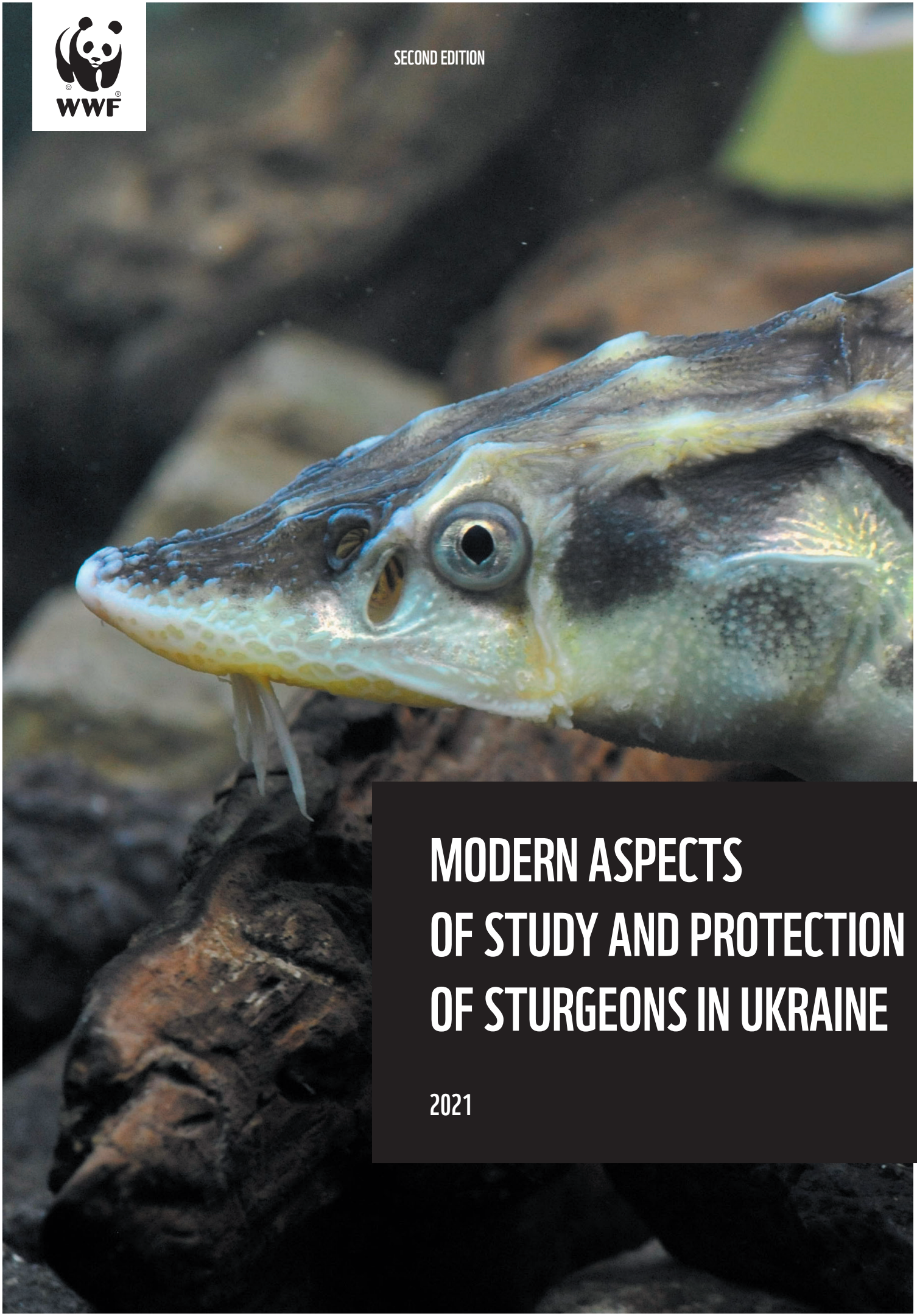

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MODERN ASPECTS OF STUDY AND PROTECTION OF STURGEONS IN UKRAINE

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MODERN ASPECTS OF STUDY AND PROTECTION OF STURGEON POPULATIONS IN UKRAINE

Second edition.

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CONTENT

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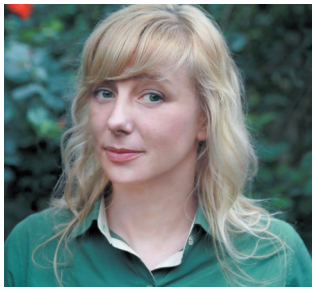
Khudiy Oleksiy, Doctor of Science, Associate Professor, Yuriy Fedkovych Chernivtsi National University. His research interests include the study of the ichthyofauna in the Carpathian region of Ukraine, as well as the development and improvement of technologies for artificial reproduction of native species with further reintroduction of fish species in the wild. In recent years, actively engaged in the conservation and creation ex citu populations of Dniester sterlet. Based on Oleksiy's initiative, Dniester sterlet reproduction in captivity became possible, which provided the opportunity to conduct sterlet restocking activities. Author of more than 150 scientific publications in the area of ichthyology, hydrobiology and fish reproduction.

Bushuyev Serhiy, Ph.D., Senior Research Fellow, Institute of Marine Biology, National Academy of Sciences of Ukraine. His main focus is the study of structural and functional characteristics of ichthyocenoses in both fresh and marine waters in the North-Western Black Sea region. Serhiy studies the species composition, estimates stocks of industrial fish species, develops recommendations for increasing the marketable fish productivity of reservoirs and effective regulation of fisheries. His recent work was about the sturgeon distribution in the North-Western part of the Black Sea, monitoring of spawning migrations of youngsters, identification of vital sturgeon habitats in the Ukrainian waters and assessment of the impact of fishing on sturgeon populations. Serhiy is the author and co-author of about 50 scientific publications.

Voloshkevych Oleksandr, PhD, Director of the Danube Biosphere Reserve of the National Academy of Sciences of Ukraine since its establishment, ichthyologist, honored environmentalist of Ukraine; member of the National Committee of Ukraine for UNESCO «Man and the Biosphere», the Union of Journalists of Ukraine. Mr. Voloshkevych has worked on the ichthyological research of the Danube Delta since 1979. In the Southern Branch of the Research Institute of Fisheries and Oceanography, he was the head of topics for the study of the migrating Danube species, the organization of fisheries in the Danube reservoirs, the evaluation of various projects, etc. The main focus of his work in the Danube Biosphere Reserve is on the study of rare and endangered fish species, ecological restoration of territories and individual species, preparation of management plans, advising on changes in regulations and legislation.



Hoch Inna, Ph.D., WWF Ukraine. A former coordinator of European Union LIFE projects «LIFE for Danube sturgeon», «Successful prosecution of crimes against wildlife in Europe / SWiPE». As for now she leads the Freshwater Program in WWF Ukraine. Inna has about 20 years of successful experience in both public and governmental institutions in the area of nature protection and conservation. Research interests include fish species composition in the Dniester and the Dniester basins, conservation of biotic and ecosystem diversity with main focus on sturgeons, management of protected areas. She has been involved as an expert in the working groups under an umbrella of the Ministry of Environment of Ukraine, the National Agency for Fisheries and Aquaculture, the Environmental Committee of the Ukrainian Parliament with a focus on PAs management, sturgeon and water related management. Author and co-author of about 40 scientific articles.

Balatsky Konstantin, Institute of Marine Biology, National Academy of Sciences of Ukraine. The main area of Konstantin's research is the study of ichthyofauna of the lower Danube. Konstantin pays particular attention to the study of sturgeon populations and sturgeon conservation measures. In 2005, he was included and actively participated in the working group which was developing the National Sturgeon Action Plan. Recent work was focused on monitoring of migration of sturgeon juveniles during spawning season, identifying vital sturgeon habitats in Ukrainian part of the lower Danube, and assessing the impact of fishing on their populations. Konstantin is the author and co-author of about 20 scientific publications.

INTRODUCTION

The modern state of wild sturgeon populations in the Ukrainian reservoirs can be assessed as extremely unfavorable. From the six native sturgeon species, two are apparently already lost (European sturgeon and Ship Sturgeon), the number of the remaining four (Russian sturgeon, Beluga sturgeon, Sterlet sturgeon and Stellate sturgeon) continues to decline rapidly. The size and age structure of populations is changing; under the anthropogenic pressure, a smaller number of sturgeon individuals can survive till sexual maturity.

The assignment of a high conservation status to all sturgeon species (all of them are included in the Red Book of Ukraine), the tightening of environmental legislation for damage to the environment, for poaching and trade of sturgeon products in general did not lead to any significant positive changes. It can be noted that all concern for the conservation of sturgeon fish is declared mainly on paper, and real, scientific based, consistent and effective actions to preserve and restore populations of wild sturgeons in Ukraine are practically not take place.

It is quite obvious that an effective system of protective measures for the restoration of sturgeon should be built taking into basis of comprehensive scientific research of the current state of the species. However, with this necessary line of activity, the situation is very deplorable. There is no coordinated national program for sturgeon research in Ukraine; accordingly, funds from the budget for these purposes, if allocated, distributed according to the departmental principle and spent irrationally. In modern conditions, studies of sturgeons in Ukraine are carried out by few grants from world and European nature conservation organizations and donors and based on the personal enthusiasm of researchers. This situation cannot be called normal. If sturgeon fish are the most valuable property of Ukraine, their preservation for future generations should be a matter of concern for responsible state bodies.

To develop and implement a system of measures for the protection and restoration of sturgeon, it is necessary to carry out the following research activities:

- monitoring of wild populations, including limited research and control of commercial by-catch;

- study of nutrition, behavior, migrations using modern fish tagging programs (CWT, PIT, acoustic, satellite tags, etc.);

- study of key habitats which are critical for the survival of sturgeons (spawning, wintering, feeding sets, migration routes), which will allow to determine priorities for targeted improvement of conditions of survival and natural reproduction;

- assessment of the current state of the base for certain sturgeon species and their age groups, determination of the modern «capacity» of habitats;

- assessment of the genetic diversity of natural populations of sturgeon, determination of the possibility of maintaining sustainable natural reproduction, the feasibility and conditions of artificial reproduction;

- preservation of the gene pool of native sturgeon populations in conditions of controlled artificial keeping, the formation of stock for replacement (priority should be the creation of Russian sturgeon stock spawning in the Dnieper River, which preservation is possible in Ukraine only);

- assessment of the potential of the gene pool of native sturgeon species that are kept in Ukrainian facilities, determination of the possibility of use for controlled artificial reproduction and exchange with sturgeon facilities with other countries of the Black Sea-Azov basin.

Similar sturgeon studies are carried out in the EU countries of the Danube basin. In Romania tens of millions of euros have been spent on sturgeon research in recent years. Ukraine's lagging based on this matter is obvious, and it can be overcome within the framework of close regional cooperation.

In this brochure, some modern aspects of the study and conservation of sturgeon in Ukraine are considered, which mainly affect the region of the North-Western part of the Black Sea and the Danube and Dniester rivers. Based on the limited time as well as material and technical capacity, the obtained results can be noted as preliminary.

The first experience in identifying the most important habitats of sterlet sturgeon in the upper Dniester is presented, the most important parts of the river are identified, which can potentially be used by sterlet sturgeon for wintering and spawning. The functionality of the identified habitats should be confirmed by further research.

In the Kiliyskiy arm of the Danube, field work was carried out to describe the section of the river, which is used by juvenile sturgeon as a seasonal feeding area. The morphometry of the bottom of the river part was determined, the relationship between the distribution of benthos and the seasonal concentration of sturgeon youngsters was studied.

The monitoring data of the downstream sturgeon youngsters migration are presented, which are an indirect indicator of the success of spawning of various sturgeon species. A certain dependence of spawning efficiency on the water regime and Danube water level was revealed.

Preliminary results on the return of CWT tags obtained in the framework are presented implementation of the joint project of the Black Sea countries POP 18 / 22.04.2013.

Sturgeon by-catches were studied during trawling in the North-Western part of the Black Sea. It is shown that all sturgeon species are most often observed in trawl bycatch. The brochure considers the experience of involving volunteers in sturgeon conservation activities.

The main result of the volunteering initiative "Sturgeon watchers» for three seasons is raising the awareness of all stakeholders on sturgeon conservation and improving cooperation between them. The main legislative problems which also affected of sturgeon conservation were described.

The Sturgeon Conservation Action Plan draft was considered as a main policy document for sturgeon conservation in Ukraine in 2021-2029. The document provides a comprehensive approach to management of sturgeon populations. The long-term goal of the Action Plan is a restoration of all wild sturgeon populations to status «Least concern» (IUCN) or «favorable» (Habitat Directive). Perspective directions of future research and projects prepared and scheduled for implementation by WWF Ukraine are presented. The implementation of the main goals and objectives of the Sturgeon Conservation Action Plan should save sturgeon populations from endangerment and significantly change population's condition.

STURGEON SPECIES OF UKRAINE

Historically, 6 native species of sturgeon have been registered within Ukraine. In modern conditions, the possibility of meeting Ship sturgeon and European sturgeon in the Ukrainian waters is extremely small. Some unverified cases of findings in the Danube were recorded more than 10 years ago. European sturgeon can be considered completely extinct in Ukrainian waters. There has been no reliable information about its findings for more than 70 years. The probability of findings of other four sturgeon species (Sterlet, stellate sturgeon, Beluga, Russian sturgeon) compared to the first two species is much higher. All these species of sturgeon are protected by the Red Book of Ukraine and various international agreements and conventions.

Common Beluga - Huso huso (Linnaeus, 1758).

Passable bottom-pelagic fish that live permanently in the sea, and spawn in rivers. Males become sexually mature at the age of 12-14 years at a length of more than 120 cm, females - at 16-18 years at a length of more than 150 cm. In the Sea of Azov Beluga reaches sexual maturity earlier than in other basins: males - at 12-14 years, females - in 14-16 (Chebanov, Halych, 2013). Spawning lasts from late April to early June at a water temperature of 8-17° C, mainly along the great depths of some rivers in areas with rapid flow and stony or sandy-pebble bottom substrate. Fertility is 200 thousand-8 million eggs. Caviar is bottom, sticky. After spawning, mature, and later young individuals roll into the sea. The youngsters consume crustaceans, worms, insect larvae, fish youngsters; adults feed mainly on fish.

In Ukraine, the species is observed in the Black and Azov Seas and the Lower parts of the Danube, Dnieper-Buh, Dniester, Utlyutsk estuaries. As a result of the regulation of the runoff of the main large rivers of the Northern Black Sea coast, natural reproduction within the Azov-Black Sea basin exists only in the Danube River. In modern conditions, poaching and by-catches significantly affect the population.

The species is included in the Red Book of Ukraine (Conservation Status «Endangered»), CITES (Appendix II), IUCN Red List (CR), Bern (Annexes II, III) and Bonn Conventions (Appendix II).

Russian sturgeon - Acipenser gueldenstaedtii Brandt & Ratzeburg, 1833.

Passable bottom-dwelling fish that live permanently in the sea and spawn in rivers. Males reach sexual maturity at the age of 11-13 years at a length of more than 90-100 cm, females - at 12-16 years at a length of more than 105-110 cm. Spawning lasts from late April-early May to mid-June, at a water temperature of 11-22 ° C, in deep areas of the root bed with a rapid flow and sand-pebble or stony substrate. Fertility is up to 50-1165 thousand eggs. Caviar is bottom, sticky. After reproduction, the adults, and later the young, roll to feeding grounds. Juveniles feed on benthic invertebrates (crustaceans, insect larvae, etc.), adults consume mollusks, large crustaceans and fish.

Within Ukraine, it is observed in the Azov and Black Seas, the Lower Danube, and occasionally it enters the Lower reaches of the Dnieper. In modern industrial catches in both the Black and Azov Seas, it is observed singly as a by-catch among other industrial species. Occasionally there are facts of registration of the species in the Dnieper-Buh, Dniester, Utlyutsk estuaries. Natural reproduction is weak and only in the Danube, but has been declining in recent decades. In the eastern part of the North-Western part of the Black Sea there is currently a certain number of artificially bred individuals of Russian sturgeon, which were released in the Lower reaches of the Dnieper by the Dnieper sturgeon plant as part of the reproduction program. The ability of these individuals to spawn naturally in the Dnieper River has not been confirmed.

The main factor in the decline is the lack of spawning grounds due to over-regulation of rivers, reduction of forage base in the sea due to the outbreak of predatory rapana in the North-Western part of the Black Sea and by-catch of young individuals to industrial fishing nets.

The species is included in the Red Book of Ukraine (conservation status «Vulnerable»), CITES (Appendix II), IUCN Red List (CR) and Bonn Convention (Appendix II).

Stellate sturgeon - Acipenser stellatus Pallas, 1771.

Passable bottom fish, which live permanently in the sea, and for reproduction enter to rivers. Maturity of males occurs at the age of 5-6 years, mainly at 9-12 years, females - at 7-17, mainly at 8-10 years (with a body length of both sexes over 95-100 cm). Stellate sturgeon, like other sturgeons, can form winter and spring forms. Winter individuals enter the river in autumn and spend the winter in it. Due to this, winter fish in spring during spawning migration move upstream than spring is the period they can enter the river from the sea. This adaptation allows more efficient use of spawning grounds.

In spring, spawning lasts from late April to middle June at a water temperature of 8-15° C and above, in deep areas of the bed with rapid flow and hard, usually sandy or stony soil. Fertility can reach 360 thousand eggs. Caviar is bottomic, sticky. After reproduction, adults and youngsters roll into the sea for feeding. The youngsters feed mainly on small benthic animals (worms, insect larvae, crustaceans, etc.), while adults feed fish, mollusks and large crustaceans.

In Ukraine, the species is observed in the Black and Azov Seas, in the Lower part of the Danube, in the Lower parts of the Dnieper to the Kakhovka Dam, the Dnieper-Buh, Dniester, Utlyutsky estuaries. Natural reproduction exists only to the Danube population. The species suffers from the absence of spawning grounds and illegal acquisition.

The species is included in the Red Data Book of Ukraine (conservation status «Vulnerable»), CITES (Appendix II), IUCN Red List (CR), Bern (Annex III) and Bonn Conventions (Appendix II).

Sterlet - Acipenser ruthenus Linnaeus, 1758

Sterlet lives in freshwater. The majority of individuals become adults at the age of 6 years. Fertility is from 40 to 90 thousand eggs. Spawning is at a temperature of 16 ° C in April-May. The most suitable places for spawning are areas of the bottom with pebble substrate at a depth of up to 10 meters. The main food is the larvae of Tendipedidae, oligochaetes, small fish. In Ukraine, the species is registered in the Lower Danube, middle Dnieper, Desna, Dniester. In recent years, the species is used extensively in aquaculture. In recent years, more than 10 million individuals have settled in the Lower reaches of the Dnieper. Unfortunately, this did not have a positive effect and population recovery is not observed, primarily due to lack of habitats for reproduction. Trial settlements of young individuals of this species in the Dniester Reservoir and the adjacent river section of the Dniester were carried out, after which the Sterlet was repeatedly registered in poaching catches.

In Ukraine, one of the main shortcomings of sturgeon reintroduction is the lack of specialized research aimed at determining the effectiveness of stockings. Natural populations of Sterlet suffer from poaching both during specialized illegal fishing and during by-catches among other industrial species.

The species is included in the Red Data Book of Ukraine (Conservation Status «Endangered»), CITES (Appendix II), IUCN Red List (VU), Bern (Annex III) and Bonn Conventions (Appendix II).

Ship sturgeon - Acipenser nudiventris Lovetsky, 1828.

This is a passable fish, that comes from the sea into rivers for reproduction. The Ship sturgeon lives about 30 years. Acipenser nudiventris spawn from late April to late May at a water temperature of 10-15 ° C. Ship sturgeon lays its eggs on sand or gravel on a fast flaw, protecting it from siltation. Fertility of a this species vary from 200 to 1290 thousand eggs. Reproduction occurs only once every two or three years. Ship sturgeon feeds on insect larvae, mollusks and crustaceans.

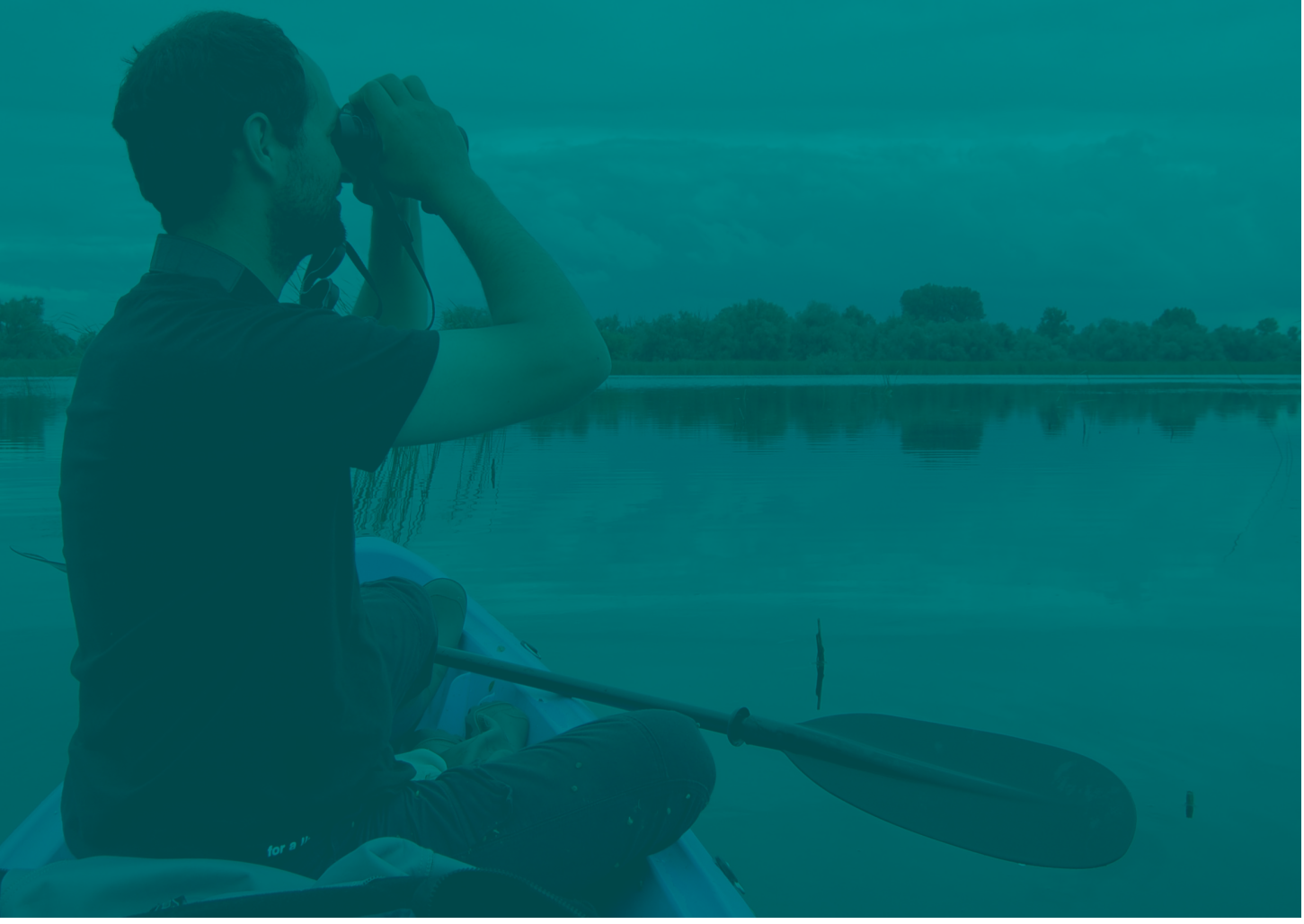
The species has not been registered in Ukrainian reservoirs for the last 20-30 years. In the Danube during the XXI century, several finds of this species are known, in particular, three individuals were registered in 2000, in 2003 a male Ship sturgeon with a standard body length of 176 cm and weighing 56.2 kg was caught in the Serbian city of Apatin (Simonovic et al., 2005), and in 2005 Ship sturgeon was registered in the Moore River (Guti, 2006). The results of the implementation of appropriate mathematical methods allow us to conclude that Acipenser nudiventris still exists in the Danube basin, but with a high probability may disappear in the next few decades (Jaric et al., 2009). Some isolated findings are known from the Rioni River.

The species is included in the Red Data Book of Ukraine (Conservation Status), the CITES list (Appendix II), the IUCN Red List (CR) and the Bonn Convention (Appendix II).

European sturgeon - Acipenser sturio Linnaeus, 1758

This is a migratory fish that breeds in rivers. Spawning occurs at a temperature of 12-17 ° C. Males reach sexual maturity at 7-9 years, females - at 8-14 years. Reproduction occurs on rocky and pebble bottoms. Females are able to produce 0.2-5.7 million eggs. European sturgeon feeds mainly on fish. In Ukraine it was observed only in the Black Sea. Despite the fact that in the territorial waters of Ukraine the last 30-40 years are not observed, at the beginning of the 21st century. registered in Georgia. It is believed to have disappeared in the Danube between 1966 and 1970 (Jaric et al., 2009). There is no information about is spawning in the Dniester and the Dnieper. The species is included in the Red Data Book of Ukraine Conservation Status (Extinct), CITES (Appendix I), IUCN Red List (CR), Bern (Annex II) and Bonn Conventions (Appendixes I, II).

RESULTS OF UKRAINIAN RESEARCH OF STURGEONS WITHIN WWF PROJECTS



RESULTS OF UKRAINIAN RESEARCH OF STURGEONS WITHIN WWF PROJECTS

The WWF initiative to study sturgeon in Ukraine began more than 10 years ago. During this time, many disscusions, meetings, practical actions were started. The works were carried out within the framework of various projects.

The first project «SAVING DANUBE STURGEONS - JOINT ACTIONS TO RAISE AWARENESS ON OVEREXPLOITATION OF DANUBE STURGEONS IN ROMANIA AND BULGARIA» LIFE11 INF / AT / 000902 was implemented in Romania and Bulgaria from July 2011 to September 2015. Project work with fishermen, law enforcement, politicians and sturgeon aquaculture producers has led to better understanding and awareness among the most important target groups. This pilot project proved that such extraordinary approaches work and provided valuable information on the problem and knowledge for further conservation efforts of sturgeon along the Danube and beyond. However, this was only the first big step towards stopping overfishing and illegal trade in sturgeon products, as well as ensuring the long-term survival of these species.

The "LIFE FOR DANUBE STURGEONS" project (the short name)/ "Sustainable protection of the Lower Danube sturgeons by preventing and counteracting poaching and illegal wildlife trade" (full name) LIFE15 GIE / AT / 001004 covered, in addition to the above-mentioned countries, neighboring countries, without which it was impossible to effectively protect sturgeon populations - Serbia and Ukraine. The aim of the project was to improve the situation in the EU and neighboring countries, in particular by supplementing the EU Strategy for the Danube Region, as well as the Danube sturgeon protection program «Sturgeon 2020» in the following areas:

- building the capacity of environmental authorities and ensuring compliance with legislation;
- conducting socio-economic measures to support sturgeon conservation;
- raising public awareness.

The project targets three target groups in Bulgaria, Romania, Serbia and Ukraine:

- fishermen and fishing communities, including young people;
- law enforcement authorities;
- market players as shops, restaurants, markets, catering companies.

The project is coordinated by WWF Austria with the participation of the following parties:

- Danube Delta Biosphere Reserve, Romania;
- Leibniz Institute for Zoos and Wildlife Research, Germany;
- World Organization for Nature, Serbia;
- WWF-DCP-Bulgaria;
- WWF-DCP-Romania;
- WWF Danube-Carpathian Program, Ukraine.

This LIFE project is funded by the European Union and the WWF. EU funding comes through the LIFE program, which supports the conservation of nature and the environment, as well as through EU climate protection projects.

The project aims to address the threats to sturgeon in the Lower Danube and North-Western Black Sea caused by illegal fishing and trade. The activities planned by the project should contribute to the recovery of sturgeon populations. Better compliance with laws and regulations through the following activities is planned to be achieved through:

- meetings at the national level that promote cooperation and exchange of experience between all government agencies responsible for the legislative regulation of sturgeon fishing, aquaculture and trade;
- discussion of issues and best practices that will improve compliance with the law and the implementation of research processes;
- regional meetings between national government agencies of neighboring countries agencies, which will stimulate important cross-border coordination and cooperation;

- special training courses, study visites, targeted information packages and messages that meet the needs of individual authorities and enhance the expert and practical skills of officials.

In addition, the project actively supports fishing communities, as they are dependent on natural resources in need of protection. The project measures are clearly aimed at solving the problem of illegal sturgeon fishing, which is taking place despite the bans. The implementation of these tasks is as follows:

- sturgeon advocates act as intermediaries, raising the awareness of fishermen about the need to protect sturgeon and comply with the law;
- developed business plans and specific business models that are offered as alternative sources of income for the fishing communities;
- Involve fishermen and other stakeholders in the process of reviewing law enforcement procedures to improve enforcement.

Another key objective of the project is to investigate the availability of legal and illegal sturgeon products on the market and to communicate the results to the relevant authorities, institutions and stakeholders. In this way, retailers get more information about the legislation that will prevent the entry of illegal products into the market.

Throughout 2017-2020, there will be a growth of researched sturgeon habitats in the Dniester and the Danube Delta based on WWF Netherlands funding within the framework of Freshwater Program. WWF and experts goal was to identify key sturgeon habitats by 2022 and provide a legal framework for their protection and effective management. To integrate the efforts of all stakeholders in Ukraine, the implementation of the National Sturgeon Action Plan has been launched in cooperation with the Ministry of Energy and Environmental Protection of Ukraine. Below are the results that have been obtained in the implementation of this project and highlight the main achievements of scientists and community initiatives.

RESULTS OF IDENTIFICATION OF IMPORTANT HABITATS OF STERLET IN THE UPPER DNIESTER

RESULTS OF IDENTIFICATION OF IMPORTANT HABITATS OF STERLET IN THE UPPER DNIESTER

Distribution and living conditions of sturgeons habitats in the Dniester basin

Throughout the history of ichthyological research in the Dniester basin, six species of sturgeon have been registered, of which five are native: Common Beluga, Russian sturgeon, Stellatus sturgeon, Sterlet, Ship sturgeon. In the second half of the twentieth century, an attempt was made to move the Siberian sturgeon into the Dubossary Reservoir (Karlov et al. 1988), but it was unsuccessful. Since 2013, a hybrid of Russian and Siberian sturgeon has been grown in net cages in the Dniester Reservoir, in connection with which some individuals are sporadically found nearby of the village Dnistrivka.

The transformation of the Dniester basin affect the state of sturgeon stocks. Thus, in 1931-1940 the maximum catch of sturgeon reached 100 quintals per year, starting from the mid-50s of the last century (after the construction of Dubossarska HPP), sturgeons lost their industrial significance in the Dniester (Syrenko et al., 1992).). The reason for this was the inaccessibility of the main spawning grounds as a result of the separation of the migration routes of migratory and semi- migratory species including sturgeons. **The Common Beluga** - Huso huso (Linnaeus, 1758) - enters the Dniester branch and the Dniester floodplains (Syrenko et al., 1992; Rusev, 2003). Earlier, before the construction of the dam of the Moldavian part of the river in 1964, it carried out forage migrations to the Kuchurgan branch (Krepis et al., 2013).

Prior to the regulation of the main Dniester riverbed in 1954 by the Dubossarska HPP dam, Beluga spawned mainly on the river section between Rybnytsia and Soroka (Yaroshenko, 1957) and even ascended upstream of Mogilev-Podilskyi to the mouth of the Ushytsia (Table 1). After regulation, the most effective spawning grounds were located in the Lower Dniester, namely in the area of Dubossary-Koshnitsa. Not only Beluga, but also other sturgeons, e.g. Russian sturgeon, and Sterlet spawned there. By the end of the 1990s, the possibility be reached by adults to the Lower part of the Dniester before the Dubossary Dam became minimal due to the overgrowing of spawning grounds with aquatic vegetation and dreisen. Small spawning grounds remained in areas of the river near the villages Delakeu, Sherpen, Telytsia-Teia, however, the conditions for spawning are worse here than in the higher spawning grounds (Krepis et al., 1999).

Table 1

Register of findings of Huso huso (Linnaeus, 1758) in the Dniester basin

LOCALITY, HABITAT	RESERVOIR	GEOGRAPHIC COORDINATES		SOURCE INFORMATION
		LATITUDE	LONGITUDE	
The mouth of the Ushytsia river	Dniester	48.559909	27.117664	Kessler 1857
Mohyliv-Podilskyi town	Dniester	48.434041	27.805696	Slastenenko 1929
Soroky village	Dniester	48.164028	28.311896	Yaroshenko 1957
Rybnitsa village	Dniester	47.788594	28.988428	Yaroshenko 1957
Tiraspol town	Dniester	46.827785	29.596424	Kessler 1857

However, in the early 2000s there was an occasional risefindings near the dam of sturgeon adults ready to spawn, including Beluga, which, however, have often been caught by poachers (Sharapanovska, 2008). After a strong summer flood in 2008, the riverbed was significantly washed away, as a result of which the condition of gravel spawning grounds in the Lower parts of the Dubossarskaya HPP dam significantly improved (Sharapanovskaya, 2009).

Russian sturgeon - Acipenser gueldenstaedtii Brandt & Ratzeburg, 1833 - in the late 19th century rose above Khotyn (Slastenenko, 1929) to Zalishchyky (Sokolov, 2004) (Table 2). Before the habitats of the Dniester, the main spawning grounds were below the town of Rybnytsia in the waters of the town Rezyna and the village of Saharna (Pavlov, 1980), which became inaccessible after the construction of a dam in Dubossary, Moldova. By the middle of the 20th century, the catch of Russian sturgeon was less than 10% of the total mass of sturgeon commercial catches in the Dniester (Yaroshenko, 1957).

Table 2

Register of Acipenser gueldenstaedtii findings in the Dniester basin

LOCALITY, HABITAT	RESERVOIR	GEOGRAPHIC COORDINATES		SOURCE INFORMATION
		LATITUDE	LONGITUDE	
Khotyn town	Dniester	48.508417	26.512556	Kessler 1857
Anadoly village	Dniester Reservoir	48.480563	26.537185	Chernivtsi fish patrol
Dnistrivka village	Dniester Reservoir	48.573236	26.926694	Khudyi 2016
Mohyliv-Podilskyi town	Dniester	48.434041	27.805696	Slastenenko 1929
Mohyliv-Podilskyi town	Dniester	48.434041	27.805696	Yaroshenko 1957
Rybnytsia village	Dniester	47.788594	28.988428	Yaroshenko 1957
Rezina (Stokhna) village	Dniester	47.732674	28.972189	Yaroshenko et al 1951
Sakharna village	Dniester	47.697260	28.978796	Yaroshenko et al 1951

During the first decade of the 21st century, single individuals of Russian sturgeon were recorded in the Lower parts of the Dniester (Usatîi et al. 2011).

In 2013, net cages began to be used in the Dniester Reservoir for sturgeon farming. The main object of aquaculture in such systems was a hybrid of Russian and Siberian sturgeon, but among the fish raised, in addition to hybrids, there were cultivated Russian and Siberian sturgeon. The first finds of Russian sturgeon that escaped from aquaculture were registered in the waters of the Dniester, Chernivtsi region, close to net cages However, on June 30, 2015, during the Chernivtsi fish patrol patrolling 1 individual of Russian sturgeon with a total length of about 30 cm was caught in the water area of the Anatolia village, Khotyn district, located approximately 80 km upstream (image 1).

Image 1. Russian sturgeon caught close to Anadoly village, Dniester Reservoir, 2015 (photo by R. Bezhenar)

This fact indicates the possibility of reintroduction of Russian sturgeon into the Dniester above the dam of the Dniester HPP-1. It should be keep in mind that without the migration of individuals to the sea with their subsequent return to the river, there will be no natural reproduction of this species in the Upper Dniester. Under such conditions, the population will have to be maintained using artificial reproduction technologies. On the other hand, in the scientific literature there is information about the possibility of the formation of Russian sturgeon freshwater form, the existence of which, in particular, is assumed in the Danube.

Stellate sturgeon– *Acipenser stellatus Pallas*, 1771 - in the 1960s and 1970s predominated in commercial sturgeon catches in the Lower Dniester (Rusev, 2003), and in general on the Dniester was the second largest sturgeon species stock after the Sterlet (Yaroshenko, 1957). Before river flow regulation, Stellate sturgeon in the tributaries of the Dniester was found in small numbers, but annually (Slastenenko, 1929), they were rising upstream by more than 900 km (Table 3). Evidence of this is the fact that the stock collections of the State Museum of Natural History of the National Academy of Sciences of Ukraine in Lviv keep Stellate sturgeon (140 and 146 cm long, weighing about 8 kg), caught in the late 19th century in the waters of Zalishchyky (Sokolov, 2004; Nowicki , 1889; Dzieduszycki 1896) (image 2).

Image 2. Stellate sturgeon from the collection of the State Museum of Natural History of the National Academy of Sciences of Ukraine

Table 3

Register of Acipenser stellatus finds in the Dniester basin

LOCALITY, SETTLEMENT	RESERVOIR	GEOGRAPHIC COORDINATES		SOURCE INFORMATION
		LATITUDE	LONGITUDE	
Zalishchyky	Dniester	48.633533	25.732112	Dzieduszycki 1896
Ustia	Dniester	48.562295	26.639242	Slastenenko 1929
Sokil	Dniester	48.538659	26.650400	Slastenenko 1929
Lyashivka (near M.-Podilskyi)	Dniester	48.434041	27.805696	Slastenenko1929
Soroky	Dniester	48.164028	28.311896	Yaroshenko 1957
Tarasivtsi	Dniester	47.880021	28.961375	Yaroshenko et al. 1951

The scientific literature describes cases of sturgeon fishing in the wintering sites in the Lower Dniester and in Turunchuk, which may indicate the presence of winter race, which enters the river in autumn and lies here in wintering sites until spring (Yaroshenko, 1957). As in the case of other sturgeon passages, after the first stage of regulation of the Dniester, spawning sites located upstream of the Dubossarska HPP became inaccessible to the sturgeon. Single individuals of this species were registered in the Lower parts of the Dniester in 2006-2010 (Usatîi et al., 2011). Stellatus sturgeon is also registered in the Dniester branch (Sirenko et al., 1992).

Ship sturgeon - Acipenser nudiventris Lovetsky, 1828 - as a very rare species is indicated in the ichthyological reports compiled by L. Berg for the Dniester basin (Berg, 1949). In the 19th century, this species was registered not only in the Lower parts (Kessler, 1857), but also in the middle part and in the main tributaries of the Dniester. Thus, in Didychitsky's ichthyological collection there was 1 individual of a Ship sturgeon with a total length of 139 cm and a weight of about 15 kg, caught in 1879 in the waters of Zalishchyky (Dzieduszycki, 1896; Nowicki, 1889). However, as early as 1929, Slastenenko pointed out the lack of reliable information about the location of the Ship sturgeon in the Podyllya section of the Dniester basin (Slastenenko, 1929). Based on the register of this species finds in the Dniester in the Lower Dniester, the Ship sturgeon was registered after 1955 (Lobchenko et al., 1999). There is no information about modern finds of this species.

Sterlet - *Acipenser ruthenus Linnaeus*, 1758 - belongs to the category of valuable commercial fish, is characterized by high gastronomic qualities. However, its populations in the reservoirs of Ukraine today are significantly undermined.

Before the river over-regulation, Sterlet was distributed in the Dniester everywhere from the Dniester branch to the middle of the river (Khudy, 2014). Based on the information available in the literature, oral reports of fishermen, reports of fisheries protection authorities, and their observations, a register of Sterlet finds in the Dniester basin within the modern Western region of Ukraine was created. With the help of the Google Map service, based on the topographic names indicated in the relevant sources, the geographical coordinates of the finds were obtained (Table 4).

At present, infrequent reports from fisherman about rare cases of Sterlet fishing are registered. The predominant number of them indicates that the core of the population is located in the Dniester between Halych town to the mouth of the Zbruch river. However, Sterlet is also sporadically found along theDniester Reservoir up to Neporotovi village.

In the past, the number of Sterlets in the Dniester was quite high, which provided an opportunity for the industrial catch of at different times and in different parts of the basin. Thus, according to Novitsky, at the end of the XIX century, Sterlet was of great importance in fishing in the Dniester within Galicia. Most individuals were up to 78 cm long and weighed up to 1.5 kg, although some individuals were recorded at about 90 cm and weighing 3-6 kg (Nowicki, 1889). In the first half of the twentieth century in the area of the Dniester from the mouth of the Zbruch to the mouth of Calush, the most intensive fishing for Sterlet occurred during the spring and summer floods. The weight of marketable fish reached 8 kg (Slastenenko, 1929). From 1946 to 1950, the total withdrawal of Sterlet in the Dniester on the section from Khotyn to Dubossary ranged from a few hundred kilograms to 3.5 tons per year (Burnashev et al., 1955).

Table 4

Reservoir and the neighboring part of the Dniester basin

LOCALITY, HABITAT	RESERVOIR	GEOGRAPHIC COORDINATES[1]		SOURCE INFORMATION
		LATITUDE	LONGITUDE	
Sambir	Dniester	49.505937	23.220467	Staff 1950
Tershakiv	Dniester	49.512978	23.759944	Balabai 1952
Rozdil	Dniester	49.450048	24.038329	Dzieduszycki 1896
The mouth of the Stryi river	Dniester	49.398239	49.398239	Shnarevych 1968
Halych	Dniester	49.127477	24.728996	Shnarevych 1968
Halych	Dniester	49.127477	24.728996	Nowicki 1889
Jezupil	Dniester	49.047409	24.806403	Nowicki 1889
Maryiampil	Dniester	49.024137	24.848571	Nowicki 1889
Nyzhniv	Dniester	48.960722	25.099611	Dzieduszycki 1896
Yazlivets (formerly Yablunivka)	Strypa	48.951433	25.420985	Shnarevych 1968
Dulyby	Strypa	48.926475	25.418022	Hoch 2008
Beremiany	Dniester	48.872155	25.433054	Khudyi 2014
Lysivtsi	Seret	48.850164	25.823469	Shnarevych 1968
Hukiv	Zbruch	48.844030	26.222534	Shnarevych 1968
Ustechko	Dniester	48.768862	25.596415	Shnarevych 1968
Ustechko	Dniester	48.768862	25.596415	Dzieduszycki 1896
Kasperivtsi (downstream)	Seret	48.667945	25.852223	Hoch 2008
Dobrivlyany	Dniester	48.667442	25.761431	Shnarevych 1968
Pechorna	Dniester	48.665684	25.674434	Ternopil fish protection, December 2013
Tsybulivka	Smotrych	48.642838	26.587383	Shnarevych 1968
Zalishchyky	Dniester	48.633533	25.732112	Dzieduszycki 1896
Zalishchyky	Dniester	48.633533	25.732112	Yaroshenko et al 1951
The mouth of the Seret	Dniester	48.620655	25.856617	Shnarevych 1968
Vasyliv	Dniester	48.605333	25.847370	Nowicki 1889
Vasyliv	Dniester	48.605333	25.847370	Shnarevych 1968
Vasyliv	Dniester	48.605333	25.847370	Khudyi 2014
Zozulyntsi	Dniester	48.590348	25.932871	Vainshtein 1961

LOCALITY, HABITAT	RESERVOIR	GEOGRAPHIC COORDINATES[1]		SOURCE INFORMATION
		LATITUDE	LONGITUDE	
Bridok	Dniester	48.607502	25.955124	Khudyi et al 2013
Samushyn	Dniester	48.606026	26.064945	Khudyi et al 2013
Onut	Dniester	48.576039	26.052504	Shnarevych 1959
Melnytsia-Podilska	Dniester	48.595230	26.144859	Shnarevych 1968
Hordivtsi	Dniester	48.512750	26.333423	Oral announcement
Prygorodok (Kozaczowka)	Dniester	48.535789	26.41806	Nowicki 1889
The mouth of the Zbruch	Dniester	48.539455	26.443035	Shnarevych 1968
Ataky	Dniester	48.547524	26.478910	Shnarevych 1959
Khotyn	Dniester	48.521721	26.500368	Yaroshenko et al 1951
Khotyn	Dniester reservoir	48.521721	26.500368	Skilsky et al 2007
Anadoly	Dniester reservoir	48.480563	26.537185	Khudyi, Khuda 2014
Anadoly	Dniester reservoir	48.480563	26.537185	Khudyi 2014
Bernovo	Dniester reservoir	48.506723	26.630569	Khudyi 2014
Sokil-Ustya	Dniester	48.544114	26.617270	Slastenenko 1929
Lenkivtsi	Dniester	48.537068	26.735862	Shnarevych 1968
Slobidka (formerly V. Miksha)	Dniester	48.573200	26.723700	Slastenenko 1929
The mouth of the Bohovytsia	Dniester	48.585692	26.739321	Slastenenko 1929
The mouth of the Studenytsia	Dniester	48.576834	26.920913	Shnarevych 1968
Dnistrivka	Dniester reservoir	48.573236	26.926694	Oral announcement 2013
Stara Ushytsia	Dniester	48.559909	27.117664	Shnarevych 1968
Neporotove	Dniester reservoir	48.609140	27.294268	Oral announcement 2013
Lomachyntsi	Dniester	48.603858	27.341141	Shnarevych 1968

Unlike other sturgeon species, the over-regulation of the main Dniester riverbed in Dubossary and Novodnistrovsk should not have reduced the Upper Dniester Sterlet population. This is because this species in this part of the Dniester is represented by this form. The open top of the reservoir provides the opportunity for adults to enter the river for spawning, and the creation of the reservoir was to create more favorable conditions for feeding and wintering. Thus, in the first five years after the creation of the Dubossary Reservoir, there was an increase in the relative number of Sterlet in catches by about 50% (Byzgu et al., 1964). This is explained by the fact that young adults from the middle part of the Dniester rised to the reservoir for feeding. A comparative analysis of available data on the size and age structure of Sterlet catches (Byzgu et al., 1964; Shnarevich 1968) showed that the growth rate of Sterlet in the Dubossary Reservoir exceeded that in the adjacent river section (image 3).

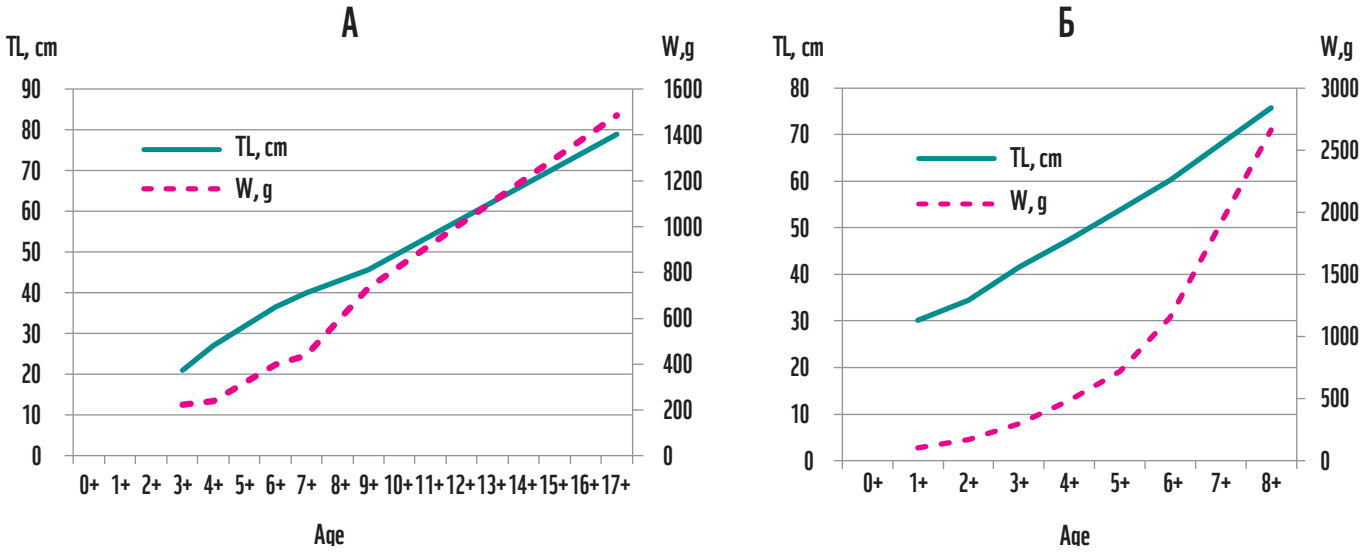


Image 3. Change in total length (TL) and body weight (W) of the Sterlet: A - Dniester; B – Dubassary reservoir

The Dniester Sterlet has a fairly wide range of feeding objects, so it is easy to find food on different bottom substrates. Thus, in the Dniester, before regulation, the feeding base of Sterlet was based on the larvae of Tendipedidae, Simulidae, Mayflies (Ephemeroptera), caddisflies (Trichoptera) and amphipods (Shnarevich 1968). It is obvious that these same organisms still form the basis of the Sterlet's forage base in the Upper Dniester. After the first stage of regulation and creation of the Dubossarsky reservoir in the food the numbers of oligochaetes increased (Byzgu et al., 1964). Interestingly, no mollusks were found in the intestines of Sterlet (Yaroshenko, 1957). Accordingly, the increase in the number of Sterlet as a result of mass stocking of young animals obtained in aquaculture will not lead to increased trophic competition with another Red Book species – the Black Sea roach, which is a typical mollusk and whose population successfully exists in the Upper Dniester (2007, Skilsky et al.)

It is obvious that the main reason for the decrease in the number of the Upper Dniester Sterlet population was not the river regulation and separation, but another factor.

The formation of the Dniester Reservoir coincided with the man-made catastrophe that occurred in September 1983 as a result of the breakthrough of the dam of the Stebnykiv Chemical Plant. Highly mineralized waste through the rivers Tysmenytsia and Bystrytsia got into the Dniester. As a result, in the area from the mouth of the Bystritsa to the dam in Novodnistrovsk, more than 500 km long, almost the entire fish population was destroyed. For a long time, it was believed that the population of the Upper Dniester Sterlet was destroyed by a catastrophe forever. However, the restoration of the ichthyofauna of the Dniester Reservoir and the adjacent section of the river was due to the Upper Dniester basin and the tributaries system (Sirenko, 1992). The Sterlet population has also recovered. Long-term ichthyological studies suggest that one of the natural native populations of Sterlet in Ukraine has been preserved in the Upper Dniester-Dniester Reservoir system (Skilsky et al., 2007).

The value of the Upper Dniester Sterlet population is enhanced by the fact that sturgeon have never been introduced into this aquatic system using not native youngsters grown in fish farms. This allowed to preserve the genetic purity of the aboriginal population. Thus, according to the results of a comparative analysis using microsatellite DNA markers, namely alleles - Afu-68, AfuB-68, Spl-163, Spl-101, Spl-106, Spl-173 (Fopp-Bayat et al., 2015), it was shown that the Upper Dniester Sterlet population is genetically different from the populations from the neighboring basin systems - the Dnieper and the Danube (image 4).

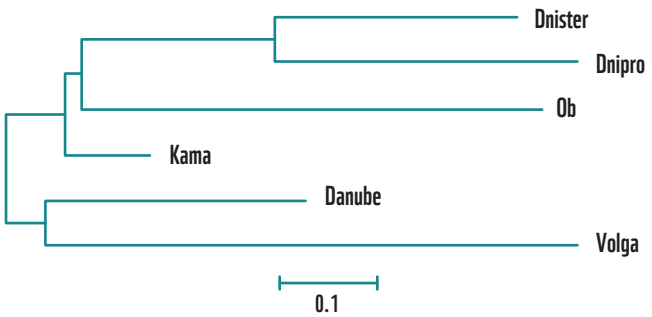


Image 4. Dendrogram of genetic distances Da between Sterlet populations from different river basins (Fopp-Bayat et al., 2015)

The majority of repair and breeding adults of Sterlet in sturgeon factories of the former Soviet Union were formed individuals came from of the Volga river population. Given the large genetic distance between the Dniester and Volga populations (image 4), it is unacceptable to stock Sterlet of unknown origin in restocking programs. Given the uniqueness of the Upper Dniester population of Sterlet, it is advisable to develop measures for its artificial reproduction, which will restore the number of this species in the Dniester.

The urgency of these measures concerning the Dniester native Sterlet population is due to several anthropogenic and natural factors that can lead to a decline in its numbers. Among the most powerful anthropogenic factors is poaching, which is carried out both to meet food needs and to illegally move adults to aquaculture production. Lack of professional training to work with sturgeon by fish farmers often leads to the death of individuals removed from nature or to the loss of their fertility in ponds.

Among the most dangerous natural factors that can negatively affect the size of the Upper Dniester population of Sterlet, it should be noted the rapid spread of eustrongylidosis among perch fish in the Dniester Reservoir (Garmatyuk et al., 2010). It is known that the causative agents of this parasitic disease can also affect sturgeons (Davydov et al., 2012; Mikailov et al., 1992).

Thus, one of the natural native populations of Sterlet in Ukraine has been preserved in the Upper Dniester-Dniester Reservoir system. This was facilitated by the fact that the reservoir has created favorable feeding conditions for young individuals and adults, and on the other hand - the open top of the reservoir provides unimpeded migration of Sterlet adults to spawning grounds located in the river area. Despite favorable conditions, the number of this population remains low. One of the ways to correct the current situation is the introduction of artificial reproduction measures with the subsequent reintroduction of youngsters into the natural environment.

Identification of key habitats of Sterlet in the middle part of the Dniester

The state of the population of a particular fish species directly depends on the state of its habitat. Any reintroduction work, regardless of how intensive are restocking activities, will not have the prospect of a positive outcome if key habitats in the reservoir are degraded. Accordingly, it is important to assess the condition of the main habitats: spawning sites, feeding areas, wintering sites.

The peculiarity of the biology of the Sterlet is that it spawns on deep part of the river with a fairly high flow rate, which can also be used as a wintering place. Also, deep areas of reservoirs with different nature of the bottom substrate can serve for wintering - sandy and even moderately silted, and with a Lower degree of flow than in spawning grounds.

The largest number of areas that can be used by Sterlet as spawning grounds and wintering sites are concentrated in the middle part of the Dniester River, which is adjacent to the top of the Dniester Reservoir. The reservoir itself is used by this species as a place for feeding and wintering, as evidenced by reports of Sterlet in the net-tools (Table 5).

Table 5

LOCATION	LATITUDE	LONGITUDE	DATE / PERIOD	CHARACTERISTICS OF THE SEIZED INDIVIDUALS	SOURCE OF INFORMATION
Budzyn village	48.902640	25.182284	2018	1 individual approximately 0.3 kg	Ivano-Frankivsk Fish Patrol
Нижче с. Долина	48.844990	25.214434	201?		місцевий житель
Below the village Dolyna	48.844990	25.214434	201?		local resident
Monastyrok village	48.825846	25.257644	2015	1 individual	local resident
Vozyliv village	48.844038	25.299291	2013	4 individuals	local resident
Above the village Kostryzhivka Zastavnivskyi district	48.670796	25.633251	2014 (within 5 years before the survey date)	1 individual approximately 0,5 kg	local resident

LOCATION	LATITUDE	LONGITUDE	DATE / PERIOD	CHARACTERISTICS OF THE SEIZED INDIVIDUALS	SOURCE OF INFORMATION
The upper limit of the village Doroshivtsi, Zastavnivskyi district, Chernivtsi region	48.588943	25.899133	2014 (within 5 years before the date of the survey)	1 individual about 0.5 kg	local resident
Dniester reservoir, close to Anadoly village, Khotyn district, Chernivtsi region	48.506723	26.630569	beginning of June 2019 (one month before the date of the survey)	3 individuals of approximately 0.5 kg per week	local resident
Dniester reservoir, water area close to Anadoly village, Khotyn district, Chernivtsi region	48.506723	26.630569	Autumn 2019	2 individuals approximately 0.7 kg per week	local resident
Dniester reservoir, water area close to Anadoly village, Khotyn district, Chernivtsi region	48.506723	26.630569	April 2020	1 individual, approximately 1 kg	local resident
Dniester reservoir, water area, village Lopativ, Sokyryany district, Chernivtsi region	48.554591	27.102175	01.02.2019	1 individual up to 1 kg	Chernivtsi fish protection patrol, video recording
Dniester reservoir, water area, village Neporotove, Sokyryany district, Chernivtsi region	48.573236	26.926694	02.01.2018	2 individuals with a total weight of 1 kg	Chernivtsi fish protection patrol, video recording

Analysis of catches of ichthyoplankton mesh nets showed a slight drift of youngsters downstream, while significant was the drift of aquatic invertebrates, primarily larvae of insects, mostly mayfly (Ephemeroptera), in much smaller numbers were larvae of caddisflies (Trichoptera) (image 6).

The high degree of development of soft zoobenthos groups creates favorable conditions for feeding benthic fish, including freshwater Sterlet.

According to the results of research in the middle of the Dniester river, the potential fish productivity, calculated according to the level of development of natural food, is more than three times higher than the actual, which allows planning reintroduction activities of native species, including Sterlet, by rearing young captives individuals without harm to fish reproduced in natural conditions.

In order to clarify the current state of wintering sites, an analysis of the depths within the Dniester riverbed was conducted. Two sections of the main river of the Dniester were surveyed: the first - from the mouth of the river Zolota Lypa to the village Rakovets (over 75 km), the second - from the village Kostryzhivka to the village of Samushin (over 50 km). In total, more than 1,300 depth places were measured within the existing wintering sites.

Based on the results of the work, an interactive map https://arcg.is/1SXPjn was created. A map of the depths explored in 2019 is available at https://arcg.is/0Pfnym.

Image 5. Sterlet seizure cases from different parts of the middle Dniester and the Dniester Reservoir

Image 6. ichthyoplankton catching

Taking into account the maximum thickness of the ice cover, which is taking place on the Dniester, wintering sites should be considered sections of the river bottom with depths from 2.5 to 3.0 m.

The bathymetric analysis allowed to clarify the actual location of sections of the river with increased depths and to make appropriate remarks. In parallel, the survey of the bottom substrate was carried out by the method of underwater photography.

Image 7. Research of the bottom substrate within the wintering sites

Image 8, 9. Field work on a wintering sites close to Zilishchyky town.

Within the first studied section of the Dniester riverbed (from the mouth of the Zolota Lypa river to Rakovets village) Ivano-Frankivsk and Ternopil fish protection patrols identified 6 areas that are important for wintering:

1. From the pipeline below Nyzhniv village downstream to the river turn near Vistrya village (Ternopil region) (200 m below the church on the banks of the Dniester) with a length of 3200 m - an area of 15.0 hectares;
2. From the island near Kutishche village upstream to the river turn near Vistrya village (Ternopil region) with a length of 1000 m - an area of 5.0 hectares;
3. From the last building on the shore Odayev village downstream to the island with a length of 2500 m - an area of 10.0 hectares;
4. From the last building on the shore in Budzin village downstream along the river turns around Lug village and Mostyshe village to the last building on the shore in the village Deleva with a length of 8800 m - an area of 35.0 hectares;
5. From the island between Dolyna village and Naberezhne village (Ternopil region) downstream along river turns around Naberezhne village (Ternopil region) and the vSokyrchyn village to the mouth of the Barysh River with a length of 6,500 m - an area of 26.0 hectares;
6. From the river turn below the mouth of the Barysh River to the last building on the bank in Vozyliv village (Ternopil region) (250 m below the church on the banks of the Dniester) with a length of 3500 m – an area of 12,5 hectares.

Analyzing them, it should be noted that many potentially important places are not taken into account and need to be included in the general official list of wintering sites. We recommend to protect by special NAFA order the following areas:

1. From the mouth of the Zolota Lypa River downstream 600 meters (image 10).
2. Expand the section from the pipeline upstream by 1 km (image 11).
3. Expand the area from the island near Kutishche village upstream to the river turn near Vistrya village (Ternopil region) for 500 meters, so that this wintering site had a length of 1500 m (image 12);
4. Add to the list of important protected official areas the section of the river near the island in Goriglyady village and at the river turn in the center of Goriglyady village (image 13).

Image 10. The area recommended for the creation of a protected wintering site in the area of Zolota Lypa village.

Image 11. The area recommended for the creation of a protected wintering site in the area of the pipeline

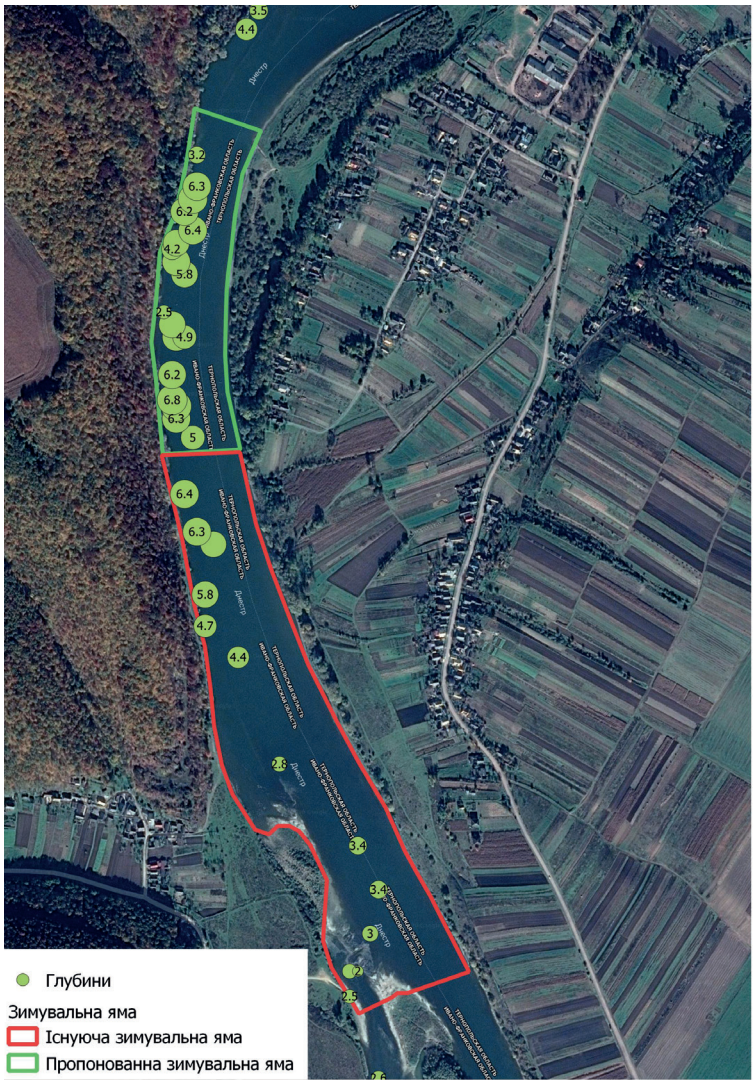


Image 12. The area recommended for increasing of the wintering site from the island Kutyshche village

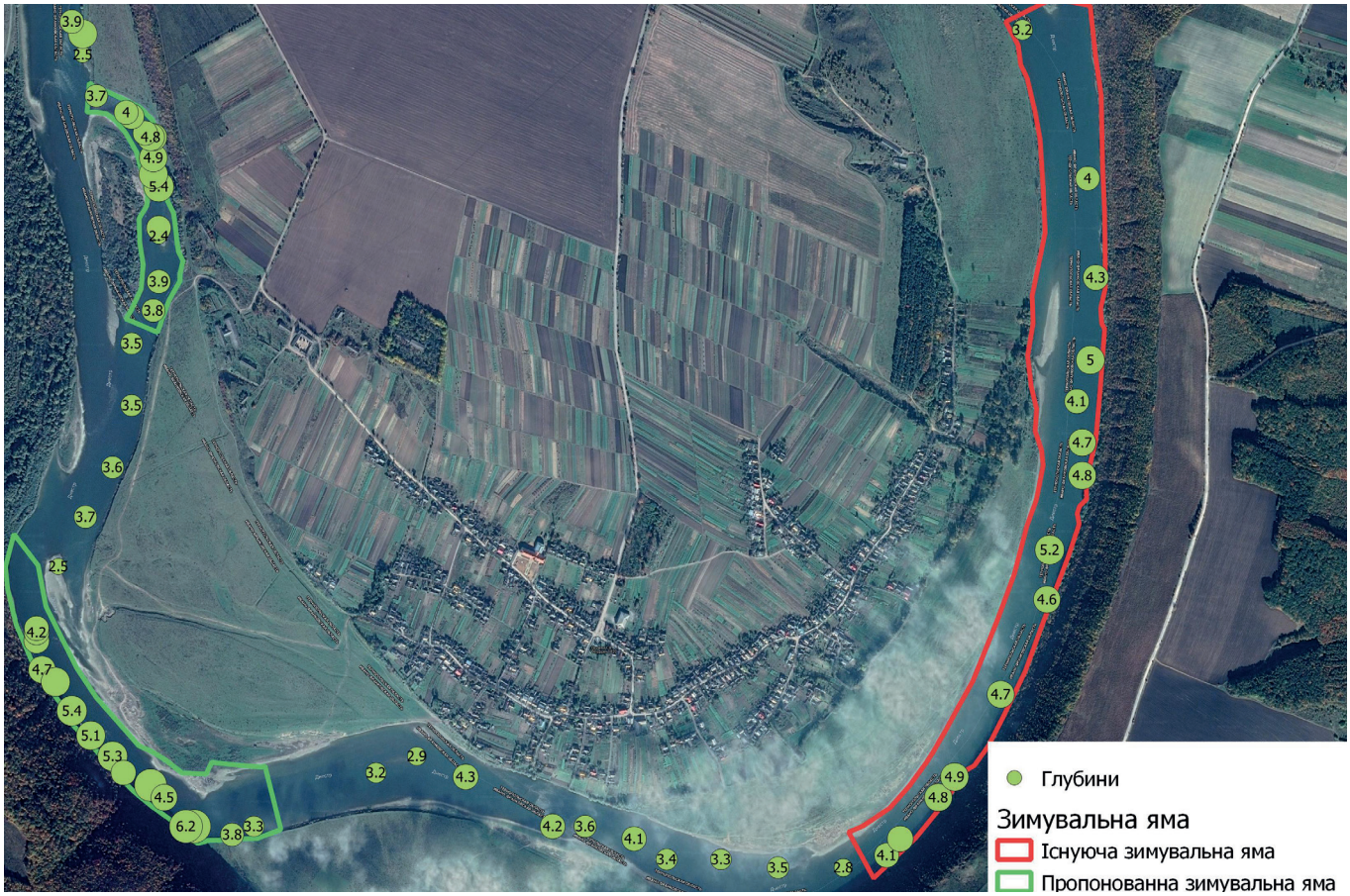


Image 13. Areas recommended for the establishment of officially protected wintering sites near the island in Horyhliady village.

Downstream within the second researched section of the Dniester riverbed (from the Kostryzhivka village to Samushyn village) the Chernivtsi Fish Patrol identified 5 areas, and the Ternopil Fish Patrol - 4 areas that are important for wintering fish (Table 6).

Table 6

Bathymetric analysis of wintering sites in the middle Dniester

IMPORTANT ICHTHYOLOGICAL TERRITORIES ESTABLISHED BY THE CHERNIVTSI FISH PROTECTION PATROL	IMPORTANT ICHTHYOLOGICAL TERRITORIES ESTABLISHED BY THE TERNOPIL FISH PROTECTION PATROL	RESULTS OF THE SURVEY AND PROPOSALS
	500 m from the last household, village Ivane-Zolote downstream to the railway bridge in Zalishchyky	We propose to establish a new Lower limit at the level of Molodizhny Park in Zalishchyky. Depths up to 4.7 meters.
600 m downstream from the railway bridge to the admin. within the village Kostryzhivka, Zastavnivskyi district, Chernivtsi region		It meets the requirements. Depths in this area reach 4.2 meters.

IMPORTANT ICHTHYOLOGICAL TERRITORIES ESTABLISHED BY THE CHERNIVTSI FISH PROTECTION PATROL	IMPORTANT ICHTHYOLOGICAL TERRITORIES ESTABLISHED BY THE TERNOPIL FISH PROTECTION PATROL	RESULTS OF THE SURVEY AND PROPOSALS
1500 m downstream from the road bridge to the administrative boundaries of the village Zvenyachyn, Zastavnivskyi district, Chernivtsi region		It meets the requirements. Depths in this area reach 6.4 meters.
		Opposite the central part of the village Dobrivliany, 800 meters long (image 14). Depths up to 7 meters.
	Within the ichthyological reserve of local significance "Gorodotsko-Dobrivlyansky" from the camp site in village Dobrivlyany of Zalishchyk district downstream to the mouth of the Seret river.	We propose to divide into 2 sections. There is a need to change the boundaries of important ichthyological areas between the village Bedrykivtsi and the village of Horodok. It is necessary to divide this area into two parts. There is a need to expand the northern part, closer to the village Bedrykivtsi, upstream (image 15).
		Near the village Vasyliv there is a need to determine a section of the river with depths of more than 4 meters as a potential wintering pit and spawning ground (image 16).
1000 m downstream from the Lower boundary of the water area of a village Vasyliv, Zastavnivskyi district, Chernivtsi region.	From the first household of the village Vinogradne to the first household of the village Zozulyntsi of Zalishchyk district.	It meets the requirements. Depths up to 7.5 meters.
800 m downstream from the ferry with. Doroshivtsi, Zastavnivskyi district, Chernivtsi region		It meets the requirements. Depths up to 3.6 meters.
From the Lower boundary of the water area of Mytkiv to the water intake in the village Mytkiv, Zastavnivskyi district, Chernivtsi region		It meets the requirements. Depths up to 4.2 meters.
	From the last household in a village Kolodribka of Zalishchyk district downstream to the ferry in the village Ustia of Borshchiv district.	It meets the requirements. Depths up to 3 meters. It is proposed to reduce the length.

Image 14. An important area near the village Dobrovliany

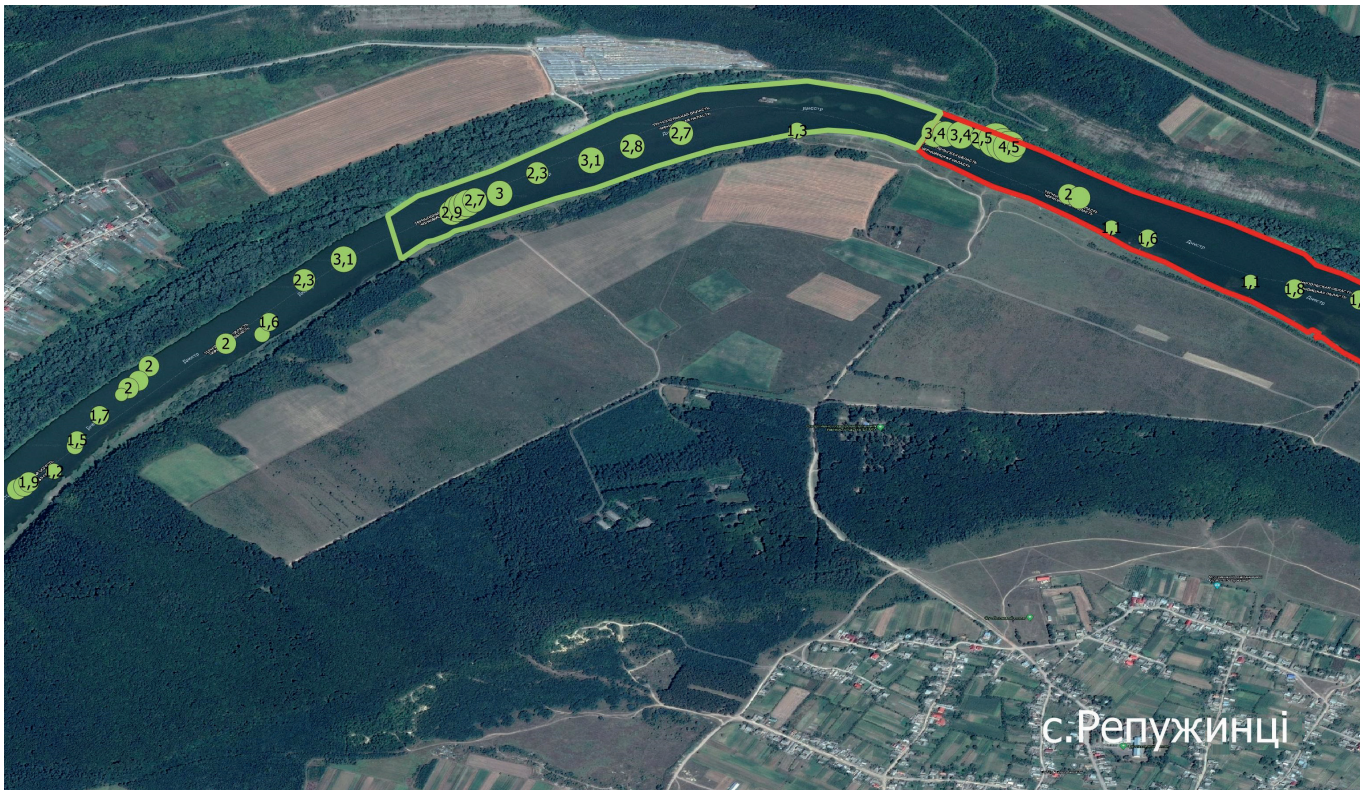


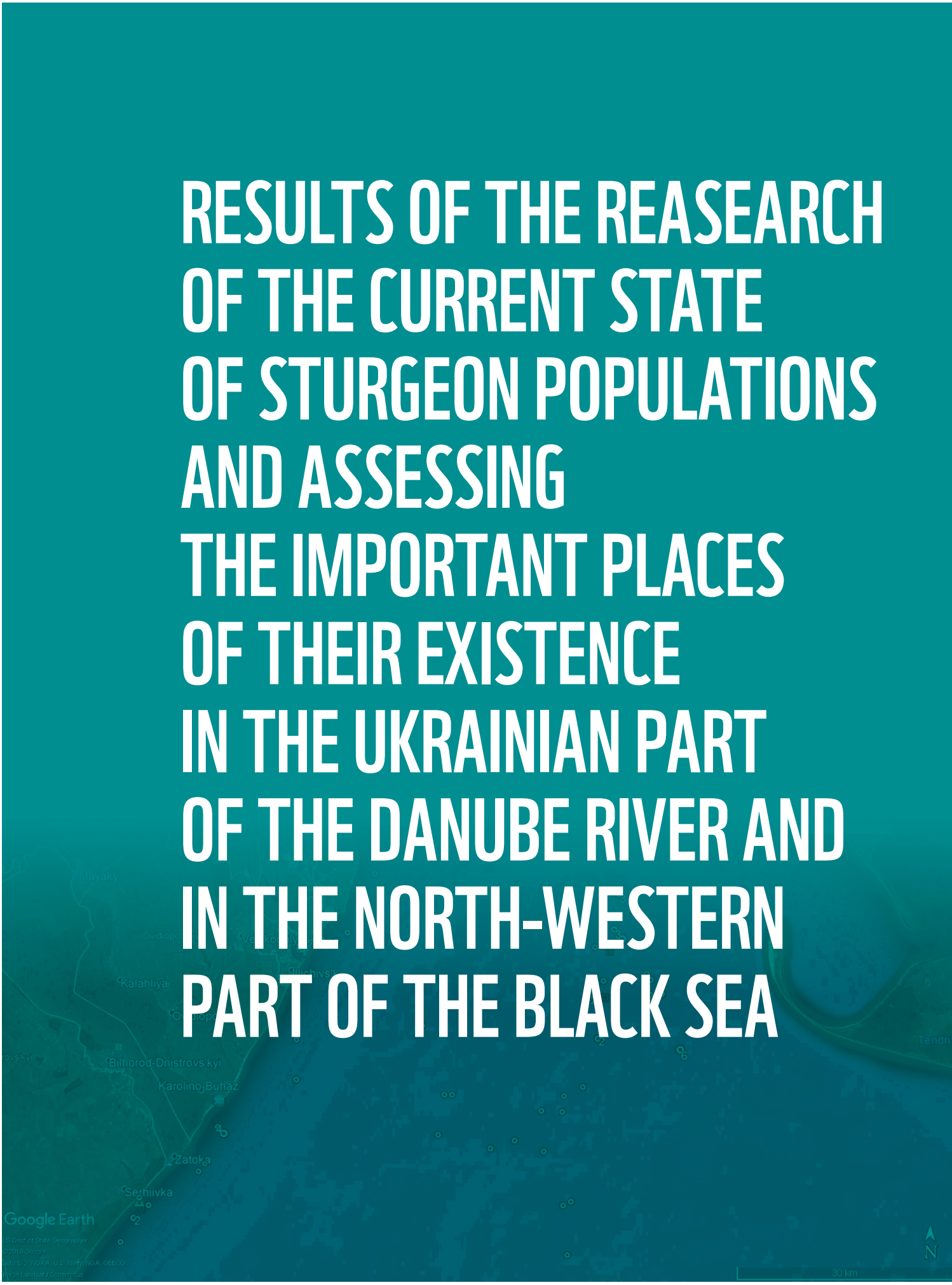
Image 15. Proposals to change the configuration of important ichthyological areas between the villages of Bedrykivtsi and Gorodok

Image 16. Promising important ichthyological area near the village Vasyliv

As part of the study of depths in the Dniester riverbed, the results were obtained, which allow us to speak about the need to clarify the location of wintering sites and important for the habitat of fish in the river.

During the analysis of the depth determination results, it was found that some wintering sites and potential spawning grounds do not meet the real requirements and cannot be identified as important for wintering fish, and some areas do not have the optimal configuration and length. The main problem, in our opinion, is the inconsistency of wintering sites between the regional fisheries protection authorities.

RESULTS OF THE REASEARCH OF THE CURRENT STATE OF STURGEON POPULATIONS AND ASSESSING THE IMPORTANT PLACES OF THEIR EXISTENCE IN THE UKRAINIAN PART OF THE DANUBE RIVER AND IN THE NORTH-WESTERN PART OF THE BLACK SEA



RESULTS OF THE REASEARCH OF THE CURRENT STATE OF STURGEON POPULATIONS AND ASSESSING THE IMPORTANT PLACES OF THEIR EXISTENCE IN THE UKRAINIAN PART OF THE DANUBE RIVER AND IN THE NORTH-WESTERN PART OF THE BLACK SEA

Experience in identifying key vital sturgeon habitats in the Ukrainian section of the Danube

The research used the methodological guide «Danube Sturgeon Habitat Manual» (Draft 0.1), which was presented by Radu Suchu (DDNI, Tulcea) at the training on habitat assessment of migratory fish species in Tulcea (Romania) 17-22.09.2018 in MEASURES project (Interreg Danube Transnational Program).

There are 4 types of the most important river habitats of sturgeon:

- areas suitable for spawning, where the maximum survival of youngstersis ensured;
- optimal ways (routes) of fish migrations up and downstream due to energy savings;
- suitable places for wintering of autumn migrants (wintering sites) / places of waiting for adults before spawning;
- feeding areas with benthic fauna, suitable for feeding young / YOY (Young of Year).

Taking into account the hydrological and size composition in the Ukrainian part of the Lower Danube, only the last three types of key sturgeon habitats are presented. All spawning grounds are located upstream. The lowest known spawning ground for Beluga and Sterlet is located at 54Nm of the river near Isaccea on the Romanian coast (Suciu, 2018).

To study the migration routes and characteristics of sturgeon behavior in the river today, the method of acoustic telemetry using mobile signaling devices and signal receiving stations is effectively used. However, due to the lack of material and technical capabilities for the organization of such a monitoring system in Ukraine, the studies focused on:

1. to collect available information on the location of wintering sites, which can potentially be used as waiting places for adults before spawning,
2. identification of feeding areas most important for feeding young individuals.

Wintering sites

Based on research conducted by the Odesa branch of PivdenNIRO more than 30 years ago, 6 most significant wintering sites have been identified in the Ukrainian part of the Lower Danube, which, along with other fish species, could potentially be used by adults of winter migrating sturgeons and Sterlet before spawning. (Table 7). Every year from November to March, the fisheries authorities introduce a formal ban on fishing in these places. In the last season, such a ban was established by the order of the Odessa Fish Patrol № 337 dated 23.10.2019. To obtain objective information about the current state of these areas and confirm the possibility of their use by sturgeon, a special survey and, if necessary, review their conservation status was done.

Table 7

Potential wintering sturgeon sites on the Ukrainian part of the Lower Danube (wintering, which is protected during the period from November to March)

CODE MEASURES	LOCATION	LATITUDE N	LONGITUDE E	DEPTH, M	DISTANCE FROM SEA KM, MILES
Ua_LDR_2	Maikan	45.440	29.395	20-34	35
Ua_LDR_3	Malyi Tataru	45.334	28.964	10-20	76
Ua_LDR_4	Izmail	45.309	28.885	20-32	87-88
Ua_LDR_5	111 km	45.257	28.791	10-20	111
Ua_LDR_6	55-56 miles	45.286	28.470	11	55-56 miles
Ua_LDR_7	Reni	45.468	28.216	11	71 miles

Identification of sturgeon feeding area in the area of Vilkove town

For more than 15 years of ichthyological observations in different parts of the Danube Delta, Kiliya branch it was found that the most common sturgeon by-catch o (YOY) is observed in mid-summer (late June - early August) in a narrow area along the left bank at 20-18 km of the Kiliya branch on the traverse of Vilkove town. In 2019, studies were conducted to confirm the use of this section of the riverbed as a seasonal feeding area for young sturgeon (nursery site for YOY sturgeons) and to determine its boundaries and size composition.

Analysis of river morphology and bottom morphometry

Areas favorable for feeding sturgeon juveniles are formed in those places of the riverbed where there is active sedimentation of solid particles of fine terrigenous and organic material carried by the river flow. This phenomenon is associated with certain places where the width of the riverbed after narrowing increases significantly, and the speed of water flow, respectively, decreases. These areas are usually associated with the presence of islands in the riverbed. Morphologically, the area of the Kiliya branch, located between Ermakov and Ankudinov islands (arrow of the island massif of the Kiliya delta), fully meets this criteria. There is a significant widening of the flow (more than twice) - from 420 m by 21 km to 950 m by 18 km of the river, reducing the depth and reducing the speed of the flow. The deepest part of the river is shifted to the right (Romanian) bank. Below the left bank near the town of Vylkove town, the river slope widens and forms an inclined terrace-like ledge with depths of 4-6 m, on which conditions are created for active sedimentation of precipitation.

The study of the morphometry of the bottom of the sloping plateau along the left bank was made to identify negative landforms in the form of small cavity. Such cavity could accumulate more rainfall and create more favorable conditions for the reproduction of soft benthic fauna and the feeding of young sturgeon, where they could stay longer. Existing navigational and bathymetric maps do not give a definite picture of the bottom relief in this section of the river, as regular depth measurements are carried out only in the area of the navigable fairway (images 17, 18). In June 2019, a bathymetric survey of the area potentially important for sturgeon feeding for 20-18 km of the Kiliya branch of the Danube River was carried out. Depths at 384 points were measured using a Hondex PS-7 handheld sounder and a Garmin Etrex 20x GPS. The survey results are presented in images 19 and 20. According to the results of the survey, it was found that the surface of the sloping section of the river slope in this place is relatively flat, no significant negative and positive landforms could not be detected.

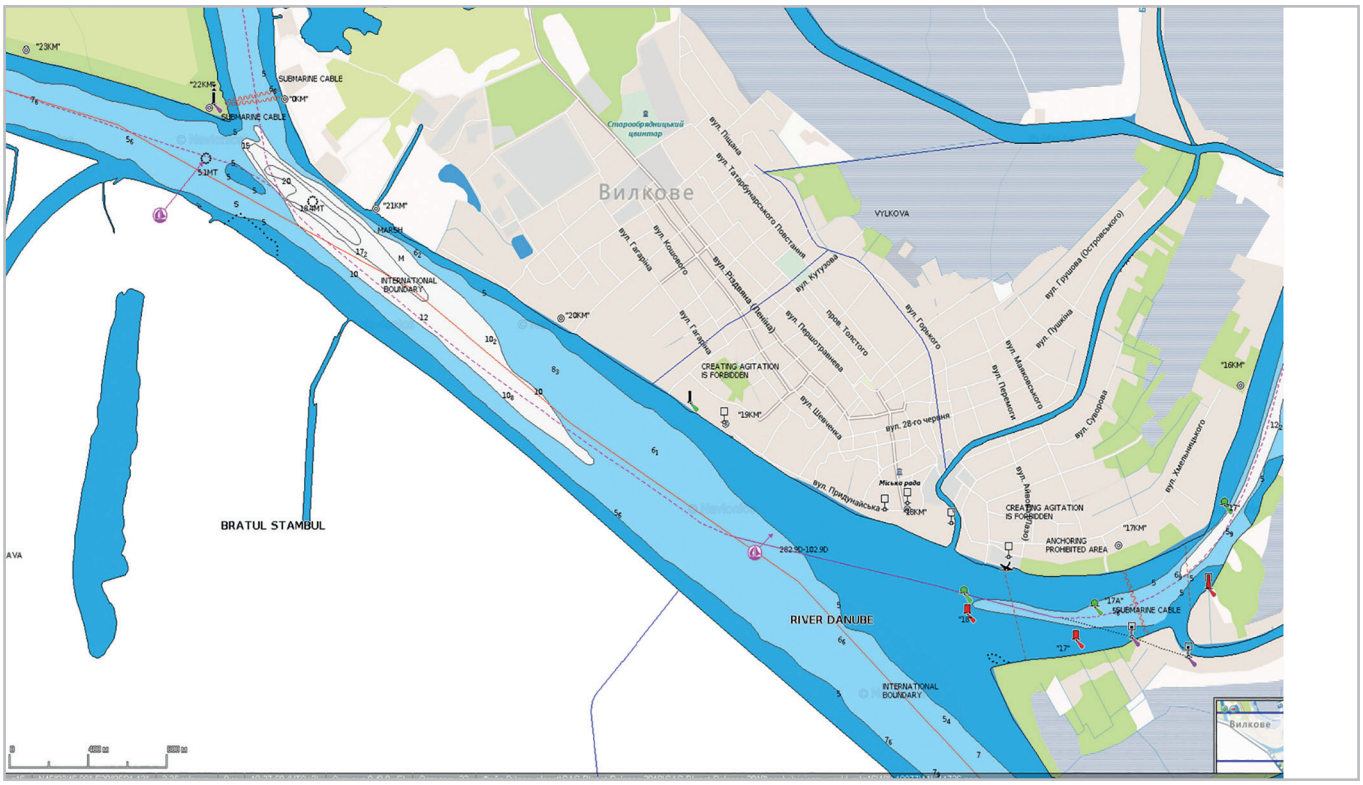


Image 17. Navigation map of the Kiliya branch, Danube, 21-18 km

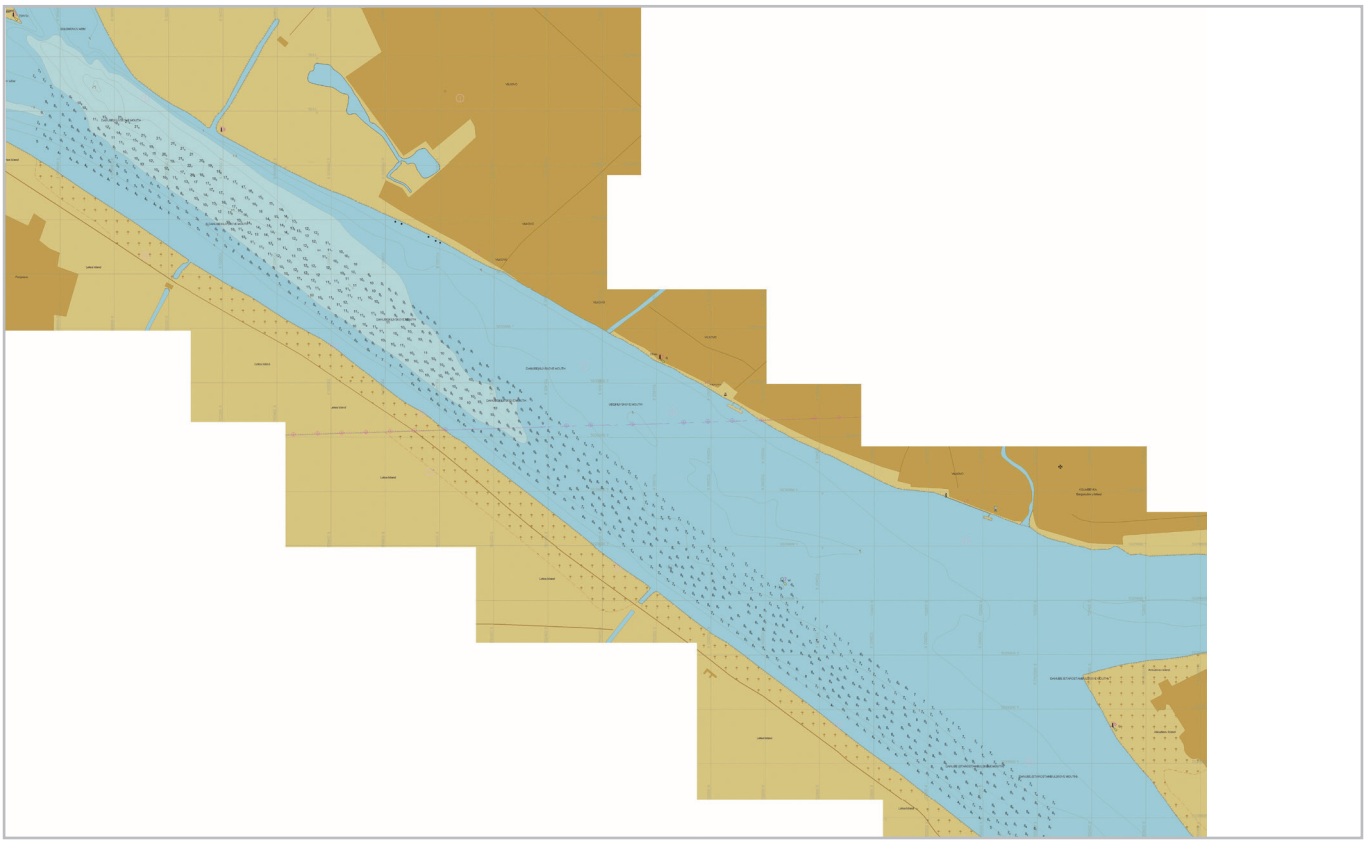


Image 18. Bathimetric map of the Kiliya branch, Danube, 21-18 km.

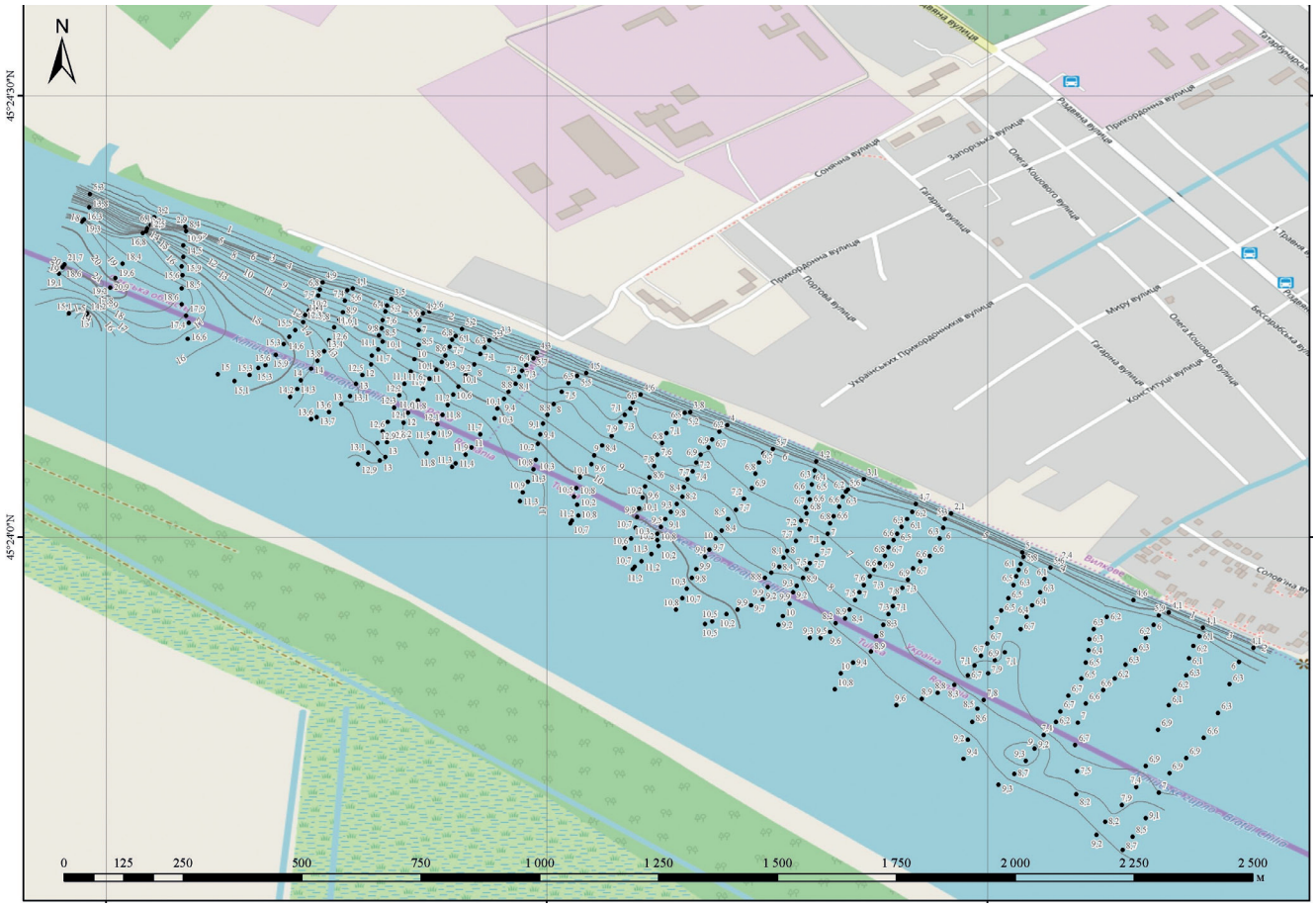


Image 19. The results of measuring the depth and bathymetry of the bottom at the Kiliya branch, 20-18 km in June 2019.

Image 20. Bathimetric map at the Kiliya branch, 20-18 km, according to the results of field research in June 2019.

Study of benthic fauna

To determine the value of the sturgeon feeding site in July, a benthic field research of 20-18 km of the Danube branch was carried out using a Petersen dredger (0.025 m2), a Hondex PS-7 handheld sounder, and a Garmin Etrex 20x GPS. At the same 6 stations, samples of macrozoobenthos and meiobenthos were collected in early July 2019 and samples of macrozoobenthos in late June 2020.

At each station, 4 samples were taken, which were then combined into one. Samples of macrozoobenthos were washed through a set of sieves with a minimum hole size of 1.0 mm. Thus, at each station, the material was collected from a total area of 0.1 m2. The collected material was processed according to standard methods (Bubnova, 1980; Mordukhai-Boltovskaya, 1975; Mokievsky et al., 2015).

Data on the species composition and biomass of macrozoobenthos and meiobenthos at stations in the Danube branch in July 2019 and in June 2020 are presented in tables 8, 9, and 10. In 2019, the basis of macrozoobenthos biomass in the study area was mollusks Sphaerium rivico and Viviparus viviparus. At station 2, the biomass of Sphaerium rivicola exceeded 2 kg / m2, which is a very high level for river biocenoses. However, due to the relatively large size (up to 10-22 mm) and strong shell, these species can not be considered as food for young sturgeon. The objects of feeding of young sturgeons first weeks of life are the organisms of meiobenthos and soft macrozoobenthos (oligochaetes, crustaceans, insect larvae), as well as small mollusks in the early stages of development. In 2020, the soil at stations 1-4 was characterized by a smaller accumulation of fine silty fraction, which, apparently, was due to the low water level of the Kiliya branch in the first half of the year. Macrozoobenthos samples in 2020 were poorer in quantitative and qualitative terms. If in 2019 13 taxa were presented in the collected samples, in 2020 - only 11. 8 taxa were common in both years.

In 2020, the maximum value of the total biomass of macrozoobenthos was also recorded at station 2. However, it was 6.5 times lower than in 2019. The basis of biomass was Dreissena polymorpha, not Sphaerium rivicola. The sizes of Dreissena polymorpha shells in the 2020 samples varied from 10 to 20 mm, which does not allow to attribute this species to feed of YOY. In general, the quantitative indicators of soft macrozoobenthos in 2020 were lower than in 2019. The maximum food biomass of macrozoobenthos was observed at 20.5 km of the Kiliya branch - 14.5 g / m2.

At depths of more than 6-7 m bottom sediments are represented by very dense agglomerated sand. Benthos on dense sand deposites is very poor and is represented in 2019 by only two taxa of meiobenthos - Nematoda and Bivalvia, and in 2020 - Hypania invalida, Sphaerium sp. and nymphs Trichoptera sp. The favorable sturgeon feeding zone (YOY) is located at depths of 4 to 6 meters and is about 50-100 m wide and about 2 km long (image 21). There are bottom sediments, represented by silted fine sand, and spots are formed with high biomass of soft food benthos. Conditions for feeding young sturgeon are formed, probably in late June-July, after lowering the water level, reducing the flow rate and increasing water temperature. However, the formation of favorable conditions for feeding is strongly influenced by the variability of the hydrological regime of the Danube.

Study of the distribution of sturgeon juveniles

To confirm the attractiveness for sturgeon juveniles of the considered area of the Kiliya branch, control catches were carried out with a triangular fry trawl (mesh size 10 mm; opening length - 2 m; length of one trawling - 1000 m; catch area - about 0.2 ha). In June-July 2019, ten trawlings were performed (Table 11) and in July 2020 - eight (Table 12). All sturgeons and juveniles of other fish species after the catch were released alive into the water.

In 2019, along with other fish species in by-catch of trawl was noted 52 individuals, Sterlet YOY weighing from 6 to 12 g. In comparison to other years, sturgeon species by-catch was not observed. CPUE trawl in 2019 was 5.2 individuals on effort.

In 2020, 4 A.stellatus YOYs were registered per trawling, but only one young Sterlet. The catch rate per efforts in 2020 (0.63) was 8 times lower than in 2019. Another 3 youngsters of the year, sturgeon were registered at 0 km of the Solomon's branch and 21-20 km of the Kiliya branch in drifter nets as a by-catch (20 mm).

Image 21. Location of seasonal forage area for sturgeon youngsters at 20-18 km of the Kiliya branch

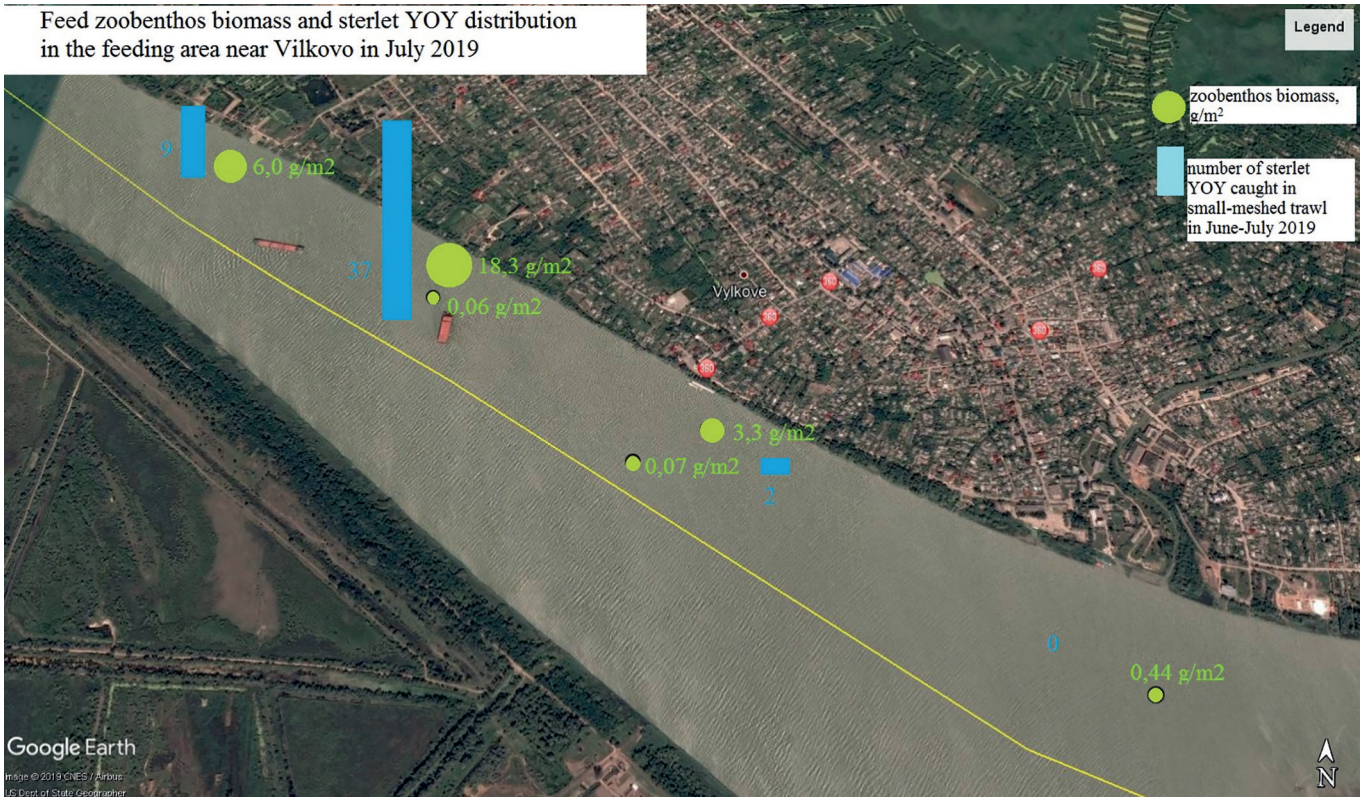


Image 22. Distribution of biomass of benthos (g / m2) and young Sterlet (YOY) in June-July 2019

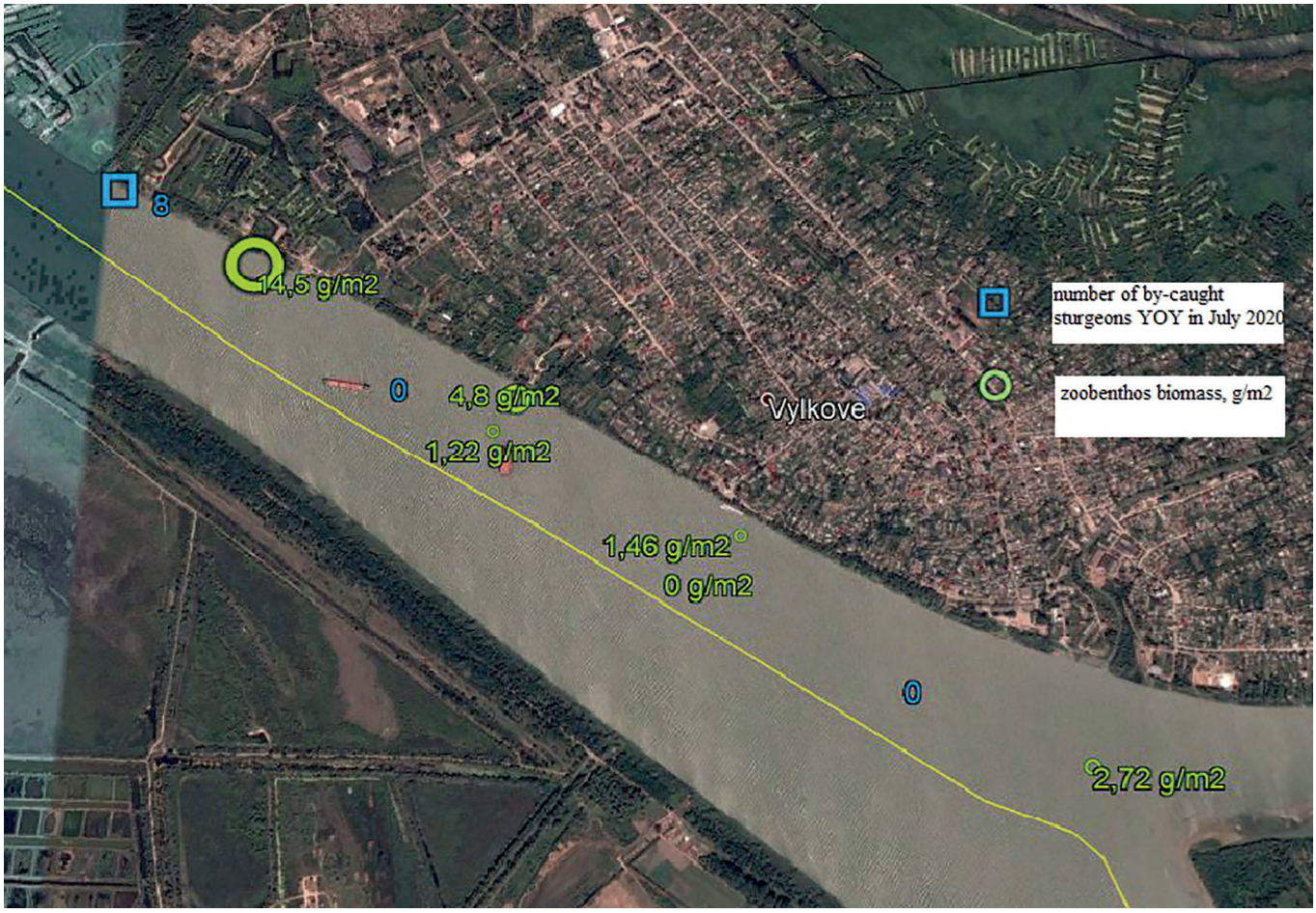


Image 23. Distribution of biomass of forage macrozoobenthos (g / m2) and young stellatus sturgeon and Sterlet (YOY) in June - July 2020

Table 8.

Composition and indicators of quantitative development (N - number, individuals/g/m2, B - biomass, g2) of macrozoobenthos at stations in the Kiliya branch of the Danube (20-18 km) in July 2019

	STATION № 1		STATION № 2		STATION № 3		STATION № 4		STATION № 5		STATION № 6	
DEPTH, M	5,4		5,9		5,9		3,8		7,4		6,8	
NATURE OF BOTTOM SEDIMENTS	FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		DENSE COARSE SAND		DENSE COARSE SAND	
TAXON	N	B	N	B	N	B	N	B	N	B	N	B
Oligochaeta g. sp.	250	0,34	170	0,45	0	0	0	0	0	0	0	0
Radix auricularia (L.)	20	0,15	0	0	30	3,06	0	0	0	0	0	0
Viviparus viviparus (L.)	0	0	10	25	0	0	0	0	0	0	0	0

	STATION Nº 1		STATION Nº 2		STATION Nº 3		STATION Nº 4		STATION Nº 5		STATION Nº 6	
DEPTH, M	5,4		5,9		5,9		3,8		7,4		6,8	
NATURE OF BOTTOM SEDIMENTS	FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		DENSE COARSE SAND		DENSE COARSE SAND	
TAXON	N	B	N	B	N	B	N	B	N	B	N	B
Theodoxus sp.	0	0	10	1,20	0	0	0	0	0	0	0	0
Unio pictorum (L.)	10	0,98	0	0	0	0	0	0	0	0	0	0
Sphaerium rivicola Lamarck	40	36	1170	2212	0	0	30	25	0	0	0	0
Pisidium amnicum (Muller)	10	0,29	0	0	0	0	0	0	0	0	0	0
Dreissena polymorpha (Pallas)	0	0	40	9,70	0	0	0	0	0	0	0	0
Chaetogammarus sp.?	10	0,22	330	5,12	0	0	0	0	0	0	0	0
Niphargoides sp.?	260	1,85	0	0	10	0,12	10	0,44				
Corophium volutator (Pallas)	1410	1,48	1800	1,73	20	0,02	0	0	0	0	0	0
Hydropsyche ornatula Mc. L. larvae	40	0,52	90	0,94	0	0	0	0	0	0	0	0
Trichoptera sp., nympha			10	0,26	0	0	0	0	0	0	0	0
Total	**2050**	**41,83**	**3630**	**2256,40**	**60**	**3,20**	**40**	**25,44**	**0**	**0**	**0**	**0**
Number of taxa	**9**		**9**		**3**		**2**		**0**		**0**	
Biomass without Sphaerium i Viviparus		**5,830**		**17,67**		**3,2**		**0,44**		**0**		**0**

Table 9.

Composition and indicators of quantitative development (N - number, ind/m2, B - biomass, mg/m2) of meiobenthos at stations at the Kiliya branch of the Danube (20-18 km) in July 2019

	STATION Nº 1		STATION Nº 2		STATION Nº 3		STATION Nº 4		STATION Nº 5		STATION Nº 6	
DEPTH, M	5,4		5,9		5,9		3,8		7,4		6,8	
NATURE OF BOTTOM SEDIMENTS	FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		DENSE COARSE SAND		DENSE COARSE SAND	
TAXON	N	B	N	B	N	B	N	B	N	B	N	B
Nematoda	700	0,48	2100	0,32	100	0,20	-	-	100	0,02	150	0,05
Harpacticoida	0	0,00	300	4,80	100	1,60	-	-	0	0,00	0	0,00
Turbellaria	0	0,00	225	1,58	0	0,00	-	-	0	0,00	0	0,00
Gastrotricha	0	0,00	75	0,01	0	0,00	-	-	0	0,00	0	0,00
Oligochaeta	1700	119,00	3300	231,00	1200	84,00	-	-	0	0,00	0	0,00
Bivalvia	4700	94,00	18375	367,50	1900	38,00	-	-	3000	60,00	3450	69,00
Eumeiobenthos	700	0,48	2700	6,71	200	1,80	-	-	100	0,02	150	0,05
Pseudomeibenthos	6400	213,00	21675	598,50	3100	122,00	-	-	3000	60,00	3450	69,00
Total	**7100**	**213,48**	**24375**	**605,21**	**3300**	**123,80**	**-**	**-**	**3100**	**60,02**	**3600**	**69,05**
Number of taxa	**3**		**6**		**4**		**-**		**2**		**2**	

Table 10

Composition and indicators of quantitative development (N - number, ind/m2, B - biomass, g/m2) of macrozoobenthos at stations in the Kiliya branch of the Danube (20-18 km) in June 2020

	STATION Nº 1		STATION Nº		STATION Nº 3		STATION Nº 4		STATION Nº 5		STATION Nº 6	
DEPTH, M	5,4		5,7		5,9		3,7		7,2		6,6	
THE NATURE OF BOTTOM SEDIMENTS	FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		DENSE COARSE SAND		DENSE COARSE SAND	
TAXON	N	B	N	B	N	B	N	B	N	B	N	B
Hypania invalida (Grube, 1860)	10	0,08	0	0	0	0	0	0	0	0	0	0
Oligochaeta g. sp.	720	2,82	50	0,1	30	0,06	70	0,1	0	0	0	0
Radix auricularia (L.)	80	9,8	20	3,6	10	1,38	10	2,38	0	0	0	0

	STATION № 1		STATION №		STATION № 3		STATION № 4		STATION № 5		STATION № 6	
DEPTH, M	5,4		5,7		5,9		3,7		7,2		6,6	
THE NATURE OF BOTTOM SEDIMENTS	FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		FINE SAND, SILT		DENSE COARSE SAND		DENSE COARSE SAND	
TAXON	N	B	N	B	N	B	N	B	N	B	N	B
Viviparus viviparus (L.)	0	0	10	29,1	0	0	0	0	0	0	0	0
Sphaerium rivicola Lamarck	10	6,2	70	90,4	20	17,1	80	79,5	0	0	0	0
Sphaerium sp.	0	0	0	0	10	1,7	10	0,68	10	0,58	0	0
Dreissena polymorpha (Pallas)	20	10,94	360	215,5	0	0	0	0	0	0	0	0
Amphipoda g. sp.	0	0	10	0,14	0	0	10	0,08	30	0,82	0	0
Corophium volutator (Pallas)	0	0	530	0,86	0	0	0	0	0	0	0	0
Trichoptera sp., nympha	0	0	20	0,1	0	0	0	0	40	0,4	0	0
Chironomidae g. sp.	90	1,78	0	0	10	0,02	40	0,16	0	0	0	0
Total	**930**	**31,62**	**1070**	**339,8**	**80**	**20,26**	**220**	**82,9**	**80**	**1,8**	**0**	**0**
Number of taxa	**6**		**8**		**5**		**6**		**3**		**0**	
Biomass without Sphaerium, Dreissena и Viviparus		**14,48**		**4,8**		**1,46**		**2,72**		**1,22**		**0**

Table 11

Cases of YOY sturgeon catching by fry trawl in the Kiliya branch of the Danube in 2019

DATE, PLACE OF FISHING	SPECIES OF STURGEON, THEIR NUMBER	LENGTH, CM (L/SL)
June 28, Kiliya branch, Bazarchuk - 21 km	not found	-
June 28, Kiliya branch, 21-20 km	Sterlet (7 ind.)	11-13/10-11
June 28, Kiliya branch, 20-19 km	Sterlet (5 ind.)	11-12,8/10-10,5
June 28, Kiliya branch, 19-18 km	not found	-
July 5, Solomon branch, 1 - 0 km	Sterlet (4 ind.)	8,5-11/10-15

DATE, PLACE OF FISHING	SPECIES OF STURGEON, THEIR NUMBER	LENGTH, CM (L/SL)
July 5, Kiliya branch 21-20 km	Sterlet (2 ind.)	10/12-13
July 18, Solomon branch 1 - 0 km	not found	-
July 18, Kiliya branch, 21-20 km	not found	-
July 18, Kiliya branch, 20-19 km	Sterlet (32 ind.)	14-18/12-15
July 18, Kiliya branch, 19 -18 km	Sterlet (2 ind.)	13/16, 14/17

Table 12

Results of by-catch of sturgeon juvenile youngsters trawling at the mouth of the Danube in Kiliya in 2020

DATE, PLACE OF FISHING	SPECIES OF STURGEON, THEIR NUMBER	LENGTH, CM (L/L)
July 07, Solomon branch, 1 - 0 km	Stellate sturgeon (1 individual)	14,3/11
July 7, Kiliya branch, 21-20 km	Stellate sturgeon (2 individuals)	14/11; 14,5/11,2
July 07, Kiliya branch, 20-19 km	not found	-
July 07, Kiliya branch, 19-18 km	not found	-
July 17, Solomon branch, 1-0 km	Stellate sturgeon (1 individual)	11/9
July 17, Kiliya branch, 20-19 km	Sterlet (1 individual)	10,3/8,7
July 17, Kiliya branch, 21-20 km	not found	-
July 17, Kiliya branch, 19 -18 km	not found	-

In general, according to the results of fishing, a known concentration of young sturgeons was found in the area with the maximum biomass of forage benthos (image 22, 23). This fact suggests the use of hypotheses about the importance of this habitat as a seasonal feeding area for young sturgeon.

It should be noted that the hydrological regime of the Danube in 2019 and in 2020 was unusual. In contrast to the norm, the peak of flooding in the river was observed not in March-April, but in June. At the same time, 2020 was also very shallow for the Danube. Achieving water level in the spring of 2020 was twice less, by 2019, and almost three times less, by 2018.

Based on the observation of the movement downstream of young sturgeon species, their spawning in 2019 was not successful. Favorable conditions for feeding young individuals in the area of the Kiliya branch near Vylkove town were formed later than usual, and this nursery and feeding site was used by young Sterlet only.

2020, apparently, was unpleasant for Beluga and Sterlet spawning and Belugas, as well as Russian sturgeon. Beluga YOYs have not been identified this year on the Ukrainian section of the Danube at all. This is also confirmed by the data came from fishermen. These summer the number of Sterlet youngsters was extremely low. However, the YOYs of these two species traditionally used the nursery area near Vilkove for summer feeding. This explains the absence of at least some significant concentrations of young sturgeons (YOY) movement downstream in this area in the summer of 2020. On the contrary, the number of young sturgeons in 2020 is generally consistent with long-term averages. Apparently, this is the only species of sturgeon, spawning which was relatively successful this year.

Mainly, which reveals the seasonal place of feeding young sturgeons places just a hundred meters from the boat docks in Vilkove. However, maintaining this key location contributes to the following factors. First, this part of the

Kiliya arm in the second half of the last century is used as a place for parking for ships and barges. As a result of the accumulation of days of lost anchors, ship chains and other metal objects, it is almost impossible to use fishing nets due to the danger of destroy. Secondly, the formation of foraging aggregates of young sturgeons appears here from late June to early August, when the herring "putina" (commercial catch) on the river is already finished and fishing activity is also included. Thus, until recently, this habitat could retain its key values for feeding young sturgeons. However, due to the potential invariability of the appropriate continuation of monitoring, its condition is to assess the possible adoption of additional protection measures.

Monitoring of sturgeon youngsters movement downstream in the Lower parts of the Danube

As one of tools for monitoring the current state of sturgeon populations and their current reproduction, studies of juvenile movement downstream in the Lower parts of the Danube can be used.

Since spawning of all sturgeon species takes place outside the Ukrainian section of the Danube, the effectiveness of natural reproduction can be assessed by observations of youngsters movement downstream in the river delta.

Since 2002, Odessa Center of the Southern Research Institute of Marine Fisheries and Oceanography (PivdenNIRO), the Danube Biosphere Reserve and the Institute of Marine Biology of NASU have annually conducted ichthyological studies in different branches of the Kiliya part of Danube Delta during the migration season of sturgeon juveniles, mainly from June to August.

Drift nets mesh size 20 mm, length 75 m and a triangular fry trawl mesh size 10 mm, opening 2.0 m were used to study the sturgeon's movement downstream. The length of one trawling is 1 km, the trawling area is 0.2 ha. In addition to the use of experimental fishing nets, we also studied young sturgeons by-catch by other smooth net netss (30-40 mm) during scientific fishing catch (image 24).

Image 24. Study of of sturgeon juveniles by-catch in smooth nets

During the whole observation period on the Ukrainian section of the Danube, young migratory species of 4 sturgeon species were observed: Russian sturgeon (Acipenser guldenstadtii), Stellatus sturgeon (Acipenser stellatus), Cammon Beluga (Huso huso), Sterlet (Acipenser ruthenus), and occasional catching sturgeon hybrids (most often - A. ruthenus * A. stellatus). The YOY of Ship sturgeon (Acipenser nudiventris) and European sturgeon (Acipenser sturio) were never noted.

The ratio of species composition and the number of young sturgeons in the Ukrainian section of the Danube River vary from year to year (image 25, Table 13). This is a reflection of the success of spawning a species. Among the many natural and anthropogenic factors that affect the spawning efficiency

of sturgeons, an important place is occupied by climatic and hydrological factors, especially the height and dynamics of the spring flood (image 26). According to long-term monitoring, the Lower Danube area is characterized by the highest spring floods from March to May (Gazetov et al., 2015; Romanchuk and Lyashchenko, 2015). The pronounced spring floods obviously have a positive effect on Beluga spawning. In any case, in 2017 and 2018, the predominance of Beluga YOYs was observed in sturgeon by-catch in smooth nets. In 2019 and 2020, the maximum of the flood was shifted to June, while the first half of 2020 was extremely shallow.

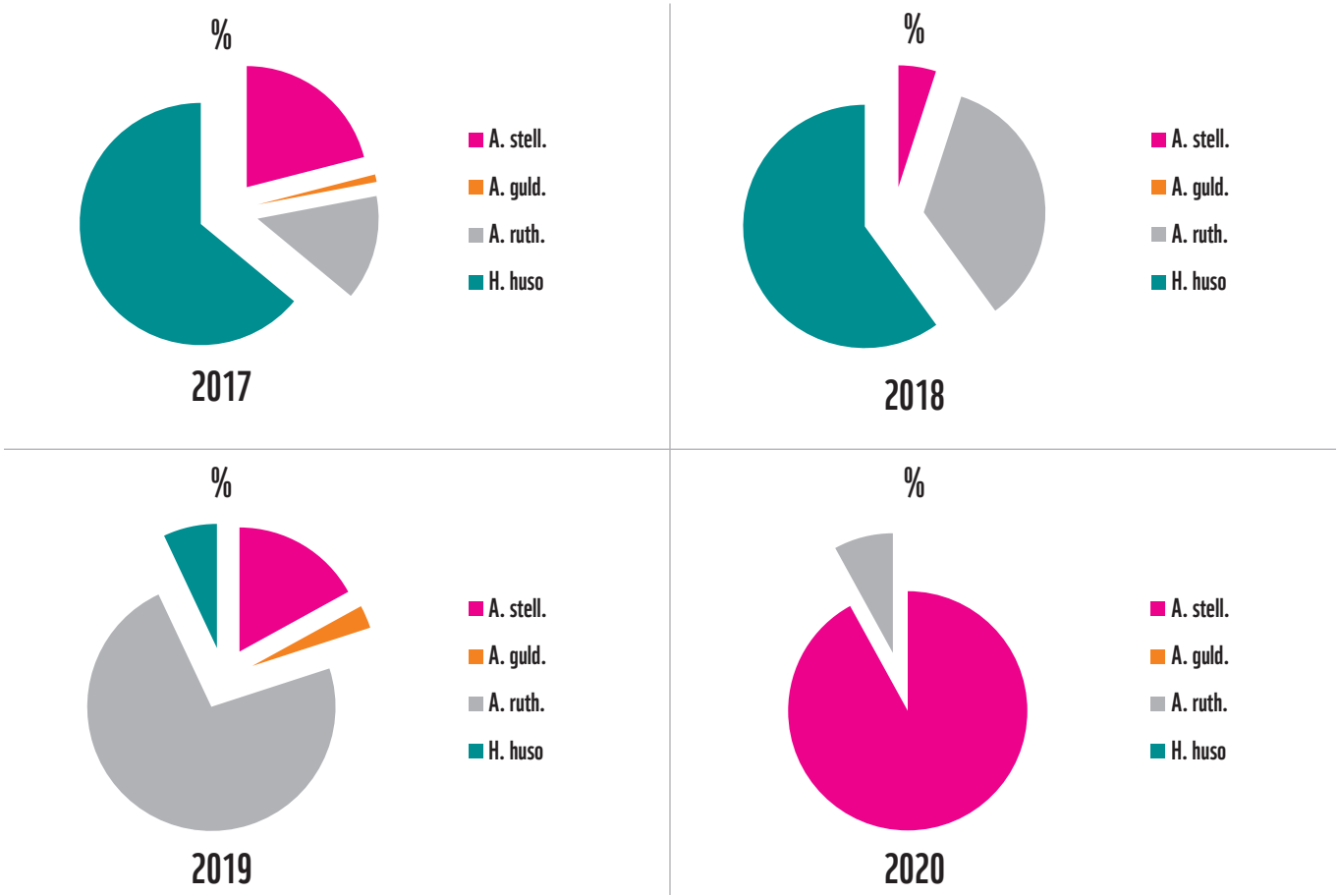


Image 25. Species ratio in sturgeon YOY by-catch of smooth nets in the Lower Danube in 2017-2020

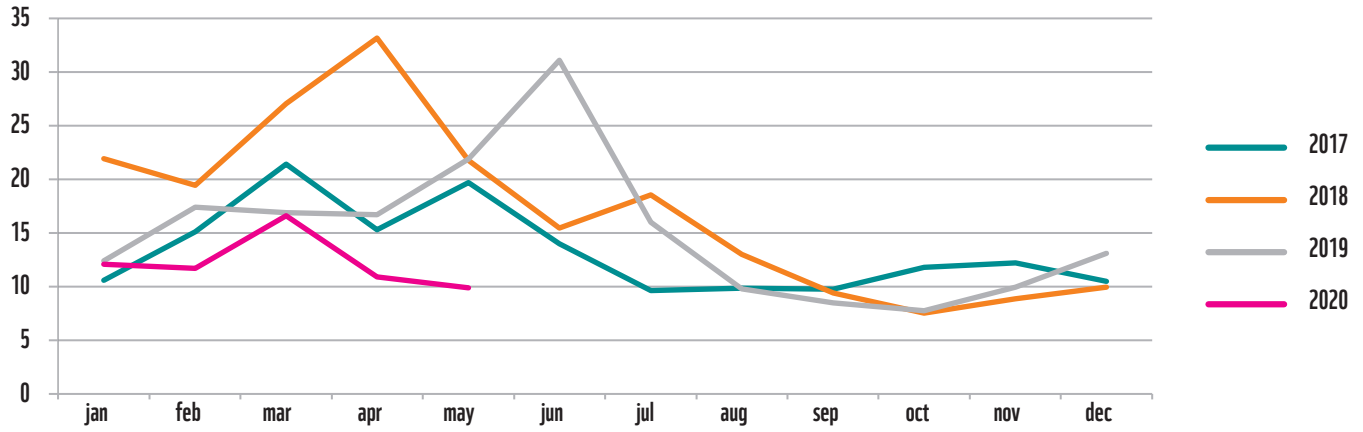


Image 26. Seasons related data of water runoff of the Danube by months in 2017-2020, W, km3 (according to the Danube Hydro Meteorological Station)

From year to year, there are significant changes in the relative number of young migrants of different species (estimated by the amount individuals in by-catch per standard catch effort - CPUE). According to observations of recent years, the maximum amount of individuals by-catch on the effort (standard sinking) of smooth nets was noted in 2017, and the minimum - in 2019 (Table 13). In 2017, the most successful spawning of Beluga and Russian sturgeon, and in 2018 - Beluga and Sterlet. The year 2019, apparently, was relatively favorable only for the spawning of Sterlet, while in the low-water 2020 only the Stellatus sturgeon successfully spawned (image 1). It is noteworthy that in the catches of youngsters trawl in 2019 was registered the Sterlet only, and in drifter nets, the part of Sterlet youngsters was 73%. In 2020, in by-catch of smooth nets absolutely dominated Stellatus sturgeon (92.3%), and in the youngsters trawl, its part was 80%. Beluga and Stellatus sturgeon YOYs in 2020 were not registered at all.

Table 13

The value of the by-catch rate per effort (standard sinking) of smooth nets in the Lower Danube in 2017-2020.

Year	2017	2018	2019	2020
by-catch rate per effort, individuals	1,80	0,54	0,315	0.37

Despite the frequent change of dominant species, Stellatus sturgeon and Sterlet predominated among migrating young sturgeons in the past, in the late twentieth century, third place was occupied by Russian sturgeon and the fourth by Beluga (Bushuiev et al., 2014). In the last decade, the types of ratios have changed significantly (Bushuyev, Balatsky, 2018, 2019). The predominant species were Beluga and Sterlet. Stellatus sturgeon in some years ranks first or third in frequency in by-catch. The presence in catches of young Russian sturgeon decreased the most. During several of recent seasons, young sturgeons from natural spawning are not registered every year in smooth fishing nets. The exception was 2015, when in Romania there was a mass artificially bred and tagged young Russian sturgeons releasing into the Danube. Obviously, the natural reproduction of Sterlet, Beluga and Stellatus sturgeon in the Danube in recent years is relatively more successful than the Russian sturgeon, which population is among the considered species most threatening. Perhaps the main reasons for the sharp decline in the number of Russian sturgeon are the reduction of the forage base in the sea after the mass increasing of Rapana venosa in the North-Western part of the Black Sea, as well as poaching in the wintering sites in Karkinitsky Bay of the Black Sea.

The results of a study of tagged sturgeon juveniles stocked into the Danube distribution in Ukrainian waters

In 2014-2015, work was carried out to search for CWT tags using T-wand detectors provided by the University of Lower Danube, Galati, Romania, in the framework of the POP project 18 / 22.04.2013, «Evaluation of survival and distribution in the Black Sea of young sturgeons stocked experimentally in the Lower Danube », Romania (2013-2015) (image 27). Involving Ukrainian experts in this project was an important initiative in strengthening Ukraine's cooperation with neighboring countries in the Danube and the Black Sea basins on the protection, reproduction and rational use of sturgeon species.

To evaluate the effectiveness of artificial reproduction measures in Romania, work began in 2005 on the mass tagging of sturgeon juveniles released into the Danube by Coded Wire Tag (CWT) using technology developed by Northwest Marine Technology, Inc., Shaw Iceland, Washington 98286, USA. This technology allows relatively simple and cheap mass tagging of sturgeons weighing more than 20 g. Since 2005, more than 700,000 individuals of artificially bred youngsters of three species of sturgeon (Beluga, Russian sturgeon and Stellatus sturgeon) have been released into the Danube River in Romania, marked with metal wire taggs CWT and acoustic sensors Vemco (images 28,29). As part of the experiment, fish of different ages and sizes were released in different parts of the Danube River (from 630 to 2 km) at different times. Work on the project was carried out only with migratory sturgeon species, excluding freshwater Sterlet. Data on the return of taggs allow us to assess the effectiveness of work on artificial reproduction of sturgeons, to study the growth rate of fish in the natural environment, their migration.

Image 27. T-Wand CWT detector (a), Multishot CWT injector (б)

Image 28. An individual marked with the SWT label

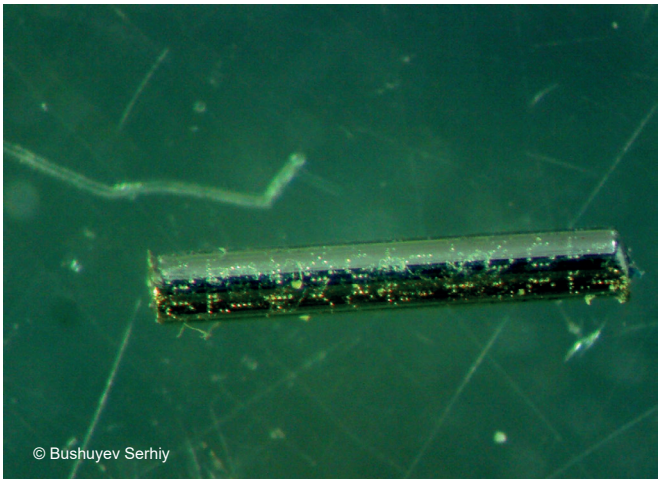


Image 29. CWT label (50x magnification)

This measure is considered an important component of the preparation and implementation of future sturgeon restocking programs by other Black Sea countries. Tagging of these sturgeons CWT allows:

1. identify the place and date of reproduction of the released youngsters;
2. identify its origin from certain offspring;
3. in the future to select individuals for artificial reproduction to avoid inbreeding;
4. assess the ultimate survival of artificially reproduced youngsters before maturity;
5. evaluate the overall effectiveness of the artificial reproduction program.

To study the movement downstream of young sturgeons in the Danube, they used small drift nets (20 mm mesh), a triangular youngsters trawl (10 mm). Fishing was carried out in the main arms of the Kiliya Danube Delta - Kiliya, Ochakiv, Starostambul and Bystre. In addition to the control of the movement downstream by experimental fishing nets, we also studied the young sturgeon by-catch of specific fishing nets (28-40 mm) (Bushuev and Balatsky, 2016).

Work on the study of sturgeon by-catch in the Black Sea and the Danube was carried out on the basis of checkpoints of the Odesa center PivdenNIRO, as well as in the implementation of field research (nets with a mesh of 45-70 mm). Employees of IMB NASU and Odesa center NIRO took part in the works: Balatsky K., Bushuyev S., Kharlov G., Finogenov O., Chashchin O., Khilchenko O. (Image 30).

Caught sturgeon were measured, weighed, identified, checked with a T-wand detector for tags, and then released into the reservoir alive. In some cases, sturgeon from the poaching catches were also inspected.

Image 30. Checking the presence of the SWT tags

In 2014-2015, data about of 545 sturgeon by-catch were collected. The main number of fish was inspected in the area of Ochakovo-Tendrivska spit (367) and in the Danube delta (165). In other coastal areas, a relatively small number of fish, 13, were collected.

The largest number of Russian sturgeon was registered - 327. Most of them were caught in the area of Ochakiv-Tendra - 260 (about 80%). The second largest species was Beluga. Stellatus sturgeon was more often observed in the Danube delta (table 14).

Table 14

Data about sturgeon by-catch and registration of CWT tags (numbers in brackets) in 2014-2015

FISHING AREA	STELLATE STURGEON	BELUGA	RUSSIAN STURGEON	HYBRID	TOTAL
Danube Delta	39 (1)	54 (-)	66 (62*)	6 (-)	165 (63)
Dniester	3 (-)	- (-)	- (-)	- (-)	3 (-)
Odessa Bay	- (-)	1 (-)	- (-)	- (-)	1 (-)
North-Western part of the Black Sea at the mouth of the Tiligul	4 (-)	4 (-)	1 (-)	- (-)	9 (-)
North-Western part of the Black Sea Ochakiv-Tendra	30 (-)	77 (10)	260 (14)	- (-)	367 (24)
Total	76 (1)	136 (10)	327 (76)	6 (-)	545 (87)

*6 of them were taken out and 4 were inspected

Species composition. The ratio of sturgeon species in different areas varies greatly. The Ochakiv-Tendra area of the Black Sea is very different in species composition from other areas. The distribution (in percentage) of Russian sturgeon in this area is 71% of the total number of surveyed individuals. In the Danube Delta, the distribution of Russian sturgeon was 40%. Outside these two areas, only 1 individual of Russian sturgeon has been registered.

It should be noted that the high rate of Russian sturgeon among migratory young sturgeons is completely atypical for the Danube in recent years. Almost all Russian sturgeons in the Danube were registered just after the release of artificially bred youngsters in Romania in 2015. Usually, Russian sturgeon juveniles from natural spawning are extremely rare in the river.

In June 2015, field research were made on the sturgeon juveniles movement downstream in the Danube River after the release of artificially bred Russian sturgeon juveniles by the University of the Lower Danube (Galati) on June 2-12, 2015. The first individuals of Russian sturgeon of artificial origin were noted on June 7, 2015. In the scientific catches were registered:

- 62 individuals of Russian sturgeon 28-45 cm long, yellowish-green color, all individuals are marked with CWT (left fin);
- 19 individuals of Beluga 10-18 cm long (origin from natural spawning - without tags);
- 3 Stellatus sturgeons 30-50 cm long (of natural origin - without tags).

Sturgeon juveniles by-catch of artificial origin on the Ukrainian section of the river began to be observed on the fifth day after the start of fish release in Galaţi. The maximum of the movement downstream (mass by-catch) was observed on June 10-11 (8-9 days after the start of release). The main migration routs were Kiliya arm and then - Starostambul arm. The intensity of sturgeon youngsters migration was registered in the middle of the day. Due to the increasing the number of sturgeon by-catch, most fishing companies have announced the stop of fishing with herring nets (mesh nets 30-36 mm) from June 12. On June 15, herring fishing (30-36 mm nets) in Kiliysky, Starostambulsky and Ochakivsky branches was stopped by the order of the Odessa fish patrol.

The results of the field research testify to the importance of the Ukrainian section of the Danube for sturgeon juvenile downstream migration, as well as to the effectiveness of artificial stocking carried out by the Romanian colleagues. It should be noted that during the entire period of observations in 2014-2015, only 4 individuals of Russian sturgeon by-catchpossibly natural origin (without tags) were registered in the Danube.

In the eastern part of the North-Western part of the Black Sea, the situation is different. Here Russian sturgeon traditionally predominates among sturgeon species. But even here it is a result of mostly artificial origin. The Russian sturgeon youngsters has been artificially bred and released for more than 30 years and produced by the Dnieper Sturgeon Fish Breeding Plant. In all, over the years of its producing, more than 50 million individuals of Russian sturgeon have been released into the Dnieper. Tagging of released sturgeon youngsters by this breeding facility is not carried out. Because of the distribution of tagged Russian sturgeons observed in Romania in the Danube region is 94%, and in the eastern part of the North-Western part of the Black Sea the distribution of tagged individuals is only 5%, we can assume that in the area of Ochakiv-Tendra predominate individuals of Russian sturgeon came from the Dnieper population. It is also obviously that the habitats of the Danube and Dnieper populations in the North-Western part of the Black Sea are partially overlapping.

Weight/lenght composition. Almost all caught fish were mature individuals. Only 3 individuals of Stellatus sturgeon (5.9%) and 3 individuals of Russian sturgeon (3.4%) reached the size of maturity.

Stellate sturgeon. The commercial length of individuals caught in the Danube Delta was generally much shorter than the length of fish caught at the Black Sea near Ochakovo. In the Danube, most individuals ranged in length from 11 to 50 cm, and in the Ochakiv-Tendra area from 61 to 100 cm. One of the reasons is that different age groups of fish were caught in these areas and fishing nets with different mesh size was used. In the Danube, sturgeons by-catch were registered mainly in nets for herring fishing (28-36 mm), and in the Ochakov area - in nets for fishing for pilengas (45-70 mm) (Image 31).

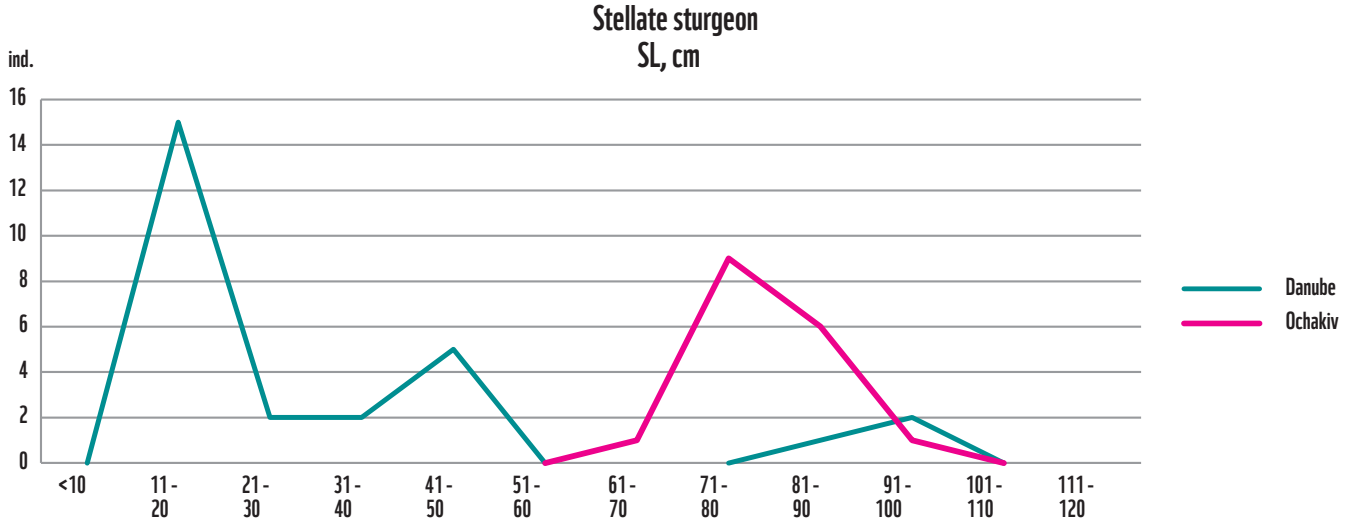


Image 31. The size composition of sturgeos by-catch in 2014-15.

Beluga. In the Danube, most of the registered individuals were 8 to 30 cm long, and in the Ochakov area 41 to 80 cm. One of the largest Beluga, which was registered in the Ochakov area, had a standard length of 114 cm and a weight of 15 kg and was immature (Image 32).

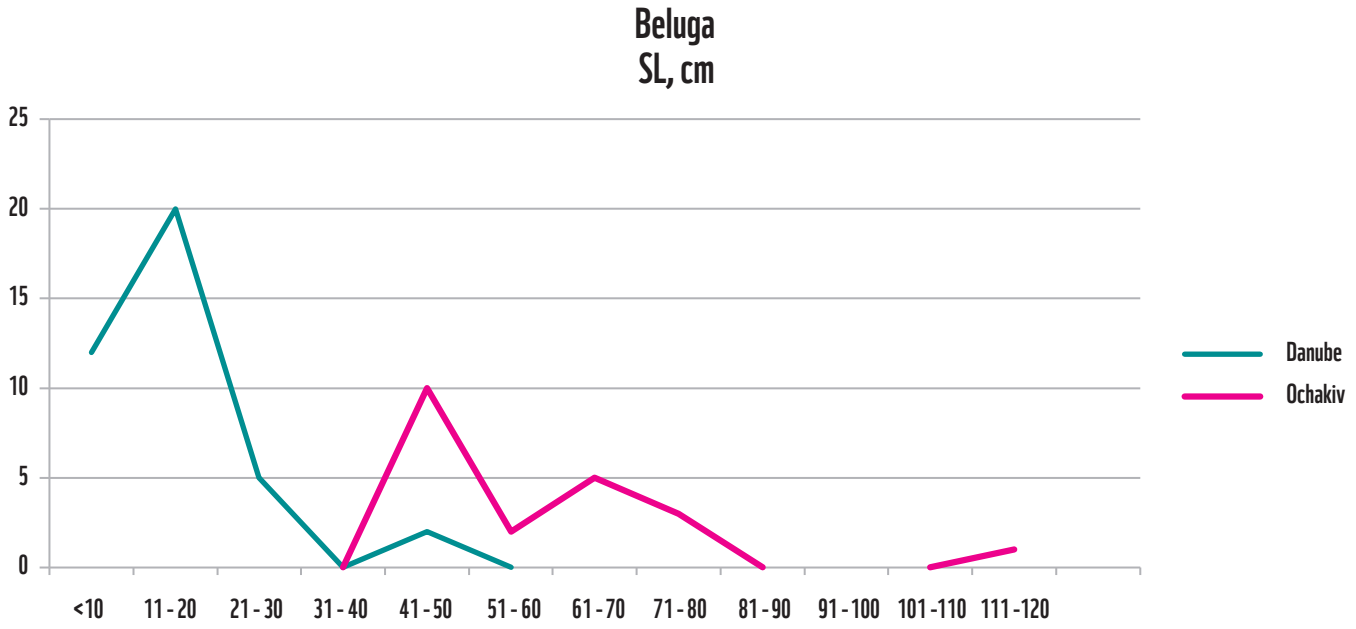


Image 32. The size composition of Beluga by-catch in 2014-15.

Russian sturgeon. The average size of Russian sturgeonby catch in the Ochakov region was significantly higher than in the Lower parts of the Danube. In the Danube, Russian sturgeons had a length of 21 to 40 cm, and in the Ochakov region - from 51 to 101 cm (Image 33).

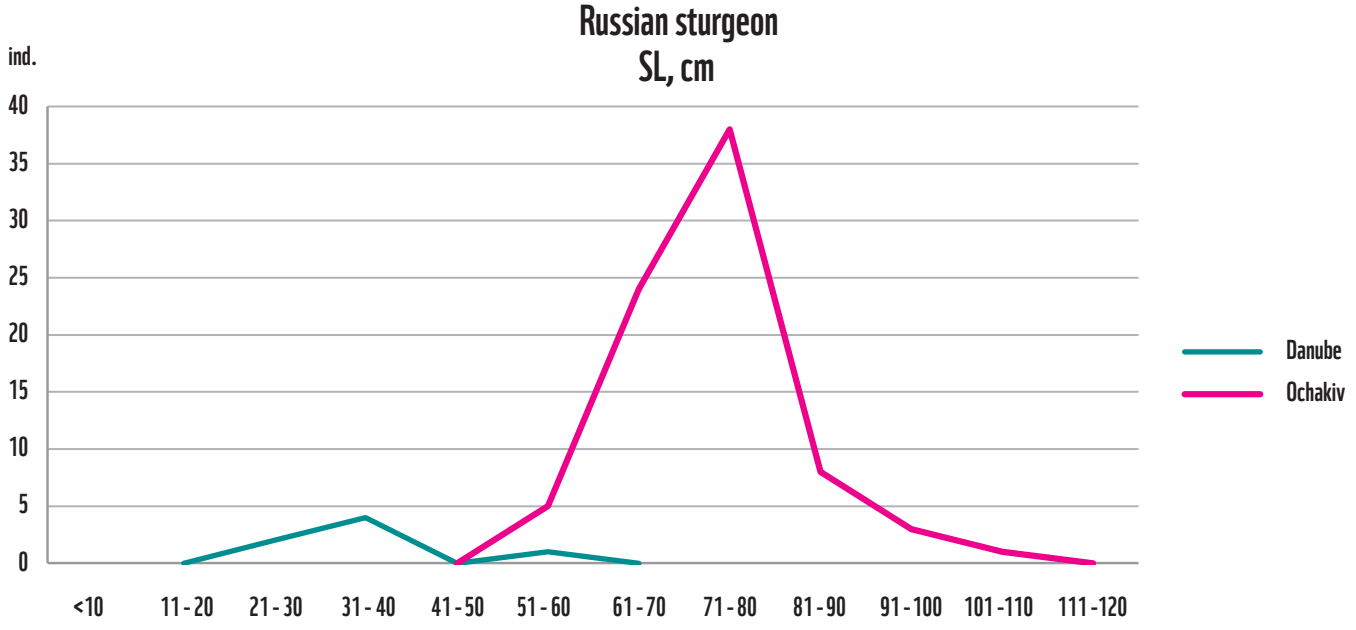


Image 33. The size of the Russian sturgeon by-catch in 2014-15.

In June 2017, Border police were confiscated a numbers of sturgeon caught by poachers in the Black Sea near the Kiliya branch in the Danube Delta. In a seizures of 42 individuals, 37 Russian sturgeons and 5 Stellatus sturgeons were registered. In fins of 32 Russian sturgeons (86.5%) the presence of CWT tags was recorded, which confirms their artificial origin. The Romanian colleagues confirmed the release of Russian sturgeon juveniles with tags from breeding facility in Fitesti and Rasova in 2013 and 2015. It seems that the sturgeon juveniles of artificial origin continue to stay together for several years of marine life in the area situated close to the Danube Delta. Dimensional characteristics of Russian sturgeon from catches of poaching nets are presented in table 15.

Table 15

Russian sturgeon size composition from catches of poaching nets (mesh nets 70-90 mm) in the Danube region of the Black Sea, June 2017

SL, CM	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-100	N
n	5	12	16	2	-	-	1	1	37
%	13,5	32,4	43,4	5,4	-	-	2,7	2,7	100

Preliminary results of work on tracking CWT-marked sturgeons.

In general, during the study period, the distribution of tagged sturgeons in Ukrainian waters was: Russian sturgeon - 23.2%, Beluga - 7.4%, Stellate sturgeon - 1.3% (Table 1). If we take into account that in the Dnieper population of Russian sturgeon there is a significant proportion of unnoticed individuals that were released by Kherson State breeding facility, it can be stated that today Russian sturgeon among the considered sturgeon species depends most on artificial reproduction, and its natural spawning is the least successful. On the other hand, for Stellate sturgeon and Beluga, the proportion of tagged individuals in the catches is much lower, which probably indicates a more successful natural spawning of these species, at least in the Danube.

Obviously, we can talk about the existence of two populations of Russian sturgeon - Danube and Dnieper. Russian sturgeons of the Danube population in the marine period of life feed mainly in the area close to the Danube Delta (Ionescu et al., 2017), and the Dnieper - in the Eastern part of the North-Western part of the Black Sea. The condition of these populations is markedly different. Possibilities of natural spawning of Russian sturgeon in the Danube are minimized. The predominance of untagged individuals of Russian sturgeon in the north-eastern part of the North-Western part of the Black Sea testifies to the existence of another, Dnieper population, formed mainly by artificial stocking of the Kherson State breeding facility. Individuals of both populations are mixed in places of feeding.

Individuals of Danube populations of Beluga and Russian sturgeon migrate freely within the Ukrainian part of the North-Western part of the Black Sea shelf. The distribution of tagged Belugas in the North-Western part of the Black Sea was almost twicely highest as the distribution of Russian sturgeon. During two years of field research, only one tagged Stellate sturgeon was registered and in the Danube only. This may indicate a clear predominance of natural spawning of Stellate sturgeon for its reproduction.

To conserve sturgeon populations, the ban on commercial fishing should certainly be maintained and fisheries should be strengthened in the Karkinitsky Bay area, where sturgeons spend the winter, as well as in areas of the sea close to Danube river arms and the Tendra and Kinburn spit areas where fish are fed. The data obtained also indicate the need to limit the use of nets for Liza haematocheilus and mullet (family Mugilidae) catching in this area. Relevant standards should continue to be included in the Black Sea Fishing Regime.

The presence of sturgeon regulary in by-catch, mostly juveniles, in the shallow zone of the North-Western part of the sea indicates the need to maintain the ban on trawling, as well as restrictions on the number of Liza haematocheilus nets and summer ban on their use in the area close to Tarkhankut - Dniester.

Field research of sturgeon by-catch by conducting of trawling in North-Western part of the Black Sea

Data on sturgeon by-catch in trawl sprat fishing in the Black Sea were obtained in the course of the research conducted from August 2018 to October 2019 within the GFCM project «Select activities of the mid-term strategy towards the sustainability of the Mediterranean and the Black Sea fisheries implemented »(BlackSea4Fish). Employees of IMB NASU and Odessa center PivdenNIRO took part in the field work: Bushuyev S., Finogenov O., Chashchin O., Kudryashov S., Gulak B.

The trawling area was located in the North-Westernpart of the Black Sea at a distance of 2 to 50 km from the shore. Depths ranged from 10 to 52 m. Fishing nets - a standard 29-meter multi-depth trawl RT-TM. In August-October 2018, by-catches of 120 trawls were analyzed

(August - 46, September - 36 and October - 38). The total sprat catch during these trawls amounted to 168.5 tons. In April-October 2019, by-catches of 174 trawls were analyzed (April - 3, May - 95, June - 21, July - 4, August - 25, September - 18 and October - 8). The total catch of sprat during trawling in 2019 was 113.3 tons. The industrialsituation in 2019 was significantly worse than in the previous 2018. Accordingly, the value of the average catch of sprat per trawl was twice lower: 2018 - 1.4 tons, 2019 - 0.65 tons (image 34).

In 2018, 29 sturgeons (26 Stellate sturgeons and 3 Russian sturgeons) were registered in trawl by-catch. Of these, in August, 12 individuals of Stellate sturgeon and 3 individuals of Russian sturgeon were registered, in September - 8 and in October - 6 individuals of Stellate sturgeon. It is noteworthy that 7 individuals of Stellate sturgeon and all 3 individuals of Russian sturgeon were caught in one day on August 25 in the eastern part of the fishing area close to the spit of Tendra. We can assume that these caught sturgeon belonged to the Dnieper population (Bushuyev, Balatsky, 2019).

In 2019, 49 sturgeons (48 Stellate sturgeons and 1 Russian sturgeon) were recorded in the trawl by-catch.

Image 34. Sturgeon by-catch in sprat catch

Both species of sturgeon caught in trawls were represented by young individuals, which were characterized by the relatively small size and low weight. The absolute length of the Russian sturgeon varied from 52 to 114 cm (industrial length - from 42 to 102 cm). The absolute length of the Stellate sturgeon is from 41 to 121 cm (industrial length is from 32 to 102 cm) (Table 16, 17).

Table 16

Size composition of Stellate sturgeon from trawl by-catches in the North-Western part of the Black Sea in August-October 2018 (SL)

SL, CM	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	УСЬОГО
n	4	2	4	4	3	3	5	1	26
%	15,4	7,7	15,4	15,4	11,5	11,5	19,2	3,9	100,0

Table 17

Size composition of Stellate sturgeon from by-catches in the North-Western part of the Black Sea in May-October 2019 (SL)

SL, CM	31-40	41-50	51-60	61-70	71-80	81-90	ВСЬОГО
n	9	24	9	6	1	1	50
%	18,0	48,0	18,0	12,0	2,0	2,0	100,0

There was dominated individuals of a large generation in 2017. Three- and six-year-old sturgeon individuals were registered less. It's important, that mature individuals of older age groups were not registered. Obviously, adult fish are quickly eliminated by illegal fishing in rivers and sea (image 35).

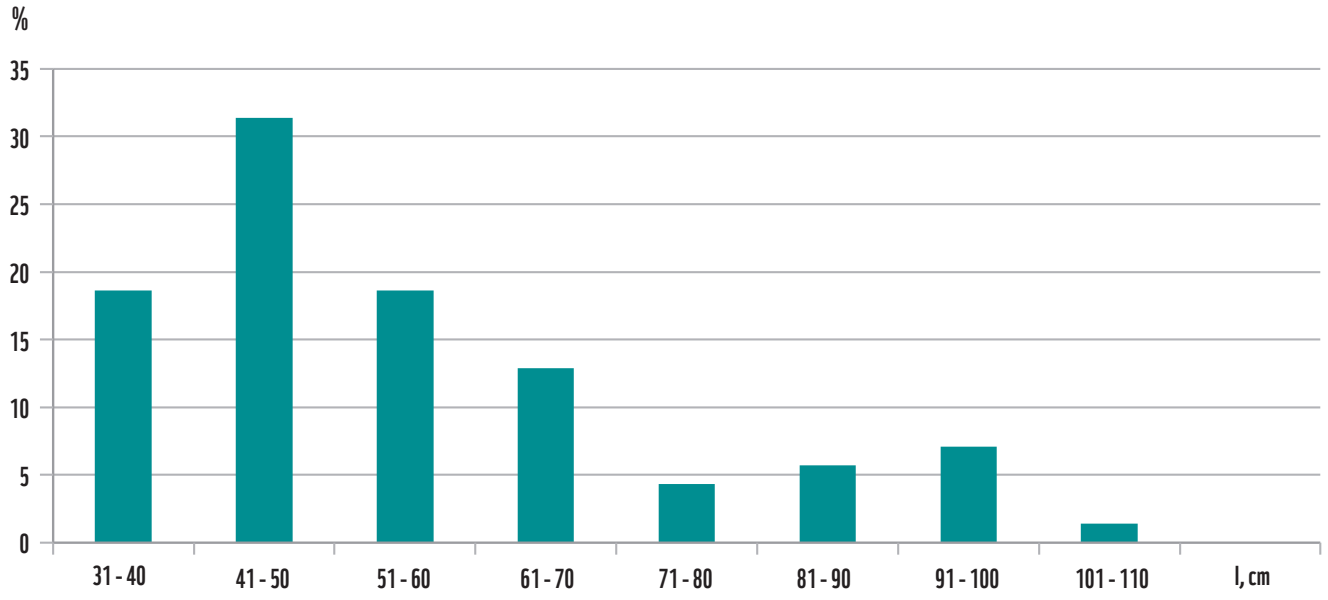


Image 35. Size composition of Stellate sturgeon in by-catches of trawls of different depths in North-Western part of the Black Sea in 2018-2019.

The weight of Stellate sturgeon ranged from 190 g to 4.7 kg, and Russian sturgeon - from 0.52 to 9.6 kg. In 14 individuals of Stellate sturgeon and 1 Russian sturgeon using a T-Wand detector found no CWT tags. Stellate sturgeon absolutely dominated among sturgeons in trawl by-catches. In 2018, its distribution was 89.7%, and in 2019 - 98.0%.

In June 2019, two cases of sturgeons by-catch (1 Stellate sturgeon with an industrial length of 41 cm and 1 Sterlet with a length of 44 cm) were recorded in bim-trawls. This by-catch was observed during the observation of 341 trawling operations. The Sterlet got into the bim-trawl in the sea due to the fact that the trawling was carried out close to Tsaregrad arm of the Dniester, in the water area where fresh water flowed.

The species composition and geographical distribution of sturgeon by-catches in all species of trawls in the North-Western part of the Black Sea are presented in images 36 and 37.

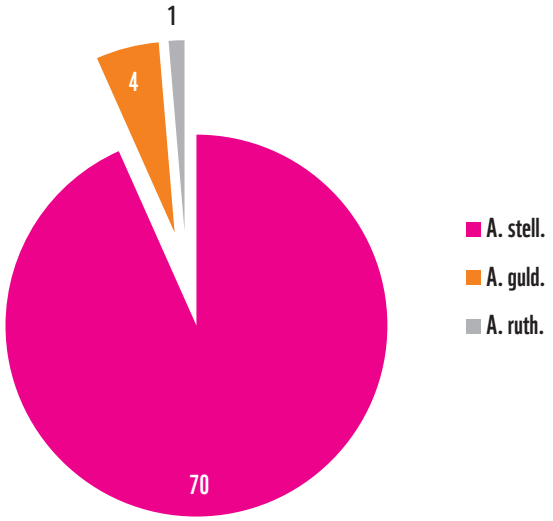


Image 36. Species ratio of sturgeons in trawl by-catch in North-Western part of the Black Sea in 2018-2019

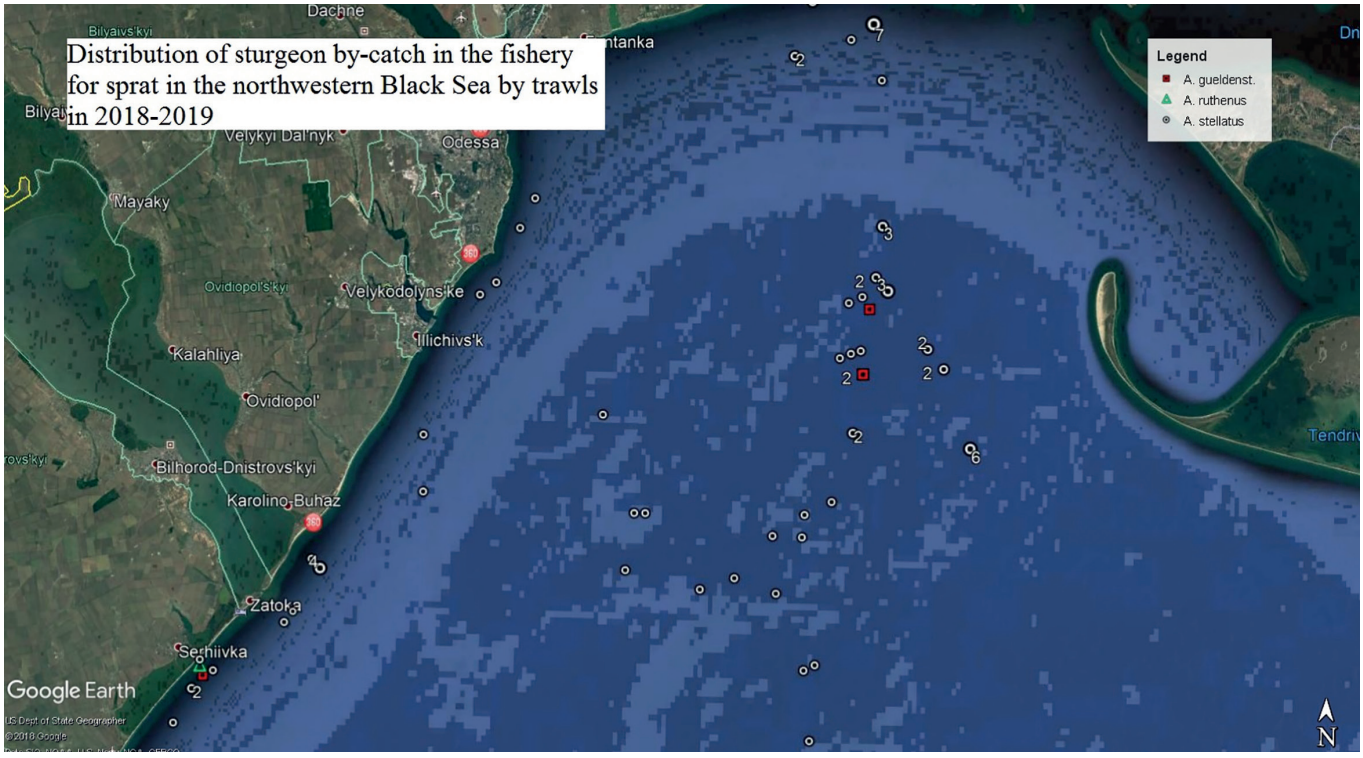


Image 37. Places of registration of sturgeons in trawl by-catch in North-Western part of the Black Sea in 2018-2019.

In 2019, the indicator of the size of sturgeon by-catches per trawl compared to the previous year has changed slightly: 2019 - 0.28 individuals; 2018 - 0.24 individuals. However, if in 2018 the by-catch of the 1st sturgeon happened on 5.8 tons of sprat, then in 2019 - only 2.3 tons of sprat, which is due to a significant deterioration of the industrial situation in 2019. Thus, the number of sturgeon by-catches depends, first of all, on the number of trawls performed (industrial efforts), and not on the number of sprat catch. On average over two years, the sturgeon by-catch was 0.26 individuals per trawl (1 individual per 3.8 tons of sprat caught). If we take into account that in 2018, 1603 tons of sprat were caught by Ukrainian waters in the North-Westernpart of the Black Sea, and in 2019 - 1370 tons, we can estimate the number of sturgeon (mostly Stellate sturgeon), which was caught during the trawl fishery, about 400 individuals per year.

“STURGEON WATCHERS”- EXPERIENCE OF CONSERAVATION ACTIVITY IN THE DANUBE DELTA

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The modern state system of protection of fish resources (including sturgeon) includes the activities of various state bodies, such as the State Ecological Inspectorate, the Ntional State Agency for Fisheries and Aquaculture and its local branches (Fish Patrols), the State Customs Service of Ukraine (in terms of illegal import and export of live sturgeon and sturgeon products), Food Safety Agency (in terms of compliance with the law during the sturgeon selling), the State Border Police of Ukraine (if the reservoir is located near the state border), the National Police (covers a wide range of issues such as illegal trade and transportation, poaching, etc.). Sturgeon conservation is also a responsibility of several Protected areas (PAs). However, even the joint activities of all the above bodies did not lead to a significant improvement in the population. That is why the problem of wild sturgeon conservation is important and requires new approaches to its solution.

The involvement of active citizens looks like a promising and very new method of sturgeon protection and conservation. A similar approach is being successfully implemented in the United States of America (Black River, Michigan). There the Sturgeon Watchers volunteer network was set up, where anyone could help protect these migrating fish after successfully passing special training. The goal of selected and well-trained Sturgeon Watchers was to travel to the upper parts of rivers, where sturgeons usually spawn, where their presence has created so-called «soft pressure» on poaching and reduced the number of such violations. The activities of the volunteers also consisted of patrolling, reporting illigal activity on the water to the relevant environmental authorities under a special number and conducting educational work. It's interesting, the number of volunteers at the beginning of such activities was very small, about twenty people, but even such a small team was able to change the trends in identifying the facts of poaching. This creative approach has proved to be effective and today in only a few, very rare cases such violations are observed on the Black River.

In Ukraine, such an approach has been implemented as part of the WWF project «LIFE for Danube sturgeons» («Life of Danube sturgeon») funded by the European Union LIFE program. Launched in Ukraine on October 1, 2016, the project began working with fishing communities, law enforcement and aquaculture producers in 4 countries simultaneously (Romania, Bulgaria, Serbia and Ukraine). The global goal of the project was to protect endangered wild sturgeon from illegal fishing and trade within the EU. The target region of activities is the Ukrainian part of the Danube Delta, namely Vilkove, Liski and Primorske villages of Odessa region (Image 38).

However, the implementation of such an approach in Ukraine required some rethinking, taking into account local realities. In particular, an important factor was that in the Ukrainian part of the Danube Delta, according to scientists, there are no spawning sites for sturgeon, the protection of which was in the possession of American colleagues and volunteers. Nevertheless, there are other important habitats: feeding or nursery sites, migration routes and wintering sites, which also need protection. In addition, the area near the river is significantly overgrown with aquatic plants, so it would be too difficult or impossible to observe water and illegal activities patrolling by foot from the shore. Equally important was the fact that the distribution of «heavy violations» in our country is extremely high, in particular, much higher than in the United States, and sturgeon poachers who commit such offenses could pose a significant danger to civilians and unarmed volunteers.

Image 38. Joint patrolling of the Danube river by members of the Sturgeon Watch

It became clear that in the Ukrainian part of the Danube Delta in the life cycle of Danube sturgeon populations there are three periods of increased danger for sturgeons, when IUU fishing can harm them - spring adults spawning season, autumn adults spawning season, spring migration downstream of young individuals from the Danube into the Black Sea. In the first and second cases, the sturgeon was posed by real poachers, well technically equipped. Recently, the spawning process has gained extreme traction, which has led to poachers being present on the river for a long time. It is clear that volunteers cannot stop them for obvious reasons, so such threats can only be addressed by increasing the institutional capacity of environmental related authorities. At the same time, sturgeon juveniles in period of spring migration downstream do not have a high commercial price and usually suffer from being caught as a by-catch. That is why, after assessing the weaknesses and possible positive results of volunteering, it was decided to focus on protecting sturgeon migration routes in that part of the life cycle that was extremely important for the recovering of the population in specific conditions of the Danube Delta and aiming to avoide dangers for volunteers. It has become clear that it is necessary to combine the forces of environmental related bodies and volunteers, for reasons of «soft pressure» on them and to prevent possible corruption. Due to the natural conditions, foot patrolling should be replaced by boat patrolling together with law enforcement officers. Thanks to this idea, the timing of the Sturgeon Watcg has become clearer, as they should be correlated with the stage of migration of youngsters in the life cycle of these ancient fish - late June-early July. In addition, this date coincided very well with the Danube Day, which could be used for communication.

From June 26 to 30, 2017, based on the experience of American colleagues, we conducted the first visit of the Ukrainian «Sturgeon Watchers», consisting of students of Kherson Agrarian University and Odesa Ecological University, in Vilkove village (Odesa region, Danube Delta). The Sturgeon Watchers worked together with the WWF Ukraine, representatives of the Danube Biosphere Reserve, inspectors of the Odesa Fish Patrol of the National State Agency of Fishing and Aquaculture, State Border Police (Izmail branch, Vilkove department) and participants of the PRIDE international project. Volunteers spent more than 20 hours with law enforcement agencies representatives,

conducting joint patrolling, inspecting commercial fishing nets, removing and releasing live sturgeons (one adult A. stellatus and seven juvenile sturgeons), did education work. The Sturgeon Watchers also researched the sturgeon forage base together with representatives of the PRIDE project, come up with big celebration of town fest "Danube Day" for the residents of Vilkove village, heard many related to sturgeons lectures and took part in interesting discussions (6).

One of the first positive effects of the Sturgeon Watch volunteer network on the community of Vilkovo is that the Danube Commercial Fisheries Association soon held a meeting with fishermen on its initiative at 11 companies currently operating. Fishermen discussed issues of sturgeon protection, and the company, which has repeatedly violated environmental legislation in terms of sturgeon illegal fishing, was excluded from the Association. However, some conclusions were drawn as to what needs to be changed in the implementation such an activity to make it work more effectively. In particular, it became clear that conducting of Sturgeon Watch based on the potential of students from specialized universities does not always justify itself, because some students are motivated to be a volunteer, and some not. That is why for the following year a system of training (theoretical course, lectures, practical course) and a system of selection more motivated Sturgeon Watchers was introduced. The structure of educational blocks was also changed, the theoretical part was reduced and the practical part was increased, the main attention was paid to innovative forms, in particular to online learning. Thus, in 2018 we managed to achieve a more motivated and better trained staff of the new «Sturgeon Watch» (image 39).

«Sturgeon Watch-2» worked in Vilkovo during June 25-30, 2018. In addition to the usual elements of activities, such as conducting fish protection patrolling with Environmental and law enforcement agencies, the scientific component was strengthened, in particular, monitoring the condition of sturgeon juvenile movement downstream in the Danube with small sized nets. The beginning of sturgeon migration downstream was confirmed, in particular, the young of A. ruthenus and H.huso were found. After all, thanks to scientists from Odessa center of PivdenNIRO and the Danube Biosphere Reserve, a few days earlier, a ban on traditional herring fishing was introduced for this critical period of time for youngsters migration. Traditionally, volunteers took part in "Danube day», where they conducted environmental education activities and were inspired to communicate with the young rmembers of community.

The third «Sturgeon Watch» took place in Vilkove from June 24 to July 6, 2019. The volunteers took a theoretical online course and were selected into two groups. Thus, it was an idea of increasing the period of stay and patrolling in the Danube Delta and, accordingly, to strengthen the protection of sturgeon juveniles migrating to the Black Sea was realized. Patrolling were carried out with the Odessa Fish Patrol, representatives of the State Border Police, and together with the Danube Biosphere Reserve youngsters migration was monitored. For the first time, the area of sea close to delta (avandelta) was patrolled together with the Black Sea Fish Patrol and State Border Police. The third trip was the most effective in terms of rescued and released sturgeons: out of 10 inspected nets (co-called "ava" by locals) 3 were effective in terms of the presence of sturgeon as of by-catch (2 Stellate sturgeons were caught by 2 nets «ava», 1 - 1 Stellate sturgeon). All sturgeons were immediately released by fishermen into the river. Traditionally, Sturgeon Watchers took part in the Danube Day.

The most important consequences of the Sturgeon Watch activity are raising the awareness of all stakeholders involved on the issues of sturgeon conservation and improving cooperation between them. The main effect of the Sturgeon Watch is not even directly in rescuing sturgeons or ensuring the unimpeded passage of sturgeon young the movement downstream, but rather in strengthening the capacity of the relevant state environmental authorities to protect them. All of the above will have a positive impact on the current state of sturgeon populations in the Danube Delta.

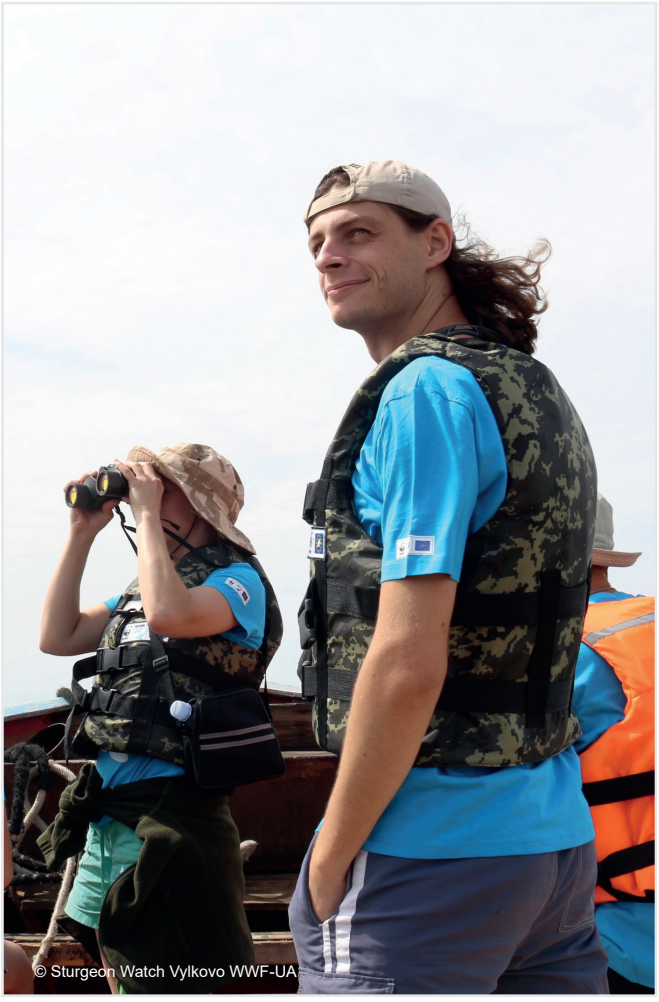
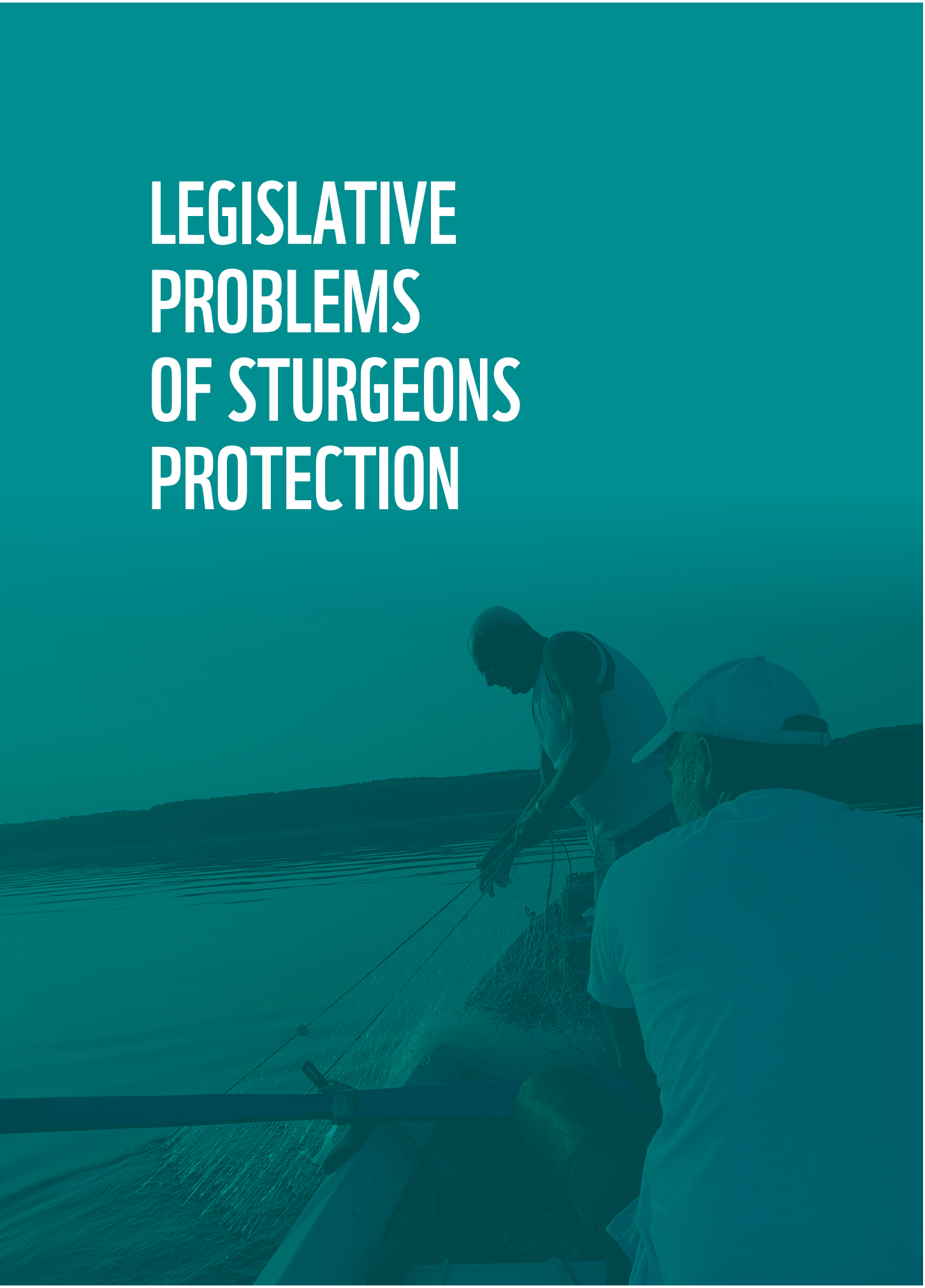


Image 39. Participants of the Sturgeon Watch in the Danube Biosphere Reserve area

LEGISLATIVE PROBLEMS OF STURGEONS PROTECTION



LEGISLATIVE PROBLEMS OF STURGEONS PROTECTION

There are a lot of reasons for the threatening condition of sturgeon populations. The construction of dams and the isolation of migrating sturgeons from major spawning sites played an important role. Overfishing before the ban on commercial fishing at the national level, poaching after such a ban, gravel mining and navigation, and illegal trade of wild sturgeon and wild sturgeon products also had a negative impact (Freyhof and Brooks, 2011). Quantitative population trends are difficult to track due to the complication of scientists' work with Red Book species, but the available data show that for all sturgeon species in Ukraine, quantitative indicators are declining.

Also, very important problem of sturgeon protection is compliance with environmental legislation. Today, these species are included in various international and national protection lists. All Ukrainian sturgeon species are listed in the Red Book of Ukraine, where A. sturio and A. nudiventris have the status of «extinct», A. ruthenus and H. huso - «on the brink of extinction», A. gueldenstaedti, A. stellatus – "vulnerable". The amount of compensation for illegal fishing for these species is shown in table 18.

It should be mentioned that all sturgeon species should be protected in accordance with international agreements: in particular, according to the European Red List, protection status is granted to all Ukrainian sturgeon species (http://www.icpdr.org), all 6 species are listed in the Annexes to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), sturgeon species protected by Berne Convention (A. sturio is included in Annex 2 as a species of strict protection, and A stellatus, A. ruthenus and H. huso are protected and included in Annex 3. The protection of sturgeons is also provided by the Bonn Convention. Goch, 2017).

Table 18

The amount of compensation for illegal fishing, destruction or damage were done to sturgeons listed in the Red Book of Ukraine, which are situated permanently or temporarily in natural waters within the territory of Ukraine, its continental shelf and exclusive (marine) economic zone (according to the resolution of the Cabinet of Ministers № 1030 of November 7, 2012)

NAME OF ANIMAL SPECIES AND THEIR TAXONOMIC RANK	AMOUNT OF COMPENSATION BY CATEGORIES OF ANIMALS, UAH PER INDIVIDUAL	
	EXTINCT	ON THE BRINK OF EXTINCTION
Ship sturgeon	110 000	-
Sterlet	-	48 000
European sturgeon	110 000	-
Russian sturgeon	-	48 000
Stellate sturgeon	-	48 000
Beluga	-	100 000

In addition to the availability of legislative tools (laws, by-laws of the state and international level), their implementation it's a matter of great importance. The practical implementation of the above legislative acts is the direct work of environmental and law enforcement agencies (e.g the State Environmental Inspectorate and

its branches, the National State Agency of Fisherieng and Aquaculture and its branches, the National Police, the State Customs Service and its branches in terms of illegal import and export of live sturgeon and sturgeon products, The National State Food Agency and its branches in terms of compliance with the law when selling sturgeon products, PAs inspectorat).

Unfortunately, the weakness of national legislation and the largely inefficient work of environmental authorities leads to significant problems in the conservation of valuable fish species in the rivers and seas belong to Ukraine. Thus, the main problems in this area include:

- lack of effective control over the trade in prohibited fishing nets. The fine for this offense is 153 - 340 UAH, what is equal to 5-10 EUR (Article 851 of the Administrative Code of Ukraine).
- lack of control over trade of sturgeon species. Thus, according to the legislation, the fine for offense in case of illegal sale is 51 to 255 UAH, what is equal 1,5-7 EUR, and for species listed in the Red Book of Ukraine, from 153 to 408 UAH, what is equal 5-13 EUR (Article 881 of the Administrative Code of Ukraine).
- unsatisfactory state of the legislative framework, which leads to contradictions and inconsistencies between the legal documents in environmental and fisheries areas.
- weak material and technical base of environmental authorities, which does not provide opportunities for effective control, detection and detention of poachers.
- the inconsistency in the work of various law enforcement agencies and the facts of corruption lead to the possibility of sturgeon poaching and illegal trade for years.
- the low level of awareness of fishermen and fish products consumers leads to the withdrawal of young sturgeon species and the possibility of their sale.

It should be noted that the open possibility of sturgeon trade is one of the biggest problems in the chain of protection of these species. Lack of demand and strict control of sturgeon sales will lead to a loss of interest of fishermen to catch such species. Unfortunately, today in many regions of Ukraine you can buy different sturgeon species and its products in regular fish open markets. An example of this is the Odessa market «Privoz», where one can buy Sterlet, Russian sturgeon, Stellate sturgeon, Beluga (image 40). You can also easily buy caviar of these species. Repeated attempts by law enforcement agencies to ban the sale of these species have been ineffective due to low level of fines and corruption. Most sellers have fake documents confirmed aquaculture origin of sturgeon products, which formally allows the sale. In fact, a large number of individuals sold on the market came from the wild. For example, Stellate sturgeon, which is bred in aquaculture farms in very small quantities, but sell very often in the open markets. Obviously, it's came from poaching. In addition, there are other features (size, color, shape of fins) that will help to identify this fish caught by poachers. The solution of these aspects of illegal sales and a possible tool for regulating and checking of the origin of sturgeon products may be the adoption of the Law of Ukraine «On ensuring the traceability of the origin of aquatic bioresources and products produced from traceable species of aquatic bioresources.»

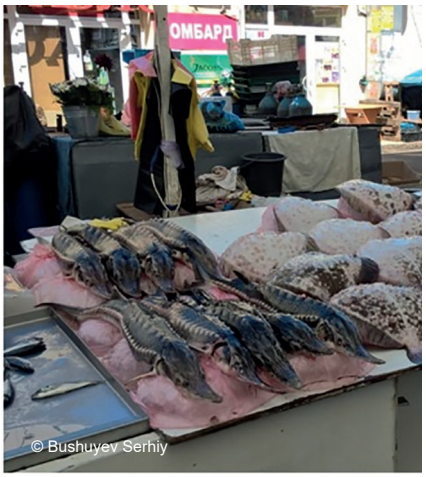


Image 40. Sturgeon individuals in the fish market «Privoz»

An important component in the chain «detection of sturgeon related offenses - its fixation – decision making - court decision» is the judicial system. No matter how well the environmental authorities work as the first stage of the detection of sturgeon related offenses, if the judicial system does not work or works incompletely, the logical chain of «violation - punishment» is broken. That is why in 2019, within the framework of the European Commission's LIFE project «LIFE for Danube

Sturgeons», a number of desk research were conducted about the trends in court decisions on sturgeon related offenses for 5 years - from 2013 to 2018. The research was conducted on the basis of data from both the primary data, which carries out the recording of offenses, and the State register of court decisions, which is an open source. According to the results of the research, only 72 cases of sturgeon related offenses were considered during the mentioned period. The largest number of violations is illegal fishing (56%) and illegal trade (36%). The facts of illegal transportation have a much smaller percentage (image 41).

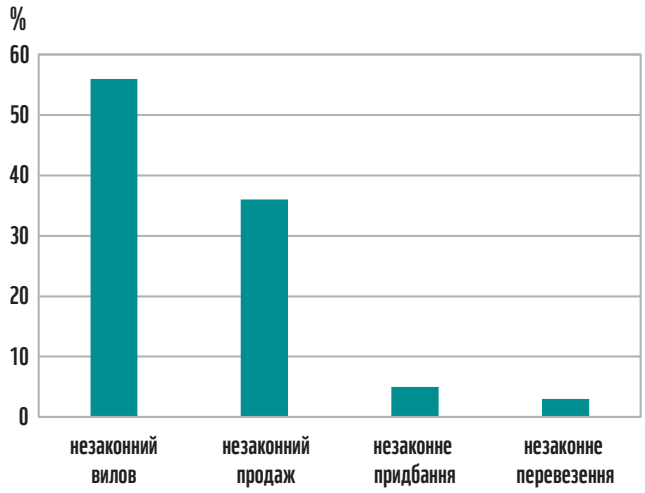


Image 41. The ratio of types of offenses related to sturgeon

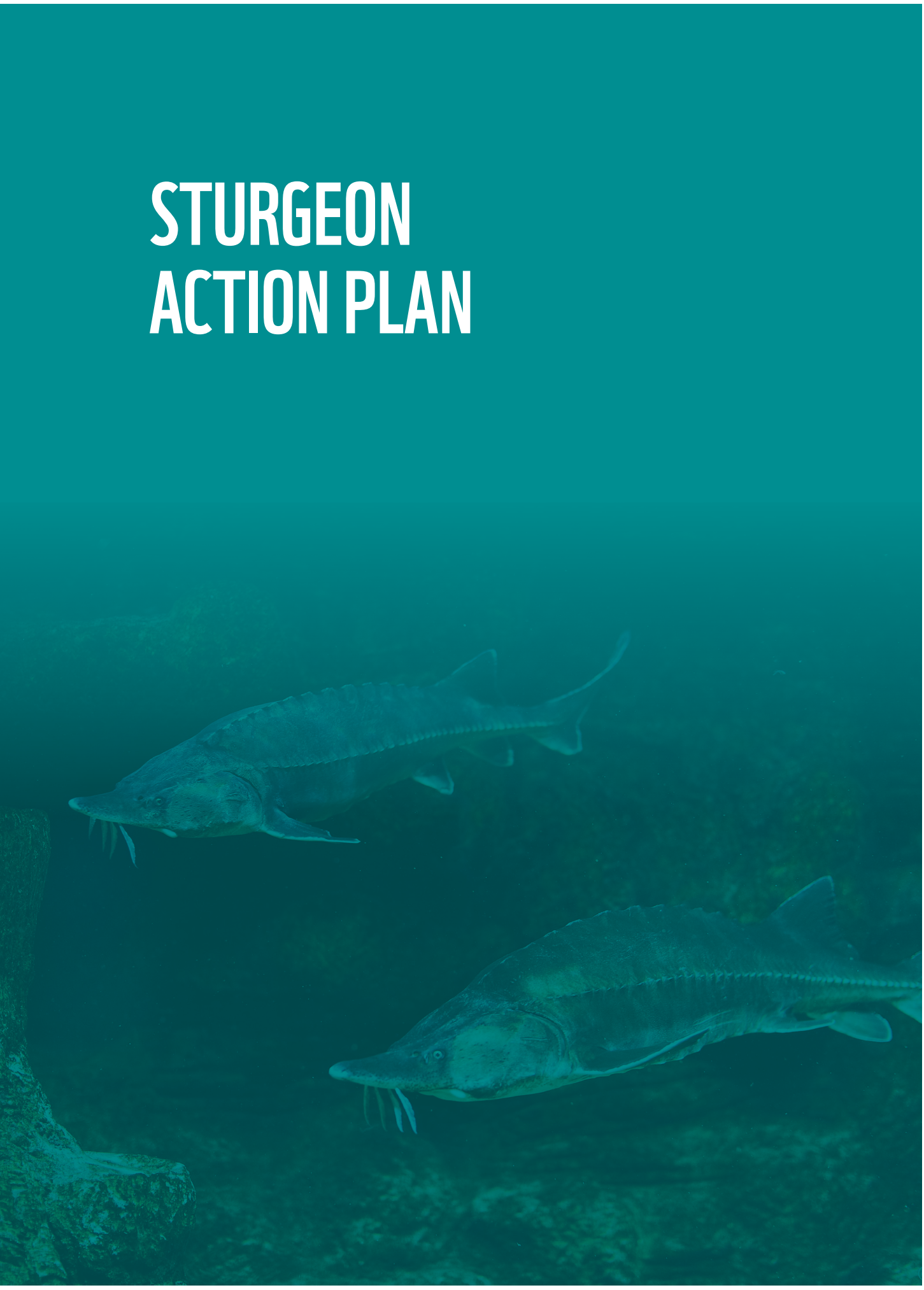
Even though the case of sturgeon protection, as mentioned above, is within the competence of many environmental authorities, out of 72 analyzed cases, 49% were identified by branches of the National State Agency of Fishering and Aquaculture (Fish patrols), 5% - by branches of the State Environmental Inspectorate, 4% - branches of the National Police, and another 4% - by joint efforts of various bodies. 35% of cases do not contain information about the implemented authorities. An important point in the punishment for illegal actions against sturgeon is not only fines that are relatively small and incomparable to the income that the offender may receive as a result of illegal action (income of the offender from caught Beluga with caviar can be up to 15,000 EUR), but additionaly penalties for each illegally obtained individual, which are significant, or even imprisonment. For comparison, the fine for illegal sturgeon fishing is from one hundred to two hundred non-taxable minimum incomes or restriction of liberty for up to three years (Article 249 of the Criminal Code). Compensation for each individual during poaching - from UAH 48,000 to 110,000. The decision to recover compensation and restraint of liberty (in some cases) for the specified period was made in only 44% of cases. In 20% of cases, only a decision was made to impose a fine (UAH 1,700, 53 EUR on average), in some cases - under Art. 85 КУпАП (340 UAH, 10 EUR on average). In 10% of cases, violators did not suffer any punishment. In 26% of cases, data on decisions are missing.

It is very difficult to detect violations committed during illegal sales. Despite the fact that illegal purchases or sales are subject of a fine of one hundred to two hundred and fifteen tax-free minimum incomes with confiscation of wild animal (Article 881 of the Administrative Code of Ukraine) to detect such violations and punish the violator is difficult because large field for manipulation. It was found that the decision to impose a fine for illegal purchases or sales of sturgeon were made in 82% of cases. The average fine was only UAH 884, 28 EUR. In 18% of cases, no fine was imposed.

Thus, on average, since 2013, less than 12 cases of illegal sturgeon fishing appear in the State Register of Judgments. Compensation by each pooached individual was spent in less than half of the cases. Unfortunately, this was not enough to protect rare sturgeons. Improving the situation lies in increasing the capacity of the executive bodies, because, of course, many real cases are simply not recorded. Equally important is increasing the capacity of the judiciary and judges' understanding of the importance of tougher penalties for wildlife crimes. Only comprehensive work to strengthen liability for sturgeon related offenses, together with the prevention and mitigation of illegal activities, can really improve the current difficult situation in this area.

In conclusion, it is necessary to say about the need for systematic work in the field of regulation of laws and by-laws, a broad educational program among consumers, producers, sellers and fishermen and the establishment of cooperation between government agencies. Only under such conditions will it be possible to ensure an adequate level of protection of sturgeon species in Ukraine.

STURGEON ACTION PLAN



STURGEON ACTION PLAN

For several years in a scientific ichthyological and environmental circles in the European Union and neighboring countries have formed a vision of the need to structure actions to protect the last sturgeon populations in Europe. All stakeholders noted that there are many international and national legislation and programs to protect sturgeon. These include the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Ramsar Convention on Wetlands of International Importance, The Berne Convention on the Conservation of European Wildlife, some relevant documents by Food and Agriculture Organization of the United Nations (FAO), the European Union Directive on the Conservation of Natural Habitats and Fauna and Flora, the EU Water Framework Directive and the EU Regulation on Wildlife Trade. However, despite the official involvement of most "sturgeon countries" in the above documents, practical actions to implement them, conflicts of interest in various cases, lack of political will did not contribute to a scenario that could reverse the negative trends in conservation, reproduction, study, stock management of last wild sturgeon populations.

The World Sturgeon Conservation Society (WSCS) has played an important role in consolidating efforts to protect recent sturgeon populations. It is a group of experts that published the Ramsar Declaration on the Global Conservation of Sturgeons in 2005, which set out the key and urgent measures required to ensure the future of sturgeons and set a timeframe for action. At the same time, over time, there has been a need to review, update and partially revise key recommendations, as well as to include new analytical information, such as the effects of climate change, to focus environmental and fisheries managers and officials, as well as national and intergovernmental institutions involved in environmental policy on key issues related to the effectiveness of sturgeon related management.

That is why the VIII International Sturgeon Symposium (ISS 8), which was attended by experts from 32 countries representing science, environmental NGOs and governmental organizations, rethought the Ramsar Declaration and created a new Vienna Declaration. It identified the following tasks, the implementation of which will allow coping with the constant and new challenges in the sturgeon conservation:

1. protect and cinserve sturgeon as a symbolic flagship or umbrella species for future generations;

2. take into account the need for long-term and appropriately secured sturgeon conservation measures with the support of improved management structures;

3. protect and restore rivers as dynamic and free flowing systems. Their hydromorphology and ecosystem services depend on the preservation of functionality in terms of the presence of longitudinal and transverse connections, as well as the ability to lateral erosion;

4. ensure that attempts to restore and protect sturgeon populations are accompanied by effective control measures to combat fraud and illegal, unregulated and unreported fishing and trade, while supporting sustainable aquaculture as an alternative to the production of high-demand sturgeon products.

The World Wildlife Fund played an important role in organizing this symposium and consolidating all stakeeholders in the direction of more sustainable management in the field of sturgeon conservation (image 42).

Image 42. Discussion of the Sturgeon Action Plan in the Ministry

The conclusions of the International Sturgeon Symposium showed that a common action plan is needed for all European countries - only with such an approach is it possible to preserve the last sturgeon populations. The World Sturgeon Society and the World Wide Fund have initiated the development of a document that was on time - the Pan-European Sturgeon Conservation Action Plan. Several joint working groups continued (involving about 40 experts from different countries), a discussion at the European Sturgeon Conference organized by the Austrian Federal Ministry for Sustainable Development and Tourism in collaboration with

the International Commission for the Protection of the Danube River (ICPDR) under the auspices of the Austrian Presidency. EU, made an additional contribution and supported and adjusted the Plan.

As a result of joint work on November 30, 2018, at the 38th meeting of the Standing Committee of the Berne Convention with the final amendments made by EU Member States, the Pan-European Sturgeon Conservation Action Plan was approved. The mentioned participants undertook to implement all activities of the plan.

Ukraine, as a signatory to the Berne Convention, has also assumed all the obligations set out in this document. According to the text of the Berne Convention, «each Party to the Convention shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the species of wild fauna listed in Annex II.» Thus, Ukraine has undertaken to strengthen the implementation of the Habitats Directive, in particular, «further develop action plans on species and habitats for species and natural habitats under greatest threat». Also, the implementation of the Sturgeon Conservation Action Plan based on the Pan-European Action Plan in Ukraine was relevant and timely.

Thanks to the joint efforts of the Ministry of Energy and Environmental Protection, specialists of several scientific institutions (Institute of Marine Biology of the National Academy of Sciences of Ukraine, Fedkovych Chernivtsi National University), the World Wide Fund for Nature in Ukrain) in Ukraine in 2021-2029 the Pan-European Sturgeon Conservation Action Plan was adopted to Ukrainian situation and working grope came up with National Sturgeon Action Plan. In early 2020, the Ministry of Energy and Environmental Protection began the process of discussing the plan and its implementation in environmental activities.

The document provides a comprehensive approach to managing the state of sturgeon populations. The long-term goal of the National Sturgeon Action Plan is to restore all existing sturgeon populations to “least endangered” (IUCN) or “favorable” status (Habitats Directive) and to restore self-reproducing populations and their life cycle in the historical range in such a way as to ensure the survival of the species and representativeness of subpopulations where possible.

The action plan focuses on the following areas:

1. PURPOSE: WILD POPULATIONS ARE PROTECTED FROM CATCHING AND CATCHING OF INDIVIDUALS. This goal is planned to be achieved by overcoming targeted catches of individuals, reducing by-catch to a level that allows populations to recover, assessing the level and reducing accidental losses of individuals due to hydropower and water intake, ensuring national and regional coordination.

2. PURPOSE: THE POPULATION STRUCTURE IS ACTIVELY SUPPORTED TO INCREASE POPULATIONS. The goals are to be achieved through the creation of an ex situ breeding stock in order to protect the genetic diversity of all local sturgeon populations, to develop and implement a reproduction and restocking program, and to ensure national and regional coordination of activities.

3. PURPOSE: SETTLES HABITATS WITHIN KEY RIVERS ARE PROTECTED AND RESTORED. Given the importance of habitat conservation, the following are planned: identification and protection against degradation of existing sturgeon habitats, restoration of habitats in key rivers, ensuring national and regional coordination of activities.

4. PURPOSE: ENSURED AND PROTECTED MIGRATION ROUTS UP AND DOWN THE RIVER. This goal assumes that migration routes are studied in detail and that no barriers to sturgeon migration in key rivers are created. National and regional coordination of these measures is also needed.

5. PURPOSE: ELIMINATION OF ILLEGAL TRADE OF STURGEON PRODUCTS. To achieve this goal, it is expected to achieve a higher level of effectiveness of law enforcement and its branches work, as well as a higher level of awareness of all stakeholders in the supply chain of black caviar. The start of implementation of all activities of the Plan is expected in 2020.

PROSPECTIVE DIRECTIONS OF WORK ON RESEARCH AND PROTECTION OF STURGEONS OF UKRAINE

PROSPECTIVE DIRECTIONS OF WORK ON RESEARCH AND PROTECTION OF STURGEONS OF UKRAINE

Because sturgeons are creatures that have a long life cycle, it is important that the work of environmentalists, government agencies, and conservationists be systemic and protect rare sturgeons at all stages of their life cycle and in all aspects.

To maintain a sustainable approach to conservation work with sturgeon, WWF Ukraine has prepared and plans to implement such projects.

1. **«Successful Wildlife Crime Prosecution in Europe» (SWiPE)**

The main goal of the project is to reduce the number of crimes against wildlife by improving compliance with EU and neighboring environmental legislation as well as by increasing the number of successfully investigated crimes. The project will increase the awareness and capacity of prosecutors and judges to ensure effective compliance with environmental standards, strengthen cross-border exchange of knowledge, skills and abilities, and strengthen cooperation between investigative bodies. In general, the SWiPE project will support the reduction of illegally destroyed wildlife, supporting the restoration of biodiversity and the health of ecosystems in Europe that are currently under threat. The project will follow a risk-based approach and thus focus on EU Member States with significant gaps in the prosecution of wildlife crimes (Bulgaria, Croatia, Poland, Romania, Slovakia, Hungary) and those who have a good practice (Italy, Spain), as well as Ukraine, Bosnia and Herzegovina, and Serbia, which are important countries as a transit points for wildlife trade and within which there are populations of many protected species, which are also distributed in the EU.

Among the tasks of the project:

1. By 2023, gather a reliable and credible database of wildlife crimes in 11 target countries, which will create a critical improvement in access to information and allow data to be compared across Europe.
2. By 2023, significantly increase the awareness, knowledge and capacity of 300 professionals involved in wildlife crime investigations and practitioners (prosecutors, judges, law enforcement experts) in 11 target countries, which will contribute to better national and cross-border governance, investigation and judicial prosecution of crimes against wildlife.
3. Increase the effectiveness of the communication on project actions and results, which will help attract 10 million European citizens belonging to key target audiences
4. Support effective project management through reliable monitoring and evaluation and ensure the achievement of project objectives and sustainability.

The project covers 11 countries with various problems. Spain, Italy and Poland have better management systems for environmental policy and compliance, more experienced in dealing with wildlife crimes. EU Member States - Slovakia, Hungary, Romania, Bulgaria, Croatia - are in the process of developing such systems and generally lack the resources to investigate such crimes. Data on confiscations in EU-TWIX for these countries indicate a low level of reporting. The situation in non-EU countries (Serbia, Bosnia and Herzegovina and Ukraine) is even more complicated, allowing organized crime groups and individual criminals to take advantage of gaps in the legislation. Ukraine is the third most frequent point of illegal trade in wildlife with the EU in the number of arrests of violators in 2017. Through the collection and analysis of data on such crimes, the training of prosecutors and judges, cross-border exchanges, and communication activities, SWiPE will facilitate the exchange of knowledge from west to east and overcome shortcomings in the implementation of legislation to increase criminal liability for wildlife crimes.

2. **«Protection of sturgeon through sustainable fishing, combating IUU fishing and supporting fishing communities and consumers» («Protection of sturgeon through sustainable fishing, combating illegal, unaccountable, uncontrolled fishing» (IUU fishing) and consumer aid).**

WWF Ukraine also plans to continue the EU LIFE

project «Sustainable protection of sturgeon in the Lower Danube by preventing and combating poaching and illegal wildlife trade « LIFE for Danube Sturgeon ”(“Sustainable protection of sturgeon Danube due to previous lack and illegal transportation of wildlife»), which has already been introduced itself in Odesa region, where the project area is located. This project brought together interested stakeholders and achieved important results. The next draft of the project proposal will continue the creation of the previous year, and its implementation is planned for June 2021. The full title of the future EU LIFE project «Protecting sturgeon through sustainable fisheries, combating IUU fishing and supporting fishing communities and consumers». The short name - «LIFE 4 Sturgeons & People».

The future project will mediate four categories of stakeholders involved in sturgeon conservation: fishing communities, including youth and children, law enforcement agencies, prosecutors and the judiciary, and consumers of caviar and sturgeon products. Work on the previous two LIFE projects will be continued, preceded by a framework for networking of fishing communities that communicate, collaborate and call on sturgeon conservation through cross-border law enforcement cooperation. Several trainings will be also provided for communities to access various financial sources for the development of alternative business activities and the use of new approaches, such as crowdfunding, business start ups pitching, etc. In addition, children who are also members of the community will be trained to improve their business skills. Expected results are alternative ways of income in the future.

As any sturgeon individual is valuable, the project will also address sturgeon by-catch by analyzing the effectiveness of actual and other potential measures to prevent accidental catches, and will suggest legislative changes that will promote best practices in this regard.

Law enforcement agencies have a persistent and old problem of staff and resource shortages. Designs to pilot the use of existing technologies, such as drones / stationary cameras, in particular, and increase the capacity of law enforcement agencies in the implementation of further similar technologies. As a result, increase the effectiveness of crime control and continuous conduct of such activities, as a result of which poaching activity will decrease. Law enforcement bodies support will be provided by several trainings done for prosecutors and the judges, working with exchange of experience and methods to identify clear approaches to the inevitability of punishment for wildlife crimes.

Sturgeon aquaculture products are becoming more and more available on the market, but these products producers, are not always aware of the legislation norms, which are important for tracking and consumption. Developing an innovative system for tracking and raising consumer awareness of sustainable and legal caviar and sturgeon products, it helps reduce the demand for illegal products. A new market survey will be conducted with help of consumers and secret customers to find out if illegal caviar and products are available in t he market.

The project includes 15 partners from 8 countries (Ukraine, Romania, Bulgaria, Germany, Austria, Croatia, Serbia, Moldova).

Project duration: 01.06.2021 - 30.12.2024 (40 months)

Project activity:

1. Development of a scope of responsibility for the conservation of sturgeon in fishing communities:

   - Ensure the ownership by trainings and long-term personal coaching for members of fishing communities so that they can implement specific business plans, apply for funds and distribute the business.

   - Develop classes / schools that participate in the entrepreneurship courses, update / develop textbooks on business startups, conduct camps to develop students’ skills.

2. Supporting the implementation of the by-catch rules (including reporting, the by-catch introduction, release into the wild) related to the promotion of collaboration with the responsible authorities and the involvement of fishermen:

   - Increase trust and engagement of fishing communities while increasing the involvement of sturgeon advocates and facilitating at least 10 exchanges between communities (inside of the country and abroad).

   - Educate fishermen on by-catch issues (legal aspects, reporting, unification).

   - Develop and implement a system and / legal schemes for fishermen to release, by-catch, replication approaches from other regions (e.g. France, Germany).

   - Examine the available factors (technical, cultural, bureaucratic, legal) that contribute to sturgeon by-catch and limit sturgeon by-catch reporting and propose technical solutions and recommendations for government and policy work.

   - Advocate for better implementation and regulation. Facilitate the implementation of the recommendations from the previous paragraphs in legislation and regulations.

3. Expansion of technical capacity of law enforcement agencies in order to more effectively control of sturgeon fishing and other kind of fishing:

   - Develop and implement 5 pilot projects in 5 countries and disseminate the results and achievements.

4. Promoting the sustainability of the sturgeon market by increasing the awareness of caviar and other sturgeon products consumers, which in the future will be willing to avoid illegal wild products, which will strengthen market control, and aquaculture products will be easier to track:

   - Develop and implement an information campaign aimed at consumer awareness, including the opportunity to contact law enforcement agencies about problematic issues;

   - National authorities will be involved in the development and implementation of a successful market analysis tool (tested and applied in the previous sturgeon project) to ensure the official use of the results of investigations.

   - Improve the traceability of sturgeon products through testing systems, round tables with national aquaculture producers and advocacy work for such approaches.

3. Assessment of Sterlet recovery potential in reservoirs of Ukraine

Sterlet is the only freshwater sturgeon species in Ukraine that can potentially create isolated populations in some areas of large rivers. Unfortunately, only a few isolated populations are known in the Dniester, Desna and Danube basins today.

In the Lower Dnieper for more than 10 years there is an artificial releasing of Sterlet. During this period, in the waters of the lower part of the river were inhabited by more than 10 million young individuals of this species. Unfortunately, this did not contribute to the formation of the natural population of Sterlet, and the work carried out is considered ineffective and contrary to the principles of the restoration of native fish species. In addition, in a number of other reservoirs of Ukraine, artificial stocking of Sterlet by young individuals is carried out without proper scientific background and without control over the genetic origin of youngsters. This can generally lead to negative changes in natural Sterlet populations.

The main goal of the project is to assess the potential places of recovery of Sterlet populations in the reservoirs of Ukraine and to develop effective mechanisms for its protection.

The project provides for the following tasks:

- Identification of key habitats suitable for Sterlet in Ukrainian reservoirs. It is important to find out the potential capacity of these waters and assess which part of life cycle they are suitable for.

- Identification of environmental, social, climatic risks for future Sterlet populations in key habitats.

- Carrying out pilot restocking of the most suitable places that meet all requirements. It is important to chip all Sterlet individuals for identification and traceability.

- Carrying out an educational campaign among the general public in order to prevent sturgeon fishing in the reservoirs of Ukraine.

- Development of protected areas within key waters, which are an important habitat for Sterlet.

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