Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

CIAT
IATTC

UPDATED STOCK STATUS INDICATORS FOR SILKY SHARKS (SAC-09-13)

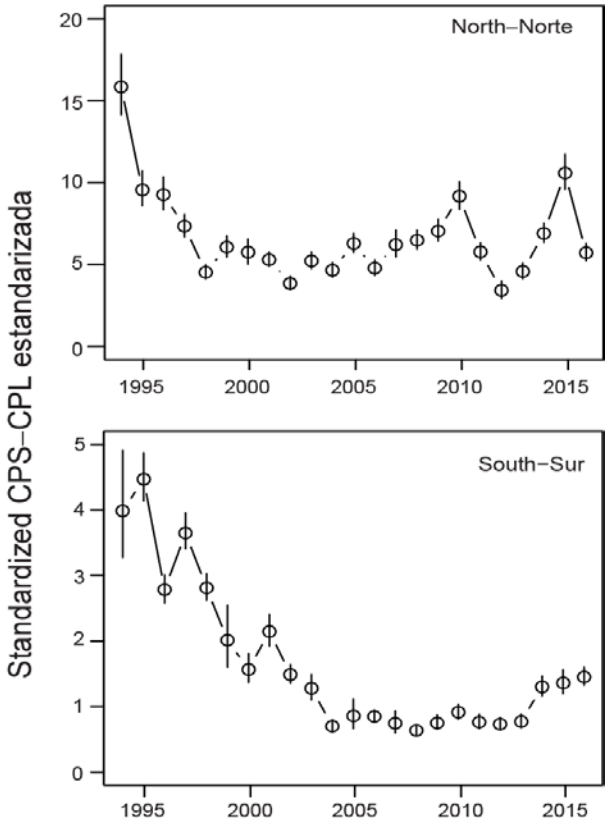
Cleridy E. Lennert-Cody, Alexandre Aires-da-Silva, Mark N. Maunder

9th Meeting of the Scientific Advisory Committee La Jolla, California USA, 14-18 May 2018

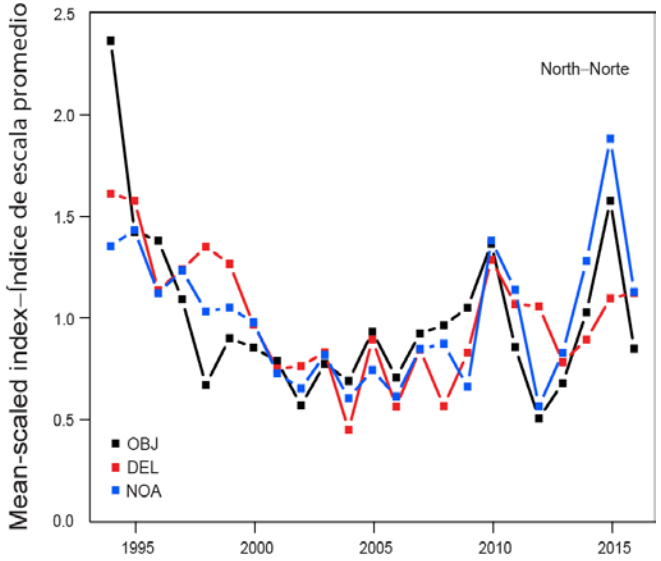
Outline

- Background
  - Environmental influences on the indices
- Updated indices for 2017
  - Data and methods
  - Results
- Future directions

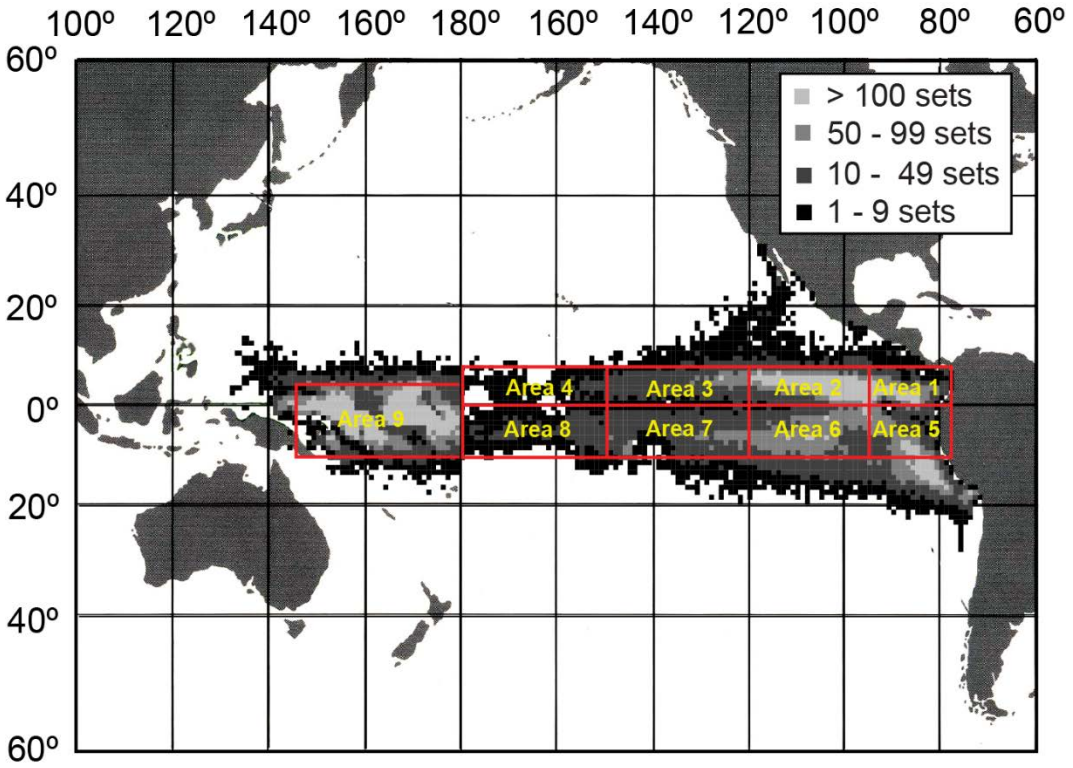
Environmental influences on the index



- Large inter-annual fluctuations in recent north EPO OBJ index.
- Unlikely due exclusively to population growth.
- Similar fluctuations seen in indices from other set types.



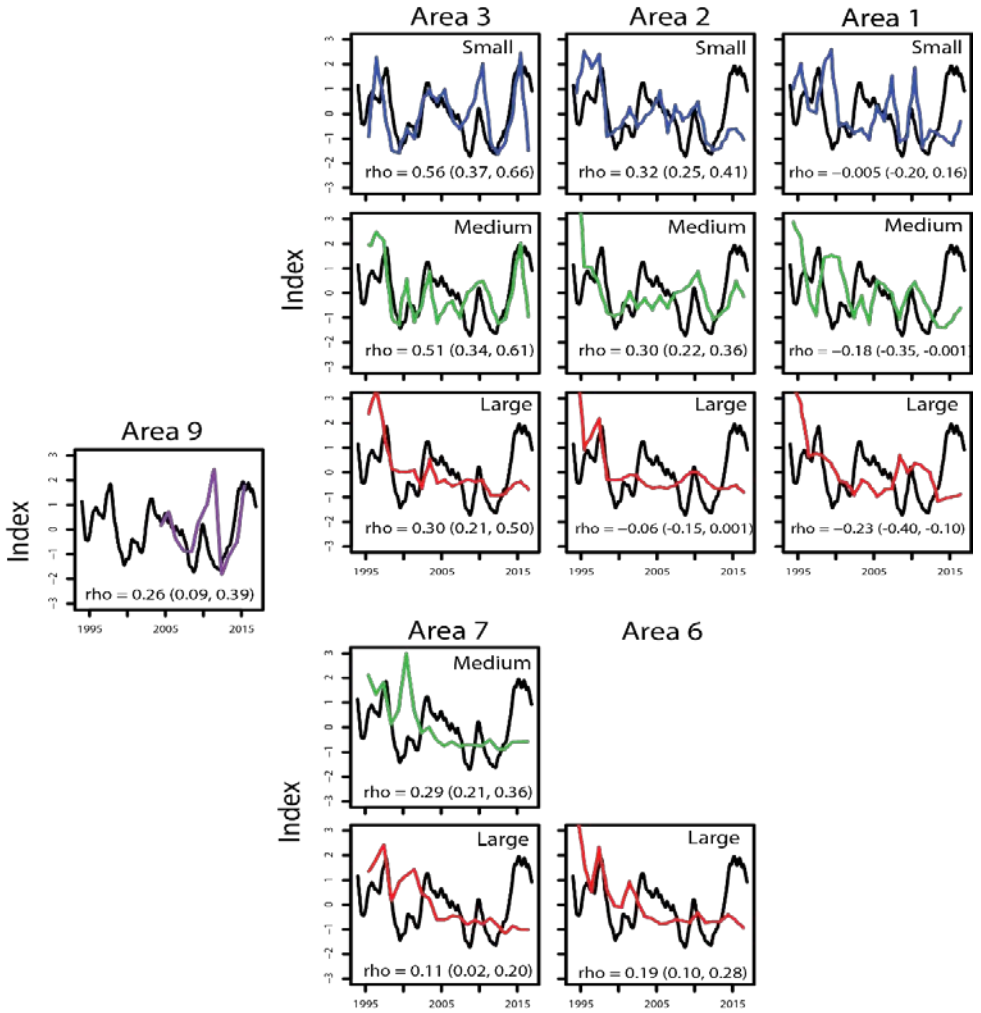
Environmental influences on the index



- Document SAC-08-08a(i) and work after SAC-08:
  - Computed floating-object set indices by region across Pacific;
  - Compared indices to the Pacific Decadal Oscillation (PDO)*
  - The PDO is an index of inter-annual-to-interdecadal variability of the Pacific Ocean climate

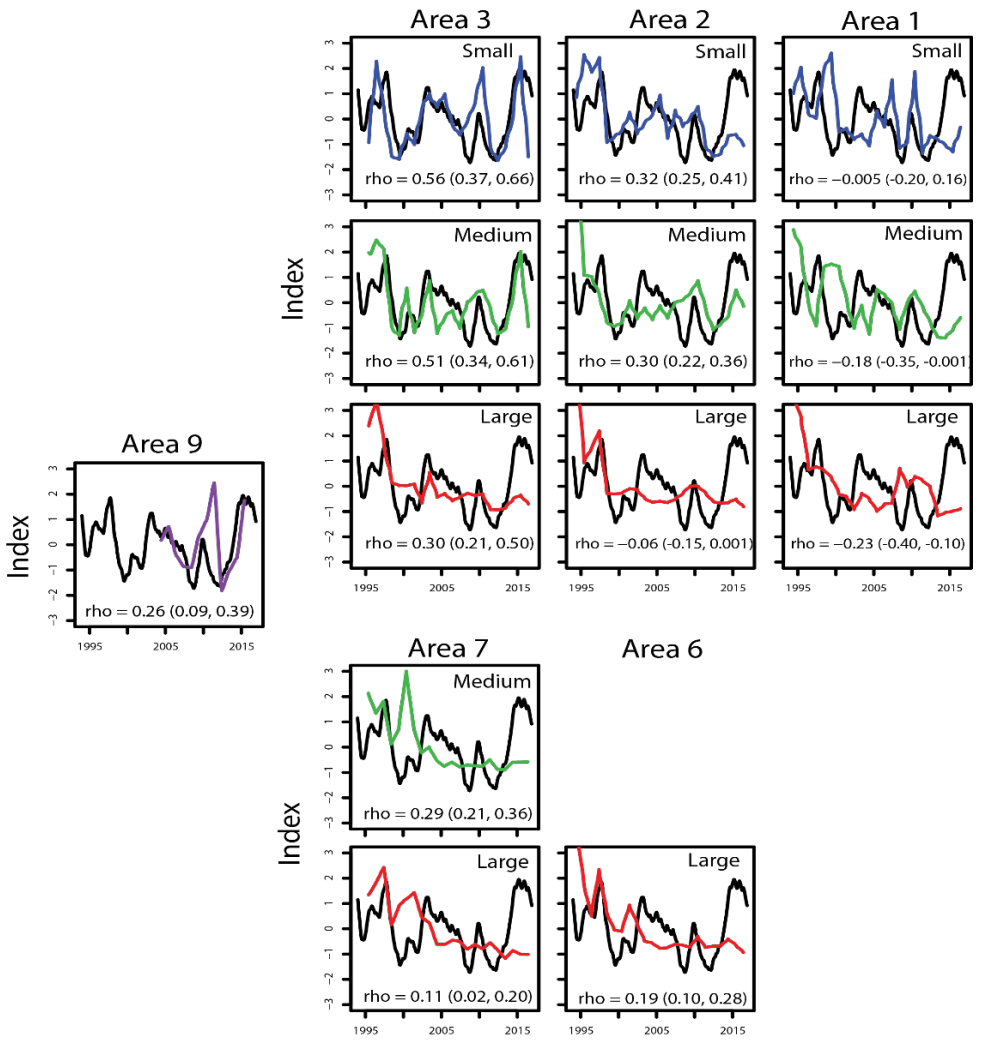
* Work is *in press* in the journal *Fisheries Oceanography*

Environmental influences on the index



- Correlation between of silky indices and PDO:
  - Differs by region and shark size category.
  - Highest for small and medium silky sharks in western EPO and western Pacific.
  - Weaker for large silky sharks throughout EPO.

Environmental influences on the index

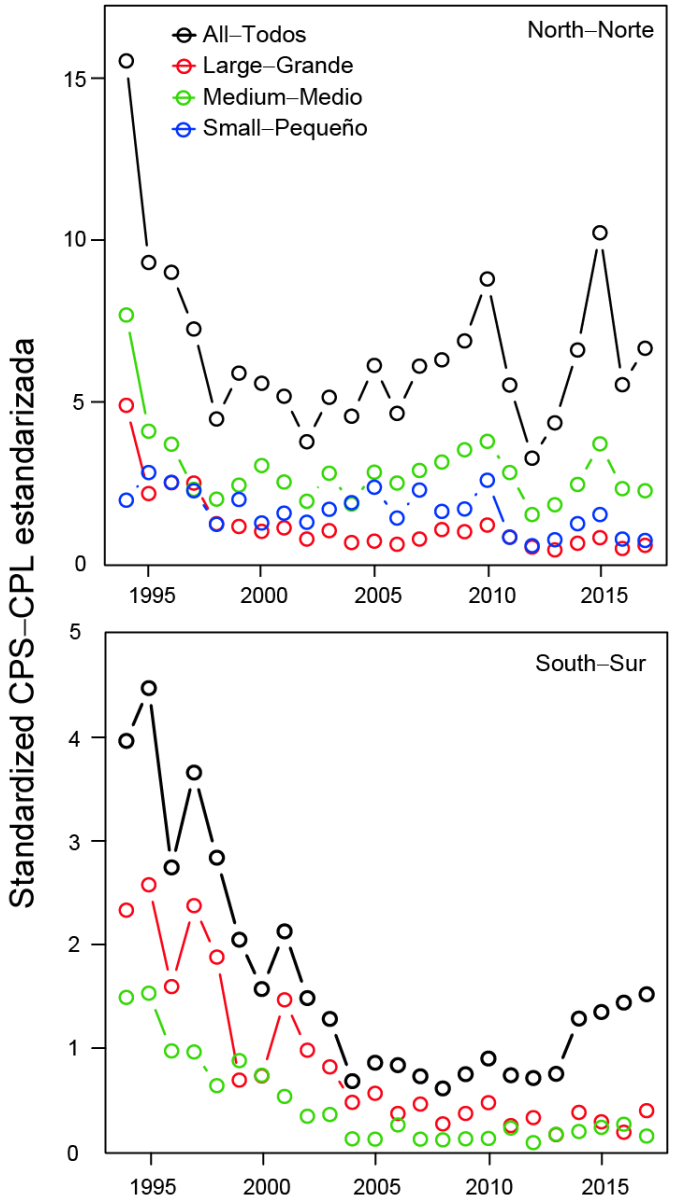


- Implications
  - ENSO events may strongly influence spatial distribution of juvenile silky sharks in EPO.
  - Large shark index is less likely to be biased and therefore a better stock status indicator.
- Working to mitigate bias, meanwhile update indices with previous methods.

Updated indices for 2017

- Floating-object set indices:
  - Observer data for 1994-2017
  - Zero-inflated negative binomial generalized additive model fitted to bycatch-per-set
  - Covariates: year, latitude, longitude, calendar day, set time, net depth, object depth, SST, proxies for local object density, log tuna catch, log non-silky bycatch
  - Compute index for small (<90 cm total length (TL), medium (90-150cm TL) and large (> 150cm TL) silky sharks
  - Index is the sum of predictions on a 1-degree grid for each year, at fixed values of other covariates.

Updated indices for 2017



- Relative to 2016, the 2017 index values remain largely unchanged:
  - Indices for large silky sharks were similar, or increased slightly.
  - Indices for medium and small silky sharks were similar or decreased slightly.

Future directions

- Adapt standardization method to develop indices that are less influenced by ocean climate forcing.
- Emphasis will be on index for large silky sharks.
- Obtaining catch and effort data from all EPO fisheries catching silky sharks to develop other indices continues to be vital.

CIAT

IATTC

Questions

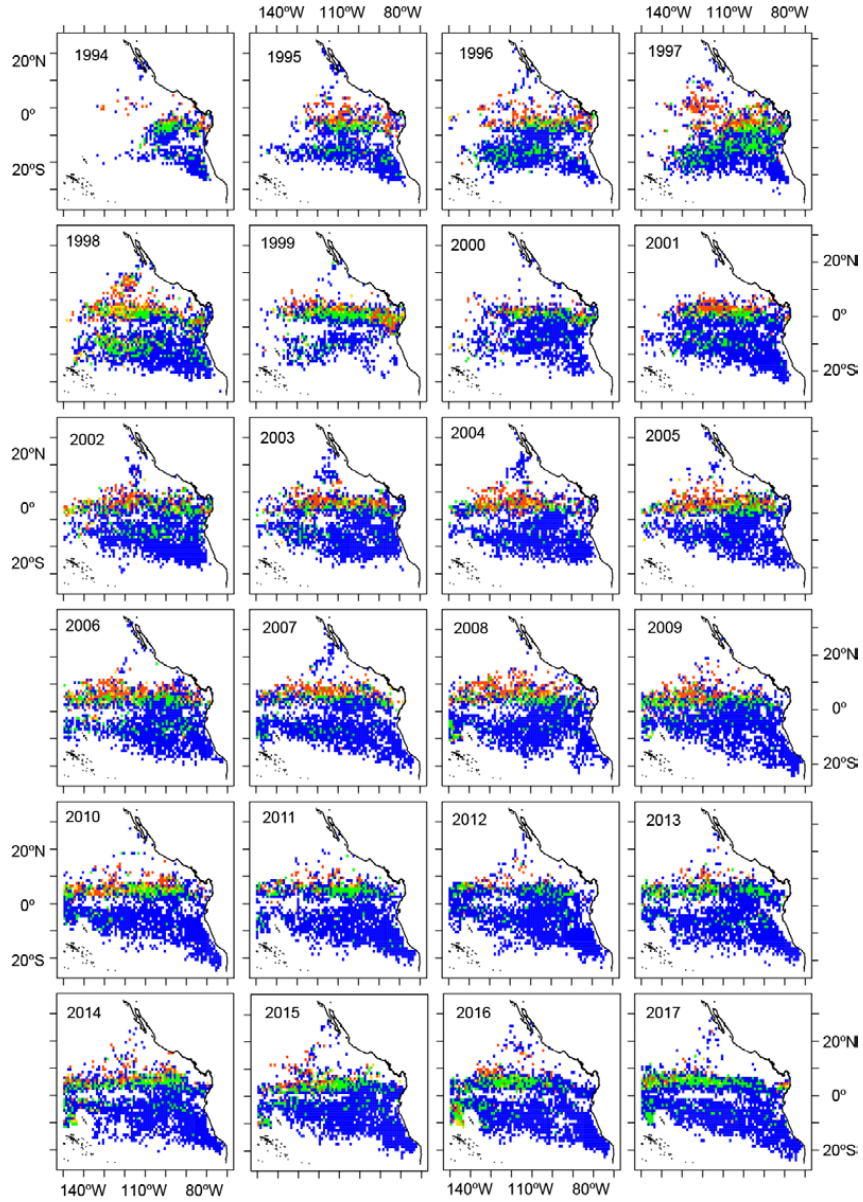


FIGURE 1a. Average bycatch per set in floating-object sets, in numbers, of small (< 90 cm total length) silky sharks, 1994-2017. Blue: 0 sharks per set, green: ≤ 1 shark per set; yellow: 1-2 sharks per set; red: > 2 sharks per set.

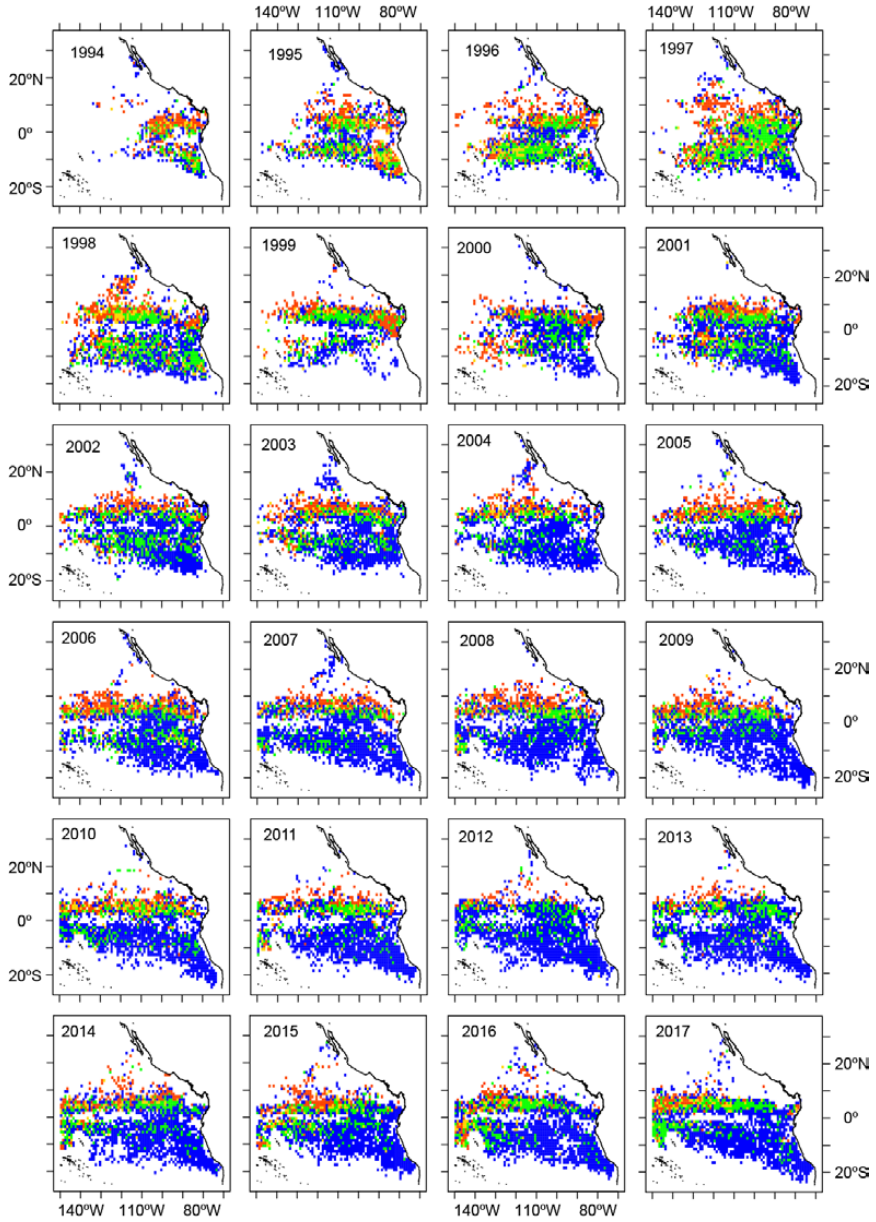


FIGURE 1b. Average bycatch per set in floating-object sets, in numbers, of medium (90-150 cm total length) silky sharks, 1994-2017. Blue: 0 sharks per set, green: ≤ 1 shark per set; yellow: 1-2 sharks per set; red: > 2 sharks per set.

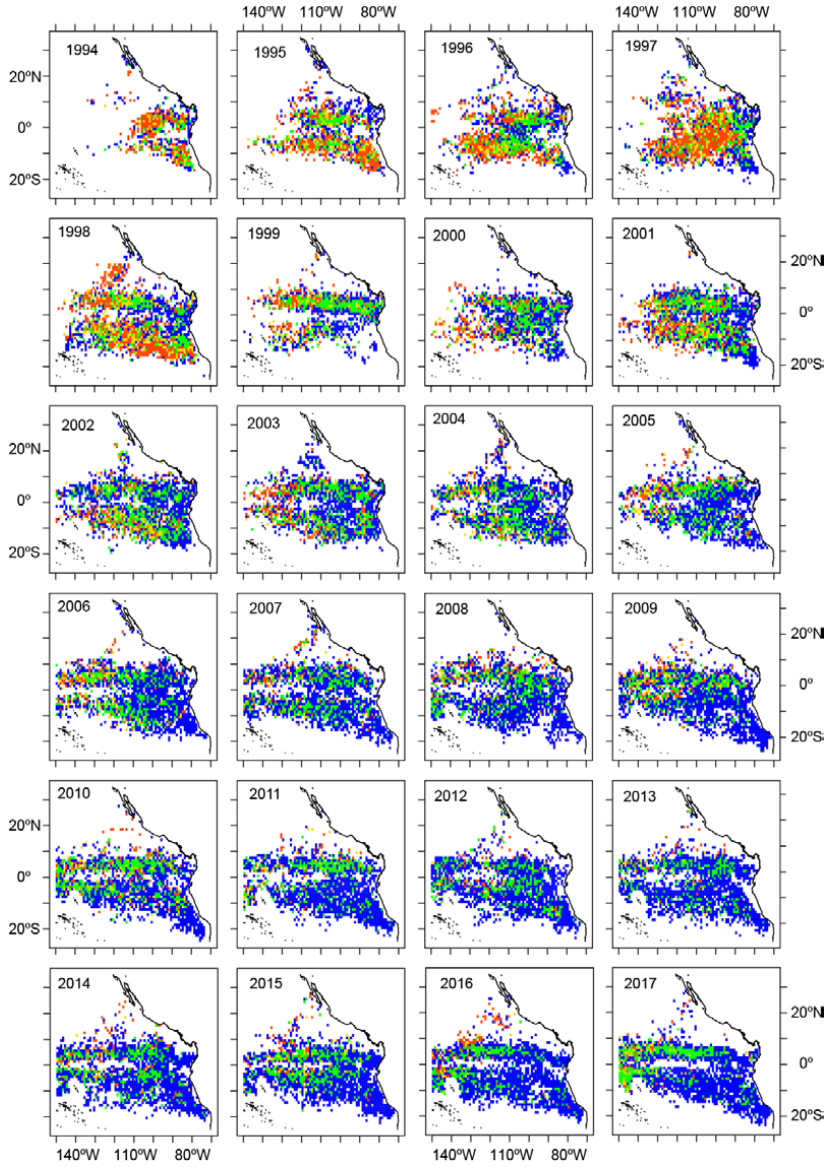


FIGURE 1c. Average bycatch per set in floating-object sets, in numbers, of large (> 150 cm total length) silky sharks, 1994-2017. Blue: 0 sharks per set, green: ≤ 1 shark per set; yellow: 1-2 sharks per set; red: > 2 sharks per set.

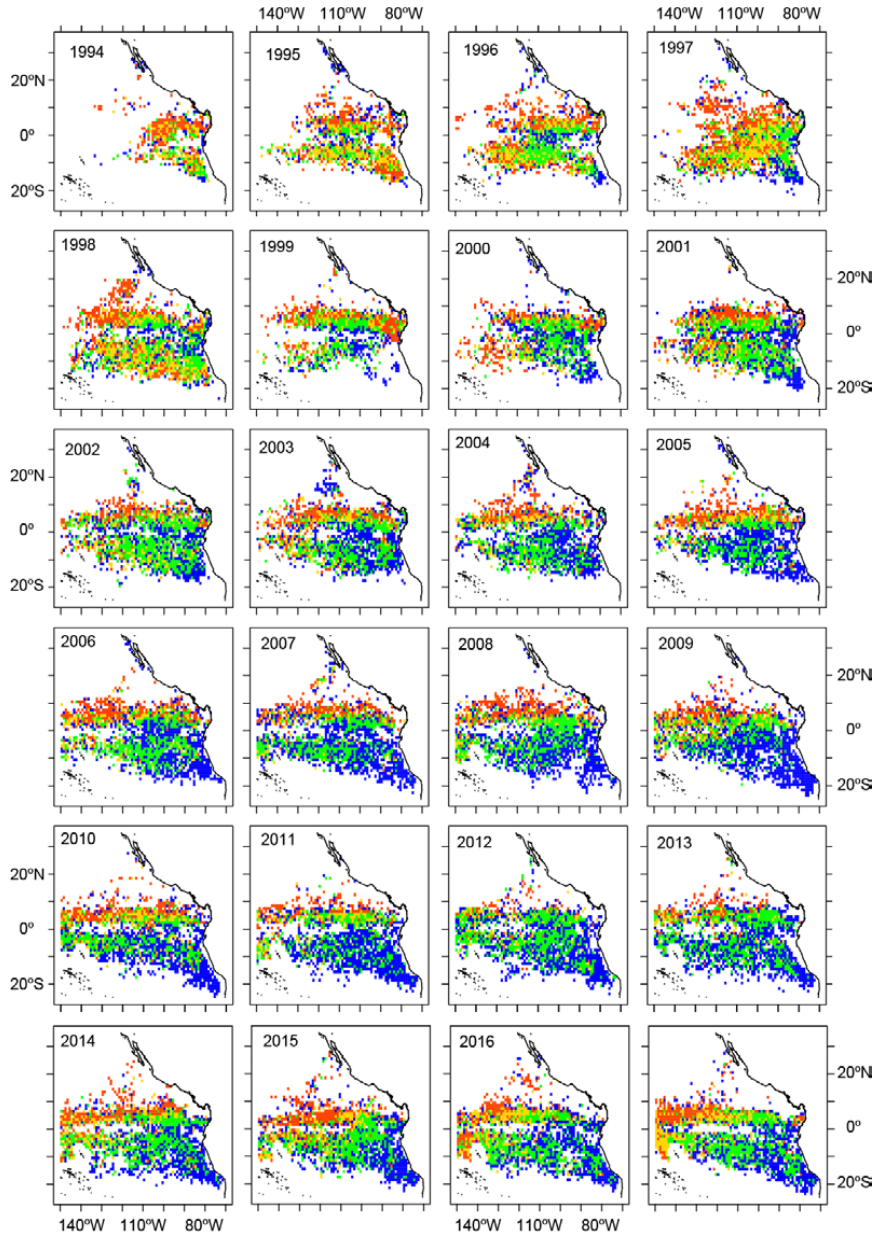
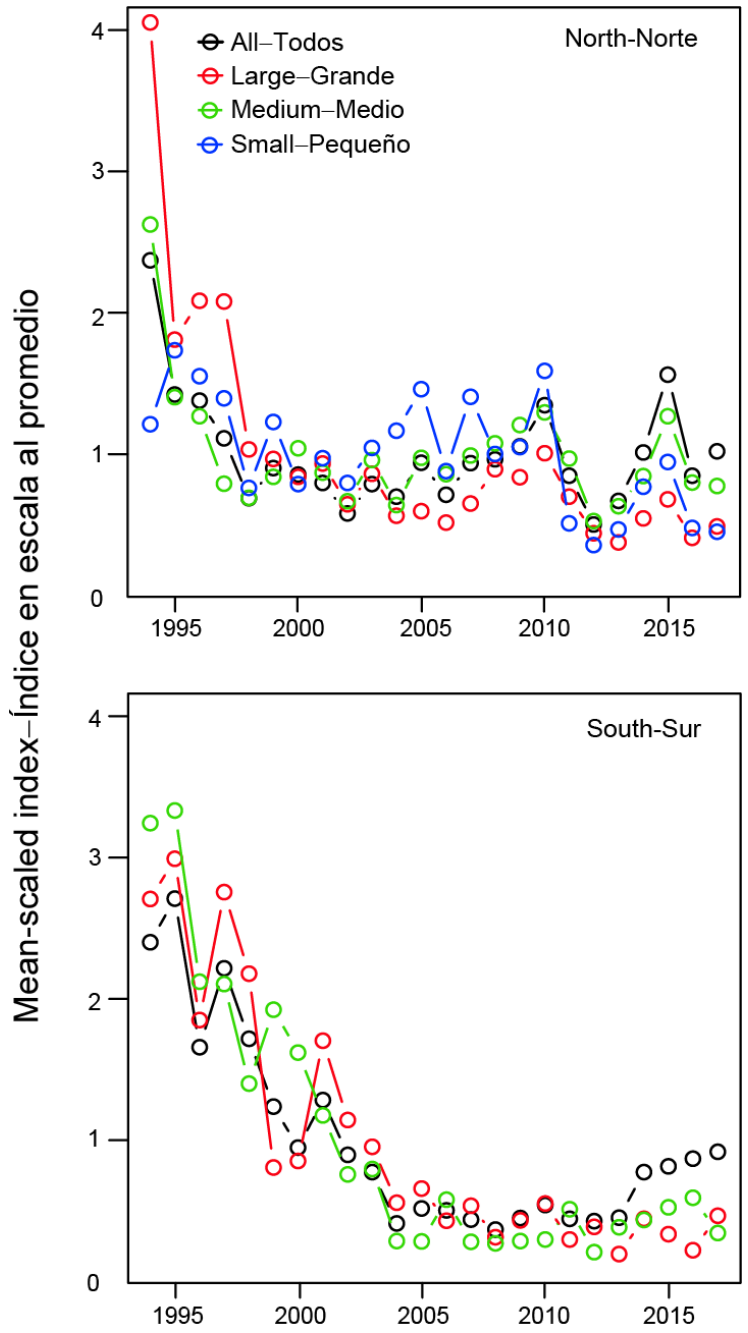


FIGURE 1d. Average bycatch per set in floating-object sets, in numbers, of all silky sharks, 1994-2017. Blue: 0 sharks per set, green: ≤2 shark per set; yellow: 2-5 sharks per set; red: >5 sharks per set.


All–Todos
Large–Grande
Medium–Medio
Small–Pequeño
North-Norte
South-Sur
Mean-scaled index–Índice en escala al promedio
0
1
2
3
4
1995
2000
2005
2010
2015