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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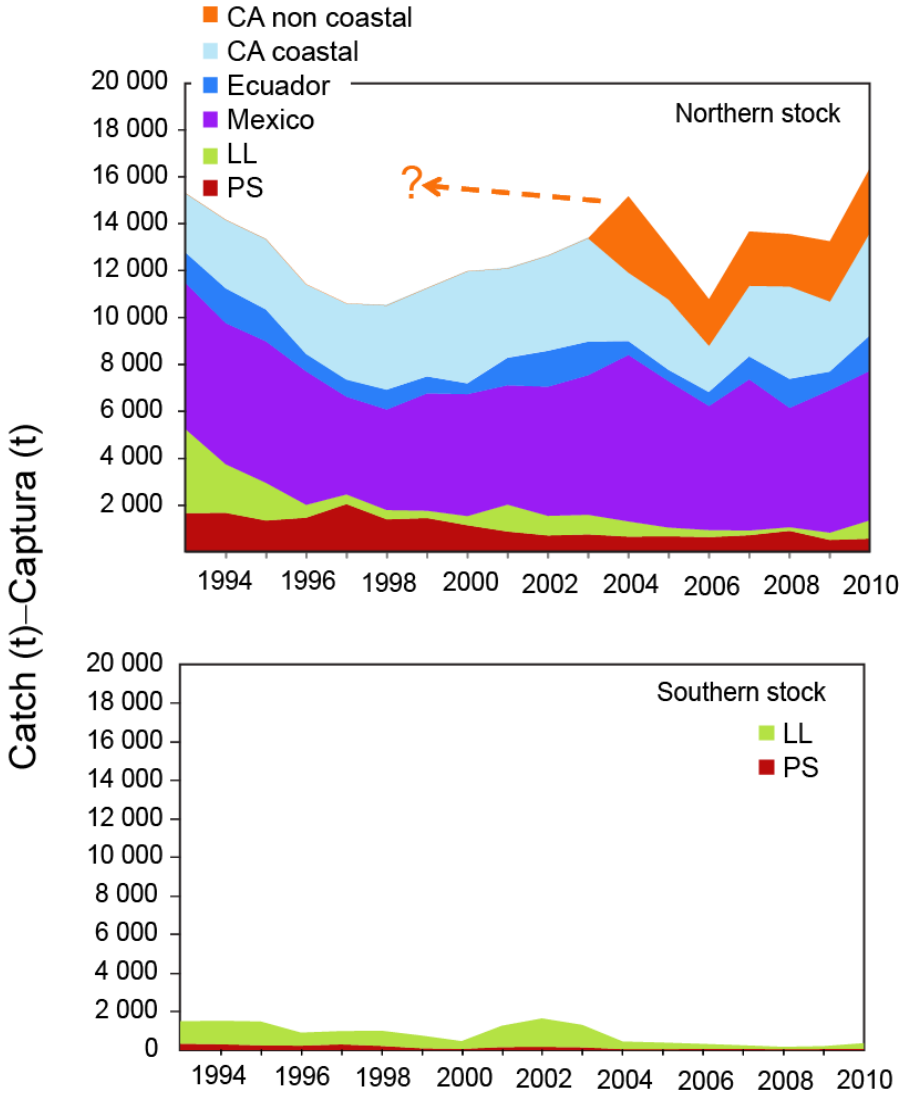
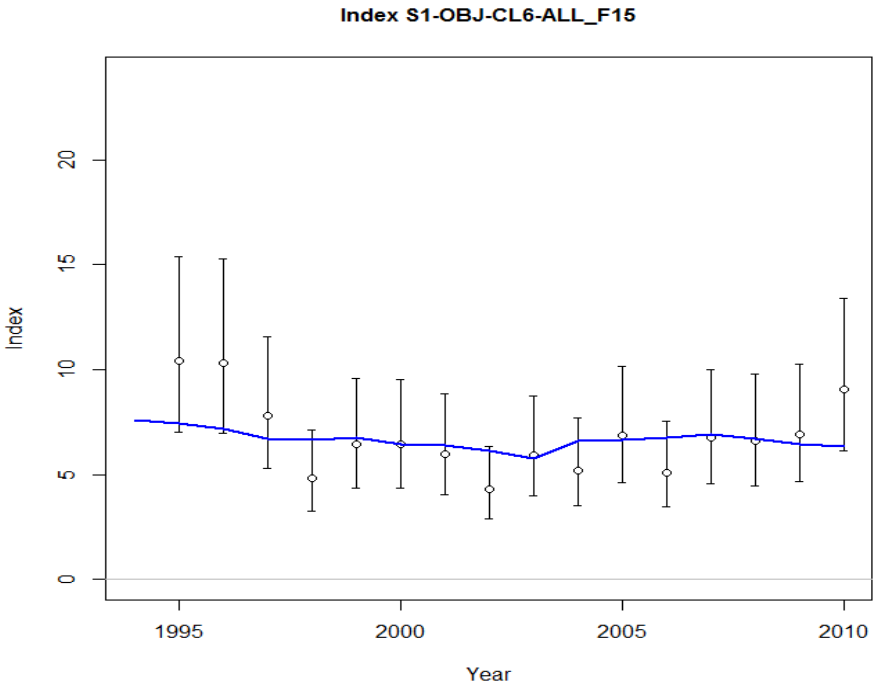
Outline of talk

- 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:

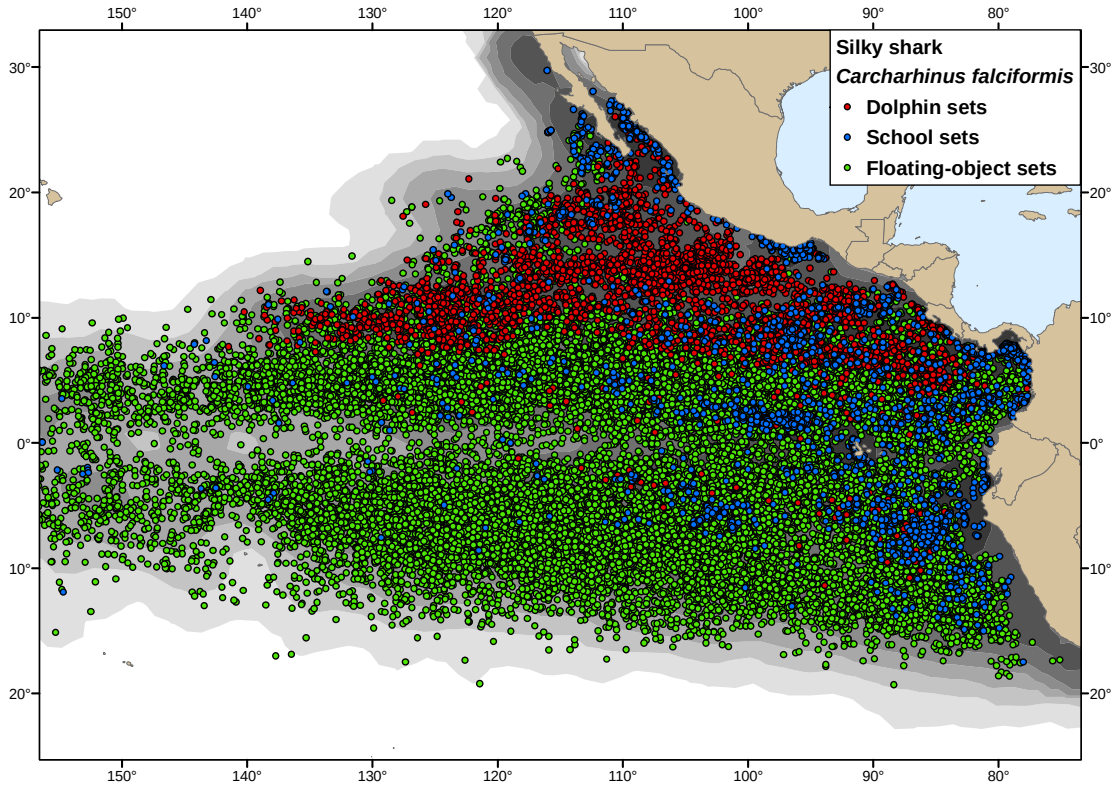
"missing catch" in early period

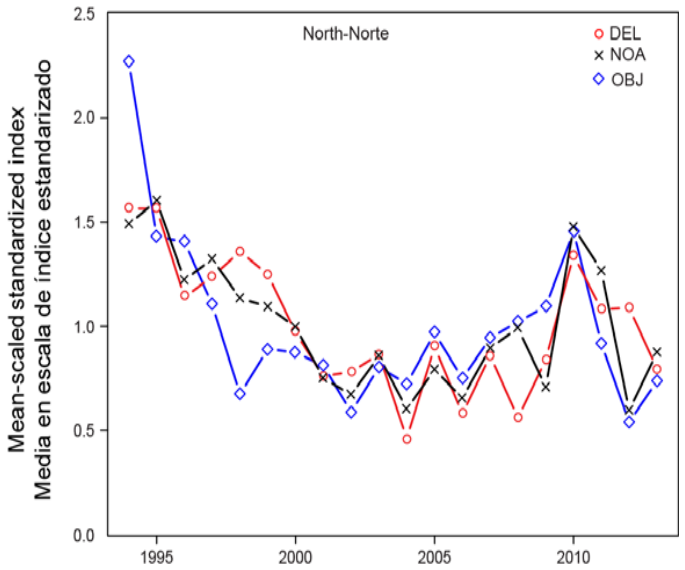




OBJ indicators for silky

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

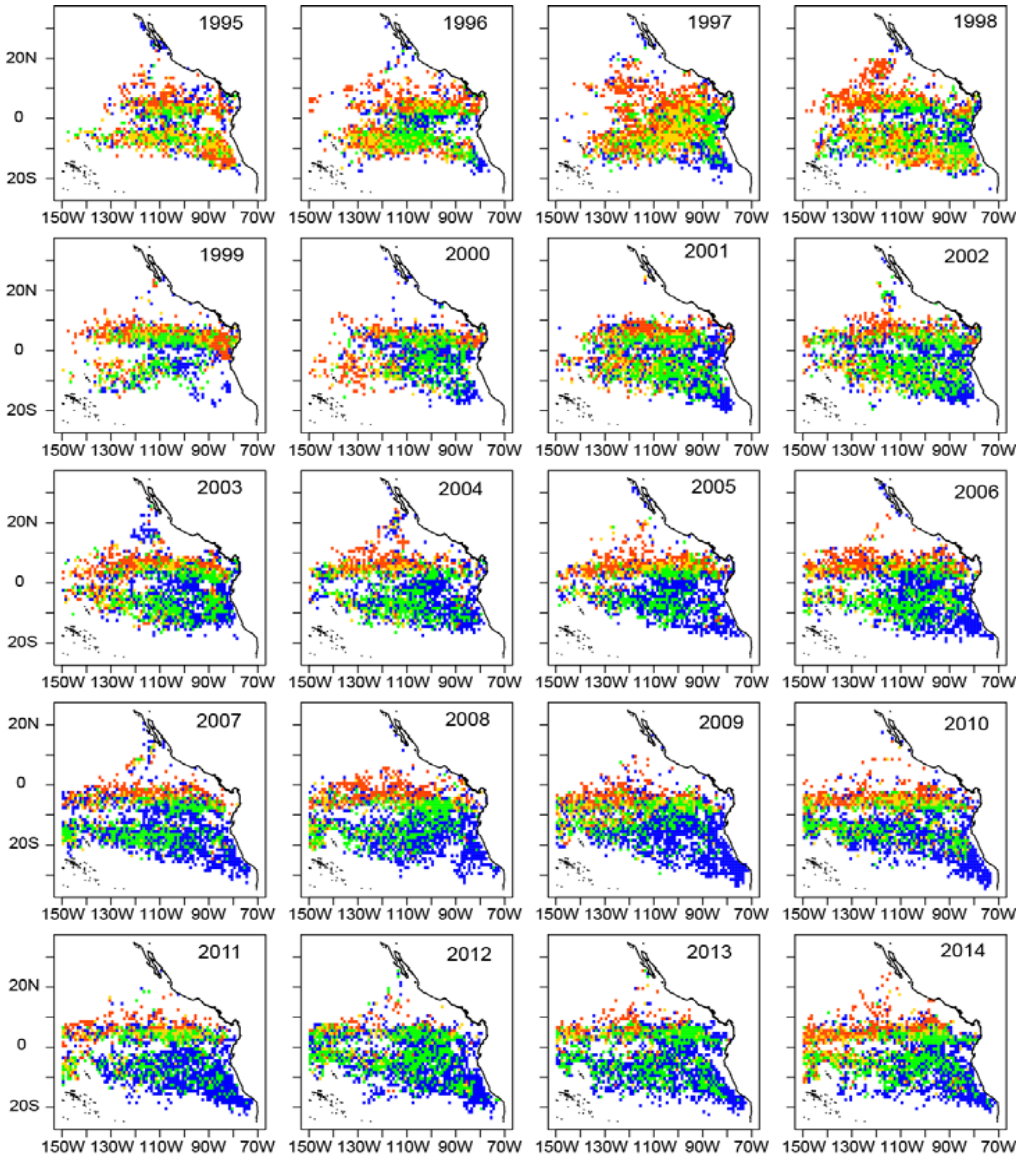




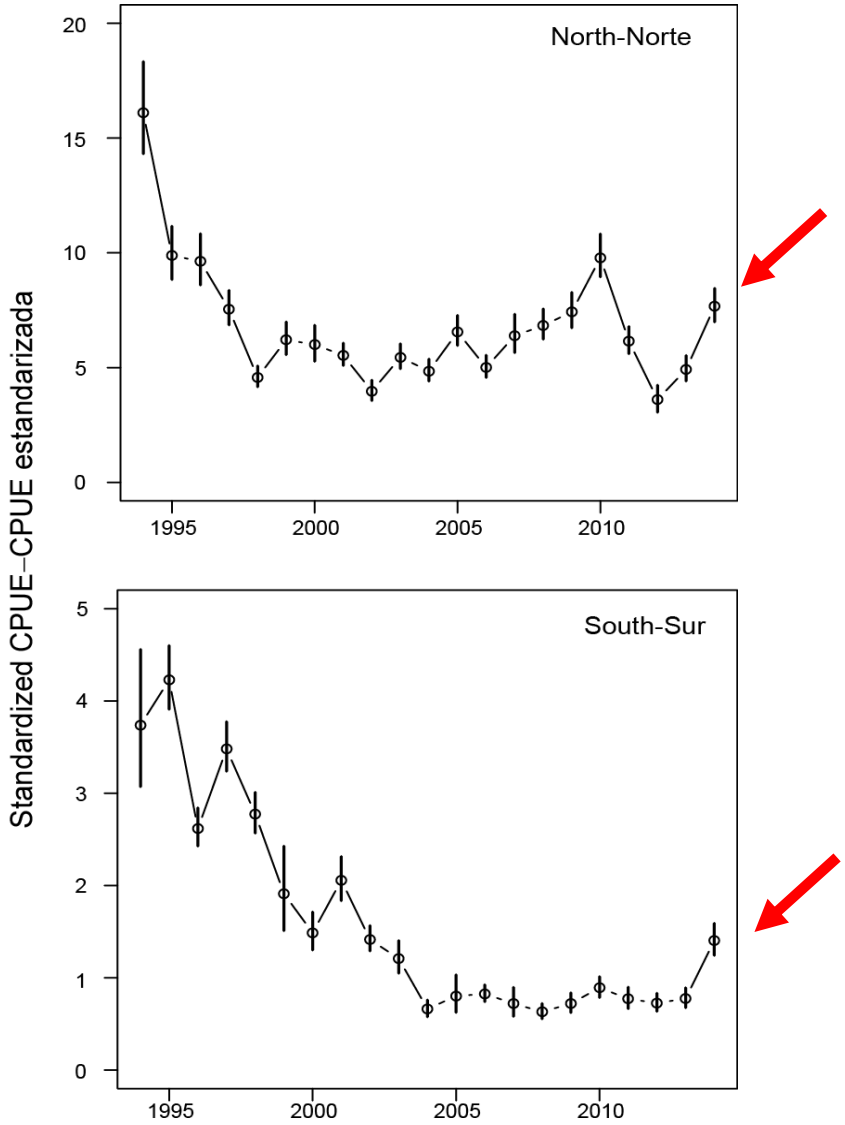
Spatial distribution of BPS

Fltobj sets
All sizes

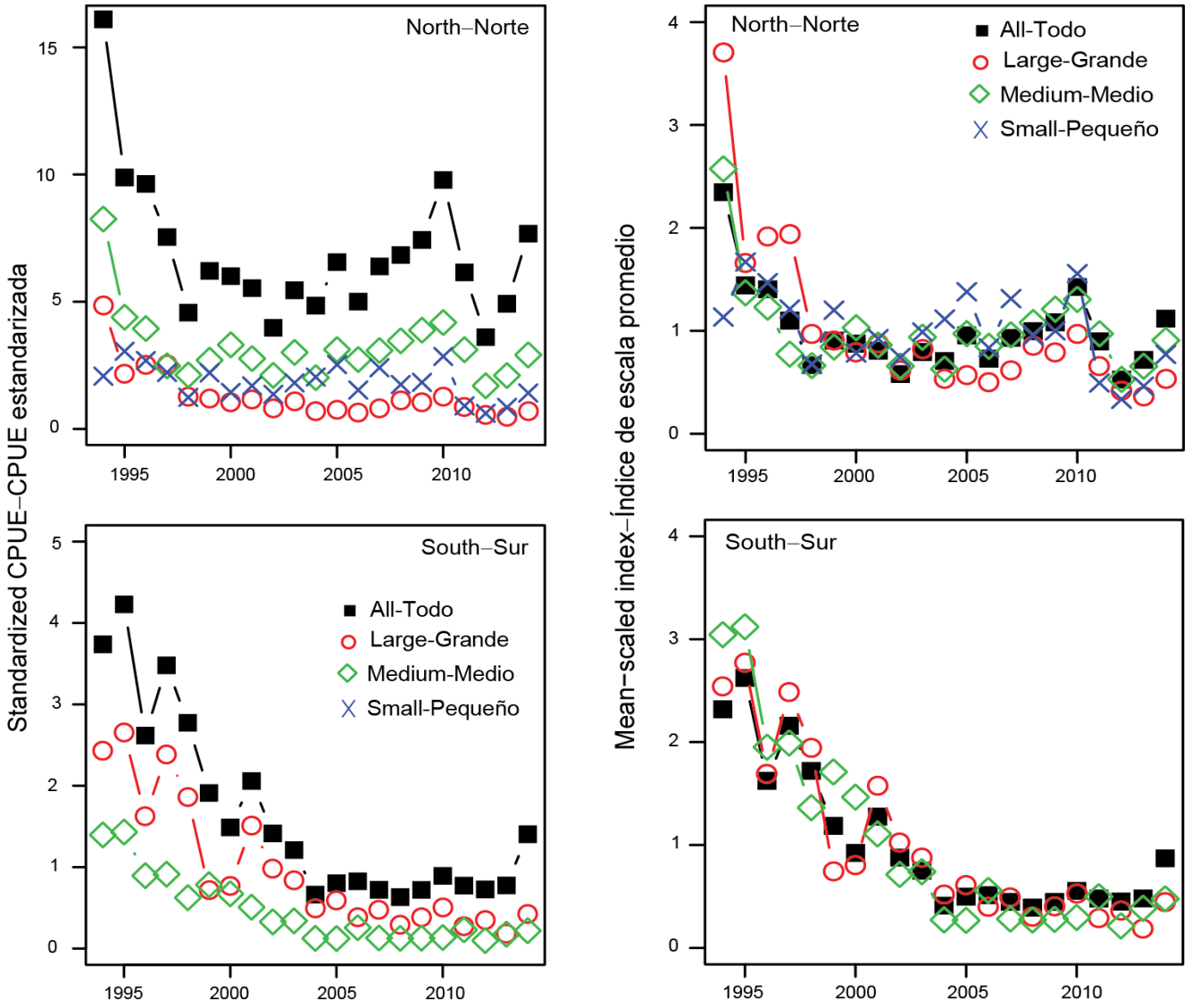
Color scale:
blue: 0 bps
green: <= 2 silky/set
yellow: 2-5 silky/set
red: > 5 silky/set



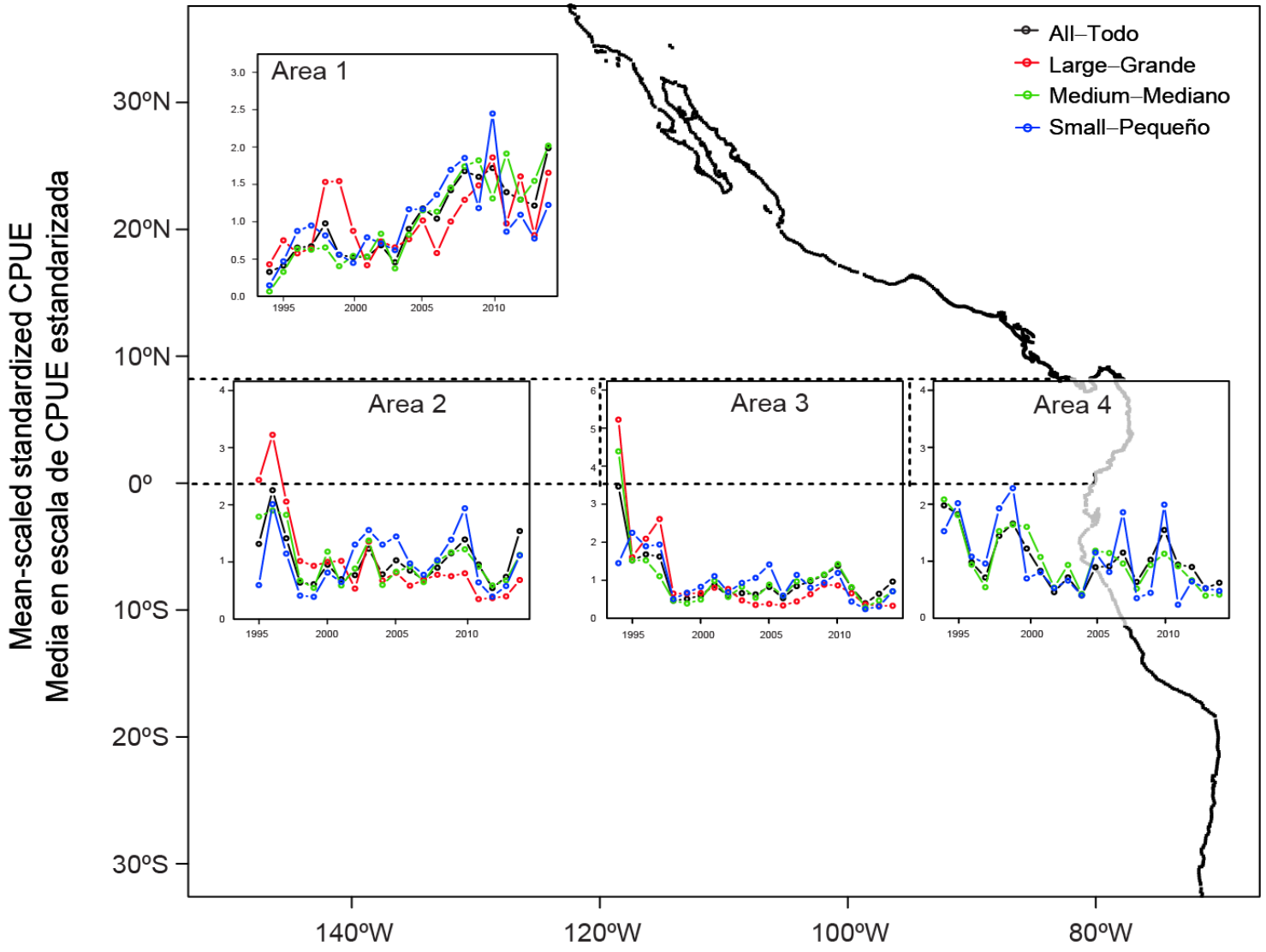
Standardized CPUE-OBJ



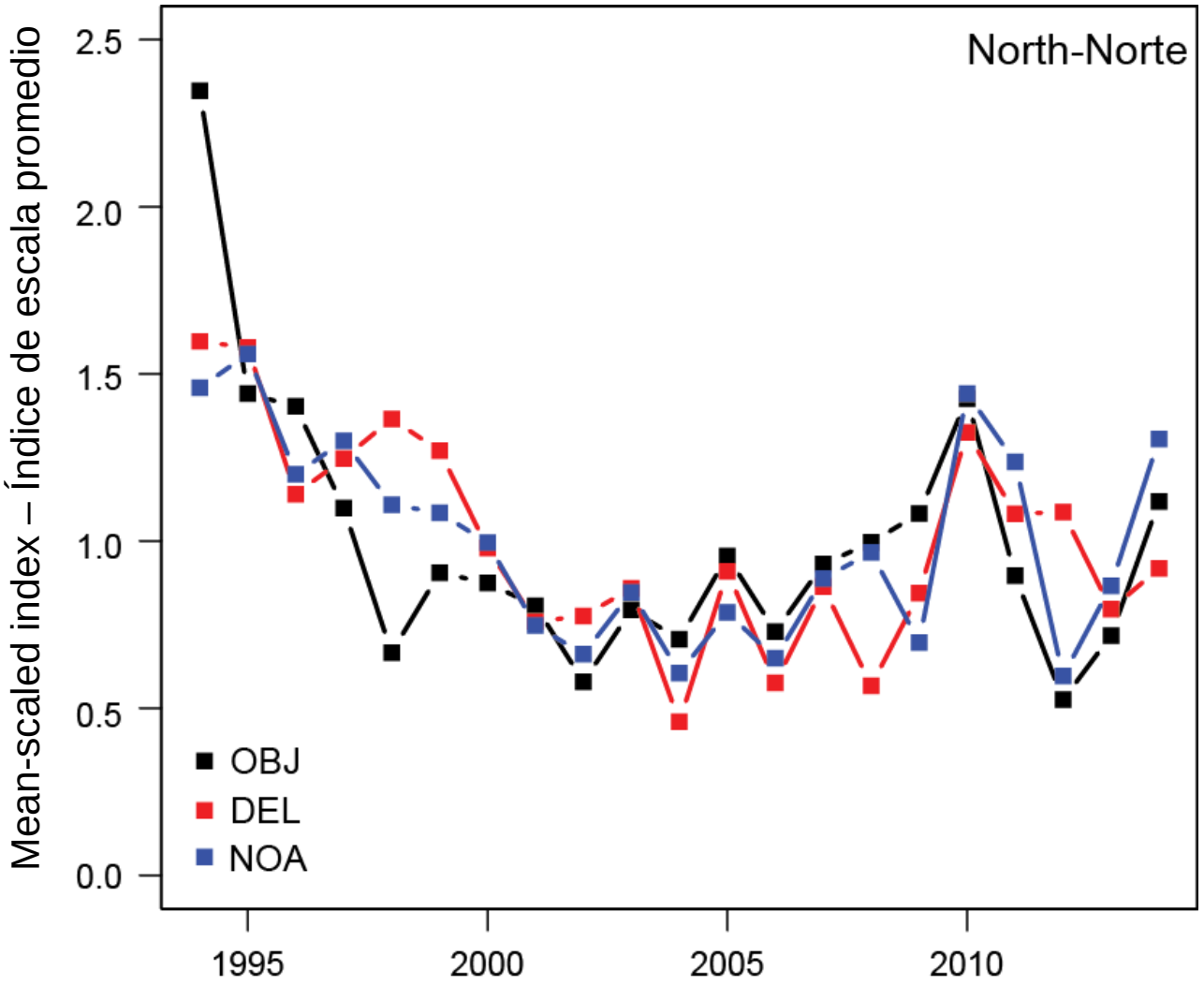
Standardized OBJ CPUE



Standardized OBJ CPUE



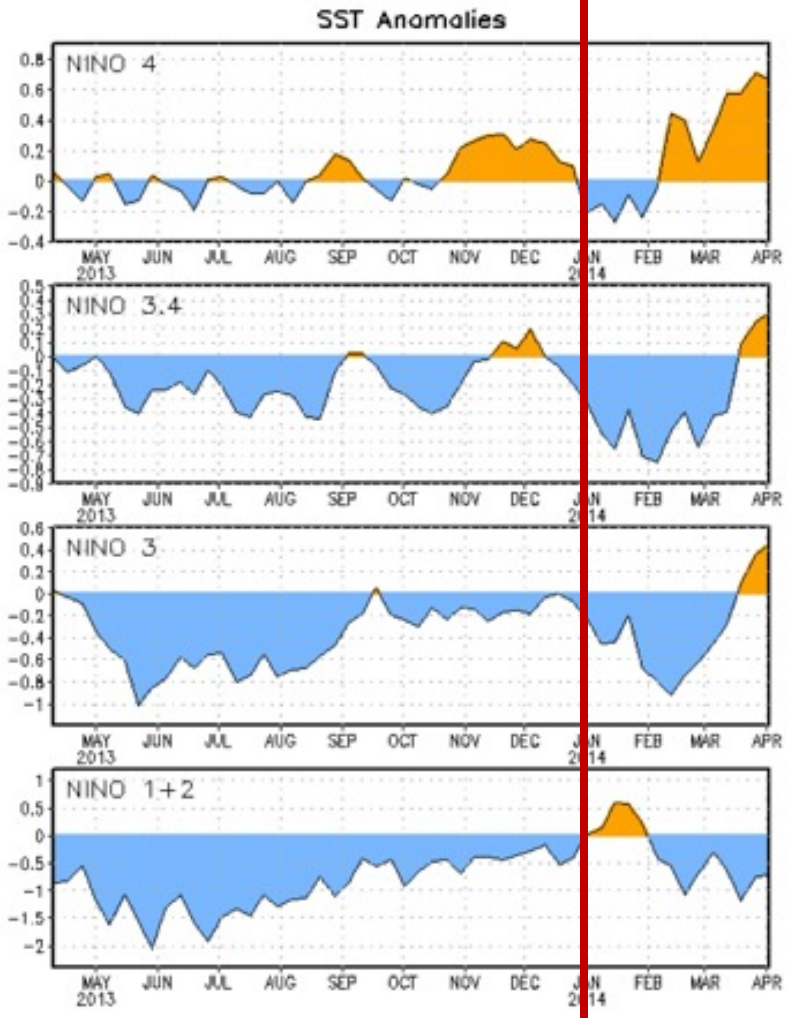
Comparisons among set types

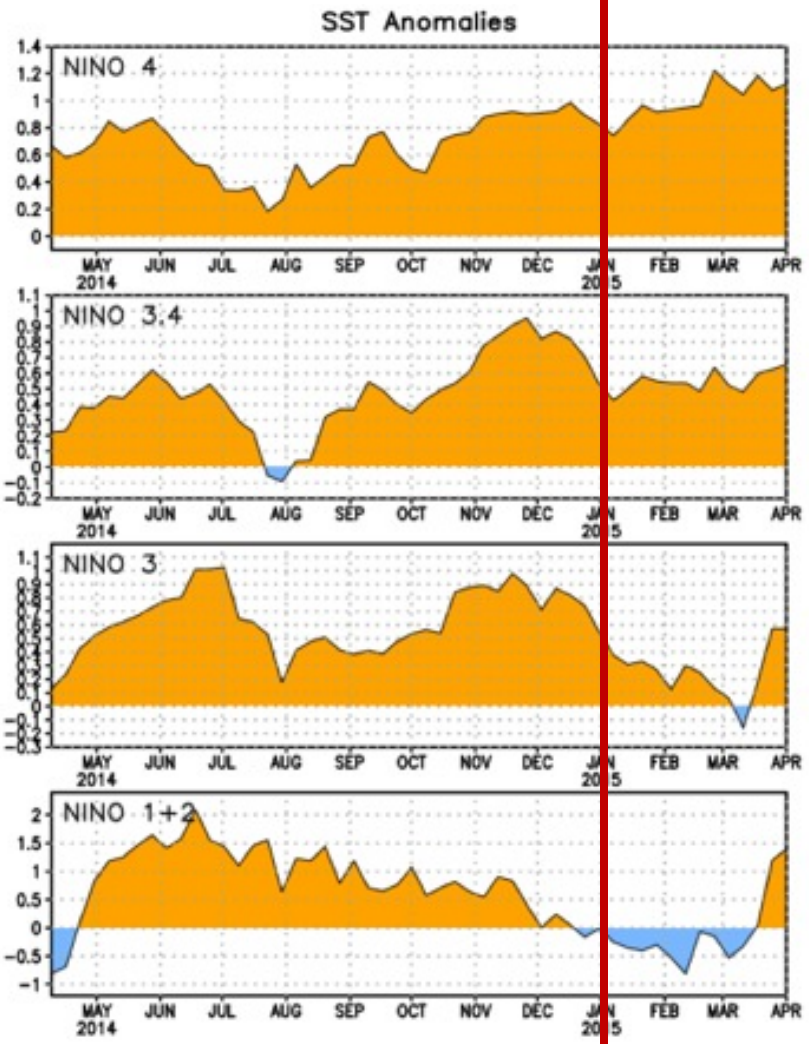


Indicators

Environmental considerations

2013 2014 2015



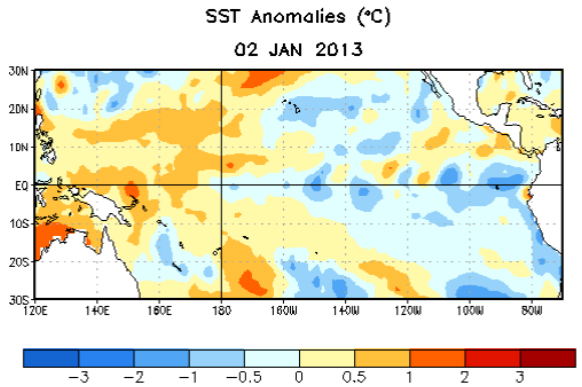


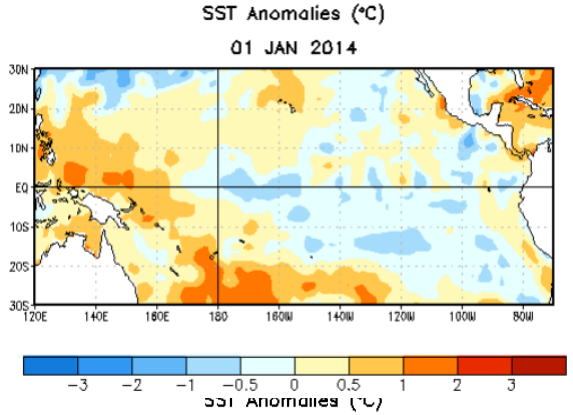
NOAA/National Weather Service

Indicators

Environmental considerations

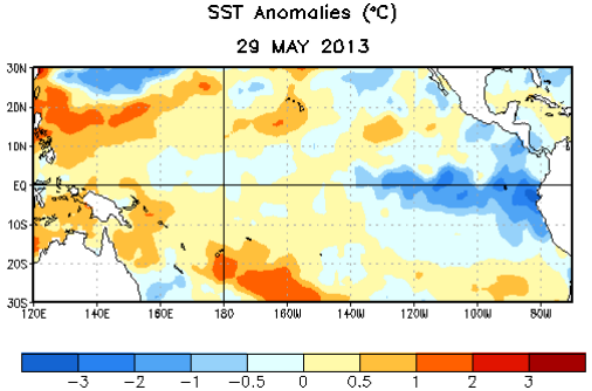
JAN 2013

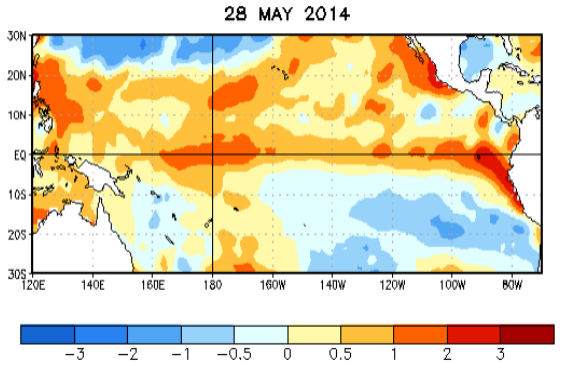




JAN 2014

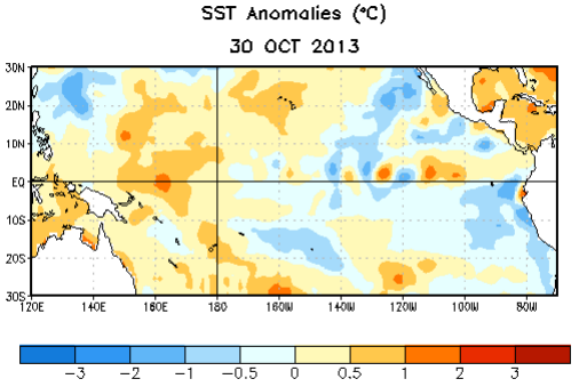
MAY 2013

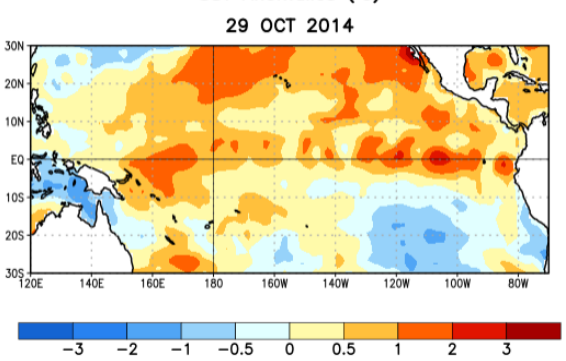




MAY 2014

OCT 2013



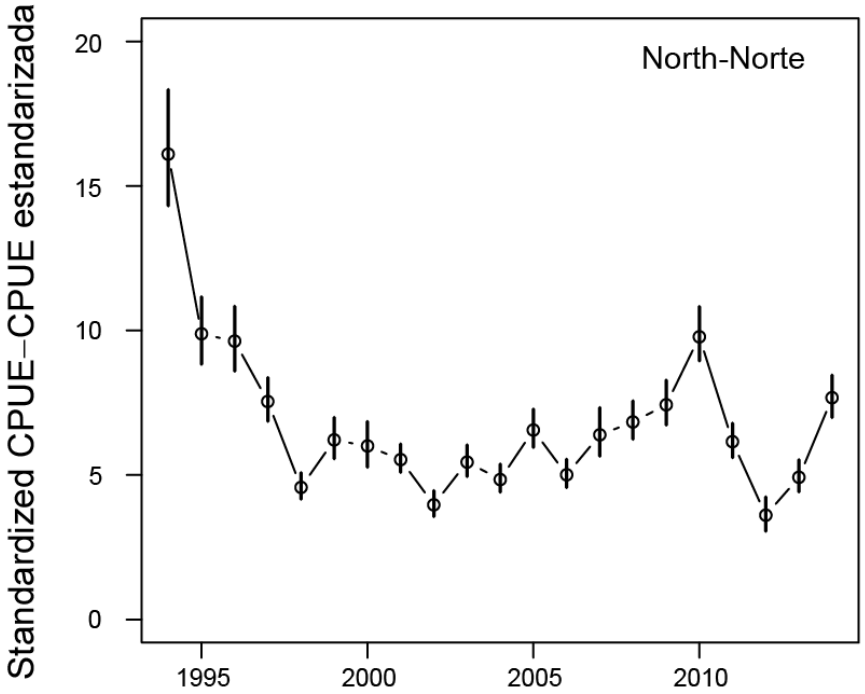


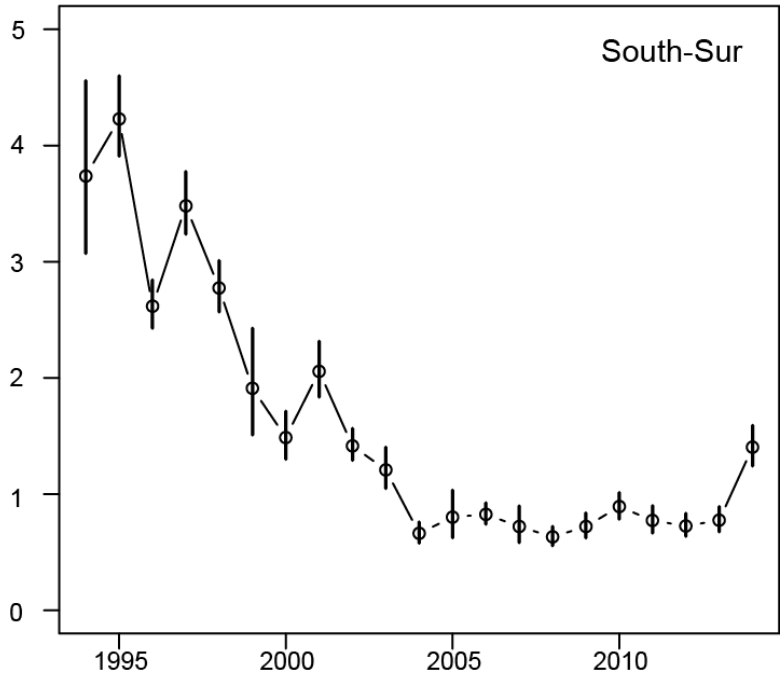
OCT 2014

NOAA

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





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 develop 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

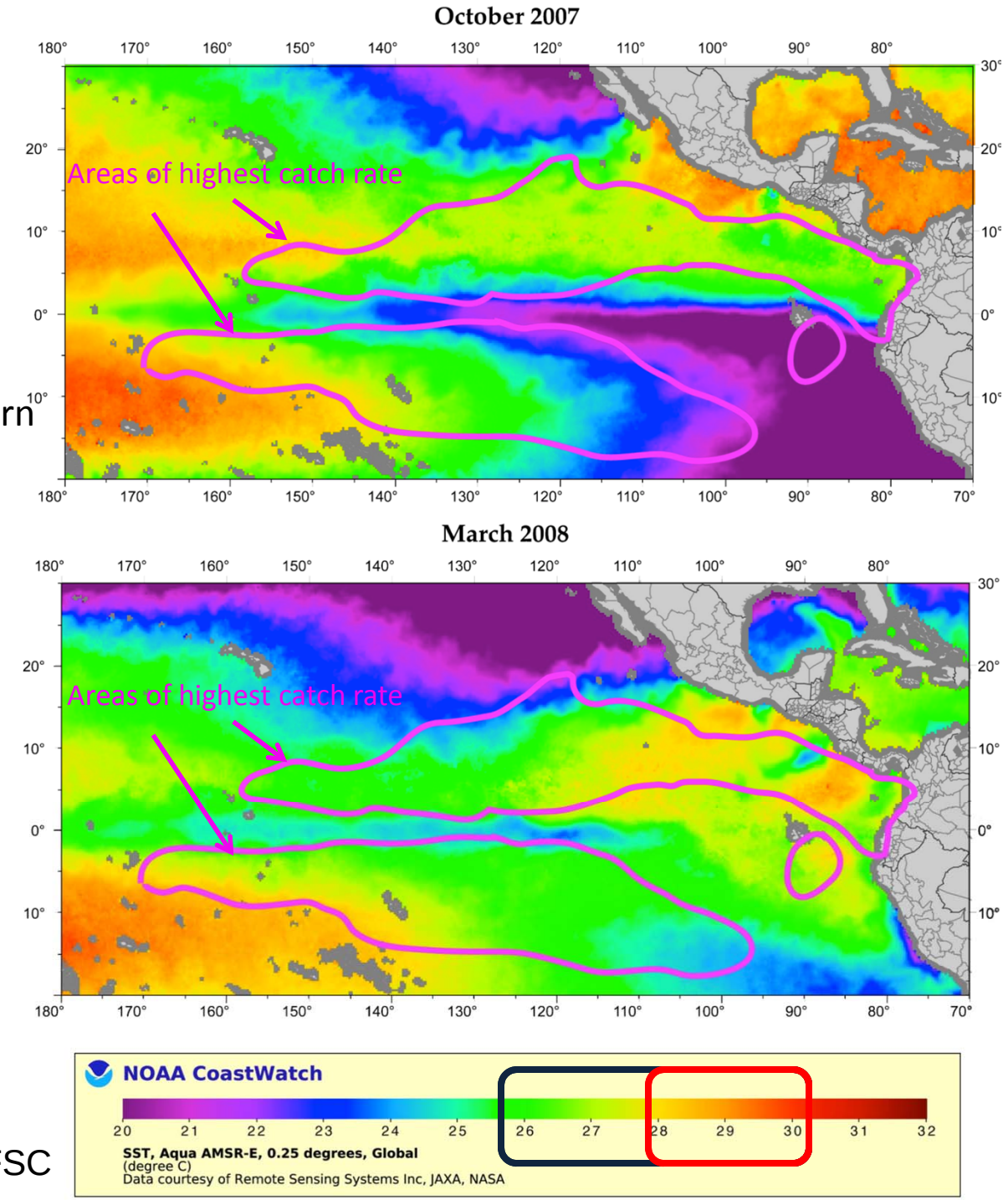
QUESTIONS?

Conclusions

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

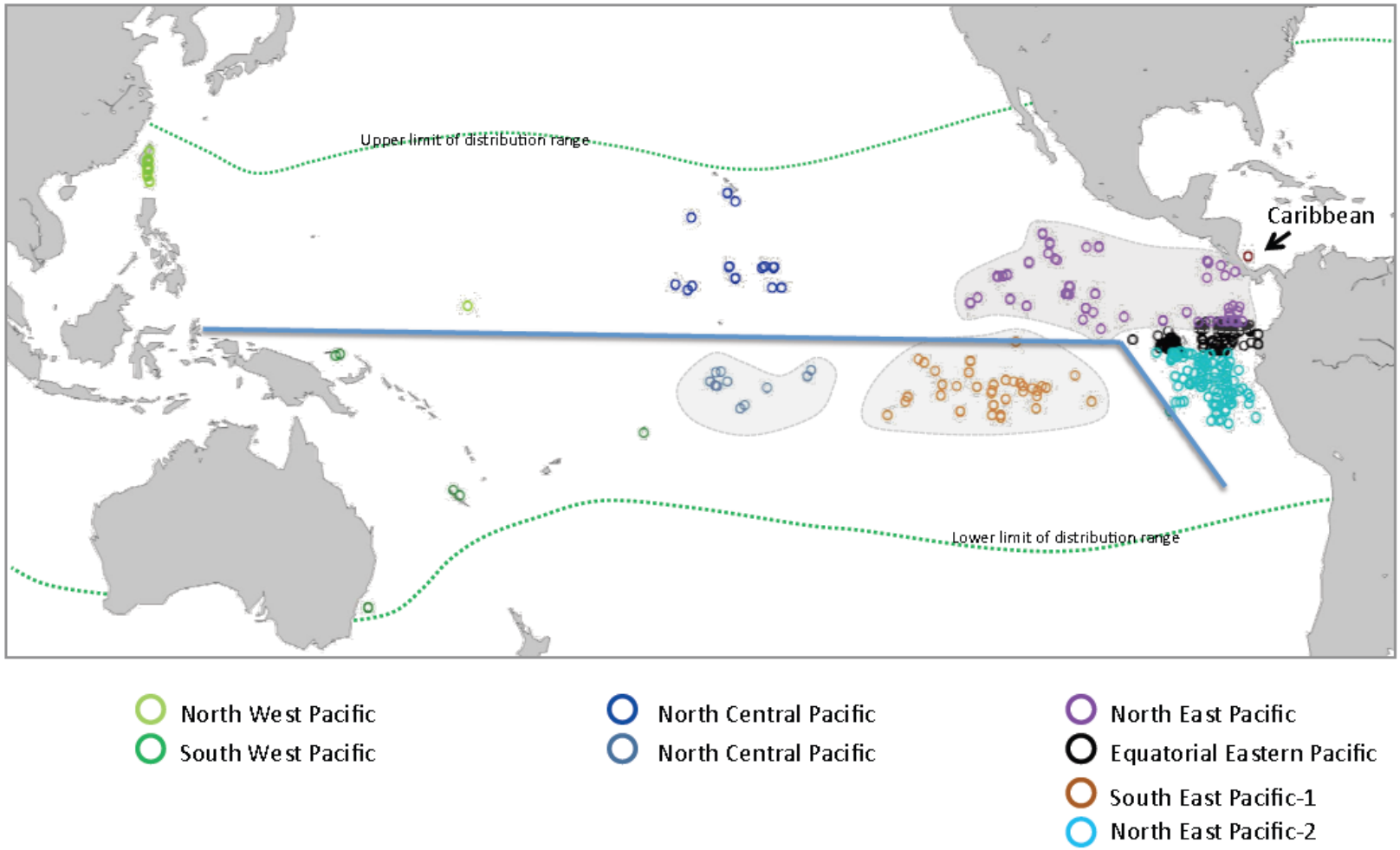
Future directions?

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



Source: John Hyde, NMFS-SWFSC

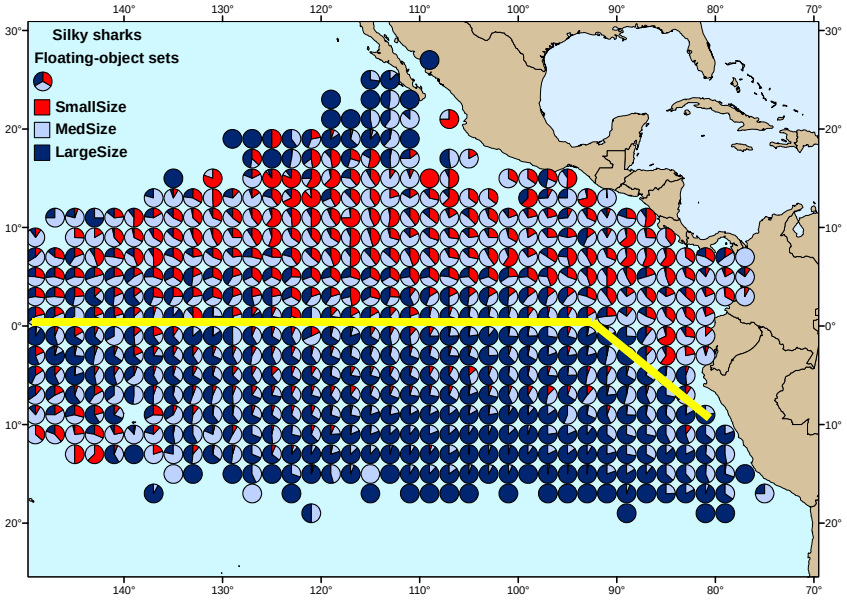
Sample distribution and hypothesized stock boundary

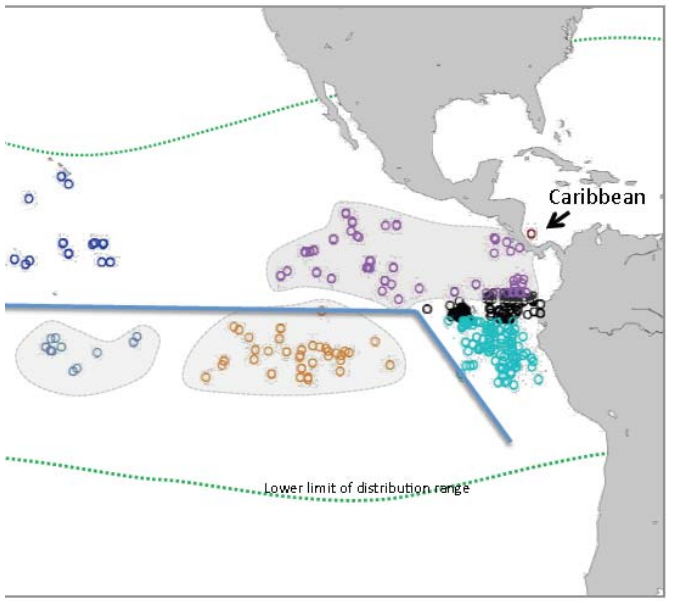


Source: John Hyde, NMFS-SWFSC

Stock assessment

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



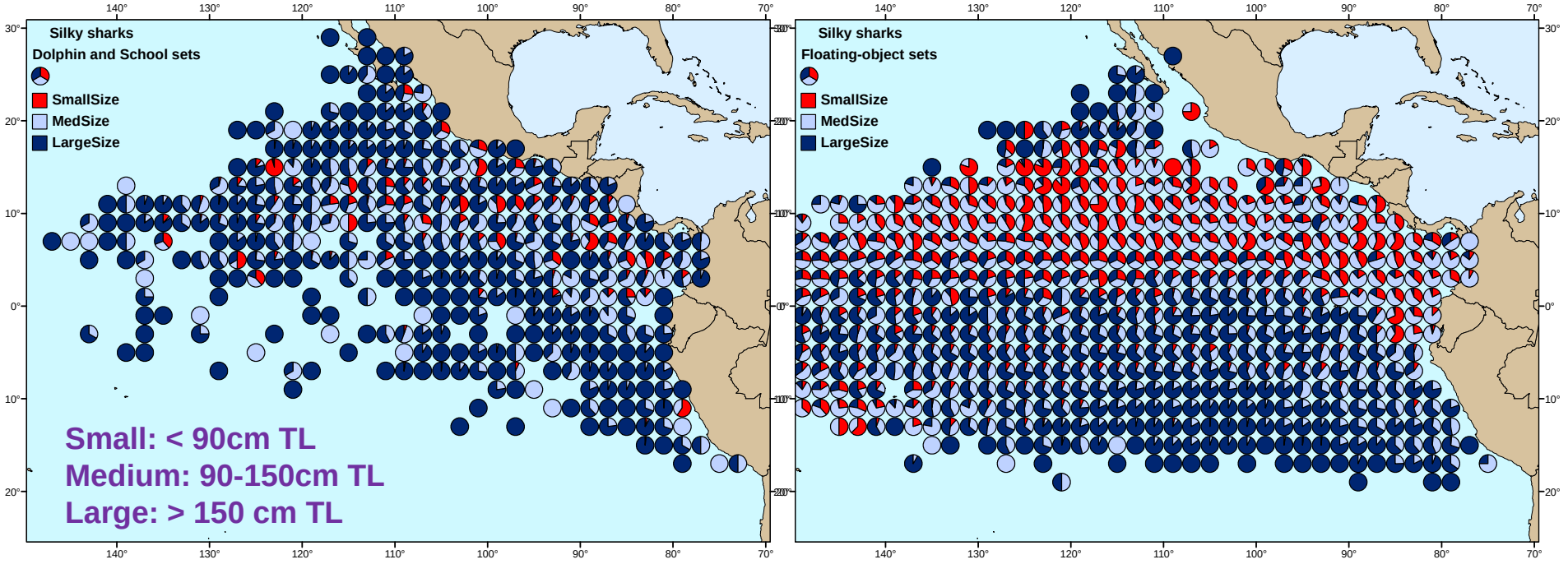


Silky spatial distribution by stage

bycatch of purse seine tuna fisheries

School and dolphin sets

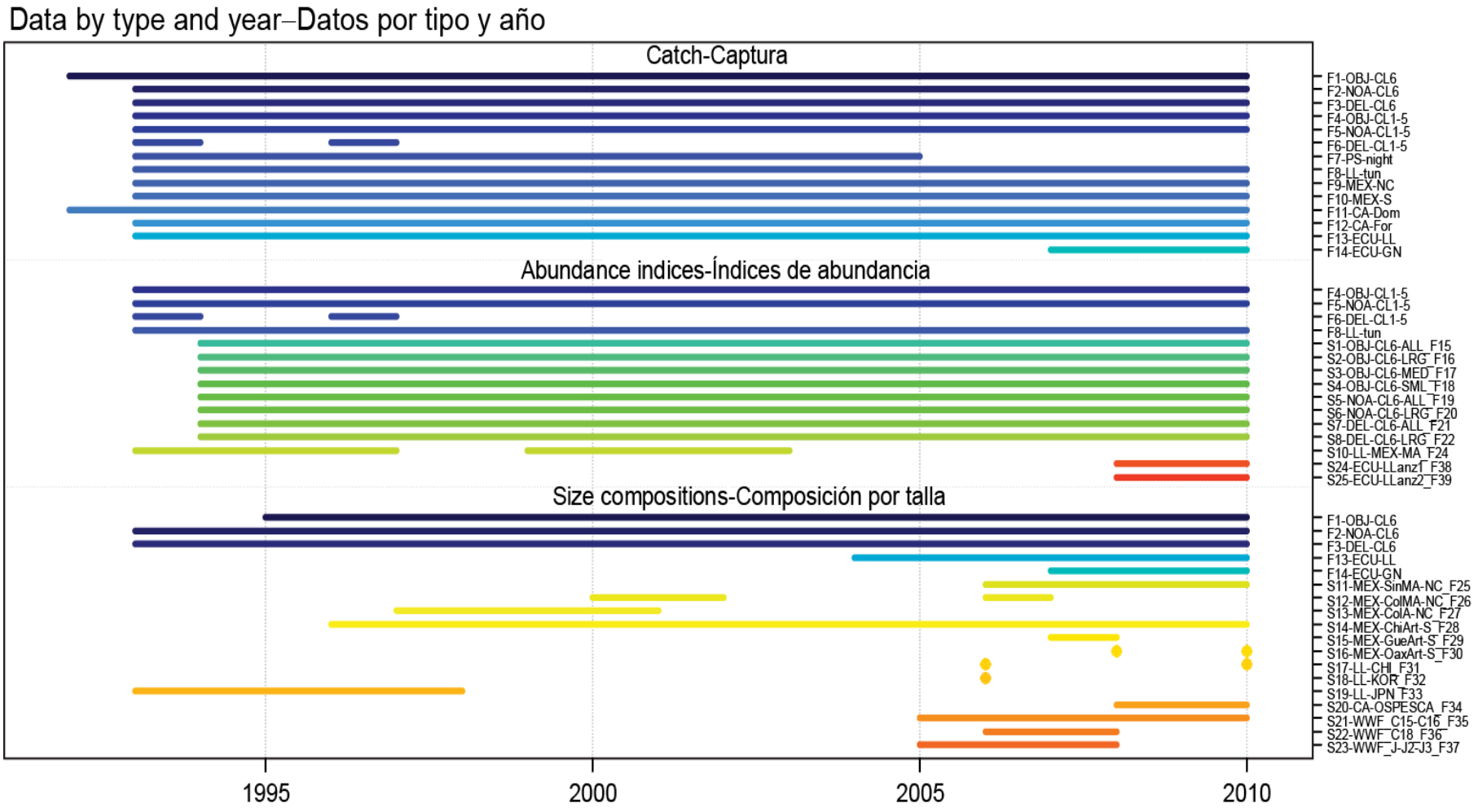
Floating object sets



Roman-Verdesoto and Orozco-Zoller, 2005

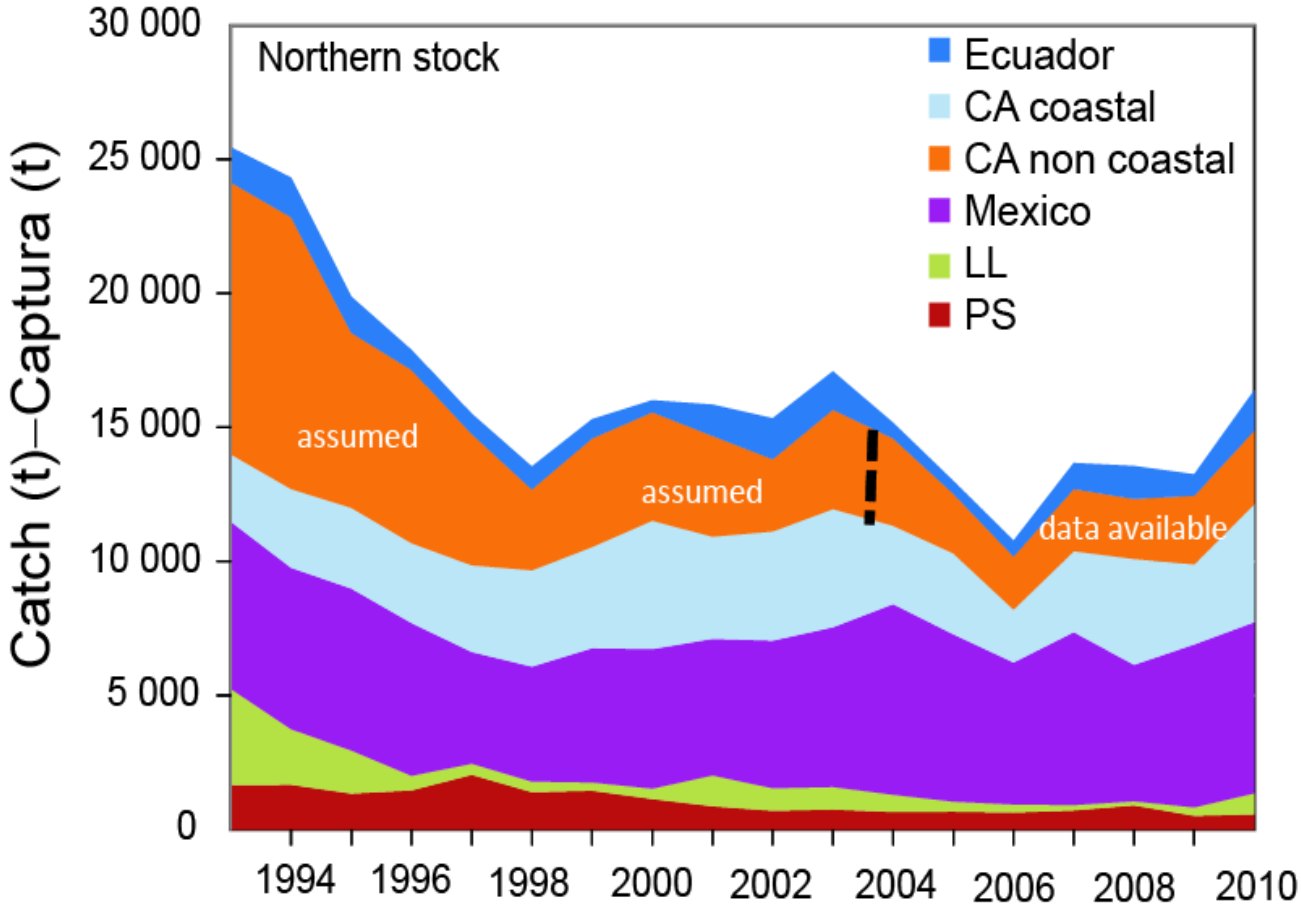
Stock assessment:

data sources obtained



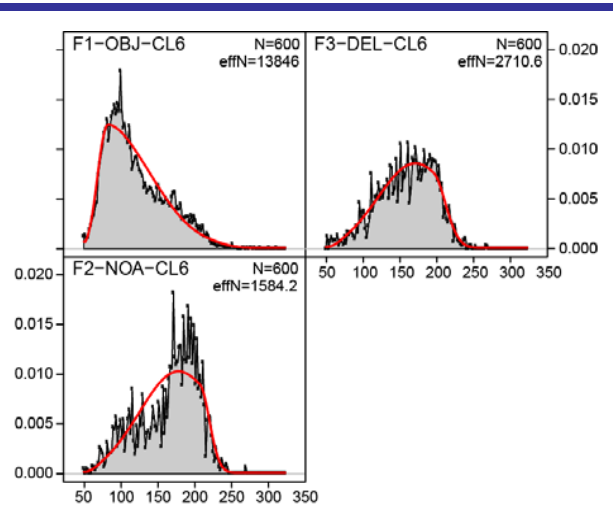
Stock assessment:

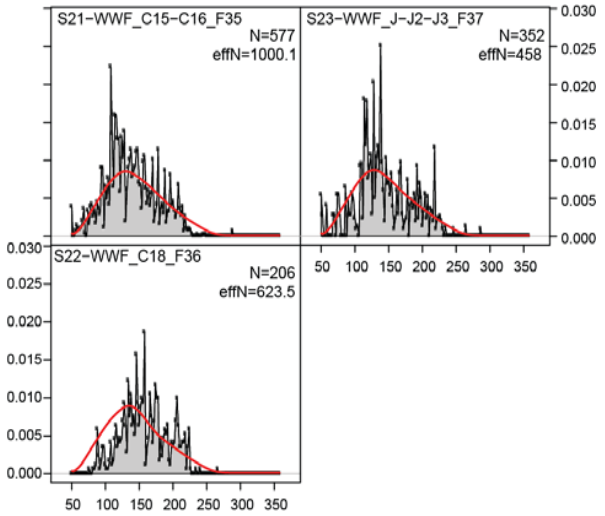
reconstruction of “missing catch”

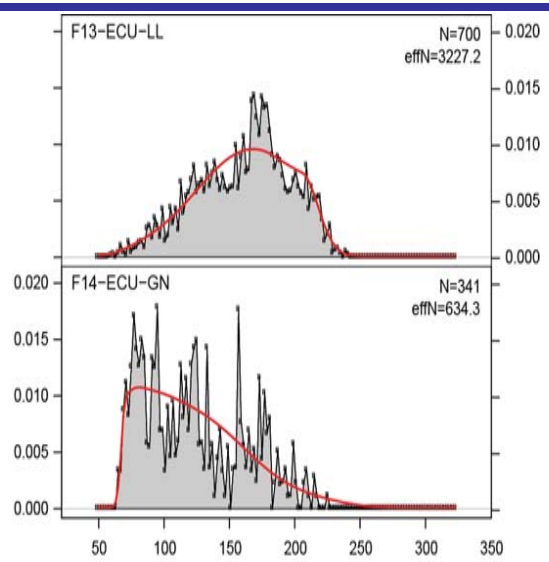


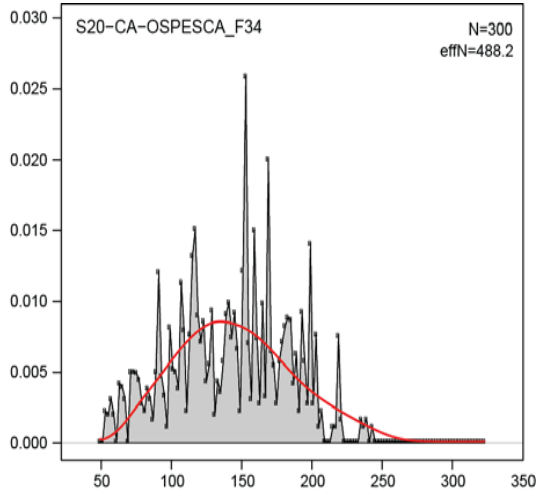
Stock assessment:

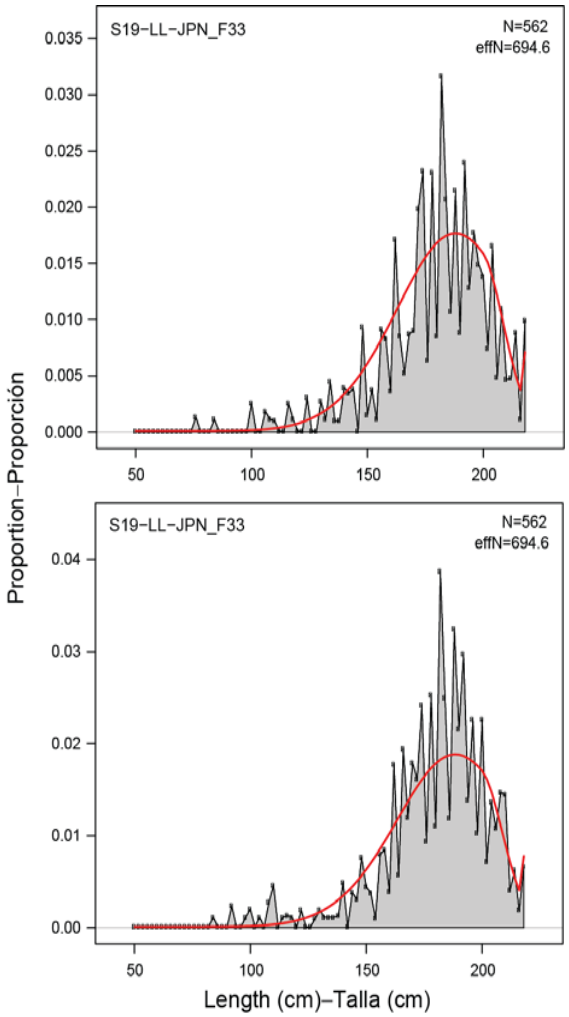
model fit to length compositions





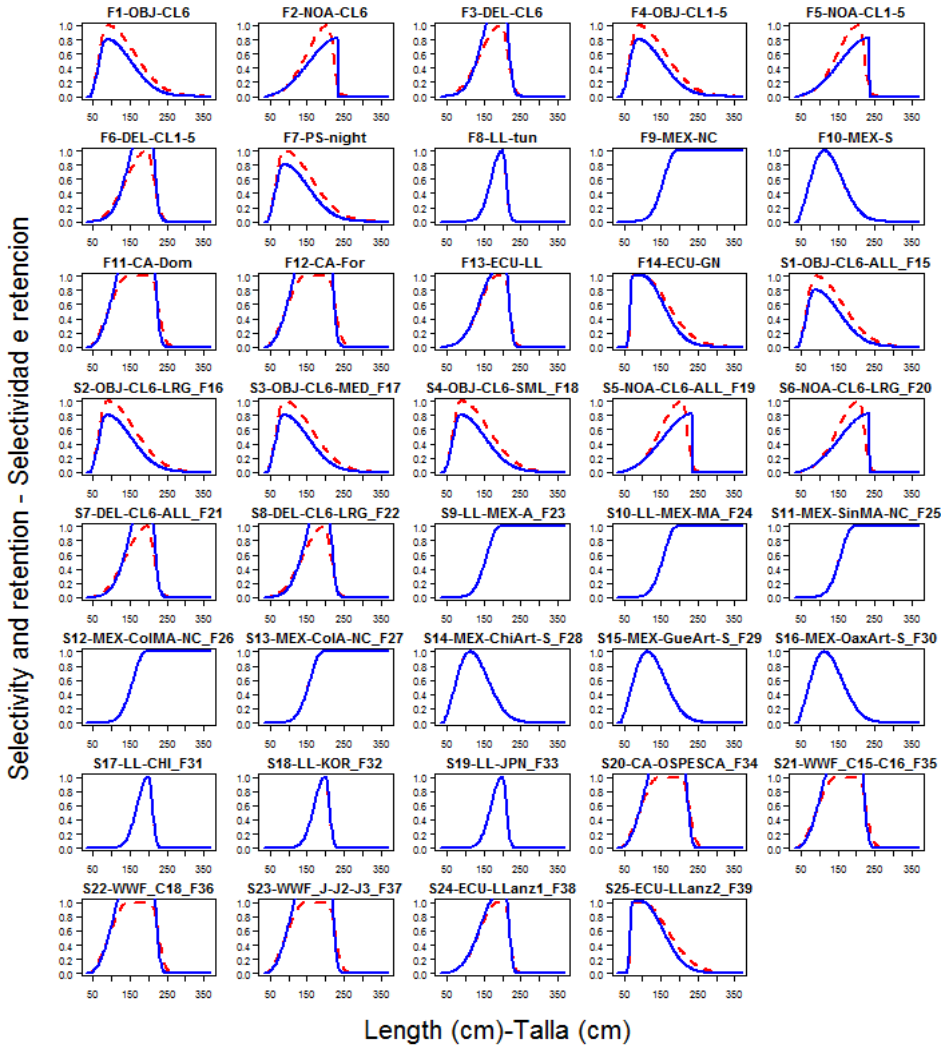






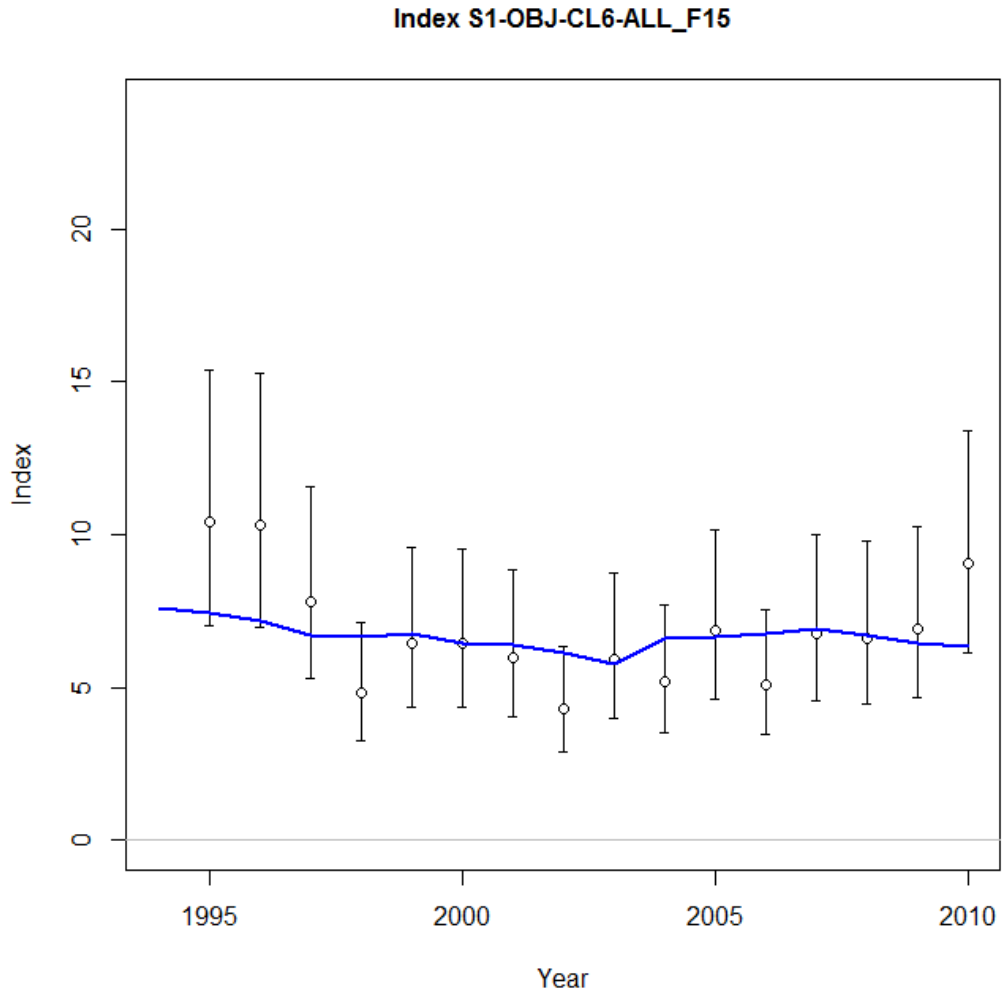
Stock assessment:

selectivities



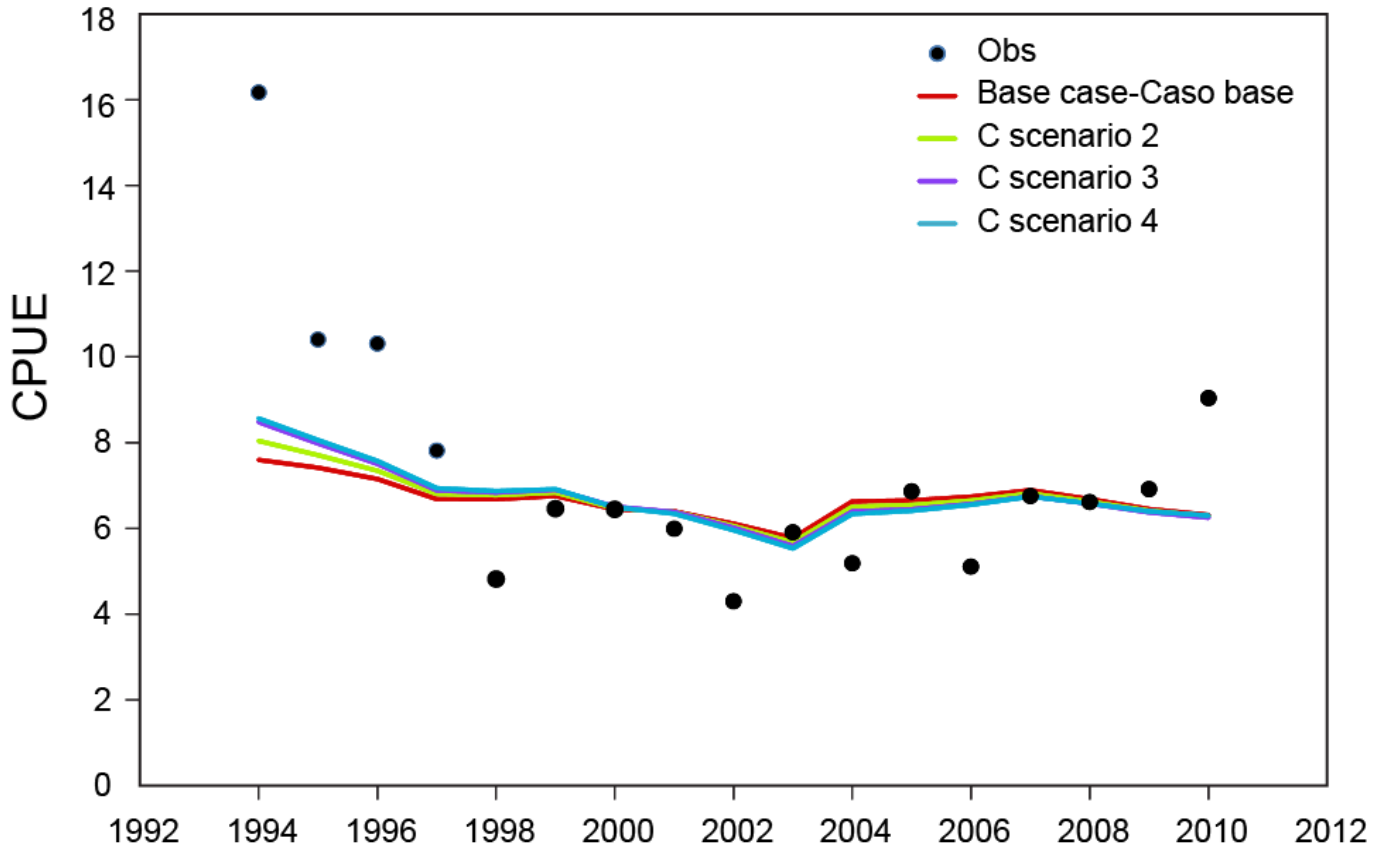
Stock assessment:

model misfit to early CPUE



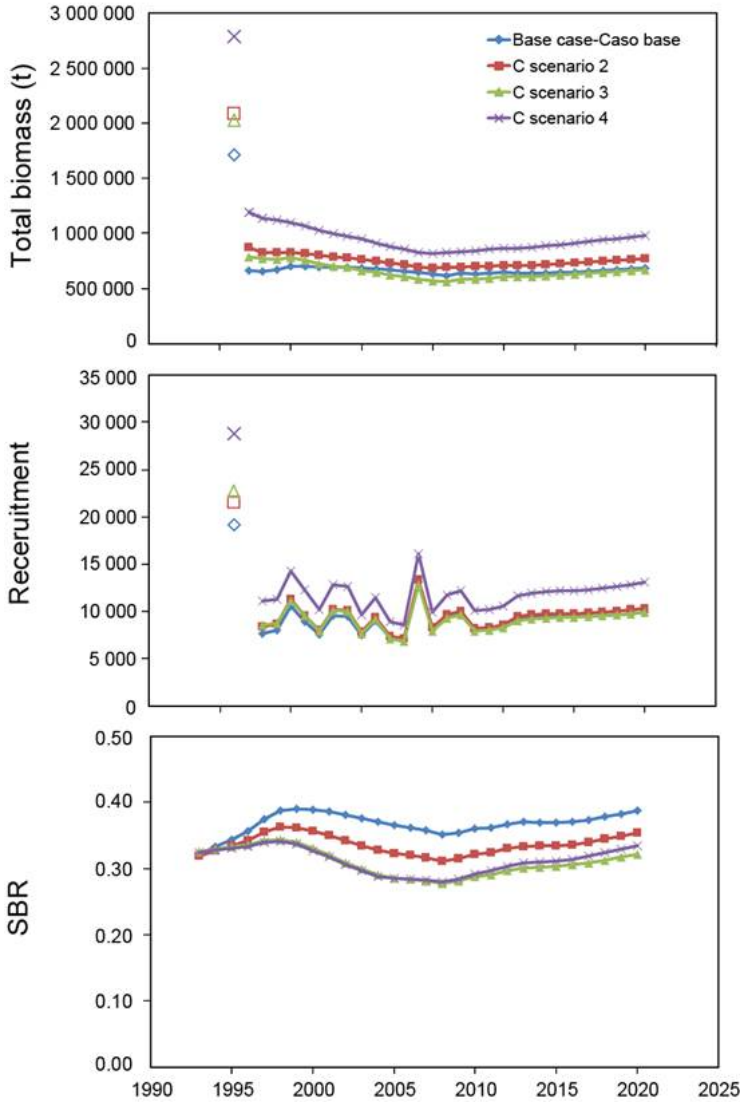
Stock assessment:

model misfit to early CPUE (sensitivities)



Stock assessment:

estimated time series



Stock assessment - conclusions

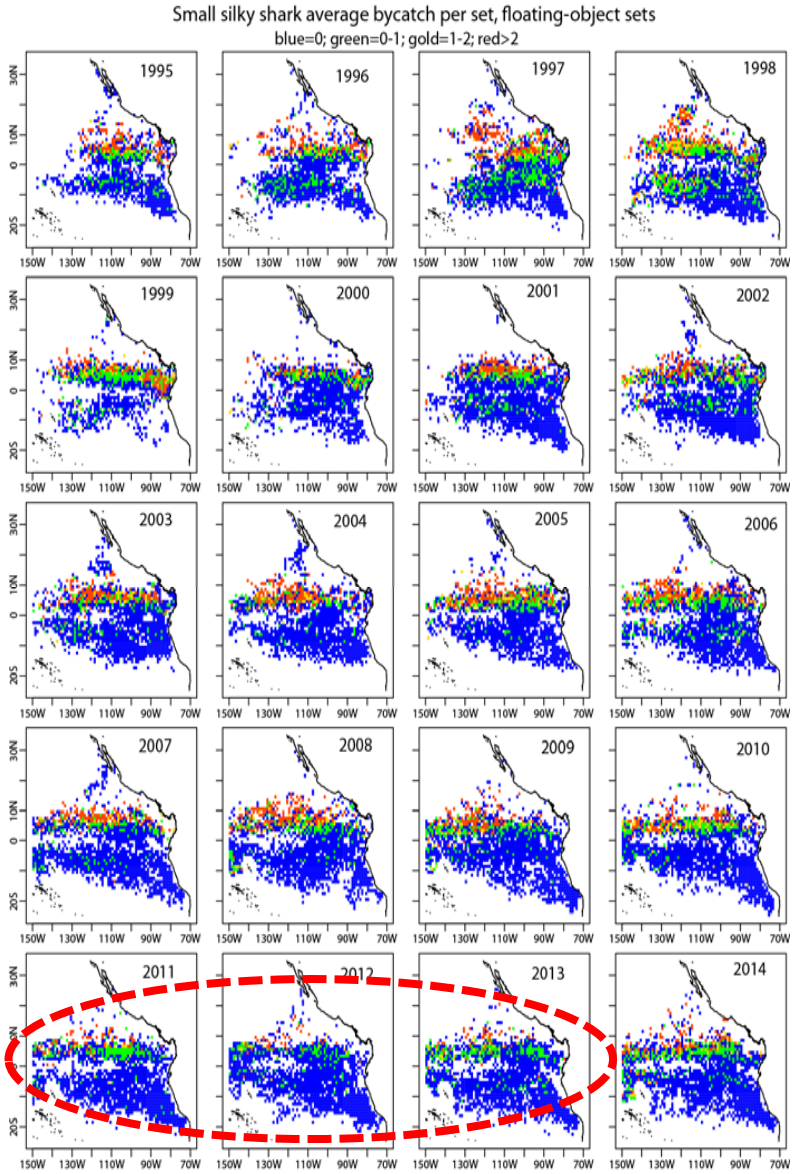
- Stock assessment was attempted using Stock Synthesis (1993-2010)
- Improved knowledge on length composition of the catches and selectivities
- Unfortunately, the model was unable to fit the main index of abundance and therefore the results are not reliable
- Poor performance of the model was probably 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)

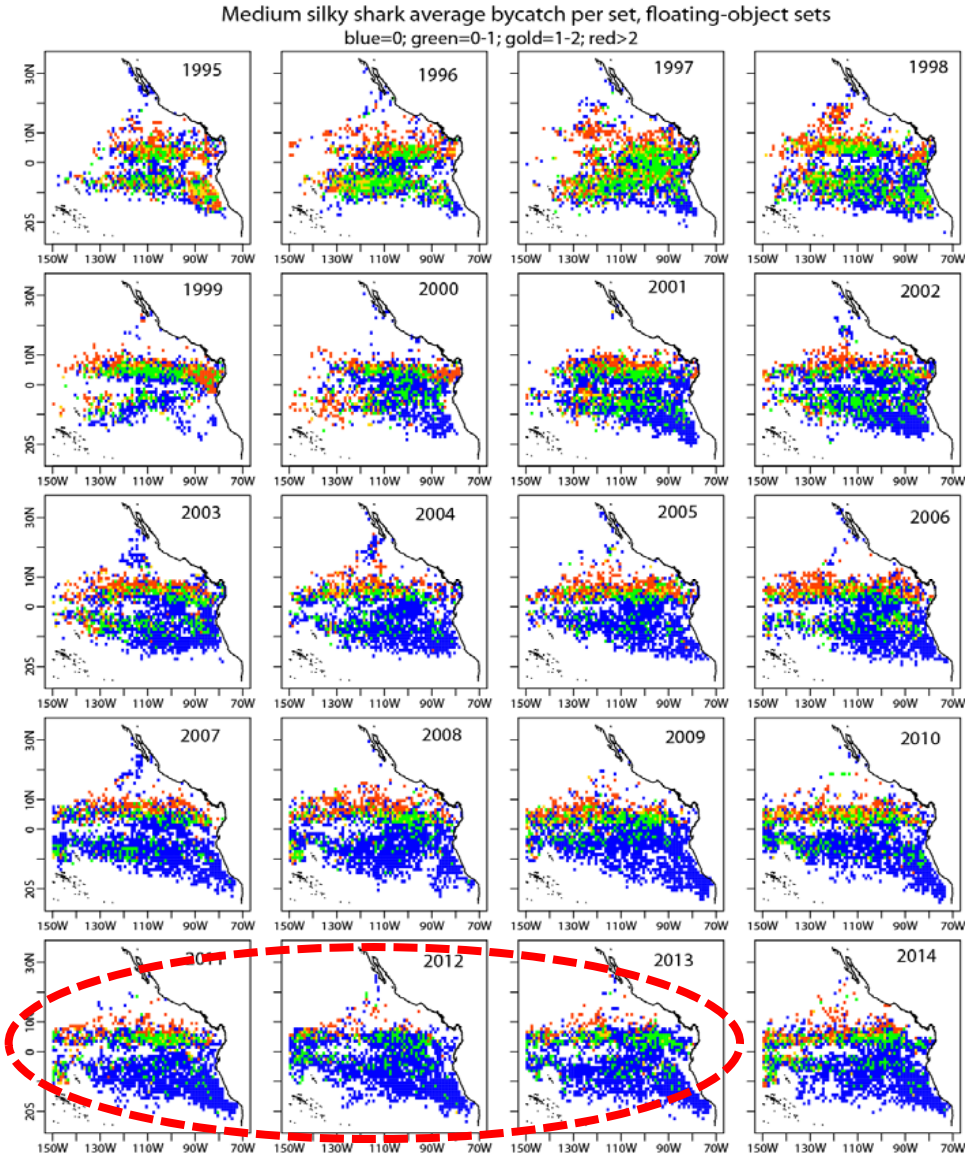
Color scale:
blue: 0 bps
green: <= 1 silky/set
yellow: 1-2 silky/set
red: > 2 silky/set



Spatial distribution of BPS

Fltobj sets
medium silky (90-150 cm)

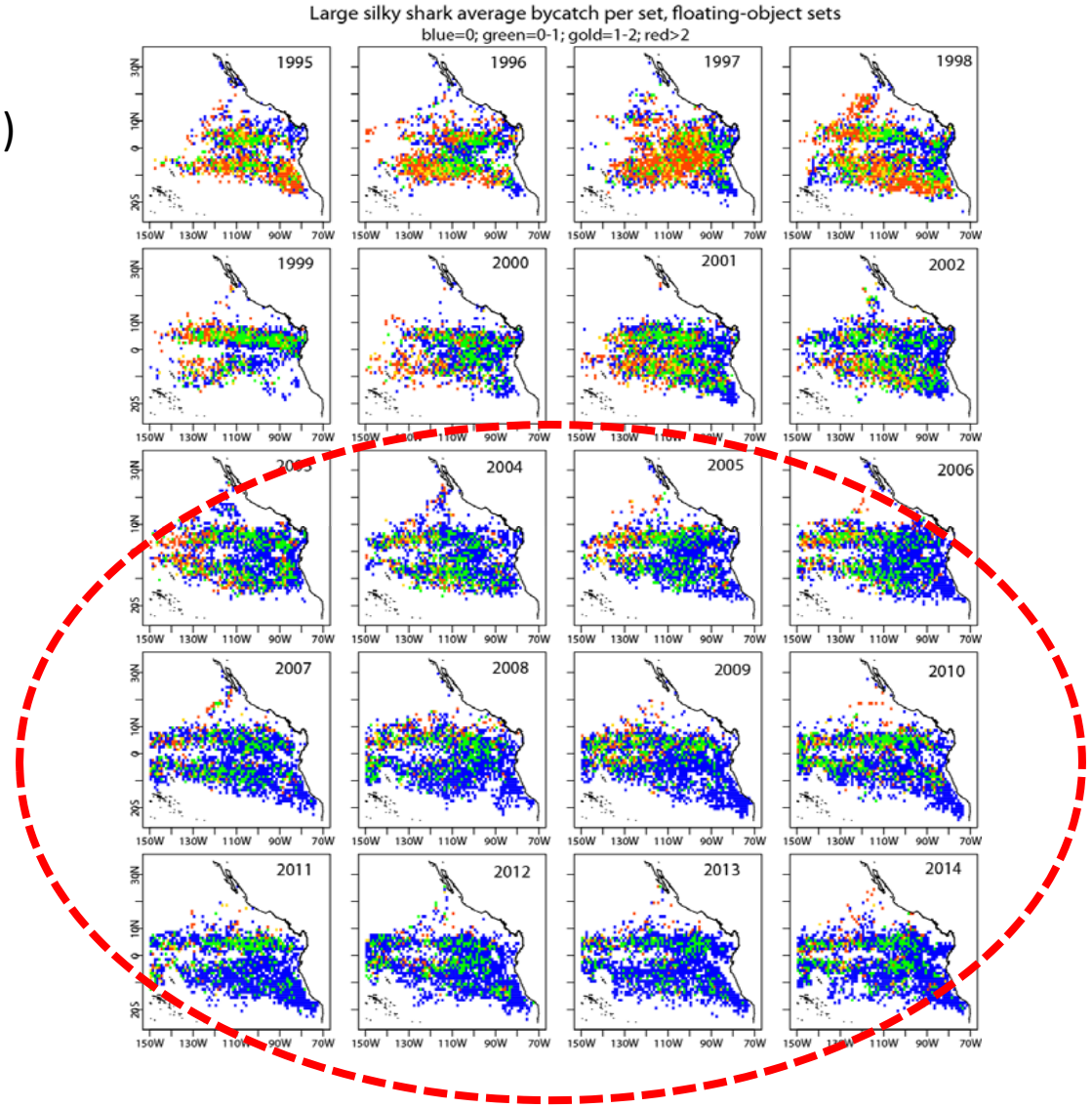
Color scale:
blue: 0 bps
green: <= 1 silky/set
yellow: 1-2 silky/set
red: > 2 silky/set



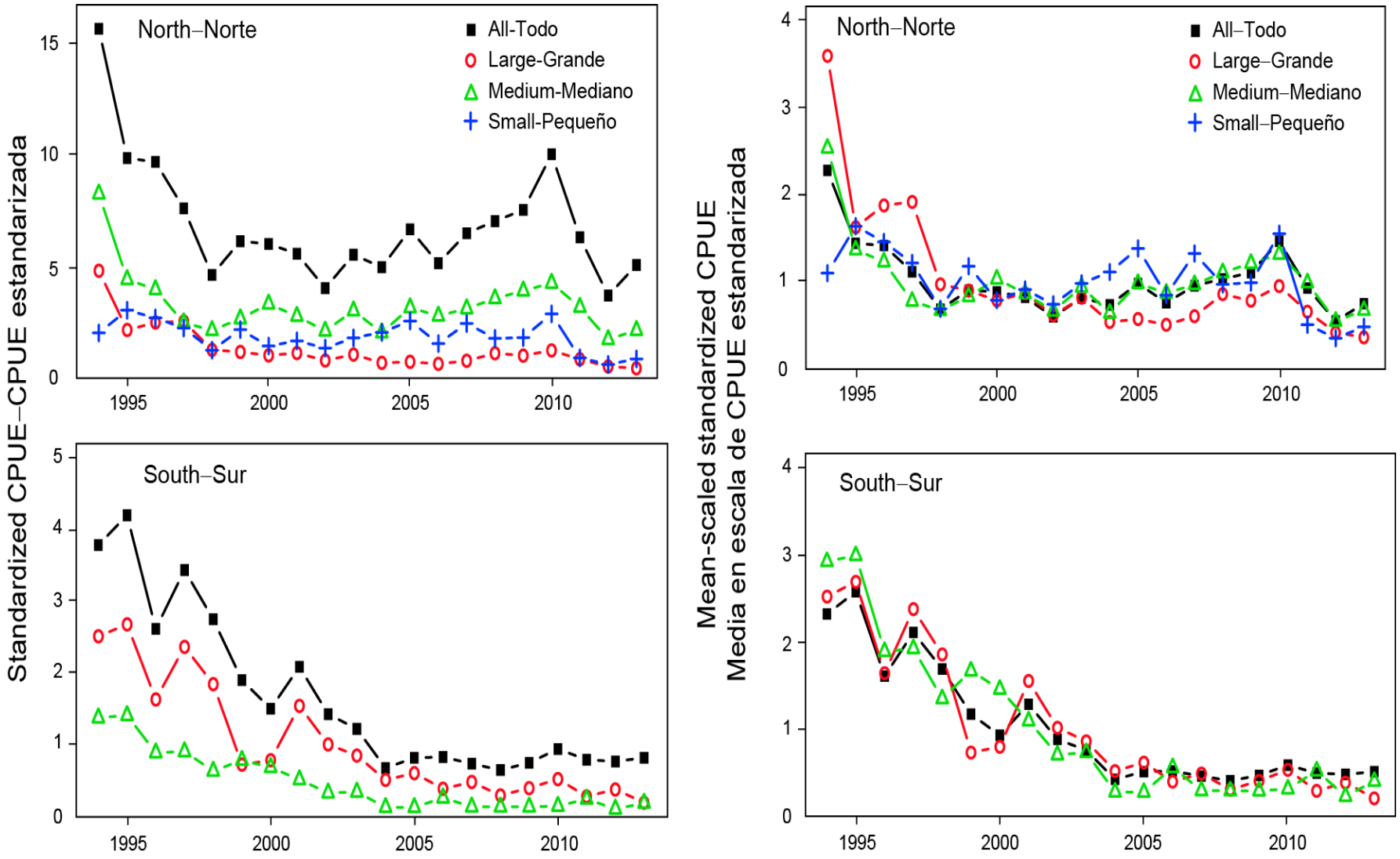
Spatial distribution of BPS

Fltobj sets
large silky (> 150 cm)

Color scale:
blue: 0 bps
green: <= 1 silky/set
yellow: 1-2 silky/set
red: > 2 silky/set

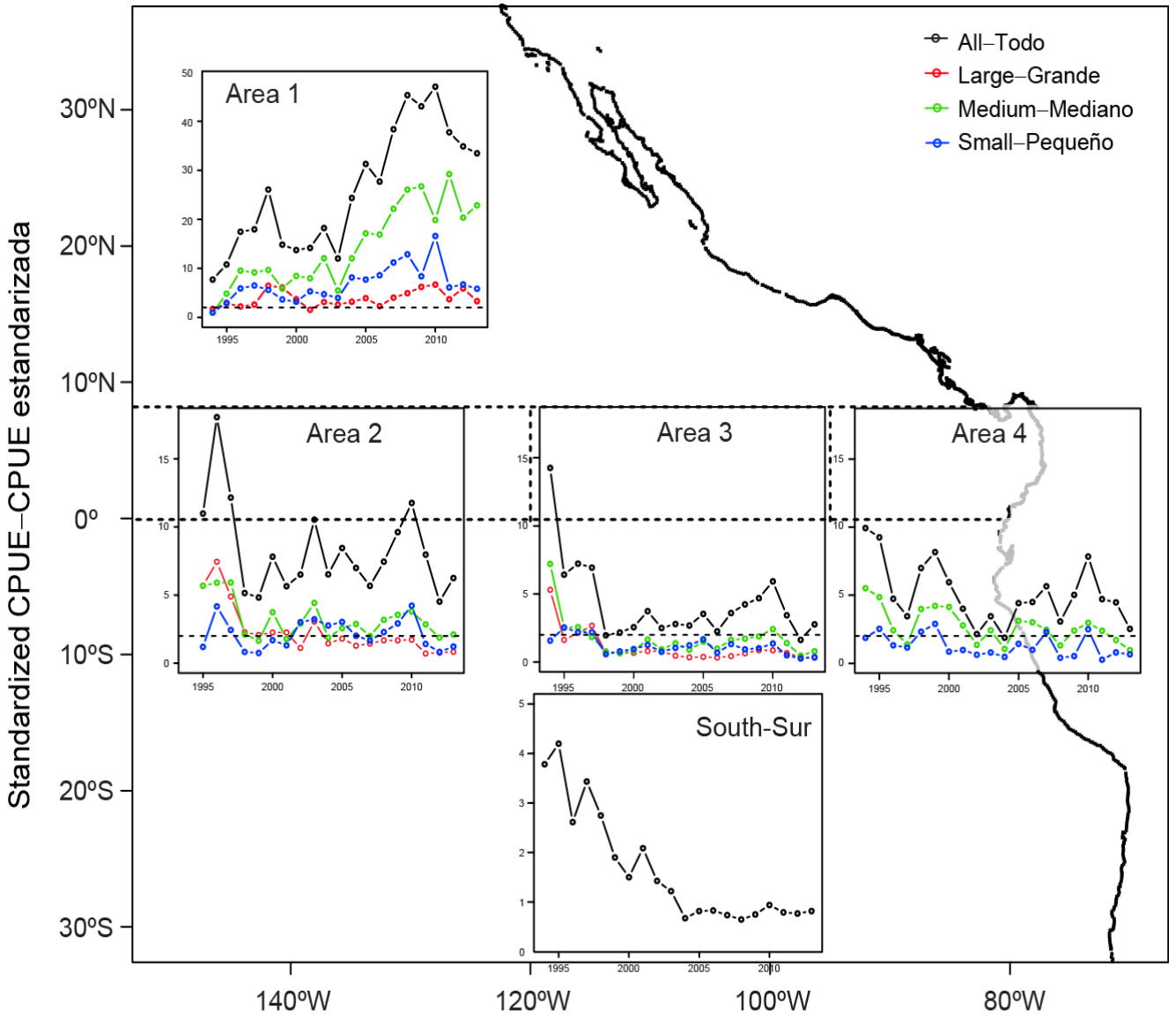


Standardized CPUE-OBJ

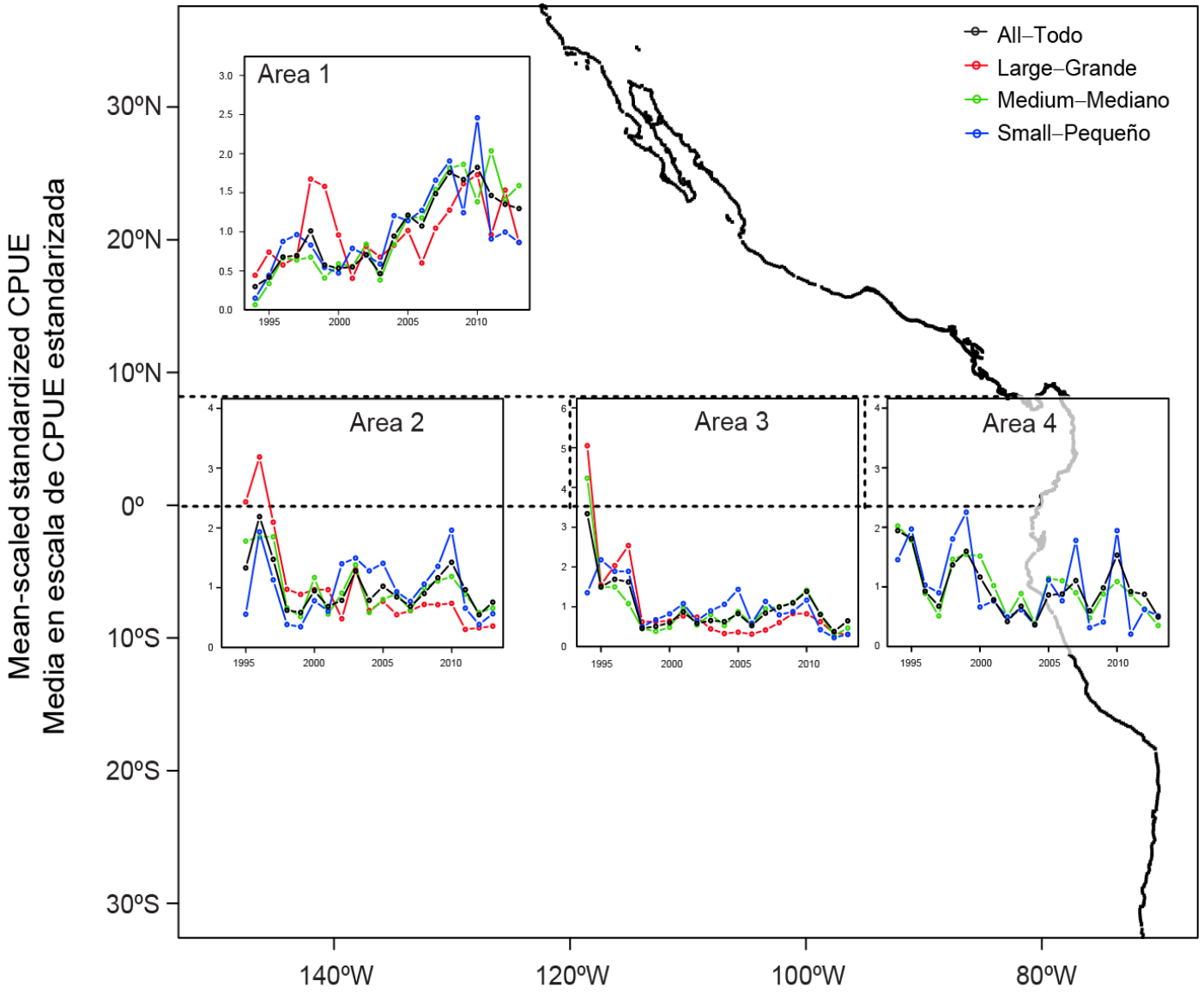


Indicators

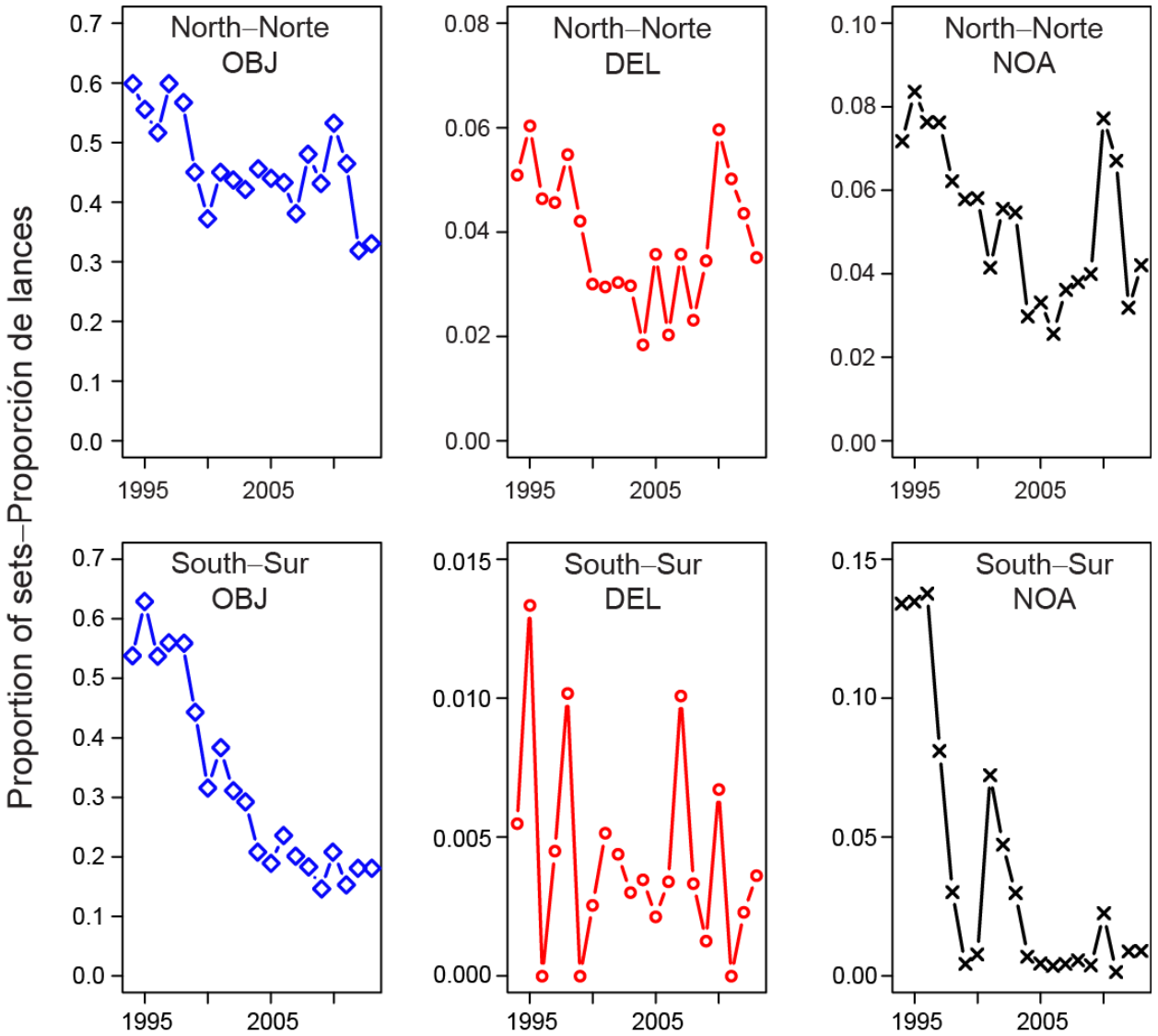
Standardized CPUE-OBJ



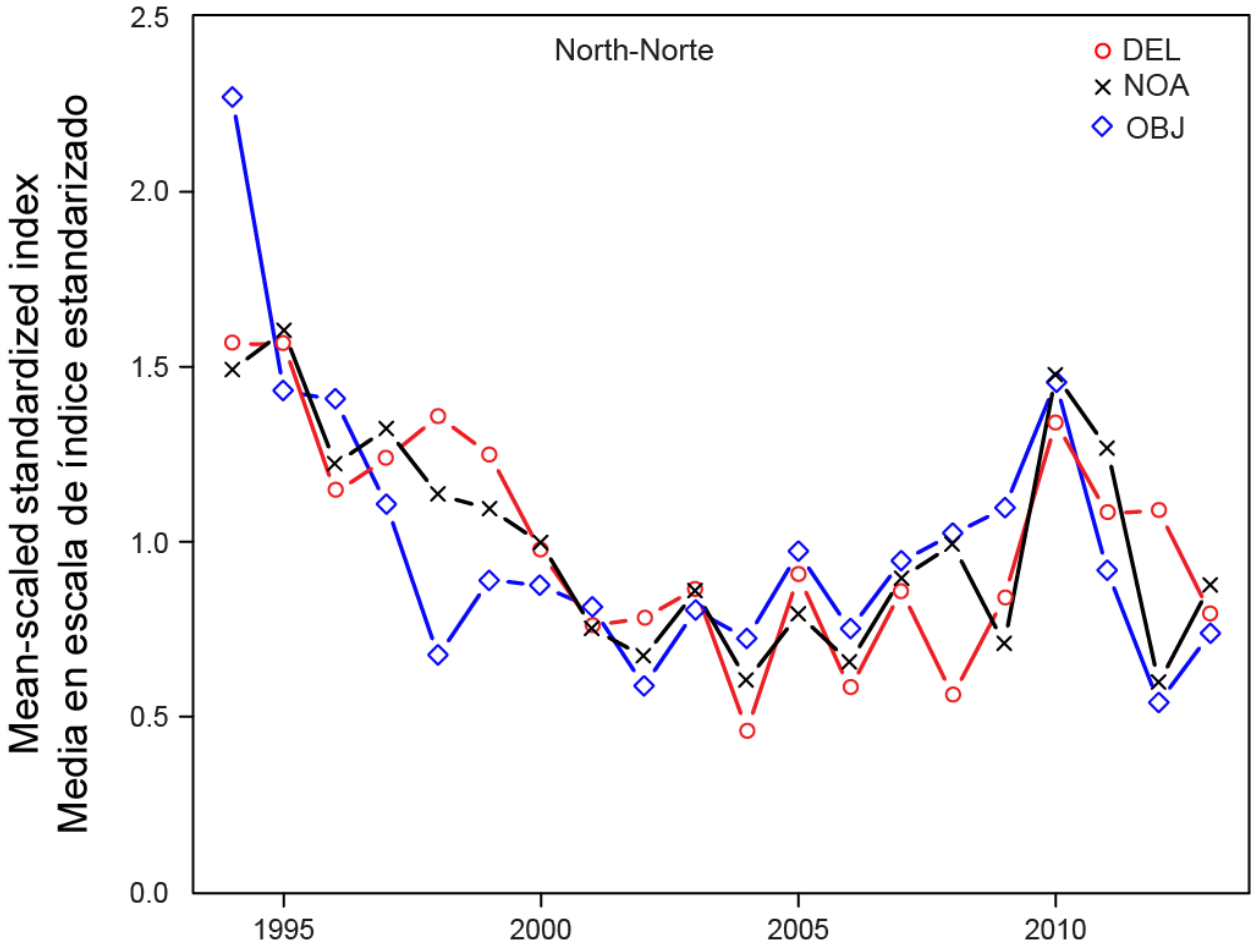
Standardized CPUE-OBJ



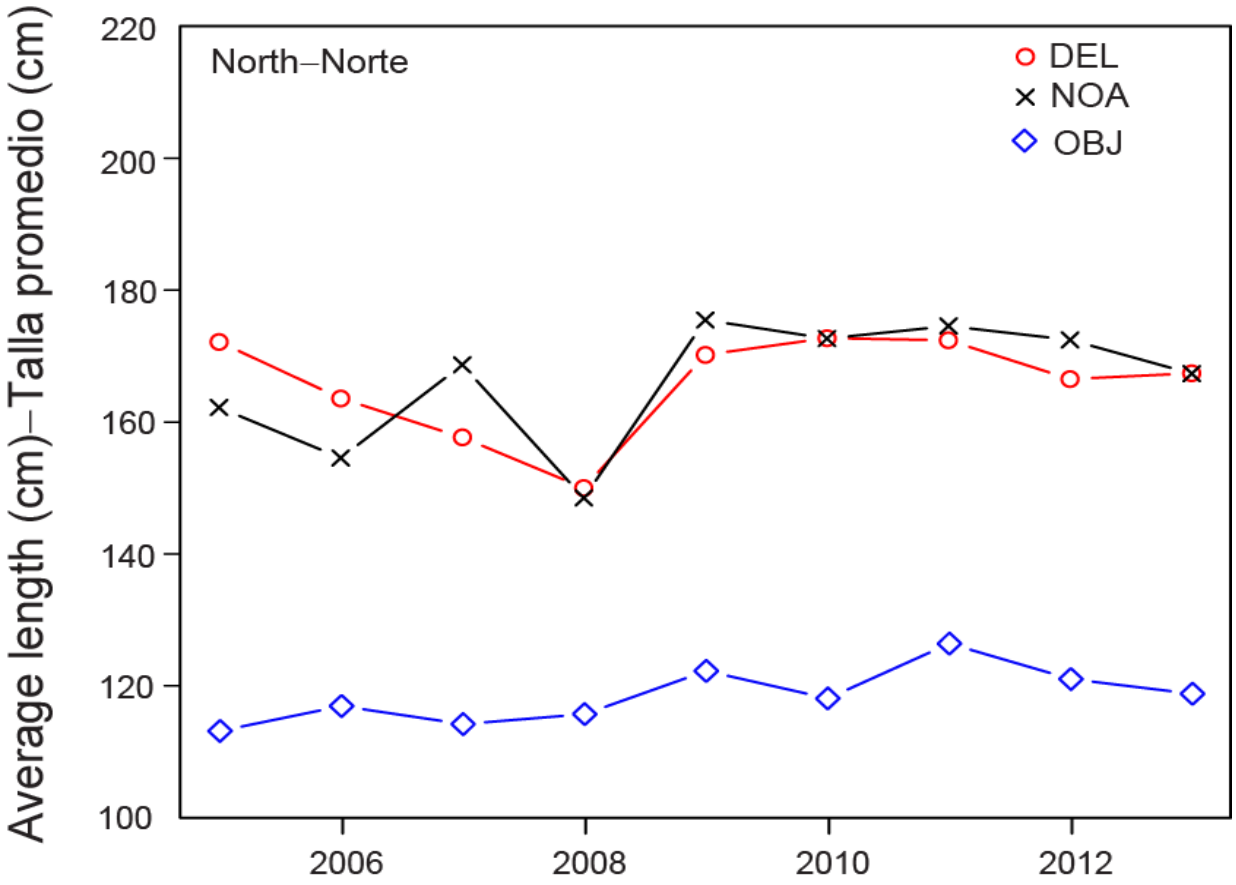
Nominal proportions of positive sets by set type



Comparisons among set types



Average length



Average length