## THE NOW PROJECT

LIVING RESOURCES AND HUMAN SOCIETIES AROUND THE NORTH WATER IN THE THULE AREA, NW GREENLAND





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Annual Report 2016

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Font-page photo: *Flensing a narwhal*. Picture taken by GPS within the Piniariarneq project, described in the report. Courtesy of Mamarut Kristiansen

## PREFACE

This third report from the Now-project covers the calendar year 2016. It describes the major activities of the interdisciplinary team – field-investigations, analyses, collaborations, publications, and presentations. Emerging results are also presented.

During the year, we held a number of workshops for all team-members, covering a wide ground of shared interests and aiming towards a joint, interdisciplinary publication. In November 2016 we made a contract with the international journal *Ambio – A Journal of the Human Environment*, to publish a Special Issue on the North Water as we have come to understand its complex nature. The Special Issue is thoroughly interdisciplinary, engaging all team members in diverse groupings in all of the nine articles. Submission for review is in April 2017.

We also designed and planned an international and interdisciplinary symposium on the *North Water. The Entanglement of Ice, Animals and People in a High Arctic Oasis.* Experts on sea-ice cover and climate are here brought in to extend the discussion. It will take place in May 2017 in the Royal Danish Academy of Sciences and Letters, from where we have also received a substantial contribution.

As always, we are grateful to the Velux Foundations and the Carlsberg Foundation for funding our project, having made it possible to establish a shared field and to experiment with new collaborative avenues of knowledge-making. Of particular note in this report is the close collaboration with the hunters in mapping the living resources.

Kirsten Hastrup, PI Bjarne Grønnow, co-PI Anders Mosbech, co-PI March 2017

## ASPECTS OF PAST LIFE AT THE NORTH WATER

by Bjarne Grønnow, Anne Birgitte Gotfredsen, Mikkel Myrup & Martin Appelt



## 1. The Fieldwork.

The main purpose of our fieldwork in 2016 was to fill in knowledge gaps concerning historic and pre-historic walrus exploitation in the Wolstenholme Fjord-area. In 2015 we were not able to visit and investigate the primary walrus-hunting site in the area, Inersussat on the island of Appat (Saunders Island), due to bad weather conditions. Thus this site became the main target of our 2016 season.

We also incorporated registration of archaeological/historical sites in the inner part of the Wolstenholme Fjord in the fieldwork, as well as further investigations at the huge and complex Uummannaq site (Fig. 1). Here, the main task was to identify the fixed points in the survey grid established by Lauge Koch and Peter Freuchen in 1916 and based on this to correlate their feature numbers and descriptions with Erik Holtved's from 1937 and ours from 2016. These data provide a rare possibility to follow the topographical development of a focal archaeological and historical site through a century.



The fieldwork during the period July 19th to August 18th was carried out by Martin Appelt and Bjarne Grønnow from the National Museum, Anne Birgitte Gotfredsen from the Natural History Museum of Denmark and Mikkel Myrup from the Greenland National Museum and Archive. Thanks to the generous support of the Danish liaison officer, Kim M. Mikkelsen, Thule Air Base served as logistic hub, while we had our base camps on Umiivik (Appat) in the period July 27<sup>th</sup> – August 6th and in the mountains above Dundas, close to the Uummannaq site in the period August 7<sup>th</sup> – 3th.

#### Investigations at the Inersussat site: Drone survey and registration of features

The settlement area of Inersussat is situated on the south-west coast of Appat (Saunders Island) on a large plain of raised beach ridges, c. 750 m E – W and 350 m N – S, formed long before the period of human settlement in the Avanersuaq region. To the North the settlement area is delimited by the steep scree of the 300 m high plateau of the island (Fig. 2).

The area shows traces of 6 winter houses (turf and stone built), 72 tent rings, 9 shelters, 10 play houses, 109 meat caches, 65 human graves and several other features. All structures seem to have been constructed by people of the Thule culture, probably most of them date to the historic 19th – early 20th century Inughuit settlement, known from the 1903-visit by the Literary Greenland Expedition.



Fig. 2: The western part of the plain with the Inersussat settlement. A grave is seen in the foreground. To the south in the distance Wolstenholme Island appears. (Photo: BGR)

From this historical source we know that several winter houses at the site were destroyed by waves and swells in 1903, and since then erosion has continued. At least 6 – 8 meters of the exposed coast have disappeared in about a century. Only the back walls of a few houses are left, except a couple of high-lying complete house ruins. All features were described, photographed and their positions were determined by GPS (Fig. 3).

Flights with the fixed winged drone secured data for a detailed topographical map of the site including positions of all the features. Likewise flight with a rotor drone provided photos and films of the terrain and the features.

Fig. 3: Well preserved ruin of one of only two remaining winter houses on Inersussat (Feature no. 52). (Photo: BGR)



We know from historical sources that also many snow houses were erected on the site. But most of the features, that have left clear traces, are from spring-, summer and fall-settlements in the shape of tent rings and shelters. Moreover, the so-called 'mountain cabin' of the Literary Expedition, constructed by the members in fall 1903 at a plateau next to the steep river bed above the site, is very well preserved. The 'cabin' was photo-documented and surveyed by means of our drone (Fig. 4).



Inersussat archaeo-zoology: sampling of bone tissue from walrus crania.

The archaeo-zoological investigations at the Inersussat site, Appat, were planned to encompass two main activities 1) sampling from walrus (Odobenus rosmarus) mandibles for isotopic and aDNA studies and obtaining measurements of walrus mandibles on the site, measured with a digital caliber, in order to evaluate the sex distribution of the walruses hunted, 2) in situ surface registration of the bones on the soil-surface seen in relation to the archaeological features at the site.



 Cabin' are seen. (Photo: ABG)

 It was decided to focus on the numerous walrus skulls on the site instead of mandibles for sampling for

isotopic and aDNA studies. The zygomatic process of the right temporal bone was sawed, in order to ascertain that individuals were only sampled once (Fig. 5). This part of the skull has a bone structure of approximately the same bone density as the mandibles which originally were selected for sampling. Due to the relative low number of mandibles it was further decided to measure all, i.e., left as well as right, mandibles. The sampled skulls and mandibles were GPS positioned, photographed and after sampling placed back in their original in situ position.

#### Sampling of walrus bone samples.

Sampling of walrus bone samples were carried out from east towards west starting at the hunters' cabin. For each sample the skull was GPS positioned (with a Garmin handheld GPS monitor), photographed, furthermore the ontogenetic stage i.e., whether the cranial sutures were fused, weathering stage, coverage with lichens and butchery traces, such as chop and cut marks, were recorded. The samples were labelled INW sample001 etc. In total 58 bone samples were collected 51 from skulls (48 dextra; 3 sinistra) and seven from mandibles (Fig. 6). Furthermore ten complete or semi-complete mandibles were collected and shipped to Denmark. The collected walrus bone samples and mandibles are currently stored in a freezer at the Natural History Museum of Denmark, University of Copenhagen.



Fig 6: Three walrus mandibles in situ in feature INA010. The mandibles INW sample 062, 063 & 064 were subsequently measured and sampled for future isotope and aDNA analyses. (Photo: ABG)

In situ surface registration of bones and their relation to features.

In order most efficiently to record the faunal material lying on the surface or partly covered by vegetation a registration method developed during the GeoArk-project in Northeast Greenland (Gotfredsen 2010: 178) was applied. The animal bones were linked to archaeological features with position (N, S, E & W) and distance to feature in question and recorded at sheets, selected bones were photographed. Parameters such as taxon, skeletal element, bone fragment type, ontogenetic age i.e., fusion stage of the bone,

weathering and clear butchery traces were recorded. Due to adverse weather conditions the period used for in situ surface registrations were restricted to c. two and a half working day resulting in a rather restricted number of recorded bones. However, the results are still suitable for comparisons with other walrus hunting sites surveyed in the same way such as Walrus Island, Northeast Greenland (Gotfredsen 2010; Grønnow et al. 2011) and the Nuulliit, Area 4 (Grønnow et al. 2015).

Sites on Umiivik (Appat), Qeqertaarsuit (Manson Islands) and Ulli, Wolstenholme Fjord. Our base camp at Appat was due to protection from swells established at the easternmost tip of Appat, Umiivik, on the lowermost of a series of beach terraces and storm ridges. Here a few stone built structures (including a couple of graves) were registered along with quite recent ('Moriusaq-phase') traces of tents and meat caches.

Later, during our stay at Uummannaq the team made a trip to the site of Paattorfiarsuk at the larger of the small Manson Islands (Qeqertaarsuit). Here we registered comprehensive traces of inughuit settlement both pre-historic and historic (the 1962-64 'forerunner' of Moriusaq). The eastern part of the island had housed a spring/summer-settlement, now showing traces of at least 30 tent rings and 100 meat caches. The remains of seven wooden houses from the early 1960s with insulating turf walls are found along the south coast (Fig. 7), and further west about 10 ruins of early historic turf houses as well as tent rings and big meat caches are situated.

The archaeo-zoological survey at the Manson Øer encompassed test digging in front of the few remaining Thule winter turf houses, which had not yet been eroded by the severe coastal erosion observed on the site. A single house ØSE018 yielded no finds whereas ØSE022 and ØSE029 provided well-preserved bone material. The in situ surface registrations were due to the short duration of the visit concentrated on the area in between the Thule winter houses. Furthermore a survey of the animal bones to give an indication of the species present and a rough estimate of abundance in the activity area in the area of the huts and cabins

were made.



Fig. 7: Remains of the former settlement, Paattorfiarsuk, on Qeqertaarsuit (Manson Island). (Photo: BGR)

Ulli on the south coast of the inner Wolstenholme Fjord was visited by the team as well. The site is known from Lauge Koch's records as a winter settlement with remains of three winter houses, but our registrations revealed many more features. Since Koch's visit in 1916 another winter house has been added, and we recorded several tent rings (12) and caches at the beach south of the houses. However, the most important new observation is the presence of c. 40 meat caches, often with large, firmly constructed chambers on the western slope of the low ridge above the site (Fig. 8). Some chambers are no less than 3 m long and most of them if not all must have been used for storage of large meat packages of beluga and/or narwhal as the registered bone materials also indicate. There are no ethnographic or ethno-historical records of large scale hunting of beluga or narwhal in the inner part of Wolstenholme Fjord, so this new archaeological observation at Ulli adds important new information on past resource spaces of the longhuit and their predecessors.

The archaeo-zoological survey at Ulli comprised test digging in front of two Thule winter turf houses resulting in a few well-preserved animal bones in front of Ulli001 and few poorly preserved bones in front of Ulli002. In situ registration of mainly very massive meat caches was further carried out. More than half of the recorded bones were from either narwhal (Monodon monoceros) or beluga whale (Delphinapterus leucas). This pattern contrasted the situation at the Inersussat site on Appat completely dominated by walrus bones and paucity of monodontid whales.



Fig. 8: At Ulli about 40 large caches, probably for beluga and/or narwhal meat and blubber, were located on a ridge above winter houses and tent rings. (Photo: ABG)

## The Koch/Freuchen map on the Uummannaq site and registrations on Ipiutaq

In 2015 the geologist Peter Dawes kindly provided us with copies of a suite of maps made by Lauge Koch when he and Peter Freuchen surveyed the entire Uummannaq site in 1916. The associated notebook is archived at the National Museum. Thus, for the first time it was possible to combine the features listed in the book with the Koch/Freuchen map sheets (6 sheets) showing fixed points from the triangulation process and all turf- and stone-built features at the site (except for one or two missing sheets covering the westernmost part of the site) and ultimately make a detailed picture of the large Uummannaq site as it appeared in August 1916. Moreover, Koch and Freuchen had noted the name of the hunting families living in the tents at the site. In order to identify these tents among the plenty archaeological features seen at the site today, we invested some days in 'decoding' the Koch/Freuchen map with the additional goal to correlate this early map with Erik Holtved's survey from 1937, covering the central area with Thule culture winter house ruins, and our own drone-based survey from 2015. It took some time and a lot of walking with the GPS to identify the positions of

Koch's fixed points (A – N) – the starting point of his triangulations – but when this was completed (except for A and B which are on the missing sheets), we managed to correlate most feature numbers and identify the tent rings of the named families from 1916. This process also demonstrated that much had happened during the period from 1916 to the forced abandonment of the site in 1953. With tis survey we have taken important steps towards an understanding of the 'anatomy' of one of the largest archaeological sites in Greenland. Finally, it must be mentioned that the grave of the famed hunter Meqqusaaq (the last of the immigrants from Canada in 1864) was identified due to our work with the Koch/Freuchen map (Fig. 9).



Fig. 9: The chamber grave of Meqqusaaq (c. 1914), Koch/Freuchen no. 193, and Fixed Point M, overlooking the eastern part of Uummannaq. (Photo: BGR)

The team also managed to record and briefly describe the features at the Ipiutaq peninsula north of the site. In the summer this low peninsula is accessible by foot from Uummannaq at low tide. Most important, the 'larder' of the site seems to be here. No less than 23 meat caches, some quite recent, were recorded. Fifteen tent rings and some play-houses showed that Ipiutaq also was a warm season site.

Human and animal bones of a few selected features at Ipiutaq were in situ surface registered, and some were photographed. The bones on the surface at the Ipiutaq peninsula were mostly very corroded and weathered and any further archaeo-zoological investigations on the site therefore were not carried out.

## Other surveys at Uummannaq

The fenced Christian graveyard on the headland is situated above the site area to the east. In fact, quite close to the slope and scree with many pre-Christian chamber graves facing the bay to the east. We recorded the positions of the graves, their state of preservation and photo-documented the entire graveyard. Likewise, we located and documented a small group of probably 'early Christian' graves (nine graves estimated to date to c. 1925) situated not far from the preserved historic turf house at the site (Feature 14 on the topographical map base on drone-surveys by the NOW-team in 2015 – see NOW Annual Report 2015). Finally, in a small bay east of the main site at Uummannaq we documented a site with remains of two old winter houses, the one partly destroyed due to construction of a gravel platform in front of a recent cabin.

#### Summary of the results of the fieldwork, 2016

The 2016 field season yielded important data and observations in relation to the research topics of the NOW project. First and foremost, we can throw new light on the exploitation of walrus in the Wolstenholme Fjord area. For the first time the most important walrus-hunting site in the area, Inersussat on Appat (Saunders Island) was documented both archaeologically and via recordings of walrus remains at the site surface. This site was in a way a 'forerunner' of the historic Uummannaq site on the mainland, and through our subsequent investigations at that site – identification of remains of dwellings and graves and comparisons between maps from 1916, 1937 and 2015 – we are now able to study the dynamics in settlement patterns and utilization of living resources in the historically central part of the Thule district. In line with this we recorded interesting sites in the central part of the fjord (on Manson Island) and in the inner fjord (Ulli), the last site with new information on the importance of beluga/narwhal hunt in prehistoric times.

## 2. Analyses of the finds

During 2016 the archaeological finds and faunal remains excavated in 2015 on Nuulliit and Uummannaq were prepared for analysis. The finds were preserved, documented and numbered and samples were

prepared and submitted to the AMS-dating lab at the University of Aarhus. AMS-dates of four samples of terrestrial materials (caribou bone/antler) from our excavations of the activity area in front of Ruin 30 (the qassi) at Nuulliit yielded absolute dates that places the activities to a probably brief period within the time span of c. 1275 – 1395 AD (i.e. the 14th century). Due to a wiggle on the calibration curve it is regrettably not possible to calibrate the dates with more accuracy. AMS dating of the bowhead whale calvarium on the surface close to the ruin yielded an AMS date that, when corrected for marine reservoir effect, places it roughly within the time range of the time frame of the qassi-workshop area. AMS dates were also made on two samples from the small test excavation, we made at the Uummannaq site in 2015. These dates fall, like the ones from Nuulliit, within the 14th century (c. 1299 – 1410 AD). Thus, the two sites were probably established by groups of the late Ruin Island phase. Analyses of the Ruin 30 at Nuulliit and the find materials formed the basis of Asta Mønsted's master thesis, defended in fall 2016.

## Settlement patterns and hunting strategies

Further compilation of archaeological and historical data was carried out and this led to analyses of prehistoric and historic settlement patterns in Avanersuaq. Subsequently a paper on settlement patterns and hunting strategies during the Thule Station Period (1910 – 1953) was published in the journal *Arctic*.

#### Archaeo-zoological analyses

The identification and analyses of the faunal material of the Nuulliit and Uummanaq sites excavated during the 2015 field campaign has now been completed. From the Uummannaq site four square meters of midden in front of House 5 (Holtved 1944) resulted in a faunal sample of 715 specimens providing at least ten identified species comprising two bird species and eight mammal species. The comprehensive and well preserved bone assemblage from Nuulliit retrieved in front House 30, the men's house (qassi), (Holtved 1954: 38-40) amounted to 11,293 specimens. About 1,500 bones could be identified to species and bone element providing a species list of at least 17 species with seven bird species and ten mammalian species. The ringed seal (Phoca hispida) was the most frequent species, as counted by bone fragments, followed by walrus and bearded seal (Erignathus barbatus), whereas caribou (Rangifer tarandus), arctic fox (Alopex lagopus) and arctic hare (Lepus arcticus) occurred in trace amounts. Birds such as Brünnich's guillemot (Uria lomvia), little auk (Alle alle), northern fulmar (Fulmarus glacialis) and eider ducks (Somateria mollissima/ spectabilis) were exploited, too. However, the vast majority of the bone debris comprised of waste material from production processes (débitage), blanks of walrus tusk as well as a smaller amount of narwhal tusk and blanks and flakes from whalebone (Fig. 10 and Fig. 11). Also contributing to the raw material for tool production a large number of large baleen fragments from bowhead whale were identified.



The in situ surface registrations of the 2015 field campaign at Nuulliit primarily from the modern "Moriusaq" phase and the registrations obtained during the 2016 field campaign of the historical Inersussat site have now been data processed. Thus the compilation of archaeo-zoological data from the study area has been completed and will form the basis of the scientific publications. Such information on the species distribution,

demographic distribution of the game animals and seasonal exploitation patterns, seen in a historical and

ethnographic frame, will further contribute to the long-term perspective central to the NOW Project.



## 3. Perspectives on collaboration

The comprehensive archaeological and faunal material from the midden of House 30 at Nuulliit holds a great potential for further specialist studies of utilization of raw materials and repair techniques of tools of the early Thule Culture immigrants. Collaboration with post doc and specialist in tool materials of Inuit cultures, Claire Houmard, CNRS, Université Paris-Ouest – Nanterre, will be conducted starting in the first half of 2017. In autumn 2016, collaboration with a new project was initiated. The project is under the MC ArchSci2020 scheme and aims to investigate the effect of human-environmental factors on gene flow, adaptive traits and genetic diversity in walruses by the means of aDNA studies. The project is a joint venture between Peter D. Jordan, University of Groningen and Morten Tange Olsen, Natural History Museum of Denmark together with Ph.D. student Xénia Weber. This project aims at gathering information on the Atlantic walrus within its present and prehistoric distribution including possible human influence on walrus populations, thus building on knowledge gained during the NOW Project. The first three walrus samples collected at Inersussat, Appat, are currently being processed in laboratory at the Natural History Museum of Denmark. Further samples of the surface sampled historical assemblages as well as the prehistorical assemblages of Nuulliit and Uummannaq will be included in the palaeogenetic studies. The collected samples henceforth will eventually contribute to the understanding of the genetic makeup of the walrus, one of the key-species of the NOW Project.

Fig. 12: The front page of the popular guide to Uummannaq. Results of the NOW-project were presented by Bjarne Grønnow at an international workshop at the University of Tromsø in April, 2016. The workshop has led to the formation of a network dealing with interdisciplinary research on well-preserved arctic archaeological sites (Joint Proxies Network).

Based on our surveys in 2015 and supplemented with the observations from 2016 we have produced a



popular guide to the Uummannaq site. An eight page folder including a detailed map describes two tours, which take the visitors to the most informative areas and ruins at the large site. At present the folder is published in Danish and is distributed electronically and in 'hard copy' by the Knud Rasmussen Community Centre at Thule Air Base, but it is the plan to make an English as well as a Greenlandic version of the folder. This is one step towards placing the Uummannaq site once again as the focal site in the history of the Avanersuaq region (Fig. 12).

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## 1. Fieldwork

2016 saw a short field season for the freshwater and palaeo-record team in McCormack fjord north of Qaanaaq in collaboration with the Arctic Research Centre (ARC). Sediment cores from non-bird catchments were collected and lakes were sampled. A single core has been selected for analysis and samples have been taken for 14C-dates to establish a chronology. This core has also been XRF scanned and is currently being analysed for algal pigment composition, and 15N and 13C isotopes.

The contaminant group also had a short field season around Qaanaaq in 2016. During May, ringed seals and glaucous gulls were collected as a joint effort with the AMAP-CORE programme. In ultimo August-primo September, samples from the 2015-16 year-round hair study were collected from the Qaanaaq hunters as well as from their dogs. In addition, sampling of muskoxen and caribou, capelins and chars was conducted. This visit also served to start up the 2016-17 winter sampling of walrus, narwhal, bearded seal, muskoxen, caribou and a long list of fish species. As samples from harp and hooded seals proved difficult to obtain in

the region, such samples (n = 18 + 18) were obtained from Gary Stenson, Fisheries and Oceans, St. Johns, Canada, as seals sampled by his group in Davis Strait migrate to the North Water region.

The seabird group had planned to spend the summer of 2016 with implanting satellite transmitters in common eiders in Wolstenholme Fjord to track their year round movements, investigate foraging behaviour and identify important foraging areas in NOW. Further, it was the plan to collect data from the year-round photo monitoring boxes installed in little auk and thick-billed murre colonies in 2015. However, satellite transmitters with dive sensors, which are crucial for identifying foraging behaviour, could not be manufactured in time, and it was thus decided to postpone the fieldwork to the summer of 2017.

## 2. Analyses and preliminary results

#### Radiocarbon dating of sediment cores

The radiocarbon dating of the lake sediment and peat cores collected in 2014 and 2015 is complete. The dates and the age modelling suggest that the different species of seabirds have distinct histories of occupation in the NOW area (Fig. 1). Dates from the peat deposits in a common eider colony at Three Sister Bees suggest that the colony is at least 5500 years old (calibrated radiocarbon years before present; cal. years BP). The peat core from Saunders Island shows that the large thick-billed murre colony here is at least 5600 years old (cal. years BP). For the little auk, we have a range of dates from different locations. At Kuukkat and Paakitsoq, peat cores give an oldest date of circa 2200 cal. years BP, but it is likely that these two cores do not capture the earliest peat formation in the colonies. Thus, the peat cores and lake cores from Annikitsoq (in earlier reports referred to as Great Lake) give a date of circa 4200 cal. years BP for the arrival of the little auk at the location. The lake and peat cores from Annikitsoq show very good agreement on the timing of the beginning of seabird influence in the catchment. Further southeast, at Salve Ø, the lake sediment core indicates that the little auk arrived around 3900 cal. years BP. The lake cores provide an unequivocal marker of the arrival point of the little auk in the form of a large change in  $\overline{\mathbf{\delta}}$  15N and a large

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increase in organic and nitrogen content in the sediment (Fig 2). Peat cores provide more equivocal dates for colony origin as peat accumulation patterns are more complex. There is no transition point, because peat is not formed before the arrival of birds. This means that we have to reach the earliest peat deposits at the localities to establish the arrival time of the birds, and in some cases we cannot be certain to have captured the whole peat sequence.

A summary of the data from the different locations suggest that the little auk arrived in the NOW region around 4200 cal. years BP. This is coincident with the start of the Neoglacial cooling at the end of the Holocene Climate Optimum, when the climate cooled, and it appears to be a time of change across the Arctic and the NOW area in particular. These results are currently being written up as a contribution the special issue of AMBIO reporting on the results on the NOW project.

## 3. On-going analyses of sediment cores

On-going analyses of the sediment cores include:

- Metal concentrations in the peat cores using ICPMS.
- Mercury analysis of the high-resolution lake sediment cores which cover the last few hundred years (and thus the Industrialization).
- Pigment analysis of long cores from both bird-affected and non-affected sites
- Analyses of fecal sterols in the long sediment cores NOW5a and NOW25c.

The aim of these latter analyses is to attempt to reconstruct changes in bird density in the breeding colonies since their arrival circa 4200 years BP.



Figure 1. NOW region and the oldest dates from the sampled seabird colonies. Thick-billed murre and common eider colonies in blue, presumed puffin colony from Carey Islands in brown (Bennike et al 2008) and little auk colonies in red. Dates are in calibrated radiocarbon years BP



Figure 2. NOW5a sediment core from Salve Ø. The selected parameters clearly show the point of bird arrival, dated to c. 3900 cal. years BP.

## 4. Mercury/contaminant analyses

Seabirds collected during summer 2015 were dissected during spring 2016. Some samples were stored for analysis at the AU lab, while other samples were transferred to University of La Rachelle for analyses and comparisons with a large seabird programme covering the entire North Atlantic.

ICPMS analyses, including mercury and selenium, were conducted for narwhals, little auks, thick-billed murres, glaucous gulls, fulmars and black guillemots sampled in 2016. Likewise, harp and hooded seals were analysed for mercury and other metals and used together with the narwhal and seabird data for the AMAP effect assessment (Fig. 3).

Mercury analyses of Inuit hair are being re-analysed due to poor reproducibility in some of the double analyses. These analyses have revealed quite alarming patterns with mercury values in hairs of Inuit hunters up to 86 times higher than a Danish reference person during the time of the year, when narwhals are consumed (Fig. 4).



Figure 3. Figure showing the percentage of individual Arctic mammals sampled from 2000 to 2015 that are at risk to methylmercury contamination based total mercury concentrations in liver tissue using raw data. Species Hg concentrations are grouped into effect categories used for harp seals by Ronald et al. (1977). The figure ranks the species and regions from highest (top) to lowest (bottom) exposure



5. Analysis of seabird foraging patterns

In 2015, synoptically with GPS-tracking and food sampling of little auks, a large ship-based oceanographic survey was undertaken in Northern Baffin Bay and the North Water using M/V Ejnar Mikkelsen from the Danish Navy and R/V Sanna from the Greenland Institute of Natural Resources as platforms of observation. This survey involved investigation of physical oceanography, systematic sampling of zooplanktion at stations in a grid, and systematic counts of seabirds on transects between stations. The survey was designed to cover the foraging areas of little auks breeding along the shores of the North Water, and in particular the foraging areas used by birds tracked by GPS from Savissivik in 2014 and Annikitsoq in 2015. Thus, the survey provides a unique opportunity for understanding the foraging patterns of little auks in NOW in general, and particularly the foraging patterns revealed by the GPS-tracking. In 2016, much of the analytical work concerning seabirds has therefore been directed towards working up the data from the survey, and coupling the results from the GPS tracking and food sampling of little auks with these data.

As an example of this: The GPS-tracking from Annikitsoq in 2015 revealed that the little auks had a bi-modal foraging strategy and used two different foraging areas, a coastal area only 9 km from the colony (depth ca. 130 m) and an offshore area centred approx. 65 km from the colony (depth ca. 500 m). The sampling stations from the ship survey transect, crosscutting these foraging areas, indicates that the reason why the little auks travel all the way to the offshore foraging area, may be a higher concentration of large specimens of the copepod C. hyperboreus in this area (Fig. 5). It is clear that little auks are actively selecting the copepod C. hyperboreus when the chick meal samples from the colony are compared with the zooplankton samples from the sampling stations at sea. The composition of the chick meal samples is different from the zooplanktion community within the foraging and diving range (0-50 m) of the little auks. Thus, the little auks are highly selective, focussing on copepods in the size range 3-5 mm, in particular C. hyperboreus (Fig. 6)





Figure 6. Relative abundance of zooplankton species in little auk chick meal samples from Annikitsoq (black bars) compared to the relative abundance of zooplankton > 1mm sampled in the upper 50 m of the water column at the nine sampling stations crosscutting the foraging areas (red bars).

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## ASPECTS OF CONTEMPORARY LIFE AT THE NORTH WATER



## 1. General introduction (by Kirsten Hastrup)

For the anthropological team, most practical and analytical efforts were centred on the collaboration with biologists and hunters in the Thule area, within the Piniariarneq-project, richly described below. The main conceptual challenge in this project is to make the qualitative material and quantitative data truly meet; this is discussed in the reports given. While conceptually challenging, the added value of the meeting of two modes of thought emerges on both sides of the equation.

In addition to this project, the anthropologists have continued analysis of field observations from all seasons, leading to both popular dissemination and scholarly publications (see lists at the end of the report). While the NOW-project has focussed on two key-species for in-depth analysis, little auk and walrus, the anthropological perspective naturally embraces all species of economical importance in the region. Clearly, the hunting community needs to pay attention to all possible resources at any given season. One of them is the Arctic char, which seems to fall out even of the hunters' own recordings of their catch. We can see how they have their own key-species – constitutive of their hunting selves. This will be further discussed in the *Ambio Special Issue* mentioned in the preface to this report.



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## 2. Piniariarneq: A one-year study, and creating new dialogues

by Janne Flora and Astrid Oberborbeck Andersen

In May and June 2016 Janne Flora and Astrid O. Andersen returned to the North Water area to finalize the collaborative data-collection project called *Piniariarneq* (Hunting trip). This research initiative is interdisciplinary in that it gathers vocational hunters from Qaanaaq and Savissivik, biologists and anthropologists from the NOW-Project, in a collective effort to map the seasonal rhythms and resource spaces of hunters in the North Water area. Using a custom made application (*Piniariarneq*) installed on handheld GPS devices, the hunters tracked their hunting routes over 12 months. In addition, they recorded the animals they observed and caught, and captured anything else they found relevant through photography and video. Initially 13 GPS devices were distributed among hunters in Qaanaaq and Savissivik in May 2015. Due to considerable interest among additional hunters to join, another 6 GPS units were distributed in the following months. The data material gathered over 12 months, which consisted of an impressive amount of registrations, videos and photos, routes, waypoints, and notes, was both unique and surprising (<u>Andersen</u>, <u>Flora</u>, Johansen 2017).

We returned to the region in 2016 with a view to finalize the project: to gather the last data so as to have a complete 12 month cycle, and to collect the GPS units. More significantly, we intended to have meetings with the collaborating hunters, and our contact persons in Qaanaaq – a faithful and ever-enthusiastic translator, and a diligent database manager and data-collector. We also wanted to present the project and its preliminary findings at public meetings in Savissivik and Qaanaaq, at which we would invite discussion and suggestions for further development.

The meeting in Savissivik, a settlement of some 40 inhabitants, was attended by three hunters, a hunter's wife with two children, a retired schoolteacher, and a handful of children. This meeting gave rise to a

conversation about the differences between Savissivik and Qaanaaq in terms of the kinds of animals that are

observed and caught in the respective places.



Fig 2.: Public meeting held in Qaanaaq June 9<sup>th</sup>, 2016. Photograph taken by a meeting attendee, with "GPS 16" that had been circulated among the attendees.

> The difference relates partly to the fact that the distribution of species is not universal, and partly to the fact that the two places are allocated different quota populations of some animal species; e.g. narwhal and polar bear. Moreover, the absence of a halibut production factory in Savissivik, means that hunters here do not engage in seasonal semi-commercial halibut fisheries as they do in Qaanaaq.

> The public meeting in Qaanaaq was enthusiastically attended by some of the occupational hunters, and especially by those who were not themselves directly engaged in hunting: women, children, retired hunters, and the young. Our presentation of the preliminary results: the maps and figures, as well as the photographs and videos recorded by the hunters, spurred a rich dialogue about the current changes in the landscape and modes of life in and around Qaanaaq. Some hunters were concerned about the future economic security of occupational hunting; and what this might mean for the purpose and future for human life in the region. Others were concerned about the impact quota restrictions of certain game species might have on

health status and life style illnesses in families whose food primarily came from imported foods. Some also noted the attention the region was receiving from the international community on a geopolitical scale, and were concerned about their own voices being drowned out. The attendees made it expressly palpable that this kind of dialogue about the way knowledge is produced and used is necessary and highly appreciated (fig. 2).

This 12-month collaborative pilot project has made the activities of people inhabiting the region visible in a new and systematised way. The material is not only unique, it is also timely and highly relevant, given the increased geopolitical interest in the region, with the polar sea opening up and the arrival of new shipping routes. Coupled with the intensified search for oil and mineral resources, and the vision to make the North Water Polynya a protected area, it is safe to say that the changes that are currently going on, already impact the livelihoods of people in this region. *Piniariarneq* holds great potential for opening up dialogue between different resource stakeholders in the region.

*Piniariarneq* could be employed as a tool, allowing hunters to bring their profound knowledge of resource spaces to forums of resource managers who rely almost exclusively on biological data. In order to meet this challenge, the research team behind the *Piniariarneq* project submitted a proposal to the Danish Ministry of Higher Education and Science (Forsknings- og Undervisningsministeriets Udlodningsmidler). We proposed to gather different stakeholders of natural resource management in Greenland, and present to them *Piniariarneq* as a tool for integrating different kinds of knowledge and viewpoints. In this way, we sought to create a space for dialogue between parties with different interests in wildlife management and usage of wild life and natural resources in Greenland: hunters from the GPS project, scientists from different disciplines and institutions, NGOs, and representatives from the Greenlandic Government. In June 2016, we received positive response to our application, and we began planning our meetings in Nuuk, which took place in January 2017. (See web-page NOW.ku.dk)

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## References

Andersen, A.O., J. K. Flora & K. L. Johansen. 2017. Piniariarneq: From interdisciplinary research towards a

new resource management. University of Copenhagen and Aarhus University, 60 pages

## 3. From data to findings: Validating interdisciplinary data in Piniariarneq

by Astrid Oberborbeck Andersen, Janne Flora & Kasper Lambert Johansen

When working across disciplines, collaboration implies that disparate modes of posing questions, of generating data, of systematizing and handling data, and of thinking somehow come together. Since what counts as 'data' in the different disciplines in the first place is not straightforward, the processes of validating interdisciplinary data sets cannot be straightforward either. In this reflection-piece we attend to the processes of data analysis and validation, which convert data into findings in a post-fieldwork interdisciplinary setting.

After completing the one-year *Piniariarneq* field-stage in May 2016 (Piniariarneq I) we (the authors) had gathered a big and complex portion of heterogeneous data that consisted of waypoints, tracks, registrations of animal observations and catches, photographs and videos. The data had made it safely from northwest Greenland to Copenhagen – though not without complications. The task was now to validate the data and begin to make sense of it across different scientific disciplines as well as the participating occupational hunters who had entered the project as partners. The challenge was to allow for all participants to partake in the validation and analysis, and so allow the results to talk to everyone's knowledge regimes and interests.

The raw data was dispersed across 49 separate databases and 22 folders holding a total of 2729 photographs and 210 video-recordings. K. Johansen, the team's GIS and database expert, merged the separate databases into one single database in July 2016, and gave the data a format with which everyone could work systematically.

According to the ESRI's GIS dictionary, validation of GIS data is "the process, using formal methods, of evaluating the integrity and correctness of data or a measurement". In the case of the *Piniariarneq* data set, the correctness related amongst other things to confirming the number of animal sightings and catches reported by the 17 GPSes, and determining the exact beginning and end of each tracked route. This evaluation corresponded to the particular interest of the NOW-Project in mapping the resource spaces and

seasonal rhythms of hunters. Beyond that, each of the collaborating disciplines had their own visions for the data, such as for instance the biological curiosity about the cost-benefits of hunting activities in the NOW region in this era of climate change and an interest in making visible areas of importance to the local communities; or the anthropological hope that the data would allow for a new kind of dialogue with other disciplines for whom the anthropological insights are sometimes irrelevant or intangible. The hunters in turn, saw the GPS as a tool that could be used to more successfully map their own knowledge and usage of the landscape, and thus strengthen their arguments in the endeavour to renegotiate hunting quotas on certain animal species. The validation was thus also a process of revealing what kinds of results the data would make possible.

Keeping these disparate knowledge interests in mind, Johansen created a table in which the anthropologist were to verify the data gathered; he ordered the photographs, gave each photo a unique name, that corresponded to each registration in the table. On August 11, 2016, Johansen sent an email called 'data-validation', containing six excel sheets and detailed instructions to Flora and Andersen (the anthropologists) of how to execute the validation of data.

#### Principles for validation of our data

The anthropologists were to check all photographs against the registrations of animal sightings or catches so as to obtain a more complete and accurate number of catches or observations of any given animal species. Data was sorted in columns by GPS device, date, and time. One important instruction from Johansen read: *"You are welcome to sort the data in a different way, but remember to sort all columns simultaneously. If you sort one column independently from the others, you will destroy the data set!* (our emphasis)". Another instruction read: *"Don't guess – only write numbers to the extent that you are certain about them."* To the anthropologists who rarely talk about their 'empirical material' as 'data', this modality of assessing and handling data was unfamiliar and disconcerting. To them, the process at first appeared like a reduction of a way of life that wasn't reducible to a spreadsheet. Although anthropological practices and processes of

validation also concern the integrity of the ethnographic material, it is nigh impossible to validate the *accuracy* of, say, an observed social situation, or what might lie behind a person's actions or statements. The risk of destroying an entire data set was new to the anthropologists, and did not make validation less disconcerting. After further instructions, validation began:

Example 1: Hunter X registers a catch of 1000 narwhals in February in an area of solid fast-ice. Although completely improbable, this registration is not deleted. Rather, the registration is flagged as 'unrealistic' in a special column in the sheet, and in the analysis of spatial and temporal patterns in narwhal hunting, the flagged registration, and others like it, are excluded.

Example 2: The raw data set contained only very few registrations of halibut, thus giving the impression that the hunters had scarcely caught any halibut at all. The photographs however, revealed many instances, where halibut were caught by longline and stacked neatly on the sea-ice. Hence, one time-consuming validation activity was to examine all photographs, count, and note down the amount of halibut visible in the photographs, as well as other catches only documented in the photos.

VAL_PicCategory	VAL_KillObs_Species	VAL_Obs_NoObserved	VAL_Kill_NoBagged	VAL_Kill_NoLost	VAL_FlaginterestingPic	VAL_PicNote	KillObsNo	FileName
					confirmation dinner			GPS08_VID_20150705_194834.mp4
					confirmation last dance - private			GPS08_VID_20150705_220618.mp4
kill	narwhal		1		harpooned narwhal		2025	GPS08_VID_20150802_112101.mp4
					summer atmosphere			GPS08_VID_20150819_074118.mp4
					hunters sleeping in hunters cabin			GPS08_VID_20150928_060414.mp4
kill	caribou		1-2?		boating with catch, caribou		2026	GPS08_VID_20150929_154617.mp4
					boating with catch, caribou			GPS08_VID_20150929_154631.mp4
observation	TB Murre		?		bird nesting cliff		2027	GPS09_VID_20150717_235744.mp4
					talking about boats at gegertat and narwhal hunters			GPS09_VID_20150824_150812.mp4
kill	polar bear		1		2-3 hunters catch polar bear, GPS arrives and films		2028	GPS09_VID_20151005_153406.mp4
kill	beluga		2		two beluga dragged by boat		2029	GPS09_VID_20151012_185824.mp4
					mistake			GPS09_VID_20151012_185903.mp4
					mistake			GPS09_VID_20151012_185907.mp4
kill	walrus		2		two walruses dragged by boat		2030	GPS09_VID_20151016_153859.mp4
					inside halibut fishing cabin, funny			GPS09_VID_20160423_231116.mp4
					chinese divers, ice edge			GPS09_VID_20160527_123443.mp4
					chinese divers, ice edge			GPS09_VID_20160527_123553.mp4
					chinese divers, ice edge			GPS09_VID_20160527_123626.mp4
					hunters on sledge, talking, parody, funny			GPS10_VID_20150621_155701.mp4
					5th march, ice edge, dispersed sledges/tents, something has been caught - what?			GPS10_VID_20160305_151405.mp4
					upside down video			GPS11_VID_20000101_211040.mp4
					halibut fishing camp, upside down video			GPS11_VID_20000102_205256.mp4
					dog sledge travel			GPS11_VID_20000105_014553.mp4
					boat on siedge, working on motor			GPS11_VID_20000105_023318.mp4
kill	TB Murre		4		TB Murre caught in net by ice edge - accidental kill?		2031	GPS11_VID_20000107_005821.mp4
					camp atmosphere, upside down video			GPS11_VID_20150619_074941.mp4
					river delta, camp, upside down video			GPS11_VID_20150712_062630.mp4
kill	ringed seal		1		camp, science tent, catch on land, summer evening, partners, generations		2032	GPS11_VID_20150809_102130.mp4
					test			GPS11_VID_20150809_191756.mp4
					boating, sideways			GPS11_VID_20150809_191802.mp4
kill	ringed seal		1		making avataq			GPS11_VID_20150816_195622.mp4
					eating in boat, couldn't catch narwhal, annoyed with himself			GPS11_VID_20150817_120233.mp4
					narwhals are out there, they're waiting till they return			GPS11_VID_20150817_120419.mp4
					who are these people? Scientists or tourists disturbing the hunt			GPS11_VID_20150821_171646.mp4
					who are these people? Scientists or tourists disturbing the hunt			GPS11_VID_20150821_171710.mp4
					mistake			GPS11 VID 20151007 140057.mp4

Fig. 3: Screenshot validation sheet. The sheet, filled out by anthropologists, shows the difficulty these researchers have in keeping their description of photos in words that only classify and don't describe.

At the face of things, the validation seemed like a violent act of reductionism, which tormented the

anthropologists. The content of the data gave resistance to the square classifications and lines in the sheets,

and the many emails back and forth between Johansen, Flora and Andersen discussing how to make

classifications in different situations bear testimony to this. However, in fact the validation served to extend the data set, make it grow; it soon became a separate "layer" on top of the raw data, so to speak: *"The raw data is inviolable; you must always be able to go back at the original registration that the hunter actually made"* (Johansen in an e-mail). None of the raw data were deleted or changed. The raw data set was kept intact with all of its complexity, and the validated data constituted merely an extract or extension, still explicitly referenced to the raw data but tailored to address specific questions of the NOW project; those of mapping resource spaces and seasonal rhythms. This was part of an interdisciplinary data-handling strategy; one that takes into consideration those different disciplines of the collaboration might be interested in extracting and elaborating different things. While requiring a rather complex database design, it ensures that other sub-sets of data, addressing new questions from other perspectives, are always possible.

#### Validating data with hunters

Another kind of validation, along a third register, took place in May 2016, when the anthropologists engaged the participating hunters in conversation about the data set.

While showing maps that illustrate the traffic intensity in the area during the different months of the year, one hunter raised his hand. He pointed to November-December, which showed very little travel activity, and asked: "So what does this tell you?". A little puzzled by the examination-like style of the question, Flora attempted an answer: The map shows that November and December are quiet months, with little hunting activity, perhaps because the sea ice has not settled yet. The answer was translated - the hunter nodded saying: "I wanted to know whether you understood."

The situation shows that the participating hunters were also interested in validation. Rather than evaluating the quality of the data, the hunter was testing whether we had gotten the interpretation of data right. In a

sense, he was verifying the data - and validating our tools of analysis, our ability to see and comprehend why the data look the way they do (Flora and Andersen forthcoming).

#### Completion

In its entirety, the data set and its different layers, is full of excess, it makes a whole, of which the validated data makes an ordered and polished, elaborated dimension, to be used to answer specific questions. This validated data represents only one of the many potential layers that the entire Piniariarneq data set contains. It holds a broader range of data than we ever imagined it would. The data can tell us many different things about landscape or area use, or about hunting and livelihoods in the High Arctic. Finding out when, where and how to present different results based on data, are the steps that now follow, as we work on analyses in coming publications. And when doing this work, we include data and findings from all the different registers of data and validation. The aspects excluded from the validation chart described here, might find a central place in the analysis.

Aspects of the collaboration around the GPS project Piniariarneq are further described and reflected upon in a research article to be published in the journal Collaborative Anthropologies (Flora and Andersen forthcoming). Scientific results from the GPS project are presented and discussed in the article "Resource Spaces and Seasonal Rhythms: Present and Past Dynamics of Inughuit Hunting Practices" (Flora et al forthcoming) to be published in AMBIO.

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# 4. Completing Piniariarneq: Mapping human resource spaces and seasonal rhythms in the North Water

by Janne Flora, Astrid Oberborbeck Andersen, Kasper Lambert Johansen, Anders Mosbech & Mads Peter Heide-Jørgensen

Over the 12 months the hunters in Avanersuaq used *Piniariarneq*, more than 165,000 GPS positions from hunting trips were recorded. These span over a distance of 700 kilometres from around 73.5 N in northern Upernavik to around 78.5 N in Inglefield Land. The hunters have registered more than 850 individual catches and observations of animals, and more than 35 different animal species. Moreover, the hunters have documented their activities and wildlife in-situ by taking nearly 3000 geotagged photographs and videos.



Fig. 4: Map showing all GPS positions from hunting trips during the full year that the hunters in Avanersuaq have used **Piniariarneg**. The entire data set holds both quantitative and qualitative data about hunting practices and reveals how hunters orientate their movements and hunting in the NOW area; which areas are used when, and for what purpose. The data can be combined with a range of other data sets such as wildlife movements, or in-depth qualitative interviews with hunters, and allows for comparison with local surveys, and ethnographic descriptions from the past.



Figure 5. Map of all routes and registrations from Piniariarneq in Kangerlussuaq (Inglefield Bredning). Every dot represents an activity. Red dots are recordings of catches, blue dots are observations of animals, yellow dots are photographs, and the green dots are video films. Many of the dots overlap and thus the number of recordings is larger than the impression one gets from the map

In addition to synthesising analyses of the complete dataset, we can follow the individual hunters one-on-one on their hunting trips. Through tracking of their hunting trips, the registrations, notes, photographs and short video recordings, the hunters have documented their hunting lives in a broad sense. This qualitative documentation is in itself very important, because it reveals the clear and subtle differences between various hunters' practices, and reveals how hunting is not an unambiguous or unchanging activity, but a complex way of life that involves hunters and their families differently. Their rich documentation also accentuates the hunt and the hunters' economic, social, familial, and cultural entwinement with the entire society. From this perspective, sustainability is not just a term that is connected to hunting practices and the size of a given

animal population. Sustainability is also about the survival of human society.



Fig 5. This route from Savissivik illustrates a hunting trip that has offered an impressive catch and many animal observations. The route on the map shows how the hunter travels along the ice edge in search for narwhal. This is a kind of assessment of wildlife and hunting areas is one that the hunters necessarily undertake on their hunting trips. It contributes to the long-term and cumulative knowledge that makes hunters capable of making the right decisions at the right time.

This material also provides a unique opportunity for visualising and quantifying the hunters' land use through the changing seasons. Based on the density of routes, or density of route points, it is possible to identify important traffic corridors and the areas used most intensively. From the recorded catches and observations of animals, as well as the rich photo and video material, it is possible to specify exactly what is happening in the areas of intensive use. We can see what animals are caught where, how many, and which mode of transport or group constellation this exploitation pattern is based on. Similar to the ongoing endeavour of mapping important areas for Greenlandic wildlife, based on tracking of individual animals or making census counts from plane or ship, *Piniariarneq* makes it possible to map areas that are important to local hunting societies across the changing seasons of the year. This information is highly relevant to area management in a broad sense.



Fig. 7. The land use of the hunters in Kangerlussuaq (Inglefield Bredning) from July to September 2015. The colour in the background displays the "traffic intensity" of the hunters in the landscape (km track line per km2) on a scale from blue (low intensity), over yellow (intermediate intensity) to red (high intensity) and thereby the relative use of different areas. The dots indicate recorded catches and observations of animals. From the map it is evident that the inner part of Inglefield Bredning constitutes an extremely important area for the hunters during summer due to the narwhal hunt. It is also apparent that several rivers north of Qaanaaq are used for catching arctic char during the summer.

In the context of the NOW-project, data from *Piniariarneq* will play a central role in a paper called *Resource Spaces and Seasonal Rhythms: Present and Past Dynamics of Inughuit Hunting Practices*, which is currently under preparation for the special NOW-issue of AMBIO. Here it will serve as the basis for mapping contemporary human resource spaces and seasonal rhythm in the NOW; patterns which are then placed in a long-term perspective by analyses the historical and archaeological record. However, we also see much broader potential in *Piniariarneq*, for shaping how similar collaborative studies can be carried out in the future. *Piniariarneq* brings the knowledge of hunters and their perspective closer to a systematic data gathering in a way that benefits the efforts of both researchers and resource managers. *Piniariarneq* can thus be used as an integrative tool for creating dialogue about the value and use of ecosystems and living resources. It also makes it possible to map important areas of a local community in a way that allows for these to be integrated on an equal footing with the biological data in an ecosystem based approach to management. Finally, research into the consequences of climate change increasingly demands holistic approaches across disciplines and collaborators, who have not traditionally found mutual understanding. The gathering of the three disciplines (hunters, biologists and anthropologists) around one technology such as the GPS, is a new work method for all disciplines as well as for research in Greenland. These perspectives are discussed extensively in Andersen et al. (2017)

This text is abridged from the report (Available online at: http://now.ku.dk/documents/Rapport\_Tresprog\_FINAL\_WEB.pdf)

#### Reference

Andersen, A. O., J.K. Flora & K. L. Johansen (2017) *Piniariarneq: From interdisciplinary research towards a new resource management.* University of Copenhagen and Aarhus University. 60 Pages.

## PUBLIC DISSEMINATION

Several popular presentations on the archaeological aspects of the NOW-project were given in 2016, i.a. by Bjarne Grønnow in the series 'Vin og Videnskab' (Wine and Science) at the National Natural Historical Museum (Sept. 7th).

Also, a richly illustrated article appeared in the Greenlandic newspaper, Atuagagdliutit, - an interview with Asta Mønsted about her master thesis on the men's house (*qassi*) - in August 2016.

The Carlsberg Foundation website brought an interview with NOW-Project PI Kirsten Hastrup: Det store nord i forandring.

The Journal Polarfronten published an article about the NOW-project in February 2016, which also included photographs and videos from field activities: https://issuu.com/polarfronten/docs/polarfronten\_2\_2015

The science news website Videnskab.dk brought two articles related to the NOW-project: Global opvarmning giver Thules befolkning nye muligheder. An interview with NOW-Project PI Kirsten Hastrup in. And Forskningsprojekt bygger bro mellem forskere og grønlandske fangere: About the Piniariarneq GPS-project.

In April, Janne Flora and Astrid O. Andersen participated in an exhibition in the Ethnographic Exploratory (Dept. of Anthropology, University of Copenhagen), with material (photos and fieldnotes) from fieldwork in the NOW area.

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## PRESENTATIONS:

Anders Mosbech, Kasper Johansen, Eva Friis Møller & Peter Lyngs: Foraging strategy of little auks during chick rearing in northwest Greenland. Presentation at the 13th International Seabird Group Conference, Edinburg September 2016.

On November 28<sup>th</sup>, NOW-researchers Martin Appelt, Anne Birgitte Gotfredsen, Mads Peter Heide-Jørgensen and Astrid O. Andersen presented short papers about their work at the Walrus Research Day, organized by Xenia Weber and Morten Tang Olsen at the Natural History Museum of Denmark, University of Copenhagen.

Anders Mosbech, Panellist in theme session: The Arctic as a Hot Topic. And presentation: *Arctic Change, the Global and the Local Greenland Environmental Perspective*. European Science Open Forum, Manchester July 2016.

Thomas A Davidson, Ivan González-Bergonzoni, Kasper Johansen, Anders Mosbech, Erik Jeppesen. *Small birds, big effects: the little auk transforms high arctic ecosystems*. Arctic Research Centre, Annual meeting, Sandbjerg Nov 23rd, 2016

Ivan González-Bergonzoni, Kasper Johansen, Anders Mosbech, Erik Jeppesen & Thomas A Davidson. *Seabird effects in the high artic in space and time*. Lake Group meeting, December 2016

Kirsten Hastrup. 15 November 2016: *Thule as Frontier. Contested Resources in the High Arctic.* Institut d'Études Avancées, Paris.

Kirsten Hastrup, 23 November 2016: *Vital Materials in the High Arctic: An analysis of Agentive Assemblages in a Hunting Community*. Laboratoire d'Anthropologie Sociale, Collège de France, Paris.

Kirsten Hastrup, 8 June 2016: *Living Resources and Human Societies around The North Water in the Thule Area* for all students and colleagues at 'Instituttets Dag', Department of Anthropology, University of Copenhagen.

Kirsten Hastrup, 28 April 2016: *Thule på tidens rand: Antropologisk arbejde i et ubegribeligt landskab*, to the Royal Danish Academy of Sciences and Letters.

Kirsten Hastrup, 25 april 2016: *New Materials and Ancient Resources in the Thule Region: The Precarious life of High Arctic Hunters;* workshop 'Climate Change and Capitalism: Inequality and Justice in an Overheated World', University of Oslo.

Janne Flora and Astrid O. Andersen held public meetings in Savissivik and Qaanaaq, in May and June 2016, in which the findings of the collaborative research initiative Piniariarneq were presented and discussed with inhabitants of the region. Read more about Piniariarneq.

Janne Flora and Astrid O. Andersen gave a science talk at Knud Rasmussen Community Center at Thule Air Base in Northwest Greenland, May 19 2016: Tracking Hunting Routes in Thule.

Astrid O. Andersen presented the paper 'Puzzling pieces and situated urgencies of climate change and capitalism in the High Arctic. Three stories from Qaanaaq', on April 26 2016 at the workshop 'Climate Change and Capitalism: Inequality and Justice in an Overheated World', University of Oslo.

Janne Flora, Astrid Andersen and Kasper Lambert Johansen hosted a dialogue meeting between researchers, hunters and stakeholders in the management of Greenland's

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natural resources at Hotel Hans Egede, 24/1-2017, and presented results from the Piniriarneq-project.

Janne Flora, Astrid Andersen and Kasper Lambert Johansen gave a talk about the Piniriarneq-project at the Greenland Institute of Natural Resources in Nuuk, 25/1-2017.

Anders Mosbech and Kasper Johansen gave the talk "Søkongerne i Nordvandet: en lille fugl med stor økologisk betydning" at the lecture event "Fangere og fangstdyr omkring Nordvandet: det tværfaglige NOW-Projekt" at Ilimmarfik, Nuuk, 25/1-2017.

Mads Peter Heide-Jørgensen gave the talk "Fangst og fangstdyrene omkring Nordvandet" at the lecture event "Fangere og fangstdyr omkring Nordvandet: det tværfaglige NOW-Projekt" at Ilimmarfik, Nuuk, 25/1-2017.

Janne Flora and Astrid Andersen gave the talk "Nordvandet set gennem hinandens øjne: tværfaglighed i antropologisk perspektiv" at the lecture event "Fangere og fangstdyr omkring Nordvandet: det tværfaglige NOW-Projekt" at Ilimmarfik, Nuuk, 25/1-2017.

Bjarne Grønnow gave the talk "Fra Thule-Stationen til Nuulliit: Hvad historien og arkæologien kan berette om fangst og bopladser i Avanersuaq" at the lecture event "Fangere og fangstdyr omkring Nordvandet: det tværfaglige NOW-Projekt" at Ilimmarfik, Nuuk, 25/1-2017.

Anders Mosbech gave a talk about the North Water Polynya and the NOW project during the event "At gå på fangst" at the culture house Katuaq in Nuuk, 26/1-2017.

Janne Flora, Astrid Andersen and Kasper Lambert Johansen gave the talk about the Piniriarneq-project during the event "At gå på fangst" at the culture house Katuaq in Nuuk, 26/1-2017.