BOTANICHESKII ZHURNAL, 2021, Vol. 106, N 10, p. 959–970

ALGAE AND CYANOPROKARYOTES FROM THE SOILS OF THE LARSEMANN HILLS OASIS (PROGRESS STATION, ANTARCTICA)

O. Ya. Chaplygina[a,#], S. V. Smirnova[a,##], and N. B. Balashova[b,###]

[a] *Komarov Botanical Institute RAS*
Prof. Popova Str., 2, St. Petersburg, 197376, Russia
[b] *Saint Petersburg State University*
Universitetskaya Emb., 7/9, St. Petersburg, 199034, Russia
[#]*e-mail: chaplygina@binran.ru,*
[##]*e-mail: SSmirnova@binran.ru*
[###]*e-mail: balanataliya@yandex.ru*

DOI: 10.31857/S0006813621100057

Information on the cyanoprokaryotes and eukaryotic algae inhabiting the grounds of the Larsemann Hills oasis in the area of the Russian station Progress is presented for the first time. The Larsemann Hills Oasis is located on the southeast coast of Prydz Bay (Ingrid Christensen Shore, Princess Elizabeth Land, East Antarctica). The oasis covers an area of 40 km^2. The territory is composed of rocky outcrops of volcanic and sedimentary rocks of various ages with heights from 60 to 150 m a. s. l. and valleys with steep slopes. Culture methods revealed 17 species of three divisions: Chlorophyta – 10, Cyanoprokaryota – 6, Ochrophyta – 1. For all the species, the regions of Antarctica are listed where they were found earlier. The studied communities include widespread species (*Pseudococcomyxa simplex*, *Stichococcus bacillaris*) and those frequently occurring (*Leptolyngbya foveolara*, *Schizochlamydella minutissima*) in the Antarctic region, as well as the species identified only in a few regions of the continent (*Heterotetracystis intermedia*, *Myrmecia bisecta*, *Heterococcus* cf. *viridis*). The composition of the microalgae communities is typical of the Antarctic soils. The richest in the number and diversity of taxa are the soils under algal and moss-lichen sods in humid, wind-protected and, consequently, well-warmed habitats.

Keywords: Cyanoprokaryota, Chlorophyta, Ochrophyta, soils, Larsemann Hills Oasis, Antarctica

ACKNOWLEDGMENTS

The authors are grateful to M.P. Andreyev (BIN RAS) for collecting the materials.

The work was carried out within the framework of the state assignment in accordance with the thematic plan of the Botanical Institute of the Russian Academy of Sciences "Flora and systematics of algae, lichens and mosses of Russia and phytogeographically important regions of the World" (No. 121021600184-6). The microphotographs were taken using equipment of the Core Facility Center "Cell and Molecular Technologies in Plant Science" at the Komarov Botanical Institute of the Russian Academy of Science.

REFERENCES

Abramov A.A., Sletten R.S., Rivkin E.M., Mironov V.A., Gilichinski D.A. 2011. Geocryological conditions of Antarctica. – Earth Cryosphere: 15 (3): 3–19 (In Russ.)

Andreev M., Andersen D., Kurbatova L., Smirnova S., Chaplygina O. 2020. Lichens, bryophytes and terrestrial algae of the Lake Untersee Oasis (Wohlthat Massiv, Dronning Maud Land, Antarctica). – Czech Polar Reports. 10 (2): 203–225. https://doi.org/10.5817/cpr2020-2-16

Andreeva V.M. 2010. Nonmotile green microalgae (Chlorophyta) in soils of the Leningradskaya and Russkaya stations (Antarctica). – Novosti Sistematiki Nizshikh Rastenii. 44: 3–10 (In Russ.). https://doi.org/10.31111/nsnr/2010.44.3

Andreeva V.M. 2011. Nonmotile green microalgae (Chlorophyta) in soils of Bellinshausen station (King George island, South Shetland islands, Antarctic). – Novosti Sistematiki Nizshikh Rastenii. 45: 3–16 (In Russ.). https://doi.org/10.31111/nsnr/2011.45.3

Andreeva V.M. 2012. Nonmotile green microalgae (Chlorophyta) in soils of Schirmacher oasis (environs of Novolazarevskaya station, Dronning Maud Land, Antarctica). – Novosti Sistematiki Nizshikh Rastenii. 46: 4–17 (In Russ.). https://doi.org/10.31111/nsnr/2012.46.4

Andreeva V. M. 2013. Nonmotile green microalgae (Chlorophyta) in soils of Molodyozhnaya ststion (Antarctic). – Novosti Sistematiki Nizshikh Rastenii. 47: 3–12 (In Russ.). https://doi.org/10.31111/nsnr/2013.47.3

Andreeva V.M., Kurbatova L.E. 2014. Terrestrial and aerophilic nonmotile green microalgae (Chlorophyta) from regions of investigation of Russian Antarctic expedition. – Novosti Sistematiki Nizshikh Rastenii. 48: 12–26 (In Russ.). https://doi.org/10.31111/nsnr/2014.48.12

Andreeva V.M., Sdobnikova N.V., Chaplygina O.Ya. 1983. Soil algae of Orenburg region. – Novosti Sistematiki Nizshikh Rastenii. 20: 3–10 (In Russ.).

Australian Antarctic Data Centre. Biodiversity database. Gabriela Mataloni on 18-Jun-2004© Commonwealth of Australia 2016. https://data.aad.gov.au/aadc/biodiversity/taxon_profile.cfm?taxon_id=114877

Bölter M., Beyer L., Stonehouse B. 2002. Antarctic coastal landscapes: characteristics, ecology and research. – In: Beyer L., Bölter M. (eds) Geoecology of Antarctic Ice-Free Coastal Landscapes. Ecological Studies 154. Springer, Heidelberg. P. 3–15.

Bonaventura S.M., Vinocur A., Allende L., Pizarro H. 2006. Algal structure of the littoral epilithon in lentic water bodies at Hope Bay, Antarctic Peninsula. – Polar Biol. 29 (8): 668–680. https://doi.org/10.1007/s00300-005-0104-3

Broady P.A. 1976. Six new species of terrestrial algae from Signy Island, South Orkney Islands, Antarctica. – Brit. Phycol. J. 11 (4): 387–405. https://doi.org/10.1080/00071617600650451

Broady P.A. 1979. Terrestrial algae of Signy Island, South Orkney Islands. – Sci. Rep. Brit. Antarc. Surv. 98: 1–117.

Broady P.A. 1982. New record of chlorophycean micro-algae cultured from antarctic terrestrial habitats. – Nova Hedwigia. 36 (2–4): 445–484.

Broady P.A. 1984. Taxonomic and ecological investigation of algae on stream-warmed soil on Mt. Erebus, Ross Island, Antarctica. – Phycologia. 23 (3): 257–271. https://doi.org/10.2216/i0031-8884-23-3-257.1

Broady P.A. 1986. Ecology and taxonomy of the terrestrial algae of the Vestfold Hills. – In Antarctic oasis. Sydney. P. 165–202.

Broady P.A. 1987. The morphology, distribution and ecology of Pseudococcomyxa simple (Mainx) Fott (Chlorophyta, Chlorophyceae), a widespuread terrestrial Antarctic alga. – Polar Biol. 7 (1): 25–30. https://doi.org/10.1007/BF00286820

Broady P.A. 1989. Broadscale patterns in the distribution of aquatic and terrestrial vegetation at three ice-free regions on Ross Island, Antarctica. – Hydrobiologia. 172 (1): 77–95. https://doi.org/10.1007/BF00031614

Broady P.A. 1996. Diversity, distribution and dispersal of Antarctic terrestrial algae. – Biodivers. Conversat. 5 (11): 1307–1335. https://doi.org/10.1007/BF00051981

Burdo A., Nikitina V., Abakumov E. 2019. Algae of terrestrial biotopes near the Rassian Antarctic scientific station Bellingshausen, King George Island. – Bio Comm. 64 (3): 189 – 200. https://doi.org/10.21638/spbu03.2019.303

Cavacini P. 2001. Soil algae from northern Victoria Land (Antarctica). – Polar Biosci. 14: 45–60.

Chaplynina O.Ya., Smirnova S.V., Balashova N.B. 2017. Algae and Cyanoprokaryota in soil of massiv Clemens (prince Charles montains, antarctic continent). – Bot. Zhurn. 102 (4): 477–493 (In Russ). https://doi.org/10.1134/S0006813617040032

Ettl H., Gärtner G. 1995. Syllabus der Boden-, Luft- und Flechtenalgen. Stuttgart. 721 p.

Fermani P., Mataloni G., Van de Vijver B. 2007. Soil microalgae communities on an Antarctic active volcano (Deception Island, South Shetlands). – Polar Biol. 30 (11): 1381–1393. https://doi.org/10.1007/s00300-007-0299-6

Hirano M. 1979. Freshwater algae from Yukidori Zawa, near Syowa Station, Antarctica. – Memories of the National Institute of Polar Research, Special Issue. 11: 1–25.

Gain L. 1911. Note sur trois espéces nouvelles d'algues marines provenant de la région antarctique sud-américaine. – Bulletin du Museum National d'Histoire Naturelle. 17: 482–484.

González Garraza G., Mataloni G., Fermani P., Vinocur A. 2011. Ecology of algal communities of different soil types from Cierva Point, Antarctic Peninsula. – Polar Biol. 34 (3): 339–351. https://doi.org/10.1007/s00300-010-0887-8

Guiry M.D., Guiry G.M. 2021. AlgaeBase. World-wide electronic publication, National University of Ireland, Galway. http://www.algaebase.org (Accessed 18.05.2021)

Izaguirre I., Mataloni G., Allende L., Vinocur A. 2001. Summer fluctuations of microbial planktonic communities in a eutrophic lake – Cierva Point, Antarctica. – J. Plankt. Res. 23 (10): 1095–1109. https://doi.org/101093/plankt/23.10.1095

Kol E. 1968. Algae from the Antarctica. – Ann. Hist.-Nat. Mus. Natl. Hung. 60: 71–76.

Kol E., Flint E.A. 1968. Algae in green ice from Balleny islands, Antarctica. – N. Z. J. Bot. 6 (3): 249–261. https://doi.org/10.1080/0028825X.1968.10428810

Komárek J., Anagnostidis K. 2005. Cyanoprokaryota. 2. Oscillatoriales. Süsswasserflora von Mitteleuropa. 19 (2). München. 759 p.

Komárek J., Kâstovský J., Mareš J., Johansen J.R. 2014. Taxonomic classification of cyanoprokaryotes (cyanobacteria genera) 2014, using a polyphasic approach. – Preslia. 86 (4): 295–335.

Ling H.U. 1996. Snow algae of the Windmill Island region, Antarctica. – Hydrobiologia. 336 (1): 99–106. https://doi.org/10.1007/BF00010823

Ling H.U., Seppelt R.D. 1998. Non-marine algae and cyanobacteria of the Windmill Islands region, Antarctica, with descriptions of two new species. – Archiv für Hydrobiologie Supplement 124, Algological Studies 89: 49–62. https://doi.org/10.1127/algol_stud/89/1998/49

Mataloni G., Tell G. 2002. Microalgal communities from ornithogenic soils at Cierva Point, Antarctic Peninsula. – Polar Biol. 25 (7): 488–491. https://doi.org/10.1007/s00300-002-0369-8

Mataloni G., Tell G., Wynn-Williams D.D. 2000. Structure and diversity of soil algal communities from Cierva Point (Antarctic Peninsula). – Polar Biol. 23 (3): 205–211. https://doi.org/10.1007/s003000050028

Mataloni G., Tesolín G., Tell G. 1998. Characterization of a small eutrophic Antarctic lake (Otero Lake, Cierva Point) on the basis of algal assemblages and water chemistry. – Polar Biol. 19 (2): 107–114. https://doi.org/10.1007/s003000050221

Mataloni G., Vinocur A., de Tezanos Pinto P. 2005. Abiotic characterization and epilithic communities of a naturally enriched stream at Cierva Point, Antarctic Peninsula. – Antarct. Sci. 17 (2): 163–170. https://doi.org/10.1017/S0954102005002579

Ruggiero M.A., Gordon D.P., Orrell T.M., Bailly N., Bourgoin T., Brusca R.C., Cavalier-Smith T., Michael D., Guiry M.D., Kirk P.M. 2015. A higher level classification of all living organisms. – PLoS ONE. 10 (4): 1–60. https://doi.org/10.1371/journal.pone.0119248

Singh S.M., Singh P., Thajuddin N. 2008. Biodiversity and distribution of cyanobacteria at Dronning Maud Land, East Antarctica. – Acta Bot. Malac. 33: 17–28. https://doi.org/10.24310/abm.v33i0.6964

Starmach K. 1995. Freshwater algae of the Thala Hills oasis (Enderby Land, East Antarctic). – Polish Polar Research 16 (3/4): 113–148. https://doi.org/10.4467/2543702XSHS.17.007.7708

Taton A., Grubisic S., Ertz D., Hodgson D.A., Piccardi R., Biondi N., Tredici M.R., Mainini M., Losi D., Marinelli F., Wilmotte A. 2006. Polyphasic study of Antarctic cyanobacterial strains. – J. Phycol. 42: 1257–1270. https://doi.org/10.1111/j.1529-8817.2006.00278/x

Vinocur A., Pizarro H. 2000. Microbial mats of twenty-six lakes from Potter Peninsula, King George Island, Antarctica. – Hydrobiologia. 437 (1): 171–185. https://doi.org/10.1023/A:1026511125146

Zidarova R.P. 2008. Algae from Livingston Island (S. Shetland Islands): a checklist. – Phytologia Balcanica. 14 (1): 19–35.