, for turbot and sprat.

MATERIAL AND METHODS

The adopted methodology for collection, processing and evaluation of data at national level is similar to that used in the Black Sea area. The first two surveys were programmed in May/June by the swept area method, using demersal and mid-water trawls. In September/October the next two surveys were foreseen, using the same methodology. The main aim of the surveys is to obtain the abundance index for sprat and turbot. Each survey includes 30-40 mid-water trawl hauls for sprat, in 8-10 working days, and 30-40 demersal trawls hauls for turbot, in 8-10 working days.

The assessment of the biomass of fishing agglomerations was made taking into account the surveyed area, the range of catch per surface unit and average catch per unit area. The obtained data was placed on distribution maps, bounding the areas with values ranging between some limits, each range of value having assigned a type of color function of t/Nm^2.

RESULTS AND DISCUSSIONS

Sprat surveys

In June 2009, the sprat agglomerations evaluated with pelagic trawl ranged between 0.13 t/Nm^2 and 30 t/Nm^2. The surveyed area was about 2,606 Nm^2, being divided in three areas with average values per unit area between 3.5 -18.2 t/Nm^2. The biggest sprat agglomerations (18.2 t/Nm^2) were found in the northern part of the littoral, in the Danube Delta Biosphere Reserve area beyond of 30 m isobaths. Also, the important agglomerations were found between Vadu and Constanța, up to near the 60 m isobaths. The average values were 11.73 t/Nm^2, the values ranging between 2.82 t/Nm^2 and 20.8 t/Nm^2. The biomass of the sprat agglomeration was evaluated at about 20,891 tons for a surface of 2,605 Nm^2, being extrapolated at 33,683 tons for the shelf up to 50 Nm from the shore (Fig. 1 a).

In May-June 2010, the sprat catch obtained with pelagic trawl ranged between 0.067 t/Nm^2 and 93.575 t/Nm^2. The surveyed area was about 2,347.5 Nm^2, being divided in five areas with average values per unit area between 0.622 - 93.575 t/Nm^2 (Fig. 1 b). The biomass of the sprat agglomeration was evaluated at about 28,002 tons for a surface of 2,347.5 Nm^2, being extrapolated at 59,643 tons for the shelf up to 50 Nm from the shore (about 5,000 Nm^2).

In the autumn period (end of October - begging of November 2009), the sprat realized agglomerations ranging between 0.26 - 41.73 t/Nm^2, the average ranging from 2.05 t/Nm^2 to 21.93 t/Nm^2. The sprat was spread on the entire shelf, but bigger concentrations were found between Gura Portiței and Cape Tuzla, from the shore beyond the 30 m isobaths (Fig. 1 c). The biomass was estimated at 20,780 tons for a survey area of 2,082 Nm^2, extrapolated at 60,075 tons for the shelf up to 50 Nm from the shore [1, 7, 10, 11, 12 and 14].

a) b) c)

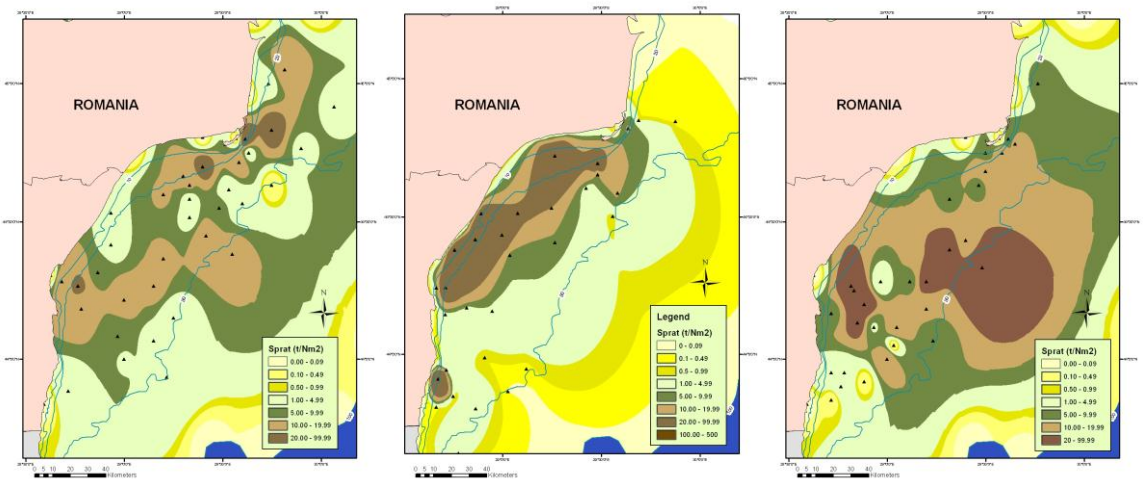


Fig. 1. The distribution of the sprat agglomerations in June 2009 (a), May-June 2010 (b) and in October 2009 (c), pelagic trawl survey

The next important species in the catches obtained with pelagic trawl, in June 2009 and May-June 2010, was **whiting**.

In June 2009, the biomass of whiting agglomerations was evaluated at 6,635 tons, being extrapolated at 10,698 for the shelf up to 50 Nm from the shore. The concentrations ranged between 0.0 t/Nm^2 and 8.9 t/Nm^2. The densest whiting agglomerations were found at depths bigger than 20 m, spreading to the southern part at depths up to 60-70 m. At depths smaller than 20 m, the presence of whiting was reduced (Fig. 2 a).

In May-June 2010, the whiting also was signaled in the hauling carried out on depths bigger than 20 m, with average values of the catch ranging between 0.17 t/Nm^2 and 1.66 t/Nm^2 (Fig. 2 b) [4, 5, 7, 9, 12 and 15].

Table 1. Assessment of the whiting fishing agglomerations in June 2009, pelagic trawl

No. polygon	Surveyed area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Notes
1	284	0.00 – 0.00	0.00	0.00	Extrapolated at **10,698** tons for the shelf up to 50 Nm from shore
2	141	0.00 – 0.00	0.00	0.00	
3	946.63	0.15 – 2.85	0.99	937.16	
4	626.75	1.46 – 4.74	2.21	1,385.12	
5	606.50	4.98 – 8.90	7.11	4,312.22	
Total	**2,604.88**			**6,634.5**	

Table 2. Assessment of whiting agglomerations in the Romanian area in the period May - June 2010, sampling gear demersal trawl

No. polygon	Polygon area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Total on the shelf (t)
1	209	0.08-0.24	0.17	35.53	Extrapolated at **7,410** tons for the shelf up to 50 Nm from shore (about 5,000 Nm^2), including the new area (near Serpent Island)
2	950	0.055.22	1.97	1871.12	
3	265.25	0.00	0.0	0.0	
4	1,145.75	0.36-3.17	1.66	1902	
Total	**2,570**			**3,809**	

a) b)

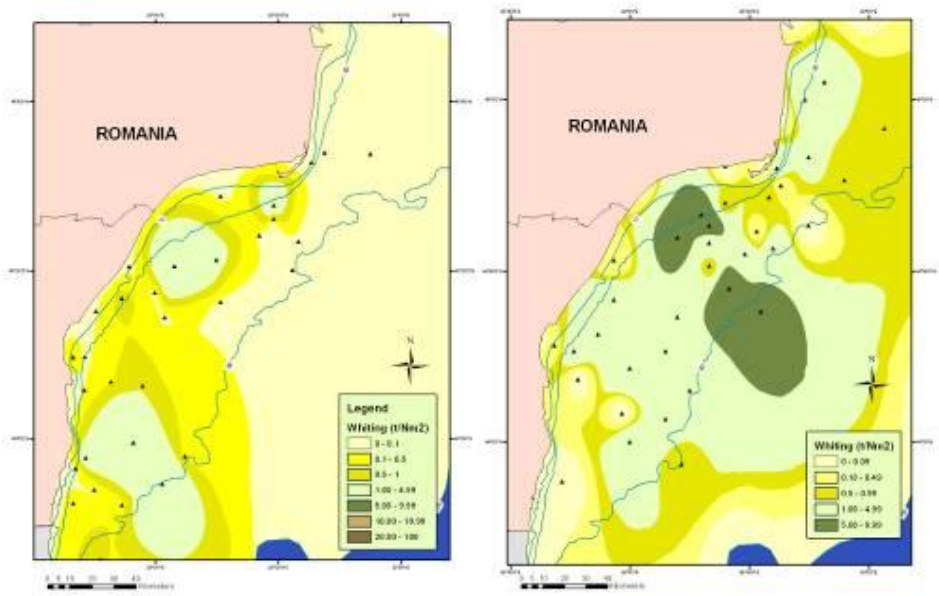


Fig. 2. The distribution of the whiting fishing agglomerations in June 2009 (a), and in June 2010 (b), pelagic trawl

During the October-November period, the whiting also was spread on the entire surveyed area (2.082 Nm^2), the catches ranging between 0.19 t/Nm^2 and 4.93 t/Nm^2. The average ranged between 0.34 t/Nm^2 and 2.45 t/Nm^2 (Fig. 3 a).

The biomass of the whiting agglomerations was appreciated at 3,728 tons, extrapolated at 7,520 tons for the shelf up to 50 Nm from shore.

In October - November 2010, the whiting realized agglomerations ranging between 0.11 - 24.67 t/Nm^2, the average ranging from 0.23 t/Nm^2 to 24.67 t/Nm^2 (Fig. 3 b). The biomass was estimated at 12,778 tons for a survey area of 3,050 Nm^2, extrapolated at 20,948 tons for the shelf up to 50 Nm from shore [6, 8, 9, 11, 12 and 15].

Table 3. Assessment of the whiting fishing agglomerations in October - November 2009, pelagic trawl

No. polygon	Surveyed area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Notes
1	189.00	0.19 - 0.49	0.34	64.26	Extrapolated at **7,520** tons for the shelf up to 50 Nm from shore
2	146.25	0.32 - 0.55	0.45	65.81	
3	350.80	0.32 - 0.65	0.51	178.91	
4	1.395.52	1.1 - 4.93	2.45	3,419.02	
Total	**2,081.57**			**3,728**	

a) b) c)

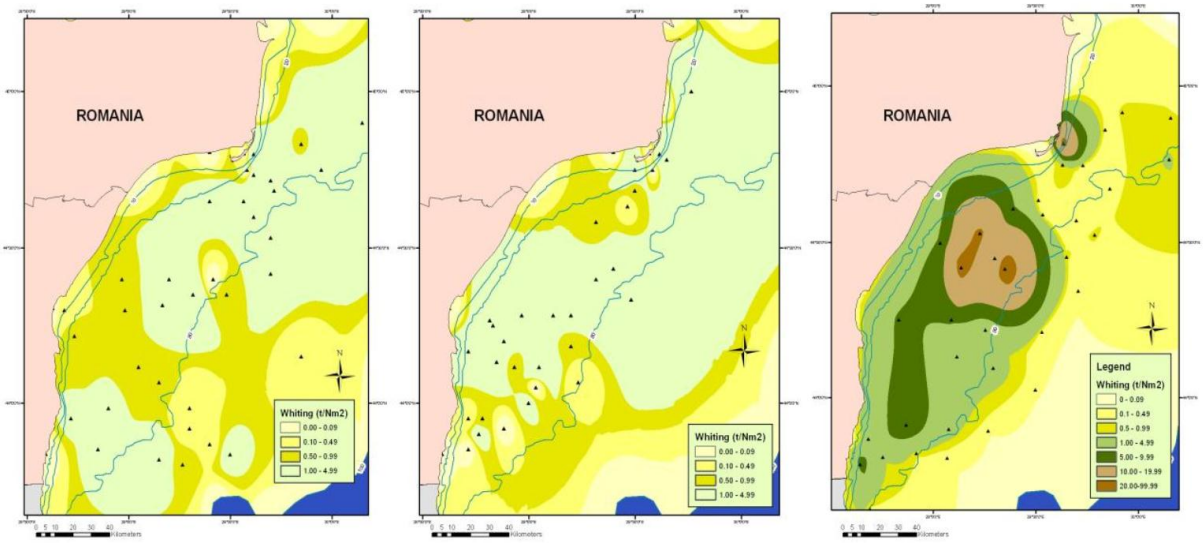


Fig. 3. The distribution of the whiting agglomerations in November 2009, demersal trawl survey (a); in October 2009, pelagic trawl (b), and in November 2010 (c), demersal trawl survev

Table 4. Assessment of whiting agglomerations in the Romanian area in the period October - November 2010, sampling gear demersal trawl

No. polygon	Polygon area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Total on the shelf (t)
1	931.8	0.11-0.54	0.23	223.6	Extrapolated at **20,948** tons for the shelf up to 50 Nm from shore (about 5,000 Nm^2), including the new area near (Serpent Island)
2	450	0.55-1.1	0.73	328.5	
3	1,303.1	0.55-8.88	3.29	4287.2	
4	299.6	10.1-27.41	21.03	6300.6	
5	66.4	24.67	24.67	1638.1	
TOTAL	**3,050**			**12,778**	

At depths bigger than 30 m, in the catches obtained with pelagic trawl, near the bottom, the **dogfish** was present, also. The catches ranged between 0.19 and 1.46 t/Nm^2; the averageframed between 0.32 and 0.92 t/Nm^2 (Fig. 4 a). The dogfish agglomeration was evaluated at 364 tons for a survey area of 2,606 Nm^2, being extrapolated at 587 tons for the shelf up to 50 Nm from shore.

In May 2009, the dogfish was also signaled in the hauling carried out on depths bigger than 30-35 m, with average values of the catch ranging between 0.26 t/Nm^2 and 0.63 t/Nm^2 (Fig. 4 b). The biomass of dogfish was evaluated at 741 tons, extrapolated at 967 tons for the shelf up to 50 Nm from shore. It is known that dogfish realize agglomerations at the Romanian littoral mainly in the spring period; therefore, the biomass values obtained in May with demersal trawl are bigger than biomass values obtained in July with pelagic trawl near the bottom (587 tons).

In May-June 2010, the catches oscillated between 0.0 - 5.62 t/Nm^2, the average 0.0 - 2.11 t/Nm^2 (Fig. 4 c). The dogfish agglomeration was evaluated at 2,897 tons for a survey area of 2,570 Nm^2, being extrapolated at 5,635 tons for the shelf up to 50 Nm from shore [2, 4, 12 and 16].

Table 5. Assessment of the dogfish fishing agglomerations in June 2009, pelagic trawl

No. polygon	Surveyed area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Notes
1	533.75	0.19 – 0.43	0.32	170.8	Extrapolated at 587 tons for the shelf up to 50 Nm from shore
2	210.00	0.64 – 1.46	0.92	193.2	
3	1,861.25	0.00	0.00	0.0	
Total	2,605			364	

Table 6. Assessment of dogfish agglomerations in the Romanian area in the period May-June 2010, sampling gear demersal trawl

No. polygon	Polygon area (Nm^2)	Range (t/Nm^2)	Average (t/Nm^2)	Total tons in polygon (t)	Total on the shelf (t)
1	630.50	0.00	0.00	0.00	Extrapolated at **5,635 tons** for the shelf up to 50 Nm from shore (about 5,000 Nm^2), including the new area (near Snake Island)
2	567.75	0.21-1.41	0.63	357.68	
3	216.75	0.24-0.68	0.47	101.87	
4	1,155.00	0.56-5.62	2.11	2,437.00	
Total	**2,570**			**2,897.00**	

a) b) c)

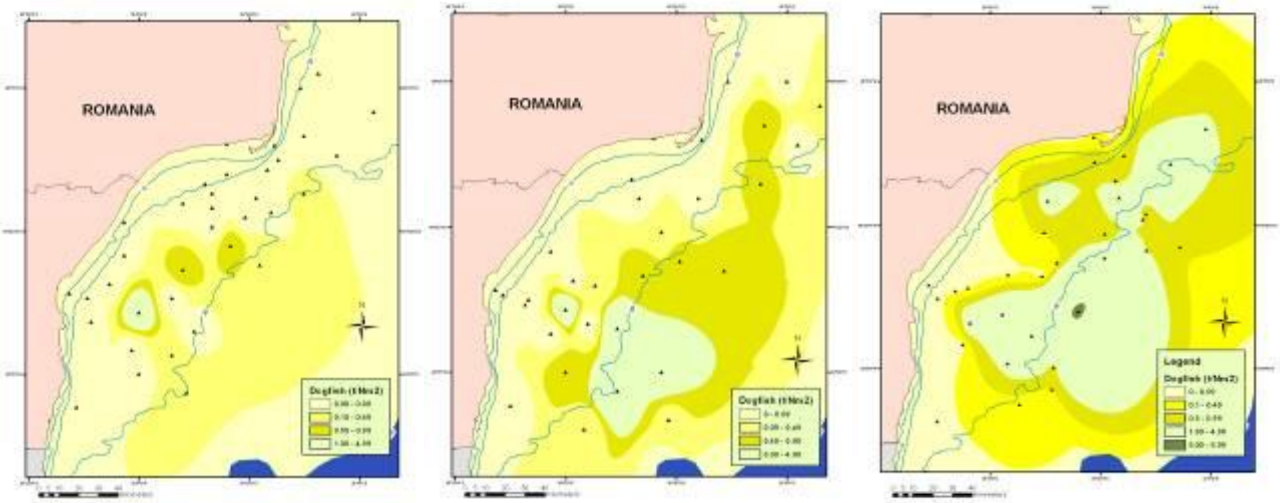


Fig. 4. The distribution of the dogfish agglomerations in June 2009, pelagic trawl survey (a); in May 2009 (b) and in May-June 2010 (c), demersal trawl survey

During the October-November 2009 period, the dogfish was spread both in the northern and southern part of the littoral, from the shore up to 50-60 m depths. The average of agglomerations ranged between 0.0 t/Nm^2 and 2.91 t/Nm^2 in the Năvodari-Constanța area (Fig. 5 a). The biomass of the dogfish agglomerations in the October-November period was estimated at 1,218 tons extrapolated at 2,455 tons for the shelf up to 50 Nm from shore.

In October-November 2010, the biomass was assessed at 7,961.04 tons, extrapolated at 13,051 tons for the shelf up to 50 Nm from shore (Fig. 5 b).

a) **b)**

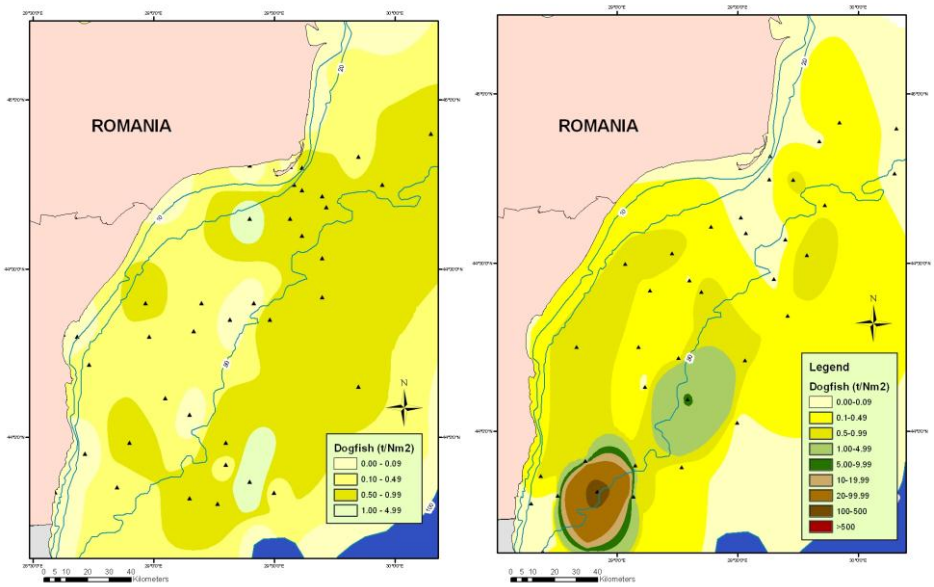


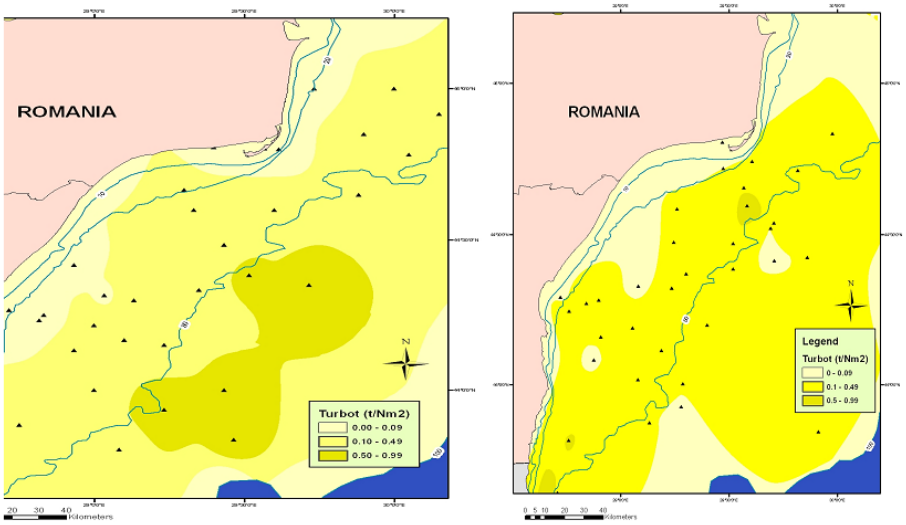
Fig. 5. The distribution of the dogfish agglomerations in October 2009, pelagic trawl survey (a), and in November 2009 (b), demersal trawl survey

Turbot survey

In May 2009, the surveyed area was of about 3,218 Nm^2, the turbot being mainly signaled at depths bigger of 30 m. The turbot catches ranged between 0.08 t/Nm^2 and 0.66 t/Nm^2, the average being of 0.32 t/Nm^2, between the 30 m – 50 m isobaths and 0.58 t/Nm^2 beyond of 50 m isobaths, mainly in the south area (Fig. 6 a).

The biomass of the turbot agglomerations were estimated at 1,056 tons, extrapolated at 1,378 tons for the shelf up to 50 Nm from shore.

In May-June 2010, the surveyed area was of about 2625 Nm^2, the turbot being mainly signaled at depths bigger than 20 m. The turbot catches ranged between 0.01 t/Nm^2 and 0.989 t/Nm^2, the average being of 0.516 t/Nm^2 (Fig. 6 b). The biomass of the turbot agglomerations was estimated at 603.3 tons, extrapolated at 1,149.27 tons for the shelf up to 50 Nm from shore [3, 5, 7, 8, 10, 11, 12 and 15].



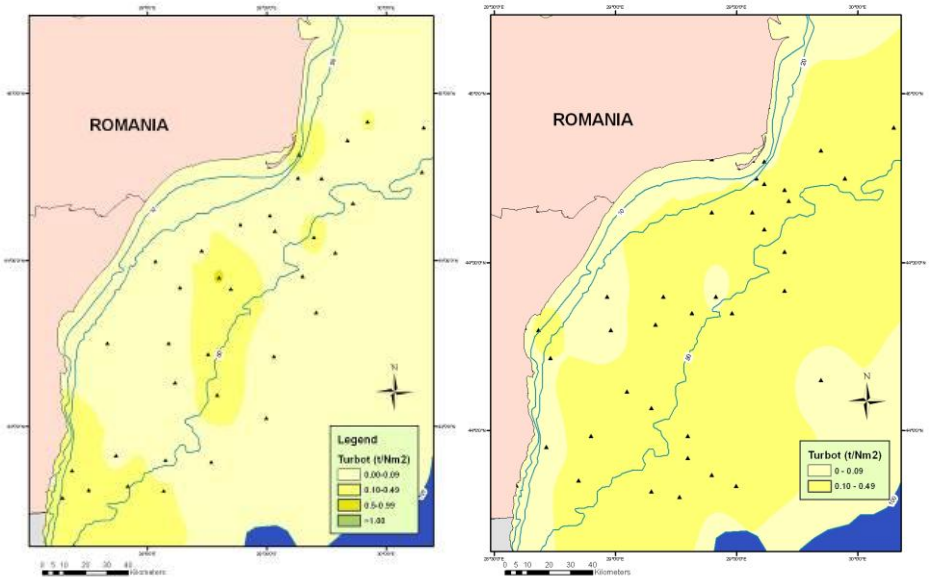
a) b)

Fig. 6. The distribution of the turbot agglomerations in May 2009 (a) and in May-June 2010 (b), demersal trawl survey

In the autumn period, in the hauling with demersal trawl, the turbot was signaled with important quantities in the area between the 30 m and 60 m isobaths. The average value of the catches ranged between 0.04 t/Nm^2 and 0.5 t/Nm^2, mainly up to the 30 m isobaths, and 0.29 t/Nm^2, beyond of 30 m isobath (Fig. 7 a). The biomass of turbot agglomerations was evaluated at 782 tons for a surveyed area of 3,163 Nm^2, extrapolated at 1,037 tons for the shelf up to 50 Nm from shore.

In October-November 2010, the average value of the catches ranged between 0.00 t/Nm^2 and 0.244 t/Nm^2 (fig. 7 b). The biomass of turbot agglomerations was evaluated at 155 tons for a surveyed area of 3,050 Nm^2, extrapolated at 254.44 tons for the shelf up to 50 Nm from shore.

a) **b)**



CONCLUSIONS

✓ As a general observation, we can remark a non-uniform distribution of fishing agglomerations for the main fish species along the Romanian littoral, both in the area of pound nets, 5-11 m depth, and in the area of trawlers activity, 20-70 m depth. Also, some changes were remarked in fish behavior, by removing the fishing agglomerations from ashore and a more pronounced dynamism.

✓ For the Romanian shelf, depending on environmental conditions, fishing agglomerations for the two species of commercial interest were estimated through direct methods, as follows: sprat - about 60,000 tons, allowing a total catch (TAC) of 10,000 tons and turbot - estimated at about 1,000 tons, the recommended TAC being of 50-60 tons.

✓ The assessment of the biomass of the main species was realized by the swept area method, using pelagic trawl for sprat and demersal trawl for turbot.

✓ Unlike previous years, during the survey, the jelly fish was less present at the Romanian littoral.

✓ The sprat was signaled throughout the entire surveyed area, both in the 2nd quarter and 4th quarter surveys, the biomass being assessed at values between 30,000 tons in spring and 60,000 tons in autumn.

✓ Turbot, target species in the surveys with demersal trawl, was signaled mainly at depths bigger than 20-

Fig. 7 The distribution of the turbot agglomerations in November 2009 (a) and in the period October-November 2010, sampling gear demersal trawl

30 m. The biomass was appreciated at 1,378 tons in spring and 1,037 tons in autumn.

✓ The biomass of turbot agglomerations at the Romanian littoral remained relatively constant in recent years; the actual fishing effort is not likely to endanger the current stock status. But, considering the regional tendency of stock decline, the STECF recommendation (Scientific, Technical and Economical for Fishermen / EC) is to reduce regional effort, implicitly reducing quotas.

✓ Because both surveys (with pelagic trawl and demersal trawl) were carried out in the adjacent areas, the catches were composed by whiting and dogfish too, species which live near the bottom.

✓ The whiting biomass was assessed at about 11,800 tons in the spring period and 7,000 tons in autumn period.

✓A recovery trend was observed for whiting agglomerations. Unfortunately, this species is less used on the Romanian market.

✓ Dogfish was signaled especially at bigger depths, its biomass ranging between 1,000 tons in spring and 2,500 tons in the autumn period.

✓ For dogfish, locally, there is an obvious improvement in stock status. For the Romanian sector, the conservation status is not affected by local fisheries, the fishing effort for this species is poorly represented.

✓ Taking into account the biomasses, the state of the main commercial species is relatively good, being at the level of the last 5-6 years.

✓ In conclusion, we can say that the sprat stock status is relatively good, being influenced only by fishing effort from the countries bordering the Black Sea, the sprat being a species with transborder distribution. On the Romanian coast, the conservation status is not affected by local fisheries; fishing effort for this species is not representative, catches in the last three years representing less than 1% of the TAC.

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