

LABYRINT



RESEARCH MAGAZINE FROM UIT THE ARCTIC UNIVERSITY OF NORWAY • 2014

ENGLISH EDITION

BLACKLISTED: Uninvited Species
HYPOTHERMIA: Surviving the Cold
CHARR: Arctic Hunger Games

Into the Arctic Wild



RESEARCH MAGAZINE FROM
UiT The Arctic University of Norway

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DESIGN: Concorde Design
LAYOUT: Tove Midtun UiT
PRINT: Lundblad Media AS
ISSN: 1890-565X
CIRCULATION: 5000

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The magazine is printed on environmentally
friendly paper.



Contents



Suffragettes. The term for the most radical advocates of women's suffrage in the UK. Their main organization was the Women's Social and Political Union (WSPU), founded by Emmeline Pankhurst and her daughters in 1903. WSPU understood how to use the mass media to create a lot of publicity far beyond Britain. They arranged a series of dramatic demonstrations in the streets and made numerous attempts to get into the Parliament, to get politicians to address their claims. They smashed windows and set fire to empty houses and factory buildings, but the most dramatic event occurred during Derby races in 1913 when Emily Davison threw herself in front of the King's horse and was killed. In the years before the World War I, certain groups of increasingly used terrorism. When women over the age of 30 got the right to vote in Britain in 1918, movement ceased to exist.
Source: Norwegian Encyclopedia.

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Fanadromous, freshwater fish that regularly migrate to the ocean too feed, and return to fresh waterfor spawning. Examples of Norwegian anadromous fish species are salmon, trout, charr and stickleback.
Source: Norwegian Encyclopedia.

Catadromous, fish species that are born in salt water and then migrate into freshwater. They live in the freshwater for the most of their life, then wander out into saltwater to spawn. In Norway this applies to the eel and flounder. These species can also grow up in salt water, skipping the freshwater stage.
Source: Norwegian Encyclopedia.

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The Arctic charr can suppress any feeling of hunger for months at a time.

22 Photo: Audun Rikardsen

Hypothermia. The condition in which the body temperature falls below 35 degrees Celsius. Hypothermia can occur when a person is exposed to cold over time, or by rapidly cooling down by falling in the cold water. Early symptoms of hypothermia are shivering, uncoordinated movements of the limbs, irrational behavior, pale and cold skin. Followed by the ceasing of the tremors, the patient becomes quiet, disoriented, withdrawn and responds slowly when spoken to. Eventually the, hypothermic patient will become unconscious with ice-cold, bluish skin. Breathing pattern changes drastically with only two to three breaths per minute. If the body temperature falls below 30 degrees Celsius, the heart will stop.



26 Source: Red Cross.

Water fleas are very common, both in freshwater and seawater. Most move through the water by jumps and bounces, which hence the name. The most common water fleas are freshwater genera Daphnia and Bosmina. In seawater there are two genera: Evadne and Podon. Characteristically water fleas have a shell covering their body. The head is only slightly separated from the rest of the body. The legs, in five or six pairs, are flattened, blade-like and serve as respiratory organs. The movement of the legs causes a flow of water through the animal and out between the shell halves. This flow allows them to breathe. It also brings with it food particles, often phytoplankton, which are filtered by the legs and taken to the mouth opening.



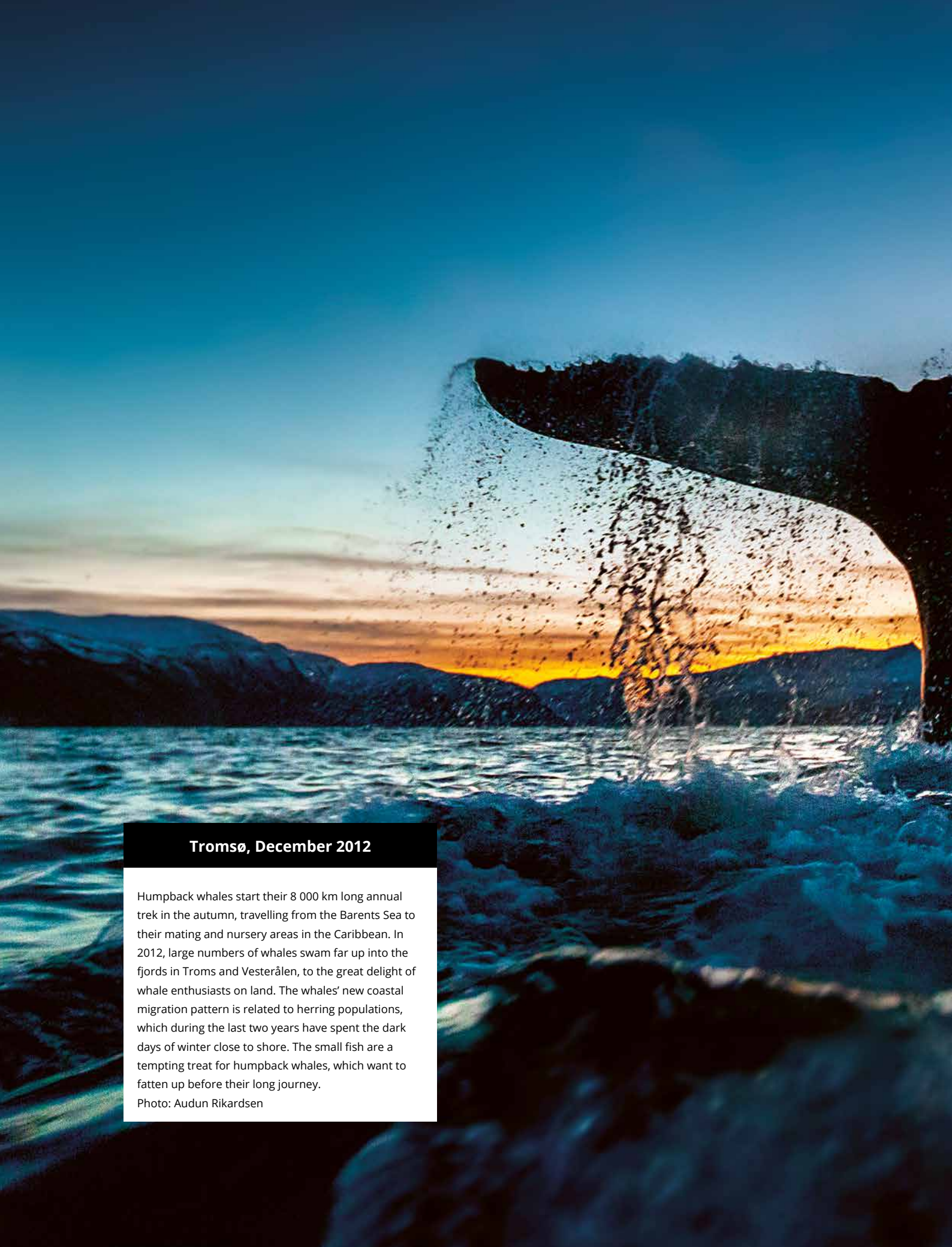
38 Source: planktonweb.no

Climate. The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere behaves over relatively long periods of time. When we talk about climate change, we talk about changes in long-term averages of daily weather.

40 Source: NASA.

Migratory birds are birds that, after the breeding season, move from northern or southern latitudes towards the equator. Birds that are staying at the same place the year-round are called resident birds.

51 Source: Norwegian Encyclopedia



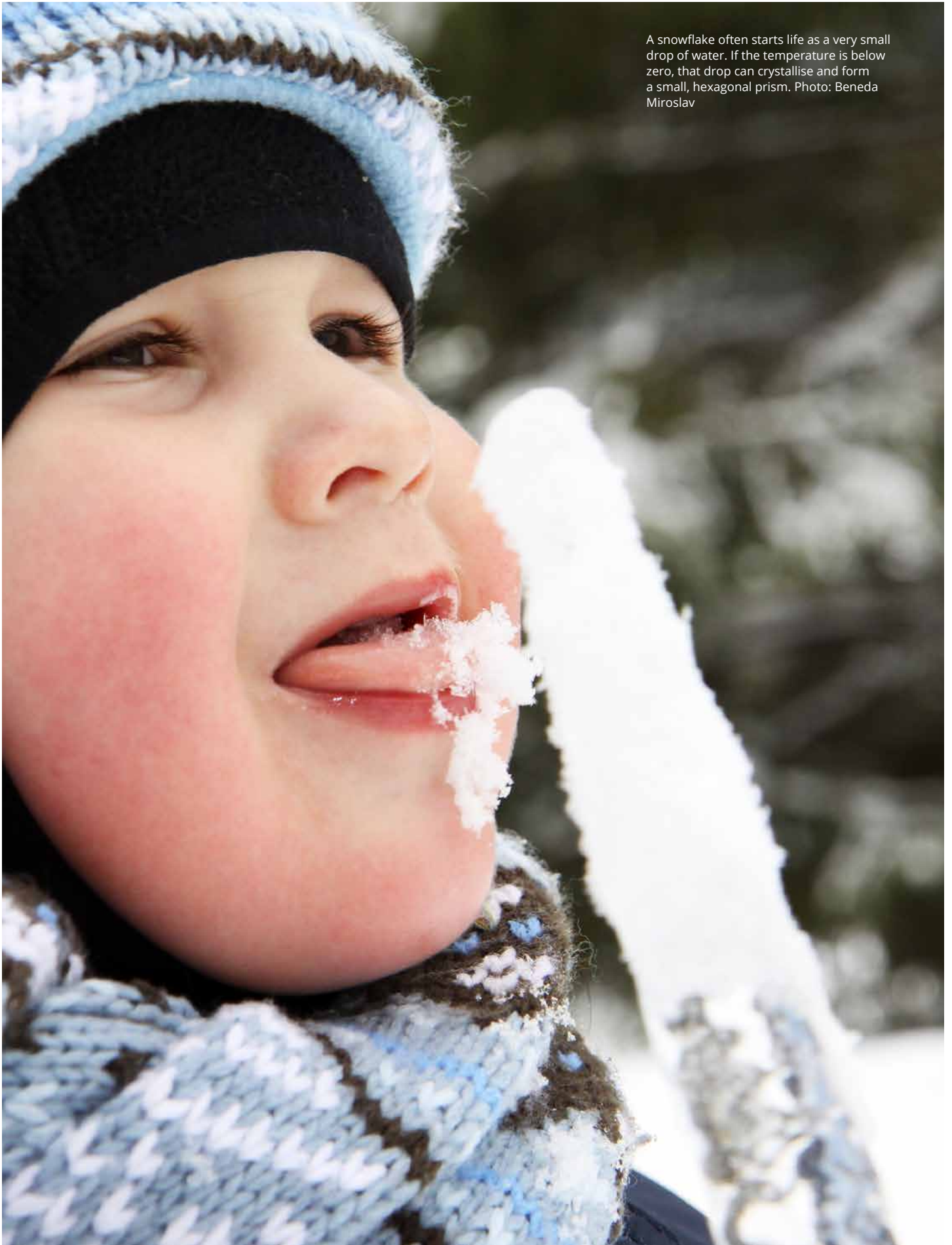
Tromsø, December 2012

Humpback whales start their 8 000 km long annual trek in the autumn, travelling from the Barents Sea to their mating and nursery areas in the Caribbean. In 2012, large numbers of whales swam far up into the fjords in Troms and Vesterålen, to the great delight of whale enthusiasts on land. The whales' new coastal migration pattern is related to herring populations, which during the last two years have spent the dark days of winter close to shore. The small fish are a tempting treat for humpback whales, which want to fatten up before their long journey.

Photo: Audun Rikardsen



A humpback whale's heart can weigh as much as 200 kg.



A snowflake often starts life as a very small drop of water. If the temperature is below zero, that drop can crystallise and form a small, hexagonal prism. Photo: Beneda Miroslav

Can you get worms in your stomach by eating snow?

Text: Elisabeth Øvreberg

MYTHS “Telling children that eating snow will give them worms in their stomach is just as true as the Easter Bunny,” chuckles Professor of Medical Biology Ørjan Olsvik at UiT.

He specialises in micro-organisms of all kinds, bacteria and worse, and he can reassure us that the scare propaganda we were exposed to when we were small and that we tell our children today is based on a lie.

ALGAL TOXINS IN SNOW

In fact, the professor is of the opinion that it is safe to eat both ice and snow, as long as you can see that it is not dirty – or yellow.

“In the old days, they probably started scaring children from eating snow to keep them from eating animal urine and faeces. Urine is not really dangerous, but I do not recommend it,” says Olsvik, adding that there is actually some snow that you should stay away from.

“You should be careful not to eat snow or drink water from glaciers that have a reddish tinge. That means the glacier contains algae. You won’t get worms from the algae, but you will get a stomach ache. They produce a kind of toxin.”

POLLUTION IN THE SNOW

No, toxins in your tummy does not sound good, and it is natural to want to find out whether

snow may be toxic in some other way. In fact, Professor Olsvik worked on exactly this problem back when cars still ran on leaded gasoline. Olsvik took snow samples and analysed the lead content in the snow lying around various kindergartens in Oslo. He also took blood samples of kindergarten children to see if they had ingested lead.

“These were kindergartens in dense urban areas, but we found no elevated lead content in the children – who most certainly ate snow,” reassures Olsvik.

OUT SKIING AND EATING SNOW

Ørjan Olsvik enjoys a bit of snow himself when he is out skiing, and he is of the opinion that anyone can do it.

“What you should know is that your body needs to use a lot of energy to melt snow into water, so you can get chilled if you eat a lot.”

The professor does have one trick in his pocket, literally. When he is out skiing and needs fluids, he brings along a thermos full of hot water in his inner jacket pocket. And since he is not afraid of eating snow, he simply fills the cup with snow and a little hot water, and, lo and behold, he has a full cup to quench his thirst.

“Smart, because you don’t always have access to firewood, and you need to eat a lot of snow to get a half litre of water.”

THE WORMS ARE IN YOUR HOME

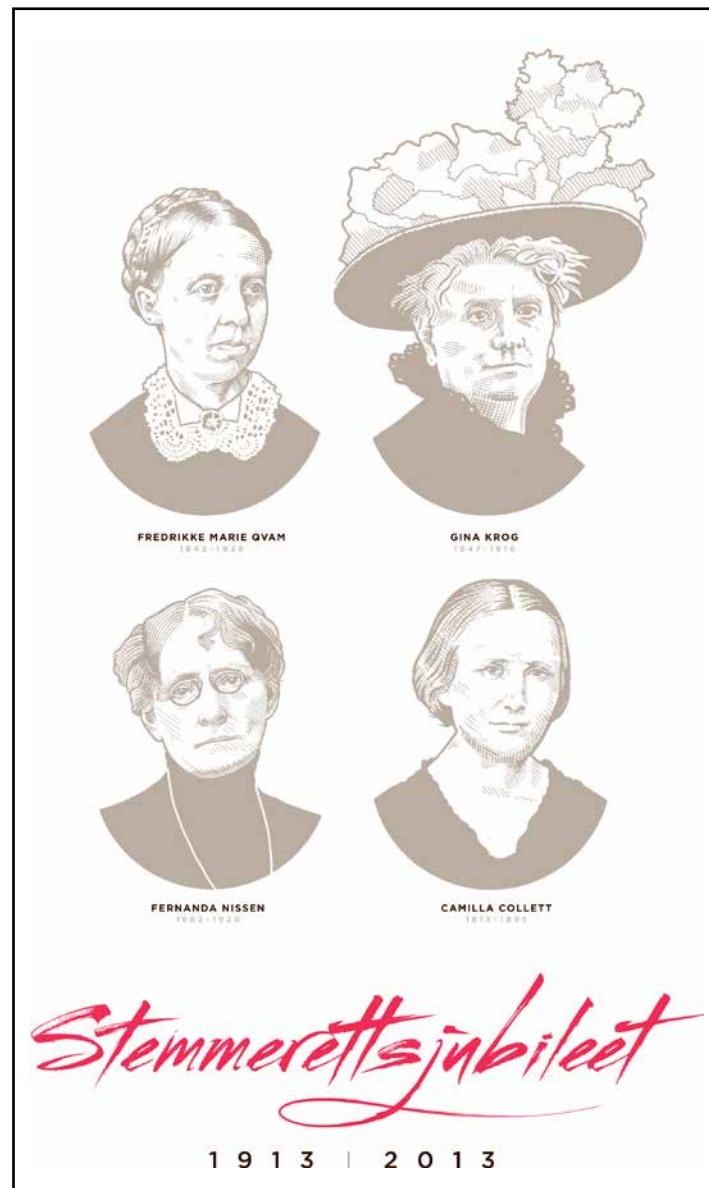
So, you don’t need to be afraid to get worms in your stomach outside in winter. If you are going to get worms, then you will most likely get them in indoors. The most common worm we have here in Norway is the threadworm, because it is transmitted so easily.

It is simply ingenious. At night, it creeps out of the rectum and lays eggs. This really itches, so the person who has threadworms scratches himself. They get the eggs on their hand and under their nails. The eggs are then transferred to the mouth, doorknobs, bed linens and towels. Then it gets inside us, and the parasite has managed to multiply.

“Threadworms cause an intense itching sensation, and when a family is affected, everyone should be treated. Bed linens and towels need to be changed,” says parasitologist Tore Lier at the University Hospital of North Norway.

Not even rubbing alcohol can kill the eggs of the threadworm, but fortunately there is a cure available at the pharmacy.

The conclusion is thus that you can safely put snow in your mouth, but not dirty fingers.



The suffrage anniversary highlights the “big four” women’s rights pioneers: Camilla Collett, Fredrikke Marie Qvam, Gina Krog and Fernanda Nissen. Read more about them on stemmerettsjubileet.no.

The early fight for women’s suffrage was an international movement, with a notable initiative in Norway. Who were the first Norwegian women to vote, what issues motivated them, and how is the female vote expressed today?

Text: Sigrun Høgetveit Berg

One hundred years of women's voting rights

VOTING RIGHTS The 100th anniversary of universal female suffrage in Norway was in 2013. It is being celebrated, discussed and highlighted, notably at the national women's conference that was arranged by UiT at the end of August, where women's participation in the national and international political scene was the theme.

One of the speakers at the conference was a professor of history and leader of the Norwegian Historical Data Centre (NHDC), Gunnar Thorvaldsen. NHDC is one of the university's great treasure troves and home to a number of digitised historical censuses. These censuses tell us not only when women gained the right to vote, but also who and where – whose great grandmother and great-great grandmother actually got to send in their ballot in Tromsø and Vardø in 1907 and in 1913. Well, almost.

"There are no complete records of who had the right to vote, and the records of those who actually did vote are even less comprehensive. However, we have developed a method that brings us closer to the truth when we evaluate the information found in old censuses," says Thorvaldsen.

UNMARRIED AND INDIGENT WOMEN EXCLUDED

In 1907, women over 25 were given limited national suffrage, after having gained limited municipal suffrage in 1901. Married women with a certain income – 400 kroner in urban areas and 300 kroner in rural areas – were given the right to vote. This was also true of women whose husbands met these requirements. This means that unmarried women and women of limited means were still excluded, with the thought behind this limitation being that one had to earn civil rights.

"The 1910 census includes information

about the profession of every person who was registered. In 1911, Statistics Norway sent out questionnaires to tax offices across the nation, and received additional data about incomes for different professions for both men and women in towns and in rural areas," Thorvaldsen explains.

"Based on the information on professions from 1910 and the average income for different professions from 1911, we can figure out who should have been able to vote in 1907. Some would naturally have been in a different living situation in 1907, but with this method we can get fairly close to the truth about potential suffragettes in 1907," he says.

"For example, we can see that Elen Dorthea Bang would have had the right to vote when she died in 1911. She lived on Rektor Steens Street number 13 in Tromsø and was married to shipmaster Karl Bang. In 1911, mates had a minimum wage of 600 kroner and earned on average 1759 kroner, so she was well within the limits of a suffragette. However, Marte Sofie Isaksen from Nordreisa, who also died in 1911, may not have been able to vote. Her husband, Jørgen Danielsen, was a miner in Salangen, and Marte didn't have the opportunity to document his income where she lived in Nordreisa.

THE SYSTEM WAS FAULTY

One of the reasons for collecting income data in 1911 was civil suffrage – the government wanted to see how the income requirement affected the voting population. They found that the average income for female servants in rural areas was 206 kroner and 395 kroner in urban areas, meaning that the system worked as intended. The political rationale for the income requirement was that you shouldn't be able to

vote if you were financially dependent on someone else, because this might have an unwanted influence on how you voted.

"But the system didn't work very well in practice," says Thorvaldsen. "There were unreasonable differences."

"First of all, incomes varied greatly from place to place – because of the seasonal fishing industry, the average income was higher in the north than in fishing districts on the west coast, meaning that the north had more voters. Three hundred kroner in Austlandet (in Eastern Norway) didn't mean the same thing as 300 kroner in Tromsø," he said.

"And imagine a city like Tromsø, where the city limits followed city streets. If you lived on one side of the street and earned 380 kroner, you couldn't vote, but living around the corner, outside the city limits, you could earn 330 kroner and vote. In other words, you could move across the street and lose your right to vote," Thorvaldsen said.

"This was impossible to enforce, something women's rights activists knew and used actively. They went along with the 1907 decision as a compromise, and came to realise that the system was like a ripe fruit, ready to fall," says Thorvaldsen.

A HUGE SPLIT BETWEEN CLASSES

The struggle for women's suffrage began as part of a general struggle for liberation in the 1800s. The first women's rights activists came from the United States, the UK and France, and the international effort quickly struck a chord with women in Norway. Several different associations were founded around the turn of the century, but it was the *Landskvindestemmeretsforeningen* (LKSF, the National Women's



Women won their rights by networking across borders. Here from a Nordic woman's congress in the old university assembly hall in Oslo, 1902. Photo: Worm-Petersen. National Library of Norway

Suffrage Association) that was the main driving force. It was founded by Gina Krog and Fredrikke Marie Qvam, among others, in 1898. In 1900, a chapter was started in Tromsø. At the first open meeting, the group gained 99 members. After the decision for limited municipal suffrage was made on 11 May 1901, 90 members met for an impromptu celebration, Kari Nerdrum Tangen wrote in her 1977 master's thesis on the history of women's suffrage in Tromsø.

"The commitment in the north was very strong. Nationally, less than 50 per cent of women in urban areas and 10 per cent in rural areas used their municipal voting rights in 1901. In light of this, it's fantastic to think that in Vardø, 75 per cent of women voted. In addition, Anna Sophie Gundersen and Nikoline Larsen, both representing the Liberal Party (*Venstre*), were voted onto the city council," tells Randi Rønning Balsvik, a history professor and another conference participant.

Foremost in the fight for women's suffrage in Tromsø was Thora Halvorsen, who was elected to the city council in 1904 as a representative for the Conservative Party (*Høyre*). Like other women's rights activists in Tromsø and nationally, she was from the middle class. So when the Labour Party (*Arbeiderpartiet*) announced that Jenny Garfjeld, a long-standing member of the

LKSF and editorial secretary and de facto editor of the local newspaper, *Nordlys*, would be their national candidate, there was dissension in the suffrage association, and a concern that the group would split. Garfjeld was not elected.

"There was a deep divide between the middle and working classes that was evident even in the fight for women's suffrage. There were no overarching loyalties among women when it came to how they voted. But it was clear that women were motivated by many of the same causes. The organised women's rights movements originated in networks that women built to tackle other common interests. We see this in the US, the UK and here in Norway. In the 1800s, the fight against slavery was foremost among issues that motivated women, and later the temperance movement – this is especially evident in fishing villages along the southern coast," says Balsvik.

AN INTERNATIONAL FIGHT

In conjunction with the centennial of female suffrage, Professor Balsvik has travelled around Norway to give presentations about the fight for women's suffrage, with a focus on how the struggle in Norway was a part of an international fight.

"Our history is so often portrayed from a national perspective. But the ideas, organisation

and the struggle itself took place throughout a strong network that was formed in Scandinavia, Western Europe and the United States," Balsvik explains.

"The ground-breaking efforts made by suffragettes in the UK, who used sexuality and all of the associated Victorian taboos to bring attention to the cause, were picked up by women like Katti Anker Møller at home in Norway. It took lots of courage to address questions about abuse of the female body, childbirth and syphilis. Without the fight for women's suffrage, the issues that in the 1920s resulted in expanded social welfare and the 'Castbergian child laws' (so-named after MP Johan Castberg), which established legal rights and care for children born out of wedlock, may never have gotten on the agenda," she adds.

STILL UNDERREPRESENTED

Is there still evidence of the suffrage efforts from 100 years ago today? Election researcher and political scientist Marcus Buck says yes.

He explains that northern Norwegian social scientist Stein Rokkan described four *thresholds* or *barriers* to the participation of underrepresented groups in the political system: legitimisation – that women were allowed to speak in political assemblies; incorporation – that women were allowed to vote; representation



Anna Rogstad (1854–1938) was the first female Member of Parliament in Norway. This picture was taken in 1911. Photo: National Library of Norway.

– that women could be elected to Parliament; and finally *executive power* – that women made their way into the government and were eventually elected as prime minister.

“When we look at these barriers and how women have broken through them compared to men, there’s a clear correlation between the fight for women’s suffrage and the underrepresentation of women in positions of power today. The question is if this is simply a lag, and that women in the future will be represented on an equal footing as men, or if we’ve hit a sort of social glass ceiling, meaning that women never will have complete equality in politics,” says Buck.

WOMEN AND MEN HAVE SWITCHED PLACES

There’s hardly any difference between men and women in voter turnout, but fewer women are elected to Parliament, municipal boards and county councils, even though many parties require that candidates be equally distributed between sexes.

“One reason for this may be that women are concerned with different issues than men. While male voters and politicians tend to be more concerned with economic, foreign policy and defence issues, their female counterparts tend to be more interested in issues related to children and health,” says Buck. “Women aren’t

generally less interested in politics than men, but male and female politicians tend to have different priorities based on their standing in society.”

Buck says the best example of this is how women and men have changed positions in the political spectrum after the Second World War. While women previously tended to vote to the centre or right on the political spectrum, with men voting more liberally, this trend switched after women entered the workforce. “An example of this is the voters of the Socialist Left Party’s (*Sosialistisk Venstreparti*), who were previously primarily working class men, but who are now mainly well-educated women employed in the public sector,” he says.

Women’s suffrage in Norway:

- **1901:** Both men and married women over 25 had municipal suffrage by rights of census, meaning that a woman or her spouse had to have a certain annual income to be able to vote: 400 kroner in urban areas, 300 kroner in rural areas.
- **1901:** Anna Sophie Gundersen and Nikoline Larsen, both members of the Liberal Party (*Venstre*), were elected as the first female city council members in Vardø.
- **1904:** Thora Halvorsen of the Conservative Party (*Høyre*) was elected as the first female city council member in Tromsø.
- **1905:** A referendum on dissolution of the union with Sweden. Women were not allowed to take part, but turned in a petition with almost 300,000 signatures of those who agreed to the dissolution (by comparison, 370,000 men voted yes). Prime Minister Jørgen Løvland stated: “The attitude of Norwegian women in the cities and rural areas is a great chapter in Norway’s history, and will be a great help to them in gaining the rights they deserve.”
- **1907:** Women gain national suffrage on the same terms as the 1901 municipal suffrage.
- **1910:** Universal municipal suffrage for women over 25 years of age.
- **1911:** Anna Rogstad of the Liberal Left Party (*Frisinnede Venstre*) was elected as the first female Member of Parliament (she had previously been elected as a deputy in 1909).
- **1913:** Universal female suffrage for women over 25 years of age.

Source: stemmerettsjubileet.no, www.rhd.uit.no, Kari N. Tangen, Tromsø led av L.K.S.F. medlemmenes arbeid for å oppnå stemmerett for kvinner i årene 1900–1913. Hovedoppgave i historie. UIT 1977.



Katti Anker Møller (1868–1945) was one of the first brave women in Norway to bring up taboo questions about the female body and sexuality. Photo: National Library of Norway.

A travelogue pioneer

She claimed to be the first woman in Svalbard. And whether or not that is true, she certainly wrote an exceptional and unique travelogue from Northern Norway in the 1800s.

Text: Linn Sollied Madsen

At a time when women were not allowed on French naval vessels, a 19-year-old Parisienne named Léonie d'Aunet used all her charm and cunning to secure a place on an extraordinary adventure. On the condition that her partner, the artist François Biard, would accompany her, d'Aunet was allowed to join a research expedition on *La Recherche* to Svalbard, one of the most remote and exotic destinations of the time.

The year was 1838, and Paris was the centre of the world. There was a great deal of consternation when d'Aunet announced her plans in the finer circles to which she belonged. A woman could never manage such an arduous and dangerous journey! Since she was not officially allowed to be on board, she and her partner travelled by road most of the way up to Hammerfest. D'Aunet not only survived, she also wrote a very entertaining travelogue about her trip through the Nordic countries.

"She's an interesting lady and coquettishly confident in her writing style," laughs Nils Magne Knutsen, a professor of Scandinavian literature at UiT. Knutsen has written a book about the French expedition.

"In contrast to other travelogues of the time, she has a very feminine outlook, and describes with great enthusiasm her culinary experiences along the way, Scandinavian women's (lack of) fashion sense and Norway's culture and architecture," he says.

CRITICAL VIEWS

The 19-year-old had a sharp pen and did not pull her punches in her meetings with other cultures. The Sami get blasted with both barrels and she doesn't spare her words in her description of Scandinavian women. They were indeed tall and fair with nice skin, but the Swedes struggled with bad teeth and "big, ugly feet". Norwegian women were also ashamed of their bad teeth and their "big ears". D'Aunet considered the natural environment in Lofoten to be the devil's work, but she was also occasionally wildly enthusiastic about some of the things she saw. She could hardly



Leonie d'Aunet, here painted by her husband François Biard, was one of the first "tourists" to visit Northern Norway and Svalbard. Her travelogue is an entertaining and arrogant description of a world that is very different from her beloved Paris. Photo: RMN -Grand Palais (Château de Versailles) / Daniel Arnaudet

find words to describe her amazement for the Northern Lights.

"D'Aunet had a taste for the dramatic and really overdid it in some cases. For example, she wrote that the main street in Tromsø 'begins at sea and ends at the foot of an enormous blue-green glacier'," Knutsen says.

Despite a good deal of complaining, the 19-year-old was clearly one tough lady. On the way home she rode side-saddle more than 200 kilometres across the Finnmark plateau from Kåfjorddalen via Kautokeino to Karesuando in Sweden, through mosquito-infested marshes and over mountains.

One person however, was less than impressed. Pastor Lars Levi Læstadius was a botanist and religious revivalist who founded Laestadianism, a conservative Lutheran revival movement, especially popular among

the Sami people. D'Aunet's party was reluctantly allowed to spend the night at the parsonage when they arrived at Karesuando, and d'Aunet describes the famous preacher as a condescending, stingy jerk.

A SCANDALOUS AFFAIR

Back home in France, d'Aunet's artist beau garnered much praise for his dramatic paintings from the far-flung corners of the world (including a painting in which Læstadius is shown preaching to some Sami from a two-metre high snowdrift), and the two lovers married the following year. D'Aunet, however, was not satisfied with a mere artist as a husband and was soon the mistress of France's then-greatest living celebrity, Victor Hugo. The result was a mega scandal, and d'Aunet even landed in prison for a few months for adultery, after her husband caught d'Aunet and Hugo *in flagrante delicto*. Fifteen years after her adventurous journey, and very well-known after the scandal, she wrote her travelogue, which became very popular. She followed this with novels and plays and made her living as a writer until her death in 1879.

"We may not know if she was actually the first woman to visit Svalbard, but it was some time before Northern Norway would be visited by a tourist like her again," says Knutsen.

Read more?

Leonie d'Aunet (1968). *A Parisienne's journey through Norway to Spitsbergen anno 1838* (in Norwegian)

Nils M. Knutsen and Per Posti (2002).

La Recherche: An expedition to the north (in Norwegian)

When size matters

It's generally thought that women are inferior to men when it comes to spatial awareness. But only one psychological test has shown this. And new research casts doubt on its merits.

Text: Maja Sojtarić

"There is only one cognitive spatial awareness test in which women have been inferior to men over time. And that's the test of mental rotation," says Bernt Ivar Olsen.

Olsen's research has shown that women's spatial awareness is not necessarily all that different from men's. Differences that are detected may be explained by the way the test is conducted. In the course of completing his PhD in computer science, Olsen made some surprising discoveries about the mental rotation test.

This specific test is one of the oldest cognitive tests in use, and has been around since the 1970s. Mental rotation involves comparing three-dimensional objects. Test subjects are shown two objects and have to determine whether they are different or if one is a rotation of the other.

"It turns out that the bigger the screen is, the slower men are in solving these problems," says Olsen.

He conducted two studies in collaboration with psychology professor Bruno Laeng.

"Psychology has employed modern technology to create tests that can teach us about how our brains solve problems. But now it is time to ask whether the technology itself has some implications for how we solve problems," says Olsen.

GIANT SCREEN CREATE FAILURES

Olsen conducted his tests using both a conventional laptop and on the biggest screen he could find: A 230-inch display wall at the university's Department of Informatics. With 22 million pixels, this is certainly a dream screen for some men. But given Olsen's results, the size is perhaps not something men should cheer about.

"In previous tests men were both faster and more accurate in mental rotation. However, our findings were quite different. It turned out that women were unaffected by screen size in my experiment. The men's performance, when tested on the big



Women and men can interpret these images differently. Is the figure on the right different from the one on the left? Or is it just a rotation? Photo: Bernt Ivar Olsen

screen, deteriorated by 27 per cent. They were still more accurate than women, but the rate went down considerably," Olsen said.

Olsen's finding may support the theory that men and women use different mental strategies to solve the mental rotation problem. Men often choose to rotate the object mentally and then make a comparison, in what is called a holistic strategy. Women choose to look at selected parts of the object and look for these variables when comparing the objects, an approach called a piecemeal strategy.

"The magnification of the object may also mean that men need more time to build the comparison mentally," says Olsen.

IMPORTANT FOR HEALTH WORKERS

This may seem like interesting but unimportant information, perhaps of greatest importance to gamers who play shooters

on the big screen. But Olsen explains that it can also be a life-or-death issue.

"People in radiology departments look at models of human organs on a monitor. When a doctor examines an X-ray, it is often only minimal differences that show whether a patient has cancer. The fact that the screen size has a significant effect on men's abilities to interpret information is important to know. Perhaps we need to invest in a comfortable size screens that provides maximum benefit and minimal inconvenience for both sexes," he says.



Insects of the region

Eight out of ten species known to science are insects. This photo reportage shows pictures of insects and other creepy-crawlies from northern Norway. Arne C. Nilssen, professor emeritus and senior curator in entomology at the Tromsø University Museum, has selected images from the museum's large photograph collection.

Text: Tromsø Museum – University Museum Photos: Arne C. Nilssen



Most people are familiar with the blowfly, which seeks out dead animals or rubbish bins in the summer. The flies lay eggs in dead animals, which develop into larvae, better known as maggots. Maggots are popular as bait for ice fishing.



Many people are afraid of wasps and their sting can even be deadly. This picture shows a wasp looking for food, normally other insects, but wasps also like sweet things.



Sundew plants eat insects, but generally smaller flies are the ones that end up in the "tentacles" of this plant. It was therefore something of a surprise to discover that the plant can also catch large dragonflies. The dragonfly in the picture never escaped, and thus turned into a substantial meal for this particular plant.



Ladybugs are cute insects, and it is said that they bring luck. But they are actually predators that love to eat aphids.



Wood ants keep aphids as livestock by “milking” them for the sugary liquid they secrete from two tubes on their abdomens. In turn, the ants protect the aphids from other predators.

– We trouble- makers don't drive on trails





Everybody drives snowmobiles in Kautokeino, a small town in Northern Norway. Nils Arne Hætta likes to test the limits of his machine, and feels there are too many rules to follow.

Accidents and the risks associated with snowmobiling are rarely discussed among young people, but in Kautokeino they believe that the number of snowmobiling accidents could be reduced by teaching people to master these powerful machines at a young age.

Text: Renate Alsén Øvergård
Photo: CPM / Johan Mathis Lynx



Girls often borrow snowmobiles, while boys own them.

Nils Arne Hætta, Mikkel Erik Triumpf and Anni Ravna Triumpf perceive themselves to be experienced drivers, since they have been doing it since childhood

SNOWMOBILING In Norway, one to two people are killed every year in snowmobiling accidents.

"The numbers are not that large, but these are nevertheless unwanted, unnecessary deaths. I wanted my doctoral project to address prevention and health promotion issues in Northern Norway, which makes snowmobiling very appropriate," says Grete Mehus. Her recently completed PhD at the University of Tromsø's Faculty of Health Sciences examines snowmobiling and safety.

LEARN AS CHILDREN

Kautokeino youths Mikkel Erik Triumpf, Anni Ravna Triumpf and Nils-Arne Hætta believe that they are well equipped to handle snowmobiling on the snowy plains around their hometown. They have been riding them since they were children.

"We start out with mini-scooters when we are four or five years old, and we learn how to drive at an early age. That makes us better drivers. We learn to master the snowmobile, and we learn how to assess risks. In the Sami culture, we are allowed to try and fail when we are very young, and we learn from this. It's very valuable," the trio says.

They point out that when accidents happen,

they often involve people who are not familiar with the area, or that there is alcohol involved.

"People who drink and drive snowmobiles are rarely caught because they drive at night. The police come out on sunny days, and then they catch families with children who are driving a little outside of the snowmobile trails," says Anni Ravna Triumpf.

The young people of Kautokeino drive nearly every day. They have roughly 1000 km of snowmobile trails at their disposal, and they live in a society where almost everyone gets their snowmobile license at the age of 16. And they drive long distances – one popular destination is Nordreisa, a trip of about 90 km via snowmobile trails.

"We dress well and bring extra food and clothing with us if we are going to be away for a long time. And we don't go out in really bad storms," says Triumpf.

However, the young people say that if you want to dress warmly, you leave your snowmobile helmet at home.

"A helmet won't keep you warm when it's 20 below. You'd freeze. No one in the village wears a helmet. There are so many silly rules," Hætta says, adding, "We troublemakers don't drive on the trails."

TAKING RISKS

These young people do admit to taking some risks. They like to test their snowmobiles in powder snow.

"You always take a risk when you drive but if it's something you love to do, you take the risk. Isn't that what most people do?" asks Hætta.

Mikkel Erik Triumpf recently had the experience of being caught in an avalanche.

"A snowmobile drove ahead of me up a hill, and then the avalanche broke loose. I saw that he slid down, and then I was caught. My snowmobile tipped over, but I sort of floated on top of the snow. I was lucky that there was so little snow. It was a little scary, but neither I nor the snowmobile were harmed," he tells.

Young people value being able to master the snowmobile, and to feel that they have mastered driving. This was something Mehus also emphasised in her research.

She interviewed 81 young people aged 16–23 years in Northern Troms and Finnmark, in Northern Norway. She found that they primarily perceived snowmobiling as a sensory experience involving the body and nature, but where the risk is underplayed.

"The boys in particular go snowmobiling for the physical feeling, or what theorists like to

call 'flow'. They don't focus on the risks because it detracts from the joy of driving. They feel complete freedom from stress, work, school or parents, and they are with their peers. They are, in other words, experiencing 'flow,' where they feel the same sense of freedom as mountain climbers and kite skiers," explains Mehus.

Mehus's results also show that boys try different driving styles to test themselves, and in pursuit of the feeling of flow and a sense of mastery, while girls are more cautious.

"The girls I interviewed are more afraid of hurting themselves, or their snowmobile. This is also because they often borrow vehicles, and do not own the machines themselves," tells Mehus.

WANT MORE POLICE CHECKS

Mehus divided the study participants into three groups: those who take minimal risks, those who sometimes take risks, and those who always take extreme risks. The first group is predominantly made up of girls, while the third group contains a small number of boys.

"This is a small group. They are constantly on the edge, violating norms and rules and exposing themselves and others to danger. They drive outside of the trail network, they sometimes drink and they run away from the police. This is also a group that others stay away from. They can be difficult to influence in a positive way because they isolate themselves and go where they please," says Mehus.

Many of the young people themselves have suggested measures, such as more police checks in the evening and late at night to catch drivers who drink.

"The kids told me that there is some drink-ing and driving – they do it in the evening and

late at night," she says.

After completing her doctorate, Mehus designed a pocket map that she has handed out in the young adult community. It contains general advice that she has prepared in conjunction with her local research. The backside of the card has a map of the trail network.

"There is a reason why there is a trail network," she said. "It has been cleared in advance by people who know the area."

Mehus believes in the need for better training, and focusing more on mountain safety and avalanche experience.

"There are some basic things you need to take with you. A new law from 2004 requires a snowmobile certificate, where participants go through theory classes and practical training on the mountain, which makes them a little better equipped to travel in the mountains," she says.

A NORTHERN PHENOMENON

Mehus points out that snowmobiles mean a lot to young people in Northern Troms and Finnmark. There are roughly 6500 km of trails from Lyngen and northward.

"A snowmobile for these young people is much the same as a small boat for teens in the southern coastal area of Southern Norway. Previously, this was a male-dominated sport, but now it's something you do with your family. For example, there are parts of the Stabbur valley where there are camps with tents and snowmobile sleds, where families can go for weekends and holidays. They drive home to work during the week, but come up with their extended family for the weekend. It is a lifestyle," tells Mehus.



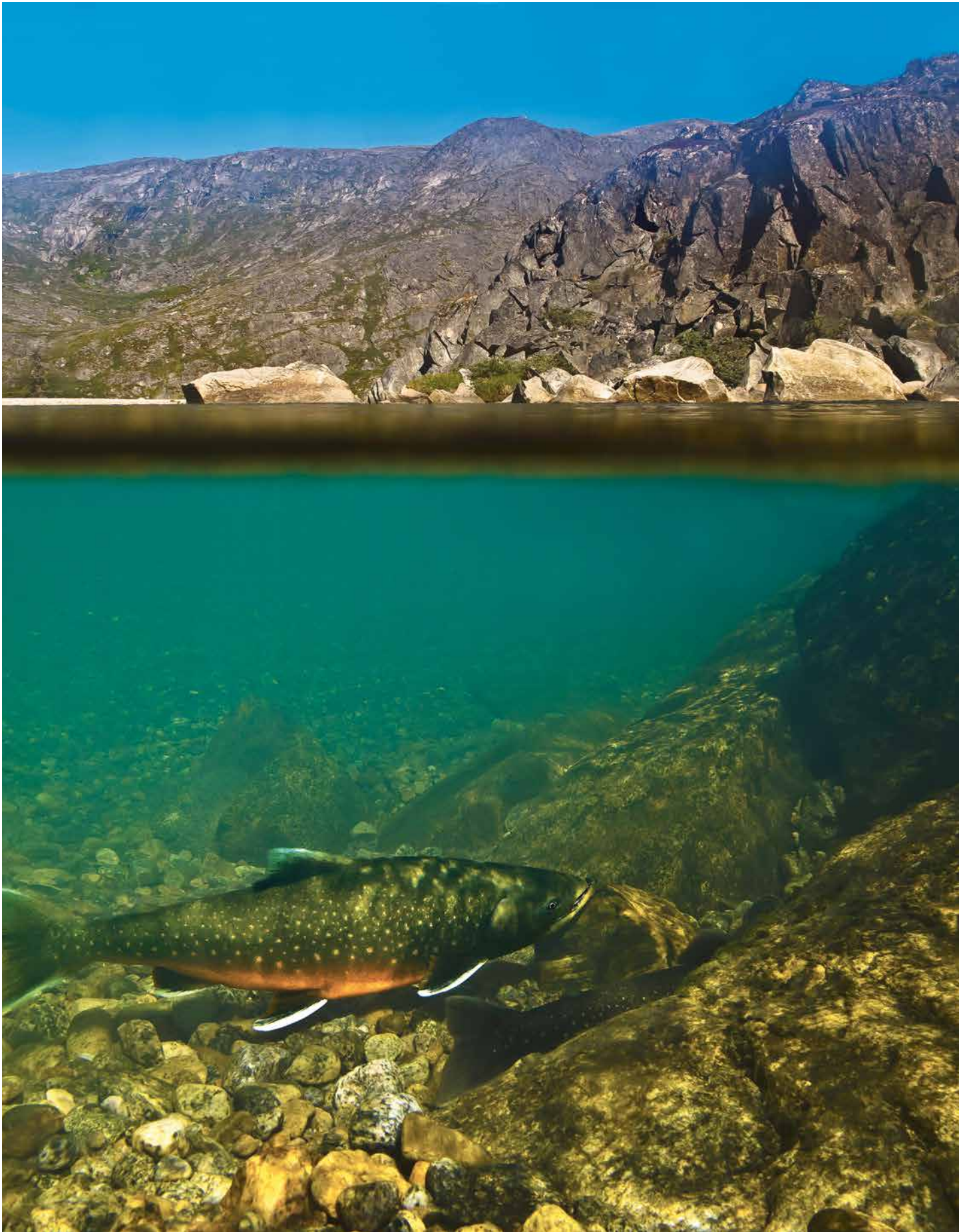
Snowmobiling Policy

- Never go out on a trip alone and in unfamiliar areas.
- Stick to the trail network and the rules – they are your safety net.
- Wear a helmet and well-insulated snowmobile clothing.
- Bring a first aid kit, rope, tools, mobile phone, compass or GPS, shovel, emergency beacon, probe, reflectors and a bivy sack (a windproof bag you can get into if you are cold).
- Never drive after drinking alcohol or if you are intoxicated.
- Slow down on ridges and over snow cornices.
- Avoid riverbeds, bad weather, trees, rocks, fences, night driving and testing your limits.
- Show consideration to everyone you meet.
- Tell people where you are going and when you will be back.

Source: Grete Mehus



Minimum age for a licence is 16 years.



The Arctic charr that live near the beach have the characteristic red belly. Photo: Audun Rikardsen.

Arctic hunger games

The Arctic charr can suppress any feeling of hunger for months at a time, while their fat reserves slowly waste away. Can knowledge of these abilities be useful in the fight against obesity?

Text: Linn Sollied Madsen

MARINE BIOLOGY Arctic charr (a salmonid fish often referred to simply as charr) is a freshwater fish, thriving in Arctic lakes. Yet, for some reason, some individuals decide to head out to sea, becoming a saltwater fish for the summer. These individuals are called sea-migratory charr and their journey is one of danger. More than six out of ten perish on their first voyage, but for those who make it, the rewards are potentially huge.

“Arctic lakes and streams are low in nutrients. The Arctic oceans however, like the Barents Sea, are some of the most nutrient rich in the world. The sea-migratory charr can become much larger and fatter than those who stay behind in the lake, and so it’s worth the risk for those who make it,” explains Even Jørgensen, professor of Arctic and marine biology at UiT.

Sea-migratory charr spend eight weeks out in the open ocean before returning to the lakes and rivers they came from for overwintering and spawning. Charr eggs cannot survive in salt water.

Turns off hunger

Yet it is the behaviour of the fish during winter that really piques scientists’ interest. Even though it also has access to food in freshwater, or even in captivity, the sea-migratory charr starves itself to the brink of death through the long winter months. It enters a hibernation-like

state where it hardly moves, and keeps caloric consumption to a minimum.

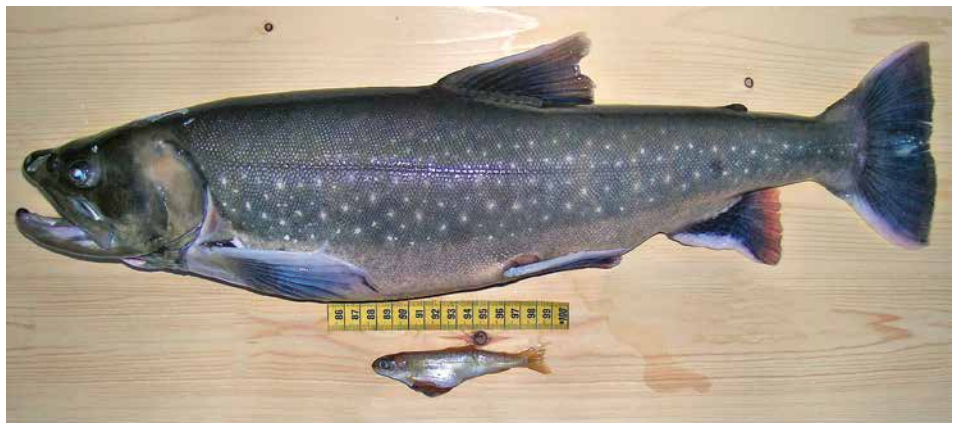
“Interestingly, the sea-migratory charr doesn’t hibernate in the real sense of the word. The charr’s starving body should be sending intense hunger signals to the brain, making it virtually impossible to resist the urge to look for food. Even in controlled experiments with access to an abundance of food, the sea-migratory charr do not eat. It turns out that there are physiological mechanisms that keep the appetite “turned off” through the winter,” says Jørgensen.

In humans and other mammals, the hormone leptin plays a crucial role when it comes

to controlling long-term appetite. We produce leptin in our fatty tissue, from where it’s circulated to the brain, carrying messages about the fat status of our bodies. Leptin will, alongside other signalling factors (e.g. insulin), keep the body weight of adult humans stable over time. A lot of fat will reduce the appetite, while emaciation normally will lead to strong hunger signals.

Evidence so far indicates that fish have the same mechanisms for regulation of appetite and energy balance as mammals.

“With the charr’s hunger mechanisms being similar to our own, we think it would be interesting to learn which physiological mechanisms



The enormous variation in size is not just genetically determined. The two adult fish in the photo, can in theory be a mother and a son. Photo: Rune Knudsen



The charr thrives in Arctic and Sub-Arctic environment.
Photo: Audun Rikardsen.

The charr is the world's northernmost freshwater fish.

can turn off the appetite. It's not unlikely that this knowledge can be advantageous to humans," tells Jørgensen.

Leptin is also supposed to limit human hunger if we put on too much weight, but this does not work properly in everybody. Humans have a more conscious and complex relationship with food than fish do, and in many people the appetite repressive effect of leptin will lessen over time.

"For people with a defect in their leptin producing genes, the introduction of extra leptin has proven to be effective against obesity. But for those who have lost their sensitivity to leptin, the treatment doesn't work," explains Jørgensen.

Those who have tried to go on a diet know that decreasing one's fat reserves often leads to an intense feeling of hunger that can be very hard to resist. Scientists have been working for decades to find a medication that can suppress hunger in humans, but no treatment has proven effective so far.

"Hopefully our studies on the anorexic charr will lead to some good ideas for the treatment of obesity," smiles Jørgensen.

THE TOUGHEST TAKE TO THE OCEANS

Research has shown that the sea-migratory charr's period of extreme dieting is not triggered

by a drop in water temperature. Experiments point to the increased length of daylight in the spring as the catalyst for "turning on" the appetite of the fish. The appetite then gets "turned off" when the sea-migratory charr has acquired the optimal amount of fat at the end of summer.

Extreme dieting is only one of the charr's many quirks. Researchers are also trying to find out why some individuals risk the perilous journey to the open sea, while others stay at home and avoid the risk, but also miss out on the potential rewards.

"There are no genetic differences between those who leave and those who stay behind; they can even be siblings. Nor is it an acquired or learned behaviour. What we see is that individual characteristics like aggressiveness and dominance are somehow connected to the mechanisms that steer the fish towards one life strategy direction or another," explains Jørgensen.

"We believe it is the toughest individuals that become sea-migratory. The ones that are the most aggressive, take more risk, the most "adventurous" individuals that choose the sea-faring lifestyle. Life at sea is hard."

As the charr originally is a freshwater fish, it has no inherent ability to survive the salt content in seawater. This skill is only developed just before they leave the lakes. The charr has also

a lot more enemies at sea, than in freshwater.

ONE SPECIES – A MULTITUDE OF VARIATIONS

This lifestyle variant is still just one of an amazing range of lifestyle adaptations found in the charr. In fact, it's one of the most adaptable vertebrates in the world.

"A sexually mature female charr can weigh anything from three grams to 15 kilos. That means a big one can weigh 5000 times more than a tiny one. The variations aren't limited to size, but also habitat, shape, colour, life history and diet," says Rune Knudsen, professor in Arctic and marine biology at UiT.

He researches the great variation you find in the Arctic charr, and is among those who believe the Arctic charr is one species with many ecological variants.

"Some scientists want to divide the different variants into different species, but I believe we're talking about one species," he says.

"These variants live totally different lives, and don't spawn with each other. But there are so many variants that if they should all count as one species each, then the whole notion of species would be meaningless."

HIDDEN ON THE BOTTOM

Knudsen has studied the different variations of charr in Skogsfjordvatnet Lake at Ringvassøya.

The lake has open access to the ocean, so it also contains the sea-migratory charr variant.

“Once we started researching the charr population in this particular lake, we were surprised to find no less than four very different variants. This included a tiny, dwarfed bottom-living variant no one knew was living down there in the deep,” Knudsen smiles.

Even in the confines of the same lake, the charr has come up with many different and sophisticated lifestyle solutions. In addition to the big and aggressive sea-migratory charr, they found the “stay-at-home” charr living close to the shore and the surface. These also grow to a considerable size and feed on large, attractive bottom fauna.

Further from the shore, at depths of 30–40 metres, is the home of the dwarfed charr. They have tiny mouths and large eyes adapted to a life with little light and small mouthfuls. It wasn’t until the scientists used nets with very small mesh size that they discovered this variant in Skogsfjordvatnet.

CANNIBALISTIC VARIANT

“Another variant we found deep down in the lake was a large, cannibalistic variant, feeding on the smaller charr and other small fish. This type had a noticeably larger head, big eyes and an impressive set of teeth. It turned out that the local fishermen already knew about this type. It even had a local name – big headed charr.”

“They specifically used to fish for this variant to use for salted charr. The charr living in the deep have completely white flesh, as opposed to the surface variant which is a redfish,” says Knudsen.

Even though the charr excels as one of the most adaptable fish in the world, this adaptation does not occur during one fish lifetime.

Except for the surface types, where some decide to take to the seas, the life of a charr is pretty much predetermined by the moment it exits the egg.

“A tiny bottom charr cannot work its way up the career ladder and end up like a king among the surface charrs. They are simply too genetically different. If you’re born on the bottom, you stay at the bottom.”

Read more?

Per-Arne Amundsen and Roar Kristoffersen (red.)

(2008) *Ferskvannsfisk. Ottar*, 273

Anders Klemetsen (2010). *The charr problem*

revisited: exceptional phenotypic plasticity

promotes ecological speciation in postglacial lakes.

Freshwater Reviews, 3: 49–74.

Three types of charr in the same lake

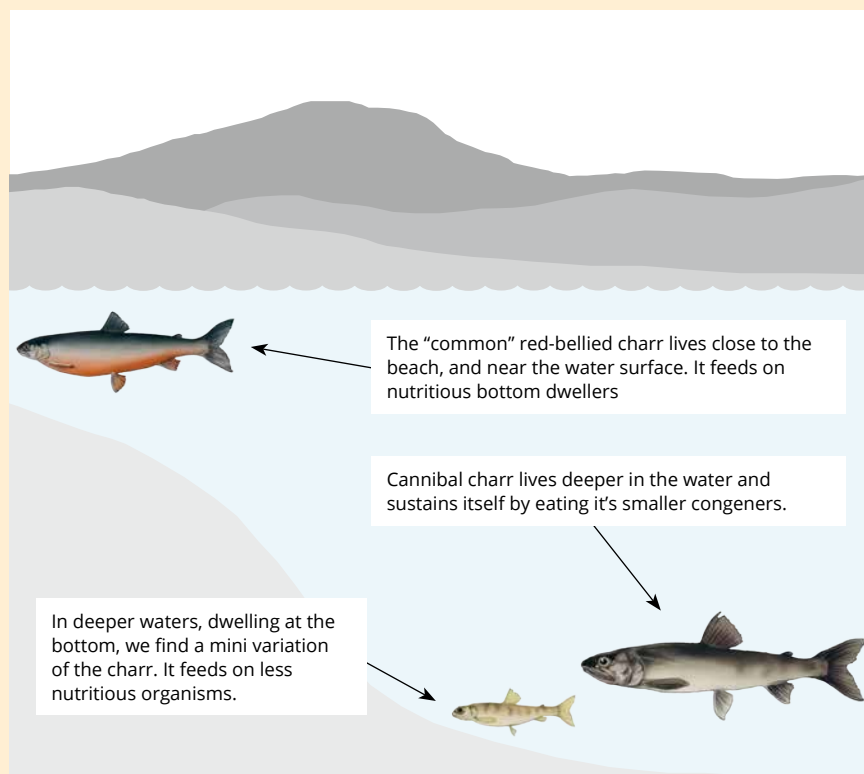


Illustration: Sigrid Skoglund/Tove Midtun

Scientists believe the different charr variants are a product of so-called sympatric evolution. This means that the different variants have developed without being physically separated from one another. They have lived in the same lake without any physical barriers, and adapted to a life in different parts of the lake, resulting in different looks and different ways of living. This way the species get to take advantage of all the habitats in the lake, which in the long run helps secure the survival of the species.

This development has happened simultaneously in all lakes that have several charr variants, with a relatively similar outcome.

All charr variants stem from the sea-migratory charr which populated the Arctic and subarctic lakes after the ice retracted at the end of the last ice age. It is the charr’s incredible ability to adapt to these environments that has resulted in these big

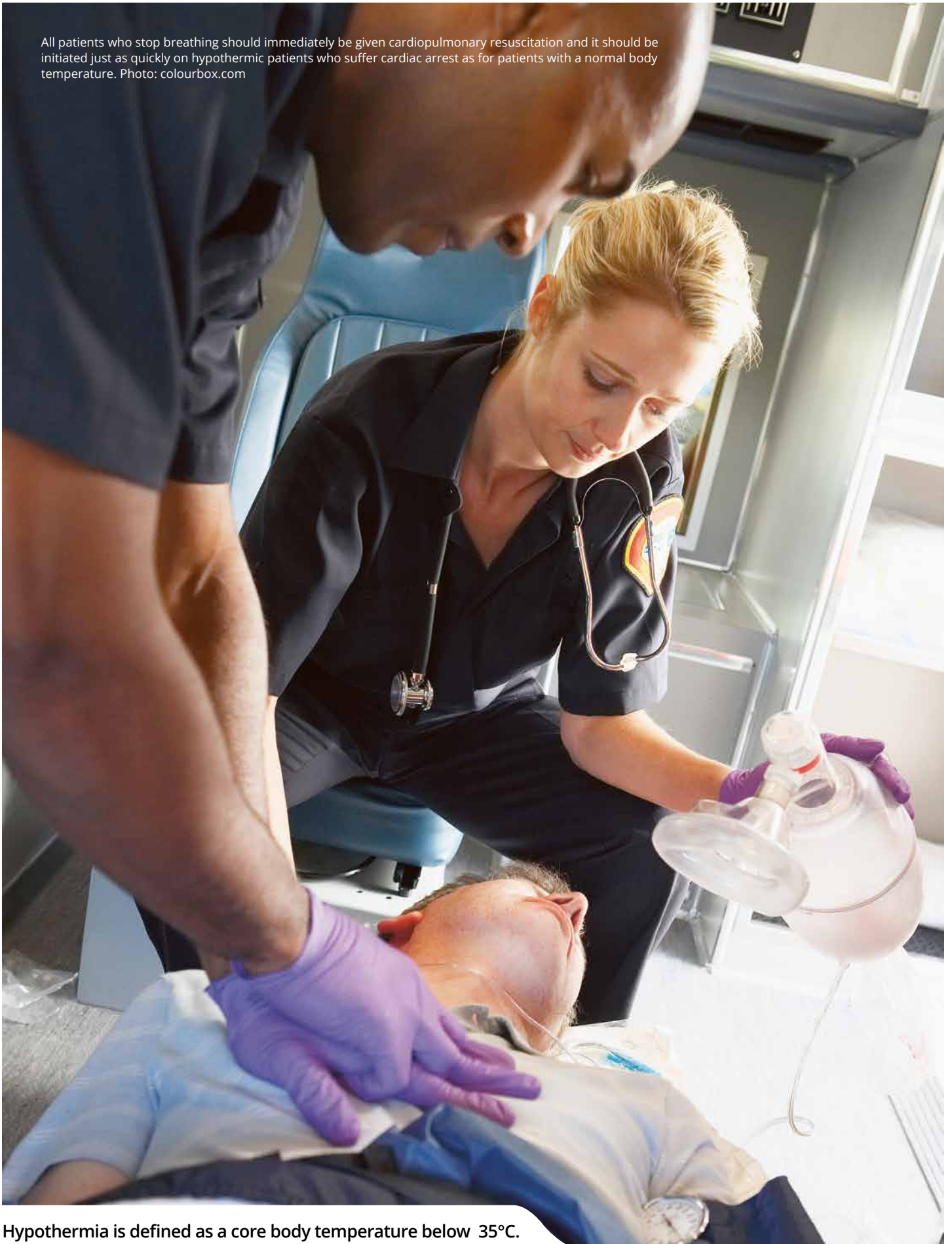
differences over the last 10,000 years.

Some of the variations have become genetic. The tiny dwarfed charr, for instance, has lost the ability to regulate the contents of its swim bladder. Yet other differences are merely governed by variations in food supply and their specialised way of life.

Under controlled conditions, a dwarfed charr can reach an impressive size if it has a constant access to food, which shows that size is not something predetermined by genes alone. Experiments actually suggest that it’s the dwarfed charr which has the best genetic prerequisites for growing quickest under optimal food conditions.

It is only the sea-migratory charr that goes on an extreme diet during the winter. The other types eat a varying amount of food throughout the year, despite contrasting differences in light intensity and water temperature.

All patients who stop breathing should immediately be given cardiopulmonary resuscitation and it should be initiated just as quickly on hypothermic patients who suffer cardiac arrest as for patients with a normal body temperature. Photo: colourbox.com



Hypothermia is defined as a core body temperature below 35°C.

Surviving hypothermia

If you're found cold, lifeless, and without a detectable pulse, you're more likely to end up in a morgue than a hospital. However, with proper first aid treatment, humans can survive many hours of cardiac arrest.

Text: Maja Sojtaric

HYPOTHERMIA In many parts of the world, a cold and lifeless body without a pulse is a clear indication that you are dead. But sometimes being extremely cold – hypothermic – can actually save your life.

If a person goes into cardiac arrest on the streets of Tromsø, the paramedics and doctors have just 30 minutes in which to revive them. If the unlucky patient is revived using cardiopulmonary resuscitation (CPR) within that 30-minute window, the chances of returning to a normal life are high. But every minute beyond those first 30 minutes drastically reduces the chance of survival.

“Patients with dramatically low body temperatures and who suffered a cardiac arrest have survived for up to six hours with continuous CPR. And they were able to return to a full life after being resuscitated,” says Torkjel Tveita, an attending physician and professor at the University of Tromsø.

The University Hospital of Northern Norway is the world's leader in treating hypothermia accidents and has been involved in several remarkable revival efforts. Now, researchers at the University of Tromsø are investigating hypothermia accidents via a project named *Cold Water Survival*.

REDUCED NEED FOR OXYGEN

To determine why you have more time if your heart stops when your body temperature is extremely low, the researchers will conduct experiments on pigs. Pigs have approximately

the same normal body temperature as humans, about 38 °C, and a body that behaves much like the human body during cooling.

“All cooling below 30 °C can be considered dangerous. Animal experiments have shown that this kind of deep hypothermia over a long time will cause heart failure that will appear during and after the patient is warmed up. If you have deep hypothermia, it is better for your heart to be cooled and warmed up quickly, rather than being exposed over a long period of time to a body temperature of 30 °C,” says physician Ole Magnus Filseth, who wrote a doctoral dissertation on the subject at the University of Tromsø.

Filseth emphasises that CPR should be started as quickly for people with hypothermia and cardiac arrest as for people whose body temperature is normal.

“All patients who stop breathing should immediately be given CPR. It's easier for a layman to determine that a person is not breathing than if the person is having a heart attack,” Filseth says.

But how is it possible that a cooled-down human body can return to near normal function after six hours of cardiac arrest? The researchers' hypothesis is that the cells need so little oxygen in a cooled state that they can get by with the little oxygen that is supplied by CPR.

“In this case, think of oxygen as the body's gasoline. You use more fuel driving at 90 km/h than at 30 km/h. The same is true with the body. Circulation naturally decreases as a

consequence of cooling, cellular metabolism is reduced and therefore the body uses less oxygen,” explains Tveita.

“The hypothesis is that by providing CPR to maintain blood circulation in a body that is cooled to 25 °C, we can reach virtually 100 per cent of optimal oxygen transport,” he says.

THE MOST EXTREME STORY

“As long as your lungs get oxygen and your heart pumps blood, there is hope,” says Tveita.

That was certainly the situation for the most extreme hypothermia case that a human has ever survived. Anna Bågenholm, a medical doctor, lost control of her skis on a mountain ski tour outside of Narvik in 1999. At 6:20 p.m., she fell through the ice on a river, head first. When her companions found her they saw just her skis and legs. The rest of her body was locked in the grip of the icy river.

Bågenholm was lucky in many ways: she landed on her back under the ice and was conscious long enough to find an air pocket. She was unconscious for 40 minutes before her heart stopped, but her core temperature was so low at that point that her body's oxygen demand was greatly reduced. Finally, after 80 minutes, her ski companions managed to chop her out of the ice. They were all doctors and immediately started CPR.

Her core body temperature was measured at 13.7 °C. She showed no signs of life. She was pale, wet and ice-cold, and her pupils were dilated. Luckily, Bågenholm ended up at the University

The Barents Sea has an estimated NOK 180 billion of petroleum in undersea reservoirs.



There will be more and more activity in the vast cold waters off the coasts of Northern Norway. Increased traffic in desolated areas of the Barents Sea demands better preparedness should someone fall into the freezing water. Photo: Linn Sollied Madsen

Hospital of Northern Norway, where emergency doctor Mads Gilbert, who is now also a researcher on the *Cold Water Survival* project, and the rest of the medical team knew that a hypothermia patient first has to be warmed up before being declared dead.

The doctors continued CPR while they warmed up Bågenholm. Her heart started beating on its own again at 10:15 p.m.

“Animal experiments suggest that heart failure occurs as a result of cooling. But this is not a huge problem in hypothermia accidents, as long as the patient is treated according to modern medical guidelines. Patients who die after they are warmed up, die from brain damage due to oxygen deficiency – in the case of drowning, for example. Or they die of multiorgan failure in an intensive care unit several days into the course of their treatment. People who are released from the hospital alive generally have

a good prognosis and will regain their original heart function,” Filseth says.

Anna Bågenholm is one of the lucky ones. Today she is very much alive, working as a medical doctor.

LITTLE STUDIED

Hypothermia accidents are actually relatively rare. In his dissertation, Ole Magnus Filseth calculated an annual rate in Norway of 0.5 cases per 100,000 people.

And despite what you may think, hypothermia accidents are no more likely to occur in the Arctic than in more southerly latitudes. In February of 2012, for example, more than 420 people froze to death in Central and Eastern Europe.

Filseth thinks that we will likely see more urban hypothermia deaths in the future, mainly because of the increased likelihood of extreme

weather events due to climate change and cut-backs in social services due to the global financial crisis.

However, there is very little research on hypothermia accidents.

Most clinical reports of hypothermia accidents are limited to isolated events such as Anna Bågenholm’s, or the story of John Arve Johansen from Sortland, who was deeply hypothermic and survived seven hours of cardiac arrest with on-going manual CPR. Johansen’s case is probably the longest time a person has been in cardiac arrest and still successfully resuscitated. He was also resuscitated by the emergency medical personnel at the University Hospital of Northern Norway.

Other investigations have been conducted on sailors and soldiers who died of hypothermia during war. The most despicable hypothermia research was conducted by the Nazis

This is how the avalanches kill

in the Dachau concentration camp. The experiments they conducted on prisoners there, as well as experiments that were conducted in US prisons, represent a blemish on the history of hypothermia research. These experiments and their results are considered unethical and are not used by scientists today, Filseth writes in his thesis.

INTEREST FROM THE OIL INDUSTRY

Now, there are signs of increasing activity in the waters of the Arctic. The Barents Sea is becoming more attractive to many industries as global warming melts away the Arctic's summer ice cap. More and more cruise ships, cargo ships, research vessels and trawlers will travel along the northern Norwegian coastline. This increased commercial activity also entails a greater need for stricter safety requirements.

The petroleum industry in particular is pushing for more research on hypothermia accidents, and *Cold Water Survival* is being funded via a Research Council of Norway programme called Petromaks. The programme was established in 2004 to support petroleum-related research and development.

"The oil industry sees that transport distances in the cold Barents Sea pose a substantial challenge. Ships, trawlers, drilling platforms and other installations are a long way from the hospital. We can provide first aid out at sea, but how do we warm these people up? For that we need a heart-lung machine, and only Norway's biggest hospitals have those," says Tveita.

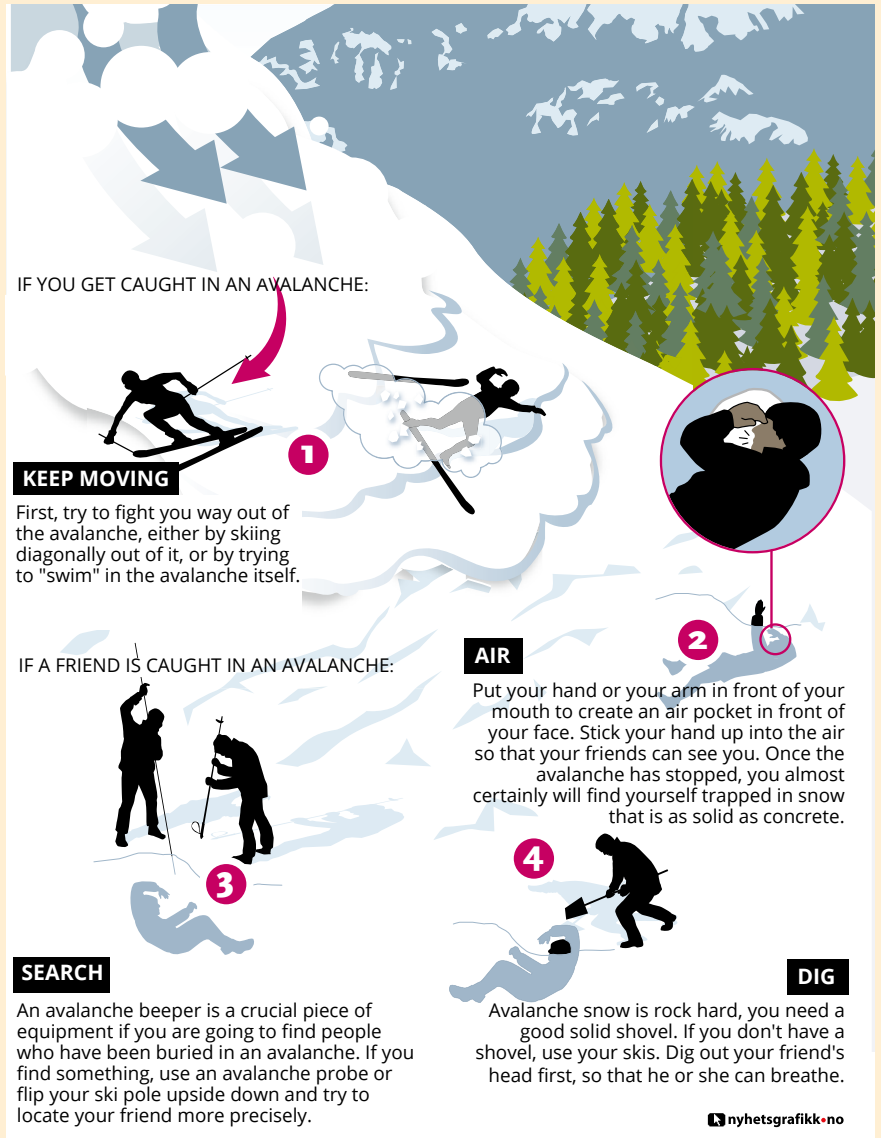
A side project, funded by the Ministry of Foreign Affairs, will ensure the creation of national guidelines for how to treat hypothermic individuals who are injured at sea. Part of the project is to find out whether it would be advantageous to use portable heart-lung machines, known as ECMO, in rescue helicopters.

"Although the proponent of the project is the oil industry, it is our goal that the new rescue and treatment methods will benefit the population as a whole," says Tveita.

Want to know more?

Filseth, Ole Magnus (2012). *Aspects of experimental cooling and rewarming with special reference to accidental hypothermia*. University of Tromsø.

The project: *Efficacy of prolonged cardiopulmonary resuscitation during accidental cold water hypothermia*.



An avalanche can move at 200 km/h. There may be more than 100,000 cubic meters of snow in an avalanche. One cubic meter can weigh 600 kg. These tremendous forces of nature can become deadly when they hit the human body. 24 percent of those who die in avalanches, die because of the impact. 75 percent suffocate. One percent dies of hypothermia.

– If you survive the force of the avalanche, and are so lucky that you are left with an air pocket in front of your face, then you get another problem. You are too well dressed, but have little oxygen. Unlike people who fall into water and get rapidly cooled down, the cooling under snow occurs relatively slowly. This means that your need for oxygen does not decrease, as we believe happens when you become hypothermic rapidly, says Professor Torkjel Tveita.

Source: storm.no, snl.no, afterposten.no, ngi.no, ut.no, nordlys.no

Avalanches kill more than 150 people worldwide each year.



Over a thousand beaches were contaminated with 63,000 tonnes of crude oil when the Prestige oil tanker sank off the coast of Spain and Portugal in 2002. The environmental damage makes it the largest environmental disaster in that area on record. To prevent something similar from happening off the coasts of Northern Norway, Norway needs to monitor Russia's plans to drastically increase its oil exports. Photo: Scanpix / AFP

Increased Russian tanker traffic raises oil spill risk

The risk of oil spills along the Norwegian coast may increase by as much as five times by 2025. This is because Russia plans to increase the export of crude oil through the Barents Sea to 100 million tonnes annually.

Text: Maja Sojtarić

OIL SPILL As a result, as much as one-third of Russian crude oil will be transported along the Norwegian coast.

“Oil transport from northwest Russia accounts for the greatest increase in maritime traffic along the Norwegian coast,” says Associate Professor Elise Karlsen.

She recently defended her doctoral dissertation in law on the legal options that Norway has to try to prevent oil spills in the country's waters.

A DRAMATIC INCREASE IN RUSSIA'S OIL CAPACITY

Statistics show that 15 million tonnes of oil were transported from Russia to Western markets via the Barents Sea in 2010. Over the next five to ten years, Russia plans to increase the capacity of its Arctic ports to 100 million tonnes of crude oil.

“Fortunately, the Norwegian authorities

are aware of the potential problems this may pose. They've developed forecasts of future sea traffic and the associated risks. I've analysed the international regulations that set the legal framework for what Norway can do to protect its coasts from oil spills, and found that there's a legal basis to do more than we are doing right now," Karlsen says.

Today, Norway can restrict traffic in its territorial waters, within 12 nautical miles of a baseline on the coast. Norway can also ask ships to follow established shipping routes in the country's exclusive economic zone, which extends to 200 nautical miles (370 km) from the coast. However, this request cannot be enforced.

"Most ships follow these requests, but it's often much shorter to travel closer to the coastline. If a ship ignores a request to remain in the shipping lanes, which are a safe distance from the coast, there isn't much we can do about it," she says.

ENVIRONMENT OVER BUSINESS INTERESTS

Much of Russia's oil will be transported in supertankers along the Norwegian coast. A supertanker can carry as much as 400,000 tonnes of oil. Projections provided at the request of the Norwegian government suggest that as many as six 300,000 tonne tankers could travel from northern Russia to the United States each week by 2015. It's not hard to imagine what kind of natural disaster would occur if one of these ships were to have an oil spill.

"These supertankers sail along the entire coast of Northern Norway coast, then head west at Røst," says Karlsen.

Other types of cargo ships also carry large amounts of oil as fuel reserves. As much as 80 per cent of all oil spills are a result of operational releases from cargo ships, rather than large spills from oil tankers.

"Ships that sail in our territorial waters are subject to what is called 'innocent passage', which means we are legally obliged not to impede their travel. However, I believe that in high-traffic areas, international conventions allow for greater restrictions than Norway currently has in place. We could introduce more passage restrictions in Lofoten, Vesterålen and Senja, where cargo ships would have to sail around smaller fishing boats, for example," she says.

"Regulations also allow for a compulsory piloting service in vulnerable areas," says Karlsen, "but this is currently only in place for Norwegian fjords, not for ships in transit."

"The political challenge here is that we as a seafaring nation can't impose too many

restrictions. But as a coastal nation, we have to consider environmental concerns over commercial interests. We have to dare to push the boundaries at international forums where we already are strongly represented," she says.

"Norway has a long, beautiful, vital coastal zone. The sea is an important part of the country's food supply today, as well as containing important resources for the future. In addition, the coastal environment has an intrinsic value," Karlsen says.

"To live in a clean environment where the shores are not spoiled by oil spills, and where seabirds are able to live and breed in their natural environment, has a value beyond what can be measured with money," she wrote in her dissertation.

NO NEED TO PANIC

Karlsen adds, however, that there's no need to panic, and that Norway in general has done a good job in protecting its shores. The preventative regulations work, and figures from recent years show that accident statistics for ship traffic

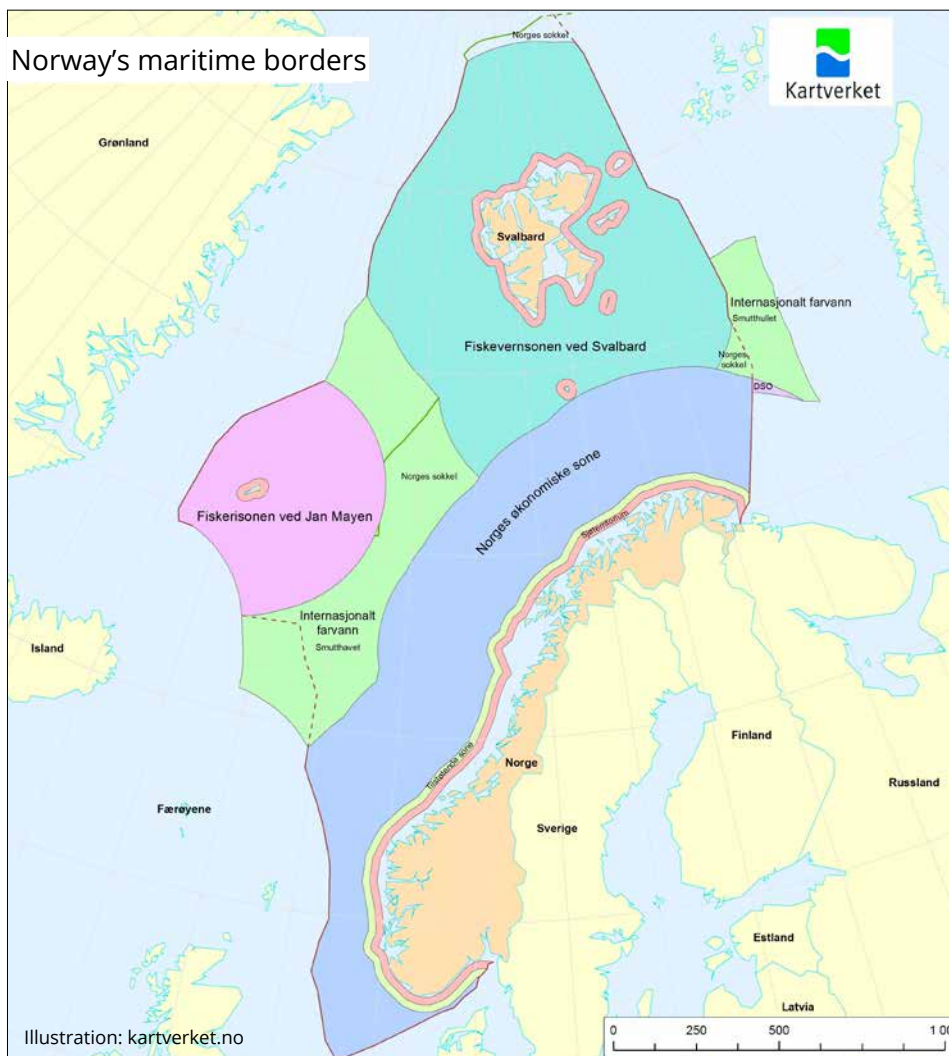
have dropped. Of course, it is in both the coastal state and shipping industry's interests to have as few accidents as possible.

The actual amount of operational releases along the Norwegian coast is unknown. It's hard to estimate because normal ship releases aren't monitored, which makes it difficult to calculate illegal discharges. This means that increasing surveillance along the coast could prevent disasters before they happen.

"It is legal to monitor shipping in the Norwegian economic zone, but not to intervene. However, if we see a spill happen, different regulations come into play and Norway can intervene in a more comprehensive way. We need to be proactive – the more security measures we have in place, the less the risk of spills in our waters," she says.

Want to know more?

Elise Karlsen, *Hvordan forhindre oljeforurensning fra utenlandsk skipstrafikk i transit.* 2013.



Your blood reveals secrets about your cancer risk

An analysis of blood cells may reveal your cancer risk. Blood cells react positively or negatively to your diet and your lifestyle.

Text and photo: Elisabeth Øvreberg

ANALYSIS “I’m studying cells in the blood, in this case our immune cells. These cells can tell me a lot about your lifestyle and your diet,” says Karina Standahl Olsen, a researcher at the Faculty of Health Sciences at UiT.

But Olsen can tease out far more information from your immune cells than just your lifestyle. Her PhD research has shown how gene activity in these cells reacts to smoking, obesity and omega-3 fatty acids, and more – and her findings represent important information about our risk of lifestyle diseases such as cardiovascular disease, diabetes and especially cancer.

INFLAMMATION AND CANCER

Most leading cancer researchers in the world believe that inflammatory reactions in the body may contribute to causing cancer, and that this kind of inflammation may promote the growth of tumours. In view of this, Olsen’s research results are particularly interesting.

She analysed blood samples and questionnaire replies from 400 healthy, middle-aged women who were participants in the Women and Cancer study. When she compared smokers to non-smokers, she found more than 3000 genes in immune cells with differing activity levels. Smokers had higher gene activity related to inflammation and the body’s processing of toxins.

“I also checked the women’s BMIs, and obesity is actually almost equally important as smoking for gene activity. The higher the

BMI, the greater the levels of inflammation-promoting gene activity in immune cells,” explains Olsen.

OMEGA-3 IS GOOD FOR IMMUNE CELLS

The good news in Olsen’s findings was that women who had high levels of omega-3 fatty acids in their blood had lower levels of inflammation-related gene activity. The same was true for women who consumed enough vitamin D.

“We can only get omega-3 fatty acids from our diet, so eat fish! This will also give you vitamin D. You can also get omega-3 from flaxseed and nuts,” she says, and points out that her research shows that immune cells are influenced by lifestyle and diet, even before the onset of any disease.

Olsen, who successfully defended her PhD dissertation this autumn, reassuringly says that we don’t need to be afraid of increasing our risk of cancer if we struggle with inflammation in a shoulder or something like that. Instead, we should focus on having a healthy lifestyle.

“On the other hand, if you have an unhealthy lifestyle, the inflammatory activity in your body will be elevated, which can be related to the development of most major lifestyle diseases, including cancer,” tells Olsen.

BREAST MILK IS A BATTLESHIP IN THE WAR ON CANCER

Blood is not the only place where we have immune cells. According to UiT Professor Tore

Gutteberg, breast milk also contains immune cells. His research shows that breast milk does much more than feed a hungry baby. Breast milk also has a protective effect and kills viruses, bacteria and even cancer.

“I cannot say enough about breast milk! Breast milk is like a liquid battleship,” says Gutteberg, who has immersed himself in the study of a protein found in human milk called lactoferrin and its corresponding peptide, lactoferricin.

Gutteberg discovered something unexpected in collaboration with his colleague Øystein Rekdal, a professor of tumour biology.

“We saw that lactoferricin inhibits and kills cancer cells,” tells Rekdal.

Rekdal realised immediately that this peptide was quite interesting.

“The peptide inhibited tumours in animal models. Not only did the peptide eliminate tumours, but it also protected the animal. Cancer could flare up again, but in this case, that did not happen,” says Rekdal, adding that UiT now has unique expertise in peptides.

Lactoferricin was the topic of a doctoral dissertation that was defended at UiT this autumn, and it is hoped that the research at the university can lead to immune therapy, which may work locally against cancer, followed by protective immune responses.

Researcher Karina Standahl Olsen

Laboratorium

Inflammation can promote tumor growth.



These white-tailed eagle young are almost fully grown and not very happy about being measured and weighed by the researchers. The largest white-tailed eagles can be a metre long and have a wingspan of up to 265 cm. They are northern Europe's largest bird of prey.

In the eagle's eyrie

Not everyone willingly participates in research projects. Some actually fight it beak and claw.

Text: Linn Sollied Madsen. Photos: Ingun A. Mæhlum

The dry branches creak ominously as Trond Johnsen from the Norwegian Institute for Nature Research (NINA) climbs into the six-metre-high coastal pine. Master's student Silja Sletten from the Department of Arctic and Marine Biology at UiT protects her colleague as best she can with ropes and other climbing equipment, but it still looks risky. It doesn't help that the goal of climb is a large eagle's nest in the top of the tree, where an irritated young white-tailed eagle looks out over the edge. Above us circle worried eagle parents, periodically screeching out warnings to the intruders.

"We've been up in quite a few eagle nests in recent years, but have never had an eagle parent attack us," Johnsen said reassuringly on our trip through the woods to find the nest.

"They probably realise that people can be dangerous, and their top priority is to stay alive. But they won't hesitate to attack a fox, for example, if it tries approach their young."

OLD NESTS

Up in the nest, a young eagle is looking down at the unfamiliar man getting closer. Even from the bottom of the hill, it is clear that we're not

talking about small birds here. By early July, the young birds are only one to two weeks from being able to fly, and not far from being as large as adult eagles.

"There are actually two young up here! A male and a female, I think," Johnsen shouts.

Down on the ground, Sletten cheers. Two young birds means that this is a good day and well worth the trip.

"The first five nests we visited this year were a waste of time. Two were empty, two others contained abandoned eggs and the eggs in one had fallen out of the nest and were destroyed.

Good examples of bad days,” says Sletten.

Eagles mate for life and typically build a number of nests over the years that they can choose from. If a nest is covered in snow and ice when they begin nesting in April, they settle in one of the other, more protected nests.

“White-tailed eagles can get up to 30 years-old, so some of the nests can be really old, I am sure that this nest is ancient,” says Johnsen.

THE HUNT FOR POLLUTANTS

We are located on South Senja, in a beautiful and bewitching coastal pine forest. The eagles have chosen an idyllic spot among twisted pine trees and heather, and with spectacular views of the fjord. This is the eighteenth nest the researchers have visited during a hectic summer season in conjunction with the RAPTOR 2015 research project. The project is attempting to identify the impact of pollutants on birds of prey, including on their reproduction abilities. This means taking feather and blood samples from the younger generation of eagles.

When the project started in 2008, samples were collected from several species of raptors. But eventually the decision was made to concentrate on the white-tailed eagle, since the species is relatively easy to deal with.

“Ouch! They’re angry,” shouts Johnsen from the edge of the nest. He is in the process of putting one of the young eagles into a roomy bag that will be hoisted down from the tree, and gets painful proof that even though the bird’s wings are not yet fully developed, its beak and claws are fully functional, thank you very much.

Once down on the ground, the young are weighed and scientists measure their beaks, feet, tail feathers and wingspan. The purpose is to collect material that can be used to follow the development and variation in the birds, and to determine the gender of the young. White-tailed eagle females can be as much as 15 per cent larger than males, and weigh up to 25 per cent more. It is most often the mother eagles that make the most commotion when Sletten and Johnsen come to visit.

“White-tailed eagles are quite dedicated parents. They lay their eggs as early as April, in flat nests in treetops, or on slopes or cliffs. For more than 40 days, they have to sit on the eggs and incubate them, in snowstorms and pouring rain,” says Johnsen.

White-tailed eagles can lay up to three eggs, depending on the quality of the resources they have access to. Sometimes there may be as much as a week between the first and the last egg, which can result in large size differences between siblings.

Sletten plucks out a few breast feathers from each of the young and takes blood samples from

The white-tailed eagle parents have chosen a nesting place with a good view, in the highest pine. Here, the first young eagle has already been brought down, while Johnsen is moving up in the tree to get the other one.





The white-tailed eagle was almost extinct in Norway when it was protected in 1968. Since then, the population has soared and the protection of these great birds is one of Norway's biggest conservation successes of all time.

a vein in their wings. It is this material that is used to determine what kinds of pollutants the birds have in their bodies, and how much the young eagles have been exposed to so far.

NOT BIG HUNTERS

This is the second year in a row that Sletten has worked as an assistant. Last year's tests form the basis of her master's research in which she's looking at whether there is any correlation between the amount of pollutants in a bird and stress variables (including stress hormones) in eagle individuals.

"We see a lot of old pollutants that are not used anymore, but that are still found in the environment," says Sletten.

"We find the old classics such as DDT and PCBs, but also pollutants that are still used today, including some flame retardants," says Johnsen.

Environmental pollutants accumulate in the food chain, so it is often species at the top of the chain that have the greatest exposure.

White-tailed eagles are among these species, and ingest contaminants via the foods they eat. An inspection of the nest shows that the young eagles have had a relatively varied diet. Johnsen picks up the remainders of flounder, a wolf fish, a hare and a medium-sized bird.

"In contrast to golden eagles, white-tailed eagles are not particularly dedicated hunters. They are equally satisfied with eating carrion. If they get the opportunity, they will steal prey from other predators, such as the otter," says Johnsen.

Although eagles do not have a particularly big impact on livestock, they were previously seen as a pest and a potential competitor. There was large-scale hunting of these birds and the population began to decline in earnest in the late 1800s. They were shot, nests were plundered, they were poisoned, and Norway had a bounty on eagles until the early 1960s. The increasing emissions of pollutants also had an impact on the population over the course of the last century. As the century wore on, the future

looked bleak for Norway's largest bird of prey.

CONSERVATION SUCCESS

In 1968, white-tailed eagles were awarded total protection. Eagles do not have very many young each year, so there was little evidence that the preservation effort did much good in the early years, but eventually the population began to expand.

The white-tailed eagle has now been established in areas where it had previously been completely wiped out, and was removed from the Norwegian Red List of endangered species in 2007. It is estimated that the Norwegian population is at about 3,600 pairs, which accounts for over 50 per cent of the total European population. Populations are also increasing in other parts of Western Europe, partly with the help of Norwegian birds that have been moved to other areas, such as Scotland.

Environmental pollutants remain a threat to eagles, however. The annoyed white-tailed eagle young that are sitting on the ground

may not realise that they have contributed to a major research project for their own good, but they will soon be able to enjoy the end of their afternoon's trial.

Sletten packs the young eagles gently back into the bag, which is then hauled up the tree again. Soon both young birds are safely back in the nest, and we can pack up and leave them in peace.

"White-tailed eagles have very well developed vision and hearing, but not a very good sense of smell. Thus, it is not true that a 'human smell' will scare parents away from returning to the nest," explains Johnsen.

The next step is the laboratory analysis of blood and feathers. Johnsen and Sletten will try to get samples from a couple more young birds before the season is over, but they're short on time.

"We have maybe one week before this year's chicks are fledged and we have to throw in the towel for now. This is an incredibly hectic time of year, and it is almost impossible to plan. It's the same thing every year," Johnsen mutters, unable to hide his love for this particular part of the job.

"I tend to pat them a little extra now at the end of the season, since I know it will be a long time until I get to be so close to these magnificent birds again," smiles Sletten as we walk through the woods back to the car.

And when you have seen these amazing birds up close, it's not so hard to understand the fascination.

Sletten is careful to handle the young birds as gently as possible as the researchers work with them.



RESEARCH PROJECT:

RAPTOR 2015

PARTNERS:

Norwegian Institute for Nature Research, the Norwegian Institute for Air Research, Bodø University College, University of Antwerp and UiT.

OBJECTIVE:

To assess the vulnerability of birds of prey to environmental change, particularly related to natural stress (such as parasites) and pollutant loads. Samples have been taken from white-tailed eagles, golden eagles and goshawks.

RESEARCH PERIOD:

2008 – 2012 (with an extension)

GEOGRAPHICAL RESEARCH AREA:

The Northern Norwegian counties of Nordland, Troms and Finnmark.

Just how did a Danish-speaking Czech end up in Tromsø researching abortions in water flea mothers? The answer is love.

Text: Elisabeth Øvreberg



Marek Cuhra

PhD candidate Marek Cuhra conducts laboratory studies of abortions in water fleas. Every third day, a water flea normally gives birth to 20–25 live young, but if the animals are exposed to glyphosate from pesticides in the water, the young are stillborn.

Photo: Elisabeth Øvreberg

“I fell in love with Tromsø. When I was here for the first time, I realised that this was where I had to live,” says Marek Cuhra, a PhD candidate in the University of Tromsø’s Faculty of Health Sciences.

He had met a girl from Tromsø in Copenhagen, and persuaded her that they had to move back to her hometown. Today he has five children in Tromsø, and a new girlfriend. He still has his love of the sea, the mountains and the scenery – which is why he studies water fleas.

Yes, you read that correctly.

If you are interested in the health of the environment, these five-millimetre-long crustaceans, commonly known as water fleas, can provide some very interesting information.

“Water fleas are fantastic. Because they have a life cycle of only 42 days, we can see how, for instance, the common herbicide *Roundup* affects them from birth, reproduction to death. If we studied any other animals, such as rats or mice, we would need up to two years for a single experiment. It would be very expensive,” says Cuhra.

WATER FLEA ABORTIONS

Cuhra’s research now shows that water flea mothers are strongly affected when they are found in water near agricultural areas where

Roundup is sprayed on crops.

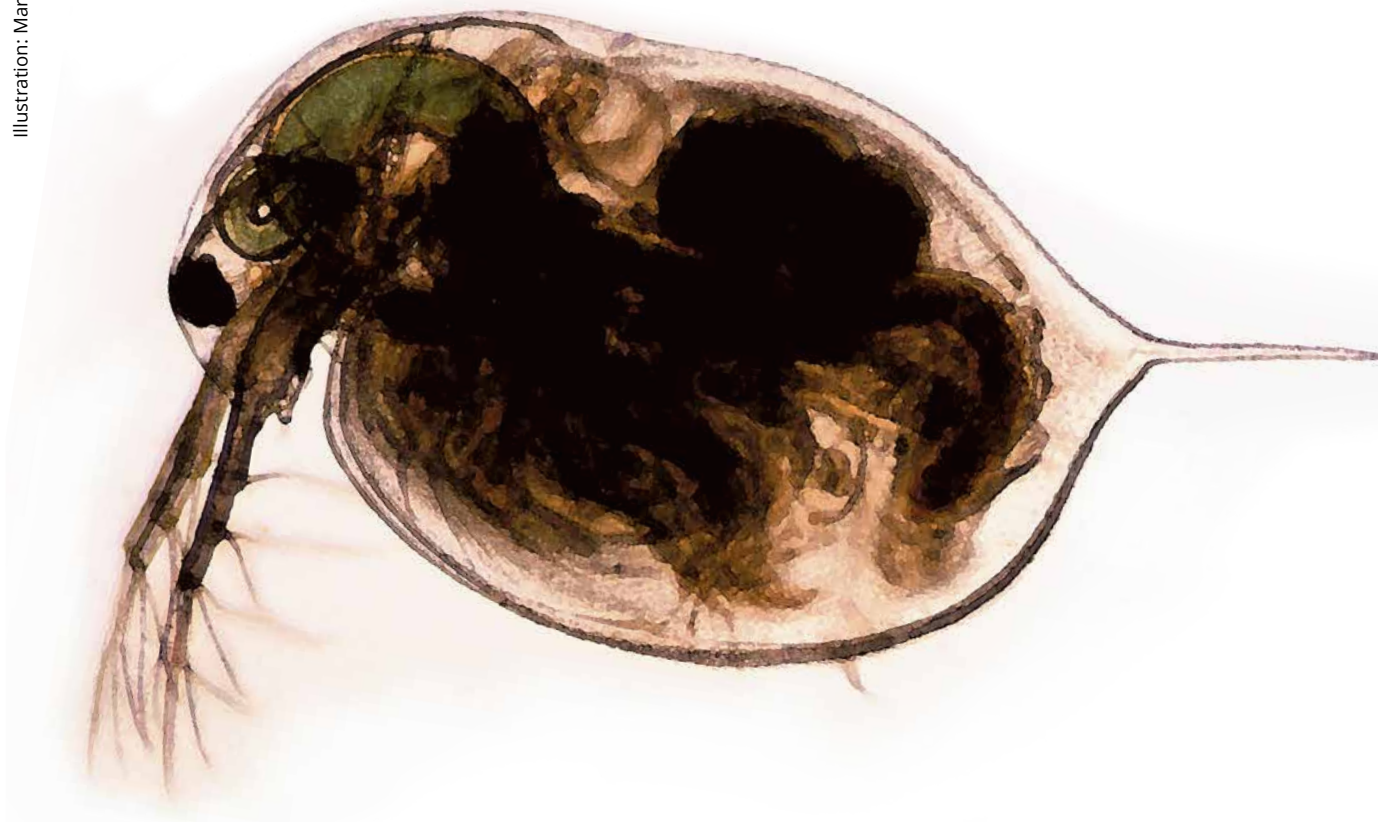
In short, water flea mothers abort in these situations, and cannot give birth to live young. The reason is that *Roundup* contains glyphosate, a substance that kills weeds, but that is tolerated by genetically modified plants, such as corn and soy.

“We only see the ecological effects, and our findings on water fleas cannot in any way be extrapolated to humans and animals. But it is interesting that water fleas, which usually give birth to 20–25 young every three days starting when they are one week old, are unable to bear live young when exposed to only 1.35 ppm of glyphosate per litre of water,” he says.

PHOTOGRAPHS OF WATER FLEAS

Cuhra has analysed the young of living and dead water fleas as well as their mothers in his Tromsø laboratory. Keep in mind, however, that we’re talking about very small creatures – newborn water fleas are only 0.8 millimetres long.

“The study involved 220 water flea mothers, and we spent thousands of hours on this and subsequent research. Every sixth day, we photographed the young water fleas under the microscope. They are vulnerable little creatures that you can gently move around in small water droplets. It is a real skill to handle these



animals,” says Cuhra.

Cuhra conducted experiments in which he looked at water fleas that were not exposed to glyphosate in water, and compared them to water fleas that were exposed to low or high concentrations of the substance.

“The results show that glyphosate is much more toxic to water fleas than previously thought,” he says. “Water fleas that are exposed to just 0.05 ppm glyphosate in their water can give birth, but their young are clearly smaller.”

GLYPHOSATE IN ANIMAL FEED

This concerns the researcher, because Roundup with glyphosate is currently used as an herbicide in large quantities – especially in South America, mainly in soy production. Every year, the world grows roughly 260 million tonnes of genetically modified soy, which is roughly 75 per cent of the soy in the world. Genetically modified soy is widely used for animal feed.

“We also analysed genetically modified soy. Basically, one-third of a soybean is comprised of oil, and the remainder is soybean meal. Soy flour is used in feed concentrates for salmon and cattle,” Cuhra explains.

“Feed manufacturers in Norway do not use genetically modified ingredients. They are concerned about the consequences. Buying non-genetically modified products is more

expensive, because with genetically modified soy and pesticides, farmers can grow soy quickly and on an industrial scale. In this case, agriculture is all about the chemistry, not the actual labour,” he says.

MORE GLYPHOSATE IN 2011

Norway has been very restrictive regarding the use of chemical pesticides, but an agricultural report from 2012 states that the use of pesticides increased in 2011. The main reason was a rainy summer, which increased the need to combat fungi, especially in corn.

Marek, who was educated as a marine biologist, is pleased that Norway is strict about pesticides and herbicides. He is an active diver, and believes that northern waters would be particularly vulnerable if the salmon farming industry fed its fish genetically engineered soy flour.

“The environment, the mountains and the sea we have here in Tromsø are unique. You can see that clearly when you dive or go out on a boat. One day I threw on my wetsuit after work and swam with humpback whales,” he says.

HEALTH AND GLYPHOSATE:

- Glyphosate shows low acute toxicity in animal experiments. It has been shown to be an eye irritant but not a skin irritant or allergen.
- Scientists have investigated whether Glyphosate could cause genetic damage, cancer, reproductive problems and damage to the nervous system, but no serious effects were found. Experiences with effects on humans have been confined to discomfort due to poisoning (high doses) and skin irritation from accidental spills. Exposure from usage is generally considered to be low.
- In light of its inherent characteristics, the health risks of glyphosate in drinking water are considered to be low.
- There is little danger of poisoning by ingestion of berries that are sprayed with glyphosate, but the berries will probably have a slight loss of quality. It is prohibited to sell berries that have been sprayed with the substance for public consumption.
- The ADI (Acceptable Daily Intake) is set at 0.1 mg/kg of body weight/day (Pesticide Council, 2004).
- It is not dangerous to walk in an area treated with glyphosate. However, children or pets are recommended to avoid any areas that are still wet after spraying. If the treated area is open to public traffic, it is supposed to be marked with signs.

Source: The Norwegian Food Safety Authority

Will climate change be greatest in the North?

The Earth's temperature is rising and the climate is changing. **Professor Morten Hald** has no doubt that climate change is man-made.

Text: Per Nordgård Næss



Morten Hald

Professor and Dean of the Faculty of Science and Technology at UiT

His main areas of interest are marine geology and palaeoceanography. This involves studying sediment cores, fossils and sediments from the continental shelf and fjord, which can provide important information about climate change in prehistoric times.

Photo: Torbein Kvil Gamst

What is climate change?

– Climate is the average weather in an area over time. Climate change is a change in these averages, higher or lower temperatures, more or less precipitation. The averages in an area have to change for a certain amount of time before you can say that the climate is changing, so when we started to notice warming in the early 1980s, it was argued that time series of just 4 or 5 years just weren't enough, statistically speaking. You need to see things from a 30-year perspective, which is what we can do now. With such a long time span, we can see a change.

It is said that the past is the key to the future, but we don't have very extensive temperature records from the past. How do we know what the climate was like before?

– The thermometer has only been around for 150 years, so if you want to know something about climate change before then, you have to use other ways of measuring. My focus as a geologist has been to study layers in marine sediments to see how the climate has changed. We can make certain measurements in sediment

cores that can give us information on actual sea temperatures at the time. Looking at this data, we can see that the sea has gotten warmer. We've looked at sediment cores from the continental shelf off the coast of Svalbard dating back 2,000 years, studying small animal fossils and the geochemical elements they contain, tracing them back in time. By creating an equation where we link the temperatures we have measured to the environment in which animals live today, we end up with a temperature curve that shows that water temperatures in the seas around Svalbard averaged 3.4 degrees until about 100 years ago, when temperatures began to rise. The seas around Svalbard are warmer now than they've ever been in the past 2,000 years. We've also taken core samples from Malangs fjord that show that the bottom of Malangen is warmer now than it's ever been on record. The accuracy of these measurements may be somewhat questionable, but the overall trends that they show are still convincing.

Is climate change man-made, or might we be seeing natural fluctuations in climate?

Spring is coming earlier to the polar regions as a result of global warming.
Photo: Hilde Kjær, colourbox.com



The greenhouse effect is much stronger today than it was 100 years ago.

– Climatic models **have been modest**, rather than exaggerated, when it comes to global warming forecasts.

– Most people agree that human activity is an important contributor to the high temperatures we've been observing. Both meteorological measurements and reconstructions that we've done show this. If we look at the changes in amounts of carbon dioxide in the atmosphere, we can see that levels are higher now than before. If you believe in the greenhouse effect, which has been physically proven, then there's no reason to doubt that global warming is much stronger now than it was 100 years ago. That alone contributes significantly to increasing temperatures. Natural causes for climate change over 100- to 200-year periods include solar activity, how much solar radiation reaches the Earth, and volcanic activity. If we only include natural causes, we simply can't account for the temperature increases we're observing. Climate change can only be explained by considering both natural and man-made causes. Most climate researchers agree on this. We've made detailed models of temperature changes taking only into account natural causes, then made similar models with both natural and man-made causes. The model that incorporates both natural and man-made climate change matches our actual temperature measurements very well, while the model that only takes into account natural changes deviated significantly from real observations.

The Arctic is strongly affected by climate change.

Is it getting hotter in Norway as a result of climate change?

– Yes, it's getting warmer in Norway. We've seen that the effect of global warming is much greater at high latitudes. It's most intense in the Arctic and Antarctic, and decreases as it reaches the Tropics. You may wonder if this is good news for Norway. Some certainly appreciate that it

gets green earlier – spring reaches Tromsø by May almost every year now, while it hardly ever did 40 years ago. Although climate change may be seen as OK for some of Norway's population, we're a small country of only five million inhabitants. Globally speaking, climate change certainly isn't a good thing.

Will a warmer climate cause major changes to the weather as we know it?

– We may not necessarily get less snow, but spring will come sooner. Generally speaking, it will be more humid, which means an increased danger of landslides. This certainly isn't a good thing for Norway. We'll also experience more extreme weather events, and sea level will rise. The rise in sea level isn't that significant right now, but if the Greenland ice cap were to melt and drain into the sea, the volume of the ocean would increase significantly. Another factor to consider when it comes to a rise in sea level is that warmer water is less dense, so as global ocean temperatures increase, so does the volume of the ocean. Rising sea levels pose major problems for nations such as Bangladesh and the Netherlands, but they aren't Norway's biggest concern.

Is that why it is important to monitor the climate in the Arctic? Will climate change be most drastic in the North?

– Yes, it is important to monitor climate change in the Arctic, because changes are very evident in the far north. Climate change in the Arctic is amplified because the Arctic Ocean, which is covered by ice for most of the year, reflects a lot of solar radiation back into the atmosphere. As sea ice disappears, less solar radiation will be reflected, and will instead be absorbed by the ocean. This will warm up the seawater and strengthen the effects of solar radiation.

If the ice melts, will ocean currents change?

– Ice ages come in cycles of about 100,000 years. The reason for this is the variation in the

– Climate is the average weather pattern in an area over time.

amounts of solar energy received by the earth due to the Earth's orbit around the sun, and the tilt and orientation of the Earth's axis. Warm periods, when there is little ice on the Earth, called interglacial periods, are relatively short, about 10,000 years. Many think that we may be headed toward a new ice age, but it may be thousands of years before this happens. Our industrial activity has also had an impact on these cycles, although we're not sure exactly how it will affect natural glacial activity. When the fresh water currently found in ice caps and glaciers melts and flows into the ocean, ocean currents will certainly be affected. We have many examples of the Gulf Stream being disrupted by large amounts of fresh water. As the Gulf Stream flows north, the water cools, its density increases, and it drops to the sea floor. We've made several models showing how this circulation can stop or slow, or how it in some cases could be stronger than it is today. We've shown that at the end of the last ice age, the circulation of the Gulf Stream almost stopped completely, and then started again suddenly.

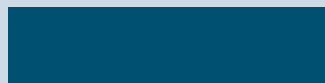
There are large amounts of CO₂ and methane stored in the ice and tundra. What will happen if these gases are released?

– It may further enhance the greenhouse effect. Methane is a disaster waiting to happen in the North – there's so much frozen in the ground, either on land or in the seabed. A Centre of Excellence has been established in the Department of Geology to study gas hydrates in the seabed. These are deposits of frozen methane that may melt as the oceans warm up. We see that with global warming, more and more of these frozen methane gas deposits will melt and rise to the surface, which will allow the methane

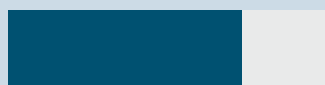
SOME FACTS ABOUT CLIMATE



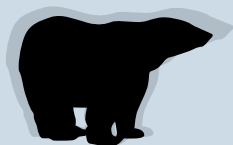
The Earth is getting warmer.



97 % of scientists believe that global warming is occurring, and is being accelerated by human activity.



72 % of the media are sceptical about global warming.



Polar bears are 10 % thinner than they were 30 years ago. Rising temperatures and melting sea ice means that hungry bears have smaller hunting grounds.

Migratory birds fly north more than 13 days earlier than they did in the twentieth century.



Sea levels have risen by about 3 mm annually from 1993 to 2005. By 2100, sea levels are expected to have risen by one metre.

11 of the last 12 years have been the warmest on record since records began in 1850.



15 % of CO₂ emissions are the result of deforestation.



20 % of emissions come from cars and trucks.

It would take 68 billion trees to offset emissions from cars and trucks.

to mix into the atmosphere and amplify the greenhouse effect further. Methane is a very powerful greenhouse gas, and something that especially concerns us here in the North. It's one of the central climate change issues that should be studied more.

Can we trust climate change forecasts?

– My impression is that the climate models tend to be too modest in their predictions for global warming and its effects. For example, no one predicted that sea ice in the Arctic Ocean would disappear as fast as it has. Discussion and debate between climate scientists is always important – no truth lasts forever, and can always be questioned and improved. I think there are very few who deny that global warming exists, and those who do generally have specific agendas.

What can we do to prevent further global warming?

– Humans are very adaptive creatures, so I think that laws, plans and preventative measures that take into consideration different scenarios that may result from climate change should be put in place. These possible scenarios include sea level rise, extreme weather, and more landslides, to mention a few. To be able to handle these things, we need to have plans and legislation that take them into account. When we build houses, we should design them to withstand extreme weather. Building sites need to be placed with an eye to the increased risk of landslides. The rise in sea level may need to be considered. Look at the Netherlands – they've been fighting the rising sea level for centuries, and have technology and contingency plans that have gained them land and prevented major flooding. Norway, as a rich and technologically advanced country, will probably not have any problems adapting to climate change, but poor countries may struggle. I'm more worried about lesser-developed countries handling climate change than Norway.

Sources: NASA, Greenfleet, pbs.org, guardian.co.uk, carbonify.com.

Mice lose weight with oil

When laboratory mice on a fatty diet were given copepod oil as a dietary supplement, interesting things started to happen.

Text: Elisabeth Øvreberg

NUTRITION Today, we often hear talk of dangerous stomach fat. By that they mean your waistline and the fat you have around your stomach and intestines. This kind of fat is the most harmful to our health. Anje Höper, a Medical Biology Research Fellow at UiT, gave mice that were on a fatty diet copepod oil as a dietary supplement. *Calanus finmarchicus* is the species of copepod from which this oil was produced, and when the mice ate this oil daily, they got thinner.

“Not only was the amount of body fat reduced, but the fat cells in the mice also got smaller. The so-called low-grade inflammation that is characteristic of fatty tissue with large fat cells was significantly reduced, suggesting that the cells function more normally,” says Höper,

who has had her research published in the *British Journal of Nutrition*.

Höper had 80 mice in her study and they were divided into four groups:

- Mice that received normal mouse feed.
- Mice that received fatty mouse feed.
- Mice that received a small dose of copepod oil along with fatty mouse feed.
- Mice that received fatty mouse feed but were only given copepod oil after seven weeks on the diet.

THE MICE STOPPED PUTTING ON WEIGHT SO QUICKLY

“Up to week seven, all the mice who ate the fatty feed developed fairly similarly. They weighed around 30 grams at that point, but then there was a change in the two groups that were given copepod oil,” says the Research Fellow. She explains that the mice stopped putting on weight so quickly. Their weight curve evened out more, while the mice that received the same diet but without the oil, continued to gain weight.

Höper weighed the mice over a period of 27 weeks and, at the end of her study, the “oil mice” weighed 42 grams, and the “fatty-diet



Calanus copepod:

- The calanus copepod is abundant in the Atlantic Ocean.
- It is mainly found in the Norwegian Sea, where it constitutes the bulk of the zooplankton.
- It is so abundant in the Arctic that it can be called the mosquito of the sea.
- Herring, smelt, mackerel, blue whiting and cod feed on the calanus copepod.
- Harvesting these copepods is currently prohibited, but dispensations are given for the harvest of up to 1,000 tonnes annually.
- This activity is expected to increase in the coming years, and the authorities are currently developing a management plan aimed at starting a more extensive harvest.
- These lipid-rich copepods can be used in food, pharmaceuticals, health food and cosmetics.

Source: The Institute of Marine Research and Report to the Storting (White Paper) No. 22 (2012–2013), *"The world's best seafood nation"*



The full Latin name of the calanus copepod is *Calanus finmarchicus*, and it can grow to up to 3 millimetres. It has a lifespan of about one year and spawns in the spring. The calanus copepod eats phytoplankton. Photo: Terje van der Meer, Institute of Marine Research

mice" weighed 47 grams. The difference may not sound so dramatic, but in the mouse world, that is a major difference. Höper and her colleagues also noted that the fat content in the livers of the mice that received copepod oil was lower than in those who did not get the oil – a sign of healthier animals compared with those who only ate fatty food.

FEWER LIFESTYLE DISEASES

Anje Höper's study also showed that the animals that only received fatty mouse feed had a precursor of diabetes, whereas this was much less pronounced in the mice that received copepod oil in their diet.

"What's interesting is that the study shows that copepod oil helps those who are already overweight. The mice that were given the oil dietary supplement from the seventh week, developed similarly to those that had received the oil from the start. In fact, other UiT researchers (Karl-Erik Eilertsen and his colleagues, editor's note) have previously shown that copepod oil may reduce atherosclerosis in mice with vascular disease.

If all these findings can be transferred to humans, this will prove very interesting for people who are overweight. Reduced intra-abdominal fat may be beneficial in terms of preventing diseases like diabetes, cardiovascular disease and high blood pressure. But Höper



points out that these findings are based only on preliminary studies in mice, and that we shouldn't just take it for granted that this oil, commercially available as Calanus Oil capsules at health food stores, has been proven to be a diet pill.

TESTED THE OIL ON HUMANS

Professor Rolf Jorde at UiT agrees. In fact, he has conducted a study with the participation of 100 subjects. Half received Calanus Oil daily for one year, while the others just got "placebo oil". After a year had passed, it was not possible to say that those who had taken Calanus Oil had lost more stomach fat than the others

"The subjects took a CT scan, where we measured the amount of intra-abdominal fat, and we saw no significant reduction in those who had taken the oil supplement," says Jorde, but he is not completely negative.

"Our results were not conclusive. It may be that changes will occur after several years of consuming Calanus Oil, and we can't say anything about whether Calanus Oil might have other positive effects, like slowing the pace of cardiovascular disease," explains Jorde. He adds that the study could have had different results if there had been more subjects, or if it had been conducted over several years.

RICH IN HEALTHY FAT

The reason why copepod oil has such a positive effect on the fat cells in mice, has not yet been conclusively determined.

According to the Institute of Marine Research, the calanus copepod contains low levels of pollutants, and is rich in healthy marine fats (polyunsaturated fatty acids like Omega-3). Höper believes they may affect how the body processes sugar and stores fat, and may lower the fat content in the blood. She adds that the oil also contains other fatty acids and antioxidants. Additionally, the fatty acids in Calanus Oil are bound in a special way, which is different compared with other dietary supplements such as cod liver oil capsules or seal oil.

"We are planning to conduct follow-up studies, where one of the things we will be looking at is what effect this oil can have on the heart."

This mink killed 22 kittiwake chicks within three hours on Ekkerøya island in Varangerfjord. Mink is an excellent hunter and is a threat to endangered bird species. Photo: Terje Kolaas.



Uninvited guests

Hundreds of plant and animal species are blacklisted in Norway, but currently there are national action plans for only five of them.

Text: Linn S. Madsen

The first alien species probably came to Norway with agriculture about 4,000–5,000 years ago.

MINK An exhausted and famished little guy was found in the harbour in Tromsdalen one day in the early autumn. The veterinarian determined he was a stray ferret puppy, and the Norwegian Society for Protection of Animals in Tromsø was contacted with the hope of finding the owner.

After a short time in foster care, however, it became clear that the little guy was not a ferret at all, but actually a small mink. The puppy was named Liam Mink Jagger and thoroughly enjoyed himself in his new surroundings, blissfully unaware that his new designation immediately meant trouble. Mink are not a natural part of the Norwegian fauna and have a major negative impact on native species. If you catch a mink, releasing it is strictly prohibited – and it is also illegal to keep a wild animal as a pet. Things didn't look good for the little mink, while local bird species had one less enemy.

“Mink is responsible for a reduction of the natural diversity in Norway, especially when it comes to ground-nesting birds. Mink kills not only what it wants to eat, but can also embark on mass killings of eggs and fledglings. This can actually lead to the eradication of entire bird colonies,” says UiT biologist Jenny Stien.

As part of her doctoral thesis, she researched methods for monitoring mink populations, and the effectiveness of removing mink from certain areas.

SIGNIFICANT THREAT TO NATURE

Mink was introduced to Norway from North America in 1927, with the advent of fur farming in Vestfold. Some individuals escaped, others were released as the economy deteriorated, and it turned out that mink easily made itself at home in the Norwegian countryside.

It has an incredible capacity to move about, both on land and at sea. It eats pretty much everything it comes across and has no natural enemies. For nearly a century now, the mink has done significant damage to many of our own species, including species on the Norwegian Red List, such as terns and gulls.

The mink's ability to multiply at the same time as it is a successful hunter has led to it being

classified as a “very high risk” to Norwegian nature, and it has thus landed on the Norwegian Black List.

In Norway, the Norwegian Biodiversity Information Centre (NBIC) is responsible for determining which species don't belong in Norway, and how harmful they are for our domestic ecosystems. In its latest report, from 2012, the NBIC lists 2,320 alien species in Norway. These are species that originally belong in a different biogeographic area, but which people have brought to Norway, either accidentally or intentionally. Of these alien species, 217 are considered to constitute such a significant ecological risk to our native species and ecosystems that they have landed on the Norwegian Black List.

The spread of alien species is considered one of the greatest threats to biodiversity. Only habitat loss leads to the extinction of more species worldwide.

FEW NATIONAL ACTION PLANS

Through the UN Convention on Biological Diversity, Norway has committed itself to fight alien species as far as possible. This is done in part by preventing the import of alien species and controlling or eradicating alien species that threaten the ecosystem. This is also reflected in our legislation, including the Nature Diversity Act. Yet, at the time of writing this article, there are national action plans in place for only five species – the raccoon dog, mink, Japanese rose, Spanish slug and the salmon parasite *Gyrodactylus salaris*.

“It takes time to develop these kinds of action plans. First and foremost, you need solid decision-making criteria. You need a lot of knowledge about how the species lives and its prevalence in Norway, and you need to find out which methods are actually effective to combat it,” says Esten Ødegaard of the Norwegian Environment Agency. The Norwegian Environment Agency is responsible for natural resource management here in Norway, and thus also has the primary responsibility for preparing action plans against invasive species on the Norwegian Black List.

He says that, in addition to the five action plans already in place, they are currently working on four new ones.

“At the same time, we have measures in place to fight many alien species even where a national action plan is not yet in place, particularly at the regional level and in protected areas.”

Ødegaard believes that Norway's efforts in this area are relatively good compared with other countries.

“From a European perspective, we are at the forefront in many areas, especially when it comes to the risk assessments conducted by the NBIC. Other European countries have not yet implemented such thorough work in this area. Naturally, there are countries that are ahead of us,” he says, and points to New Zealand and Australia, which have very strict rules on what can be brought into the country.

NOT EVERY SPECIES ON THE BLACK LIST IS UNWELCOME

As with so many other things, it is often more cost effective to prevent new species from establishing themselves than trying to eradicate them later. And just because a species is on the Black List, it doesn't automatically mean that an action plan will be developed.

“Even if a species poses a significant ecological risk, it doesn't mean that Norway is best served by doing something about it,” says Lisbeth Gederaas of the NBIC.

Several of the species on the Black List actually have other positive consequences, such as being financially profitable. The king crab is one such species. It is an active predator considered to pose a very high ecological risk in Norwegian waters, but since fishing king crab is so lucrative, it has nevertheless been decided that a stock will be maintained off the coast of East Finnmark.

“This is a typical example of a cost-benefit effect that is often considered in these contexts. It falls outside the scope of our mandate, though, which is only to assess the ecological risk,” says Gederaas.

NBIC's work does not actually include conducting its own research, it is a neutral party



Lina Mink Jagger has a bright future ahead of her, despite the fact that she is unwanted in Norwegian nature. Photo: The Norwegian Society for Protection of Animals, Tromsø.

that organises available information.

“We want to generate a stronger focus on and more knowledge of the challenges associated with alien species, and what we can do is to highlight and point out the knowledge gaps we find. We need much more information to ascertain the challenges, consequences and what methods should be used in the fight against invasive species.”

NEED MORE KNOWLEDGE

This makes the work of biologists like Stien essential in the fight against alien species. Along with her UiT colleagues, Rolf Anker Ims og Nigel G. Yoccoz, her research has produced the knowledge base and recommendations that

form the scientific basis for the national action plan against mink, one of the best known species on the Black List.

“It would be virtually impossible to completely eradicate the mink here in Norway. So the focus is mostly on eliminating mink from selected high-risk areas where it will be difficult for it to return, like on small islands where endangered bird species nest,” explains Stien.

But even with the strong efforts she and her colleagues make, she says that they still have far too little knowledge of mink in Norway.

“So far, there have been few systematic studies on mink in Norway. We know nothing about the density of the mink population or what the consequences will be if we eliminate the mink

population from a certain area. Will other mink immediately move in? Will removing the mink have an impact on the reproductive rates of ground-nesting birds or will other predators move in and do the same damage? These are some of the questions we’re trying to answer,” she explains.

Stien tells that what is particularly lacking is information on population density and potential distribution in the selected areas.

“This is essential if we are going to eliminate mink from an area. We need to know whether it will actually have an effect. Have we succeeded if we remove 100 mink? If you want to claim that the mink has a negative impact on other species, then you have to measure whether that was actually true after the mink have been removed.”

Stien herself is from the UK and wishes the fight against alien species would be stepped up here in Norway.

“In the UK, we have a dense population and almost no nature left. So, we have been very conscious of preserving what we have left. In

Vascular plants (all land plants except mosses) account for over half of the alien species in Norway.



Some alien species have a slightly stranger story than others. The European starling has now spread to the four winds in North America after Eugene Schieffelin put it out in Central Park in 1890. The reason: Schieffelin believed that all birds mentioned in Shakespeare's works should exist in the United States. Photo: Espen Bergersen – NaturGalleriet.no

Norway, I feel that many people think that we have so much nature around us, that management is superfluous. But we need to remember that prevention is easier than fixing things later," she says.

HAPPY ENDING

So, the little bird killer, Liam Mink Jagger, could not be released into the wild again, but putting down such a sweetheart was not tempting either.

After a collective brainstorming session, the solution was the Polar Zoo. They agreed to give the mink a home, if the Norwegian Environment Agency approved the application. When the application was rejected, the mood was gloomy indeed.

But the mink had already been in the newspaper several times and had become something of a media favourite. Within a few days, a petition received over 7,000 signatures, and the Norwegian Environment Agency was quick to change its mind after receiving a written complaint about their decision. This was on the

condition that the issues surrounding the species would be presented at the zoo and that the mink had to be castrated. It was only then that it was discovered that the mink actually was a girl, and she was quickly renamed Lina Mink Jagger.

"The Norwegian Society for Protection of Animals is incredibly excited that the tame and social mink Lina has been given the opportunity to live at the Polar Zoo. To achieve this, however, we are entirely dependent on donations to get the remaining NOK 50,000–65,000 to build a large, scenic enclosure where the mink can also swim around this spring," says the head of the Norwegian Society for Protection of Animals Tromsø, Cecilie Johansen, who has initiated a fund drive.

Want to help?

Jenny Stien would love to hear from hunters who have experience with mink. To take part in the survey, please visit <http://bit.ly/17XntsB>

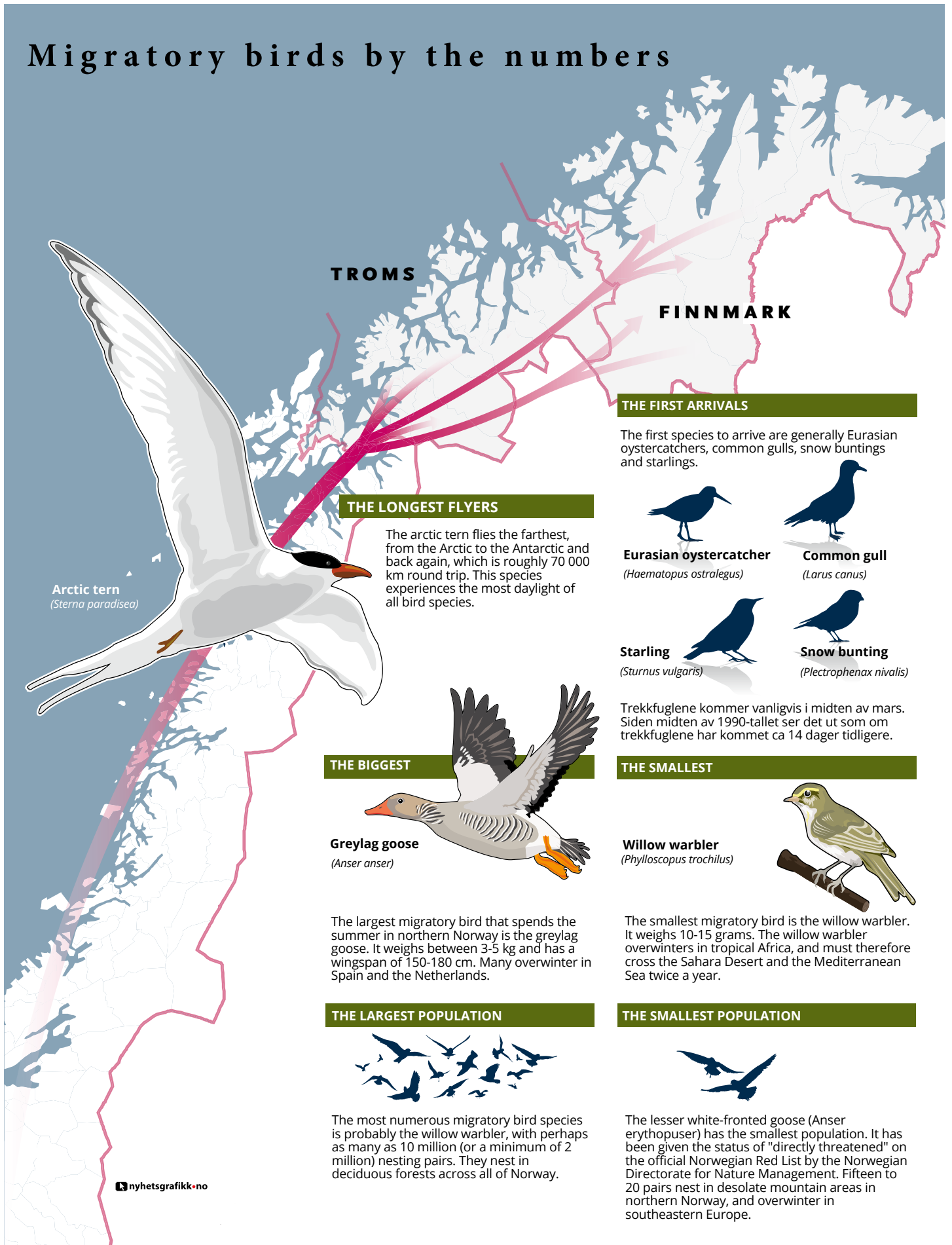
About the Norwegian Black List :

- Alien species are species that have spread from the biogeographic region where it belongs to a different biogeographic region, with human help. This spread may have been intentional or accidental.
- NBIC has documented 2,320 alien species in Norway. About half are not able to reproduce in this country and thus have not been risk assessed. However, 217 qualify as such a high ecological risk that they have been put on the Black List. Only species that have been introduced since 1800 are included in the list.
- The Black List consists of the alien species that are considered to pose a "very high risk" or a "high risk" for Norwegian ecological systems.
- Alien species are particularly assessed using two criteria: the extent of the negative consequences they have for domestic species and habitats, and their ability to multiply.
- NBIC updates the Black List about every five years. The latest version was released in 2012.



Bronze dress clasp. 900 AD. Harstad, Northern Norway
Photo: Adnan Ičagić

Migratory birds by the numbers





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