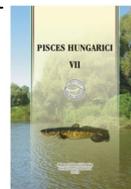




# PISCES HUNGARICI

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## A new and peculiar habitat type used by *Chondrostoma nasus* (LINNAEUS, 1758) in the lower Crisuri river drainage (NW Romania)

## A paduc – *Chondrostoma nasus* (LINNAEUS, 1758) – új és különös élőhelytípus-használata a Körös alsó vízrendszerében (ÉNy-Románia)

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**Keywords:** fish fauna, artificial channels, concrete embankments, bridges, weirs

**Kulcsszavak:** halfauna, mesterséges csatornák, betongátak, hidak, bukógátak

### Summary

Our recent findings concerning the fish communities from the lowland rivers and channels of the Crisuri drainage revealed that *Chondrostoma nasus* extended its distribution into an isolated area far away from its characteristic habitat in the Crisul Repede river. The unfavourable habitats of the Collector channel's system characterized by slow-flowing water and muddy bottoms became an acceptable biotope for this species due to the availability of small bridges, concrete embankments and weirs. The concrete structures provide a large submerged surface covered by algal periphyton, which represents an optimal feeding habitat for the nase. Large individuals of *Chondrostoma nasus* were observed close to small bridges and channel embankments near the Cefa fishponds (the area of Cefa Natural Park) up to 24 km away from the Crisul Repede river. Our observations reveal the ability of *Chondrostoma nasus* to successfully occupy new habitats in these channels due to the availability of concrete structures of anthropic origin. This also reveals an opportunistic pattern of habitat use.

### Kivonat

Az utóbbi időszak kutatásai a Körösök alsó szakaszán és a hozzájuk kapcsolódó csatornáknál kimutatták, hogy a paduc (*Chondrostoma nasus*) egy elszigetelt területen is előfordul, messze a Sebes-Körösben jellemző élőhelyétől. A Gyűjtő-csatorna lassú vízfolyású és üledékes aljzatú, kedvezőtlen élőhelyeit az itt épült kis hidak, betongátak, bukógátak alkalmas biotóppá teszik az adott faj számára. A betonépítmények nagy vízfelszín alatti felületet kínálnak, amelyen algákból álló élőbevonat képződik, és ez optimális táplálkozási helyet kínál a paduc számára. Nagy méretű paducegyedeket észleltünk a kis hidak és a csatornapart mellett a cséfi halastavak közelében (a Cséfa Természeti Park területén), 24 km távolságra a Sebes-Köröstől. A megfigyeléseink bizonyítják, hogy a paduc sikeresen foglalhat el új élőhelyeket ezekben a mesterséges csatornáknál az ember által épített betonműtárgyaknak köszönhetően. Megfigyelésünk egyúttal jól mutatja a faj opportunistátl élőhelyhasználatát is.

### Introduction

*Chondrostoma nasus*, one of the European potamodromous fish species, is a gregarious species occurring in large to medium-sized rivers with rocky or gravel-covered bottom, in deep waters with fast or moderate current (Freyhof 2011). It spawns in fast-flowing water on shallow gravelly riverbeds, often in small tributaries. This species may show a strong size-related longitudinal distribution in smaller rivers, with adults inhabiting more upstream river stretches (Kottelat & Freyhof 2007, Freyhof 2011).

The above-mentioned habitat requirements lead to the conclusion that nase populations stayed exclusively in middle and lower river reaches characterized by a stony bed and fast-flowing waters. Previous data on the fish fauna of the Crişuri river system also refer to the species *Chondrostoma nasus* as a typical inhabitant of main river channels (Bănărescu 1954, 1964, 1981, Bănărescu et al.1997, Györe et al. 2013). The same habitat requirements and stream location were reported from the upper Tisa river (Harka & Bănărescu 1999). Recent studies on the fish fauna of the lower Crisuri drainage and the Collector channel, which connects both rivers, revealed the occurrence of *Chondrostoma nasus* in artificial channels and their peculiar habitats (Harka 1997, Harka & Sallai 2004, Telcean et al. 2002, 2006, Telcean 2010).

Until our recent studies in which nase specimens were found in the Collector channel, this species was considered to have a habitat restricted to the main river channels of the Crisuri system (Telcean & Bănărescu 2002, Telcean & Cupşa 2007). Further studies are needed to establish if the fish occurring in these channels can spawn in the new habitat type, and if they have abandoned their migratory behavior.

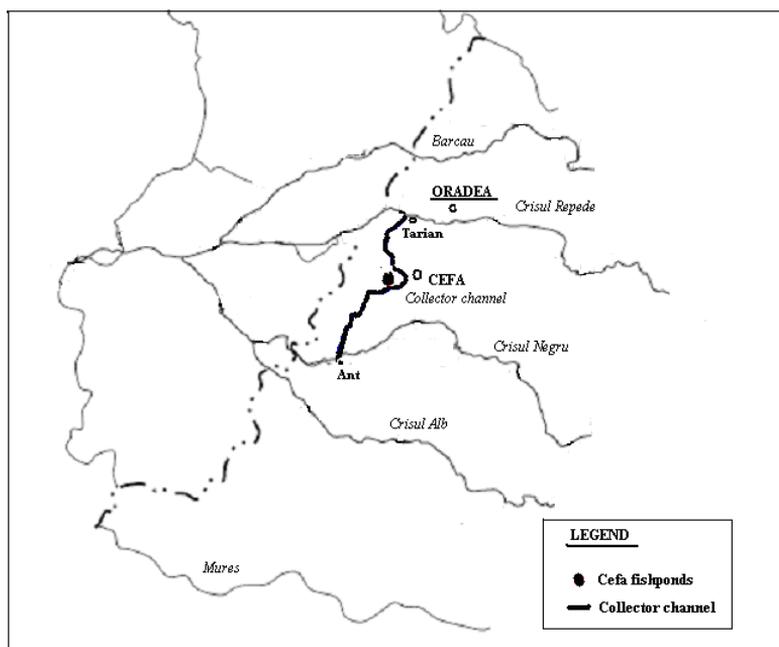


Fig. 1. The Collector channel and the studied area

### Material and Methods

The research was carried out during the spring and late summer of the years 2010 – 2012 in several stretches of the so-called Collector channel of the Crisuri drainage system (Fig. 1). The investigated channel stretches are close to the Cefa fish farm and have numerous concrete structures such as embankments, weirs, small bridges and passages (Fig. 2). The area in question is located 24 km away from the starting point of the Collector channel in the lower reaches of the Crisul Repede. All the mentioned structures have large submerged concrete surfaces representing a new biotope component in these channel habitats.

The studies on the fish fauna consisted in analyzing fish samples and directly observing *Chondrostoma nasus* specimens in the channel stretches adjacent to concrete structures. The

capture methods are combined the electro-narcosis and fishing nets with fine meshes. The electric gear was portable Samus 725 MP. The fishing nets has small dimensions in order to access the small areas close to the vegetation bunches. There was used also the crawfish-traps in order to have a screening for the small specimens and juveniles of local fishes. This was also an indirect method to make certain if the mature nase specimens spawn in that new habitat. (There is no adequate method to identify the properly eggs.)

During the study, there was no necessity of preserving specimens or transporting samples to the laboratory for further studies. The collected *Chondrostoma nasus* specimens were large-sized and thus, their identification was done directly and easily. A special objective of the study was to observe whether the fish occurred in this habitat type permanently and find out which biotope element was responsible for their presence. The habitat conditions are investigated by dredging the bottom substrate on that channel using a limnological dredge and nearby of this procedure, the presence of aquatic vegetation was noted. The bottom texture with mud and sand is covering long sectors of the Collector channel. The presence of the submerged concrete structures was distinctively noted and it was associated to the nase occurrence to the proximity of the Cefa fish ponds. Neither specimens of *Chondrostoma nasus* was noted alongside the channel sector from its starting point to the Cefa area. Our observations regarding the occurrence of specimens of *Chondrostoma nasus* in the area of Cefa fish ponds from the springtime to the late summer are supporting us to consider these specimens sedentary in this area.

Besides *Chondrostoma nasus*, other river-dwelling species that occurred here frequently were *Squalius cephalus* and *Alburnus alburnus*. Unlike the nase the others are not diadromous species.



Fig. 2. One of the weirs of the Collector channel.

### Results

In the middle stretch of the Collector channel, which connects the lower sections of the rivers Crisul Repede (Sebes-Körös) and Crisul Negru (Fekete-Körös), large specimens of *Chondrostoma nasus* (of lengths ranging 30-40 cm) have been observed since the summer of 2010. In August 2012, aggregations of adult *Chondrostoma nasus* were seen rasping the

algae layer from a concrete-made pier. Later, numerous observations regarding habitat conditions were carried out in order to establish the species' ability for adaptation. The local habitat of the fish consists of a channel connected to the Cefa fishponds, which are situated in the Cefa Natural Park. Several concrete embankments, weirs, piers and channel passages have been built here. It is notable that the atypical habitat occupied here by *Chondrostoma nasus* is situated far away from the original habitat of the species in the Crisul Repede river. The Collector channel starts at the village Târian (Köröstarján) on the lower Crisul Repede river, approximately 24.5 km away from the studied area. The entire channel is characterized by a high level of uniformity with shallow and slow waters and predominantly muddy and sandy bottoms. The submerged vegetation is well-developed, especially in the summer season when the water temperature also increases and the oxygen saturation becomes low. All these biotope characteristics occurring in the artificial channels of the Collector system are unfavourable to *Chondrostoma nasus*. It is important to mention that the habitat requirements of *Chondrostoma nasus* are well-defined and consist in stony bottoms and moderate to fast-flowing waters. Thus, the occurrence of nase in the channels is an evidence of the species' ability to occupy new habitats, such as those of the artificial channels.

Regarding the feeding habits of *Chondrostoma nasus* in these new habitats, we observed the special ability of the adults to graze the algal layer from the submerged concrete surfaces using their rasping feeding apparatus. As all the observed individuals were adults, it can be assumed that the submerged concrete surfaces covered by algae represent the main dietary source for this species. No juveniles were found in the studied habitat.

A special observation refers to the non-migratory behavior of the *Chondrostoma nasus* population inhabiting the middle stretches of the Collector channel. Adult fish were observed from summer to autumn in the same stretches of the channel. They stayed close to the submerged surfaces of concrete structures covered with algae, which are a stable food source during the warm season. No individuals of *Chondrostoma nasus* were found in other stretches between the channel mouth at the locality Târian and the fishponds of Cefa (Fig. 1). Considering the population's restricted area of occurrence in the middle sector of the Collector channel, it can be assumed that it has become non-migratory here.

The other fish species found in the same habitat along with *Chondrostoma nasus* are with two exceptions (*Squalius cephalus* and *Alburnus alburnus*) typical inhabitants of standing waters. They are *Carassius gibelio*, *Cyprinus carpio*, *Abramis ballerus*, *Rutilus rutilus*, *Scardinius erythrophthalmus*, *Perca fluviatilis*, *Sander lucioperca* and *Gymnocephalus cernuus*. These species occur in the entire channel system.

### Discussion

Until the present study, the species *Chondrostoma nasus* from the Crisuri drainage system was considered to have an area of occurrence restricted to the middle and lower river stretches. It seems to have the same distribution in other Romanian rivers, too (Bănărescu 1954, 1964, 1981, Bănărescu et al. 1997, Györe et al. 2012, 2013). In European rivers, nase is considered a rheophilic fish species with distinct habitat requirements (Hofer & Kirchhofer 1996). It inhabits medium to large rivers, where the individuals show a gregarious behaviour, staying in shoals (Freyhof 2011). The shoaling mechanisms of nase are still unknown, except for its reproductive behavior (Prokes & Penaz 1978; Dedual 1990). All nase specimens found in the Collector channel also stayed in shoals near submerged concrete structures. It seems that the gregarious behavior was preserved in the new channel habitat.

The most distinctive characteristic of *Chondrostoma nasus* is its potamodromous behavior. Adult fish are reported to occur in monospecific shoals (Lusk 1967) and change their location in search of food. Although nase are known for their spawning and

postspawning migrations (Penaz 1996), they remain stationary over longer periods demonstrating a pronounced home-range affinity (Philippart 1981; Fielenbach 1996). The size of the home range must be large enough to provide sufficient food for the animals (Huber & Kirchhofer 1998). However, we found no evidence of migrations that could confirm the potamodromous behavior of nase inhabiting channel habitats. The only observed movements of the shoals took place between their feeding places in different sites with submerged concrete surfaces of man-made structures. The distances did not exceed 200-250 m. This raises a question regarding the possible abandonment of the migratory behavior by nase in the new conditions of the channel habitats. The transition from migratory to sedentary behavior is observed in special conditions and is a characteristic of declining populations. Furthermore, migrations are directly reduced under certain unfavorable external conditions (e.g., in regulated and dammed streams) (Peňáz 1996).

There are no conclusive data regarding the spawning of *Chondrostoma nasus* in the new channel habitats. Juveniles were not found together with the adults, nor in the adjacent habitats along with juveniles of other fish species. Theoretically, the spawning of *Chondrostoma nasus* in a habitat without a gravelly riverbed and with slow-running waters is not possible. Studies on this subject demonstrated that the spawning sites of nase are characterized by water depths in the range of 0.2-0.3 m and an average water current velocity between 0.4 and 0.6 m/s. The sediment composition at the spawning area is characterized by a high proportion of gravel and pebbles (Keckeis 2001). Comparing the above-mentioned water depth and velocity requirements with the actual conditions in the artificial channels reveals no resemblance. The only possibly suitable spawning sites are represented by the submerged surfaces of concrete embankments. Whether the nase inhabiting the artificial channels are able to spawn in these new conditions is to be confirmed by subsequent studies. However, the hypothesis of spawning in those channels is supported by observations on the nursery habitat requirements of *Chondrostoma nasus* (Keckeis et al. 1997). These are characterized by shallow waters near the riverbank with gravelly and sandy bottom. The channels' embankments resemble these characteristics except the substrate. At the same time, the lack of juveniles in these channels contradicts the spawning hypothesis.

The delicate subject of the reproduction of nase in artificial channels is linked to another question regarding the colonization of that new habitat. The modality of channel colonization by *Chondrostoma nasus* individuals from the river Crisul Repede is unclear. The river's main channel is located at a distance of 24.5 km from the studied area. We suppose that the channel colonization was progressive and happened step by step using favorable places represented by submerged surfaces covered by algal periphyton. This supposition is contradicted by the absence of *Chondrostoma nasus* specimens in the intermediary stretches of the channels between the river and the site where the species was found. More investigations on this subject are needed.

The colonization of the new habitat type of artificial channels by adult individuals of *Chondrostoma nasus* can be considered an indication of the opportunistic behavior of this species. The dissimilar habitat features of the newest biotope exceed the range of the species' adaptation as it is known currently.

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