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BIOLOGICAL RESEARCHES AROUND THE BELARUSIAN ANTARCTIC EXPEDITION'S CAMP «VECHERNYAYA MOUNTAIN» (EAST ANTARCTICA)

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Биологические исследования в районе расположения Белорусской антарктической экспедиции на Горе Вечерней (Восточная Антарктида). Ю.Г. Гигиняк, О.И. Бородин.

Реферат. Местом проведения исследований был район базирования белорусской экспедиции – полевой лагерь «Гора Вечерняя». Лагерь располагается в пределах оазиса Молодежный на побережье моря Космонавтов, окраинное море Восточной Антарктиды, занимающее пространство примерно между 33° и 54° в.д. Выделены три основных группы микроводорослей: Синезелёные – Chuanophyta, Зелёные – Chlogophyta и Эвгленовые – Euglenophyta. Из 79 видов водорослей, обнаруженных нами в исследованных озёрах Антарктики, 75 встречаются в пресноводных озерах Беларуси. Из 19 видов лишайников семь встречаются на территории Беларуси. Все три вида моховидных (Bryophyta) являются обычными для Беларуси. Основными представителями зоопланктона исследованных пресных озёр являются коловратки. Среди рыб наиболее массовым является *Trematomus newnesi*. Проведен учет ластоногих (2 вида) и птиц (10 видов). Определена калорийность рыб. Содержание органического вещества у гидробионтов Антарктики изменяется от 16,8 до 98%, а калорийность от 0,5 до 8,3 кал/мг сухого вещества. Выявлен высокий уровень сходства между фауной и флорой наземных и пресноводных экосистем в районе деятельности БАЭ и умеренной зоны Северного полушария (Европа, Беларусь). Установлена таксономическая близость водорослево-бактериальных образований донных отложений из пресноводных озёр Антарктики и горячих источников Камчатки.

Ключевые слова: Антарктида, база «Гора Вечерняя», Беларусь, пресноводный фитопланктон и зоопланктон, озёра, лишайник, моховидные, калорийность.

Key words: Antarctica, biological researches, base “Vechernyaya Mountain”, Belarus, fresh-water phytoplankton and zooplankton, lakes, lichen, Bryophyta, caloric content.

The main goal of biological researches in Antarctic is carrying out of scientific researches, as one of elements of State policy realization in the region. These researches are directed on preservation and fastening of Belarus positions in Antarctic, and maintenance of its long-term interests of the further presence and practical activities.

The basic practical exit of biological researches in Antarctic is definition of an initial reference state of environment to which predicted changes will be compared.

The area of our investigations was the field camp of the seasonal BAE (Belarusian Antarctic Expedition) which is situated in immediate proximity to the Russian Antarctic expedition's field base “Vechernyaya Mountain”. Geographical coordinates of the Belarusian seasonal Antarctic expedition's field camp are S67039.550/, E46009.496/, h = 79.7m.

The work program included qualitative and quantitative estimation of sea, fresh-water and land flora and fauna.

Biological objects were registered practically on all free from ice oasis sites, in fresh-water reservoirs and in the Cosmonaut Sea.

There are a lot of freshwater reservoirs around Vechernyaya Mountain. Mainly they have insignificant sizes, but there are also reservoirs with area up to 1400 square meters.

Our researches of 2007-2009 have allowed to define for the first time for this region species structure of fresh-water phytoplankton and zooplankton and to present their quantitative estimation, to define new for this region species of mosses and lichens, to describe species structure of local species of fishes and to define their caloric content. For the first time for the given region migratory dynamics of Pinnipedia and birds are tracked, and also their species structure is defined. Such species of seafood as seaweed and fishes have been used in a food of the Belarus polar explorers.

However the data about taxonomic structure of vertebrate and invertebrate animals of investigated region is fragmentary. There are no data on species structure of such large taxon as Protista, Porifera, Plathelminthes, Nematelminthes, Echinodermata e.t.c, complexes Coelenterata, Ctenophora, Bryozoa, Pantopoda are obviously poorly investigated.

The first biological investigations in the Cosmonauts sea, around the station Molodezhnaya (20 kilometers from BAE) have been carried out by the Belarus biologists in 1971 (Giginyak Yur.). Sea macrozoobenthos, photosynthesis, speed of breath of sea hydrobionts, their fertility and caloric were investigated. Single samplings of zooplankton and bottom sediment from lakes on the Vechernyaya Mountain, and samples of macrozoobenthos from the Cosmonauts sea are carried out by A. Gaidashov in 2008.

In 2008-2009, in the same area O. Borodin as a participant of 2nd BAE has collected a material on: microarthropods, lichens, mosses and land algae; phytoplankton and a zooplankton from fresh-water lakes; sea fishes and some representatives of sea ground fauna. He calculated birds and Pinnipedia. Collecting of material on fresh-water biota was carried out in 25 reservoirs. The bathymetric survey conducted in 6 fresh-water reservoirs has shown potential availability for diving only in lake Nizhnee. All other reservoirs had maxima of depths about 1,5–1,7 m.

All these materials have formed a basis for successful performance of the task «To estimate prospects of use of renewed live sea resources of Antarctic around the Belarus station» of State target program «Monitoring of polar areas of the Earth and maintenance of activity of the Arctic and Antarctic expeditions for 2007–2010 and for the period till 2015».

It is necessary to note that in connection with force-majeur conditions the part of biological collections remained on the Vechernyaya Mountain and hasn't been delivered to Belarus.

At studying of ecosystems of Antarctic fresh-water lakes the particular interest is represented the ancient bottom sediment. The taxonomic analysis of algae from bottom sediment of fresh-water lake located around Vechernyaya Mountain has allowed to allocate three basic groups of microalgae as part of this community. It is Cyanobacteria, Chlorophyta and Euglenophyta. Among Cyanobacteria it is necessary to allocate representatives of kind *Lyngbya* Ag. and *Oscillatoriaceae*. These algae were found in Lake bottom sediment. The similarity of algaebacterial complexes of bottom sediment of Antarctic freshwater lakes and Kamchatka thermal spring is noted.

The similarity of species complex from bottom and water column are established.

From 79 algae species found in lakes of Antarctic – 75 meet and in fresh-water lakes of Belarus (table 1).

Phormidium sp., *Cyclotella*, *Oscillatoria agardhii*, *Diatoma*, *Epithemia* and have not determined yet representatives of red algae are noted in Phytoplankton. *Oscillatoria agardhii* и *Lyngbya* sp. are common species noted in water column and bottom sediment.

19 species from 17 kinds and 9 families of lichens are mentioned for investigated region. Lichens from sort *Lepraria* demand the further studying. The greatest role in region flora is played by families *Acarosporaceae*, *Lecanoraceae*, *Lecideaceae*, *Parmeliaceae*, *Physciaceae* and *Umbilicariaceae*. The great bulk of lichens make crustose lichen – 11 species, foliose lichen – 6, fruticose lichen – 2 (table 2).

Table 1

Distribution of Algae registered in Belarus and in vicinities of Vechernyaya Mountain on sections

Species	Belarus		Antarctic (BAE)	
	Number of species	% from all amount	Number of species	% from all amount
Cyanophyta	260	14,2	25	31,6
Cryptophyta	14	0,8	1	1,3
Dinophyta	25	1,4	3	3,8
Chrysophyta	70	3,7	2	2,5
Bacillariophyta	622	34,1	33	41,7
Xanthophyta	69	3,8	2	2,5
Euglenophyta	126	6,9	4	5,0
Chlorophyta	624	34,1	9	11,4
Charophyta	17	0,9	Not found	—
Rhodophyta	4	0,2	Not found	—

Table 2

The basic features of lichen biota of studied territory

Lichen species	Life form	Occurrence
1. <i>Acarospora gwynnii</i> C.W. Dodge & E. D. Rudolph.	crustose	uncommon
2. <i>Buellia frigida</i> Darb.	crustose	quite frequent
3. <i>Caloplaca citrina</i> (Hoffm.) Th.Fr.	crustose	sporadic.
4. <i>Candelaria murraui</i> (C.W. Dodge) Poelt.	foliose	uncommon
5. <i>Candelariella flava</i> (C.W. Dodge & Baker) Castello & Nimis.	crustose	frequent
6. <i>Lecanora expectans</i> Darb.	crustose	sporadic
7. <i>L. polytropa</i> (Hoffm.) Rabench.	crustose	quite frequent
8. <i>Lecidella lapicida</i> (Ach.) Ach.	crustose	—
9. <i>Lecidella stigmatea</i> (Ach.) Hertel et Leuck.	crustose	sporadic
10. <i>Neuropogon sulphureus</i> (Koenig) Hellb.	fruticose	quite frequent
11. <i>Physcia caesia</i> (Hoffm.) Führr.	foliose	quite frequent
12. <i>Pleopsidium chlorophanum</i> (Wahlend.) Zopf.	crustose	uncommon
13. <i>Porpidia crustulata</i> (Ach.) Hertel	crustose	sporadic
14. <i>Pseudephebe minuscula</i> (Nyl. ex Arnold) Brodo & D. Hawksw.	fruticose	quite frequent
15. <i>Rinodina olivaceobrunnea</i> C.W. Dodge & G. E. Baker.	crustose	sporadic
16. <i>Umbilicaria aprina</i> Nyl.	foliose	quite frequent
17. <i>U. decussata</i> (Vill.) Zahlbr.	foliose	quite frequent
18. <i>Rusavskia elegans</i> (Link) S. Kondr. & Karnefelt	foliose	quite frequent
19. <i>Xanthoria candelaria</i> (L.) Th. Fr.	foliose	uncommon

The greatest number of species concerns to epiphytic lichens. *Buellia frigida* Darb., *Neuropogon sulphureus* (Koenig) Hellb., *Physcia caesia* (Hoffm.) Führr., *Pseudephebe minuscula* (Nyl. ex Arnold) Brodo & D. Hawksw., *Umbilicaria aprina* Nyl., *U. decussata* (Vill.) Zahlbr. и *Rusavskia elegans* (Link) S. Kondr. & Karnefelt are common on stones and rocks in a vicinity of studied territory.

Remarkable feature is that from 19 species of lichens 7 meet in territory of Belarus.

Importance of lichens studying is that they are good objects for monitoring and are suitable for food.

Taksonomic diversity of Bryophyta in vicinities of Expedition's Camp "Vechernyaya mountain" is presented by only three species: Bryophyta – *Bryum argenteum* Hedw.; *Brium pseudofriguetium* Hedw.; *Ceratodon purpureus* (Hedw. Bridel.). All species are common for Belarus.

Zooplankton. Within the Belarus Expedition's Camp "Vechernyaya mountain" six fresh-water lakes – the lake Sandy, Deep, Summer, Snow, Red, Camp and number of small reservoirs are located.

Rotifera are the basic representatives of a zooplankton of the investigated fresh lakes. Lake Camp (Molodezhnaya) - *Kellicottia longispina* (Kellicott, 1879), *Holopedium gibberum* Zaddach, 1848. Lake Nizhnee - *Bdelloida* sp., *Keratella cochlearis* (Rotifera) and Copepoda. Lake Superior (Vechernyaya mountain) - *Bdelloida* sp., *Kellicottia longispina* (Kellicott, 1879), *Keratella cochlearis tecta* (Gosse, 1851). Lake Camp (Molodezhnaya) - *Bdelloida* sp., *Collotheca* (see the figures at the color paste between pages 96 and 97).

132 stationary and 29 routing observations are spent over birds and mammals and 111 supervision executed on a course of Scientific Expedition Ship «Academic Fedorov». 7 species of birds from 3 order in vicinities of Belarusian Antarctic Expedition's Camp «Vechernyaya Mountain» and 2 species of Pinnipedia are revealed. 350 samples of fishes concerning to Notothenioidea are caught. Almost 100 % infection of the caught fishes with nematodes and plerocercoids are noted. Absolute fertility of *Tr.hansenii* is approximately equal 11641 berries.

4 species of Echinodermata – *Sterechinus neumayeri*, starfishes (2 species), basketfish have been registered also.

Mammals around Belarusian Antarctic Expedition's Camp have been presented only by two species of seals – *Leptonychotes weddelli* and a crab-eater seal (*Lobodon carcinophagus*). The single sample of crab-eater seal has been noted in January around station Molodezhnaya. Birds are presented by following species - Sphenisciformes – Adeli penguin (*Pygoscelis adeliae*), an Emperor penguin (*Aptenodytes forsteri*); Waders (Charadriiformes) – South polar skua (*Stercorarius skua*); Procellariiformes – a snow petrel (*Pagodroma nivea*), pintado bird (*Daption capensis*), Wilson's petrel (*Oceanites oceanicus*) and *Fulmarus glacioides*. Thus the great amount of registration is refer to *P. adeliae* and *S. skua*.

Definition of caloric content of various fishes from region of Belarusian Antarctic Expedition's Camp «Vechernyaya Mountain», The Cosmonaut Sea (East Antarctica) is carried out:

Trematomus hansenii – 4,1-5,0 kal/mg of organic matter

Trematomus bernachii – 3,5-3,7 kal/mg of organic matter

Trematomus niunesi – 3,5-4,1 kal/mg of organic matter

Nototenia neglecta – 4,5-4,7 kal/mg of organic matter

Trematomus hansenii (organs are withdrawn from the fixed sample):

Intestines and stomach fat – 7,4-7,6 kal/mg of organic matter

Liver – 5,4-5,7 kal/mg of organic matter

Spleen – 4,9-5,2 kal/mg of organic matter

Heart – 4,3-4,6 kal/mg of organic matter

Stomach without contents – 4,5-4,6 kal/mg of organic matter

Hard roe – 4,9-5,1 kal/mg of organic matter

Caloric content of *Calanus propinquus* reaches 7,0 - 7,3 kal/mg of dry matter or about 8,5 kal/mg of organic matter. The fat content of *Calanus propinquus* during some seasons can reach 73 % (in the beginning of April).

Hundred species of hydrobionts live in the seas surrounding Antarctica, many of which can be refer to seafood, i.e. to use in food. All species of fishes are in diet of polar explorers.

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