Spatial ecology and fisheries of juvenile blue shark (*Prionace glauca*) in the mid-North Atlantic

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Why blue shark (BSH)?

- Pelagic predator
- Circumglobal distribution
- High abundance

BUT

- Mostly captured shark world wide
- Target/bycatch of pelagic longline fisheries, mainly SWO LL (up to 70 – 80% of the catch)

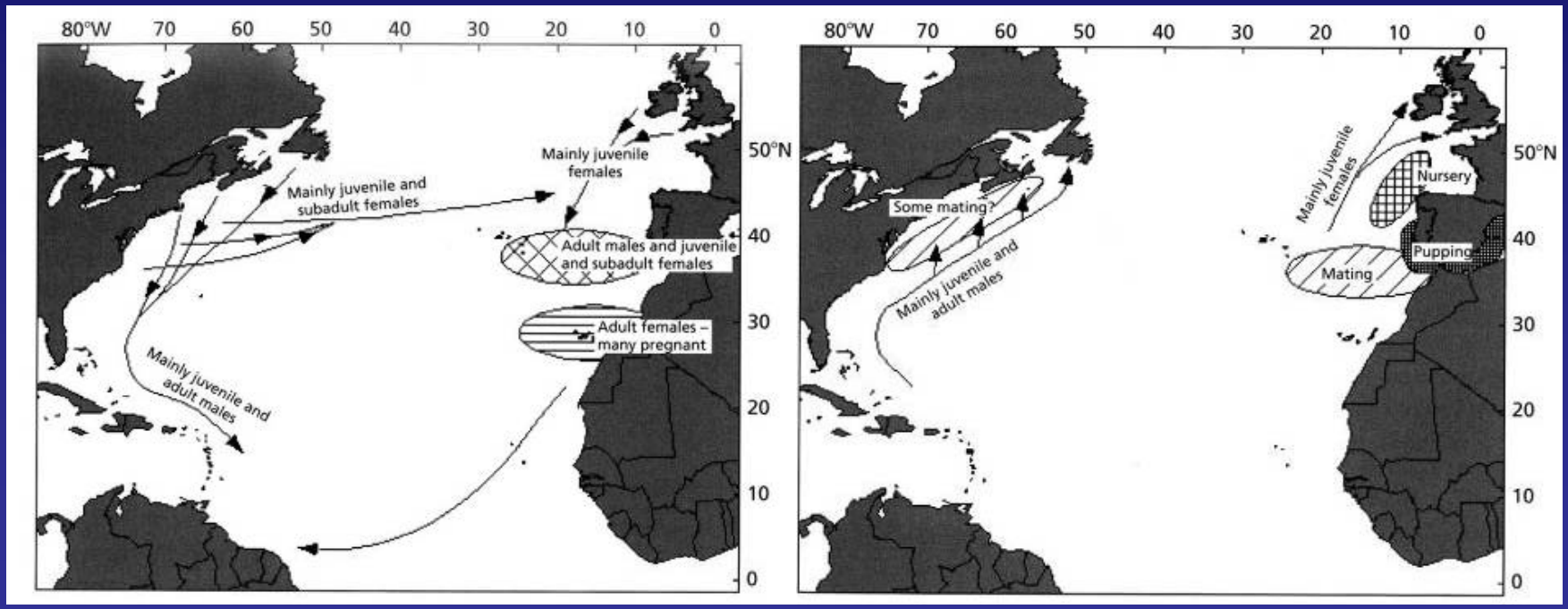
- Risk analysis: Population growth strongly dependent on juvenile survival (*Aires-da-Silva and Gallucci 2007*)

Sooner or later MANAGMENT STRATEGIES will be necessary in which protection of JUVENILES could be important

BSH ecology

- Highly migratory
- Segregation by sex and life stage

(Nakano and Stevens, 2007)



Winter Summer

Need to resolve spatial ecology for designing effective (spatial) measures

Objectives

Where are the essentail habitats in NA?

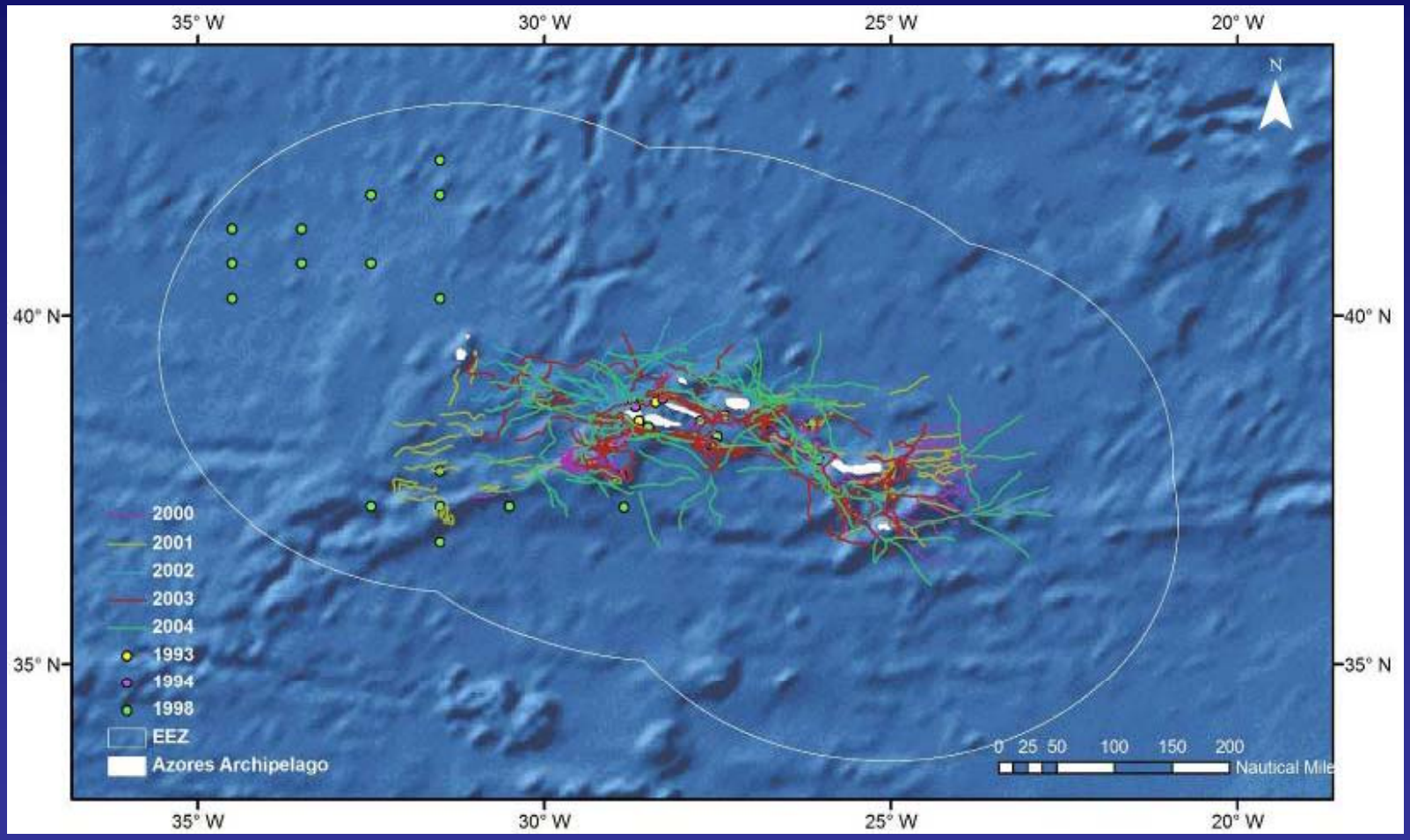
- Nursery (pupping / growth) in mid-NA/Azores?
- Residency times?
- Connectivity with other areas?

→ Fisheries data (population abundance patterns)

→ Satellite Telemetry (indiviual movement patterns)

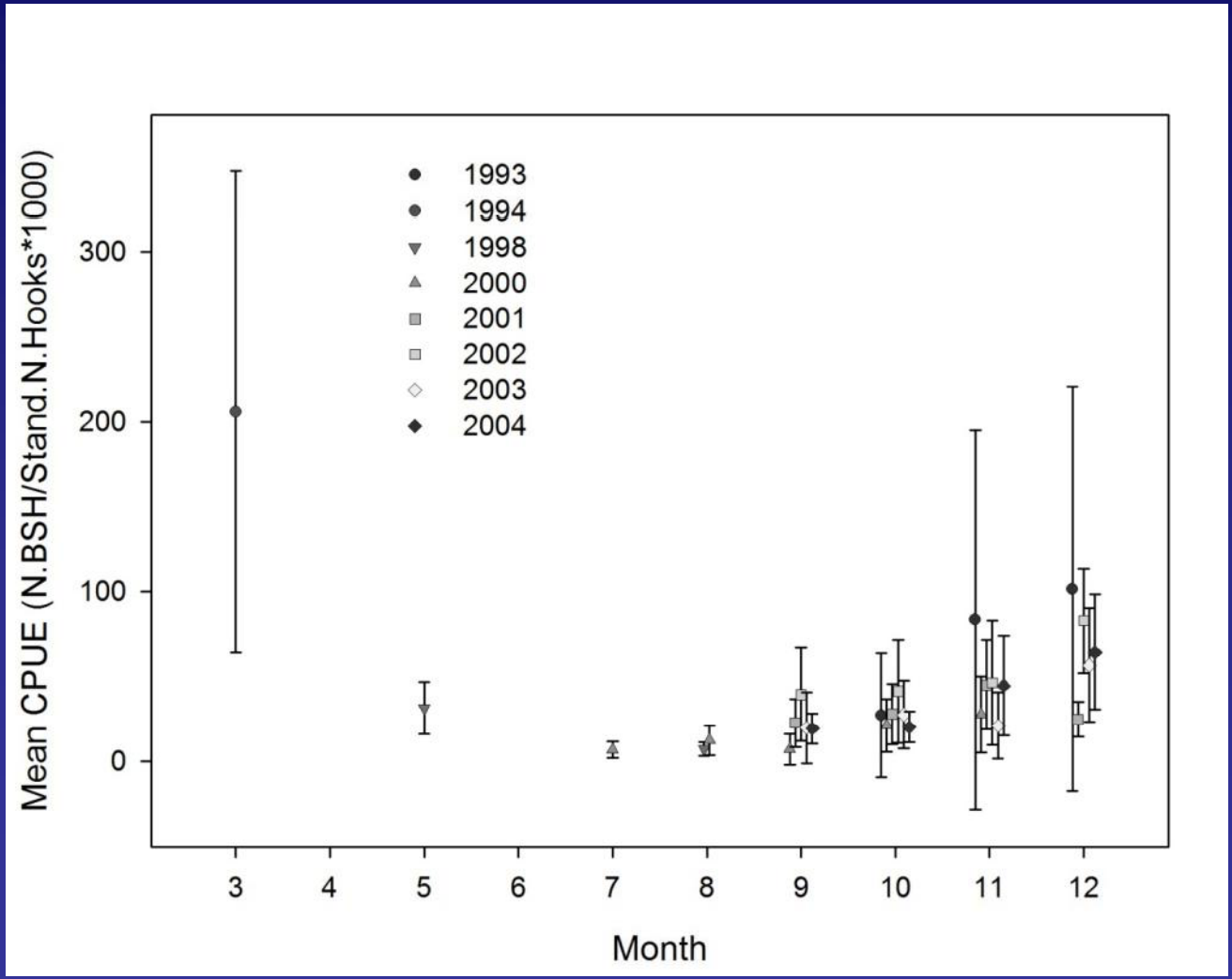
Propose an updated migration model for the NA

Fisheries data



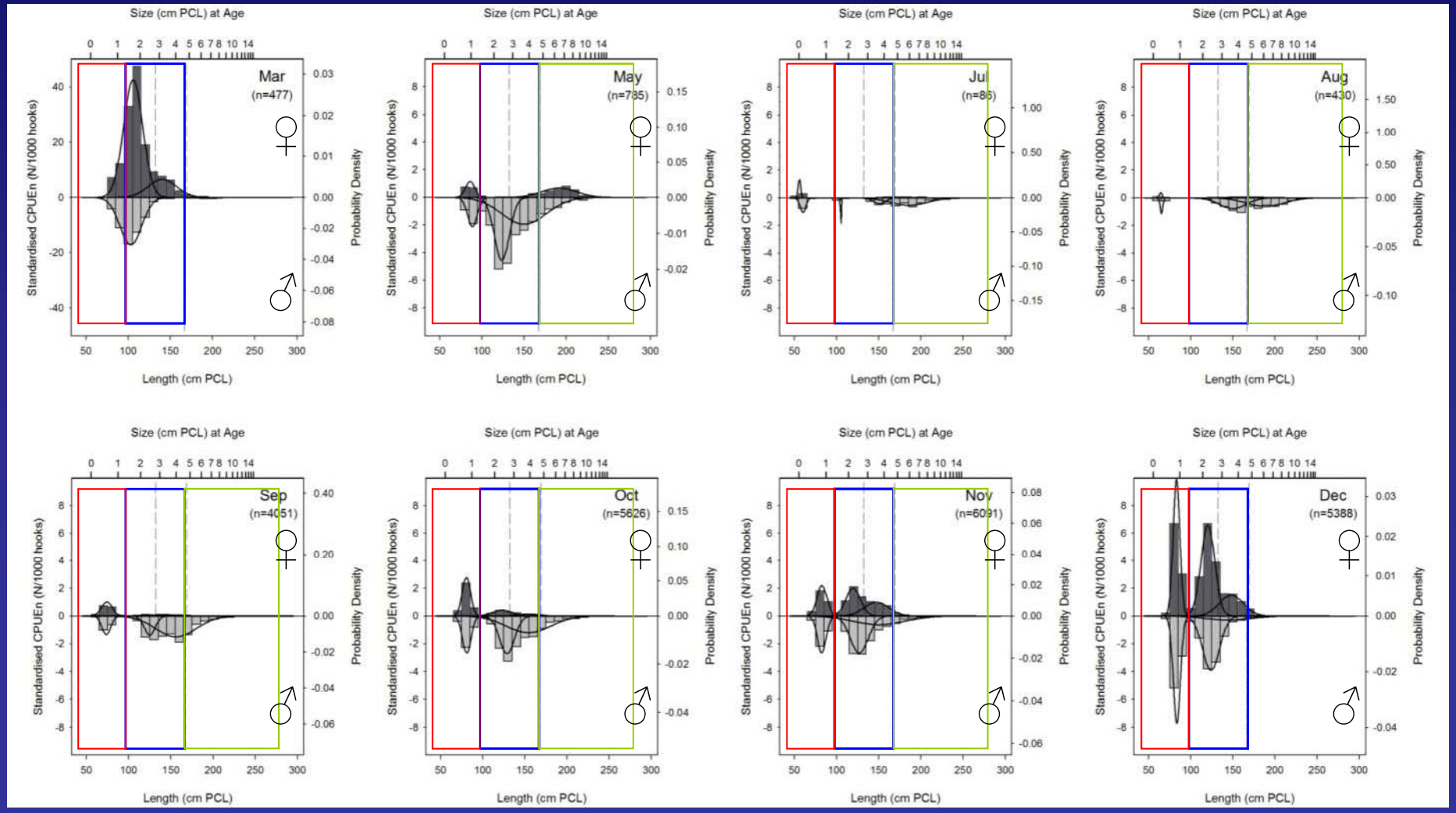
Scientific and observer data 1993-2004 388 sets - 23119 BSH (81.5% of the catch)

Seasonal abundance



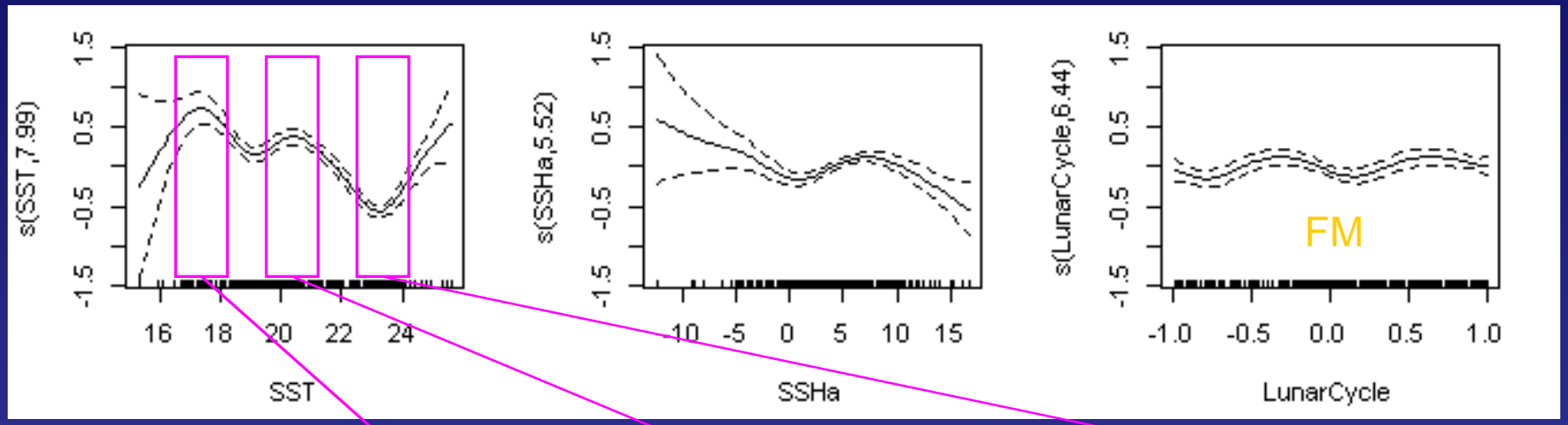
Seasonal abundance

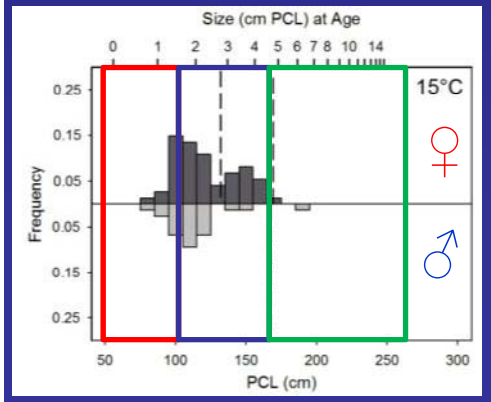
Young of the year (YOY) and sexed adult females

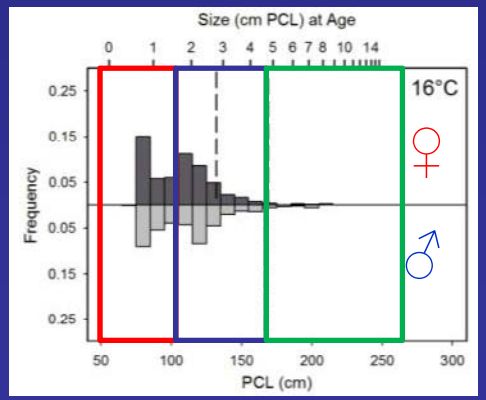


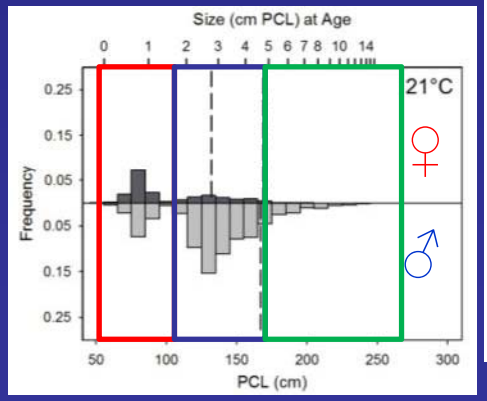
Relationship with environment

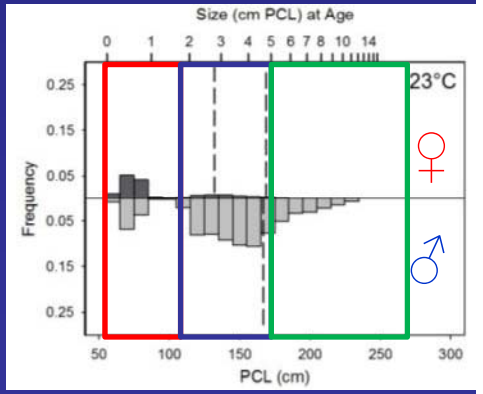
(neg. bin. GAM – R^2 = 0.76)





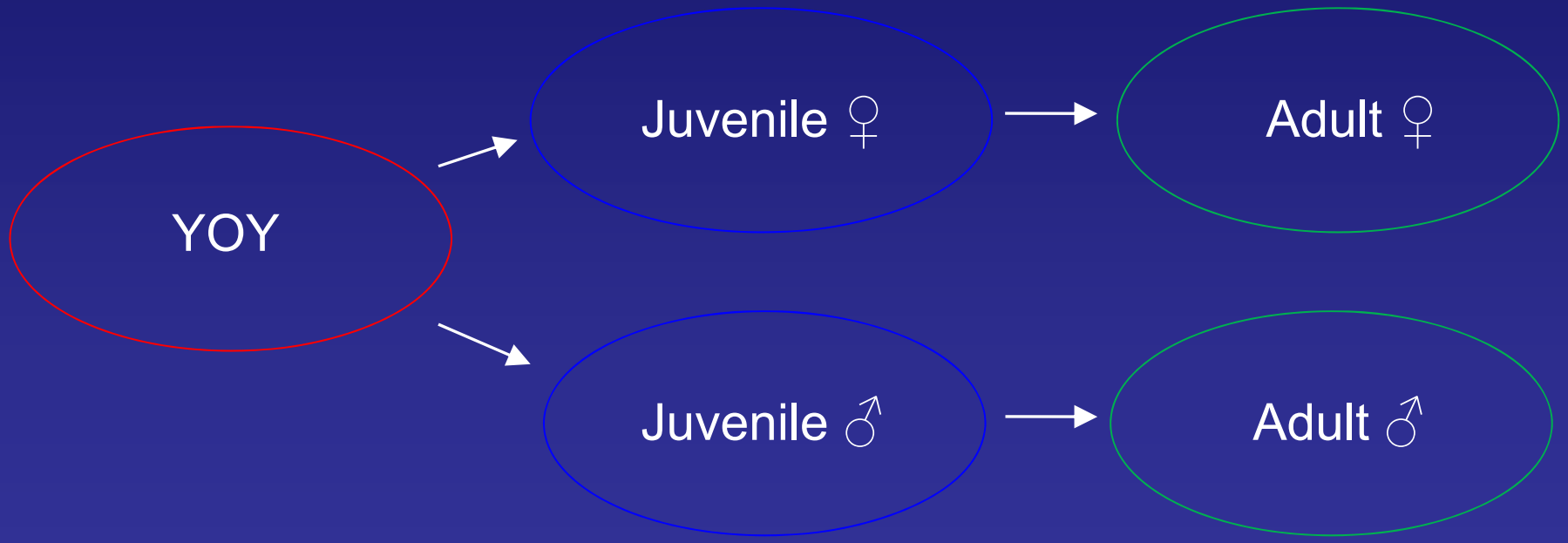






Conclusion analysis of fisheries data

Different groups with distinct seasonal abundance



Sattelite telemetry

SPOT Tags (Argos positions only)

⟶ Juveniles and adults

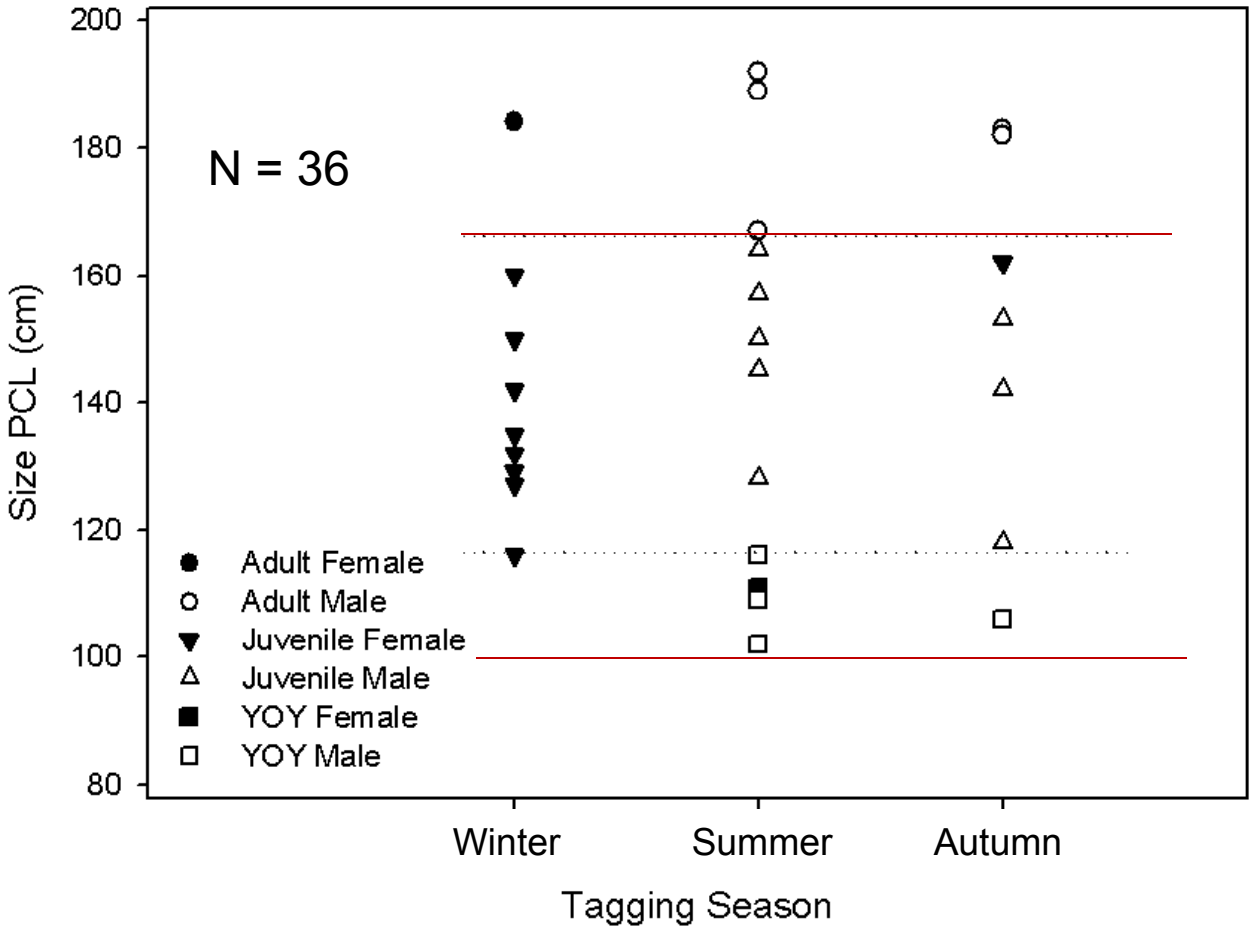
MiniPATs (Geolocations)

⟶ YOY

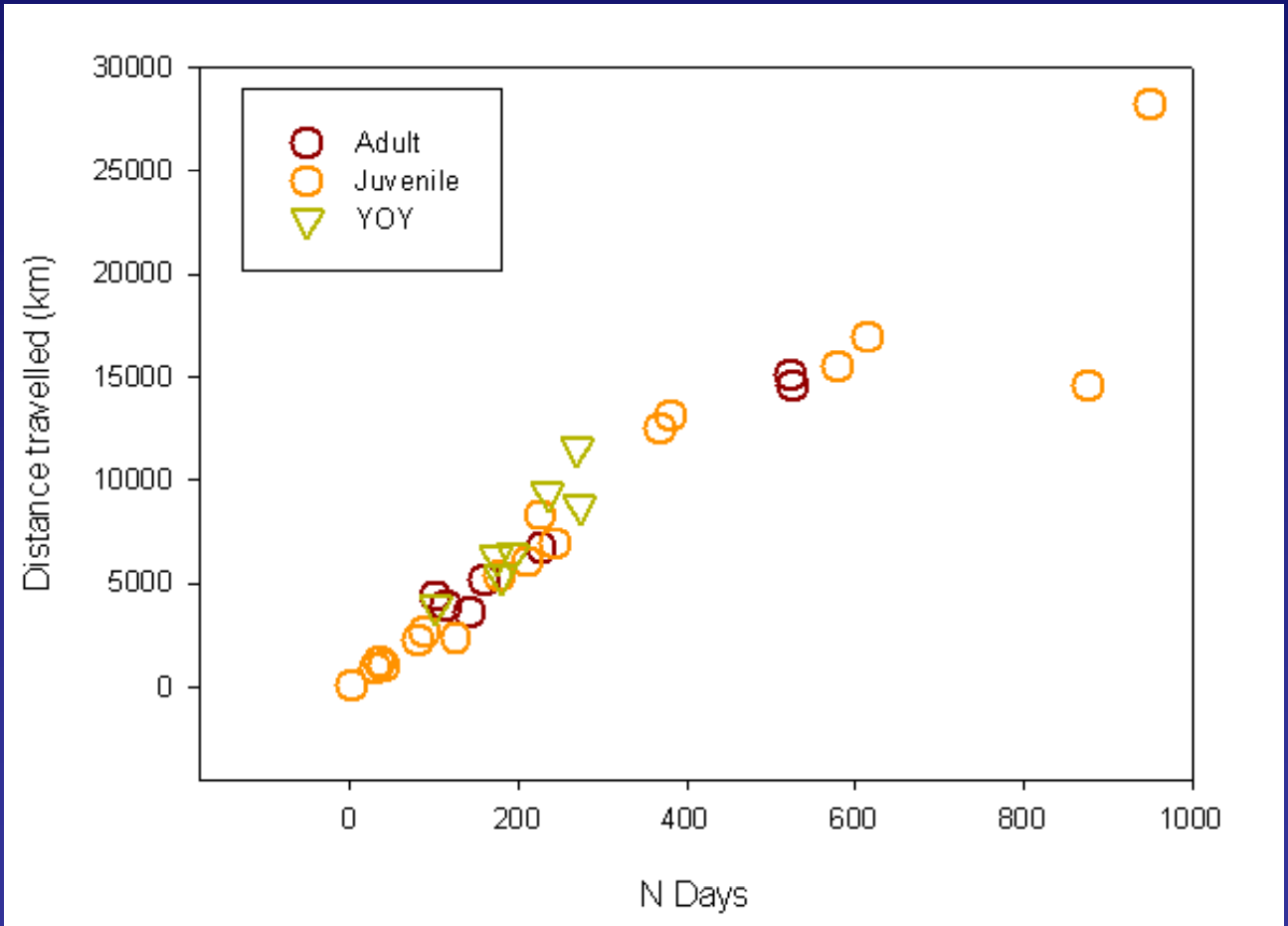
PATs (Geolocations)

⟶ Juveniles and adults

Experimental set up

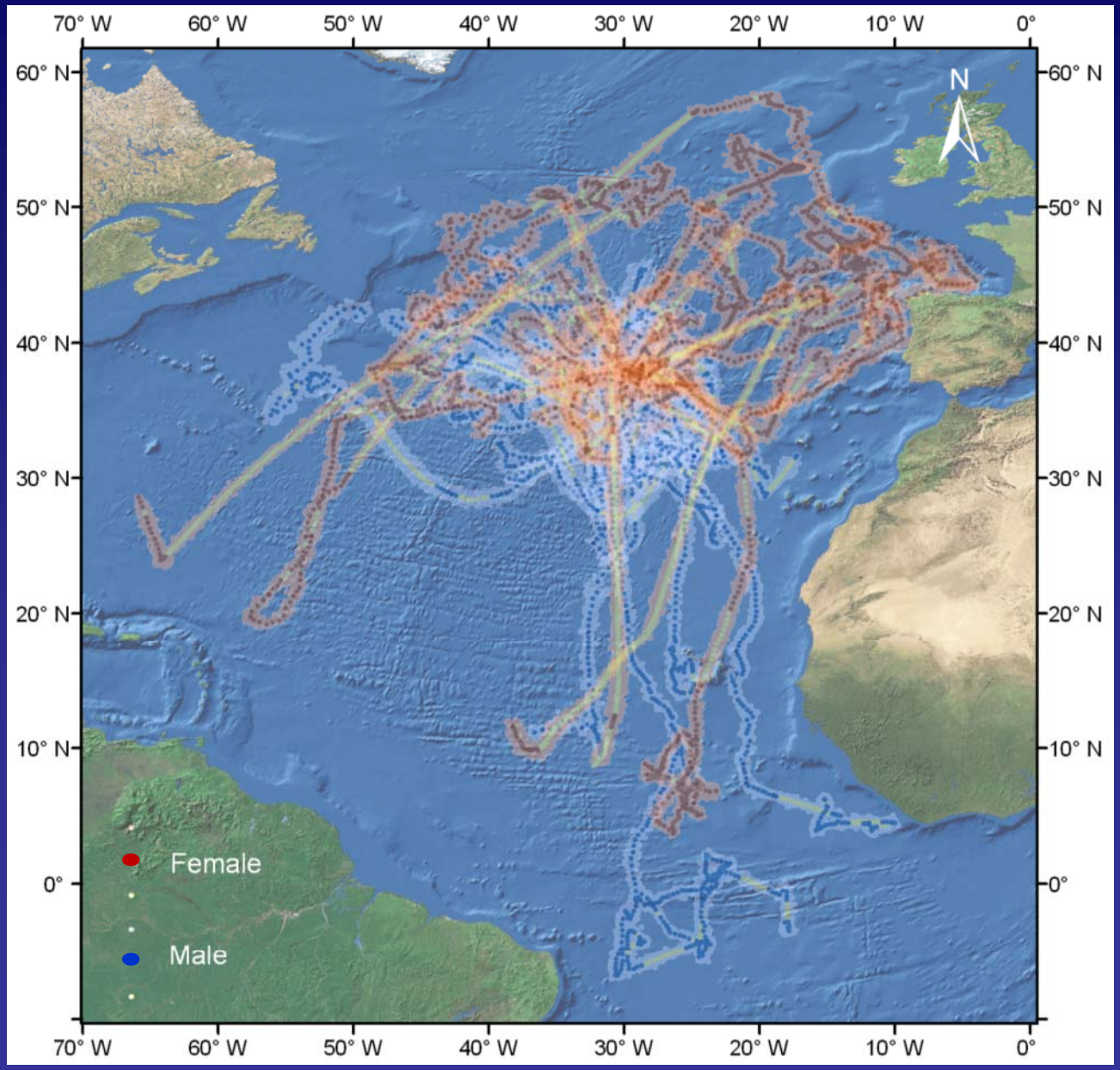


Number Days vs Distance travelled (km)



Modelled tracks

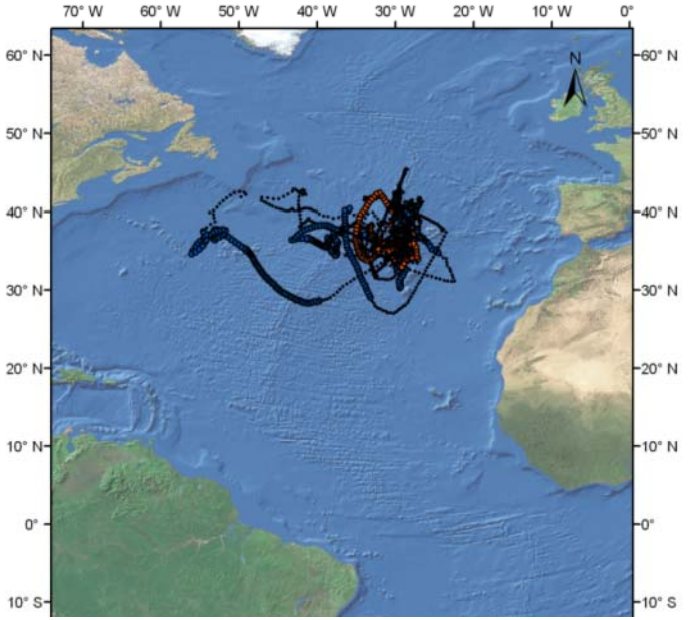
IKNOS
(Tremblay et al. 2010)



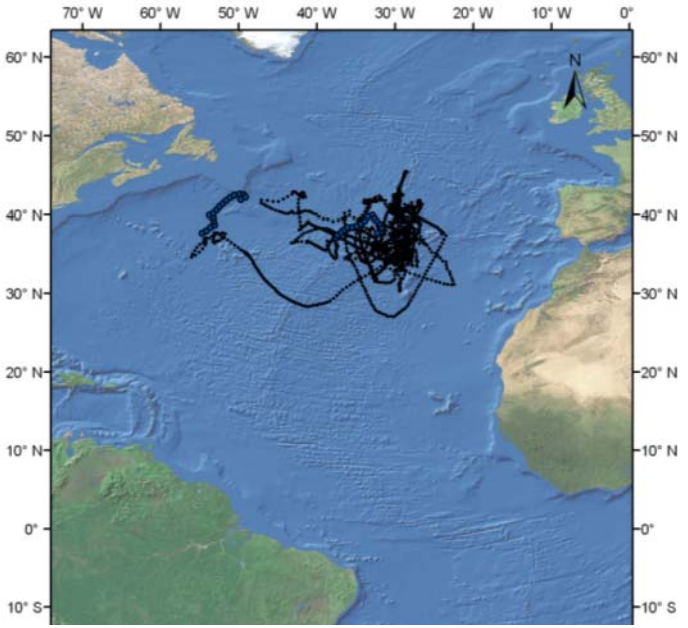
YOY?

♀ & ♂

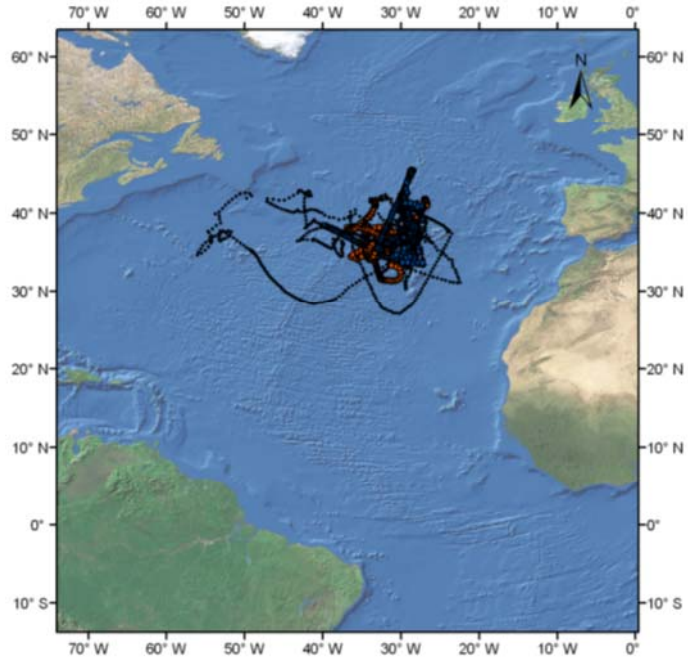
Winter



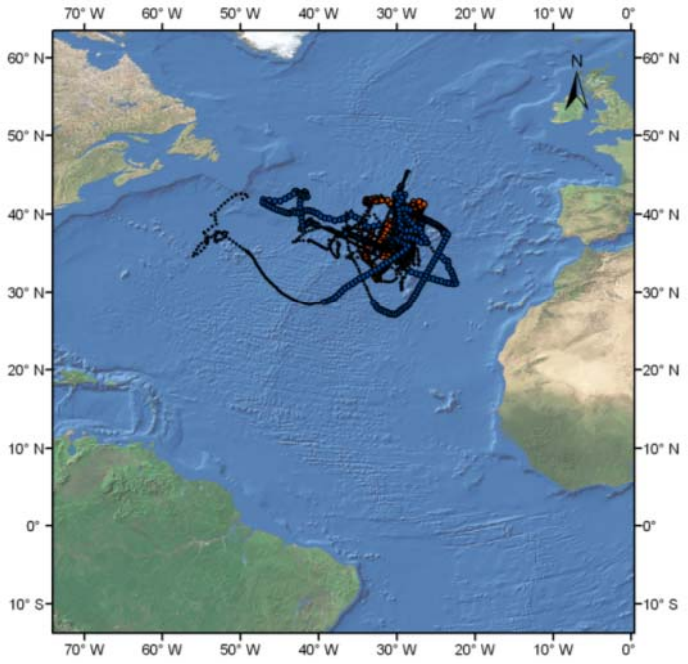
Spring



Summer



Autumn



Juvenile

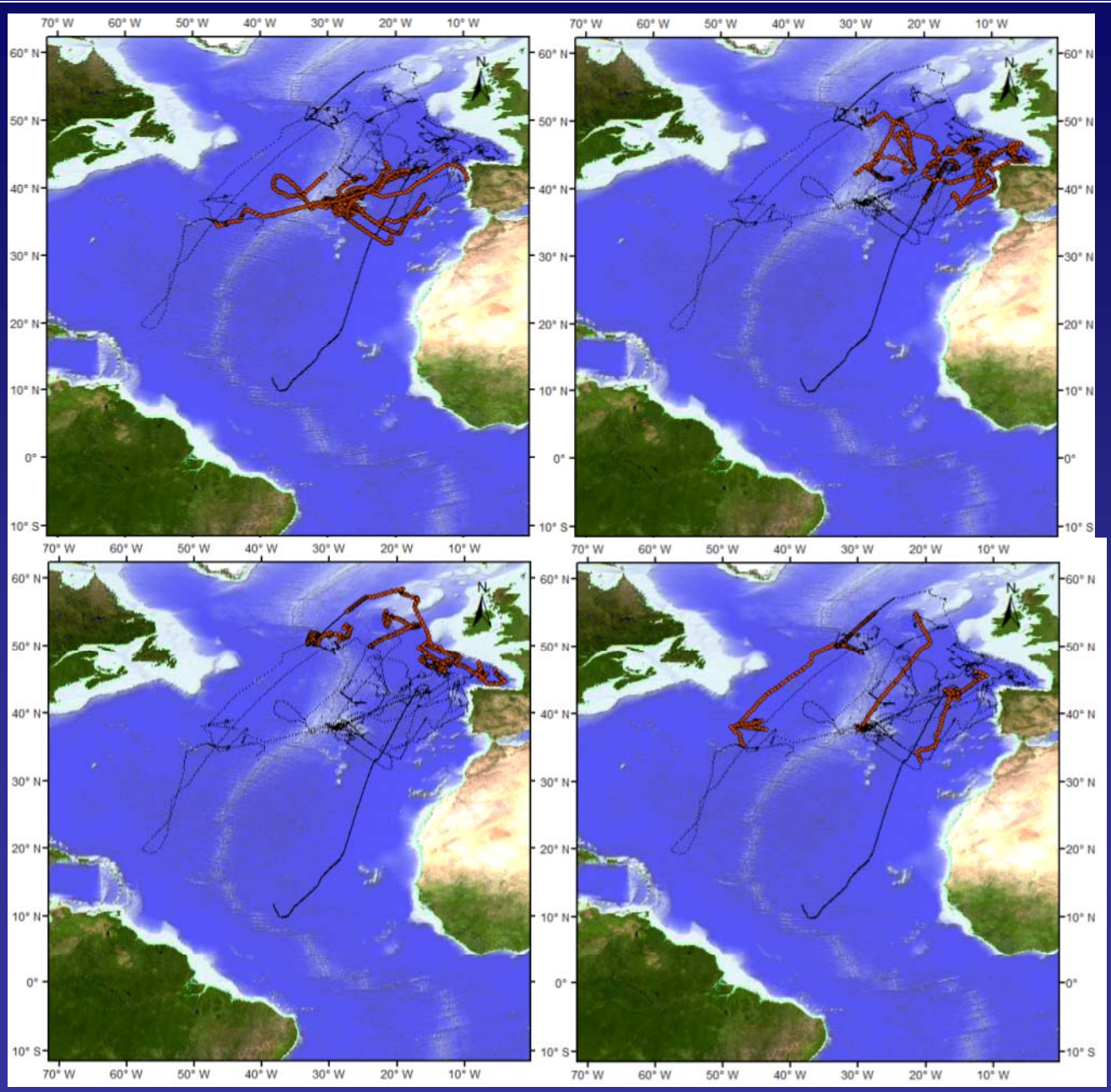
♀

Winter

Spring

Summer

Autumn



Juvenile

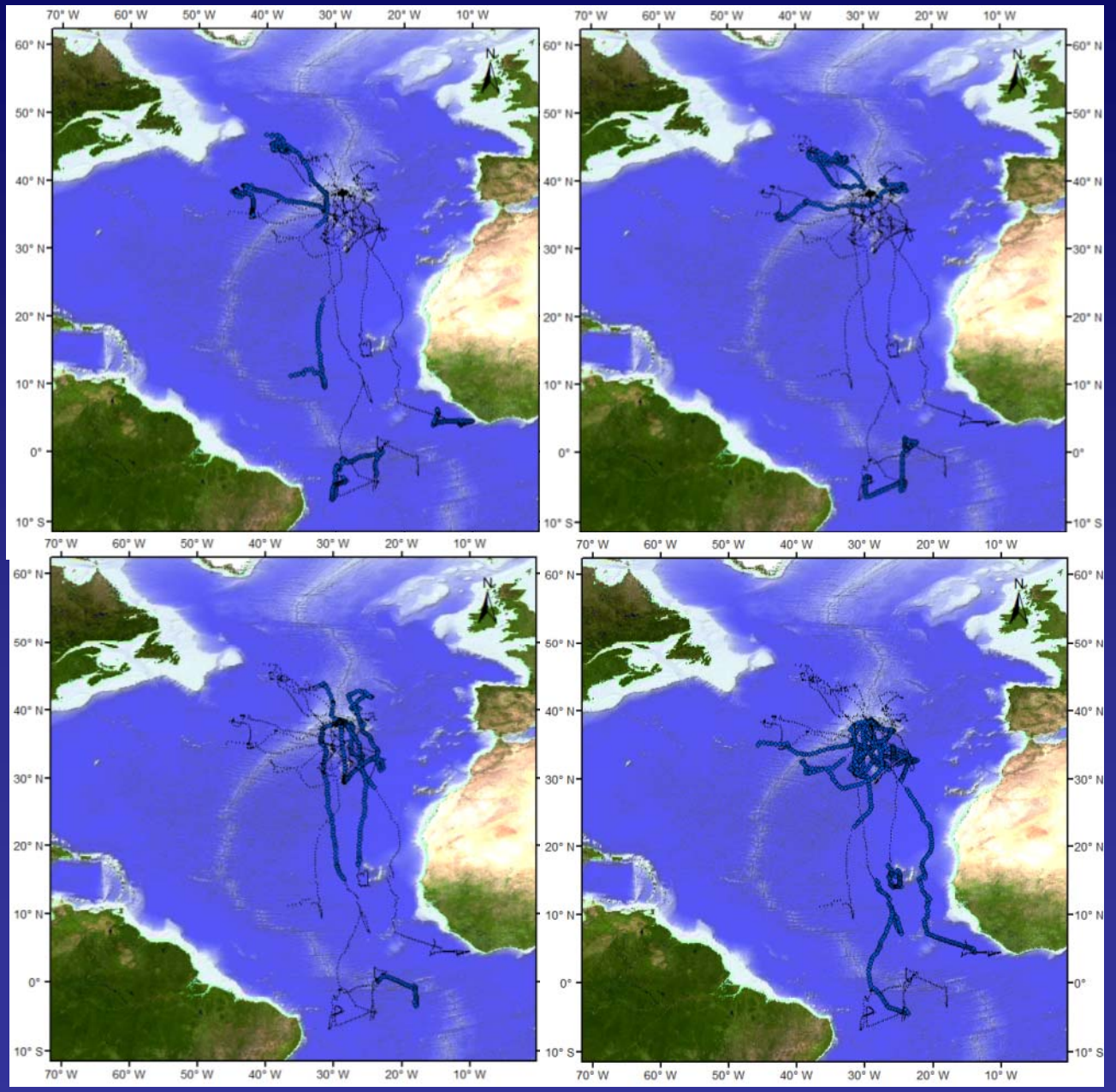
♂

Winter

Spring

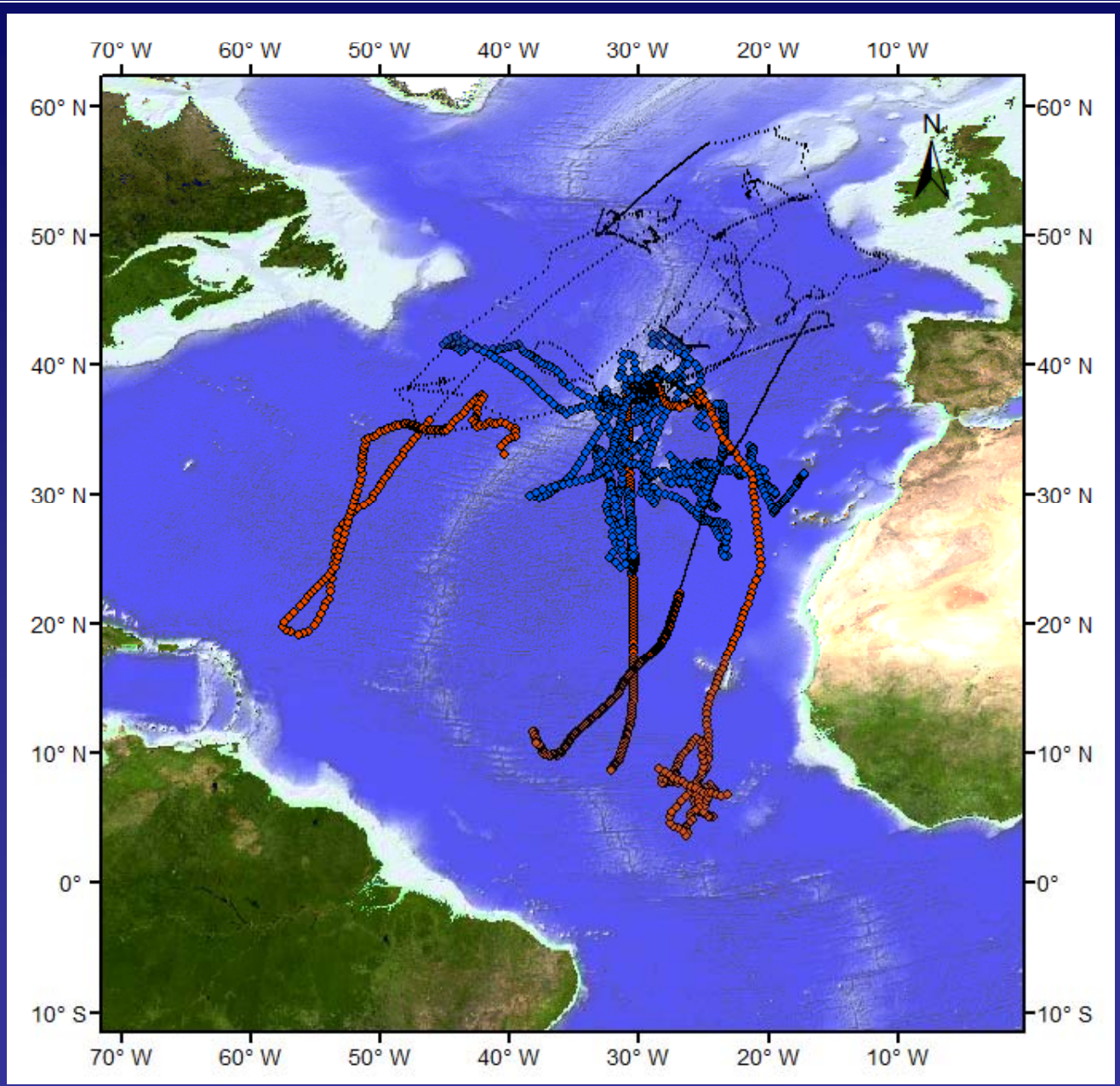
Summer

Autumn



Adult

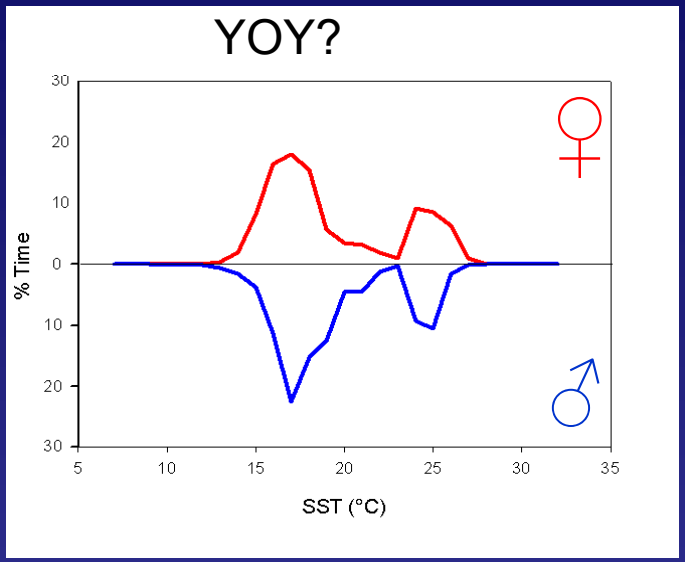
♀ & ♂



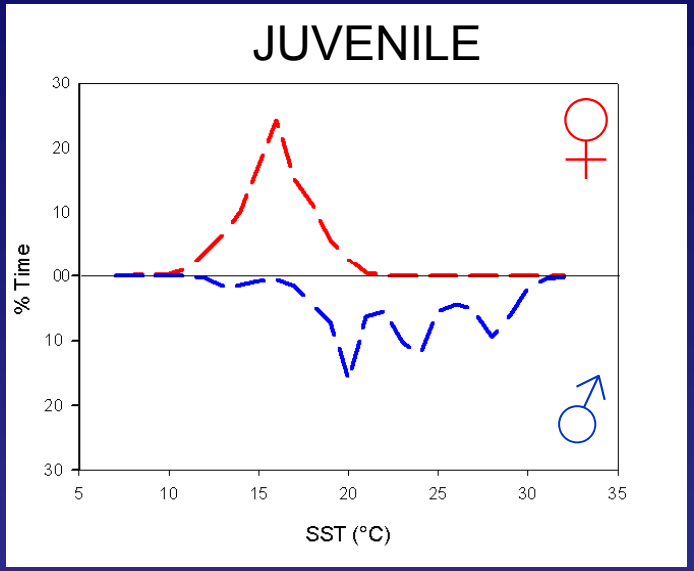
TIME AT TEMPERATURE (TAT)

(MODIS 4km 8day)

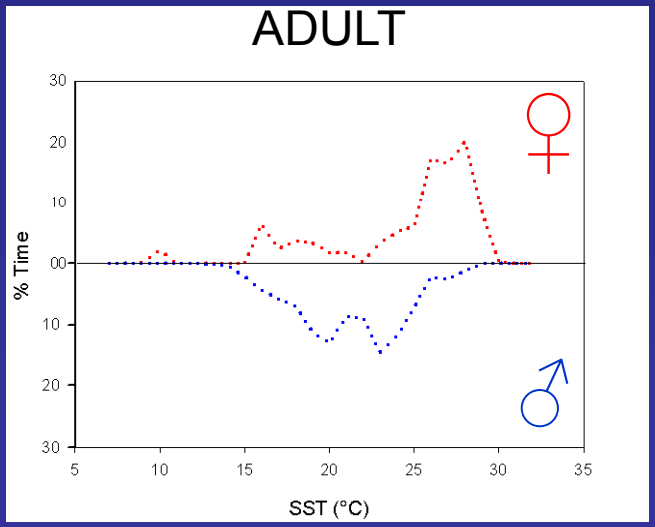
YOY?



JUVENILE

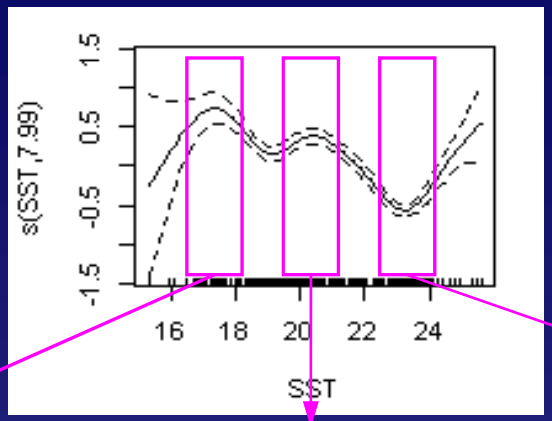


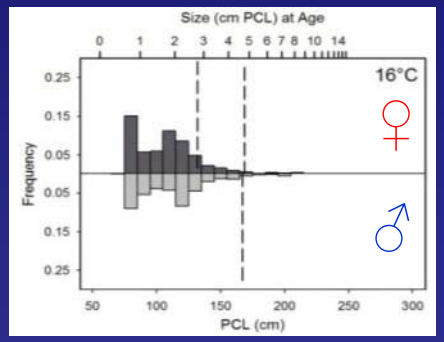
ADULT

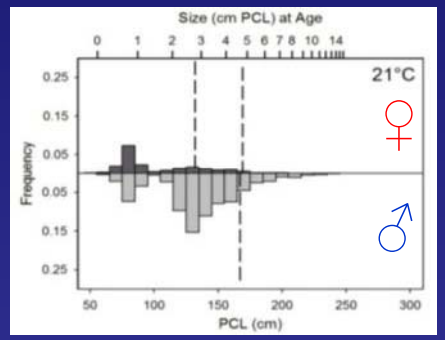


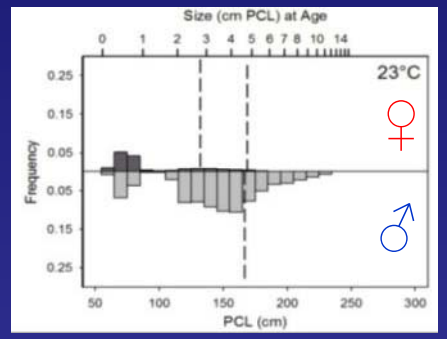
Fisheries data

- Population
  abundance pattern
- Local



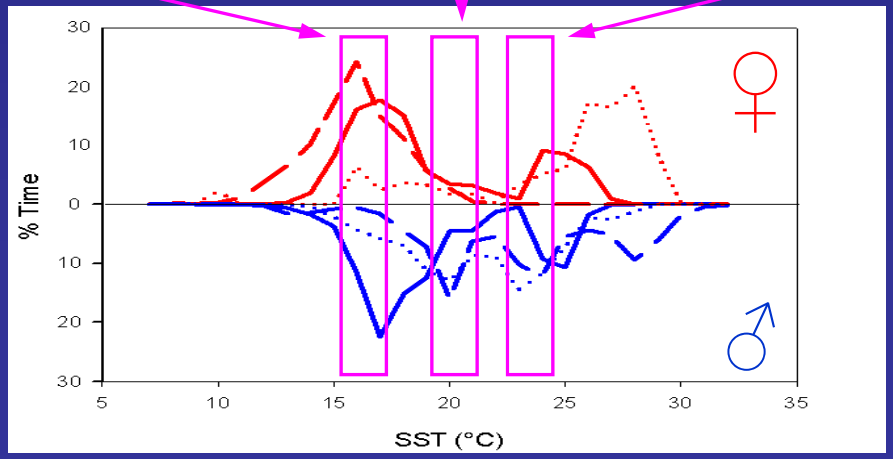






Telemetry data

- Individual behaviour
- Basin scale

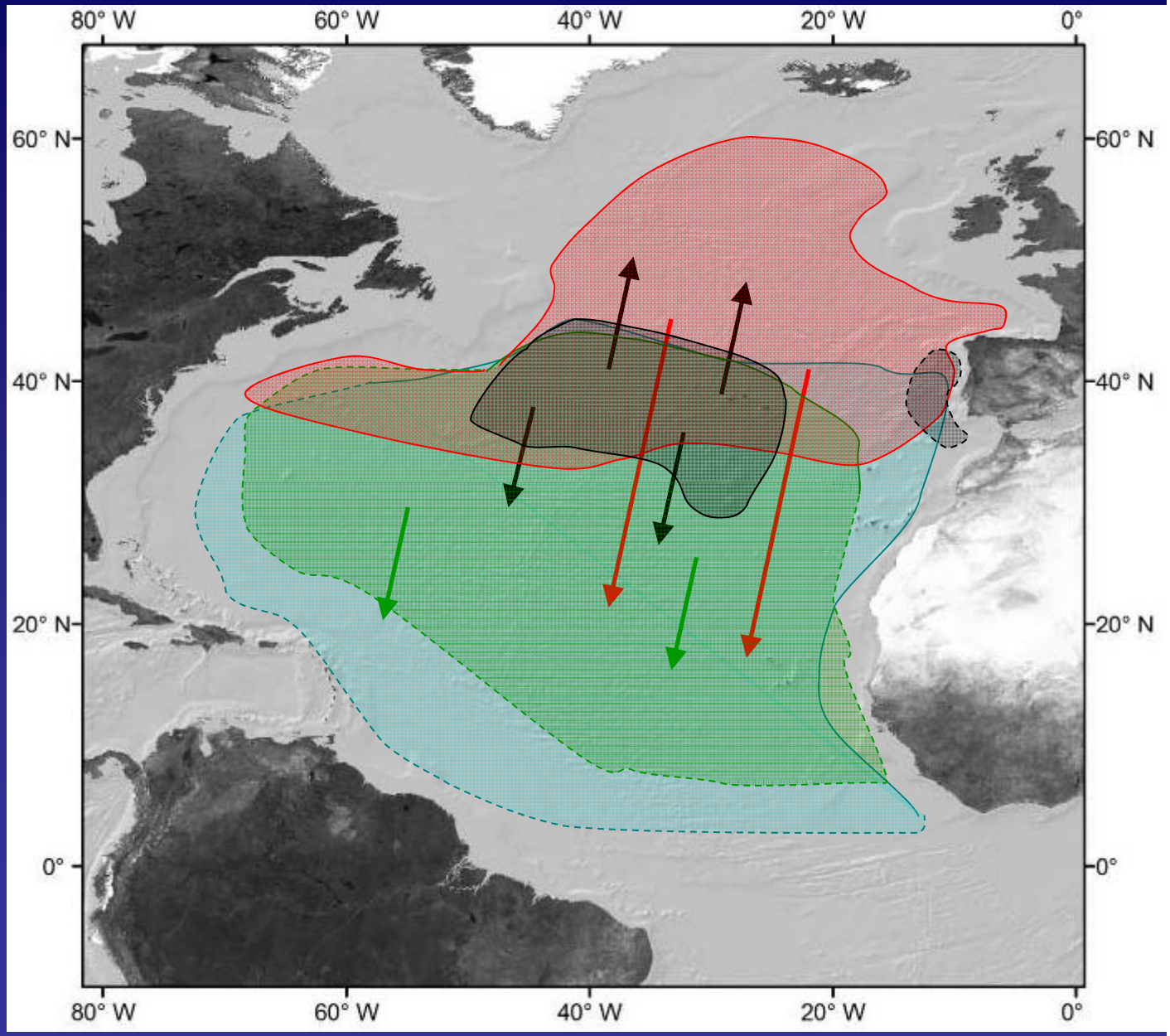


YOY ♀ ♂

Juvenile ♀

Juvenile ♂

Adults ♀ ♂



Conclusions

- Mid-NA region/Azores is an area were the distribution of different sex and life stage alternate, especially:

  nursery (pupping?) for YOY

  nursery for juvenile ♂ and ♀

- SST seems an important factor influencing this segregation.

- These nursery areas are more dynamic than previously thought, covering large parts of the NA, but are well defined in environmental space, in particular looking at SST

Oportunity for spatial management?

Thank you

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SEVENTH FRAMEWORK PROGRAMME

DEPARTAMENTO DE OCEANOGRAFIA E PESCAS DOP UNIVERSIDADE DOS AÇORES

MADE Mitigating adverse ecological impacts of open ocean fisheries

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