

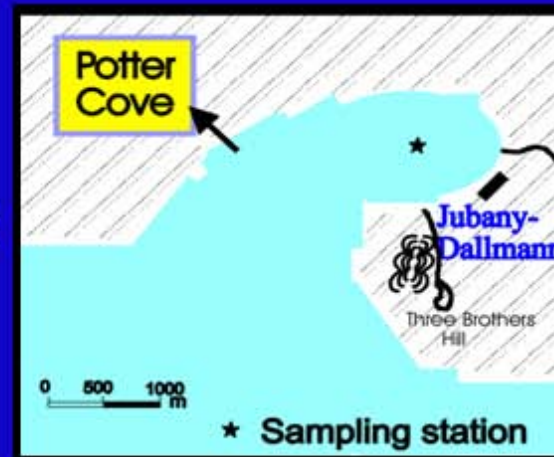


Zooplankton mortality events in Antarctic coastal areas: a relation with glacier melting?

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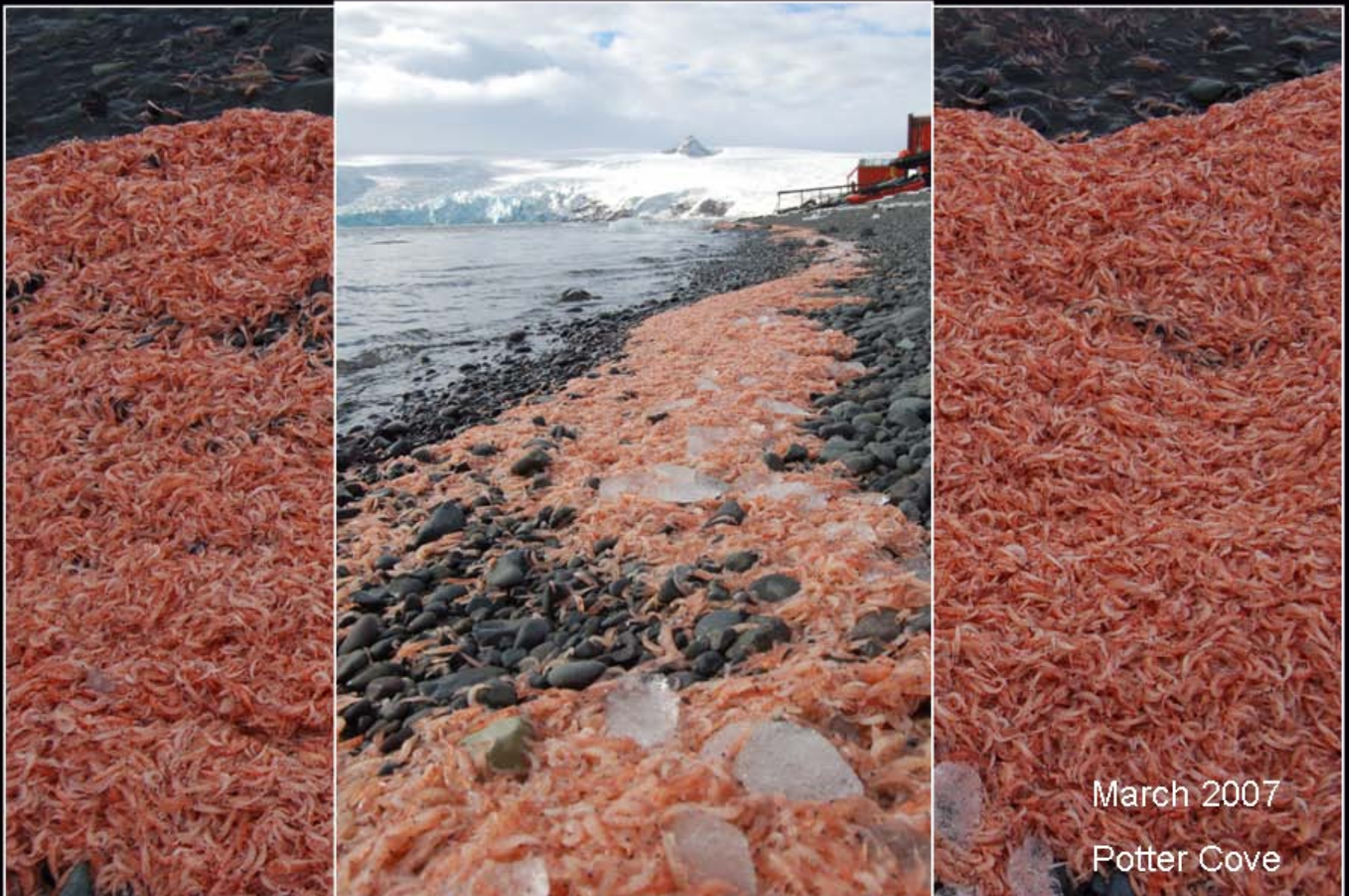


Jubany/Dallmann Station

Potter Cove

Collins Glacier

What kind of zooplankton mortality events are we talking about?



March 2007
Potter Cove

Background Information

- **Glacier melting processes**



Appearance of brown water

Data from surface waters (10m) in Potter Cove: temperature and SPM increased significantly over the past 15 years and salinity has decreased. Schloss et al. In press

- Environmental parameters somehow linked with the mortality events: wind direction and speed, tides and the **appearance of brown water**

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- **Glacier**



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■ Previous studies:

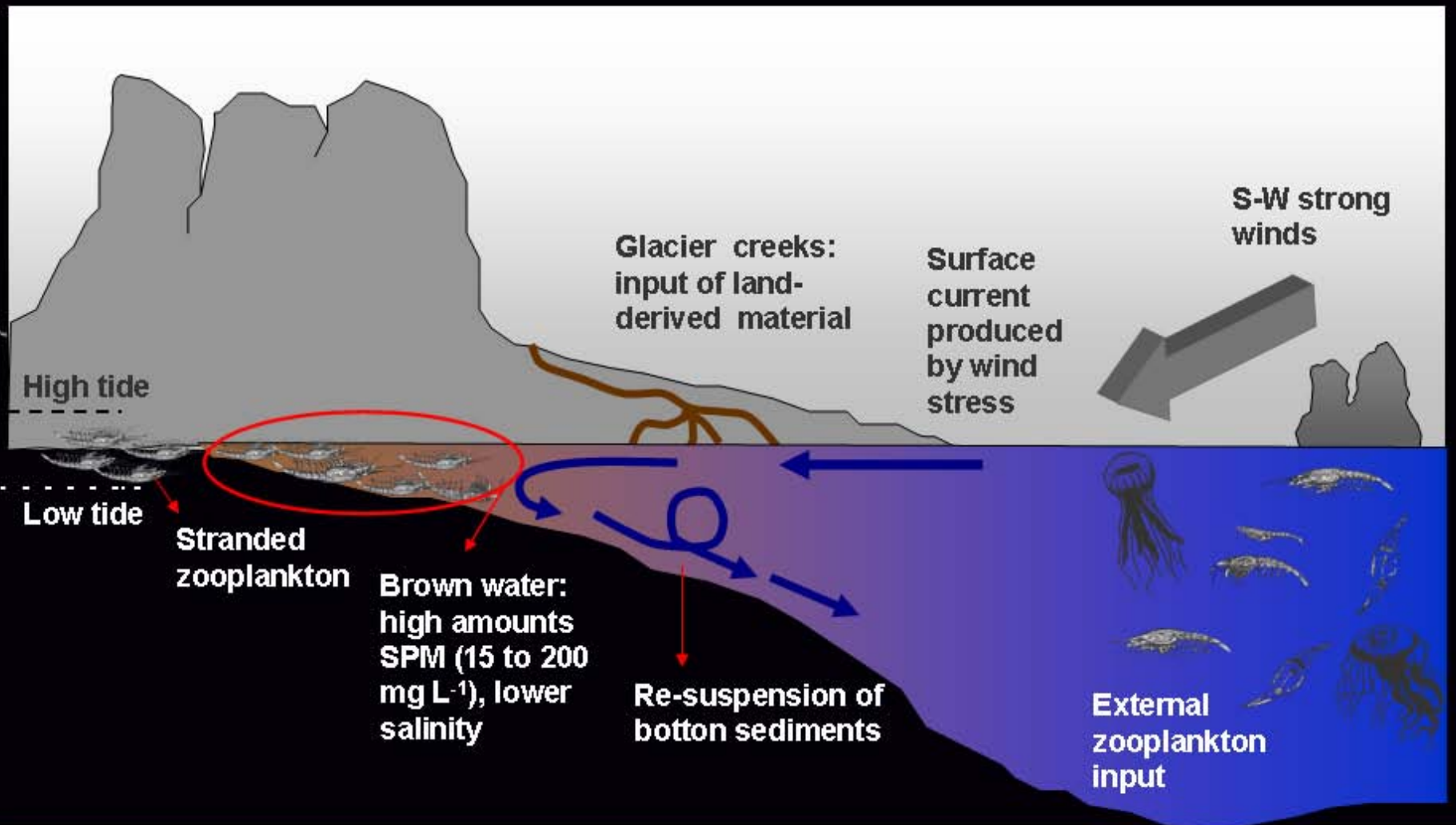
Arctic

- Some research linking directly zooplankton mortality with glacier outflow (Weslawski and Legezynska 1998, *Journal of Plankton Research*, 20 (7) - Zajaczkowski and Legezynska, 2001, *Oceanologia*, 43 (3).

Antarctica

- Many observations of krill mortalities in coastal sites but, to our knowledge, causes are not known. Some papers dealing with plankton mortality as food source for seabirds: Favero 1995, *Marine Ornithology* (23) and Davenport 1995, *Marine Biology* (123).

Considering all this information together:



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Our questions:

- If zooplankton mass mortality is related to glacier melting, which variable/s could be responsible for it?
 - the amount of suspended material
 - the low salinity
 - a combination ...

We started trying to answer these questions considering the amount of suspended material

- What happened with the animals under these conditions, why did they strand?
 - **they could not breath (clogging) or were not able to feed?**
 - **The salinity and/or temperature are not in the animals` optimal range?**
 - **In the case of krill, do they lose the orientation?**

Methods

- Observation and registration of the mortality events since 2002 (quantitative and qualitative analyses). Simultaneous measurement of environmental variables
- Compare stranded zooplankton composition and abundance with zooplankton samples from Potter Cove and outside Potter Cove (Maxwell Bay).
- Experiments on the effects of different concentrations of suspended sediments on animals that are most affected by these mortality events

What we know until now:

- Example of Summer 2003:

Date	N° of organisms m ²					
	<i>Euphausia superba</i> adult	<i>E. superba</i> juvenile	<i>E. superba</i> larvae	<i>Thysanoes a macrura</i> larvae	<i>Salpa thompsoni</i> aggregated	<i>S. thompsoni</i> solitary
24/2/03	20	1130	770	-	-	-
24/3/03	5	880	900	1300	141	84
26/3/03	25	254	30	703	13	5
10/4/03	-	-	-	-	423	49

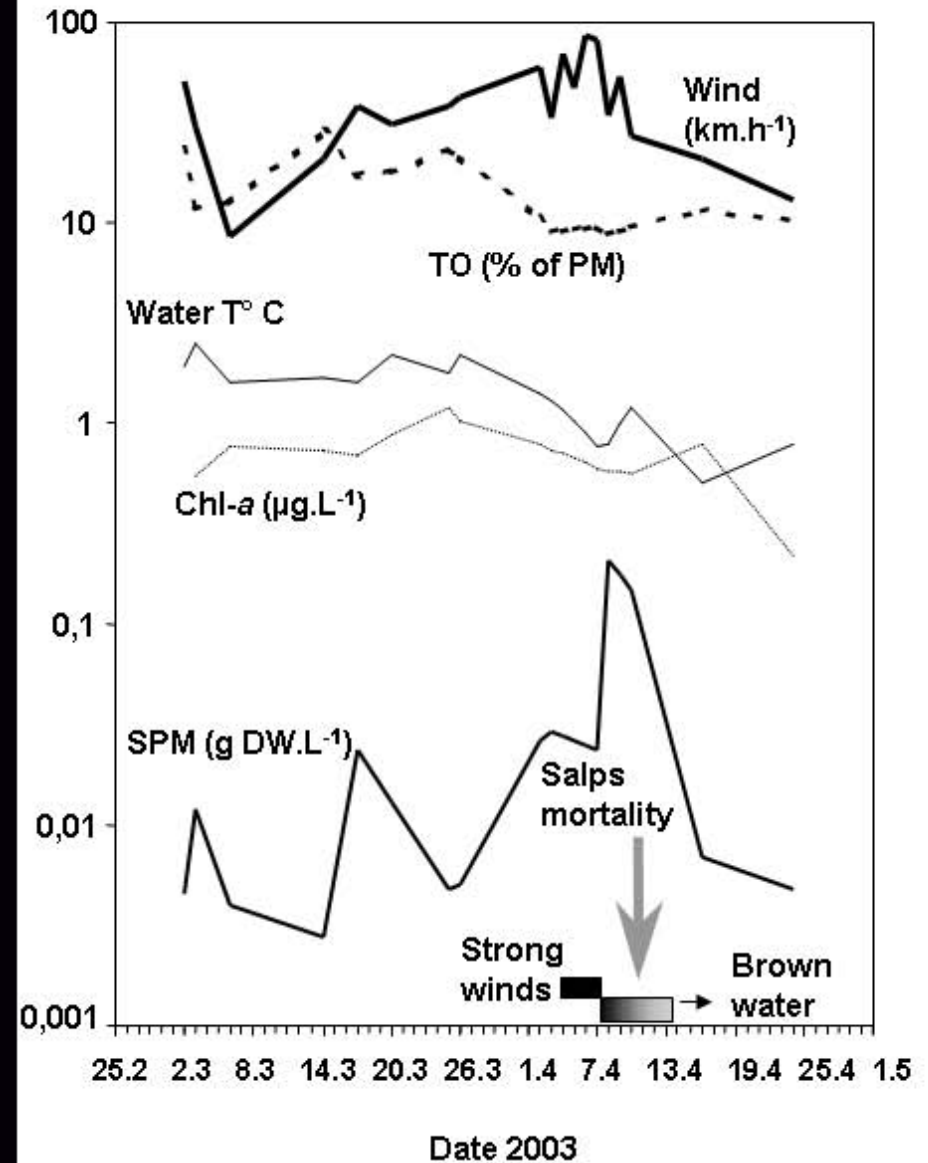
- Summer 2006-07 (December to March): **12 events** of *E. superba*



When salps? When krill? Linked with its presence in the area.

1) Salps

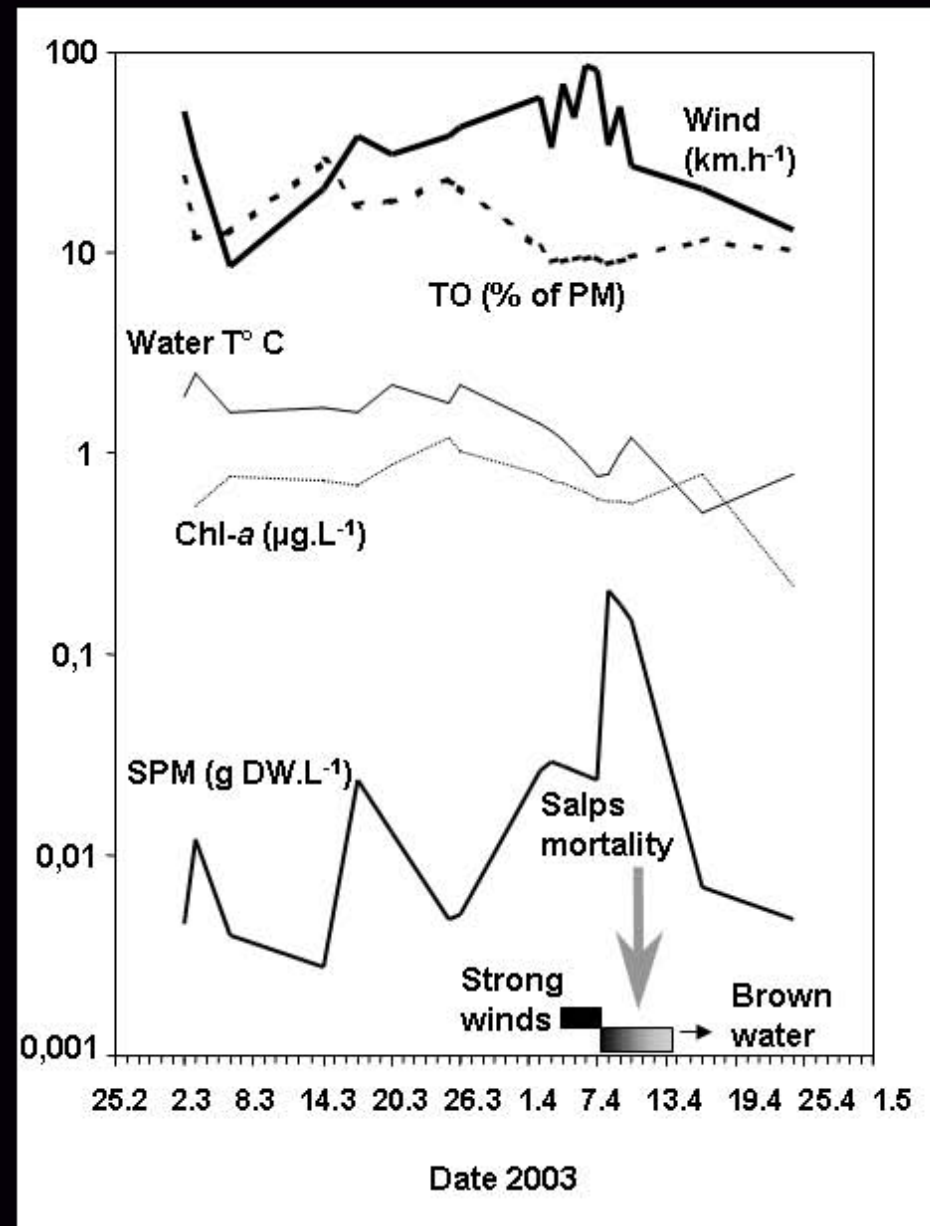
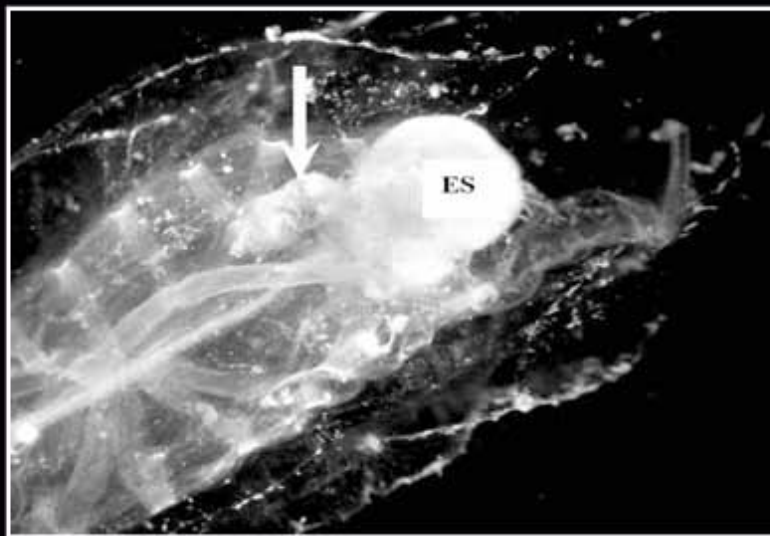
- Mortality events always linked with high SPM concentration in the water column
- Example: mass death event registered in Potter Cove in 2003



E. A. Pakhomov, V. Fuentes, I. Schloss, A. Atencio and G. B. Esnal. Beaching of the tunicate *Salpa thompsoni* at high levels of suspended particulate matter in the Southern Ocean. *Polar Biology* (2003) 26: 427–431.

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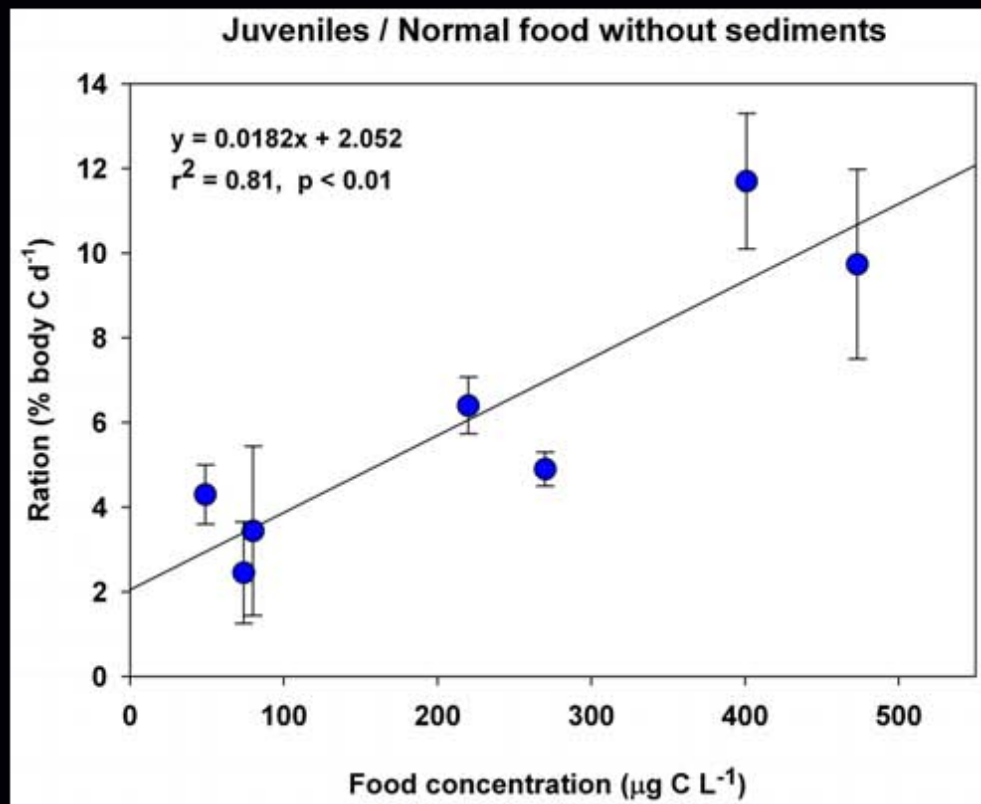
- Mortality events always linked with high SPM concentration in the water column
- Example: mass death event registered in Potter Cove in 2003
- Clogging of salps mucous filtering nets



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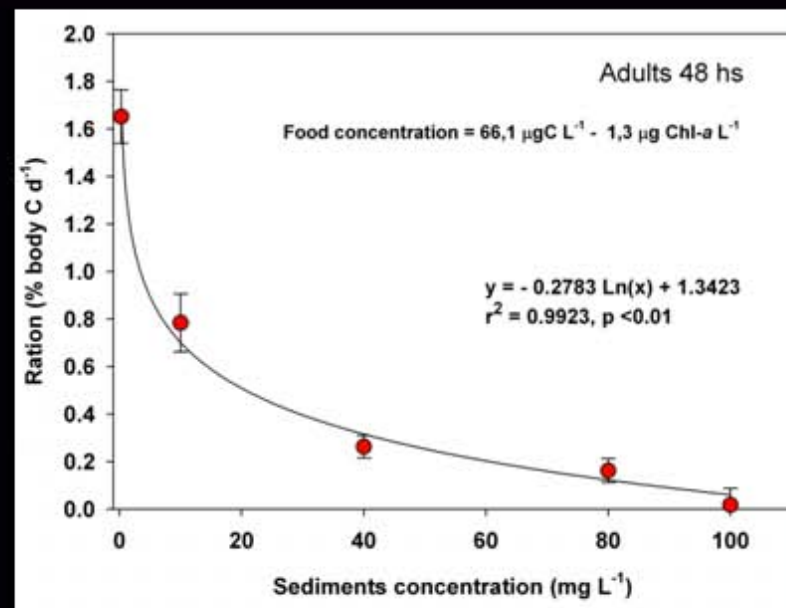
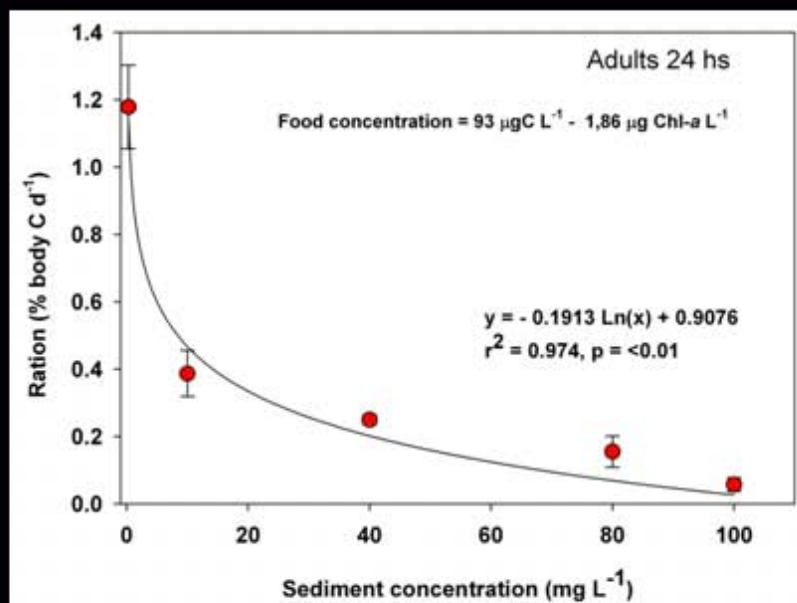
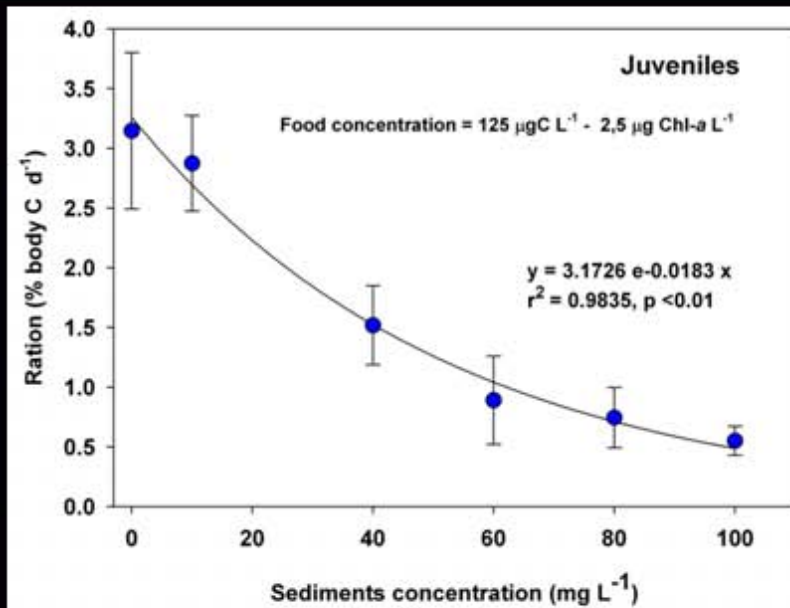
2) Krill

- Feeding experiments: juveniles and adults (Potter Cove, Summer 2006-2007)



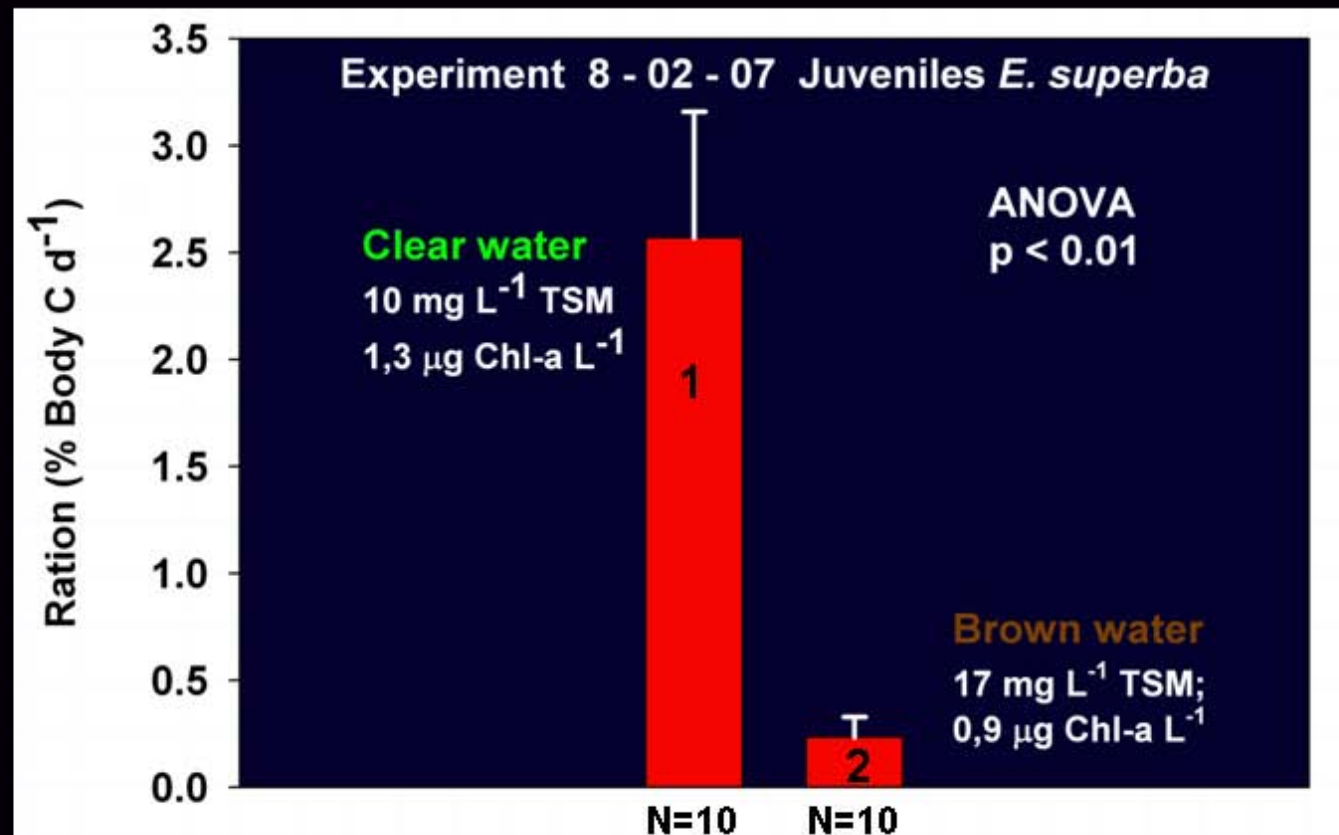
Feeding activity of juvenile krill in natural sea water enriched with phytoplankton (NO sediments added)

Experiments with sediments



Experiments using natural brown water

- Treatment 1: Natural water collected outside the cove (“clear water”)
- Treatment 2: Natural brown water collected in the cove (“brown water”)



Summary

- The zooplankton mass mortality events have increased in frequency and intensity since 2002. This fact might be related to the progressive melting of the glaciers around Potter Cove.
- The high amount of SPM can produce the clogging of the net filtering systems in planktonic organisms like salps.
- In the case of krill, increasing amounts of SPM have a negative effect on ingestion rates.
- The brown water from the field has a stronger effect on krill ingestion rate than the sediments it self.

And thinking about krill...

The glaciers in the Antarctic Peninsula are retreating,



the supply of land derived material to sea is increasing (like we know from Potter Cove),



the coastal places could become a very unfavorable environment for krill,



this might have an impact considering the importance of krill in these ecosystems

Because this is just the beginning...

Future research:

- Test the effect of lower salinities and higher temperatures on krill physiology (feeding, respiration, growth, etc.)
- Conduct experiments with other krill developmental stages
- Measure stress indicators in animals collected in different scenarios

Thank you very much for your attention
Dedicated to Francesc Pagès



Collins glacier, Potter Cove, March 2007