

Oceanographic conditions and Congo River as drivers for *Sardinella* recruitment off western Africa

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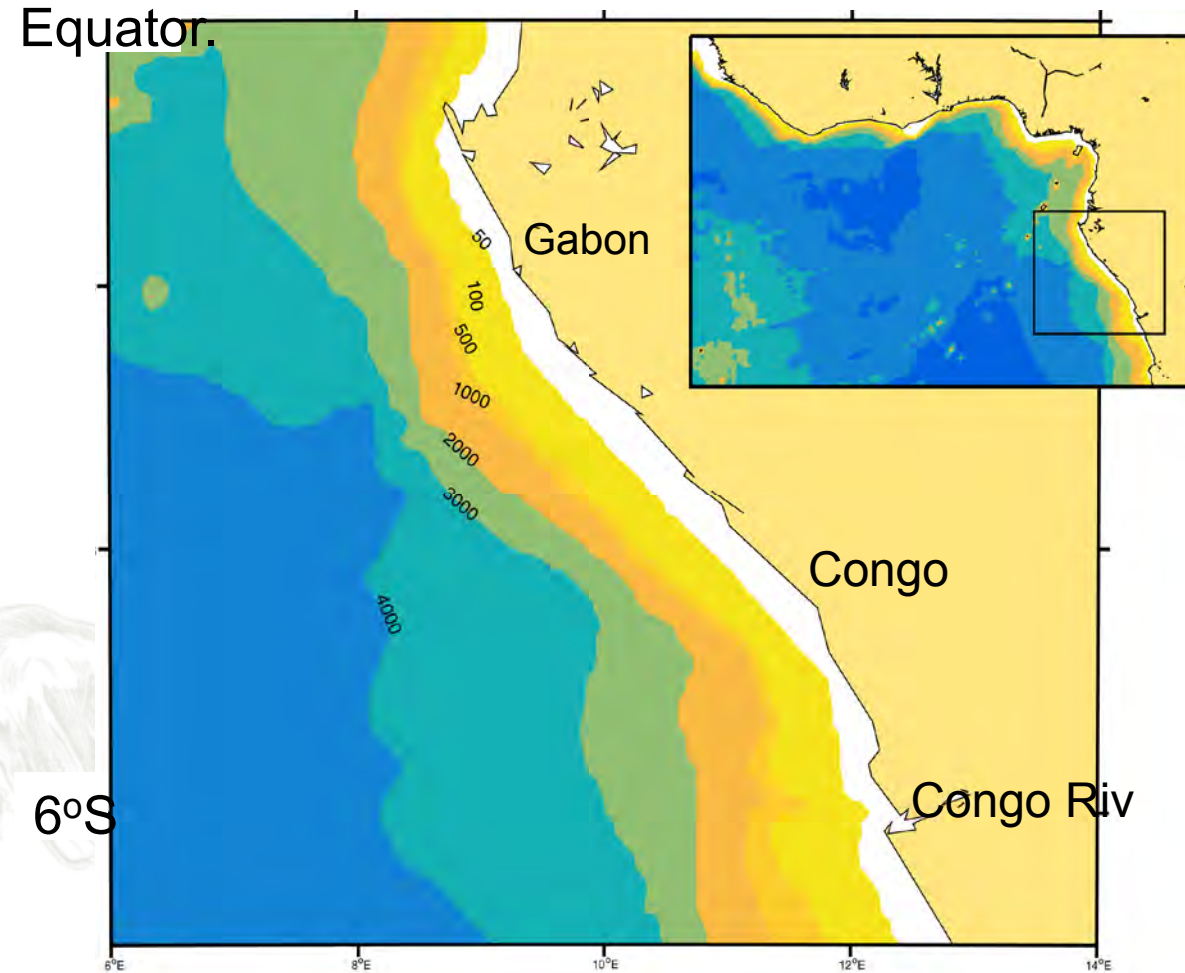
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EAF-Nansen Project

Sardinella survey: Congo - Gabon

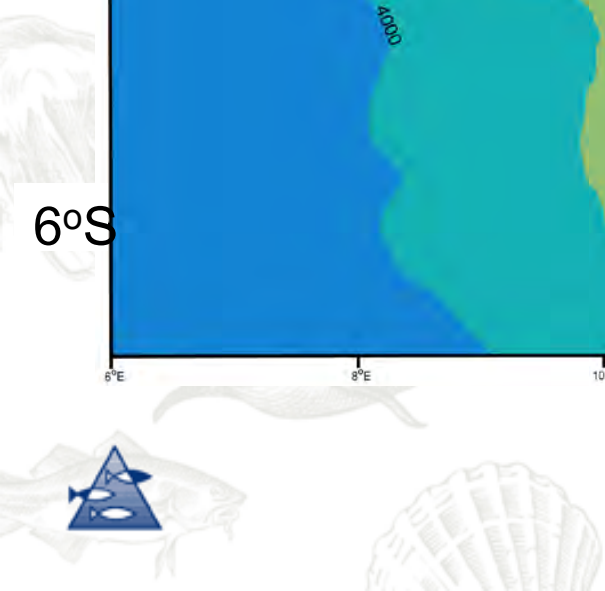


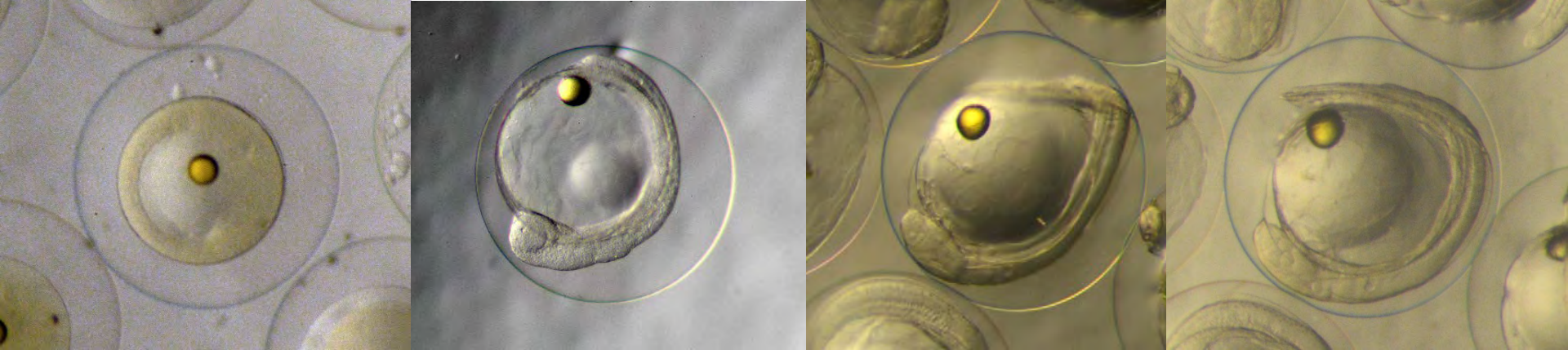
2014: May-June

2016: Apr-May

Data collected:

- Sardinella*:
egg, larvae, trawling,
acoustics
- Nutrients
- Zooplankton
- Physics: CTD/ADCP





Length at hatching 2.5 mm
Egg hatching time ~24h at 29°C
(Ditty et al. Gulf of Mexico),
Growth; roughly 1 mm day⁻¹ (Litt.)

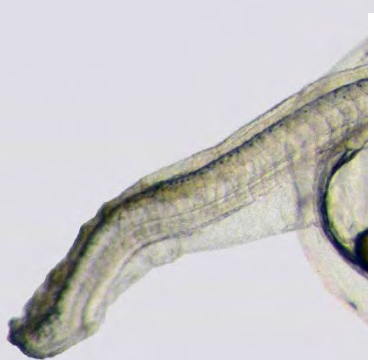
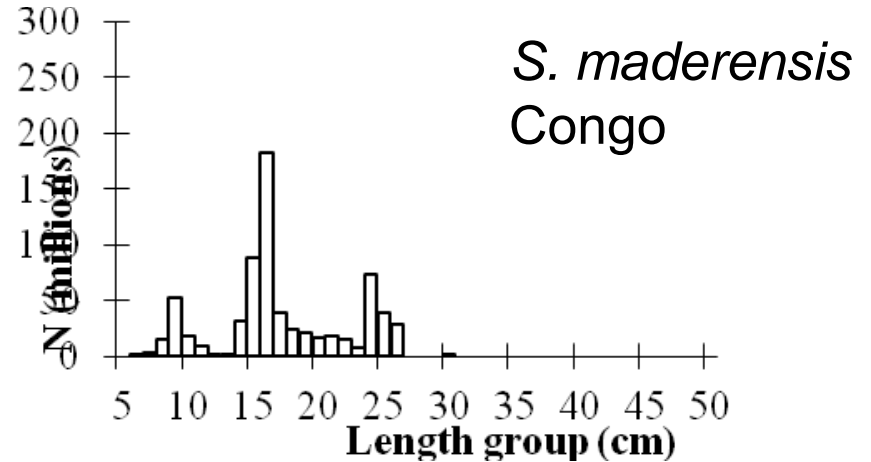
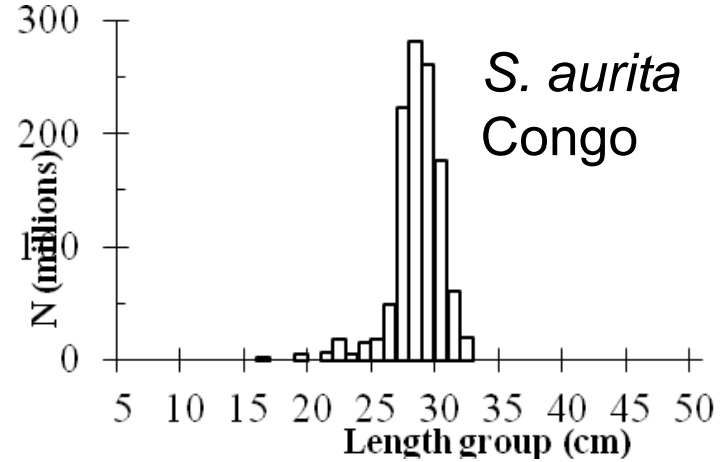
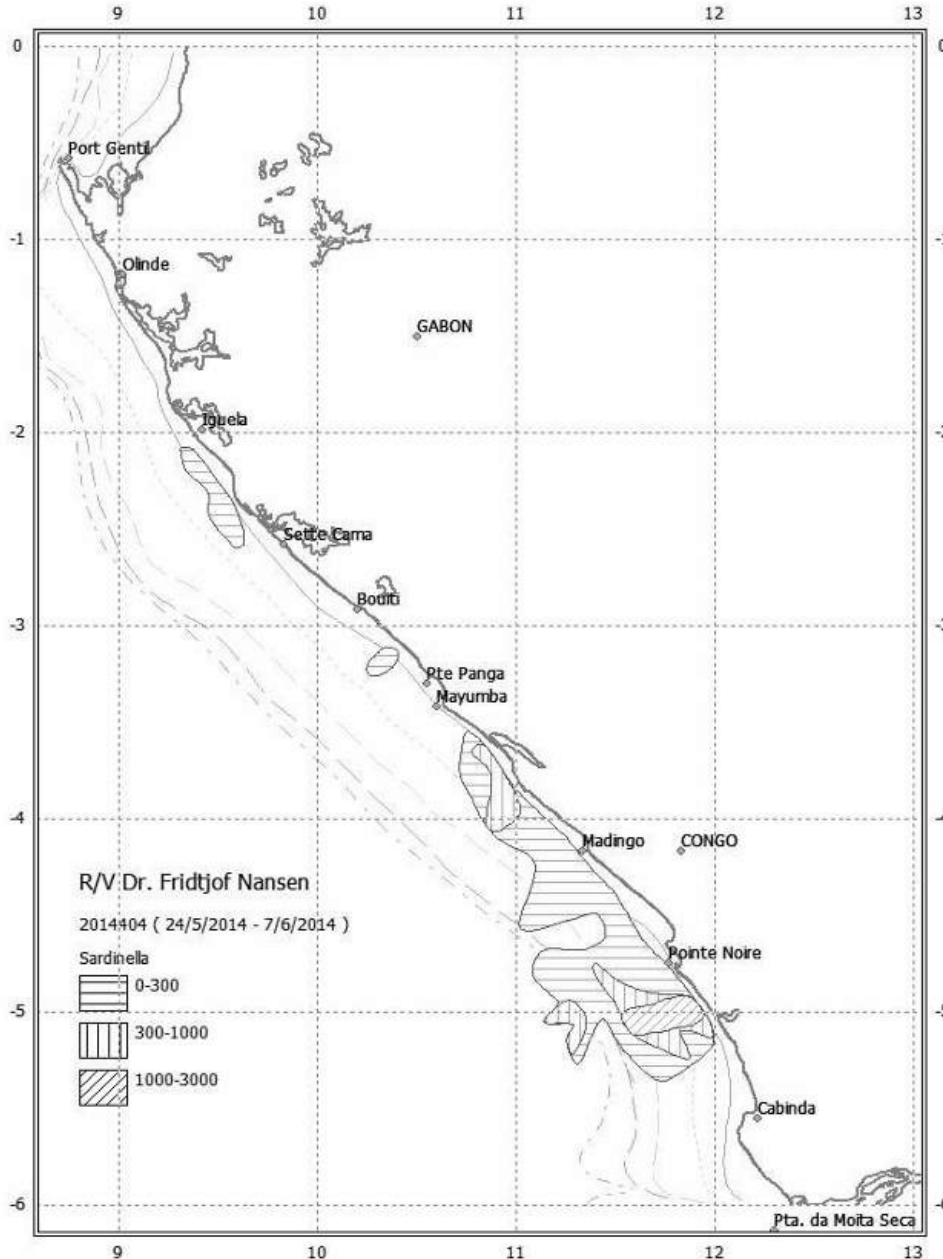


Photo: tor.magne.ensrud@imr.no

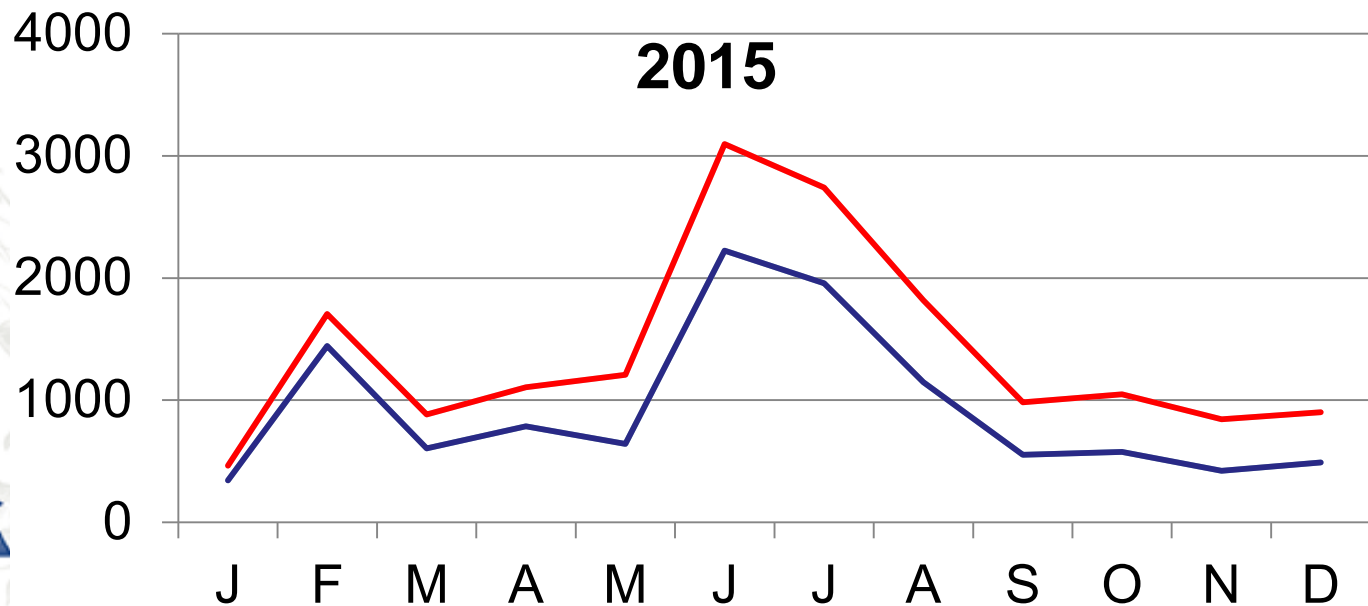
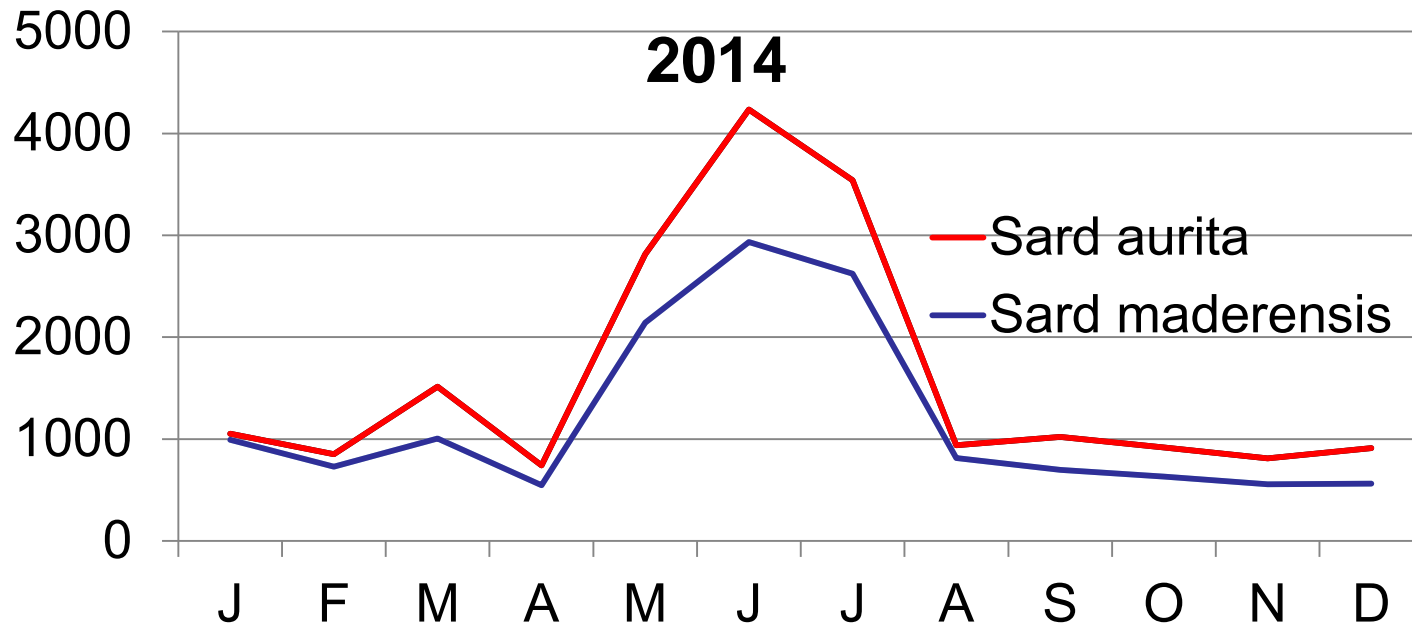
Sardinella distribution: Congo - Gabon



Sardinella acoustic biomass
Gabon-Congo 236 000 tonnes.

S. aurita: 83% and *S. maderensis*: 17%

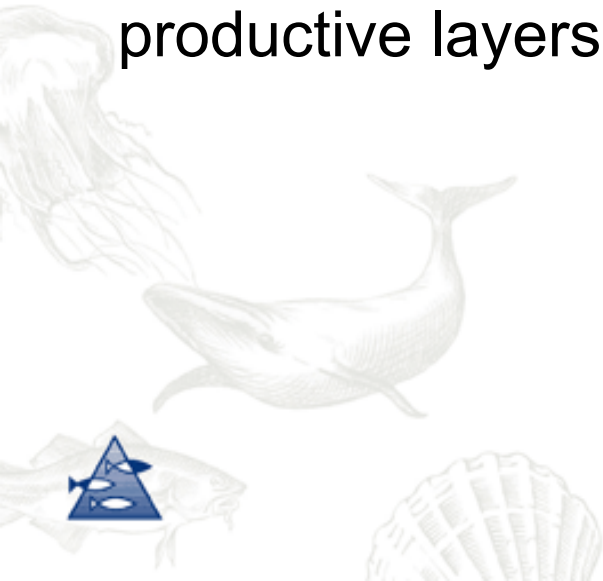
Sardinella catch: local fisheries



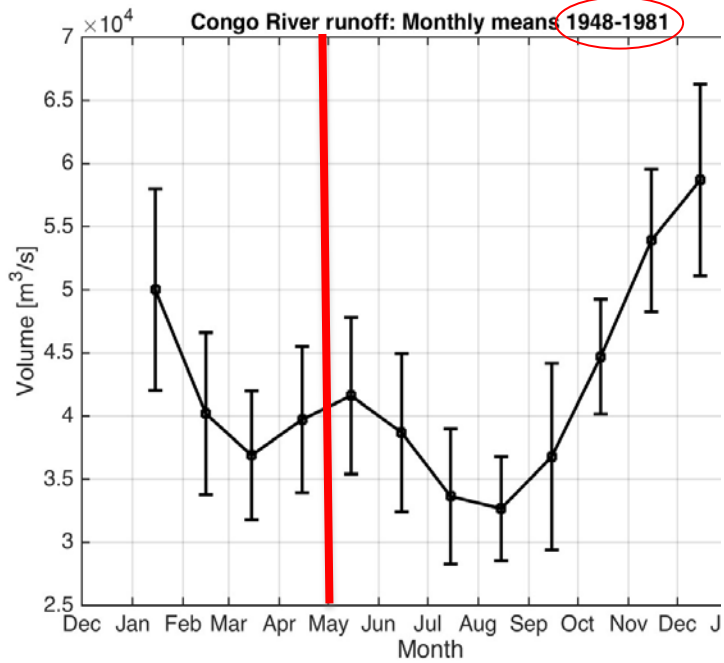
The main factors determining the functioning of the Congo-Gabon ecosystem;

- i) the freshwater discharge by the Congo River,
- ii) the large-scale ocean circulation
- iii) the regional wind field.

How important is the Congo River runoff compared to other drivers for providing nutrients to the productive layers?

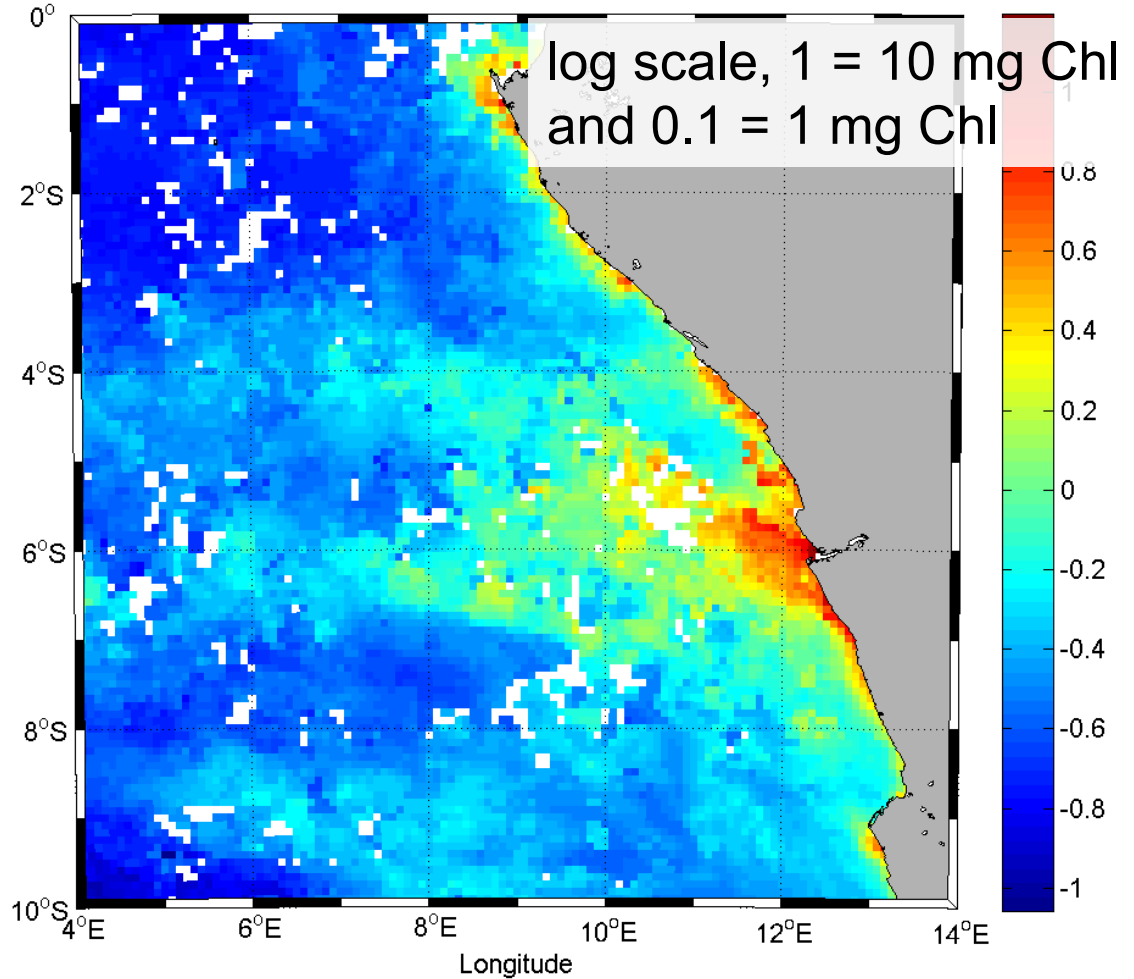


Freshwater runoff Congo River

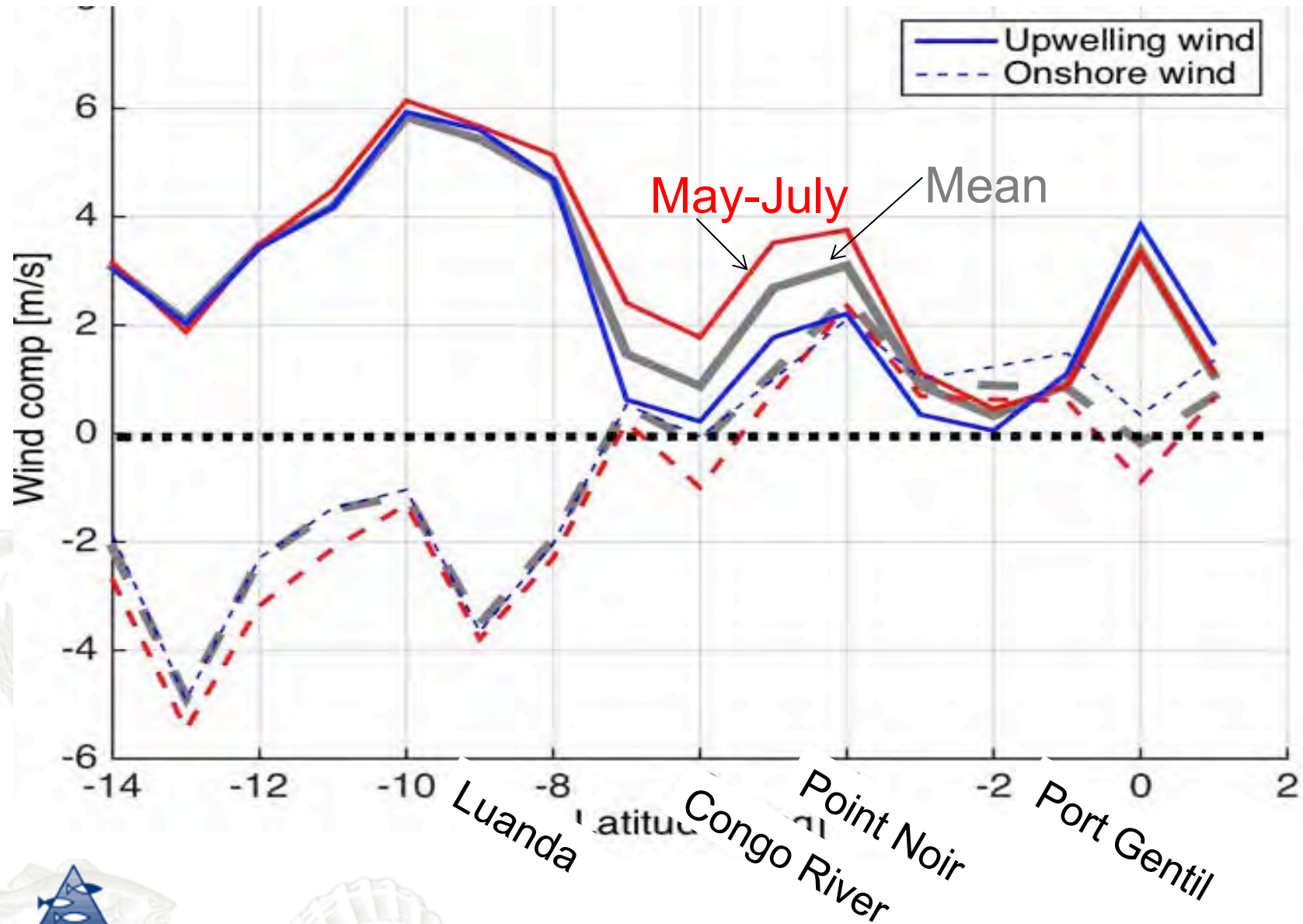


Annual mean 40.000 m^3/s
Kraakstad pers com.

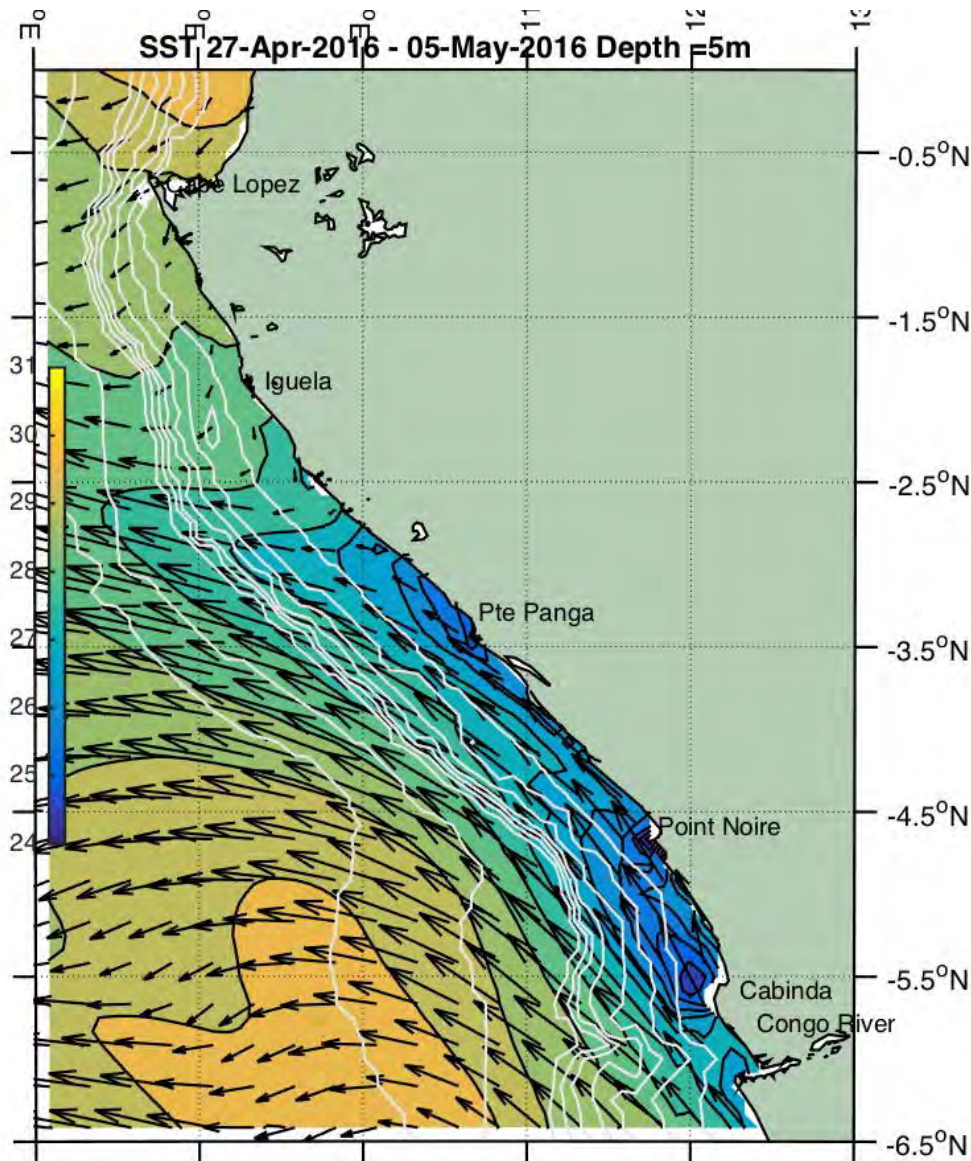
April 2016, logChl



Wind conditions: Upwelling – along coast component



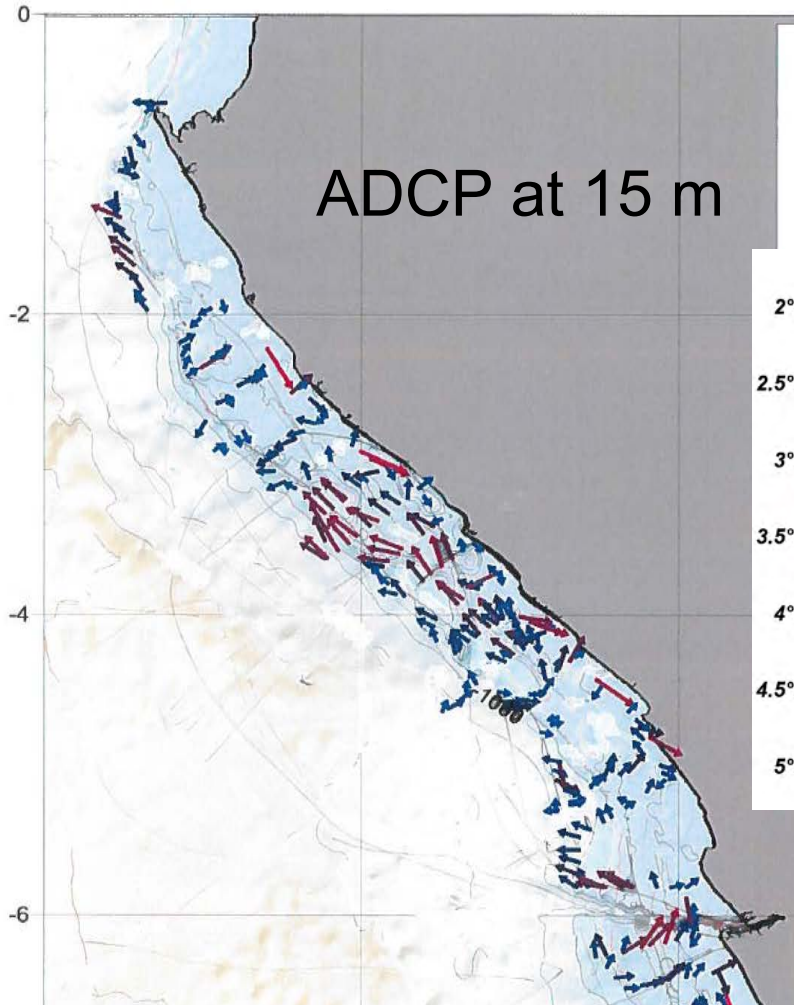
Mercator model: SST and currents (z=5m)



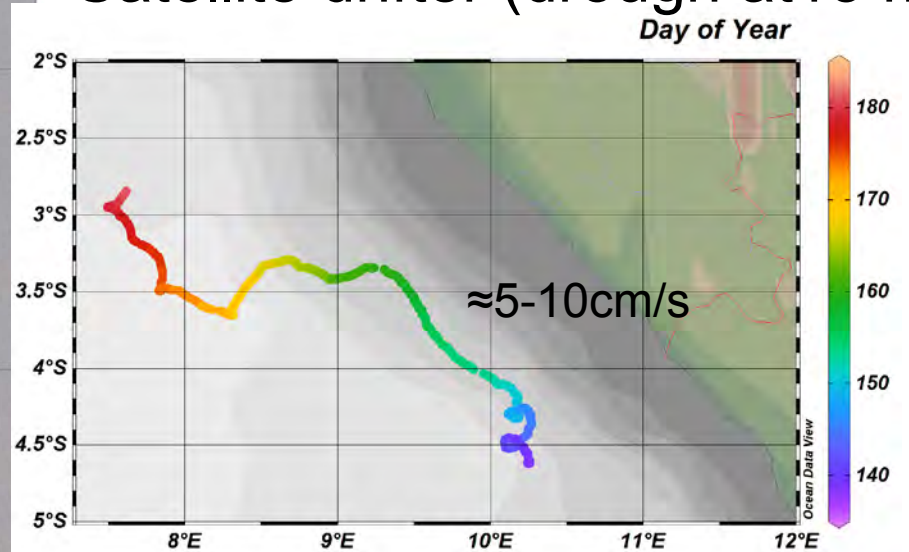
Temperature (in colour) and ocean currents (arrows) at 5 m (left) during 27. April to 5. May 2016. Data from the operational Mercator ocean analysis at $1/12^\circ$ resolution. Plot calculated from daily averaged fields.

<http://marine.copernicus.eu>.

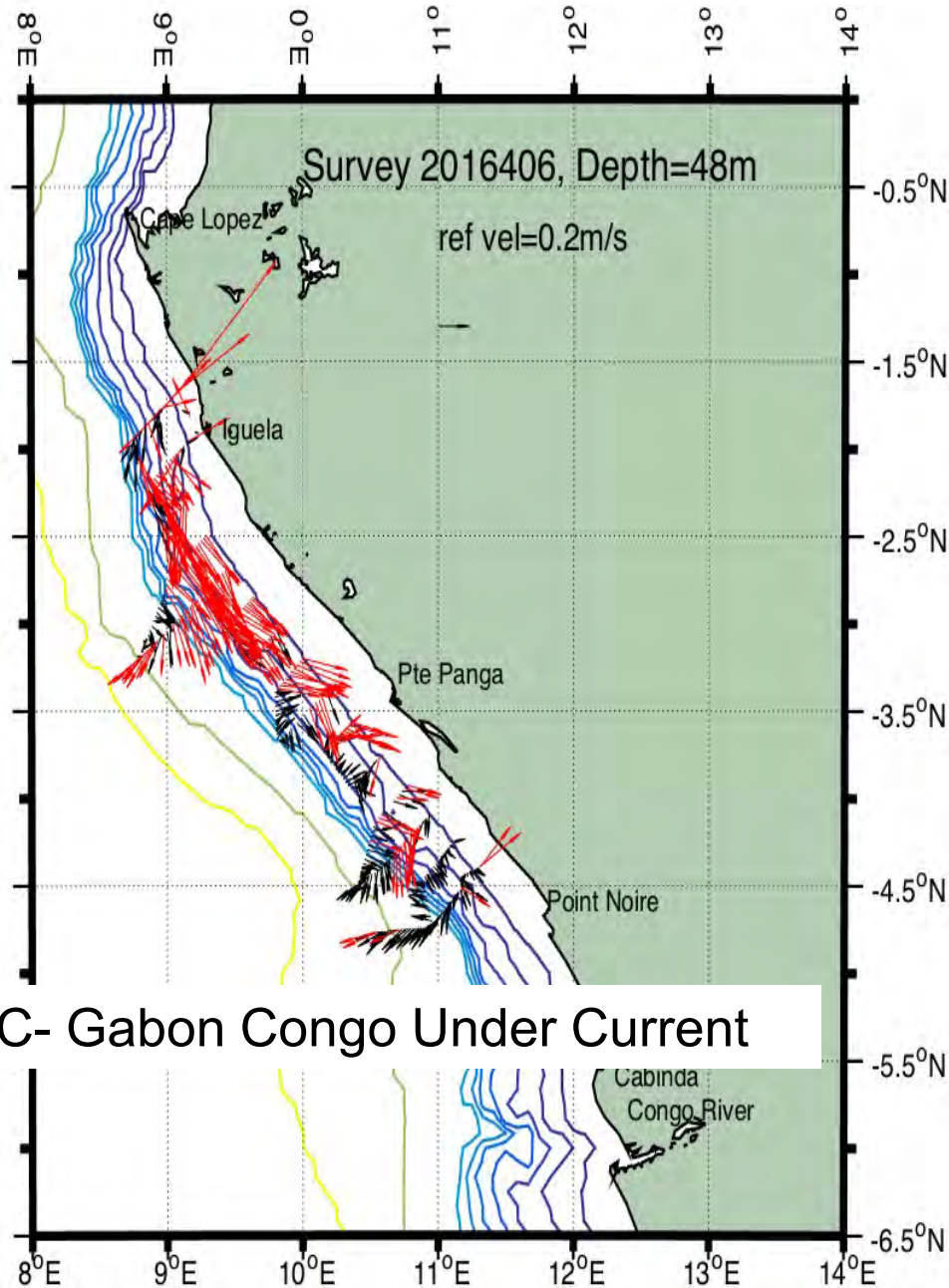
Near-surface currents (15m)



Satellite drifter (drough at 15 m)



Reversed Currents at depth (z=48m)



On the shelf the currents consistently flow toward southeast with a tendency for the strongest currents ~48 m. This confirm the GCUC (Wancogne and Piton, 1992).

GCUC- Gabon Congo Under Current

Summary

The data suggest that the northern outskirts of Congo River plume represents a hotspot for *S. aurita* reproduction, and that the spawning of *S. aurita* centred around May coincides with relative low Congo River outflow and the maximum of the Equatorial Under Current, the source for the Gabon-Congo Under Current.

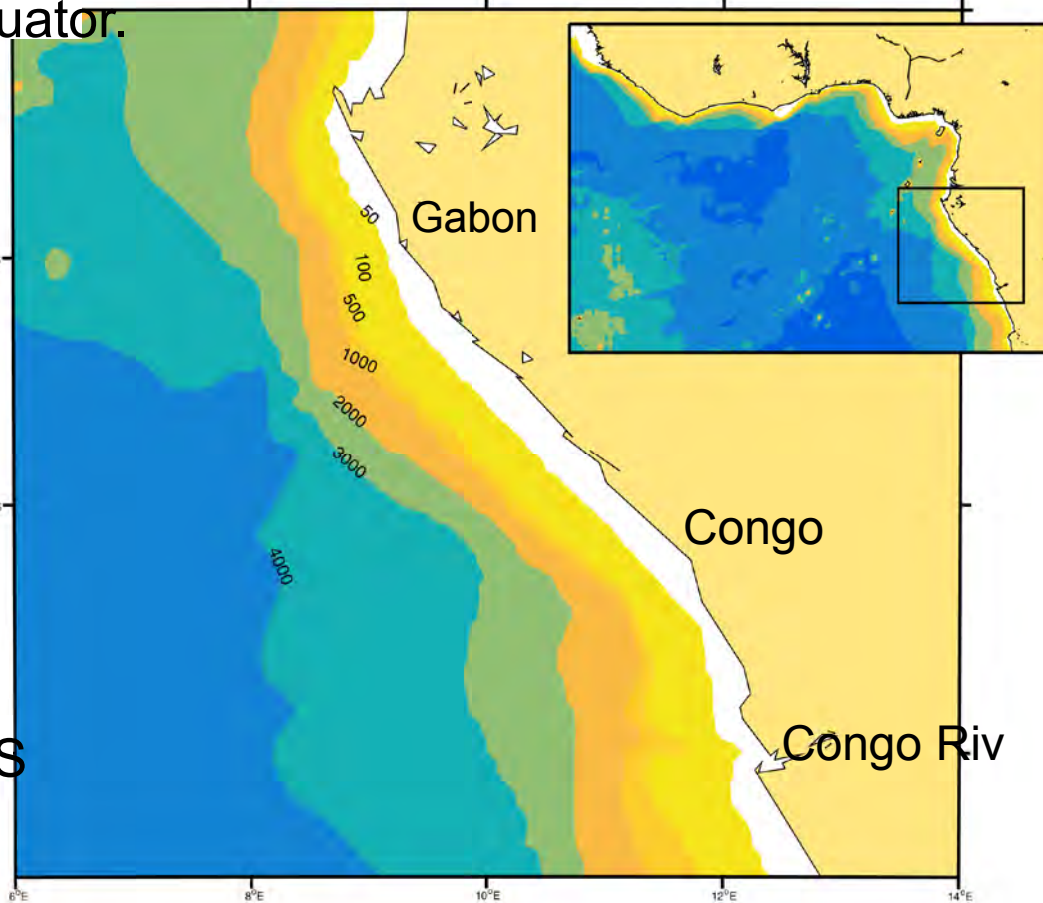
Hypothesis

We postulate that around May (the time of cruises), the nutrients supply is still sufficient for new production, and that the intermittent Gabon-Congo Under Current plays a role in retaining sardinella larva in the shelf area.

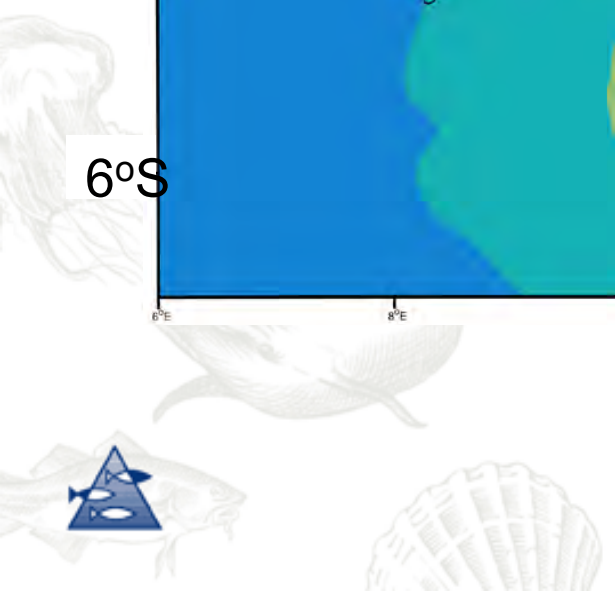


Summary

Equator.



Hypothesis



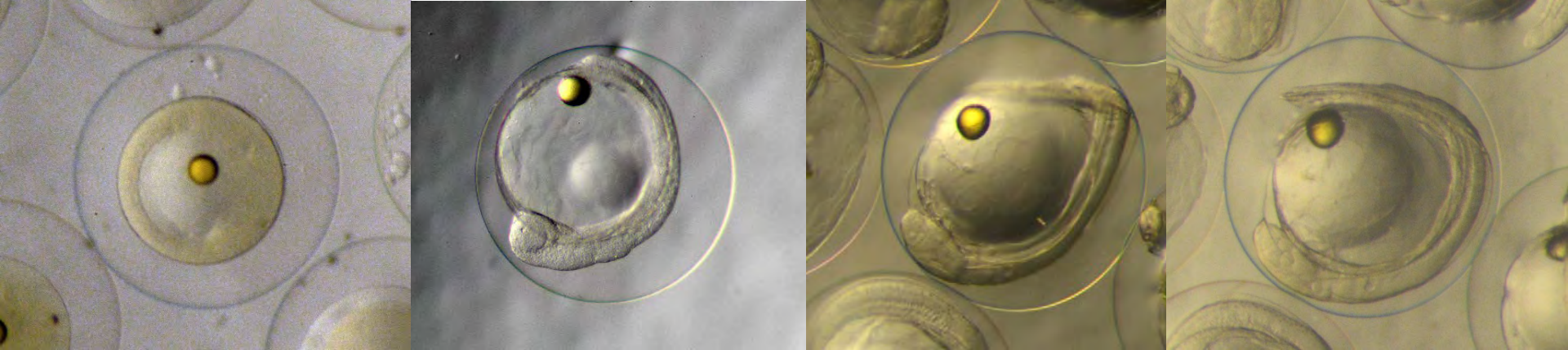


Photo: tor.magne.ensrud@imr.no

The main factors determining the functioning of the Congo-Gabon ecosystem;

- i) the freshwater discharge by the Congo River,
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- iii) the regional wind field.

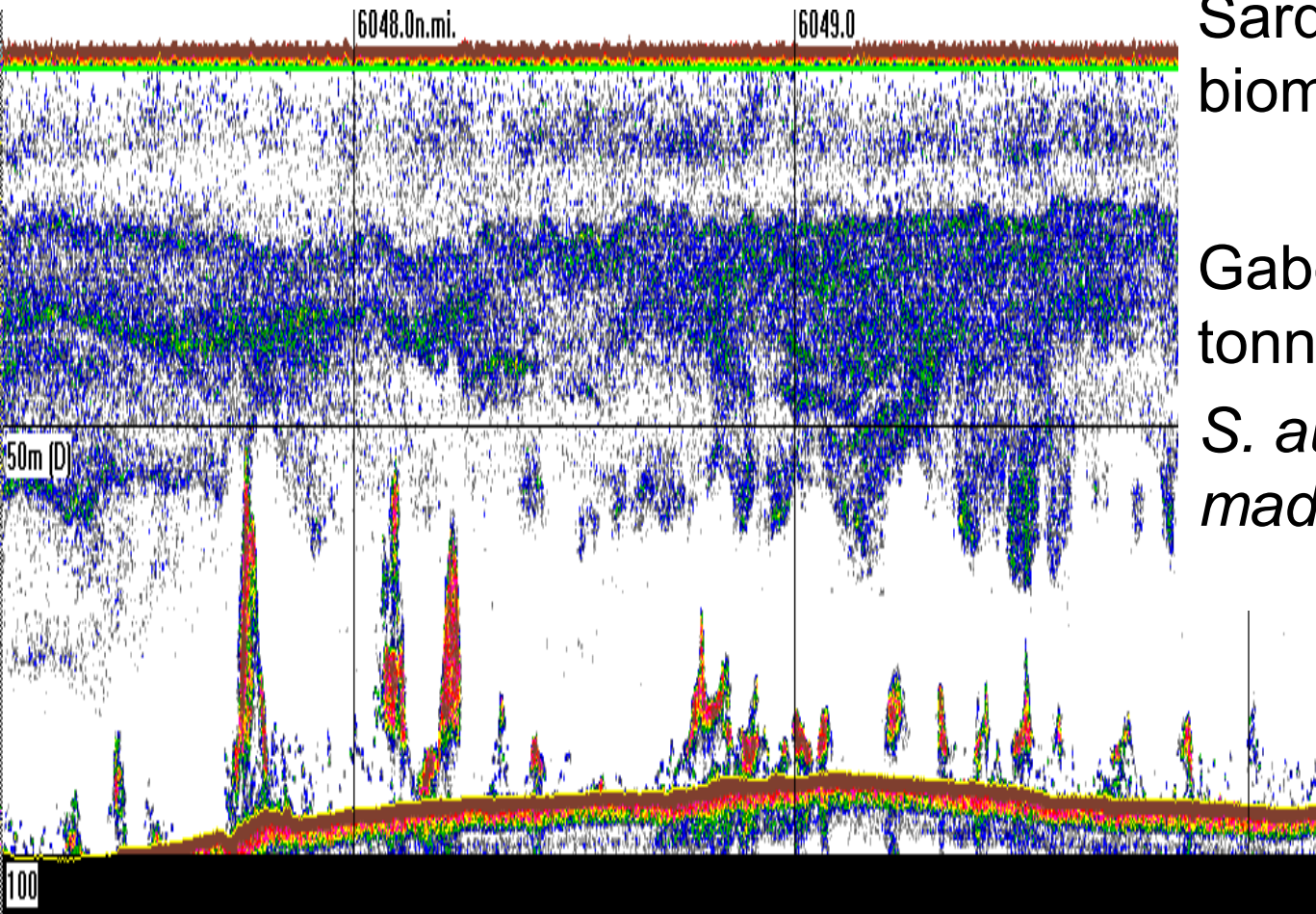
Inshore, the effect of the Congo River causes a situation where colder and more saline water masses are prominent in the surface layers. This layer is advected from oceanic water masses below the river influenced water.

Sardinella eggs drift northward in the sub-surface current, and hatch relatively quickly

Larvae are active swimmers they move deeper and use the GCUC who flow toward southeast to reach the coast



Sardinella: acoustic estimate



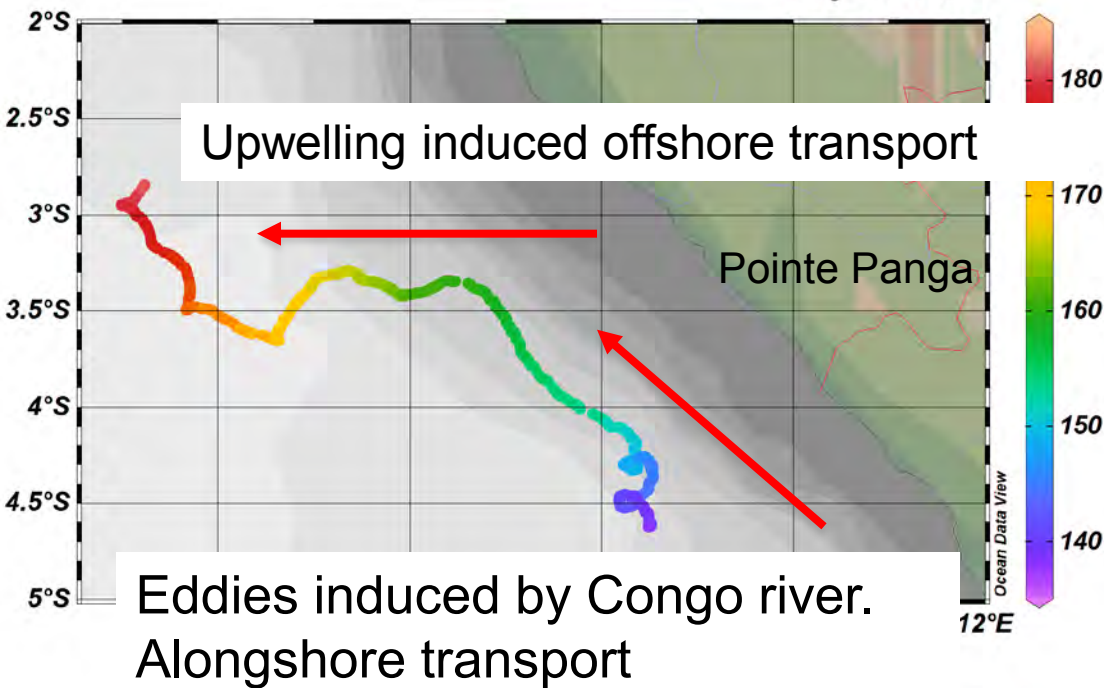
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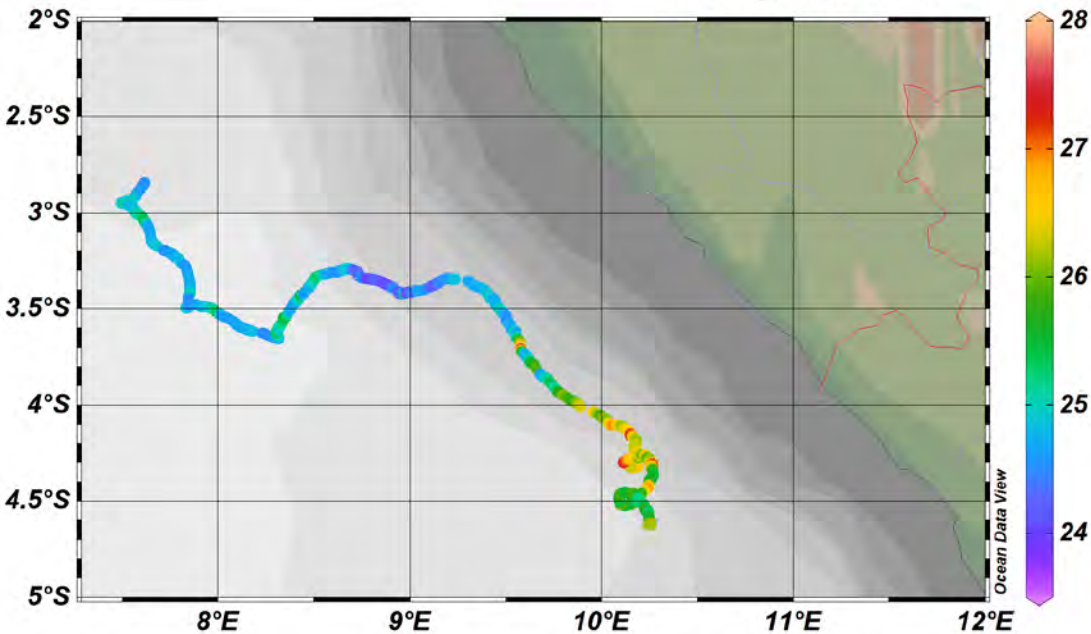
Day of Year

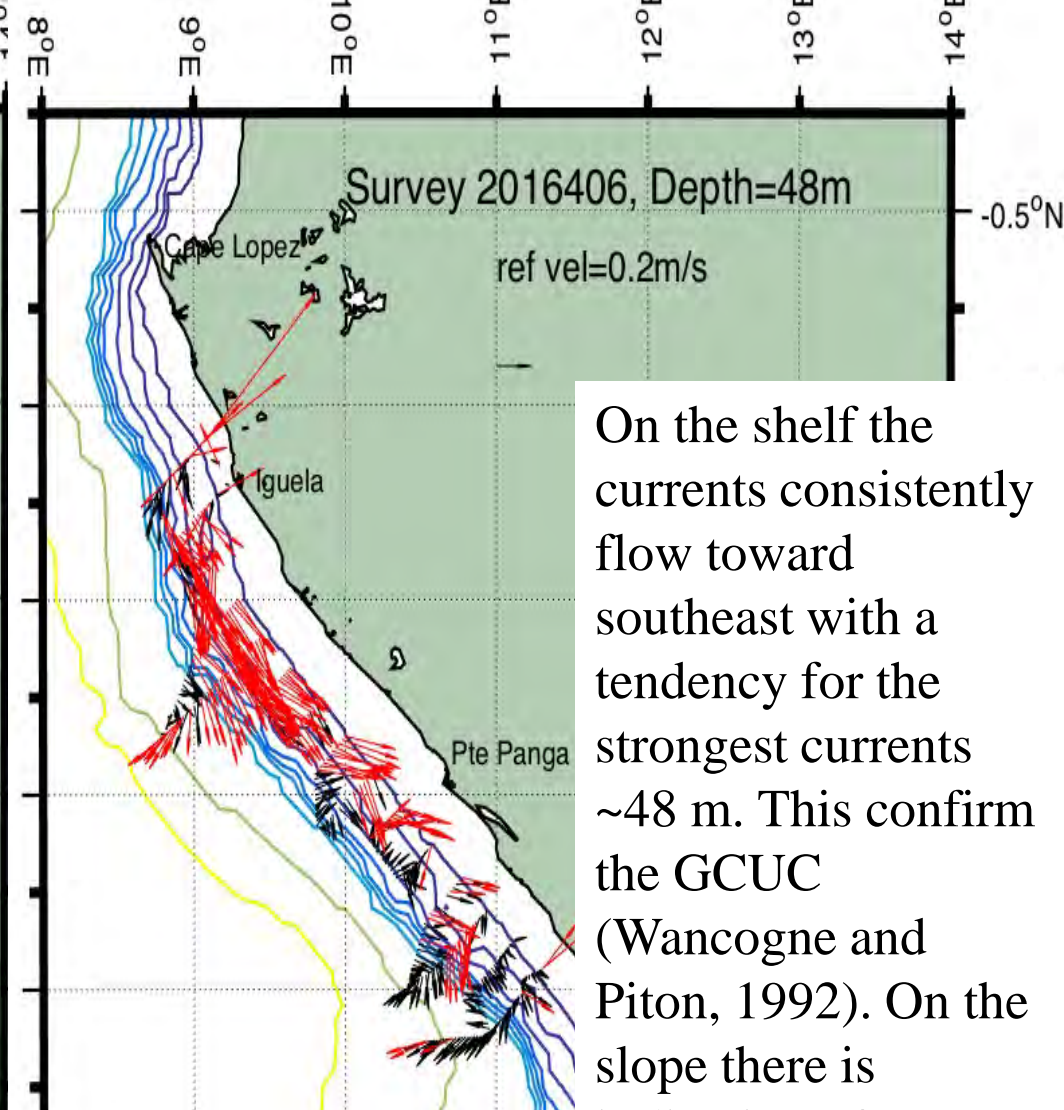
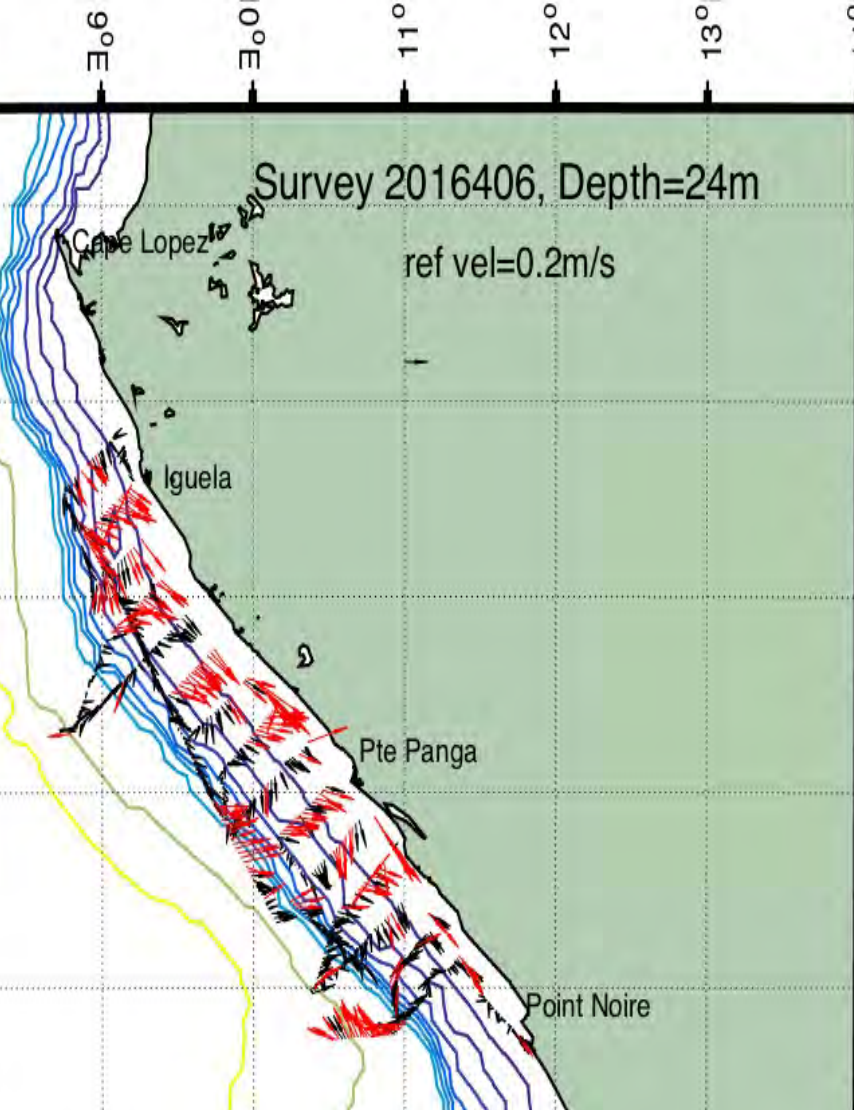


DRIFTERS

6 drifters deployed
Only one was left drifting
Drifter depth ca 15 m
below surface

SST @ FMTID=first





On the shelf the currents consistently flow toward southeast with a tendency for the strongest currents ~48 m. This confirm the GCUC (Wancogne and Piton, 1992). On the slope there is indication of a relatively weaker return current (toward northwest) at the 128 m depth

GCUC- Gabon Congo Under Current

