

INVESTIGATIONS OF SOME BIVALVE MOLLUSKS IN BOURGAS BAY (BULGARIAN BLACK SEA COAST)

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The distance between the northern and southern point on the Bulgarian Black Sea coast on straight line is 199 kilometers and actually the length of the coastline is 378 kilometers. In the western part of the Black Sea Bourgas Bay, the largest bay along the Bulgarian Black Sea coast, is situated. Its maritime boundary passes through the line cape Emine in the north and town Sozopol to the south. On this line the width is 33 km and the length 25 km. Its maximal depth is 36.5 meters. In the region of the Large Bourgas Bay zones are located providing conditions for life and reproduction of bivalve mollusks. The paper presents the results from investigations of two mollusks species – the sand mussel *Chamelea gallina* (L., 1758) and the black mussel *Mytilus galloprovincialis* (L., 1819). Our investigations include the fields in the sand sublitoral for the sand mussel and in the mud sublitoral for the black mussel. The best catch of *Chamelea gallina* was found in the field "Sunny Beach" – 563 tones and for *Mytilus galloprovincialis* in the field in the front cape Emine – 25,111 tones.

Key words: Black Sea; Bourgas Bay; bivalve mollusks; stock assessment

ИСТРАЖУВАЊЕ НА ОДРЕДЕНИ ДВОКАПАЧНИ МЕКОТЕЛИ ВО ЗАЛИВОТ БУРГАС (БУГАРСКИ БРЕГ НА ЦРНО МОРЕ)

Растојанието помеѓу северната и јужната точка на брегот на Црното Море на Бугарија праволиниски е 199 километри, а конкретната должина на линијата на крајбрежјето е 378 километри. На западниот дел од Црното Море се наоѓа заливот Бургас, најголемиот залив на бугарското крајбрежје. Крајбрежната граница минува низ линијата на 'ртот Емине на север и градот Созопол на југ. Ширината на оваа линија е 33 km, а долга е 25 километри. Максималната длабочина изнесува 36,5 метри. Во регионот на големиот залив Бургас се лоцирани зони кои овозможуваат услови за живот и репродукција на двокапачните мекотели. Ова истражување ги претставува резултатите од испитувањата на два вида мекотели: песочни школки *Chamelea gallina* (L., 1758) и црни школки *Mytilus galloprovincialis* (L., 1819). Нашите истражувања ги опфатиле областите на песочните сублиторали за песочните школки, како и калливите сублиторали за црните школки. Најдобар лов на *Chamelea gallina* беше изведен во регионот „Сончев брег“ (563 тони) и за *Mytilus galloprovincialis* најдобар беше во регионот на 'ртот Емине (25.111 тони).

Клучни зборови: Црно Море; залив Бургас; двокапачни мекотели; процена на стока

1. INTRODUCTION

Even tough there are 175 fish species in the Black Sea, only a small part of them are object of fishery. The main reason for this is that they have none or very low market value. Others are so rare that only by accident can get caught in the fishing casting nets (Kolarov, 2005). Until the beginning

of the ecological changes (1965–1970) the main ecoomically valuable species are: mackerel (*Scomer scombrus*), bonito (*Sarda sarda*), horse mackerel (*Trachurus mediterraneus ponticus*) and sprat (*Sprattus sprattus*) and less fished – Mugilidae, bluefish (*Pomatomus saltatrix*), garfish (*Belone belone euxini*). All together they reached the fishing amount of about 4–6 thousands tones per year.

In period from 1970 to 1990 the Black Sea coast was highly polluted. This lead to consequences of extinction of some the species mentioned above, and drastic decreasing of others, which itself lead to crucial changes in the structure of catches. In 2004 the total amount of catch was 12,940 tons and it looked like this: Sprat (*Sprattus sprattus*) – 61.8 %, anchovy (*Engraulis encrasiolus*) 1.2 %, Gobies – 0.9 %, horse mackerel (*Trachurus mediterraneus ponticus*) – 0.9 %, shad (*Alosa pontica*) – 0.6 %, bluefish (*Pomatomus saltatrix*) – 0.3 %, *Rapana venosa* – 32.5 %, *Mytilus galloprovincialis* – 4 %, other species – 1.2 %.

As it can be seen a third of the catch is for the non-fish products *Rapana venosa* and *Mytilus galloprovincialis*.

Researches have proven that each sea bivalves can be used for nourishment for humans as well as for animals. For industrial catch big sized mollusks from various species are preferred. Their habitat is shallow waters and they live in colonies which make them economically beneficial (Scarlato, 1981).

The aim of the present paper is to identify the quantity of colonies of two particular mussels in the Big Burgas Bay – the biggest on the Bulgarian coast, in which we find good conditions for the well being and development of bivalve mollusks.

From the Black Sea mussels the black mussel (*Mytilus galloprovincialis*) is the most widespread. It can be found all over the Black Sea – in depth to 65 meters and in the Bay covering places about 15–20 meters.

The correlation between the separate parts of the body is: meat 15–20 %, shell – 35–45 %, mantle liquid – 35–45 %. The chemical composition of the mussel according to Abliamitova-Vinogradova (1949) is as it follows: water 86.76 %, proteins 7.31 %, carbohydrate 3.55 %, fat 0.78 %, mineral matters 1.6 %.

The sand mussel *Chamelea gallina* widely spread in the sand littoral is. In their work (1966) Kyneva-Abadjivea and Marinov calculate its quantity from 153 ind/m² and biomass 223.4 g/m². Its vital cycle is three years (Chuhchin, 1965).

2. MATERIAL AND METHODS

Materials for researches from the two species were collected with special dredges for catch of

the sand mussel (*Chamelea gallina*) during 2003 and for the black mussel (*Mytilus galloprovincialis*) during 2005.

The size of the two species (length and width) was determined by means of a Shubler calliper on the shipboard, as well as their weight with the analytical scale. The estimating of the stock was performed by the methods of areas. The time for dredging was 15 minutes.

3. RESULTS AND DISCUSSION

Investigations of the black mussel (Mytilus galloprovincialis)

The trawling activities for black mussel in the Burgas Bay are concentrated in two main fields-cape Emine and St.Vlas.

Characteristics of the mussel field “cape Emine”. It is situated north on the cape of St. Atanas and south on the cape Emine. The field is entirely in *Mytilus biocenose*. The sediment is typical *Mytilus mud*, with a lot of shells of black mussels, some of them destructed. There have been 6 trawlings in the depth from 18 to 40 metres. The results are in Table 1.

Table 1

Results from the trawling for black mussels in mussels field “cape Emine”

Trawl	Depth	Mussels/ yield/kg	Size composition (cm)	MI	Additional species
1	40	500	4.0–8.5	5.67	5
2	30	740	4.0–7.0	5.6	6
3	18	200	4.0–7.5	5.64	5
4	32	200	4.0–8.0	5.89	6
5	38	40	3.5–7.5	5.58	6
6	38	200	3.5–7.5	5.35	10

The bottom of the field is clean and clear and it allows longer trawling in the same direction. The extraction quantity for 15 minutes trawling is from 40 to 740 kilograms. The average length of the mussels in the field is 5.62 cm. Most of them have the length from 4.5 to 6.5 cm (Fig. 1).

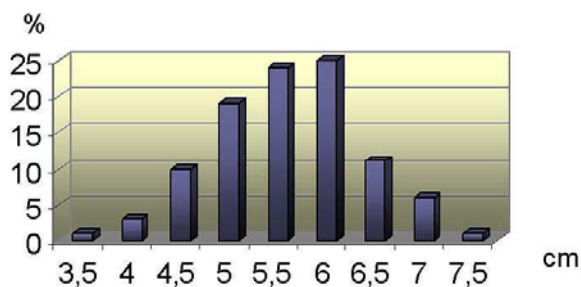


Fig. 1. Size composition of *M. galloprovincialis*, mussel field “c. Emine” – trawl V

Average length (M) = 5.58 cm
Size composition = 3.5 – 7.5 cm
Yield = 40 kg
Other species = 6

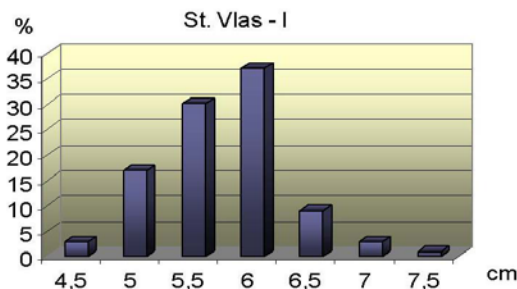


Fig. 2. Size composition of *M. galloprovincialis*, mussel field “St. Vlas” – trawl I

Average length (M) = 5.72 cm
Size composition = 4.5 – 7.5 cm
Yield = 280 kg
Other species = 6

Based on the catches in the mussels field it is calculated that this is the richest mussels field on the Bulgarian coast – with 25,111 tons.

Characteristics of the mussel field “St. Vlas”.

The mussel field is in depths from 17 to 27 metres in the Mytilus biocenose. The results are in Table 2.

Table 2

Results from the trawling for black mussels in mussels field “St. Vlas”

Trawl	Depth	Mussels/ yield/kg	Size composition (cm)	MI	Additional species
1	23	280	4.5–7.5	5.72	6
2	27	400	4.0–8.0	6.01	8
3	23	500	2.0–7.5	5.75	3
4	22	40	4.5–7.5	5.91	6
5	23	40	4.5–7.5	5.85	4
6	24	400	4.0–7.0	5.79	4
7	25	–	–	–	–
8	23	40	4.0–9.0	6.29	4
9	19	–	–	–	6
10	17	–	–	–	3
11	23	60	4.0–7.5	5.91	7

The extraction quantities for 15 minutes trawling vary from 0 to 500 kg. The average catch is 160 kg. The size composition of the mussels varies from 2.0 to 9.0 cm. The average length from the separate catch varies from 5.72 to 6.29 cm, mostly are presented as the groups – 5.0–6.5 cm.

The calculated stock in the field was 13,935 tones.

Investigations of Chamelea gallina

Dredgings for *Chamelea gallina* in the Bourgas Bay are held in 4 fields – Harmanite, Golden Fish, Aheloi and Sunny Beach.

Characteristics of the field “Harmanite”. It is situated in the direction north-east north-south. The bottom is clean, covered with sand. The size composition of the industrial stock includes species with length from 15 to 28 mm (Fig.3):

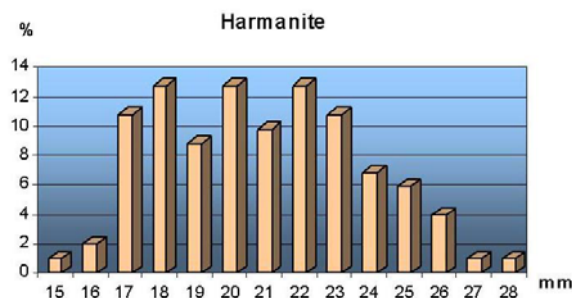


Fig. 3. Size composition of *Chamelea gallina*, field “Harmanite”

The majority is the length group with the size of 18, 20, 22 mm.

The main data for the field are:

- Size of industrial stock – 15–28 mm
- Other species – 10
- Total stock – 321 tons
- Industrial stock – 234 tons = 72% of total 321 tons

Characteristic of the field “Golden Fish”. It is situated in the direction north-south. The sand biocenose is developed to 12–13 m. The size com-

position on the industrial reserve of *Chamelea gallina* includes species from 16 to 32 mm (Fig. 4).

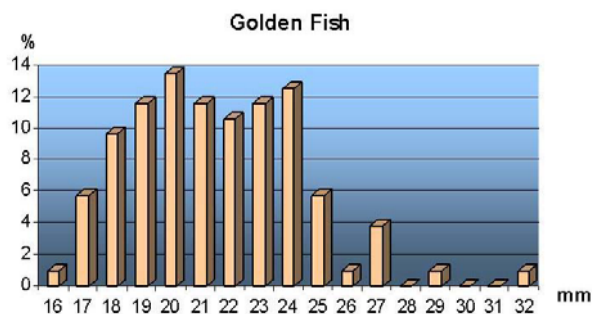


Fig. 4. Size composition of *Chamelea gallina*, field "Golden Fish"

The main data for the field are:

- Size of industrial stock – 16–32 mm
- Other species – 9
- Total stock – 311 tons
- Industrial stock – 224 tons = 72 % of total 311 tons.

Characteristic of the field "Aheloi". It is situated in the direction northeast-southwest. The bottom is sandy. The sand biocenose is developed to 12 m depth. The size composition of the industrial stock includes species with length of 13–25 mm (Fig. 5).

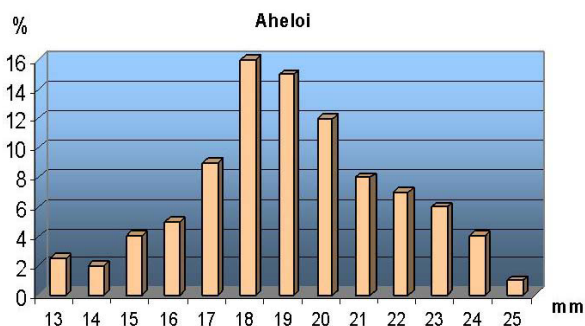


Fig. 5. Size composition of *Chamelea gallina*, field "Aheloi"

The majority is the length group with the size of 16, 17, 18 and 19 mm

The main data for the field are:

- Size of industrial stock – 13–25 mm
- Other species – 9
- Total stock – 294 tons
- Industrial stock – 213 tons = 72 % of total 294 tons.

Characteristics of the field "Sunny Beach". It is situated in direction east-west. The sand biocenose is developed to 15 m depth. Size composi-

tion of the industrial stock includes species from 14 to 28 mm.

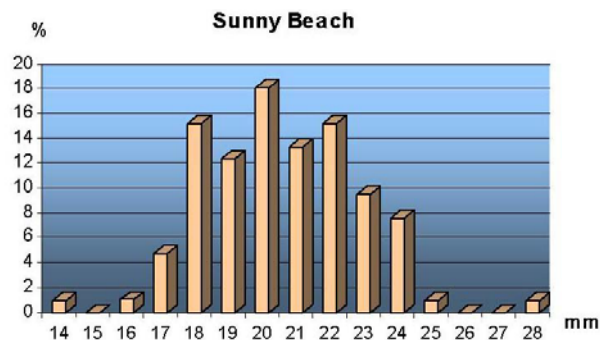


Fig. 6. Size composition of *Chamelea gallina*, field "Sunny Beach"

The majority is the length group with the size of 18, 20, 22 mm.

The main data for the field are:

- Size of industrial stock – 14–28 mm
- Other species – 12
- Total stock – 563 tons
- Industrial stock – 411 tons = 70 % of total 563 tons.

4. CONCLUSIONS

The reserve of the black mussels (*Mytilus galloprovincialis*) is determined in both fields after the full distinction of the sea snail *Rapana venosa* in the 70s of the last century;

The fields of *Chamelea gallina* in the Burgas Bay are being characterized as their total and industrial stock has been calculated;

The colonies are big; the distances are not too far away from the seashore, which makes the mussel fields for the black mussels and *Chamelea gallina* financially beneficial for exploitation.

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