Natura Somogyiensis	7	105-117	Kaposvár, 2005

Herpetofauna of the Dráva-valley (2002-2004)

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KOVÁCS T. & BRANDON A.: *Herpetofauna of the Dráva-valley (2002-2004).*
Abstract: As part of the Duna-Dráva National Park (DDNP) initiated Dráva Monitoring Program involving over 25 indicator taxa groups, monitoring of amphibians and observing water dependent reptiles since 2000 have been conducted by one of the authors (Kovács). The monitoring protocol has been adjusted to reflect principles expressed by the Ministry of Environmental Protection and Water, Directorate for Nature Protection. In this work we aim to complement our work in quantifying number of species by also identifying water-bodies as possible egg-laying habitats. The basis of the entire program is to estimate possible effects of the planned Croatian hydroelectric power station. Although the location of the station would be on a section of the Dráva that belongs to Croatia, it undoubtedly would influence the water regime and the condition of various wetlands along many sections of the Dráva.
Data was collected altogether from 21 sites and from 2002 to 2004 the presence of 2 newt, 8 anuran, 1 terrapin, 1 lizard, and 3 snake species were established in the study area. Using three separate indices we estimated herpetofauna habitat quality of the sampled areas. Besides of the distributional data we present the variance in the water level of the breeding sites between 2002-2004.

Key words: Amphibians, reptiles, Drava valley, long-term monitoring

Introduction

Monitoring programs are increasingly being employed to assess trends in species abundance, distribution, and biodiversity (GIBBS et al. 1998, HINTERMANN et al. 2000, YOCCOZ et al. 2001). Widespread amphibian population declines (BLAUSTEIN and WAKE 1990, PHILLIPS 1990, GRIFFITHS and BEEBEE 1992) have initiated a more critical global review of the status of amphibian species (VIAL and SAYLOR 1993). Complicating the understanding of amphibian declines and population dynamics is naturally high fluctuations of many populations (PECHMANN and WILBUR 1994, MARSH 2001) and metapopulation dynamics, with decreases in some local populations coinciding with increases in others (SJÖGREN 1991). Amphibians have also been recognized as potential indicators of environmental change (VITT et al. 1990, STEBBINS and COHEN 1995, BOWERS et al. 1998), an additional factor driving inventory and monitoring efforts. Moreover, monitoring data are essential to identify key issues for policy and management goals, such as assessing priorities for conservation and land use, for environmental impact assessment, and for informing managers, policy-makers, and the general public about the state of nature (STORK and SAMWAYS 1995). To assess the status of amphibian populations, distribution patterns and population characteristics need to be examined. However, assessments are difficult because few comparable data sets and long-term studies exist (BLAUSTEIN 1994,

REED and BLAUSTEIN 1995). The need to establish inventories and monitoring has been emphasized, both in Hungary and elsewhere (PECHMANN and WILBUR 1994, KORSÓS 1997).

The assessment of Hungary's amphibians and reptiles has a long history. Well known zoologists of the XIX. and early XX. century, including Géza Encz, Lajos Méhelyi, Ottó Hermann and Gyula Fehérváry have contributed to the detailed anatomical knowledge about the country's herpetofauna and its taxonomic classification. Following the Second World War emphasis was placed on the faunal description of various regions. Prominent works include DELY (1967, 1987, 1990), MARIÁN (1960, 1963, 1968, 1981, 1982 1987), MARIÁN and MARIÁN (1980), MARIÁN and SZABÓ (1968), MARIÁN and TRASER (1978) and SZABÓ (1956). As a result of these works we had a comprehensive knowledge about the Hungarian herpetofauna including species distributions by the end of the 1970s. However, in some areas, such as the Velencei and the Cserhát mountains we lack not only detailed assessments, but elementary species lists as well. In the past two decades strict faunal surveys were not in the focus of Hungarian herpetologists - other than the complex issue of the edible frog (GUBÁNYI and CREEMER 1994, LŐW et al. 1989, TUNNER and KÁRPÁTI 1997, KOVÁCS 2003). Today civil organizations are trying to fill these resulting gaps in knowledge. The first surveys of amphibians and reptiles with their protection in mind were conducted 20 years ago. A prominent species of this activity was the Hungarian Meadow Viper (KORSÓS 1991, KORSÓS and FÜLÖP 1994) which has suffered serious population losses since the 1980s. As a result of the strengthening of Hungarian nature protection, increasingly more long-term monitoring projects were launched, specifically with protection in mind. Monitoring reptile and amphibian populations became an integral part of these projects in the most important locations, such as the Szigetköz, Kis-Balaton and Dráva-valley.

As part of the Duna-Dráva National Park (DDNP) initiated Dráva Monitoring Program involving over 25 indicator taxa groups, monitoring of amphibians and observing water dependent reptiles since 2000 have been conducted by one of the authors (Kovács). The monitoring protocol has been adjusted to reflect principles expressed by the Ministry of Environmental Protection and Water, Directorate for Nature Protection. However, this protocol was only finalized in 2003, thus methods used at the Dráva are unique in many ways. The relevant sections of the National Biodiversity Monitoring Program that concern amphibians deal primarily with wet habitats (KISS et al. 2002). In this work we aim to complement our work in quantifying number of species and individuals by also identifying water-bodies as possible egg-laying habitats. The basis of the entire program is to estimate possible effects of the planned Croatian hydroelectric power station. Although the location of the station would be on a section of the Dráva that belongs to Croatia, it undoubtedly would influence the water regime and the condition of various wetlands along many sections of the Dráva.

Prior to the data collected in the Dráva monitoring program - started in 2000 - there were no publications or other informative literature on the herpetofauna of the Dráva valley. Other surveys, if they were conducted, were not reported. To date only one publication has been made from the data of the reports (KOVÁCS 2002). Geographically, the closest survey was done by PUKY (2000).

Methods

Samples were taken at habitat areas identified by the DDNP. In choosing exact locations the effects of the modifications on the Dráva were considered. Thus, where possi-

Fig. 1.: Sample sites by Vízvár

Fig. 2.: Sample sites in the Lankóc Forest

Fig. 3.: Sample sites near Őrtilos

Fig. 4.: Agile frog (*Rana dalmaitina*) in Lankoci forest

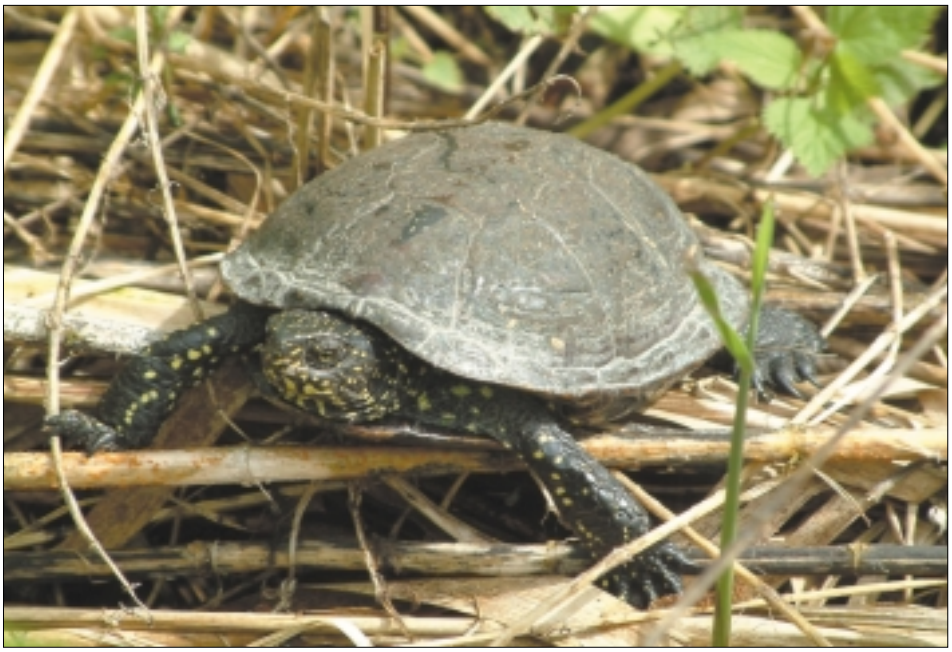

Fig. 5.: Pond turtle (*Emys orbicularis*) at Duics-gödrök

ble, egg-laying areas less than 1 km from the river were marked. Three regions were involved in the monitoring: Őrtilos (46°17.0′; 16°53.5′), Lankóc Forest (46°13.5′; 17°03.5′) and Vízvár (46°06.0′; 17°13.5′). Data was collected from 21 sites in the following areas (geographical coordinates available in DDNP report): Őrtilos (7), Lankóc Forest (6), Vízvár (8). The following types of water-bodies were identified: used or unused gravel pits (13), oxbows (1), alder swamps (5) and unknown origin (2). Detailed descriptions of these water-bodies are not within the scope of this paper.

The following methods were used for collection and observation: riparian visual encounter surveys, counting egg-masses, utilizing the call-based Wisconsin-index, catching salamanders by bottle-traps, netting tadpoles and larvae. Members of the edible frog complex were identified based on four morphological parameters after capturing them with a net. Terrapins were captured with a 60x60x100cm fish-basket, using pig-liver as bait. Snakes and lizards were registered only by visual observation. The methods of the field survey are described in the protocol of the Amphibian-Reptile project of National Biodiversity Monitoring System (KISS et al. 2002). The selected methods are harmonized with those presented by Heyer et al (1994).

Sample sites are indicated on figures 1., 2., and 3. Sampling was conducted on seven occasions between 15th March and 30th September, focusing on the breeding season in March, April and May. Considering the low activity of amphibians in the dry season field visits were cancelled in July and August. The date of the field works were designated flexibly depending on the weather conditions.

In 2002, 2003 and 2004 regular water-level measurements were also taken at seven water bodies which represent different types of water regimes:

1. direct contact with the Dráva through surface stream (Kenderáztató),
2. indirect contact with the Dráva through ground waters (Horgászgödör, Horgásztó /Vízvár/)
3. water regime fairly independent from the Dráva (Égés, Duics, Kis-Duics, Mélymocsár)

Results and discussions

From 2002 to 2004 the presence of 2 newt, 8 anuran, 1 terrapin, 1 lizard, and 3 snake species were established in the study area (Table 1). Generally, species common in the low-lying areas of the Carpathian Basin are represented in the Dráva valley. The following are missing from the current list:

1. species of hilly and mountainous areas of Hungary: Alpine Newt (*Triturus alpestris*), Fire Salamander (*Salamandra salamandra*), Yellow-bellied Toad (*Bombina variegata*), Common Frog (*Rana temporaria*);
2. species of dry grasslands, dry forest or rocky areas: Green Toad (*Bufo viridis*), Snake-eyed Skink (*Ablepharus kitaibelii*), Wall Lizard (*Podarcis muralis*), Balkan Wall Lizard (*Podarcis taurica*), Green Lizard (*L. viridis*);
3. species of relict ice-age habitats: Viviparous Lizard (*Zootoca vivipara*);
4. species distributed in small, well defined areas of Hungary: Italian Crested Newt (*T. carnifex*), Common Adder (*Vipera berus*), Meadow Viper (*Vipera ursinii rakosiensis*), Large Whip Snake (*Coluber caspius*);
5. species difficult to detect: Aesculapian Snake (*Elaphe longissima*), Slow Worm (*Anguis fragilis*).

Table 1. Current species list of the surveyed locations. Tv: Smooth Newt (*Triturus vulgaris*), Td: Danubian Crested Newt (*T. dobrogicus*), Bo: Fire-bellied Toad (*Bombina bombina*), Bb: Common Toad (*Bufo bufo*), Pf: Common Spadefoot Toad (*Pelobates fuscus*), Ha: European Treefrog (*Hyla arborea*), Ra: Moor Frog (*Rana arvalis*), Rd: Agile Frog (*R. dalmatina*), Re: Edible Frog (*R. kl. esculenta*), Rl: Pool Frog (*R. lessonae*), Eo: Pond Turtle (*Emys orbicularis*), La: Sand Lizard (*Lacerta agilis*), Nn: Grass Snake (*Natrix natrix*), Nt: Dice Snake (*N. tessalata*), Ca: Smooth Snake (*Coronella austriaca*)

Locations	*Site No.*	Tv	Td	Bo	Bb	Pf	Ha	Ra	Rd	Re	Rl	Eo	La	Nn	Nt	Ca
Örtilos region																x*
Andrasik	*1*	x		x	x	x	x	x	x	x	x	x		x		
Horgásztó	*2*	x		x	x		x		x	x	x	x	x	x	x	
Horgászgödör	*3*	x	x	x	x		x		x	x	x			x		
Keskeny-gödör	*4*	x	x	x	x	x	x	x	x	x	x	x	x	x		
Apró gödör	*5*	x		x	x	x			x	x	x			x		
93-as	*16*	x	x	x	x	x	x		x	x	x			x		
Holtág-gödör	*32*	x		x	x				x	x	x	x		x		
Lankóc Forest																
Égés	*6*	x	x	x	x	x	x	x	x	x	x	x		x		
Lapos	*7*	x	x	x	x	x	x	x	x	x	x	x		x		
Híd	*23*								x	x	x	x		x		
Nagyláp	*25*								x	x	x	x				
Mélymocsár	*26*								x			x				
Kubik	*31*								x	x	x	x		x		
Vízvár region																
Duics	*8*	x	x	x	x	x	x	x	x	x	x	x		x		
Kis Duics	*9*	x	x	x	x	x	x	x	x	x	x	x		x		
Horgásztó	*10*	x	x	x	x		x	x	x	x	x			x		
Kenderáztató	*11*	x	x	x	x	x	x	x	x	x	x	x		x		
Zoli-gödör	*12*								x	x		x				
Apró gödör	*13*								x	x	x	x				
Nyakas gödör	*14*									x		x				
Feneketlen-tó	*27*				x	x			x	x	x			x		

* Smooth Snake was observed 600m away from the Horgásztó (No. 2).

Habitat Assessment

Using three separate indices, BCK (BÁLDI et al. 1995), P (KISS 2005) and BK (BAKÓ and KORSÓS 1999), we estimated herpetofauna habitat quality of the sampled areas (Table 2). Each index type consists of a scoring list of all native amphibian and reptile species. The scores are based on the distribution, abundance and level of vulnerability of each species. Results demonstrated that there is significantly strong agreement amongst the indices with a 100% match in rank between BCK and P indices. The BK index agreed in 20 of 21 sites with the other two indices.

Table 2. Combined evaluation of wet areas as amphibian-reptile habitats by three different indices

Locations	*Site No.*	BCK	P	BK
Örtilos region				
Andrasik	*1*	292	15	23
Horgásztó	*2*	290	15	20
Horgászgödör	*3*	223	12	17
Keskeny-gödör	*4*	347	19	28
Apró gödör	*5*	193	10	15
93-as	*16*	251	14	22
Holtág-gödör	*32*	211	11	15
Lankóc Forest				
Égés	*6*	320	18	27
Lapos	*7*	320	18	27
Híd	*23*	139	7	10
Nagyláp	*25*	111	6	8
Mélymocsár	*26*	73	4	6
Kubik	*31*	139	7	10
Vízvár region				
Duics	*8*	320	18	27
Kis Duics	*9*	320	18	27
Horgásztó	*10*	246	13	19
Kenderáztató	*11*	320	18	27
Zoli-gödör	*12*	92	5	6
Apró gödör	*13*	111	6	8
Nyakas gödör	*14*	65	4	5
Feneketlen-tó	*27*	144	8	12

The distribution of water dependant amphibians and reptiles is determined, beyond larger climatic factors, by the number and spatial distribution of water bodies suitable for egg-laying and feeding. Another important factor is the water retention ability and water level of the water bodies. Habitats along the Dráva river can be grouped into two main categories. The first contains water bodies the water circulation of which is determined by the river's flow. The circulation of the other type is not measurably influenced by the Dráva due to larger distances and barriers between them (eg. Lankóc Forest). Fig. 6. represents the water levels of seven water bodies in 2002, 2003 and 2004. The consecutive years differed in the all over water supply. While 2002 can be accounted as an average year, 2003 was extremely dry and 2004 was extremely wet. The last year, beside of the high volume of precipitation was characterized by an unusually high flood of the Dráva river. It clearly shows that while the level of most water bodies was drastically reduced by the end of summer in 2002, even to the point of drying out, the water level of the Horgászgödör of Őrtilos (No. 3) and the Kenderáztató of Vízvár (No. 11), both strongly influenced by the Dráva, visibly increased due to the rise in the level of the river.

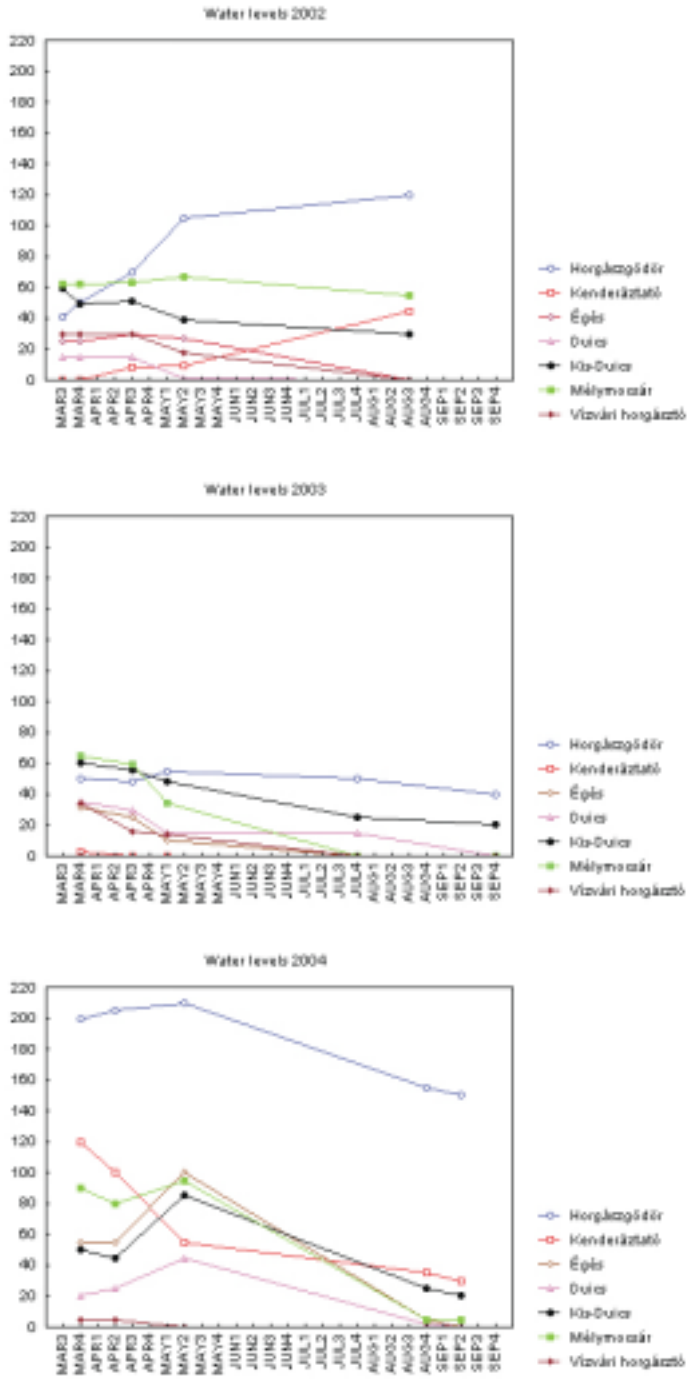

Fig. 6.: Water levels (cm) in selected water-bodies. 1, 2, 3, 4= week of the given month

Species Distribution

Moor Frogs and Agile Frogs appeared in the same ponds roughly at the same time and probably competed for the better breeding sites. Moor Frogs formed compact choruses and built egg-mats unlike the Agile Frogs, which dispersed their egg clutches. When the water level was low the Moor Frog sites became insufficient for choruses and laying eggs. In 2003 due to the dry climatic conditions Moor Frog has delayed the egg-laying in Lankóc Forest's Égés site (No. 6) and only a few individuals were observed even in 2004 (before the presented observation period, 2000 was definitely a rich year, while the drier 2001 season resulted in poor recruitment of Moor Frogs).

Large newts were identified as Danube Crested Newts by using the Wolterstorff index (forelimb length/distance between legs). This species occupies the Carpathian Basin (GRIFFITHS 1996) and not the related northern crested newt (*T. cristatus*) from which it was separated. Danube Crested Newts were always found together with Smooth Newts, whereas the latter species occupied some ponds where the first was not present. The relative density of Smooth Newts was always higher than that of Danube Crested Newts.

Common Toad and Tree Frog are common species of the region and can be observed in the majority of the monitored sites. However, their proportion in the local amphibian community showed wide variety. Common Toads formed large choruses (>100 specimens) in those water bodies which possessed relative large open surfaces (No. 2, 10, 16, 27 and 32). Similarly, large mating assemblages (>50 specimens) were observed in Tree Frog in some of the ponds (No. 1, 6, 7, 8 and 16). The correlation between the vegetation structure and the abundance of this latter species has not yet been revealed.

Even in the larger fishponds or lakes Pool Frog/Edible Frog breeding communities were found. In some locations (No. 12, 14) the pure Edible Frog populations indicated disturbed habitats. Surprisingly Marsh Frogs (from the green frog complex) are a rare species in the Dráva valley and were found only in some locations situated out of the surveyed areas.

European Pond Turtle was observed in much higher number of the water bodies than it had been assumed earlier. However, the frequency of the observations during the years were not uniform. In 2003 the species disappeared completely from 7 of the 21 sites already by April and later they left 2 more sites due to the long drought. These sites were quickly recolonized in 2004.

Green toads were not found in the breeding ponds. This was unexpected since considerable numbers were killed on the roads of the surrounding villages. It seems that they are unable to compete with other species for the best breeding sites, and instead sought ephemeral puddles.

One of the most crucial factors affecting the breeding sites and amphibian breeding success is the water level of the Dráva river, which changes dramatically depending on the schedule of the Dubrava power station in Croatia built more than 10 years ago. Fast daily changes of water level make several inlets of the river unsuitable for breeding amphibians. Another important point is the annual variation in water regime. In 2000 the water level in the river Dráva did not show striking variation so the most optimal aquatic plant community developed in those ponds located close to the river. Due to favourable breeding conditions, the number of mating amphibians reached an optimum. The following year (2001) started with very high water levels in the sample sites in Ortilos and Vízvár regions, so the native shallow water vegetation could not properly develop. However, in Lankóc Forest, 5 km away from the river, the level of the river did not influence pond wildlife. Year 2002 was again similar to the starting year of the project (2000) followed by the great fluctuations in 2003 and 2004.

Low water level naturally provides less breeding habitat, and in many species exposure of eggs to dry conditions can result in significant losses of the yearly progeny. According to observations by the Dráva, overly high water levels for extended periods of time are also disadvantageous for egg-laying in some habitats. Most of the gravel pits are lined by steep walls with minimal plant protection. In case of high water levels even this narrow strip of vegetation cannot develop, and even bottom anchored reed-grass populations do not reach the surface of the water. Under these conditions amphibians cannot find suitable habitat either for egg-laying or for cover. An illustrative example is the Horgászgödör at Őrtilos (No. 3), where in 2002 no newts were observed at all, and only a limited numbers of eggs of other species.

Conclusions

The Dráva monitoring revealed that the Moor Frog, which previously was not considered important in amphibian conservation biology in Hungary, is sensitive to the quality and drying of egg-laying areas. This may be due to its propensity to lay eggs close to riparian edges. While the much more water-dependant Edible Frog, Moor Frog, Pool Frog, and Fire-bellied Toad utilize shallow, muddy waters as well, the Moor Frog only tolerates minor destruction of the egg-laying areas. Our field observations indirectly prove immigration of Pond Terrapins from their habitats. In 2002 and 2003 when the Kenderáztató at Vízvár (No. 11) temporarily dried out the terrapins disappeared from its bed. At the same time 4 individuals were found in the Apró gödör (No. 13) where previously none were found. The hole has an approximately 30m^2 surface area, and is subject to human disturbance. It is not suitable as long-term terrapin habitat, but in drought periods it may be a good refuge.

Long term monitoring of species in the *Rana esculenta* complex is important. Surveys of the Kis-Balaton show significant change in four populations during a ten-year period (KOVÁCS 2004). The change in species composition can indicate change in water quality, especially dissolved oxygen, and the existence of suitable over-wintering sites.

Studies to date have not indicated significant changes in the herpetofauna by the Dráva River. However, there is cause for concern: the recurring droughts have, in 2002-2003, significantly reduced the number of Moor Frogs, Edible Frogs, Pool Frogs and Fire-bellied Toads.

The Croatian investing company (Hrvatska Elektropriveda) have compiled a series of impact assessments regarding the expected changes of the water regime of the Dráva River (www.kvvm.hu). According to these studies there will be a drastic change in the level of the ground water below the main dam of the planned reservoir: 1. a side-canal would derive the majority of the water from the recent main branch of the river and 2. the outflowing water would have a dramatically accelerated speed which could carve the river bed 2 m lower in the first 10 years. Also the daily changes of the water level could reach 2 m in the Dráva which may be unfavourable for the current natural plant and animal communities. At this stage it is uncertain how this will affect water levels at amphibian egg-laying sites, thus the direction of change cannot be predicted as the connection between the breeding ponds and the river has not yet been revealed.

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KOVÁCS TIBOR ÉS BRANDON ANTHONY

A Dráva völgy kétéltű és hüllőfaunája (2000-2004)

A Duna-Dráva Nemzeti Park 2000-ben indította el természetvédelmi célú biodiverzitás-monitorozási programját a Dráva Őrtilos és Vízvár közti szakaszán a Horvátország által megépíteni szándékozott vízerőmű tervei kapcsán. A monitorozásra kijelölt élőlény-csoportok közé bevonták a kétéltűeket és a vizek mentén előforduló hüllőket. Jelen tanulmány a program 2002-2004 közti időszakának eredményeit mutatja be.

A mintavételi helyek kijelölése három régióban, 21 ponton történt meg. Az első Őrtilos-Szentmihályhegy közelében, a Dráva kissé kiszélesedő árterén található, és kizárólag egykori kubikgödröket vagy kavicsbánya-tavakat foglal magába. A második körzet a Lankóci-erdő, ahol a mintavételi pontok közt szerepel újonnan nyitott kubikgödör és stabil, természetvédelmi szempontból kifejezetten értékes égerláp is. A harmadik körzet Vízvár mellett található, ahol egykori holtágak, kubikok, mesterséges eredetű horgásztavak és égerlápok is szerepelnek a mintavételi helyek listáján.

A vizsgálati periódusban 2 gőte- (*Triturus vulgaris, T. dobrogicus*), 8 béka- (*Bombina bombina, Bufo bufo, Pelobates fuscus, Hyla arborea, Rana arvalis, R. dalmatina, R. lessonae, R. kl. esculenta*), 1 teknős- (*Emys orbicularis*), 1 gyík (*Lacerta agilis*) és három kígyófaj (*Natrix natrix, N. tessalata, Coronella austriaca*) jelenlétét sikerült kimutatni.

A mintavételbe bevont víztesteket a bennük előforduló fajok száma alapján értékeltük, melyhez három különféle indexet használtunk. A víztestek értéksorrendje mindhárom index alapján közel azonosnak mutatkozott. A legmagasabb értékpontokat a változatos növényzeti struktúrával rendelkező erdei lápok és idősebb kubikgödrök érték el, míg a legalacsonyabbakat a meredek falú, gyakorlatilag növénymentes, a Dráva napi vízszintingadozása által is erősen befolyásolt víztestek esetében kaptuk.

Folyamatosan mértük néhány kiválasztott víztest vízszintjét is. A 2002. évi, átlagosnak mondható vízállást 2003-ban szélsőséges szárazság követte, majd 2004-ben a Dráva árvizek miatt igen magas vízszinteket regisztráltunk. Világossá vált, hogy még közvetlenül a Dráva egykori árterén elhelyezkedő víztestek között is eltérő mértékű a Dráva vízállásától való függőség, ez pedig erősen befolyásolja a bennük előforduló fajok számát az adott évben.