MONITORING PROGRAMME FOR

STREBER (*ZINGEL STREBER*)

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using parts of the text and list of references prepared by Doru Bănăduc

Range

The range of *Zingel streber* includes the Danube Basin from Bavaria to the Danube Delta and also the Vardar and its main tributaries. *Z. streber* is also present in neighbouring countries of Croatia, namely, Slovenia, Hungary, Serbia, Bosnia and Herzegovina.

Distribution in Croatia

Z. streber occurs only in the Continental Biogeographical Region. Until now, distribution data about *Z. streber* in Croatia have not been systematically collected. The little knowledge of this species in Croatia is based on the last few decades of studies in the Danube and some of its main tributaries, such as Drava, Kupa, Sava and also in their smaller tributaries (Figures 1 and 2). *Z. streber* is considered as **rare or very rare** in some areas of the Croatian Danube Basin.

Nationally, there has been no permanent or long-term specific monitoring on distribution or population status of *Z. streber*, as not all areas were studied in this respect for the proposal of Natura 2000 sites. No exhaustive data regarding *Z. streber* distribution in Croatian territory is available, a relatively common situation in other European countries also.
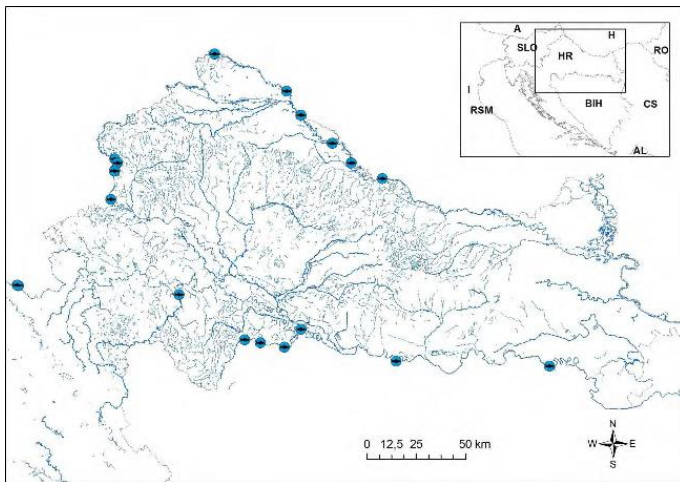

Figure 1: *Z. streber* presence identified in the last years on Continental part of the Croatian national territory (prepared by SINP).
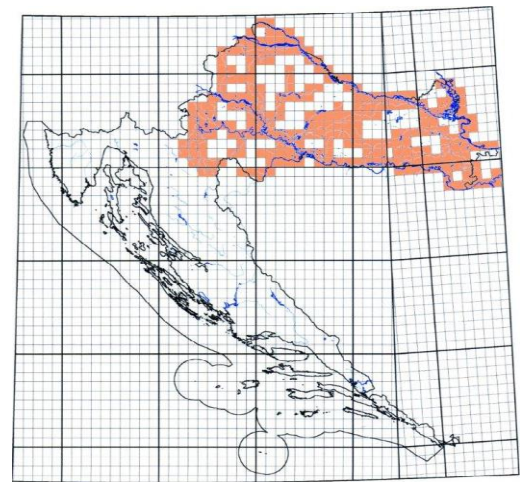

Figure 2: Distribution of *Z. streber* (Mrakovčić *et al*., 2010).

Habitat

Z. streber is a freshwater, benthopelagic and rheophilic species which inhabits the Danube Basin, in both hilly and plain rivers. It is found exclusively in rivers with high water velocity and with a substrate of pebbles and/or sand, and sometimes on clay substrata, in the barbel and bream zone.

Phenology and population biology

Z. streber stay in small shoals of a few individuals. This species is active at night when it moves into shallow waters in search its prey which consists mainly of aquatic invertebrates, but occasionally roes and alevines. The reproduction period is between March and April where females lay large, sticky eggs on the surface of rocks or wood pieces in parts of the river with clean gravelly beds.

Pressures and threats

Z. streber is threatened by the decrease in suitable habitats for spawning, schooling, feeding, sheltering, etc. Habitat quality has declined due to pollution, habitat modifications, degradations, destructions, disappearance (channelling, watercourses regulation, remodelling, etc.), unnatural water level fluctuations, rheophilic habitats disappearing and illegal extraction of sand and sand overexploitation. The introduction of non-indigenous species has also been shown to have a negative impact on *Z. streber*. The number of locations and subpopulations of *Z. Streber* currently displays significant flucuations.

Conservation measures

Specific recommended conservation measures for Natura 2000 sites for *Z. Streber* are as follows: maintain or improve water quality by reducing or prohibiting pollution (including river transport, transport of dangerous goods, sewage waters from sugar factories, farms etc.), build waste water treatment plants, protect natural rheophylic habitats with high velocity and characteristic substrate (gravel), prevent remodeling and slowing of river habitat (including the construction of new dams), restrict regulations of banks and riverbed, prohibit extraction of sand and gravel in the riverbed, prevent entry of foreign and invasive species (namely g. *Neogobius*), achieve international cooperation in order to preserve parts of the boundary watercourses, implement revitalization and restoration of habitats and restore the watercourse to its original condition, allow natural flooding of certain areas around the river, build fish passages. Also authors of the Croatian Red Book propose ensuring of some of these measures.

Specific measures are needed where the local situation requires action for preserving and improving the favorable ecological balance of the natural waters inhabited by *Z. streber*,. In general, this is achieved by creating water and sediments flow conditions as close to the natural regime as possible, preserve habitats with rapid course, prohibition of alien/invasive species entry and reproduction, live baits prohibition, construction of appropriate devices for water recycling, avoiding lotic fragmentations due to different categories of constructions in the river bed, etc.

Annexes of the Habitats Directive

Z. streber is listed in Annexes II and IV of the Habitats Directive and also in the Annex III of the Berne Convention.

Red List

Z. streber is considered as a vulnerable (VU) species in Croatia. It is also a strictly protected species by law.

MONITORING PROGRAMME FOR THE CONTINENTAL BIOGEOGRAPHICAL REGION

There are three parts to the monitoring programme in order to determine the conservation status assessment for *Z. streber*. The distribution of *Z. streber* is established by field mapping, the status of population is monitored on plots and the unsystematic data gathering will help to finalise the assessment, especially in regard to its distribution. The monitoring on plots is needed more frequently

due to difficulties of field research for the species. The additional mapping helps to fill in gaps of knowledge about the species distribution. This approach brings together the data needed for reporting and future management planning.

The monitoring programme will share the data on habitat quality with the system on evaluation of the ecological status according to the Water Framework Directive.

The similar approach should also be used for other fish species of Community Interest, mainly *Zingel zingel* and *Gymnocephalus schraetzer*.

Fieldworkers should respect the national regulations regarding fishing and ichthyologic surveys, in particular electrofishing and avoiding hazardous substances. Field studies will only be carried out when necessary legal permits have been obtained from the Ministry responsible for nature protection and from the Ministry responsible for fisheries.

Field mapping

Objectives

The information on distribution of *Z. streber* is currently insufficient and this crucial component would be completed in subsequent years. The monitoring on plots should be subsequently designed based on the completed dataset on localities occupied by this species.

Fieldwork instructions

The section of the river or stream is recorded into a map provided by SINP. The length of the section is not decisive. The mapping is carried out for 45 minutes (30 minutes if two anodes are used) on a section (including only work with electrofishing device in the water) in places where the electrofishing is possible. The time is the most useful unit of effort for this purpose, the speed of research should be oriented to catch the highest number of *Z. streber* individuals as possible.

The field survey must be carried out in the period from 15th April up to 15th November, excluding when maximum daily temperatures exceed 30°C (when there is increased risk of mortality due to low oxygen content in the water). The current flow cannot be higher than average flow. The electrofishing cannot be realized during the rain because of safety.

The standard electrofishing method will be applied with the electric device set at the local water parameters. A backpacks electrofishing device could be used only in shallow water (depth not higher than 75 cm at more than 90% of the section surface). The field crew consists of a minimum of three persons (if backpacks electrofishing device is used), ideally five persons (for generators placed at the banks or in boats). As a minimum, the crew leader and person operating an electrofishing device must be specialists in ichthyology.

The survey is oriented to all identifiable fish specimens going through the section. Only suitable parts for the occurrence of *Z. streber* are monitored. The river section should be bounded by stop nets or another temporary migration barrier.

All the fish will be held in containers with sufficient oxygenated water. Each individual is identified, measured to an accuracy of 5 mm and released as soon as possible back to the river section. The standard length (SL) is prescribed, whereby individuals are measured to the posterior end of body (of the last vertebra, not scales).

Sampling design

The mapping is based on surveillance in areas near the "sections of occurrence" (see subchapter Evaluation – Range). The sites for mapping are selected in the distance ca. 10 km from the border of "sections of occurrence" in suitable habitat. If the survey provides new information on *Z. streber*, an additional mapping site is selected in the distance ca. 10 km. If it is with negative result, one more attempt is carried out in between this additional site and the border of "sections of occurrence" (ca. 5 km from each of them).
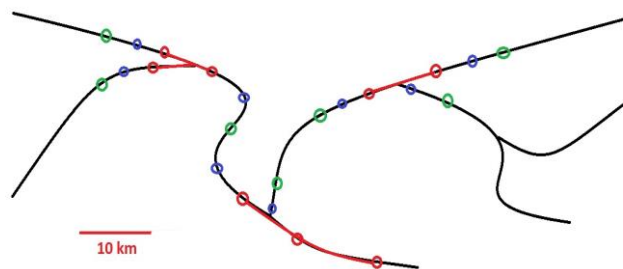
Figure 3: Model proposal of mapping sites (green, if without *Z. streber*r findings then blue), see also Figure 4

The number of sites for mapping is limited to 20 sites per year.

It is proposed that this mapping is undertaken in the first two years of a six-year period. If the number of negative results is in excess of positive ones, the mapping should be done only every second period.

During the period 2014-2015, the Natura 2000 Integration Project (NIP) inventory of freshwater ichthyofauna will be carried out in the areas where there are gaps in data, and could be connected with the mapping of *Z. streber.*

Data forms

The data form for mapping (and research on localities) is used (see part I of the data forms). Data on the character of the habitat, affecting pressures and conditions of the survey are recorded directly in the field in the attached data forms 1 and 2 (in white boxes). Information is then added to the electronic data form. Data on *Z. streber* are recorded only on paper in the field, which is subsequently analysed in the office and processed in electronic form in the structure of data form 3. Form 3 is also used for other target species (following other monitoring programmes). For species other than *Z. streber*, the numerical representation in the sample is completed in data form 4. The map is added to the data form 5 and representative photos to the data form 6.

Monitoring on plots

Objectives

The assessment for trends in population should be prepared according to the monitoring results. Monitoring will start in 2015 to ensure good reference values after the first monitoring period (after 2018).

Fieldwork instructions

The plot is represented by a section of the river. The exact location of the plot is recorded onto a map (only in the first instance to allow comparisons in following periods). The length of the section is not decisive. The monitoring is carried out for 60 minutes (45 minutes if two anodes are used) on each section in parts of the river where electrofishing is possible. Only one sample is required for *Z. streber*.

The field survey must be carried out in the period from 15th April up to 15th November, excluding when maximum daily temperatures exceed 30°C (when there is increased risk of mortality due to low oxygen content in the water). The current flow cannot be higher than average flow. The electrofishing cannot be realized during the rain because of safety.

The standard electrofishing method will be applied with the electric device set at the local water parameters. A backpacks electrofishing device could be used only in shallow water (depth not higher than 75 cm at more than 90% of the section surface). The field crew consists of a minimum of three persons (if backpacks electrofishing device is used), ideally five persons (for generators placed at the

banks or in boats). As a minimum, the crew leader and person operating an electrofishing device must be specialists in ichthyology.

The survey is oriented to all identifiable fish specimens going through the section. Only suitable parts for the occurrence of *Z. streber* are monitored. The river section should be bounded by stop nets or another temporary migration barrier.

All the fish will be held in containers with sufficient oxygenated water. Each individual is identified, measured to an accuracy of 5 mm and released as soon as possible back to the river section. The standard length (SL) is prescribed, whereby individuals are measured to the posterior end of body (of the last vertebra, not scales).

Sampling design

The monitoring on plots will start in 2015, following the field mapping. This will be carried out once every two years due to difficulties in fieldwork and the uncertainty of positive findings. The total number of sites to be sampled is 20 (i.e.10 sites per year) due to the limited distribution of the *Z. streber*.

The plots have to be placed on sections completed after the mapping. The selection is based on a system of classification. Two main parameters are chosen as most representative – status of water quality (bad or good status[1]) and river basin (Danube, Drava, Sava and Kupa).

The proportion of the length of 'sections of occurrence' between classes (combinations of these two parameters) is taken by determining the number of monitoring sites in these classes. The approximate position of sites is chosen at random by computer, and is specified on the map with regard to habitat and possibilities of field survey, and finally exactly determined in the field (in the first instance).

If there is no positive finding during first two surveys, another site is selected in the same class.

Length of sections of occurrence in classes:

	bad water quality	good water quality
Danube		
Drava		
Sava		
Kupa		

→

Number of monitoring plots in classes:

	bad water quality	good water quality
Danube		
Drava		
Sava		
Kupa		

Data forms

The data form for monitoring is used (see part II of the data forms). Data on the character of the habitat, affecting pressures and conditions of the survey are recorded directly in the field in the attached data forms 1 and 2 (in white boxes). Information is then added to the electronic data form. Data on *Z. streber* are recorded only on paper in the field, which is subsequently analysed in the office and processed in electronic form in the structure of data form 3. Form 3 is also used for other target species (following other monitoring programmes). For species other than *Z. streber*, the numerical representation in the sample is completed in data form 4.

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[1] "Bad" and "good" will be specified after receiving the data on waters quality from Croatian Waters.

Unsystematic data gathering

<u>Objectives</u>

There are available sources of information on actual occurrences of *Z. streber* which can be easily collected and interpreted for the purpose of determination of the species distribution.

Basic data sources are represented by:

- surveillance of other fish species organized directly by SINP
- sharing the data with Croatian Waters (mainly the data from monitoring of ecological status according to WFD)
- all ichthyologic surveys in the Continental biogeographical region (mainly done by universities and expert NGOs)

<u>Fieldwork instructions</u>

No special fieldwork is needed. All Croatian ichthyologist teams will be contacted and asked to provide information on the species occurrence discovered during different surveys in the field. Only presence data are required.

<u>Data forms</u>

The data form for unsystematic data gathering is used (see part III of the data forms). This form can be completed in the office since it only utilises data from other data sources. If there is any information on abundance or population structure, it should be noted into the field for "comments".

EVALUATION OF THE CONSERVATION STATUS COMPONENTS

Range

Z. streber is distributed in specific parts of rivers where there is high water velocity. The following approach will be used for preparation of the range and distribution map.

In the first step, all findings from last 12 years with a distance less than 10 km are connected to "sections of occurrence" (also before starting the first monitoring period for use of selection of sites for mapping).
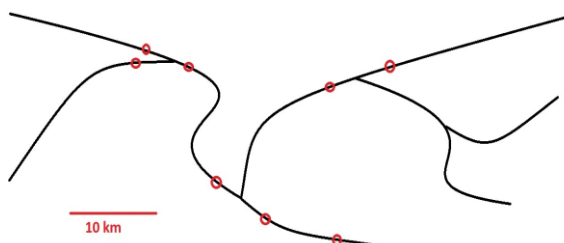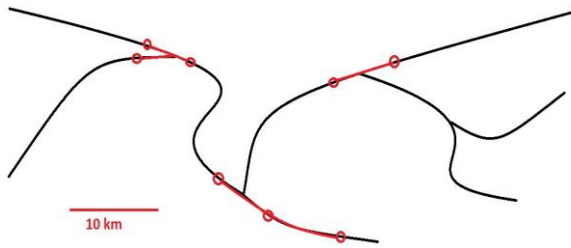

A)

Figure 4: Model example of species findings (A) and findings distant less than 10 km connected to sections of occurrence (B).

B)

In the second step, these "sections of occurrence" are prolonged 5 km upstream and 10 km downstream on occupied rivers, the result is "sections of distribution" representing the distribution of *Z. streber* depicted in the reporting.

In the third step, "sections of distribution" are prolonged 5 km upstream and 10 km downstream on occupied rivers and all quadrants 10x10 km overlapping obtained sections represent the range.

The favourable reference range will be specified according to principles described in official Guidelines (ETC/BD, 2011) by SINP with expert assistance of working group for fish monitoring.

Expansion or increasing of the range could be taken into account only in places where findings show *Z. streber* was not previously present. Other information would be interpreted as changes resulting from improvement in knowledge.

Potential loss in range could be indicated by repeated negative findings in some areas.

Population

The most useful population unit is km of the river system occupied by *Z. streber*. This is calculated as the length of sections of distribution. The possibility of estimation of the population size using number of individuals is unfortunately inconceivable.

The evaluation of trends is based on changes in the length of sections of distribution and calculation of the indexes. The indexes are calculated in the following way. The results from one monitoring plot are averaged for one period (two entries for 2015-2018, three for the following periods). The results from the first period (average of two entries from 2015-2018) represent the reference baseline (100%) and it is proposed to take the value from the first reporting period as the favourable reference population. The results are representative on biogeographical level, could be interpreted for categories of classification (ex. for specific river basins) and in the long-term, also on local level of specific plots.

The changes are evaluated as values of index on the Continental biogeographical level and the assessment of the component "population" follows the principles of the evaluation matrix for the conservation status assessment (for both – indexes and length of sections of distribution, always the stricter rule is taken into account). Also if *Z. streber* disappears from more than 20% of the plots inhabited in previous period, the status of the component "population" must be evaluated as bad. If the species disappear from more than 10% plots inhabited in the previous period, the status of the component "population" would not be evaluated as favourable.

The evaluation of population structure of *Z. streber* is not highly accurate due to the difficulties connected with the sampling specific age categories of this species. Analyses on reproduction, mortality and age structure are not recommended. Nevertheless, the information on length structure should be taken into account in the conservation status assessment process.

Habitat for the species

The evaluation of the habitat is completely taking over the assessment from the last report according to the Water Framework Directive.

The habitat quality is assessed as <u>favourable</u> if the ecological status of the length of inhabited watercourses is:

- from > 80% in high or good status
- from > 60% in high or good status AND from < 10% in poor or bad status

The habitat quality is assessed as <u>bad</u> if the ecological status of the length of inhabited watercourses is:

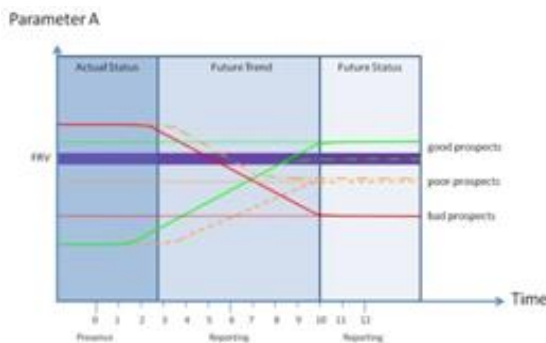- from < 30% in high or good status
- from > 25% in poor or bad status

All other combinations of the ecological status assessment are taken as describing the inadequate status of the habitat for the species.

The numerical limits mentioned above should be calibrated during the first conservation assessment process in 2019 depending on the ecological status assessment for Croatian waters.

Future prospects

This conservation status component should be evaluated by expert judgement according to methodology proposed by ETC/BD. The future trends and status will be estimated for range, population and habitat for the species following these principles:

A)

B)

Actual status of parameter	Future trend	Future status	Prospects (numbers refer to notes below)		
At/above FRV	+ (increasing)	> (above FRV)	Good		
At/above FRV	= (stable)	=/> (on/above FRV)	Good		
At FRV	- (decreasing)	</<< (under FRV)	Poor (1)		Bad (1)
Above FRV	- (decreasing)	>/=/</<< (above/on/under FRV)	Good (2)	Poor (2)	Bad (2)
Below FRV	+ (increasing)	>/=/< (above/on/under FRV)	Good (3)	Poor (3)	Bad (3)
Below FRV	= (stable)	< (under FRV)	Poor (1)		Bad (1)
Below FRV	- (decreasing)	< (under FRV)	Poor (1)		Bad (1)
Unknown	+ (increasing)/ - (decreasing)/ = (stable)/ X (unknown)	X (unknown)	unknown		
under FRV on/above FRV	X (unknown)	X (unknown)	unknown		

C)

Parameter	Future Trend	Future Status	Prospects
Range			
Population			
Habitat			
Future Prospects			

Figure 5: Assessment of the future prospects of a parameter based on its future trend and predicted future status (A), evaluation matrix (B) and assessment table (C) for future prospects (ETC/BD, 2011)

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