Biological research of the ponds of the southern part of Česká Kanada (south Bohemia)

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Introduction

There are not many places in the Czech Republic that can truly be called lonely. But there are several extinct villages of Romava and Rajchéřov and their surroundings that are typical examples of such places. The area in question is located in the south of the Czech Republic, about 6km south-west of Staré Město pod Landštejnem. Only few tourists can be found in that area. Although, at the end of World War II there were some villages that were inhabited mostly by German population. However, the Germans were then moved to their home country and replaced by the Czech villagers. Unfortunately, the people did not stay long in this place. Hand in hand with the oncoming communist regime, the area became isolated, the villages were displaced and the houses of the villages were pulled down. The area became accessible only after the Velvet Revolution in 1989 and thus the nature had been untouched for five decades. Apart from the omnipresent nettles and sundial lupines, only piles of rocks, ruins of walls and ponds bear witnesses to the former settlements. There are only five ponds in the area that have become an inseparable part of the scenery. Due to its loneliness, this area has become a wonderful place where many spieces of plants and animals can be found. Most of them are protected.

Our school came to study this area first in 1996. We call those trips „Expeditions" and they are pedagogical and research projects. Our school have visited many places during the Expeditions (they take place in June). Since 1996. we have visited this part of the Czech Republic many times – in 1997, 1998, 2000 and 2002. Natural science surveys and projects were focused on phytosociology, hydrology and hydrobiology. A zoological survey was then executed thanks to Martin Sládeček and Tomáš Göndör, the oldest members of the group. Although the survey was focused on the extinct villages of Romava and Rajchéřov, no pond research was included in 2002.

We had finally realized the importance of such research so when there was another Expedition in 2005, we decided to form a group that would deal with monitoring five ponds of that area. The group was looking into the ornitological, amphibious, herpetological and hydrobiological aspect of the ponds. Thus a 10-member group had been formed (2 students from the 4th grade and 8 students from the 2nd grade).

Apart from carrying out the research on spot, the students were trying to suggest a higher level of protection. Especially considering the most valuable parts of that area. They also claimed that advertising the natural values of the area should be done.

We truly hope that this research report will help fulfill those goals mentioned above.

Division of work in the group

Martin Sládeček (15 yrs)	group leader, ornitological survey
Tomáš Göndör (15 yrs)	hydrobiological survey
Marie Hrdinová (13 yrs)	hydrobiological survey, photo documentation
Nikola Kapic (14 yrs)	botanical survey
Jonáš Didunik (13 yrs)	botanical survey, grafic designer of the report
Timothy Dimoskakis (13l yrs	botanical survey
Martin Třešňák (14 yrs)	botanical survey
André Langer (13 yrs)	amphibious and herpetological survey, a documentary film maker
Tomáš Miklovič (13 yrs)	amphibious and herpetological survey, photo documentation
Petr Dohnal (13 yrs)	cooperation on the hydrobiological survey

General objectives

1) To make the biological, ornitological, amphibious, herpetological and hydrobiological surveys of the ponds and their surroundings.
2) To map endangered species in detail.
3) To trace down the most valuable parts of the area and the influences that threaten them.
4) To suggest a legitimate protection of the most valuable parts of the area.
5) To make a short documentary film which would show the biological value of the area.
6) To focus on public advertising of the values of the monitored area in relation to the future

Objectives of the surveys

Botanical survey

1) To do a botanical survey of 5 ponds (Rajchéřovský, Romavský starý, Romavský mlýnský, Kačer a Návarský). To exclude bryophytes and meadow grasses from determinig the species.
2) To determine the vegetation level (herbal level, frutescent level, arboreal level), biotope in which the species occur (wet meadow, dry place etc.) and the percentage of area that the species cover in each vegetation level.
3) To map the occurrence of the endangered species of plants.
4) To determine the main biotopes of the ponds (location, character of the biotope, dominant species, the number of species found, species not indigenous to this place and endangered species) and set their ecological stability.
5) To find and choose botanically interesting biotopes.
6) To trace down negative influences at each pond and its surroundings.
7) To suggest a way how to protect or increase the biological value of the ponds.

Hydrobiological survey

1) To examine the occurrence of the spieces of water invertebrate animals. To determine the saprobic index according to the occurence of the species in each pond (banks, inflow, outflow).
2) To carry out hydrological characteristics of the ponds (depth, temperature, transparency, texture of the mottom, smell and potential sources of pollution.
3) To compare the ponds according to the cleanness, using the saprobic index.
4) To determine the influence of the pond on the stream comparing the saprobic indicies of the inflow and outflow.
5) To determine dangerous factors.
6) To suggest a way how to protect and improve biological values of the ponds considering hydrobiology.

Ornithological survey

1) To map the occurence of water and wetland birds.
2) To determine a number of pieces or couples of bird population.
3) To focus on finding endangered species and to map their occurence.
4) To characterise the occurence of every species – to determine the probability of nesting.
5) To find out which biotopes are mostly inhabited by water and wetland birds.
6) To determine factors that negatively influence the bird population.
7) To determine ornithologically intersesting ponds which could be recommended for protection.

Amphibious and herpetological survey

1) To map the occurence of all the species of amphibians and reptiles at the ponds and their surroundings.
2) To focus on tracing down the endangered species and to map their occurence.
3) To prove that the species are capable of reproduction.
4) To find out which biotopes are mainly settled down by amphibians and reptiles.
5) To set a saprobic index of each pond using the saprobic indices of the amphibians and to compare them with the saprobic indices of the water invertebrate animals.

Methodology

Botanical survey

When we got to the pond we determined the main biotopes at the bank of the pond. We were examining the biotope from the bank (or from the tideland area) to the point where the influence of the pond on the plants was still noticeable. We marked the location of each biotope in a map (1:10 000).
The botanical group was formed by two couples. Each couple was examining their own biotope. When we came to a certain biotope we marked a 10x10m square using sticks. Each locality was given a code which consisted of a pond code and a Roman numeral which showed the numerical order (e.g. 3rd locality at Kačer pond = Ka/III). When the biotope was extremely interesting, we set more localities there. In that case, another marker had to be added (a, b, c,…).

Each code was then marked in a map and a table (see supplement). Furthermore, we took down the biotope´s water status (extremely wet, slightly wet, slightly dry, dry and extremely dry), characzeristics of the biotope, its code and ecological stability (scale 0 – 5) accordring to the methodology of monitoring the country (SMS).
We tried to find as many species of plants in the marked square and then we specified their class and took down their Czech name, Latin name, percentage of area that the species cover, more detailed location and the herbal level. When we were not sure about the class we used specialized literature (see literature) or we put it into a herbarium and consulted it with a botanist Mgr. Jakub Mrázek, a postgraduate student of botanic at the Faculty of Natural Sciences, Charles University, Prague.

We didn´t class any meadow grasses or bryophyte. On the other hand, we focused on endangered species of plants. We wrote down their occurence in special maps. The data about the level of legitimate protection were taken from the regulations of the Ministry of the Environment (MŽMP ČR 395/1992 Sb). We also listed species sensitive to human presence in the special column of the table.

We carried out the same procedure when examining each biotope. After that we put the outcomes of all biotopes together and we could determine the whole phytosociological characteristics of the pond.

In the conclusion of this report, we focused on defining botanically interesting or valuable places and suggesting the protection or improvement of ecological stability.

Hydrobiological survey

The localities were marked out similarly to the botanical survey. They were at all inflows, outflows, dykes and banks. The number of localities was determied according to the size of the pond but at least one examination had to be made at each bank biotope. Those localities were defined on 4 square meters. Then the locality was given a code, the setting was described and its location was marked in a map (1:10 000). Furthermore, a biotope, the character of the bank and its adjustments, the terrain profile and the type of the bottom (sandy, muddy, stone-sand etc.) were determined. Then we took the air temperature and recorded it in the table. If necessary, other notes were added in the table.

The following parameters were determined at all locations: water depth, water temperature at the bottom, transparency of the water and the smell. Measuring the transparency and the depth of water was carried out by a nylon thread and a compact disk. The CD was fixed to the nylon thread and weighted down with lead. The CD was lowered into the water at a standard distance of 1 meter from the bank. The depth was measured and after that the cd was slowly lifted up. When the silhouette of the cd was distinguishable, the depth was recorded in a table. The thread was marked after every 5 cm. Measuring the temperature was carried out by a HAMA thermometer. When the thermometr broke down, we used an alcohol aquarium thermometer. Measuring of the smell was done subjectively by sniffing at a beaker. The smell was determined according to a scale: 1 – without smell, 2 – insignificant smell, 3 – slight smell, 4 – strong smell, 5 – unbearable smell.
When we were extracting the biological material (water animals) from the water we used a net or a strainer. Then sample was freed from mud and poured out into a bowl with water. When clean, the water animals were moved into a petri dish and classified. If it was impossible to classify them on spot, we took the sample to our base and did the job there with of more detailed books. When the animals were classified, we determined their bio-toxic indices (indices that show an approximate biological pollution of the water) and saprobic indices (a saprobic index is an important parameter that shows the level of pollution by organic substances that disintegrate in water).

Then we counted an arithmetic mean of all indexes a that gave us an index of one locality. Counting an arithmetic mean of all localities gave us an index of the pond. The outcomes of all localities were then summed up and showed the overall characteristics of a pond. In the conclusion of

this report we focused on pinpointing hydrobiologicaly interesting or valuable areas and we suggested protection and improvement of the ecological stability.

The following gear was used: a net or a strainer, a fine net for catching plancton, a white dish, white pots, a petri dish, entomological tweezers, a magnifying glass, clean water-resistant jars, tables (see supplement), special literature (Atlas vodních organismů se zřetelem na vodárenství, povrchové vody a čistírny odpadních vod (2. díl: Konzumenti) prof. RNDr. Vladimír Sládeček Drsc. A prof. RNDr. Alena Sládečková Csc. Ústav technologie vody a prostředí a VŠCHT Praha 1997, Klíč k určování sladkovodních a bezobratlých živočichů REZEKVÍTEK Brno 1997).

Ornithological survey

We carried out at least two detailed observations of birds. We also gathered data during walking around the ponds. During the observation we visited places where birds would be likely to reside. We got to the litoral places using the rubber fishing pants that would allow us to move in 1 meter deep water. When we encountered possible nesting sites, we systematically searched the place and then (if one was found) we recorded all data.

We observed the birds with Carl Zeiss 8x30 binoculars. When we were unsure about the data, we checked them in a special book (see literature). All data were instantaneously recorded in a chart. We also recorded: location, number of birds (age and sex if possible), population around the pond (in the case the bird was nesting at the pond, we included data about the nest) and a scale which provided us with the probability of nesting.

Scale:
A – presumptive occurence of nest
B – possible occurence of nest
C – presumable occurence of nest
D – proved occurence of nest

Degree	Category
A	0 – Species was observed in time of nesting
B	1 – Species was observed in time of nesting and in nesting environment
	2 – A singing male was observed or heard in the nesting area
C	3 – A couple was observed in time of nesting and in nesting environment
	4 – Fixed location persumed on behalf of territorial behaviour
	5 – Species was observed during wooing or copulation
	6 – Finding possible nesting sites
	7 – Excited behaviour and warning the older birds, probably near the nest or to the chicks
	8 – Presence of nesting swamps
	9 – Old birds were observed while making a nest or nesting hollows
D	
	10 – Distracting enemies from finding the nest or chics by pretending an injury
	11 – Finding a used nest or the remains of the eggshells
	12 – Finding downy chick or birds which can fly
	13 – Observing old birds who are approaching the nesting sites or leaving them (possible presence of chicks).
	14 – Observing the old birds which are moving excrement from the nest or bringing food into it.
	15 – Finding a nest full of eggs
	16 – Finding a nest with chicks (seen or heard)

In the first phase we gathered data from the observations and recorded them in a file for each pond.

For the characteristics of the increase or decrease of the number of birds during our research, we used the files of the ponds.

In the second phase, we characterized the occurence of a certain species and their increase or decrease according to the gathered data. We also characterized each pond.

We focused on endangered species and we gained the information from the regulations of the Ministry of the Environmet.

Amphibious and herpetological survey

The research of amphibians and reptiles was based on observing and hearing those animals. We devided the pond into several areas (that correlated with each biotope) – banks and surroundings. Then we were looking for amphibians and reptiles that lived there.

We were looking for the amphibians mainly around the wet banks. If the area was not accesible, we used the rubber fishing pants. We were trying to find the tadpoles and newts in pools with a help of a net or a strainer.

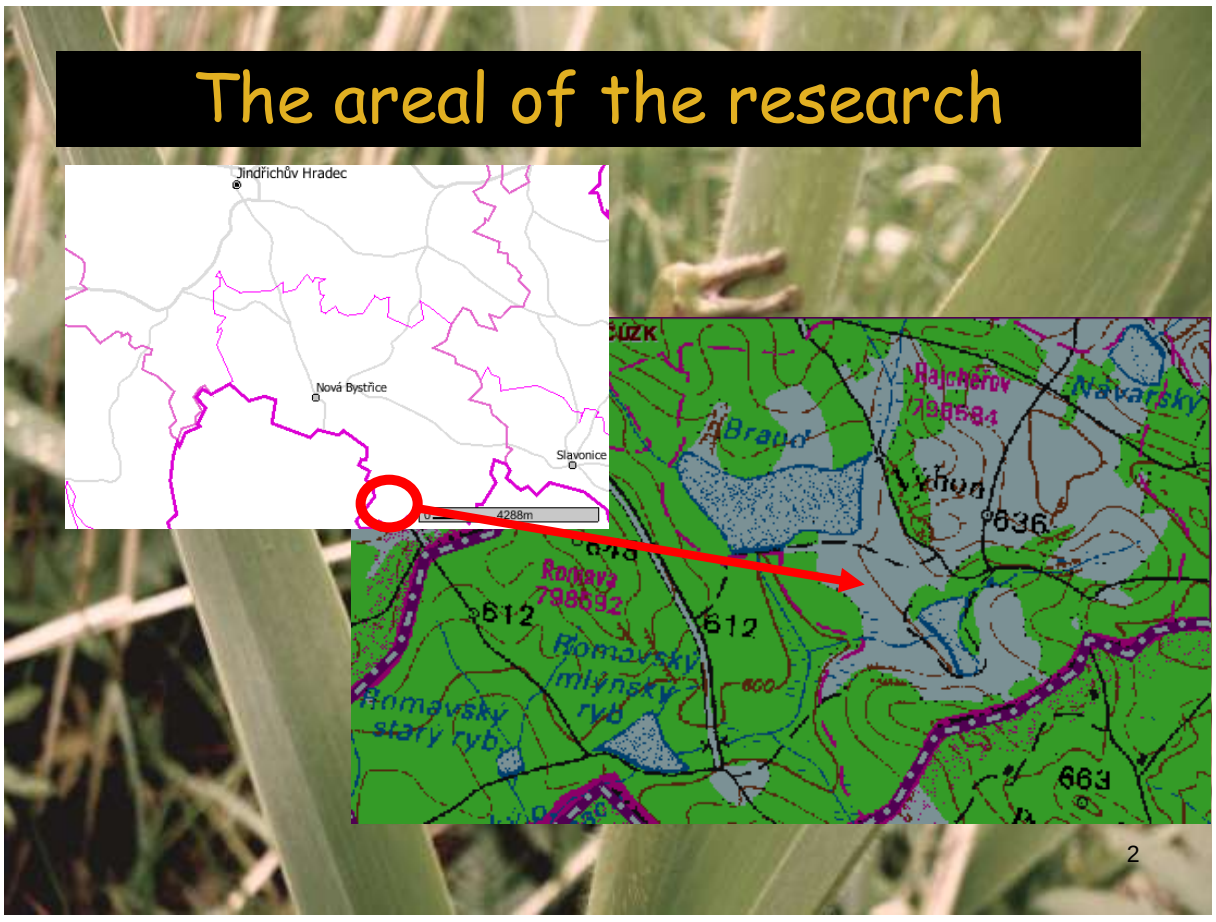
We were looking for reptiles at drier and sunny places.

Then we classified the animals on spot using special books. Animals that were interesting were video taped. To record the gathered data, we used tables. We were taking down: their number, the stage of their biological development and saprobic indices.

We also recorded the number of species of ampibians and reptiles that was found, the name of the pond, the code of the locality, the location of the locality, the characteristics of the biotope, the character of the bank (artificial, adapted and natural), the weather and water and air temperature.

In the second phase, we characterized the occurence of the species aaat each pond according to the gathered data. We also characterized each pond according to the occurence of the amphibians and the reptiles.

We focused on the occurence of the endangered species of amphibians and reptiles and we gained the information from the regulations of the Ministry of the Environment.



Outcomes

The characteristics of the examined area

The area is located 5 km south-west of Staré Město pod Landštejnem and is very close to the state border. The altitude of the area between 600 m and 650 m. The subsoil consists of Moldanubic pluton that was lifted up during the Hercynian folding. The subsoil rock in the whole area is granite. Due to this fact, the whole area is very acid and lacks limy and pyretic cations. There si also the main European watershed the Elbe-the Danube. One pond (Návarský) is situated on the watershed of the Danube and the four others are situated in the watershed of the Elbe. Návarský pond has one inflow – Pstruhovec. Kačer pond and Romavský Mlýnský pond have also one inflow – Romavský stream.

The examined area lacks the reservoir of the ground water. The granite in its subsoil is typical for its rift permeability and thus the area has almost no ground water. The ground water itself occurs only on the top of the graphite pluton and is maintained due to vast forests. If there were no trees and the riverbeds and streambeds were regulated, the quality and amount of the ground water would be a serious problem.

The original ground cover was made of acidophilic beech trees. The areas of wolds were covered by alder trees.

The first inhabitants came to this area approcimetly in the 13th century. This period of time was known thanks to the Austrian path that was near the village called Romava.

The ponds which are situated near the extinct villages of Romava and Rajchéřov were probably found by the first inhabitants in the area of wolds and wetlands. The first reference of Romavský and Rajchéřovský pond dates back to 1487. They were called Robnawa a nd Raicherzowsky. We have no other evidence of the other ponds from that period of time. The first reliable source of records is the Müller´s map of Bohemia. The other ponds are already recorded in it. The presence of all of the ponds was known for sure only from the 17th century. Starý Romavský pond was probably found between 1723 and 1763. The greatest number of ponds (8ponds) was around villages of Romava and Rajchéřov in 1787-1852. All ponds in Bohemia were taking up space of 180 00 ha in the first part of the 17th century. The area had decreased to 35 00 ha in the following two centuries. This decrease also affected the area of Romava and Rajchéřov. This fact was recorded during the 3rd military mapping. Only four ponds out of eight remained up to now (Romavský mlýnský, Romavský starý, Kačer and Rajchéřovský). If we took a detailed look at the military maps, we would not find any regulations of the streams (amelioration, straightening). This is the evidence that the regulations must have been done after 1918, most likely in the 60´s and 70´s of the 20th century.

The villages of Romava and Rajchéřov were affected by the displacement of the Germans. At the beginning of the 50´s, the houses were pulled down and the whole area was isolated – there was a boundary belt. Until 1989, no one except military personel was allowed into this area.

The ruins of the villages haven´t been affected by humans since 1950´s. Although the area has been freely accessible since 1989, not many people (except few farmers and foresters) have visited it. The area around the extinct villages is beginning to sprout. There are new spruces and thanks to the natural seeding, the area around Rajchéřov is being afforested. The dominant species are birch and pine.

Due to all these influences, the ponds and their surroundings provide a great place to live for various endangered species of animals and plants. After 1990, the whole area was included into the Park of Česká Kanada that was found by local authorities.

Global characteristics and conclusions of the research. Project of protecting the ponds

Návarský pond

There is a thick litoral area of sedge and reed around the pond. This area is the most developed one. The litoral area of sedge is an ideal environment for reproducing of the amphibians, especially the green frog and the newt. The biggest number of these species was present at this pond. We regard this pond (together with Kačer pond) as the most interesting one according to the occurence of amphibians. A great number of water invertebrate animals was also found here.

The litoral area also provides a suitable environment for birds such as a dipper (Tachybaptus ruficolis), a coot (Fulica atra) or a swan (Cygnus olor). The litoral area of the pond is such a good shelter for them that is very difficult to find them. The dippers and coots did not even occur on the water surface. Although we have not find any evidence of destroying the eggs, we think it is very likely because we found out that the swans had only one chick. We were quite surprised that we could not find any proof of nesting of the ducks. It seemed the duck used the pond only for resting. We could

assume that neither the flocks of ducks resting in the litoral area nor the ducks floating on the water surface had any nesting sites around. Only one duck (observed on 15.6. 2005) seemed to have a nest in the area but we also could have missed other hidden ones.

The inflows of this pond were in the majority of cases drained into ameliorative channels. Although they have maintained natural look, they are causing the decrease of the area of wetland ground cover (trees, bushes, etc.). Moreover, they cannot compensate the character of the natural stream.

The outflow is even in a worse condition. It is surrounded by pastures and the ameliorative channel is about 50 m long. It has very steep banks and leaves no space for wetland ground cover.

We consider the biggest problem to be the presence of blue-green algas (Cyanophytes) in the pond. We encoutered them during the second observation on 15.6. 2005. Although the number was not enourmous, we had not seen them during the first observation on 5. 6. 2005 and thus it is very likely that the number will increase.

The main cause of infestation of the blue-green algas might be fertilising the pond. There is a concrete obstacle at the dyke where the manure concentrates. We regard fertilizing the pond as unnecessary. The litoral area forms a significant part of the 10 ha pond with a large amount of biomass. Moreover, the pond is surronded by pastures which take part in fertilizing the pond. It may be possible that the water management uses the pastures as a cheap source of manure.

Recommended steps for maintaining and improving the biological value of the pond:

1) To stop developing ameliorative channels and to let the inflow gain its natural character.
2) To maintain the natural character of the banks (slow transition between the land and the water, presence of sedges and reeds at the banks).
3) To stop fertilizing the pond (it may also stop the infestation of the blue-green algas).
4) Trying to prevent destroying swan´s (and other) nests.
5) To consider a certain level of protection of the pond (amphibians and birds).

Návarský pond

Rajchéřov pond

The pond is surrounded by remains of the extinct village of Rajchéřov (from the north and the west). There was a thin litoral area of sedge (thick in the southern part of the pond). There were no reeds around the pond, although the water reached the former village. As a result, there were small pools which formed small channels with the pond. The pools were shaded by trees and the banks were densely covered by plants that are sensitive to human presence - nettle (Urtica dioica), Aegopodium podagraria, etc. Since the pools almost reached the former rooms of the houses, we assume that they must have originated due to a soil slide. The influence of the former village on the environment is obvious not only due to the presence of nettles but also due to the occurence of decorative flowers and fruit trees. Those were mostly pear trees and apple trees situated at the dyke. We also noticed the presence of sundial lupine that was spread all over the former village. In comparison with the other village (Romava), there is less density.

There is one plant we did not encounter anywhere else. It is the sweet rush. We found it at the Rajchéřov pond in the litoral area. It is one more species that prove former presence of a human.

The pools mentioned above formed the most valuable hydrological locality together with the infolws - there was the highest diversity (9 species). We found only up to 6 species at other localitie of the pond. The only possible explanation for the low diversity was teh presence of blue-green algas.

The quantity of the blue-green algas is still a question, because we did not notice any sign of over fertilizing the pond. We assume that the possible cause of the presence of the blue-gree algas was the former activity of the villagers and the proximity of the ruins. There is a lot of nitrogen stored in the soil due to the presence of a human and it is supporting the environmet suitable for the blue-ghreen algas (together with calcium an phosphore).

A little disturbing was a discovery of destroyed swan eggs (Cygnus olor). This must have been done my a human. Probably a fear of an infestation that was last noticed in 2002. It si obvious that swan do no harm in agriculture so we asked our selves what migh have pushed anyone to do it.

In general, the pond is frequently used by birds in order to nest: dipper (Podiceps cristatus), coot (Fulica atra), gadwall (Anas strepera). Even at this pond we encounered a certain trend of settling down in the litoral area of sedge. We also noticed a sea eagle but most likely it was a bird wchich was not nesting in thei area. There is an area where these birds occur very often. It is in Třeboňsko, approximately 50km north west of this area.

There si a very long dyke at the pond in comparison to its size (7 ha). It is coverd with very old trees – mostly with pedunculate oak which forms a lovely scenery with the nearby meadows. There was also the highest diversity of plants at the dyke.

There is very low diversity of the amphibians (3 species) although the number of the brown frog is very high.

Recomended steps for maintaining and improving the biological value of the pond

1) To stop fertilizing and increasing the number of blue-green algas (by restricting the incoming nitrogen and phosphore)
2) To stop destroying swan nests and other nests as well
3) To maintain the natural character of the east bank
4) To keep the old trees at the dyke

Kačer pond

The Kačer pond is the biggest and the most miscellaneous pond of all the examined ones. Its natural and harmonious location in nature is enriched by an extraordinary impression. The pond itself is very valuable due to the presence of the amphibians and some endangered species of plants and birds. The most valuable biotopes are the pools around the pond which can be regarded as remains of the litoral areas, especially around the northern inflows. This caused a few ecological problems.

During our examination, the pond was half empty. Starting June 10th, the pond started to charge its water back. The pond is probably being discharged regularly because when we came to this place in 2002, the situation was the same. The fishermen discharge the pond due to the lack of sustenance and do the green manuring instead. It is done by discharging the pond and the uncovered banks increase their size. Therefore, the plants can grow there. When the pond is full of water these plants decay and become food for the fish and other animals.

A new biotope then originates on the uncovered bottom and it is biologically interesting as a nesting site for plovers (Charadrius dubius). They are present in the same number as in 2002. We suppose that they have developed their skills of building the nests further from water and thus they are not in danger when the pond is discharged.

On the other hand, for birds such as ducks or dippers, there is a place for nesting missing. They occur on the water surface because the size of the pond guarantees relative rest but they don´t make nests. The interesting fact is that in 2002 there was a couple of Anas platyrhynchos and the environment was pretty much the same.

Another advantage of discharging the pond is the fact that when empty, it gives us a wonderful view on the banks that penetrate the forests.

The impact of the discharged pond is quite negative on the amphibians, bentos (small water organisms) and nekton. Apart from some rocks, there are very few natural shelters on the bottom of the pond. At the localities, there was very low diversity and the species tended to repeat at each location. The low level of water surface may cause drying up the water pools that are very importatnt for reproducing the amphibians.

We think that the wetland population might suffer from the same thing. Unfortunately, there are someendangered species fully dependent on th wet and awashed soil. The only suitable localities for these animals and plants were the water pools around the inflows. They form a good environment for reproducing the amphibians, especially the brown frog and the newt. Moreover, those locations had the highest diversity of bentos and nekton.

Another negative effect of the discharging the pond is the decrease of the number of reeds.Although there was a great number of reeds at Kačer pond, most of the plants were not in the water but on a dry soil. The only place where we found the reed present in the water were the water pools around the inflows (e.g. Černý pond).

We consider the greatest problem of this pond to be its steep and raked out banks. This caused the decrease of the wetland area and the wetland ground cover which lowered the diversity of species around the pond. Most of the bank lacks the litoral area. This is formed partly by the reed and the sedge occured only around the inflow – Romavský pond. Unfortunately, sedge strips are the most important biotopes that allow certain species of birds to nest (ducks, dippers, etc). They are also a biotope of the highest diversity of the amphibians and water invertebrate animals. Most of the animals lay their eggs there as well as the invertebrate animals hatch out there.

The next negative factor of the pond ecosystem is a presence of a drain that leads from the north-east part of the pond to its dyke. It carries the unnecessary water and prevents the periodic flooding of the area that enables the wetland population of plants to grow there.

Furthermore, the fishemen fertilize the pond inadequately. In the time of the research there was a pile of manure at the bank. In comparison with the size of the pond, we may say that the amount of the manure was not huge but it such treatment may cause infestation of the blue-green algas in the future. We think that if the litoral areas were revived, there would be no such need or, at least, minimal.

Due to the plan of building a recreational centre in this area, am EIA review was carried out in 1996. There is a notice about a colony of herons (Ardea cinerea). Unfortunatelz, we found no sign of the presence of the herons, not even trees that would prove their occurence (herons produce very agressive excrements). There was only one adult individual of that species present in the area. In 2002, we found more or less the same number. Since the weather was almost the same during the whole research, it is likely that the heron population became extinct in this area due to the human intervention.

Recomended steps for maintaining and improving the biological value of the pond

1) To discharge the pond once every two years
2) To revive the natural banks – to make a smooth transition between the water and the meadows and to revive the litoral area (especially around the inflows in the north)
3) To stop any bank modifications
4) When the level of water is low, do not fill up the pond until the second half of June in order to let the plovers (Charadrius dubius) resettle
5) To consider a certain level of protection of the pond – due to endangered species of the amphibians, birds and plants

Meadow with *Lupinus polyphyllus*

Romavský mlýnský pond

The pond is surrounded by ruins of the extinct village of Romava in the east. Parts of the village were situated right at the bank of the pond. In these place we could find a great number of nettles and very old trees – maple (Acer pseudoplatanus) and elm. The main impact of the village on the environment showed the presence of the decorative flowers and fruit trees that were planted by the villagers.Those were mostly pear trees and apple trees. We also noticed the presence of sundial lupine and lilac. We did not find any negative or positive impact of the village on the animals.

There are two main inflows flowing through the village that for several water pools. We believe that several more water pools were connected to the pond in the past. We regard those water pools as biologically very valuable. Unfortunately, the banks have been steepened and therefore these water fools were cut off the pond. We think so because most of the pools were situated right behind the bank wall and the possibility they have not been a part of the pond is very unlikely. The bank was between 1 and 2 m high and the water depth at the bank was about 60 cm. Moreover, there are no high trees at the banks, only young and small birches or shrubs.

We regard the steepened banks as the biggest problem. They have a negative impact on the bank flora, especially on the litoral area of sedge which is even absent on some places of the bank. When present, it is no wider than 2 m. The only exeption is a place where lots of reeds were situared – in the north part of te pond. We suggest it should be kept there because it is biologically valuable.

The absence of the litoral area causes low diversity of plats and the amhibians, especially the brown frog. The steepened banks have also a negative impact on the birds. We were surprised by the low number of nesting birds because the pond offers great conditions for nesting. To mention some, there are two small islands in the centre of the pond that are cobered with reed and sedge. In 2002 we found a nest of a scaup there. This time we did not bring a craft with so we unable to access the islands. On the other hand we were observing the bird very carefuly so we think that if there was a nest we would have been able to notice the birds. The low number of birds at this pond may be caused by the lack of the litoral area of sedge because we found out that the birds concebtrate right there. We found interesting the occurence of an adult swan which might have nested at the nearby ponds or it could just look for food for it chicks.

The pond is interesting for the presence of the invertebrate organisms. Their saprobic indicies are the lowest along with the ones we found at Kačer pond. Moreover, there we lost of species found (35 species). A high diversity is not only around the inflows (7, 10 species), but also at the dyke (10 sepcies) and at the banks (9, 10 species). We were surprised by such numbers because of the narrow litoral area. It may be possible that this state suits the organisms but it could be just a coincidence (good weather, etc.).

There is much lower diversity at the outflows – localities 5 and 6. This might be caused by a slight the water pollution in these places or by the low flow rate. On the other hand the overall saprobic index of this pond is 1, 6 which does not point any pollution. According to the hydrobiological point of view, this pond is very valuable mostly due to the presence of a bivalve, an endangered species.

Firthermore, we did not encounter any duck breeding equipment this year, nor we noticed any ducks on the pond.

When we compared our observation with the one we carried out in 2002, we did not find any bigger change at the pond. Only the number of bird was smaller this year.

Recomended steps for maintaining and improving the biological value of the pond

1) To stop steeping the banks, especially in the north of the pond and to let the litoral area grow naturaly
2) To keep the reed in the north and to maintain thge presence of the islands
3) During the discharging of the pond and pond fishing, be aware of the presence of the endangered bivalve

Romavský starý pond

his pond is formed in a orthorhombic shape and is the smallest one. It is the last pond that is situated before the state border with Austria. The dyke is in the southern part of the pond and is covered mostly by young trees – apart from two old oaks. There were many more of the oaks inthe psat but must have been cut off. We believe so because we found several tree stumps.

The rest of the bank is covered with a litoral area of sedge, sphagnum moss and heather. There is olso the pine on some spots (Pinus sylvestris).

There are also a lot of water pools wchich make a suitable place for the ambphibians to live (brown frog and newt). We found many individuals in the litoral area of sedge. There is also Naumburgia thyrsiflora in the litoral area. According to the above mentioned species, we regard this pond as a very valuvale from th ebiological point of view.

The pond is very depthless. The maximum depth we we able to masure was about 1 m. This means that the presence and action of human was restricted in these places.

In the time of observation we found pieces of bread floating on the water surface.It must have been brought here by the fishermen. This might be a possible source of pollution or overfeed the organisms in the water.

When we compared all saprobic indicies found at all localities of the pond we determined the pond to be medium polluted (the arithmetic mean of the saprobic indicies of the pond is 1,7). The saprobic index of the inflow was 1,6 and the saprobic index of the outflow was 2. We also find six species of invertebrate organism at each locality. There was also a high diversity of species around the inflow (9-10 species).

The pond is not very interesting from the ornithological point of view. The only bird that was nesting there was a duck (Anas platyrhynchos). We assume that the pond is too small for birds to nest or even to draw birds for food.

Recomended steps for maintaining and improving the biological value of the pond

1) To maintain the litoral area of the pond which is a good shelter for the amphibians and plants.
2) To stop overfeeding the organisms with bread.

Litoral zone over fishpond Brand

Conclusion of the surveys

Botanical survey

1) We managed to carry out a research of five ponds of Česká Kanada. We found lots of species of plants and animals.
2) We recorded all needed data
3) We found two species of endangered plants around the ponds. One of them is Naumburgia thyrsiflora that occured around Kačer pond, Návarský pond, Romavský mlýnský and Romavský starý pond.
4) We characterized all biotopes of the ponds and they are mentioned in the botanical report.
5) The biotope with most species was usually the dyke. The reason for that is that the dyke is a place where many biotopes meet. Unfortunately, the dyke was created by humans so it loses its biological value. The most valuable biotopes were the flooded meadows and the natural banks of the pond. We encountered more species of endangered plants in these places
6) The only critical factor was the human presence around the ponds, especially fertilizins the ponds. The nearby pasture were not very significant. Next problem was drying the the wet biotopes by ameliorative channels and steepig the banks
7) We recommend to protect some parts of the region, especially the places where the endangered specie occur. We recommednd that the activity of the fishermen should be controlled. We also suggest that all modifications to the natural character of the ponds and streams should be stopped.

Hydrobiological survey

1) We carried out a research of the water invertebrate organisms on 5 ponds. We found 74 species at 52 localities. According to this survey we determined the saprobic indicies.
2) We characzterized the 5 ponds
3) We compared the ponds according to their saprobic indicies. The least polluted were Kačer pond and Romavský mlýnský pond (s.i. 1,6). On the other hand, the most polluted pond was Návarský pond (s.i. 2).
4) By comparing the saprobic indicies we found that the water quality got worse at Kačer pond and stagnated at the ponds of Romava. Návarský and Rajchéřovský pond were the most polluted ones but the quality imroved. We think that it was caused by the size of the litoral area.
5) The most frequent critical factors were: infestation of the blue-green algas at Rajchéřovský pond and Návarský pond, frtilizing the pond water, putting away the mud from the ponds – it has a negative impact on the occurence of sedge, reed and some water organisms. It also may have an effect on the presence of the bivalve (Anodonta cygnea). We recomend to do this only half as much. Some ponds are even being freed from mus wrongly – thus a lot of pools occur. IIIt may also affect the biological and chemical qualities of the water.
6) We recommend to pay attention to the occurence of the invertebrate organisms at Romavský mlýnský pond because there is critically endangered species of bivalve.

We would be very glad if the ponds were preserved as long as possible because they enrich the beauty of the country. Moreover, they enrich the ecological stability by offering great number of species. The most valuable ones are Kačer pond and Romavský Mlýnský pond. We would also like to ask the local inhabitants to také care of them. We would also like to ask the people who operate in this area to be careful with fertilizing the ponds. Especially the Romavský mlýnksý pond.

Amphibious and herpetological survey

1) We accomplished to map the occurence of 8 species of the amphibians and 3 species of the reptiles. The amphibians were represented by 5 species of frogs and 3 species of newts. The reptiles were represented by 2 species of lizards and one snake.
2) One of the eight species of the amphibians is a newt that is critically endangered. The tree frog, the brown frog and the newt are strongly endangered and the toad is endangered as well. Two out of three found species of reptiles are strongly endangered (lizard) and the ring snake (Natrix natrix) is endangered.
3) We were able to prove that four species of the amphibians are able to reproduce. We were able to prove that the brown frog and the newt were able to reproduce at all ponds. We were unable to prove that any other specdies of reptiles are capable of reproducing in that area.

4) The brown frog and all species of the newts were found in the litoral areas of sedge and around the water pools we found in the proximity of the inflows. Other species of the frogs were found at drier places. We were able to localize the tree frog in the reed and the sandy banks of Kačer pond. We found the ring snake mainly at the dykes but sometimes even at drier places at the banks.
5) According to the saprobic index, the Starý romavský pond is the cleanest pond (s.i.1). Kačer pond has a saprobic index of 1,2. According to the water invertebrate organisms the ponds would be more polluted.

Ornithological survey

1) We managed to examine the occurence of the water and wetland birds at five ponds. We classed 16 species of water and wetland birds.
2) We roughly determined the population of the species at each pond, especially the ones that did not have a nest in that area.
3) One species of birds belong to the group of critically endangered - sea eagle, the stork is strongly endangered and four species of the dipper are endangered.
4) We were able to prove that four species had their nesting sites at the ponds we were examining. But, of course, there may be more.
5) Most of the species of water and wetland birds are dependent on the presence of the litoral area of sedge or reed. The only exeption are the birds that have special biotopic requirements (plover, stork).
6) Destroying the nests and swan and heron eggs may be the most serious thread to the presence of the birds.
7) Accordign to nesting, the most valuable ponds are Návarský pond and Rajchéřovský pond. Kačer pond is the most valuable considering the number of bird that gather there. This pond may be very suitable for the water and wetland birds but none of them have any ornithological value so we would not recommend this pond for protection.

Toad *(Bufo bufo)*

General conclusion

During the two weeks of the research we observed five ponds. We focused on biological, ornitological, amphibious, herpetological and hydrobiological surveys of the ponds and their surroundings. Suprisingly, we found a great number of endangered organisms – 19 psecies. Two of the mentioned endangered species are even critically endangered and ten are highly endangered.

The biotope that essential for surviving of these species is the litoral area, especially flooded litoral area of sedge. Therefore, we rocommend to maintain those areas at each pond. Biologically most valuable ponds are Návarský pond and Kačer pond. According to their biological value we strongl recommend to raise the level of legitimate protection of the pond.

Making use of the project, future plans

More than seven months have passed since the research ended but we have been dealing with the problem for all that time and we were presenting our research to the public.

The first presentation was carried out after the research at the Faculty Of Natural Sciences, Charles University, Prague. During the summer holidays we were focusing on writing the report and in autumn we presented our outcomes in the western part of the Czech Republic.

Our schools also published a magazine **Česká Kanada 2005- studentský výzkum krajiny** (Czech Canada, the student research). There was also an article about our research that was called „Lost Paradise – a biological survey of the ponds“. There were 1500 pieces of the published and it was and is being distribute ob the internet and in the region where we carried out our research.