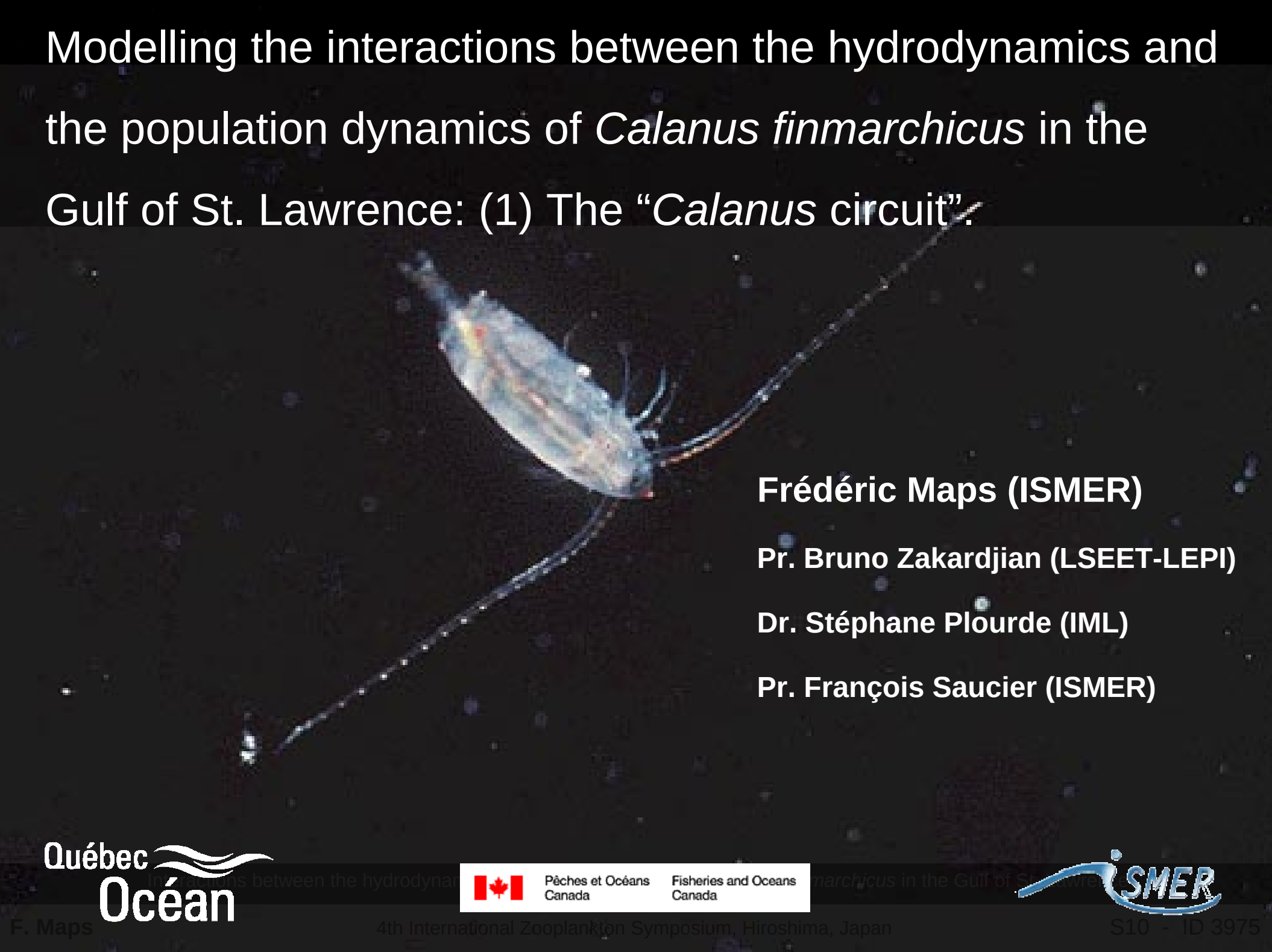
Modelling the interactions between the hydrodynamics and the population dynamics of *Calanus finmarchicus* in the Gulf of St. Lawrence: (1) The "*Calanus* circuit".



Frédéric Maps (ISMER)

Pr. Bruno Zakardjian (LSEET-LEPI)

Dr. Stéphane Plourde (IML)

Pr. François Saucier (ISMER)

Québec Océan

Pêches et Océans Canada | Fisheries and Oceans Canada

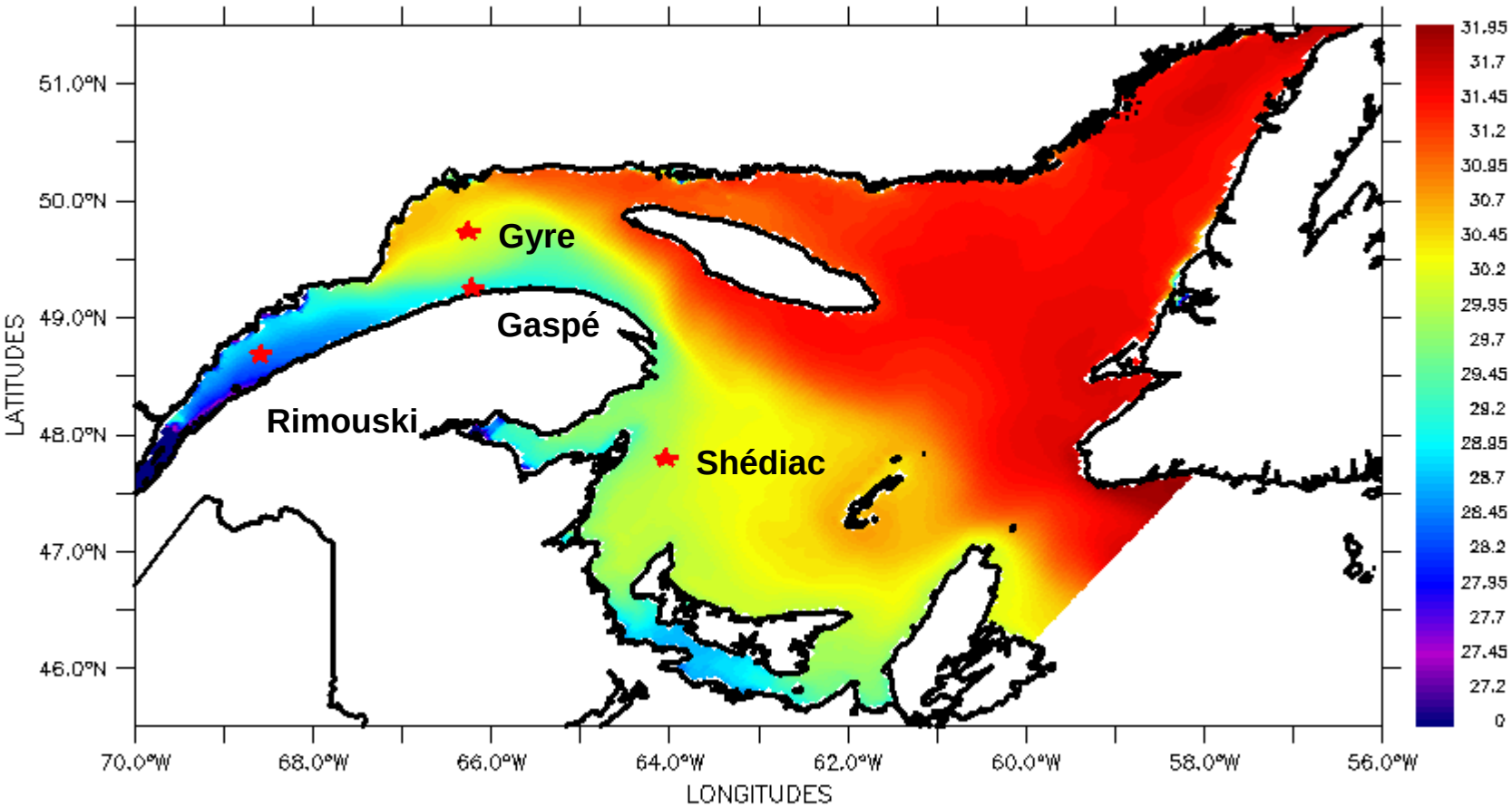
ISMER

INTRODUCTION

- **The Gulf of St. Lawrence (GSL) system :**
  - **Semi-enclosed sea with contrasted topograpy and circulation features**
  - **Seasonal sea-ice cover**
  - **Estuarine-like general circulation, highly variable**
  - **Productive pelagic ecosytem : *C.finmarchicus***

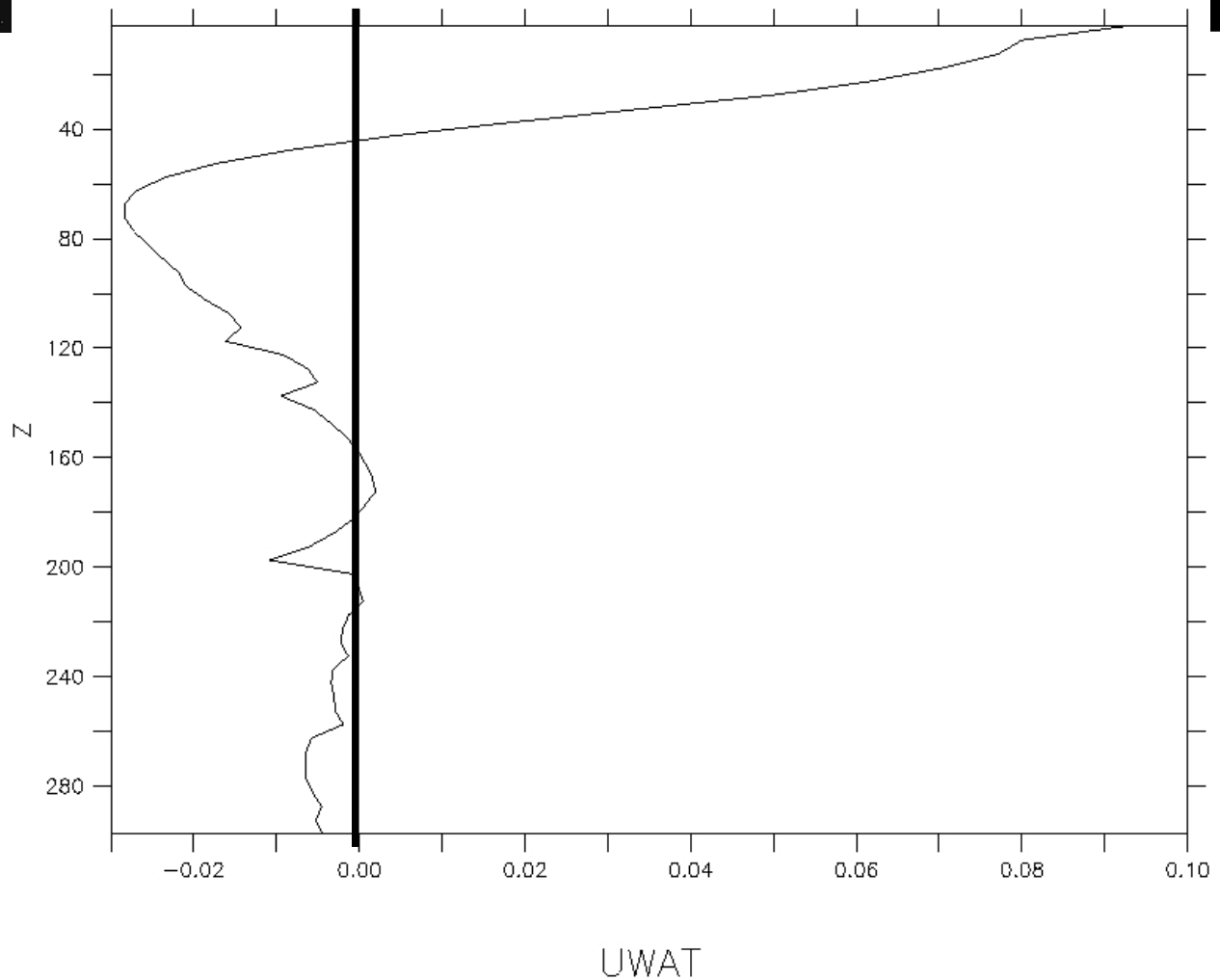
INTRODUCTION

Salinity, 1999 0-30m



INTRODUCTION

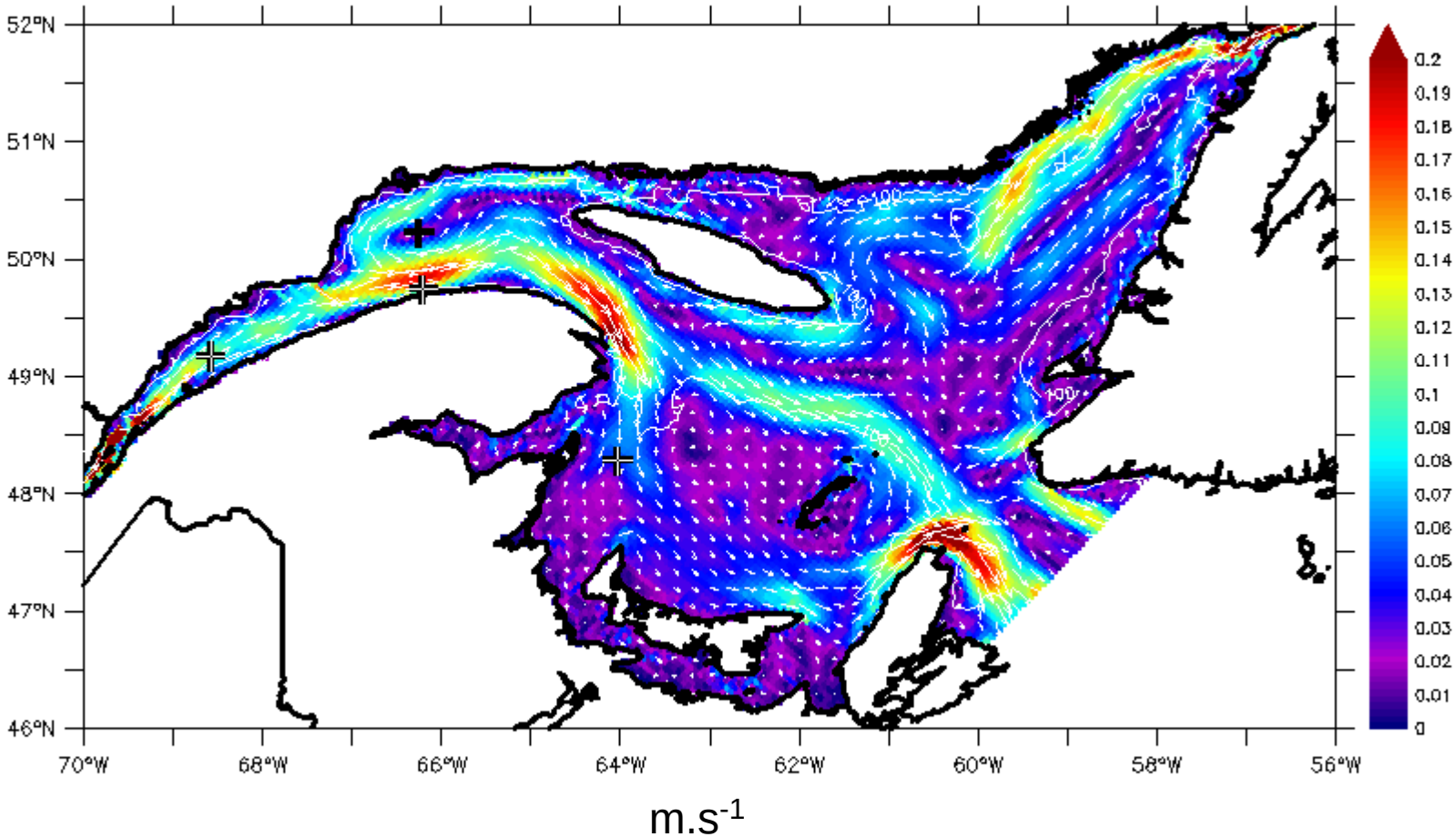
Currents, 1999 Pointe-des-Monts



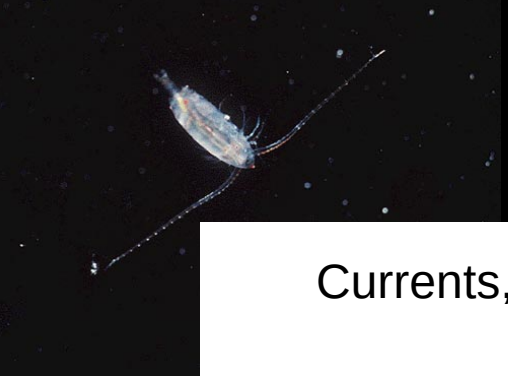
INTRODUCTION

Currents, 1999

0 - 30m



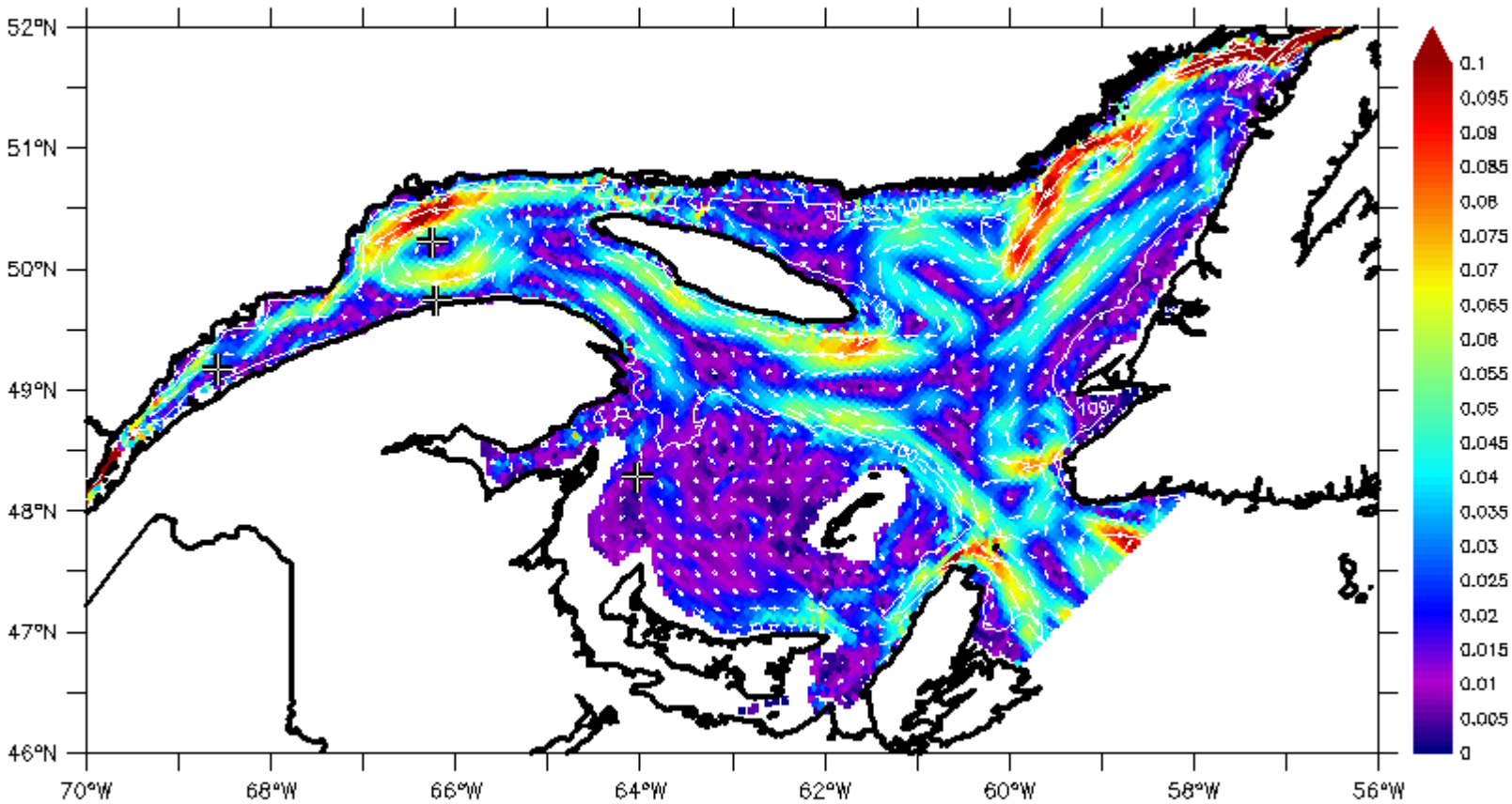
$m.s^{-1}$



INTRODUCTION

Currents, 1999

30 - 100m

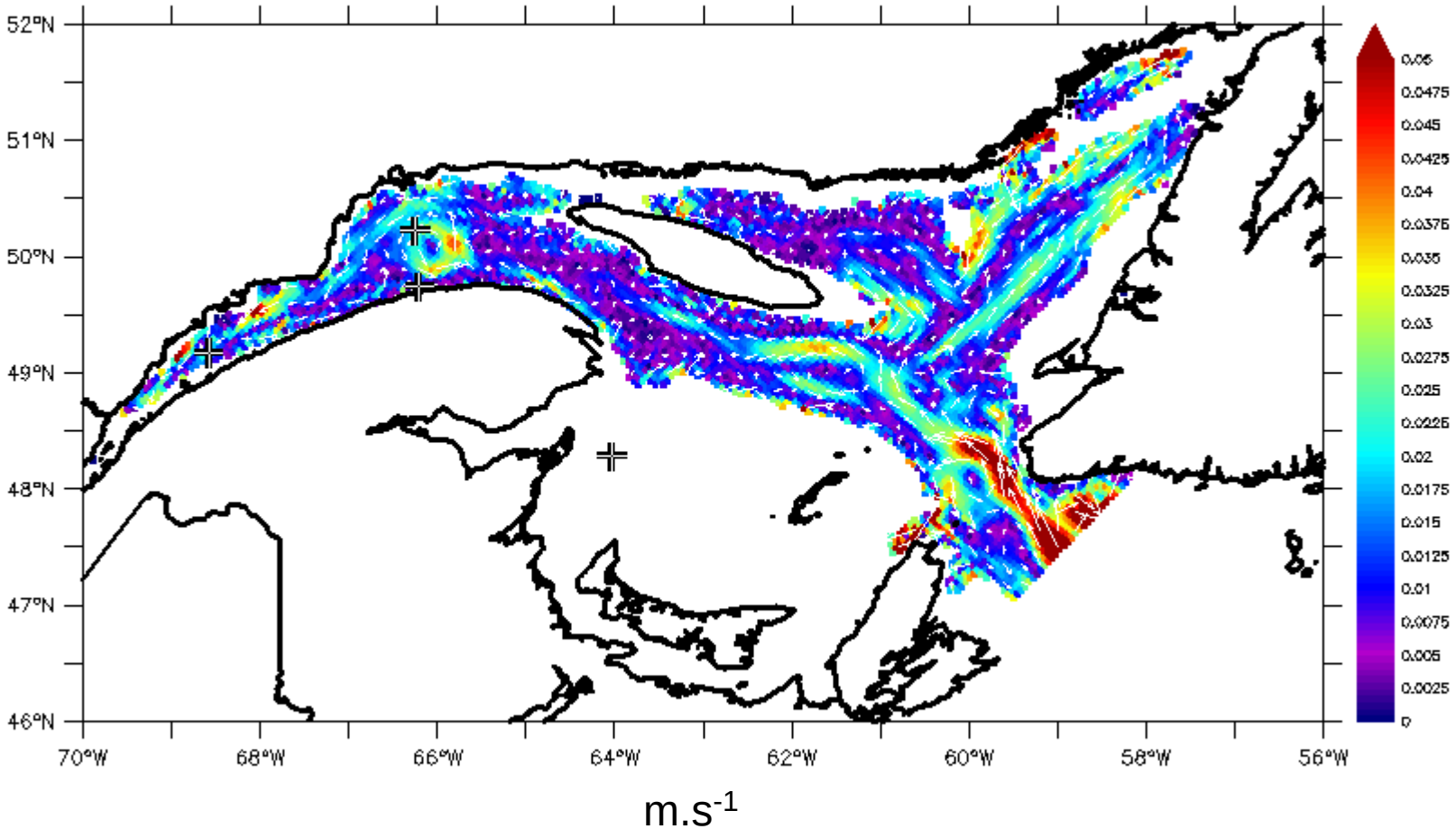


$m.s^{-1}$

INTRODUCTION

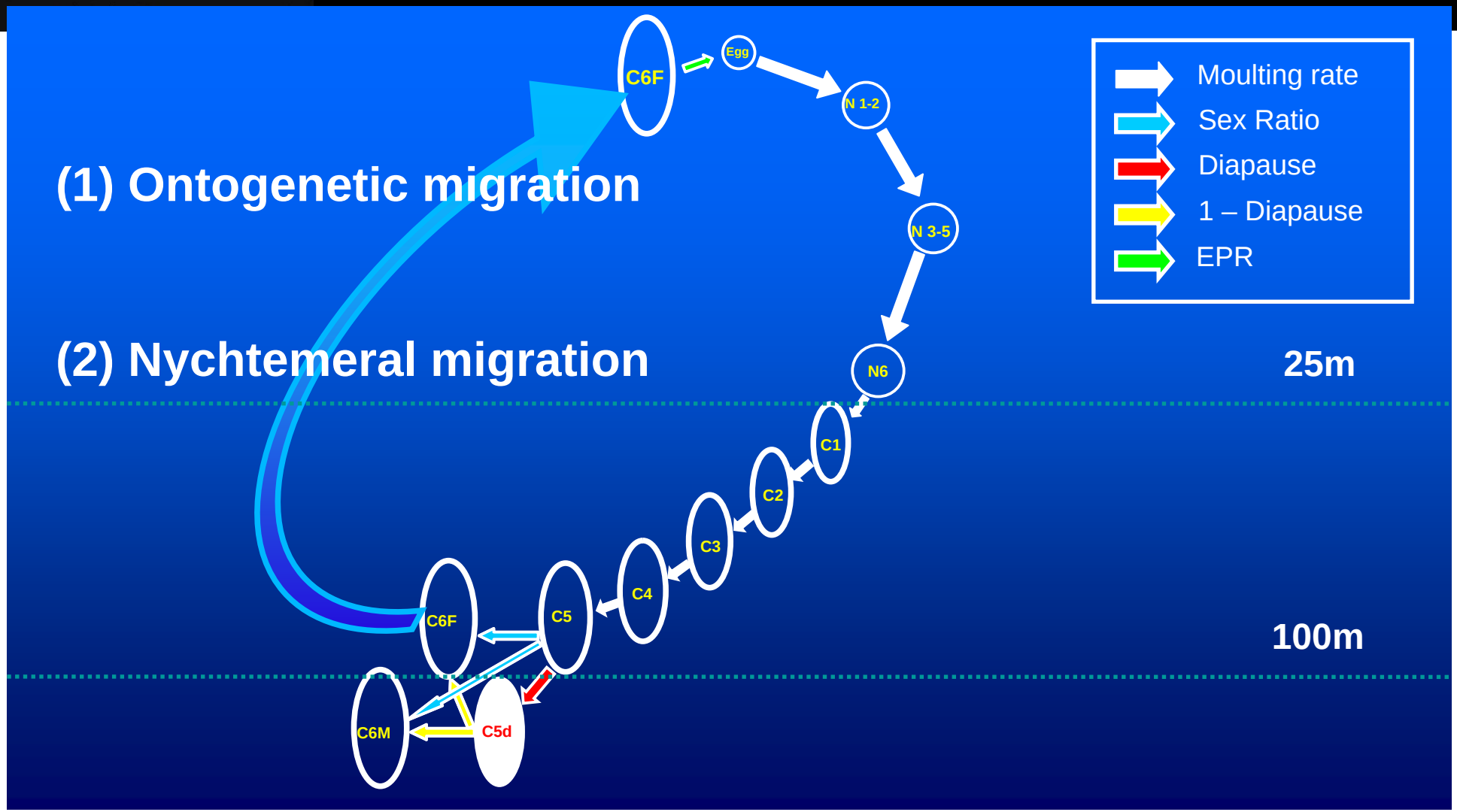
Currents, 1999

100 - Bottom



$m.s^{-1}$

INTRODUCTION



Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

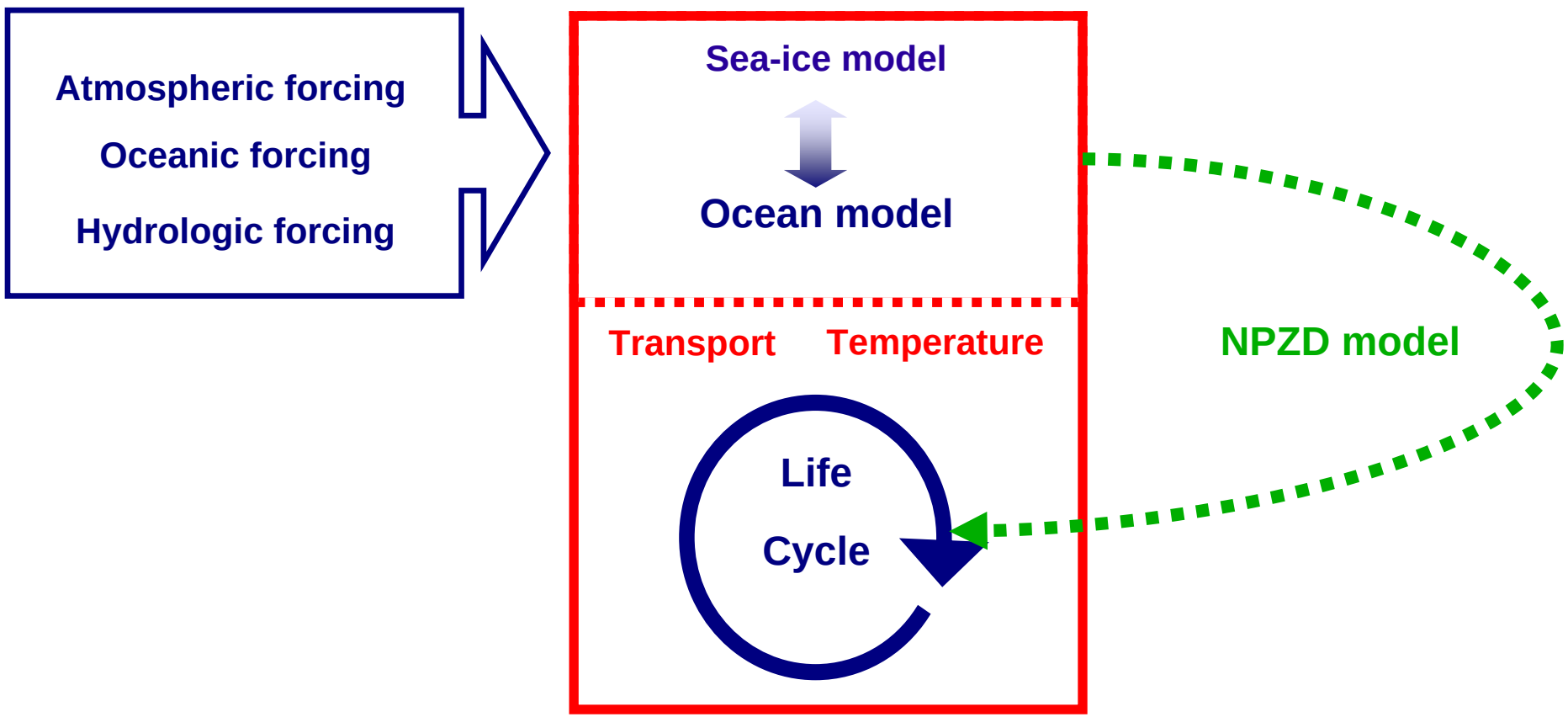
OBJECTIVES

(1) Test the few conceptual models regarding the persistence of the *C.finmarchicus* population in the GSL system

(Plourde & Runge 1993; Runge et al. 1999; Plourde et al. 2001; Zakardjian et al. 2003)

(2) Give a comprehensive picture of *C.finmarchicus* dynamics in the GSL system

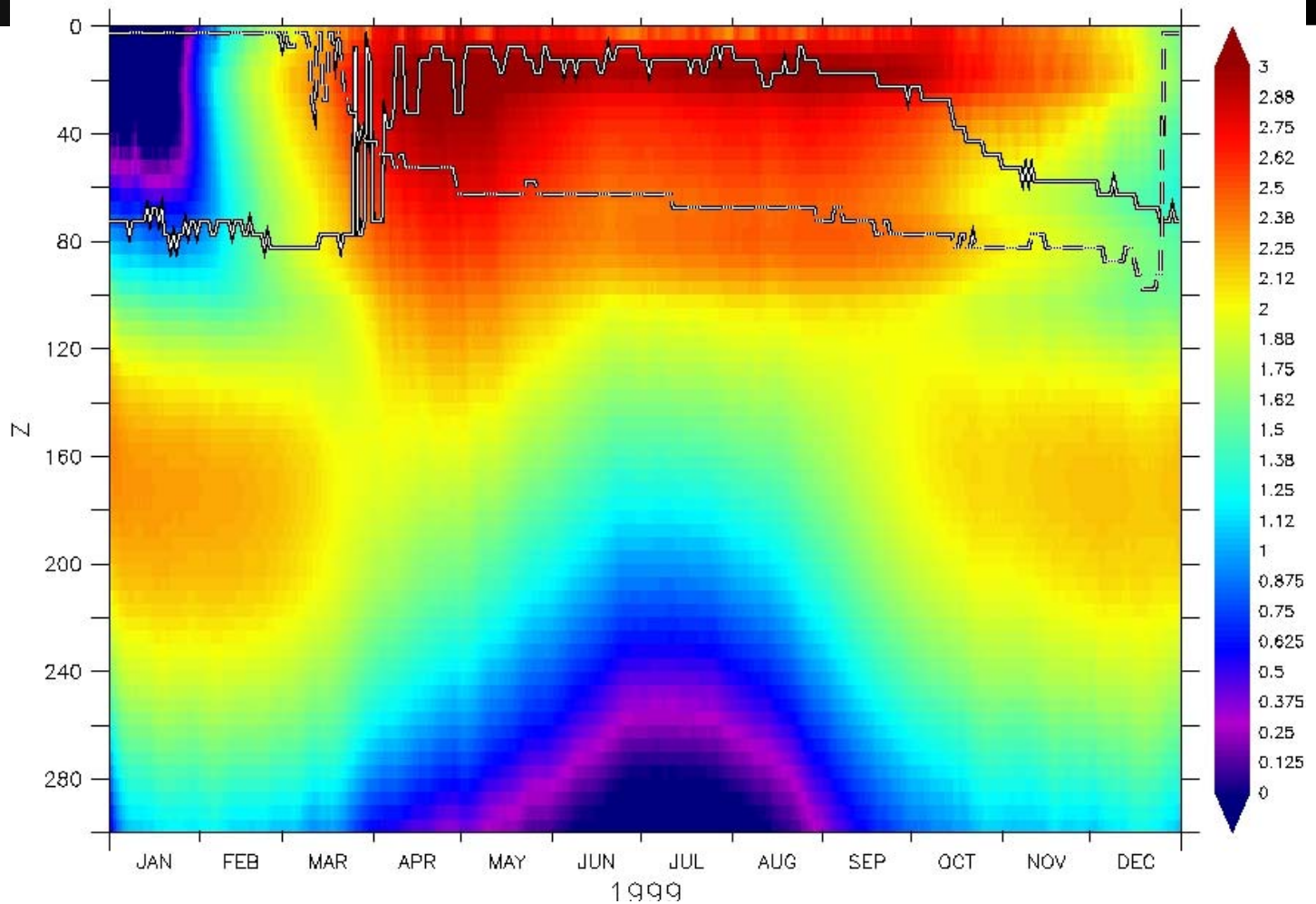
MATHERIAL & METHODS



MATHERIAL & METHODS

- **Biologic model Parametrization :**
  - **Stage-based**
  - **Transfer rate f (T)**
  - **Egg production rate f (C), C = Diatoms + Flagellates (NPZD)**
  - **Mortality rate f (N,T)**
  - **Vertical migration**

MATHERIAL & METHODS



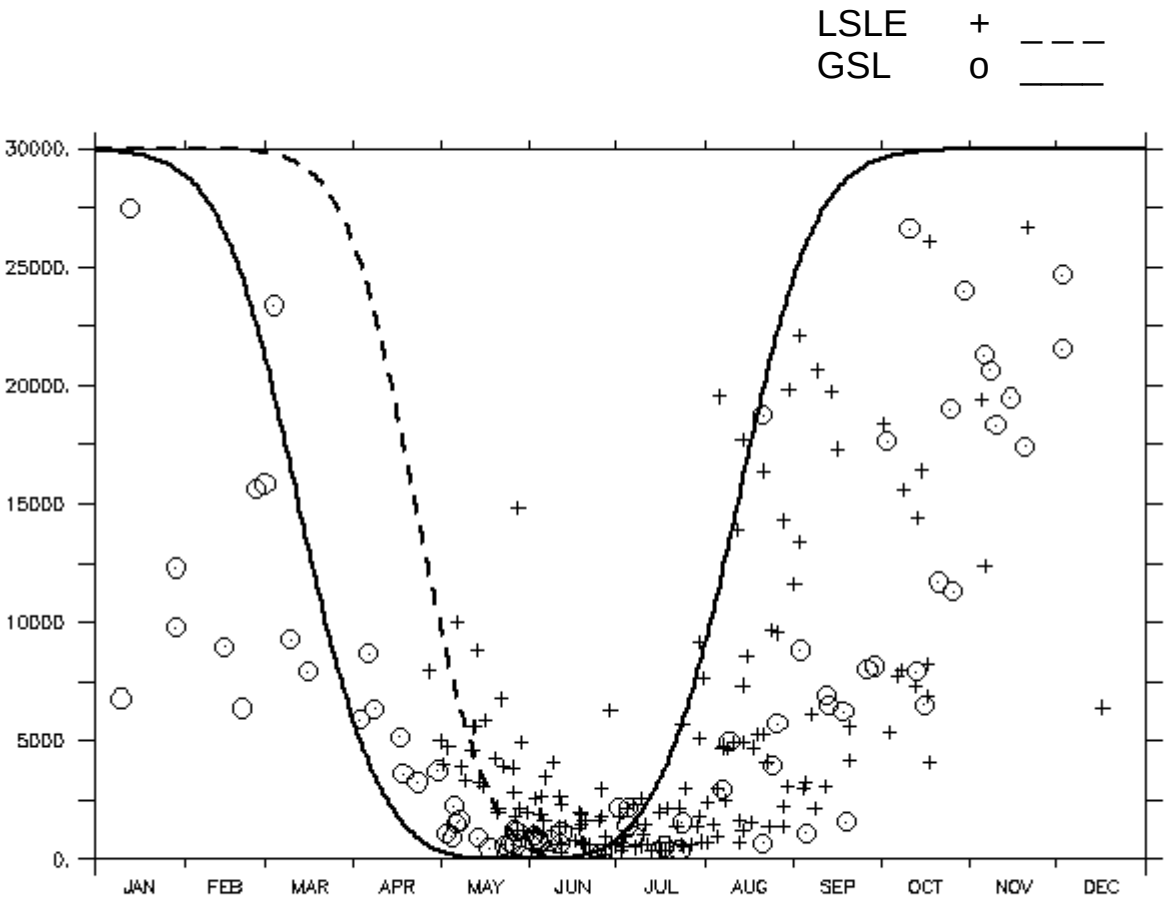
C.finmarchicus log(#.m^{-3})

Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

MATHERIAL & METHODS

- **Biologic model Parametrization :**
  - **Stage-based**
  - **Transfer rate f (T)**
  - **Egg production rate f (C), C = Diatoms + Flagellates (NPZD)**
  - **Mortality rate f (N,T)**
  - **Vertical migration**
  - **Diapause window**

MATHERIAL & METHODS

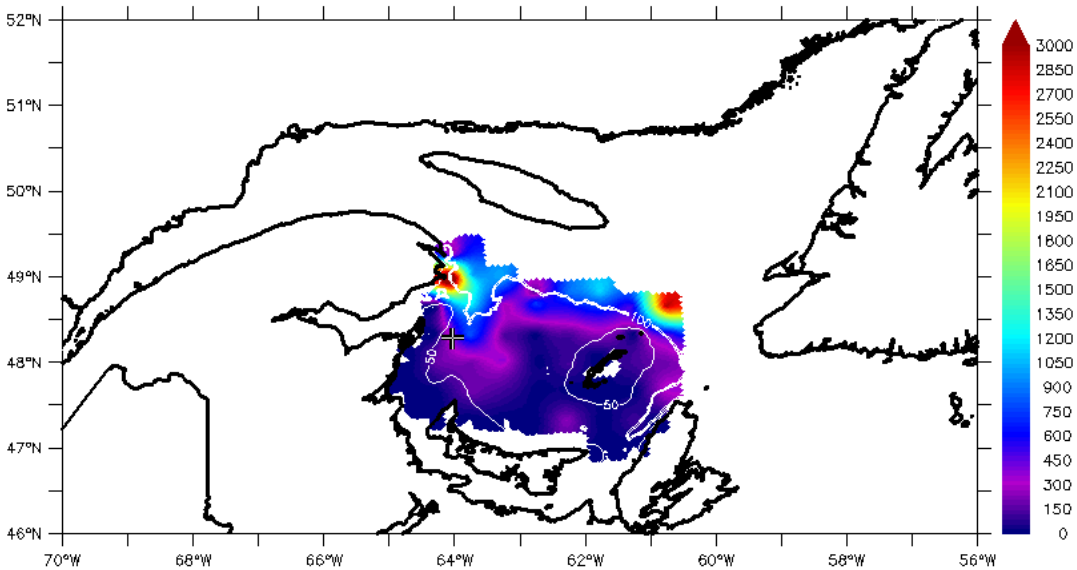


1994 - 2003

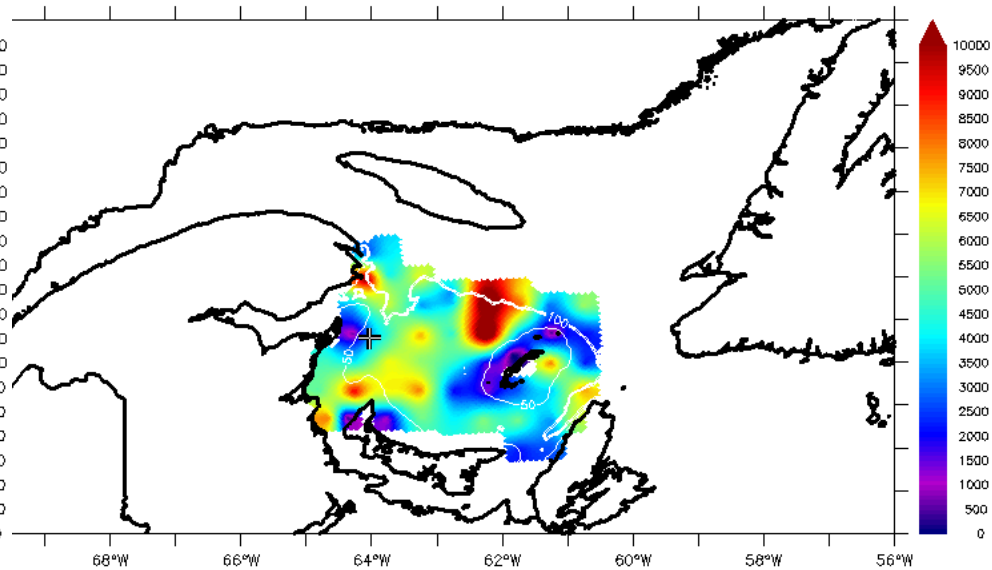
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS

Observed



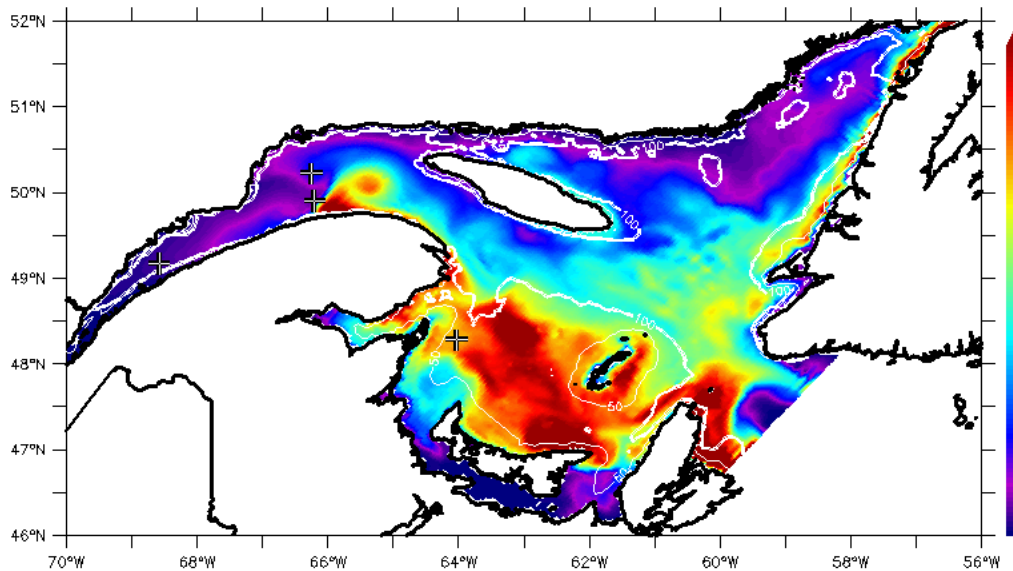
1999 # females.m^{-2}



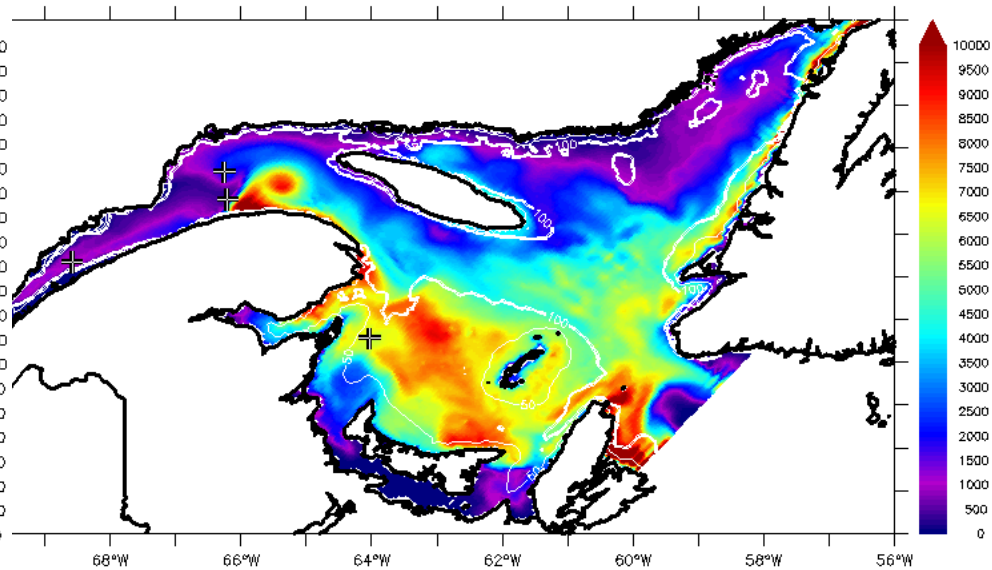
1999 # C5.m^{-2}

RESULTS

Simulated - No migration



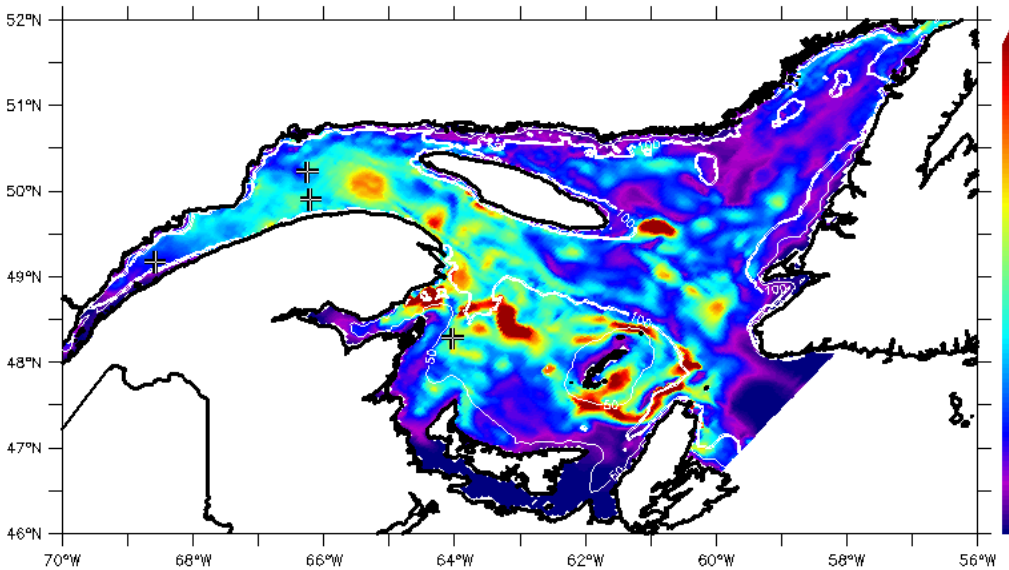
1999 # females.m^{-2}



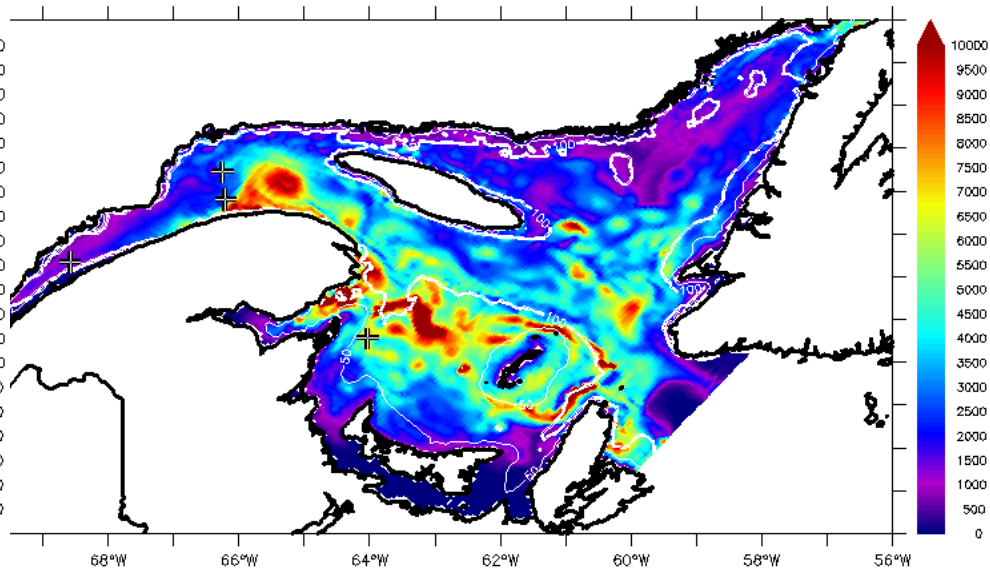
1999 # C5.m^{-2}

RESULTS

Simulated - Migration

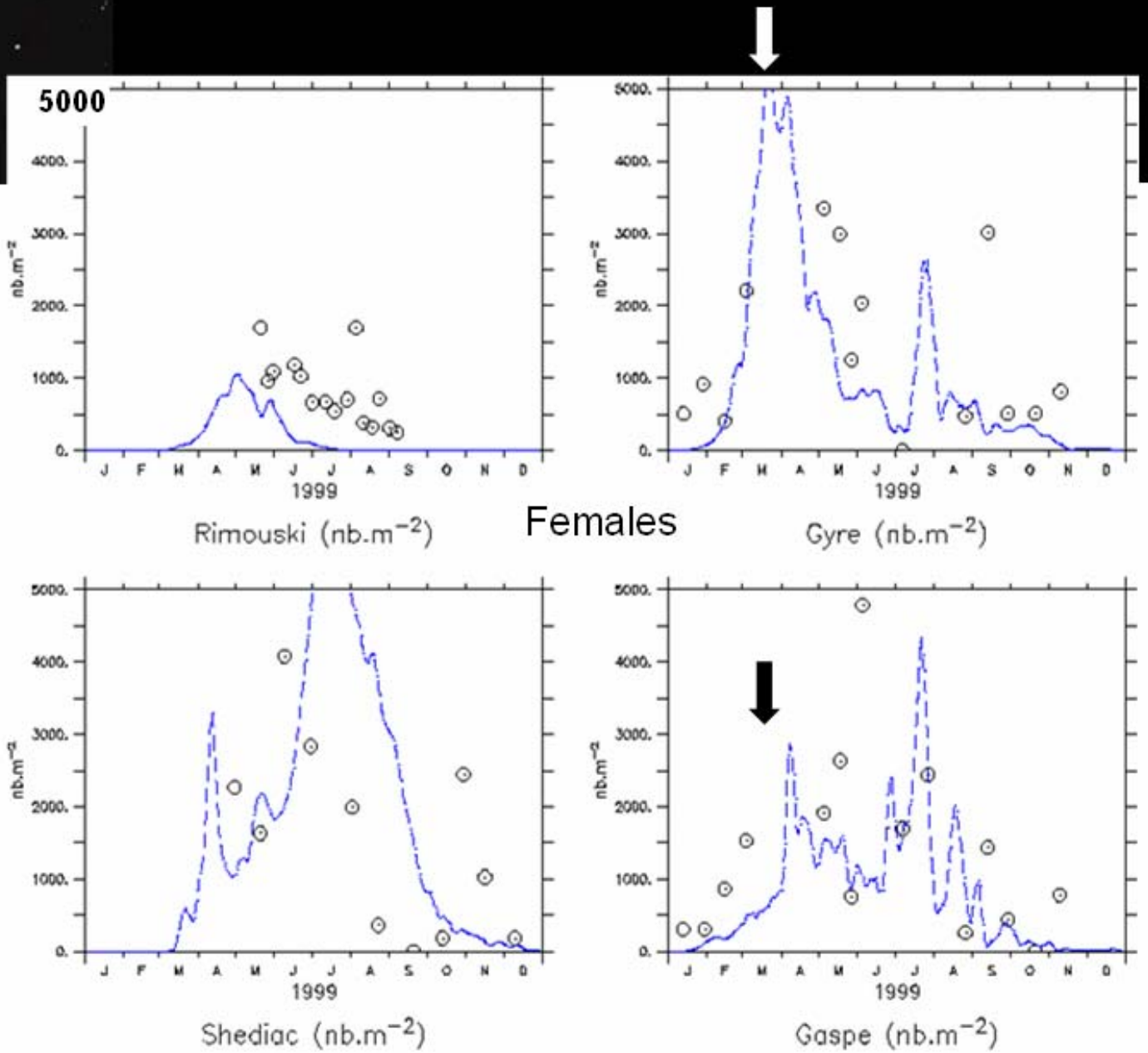


1999 # females.m^{-2}



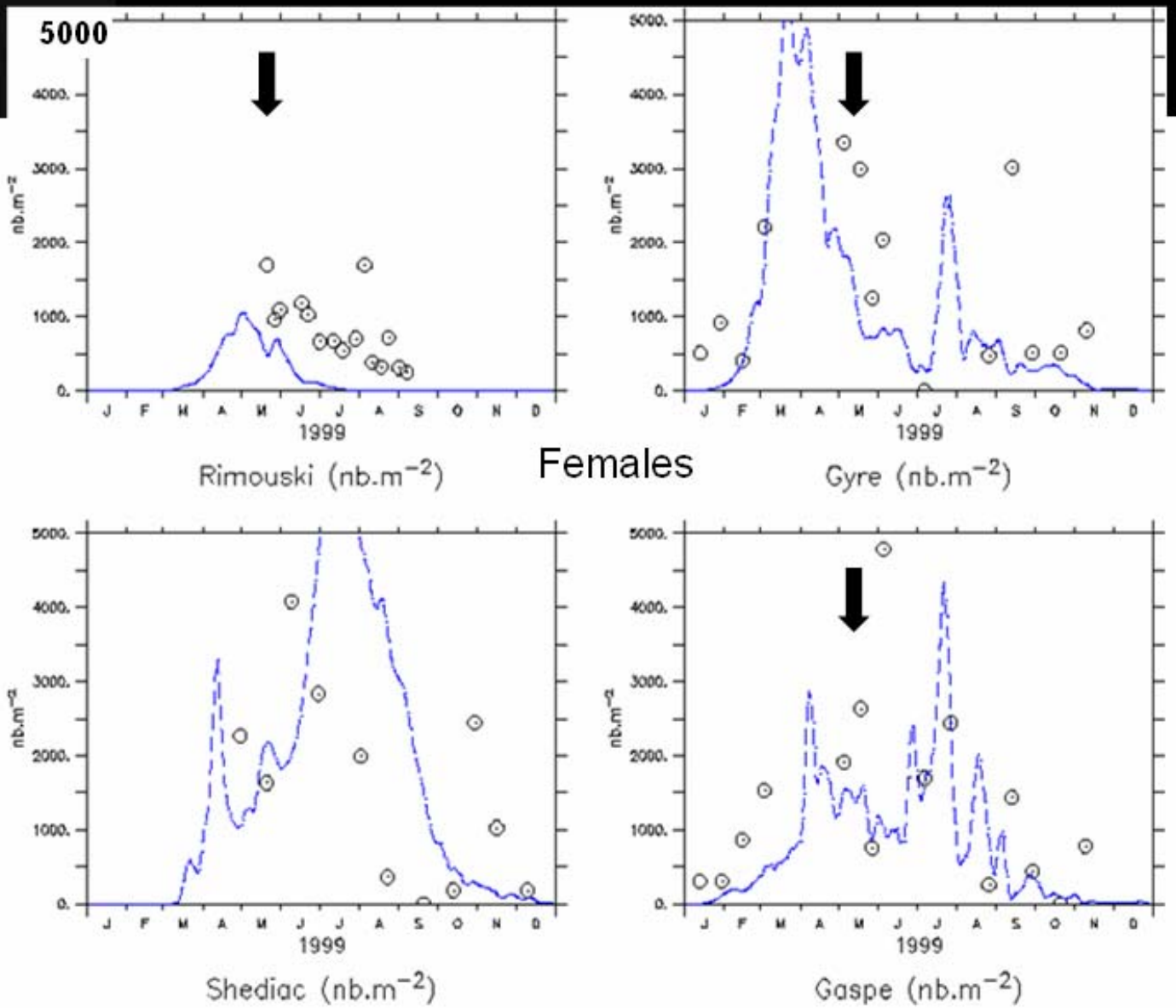
1999 # C5.m^{-2}

RESULTS



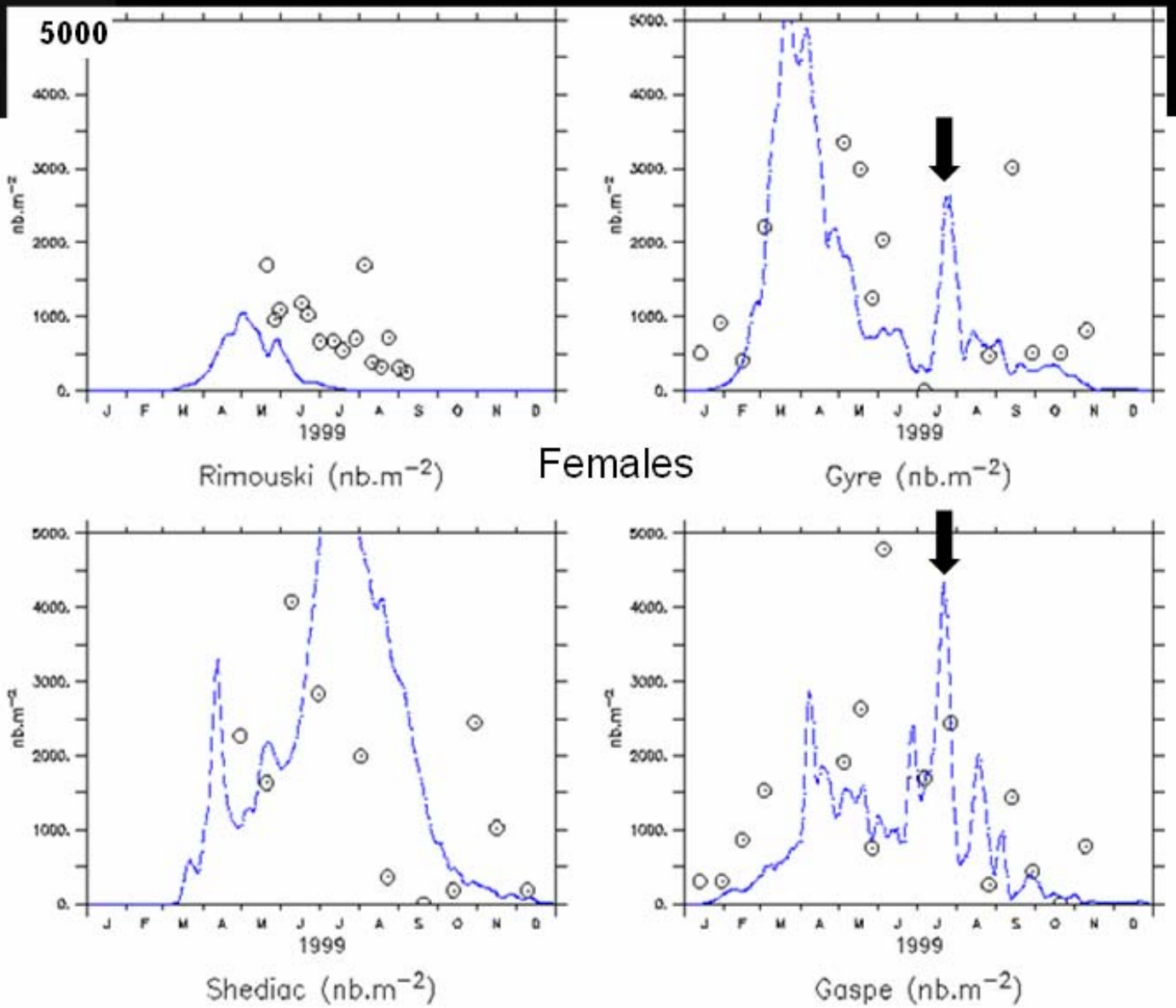
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS



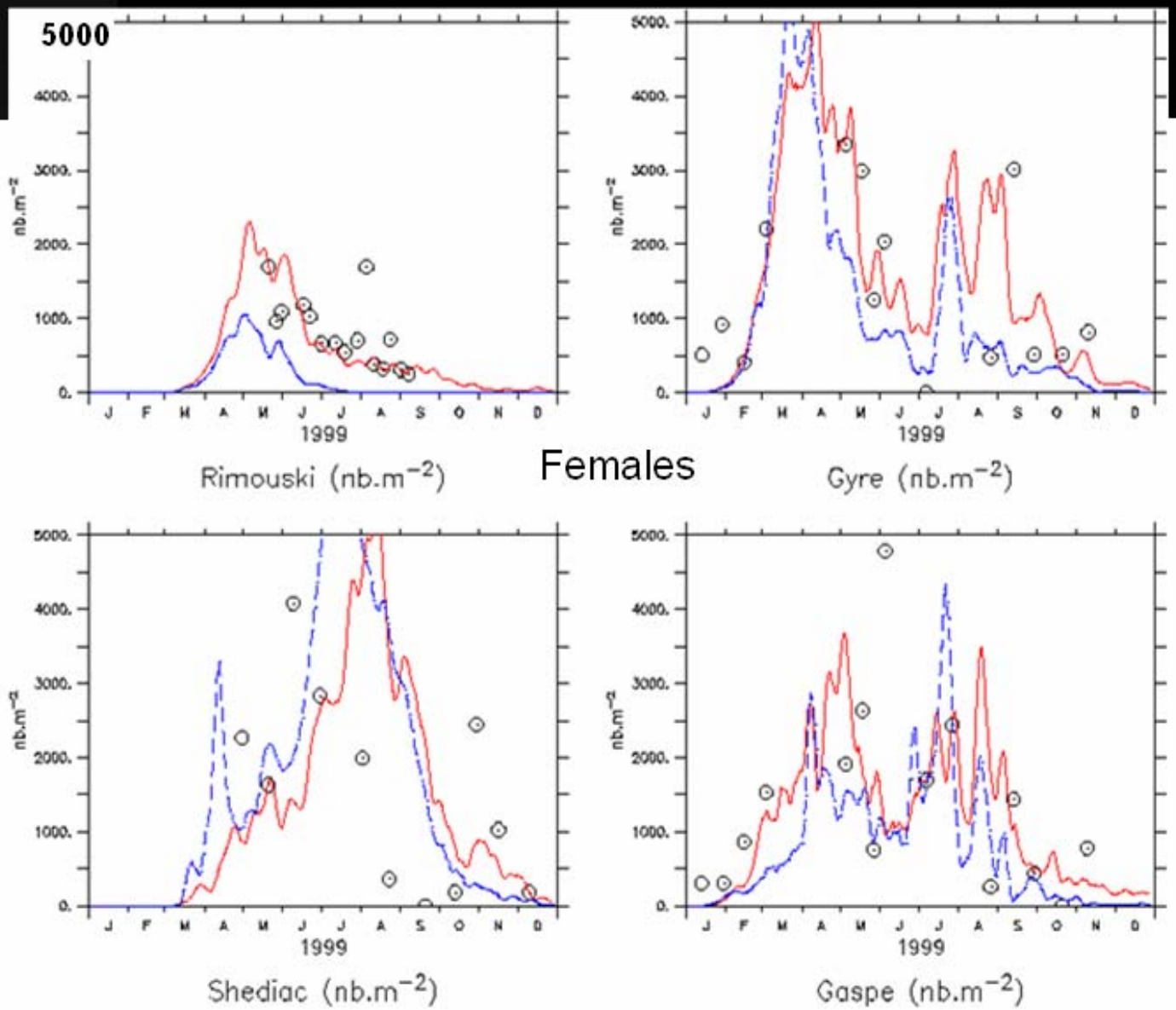
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS



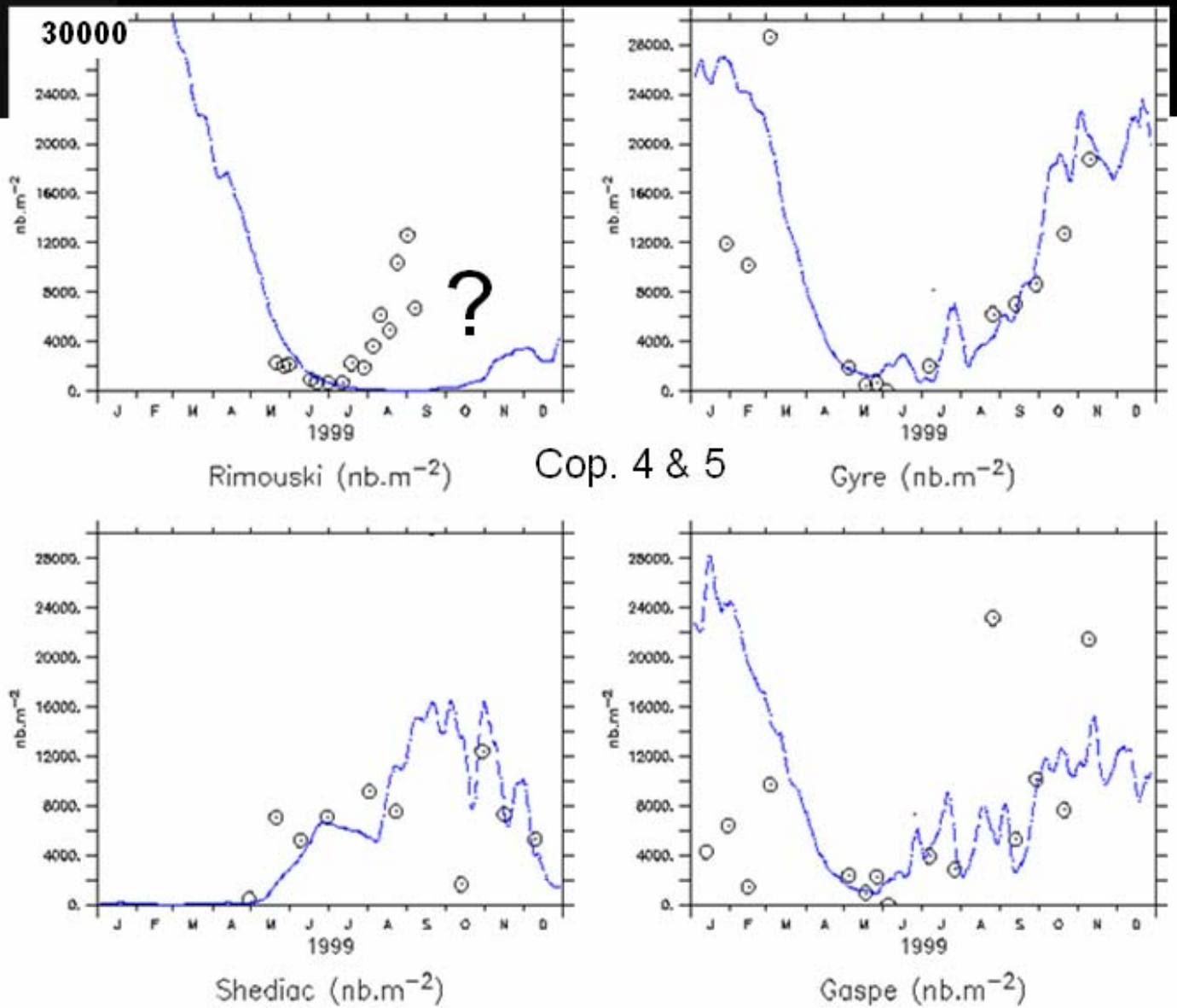
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS



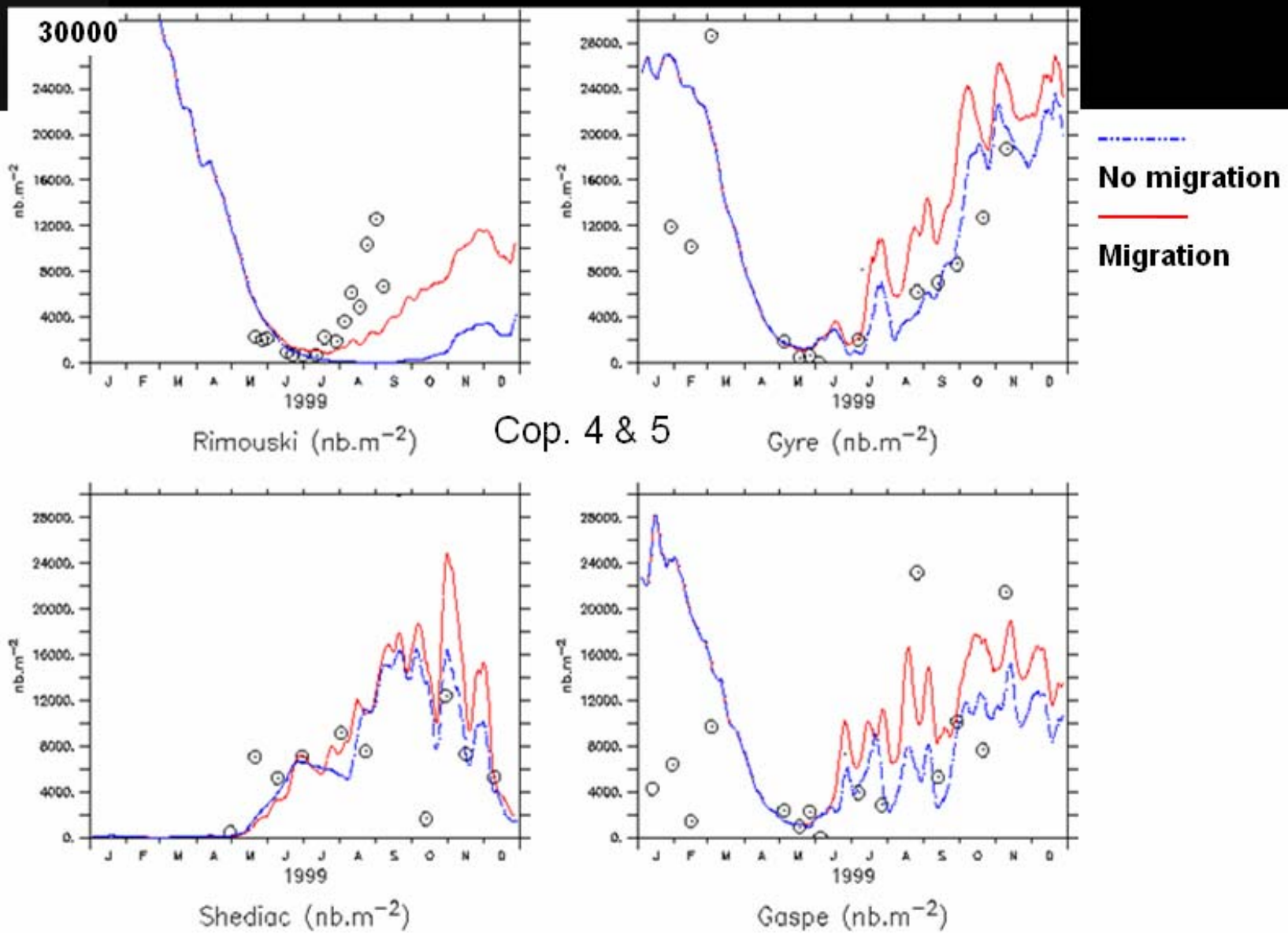
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS



Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

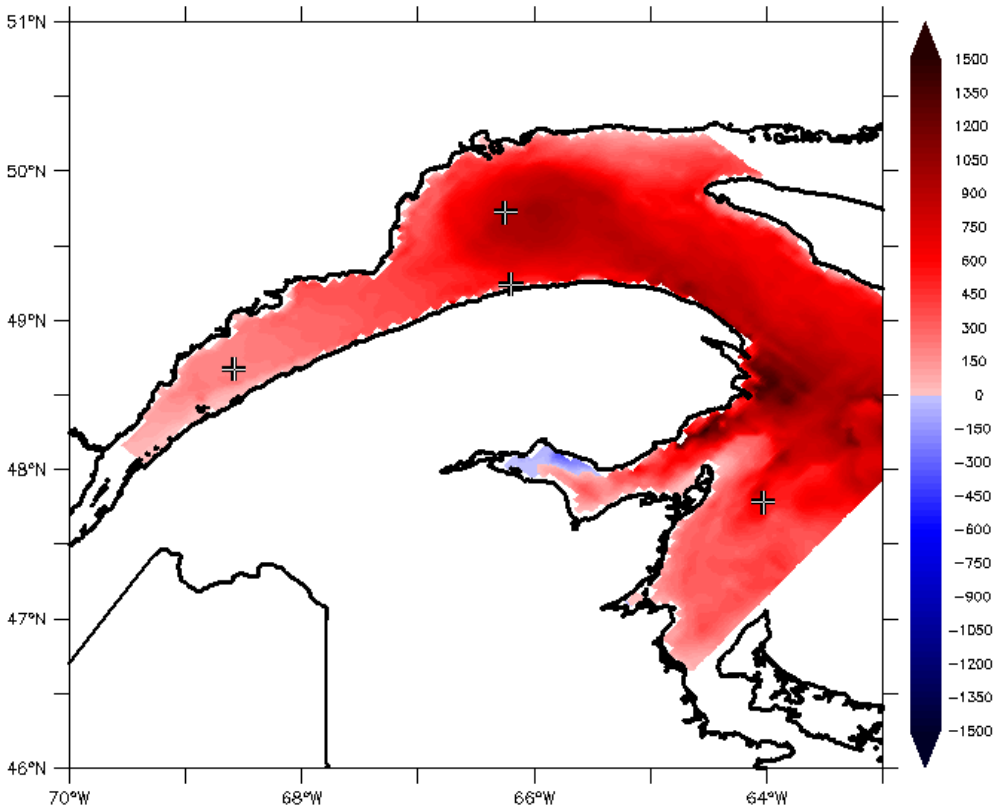
RESULTS



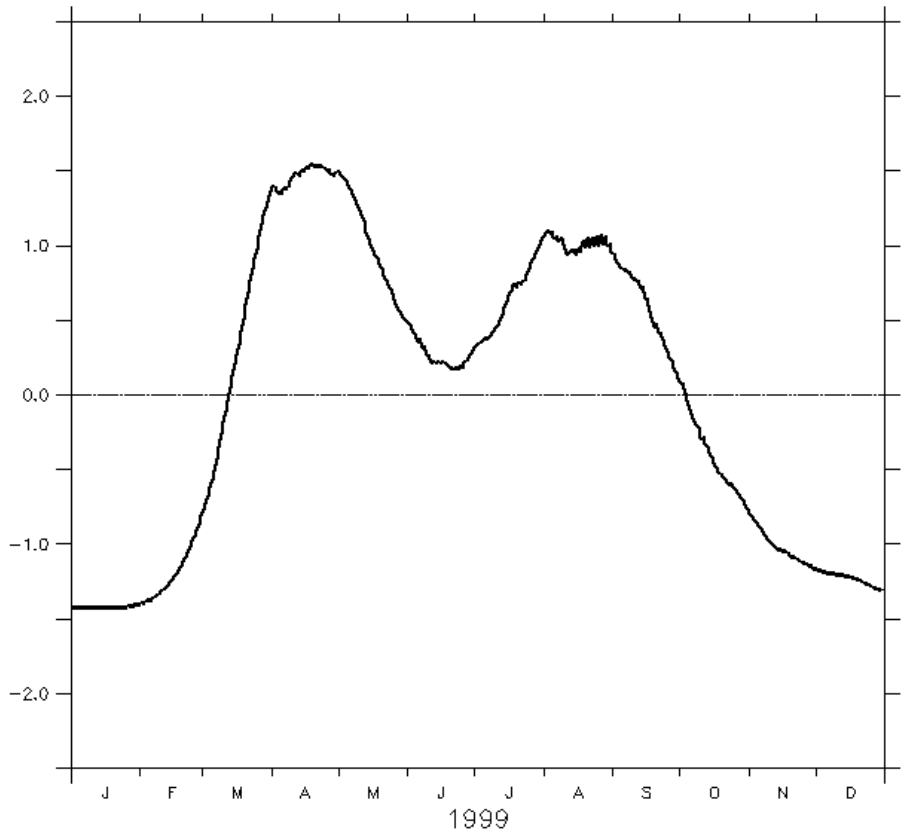
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS

Simulated - Migration ~51% EOF 1 TAF 1



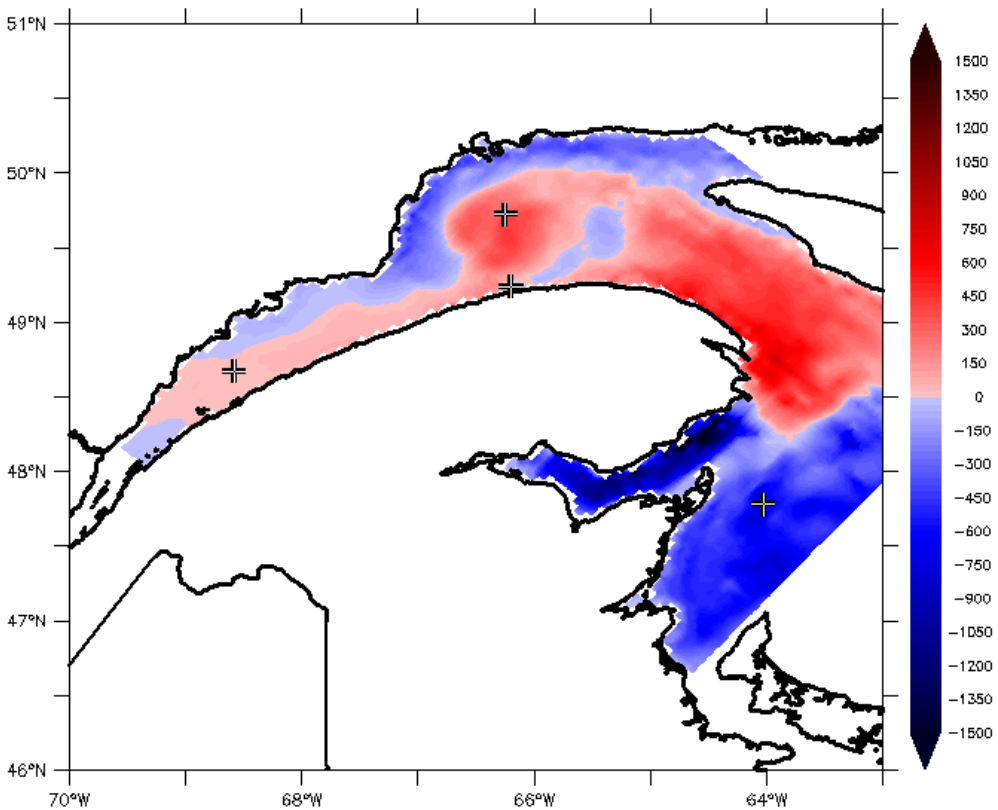
females.m^{-2}



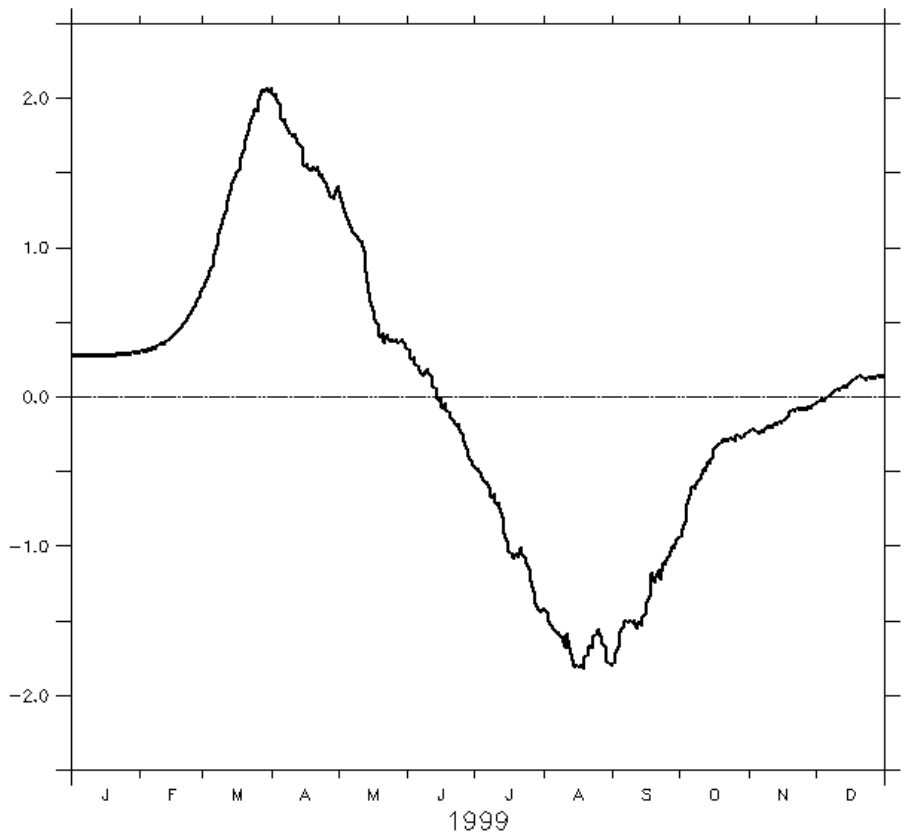
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS

Simulated - Migration ~19% EOF 2 TAF 2



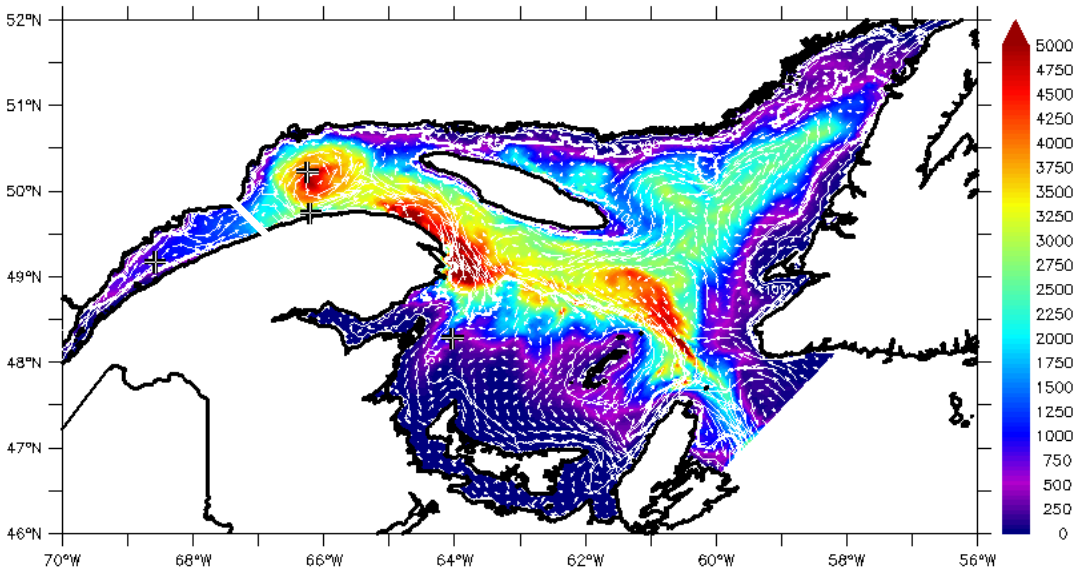
females.m^{-2}



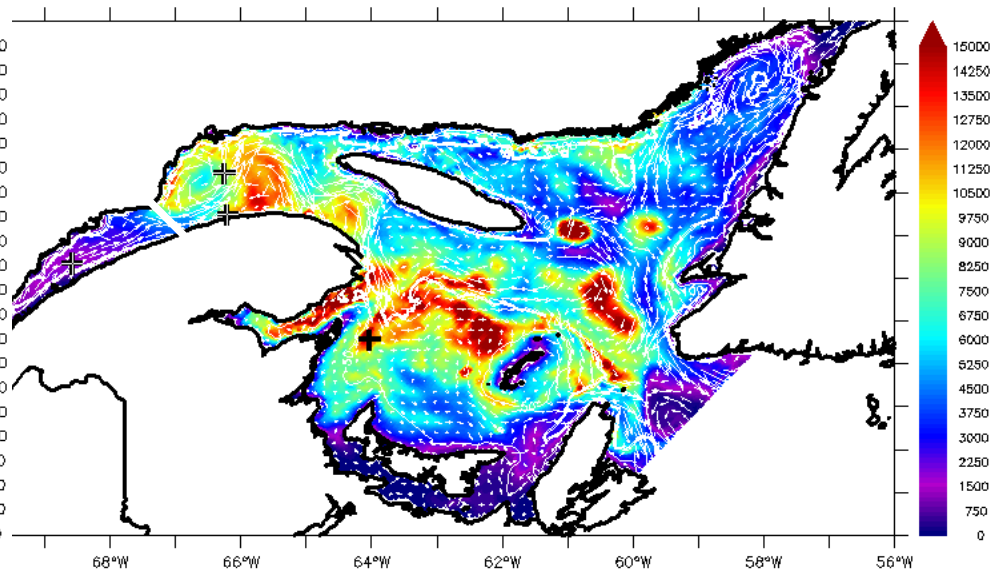
Interactions between the hydrodynamics and the population dynamics of *C.finmarchicus* in the Gulf of St. Lawrence

RESULTS

Simulated - Migration



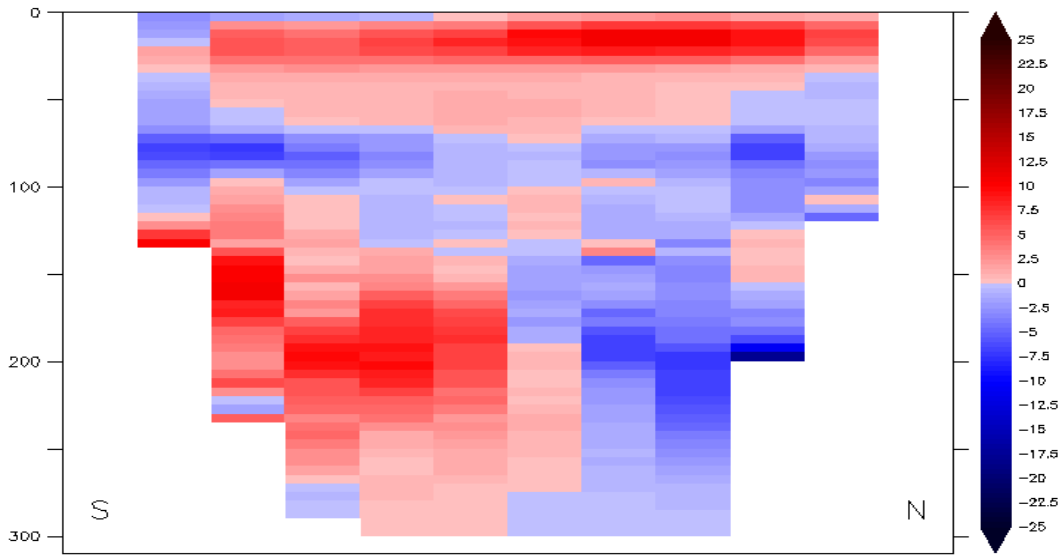
April 1999 # females.m^{-2}



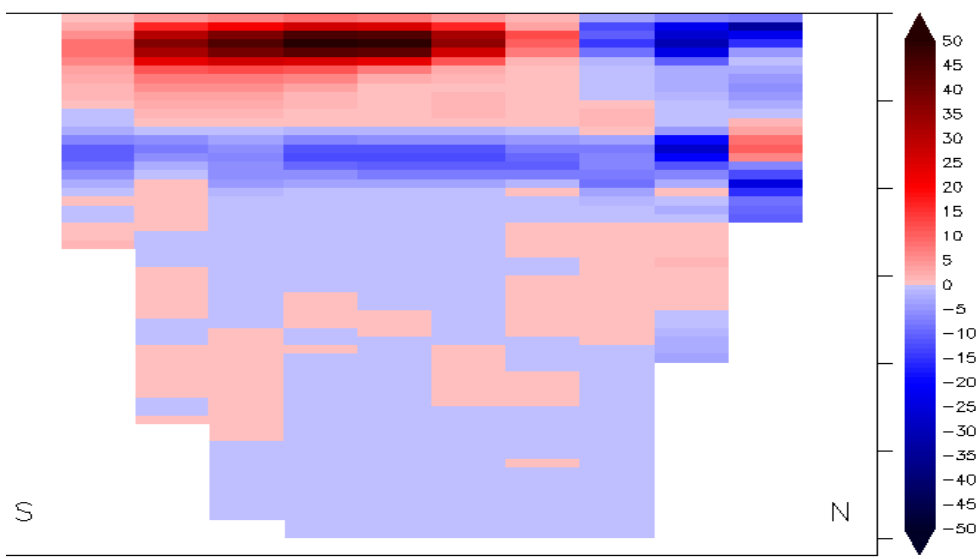
August 1999 # females.m^{-2}

RESULTS

Simulated - Migration



April 1999 # C4-5 & females.$m^{-2}.s^{-1}$



August 1999 # C4-5 & females.m^{-2}

CONCLUSION

- **Critical role of the swimming behaviour**
- **More mecanistic knowledge of the few key features of *C.finmarchicus* population dynamics is required:**
  - **Ontogenetic & nychtemeral migrations**
  - **Diapause** **Poster in Session 10, ID 3522**
  - **Mortality <--> Cannibalism** **Poster in Session 4, ID 3543**

THANK YOU

- *In situ* data were provided by the Atlantic Zonal Monitoring Program (AZMP) of DFO Canada

- This work was partially funded by a NSERC grant to F.M.

- Attendance to this symposium was partly supported by the organisation of the 4th Zoooplakton Production Symposium

- Data analysis and visualization were performed with the Ferret program (NOAA – PMEL)