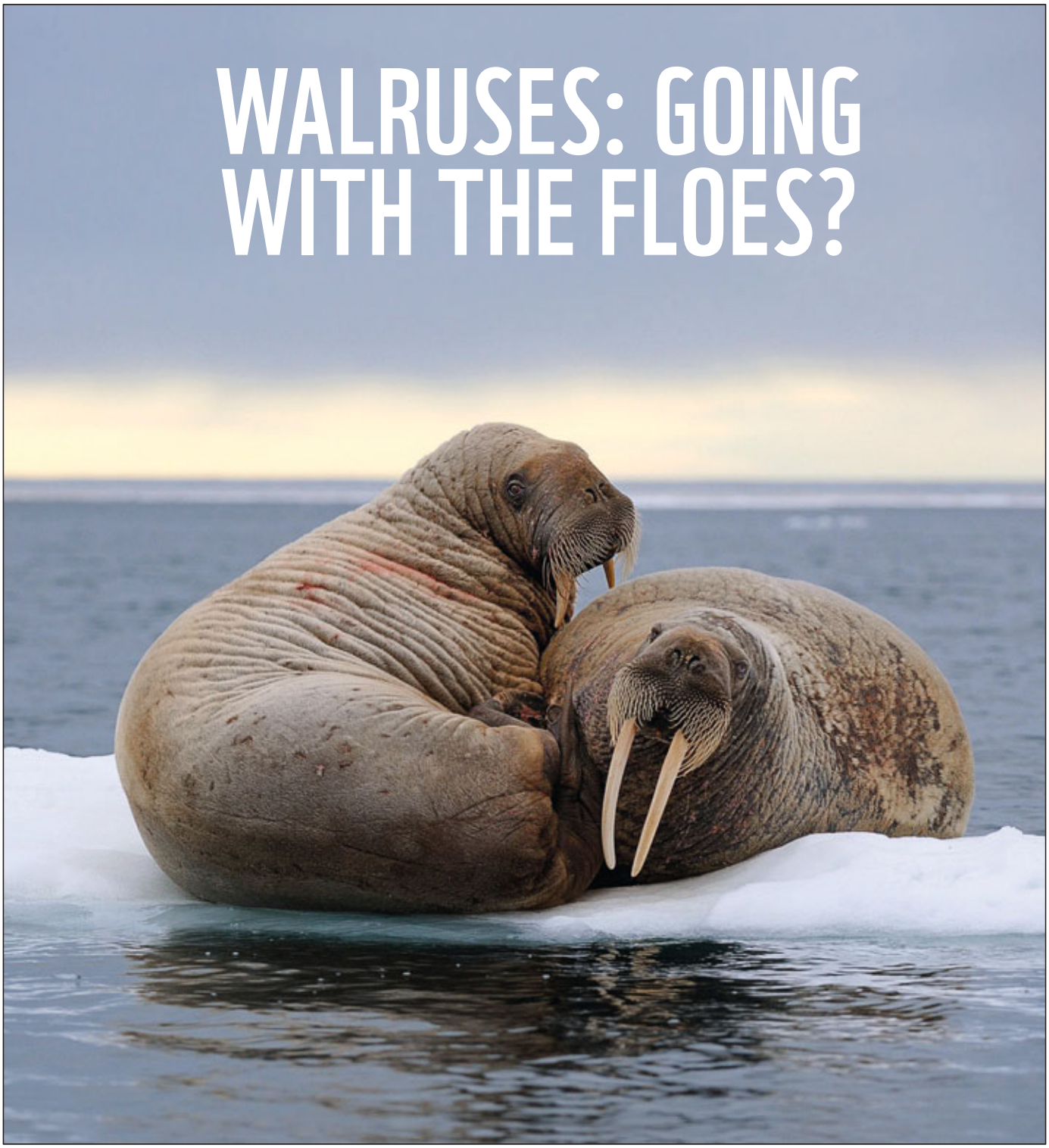
WWF
MAGAZINE
No. 2
2017

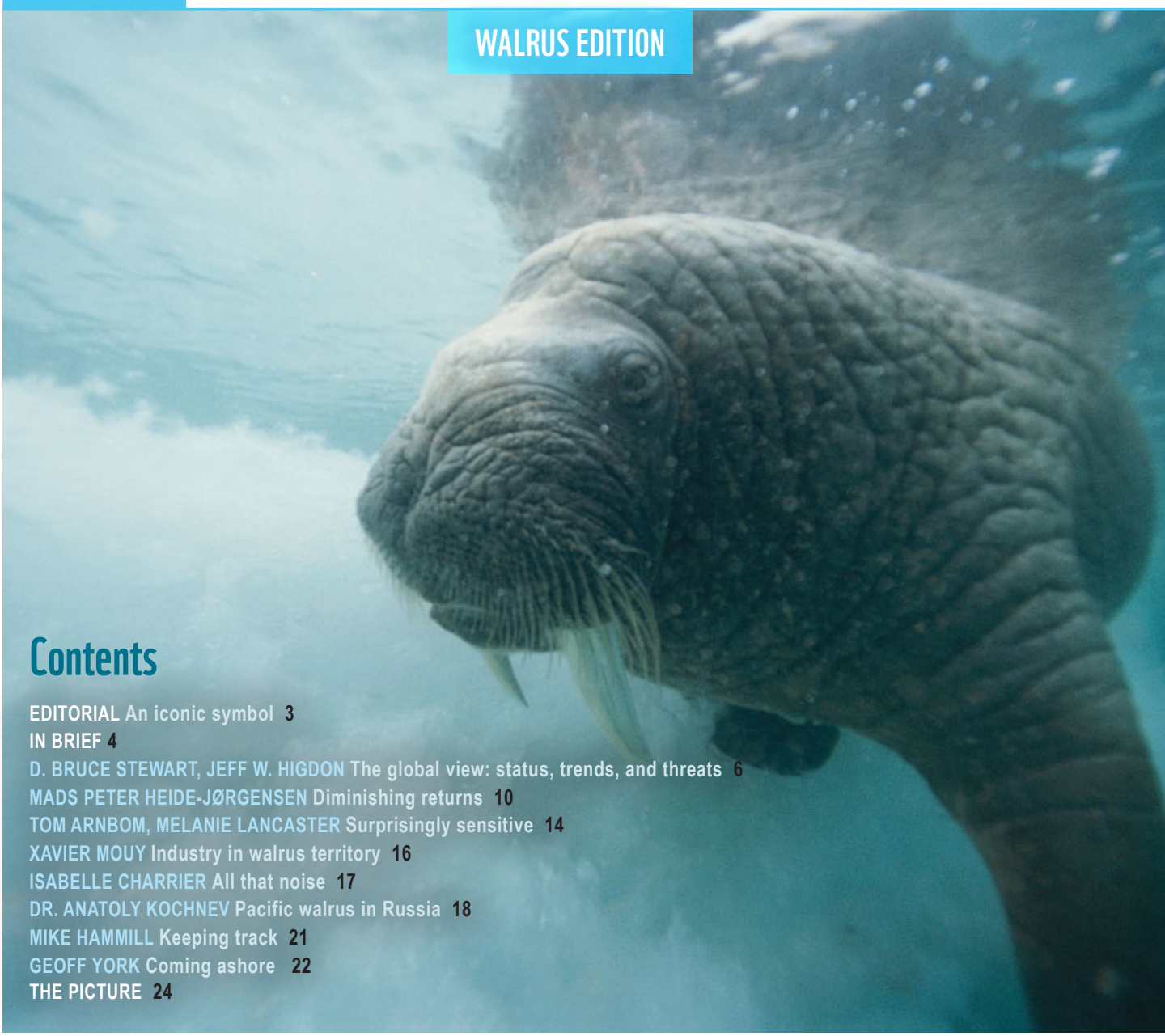
THE CIRCLE

WALRUSES: GOING WITH THE FLOES?



PUBLISHED BY THE WWF ARCTIC PROGRAMME

WALRUS EDITION



Contents

The Circle is published quarterly by the WWF Arctic Programme. Reproduction and quotation with appropriate credit are encouraged. Articles by non-affiliated sources do not necessarily reflect the views or policies of WWF. Send change of address and subscription queries to the address on the right. We reserve the right to edit letters for publication, and assume no responsibility for unsolicited material.

Publisher:
WWF Arctic Programme
8th floor, 275 Slater St., Ottawa, ON, Canada K1P 5H9.
Tel: +1 613-232-8706
Fax: +1 613-232-4181

Internet: www.panda.org/arctic

ISSN 2073-980X = The Circle

Date of publication:
July 2017.

Editor in Chief: Clive Tesar, gap@wwfcanada.org

Managing Editor: Becky Rynor, brynor@uniserve.com

Design and production:
Film & Form/Ketill Berger, ketill.berger@filmform.no

Printed by St. Joseph Communications

COVER: Two walrus (Odobenus rosmarus) resting on ice. Foxe Basin, Nunavut, Canada.
Photo: naturepl.com / Eric Baccega / WWF

ABOVE: Atlantic walrus (Odobenus rosmarus rosmarus) swimming in the clear water of the Foxe Basin, Nunavut, Canada.
Photo: Norbert Rosing/National Geographic Stock / WWF-Canada

Thank you for your interest in The Circle. Many of our subscribers have moved to an e-version. To receive an electronic copy in your email instead of a paper copy, please write to us at gap@wwfcanada.org and help us reduce our costs and footprint.

Walruses: an iconic symbol

AS A CHILD, I was fascinated by walruses: their bulbous, watchful eyes, abundantly whiskered muzzles, those impressively long canines and their great blubbery bodies so efficiently designed for foraging for shellfish in frigid Arctic waters. Now working in conservation biology, that fascination continues. However, it has shifted from physical intrigue to a desire to understand the role walruses play in the Arctic ecosystems and the information they provide into our changing climate.

Consider the recent shifts in behaviour of Pacific walruses in Eastern Russia and Alaska. Herds of walruses in the tens of thousands have begun to come ashore, attracting the attention of residents and global media. This unusual behaviour appears to be tied to the ongoing loss of sea ice in the walruses' more favoured feeding grounds. Images of walruses piled on beaches have become commonplace and as iconic a symbol for climate change as the lone polar bear on an ice floe.

The walrus story is more complicated than a beach snapshot. As Jeff Higdon and D. Bruce Stewart write, there are many unknowns surrounding the two walrus sub-species. Several authors in this issue help fill some of the gaps in our knowledge. Isabelle Charrier distils research on ocean noise, focusing on the effects on communication between walrus mothers and calves. Geoff York explores the potential for increasing conflict between walruses and polar bears as they meet with increasing frequency on Arctic shores. Mike Hammill writes about the "difficult, complex and labour intensive" business of counting walruses in the Canadian Arctic. Walrus ecology is complicated by growing human activity across their range; Xavier Mouy writes of how one such activity, exploring for oil and gas, influences walrus behaviour in the Chukchi Sea off Alaska.

Changing climate, increasing development, and shifting walrus behaviour make conservation planning difficult. However, as Mads Peter Heide-Jørgensen notes, the history of human disturbance and abandonment of walrus sites in Greenland clearly demonstrates the need to manage these activities around areas of ecological importance to walruses. Similarly, Anatoli Kochnev argues protected area designation in Russia will not be enough to protect mobile walrus populations, that we must ensure important beaches outside protected areas are appropriately managed. Melanie Lancaster and Tom Arnbom flag critical conservation measures that could be taken immediately, including re-directing shipping routes away from important walrus habitats.

THE WALRUS STORY IS MORE COMPLICATED THAN A BEACH SNAPSHOT

In the interests of having the most up to date information available, WWF has commissioned a report on the circumpolar status of the walrus. The report, written by Jeff Higdon and D. Bruce Stewart will be available on our website. Another recent report – the Arctic Council's Snow, Water, Ice and Permafrost (SWIPA) report – indicates walruses will have to endure at least several decades of a warming Arctic. Although their future is uncertain, my hope is that walruses will continue to fascinate children and adults around the world, and one day return to an undisturbed habitat abundant with ice and shellfish. ○

MARGARET KINNAIRD is the Global Wildlife Practice leader at WWF International

Photo: Pavel Kochkarev / WWF Russia.

Reindeer pelts left behind by poachers. Krasnoyarsk region, Russia, April 2017.

Wild reindeer slaughter uncovered in Russia

AN ANTI-POACHING RAID supported by WWF-Russia has found more than 800 locations where wild reindeer appear to have been illegally killed. It is estimated roughly 20,000 reindeer have been poached in Russia this year after game wardens, police and inspectors from the Central Siberian Nature reserve found hundreds of dead reindeer in the central Krasnoyarsk region. Many had been discarded with little or no meat removed.

Poaching and legal loopholes which allow overhunting are the primary threat to wild reindeer in Russia which have declined from an estimated 1.5 million to 900,000.

"We saw signs of poaching in this region, but the true scale of the phenomenon is outrageous," says Ivan Mizin, project coordinator at the WWF Russia Barents Office.

Wildlife wardens in the Krasnoyarsk region face numerous challenges: poachers are well armed and equipped with modern ATVs and snowmobiles, while the vast size of the region makes it difficult for inspection staff to adequately monitor poaching activity.

Avoiding collisions with marine mammals

DECREASING SUMMER SEA ice will likely mean more ships passing through the Hudson Strait – the passage connecting the Atlantic Ocean to Canada's Hudson Bay – putting whales, polar bears, seals and walruses at greater risk. However, a new WWF-Canada guide could help ships avoid collisions with these vulnerable marine mammals. The Hudson Strait Mariner's Guide can be hung on a ship's bridge to help mariners identify Arctic species native to those waters. Maps of marine mammal habitat and contact information are also included so mariners can report sightings and incidents. In addition, the guide provides operational guidance when encountering marine mammals.

"We hope this guide will minimize disruptions to important habitat, and increase awareness in the shipping community about the wildlife that share these waters," says Andrew Dumbrille, senior specialist, sustainable Arctic shipping.

Ship traffic affects marine mammals in numerous ways:

- Ship noise makes it difficult for whales to communicate with each other;
- Ships disrupt feeding patterns, and often drive marine

mammals away from their usual habitat;

- Ship strikes can seriously injure seals denning on sea ice;
- In the event of a spill, pollution from sewage, grey-water, ballast water and fuel could damage marine mammal habitats.
- Ships can carry non-native species on their hulls to places they do not belong, potentially affecting the entire ecosystem.

Man-made snow banks protect rare seals

WARMER WINTERS and low snowfalls have made breeding for the extremely endangered Saimaa ringed seals more difficult. Found only in the Saimaa water system in Finland, these rare ringed seals build cave-like lairs in snowbanks on the ice. Low snowfall in recent years has forced the seals to birth their pups on top of the ice, where they have no shelter against predators, the cold and other disturbances.

An initiative led by Parks & Wildlife Finland and assisted by WWF Finland along with a large group of volunteers is helping the Saimaa seals by creating snowbanks on Lake Saimaa's frozen surface where the seals can build lairs and give birth. This past winter saw nearly 280 artificial snowbanks built with the seals birthing 81 pups. Ninety percent of those pups were born in man-made snow banks. During low-snow winters up to half of the pups die. This year, the proportion of pups that died in their nests was 18 percent, half the number of pups lost during low-snow winters when no snow banks were made by humans.

"This is a prime example of concrete and productive nature conservation," says WWF Finland's Petteri Tolvanen. One of the rarest seals in the world, the Saimaa ringed seal was facing extinction. Populations have been preserved and even increased to an estimated 360 seals. A population of 400 is the level at which the population is deemed safe.

A stuffed Saimaa ringed seal (Pusa hispida saimensis) at the Finnish Museum of Natural History in Helsinki, Finland

Photo: Tomi Tapio K, CC, Flickr.com

Changed Arctic, changed world

IT IS LIKELY that many people alive today will see the end of the Arctic as we know it, according to the stark findings of the Arctic Council's Snow, Water, Ice and Permafrost in the Arctic (SWIPA) report.

The report, written by more than 90 scientists, brings together data from the past six years which show "...the Arctic will not return to previous conditions this century..." according to the climate scenarios considered by the report.

The report warns that vast expanses of summer sea ice trod by polar bears, the ice edge habitat of pods of narwhals, days-long migrations by herds of caribou crossing the tundra, are all threatened by current and future climate change which will have an impact on life around the world.

The report says that before 2050, autumn and winter temperatures will soar by 4-5 degrees above what they were in the late 1900s. It says these temperature increases are "locked in" by greenhouse gases already in the atmosphere and by heat held in the oceans. The report also advances the date at which the Arctic Ocean will be largely ice-free to some 20 years from now although it says making precise dates for this event is difficult. On land, the vast boreal forests will experience an increase in forest fires and insect pests, and the icy ground will continue to thaw.

"The impacts of the changes are already affecting Arctic wildlife and Arctic peoples. That will intensify," says WWF Climate Expert Martin Sommerkorn. The report concludes that Arctic ecosystems will face significant stresses and disruptions. Shrinking sea ice means a shrinking range for some seals, walrus, and polar bears. Changes on land can make food more difficult to access for grazing animals such as caribou/reindeer and muskoxen. When the animals are stressed, the people that rely on them, from Inuit hunters to Saami herders, will also feel the effects.

What the Arctic changes mean for the rest of the world is still somewhat uncertain, but it is becoming clearer that changes in the Arctic will resonate globally. The SWIPA report pegs the minimum increase in sea levels at more than half a metre by 2100, much of it due to melting ice from Arctic glaciers. There is also increasing evidence that changes in the Arctic are interfering with established weather patterns around the world.

The global view: status, trends, and threats

The walrus (*Odobenus rosmarus*) has a circumpolar Arctic and sub-Arctic distribution with two subspecies, the Atlantic walrus, *O. r. rosmarus,* and Pacific walrus, *O. r. divergens*. Walruses are widely distributed but occupy a narrow ecological niche. They require areas of shallow water with a productive bivalve community, the reliable presence of open water to access these feeding areas, and suitable ice or land for hauling out. Walruses often gather in large herds. They are associated with moving pack ice for most of the year but when ice is absent haul out on land at predictable locations. Walruses are sensitive to disturbance at these haulouts. ➤

THEIR HABITAT USE and behavior make walruses relatively easy for hunters to locate, and vulnerable to environmental changes and disturbance. Hunting by humans has strongly influenced their distribution. Many populations were historically over-harvested, with varying levels of recovery. Suitable habitat has declined as human activities have expanded.

Understanding of walrus population trajectories is limited by the difficulty and cost of surveying in remote areas. Survey coverage has typically been limited to a small subset of a population's distribution. Few populations have been resurveyed over time using comparable methods, and the structure of some populations is poorly understood. *Information on the populations and on the IUCN (International Union for the Conservation of Nature) status of each subspecies is summarized on the map*. Most countries need to update the conservation status of walrus populations within their jurisdiction.

D. BRUCE STEWART is an aquatic biologist who works with Government, Indigenous peoples, and others on Arctic & northern, marine & freshwater environmental issues.

JEFF W. HIGDON is a marine mammal scientist who works with Government, Inuit, and conservation organizations on Arctic marine conservation issues.

ATLANTIC WALRUSES

Atlantic walruses historically ranged from the central Canadian Arctic east to the Kara Sea, north to Franz Josef Land and south to Nova Scotia, Canada. Six extant populations are recognized based their genetic interchange and other factors such as geographical separation. Several are shared by Canada and Greenland, and Norway and Russia share the Svalbard-Franz Josef Land population. The historically abundant population in southeastern Canada was wiped out by hunting ca. 1850, and is unlikely to re-establish due to the increase in other human activities in the region.

CLIMATE CHANGE HAS THE POTENTIAL TO AFFECT ALL WALRUS POPULATIONS THROUGH DECLINES IN SEA ICE HABITAT

PACIFIC WALRUSES

Two Pacific walrus populations are recognized, one in Russia's Laptev Sea and the other, shared by Russia and Alaska, in the Bering and Chukchi seas. The Laptev Sea population was once considered a separate subspecies but recent studies support its recognition as the westernmost population of Pacific walruses. These populations may have formed a continuum prior to commercial exploitation. Little information is available on the Laptev Sea population and its abundance and trends are unknown. The Bering and Chukchi Seas population occurs throughout the continental shelf waters of both seas and ranged farther south prior to excessive hunting. Population size has fluctuated markedly in response to varying levels of human exploitation.

HUMAN ACTIVITIES FURTHER ENCROACH ON WALRUS HABITAT IN RESPONSE TO CLIMATE CHANGE

THREATS

Key threats and factors limiting walrus populations stem from subsistence hunting, industrial development and resource extraction, tourism and other disturbances, and climate change. Stressors from these threats, such as habitat disturbance and hunting mortality, can alter walrus distribution or reduce walrus abundance, with ecological impacts and socioeconomic costs. Subsistence hunting affects Atlantic walrus populations in Canada and Greenland and Pacific walrus in the Bering and Chukchi seas. Atlantic walruses in Norwegian and Russian waters are not hunted for subsistence, nor are Pacific walruses in the Laptev Sea.

Industrial development and disturbance by human activities may become increasingly important threats. Hydrocarbon exploration and development has the potential to affect Atlantic walruses east and west of Greenland and in the Barents Sea, and Pacific walruses in the Chukchi Sea. Shipping on a massive scale from iron mine development may soon disrupt Atlantic walrus habitats in Canada year-round. Loss of sea ice is helping to enable these activities and others such as ship-based tourism.

Climate change has the potential to affect all walrus populations through declines in sea ice habitat that alter their seasonal distribution, ocean acidification that causes shifts in species, and changes in human access. Pacific walruses in the Bering and Chukchi seas appear to be particularly vulnerable to ice loss, which is forcing them ashore earlier in the season in very large numbers. Greater use of coastal haulouts limits their access to offshore feeding areas, may facilitate the spread of disease, and has resulted in trampling mortalities when they are disturbed.

GAPS

Research is ongoing for all populations but many information gaps and uncertainties remain related to walrus ecology and population dynamics. Some of these, such as population-specific growth rates

Walrus distribution, abundance and challenges

Map: Ketill Berger, Film & Form, www.filmform.no
Source: Higdon, J.W., and D.B. Stewart. 2017. State of circumpolar walrus (*Odobenus rosmarus*) populations. Prepared by Higdon Wildlife Consulting and Arctic Biological Consultants, Winnipeg, MB for WWF-Canada, Ottawa, ON.

and hunting loss rates (*i.e.*, animals struck and lost) apply to most populations; others to a few. Two conservation and management measures are overarching: the need for international cooperation in managing shared populations, and the need for a proactive approach to the assessment of potential impacts from human activities. The importance of both measures will increase as human activities further encroach on walrus habitat in response to climate change. ○

Subsistence hunting

Walruses have been hunted by people for thousands of years and are particularly important to Indigenous peoples such as Inuit, Yupik, and Chukchi. Walrus meat still feeds people, the hides are still used for footwear, and the ivory tusks for carving. Over the past five hundred years but particularly in the eighteenth and nineteenth centuries, commercial hunting of walruses for oil, skin, meat and tusks resulted in huge declines of both Pacific and Atlantic walruses across their ranges. By the late 1800s, as much as half of the Pacific walrus population was gone and the most southerly population of Atlantic walruses was extirpated, with other populations brought to the brink of extinction. As well as endangering the survival of walruses, losses resulting from commercial hunting threatened the communities who relied on walruses to live. From the early 1900s onwards, commercial hunting of walruses was gradually prohibited by Arctic nations. Today, subsistence hunting by Arctic peoples is carried out in Canada, Greenland, Alaska and Russia and is managed usually through co-management between native organisations and government bodies. Hunting of walruses is culturally important and contributes to a subsistence economy, providing a nutritional component to diets and income from the sale of walrus products. In recent years, sea ice loss resulting from climate change has had a serious impact on the ability of Arctic people to access walruses in some regions, and this has potentially dire consequences for their livelihoods in the future.

Photo: Kevin Schafer / WWF

Walrus tusks gathered for sale Punuk Island near St. Lawrence Island, Alaska.

Melanie Lancaster is WWF's Senior Specialist – Arctic Species.

In the news

Journalist Lisa Demers has written extensively about the role walruses continue to play in the lives of Indigenous cultures. You can read her series for the Alaska Dispatch News, a daily newspaper based in Anchorage, Alaska, at this link:
www.adn.com/features/alaska-news/rural-alaska/2017/05/26/for-two-alaska-villages-walruses-remain-essential-as-sea-ice-disappears-can-it-last/

Photo: Kevin Schafer / WWF

Stretching of walrus hide at Savoonga St. Lawrence Island, Alaska.

Photo: Mads Peter Heide-Jørgensen

Walruses hauling out on sea ice in front of Thule Air Base.

Diminishing returns

Human activity coupled with diminishing sea ice means walrus herds are being forced to look for new platforms for feeding, mating and resting. MADS PETER HEIDE-JØRGENSEN says walrus distributions around Greenland have changed alongside past and present human activities and climate change.

ALL POPULATIONS of walrus seem to be highly sensitive to human activities such as hunting and boat traffic. They appear to be especially so near haulout sites. In Greenland, at least 19 locations have been used by walrus for haulouts. In West Greenland walruses have not been using terrestrial haulouts or 'uglit', for the last 50 years. In East Greenland about 6 uglit are currently used, but these are all in the northern part of the East Greenland National Park where there is no hunting and almost no human activity.

The abandonment of the haulout sites in Greenland is due to some level of human activity, mostly hunting. However, it's believed one site on the west coast of Disko Island was perhaps abandoned due to the establishment of a Loran C radio station close to the uglit in 1954. This was a radio navigation system that used low frequency radio signals transmitted by land-based radio beacons.

Several hundred walruses regularly used other uglit in West Greenland until they were abandoned in the 1920s. Even though some of the human disturbances have been discontinued and at least one population of walrus (in East Greenland) has recovered from past exploitation, there are still no signs of re-colonization of traditional haulouts. It must be recognized that some walrus ➤

MADS PETER HEIDE-JØRGENSEN is a professor at the Greenland Institute of Natural Resources and the Danish Natural History Museum. He studies marine mammals, mainly cetaceans.

habitats in Greenland have been permanently lost due to human activities such as continued hunting and expanding villages close to the haulouts.

Abandoned haulout sites provide an important lesson on the sensitivity of walruses and emphasizes the need for avoiding human activities in areas of importance to them. Recent plans for shipping and ice breaking through the walrus wintering grounds in the eastern part of Davis Strait pose a threat to walrus that are wintering in that area. These walruses were previously using terrestrial haulouts on small islands in West Greenland but for the past 80 years have been using drifting pack-ice as haulout platforms during the six winter months when the walruses are mating, whelping, and feeding intensively on the shallow banks.

ABANDONED HAULOUT SITES PROVIDE AN IMPORTANT LESSON ON THE SENSITIVITY OF WALRUSES

Mining is another obvious threat especially when it involves retrieval of mineral deposits in mussel bed communities which are prime walrus feeding grounds. In some cases, it might be necessary to choose between protecting walrus herds or extracting non-renewable resources. In other areas, strict regulation of the timing of the activities will be necessary to cause as little disruption as possible. Activities in offshore areas such as ice breaking are usually not covered by national environmental impact assessments. Therefore, regulation of activities requires international cooperation from the participating nations.

Photo: Mads Peter Heide-Jørgensen

Walruses resting on sea ice while drifting over mussel beds.

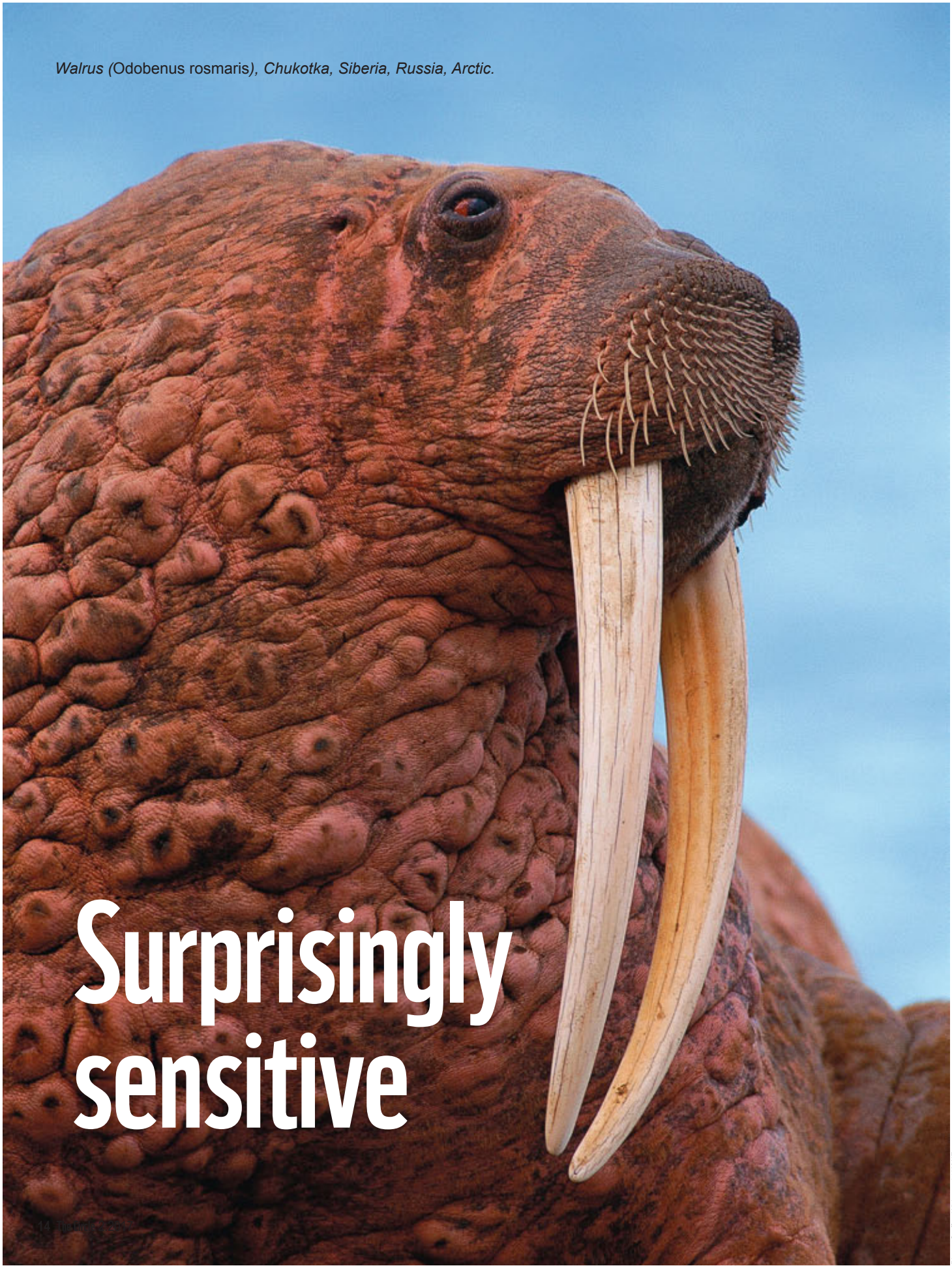
Photo: Carsten Egevang

Walruses seeking shelter from the northern wind behind an ice berg in Nares Strait.

Photo: Mads Peter Heide-Jørgensen

Declining sea ice means walruses will lose the second type of haulout platform. Sea ice allows walruses to rest over the feeding banks while drifting around and thereby dispersing the predatory pressure on shellfish resources over larger areas. There are already signs that walruses in areas of Northwest Greenland with sea ice decline are using terrestrial haulouts in remote areas of Northern Canada during summer. But terrestrial haulouts are often located far from the feeding banks and the walrus will have to commute from resting localities to feeding grounds, expending far more energy compared with drifting on ice pans above the food. One option for the walrus is to use its pharyngeal pouches (air filled sacs located along the throat) to keep drifting over feeding banks, but whether that is a viable alternative to hauling out on ice is unknown.

The walrus is closely associated with the shallow water areas of the Arctic. There are regional differences in the distance between haulout sites and feeding grounds. This will be a decisive factor for the future of walrus populations that are under pressure from declines in sea ice and increased human presence in the Arctic. ○



*Walrus (*Odobenus rosmaris*), Chukotka, Siberia, Russia, Arctic.*

Surprisingly sensitive

Photo: Staffan Widstrand / WWF

Despite occurring over a vast area and having healthy population sizes in many regions, walruses face an uncertain future. MELANIE LANCASTER and TOM ARNBOM look at conservation actions to safeguard walruses from threats to their survival.

Pacific walruses (including the divergent Laptev walrus group) have a global population size of over two-hundred thousand and Atlantic walruses number around twenty five thousand. That sounds quite healthy, doesn't it? Why then, you might ask, are we concerned about their future survival? Because, according to experts, all climate scenarios anticipate drastic changes to sea ice habitat in the Arctic, and this will eventually cause walrus populations to decline throughout their range. For this reason, they have been listed as Vulnerable on the International Union for Conservation of Nature (IUCN) Red List, and are a focus of conservation efforts across many organisations.

Conservation actions are not "one size fits all", and Pacific, Atlantic and Laptev walruses are experiencing the effects of a warming Arctic in subtly unique ways.

Pacific walruses spend spring and summer feeding over the huge, shallow continental shelf in the Chukchi Sea, north of Russia and Alaska. Mothers with calves rely on ice platforms over the shelf for giving birth and resting between dives to the seafloor. In recent years, sea ice has drifted hundreds of kilometres north of the shelf earlier in summer. This has forced walruses to come ashore along coastlines to rest in huge, crowded groups of tens of thousands of animals in Russian Chukotka and Alaska. From these coastal haulouts, they must travel farther to reach rich feeding grounds and are prone to being crushed in stampedes if they or their neighbours are suddenly startled. Thousands of walruses have been killed in stampedes, and walrus calves are particularly vulnerable.

In contrast, walruses in the Atlantic Ocean seem to prefer to rest on land, rather than ice. The reason for this difference is likely because the continental shelf of the Atlantic Ocean is much narrower and most feeding grounds in the Atlantic are often islands or closer to land. In the short term, walruses in the Atlantic should still be able to reach existing feeding grounds, and the loss of sea ice could even open new feeding areas for them.

Laptev walruses are different yet again. Along the Russian Arctic coast is the Laptev Sea where the Atlantic and Pacific walrus populations meet. In summer, walruses here seem to have adapted to live with no summer sea ice to rest and hunt from, hauling out on land to rest. However, these resting sites attract polar bears, which feed on walrus calves.

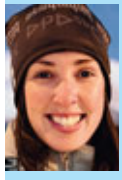
What conservation actions can we take to ensure the future for walrus? Undoubtedly, the most urgent and impactful conservation action the world can is to reduce global greenhouse gas emissions.

But several other threats face walruses and need addressing. The lengthening ice-free period in the Arctic brings greater opportunity for industrial development including shipping, mineral exploration and extraction, commercial fishing and infrastructure builds such as housing, harbours and airports. Best management practices through voluntary or regulated measures can be put in place to reduce harmful impacts of industry on walruses. Impacts include underwater and atmospheric noise (e.g. ship engines, seismic surveys), sea ice break up, direct disturbance and bycatch of walruses. In addition to incidental catch of walruses in fishing nets (bycatch), bottom trawling fisheries can destroy the sea floor and the fragile feeding grounds of walruses, who rely on mussels for their main food base.

Identifying and safeguarding walrus haulout and feeding areas is another measure to protect them.
Temporary closures during particularly vulnerable times of the year and "no-go" zones are approaches that have worked to safeguard walruses hauled out onshore in eastern Russia. Another tool to reduce disturbance of these surprisingly sensitive giants is ship re-routing. This strategy is used successfully to protect harp seal pupping grounds in the White Sea using daily satellite images of seal locations, which inform shipping routes through the area.

Regular monitoring of populations and understanding population boundaries is essential for ensuring a sustainable walrus harvest. Walruses have been hunted for subsistence purposes for centuries by Arctic peoples. They are culturally important to Indigenous traditions, they are harvested for their meat with the sale of their ivory tusks and ivory crafts is an important source of income for Arctic communities. Overhunting is recognised as a potential threat to walruses, but is governed through responsible co-management systems in most countries with legal hunting.

TOM ARNBOM is a senior conservation officer with the WWF



MELANIE LANCASTER is WWF's Senior Specialist, Arctic Species

Monitoring of walruses is ideally done through a combination of scientific research and traditional/local knowledge. Healthy walrus populations are vital to Arctic people, but the Arctic's remoteness means that monitoring can be challenging. Knowledge from local hunters is therefore hugely valuable for detecting changes in population distribution, body condition and health of walruses, and can provide early warning of broader ecosystem changes. In a warming Arctic, this is more important than ever to ensure the survival of this valuable natural resource and ecological asset into the future. ○

Industry in walrus territory

Pacific walruses are segregated by gender for much of the year. Adult females and young follow the ice edge as it recedes through the Chukchi Sea in summer and they return to the Bering Sea in winter, while most males stay in the Bering Sea year-round. XAVIER MOUY says studies are underway to assess the effects of industrial activities on walruses.

CLIMATE CHANGE has led to an earlier retreat of sea ice in summer and a later fall return, requiring walruses to change their use of the Chukchi Sea. At the same time, longer open water periods make the region more accessible to human activities.

The oil and gas industry has been assessing hydrocarbon prospects in the northeastern Chukchi Sea off Alaska over the past decade. Ship traffic in the Arctic has increased over the years, with growth expected to continue through 2050 when the Arctic Ocean is expected to be largely free of summer sea ice. The effects of reduced sea ice and increased human activity near walrus feeding habitat could be detrimental to these mammals.

XAVIER MOUY is a scientist with the Canadian consulting company JASCO Applied Sciences. He specializes in the passive acoustic monitoring of whales, pinnipeds and fish for numerous environmental impact studies for industry in the U.S. and Canadian Arctic.

Oil and gas activities include seismic surveys that use underwater airguns to generate loud pulses of sound used for mapping hydrocarbon deposits within the sea bottom, and drilling of exploration wells to assess viability of the most promising finds. Both operations generate underwater noise that can affect walruses' hearing and use of sound. To mitigate such impacts, on-site acoustic measurements are carried out in combination with sound propagation modeling to determine the distances from activities over which harmful noise effects could occur. Marine mammal observers (MMOs) are deployed on most exploration vessels to watch carefully for animals that could approach within marine mammal exclusion or safety zones. MMOs have the authority to halt the noise-generating activities if animals are observed close to the exclusion zone.

THE EFFECTS OF CHRONIC INCREASES IN BACKGROUND NOISE ON WALRUS BEHAVIOR AND COMMUNICATION ARE POORLY UNDERSTOOD

From 2006 to 2015, several oil and gas companies performed hydrocarbon exploration in the northeastern Chukchi Sea. Some of these companies funded multidisciplinary long-term environmental projects to collect ecological baseline measurements and to inform regulatory permit applications. The Chukchi Sea Environmental Studies Program (CSESP), the largest of these multiyear studies, included a large passive acoustic monitoring component that enabled scientists to describe seasonal and spatial use of the northeastern Chukchi Sea by walruses, by listening for underwater sounds produced by these highly vocal animals. This study identified important walrus concentrations, or "hotspots", and quantified the natural and man-made underwater noise levels over a large area of the sea. Such baseline measurements are essential to understand the effects of additional noise from human activities on walruses and to inform planning to mitigate possible impacts; they help industry and regulatory agencies make informed decisions on where and when to operate (i.e. by avoiding loud activities near sensitive walrus habitat when walruses are present).

These large environmental programs have advanced the understanding of the distribution of walruses in the northeastern Chukchi Sea, leading to several peer-reviewed publications in scientific journals and environmental impact assessment reports provided to government agencies. Still, many knowledge gaps remain. While there is some quantitative information available on walrus hearing, the effects of chronic increases in background noise on walrus behavior

and communication are poorly understood.

The northeastern Chukchi Sea is an important feeding ground for mothers and calves during the summer months. Sound is an essential tool to them as they vocalize to communicate and keep track of each other. It has been shown that calves can recognize their mothers from their vocalizations alone. Disruption of this communication due to increased noise in the ocean could lead to detrimental effects on the survival of calves and consequently on the walrus population. Noise levels at which such communication disruptions occur are currently unknown. The effects of noise on walruses' behavior is also poorly understood, and it is currently unknown whether walruses avoid areas with increased noise levels. If they do, industrial noise might deter walruses from prime feeding habitat.

Industry-funded research has furthered knowledge about Pacific walruses in the northeastern Chukchi Sea on a scale that would likely not have happened otherwise. It has filled critical information gaps and provided valuable baseline data that are keystones for quantifying the effects of underwater noise on walruses. Many other pieces of the puzzle are however still missing to fully understand how the walrus population might be affected and what can be done to mitigate adverse effects. Such questions must be addressed before any large scale industrial activities happen in this region of Arctic waters. ○

All that noise

The walrus is an emblematic species of the Arctic. They are also highly social, gregarious mammals that rely on vocal cues. But researcher ISABELLE CHARRIER has found increasing noise pollution is having an adverse effect on the pinnipeds.

WALRUSES CAN FORM herds of several hundreds of individuals. Even if they stay in groups all year round, the group size and composition varies between the two subspecies (Atlantic and Pacific walrus), and changes with the time of year and gender. For instance, in summer, Atlantic walruses form mixed groups of individuals whereas Pacific walruses form large sex-segregated herds.

Walrus produce vocalisations in air and under water in many social contexts including mother-calf interactions, adult-adult interactions, courtship display, predator or danger alert. With climate change, the extreme loss of sea ice gives more opportunities to develop maritime traffic which in general will increase human activity in the Arctic. The absence of ice during summer has lead walruses to come ashore to rest more often. This has been seen for several consecutive summers in Alaska, with the most striking example being the largest aggregation of Pacific walruses at Point Lay in September 2014 where 40,000 animals were observed, mainly females with calves. Walruses are very sensitive to aerial noise such as boat engines, but also noise from low flying aircrafts, so the risk of stampede induced by aerial noise is extremely high and results in a tremendous number of deaths, mostly young animals crushed by congeners running to the water. If aerial noise clearly affects walrus behaviour and thus threatens the survival of the youngest animals, the same can be said of underwater noise due to human activities such as boat traffic, drilling, air guns, etc. This underwater noise is loud and composed of low frequencies that can propagate over long distances. During movements from foraging grounds to resting periods on ice in summer, walruses swim in groups and communicate by sounds (both in air and under water) to stay together. Mothers and calves recognize each other by voice, and the bond between the mother and her calf is among the strongest in mammals, persisting several years after weaning. Underwater noise can impair their vocal communication which can be particularly dramatic for calves if they are separated from their mothers and cannot reunite using vocal cues. The amplitude level of traffic noise can be extremely loud, and it has been recently shown in Scotland that shipping noise levels are above those known to induce temporary hearing loss in harbour seals. Impact studies in Arctic waters are thus needed to evaluate the increasing risk of shipping traffic and human activities on walrus behaviour and physiology. Auditory masking of their social vocalisations and temporary hearing loss due to human-activity noise can have a great impact on both walrus reproduction and survival rate. Finally, such impact studies will help in developing rules or laws to limit the level of human-made noise in Arctic waters especially in areas where walrus and any other marine mammals are known to come for foraging or breeding. ○

ISABELLE CHARRIER studies the vocal communication in pinnipeds (seal, sea lion and fur sea, and walrus).

NOISE CAN HAVE A GREAT IMPACT ON REPRODUCTION AND SURVIVAL RATE

Pacific walrus in Russia

The Pacific walrus has long been a staple of subsistence for the Indigenous peoples of northeastern Russia and the Inuit of Alaska in the United States. As climate change continues to adversely affect this important shared resource, ANATOLY KOCHNEV says effective research, monitoring and management of walrus populations will rely on the joint efforts of both countries.

BY THE EARLY 1960S, over-hunting saw the Pacific walrus drop to an estimated 50-90,000. Protective measures saw herds restored to the optimal population of 275-386,000 by the early 1980s. But even with significant harvest reduction, there are signs the Pacific walrus population is again decreasing. This trend was first observed in the mid-1980s when a survey by American researchers of the age and sex composition of the walruses in the Chukchi Sea showed alarmingly low population productivity and survival of young animals. This was confirmed by the Soviet-American aerial survey in 1990 when numbers were determined to be 201-296,000 indicating a 25 per cent decrease over 10 years. By the 2000s, numerous coastal haulouts on the Kamchatka Peninsula and the Koryak coast had stopped, and where the walruses did continue to haul out, numbers had fallen dramatically. Compared with the mid-1980s the number of walrus herds staying for the summer in the northern part of the Anadyr Gulf had almost halved. In 2006 joint US-Russia aerial surveys estimated the number of Pacific walruses had further dwindled to 129,000 – a return to the level of the early 1970s.

DR. ANATOLY KOCHNEV is Senior Scientist of the Mammals' Ecology Lab of Institute of Biological Problems of the North, Russian Academy of Sciences

It is now clear that global climate fluctuations are the main cause of these decreasing numbers. Climate change has caused a significant decrease of summer and autumn sea ice cover making it difficult for walruses to rest on the ice floes or use them as platforms for feeding in the extensive shallows of the central Chukchi Sea. Walruses are forced to remain near shore for excessively long periods, creating dense haulouts in the tens of thousands. With such a concentration of walruses in the coastal waters, there is an acute shortage of food and many of the animals are in poor physical condition. There is also growing interference from predators and humans, leading to panic among the tightly-packed crush on shore and is likely the cause of annual mass deaths of walruses on coastal haulouts. This peaked in autumn 2007 when up to 10,000 animals died along the Arctic coast of Chukotka.

The decline of walruses from the southern part of the range is even more pronounced although it seems they have been able to adapt to ice losses, albeit in low numbers. In the absence of ice this adaptation is manifested as walruses concentrate on coastal haulout places located at a minimum distance from areas with the most productive sea floor communities, where bivalves and other organisms eaten by walruses predominate. Thus, the loss of energy in walruses during feeding and movement from land haulouts to feeding ➤

Photos: Anatoly Kochnev

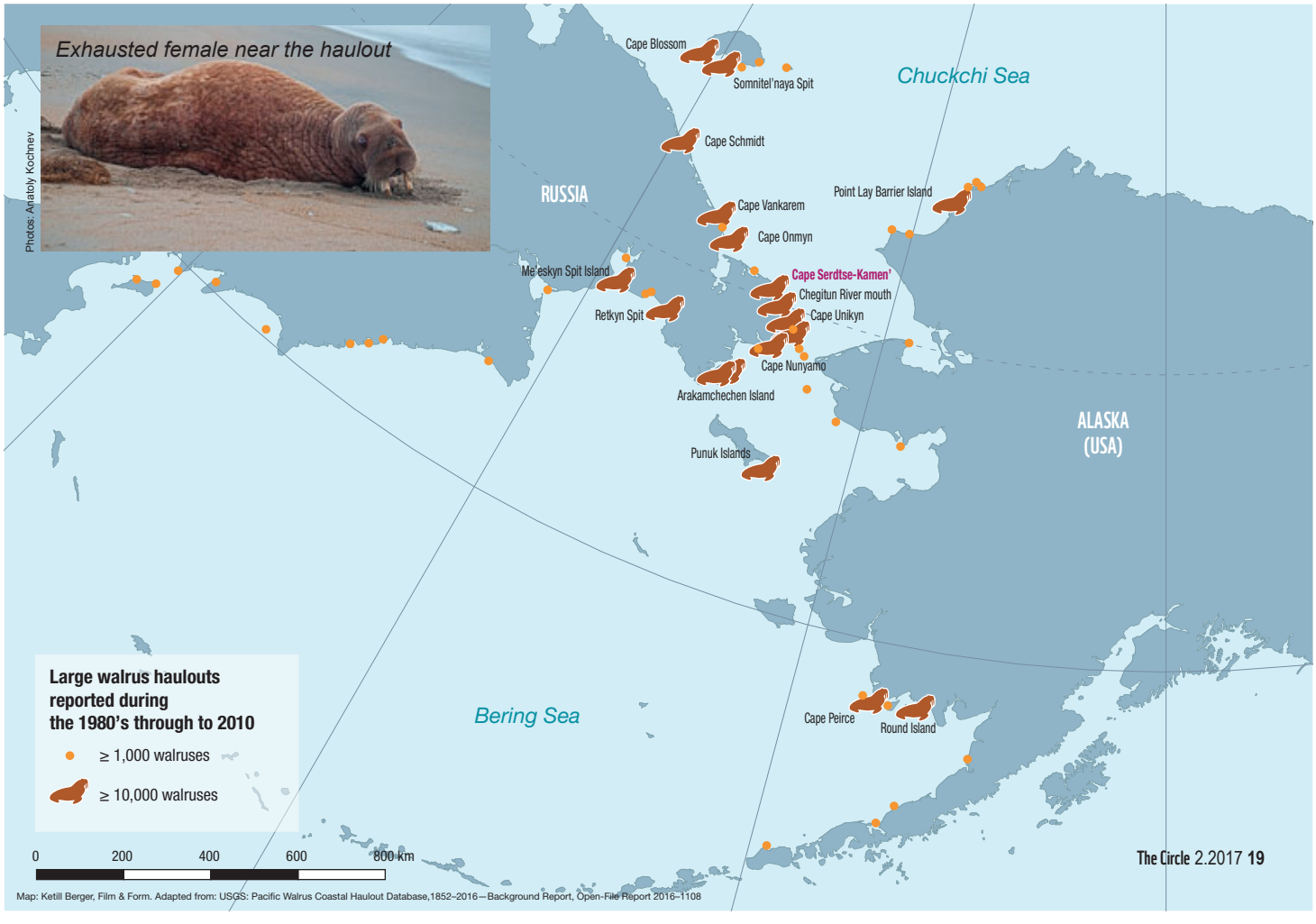
Fresh corpses of walruses on the edge of haulout, after the walruses had recently left, Cape Serdtse-Kamen',

Photos: Anatoly Kochnev

The world's largest haulout of Pacific walruses at Cape Serdtse-Kamen', Chukotka, Russia

Exhausted female near the haulout

Photos: Anatoly Kochnev



Map: Ketill Berger, Film & Form. Adapted from: USGS: Pacific Walrus Coastal Haulout Database,1852–2016—Background Report, Open-File Report 2016–1108

areas can be compensated by the high density of food. After a long break, walrus haulouts have again begun first on the Russian coast of the Chukchi Sea, and then on the northern coast of Alaska. These locations have seen regular use from August to November over the last two decades. I discovered one of these important haulout places in 2009 on the Russian coast of the Chukchi Sea near Cape Serdtse-Kamen'. The monitoring conducted by myself and my colleagues from the Chukotka branch of the Pacific Research Fisheries Center in 2009-2016 showed that 75-115,000 walruses are concentrated at Cape Serdtse-Kamen' and adjacent parts of the coast in October constituting the main part of the Pacific population. The mortality of walruses at Cape Serdtse-Kamen' and other coastal haulouts remains high, but not as high as in the critical year of 2007. Observations at Cape Serdtse-Kamen' indicate that in current years the population has stabilized although this is a temporary respite for walruses. If losses of ice habitat in the Chukchi Sea continue it is difficult to imagine how they will survive it.

The problem is further aggravated by the fact that the shrinking of the sea ice cover becomes a catalyst for increasing the anthropogenic pressure on the Arctic. Historically, high sea ice density created the conditions to make the Chukchi Sea a natural reserve for walruses and other marine mammals. Now the sea ice barrier has disappeared, and people are expanding their economic activities in the Arctic. In Russia, oil and gas exploration of the Bering, Chukchi and East Siberian seas and construction of a floating nuclear power plant in the East Siberian Sea is underway. The intensity of navigation is increasing, with new civil and military complexes being built next to key Pacific walrus habitats. The reaction of walruses to an inevitably sharp increase in economic activity and possible pollution in most of their range is unpredictable.

Currently, efforts to protect the Pacific walrus in Russia involve limiting the traditional native harvest (any other harvest is prohibited, except for capturing calves for zoos and aquariums) and the creation of designated protected areas in Chukotka. In 1976 a federal reserve was established on the Wrangel and Herald islands which was extended in 1997 to the 12-mile coastal water area around these islands. In 2012 a 24-nautical mile protective zone was created adjacent to the reserved water area. In 2013, the Beringia National Park was established in the Bering Strait area and the southern part of the Chukchi Sea. However, these measures are not enough for successful conservation and growth of the Pacific walrus population. Walruses like any other marine mammals actively move within the range, and they are difficult to protect by creating any limited protected land and water areas. Systematic, longterm monitoring of the Pacific walrus population is needed throughout all ranges, and effective control of anthropogenic activities, including flexible restrictions that respond quickly to changes in the distribution and behavior of walruses. ○

*Group of Walrus (*Odobenus rosmaris*), Chukotka, Siberia, Russia, Arctic.*

Photo: Staffan Widstrand / WWF

Keeping track

Counting walruses is difficult, complex and labour intensive usually requiring repeat visits to haulout sites. Even then there are numerous variables swaying the numbers. MIKE HAMMILL says good record keeping is integral to good management of declining herds.

WEIGHING UP TO A TON, the walrus is the largest seal native to Canada. Good walrus habitat is characterized by relatively shallow water (ca 80 m or less) with a seabed that supports plenty of shellfish in areas not far from haulout sites. Walruses were once widely distributed in Canada and common south to the Gulf of St Lawrence and Sable Island. By the late 1700s, commercial whaling in the Gulf of St Lawrence was already in decline as whales became harder to catch. Whalers began searching out new areas for harvesting and shifted their attention to other species to fill their holds. By the end of the century, Atlantic walruses (Odobenus rosmarus rosmarus) had been killed off from the Gulf of St Lawrence and sites on Canada's east coast such as Sable Island. Today, walrus distribution is limited to Hudson and James bays, and areas to the north into the central and High Arctic (Fig. 1).

An understanding of abundance and population trend is needed to make informed decisions for harvest management, evaluating industrial impact and understanding how this species responds to climate change. Walruses are a challenging species to enumerate due to a combination of factors including: a highly clumped distribution; movements between haulout sites; variability in detection probabilities depending on whether animals are hauled out on land, on the sea ice, or are in the water; and uncertainty in the fraction of the population hauled out when the survey is flown. In September 2017, the Canadian Department of Fisheries and Oceans is planning a survey to obtain information on walrus abundance along the southeast coast of Baffin Island, in Hudson Strait, around Southampton Island and along the northwest coast of Hudson Bay. This survey will also test some new developments to see if we can improve our estimates of abundance.

BY THE END OF THE CENTURY, ATLANTIC WALRUSES HAD BEEN EXTIRPATED FROM THE GULF OF ST LAWRENCE AND SITES ON CANADA'S EAST COAST

Walrus surveys are complex. The basic design is to fly over areas where they are resting and to photograph animals at the haulout sites for later counting in the laboratory. To determine which areas should be surveyed we review the literature to determine which islands they use as haulout sites and we build on this through consultations with hunters to determine if new sites have been colonized or if certain sites have been abandoned. The number of wal- ➤

MIKE HAMMILL is a research scientist with the federal Dept. of Fisheries & Oceans in Canada

Figure 1. Location of Atlantic walrus stocks in the eastern Canadian Arctic. The stocks are Baffin Bay, West Jones Sound, Penny Strait-Lancaster Sound, Hudson Bay-Davis Strait, and South and East Hudson Bay. The North and Central Foxe Basin stocks are surveyed together and are referred to as Foxe Basin (Adapted from Stewart et al. 2013)

Stewart, R.E.A., Hamilton, J.W., and Dunn, J.B. 2013. Results of Foxe Basin walrus (*Odobenus rosmarus rosmarus*) surveys: 2010-2011. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/017: iv + 12 pp.

➤ ruses hauled out at any single moment can be quite variable and is thought to be affected by local conditions, social behaviour, and environmental factors. At key haulout locations we plan to visit the site multiple times. Multiple counts will provide more information on how the number of animals at a site might vary. However, multiple visits are not always feasible, so we are proposing to install remote cameras at certain test sites. These will be programmed to transmit images of hauled out walruses via satellite which will allow for real-time data collection over multiple days. If successful, multiple counts from the remote cameras will provide greater insights into the numbers of walruses using a haulout site and how these numbers might vary in a way that is not feasible using an aerial survey aircraft. Multiple installations could also offer long term monitoring opportunities which might be more cost effective than using aircraft to cover large areas at considerable expense. ○

Coming ashore

Diminishing sea ice means polar bears and walrus are spending more time on land. Will this lead to more conflict between the two species? GEOFF YORK examines the evidence.

IT HAS LONG BEEN surmised that as the Arctic warms and sea ice recedes, more polar bears will spend longer time on shore throughout their range. This is supported by recent research using movements data from polar bears in the Southern Beaufort and Chukchi Seas along with anecdotal reports of increased sightings and encounters. Much thought and some new projects have focused on what this likely means for conflict between people and polar bears, while other research has also

Photo: Sergei Kaviry

Maintaining a respectful distance; looking for easy prey.

highlighted the potential impacts to shore dwelling birds and bears. Less thought has been given to the potential impacts on other marine mammals such as walrus who are also increasingly forced to spend more time on land.

Pacific walrus have shown signs of shifting distribution with historically large or new haulouts reported in both Chukotka and Alaska. While use of land is nothing new, traditionally these haulouts were composed of males, the haulouts were much smaller in size, and were not dominated by females and calves as is now the case. This is entirely new and likely tied to the retreat of sea ice beyond the productive continental shelf – a key feature of the vast and relatively shallow Chukchi Sea that defined this largely benthic system for decades if not millennia. When walruses are at sea and using the ice as a resting and rearing platform, they tend to occur in lower numbers and are continuously in motion with the sea ice, distributing their foraging across the Chukchi. As lack of sea ice forces the animals ashore, the new haulouts can number 20,000-70,000 individuals or more.

THE FUNDAMENTAL ECOSYSTEM THAT WALRUS AND POLAR BEARS EVOLVED TO EXPLOIT IS BEING PULLED OUT FROM UNDER THEM

On land and in herds of this size, walruses are prone to stampede events that endanger young and old, resulting in increased mortality of females and new calves. The presence of walrus and of carcasses is a strong attractant for polar bears. These species have evolved together in a sea ice dominated system but an adult male walrus can more than match most polar bears with its size, strength, incredibly tough hide, and dangerous tusks. They can and do mortally injure polar bears so it is common to see bears showing deference to adult walrus. As with seals and small whales, in open water the advantage goes clearly to the walrus. Young, injured, or sick walrus are another matter and can easily fall prey to a savvy bear while carcasses from stampede events or other natural mortalities can provide a veritable bounty for polar bears lucky enough to encounter them along the coast.

I have had the fortune to observe polar bears and walrus within meters of one another on more than one occasion while working in the Russian Arctic. In one situation, an incredibly well fed male polar bear was feasting on carcasses adjacent to a haulout estimated at over 80,000 animals. Neither the bear or the living walrus appeared to pay one another much attention, though I imagine the walrus, mostly females and calves, were keeping a watchful eye. In both other cases, the herds were smaller and the haulouts more traditional: adult males dominated the use of land while females and younger walrus stayed close to or in the water, at least when a bear was present. At both sites, an adult male polar bear could simply walk up to within a few meters of the male walrus and lie down and observe, likely assessing the situation for any easy targets, but an attempted predation was not observed.

So what can we expect as more polar bears and more walrus spend more time ashore? Likely more skirmishes as either inexperienced bears, or those in poor shape, take more risks in attempts to secure food. A small number of polar bears will also benefit greatly from increased carcass availability. However, the greatest threat to both species will remain the loss of sea ice habitat. As the Arctic continues to warm at a pace more than double that of the global average, the fundamental ecosystem that walrus and polar bears evolved to exploit is being pulled out from under them. This exposes both species to increased foraging costs, factors that decrease reproductive success, and that increase mortality: fundamental shifts to the ecosystem itself; new disease vectors; and competition from what were historically southern species. The last walrus will not likely be taken by the last polar bear, rather they will both be greatly reduced in range and numbers unless warming and subsequent loss of sea ice can be stabilized or reversed. ○

GEOFF YORK is Polar Bear International's Senior Director of Conservation

Return WWF Arctic Programme
275 Slater Street, Suite 810,
Ottawa ON, K1P 5H9, CANADA

THE PICTURE

Carved in ivory

Photo: Staffan Widstrand / WWF

Chukchi carving in walrus tusk ivory, depicting walrus and whale hunters.

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.panda.org/arctic