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Alexander Saveljev, Alexey Sergeyev, Ivan Grebnev, Sergey Chirkov, Vladimir Sotnikov;
Kirov, Russia

The hunting resources of a green belt of a big city in the East of Europe: number, sanitary parameters, and possibilities of sustainable harvest

Schlagworte /key words: Wildbestand, Urbane Populationen, Wasservögel, Überwinterung, Ondatra, Elch-Rachenbremse, Schwermetalle, Kirov, Russland; hunting animals, wintering, waterfowl, muskrat, moose throat bot fly, heavy metals, harvesting, Kirov, Russia

Introduction

Urban green areas play an important ecological role as a buffer between urban complexes, and natural ecosystems (Adams et al. 2005). On one hand they are a high recreational loading, storage and disposal of waste, unauthorized logging, frequent fires and grazing farm animals. On the other hand, the green areas are home to many wildlife species. Favorable trophic conditions near human settlements provide, at times, higher population densities than the wild taiga habitat.

Materials and methods

The investigations were carried out during the period 1998–2013 years. For determining the number, sanitary parameters, and possibilities of sustainable harvest of wildlife in green belt around the Kirov city field data, the official report of the Government of the Kirov region, personal communication of hunters were used.

Hunting on animals in the city was carried on permits of Department of Conservation and Use of Fauna of the Kirov Region. Collected animals were studied in complex: morphological parameters, the content of trace elements, pathological conditions and parasites have been identified. The peculiarities wildlife ecology in the urban habitat were studied.

Research of chemical nutrition of muskrat and beaver take place in "green belt" around the Kirov city and in other districts of Kirov region located far away from industrial sources of pollution. Investigations included the estimation of microelements in different organs and tissues with the aim to evaluate the contamination level in such an object. Samples were collected during the autumn-spring hunting periods. Shooting and trapping methods for animal harvesting were used. Samples of muscle, liver, kidneys, lungs, heart and spleen bones were taken.

The probes were put in chemical passive pack and frozen about -20°C until the time of the determination. In the laboratory samples were dried under the temperature 60°C till the weight became consistent, then the homogenized probes were prepared with "dry" method. The estimation of lead and cadmium concentrations is based on the method of flame atomic absorption spectrometry. The apparatus are "Spectr-5-3". For statistical processing of results generally accepted methods of analysis are used.

General characteristics of the study area

Kirov (also known as Vyatka and Khlynov) is the capital and administrative center of Kirov region of Russia. The city is standing on the banks of the Vyatka River about 900 km east from Moscow. Novgorod city merchants founded Khlynov fort near the Ural Mountains in 1181. The settlement was first mentioned as town in 1374. Khlynov town became part of Moscow state in 1489. The population of modern Kirov city is about 478,000 (2012), the land area is 170 sq.km. Kirov is a big transportation juncture. Federal highway A119 "Vyatka" is very close to the city. The city is also crossed by Trans-Siberian railway. About 22 km from the main territory of city the airport "Pobedilovo" is located. Also there is a river port. The main industries of the city are machinery, textiles, food products, metals and timber.

Size of green belt of Kirov city, Kirovo-Chepetsk, Slobodskoy is 1,700 sq.km. (fig. 1) The number of hunters in Kirov during the past 25 years has steadily increased: 3,600 (in 1986), 5.120 (2002), 9.863 (2008). The climatic conditions of the Kirov area are quite harsh. (table 1)

Table 1 Some climatic indexes of the Kirov region

Index	Values
Abs. maximum, °C	36.9
Mid-annual temperature	3.1
Abs.minimum, °C	- 45.2
Precipitates, mm	676
Max. depth of snow in forests, cm (March 2013)	90

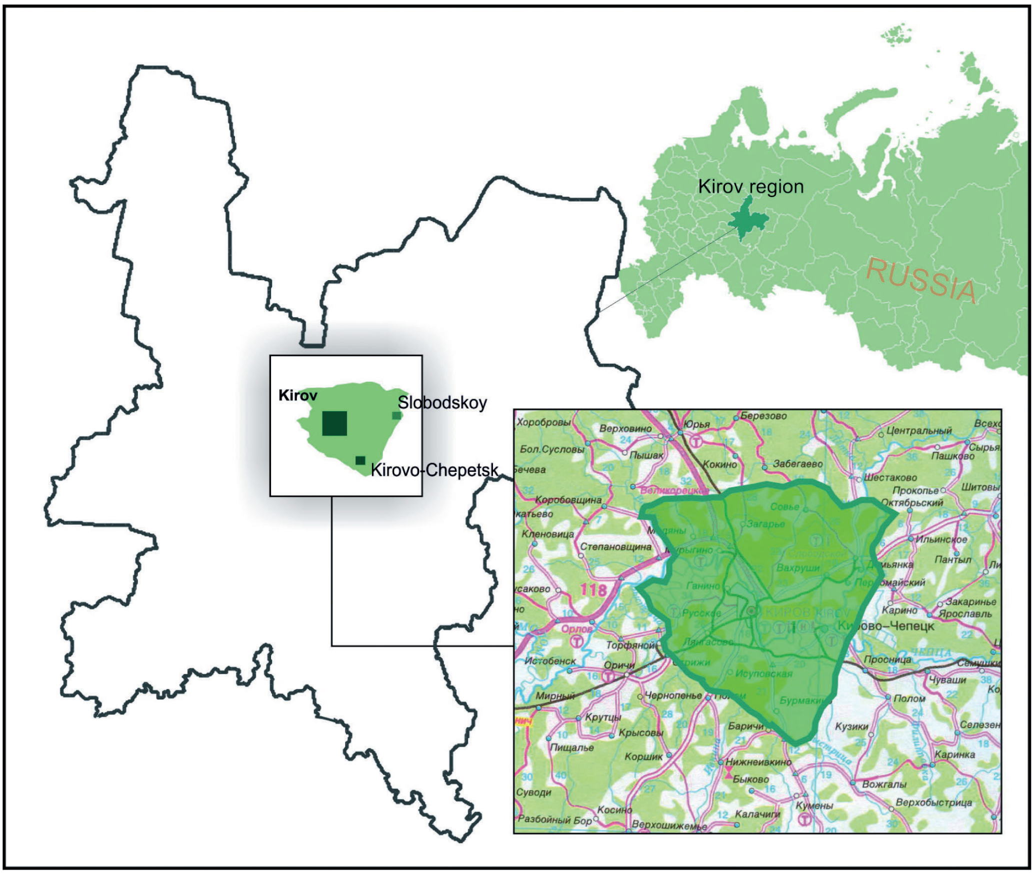

Fig. 1 Territory of the green belt of Kirov

Fig. 2 Population of beavers in the Kirov region has reached 40000 individuals, in a green belt – more than 2000. Animals well feel in immediate proximity from the city. Foto at December 9th 2009 by Dmitri Gorshkov.

Wildlife in green belt

The green belt is habitat of more than 80 % of the species from the List of game animals of Kirov region. Many species can live in the city (figs. 2–3). Population density of the major game species in the green zone is higher than average in the Kirov region. The only exception is the brown bear and capercaillie (table 2).

Fig. 3 Young pine marten regularly come into the most densely populated city quarters especially in a period of deficiency of forages. Foto at February 5th, 2009 by Andrey Sinitsyn.

Table 2 Comparison of density of game in green belt of Kirov city and Kirov Region in 2010 (source: Department of Conservation and Use of Fauna of the Kirov Region)

Species	Population density (ind. x 100 sq.km^{-1}, average)	
	green belt	Kirov Region
Moose *(Alces alces)*	45.8	20.2
Wild boar *(Sus scrofa)*	12.2	7.3
Brown bear *(Ursus arctos)*	no data	4.9
Polecat *(Putorius putorius)*	4.1	2.2
Squirrel *(Sciurus vulgaris)*	138.9	89.8
Pine marten *(Martes martes)*	10.9	8.5
Red fox *(Vulpes vulpes)*	15.7	6.3
Snow hare *(Lepus timidus)*	100.9	56.9
Wolf *(Canis lupus)*	1.0	0.3
Muskrat *(Ondatra zibethicus)*	140	4.09
Stoat *(Mustela erminea)*	1.58	1.12
Capercaillie *(Tetrao urogallus)*	4.65	5.92
Black grouse *(Tetrao tetrix)*	133.78	57.40
Hazel grouse *(Bonasa bonasia)*	35.61	23.50

Within the green zone hunting and resource management make eight hunting grounds. An example of efficiency of two of them is shown in table 3.

Table 3 Productivity of two hunting grounds (Bakhta and Slobodskoy) within green belt in season 2008/2009 (source: Department of Conservation and Use of Fauna of the Kirov Region and Grebnev 2011).

Species	**Game productivity (ind. 100 x sq.km^{-1})**
Moose *(Alces alces)*	1.8
Wild boar *(Sus scrofa)*	2.0
Brown bear *(Ursus arctos)*	0.2
Pine marten *(Martes martes)*	1.3
American mink *(Neovison vison)*	1.3
Red fox *(Vulpes vulpes)*	2.5
Eurasian beaver *(Castor fiber)*	2.3
Muskrat *(Ondatra zibethicus)*	81.1
Black grouse *(Tetrao tetrix)*	1.8
Waterfowl	41.8

Muskrat is an interesting model object for understanding of adaptation mechanisms of biota elements to habitat change. This is a very plastic species, actively explore the urban area (fig. 4). In the city muskrat inhabits even the most unsuitable water. Females usually produce two litters a year. This is primarily due to a rodent acceptable hydrological regime (no significant fluctuations in water level), and a good food supply. Despite a certain low abundance of food plants species, phytomass productivity is high due to the "thermal pollution" and water saturation in organic matter. In such circumstances the muskrat population is fairly plentiful and productive. Average productivity is 140 skins per 10 km^2 and up to 1,000 animals possible to bag on ponds of the city.
The proportion of adult animals in the bag ranged from 18.5 % to 21.2 %, while the proportion of males and females is 1.3: 1. The predominance of males in subadult group (over 85 %) is likely to indicate a selective trapping most mobile individuals in the period of settlement. According to the results trapping out of young animals on pair of adults per year ranged from 7.2 to 8.8 individuals. Average fertility is determined by placental scars was 15.2 puppy on one adult female (n = 6, lim 9-19). We do not found breeding <1 year female among the 14 surveyed.

One of the interesting peculiarities of the city muskrat population is **white spotting**. The spots are usually seen on the tail and limbs of animals. Frequency of occurrence (penetrance) white spotting on the front legs is close to 100 %. Outside the city are common muskrat no spots on front limbs. White tip of the tail (from 1 cm to half the length) have 31.9 % of individuals. Some of these animals had abnormally bent up, "saber" tail (fig. 5). In the group of "white-tailed" found 12 individuals, or 7.1 % of the sample with white spots even on the lower surface of the hind limbs. It is unknown whether the unusually high penetrance

Fig. 4 Signs of dwelling of a muskrat and water vole can be meet and in the watersheds having high degree of pollution by heavy metals and bioorganic compounds (foto by Alexander Saveljev)

of white spotting in Kirov muskrats result distress ecological situation in the city, or is it a consequence of genetic processes in restricted population.

Regular invasion in city territory of **moose** (mainly young individuals), pine martens, owls, and other typically taiga animals occur (fig. 6). Cases of moose infection by moose throat bot fly have been observed. These flies *Cephenemyia ulrichii* (Oestridae) excrete while flying their (15–100) eggs in the nostrils of moose, where they grow up and may block breathing (fig. 7a, b).

Environmental pollution

determines the high content of pollutants in animals on technogenic areas. It is shown that content of trace elements in soils and terrestrial plants and neighbourhoods Kirov city, with the exception of iron, was higher than in the soils of background areas. It was found 42 species of plants and 2 species of fungi in the largest quantities of concentrating pollutants in technogenic habitats (Shikhova & Egoshina 2004).

We found that lead concentration in a food objects of black grouse (by goiters content) from the vicinity of the city of Kirov significantly higher than background levels (fig. 8).
In the lungs of birds from technogenic habitats level of lead contained to be twice (3.25 and 1.47 mg/kg, respectively). However, the Pb concentrations in the kidneys, liver and bones of black grouse from two sites were not significantly different.

Food plants of the beaver and muskrat from polluted water systems contained in the 1.5–

Fig. 5 Urban Kirov population of a muskrat unusually high frequency (prevalence) white spotting is characterized: about 100 % of animals have spots on forward extremities, 7 % – on hinder legs, the third of population – the white tail sometimes having the form of a "sabre" (foto by Alexander Saveljev)

Fig. 6 Moose regularly (1–2 cases per year) come into the Kirov city (foto at May 22th 2010 by Alexander Saveljev).

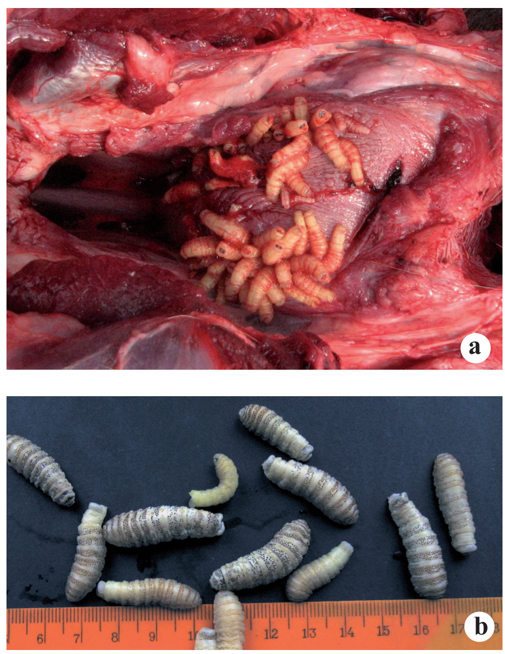

Fig. 7a, b The most of A.alces population in Kirov region is infected by larvae of the moose throat bot fly / Elch-Rachenbremse Cephenemyia ulrichii. a) *Intensity of invasion happens such high that leads to difficulty of breath (foto at March 17, 2012 by Alexander Saveljev);* b) *Larvae of moose throat bot fly from the pharynpeal/ nostril region of a moose died in Kirov city at June 7th 2011 (foto by Andrey Pankratov)*

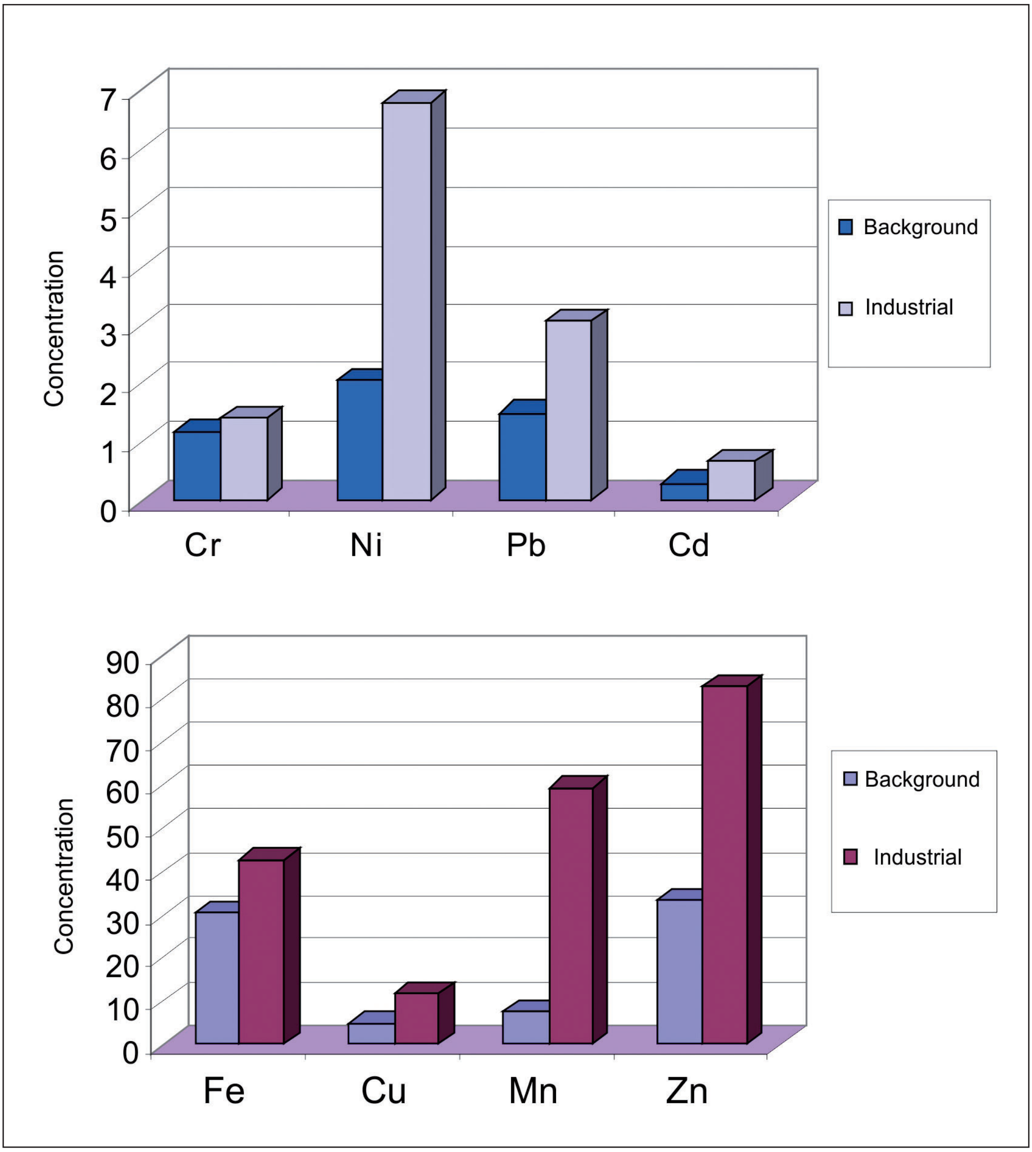

Fig. 8 Levels of some biogenic and toxic trace elements (mg x kg^{-1} d.w.) in forages of black grouse from industrial (near the Kirov city) and background areas.

3.0 times more copper, cadmium, lead, zinc, chromium and manganese in comparison with the plants from background regions. In terms of pollution is intense accumulation of copper, nickel, cadmium and lead in consumers, and the levels of iron and zinc, however, are reduced. Accumulates in plants manganese and chromium, do not accumulate in animal tissues.

Distribution of pollutants in organisms of investigated animals generally similar. Maximum concentrations of Fe, Cu, Mn and Cr were found in the liver, Ni and Pb and Zn – in bones, Cd – in bones and kidneys. Testis, heart, muscles turned out to be contaminated least of all. (table 4). Trace element composition of tissues from beaver and muskrat as a whole correspond

Table 4 Concentrations of trace elements (mg x kg^{-1} d.w.) in tissues of beavers of background and industrial territories of Kirov region

	Extreme and mean values	Fe	Cu	Mn	Zn	Cr	Ni	Pb	Cd
Background territories	**Bones** (n=4)								
	Lim	6,25-12,4	0,92-4,45	4,13-4,70	20,8-24,8	1,2-2,27	2-3,5	4,21-5,06	0,90-1,00
	M±m	9,33±3,08	2,69±1,77	4,42±0,29	22,80±2,00	1,74±0,54	2,75±0,75	4,64±0,42	0,95±0,05
	Lungs (n=4)								
	Lim	26,8-61,3	1,73-9,98	2,80-4,60	9,21-18,44	0,57-3,47	0,77-2,86	0,97-2,84	0,17-1,20
	M±m	52,53±8,59	6,07±1,71	3,74±0,40	14,72±1,96	1,49±0,67	1,56±0,47	1,67±0,45	0,52±0,24
	Muscles (n=4)								
	Lim	9,16-22,8	2,29-3,90	2,68-3,53	10,81-28,12	0,55-1,14	0,60-1,20	0,50-0,90	0,10-0,19
	M±m	19,29±5,13	3,23±0,48	3,18±0,26	20,58±5,12	0,76±0,19	0,90±0,17	0,68±0,12	0,15±0,03
	Liver (n=6)								
	Lim	27,73-273,9	4,51-13,86	5,17-29,05	10,18-30,11	1,06-5,78	0,15-1,10	1,00-2,11	0,01-1,01
	M±m	113,23±42,12	9,00±1,73	12,37±4,26	20,53±3,18	3,11±1,03	0,84±0,18	1,68±0,23	0,33±0,18
	Kidneys (n=6)								
	Lim	41-90,11	5,58-12,78	3,15-8,69	15,8-28,25	0,73-8,38	0,11-1,8	0,8-2,15	0,20-0,41
	M±m	69,96±9,70	8,60±1,29	5,62±0,90	20,27±2,71	2,79±1,42	0,87±0,27	1,45±0,27	0,38±0,11
	Heart (n=6)								
	Lim	15,80-78,20	4,04-20,26	2,82-5,88	15,11-28,85	0,61-2,83	0,55-2,80	0,69-1,21	0,01-0,3
	M±m	39,86±11,49	9,73±2,78	4,11±0,53	22,07±2,83	1,51±0,41	1,37±0,38	1,02±0,11	0,14±0,05
industrial territories	**Bones** (n=4)								
	Lim	1,21-52,4	3,52-4,79	1,44-3,83	18,21-70,8	0,31-1,84	1,81-5,2	1,00-4,00	0,2-1,98
	M±m	17,78±11,92	4,17±0,35	3,08±0,38	48,38±10,30	1,03±0,31	2,01±0,10	2,85±0,45	1,22±0,31
	Lungs (n=9)								
	Lim	7,14-48,40	2,94-13,08	1,31-14,01	20,8-40,11	0,31-2,11	0,8-3,11	0,80-3,11	0,08-1,00
	M±m	26,61±3,80	8,19±1,24	6,27±1,36	28,59±1,85	1,02±0,16	1,17±0,13	1,60±0,24	0,39±0,11
	Muscles (n=7)								
	lim	17,41-20,81	2,51-8,51	1,38-6,31	19,10-35,80	0,45-2,11	0,68-1,11	0,75-1,31	0,08-0,80
	M±m	19,35±0,54	5,72±0,68	3,77±0,66	26,83±1,97	1,28±0,25	0,84±0,06	1,01±0,08	0,27±0,10
	Liver (n=7)								
	lim	38,96-82,10	5,01-35,61	2,55-5,75	35,80-54,4	0,98-5,08	0,89-3,45	2,00-3,80	0,5-1,35
	M±m	59,48±6,84	11,96±4,01	3,60±0,44	42,70±2,32	2,67±0,60	2,10±0,39	2,49±0,27	0,94±0,10
	Kidneys (n=9)								
	lim	28,13-80,64	2,72-11,99	1,35-8,99	17,11-62,1	0,29-5,48	0,28-4,05	0,75-4,20	0,08-1,35
	M±m	48,97±6,03	7,04±1,08	3,97±0,92	39,70±4,69	2,69±0,61	1,78±0,40	2,34±0,44	0,82±0,16
	Heart (n=8)								
	lim	40,80-81,20	4,23-22,90	2,01-11,20	30,10-50,80	0,56-8,15	0,98-4,11	1,00-3,21	0,20-1,48
	M±m	63,45±5,18	11,18±1,15	4,08±0,39	43,94±2,68	3,02±0,44	2,00±0,43	1,85±0,29	0,69±0,18

to the data for these animals from other regions of Russia (Davletov 1999). Specimens that have been taken at the industrial zone near the city of Kirov and Kirovo-Chepetsk proved to be most contaminated by Cd in liver ($t = 3.00$, $p < 0.01$) and heart ($t = 2.99$, $p < 0.01$), Pb in heart ($t = 2.65$, $p < 0.05$), Cu in muscles ($t = 2.98$, $p < 0.01$) and Zn in liver ($t = -5.64$, $p < 0.001$), kidneys ($t = 3.58$, $p < 0.01$) and heart ($t = 5.62$, $p < 0.001$) as compared with all the other samples. However, even those levels of pollution turned out to be significantly lower then those in the West Europe (Sergeyev et al. 2009).

Urban muskrats can bioaccumulate significant amounts of lead, cadmium, nickel, chromium and copper. (table 5). However, comparison of synantropic and background regions muskrats revealed no significant differences in the concentrations of these elements, which are likely due to an insufficient number of samples taken at clean territories. Despite the intense chemical pollution muskrat habitat in the area of human, the population of these animals is characterized by relatively high reproductive rates and rapidly growing populations.

Significant relationship of some metals accumulation and age of the muskrat was found. As the urban muskrat population is intense withdrawal animals through illegal hunting, the basis of the reproductive core population are individuals aged 1+. Organisms of these animals do not have time to accumulate more dangerous doses of pollutants that have a significant adverse effect on reproduction. Perhaps this is one reason for the high rate of reproduction of the population in conditions of strong chemical pollution.

The increased concentration of toxic metals in the elements of the biota neighborhoods the city suggests the presence of biogeochemical anomalies. Current economic conditions are forcing local residents most intensively exploit these

Table 5 Concentrations of trace elements (mg/kg^{-1} d.w.) in tissues of muskrat from industrial territories of Kirov city

Extreme and mean values	Fe	Cu	Mn	Zn	Cr	Ni	Pb	Cd
***Bones** (n=26)*								
lim	3,14-30,5	0,52-11,5	1,36-16,11	22,40-70,0	0,48-4,28	0,58-0,45	0,45-16,21	0,02-4,05
M±m	10,77± 1,37	4,42±0,67	4,01±0,67	42,93±2,64	2,32±0,23	2,67±0,28	4,22±0,63	1,52±0,22
Lungs (n=18)								
lim	2,8-69,11	0,2-10,82	0,38-18,03	2,20-72,10	0,02-5,44	0,23-3,00	0,16-5,11	0,00-0,98
M±m	34,42±3,64	5,40±0,63	7,64±1,14	26,60±3,70	1,77±0,36	1,53±0,13	1,90±0,31	0,21±0,07
Muscles (n=25)								
lim	4,25-91,80	0,64-11,7	0,81-12,00	19,80-60,80	0,01-6,11	0,11-1,25	0,50-3,15	0,01-1,00
M±m	22,33±3,56	3,65±0,50	3,62±0,54	31,25±2,11	1,38±0,34	0,61±0,06	1,28±0,17	0,23±0,06
Liver (n=20)								
lim	18,06-270,8	1,35-18,10	1,58-26,54	10,80-101,20	0,45-10,08	0,72-8,85	0,51-15,80	0,01-4,84
M±m	53,25±13,07	6,41±0,99	7,77±1,41	38,72±4,95	2,96±0,62	2,00±0,43	5,39±0,87	1,41±0,28
Kidneys (n=18)								
lim	17,82-145,4	3,03-28,84	1,93-20,42	19,20-72,10	0,38-7,11	0,12-8,70	1,00-4,80	0,28-3,80
M±m	39,59±7,33	8,38±1,52	7,73±1,40	37,28±4,20	2,27±0,46	1,98±0,53	2,40±0,27	1,27±0,23
Heart (n=14)								
lim	16,95-128,5	2,42-9,80	2,1-16,89	15,80-50,80	0,08-2,95	0,01-3,11	0,20-3,20	0,01-1,20
M±m	58,44±9,45	7,06±0,51	6,99±1,28	32,79±2,72	1,19±0,24	1,01±0,28	1,53±0,24	0,43±0,12

areas. There are agricultural activities, hunting, picking mushrooms, berries and herbs. Use of contaminated products threatens the health of modern and future generations of people.

Waterfowl wintering within the green zone

Since the second half of the twentieth century in the European part of Russia were observed wintering waterfowl. Mainly wintering ducks are concentrated within urban agglomerations. Regular natural wintering of waterfowl never existed in Kirov region. But in recent decades, in winter finds eleven species of waterfowl, including nine species in wintering within the "green zone" (Sotnikov et al. 2007).

Wintering of following species of waterfowl were registered: whooper swan (*Cygnus cygnus*), mallard (*Anas platyrhynchos*), common teal (*A. crecca*), pintail (*A. acuta*), red-crested pochard (*Netta rufina*), ferruginous duck (*Aythya nyroca*), tufted duck (*A. fuligula*), long-tailed duck (*Clangula hyemalis*), common goldeneye (*Bucephala clangula*), gooseander (*Mergus merganser*), smew (*Mergellus albellus*). For most species have been isolated cases of wintering. The majority (99 %) of wintering waterfowl are the mallards. Mallard on non-freezing ponds of Kirov spend the winter annually since the early 1980's. First wintering ducks were observed at an ice-free small river in the city center and on technical ponds. Subsequently, the number of wintering birds increased. They appeared on a water opening on Vyatka river in municipal wastewater treatment plants and city ponds. They were regularly fed by citizens (fig. 9 a, b). Number of wintering mallards is increasing year by year (fig. 10), which suggests the formation of a settled population.

Since the early 1990s, mallards begin to wintering outside the regional center. Since then, their number and the number of wintering sites is constantly increasing, and the birds are found not only on the nonfreezing technogenic and spillways rural ponds, but also on the ice free areas of small forest streams.

Increasing the frequency of wintering waterfowl, probably related to climatic factors: average winter temperatures rising, fewer extremely cold days, shorter winter season. Thus, the river Vyatka near Kirov in the beginning of XXI century was freezing on average 12 days later, and opened on 6 days before the beginning of the twentieth century (Soloviev 2012). An important role is also played by anthropogenic factors, including favorable thermal conditions of technogenic and spring waters that are free of ice all winter.

Hooded crow and dynamics of their population

Nesting of *Corvus cornix* in Kirov and other cities of the Volga region began in the 1960s. In urban areas are concentrated the wintering birds. The maximum size of 50.000 individuals was observed in the late 1980s. During the

Fig. 9 Wildlife feeding (a) *is a popular activity in urban areas and has essential influence on distribution of wintering waterfowls in vicinities of Kirov* (b) *in the most difficult period (foto at January, 17th 2010 by Andrey Sinitsyn).*

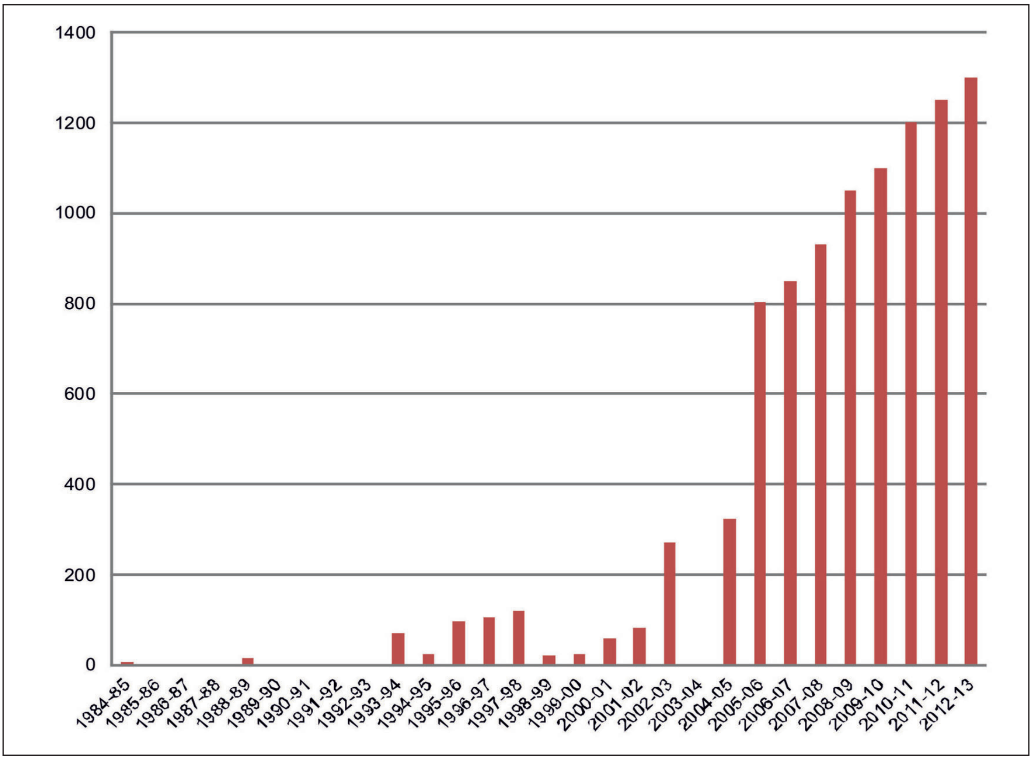

Fig. 10 Number of mallards (individuals) wintering in city of Kirov

period of "Perestroyka" the number has fallen by more than 10 times (Makarov 1997). Now there is a second wave of growth in numbers. Current estimates is 7–6 thousands birds.

Municipal landfill as habitats for wildlife

There are 17 landfills with solid waste in the Kirov region. The two largest are in the green zone of Kirov city (fig. 11). The total area of landfills is about 200 hectares. According to the Department of Conservation of the Kirov region more than 2 million tons of waste has been accumulated here. City dumps are very attractive places to many species of birds (mostly Corvidae – year-round, and Laridae – in the warmer months) and land predators. In Kirov and Kirov-Chepetsk landfills were registered following carnivores: dog (*Canis familiaris*), red fox (*Vulpes vulpes*), lynx (*Lynx lynx*), pine marten (*Martes martes*), stoat (*Mustela erminea*), and polecat (*Putorius putorius*). Trophic

Fig. 11 City dumps are very attractive places to many species of birds (mostly for hooded crow Corvus cornix) and land predators (foto at March 20th 2006 by Alexander Saveljev).

specialization of predators is Norwegian rat (*Rattus norvegicus*).

The rivalry of predators has been registered. For example, in February 2011 on the outskirts of the landfill we found remains of the two foxes, eaten by lynx brood.

Conclusions

Within a green belt of the Kirov city the status of resources of the animals included in the list of objects of hunting does not cause anxiety. This together with regularly arising of expansion of large animals in a city cause necessity and possibility conducting in this territory of adjustable hunting. Game resources management also is necessary from the sanitary point of view.

Summary

The hunting resources of a green belt of a big city in the East of Europe: number, sanitary parameters, and possibilities of sustainable harvest

The analysis of populations of the game animals in a green belt of Kirov city – a half-million city in the east of the European part of Russia – is given. Despite high enough degree of urbanization of territories (total area 1,700 sq.km), density of populations of the most species (except for brown bear and capercaillie) are here higher than in average across the ‘Kirovskaya Oblast’ (region).

Long-term tendencies in change of ecology of wintering on city territory waterfowl and Corvidae are featured. The sanitary status of urban populations of muskrat and beaver is explored. The phenomenon of white spotting in urban muskrats is described. Regular invasion in city quarters of young moose’s, pine martens, owls, and other typically taiga animals is observed. The state of bioresources and legal norms allow to conduct sustainable game management in a green belt of Kirov city without conflicts with conservationists.

Резюме

Охотничьи ресурсы зелёной зоны крупного города на востоке Европы: численность, санитарные показатели и возможности использования

Дан анализ ресурсов охотничьих животных в зеленой зоне Кирова –полумиллионного города на востоке Европейской части России. Несмотря на достаточно высокую степень урбанизированности территории (общая ее площадь равна 1700 кв. км), плотность популяций большинства видов (за исключением медведя и глухаря) здесь выше, чем в среднем по Кировской области. Описаны многолетние тенденции в изменении экологии зимующих на городской территории водоплавающих и врановых птиц. Исследован санитарный статус городских популяций ондатры и бобра. Описан феномен белой пятнистости в урбанопопуляции ондатры. Регистрируются регулярные инвазии в городские кварталы молодых лосей, куниц, сов и других типично таежных животных. Состояние биологических ресурсов и юридические нормы позволяют вести в зеленой зоне регулируемую охоту без конфликтов с не-охотничьим населением.

Zusammenfassung

Die Jagdressourcen der grünen Zone einer Großstadt im äußersten Osten Europas: Wildbestand, sanitäre Parameter und die Möglichkeiten der nachhaltigen Nutzung

Es wurde der Wildbestand in der grünen Zone von Kirow – einer Halbmillionenstadt im Osten des europäischen Teils Russlands – analysiert. Ungeachtet der hohen Urbanisierung des Territoriums (seine Gesamtfläche beträgt 1700 km^2), ist hier die Populationsdichte der meisten Wildarten (ausgenommen des Bären und Auerhahns) höher, als durchschnittlich im Gebiet Kirov.

Es wurden langjährige Trends in der ökologischen Veränderung der auf dem städtischen Territorium überwinternden Wasser- und Rabenvögel beobachtet und der Sanitätsstatus der Stadtpopulationen von Bisamratte und Biber

untersucht. In der urbanen Population der Bisamratte wurde das Phänomen der Weißfleckigkeit gefunden.
Es kommt zu regelmäßigen Invasionen von Elchen, Baummardern, Eulen und anderen typischen Taiga-Arten in die Stadtviertel. Der Zustand von biologischen Ressourcen und die Rechtsnormen ermöglichen, in der grünen Zone die geregelte Jagd auszuüben.

References

ADAMS, C.E.; LINDSEY, K.J.; ASH, S.J. (2005): Urban Wildlife Management. – CRC Press.

DAVLETOV, I.Z. (1999): Osobennosti ekologii rechnogo bobra v uslovijah urbanizirovannoj sredy [Ecology peculiarities of beaver under conditions of urbanized environment]. Unpubl. Dissertation. Udmurtia State University, Izhevsk: 1–172 (in Russian).

GREBNEV, I.A. (2011): Problemy ispolzovania ohotnichyih resursov zelyonyh zon gorodov (Die Probleme der Nutzung der Jagdressourcen der grünen Zonen der Städte) Unpubl. Dissertation. VNIIOZ, Kirov: 1–168 (in Russian).

MAKAROV, V.A. (1997): Biologicheskiye predposylki meroprijatij po regulirovaniu chisslennosti seroj vorony v Volga-Kama mezhdurechyi (Die biologischen Vorbedingungen zur Regulierung der Anzahl der Nebelkrähe im Wolga-Kama-Zwischenstromland.) Unpubl. Dissertation. VNIIOZ, Kirov: 1–164 (in Russian).

SHIKHOVA, L.N.; EGOSHINA, T.L. (2004): Tjazholye metally v pochvah i rasstenijah severo-vostoka Evropejskoj chasti Rossii (Die Schwermetalle in den Böden und den Pflanzen im Nordosten des europäischen Russlands) NIISH of RAAS Publ., Kirov (in Russian).

SERGEYEV, A.; SAVELJEV, A.; SOLOVYEV, V.; ORLOV, P.; BONDAREV, A.; KOMAROV, I.; CHEREMNYKH, S. (2009): Is Russian game meat dangerous? A lead and cadmium case study. – Beitr. Jagd- u. Wildforsch. **34**: 160–178.

SOLOVIEV, A.N. (2012): Wintering of migratory birds for mid-latitudes in East of Russian Plain. – Bulletin of Moscow Society of Naturalists **117** (3): 3–16 (in Russian with Engl. summary).

SOTNIKOV, V.N.; PIMINOV, V.N.; SERGEYEV, A.A. (2007): Zimniye nahodki guseobraznyh na territorii Kirovskoj oblasti (Die Winterfunde Anseriformes auf dem Territorium des Kirov Gebiet) – Ekologicheskij Vestnik Chuvash Republic **57**: 305–308 (in Russian).

Anschriften der Verfasser:

Dr. Sci. Biol. ALEXANDER PAVLOVICH SAVELJEV
Dr. ALEXEY ANATOLIEVICH SERGEYEV
Department of Animal Ecology
Russian Research Institute of Game Management and Fur Farming of RAAS
Preobrazhenskaya Str. 79
Kirov 610000 RUSSIA

Dr. IVAN ANATOLIEVICH GREBNEV
Dipl. Game Biol. and Law. SERGEY GENNADIEVICH CHIRKOV
Department of Conservation and Use of Fauna of the Kirov Region
Volodarski Str. 82
Kirov 610020 RUSSIA

Dipl. Biol. VLADIMIR NESTOROVICH SOTNIKOV
Kirov City Museum of Natural History
Lenin Str. 179
Kirov 610007 RUSSIA

E-Mail: saveljev.vniioz@mail.ru