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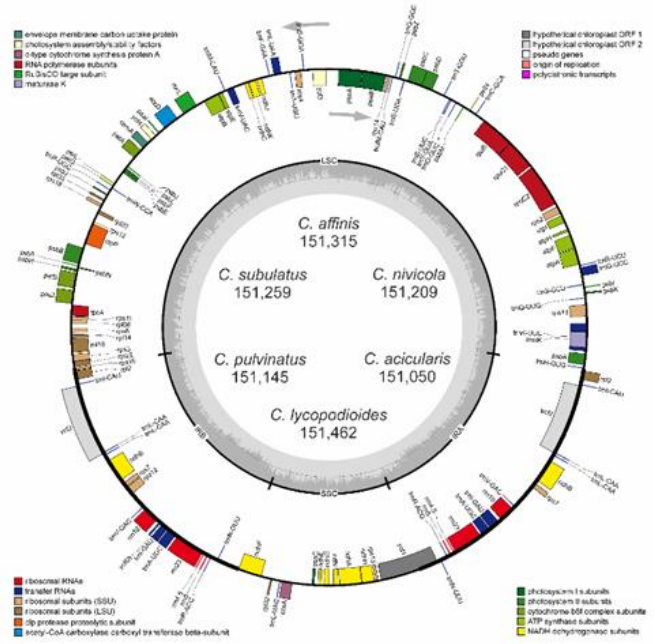
| *See the following pages* |  |  |  |  |  |  |

**Androsiuk P., Jastrzębski J., Paukszto Ł., Makowczenko K., Okorski A., Pszczółkowska A., Chwedorzewska K., Górecki R. & Giełwanowska I. 2020. Evolutionary dynamics of the chloroplast genome sequences of six *Colobanthus* species. *Scientific Reports* 10: 11522**

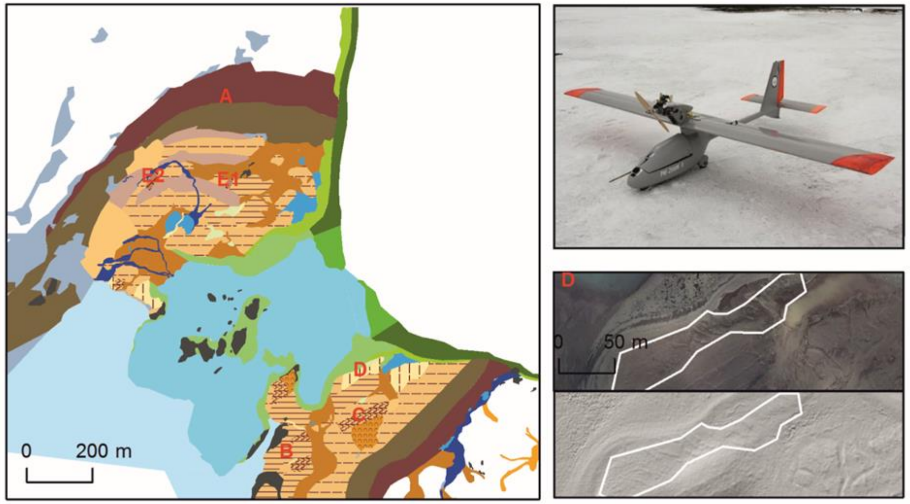
*Colobanthus* (Caryophyllaceae) contains about 26 species that are mainly distributed in the Southern Hemisphere. *Colobanthus quitensis*, the only representative of Dicotyledoneae in the maritime Antarctic, is the best known representative of that genus. To better understand the evolutionary relationships and mutation patterns in the chloroplast genome of *Colobanthus*, the complete plastome sequences of six species were sequenced. The chloroplast genome sequences of *C. acicularis*, *C. affinis*, *C lycopodioides*, *C. nivicola*, *C. pulvinatus* and *C. subulatus* ranged from 151 050 bp to 151 462 bp. Their typical quadripartite circular structure shares the same overall organization and gene content, with 73 protein-coding genes, 30 tRNA genes, four rRNA genes and five conserved chloroplast open reading frames (ORFs). A total of 153 repeat sequences were revealed in the plastomes of six *Colobanthus* species. The forward repeats dominated over palindromic and reverse repeats. The complementary repeats were found only in cp genome of *C. pulvinatus*. The distribution and type of SSRs were also studied. The mononucleotide SSRs were the most common, whereas hexanucleotide SSRs were detected only in *C. nivicola* and *C. pulvinatus*. Eleven highly variable regions were identified within *Colobanthus* cp genomes that could be utilized as potential markers for phylogeny reconstruction, species identification, or phylogeography of this plant group.  Reconstructed phylogeny of all sequenced so far representatives of Caryophyllaceae, including eight *Colobanthus* species, is consistent with the systematic position of studied species, with the representatives of the same genus gathered in one clad. All studied *Colobanthus* species form one group with *C. lycopodioides* sharing the less similarity. The results of this study will be helpful for elucidating *Colobanthus* phylogenetic relationships.



Gene map of the six *Colobanthus* chloroplast genomes. Gene s drawn inside the circle are transcribed clockwise, and those outside are transcribed counterclockwise (indicated by arrows). Differential functional gene groups are color-coded. GC content variations is shown in the middle circle.

**Dąbski M., Zmarz A., Rodzewicz M., Korczak-Abshire M., Karsznia I., Lach K.M., Rachlewicz G. & Chwedorzewska K.J. 2020. Mapping glacier forelands based on UAV BVLOS operation in Antarctica. *Remote Sensing* 12: 630.**

In recent decades, hundreds of glaciers draining the Antarctic Peninsula and adjacent islands have undergone general retreat. Marginal zones of the glaciers are considered an important indicator of global climate change due to the sensitivity of polar terrestrial ecosystems and rapid proglacial modification of landscapes. We aimed to determine the area and spatial distribution of glacial and fluvioglacial landforms developed on forelands of Ecology (EGF), Sphinx (SGF) and Baranowski (BGF) glaciers, using aerial photographic images taken by a fixed-wing unmanned aerial vehicle (UAV) during the Beyond Visual Line of Sight (BVLOS) flights, followed by Geographic Information System data processing to detect and quantify the landform assemblages. We determined areas occupied by ground moraine and glacial lagoons and found out that the most profound features of EGF are the large latero-frontal moraine ridges from Little Ice Age and the first half of the 20th century. Large areas of ground moraine, frequently fluted and marked with large recessional moraine ridges, dominate on SGF. A significant percentage of bedrock outcrops and end moraine complexes characterize BGF. The landform assemblages are typical for discontinuous fast ice flow of tidewater glaciers over a deformable bed. It was inferred that ice flow velocity decreased as a result of recession from the sea coast, resulting in a significant decrease in the length of ice cliffs and decrease in calving rate. Image acquisition during the fixed-wing UAV BVLOS operation proved to be a very robust technique in harsh polar conditions of King George Island.



Geomorphological map of the Ecology Glacier foreland (left); PW-ZOOM unmanned aerial vehicle (designed, manufactured and tested at the Warsaw University of Technology in Poland) used for photogrammetric flights (upper right); ground moraine with annual push/stagnation moraines visible on orthophoto and digital elevation model (lower right)

**Grzesiak J., Kaczyńska A., Gawor J., Żuchniewicz K., Aleksandrzak-Piekarczyk T., Gromadka R., & Zdanowski M.K. 2020. A smelly business: Microbiology of Adélie penguin guano (Point Thomas rookery, Antarctica). *Science of the Total Environment* 714: 136714.**

Adélie penguins (*Pygoscelis adeliae*) are the most numerous flightless bird group breeding in coastal areas of maritime and continental Antarctica. Their activity leaves a mark on the land in the form of large guano deposits. This guano is an important nutrient source for terrestrial habitats of ice-free Antarctic areas, most notably by being the source of ammonia vapors which feed the surrounding grass, lichen and algae communities. Although investigated by researchers, the fate of the guano-associated microbial community and its role in decomposition processes remain vague. Therefore, by employing several direct community assessment methods combined with a broad culture-based approach, we provide data on bacterial numbers, their activity and taxonomic affiliation in recently deposited and decayed Adélie penguin guano sampled at the Point Thomas rookery in maritime Antarctica (King George Island). Our research indicates that recently deposited guano harbored mostly bacteria of penguin gut origin, presumably inactive in cold rookery settings. This material was rich in mesophilic enzymes active also at low temperatures, likely mediating early stage decomposition. Fresh guano colonization by environmental bacteria was minor, accomplished mostly by ammonia scavenging *Jeotgalibaca* sp. cells. Decayed guano contained 10-fold higher bacterial numbers with cold-active enzymes dominating the samples. Guano was colonized by uric-acid degrading and lipolytic *Psychrobacter* spp. and proteolytic *Chryseobacterium* sp. among others. Several spore-forming bacteria of penguin gut origin persisted in highly decomposed material, most notably uric-acid fermenting members of the Gottschalkiaceae family.

Point Thomas penguin rookery (left); Bacteria in penguin guano stained with a fluorescent dye (top); Bacterial phyla detected in penguin guano (bottom); *Jeotgalibaca* sp. (red) growing on the metabolites secreted by *Psychrobacter* sp. (cream) growing on uric acid (right).

**Geosciences**

1. Jadwiszczak P. 2020. Outline shape analysis of penguin humeri: a robust approach to taxonomic classification. *Polar Research* 39: 4370.
2. Król P., Kusiak M.A., Dunkley D.J., Wilde S.A., Yi K., Lee S., Kocjan I. 2020. Diversity of Archean crust in the eastern Tula Mountains, Napier Complex, East Antarctica. *Gondwana Research* 82: 151–170.
3. Majewski W., Prothro L.O., Simkins L.M., Demianiuk E.J., Anderson J.B. 2020. Foraminiferal patterns in deglacial sediment in the western Ross Sea, Antarctica: Life near grounding lines. *Paleoceanography and Paleoclimatology* 35: e2019PA003716.
4. Nawrocki J., Pańczyk M., Wójcik K., Tatur A. 2020. U–Pb isotopic ages and provenance of some far-travelled exotic pebbles from glaciogenic sediments of the Polonez Cove Formation (Oligocene, King George Island). *Journal of the Geological Society* 178: jgs2020-113.
5. Prothro L., Majewski W., Yokoyama Y., Simkins L., Anderson J., Yamane M., Miyairi Y., Naohiko Ohkouchi N. 2020. Timing and pathways of East Antarctic Ice Sheet retreat. *Quaternary Science Reviews* 230: 106166.

**Life sciences**

6. Androsiuk P., Jastrzębski J., Paukszto Ł., Makowczenko K., Okorski A., Pszczółkowska A., Chwedorzewska K., Górecki R., Giełwanowska I. 2020. Evolutionary dynamics of the chloroplast genome sequences of six *Colobanthus* species. *Scientific Reports* 10: 11522.
7. Buda J., Łokas E., Pietryka M., Richter D., Magowski W., Iakovenko N.S., Porazinska D.L., Budzik T., Grabiec M., Grzesiak J., Klimaszyk P., Gaca P., Zawierucha K. 2020. Biotope and biocenosis of cryoconite hole ecosystems on Ecology Glacier in the maritime Antarctic. *Science of the Total Environment* 724: 138112.
8. Latip M.A.A., Alias S.A., Smykla J., Yusof F., Mohamad M.A.N., Nordin N.F.H. 2020. Discovery of cold-active protease from psychrophilic bacteria isolated from Antarctic region for bio-prospecting. *Malaysian Applied Biology* 49: 55–60.
9. Habib S., Ahmad S.A., Wan Johari W.L., Abd Shukor M.Y., Alias S.A., Smykla J., Saruni N.H., Abdul Razak N.S., Yasid N.A. 2020. Production of lipopeptide biosurfactant by a hydrocarbon-degrading Antarctic *Rhodococcus*. *International Journal of Molecular Sciences* 21: 6138.

10. Rogala M.M., Gawor J., Gromadka R., Kowalczyk M., Grzesiak J. 2020. Biodiversity and habitats of polar region polyhydroxyalkanoic acid-producing bacteria: Bioprospection by popular screening methods. *Genes* 11: 873.
11. Stepanowska K., Nędzarek A. 2020. Changes in the body chemical composition and the excretion of nitrogen and phosphorus during long-term starvation of Antarctic fish *Notothenia coriiceps* and *Notothenia rossii*. *The European Zoological Journal* 97: 571–579.
12. Xavier J.C., Cherel Y., Boxshall G., Brandt A., Coffer T., Forman J., Havermans C., Jażdżewska A.M., Kouwenberg K., Schiaparelli S., Schnabel K., Siegel V., Tarling G.A., Thatje S., Ward P., Gutt J. 2020. *Crustacean guide for predator studies in the Southern Ocean*. Scientific Committee on Antarctic Research, Cambridge, UK: 253 pp.

*Sea birds and pinnipeds*

13. Ausems A.N.M.A., Skrzypek G., Wojczulanis-Jakubas K., Jakubas D. 2020. Sharing menus and kids' specials: Inter-and intraspecific differences in stable isotope niches between sympatrically breeding storm-petrels. *Science of the Total Environment* 728: 138768.
14. Fudala K., Bialik R.J. 2020. Breeding colony dynamics of southern elephant seals at Patelnia Point, King George Island, Antarctica. *Remote Sensing* 13: 36.
15. Grebieniow A., Korczak-Abshire M., Gasek A., Górecka-Bruzda A. 2020. Antarctic fur seal (*Arctocephalus gazella*) annual migration and temporal patterns of on-shore occurrence of leucistic individuals on King George Island. *Polar Biology* 43: 929–935.
16. Grzesiak J., Kaczyńska A., Gawor J., Żuchniewicz K., Aleksandrzak-Piekarczyka T., Gromadka R., Zdanowski M.K. 2020. A smelly business: Microbiology of Adélie penguin guano (Point Thomas rookery, Antarctica). *Science of The Total Environment* 714: 136714.
17. Panasiuk A., Wawrzynek-Borejko J., Musiał A., Korczak-Abshire M. 2020. *Pygoscelis* penguin diets on King George Island, South Shetland Islands, with a special focus on the krill *Euphausia superba*. *Antarctic Science* 32: 21–28.

*Limno-terrestrial diatoms*

18. Kochman-Kędziora N., Olech M., Van de Vivjer B. 2020. A critical analysis of the type of *Navicula skuae* with the description

of a new *Navicula* species (Naviculaceae, Bacillariophyta) from the Antarctic Region. *Phytotaxa* 474: 15–26.

19. Kochman-Kędziora N., Zidarova R., Noga T., Olech M., Van de Vijver B. 2020. *Luticola puchalskiana*, a new small terrestrial *Luticola* species (Bacillariophyceae) from the Maritime Antarctic Region. *Phytotaxa* 450: 085–094.
20. Noga T., Kochman-Kędziora N., Olech M., de Vijver B.V. 2020. Limno-terrestrial diatom flora in two stream valleys near Arctowski Station, King George Island, Antarctica. *Polish Polar Research* 41: 289–314.

_*Aliens in Antarctica*_

21. Augustyniuk-Kram A. 2020. Unintentional transport of fungi propagules to Antarctic biome and the ability to develop at low temperatures. *Studia Ecologiae et Bioethicae* 18: 271–281.
22. Chwedorzewska K.J., Korczak-Abshire M., Znój A. 2020. Is Antarctica under threat of alien species invasion? *Global Change Biology* 26: 1942–1943.
23. Potocka M., Krzemińska E., Gromadka R., Gawor J., Kocot-Zalewska J. 2020. Molecular identification of *Trichocera maculipennis*, an invasive fly species in the Maritime Antarctic. *Molecular Biology Reports* 47: 6379–6384.

### Physical Sciences

24. Dąbski M., Zmarz A., Rodzewicz M., Korczak-Abshire M., Karsznia I., Lach K.M., Rachlewicz G., Chwedorzewska K.J. 2020. Mapping glacier forelands based on UAV BVLOS operation in Antarctica. *Remote Sensing* 12: 630.
25. Herman K., Gudra T., Opieliński K., Banasiak D., Budzik T., Risso N. 2020. A study of a parametric method for the snow reflection coefficient estimation using air-coupled ultrasonic waves. *Sensors* 20: 4267.
26. Potapowicz J., Szumińska D., Szopińska M., Bialik R.J., Machowiak K., Chmiel S., Polkowska Ż. 2020. Seashore sediment and water chemistry at the Admiralty Bay (King George Island, Maritime Antarctica) – Geochemical analysis and correlations between the concentrations of chemical species. *Marine Pollution Bulletin* 152: 110888.
27. Potapowicz J., Szumińska D., Szopińska M., Czapiewski S., Polkowska Ż. 2020. Electrical conductivity and pH in surface water as tool for identification of chemical diversity. *Ecological Chemistry and Engineering* S 27: 95–111.

<u>*Anthropogenic pollutants*</u>

28. Szufa K.M., Mietelski J.W., Olech M.A., Kowalska A., Brudecki K. 2020. Anthropogenic radionuclides in Antarctic biota – dosimetrical considerations. *Journal of Environmental Radioactivity* 213: 106140.
29. Habib S., Iruthayam A., Abd Shukor M.Y., Alias S.A., Smykla J., Yasid N.A. 2020. Biodeterioration of untreated polypropylene microplastic particles by Antarctic bacteria. *Polymers* 12: 2616.
30. Kobusińska M.E., Lewandowski K.K., Panasiuk A., Łęczyński L., Urbaniak M., Ossowski T., Niemirycz E. 2020. Precursors of polychlorinated dibenzo-p-dioxins and dibenzofurans in Arctic and Antarctic marine sediments: Environmental concern in the face of climate change. *Chemosphere* 260: 127605.
31. Potapowicz J., Lambropoulou D., Nannou C., Kozioł K., Polkowska Ż. 2020. Occurrences, sources, and transport of organochlorine pesticides in the aquatic environment of Antarctica. *Science of The Total Environment* 735: 139475.

**Social sciences**

32. Wilkońska A., Maciejowski W., Damaszke M., Jerzak B., Łabno R., Matuszczak B., Palikot E., Pińkowska K. 2020. Tourist profile in polar regions on the example of visitors to the Henryk Arctowski Polish Antarctic Station. *Folia Turistica* 55: 167–182.