


Development of seabird based sampling strategies for the determination of plankton communities with special focus on HAB species

Bernd Krock & Susan Waugh





1. Planktonic response to climate change in
the Southern Ocean

The Southern Ocean is dominated by a Diatom – Phaeocystis community

How will they respond to climate change?

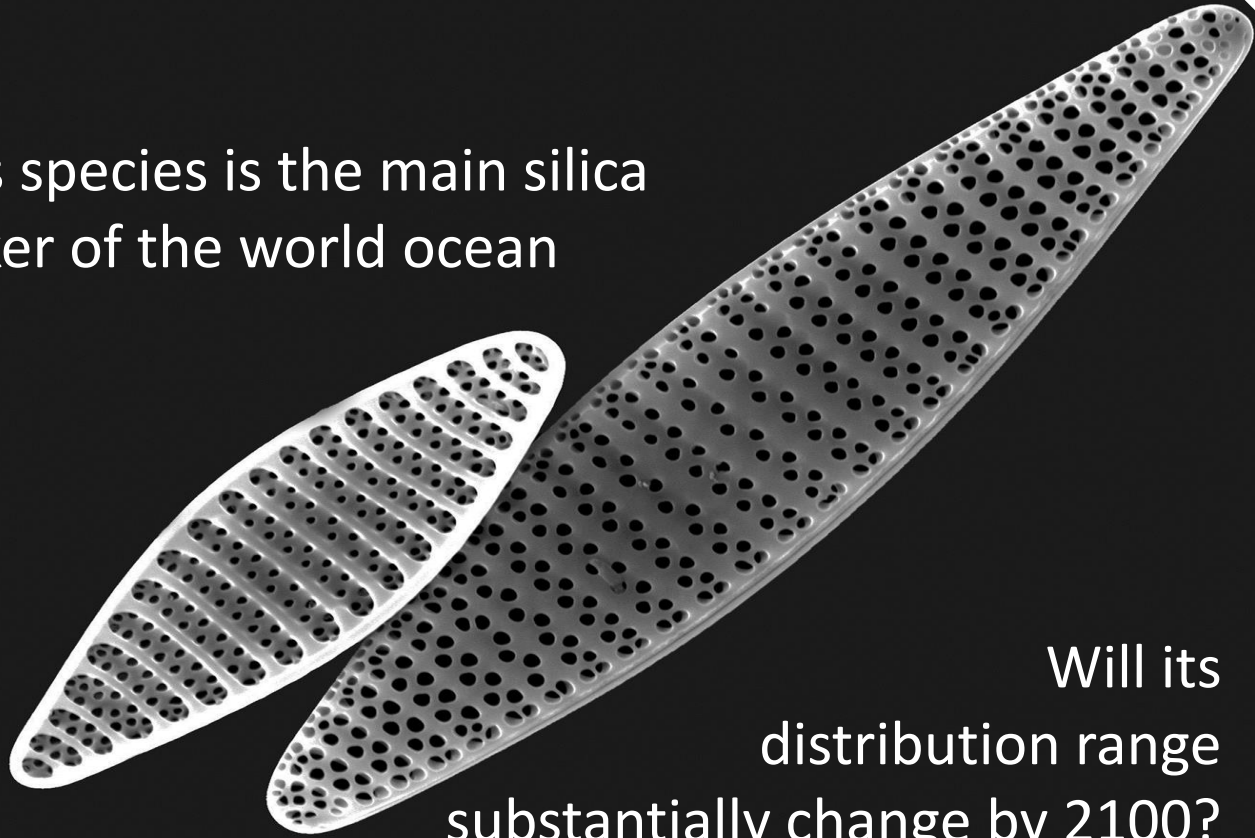
to an extreme environment
quality – winter light limitation

nutrient availability (Fe)
pressure

upon global elemental
climate regulation

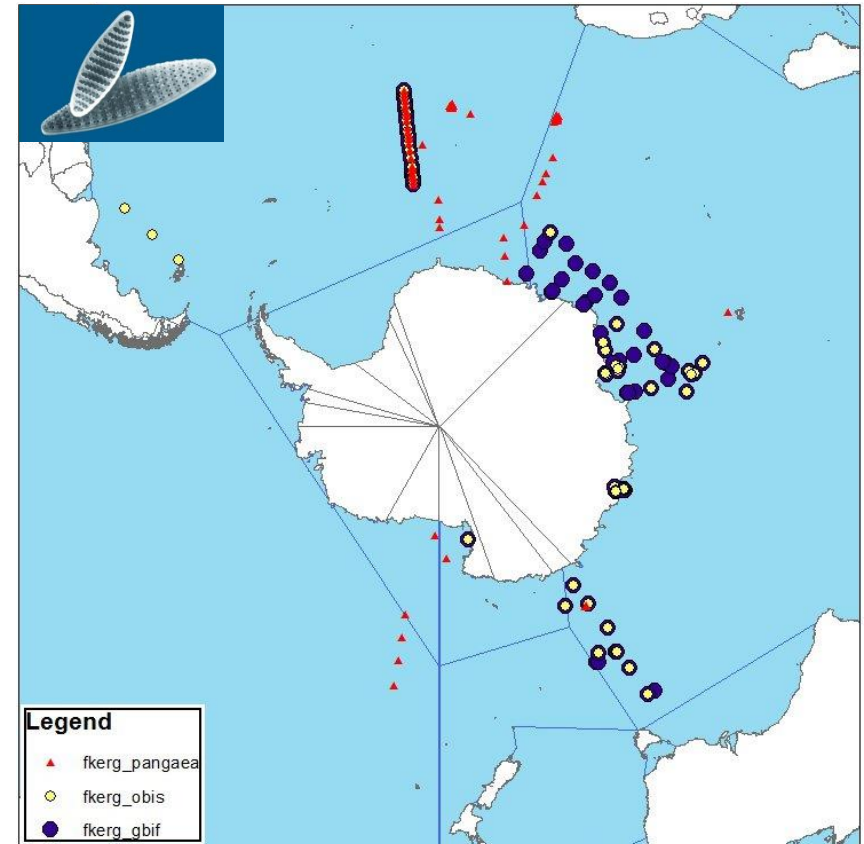
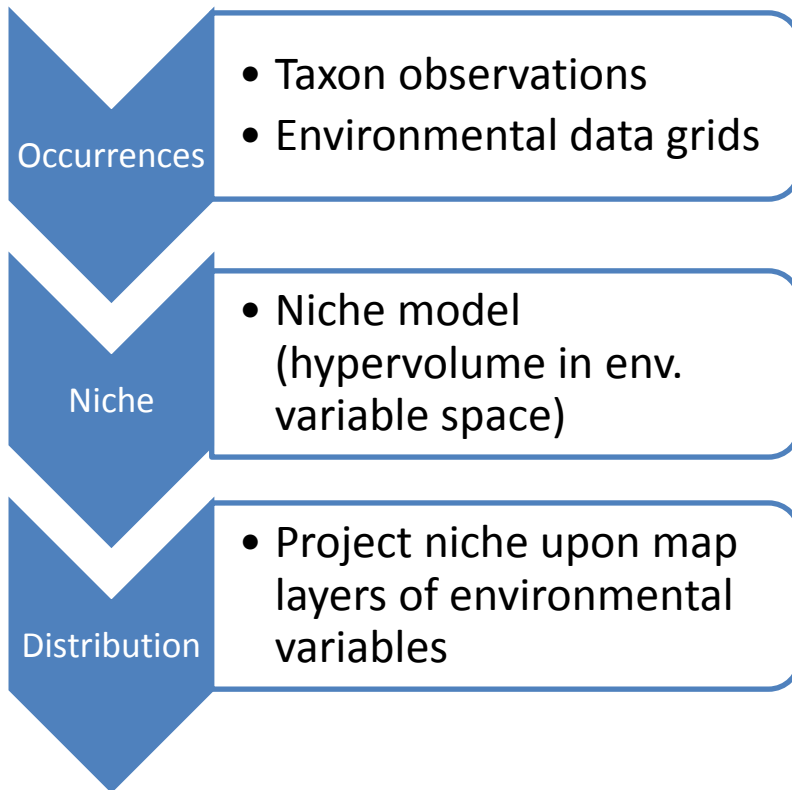
Distribution models – *Fragilariopsis kerguelensis*

This species is the main silica
sinker of the world ocean

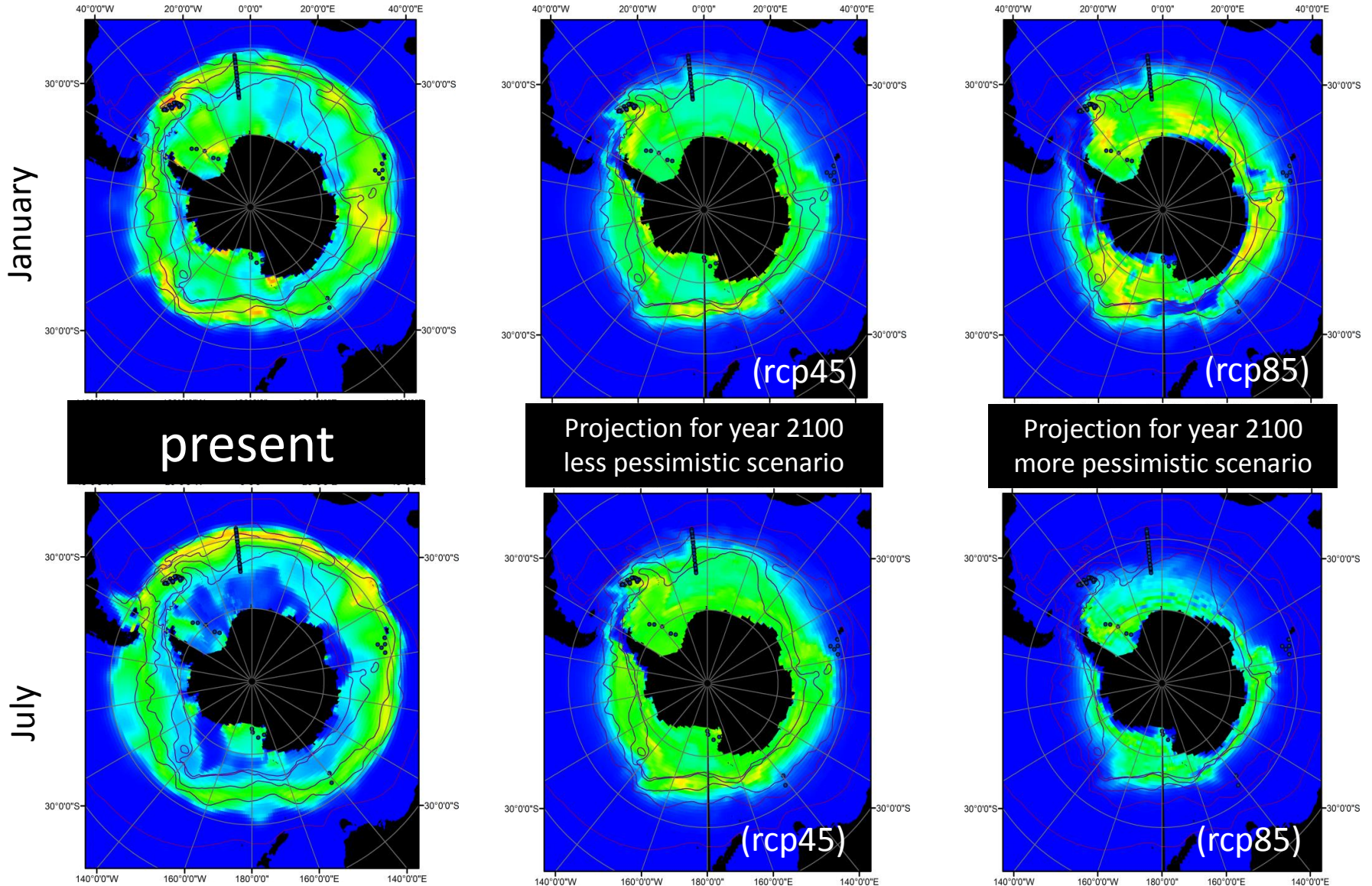


Will its
distribution range
substantially change by 2100?

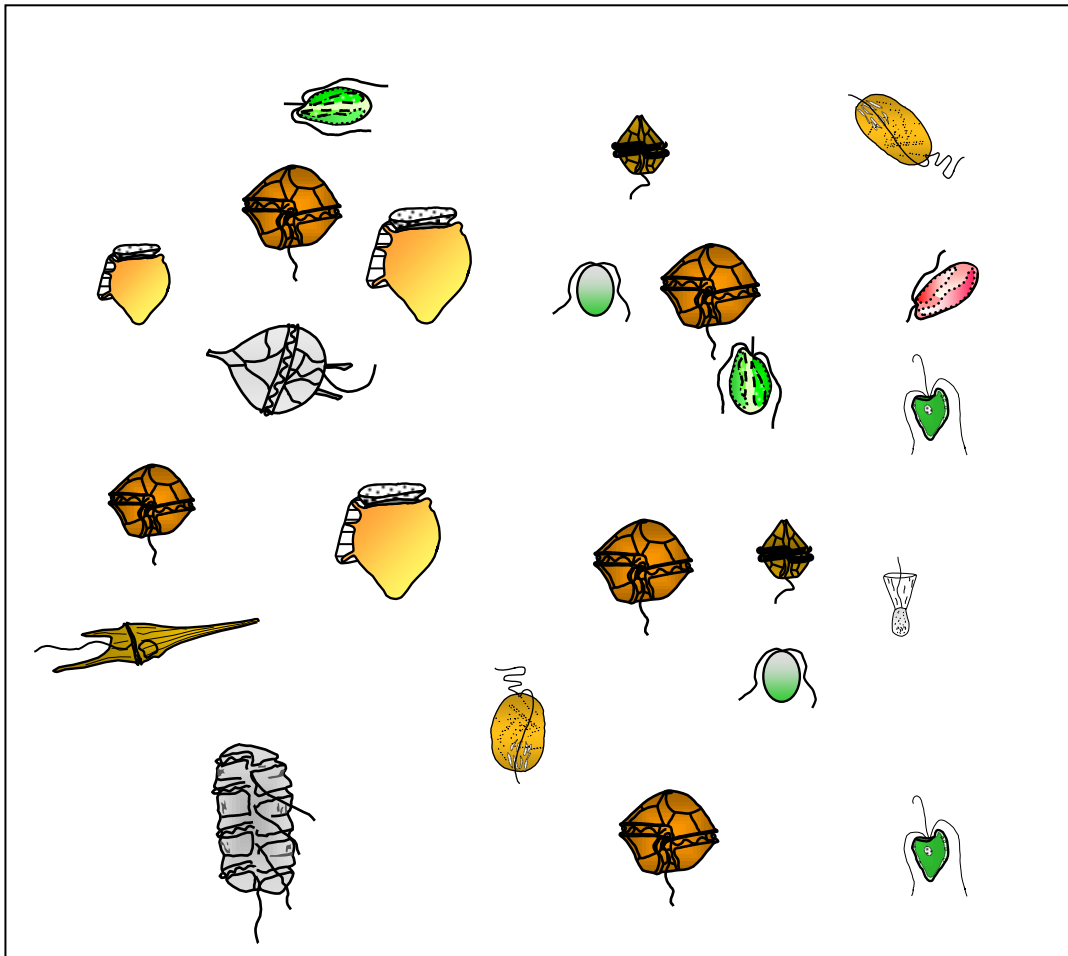
Biogeographic scenario projections



Distribution models – *Fragilaria kerguelensis*

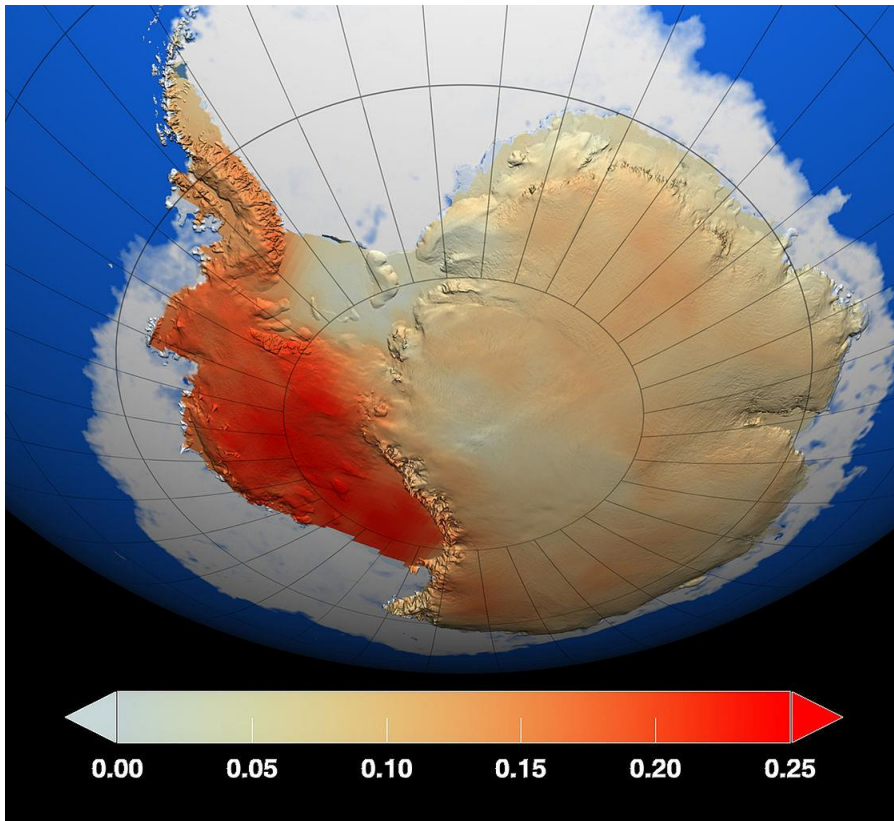


With decreasing diatom abundance there may be a shift to a Flagellate dominated community



including
Harmful Algal Bloom
(HAB)
species

Antarctic Peninsula



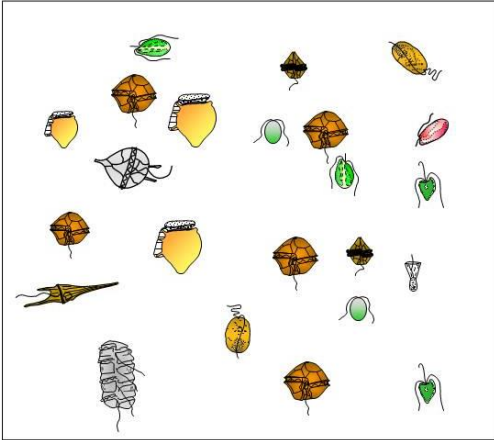
The West Antarctic Peninsula is one of the fastest warming areas on earth

Antarctic peninsula is a good model system to study changes in plankton community

Antarctic surface temperature trends for 1957-2006
Author: NASA Earth Observatory



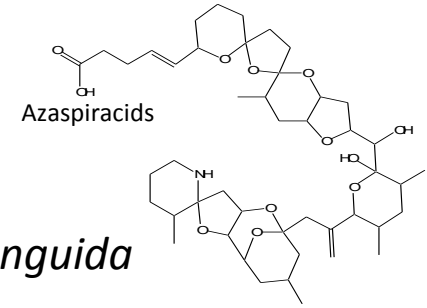
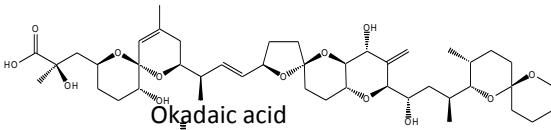
2. Dinoflagellates and Phycotoxins



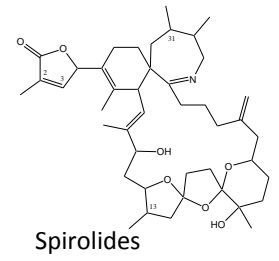
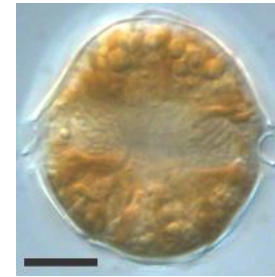
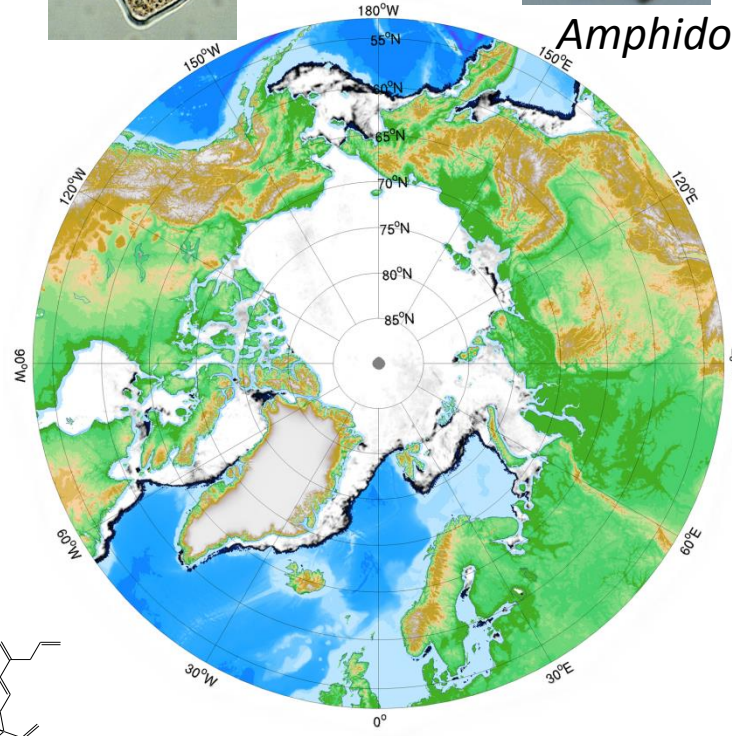
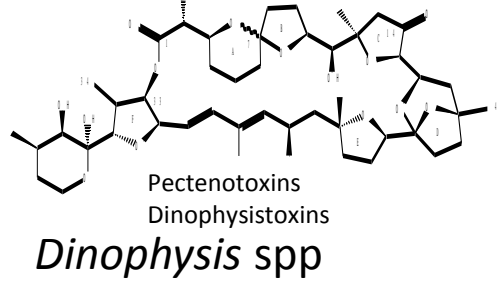
Why are phycotoxins interesting apart from their toxic effects?

Phycotoxins can be used as **chemotaxonomic markers** which are (relatively) easy to sample/detect

HAB species in the Arctic



Amphidoma languida



Alexandrium ostenfeldii

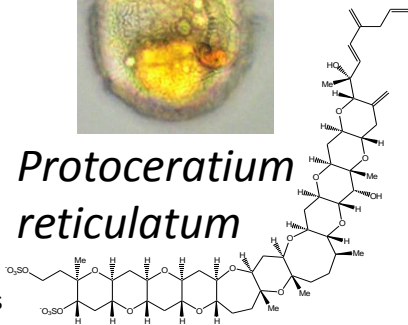


Protoceratium reticulatum

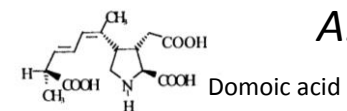


A. tamarense

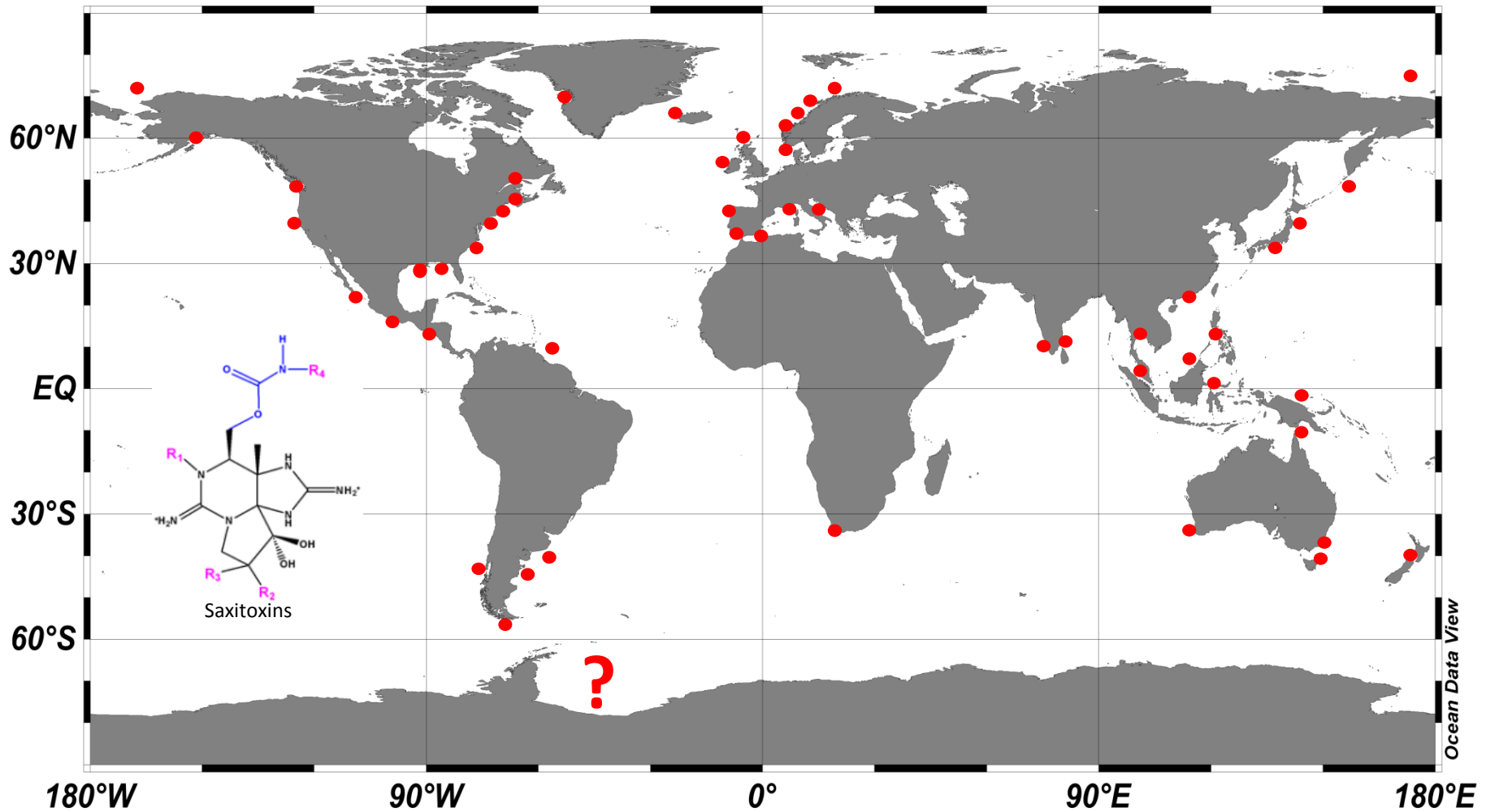
Yessotoxins



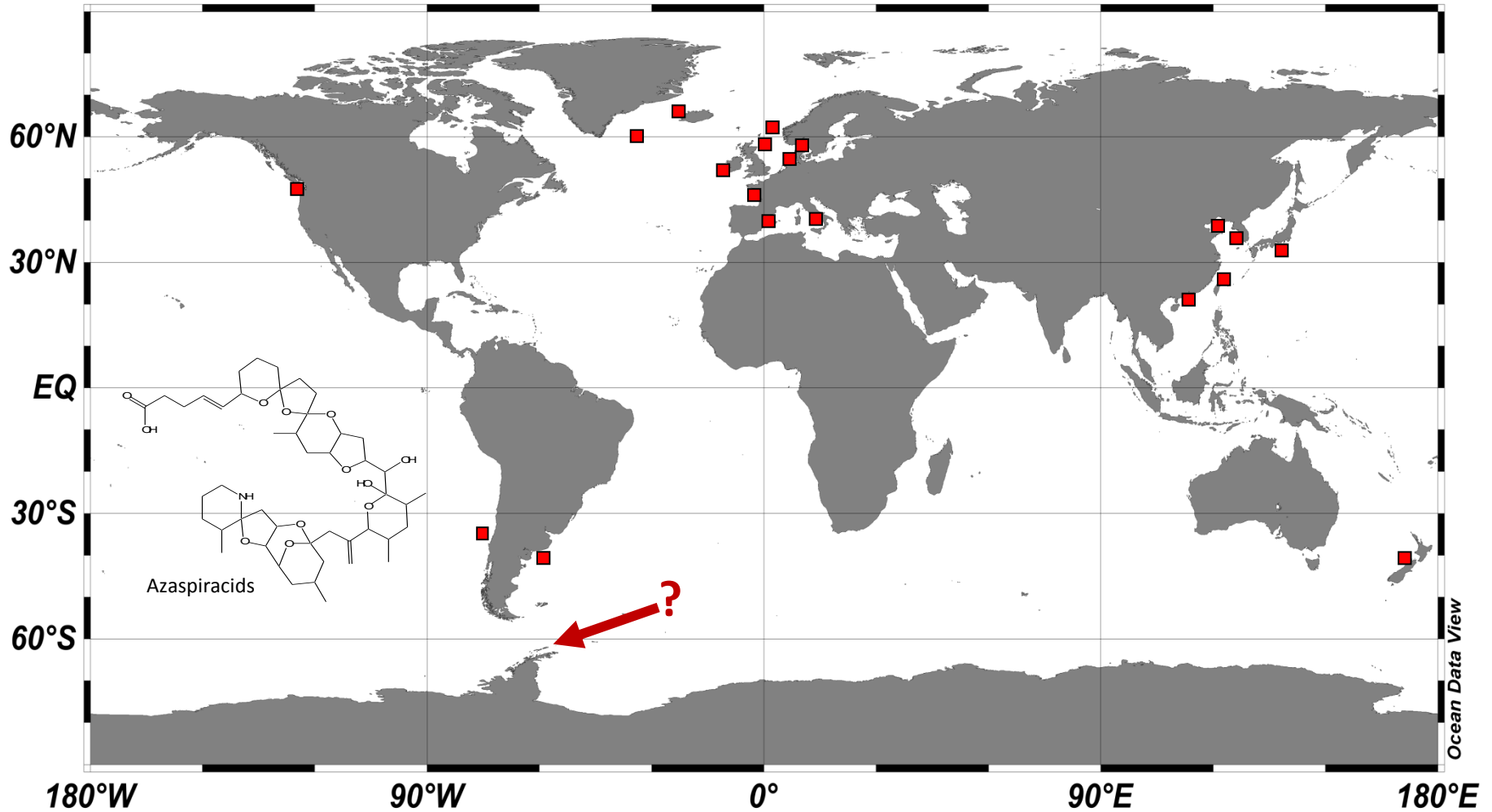
Pseudonitzschia spp




Global distribution of PST

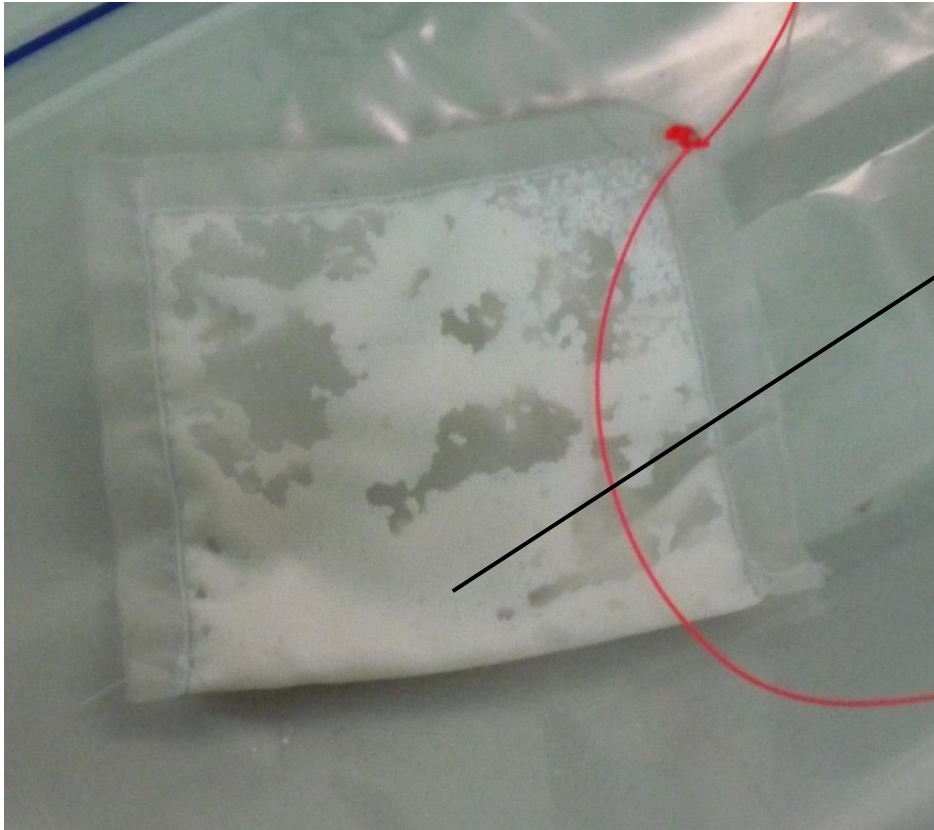


Global distribution of azaspiracids





3. Passive sampling strategy for phycotoxins
(and other chemotaxonomic markers)



Organic lipophilic
(hydrophobic) polymer

Needs to be preconditioned
(wetting with organic solvent
e.g. methanol)

Rinsing with water

Must not become dry
before application

Solid Phase Adsorption Toxin Tracking
(SPATT)

MacKenzie et al. (2004), *Toxicon* 44 (8), 901-918.

Phyctotoxin sampling

King George Island

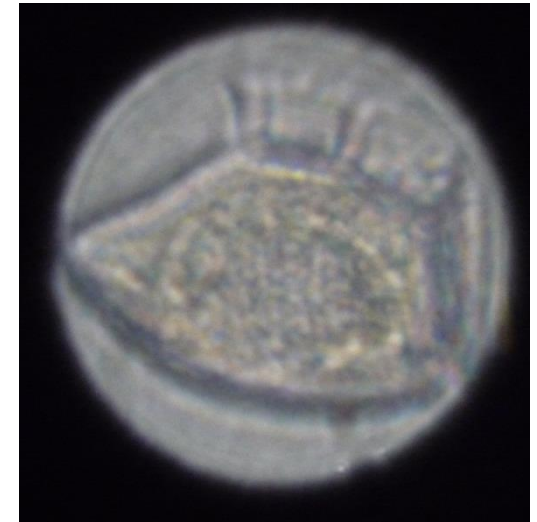


Map: www.wikipedia.org

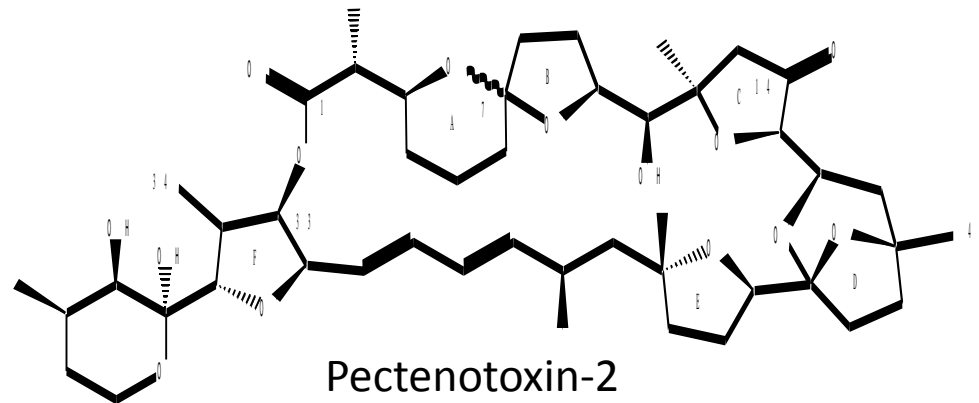
First preliminary results



Plankton Net Haul



Dinophysis (norvegica ?)





4. Seabirds as sampling platforms?

Why are seabirds interesting as sampling platforms?

- 1) Seabirds easily access otherwise difficult to reach areas
- 2) Seabirds actively search areas with high primary productivity

A first pilot study was performed in November 2014 in New Zealand in cooperation with the Te Papa (Natural history museum of New Zealand, Dr. Susan Waugh)

Why New Zealand?

1. There is already ongoing Penguin field work
2. NZ has set up a very dense phytoplankton monitoring which supplies reference data
3. Almost all known classes of phycotoxins occur in NZ waters

Seabirds as sampling platforms

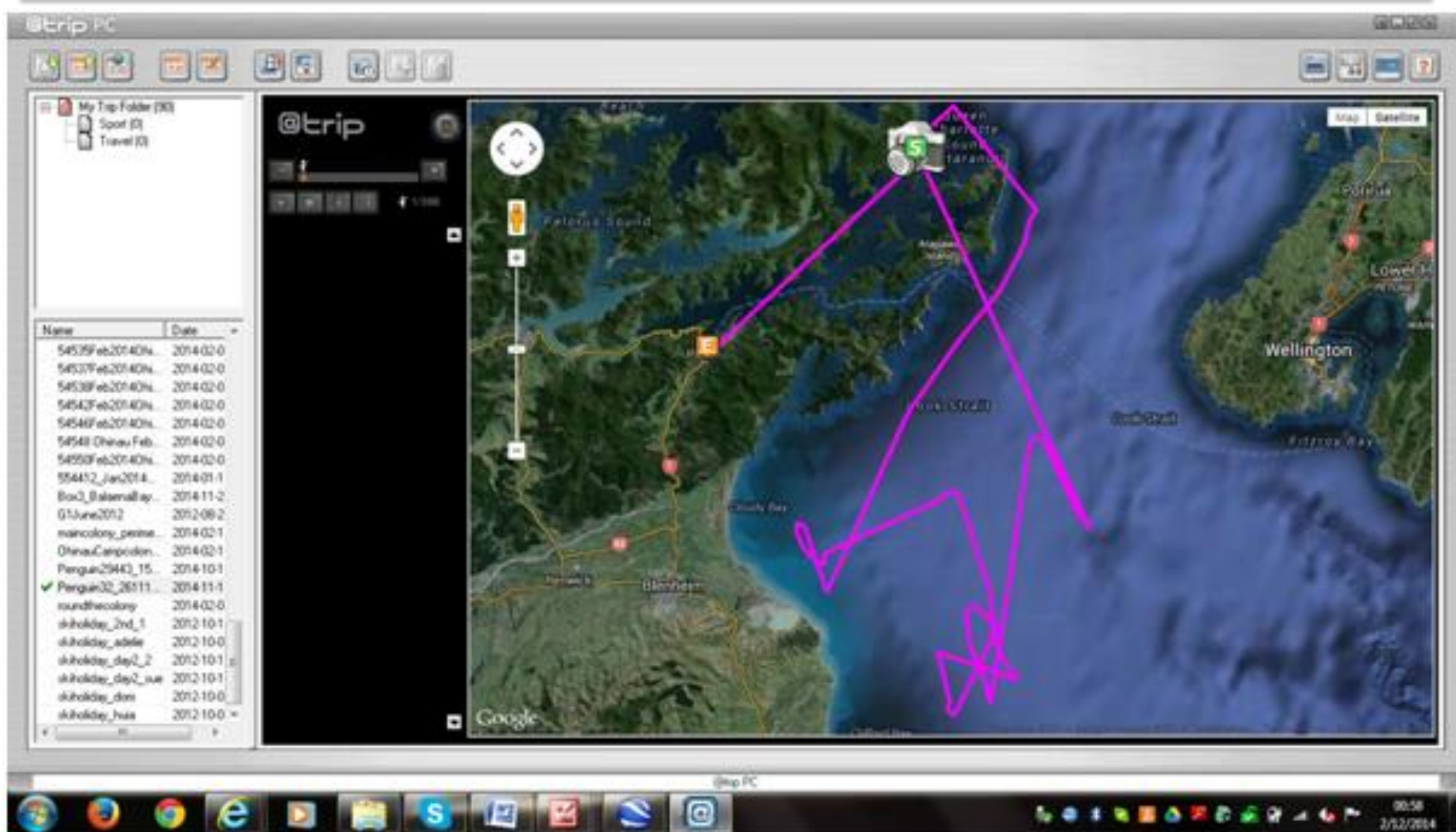


Little Blue Penguin
(*Eudyptula minor*)

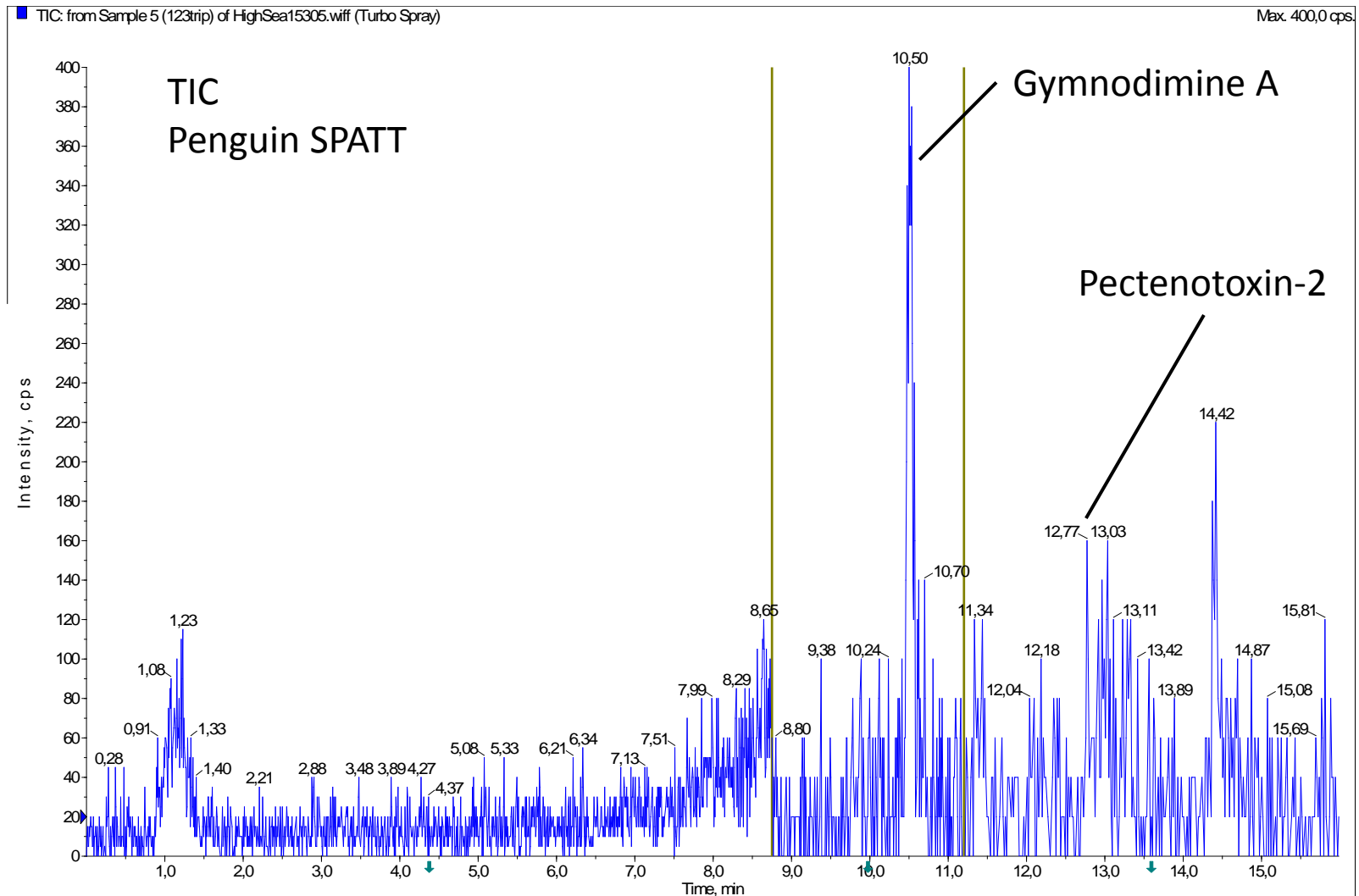
Seabirds as sampling platforms



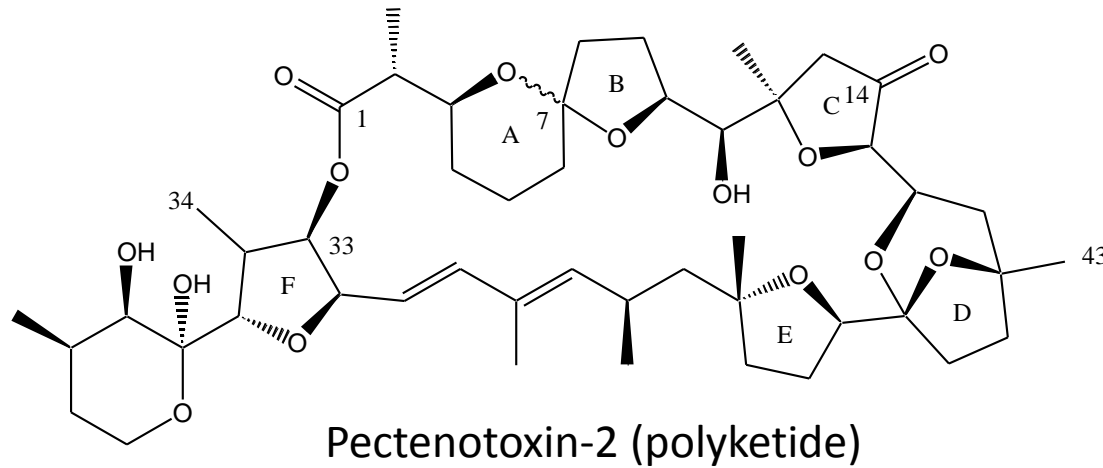
Seabirds as sampling platforms



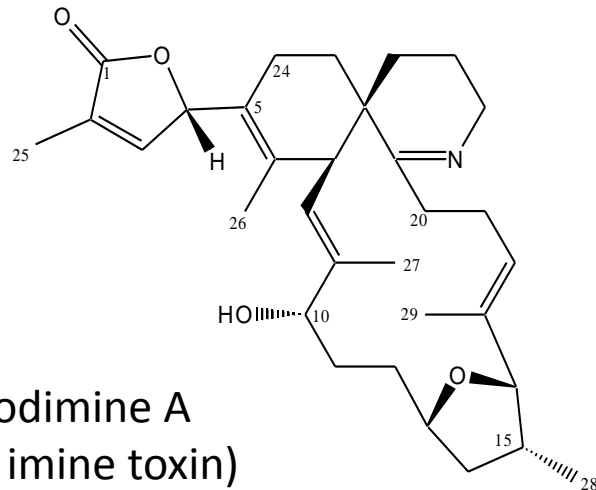
Seabirds as sampling platforms



Seabirds as sampling platforms



Dinophysis spp.



Karenia selliformis

Implications:

1. Method works
2. Detection of low background level possible
(no plankton bloom at this time/location)

Applications:

1. Assessment of phycotoxin distribution in remote areas
2. Plankton composition (by chemotaxonomic markers)

1. Ecological niche models predict that diatom abundance will be declining with increasing temperature in the Antarctic region
2. There may be a shift from a Diatom-Phaeocystis dominated plankton community to a Flagellate dominated community in the Southern Ocean including HAB species
3. Phycotoxins can be used as proxies for a changing plankton community
4. Seabirds may be interesting sampling platforms for phytoplanktonic chemotaxonomic markers in remote areas



... and for your attention!

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Any
Questions?