

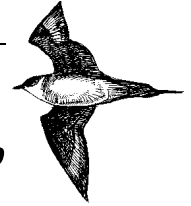
## News

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# Ny-Ålesund Newsletter



13<sup>th</sup> edition  
December  
2003

## Breeding strategy of the female Eider: From evolutive ecology to molecular physiology

This programme aims at studying the energetic cost of reproduction during the incubation fast in long-lived birds. We plan to better understand how is controlled the trade-off between reproductive effort and adult survival when body condition deteriorates in the female Common Eider (*Somateria mollissima*).

At first, two approaches seek to explain how an adult bird perceives the reproductive value of its clutch: the clutch size hypothesis (in which the main factor is the number of eggs produced) and the parental investment hypothesis (egg loss being the principal modulator). According to the latter theory, female Eiders should adjust their parental effort to the current value of the clutch. To test this hypothesis, we plan to assess the influence of egg manipulation (egg removal and addition) on nest desertion, and whether modifications of plasma concentrations of the two main hormones implicated in the regulation of parental effort, namely corticosterone (inducing nest abandonment) and prolactin (stimulating incubation) are modified.

One of the trade-offs appears in the parental decision to desert the nest, which is modulated by several factors. In Common Eider, reproduction strategies differ among individuals, females at the hatching stage favouring either abandonment or tending of ducklings. This parental decision depends mainly on female's body condition since birds with a high body mass are less prone to abandon their youngs. Corticosterone redirects behavioural processes towards nest abandonment and adult survival in long-term fasted birds. Thus, this hormone may also be implicated in the young abandonment decision. By experimentally shortening the incubation period and using the stress reaction protocol, we propose to test whether corticosterone is linked to body mass loss during incubation and to precise how this putative relationship can be modified at hatching.

When incubation is associated with fasting, nest desertion is supposed to be activated by an unknown refeeding signal when

body condition becomes critically deteriorated. As reported above, the rise in corticosterone levels has been suggested to be the triggering factor. We sight to evaluate the role of this hormone (1) on nest desertion by observing the effect of corticosterone implants and (2) on reproductive success and plasma prolactin levels of female Eiders.

Moreover, a special emphasis will be put on the putative relationships between body fat, plasma leptin and ob gene expression during fasting in birds to check whether leptin can also be viewed as a refeeding signal. Indeed, leptin, the product of the ob gene, is a hormone mainly synthesized in the adipose tissue that is important in the regulation of food intake, adiposity and energy expenditure in mammals.

Another aim of our research is to highlight a potential cost of reproduction during incubation fast in term of reduced immunocompetence in female Eider. In this view, we will measure both components of immunity of incubating females according to initial clutch size and incubation stage. Cellular immune response mediated by T-Lymphocytes will be evaluated thanks to phytohaemagglutinin skin test while humoral immune response mediated by immunoglobulins will be measured with ELISA tests. The hormonal determinism of immune response and the sensibility of the immune system will also be considered in further experiments.

Complete development of avian eggs requires external heat, inducing in most species an energetic cost of incubation for the parents. Triiodothyronine ( $T_3$ ) has been implicated in the control of the metabolic rate and is decreased during fasting in most bird species. This raises the question of the regulation of  $T_3$  during reproduction when incubation (thus heat production) is associated with fasting (and energy sparing). Therefore, plasma concentrations of  $T_3$  will be determined for different clutch sizes in incubating, as well as in non-incubating fasting female Eiders. Several metabolic pathways contribute to loss of energy and mitochondria play a central role in energy expenditure by cells. Recently several genes (such as that

encoding avian uncoupling protein) homologous to the gene encoding brown fat uncoupling protein have been identified and represent candidate genes for the control of energy expenditure. In this framework, the role of avian UCP in energy expenditure and its regulation by hormones and metabolites will be investigated.

**In addition to data dealing with the breeding strategy of the female Eider, the study of duck's adaptation to extended fasts occurring at specific stages of their life. This might help to understand important underlying physiological mechanisms, such as reduction in energy expenditure, body fat storage and mobilization, regulation of body fuel utilization and long-term control of food intake.**

This programme is supported by the French and Norwegian Polar Institutes.

*Drs François Criscuolo and Thierry Raclot  
CEPE, CNRS, Strasbourg, France*

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## Chinese first wintering activity at Ny-Ålesund

China has sent a team to Ny-Ålesund to carry out its first wintering activity from November 17, 2003. This team, including 2 scientists from Polar Research Institute of China and 1 postgraduate student from Wuhan University, will carry out following tasks during the winter:

### 1. Installation of 3 all-sky CCD imagers and wintering observation of aurora

An aurora observation system comprising of 3 monochromatic all-sky CCD imagers will be installed on the roof of "Ungkarshemen 1". The configuration of 3 different cameras, rather than a camera with wheeling filters, will allow this system for the first time to simultaneously catch aurora images on wavelengths of 427.8nm, 557.7nm and 630.0nm with a sampling rate as high as a frame every 6 seconds. Continuous observation of aurora will be carried out whole the winter till the beginning of March.

### 2. Campaign observation with EISCAT Svalbard Radar (ESR)

Two observation campaigns are planned to aim at the cusp and afternoon 'bright spots' auroras (the latter has only been noticed by satellite observation) by incorporating Chinese all-sky CCD imagers observation with the ESR detections. The time windows for these two campaigns are set for from 1000 to 1600 in MLT (or 0700-1300 in UT) during 5-11 December 2003 and 4-11 January 2004, which are the two new moon periods within polar night of Svalbard.

### 3. Preparations for an official opening of Chinese Station at Ny-Ålesund

The wintering team will do preparations for the set up of a Chinese station in the building of "Ungkarshemen 1" at Ny-Ålesund, which will be operated as a permanent and national platform for disciplines of upper atmospheric physics,

atmospheric science, glaciology, biology, marine science and geophysics etc. In the first season of 2004, about 10 Chinese scientists are expected to come to Ny-Ålesund to carry out field investigation activities slightly before an official opening for the station which will bring up a high level official delegation and some journalists of Chinese mass media.

*Huigen Yang (Huigen\_yang@263.net)*

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## Field report from expedition along the Eastern coast of Greenland with R/V "Jan Mayen"

In the framework of a collaboration with colleagues of the University of Tromsø and of the Norwegian College of Fishery Science, Tromsø (JS Christensen and SE Fevolden), Guido di Prisco, Donatella de Pascale (Institute of Protein Biochemistry, CNR, Naples, Italy) and Laura Ghigliotti (DIBISAA, University of Genova, Italy) participated in the TUNU-I international expedition onboard the R/V "Jan Mayen" (02-16.10.03), organised by the University of Tromsø, the Norwegian College of Fishery Science, and the Institute of Aquatic BioSciences. The expedition was mostly centred on fish along the coast and in some fjords of East Greenland, which are pristine areas where little or no marine investigations have been conducted so far.

Blood and other tissues were collected from fish captured by bottom trawling in 19 stations, for biochemical and molecular-biological characterisation of hemoglobins and globin genes. Studies on the evolutionary adaptation of the oxygen-transport systems of several Arctic species are in progress. Two Gadidae, *Artogadus glacialis* (Arctic cod) and *Boreogadus saida* (polar cod) were the dominant species in most catches. Another Gadiform (*Gaidropsarus argentatus*) was collected in two stations at depths close to 1000 m. Several species of Rajidae, Liparidae and Zoarcidae were also collected, and will be investigated in comparison with Antarctic species of the same families.

Chromosome suspensions from most species were prepared for conventional cytogenetics (staining and banding) and molecular biology (Fluorescence In Situ Hybridisation, FISH). Colchicine was injected in live specimens; this procedure was followed by dissection and fixation.

Another research theme is the study on new psychrophilic and psychrotolerant bacterial strain. To this aim, sediments were collected in three stations.

*Guido di Prisco*

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## AWI aircraft's POLAR 2 and POLAR 4 will occur on the sky over Spitsbergen in May and June 2004

Four years after successful ASTAR 2000 campaign ([http://www.awi-potsdam.de/www-pot/astar/astar\\_eingang.html](http://www.awi-potsdam.de/www-pot/astar/astar_eingang.html)), focused on characterization of atmospheric aerosols during the Arctic haze period by means of aircraft measurements, new set of airborne measurement campaigns will take place during May and June 2004 (VALHALA – Arctic 2004) and April 2005 (VALHALA - Arctic 2005). The main focus of the upcoming campaigns VALAHALA –Arctic (Vertical distribution of Aerosols at high Latitudes in both Hemispheres using Airborne Laboratories) is to provide the observational data necessary for better assessment of the aerosol direct and indirect effects on the radiative balance of the Arctic. This will be achieved by utilizing unique aircraft payloads onboard of AWI POLAR 2 & POLAR 4 Dornier 228-101 airplanes, addressing both aerosol and cloud measurements. During the VALHALA - Arctic 2004 measurements will be performed in a transition period from the Arctic Haze to the clean Arctic summer conditions. One year later, the VALHALA - Arctic 2005 campaign will focus fully on the Arctic Haze phenomenon.

Motivation and scientific questions for both campaigns can be summarized into two major objectives:

- 1) **Determination of the vertical structure of the chemical, physical and optical properties of Arctic aerosol, including radiative closure between observed and calculated aerosol properties (direct climate effect)**
- 2) **Investigation of cloud microphysical and optical properties in the Arctic as a function of different tropospheric aerosol load and the regional variability of aerosol and cloud properties (indirect climate effect)**

The information gained during the aircraft experiments can be extended to a larger temporal and spatial scale only in combination with ground-based measurements and satellite observations. Thus coordinated activities with present and future satellite projects, SAGE III, SCIAMACHY, ILAS II, CALYPSO and ground-based stations in the Arctic, including Ny-Ålesund research facilities, are essential and they are one of the key parts of the ASTAR campaigns.

ASTAR 2004 & 2005 campaigns are collaborative effort between Alfred Wegener Institute (AWI), Bremerhaven, Germany, The National Institute for Polar Research (NIPR), Tokyo, Japan, and Stockholm University, ITM – Air Pollution Laboratory. To reach the objectives, this core group will liaison with other groups including German Aerospace Center (DLR), Institute of Atmospheric Physics, Oberpfaffenhofen, Germany, University of Blaise Pascal, Laboratory of Physical Meteorology, Clermont – Ferrand, France, Institute for Tropospheric Research (IFT), Leipzig, Germany, Finnish Meteorological Institute (FMI), Helsinki, Finland, CNR Bologna, Italy, IO PAS Sopot, Poland, IUP Bremen, Germany, Hokkaido University, Japan, Nagoya University, Japan, NASA LaRC, Hampton, USA. As support to the airborne activities, model predictions, used for mission flight planning and

simulations to aid data interpretation, will be performed in co-operation with the Norwegian Institute for Air Research (NILU), AWI Potsdam, Germany and KNMI de Bilt, The Netherlands.

Project coordinator and contact person: Dr. Andreas Herber ([aherber@awi-bremerhaven.de](mailto:aherber@awi-bremerhaven.de))

*Radek Krejci*

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## The Marine laboratory in Ny-Ålesund

The building of the Marine laboratory was started this fall. In August the board of Kings Bay AS made the decision to start building the fundament of the laboratory. The construction work on the fundament was finished in October. Call for tender for putting up the laboratory building has been sent out. If everything works out well according to the plan, the laboratory will be built during summer and fall 2004, and the installation work will be done during winter 2004/5. The first scientist will then have access to the laboratory in spring 2005.

Two new members have been included in the consortium: the Korea Ocean Research and Development Institute (KORDI), Korea and Dunstaffnage Marine Laboratory and the Scottish Association for Marine Science, UK. Iceland has also showed their interest, but has so far not entered the consortium.

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## Strategy plan for Kings Bay AS

The board of Kings Bay AS decided in a meeting 2<sup>nd</sup> of September to draw up a Strategy plan for the company. The Strategy plan will include all relevant matters related to the role, mission and tasks that Kings Bay has in Ny-Ålesund:

- Organisation of the scientific activity, and the role of Kings Bay AS
- Management of the nature and the cultural heritage
- Service and support to the stations and the scientists
- Management of the infrastructure
- Cost level
- Other matters

The Strategy plan will act as a steering document for short and medium term planning, decision-making and priorities. This plan, which will be valid for the next four years, will be based on the guidance laid down in governmental white papers and from the owner of the company, the Ministry of Trade and Industry. Additionally, and just as important, the plan will be worked out in close dialogue and cooperation with the scientific communities and the users of Kings Bay's services.

The Strategy plan will be finalised before Easter 2004.

## Calendar of Arctic Meetings

**Arctic Science Summit Week 2004** will be held in Reykjavik, Iceland, 21-28 April 2004. For more information go to the web site: <http://www.congress.is/assw>

**IV Conference: Complex Investigations of the Spitsbergen Archipelago Nature** 8 - 10 April 2004, Murmansk, Russia  
Contact Secretary of the Organising Committee Pogodina Irina Aleksandrovna at e-mail: [pogod@mmbi.info](mailto:pogod@mmbi.info) for more information

For a comprehensive list of published meetings, look at **SAM** (Survey of Arctic Meetings) on the IASC home page: <http://www.iasc.no/>

## Staff News

### Alfred Wegener Institute (AWI):

#### **Koldewey station:**

**Barbara Lahnor**, was replaced by **Konni Piel** as station engineer in August 2003.

### Norwegian Polar Institut (NP):

**Leif Arild Håjem** has replaced **John Wilsgaard** as logistic manager in July 2003.

## Publications

Quirin Schiermeier 2003:

**Arctic research: Summer in Svalbard**  
*Nature* 424, 992 – 994, News Feature

Quirin Schiermeier 2003:

**Arctic rockets give glimpse of the atmosphere's top layers**  
*Nature* 424, 243, News

For more publications see the electronic version of Newsletter December 2003  
<http://npolar.no/nysmac>

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### Next edition of Ny-Ålesund Newsletter:

Summer 2004

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