

Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission



Ecosystem Considerations in the eastern Pacific Ocean

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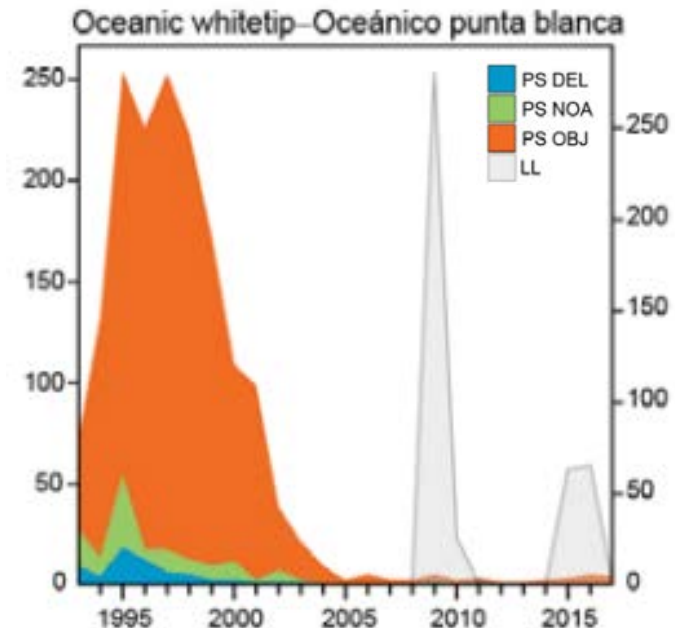
Outline

- New format for reporting bycatch time series by taxonomic group
- Reporting of physical environmental indicators as drivers of catch changes
- Reporting on a suite of ecological indicators to monitor changes in ecosystem structure and function



Catch reporting

- Previous IATTC *Ecosystem Considerations* papers reported only current year catch, mortality, interactions by taxonomic group
- This provides no context as to the relative magnitude of change
- Important to consider time series as an early warning system for potentially vulnerable species (e.g. Oceanic whitetip shark)

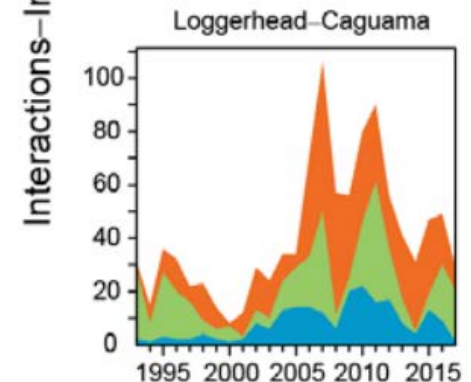
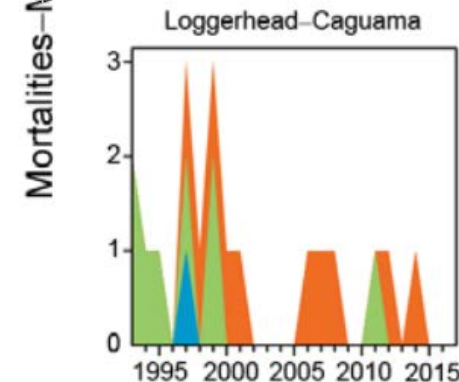
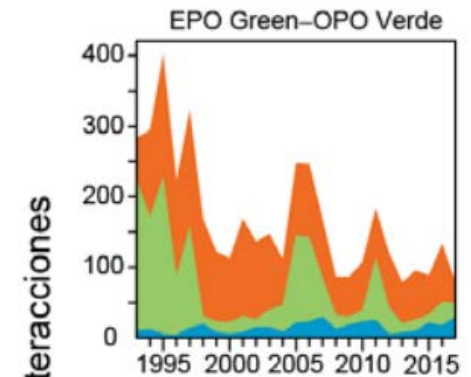
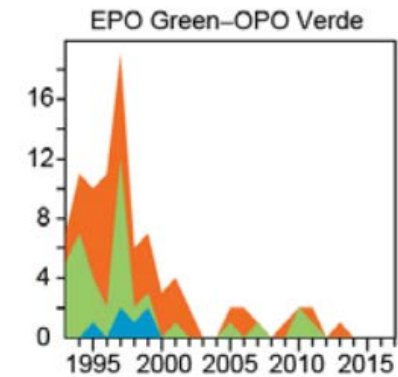
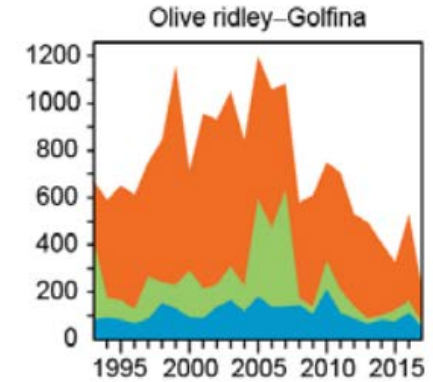
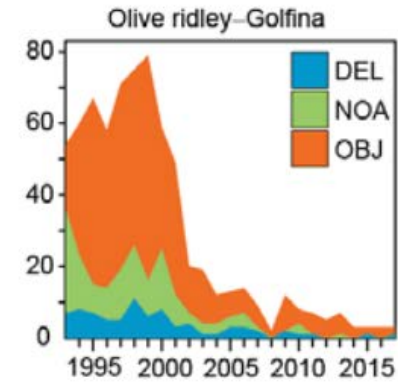


Sea turtles

- Sea turtles report now include mortalities and interactions since 1994, and current year
- No longline data, but will change with reporting of set-by-set data in 2018.

TABLE 2. Interactions and mortalities of sea turtles with large purse-seine vessels in the EPO, 2017 (preliminary data).

| | Interactions | | | | Mortalities | | | |
|-----------------------|--------------|-----|-----|-------|-------------|-----|-----|-------|
| | Set type | | | Total | Set type | | | Total |
| | OBJ | NOA | DEL | | OBJ | NOA | DEL | |
| Olive Ridley | 132 | 16 | 48 | 196 | 2 | - | 2 | 4 |
| Eastern Pacific green | 29 | 19 | 30 | 78 | - | - | - | - |
| Loggerhead | 9 | 19 | 1 | 29 | - | - | - | - |
| Hawksbill | 3 | 1 | 2 | 6 | - | - | - | - |
| Leatherback | 1 | - | 1 | 2 | - | - | - | - |
| Unidentified | 187 | 23 | 69 | 279 | - | - | - | - |

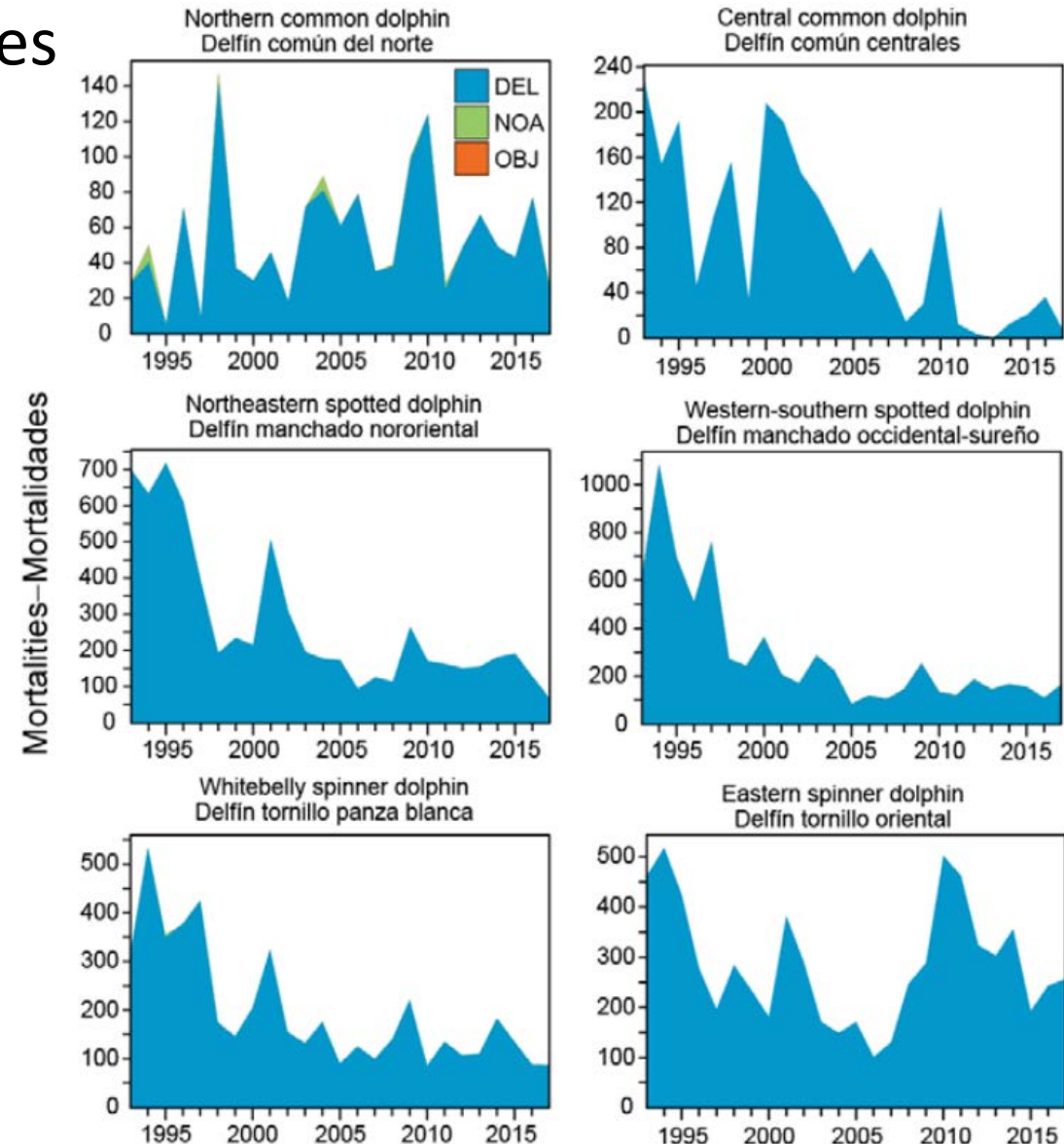


Marine mammals

- Marine mammals report includes mortalities by set type since 1994, and current year
- No longline data, but will include in 2019.

TABLE 1. Mortality of dolphins and other marine mammals caused by the fishery in the EPO, 2017 (preliminary data).

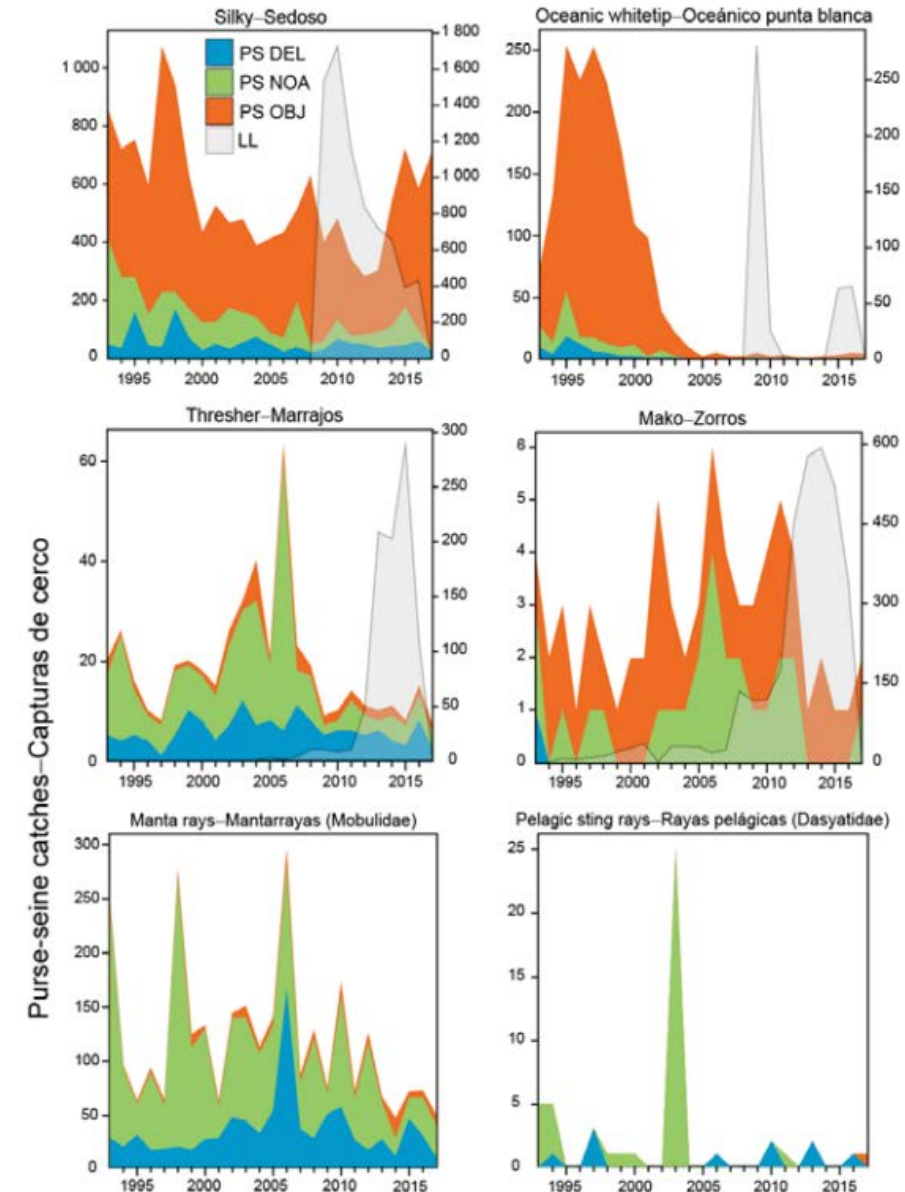
| Species and stock | Incidental mortality | |
|--------------------------|----------------------|-------------|
| | Numbers | t |
| Offshore spotted dolphin | | |
| Northeastern | 92 | 6.0 |
| Western-southern | 178 | 11.6 |
| Spinner dolphin | | |
| Eastern | 266 | 11.8 |
| Whitebelly | 98 | 5.9 |
| Common dolphin | | |
| Northern | 26 | 1.8 |
| Central | 9 | 0.6 |
| Southern | 16 | 1.1 |
| Other mammals* | 3 | 0.2 |
| Total | 688 | 39.1 |



Elasmobranchs and large fishes

- Report includes reported catch totals by set type and longline since 1994, and current year
- Longline data minimum, but will improve 2019

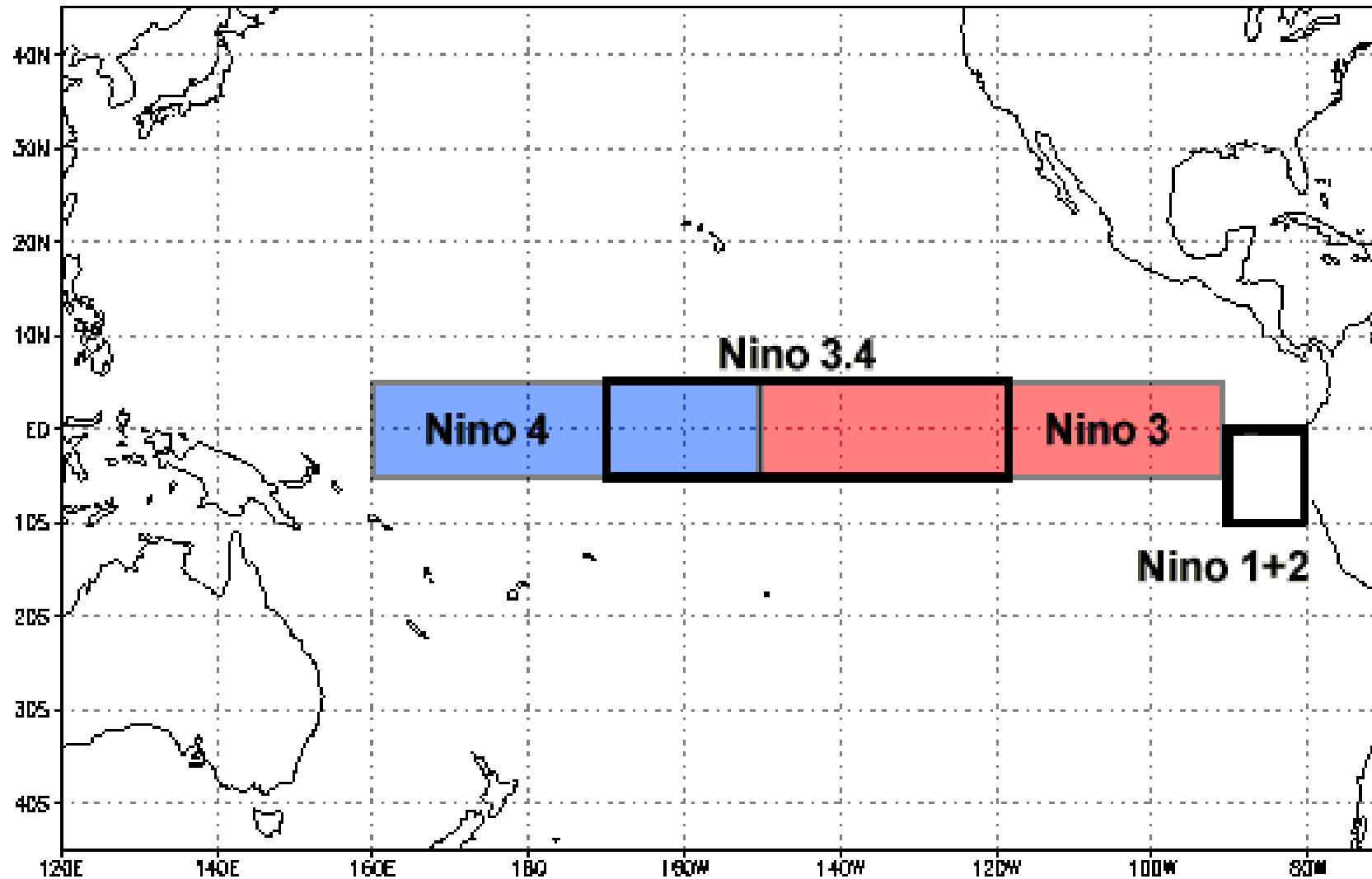
| | Purse-seine | | | | Long-line |
|---|-------------|-----|-----|-------|-----------|
| | OBJ | NOA | DEL | Total | |
| Silky shark (<i>Carcharhinus falciformis</i>) | 678 | 7 | 26 | 711 | 452 |
| Oceanic whitetip shark (<i>C. longimanus</i>) | 4 | <1 | <1 | 5 | 65 |
| Hammerhead sharks (<i>Sphyrna</i> spp.) | 21 | 6 | 2 | 28 | 34 |
| Thresher sharks (<i>Alopias</i> spp.) | 2 | 3 | 2 | 7 | 107 |
| Mako sharks (<i>Isurus</i> spp.) | <1 | <1 | 0 | 2 | 340 |
| Other sharks | 89 | 3 | 3 | 95 | 841 |
| Blue sharks (<i>Prionace glauca</i>) | - | - | - | - | 1,816 |
| Manta rays (Mobulidae) | 10 | 30 | 9 | 49 | - |
| Pelagic sting rays (Dasyatidae) | <1 | <1 | <1 | <1 | - |



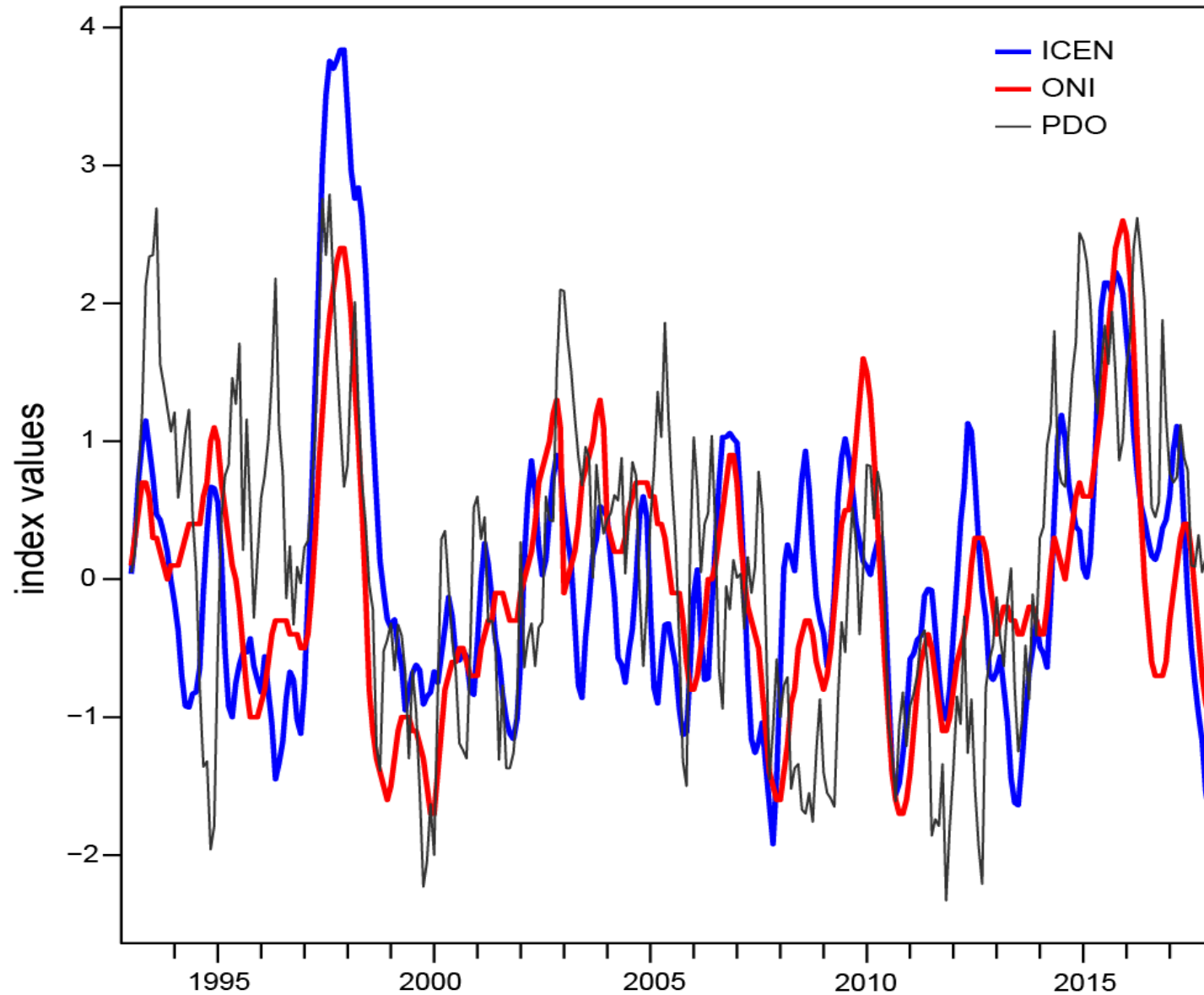
Physical Environment

- Oceanographic indices to describe SST anomalies
 - Shorter-term, interannual events (e.g. ENSO events)
 - Longer-term, interdecadal events (e.g. Pacific Decadal Oscillation (PDO))
- Primary indicators of warm El Niño and cool La Niña conditions
 - Oceanic Niño Index (ONI), Niño 3.4 region
 - Índice Costero El Niño (ICEN), Niño 1+2 region
- PDO tracks large-scale interdecadal patterns of environmental and biotic changes
 - Primarily in NPO, secondary signatures in tropical Pacific

Oceanographic indices: Niño regions

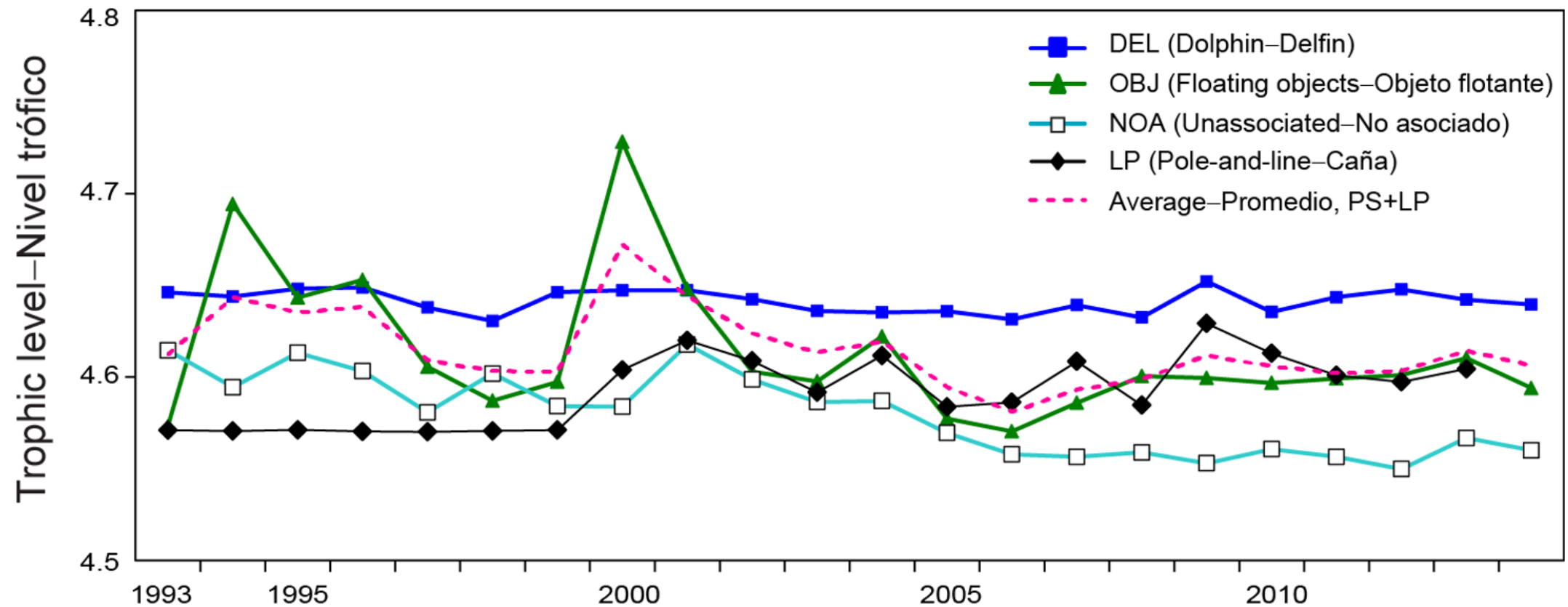


Oceanographic indices: Niño regions



Ecological indicators

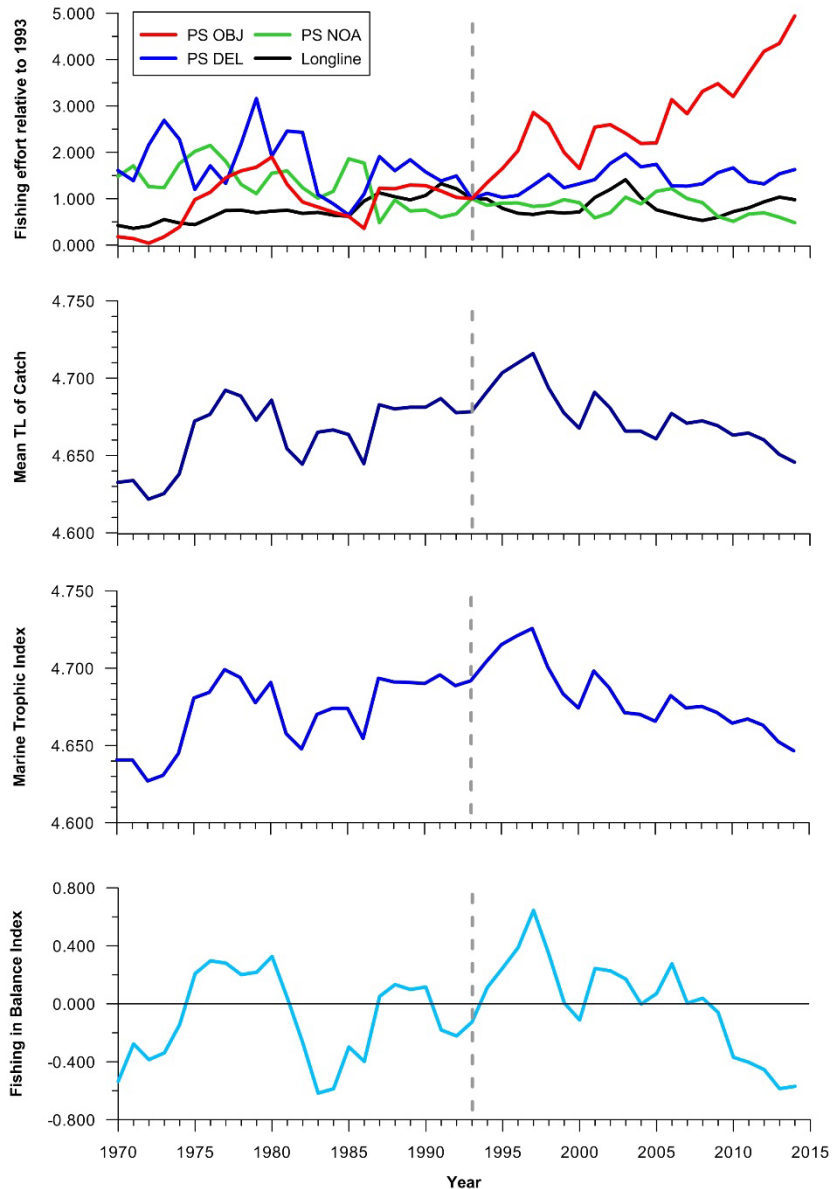
- Previously IATTC has reported only mean trophic level of catches (MTLc)



Ecological indicators

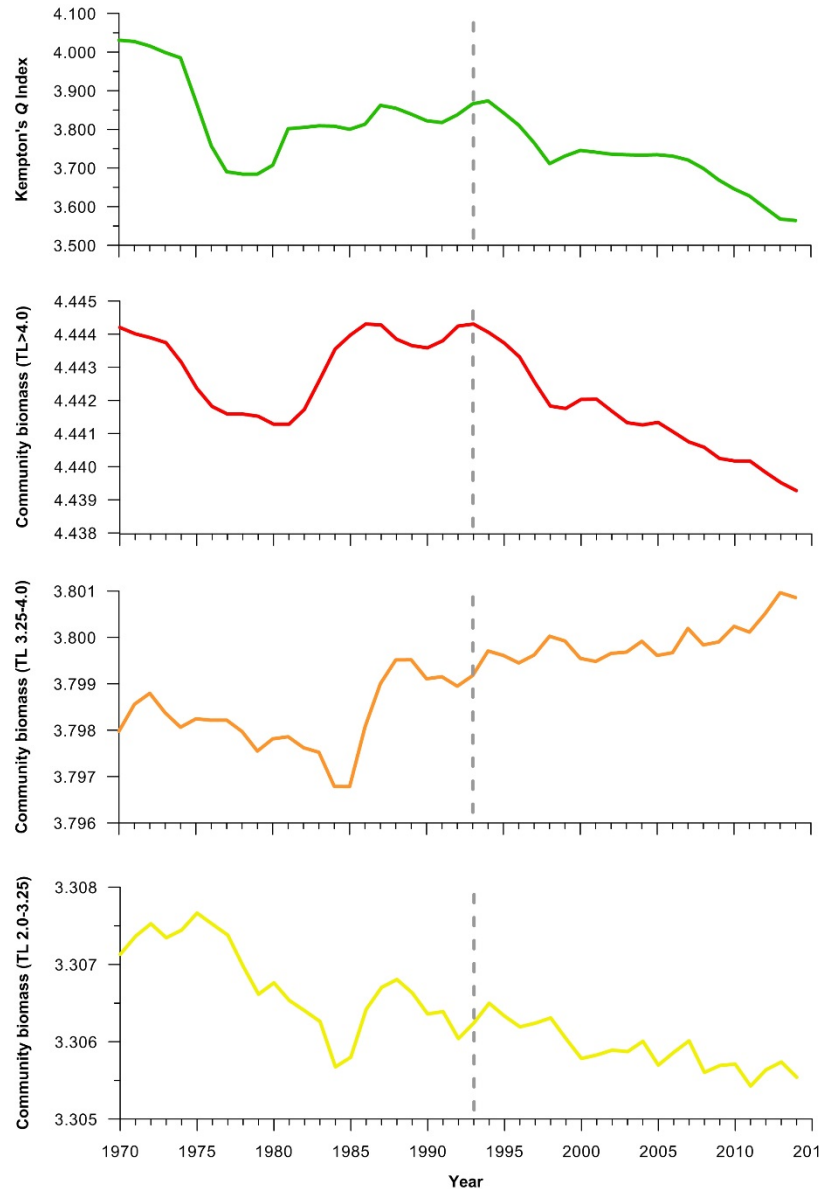
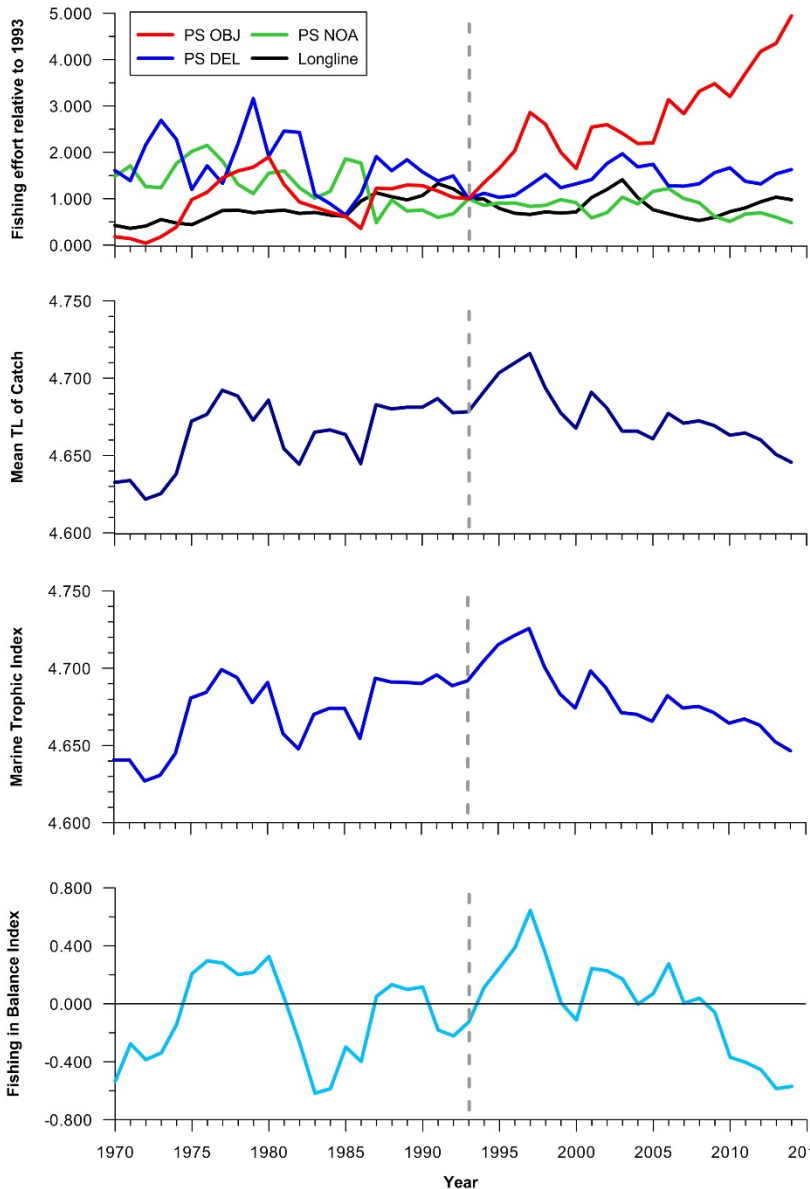
- Previously IATTC has reported only mean trophic level of catches (MTLc)
- Complex marine ecosystems require several indicators to describe changes to their structure and function
- Updated Ecopath model of Olson & Watters (2003) with data 1970-2014
- Fishing-based indicators
 - MTLc - >0.1 TL per decade is a significant change
 - Marine Trophic Index (MTI) – MTLc of TL > 3.25
 - Fishing in Balance Index (FIB) – is the MTI changing as expected given available productivity?
- Community-based indicators
 - Kempton's Q index – relative biomass composition of functional groups in the ecosystem
 - Community biomass of low (TL 2.0-3.25), intermediate (TL 3.25-4.0), high (TL > 4.0) trophic levels can provide indicators of trophic cascades.

Fishing-based indicators



- Nominal fishing effort scaled from 1993
 - Start of the artificial FAD fishery
- MTLc and MTI declined by 0.06 for 1997-2014
- FIB below zero since 2007
 - Catch lower than expected given available productivity

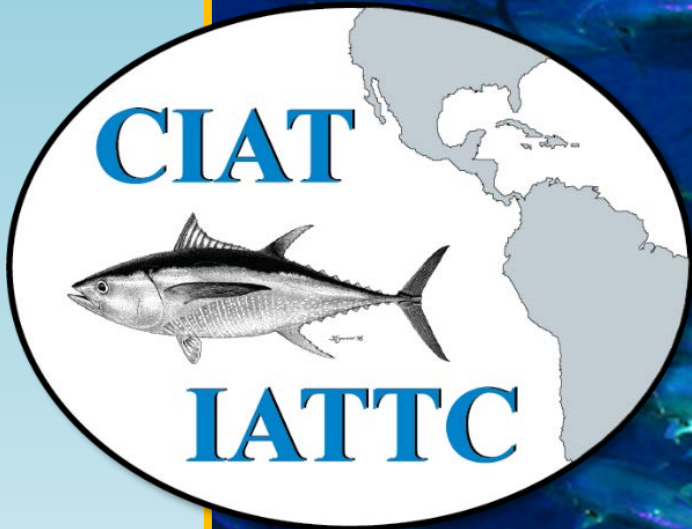
Community-based indicators



- Changing “richness”
- Alternating biomass trends by TL
- Minor trophic cascade
- Not detrimental changes, but certainly requires monitoring

Summary

- Ecosystem Considerations report has been greatly condensed to summarize current catches of key taxonomic groups.
- Time series of catches now included to place current year's data in context and provides greater transparency of catch trends.
- Report expanded to include environmental indicators to assist in explanation changes in catch of target and non-target species.
- Inclusion of ecological indicators (fishing- and community-based) to monitor changes in the structure and function of EPO ecosystem.
- Together, these provide greater transparency in our goal to consider the ecological impacts of EPO fisheries under a changing climate.



Questions?

