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Wolf (*Canis lupus*) conservation plan

Photo by V. Vītola ©

Produced by: Latvian State Forestry Institute „Silava”
Authors: Jānis OZOLIŅŠ, Agrita ŽUNNA, Alda PUPILA, Guna BAGRADE and Žanete ANDERSONE-LILLEY

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Summary

- **Conservation policy**

The species conservation plan has been produced in accordance with the requirements of the paragraph 17 of the Law on Species and Habitat Conservation (in force since 05.04.2000.) and is meant for sustainable management of wolves in Latvia and in the Baltic population. The plan includes a strategy for conservation and management of the wolf population while conservation priorities and tasks are to be reviewed at least once every 5 years.

- **Population status**

Wolves inhabiting Latvia belong to the Baltic population, which totals about 3600 individuals with uneven distribution. In Latvia, wolves are more common in the west, north and east and rare in the central part of the country. The last official census showed about 600 individuals in total. The number and distribution of wolves in the country has been fairly constant since the beginning of the 21st century.

- **Legislation**

Wolf is an especially protected species that can be exploited to a limited extent. The hunting season is closed from the 1st April until the 14th July. Quotas are set and controlled by the State Forest Service. Immediately after a wolf is hunted, the leader of the hunting party makes a standardised protocol. The owner of the trophy gets a hunting permit where, according to this protocol, data on the harvested individual are written. The fine for poaching a wolf (incl. if a hunted animal is not reported) is administrative. The first version of the wolf conservation plan (Ozoliņš and Andersone 2002) was approved by the Minister of Environment on 28 April 2003 and is in principle implemented.

- **Conservation objective**

To maintain the Latvian wolf population of least 300-500 individuals indefinitely in the future ensuring continuous species distribution in Latvia. To maintain high environmental carrying capacity and natural ecological functions of the species in the ecosystem.

- **Conservation priorities**

The main focus should be on the common status of the Baltic population. To maintain regular contacts with wolf experts in the neighbouring countries and to use the most up-to-date and quality information on the population trends in the population as the whole. To carry out constant monitoring of the Latvian population paying special attention to the demographic characteristics that ensure population's renewal. To improve public attitude (special target audiences – farmers, hunters, foresters, schoolchildren) and their knowledge of the species ecology, status on the European scale and potential ways of reducing damage. To follow up on the public attitude and analyse various opinions.

- **Measures**

To continue setting wolf hunting quota and to control hunting (to be carried out by the State Forest Service).

If a decrease in wolf population happens at the Latvian scale, it can be necessary to set local and seasonal hunting limitations or bans in those hunting areas (districts, forestry units) where wolves are rare or where their distribution or density are especially important for the existence of the continuous Baltic wolf population, unless it causes significant losses to livestock husbandry.

To tighten control over the circulation of the wolf hunting permits and trophies after the animal is legally shot.

To continue research on territorial behaviour using telemetry methods.

To take into account species territorial behaviour when carrying out landscape ecological planning and designing new wildlife crossings on motorways.

To further develop research on the impact of wolves on their prey populations.

To continue population demography studies using their results to analyse population's vitality.

To continue public opinion studies.

To continue hunters' involvement in large carnivore monitoring and decision-making process on local hunting bans.

To inform the public on a regular basis about species status, management and research and ways to reduce damage.

The next update of the action plan is due in 2014.

Introduction

Wolf is a typical representative of the mammal fauna of the eastern Baltics that appeared in the territory of Latvia after the last Ice Age – about 9,000 years ago (Taurinš 1982; Timm *et al*. 1998). Man has from the time immemorial regarded wolf as his competitor in hunting wild ungulates. When humans started breeding livestock the conflict became even stronger. Attacks on livestock were the principal reason why humans were exterminating wolves, though their hide and meat were also used in the past (Сабанеев 1988). Occasional attacks on people, especially children, only aggravated the situation (Корытин 1990; Павлов 1990; Jhala and Sharma 1997; Linnell *et al*. 2002).

The earliest scientific data on wolves in Latvia date from the 19th century, when the number of wolves was very high (Kalninš 1943). However, by the late 19th century, most wolves were exterminated by hunting. Wolf population recovered during the WWI but by the time WWII broke out, only 17 wolves were left again. During the post-war period the wolf population increased rapidly to more than 1,000 individuals. According to the hunting statistics, in the 1960s, the wolf population of Latvia was on the verge of extinction again. However, it gradually recovered again by the end of the 1970s. During the 1980s, the wolf population was stable and distributed evenly throughout Latvia, contrary to the situation in Western Europe, where wolves were found only in Spain and Italy. In the early 1990s, greatly due to the changing political situation in Latvia, there was no wolf control for a few years. At the same time, a strong population of ungulates in the late 1980s - early 1990s created an excellent food base for carnivores. As a result, wolf population rapidly increased again reaching almost 1,000 individuals. Also in Europe, the 1990s saw an increase in the wolf population and its distribution range. As a result of natural dispersal, wolves appeared even in such countries as Switzerland, France, Austria etc. where they had been absent for more than a century.

Nowadays, wolf is recognized as an intrinsic part of the wildlife and as a wilderness symbol, and a number of countries facilitate wolf re-introduction. Actually, wolves are able to survive in a highly transformed and densely populated landscape, though under such circumstances, species conservation is often shadowed by the conflicts, from fears for safety that are mostly ungrounded these days (Linnell *et al.* 2002) to significant losses caused to livestock husbandry. Therefore, a stable and sustainably managed wolf population in the modern terms is not so much a symbol of wilderness but rather a symbol of a well established and successfully managed nature conservation system. The basis of such system is not a network of protected areas that are too small for large carnivores, but a set of measures that make human and wolf coexistence easier. In Latvia, the appropriate legislative and species management system that would be able to reduce or stop wolf hunting should there be threats to the long-term existence of the wolf population, was created only in 2004.

Wolf population status in Latvia has not become worse since the late 1990s when the wolf research started. Research results together with the data from other countries have become a solid basis for scientifically based species conservation measures. The first draft of the wolf conservation plan was written in 2000. An updated version of that draft (Ozoliņš and Andersone 2002) was approved by the Minister of Environment on 28 April (precept Nr. 121) and implementation was immediately started. As result of the plan's elaboration and implementation, a system for monitoring and studying harvested wolves was created in Latvia. After the EU accession on 1 May 2004, in relation to the EC Species and Habitat Directive 92/43/EEC, Latvia became a so called geographic exemption – the species was moved from Directive's Annexes II and IV to Annex V, which means that wolf hunting is allowed (using methods not banned by the Directive) provided that population is monitored and a favourable conservation regime is

ensured. Updating of the plan was planned in 2005, however, its successful implementation and the efficient functioning of the system of conservation measures allowed to leave the plan unchanged until 2008.

The goal of the updated wolf conservation plan is to provide the existing system of species conservation and limited exploitation with the most up-to-date scientific data and experience obtained through implementation of conservation measures since 2003. The biggest difference in the updated conservation plan is a regional outlook and stronger emphasis on species conservation measures in relation to the situation at the level of the Baltic wolf population.

1. Species description

1.1. Taxonomy and morphology

Wolf *Canis lupus* belongs to the order Carnivora, dog family (Canidae). There are several wolf subspecies based on the relatively high morphological diversity within the species in the different parts of its range (body size, pelt colour, skull condylobasal length). In Latvia, the nominal subspecies is found - *Canis lupus lupus* Linnaeus, 1758. Specimens of this subspecies are of average size, pelt colour is dark grey with admixture of red colour (Соколов 1979).

In appearance, wolf resembles a big dog. However, unlike the latter, its withers are higher, with longer hair, the muzzle is shorter and snub-like, the forehead is broader and the neck – shorter and thicker (Taurinš 1982). The front part of its thorax is laterally flattened and looks narrower than that of a dog. Eyes are normally fair – yellow or greenish, but also can be dark brown, situated more sideways and slanted. Its tail is usually pointing down. Contrary to a dog, a grown-up wolf never has its tail coiled up and held above the line of its spine. Furthermore, wolf is never lop-eared. Its pelt colour may vary from fair (nearly white) to completely black (wolves of such colour are common in North America). In Latvia, the majority of wolves are grey or fawn-coloured, occasionally showing a tint of red. The lower part of the muzzle and neck are usually lighter, eyes may be encircled by rings of fair colour with a dark stripe extending from the eye corner to the ears. The back and front paws may show distinctly dark stripes (Bibikov 1985).

Table 1.

Body size (cm) of adult wolves harvested in Latvia: data from 1997 – 2001

Size	♂♂					♀♀				
	x	min	max	s	n	x	min	max	s	n
Weight (kg)	41.2	25.7	67	7.7	66	34.0	16	52	6.1	46
Height	77.3	62	108	9.5	173	71	54	85	5.9	134
Length	117.7	78	148	11.5	173	109.8	71	140	12.0	131
Tail length	42.6	26	65	11.2	173	48	30	56	5.3	131

Notes: x – averages of the body sizes measured;
min – minimum value of measurement;
max – maximum value of measurement;
S – standard deviation, describing the dispersion of the measurements in relation to the averages, used for comparing the average measurement data between two populations;
n – number of individuals measured; the body height is the distance between the highest point on the animal's back (at shoulder blades) and the rear edge of the paw pads; the body length is the distance between the muzzle tip and the anus, measured on an animal laying on its back, the tail length is measured from the anus to the tip of the tail.

The most typical gait for a wolf is an easy trot. When running, its movements are vigorous, yet not as fast as those of a dog. Wolf often moves in a special easy gallop, with its back remaining straight (Bibikov 1985). It can develop a speed of 40-50 km/h, and on shorter distances – up to 65 km/h (Павлов 1990).

Wolf is a very cautious animal, therefore, direct observations are very unlikely. When persecuted intensively, wolves are active mainly at night or at dawn/dusk that is why they can be encountered early in the morning or late in the evening. Occasionally wolves can be seen also in the daytime, usually on forest roads or paths. Wolves can also be seen when attacking livestock. Even the human presence sometimes does not prevent a wolf from dashing off with its prey. In the field it can be difficult to tell apart a wolf and a stray dog. Therefore, one cannot judge about the species presence based only on occasional direct observations, also indirect signs should be taken into account.

Wolf footprints, best seen in the snow, are the most common indicators of its presence. The footprint of the front paw is bigger than that of the hind paw, its length varies from 8.5 to 13.5cm, width – 8 to 12cm. Most often, though, the print of the hind paw totally covers the footprint of the front paw which should be judged. It has clearly four fingers and contrary to the dog's footprints of the same size, the former is extended longitudinally so that a straight line may be drawn between the lower edge of the footpad of the 2nd and 3rd toe and the outer edge of the 1st and 4th toe. However, this is not always visible in the field (Fig. 1) and in reality it is very difficult to distinguish between wolf track and that of a dog of similar size. It is typical for wolves that their footprints nearly fall in a line. Besides, animals walk in step of each other, therefore, often it is impossible to tell how many individuals there are in a pack. In order to be able to tell that, one must follow their tracks to the place where animals disperse for some reason.

Fig. 1. Wolf footprint on the left and a dog footprint on the right – there are almost no differences.

Despite the above-mentioned problems, snow-tracking is the main method of wolf census and one of the most common hunting methods in Latvia.

1.2. Ecology and habitat

It is a generalist species, whose natural distribution range includes not only the forest zone, but also tundra, steppe and desert. Availability of food and safe hiding places for resting and making dens are the main requirements. The proximity of water is also of great importance for wolves. That is why their dens are often next to rivers or bogs (Сабанеев 1988; Павлов 1990).

Nowadays, forest is the main wolf habitat in Europe because wolves feel safe there. The fact that wolves have become typical forest dwellers is secondary. About one thousand years ago wolves lived mainly in an open landscape (Bibikov 1985). Vast forest areas are not inhabited by wolves. E.g., wolves entered the taiga only when humans started to use this area, to build roads and cut forests (Bibikov 1985). Peat bogs are not among the habitats favoured by wolves, though they often choose small islands as denning sites due to their difficult access for humans. Such places are often chosen by wolves in Latvia, too. In the wintertime, wolves hide in the bogs from hunters as hunters usually fail to encircle them in the bog. Wolves also occur in the farmlands provided that they are interspersed with forest patches and other suitable hideaways. In such places, synanthrope wolf packs can form, they depend on humans for food and feed on livestock and their carcasses as well as at the dump sites (Salvador, Abad 1987; Meriggi et al. 1991; Boitani 1992; Papageorgiou et al. 1994).

Wolf as a species is highly flexible and can adapt to a wide variety of conditions. However, wolf distribution is determined by anthropogenic factors, mainly by the direct persecution. The diet is the most important ecological aspect that is most closely related to the species conservation problems. Wolves are carnivores that consume up to 5kg of food per day, mainly meat (Павлов 1990). The weight of the stomach content usually does not exceed 2kg. In Latvia, the results from the stomach content investigations show that it is mainly below 1.5kg (Fig.2). However, it should be noted that wolves have very quick digestion and under the favourable conditions they can eat twice a day (Mech 1981). Taking into account inevitable fasting periods, a wolf consumes from 500 to 800kg of food per year (Bibikov 1985).

As an opportunistic predator, wolf prefers the most accessible and most abundant prey, therefore, in Europe, red deer is one of their most favourite prey species (Jedrzejewski *et al.* 1992; Okarma 1995; Okarma *et al.* 1995; Jedrzejewska *et al.* 1997).Where red deer is scarce, wolves predate on roe deer and wild boar (Valdmann *et al.* 1998) as well as elk (Peterson, Page 1983). There are indications that wolves are selectively hunting wild boar, i.e. their proportion in the wolf diet is disproportionately high compared to their share in the ungulate community in general (Jedrzejewski *et al.* 1992; Andersone 1998b). This is most likely caused by the selective hunting of piglets as the wild boar proportion in the wolf diet increases in the summer (Jedrzejewski *et al.* 1992). In the northern parts of the wolf distribution range and in parts of Europe, wolves often hunt hares. In some areas, hares can constitute as much as 70-90% of the wolf diet. Quite often various rodents are found in the wolf diet – mice and voles, marmots, muskrats etc.

Rodents are the staple diet of wolves in the steppe and desert zone in the years when rodent populations are at their peak. Rodents usually constitute from 2-3% up to 10% of the wolf diet, they can be more often found in the diet of young wolves (Руковский 1985). Often, especially in North America, wolves prey on beavers (Landry and Van Kruiningen 1979; Павлов 1990; DelGiudice 1998). Their proportion in the diet can reach from 14 % (Belarus) (Павлов 1990) up to 63% (Canada) (Руковский 1985). Given the chance, wolves eat fish, they can also

eat amphibians, reptiles, insects and vegetarian food – grass, berries, fruit (Новиков 1956; Формозов, Голов 1975; Павлов 1990).

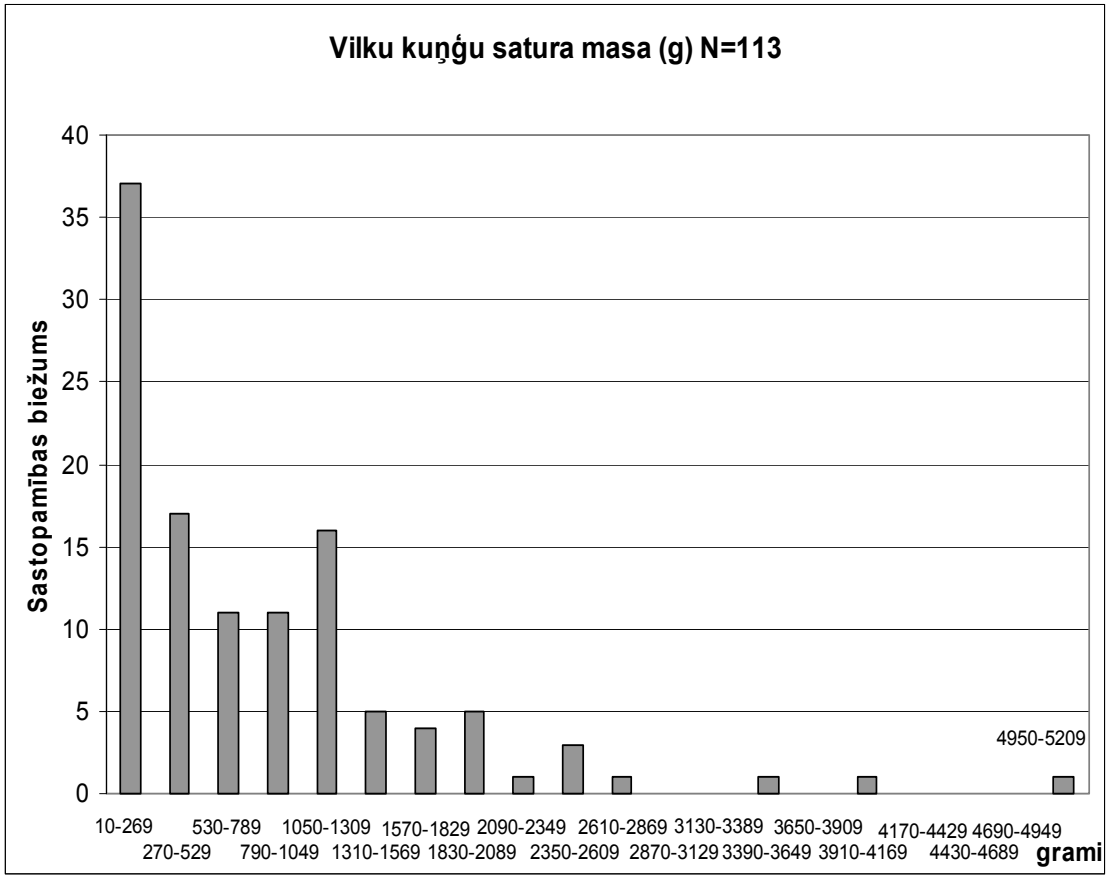


Fig. 2. The results of the stomach content analysis in the hunted wolves (the data from 1998-2007). X axis shows ranks of the weighed stomach contents in grams; Y axis shows frequency of occurrence within sample of 113 stomachs.

Wolf diet studies in Latvia show that wolves mainly prey on wild ungulates (cervids and wild boar) – they constitute about 75% of the wolf diet. Beaver is a common food object as well (14 - 30%). As in other parts of their distribution range, Latvian wolves also eat hares, rodents, insectivores, small carnivores, birds, reptiles, insects and plants (Andersone 1999; Andersone and Ozoliņš 2004a).

The wolf diet varies depending on the season. In winter, wild ungulates (cervids and wild boar) predominate (Reig and Jedrzejewski 1998) while a more diverse diet is typical for the summer, including birds, small mammals, berries, fruit etc. (Bibikov 1985). In winter, livestock carcasses used by hunters as bait can be a significant part of the diet (Lesniewicz and Perzanowski 1989; Smietana and Klimek 1993). In the landscapes transformed by man (such as the farmland) where wild ungulates are scarce or absent, wolves can increase their attacks on livestock (Формозов, Голов 1975; Salvador and Abad 1987; Meriggi *et al.* 1991; Papageorgiou *et al.* 1994; Poulle *et al.* 1997; Sidorovich *et al.* 2003) as well as feed at dump sites (Boitani 1992). It is possible that wolf-dog hybrids attack livestock more often as they are less afraid of humans and more easily adapt to the synanthrope lifestyle (Рябов 1988). There is also a view that

single, non-territorial wolves attack livestock more often (Bibikov 1985), and stray dogs should also take a part of the blame (Andersone *et al.* 2002a). In Latvia, the analysis of wolf attacks on domestic animals show that the following animals fall prey to wolves most often - sheep (57,6%), cattle (18,6%) (mainly calves), goats (16,9%) and dogs (6,8%) (Fig. 3).

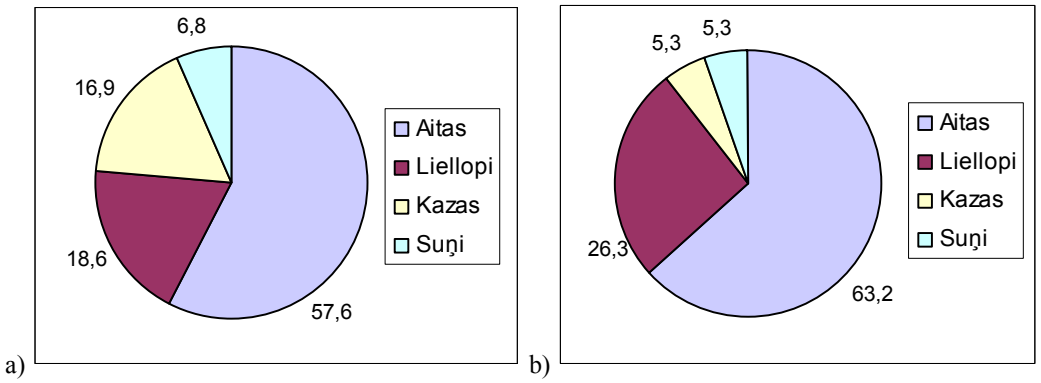


Fig. 3. The proportion of killed (a) (n=118) and injured (b) (n=38) livestock from April 2002 until April 2005. Translation of animal names from Latvian: "aitas" – sheep; "liellopi" – cattle; "kazas" – goat; "suņi" – dogs.

The majority of attacks happened during the summer season (April – October), 85.3% of those happened during the summer and the beginning of autumn. During other months, attacks were infrequent or non-existent (Fig. 4). During winter, only 8 animals were killed – 3 dogs (out of 8) and 5 sheep (out of 68) which is obviously related to the fact that livestock is kept indoors during the winter season.

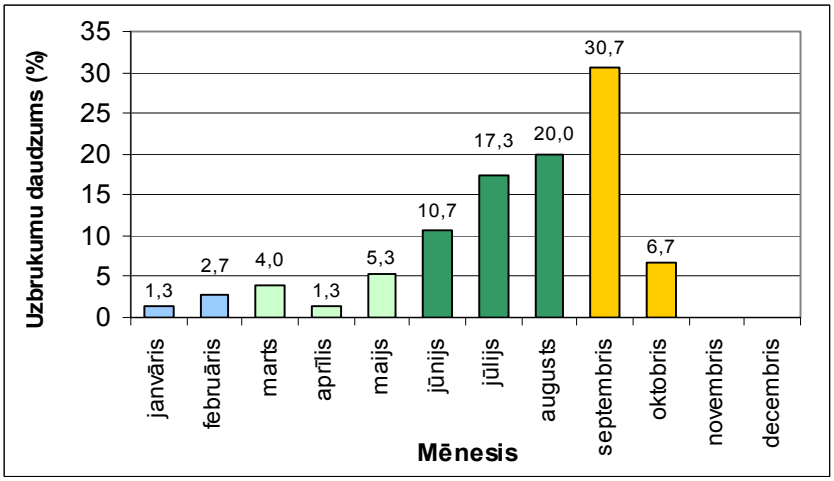


Fig.4. The distribution of wolf attacks on livestock throughout the year (percentage occurrence per month from January till December; n=75).

The time of attack is known for 73 out of 75 cases. The majority of attacks happened during the night (68,5%). Only one case happened in the evening (1.4%) but since it was in October, it can be regarded as an attack during the dark time of day. During the daylight hours, the number of attacks is significantly lower – 17.8% in the morning and 12.3% during the day. In Latvia, neither shepherds nor shepherd dogs are used. The distance to the house is known for 55 out of

75 cases. A large proportion of attacks happened closer than 100m from the house (58.2%) (Fig. 5).

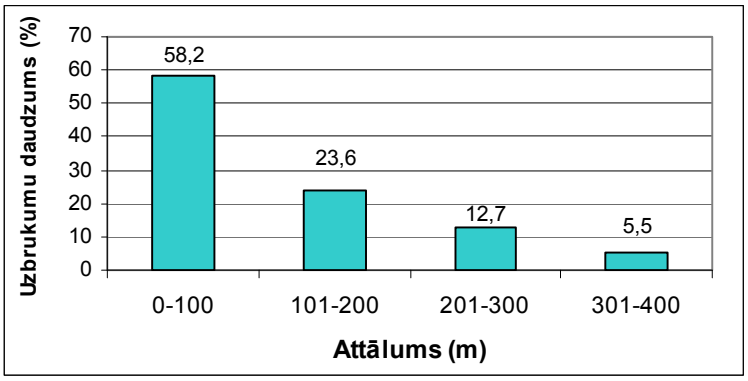


Fig. 5. The distance (m) from the house in cases of wolf attacks on livestock. X axis shows the ranks of distance; Y axis shows the percentage occurrence.

The distance from the forest is known for 31 out of 75 cases. Usually attacks happened in the vicinity of the forest (Fig. 6) the majority up to 100 m (58.1%) as well as at 200 – 300 m from the forest (25.8%).

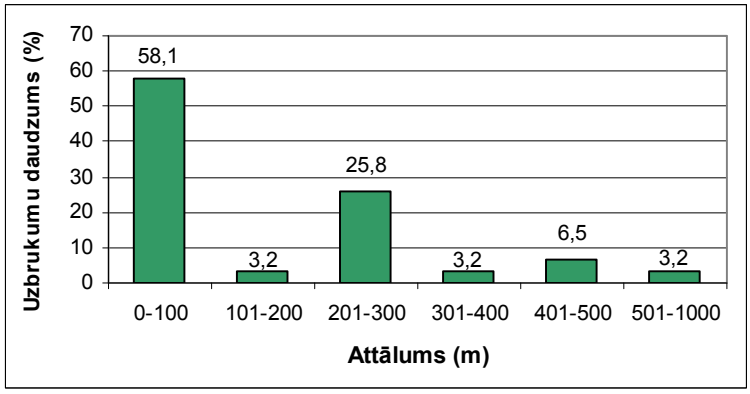


Fig. 6. The distance (m) from the forest in cases of wolf attacks on livestock. X axis shows the ranks of distance; Y axis shows the percentage occurrence.

Wolf impact on the wild ungulate populations is different from the human impact, as carnivores select prey from different age and sex groups compared to human hunters (Бибиков, Караваева 1989). Of course, hunters can reduce these differences by choosing the appropriate hunting methods and principles. Most of the time, wolves hunt red deer hinds and calves (Okarma 1991) and in the end of the winter – bulls weakened by the rut season (Bobek *et al.* 1992). Compared to other mammals, wolves are relatively fast breeders, they are able to quickly compensate losses within the population and closely follow the increase in prey populations (Jedrzejewska and Jedrzejewski 1998). Human hunters usually lag behind the increase in prey populations.

Wolf mating season is January – February and pups are born in the end of April – May. A female can give birth to up to 13 pups (usually no more than 5-6). However, pup mortality is high – 50% die until they reach 3 months, 65% - until 1 year (Jedrzejewska *et al.* 1996).

According to research data from Latvia, the average number of embryos per female is 6.5±0.25 (n=40). This value varies from year to year (Fig. 7), though it is not possible to collect enough data each year in order to have statistically significant differences. Also our data show evidence of the high mortality among pups. The age of 1 year is reached by only 11.2% of newborns. By the first hunting season, only 37.5% of the pups born that year can be found in the population.

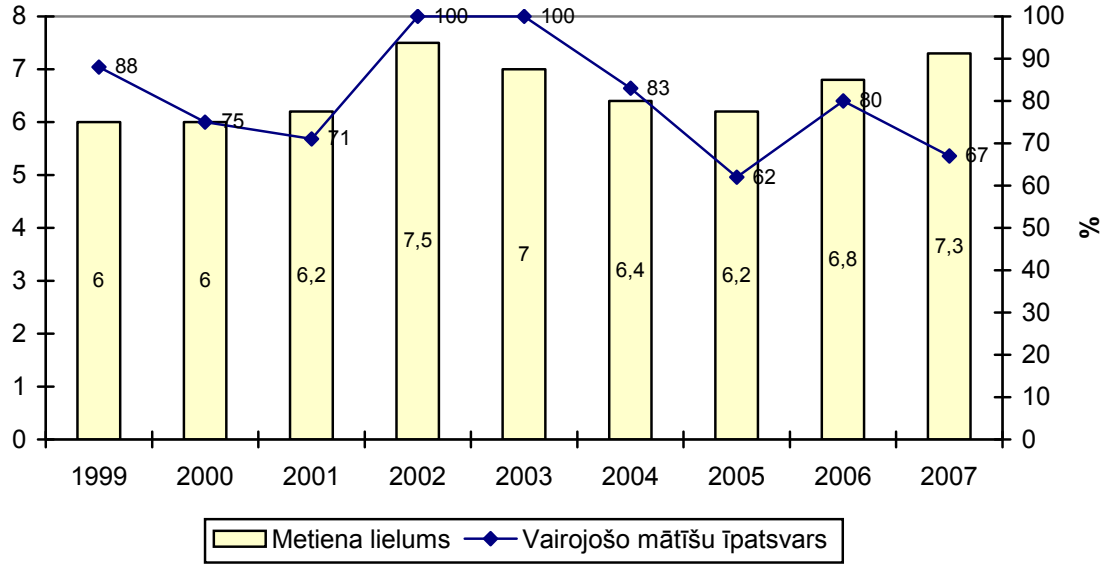


Fig. 7. The average litter size for the female wolves hunted in Latvia (yellow bars) and the proportion of adult females that had offspring in the year they were hunted (if the carcasses were collected from March until December) or were in heat (if the carcasses were collected from January until March) (blue dots and line).

The sex and age structure of the population during the study period can be regarded as favourable. However, it also indicates to a heavy compensation of the loss caused by hunting pressure (Fig 8). During the hunting season, 43% of the population are animals younger than 1 year. This proportion varies from year to year (Fig.9). The proportion of 1-year old wolves in the population is on average only 13%. The highest proportion of pups was found in the sample from 2005 (Fig.9). Also the proportion of 1-year olds in 2006 was 14.3% of the population. This indicates to the possibility that in 2005, wolves had the highest population increase during the monitoring period, though data on the litter size show the opposite (Fig.7).

Wolves live in packs usually consisting of family members – parents, pups and 1-2 year old animals. Sometimes, strange wolves are accepted into a pack but that does not happen often. Young animals usually leave the pack after reaching 1-2 years, in rare cases after the age of three. The pack has a certain social hierarchy that reflects the pack's age, sex and reproductive structure. The main (parental) pair, alfa-male and alfa-female, has the highest rank. Other animals take accordingly lower ranks. Usually, only the alfa-pair breeds in a pack, very seldom there are packs with several breeding pairs (Mech 1981). In Europe, wolf populations are significantly impacted by hunting and large packs are non-existent (Boitani 2000). The pack reaches it maximum size in autumn and winter when young animals and parents stick together (Mech 1981, Калецкая, Филонов 1987). The pack size depends both on ecological and social factors – wolf number required for successful hunting, the size of the main prey (big packs hunt bigger animals), social

contact between animals, internal competition. It is believed that social factors are the most crucial ones.

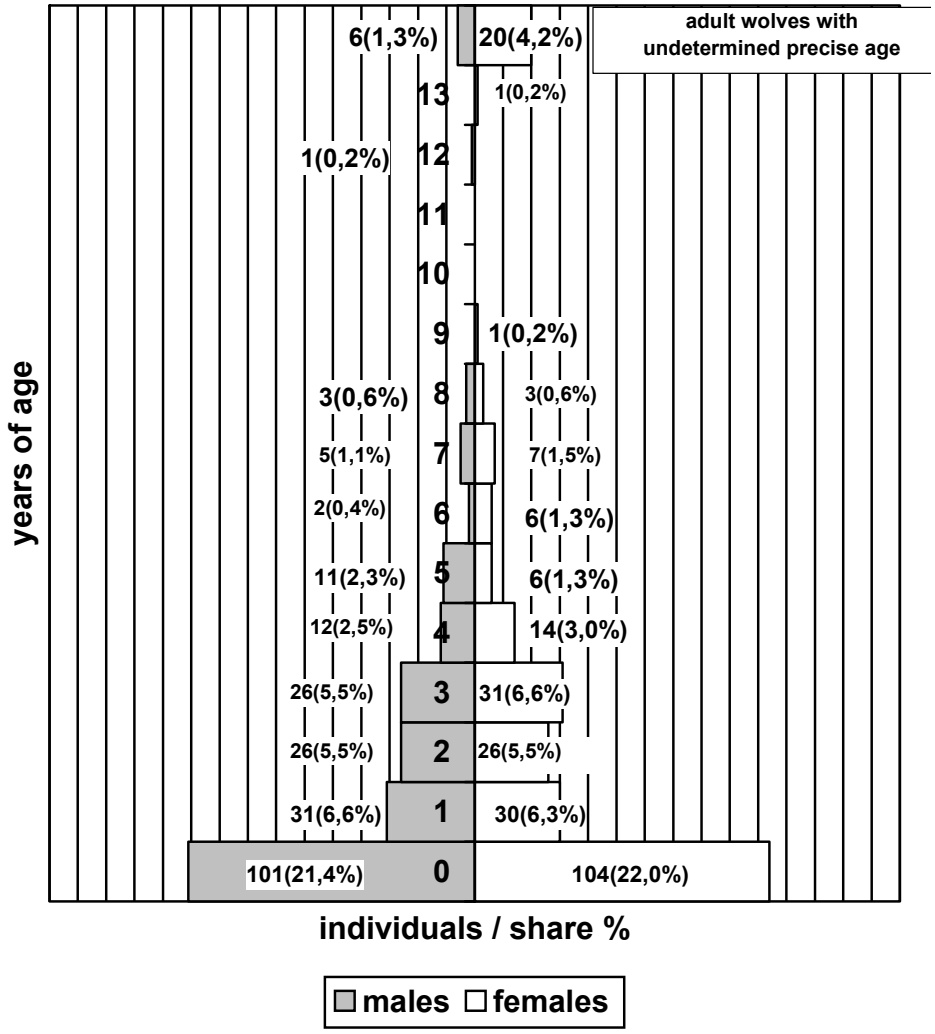


Fig. 8. Wolves harvested in Latvia that had their sex and exact age determined during the large carnivore monitoring programme from 1998 until 2007 (Ozoliņš *et al.* 2001), n=473.

Each pack inhabits its own territory which is marked and protected from neighbours (Jedrzejewska and Jedrzejewski 1998). Home range size varies from 30 to 1000 km^2 (Bibikov *et al.* 1983). There are also non-territorial animals but usually territorial individuals make up at least 60% of the population (Bibikov 1985). The home range includes the primary (den) area, litter area and the main territory (Бологов 1984). Between home ranges of different packs there is a so called buffer zone where conflicts can occur between neighbouring pack (Mech 1984). The home range size varies depending on food availability but there is a certain correlation – it is bigger in winter and in the north of the species distribution range (Линейцев 1983; Кудактин 1984; Bibikov *et al.* 1983; Bibikov 1985). In the forest zone, home range size varies from 100 to 300

km^2 (Jedrzejewska and Jedrzejewski 1998). Due to the lack of studies, the average home range size for wolves in Latvia is not known.

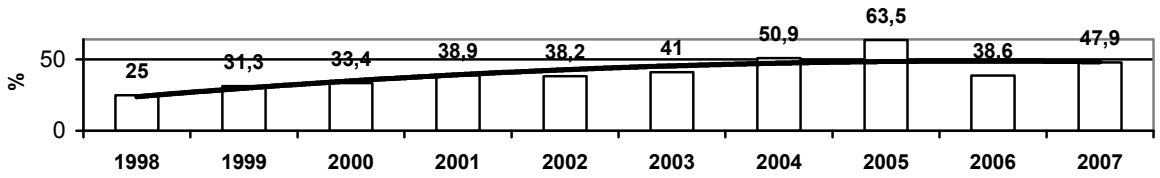
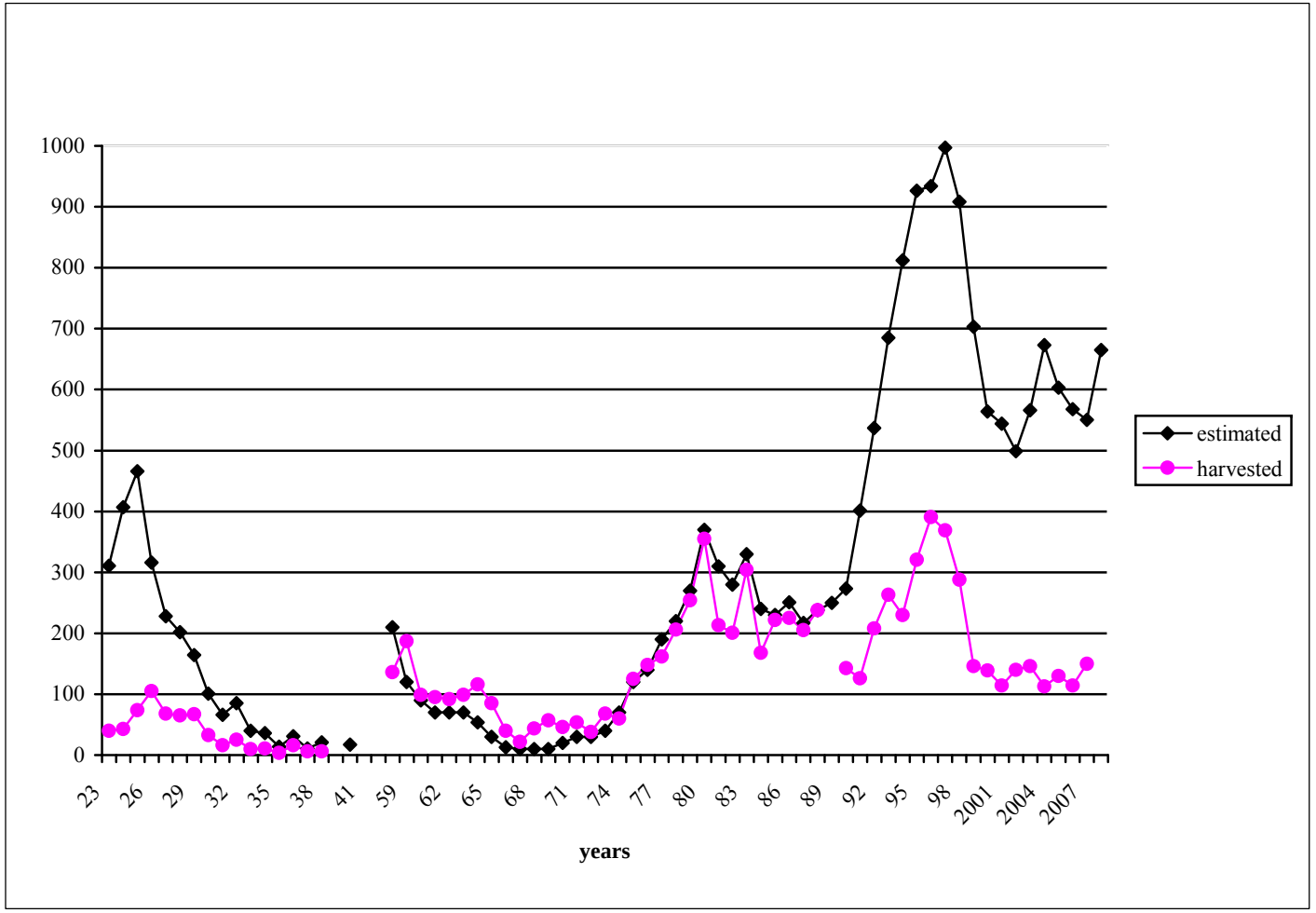


Fig. 9. The proportion of wolves younger than one year among the harvested sample in Latvia.

Research data show that wolf density varies from 0.6-1 to 3.6-10.4 individuals per 100km^2, in heavily exploited populations – even less than 0.1 individuals per 100 km^2 (Осмоловская, Приклонскй 1975). In North America, wolf density is 0.3-4.3 ind./100 km^2, in Europe from 1 to 3 ind./100 km^2. Wolf population density is affected by food resources, habitat characteristics and the level of persecution by humans (Boitani 2000). There is no research data on wolf density in Latvia. State Forest Service and its predecessors' census data show wolf population trends since the early 20th century (Fig.10). In Latvia, wolf numbers in the 20th century varied widely due to changing hunting intensity. The population increased to several hundred individuals after WWI but during the next 20 years after Latvia had its independence wolves got almost completely exterminated. In 1940, the census showed only 17 individuals. After WWII, the population recovered again but in the 1960s, when the anti-wolf campaign picked up again in the whole of the USSR, the wolf population in Latvia was reduced to just a few individuals. The population started to recover only in the 1970s reaching the post-war maximum in the middle of the 1990s. In the last ten years the population size has been quite stable though its distribution range in Latvia has been getting fragmented. Even though according to the official statistics, there are about 600 wolves in Latvia, experts estimate that after the hunting season is over, there are no more than 200-300 wolves. However, considering the population's favourable demographic situation as well as the link to the populations in the neighbouring countries, wolves successfully maintain their numbers, and the overall population is stable. There are two areas with a higher wolf density – North Kurzeme (W Latvia) and East Vidzeme – Latgale (E Latvia). Zemgale plain (Central Latvia southwards from Riga city) with its low forest cover and a high degree of urbanisation in the Riga district hinders animal dispersal from the east to the west. This in the long term can increase isolation between these two micro-populations resulting in decreased genetic diversity (Randi 1993) unless ecological corridors are ensured. The morphological data from skulls already show that animals of the same age are bigger in the east (Andersone and Ozoliņš 2000).

Fig. 10. Wolf population dynamics in Latvia. The data are not available for the WWII and post-war years as well as for 1989 (official



data of the State Forest Service).

1.3. Species distribution

In the 1980s, wolf distribution range in Europe reached its minimum. However, in the last 15 years there is an increasing trend both for the range and population size (Fig. 11). At present, wolves are found in the following European countries (in addition to the Baltic population) – Spain, Portugal, Italy, Greece, Poland, Slovakia, Romania, Scandinavia, Russia etc. (Pulliainen 1980; Bibikov *et al.* 1983; Wabakken *et al.* 1983, 1984; Blanco *et al.* 1992; Okarma 1989, 1993; Nitsche 1996; Adamič *et al*. 1998; Bluzma 1999).

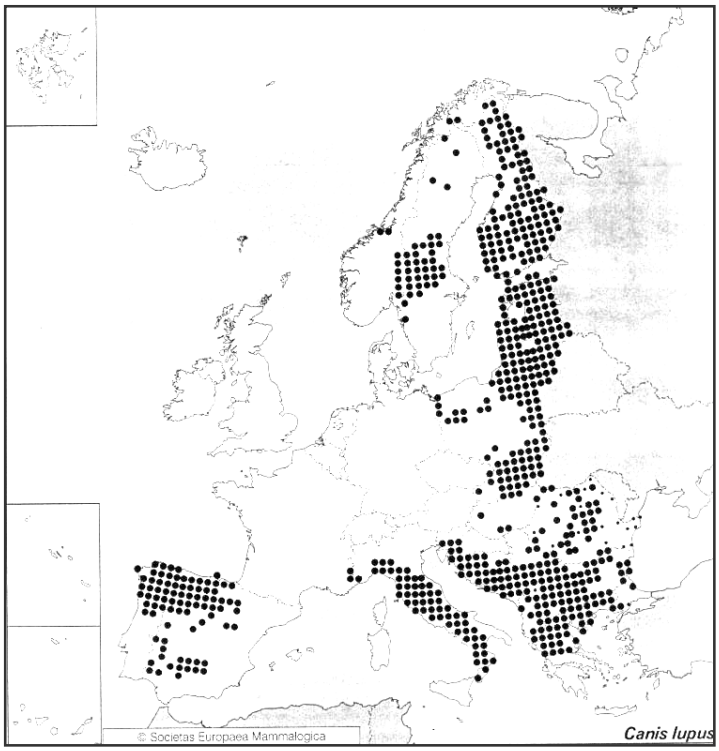


Fig. 11. Wolf distribution in Europe in the end of the 20th century in 50X50 km UTM squares, according to the European Mammal Atlas, CIS countries excluded (Mitchell-Jones *et al.* 1999).

Due to natural dispersal wolves are coming back to France, Switzerland, Austria, Germany. In many areas, e.g., in France and Switzerland, they come back to the sheep husbandry territories where they cause severe conflicts between economic interests and nature conservation (Poulle *et al.* 1997).

Information on the species and population characteristics and distribution is regularly updated through international cooperation of wolf experts. The latest update was related to the project "Guidelines for Population Level Management Plans for Large Carnivores" which was commissioned by the EC and implemented by the European Large Carnivore Initiative in 2007. According to the latest update (Linnell *et al.* 2008), the Baltic population counts about 3600 individuals. Wolf populations from the following areas were regarded as belonging to the Baltic wolf population – Baltic countries (Table 2), NE Poland, Belarus, N Ukraine, and some regions in the Russian Federation (Leningrad, Novgorod, Pskov, Tver, Smolensk, Brjansk, Moscow, Kaliningrad, Kursk, Belgorod and Orel). The worst status has the wolf population in Poland.

Table 2.

The summary on the wolf population in three Baltic States.

	Estonia	**Latvia**	**Lithuania**
Area (thousand km^2)	45227	64589	65200
Human population (million)	1,35	2,3	3,5
Forest cover (%)	45	46*	30
Wolf population according to the expert opinion	100-150	300-500	400-500
Annual harvest of wolves	40	130	20
Hunting season		15.07.-31.03.	01.12.-01.04.
Estimate basis	Number of breeding pairs	The sex-age structure of the harvested sample	Snow-tracking (number and distribution of tracks)

* In 2008, 50.2% according to the Forest register data

A gap in the wolf distribution in central Latvia is a cause for concern. The northern part of the Latvian wolf population is linked to the Karelian population of about 750 individuals which are separated by a geographic barrier - Karelian lakes. Some weak link possibly exists with the Carpathian population in SW Poland (Fig. 13). Historically, the Baltic population developed similarly to those in the other former Soviet republics (Fig. 12).

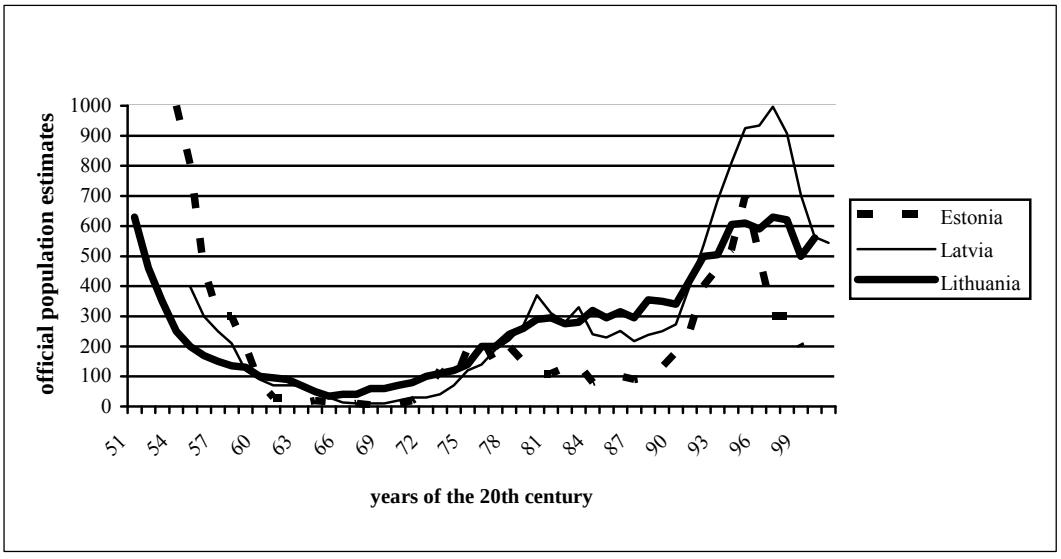


Fig. 12. Wolf population dynamics in three Baltic States in the second half of the 20th century.

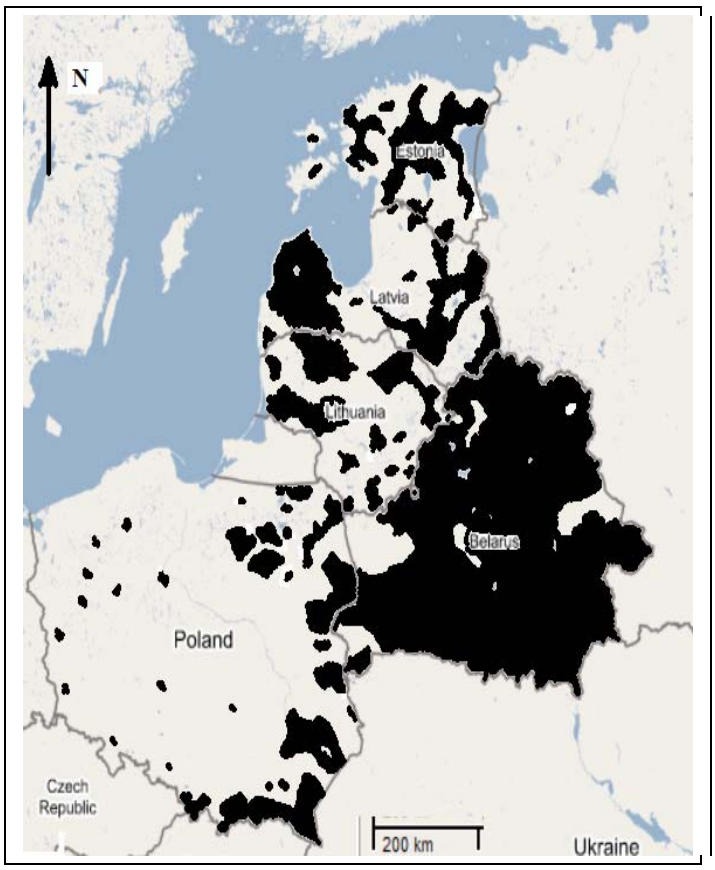


Fig. 13. Wolf distribution (black colour) in the Baltic States, Poland and Belarus in 2005.

In Latvia, the distribution range of wolves is closely monitored by the State Forest Service that carries out simultaneous one-day snow-tracking of fresh wolf tracks in the whole territory of the country. Wolf distribution is uneven (Fig. 15), though it has remained practically unchanged in the last 10 years (Fig. 14). At the moment, there are four main regions of higher wolf density – North Kurzeme, North Vidzeme, Selija (or the left bank of River Daugava in Aizkraukle and Jēkabpils districts) as well as Latgale (along the border with Russia and Belarus from Baltinava town to Dagda town). Due to Latvia's geographic position, maintaining the link between these clusters is crucially important as a guarantee of the united Baltic population.

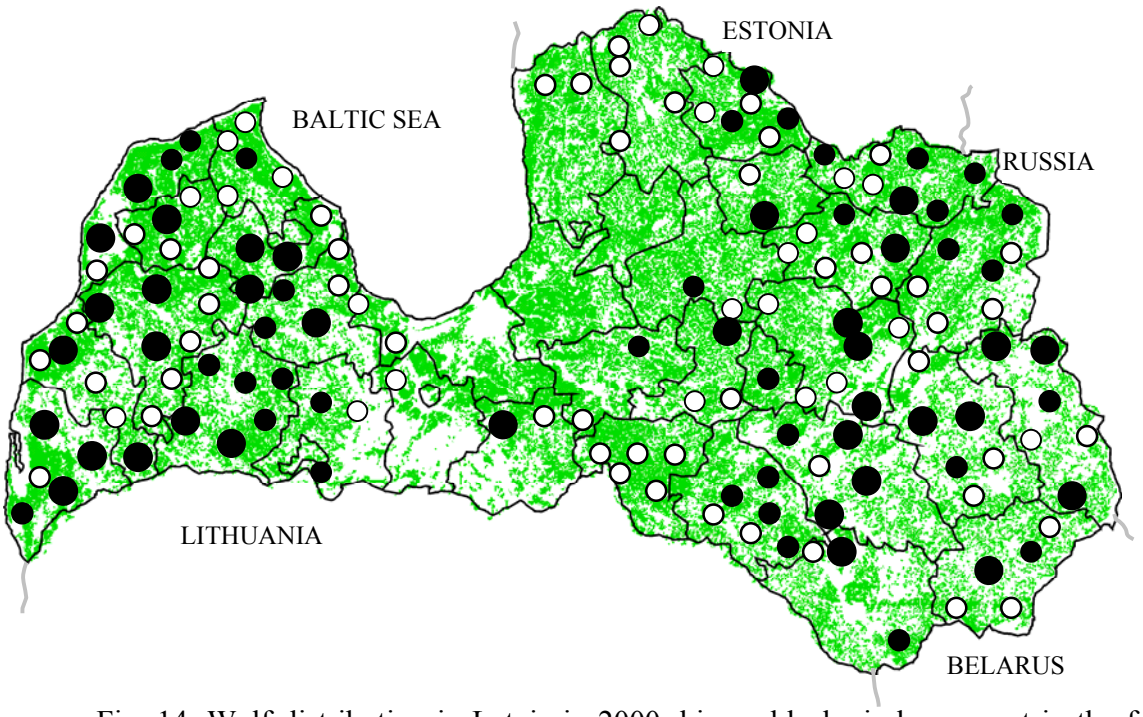


Fig. 14. Wolf distribution in Latvia in 2000: bigger black circles are put in the forestry units where more than one wolf was harvested in the hunting season of 1999-2000, smaller black dots – where one wolf was harvested, white dots – where wolves were counted as present but not shot.

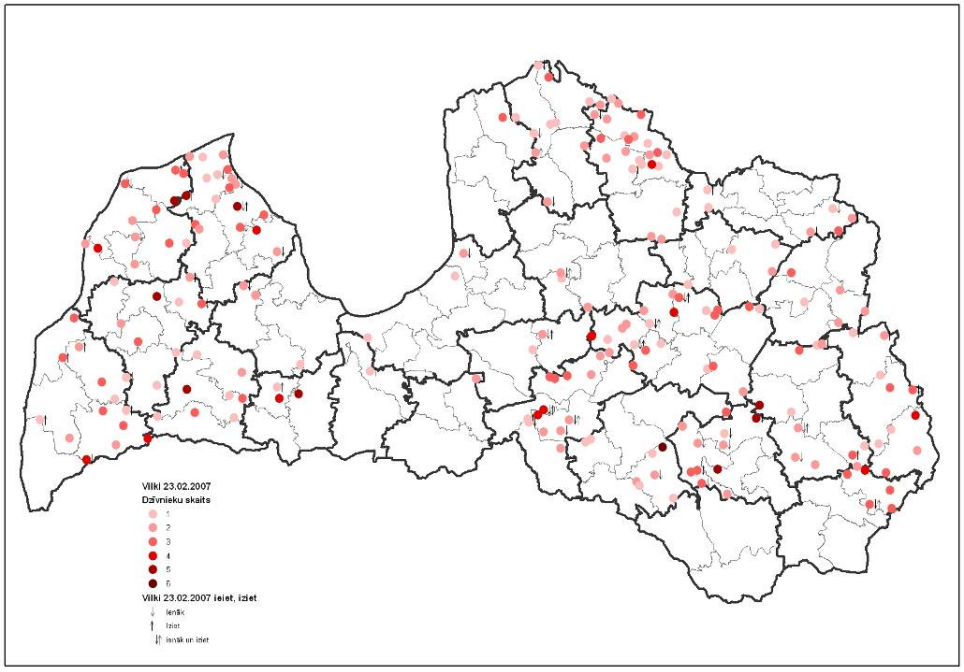


Fig. 15. Fresh wolf footprints registered in Latvia during a simultaneous census in February 2007 after more than 100 wolves were harvested in the hunting season of 2006-2007.

1.4. Species status

On the global scale, according to the IUCN criteria, the species was moved in 2001 from the category "vulnerable" (which means that the number of individuals and the species range is steadily declining and the species requires population dynamics monitoring and special protection) to "least concern" which is relevant for the species that are widely distributed and are not threatened.

On the European scale, the species is regarded as more endangered. In the Bern Convention, the species is included in Annex II (strictly protected species of fauna with a ban on capturing and killing, destroying resting and denning sites, disturbance as well as trade with alive or dead individuals). Latvia ratified the Bern Convention on 01.05.97 with the clause that wolf will not be protected. The EC Species and Habitat Directive mentions wolf in Annex II (its habitats should be made specially protected areas) and Annex IV (exploitation ban). Latvia has got a geographic exemption – the wolf is added to Annex V species which means that it can be hunted using methods not banned by the Directive provided there is population monitoring.

On the Baltic scale, species status varies. However, a joint document (Ingelőg *et al.* 1993) acknowledges wolf as a rare species in 1993 only in Finland, Poland and Sweden. Since then, population status has improved also in these countries.

Wolf is not included in the Latvian Red Data book and according to the IUCN criteria it would correspond to the category of 'least concern' (Linnell *et al.* 2008).

1.5. Current species research and monitoring in Latvia and abroad

Wolf research in Latvia started only in 1997 when a 3-year project ("The ecological background of wolf control") was commissioned by the State Forest Service to the State Forest Inventory Institute. During that project, the background data was obtained on species ecology in Latvia, population spatial and demographic structure, morphometrics. Some observations on presumable wolf damage to game management were registered also earlier (Gaross 1994, 1997), but it happened in limited areas and could not be extrapolated to the whole country.

In 1998-1999, The Environmental Fund financed a project in North Vidzeme Biosphere reserve "Biological and socio-economic prerequisites of the long-term existence of wolves and lynx". The project supported collection of scientific data in this region and published a leaflet on wolves.

In 1999, Estonian and Latvian Funds for Nature had a joint project "Conservation planning of wolves in Estonian-Latvian cross-border region", where Latvian and Estonian border guards participated. The project during two winter seasons studied transboundary movements of wolves across Estonian-Latvian, Latvian-Russian and Estonian-Russian borders. The study showed that there is a relatively intensive cross-border movement of wolves but without marking individuals it was impossible to judge the extent of this process and its significance for the Latvian wolf population.

Studies on the wolf diet and population age structure were carried out by the State Forestry Research Institute "Silava" with the funding from the Science Council of the Republic of Latvia. The following projects were funded - "Interaction between natural consuments and game management in the forest ecosystem" (2001-2002), "Large carnivore and herbivore research" (2003-2005) and "Game mammal feeding ecology and parasite fauna in the food chain" (2006-2008). In the University of Latvia, research on wolves was carried out at various levels of

academic grades. Ž. Andersone (later - Andersone-Lilley) defended her PhD in 2002. An important part of that research was participation in the work that clarified the genetic identity of Latvian wolves and confirmed cases of wolf-dog hybridisation (Andersone *et al.* 2002).

Studies on wolves were carried out also within a PIN - Matra funded project "Integrated Wetland and Forest Management in the Transborder Area of North Livonia" (2003-2005).

In 2003-2005, The Norwegian Research Council funded a cooperation project where partners from the Norwegian Nature Research Institute (NINA), Estonia, Lithuania and Poland participated. The project was called "Large carnivores in northern landscapes: an interdisciplinary approach to their regional conservation". Partners from the Latvian side were the State Forest Service and Latvian State Forest Research Institute "Silava" as well as the administration of Kemeri National Park and some hunting clubs. Within this project, wolf research data are compared and published throughout a wide area – from Norway to Poland. This work is still ongoing. The final report of the project is not published but information can be requested by e-mail (Janis.Ozolins@vmd.gov.lv).

Public opinion on wolves was studied and analysed in comparison to two other large carnivore species – lynx and brown bear (Andersone and Ozoliņš 2004).

Wolf monitoring methods are summarised in international publications (Linnell *et al.* 1998). Most of them are elaborated and tested in North America.

There are 3 main tasks for the wolf monitoring in Latvia:

1. to collect for investigation a sample of harvested animals in order to check the sex, age, female fertility (Fig. 16);

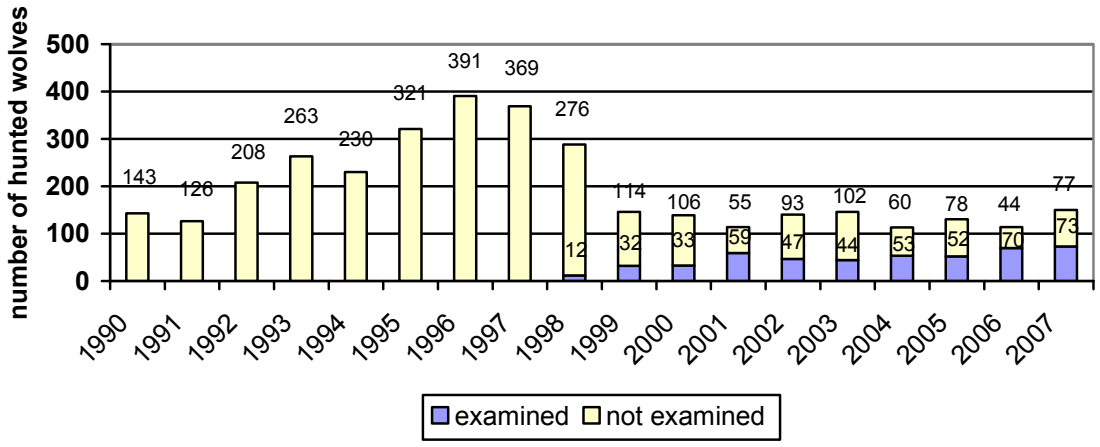


Fig. 16. The number of wolves shot and collected for examination in the last 18 years.

2. to carry out simultaneous snow-tracking in the whole territory of Latvia at least once a year during good snow conditions;
3. to verify on site the reports on large carnivore attacks on livestock.

State Forest Service and LSFRI "Silava" are involved in the monitoring and it is funded by the state budget and by the Game Development Fund.

IUCN LCIE (Large Carnivore Initiative for Europe) joins and coordinates work of wolf researchers in all European countries and regions. Information about projects, international cooperation and the results can be found on its web site www.lcie.org.

2. The reasons for changes in the population and its habitat

2.1. Factors affecting the population

The main factor limiting wolf numbers in Latvia and almost all over its distribution range is direct persecution. Humans do it mainly to protect livestock and increase the number of wild ungulates. Other reasons threatening the species, such as low population density and fragmented distribution, low genetic diversity, hybridisation with dogs etc., are all direct consequences of the main reason. In Latvia, wolf hunting was not limited in any way until 2003 – there was no hunting quota, no closed season and up to 1999 there was a bounty system. However, wolves were never totally exterminated in the country. Although wolf populations tolerate very high hunting pressure, it is believed that the numbers start reducing after more than 30-40% of the population is killed (Ballard *et al.* 1987). Though we do not have precise data, one can judge by the population trend that in the mid-1990s, when more than 300 wolves were killed during one hunting season (Fig. 14), population size at the beginning of the hunting season must have been around 900 individuals. This estimate is almost the same as the official figure, though one should remember that the official census has always been carried out by 1 March, i.e., at the very end of the hunting season when there is still snow on the ground. Therefore, the population was most likely assessed without taking into account its harvested part. From 1998, the official statistics show a decline in the wolf population followed by a more stable situation. Since 1999, on average about 130 wolves are hunted annually, while the census data ranges from 500 to 700 individuals. We believe that such population estimate is optimistic. According to L.D. Mech (Mech 1981) who worked on North American wolves, if a population is stable, then the number of wolves killed per year should be about the same as the number of wolves younger than one year. In Latvia, the proportion of young wolves is 43% (Fig. 9), therefore, it can be assumed that during the last 10 years, about 43% of the population is hunted annually. This means that there are only about 300 wolves at the beginning of the hunting season. Hunters find it difficult to accept such an estimate as they consider wolf hunting much more energy-consuming and less efficient than hunting for other species.

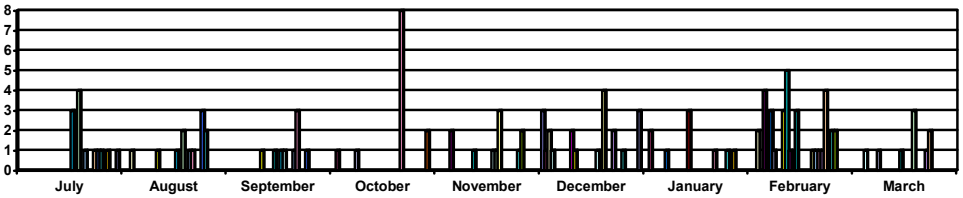


Fig. 17. Distribution of hunting bag throughout the year, hunting season 2005-2006 (n=130).

Actually, most wolves in Latvia are shot accidentally when hunters are waiting for other animals. In contrast to lynx, where most of the quota is reached within the first month after the hunting season is open (Ozoliņš *et al.* 2008), wolves are hunted relatively evenly throughout the hunting season (Fig. 17). Targeted wolf hunting is organised mainly in February – beginning of March when snow conditions are favourable and the hunting season for other species is over. However, by that time, about 70% of the quota is reached. Therefore, one can make an assumption that the sample of harvested animals is the result of accidental encounters between

hunters and wolves and as such it is reflective of the natural age and sex structure, unlike in other species where hunting selection is much stronger.

The main reason for wolf hunting in Latvia is a deeply rooted belief among hunters that wolf is their competitor for wild ungulates. Damage to livestock is very limited and localised, and targeted hunting in order to prevent damage has rarely been successful. Damage could be reduced through educating farmers and explaining to them how to avoid such conflict situations.

There are also several other reasons of wolf hunting. Most likely, these reasons do not affect the hunting bag very much but they have to be taken into account when collecting data for the population monitoring:

- wolf pelts and skulls are assessed at hunting trophy exhibitions according to the united standard (CIC points);
- wolf has always been a relatively rare trophy and killing one increases the social rank of the hunter;
- in the last few years. there has been an increased demand for stuffed wolves as an interior design feature;
- a chance to kill a wolf while hunting for other species is tempting for foreign hunters in whose home countries wolf hunting is banned.

It all shows that wolf hunting is not only a measure of population control but a hunting tradition in itself. In this situation it is very important to choose the right reasons for wolf hunting limitations, in order not to create an impression that the hunting tradition in itself is being threatened. On the contrary, hunting traditions (i.e., a wish to hunt the species in the long-term perspective) can be used as a regulating tool for wolf conservation, reducing the conflict between such issues as the allowed maximum wolf population size and carnivore impact on populations of other species.

Since 2004, there is a hunting quota and a restricted hunting season – from 15 July until 31 March. When planning the first quota (hunting season 2004-2005), the average hunting bag from the previous years (150) was chosen as a reference point. Because this quota was not reached, the next two years had a reduced quota of 130. The same quota was set also for the hunting season 2007-2008 when it was reached already in mid-February. Due to the reports on attacks on livestock and a case of rabies in wolves, the State Forest Service immediately set an additional quota of 20 individuals in W Latvia. This quota was reached by the end of the hunting season. In the hunting season 2008-2009, the quota is again set at 150 wolves.

There is very little information in Latvia on wolf mortality that is not a result of hunting. According to the data from the territorial units of the State Forest Service, in the last few years 3-4 wolves died on the roads, which is a new but probably growing mortality factor in Latvia. According to the data from the Food and Veterinary Service of the Ministry of Agriculture, in 1987-1998, there was on average one case of rabies in wolves per year. Recently, the occurrence of rabies in wolves has decreased and is on average found once every two years. It has to be noted that the Veterinary Service only has data on rabid wolves that had some kind of contact with humans or livestock. However, even if one assumes that some part of rabid wolves dies in the wild and never appears in the official data, it cannot be a big proportion of the population since there are no vast unpopulated areas in Latvia, and taking into account wolf mobility, a rabid animal would sooner or later come into contact with humans. It can be concluded that rabies in wolves is a certain threat to the inhabitants of Latvia but this disease does not significantly affect the wolf population. Sarcoptic mange is another disease that can cause epizootics in wolves. However, it is found only in 4% of harvested wolves. Wolves have rich parasite fauna – in

Latvia, 18 parasite species were found in wolves (Bagrade *et al.* 2005ab) – 10 tapeworm species, 7 nematode species and 1 trematode species. The most common species is trematode *Alaria alata* (85.3%) and nematode *Trichinella* sp. (69.7%) as well as tapeworms *Taenia multiceps* (47.1%), *T. hydatigena* (41.2%) and nematodes *Pearsonema plica* (41.4%) and *Uncinaria stenocephala* (41.2%). All wolves checked until now (more than 30 in total) were infected by at least one species of parasites, maximum – by 8 species. Recent studies show that the level of infestation by parasites does not increase with the animal's age, thus, it is unlikely that parasites can significantly influence the status of the population in general.

Wolves almost do not have natural enemies throughout their range, though there were some cases when bears attacked wolves (Bibikov 1985). In Latvia, it was observed that a golden eagle *Aquila chrysaetos* was feeding on a young wolf (U.Bergmanis, pers. comm.). Wolves can die when hunting large ungulates such as elks which can effectively protect themselves and even kill wolves (Сабанеев 1988). However, such cases are rare and cannot have a significant impact on the wolf population.

Some believe there is a competition between wolves and lynx. However, the data on their distribution in Latvia does not support this idea. It is likely that wolf thanks to its social structure (pack) can outcompete lynx. There are known cases when wolves attacked and ate lynx (Bibikov 1985). Lynx has a more narrow food niche (mainly roe deer and hares) while wolves can kill bigger animals as well (Jedrzejewska *et al.* 1997). Therefore, competition for food is not strong between these two species, especially since they choose different habitats (Jedrzejewska and Jedrzejewski 1998). Competition for food is possible not only with other carnivores but also, for example, with wild boar that willingly consumes leftovers from carnivore kills (Bibikov 1985). At the same time, wild boar is an important prey for wolves (Andersone and Ozoliņš 2002) and a strong wild boar population can be regarded as a favourable factor.

Stray and feral dogs can be a threat to wolf populations as is the trend to keep wolf-dog hybrids as pets (Boitani 2000). Hybridisation between wolves and dogs is quite common in some regions and has been observed, e.g., in Krasnodar, Krasnoyarsk, Voronezh regions in Russia as well as in Asia, Moldova and in other places (Гурский 1975; Рябов 1985). It is believed that hybrids are not a threat to a viable wolf population as they do not cross-breed with wolves in the further generations. From the ecological point of view, hybrid populations can compete only with wolf populations that have been weakened by some other factors (Zimen 1990). Hybridisation in the wild happens also in Latvia as it was confirmed by a hybrid litter from Silene (Кронит 1971). In 1998, 25 tissue samples from wolves hunted in Latvia were sent to Dr. E. Randi from the Italian Wildlife Research Institute where they were checked for hybridisation. The results of the genetic analysis showed that all 25 samples did not have a sign of hybridisation. Later, a confirmation of hybridisation was obtained in March 1999, when in the Aloja forestry unit a litter of seven 2-weeks old pups was found. After checking their blood samples in the Italian Wildlife Research Institute (Andersone *et al.* 2002) it was found that mDNA was typical for wolf, even though pups looked like dogs. Their possible mother that was later hunted also turned out to be a hybrid, though she did not have any dog exterior traits apart from some skull features.

2.2. Factors affecting the habitat

Though forests and raised bogs are the main wolf habitats, there is no strong correlation between wolf numbers in Latvia and the forest cover (Fig. 18. and 19). There is a certain trend, though, when comparing both statistical parameters retrospectively (Table 3) which can be explained by the political and social changes in the country that influenced both forests and the wolf population. In the first half of the 20th century, agriculture became a priority which

caused a decline in forest areas and intensive extermination of wolves. After WWII, forest areas started to increase (Matīss 1987, Priedītis 1999) but the Soviet government supported large carnivore extermination campaigns because wolves in the former USSR's area indeed caused serious losses to livestock husbandry and hindered the development of professional game management which had a certain place in the state's economy. Also In the Soviet Republic of Latvia, there were certain elements of professional game management system (e.g., various state plans to supply game produce) which did not promote tolerance towards large carnivore presence in the hunting grounds. However, in the 1980s the wolf population increased which can be explained only by the increasing quality of habitats that reduced competition between hunters and carnivores. During that time ungulate and beaver populations significantly increased in Latvia (Andersone-Lilley and Ozoliņš 2005). An increase in the forested areas and prey density are positive factors that ensured wolf population's existence until nowadays. It must be concluded that forest cover is not the main factor determining wolf density but forests and favourable feeding conditions have a positive impact on wolf population's renewal after a decline caused by direct persecution.

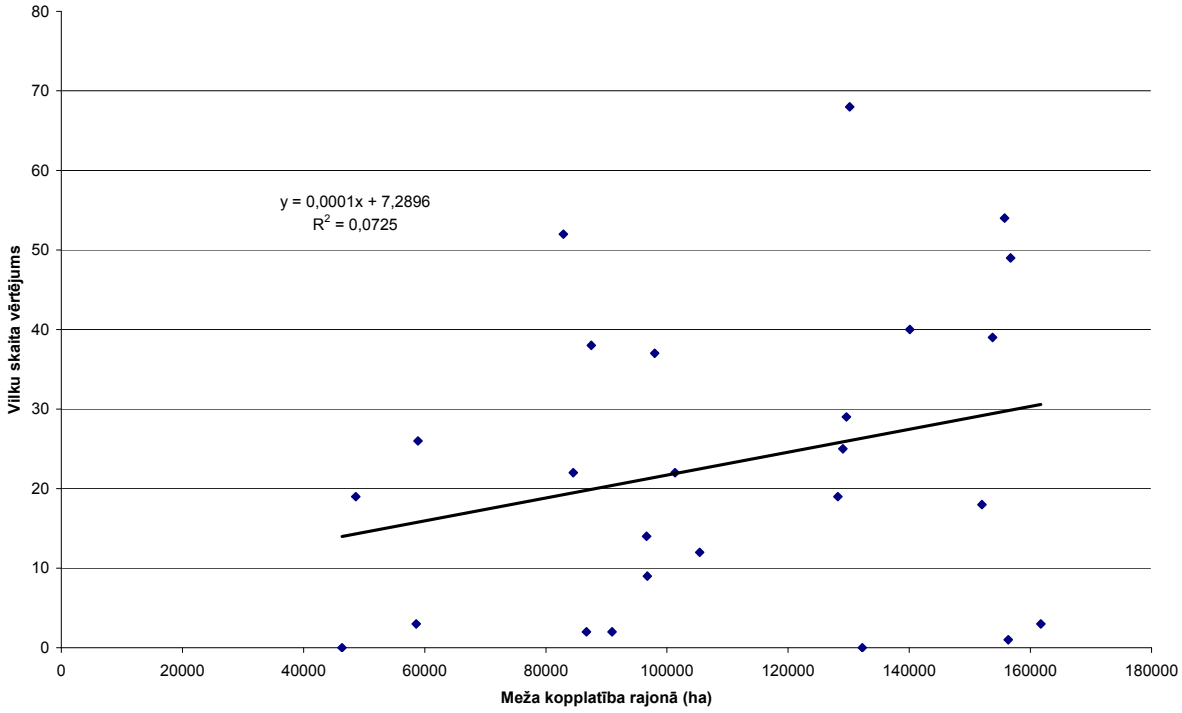


Fig. 18. The relationship between the wolf number and the total forested area in 26 districts of Latvia (2005). X axis shows the forest area (ha); Y axis shows accordingly estimated numbers of wolves in 26 districts.

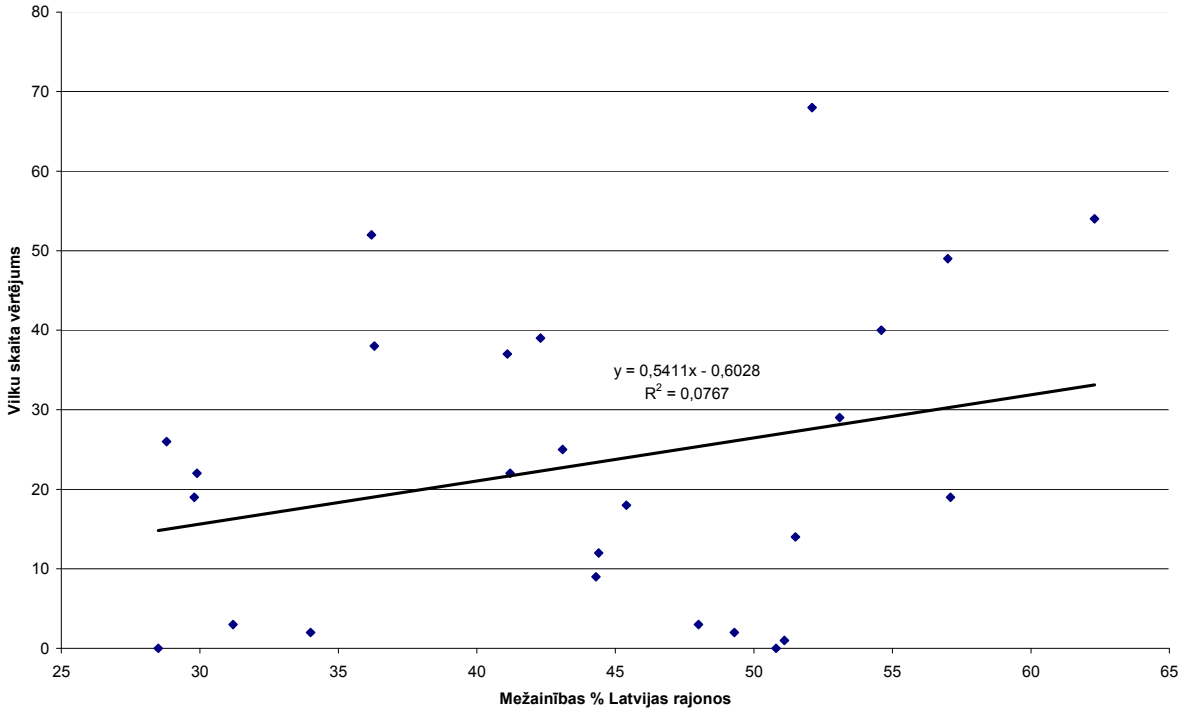


Fig. 19. The relationship between wolf number and forest cover in 26 Latvian districts in 2005. X axis shows the share of forested area (%); Y axis shows accordingly estimated numbers of wolves in 26 districts.

Table 3.

Changes in the forest cover and wolf number in Latvia

Year	Total forest area (ha)	Number of wolves
1924.	1780400	407
1929.	1659200	164
1935.	1747100	14
1961.	2439500	70
1973.	2578900	40
1983.	2782300	330
2006.	2950267	568

3. The current conservation of the species and its habitat

3.1. Legislation

National legislation

In Latvia, according to the Law on the Conservation of Species and Biotopes (05.04.2000) and Annex 2 of the Regulations No. 396 "List of the Specially Protected Species and the Specially Protected Species Whose Use is Limited" (Cabinet of Ministers, 14.11.2000), wolf is classified as a specially protected species whose use is limited. Wolf is also on the game species list of the Regulations No. 760 "Hunting Regulations" (Cabinet of Ministers, 23.02.2003). Wolf hunting is allowed from the 15th July until the 31st March in accordance with the quota set by the State Forest Service. Illegal killing of a wolf results in an administrative fine.

International obligations

Washington Convention – "Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)". In force since the 1st July 1975, Latvia as an independent state joined it in 1997. The wolf is listed under Annex 2 as potentially threatened. This means that international trade with this species is limited and may only occur under strict control.

Bern Convention – "Convention on the Conservation of European Wildlife and Natural Habitats". The wolf is listed under Annex 2. Latvia when signing this convention (accepted in 1979, in Latvia since 1997), had an amendment that the country is allowed a limited exploitation of the species (with a restricted hunting season and certain hunting methods) as well as to regulate to trade of animals and their body parts.

Rio Convention - "Convention on biological diversity" (1992). Latvia took part in signing the document and ratified it in 1995. This convention does not contain any species lists or annexes but provides general guidelines on conservation of biological diversity, research and public awareness.

EU Habitat Directive 92/43/EEC On conservation of natural habitats and wild fauna and flora (Species and Habitats Directive). The wolf is listed under Annex 2 (wolf habitats have to be designated as strictly protected areas) and Annex 4 (prohibition of exploitation). Upon joining the European Union on the 1st May 2004, Latvia got an exemption to apply Annex V requirements in relation to the wolf – species can be hunted but the country has to ensure favourable status of the population, species monitoring and hunting methods listed in Annex IV should be banned.

European Council's Regula No. Nr. 338/97 "On conservation of wild animal and plant species via regulating their trade". The wolf is included in Annex A, which means that trading limitations are essential for its conservation, and the regula has a very strict order how wolf or their body parts can be imported/exported to/from the European Community.

In 2008, EC accepted "Guidelines for large carnivore conservation plans at the population level" (Linnell *et al.* 2008). It is not a legislative document signed by member states

but a document providing guidance and recommendations for achieving and maintaining favourable status of large carnivore populations. Adherence to these guidelines will depend on the ability of member states to cooperate at the international level and their willingness to coordinate their national interests with the species conservation requirements. The document will act as a tool to assess good practice in large carnivore management.

3.2. Species and habitat conservation measures

There is a hunting quota for wolf hunting that is set for the whole country (not divided between forestry districts) and is controlled in a centralised way. When setting a quota, the wolf monitoring results and the hunting bag data from the previous season are taken into account. The quota is planned in such a way so as not to decrease the total number and distribution range of wolves in Latvia. The controlling institution, State Forest Service, has the data on the exact places and times where wolves were hunted. As soon as there are only 10 individuals left on the quota, hunters are not allowed to organise wolf hunting in several areas simultaneously, without the permission from the Game Department of the SFS. After the quota is reached, wolf hunting stops until the next year's hunting season.

Based on the individual management regulations and conservation plans of protected areas, wolves are not hunted in Slītere un Gauja National Parks, in the strict protection zone of Ķemeri National Park (while in the buffer zone the hunting is possible under supervising by park's administration), in all state nature reserves (where no hunting is allowed at all) as well as in the areas of some nature sanctuaries during the time when they have a general hunting ban (small areas). Wolf hunting can be also organised outside the hunting season and an extra quota can be set in the following cases – if there is damage to livestock and other preventive measures have been inefficient, also in order to prevent and restrict epidemics and epizootics. Such cases have to have a special permission from the State Forest Service and the administration of the protected area (if hunting is carried out in the area where hunting is banned according to the territory's regulations). This possibility was used by the SFS in February 2008, when an additional quota of 20 wolves was set in W Latvia after rabies outbreak.

Habitat conservation measures are not planned.

3.3. Species conservation plan in relation to other species' and habitats' conservation plans

A European scale wolf conservation plan was published in 2000 (Boitani 2000). This plan included also information and conservation recommendations for Latvia.

Wolf conservation plan's measures and their implementation schedule is closely related to the Eurasian lynx (*Lynx lynx*) conservation plan which was approved by the Minister of Environment (precept Nr. 683) on 13 November 2007.

3.4. Risk analysis of the current conservation and plan's implementation

Wolf population status has been stable since conservation measures were implemented in 2004 (Ozoliņš 2002). According to the biological criteria, the species was not endangered also before the plan was implemented but the aim of the conservation measures was to ensure population's stability. There is a risk that if the wolf numbers increase, management problems

would arise and the public opinion would become more negative. The current tolerant attitude towards wolves is ensured by the possibility to continue wolf hunting, a low level of local conflicts with livestock owners and the increasing wild ungulate density that reduced competition between carnivores and hunters.

In 2001, WWF funded a study on public opinion on large carnivores in Latvia 2001. It included 3 large carnivore species – brown bear, lynx and wolf (Andersone and Ozoliņš 2004.). The study used a questionnaire method in families using "the next birthday rule". Questionnaires were distributed in different regions in Latvia (Rīga, Vidzeme, Zemgale, Kurzeme and Latgale) and among different target audiences, including families with kids of school age (N=401) and the audience of the magazine "Medības, Makšķerēšana, Daba" (N =157). Family questionnaires showed a more positive attitude towards large carnivore conservation than hunters that were more supportive of carnivore control. The majority of respondents acknowledged that there are enough wolves in Latvia. The negative attitude was usually explained by economic losses to livestock husbandry and game management. The bear is regarded as most dangerous to humans out of the three species (61.7%), followed by the lynx (50%) and the wolf (42.2%).

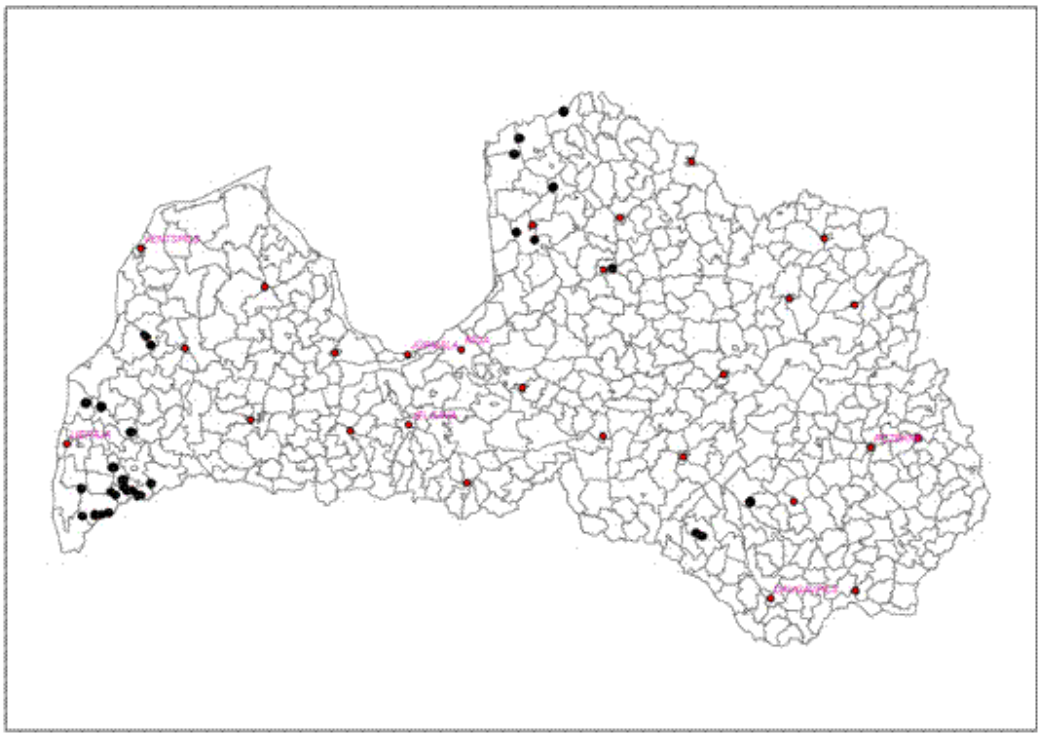
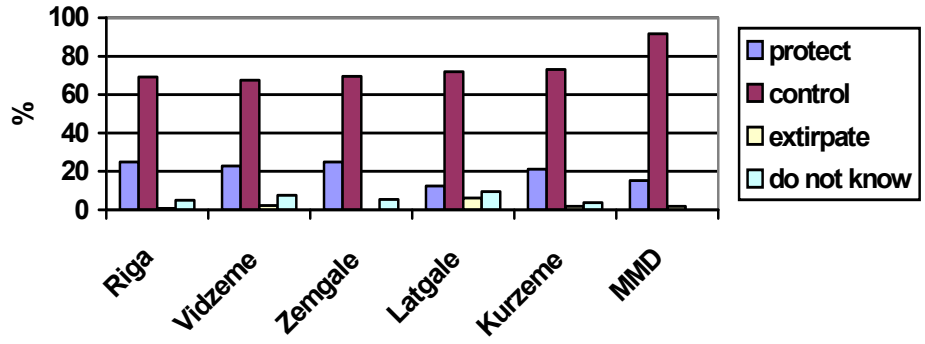


Fig. 20. Sites (black dots) where wolf attacks on livestock happened in 2006.

The majority of respondents (70%) supported wolf control, only 21.7% were in favour of full protection of wolves and very few supported wolf extermination (2%). 6.3% respondents had no opinion. The highest proportion of wolf extermination supporters (6.2%) and the lowest proportion of those in favour of wolf protection (12.5%) was found in Latgale, the region with a relatively low forest cover where wolf number is at times highest in the country. The highest proportion of wolf control supporters (73.1%) is in Kurzeme where attacks on livestock are not uncommon (Fig. 20). The highest proportion of wolf protection supporters is found in Rīga and Zemgale (25% in each region) (Fig. 21). In a study commissioned in 2008 by the Latvian Hunters Association, 74% of respondents acknowledged that wolf hunting is necessary (www.latma.lv).

Fig. 21. What should be done to wolves in Latvia?



Another public opinion poll was carried out in 2005 after implementing the planned conservation measures within the project "Large carnivores in northern landscapes: an interdisciplinary approach to their regional conservation" (see Chapter 1.5). During that study, 1250 questionnaires were distributed via schools in Rīga, Ventspils and Madona districts, 911 (73%) filled questionnaires were received. Questionnaires of the same content were distributed in Estonia, Lithuania, Poland and Norway. The study results show that Latvians are happy to live closest to wolves and are ready to accept one of the biggest populations in their country but at the same time they were also more concerned about how wolves would affect the safety of their families and their income compared to Estonians and Norwegians. It is possible that if the wolf population increased it could decrease the positive attitude towards the species.

The results show that at the moment the public attitude is positive towards wolf conservation. However, in order to decrease risks to the implementation of the planned conservation measures one should avoid focusing only on the improvement of the population's biological status. Maintaining the current situation and being diplomatic in communication with various interest groups should be regarded as a priority when defining species conservation goals and tasks.

4. Goals and tasks of the species conservation plan

The aim of the species conservation plan is to maintain a favourable status of the wolf population in Latvia in the long-term future and to facilitate reaching and maintaining a favourable status in the whole Baltic wolf population. Latvia should maintain the population of at least 300-500 wolves. The favourable population status means not only sufficient numbers of individuals but also:

1. A demographic situation that ensures self-renewal; 2. Genetic structure that ensures gene exchange within the distribution range of the population as well as maintaining genetic and morphological identity and genetic diversity necessary for evolutionary processes; 3. Ecological status when the species maintains its natural functions in the ecosystem (feeding, ability to affect prey populations, habitat use etc.).

   Whether or not the goal is achieved can be evaluated by the following criteria:

- The distribution range does not get fragmented and reduced;
- Wolf-free areas decrease;

- The public appreciates wolf presence in the rural (forested) landscape, does not regard the species as an unwanted competitor, threat or an obstacle for management, is positive towards seeing evidences of wolves' presence and receptive towards information on wolf biology and population status;
- There are no areas with high wolf density and the resulting escalation of the conflicts;
- Wolf functions in the ecosystem (feeding, choice of denning sites, dispersal possibilities) are maintained as natural as possible;
- Species harvest by hunting is possible provided that population's self-renewal ability is maintained;
- Wolf population status does not become worse in the Baltic in general.

In order to achieve the goal the following tasks are required:

- To maintain as high ungulate population density as is feasible in relation to forestry interests, paying special attention to the problems related to the development of road infrastructure and traffic intensity (wildlife crossing points, warning signs, speed limits etc.);
- To follow changes in the demographic structure of the wolf population and to use the results for forecasting changes in the population status;
- To reduce hunting quota at the first signs of population distress as well as to use legal possibilities to shorten the hunting season if necessary;
- To prevent *ungrounded* hunting bans in conservation plans of the specially protected areas that can decrease public acceptance of wolf conservation, at the same time to implement conservation measures at the national level;
- To continue wolf research, especially on its diet, breeding and habitat selection;
- To continue public awareness-raising on wolf conservation problems; a special emphasis should be put on the ways how to reduce the risk of wolf attacks on livestock and other domestic animals;
- To take into account wolf conservation requirements when amending legislation regarding game management, forestry and nature conservation.

5. Species and its habitat's conservation measures

5.1. Legislation and nature conservation policy

In context with the conservation policy for wolf and brown bear, an issue of compensation for the large carnivore-induced damage to agriculture (livestock husbandry) should be solved. This issue is particularly important in regard to wolves in Latvia, as Latvian people are not used to extra costs related to livestock protection while wolves, in their turn, can quickly adapt their behaviour and start hunting the most accessible prey as well as to transfer this knowledge to the next generation. There are a number of controversial points in the current legislation:

- According to the Hunting Law, the damage is compensated by users of the hunting rights. But the problem is that a home range of one large carnivore (at least 200km^2) can comprise territories where hunting rights belong to a number of physical and juridical persons.
- Wolves are protected by the state, which limits their control possibilities.
- According to the Council of Ministers Regulations No. 497 "The order in which damage incurred by game animals to agriculture and forestry is calculated" (valid from 21.07.2007.),

damage is evaluated only in those cases when relevant preventive measures were taken. Electric fence is an efficient (though not 100%) preventive measure against large carnivores. However, according to the Hunting Law, a fenced area is not regarded as hunting grounds. Therefore, the user of the hunting rights is unlikely to be held legally responsible for what happens outside the hunting grounds.

- In many cases, the part suffering the damage is also a user of the hunting rights.

A possible solution for the above-mentioned controversies would be to provide funding (e.g., redistribution of funding from the Rural Support Service) for the owners of livestock who suffered economic losses due to large carnivores (cases of damage would be assessed by the independent experts) for ensuring preventive measures in the future. In order to avoid negligence and to decrease the risk of a drastic increase in application numbers should the compensation system be established, the amount of pay-out should be lower than the market value of the animal killed.

It should be ensured that adherence to the first part of paragraph 5 of the Hunting law is properly controlled and fines are imposed on those persons that accept wolf trophies for processing, transporting and keeping from persons who cannot present a valid hunting permit or its copy. To achieve that, taxidermy and fur workshops that process large carnivore trophies and make stuffed animals, should check the relevant hunting permits.

5.2. Species conservation measures

To continue setting the annual quota and controlling its fulfilment throughout the hunting season. To be carried out by the State Forest Service according to the following scheme:

1. To set an annual quota for the whole country based on the population trend (obtained through the monitoring) and the hunting bag size of the previous season.
2. Within the total quota, to impose territorial and seasonal hunting limitations or bans if the total Latvian wolf populations is decreasing, or in the areas where wolves became so scarce that it can endanger population's renewal, or if a particular region or wolf density in a particular site has a special importance for the long-term existence of the united Baltic wolf population and maintenance of its favourable status.

5.3. Habitat conservation measures

Although wolves do not require protection of a specific habitat, it is important that the distribution of wolves and their prey populations is not fragmented by such obstacles as human infrastructure and roads. Wolves and other large carnivores are very suitable species for landscape ecological planning and arranging so called "green corridors" (crossing points) when renovating roads and building new motorways. The first experience of this kind was obtained during elaboration of the landscape ecological plan of the North Vidzeme Biosphere reserve (see www.biosfera.gov.lv) and it should be continued in the rest of Latvia. Large carnivore experts should invite representatives of the Regional Development Ministry and other relevant

institutions involved in the territorial planning to the seminars and discussions regarding large carnivore conservation.

5.4. Research and monitoring

- To study home range size using the telemetry method.
- To broaden research on wolf impact on prey populations and their impact on game management (Kawata *et al.* 2008). To make a comparison between a proportion of wolf kills and prey population's productivity and quality.
- To continue research on wolf demography using the results in the population vitality analysis (Beisinger and McCullough 2002).
- To continue research of public opinion using the questionnaire method.

5.5. Awareness-raising and education

- To continue involving hunters in large carnivore monitoring.
- Regularly inform the public on the species' status, management and research. The most influential ways of communication should be chosen – training courses for hunters, radio and TV, biggest newspapers.
- When elaborating management plans and conservation and management regulations for protected areas, one has to carefully assess the planned conservation measures in order to avoid imposing unnecessary restrictions which are not implied by the wolf conservation plan.
- Livestock owners should be informed about possible ways of preventing wolf attacks as well as about the risk factors that increase the probability of such attacks.

5.6. Implementation table

Measure (ordered according to priority)	**Implementer**	**Timeframe**	**Cost estimate, LVL**	**Potential donor**
1. Monitoring of the population status	State Forest Service (SFS), LSFRI „Silava”	6 months per year	15000 per year	Game Development Fund, SFS annual budget
2. Elaboration of the compensation system for the wolf-caused damage where funding would be obtained from structural funds for rural support.	Ministry of Agric	2010.	-	-

3. Inspections of taxidermy workshops and fur processing workshops	State police, SFS, State Environment Service	As required	Within the annual budget of the relevant departments	
4. Wolf diet research and assessment of wolf impact on prey populations	LSFRI „Silava”	6 months every year	4000 per year	Science Council of the Republic of Latvia
5. Information work on livestock protection from wolf attacks, based on the experience from other countries	State Forest Service	Ongoing	-	Checking attacks sites, mass media
6. Telemetry project with the aim of finding out the home range size and wolf territorial behaviour	LSFRI „Silava”, University of Latvia	To start until 2010	As a part of student work and scientific research	Science Council of the Republic of Latvia
7. Anonymous opinion poll among hunters on wolf numbers, unregistered cases of wolf mortality and the attitude to the hunting control system	LSFRI „Silava”	2012	3000	Game Development Fund
8. To introduce a more user-friendly and fool-proof system of reporting wolves that were hunted and found dead due to other reasons	SFS, Latvian Hunters Association	2010	3000	Game Development Fund
9. Seminars for specialists from relevant fields on wolf (large carnivore) conservation news in the country	Latvian Theriological Society	Once a year	-	-
10. Public education and awareness-raising	Latvian Hunters Association, SFS, Latvian Theriological Society	Ongoing	-	Mass media

The implementation analysis and updating of the tasks to be carried out in 2014.

6. Implementation of the species conservation plan

Since 2003, most of the measures planned in 202 have been implemented.

1. In 2003, the new Hunting Law and Hunting Regulations (that are in accordance with the requirements of the EC Species and Habitat Directive) were introduced.

2. The State Forest Service (SFS) and the Latvian State Forestry Institute "Silava" annually carry out population status monitoring. In addition to the SFS' main budget, additional funds for large carnivore monitoring are regularly given by the Game Development Fund.

3. SFS creates and controls the system of setting the annual hunting quota for wolves.

4. Questions on wolf biology, conservation and hunting regulations are included into the theory examination for hunters and hunting leaders.

5. SFS regularly organises trainings, seminars and meetings for game specialists, head foresters and their deputies, rangers and leaders of hunting clubs. These events include issues on large carnivore (including wolves) population management.

6. Articles and interviews on wolf population status, scientific research and the progress of conservation measures have been in the following mass media – daily newspapers „Diena", „Neatkarīgā Rīta Avīze", „Latvijas Avīze", Magazine of the Latvian Hunters Association „Jakts" ("Hunting"), magazine „Medības, Makšķerēšana, Daba" ("Hunting. Fishing. Nature"), a TV programme „Uz meža takas" ("On the forest path") on the Latvian TV, Channel 3, in the programmes of Latvian Radio, channels 1 and 4, and other mass media.

7. In 2008, the species conservation plan was updated.

Several tasks planned in 2002 were not implemented.

1. A leaflet on wolf population status and management in Latvia is not published.

2. No new protected areas for large carnivore and their habitat protection were established.

3. A functioning compensation system for wolf-caused damages is not established.

4. A telemetry project has not been carried out.

5. The introduced hunting ban is 1.5 months shorter than the one recommended in the conservation plan.

It is unlikely that the lack of the leaflet has decreased public level of knowledge on wolf conservation. It was substituted by frequent information work through mass media which was much more cost-efficient. In addition, information on wolves and other large carnivores is now available on the Internet on www.vmd.gov.lv and www.latma.lv as well as in English www.lcie.org

As to the new protected area establishment for large carnivores, it is currently considered that is can be entirely substituted by the existing system of hunting limitations. In case of population decline, SFS can decrease or impose a temporary ban on wolf hunting in any of its territorial units. Along with the existing monitoring, such a system is more efficient and easily communicated to users than administratively complicated and inflexible system of increasing protected area network. The main advantage of the current system is that wolves, in their current population development stage, do not require another conservation mechanism apart from

hunting limitations (imposed by SFS) and maintaining or increasing forest cover (guaranteed by the Forest Law, 24.02.2000.)

The current limits for hunting season on wolves can be regarded as appropriate. It seems like the opportunity to hunt wolves in the end of July and in August does significantly make the demographic situation worse. At the same time, it allows to decrease wolf numbers at the very time and sites where they cause damage to livestock. It is true, however, that during wolf hunting in July-August, sometimes one or both parents are killed that has a negative impact on the behaviour of the pups and can be regarded as unethical hunting practice. We recommend carrying out a separate study on hunting season's optimisation. The data for it can be provided by the existing large carnivore monitoring.

In order to implement measures prescribed by this plan, there is no need to establish or to re-organise any of the existing institutions. The current system should be supported and continued where several governmental and non-governmental organisations cooperate such as:

Forest Resource Department of the Ministry of Agriculture;

State Forest Service;

Department of Nature Protection of the Ministry of Environment;

Nature Protection Board;

State Environmental Service;

Latvian State Forestry Research Institute „Silava";

University of Latvia;

Administrations of Gauja National Park, Ķemeri National Park, Slītere National Park, Rāzna National Park, Teiči Nature Reserve and North Vidzeme Biosphere reserve;

Stock company „Latvian state forests"

Latvian Natural History Museum;

Latvian Hunters Association;

Latvian Theriological Society;

Latvian Fund for Nature;

WWF

etc.

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