IMPROVED MONITORING OF MIGRATORY ANADROMOUS MARINE STURGEONS USING DKTB TELEMETRY STATION

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INTERNATIONAL CONFERENCE "MARINE RESEARCH HORIZON 2020" 17-20 SEPTEMBER 2013, BULGARIA

Introduction

• Currently, in Black Sea coexist 3 principal species of migratory anadromous sturgeons:

- **beluga** - *Huso huso* Linnaeus, 1758,
- **russian sturgeon** - *Acipenser gueldenstaedti* (Brandt, 1883,
- **stellate sturgeon** - *Acipenser stellatus* Pallas, 1771.

• Before 1999, Romania had some difficulties in performing a correct sturgeon population assessment especially because of illegal and unreported fishing which could reach almost 90% of the total catches[1]. This phenomenon continued until 2006 when, in the purpose of all sturgeon species recovery, commercial fishing has been banned for a period of 10 years.

[1] Bacalbasa-Dobrovici, Patriche, 1999

Materials and methods

2011

"Monitoring the environmental impact of the works regarding the improvement of the navigation conditions on the Danube River between Călărași and Brăila, km 375 – 175"

2017

National Institute for Research and Development in Environmental Protection

sturgeons migration was monitored by ultrasonic tag remote sensing

Materials and methods

- Present method allows to perform a continuous recording of the fish movement both actively - in real time, by using a mobile tracking device, or passively, by using a network of automatic receivers.
- The information received consists of data on: time, water temperature and water swimming depth - information being useful for highlighting sturgeons' behavioral particularities and for mapping their migration.

Automatic receivers

Materials and methods

At the beginning were used two systems for installing the automatic receivers.

- First system was proposed by an expert of National Institute for Research and Development in Environmental Protection – subunit Danube Delta, Tulcea.

Figure 1:
Metal anchor cable

Figure 2:
Roller system for receiving stations recovery installed on boat

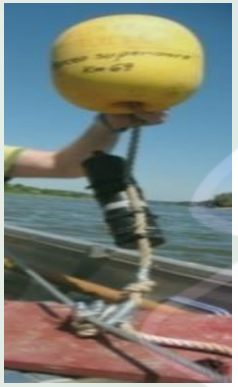


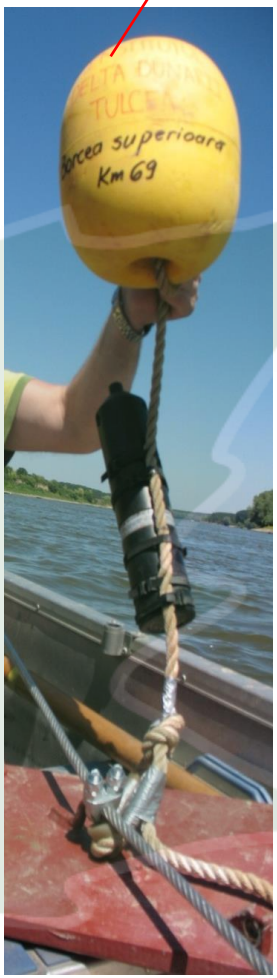
Figure 3:
Reception station assembly

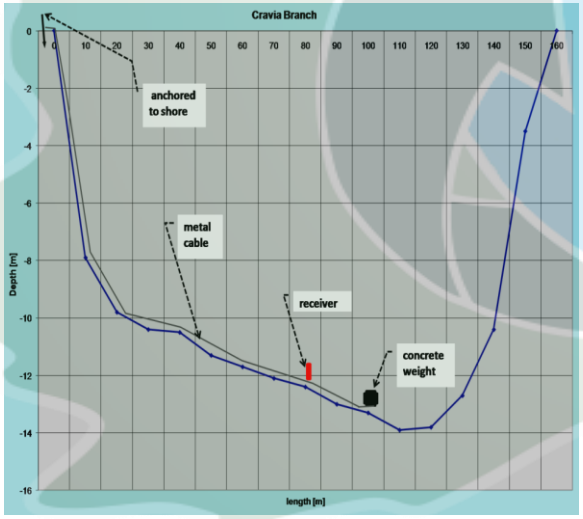
Installing acoustic telemetry arrays – First system

Metal anchor cable

metal plate
(weighting 20 kg)

Reception
station
assembly





Materials and methods

- **Second** system was proposed by an expert of National Institute for Research and Development in Environmental Protection – subunit "Grigore Antipa" Constanta.

Figure 5: Receiving stations system

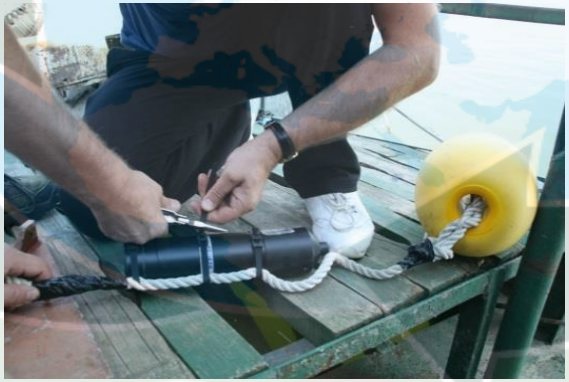
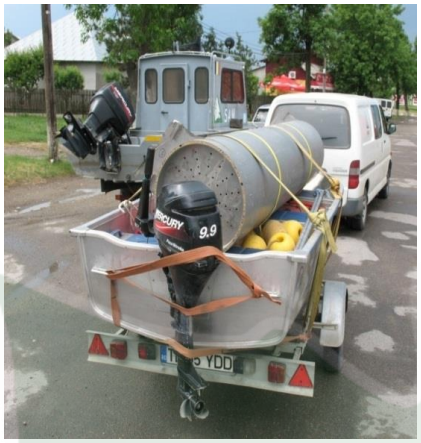
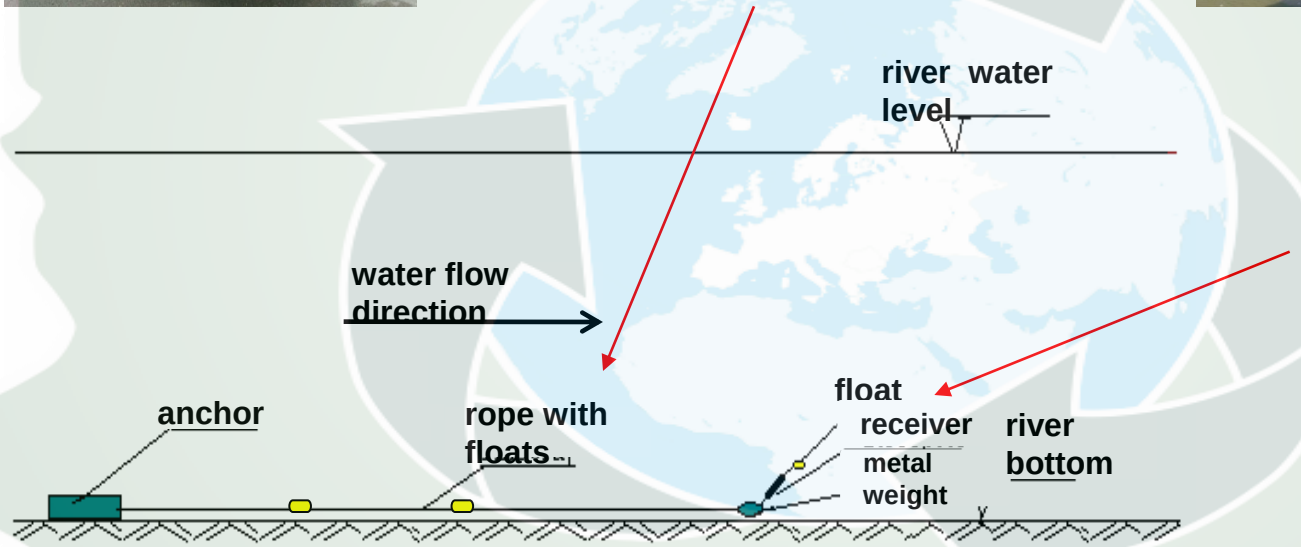


Figure 6: Reception station installed on the rayon wire

Figure 7: Ultrasonic tag attached to the system

Installing acoustic telemetry arrays - Second System





Materials and methods

- The effectiveness of these two systems was very low due to irretrievable loss of some stations and hence loss of important data.

- The experts from National Institute for Research and Development in Environmental Protection Bucharest developed a new system called “DKTB Telemetry Station for sturgeons monitoring in different hydromorphological conditions”, **file patent no. A100773/30.10.2012.**

Components of the system:

- metallic cap with special closing system - ø 15-20 cm;
- protective metal tube provided with openings for water passage - ø 10-15 cm;
- bank anchorage clamp,
- cable for fixing the multiparameter sensor and the reception station;
- fixed station for continuous multiparameter measurements;
- station for ultrasonic signal reception;
- floater useful in warning when water level drops and the equipment is not any more submersed;
- grid for elimination risks associated to introducing the device into the pipe protective shield.

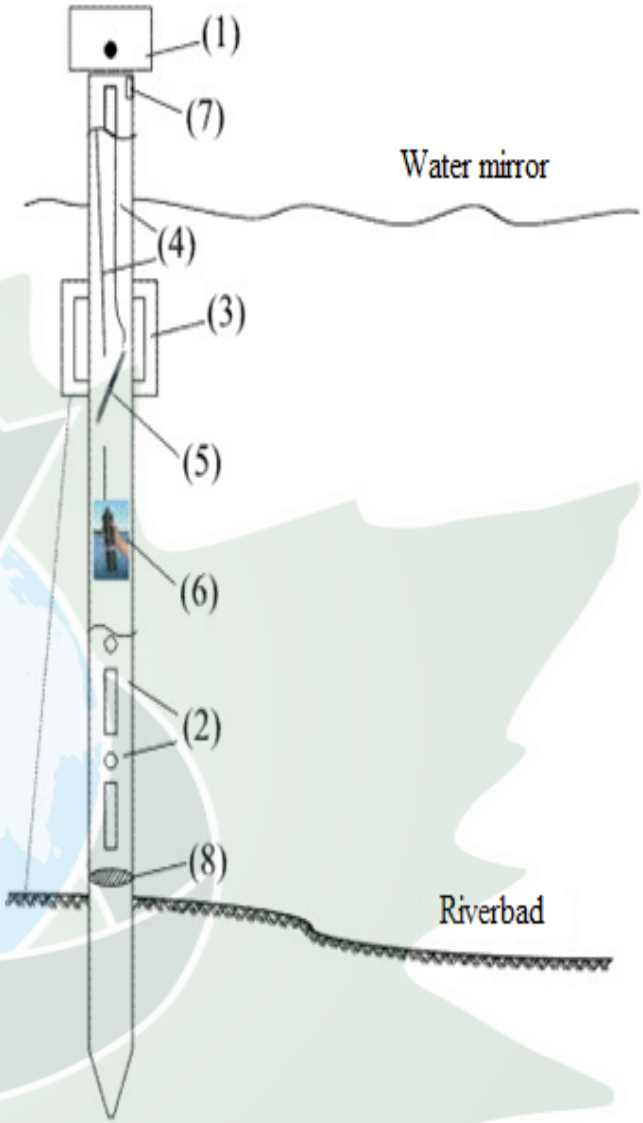


Figure 8: **Sketch of DKTB monitoring system**

Bathymetric measurements

- Boat with equipment for bathymetric measurements single/multibeam (Figure 9), there were made sections measurements along the riverbed on an area of 600 m (300 m downstream and 300 m upstream of the monitoring equipment installation).

Figure 9: Boat equipped for single beam measurements

Results and discussions

- Bathymetric measurements test - July 2012 - on Danube River's Borcea Branch in a location with high sturgeon reproductive potential
- The test revealed that the riverbed has a width of almost 450 m on the studied section (Figure 10) and that, near the right bank, there is a very deep ditch which reaches 20 m and is composed of sand and limestone formations.

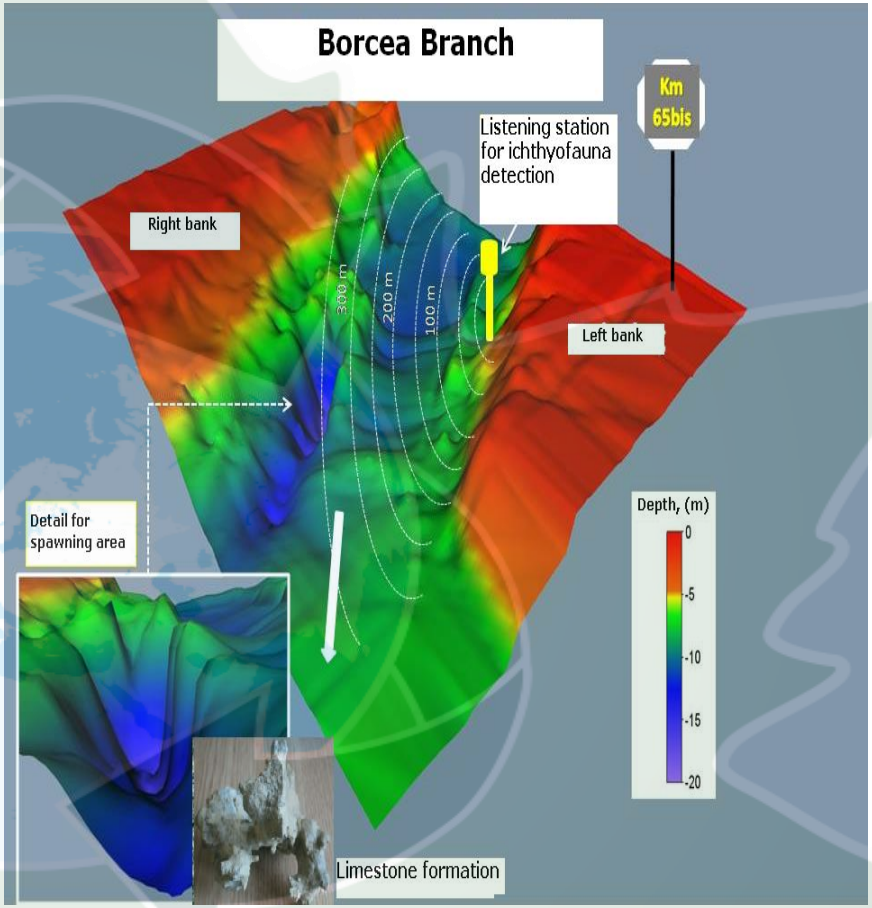


Figure 10: 3D representation of the location with the highest reproductive potential

Results and discussions

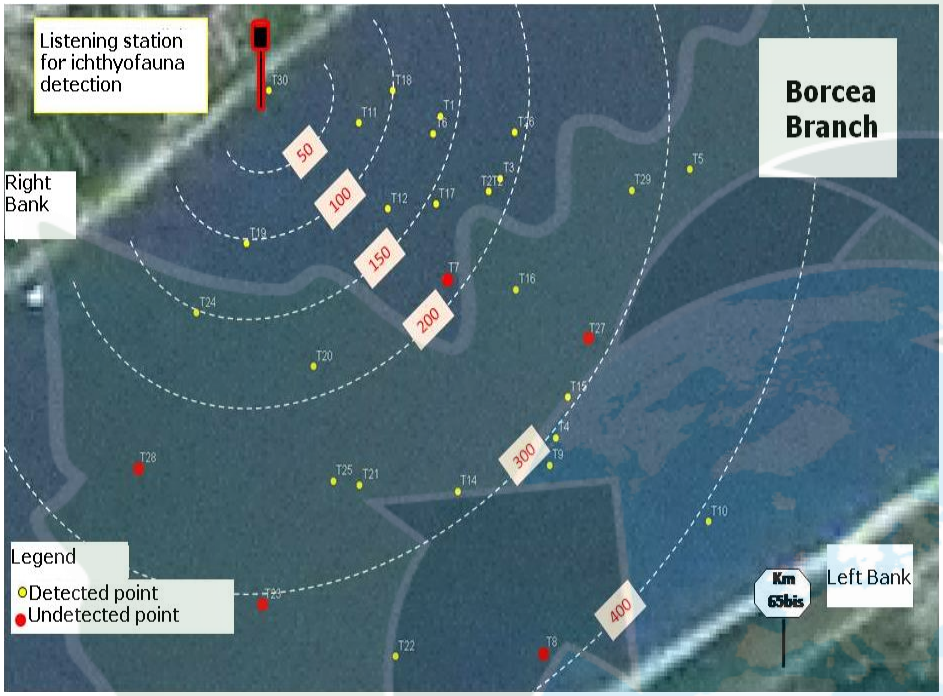


Figure 11: Map of detected and undetected points by using the DKTB telemetry station

- Conducted test showed that 83.34% of the cases, tag's acoustic signal was received by the monitoring station
- Turbidity values were in between 15 and 39.4 NTU (an average of 27 NTU) at a water average temperature of 23.22 C.
- Maximum received signal was recorded from a distance of 420 m from the station.

Results and discussions

- Installation of DKTB monitoring system for ichtyofauna was made according to the Danube River conditions by creating a gate which consists of two fixtures in sections where the transversal section of the riverbed usually does not exceed 300-400 m.

- The depth is a decisive factor because sturgeons choose to spawn in strong water current because there is a low possibility of sediment deposition and plundering, while the position near the bank facilitates system anchoring. As an additional measure, the monitoring station can be attached to a buoy.

Conclusion

- Installing “DKTB Telemetry Station for sturgeons monitoring in different hydromorphological conditions” represents an improvement of actual methods and implies realizing a complex set of bathymetric measurements and physical, chemical and biological analysis before starting the monitoring.

- Irrespective of fixing method, in the condition of an increased turbidity, the probability for the ultrasonic signal to reach the reception station decreases drastically, thus is recommended to install more reception stations, each one acting as a gate pillar in order to overlap the transmission area.

Conclusion

- As a general conclusion, by using DKTB monitoring system, there were recorded significant decreases in costs associated to stations installation and recovery, in number of persons involved, in data collecting and in time needed for monitoring.

- Therefore, monitoring station losing is stopped and thus data collection is improved, in order to gain knowledge on sturgeon’s migration.

Institutul Naţional de Cercetare-Dezvoltare pentru Protecţia Mediului

National Institute for Research and Development in Environmental Protection

*Thank you for your attention!

Results are part of the thesis of PhD. Alin Marius Badilita - funded by POSDRU/107/1.5/S/76888 project, with the support of the National Institute for Research and Development in Environmental Protection, Bucharest.