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SPATIAL DISTRIBUTION, DIMENSIONAL-MASS AND AGE STRUCTURE OF DAB OF THE GLOSS *PLATICHTHYS LUSCUS* POPULATION OF SHABOLATSK LIMAN

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Шаболатський лиман розташований в північно-західному Причорномор'ї та відноситься до типу напіввідкритих, солонуватоводних лимано-лагун.
З середини XX сторіччя в гідроекосистемі лиману відбувалися значні зміни, які призвели до суттєвої трансформації біоти водойми.
Мета дослідження полягала у з'ясуванні змін просторового розподілу, розмірно-масової і вікової структури популяції камбали глосі Platichthys luscus Шаболатського лиману.
Досліджувалися склад і популяційна структура іхтіоценозу Шаболатського лиману, біолого-екологічні характеристики найбільш масових видів риб на прикладі камбали глосі.
Проведені дослідження просторового розподілу популяції камбали глосі Platichthys luscus Шаболатського лиману показали, що глось нагулюється по всій акваторії лиману, але в осіннє-зимовий період збирається в ослоненій, глибоководній південно-західній частині лиману.
Проведені дослідження розмірно-масової і вікової структури популяції Platichthys luscus Шаболатського лиману дозволили встановити, що, як і в попередній період, популяція була представлена п'ятьма віковими групами, але частка риб старшого віку зменшилась.
Розмірно-масові показники і вгодованість камбали знизились. Встановлено, що втрата значної частини нерестового стада в 1992 р., опріснення і погіршення кормової бази привели до стійкої депресії популяції камбали в лимані в наступні роки.
Враховуючи харчові уподобання Platichthys luscus (основу харчування глосі складають молюски, ракоподібні і риба (бички і атерина)), при формуванні полікультури в Шаболатському лимані, можна рекомендувати камбалу глосу, як одного із основних споживачів зообентосу, що не вступає в харчову конкуренцію з іншими видами риб
Ключові слова: *Шаболатський лиман, формування іхтіоценозу, камбала глось, популяція, вгодованість, маса*

1. Introduction

A series of saline-water limans – high-productive ecosystens with a great nature protective, economic and recreational value is situated between Danube and Dniester.

One of most known limans, located between Danube and Dniester, is Shabolatsk (Budaksk) one that relates to the type of semi-open, saline-water liman-lagoons. Climatic conditions, morphometric characteristics of the basin, connection with adjacent sea and freshwater areas determine the uniqueness of its hydrologic-hydrochemical regime, provide formation of the ecosystem that differs by the great biological diversity and productivity [1].

2. Literary review

Results of the transformation of natural ecosystems of the Shabolatsk liman under the effect of anthropogenic factors (connection with adjacent water areas, salinity of waters, pollution, acclimatization and so on) affected the composition of ichthyocenosis, change of main population characteristics of most mass types [1, 2].

Dab gloss together with gobies and grey mullet always occupied an important place in the Shabolotsk liman trade. The gloss population, able to self-recreation, formed in this basin. But the influence of the complex of unfavorable factors on the gloss population is extremely high that just determines the population condition of this specie and its number [6].

The structure of the dab gloss population in the liman and its main biological characteristics mainly allow to judge about its ecological condition and nutrition parameters, and fatness of fishes gives a possibility to estimate fattening conditions and to construct the model of using this specie in the poyculture at pasturable breeding [2, 3].

3. Aims and tasks of the article

The aim of the work was in explaining changes of the spatial distribution, dimensional-mass and age structure of the population of dab gloss *Platichthys luscus* in the Shabolatsk liman.

The following tasks were set for attaining this aim:

1. To analyze regularities of forming the dab gloss population, depending on: water salinity, connection with adjacent water areas, acclimatization and introduction of fishes, anthropogenic load;

2. To establish the features of spatial distribution of the population *Platichthys luscus* in the basin water area;

To study the dimensional-weight and age structure of the dab gloss population.

4. Research materials and methods

The research object was dab gloss (*Platichthys luscus*). The ichthyological material was collected in the peri-

od from 2009 to 2012 in all year seasons. The accounting of dab distribution and number in the liman water area was conducted visually (using a mask and a tube) and using fry scrapers.

For collecting the ichthyological material, there were used industrial fishing devices (triple dragnets, nets, scrapers). Representative samples were taken (25–50 ind.) [4]. Fishes were subjected to the complete biological analysis. There were determined: sizes, mass of a carcass, sex and maturity stage of sexual products, fatness and other parameters [4]. Samples were taken for determining age. It was determined by otoliths. The collected material was statistically processed [5].

The material for the studies was taken from industrial fishing devices in spring, summer and autumn periods of 2009–2012. The methods of taking representative average samples were used [4].

5. Research results and their discussion

The population of dab gloss in the Shabolatsk liman occupies the most saline and deep-water Southern-Western part of the basin (Fig. 1).

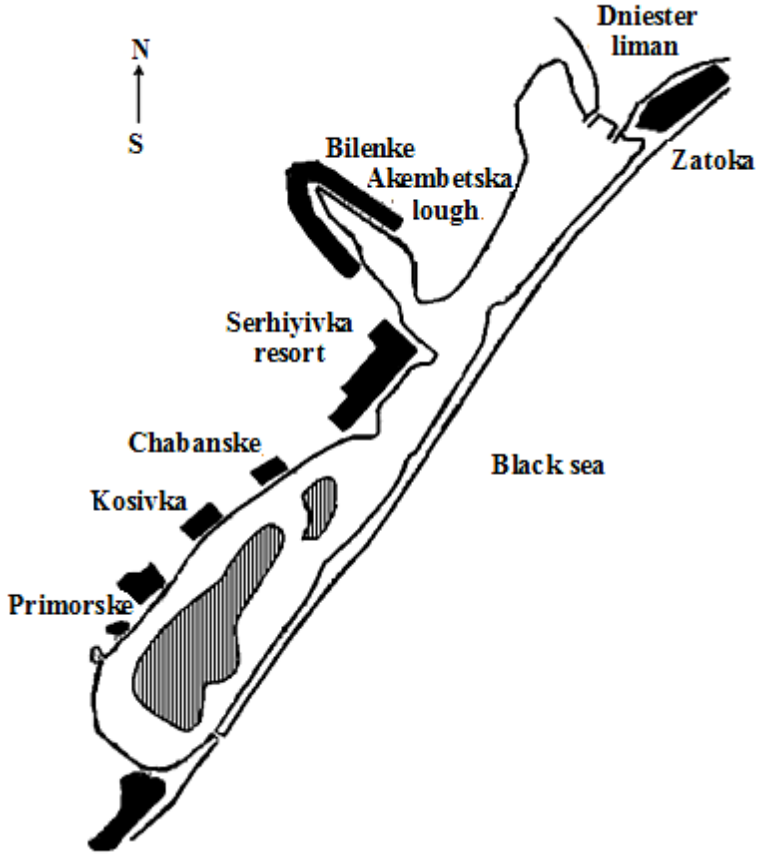

Fig. 1. Spatial distribution of the gloss population in the Shabolatsk liman in 2009–2012

In the spring-summer period the main mass of sires and fish of elder age groups concentrates there. In the autumn-winter period gloss spreads along almost the whole Southern-Western part of the liman (to the Serhyiv bridge) in the saline water area. Young fishes from March to November concentrate mainly in shoal water (depth to 1 m) along the sea tongue of land from v. Kurortne to the Serhyiv bridge.

The districts, presented on Fig. 1, are of the depth up to 2–2.5 m, due to that there is observed inessential stratification of temperature (±0.5–1.4 ^{o}C) and salinity (±1.3–2.5 ‰) of waters. At that desalination of the liman in the last years resulted in worsening of conditions for dab recreation.

It has been established experimentally, that gloss roe can be impregnated in the salinity diapason from 7 to 32 ‰, but embryogenesis takes place normally only at the salinity no less 15–16 ‰ , but such conditions form not often in the Southern-western part of the liman in the last time.

The mass death of dab in 1992 essentially influenced its population decrease.

In June of 1992 the total stuffiness was observed in the liman. The analysis of the type of stuffiness zone spread and quantitative distribution of dead fish (Fig. 2) testified that an unknown substance could come in the liman near the Serhyiv bridge, then it could spread along the whole Southern-Western part of the liman that caused the mass death of fish [6].

The great amount of dead fish was observed on the banks and bottom in the littoral zone of the basin. It was mainly goby (98 %), gloss and silversides (2 %). The total amount of dead fish was approximately estimated as 75–90 t.

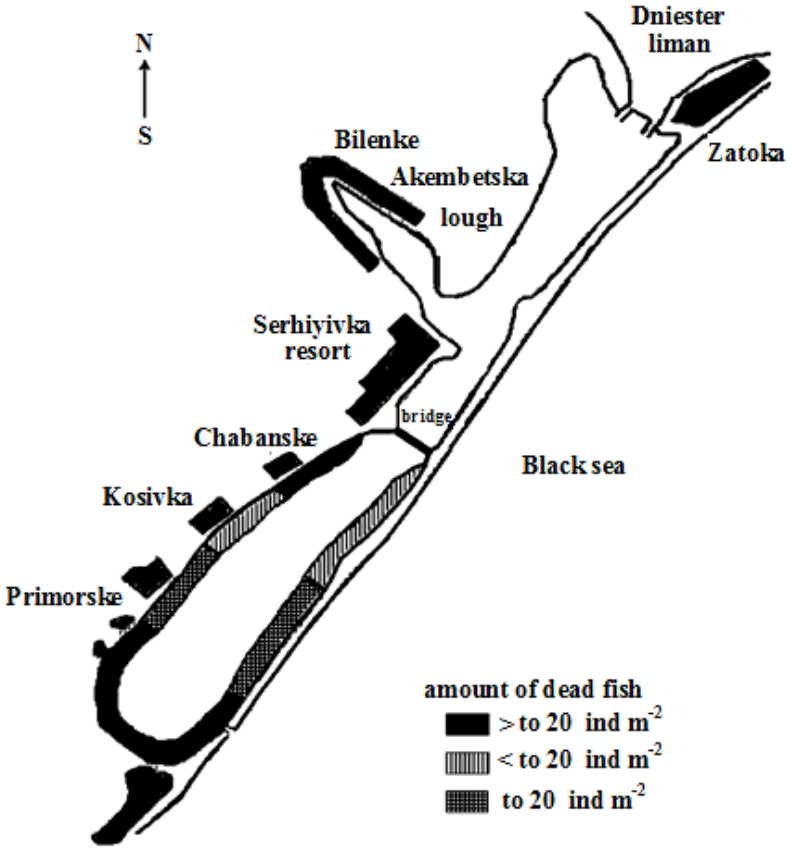

Fig. 2. Scheme of the quantitative distribution of dead fish in the stuffiness zone as a result of the catastrophe of 1992 [6]

According to existent estimations, no less 1.5–1.8 t of gloss died in that time in the liman (some fishes could stay on the bottom in the deep-water part of the liman). It was mainly young fishes (60–70 %), two- and three year old individuals (30–40 %) that is the essential part of "repair" that must refill the mother herd of gloss in the liman in 1995–1997. Thus, the reduction of the gloss mother herd, experienced from 1995, together with unfavorable environmental conditions (desalination and worsening of provision with natural fodders) resulted in the long and stale depression of the population.

The gloss population in the liman in the period of our studies, from March to November of 2009–2012 was presented by five age groups. One-year old individuals were 10.0–16.5 %, two-year old ones – 20.0–25.0 %, three-year old ones – 59.7–65.5 %, four-year old ones –5.0–8.4 %; five-year old ones – 1.2–2.0 %. The modal group – 50.5 % was formed by three-year old individuals (Fig. 3).

In 80-ies of XX century three- and four-year old individuals prevailed in the gloss population of Sabolatsk liman 35.0 % and 55.0 %, and a share of five-year old individuals didn't exceed 5 % [7].

Thus, although the gloss population in the basin was presented by the five-year old groups, like in previous years, its structure in 2009–2012 changed. A share of fishes of older age groups (sires) decreased that may testify to its difficult status and bad recreation conditions.

The gloss population in the Milk liman in 60-ies of XX century was presented by the five age groups. Four-year old individuals prevailed (near 80 %), and in 1997–2000 – five-year old ones [8. 9], that may testify to its satisfactory status in this basin, but the decrease of a share of spawning herd refilling causes bother.

The changes of the age population structure, observed in the liman, may be connected with desalination and essential elimination in 1992, and in the Milk liman, on the contrary, with complete isolation from the sea and salinity growth. In both cases the described changes had a negative character and resulted in worsening reproduction conditions and disturbing the population structure, and finally in decreasing the population number.

Two forms of gloss: sea and liman *Platichthys luscus* live in the Azov-Black Sea basin. The sea form differs by a bit more sizes and some stable plastic signs: wider tail fin, prolonged tail stem, shortened spine and anal fins with a less number of radiuses and so on [10].

Young gloss fishes from the sea can come to the liman, and at spontaneous ruptures in the sea tongue of land, a share of gloss can come to the sea from the liman in the summer period. It is expected, that sea and liman gloss forms are not mixed, even living in the same water areas that explain stable differences between their plastic and meristic signs [11].

Differences in the growth of gloss from different water areas (Fig. 4) may be connected with different living and nutrition conditions (food provision).

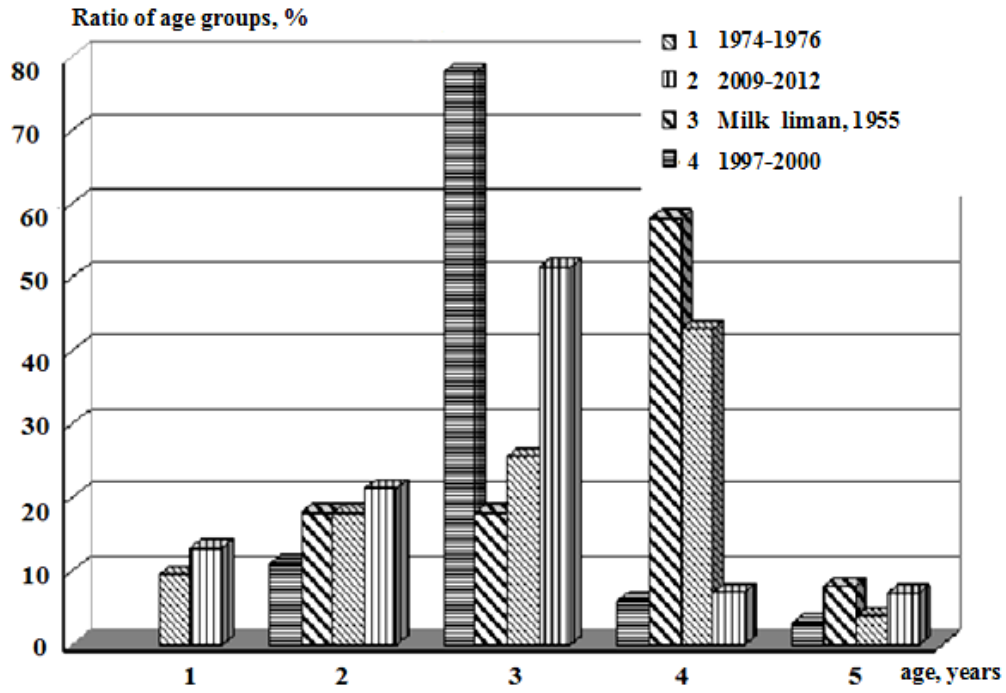

Fig. 3. Ratio of age groups in the dab gloss population in the Shabolatsk liman:
1 – 1974–1976 [7]; 2 – 2009–2012 (own data); 3 – Milk liman 1955 [8]; 4 – 1997–2000 [9]

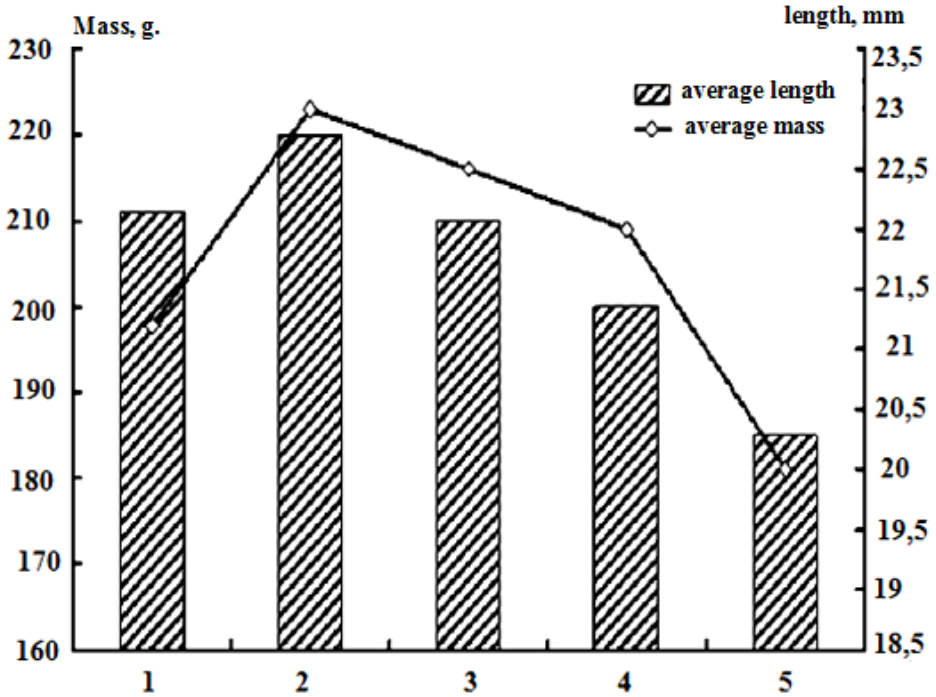

Fig. 4. Average indices of three-, four-year old individuals of gloss (industrial catches): 1 – Milk liman [9];
2 – Tuzla limans [7]; 3 – Tiligul liman [12]; 4 – Shabolatsk liman 1976 [7]; 5 – 2009–2012 own data

Maximal sizes – 36–38 cm were inherent to Black Sea gloss. In Azov sea it reached length 30–40 cm, and in limans of the Azov-Black Sea basin – 24–27 cm. The mass of gloss in the sea sometimes exceeded– 400 g, in the limans – 300 g [13, 14].

Gloss from the Tiligul and Tuzla limans differed by the most sizes and mass (Fig. 4).

The dimensional-mass indices of the population from the Shabolatsk liman in 2009 practically didn't differ from ones in 2011–2012 that may testify to the rather stable status of the population in the liman (Table 1).

The fatness of fishes in the Shabolatsk liman in the studied period was maximal in April-May. In average it was 2.11 (*QF*) and 1.89 (*Qc*) for sexually mature fishes

of both sexes. Till autumn their fatness decreased (*Qf* – 1.77 and *Qc* – 1.64). The fatness of males in the spring period was lower than in females *QF* – 2.02 (1.89–2.15) and *Qc* – 1.78 (1.55–1.84) and 2.18 (2.11–2.21) and 1.98 (1.77–2.00) respectively.

Females prevailed in the population of the Shabolatsk liman in 2009–2012 – 56 %. The analogous indices were obtained in 1976 and 1989 (♀♀ – 55; ♂♂– 45 %) [10]. In the Tuzla gloss population the ♂♂:♀♀ ratio was near 1:1 [7]. Sizes and mass of females of all age groups were reliably lower than in males (P>0.98) (Table 2).

In January and at the beginning of February up to 75 % of females and more 80 % of males in the Shabolatsk liman had gonads at the final IV; IV-V maturity stage, and near 15 % of males at the V maturity stage. From 20–25.02 to 20–25.03 gonads of 65–75 % of females and testicles of 80 % of males were at the V maturity stage. In this period mass spawning takes place at water temperature 3–9 ºC. 30–35 % of females and 10–15 % of males usually finish spawning till 15–25 of March.

Their gonads transform to the VI–II stage. Spawning is completely over in March–April.

Table 1

Dimensional-mass composition of gloss of the Shabolatsk liman in 2009 and 2011–2012

Age	0+		1+		2+		3+		4+	
Parameters	Cp.	min-max	Cp.	min-max	Cp.	min-max	Cp.	min-max	Cp.	min-max
2009										
Length (L), cm	3.4	1.5–5.7	8.6	6.4–12.6	11.6	10.5–15.6	15.5	11.5–20.0	19.5	16.6–21.0
Mass (W), g	4.5	2.5–8.5	20.2	6.7–42	55.0	15–135	115.5	30.0–170	170	140–205
2011–2012										
Length (L), cm	3.0	1.5–6.0	9.2	6.5–13.0	12.5	10.5–16.2	15.0	13.7–21.5	20.0	17.6–20.5
Mass (W), g	4.0	2.0–7.5	19.8	6.7–45	61	19–140	110.0	40–188	180	135–200
L av, cm	3.2	1.5–6.0	8.9	6.4–13.0	12.0	10.5–16.2	15.3	11.5–21.5	20.0	16.6–23.2
W av, g	4.3	2.0–8.5	20.1	6.7–45.0	58.0	15.0–140.0	112.3	30–188	175	135–255

Table 2

Size-mass indices of males and females of dab gloss in the Shabolarsk and Tiligul limans

Parameters	Age				Source
	2	3	4	5	
Males ♂♂					
L±m, cm	15.5±1.2	17.0±1.1	19.8±1.7	20.3±1.2	Shabolatsk liman.
W±m, g	111±9.1	167±32	201±41	247±63	2009–2012.
L av, cm	13.8	18.2	23.5	24.0	Tiligul liman.
W av, g	48.0	96	267	295	1980
Females ♀♀					
L±m, cm	16.5±0.9	19.4±1.4	21.3±1.2	22.5±1.1	Shabolatsk liman.
W±m, g	121±11.1	192±22	225±32	267±55	2009–2012
L±m, cm	19.4	22.6	25.3	28.0	Tiligul liman.
W±m, g	192	218	320	385	1980

At the end of April 95 % of males and up to 85–87 % of females had sexual glands in the after-spawning condition (stages VI-II). Gonads of 10–15 % of females are at the stage of resorption. In abnormally warm years and at desalination of the Southern-Western part of the liman, their share grew to 15–22 %. In September–November more than 75 % of males and females had gonads at the II and II-III maturity stages.

Under conditions of abnormally warm winters and absence of ice formation in the last years, there is observed the shift of terms of the beginning and end of spawning by 7–12 days, comparing with1970-1980 of the previous century.

6. Conclusions

1. The gloss population occupies the most saline and deep-water part of the Shabolotsk liman. The loss of the essential part of the spawning herd in 1992, desalination and worsening of the fodder base resulted in the stable depression of the dab population in the following years.

2. The gloss population in the liman in the period of our studies (2009-2012) was presented by the five age groups like in the previous years. The modal group – 50,5 % was formed by three-year old individuals. A share of fishes of older age groups (sires) decreased, comparing with the previous period that may testify to its difficult status and bad recreation conditions.

3. Dimensional-mass indices of gloss of the Shabolatsk population in the studied period were lower than in 1970 years of the previous century. Females prevailed in the Shabolatsk liman population in 2009-2012 – 56 %, their sizes and mass were higher than in males.

4. Taking into account food inclinations of Platichthys luscus, at forming the polyculture in the Shabolatsk liman, dab gloss may be recommended as one of main consumers of zoobenthos that doesn't come in food competition with other fish types.

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