

# Migrations, home range and seasonal habitat use of adult Barbel in the Border Meuse.



De Vocht A<sup>1</sup>, F. Van Belleghem<sup>1</sup>, E. Baras<sup>2</sup> and J.C. Philippart<sup>2</sup>

<sup>1</sup> Limburgs Universitair Centrum, Centre for Environmental, Environmental Biology, Universiteitscampus, building D, B-3590 Diepenbeek, Belgium e-mail: [de.vocht@ilvo.vlaanderen.be](mailto:de.vocht@ilvo.vlaanderen.be)

<sup>2</sup> University of Liège, Laboratory of Fish Demography and Aquaculture, 10, Chemin de la Justice B-4500 Sart Tilman, Belgium



## Introduction

The Border Meuse still accommodates populations of rheophilic fish species such as barbel, nase and chub. The last century the population of barbel has declined due to gravel extraction, bank stabilization, water pollution and artificial water regime. For the population still present, little is known about the way the fishes use this modified part of the river. For river restoration, knowledge habitat use of this part of the Meuse, is important. At the start we were puzzled by the following questions (among others of course):

1. Where do the barbel stay by high discharge in winter?
2. Does and where does barbel spawn in the Border Meuse?
3. Which areas are chosen by barbel as residence area in different seasons and how big is the home range of barbel?
4. Are tributaries suitable spawning or residence habitats for barbel?

## Material and methods

Fourteen adult (F.L. 47.5 – 57 cm) barbel (*Barbus barbus*) were caught by electrofishing and radio tagged (ATS 40 MHz) in the Border Meuse (Borgharen – Maaseik): 5 in May 2001, 3 in October 2001 and 6 in April 2002 (figure 1, figure 2).

From May 2001 till September 2002 fishes were localised weekly throughout the year and daily in April and May in order to localise spawning grounds and investigate seasonal migrations and habitat use (figure 3).

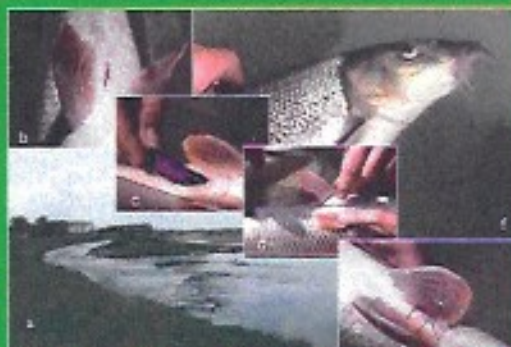


Figure 2. Capture site of adult barbel in the Border Meuse (a), with details of the tag location of the transmitter (b, c, d, e) and a barbel recovering from anaesthesia (b).



Figure 1. Watershed of the Meuse with study area (Border Meuse).



Figure 3. Researcher with radio receiver and loop antenna for localisation of the transmitter (and usually the fish).

## Results and Conclusions

1. Four barbel radio tagged during winter (November-April) remained in the main channel (area shown in figure 4). In periods with high discharge (up to 2,500 m<sup>3</sup>/s) barbel maintain their positions near obstacles in the riverbed.
2. No distinct upstream spawning migrations occurred. Near Maasmechelen three barbel migrated downstream and two upstream to a potential spawning ground on April 25th and May 2 th, when water temperature reached 13.5 °C in the morning (figure 4). One of the three barbel in the Geul migrated to the mouth of the Geul in the Meuse when daily minimum temperature reached 13.5 °C and moved back in the Geul three days later. Spawning grounds for barbel in the Border Meuse are sparse ( $\pm 100$  m<sup>2</sup>), bottlenecks for successful spawning are the availability of gravel (2-5 cm) and low water velocity (<0.5 m/s).
3. In summer barbel moved individually from the Geul in to the Meuse (figure 5). Habitat shifts in spring and summer are determined by water level or discharge (Q)(figure 6). The radio tagged barbel have a individual knowledge habitats within their biotope. Home ranges of adult barbel in a highly structured part of the river are significantly smaller than those from other parts of river (figure 7).
4. Barbel captured in the Geul showed distinct individual differences in habitat use, as well in selection of a spawning habitat as in selection of a summer residence (figure 5). The mouth of the Geul is not a permanent habitat for barbel.



Figure 4. Migrations to spawning site of barbel near Maasmechelen in spring 2002 (barbel 4, barbel 5, barbel 1 and 2, barbel 3) with detail of the spawning site.



Figure 5. Migrations of three barbel from the Geul in to the Meuse on different networks in 2002



Figure 6. Migrations and habitat use of two barbel determined by discharge and water level.

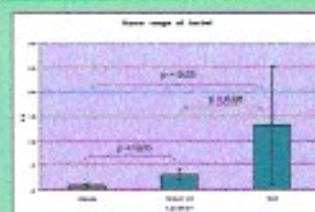


Figure 7. Mean home ranges (error bars indicate standard deviation) of the barbel tagged near the islands, at the entrance of the gravel pit and in the mouth of the tributary (Geul), differences are indicated with the p-value (Mann-Whitney U test)