Rannsóknastöðin Rif
Rif Field Station

Annual report 2023

Rannsóknastöðin Rif | Aðalbraut 16, 675 Raufarhöfn | rif@rifresearch.is | 8569500

Content

Resume

2023 brought new challenges to Rif Field Station (Rif). Rif is administrated by the Náttúrustofa Norðausturlands (NNA) and operates in accordance with an agreement between NNA, Norðurþing municipality and the Ministry of the Environment, Energy and Climate. Pedro Rodrigues continues to be the manager of Rif to develop the station in accordance with the Rif´s Research and Monitoring Plan 2021-2025 (R&M) and the NNA´s projects in Melrakkaslétta.

Rif is financed by the Náttúrustofa Norðausturlands, the Norðurþing Municipality, the Ministry of the Environment, Energy and Climate, and by several projects that Rif is developing and cooperating. The EU approved another year of INTERACT, extending the project until the end of 2024. Nevertheless, Rif continues to be an official member of the INPA - INTERACT Non-Profit Association to continue to develop projects with the other INTERACT stations. Rif will be part of the new European project POLARIN, which aims to support researchers in their studies in the Arctic and Antarctic with Transnational and Remote access. The project will begin in March 2024 and will last a minimum of five years.

Ongoing projects are part of the R&M, and new projects in cooperation with NNA and other national and international institutes were also developed (see Research and Monitoring section of the present report).

In relation to the local development and education, Rif continues to develop projects with the Myndlistaskólinn í Reykjavík and with Óskarsbragga in Raufarhöfn. A new project with the local school about the biodiversity of Melrakkaslétta has been developed and will start during the Spring of 2024. Rif is also part of the BIODICE group that promotes awareness and understanding of biodiversity in Iceland. The Coffee Science project was partially funded by the Northeast Development Fund (SSNE), and five researchers came to Raufarhöfn to present and share their work.

Various groups of researchers and students visited Rif during the year, and several already communicated their interest in returning during 2024.

Overall, 2023 was a good year for Rif Field Station in terms of projects development and establishment of new international collaborations, and our team is looking forward to the year ahead to continue to develop Rif and preserve Melrakkaslétta natural heritage.

Research and monitoring plan 2021-2025

Rif's strategy for the next few years will be to continuing to follow the Research and Monitoring Plan 2021-2025 (R&M). The R&M plan is available online on Rif's webpage (RIF'S RESEARCH AND MONITORING PLAN 2021-2025 (WORDPRESS.COM)).

The main objective of the R&M plan is to ensure the long-term sustainability of Rif, developing three main points (Research, Education, and Local development), in collaboration with national and international institutes, to build the foundations for its future international recognition as an institute of excellence for the study of climate change and its impact on the southern edge of the Arctic ecosystem.

At the Research level, Rif will continue to implement and develop the Freshwater and Terrestrial Arctic Biodiversity Monitoring Plan in collaboration with national and international institutions and within the Work Package 7 in the INTERACT, to enhance the scientific knowledge of the Arctic biodiversity and its threats. As part of these goals, Rif will continue to provide good data management and communication of scientific findings. As part of Náttúrustofa Norðausturlands, Rif will continue to develop and implemented monitoring projects related to biodiversity in Melrakkaslétta.

At the Education level, Rif will collaborate with the local schools through the development of projects, aiming to increase the interest in science, Nature, and its conservation. Rif will encourage students to develop their research in the Melrakkaslétta area (i.e., Erasmus, Master, and PhD theses, etc.), in collaboration with national and international universities and institutes. Small lectures and the development of projects will be established with local schools. Rif could also act as a precursor of summer courses for university students, ecotourism professionals and environmental staff employees.

At the Local Development level, Rif will support the local community being an active organization, encouraging that jobs created at the station will benefit locals, helping on the development of small ecotourism companies, giving formation on the biodiversity of Melrakkaslétta, implementing good practice rules to keep a sustainable tourism activity in the area, and engaging citizen science projects to include the local knowledge on Rif's projects and activities.

The development of the R&M for the years 2021 to 2025, was fundamental to obtain funds from the Ministry of the Environment, Energy and Climate, and the Municipality of Norðurþing.

Rif's advisory board

Rannsóknastöðin Rif ses. was formally discontinued by the wishes of its board and decision by the District Commissioner of Northwest Iceland from 30.6.2022. The former board of Rannsóknastöðin Rif ses. has operated as an advisory board since then, as all administrative duties now lie with NNA in accordance with agreement between NNA, Norðurþing municipality and the Ministry of the Environment, Energy and Climate dated 22.06.2021. 2023 brought changes to the Rif's advisory board as Starri Heiðmarsson, representing the Icelandic Institute of Natural History (IINH) left the board. There are now four members of the board: Þorkell Lindberg Þórarinsson representing the Náttúrustofa Norðausturlands, Embla Eir Oddsdóttir representing the Háskólinn á Akureyri and the Stofnum Vilhjálms Stefánssonar, Hlynur Óskarsson representing the Lanbúnaðarháskóli and the Háskóli Íslands, and Birna Björnsdóttir representing the Sveitarfélagið Norðurþing. Replacement of the IINH´s representative is expected in 2024.

The advisory board met once in 2023, in November.

Team 2023

The 2023 team included only Rif´s Station Manager

Pedro Rodrigues

Biology degree (University of Azores, Portugal), MSc in Marine Sciences (University of Porto, Portugal), PhD in Biology, expertise in Animal Biology – Natural History (University of Azores, Portugal).

Manager of Rif Field Station since May 10, 2021, in Raufarhöfn. Responsible for the development of Rif's scientific and education activities and projects, biodiversity monitoring, local development, and institutional growth.

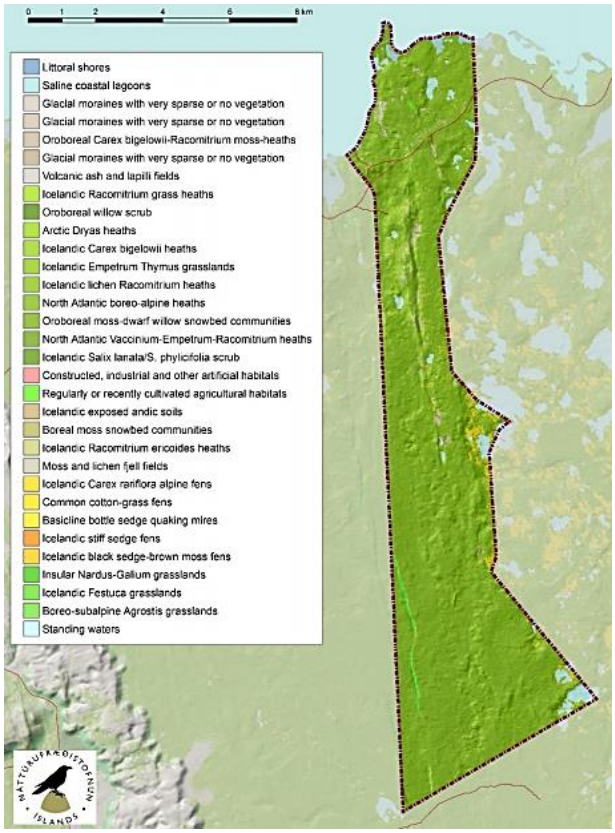
Housing and research infrastructures

The station's housing facilities at Raufarhöfn continued to be merged with the Nest guesthouse at Aðalbraut 16, which includes accommodation and cooking facilities, as well as storage (prices in the table below). The facility has also been used as an office for the station's staff with internet connection. Rif has a laboratory at Raufarhafnarskóli, renovated in 2019 with tables, chairs, one microscope, one magnifier, a refrigerator, a freezer, and other research equipment.

Prices per night staying in Nest guesthouse during 2022. Prices are already with 30% discount for Rif.

Number of persons per room	**1**	**2**	**3**	**Studio**
Price (ISK)	7.700	11.800	15.900	20.100

Rif continues to use the land of the former farm named Rif, which has been used as an intensive monitoring and research area, 3 km south from the Arctic Circle, 15 km northwest from Raufarhöfn village. The use of Rif´s land is based on an agreement with the Ministry of Finance and Economic Affairs. There is a meteorological station implemented by Rannsóknastöðin Rif and the Icelandic Meteorological Office on Rif´s land in September 2018, and a new antenna, acquired through INPA by the Arctic Passion project, with four sensors (Soil temperature profiler sensor, Heat flow sensor, Snow depth sensor, and Net radiation sensor) was implemented in 2023.



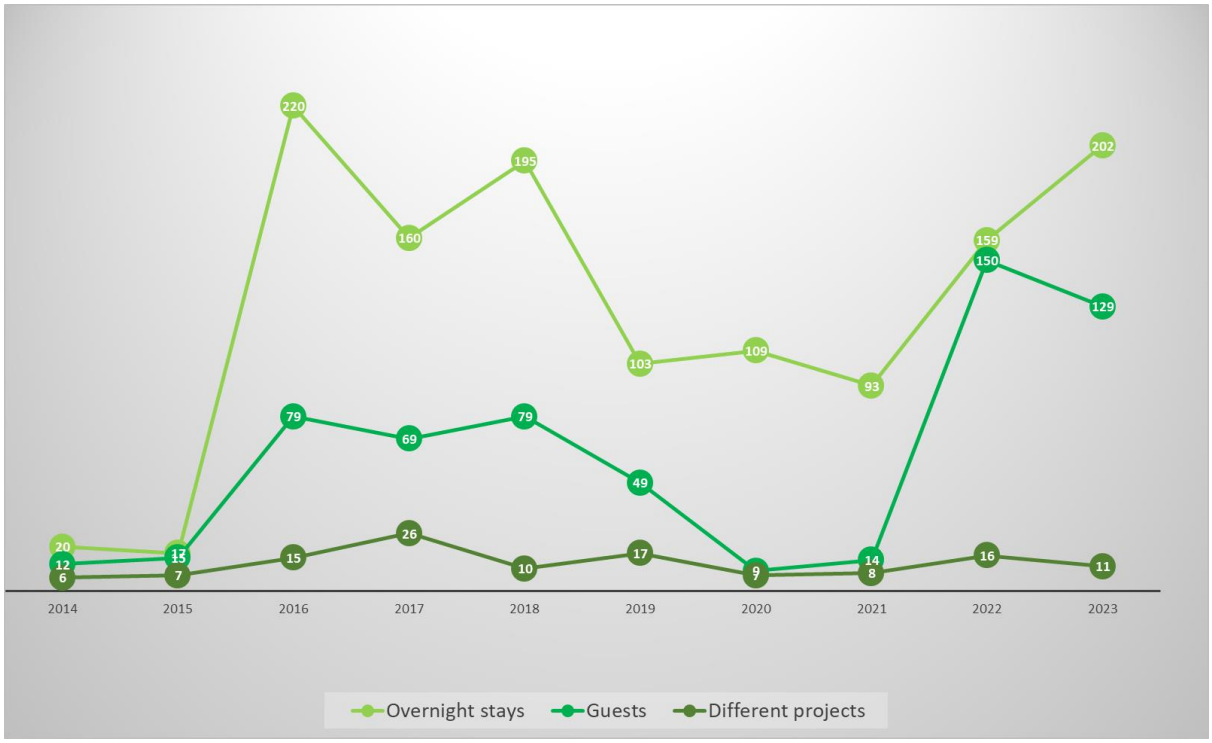
Rif area in Melrakkaslétta, with the description of habitats

Activities during 2023

Reception of scientists and students

Rif received several students, teachers, and researchers during 2023, in a total of 129 persons. From these, eight groups spent one or more nights in Nest Guesthouse through Rif, in a total of 130 nights. Three persons stayed at the Norðurljós Hotel through Coffee Science project. Other groups stayed in Norðurljós Hotel and at the local school.

All these individuals/groups brought income to the Raufarhöfn community by their stay in Nest Guesthouse and in the local hotel, and use of the local services as the bank, post office, swimming pool, minimarket, restaurant, cafe, and bar.



Number of people visiting Rif Field Station during the last 10 years, 2014-2023.

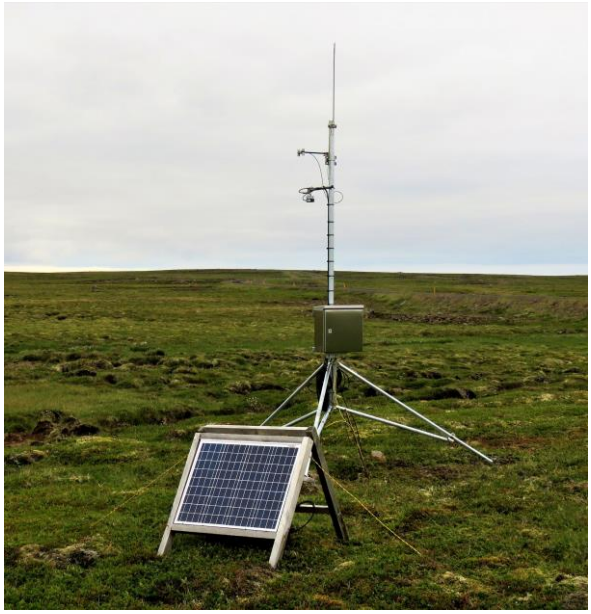
Research and Monitoring

During 2023, Rif developed several projects in Melrakkaslétta in collaboration with national and international institutes, following the Rif Field Station Ecosystem Monitoring developed with the direction of the Circumpolar Biodiversity Monitoring Program (CBMP) as part of INTERACT Work Package 7.

- **INTERACT - International Network for Terrestrial Research and Monitoring in the Arctic**. Horizon 2020, European Union funding for research and innovation: International

Network for Terrestrial Research and Monitoring in the Arctic | INTERACT | Project | Fact sheet | H2020 | CORDIS | European Commission (europa.eu).

- **POLARIN** – Polar Research Infrastructure Network. Horizon-INFRA-2023, Europen Union funding for research and innovation: POLARIN: POLAR RESEARCH INFRASTRUCTURE NETWORK | POLARIN | Project | Fact sheet | HORIZON | CORDIS | European Commission (europa.eu).
- **ARCTIC PASSION – Pan-Arctic observing System of Systems: Implementing Observations for societal Needs**. Project funded by the EU, in the call H2020-LC-CLA-2018-2019-2020 – "Building a low-carbon, climate-resilient future: climate action in support of the Paris Agreement". Interact INPA is a partner. Rif received an antenna with four sensors: soil temperature profiler, heat flow, snow depth, and net radiation: Pan-Arctic observing System of Systems: Implementing Observations for societal Needs | Arctic PASSION | Project | Fact sheet | H2020 | CORDIS | European Commission (europa.eu).



Antenna installed in Rif area, Melrakkaslétta.

- **Freshwater monitoring**. Project in collaboration with NNA to collect data and develop freshwater monitoring in Arnarvatn in Rif area.
- **Túndran og tifið á Sléttu**. Project in collaboration with the Myndlistaskólinn í Reykjavík. The objective of this project is to develop workshops to bring together artists and scientists to increase the understanding of the artist community on the impacts of climate change, to give scientists a new view on how to communicate science using art, to gain exposure to new ways to view and

interpreting the environment, and to explore art as an effective communication technique to bring awareness about climate change: Túndran og tifið á Sléttu - Óskarsbraggi (oskarsbraggi.com).

- **Art Course in Raufarhöfn**. Project in collaborator with Myndlistaskólinn í Reykjavík for the course Endimörk Alheimsins: Náttúra og líf við ysta haf.
- **CRYPTO – Molecular Identification of Cryptogenic Macroalgae with Invasive Potential**. Project from the Azores University to identify cryptogenic algae from the Atlantic. Rif is a partner: Projeto CC890 CRYPTO * Fundação Gaspar Frutuoso (uac.pt).
- **Application of Nanopore sequencing to investigate carriage of microbial risks in Arctic bird species.** Rif is a partner on this project with Moredun Institute, Scotland. The objective is to use genetic to discover possible diseases and threats to Arctic species.
- **Coffee Science**. Project partially funded by the Northeast Iceland Development Fund (SSNE).

Second Coffee Science Session of 2023. "Dust and Deserts: Extent and effects of windborne sediments within Iceland" by Hlynur Óskarsson.

- **BIODICE**. Rif collaborates with this project that aims to promote greater awareness and understanding of biodiversity in Iceland through Coffee Science and International Day for Biological Diversity: HOME - BIODICE.
- **Waterfowl monitoring**. Monitoring of breeding waterfowl species on lakes across Melrakkaslétta in collaboration with NNA. Part of the monitoring of nature conservation areas.

- **Winter Anatidae**. Monitoring of ducks and similar species across the coast of Melrakkaslétta during the winter. Project in collaboration with NNA.
- **Heathland birds**. Monitoring of breeding heathland birds in Melrakkaslétta in collaboration with NNA. Part of the monitoring of nature conservation areas, which is a collaborative project between the nature research centres and the Icelandic Institute of Natural History.
- **Biodiversity of Melrakkaslétta.** Rif is collaborating with Raufarhöfn school to teach the students the basic information about the biodiversity of Melrakkaslétta, its importance and threats.
- **Global lake sampling.** Rif is a partner on this project that will collect EDNA from 1200 lakes worldwide on the International Day for Biological Diversity: Global lake sampling – Environmental DNA | ETH Zurich.
- **Migratory waders**. Monitoring of migratory waders through Melrakkaslétta in spring. Project in collaboration with NNA. Part of the monitoring of nature conservation areas.

Migratory waders across Melrakkaslétta coastal areas.

- **Tunicates from Raufarhöfn**. Project in collaboration with Joana Micael from the Náttúrustofa Suðvesturlands. Samples of tunicates from the Raufarhöfn harbor are being collected and a monitoring system of seawater surface temperature and pH were implemented to create a data set on sea abiotic parameters.
- **EULVA – European Ulva Taxonomy Initiative.** Rif is a partner on this project to create a DNA-based species assessment of Ulva in Europe: European Ulva Taxonomy Initiative - Onderzoeksportaal (friscris.be).

Deliverables/Outreach

During 2023, several deliverables were achieved:

- Release of a news press in a science page from the University of the Azores about Rif Field Station.
- "Recent spread of non-indigenous ascidians (Chordata: Tunicata) in Icelandic harbours", where Rif Field Station/ Náttúrustofa Norðausturlands are one of the author affiliations, were published in the Marine Biology research, and it is available at: Recent spread of non-indigenous ascidians (Chordata: Tunicata) in Icelandic harbours: Marine Biology Research: Vol 18, No 9-10 (tandfonline.com).
- Birdwatching activity in Melrakkaslétta, for the International Day for Biological Diversity (22 of May). Register of 36 species in Neslón area.
- Interview on the Portuguese journal "Correio dos Açores" about Rif Field Station.

4 entrevista Correio dos Açores, 12 de Janeiro de 2023

Pedro Rodrigues, biólogo açoriano em investigação na Islândia

Os Açores "sofrerão as consequências de um ambiente em degradação rápida mais severamente do que áreas continentais"

Correio dos Açores - Licenciou-se em Biologia na Universidade dos Açores e fez o doutoramento sobre aves dos Açores. Porque optou pelas aves?

Pedro Rodrigues (Biólogo) - Licenciei-me em Biologia, ramo marinho na Universidade dos Açores e tirei o mestrado em Ciências Marinhas - Recursos marinhos, com especialização em Ecologia Marinha na Universidade do Porto. Em relação ao doutoramento em Biologia na Universidade dos Açores, em filogeografia dos passeriformes dos Açores, teve a ver com o meu interesse na evolução das espécies e no trabalho de Darwin nas Galápagos. Na altura em que estava a definir o que fazer após o mestrado, conheci o Peter e a Rosemary Grant, investigadores que trabalhavam nas Galápagos com os tentilhões. Foi aí que entendi que havia, e há, muito para fazer nos Açores nesta área.

Pode fazer uma breve descrição do seu percurso profissional?

Após o doutoramento, na Universidade dos Açores, fiz um pós-doutoramento na Universidad Austral de Chile e fui o principal investigador em diversos projectos relacionados com a filogeografia e a co-evolução com parasitas de diferentes espécies de animais (aves, mamíferos marinhos, invertebrados marinhos). Além disso, dei aulas a alunos dos cursos de Biologia e de Veterinária em manuseamento da vida selvagem, e em ecologia de aves.

Em 2019, mudei-me para a Islândia, onde continuei a desenvolver artigos científicos e a participar em diversos projectos científicos, e em 2021 comecei como Ddo Rif Field Station, em Raufarhöfn, localidade com cerca de 150 pessoas, no nordeste da Islândia, onde estou desde então.

"Quando estou no campo, passam dias em que não vejo nenhum humano"

"Com os estudos que fiz durante o meu doutoramento, constatei que as Flores apresentam uma estrelinha genética e morfologicamente distinta que talvez pudesse ser considerada uma espécie. Após o meu doutoramento, apresentei um projecto ao Governo Regional da altura para desenvolver estes estudos nos Açores, mas nunca me responderam com uma resposta afirmativa, nem tão pouco negativa."

Por que motivo decidiu sair dos Açores? Por escolha própria ou por falta de oportunidades na Região?

Após terminar o doutoramento, em 2012, esperei dois anos e meio por um pós-doutoramento, ou outra posição que permitisse desenvolver os meus conhecimentos científicos e fazer carreira nos Açores, terra que adoro, não só por ser o sítio onde nasci, mas também por ser um local onde muito há a descobrir. A oportunidade de continuar nos Açores nunca surgiu e em 2014, quase por acaso, descobri estarem abertos projectos de investigação no Chile e

Correio dos Açores interview from January 12, 2023.

- Interview about Rif and the life of the Rif's manager in Raufarhöfn by Halla Ólafsdóttir for a Rúv television show.
- Interview about Melrakkaslétta and natural resources by four Architecture students from the Háskóli Islands.
- Global Bird Fair (15th-17th July).

- “Spring arrival times and leukocyte profiles of breeding phalaropes in northern Iceland" submitted to the Journal of Ornithology.
- “Dispersion of non-indigenous ascidians under climate change in Iceland”. Presentation at the 56th European Marine Biology Symposium (EMBS 2023). 4-8 September. Hótel Natura Reykjavik, Iceland.
- Twelve different texts about the biodiversity of Melrakkaslétta were written and posted in Rif’s Facebook page on the first day of each month.

The Autumn Tundra

Autumn has arrived, and the Tundra explodes with color. This vast, cold biome that covers the northernmost regions is undergoing a dramatic transformation. Yellows, oranges, reds, and browns are the main components of a color palette that awakens nostalgia and reveals the cycle of life and death. These colors are not only pleasant to the eye, creating a wow effect, they also have a purpose. They help plants conserve energy, protect themselves from frost and attract pollinators. The most colorful plants in the tundra are the shrubs, such as willows, birches, and berries. They have woody stems that can survive the cold and store nutrients for the next year. Their leaves contain pigments that reflect different wavelengths of light, depending on the temperature and the amount of sunlight.

Chlorophyll gives plant leaves their green color. Plants need warm temperatures and sunlight to produce this pigment. In autumn, the amount produced begins to decrease and the existing chlorophyll is slowly decomposed, reducing the green color of the leaves.

Carotenoids and flavonoid pigments began to appear as chlorophyll is broken down in the fall. Xanthophylls, a subclass of carotenoids, are responsible for yellows, and beta-carotenoids are responsible for oranges, as they absorb green and blue light and reflect red and yellow light, resulting in the orange appearance. The synthesis of anthocyanins is produced due to the action of sunlight on the sugars concentrated in the leaves, reflecting distinct intensities of red.

Falling leaves create a thick layer of organic matter that insulates the soil and provides nutrients for the next year. Some grasses and sedges also produce seeds that are dispersed by the wind or by animals. Autumn is also time for bird migrations, from their breeding grounds to wintering grounds, featuring groups of birds flying in a V-formation. These spectacular formations help birds conserve energy by reducing wind resistance and producing an updraft. Researchers think that migration during the autumn is closely related to temperature and aligned with atmospheric conditions.

Next time you visit Melrakkaslétta during autumn, remember that colors explain how nature adapts to the changing seasons and prepares for the long winter ahead.

One of the texts about the biodiversity of Melrakkaslétta posted in Rif´s Facebook.

- Coffee Science sessions.

Coffee Science logo.

- Presentation about Rif Field Station 10-year history on the Seminar on the rural development project Fragile Settlements (5th October).

Seminar on the rural development project Fragile Settlements.

- Several groups of teachers and students from international courses, who have been visiting Melrakkaslétta for several years, namely the Polar Biology course from the DIS Nonprofit Study Abroad Foundation and the Wildlands Studies of the Western Washington University, both from the USA, were received by the Rif manager, who gave a class on Melrakkaslétta biodiversity and accompanied the groups around the area, presenting Rif's projects.

Group from the Wildlands Studie Program.

- Development of Rif Field Station webpage. RANNSÓKNASTÖÐIN RIF — RIF RESEARCH.
- Development of Rif Field Station Facebook page. FACEBOOK.
- Development of Rif Field Station Instagram page. Norðurljós, the wonder of the Arctic. Read the story in Rif Field Station Facebook page. | Instagram.

Meetings

During 2023, the Rif Field Station manager was present at several meetings with teams of national and foreign researchers that are developing research in Melrakkaslétta, and with national and international university courses, who visited Melrakkaslétta, to help them define methodologies and clarify doubts about the area. Several meetings were held with Rif partners about scientific and monitoring projects.
Rif Field Station was also part of the "Within-species diversity workshop" developed by the ICEBIO group (Hólar, 16-17 January) and on the Raufarhöfn residents meeting.

INTERACT

- INTERACT General Assembly 2023 in Toolik Field Station, Alaska (the director of Náttúrustofa Norðausturlands was there representing Rif). The meeting was also transmitted by the web.
- Rif received one Remote Access project: "ANSABS - Application of nanopore sequencing to investigate carriage of microbial risks in Arctic bird species". This project is the continuation of a previous INTERACCESS project.
- Rif continues to be part of INPA - INTERACT Non-Profit Association.

INTERACT annual General Assembly. 11th – 14th September 2023. Toolik Field Station, Alaska.