

Origins of the *Calanus* population on the Lofoten shelf as the main food source for cod larvae: combining particle tracking and stable isotopes analysis

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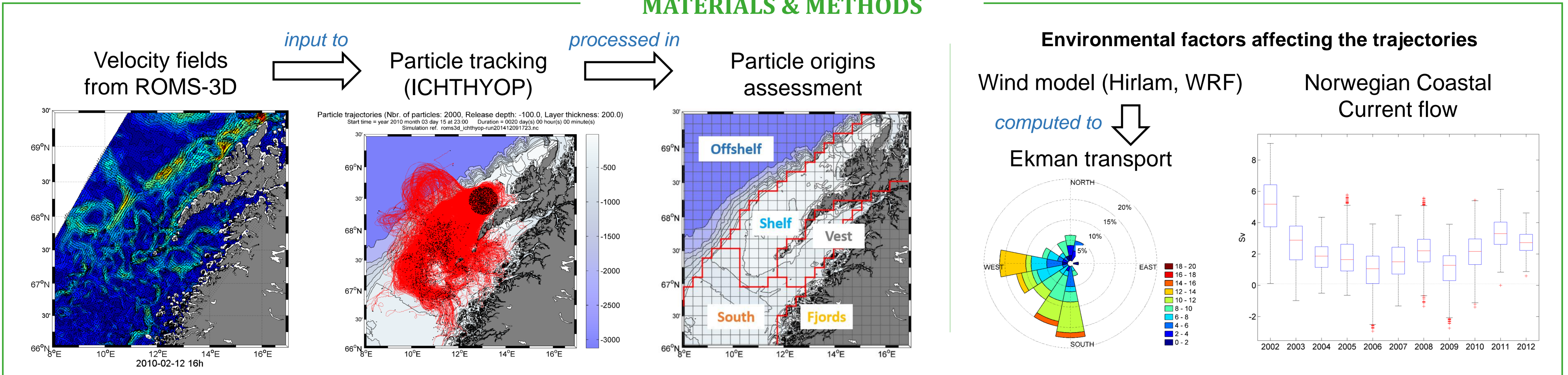
ICES/PICES 6th Zooplankton Production Symposium

INTRODUCTION

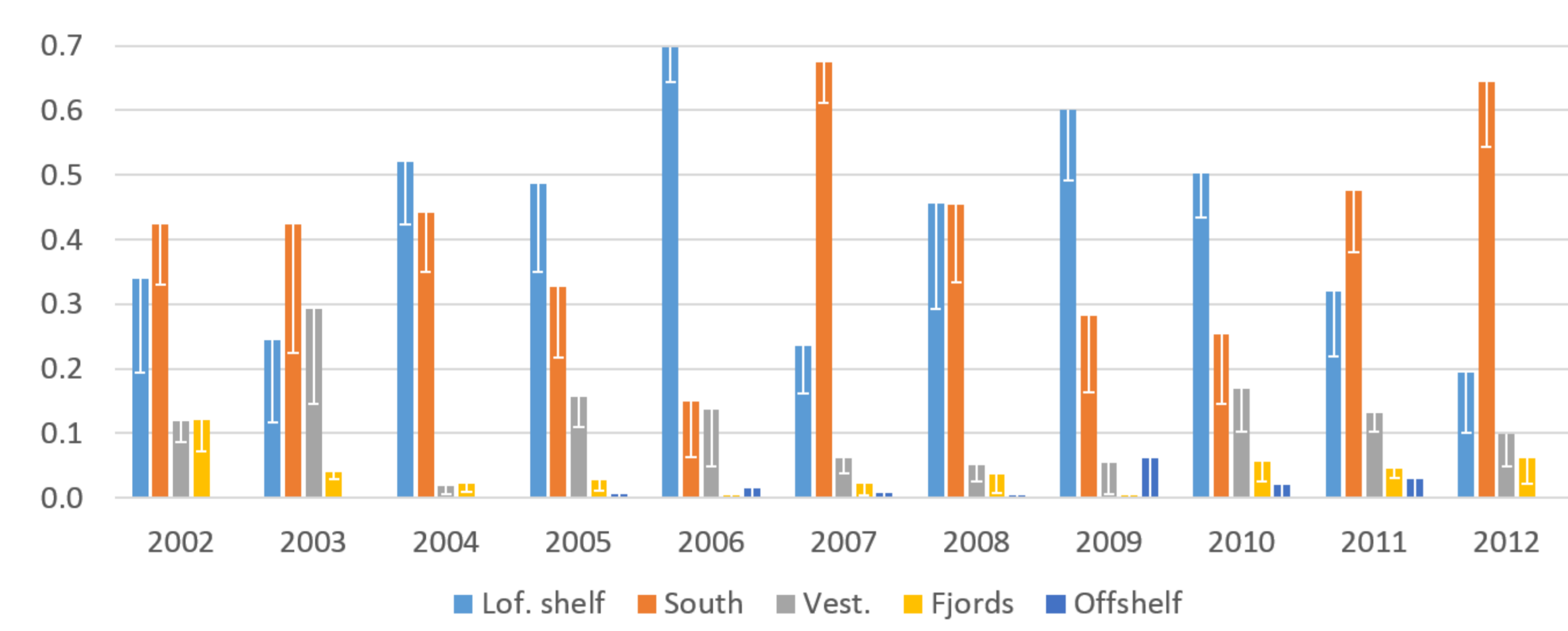
The Lofoten shelf is an important spawning ground for several commercial species and especially the Arcto-Norwegian Cod [1]. This area shows complex hydrographic features leading to gather cod larvae and nauplii of *Calanus*. How cod larvae hatching will spatially and

temporally match with the peak of nauplii abundance will shape the size of juvenile cod stock for the next year. In early spring, *Calanus* nauplii population is determined by the number of adult females overwintering onto the shelf or advected from the adjacent fjords and the offshore region.

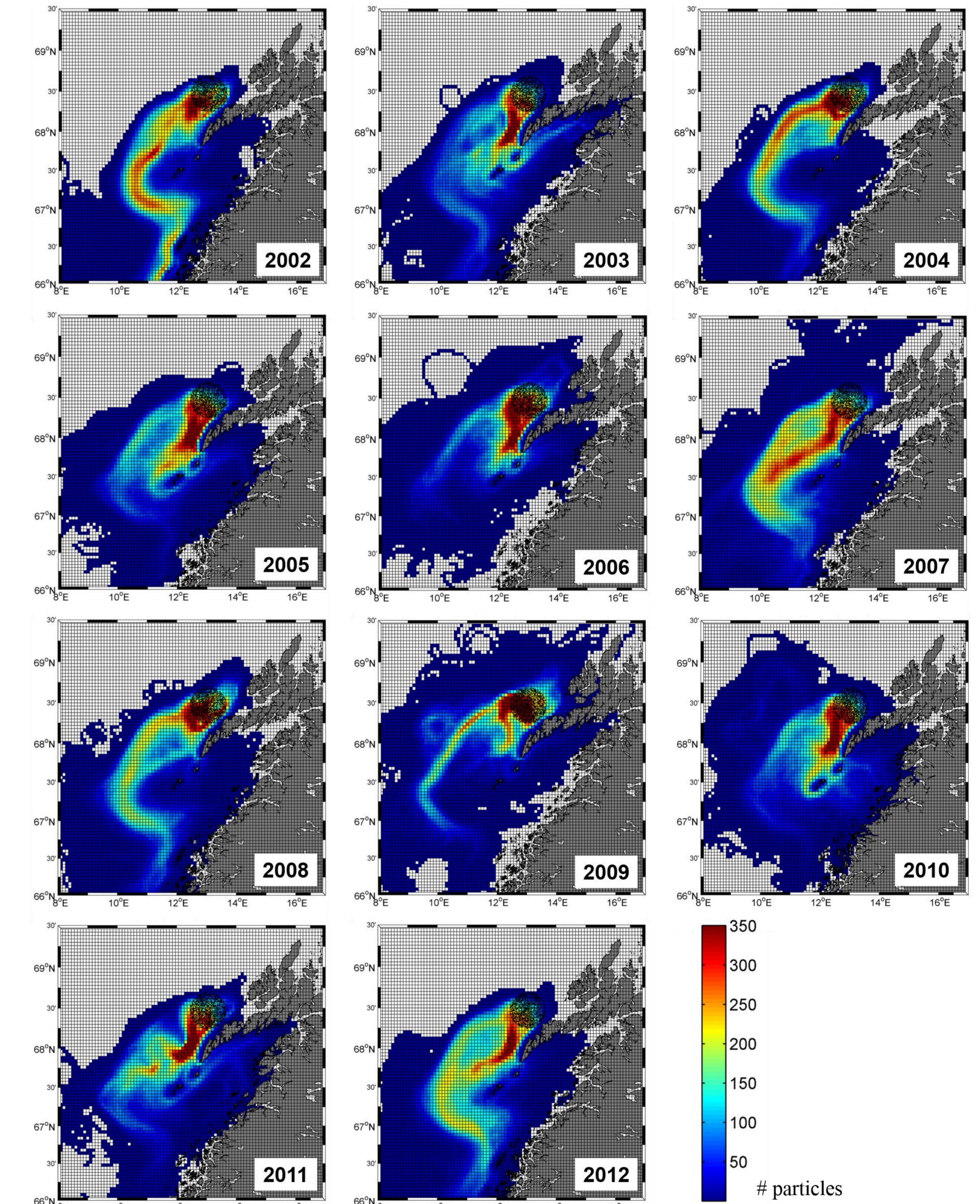
MATERIALS & METHODS



Origins of particles (% of particles originated from the areas defined above)

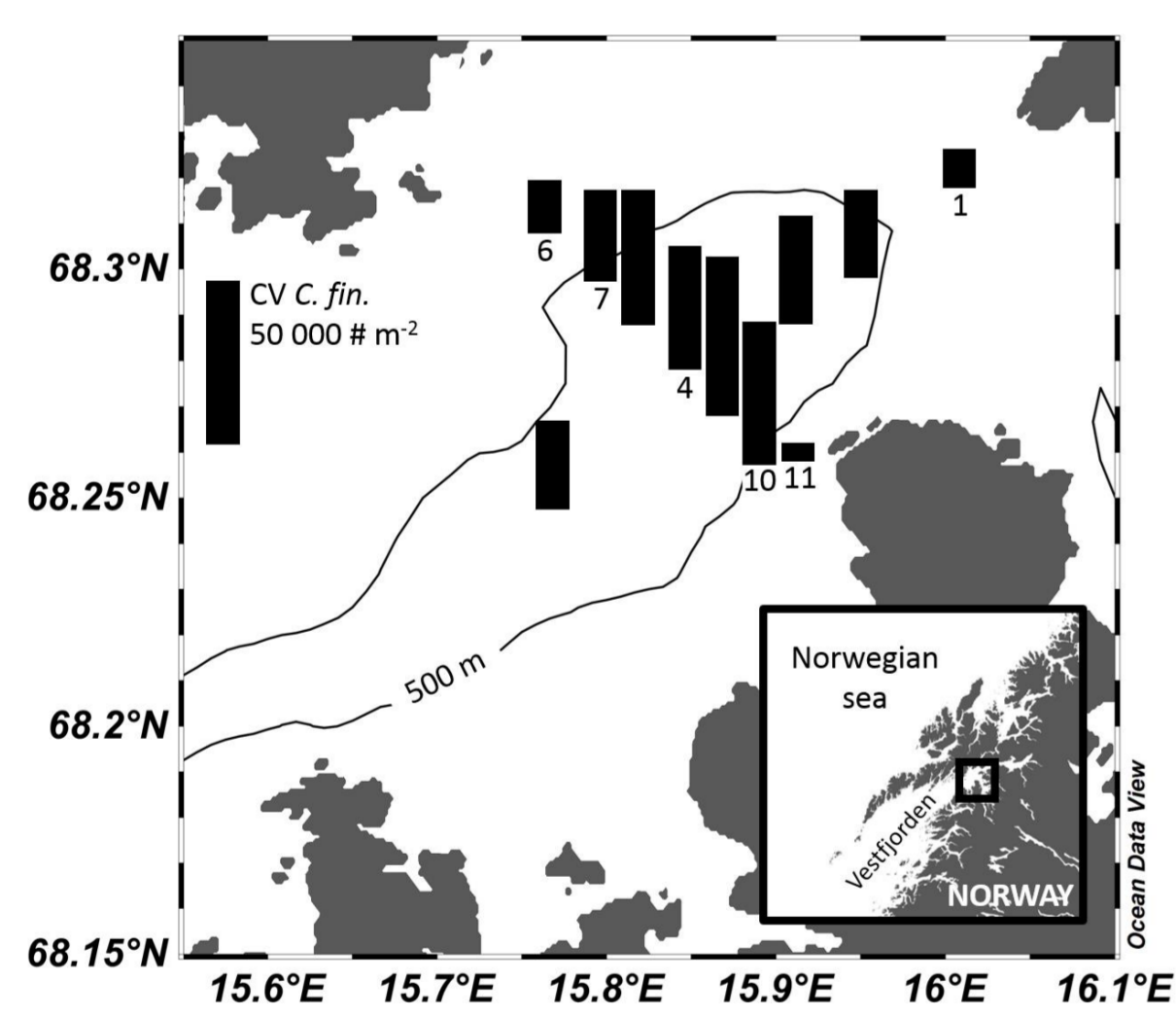


Particle trajectory probability (20 days backward simulations)

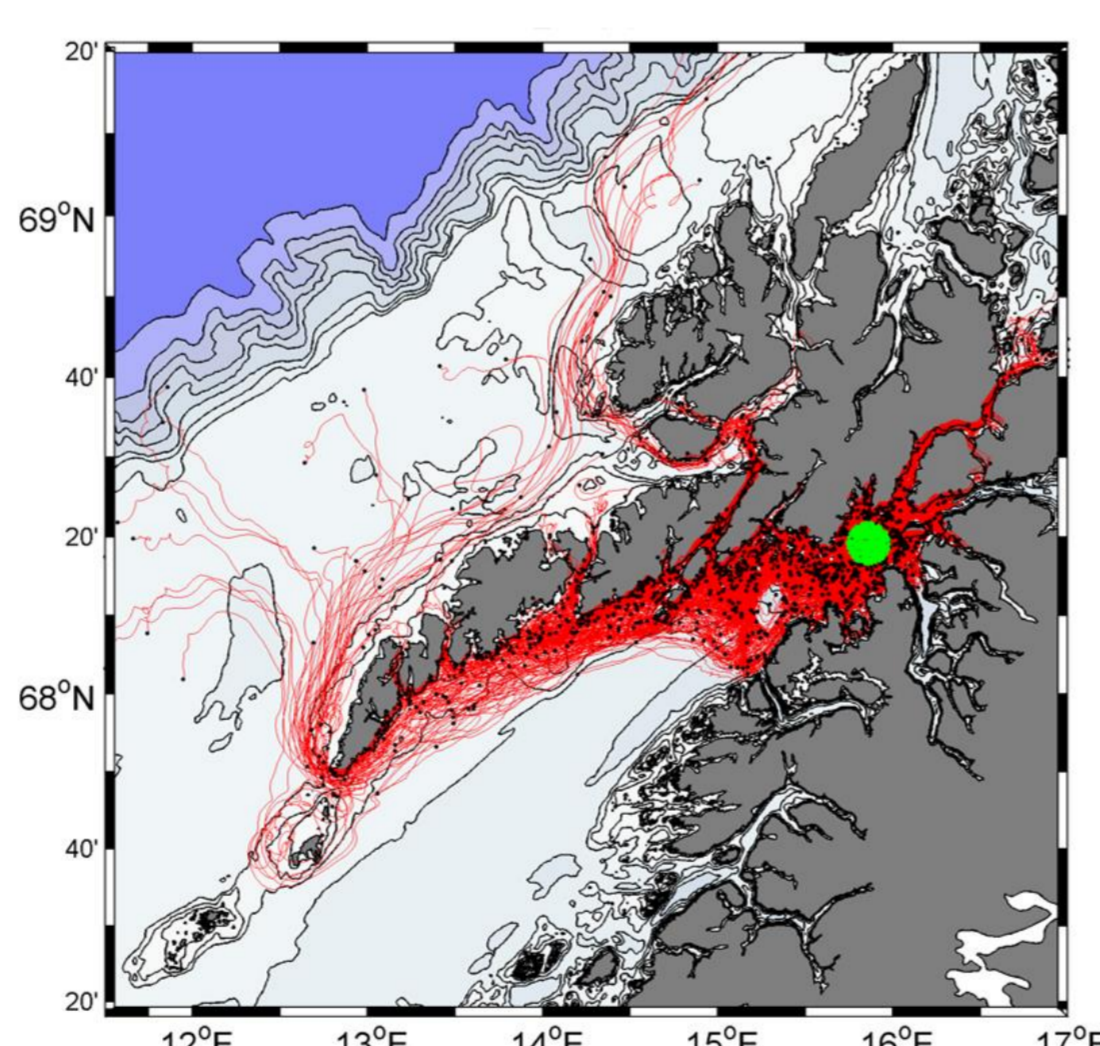


CASE STUDY: Inner part of Vestfjorden

Overwintering *Calanus* population (Vestfjorden, January 2015) [3]



Modeled nauplii advection (upper 50 m, 20 days)



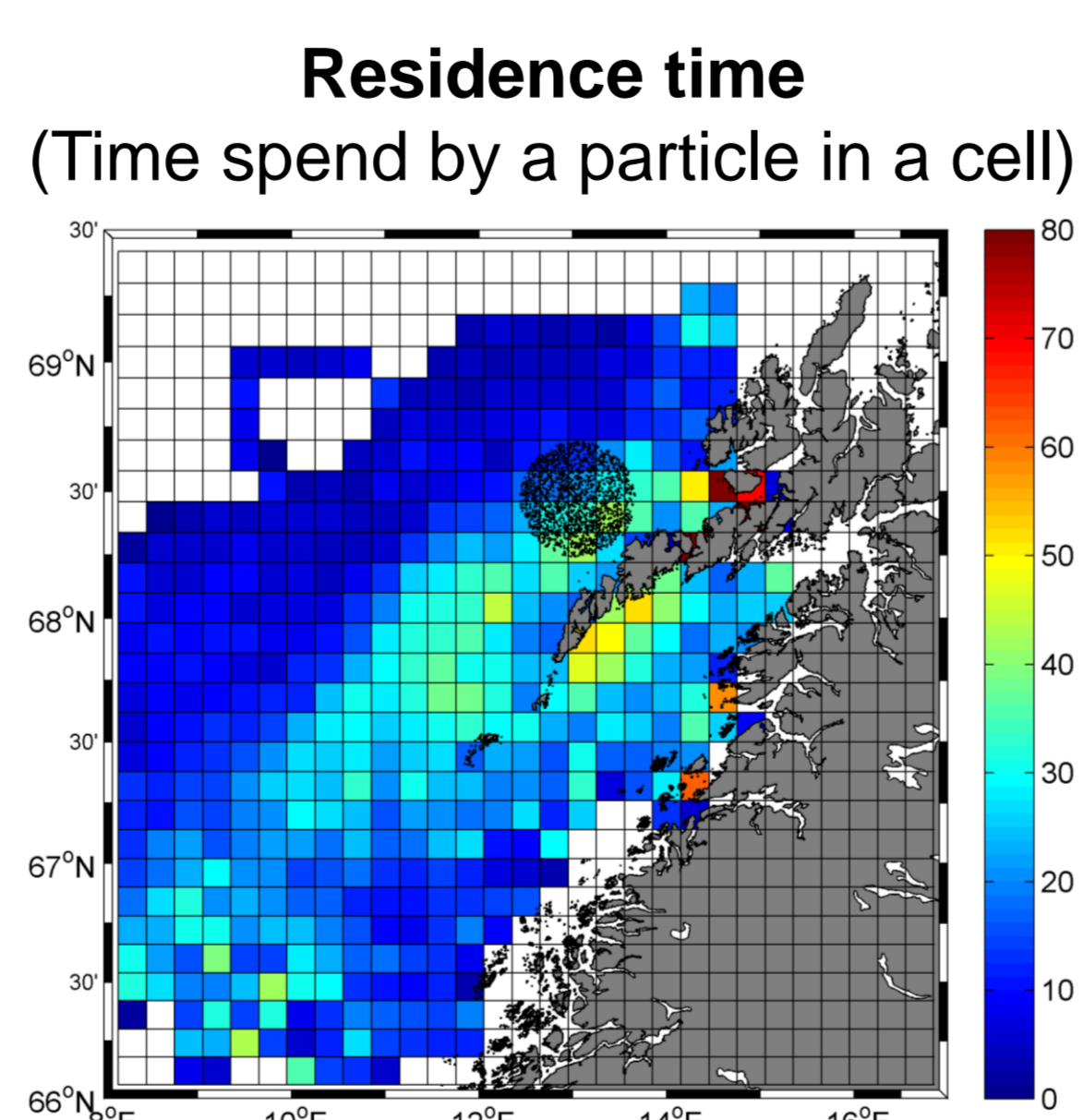
Impact on cold larvae survival:

- New food input in addition to offshore source
- Delayed in time, compared to offshore source, resulting in an extended period of nauplii presence in cod spawning ground

USE AND POSSIBILITIES

Get information on:

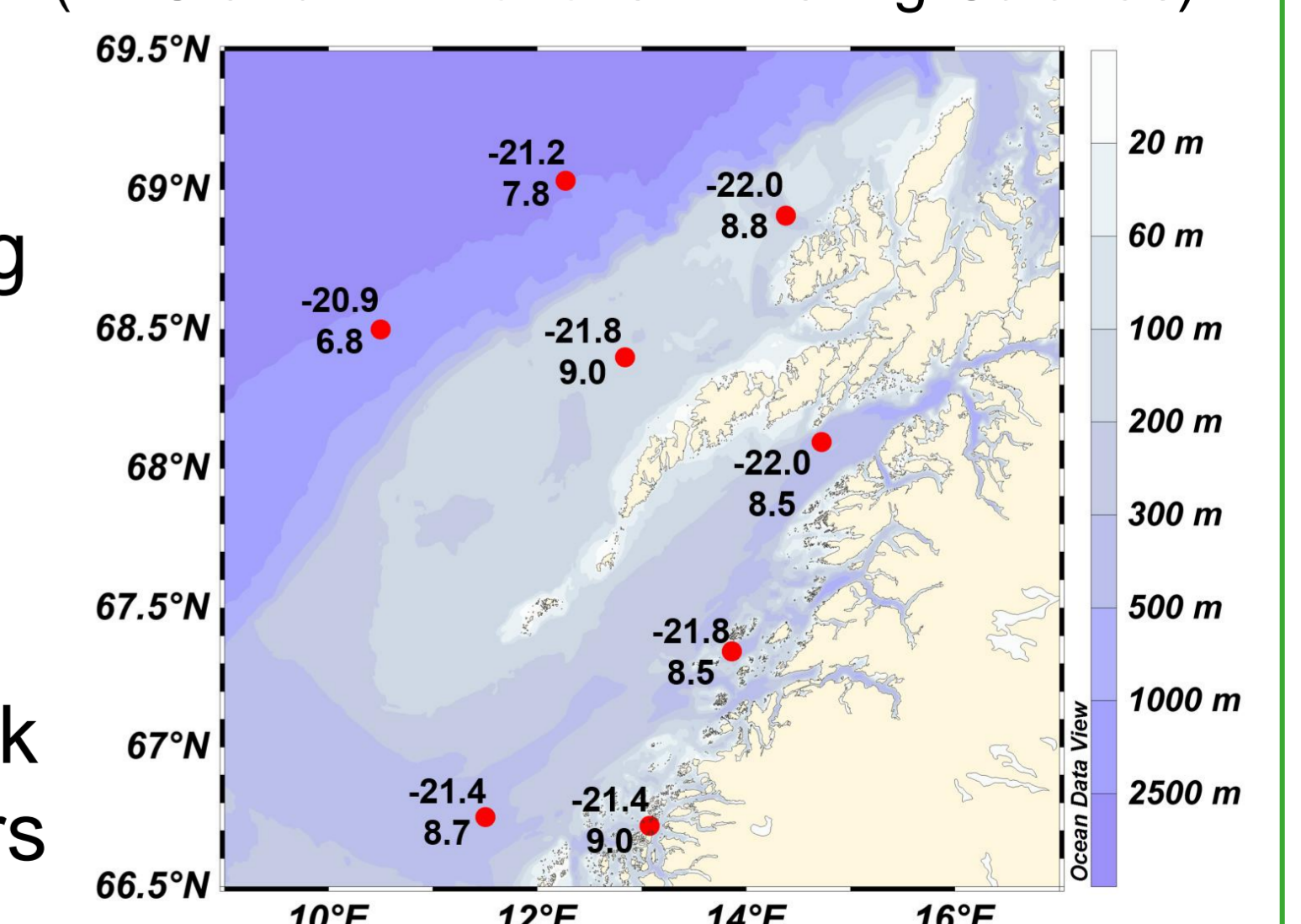
- Inter-annual variability in advection patterns [2]
- Relative contribution of the potential sources (offshore, fjords,...)
- Residence time in specific areas (e.g. fish spawning ground)



Further:

- Validating particle tracking results with isotopic analysis
- Coupling with *Calanus* field data
- Infer cod larvae food stock from environmental factors

Stable isotope signatures ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of overwintering *Calanus*)



References: [1] Ottersen, G., Bogstad, B., Yaragina, N. A., Stige, L. C., Vikebø, F. B. and Dalpadado, P. (2014) A review of early life history dynamics of Barents Sea cod (*Gadus morhua*). ICES Journal of Marine Science: Journal du Conseil, 71, 2064-2087.
[2] Espinasse B., Tverberg V., Nøst O.A., Basedow S., Albersten J., Skardhamar J. and Eiane K. (Submitted) Mechanisms regulating inter-annual variability in zooplankton advection over the Lofoten shelf, implication for recruitment success of cod larvae. Fisheries Oceanography
[3] Espinasse, B., Basedow, S., Anders, O., Tverberg, V., Eiane K. (2016) Evidence of a major *Calanus finmarchicus* overwintering population inside a deep fjord in northern Norway and implications for cod larvae recruitment success. Journal of Plankton research, 10.1093/plankt/fbw024



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