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Introduction
A series of biodiversity assessment studies was carried out on cenotic and species levels in 1997-1999 under a Russian-Finnish project with the same name. Specialists of four institutes of the Karelian Research Centre, Russian Academy of the Sciences, were involved in the project. Joint research and analysis of available materials provided extensive data on the characteristics of the study region.

Methodological approach
The study was conducted in accordance with the following programme:

1. Physical - geographical conditions with assessment of biotic life
   1.1. Geological characteristics of the territory
   1.2. Geomorphologic characteristics of the territory
   1.3. Characteristics of Quaternary deposits and history of geological development in the Quaternary period (with evidence for species dynamics pattern)
   1.4. Hydrographic characteristics of the territory
   1.5. Characteristics of the soil cover

2. Diversity and present state of ecotopes, forest, mire and meadow communities
   2.1. Taiga landscapes
   2.2. Forest cover (present situation)
   2.3. Mires
   2.4. Meadows
3. Flora and fauna of terrestrial ecosystems: characteristics and assessment of the pattern of changes caused by human activities

3.1. Vascular plants
3.2. Mosses
3.3. Aphyllophorous fungi (Aphyllophorales s. lato)
3.4. Lichens
3.5. Mammals
3.6. Birds
3.6.1. General description of ornithofauna
3.6.2. Characteristics of local bird fauna
3.7. Insects

4. Flora and fauna of aquatic ecosystems: characteristics and assessment of the pattern of anthropogenic changes

4.1. Higher aquatic vegetation
4.2. Phytoplankton
4.3. Periphyton
4.4. Zooplankton
4.5. Macrozoobenthos
4.6. Fish

5. Unique species: characteristics of populations (Ladoga seal, Margaritifera margaritifera etc.) and their variation pattern

Study areas

In the first two years, our research work was focused on the Finnish-Russian border areas and the White Sea coast, with special attention to the territories proposed for national parks (Fig 1.). The assessment study has shown that the forest, mire and water ecosystems in the vast study territory are either in natural state or are slightly disturbed, and that rare, vulnerable and Red Data Book species are widespread there. In 1999, the study continued on the Zaonezhye Peninsula and in the northern Lake Ladoga region known to display the highest biota diversity. In 2000, Central Karelia was studied. The protection of these natural floristic and faunistic complexes was shown to be highly important.

Two belts of proposed and existing protected areas are now being formed in Karelia. They are represented by natural forest and mire communities evolving along the Russian-Finnish border and on the White Sea coast. These, together with other protected areas, form probably the largest and most representative regional system of protected areas in the West European boreal zone, which is second to none in West Europe. It will help maintain biotic diversity more efficiently.
Fig. 1. Biodiversity inventory areas in 1997–2000.
**Results**

The main part of the region, most valuable with respect to biodiversity, has been studied for 3 years. The results of research are summarised in three volumes that have a total of about 650 pages. In 2001, the results of the assessment study, carried out in Central Karelia, will be reported in volume 4. The data presented have no analogues, at least in other boreal regions of Russia.

**Example from Zaonezhye Peninsula**

Because the data collected are voluminous, only the main results of our biodiversity assessment studies on the Zaonezhye Peninsula are briefly reviewed.

The biotic diversity of this area is higher than that of East Fennoscandia. In comparison with the White Sea region and some border areas, the higher diversity of the local biota results largely from the transformation of natural complexes by human activities, let alone environmental conditions. Until now, the present biotic diversity and its variation pattern have not been thoroughly assessed. Besides, in the study territory we face a lot of environmental, economic and social problems in the comprehensive development of forest, recreational, mineral, agricultural and other resources. One major problem is to prevent the loss of biotic diversity and to optimize the ecological, social and economic parameters of wildlife management with due regard for the public opinion.

The geological and geomorphological settings of the biota are described in detail and a set of maps was presented. Twenty-one highly valuable geological sites were identified on the Zaonezhye Peninsula. The most significant geomorphological sites formed during the Quaternary Period are listed and briefly described. The geological history of the region over the past 130 000 years and the main geological processes, responsible for the formation of the Earth’s surface and the evolution of landscapes, are discussed in detail. The formation of biota is traced, using pollen-and-spore diagrams. The hydrographic pattern of the peninsula is discussed and major water bodies and watercourses are analysed quantitatively. A soil map was made and various types of soils were described.

Two types of geographic landscape are identified on the peninsula. The present state and diversity of ecotopes and forest and mire communities are characterized quantitatively and qualitatively for each landscape. Available forest management data on the present structure of the forest cover are presented in detail, stands being split into age groups, types and quality classes. Forest communities older than 100 years make up about 20%. Various types of mires, unique mires and their plant diversity are described. It is noted, for example, that 83% of Karelia’s mire flora, including 8 Red Data Book species, occur on the Zaonezhye Peninsula. The study of meadows on the eastern shore of the peninsula has shown that meadows with highly diverse vegetation are numerous there. The region’s meadow flora consists of 159 vascular plants, which is over ½ of Karelia’s meadow flora (in all, 304 species).

A list of protected plants is presented. Occurring in Zaonezhye are 77 plant species listed in various Red Data Books, such as: the Red Data Book of Russia 6, the Red Data Book of Karelia 53, and the Red Data Book of East Fennoscandia 62 species. Protected species were reported from over 400 localities. Most of them (53%) were found in the skerries, 33% on the plains and only 14% in the upland part of the peninsula. Areas and localities, most valuable from the point of view of protection of rare and the most vulnerable vascular plant species, were specified. Valuable localities are understood as localities known to host at least 5 protected plant species. They are characterized briefly, other regionally rare but not protected species being listed, too. A list of leading families and genera of cormophyte mosses is presented. The mire
bryoflora of Zaonezhy is represented taxonomically by 90 cormophyte moss species (Sphagnum and Bryaceae), of 38 genera and 18 families. The aphyllophorous fungi occurring on islands in Zaonezhye are listed and characterized taxonomically. The list of aphyllophorous fungi collected so far on the Kizhi islands consists of 64 species from 41 genera and 17 families. A list of lichen species occurring in the insular part of the peninsula is given. The preliminary studied lichen flora consists of 53 species and subspecies. Most of them are synantropic species living in nitrotic environments.

A full list of mammals and a set of maps showing the abundances of some species in the different parts of the peninsula are presented. Special estimations made in 1999, analysis of the archives and the study of the relevant literature have shown that Zaonezhye hosts 44 mammal species, 12 species being listed in the Red Data Book of Karelia (1995). The bird fauna is generally characterized, and a full list of birds is given and their migration patterns and abundances are specified. Areas and sites of high ornithological value are described. The full list of birds consists of 223 species, including 136 nesting species, 42 presumably nesting species, 2 species that nested in the past, 28 species that stop there during migration, and 15 alien species. The pattern of stay of most of them is supported by encounters of birds, findings of nests and broods. The local bird faunas of the peninsula and adjacent areas are thoroughly analysed. For example, the list of rare and vulnerable species, which occur only in the Zaonezhye Park to be established and need strict protection, consists of 39 species, of which 24 species are listed in the Red Data Books of Russia and Karelia. A list of insect species is presented and their protection status is specified. Some species, not reported earlier from other parts of Karelia, are identified.

Higher aquatic vegetation is described, with examples from the largest lakes. Six plant species need protection. The taxonomic and species composition of phytoplankton in major water bodies is discussed. The communities identified are found to be diverse. For instance, in the Kizhi skerries phytoplankton is represented by 124 species and varieties. Seventy-four algal taxa, lower in rank than a genus, were identified in periphyton. The species composition and relative abundance of algae in the periphyton of the water bodies located on the peninsula are described. The planktonic lake fauna consists of 90 taxa (a list is given). The invertebrate fauna is represented by 70 unequally ranking taxa (a list is given). The benthic cenoses were found to be highly diverse. The water bodies are inhabited by 32 fish and fish-like species and one crayfish species. Nine fish species and fish varieties, listed in the Red Data Book of Karelia (1995) and in the Red Data Book of East Fennoscandia (1998), are known there.

To sum up, the natural-areal complexes of the study region are shown to be highly significant from the point of view of conservation of cenotic and species diversity in East Fennoscandia. Arguments in favour of the establishment of a protected area in the central (selkä) part of the Zaonezhye Peninsula, including the skerries, are provided.

**Perspectives**

Assessment of biodiversity is, in fact, a never-ending process, and this work will continue. However, the main fundamental and practical problem is as follows. Scientists must answer two simple but principal questions: 1) What and how much are we losing or may lose from the point of view of biodiversity? 2) What should we do to minimize the adverse anthropogenic transformation of natural communities and species diversity?