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Article

On establishment of biological (zoological) reserves for conservation of aquatic biological resources and their habitat in the Sheksna and Rybinsk reservoirs

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Abstract. New specially protected natural areas (SPNAs) of regional significance, i.e. state biological (zoological) reserves "Spawning Grounds of Belozerye" and "Ramenye", have been established in waters of the Sheksna and Rybinsk reservoirs located within the boundaries of Vologda Oblast. In waters of both reserves, producers and the young of phytophilous fish (bream, pike, perch, roach, silver bream, etc.) are concentrated in the spring-summer period. Their share in catches implemented with fixed nets makes up 81–85% ("Spawning Grounds of Belozerye") and 81–96% ("Ramenye"). The area of flooded in spring overgrown sites, which are major spawning grounds for phytophilous fish species, reaches about 37.5 km^2, or 29.8% of the total protected area in the "Spawning Grounds of Belozerye" and 34.8 km^2, or 23.4% – in the "Ramenye" reserve. Taking into account the localization of spawning substrates, the boundaries of both SPNAs have been adjusted with further development of restrictions to be imposed on economic and other activities.

Keywords: spawning grounds, phytophilous fish, specially protected natural areas, SPNA, "Spawning Grounds of Belozerye", "Ramenye", Vologda Oblast

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Научная статья

О создании биологических (зоологических) заказников для сохранения водных биологических ресурсов и среды их обитания на Шекснинском и Рыбинском водохранилищах

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Аннотация. В акватории Шекснинского и Рыбинского водохранилищ в границах Вологодской области организованы новые особо охраняемые природные территории (ООПТ) регионального значения: государственные биологические (зоологические) заказники «Нерестилища Белозерья» и «Раменье». В акватории обоих заказников в весенне-летний период концентрируются производители и молодь фитофильных видов рыб: леща, щуки, окуня, плотвы, густеры и др., доля которых по численности в уловах ставными сетями составляет 81–85% (заказник «Нерестилища Белозерья») и 81–96% (заказник «Раменье»). Площадь участков с растительностью, заливаемых в период весеннего половодья, представляющих собой важнейшие нерестилища фитофильных видов рыб, в заказнике «Нерестилища Белозерья» составляет около 37.5 км^2, или порядка 29.8% от общей площади ООПТ, а в заказнике «Раменье» – 34.8 км^2 и 23.4% соответственно. С учетом локализации нерестовых субстратов внесены корректировки в окончательный вариант границ двух ООПТ и разработаны ограничения хозяйственной и иной деятельности.

Ключевые слова: нерестилища, фитофильные рыбы, особо охраняемая природная территория, ООПТ, «Нерестилища Белозерья», «Раменье», Вологодская область

Финансирование. Финансирование исследований по подготовке комплексного биологического обоснования создания двух рассматриваемых заказников в 2021 г. осуществлялось Департаментом сельского хозяйства и продовольственных ресурсов Вологодской области. Также использованы результаты многолетнего мониторинга водных биоресурсов и среды их обитания, выполнявшегося в 2002–2022 гг. в соответствии с государственным заданием Вологодского филиала ФГБНУ «ВНИРО» (ранее – Вологодского отделения ФГБНУ «ГосНИОРХ»).

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Introduction

In accordance with resolutions of the Government of Vologda Oblast dated April 18, 2022 No. 489[1] and August 29, 2022 No. 1077[2], new specially protected natural areas (SPNAs) of regional significance, i.e. state biological (zoological) reserves “Spawning Grounds of Belozerye” and “Ramenye” were established at the Sheksna and Rybinsk reservoirs (Fig. 1). The main goal of their creation was to preserve the most important spawning and feeding grounds of juvenile phytophilous fish in the lake part of the Sheksna Reservoir, i.e. Lake Beloye and Sheksna Reach of the Rybinsk Reservoir. For Vologda Oblast, it was the first experience in organizing such SPNAs for fishery purposes with the focus on conservation and reproduction of commercial species of aquatic biological resources.

This article summarizes the main results of the conducted research, which confirm the nature conservation status of the considered SPNAs[3].

[1] Decree of the Government of the Vologda Region dated April 18, 2022 No. 489 “On the creation of a specially protected natural area of regional significance of the state biological (zoological) reserve “Spawning Grounds of Belozerye”, reorganization of a specially protected natural area of regional significance, the complex (landscape) state natural reserve “Bolshaya Pokhta” and on amendments to the resolution of the Regional Government dated 06.06.2011 No. 633”.

[2] Decree of the Government of the Vologda Region dated August 29, 2022 No. 1077 “On the creation of a specially protected natural area of regional significance of the state biological (zoological) reserve “Ramenye”.

[3] The materials of the article were presented at the XV regional scientific and practical conference “Local History (natural history) research in the European North” dedicated to the 30th anniversary of the creation of the “Russian North” National Park.

Fig. 1. Location of SPNAs within the boundaries of Vologda Oblast. 1 – "Spawning Grounds of Belozerye" reserve on the Sheksna Reservoir; 2 – "Ramenye" reserve on the Rybinsk Reservoir.

Material and methods

The work is based on the long-term ichthyological investigations carried out in 2002–2022 by the Vologda Branch of FSBSI "VNIRO" in the basin of Lake Beloye, referred to a lake part of the Sheksna Reservoir, and on the Sheksna River, functionally connected with Sheksna Reach of the Rybinsk Reservoir. When preparing this publication, we used the materials of the Vologda Branch of FSBSI "VNIRO" on the dynamics and structure of catches, species composition and ecological characteristics of fish dwelling and breeding in the studied water areas. In May and August–September of 2021, additional ichthyological studies were performed to specify the peculiarities of fish distribution in waters of the established reserves during the season of spawning and feeding. Research catches implemented by means of fixed nets (mesh size: 20–65 mm) became the basis for collecting the ichthyological material, the collection and processing of which were made in accordance with standard generally accepted methods (Pravdin, 1966).

To assess the spawning potential of both reserves and determine the localization of main spawning substrates, the water area of SPNAs during floods and low water periods, including the periodically flooded

overgrown sites (identified from satellite images), were studied. Adjacent to the reservoirs and inundated during spring floods sites were digitised. Satellite images from the U.S. Geological Survey[4] (USGS) catalog were analysed after processing the remote sensing data. The water area of both reserves at the maximum water level (May–June 2020) was determined from Landsat-8 satellite images (LC08_L1TP_179018_20200615, LC08_L1TP_179018_20200523 and LC08_L1TP_179019_20200523) by calculating the mNDWI index (Xu, 2006), while at its minimum – from Sentinel-2 satellite images for August 2018 using the NDWI index (McFeeters, 1996). For Kovzhsky Flood (Razliv) of Lake Beloye, scenes T37VDG_20180801T090019 and T37VCG_20180801T090019, whereas for Sheksna Flood at Ramenye Island – scene T37VDF_20180801T090019 were used. Based on the same Sentinel-2 images for August, the overgrown area was calculated by means of the NDVI index (Rouse et al., 1973; Sakuno and Kunii, 2013; Oyama et al., 2015) and further compared with the data on field observations at control sampling sites in the littoral zone. The scheme for defining the boundaries of the flooded areas covered with vegetation and estimating the water level for the entire water area of Lake Beloye was earlier presented in more detail in (Filonenko et al., 2021).

Results and discussion

Reserve "Spawning Grounds of Belozerye"

In terms of total catches and commercial fish biomass, Lake Beloye has the highest fishery value among other Vologda fishery reservoirs (Konovalov et al., 2023). In recent years, about 41% of the total annual fish production in the region falls on this lake (Borisov et al., 2019). In 2021, the amount of total catches of aquatic biological resources here remained almost at the level of the previous year, being slightly lower than in 2017–2019 (approximately 593 tons for all types of fishing). In Lake Beloye and its basin, 35 species were recorded; 21 of them were found in commercial and recreational catches. Among them 13 phytophilous species were detected: bream *Abramis brama* (Linnaeus, 1758), zope *Ballerus ballerus* (Linnaeus, 1758), roach *Rutilus rutilus* (Linnaeus, 1758), silver bream *Blicca bjoerkna* (Linnaeus, 1758), golden crucian carp *Carassius carassius* (Linnaeus, 1758), common asp *Leuciscus aspius* (Linnaeus, 1758), ide *L. idus* (Linnaeus, 1758), bleak *Alburnus alburnus* (Linnaeus, 1758), tench *Tinca tinca* (Linnaeus, 1758), rudd *Scardinius erythrophthalmus* (L innaeus , 1758), carp *Cyprinus carpio* (Linnaeus, 1758), river perch *Perca fluviatilis* Linnaeus, 1758, common pike *Esox lucius* Linnaeus, 1758. Bream, pike, perch, roach and silver bream had the largest share in the catches. Their commercial biomass was about 40% of the total estimated commercial stocks of the reservoir.

In recent years, bream greatly dominated in biomass of commercial stocks and total catches of Lake Beloye. In 2012–2021, bream catches varied from 142 to 254 tons and its share in the total catch ranged within 19–38% that was noticeably higher than for other fish species. In 2017–2021, biomass of the commercial bream stock ranged as 862–1393 tons, and their share averaged about 20% of the total estimated for the main fish species of the reservoir. In net catches of 2021, fish with a length of 29–37 cm from generations 9+ – 10+ (distinguished by higher number compared to related generations) prevailed. The proportion of fish of these age groups made up 63%. Note that individuals of the productive generation of 2011 (10+), which dominated in catches in previous years, had a fairly high proportion. The share of roach (9.5%), perch (9.2%) and pike (3.4% of the total) in Lake Beloye was relatively high as well. Hence, phytophilous fish species are the most important representatives of the commercial ichthyofauna of the lake. Being a part of the "Spawning Grounds of Belozerye" reserve, its water area plays the key role in preservation and reproduction of fish stocks.

The "Spawning Grounds of Belozerye" reserve is located at the Sheksna Reservoir, including its lake part – Lake Beloye with a number of tributaries running through the territory of the Belozersky and Vashkinsky municipal districts of Vologda Oblast. After the Volga-Baltic waterway reconstruction and water rise in Lake Beloye as a result of the Sheksna Reservoir construction, in the northwestern part of the reservoir, i.e. in the estuarine parts of rivers Kovzha, Kema and Shola, a 10–12 km shallow flooding up to 5–6 km wide, the so-called Kovzhinsky (or Kovzhsky) Flood was formed. Besides, the estuarine Megra Flood and partially the water area of Lake Beloye were included in SPNAs, the total area of which made up about 126 km^2.

[4] USGS Global Visualization Viewer. Web page. URL: http://glovis.usgs.gov (accessed: 01.12.2022).

Ichthyological studies of waters of the “Spawning Grounds of Belozerye” reserve suggest that in research catches typical for Lake Beloye phytophilous fish, which spawn on vegetation in sites of flooding of rivers Kovzha, Kema, Shola and Megra, dominated. In spring and summer, producers of bream, pike, perch, roach, silver bream, etc. concentrate, spawn and then feed their larvae and baby fishes here. In 2021, the average share of phytophilous fish in terms of number in research catches with fixed nets (with different mesh spacing) during this period reached 81–85% and biomass –around 82–86% that clearly demonstrates high importance of waters of the created SPNA in conservation and reproduction of these fish species throughout Lake Beloye and its basin.

The Kovzhsky Flood is a vast shoal, where depths up to 2 m occur at 10800 ha occupying 67.9% of the water area (Papchenkov and Kozlovskaya, 2002). Therefore, this area is subject to temporary inundation during spring floods, unlike other floodplains adjacent to Lake Beloye. Because of small depths, this zone is strongly overgrown by terrestrial moisture-loving and aquatic plants. Inundated during spring floods sites with vegetation are the perfect spawning substrate for spawning phytophilous fish.

The water area within the reserve boundaries is about 59.0 km^2 at the minimum water level of the Sheksna Reservoir (Fig. 2) that usually occurs in summer low-water periods and at the end of summer (in recent years, it was noted in early August). At the maximum water level, the study water area of the reserve reaches about 88.1 km^2 (Fig. 2). The highest water level in the reservoir is usually recorded during spring floods (e.g. the last decade of May 2020). Thus, the area of the temporarily inundated floodplains here is about 29.1 km^2, or 23.1% of the total area of the reserve.

The sites with herbaceous and shrub plants inundated during spring floods occupy approximately 37.5 km^2, or 29.8% of the total area of the reserve (Fig. 3). Thus, the area of sites with vegetation slightly exceeds that of temporarily inundated floodplains. This is due to the fact that even during a period of summer low water, some vegetation identified from satellite images remain partially submerged in the water. To a first approximation, the overgrown areas in Fig. 3 can be interpreted as localizations of major spawning substrates of phytophilous fish in the considered part of the lake basin. The actual area of phytophilous spawning grounds in SPNAs was a bit larger because fully submerged aquatic vegetation (not identified from satellite images) was improperly considered in the analysis. According to the field survey data, this vegetation poorly develops. As the spawning substrate, it only complements the overgrown sites flooded during high water.

To evaluate the significance of the “Spawning Grounds of Belozerye” reserve in reproduction of phytophilous fish species of Lake Beloye, one can compare the flooded overgrown areas within this SPNA with similar sites in other parts of the reservoir and related water bodies (Filonenko et al, 2021). For instance, the inundated (during high water) overgrown (mainly with thickets of southern reed *Phragmites australis* (Cav.)) area in sites of flooding in the Sheksna River source makes up 10.6 km^2. The flooded overgrown area in the estuarine places of rivers inflowing Lake Beloye, except for the mentioned Kovzha, Kema, Shola and Megra Floods, is about 3.7 km^2. These are mainly shoals located in the estuarine sections of rivers Ukhtomka, Munga, Slobodka, Kiuya, Vodoba, etc. The “Spawning Grounds of Belozerye” reserve includes about 70% of the area of key potential spawning grounds of Lake Beloye and estuarine zone of its tributaries.

In accordance with the prepared substantiation, the boundaries of the “Spawning Grounds of Belozerye” reserve run along the water's edge at the maximum permissible level (forced headwater level) of 113.96 m for Lake Beloye[5] that is very close to its maximum observed in 2020 (Fig. 2). Flooded (at this level) overgrown areas serve as spawning grounds for phytophilous fish species (Fig. 3). Taking into account the localization of spawning substrates, the following adjustments of SPNAs boundaries have been made:

The Kovzha River section (776 km of navigating channel upstream till Kurdyuk village) has been excluded from the reserve because of drastically anthropogenically transformed water area. Here, the Volga-Baltic Waterway with its infrastructure passes through the narrow river channel characterized by scarce overgrowth and the absence of large flooding in the river estuary with its inflowing tributaries (Fig. 3).

[5] Order of the Federal Agency for Water Resources dated September 14, 2017 No. 194 “On approval of the Rules for the use of water resources of the Kovzhskoye and Sheksninskoye reservoirs”.

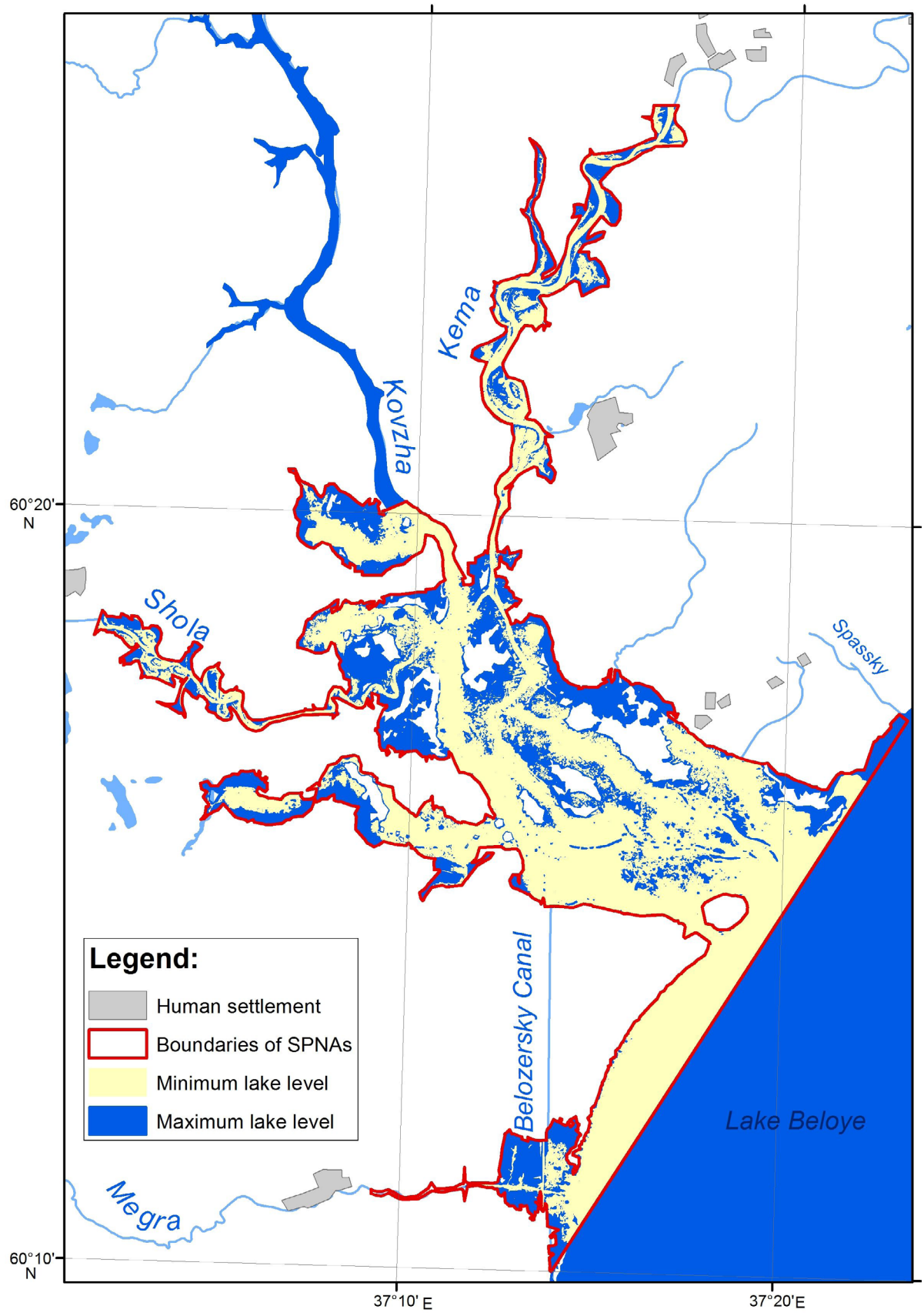

Fig. 2. Schematic map of the water area within the boundaries of the “Spawning Grounds of Belozerye” reserve at different levels of the Sheksna Reservoir.

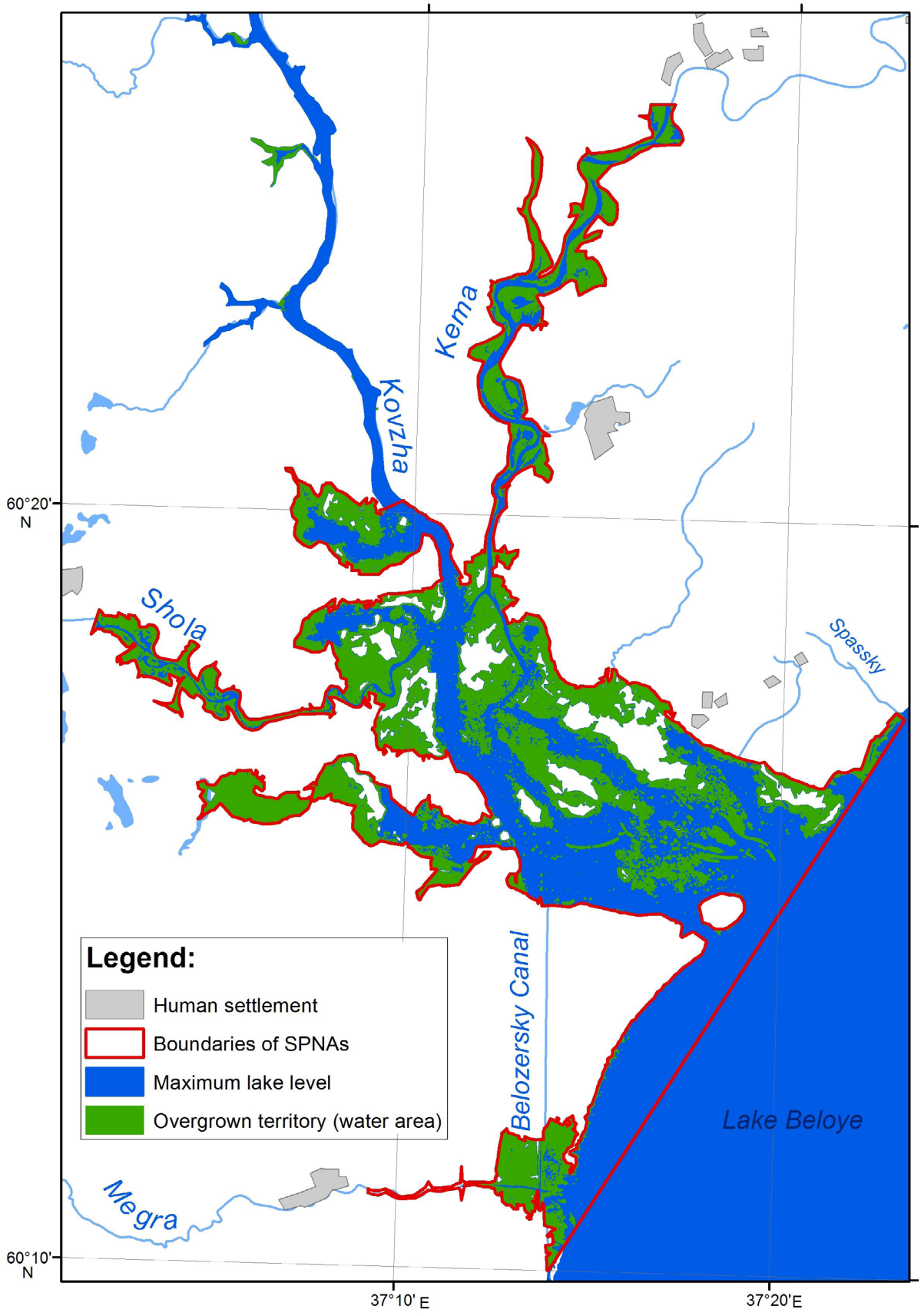

Fig. 3. Schematic map of the overgrown territory (water area) within the boundaries of the “Spawning Grounds of Belozerye” reserve.

2. The reserve includes a section of Lake Beloye from the Kovzhsky Flood up to the Spassky Stream estuary. This part is shallow, abundantly overgrown with vegetation, including reed thickets (Fig. 3). The coast adjacent to the lake is heavily swamped and partially flooded in spring during high water that contributes to the formation of perfect spawning grounds for phytophilous fish.

3. The land territory of Kovzha Island (along the water's edge) has been excluded from the reserve because it is heavy transformed and there are no adjacent large sites of submerged plants.

4. Partially, the territory (water area) of the state complex (landscape) nature reserve "Bolshaya Pokhta" is referred to the new reserve "Spawning Grounds of Belozerye". To avoid overlapping of SPNAs boundaries and bearing in mind fishery importance of the latter, the boundaries of the "Bolshaya Pokhta" adjacent to the Shola River, the Kovzhsky Flood and Lake Beloye were corrected. Now they run along the water's edge at the maximum permissible level of 113.96 m for Lake Beloye.

Reserve "Ramenye"

Along with Lake Beloye, the Rybinsk Reservoir is among the most important fishery water bodies in the region (Konovalov et al., 2023). In Vologda Oblast, Sheksna and Molozhsky Reaches of the reservoir account for about 19% of the total production of regional aquatic biological resources (Borisov et al., 2019). In terms of absolute catches, the Rybinsk Reservoir is the second after Lake Beloye. In this reservoir and its tributaries, 54 species of fish are currently found; the most numerous are bream, bleak, zope, silver bream, ide, tench, sabrefish, roach, common pike, river pikeperch, sprat *Clupeonella cultriventris* (Nordmann, 1840), silver crucian *Carassius auratus* (Linnaeus, 1758), common catfish *Silurus glanis* Linnaeus, 1758, common ruff *Gymnocephalus cernua* (Linnaeus, 1758), burbot *Lota lota* (Linnaeus, 1758), pikeperch *Sander lucioperca* (Linnaeus, 1758), Volga sander *Sander volgensis* (Gmelin, 1789) (Ryby Rybinskogo..., 2015). Zope (29–39% of total fish production), bream (21–31%), roach (17–25%), river perch, pikeperch and pike dominate in industrial catches of Sheksna and Molozhsky Reaches. In the Rybinsk Reservoir and Lake Beloye, the largest role in the catches composition play phytophilous fish species (88–92% of the total fish production) (Borisov et al., 2019; Konovalov et al., 2023).

In the Rybinsk Reservoir, the most important spawning grounds of phytophilous fish are located within the federal SPNA "Darwin State Natural Biosphere Reserve". Long-term monitoring of natural reproduction of fish here is carried out at the permanently operating ichthyological stations in Loshinsky and Mshichinsky bays of Molozhsky Reach (Zelenetsky and Zelenetskaya, 2015; Zelenetsky et al., 2017). The findings confirm that earlier spawning is induced by global warming. As a result, the lack of spawning grounds and reduced efficiency of phytophilous fish spawning at spring increase of water levels in the reservoir are also noted. Besides, a decrease in number of cold-water arctic fish species and an increase in number of Ponto-Caspian and boreal species, which spawn on flooded vegetation, are recorded. In recent years, a restoration of the depressed (since the 1960s) tench population and an increase in number of a large predator catfish have been observed in Molozhsky Reach of the reservoir (Zelenetsky, 2014; Zelenetsky and Zelenetskaya, 2022).

The "Ramenye" reserve, located in Sheksna Reach of the Rybinsk Reservoir in the Cherepovets municipal district of Vologda Oblast, was established in the Kondoshka Flood site. With the Rybinsk Reservoir construction, the riverbed and its valley were inundated and later Kondoshsky (Korotovsky) Bay appeared. Its width at the junction with the main water area of Reach at Ramenye Island is 11 km and in its narrowest place at Klopuzovo village – less than 700 m. This water area is represented by shallow flooding of the Kondoshka River and its small tributaries: Serenzha, Ulomka, Kisovka, Karpovka, Kolodinka, Khmelinka. About 27% of the reserve area consists of islands, among which Ramenye, Zmeiny, Annino, Lychnoye, Pekhteevo, Lyubets, Tsapliny and Kolkhozny are the largest.

In contrast to most part of the Rybinsk Reservoir, Kondoshsky Bay shores are not eroded due to a highly indented coastline, a wide strip of flooded forests and vast spaces of thickets of aquatic and coastal vegetation. Overgrowing of the reservoir largely depends on a water availability (Papchenkov, 2013). In high-water years, the overgrowth of Sheksna Reach accounts for 7.7% (53.7 km^2), while in low-water years it is under 2% (10.9 km^2). The ratio of the main ecological groups in the composition of thickets of higher aquatic plants and dominant species changes depending on water content. In low-water years, about 70% of all thickets consists of two species (southern reed and large manna *Glyceria maxima* Holmb.). In high-water years, this indicator makes up 66.3% for four species (large manna, southern

reed, pierced-leaved pondweed *Potamogeton perfoliatus* L., lake reed *Schoenoplectus lacustris* (L.) Palla) (Papchenkov, 2013). In years with low water levels, vast areas of the coastal shallow waters of the reservoir with thickets of reed canary grass *Phalaris arundinacea* L., sedge, manna and most of reed dry out. Therefore, the reservoir overgrowth is significantly reduced.

Ichthyological studies in the water area of Sheksna Reach showed that phytophilous fish (roach, perch, silver bream, zope, bream, and pike) dominated in research catches implemented by fixed nets with different mesh spacing. In some years, their total share in such catches varied as 81–97% and biomass – from 71 to 96%.

The coastal zone, with its shoals and rapidly warming water, creates favorable conditions for spawning of phytophilous species and feeding of their baby fishes. The study part of Sheksna Reach of the Rybinsk Reservoir includes most valuable grounds for spawning phytophilous fish (bream, pike, roach, silver bream, perch, blue bream, tench, etc.). Specialists from the Papanin Institute of Inland Water Biology RAS report that the Kondoshka Flood is the most important spawning area for fish reproduction and feeding their young even in the years with the lowest water levels (Sovremennoe sosotoyanie..., 1997). Therefore, the water area within the boundaries of the “Ramenye” reserve plays a key role in conservation and reproduction of phytophilous fish stocks in Sheksna Reach of the Rybinsk Reservoir. The total area of the “Ramenye” reserve is 146.8 km^2; its water area at the maximum level of the Rybinsk Reservoir reaches 106.9 km^2 and at the minimum – 76.5 km^2 (Fig. 4). The lowest water level in the reservoir usually occurs in the summer low-water period and at the end of summer, whereas its peak – during spring floods. Temporarily inundated floodplain area is about 30.4 km^2, or 20.7% of the total area of the reserve and 28.4% of the water area.

The sites covered with vegetation and flooded during spring floods are key spawning grounds of phytophilous fish species. According to satellite images, their area within the boundaries of the ‘Ramenye’ reserve is estimated as 34.8 km^2 that is 23.4% of the total area of the reserve, or 32.6% of the water area (Fig. 5). During field studies of the Kondoshka Flood site in the autumn of 2021, a water level was low, the overgrown sites were dried up and submerged plants practically disappeared. Southern reed, lake reed, large manna, reed cane grass and various types of sedge were growing on the drained bottom.

Thus, the leading role of the ‘Ramenye’ reserve in reproduction of phytophilous fish in Sheksna Reach of the Rybinsk Reservoir is confirmed by the fact that almost 65% of the overgrown total area falls on Sheksna Reach.

In accordance with the prepared substantiation, the boundaries of the “Ramenye” reserve run along the water's edge at the level of the forced horizon of 102.41 m for the Rybinsk Reservoir (Litvinov and Roshchupko, 2007). Taking into account the localization of spawning substrates, the following adjustments of the boundaries were made:

1. The reserve covers Ramenye Island and a section of the water area of the Rybinsk Reservoir in 500 m from this island because this part of the water area of the Rybinsk Reservoir has been included in the list of spawning areas of the water bodies of fishery importance of the Volga-Caspian fishery basin according to the Fishery Rules[6] being in force to the date of the reserve creation.

2. The reserve includes the southwestern section of Kondoshsky Bay in sites of Kolodenka, Teshilka and Osetra river flooding. This part of the Rybinsk Reservoir has been also included in the list of spawning areas of the water bodies of fishery importance of the Volga-Caspian fishery basin according to the Fishery Rules being in force to the date of the reserve establishment. The considered part of the reservoir is shallow and heavily overgrown; its adjacent shore is very swampy and prone to flooding during high water that results in the formation of good spawning grounds for phytophilous fish.

Conclusion

The study areas of the Sheksna and Rybinsk Reservoirs with shallow estuarine flooding sites of rivers are the most important spawning grounds of phytophilous fish, including bream, pike, roach, silver bream and perch, zope, tench, etc. In spring-summer, producers of these fish species are concentrated, then spawn and feed their larvae and baby fishes here. In terms of conservation value, the territory

[6] Order of the Ministry of Agriculture of Russia dated November 18, 2014 No. 453 “On approval of fishing rules for the Volga-Caspian fishery basin”.

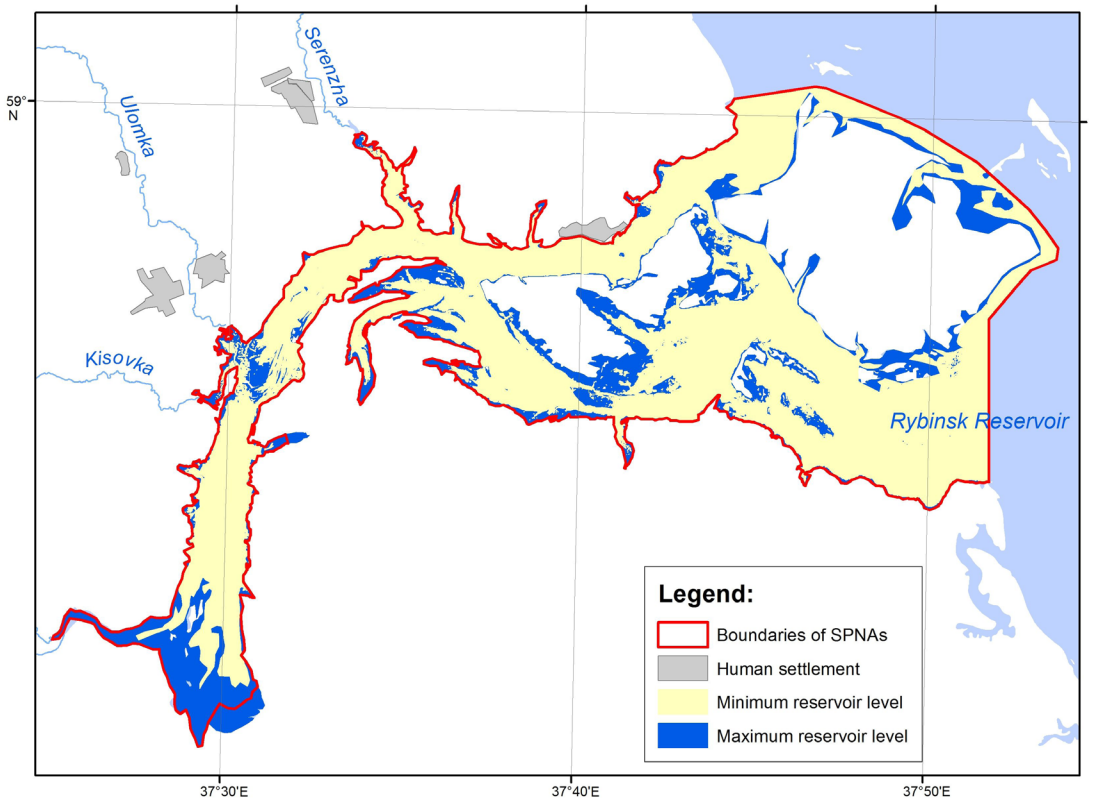

Fig. 4. Schematic map of the water area within the boundaries of the “Ramenye” reserve at different levels of the Rybinsk Reservoir.

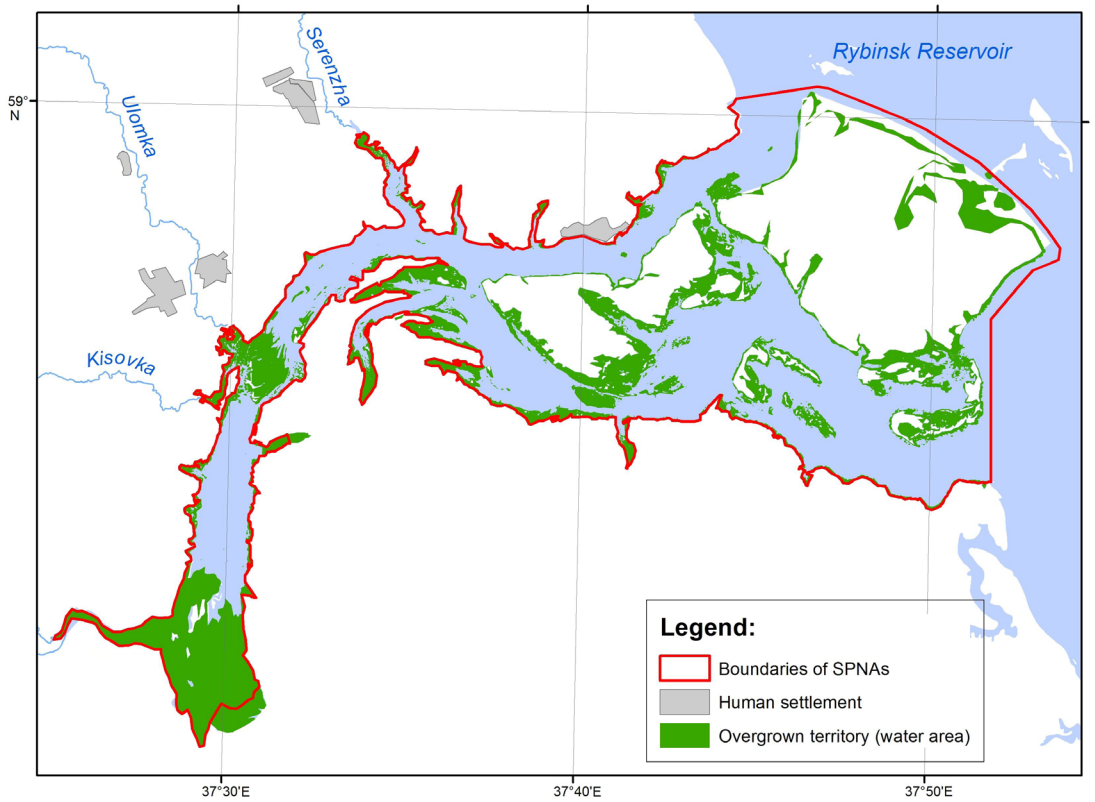

Fig. 5. Schematic map of the overgrown territory (water area) within the boundaries of the “Ramenye” reserve.

(water area) of both SPNAs represent large overgrown shoals, which create favorable conditions for reproduction and feeding of phytophilous fish. This is confirmed by the studies on localization of major spawning substrates and general estimation of the spawning potential of the "Spawning Grounds of Belozerye" and "Ramenye" reserves. The water areas of both reserves are the unique natural reproductive complexes consistently providing high stocks of phytophilous fish in Lake Beloye and Sheksna Reach of the Rybinsk Reservoir.

Being unique, these areas need a special protection regime. Note that fishing restrictions introduced in both SPNAs, basically, correspond to those specified in the Fishery Rules. In the "Spawning Grounds of Belozerye" reserve, the-calendar-year ban has been introduced on industrial extraction of all types of aquatic biological resources, except for European smelt (smelt) *Osmerus eperlanus* (Linnaeus, 1758), which can be fished with smelt tools from April 15 to May 20. Similar ban has been established on the extraction of all types of aquatic biological resources during recreational fishing using any gear, except for one float or bottom fishing rod with 2 hooks (not more) per citizen.

In the waters of the 'Ramenye' reserve, a ban (from April 15 to June 5) has been introduced on the commercial extraction of all types of aquatic biological resources. A similar ban (from April 25 to June 1) has been established on the extraction of all types of aquatic biological resources during recreational fishing. Catching of pikeperch, bream, asp, and pike is prohibited from April 25 to June 5 and catfish – from June 5 to July 5.

In addition, limited hunting and use of small motor boats during prohibited by the Fishing Rules periods, including other restrictions on activities that can cause deterioration of living conditions of fish and their habitat, have been established for these SPNAs.

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