

The Taxonomic Characteristics of The Fish Fauna of The Middle - Amur in Comparison With The Freshwater Fish Fauna of Some Areas of The Far East of Russia

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Abstract

The article presents the *taxonomic* characteristics of a fish fauna of the *middle* Amur and of some areas of the Far East: the next sites of a river basin the Amur, lake Khanka, the rivers of coast of Primorski Krai and northwest Sakhalin, Chukotka. For the first time attempt of the comparative analysis of structure of a fresh-water fish fauna of various territories of the Far East region of Russia is undertaken.

Keywords: fishes, species, river, representation, generality, basin, area.

Introduction

The water system of the Jewish Autonomous region (JAR) is represented by the South bend of the middle Amur river and the network of its left tributaries. As in the rest of the Amur fish fauna, here the Sino-Indian by origin of taxa are dominated (Cypriniformes, Siluriformes, etc.), the Palearctic species of fish (Esociformes, Salmoniformes, etc.). From the Sino-Indian taxa in the fish fauna the most numbers of fish represented by the group of the fish species of the Chinese plain. The freshwater fish fauna of territories of the Russian Far East, representing the basins of the Pacific and Arctic oceans connected with the Amur fish fauna. It is either a widespread throughout the Far East of a number of species in past geological epochs (tertiary fish fauna, boreal ichtiocomplex, etc.), or secondary area of distribution of some species of fish from the basin.

The purpose of this article is comparison of data available today about structure of a fish fauna of various territories of the Far East region of Russia and a fish fauna of the Jewish autonomous region, identification of a filogeniya and degree of similarity of fish fauna of various territories.

Study Area, Material, Methods

From 2001 to 2012 we studied taxonomical structure of a fish fauna in the river basin of an middle watercourse of Amur in the Far East of Russia, in the Jewish autonomous region.

Methods of work were field route and stationary researches, ichthyological control fishing, a method of direct supervision in the nature. When studying specific structure determinants of fresh-water fishes and vertebrate animals of fauna of the USSR were used.

When writing article the analysis of the scientific data published by the Russian scientists on a fresh-water fish fauna of the Far East of Russia was carried out: Amur River, rivers of Primorye, Sakhalin, Chukotka.

Systematic groups are given according to the book of N.G. Bogutskaya, A.M. Naseki «The catalog Cephalaspidomorphi and fishes of fresh and saltish waters of Russia with nomenclature and taxonomical comments».

Results and Discussions

At the present time within the limits of the Jewish Autonomous region is inhabited by the representatives of 12 units of fish and fish-shaped: Petromyzoniformes - 1 family, 1 genus, 2 species; Acipenseriformes - 1 family, 2 genera, 2 species; Cypriniformes - 3 family, 41 genera, 61 species; Siluriformes - 2 family, 3 genus and 6 species; Esociformes - 1 family, 1 genus, 1 species; Ocmeriformes - 1 family, 1 genus, 1 species; Salmoniformes - 3 family, 5 genera, 7 species; Gadiformes - 1 family, 1 genus, 1 species; Beloniformes - 1 family, 1 genus, 1 species; Gasterosteiformes - 1 family, 1 genus, 1 species; Scorpaeniformes - 1 family, 2 genera, 2 species; Perciformes 6 families, 7 genera, 7 species.

In General ichthyological diversity of the middle Amur river in the JAR are widely presented. There are 22 from 25 families in the Amur basin, presented by 66 genera, 92 species of fish (table. 1). This is 74.2% of the species diversity of fish in the basin of the Amur.

For the comparative analysis of the taxonomic structure of fish fauna of JAR we show the data of the fish fauna of the neighbouring plots of the Amur basin - Zeisky reservoir with the adjoining plot of the river Zeya is in the West, Amur river is near the Komsomolsk nature reserve in the East, the lake Khanka in the southern plot of the Amur basin (table. 1).

Naturally, that in the fish fauna of the reservoirs of JAR are not represented the marine and brackish water species of mullet-mullet *Mugil cephalus* (family Mugilidae) and the starry flounder *Platichthys stellatus* (family Pleuronectid) marked on the lower Amur. It is not confirmed the presence of a representative of the family Salangidae - *Protosalanx hyalocranius* (noodles-fish). Other families are also unequally presented, both the quantity of births, and in the species composition.

The fish fauna are represented by seven groups of fish and fish-shaped (Cyclostomatae), which differ historical and geographical origin. The main group of fish – the Chinese plain complex, includes 43 species, representatives of Cyprinidae, Balitoridae, Cobitidae, which is about 47% of all the species of fish living in JAR. The representatives of the boreal fauna are the second by the quantity of species group (18 species), the ancient tertiary fauna is well represented by 16 species of fish. In addition, there are the inhabited by the representatives of South Indo-African fauna (7 species), Northern fresh-Arctic complex (3 species), Pacific ichthyocomplex (3 species), and marine origin (2 species) water basins.

The quantity of submitted species of fish (92) in the fish fauna of JAR is more than the quantity of fish which are in the fish fauna of basic sites of the Amur basin, because on the compacted area of the region lives the majority of representatives of cold water, and heat-loving groups of the Amur fish fauna. The fish fauna of JAR is inferior to the number of families to the river fish fauna of the coast of the Primorsky territory (table. 2). In Primorye is represented fish fauna the number of euryhalinous species and genera of fish of the families of the Salangidae, Gadidae, Belonidae, Hemirhamphidae, Mugilidae, Syngnathidae, Sebastidae, etc. A number of families (Salmonidae, Ocmeridae, Cyprinidae, Gobiidae) is represented also in the fauna of Primorye by the species and genera euryhalinous and anadromous fish (shem, humpback salmon, sakhalin taimen, red-eye, gobies-rings set, etc.), which are not occurring in JAR. However, in the coastal rivers there are less species of fish of one of the main families of the fishfauna of the Sakhalin and the Amur fish fauna in general - Cyprinidae. Naturally, by representation of families and genera the species composition the fish fauna of JAR sharply differs from the fish fauna of the most distant area of The Far East, Chukotka.

To identify the degree of similarity of the species composition of fish fauna of JAR and freshwater fish fauna of the other regions of the Far East of Russia, we used the formula of community by Jacquar:

$$K = C \times 100 / (A + B) - C$$

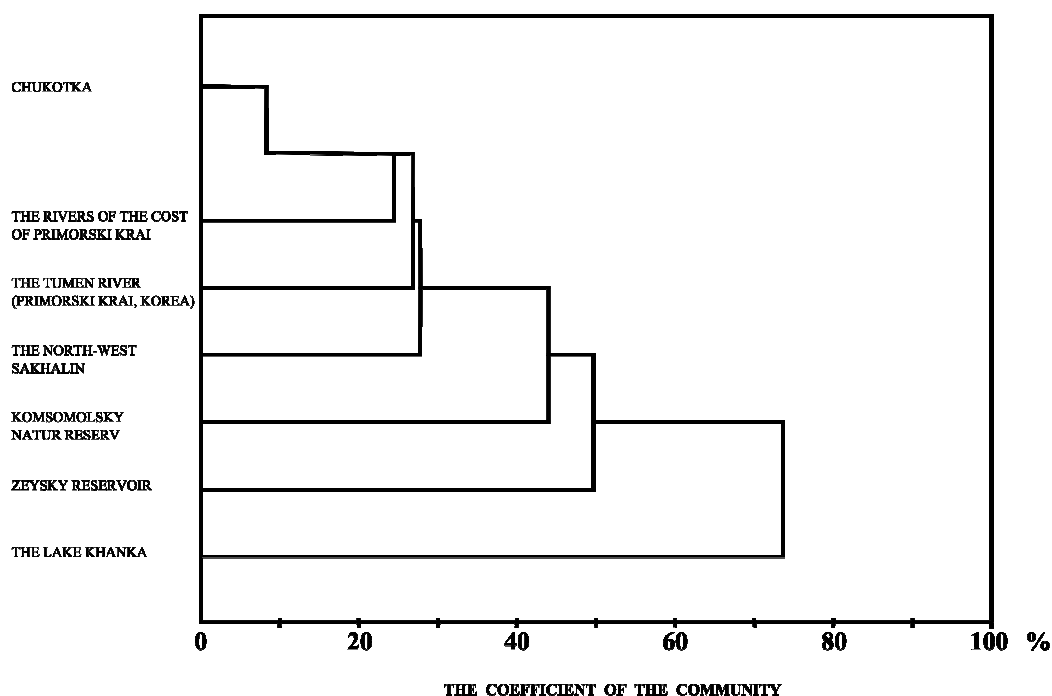
where

A is the number of the species in the fish fauna of the first region (in our case - JAR);

B is the number of species in the fish fauna of the other region;

C is the number of species for both regions;

K is the coefficient of community (index Jacquar), used in a percentage. The higher the community, the higher the similarity of the two species compared communities.



Picture 1. Dendrogram of community of species composition of fish fauna of a number of areas of the Far East with the fish fauna of the Jewish Autonomous region on the index Jacquar (100% is the value of K for JAR).

The fish fauna of the lake Khanka is the most close to the provided in JAR fish fauna of the southern bend of the Amur river (table. 3; pict. 1), both by the number of taxa, and by the species composition. The coefficient of the taxonomic similarity is 73.5 percent. In this warm water body of the Russian part of the Amur basin also dominates a group of the fishes of the Chinese plain ichtiocomplex. In more Northern areas of the Amur basin (Zeysky reservoir, the average flow of the river Zeya, Komsomolsky nature reserve) the composition of the fish fauna is poorer in the representation of genera and species in the families. The species of the boreal plain the boreal foothill ichtiocomplexes are dominated. The further thee areas from the river basin Amur, the lower is coefficient K of the generality of the local fish fauna with fish fauna of JAR (table. 3).

By the taxonomic structure and by the representation of the species on to the Amur fish fauna is close enough the fish fauna of the rivers of Primorye coast and the North-Western Sakhalin, as well as the depleted fish fauna of Amur river and supplemented by some evrigaline species (saltish waters species) of the Pacific coast (table. 2, 3).

Table 1 Total Number of Families, Genus And Species Cephalaspidomorphi And Fishes of Amur River, Reservoirs of The Jewish Autonomous Region and Other Sites of The Basin of The Amur River

№	Family	Amur fish fauna of Russia (25 families)		Jewish Autonomous region (22 families)		Zapysky reservoir (16 families)		The lake Khanka (18 families)		Komsomolsky nature reserve (17 families)	
		Number of genus	Number of species	Number of genus	Number of species	Number of genus	Number of species	Number of genus	Number of species	Number of genus	Number of species
1	Petromyzonidae	1	2	1	2	1	2	1	1	1	1
2	Acipenseridae	2	2	2	2	2	2	2	2	2	2
3	Salmonidae	4	11	3	4	2	3	4	5	3	4
4	Coregonidae	1	4	1	2	1	2	1	1	1	1
5	Thymallidae	1	5	1	1	1	1	1	1	1	1
6	Osmorhiza	2	3	1	1	1	1	-	-	-	-
7	Salangidae	2	2	-	-	-	-	1	1	-	-
8	Esocidae	1	1	1	1	1	1	1	1	1	1
9	Cyprinidae	35	55	35	49	16	23	34	53	19	22
10	Balitoridae	2	4	2	3	1	1	2	2	-	-
11	Cobitidae	4	8	4	9	2	3	3	4	2	2
12	Bagridae	2	4	2	4	2	2	2	5	2	3
13	Siluridae	1	2	1	2	1	1	2	2	1	1
14	Lotidae	1	1	1	1	1	1	1	1	1	1
15	Mugilidae	1	1	-	-	-	-	-	-	-	-
16	Adrianichthyidae	1	1	1	1	-	-	-	-	-	-
17	Gasterosteidae	2	5	1	1	-	-	1	2	1	1
18	Cottidae	3	4	2	2	2	2	-	-	1	1
19	Percichthyidae	1	1	1	1	1	1	1	1	1	1
20	Percidae	2	2	1	1	-	-	1	1	1	1
21	Osphronemidae	1	1	1	1	-	-	-	-	-	-
22	Odontobutidae	2	2	2	2	1	1	1	1	1	1
23	Gobiidae	2	4	1	1	-	-	1	1	-	-
24	Channidae	1	1	1	1	-	-	1	1	1	1
25	Pleuronectidae	1	1	-	-	-	-	-	-	-	-
Total:		76	128	66	92	36	47	60	85	40	45

Table 2: Total number of families, genus and species cephalaspidomorphi and fishes of fresh waters of northwest sakhalin, primorye, chukotka

№	Family	Rivers of the North-West of the Sakhalin (24 families)		Rivers of the Primorye coast (34 families)		The Tumen river (15 families)		Freshwaters of Chukotka (16 families)	
		Number of genus	Number of species	Number of genus	Number of species	Number of genus	Number of species	Number of genus	Number of species
1	Petromyzontidae	1	5	1	2	1	2	1	3
2	Acipenseridae	-	-	1	1	1	1	1	1
3	Clupeidae	1	1	2	3	-	-	1	1
4	Salmotracheidae	5	11	4	8	3	5	4	13
5	Coregonidae	1	1	1	1	-	-	3	11
6	Thymallidae	1	1	1	2	-	-	1	3
7	Osmeridae	3	5	3	5	3	3	3	3
8	Salangidae	-	-	1	1	1	1	-	-
9	Esocidae	1	1	1	1	-	-	1	1
10	Dallinidae	-	-	-	-	-	-	1	3
11	Cyprinidae	11	18	14	17	16	20	3	4
12	Carostomidae	-	-	-	-	-	-	1	2
13	Belontiidae	2	2	2	2	2	2	1	1
14	Cobitidae	2	3	2	2	2	4	-	-
15	Bagridae	1	1	2	2	-	-	-	-
16	Siluridae	1	1	1	2	1	1	-	-
17	Gobiidae	1	1	1	1	-	-	-	-
18	Labiidae	1	1	-	-	-	-	1	1
19	Belontiidae	-	-	1	1	-	-	-	-
20	Hemirhamphidae	-	-	1	1	-	-	-	-
21	Mugilidae	1	2	1	2	1	1	-	-
22	Gasterosteidae	2	4	2	4	1	1	2	3
23	Syngnathidae	-	-	1	1	-	-	-	-
24	Selaciidae	-	-	1	1	-	-	-	-
25	Cottidae	4	5	3	6	1	3	1	2
26	Lipariidae	-	-	1	1	-	-	-	-
27	Blepharidae	1	1	-	-	-	-	-	-
28	Percichthyidae	1	1	1	1	-	-	-	-
29	Percidae	-	-	1	1	-	-	2	2
30	Sparidae	-	-	1	1	-	-	-	-
31	Sichanidae	-	-	1	1	-	-	-	-
32	Cryptacanthodidae	-	-	1	1	-	-	-	-
33	Pholidae	1	1	2	2	-	-	-	-
34	Odonobolidae	1	1	1	1	1	1	-	-
35	Gobiidae	2	3	6	12	6	8	-	-
36	Zoaridae	1	1	-	-	-	-	-	-
37	Channidae	-	-	1	1	1	1	-	-
38	Pleuronectidae	2	2	2	2	-	-	-	-
39	Tetraodontidae	-	-	1	1	-	-	-	-
Total:		49	73	66	79-12*	41	54	27	64

* - in fauna of the rivers of the coast of Primorye it is registered 79 native and 12 introduced species of fish (Shedko, 2001).

Table 3. The representation of the common taxa in the fish fauna of the JAR and the other regions of the Far East of Russia

Regions Taxa	<i>Zeysky reservoir</i>	<i>The lake Khanka</i>	<i>Komso- molsky nature reserve</i>	<i>Rivers of the North-West of the Sakhalin</i>	<i>Rivers of the Primorye coast</i>	<i>The Tumen river</i>	<i>Freshwaters of Chukotka</i>
Units	9 (100%)	9 (100%)	10 (100%)	9 (56,3%)	10 (62,5%)	8 (88,9%)	8 (80%)
Family	16 (100%)	18 (100%)	17 (100%)	17 (70,8%)	19 (55,9%)	13 (86,7%)	13 (81,3%)
Genus	36 (100%)	56 (93,3%)	38 (97,4%)	29 (59,2%)	30 (45,5%)	25 (61%)	13 (48,1%)
Species	46 (97,9%)	75 (88,2%)	42 (95,5%)	36 (49,3%)	36 (39,6%)	31 (57,4%)	12 (18,8%)
Index Jacquar, K	49,5%	73,5%	44,2%	27,9%	24,5%	27%	8,3%

Conclusions

On the basis of the analysis of taxonomic proximity of the fish faunas of the numbers of areas of the Far East to the fish fauna of the middle Amur, we can distinguish three categories of areas:

1. The Areas, where the taxa are more than 80% in the fish fauna, the index of community species composition are 40% (Khanka, Zeysky reservoir and the adjacent area of the river Zeya, Amur in area of the Komsomolsky nature reserve);

2. The Areas, where the taxa are more than 35% in the fish fauna, the index of community species composition are 20% (the Tumen river and other rivers of the Primorye coast, the rivers of the North-West of the Sakhalin island);

3. The Areas, where the index of community species composition are 10%. (freshwaters of Chukotka).

In the first category, the differences in taxonomic structure are caused by the environmental characteristics of the habitats, because there are no the natural obstacles for fish distribution between sections of the basin. The fish fauna of reservoirs of the districts of the second category has phylogenetic connection with the Amur fish fauna, which, obviously, applied in different historical epochs. In the fish fauna of the Tumen river there is a large Sino-Indian component, however, the representation of these groups of fish is smaller than in the Amur. In small rivers of Primorye the composition of the fish fauna is poorer and Sino-Indian species are represented less, because the range of ecological conditions of the water bodies do not allow the populations of many species of Amur fish exist productively. The least similarity of the fish fauna of JAR owing to the remoteness has with the freshwater fish fauna of Chukotka, here General are only some Palearctic and boreal taxa.

The specificity of the fish fauna of JAR is zoogeographic diversity. It is caused by the border geographical position of the region and the rich taxonomic representation. Comparison of the fish fauna of the southern area of the basin of the middle Amur river with fish fauna of the neighboring areas of the Amur basin and other regions by the degree of taxonomic proximity confirms I.A. Cherishnev's theoretical views. He supposed there was the settling of Sino-Indian component from the Amur basin in the basins of the southern part of the Far East of Russia.

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