1 Danube Delta Biosphere Reserve **2** Srebarna Nature Reserve **3** Kalimok-Brushlen Protected Site **4** Rusenski Lom Nature Park **5** Persina Nature Park **6** Djerdap National Park **7** Gornje Podunavlje Special Nature Reserve **8** Kopački rit Nature Park **9** Lonjsko Polje Nature Park **10** Duna-Dráva National Park **11** Duna-Ipoly National Park **12** Dunajské luhy Protected Landscape Area **13** Záhorie Protected Landscape Area **14** Donau-Auen National Park **15** Donauauwald Neuburg Ingolstadt

REINTRODUCTION OF THE EURASIAN BEAVER (CASTOR FIBER) IN HUNGARY

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Programme co-funded by the EUROPEAN UNION

SOUTH EAST EUROPE
Transnational Cooperation Programme

DANUBEPARKS
network of protected areas

Title: Reintroduction of the Eurasian beaver (*Castor fiber*) in Hungary

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Publication: Budapest, 23 December 2011

The publication was ordered by the Directorate of Duna-Dráva National Park, as part of the "Danubeparks" (SEE/A/064/2.3/X) tender

Contents

1.) Abstract

In this paper, I summarize the history and results of the Eurasian beaver (*Castor fiber*) reintroduction in Hungary, based on the available literature and consultation with the managers of the reintroduction project. The Eurasian beaver became extinct in 1865 in Hungary, mostly because of overhunting. After the extinction, the beaver was missing from the Hungarian fauna for 120 years, until 1985-86, when it appeared again in Szigetköz area. The Hungarian animals probably wandered here from the population successfully established in Austria with reintroduction. In 1988, experts also found beavers near Lake Tisza – this small population was augmented with seven more animals by the staff of the National Park Hortobágy. Later they realized that the reintroduced specimens were Canadian beavers; because of this, they captured the last living specimen. Between 1996 and 2008, 234 beavers have been reintroduced in the areas of Gemenc, Hanság and next to the rivers Tisza and Dráva. Most of these beavers came from Bavaria, Germany, and some animals from Austria. OBI – the main sponsor of the project, gave 100 million HUF for this project. Since the reintroduction, experts are continuously monitoring the Hungarian beaver population, which shows a growing tendency and currently counts 718-905 individuals. Since 1991, experts found 34-43 dead beavers in Hungary; five of them pertished directly in connection with the reintroduction.

2.) Introduction

Nowadays, when the wildlife of the Earth is in a crisis (Butchart et al. 2010), conservation experts are trying to help the survival of a lot of species worldwide in a lot of areas with reintroduction and captive breeding projects. With these, they try to restore the wildlife of these areas (Griffith et al. 1989; Sarrazin and Barbault 1996; Snyder et al. 1996; Soorae 2008, 2010). The first conservational reintroduction probably occured in 1907 in Oklahoma, when 15 American bisons (*Bison bison*) – originally raised up in captivity – were released into the wild (Kleiman 1989; Seddon et al. 2007). According to the database of the International Union for Conservation of Nature (IUCN) Reintroduction Specialist Group (RSG), reintroduction projects for at least 489 animal species have been started – or have been planned to start – with a conservation goal (Seddon et al. 2005). There are a lot of publications about reintroduction which implies that there are many projects going on

currently: between 1950 and 2007 at least 3,826 scientific papers, book chapters and popular articles have been published in this topic (Bajomi et al. 2010). According to international statistics, approximately 11-62 percentage of the reintroduction projects are successful (Griffith et al. 1989; Matson et al. 2004; Short et al. 1992). In Hungary, several reintroduction and/or breeding projects have been initiated – for example the reintroduction attempt of the white-headed duck (*Oxyura leucocephala*) and the western capercaillie (*Tetrao urogallus*). Some of these are currently running, like the breeding and reintroduction of the european mudminnow (*Umbra krameri*).

In this study I use the term reintroduction according to the IUCN's definition, which says that reintroduction is “an attempt to establish a species (2) in an area which was once part of its historical range, but from which it has been extirpated or become extinct” (IUCN 1998).

Reintroductions of the rarefied Eurasian beaver have started early, namely in 1922 in Sweden. This have been followed by more than 20 European countries until the end of the twentieth century. Beaver reintroductions are among the world's most successful projects of their kind (Haarberg 2007; Haraszthy 1996). Due to successful reintroduction and conservation programs the population of the Eurasian beaver counts currently at least 639 000 animals (Halley and Rosell 2003). These fine results came after the bad situation at the beginning of the twentieth century, when beaver population decreased to about 1,200 specimens (Halley and Rosell 2002; Halley and Rosell 2003; Nolet and Rosell 1998).

3.) Methods

In this paper I use the available literature and interviews made with experts involved in the Hungarian beaver reintroduction program to describe the history and results of this project. To better estimate the effectiveness of different reintroduction projects, and thus achieve more success in future reintroduction projects, Sutherland et al. (2010) suggested “a series of standards for documenting and monitoring the methods and outcomes associated with reintroduction projects for birds.” In their article the authors enumerate ten points that are minimally needed to document animal releases. According to this paper, managers have to document for example the number of

released specimens, the place of introduction, and whether the animals were marked or not, etc. The authors also give advice on the preliminary documentation and the monitoring of the project after the releases. In their article, the authors mention that their standards can be applied not only for birds but also for other vertebrate species. Hereinafter I will use these standards to publish currently available information on the Hungarian beaver reintroduction project.

4.) The circumstances and reasons of decline

Beavers occurred originally along river systems throughout most of Europe and Northern and Middle Asia until the 17-18th century (Nolet and Rosell 1998; Reichholf 2006) but disappeared from a large part of Europe by the middle of the 19th century (Haraszthy 1996). The numbers of the species had been reduced to 1,200 in 8 different populations (Nolet és Rosell 1998; Halley és Rosell 2002; Halley és Rosell 2003) mainly because of hunting for meat, fur and castoreum (Haraszthy 1996). The importance of beaver's meat is confirmed by a Hungarian cookery book published 23 years after the species' extinction from Hungary that included 2 recipes to prepare beaver's meat (Czifray 1888). Habitat loss probably had also contributed to the decrease (WWF Hungary 2011).

The last specimen in Hungary was hunted in 1857 near Ács in Komárom-Esztergom county, the last two individuals were also signed here. The last observation in historical Hungary was on islands of Danube and Száva close to Zimony which belongs to Republic of Serbia today.

5.) The history of the Hungarian reintroductions

5.1.) The reappearance of the beaver in Hungary

After 120 years absence from the Hungarian fauna, beavers appeared again in Szigetköz area of the country in 1985/1986. Presumably these animals came from Austria where successful reintroductions had happened earlier (Schwab & Lutschinger 2001; Haarberg 2007). Nowadays

the biggest beaver population of Hungary lives in Szigetköz (Haarberg 2007, WWF Hungary 2011). Around 104 territories were observed here in 2008 - that means 360-370 individuals, which number is probably underestimated (Varju 2008).

5.2.) The first releases

The first attempt was not a reintroduction in the strict sense of the world: it was instead a supplementation or re-stocking. A fishing guard found a lodge and beaver tracks on the bank of Hordódi-Holt-Tisza in the Bird Reservation of Tiszafüred in Autumn 1988. The origin of the animals was unknown. The number of specimens was estimated at two. To augment the population Miklós Dudás, a colleague of the Directorate of Hortobágy National Park (DHNP) brought 7 younger and elder specimens from Bad-Kissingen safari park, Germany between 1991 and 1994 (Table 1, Bozsér 2001; Dudás 2002; Haarberg 2007).

Beaver releases at Tisza lake (Dudás 2002)		
Date	**Number**	**Age**
April 1991	4	Separated youngsters
1992	2	Yearling siblings
1994	1	2-year old

Table 1: Beaver releases at Tisza lake

The first release at Tisza-lake was a soft release: the animals were introduced to artificial lodges, few hundred meters away of the natural lodge found in the area. Auxiliary food (apple, corn, etc) was provided in the next few days for the released animals (Dudás 2002).

A young beaver was found dead in a fish trap at Poroszló at a distance of 15 km from the place of the release in 1991. Its body was covered by bite marks. Harmed trees were detected in the same year on the banks of the Eger and Rima streams close to Maklár and Egerfarmos 20-25 km from the releasing place. This beaver was shot by a local hunter who supposed the swimming animal was a muskrat. In the next years, there were tracks only close to the natural lodge. The park rangers found a decaying carcass here which was proofed European beaver after the study of the skull (Dudás 2002).

Gerhard Schwab told on a conference in Poland in 2000 that the beavers released at Tisza-lake were Canadians (*Castor canadensis*). Therefore the park rangers trapped the last specimen from the Tisza-lake that was proved Canadian by two independent (Austrian and German) institutes. The same result was produced by the analysis of the fur of two beavers found at Poroszló and Egerfarmos. The live-trapped specimen was sent to the Budapest Zoo (Dudás 2002).

5.3.) The beaver reintroduction program of WWF Hungary

5.3.1.) Feasibility study, habitat survey

The idea of the Hungarian beaver reintroduction program arose in 1994. The feasibility study was prepared by László Haraszthy (the director of WWF Hungary at that period) with the support of Günther Lutshinger, the director of WWF Austria (Haraszthy 1996; Bozsér 2001b; Halley és Rosell 2002). The potential habitats were surveyed before every release on the basis of a habitat suitability modell (Bozsér 2000, 2002a, b, c; Haarberg-Bozsér 2005; Czabán 2007, 2008). This model was developed originally in America and was adopted in Switzerland and rewritten by Orsolya Bozsér to the Hungarian actualities. The reintroduction places were chosen by the help of habitat monitoring specialists. The opinion of the Directorates of National Parks was taken into consideration (Márta Bera pers. comm.). Almost all localities are protected by law, except 2-3 places.

The following documents were obtained every time: permission of Hungarian Customs And Final Guard for importing living animals, veterinarian certification from abroad and Hungary, permissions from the Ministry of Agriculture and Rural Development, the Environmental and Water Authority (KÖVIZIG) and the Directorate of the National Park. The permissions from abroad were brought by the Austrian and German colleagues. Although all papers could finally be collected, the contribution of the Water Authority was difficult to obtain in some cases. According to the Authority flood-prevention is most important and the beavers are potentially dangerous due to their digging in river banks and building dams causing floods. Because the habitat assessments had always been prepared with the involvement of the National Park Directorates and their opinion had always been used in the planning, the permissions of the National Park Directorates were always obtained easily. Before Hungary joined the European Union the animals were inspected by an official veterinarian Tibor Hadarics and a custom guard – this procedure has ended after Hungary joined the EU. The following

organisations and persons were informed: local councils, hunting and angling clubs and land owners. At some localities, local council co-workers took actively part of the preparation work and informed local people about the arriving of the beavers. It is worth to mention the specieal case of a man who owns a lake and the surrounding area at Domoszló. He has contacted WWF Hungary and offered to provide home for beavers, if the experts judge the area suitable. After a common tour of inspection, the locality proved to be suitable, so they signed a partnership contract, according to which the owner of the lake and surroundings do not complain about the potential damage caused by beavers in the forest (Márta Bera pers. comm.).

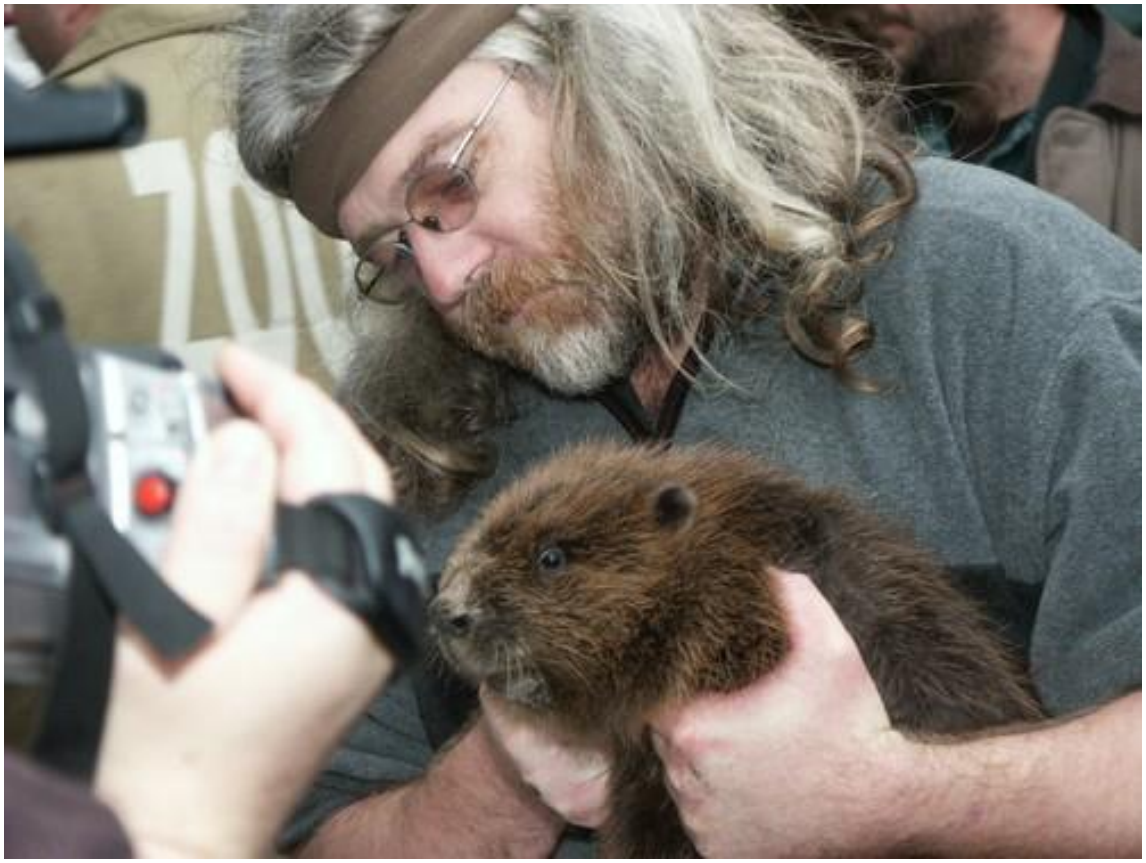
5.3.2.) Goals

According to Sutherland *et al.* (2010) it is important to define the goals of the reintroduction before starting the program, and it is recommended to establish "clear, quantitative, measurable, taxonspecific principles for assessing project success at defined stages". According to the Hungarian beaver reintroduction feasibility study (Haraszthy 1996) the goal of the program was to reintroduce beavers to oxbow lakes close to the rivers that are suitable for this species. Márta Bera who became the manager of the project said that the aim of the program was to reach a self-supporting beaver population in Hungary in function of the carrying capacity of the concerned protected areas. The feasibility study did not define the success of the program and did not determine quantitative and measurable goals. In the course of the program the „ideal" population number was estimated according to the carrying capacity of the actual protected area and the reproduction of the animals (Márta Bera pers. comm.)

Sarrazin & Barbault (1996), Seddon et al. (2007) and Sutherland et al. (2010) suggested concordantly that reintroductions should be planned as ecological experiments. A priori hypothesises to be tested can help the development of the science of reintroductions and the theoretical background of ecology. For example, they can establish which reintroduction methods are most effective at the given species Studies on ground squirrel reintroductions in Hungary tested which time period is the best for releasing the animals and what types of artificial tunnels are the most acceptable for the squirrels (Gedeon et al. 2011). Unfortunately there were no similar experiments at the Hungarian beaver reintroductions and the releases did not follow the experiment planning rules.

5.3.3.) Releases

WWF Hungary launched the beaver reintroduction program in the presence of Prince Philip, international leader of the organisation at that time (OBI and WWF Hungary 2010).



The German wildlife biologist Gerhard Schwab with a beaver in his hands during a Hungarian reintroduction

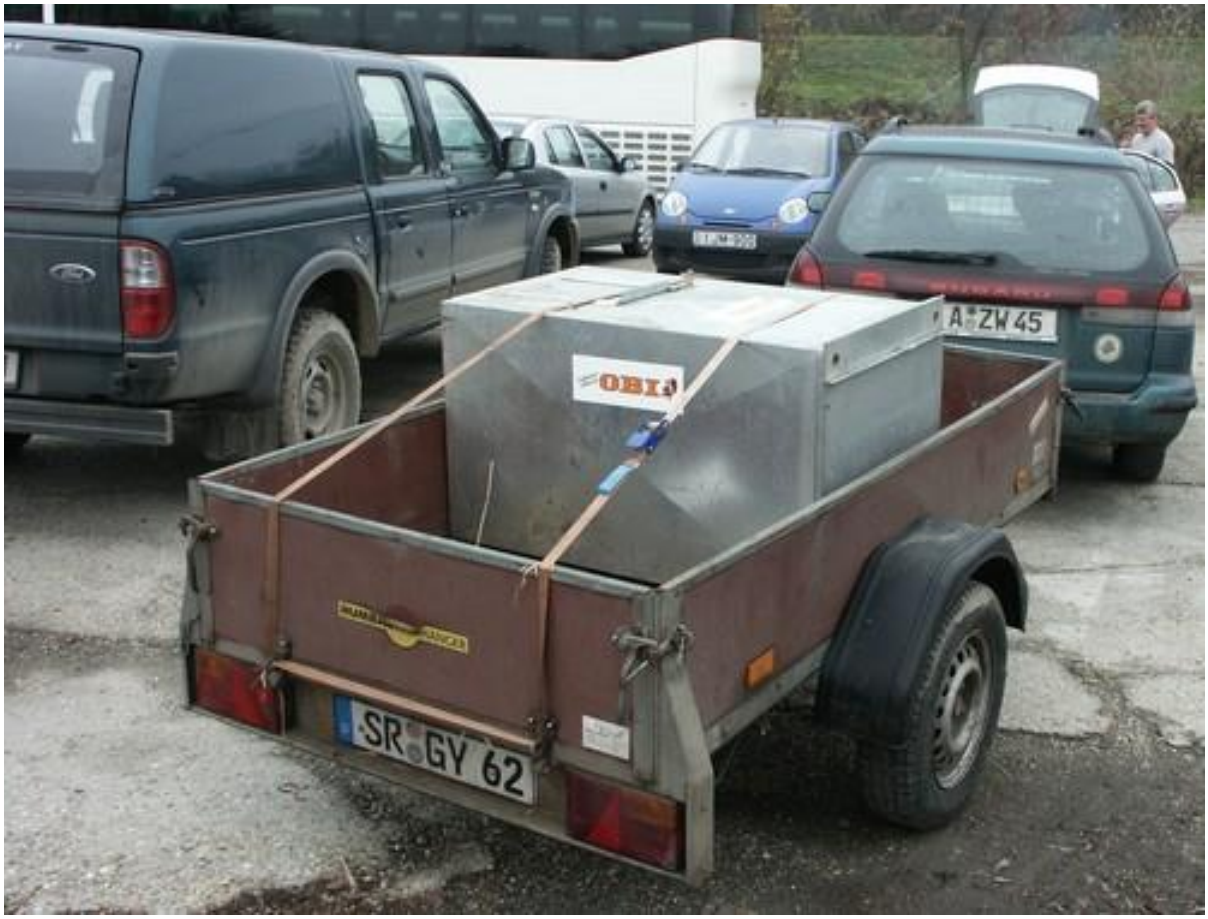
Beaver reintroductions in Hungary organised by WWF Hungary (Tallósi 2007; WWF Hungary 2008, Gerhard Schwab pers. comm.)			
Date	**Number**	**Area**	**Origin**
September 1996 – October 1998	**33** (7 family, 2 pair, 4 solitary)	**Gemenc** (Duna-Dráva National Park)	**Austria, Bavaria** (Germany)**, Poland**
4 April 2000	**4** (1 male, 1 females, 2 subadults)	**Király-lake** (Fertő-Hanság National Park)	**Zierlmühle, Ingolstadt-Neuburg, Weichering, Pöttmes, Bavaria** (Germany)
04 April 2000	**8** (1 adult, 2 subadults, 1 juvenil)	**Fehér-lake** (Fertő-Hanság National Park)	**Hausen, Bavaria** (Germany)
09 November 2000	**6** (2 adults, 4 subadults)	**Király-lake** (Fertő-Hanság National Park)	**Pförring, Bavaria** (Germany)
31 October 2001	**5**	**Öreg-Túr** (Hortobágy National Park)	**Bavaria** (Germany)
05 April 2002	**10**	**Király-lake** (Fertő-Hanság National Park)	**Bavaria** (Germany)
30 October 2002	**15**	**Tiszalúc, Holt-Tisza** (Kesznyéten Protected Area, Bükk National Park)	**Bavaria** (Germany)
30 October 2002	**5**	**Öreg-Túr** (Hortobágy National Park)	**Bavaria** (Germany)
30 October 2003	**20**	**Middle-Tisza, from Tiszadob to Tiszaladány** (Hortobágy National Park)	**Bavaria** (Germany)
24-25 October 2004	**38**	**Middle-Tisza (**Kisköre, Pély, Tiszaroff, Kőtelek, Besenyszög, Szolnok, Martfű, Cibakháza, Hortobágy National Park)	**Bavaria** (Germany)
12 November 2004	**20**	**Gemenc, Béda-Karapancsa** (Duna-Dráva National Park)	**Bavaria** (Germany)
25 October 2005	**23**	**Middle-Tisza** (Poroszló, Hordód, Göbe, Patkós, Csatló**,** Cibakháza, Hortobágy National Park)	**Bavaria** (Germany)
25 October 2005	**3**	**Mátra** (Domoszló) (Bükk National Park)	**Bavaria** (Germany)
03 November 2006	**6**	**Körtvélyesi Holt-Tisza** (Kiskunság National Park)	**Bavaria** (Germany)
03 November 2006	**2**	**Sas-ér** (Kiskunság National Park)	**Bavaria** (Germany)
03 November 2006	**3**	**Göbe forest** (Hortobágy National Park)	**Bavaria** (Germany)
26 October 2007	**24**	**Duna-Dráva National Park** (Sidebranches at Vízvár, Erzsébet-island, Hármas-island, Drávatamási-sidebranches, Tótújfalu, Szilháti-lake)	**Bavaria** (Germany)
31 October 2008	**13**	**Tiszatarján** (Tiszatarján – Holt-Tisza, clay holes; Nagyecsér, Hortobágy)	**Bavaria** (Germany)
Sum	**234**		

Table 2: Beaver reintroductions in Hungary organised by WWF Hungary

The sex of the beavers is not detectable morphologically; the only method is inspecting whether the excretion is grey or yellow. This method is difficult therefore the sex was not checked at the reintroductions. The German scientists informed the Hungarian colleagues which specimens belong to the same families (Márta Bera pers. comm.) The age of the individuals (adult, subadult or juvenil) was always recorded (Tamás Gruber pers. comm.).

Over 90% of the beavers reintroduced in Hungary originated in Bavaria, from the Regensburg – Bavarian Forest – Danube region. The rest of them came from Austria and Poland according to Márta Bera. The Bavarian population was established also as a result of a reintroduction program: between 1966 and 1980, 120 specimens were reintroduced from Italy and Poland; at the turn of the millennium the beaver population reached 5,000 individuals (Schwab and Lutzinger, 2001). Since their activity began to cause economic damages, some of them had to be removed. The beavers captured in Bavaria have been relocated to e.g. Croatia, Hungary, Romania and Belgium since 1996 (Schwab, G. & Schmidbauer 2001). Thus, the Hungarian reintroduction was a serial translocation. The majority of the beavers captured in Germany was used to less satisfactory habitats e.g. along canals. That made some of them migrate from the optimal habitats in Hungary designated by the habitat assessment experts to canals similar to their original German habitats.

The transportation took place in airing metal boxes lined with straw. On their way animnals were fed with apples and other fruits (Márta Bera prs. comm.). The distance was 500 to 1000 km, 5 to 10 hours by car.



Metal box on a trailer

Since 2004, the reintroduced specimens have been marked with microchip implants with ID numbers. Chips used for beavers were similar to dog chips, so all veterinarians and Budapest Zoo co-workers have the compatible equipment to handle it. The chips were, after all, not used during the monitoring, as the beavers were not recaptured after release. Only one case of finding a chip in a beaver corpse was reported (Márta Bera and Tamás Gruber pers. comm.). Upon release, the beavers were subjected to a quick non-lab veterinary inspection. Before the Hungarian accession to the EU, the inspections at the border were conducted by Dr. Tibor Hadarics, after the accession they were taken over by Dr. Endre Sós of Budapest Zoo. Towards the end of the program the local veterinarian implanted the chips at some of the relocation venues. In some individual cases, veterinary procedures, vaccinations and genetic tests were taken. At Lake Tisza Canadian beavers were captured and there DNA was examinated. In the course of the 2006 relocations in the Mártély Conservation Area DNA analyses were performed on previously taken hair samples. In 2010 the DNA

and skull of another corpse formerly found in Rábagyarmat was examinated, and it turned out to be a European beaver.

The beavers were always released from the carriage boxes on the day of arrival. The releases with media publicity were hard releases, while at the rest of the releases the beavers were allowed more time to adapt. Some of the latter releases were hard, others soft. In some cases the cages were left open to set the beavers loose, then organisers returned for the empty cages. The beavers were not fed afterwards. During the reintroductions at Lake Tisza in 2005, at Mártély in 2006 and in Tiszatarján in 2008 organisers made artificial lodges, but the beavers did not use any of them. No control of predators or competitors was necessary in connection with the reintroductions (Márta Bera and Tamás Gruber pers. comm.).

A newly released beaver reaching Drava in October 2007

5.3.4.) Specimens found dead

With its 18 year, the lifespan of the Eurasian beaver is outstanding among rodents (Horn et al. 2011, S7). Since 1991, 39-48 dead beavers were found in Hungary, 2 of which were identified Canadian and 14 Eurasian. The rest is doubtful, but probably Eurasian. 5 specimens, 2% of all released animals died in direct connection with their reintroduction. That is a favourable result

considering that in some other reintroduction programs mortality rates around 50% were reported (Teixeira et al. 2007). Two specimens died during transport and captivity, one at the Upper Tisza, one at the Hódmezővásárhely release. One kitten died in 2006, during the Mártély Conservation Area reintroduction. From the beavers reintroduced to the Tisza backwater at Cibak in 25 October 2004, one was found dead within a month. Because of the bad condition of the body, it was not investigated, and the implanted chip was not read. During the reintroductions near Drava on 26 October 2007 two specimens of different breeds were released at the same time, and most likely because of the distress, the new environment and the competitive situation they attacked each other, and one of them suffered lethal injuries (Bera and Gruber, 2007 and Márta Bera pers. comm..).

5.3.5.) Coordination and expenses

The reintroduction program was worked out by László Haraszthy, director of WWF Hungary, in cooperation with beaver specialist Dr. Günther Lutschinger, managing director of WWF Austria. At start-up, the following organizations participated in the program: WWF Hungary, WWF Austria, Gemenci Erdő- és Vadgazdálkodás Részvénytársaság (Gemenc Forestry and Wildlife Management Ltd.). During the planning period the program was supported by the Ministry of Environment and Rural Development, Hungary (KTM) and the National Water Authority, Hungary, joined later on by OBI home improvement chain store. At the beginning, WWF set up a five-person advisory board consisting of senior advisor Győző Buzetzky, head of Gemenc Conservation Area, senior advisor Gábor Nechay, Bureau for Natural Protection, journalist István Palugyai at Népszabadság newspaper, Aladár Pettkó-Szandtner CEO, Gemenc Rt, Prof. István Zsuffa, Department of Hydraulic and Water Resources Engineering, Budapest University of Technology and Economics (Haraszthy 1996). During the time span of the program, several persons had been involved as Public Relations officers in the communication work because of personnel changes: Hajnalka Schmidt, Viktória Kisberné Gabnai, Alexandra Balogh and Mónika Kiss.

In Bavaria, German wildlife biologist Gerhard Schwab and his co-workers captured the beavers and transported them to Hungary. The reintroductions were first coordinated by Márta Bera and later Tamás Gruber, both project managers. The preparatory habitat analyses as well as the follow-up monitoring were taken care of by the following commissioned experts: Orsolya Bozsér, Dávid Czabán, Béla Kalocsa , András Lelkes, József Mercsák, László Meszlényi, Attila Mórocz, István Sándor, István Somodi, Edina Sztaskó, János Puskás, dr. Béla Tallósi and József Varju.

During the course of the program over 25 persons got involved, forming a multidisciplinary team made up by, among others, conservation specialists, biologists, communication experts and water engineers.

The sole financial sponsor of the program was OBI chain store that previously had a beaver in its logo. For the company, the beaver was a symbol of "a family animal that consciously shapes its home and environment", which characteristics they shared with the customers of the chain store (OBI and WWF Hungary 2010). During the dozen years between 1996 and 2008 the company funded the program with HUF 100 million (approx. EUR 325 000) (Szabó 2008).

OBI's logo at the time of reintroduction program launch

5.3.6.) Documentation of the reintroduction program

Unfortunately, in many cases, the experts involved in reintroduction programs do not provide a correct documentation (Fischer and Lindenmayer, 2000). For one example, relatively little has survived on the white-headed duck reintroduction conducted in the 1980ies in Hungary (Bajomi, 2003a, b, c). Thorough description of methods and results of such programs as well as their accessibility for local and international readers is crucial to the development of conservational biology (Bajomi et al., 2010; Fischer and Lindenmayer, 2000). Fortunately the Hungary beaver reintroduction program is well documented. Preceding the launch of the program, feasibility studies were conducted (Haraszthy, 1996). During the project internal studies were written on the reintroduction sites, the marked specimens, the follow-up monitoring and deaths (e.g. Bera and Gruber, 2007; Bozsér, 2002b; Czabán, 2011). For the general public WWF Hungary issued two illustrated brochures (Bozsér, 2001b; Haarberg, 2007), besides the numerous news articles, media appearances, 7 academic theses (Bajomi, 2003b; Barta, 2009; Bozsér, 2002a; Czabán, 2003; Erdélyi, 2009; Pintér, 2001; Sztaskó, 2001), and several scientific publications (e.g. Bozsér, 2004; Karcza, 2000) that came out in connection with the program. For the international scene, a 3-page summary

of the program was published in English in the proceedings of a conference on beavers (Bozsér, 2001a). The Hungarian program is also shortly referred to in a number of English language articles (Halley and Rosell, 2002; Halley and Rosell, 2003; Nolet and Rosell, 1998; Schwab and Lutschinger, 2001). Until now, no detailed account on the Hungarian program has been published in a peer-reviewed journal.

6.) Present spreading and population estimate

6.1.) Monitoring

Beavers are nocturnal animals, and as such, they are rarely observed. Therefore the monitoring of their population is mostly indirect: after searching for harmed trees, lodges and dams, the surveyors try to identify their territories. According to the literature, the size of the territory is very variable. Dutch researches have shown that early comers have bigger territories than late comers. Winter territories are about 7,9 ± 0,5 km long, with about 3 ± 0,4 km long riverside sector with trees. In dens populations, new territories can follow after only 1 km (Czabán 2003). In Szigetköz, where their population density is the highest in Hungary, József Varju, the surveyor used 0.3-1.3 river kilometres when calculating the population estimate (Varju, 2008).

The population of an area can be estimated based on the number of territories. Normally surveyors count 3.5 specimens per territory (Czabán, 2011; Varju, 2008). The monitoring basically follows the changes in specimen numbers estimated on territorial basis, but they also take notes of the relatively rare occasions of direct encounters, new lodges, traces of beaver kits and corpses found. Illnesses are not observed as the beavers are never recaptured after release (Márta Bera pers. comm..).

Under the program of WWF, in the beginning there was regular monitoring wherever reintroductions took place. The longest recent surveys since 2000 have been in regions Hanság, Middle and Lower Tisza, Gemenc and along rivers Zala, Mura and Kerka. There were also surveys in Szigetköz for a while, but later the territories became saturated, and WWF discontinued the surveys. Observations of beavers and beaver traces are reported from various places countrywide. The Eurasian beaver has a relatively high longevity of 18 years (Horn et al., 2011, S7). According to

Sutherland (2010), species of such longevity are worth monitoring for ten years after release, as the evaluation of the program's success takes a long time. WWF Hungary tries to track the population as long as available funds make it possible (Márta Bera and Tamás Gruber pers. comm., WWF Hungary 2011).

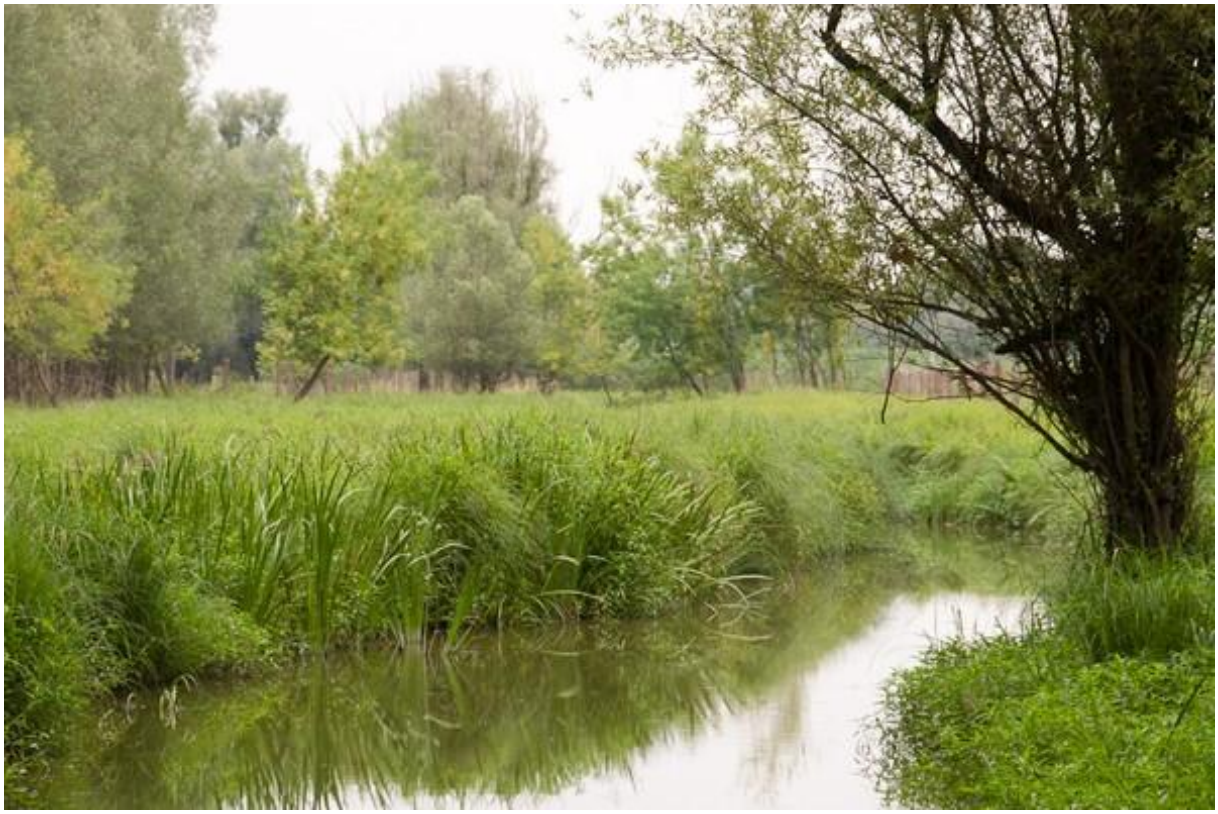
The beaver population in Hungary is growing. Their number in 2011 was estimated between 718 and 905. Of all the monitoring sites, in Hanság, Zala, along Mura and Kerka their number is growing, while in Gemenc and along Middle Tisza it is constant (WWF Hungary 2011).

Area	**Population, 2011**		**References**
	min.	**max.**	
Szigetköz	382	399	Varju (2008), József Varju and Tibor Limp pers. comm.
Gemenc, Lower-Danube	44	54	BITE (2011)
Zala county	105	140	Lelkes (2011)
Hanság	105	105	Czabán (2011)
Dráva and tributaries	10	20	László Fenyősi pers. comm.
Middle-Tisza	21	28	Dr. Béla Tallósi pers. comm.
Lower-Tisza (Csongrád county)	10	15	Somodi István pers. comm.
Observations by local people - Danube	19	67	
Observations by local people - Tisza	2	7	
Observations by local people – other areas	20	70	
Total in Hungary	**718**	**905**	

Table 3. Beaver findings in 2011

Beavers are now found nearly everywhere along the Danube. They reach their highest number in Szigetköz, despite the fact that there were no reintroductions there – they have reached this area through migration from Austria. During the 2008 monitoring about 104 territories were found, the calculated population is accordingly between 360 and 370 which is probably an underestimation (Varju 2008). According to Tibor Limp, director of Kisalföldi Erdőgazdaság Zrt. forester dept. Győr, 5-10 more families, living between Ásványráró and Vámosszabadi have been omitted from the WWF survey, so they should be added to the previous number. Though monitoring stopped after 2008, according to surveyor József Varju the population has grown further since and specimens from the great Szigetköz population are migrating all over.

Population keeps growing dynamically in most places, and according to WWf experts, “this growth will continue undisturbed, as there are more habitats for beavers especially along smaller streams” (WWF Hungary 2011). Thus the species is expected to show up in every part of the country (Bajomi, 2010).



Beaver habitat in Gemenc, *near Szekszárd-Keselyűs*

6.2) Canadian beavers in Hungary

Since it is hard to make a difference between Eurasian and the Canadian beaver, in some European countries – also in Hungary – conservational biologist inadvertently reintroduced some Canadian beavers along Eurasian ones (Haarberg 2007). In Hortobágy National Park experts introduced Canadian beavers by misadventure. In the end, this population hasn't been established. There was also a suspicion that near the River Rába, Canadian beavers wandered in from Austria, but the only specimen explored until now has confuted this idea – it turned out that the skull of this beaver was an Eurasian one. As Gábor Csorba, leader of the Hungarian Natural History Museum's Mammal

Collection has noted, in the 1990s he was shown the skull of a Canadian beaver, which came from Zala County, but the justificatory specimen is missing. Besides these examples, in the 1970s some specimens of Canadian beavers probably wandered through the Hungarian border with Austria, but no trustworthy data are available on these occasions. According to these events, in theory, it may be hypothesized that the beaver population in Szigetköz is also a mixed one, consisting of Eurasian and Canadian beavers. This question needs further exploration; for this, it may be enough to explore the found beavers corpses (Dávid Czabán, pers. comm.).

In the 1990s, some Canadian beavers escaped from the Animal and Nature Park Herberstein, which is located near River Rába. It is still not known whether all the escaped specimens were successfully captured or not. It may be possible that some individuals wandered to Hungary, and the harmed trees found in Szany, January 2011 originated from these beavers (Czabán 2003).

7.) Success of the program

There are many different definitions for the success of reintroduction programs. Here we apply the definition accepted by the 7th World Conference on Breeding Endangered Species, held in Cincinnati (USA) in 1999. According to that, a program is successful if the release generation survives, the release generation and their offspring breed, and the re-established population persists (Seddon 1999). Most of these criteria have been met, only the breeding of the offsprings is difficult to be proved (Tamás Gruber pers. comm.). According to Dávid Czabán, who is involved in the monitoring in Hanság area, the breeding of the offspring is sure there. This way, we can state that the Hungarian beaver reintroduction program is a success.

8.) Acknowledgements

I would like to thank the following WWF coworkers and experts: Márta Bera, Dávid Czabán, Tamás Gruber and Orsolya Haarberg. I would also like to thank Imre Babos, Anna Zsófia Bajomi, Iván Bajomi, Zsolt Beke, Mihály Imre, József Kertész, Gábor Kovács, Tibor Limp, Nóra Nagyszöllősi, Tibor Parrag, Viktória Pálinkás, Márta Radó, Lajos Sinkó, András Takács-Sánta, Zsuzsa Tímárné Bende, Dr. Olivér Váczi and LászlóVersegi for their help.

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1 Danube Delta Biosphere Reserve **2** Srebarna Nature Reserve **3** Kalimok-Brushlen Protected Site **4** Rusenski Lom Nature Park
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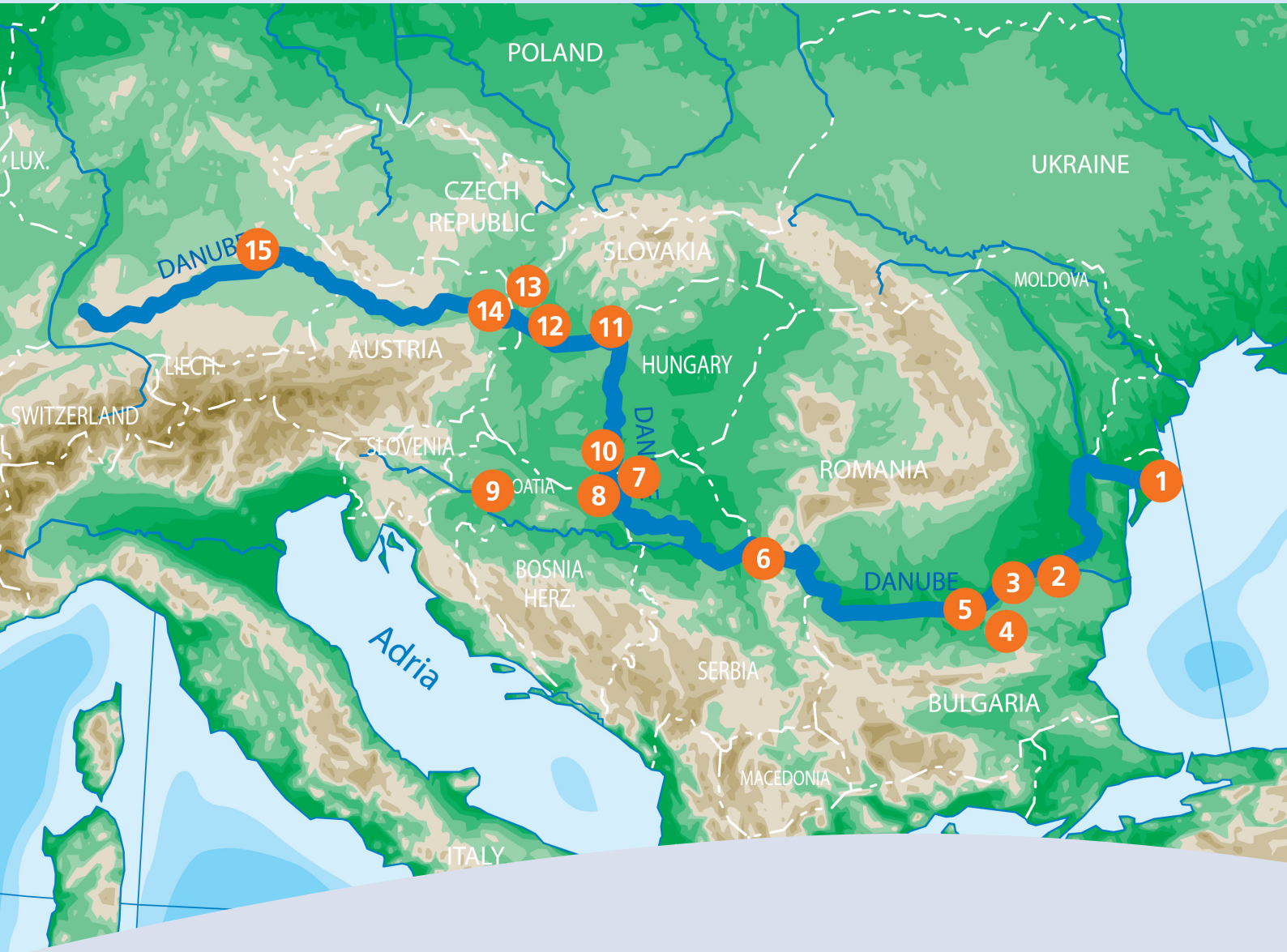
9 Lonjsko Polje Nature Park **10** Duna-Dráva National Park **11** Duna-Ipoly National Park **12** Dunajské luhy Protected Landscape Area
13 Záhorie Protected Landscape Area **14** Donau-Auen National Park **15** Donauauwald Neuburg Ingolstadt



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