

Patterns of Turtle Bycatch in Tuna Fisheries off Southern Brazil: Towards EBFM of Pelagic Fisheries in the Southwest Atlantic Ocean

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Outline

- **Motivation**
- **Aims**
- **Study area and species**
- **Data collection**
- **Main findings**
 - 1. Critical Areas: Higher CPUE's
 - 2. Interannual variation
 - 3. Seasonal peak
 - 4. Sea surface temperature and depth correlation
 - 5. Size distribution (CCL)
 - 6. Size and critical areas
 - 7. Diet and hooking
 - 8. Mortality by fleet
- **Concluding remarks**

Motivation

- ➔ **Mortality and injury of young and adult sea-turtles worldwide**
- ➔ **Observed population decline and/or difficulty in recovery of loggerhead and leatherback sea turtles.**
- ➔ **Poor knowledge on the distribution of turtles populations in the South Atlantic Ocean, as well as on their incidental catch by commercial fishing**

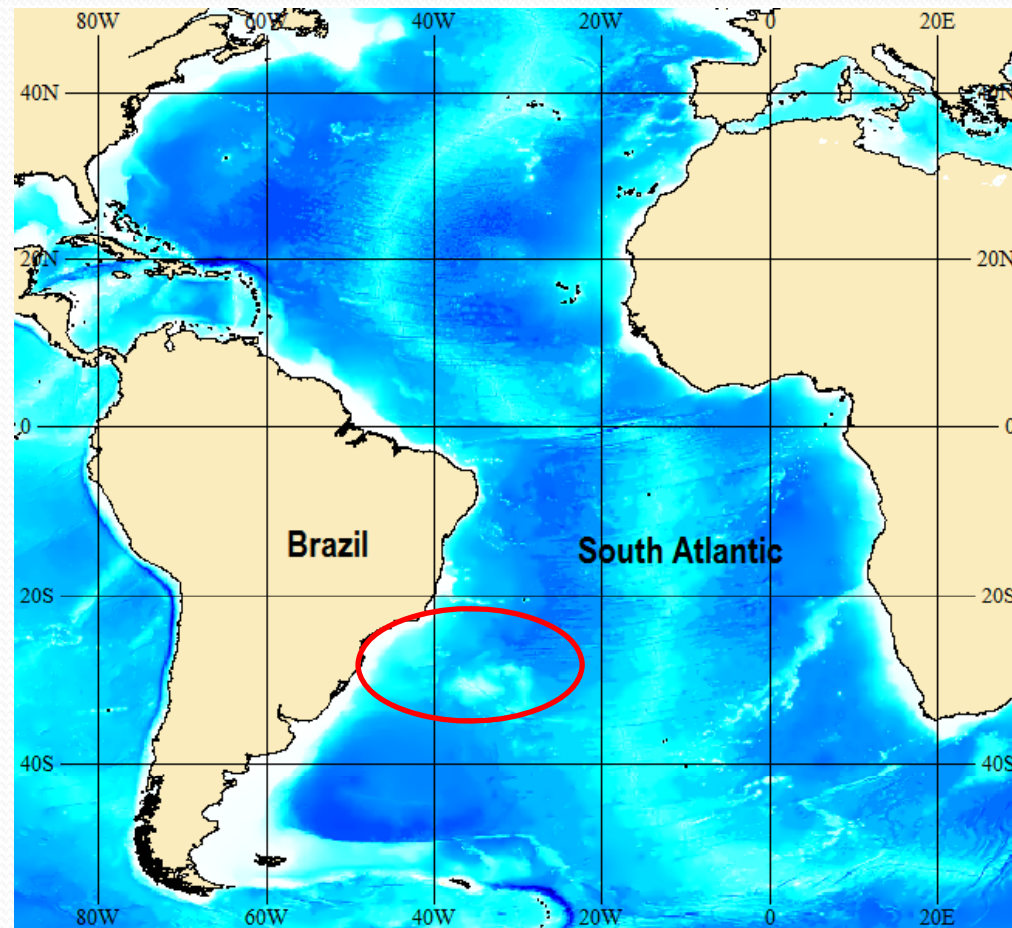


Aims

- To verify spatiotemporal patterns on the distribution of sea turtles species (incidental catch) in the South Brazil Large Marine Ecosystem.
- To identify possible biological, environmental and/or operational factors determining these interactions.

This study will provide **key information** for evaluation of the interaction of sea turtles in the context of the **ecosystem approach to fisheries** and **marine conservation policies**.

Study area



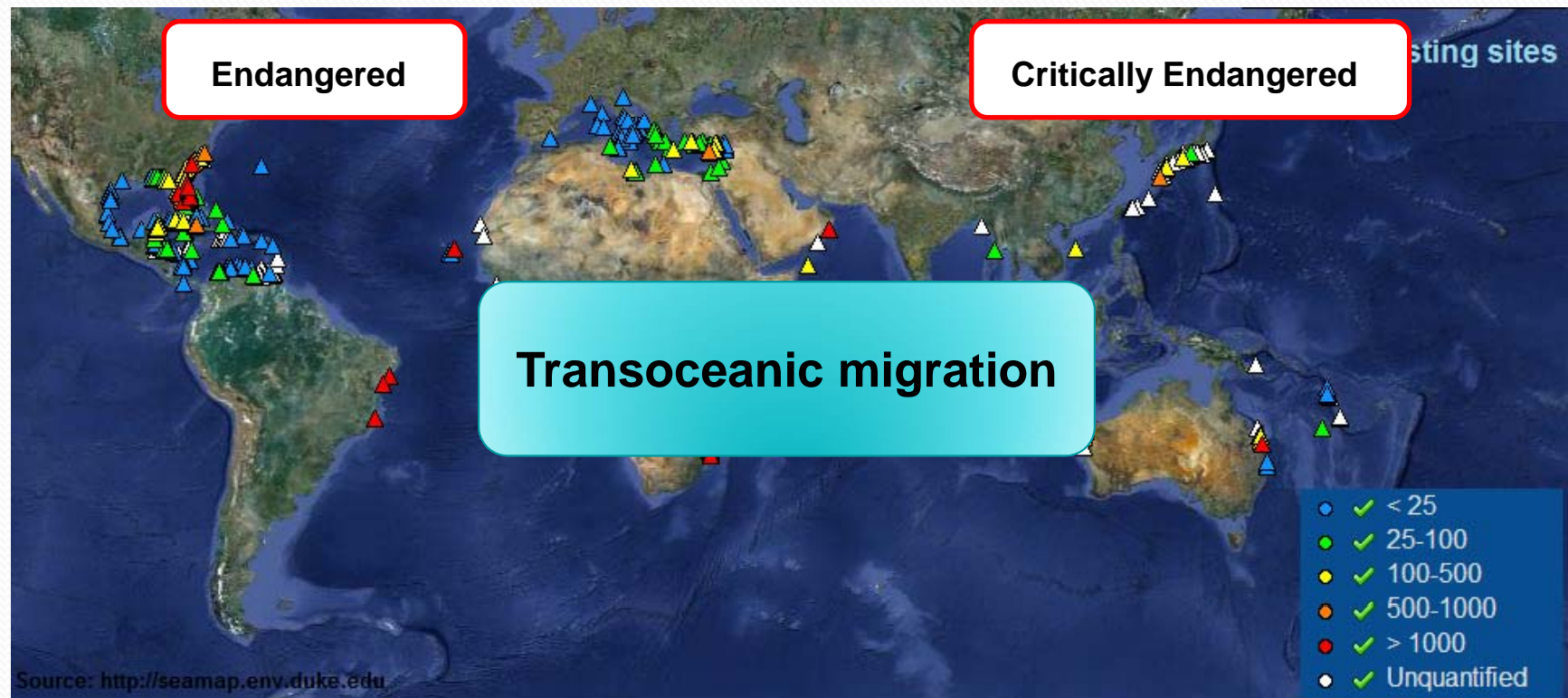
Species



Caretta caretta (Loggerhead)



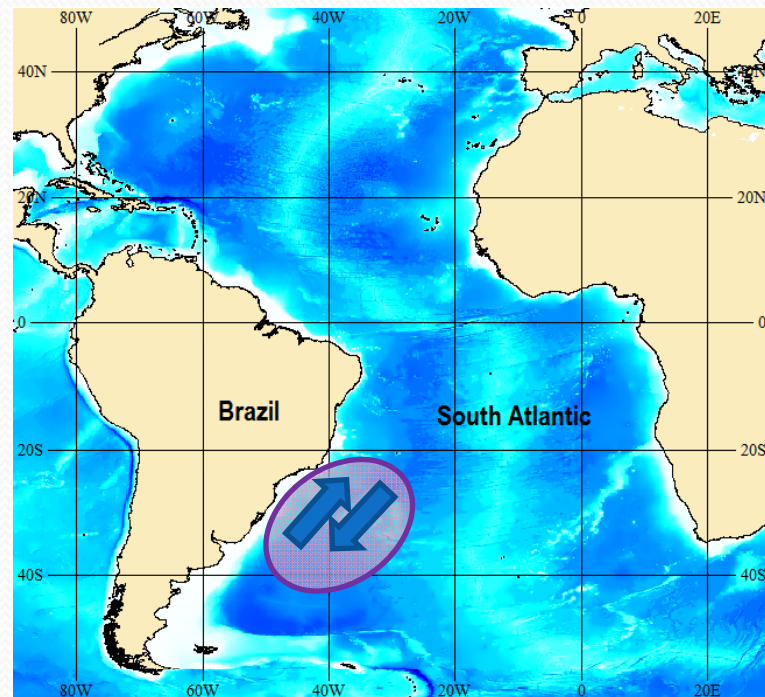
Dermochelys coriacea (Leatherback)



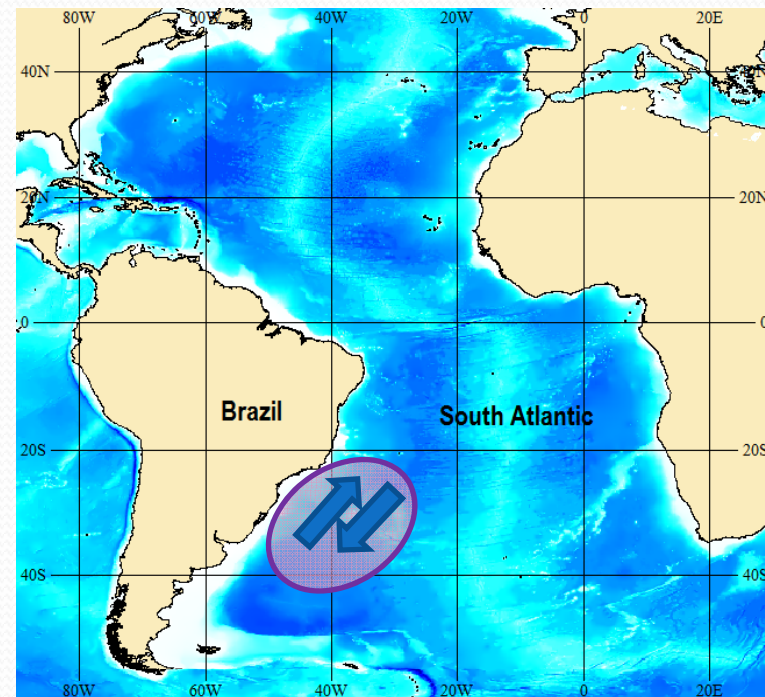
Migration route



***Caretta caretta* (Loggerhead)**

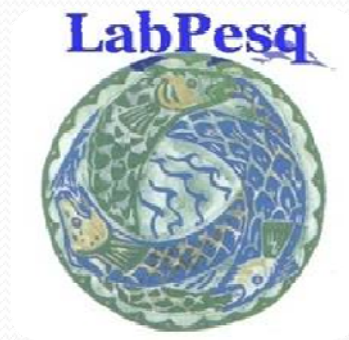


***Dermochelys coriacea* (Leatherback)**



Data Collection

- Source: On-board observers program (longline fleet coverage: 5%)
 - Period: 2003 - 2010



25 longline vessels



1290 bids in
106 fishing trips



Total N = 1153 *Caretta caretta*
255 *Dermochelys coriacea*



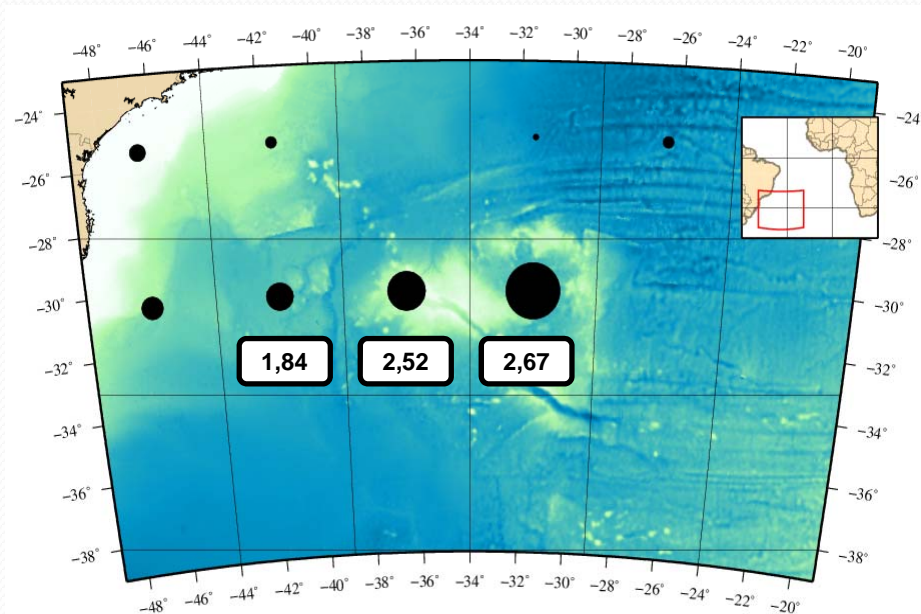


Main findings

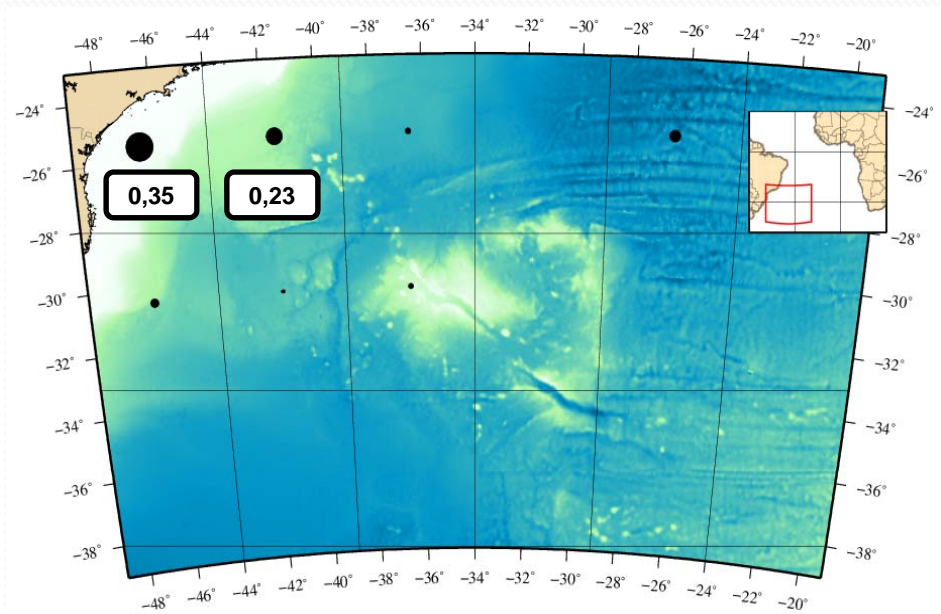
Critical Areas: Higher Total CPUE



Loggerhead

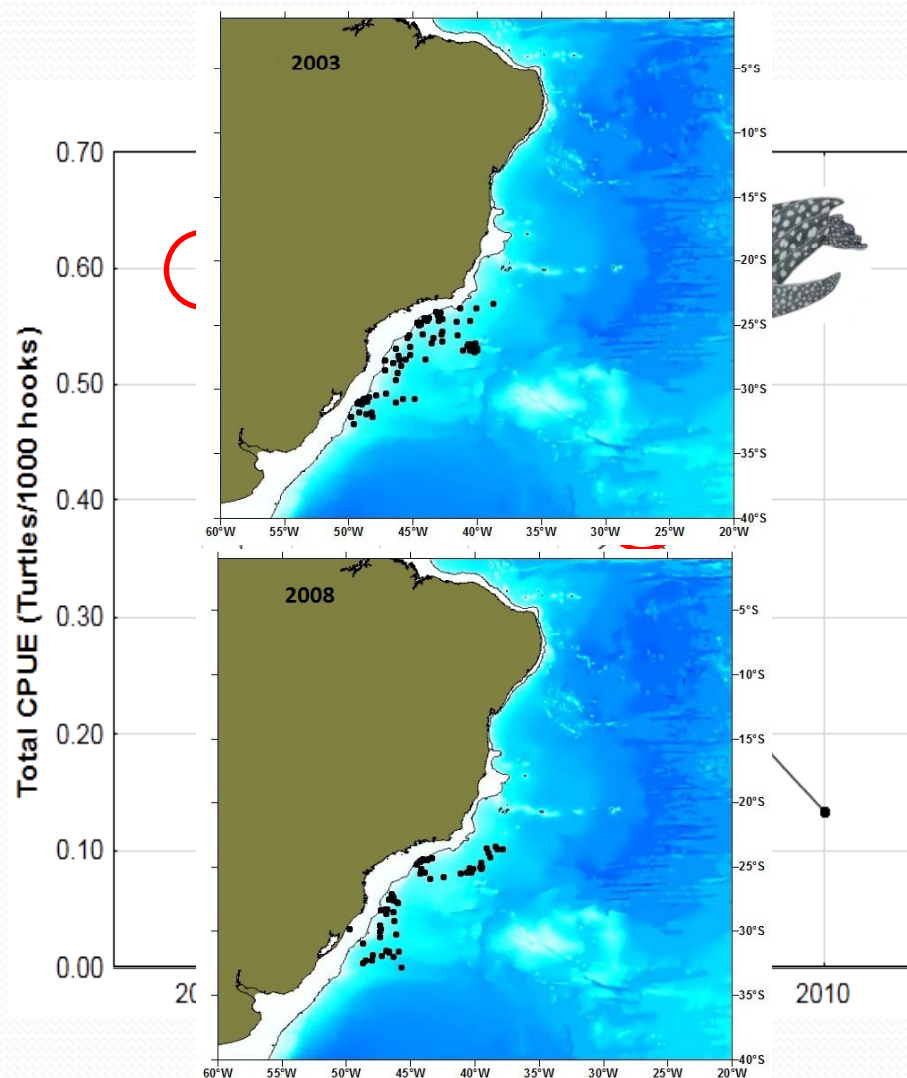
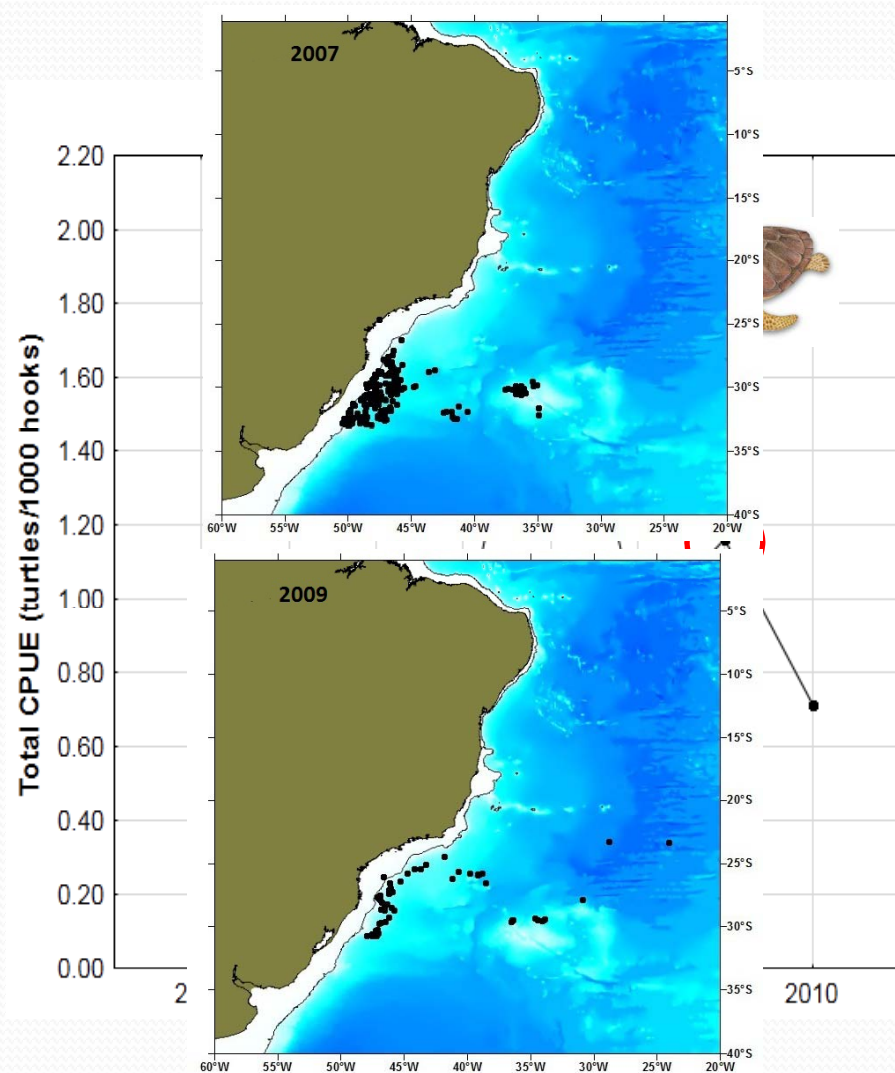


Leatherback



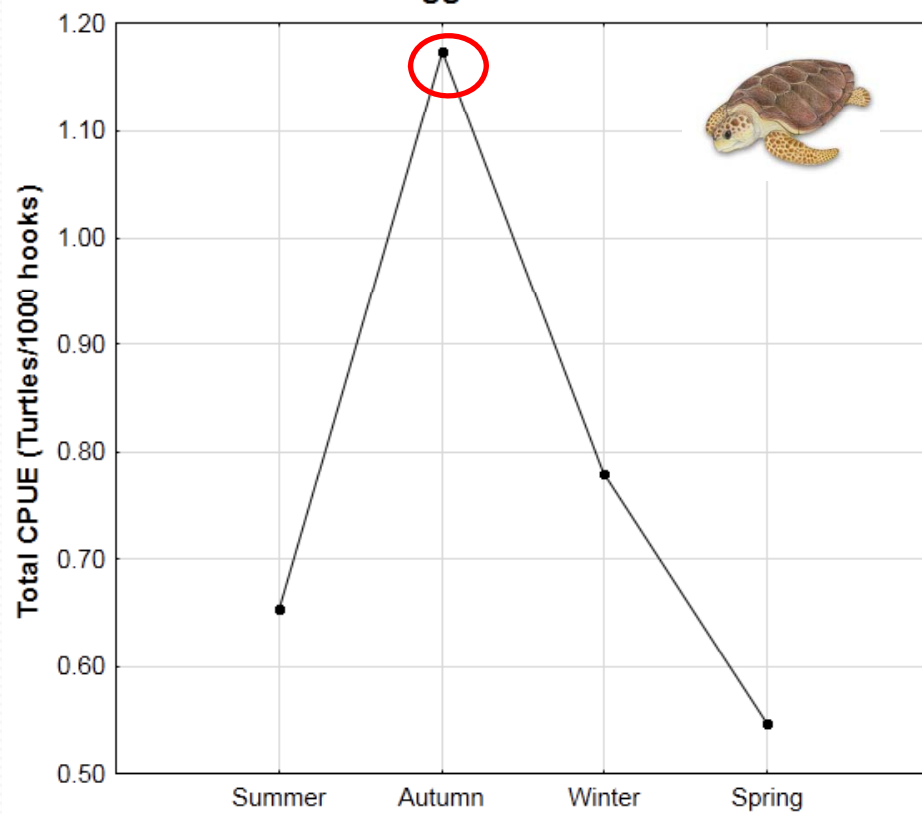
CPUE= Turtles caught/1000 hooks

Interannual variation

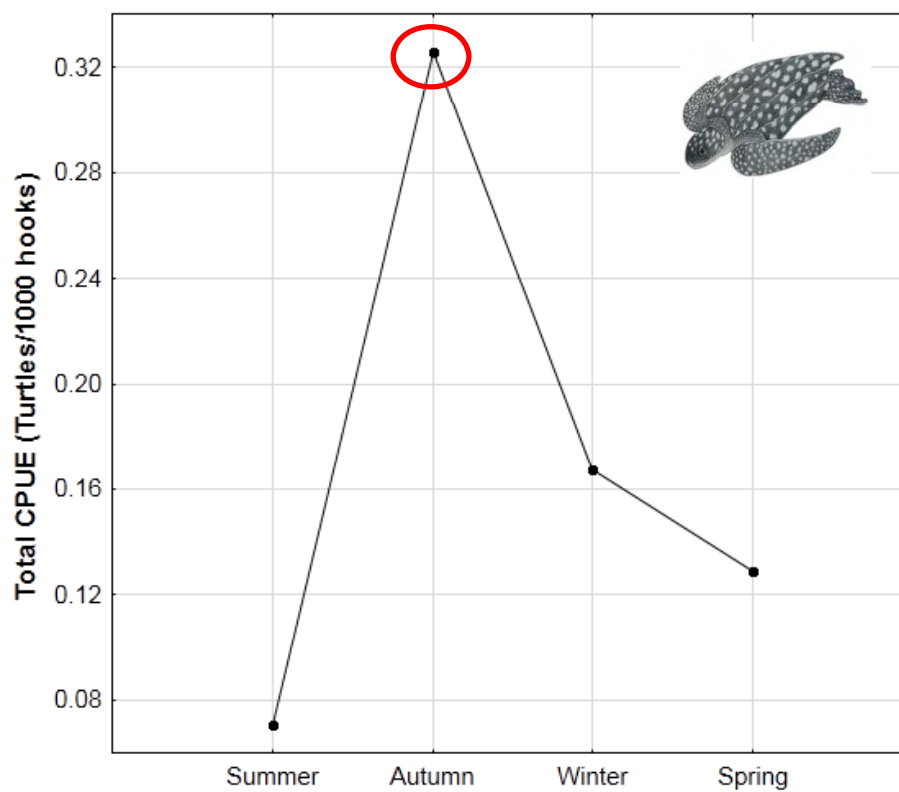


Seasonal variation

Loggerhead

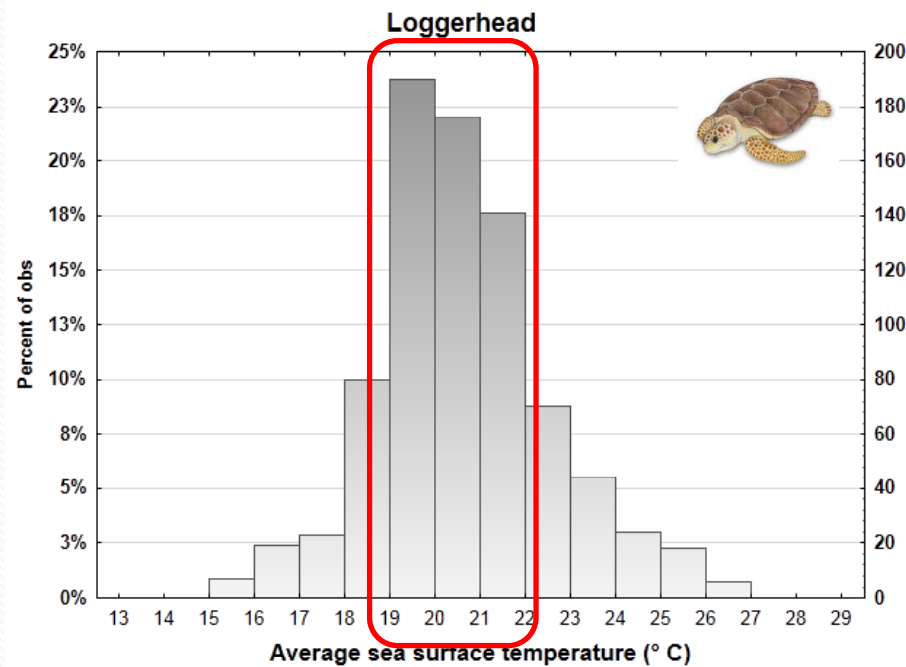


Leatherback



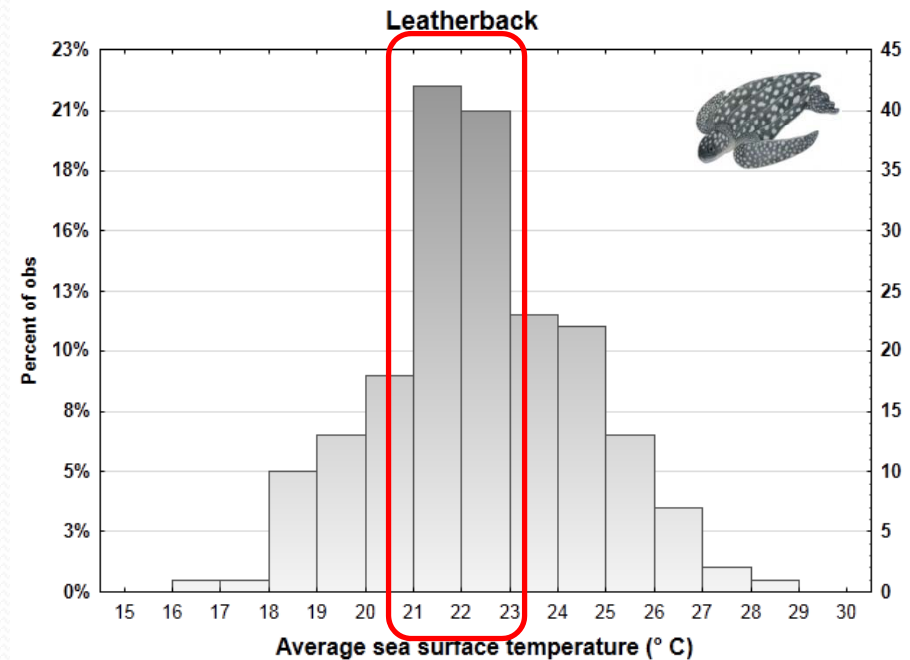
Sea surface temperature

Relatively Lower SST



Correlation between the CPUE and SST was significant

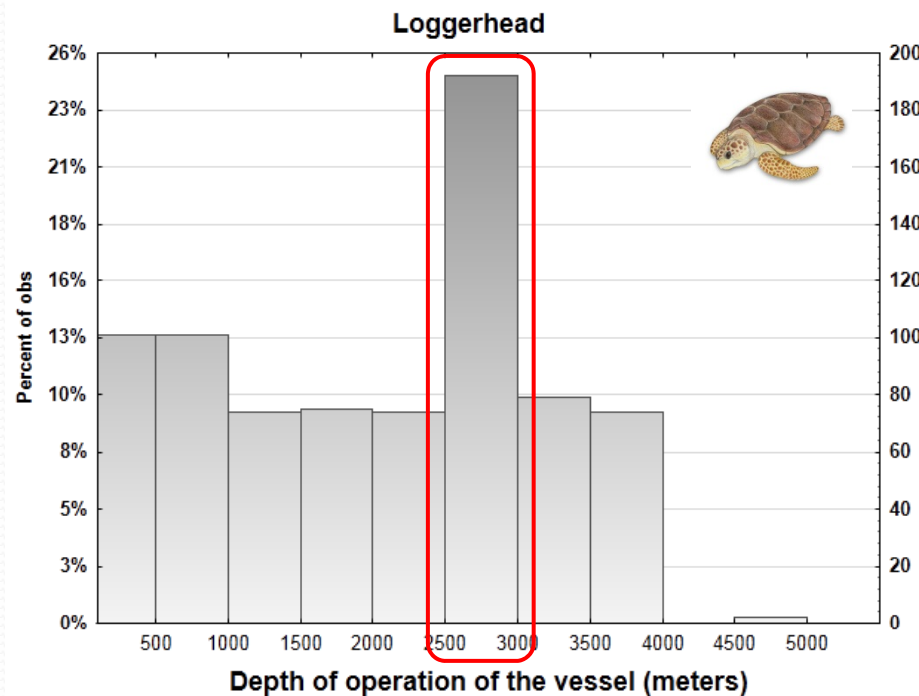
Relatively Higher SST



Correlation between the CPUE and SST was not significant

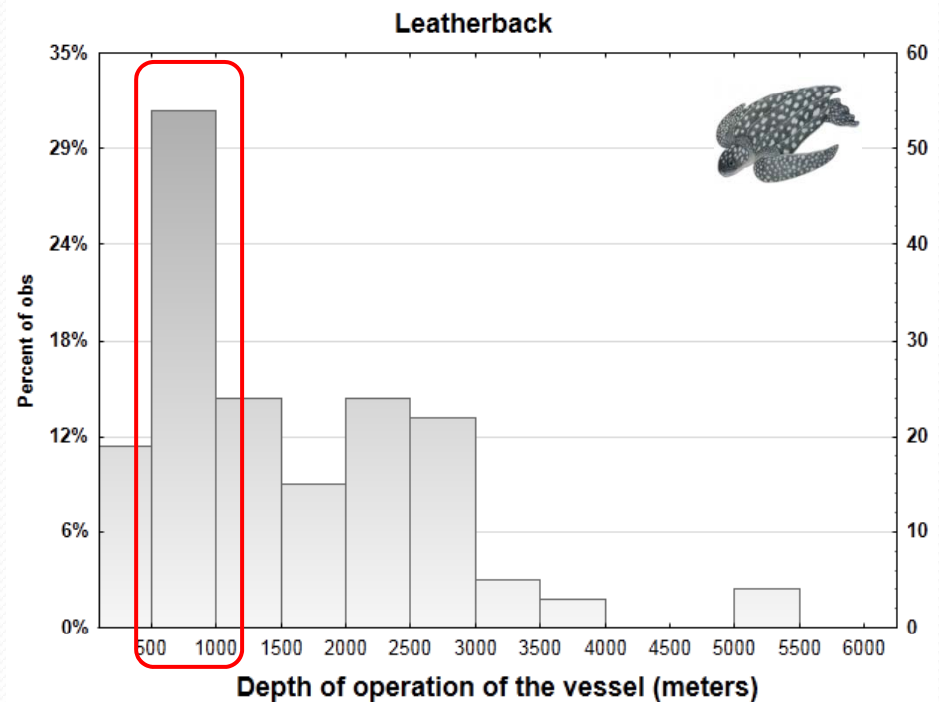
Depth (occurrence area)

Relatively Deeper



Correlation between the CPUE and fishing depth was not significant

Relatively Shallower

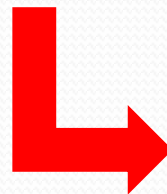


Correlation between the CPUE and fishing depth was significant



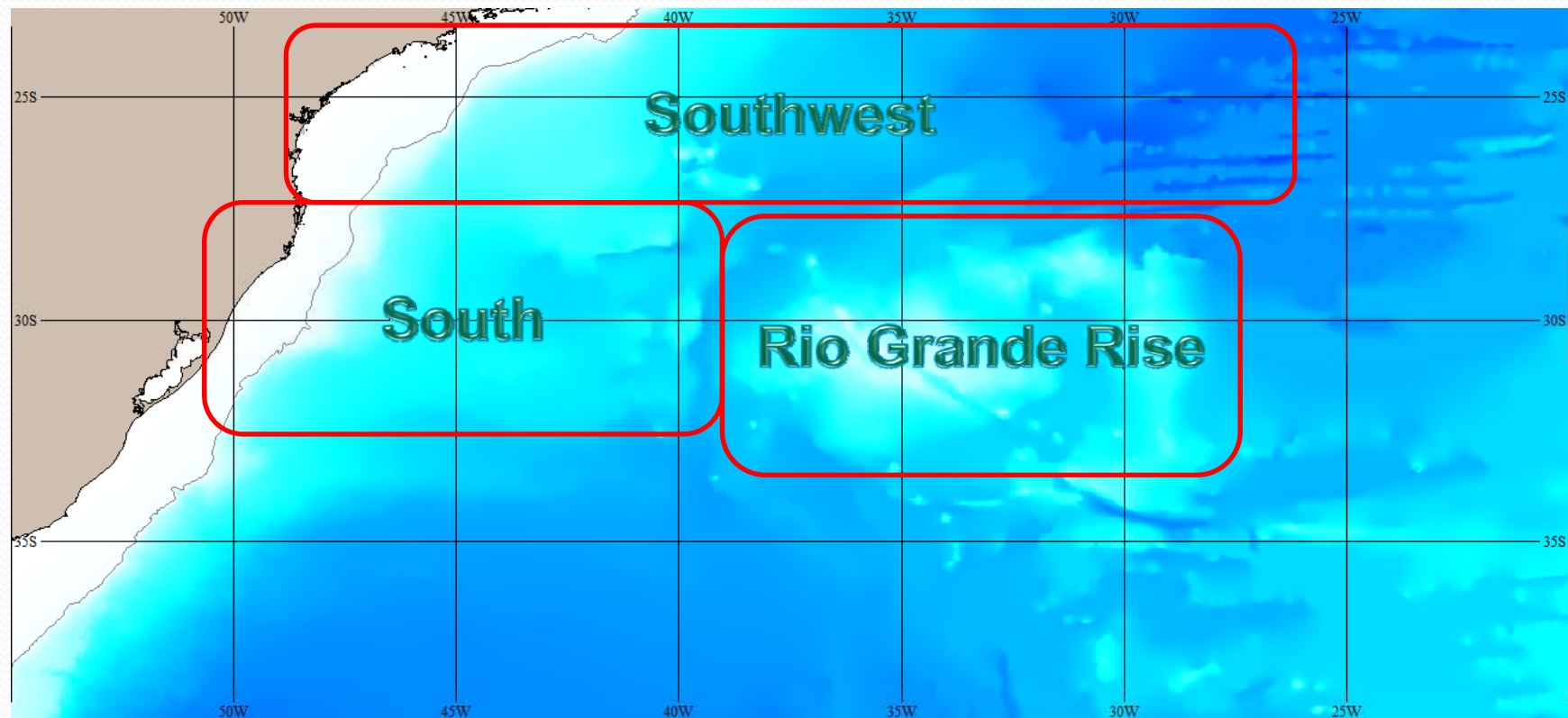
Other variables were tested as:

- Seawater conditions
- Wind speed
- Atmospheric pressure
- Air temperature.



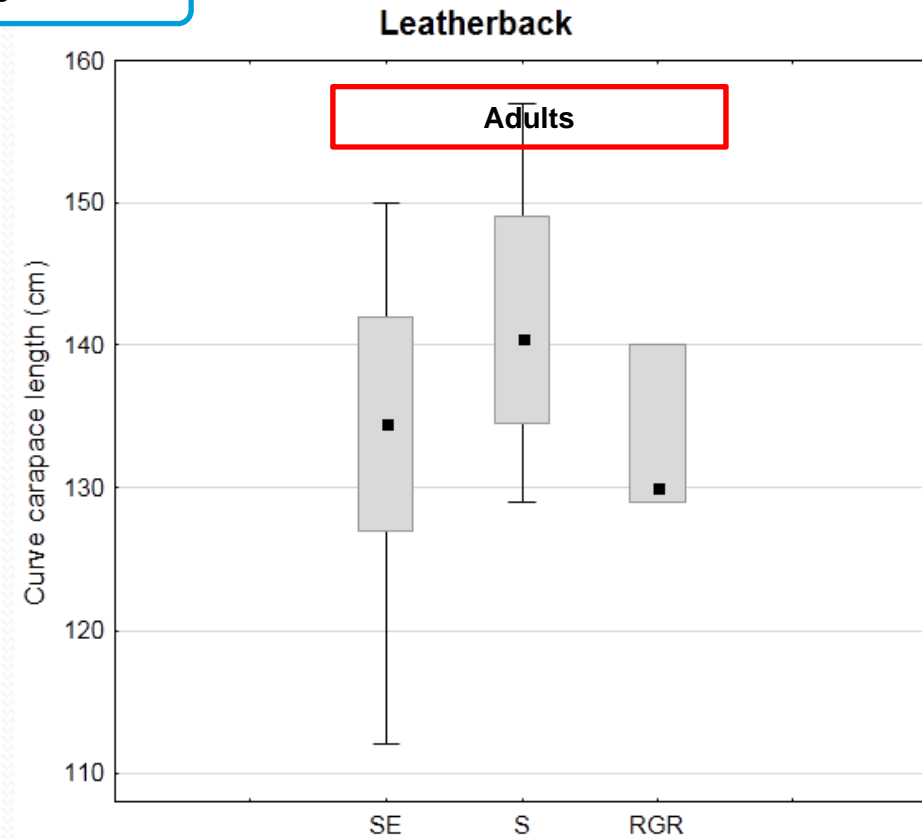
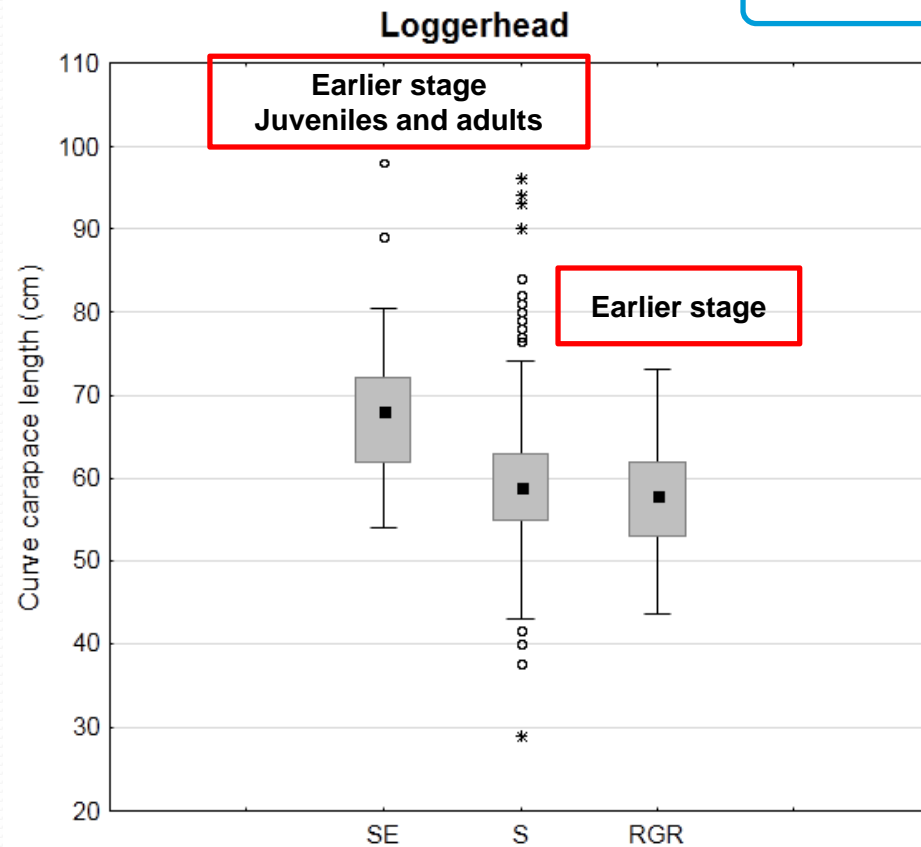
**No correlation
with CPUEs**

Size Distribution (CCL)



Size Distribution (CCL)

Were caught turtles



Sea turtles attends different habitats depending on their life stage

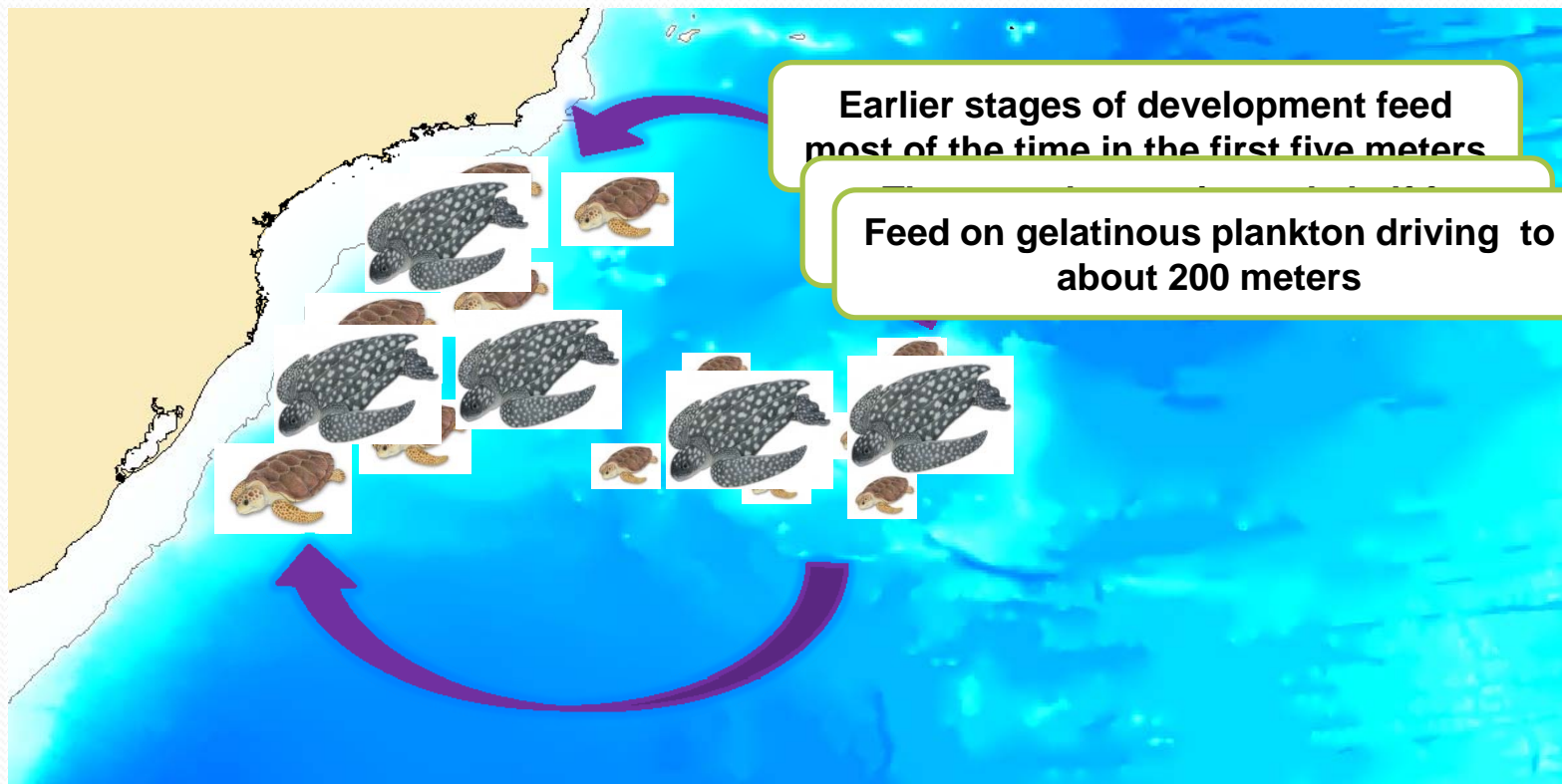
Size Distribution (CCL)



Loggerhead

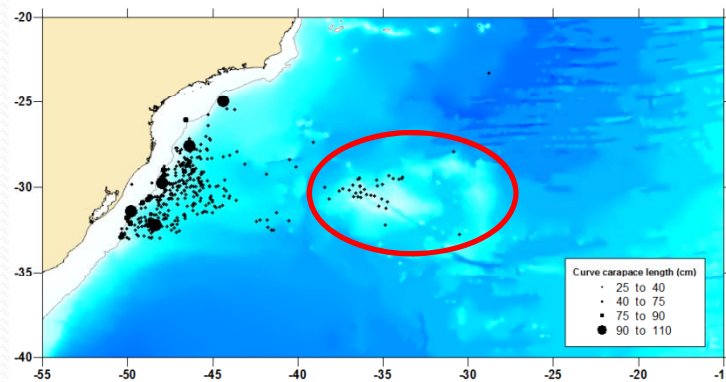


Leatherback

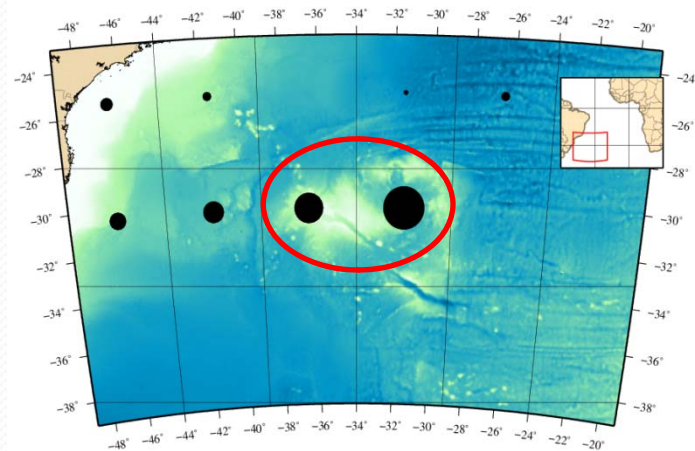


Size and bycatch

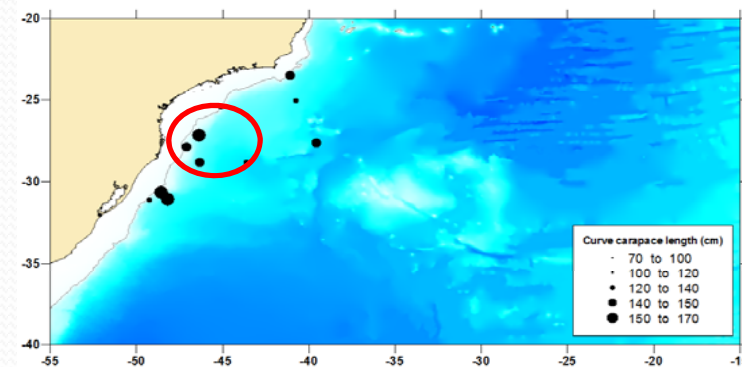
Loggerhead



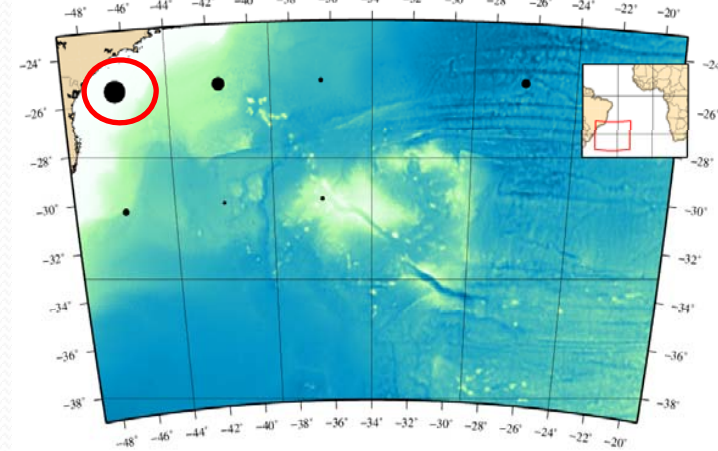
Also an area of animals in early stage of development



Leatherback



Animals in adult and reproduction phase suffer higher CPUE



Diet and bycatch

The feeding behavior influenced the site of insertion of the hook.



Internal injuries
Survival after bycatch???

**Carnivory: feeding on crabs, clams, mussels,
fish and invertebrates**
(BARROS *et al.*, 2009)



**Entangled
with the hook
externally**

**Diet consists of gelatinous zooplankton, such,
pyrosomos and salps**
(WITT *et al.*, 2007)

Mortality by the fleet

5%
coverage

Total bycatch
1408 sea turtles
(2003 – 2010)

If 100%

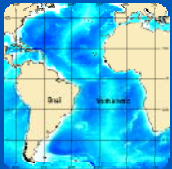
An estimate of
26221 turtles
(2003 – 2010)

Mortality:
Average of
2924 turtles /year

Concluding remarks

- Rio Grande Rise is a **critical area** for loggerhead and the area close to the slope is critical for Leatherback.
- **South Brazil Large Marine Ecosystem** proved to be an important area of **growth and feeding** species of Loggerhead and Leatherback.
- The **autumn** was the **season** with high CPUE for both species, and technical measures could be proposed in a seasonal basis.
- A positive **correlation** between **CPUE** and **SST** for loggerhead raise the question of implications for **climate change** affecting this species.
- Loggerhead shown to be more **susceptible** to bycatch in **early stage of development**. Thus a fisheries management in the areas of development of this species could be proposed.
- **Loggerhead** was hooked mainly by **mouth**. Propose measures to remove the hook can power increase the **chance of survival** of this sea turtle after the bycatch.

Concluding remarks



Ecosystem-based fishery management (EBFM) should be a new direction for pelagic fisheries management.



In this sense, RFMO's should take into consideration the RMU's proposed by Wallace *et al* (2011) as high conservation priority areas.

However, subareas of an RMU such as our study area should be considered more relevant to EBFM, also fitting with the Large Marine Ecosystem definition.

Thank you!!!

Acknowledgements:



*EBFM Tuna – 2012: Towards Ecosystem
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