

Longitudinal training dams: an innovative training measure to mitigate ecological impacts of navigation



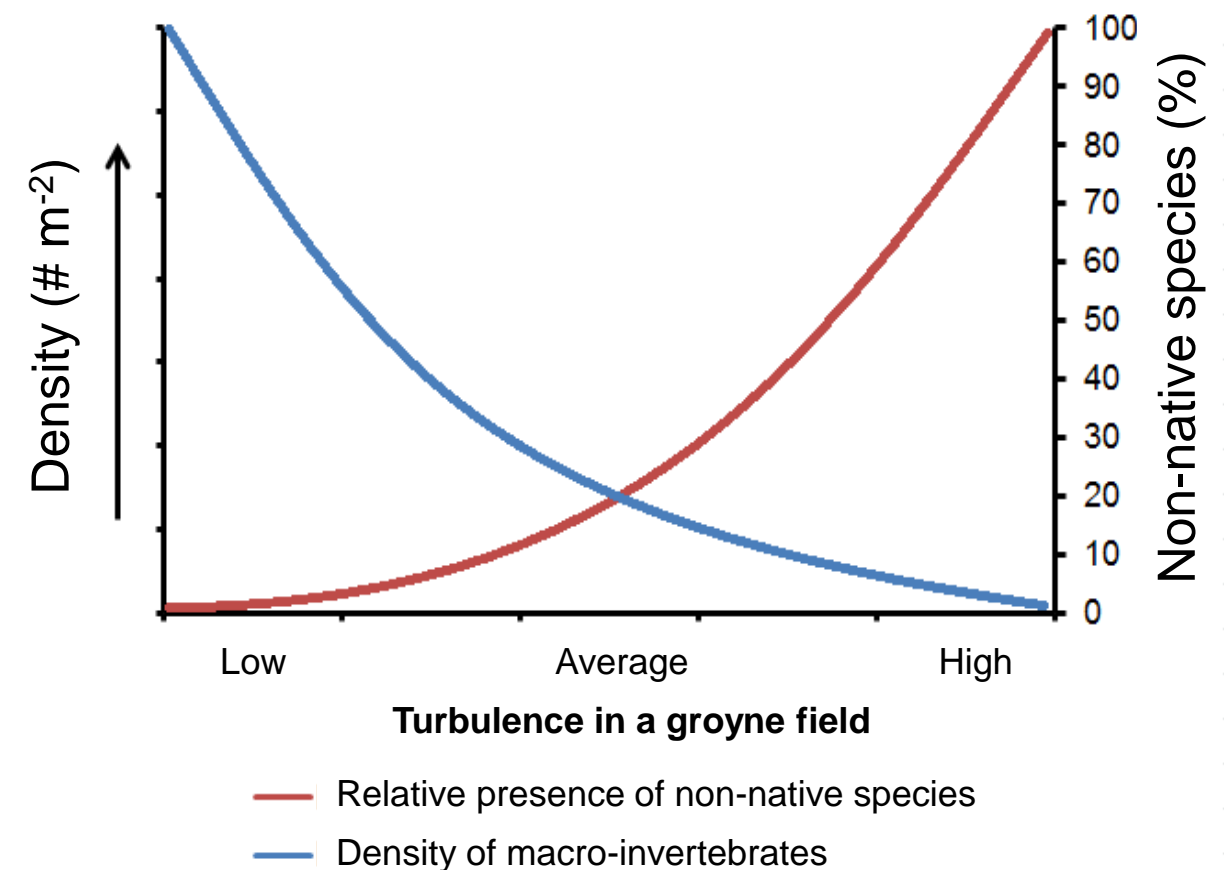
F.P.L. Collas

Presentation: Fish & Ships

Date: 13-11-2018

Introduction

- Ecological value of traditional groyne fields is limited
 - Few and low abundance (target) species
 - Strong dominance non-native species
- Traditional groyne fields are highly dynamic (unnatural variability in hydrological parameters) by
 - Shipping induced water displacement
 - Changes in discharge regime
- Are LTDs an ecological sound alternative?

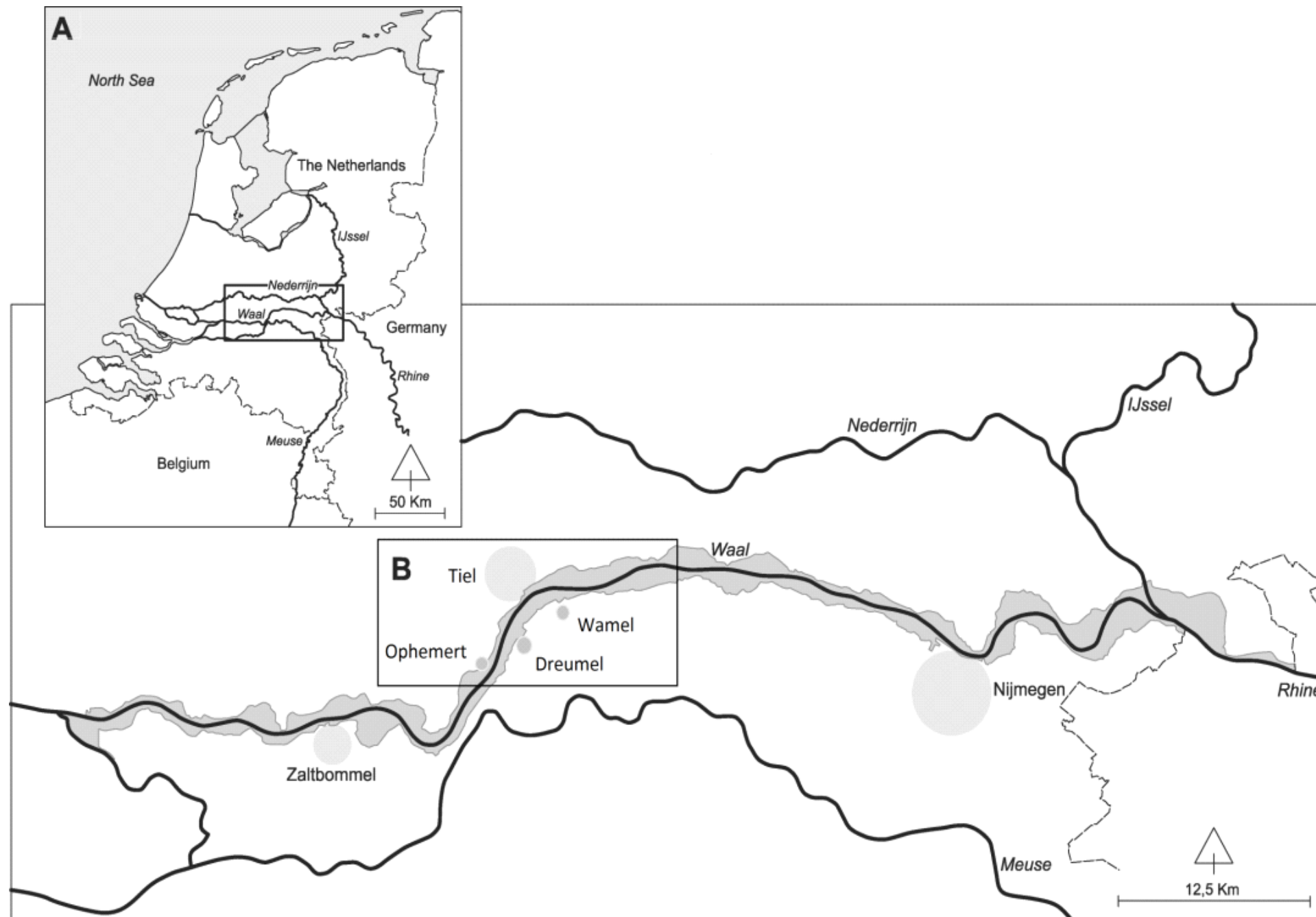


Introduction

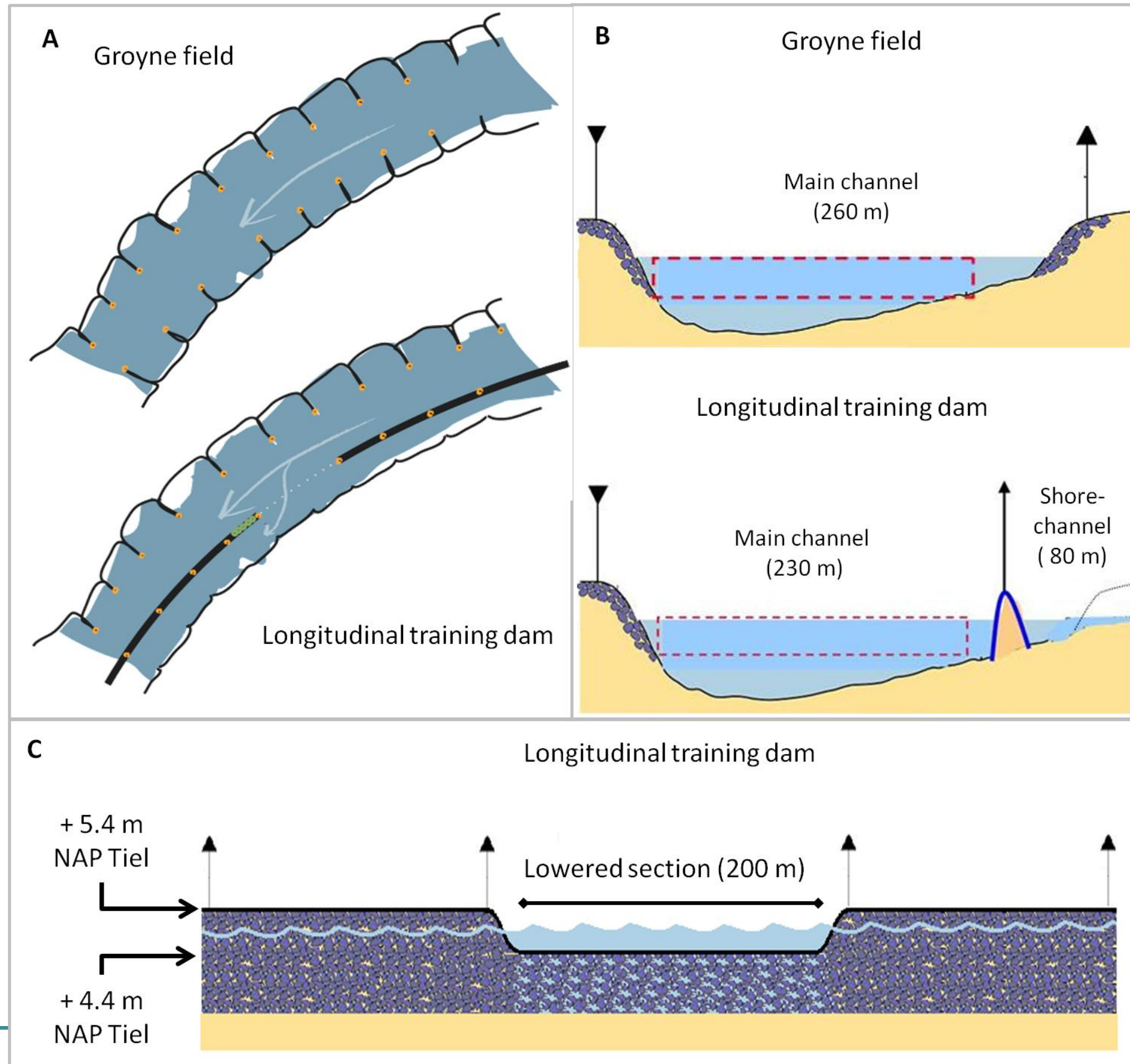
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Introduction



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Aim and Research questions

- LTDs
 - Increase low water levels
 - Higher discharge capacity during floods
 - Safe discharge of ice
 - Reduced maintenance costs
 - **Increased habitat diversity and stability**
- RQ:
 - 1) To what extent do **LTDs** affect ecological **conditions** and **biodiversity**
 - a) Compared to other river training structures
 - b) Temporal development of LTD area

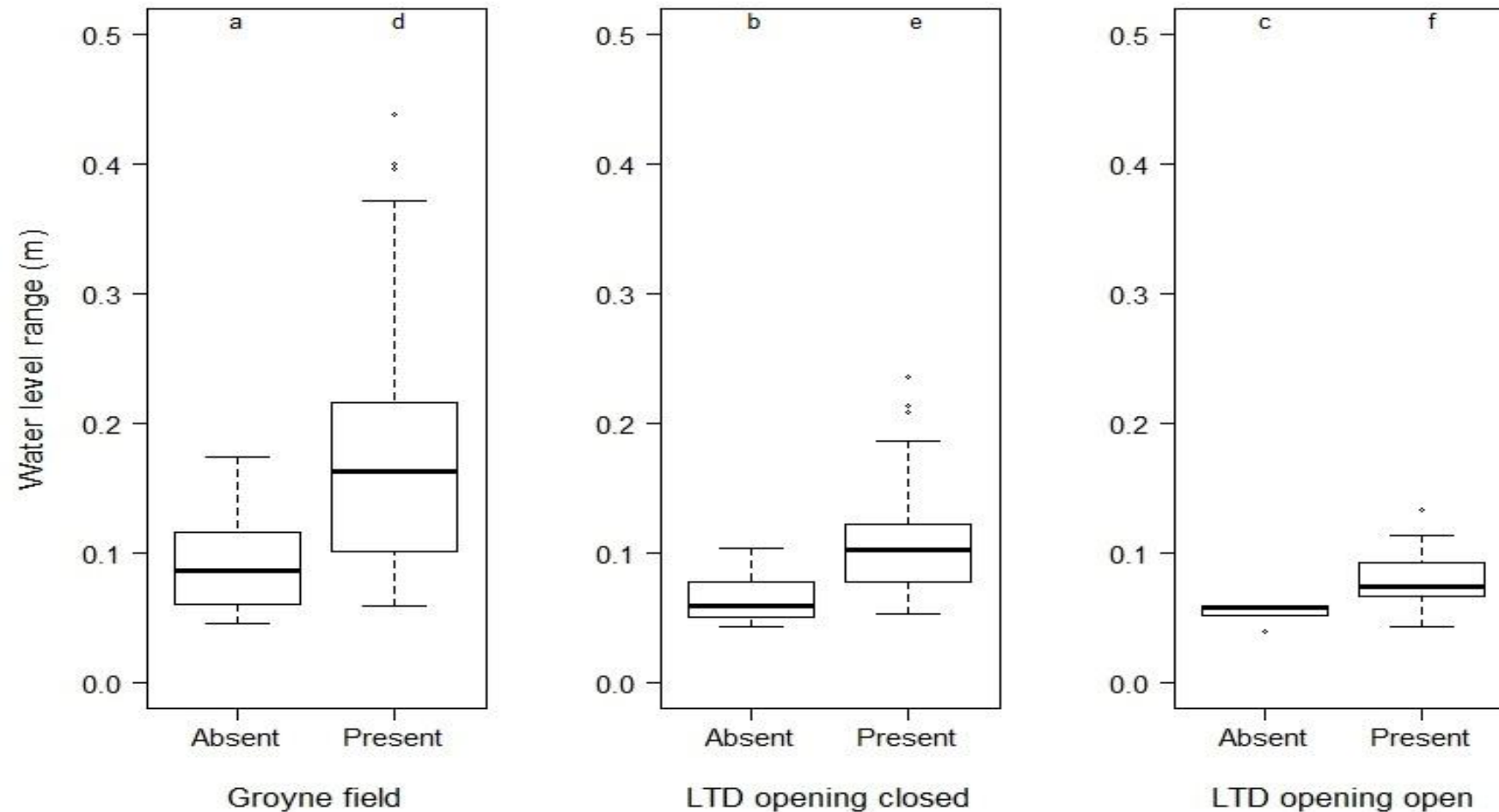
Method

- Measurements effect navigation
 - Waterlevel, water dynamics, flow velocity, water temperature, underwater sound levels
 - During passage of ships (N = 106) or during a set time
 - 1 measurement a second



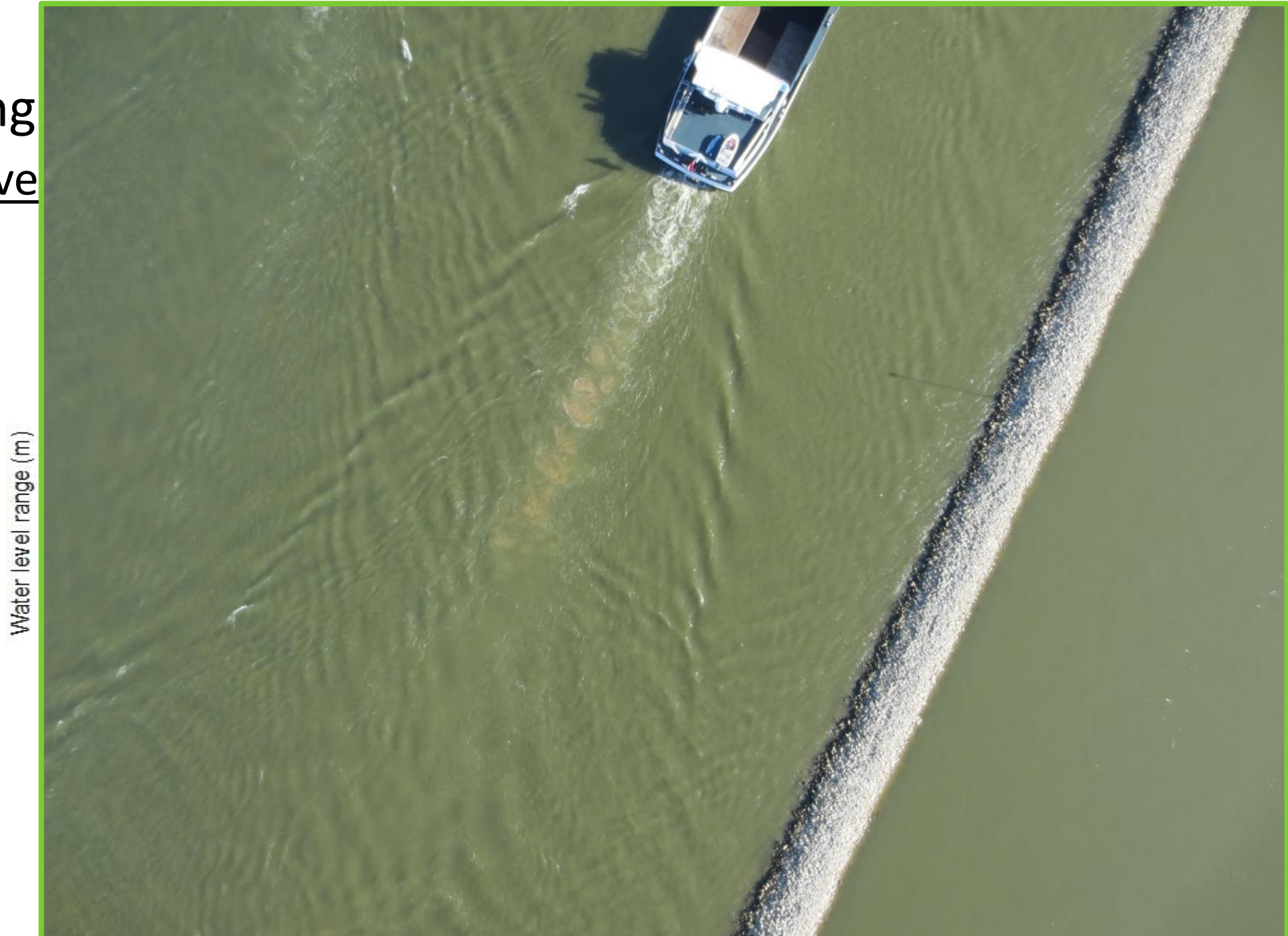
Variation in environmental factors

- Shipping
 - Wave action, flow velocity, water dynamics, temperature, sound



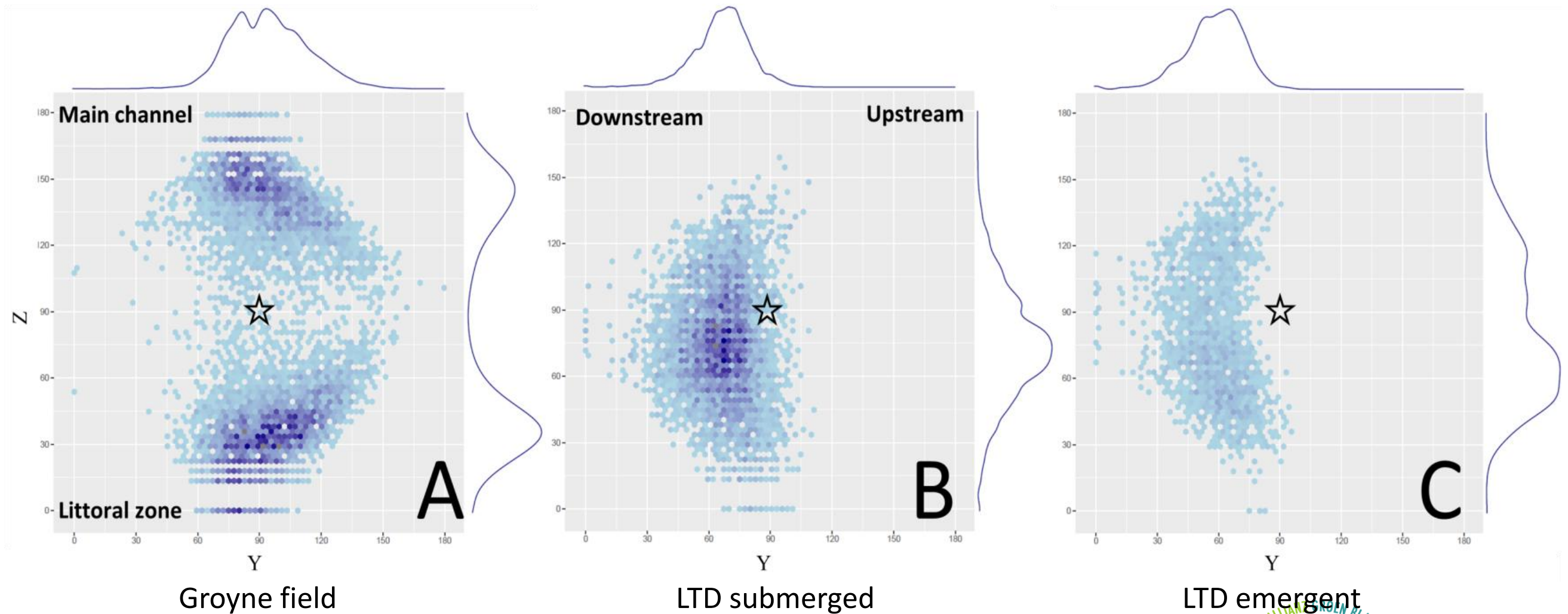
Variation in environmental factors

- Shipping
 - Wave



Variation in environmental factors

- Shipping
 - Wave action, flow velocity, water dynamics, temperature, sound



Method

- Fish monitoring

- Shore zone: seine net (20 x 3 m; mesh size 5 mm); after sunset during July and October 2016 and 2017; monthly July 2017 to September 2018
- Electrofishing stones LTD July and October 2016
- Groyne field – dynamic LTD – sheltered LTD



Interesting sightings



Interesting sightings



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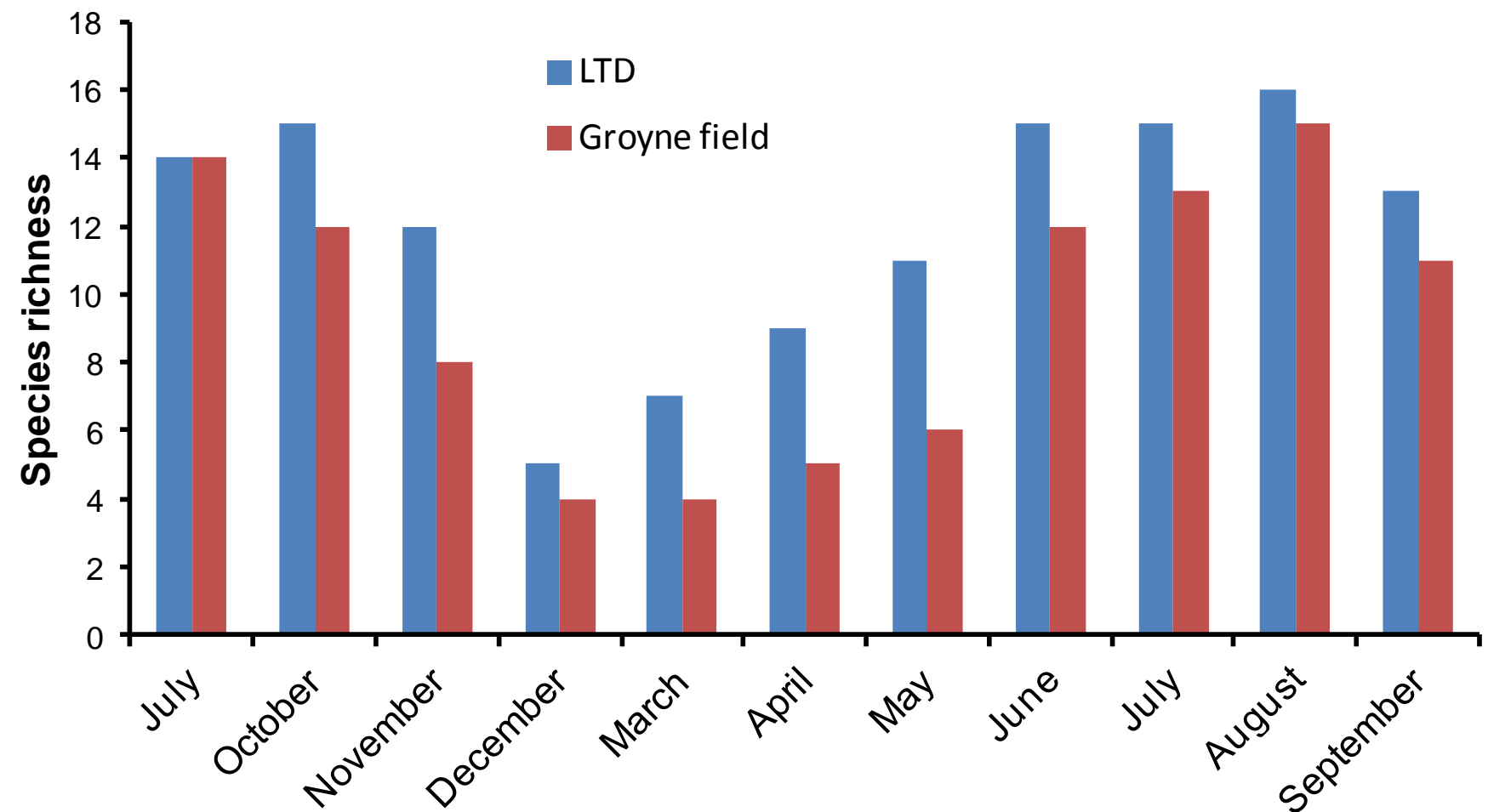


Fish diversity

Species richness

(July 2017 up to September 2018)

LTD > groyne field

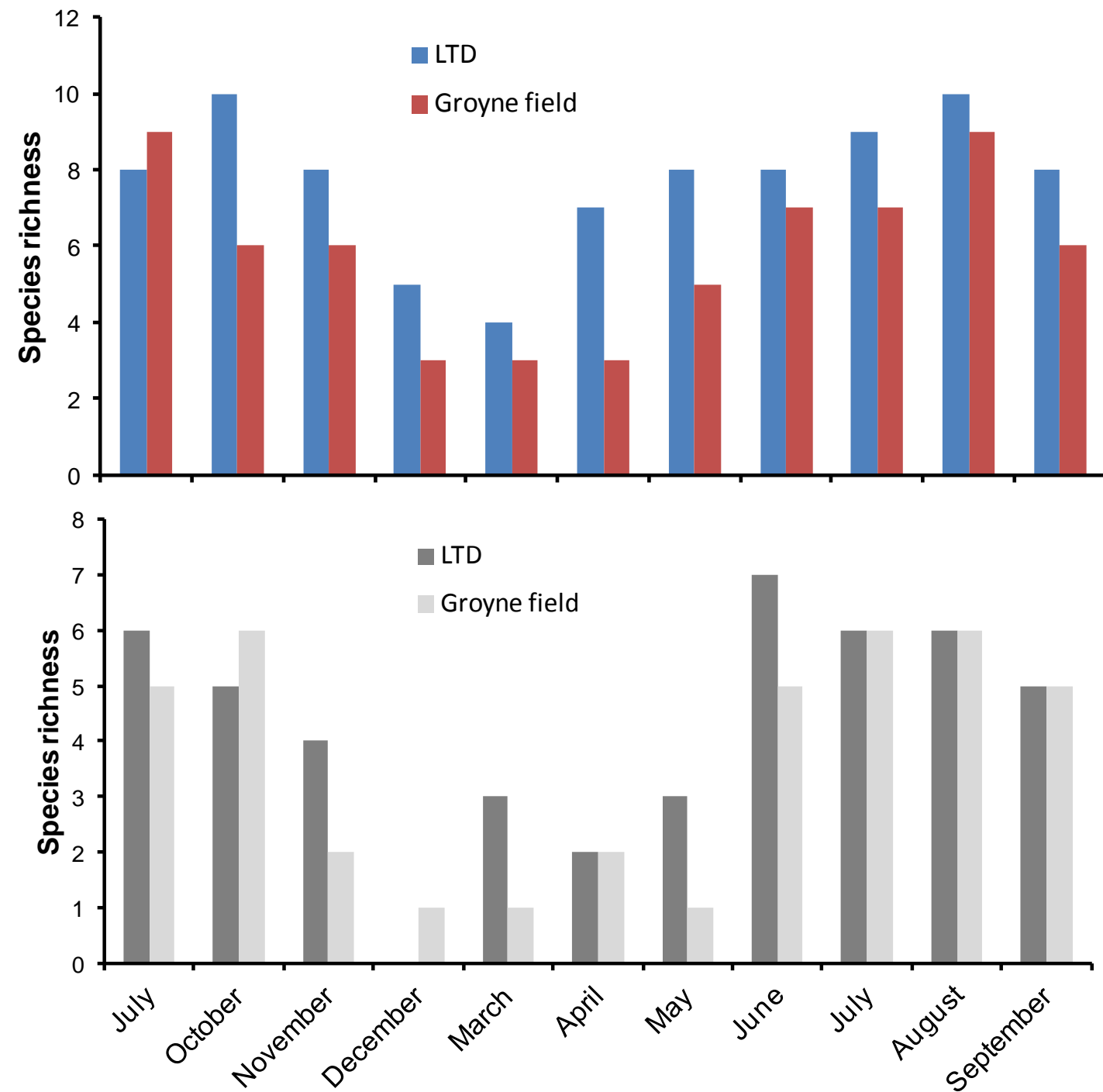


Fish diversity

Species richness
(July 2017 up to September 2018)

Native fishes
LTD > groyne field

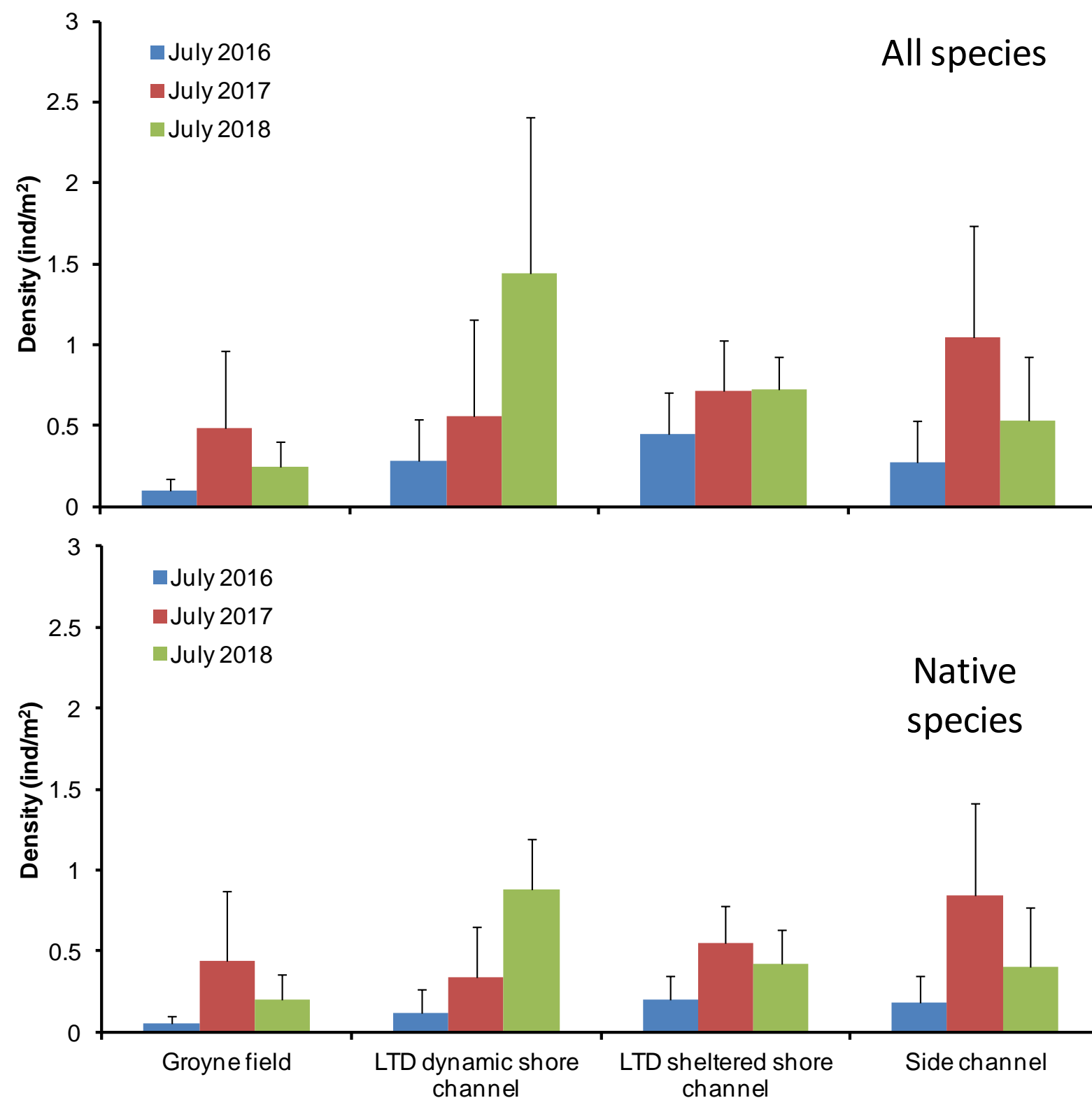
Alien fishes
LTD = groyne field



Fish density

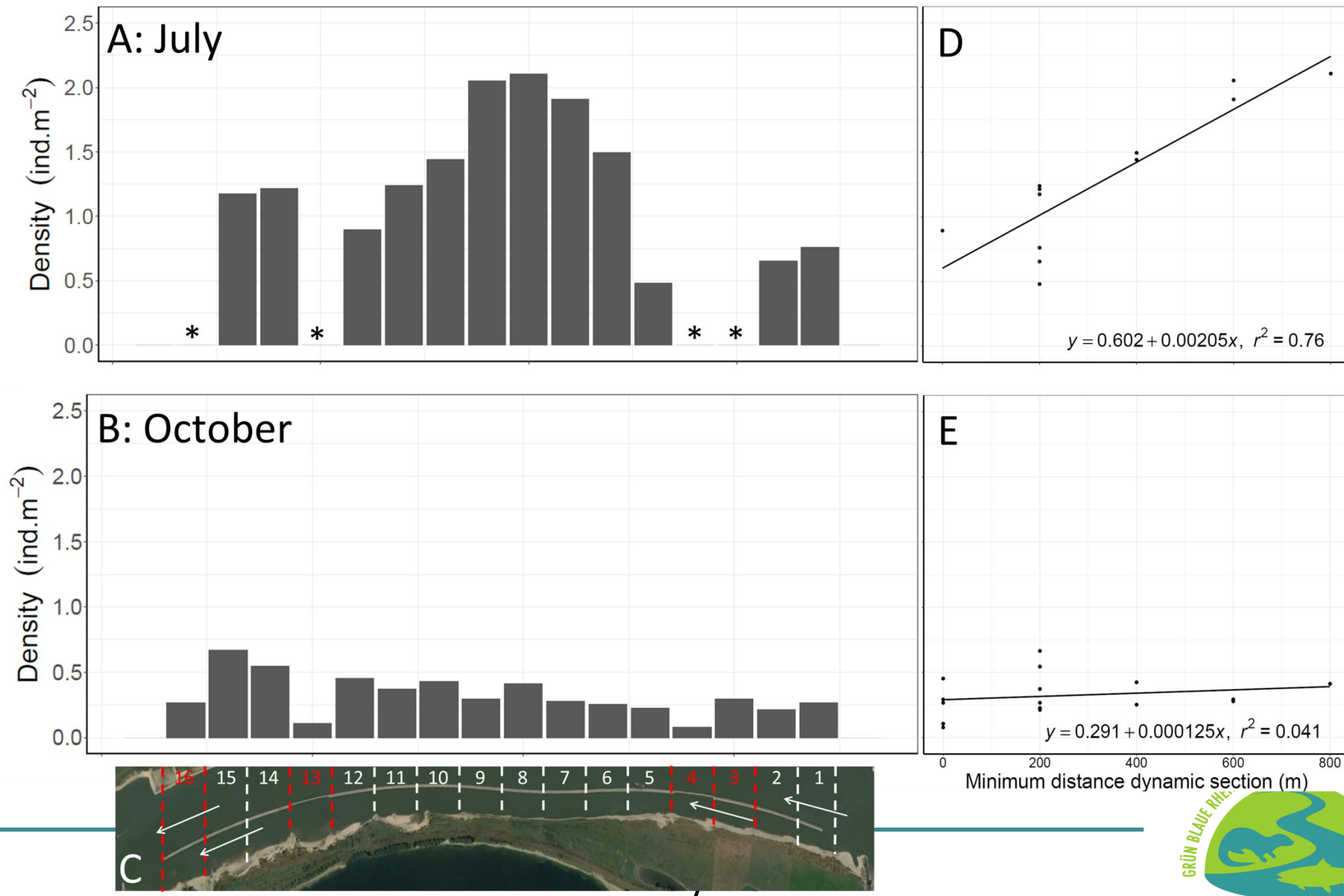
Fish caught using seine
(July 2016, 2017 and 2018)

LTD > groyne field
(all three years)



Fish density

Fish caught between the stones of the LTD using electrofishing (July)



Method

- Macroinvertebrate monitoring
 - Shore zone: core sampler; July 2016, 2017 and 2018; three locations; five samples at each location
 - Sightings during seine net fishing and siphon dredge

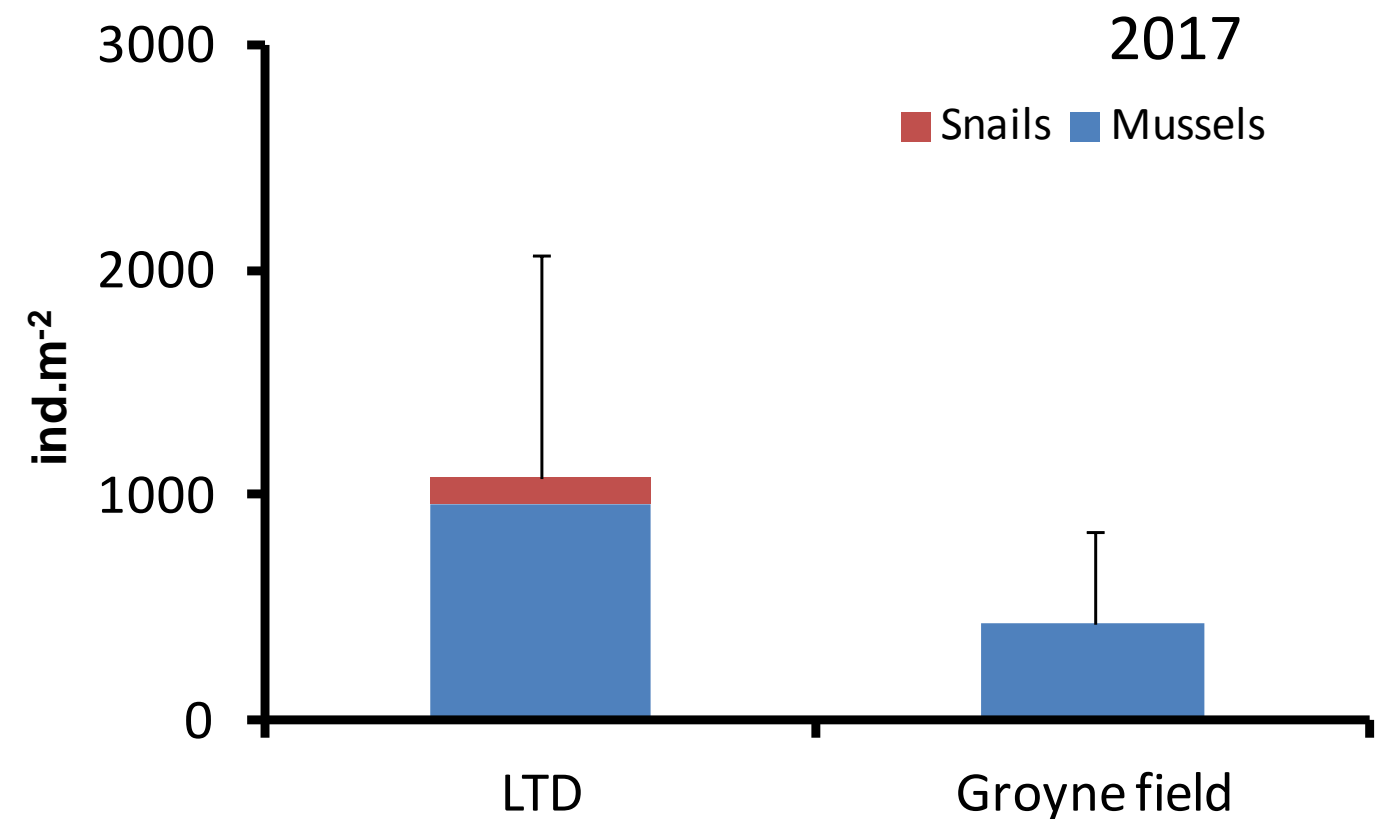


Macroinvertebrates

Densities

- 2016: LTD = GF
 - 2017: LTD > GF
 - 2018: LTD > GF
- } Final stage of id-ing

- molluscs: LTD > GF ($P < 0.05$)
- ‘other species’: LTD > GF
($P < 0.001$)
- (Chironomidae, Diptera, Chaoboridae
Culicidae, etc.)

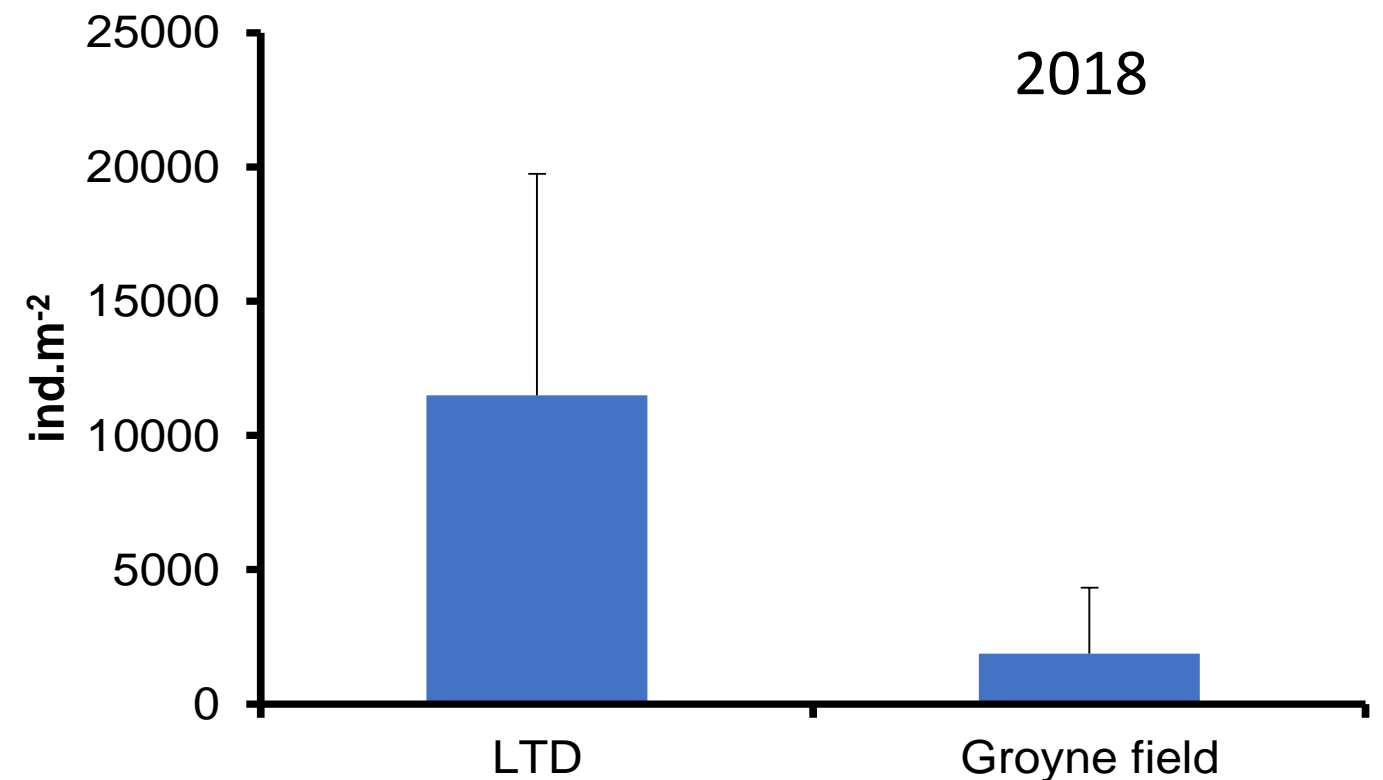


Macroinvertebrates

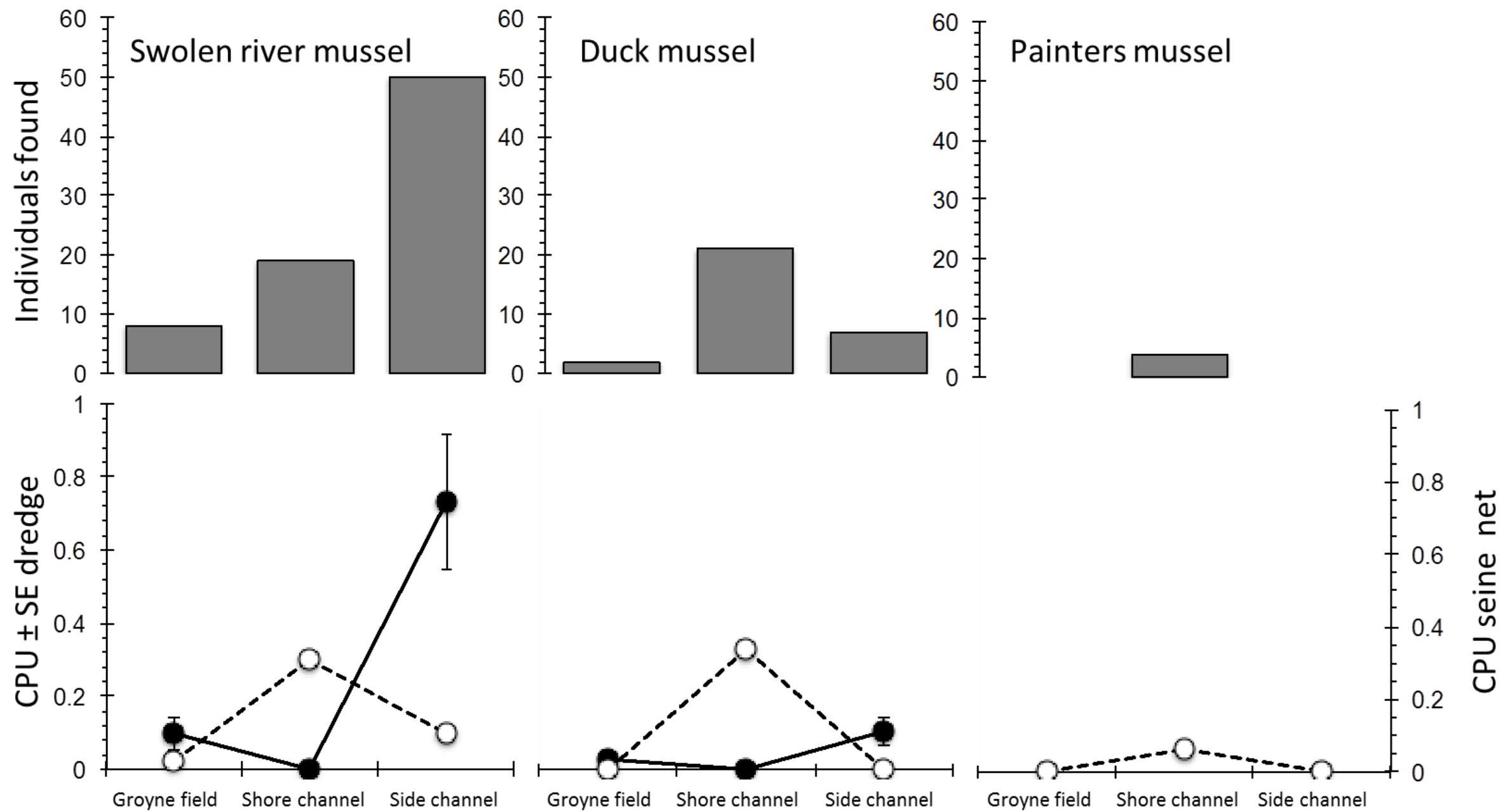
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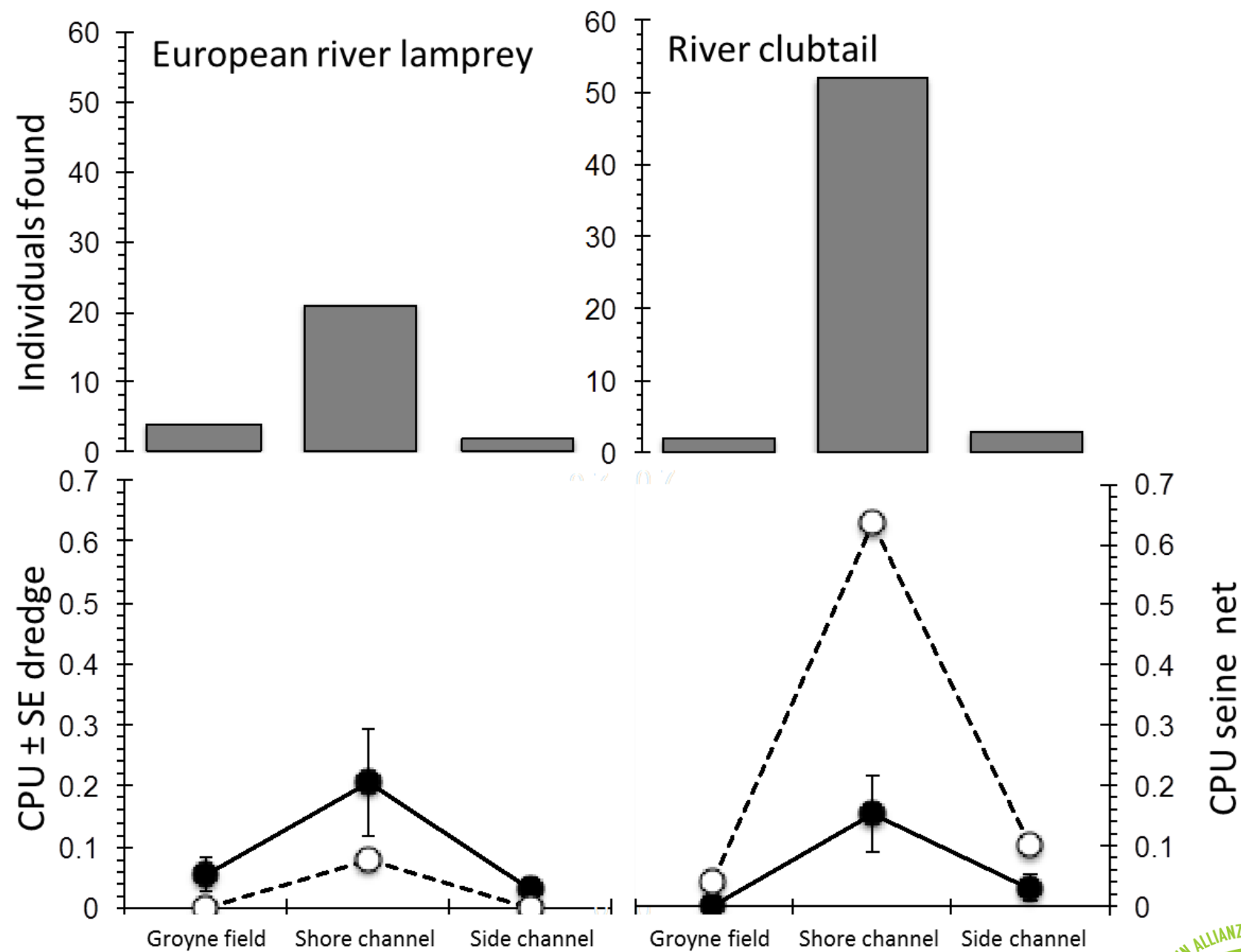
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Macroinvertebrates



Macroinvertebrates



Conclusions

- Conditions in the shore channel are locally on a short time scale less dynamic than traditional groyne fields; sound levels drastically reduced
 - Fish and macroinvertebrate density in shore channel higher than in reference groyne fields
 - Native species increase in diversity and density
- LTDs offer the opportunity to mitigate the impact of ships while simultaneously allowing for an increased usage of rivers

A hagfish, a jawless fish, is shown resting on a white, textured surface. The hagfish has a long, slender body with a dark dorsal side and a lighter ventral side. Its head is elongated and tapers to a point, with a prominent eye and a small mouth. The text "Questions and suggestions" is overlaid in white on the hagfish's body.

Questions and suggestions