Pathogen dilution effects in the Wadden Sea:

How invasive species release natives from pathogen pressure

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Invasive Species

More than 50 species have been introduced to the Wadden Sea including crabs (*Hemigrapsus sp.*), algae (*Sargassum muticum*) and most notably, the Pacific oyster (*Crassostrea gigas*). In general, alien species are known to threaten biodiversity and have economic implications. However, more recently, it has been recognised that invasive species may benefit native fauna by reducing pathogen infection levels (the dilution effect).

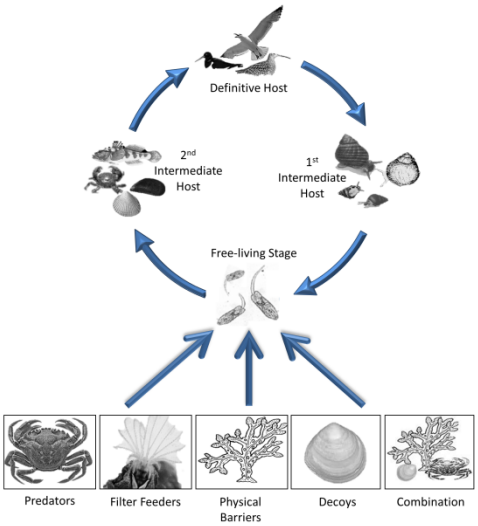

Figure 1. Typical trematode life cycle and key mechanisms which result in dilution of trematode cercariae.

The Dilution Effect

Trematodes, ubiquitous pathogens in coastal ecosystems, have complex life cycles including a free-living cercarial stage. Cercariae enter the water column in order to find 2nd intermediate hosts. At his point cercariae are vulnerable to the dilution effect.

The dilution effect occurs when ambient organisms interfere with pathogen transmission (Figure 1). In coastal ecosystems interference may be caused by:

- Predators (crabs, shrimp)
- Filter feeders (barnacles, oysters)
- Physical barriers (algae, stones, empty shells)
- Decoy organisms (non-host snails and bivalves)

Can Invasive species interfere with parasite transmission and therefore reduce infection risk in Native hosts?

First Results:

Cercariae broth (*Renicola* spp.) was added 8 control tanks and 8 tanks containing dilutors and incubated for 3 hours at 18°C. After 3 hours remaining cercariae were counted (Figure 2A). Results showed:

- Some invasive species found in the Wadden Sea significantly reduce the number of cercariae (Figure 2B).
- *S. muticum*, a physical barrier, diluted the most cercariae.
- Both *C. gigas* shells and *C.gigas* reduce the number of free-living cercariae.

Next Step:

It is assumed that this reduction in cercariae by invasive species reduces the number of potential infections in native 2nd intermediate hosts, and subsequently, native definitive hosts. Therefore, future mesocosm experiments shall include 2nd intermediate hosts to test this.

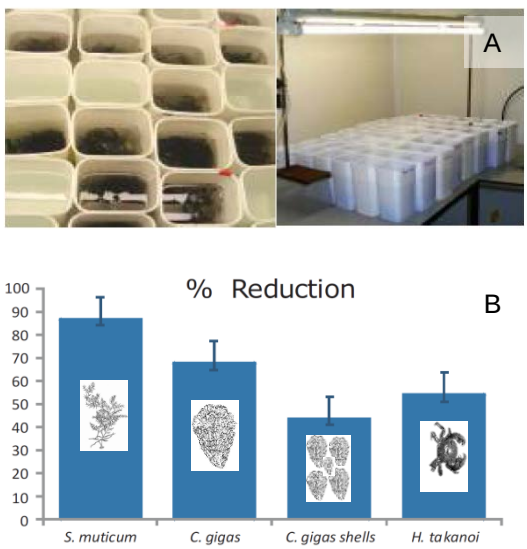

Figure 2. A) Experimental set up. **B)** The % reduction (±standard error) of free-living cercariae caused by invasive organisms.

Prospective Aim

This study is a part of a PhD project which aims is to investigate the underlying mechanisms of dilution effects in marine ecosystems. In mesocosm experiments, specific diversity, density and pathogen dose effects on dilution effects shall be tested.

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