

Updated Stock Status Indicators for Silky Sharks in the Eastern Pacific Ocean (Document SAC-06-08b)

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Comisión Interamericana del Atún tropical
Inter-American Tropical Tuna Commission (IATTC)

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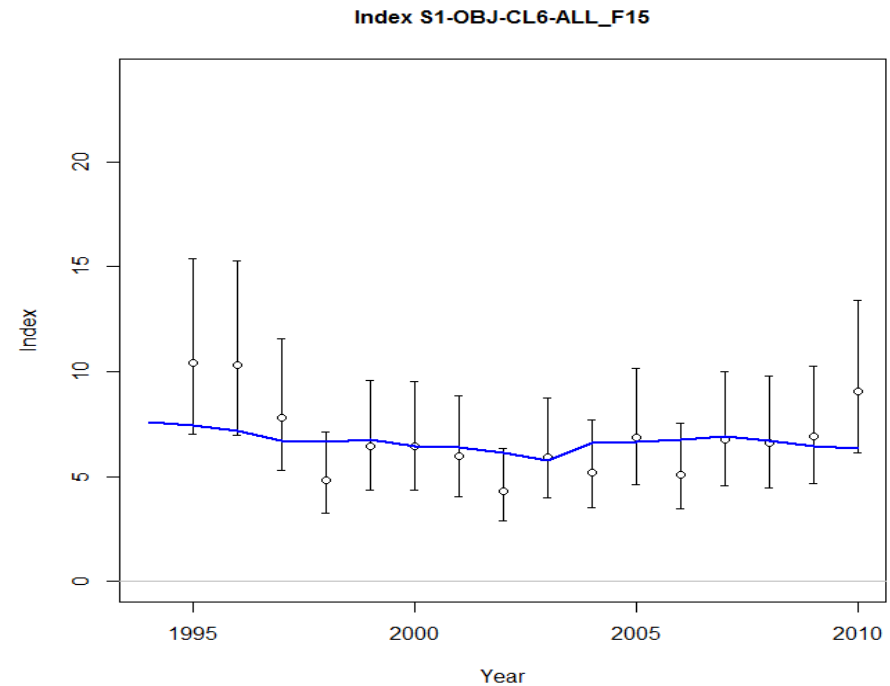
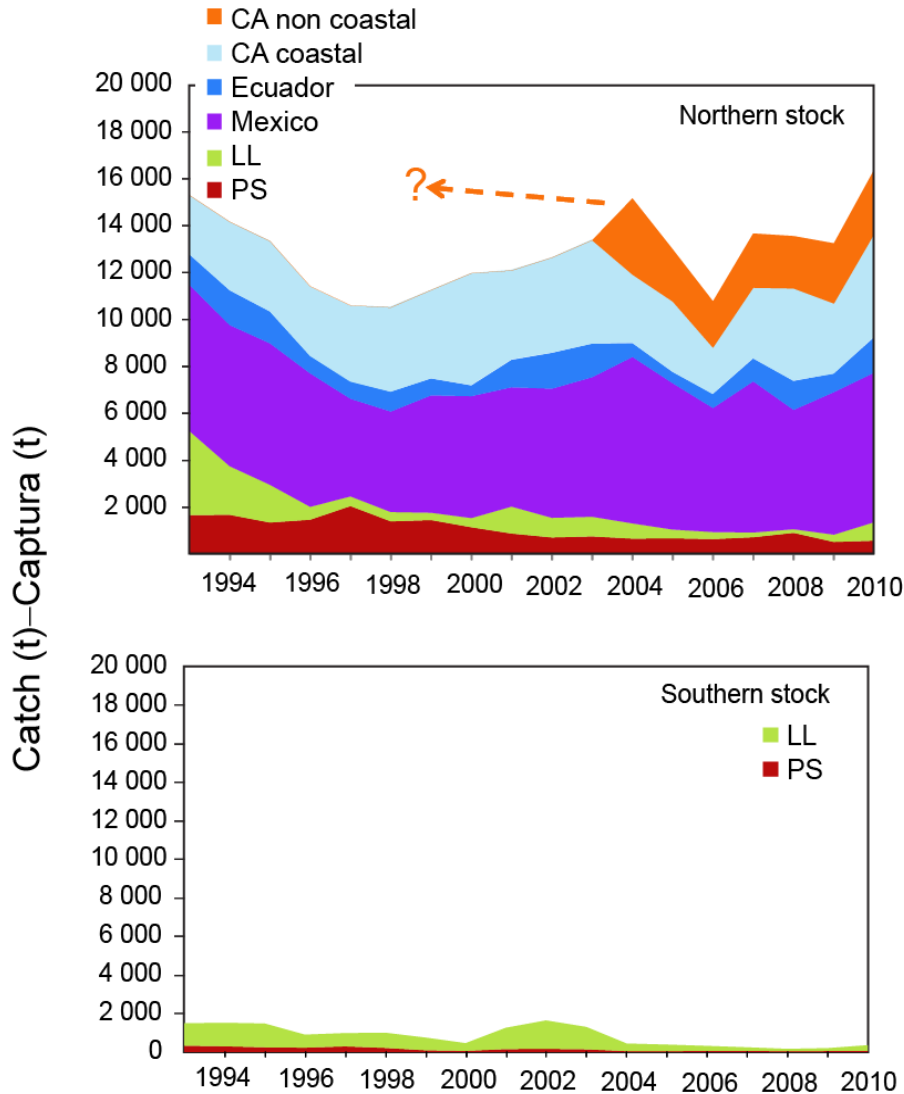


Outline of talk

- Background
 - Previous attempt to conduct conventional stock assessment
 - How that brought us to indicators
- Updated stock status indicators (SSIs)
 - Spatial distribution of silky bycatch-per-set on floating-objects (OBJ)
 - Standardized CPUE from OBJ purse seine-sets
 - Standardize indices of presence/absence on DEL and NOA purse-seine sets
 - Spatial trends in indicators from purse-seine sets on OBJ set
- Environmental considerations (2014)
- Summary conclusions



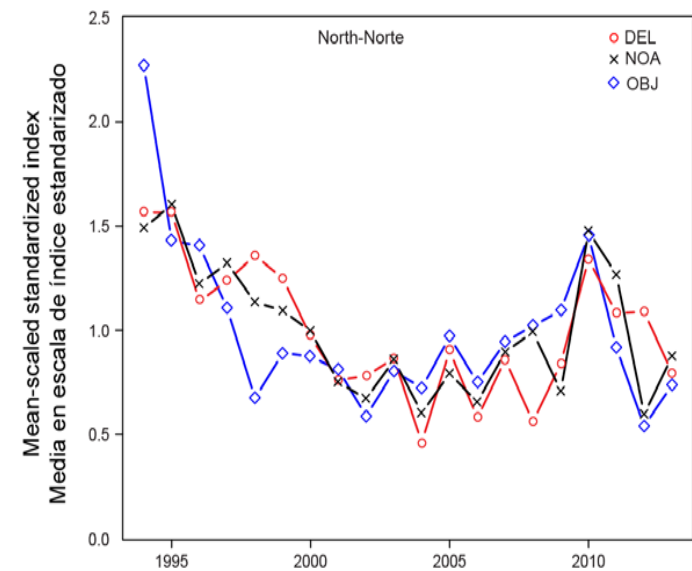
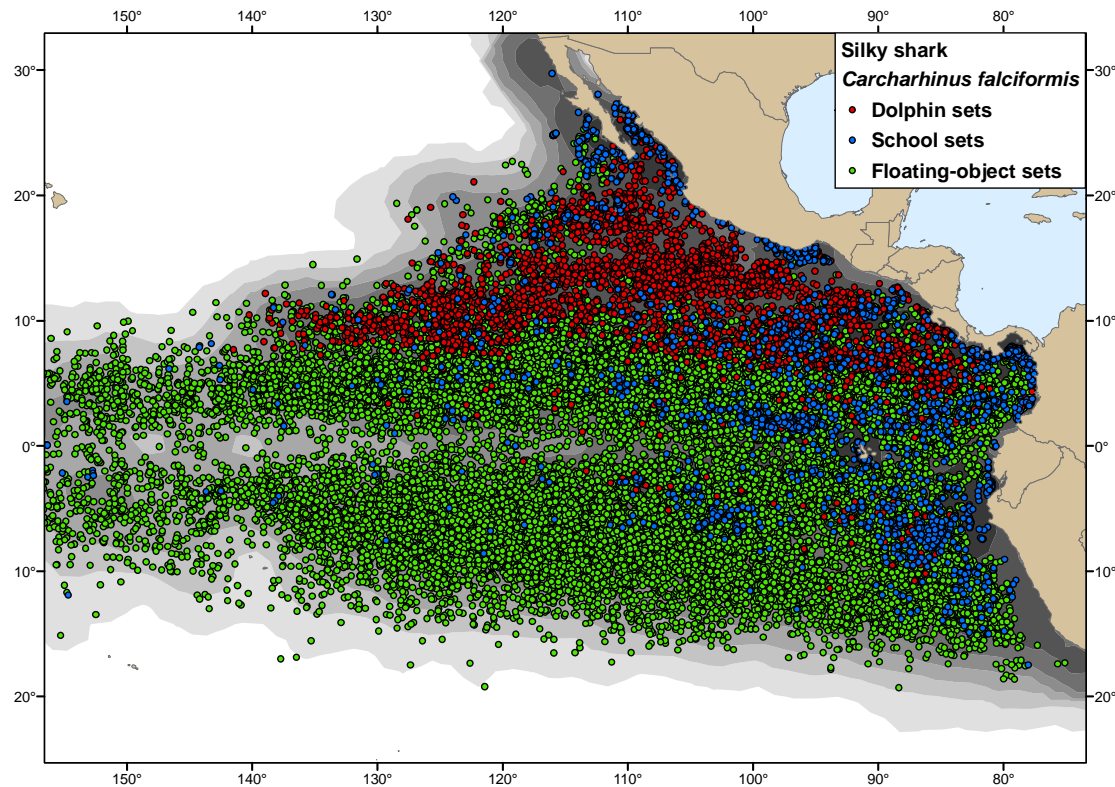
Stock assessment: “missing catch” in early period





OBJ indicators for silky

- Indices based on standardized CPUE in PS-OBJ were proposed as best indicators for representing silky population trends in the EPO





Spatial distribution of BPS

Fltobj sets
All sizes

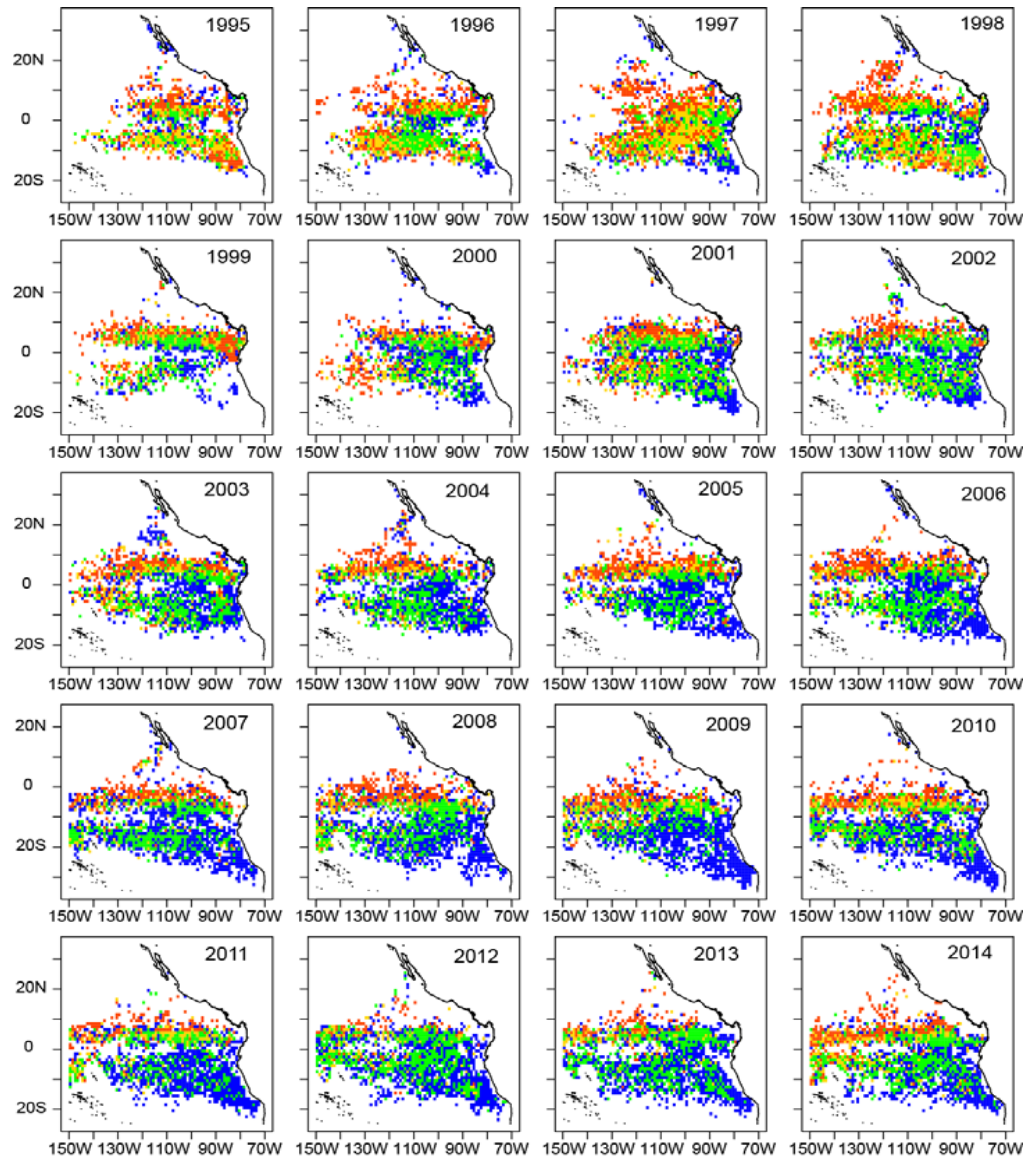
Color scale:

blue: 0 bps

green: ≤ 2 silky/set

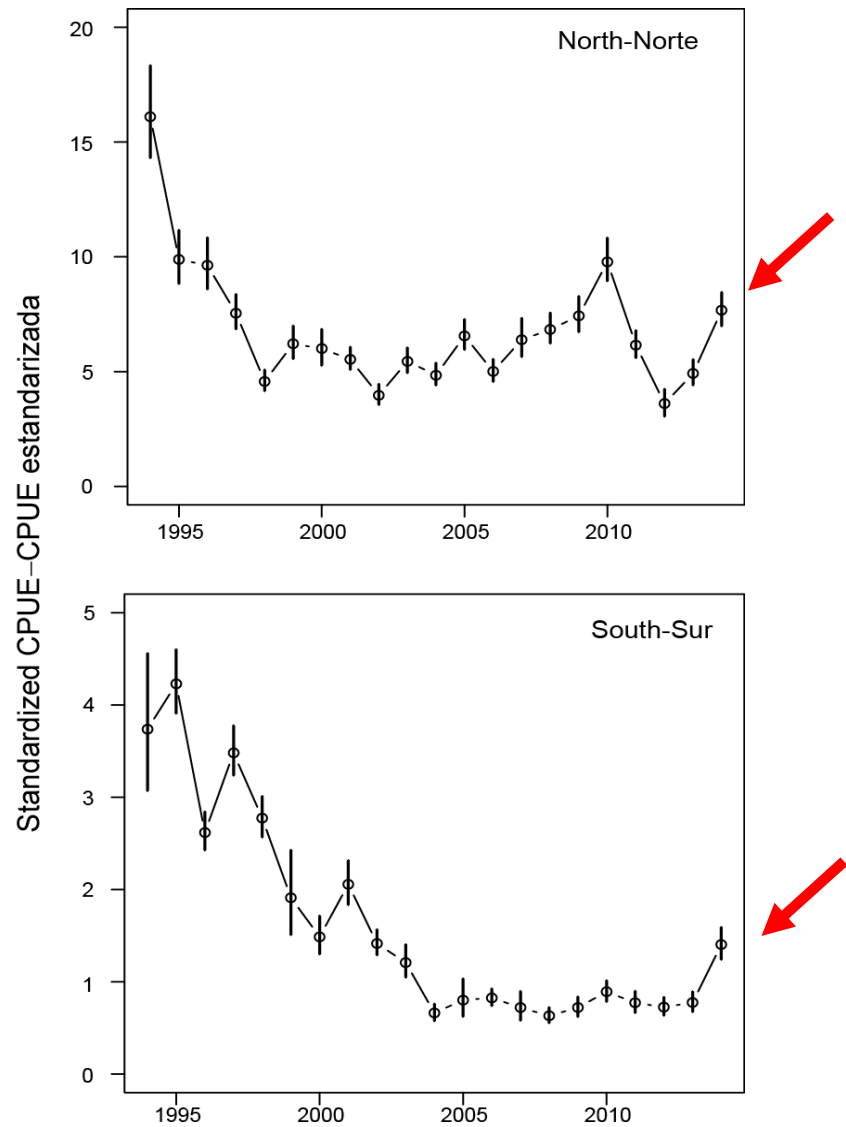
yellow: 2-5 silky/set

red: > 5 silky/set



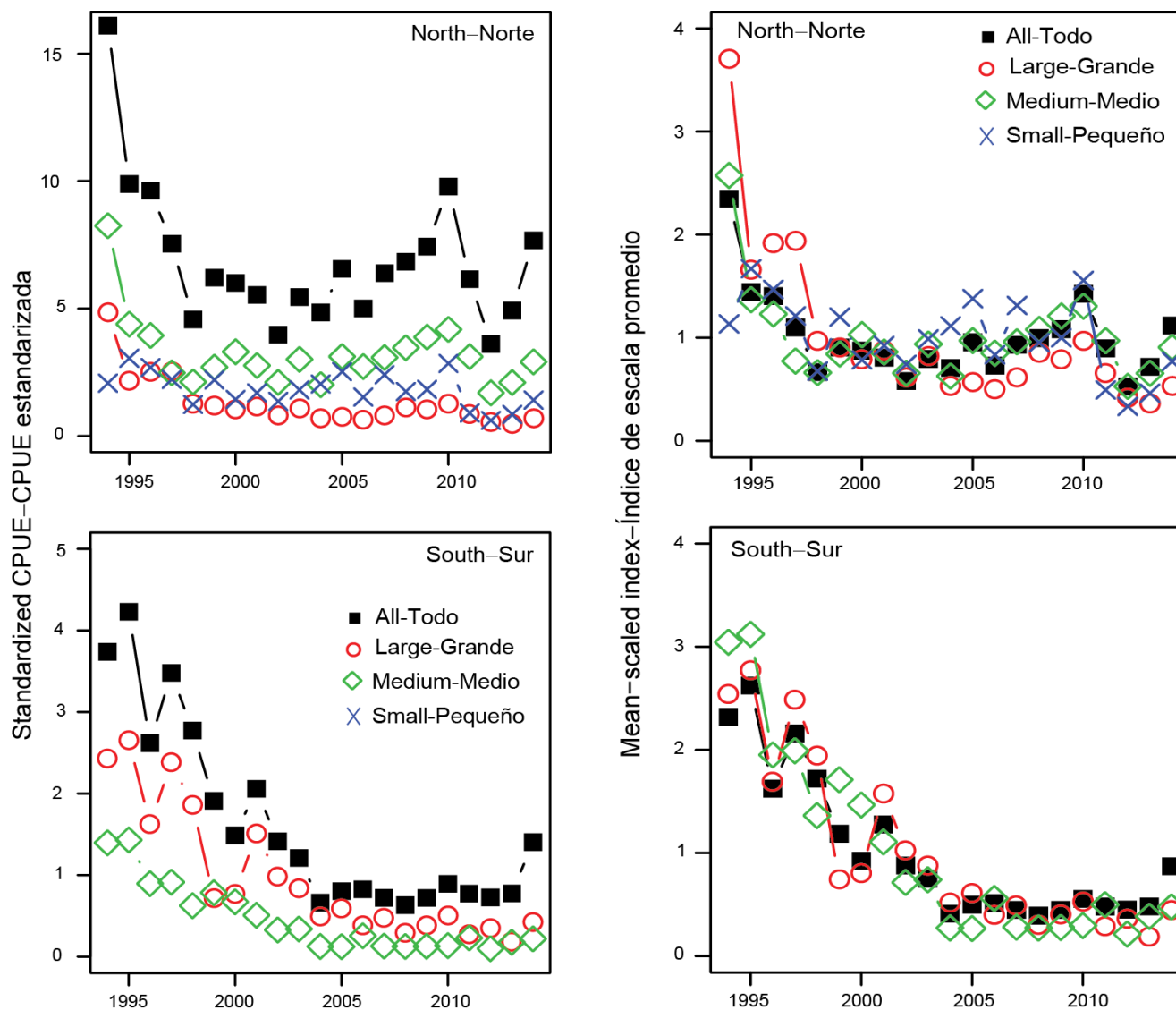


Standardized CPUE-OBJ



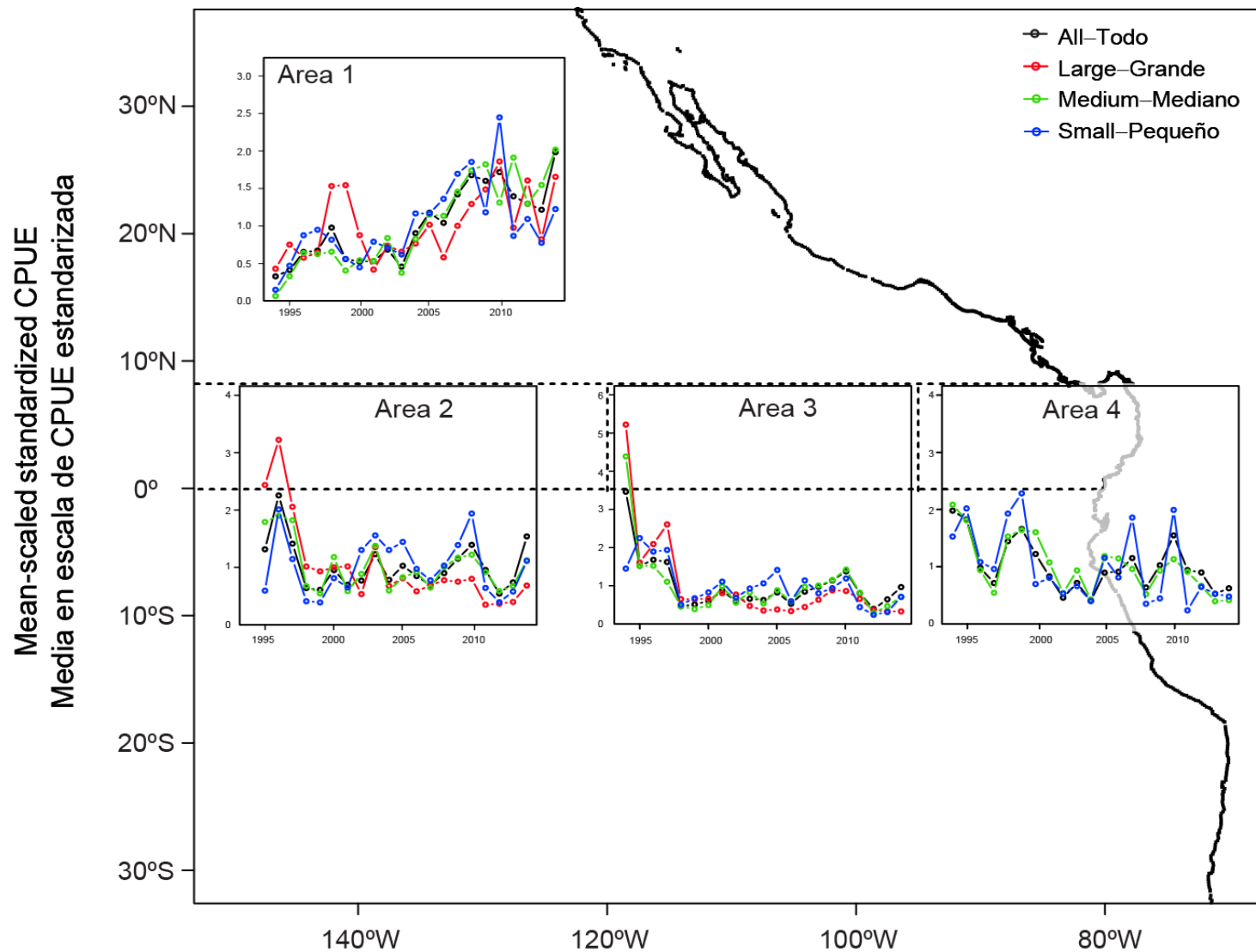


Standardized OBJ CPUE



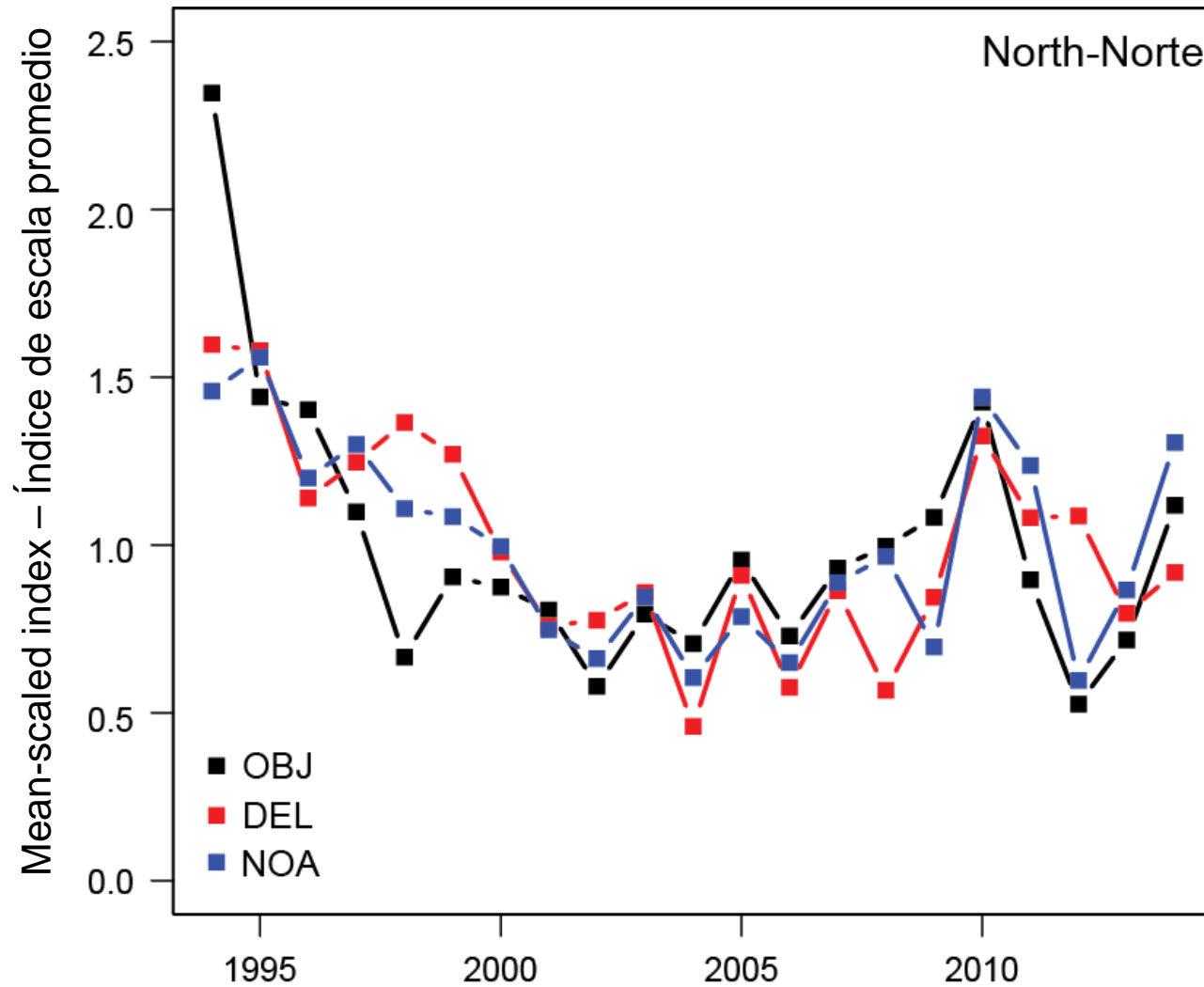


Standardized OBJ CPUE





Comparisons among set types



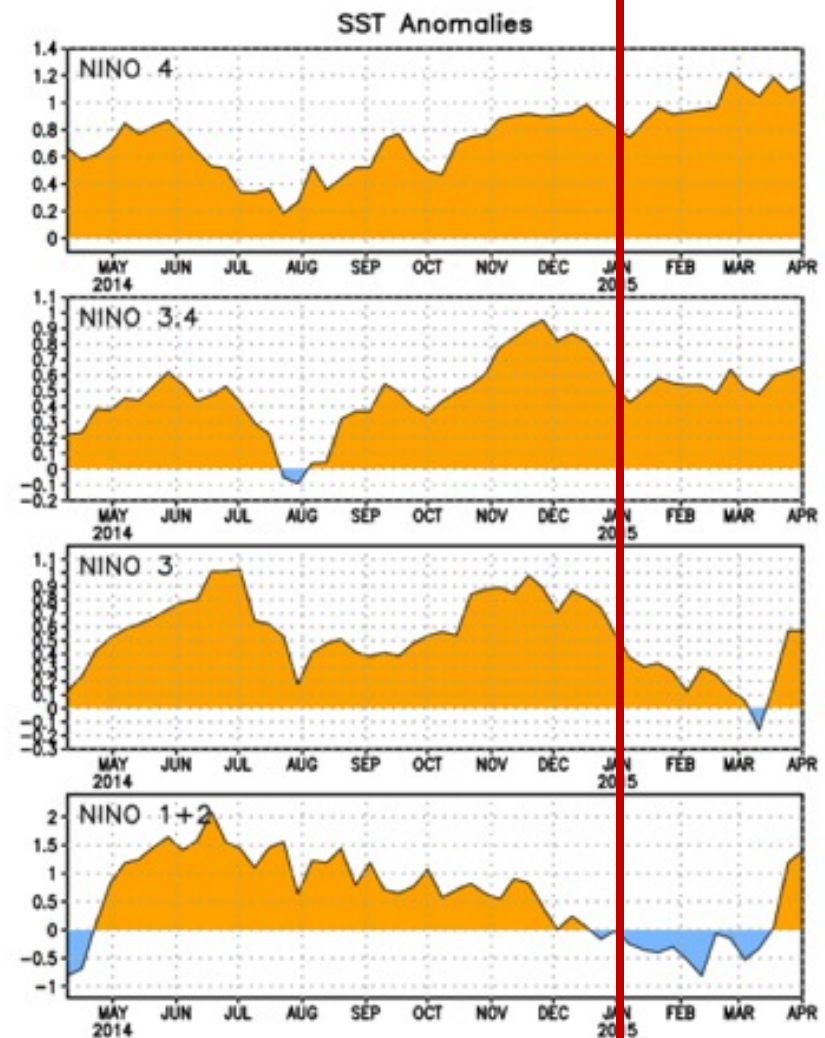
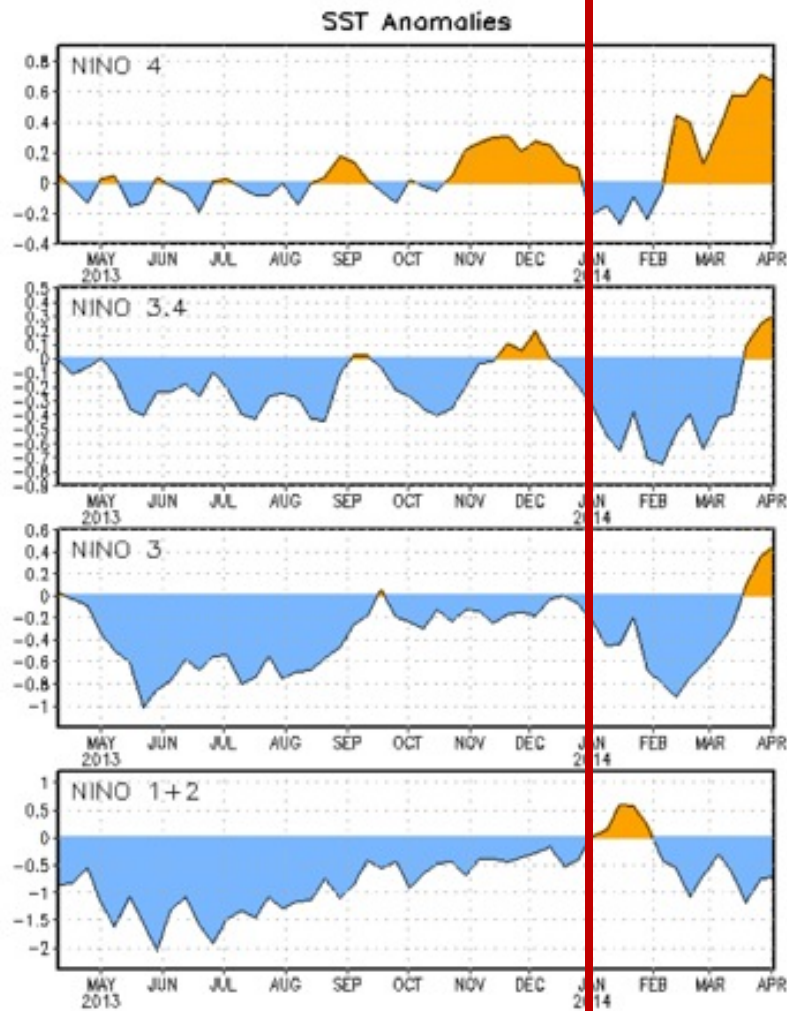


Environmental considerations

2013

2014

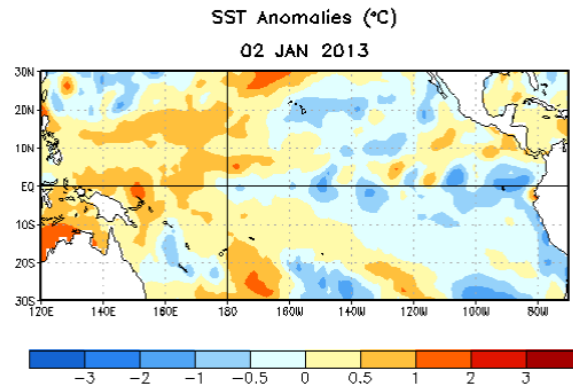
2015



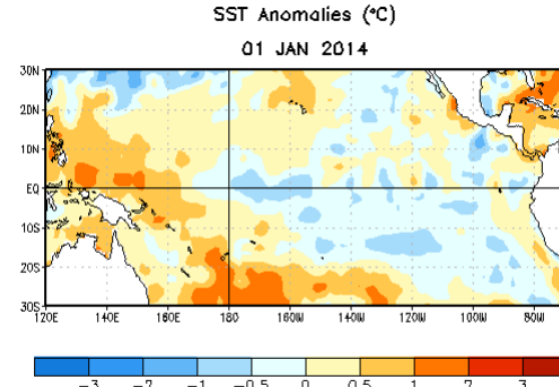


Environmental considerations

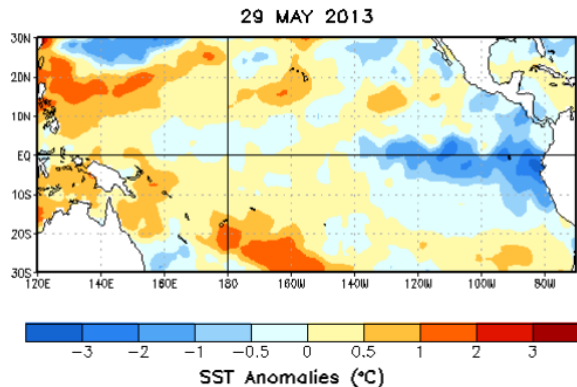
JAN 2013



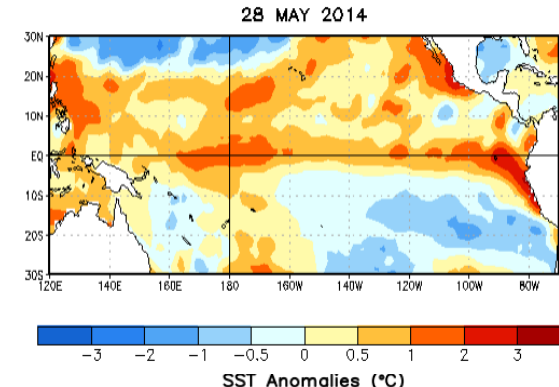
JAN 2014



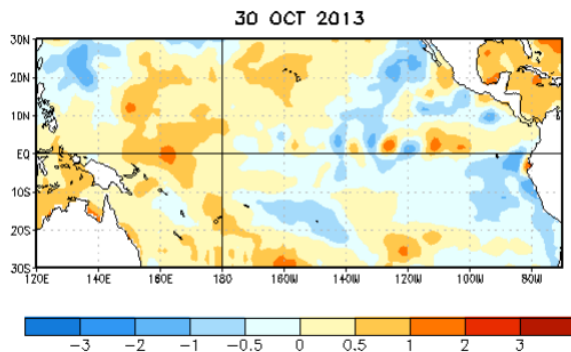
MAY 2013



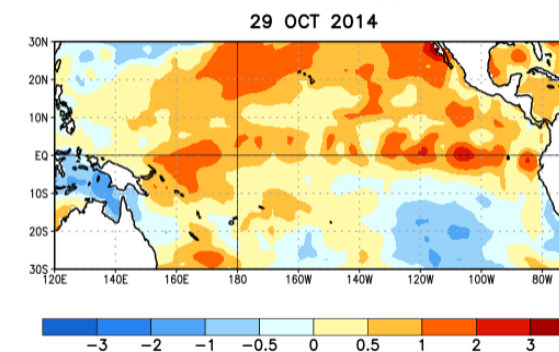
MAY 2014



OCT 2013



OCT 2014

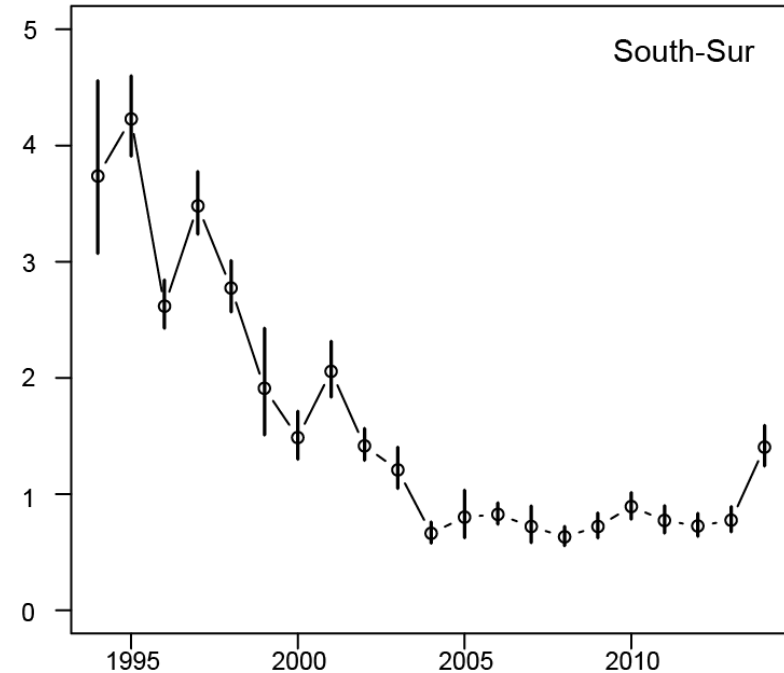
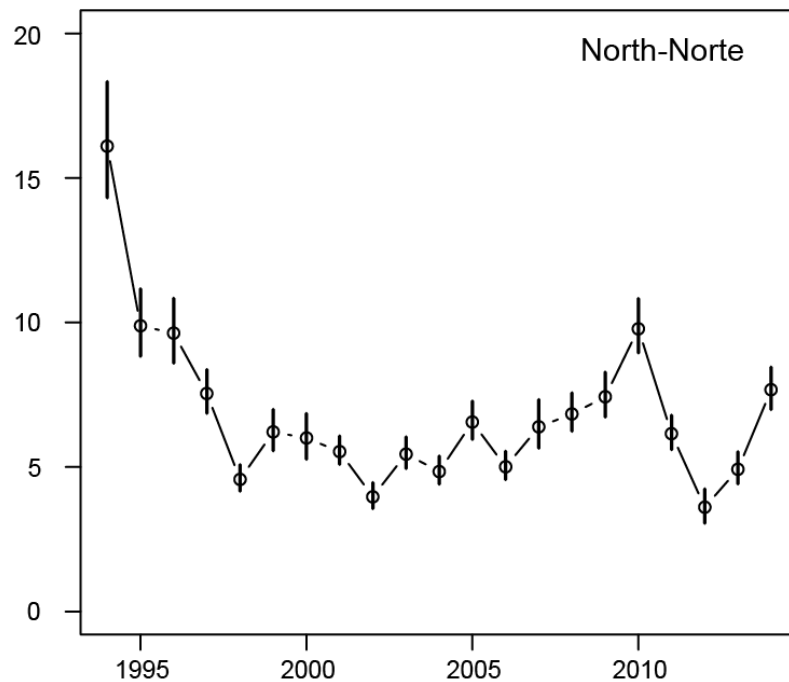




Indicators - conclusions

- Silky shark stocks have been depleted to low historic levels when compared to the mid-990s
- Recent increases in CPUE should be regarded with caution
 - There have been environmental changes in 2014
 - Increases may reflect increased availability rather than abundance

Standardized CPUE—CPUE estandarizada





Indicators - conclusions

- No stock stats target and limit reference points have been developed for silky sharks based on these indicators
- Harvest control runs have not been developed and tested neither
- Future research: Management strategy evaluation work (MSE) to identify the reference points and harvest control rules that can achieve conservation goals
- Management: It is critical that precautionary management be implemented immediately to allow silky shark populations to rebuild

QUESTIONS?

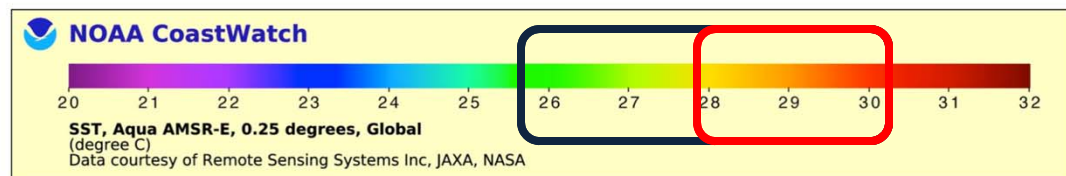
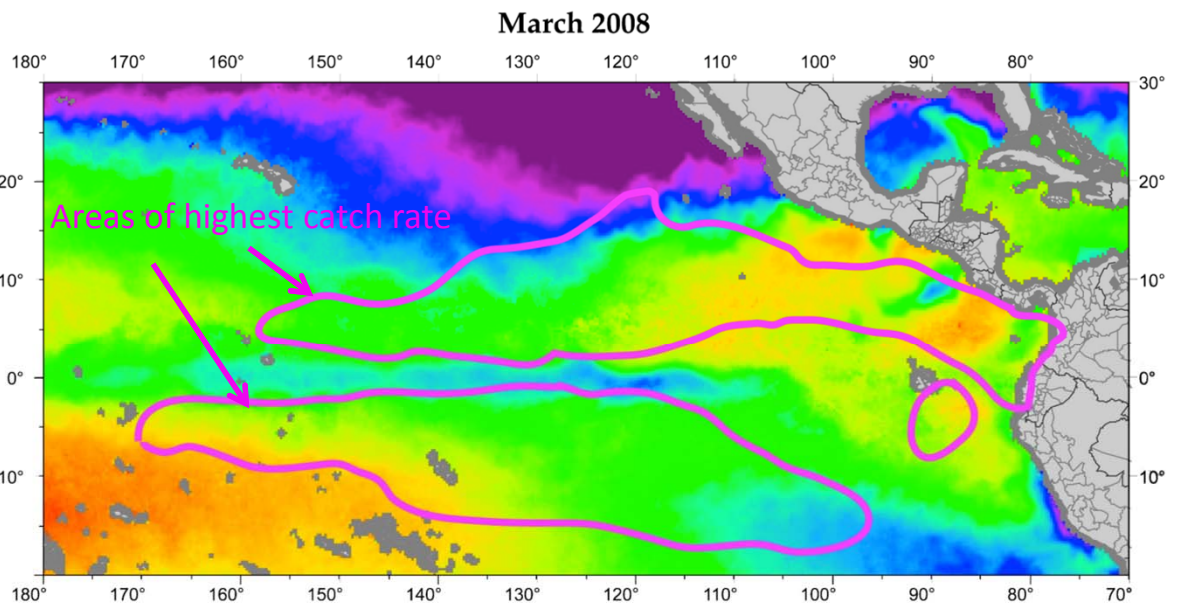
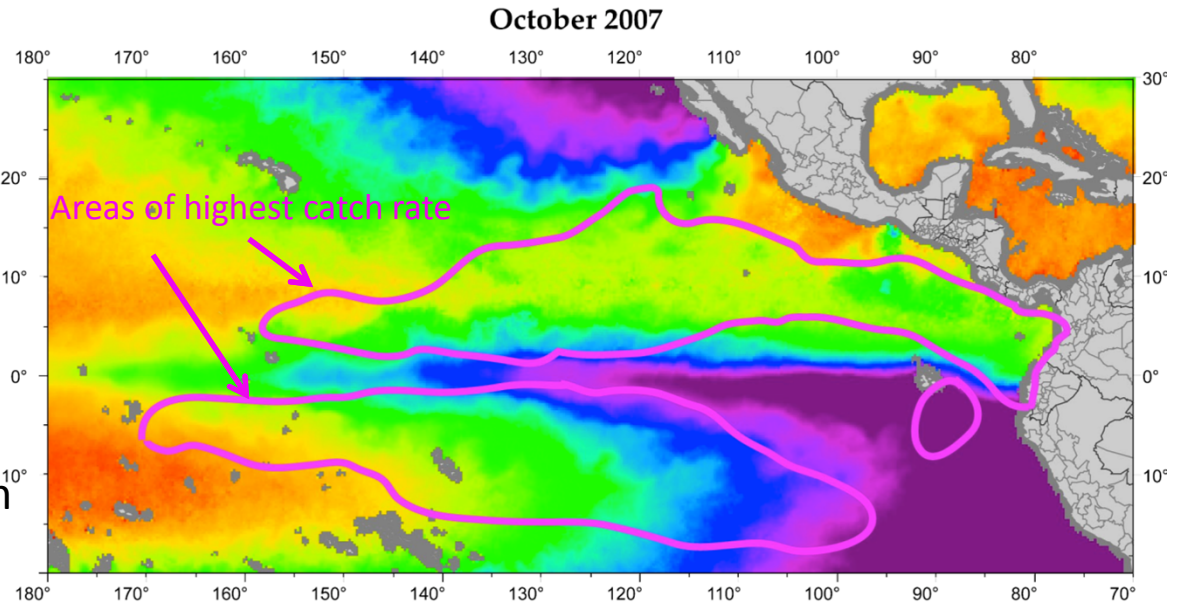


Conclusions

- Weak N – S structure
- Animals south of the equator and near the S. American coast most closely allied with Northern animals
 - Seasonal overlap?

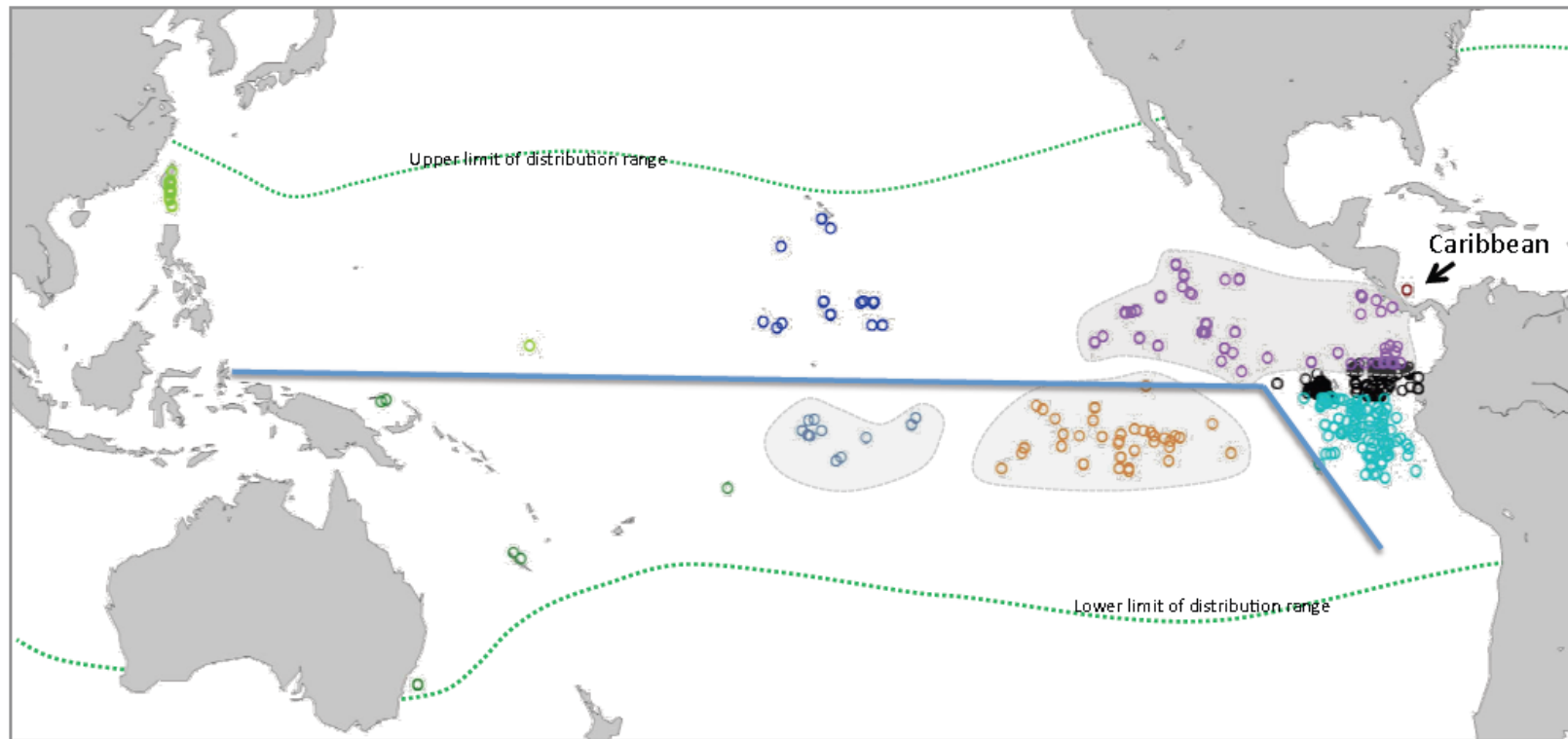
Future directions?

- More satellite tagging
- More samples from central and western South Pacific



Source: John Hyde, NMFS-SWFSC

Sample distribution and hypothesized stock boundary



○ North West Pacific
○ South West Pacific

○ North Central Pacific
○ North Central Pacific

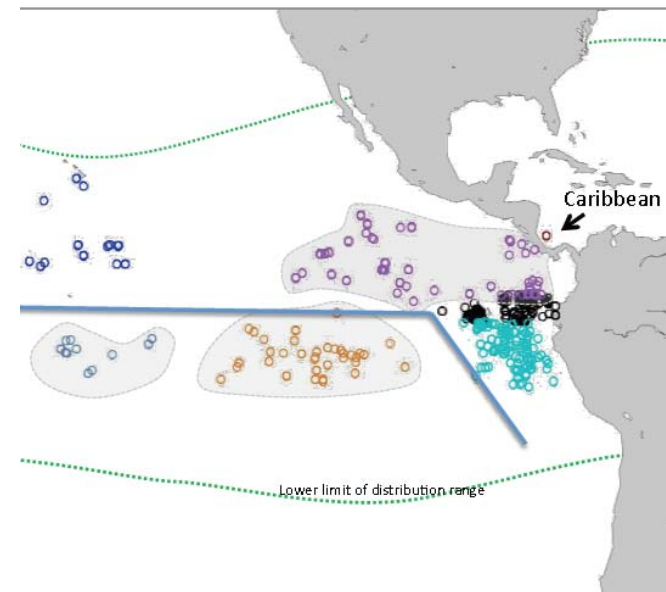
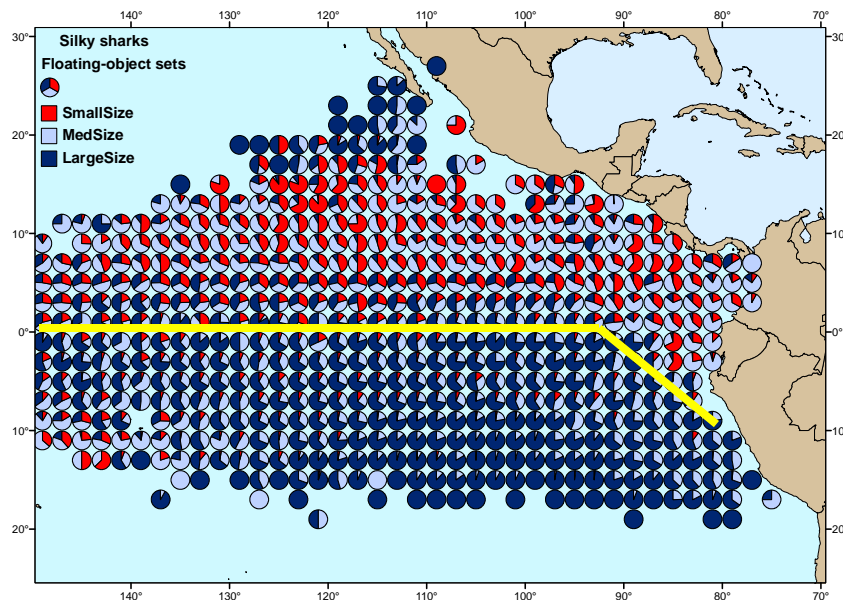
○ North East Pacific
○ Equatorial Eastern Pacific
○ South East Pacific-1
○ North East Pacific-2

Source: John Hyde, NMFS-SWFSC



Stock assessment

- Northern Stock
 - Stock Synthesis model and fishery indicators (standardized CPUE and average sizes)
- Southern Stock
 - Fishery indicators: standardized CPUE





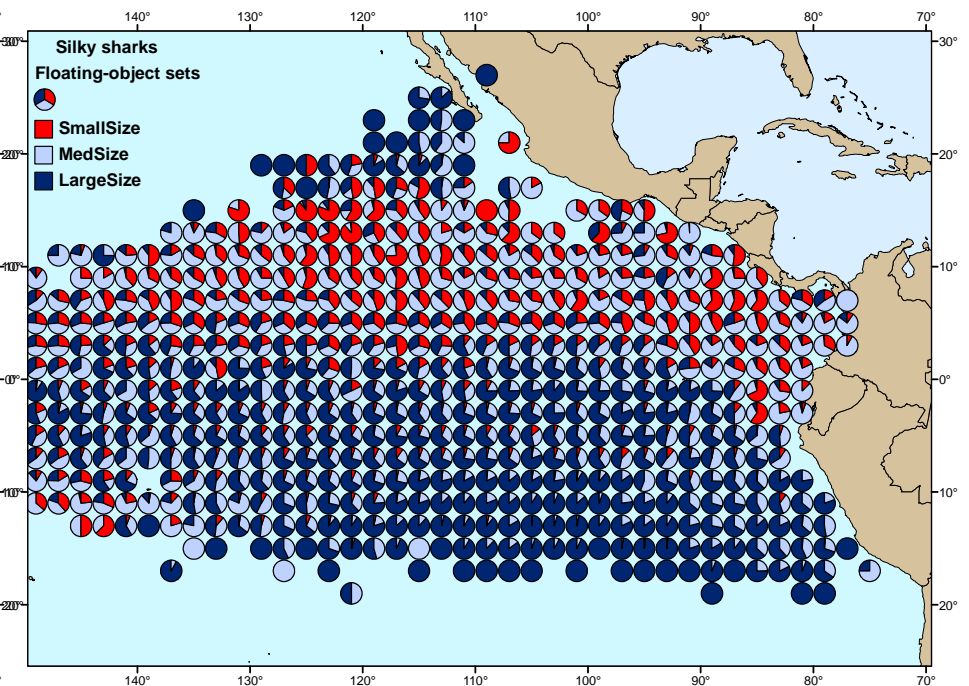
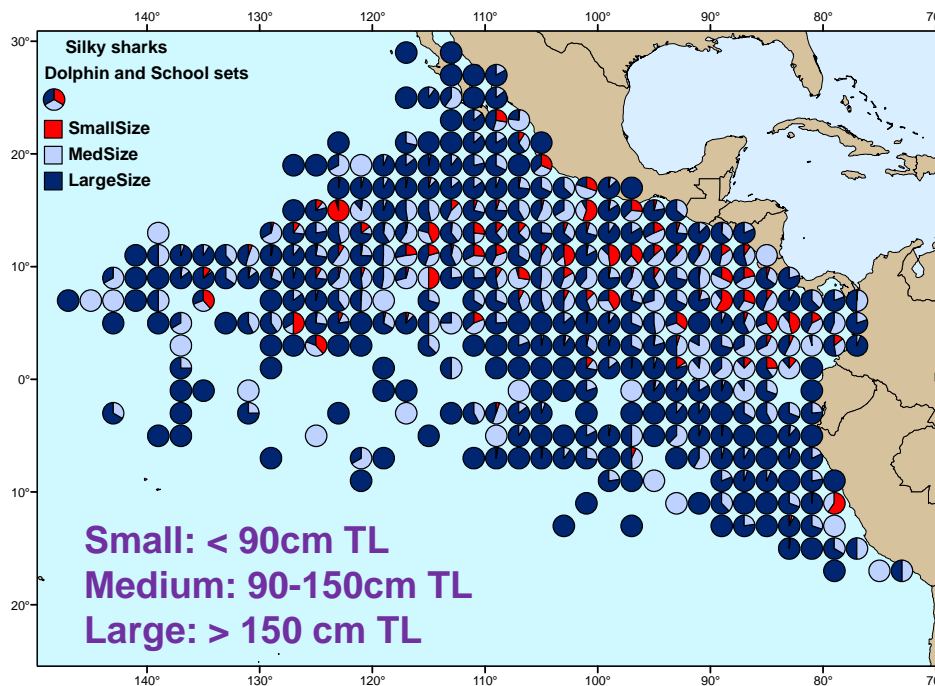
Silky spatial distribution by stage bycatch of purse seine tuna fisheries



School and dolphin sets



Floating object sets

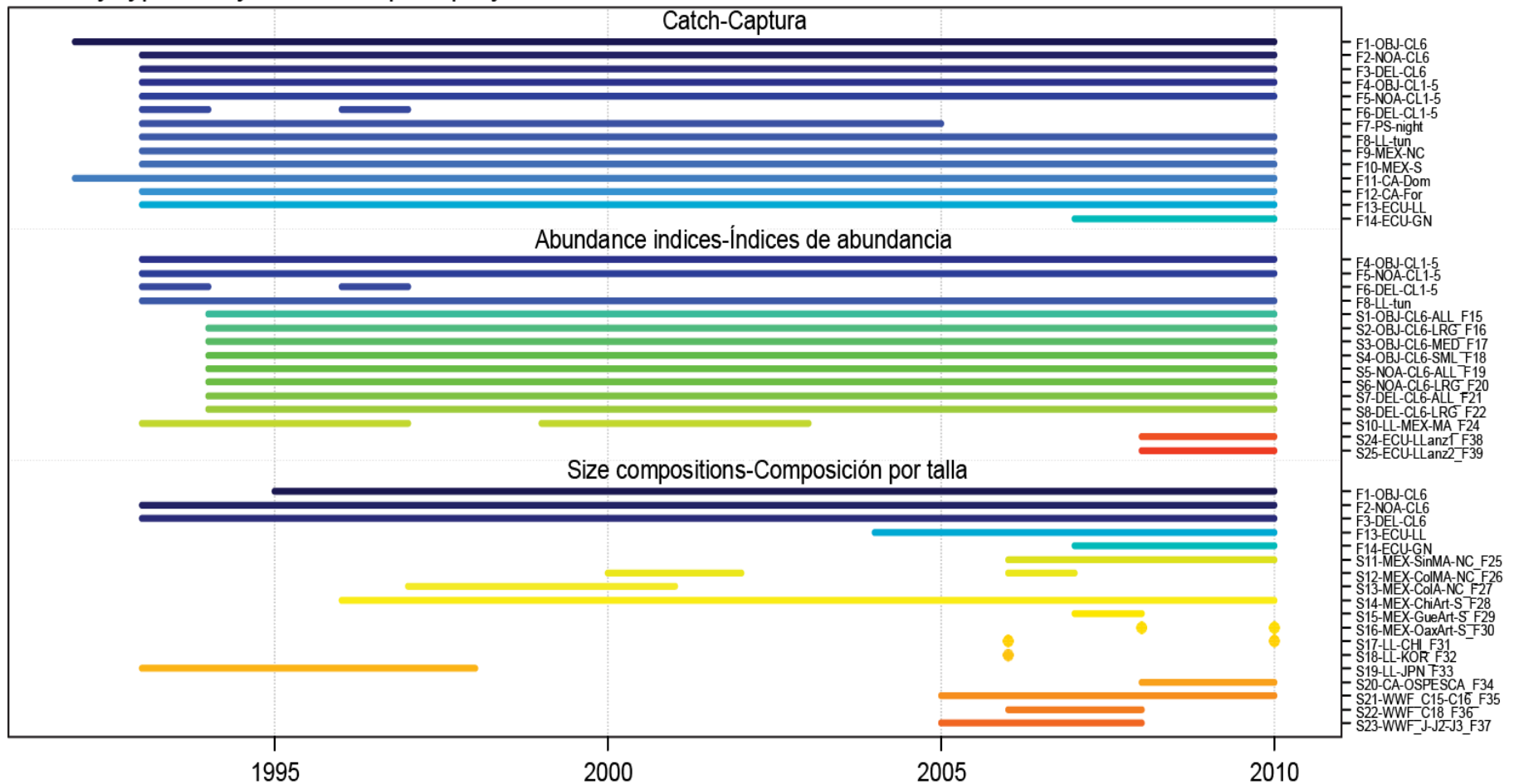


Roman-Verdesoto and Orozco-Zoller, 2005



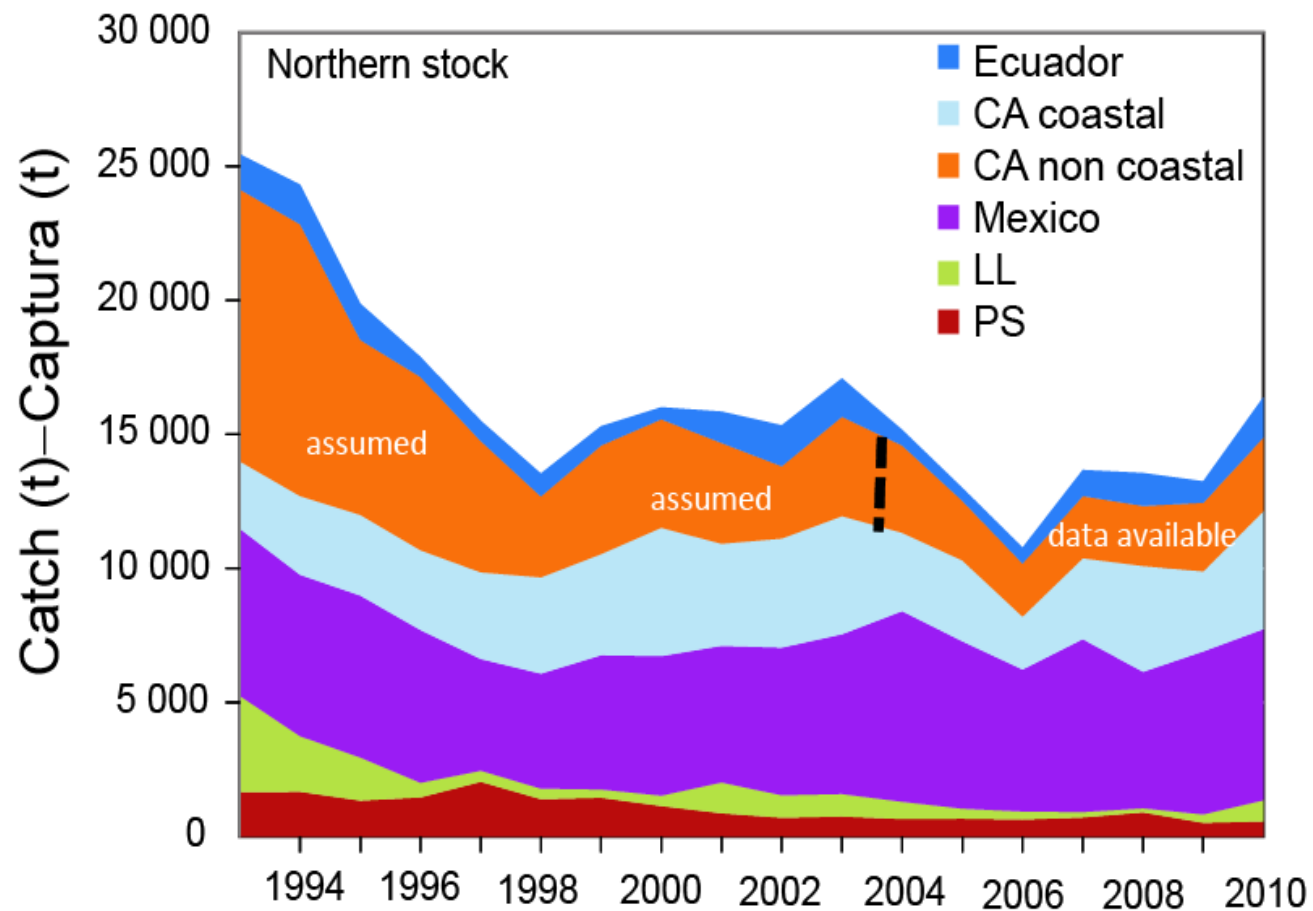
Stock assessment: data sources obtained

Data by type and year – Datos por tipo y año



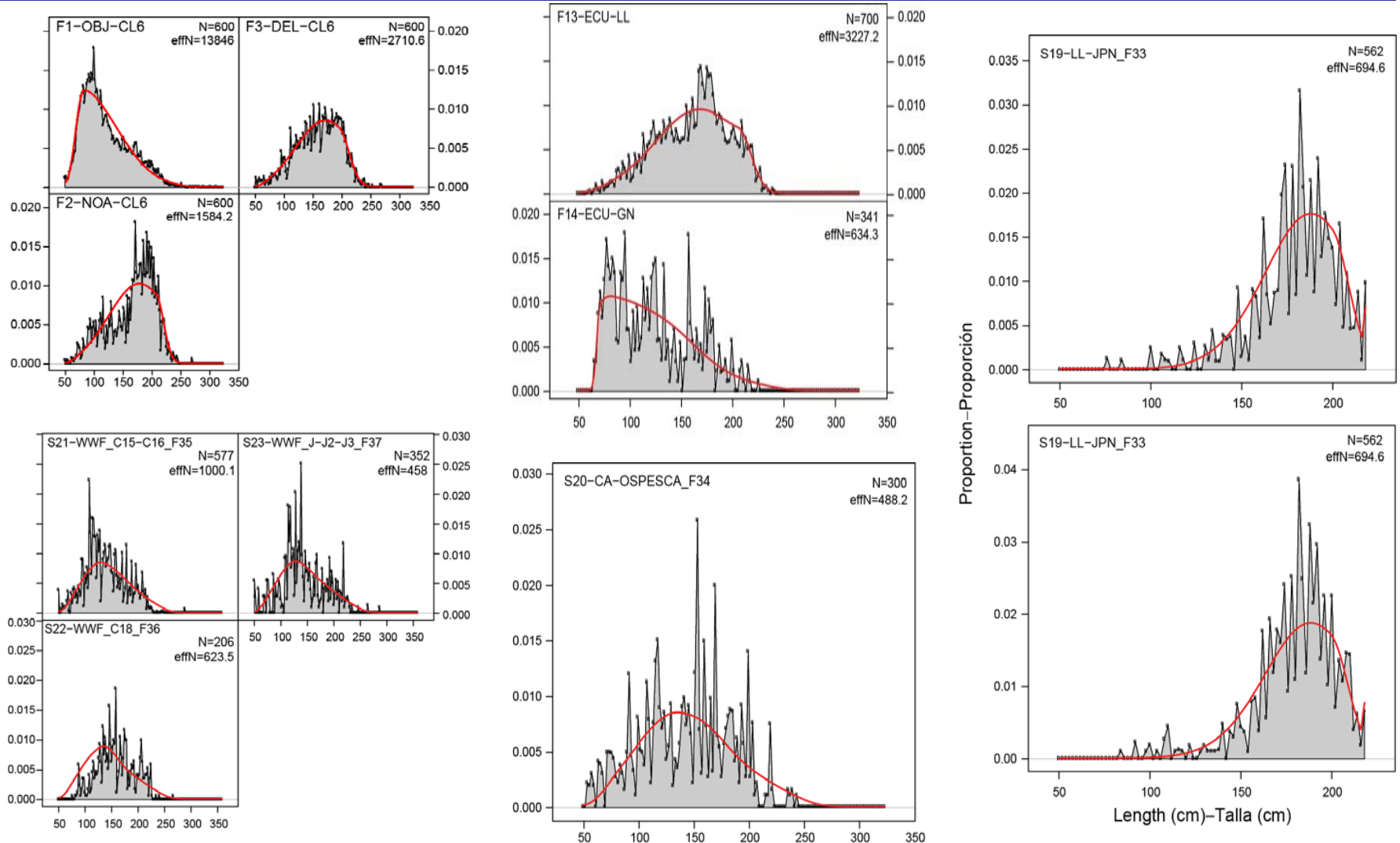


Stock assessment: reconstruction of "missing catch"



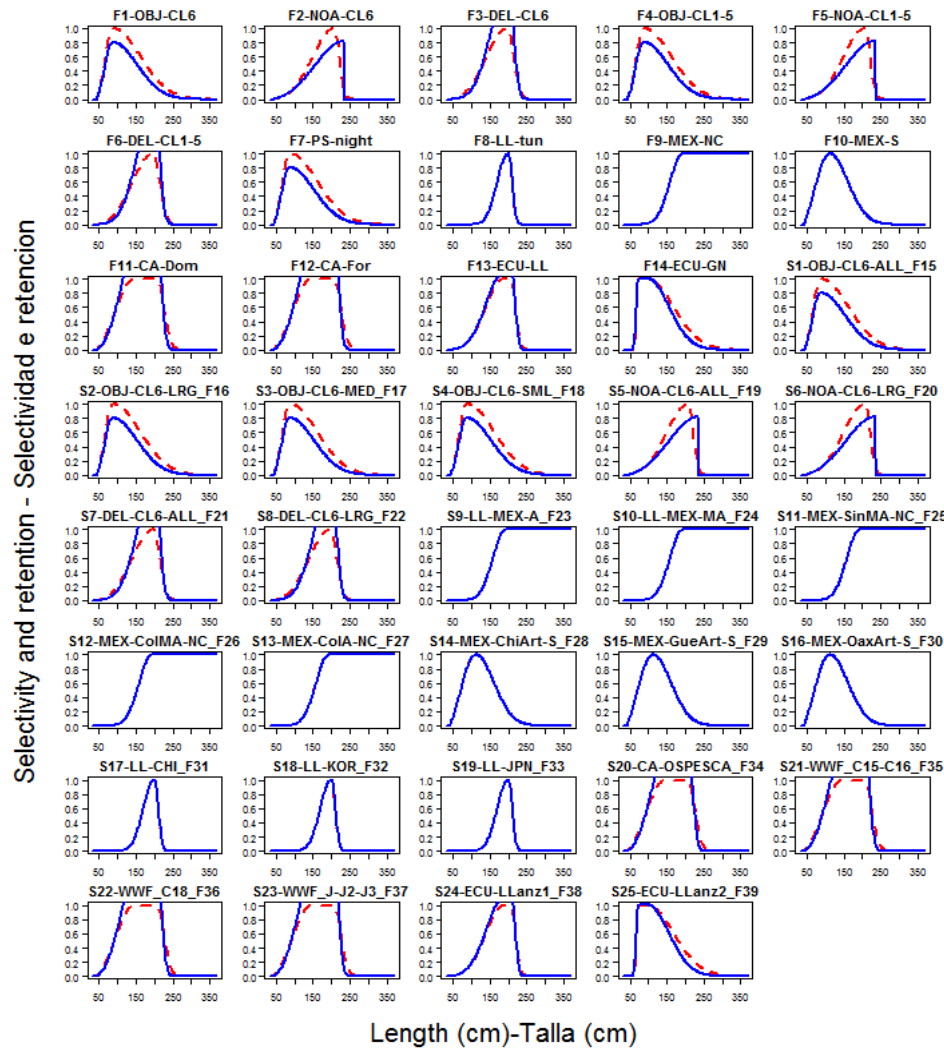


Stock assessment: model fit to length compositions





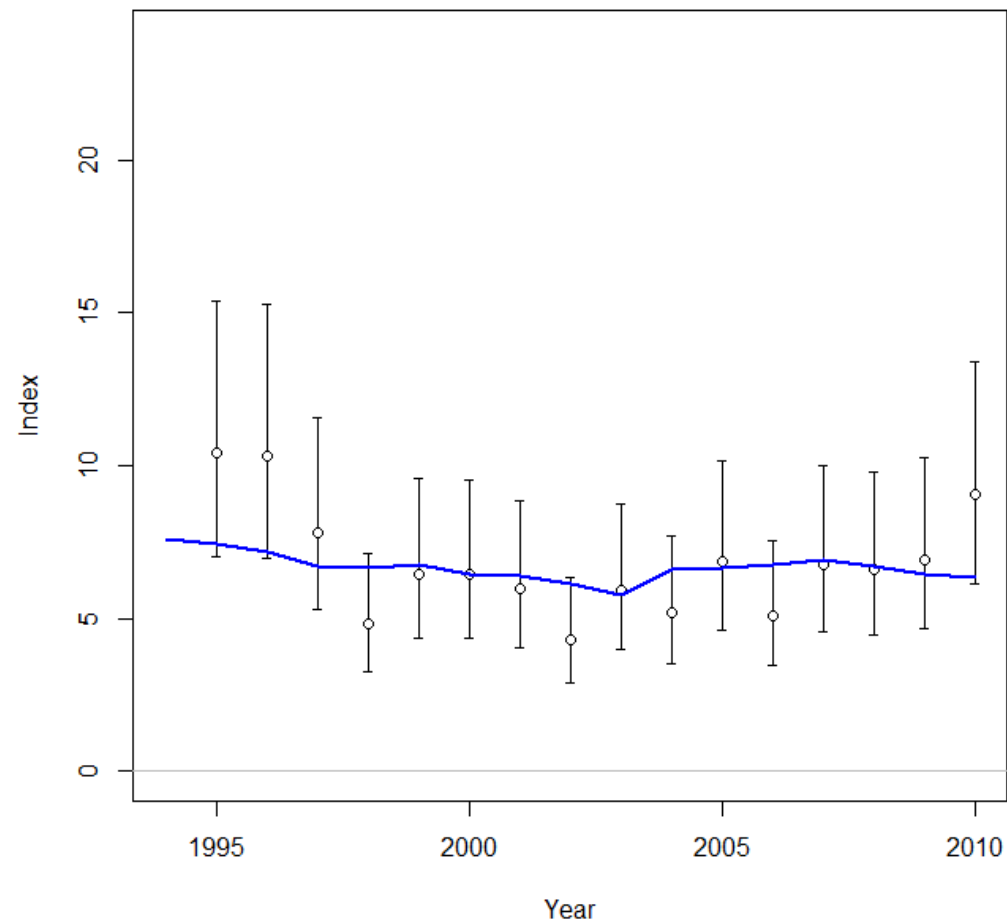
Stock assessment: selectivities





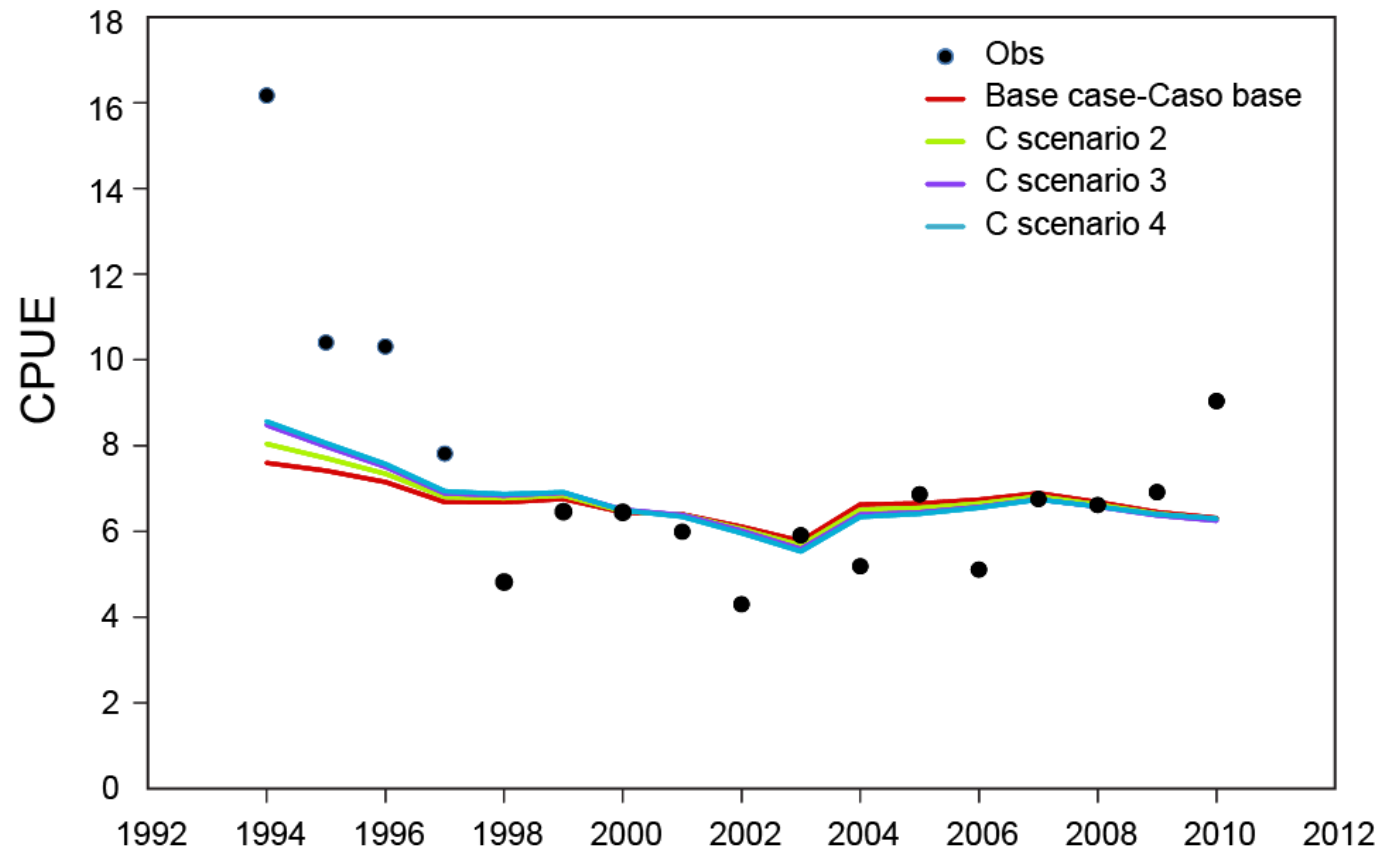
Stock assessment: model misfit to early CPUE

Index S1-OBJ-CL6-ALL_F15



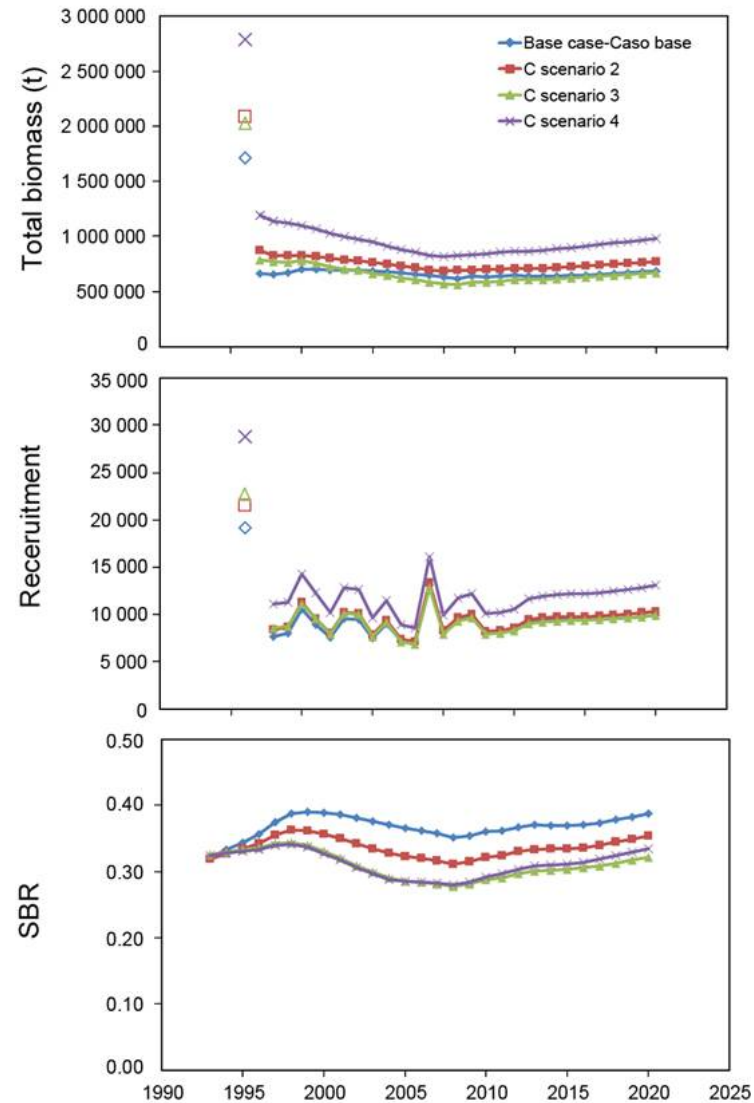


Stock assessment: model misfit to early CPUE (sensitivities)





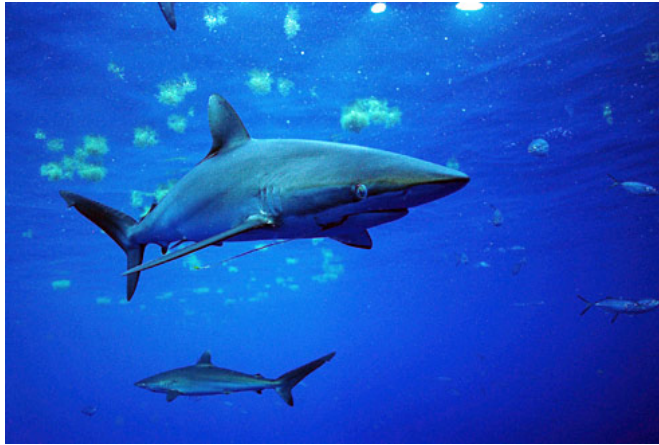
Stock assessment: estimated time series



Stock assessment - conclusions



- Stock assessment was attempted using Stock Synthesis (1993-2010)
- Improved knowledge on length composition of the catches and selectivities
- Unfortunately, the model was unable to fit the main index of abundance and therefore the results are not reliable
- Poor performance of the model was probably due to the incomplete knowledge of the total catch in the EPO, particularly for the early period of the assessment (1990s and early 2000s)
- An alternative approach is needed to provide management advice
- Use indicators until information is adequate for a full assessment



Fishery indicators (1994-2013)



Spatial distribution of BPS

Fltobj sets
small silky (< 90 cm)

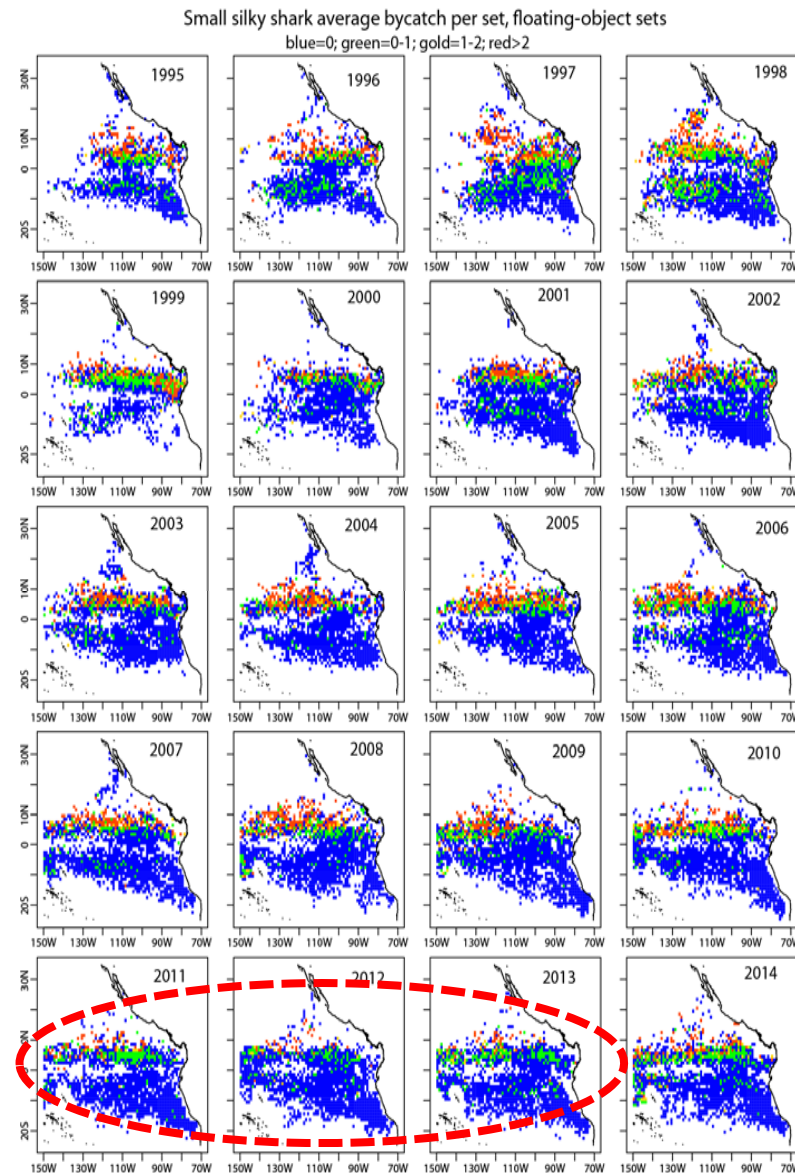
Color scale:

blue: 0 bps

green: ≤ 1 silky/set

yellow: 1-2 silky/set

red: > 2 silky/set





Spatial distribution of BPS

Fltobj sets
medium silky (90-150 cm)

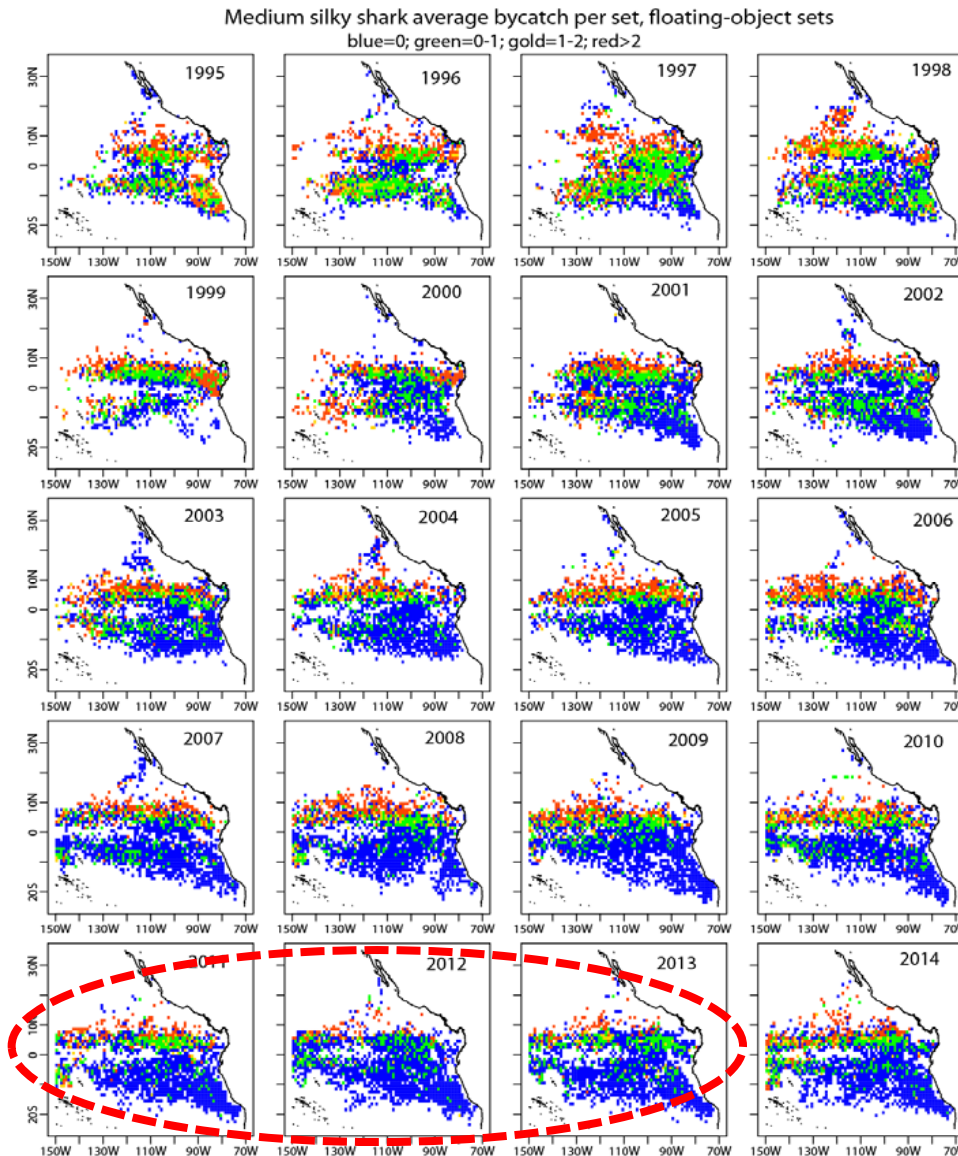
Color scale:

blue: 0 bps

green: ≤ 1 silky/set

yellow: 1-2 silky/set

red: > 2 silky/set





Spatial distribution of BPS

Fltobj sets
large silky (> 150 cm)

Color scale:

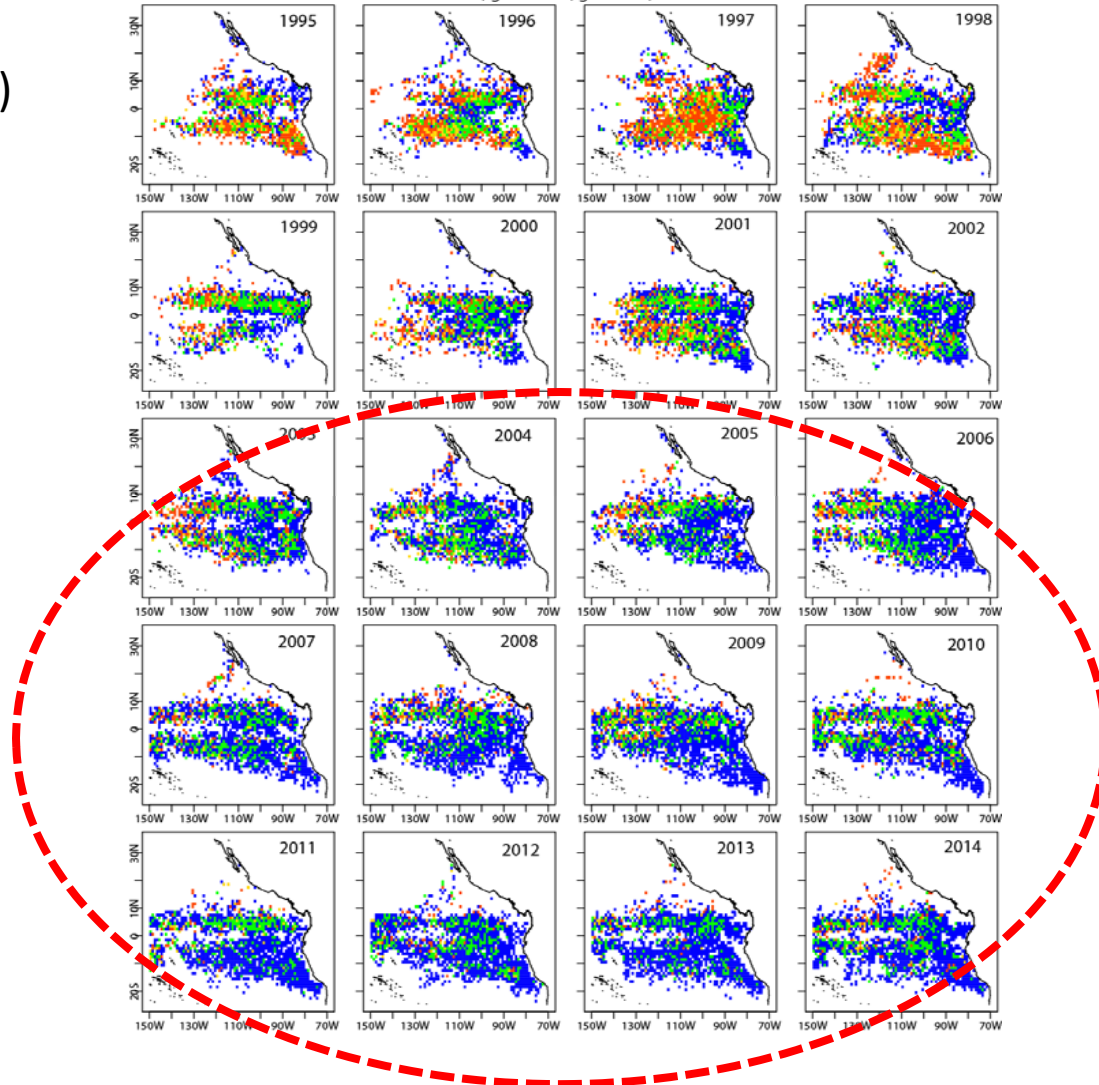
blue: 0 bps

green: ≤ 1 silky/set

yellow: 1-2 silky/set

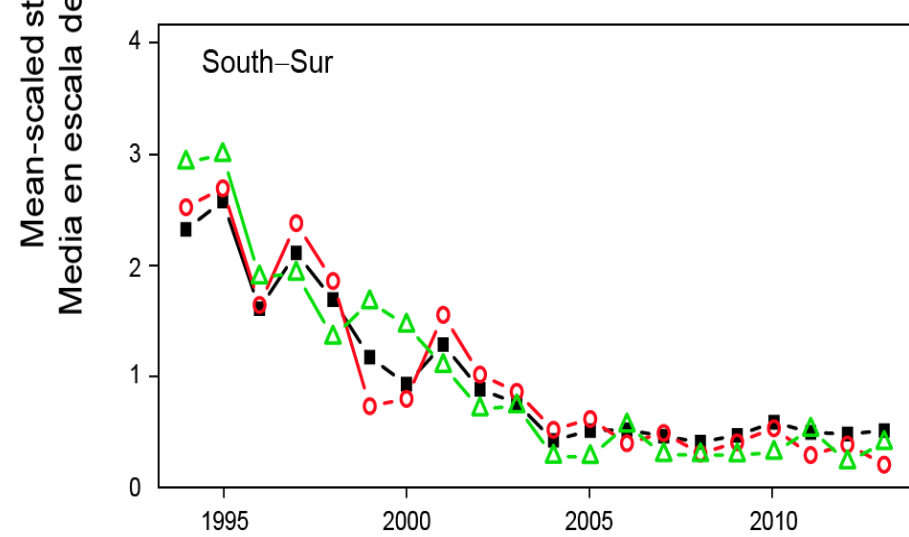
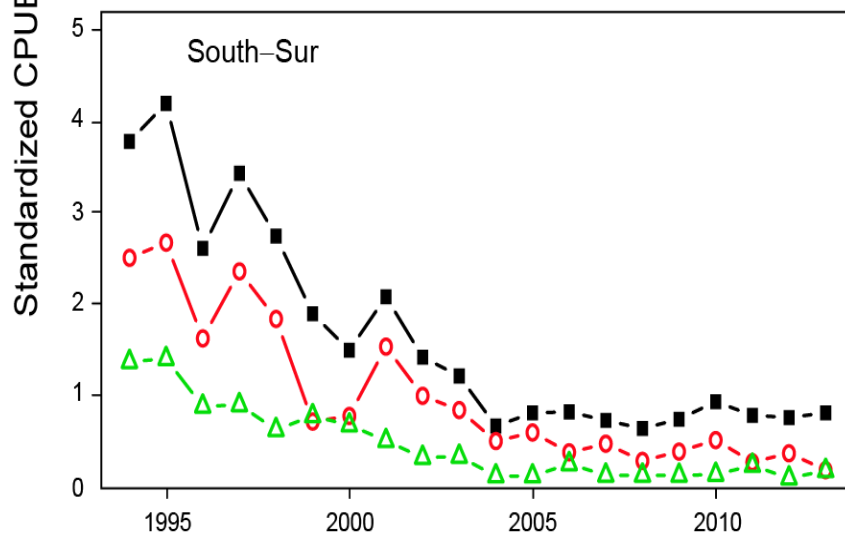
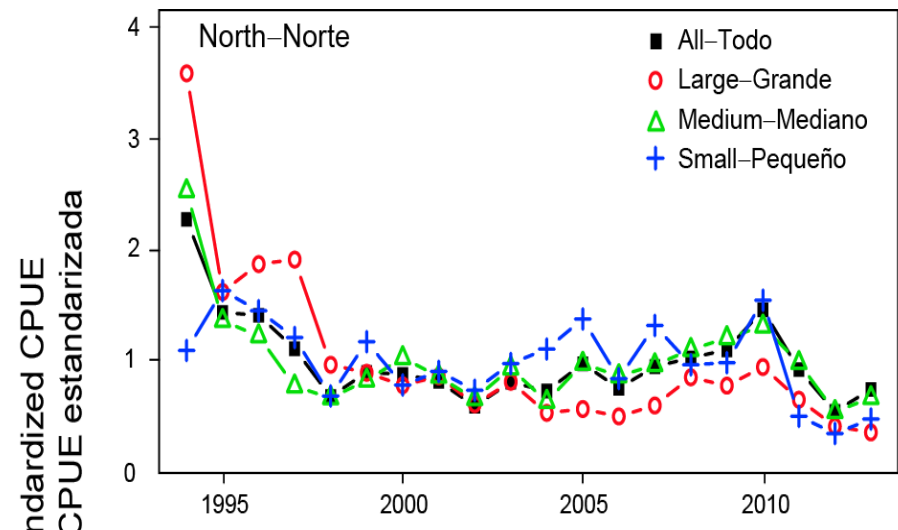
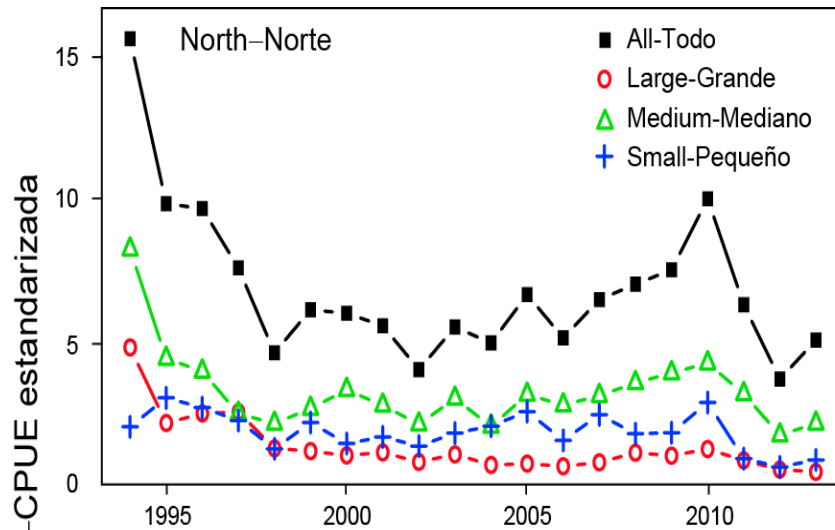
red: > 2 silky/set

Large silky shark average bycatch per set, floating-object sets
blue=0; green=0-1; gold=1-2; red>2



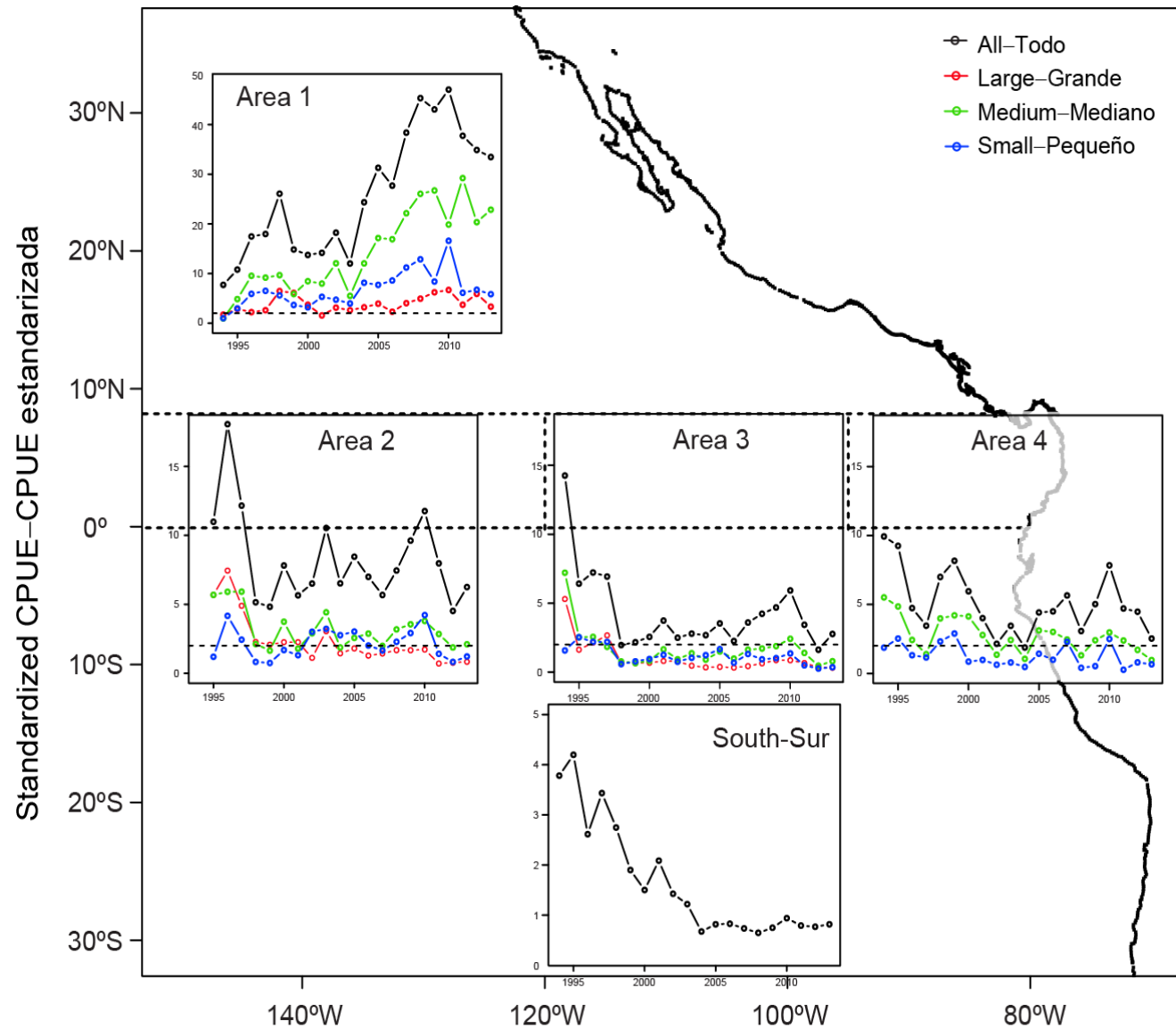


Standardized CPUE-OBJ



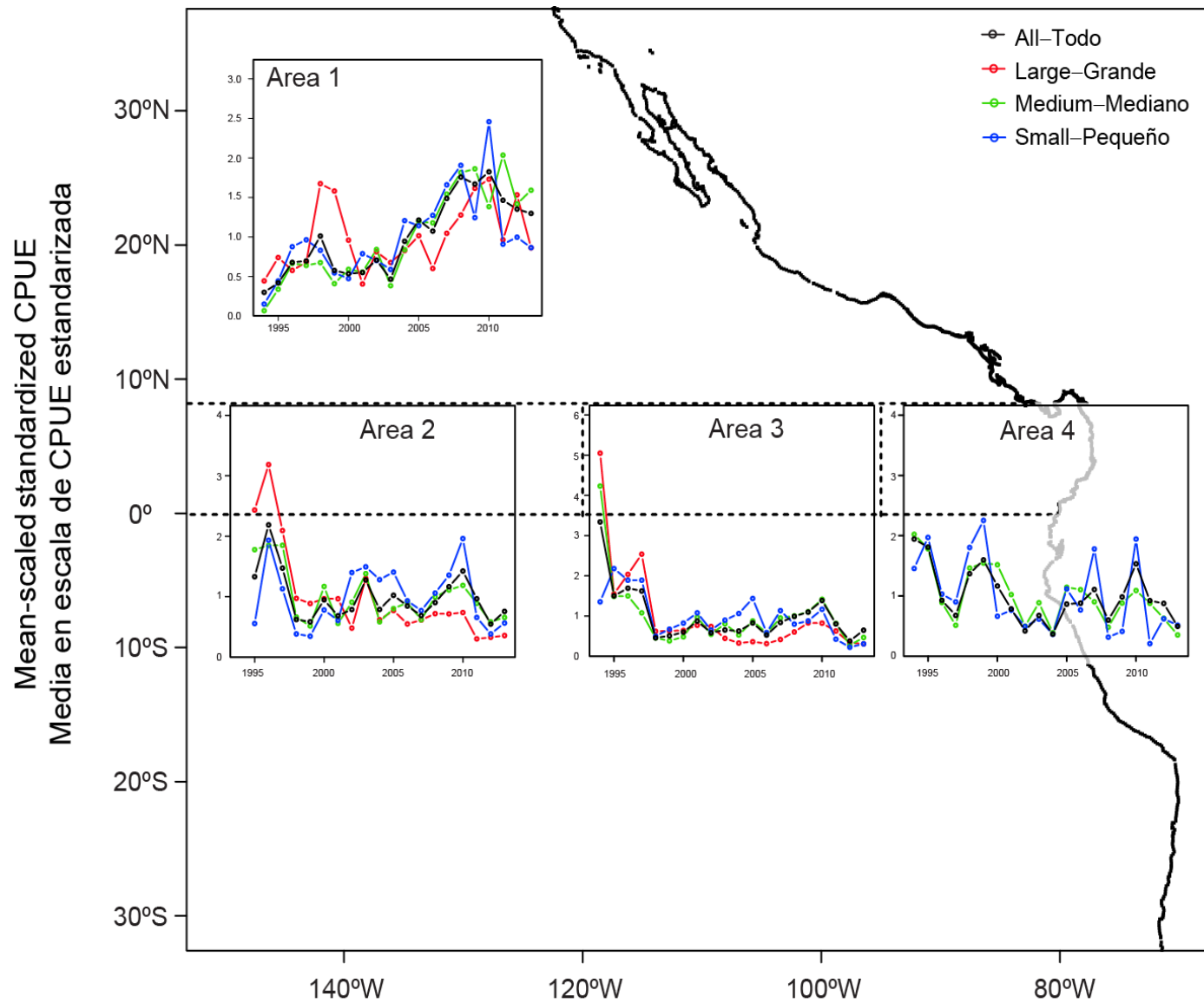


Standardized CPUE-OBJ



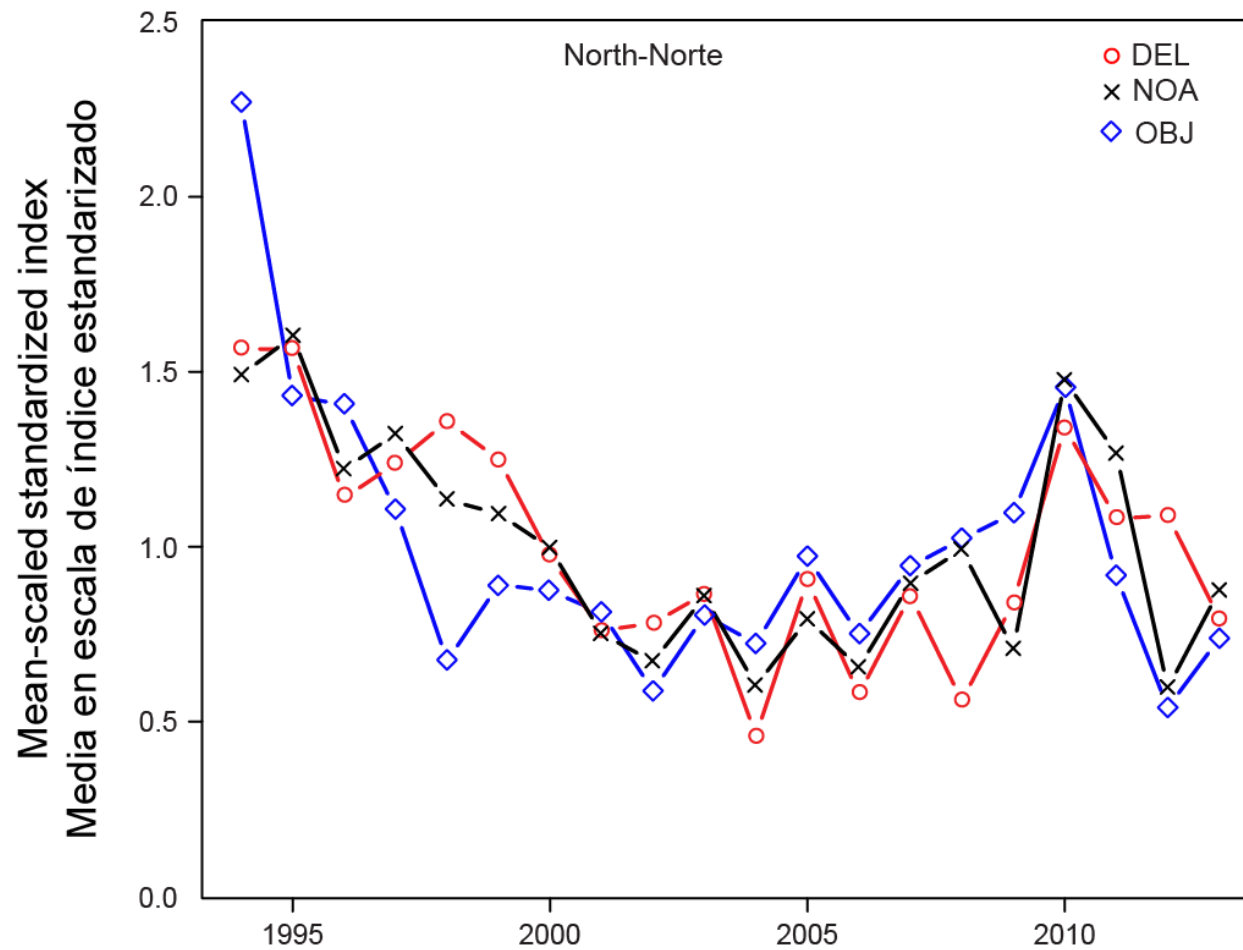


Standardized CPUE-OBJ



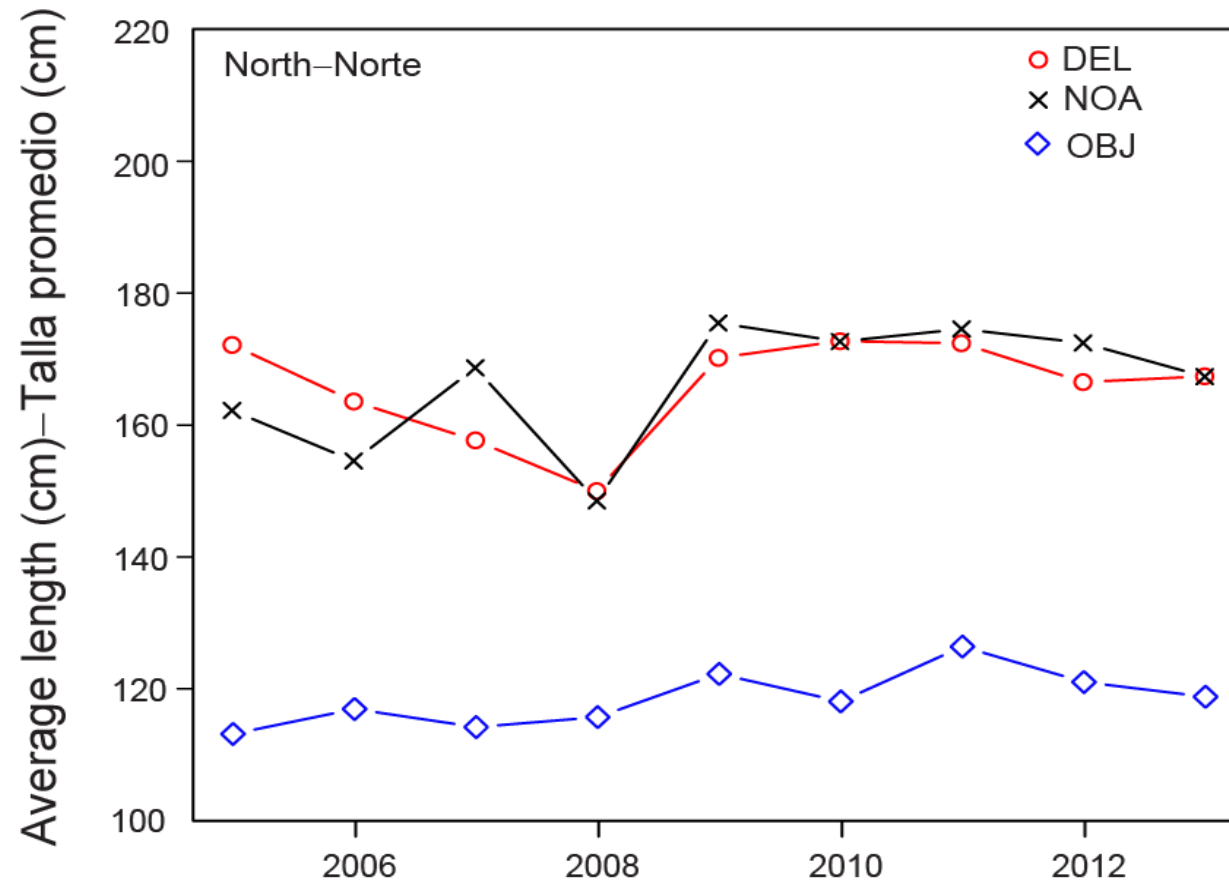


Comparisons among set types





Average length





Average length

