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Action Plan for Eurasian otter *Lutra lutra* Conservation

Plan is elaborated for the period from 2018 to 2028

Developed by the Latvian State Forest Research Institute "Silava"
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List of used abbreviations and glossary

Aquaculture – cultivation (breeding, rearing, and harvesting) of aquatic organisms using methods for increasing the production of the organisms beyond the natural capacity of the environment; aquatic organisms remain in the ownership of an individual or corporate body which has owned them throughout their cultivation period.

Biotope (according to the Law on Species and Habitat Conservation and this Action Plan) – natural or semi-natural land or water areas characterized by certain geographic, abiotic (i.e. microclimatic and non-living) and biotic factors (i.e. by presence of living organisms).

Biological (ecological) carrying capacity – the maximum sustainable population size of a given species that can be supported in a habitat without causing significant changes to the ecosystem concerned.

Habitat (according to the Law on Species and Habitat Conservation and this Action Plan) – a set of specific abiotic and biotic factors in the area where the species exists at every stage of its biological cycle.

Organochlorine compounds – organic compounds containing chlorine (Cl) atoms; the most harmful for otters are PCBs (polychlorinated biphenyls), which consists of two isolated (i.e. bound without common C atoms) benzene rings and Cl.

Methods of non-invasive research – wildlife research techniques without the need to kill, capture or even observe animals directly (e.g. observation of animal tracks and other records of activity signs/evidence of presence, use of camera traps, etc.).

Placental scars – marks of previous placement of placentas in the uterus walls which remain visible after the birth of pups.

Polyandry – female mates with multiple males during one breeding season.

Polygamy – one individual mates with multiple individuals from the opposite sex during one breeding season.

Relative frequency of occurrence of food in spraints – number of occurrences of a food item determined in all analysed spraints related to the number of all food items identified in the whole sample.

Spraint – otter excrement, this term is used specifically for the faeces of otters.

CITES – *Convention on International Trade in Endangered Species of Wild Fauna and Flora*

NCA – Nature Conservation Agency

SPNAs – Specially Protected Nature Areas

Action Plan – Action Plan for Species Conservation

Summary

The Eurasian otter *Lutra lutra* is a relatively common species in Latvia, but has been included in the list of protected species since 1977. The number of individuals in the population is estimated at around 4,000 and distributed throughout the country. Over the past 20 years, the distribution of otters has not changed significantly. The most important otter habitats are watercourses and their bank shores. In the Baltic States, the otter population is considered to be uniform. The main known mortality factor is accidental killing in beaver hunting. The main threats in the future are conflicts caused by damage to fish ponds, lack of public awareness or understanding about the need to preserve the species. At the European level, otter is a threatened species that is protected in all Member States, including Latvia, according to Annexes II and IV of the European Council of Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. In Latvia, otters are listed among specially protected species. According to the report under Article 17 of the Council Directive 92/43/EEC in 2013, the species status (population size, distribution, amount of suitable habitats and future prospects) is deemed favourable in the country.

The purpose of the Action Plan for Eurasian otter *Lutra lutra* Conservation (referred to hereafter as the Action Plan) is to maintain a favourable status for the otter population in Latvia for an unlimited period of time, maintaining a high biological carrying capacity and natural ecological functions of the species and ensuring the presence of otters as a united and functional component of the wildlife environment in man-made and managed landscapes, respecting and promoting the quality of life and wellbeing of a diverse society.

The Action Plan describes actions and measures required to ensure the conservation and management of the species in legislation, species research and data collection, information, education and training, as well as organizational and planning actions.

The Action Plan was developed at the Latvian State Forest Research Institute "Silava" within the project "Elaboration of the Eurasian otter *Lutra lutra* conservation plan" (No. 1-20/116) supported by the Latvian Environmental Protection Fund.

Introduction

The otter is a typical representative of the Eastern Baltic mammal fauna, which entered the present Latvian territory, starting with the post-glacial era, i.e. about 9,000 years ago (Tauriņš 1982). Throughout this period, humans have hunted otters to obtain their pelts, but in ancient times they also consumed otter meat (Mugurēvičš un Mugurēvičš 1999). Otter pelts are characterized by outstanding endurance and their value has always been very high. However, unlike beavers, which were completely eradicated in Latvia in the second half of the 19th century, mainly due to hunting for pelts (Балодис 1990), otters have suffered less from direct killing, and they were listed among fairly common representatives of the fauna in the 18th and 19th centuries (Grevé 1909). Hunting statistics (Kalniņš 1943) indicate that the number of otters in the country declined significantly in the 1930s, the population in Latvia decreased, became territorially fragmented and was presumably excessively exploited. After the Second World War, the number of otters has grown rapidly. However, since 1977, due to repeated decline in the number of otters, their hunting has been stopped (see Table 3), while their status in Europe at the end of the 1970s already indicated disappearance of the species in a vast area (Reuther 1980).

In the 1980s, evidence was obtained (Ozoliņš 1999) that otters are found throughout the territory of Latvia in relatively large numbers. Beaver hunting, which was resumed in Latvia during this time, revealed that a large number of otters are accidentally killed by traps, suggesting either an erroneous previous assessment of the population status or a rapid increase, possibly as a result of a ten-year hunting ban. Conversely, the return of otters to their range in Central Europe, which had been uninhabited for several decades, was only observed in recent decades (Reuther and Krekemeyer 2004), and this achievement is due to intensive work in research and environmental protection.

Today the otter is a widely acknowledged symbol of successful wildlife and habitat conservation. Otter research and conservation measures serve to preserve large-scale freshwater and riparian ecosystems and their significance exceeds economic and national interests. It is expected that the most difficult task in otter conservation in Latvia will be convincing the public that reasonable regulation in some economic activities are required to maintain a favourable status of the species, which is currently the situation without any particular restrictions in place. Apart from accidental killing during beaver hunting, on roads or in creels, otters also suffer from pollution. Consumption of fish and amphibians, high energy turnover and a lifespan of up to 15 years contribute to the accumulation of toxic compounds in otters. Researchers have been following the relationship between the occurrence of otters and organochlorine compounds

(Sjöåsen et al. 1997) for a long time, the presence of which is now also intensively monitored in Baltic Sea fish species. Harmful compounds are threatening not only to otters, but also other species and people. Areas which are unsuitable for otters can also be unfavourable or even dangerous to humans, therefore otter population status is closely related to environmental quality (Reuther 1993) and they should be protected as a significant indicator species of ecosystem health status.

The purpose of the Action Plan for Eurasian otter *Lutra lutra* Conservation is to maintain a favourable status for the otter population in Latvia for an unlimited period of time, maintaining a high biological carrying capacity and natural ecological functions of the species and ensuring the presence of otters as a united and functional component of the wildlife environment in man-made and managed landscapes, respecting and promoting the quality of life and wellbeing of a diverse society.

1. Species characteristics

1.1. Taxonomy and morphology

The Eurasian otter *Lutra lutra* (hereinafter referred to as the otter) found in Latvia is one of the 13 species of the otter subfamily (Lutrinae), family Mustelidae, order Carnivora. Another species of the genus *Lutra* is the Sumatran otter *L. sumatrana*, inhabiting a relatively small area in the Indonesian islands (Kruuk 2006).

In nature, the otter can be recognized by its low, elongated silhouette and long, hairy tail, which is thick at the base, but narrows conically and ends with a pointed tip (Tauriņš 1982, Reuther 1993, Kruuk 2006, Wilson and Mittermeier 2009). By focusing on these characteristics, the otter can easily be distinguished from the beaver (*Castor fiber*) which is considerably stumpy, as well as from the widely occurring American mink (*Neovison vison*), whose tail is bushy and visually thinnest at the base. Otter fur is brown. The brown tones can be different, and sometimes the wet fur appears almost black. The muzzle, chin, throat and belly are grizzled in adults. The otter pelt is one of the most durable pelts, and the amount of hair per 1 cm^2 (60 – 80 thousand) significantly exceeds that of the vast majority of terrestrial mammals (Kuhn et al. 2010).

When running on land, the otter moves by short jumps, but small distances are also covered by trotting. The hind part of the body during the run is lifted slightly higher, forming a hump, a characteristic for the Mustelid family. The tail is stretched and its tip touches the ground when running. When swimming, only the surface of the head is visible, and sometimes, usually when diving, also the back and the arched tail (Reuther 1993).

The weight of adult otters is between 5 and 10 kg. Males are larger and heavier than females, but gender dimorphism is more explicit in adult individuals (Table 1).

Table 1

Body dimensions (cm) for otters caught by beaver traps in Latvia (Ozoliņš 1999)

Dimensions	♂♂					♀♀				
	∅	min	Max	s	n	∅	min	max	s	n
One year olds:										
body length	55.07	50.5	60.0	3.45	7	56.50	52.0	59.0	2.57	6
tail length	27.93	23.5	34.0	3.22	7	34.25	27.0	46.0	6.78	6
front foot	7.08	6.5	7.5	0.49	6	6.25	5.0	7.5	0.94	6
hind foot	7.67	6.5	8.5	0.68	6	6.92	6.0	8.0	0.74	6
mass (kg)	4.14	2.6	5.0	0.76	9	3.93	3.2	5.0	0.58	8
Two year olds:										
body length	67.00	57.5	73.0	4.74	9	62.80	55.0	70.0	4.30	9
tail length	38.94	34.0	45.0	3.18	9	36.50	34.5	38.0	1.22	9
front foot	7.28	5.0	8.0	0.94	9	6.72	5.0	8.0	1.00	9
hind foot	8.00	6.0	9.0	0.83	9	7.22	5.5	8.5	1.00	9
mass (kg)	6.30	5.2	7.8	0.88	8	5.43	4.0	6.2	0.64	11
Adults:										
body length	76.83	65.5	90.0	5.71	20	69.18	61.5	83	5.05	20
tail length	40.90	37.0	47.0	2.59	20	37.05	32.5	42.0	2.08	20
front foot	7.71	6.5	9.0	0.53	17	6.82	5.5	8.5	0.80	19
hind foot	8.44	7.5	10.0	0.61	17	7.45	6.0	8.5	0.62	19
mass (kg)	8.23	6.0	9.8	0.96	28	6.05	5.0	7.5	0.64	24

Notes: ∅ – average value of measurements; min – minimum value; max – maximum value; s – standard deviation that describes variation of measurements around the mean value and is necessary for comparing the mean values of two populations; n – number of animals measured; the body length measured from the muzzle tip to the anus; the tail length measured from the anus to the tip of the tail; the foot length measured from the bare part of the sole that forms the footprint

Direct otter observations are more likely to occur early in the morning and late in the evening, but on cloudy days, especially in winter, it is also possible to observe them during day time (Fig. 1). The most common situations when otters are seen are during their diving for food, running along the shore, including crossing roads near bridges, dams and culverts, as well as getting out of the water and marking the territory with spraints at entries of streams or drainage system tubes. There is no information that there is a significant relationship between circadian activity and conditions required for otter conservation. Theoretically, nocturnal activity increases the risk of traffic collisions involving otters. The observer should remember that the probability of observing a beaver or an American mink is much greater than the otter. Therefore mainly indirect and non-invasive methods should be used in monitoring otter distribution and number. It has been found that in the dark, otters may not be captured by automatic cameras, which is explained by the fact that the body surface temperature of otters which have just emerged from the water, does not

differ from the ambient temperature (Lerone et al. 2015), however, practical results suggest that nocturnal snapshots of otters are possible (Fig. 2).

Figure 1. Otters at the opening in the ice during the day. Photo by K. Dukule-Jakušenoka.

Figure 2. Otter snapshot by an automatic camera on ice of a frozen beaver pond (from research material archive of the LSFRI "Silava").

Footprints are the most commonly found otter indications. Unlike in fox, raccoon dog or dog footprints of similar size, five toes can be seen in full otter footprints (Fig. 3). However, it should be kept in mind that, as shown by precise footprint analysis (Reuther 1993), in almost 40% of cases, all toes do not leave prints. Therefore, in field conditions, it is always advisable to look for multiple footprints, rather than judging by separate ones. The length of a full footprint is 5–10 mm larger than the length of the bare part of the sole (Tab. 1). The width of the feet depends on spreading of the toes, which depends on the substrate and inclination of the surface. Otter track census is the oldest and the most widely used method. It can be most successfully used in fresh snow conditions. It should also be taken into account that the use of track census in Latvia is limited by unstable weather conditions in winter and a high probability that otters move through beaver burrows and airspaces under ice and therefore may not emerge on the surface of snow and

ice. The census method is based on sexual dimorphism of otters, which is reflected also in size of the feet (Sidorovich 1991, Сидорович 1992). Individuals of different sex and age having footprints of the same size was reported by Sidorovich to be a negligible factor in Belarus, but is very common in Latvia. Only adult males can be reliably distinguished from females who have not reached the age of one year by footprint size (Ozoliņš 1999).

Figure 3. Otter footprints of all four limbs in snow. Photo by A. Ornicāns.

Otter spraints are easily discoverable proof of their presence. Mostly they are shapeless, black, gray or greenish. If the digestive tract contains a lot of undigested residues, they are oblong and can have a curved cylindrical shape (Fig. 4). The spraints are located in characteristic places along banks of the water body or on stones and horizontal tree trunks, slightly raised from the water surface; they can also often be found on beaver dams. The most common locations of high densities of spraints are under bridges with sufficient space under them, where otters are able to emerge onto the bank. Spraints have a specific odour that is not unpleasant. They do not contain harmful parasites or their eggs (Vismanis and Ozoliņš 2002). A spraint census can be undertaken in a short time. The importance of spraint quantity and distribution in otter monitoring has been extensively discussed in the literature. In studies where it was possible to compare the number of spraints with the number of direct otter observations, no unambiguous relationship between the two indicators was found (Jenkins and Burrows 1980; Conroy and French 1987). Although the spatial distribution of spraints along the shore is grouped, several other factors influence this apart from the number of otters. The main factor is season, with a significantly greater amount of spraints found in the period from late autumn to spring (Jenkins and Burrows 1980; Conroy and French

1987; Kranz 1996). Other important factors include the length of the census unit (Kruuk and Conroy 1987), littoral vegetation, human activity, meteorological conditions (Jenkin and Burrows 1980), and the fact that females leave spraints in the water more than males, and during lactation they do not mark the surroundings of the den at all (Conroy and French 1991). All of the authors mentioned above have concluded that the spraint census can be applied for otter monitoring only after careful analysis of the influence of these factors. Actual changes in population dynamics could only be inferred if, under identical conditions, the amount of spraints changed by more than 30% (Conroy and French 1987). Modern molecular genetic technologies enable the use of fresh otter spraints and hair for DNA extraction (Anderson et al. 2006, Lampa et al. 2015).

Figure 4. Otter spraint with remnants of frogs' bones. Photo by J. Ozoliņš.

The third most commonly found evidence of otter presence is territorial marks. They are heaps of sand made by otters (Fig. 5) or rolled grass marked on the surface with spraints or anal jelly, which is similar to spraint but does not contain residues of undigested food. Territorial marks are left only at particular and suitable places. Their quantity cannot be directly related to the number of otters, because, for example, in places with dense littoral vegetation, otters are unable to mark their territory. Otter territorial marks should be distinguished from the piles made by beavers, which are scent-marked by castoreum and are more refined in shape, although rarely otters may also mark the piles that initially have been made by beavers (authors' obs.).

Other traces of otter activity – lairs, passages, food remains etc. – are distributed more infrequently and are less likely to be found.

Figure 5. Otter territorial mark on sandbank. Photo by J. Ozoliņš.

1.2. Species ecology

Otters inhabit all types of water bodies where food is available as well as safe hiding places for resting and constructing dens for breeding. The basic elements of the habitat, which are required for otter survival in addition to food resources are as follows:

- sufficiently clean water that does not contain poorly soluble salts, oil products or other substances, which impair the thermal insulation properties or promote waterlogging of the fur;
- access to water during the winter – non-freezing rapids or other access points under the ice;
- transitionary hiding places for temporary resting;
- safe hiding places from land predators with the ability to enter the water quickly;
- possibilities to dry and tend the fur periodically;
- places suitable for territorial marking.

Many authors have described habitats suitable for otters (Chanin 1985, Mason and Macdonald 1986, Reuther 1993, Jahrl 1995, Kruuk 1995, Ozoliņš 1997, Reuther and Krekemeyer 2004, Clavero et al. 2006, Larivière and Jennings 2009 and others). The necessary or optimal density and distribution of these environmental components in the area are not measurable, therefore it is possible to provide only descriptive estimates of the main otter habitats.

Watercourses are the main otter habitats (Table 2), and the biological carrying capacity of the area mainly depends on the hydrography. The classification of watercourses according to suitability or specific biological capacity in Latvian conditions is very problematic, since each river in its course is variable, but uniform stretches are often shorter than length of a compartment needed for one otter. The signs of otter activity are found in all types of watercourses and during all seasons. In rivers, sites of their habitual residence are found on average every 8–9 km (Ozoliņš 1999). During a survey of otters in 24 rivers of various sizes in the 1980s and 1990s (Ozoliņš un Rantiņš 1987, 1988, 1992a, 1992b, Ozoliņš 1999), significant deviations from this mean value were also observed, however, these differences were not related to the geographical location of the river, or with dimensions or any other obvious common features. Rather, the suitability of a watercourse should be assessed on a case-by-case basis. Nor can it be considered that a natural, almost unaltered watercourse, as a rule, is more appropriate for otters than a straightened, dredged or otherwise modified river.

Table 2

Hydrographic structure of Latvian watercourses (after Sarma 1990)

River length class, km	Number	Total length, km
<10	~11 500	~19 000
10-20	501	6454
21-50	209	5315
51-100	50	3999
>100	17	2739
In total*	12 277	37 507

* after A. Pastors (1995) data there are more than 12,400 rivers in Latvia, which comprise ca. 38 000 km

Lakes play an important role in improving nutrition conditions for otters. There are 3,052 lakes and artificial reservoirs with an area of 1 ha and more, but their total area comprises 1,149 km² or 1.7% of the territory of Latvia (Pastors 1995). The distribution of the lakes is very uneven. More than 40% of Latvian lakes are located in the highlands of Latgale (South eastern Latvia). For otters, it is important that lakes be connected to the watercourse network, as is the case for the greatest proportion of Latvian lakes. They serve mainly as foraging habitats, because they contain larger fish than small watercourses (Fig. 6). Otters can fully utilise lakes only during the ice-free period. As dense ice can cover lakes for 3½–5 months per year (Tidriķis 1995), they are considered

as seasonal habitats. Exceptions could be small fluvial lakes, which can be used throughout the year due to the location of outlets and entries. In Latvia, such lakes are quite numerous – about a half of the total number of lakes do not exceed 5 ha in size (Tidriķis 1995).

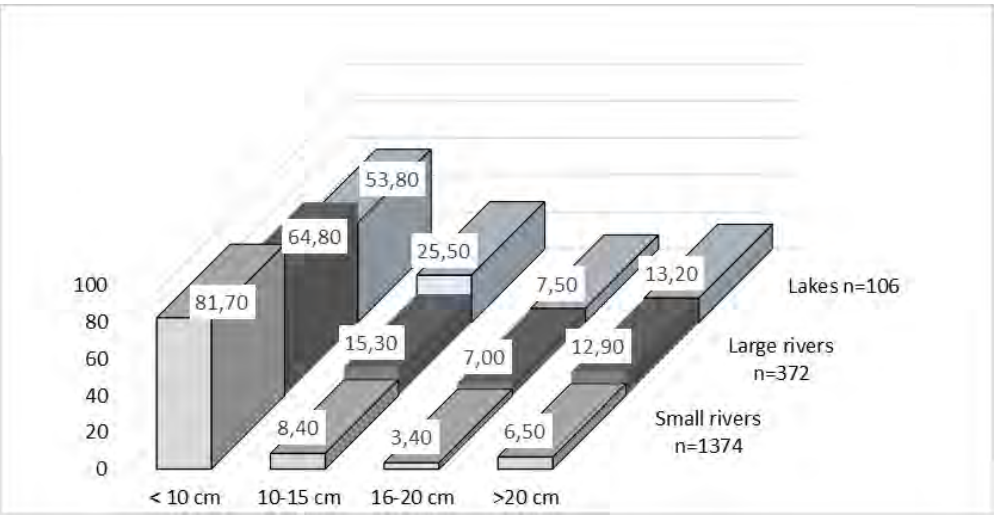

Figure 6. Distribution of fish consumed by otters according to their length in various habitats in ice-free conditions (Ozoliņš 1999) (n – number of fish for which the body length is determined after residual sizes found in otter faeces).

Open drainage systems are continuously visited by otters. Methodically, it is difficult to separate them from regulated river upper courses, small rivers and streams. Also nutritional conditions in them may be quite similar.

A cartographic survey of watercourses based on 200 2x2 km plots, using Municipality plans for the year 1990/91 at scale 1:25000 was conducted in 1994 (Ozoliņš and Sjöåsen 1996). The study revealed that on average, there are 0.939 km of river beds per 1 km² in Latvia. As the average density of river network is ~0.6 km/km² (Pastors 1995), the difference between the two figures is the length of open drainage systems or the amount of ditches. Ditches are otter habitats equivalent to regulated rivers, if there is constant water flow and vegetation is not intensively removed from the shores. Ditch sections that are inhabited by beavers building dams are particularly favourable for otters (Ozoliņš et al. 1992). Other ditches can be used seasonally and play a role in the dispersal and mixing of populations.

The seacoast is regularly visited at river estuaries, but otters are sometimes also seen far from them, e.g. at cape Kolka or the Kaltene pier. There are few possibilities for hiding at the sea coast, hence it is considered as an additional foraging habitat. There is no evidence that otters are feeding in the sea for extended periods, since the composition of spraints collected at the coast does not differ much from those collected inland (Ozoliņš et al. 1998). However, the fact that otters occur at estuaries and even at beaches far from them indicates the importance of these habitats for

providing continuous territorial structure for dispersal of the population. The coast of the Baltic Sea and the estuaries could ensure faster natural recovery of the otter population along the Baltic Sea from possibly overpopulated eastern parts toward the west (Poland, Germany and the Danish coast).

Otters are predatory mammals that consume 1–1.5 kg of food per day, mainly freshly killed animals (Chanin 1985, Mason and Macdonald 1986 Hofmann und Butzek 1992, Brzezinski et al. 1993, Kruuk 1995, Lanszki et al. 2015, 2016 and others). The fairly frequent occurrence of plant residue in spraints (Fig. 7) can be explained by high degree of overgrowth of the Latvian waters, as fragments of plants enter the otter digestive system unintentionally while catching fish and other aquatic animals. Most studies that were conducted earlier in other countries, as well as before the World War II in Latvia (Lange 1970), indicate that fish (60–90% of food residues in spraints) dominate in otter food. Over the past 15–20 years, several peculiarities have been identified that characterise otter feeding in Latvia and possibly in the rest of the Baltic region (Laanetu 1989).

Firstly, in Latvia, fish make up a relatively small proportion of the otter diet. According to relative occurrence in spraints (Ozoliņš 1999), the largest amount of fish, on average 41% per year, was consumed by otters that inhabit the largest rivers such as Daugava, Gauja, Lielupe, Venta and others. In small and medium rivers, as well as in lakes, the relative occurrence of fish in otter spraints does not exceed 38%. Temporarily, the proportion of fish in the diet can considerably increase, up to 56% in November, or decrease, ca. 30% in the summer months (Fig. 7).

Secondly, amphibians play a very important role in the diet, mainly the common and the moor frog or so called “brown frogs” (*Rana temporaria* and *R. arvalis*). In December, January and February, amphibians account for more than half of the consumed food, but also in the summer months over 20% in the otter diet are frogs. It should be considered that common frogs hibernate in water, but in summer they occur mostly on land. Hence, during this time otters gain a large portion of food in the littoral zone. By grouping the food objects according to the location where the otters can obtain them, it is possible to judge the role of various habitat elements in otter survival. Otters feed mostly in the littoral zone from May to October. An especially high proportion of terrestrial prey are consumed in June and July (Dukule 2011). The proportion of aquatic animals during the year is relatively stable. From September, but especially from November, until the first half of April, a large proportion of otter food is obtained from the river-bed. Since otters are adapted for feeding in the water, November in Latvia is considered as the most optimal period for foraging. At this time about 95% of the food is obtained in water. In contrast, from June to August, almost half of the consumed objects are terrestrial animals.

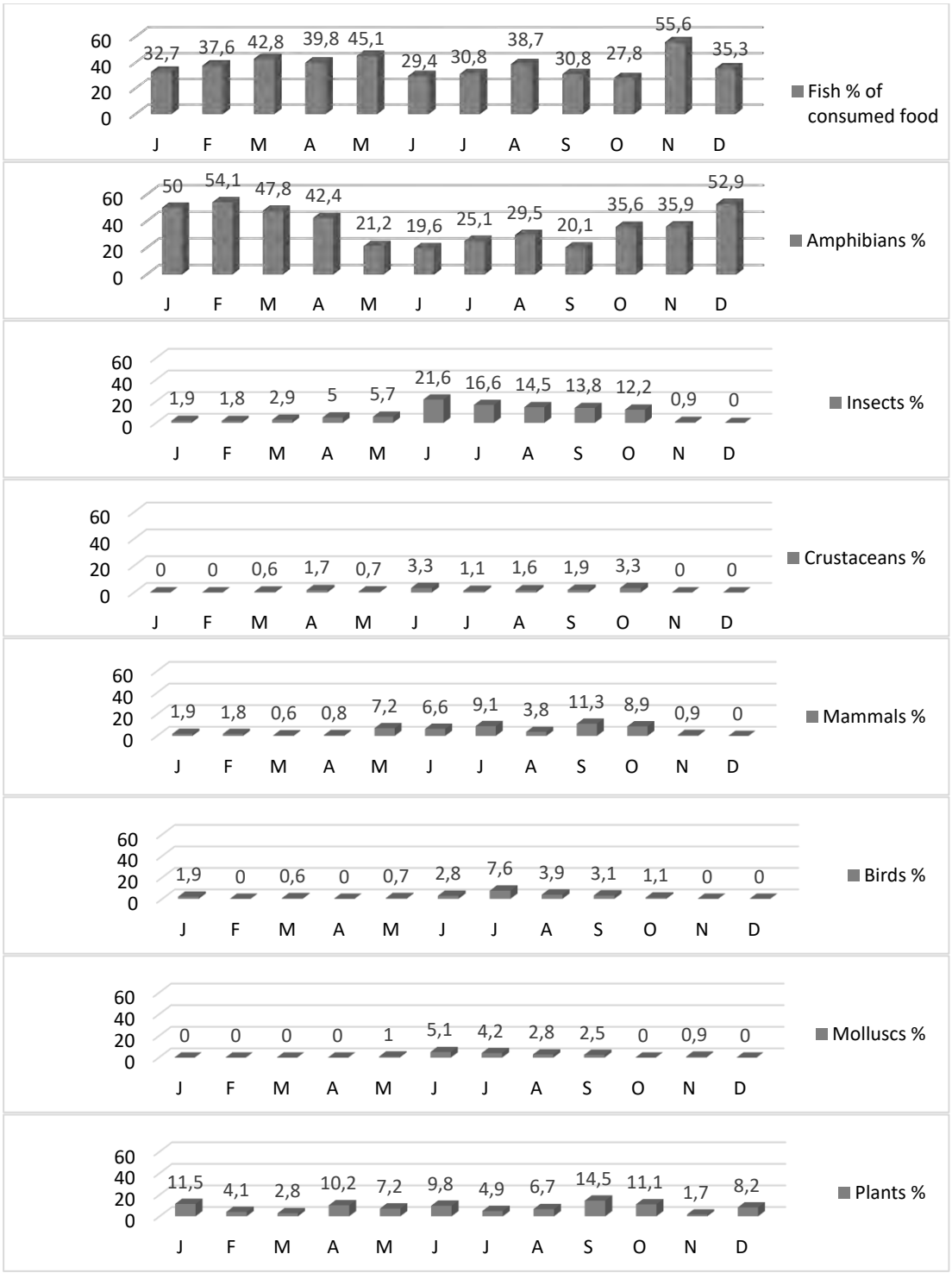

Figure 7. Seasonal changes in relative occurrence of food objects in otter spraints in small and medium rivers. In total 1218 spraints were analysed and 2477 food objects were identified (Ozoliņš 1999).

Food resources for otters in Latvia are more diverse than in most Central and Western European countries (Lanszki et al. 2016). Fish biomass in Latvian rivers is considered relatively small. The reason for this is probably not the insufficient richness of fish species. In Salaca river basin, which is an area rich in species (Zvirgzds 1987), the fish biomass, according to the materials

of the Latvian Fishery Research Institute (Birzaks et al. 1998), was estimated to be 3.563–7.757 g/m². In total, 33 freshwater fish species were found in spraint analysis, as well as river lampreys (Ozoliņš 1999), i.e. about 55% of the species living in Latvia (Plikšs, Aleksejevs 1998). Fish sizes are not large – fish shorter than 10 cm are predominant (Fig. 6). In the rivers, the most commonly consumed species (according to the number of individuals) are bullheads, sticklebacks, bearded stone loaches, perches, minnows and roaches, but in some rivers – also juvenile brown trout and salmon.

In comparison, as few as 16 fish species were consumed in Estonia (Laanetu 1989), 19 in Lithuania (Малджюнайте 1963), 35 in Belarus (Sidorovich and Pikulik 1997), 19 in the south of the Czech Republic (700 km², Jurajda and Roche 1998), 13 in the east of Germany (487 km², Hofman and Butzek 1994). In contrast, the Scottish rivers have a biomass of 9.2–14.4 g/m², which, on average, provides an annual increment of 16.1 g/m². Hence the productivity of fish in rivers is higher than their standing biomass. It is estimated that otters consume 53–67% of this productivity (Kruuk 1995). The smallest proportion of fish in the otter diet in British rivers is almost twice as high as in Latvia – 66.2% of all prey consumed (Webb 1975, cited after Mason and Macdonald 1986).

It should be concluded that the relatively favourable otter conditions in Latvian waters are determined by rich resources of amphibians, insects and terrestrial vertebrates, although recent research has indicated that the amount of terrestrial items in otter food has decreased in Latvia (Dukule 2011). Such feeding is also likely to be beneficial in terms of energy. Firstly, by swimming and diving, otters lose much energy in terms of heat (Kruuk 1995). Secondly, it has been found that common frogs contain more fat than roaches (Sjöåsen et al. 1997), one of the most common fish species in Latvia. In addition, frogs are easier to catch, especially during their hibernation period. Hence, in order to ensure good nutritional conditions for the otter population, the existing features of the littoral zone should be preserved, which makes it possible to replace fish resources with terrestrial species.

Otters are characterized by a slow reproduction rate of the population, which is associated with a long-term dependence of the pups on the mother – at least 9–12 months (Ruiz-Olmo et al. 2005). The signs of lactation, estrus and post-estrus of female otters caught in beaver traps indicate that on average, only 38% of adult females participate in the reproductive process within a year (Ozoliņš 1999). The breeding season is not strictly fixed, and the birth of pups has been detected between February and October. Most pups are born in the summer months. The average litter size is 2.69 ± 0.26 (n=13). Since this material has been collected in places where beaver hunting has taken place by annual trap installation, it is possible that the overall birth rate of the Latvian

population is slightly lower. It should be remembered that increased mortality (in this case, by beaver trapping) can increase birth rate at the population level.

The social structure of the otter population is not fully understood. The most comprehensive description on social behaviour of otters has been provided by H. Kruuk (1995). The prevailing view is that adult males spend most of their lives solitarily. The home range of males exceeds that of females by about three times and can therefore cover multiple female ranges. On the other hand, multiple adult males may appear in the same area of one female. Reproductive females stay with a male, but this male is not always the same individual (*polygamy* and *polyandry*). Females take care of pups for a long time: 9–16 months, until they fully master the ability to fish independently. It must be emphasized that, in Latvia, neither territorial nor social behaviour of individual otters has been studied. It is only known that in rivers, concentration of sites with signs of otter activity are mostly located 8–9 km apart from each other.

In Latvia, the sex and age structure of the population has been studied by determining the sex and age of otters that have been captured in beaver traps. It is assumed that otter trapping is accidental and proportional to their actual number in the wild, except for pups, which in the first months of their life usually tend to follow the mother and leave the den for the first time at the age of 2–2.5 months (Kruuk 1995). Therefore, the proportion of this age group is calculated not by the number of trapped pups (they are less likely to be caught in comparison to older animals), but by the number of placental scars, determining the litter size for caught female otters. The population is generally characterized by the same ratio between males and females, as well as a high proportion of adult animals (Fig. 8), which can be explained by a long life span of 16 years (Ansorge et al.1997).

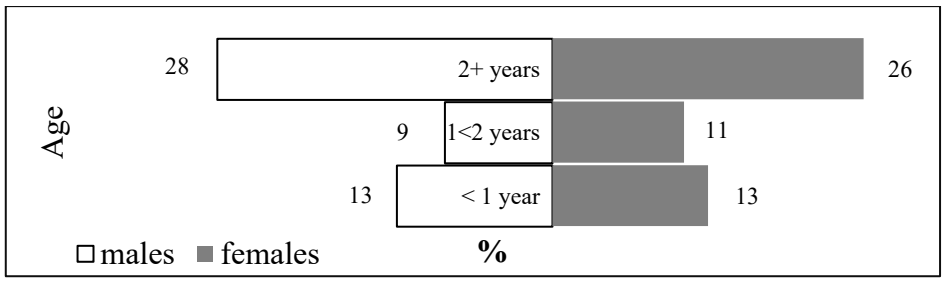

Figure 8. Sex and age structure of the otter population in Latvian rivers at the end of the 20th century (Ozoliņš 1999).

Attacks by other larger predators on otters are rare. In Latvia, one case of otter consumption by wolf (*Canis* lupus) has been reported (Andersone, 1998). Similar attacks have also been reported in Belarus (Sidorovich, pers. com.).

The main theoretical otter food competitor is American mink (Clode and Macdonald 1995). Both mammals use the same habitats, as shown by a comparative study in Lithuania (Ulevičius and Balčiauskas 1999). Mink activity – the frequency and duration of stay in one location, and therefore density, is greater. There is no evidence that otters suffer from this competition, in contrast to the mink. In Latvia, there are comparatively long river sections inhabited by otters only. In contrast, minks are found on the banks of lakes without river flow, which otters do not inhabit.

Otter diseases, excluding parasitic worms, have not been studied in Latvia and the Baltics. The issue of otter parasites is relevant, as otters live in a relatively closed ecological niche and consume a large number of individuals from a wide variety of animal species. They can therefore come into contact with many parasitic species, and they themselves could become vectors. By conducting examination of spraints and otter dead carcasses, it is not always possible to differentiate parasites infecting otters from "transit parasites". Among the otters investigated in Latvia (n = 13), 8 parasitic worms species were detected, of which 6 are considered otter parasites (Vismanis and Ozoliņš 2002). Comparing our results with the list of parasitic worms compiled by other authors, the otter helminthofauna studied in Latvia so far has not been very rich. We found 13% of known parasitic worm species of Eurasian otters. It has not been observed anywhere in the world that parasites could significantly affect otter survival (Chanin 1985).

1.3. Species distribution and population size

The Eurasian otter inhabits the widest area of all 13 known otter species in the world. Its area comprises most parts of Europe and Asia, except deserts, alpine areas and tundra zones, reaches the northern part of the African continent, the Indian peninsula and the Indonesian islands (Fig. 9).

Due to human activities in the second half of the 20th century, otters disappeared or became endangered in most parts of Europe: England, southern Sweden, Denmark, Belgium, France, Germany, Austria, the Czech Republic and Italy. Today otters are scarcely found in the Netherlands, Switzerland and Liechtenstein. Strong populations have remained in Ireland, Scotland, Norway, Finland, Portugal, Spain, Greece and Poland, as well as throughout the Eastern Baltic (Beier and Tölgyesi 1993, Jahrl 1995, Binner and Reuther 1996, Prigioni 1999). Otter population dynamics in the former USSR have been similar in all the Baltic States (Блузма 1990,

Ornicāns 1996, Laanetu 1998) and have differed significantly from the majority of Europe, where the number of otters has constantly decreased. Decline in the number of otters was registered in Latvia at the end of the 1960s and early 1970s. In Central and Western Europe, a catastrophic disappearance of otters occurred at that time, which many researchers associated with a significant amount of organochlorine compounds (PCBs and DDT) in the environment (Mason 1989, 1997, Olsson and Sandegren 1991a, 1991b).

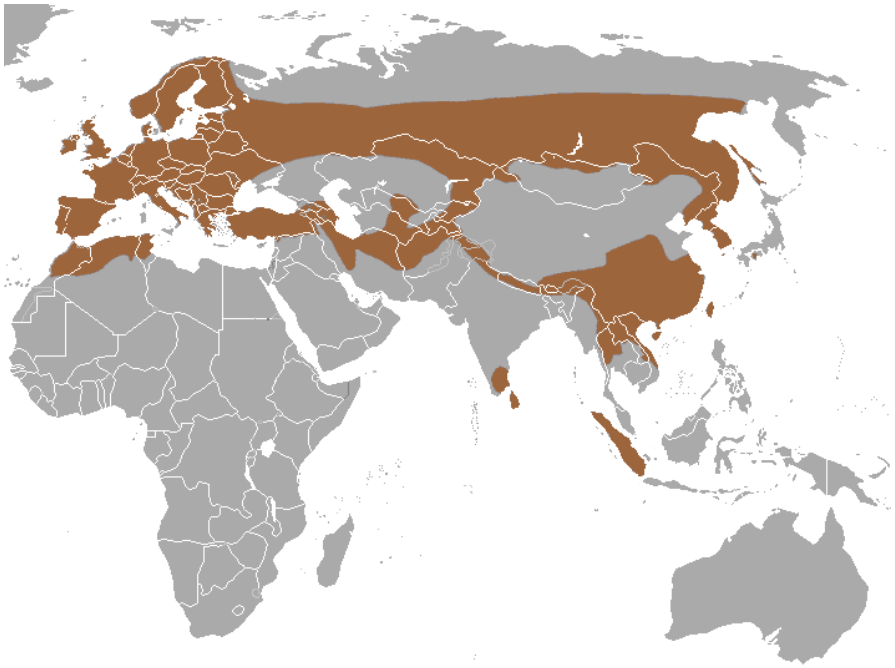

Figure 9. The range of Eurasian otter by Larivière and Jennings 2009.

Due to conservation programs the number of otters has grown steadily in recent years in Germany, Denmark, Sweden and Austria. A successful reintroduction program was started in 2002, when 10 otters, caught in Latvia, were transported to the Netherlands, (Néill et al. 2007). Currently, the Dutch otter population exceeds 200 individuals (A. de Jongh, pers. com.).

Since the 20th century, in Latvia, as well as in its neighbouring countries, otters are considered to be a widespread species (Блузма 1990, Sidorovich 1991, Ozoliņš un Rantiņš 1992a, Laanetu 1998). According to official statistics, their number in Latvia has grown significantly since the mid-1980s. According to experts, official records indicate an erroneous trend, and in fact the number of otters increased earlier, but since the beginning of the 1980s otter numbers have remained relatively stable (Ozoliņš un Pilāts 1995). The species distribution area in Latvia during this time is not fragmented and covers the entire territory of the country, but the population density is mainly dependent on the local hydrography. The population size is estimated at around 4000

(Ozoliņš 1999). The regular distribution is also confirmed by the latest otter monitoring results in 2014–2016. (Fig. 10).

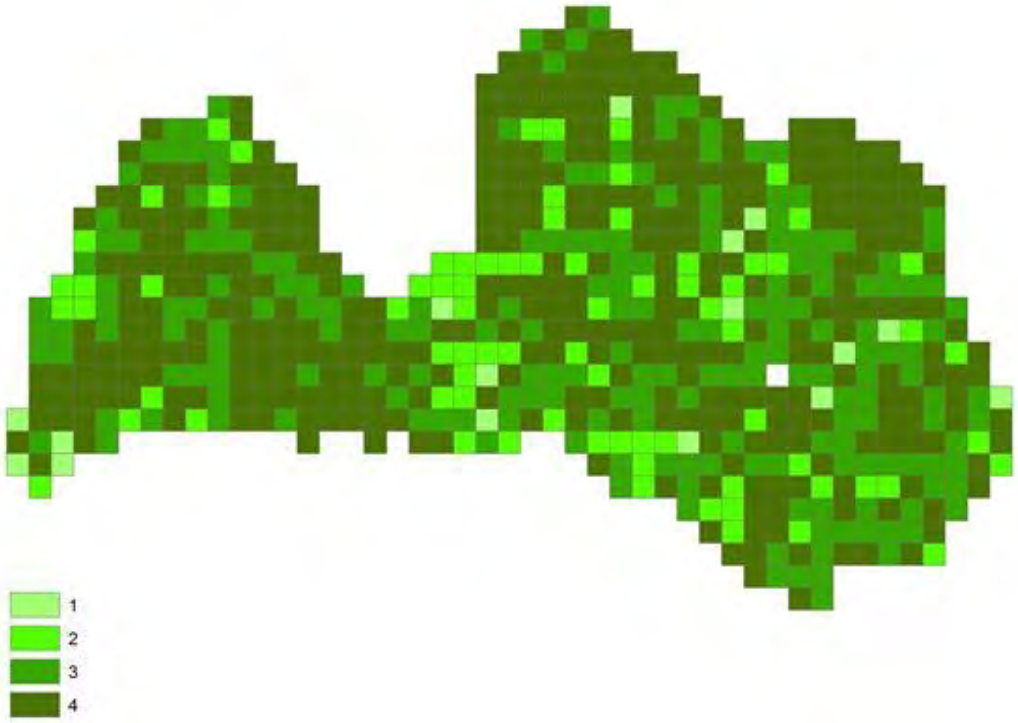

Figure 10. Distribution of otters in Latvia according to monitoring data (2014–2016).

1 – the presence of otters found at one of the four investigated sites in a 10x10 km square; 2 – the presence of otters was detected in two of the four test sites in a 10x10 km square; 3 – the presence of otters was detected in three of the four test sites in a 10x10 km square; 4 – the presence of otter was detected in all four test sites in a 10x10 km square.

1.4. Threats and conservation status

Opinions on the threat to otters and associated conservation status has changed several times over the last hundred years (Table 3). The species has been protected in Latvia since the Second World War, during the years of occupation, but after the war it was used for pelts. Since 1977, otters in Latvia have been protected by the state. In the Red Book of the Latvian SSR, created in 1980 (Andrušaitis 1985), the species was listed in Category 3 – a relatively rare species with decreasing area and number of individuals for several years. In the next edition of the Red Book, the otter was listed in Category 4 (Andrušaitis 2000). This category includes poorly studied species, which may be threatened to extinction, but due to a lack of information, their current status cannot be accurately assessed.

Although the status of the species on the global scale is considered to be "Near Threatened" (The IUCN Red List of Threatened Species, 2017), it must be acknowledged that the estimated poor situation in Latvia in both editions of the Red Book was unfounded.

When assessing the species conservation status in Latvia in accordance with the report under Article 17 of the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora for the period 2007–2012, it is generally considered as favourable.

Table 3.
The earliest situation of otters in Latvian legislation

Legislative Act	Year	Closed season
Rules on Hunting of the Republic of Latvia	1922.	none
Hunting Law of the Republic of Latvia	1923.	1.04.-15.07.
Hunting Law of the Republic of Latvia	1935.	1.04.-19.07.
Hunting Law of Germany, 1934, with amendments in 1938	1941.	entire year
Decree on hunting in Ostland by Reichskommissar Regulation on Hunting season	1942.	entire year
Hunting Regulation for the territory of Latvian SSR	1945.	None
Decision on partial amendment of thevHunting Regulation by Minister Council of the Latvian SSR	1946.	1.03.-25.10.
Regulation on Hunting and game management of the Latvian SSR	1974.	16.02.-31.10.
Decision by Minister Council of the Latvian SSR No. 241 *On Approval of the Natural Objects Protected by State in the Territory of the Latvian SSR*	1977.	entire year
Resolution by the Presidium of the Academy of Sciences of the Latvian SSR *On the approval of the Red Book of the Latvian SSR*	1977.	entire year
Regulations on Hunting and Hunting Ground Management in the Territory of the Latvian SSR	1984.	entire year
Decision on otter exclusion from the Red Book by the Latvian SSR Red Book Council	1987.	-
Hunting regulation	1995.	entire year
Regulation by Cabinet of Ministers No. 396 *Regulations on the List of Specially Protected Species and Restricted Use of Specially Protected Species*	2000.	entire year

1.5. Previous research

The assessment of the otter population status in Latvia until 1986 was made solely on the basis of studies in other countries, hunting statistics and opinions by fauna specialists without expertise in otter research (Tauriņš 1982, Andrušaitis 1985). Targeted research was initiated in 1986 within the framework of a research contract for the Latvian organization of forest exploitation "*Economically important amphibionts*", under the leadership of Dr. habil. Mārtiņš Balodis. Research continued under various contracts until 1997, and results of the project were transferred to the archives of LLC "Latvian Forest Inventory", LSFRI "Silava" and the State Forest Service.

The main results of these studies have also been published since 1987 (Ozoliņš un Rantiņš 1987). The first precise information on the species distribution up to 2002 (Vismanis and Ozoliņš 2002) also included initial data on otter parasites. At the University of Latvia, Faculty of Biology, several theses on otters were defended, including two bachelor theses (Dziļuma 1989, Riekstiņa 1989), three masters theses (Ornicāns 1996a, Pupila 2002, Dukule 2011) and one doctoral dissertation (Ozoliņš 1999). In the following years, active research on the species in Latvia ceased until 2014, when in the framework of a research contract ordered by the Nature Conservation Agency, a three-year otter monitoring project throughout the country was conducted by LSFRI "Silava" (https://www.daba.gov.lv/public/lat/dati1/state_monitoringa_dati/). The otter is an inappropriate species for utilising observations from the general public, as in the last three years, only one otter observation report has been registered in the website "Dabas dati" (Nature data, https://dabasdati.lv/lv/dosearch/ - downloaded 24.11.2017).

The methods used for the otter research in Latvia include activity sign census and mapping along inland waters and seashore (Ozoliņš and Rantiņš 1987, 1988), analyses of spraint content (Ozoliņš and Rantiņš 1992a, Ornicāns 1996a, Dukule 2011), investigation of dead animals by performing morphometric and craniometric measurements (Ozoliņš 1999), age determination by means of microscopic examination of canine longitudinal sections (Pupila 2002), analysis of stomach contents and complete parasitological examination of the internal organs for helminths (Vismanis and Ozoliņš 2002). The amount of DDT and PCBs in otters and their main dietary objects was also analyzed (Sjöåsen et al. 1997). A DNA study has been conducted for comparing native individuals to the rest of the European population (Mucci et al. 2010).

The Otter Specialist Group (IUCN SSC OSG) unites and organizes the work of otter researchers in all countries and regions of the world. Descriptions of the research and their results are published in the annual bulletin of the IUCN / SSC Otter Specialist Group. Information on projects, international co-operation and country involvement can be found on the web site http://www.otterspecialistgroup.org. The International Otter Specialist Group develops and updates guidelines for research of all otter species and distribution regions depending on their specific features. The group also involves representatives of Eurasian otter researchers from Latvia and Lithuania.

Knowledge gaps and approaches to species research

Although the main characteristics of otters are relatively well studied in Latvia, there is a lack of research regularity and comparison with the latest data on changes in the status of other associated species in ecosystems. The comparisons are relevant at the monitoring level – changes

in freshwater fish and tailless amphibian populations, the status of freshwater habitats in terms of biodiversity, as well as hydrochemical measurements in surface waters.

Otter damage to aquaculture, a pressing problem in Central European countries during the 1980s and 1990s, (Kemenes 1989, Kranz 1995, Geidezis 1998), has been little studied in Latvia. Isoloated cases of otter damage to private ponds considered significant by the pond owners are not officially recorded and summarised. In addition, inspections have not been undertaken to validate whether the damage was actually caused by otters or by American mink. When restoring the market economy and developing new economic sectors, the impact of pond management on otter conservation should not be neglected (Toman 1998). During development of the Action Plan on species conservation, an inquiry was conducted in 2017, which included responses by owners of 8 fish farms. The preliminary study and examination of the indicated objects in the field revealed that further accumulation and analysis of data on the nature and extent of otter damage should be done, taking into account several factors: area and distribution of the ponds, location in relation to watercourses, littoral vegetation, composition of fish species, presence of other piscivores, as well as beaver activity. The pond owners have very different assumptions on the amount of lost fish, but generally it should be acknowledged that it does not coincide with the specialists' conclusion that the proportion of losses to fish biomass caused by otters in large ponds is comparatively smaller than proportion of fish lost in small ponds (Toman 1998, Kranz, pers. com.). Determining the extent of damage to fish ponds continues to be a controversial issue and is also widely studied in other countries, both in terms of otter ecology and damage assessment methodology (Roche 1996, Jurajda and Roche 1998, Kranz 1998, Kucerová 1998, Bauer-Haáz et al. 2014). In order to verify the validity of the opinion of Latvian pond owners, studies on the number of otters, duration of their presence and food composition at particular ponds with a known area and other characteristic parameters are required.

2. Key factors affecting species status

2.1. Factors affecting species survival

Many anthropogenic factors that have endangered otter populations in Europe in the second half of the 20th century have been discussed in the literature (Mason and Macdonald 1986, Macdonald and Mason 1990). Among them are direct killings (hunting, mortality on roads, drowning in fishing gear), mechanical degradation of the environment (straightening of watercourses, removal of littoral vegetation, bank protection, construction, drainage of wetlands, installation of artificial dams), environmental contamination (particularly polychlorinated biphenyls PCBs), reduction of food resources, which is mainly the result of changes in these

environmental conditions, as well as disturbances caused by tourists, anglers, water sports and dogs. In Latvia, none of these factors is completely absent, but the actual population status indicates that currently, their impact is not dangerous. The following limiting factors of the otter population in Latvia have been studied in more detail: food resources, pollution and hunting.

Food resources

Although the obtained data suggest that fish biomass in Latvian rivers is relatively small (Birzaks et al. 1998), there is no reason to believe that in the current circumstances, this could lead to a decrease in the otter population. Although the energetic value of frogs and toads is lower than that of fish (Nelson and Kruuk 1997), in Latvia, due to their much easier accessibility, they should be considered as an equivalent or an even more important food resource for otters than fish. Geographically, the closest quantitative inventory of amphibians was conducted in Belarus. It was found that the biomass of frogs in rivers from October to April can reach 858 kg per 1 km of watercourses (Sidorovich 2011), which is tens of times higher than fish biomass in small and medium rivers of Latvia. The importance of wintering frogs in the otter diet has been reported in Estonia (Laanetu 1989), Belarus (Sidorovich 2011), Poland (Brzezinski et al. 1993) and Finland (Sulkava 1996). The role of amphibians in otter survival in Latvia becomes even more apparent when analysing the situation during the summer period. In the middle of summer, the small and medium rivers in Latvia are not rich in fish. To survive, the missing portion of the food, 40 to 50%, is compensated by terrestrial animals, most of which are arthropods, as brown frogs have moved from water to land during that time. Consequently, in the period from May to October, the riparian zone of small and medium rivers is very important for otters (Ozoliņš 1999).

Lack of food can occur either at the end of the winter, when overconsumption or freezing may result in food shortages in the water, which cannot be compensated from the riparian belt, or in the middle of the summer, when otters, against their own specialization, feed mainly on land. The latter case is less harmful for the population, as compensation for the missing resources is possible due to expansion of the dietary spectrum. Along with amphibians, insects (e.g., larvae of dragonflies and large water beetles) are able to provide food for otters in fish-poor habitats and contribute to continuous survival of the otter population in Latvia. In Belarus, otter switching to frogs has been recognized as typical in anthropogenic landscapes, where fish resources have been degraded as a result of human activity, mostly due to drainage works. This phenomenon is regarded as a typical survival strategy of otters in an anthropogenic landscape (Sidorovich and Pikulik 1997).

Pollution

When analysing the negative effects of anthropogenic factors on Eurasian otter populations, pollution is mentioned as the primary factor in the literature, although it is emphasized that the number and distribution of otters has been influenced by the combined effect of several factors (Mason and Macdonald 1986, Macdonald and Mason 1990). Of all types of contamination, the concentration of organochlorine compounds has been most closely associated with deterioration of otter populations. Polychlorinated biphenyls, denoted as PCBs in the international literature, organochlorine insecticides – dieldrin ($C_{12}H_8OCl_6$) and DDT with its decomposition products DDE and DDD are considered as the most dangerous. The most extensive studies and evidence of harmful effects of these substances have been obtained for PCBs (Mason 1989, Olsson and Sandegren 1991a,b, Smit et al. 1996). Their accumulation in marine ecosystems has also been studied in the Baltic (Roots and Aps 1993).

In a special study (Sjöåsen et al. 1997), it was found that concentrations of PCBs and DDT in Latvian otters are significantly lower compared to the available data from other European regions (Table 4). It is even lower than in Northern Norway, where the coastal otter population is considered to be very dense (Christensen 1995 quoted by Sjöåsen et al. 1997). In extracted muscle fat (Mason 1997) the level of PCBs is below the critical level indicated in the literature – 10 mg/kg (critical level 30 mg/kg). Recent studies warn that the accumulation of fluorine (F) organic acids in the environment may also be hazardous to otters (Roos et al. 2013).

Table 4
Concentration of PCBs and DDT (mg/kg) in extracted fats from otter muscle in different European regions in chronological order

Region	Years	n	PCBs		DDT		Authors
			mean	lim.	mean	lim.	
Norway	1970s	23	17	1,6-30	1,7	0,18-5,9	Sandegren et al. 1980
Central Sweden	1970s	53	120	4,7-970	4,1	0-27	
Northern Sweden	1970s	24	52	4,7-170	-	-	Olsson et al. 1981*
Southern Sweden	1970s	29	183	12-970	-	-	
Great Britain	?	14	53	0-300	18,5	0-85	Mason and Macdonald 1986
British Isles	?	21	36,1	0-300	15,5	0-80	(Mason et al. 1986, Mason 1988, Mason and Reynolds 1987)**
Greece	?	1	-	-	1,8	-	Gaethlich and Mason 1986**
Finland	1982.	1	6,9	-	-	-	Skaren 1988

France	1987.-1988.	3	26	12-55	-	-	Lafontaine et al. 1990*
The Netherlands	?	5	82,2	3,9-231,2	-	-	Broekhuizen 1989***
Denmark	?	16	16	7,5-60	0,9	0,39-1,88	Olsson and Sandegren 1991a
Czech Republic	1990.-1991.	8	131,5	19,3-260,5	4,3	0,24-8,28	Hlaváč and Toman 1991
Norway	1978.-1992.	110	7,41	0,58-29	-	-	Christensenand Heggberget 1995*
Spain	?	21	100	4,4-1000	-	-	Ruiz-Olmo 1994*
Latvia	**1991.-1992.**	**8**	**2,3**	**0,4-10**	**0,22**	**0,028-0,760**	**Sjöåsen et al. 1997**
Czech Republic	1990.-1995.	20	93,6	19,4-260,5	8,58	0,2-61,36	Hlaváč 1997

Cited after * Sjöåsen et al. 1997; ** Mason 1989; *** Smit, de Jongh 1991

Hunting by beaver traps

Due to similar habitat use by both species, the otter is undoubtedly influenced by beaver hunting. In Latvia, a remarkable factor in otter mortality during the 1980s was related to traps set for beavers (Ozoliņš and Rantiņš 1994, 1995). The largest number of beavers, and hence also otters, were caught in the autumn months before freezing of water bodies – from October to November. From 1984 to 1991, 2,143 otters were legally (accidentally) killed as a result of beaver hunting in Latvia. The maximum recorded otter mortality peaked in the hunting season of 1988/89 (> 400 individuals). From 1992, otter mortality in beaver traps started to decline, as this type of hunting declined in popularity due to the low price of beaver pelts. However, this may not indicate that the actual number of otters caught was as low as shown by the official statistics, since control of this type of hunting was also weakened due to its lower economic significance.

The most complete information on otters caught in beaver traps is from 1988/89, when the otter mortality was the highest (Ozoliņš 1999). According to data gathered from hunters, 13.2% (n=302) of the otters were juveniles and subadults, younger than 1 year of age. The proportion of males was highest among the trapped juveniles – 82.5% (n = 40), but in older age-classes it was 66% (n=262). This sex ratio disparity might be explained by the increased activity and lower caution of males, as investigations of the sex ratio in nature have reported a similar numbers of males and females (Stubbe 1969) or even a female predominance (Ansorge et al., 1997). However, the information provided by Latvian hunters is contradicted by data from 113 animals trapped over a period of 12 years, which indicates that the sex ratio among the trapped otters is close to 1:1 (Fig. 4). This may be explained by errors made by hunters in cases when sex was not determined, but later it was necessary to enter the corresponding data in hunting documentation forms. The existence of this type of errors is also confirmed by the fact that a high proportion of males were

reported among juveniles. However, studies have shown that pups are born in a ratio of 1:1 (Reuther 1991).

Modelling of the structure of an intensively harvested population was created by combining information from a 12-year study of otters caught in a 60-km-long section of the Gauja River including tributaries (Fig. 11). The model indicated that this population was able to recover and compensate for the decrease in otter number by influx of females of reproductive age from the near vicinity (17.1% of the total). According to the model, they supposedly forced young otters (1–2 years old) from the area. This does not mean that the recovery of the population would be as successful if traps were installed at the same density on an even longer section of the river. In addition, the study found that trapping beavers in autumn also kills female otters, whose pups, which are not caught, are likely to die.

In general, it should be acknowledged that the annual mortality within the otter population in Latvia due to hunting did not exceed more than 10–15% of the total population. As other mortality factors were insignificant (in Latvia during those 12 years, only a few cases of otters killed on roads or otherwise had been reported) and the proportion of juveniles was 26% (in some places, e.g., in the Gauja river – up to 36%) of the population (Ozoliņš 1999), then it must be concluded that hunting had not reduced the number of otters. In addition, these results also suggest that locally, as owners of fish ponds would desire, it is not possible to reduce otter numbers by trapping.

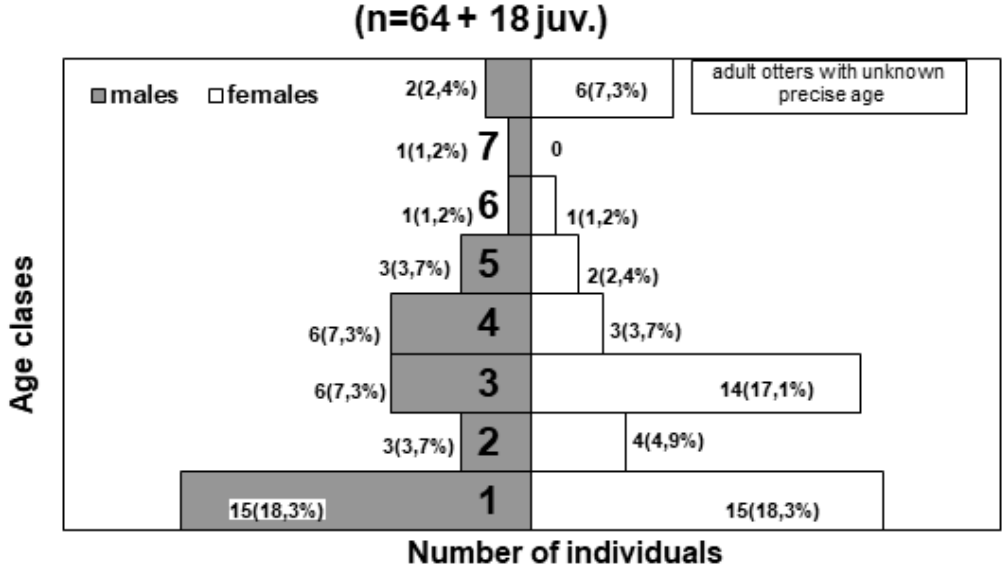

Figure 11. Sex and age structure of accidentally trapped otters in beaver traps within the Gauja river basin during the 1980s and 1990s. The number of pups was additionally estimated according to the number of placental scars, which exceeded the actual number of trapped juveniles by 18 individuals.

2.2. Factors affecting species habitat

According to current assessments, the status of otter habitats in Latvia is favourable (https://bd.eionet.europa.eu/article17/reports2012/species/report/?period=3&group=Mammals&country=LV&region=). The habitat status was determined by monitoring NATURA 2000 sites (https://www.daba.gov.lv/public/lat/dati1/valsts_monitoringa_dati/). If no unfavourable factors for otters was found, the habitat condition was evaluated as excellent, one negative factor – good, two unfavourable factors – moderate, more than two unfavourable factors – poor. Most of the Natura 2000 sites had an excellent habitat status, with a smaller number having a good or moderate habitat status (Fig. 12). The lowest number of sites were rated as poor. Poor habitat status was observed at 23 locations in 16 Natura 2000 sites. However, these assessments only apply to individual checkpoints and not to any of these Natura 2000 sites in general.

The habitat status did not correlate with otter presence or absence at these places. In places with poor habitats, otters were found most rarely – in 81% of locations. In contrast, in places with excellent habitats, otter presence was not much higher – 86%. The condition of habitats in places where signs of otter activity were not found was mostly excellent or good.

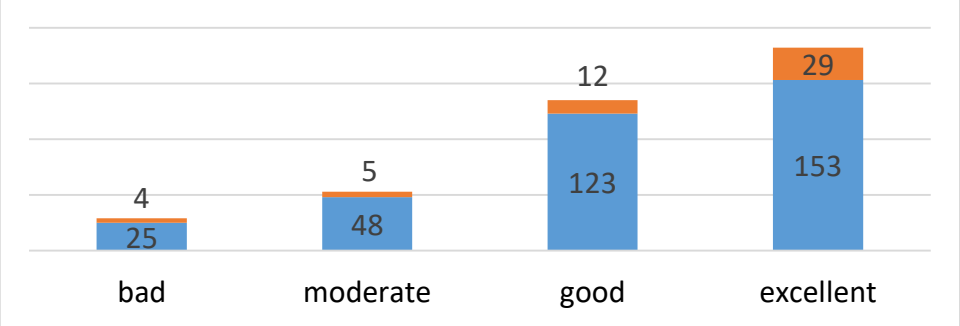

Figure 12. Distribution habitat status at locations in Natura 2000 sites (the number of locations where otter signs were observed is indicated by the blue colour, but the orange colour corresponds to the number of sites where signs of otter activity were not observed).

Of all the negative impacts at Natura 2000 sites, no industrial water pollution, domestic wastewater pollution, crayfish breeding and illegal killing were detected. In seven locations water pollution from agricultural activities was observed, and in seven locations fish breeding ponds were observed. Light pollution was detected in 15 locations, the impact of small hydroelectric power plants – in 24 locations, acoustic pollution – in 36 locations, road construction – at 47 locations, and disturbance by tourists and anglers – at 49 locations. The most frequently observed factors were the presence of invasive species (mostly American minks) (at 73 locations) and beaver hunting (at 78 locations). The reported factors did not affect the otters significantly – in all areas within their borders signs of recent activity were found. Although the effect of acoustic pollution, as well as transport and road construction, slightly reduced otter occurrence, otters were detected

at 77% and 68% sites with such disturbing factors, respectively. In places with other negative factors, the percentage of occurrence was above 83%.

During the monitoring period no unfavourable trends were found in otter distribution and spatial connectivity of the habitats.

Latvia is involved in the Interreg Baltic Sea Region project Water Management in Baltic Forests (WAMBAF) from 2016 to 2019, which will also be expected to contribute to research and maintenance of a favourable status of otter habitats. The aim of the WAMBAF project is to reduce nutrient and mercury flow into watercourses and water bodies as a result of forestry, in particular by focusing on renovation of forest drainage systems, protection zones and management of beaver ponds (http://www.silava.lv/23/section.aspx/View/188).

3. Present conservation of the species, and effectiveness of actions

3.1. Legislation

International obligations:

Convention on Biological Diversity (Rio, 1992). Latvia took part in signing the document and ratified it in 1995. Rather than containing any species lists or annexes, it provides general guidelines on the conservation of biological diversity, research and public awareness, which the parties within the agreement follow according to their capabilities and needs. Otter conservation is considered under Article 8 '*in-situ* Conservation'. Its enforcement in Latvia is implemented by the Law *On Convention on Biological Diversity (Rio, 5 June 1992)* (adopted on the 31st of August 1995, enforced since the 8th of September 1995).

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979). Otter is listed under Annex II 'Specially protected fauna species'. This means that signatory parties of this convention stipulate a strict protection, restricting species exploitation. Its enforcement in Latvia is implemented by the Law *On the Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979)* (adopted on the 17th of December 1996, enforced since the 3rd of January 1997).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; Washington, 1973, in force since the 1st of July 1975). Otter is listed under Appendix I as threatened species at risk of extinction. This means that international trade with this species for commercial purpose is prohibited. Its enforcement in Latvia is implemented by the Law *On the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington,*

1973), adopted on the 17th of December 1996, enforced since the 3rd of January 1997, and by the European Council regulations, which are directly enforced in Latvia.

Documents that describe the conservation status of otters emphasize that conservation of their habitats at the international scale is supported by the *Convention on Wetlands of International Importance especially as Waterfowl Habitat* (Ramsar, 1971, in force since 1975). Its enforcement in Latvia is implemented by the Law *On the Convention of the 2nd of February 1971 on Wetlands of International Importance especially as Waterfowl Habitat* (adopted on the 5th of April 1995).

The otter is included in Annex A of the Council's Regulation (EC) No 338/97 *On the protection of species of wild fauna and flora by regulating trade therein*, and its actual redaction while developing the Action Plan for this species is decreed by the Commission Regulation (EU) No 2016/2029 *amending Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein.* This regulation decrees a strict process, implemented by a system of special permits and certificates, on how individual otters or their products can be imported or exported to or from the European Community and used within the borders of the European Community or in local trade.

European Council's Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Otter is listed under Annex II (species of Community interest whose conservation requires the designation of special areas of conservation) and Annex IV (species of Community interest in need of strict protection). The Directive's claims are implemented by all national legislation (laws, regulations issued by the Cabinet of Ministers, decisions of responsible institutions, decrees) concerning conservation and exploitation of wild species and natural habitats.

By limiting permitted hunting tools and methods, otter conservation status is indirectly improved by Council Regulation (EEC) No. 3254/91 *prohibiting the use of leghold traps in the Community and the introduction into the Community of pelts and manufactured goods of certain wild animal species originating in countries which catch them by means of leghold traps or trapping methods which do not meet international humane trapping standards* (Laws on Leg-Hold Animal Traps Around the World, 2016). The normative document is directly applicable in Latvia, since it has become a member state of the European Union.

National legislation:

In Latvia, according to the Law on the Conservation of Species and Biotopes (16/03/2000, latest amendments 08/10/2015) and Annex 2 of the Regulation No. 396 *List of the Specially Protected Species and the Specially Protected Species Whose Use is Limited* (Cabinet of Ministers,

14/11/2000, amended by Regulation No. 627, 27/07/2004), otter is classified as a specially protected species.

In accordance with Regulation No. 1055 *Regulations for the list of animal and plant species of importance in the European Community requiring protection and the list of individuals of animals and plants that may be subject to conditions of restricted exploitation in the wild* (Cabinet of Ministers, 15/09/2009), issued according to the Paragraphs 15 and 16 of Article 4 of the Law on the Conservation of Species and Biotopes, otter is listed among animal and plant species of importance to the European Community which require protection.

The Animal Protection Law (09/12/1999, last amendments on 15/06/2017) determines general requirements for wildlife conservation, including Article 27 – "It is prohibited to capture and keep in captivity wild amphibians, reptiles, birds and mammals, except for the cases specified in this Law and laws and regulations governing nature protection and hunting". This law prohibits cruel treatment of all animal species, as well purchasing, keeping in captivity, expropriating and keeping for trade, exchange or offering for trade carnivore species of wildlife, except for zoos and registered holdings of wild animals.

Paragraph 8 of Article 5 of the Law on the Conservation of Species and Biotopes appoints the Ministry of Environmental Protection and Regional Development and its subordinate institutions to ensure the monitoring and recording of incidental capture or killing of specially protected species. According to Paragraph 18 of Article 5 of the Law on the Conservation of Species and Biotopes, promotion of education and access to information on the need to protect wild fauna and flora and preserve biotopes, species and their habitats is provided for. In addition, Section (1) of Article 6 states that the Ministry of Education and Science promotes research and development of scientific research necessary for the implementation of this Law. Section (1) of Article 10 of this Law entitles land owners and permanent users with the right to receive compensation from the funds of the state budget regarding significant damages caused by animals of specially protected non-game and migratory species (including otters), providing necessary protective measures and cautious ecological methods have been taken and introduced to prevent or reduce loss, using knowledge, skills and practical capabilities. The land owner or user is not entitled to receive compensation, if he or she has deliberately furthered the damage or increased its amount in order to receive compensation. Article 11 of the Law prohibits deliberate killing and disturbance of specially protected species, particularly during breeding and hibernation periods, as well as transport and trade of these species and products derived from them. Whereas Article 14 sets out the conditions for exceptional cases when the Nature Conservation Agency (NCA) is entitled to issue a permit for the acquisition and possession of individuals of specially protected

species under strictly controlled conditions. Article 22 of the Law provides that each person is obliged to notify the NCA about cases of illegal capture, accidental killing or discovery of a dead individual.

The procedure for receiving permits for otter acquisition according to granted exceptional conditions is set out in Regulation No. 1165 *Procedure for issuing permits for the acquisition of individuals of non-game species, introducing wild species uncharacteristic to Latvian wildlife (introduction) and restoring species populations in the wild (reintroduction)* (Cabinet of Ministers, 21/12/2010).

Since the 10th of June 2016, Regulation No. 353 *Procedure for determining amount of losses caused to land owners or users, related to significant damage by specially protected non-game or migratory species, and requirements of minimum protection measures for prevention of damage* (Cabinet of Ministers, 07/06/2016) has come into effect. Article 2 of this Regulation determines that compensation for losses (hereinafter – compensation) is to be paid from funds provided for this purpose from the state budget after it has been established that damage was caused by animals of specially protected non-game or migratory species, the damage is significant and the land owner or user at the site of damage has implemented the protection measures for prevention of damage specified in this Regulation.

On the basis of Paragraph 3 of Article 4 of the Law On the Conservation of Species and Biotopes and Paragraph 40.2 of Regulation No. 281 *Regulations on preventive and sanitary measures and procedure for damage assessment to environment and calculation of costs related to preventive, emergency and sanitary measures* (Cabinet of Ministers, 24/04/2007), the damage to the environment, caused by killing or wounding an otter, must be refunded by 10 minimum monthly wages per each individual. The damage to the environment must be refunded in a threefold amount if otter is killed or injured in a nature reserve, restricted area, national park or restricted zone of a biosphere reserve, as well as within a micro-reserve or a specially protected forest district.

The procedure for otter registration for keeping in captivity is determined by Regulation No. 1139 *Procedure for the storage, registration, keeping in captivity, marking, trade and certificate issuance for international trade of endangered species* (Cabinet of Ministers, 06/10/2009).

In order to ensure conservation of otter habitats outside specially protected nature areas, compliance with the requirements laid down in the *Protection Zone Law* (05/02/1997, most recent amendments on 19/05/2016), as well as Regulation No. 475 *Procedure for cleaning and deepening of surface water bodies and port waters* (Cabinet of Ministers, 13/06/2006*)* is of great importance.

Application of international and national legislation in species conservation and management:

The legal protection of otters provides for practically all aspects related to maintaining a favourable species conservation status:

- population status assessment;
- procedures concerning individuals that have been accidentally killed or found dead;
- keeping and breeding conditions in captivity;
- trade, import / export, storage and transportation of individuals and products;
- penalties for unlawful killing;
- liability for damage to aquaculture and procedures for determining the extent thereof;
- promotion of education and professional competence.

However, it should be acknowledged that practical application of legal standards lacks a solution for cases involving conflict situations, such as preventive measures to reduce the risk of damage, measures to mitigate beaver and American mink hunting processes with an increased probability of accidental killing of otters, and assessment of an adequate amount of compensation for losses in cases when damages are caused over a long-term period by several piscivorous species. In the area of legal protection, specific guidelines for conservation of otters and other carnivores would be useful, which would facilitate adoption of administrative decisions and application of future legislative initiatives.

3.2. The role of specially protected nature areas and micro-reserves in species conservation

Specially Protected Nature Areas (SPNAs) play an important role in protecting otter habitats and foraging sites. In the context of species conservation, they are even more important in cases of beaver hunting and demolition of beaver dams. Territory surveys with the aim of investigating the occurrence of otters has been initiated during the implementation of a preliminary inventory of specially protected nature areas (EMERALD) for the establishment of NATURA 2000 site network in Latvia. It is still on going by developing new or updating previously developed action plans for SPNAs and monitoring otters.

Presence of otters and their activity signs have been detected in a large number of SPNAs. This is confirmed by otter monitoring results (https://www.daba.gov.lv /public/lat/dati1/valsts_monitoringa_dati/#ziditaji). Otters were found in 97% of the surveyed SPNAs. The species was found in 92 territories in a total area of 64,3743 ha. This means that conservation of otters and their habitats is secured in almost 10% of the total national land area. In most cases, otter habitats are in good or excellent condition. The most common adverse factors are

presence of invasive species (mostly American minks) and beaver hunting. However, these factors, as well as other unfavourable factors, generally do not significantly affect the occurrence of otters in the SPNAs. The incidence of otters in their main habitats – rivers – does not actually differ between areas of NATURA 2000 sites and the country as a whole (Fig. 13).

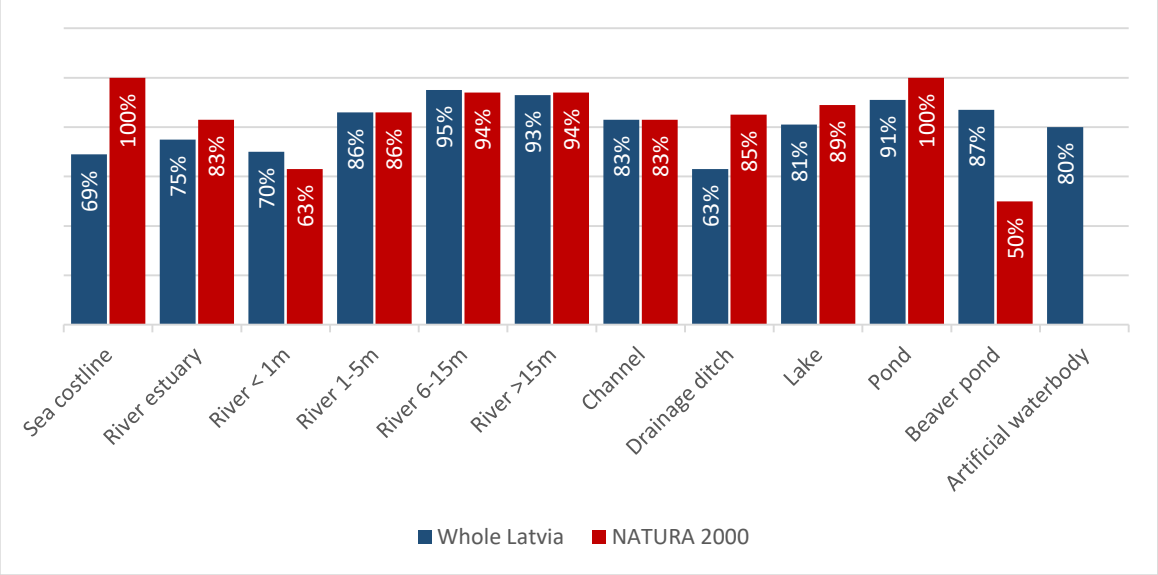

Figure 13. Occurrence of otters during monitoring (2014–2016) depending on site protection status.

Of all the SPNAs that have individual protection and exploitation regulations, only the regulations of individual protection and exploitation of the restricted area 'Mežmuižas Avoti' indicate that the restricted area has been established to preserve otter habitats. Specific conservation measures, other than prohibitions or restrictions on other game animals, are not anticipated for most SPNAs.

Throughout the nature park 'Dviete flood-plane' it is forbidden to hunt beavers by using such hunting tools as Conibear traps. This prohibition has a beneficial effect on otters, as they often enter and die in these traps. Therefore, in future, the development or processing of individual protection and exploitation rules for SPNAs related to hunting, beaver hunting should be assessed in a context of otter conservation. In areas where beaver hunting may be conducted, hunting regulations must specify prohibited / permitted hunting tools.

However there may be cases, when beaver activity may harm habitats or other rare species such as thick shelled river mussel (*Unio crassus*) and freshwater pearl mussel (*Margaritifera margaritifera*), therefore the number and activity of beavers must be significantly limited. In such cases, experts should consider the priority protected species within a SPNA and decide on appropriate conservation measures. If a beaver dam is planned to be removed in a SPNA, then it is desirable to do it after the spawning of amphibians if the beaver pond is suitable for spawning.

Amphibians are the main food for otters and a decrease in their number affects the occurrence of otters and their survival. Beaver dams and ponds have a beneficial effect on the otter population, as otters are attracted to the ponds created by beaver activity and their dwellings.

3.3. Previous species conservation actions and measures

The first draft of the Action Plan for Otter Conservation was developed in 2000 during the project *Species and Habitat inventory, development of conservation plans and development of nature conservation structures in Latvia in connection with the adoption of EU Birds and Habitats Directives*, however, this plan was not further developed. Despite this, a number of measures have helped to protect the species. The most important include the publication and distribution of an educational booklet in late 1990s (Ozoliņš 2001a), the nomination of the species for the *Animal of the year* and related education activities by the Latvian Museum of Natural History in 2010, as well as otter monitoring in 2014–2016. In order to improve the conditions for otters, a positive factor in the 1970s and 1980s was creation of protected forest zones, at least 100 m in width, in all woodlands along rivers and tributaries exceeding 10 km, and lakes greater than 50 ha. In these zones, clear cutting was prohibited, which under these conditions practically meant preservation of the forest in general.

4. Assessment of the requirements and capabilities for species conservation

Actions required to maintain a favourable otter conservation status have been widely evaluated and based on existing conservation plans of the species at a global and local scale in other regions and countries (Macdonald and Mason 1990, Kučerova and Roche 2000, Ruiz-Olmo 2001, Reuther et al. 2002, Weber und Trost 2015 etc.). Latvia has developed otter research and monitoring methods, by which the obtained data are mutually comparable both between different assessment cycles, as well as for comparing species status to other countries and regions. Mapping of otter distribution, study of sex and age structure of the population by individuals found dead, morphometric description, diet composition and concentration of toxic compounds in the organism of otters and their prey comply with such requirements. In the current situation, the main resources for further species conservation should be focused on replicating and refining these studies with the latest technology. Information from monitoring of other ecologically associated species (fish, amphibians) and freshwater habitats (rivers, lakes) is to be used extensively. Exact knowledge of the species status is a prerequisite for the implementation and further planning of other conservation measures.

During the meeting for the Action Plan development (14/06/2017), in which representatives from 17 different state institutions and non-governmental organizations participated, the main objections against measures maintaining a favourable conservation status of the species were mentioned in relation to restriction on the control of the number of beavers and damages caused by them. It is equally important to regulate issues related to compensation for damage to aquaculture caused by otters.

The main predictable difficulties in launching species conservation measures are related to the ability of the responsible institutions to cooperate with interest groups, which consider that attention should be focused only on species that are already at risk of extinction in a particular place and time. Since the condition of otters in Latvia has been favourable for a long time, strict conservation requirements may seem unfounded (Ozoliņš 2001b). During the development process of the Action Plan, this position was confirmed by representatives of the users of hunting rights, forest owners and fish farmers. Consequently, the main threats to ensure otter conservation in future are conflicts with aquaculture, lack of public awareness or misunderstanding about the need for conservation.

As with many other wild species, there are also stereotypes about otters in public attitude that can affect the success of species conservation. In fiction and motion pictures, the high intelligence, playfulness and rapid connection with people of otters kept in captivity have been emphasized (Von Sanden 1939, Vītola 2011). At the same time, this positive attitude can also induce an unwarranted desire to keep wild otters as pets. On the other hand, dramatization of the scenes in these works highlights the moral values of the relationship between people and otters, condemning the killing of animals solely for the sake of material interest. The impression of otters as portrayed in various art forms also has to be taken into account in the implementation of conservation measures, because, due to their secretive lifestyle, this animal, despite its widespread distribution, is not familiar to most of the public. In Latvia, currently there is a lack of research on societal attitudes to and knowledge about otters.

5. The aim and tasks of the species conservation plan

The purpose of the Action Plan is to maintain a favourable status for the otter population in Latvia for an unlimited period of time, maintaining a high biological carrying capacity and natural ecological functions of the species and ensuring the presence of otters as a united and functional component of the wildlife environment in man-made and managed landscapes, respecting and promoting the quality of life and wellbeing of a diverse society. These objectives were defined based on analysis of the situation in Latvia and internationally, as described in the

previous chapters, as well as recognising the need for developing economic sectors and infrastructure that could potentially endanger the species, as established from the experience of other countries.

To achieve this goal, general long-term tasks (I) were defined that have been initiated or partially conducted on the basis of existing legislation or are to be initiated and continued throughout the future conservation process, as well as other tasks that must be implemented in the nearest future (II), which, once implemented, will ensure long-term conservation measures.

I. Long-term tasks that constitute the system of species conservation and management.

- Society is to be informed about the most important environmental resources required by otters, emphasizing the importance of surface water body and coastal protection zone conditions.
- When planning new surface water bodies in the landscape or converting existing objects for economic and recreational purposes, the possibility of otter presence and feeding should be taken into account. Before starting work, developers of such projects must acknowledge in writing the awareness of risks associated with otter damage and species conservation requirements throughout the management of newly constructed or modified water bodies.
- Conflicts associated with the presence of otters in fish ponds are to be reduced by providing both advisory support and, in cases of unavoidable and significant damage, financial support as well, by developing a convenient system and procedures for reporting, investigating and recording cases of damage.
- When damage to fisheries by fish-consuming wildlife is assessed, the role of otters is to be specified within the total losses incurred.
- Use and limitation of the number of other wild species (beavers, American minks, muskrats, fish, river lampreys, crayfish) and habitat management (e.g. for conservation of the freshwater pearl mussel) is to be conducted in order to ensure that presence of otters and their functions in the ecosystem (foraging, breeding, short-term resting, grooming and free movement possibilities) would be preserved and could be detected in the widest continuous area as possible (for basic elements of habitats see Chapter 1.2).
- Assess the compliance of otter conservation requirements with the long-term favourable species conservation status and take them into account when making further changes and additions to the legislation concerning hunting, fishery and environmental protection.

- To re-evaluate the population status, a unified monitoring system methodology is to be used in order to obtain mutually comparable data. Examination of dead animals is to be included in the monitoring and the public and non-governmental organizations are to be involved in data collection and information gathering.
- Improvement of the registration of otter damages and support system for fish pond owners who have suffered losses. Organizational and financial support should not focus on compensating for damage, but minimising the risk of damage. Information necessary for assessing damage risk is to be provided to fish pond owners and workers employed in aquaculture.
- Scientific research on otters is to be intensified, with particular emphasis on diet, breeding and environmental pollution issues.
- International contacts and regular cooperation are to be maintained among specialists from neighbouring and European Union countries.
- The public attitude towards the presence of otters at the landscape level and within the context of wildlife diversity, including outside of the SPNAs, is to be improved, so that this species is not perceived as an unwanted competitor or an unacceptable obstacle to economic activity. Therefore, the possibility to observe otters in the wild and evidence of their presence would be positively perceived and information on the otter population status would be widely available.

II. Short-term tasks that serve to support the conservation and management system of the species.

- To develop recommendatory guidelines for administrative decision makers that facilitate estimation of otter caused losses in investigations of aquaculture damages.
- To evaluate procedures for applying for damage inspection and compensation for losses to aquaculture, paying particular attention to reducing the administrative burden and costs for the institutions involved in the inspection, deciding on appropriate preventive measures to avoid damages and proportionality of the compensation amounts. As a result of the evaluation, if necessary, proposals for amendments in Regulations No. 353 *Procedure for determining amount of losses for land owners or users related to significant damages caused by specially protected non-game and migratory animal species, and minimum requirements for preventive measures to avoid damages* (Cabinet of Ministers, 07/06/2016) are to be prepared.
- To establish and validate a legal procedure for the registration and use of individual otters which have been acquired or killed in the wild under special circumstances.

- To improve the cooperation framework among institutions that supervise the implementation of CITES requirements, regulate hunting and conduct scientific research, maintaining strict surveillance on compliance with the ban on trade of otter pelts and their products.

6. Recommendations for species conservation

All recommended actions are evaluated by a three-point scale of importance/priority, where:

I – indicates crucial actions: their non-fulfilment could lead to species extinction from the current range and habitats or jeopardize international obligations;

II – indicates important actions: their fulfilment helps to achieve conservation goals within the current reference period of the Action Plan, however omitting these does not endanger species survival within the current range or habitats;

III – indicates significant actions that are recommended, yet do not crucially impact population survival at the national level.

6.1. Changes in legislation

Priority II

Supplementing Paragraph 3 of Regulation No. 1165 *Procedure for issuing permits for the acquisition of individuals of non-game species, introducing wild species uncharacteristic to Latvian wildlife (introduction) and restoring species populations in the wild (reintroduction)* (Cabinet of Ministers, 21/12/2010) with a Sub-paragraph 3.3 in the following wording:

3.3. Delivering a dead individual of non-game species to a research facility which conducts scientific research or monitoring of this species, if a standard statement of this case has been drawn up.

Annex 3 is to be developed to Regulation No. 1165 *Statement on finding a dead individual of non-game species* (Cabinet of Ministers, 21/12/2010).

6.2. Establishment of specially protected nature areas and/or micro-reserves

Not required.

6.3. Measures for population renewal

Not required.

6.4. Measures for species habitat management

Not required.

6.5. Research and data collection

6.5.1. Monitoring of population status *(Priority I)*. Otter monitoring is to be continued according to current methodology, which is included in the Biodiversity Monitoring Program as background monitoring within the framework of mammal monitoring (http://biodiv.daba.gov.lv/fol302307/fol634754/fona-monitoringametodikas/ziditajdzivnieki-udrs). The general field work required for the monitoring must be repeated at least every 5 years. Current methods need to be complemented with data on otter demography so that the obtained information would be comparable for local requirements and at the trans-border level. Users of hunting rights, the State Forest Service, scientific institutions and volunteers are to be involved in data collection. The results of the monitoring should include reports on dead otters with exact locations and dates. In agreement with the research institute, which performs otter monitoring, bodies of otters, accidentally killed or found dead, are to be collected for precise age determination, parasitological examination and diet studies. The monitoring results are to be interpreted in conjunction with data available from monitoring other otter-related species (fish, amphibians). Updating of monitoring methods and procedures for compiling the results and publishing them in accordance with the National Monitoring Program are determined by the NCA.

6.5.2. Research on species ecology *(Priority II).* Ecological research on the species is to be resumed. Data are to be collected for comparison with previous studies and results from otter research in Lithuania, Belarus, Poland, Scandinavia and the European part of Russia, paying particular attention to the relationship between distribution data and location of available habitats and their conservation regimes, diet studies (in relation to available fish, amphibian and crayfish resources and their dynamics), interaction with other species (beavers, American minks), amount of toxic compounds in body tissues and indices for population viability (genetics, reproduction, body condition). Monitoring results and data collected by other methods are to be used for the research.

6.5.3. Analysis of data obtained in damage investigations and clarification of criteria for compensation of losses *(Priority I)*. Data collected during inspections of damage caused by otters are to be systematised and analysed in order to compile information on fish species, pond size, distance from watercourses, condition of littoral vegetation cover, remains of consumed fish in otter spraints, presence of other piscivorous species, beaver activity and other factors, including conformity of protection measures against damage to the extent of the damage.

6.5.4. Clarification of otter mortality in the process of beaver hunting *(Priority II).* Actual extent and circumstances of otter mortality in the process of beaver hunting are to be ascertained. Since the current legislation does not provide for collection of accurate information on beaver

hunting, except for the number of hunted beavers at the end of the season, the study should be conducted in cooperation with hunters who agree to report on the methods used in beaver hunting, the hunting effort and intensity (number of traps, duration of installation, meteorological conditions etc.).

6.5.5. Survey of societal needs and attitudes *(Priority III).* A study on societal needs and attitudes towards otters and conservation of environmental conditions necessary for them is to be conducted. To obtain significant information for species conservation, this study should be conducted on two levels: involving a comprehensive survey of the situation at the end of the planned period and prior to the next renewal of the Action Plan, and the assessment of particular conservation measures and performance of their implementation (e.g., evaluation of the system for informing aquaculturists on methods to protect against damage and evaluation of the support system for conservation measures). The questionnaires should be as user-friendly as possible and should be conducted with the most appropriate technical means for the target audience.

6.6. Information and education, improvement of professional qualifications

6.6.1. Joint training of responsible specialists for species identification in cases of damage, including both analysis abilities of onsite activity indicators and collection of required samples *(Priority II)*. A joint training of responsible specialists is to be organised for the identification of piscivorous species in cases of damage to aquaculture, including sampling for analysis of otter spraints – for determination of diet composition and DNA extraction.

6.6.2. Analysis and dissemination of information on beaver hunting methods less hazardous to otters *(Priority II).* Exchange of information with beaver hunters on trapping methods less hazardous to otters. Appropriate recommendations are to be developed and disseminated for training of new and candidate hunters.

6.6.3. Acquisition of species identification skills from otter body parts (for monitoring of CITES requirements) among the staff of the responsible and involved institutions and organizations *(Priority I).* Species identification skills from otter body parts (pelt and its products, skull, baculum) should be improved and disseminated.

6.6.4. Informing society on species status, course of management and scientific research *(Priority III).* The society is to be regularly informed about the species status, progress of conservation measures and results of scientific research. The most influential forms of information should be chosen that are appropriate to the target audience and follow trends of information technologies.

6.6.5. When designing action plans for SPNAs, otter conservation measures are to be aligned with objectives and tasks of the Action Plan *(Priority III).* During development of SPNA management plans in NATURA 2000 sites designated, among other species, for otter conservation, the required otter protection measures, if needed, should be carefully assessed – in order to be consistent with the objectives and tasks included in this Action Plan for otters.

6.6.6. Workshops on improving public relations and conflict resolution skills for involved stakeholder groups *(Priority III)*. Workshops for public relations and conflict resolution training are to be organised for interest groups involved in conducting otter conservation and management actions – aquaculturists, hunters, farmers, representatives from government and non-governmental institutions etc.

6.7. Organizational, planning and other activities

6.7.1. Set of measures to support observation of restrictions in inland water body and coastal protection zones *(Priority II).* Organize a set of measures, by means of increased inspections and clarification of requirements, to encourage compliance with restrictions on economic activities in coastal protection zones of surface water bodies, the Baltic Sea and the Gulf of Riga, as well as compliance with the procedures specified in the legislation for conducting cleaning and deepening of surface water bodies. Supervisory institutions, the public and the media are to be involved in the campaign.

6.7.2. Workshop for extending public participation in species monitoring *(Priority II).* In order to coordinate involved and interested parties as well as extend public participation in species monitoring (in relation to actions referred in paragraphs 6.5.1, 6.5.4, 6.5.5, 6.6.1, 6.6.2 and 6.6.3.), one workshop is to be organized at least once every two years. The aim is to develop a network of contributors, involving volunteer pond owners, hunters, anglers and the rest of the community.

6.7.3. Labelling of otter pelts and stuffed otters in accordance with CITES certificates issued by the NCA *(Priority II).* Labelling of otter pelts and stuffed otters (including both found dead and legally acquired) is to be organized according to CITES certificates issued by the NCA. With the help of a unique marking, otter pelts are to be linked with their corresponding CITES certificate numbers and their registration data base. The possibility of legalizing previous legally acquired trophies is to be organised in accordance with CITES requirements. For requesting and issuing of permits, a user-friendly electronic system must be created, which simultaneously also allows for rapid confirmation for inspection purposes.

6.7.4. Creation of an exhibit for correct and effective aquaculture protection against otter damages *(Priority I).* Financial support for introducing preventive measures may be requested

from the European Fisheries Fund within the framework of the *Action Program for Fishery Development 2014–2020* or indirectly – from the *Latvian Rural Development Program 2014–2020* within the framework of the measure *Investments in tangible assets*, when, together with other construction projects, it is possible to install fences or pond illumination fixtures etc., as well as by submitting a project to the Latvian Environmental Protection Fund and EU fund programs (which,, in accordance with the requirements of the relevant EU regulations, cover 50% of the eligible project costs). Also a recommendatory description is to be developed which fish pond owners could use to reduce the risk of damage caused by otters when ponds are established or restored. Planning protection measures against piscivore damage in fish ponds, which are situated in SPNAs that serve for the conservation of specially protected species, requires a different approach. In such cases, compensation for losses should be preferred rather than repelling the specially protected species.

6.7.5. Examining options for compensation of losses beyond the *de minimis* limitation *(Priority II).* Possibility of offsetting compensation for a correctly estimated amount of damage caused by otters is to be considered in addition to the funding stipulated by receiving *de minimis* aid in accordance with the legislation regarding the procedure for recording and allocating aid in fishery and aquaculture sector. The adequacy of formula for calculating loss as set out in Paragraph 30.2 of the Regulation No. 353 *Procedure for determining amount of losses caused to land owners or users, related to significant damage by specially protected non-game or migratory species, and requirements of minimum protection measures for prevention of damage,* as well as the possible reimbursement threshold are to be evaluated.

6.7.6. Developing recommendations for conservation of otter habitats while eliminating beaver ponds *(Priority II).* Differing approaches are to be undertaken when demolishing beaver dams, depending on the location of the pond and the type of land use.

6.7.7. Renewal of the Action Plan *(Priority I).* Upon expiration of the planned term of Action Plan activities, performance of the tasks and achievements of the conservation aims are to be assessed. The current requirements of species conservation are to be considered at the time of the plan renewal.

7. Review of planned actions and events

The actions are arranged in the sequence used in Chapter 6, indicating the order number of the event, the scheduled time for execution and the assessment of the required resources.

Action/event	Priority	Due term (necessary time)	Estimated cost (EUR)
6.1. Supplementing Cabinet Regulation No. 1165	II	12 months	Within the budget of the responsible authorities
6.5.1. Monitoring of the population status: • within the framework of current monitoring of biological diversity; • methodology of otter monitoring is to be supplemented, anticipating examination of dead animals	I I	2 years Continual	65 000 15 000 per year
6.5.2. Research on species ecology	II	Continual	20 000 per year
6.5.3. Analysis of data obtained in damage investigations and clarification of criteria for compensation of losses	I	12 months	6000
6.5.4. Assessment of otter mortality in the process of beaver hunting	II	2 years	6000
6.5.5. Survey of the needs and attitudes of society	III	18 months	12 000
6.6.1. Joint training for species identification in cases of damage among the responsible specialists, including both identification abilities for onsite activity indicators and sampling	II	2 years for improving the system and continual thereafter	3000 for workshops and training, maintenance of the procedure within the budget of responsible authorities
6.6.2. Analysis and dissemination of information on beaver hunting methods less hazardous to otters	II	18 months	7000
6.6.3. Acquiring species identification skills from otter body parts (for monitoring of CITES requirements) among the staff of the responsible and involved institutions	I	Continual	2500 for development of the procedures, and thereafter within the budget of responsible authorities
6.6.4. Informing society on species status, management and scientific research	III	Continual	1000 per year
6.6.5. When designing action plans for SPNAs, otter conservation measures are to be aligned with objectives and tasks of the AP	III	If necessary	-

6.6.6. Workshops on public relations and conflict resolution training for stakeholder groups (hunters, aquaculturists, farmers, representatives from government and non-governmental institutions etc.)	III	2 events during AP planning period	2000
6.7.1. Set of measures to encourage compliance with restrictions in inland water body and coastal protection zones	II	2 months during AP planning period	2000 for coordination, within the budget of responsible authorities
6.7.2. Workshop for expanding public involvement in species monitoring	II	5 events during AP planning period	5000
6.7.3. Labelling of otter pelts and stuffed otters in accordance with CITES certificates issued by NCA	II	2 years for introducing the system and continual thereafter	3000 for establishment, maintenance within the budget of responsible authorities
6.7.4. Creation of an exhibit demonstrating correct and effective aquaculture protection measures against otter damages	I	6 months for creation	5000 for creation, 500 for maintenance per year
6.7.5. Examining loss compensation options beyond *de minimis* limits	II	5 days for workgroup and 1 year for changing the legislation	Within the budget of the responsible authorities
6.7.6. Developing recommendations for conservation of otter habitats while eliminating beaver ponds	II	3 months	1000
6.7.7. Action Plan renewal	I	1 year	15 000

8. Assessment of the effectiveness of population restoration of the species, habitat management and implementation of other measures

The success of species conservation is assessed on the basis of changes in distribution, which are established by repeated inspection of otter indicators in suitable places every 5 years (otter monitoring).

9. Implementation of species conservation plan

The main activities are arranged in the sequence used in Chapter 6, indicating the year of launch, the institutions involved (the responsible institution underlined), stakeholders and type of cooperation.

Action/event	Start of execution*	Involved institutions	Form of cooperation
6.1. Supplementing Cabinet Regulation No. 1165	2018	Ministry of Environment and Regional Development, Nature	Working group

		Conservation Agency, Ministry of Agriculture	
6.5.1. Monitoring of the population status: • within the framework of current monitoring of biological diversity; • methodology is to be complemented with inspection of dead animals and involvement of volunteers	2022 2019	Nature Conservation Agency, State Forest Service, scientific institution responsible for monitoring, users of hunting rights	In the framework of the functions by supervisory authority and contractual work
6.5.2. Research on species ecology	2019	Nature Conservation Agency, institution responsible for monitoring, entrepreneurs involved in fishery and their associations, users of hunting rights, university students and PhD students	In the framework of grants supervised by the Ministry of Education and Science and projects from various financial instruments
6.5.3. Analysis of data obtained during damage investigations and clarification of criteria for compensation of losses	2018	Scientific institution responsible for monitoring, Nature Conservation Agency, university students and PhD students	In the framework of projects from various financial instruments as well as MSc and PhD theses
6.5.4. Assessment of otter mortality in the process of beaver hunting	2019	Nature Conservation Agency, State Forest Service, public organizations representing users of hunting rights, scientific institution responsible for monitoring	In the framework of projects of various financial instruments
6.5.5. Survey of the needs and attitudes of society	2022-2025	Scientific institution responsible for monitoring, university students and PhD students	In the framework of projects from various financial instruments as well as MSc and PhD theses
6.6.1. Joint training for species identification in cases of damage among the responsible specialists, including both identification abilities for onsite activity indicators and sampling	2018-2019	Nature Conservation Agency, Rural Support Service, Food and Veterinary Service, scientific institution responsible for monitoring, certified species experts, entrepreneurs involved in fishery and their associations	Functions of the supervisory authority, interinstitutional collaboration In the framework of projects of various financial instruments
6.6.2. Analysis and dissemination of information on beaver hunting methods less hazardous to otters	2018-2019	State Forest Service, Nature Conservation Agency, public organizations representing users of hunting rights, scientific institution responsible for monitoring	Exchange of information within the framework of the contractual work
6.6.3. Acquiring species identification skills from otter body parts (for monitoring of CITES requirements) among the staff of the responsible and involved institutions	2018-2019	Nature Conservation Agency, State Forest Service, State Border Guard, Customs Administration of State Revenue Service, LSFRI "Silava"	Interinstitutional collaboration within the framework of functions by supervisory authorities
6.6.4. Informing society on species status, management and scientific research	2018	Nature Conservation Agency, scientific institution responsible for monitoring, certified species experts, non-	Science promotion activities, regular information on websites, information to the press services

		governmenltal organisations of environmental protection	
6.6.5. When designing action plans for SPNAs, otter conservation measures are to be aligned with objectives and tasks of the AP	2018	Nature Conservation Agency, parties involved in planning	In the framework of functions by supervisory authority, meetings for plan development by working groups and public
6.6.6. Workshops for public relations and conflict resolution training involved for stakeholder groups (hunters, aquaculturists, farmers, representatives from government and non-governmental institutions etc.)	2020	Nature Conservation Agency, State Forest Service, Latvian Association of Local and Regional Governments, scientific institution responsible for monitoring, public organizations representing users of hunting rights, representatives from other stakeholder parties	Workshops involving experts within the framework of projects of various financial instruments
6.7.1. Set of measures to encourage compliance with restrictions in inland water body and coastal protection zones	2019	State Environmental Service, regional departments of Nature Conservation Agency, State Forest Service, Latvian Association of Local and Regional Governments, non-governmental organisations of environmental protection	Inspection raids
6.7.2. Workshop for expanding public involvement in species monitoring	2019-2020	Nature Conservation Agency, scientific institution responsible for monitoring, certified species experts	Workshops involving experts within the framework of projects of various financial instruments, web-based educational materials
6.7.3. Labelling of otter pelts and stuffed otters according to CITES certificates issued by the NCA	2019-2020	Nature Conservation Agency, State Forest Service, public organizations representing users of hunting rights	In the framework of projects of various financial instruments
6.7.4. Creation of an exhibit demonstrating correct and effective aquaculture protection measures against otter damages	2020	Nature Conservation Agency, Institute of Food Safety, Animal Health and Environment "BIOR", Ministry of Agriculture, Latvian Association of Local and Regional Governments, organisations representing interests of farmers and aquaculturists, LSFRI „Silava"	In the framework of projects of various financial instruments
6.7.5. Examining loss compensation options beyond *de minimis* limits	2018	Ministry of Environment and Regional Development, Ministry of Agriculture, Latvian Association of Local and Regional Governments, organisations representing interests of farmers and aquaculturists	In the framework of functions by supervisory institutions, interinstitutional working group
6.7.6. Developing recommendations for conservation of otter habitats while eliminating beaver ponds	2019	Nature Conservation Agency, State Forest Service, JSC "Latvia's State Forests", public organizations representing	Consultations, information exchange, workshops

		users of hunting rights and forest owners	
6.7.7. Action Plan renewal	2027-2028	Nature Conservation Agency, Ministry of Environment and Regional Development, certified species experts	Interinstitutional collaboration, contract supervision

* On the initiative of the responsible institution and in agreement with the cooperation partners, the implementation of the measure can be initiated more quickly if possible and necessary.

10. Deadlines for the implementation and review/evaluation of the species conservation plan

The Action Plan is developed for implementation of otter conservation and management measures for the next ten years (2018–2027). It is advisable to start assessment of the implementation of the current Action Plan in 2026 to prepare tasks and plan the necessary funding for renewal of the Action Plan. This deadline was chosen with consideration that, firstly, the results of otter monitoring indicate a favourable and stable conservation status of the population in Latvia, secondly, no rapid changes in population status are anticipated for the next 10 years, and the existing legal protection ensures that the species is not threatened by direct killing.

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Appendices

Andreas Kranz *Comments on the Action Plan for Eurasian otter Lutra lutra Conservation*