

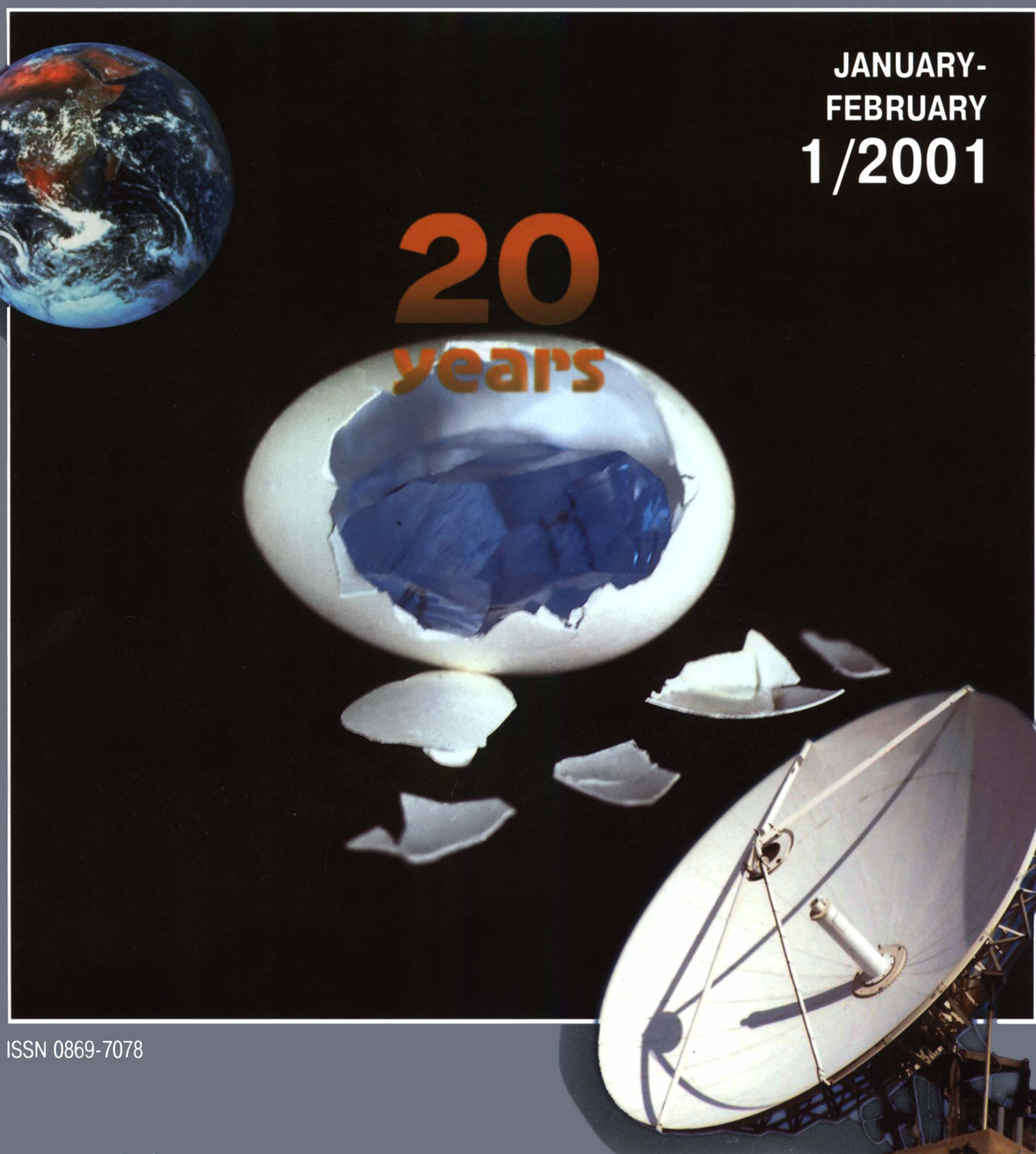
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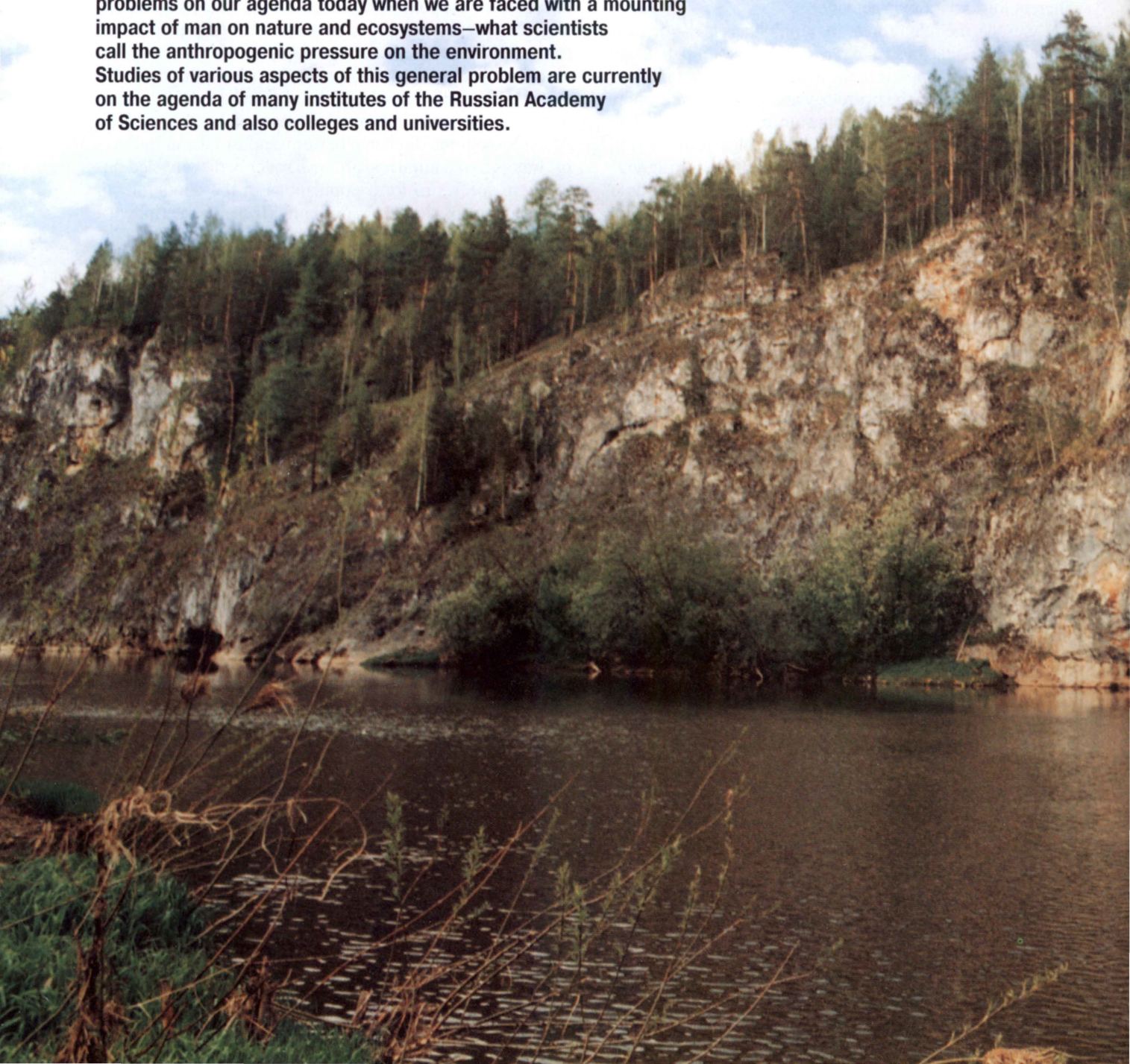


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THEY ROOST IN URAL CAVES

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The preservation of biodiversity is one of the vitally important problems on our agenda today when we are faced with a mounting impact of man on nature and ecosystems—what scientists call the anthropogenic pressure on the environment. Studies of various aspects of this general problem are currently on the agenda of many institutes of the Russian Academy of Sciences and also colleges and universities.



*Serge river cave—
hibernation site of bats.*



Looking at this problem from our own angle, we regard as one of the most interesting groups of animals found within the bounds of this country the bats—flying mammals belonging to the order *Chiroptera* (of 981 species). These are the only mammals capable of what we call active flight and many of these species are now listed as endangered ones in the Red Data Books of Russia and its individual provinces and in the international rosters of species threatened with extinction. To give just one example, bat species like the water bat (*Myotis daubentoni*), the pond bat (*Myotis dasycneme*), the brown long-eared bat (*Plecotus auritus*) and the northern bat (*Eptesicus nilssoni*), dwelling in the Urals were entered in the Red Data Book of the Middle Urals (1996), and the pond bat and the long-eared bat are also on the European Red Data roster.

The insect-eating, or insectivorous bats (*Microchiroptera*) use echolocation for navigation and catching prey on the wing, and, like birds, they migrate over large distances. One interesting feature of their biology in the conditions of this country's middle and northern regions is their ability to withdraw into long wintertime hibernation, during which their metabolism is sharply reduced, the same as the functions of all body organs. The bats find optimal conditions for wintering in caves which offer them practically constant air temperature (above zero) and increased humidity with practically no draughts. There is a whole number of such "bat habitats" known to experts on the territory of this country, with populations ranging from single animals to tens and hundreds of them. In any case, however, bats roosting there are an easily accessible and absolutely helpless prey.

Malaya Arakaevskaya Cave.

Another interesting fact about bats is their special role in ecosystems which consists in the fact that they consume large numbers of insects whose larvae develop in water which makes them a kind of a link between the water and ground-and-air ecosystems. This feature is of particular importance for the Urals where experts studied and described for the first time what they call the phenomenon of formation, with bats' participation, of local foci of radioactive ground pollution. Their radio-isotope composition bears "striking resemblance" to the list of radionuclides contained in the waste-water ponds located near the MAYAK waste-processing plants near the industrial center of Chelyabinsk.

The Ural Mountains stretch from the north to the south over a distance of more than 2,000 km, from the tundra and forest-tundra of the Arctic coast to the steppes and semi-deserts of Kazakhstan. Very common in this region are karst rocks, mainly "gravitating" to the foredeeps of the Main Ural Ridge. The total number of caves there exceeds 1,500 with some 500 of them located in the Central Ural. Their length ranges from several meters to more than 5 km. The mountains are flanked from the west and east by vast plains—a fact which made zoologists to conclude that gathering in the local caves for the winter are bats from vast territories which have no natural shelters.

Studies conducted for more than 40 years by researchers of the Institute of Plant and Animal Ecology of the Ural Branch of the Russian Academy into the mechanisms of bat adaptation to the local environment and the problems of preservation of their biodiversity have made it possible to identify some of the peculiarities of these mammals. All in all we found 6 bat species roosting in wintering areas. The most interesting observations were conducted in the Smolinskaya Cave—one of the better known and frequently visited



*The northern bat
in Malaya Arakaevskaya Cave.*





The brown long-eared bat wintering in Gostyovskaya Cave.

caves in this region. Its entrance is a narrow slit under overhanging outcrops of limestone which is located in a steep ravine not far from the Iset River. After the first 15 m, a narrow and long passage opens up into the Bolshaya Kelya grotto, which is about 4 m high, after which one enters again a maze of passages, grottos and sidings (with a total length of some 500 m). The walls and ceilings are covered with fissures and scours or rain rills, with water seeping through some of them.

The Smolinskaya Cave has been known for quite a long time as the wintering grounds of large numbers of bats. It was investigated for the first time back in 1890 by a student of the region, V. Olesov, who later wrote about the noises and squeaks of bats roosting in one of the grottos. A Leningrad zoologist, P. Strelkov, who visited the cave in March of 1956, discovered in the main passage alone no less than 1,000 wintering bats, chiefly of the two species—the pond bat (*Myotis dasycneme*) and the water bat (*Myotis daubentoni*). And there were also several *Myotis mystacinus* bats there as well. In the opinion of the researcher the wintering ground was one of the biggest roosting places of the pond bat (*Myotis dasycneme*) not only in Russia but in Europe as a whole. He counted no less than 800 of these bats during his visit there.

Indeed, by the numbers of wintering bats the Smolinskaya Cave can be called unique in the Urals. In comparison several tens of these animals only were observed in the Kapovaya Cave in Bashkortostan, some 60 bats in the Divya Cave in the Perm Region and only 8 in the Pashiyskaya Cave in the same region. Wintering sites were also found in the caves of Druzhba and Arakayevskaya (Sverdlovsk Region), Skaz, Kuvshinskaya (Chelyabinsk Region) and in the Kurgazak karst hole, or pit (Bashkortostan). But found there as a rule were but single bats of different species, with the



Wintering site of the pond bat in Smolinskaya Cave—one of the biggest in Europe.





**The long-eared bat wintering
in Arakayevskaya Cave.**

largest groups being no more than 20 or 30 in number.

The wintering grounds in the Smolinskaya Cave have been under regular observations since 1958 and more than 40 bats of the *Myotis dasycneme* species have been ring-marked. These studies led the researchers to the conclusion that the site is most favorable for bats thanks to its stable above-zero temperature (over the years of observations in the cave its winter temperatures fluctuated within the range of +1.5° to 5°C only) and there was high relative humidity of the air and no draughts. The highest and most stable temperature was registered in the remote Altar grotto.

The first wintering bats come to the cave usually in October and, depending on the kind of a year, stay there till the end of April or early May. The bats roost in most of the grottos and passages and the only place they shun is a system of passages called literally Road to Hell. Researchers came across some very large colonies of bats (of more than 100 animals). This applies to nearly 70 percent of the *Myotis dasycneme* bats found there, which draped like a living carpet the cavities in the ceiling, filling in the cracks and hanging down in festoons. Only 7 such bats and about 15 percent of *Myotis daubentoni* were hanging down from the walls separately.

And there is no denying the fact that in the 1960s the cave has been attracting growing numbers of tourists whose popular "sport" was hitting, and killing, bats on the walls. On our tours of inspection we repeatedly found dead bats on the bottom of the Bolshaya Kelya and Favor grottos. Considerable number of bats were taken from the cave for "collections of curiosities" by groups of school children and tourists who often carried away with them scores of bats on one visit. What is more, the wintering bats began to include some animals disturbed in their hibernation by tourists' torches and candles which is having a strong negative effect on the animals.

Faced with these facts, members of the our staff have embarked on a kind of public education campaign, explaining the role of bats in nature and the need for their protection. We also produced the well-known Red Data Book of the Middle Ural. And the results have been quick in coming with the bat population of the Smolinskaya Cave beginning to grow again and reaching 1730 bats in November 1998.

Our studies of bat species distribution at cave wintering sites by the range of temperatures have revealed the following pattern: the most "heat-loving" species is *Myotis dasycneme* (favorite temperature range +3° to +5°C). These bats like to roost in spacious, grottos and high from the ground.

The water bat (*Myotis daubentoni*), Brandt's bat (*Myotis brandti*) and the long-eared bat (*Plecotus auritus*) belong to a group of species which have a common "attitude" to ambient temperature (most preferable temperature is 2–3°C). As for the northern bat (*Eptesicus nilssoni*), it seems to be the most cold-resistant type. In "Mine 49", for example, at –12°C the temperature in various sections of the fissure varied from 0.4° to 4.2°C (relative humidity—90 percent). And it was exactly there where we came across these wintering bats. We also inspected a vertical karst fissure—the Kurgazak pit (47 m deep), located on the border of the Chelyabinsk Region and Bashkortostan not far from the Aiy River. Wintering bats, openly hanging on vertical walls, were found there at a depth of 17 m from the ground surface.

Incidentally, wintering bats may "wake up" from their slumbers from time to time and move to cave sections with a better temperature (this was more often observed with *Myotis dasycneme*).

On the whole our studies make it possible to draw the following conclusion: resistance to cold of the wintering species decreases in the following succession: the northern bat—the long-eared bat—Brandt's bat—the water bat—the pond bat.

The total numbers of bats in caves with wintering sites shrinks considerably in summertime because of the bats

migrating to their summer habitations, including small grottoes and caves. In a number of caves where bats were found during the winter, not one was seen during the summer (say *Eptesicus nilssoni* which, according to our observations, never use their wintering "homes" as summer residences. *Myotis dasycneme* was the one which was most "attached" to caves for the summer).

At the VIII European Symposium on the studies of bats which met in Krakow in 1999, the participants formulated the three main "avenues" of bats protection: of the animals themselves from direct annihilation; of their summer dwellings and of their wintering sites. Within the framework of the first of these objectives in Europe considerable importance is attached to what is called ecological education, beginning with pre-school age, cultivating a considerate attitude to living nature in general and bats in particular. The main form of protection of their winter and summer habitats is giving them the status of natural preserves. And the restrictions involved can be of different kinds. One can restrict, or fully ban, visits to caves during the wintering season (from November to March) and during the formation of what we call hatching colonies (May–July). In a number of European countries this is done by closing cave entrances with iron bars. In our own conditions, however, such isolated protective measures can be ineffective and insufficient. What we need is a whole set, or complex, of protective measures which can be translated into practice only by giving bat habitats the status of what we call specially protected territories within the framework of a wildlife preserve.

The setting up in the Sverdlovsk Region in 1999 of the Oleny Ruchei (deer springs) natural park with karst formations in the Sergi valley—a site of winter and summer habitats for considerable numbers and species varieties of bats—should become an important step in the establishment of a network of wildlife preserves for these animals.