Rannsóknastöðin Rif
Rif Field Station

Annual report 2021

Rannsóknastöðin Rif | Aðalbraut 16, 675 Raufarhöfn | Netfang: rif@rifresearch.is| www.rifresearch.is

Content

Resume

The last two years brought several challenges to Rif Field Station (Rif). The Covid-19 situation reduced the number of researchers accessing our station, plus, personal reasons have led the former Rif manager, Hrönn Guðmundsdóttir, to resign her position and move to Reykjavik at the end of 2020, where she continues to work with Rif performing different functions. Despite the difficulties, new opportunities were created, and Rif is growing towards a bright future.

2021 was marked by the COVID situation, and fewer researchers and students were in Raufarhöfn than would have been expected without the pandemic situation. The arrival of a new station manager and the signed agreement between the Ministry of the Environment and Natural Resources, the Municipality of Norðurþing, and the Northeast Iceland Nature Research Centre to grant a total of 67MKr. to Rif, during the years 2021-2025, to promote research, monitoring and environmental education in Melrakkaslétta, where turning points.

Ongoing projects were accomplished and, despite the efforts to fulfill the monitoring plans for 2021, the freshwater data collected was not performed due to tight schedule during the summer. A Research and Monitoring project was also presented for a five-year period (2021 to 2025), and new projects in collaboration with several research institutions started to rise. In relation to the local development and education, Rif started to develop projects with the local school and the Myndlistaskólinn í Reykjavík, and to collaborate with Samtök Sveitarfélaga og Atvinnuþróunar á Norðurlandi Eystra (SSNE).

2021 brought several challenges for Rif, but with the effort of its team, board members and local and institutional collaborations, these were overcome and turned into new opportunities. Overall, 2021 was a good year for Rif, 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 follow the Research and Monitoring Plan 2021-2025 (R&M) presented and accepted by the board, the Ministry for the Environment and Natural Resources and the Norðurþing Municipality. 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.

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 and Natural Resources and the Municipality of Norðurþing.

Rif's board

2021 brought changes to the Rif's board. Þorkell Lindberg Þórarinsson have left the board and Aðalsteinn Örn Snæþórsson replaced him as representative from the Náttúrustofa Norðausturlands. Níels Árni Lund, representing the Sveitarfélagið Norðurþing, also left the board. The other members of the board are Embla Eir Oddsdóttir, representing the Háskólinn á Akureyri and the Stofnum Vilhjálms Stefánssonar, Hlynur Óskarsson, representing the Lanbúnaðarháskóli and the Háskóli Íslands, and Starri Heiðmarsson, representing the Náttúrufræðistofnum Íslands.

There was a board meeting during 2021, on 20 September in Raufarhöfn. The main objectives of the meeting were for the board and the new station manager to get to know each other, and for him to present the Research and Monitoring plan for the years 2021 to 2025, also Aðalsteinn Örn Snæþórsson explain the process of the acceptance of the R&M by the Ministry for the Environment and Natural Resources and the Norðurþing Municipality.

Team 2021

Pedro Rodrigues

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

Hrönn Guðmundsdóttir

Environmental Scientist degree (Lund University, Sweden), BA degree in Philosophy and a diploma in Public Administration (both from the University of Iceland).

Partial remote worker on the development of the accounting, INTERACT reports, writing of Rif's Newsletter, and institutional Icelandic contacts.

Árdís Höskuldsdóttir

Graduated in Fisheries (University of Akureyri).

Partial worker in Raufarhöfn as a technician on the project HiLDA – Iceland as a model for high-latitude dust sources.

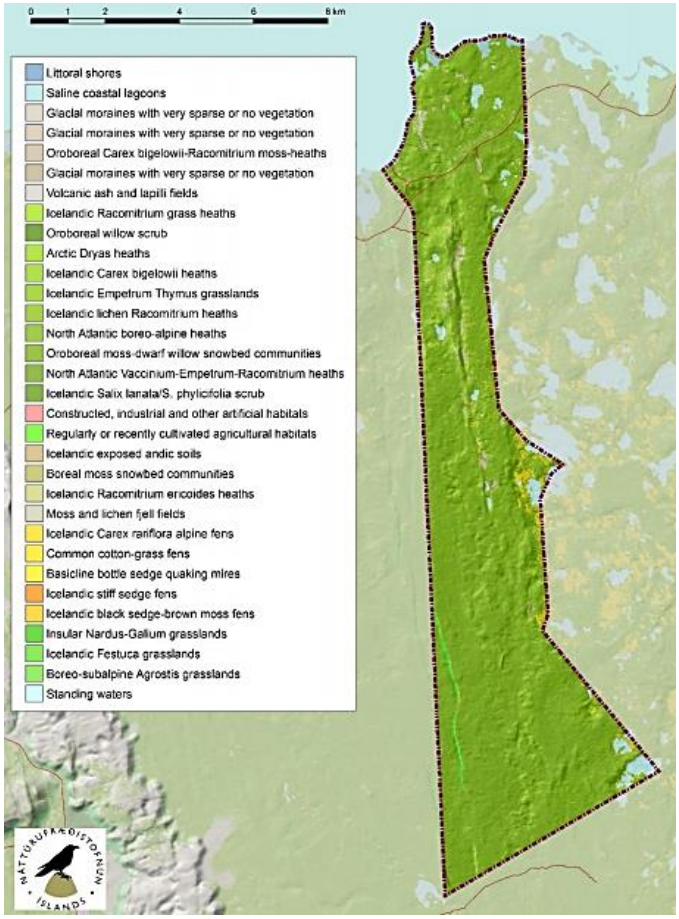
Housing and research infrastructures

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, and a probe to measure temperature and pH.

Prices per night staying in Nest guesthouse during 2021. 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 as been used as an intensive monitoring and research area, 3 km south from the Arctic Circle, 15 km northwest from Raufarhöfn village. There is a meteorological station implemented by Rif and the Icelandic Meteorological Office in September 2018.



Rif area in Melrakkaslétta, with the description of habitats.

Activities during 2021

Reception of scientists and students

Despite the Covid situation, 12 persons, in a total of 93 nights, stayed in Nest guesthouse to develop their scientific projects in Melrakkaslétta:

- Ólafur Karl Nielsen, from the Icelandic Institute of Natural History, to continue developing his studies about the gyrfalcon (*Falco rusticolus*) in Northeast Iceland;
- Gunnar Þór Hallgrímsson and a colleague, from the University of Iceland, to continue developing his studies on purple sandpiper (*Calidris maritima*) and its migration;
- Dominik Arend, master student developing a project on the Influence of Arctic fox denning activities on vegetation and soil nutrition in Iceland, with Ester Rut Unnsteinsdóttir from the Icelandic Institute of Natural History;
- George Kodl and William Koster, two PhD students at the University of St. Andrews, Scotland, developing a project in drone geology-mapping and pollen surveys, respectively;
- Þórný Barðadóttir, a PhD student in Tourism studies at the University of Iceland developing several interviews with local people and institutions to understand how tourism is important for Melrakkaslétta inhabitants;

Chick of purple sandpiper (*Calidris maritima*).

- Konrad Kandler and Tom Dean, from the Technische Universität Darmstadt, Germany (project HiLDA), to access their dust collectors located in Raufarhöfn and take the samples that Árdís Höskuldsdóttir had collected during the year;
- José Valdebenito Chavez, a Post-doc researcher from the University of Debrecen, Hungary, to collect samples for his research in association of mating system variation with sex-specific immune function in shorebirds. He stayed in Raufarhöfn funded by INTERACCESS from the INTERACT;
- Jan Kavan and Vincent Haggmans, Post-doc researcher from Masaryk University, Czech Republic, and undergraduate student from ETH University, Switzerland, respectively, to quantify high latitude dust deposition in Sandur (Oxarfjordur area). They stayed in Raufarhöfn funded by INTERACCESS from the INTERACT.

Rif staff developed the capture method of red-necked phalaropes (*Phalaropus lobatus*) to help José Chavez.

Research and Monitoring

During 2021, Rif developed several monitoring projects already implemented 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. For more information on each project please consult the Research and Monitoring Plan 2021-2025:

- **Freshwater monitoring** - Despite, the tight schedule during the summer to collect freshwater data, Rif staff was with Aðalsteinn Örn Snæþórsson on August 20th to collect freshwater samples in Vikingavatn to harmonize methodologies;
- **Biotic Interactions tracked by computer vision (BITCue)**, project in collaboration with the Aarhus University, Denmark. Eight cameras were set-up in the Rif area in May (with Starri Heiðmarsson from Náttúrufræðistofnum Íslands). Batteries and material were checked every 10 days interval and memory cards changed and downloaded to an external disk, until September 15th when all the material was removed from the field and the external disk with all the pictures was sent to Toke Thomas Høye, the responsible for the project from Aarhus University;
- **Harbour seal monitoring**, project in collaboration with Selasetur Íslands. Four counting days were performed across Melrakkaslétta and Sandur (Oxarfjordur area), during May and June, to monitor the presence of harbour seals (*Phoca vitulina*). The first day of counting, Rif staff was joined by Guðmundur Örn;
- **HiLDA – Iceland as a model for high-latitude dust sources**, project in collaboration with the University of Darmstadt, Germany. Every week samples are collected from several dust meters installed in Raufarhöfn and stored in the laboratory. This is a Remote Access project from INTERACT.

Harbour seal (*Phoca vitulina*) registered during the Harbour seal monitoring.

New projects

During 2021 several projects were developed and submitted for approval and/or funding:

- **Icelandic birds as indicators of Arctic health (ICEBIO-Arctic)**. This project was developed and submitted to Rannís (Project Grant), with the specific aims of creating a baseline study on Haemosporidian parasites hosted by shorebirds in the Icelandic Arctic environment and to detect the presence of antimicrobial resistance genes and mobile genetic elements. Rif will be the host institution and the University of Iceland, Northeast Iceland Nature Research Centre, Suðurnes Science and Learning Centre, and the Moredun Research Institute, Scotland, are the collaborating institutions. If accepted, the project will start in 2022. Independently of funding, collection of samples will start during 2022;
- **Tunicates from Raufarhöfn**. Rif started to sample tunicates from the Raufarhöfn harbour and monitor the seawater surface temperature and pH to create a data set on sea abiotic parameters. The objective of this project, in collaboration with Joana Micael from the Náttúrustofa Suðvesturlands, is to create a baseline study on tunicates in Melrakkaslétta and to understand if changes will occur in the future with the arrival of non-indigenous species.
- **Constant Effort Station**. Two bird ringing stations were designed by Rif staff and accepted by Guðmundur A. Guðmundsson, the responsible for ringing in Iceland from the Icelandic Institute of Natural History. One station is located in Akurgerði forest (near Ásbyrgi) to collect data from passerines, and the other in coastal areas of North Melrakkaslétta (near Raufarhöfn), to collect data from waders arriving during their migration to the north. The long-time data obtained by a constant effort station is important to estimate the population trends of species in the study areas and the health state of the ecosystem. Climate change affect patterns and some species could leave the area and others arrive, affecting the presence of vector borne diseases. During 2022, the constant effort station in Akurgerði will start and the one in the coastal areas will be evaluated for best sites.

Capture of a goldcrest (*Regulus regulus*) in Akurgerði forest to test the mist nets.

- **Young Nature Guides**. This project was developed and submitted to the Northeast Infrastructure Fund. The main objectives were to engage young people from Raufarhafnarskóli with Nature and to develop conservation acquaintance, values, and skills to get involved with their surroundings and make a difference in their community. It is intended to provide basic knowledge on the history and costumes of their town to understand how important Nature is to humans, and to deliver tools to develop their interest in outdoor activities. To reinforce their interest in the subjects, diverse activities will be developed outside the classroom, some of which with the elder people from Raufarhöfn, and experts in different areas related to the environment, science, conservation, and industry. At the end of the school year, the students will do a presentation on several topics related to the biodiversity of the area, and guide students from other schools across several natural areas of interest in Melrakkaslétta.
- **360º degree photos of Rifstangi**. Photos have been taken from Rifstangi and of other places in Rif's area and uploaded to Mapillary website. This is a project from INTERACT to give information to researchers about the areas around the INTERACT stations. Link to an area/photo in the following link: https://www.mapillary.com/app/?pKey=366221651540171.
- **Art C³ - Art for climate change communication**. Rif started to develop this project 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. This project probably will start in the summer of 2022;
- **Art Course in Raufarhöfn**. Rif was a collaborator in the course Endimörk Alheimsins: Náttúra og líf við ysta haf, developed by the Myndlistaskólinn í Reykjavík in Raufarhöfn (9 – 13 August). Rif staff guided a field trip through the coast of Melrakkaslétta to talk about Rif's projects, biodiversity of Melrakkaslétta, and the effects of climate change in different habitats.

Field trip to the Melrakkaslétta coast in the course Endimörk Alheimsins: Náttúra og líf við ysta haf.

Deliverables

During 2021, several deliverables were achieved:

- Scientific paper accepted on international review: Micael J, Rodrigues P, Gíslason S. 2021. Native vs. non-indigenous macroalgae in Iceland: The state of knowledge. Regional Studies in Marine Science 47:2352-4855. https://doi.org/10.1016/j.rsma.2021.101944;
- The scientific manuscript "Climate change: The thriving of temperate tunicates in Southwest Iceland", in collaboration with Náttúrustofa Suðvesturlands, was submitted to Marine and Freshwater Research;
- The scientific manuscript "Bryozoa of Iceland: Diversity and biogeographic patterns", in collaboration with Náttúrustofa Suðvesturlands, was submitted to Polar Biology. After revision, the reviewers suggested the division of the manuscript in two distinctive papers, as the subject is vast and interesting for the readers. It is expected to submited both papers during 2022;
- At the beginning of each month, from June to December 2021, Rif published small articles about the biodiversity of Melrakkaslétta in its Facebook page (Rannsóknastöðin Rif - Rif Field Station - Home | Facebook), and after a translation to Icelandic, in the Raufarhöfn page. Translation to Icelandic has been kindly made by Nanna Steina Höskuldsdóttir, a resident in Raufarhöfn;
- The National Geographic Endurance was for a few hours in Raufarhöfn. I presented the Rif Field Station and talked about *Dryas octopetala* to some passengers at the village (12 August);
- It was issued the vol. 7 of Rif's Newsletter rif_newsletter-fall-2021.pdf (wordpress.com);
- A call for INTERACT TA/RA was open until November 30th, and at least five different researchers/scientific teams contacted Rif for more information.
- The first Coffee Science session was developed in the local coffee Kaupfélagið. Pedro Rodrigues made the presentation "Melrakkaslétta natural heritage" and José Valdebenito presented his work "Why female birds die more than males?". Ten participants assisted the event (26 June);

First Coffee Science in Kaupfélagið, Raufarhöfn.

- Rif was represented at the Líffræðiráðstefnan 2021 / IceBio Conference 2021 (Reykjavik 14 – 16 October). A talk "Towards the management of an invasive tunicate" and a poster "Incas and the billion-dollar birds: the first conservationists", was presented in collaboration with Náttúrustofa Suðvesturlands;

Poster presented at the Líffræðiráðstefnan 2021 / IceBio Conference 2021.

- Rif staff was invited to present the biodiversity of Melrakkaslétta peninsula and the Rif Field Station for some teachers and students of the Master programme in Polar Law from the University of Akureyri (7 October), in collaboration with SSNE, at the Hotel Norðurljós in Raufarhöfn;

Presentation for the Master programme in Polar Law from the University of Akureyri.

Meetings

- NORA Webinar. NORA (North Atlantic Cooperation), 17 August;
- Líffræðiráðstefnan 2021 / IceBio Conference 2021 in Reykjavik, Iceland, 14 to 16 October;
- Web meeting with the other managers of the INTERACT Icelandic stations: Hlynur Óskarsson (Litla-Skard), Hanna Maria Kristjánsdóttir (Þekkingarseturs Suðurnesja), and Skálanes (Ólafur Örn Pétursson), 4 November;
- Opening Webinar: Canada-Iceland Arctic Research Cooperation Series, 18 November;
- INTERACT annual meeting in Kilpisjärvi, Finland, 23 to 26 November.

Interviews and media

- Fólk í norðurslóðamálum, Icelandic Arctic Cooperation Network (Pedro Rodrigues - Icelandic Arctic Cooperation Network (arcticiceland.is));
- Ískirkja á reki rétt undan ströndum Melrakkasléttu (Ískirkja á reki rétt undan ströndum Melrakkasléttu | RÚV (ruv.is));
- Sá stórfenglegan ísjaka norður af landinu (Sá stórfenglegan ísjaka norður af landinu (mbl.is));
- Stór og mikill borgarísjaki undan ströndum Melrakkasléttu (Stór og mikill borgarísjaki undan ströndum Melrakkasléttu - Vísir (visir.is));
- Ískirkja fyrir utan Hraunhafnartanga (Ískirkja fyrir utan Hraunhafnartanga - Vísir (visir.is));
- Giant ice floe sighted off North coast (Giant Ice Floe Sighted Off North Coast (icelandreview.com)).

Iceberg at the North coast of Melrakkaslétta.

INTERACT

- Rif received two Transnational Access researchers (more information in Reception of scientists and students);
- Rif had one Remote Access project, HiLDA – Iceland as a model for high-latitude dust sources (more information in Research and Monitoring);
- It was submitted the final report of INTERACT II;
- It was submitted the reporting period of the INTERACT III (01/01/2020 – 30/06/2021);
- The manager of Rif was at the INTERACT annual meeting in Kilpisjärvi, Finland (23 to 26 November).

Group photo of the INTERACT annual meeting in Kilpisjärvi, Finland.

Finances

This is a summary of Rif's finances in 2021. PwC will review the accounting data for the year.

Rif has two bank accounts in Landsbankinn. A Current account, for the payment of salaries, expenses, taxes, and inflow of money; and an Interest account, to receive funds from the INTERACT project.

At the beginning of 2021, Rif had almost ISK 4.5 million in the Current account from the previous year. Revenues during 2021 were mainly contributions from the Ministry of the Environment and Natural Resources (ISK 10 million) and the municipality of Norðurþing (ISK 3 million) to develop the 2021-2025 Research and Monitoring project, and from the Darmstadt University of Technology in Germany for the annual reimbursement of costs related to HiLDA project (ISK 437.960). Rif also received a reimbursement of ISK 600.000 by Skatturinn for an improper fine paid in 2020.

In relation to the Interest account, no payments were received from INTERACT in 2021, but in 2020 a final payment of ISK 4.6 million was received for INTERACT II (which formally ended in October 2021), as well as an advance payment of ISK 5.4 million for INTERACT III. In November 2021, INTERACT submitted a final account to the European Union (EU) for INTERACT II, and in the coming months it will be clear how much Rif will have to repay INTERACT from the funds received for this call. Due to the Covid situation during 2020 and 2021, some researchers cancelled their visit to Rif and the funds related to these Transnational Access projects should be returned to the EU, in an estimated a value between ISK 600.000 and 1 million. Other entries in the Interest account are capital gains and interests.

In 2021, Rif did not receive operating funds from the Ministry of the Environment and Natural Resources and the Municipality of Norðurþing until late in the autumn, so, when the Current Rif account was almost empty, it was decided to transfer a total of ISK 3 million from the Interest account to cover wage costs.

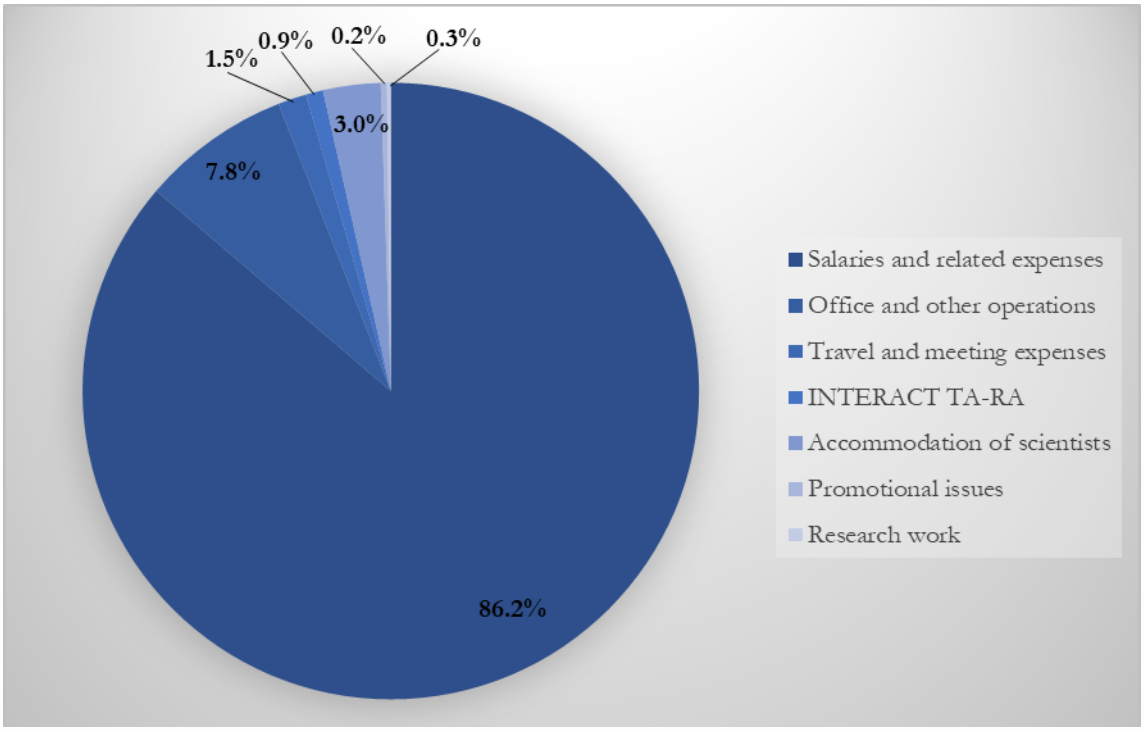
During Rif activities in 2021, 3,962 km were covered, and 277 l of fuel were consumed. It was decided not to put this item in the Rif costs for 2021.

On the table below, it is presented the balance of the year 2021.

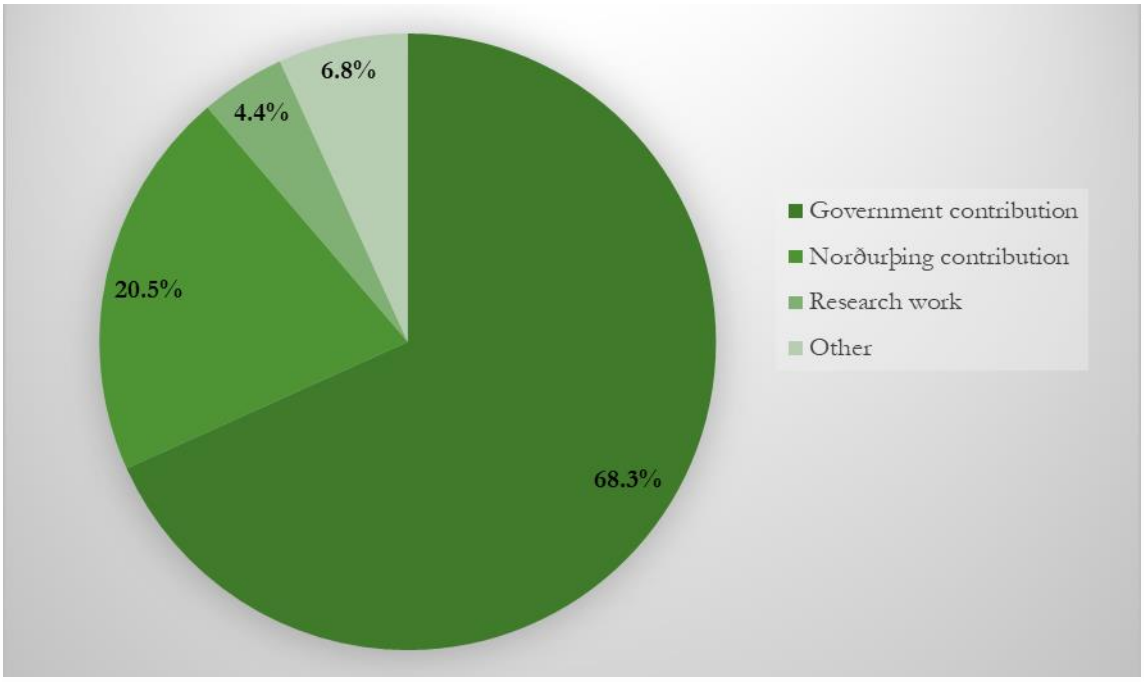
Balance of Rif's accounts (ISK) in 2021.

Account	January	December	Balance
Current Rif account	4.419.266	8.905.857	+4.486.591
INTERACT account	12.399.876	9.433.978	-2.965.898
Total	16.819.142	18.339.835	+1.520.693

Graphics of Rif expenses and income during 2021 can be seen below.



Rif expenses during 2021.



Rif income during 2021.