



Observing networks in Greenland

Sustained Arctic Observing Networks (SAON) Phase II



Lone Nukaaraq Møller, Research Coordinator

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2. Introduction

The Arctic Council has agreed to establish a formal body, in partnership with IASC and WMO, to continue the development of Sustained Arctic Observing Networks (SAON). This body – the SAON Steering Group (SAON SG) – was formed in May 2009 and consists of national coordinators representing the eight Arctic countries, permanent participants in the Arctic Council, and representatives of the Arctic Council working groups. With the inclusion of representatives from IASC and WMO, the SAON SG is also connected to the Arctic Science, observing and data management activities and interests of the non-Arctic countries, as well as to the global observing systems.

The SAON SG is the successor to the SAON IG (Initiating Group), which organized a consultative process during International Polar Year 2007-2009 that culminated in a set of recommendations for the development of Sustained Arctic Observing Networks. This survey continues the process for gathering information that will assist the SAON SG as it strives to facilitate the development of SAON and the realisation of Arctic and global value-added services and benefits. The SAON SG relies on information and advice from those who operate observing sites, systems and networks, provide data and information management services, and use the observing data and information.

The survey consisted of two questions and an inventory form requesting some basic information about Arctic observing sites, systems or networks, or data and information management activity. These questions and inventory form were sent to Greenlandic research institutions and companies who perform research.

The data in this report on monitoring projects and networks has been gathered in collaboration with the research institutions and through the websites of the institutions. The data has been obtained by the Government of Greenland representative.

The report will be updated whenever necessary by the Greenlandic SAON representative.

Best regards,

Lone Nukaaraq Møller, Research Coordinator
Government of Greenland
P.O. Box 2221
3900 Nuuk
Greenland

3. Projects

3.1. Zackenberg Ecosystem Monitoring (ZERO)

Contact person (e-mail):

Dr. Morten Rasch, scientific leader at Zackenberg Station, mas@dmu.dk.

Website:

<http://www.zackenberg.dk>

Main objective of the project:

The objective of the station is to facilitate ecosystem research in the High Arctic. According to the framework programme of Zackenberg Ecological Research Operations (ZERO) this includes:

- Basic quantitative documentation of ecosystem structure and processes;
- Baseline studies of intrinsic short-term and long-term variations in ecosystem functions;
- Retrospective analyses of organic and inorganic material to detect past ecosystem changes;
- Experimental studies enabling predictions of ecosystem responses to Global Change.

The programme is coordinated with Nuuk Ecological Research Operations (see below) within the Framework of Greenland Ecosystem Monitoring (GEM).

Member of or connected to a global network:

Zackenberg Ecological Research Operations.

Type of activity:

- **ClimateBasis**
 - o Climate
 - o Snow
 - o Hydrology
 - o UV radiation
- **GlacioBasis**
 - o Climate
 - o Snow
 - o Glacier ice
- **GeoBasis**
 - o Climate
 - o Snow
 - o Hydrology
 - o UV radiation
 - o Soil
 - o Gas flux
- **BioBasis**
 - o UV radiation
 - o Soil
 - o Vegetation
 - o Gas flux
 - o Lakes
 - o Arthropods
 - o Mammals & birds
- **MarineBasis**
 - o Snow
 - o Hydrology
 - o UV radiation
 - o Benthic animals
 - o Mammals & birds
 - o Sea ice
 - o Sea water
 - o Sea bottom

Geographical coverage (countries):

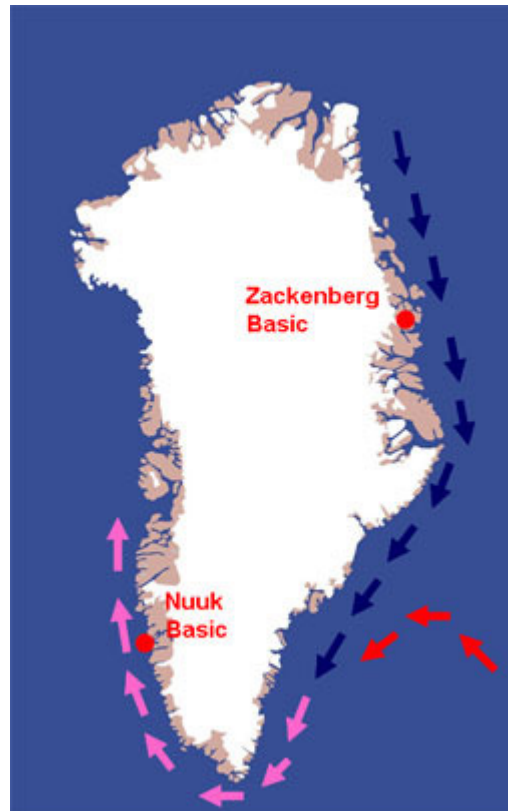
The station is situated in North East Greenland.

Data archive/centre, including Web site:

<http://www.zackenberg.dk>

Data availability:

- All data are available free of charge.



3.2. Nuuk Basic Ecosystem Monitoring (NERO)

Contact person (e-mail):

Dr. Morten Rasch, scientific coordinator of Nuuk Ecological Research Operations (NERO), mras@dmu.dk.

Website:

<http://www.nuuk-basic.dk/>

Main objective of the project:

The objective is to allow comparative studies of ecosystem dynamics in relation to climate variability and change in respectively a high arctic and low arctic setting as Nuuk Basic comprises the same components as Zackenberg. According to the framework programme of Zackenberg Ecological Research Operations (ZERO) this includes:

- Basic quantitative documentation of ecosystem structure and processes;
- Baseline studies of intrinsic short-term and long-term variations in ecosystem functions;
- Retrospective analyses of organic and inorganic material to detect past ecosystem changes;
- Experimental studies enabling predictions of ecosystem responses to Global Change.

The programme is coordinated with Zackenberg Ecological Research Operations (see above) within the Framework of Greenland Ecosystem Monitoring (GEM).

Member of or connected to a global network:

The scientific components of the programme are coordinated by the Nuuk Basic secretariat at the National Environmental Research Institute at the University of Aarhus, Denmark.

Type of activity:

- **ClimateBasic**
 - o Climate
 - o Snow
 - o Hydrology
 - o UV radiation
- **MarineBasic**
 - o Snow
 - o Hydrology
 - o UV radiation
 - o Benthic animals
 - o Mammals & birds
 - o Sea ice
 - o Sea water
 - o Sea bottom
- **BioBasic**
 - o UV radiation
 - o Soil
 - o Vegetation
 - o Gas flux
 - o Lakes
 - o Arthropods
 - o Mammals & birds
- **GeoBasic**
 - o Climate
 - o Snow
 - o Hydrology
 - o UV radiation
 - o Soil
 - o Gas flux

Geographical coverage (countries):

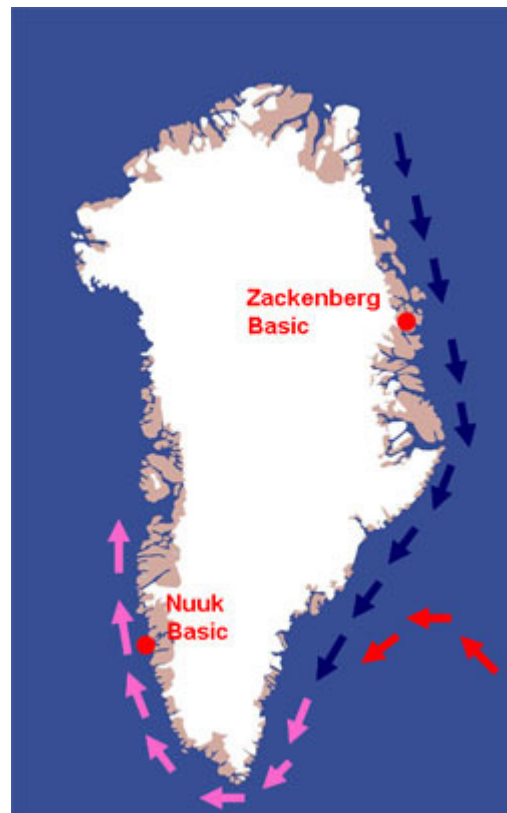
The station is situated in Mid West Greenland.

Data archive/centre, including Web site:

<http://www.nuuk-basic.dk/>

Data availability:

- All data are available free of charge.



3.3. Aerial Surveys for marine mammals

Contact person (e-mail):

Mads Peter Heide-Jørgensen (mhj@ghsdk.dk) & Fernando Ugarte (feug@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is to provide management advice for harvested species (large whales, narwhale and beluga, walrus).

Member of or connected to a global network:

The results from the surveys are presented to international scientific fora e.g. International Whaling Commission, The North Atlantic Marine Mammal Commission, and the Canada-Greenland Joint Commission for the Conservation and Management of Narwhal and Beluga.

Type of activity:

The surveys are conducted from fixed winged twin engine aircrafts with 2-4 observers, that systematically survey for marine mammals in the prime habitats in Greenland. Surveys are conducted as strip census, line transect, photographic survey or independent observer surveys. Target species and areas shift between years but it is attempted to maintain a 5-6 survey cycle in the areas with the largest hunting pressure (i.e. West Greenland). For East Greenland a survey cycle of 10 or more years will be maintained.

When operational (year):

Methods under development since first survey in 1981 but backward compatibility is ensured for most important species.

Geographical coverage (countries):

West and East Greenland (East Greenland to a lesser extent).

Data archive/centre, including Web site:

Data (incl. continuous video coverage of transect lines) are archived at 10 terrabyte raid station at Greenland Representation in Copenhagen.

Data availability:

Data are generally not available to researchers outside GINR or those contracted by GINR to conduct special analyses. Most of the important results from the surveys are published in the primary literature.

3.4. Seabird Monitoring

Contact person (e-mail):

Flemming Merkel (flme@natur.gl) & Aili Labansen (aila@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is to monitor the breeding seabird populations (primarily *Uria lomvia*, *Somateria molissima* and *Rissa tridactyla*).

Member of or connected to a global network:

Type of activity:

When operational (year):

1998- (annual or less frequently). Opportunistic surveys in the past.

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

Data availability:

3.5. Monitoring of shrimps and fish stocks in West Greenland

Contact person (e-mail):

Helle Siegstad (helle@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is resource monitoring of commercially important populations and non commercial species, West Greenland (several fish species and shrimps).

Member of or connected to a global network:

Type of activity:

Ship survey.

When operational (year):

1988- (annual).

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

Greenland Institute of Natural Resources <http://www.natur.gl>

Data availability:

3.6. Monitoring of shrimps and fish stocks in East Greenland

Contact person (e-mail):

Helle Siegstad (helle@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is resource monitoring of commercially important populations and non commercial species, West Greenland (several fish species and shrimps).

Member of or connected to a global network:

Type of activity:

Ship survey.

When operational (year):

2007- (annual). Plus older time series.

Geographical coverage (countries):

East Greenland.

Data archive/centre, including Web site:

Greenland Institute of Natural Resources <http://www.natur.gl>.

Data availability:

3.7. Monitoring of Greenland Halibut in East Greenland

Contact person (e-mail):

Kaj Sünksen (kasu@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is resource monitoring (primarily Greenland Halibut).

Member of or connected to a global network:

International Council for the Exploration of the Sea (ICES)

Type of activity:

Surveys and sampling from the commercial fishery

When operational (year):

1998- (annual (minus 2001)).

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

Local network

Data availability:

Data can be requested by contacting GINR.

3.8. Monitoring of offshore stock of Greenland Halibut, West Greenland

Contact person (e-mail):

Kaj Sünksen (kasu@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is resource monitoring (primarily Greenland Halibut).

Member of or connected to a global network:

Northwest Atlantic Fisheries Organization (NAFO)

Type of activity:

Surveys and sampling from the commercial fishery

When operational (year):

1997- (annual).

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

Local network

Data availability:

Data can be requested by contacting GINR

3.9. Monitoring of inshore stock of Greenland Halibut, West Greenland

Contact person (e-mail):

Bjarne Lyberth (bily@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is resource monitoring of Greenland Halibut.

Member of or connected to a global network:

Northwest Atlantic Fisheries Organization (NAFO).

Type of activity:

Surveys, sampling from commercial fisheries.

When operational (year):

1993- (annual).

Geographical coverage (countries):

Uummannaq Upernavik and Disko Bay, West Greenland.

Data archive/centre, including Web site:

Local network

Data availability:

Data can be requested by contacting GINR.



Photo by Bjarne Lyberth

3.10. Monitoring of inshore stock of snow crab

Contact person (e-mail):

AnnDorte Burmeister (anbu@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the network:

The main objective is resource monitoring (Snow crab *Chionoecetes opilio*).

Member of or connected to a global project:

Type of activity:

When operational (year):

1997- (annual).

Geographical coverage (countries):

West Greenland (Disko Bay and Sisimiut).

Data archive/centre, including Web site:

Data availability:

3.11. Monitoring of offshore stock of snow crab

Contact person (e-mail):

AnnDorte Burmeister (anbu@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the network:

The main objective is resource monitoring (Snow crab *Chionoecetes opilio*).

Member of or connected to a global project:

Type of activity:

When operational (year):

1999- (Sisimiut) and 2001 (Nuuk-Paamiut) (annual).

Geographical coverage (countries):

West Greenland (Sisimiut area and Nuuk-Paamiut).

Data archive/centre, including Web site:

Data availability:

3.12. Monitoring of inshore stock of cod

Contact person (e-mail):

Holger Hovgaard (hoho@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the network:

The main objective is resource monitoring (cod *Gadus morhua*).

Member of or connected to a global project:

Type of activity:

When operational (year):

1982- (annual).

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

Data availability:

3.13. Sampling from the commercial fisheries

Contact person (e-mail):

Bjarne Lyberth (bjly@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the project:

The main objective is sampling biological samples from the commercial fisheries.

Member of or connected to a global network:

Type of activity:

When operational (year):

1993- (annual).

Geographical coverage (countries):

West and East Greenland.

Data archive/centre, including Web site:

Data availability:

3.14. Sampling from salmon fisheries

Contact person (e-mail):

Rasmus Nygaard (rany@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=35>

Main objective of the project:

The main objective is sampling biological samples from salmon fisheries at West Greenland to provide data for the ICES Working Group on North Atlantic salmon (WGNAS).

Objectives include

- Continue the time series of data (1969-present) on continent of origin and biological characteristics of the salmon in the West Greenland Fishery.
- Provide data on mean weight, length, age and continent of origin for input into the North American and European run-reconstruction models.
- Collect information on the recovery of internal and external tags.
- Collect additional biological samples from fresh whole fish in support of SALSEA West Greenland or other special sampling programs as requested.

Member of or connected to a global network:

ICES and NASCO.

Type of activity:

Samples are obtained from Atlantic salmon (*Salmo Salar*) landed by commercial fishermen at local markets hotels or restaurants. Prior to 1998 when a commercial fishery for Atlantic salmon was still allowed samples were also obtained at fish factories. Sampling includes Length-weight data, and scale samples for age and lifehistory readings. Since 2002, samples have also included a DNA tissue sample for assignment of landings to the American or European continent of origin.

When operational (year):

1969- (annual).

Geographical coverage (countries):

West Greenland.

Data archive/centre, including Web site:

The sampling database is archived and maintained by the Department of Fisheries and Ocean Canada (DFO), Northwest Atlantic Fisheries Center.

Data availability:

3.15. Oceanographic-monitoring, West Greenland.

Contact person (e-mail):

Helle Siegstad (helle@natur.gl), Greenland Institute of Natural Resources.

Web site:

<http://www.natur.gl/index.php?id=1&L=3>

Main objective of the network:

The main objective is to monitor physical parameters (salinity and temperature).

Member of or connected to a global network:

Type of activity:

Oceanographic (CTD sampling)

When operational (year):

1950 - (annual).

Geographical coverage (countries):

Nuuk, West Greenland.

Data archive/centre, including Web site:

ICES <http://www.ices.dk/ocean/>

Greenland Institute of Natural Resources <http://www.natur.gl>

Data availability:

3.16. Programme for Monitoring of the Greenland Ice Sheet (PROMICE)

Contact person (e-mail):

Andreas Ahlstrøm (apa@geus.dk)

Web site:

<http://promice.dk>

Main objective of the project:

The main objective is to quantify the annual mass loss of the Greenland ice sheet, track changes in the extent of local glaciers and ice caps, and track changes in the position of the ice-sheet margin.

Member of or connected to a global network:

The programme is funded by the Danish Ministry of Climate and Energy, and carried out by the Geological Survey of Denmark and Greenland in corporation with the Technical University of Denmark and Asiaq - Greenland Survey.

Type of activity:

- Observing and modelling the ice-sheet surface-mass balance
- Quantifying the mass loss caused by iceberg calving
- Monitoring the change of glaciers and ice caps in Greenland
- Outlook

When operational (year):

The programme is operational all year round.

Geographical coverage (countries):

Greenland ice sheet margin.

Data archive/centre, including Web site:

<http://promice.dk>

Report from the programme can be read at: http://promice.dk/xpdf/rosa_2007_no15_p61-64.pdf

Data availability:

- Data available on request. From December 2009 data may be downloaded from the website <http://promice.dk>.
- No charge for data.

3.17. Permafrost

Contact person (e-mail):

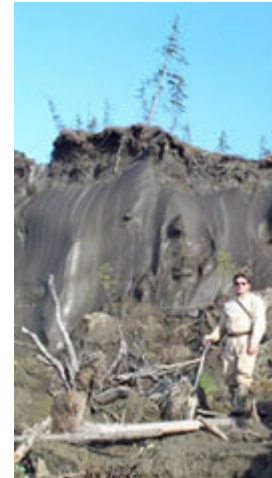
General Manager Keld Hornbech Svendsen (khs@asiaq.gl).

Web site:

www.asiaq.gl

Main objective of the project:

The purpose of the project is to combine the Danish Meteorological Institute' HIRHAM climate model and permafrost research. This collaboration between the two fields is expected to result in a prognosis of changes in the permafrost distribution in Western Greenland (maritime Arctic climate) and Alaska (continental Arctic climate) to the year 2050.



Member of or connected to a global network:

In 2006, Asiaq entered a collaboration with the University of Alaska Fairbanks, Arctic Technology Centre (at Technical University of Denmark), and the Danish Meteorological Institute on a three-year project directed at studying and modelling the distribution of permafrost in Greenland and Alaska.

Type of activity:

- Permafrost

When operational (year):

Since 2005.

Geographical coverage (countries):

Greenland and Alaska

Data archive/centre, including Web site:

Data availability:

- All data
- No charge for data

3.18. Wind resource measurements in Greenland

Contact person (e-mail):

Senior Scientist Kurt S. Hansen, Department of Mechanical Engineering, DTU, (ksh@mek.dtu.dk).

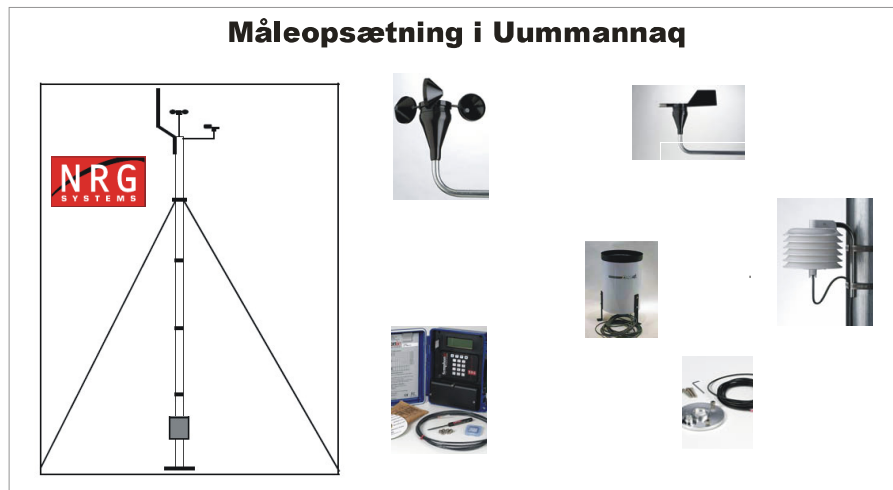
Website:

www.winddata.com/greenland

Main objective of the project:

Wind resources measurements near several settlements to determine whether wind energy can be used as a local energy source and replace fossil fuel. The project concentrates on settlements in Sisimiut and Uummannaq and includes 6 settlements.

A standard measurement setup consisting of a 10 m NRG-Systems meteorological mast equipped with a cup anemometer, a wind vane and a thermometer has been installed at each location.



Site	Measurements period	Hours	Status
Dumpen, Sisimiut	Aug2004-Aug2008	29400	Finished
Sarfannguit, Sisimiut	Aug2003-	27400	Ongoing
Itilleq, Sisimiut	Aug2009-	1800	Ongoing
Uummannaq	Aug2006-	21900	Ongoing
Ukkusissat, Uummannaq	Oct2006-	19600	Ongoing
Saattut, Uummannaq	Oct2006-Jul2009	13600	Stopped
Ikerasak, Uummannaq	Oct2006-Aug2009	20500	Stopped

All statistics are screened and available through Database of Wind Characteristics: together with site documentation and project reports at www.winddata.com/greenland. Furthermore, the wind database serves as a repository for other wind measurements from Greenland e.g. Godhavn and Nanortalik.

A 6 kW demonstration wind turbine has recently been erected in Sarfannguaq to document the potential of merging wind energy with a diesel powered electricity system.

Member of or connected to a global network:

Participation from ARTEK, DTU.MEK and Nukissiorfiit.

Type of activity:

- Wind resources

When operational (year):

Since 2003.

Geographical coverage (countries):

West Greenland

Data archive/centre, including Web site:

All the statistics are stored in a central database located on DTU.

www.winddata.com/greenland

Data availability:

3.19. Health Behaviour in School-aged Children in Greenland (HBSC Greenland)

Contact person (e-mail):

Dr. Publ. Health. Birgit Niclasen (bivn@gh.gl or niclasen@greenet.gl).

Web site (if any):

None yet.

Main objective of the project:

The HBSC network is a WHO supported research network on health and health behaviour in school-aged children performing surveys every 4 years in 41 countries. The data are used in monitoring, research and health promotion.

Member of or connected to a global network; if yes, which:

HBSC.

Type of activity:

- Research network
- Child health
- Human & socio-economic
- Location(s): Greenland and 40 other countries.....

Main variables:

Social variables including affluence, health, health behaviour, smoking, alcohol use, violence and injuries among others.

When operational (year):

Every 4 years, next data collection will be in 2009/10.

Geographical coverage (countries):

Greenland, Denmark, Sweden, Norway, Finland, Iceland, and Russia.

Data archive/centre, including Web site:

www.hbsc.org, international data archive at the University of Bergen.

Data availability:

- All data are available after application and approval.
- No charge for data.

4.0 Network

4.1. The CircumArctic Rangifer Monitoring & Assessment Network (CARMA)

Contact persons (e-mail):

- Don Russell (coordinator, synthesis),
- Anne Gunn (demography, synthesis),
- Roy Ashenfelter (community, Alaska)
- Susan Kutz (parasites and disease),
- Brad Griffith (habitat/remote sensing),
- Gary Kofinas (co-management),
- Robert White (synthesis, analysis)
- John Mameamskum (community, Ungava)

Web site:

<http://carmanetwork.onconfluence.com/display/public/home>

Main objective of the network:

The main objective is to monitor and assess the impacts of global change on the Human-Rangifer System across the Arctic through cooperation, both geographically and across disciplines.

CARMA is a network of researchers, managers and community people that share information on the status of the world's wild Rangifer (reindeer and caribou) populations and how they are affected by global changes (e.g. climate change and industrial development).

CARMA is primarily focussed on the status of most of the large migratory Rangifer herds and thus, as yet, do not deal with woodland caribou and Peary caribou in North America or forest and marine reindeer in Fennoscandia and Russia. As well, they do not deal with domestic reindeer or the herding economy.

Member of or connected to a global network:

Type of activity:

- Networking
- Data, experience and knowledge exchange

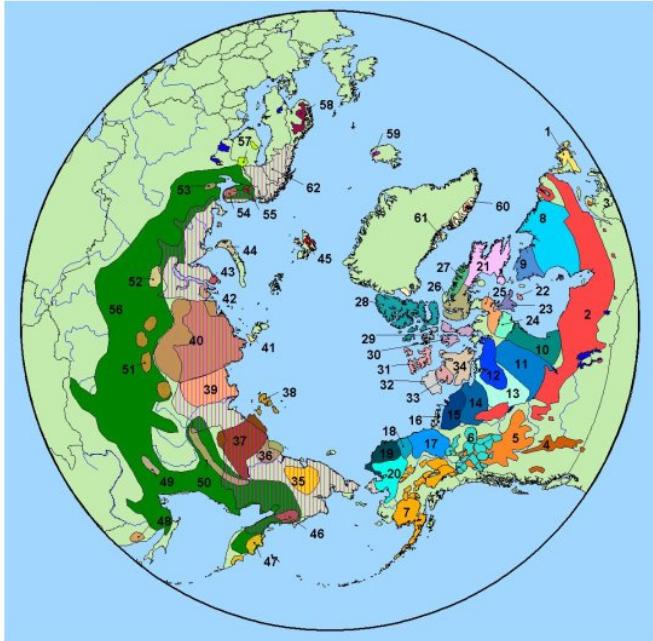
When operational (year):

Since 2003 (annual conference).

Geographical coverage (countries):

Arctic; Alaska, Canada, Finland, Iceland, Russia, Norway, and Greenland.

Rangifer Herds of the Circumpolar North



- | | |
|-------------------------------------|----------------------------------|
| 1 Newfoundland | 32 Banks Island |
| 2 Boreal | 33 Northwest Victoria Island |
| 3 Atlantic | 34 Dolphin-Union |
| 4 Southern Mountain | 35 Chukotka |
| 5 Northern Mountain | 36 Sudninskaya |
| 6 Yukon | 37 Yana-Indigirka |
| 7 Alaska | 38 Novosibirskii Ostrova |
| 8 George River | 39 Lena-Olenek |
| 9 Leaf River | 40 Tamyr |
| 10 Qamanuqan | 41 Severnaya Zemlia |
| 11 Beverly | 42 Gydan |
| 12 Ahlak | 43 Bel'ri |
| 13 Estburg | 44 Novaya Zemlia |
| 14 Ehenose East | 45 Svalbard |
| 15 Ehenose West | 46 Egepolskii |
| 16 Cape Estburg | 47 Kancobeka |
| 17 Porcupine | 48 Amur |
| 18 Central Arctic | 49 Okhotsk |
| 19 Tesheknuk | 50 Yalutsk |
| 20 Western Arctic | 51 Evreniya |
| 21 South Baffin Island | 52 Nadyu-Pur (Yamal Okrug) |
| 22 Coats Island | 53 Arkhangel'sk Oblast |
| 23 Southampton Island | 54 Terskii Bereg (Kola) |
| 24 Lorillard | 55 Laplandskii Zapovednik (Kola) |
| 25 Wager Bay | 56 Range of Forest Reindeer |
| 26 North Baffin Island | 57 Finland |
| 27 Northeast Baffin Island | 58 Norway |
| 28 Eastern Queen Elizabeth Islands | 59 Iceland |
| 29 Estburg Island | 60 Greenland |
| 30 Prince of Wales-Somerset-Boothia | 61 Greenland Feral Reindeer |
| 31 Western Queen Elizabeth Islands | 62 Range of Domestic Reindeer |