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USE OF TELEMETRY IN THE CONSERVATION OF THE ENDANGERED FISH SPECIES: *ROMANICHTHYS VALSANICOLA* DUMITRESCU, BĂNĂRESCU & STOICA, 1957 (PISCES: ACTINOPTERYGII: PERCIFORMES: PERCIDAE)

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Abstract. Ten fish (*Romanichthys valsanicola* Dumitrescu, Bănărescu & Stoica, 1957) implanted with radio-transmitters, were tracked from autumn 2004 to summer 2005 in the River Vâlsan, a central Romanian river, tributary of Argeș River. The efforts on the pursuing of fishes are focused on the estimation of home-range of the fish. We have gained some primary information on the movements of the fish and on the utilization of the habitat during the 24 hours cycles. From this information we have acquired the distances, periods and the pace of displacements between the successive locations. We have also calculated a movement hint during a period of time (Kenward, 1992). There have been acquired, also, information on his fidelity to a site. The analyze of the movement hint suggest that *Romanichthys* spends the bulk of its time not moving at all, or moving the width of the river, from shelter to shelter. From time to time fish relocate in another area, situated downstream. The movement hint and activity profiles, commonly shows a variable behavior with movement extending day and night. This is the first study on the movement of the *Romanichthys valsanicola* in its natural environment.

Résumé. Dix poissons (*Romanichthys valsanicola* Dumitrescu, Bănărescu & Stoica, 1957) implantés avec des radio-emmèteurs, ont été suivis à partir de l`automne 2004 jusqu'à l`été 2005 sur la rivière Vâlsan, une rivière du centre de la Roumanie, affluent de la rivière Argeș. Les efforts de poursuivre les poissons se sont concentrés sur l`estimation du domaine vital du poisson. Nous avons acquis des informations primaires sur les mouvements des poissons et sur l`utilisation de l'habitat au cours des cycles de 24 heures. De cette information nous avons appris les distances, la période et le rythme des déplacements entre des locations successives. Nous avons également calculé un indice de mouvement pendant une période de temps **(**Kenward, 1992). On a aussi acquis des informations sur sa fidélité à un site. L`analyse de l`indice des mouvements suggère que *Romanichthys* passe la plupart du temps sans bouger, ou se déplacer dans la largeur de la rivière, d`un abris à l`autre. De temps en temps le poisson se déplace dans une autre zone, située en aval. L`indice des mouvements et le profil des activités, montre un comportement variable; avec des déplacements prolongés jour et nuit. C`est la première étude sur les déplacements du *Romanichthys valsanicola* dans son habitat naturel.

Key words: ecology, telemetry, endemic species, *Romanichthys valsanicola*, habitat utilisation, home range, Romania.

INTRODUCTION

The fish *Romanichthys valsanicola* Dumitrescu, Bănărescu & Stoica, 1957 is an extremely endangered species, endemic to a Romanian river: Vâlsan. It is the fish genus having the smallest range in Eurasia and was considered the most endangered freshwater fish species in Europe, by Maitland (1991). Once Palaearctic the fish is now a preglacial relict, which can be found in our days only in the Vâlsan River, in a restricted area of about 7-9 km (Bănărescu et al., 2003). The distribution of *Romanichthys valsanicola* has decreased dramatically during the last century.

In figure 1 it can be seen the area were the fish survives, the zone of this tracking study.

Romanichthys valsanicola is found in cold clear fast-flowing areas, hidden under rocks. It is territorial, excepting the spawning period. The fish is a predator feeding exclusively on aquatic invertebrates: larvae of rheophilic insects, mainly mayflies and stoneflies.

Directly observing fish in the wild is often impossible, however, radio telemetry allows the locations of fish to be accurately identified.

Day-night alternation represents a major zeitgeber which rules the use of time and space by most teleost fishes (Thorpe, 1978; Helfman, 1986; Boujard & Leatherland, 1992).

Depending on species, age, size and environmental conditions fish may use the same habitats all day long both for feeding and resting (e.g. *Salmo trutta*, Heggens et al., 1993; Ovidio et al., 1998) or different habitats for different activities at different time on the 24 h cycle (Cyprinids, Ladle & Clough, 1997; Fredrich et al., 1997). Although this is not a rule of thumb, residence and feeding areas, when spatially distinct are frequently connected by functional links: fish exploit a feeding area from a precise resting place (or set of neighboring resting places), move to another resting place as they select another feeding area and vice-versa (Barras, 1992, 1996; Fredrich et al., 1997). For these reasons, the daily positioning of fish equipped with telemetry devices, coupled with continuous tracking over some 24 h cycles, may give a representative picture of the way fish utilize their environment. For the small fishes like *Romanichthys* the small tags used with small batteries impede the tracking for more than 5-6 days.

The fish was traditionally described as a sedentary species (Bănărescu, 1965, 1994). Relatively little is known about space use by those fish in rivers. In this study, radio-tagged *Romanichthys* were used to obtain more detailed information on the spatial behavior of this species in his natural area.

MATERIALS AND METHODS

In a study on the behavior and ecology of *Romanichthys*, 14 radio-tagged fish were tracked in the Vâlsan River, a central Romanian stream, from august 2004 to June 2005. Unfortunately four of them had been lost. The radio-tracking procedures were obstruct during July, August and November 2004, and also in the summer of 2005, because of high rainfall who caused the River Vâlsan to flood repeatedly, these floods being of unusual duration and severity. The small population of *Romanichthys* was affected by those floods; the number of adult fish, which can be radio tracked, found in the area of research was scarce. This study was developed under the authorizations no. 12/2004 and 8/2005 from the National Agency for Fishing and Aquaculture.

Initial tracking sessions were designed as a pilot study to determine a tracking protocol. This aimed to identify the number of location records required to describe a stable range, an issue that has rarely been addressed in studies of river fish. Exceptions are Natsumeda (1998) and Snedden et al. (1999). An optimal sampling interval was also sought. The effects of sampling interval have been considered when radio-tracking river fish (Lucas & Batley, 1996; Baras, 1998; Ovidio et al., 2000), and autocorrelation between location records has also been considered (Chapman & Mackay, 1984).

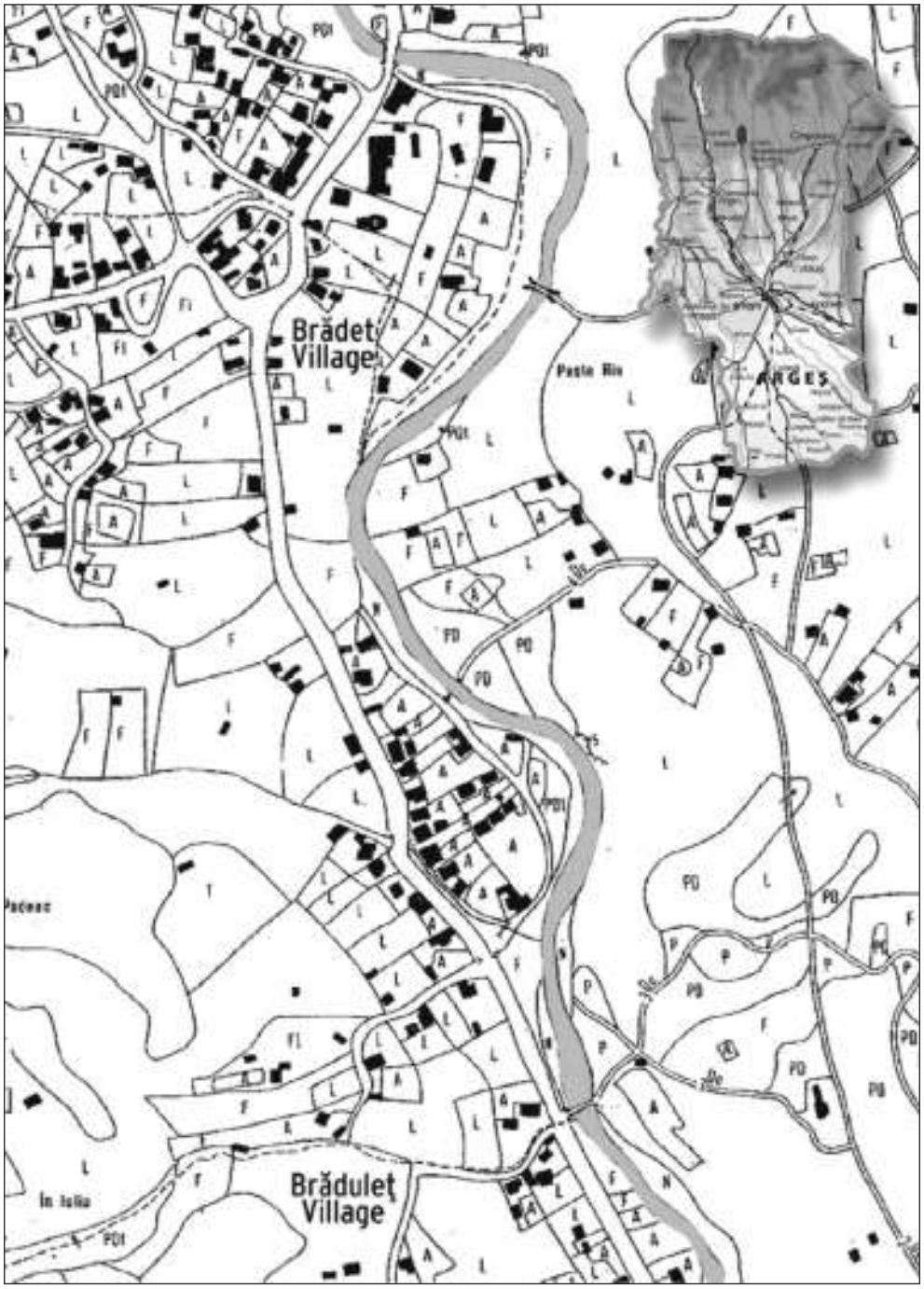


Fig. 1 - General localization of the study area, at the scale of Argeş County. In the background the area of study situated between Brădet and Brăduleț villages. On this map Vâlsan River is figurated in gray.

Study area

All of the fish in this study were caught, tagged and released in Vâlsan River. The Vâlsan River, situated in the centre of Romania is a typical medium size mountain river. River Vâlsan is situated in the middle section of Argeş River, a tributary of the Danube River. Mean channel width vary between 4 and 12 m. The study was conducted in a 1.5 km reach, in the middle section of the Vâlsan River, 40 km up to the confluence with the Argeş River**.**

The bed of the Vâlsan River, where the *Romanichthys* is present, is covered with rocks, gravel and sand from Oligocene and Neocene origin. The bed is constituted also of clay (Lower Eocene). The sediments is constitute of 54-86% rocks and clay, 14-45.99% gravel and sand and 0.01-0.20% mud. The main river study area had an average width of 8 meters and had a sinuous course. Depths ranged from 1.5 m in the deepest pools to only a few centimeters in the shallowest riffles. The average depth is about 15 – 20 cm.

Water clarity is usually excellent but the homocromia of the fish make the visual observation of the fishes extremely difficult.

In this area *Romanichthys* lives in association with other fish species: chub (*Leuciscus cephalus*), spirlin (*Alburnoides bipunctatus*), brown trout (*Salmo trutta fario*), sculpin (*Cottus gobio*), Romanian loach (*Sabanejewia romanica*), Mediterranean barbel (*Barbus meridionalis*), stone loach (*Barbatula barbatula*), minnow (*Phoxinus phoxinus*), gudgeon (*Gobio gobio optusirostris*).

Equipment and tag attachment

Fish were captured by electrofishing. Details of the *Romanichthys* subsequently referred to in this paper are shown in table 1. Each fish was identified using a letter of the alphabet.

Fish were tagged using externally backpack Biotrack micropip AG 337 activity sensing radio-tags (Biotrack Ltd., Wareham, U.K.). These small tags measure 7 (W) x 4 (H) x 13 mm (L) and weight only 0.35g. Each radio-tag transmitted on a unique frequency within the 148 MHz bands allocated to wildlife radio-tags in the E.U. (Kenward, 2001). The tags are attached from the back of the fish (dorsal musculature) with sterilized medical needle and thread. Fish is cross over once under the dorsal fin, according to a method used by Beaumont et all (1996).

All surgical equipment used during the tag implantation procedure had been sterilized. The operator wore sterile gloves throughout the procedure described below; all tagging procedure was carried out on the riverbank.

Each fish was placed in 1:1000 dilution of the anesthetic quinaldin, until it no longer responded to external stimuli. The fish was then placed onto a plastic operating table. Scales for ageing purposes were removed from an area between the dorsal fin and the lateral line. After full recovery the fish were released back into the wild at the site of capture.

Operating times ranged from two to three minutes and time to recovery ranged between nine and twenty minutes. Due to the small dimensions the Pip 337 tag has a short battery life so the period in which the animal gets accustomed with the tag was reduce to only one and a half or two days. From our experience in tagging fish and following published accounts data from the first 24-48 hours following a tagging operation was excluded from any analysis.

Between August 2004 and June 2005, the radio-tagged *Romanichthys* were located using a Sika radio receiver and a five element Yagi antenna.

Data collection

Due to the small mobility of *Romanichthys valsanicola* the use of a GPS to record each position of the fish, prove to be useless, because we are talking about displacements with amplitude of less than 2-3 meters in 24 hours. Such small, but sometimes frequent displacements cannot be properly identified using a GPS unit. So, in order to gain precision, the move and the location of each fish were recorded using a fixed point as landmark. Fixes were taken on the riverbank. Each fish was monitored for at least one minute, when located.

Fix positions were obtained by approaching the fish as closely as possible, and estimating its position in relation with the fixes taken on the riverbank. After identifying a fish's position, observers marked the bank at a point perpendicular to its position and measured the distance to the nearest stake. The positions were used to determine the home range (the difference between the furthest upstream and downstream points) and also the core areas of each fish home range.

Fixes were obtained every two hours in order to build up a picture of both activity patterns and the range of movements of the fish.

From previous research it's known that the dependency between number of radio fixes and estimated home range size was checked by plotting home range size against the cumulative number of fixes. In almost all cases the curve tended to level off before 20 fixes were included. Therefore it seems reasonable to assume that the radio telemetry data with N (greater than or equal to) 20 give an adequate description of individual space use at least for comparative purposes. Animals with (less than) 20 fixes recorded should be excluded from any analysis.

During this period we have tagged 14 fish but we have lost four of them, two were lost in August, during a severe flood, the third, the smallest (8.5 cm fork length) seems to be quite too small for tagging, and was lost after 1.5 tracking days, and the fourth was lost in June, due to an extremely large flood.

After the fish were released there were one or two days of repose, for the fish getting accustomed with the tag. Then tracking took place for three cycles of 24 hours, every two hours. All-day successful tracks took place on the 25th-27th of September, 22nd-24th of October, 12th-14th of November, 10th-12th of December 2004 and 13th-15th of January, 24th-26th of February, 17th-19th of March, 14th-16th of April and 5th-7th of May.

RESULTS

Movements

Estimations of fish movement are minimum estimations of displacement. Fish do not move in a straight line (Guy et al., 1994; Rogers & Bergersen, 1995), so the more times a fish are located in a day, the more total movement will increase. Better estimations of true movement can therefore be obtained if continuous tracking schedules are employed, or if fish are monitored frequently over a 24 hours period at least, or over cycles of 24 hours period.

Units of measure of fish movements reflect the precision that was conferred when the data was acquired. For instance, as fish were located numerous times over

a seventy-two hour period, we express movement as minimum displacement per hour (MDPH).

During the period of the study, ten fish tagged with radio-transmitters were successfully located in 373 positional fixes between September 2004 and May 2004. Another four fish tagged were lost, two of them in August 2004, the third in November 2004, and the fourth in June 2005. In order to minimize the stress upon radio-tagged fishes the movements of the radio-tagged fishes were not observed in the first $1^{1/2}$–2 days after the implantation of the tags.

Although the fish move also up-stream, the net movement of the radio-tagged fish was in a downstream direction from the point of release.

Generally, the fish seemed to recover in a few hours. All fish moved downwards hundreds of meters in the first hours after release, but some fish move also downstream hundreds of meters, during the 72 hours tracking. Fish appeared to spend periods in a restricted area before relocating, always downstream. They never return to areas of previous occupancy, or to the area of release, during the three days of the tracking.

The graphic representations of the movements of some of the ten fishes, with the identification of the core area(s) of the home range of those fish can be seen in figures 2–5.

Habitat use

Interest in evaluating the habitat used by fish has been a cornerstone of telemetry projects and one of the primary reasons for doing telemetry study. The overriding question is do fish spend more time in some habitats than would be expected based on the availability of those habitats. When this occurs, this behavior is said to be selective (Clough S., W. R. C. Beaumont, 1998). Animals are presumed

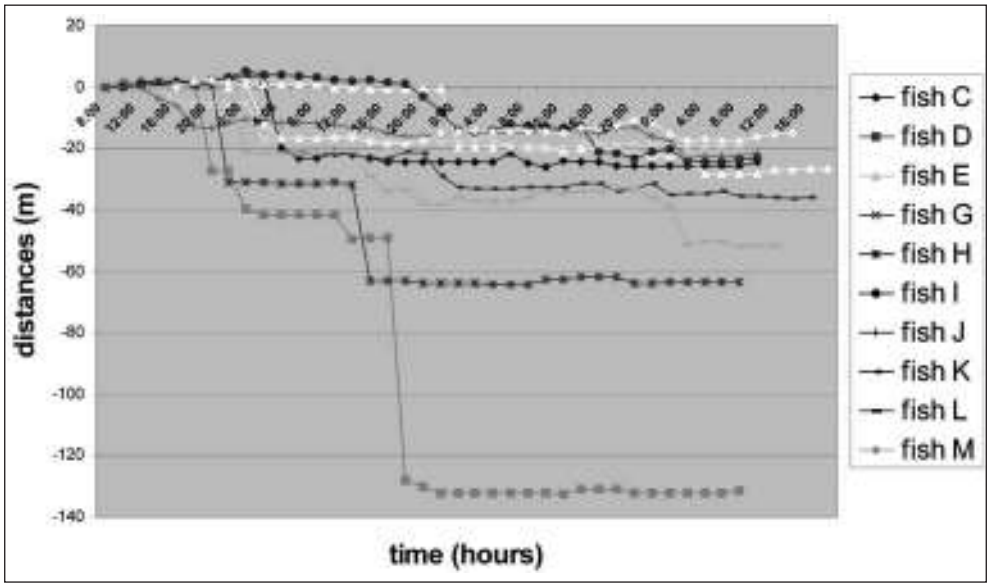


Fig. 2 - Distances traveled upstream and downstream in the 72 hours of the tracking protocol (home range) in 2004 and 2005.

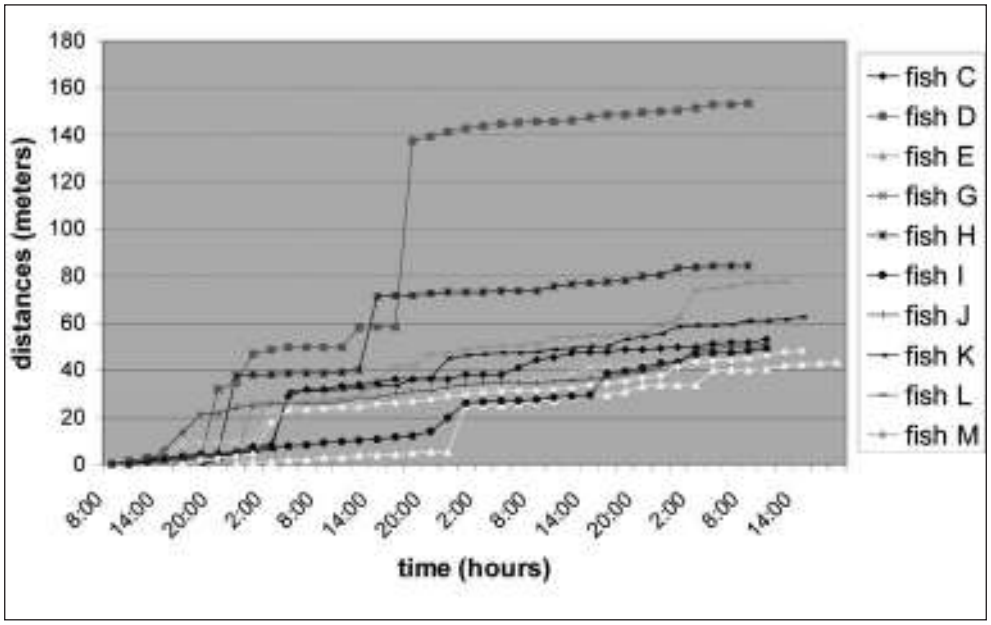


Fig. 3 - Mobility (total distances traveled by the fishes) during the 72 hours of the tracking protocol (2004 and 2005).

to use habitats that confer fitness, so that by studying habitat use, biologists can hope to assess what habitat features may be limiting. By studying where animals allocate their time, one can gain insight into how they meet their requirements for survival.

The fish live hidden almost all of the time under the stones, or on the gravel (especially during the night), and their homocromia make them extremely difficult to observe, even in the clear shallow waters. During the night, fish are moving more and they are getting out of their shelters, more often, in order to find food.

The tracking of the ten fish shows that *Romanichthys* move a lot in the width of the river, in restricted area, no longer than a few meters.

From morphodinamic point of view the main channel is predominantly flat (90%). There is some deep pools, always bellow the shores, but the fish prefer the flat areas, and didn't goes in the deepest zones. The bed of the area where we have tracked the fish is made of gravel and stones, sand and gravel, or clay. There are distinctive zones with river bed formed only of clay. In those areas the stream velocity is extremely high and the depth of the water is under 15 cm, and the fish didn't remain in those areas, because there aren't places to hide, or to protect from the high stream velocity.

During the day the fish live hidden under the stones, and move by one stone to another, and only the night they visit also the areas with gravel and sand, in searching for food.

The relocation of the fish from one area to another is identified, also by the presence of the clay bed zones, whom the fish seems to avoid, only passing by those areas.

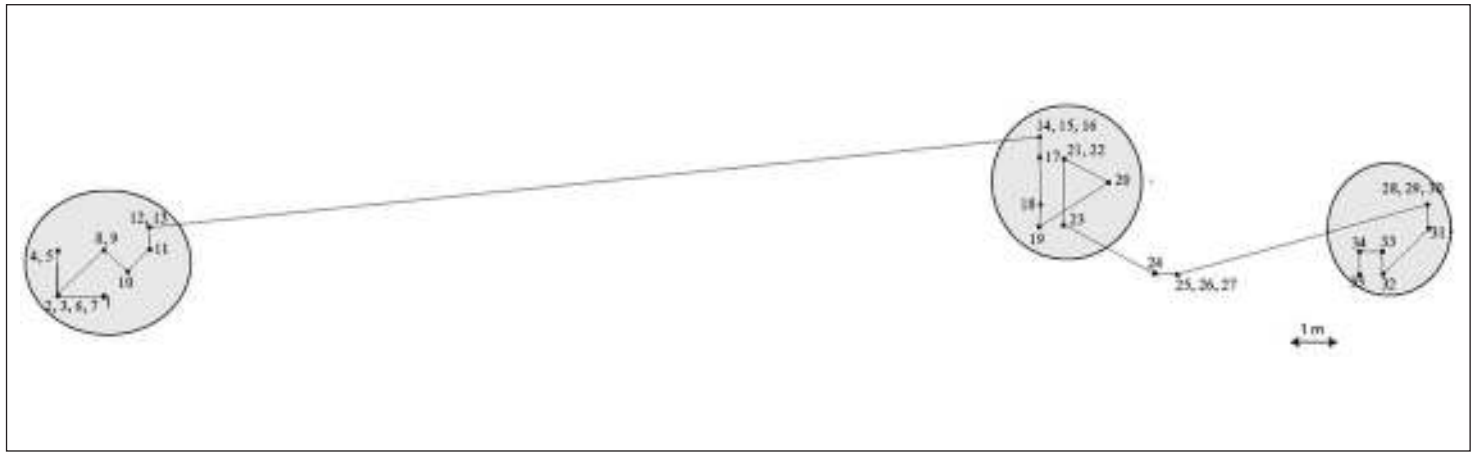
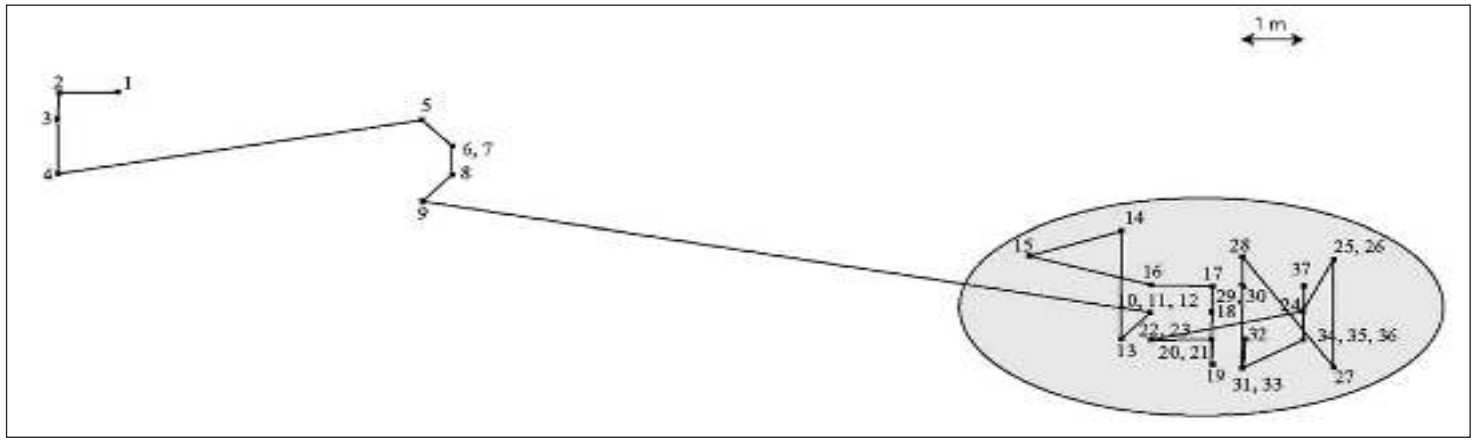


Fig. 4 - The presentation of movements of fish E (up) and G (down) during the 72 hours of the tracking period. With numbers representing the fish positions in the order of their location. The width of the picture represents the width of the river. In gray they are represented the core areas of the home range.



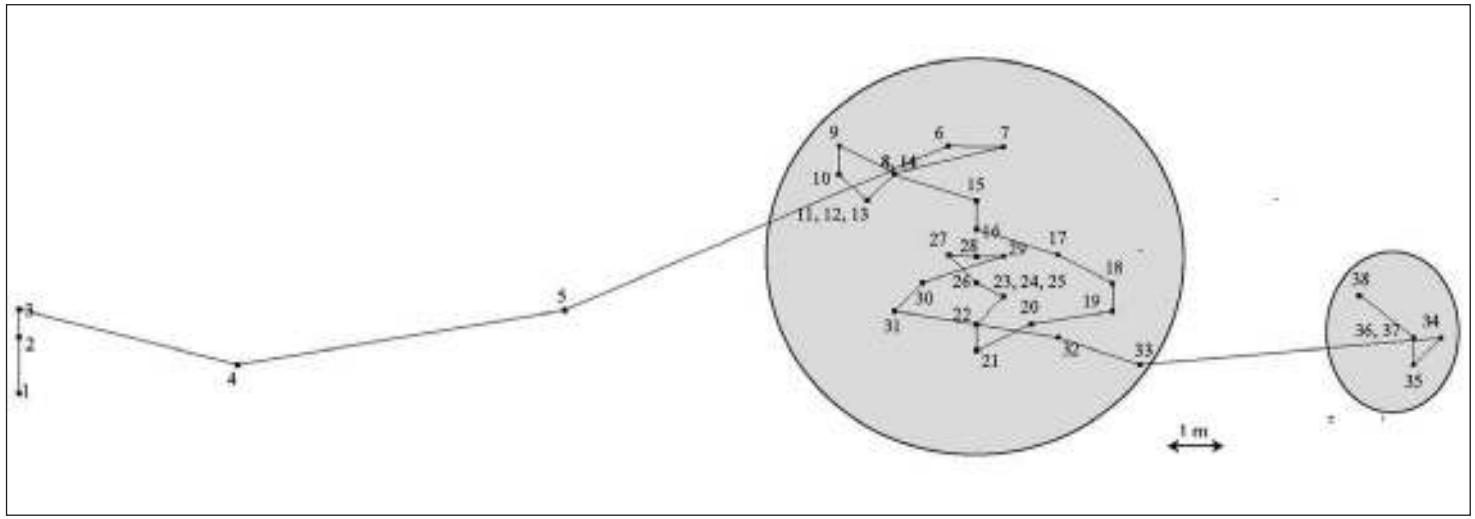
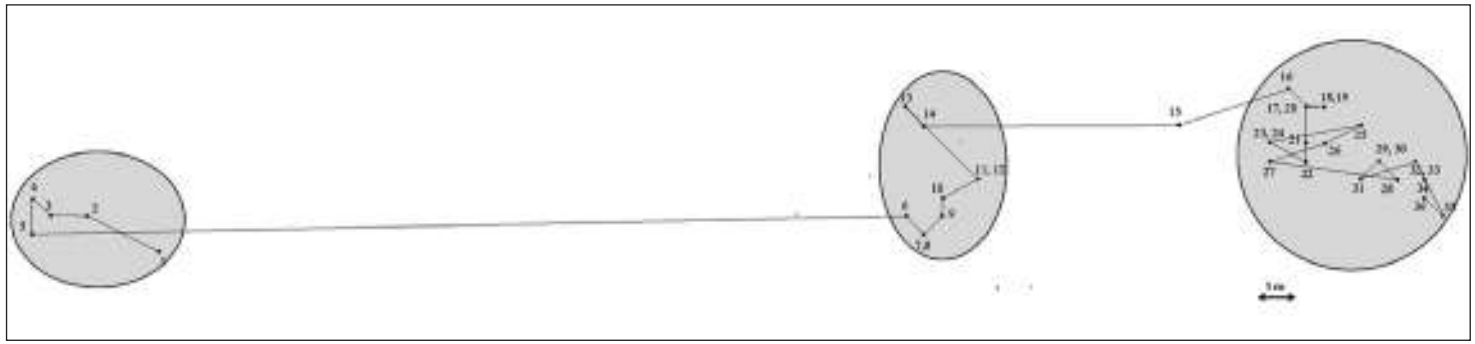


Fig. 5 - The presentation of movements of fish J (up) and K (down) during the 72 hours of the tracking period. With numbers representing the fish positions in the order of the location. The width of the picture represents the width of the river. In gray they are represented the core areas of the home range.



Activity patterns

Although the fish described as most of all nocturnal, with slight tendencies of displacement during the day, the analysis of its 24 hours movement patterns shows that the fish move a lot, also, during the day, which was previously unknown.

We didn't observe any major differences in the pace of the displacements of the fish between the seasons. But we must say we didn't track the fish during the hot season, when it's possible that the high temperature influenced the metabolic activity of the fish, due to severe floods which have stroken southern Romania in the summer of the last two years.

We have observed that the fish didn't migrate for long distances in the pre-spawning period, only they tried to congregate. The fish seems to spawn in the same areas were they live. This year the repeated and unusual severe floods had affected the spawning season of the fish.

The analysis of the fish movements shows the *Romanichthys* as a sedentary fish, with small mobility. The longer displacements of some of the tracked fish should be a result of the necessity to pass the clay bed areas, where the fish didn't find safe, or also an abnormal behavior due to the presence of the tag.

The number of the tracked fish is insufficient to get enough information to drawn clear conclusion. We have observed that the fish shows a lack of movements in late night and early day, especially in the cold season. It's also the time when the temperature is the lowest during the 24 hours cycles. But we didn't take that as a rule.

Home range and core areas

Home range is defined as "that area traversed by the individual in its normal activities of food gathering, mating and caring for young" (Burt, 1943). The maximal upstream and downstream locations are frequently used to define the home range, often expressing range area as the longitudinal displacement multiplied by mean stream width (Minns, 1995; Huber & Kirchhofer, 1998). This approach gives a good indication of the overall area available to the fish but may oversimplify the understanding of space use.

Rogers & Bergersen (op. cit.) consider movement (MDPH) and home range are highly correlated. The entire home range concept may not be as appropriate for fish as it is for terrestrial mammals (especially those with altricial young).

Total home range (calculate for all the localizations) was estimated by MCP method (method of convex polygon). And we have, also estimated the home range by MRP (method of reduced polygon which exclude the extremes localizations), and LM (lineary method which determine the upstream – downstream amplitude). All those results are presented in the table 3, which includes also the distances covered during the 24 hours tracking. There is also indicated the number of localizations (N). The mean width of the river in the area where the fish were tracked is about 8 m.

We must note that we didn't observe major differences between the home range of the fish during the year. The dropping of the temperatures modified the metabolic activity but with a lesser degree then was expected. The home range varies between 20 m and 134 m lineary upstream – downstream distance. The distances traveled by day varies from 0.5 m to 91 m.

Core areas are those areas in which the animal spends most of its time, which may, for example, be centered on a favored feeding area. We have estimated and marked the core areas in figures 4-5.

The fish remain most of the time on a restricted area or restricted areas, which could be represented as core area. Those areas represent between 10 to 40% of their total home range.

DISCUSSION

This is the first study on the movement of the *Romanichthys* in his natural environment. The main objective is acquiring information on general movements, home range, and on his behavior in general. The efforts on the pursuing of fishes are focused on the estimation of home-range of the fish.

Burt's (op. cit.) original home range concept was developed for mammals as the area used for foraging that surrounded a permanent home site. Fish seem to display more transitory ranges (Winter, 1977; Cook & Bergersen, 1988; Jones & Rogers, 1998). Changes in home range areas appear to occur with changes in forage, water temperature (Savitz et al., 1993), or body size (Minns, 1995), rather than intraspecific competition.

Home ranges still increase in size if a fish decides to relocate to new centers of activity on a regular basis, requiring the investigator to subjectively decide what location data include in the analysis.

We have gained some primary information on the movements of the fish and on the utilization of the habitat during the 24 hours cycles. From these information we have acquire the distances, periods and the pace of displacements between the successive locations.

We have also calculated a movement hint during a period of time (Kenward, 1992). We have acquired some information on his fidelity to a site, too.

The use of radio-telemetry has allowed valuable data to be collected on the habitat usage of *Romanichthys* during fall and winter. The fish was traditionally described as a sedentary species and our study confirm this description and offers new information on the movement hint, the distances, periods and the pace of displacements between successive locations and on his fidelity to a site.

During the 10 months of the study the radio tracked fish showed similar behaviors.

Adult *Romanichthys* showed predominantly localized but also width ranging movement throughout the tracking period.

Although we have tried not to scare the fish during the tracking it was obvious that the fish were sensitive to noise generated in the water by the approaching of the operator. The fish generally doesn't move when the operator is near, but there were some occasions when the fish was probably afraid of the vicinity of the operator and move on short distances.

The analysis of the movement hint suggest that fish spends the bulk of its time not moving at all, or moving the width of the river, from stone to stone.

The movement hint and activity profiles, commonly shows a variable behavior with movement extending day and night. Maximum of activity was observed in the evening and in the first part of the night.

The results presented here reflect the effect of the tagging procedure and the presence of the tag with all the implications that this may have for abnormal behavior. Certainly the fish moved downward from the tag site after release and

observations indicated that movement was wider ranging in the subsequent 2-3 days after which the pattern of behavior seemed more predictable. The precise effect of the tag however remains unknown. In the absence of any other comparative data for *Romanichthys valsanicola*, this study provides an initial insight into the range and activity patterns of the fish.

Individual tagging allowed for the estimation of some demographic parameters that could improve our understanding of *Romanichthys valsanicola* population dynamics and reveal mechanisms that may affect population persistence, such as stochastic recruitment and low survival

The restricted conditions of radio tracking, due to the small size of the fish, and also the reduced number of available fish for the radio tracking procedure, due to very small population, are perturbatory factors which influenced the efficiency of the method.

The fact that the net movement of the radio-tagged fish was in a downstream direction from the point of release, and that they never return to areas of previous occupancy, or to the area of release, suggest that behavior of the fish is, more or less, influenced by the presence of the tag, at least in the first days. Also the small size of the fish which compel to the utilization of smallest tags available impede for a longer tracking of the fish. So it's possible that we cannot reach the valuable information, cause of restricted conditions of radio tracking presented above.

Similar studies (unpublished personal observations) on Alpine Bullhead (*Cottus poecilopus*) revealed little influence of tag on fish displacements after the tagging. That thing is corroborated with a more pronounced territoriality on the Alpine Bullhead, comparing with the *Romanichthys*, and also a reduce displacement pace.

For future similar studies we recommend the use of a solution applied by others on dace (Clough & Beaumont, 1998): the tagged fish are maintain in boxes with untagged fish in the place of capture and release for 1-2 days, to avoid the migration of fish downward the river, in the first hours after the releasing. This way the fishes have the possibility to recover and remain in the area where they were fished and released.

The analysis of the fish captured during the period of the study shows that the annual survival rates are slow. We find only one four years fish old and the majority of the fish was between two and three years old.

The population of this endemic species, which had been recovered in the last 3-4 years, was stroke by repeated and unusual strong floods in the summer and autumn of 2004 and also in the summer of 2005. After the lost of the fish caught in June 2005, due to a violent flood we have taken the decision to stop the study, in order to let the population to recover. The flood from June had also affected the spawning period of the fish.

Romanichthys valsanicola is quite affected by the floods, because, the river in the area where the fish is present had a narrow basin, and the fish are pushed downstream, with negative consequences on their chances to survive. Moreover the dam lake which was built in the upstream area must be emptied from time to time, with negative consequences on the turbidity level, and on the transparency of the water.

During the ten months of the study we have found fish, which were previously radiotracked. Fish looked fine, with little signs of previous tag attachment.

Such kind of specimens, which were previously monitored, were released immediately when they were caught later, not to create a supplementary stress on them.

The lost species escaped the tag attachments because the surgical thread absorbed itself within a few months.

Table 1

Standard lengths and ages at capture of radio-tagged fish in the Vâlsan River.

Fish	Standard Length (mm)	Age	Date of capture and tag implantation
A	10.2	3+	20/08/04
B	10.1	3+	20/08/04
C	10.5	3+	22/09/04
D	11	3+	20/10/04
E	10.2	3+	11/11/04
F	8.6	2+	11/11/04
G	10.3	3+	08/12/04
H	10.8	3+	08/12/04
I	10.5	3+	11/01/05
J	10.4	3+	22/02/05
K	10.3	3+	16/03/05
L	10.7	3+	12/04/05
M	11.4	4+	03/05/05
N	10.4	3+	08/06/05

Table 2

Total home range and mobility of the ten fish (*Romanichthys valsanicola*) radio-tracked in the Vâlsan River.

Fish		Total home range over 3 days – liniary method	Distance traveled over 3 days	Duration of track (hours)	Minimum displacement per hour (MDPH) m/h
n°	FL (mm)	Size (m)	Total (m)		
C	10	28.5	53	72	0.7361
D	10.5	134	153.5	72	2.1319
E	8.5	29	43.5	68	0.6041
G	9.8	21	46	72	0.6388
H	10.4	65.5	84	72	1.1666
I	10.5	29.5	49.5	72	0.6875
J	10.4	22.5	51.5	74	0.6959
K	10.3	39	63	70	0.9000
L	10.7	53	77.5	70	1.1071
M	11.4	20	48.5	70	0.6928

Table 3

Total home range and day home range (calculate for each 24 hours tracking) of the 10 fish in the Vâlsan River. The estimation is calculated with several methods: MCP - methods of convex polygon (home range extends to all the localizations), MRP – method of reduce polygon (home range exclude the extremes localizations), and LM – liniary method (the upstream – downstream amplitude). The distance covered (DC) during the 24 hours tracking is also indicated. N – number of localizations.

Fish	Total home range			Mean day home range		
	MCP (m^2)	MRP (m^2)	LM (m)	N	MCP (m^2)	DC (m)
C	228	212	28.5	37	114.6	10.1
D	1072	1052	134	37	358.6	44.8
E	232	216	29	35	73.3	9.1
G	168	156	21	36	57.3	7.1
H	524	512	65.5	36	178.6	22.3
I	236	224	29.5	37	81.3	10.1
J	180	140	22.5	38	57.3	7.1
K	312	312	39	36	112	14
L	424	420	53	36	153.3	19.1
M	160	152	20	36	78.6	9.8

Table 4

Indicators values of water quality in the Vâlsan River (in 2004).

Data of sampling	20.08.04	22.09.04	20.10.04	11.11.04	08.12.04
Debt qm * s^{-1}	1.38	0.375	0.763	1.26	1. 14
Water temperature °C	17.0	11.0	7.0	4.0	2.0
pH	6.9	7.1	7.4	7.3	7.5
Dissolved Oxygen mg/l	8.3	8.5	9.5	10.3	10.8
CBO5	0.5	1.5	1.2	0.8	1.5
CCO-Mn	8.5	5.1	4.3	4.5	4.2
Chloride	10.0	11.0	13.0	16.0	19.0
Sulfate (SO_4)	52	35	64	114	32
Calcium	24.0	35.2	44.1	33.6	43.2
Magnesium	13.3	15.8	7.2	10.8	15.4
Sodium	7.0	6.2	7.2	9.2	9.8
Ammonia	0.0	0.0	0.0	0.0	0.0
Nitrite	0.0	0.0	0.0	0.0	0.0
Nitrate	2.3	2.3	1.3	4.5	5
Suspensions	12.0	8.0	12.0	16.0	8.0
Total Hardness	6.4	6.7	7.8	6.8	8
Carbonate hardness	2.8	2.0	3.8	3.6	3.8
Bicarbonate HCO_3	79.2	105.3	91.2	115.0	132.4

Table 5

Indicators values of water quality in the Vâlsan River (in 2005).

Data of sampling	15.01.05	26.02.05	19.03.05	16.04.05	07.05.05
Debt qm * s^{-1}	0.563	0.475	0.563	0.734	1. 29
Water temperature °C	2.0	2.0	6.0	8.5	13.0
pH	8.0	7.7	7.5	7.3	7.4
Dissolved Oxygen mg/l	12.8	12.7	11.5	9.8	8.8
CBO5	4.2	3.8	1.7	1.2	2.5
CCO-Mn	3.5	3.9	5.3	3.5	5.2
Chloride	22.0	20.0	20.0	17.0	16.0
Sulfate (SO_4)	153	162	201	124	103
Calcium	25.0	24.2	21.1	18.6	21.2
Magnesium	13.3	15.8	7.2	10.8	15.4
Sodium	11.2	11.5	15.3	11.2	8.3
Ammonia	0.0	0.0	0.0	0.0	0.0
Nitrite	0.0	0.0	0.0	0.0	0.0
Nitrate	5.3	5.1	3.3	4.5	4.1
Suspensions	4.0	4.0	5.0	7.0	8.0
Total Hardness	17.4	17.7	20.8	13.8	14.1
Carbonate hardness	9.8	10.0	13.8	6.6	6.8
Bicarbonate HCO_3	179.2	178.3	172.2	155.0	172.4

UTILIZAREA TELEMETRIEI ÎN CONSERVAREA UNEI SPECII PERICLITATE: ASPRETELE, *ROMANICHTHYS VALSANICOLA* DUMITRESCU, BĂNĂRESCU & STOICA, 1957 (PISCES: ACTINOPTERYGII: PERCIFORMES: PERCIDAE)

REZUMAT

10 peşti (*Romanichthys valsanicola* Dumitrescu, Bănărescu & Stoica, 1957) implantaţi cu radio-emiţătoare, au fost urmăriţi din toamna lui 2004 până în vara anului 2005, pe râul Vâlsan, afluent al râului Argeş. Acesta este primul studiu al deplasărilor aspretelui în mediul său natural de viaţă. Pe perioada studiului am marcat şi urmărit 14 peşti dar am pierdut patru dintre ei.

Eforturile de urmărire a deplasărilor peştilor s-au focalizat pe estimarea domeniului vital a aspretelui. Am obţinut informaţie primară asupra mişcărilor peştelui şi asupra utilizării habitatului pe parcursul ciclurilor de 24 de ore. De la aceste informaţii am obţinut distanţele, perioadele şi rata deplasărilor între locaţii succesive. Am calculat de asemenea un indice de deplasare de-a lungul unei perioade de timp (Kenward, 1992). De asemenea au fost obţinute date asupra fidelităţii peştelui la un anumit sit. Analiza tiparului deplasărilor sugerează că aspretele petrece cea mai mare parte a timpului nemişcat sau se deplasează în lăţimea râului, de la un adăpost la altul. Din timp în timp peştele se relocalizează în altă zonă, situată mai în aval. Tiparul deplasărilor şi profilul activităţii peştilor sugerează un comportament variabil cu deplasări extinse pe toată durata a 24 de ore, atât ziua cât şi noaptea.

Aspretele a fost descris în mod tradiţional ca o specie sedentară şi studiul nostru confirmă această descriere şi oferă noi informaţii asupra tiparului deplasărilor, asupra distanţelor, perioadelor şi a ritmului deplasărilor între locaţii succesive şi asupra fidelităţii sale la un anumit sit.

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