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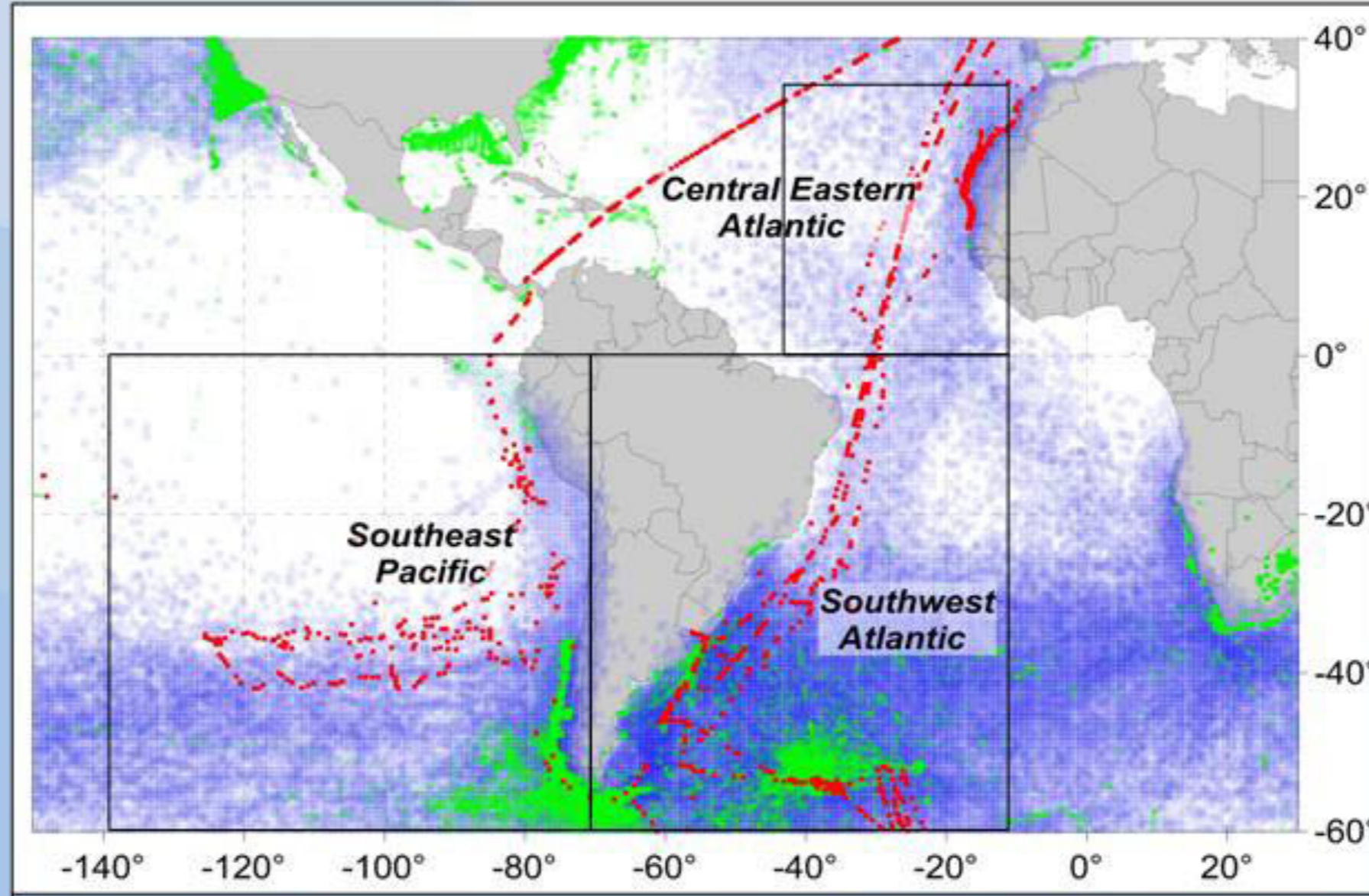
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Preface

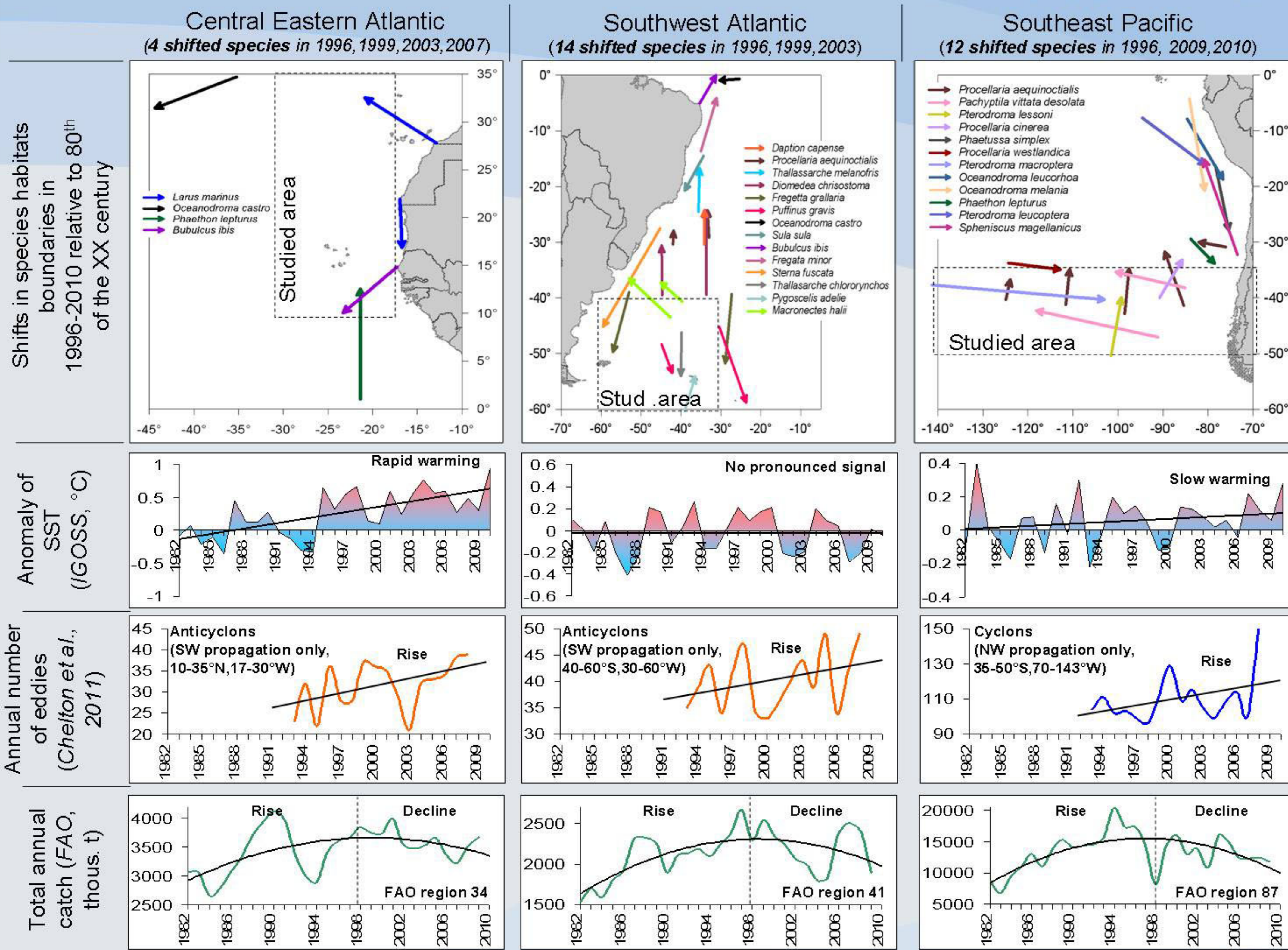
Shifts of different marine species' ranges significantly influence the **Large Marine Ecosystems (LME's) boundaries**, therefore are considered in frameworks of complex ecosystem approach. Monitoring the habitats ranges of widespread **top predators like seabirds** provides appropriate basis for such analysis. Seabirds are abundant and clearly detected component of LME's which contact with various prey species, many of which are economically important.



AtlantNIRO seabirds records in 1996-2010 relative to world databases records (red points – AtlantNIRO; blue - seabirdtracking.org; green - iobis.org)



Data were collected onboard three scientific and one training vessels

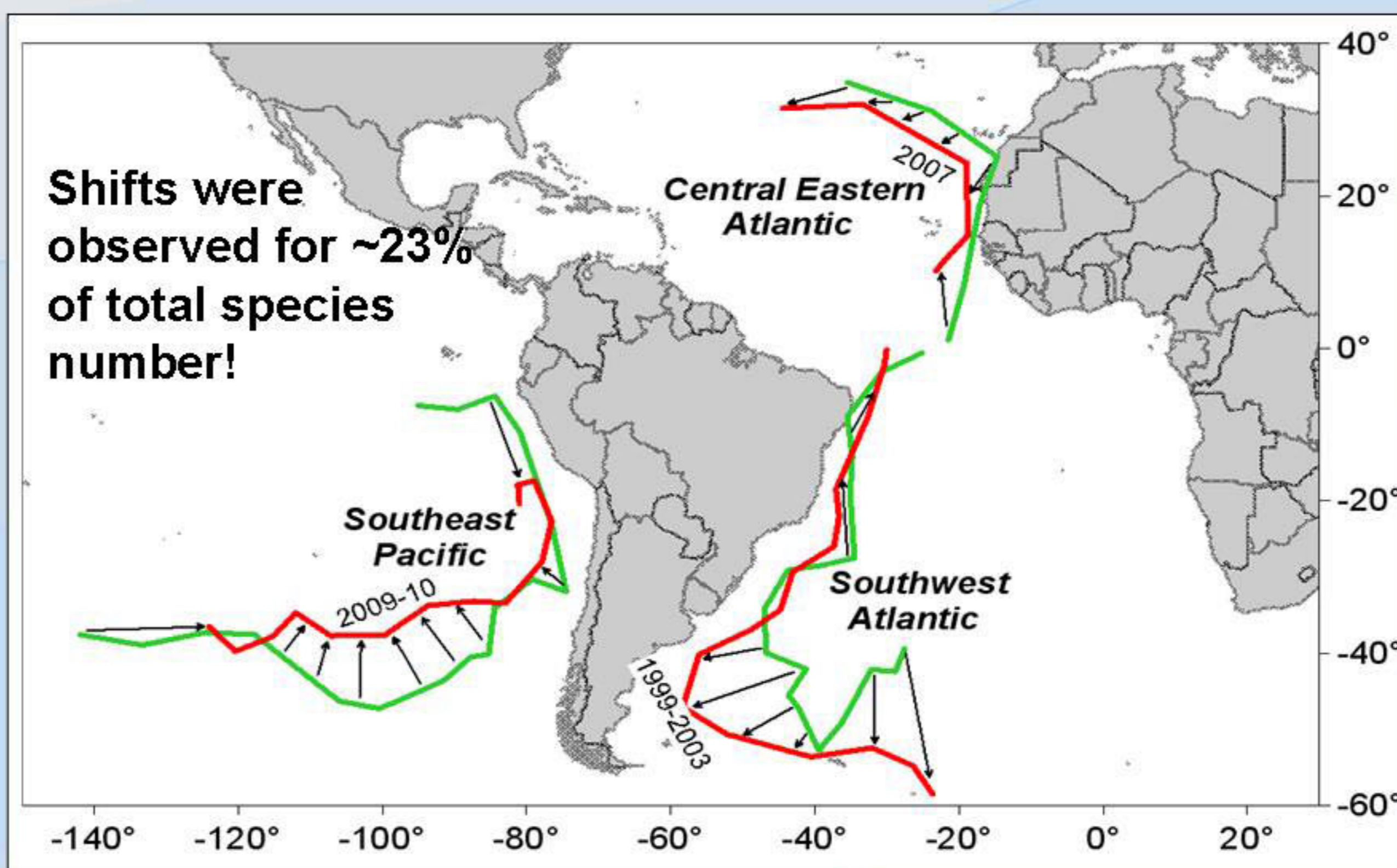


Data Mining & Processing

Data of seabird's observations collected by AtlantNIRO in 1996-2010 were analyzed against literature sources. The trends in the upper ocean layers temperature, circulation, primary production, some commercial fishes stock assessments and total annual catch by FAO regions were compared to seabird's species habitats shifts, occurrences, abundances and species compositions of seabird's community in the open waters of the **Central Eastern Atlantic, Southwest Atlantic and Southeast Pacific Oceans.**

Results interpretation

The maps of seabird's distribution, surface temperature, circulation and primary production along with time-series show that observed **seabird's distributional shifts can attain 7-15°** of latitude and/or longitude for some seabird species such as *Oceanodroma melania*, *Oceanodroma leucorhoa*, *Procellaria aequinoctialis*, *Procellaria westlandica*, *Puffinus gravis*, *Pterodroma leucoptera* etc. The pronounced correlation between seabird's ranges shifts and environmental parameters changes in the latest decades demonstrates it.



Shifts were observed for ~23% of total species number!

General scheme of shifts in seabird species habitats boundaries in 1996-2010 relative to 80th of the XX century (green lines – combined habitats boundaries adopted to Harrison, 1996; red – "new" smoothed observed habitats boundaries)

References

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- Chelton D., Schlax M., Samelson R. Global observations of nonlinear mesoscale eddies /Prog.Oceanog., In press
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