

2nd International Conference Problems of Health and Sanitary-Epidemiological Wellbeing in the Arctic November 13-15, 2019, St-Petersburg



Inuit Circumpolar Council (ICC) – Global actions on contaminants

Eva M. Krümmel, Carolina Behe, Stephanie Meakin,
Joanna MacDonald

Contaminants in the Arctic

- Long-range transport (few sources within the region)
- Biomagnification in (marine) food webs
- Subsistence consumption of marine foods (marine mammals)
- Very high levels of mercury and other contaminants in some Arctic human populations (exceeding guidelines)
- Concern for ecosystem and human health effects

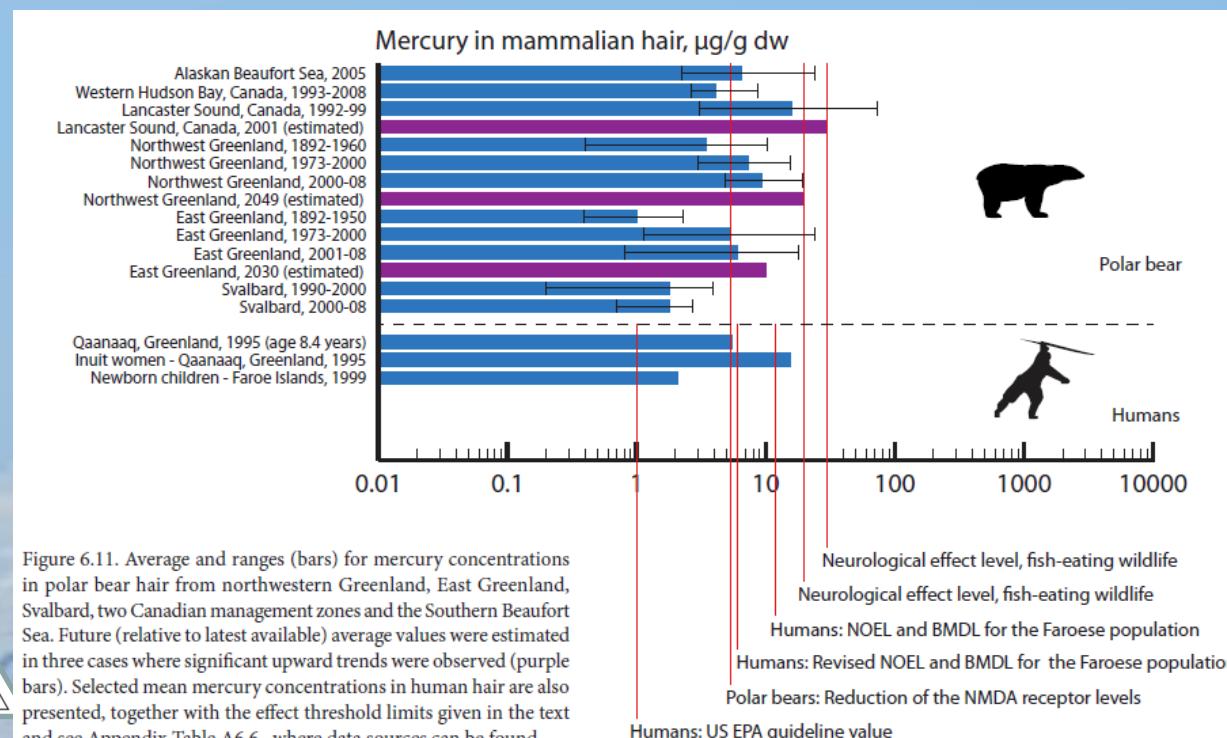
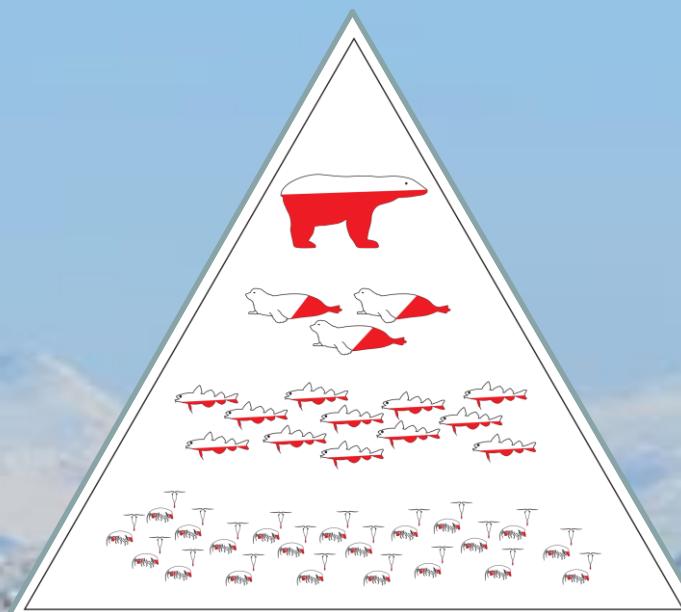


Figure 6.11. Average and ranges (bars) for mercury concentrations in polar bear hair from northwestern Greenland, East Greenland, Svalbard, two Canadian management zones and the Southern Beaufort Sea. Future (relative to latest available) average values were estimated in three cases where significant upward trends were observed (purple bars). Selected mean mercury concentrations in human hair are also presented, together with the effect threshold limits given in the text and see Appendix Table A6.6., where data sources can be found.

RUSSIA

INUIT NUNAAT INUIT HOMELAND



Offices

U.S.A.

BAKALAIT SETTLEMENT REGION

CANADA

KALAALLIT NUNAAT
GREENLAND

HUAVUT

MUNASAYU

MUNAVIK



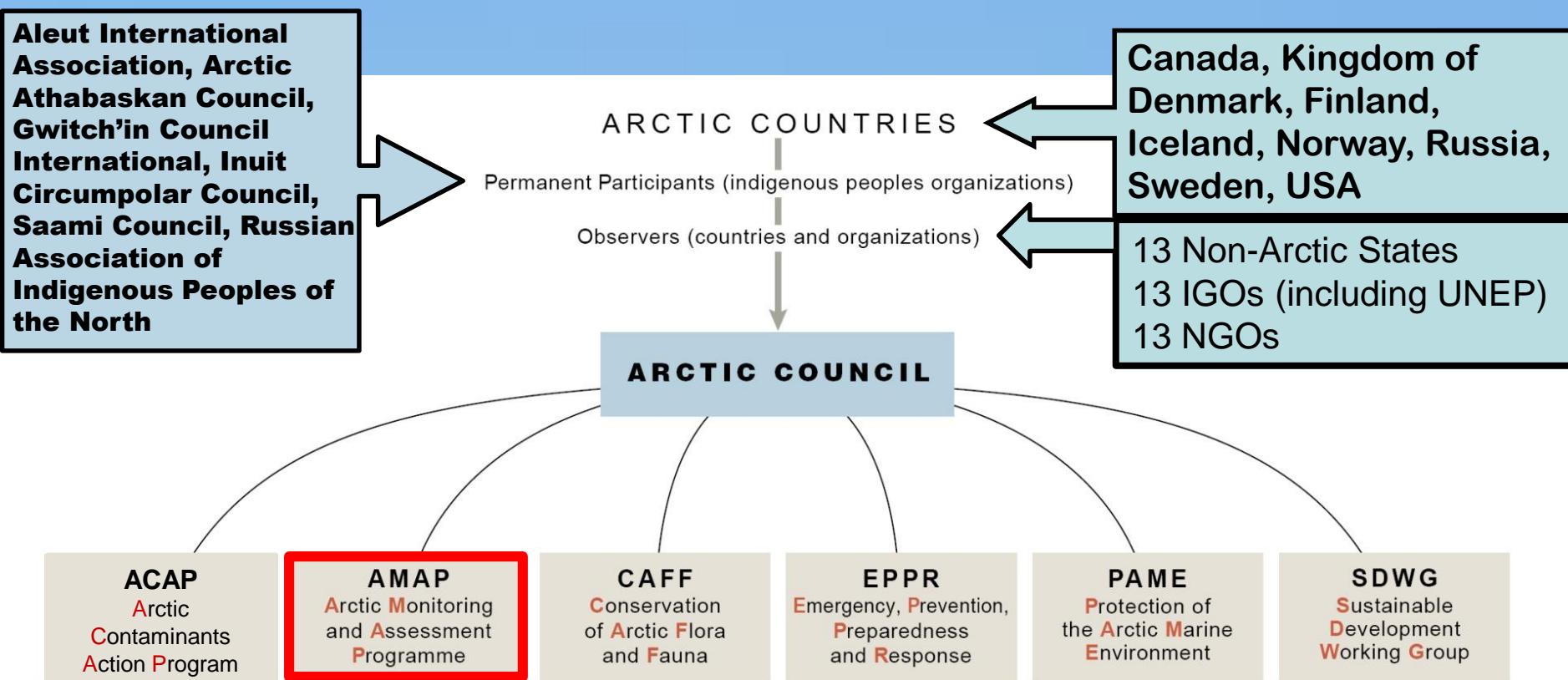
Inuit Tapiriit Kanatami

Map Source: Canadian Aboriginal Affairs and Northern Development, 2006

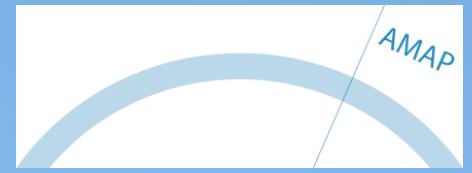
Scale 1: 4,000,000

Albers Conic Equal Area Projection

Arctic Council



Arctic Council's Arctic Monitoring and Assessment Programme

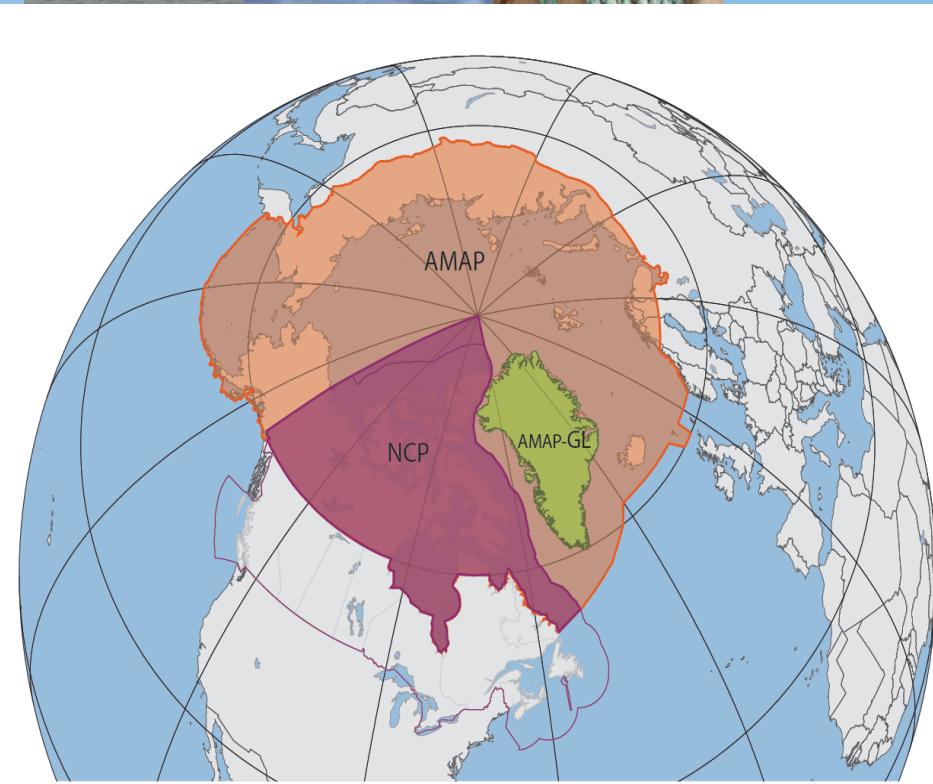


Priorities: POPs, Metals, Human Health; Climate, Ocean Acidification, Oil, Radioactivity

Media: Atmospheric, Terrestrial, Marine, Freshwater, Humans

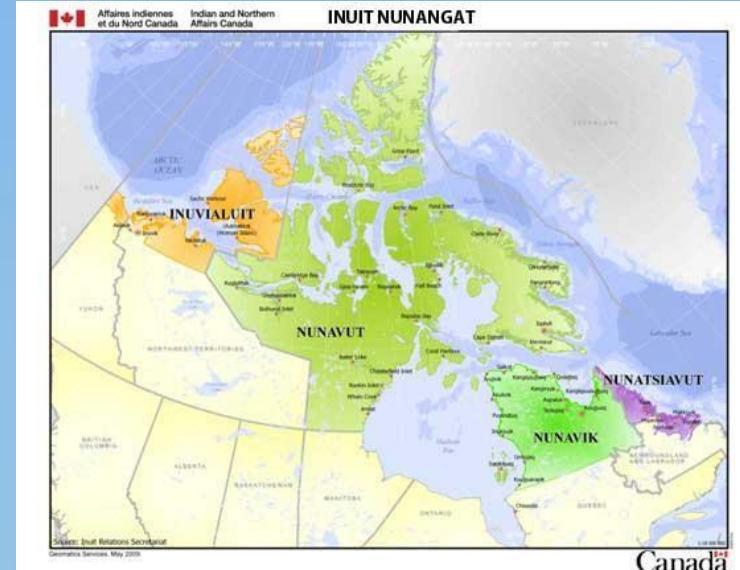
Documenting: Sources, Pathways, Levels, Bio-accumulation, Trends & Effects, New Chemicals

- Coordinated monitoring, method development
- Data collected at thematic data centres
- QA/QC: AMAP inter-laboratory studies
- Assessments available at www.amap.no



Northern Contaminants Program (NCP) - Canada

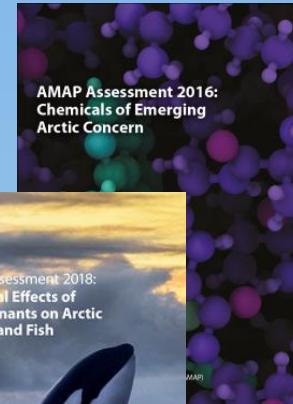
- Established in 1991, run by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
- Working towards reducing and, where possible, eliminating contaminants in traditional country foods
- Research and Monitoring of contaminants in the Canadian Arctic environment and people
- Management Committee includes federal and regional government departments, Canadian Indigenous organizations
- Funding for Indigenous partners



Canadian Government: Northern Contaminants Program (NCP)



Arctic Council: Arctic Monitoring and Assessment Programme (AMAP)



International Agreements (e.g. UNEP):
- Stockholm Convention on POPs
- Minamata Convention on Mercury



Decreasing contaminant levels

United Nations Environment

1) Stockholm Convention on POPs

- Global, negotiated from 1998 to signing in 2001, in force since 2004. 183 countries ratified up to now (are “Parties” to it). Started with 12 POPs (the “dirty dozen”), currently 30 POPs listed.
- Conference of the Parties (COP) take place every two years, last one in April/May 2019.
- Has technical POP Review Committee (POPRC), meets annually to review new nominated chemicals

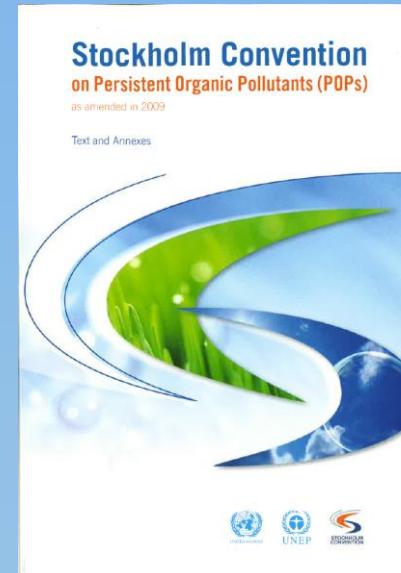
2) Minamata Convention on Mercury

- Negotiated from 2010. Officially adopted and opened for signature in October 2013, came into affect August 2017.
- Currently has 128 signatures and 114 ratifications (as of 07 Nov 2019).
- 3rd Conference of the Parties (COP-3) will take place end of November this year.

Importance of the Arctic

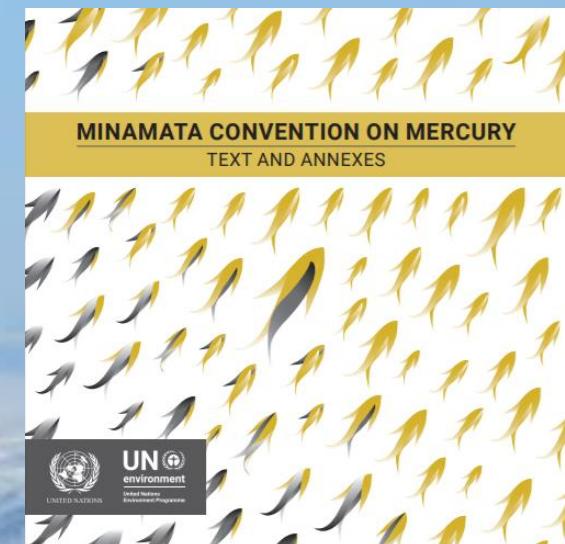
Preamble of the Stockholm Convention:

“Acknowledging that the Arctic ecosystems and indigenous communities are particularly at risk because of the biomagnification of persistent organic pollutants and that contamination of their traditional foods is a public health issue.”



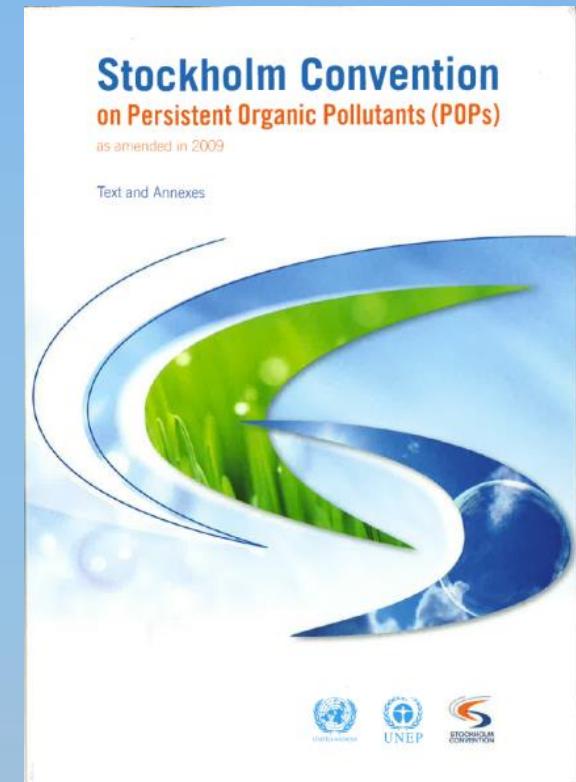
Preamble of the Minamata Convention:

“Noting the particular vulnerabilities of Arctic ecosystems and indigenous communities because of the biomagnification of mercury and contamination of traditional foods, and concerned about indigenous communities more generally with respect to the effects of mercury,”



Stockholm Convention - Annexes

- Has three annexes to list POPs:
 - Annex A (elimination, time-limited specific exemptions Parties need to register for): most POPs
 - Annex B (restriction, has acceptable purposes without time-limits and specific exemptions, are reviewed regularly): e.g., DDT (used for disease vector control to combat malaria), PFOS (many specific use exemptions and acceptable purposes!)
 - Annex C (unintentional production): e.g., dioxin/furans, PCBs



Stockholm Convention – Effective?

- Many reports about declines of so-called legacy POPs (mostly “dirty dozen” chemicals).

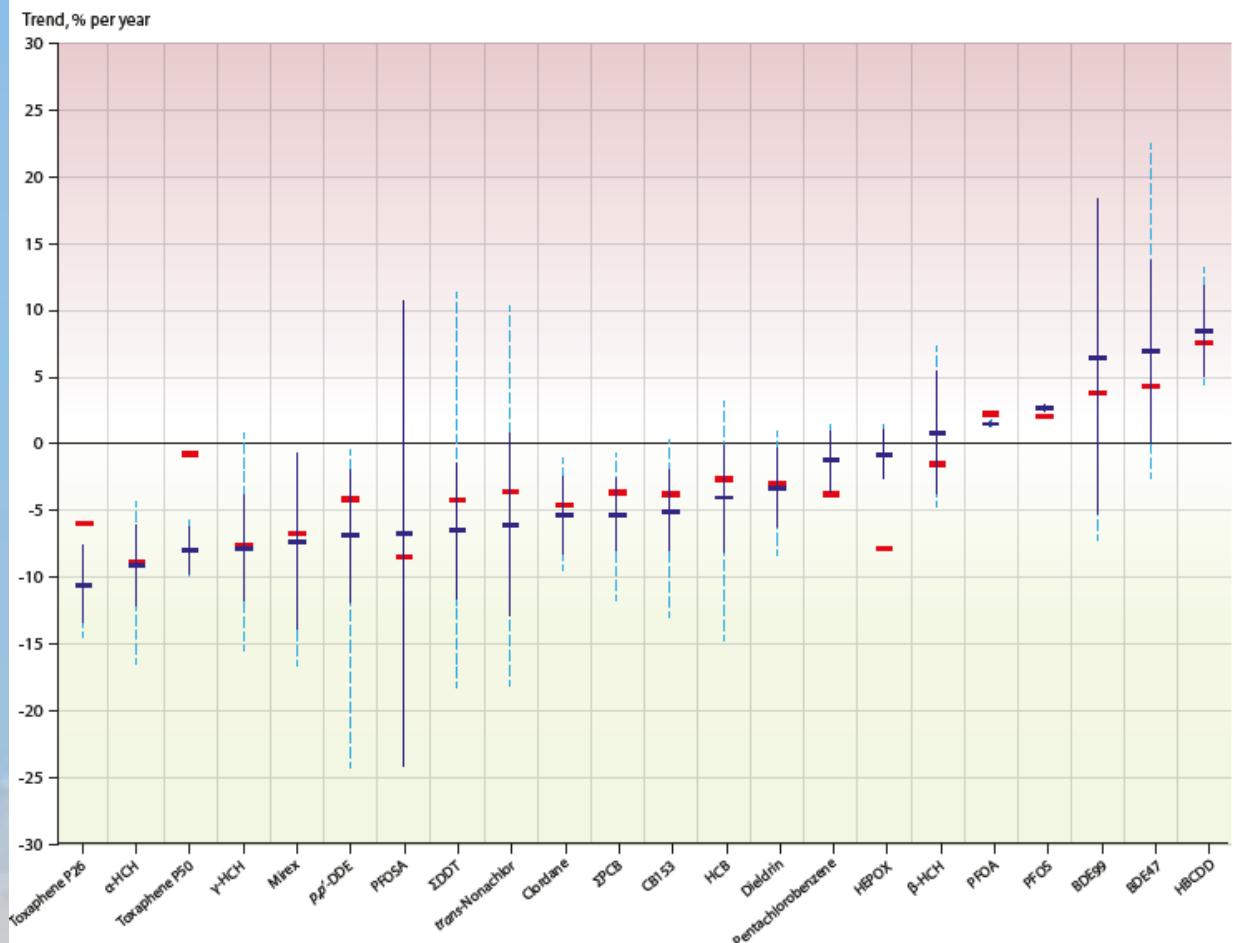
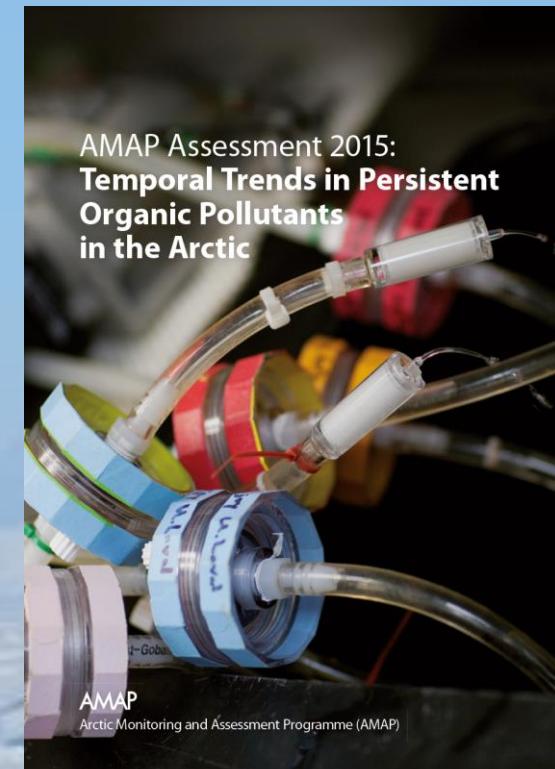
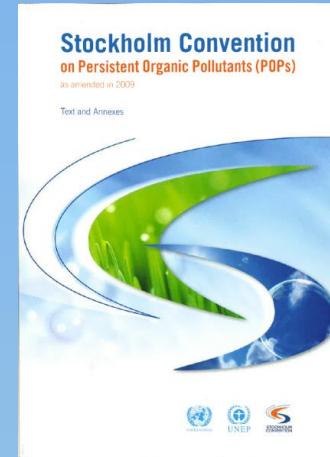


Figure 5.1 Summary of biota trends for different contaminants – results for time-series starting before 2000 where trend results were statistically significant and/or time-series were of ‘adequate’ power. The graphic shows the ranked mean \pm SD (dark blue solid line), range (light blue dashed line); red marks indicate the mean for all runs.



AMAP Assessment 2015:
Temporal Trends in Persistent
Organic Pollutants
in the Arctic

AMAP
Arctic Monitoring and Assessment Programme (AMAP)

The Return of Legacy POPs?

PERSISTENT CHEMICALS

Predicting global killer whale population collapse from PCB pollution

Desforges *et al.*, *Science* **361**, 1373–1376 (2018)

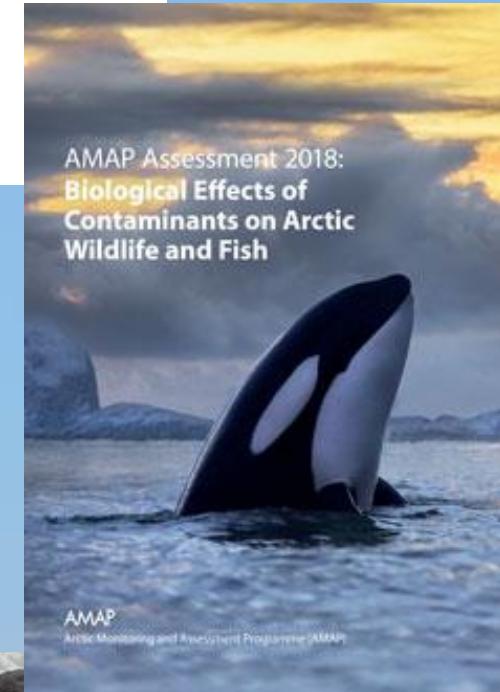
- Polychlorinated biphenyls were manufactured from the 1920s
- Banned in the US in 1979, the UK in 1981 and the rest of the EU
- Europe produced some 300,000 tonnes from 1954 to 1984
- The majority has yet to be destroyed or safely stored away
- PCBs were popular in coolant fluids in electrical apparatus
- They were used in building construction, especially in sealants
- Also in cutting fluids for machining, and carbonless copy paper
- Today, only North Korea still manufactures polychlorinated biphenyls

The curse of polychlorinated biphenyls, or PCBs
Science & Environment

Pollution threatens the future of killer whales

By Jonathan Amos and Victoria Gill
Science correspondents, BBC News

27 September 2018



Paul Jepson added: "I don't think there'll ever be another PCB story."

"I think the chemical industries have learnt the lesson - we know that being fat-soluble is a big risk factor, because that allows things to bioaccumulate."

"So, nowadays, no chemical with those properties would be allowed. But PCBs are so difficult to get rid of that we'll be dealing with the legacy for a long time."



Where do POPs go?

Brief Communication

Bioaccumulation of persistent organic pollutants in the deepest ocean fauna

Published online: 13 February 2017

Nature Ecology & Evolution 1, Article number: 0051 (2017)

doi:10.1038/s41559-016-0051

Alan J. Jamieson, Tamas Malkocs, Stuart B. Piertney, Toyonobu Fujii & Zulin Zhang

The legacy and reach of anthropogenic influence is most clearly evidenced by its impact on the most remote and inaccessible habitats on Earth. Here we identify extraordinary levels of persistent organic pollutants in the endemic amphipod fauna from two of the deepest ocean trenches (>10,000 metres). Contaminant levels were considerably higher than documented for nearby regions of heavy industrialization, indicating bioaccumulation of anthropogenic contamination and inferring that these pollutants are pervasive across the world's oceans and to full ocean depth.

POPs were released into the environment through industrial accidents and discharges, leakage from landfills, or incomplete incineration⁷. Two key POPs are polychlorinated biphenyls (PCBs, used as dielectric fluid) and polybrominated diphenyl ethers (PBDEs, used as flame retardants). From the 1930s to when PCB production ceased in the 1970s, the total global production was ~1.3 million tonnes⁸. Approximately 65% is thought to be contained in landfills or still within electrical equipment, with the other 35% residing in coastal sediments and open oceans⁹.

The salient finding was that PCBs and PBDEs were present in all samples across all species at all depths in both trenches (Figs 1 and 2). The ΣPCB7 concentrations ranged from 147.3–905 ng g⁻¹ dw in the Mariana and 18.03–42.85 ng g⁻¹ dw in the Kermadec, with mean values of 382.28 ng g⁻¹ dw (± 281.6 s.d.) and 25.24 ng g⁻¹ dw (± 9.1 s.d.), respectively.

Guam, 240 ng g⁻¹ dw in Japan and 160 ng g⁻¹ dw in Australia¹⁷. Indeed, in the Mariana, the highest levels of PCBs were fifty times more contaminated than crabs from paddy fields fed by the Liaohe River, one of the most polluted rivers in China¹⁸. The only Northwest Pacific location with values comparable to the Mariana Trench is Suruga Bay (Japan), a highly industrialized area with historically heavy usage of organochlorine chemicals¹⁹.

Stockholm Convention - PCBs

- Elimination of use of PCBs in existing equipment (transformers, capacitors...), by **2025**, subject to review by the COP, in accordance with priorities:
 - “**Make determined efforts**” to identify, label and remove from use equipment containing >10% PCBs and volumes >5L
 - “**Make determined efforts**” to identify, label and remove from use equipment containing >0.05% PCBs and volumes >5L
 - “**Endeavour to identify and remove**” from use equipment containing >0.005% PCBs and volumes >0.05L



Greenland



Canada, Cape Dyer Site

Successful regulations?

- Some declines, but still sources of regulated POPs
- Vast amounts and numbers of different chemicals introduced into the environment, few regulated.
- Introduction of new POPs as replacement of regulated ones.
- Slow and expensive process of detecting, researching and regulating nationally and internationally.
- Inadequate implementation, no compliance mechanism in Stockholm Convention.

The logo for The Guardian newspaper, featuring the word "the" in a smaller blue font above "guardian" in a larger bold blue font.

Untested chemicals are everywhere, thanks to a 39-year-old US law. Will the Senate finally act?

Compounds of Emerging Concern

- New chemicals, compounds and products reaching the Arctic that do not fulfill Stockholm Convention criteria, and/or are not addressed by current legislation.
- An example is plastics/microplastics

1/29/2016

Plastic now pollutes every corner of Earth | Environment | The Guardian

the guardian

Plastic now pollutes every corner of Earth



Beached Whale Found With 30 Plastic Bags Crammed In Its Belly

"It wasn't like it was in just part of the stomach. It filled up the whole space."

Observational Study Unveils the Extensive Presence of Hazardous Elements in Beached Plastics from Lake Geneva

Montserrat Filella^{1*} and Andrew Turner²

NATURE | NEWS

Plastic waste taints the ocean floors

ROYAL SOCIETY
OPEN SCIENCE

The deep sea is a major sink for microplastic debris

Ways forward

- Better implementation of existing treaties and legislation
- Enhance partnership with Indigenous Peoples, utilization of Indigenous knowledge, community-based monitoring
- Precautionary/proactive approach needed
- Education/communication

