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PRELIMINARY RESULTS ON THE LOWER DANUBE STURGEON MIGRATION MONITORING

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Abstract

Amongst the many severely endangered species range the sturgeons. The diminishing stocks are considered to have been the result of several factors such as energetically hydro technical work, hydro technical work to improve conditions of navigation, excessive fishing, poaching and the increasing pollution. Typical migratory, the Black Sea sturgeons reproduce in rivers flowing here and hence the Danube. Deepening knowledge of migration and breeding conditions in this stage are a must. During the 2011 autumn migration there were monitored 50 copies of sturgeons from 4 species. Initial results showed that some marked specimens haven't remained on the Lower Danube to winter but returned to the mouth of the sea, using the Old Danube route between km 197 and km 186.

Key words**:** *sturgeons, migration, acoustic telemetry, transmitter, reception stations*

INTRODUCTION

Sturgeons are among the oldest fish that inhabited the waters of the earth; their dissemination areas are the northern waters. The sturgeons belong to Acipenseriformes order, Acipenseridae family and include 4 genus: Huso, Acipenser, Scaphyrhyncus and Pseudoscaphyrhyncus. On the Romanian territory it can be found 6 species of sturgeon, according to the literature: Huso huso, Acipenser gueldenstaedti, Acipenser stellatus, Acipenser sturio, and Acipenser Acipenser nudiventris ruthenus [1].
The typical migratory route from the Black Sea to the Danube is more or less similar; it differs the places of quartering, time of penetration and migration of juveniles [2]. Currently their number decreased dramatically and a large number of species are endangered due to pollution, poaching or hydro technical works for the Iron Gates I and II, which impede migration to natural spawning areas [3].

The estimation of the environmental impact of hydro technical works began to be realized with the United Nations Conference on the environment - Stockholm Declaration, in June 1972. This proclaimed that environmental protection and the improvement of the environment are major problems affecting the welfare and economic development worldwide. Thus our research will focus on the hydro technical work which can improve navigation on the Danube but without having a negative impact on the sturgeon population.

MATERIAL AND METHOD

In the project "Monitoring the environmental impact of improvement works to navigation conditions on Danube between Calarasi and Braila, km 375 and km 175" for sturgeon migration monitoring on the Lower Danube started in 2011, acoustic telemetry was chosen as a method of tracking.

Acoustic telemetry is used to obtain data of relatively continuous record of fish movements and is ideal for asking fine scale questions. There are two methods of monitoring: actively, in real-time, or passively, using a listening station (Photo 1). For both the first step is to secure an acoustic transmitter or "pinger" to a fish. This pinger emits an acoustic pulse at a frequency from 32 to 300 kHz. This sound pulse is then recorded by a hydrophone.

Photo 1. Reception station

With passive tracking the hydrophone is mounted on a secured listening station. The listening station picks up any tags within its range and logs the occurrence of the tagged fish. The range is generally 100 to 1000 meters and depends on the frequency of the transducer and the power output of the tag. (Photo 2). Thus, depending of the ultrasonic sensors embedded in the transmitter is received information on the date and time of the detection, the depth or temperature shift [4]. By fitting stations in strategic points specific information can be revealed on the migration routes used by sturgeons upstream or downstream, when they go back into the sea.

For sturgeon monitoring were used submersible reception stations VR2W Vemco. Their position in water was carried by the following method: the principle supposed the use of a design composed of concrete anchor placed on the fairway to bind to a steel cable attached to the shore with a metal stake.

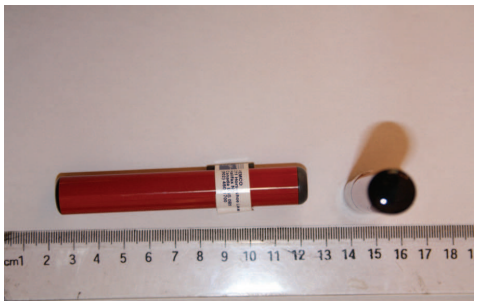

Photo 2. Acoustic transmitter

By this cable has been fixed a metal plate bound to a relon rope length of 0.7 m, onto which was attached a VR2W station, vertically supported by a raft (Photo 3). The entire assembly was positioned so to capture signals from the marked fish transiting that area.

Photo 3. System fixing for station

After the monitoring system was positioned, the fish were captured and marked with ultrasonic transmitters. Each sturgeon was introduced inside a tube cell (Photo. 4) that was specially made to allow maintenance of vital signs during transmitter's implantation (Photo. 5), without having to be removed from the water, thus eliminating the stress. As tranquillizer it has been used an electroshock therapy system (DC 28-30 V) and lidocaine was used as a local anesthetic, injected into 3 points. The suture of the incision has been made with resorbable wire and the disinfecting was made with terramycin spray.

Photo 4.Mobile tube used for implantation

Photo 5.Implantation of the transmitter

Besides the marking with acoustic transmitter it has been used a second type of mark called "Floy tag ". This is made from plastic materials and has the shape of a spaghetti engraved with a unique identification code and contact date of the National Institute of Research and Development for Environmental Protection in Bucharest, necessary when a fish is recaptured by fishermen. The mark is attached to the fish dorsal fin implantation with the help of a special gun without harming the specimens (Fig. 6). This method offers limited information. The information which is gathered will transmit the area where the fish was released and the area where it was captured without being able to draw its specific route. In this case the method is used for both the above mentioned goal and to easier identify specimens marked with ultrasound mark, captured and then released by fishermen.

Photo 6.Implantation Floy tag type

For each marked sturgeon were made the following biometric measurements: total length (TL), standard length (SL) and weight (Fig. 7); the data obtained were recorded on observations sheets and then introduced in a centralized database. The identification of the sex of the sturgeons, which were captured and marked with ultrasonic transmitters, was done using a nondestructive method, by using a rigid Welch Allyn endoscope (Fig. 8). Its probe was inserted into the abdominal cavity through the genital pore and guided by the fiber optic lighting system, which displayed the evidence of milk, in the case of males or of caviar, in the case of females.

Photo 7.Biometric measurements

Photo 8.Determination of sex

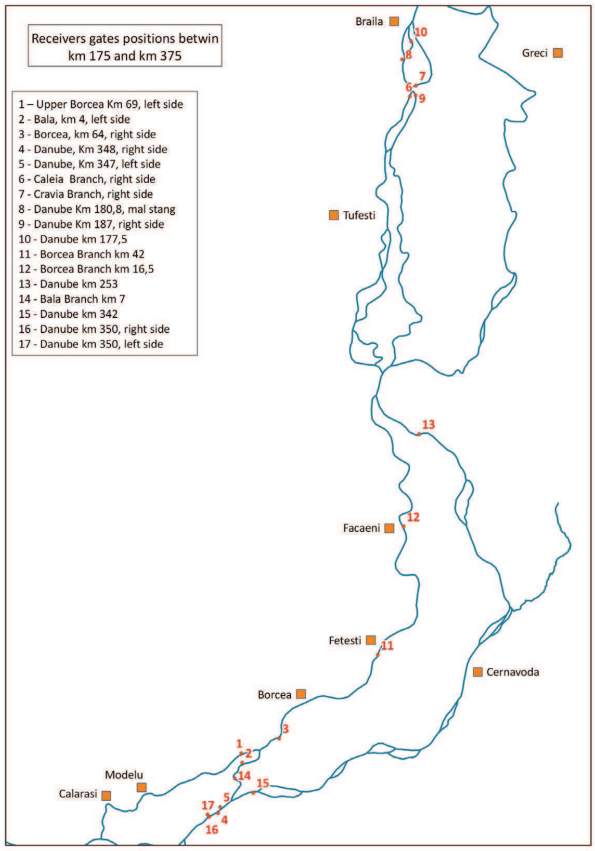

Fig 1. Automatic positioning stations

After the marking operation and the biometric measurements have been taken, sturgeons have been released into the wild. Reading data has been periodically conducted from the VR2W Vemco reception stations using the Vemco User Enviroment (VUE) software for data extraction. After this, the stations were relocated to their initial location.

RESULTS AND DISCUSSIONS

On the Calarasi – Braila monitoring sector, from km 175 to 375, there were located a total of 17 VR2W submersible Vemco automatic stations (Fig. 1). There was also been fixed an additional station outside this area, on the Danube, at km 100, to record fish that return from the Danube Delta to the Black Sea. The storage capacity is 1,000,000 records and the average battery life is 15 months. The Operating Temperature is between -5^{0}C and + 60^{0}C. Their installation was made in places where there weren't interfering with the fishing and outside the mooring areas marked on the sides.

Between October and December 2011 there have been marked a total of 50 copies of sturgeon species.

Amongst them, 30 were marked both with ultrasonic transmitter and a conventional mark (Floy tag), and 20 using only a conventional mark (Floy tag). The weights of the fish were between 8 kg (*Acipenser gueldenstaedtii*) and 180 kg (*Huso huso*). The highest percentage of captures was in the Borcea branch km 30-47 with 75% captures, followed by the Borcea branch km 50-57 with 17.86% of the catch (Fig. 2). On the Caleia branch and the Danube, between km 195 and 197, have been marked only 3.5% of the total catches of the autumn campaign.

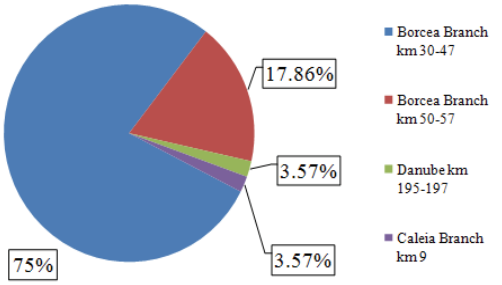

Fig 2. Distribution of catches by fishing areas

Regarding the allocation of catches by species it can be seen that the highest number of catches is sturgeon morun, followed by sturgeon cega. The latter is a specific Danube species migrating on the river. A single female specimen was marked from the sturgeon nisetru and two from the sturgeon pastruga. It is known that sturgeon pastruga migrate in smaller numbers in the fall migration than in the spring when they make clutch. The project provides for the capture and marking of males species than females, which are more sensitive. This can be seen from the diagram below (Fig. 3).

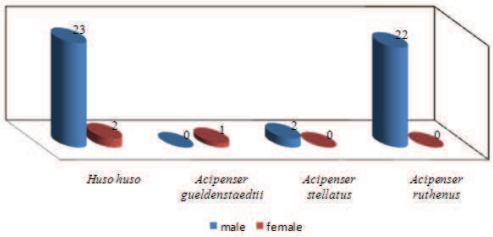

Fig 3. Distribution of sturgeons captured during October-December 2011 by species and gender

After the processing of the collected data stored on the VR2W automatic reception stations it has been noted that 16 copies of sturgeon have crossed 8 perimeters out of the 18 stations located on the Danube. Most of the specimens have had the tendency to move downstream. A total of 7 fish were recorded in the Isaccea station, on the Danube km 100, and heading to the mouth of the Danube into the sea. In the downstream at km 197, the Danube is divided in two branches, namely: Caleia arm and the Old Danube arm stretching for 10 km. At km 186 the two arms meet for a short distance then a new fork is following. In their descent migration 4 moruni sturgeons used the Old Danube as their route, not Caleia, where there will be built a bottom threshold for improving the navigation. On Caleia arm there were no records available. There is only one catch of morun sturgeon weighing 100 kg and being 228 cm long dated 11/04/2011, marked and released by the INCDPM team. This capture was made at km 7 by authorized INCDPM fishermen for scientific purposes.

CONCLUSIONS

The high percentage of catches on the Borcea arm highlights its importance regarding the sturgeon migration route. The VR2W recordings on the Danube km 100 show that not all specimens of sturgeon which climb the river in the fall migration to wintering remain in deep holes over 15 to 20m. Some of them prefer to go down to the mouth of the sea, following that next spring to return to the deposit tip. I noticed that in their downstream route 4 sturgeons used the Old Danube arm between km 197 and km 186. This is very important in the context in which on the other side arm, Caleia, it will be build a bottom threshold that would prevent upstream fish migration. Research in the area will continue in coming years both during the development works and post construction to determine the exact extent the threshold may affect the reproduction of sturgeons.

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