ICES CM 2015/C:17

Integrated understanding of initial conditions of early life stages using integrated ecosystem survey data

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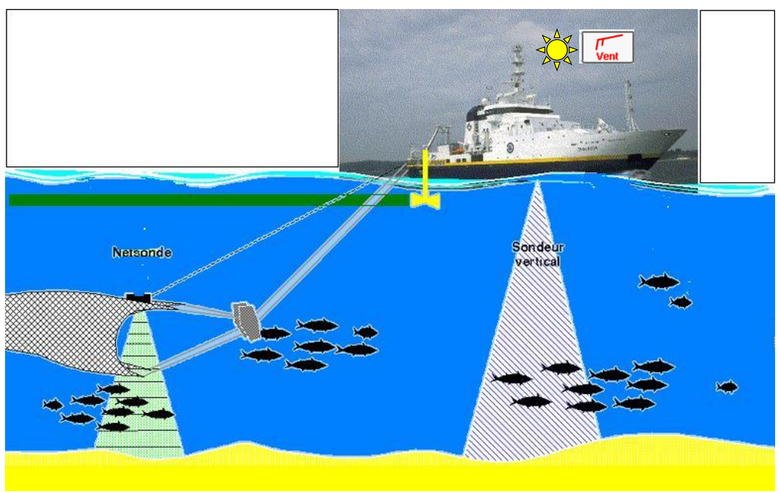
Data on anchovy in its ecosystem in the Bay fo Biscay, 2000 – 2013

PELGAS integrated pelagic ecosystem surveys



Simultaneous sampling along transects during the day of :

+ spawning adults using acoustics (the fish schools during day-time and disperses at night

+ their eggs using CUFES (5m)

+ surface (5m) hydrological conditions and meteorological conditions

Anchovy forms schools during day-time and disperses at night near surface. Spawning occurs at night. Eggs are located at sub-surface (0-15m).

Question : How accurate are day-time adult and egg distributions in characterizing spawning habitats ?

1. Methodology to compare maps

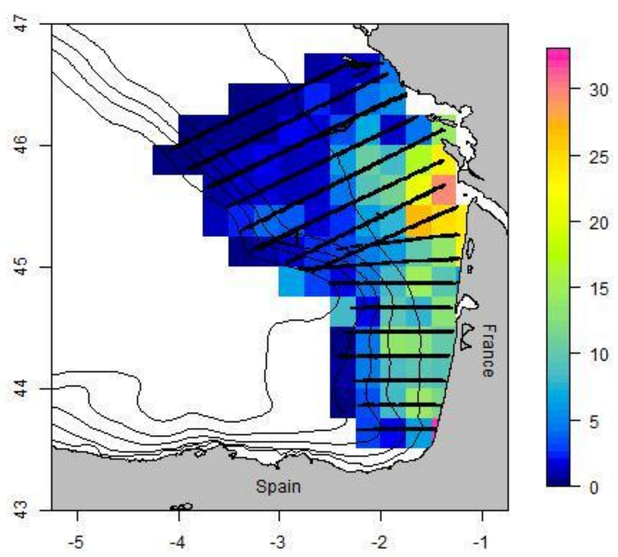
Differences between fish and egg distributions are characterized

using gravity centres (CG) and inertia

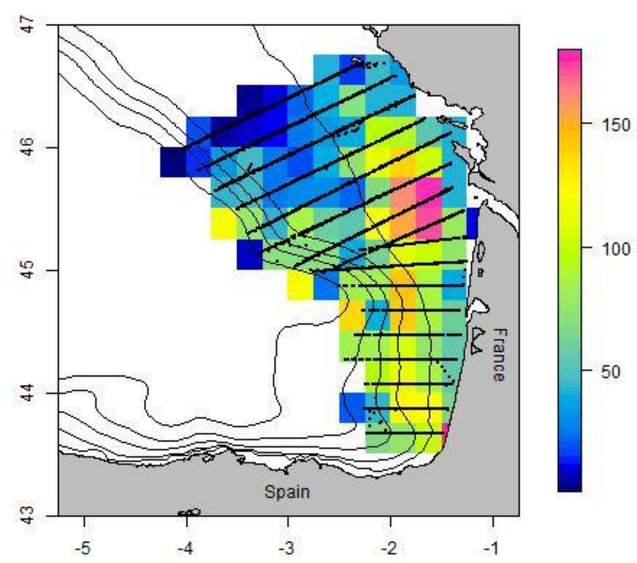
Overlaps between distributions are characterized

using the geostatistical Global Index of Collation (GIC)

Average distributions all years pooled (2000-2013)



Anchovy biomass (tonnes nm^{-2})



Anchovy egg counts (Nb $10m^{-3}$)

2. Differences between fish and egg distributions

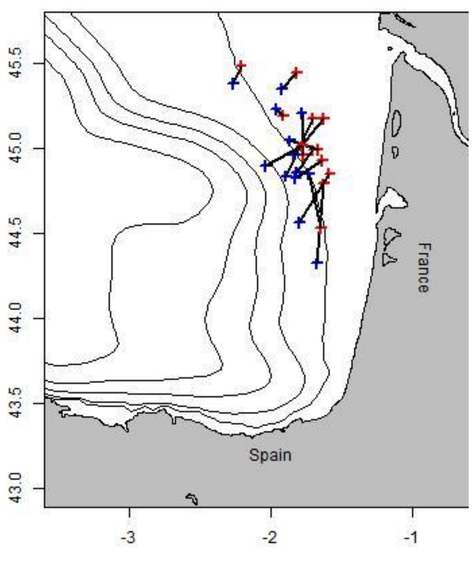
The distributions of the adult fish are more coastal and less dispersed than that of their spawned eggs

In comparison to the fish, the eggs are shifted to the SW and from 12 n.m. (on average, green)

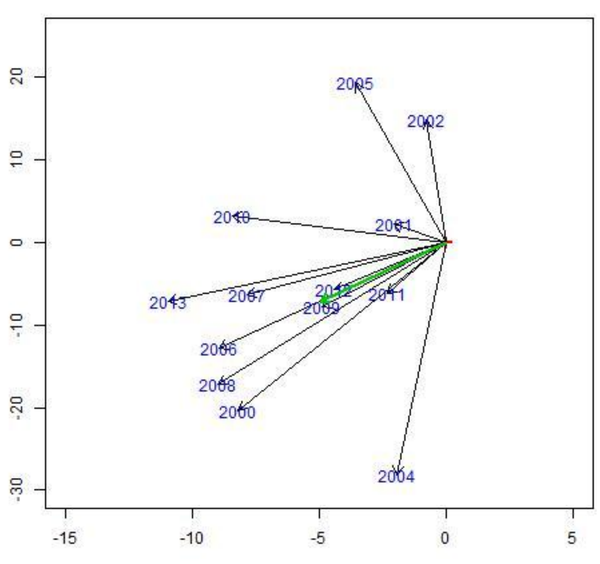
The variation across years in CGs and inertia of the fish are correlated with that of the eggs (not shown)

Variation across years in overlaps depend most on distance between CGs (not shown)

Shift in distributions between fish and eggs



CG by year for the fish (red) and the eggs (blue)



Direction and distance between the CGs

3. Working hypotheses to explain differences in distributions

Fish schools at surface in the acoustic blind zone (controled by lateral sounder)

Fish movement between day and night

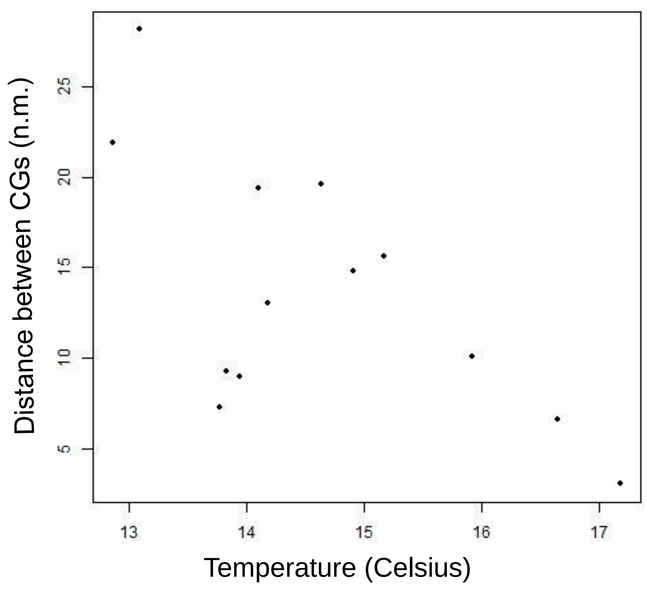
Spatial variation in fish fecundity

Environmental factors : Temperature and duration of egg development

Wind and advection/ diffusion

4. Testing relationship with environmental conditions

Distance between CGs correlates best with Temperature



5. Discussion

Maps of adult fish and their eggs are related but do not match exactly

Understanding their differences informs on major processes acting on early life stages

Would potential fecundity maps derived fom fish maps compare better with egg maps ?

Can differences between maps serve to construct a quality index of the survey biomass estimate?

References: Simmonds, Mc Lennan 2005 Fisheries Acoustics, Oxford. Checkley et al. 1997 A continuous underway fish egg sampler. Fish. Oceanogr. 6: 58-73. Woillez et al. 2009 Notes on survey-based spatial indicators for monitoring fish populations. Aquat. Living Resour. 22: 155-164. Motos et al. 2000 Vertical distribution of anchovy eggs and field observations of incubation temperature. Ozeanografika 3: 253-272.