BABEŞ-BOLYAI UNIVERSITY
FACULTY OF BIOLOGY AND GEOLOGY
DEPARTMENT OF TAXONOMY AND ECOLOGY

- PhD thesis SUMMARY-

Biology and Ecology of some problematic species: Water rail (*Rallus aquaticus*) and Little crake (*Porzana parva*) – studys on the Fizeş Basin's populations

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Keywords:

Rallus aquaticus, Porzan parva, social behaviour, aggressiveness, competition, sexing, predation, population genetics, territoriality, habitat preferences, niches overlap, *Porzana pusilla*, conservation, Fizeş bazin.

INTRODUCTION

The summarized work, conducted between 2009 and 2012 in the Fizeş Basin, presented the studies' results and interpretations on two ralids species. The fact that they are "the most unknown and elusive species of all birds" (Ripley, 1977) was one of the reasons for choosing this subject as my PhD research topic.

In this context, the objectives of this study were to:

- highlight the biometric variations specific to individuals from the Fizeş Basin and establish a sex discrimination formula for water rail meals and females;
- reveal the genetic variation on water rail populations;
- evaluating the species' habitat preferences and territoriality;
- evaluating the Fizeş Bazin population's specific breeding biology facts;
- evaluating the predation and water rail embryos' resistance to flooding;
- reveal the intraspecific and interspecific interactions;
- evaluate the monitoring methods and improving them for better results in some specific environments like large reed beds with high population density;
- reveal the anthropogenic and natural facts causing population decline;
- determine some solutions for species management and conservation;
- evaluate the data and create a Baillon's crake distribution maps for Romania.

My thanks, for their help in achieving my objectives go to: prof. dr. László Rákosy, dr. Alin David, Liviu Pripon, m. c. acad. dr. Dan Munteanu, prof. dr. Ioan Coroiu, Cristina Radu, Raluca Băncilă, Dan Bock, Ligia Baştea, Iulia Ieţcu, Ioana Văsar, Cosmina Irimieş, Ana Blăjan, Ioan Tăuşan, dr. Angela Schmitz Ornés, dr. Martin Haase, dr. Alexander Eilers, Nina Seifert, Silke Fregin, Susan Zielske, Christel Meibauer and also to my family. I am Thankful to"Transylvanian Bank Foundation".

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CAP. 1

SPECIES' TAXONOMY, PHYLOGENY, BIOLOGY AND ECOLOGY- A REVIEW

To have a start bases for this study we will create a review for this two species (Water rail and little crake) and also about Rallidae family.

The conclusions of this review are as follows:

- rails evolved in Cretacic (50 – 80 mil. years ago), the primordial form has spread all over the world except Antarctica and some oceanic islands (Perrins, 2004; Houde, 2009) ;
- the group's geographic origin remains a questionable subject, a large number of rails are located in the Old World while in the New World a lower number of species exist, many of them derived from the Old World's forms;
- *Rallus* and *Fulica* genera have been specialized in the New World, re-invading the Old World;
- Rallidae family have 34 genera with 133 (135-142) species divided in three non-taxonomical groups: rails, coots and moorhens (Perrins, 2004; Houde, 2009);
- in the Romanian fauna there are one species of *Rallus* genera (*R. aquaticus*) and three species of *Porzana*'s (*P. porzana, P. parva and P. pusilla*) present;
- despite having a global distribution, and occupying habitats as common as wetlands or forests, rails remain one of the most poorly represented groups in ornithological research;
- Water rail and Little crake are poorly studied, mainly due to its secretive nature, and the difficulty of accessing its habitat.

CAP. 2

STUDY AREA

The Fizeş Basin is located in the Transylvanian Plane, having an area of 56000 ha as part of central-south Someșan Plane (Pop, 2001; David, 2008) including the largest number of wetlands from Transylvanian Plain (Fig. 1).

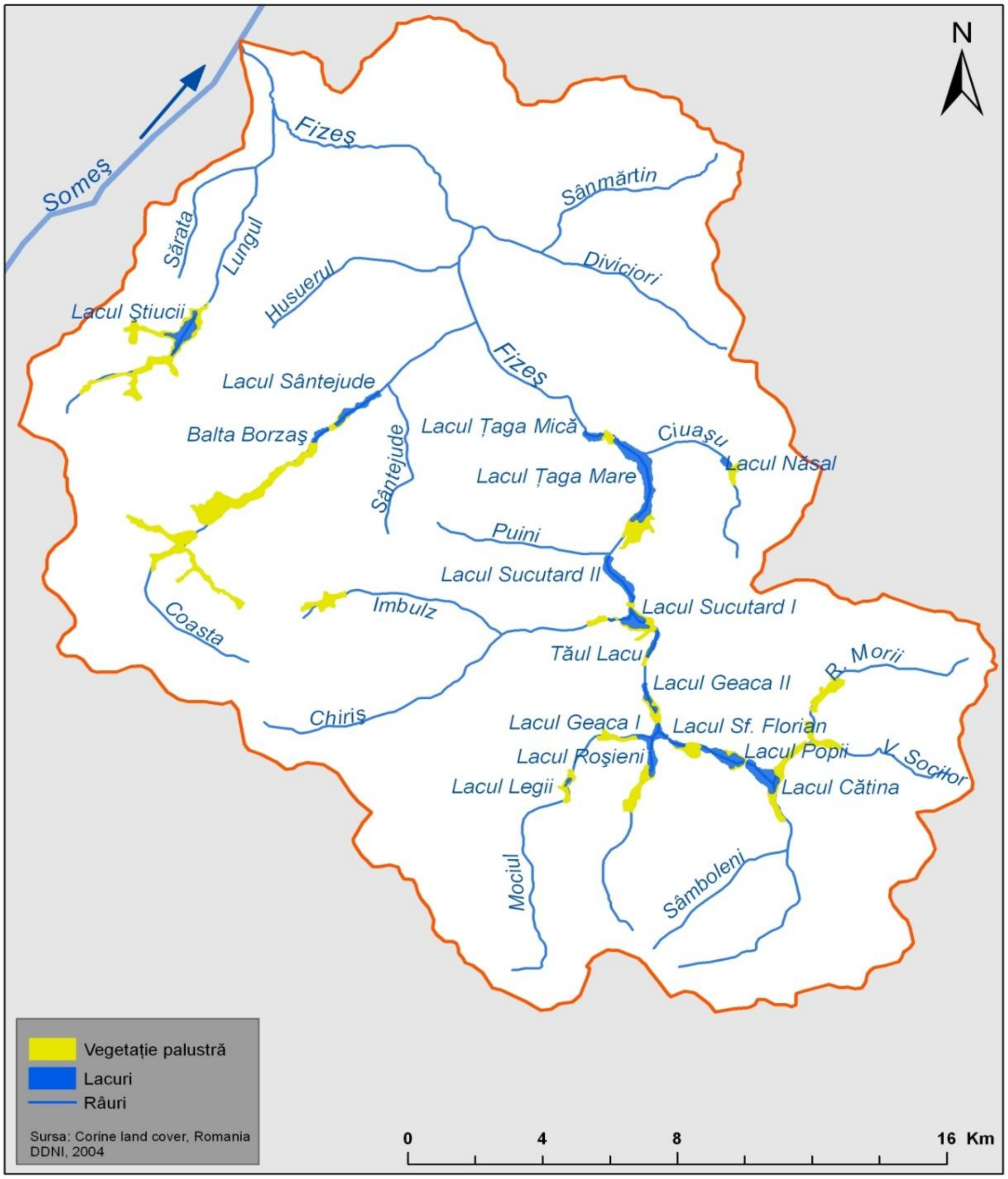

Figura 1. Fizeş Basin's wetland network (according David, 2008).

CAP. 3

WATER RAIL AND LITTLE CRAKE BIOMETRY AND SEXING ON FIZEŞ BASIN'S POPULATION

To capture the rails we used Potter's traps (Davis, 1981) and automatically closing traps (Bub, 1991).

During all this study we have capture 42 Water rails and 10 Little crakes. Regarding the capture rate, the highest number of birds were captured in April, when the birds are coming from the South and are looking for their breeding territory.

Analysing the biometrical data (the bill's length, wing length, tarsus length and body mass) we conclude that Water rail's and Little crake's populations from the Fizeş Basin are similar to other areal species' populations (Taylor, 1998; Cramp şi Simmons, 1980; Eilers *et al.,* 2012).

We used genetic methods for sexing 41 water rails (23 males and 18 females; 20 were juveniles (10 males and 10 females) and 21 adults (13 males and eight females).

Using genetic and biometric data the resulting discriminant function between males and females is: **D= (0.064 * Aripa + 0.265* L_cioc)- 17.707,** where Aripa- the wing length, L_cioc- bill length, if D > (-0.371) the bird is a male and if D < (-0.371) it is a female.

Because some studies falsified the general assumption that sexual dimorphism is independent of time and space (Van de Pol *et al.,* 2009) the discriminant functions may have to be adjusted through inclusion of new findings, in this case being valid for Water rails populations from central Eurasian species areal.

GENETIC VARIABILITY IN WATER RAIL POPULATIONS'

31 COI sequences from Water rail DNA were analyzed here (2 from north Germany, 3 from Spain, one from Montenegro, and 25 from Fizeş Basin) being described 3 haplotypes. We used also 50 de sequences from GenBank having in this way 12 different haplotypes (Fig. 2).

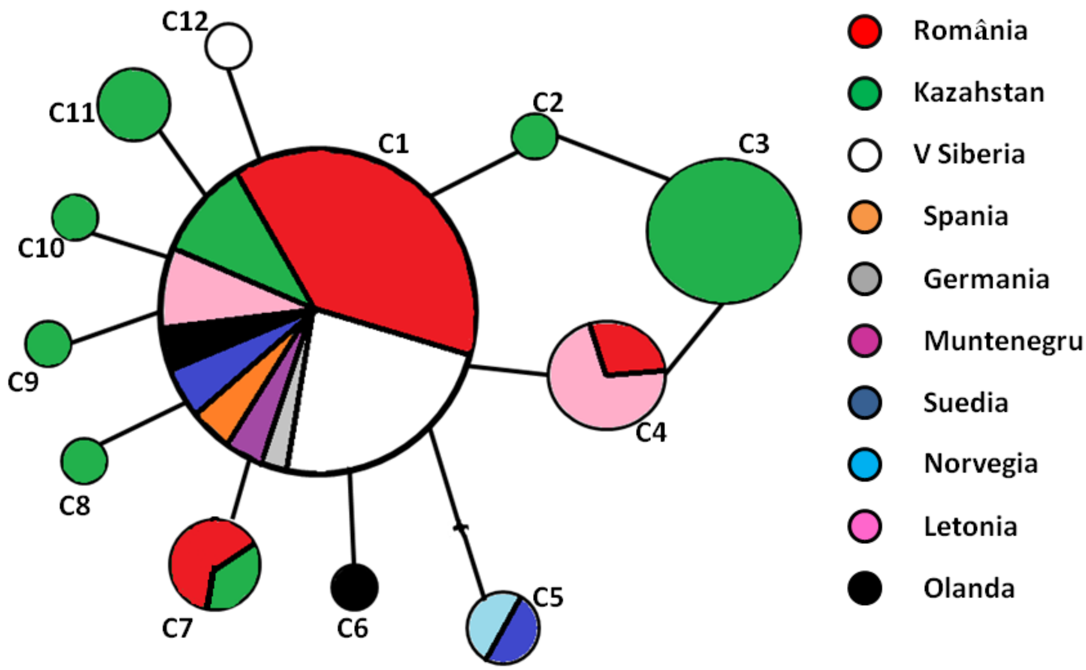

Figura 2. Median-joining network connection haplotypes according with the frequency and population location.

The results show that Water rail population from Fizeş Basin is a buffer population between the populations of west and east areal extremities, being the only one founded in Europe with a Kazakhstan haplotype, except the dominant once.

It may be suggested that after the last ice age, the population from which the species expansion took place towards Europe and Kazakhstan, had a refuge close to Kazakhstan, because for all described populations, a haplotype has been described found in each population with a high frequency, explaining their origin in a single population. The single glacial refuge close to Kazakhstan hypothesis is also supported by the presence and type of biomes that covered Europe, West Asia and North Africa in the time of the last ice age (Prentice *et al.,* 1992; Elenga *et al.,* 2000).

HABITAT PREFERENCES AND TERRITORIALITY IN STUDIED SPECIES FROM FIZEŞ BASIN

Between 2010- 2012, using playback we located the areas from the wetlands of the Fizeş Basin where Water rail and spotted crake were present, looking for the nests, marking and measuring them. In this way we located 80 Water rails' nests and 46 Little crake nests'.

After analysing them we conclude the following:

- The Water rail presents some variation in nest site selection and implicitly a lower selectivity when it comes to choosing its placement, compare with the Little crake which can be characterized as a stenobiont species;
- although the niches appear to have some overlapping in the generated dendogram, this being exceptional, from a statistical stand point the nesting areas of these two species are totally different;
- according to the DFA (discriminate function analysis) the representative factor, which makes the difference between the two species is the one regarding the nesting place, the water depth, and in the case of nest construction, the distance between the nest and the water surface;
- looking on the distance between water rail's nests we found a similarity with the data from Britain and north Italy (Taylor, 1998; Brambilla, Rubolini, 2004);
- the Water rail's territory is not yet represented in the first part of April, being more delimitated in the first part of May;
- regarding to the Little crake distance between nests we found them to be closer to each other, then in previous studies (Taylor, 1998);
- Regarding the Little crake, we found that population density variations from the Fizeş Basin are similar to the ones described in the western part of the (Taylor, 1998).

WATER RAIL AND LITTLE CRAKE

BREEDING BIOLOGY

All eggs from the located nests were measured and the volume was calculated as $V= k \times L \times B^2/1000$ where V- the volume (cm^3), L-large diameter (mm), B- small diameter (mm) and k- specific constant (in this case, according to Hoyt (1979), k= 0.51).

According to the nest localization rate, the majority of Water rails that nest in the Fizeş Basin build their nests in the same time period, the second half of April and the beginning of May. The clutch size for Water Rail varied from four to ten eggs, while for Little Crake they varied from four to eight.

Regarding the Little crake we identified three maximums in nest rate location, during the first part of the breeding season. This can be explained by the fact that at the end of May and beginning of June for the first two years of this study powerful storms occurred in the Fizeş Basin. Due to winds and hail, the majority of nests, which didn't contain any eggs yet, were destroyed, the bundles of rushes being blown away exposed the nest to the winds, thus the Little Crake pair was forced to construct another nest somewhere else. This can explain why those oscillations in a short period of time in the nest localization rate occurred. The forth maximum, registered at the end of July represents the replacement clutches.

The repeatability in egg measurements for Little crake (0.574- 0.260) and Water rail (0.157- 0.489) were really low, compared with the other values from another species(Zduniak, Antczak, 2003; David, 2008) revealing that the environmental impact is higher than the genetic structure.

We also used thermo buttons to monitor the nest and environmental temperature, looking in three active and two inactive nests of Water rail, from Sic Reedbeds, and one active nest of Little crake, from Sucutardul Mic. Recording also the temperature near to the Little crake's nest, we found that the Little crake nest is better isolated then the Water rail one due to the nature of building materials.

We found Water rail nests which were flooded and then incubated. Looking on that we create the hypothesis of Water rail embryos being resistant to water flooding. To test this hypothesis we conducted an experiment using 52 Water rail's eggs and 60 quail's eggs. The eggs were dividend in three groups (one as the control, one which was flooded for two hours and one for three hours). We found that the chance of Water rail survival to the two hour flood were 568% higher than quail ones, and with 180% higher in the case of the three hours flood.

Analysing the predation rate of Water rails nests in Sic Reedbeds we found that is higher than in other western Europe areas (Flegg, Glue, 1973; Jenkins, 1999; De Kroon, 2006. Regarding the Little crake population from the Fizeş Basin, the factors whish control the population are water level and storms.

Using 54 artificial nests with one quail egg and another one from plasticine, similar with Water rails nests, we conclude that the main predators were the Marsh harrier, Water vole, Water rail and Great reed warbler.

In the majority of cases the Water rail destroyed all the eggs out of the nests, while the Marsh harrier and Water vole consume them in the nests.

STUDIED SPECIES' SOCIAL INTERACTIONS

On the footbridge that crosses part of the Sic reed bed we chose 10 points situated at 100 m apart and made observations on the vocal activity of the Water Rail. Observations of vocal reaction were made from each point, three times a day (6:00-9:00, 13:00-16:00 and 20:00-23:00), for three days in three sessions. The dates of sessions were as follows: 23-26 April, 19-23 July and 9-17 September. At each survey point using digital playback of Water Rail, Little Crake, Spotted Crakes, Baillon's crake, Moorhen and corn crake territorial calls, we noted all the Water Rails responses after each playback. During 30 second after playback we counted the birds reaction.

Analyzing the number of birds which reacted during all playbacks stimulation, in all seasons, we found a statistically significant difference, having four statistically different groups: one formed by corn crake's, Spotted Crake's and Little Crake's, and the other three formed by Water Rail's, Moorhen's and Baillon's crake's playback reaction. The highest number of recorded birds was found during Moorhen's territoriality call stimulation and the lowest number was found during Baillon's crake's playback performance

In the first season the aggressive reaction decrease significantly in the direction (Water Rail= Moorhen) > (Corncrake = Little Crake = Spotted Crake) > (Bailon's crake), in the second one: (Moorhen) > (Water Rail) > (Corncrake = Little Crake = Spotted Crake = Baillon's crake), being almost zero in the third one.

Most of the aggressive reaction levels can be explained in the context of nest placement competition and food competition but also regarding to nest parasitism behavior of Moorhen and body mass differences in Water Rail and crakes (Dhondt, 2012). The highest aggressiveness in European rallid communities was revealed between Water Rail and Moorhen followed in intensity by Water Rail and Corncrake, Spotted and Little Crake, being almost inexistent for Water Rail and Baillon's Crake coexistence.

STUDIED SPECIES CONSERVATION ISSUES

The monitoring methods used on water rail do not seem to return results in conformance with reality reed (Jenkins & Ormerod 2002), in large reed beds with large population densities, and this is why we started the testing of six monitoring methods. Using the timing described in cap. 7 at each survey point, we recorded the spontaneous vocal activity performed for a time span of 5 minutes. After that using digital playback of male song and pair duet as a stimulus, we noted the response in all calling activity. In conclusion, among all methods used in this study, a five-minute survey of birds during spontaneous activity proved to be the most successful. The highest detectability of this species was found during the first period of the day of the first season, having no statistical differences between that and the periods of the day in the other two seasons. Given these considerations, we suggest that the most efficient time frame for counting Water Rail is in the morning (6:00 to 9:00 am).

Regarding the Little crake population and habitat conservation in the Fizeş Bazin we conclude that wetland management should strongly consider increasing or maintaining the water level over 1-1.5 m, and the habitats diversity as a solution to avoid strong competition between water rail and little crake. Also, reforestation of the hills surrounding the wetlands will decrease the rate of lake sedimentation, and will maintain the diversity of the wetlands habitats.

Regarding all rails and homogenous or heterogeneous habitats' structure we found that heterogeneous habitats are very important in rail conservation, being considerable areas in rail breeding.

The homogeneous habitats are also really significant and necessary, being typical habitats in rail migration and dispersal. The homogenous habitats, like reed beds are impotant points in ralid migration paths, being dispersion points in their migration towards breeding areas(with homogenous or heterogeneous habitats), having in this way a major importance for the ralid phenology, and for the wetlands biodiverisity.

THE PROBLEMS ABOUT BAILLON'S CRAKE AND SPOTTED CRAKE PRESENCE AND DISTRIBUTION IN STUDY AREA AND ROMANIA

Only five Spotted crake were located in Fizeş bazin during 2010- 2012, revealing a fluctuation in population size.

Baillon's crake it is one of the least known and studied birds in Europe (Taylor, 1998). Being a rare and very local species our aim is to create a map of the geographical and historical distribution of Baillon's crake in Romania, based on data available from museum collections, literature (Herman, 1971; Munteanu, 2009) and other databases.

From all 16 museum collections investigated by us, we found Baillon's crakes specimens in just six collections. From all this six collection we had the possibility to exanimate directly just 10 specimens from four collection. We found that nine specimens were wrongfully determined (being in fact Little crake) and one cannot be determined certainly due to their color deterioration. In this context, we will take into account in the map just that data which was not determined directly or certainly by us (Fig. 3).

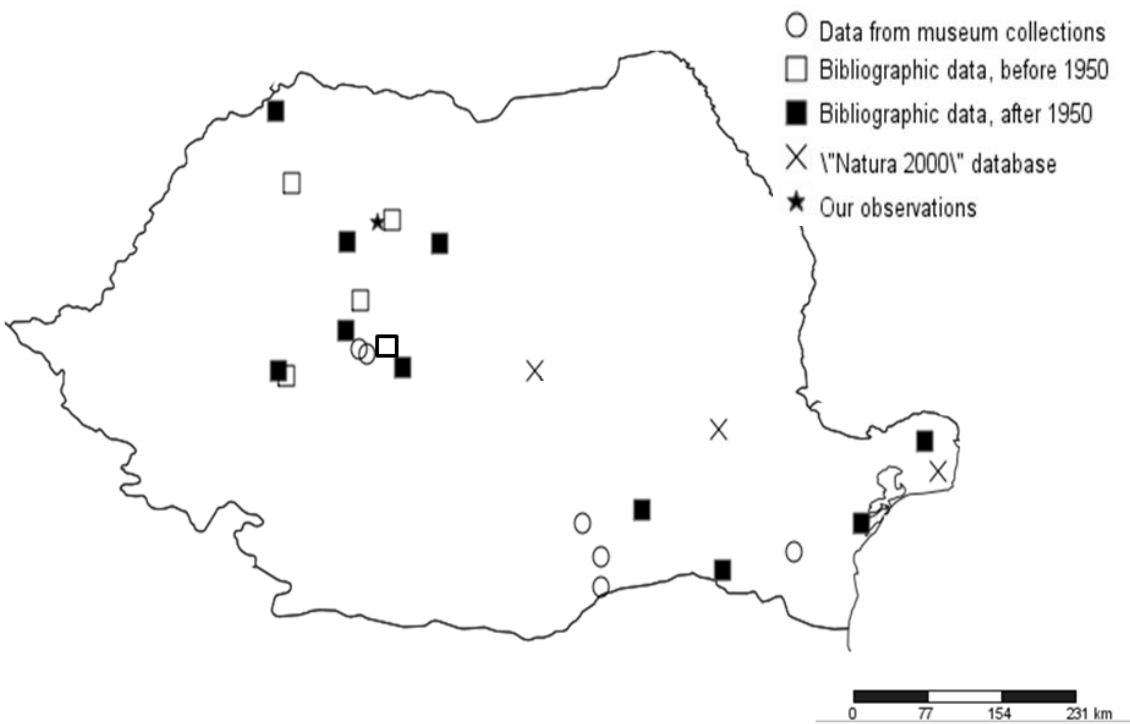

Figura 3. Baillon's crake geographical and historical distribution in Romania.

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