Management Plan for the Eurasian otter *(Lutra lutra)* in the Czech Republic for 2009 – 2018

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Contents

Summary of the Management Plan

The Eurasian otter *(Lutra lutra*) is the world's most wide-spread species of otter. It is registered on the IUCN Red List as a Near Threatened species and is subject to Europe-wide protection – being listed in Annexes II and IV of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. It is also listed in Annex II of the Berne Convention on the Protection of European Wildlife and Natural Habitats. In the Czech Republic, the Eurasian otter is classified as a strongly threatened species under Implementing Decree No. 395/1992 Coll. of Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended. It is listed as a vulnerable species on the current Red List of the Czech Republic.

In the past, the Eurasian otter was found throughout the entire territory of the Czech Republic. However, as a consequence of fur hunting, poaching, deterioration in water quality and food supply in flowing waters, there was a big decline in the number of otters during the 20th Century, approaching extinction. Fortunately, otters never became extinct in the Czech Republic, unlike in many states of Western Europe. The Eurasian otter population grew from the end of the 1980s, and this growth continues to date. The latest nationwide mapping in the Czech Republic conducted in 2006 revealed occurrence of otters in 510 of the 661 map quadrates (77.2% of the quadrates) and the occurrence of otters was labelled as permanent on 60% of the range. Nevertheless, the otter still does not occupy its historic range.

The Eurasian otter's life is linked to the water environment, which in the setting of the Czech Republic means namely water courses and ponds. The presence and density of otters in the environment are mainly limited by the amount of available food, and thus those factors influencing the quantity and quality of available prey, i.e. in particular fish, are the most important for otters as far as their biotope demands are concerned. These factors include, for example, water pollution or the degree of eutrophication. However, otters also spend a significant portion of their time on land, where they take advantage of a wide assortment of shelters, both those on the ground as well as those located underground, and other elements in order to rest, sleep, rear their cubs or to protect themselves from adverse climatic conditions. As such, a lack of suitable shelters may also act as a limiting factor for the occurrence of otters. Use of the various types of shelters varies depending on age, gender as well as the season of the year. Nevertheless, it has been proven that otters prefer an environment with natural vegetation for the purpose of conducting these activities. Otters usually occupy a relatively large range, with the use of this range changing, as a rule, depending on many factors (gender, age, social status, the season of the year, quality of the biotope, etc.). Territories along rivers are linear in shape, whereas those in fishpond areas tend to be square in character (several ponds which an otter visits in turn). The size of an otter's home range in the Czech Republic, ascertained using telemetry, is anywhere from 2.6 km^2 to 27.3 km^2.

On the basis of data on the mortality of otters in the Czech Republic, the most important factors threatening the otter population in this country are considered to be illegal hunting and deaths on roads, which have been on the increase in recent times. Other negative factors include a decline in the number of suitable habitats and deterioration in water quality. The same causes of threat also apply to a majority of the Eurasian otter's total range. The importance of the individual factors may vary, e.g. in individual countries, depending on the local laws or the local approach to nature conservation and according to the overall state of the environment.

Along with the growth in otter numbers, there has also been an increase in the level of doubt as to the sense of their protection and the development of a Management Plan for this species. However, despite the seemingly "stable" Eurasian otter population in the Czech Republic, this species is very vulnerable, not only due to the ever-increasing traffic or the decline in suitable habitat, but also due to poaching. If fundamental conditions of conservation for the otter are not put in place, this species could once again quickly find itself on the brim of extinction. However, the reason for protecting the Eurasian otter is not only the endeavour aimed at its unilateral protection at the expense of everything else. An integral component of the otter's protection is also the endeavour to find a solution to the conflict between the Eurasian otter and fishermen fishing in our waters. This is the only way to guarantee the otter's permanent survival. The entire Management

Plan for the Eurasian otter in the Czech Republic, presented herein, was prepared entirely within the framework of this endeavour.

The whole concept of the Management Plan for the Eurasian otter ensues from the following key long-term objective:

To ensure that the existing state, from the viewpoint of the size of the population and the area of the range[*)] occupied by the Eurasian otter in the Czech Republic, does not deteriorate.

This long-term objective should be attained by means of the following key groups of measures:

- education of the target groups, namely fishermen, thereby improving their relationship to the otter
- minimising the negative effects of traffic on the otter population
- research aimed at new findings from the spheres of biology and ecology of the species
- economic tools and the provision of information about these tools

Regular monitoring shall be employed to ascertain the fulfilment of the planned objectives and the effectiveness of the proposed measures.

With regard to the already mentioned, currently most important threatening factors to this country's otter population (illegal hunting and road deaths), the main pillars of this Management Plan are the education of the target groups (namely fishermen, road management departments and the lay public) and minimising the negative effects of traffic. A targeted education programme should help to improve the relationship between the fishermen (as well as other) community and the otter, which is considered a key point aimed at fulfilling the main objective of the Management Plan. Keeping the negative effects of traffic to a minimum should be attained by caring for the Eurasian otter's biotope, namely by identifying critical places and by making bridges and roads passable for the otter.

Another measure leading directly to the fulfilment of the prescribed long-term objective is caring for found and injured otters and their release back into the wild. The following spheres of measures then contribute indirectly towards fulfilling the long-term objective:

- research (food relationships, secondary damage to fish stocks, testing of preventive measures for fishermen, genetic variability and structure of the otter population, creation of population models, collection of dead animals and their analyses)
- economic and technical tools (devising the optimisation of the system of resolving conflicts between the economic interests of the fishing industry and the Eurasian otter, devising and testing measures for the prevention of damage caused by the otter)
- monitoring (regular nationwide mapping of distribution and mapping of marginal areas of occurrence, estimate of abundance in selected areas)

The results of the regular monitoring will also enable to evaluate the effectiveness of individual measures and the overall fulfilment of the key objective of this Management Plan. Measures that are not sufficiently effective pursuant to the prescribed criteria shall be revised. The time frame for the operation of this Management Plan is 10 years, with a more detailed time schedule for the individual measures stipulated in chapter 4.

The Management Plan for the Eurasian otter should thus help to preserve a viable otter population on our territory whilst at the same time assisting in resolving the conflict between otters and fishermen.

[*)] The current population size and the distribution range is considered, for the purpose of this Management Plan, to be the number and range ascertained within the framework of the nationwide monitoring conducted in 2006 and the monitoring of marginal areas of occurrence conducted in 2008. A decline in range is considered a decline in the permanently occupied quadrates or a decline in the temporarily occupied quadrates by more than 20%.

1. INITIAL INFORMATION

1.1 Taxonomy

Eurasian otter - *Lutra lutra* Linnaeus, 1758.

Mustela lutra Linnaeus 1758, Syst. Nat. Bk. I: 45 (Stockholm). Names of the species in other languages: Eurasian otter (GB), Fischotter (D), la loutre (F).

Within the range of the species, a number of sub-species have been described, an overview of which, including synonyms, is given by Harris (1968). Davis (1978) gives 10 sub-species, of which the nominotypical sub-species *L. l. lutra* Linnaeus 1758 is the most wide-spread sub-species for the entire Palaearctic region. Taxonomic evaluation of our population was conducted by Zejda and Voskár (1987). This study clearly shows that our entire population of otters belongs to the nominotypical sub-species *L. l. lutra*.

1.2 Distribution

1.2.1 Overall distribution

The range of the species is the most wide-spread of all of the otter species, covering most of the Palaearctic and Indomalaysian region. It covers most of Europe, save for Iceland and the Mediterranean islands of Sardinia, Corsica, Balearic Islands, Crete and Cyprus. To the east, the distribution range stretches as far as Japan and South East Asia, including the islands of Sumatra and Java; there is mention of isolated occurrence of the species in the southern areas of the Indian Subcontinent and Sri Lanka. The range's northern border runs roughly along the Arctic Circle, only breaching this border in Scandinavia and in northeast Russia (Corbet 1978). The range encompasses North Africa's semi-desert area. However, the entire range does have gaps at the present time, caused by a recent extinction of the species. In many areas of the Eurasian region the existing occurrence of the Eurasian otter is mosaic-like in character or is absent altogether. Currently, the species is found on most of the British Isles, Portugal, significant parts of Spain and France, in southern Italy, northern, central and southeastern Norway, northern and central parts of Sweden, on most of Finland, Denmark and the Baltic states (Estonia, Latvia, and Lithuania). In Central Europe, the otter is found in one part of Germany, over most of Poland, the Czech Republic, Hungary and the Slovak Republic and in the northern and southern parts of Austria. On the Balkan Peninsula (former Yugoslavia, Romania, Bulgaria, Moldova, Macedonia, Albania, Greece) the otter is considered a common species, but recent information on its distribution is missing and a similar situation is also evident in southern Europe (Ukraine, Belarus, European part of Russia). (Macdonald & Mason 1982, Foster-Turley *et al.* 1990, Ozolins *et al.* 1998, Mitchell-Jones *et al.* 1999, Conroy & Chanin 2002).

The Eurasian otter is completely extinct in Japan and on many regions of South East Asia. There is a lack of information available on the situation in the Asian part of Russia (Mason & MacDonald 1986). The otter is extinct in Switzerland, the Netherlands, Belgium and Luxembourg (Foster-Turley *et al.* 1990).

1.2.2 Distribution in the Czech Republic

1.2.2.1 Historic distribution

According to the available historic data, the otter was found throughout the entire region of the present-day Czech Republic until mid-19th century (Baruš *et al.* 1989, Anděra & Kokeš 1994). Significant changes occurred in the range as well as otter numbers during the course of the second half of the 19th century and during the 20th century; nevertheless, it is impossible to make an objective evaluation of the historical course of these changes, due to a lack of data. The available historic data was summarised by Anděra and Kokeš (1994). These same authors employed a questionnaire-based research to evaluate the occurrence of the otter in 1920-30 and 1970-75. The authors estimate that the otter occupied 40% of the territory of the Czech Republic in the first period, but that this had declined to a mere 29% of the territory in the second period (Anděra & Trpák 1981). The first aggregate study about the distribution and number of otters, based on the data from the questionnaires, was published by Baruš and Zejda (1981). They stipulate that the otter was a permanent or temporary species in 342 localities, with the population in 1978 being estimated at 174 individuals.

1.2.2.2 Recent distribution

The first nationwide mapping of the occurrence of otters was conducted in this country in 1989-92 and, unlike past studies, was based on finding signs of the presence of otters (Toman 1992). Permanent occurrence of otters was ascertained in 135 map quadrates (21.5% of the territory of the Czech Republic), with irregular occurrence of otters being found in 51 quadrates (8.1%). Our territory was occupied by three mutually independent populations, which also reached into neighbouring states (Figure 1).

Another nationwide mapping of the otter population was conducted in 1997-2000 using the so-called standard method of the IUCN/SSC Otter Specialist Group (Reuther *et al.* 2000, see Annex No. 3). This mapping process showed that the otter was spreading into new areas; the occurrence of the otter was confirmed over 43% of the territory of the Czech Republic, 30% of which represented permanent occupancy (Kučerová *et al.* 2001, Figure 2).

The last nationwide mapping of the occurrence was conducted in 2006 and the occurrence of otters was once again ascertained with the help of signs of the presence of otters using the modified standard method of the IUCN. A total of 1625 of the visited points were positive and 1644 points were negative (i.e. 49.7% positive points). Ascertained were 1365 positive and 1022 negative sub-quadrates (57.2% positive), which corresponds to 510 positive and 151 negative quadrates (77.2% positive; Figure 3). The occurrence of otters was designated as irregular on 15% of the territory and permanent on 60% of the territory (Poledník *et al.* 2007a).

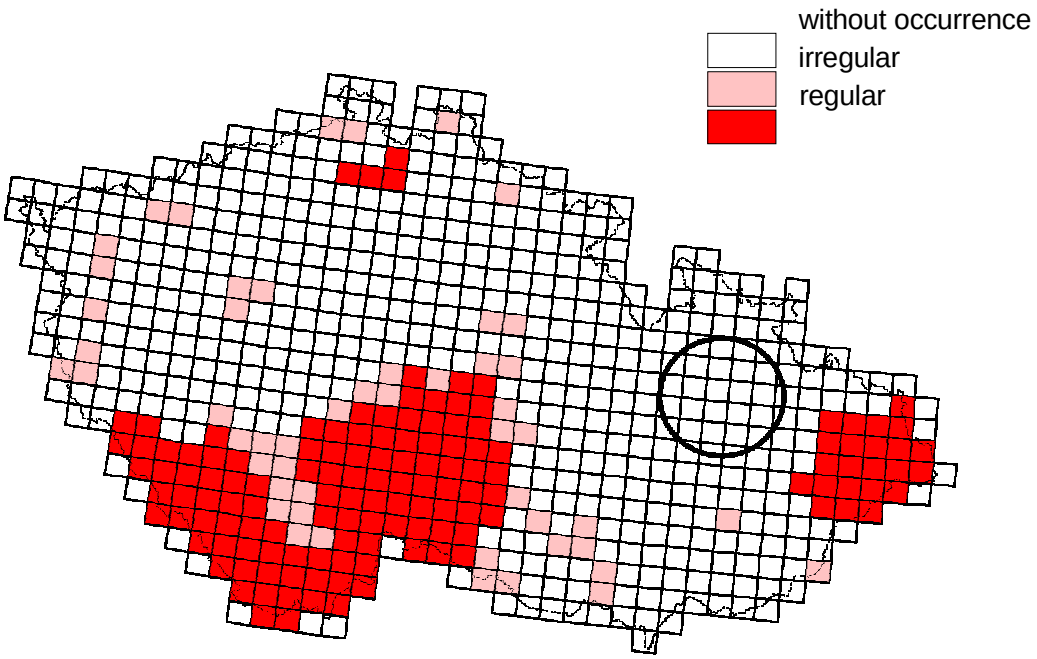

Figure 1. Distribution of the Eurasian otter in the Czech Republic based on the mapping results in 1989-1992 (Toman 1992). The circle designates the area in which repatriation was performed.

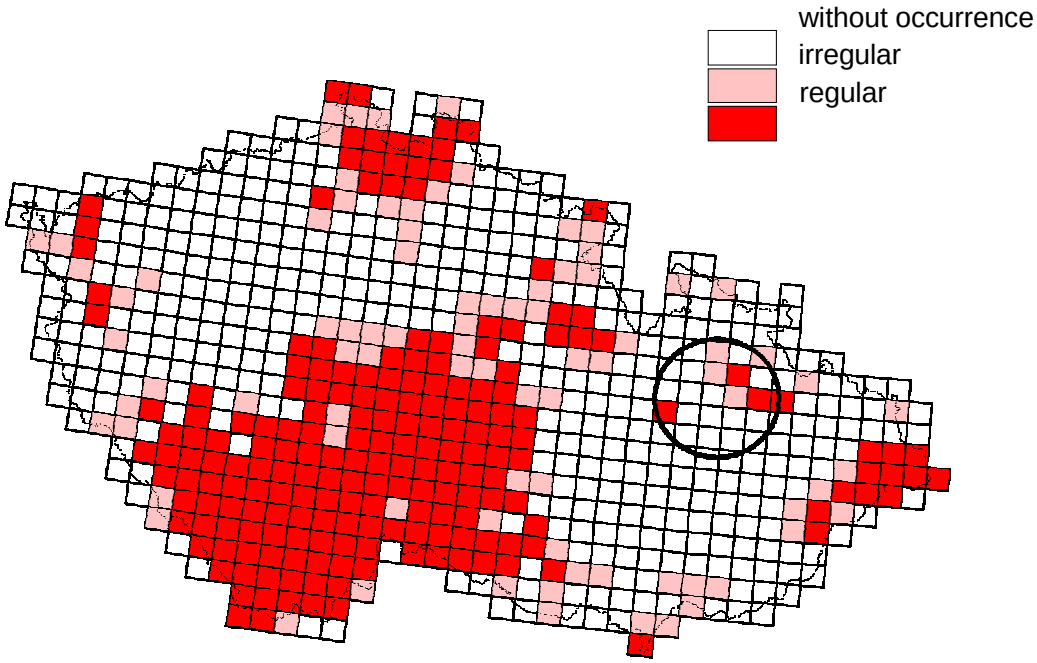

Figure 2. Distribution of the Eurasian otter in the Czech Republic based on the mapping results in 1997-2000 (Kučerová *et al.* 2001). The circle designates the area in which repatriation was performed.

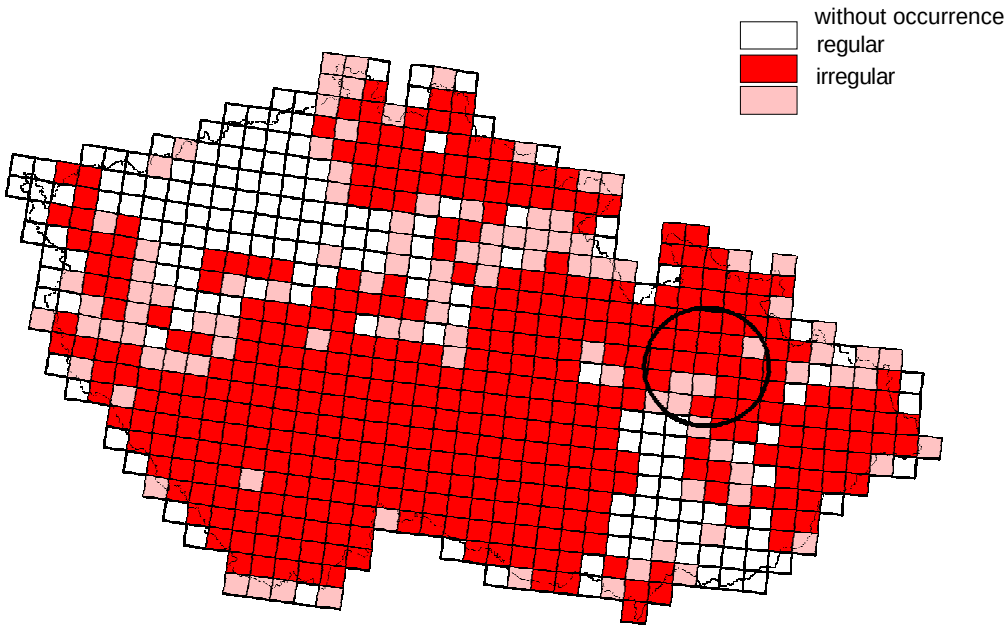

Figure 3. Distribution of the Eurasian otter in the Czech Republic based on the mapping results in 2006 (Poledník *et al.* 2007a). The circle designates the area in which repatriation was performed.

At the present time, otters have fully occupied (more than 80% of the points are positive) Vltava's upper catchment area (after its confluence with the Otava River), as well as the Chrudimka, Jihlava, Lužnice, Malše, Olše, Ostravice and Otava catchment areas, as well as a greater part (more than 60% of the points are positive) of the Bečva, Dyje, Nisa, Opava, Sázava and Svratka catchment areas. The occurrence of otters is less frequent (less than 50% of the points are positive) on the Morava River's upper and central basin and on the basins of the Jizera, Loučná, Metuje rives, on the Odra itself (excluding the above-mentioned tributaries), Orlice, Ploučnice, Radbůza, Úhlava and Úslava. The occurrence of otters on the lower basin of the Morava and Vltava rivers, the upper catchment area of the Ohře River (above the Nechranická dam) and the catchment area of the Labe River itself (excluding the above-mentioned tributaries) and the Berounka and Mže rivers can be labelled as sporadic (under 30% of the points are positive). Spraints found at two isolated locations in North Bohemia, on minor water courses flowing to Germany, is probably evidence of the expansion of the otter population in the adjacent area of Germany (the closest population of otters on the Czech side of the border is roughly 30 km away). From the recent period, the first occurrence of otters in this area of Germany was recorded to the south of the city of Chemnitz in 1995 (Klenke 1996, Klenke 2002) and during the last mapping conducted in 2004-2005 otters were found roughly 15 km from the place of occurrence under this mapping.

Two larger areas remain unoccupied. One is in North Bohemia on the lower catchment area of the Ohře. The second area is found in South Moravia, where otters have occupied the Morava River itself, but its tributaries, such as Haná, Litava, Dřevnice, are devoid of otters.

A presentation of the results of the more detailed resolution in the form of sub-quadrates (Figure 4) gives important information not visible on a traditional map with 11.2 x 12 km quadrates. The gap separating the Beskydy and Jeseníky otter populations is bigger than it appears on the presentation in the form of whole quadrates. Likewise, the occurrence of otters in East Bohemia is not contiguous, but rather mosaic-like with a series of quadrates which are occupied more often than not on an irregular basis. Negative points were recorded in a series of places along the basin of the Otava River in South Bohemia, in an area with a long-standing occurrence of otters. Conversely, in the core areas of otter occurrence it can be seen that the absolute majority of points are positive.

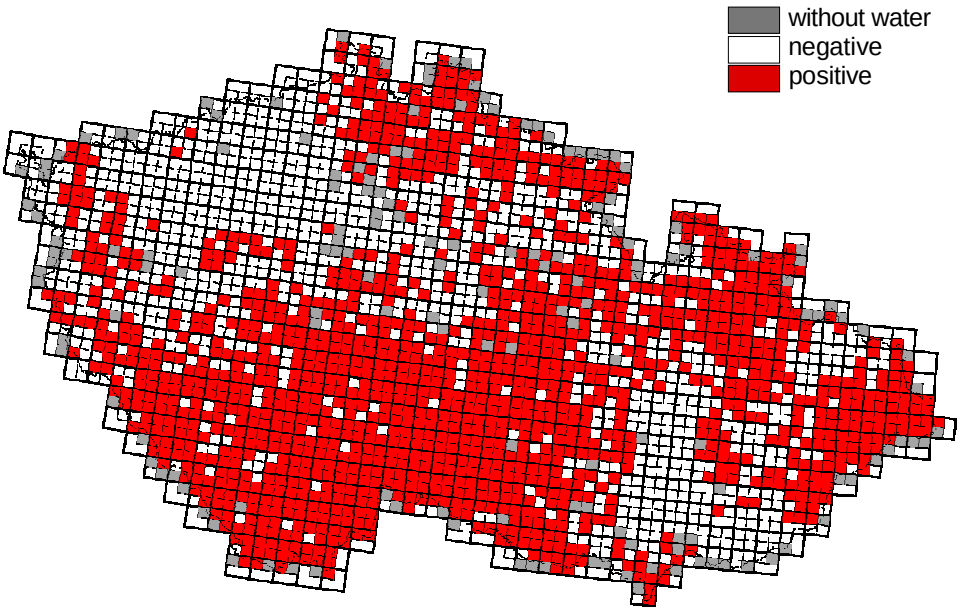

Figure 4. Distribution of the Eurasian otter in the Czech Republic in the individual sub-quadrates based on the mapping results in 2006 (Poledník *et al.* 2007a).

1.2.2.3. Trends in distribution and abundance

It is already clear from the above text that the individual projects for the nationwide mapping of the distribution of otters differ in the methodologies employed. Nevertheless, these differences, mainly comprising in the number of points controlled in the individual quadrates and their location within the quadrate, are not large and enable the development of the distribution of the Eurasian otter to be sketched out on the basis of the results of the individual mapping in this country for the last 15 years.

When comparing the results of the first nationwide mapping (Toman 1992) and the subsequent mapping (Kučerová et al. 2001), there is a clear increase in the range occupied by the otters in the Czech Republic. From the 21.5% of permanently occupied range, as established by the first mapping research, the otter has increased its range to 30%, with the size of the irregularly occupied range increased from 8.1% to 13%.

A comparison of the range of the Eurasian otter in 2006 (Poledník *et al.* 2007a) with the range ascertained in 1997 to 2000 (Kučerová *et al.* 2001) shows another increase. A new occurrence of the Eurasian otter was reported in respect of 233 quadrates, with a decline being reported in respect of 10 quadrates (the positive quadrate is now a negative one).

From a look at the map of the distribution of the Eurasian otter during individual mapping surveys (Figure 1, 2 and 3) it is clearly evident that there has been a gradual merging of the three previously separate populations of the Eurasian otter in the Czech Republic during the last 15 years. The South Bohemian population expanded during the course of the years in all directions, but mainly to the east. The repatriation of otters in the Jeseníky Mountains also aided the further expansion of the range, mainly in the basin of the Morava, Odra and Orlice rivers (Hlaváč *et al.* 1998). From the long-term viewpoint, the North Bohemian otter population tends to be stable.

In comparing the distribution for the individual catchment areas (Figure 5 and 6), it is clear that in the area of Vltava's upper catchment area (after its confluence with the Otava River), Malše, Lužnice and Nežárka, the otter had, at the time of the mapping completed in 2000, occupied the entire catchment areas and that in 2006 there was no change in the occupancy of these areas. A similar situation (and stable from the viewpoint of a comparison of the two mapping sessions) also prevails in some of the catchment areas in South Bohemia (Otava, Blanice), in the area of the Czech-Moravian Highlands (Sázava) and in North Bohemia (Nisa and short water courses flowing to Poland in the Broumov region). There was a clear improvement in the situation of catchment area occupancy in the area of the Odra River catchment area. A similar increase in the otter range was reported in the Morava River catchment area, mainly on the Bečva, Jihlava, Dyje, Svratka and Svitava rivers and also in East Bohemia (the catchment areas of the Orlice, Chrudimka and the upper catchment area of the Labe). A less marked increase was reported on water courses in West Bohemia (mainly in the Berounka River catchment area). The Moravská Sázava, Třebůvka, Valová, Haná and Litava rivers belong to the newly-occupied areas in the Morava River catchment area, with the newly-occupied area in the Labe River catchment area being the Vlkava River.

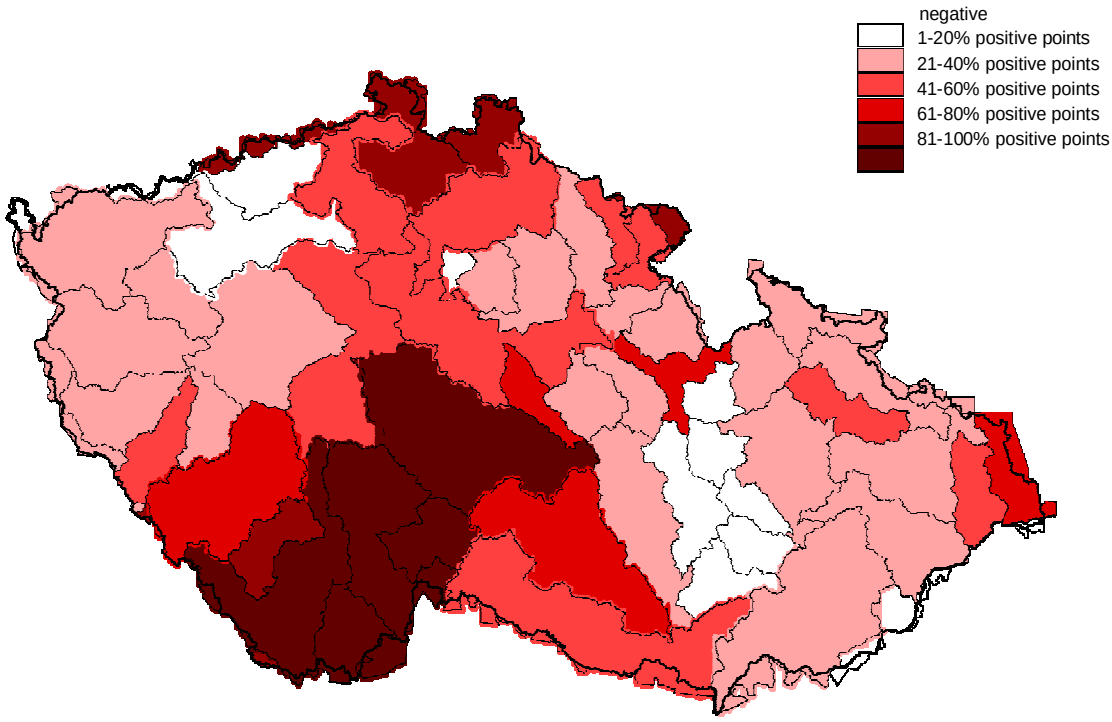

Figure 5. Occupancy of the individual catchment areas during the mapping of the occurrence of otters in 1997 - 2000 (data source: Kučerová *et al.* 2001).

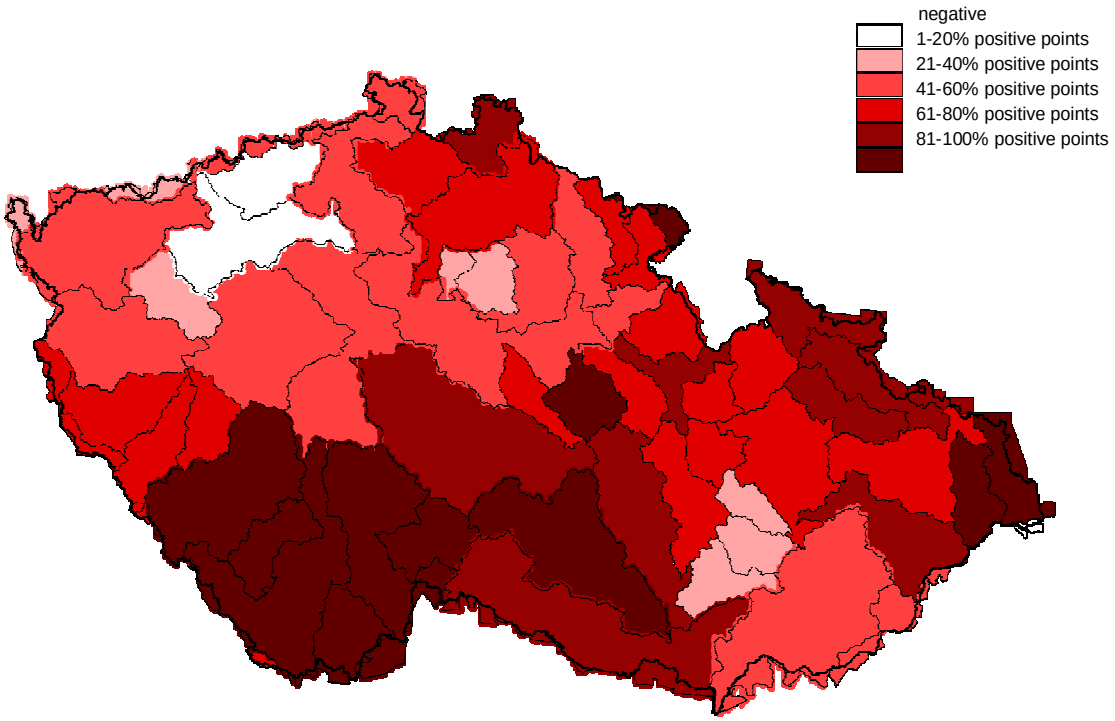

Figure 6. Occupancy of the individual catchment areas during the mapping of the distribution of otters in 2006 (Poledník *et al.* 2007a).

Data on otter densities ascertained in various areas by their tracking on fresh snow (Kranz & Toman 2000, Roche 2004, Poledník *et al.* 2004a, Poledník *et al.* 2007b), which were compared with the values of various landscape factors describing the individual tracking squares, were used to estimate the abundance of otter on the territory of the Czech Republic. Using multiple regression, it was ascertained that a suitable factor explaining the number of otters is the length of the shores of ponds in the area, which explained 97% of the variability in densities (Poledník 2005). A regression formula of this relationship and the distribution of otters in 2006 were then used to calculate the size of the population throughout the entire Czech Republic. The population of otters in the Czech Republic was estimated at approximately 2,200 adult individuals. The abundance of otters at the start of the 1990s was estimated at 300-400 individuals (Toman 1992), with the estimate of the otter population at the end of this decade being 800-900 individuals (Kučerová *et al.* 2001). The individual estimates cannot be compared or be used as a basis for the making of derivations of the speed of population growth, as the estimates are based on dissimilar data and different methodology. The only thing that can be said with certainty is that the otter population has grown in the last 20 years (the distribution range and the total number of animals).

1.3 Biology and ecology of the species

1.3.1 Environmental requirements

Otters use a very varied series of freshwater, brackish and sea habitats encompassing rivers, swamps, streams, irrigation channels and sea coasts. In view of the fact that an otter also spends a significant amount of time on land, a sufficient number of suitable and safe shelters can also be a limiting factor. Otters use these places in the inactive phase of the day to rest, sleep, to rear their cubs and to protect them from climatic conditions or predators. Every individual needs several surface and underground shelters, with their use changing not only depending on the age and gender, but also on the season of the year (Kranz 1995, Urban 2000, Hobza 2005).

Otters usually occupy a relatively large range. An otter is a highly adaptable creature and the area of the range it uses changes depending on many factors: the gender, age and social status of the individual, the season of the year, climatic conditions and the quality of the biotope (amount of accessible food, availability of hiding and resting places). The area of the otter's range can vary from several square kilometres to several tens of square kilometres. Some localities within the home range are used more than others. Territories along rivers are linear in shape, extending from 39 to 84 km in the case of males, and 16 to 22 km in the case of females (Green *et al.* 1984, Durbin 1993), with this length depending on the amount of food available. In fishpond areas, otters use several ponds as a source of food, taking turns to visit each pond regularly. The range tends to be square in character and its size depends on concentration and sustainability of water areas in the landscape.

The size of the home ranges in the Czech Republic are being monitored on a long-term basis using telemetry of the wild otters living in the fishing area in the surroundings of Dačice. The home ranges of the telemetred individuals varied significantly in many respects (Figure 7, Tab. 1). The total area of the home ranges of the monitored individuals varied from 2.6 km^2 to 27.3 km^2 (Poledník 2005). The individual ranges included 8 to 24 ponds (average of 18) with a total area ranging from 10 to 22 hectares (Tab. 1). During a single night of monitoring, individuals either did not visit any pond and remained the whole time on the water courses, or hunted in one pond, or visited several ponds in one night. The maximum number of ponds visited during one night ranged from 5 and 13 ponds. From the viewpoint of the size of the home range, this means that otters visit a maximum of one-half of the ponds included in the home range during a single night. However, one otter visits an average of three ponds during a single night.

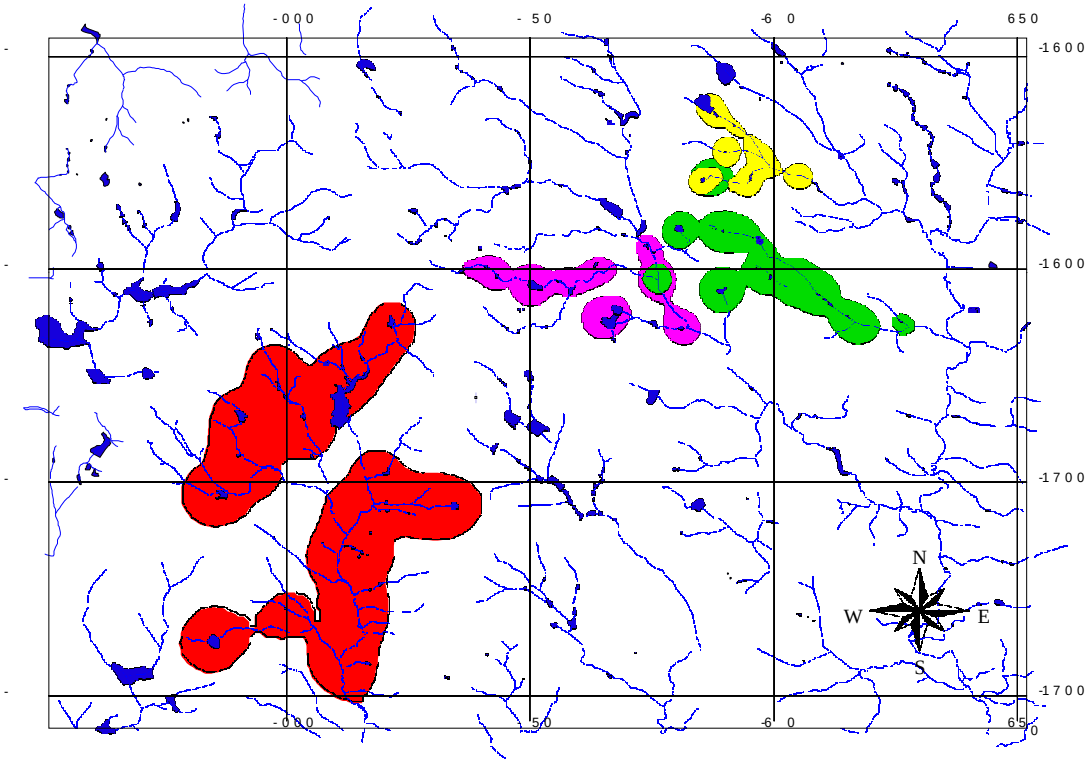

Figure 7. The home ranges of otters monitored using telemetry in the Dačice area (red – male MO1, pink - family Fa, green – male MO2, yellow – female FO1; 5 x 5 km square). (Poledník *unpublished*)

Table 1. Home ranges (HR) of the monitored otters.

	FO1	**Fa**	**MO1**	**MO2**
Size of the HR (km^2)	2.6	5.1	27.3	7.3
Total water area in the HR (ha)	14.5	20.0	57.2	9.6
Area of ponds in the HR (ha)	14.5	20.0	22.3	9.6
Number of ponds in the HR	8	13	24	21
Length of streams in the HR (km)	7.9	8.5	40.7	10.7

The occurrence and density of otters in the environment is primarily limited by the quantity of food available (Kruuk *et al.* 1993, Carss 1995, Poledník 2005). Thus, from the viewpoint of an otter's environmental demands, of importance are mainly those factors that influence the abundance and quality of its prey (mainly fish). Water is the environment of fish, and so the quality of the water environment (pollution, degree of eutrophication) strongly influence the fish population. Furthermore, toxic substances (mainly heavy metals and PCBs) accumulate in the bodies of otters on account of their status as predators at the top of the food pyramid, which can influence their survival and ability to reproduce (experimentally proven in the case of the American mink, Jensen et al. 1977). Also of importance to the fish population, besides water quality, is the quality of the environment itself (structure of the biotope, presence of bankside vegetation, fragmentation, etc.). This then has an effect on the bearing capacity of the environment and the reproductive ability of fish.

Besides food, the presence of otters is also influenced by the availability of suitable daytime resting places. It was ascertained, by telemetric monitoring of otters conducted in this country (Hobza 2005), that otters are capable of using a range of elements, found in the given area, as a daytime shelter. Nevertheless, despite this high degree of plasticity, it was also shown that, in order to rest, otters require an environment with natural vegetation (e.g. reeds) and that they avoid disturbed vegetation (e.g. a ruderal community dominated by stinging nettles).

Furthermore, during the winter period and in early spring otters are dependent on the availability of underground resting places, which are mostly linked to the presence of larger trees close to the water.

1.3.2 Reproduction and life strategy

The Eurasian otter is primarily a solitary creature. Depending on the capacity of the environment, the range is used by one or more individuals, mostly of the opposite gender. Individuals of the same gender avoid each other and besides family groups comprising of a mother and her cubs, otters do not create any social groups. The only exception to this rule is made at a time of low food availability, when several individuals can gather in once place to feed - this has, for example, been observed in the Třeboň Region Protected Landscape Area (PLA) at Stará řeka (Kranz 1995, Föerster 1996). Depite their close proximity in such a case, physical contact between individuals is minimal and otters will disperse as soon as food is once again available outside of this range.

Individuals use scent markings to communicate with each other. These markings are mainly formed by spraints, but otters also use urine and secretions from their anal glands (Gorman et al. 1978, Trowbridge 1983). These markings probably serve to inform other otters of an individual's gender, kinship and social status, of its breeding readiness, or of the use of a resource, namely a food resource (Erlinge 1968, Chanin 1985, Kruuk 1992). Scent markings are often deposite d at conspicuous places: near river junctions, under bridges or pronounced rocks. Marked places have a tendency to be permanent, but the intensity of the markings varies significantly, depending namely on the season (mostly lower in summer, higher in autumn and winter, eventually in spring), as well as the type of biotope, availability of food as well as the specific individuals (their age, gender, social status, physiological condition, etc.) (Macdonald & Mason 1987, Kranz 1996, Roche 2001).

The only period of the year when both genders are actively searching for each other is the courtship period. Courtship lasts approximately two weeks and culminates in copulation. However, the male leaves the female soon after mating, with all care for the cubs being left up to her.

Females reach sexual maturity approximately at 24 months of age; in the case of males it is around 18 months (Ansorge *et al.* 1997). Information in the literature on the interval at which females come into heat (estrus) varies. For example, Gorman *et al.* (1978) cite roughly one month, Veselovský (1998) cites 40-45 days and Mason and Macdonald (1986) mention 30-40 days. Females come into heat throughout the entire year, but most cubs are born from May to August (e.g. Kruuk *et al.* 1987), i.e. at the time when food is most plentiful. The presumption is that this provides for the higher survival rate of the cubs. The otter has a gestation period of between 59 and 63 days, with the female giving birth to between one and three blind cubs. The average litter ascertained on the territory of the Třeboň region's PLA & BR comprised of 1.7 cubs (Kučerová & Roche 1999), with the nationwide average (ascertained by means of tracking) being 1.57 (Kranz & Toman 2000, Roche 2004, Poledník *et al.* 2004a, Poledník *et al.* 2007b).

An otter does not make markings in the vicinity of the maternal den so as not to bring attention to the cubs (Kruuk 1992).den

During the first days after birth the mother must keep her cubs warm on account of their imperfect thermoregulation. The cubs leave the den for the first time when they are two months old, when they familiarise themselves with water and start to learn to hunt (Kruuk 1995). Cubs remain with their mother until between eight months to one year of age, after which they gradually achieve their independence, leave their mother and find their own home range. A relatively low average survival age - around 3.5 years of age (Kruuk 1995) is typical on account of their high mortality in the first years of life. Only rarely do otters live in excess of 10 years of age (Ansorge *et al.* 1997).

1.3.3 Food ecology

Otters are carnivorous predators at the top of the food chain. An otter behaves like a typical foraging opportunist – with the relative representation of the components (or types) of prey in an otter's diet changing depending on their abundance and, in particular, their availability (Chanin 1985, Carss 1995).

The dietary composition varies from season to season and between different localities. In general, fish represent approximately three-quarters of an otter's diet, but in some areas fish form a smaller portion of their diets, with other food sources being of greater importance: amphibians (Amphibia), reptiles (Reptilia), mammals (Mammalia), birds (Aves), crustacians (Crustacea) and insects (Insecta) (Kučerová 1997, Conroy & Calder 2000, Kučerová & Nový 2001).

Wild individuals' daily food consumption equals approximately 15% of an otter's weight (Kruuk 2006). An otter needs to catch 0.4 – 0.9 kg of prey per day in order to maintain good health. During the winter period an otter must compensate the temperature loss by increasing the size of its catch – up to 1.5 kg daily. Nursing females also need greater amounts of food.

The proportion of fish species depends on their local abundance and also on their mobility, with otters giving preference to less mobile fish types (e.g. Erlinge 1968, Geidezis 1996). The size of the hunted fish also depends on availability. Smaller individuals, which in a majority of ichtyocenoses are the most abundant, prevail (Mason & Macdonald 1986). The most frequently consumed fish size category is 10-15 cm (e.g. Mason & Macdonald 1986, Kožená *et al.* 1992, Hájková 2001, Roche 2001). However, an otter is also capable of catching relatively large fish, should the opportunity permit it. A study of the partially-consumed fish in the Vodňany region (Adámek *et al.* 2003) and in the area of South Bohemia (Pacovská 2007 *unpublished)* ascertained the catching of carps 30-68 cm in length and weight of 1-11 kg (average of 49 cm and 3.5 kg). The research conducted in Vodňany ascertained that these large fish accounted for an average of 27% of the weight consumed by otters, i.e. 1 kg on average, which corresponds to an adult otter's daily consumption, and thus it can be concluded that these fish were not hunted for fun. Nevertheless, these studies show that it is not common to find leftovers from food (24 fish found during two winters in the Vodňany region and 21 fish found during one winter in South Bohemia, predominantly in the Jindřichův Hradec region). Any food leftovers can also be quickly consumed by other animals. Unfortunately, leftovers from large fish consumed are very conspicuous and even despite the fact that this phenomenon occurs very rarely, it is widely known among the fishing community.

Seasonal changes in dietary composition are influenced by various activities and the abundance of prey, an otter's energy requirements and the type or productivity of the biotope (Chanin 1981, Wise *et al.* 1981). For an otter it is more energy efficient to hunt in places where fish are easier to catch, i.e. abundant in greater numbers (e.g. ponds with a high stock of fish, water courses rich in fish, breeding capillaries). Fish stocking and, in particular, fish over-stocking lead to an increase in an otter's food supply.

In larger ponds or dams, an otter hunts predominantly in the littoral zone.

Birds comprise only a small share of an otter's diet, but may account for a more significant share in pond and wetland biotopes (Toman 1995c), where an otter can more frequently catch birds that remain on the water's surface (ducks, didappers, bald-coots). An otter also hunts animals equipped with protective poison organs (e.g. toads). Whereas an otter eats edible frogs whole (including the head), it must skin a toad under water in order to avoid the unpleasant effects of the poison (Toman 1995c). Reptiles are also consumed, as the opportunity arises (Toman 1995c). Traces of insects are often found in otter spraints, but this is mostly from the food eaten by fish (Mason & Macdonald 1986). There are however also known cases of the direct consumption of insects, e.g. diving beetles, as well as other large species – Dytiscidae (predaceous water beetles), Corixidae (water boatmen), Notonectidae (backswimmers), and *Odonata* imagos (Toman 1995c, Roche 1996). Consumption of molluscs by the otter tends to be less common. In most cases, the mollusc phylum is represented by *Anodonta* genus (shellfish), with fragments of their shells found in their spraints (Roche 1996). The consumption of fruit is also very interesting. In the Havlíčův Brod region otters were found to have consumed fallen plums, with other types of fruit also being found to have been consumed by bred otter – in the autumn months their spraints

regularly contained remains of apples and blackberry pips (Toman 1995c).

The results of many dietary studies talk about the seasonal changes in the composition of an otter's diet. It has been found that in the summer months an otter's diet is often the most varied in its composition as well as containing the highest share of non-fish prey (Kučerová 1996, Hájková 2001, Roche 2001, Poledník *et al.* 2004b). The higher non-fish share in the summer period and the associated greater dietary diversity is related to the greater abundance of various types of potential prey during this period. This is due to the fact that summer is a period during which many species of living beings exhibit heightened activity as well as being a period of reproduction and the upbringing of cubs. Conversely, the higher representation of fish in an otter's diet during the winter season is the result of the low availability of other types of prey as well as related to the otter's focus on the easiest to catch and thus most energy-efficient prey (Hájková 2001, Poledník *et al.* 2007c). Seasonal changes in dietary composition are the result of seasonal dynamism in the number and activity of the individual types of prey and the related change in the availability of the given species (Roche *et al.* 1995).

All fish-eating animals may be the Eurasian otter's competitors for prey. An American mink *(Neovison vison)* can be considered a problematic species, which is not indigenous to our country and a relatively large portion of whose diet is comprised of fish. Nevertheless, the mutual competition between these two species is low in areas with a large supply of terrestrial mammals (Bonesi & Macdonald 2004a, Bonesi et al. 2004). This fact is confirmed by a comparison of the composition of the diets of minks and otters inhabiting the same area (Dačice region) – there was only a small overlap between the diets of both species (Poledník & Poledníková 2005). Furthermore, studies conducted in Great Britain tend to show that in areas of strong competition between both species, the otter in most cases pushes the mink out of the range or lowers its population density (Bonesi & Macdonald 2004b). Significant competitors of the otter can be migrating flocks of Great Black Cormorants *(Phalacrocorax carbo).* These days, it is man who largely decides, by his management of ponds and water courses, the availability of food for the Eurasian otter.

Examples of the ascertained composition of an Eurasian otter's diet in various types of biotopes in the Czech Republic

Fishpond areas

All of the results quoted (unless stated otherwise) are presented as values of dominance (i.e. percentual representation of the individuals of a certain species or category of the total number of all individuals found in the diet). This is the most commonly employed method in diet studies. The disadvantage is that it deems all individuals included in the diet as equal. This exaggerates the significance of numerous, yet small types of prey and undervalues the significance of larger, heavier types of prey (Roche 1995, Hájková 2001). Nevertheless, the order of the main components of the diet normally corresponds to the biomass of fish consumed by the otter (Carss & Parkinson 1996).

Diet study in the Třeboň region (Roche 2001)

A study was conducted in 1994 – 1996 at four localities, which characterised various types of habitats within the range being studied:

1. Large ponds (> 100 ha) within 0.5 km from Stará řeka (pond / river habitat)
2. Medium sized ponds (> 25 ha) more than 4 km from Lužnice (pond habitat)
3. Meandering upper course of the Lužnice River not excluding ponds in a belt up to 3 km (river habitat)
4. Private ponds mostly < 5 ha in the trout belt of the Malše River (pond habitat / trout belt)

An analysis of the spraints found in habitats 1 – 3 showed a total of 19 fish species from 8 families, of which 12 species belonged to the carp (Cyprinidae) family. When comparing with the results of the catches using an electric aggregate conducted at the given localities (24 species recorded), it was confirmed that the otter hunts most of the common species (Roche 1998). Fish accounted for 83.5% of the otter's diet. Furthermore, six categories (other than bird prey) were identified: birds, mammals, amphibians, molluscs, reptiles and insects. Three species of fish: the common roach *(Rutilus rutilus)*, the carp *(Cyprinus carpio)* and the perch *(Perca fluviatilis)*, were dominant in the otter's diet.

There were conclusive differences in the composition of the diet in the individual habitats. The fish prey was more diverse in the habitat pond / river (17 species) than in the pond habitat (13 species) and the river habitat (12 species) (Figure 8-10). Differences in diet depend on the season of the year. Prey other than fish was consumed mainly in summer. A total of nine fish species were consumed throughout the course of the entire year, but only carp, the common roach and the perch were consumed in significant quantities.

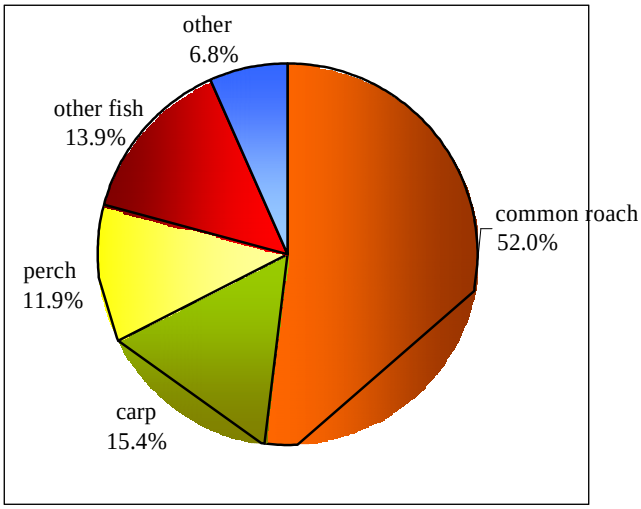

Figure 8. Representation of the individual species in the diet of otters living in the pond / river habitat (dominance of fish species and other categories in otter spraints). Source: Roche (2001).

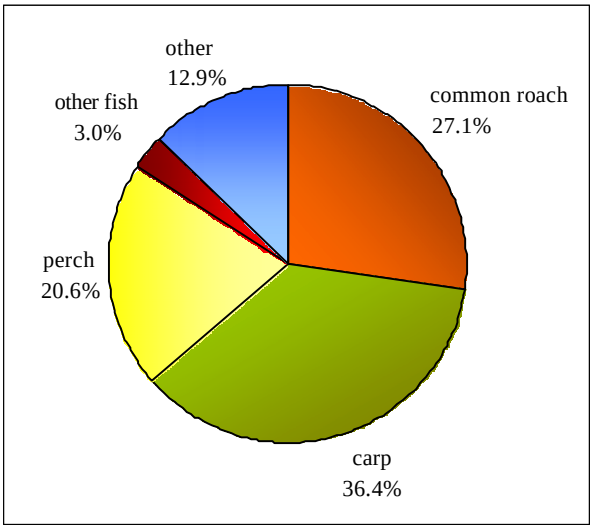

Figure 9. Representation of the individual species in the diet of otters living in the pond habitat (dominance of fish species and other categories in otter spraints). Source: Roche (2001).

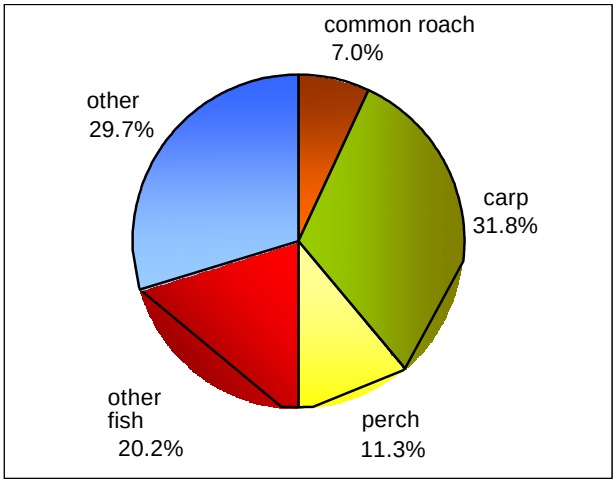

Figure 10. Representation of the individual species in the diet of otters living in the river habitat (dominance of fish species and other categories in otter spraints). Source: Roche (2001).

The dominant component of an otter's diet in habitat no. 4 (pond / trout belt) was fish, forming 94.9% of total consumption. The species of fish most represented in an otter's diet were carp, trout (*Salmo trutta*), perch, European bullhead (*Cottus gobio*) and burbot (*Lota lota*). Carp was the dominant component of an otter's diet during the entire year. The remainder comprised of 13 species of fish, which were only consumed in small quantities. An otter's diet corresponded to the fish available in the locality. Prey other than fish (namely large insects, amphibians, small mammals and reptiles) accounted for 4.9% of the otter's diet (Figure 11). The highest number of fish species was recorded in summer and spring. Prey other than fish was consumed throughout the course of the entire year, most being consumed in autumn and least in winter.

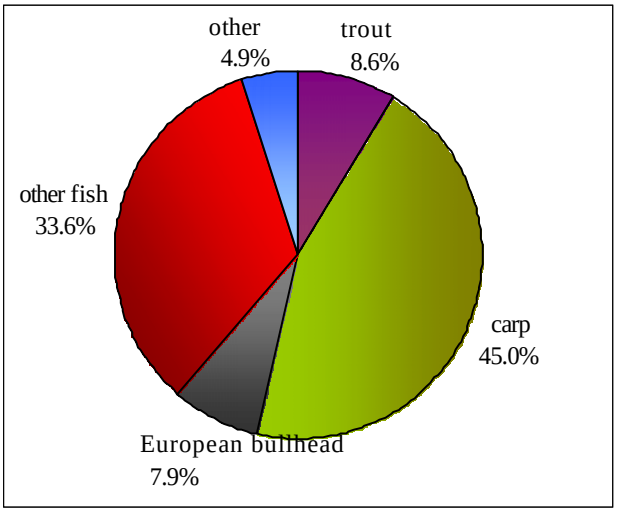

Figure 11. Representation of the individual species in the diet of otters living in the pond/trout belt habitat, (dominance of fish species and other types of prey in otter spraints). Source: Roche (2001).

Diet study in the Waldviertel/Dačice border region (Knollseisen 1996)

This study was conducted in localities in the fishpond areas of Waldviertel - Litschau and in the Dačice region. The Litschau area has approximately 1,400 ponds, 70% of which have an area of less than 0.5 ha. The Dačice area has ponds averaging 1.3 ha in size.

An analysis of the excrement revealed a total of 15 species of fish, eight of which were from the carp species. In the Litschau area, fish formed the most significant part of the diet of otters (80 – 97%), with amphibians and birds being the most commonly represented of the other prey. The most important species in the diet during the course of the year were perch (18 - 48%), bream (*Abramis sp.*, 7 - 32%) and ide (*Leuciscus sp*., 1 – 17%). Carp formed a relatively small part of the diet, reaching no more than 15%. Fish accounted for between 39 and 99% of telemetrically monitored individuals' diet during the course of the year. Perch (61%) was the most commonly represented species, with amphibians, crayfish and insects forming a relatively important component. The dominance of the carp in the diet ranges from 0 to 69%.

Diet study in the Dačice region (Poledník *et al.* 2007c)

The Eurasian otter's diet was studied using an analysis of 2,701 spraints sample, collected from 40 ponds in the Czech-Moravian Highlands in 2003 and 2004. The number as well as share of the individual species of prey varied significantly between the individual ponds (Figure 12). Fish was the main component of otters' diet, accounting for 80% of their prey (expressed as the relative number of individuals). A total of 19 fish species were identified, which corresponds to the spectrum of species found in the given study area. The proportion of fish in the diet varied significantly in the individual ponds, ranging from 25% to 100%. Amphibians were the second most important prey regularly represented in otters' diets, forming 13% of the total. From this group, otters' diets showed the presence of both frogs (Anura) - edible frogs and toads, and, on sporadic occasions, even salamanders (Caudata) – particularly efts. Crayfish, represented by the European crayfish (*Astacus astacus*), formed an important dietery component in the places of occurrence; however, on average, their share in the diet reached only 4%. Insects, reptiles, birds and mammals formed an insignificant part of the diet. The most common and recurring fish species was the common carp, which is also the most important and most frequently stocked farm fish in the area. A carp's share of the diet of otters living on the ponds, where the carp was stocked, fluctuated significantly: from 2% to a maximum of 91%. In total, the carp accounted for 24% of the prey on all the ponds monitored. Other important fish species forming a regular component of otters' diets were the common perch (11%) and the stocked tench (*Tinca tinca*, 9%). Locally, the common roach, belica (*Leucaspius delineatus*), topmouth gudgeon (*Pseudorasbora parva*), gudgeon (*Gobio gobio*), European stone loach (*Barbatula barbatula*) and, of the stocked fish, the grass carp (*Ctenopharyngodon idellus*), formed a noticeable share of an otter's diet. Their diet varied significantly among individual ponds, both in terms of the number of species consumed as well as their proportion in the diet. Commercial fish species formed on average 35% of the prey in the summer months and 42% in winter. In expressing the composition of the diet in biomass values, the proportion of carp (69% of biomass vs. 24% by the number of individuals), and consequently of commercial fish (70% of biomass vs. 35% by the number of individuals), showed considerable differences compared to their relative abundance in the diet. An analysis of the food resources at the individual ponds indicates that the proportion of commercial fish can be reduced significantly when alternative prey (non-commercial fish species, amphibians, crayfish) is available.

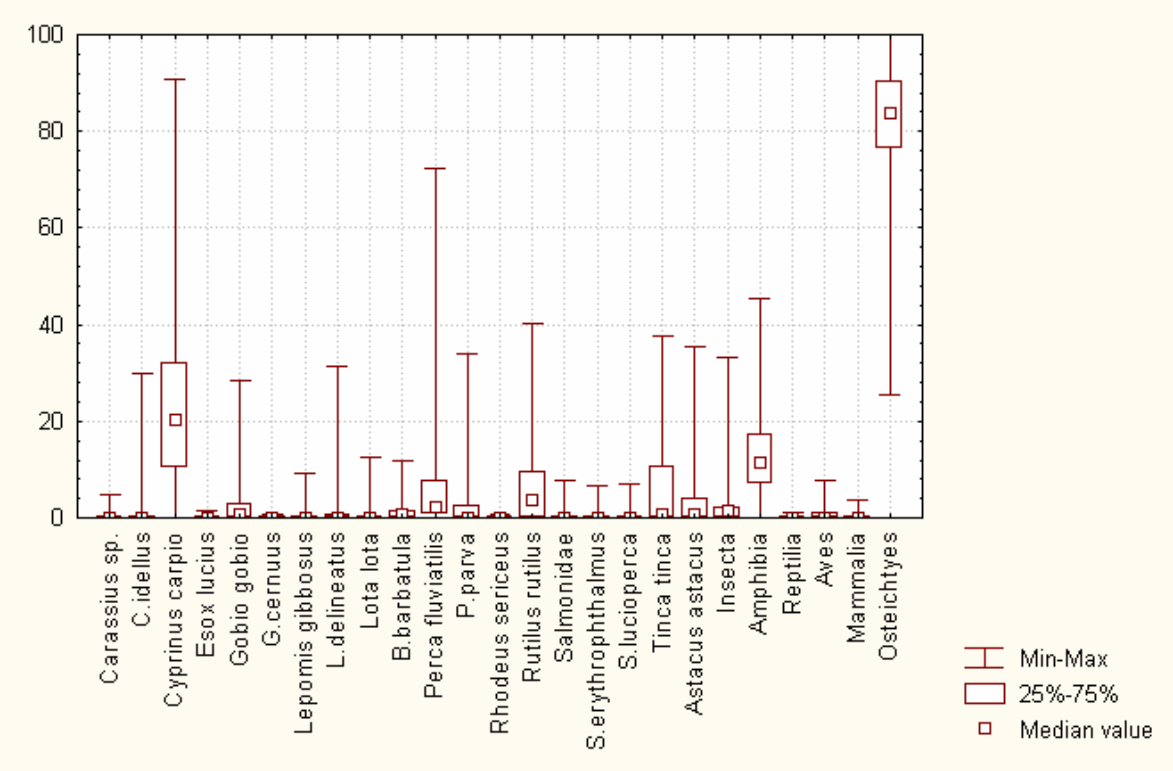

Figure 12. Representation of the individual fish species and the main categories of prey in the diet of otters on ponds in the Czech-Moravian Highlands in the growth period of 2003 and 2004, expressed as the relative number of individuals
(n=33 ponds, 5,454 individuals of prey).

Rivers

Jihlava and Dyje rivers (Vrbová 1991)

Research was conducted in 1989 - 1990 in the Czech-Moravian Highlands area, specifically on sections of the Jihlava and Moravská Dyje rivers. After employing catches using an electric aggregate to ascertain the fish species found in these river sections (17 species found, with the most common species in both localities being: the common roach, chub (*Leuciscus cephalus)*, perch, bream, pike (*Esox lucius*) and carp), an analysis of the spraints samples was conducted, with similar results found on both river flows. Fish formed roughly 89% of the diet. The common roach was the most common prey (20.4%), followed by perch (18%), chub (14.7%), with pike comprising a relatively high percentage (1.2% of the samples). Fish from the carp family were dominant (60% of the samples). Prey other than fish was represented as follows: mammals 6%, birds 3% and amphibians 2% of the samples.

Trout streams

Beskydy (Mitrenga 2005)

A total of 1,786 spraints samples were collected from 2000 to 2004 in four sections in the Beskydy area (the Olše, Lomná, Hluchová and Kopytná water courses). A total of 5,177 food items, belonging to 29 prey categories, were ascertained from these samples. A comparison of the fish populations in the monitored water courses with the otters' diet revealed that their diet reflects the food available or shows a preference for bottom-living, slow-moving fish, in this case sculpins and stone roaches.

Fish was the most important component of otters' diet in the Olše River catchment area. The share of fish in the diet (% of individuals) on the individual water courses ranges from 53.5% (Hluchová) to 86.4% (Olše). Amphibians (in the absolute majority of cases this pertains to various frog species) are another significant component of the diet, accounting for a total of 16.7% of an otter's diet. This is followed by invertebrates with 8.6%. Other groups of prey represent only an insignificant part of the diet – with mammals representing a total of 0.3%, reptiles 0.1% and bird remains being determined on only one sample from Hluchová. A comparison of the biomass quantities of otters' main categories of prey revealed that the most important group is that of the salmonids (Salmonidae), followed by the alpine bullhead (*Cottus peocilopus*), the nase (*Chondrostoma nasus*) and frogs (Figure 13).

A commercially important size of salmonids (bigger than 25 cm) accounted for 245 kg (7.3%) of an otter's diet in this area per year. The average annual salmonid catch by sports fishermen in the area of study is 598.5 kg per year. The share of the biomass of salmonids bigger than 25 cm consumed by otters thus represents 41.0% of the sports fishermen's catch.

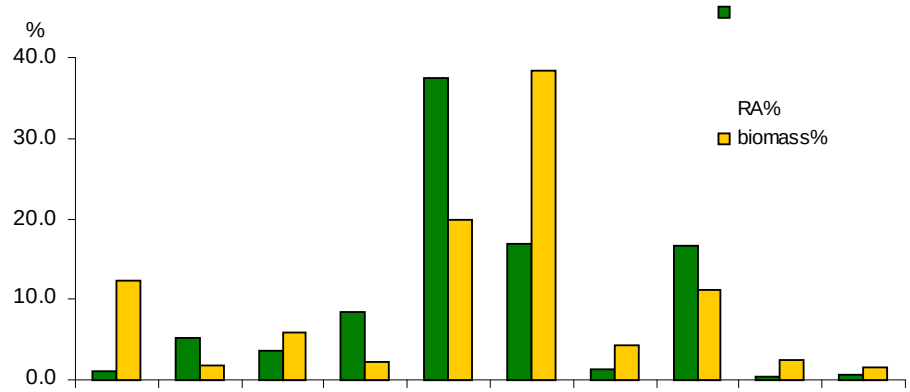

Figure 13. Comparison of the biomass and abundance (RA) of selected categories of prey in the diet of otters in the Olše River catchment area (n = 4,771 food items).

Moravice River catchment area (Poledníková *et al.* 2007)

A one-year diet study was conducted in the area of the repatriation of the Eurasian otter in the Moravice River catchment area. A total of 1,573 spraints in four sections of the foothill water courses (Moravice River and the Černý and Podolský stream tributaries). Here the Eurasian otter consumes almost all fish species found in the area, and all of their size categories. The composition of the diet corresponded to the food available in the area (Figure 14).

The proportion of trouts fluctuated on the individual sections from 1 to 38%, with the proportion of grayings (*Thymallus thymallus*) fluctuating from 0 to 10% of all the individuals consumed (expressed as the relative number of individuals). When expressed as a proportion of biomass, trouts accounted for as much as 39% on some sections, with the proportion of grayings representing 16% of the total biomass. Another important prey was the European bullhead (up to 42% of the number of consumed individuals), the European stone loach (up to 45%), the common minnow (*Phoxinus phoxinus*, up to 27%), perch (up to 61%), the common roach (up to 42%) and, from non-fish prey, frogs (up to 25%). Birds were probably also significant in biomass terms.

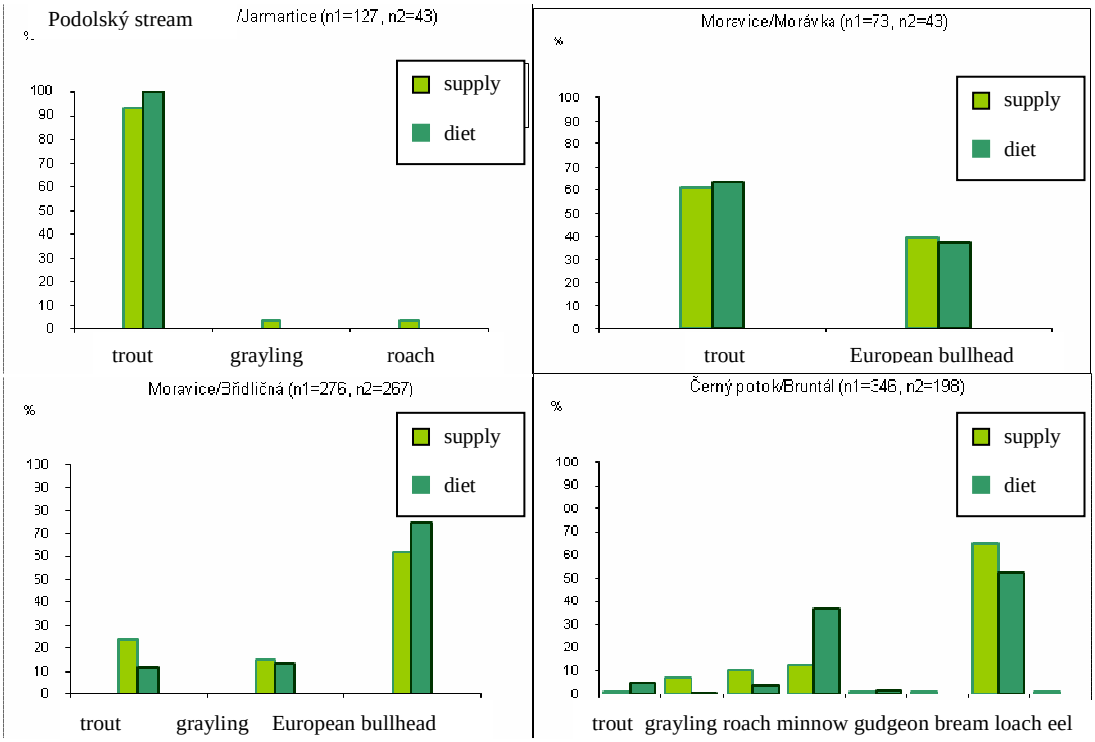

Figure 14 a-d. Comparison of the fish diet of the Eurasian otter and the food availability on the individual water courses. The availability is based on catches using an electric aggregate performed on 1 October 2007. The diet is based on an analysis of the spraints collected in autumn 2007: 2 days to 2 months following the catches. The food availability, as well as the diet, is expressed as a proportion of the individuals (pieces). n1 = number of fish caught, n2 = number of individual fish identified in the spraints of the otters.

South Bohemia - Malše River catchment area (Pacovská 2006)

The diet of the Eurasian otter was studied at two localities in the Malše catchment area on the basis of an analysis of the spraints collected at regular monthly intervals from December 2003 to January 2005 (Figure 15 and 16).

A total of 956 individuals of eight fish species from three families and five non-fish species of prey were identified from an analysis of 465 samples collected at two localities. Fish formed the main diet component at both localities. Trout was the most represented fish species, accounting for 48.2% of the diet and 43.7% of the biomass in the Jaroměř stream locality. In the Zdíkov stream locality the trout accounted for 58.9% of the diet and formed 29% of the biomass. The common roach and the carp were two other more significant components of diet in the Jaroměř stream locality. The common roach was the second most important component of diet in the Zdíkov stream locality. Other fish species were less well represented in these localities. Smaller fish (up to 15 cm) formed the dominant part of otter's diet in both localities.

The presence of a non-fish component was also discovered in an otter's diet. Amphibians and insects were the types of food most represented in the diet, followed by crustaceans, birds and mammals. Amphibians, crustaceans and birds accounted for the greatest portion of the biomass, with a smaller quantity comprising of mammals and insects.

Only information on ichtyocenoses supplied by the local organisation of the Czech Anglers Union in Kaplice was used in the study to compare the food supply and composition of an otter's diet. This information identified the dominant occurrence of the trout, which was added in both localities in the spring period as well as being highly dominant in the diet of the otters. Differences in the representation of certain fish species in the diet and food supply were recorded. In these cases, species appeared in the otter's diet which can be assumed to have been caught by the otter in surrounding ponds.

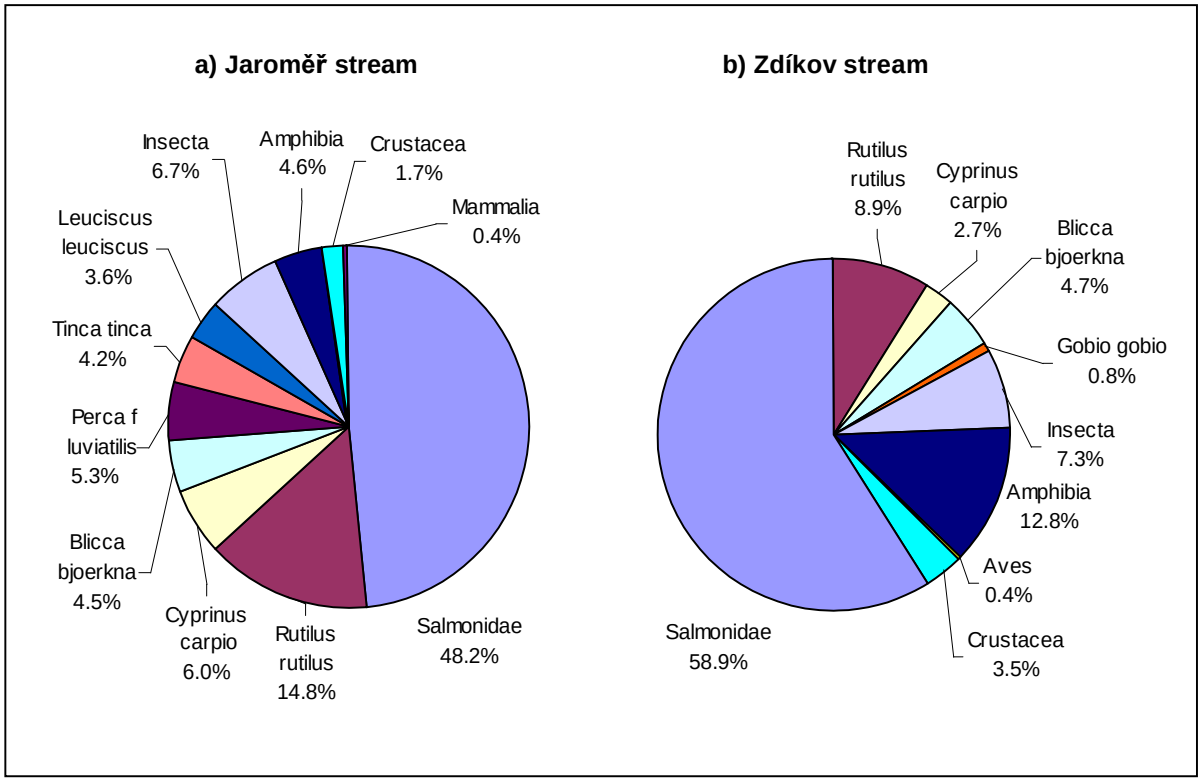

Figure15 a-b. Dietary composition of the Eurasian otter at localities in the Malše River catchment area (values of dominance).

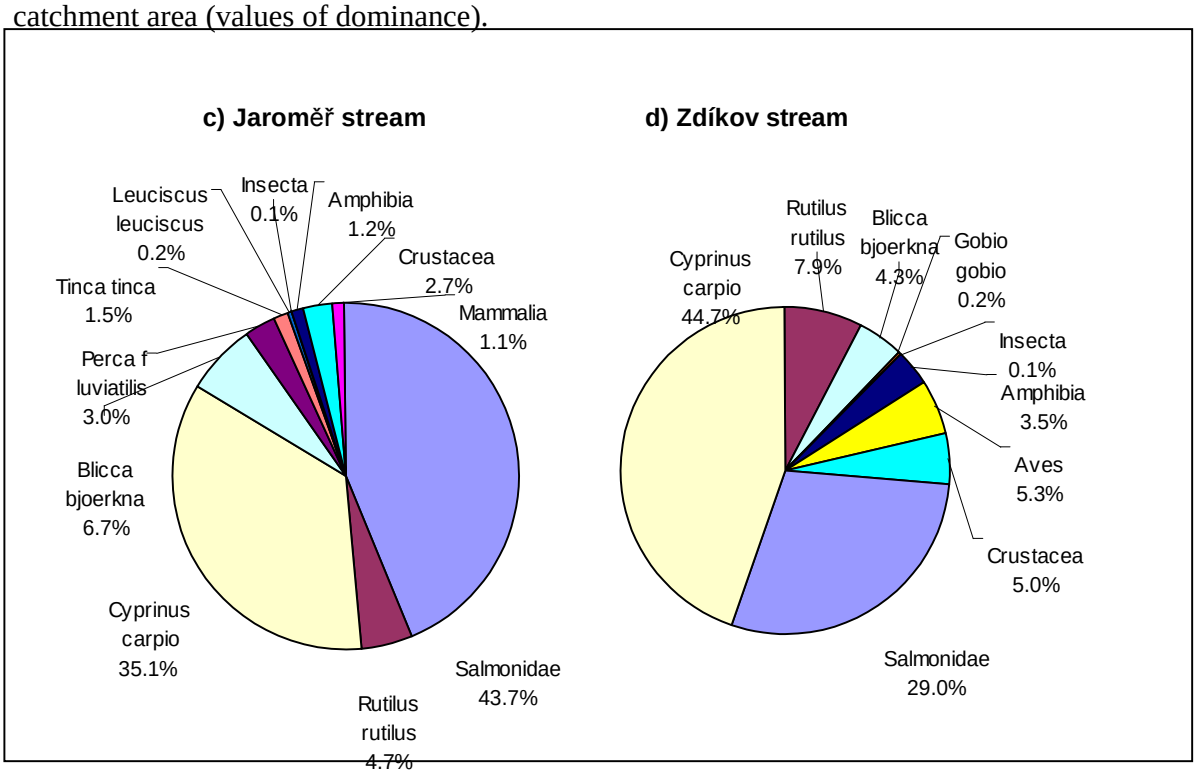

Figure 16 c-d. Dietary composition of the Eurasian otter at localities in the Malše River catchment area (biomass values).

1.3.4 Movement, migration

It is typical for an otter to mostly wander around the range it uses. These wanderings may be longer than 10 km per night; even movement in excess of 20 km during the course of one night has been recorded (Kranz 1995). Otters do not limit their movements along water courses, but are also able to cross larger distances on dry land, including passing over forest ridges between different water courses and catchment areas.

The movement of otters in fishpond areas is also effected by changes in the use of the ponds, e.g. increased movement tends to be recorded in autumn during the period of fish-pond clearances (Roche 2004). More intensive otter movements are recorded during the mating period and at the time that sub-adult individuals are forced to find an unoccupied range to call their own. They settle territory vacated inside the existing population zone or settle at its edges.

Migration in search of food demonstrates that food strategy and behaviour adapts to the abundance and availability of prey (changes in fish populations and changes in fish behaviour). An otter endeavours to change its food sources so as to utilise changes in food availability as efficiently as possible. (Kučerová & Roche 1999).

1.3.5. Role in the ecosystem

The Eurasian otter is a species standing at the top of the food pyramid of freshwater ecosystems. Its opportunistic foraging strategy (it hunts prey that is readily available) predestines it to be act as the natural regulator of fish populations. If the population of some fish species increases, the otter is one of the factors that can help to return the size of this population to its original size. As the otter does not favour minority species, its existence does not pose any danger for rare and threatened species. The otter's influence at the present point in time on the natural ecosystem is significantly suppressed on account of the fact that most water bodies today are kept in an ecologically unnatural state thanks to fish farming. The commercial breeding of selected fish species in ponds, stocking of water courses with fish attractive for fishermen, as well as the ongoing intensive fishing of older carnivorous fish (above the statutory limit), influence the aquatic ecosystem in such a manner that the otter's role as the regulator of their development is very limited. The only place we can see an otter's positive role on the ecosystem at the present time is on the oligotrophic water basins of mountain and foothill water courses, not used for fishing purposes (specially protected territories, protected fish areas). Here the otter clearly maintains the population of the trout in such a state enabling the existence of other important fish species (the common minnow, European bullhead and others) by the uniform catching of fish in all age classes (according to their abundance). The more rapid renewal of the trout population in this area can also contribute to improving the reproduction success rate of the freshwater pearl mussel (*Margaritifera margaritifera*) - older trout, which have already been invaded once by the larvae of freshwater pearl mussels, are far more resistant to an invasion in later years and their elimination by the otter is thus beneficial for the freshwater pearl mussel. The otter is thus an entirely essential member of these ecosystems, as it maintains the various components in an optimum ecologically balanced state.

The assessment of the importance of the otter in the ecosystem in areas used for fishing is disputable. Farm trout streams or ponds used for the farming of carp are, from the ecological viewpoint, in a highly imbalanced state (artificially raised abundance of one species at the expense of the others) and the otter returns them to the state of ecological equilibrium. This function of the otter here is in fundamental contradiction to fishing interests. The greater the intensity of the breeding of fish, the more skewed the natural equilibrium is, to which otters react by increasing their numbers. Paradoxically, the greatest otter population does not live in naturally preserved areas, but in intensive fish farming areas – but in such areas otters live at the expense of economic losses incurred by fishing entities (without having the chance to influence the ecosystem maintained by man). But in so doing, the otter becomes one of the species causing economic losses. From the economic viewpoint, the otter clearly has the most significant effect on trout breeding capillaries and smaller ponds. The influence of

otters is significantly less pronounced in sports (trout as well as non-trout) grounds, as in this setting hunting for an otter is nowhere near as "advantageous" as in small breeding water courses, as well as being distributed into a wider spectrum of fish (including species not attractive to fishermen). Damage on large ponds is also smaller, as an otter hunts predominantly in circumlittoral sectors and fish in wild water are difficult for it to catch.

According to the fishing community, an otter can, in addition to the primary damage caused by the direct consumption of fish, also cause secondary damage, with the mass death of hibernating fish due to stress, or fish stressed by the otter exhibit higher sickness rates and lower weight gains. Nevertheless, sufficient information is lacking to date about the primary response to stress evoked by the otter (measured by the level of glucocorticoids), as well as data on the metabolic and medical changes and their influence on fish growth and survival rates. Experiments conducted at the Pavlov Fauna Protection Station demonstrated changes in the metabolic, glycide and mineral metabolism of the stressed fish (visited by an otter once or twice a week). Furthermore, there was an increase in their stress hormone levels and a reduction in their fat reserves. The metabolic changes were the most significant in the case of less frequently stressed fish, which indicates a certain ability of fish to adapt to more frequent disruption by a predator. However, a comparison of the rate of survival and hibernation as well as the rate of growth in the subsequent vegetative period did not show any differences between the individual groups of fish (the control group and both groups of stressed fish) included as part of the experiment (Poledník *et al.* 2007). Nevertheless, further research is required, both in captivity as well as nature, to clarify the role of an otter as a stress factor for the fish stock.

As has already been mentioned in the introduction, the existence of the otter does not represent any significant danger for the populations of other specially protected species. An otter is not a significant predator of threatened fish species or water clams (freshwater pearl mussel, Unionidae; the remains of the shells of species from the Anodonta genus are found in the food of otters only sporadically). Even though an otter routinely hunts amphibians and also, in rarer cases, reptiles, it has never been proven that their abundance is influenced by predatory otters.

An otter also regularly hunts noble crayfish in localities where this species is also found. However, long-term monitoring of water courses settled by crayfish and otters has not revealed any significant effect on the size of the crayfish population. A credible description of any effect of an otter on the population of threatened bird species has yet to be given. Also, the relationship between the otter and the expanding population of American mink is not sufficiently known. Some contemporary notes suggest that an otter can keep the population density of the mink population at a lower level. In view of the fact that the American mink poses a real danger for our natural ecosystems, the otter would play a significant positive role in this respect.

The importance of the otter also rests in the fact that it has become a so-called flagship species for programmes for the conservation of water courses and wetlands. As a very attractive and "likeable" creature as well as a top predator reflecting the state of its environment, the otter has all the prerequisites for becoming a symbol of conservation campaigns aimed at saving aquatic ecosystems.

1.3.6 Genetic variability and population structure

The Eurasian otter populations declined significantly in most European countries during the course of the 20th century. The populations became fragmented due to changes in biotopes, chemical pollution as well as direct pursuit. These factors can lead to a loss of genetic variability and a reduction in fitness as well as an increase in the genetic differentiation of the sub-populations (Frankham *et al.* 2002).

A very low variability was ascertained from existing analyses of mitochondrial DNA (cytochrom *b* and the control region) in respect of the Eurasian otter from European populations (Effenberger & Suchentrunk 1999, Mucci et al. 1999, Cassens et al. 2000, Ferrando et al. 2004). A genetic drift in the case of the basic post-glacial population with a long-standing low abundance, in connection with the subsequent historical anthropogeneous pressure is considered a possible cause of this fact (Effenberger & Suchentrunk 1999), or also the possible post-glacial recolonisation of the entire

European landmass from a single refugium (Ferrando *et al.* 2004). The genetic variability of European populations of Eurasian otters is higher at the microsatellite DNA level (in comparison with mitochondrial DNA). The allelic variability and heterozygousness ascertained in respect of most populations hitherto analysed (particularly from Western European countries) is comparable with the values most frequently given for microsatellite loci in respect of larger species of mammals (Randi *et al.* 2003). However, it is lower in the case of certain populations (e.g. the Shetlands, southern Britain, Denmark), which can be caused by the isolated nature of the populations and the contemporarily as well as historically significant declines in numbers – population bottlenecks (Dallas *et al.* 1999, 2000, 2002; Pertoldi *et al.* 2001).

Until recently, three isolated sub-populations were found in the Czech Republic: (1) the edge of a relatively strong east German population reaching into Northwest Bohemia, (2) the so-called South Bohemian population (Šumava, South Bohemia, Czech-Moravian Highlands) – part of a relatively strong, but isolated population even reaching into Austria and partially into Germany, and (3) a population spur from the Slovak Republic and Poland reaching into north-east Moravia (Kučerová et al. 2001, Figure 2).

A small population was created in the Jeseníky Mountains and surrounds area under the repatriation programme of the ANCLP CR (Agency for Nature Conservation and Landscape Protection of the Czech Republic) in 1997-2003 (Šusta & Toman 2001, see chapter 1.6.2.2). At present, the linking of the Czech and Polish populations, including the repatriated population in the Jeseníky Mountains, has now been proven (see Figure 3 – nationwide mapping of the distribution of otters in 2006). The Eurasian otter population in the Czech Republic is probably still isolated from the Slovak population. But these populations are expected to link up in the near future – the nationwide mapping of the distribution of otters in 2006 revealed that the positive quadrates from the Beskydy and Jeseníky mountain areas were almost touching (Figure 3, 4). From the viewpoint of preserving the genetic variability of the Eurasian otter populations in the Czech Republic it is important to maintain the linking of the individual sub-populations. Genetic analyses give the ability to identify individuals, monitor the intensity of gene flows, detect inbreeding and estimate the genetic differentiation of sub-populations.

Genetic variability at the microsatellite level was determined by an analysis of the DNA isolated namely from the available tissue of deceased otters and otters killed by motor vehicles from the entire Czech Republic (Figure 17). The genotypes of 132 individuals have been obtained hitherto, with the resulting variability being compared with the Slovak population as well as with other European populations of the Eurasian otter.

It was found, on the basis of an analysis using F-indices, that the Czech population is in a Hardy-Weinberg equilibrium (F_{IS} index N.S.; Hájková *et al*. 2004), i.e. a raised frequency of inbreeding has not been found. When compared to the Slovak population, the value of the F_{ST} index was significant (F_{ST} = 0.154; $p < 0.001$), which confirms the existence of a barrow of genes between the Czech and Slovak populations and indicates their slight to high genetic differentiation (Hájková et al. 2007). Analyses of genetic data using special computer programs (Bottleneck, MSVAR) confirmed that there was a significant decline in abundance in the Czech population in the recent past – a so-called recent population bottleneck. The dating of this decline is in accordance with known data on developments in the otter population in the last century. The current effective size[2] of the Czech population is low as a consequence of the bottleneck, and the population continues to be very vulnerable – sensitive to more pronounced demographic changes (Hájková 2007, Hájková *et al*. 2007).

It is necessary to continue with genetic analyses in order to conduct more detailed studies of genetic variability, population and genetic structure and monitoring the gene flows. An analysis of more extensive material would be appropriate – i.e. of further samples, particularly from the areas from which material has yet to be analysed. Samples of very fresh spraints can also be used for the purpose of

[2] Effective population size – that part of a population participating in reproduction, influenced by gender ratio, pairing system, variability in the number of cubs, fluctuation in the number and overlap of generations; the effective population size in the case of larger mammal species averages only 10-30% of the population size (e.g. Frankham *et al*. 2002).

genetic analyses (Hájková *et al.* 2006).

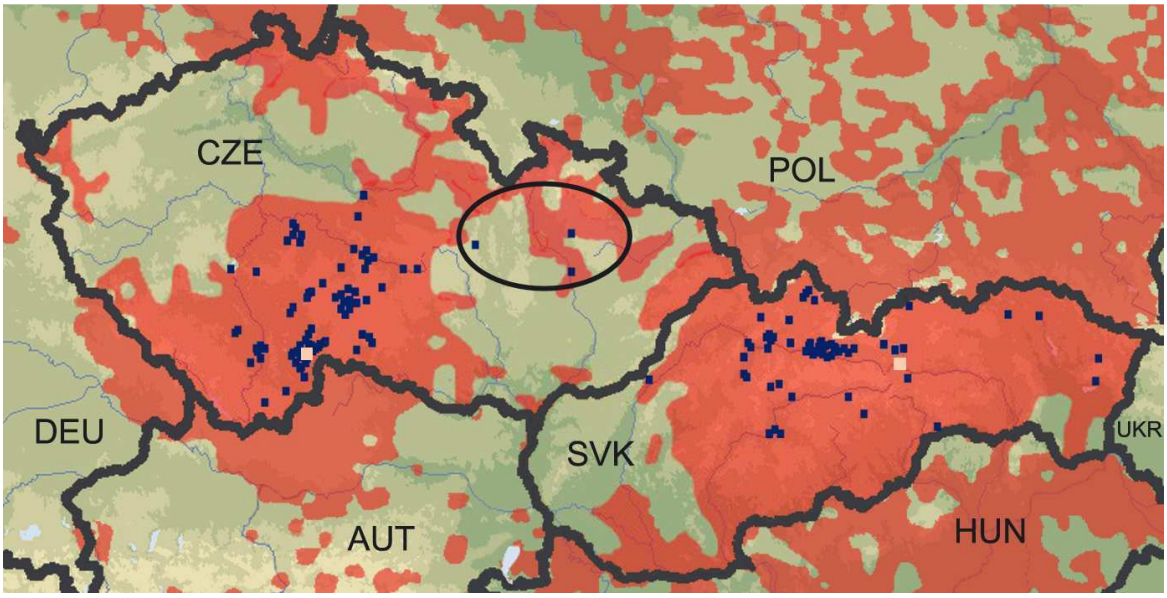

Figure 17. Distribution of the Eurasian otter in the Czech Republic and the Slovak Republic (state as in 2003, marked in red) with a marking of the localities from which material was sourced for the purpose of genetic analyses. Individuals having a specific allele of 242 bp on the locus Lut701 are marked separately (see chapter 1.6.2.2 Repatriation).

1.4 Causes of threat

A total of 101 dead Eurasian otters were collected in the Czech Republic from 1993 to May 2004 (Figure 18).

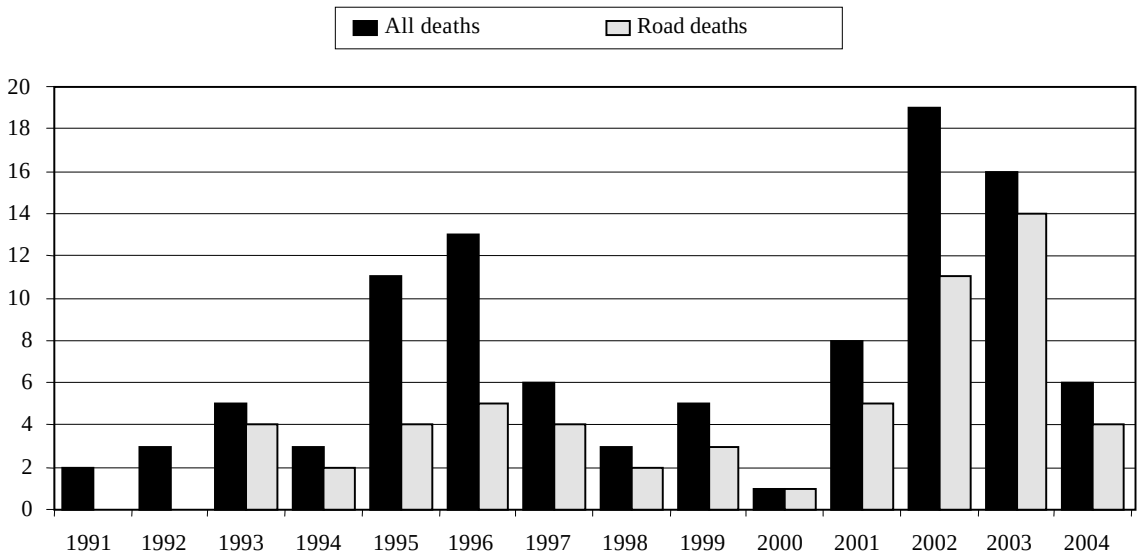

Figure18. Amount of dead individuals collected from 1993 to May 2004 (all deaths and road deaths). The peaks in 1995-96 correspond to the more extensive field work in the course of the telemetric monitoring of otters.

The obtained data was used to determine the main causes of death. More than half of all animals (58%) died as a result of being hit by motor vehicles, with the cause of death in the case 23% of the cases being unknown (no visible cause of death or impossible identification due to the body being highly damaged). Natural causes (old age, starvation, diseases) accounted for 8% of otter deaths, 6% of deaths were caused by an otter being attacked by another animal (dogs) and 5% of total otter deaths were caused by man, i.e. by illegal hunting (Figure 19).

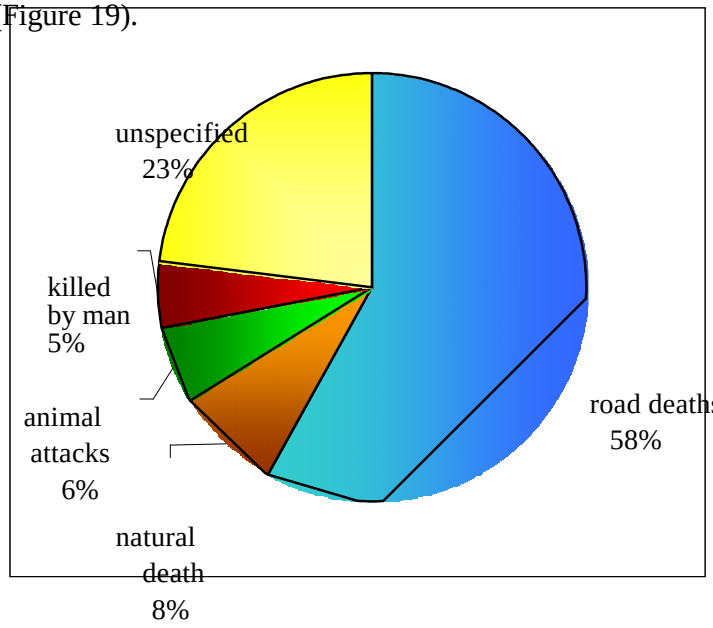

Figure 19. Percentual representation according to the cause of the death of the individuals found (n = 101). Source: Roche 2004.

Furthermore, an analysis was conducted of the age and gender structure of the deceased animals and changes in the causes and degree of death during the entire year. Otters were divided into three categories for the purpose of analysing the age structure of deceased individuals (Figure 20): juveniles (age < 0.5 years), sub-adults (0.5 – 2 years) and adults (older than 2 years). Osteological material was prepared for 24 individuals, a precise determination of their ages being made from the lower incisors, with an incision made at the root of these incisors (after decalcification) and a count made of the dentine growth layers. The age of the other animals was determined only as a ballpark figure by the overall wear and tear on their teeth (Toman 1995b). Adult individuals accounted for the largest percentage of deaths (48%), followed by sub-adult individuals (29%), with juveniles accounting for only 15% of total deaths. Males represent 57% of all deceased individuals collected (40% of which were killed on roads) and females form 31% (15% of which were killed on roads). It was not possible to determine the genders of the remaining otters.

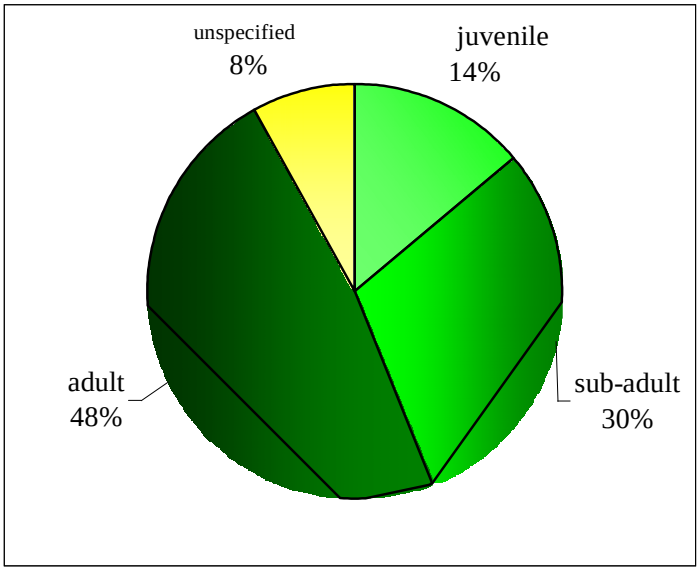

Figure 20. Percentual representation of age categories among deceased individuals (n = 101). Juvenile (juv.):< 0.5 years; sub-adults: 0.5 – 2 years; adults: > 2 years.

If we take the time of the year into account, then natural death (diseases, starvation), killing by other animals and illegal hunting are the most common causes of death in winter, in autumn and partially at the onset of spring. Two peak death periods were identified during the course of the year in the case of individuals killed by motor vehicles, with the biggest peak being from August to October and the second, lower peak, being from in spring (Figure 21).

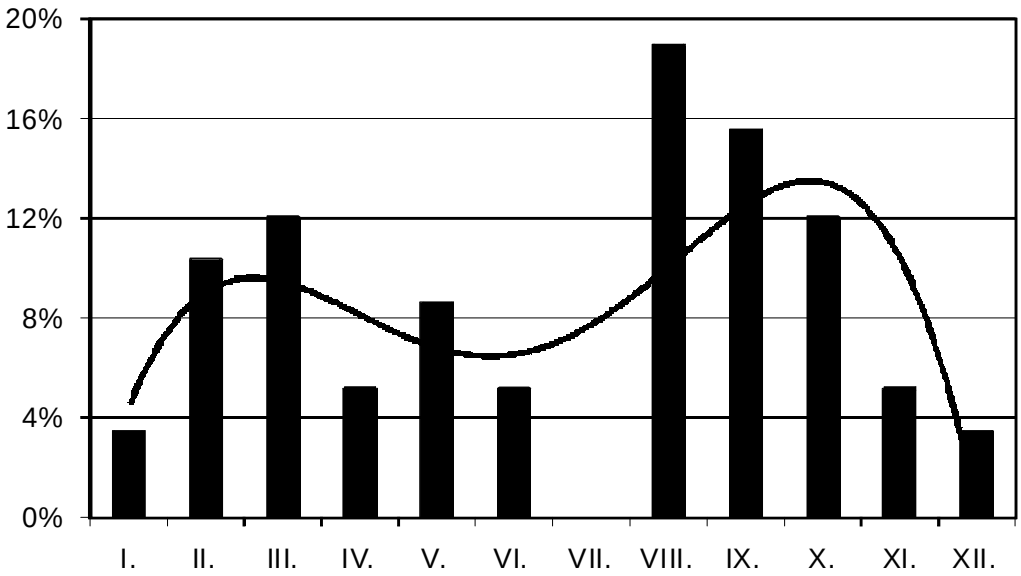

Figure 21. Representation of individuals killed on the roads during the course of the year (n = 58). Source: Roche (2004).

K, the condition index (Kruuk 1995) for individuals killed on roads is normally good; about two-thirds of all individuals found had a condition index greater than 1. The majority of the individuals found in the case of all other categories had a condition index less than 1, meaning that they were not in a good medical condition at time of death. The condition index in the case of individuals killed by man was around or above 1 (Roche 2004).

Factors threatening the Eurasian otter population were then derived from data on the mortality of otters in the Czech Republic. The significance of the threatening factors is estimated on the following scale: critical factor – its effect shall result in the species' population dying out with a high probability in the next 20 years, highly significant factor – its effect shall result in a reduction in the species' population by more than 20% in the next 20 years, moderately significant factor – its effect shall result in a reduction in the species' population by less than 20% in the next 20 years.
The results of the analysis of the threatening factors are summarised in Table 2. Illegal hunting and road deaths are the most significant factors threatening the populations of the Eurasian otter in the Czech Republic. Both of these factors are on an upward trend.

Table 2. Overview of the individual causes of threat to otters and their importance for the conservation of this species in the Czech Republic.

Cause of threat	**Importance**	**Assumed development**
Illegal hunting, pursuit	highly significant	Growing tendency
Road deaths	highly significant	Growing tendency
Decline in the number of suitable habitats	moderately significant	stagnating
Water quality	moderately significant	stagnating

1.4.1 Illegal hunting, pursuit

As the economic use of water areas increases, otters are once again starting to be perceived as competitors to man's interests. Carp farming has a long historical tradition in Central Europe, as does the pursuit of otters. The economical and political changes that took place after 1989 resulted in the economy becoming more open and the profitability of economic activities more important. A sociological survey conducted in 2002 (in the districts of Pelhřimov and Jindřichův Hradec – areas with the greatest populations of Eurasian otters) revealed an increased level of dissatisfaction among small fish farmers, sports fishermen and fishing companies with the growing Eurasian otter population. A large proportion of the respondents called for regulation or translocation of the otters, as they see the compensation available under Act No. 115/2000 Coll. as a partial solution or as no solution at all. Some respondents openly admitted that they had purposefully pursued otters or that they knew someone who had already killed an otter. Not even the knowledge that an otter is a protected animal in the Czech Republic and that their conduct is thus illegal had any power to stop them from doing so (Moravcová 2002). This threatening factor is very significant for the conservation of the otter.

Reports were also noted about the killing of otters for their furs. It is not possible to determine the precise number of otters killed by poachers. Some documented examples are given by Toman (1995d). For example, almost 20 assorted traps clearly designed to catch otters were found during 1990-2005, and in South Bohemia and the Highlands region four individuals out of 12 otters hooked up with transmitters during the course of telemetric monitoring were demonstrably killed by man. In addition, information was obtained about 15 otters processed by one naturalist from the Třeboň region during one year (Kučerová & Roche 1999). The significance of carbofuran poisoning is also on the increase in recent years. In 2006 – 2008, poisoning by this highly effective and hazardous poison was proven in a total of six otters found at random. It is highly likely that this poison was the cause of death in at least two other instances. This data suggests that illegal killing is probably one of the most significant factors endangering the population.

1.4.2. Road deaths

The results of studies in Europe indicate that the numbers of individual otters killed by transport means are on the increase in recent years (Toman et al. 1995, Sogaard & Madsen 1996, Lafontaine & Liles 2002). Increased urbanisation, a significant growth in infrastructure and the number of cars are the main causes of these deaths and can have serious consequences in areas where the otter population is low (Kučerová & Roche 1999).

The mortality of Eurasian otters caused by collisions with motor vehicles reached 58% in an assessment of the causes of the death of 101 individual otters in 1993 - 2004 in the Czech Republic. As such, road deaths appear to be the most significant of the factors that can be demonstrably monitored.

1.4.3 Reduction in suitable habitats

Besides excessive hunting, the decline in otter numbers in the 20th century was accentuated by a loss of suitable habitats (amelioration of agricultural land and regulation of water courses) and their pollution, particularly in lowlands, which led to a significant interference of the ichtyocenoses. Otter populations survived in higher altitude areas, particularly thanks to a sufficient food supply (breeding ponds), bank side vegetation and low anthropogeneous disruptive elements (Roche 2004). Bank side trees with dense exposed root systems are of particular importance to otters (Hobza 2005), particularly in the winter period and in spring, when otters make greater use of underground shelters. Furthermore, telemetric studies show that otters prefer to rest in an undisturbed environment (Hobza 2005). Radical maintenance of shore vegetation may, if of a greater extent, have a damaging impact on the biotope and worsen the conditions for the existence of the otter (directly as well as by influencing the otter's food). During the last thirty years there has been an enormous increase in the recreation use of water areas and disruptive phenomena close to rivers and water reservoirs. However, if otters have a sufficient number of safe places to rest, they are able to tolerate a relatively high level of disturbance (Green *et al.* 1984, Kranz & Toman 2000).

In view of the lower importance of this factor and its stagnating tendency, it is not necessary to adopt any special measures in this respect at the present time.

1.4.4 Water quality

In recent years many studies have been conducted on the effect of the bioaccumulation of pollutants on the decline in otter populations in Europe. The otter stands at the top of the aquatic food pyramid and so these toxic substances pose a particular threat to it. A series of various pollutants was found in the tissue of otters. Responsibility for the decline in otter populations since the 1950s is clearly borne by three main groups of pollutants: insecticides containing chlorinated hydrocarbons, polychlorinated biphenyls (PCBs) and heavy metals.

Other aspects of water quality may also have an effect on otter survival. High organic pollution may kill off the ichtyofauna and starve otters of their main source of food. Intensification of agriculture, improper management of waste from livestock production and insufficiently treated municipal waste water have contributed to a decline in water quality in recent years.

Acidification, particularly in oligotrophic mountain water courses surrounded by coniferous forests, can influence the occurrence of otters by lowering or completely eliminating fish populations (Kučerová & Roche 1999).

Measures aimed at improving water quality are currently a general priority in the environmental protection area, and so no special measures are planned in this field within the framework of the Management Plan.

1.5 Conservation status

1.5.1 Conservation status at international level

IUCN Red List: Near threatened species (NT).

Council Directive No. 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (Habitats Directive): the Eurasian otter is listed in Annex II (Animal and plant species of Community interest whose conservation requires the designation of special areas of conservation) and in Annex IV (Animal and plant species of Community interest in need of strict protection).

Convention on International Trade in Threatened Species of Wild Fauna and Flora (CITES; The Washington Convention): Eurasian otter listed in Annex No. 1.

Convention on the Protection of European Wildlife and Natural Habitats (The Berne Convention): the Eurasian otter is listed in Annex No. 2.
As a signatory to the Berne Convention, the Czech Republic is obliged, pursuant to Recommendation No. 53 (1996) of the Standing Committee dated 6 December 1996, to adopt suitable measures to protect this species.

The Eurasian otter is also indirectly protected under the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, known as the "Ramsar Convention" (mainly protecting the habitats of the otter as a species that is a member of wetland ecosystems).

1.5.2 Legislative aspects of conservation of the species in the Czech Republic

In the Czech Republic, the otter is included among the specially protected species of animals pursuant to Act No. 114/1992 Coll., on Nature and Landscape Protection, as amended by subsequent legal regulations. Implementing Decree No. 395/1992 Coll. pertaining to this legislation classifies the otter in the "strongly threatened - endangered species" category. The fundamental conditions of the protection of specially protected species are stipulated in Section 50(1) and (2) of Act No. 114/1992 Coll., and anchor, among other things, the protection of all developmental stages, natural as well as artificial homes and biotopes of these animals, ban on harmful interference with their natural development (which includes, for example, a ban on catching these animals, on breeding them in captivity, on disturbing, hurting or killing them) as well as bans on the collection, destruction, damage or relocation of their developmental stages or homes as well as bans on the holding, transportation and exploitation. This protection is also applied appropriately to dead individuals or products made from such dead individuals (Section 48(4) of Act No. 114/1992 Coll.)

Besides the special protection of the species, localities of Community Importance (Section 45a-45c of Act No. 114/1992 Coll.) have also been demarcated for the protection of the Eurasian otter in the Czech Republic in connection with the requirements of Council Directive 92/43/EEC, on Habitats. The Eurasian otter is the subject of protection (or one of the subjects of protection) in a total of 26 sites of Community Importance, which are distributed throughout the entire present-day area and include representative samples of the various types of environment (foothill brooks and streams, as well as larger water courses and fishpond areas). A number of these localities are already part of existing specially protected territories, giving them an adequate level of protection. Protection of newly-demarcated sites shall be provided for in accordance with the procedure stipulated in Section 45c of Act No. 114/1992 Coll. A complete overview of the sites of Community Importance, within the framework of which the Eurasian otter is the subject of protection, is available at www.nature.cz/natura2000.

Pursuant to Act No. 449/2001 Coll., on Game Management, as amended, the Eurasian otter is classified as an animal that cannot, pursuant to international conventions or for reason of its inclusion among specially protected animals, be hunted. Hunting is only possible if an exemption was allowed pursuant to Section 56 of Act No. 114/1992 Coll., on Nature and Landscape Protection, and a permission subsequently issued by the state game management body pursuant to Section 39 of the Game Management Act, in the case of the need to reduce the game stock due to damage suffered or pursuant to Section 40 of this legislation, in the case of hunting for scientific purposes. In view of the fact that an otter is classified as game, the other provisions of the Game Management Act shall also apply, e.g. the basic duties and restrictions prescribed for the protection of game in Section 8 and 9 of this legislation (including, for example, a ban on scaring the game in any way and disturbing it during nesting and rearing its cubs and a ban on performing other activities negatively affecting the life of the game as wild animals), as well as restrictions on the performance of certain activities or their conditionality on a permit issued by the state game management body or the hunting grounds holder – this concerns, for example, the release of game into the hunting grounds (Section 5 – requires the consent of the hunting grounds holder as well as of the state game management body), breeding in captivity (Section 7 – requires the consent of the state game management body; a special procedure is prescribed in the case of rescue stations), hunting and permission to hunt (Section 39, 40, 42, 46-48 – only persons authorised under the Game Management Act may, among other things, hunt, i.e. holders of a valid hunting licence, hunting permit and insurance) or banned hunting methods (Section 45).

As far as dead Eurasian otters is concerned (the finding of which may be an important source of information about the distribution of the Eurasian otters as well as about the structure of their population, etc.), the Game Management Act prescribes, as part of the definition of hunting rights (letter h) of Section 2), the right to appropriate dead game. However, further regulation of this issue, including the restriction on holding dead game by persons than those prescribed by the Game Management Act, or the prescription of the duty to hand in any dead game, e.g. to the hunting grounds user, is not clearly prescribed in this legislation. According to certain interpretations (e.g. Řehák *et al* 2002) and established practice, dead game is generally awarded to the hunting grounds user, with reference mostly made to Section 43 of the Game Management Act (this is a provision on searching for game wounded by shooting or another means, paragraph 3 of which prescribes that "*found game shall belong to the user of the hunting grounds from which it crossed the border* and *dead game that is found otherwise on non-hunting grounds shall belong to the user of the nearest hunting grounds*" – it is not clear whether the term dead game is understood to mean solely game that has been shot or otherwise wounded during a hunt or all dead game and to whom dead game found outside of the search area on the hunting land belongs). However, in the case of specially protected animals that are simultaneously classified as game under the Game Management Act, and thus also in the case of dead Eurasian otters, the ban on holding prescribed by law applies (Section 50(1) of Act No. 114/1992 Coll., also applying, pursuant to Section 48(4) of this legislation, to dead individuals and parts of its body). The determining factor, in regards to, among other things, the speciality of the Nature and Landscape Protection Act, is the potential decision on the exemption pursuant to Section 56 of Act No. 114/1992 Coll., by which the holding may be permitted to a specific person. However, in view of the other provisions of the Game Management Act (particularly in connection with the provisions of Section 36 and 37 on the planning of game management), information on dead individuals found must be supplied to the hunting grounds user and it is appropriate to discuss, in particular, the planned targeted search for and collect of dead individuals with the hunting grounds user in advance.

Act No. 115/2000 Coll., on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna, which came into force in 2000, enabled the provision of compensation for damage caused by the Eurasian otter to commercially farmed fish stocks, assuming that the otter was demonstrably present at the time and place of the damage being suffered. If damage was caused to fish in hatcheries, fish nurseries and rearing facilities, cage farming facilities or trout farms, compensation for damage shall be provided only if these facilities

were fenced off and any water inflows and outflows were equipped with security grills preventing otters from getting in at the time of the damage being suffered. The amount of the damage must always be documented by means of an expert opinion. However, the authority contained in Section 7(3) of the Act on the Provision of Compensation has yet to be exercised and the procedure for determining the amount of the damage is thus not uniform.

In 2006 (Act No. 130/2006 Coll.), the definition of fish for the purposes of the Act on the Provision of Compensation was widened to also cover "fish in fishing grounds" in order to expand compensation to also cover fish in water courses. Given the purpose of this legislation and the definition of damage, which pertains solely to damage to life, health or the prescribed property of persons, compensation cannot be claimed henceforth in fishing grounds, i.e. to fish in water courses, which are considered to be "no one's thing" (for more information see the Bulletin No. 9/2006 of the Ministry of the Environment).

The otter is listed on the Red List of the Czech Republic as a vulnerable species (Anděra & Červený 2005).

1.5.3 Conservation status in surrounding countries with a recent occurrence of the species

Slovak Republic: protected species, an otter is protected under Act No. 543/2002 Coll., on Nature and Landscape Protection, and Decree No. 24/2003 Coll. of the Ministry of the Environment of Slovak Republic, which already incorporate Directive No. 92/43/EEC. Classified as a species of Community Importance. Otters are considered game under the Game Management Act, but no hunting period has been set. Act No. 543/2002 and the appropriate decree also contain a section pertaining to compensation for damage caused by animals, including otters. The compensation pertains to the damage to fish stocks in ponds and fish farming facilities; the decree stipulates the need to submit an expert opinion along with the application for compensation for damage.

Germany: critically threatened species, the otter is included on the list of game, subject to year-round protection. The Federal Nature Protection Act and the Federal Species Protection Act classify the otter as a strongly/critically threatened species ("streng geschützt", in English: "strictly protected"). Both pieces of legislation also protect places of occurrence as part of the same category. An otter is classified as game under the Federal Game Management Act. It is not included in the Decree on Game Hunting Seasons, meaning that it is a year-round protected game species (since 1968).
Compensation for damage caused by an otter is only paid in the state of Saxony (see chapter 1.6.1.1).

Poland: partially protected species, the otter is subject to year-round protection - besides ponds, on which an exemption to the hunting ban is possible (Decree of the Minister of the Environment of 28 September 2004 on the protection of wild species of animals).

Austria: threatened species; in most federal states the otter is classified as game, without a hunting season permitted, or is protected by the Nature Protection Act.
The otter is not protected at the national level, with nature protection fully within the authority of the individual federal states. In most federal states (Burgenland, Carinthia, Lower and Upper Austria, Salzburg), the otter is classified in the Game Management Act as game without a hunting season. In other states (Styria, Tyrol, Vorarlberg, Vienna) it is protected by the Nature Protection Act and simultaneously classified in the Game Management Act as game without a hunting season.

Red lists:

Slovak Republic: classified in the category VU = "Vulnerable" – vulnerable species (Žiak & Urban 2001)

Germany: this species is classified on the Red List in the most threatened category 1 – in danger of extinction, "vom Aussterben bedroht" (Binot et al. 1998)

Poland: the otter is not classified on the Red List (Glowacinski 1992)

Austria: classified in the category VU = "Vulnerable" – vulnerable species (Zulka 2005)

1.6 Existing measures for the conservation of the species

At the beginning, the protection of otters in the Czech Republic was mainly aimed at ascertaining the current distribution of otters in the Czech Republic and the biology of this species. Along with the sourcing of this data, significant effort was made to manage the breeding and rearing of this species in captivity. The knowledge gained was then used in the course of the subsequent repatriation in North Moravia. Ever greater emphasis has been placed on education and resolving the conflict arising between the protection of the Eurasian otter and the commercial interests of fishermen in recent years, in connection with growth in the distribution range and the increasing population (Poledník & Poledníková 2006).

At present, the protection of otters is namely coordinated by the ANCLP centre in Havlíčkův Brod, the Pavlov Fauna Protection Station attached to the ANCLP CR (hereinafter referred to as the Fauna Protection Station), and by the Czech Otter Foundation Fund (hereinafter referred to as the Foundation Fund). Research is conducted chiefly by the organisation ALKA Wildlife, o.p.s. and the Institute of Vertebrate Biology of the Academy of Sciences of the Czech Republic in Brno.

Measures implemented in this country in the past for the protection of the species rank the Czech Republic among the countries with an elaborate and systematic protection of otters. Nevertheless, it is still possible, particularly by employing methods and programmes already operating in other countries (e.g. Germany and Austria), to achieve significant advancement.

1.6.1 Non-specific protection

1.6.1.1 Non-specific protection of the species abroad

Germany, Saxony: Agro-Envi programme

The programme is abbreviated to "NAK" (Naturschutz und Erhalt der Kulturlandschaft - Conservation of Nature and Preservation of the Cultural Landscape), is part of the programme abbreviated to "UL" (Umweltgerechte Landwirtschaft – Ecological Agriculture). The objective of the programme is the re-use of fallow land in an environmental friendly manner, arranging for the use of cultural landscape in a manner friendly to the conservation of nature and support of activities preventing reductions in biological diversity.

The NAK programme contains a set of measures for meadows, breeding of sheep and agriculture and the "conservation of threatened ponds, of importance from a cultural and historical aspect". The programme was announced pursuant to Decree (EC) No. 1257/1999 (EAGGF). The EAGGF fund covers 75% of the programme's costs. The contract is announced for a period of five years and contains a list of instruments to which the operator commits. The fundamental instrument for ponds is solely the necessary maintenance of the ponds (includes not interfering with shore vegetation, except for levees, not using disinfection and biocides, not using granules as additional feed,

banning sports fishing, not clearing submerged vegetation, preserving wild fish species, banning the breeding of the grass carp, and the like.). The amount for this fundamental instrument is Euro 200/ha/year. If this instrument is met it is possible to apply for supplementary instruments, which include the creation and maintenance of pond structures, the non-stocking of fish, abstaining from extra feeding, not letting the pond go dry for several years, immediate filling of pond after haul, filling of pond after winter period, stocking of fish for winter, determination of the haul and filling of pond, determination of the fish stock, as well as "support of the food source for protected animals". The instrument mentioned last is also known as the Otter Bonus, in view of the fact that it practically pays off only in respect of the otter. The Otter Bonus may, in exceptional cases, also be applied for even without the fundamental instrument. The amount for this instrument is Euro 103/ha/year.

System of compensation for the event of losses caused by restrictions ensuing from governmental decrees in Saxony

Damage is compensated by the state or the city, depending on which decree the restrictions ensue. In the case of the otter, this is compensation for damage to wild animals, which are included in the Game Management Act, as well as for restrictions consisting of the regulation of the species for reason of its protection. Compensation of damage is limited by the amount of the damage (with only damage above a certain amount being compensated). Compensation for damage is only paid to professional companies.

Support of preventive measures against damage caused by otters in Bavaria

There are two legislative decrees in Bavaria pertaining to the support of preventive measures against otters. The first of these is the directive on the support of fish farming pertaining to commercially utilised ponds of the Bavarian Ministry of Agriculture, according to which it is possible to obtain financial support for as much as 30% of the total fencing costs. The second of these is the directive of the Bavarian State Ministry of the Environment, Public Health and Consumer Protection on the support of measures for the conservation of nature and species, according to which support of up to 70% of the total fencing costs may be provided to private entities, associations, etc.

System of compensation operating in Lower and Upper Austria

A system of compensation exists in Lower Austria, but it is not based on any legislative duty, and is thus purely voluntary in nature. Finance is provided in part from the ÖPUL programme (Österreichisches Programm für eine umweltgerechte und den natürlichen Lebensraum schützende Landwirtschaft - Austrian Ecological Agriculture Programme) and in part from the landscape fund. Compensation is paid only in respect of ponds, not in respect of flowing water courses. Participants of the ÖPUL programme must use more than two (2) hectares of ponds. The ÖPUL programme supports extensive farming, and so participants must adhere to certain conditions.

The possibility of financing damage on water courses is currently under discussion in Upper Austria, on the condition that the presence in the relevant year of a female with cubs is demonstrated.

Compensation for damage caused by otters in the Slovak Republic

This issue is regulated by Act No. 543/2002 Coll., on Nature and Landscape Protection, and the appropriate Decree No. 24/2003 Coll. The compensation pertains to the damage caused to fish stocks in ponds and fish farming facilities. The extent of the claimed damage is documented by means of an expert opinion. The application is submitted to the competent nature and landscape body. No applications were submitted in 2003 (the first year of the decree's validity), with only a single application being submitted in 2004, and settled in full. Three applications were submitted in 2005, two of which were settled, and in 2006 two applications were submitted. No applications were submitted in 2007 (Tab. 3).

Table 3. Overview of the applications for compensation of damage caused by otters in the Slovak Republic.

Year	Region	Compensation in SKK	Notes
2004	Žilina	38,626	1 application
2005	Trenčín	0	1 application, damage claims were not awarded
	Žilina	38,062	
	Prešov	157,820	1 application
2006	Žilina	93,690	1 application, together with cormorant
	Žilina	36,683	1 application

Territorial protection of Eurasian otter sites under the EU NATURA 2000 network

In EU states the Eurasian otter, as a species listed in Annex II. of the Habitats Directive, is the object of protection on Natura 2000 sites.

1.6.1.2 Non-specific protection of the species in the Czech Republic

Building of underpasses

Otter mortality caused by motor vehicle traffic is one of the main causes of threat to the otter population at present. Collisions occur at the point where a road intersects a water current, where a bridge does not permit otters to go underneath a road, or in places where footbridges were constructed in an unsuitable manner (Toman 1995b).

Two methodologies for permitting otters to overcome line barriers were compiled and made public in a publication of the ANCLP CR on the basis of knowledge gathered from a monitoring of the dead animals (Toman et al. 1995, Hlaváč & Anděl 2001). The ANCLP CR also submitted a contribution to a pan-European publication on the issue of the fragmentation of the environment by line structures (Iuell *et al.* 2003). At the present time, all new road and freeway projects are designed in accordance with this methodology.

The construction of five footbridges and fencing was completed from 1997 to 2000 on the initiatives of the ANCLP CR and the Czech Otter Foundation Fund in South Bohemia and another two underpasses in the Highlands region (on the Majdaléna – Lomnice nad Lužnicí section of class I road no. 150, on the Veselí nad Lužnicí - České Budějovice section of class I road no. E55, and on the Telč – Dačice section of class II road no. 406). All of the underpasses were subsequently monitored and their utilisation was evaluated. Otters started to use the footbridges almost immediately following their installation and the number of cases of otters crossing roads declined to a minimum. In addition to otters, the underpasses were also used by other stoats. No subsequent otter deaths were reported at the locations where the underpasses were constructed. These underpasses were financed by the Czech Otter Foundation Fund, the Landscape Management Plan (CZK 12,000 per site) and directly by the investor pursuant to the request of the ANCLP CR.

Evaluation:

The issue of overcoming linear barriers was compiled very thoroughly, with its subsequent implementation into practice being important. Data from the monitoring of the locations at which underpasses were constructed also indicates the positive impacts of these measures on an overall reduction in the number of otters killed on roads. Nevertheless, it is necessary to continue with the implementation of these activities into other areas settled by the otter in recent times in response to expansion of Eurasian otters into other regions of the Czech Republic.

The lack of the regular maintenance of the underpasses constructed must be evaluated negatively, as this fact could make these structures ineffective or could, in a worse-case-scenario, actually lead to the underpass becoming dangerous (an animal gets on a road through a hole in a

fence and is then unable to find its way back).

Act No. 115/2000 Coll., *on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna*

Act No. 115/2000 Coll., on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna, came into force in the Czech Republic in 2000. The purpose of adopting this piece of legislation was to raise the acceptance on the part of economic entities of the presence of conflict species in the landscape and to keep any possible collisions to a minimum (demands for hunting or illegal hunting itself) by providing financial compensation for damage caused. Under this legislation, compensation is provided for damage caused by Eurasian otters to commercially farmed fish stocks in ponds, hatcheries, fish nurseries and rearing facilities, cage farming facilities or trout farms. Compensation is not paid for damage caused to fish stocks in flowing water courses. Compensation for damage to fish can only be provided upon the meeting of the following conditions: a) if the otter was demonstrably present at the time and place of the damage being suffered; b) if damage was caused to fish in hatcheries, fish nurseries and rearing facilities, cage farming facilities or trout farms, compensation for damage shall be provided only if these facilities were fenced off and any water inflows and outflows were equipped with security grills preventing otters from getting in at the time of the damage being suffered. As part of an amendment of the Act on Farm Animal Breeds (Act No. 130/2006 Coll.), an amendment was also made to the Act on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna, by the widening of the definition of fish to also cover "fish in fishing grounds". However, another provision of the legislation prohibits the application of compensation for damage in the case of fish in fishing grounds, or in water courses, as the case may be (see also chapter 1.5.2). The amount of the damage must always be documented by means of a professional opinion or an expert opinion. Professional opinions were hitherto mostly compiled by the ANCLP CR or by the Czech Otter Foundation Fund, but it will clearly not be possible to sustain this state of affairs as the number of applications grows.

Evaluation:

The following assessment of the influence and functionality of Act No. 115/2000 Coll. is based on an analysis of the applications submitted for the compensation of damage and two sociological surveys conducted by means of questionnaires and interviews in 1998 (prior to the introduction of the Compensation Act - Kranz 2000) and in 2004-6 (after the introduction of the Compensation Act - Culková 2007).

A total of 986 applications were submitted from 2000 to April 2008. Compensation in excess of CZK 38 million has been paid out to date (Tab. 4).

Table 4. Total overview of the applications for compensation and amounts actually awarded in the period from 2000 to April 2008.

The data for the purposes of the thesis (Culková 2007) was sourced directly from the individual regional authorities for the 2000-2008 period. Data for the Highlands could not be sourced for the 2000-2002 period (the ballpark figure gives a total of 14 compensation payments made).

Year of payment	No. of applications	Amount awarded (in CZK)
2000	0	0.00
2001	28	2,300,000.00
2002	65	3,200,000.00
2003	85	4,487,000.00
2004	137	4,967,000.00
2005	142	6,166,200.50
2006	208	7,648,438.00
2007	220	6,425,464.50
2008	101	3,335,195.50
Total	**986**	**38,529,298.50**

Table 5. Overview of the applications for compensation and amounts of compensation actually awarded, classified by individual regions (amount for the period from 2000 to April 2008).

Region	Number of applications	Amount awarded
South Bohemia	647	32,575,421.50
South Moravia	1	17,000.00
Liberec	2	9,024.00
Moravia-Silesia	5	153,130.00
Pardubice	12	104,484.00
Pilsen	3	18,756.00
Central Bohemia	21	201,365.50
Ústí	1	10,886.00
Highlands	294	5,439,231.50
Total	**986**	**38,529,298.50**

It is evident from the number of applications that only a very small proportion of the pond owners have applied for damage compensation hitherto. Even though it can be assumed that the greatest amount of applications will come from the South Bohemia and Highlands regions, which corresponds, the low number of applications from the other regions is almost bewildering. Most of the amounts awarded seem to be sufficiently high and most of the applicants submit another application within another deadline.

The effect of the introduction of Act No. 115/2000 Coll. can also be seen by comparing two sociological surveys conducted by means of questionnaires and interviews in 1998 (prior to the introduction of the Compensation Act - Kranz 2000) and in 2004-6 (after the introduction of the Compensation Act - Culková 2007). According to the survey conducted in 1998 (Kranz 2000), regulation of otter numbers was considered by most fishermen (74%) as the best method for resolving the conflict. Furthermore, there were calls for the introduction of a system of damage compensation. The second survey (Culková 2007) was conducted four to six years after the introduction of Act No. 115/2000 Coll., on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna. Despite the wide-ranging knowledge of the said legislation (with 100% of the fishing companies, 95% of the representatives of the local organisation of the Czech Anglers Union, and 73.3% of the private fish farmers being aware of this legislation), only a surprisingly small group of fishermen took advantage of the possibility to receive compensation under this legislation (72.2% of the damaged fishing companies, 24% of the local organisations of the Czech Anglers Union, and 10% of the private fish farmers). Most of the respondents continued to hold the opinion that this legislation only addresses the problem of damage partially and that it should be supplemented by regulation of otter numbers. Also of interest is the fact that even respondents already having taken advantage of the provisions of this legislation did not (except for one exception) see it as being the full solution to the problem: a third of them actually thought that this legislation does not resolve anything.

From the above it can thus be assumed that the reason for the limited use of the system of damage compensation is not insufficient compensation and the administrative burden connected with the submission of applications, but rather ignorance of the applicable legislation, and possibly the a priori scepticism vis-a-vis this legislation and also interest in fish rather than financial compensation. It is thus necessary to raise the level of awareness among the fishing community as far as this legislation is concerned as well as providing assistance in completing the first application.

It can be stated, on the basis of experience gained to date with the application of the legislation as well as on the basis of the above-mentioned findings, that this legal regulation has not meet the original expectations in the case of Eurasian otters, both on the nature conservation part as well as on the part of the farming entities. One of the serious deficiencies of this legislation is the

fact that the damage caused by fish-eating predators cannot be clearly determined and expressed in numbers (it is only an expert estimate). Damage to fish stocks is determined by means of expert or professional opinions, which may exhibit various degrees of subjectivity. Furthermore, the construction of the legislation itself, particularly from the procedural viewpoint (the procedure required to report damage, etc.) does not correspond to the character of the damage arising due to the foraging activities of Eurasian otters (recurring, de facto continuous consumption of fish from various sources within a range). Clearly, in view of the difficulty of determining the damage actually caused to a specific fish farming facility, a more appropriate instrument for compensating the damage caused by Eurasian otters would be the creation of a subsidy entitlement providing a contribution to fish farming entities in the area of occurrence of Eurasian otters, without the need to provide further proof of the factual damage. In order to eliminate the risks of subjectivity in the evaluation of damage to fish stocks it would be necessary to at least prescribe a uniform procedure for determining the amount of the damage (include the method of determining the amount of the damage in an implementing decree on the basis of the authority, yet to be exercised in respect of fish, contained in Section 7(3) of the Act on the Provision of Compensation).

Education

Pavlov Fauna Protection Station attached to the ANCLP CR

The Fauna Protection Station (FPS) in Pavlov near Ledeč nad Sázavou was founded in 1988 as a specialised facility for the protection of Eurasian otters in the Czech Republic. The rearing of rescued otters and their subsequent repatriation was performed until 2003. Currently, the FPS (beside its other activities) is caring for handicapped otters – most frequently for orphaned cubs. The FPS is the only state-operated rescue and rehabilitation station for injured animals. It is also currently the only facility of this type equipped to care for this species. The FPS is open daily to the public from May to September. Moreover, it can also be open upon prior agreement being over the telephone. Inspections of the station, with professional commentary by a guide, supplemented with instructional boards around the facility. The main attraction of the station is the opportunity to see otters in natural runs. Several secondary and tertiary students (mostly from the fields of environmental protection or agriculture) complete their practical experience at the station every year. The station is visited by around 3,000 - 5,000 visitors annually (e.g. 4,391 fee-paying visitors in 2007, with the maximum attained in the past years being 6,000). Weekend and vacation stays, as well as lectures, are regularly organised for youth, with the centre also being represented at exhibitions (e.g. the Czech Anglers Union Humpolec 2008 annual exhibition). In addition to contact with the public made at the FPS, the station's employees also speak to several thousands of other people annually.

Aside from these activities, the FPS also participates in the preparation of specialist as well as popular-educational seminars and get-togethers on otter protection (e.g. a seminar for the staff of regional authorities involved with the compensation of damage, a seminar for civil servants employed by municipal authorities of municipalities with extended competencies of delegated state administration – 2008). A seminar on otter research and rescue was held at the station in 2006, 2007 and 2008 in co-operation with the Czech Otter Foundation Fund, attended by experts from various countries, including the Slovak Republic, as well as by students and state administration representatives (ANCLP, regional authorities). A component of the educational work that cannot be left aside is the station's influence on the conflict group of fishermen directly in the field in the course of the compilation of opinions for the purposes of Act No. 115/2000 Coll., and co-operation with the media.

The FPS has been issuing, in co-operation with its Slovak colleagues, the Bulletin Vydra magazine (the latest issue being 14/2007). This magazine contains articles pertaining not only to research but also to the protection of and support for otter populations in the Czech Republic and the Slovak Republic.

The FPS is also involved in international co-operation, participating in the organisation of and presenting its activities most recently at the 25th Mustelid Colloquium, Třeboň 2007. The service participated in the preparation of the Czech-German seminar on aquatic ecosystems, a

large part of which was aimed at the otter, held in Mauth, Germany (April 2008). A German-Czech exhibition titled "Otter trails into Upper Franconia" was installed at the station in autumn 2008, with the FPS being responsible for this exhibition's Czech tour until May 2008.

Czech Otter Foundation Fund

The Czech Otter Foundation Fund (COFF) created and presents a touring exhibition titled "The Eurasian otter – a mysterious lady of waters and wetlands", which has a permanent exhibition in two places. This exhibition was visited by over 25,000 people in 2002 – 2007. A new exhibition, titled *"G'day Otter! /* Čus vydrus!*"*, was created in 2006 in co-operation with a division of young conservationists from Třeboň. This exhibition attained popularity particularly with the young generation, mainly on account of the form (comics) and humour it employed. The Foundation Fund gives lectures throughout the country on the "Eurasian otter and its conservation" for students of primary and secondary schools. The Foundation Fund is currently also holding lectures at schools on selected species of carnivorous animals, on important avian species of Czech fauna, or on ordinary animals living unnoticed all around us. These lectures have been attended by over 8,000 children since 2000. The organisation also holds lectures for adults at the Třeboň spas.

Between 1998 and 2007, the Foundation Fund published brochures and a series of fliers providing information on the biology and protection of Eurasian otters, on the issue of damage caused by the otter and the conflict between the otter and the fishing industry.

These materials are offered predominantly to the fishing community. The Foundation Fund also issued a so-called "Otter Package" – an instructional set for students of various age categories. The organisation, in co-operation with the Třeboň Region PLA Authority, conducts field ecologic education programmes in Hajnice u Mirochova. Two circuits are prepared for school classes: "Via the Otter's Trail" and "Via the Moose's Trail". A Protection Station for Injured and Handicapped Animals attached to the COFF in Třeboň was also established, with school-aged children as well as the general public having an opportunity to look at the station's patients.

The COFF also holds regular seminars on the topic of: "Experience with compensation for damage caused by the otter", during the course of which an explanation is given of the methodology for calculating the damage, the legislative framework, with room being provided for discussions with the participants. During the course of these seminars emphasis is also placed on the American mink and connections with its expansion in the Czech Republic. These seminars are attended mainly by state administration employees, fishermen and gamekeepers.

The COFF, together with the Highlands Regional Authority, held a conference in July 2005 titled Fishing in the Highlands region, with the participation of ANCLP Havlíčkův Brod, one of the main points of which was the presentation of Act No. 115/2000 Coll., on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna, and familiarisation with the biology of Eurasian otters. Other seminars on this issue were organised by the COFF, in co-operation with the Ministry of the Environment, in 2001, 2003 and 2006 for representatives of district and regional authorities.

In 2006, the COFF launched a new website (www.vydry.org), where nature lovers, students, as well as gamekeepers, fishermen and state administration employees can find a great deal of information on the biology of the otter, as well about the otter and fishing issue, with an instruction manual on how to obtain compensation for damage caused by otters, etc. The website of the Czech Otter Foundation Fund and the website of Krasec, the Regional Network of Environmental Centres (www.krasec.cz), also have an on-line advisory service pertaining to the issue of compensation for damage. Some questions are also published in the periodical called "14 days" in the South Bohemia region.

The otter is presented in regional as well as nationwide press, in television programmes as well as radio broadcasts, seminars are held on the topic of damage compensation for the relevant regional authorities and the current state of the otter population is also regularly mentioned at specialist conferences.

Evaluation:

In recent years, the education aimed at the protection of otters in the Czech Republic was aimed mainly at two target groups: school-aged children and fishermen. An objective evaluation of the campaign's influence on children is not possible; nevertheless, from experience gained abroad as well as from the ever-increasing number of schools taking part in the education lectures, the positive and ever-expanding influence of education on this target group can be assumed.

Partial evaluation of the education campaign's influence on the fishing community can be detected by comparing the sociological surveys in 1998 (Kranz 2000) and 2004-6 (Culková 2007).

According to the survey from 1998 (Kranz 2000), the otter was considered as the species most often causing damage (72% of the fishermen). The actual consumption of fish by the otter was not considered a serious problem; far more serious is, according to the fishermen surveyed, the secondary damage to fish as a result of stress during the period of hibernation (50% of the fishermen) as well as the excessive killing of fish (27% of the fishermen).

According to the second survey conducted in 2004-6 (Culková 2007), the losses caused by the disruption to fish during the winter period and the so-called "hunting for fun" continue to be considered the most sensitive losses. Only a minority of the respondents (27%) employ some recommended form of protecting the fish from damage. Most of the respondents consider the proposed preventive measures to be insufficient, or claim that their implementation is too expensive (e.g. electric fencing and surround) and request state subsidies.

Regulation of otter numbers was one solution continuously proposed within the framework of both surveys for the ever-increasing damage caused by the otter (74% of the respondents - Kranz 2000, and 88% of the respondents - Culková 2007, respectively). The Act on Damage Compensation was thus considered to provide partial or no solution (92% of the respondents – Culková 2007). A total of 83.5% of fishermen knew of, or rather, were aware of the existence of the legislation up till 2004; nevertheless, only 33.3% of fishermen suffering damage utilised this legislation (Culková 2007).

1.6.2 Specific protection

1.6.2.1 Measures implemented abroad

This chapter contains examples of the specific measures for the protection of Eurasian otters, which were or are implemented in various European landscapes. They include, for example, action plans (operating or in the process of preparation) and various other projects.

Action Plan for the otter in the Slovak Republic

The "Action Plan for the Protected Threatened Eurasian Otter *Lutra lutra* (Linneaus, 1758)" was approved in January 2002 in the Slovak Republic for a period of five years. The programme consists of three chapters: (1) analysis of the current state, including the existing distribution, biological and ecological requirements, threatening factors and an evaluation of the existing provision for protection, (2) framework principles of protection, and (3) proposal of the measures for improving the state or eliminating the cases of the threat. This last part contains recommendations pertaining to legislation, practical care for this species and its biotope, monitoring, education and co-operation with the public. The programme emphasises the need for constant monitoring and research, elimination of the excessive mortality of individual otters in collisions with transport means, elimination of the negative interferences into the biotopes and illegal hunting. A new Action Plan is now prepared for the otter in the Slovak Republic for 2008 to 2013, which has yet to be approved by the Ministry of the Environment of the Slovak Republic.

Action Plan for the otter in Saxony

The fundamental objectives of the plan are the protection of the species in the core area, reduction of conflict with fishermen and support of the repatriation of the otter to the foothill and mountain areas. Protection of the otter population in Saxony is of pan-German and pan-Community Importance from the aspect of the expansion of otters to neighbouring federal states of Germany, where the otter has become extinct, and for linking with the populations in the Czech Republic and Bavaria. The preparatory phase consisted of research and supplementation of missing information (distribution, habitat utilisation, and food and threatening factors). This research formed the basis for the drafting of directives for the compilation of a detailed plan for the protection of the species.

Action Plan for the otter in Great Britain

The Eurasian otter population declined rapidly in Great Britain between the 1950s and 1970s, as it had in most of Europe. The otter had disappeared completely from the central and south-eastern parts of the country by the end of the 1980s. At present there is a strong population in Wales, southwest England and Scotland, with the decline in numbers halted and the otter is returning to some of its original areas of occupancy.

The main cause of threat of the otter in the Great Britain is considered to be pollution of the water and the related lack of food, inappropriate types of biotopes alongside shores and deaths on roads and in traps for freshwater eels. The Action Plan for the otter has been operating since 1995 and its main long-term objectives are: maintaining the existing otter population in Great Britain, expanding this population and renewing the viability of the otter population in all catchment area s and bank side areas where otters were reported to live since 1960, that being until 2010.

A whole series of local projects (e.g. inclusion of otter protection into plans for the Management Plans for the individual catchment areas and bank side areas) is conducted within the framework of this Action Plan, but effort is of course also made to co-ordinate the individual activities, exchange of information, publicity and research. It is this research together with the monitoring activity that forms one of the most important components of this Action Plan.

Action Plan for the otter in Italy

Despite improvements in the state of the Eurasian otter populations in most of Europe, this species is still listed as critically threatened in Italy. In the 1980s, otters became extinct in the north and most of the central part of the country, with recent estimates of otter abundance mentioning only about 300 individuals. Furthermore, the Italian population is markedly fragmented, with the main areas of occurrence at the moment being Camparia (Cilento and Vallo di Diano national parks) and Calabria and Basilicata (Pollino national park). For this reason, the Italian Ministry of the Environment authorised the government agency INFS (Instituto Nazionale per la Fauna Selvatica) in 2006 with the task of co-ordinating the national action plan for Eurasian otters. The action plan is being realised in co-operation with the University of Molise and other experts, in particular teams from the main area of otter occurrence – the Cilento and Vallo di Diano national parts. The project is aimed particularly at the following aspects: compilation of maps depicting the current distribution of otters in Italy, review of the available literature, evaluation of the main causes of threat, creation of a website to provide up-to-date information about dead otters found, evaluation of the suitability of habitats using maps and computer models, assessment of the most critical areas from the viewpoint of protection, issue of protocols with standard instruction manuals for the monitoring, catching, autopsy and rehabilitation of injured individuals, or rearing programme.

Otter repatriation project in the Netherlands

Otters became extinct in the Netherlands in 1988. Since that time, many local organisations have joined forces in an effort to return this species to Dutch nature. Various significant research projects were conducted as part of these efforts and the natural habitat of otters was also improved – there was, for example, an improvement in water quality, underpasses were constructed for the animals

on problematic sections of roads and preliminary agreements were concluded with fishermen on preventing otter deaths in fishing nets. However, despite these improvements, the prevailing opinion was that it is very unlikely that the otter will re-occupy these suitable areas of the Netherlands spontaneously within approximately the next 50 years. For this reason, a project was approved in 2002 for the repatriation of the otter into five areas: Weerribben, Lindevallei, Rottige Meenthe, Wieden and Oldematen. The animals that were released came from various European countries (Belarus, Sweden, Czech Republic, Latvia, Germany, Russia, Poland), mostly originating from the wild, but with some individuals also originating from captivity. The first seven animals were released into the Weerribben National Park in July 2002. A total of 29 otters were gradually released until 2008 as part of this project. Each animal was subject to quarantine and a veterinary inspection to check for parasites, DNA samples were taken and a transmitter for telemetric monitoring purposes and an ID chip were implanted prior to release. This enabled the released animals to be monitored in detail for approximately one year after their repatriation and the identification of any dead animals found. An important component of the project is genetic monitoring – DNA analyses of the spraints, which enable the individuals to be monitored after the transmitter ceases to operate, the discovery of newborn individuals in the area and the identification of their parents and monitoring of the population's genetic state. It is estimated that the repatriation area's current population abundance is at least 35 animals, which is essentially equal to the range's full occupancy. A high reproduction rate has also been noted – with approximately 90% of the females giving birth every year. But the problem is the high mortality rate, particularly on roads – e.g. six animals were killed by motor vehicles between October 2007 and March 2008. Average annual mortality is estimated at 24% (Lammertsma *et al.* 2006). Another problem of the repatriated population is the considerable degree of inbreeding – with a mere six individuals participating in the reproduction process out of the 23 animals released during the first phase of repatriation. This has resulted in low genetic variability and a low effective population size (only five individuals in October 2007). It thus seems necessary to continue to bolster this population by releasing new animals.
Up-to-date information about this project is available at http://www.otter.wur.nl/UK/Latest+news/.

1.6.2.2 Measures implemented in the Czech Republic

Breeding of otters in captivity

Three facilities are currently being used to breed otters in the Czech Republic – the Pavlov Fauna Protection Station (FPS), the Ohrada Zoo near Hluboká nad Vltavou and the Jihlava Zoo. However, from the aspect of the species' protection, only the breeding facility in Pavlov is significant, which was, for example, a source of the individuals released as part of the repatriation in North Moravia (see below) and which still endeavours return to the wild most of the animals it receives.

The station was completed in 1994 (Toman 1995a). Today, it operates several programmes of species protection, but its fundamental programme has, since its establishment, been the "Protection programme for the Eurasian otter". A total of 56 animals from the wild were received from 1992 to 2004. Most of the cubs came from the South Bohemia region (71%), followed by the Highlands region (23%), two animals came from the South Moravia region, two animals from the Beskydy Mountains and one animal from the Slovak Republic. These were injured or weakened animals, or abandoned or confiscated cubs. Another 12 animals were reared in breeding facilities. Almost 50% (31 individuals) were returned to the wild, mostly as part of the repatriation programme in North Moravia, with six adult individuals remaining part of the station's breeding stock. Four animals were provided for repatriation projects in the Netherlands, two in Germany and two are part of the breeding programme at the Ohrada Zoo.
In the 2005 – 2008 (July) period, the centre received 18 animals from the wild, one animal was imported from Poznan Zoo, and two animals were reared in the breeding facility. The station is

currently (as at December 2008) caring for seven adult and two juvenile individuals.

The FPS is involved in the European Endangered Species Programme (EEP) for the Eurasian otter, with line A animals (animals from the wild who could not be returned to the wild because they have lost their timidness) being placed into countries such as Germany, Austria and Denmark in 2005-2008 as part of international co-operation.

Besides the rearing and rehabilitation of weakened individuals, a study of the otter's biology, behaviour and food preferences is also being conducted at the station (e.g. Poledník 1998, 2000, 2007, Platilová 2000, Mitrenga 2005, Větrovcová 2006, Zejdová 2007, Černý 2007, Zemánek 2008).

The breeding and reproduction of otters in captivity can be considered as successful, and the existence of such a station in the Czech Republic is very important from the aspect of the future. That means both from the aspect of the need for individual animals for research purposes (particularly in the area of research dealing with the problem of damage) as well as from the aspect of the rehabilitation of abandoned or injured cubs or injured adult animals found in the wild.

Repatriation of Eurasian otters in North Moravia

Repatriation in North Moravia was conceived on the basis of knowledge of the otter's distribution and the fact that it is desirable to arrange for the linking of the South Bohemian population with the strong "Eastern European" population, so that genetic variability does not decline in the future. The "stepping stones" method will be employed to progressively link up the otter populations in Europe, which are currently distributed in an island format. The repatriation was mentioned and planned, in a framework manner, as part of the internal material of the Czech Nature Protection Authority (CNPA) titled the "Protection programme for the Eurasian otter in the Czech Republic". The objective was to create a viable population in a suitable habitat, thereby increasing the probability of successful migration and providing for the gradual linking, in the long-term, of the individual population territories.

The project comprised of three phases:

1. Preparatory phase (1994-1997):

The actual repatriation was preceded by detailed, extensive and long-term preparation, mainly comprising of selecting the most suitable release area, evaluation of the causes of extinction of the original population and a thorough evaluation of the state of the habitat from the aspect of the otter's requirements (Hlaváč 1995).

Information about the distribution, abundance and population density of otters in certain areas of occurrence was obtained in the years prior to repatriation. Basic data on the otter's social behaviour and habitat utilisation was obtained using telemetry. Knowledge about the otter's foraging was of a very good standard (diet study from the Třeboň region and the Highlands region – see chapter 1.3.3), as was knowledge about reproduction, thanks to experience from the breeding facility. At present, no natural otter predator exists in the elected area. The otter is a natural predator at the top of the food pyramid for the ecosystem to which it will be repatriated (oligotrophic mountain and foothill water courses), having its niche in and irreplaceable importance for this ecosystem.

It is evident from historical sources that the receding of the otter population from the Jeseníky Mountains dates back to as early as the end of the 19th century and was mainly linked to the destruction of water courses and the collapse of fish stocks due to pollution from the paper and textile industries and the floating of timber along water courses. Most of these types of plants were no longer in operation at the end of the 20th century, or were equipped with adequate cleaning equipment.

Furthermore, an analysis of the habitat of all larger water courses in the area was conducted from the viewpoint of each water course's condition of preservation, condition of shore vegetation, trafficability of the water course for the otter, its sustainability and the fish stock's burdening by foreign substances. This data was entered into map source documentation and evaluated. An area

for experimental repatriation was subsequently selected on the basis of this evaluation.

A socio-economical study was not conducted, but the intention of the repatriation was consulted in advance with the most affected interest group - sports fishermen. The Czech Anglers Union (CAU) co-operated in the preparatory phase of the repatriation by providing data on fish stock numbers, catches using an electric aggregate and mapping of the water courses. Public forums were prepared and a video titled "Return of the Otter" was made and distributed by the Bruntál District Authority. No negative approach to the project was reported, mainly because there are no ponds in the area and fish farming is limited to fenced trout reservoirs. The only negative response was the critical article in the periodical called "Gamekeeping", which was based on unfamiliarity with the subject at hand. A more serious problem was convincing part of the public that repatriation had also been implemented in other areas (Highlands, South Bohemia), despite this being denied in a number of articles and appearances in the media, and to set the record straight.

2. Trial repatriation (1997-1998):

Four otters, tagged with microchips, were released in the upper catchment area of the Moravice River in 1997. Three individuals also carried transmitters and were monitored for several months using telemetry (Hlaváč et al. 1998). All the animals remained in the area, with the birth of cubs during the following year being proven. Monitoring was conducted in the winter periods of the subsequent years on the snow and occupancy of the area and the gradual expansion of the otter into areas with a link to the place of repatriation were proven (Šusta & Toman 2001).

3. Main phase of the repatriation (1998-2003):

In the case of the Eurasian otter, no sub-species or races other than the nominotypical sub-species *Lutra lutra lutra* have been differentiated within Europe. It was therefore not necessary to give consideration to the taxonomic status of the repatriated individuals. The methodology for determining genetic variability and identification of individuals was not commonly known or used at the time of their release, and so a genetic inspection was not conducted. The number of individuals required was set at 20-30, based on experience from other repatriation programmes implemented abroad. The number of individuals released in the individual years was subject to the possibilities and animals available. Two-thirds of the animals used in the repatriation were from the wild.

These were the reared cubs that were found or injured individuals from the South Bohemian population (20 individuals). The remaining one-third of the animals (9) used in the repatriation comprised of the rearing facility from the Pavlov FPS. The fathers of these cubs originated from the South Bohemian population, but their mother was a female originally from the otter station in Hankensbüttel (Germany). It was recently (2005) ascertained, during research into the population and genetic structure of the Eurasian otter in the Czech Republic, that the microsatellite locus Lut701 contains a specific allele 242 bp in size (Hájková et al. 2007) in all three of the dead individuals found in the vicinity of the locations where repatriation was conducted. This allele was not found in any other individuals in the Czech or Slovak Republics. It was ascertained, after making a comparison to the data from the pan-European genetic structure research project currently underway, that this allele is found only in the Israeli population and introduced individuals from the Wayre line (Otter Trust, UK) in England and France (Randi *in litt.*, Mucci et al. 2007). An analysis of the breeding records in the Eurasian Otter Studbook revealed the origin of this female. Its ancestors were from a breeding station in Norfolk (UK), with the origin of the paternal as well as part of the maternal lineage traced back to the wild population in England. But the origin of the two ancestors in the maternal lineage is not known (Hájková et al. 2007). It will probably be possible to attain more detailed data after the completion of the analyses of the pan-European project. The specific allele mentioned above (probably of a non-European origin) is a valuable genetic marker for population and genetic analyses. It allows the offspring of this specific

female to be identified and also, in the event of more extensive research being conducted, ascertainment of their contribution to the genofund of the newly-created population in this area.

Individuals ready for repatriation were always kept under constant veterinary control for several months at the station in quarantine conditions. They were vaccinated against rabies, distemper, parvovirus and hepatitis prior to being released into the wild.

A total of 25 animals were gradually released between 1998 and 2003 in four catchment areas. Thus, a total of 29 otters were released into the wild: in the catchment area of the Moravice River– 12 animals, in the catchment area of the Morava River – eight animals, in the catchment area of the Odra River – five animals and in the catchment area of the Orlice River – four animals (Toman *et al.* 2003). The gender ratio was skewed 18:11 in favour of males.

Evaluation:

The main objective of the repatriation of the otter in the Jeseníky area was to create a stable otter population in the selected territory. This population was to serve as a "stepping stone" in connecting two mutually isolated metapopulations, the South Bohemian population and the population reaching into northeast Moravia from Eastern Europe. From this aspect, the repatriation can be judged a success, as subsequent studies and mapping of the distribution of otters proved that there was a stable, increasing population of otters in the given area and also proved the linking of the South Bohemian population with other populations to the east (Šusta & Rejl 2001, Poledník *et al.* 2007, Poledníková *et al.* 2007).

The question that remains to be answered is whether the populations would not have linked up even in the absence of the repatriation, as indicated by data on the development of the distribution range from recent years. Nevertheless, at the time of planning and the first phase of the repatriation, the distribution of Eurasian otters in the Czech Republic was markedly restricted and it was not assumed that the situation would improve as quickly as it did in the coming years.

The comprehensive implementation of the entire repatriation can be evaluated favourably: the entire project's thorough preparatory phase, monitoring of the individuals released during the experimental phase and monitoring of the released individuals at the end of the main phase of the repatriation. The repatriated individuals remained released in the area for the duration of the monitoring (Hlaváč et al. 1998) and in the coming years natural reproduction also occurred in the case of these individuals (Šusta & Toman 2001).

The evaluation of the success of the repatriation from the genetic viewpoint is disputable. The reason for this is the release of individuals from a female bred in captivity and having an unknown origin abroad. However, the methodology for determining the genetic origin of individuals was not commonly used at the time of the project's realisation. From a genetic viewpoint, it is possible to evaluate favourably the support given to the linking of the sub-populations. However, the repatriation should have been restricted to individuals of solely Czech origin (Hájková *et al.* 2007).

Evaluating the repatriation from the viewpoint of measures leading to the minimalisation of conflict between otter conservation and fishing interests in the area where the otters were released is also disputable. However, conflict did, to a certain degree, arise in the area, despite the project being presented to the public and discussed with the CAU. The otter is accused by the CAU of decimating populations of commercial fish species (trout and grayling) on water courses in the repatriation area and one of the arguments is that more otters were released into this area than this area can sustain. According to an independent study, the number of animals released was adequate to the size of the range, the sustainability of the given habitat and the objective of the project (Poledníková *et al.* 2007). Unfortunately, it is not simple to ascertain the cause of the decline in populations of huntable fish species in the area in view of other factors complicating the situation in the area (e.g. the building of the Slezská Harta valley reservoir). However, it seems that the repatriation was not sufficiently discussed with the local members of the CAU.

2. OBJECTIVES OF THE MANAGEMENT PLAN

The objective of the Management Plan is to secure by all means available, particularly by education and legal and economic tools, conditions for the permanent, independent, sustainable existence of this species in nature. A situation when the otter permanently inhabits all areas of its current distribution range, eventually also further suitable areas (which will be colonised spontaneously and in abundance corresponding to environmental conditions) can be considered as such a state. In this respect, interconnection among all the areas of otter occurrence must be viewed as priority.

The specific long-term objective of the Management Plan is:

To ensure that the existing state, from the viewpoint of the size of the population and the area of the range[*)] occupied by Eurasian otters in the Czech Republic, does not deteriorate.

This long-term objective should be attained by means of the following key groups of measures:

- education of the target groups, namely fishermen, thereby improving their relationship to the otter
- minimising the negative effects of traffic on the otter population
- research aimed at new findings from the spheres of biology and ecology of the species
- economic tools and the provision of information about these tools

Regular monitoring shall be employed to ascertain the fulfilment of the planned objectives and the effectiveness of the proposed measures.

[*)] The current population size and the distribution range is considered, for the purpose of this Management Plan, to be the number and range ascertained within the framework of the nationwide monitoring conducted in 2006 and the monitoring of marginal areas of occurrence conducted in 2008. A decline in range is considered a decline in the permanently occupied quadrates or a decline in the temporarily occupied quadrates by more than 20%.

3. PLAN OF MEASURES

The following chapter describes the measures arising from the set objective of the Management Plan. A motivation is presented for each measure (a reason why the measure is important) and the contents of the measure. The priority of implementing individual measures, their mutual links and possible time sequence are described in the Plan of Measures (Chapter 4).

3.1 Biotope Management

3.1.1 Minimising the negative effects of traffic

Motivation:

Road deaths are one of the most significant causes of the threat to Eurasian otters in this country. Car collisions occur mostly at a crossing of a water course with a road. Some individuals are found dead on the road and at considerable distances from a water course. It is often shown that the water course is blocked here at the point of the crossing with the road so otters go round this point (e.g. a municipality). Hence the danger needs to be reduced in places where there are recurring accidents and deaths of otters on roads such as the construction and reconstruction of bridges in areas of the present or assumed range of the otter.

Measure contents:

Prepare and enforce a complex methodology for relevant nature protection authorities (regional authorities and municipalities with extended jurisdiction), which will contain:

1. A map of the critical sites at which there are frequent otter deaths through collision with transport vehicles and where priority should be given to reduce the effect of traffic on the population of Eurasian otters. A map will be drawn up based on information about otter deaths on roads and based on the collection of dead otters (see measure 3.3.5).
2. The main principles of constructing thoroughfares for the otter across all types of roads, making existing bridges and construction of new bridges navigable. This issue was already described in the available literature (e.g. Toman *et al.* 1995, Hlaváč and Anděl 2001, Iuell *et al.* 2003), however it will be updated based on the latest knowledge.
3. Recommended procedure for OOP under Act No. 114/1992 Coll.

Other state administrative authorities (building authorities and the like) and relevant owners or road managers will also be provided with a map of the critical sites and the principles of the construction of thoroughfares as a basis for adopting the necessary measures, including preparations for projects with the use of EC structural funds (OP Environment – Priority Axis 6, investment measure directed at increasing adaptive abilities of ecosystems and species to the growing fragmentation of the landscape; OP Traffic – Priority Axis 2 and 4, a measure leading to a reduction in the effect of completed constructions of individual segments of the environment).

3.2 Species Management

3.2.1 Rearing of orphaned young, rehabilitation of injured individuals and their release back into the wild

Motivation:

Every year abandoned young are found and injured individuals of Eurasian otters throughout the country which perish without human aid. This mostly concerns young otters who have been orphaned (e.g. the mother dying on the road) or individuals who have been dug out of their dens by dogs.

Measure contents:

The rearing of young and handicapped individuals from the wild in conditions which will guarantee their successful release back into the natural environment. Facilities with large otter enclosures enabling the training of young otters (swimming, diving, hunting, use of natural shelters, etc.) are necessary for rehabilitation and breeding. The only facility equipped in such a manner at the present time is the Pavlov FPS attached to the ANCLP CR. In view of the current state of the population, at least one such equipped facility needs to be maintained which, if required, will be able to manage the rearing of young and handicapped individuals of this species in conditions of the Czech Republic.

Orphaned young otters are also sometimes illegally held by private persons as domestic "pets". Such behaviour needs to be prevented through education and legal tools. The young should always be placed in specialised facilities where they will have the chance to return to the wild (and in case this proves unsuccessful at least become involved in the EEP – see below).

3.2.2 Breeding of the otter in human care within international cooperation

Motivation:

The recommendation of the Standing Committee of the Bern Convention No. 53 of 6 December 1996 binds the signatories to international assistance and exchange of experience in the protection of Eurasian otters. Some facilities in the Czech Republic have been engaged in the long-term in the breeding of otters (FPS Pavlov, ZOO Ohrada) and are involved in the EEP (Eurasian Endangered Species Programme) for Eurasian otters.

Measure contents:

Currently otters do not have to be reared in the Czech Republic for the purpose of repatriation as was the case in the past. Reared and handicapped individuals, which cannot be returned to the wild can, however, thanks to international cooperation as part of the EEP (Eurasian Endangered Species Programme) for Eurasian otters be placed in various European ZOOs and contribute to the regeneration of the genetic base of this species being cared for by man. For example, ANCLP CR FPS Pavlov (despite the fact that it is not a member of the EAZA – Eurasian Association of Zoos and Aquaria) had already, in past years, placed otters in breeding facilities in Germany, Austria, Denmark, and is an active member of the EEP for the Eurasian otter. Given the international cooperation it is appropriate to maintain a facility which, if required, will be able to manage the rescue breeding of this species in the conditions of the Czech Republic.

3.3 Monitoring

The state of the population of Eurasian otters will be monitored using several methods. The basis will be full-scale mapping of the distribution accompanied in the meantime by the mapping of marginal areas of occurrence. This will provide information about the current size of the range of Eurasian otters in this country and the speed of occupancy of new areas of occurrence or about the reduction in the size of the range. There will be more detailed monitoring in selected core areas of the occurrence of the otter which will add data from nationwide mapping about information on population density and the population structure in these core areas. By applying appropriate mathematical models, this will enable to determine the relatively narrow range of the estimate of the abundance of the population throughout the Czech Republic and ensure development trend in this population. The state of the population of Eurasian otters will continue to be monitored at local level as part of the SCI (Sites of Community Importance) monitoring, the objective of which will be to gain information about the state and development of the population in these specific localities, earmarked for the protection of Eurasian otters based on the requirements of European law.

3.3.1 Nationwide mapping of the distribution of otters and mapping of marginal areas of occurrence

Motivation:

The nationwide mapping serves to monitor development trends in the occurrence of the Eurasian otter population in the Czech Republic in the long term. In view of the experience from previous mapping (in the Czech Republic 1997- 2001, 2006, in Austria 1999-2004, Kučerová *et al.* 2001, Poledník et al 2007, Kranz *et al*. 2001) and the limitation of this method (see Annex No. 3) it should be carried out by a small group of experts in a short period and in the most appropriate time of the year. A period of five years is considered a suitable interval between the individual nationwide mapping sessions.

The mapping of marginal areas of occurrence of the otter allows an estimation of the population trends in the core areas of distribution in the periods between nationwide mappings. Given this concerns smaller territory (in the Czech Republic this concerns a zone of approximately 20,000 km^2 or 200 mapping squares) this method is less time consuming than nationwide mapping. The monitoring of peripheral parts of the range should be carried out at least once in the period between two nationwide mapping sessions.

Measure contents:

Ensure the nationwide mapping of the occurrence of Eurasian otters under the methodology presented in Annex 3 in years 2011 and 2016.

Ensure the mapping of the occurrence of Eurasian otters in peripheral areas of the range under the same methodology in years 2013 and 2018.

3.3.2 Estimates of abundance in selected areas

Motivation:

Information will be obtained from an otter count in selected core areas of occurrence about the density, abundance, structure and development of the population trend in these areas. The regularly updated information about population density will also be used as one of the source documents for calculating damage caused by the otter.

Measure contents:

In view of the time and organisational demands of this method the abundance of otters will be determined in one year only in several squares (4 to 6). The mapping will take place regularly in selected core areas. Individual areas represent various types of environments used by otters in this

country (from lowland fishpond areas to foothill water courses) and reflect the historic development of the range of otters in this country (gradual link of separated sub-populations and repatriation areas see chapter 1.2.2.3). In some cases these areas overlap with important community otter localities. In these cases tracking may provide information about the trend in the otter population in the SCI concerned.

The following areas are proposed:

- Třeboň region (low-lying fishpond area, south Bohemian sub-population)
- Dačice region (highland fishpond area, south Bohemian sub-population)
- Havlíčkův brod region (highland fishpond area, south Bohemian sub-population)
- Šumava (trout stream area of the Bohemian Massif, south Bohemian sub-population)
- Beskydy (trout stream area and gravel-bed rivers in the Carpathians, east-European sub-population)
- Jeseníky (trout stream area, repatriation area)
- České Švýcarsko (foothill water courses in a sandstone area, northern sub-population)
- Orlice (meandering lowland water course, northern sub-population)

One square (10x10 km) will be selected in each area representing a typical otter biotype in the area concerned. A regular count will be taken in these squares using tracking in fresh snow (see Annex No. 3).

3.3 Monitoring Sites of Community Importance designated for protection of the otter

Motivation:

The monitoring of the situation of the Eurasian otter as an important community species under Section 3 o) of Act No. 114/1992 Coll. is compulsory under Section 45f of this Act in order to gain source documents for drawing up an evaluation report on the situation of important community phenomena and is important for the effective management of these territories.

Measure contents:

The SCI will be monitored by a visiting rate monitoring method of selected points and an occupancy monitoring method of selected points (see Annex No. 3). The monitoring method will be selected based on the character of the SCI territory (size, shape, biotope type, see table 6). The monitoring of individual localities is planned so that each locality is controlled twice in the course of five years. If the monitoring results of the locality concerned indicate an ascending trend in the population a third monitoring session can be carried out in the sixth year. Such proposed monitoring will enable an evaluation of the trend in the population for the SCI locality.

A list of regularly monitored SCI localities is listed in table 6.

Table 6. Overview of Sites of Community Importance (SCI) with the proposed monitoring methods (additional information from the tracking of core areas can be expected for areas marked with an asterisk) which are monitored regularly:

Code of the territory	Name of the territory	Monitoring method	Years	Tracking
CZ0213009	Vlašimská Blanice	Visiting rate	2010, 2012, 2015, 2018	

CZ0313101	Krvavý & Kačležský pond	Occupancy	2011, 2013, 2017	*
CZ0313106	Lužnice a Nežárka	Occupancy	2011, 2013, 2017	
CZ0313110	Moravská Dyje	Visiting rate	2010, 2013, 2017	*
CZ0313123	Stropnice	Occupancy	2011, 2013, 2017	
CZ0313128	Nadějská soustava	Occupancy	2011, 2013, 2017	
CZ0314019	Velký and Malý Tisý	Occupancy	2011, 2013, 2017	
CZ0314022	Horní Malše	Occupancy	2011, 2013, 2017	
CZ0314023	Třeboňsko - center	Occupancy	2011, 2013, 2017	
CZ0314024	Šumava	Occupancy	2009, 2012, 2015, 2018	*
CZ0423507	Horní Kamenice	Occupancy	2009, 2012, 2015, 2018	
CZ0424031	České Švýcarsko	Occupancy	2009, 2012, 2015, 2018	*
CZ0424111	Labské údolí	Occupancy	2009, 2012, 2015, 2018	
CZ0513505	Dolní Ploučnice	Occupancy	2009, 2012, 2015, 2018	
CZ0513506	Horní Ploučnice	Occupancy	2009, 2012, 2015, 2018	
CZ0524049	Orlice and Labe	Visiting rate	2010, 2013, 2017	
CZ0533303	Chrudimka	Visiting rate	2010, 2012, 2015, 2018	

CZ0613321	Jankovský stream	Visiting rate	2009, 2012, 2015, 2018	
CZ0613332	Šlapanka and Zlatý stream	Visiting rate	2009, 2012, 2015, 2018	*
CZ0613334	Trnava	Visiting rate	2010, 2012, 2015, 2018	
CZ0624103	Mušovský luh	Visiting rate	2010, 2013, 2017	
CZ0624119	Soutok - Podluží	Occupancy	2009, 2012, 2015, 2018	
CZ0714073	Litovelské Pomoraví	Occupancy	2009, 2012, 2015, 2018	
CZ0724089	Beskydy	Occupancy	2009, 2012, 2015, 2018	*
CZ0813456	Moravice	Visiting rate	2010, 2013, 2017	
CZ0813516	Olše	Occupancy	2009, 2012, 2015, 2018	

3.3.4 Collection of dead animals and their analyses

Motivation:

The findings of the causes of the death of discovered otter individuals provides a highly source of information about the factors affecting the otter population in the Czech Republic and has an impact on the planning of specific measures for the protection of Eurasian otters in this country. The need to establish a system ensuring the monitoring of accidentally killed individuals of the species included in Annex IV of the Habitats Directive (92/43/EEC) arises from Article 12, (4) of this Directive.

Measure contents:

Ensure the system of collecting dead individuals of Eurasian otters from throughout the Czech Republic in collaboration with local entities – nature protection authorities, game-keeping associations, rescue stations, preparators, etc.; i.e. to create a network of entities authorised under an exemption pursuant to Section 56 of Act No. 114/1992 Coll. to keep dead individuals able to ensure their collection at the site of death and store for possible further analyses.

As part of the project VaV (SP/2d4/16/08 – "Finding the missing data on the biology and ecology of the Eurasian otter: creation of a population development model") more detailed analyses of dead individuals will take place in years 2008-2010. A detailed dissection to determine the cause of death and the overall condition of the animal, while the age will be estimated after an analysis of the teeth. Samples will be taken of the tissue of all dead animals for subsequent genetic analyses and to determine the genetic

profiles of the individuals.

The system of collecting dead animals will work throughout the Management Plan, nonetheless once the VaV Project ends, analyses will be limited to the essential extent depending on the finances available (cause of death, determining gender, age estimate based on morphometric parameters). The, time and other circumstances will be recorded for each finding to be used for planning specific protective measures for Eurasian otters.

3.4 Research

3.4.1 Diet analyses of the otter versus the American mink

Motivation:

The American mink (*Neovison vison*) is one of the species of mammals newly-expanding on the territory of the Czech Republic. The latest research findings, confirming mink occurrence over 26.8% of the territory of the Czech Republic (Červený et *al.* 2001); suggest that this species is rapidly spreading in this country. The presence of an introduced species may bring negative repercussions in the form of interspecies competition, predation, transmission of a new disease or parasites and hybridisation (Ebenhard 1988, Kauhala 1996). Competition from the American mink may threaten the indigenous mustelids of Europe including the otter.

Foreign and national studies have been carried out about the diet of both these species (e.g. Erlinge 1969, Chanin 1981, Wise *et al.* 1981) and these studies show that the food niches between them overlap. In view of the food opportunities of both species the relationship between them depends on the specific supply of food on the territory concerned and so the study of the diet of the mink should, in view of the otter's diet composition, focus above all on the specific problem situation. For example, it is probable that the mink is responsible for part of the damage ascribed to the otter on fishponds and open waters. Hence the share of damage by this species needs to be estimated in areas with a high mink population density (e.g. Jihlava River). The otter is often ascribed for the increased predation on crayfish, or further protected animals (e.g. kingfisher) which fishermen often use as a supporting argument for requesting the regulation of the number of otters "for conservationist reasons". However, even here the American mink can play an important role.

Measure contents:

Compare the composition of the diet of the Eurasian otter and American mink at localities with the occurrence of both species, particularly where there is damage to fisheries and where the predation of these species significantly contributes to the threat of other protected animals. Based on these data the share must be estimated of the damage caused by both species and estimate to what extent the predation by the otter and mink has a negative effect on the population of other species.

3.4.2 Genetic variability and population structure

Motivation:

One of the main objectives of the Management Plan is to maintain the links of all current areas of occurrence of Eurasian otters in the Czech Republic. The link between individual sub-populations is important particularly in terms of maintaining genetic variability which is an essential precondition of the ability of the species to adapt and survive. The genetic methods provide the possibility to determine genetic variability, monitoring the intensity of the flow of genes, detection of inbreeding and estimate the genetic differentiation of the sub-population (Schwartz et *al.* 2006). Using DNA analysis it is also possible to identify the reproduction barriers (barriers of the flow of genes) which it is not possible to capture during mapping distribution using the traditional field method (Janssens *et al.* 2008). The genetic methods, particularly the non-invasive ones, are also more frequently applied

to monitoring (Flagstad *et al*. 2004, Prugh *et al*. 2005, Bellemain *et al.* 2007). However the disadvantage is the high financial costs.
Genetic research in the repatriation area (Jeseníky, Litovelské Pomoraví, Podorlicko; catchment area of the Moravice, Odra, Orlice and middle course of the Morava River) may also bring useful data where specific alleles coming from a female from a breeding station in Germany were detected in all three discovered dead individuals (see chapter 1.6.2.2). These alleles represent a valuable genetic marker. This allows the identification of the offspring of this specific female and in the event of more extensive research also finding their contribution to the gene fund of the newly emerged population in this area.

Measure contents:

Monitor the intensity of the flow of genes between sub-populations and evaluate their interconnection. Determine the genetic differentiation of sub-populations, detect possible inbreeding. Monitor the spread of specific alleles of the female from the breeding station in Germany and evaluate their effect on the gene fund of the local population.

Research in this subject is partly underway as part of the project VaV-SP /2d4/16/08 "Finding the missing data on the biology and ecology of the Eurasian otter: creation of a population development model" to which ALKA Wildlife o.p.s., Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic v.v.i. and ANCLP CR contribute.

3.4.3 Structure and dynamics of the population and modelling

Motivation:

Despite the fact that the otter is one of the most intensively examined species of mustelids in recent years, some of the basic population characteristics are still not adequately known. The monitoring of the population, rate of growth and effect of threatening factors on the population are fundamental data essential for creating a functional species Management Plan. The current distribution of Eurasian otters in the Czech Republic is known (Poledník *et al.* 2007), estimates of the size of the population are very rough and speculative. Likewise the density of the population is known only from some areas (Poledník *et al.* 2004a, Šimek 1997). There is no or inadequate information about other population parameters (immigration, emigration, dispersal, gender ratio, age and reproduction structure of the population, mortality, natality).

Measure contents:

Obtain data enabling the modelling of the size of the Eurasian otter population in our country. Evaluate the viability of the population during various interventions in the population. Identify and evaluate the factors with a decisive effect on the trend of the otter population in this country.

Research in this subject is partly underway as part of the project VaV-SP /2d4/16/08 "Finding the missing data on the biology and ecology of the Eurasian otter: creation of a population development model" to which ALKA Wildlife o.p.s., Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic v.v.i. and ANCLP CR contribute.

3.4.4 Secondary damage to fish caused by otter disturbance of fish

Motivation:

Fish are exposed in the water environment to a number of negative factors which cause their stressful reaction. The result of this is metabolic and health disorders and the gravity depends on the intensity and length of exposure to the burden of stress. Besides changes to water chemism (fall in oxygen, rise in hydrogen sulphide and ammonia, penetration of acidic waters), fish stock could be stressed by fish predators. Hence, otters are considered to be a problem

by fishermen not only because of direct predation, but also the consequence of secondary damage which is stress of fish from the presence of the predator resulting in the subsequent loss of weight and susceptibility to diseases, in extreme cases to mass raising of hibernating fish and death. Experiments conducted at the Pavlov FPS indicate the effect of the otter on the condition of hibernating fish. Nevertheless, it is necessary to verify these findings during normal fish farming in a natural environment.

Measure contents:

Quantify the effect of fish disturbance by Eurasian otters during the period of hibernation and in the vegetative period. Monitor changes in the physical condition, metabolic and enzymatic changes, level of long-term stress hormones, changes in weight gain and survival in fish exposed to various degrees of disturbance by Eurasian otters. Gain data for the adjustment of the methodology for calculating the damages caused by the otter. Monitor the effect of fish disturbance depending on the quantity and composition of fish stocks.

Research in this subject is partly underway as part of the project VaV-SP/2D3/209/07 "Fish farming respecting the strategy of sustainable development and support of biodiversity," to which the Czech Otter Foundation Fund, Rybářství Třeboň a.s. and ENKI o.p.s. contribute.

3.4.5 The otter and decline in populations of the brown trout in trout waters

Motivation:

One of the main causes of the decline in populations of trout, particularly in recent years, is the excessive pressure in many localities by sport fishermen on predators including Eurasian otters (Kepr 2003, Mareš & Habán 2003). Conflict between the fishing industry and conservation of Eurasian otters thus no longer concerns just fishpond areas, but is also strongly increasing in trout waters. Fishermen see the problem as being in the reduced success of catching for sport fishing, in economic losses and also in the negative effects on populations of rare species such as the noble crayfish and freshwater pearl mussel (Kranz et *al.* 2003). Stream trout is the main component of the diet of otters living in trout water (Poledník *at al.* 2004b, Kranz *et al.* 2003), however this need not necessarily cause the decline in its population. On the contrary, a predator may even have a positive effect on the prey population (e.g. selective predation on weak and diseased individuals, reduction of population density of prey leading to a reduction in intra-species competition). Research work of recent years shows that the main reason for the decline in populations of trout (and other) species of fish is probably bad management – introducing non-indigenous, genetically different individuals which may have reduced survival and reproduction success rate and cross-breeding with indigenous population passing on these properties (Hansen *et al.* 2000, Miller *et al.* 2004, Laikre *et al.* 2005).

Measure contents:

Evaluate the effect of the otter on the trout population. Propose measures for reducing the predatory pressure of otters on trout and identify further factors with a decisive effect on the trout population in the Czech Republic.

3.5 Education

In view of the fact that the otter is a conflicting animal, working with the public and educating them about the species forms a fundamental part of the Management Plan. Historic sources show a long tradition of the conflict between the otter and fish farming, and there are few animal species with which man has such a conflicting relationship with as he has with otters. The fact that the otter is popular with nature lovers on the one hand and on the other persecuted by fishermen and fish farmers has persisted to this day.

What is the strength of the success of the protection of the otter in relation to the public is the fact that the otter is quite an adaptable animal, being capable of settling localities altered by man and is not overly sensitive to anthropic factors. The otter is perceived by most people as a pleasant animal which does cause damage and comes into conflict with the fishing community. The attitudes of individual target groups are succinctly presented in terms of their strengths and weaknesses. The characteristics of the group are followed up by the objectives of education and the measures which will follow are also included.

3.5.1 Fishermen and gamekeepers

Motivation:

In 2002 a sociological survey was conducted between the fishing community in the districts of Jindřichův Hradec and Pelhřimov. Three categories of respondents were selected – private owners (natural persons) n = 120, fishing companies (joint-stock companies, limited liability companies) n = 7, and representatives of the MO ČRS (Local Organisation of the Czech Fishing Union) (usually the farmers) n = 18. Hitherto experience and the results of the survey show great mistrust in the system of compensation and nature protection in general. The fishing community may be well informed of the existence of the law, but have highly distorted information about the actual process of compensation (with the exception of bigger fishing companies, of which the majority are relatively satisfied). What is surprising is the strong underestimation of poaching when defining the factors causing fish losses. A highly problematical group in particular is small private owners. Although almost each one stated that the otter causes them bigger or smaller damage, only 6 respondents out of the 120 private farmers (i.e. 5%) demanded compensation. However without demanding compensation private farmers complained about the very lengthy procedure and insufficient level of damage compensation so "there is no point to demand compensation and waste time." Many consider it highly problematical to prove that otters had been in their fishpond. Unlike fishing companies and the MO ČRS, private farmers often do not have a documented quantity of stocked fish, they do not keep economic records of the breeding of fish in the fishpond, and so they often do not know precisely how many fish they have in their fishpond. Respondents from this category in some cases do not demand damage compensation also because they are farming "illegally" and are therefore breaking the law on the handling of waters. Unfortunately recorded commentaries clearly show a high level of illegal pursuit and killing of otters on the part of fishermen.

The game-keeping community usually takes up a relatively inert attitude to the otter. Despite this, a certain section of gamekeepers who are also engaged in sport fishing or fish farming may perceive the otter in a conflicting and relatively negative way. It is difficult to prove an illegal catch, but there are certain indications confirming this happening (of the 11 telemetrically monitored animals, five were killed by man). This target group should be an important partner when acting upon the general public, particularly in the sphere of education, providing information and solving cases of illegal otter hunting (common interests – nature, breaking the Game-keeping Act).

Measure contents:
The main objective of education is to lessen the negative perception of Eurasian otters by fishermen and gamekeepers. This can be achieved particularly by providing information and with the aid of prevention and compensation of damage caused by the otter to fisheries and promotion of further economic tools associated, for example, with the observance of economical methods of farming:

- create a network of contact persons and experts providing information and consultation
- providing information about the Operational Programme (OP) Fisheries which can provide support for setting up fish-breeding facilities and fishponds against protected fish-eating predators or compensation for losses to production as a consequence of the observance of economical methods of farming
- continue to operate websites and provide online advice (www.krasec.cz, www.zachranneprogramy.cz)
- continue to give lectures to interest groups, secondary schools and universities of fish culture and forestry schools
- organise inter-field meetings (nature protection bodies, the fishing community, environmental non-profit organisations, the game-keeping community and the like)
- continue publishing articles about the otter in printed matter of these interest groups (e.g. Fisheries, Game-keeping)

3.5.2 Road Management

Motivation:
This target group probably does not have a clear opinion of the otter and it can be assumed that we can come across a relatively broad spectrum of opinions influenced by the affiliation to other interest groups. Sometimes road managers feel restricted in their activities by nature protection in general which may also cause a negative attitude to the protection of the otter. It is appropriate to influence representatives of this group in the area of the improvement of the navigation and increasing safety at spots where roads cross water courses.

Measure contents:
The main objective of educating this group is to get road management in areas of occurrence of the otter when building and reconstructing bridges to allow or ensure their navigation for the otter and potentially for other animals.
Individual activities as part of the measure:

- provide information about economic tools from which the measure can be paid for the construction of thoroughfares for otter across roads, making existing bridges and new-
- bridge constructions navigable (see measure 3.1.1.), including the promotion of existing grants (OP Environment – Priority Axis 6, investment measures directed at increasing the adaptive abilities of ecosystems and species to the increasing fragmentation of the region; OP Transport – Priority axis 2 and 4, measures leading to the reduction of the effect of completed structures on individual components of the environment)
- provide information about the possibilities of technical solutions to the construction of thoroughfares for the otter, making existing bridges and new bridge constructions navigable (see measure 3.1.1.)
- organise specialised lectures about the problems/methods of making roads navigable and construction of thoroughfares or bridges (web, advice, consultancy)

- organise information activities about the problems/methods of making roads navigable and constructing thoroughfares or bridges at technical universities and secondary schools specialising in road communications (lectures, distribution of information material, incorporating this problem into the teaching curriculum)

3.5.3 Nature protection and environmental non-profit organisations

Motivation:

Conservationists consider Eurasian otters to be part of nature and also partly a symbol of nature protection – the occurrence of the otter is usually positively accepted. However, in the areas of more intensive conflict between the otter and the fishing community the otter causes certain problems in their work. Often resorting to damage compensation poses an excessive burden and they no longer regard the presence of this animal so positively. Nature protection workers sometimes use the occurrence of the otter as an argument for the protection of the other natural elements or the character of the landscape. However they are not always adequately informed about the current situation of the otter in the Czech Republic, and also especially in areas without the regular occurrence of the otter they could have incomplete knowledge about the biology and ecology of this animal (e.g. distinguishing signs of presence).

Environmental non-profit organisations (NPOs) are relatively intensively engaged in educational activity, have a network of centre of ecological education and advice centres. Part of these activities also involves the presentation of the otter and the problems of its protection. However, the potential of this sector is not sufficiently exploited for the area of "public relations" and mutual cooperation and communication is not systematic and effective. Unfortunately the representatives of NPOs are not always sufficiently informed of the current situation of the otter in the Czech Republic and have incomplete knowledge about the biology and ecology of this animal. This fact may sometimes result in unintentionally misinforming the public and the media.

Measure contents:

The main objective of the education of this group is to ensure the expertise of its members and provide quality and current data in the area of ecology of Eurasian otters and the state of its population in the Czech Republic.

Individual activities as part of the measure:

- continue with lectures for primary and secondary schools and present lectures for universities specialising in education in agricultural, forestry, biology and landscape fields
- continue in giving lectures to workers in state administration and hold debates with members of NPOs and their management
- continue with regular (annual) conferences/seminars/meetings devoted to otter protection, research and management in the Czech Republic
- organise inter-field meetings (nature protection bodies, the fishing community, environmental NPOs, the game-keeping community and the like)
- continue to publish articles in specialised nature protection magazines (e.g. Nature Protection, Nature magazine) and NPOs printed matter
- train NPOs workers to convey information about otter protection and management to the public more effectively and objectively

3.5.4 Lay public

Motivation:

The lay public which is a very broad group usually regards the otter as a pleasant animal. Its return is received positively and interpreted as an improvement of the environment. Unfortunately the public still not greatly informed about the ecology and biology of the otter and so is easily manipulated. Some media presentations about the damage caused by the otter contain an emotional undertone and are associated with accusations of nature protection. A special group is children and youth for which the otter is a highly attractive animal which was confirmed by the pronounced success of the children's series about Vydrýsek the Otter. Unlike adults this age category is still forming its opinion of nature protection and is more open to new information.

Measure contents:
The main objective of the education of this group is to provide factually correct information about the biology and ecology of Eurasian otters under the conditions of the Czech Republic and achieve the best level of educating the lay public in this area.
Individual activities as part of the measure:

- form good cooperation with the media (radio, television, magazines and newspapers) for the purpose of providing objective information about the problems of Eurasian otters
- continue to make separate presentations about the otter on the internet for the public, children and youth (e.g. the websites www.vydry.org, www.zachranneprogramy.cz)
- continue with field and school instruction programmes
- continue to publish materials for children (postcards, colouring books and the like) and the general public
- continue with a series of lectures about the otter for primary and secondary schools and the public
- create "Otter Nature Trails" in selected Sites of Community Importance renowned for the occurrence of Eurasian otters

3.5.5 Media

Motivation:

The media represents a specific target group in the area of "public relations", above all in its role of the transmission of information and influencing public opinion. The otter is a relatively interesting subject for the media – particularly thanks to its attractive and pleasant appearance. Unfortunately the media does not always create a true media picture of the otter. On the one hand dramatic and one-sided narration appears about the problems of damage caused by the otter and on the other the otter is presented as a pleasant domestic pet which also does not help to promote its protection. Representatives of the media search for sensational news, but generally have little knowledge of the biology and ecology of the otter which is displayed in the mistakes contained in their reports. There are also programmes such as "Nedej se" (Hold one's own) and "Hádání o přírodě" (Guessing about Nature) which are devoted above all to environmental issues and it is these which are highly appropriate for presenting the problems concerning the otter.

Measure contents:
The main objective of the education of this group is to ensure the publication of objective news about Eurasian otters and the problems associated with it in the media.
Individual activities as part of the measure:

- continue operating the websites with regularly updated information for journalists (www.vydry.org, www.zachranneprogramy.cz)
- automatically issue objective press releases about all damage and problematical matters

- in case of need organise press conferences

3.6 Other Measures

3.6.1 Drawing up new methodology for calculating damage caused by the otter

Motivation:

The current system of determining the level of damage caused by Eurasian otters requires expert assessment of each case by experts who have detailed knowledge about the biology of the Eurasian otter and practical knowledge from findings made about this species at the locality. The fishpond assessed always needs to be visited often repeatedly. Besides being time-consuming this system is limited by restricted access of an adequate number of experts. If applications for damage will increase significantly, this procedure will no longer be sustainable.

Measure contents:

Complete the new method of calculating damage caused by Eurasian otters which will simplify the existing system and also ensure a uniform approach to determining the level of damage. The methodology is drawn up as the basis for creating an implementing regulation based on the authorisation in Section 7 (3) of Act No. 115/2000 Coll. on the Provision of Compensation for Damage Caused by Some Selected Specially Protected Species of Fauna.

3.6.2 Drawing up methodology for measures reducing damage caused by the otter

Motivation:

A precondition for paying out compensation for damage caused by the otter also means minimising this damage by the applicants. An important task will be to draw up a methodology of measures which reduce damage caused by the otter. Some methods have already been tested as part of the research while some still have to be verified (see measure 3.6.4).

Measure contents:

Prepare a methodical guide for fishpond farming entities which will provide effective instructions for reducing the risk of economic losses and will form the basis for any preparation of projects using funds from the EC structural funds (OP Environment – Priority Axis 6, measure to minimise and prevent damage caused by severely and critically threatened specially protected species of animals on roads, water-management buildings, agricultural and forest cultures, fish farming and beekeeping; OP Fisheries – Priority Axis 2, improving the protection of fish farming against damage caused by wild predators). Currently the following measures are recommended:

a) Adding “non-commercial” species of fish (common roach, perch, etc.) to the stock. The otter prefers some species of fish to carp (the main commercial fish), so their presence in the stock helps to minimise damage to commercial species.
b) Installation of sound repellents for small, densely populated fishponds.
c) Frequent walks around fishpond most frequently visited by the otter.
d) Fencing off hatcheries, chamber fishponds or fishponds in a built-up area and with dense stock.
e) Selection of “reasonable” fish stock. The reason is to reduce the stress effects caused by the presence of the otter in the fishponds (which are probably stronger in overpopulated fishponds) and also for removing the effect of an easier catch with a greater accumulation of fish.

All the possibilities of minimising damage will be discussed, verified and subsequently summarised in the methodology on damage minimisation.

3.6.3 Proposed optimisation of the system of dealing with the conflict of economic interests of fisheries and the otter

Motivation:
Compensation of economic damage caused to fishpond owners as part of Act No.115/2000 Coll. is an already established tool. However this is in practice used particularly by bigger owners for whom it is worthwhile to proceed with the relatively demanding administrative process of applying for compensation. The owners of very small fishponds consider it sufficiently attractive in view of the low amounts they receive after proving damage. This situation may pave the way to illegal otter hunting. Likewise this system shows a series of flaws already described in chapter 1.6.1.2. In terms of protection of aquatic ecosystems, the existing situation is debatable when the level of damage caused by the otter and the level of compensation paid out to a fish-farming entity increases with the intensity of fishpond management – high compensation of economic damage can motivate fishing entities towards aggressive, intensive fish farming.

Measure contents:
Carry out a complex analysis and possibilities of dealing with the economic damage caused by the otter, and focus in the analysis particularly on the situation of private owners of small fishponds. Based on the results of this analysis propose an additional tool which would take into account the situation of small fishpond owners and also motivate all fishing entities to effective (extensive) fishpond management, and in the broader context management of aquatic ecosystems and Eurasian otters as its part. As part of the analysis the existing experience must be taken into account with the application of Act No. 115/2000 Coll. focusing on material and procedural flaws applying to the damage caused to fish. In the proposal focus attention on a solution not requiring strict proof of damage.

3.6.4 Testing preventive measures

Motivation:
Using effective preventive measures which prevent predators to gain access to prey and can significantly decrease the conflict between economic interests and protection of the species. Fishpond owners use traditional measures such as human hair, sheep's hair, plastic, scarecrows and musical greeting cards. Attempts with otters in human care (Platilová 2000) showed the specific effect of traditional odour repellents (sheep's wool, spraints of potential tiger and wolf predators). Testing these odour repellents (sheep's wool, human hair, fabric and wolf, lynx and bear droppings) in the wild have shown the opposite that they do not work (Kranz *et al.* in prep.). Up till now the only effective measures which reduce or totally prevent otters approaching a fishpond are fences and an electric enclosure (Bodner 1995). However such measures are expensive even in terms of maintenance and they also cannot be effectively or adequately used on all types of fishponds (particularly bigger fishponds, fishponds in the open countryside and with natural banks).

Sufficient attention has not been paid so far to creating and testing further alternative preventive measures such as substitute prey or diverting fishponds.

Measure contents:
Create and test further alternative preventive measures such as substitute prey or diverting fishponds. Also test some other "traditional" measures (visual, acoustic repellents). In the first stage it is possible to test these tools in conditions of a regulated attempt at individual human management. However they must also be tested in the wild.

Farming entities must also be informed of the results of these tests and the possibilities of financial support for introducing such preventive tools (e.g. OP Fisheries). Information of this type will be provided as part of the education of individual target groups (see chapter 3.5).

3.6.5 Development and specification of monitoring methods for use in Sites of Community Importance designated for the Eurasian otter

Motivation:
Monitoring the condition of Eurasian otters as an important European species under Section 3 (n) of Act No. 114/1992 Coll. is mandatory under Section 45f of this Act in order to gain source documents for drawing up an evaluation report on the condition of important community phenomena and is also important for the effective management of these territories. Nevertheless, currently methods applied to the monitoring of Eurasian otters in terms of following the trend of the populations in these relatively small territories have a low reporting value (IUCN OSG standard method) or are greatly dependent on weather and can be applied only in some years (by tracking in fresh snow). New methods need to be tested for monitoring the trend of the populations of Eurasian otters in these areas.

Measure contents:
Testing existing methods for detecting the presence, abundance and trend of the use of territory by the otters. Propose methodology for monitoring specific Sites of Community Importance for Eurasian otters existing in the Czech Republic.

4. IMPLEMENTATION PLAN

Chap.	Measure	Priority	Implemen. time	Frequency	Follow-up from other measures	Comment
3.1	**Biotope management**					
3.1.1	Minimising the negative effects of traffic	1	continuously	repeated measure	partly arises from measure 3.3.4	
3.2	**Species Management**					
3.2.1	Rearing of orphaned young, rehabilitation of injured individuals and their release back into the wild	2	continuously	repeated measure		
3.2.2	Breeding of the otter in human care within international cooperation	3	continuously	repeated measure		
3.3	**Monitoring**					
3.3.1	Nationwide mapping of the distribution of otters and mapping of marginal areas of occurrence	1	2011 and 2016 (nationwide) 2013 and 2018 perip.)	repeated measure		
3.3.2	Estimates of abundance in selected areas	1	continuously	annually	partly arises from measure 3.3.3	area may be regulated during the course of monitoring
3.3.3	Monitoring Sites of Community Importance designated for protection of the otter	1	continuously	annually	partly included in measure 3.3.2, methodology see measure 3.6.5	
3.3.4	Collection of dead animals and their analyses	1	continuously	repeated measure		Extent of analysis for the duration of PP regulated
3.4	**Research**					
3.4.1	Diet analyses of the otter versus the American mink	3	up to 2018	one-off measure		
3.4.2	Genetic variability and population structure	2	continuously	repeated measure		
3.4.3	Structure and dynamics of the population and modelling	1	up to 2010	one-off measure	follows on from measure 3.3 and 3.4.2	
3.4.4	Secondary damage to fish caused by otter disturbance of fish	2	up to 2018	one-off measure		

3.4.5	The otter and decline in populations of the brown trout in trout waters	2	up to 2018	one-off measure		
3.5	**Education**					
3.5.1	Fishermen and gamekeepers	1	continuously	repeated measure		
3.5.2	Road management	1	continuously	repeated measure	partly follows on from measure 3.1.1	
3.5.3	Nature protection and environmental non-profit organisations	2	continuously	repeated measure		
3.5.4	Lay public	1	continuously	repeated measure		
3.5.5	Media	2	continuously	repeated measure		
3.6	**Other measures**					
3.6.1	Drawing up new methodology for calculating damage caused by the otter	1	2009	one-off measure		
3.6.2	Drawing up methodology for measures reducing damage caused by the otter	2	2011	one-off measure	arises from results of measure 3.6.4	
3.6.3	Proposed optimisation of the system dealing with the conflict of economic interests of fisheries and the Eurasian otter	2	2011	one-off measure	arises from results of measure 3.6.1 and 3.6.2, or from results of measure 3.4.4	
3.6.4	Testing preventive measures	2	continuously	repeated measure		
3.6.5	Development and specification of monitoring methods for use in Sites of Community Importance designated for the Eurasian otter	1	as required	repeated measure	part of measure 3.3.4	

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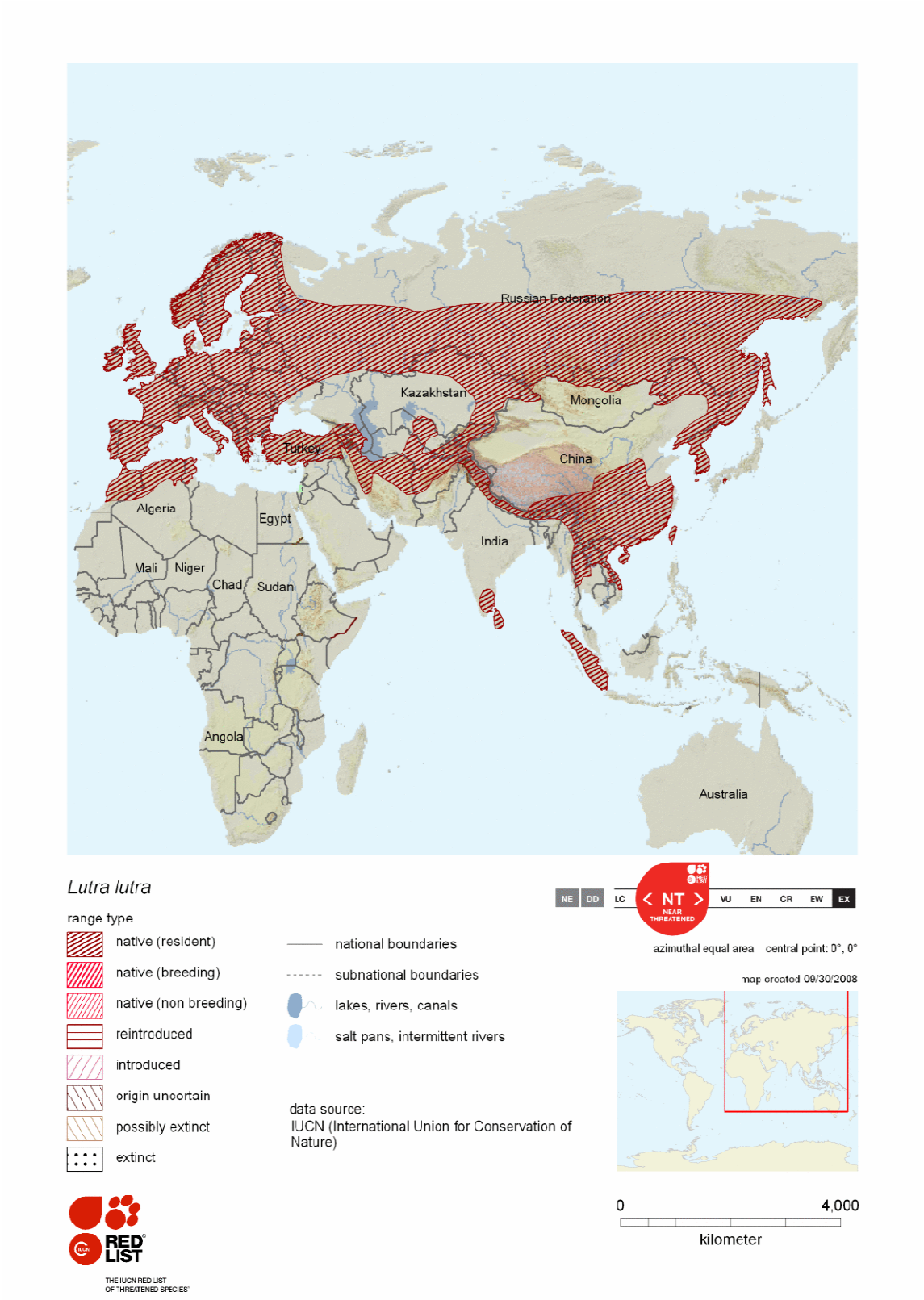
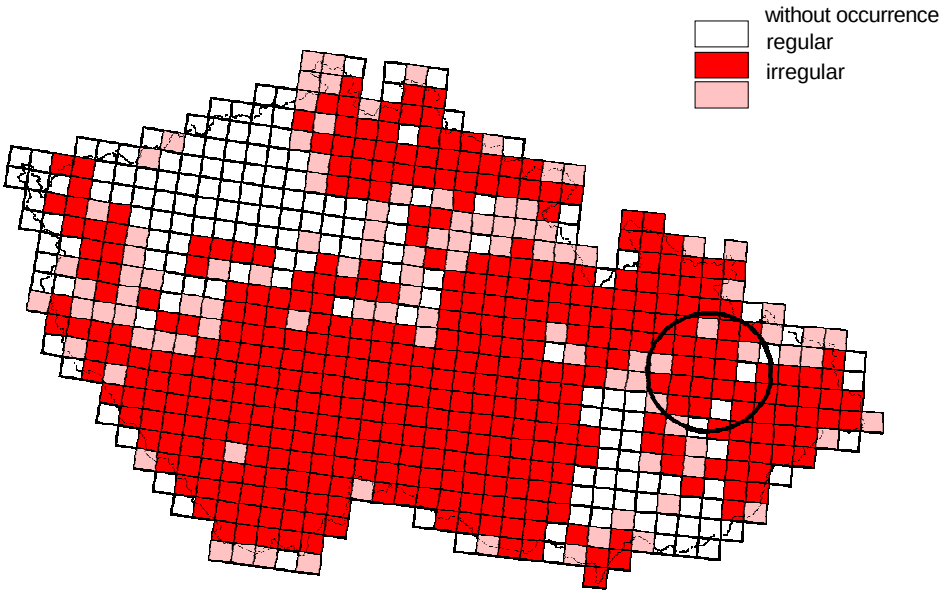
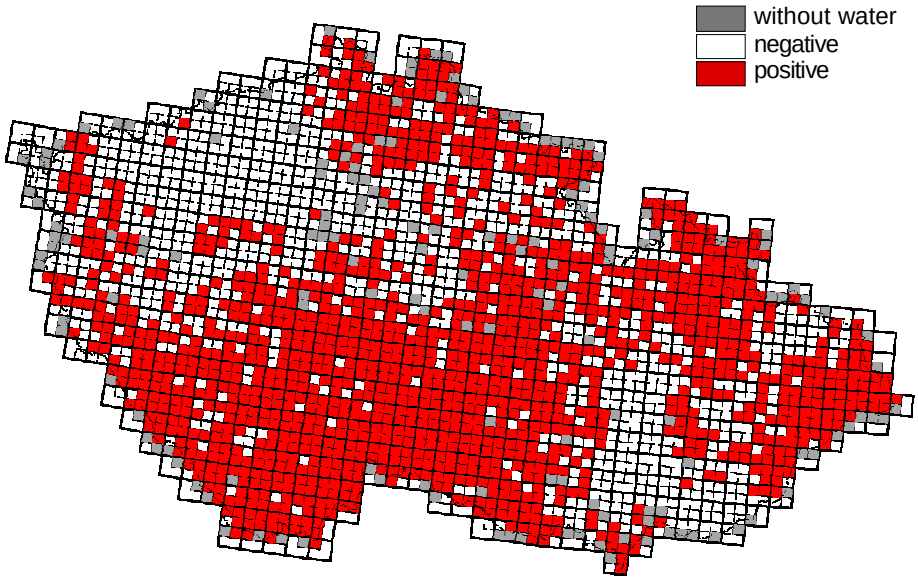
Annex 1 – Map of recent species range (source: IUCN Red List of Threatened Species)



Annex 2 – Map of recent species distribution in the Czech Republic



Distribution of Eurasian otters in the Czech Republic based on the mapping results in 2006 (Poledník *et al.* 2007a). The circle designates the area in which repatriation was performed.



Distribution of Eurasian otters in the Czech Republic in the individual sub-quadrates based on the mapping results in 2006 (Poledník *et al.* 2007a).

Annex 3 – Monitoring Methods

1. Method for nationwide mapping and mapping of marginal areas of occurrence

As part of the Otter Specialist Group at the International Union for Conservation of Nature/ World Species Survival Commission (IUCN/SSC Otter Specialist Group) a standardised method of the monitoring of otter distribution was prepared (Reuther *et al.* 2000). The mapping of distribution is based on a grid of squares (10 x 10 km) (UTM; WGS 84). Four localities are marked out within each square, whereby the square is divided into four sub-squares (5 x 5 km) and one point is selected in each sub-square.

A 600 m long section is controlled at these localities on one bank (300 m along the current and 300 m against the current or 600 m in one direction) until the first finding of a sign of presence of the otter.

In case all four controlled sites in the square are negative, then another two sites are controlled in the square.

The control site is selected with regard to the biggest probability of finding a sign of presence of the otter. In the case of central Europe this means controlling bridges at the most preserved sections of water courses, or their confluences, near stagnant waters and above all their inflow and outflow. Spraints including anal secretion and tracks are recognised as conclusive signs of presence. Individual control points in the square should be distributed in such a way that they best cover the aquatic systems of the square. The output of this method is a map of the Eurasian otter distribution in the territory showing positive and negative quadrates. Thanks to the division of these basic 10 x 10 km quadrates into sub-quadrates a more detailed picture of distribution is possible (see page 11).

In the Czech Republic the standard method was modified. The quadrate network of the SJTSK (Czech national cartographic projection) system of 11.2 x 12 km is used as a network of squares for mapping and suitable bridges without a 600-metre section of a river bank or water reservoir for the control of signs of presence. If no suitable bridge is found in the sub-quadrate, a section of 600 metres is used instead.

It is necessary that mapping is carried out in the optimum season of the year when signs left by otters are relatively high (September-April) and there is no great fluctuation in the flow of the monitored aquatic systems even in heavy snowfall or rainfall.

In case of central Europe the most suitable season is autumn, particularly the months of October to November.

The standard method of mapping can also be used to estimate the trend in population density of the species when the quantity and age of the spraints found in the locality is recorded and mapping takes place under comparable conditions. Otter spraints are divided into three groups according to their age: dark, moist with a strong odour are considered to be fresh (several days old); dark, compact, dry, but still with a distinct odour are moderately old (1-3 weeks) and light, decaying ones with a slight odour are old (more than 3 weeks old).

This method enables the distribution of the species in quite extensive territory to be estimated relatively cheaply, in the short term and with relatively great accuracy. Currently it is used throughout Europe and provides data comparable in all of Europe. Nevertheless, data on the estimation of abundance trends are very rough. Even if this method is not particularly sensitive to weather changes, heavy rain, especially in mountainous areas, could remove the signs of presence of otters and can distort the results.

2. Method of estimating abundance

The abundance of the Eurasian otter population is estimated by tracks found in fresh snow (from the previous day) in a 10 x 10 km square. Trained workers gradually examine the water courses and spaces throughout the designated square. All detected otter trail tracks are

marked into copies of maps. The direction of each trail track (against or along the current), size of the tracks and number of animals are recorded at each trail track. This method enables the detection of all the individuals that moved around in the square the previous night. It is possible to determine the adult males and females accompanied by their young depending on the size of their tracks.
The method of tracking in fresh snow is relatively cheap, providing reliable data about the abundance of otters in a certain territory, and also about the number of reproducing animals in the area. The critical factor is suitable snow conditions (sufficient snow cover; fresh snow from the previous day, at least a partly frozen water area). The method is difficult to coordinate because it is necessary in a relatively short time (several hours) to secure a sufficient number of field workers (6-10 workers per 100 km^2).

3. Method of estimating the visiting rate

The method is based on repeated control of signs of otter presence under a bridge/bridges.
Two to three suitable bridges are selected in each locality (SCI). "Suitable" bridges are bridges where otters can mark sites and the marked sites are as high above the water level as possible which reduces the risk of these marking sites being flushed by water when the water level is higher. Ten controls should be carried out in about weekly intervals apart in the autumn months. Both banks are controlled and all signs of otter presence are recorded (spraints, secretions, tracks, piles) and their age. The age is distinguished by the sign of presence (most frequently spraints) from the previous night which precedes the control and signs of presence which are older. After each control the signs of presence are removed.
The "visiting rate" of the otter is monitored as an output, i.e. how often otters walk under/mark a bridge. The visiting rate is calculated based on the finding of the signs of presence and different probability of finding of fresh (day old) and older spraints (spraints from further nights between controls) (Gruber *et al.* 2007). The visiting rate ranges between values 0 (otters did not visit the bridge throughout the time) and 1 (otters visited the bridge every night in the monitored period). The method is suitable for monitoring detailed used specific localities (fishpond, section of a water course, etc.).

4. Method of estimating occupancy

The method based on two controls of the signs of otter presence under more than one bridge within a larger area (SCI). Ten "suitable" bridges are selected within the area, i.e. bridges where otters can mark and marking sites are as high above the water level as possible which reduces the risk of these marking sites being flushed by water when the water level is higher. Both banks are controlled and all signs of otter presence are recorded (spraints, secretions, tracks, piles). During the first control the signs of presence are removed. Controls should take place in an interval of approximately one month.
The total "occupancy" of bridges in the SCI is monitored as an output. Occupancy is calculated based on information of a positive/negative finding during individual controls. Occupancy is calculated according to MacKenzie et al. (2006).

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