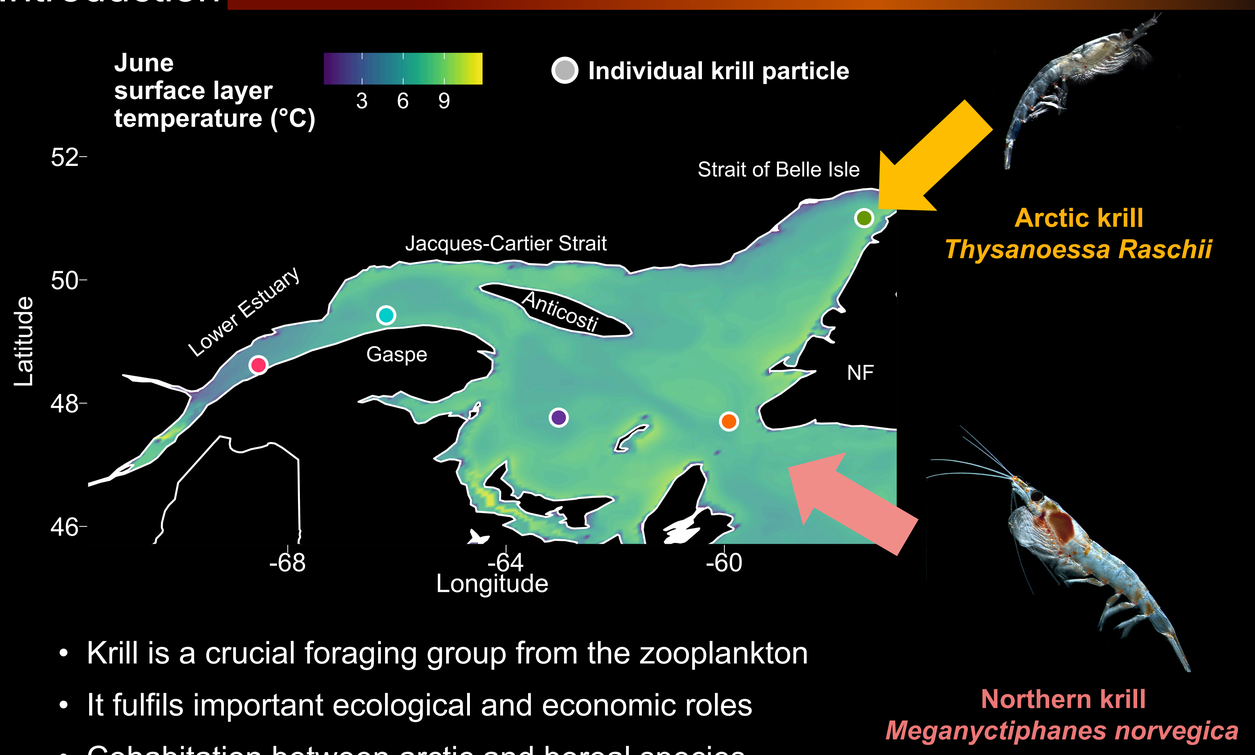
# Production dynamics of the Arctic krill (*Thysanoessa raschii*) and the Nordic krill (*Meganyctiphanes norvegica*) in the Gulf of St. Lawrence (Canada) emerging from their physiology and swimming behaviour

Déborah Benkort[1], Diane Lavoie[2], Stéphane Plourde[2] and Frédéric Maps[1]

[1] Département de Biologie, Université Laval, Québec / Takuvik (UMI 3376); [2] Institut Maurice Lamontagne, Pêche et Océans Canada, Mont-Joli

## Introduction




**Arctic krill**
***Thysanoessa Raschii***

**Northern krill**
***Meganyctiphanes norvegica***

- Krill is a crucial foraging group from the zooplankton
- It fulfils important ecological and economic roles
- Cohabitation between arctic and boreal species in the St Lawrence system

**How does individual physiology and behaviour influence the spatio-temporal dynamics of *T. raschii* and *M. norvegica* production in the GSL?**

## Methods

**Input & Forcing**

**Regional circulation model**
(Currents, salinity and temperature fields )

**NPZD biogeochemical model**
(Two food sources for krill: Phyto and Zooplankton)

**Individual model**

**Physiological Individual Based Model**
(Species-Specific)

| Growth = ingestion – metabolism | Adult moulting | Egg production |
|---|---|---|
| Energetic balance = *f*(temperature, phyto, zoo) | Intermoult period (IMP) = *f*(temperature) | Allometric relationship *f*(size) Energetic balance |

**DVM**
(Dial Vertical Migration)
Swimming behaviour

**Outputs**

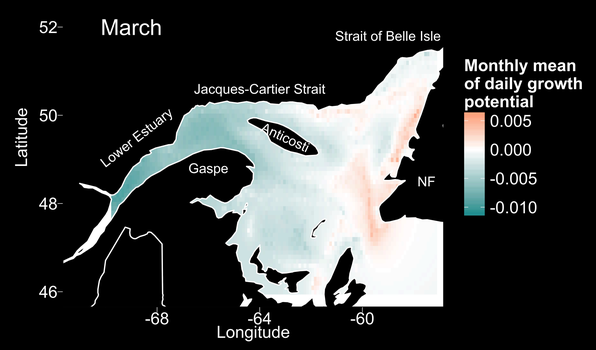
Change in **mass** — Change in **length** — Change in **reproduction**

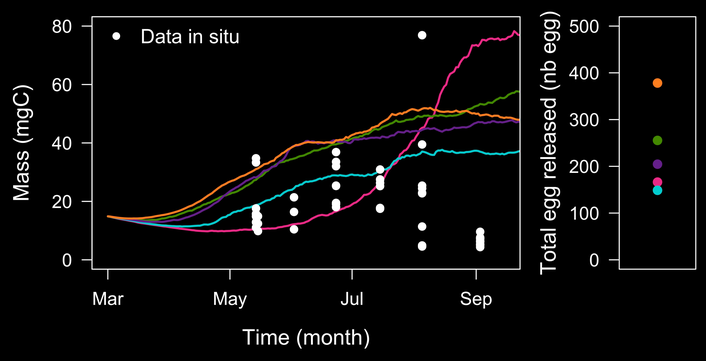
**Temporal and Spatial variability**

**Productive areas**

## Results

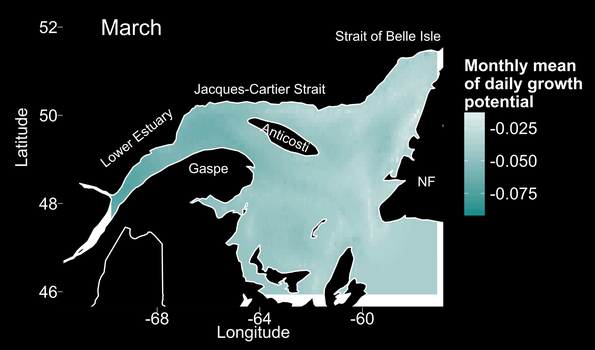
### *Thysanoessa Raschii*

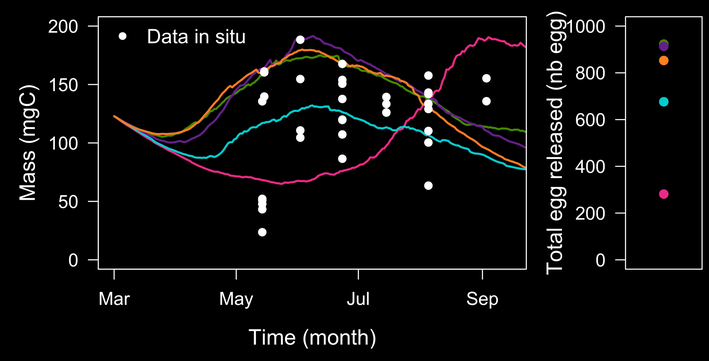



- Earlier appearance of productive zones for *T. raschii*. Begins in March for *T. raschii,* but only in April for *M. norvegica* *(Use the figures on the side of the poster to compare the dynamics)*
- For both species, production follows a east-west progression
- The study of individuals' growth trajectory confirms that the production season is longer for *T. raschii* (March to September) than for *M. norvegica* (April to August)
- Individuals of the same species coming from different areas of the GSL have similar dynamics, but resulting variability in lifetime growth and egg production is large
- The growth is stronger and later for both species in the estuary
- In situ observations showed similar range of individual variability

### *Meganyctiphanes norvegica*




## Conclusions

- From the interactions between temperature dependence, allometry, swimming and feeding behaviours emerged species specific krill production dynamics in the GSL
- The Strait of Belle Isle, the west coast of Newfoundland (NF), and the lower Estuary are the most productive regions. During spring, the Eastern GSL is most productive, while during summer production shifts towards the west.

## Next steps

- Test model predictions with available observations (obtain more observations)
- Full coupling with advection-diffusion from the regional circulation model
- Studying the interannual variability of both krill species production dynamics