



# Organotin distribution in sediments of harbours around Svalbard – a first glance

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## Introduction

Arctic sea routes are opening up for maritime transport due to sea ice retreat.

Organotin compounds are toxic chemicals that are applied on boat hulls to prevent attachment of organisms, which increases drag and fuel consumption of vessels. These compounds also leach into the marine environment where they pose a risk to aquatic organisms. A well-known effect is imposex in marine snails caused by exposure to Tributyltin (TBT).

The International Maritime Organisation (IMO) banned the application of TBT coatings on ships as of 2003 (no new TBT applied on ships) and 2008 (no TBT present on ships). However, not all countries have ratified this ban. Consequently, there are still vessels coated with TBT containing paints.

## Research goal

To assess current organotin levels in sediments of harbours around Svalbard.

To conduct a pilot test for imposex occurrence in Svalbard.

## Material & methods

### Sediment and species collection

Sediments in and near harbours of Svalbard were collected in 2009, 2012 and 2013 using a Van Veen grab (see figure 1).

19 individual marine snails (*Buccinum* sp.) were collected in Ny-Ålesund harbour in 2013 using baited traps.

### Analysis

Organotin analysis in sediments consisted of monobutyltin (MBT), dibutyltin (DBT), TBT, monophenyltin (MPhT), diphenyltin (DPHT), and triphenyltin (TPHT), using an RvA accredited method (based on <sup>a</sup>).

Snails were examined for imposex occurrence using standard procedures <sup>b</sup>.

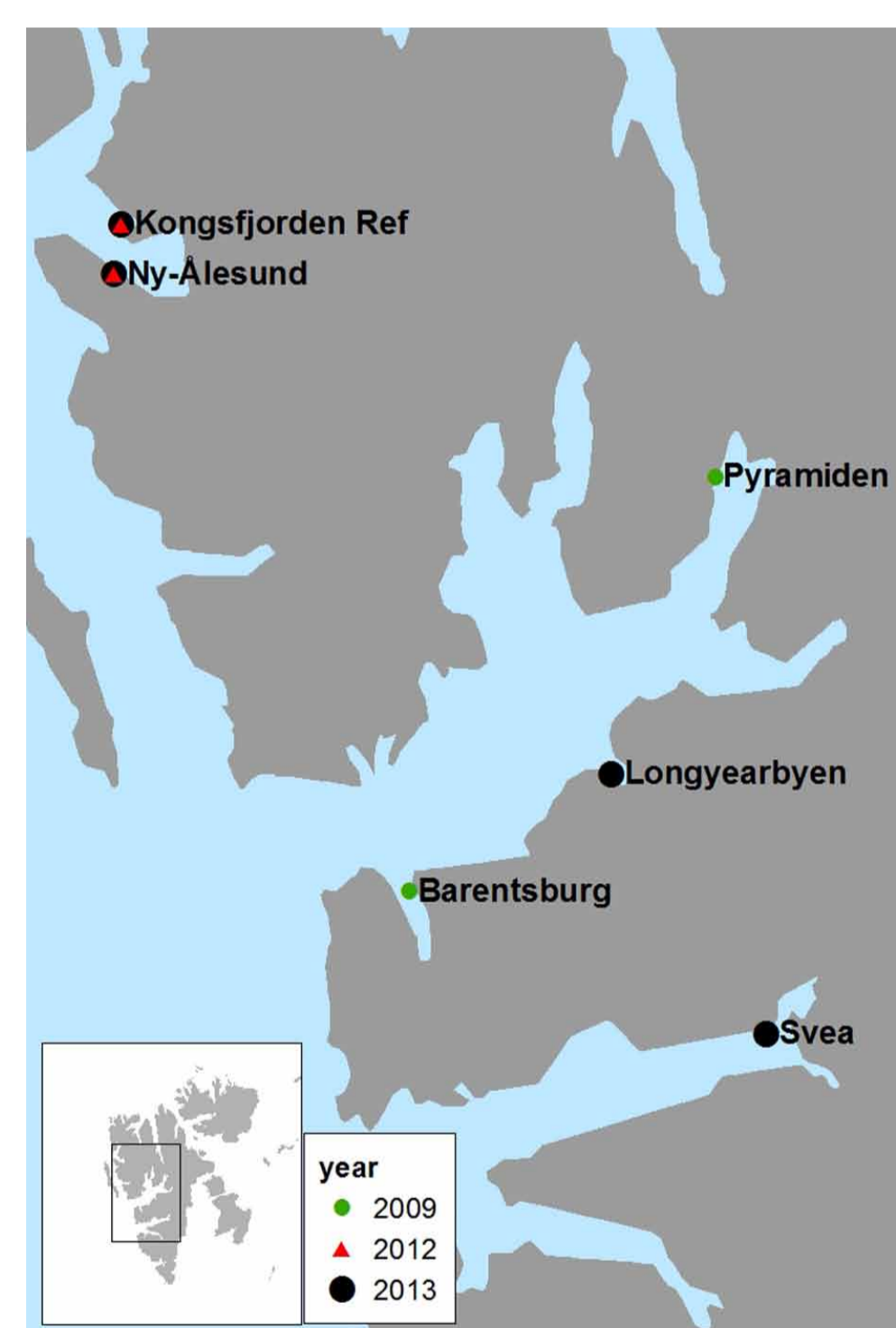


Figure 1. Sediment sampling locations in Svalbard (2009-2013).



*Buccinum* sp.



## Results

Table 1. Percentage of samples containing organotin concentrations above detection limits (%>dl) and sum butyltin concentration in harbour sediments of Svalbard. dl = detection limit.

Year	Harbour	Area	N	MBT	DBT	TBT	Range sum-butylin (Sn)	Range sum-butylin (Kation)
				(%>dl)	(%>dl)	(%>dl)	(ug/kg dw)	(ug/kg dw)
2009	Pyramiden	Billefjorden	5	0	0	20	<dl-1.8	<dl-4.4
2009	Barentsburg	Grønfjorden	4	0	0	25	<dl-1.6	<dl-4.1
2012/2013	Ny-Ålesund	Kongsfjorden	11	36	27	45	<dl-14	<dl-25
2012/2013	Kongsfjorden ref (Tonsneset/Blomstrand)	Kongsfjorden	6	0	33	33	<dl-0.5	<dl-1.2
2013	Longyearbyen	Adventfjorden	4	0	0	0	<dl	<dl
2013	Svea	Van Mijenfjorden	6	0	0	67	<dl-2.1	<dl-4.9

- At most harbours organotin compounds were identified and quantified (Table 1), except at Longyearbyen harbour.
- TBT was the most common organotin compound in these samples. Phenyltin compounds were not found above detection level. Total butyltin concentrations varied between <dl-14 µg Sn/kg dry weight.
- Of the 19 analysed snails, 3 individuals were male, 16 individuals were female. None of the females showed any stage of imposex.

## Discussion and conclusion

- These are the first preliminary results of quantified organotin concentrations in sediments around Svalbard.
- Reported concentrations are low compared to other areas around the world. Areas with highest organotin levels in sediment are harbours with high vessel activity containing concentrations ranging up to several mg/kg (dry weight) <sup>c</sup>.
- Occurrence of imposex in marine snails has been reported before in the Arctic, e.g. in Svalbard in the early '90s (<sup>d, e</sup>), but not in this pilot test in Ny-Ålesund harbour.

## Value of this project for industry and policy

The results of this study form a background for the assessments of impacts from future shipping activities in this region.

## Acknowledgements

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## References

- <sup>a</sup> Verslycke et al (2005). Flame retardants, surfactants and organotins in sediment and mysid shrimp of the Scheldt estuary (the Netherlands). *Environmental Pollution* 136: 19–31.
- <sup>b</sup> OSPAR Commission (2009). JAMP Guidelines for Contaminant-Specific Biological Effects (OSPAR Agreement 2008-09). Ref. No: 2008-9.
- <sup>c</sup> Fent (2006). Worldwide Occurrence of Organotins from Antifouling Paints and Effects in the Aquatic Environment. *Hdb Env Chem Vol. 5, Part O*: 71–100.
- <sup>d</sup> Brick & Bolte (1994). Cytology of the outer penis epithelium of *Buccinum undatum* from the Arctic region – an observation of the imposex phenomenon. *Helgoländer Meeresuntersuchungen* 48: 123-131.
- <sup>e</sup> Strand et al (2006). Imposex occurrence in marine whelks at a military facility in the high Arctic. *Environmental Pollution* 142: 98-102.

