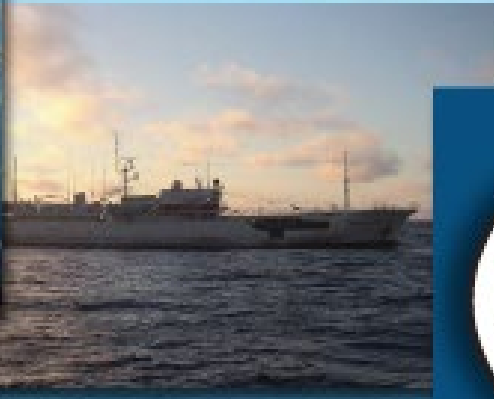


Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission



Ecosystem considerations (SAC-10-14)

Leanne Fuller and Shane Griffiths

Outline

- Review of IATTC ecosystem mandates, EAF and strategic goals for ecosystem group
- Reporting of bycatch time series by taxonomic group
- Reporting of physical environmental indicators as drivers of changes in catch
- Ecological Risk Assessments (ERA)
- Trophic interactions
- Ecosystem indicators (**SAC-10-15**)
- Future research



IATTC mandates

- Under the Antigua convention, the IATTC is responsible for ensuring the “*long-term conservation and sustainable use of the stocks of tunas and tuna-like species and other associated species of fish taken by vessels fishing for tunas and tuna-like species in the eastern Pacific Ocean (EPO)*”
- Article IV. “*Where the status of target stocks or non-target or associated or dependent species is of concern, the members of the Commission shall subject such stocks and species to enhanced monitoring in order to review their status and the efficacy of conservation and management measures. They shall revise those measures regularly in the light of new scientific information available.*”
- Article VII. “*adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened*”

Ecosystem Approach to Fisheries (EAF)

- Recognizes broader impacts of fisheries on the ecosystem
- IATTC proactive in pursuing EAF and ecological sustainability
 - Dolphin mortality limits (DMLs)
 - Monitoring catches of incidentally-caught species
 - Resolutions pertaining to such species
(e.g. silky and oceanic whitetip sharks, mobulid rays)
 - Supporting research on trophic ecology
 - Development of ecosystem model (Olson and Watters)
 - Updating ecological indicators (**SAC-10-15**)
 - Exploring ecological risk assessments (ERAs) through PSA and EASI-Fish

Strategic projects of the ecosystem group

- Goal A: Database maintenance, preservation, and access
 - Develop life-history database to parameterize ERAs and ecosystem models (**Project A.3.b**)
- Goal L: Evaluate the ecological impacts of tuna fisheries
 - Produce habitat models to determine species overlap with fisheries (**Project L.1.a**)
 - Develop spatially-explicit ERAs to assess cumulative impacts of fisheries (**Project L.1.b**)
- Goal O: Improve our understanding of the EPO ecosystem
 - Conduct trophic studies to obtain parameter values for ecosystem models (**Project O.1.b**)
 - Methods review to determine prey consumption rates, gastric evacuation and daily ration (**Project O.1.c**)
 - Update ecological indicators for the ETP using Ecopath model (**Project O.2.b**)

Reporting of bycatch species

- Followed reporting format presented last year in IATTC's "*Ecosystem Considerations*"
- Provide transparency and context to the relative magnitude of change
- Inclusion of minimum catch estimates by longline vessels
 - Obtained using "Task I" data of annual removals
 - Iterative process to improve LL data reporting
(see SAC-08-07b, SAC-08-07e, SAC-09 INF A, SAC-10 INF A, SAC-10 INF-H)
- Important to consider time series as a early warning system for potentially vulnerable species

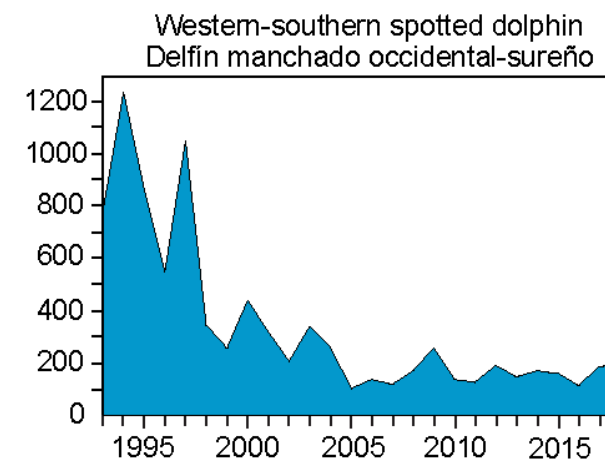
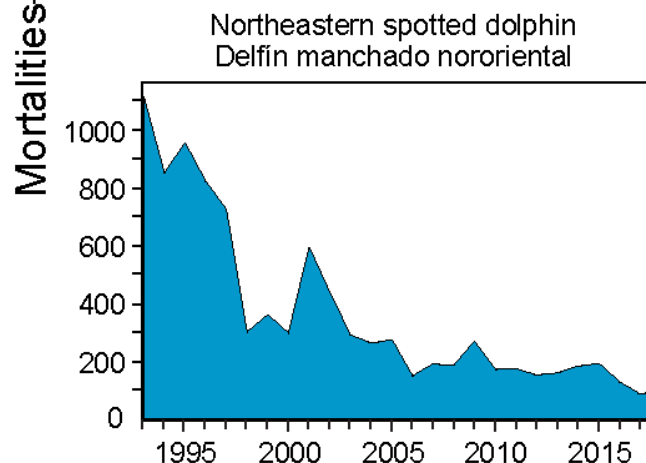
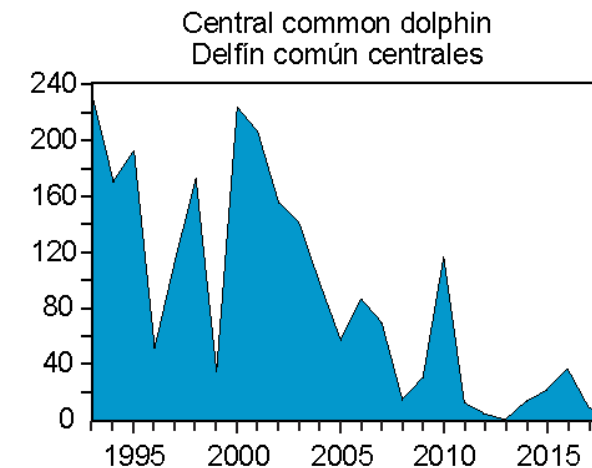
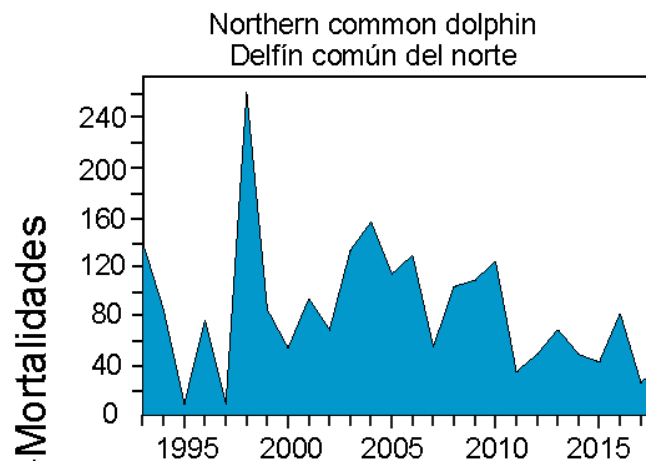
Reporting of bycatch species: Marine mammals

- Includes estimates of incidental mortalities from the purse-seine fishery
 - Catches in current year
 - Time-series: 1993-2018

TABLE 1. Incidental mortality of dolphins and other marine mammals by the purse-seine fishery in the EPO, 2018

Species and stock	Incidental mortality	
	Numbers	t
Offshore spotted dolphin		
Northeastern	99	6.5
Western-southern	197	12.9
Spinner dolphin		
Eastern	252	11.2
Whitebelly	205	12.4
Common dolphin		
Northern	41	2.9
Central	1	0.1
Southern	18	1.3
Other mammals*	6	0.4
Total	819	47.5

*"Other mammals" includes the following species and stocks, whose observed mortalities were as follows: Central American spinner dolphin 3 (0.1 t), bottlenose dolphin (*Tursiops truncatus*) 2 (0.2 t), unidentified dolphins 1 (0.1 t)

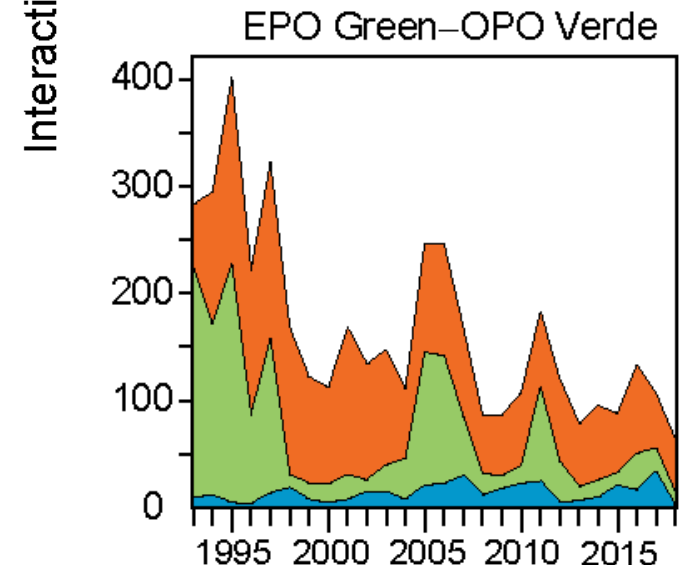
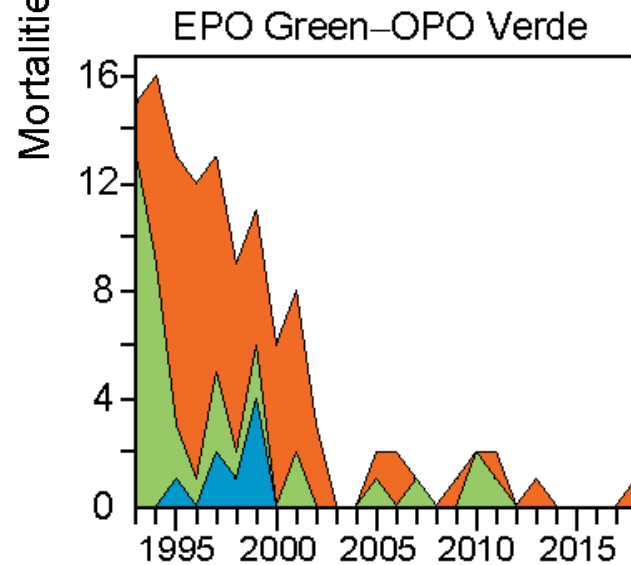
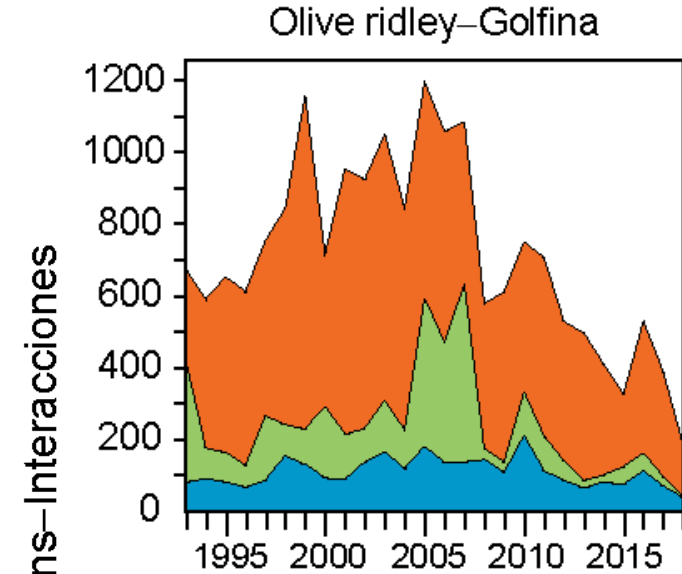
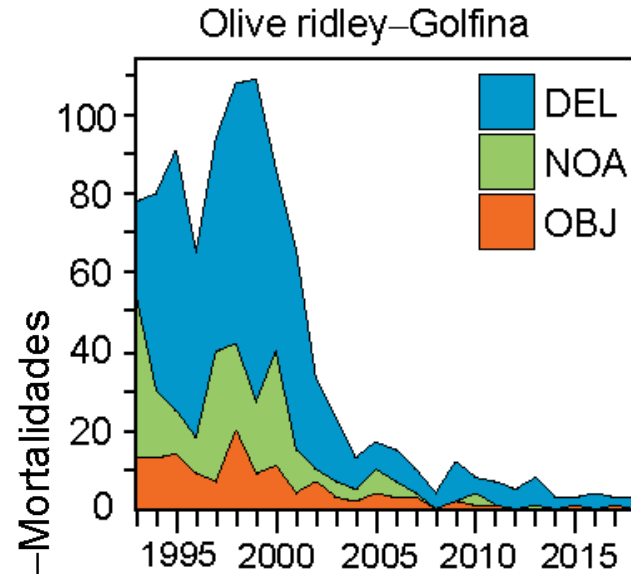


Reporting of bycatch species: Sea turtles

- Includes mortalities and interactions from the purse-seine fishery
 - Current year: 2018
 - Time-series: 1993-2018

TABLE 2. Interactions and mortalities of sea turtles with purse-seine vessels in the EPO, 2018

Species	Interactions				Mortalities			
	Set Type				Set Type			
	OBJ	NOA	DEL	Total	OBJ	NOA	DEL	Total
Olive Ridley	141	2	39	182	3	-	-	3
Eastern Pacific Green	49	12	2	63	1	-	-	1
Loggerhead	11	4	3	18	-	-	-	-
Hawksbill	5	2	-	7	-	-	-	-
Leatherback	3	1	1	5	-	-	-	-
Unidentified	128	21	164	313	-	-	-	-
Total	337	42	209	588	4	-	-	4

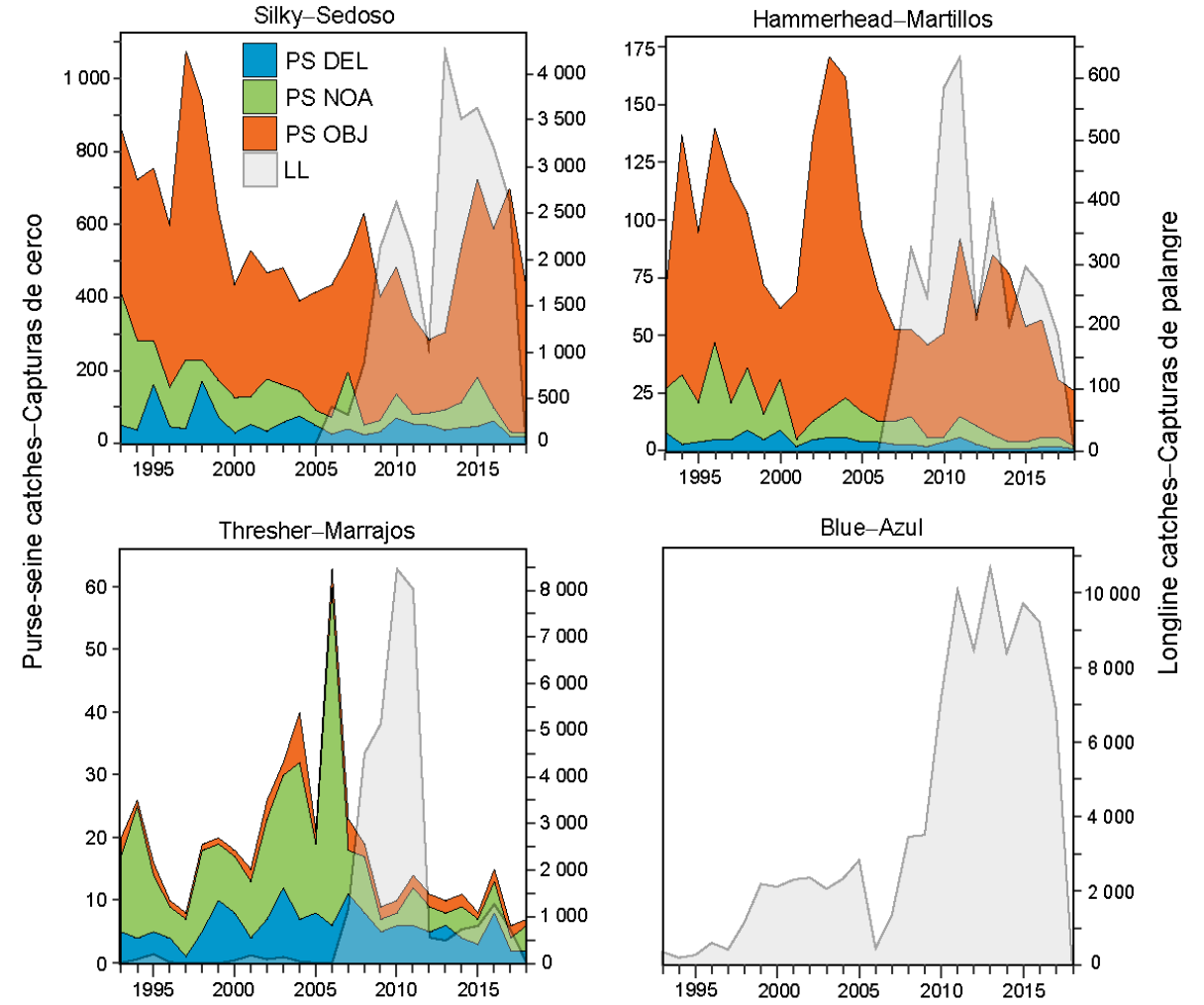


Reporting of bycatch species: Elasmobranchs and large fishes

- Includes mortalities from the purse-seine fishery by set type and minimal estimates by longline
- Catches in current year: 2018
- Time-series: 1993-2018

TABLE 3. Catches, in tons, of sharks and rays in the EPO by large purse-seine vessels, by set type, 2018, and by longline vessels, 2017. *Longline sample data should be considered minimum catch estimates due to incomplete reporting (see section 2.1)

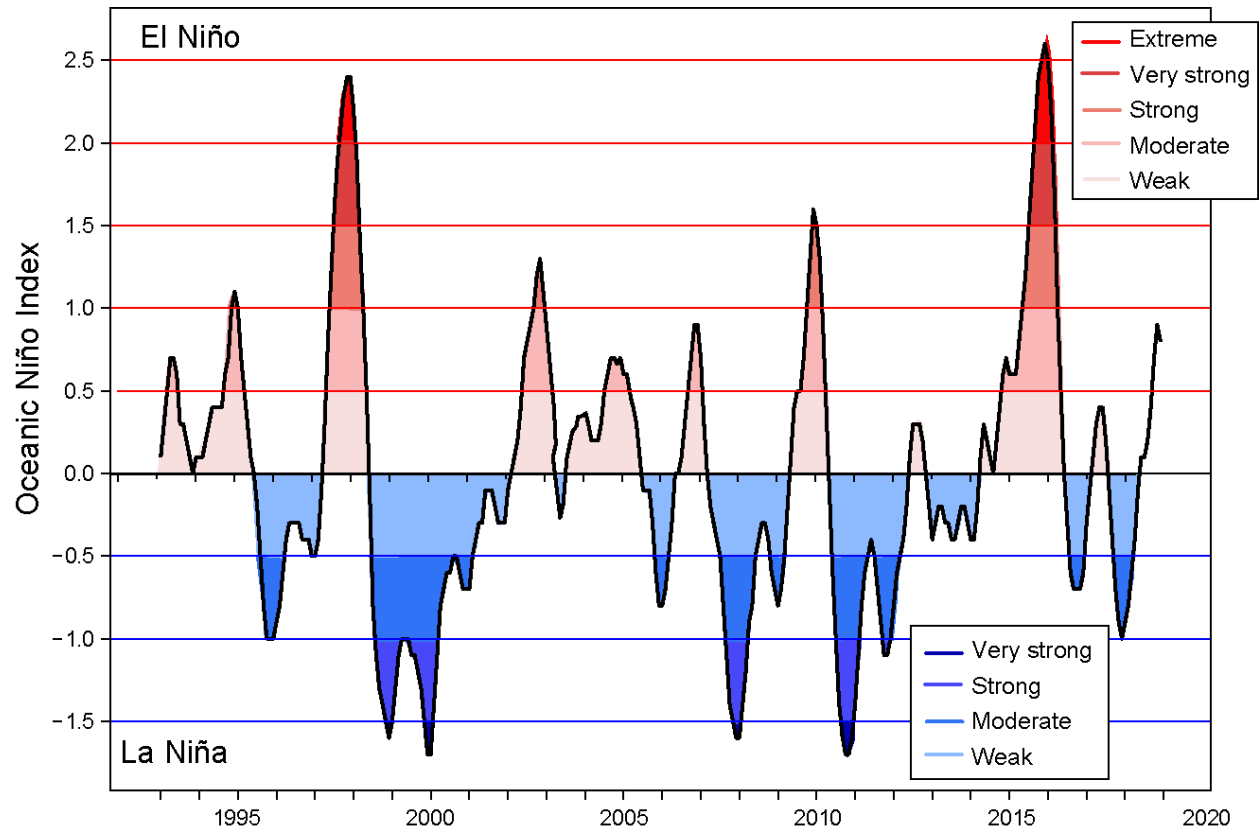
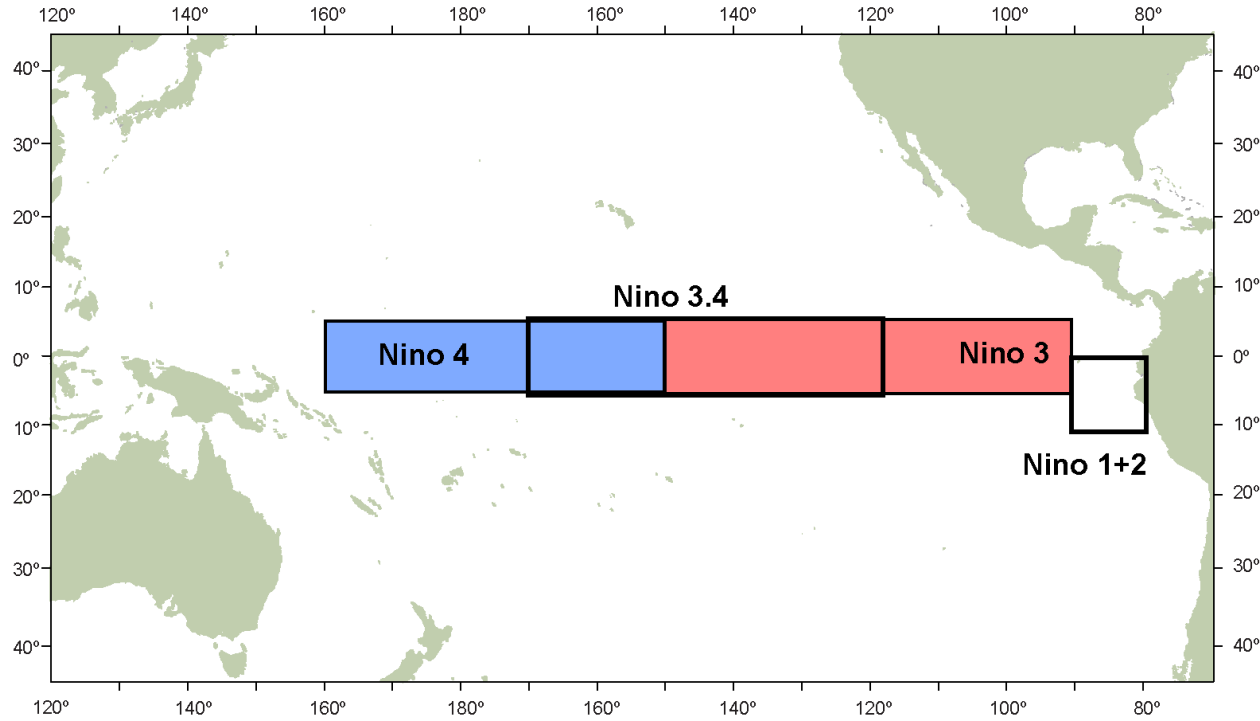
Species	Purse seine				Longline*
	OBJ	NOA	DEL	Total	
Silky shark (<i>Carcharhinus falciformis</i>)	400	11	20	431	2626
Oceanic whitetip shark (<i>C. longimanus</i>)	3	-	<1	3	202
Hammerhead sharks (<i>Sphyrna</i> spp.)	24	<1	<1	26	186
Thresher sharks (<i>Alopias</i> spp.)	<1	4	2	7	724
Mako sharks (<i>Isurus</i> spp.)	1	<1	<1	2	1606
Other sharks	31	4	1	36	1,430
Blue sharks (<i>Prionace glauca</i>)	-	-	-	-	6,908
Manta rays (Mobulidae)	16	20	13	49	-
Pelagic sting rays (Dasyatidae)	<1	<1	<1	1	-



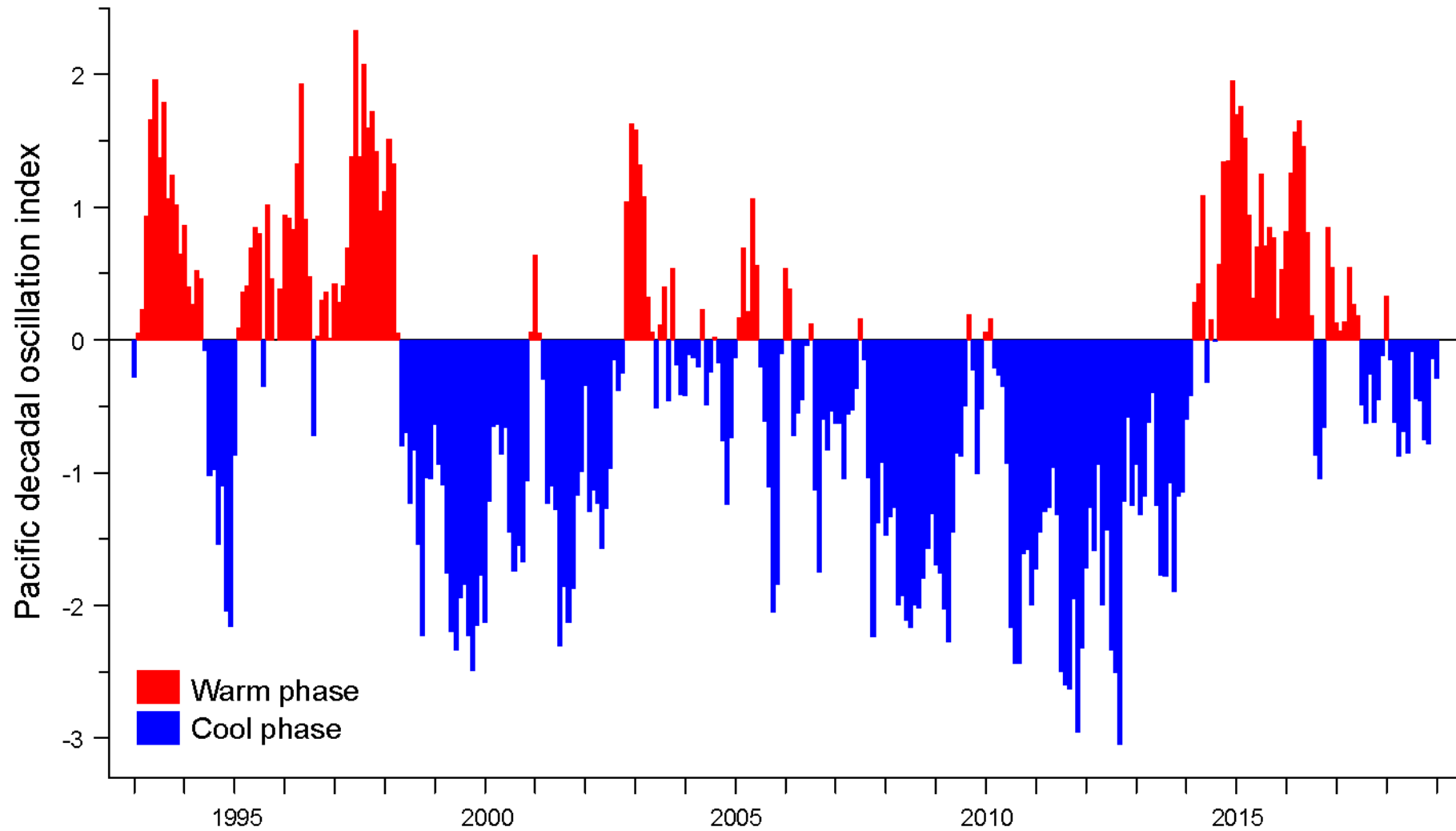
Physical Environment

- 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 indicator of warm El Niño and cool La Niña conditions
 - Oceanic Niño Index (ONI), Niño 3.4 region
- PDO tracks large-scale interdecadal patterns of environmental and biotic changes
 - Primarily in NPO, secondary signatures in tropical Pacific

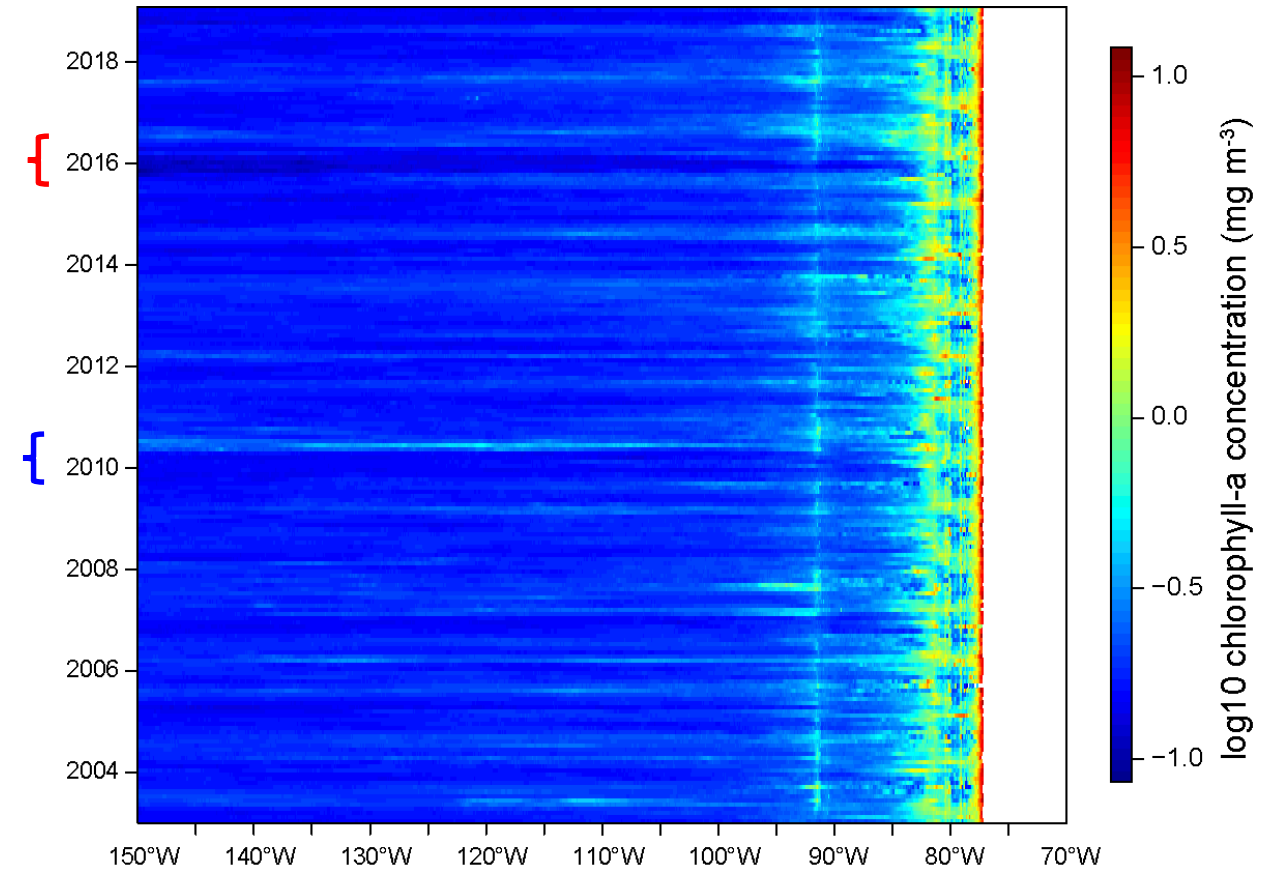
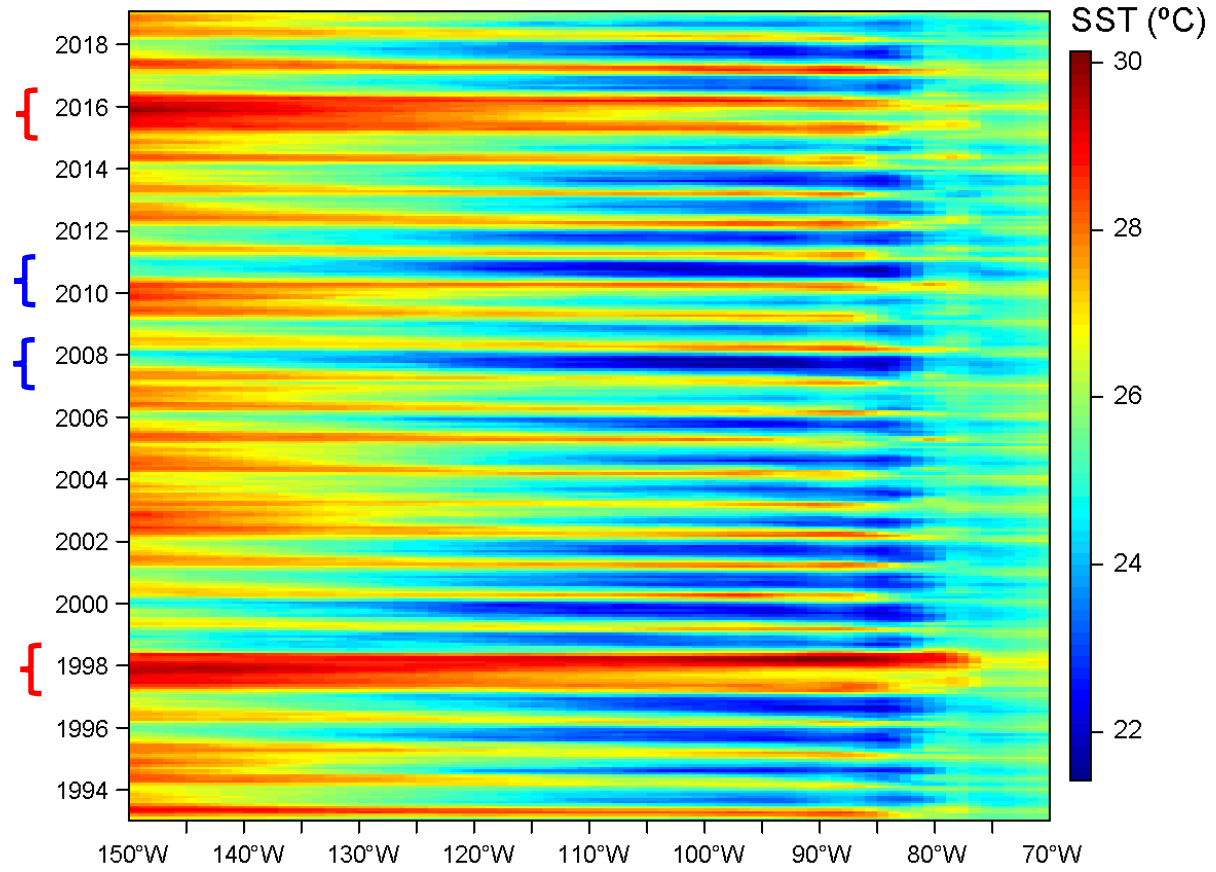
Physical Environment: Oceanic Niño Index (ONI)



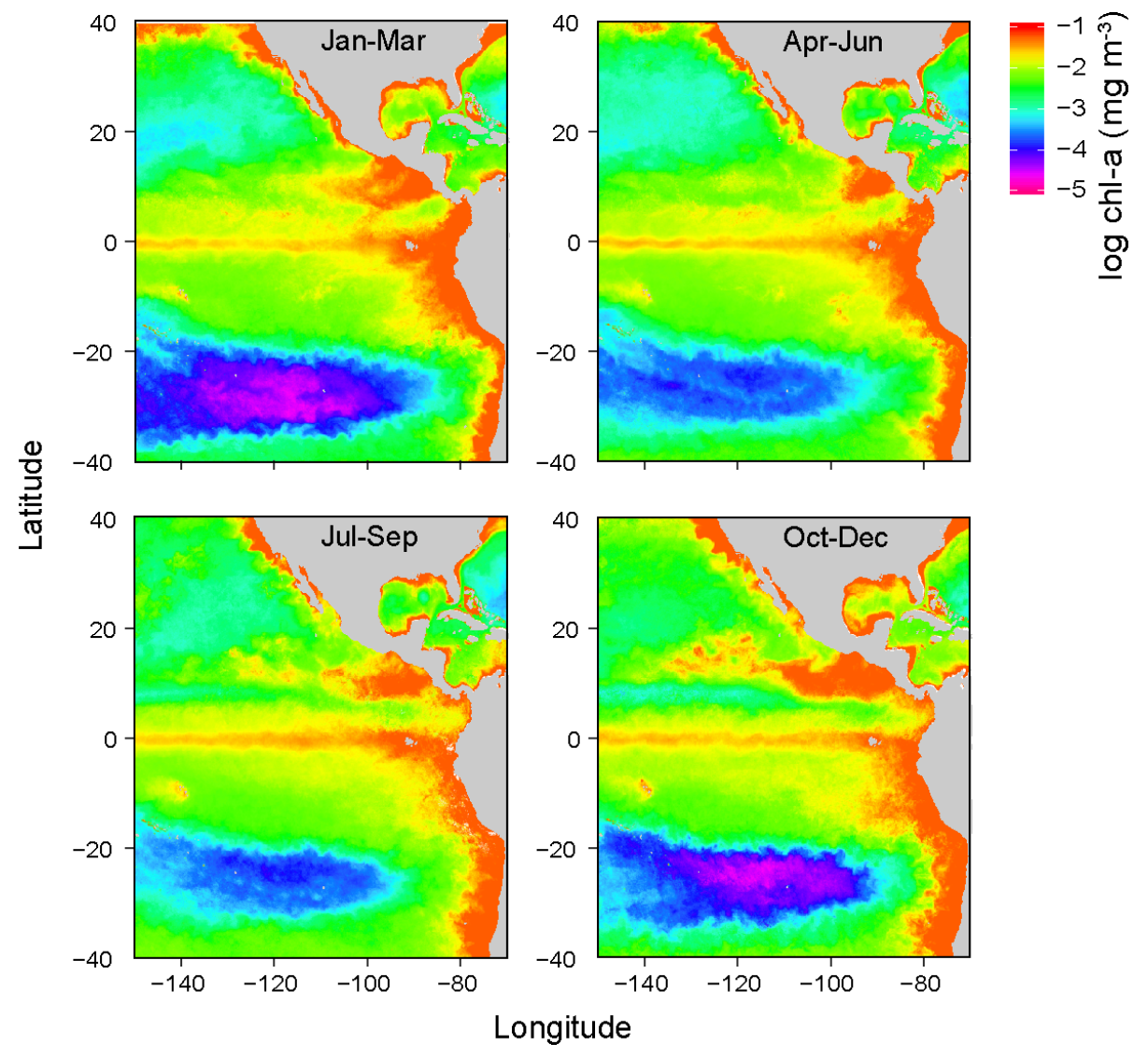
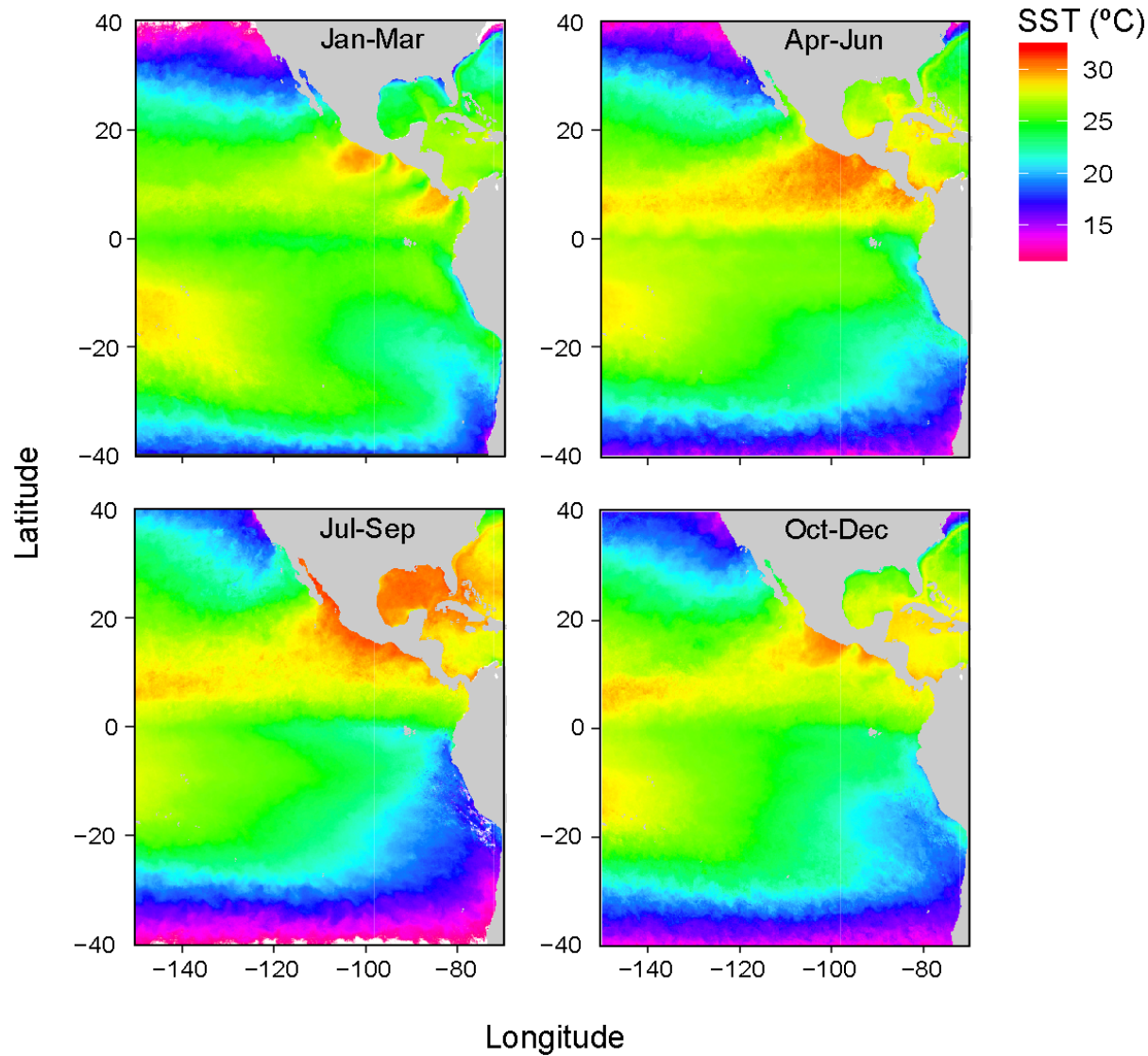
Physical Environment: Pacific Decadal Oscillation Index (PDO)



Physical Environment: SST and chlorophyll time series



Physical Environment: Quarterly SST and chlorophyll concentration

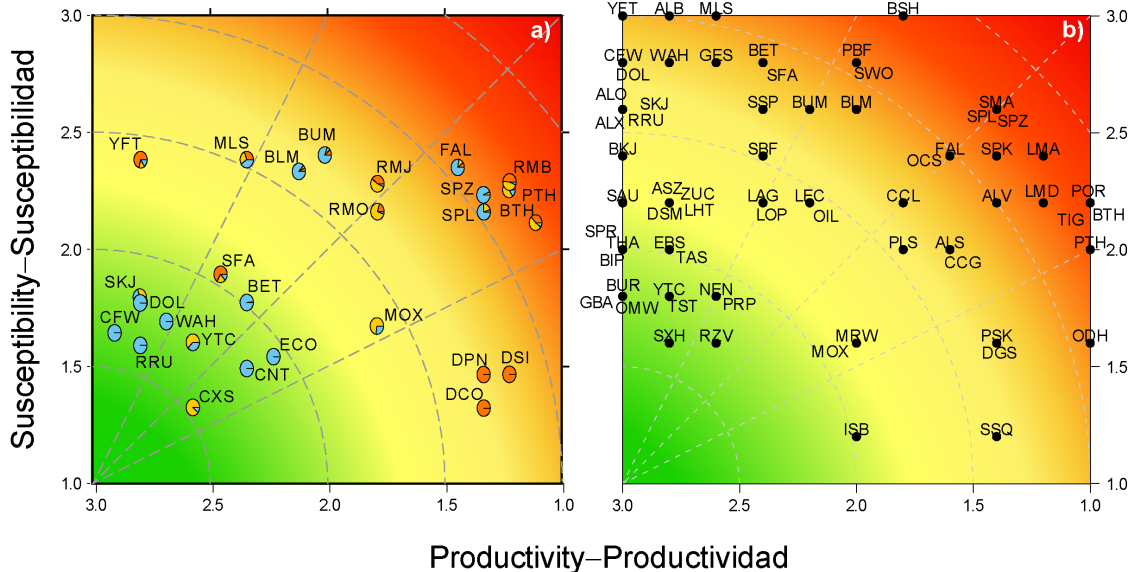


Ecological Risk Assessment

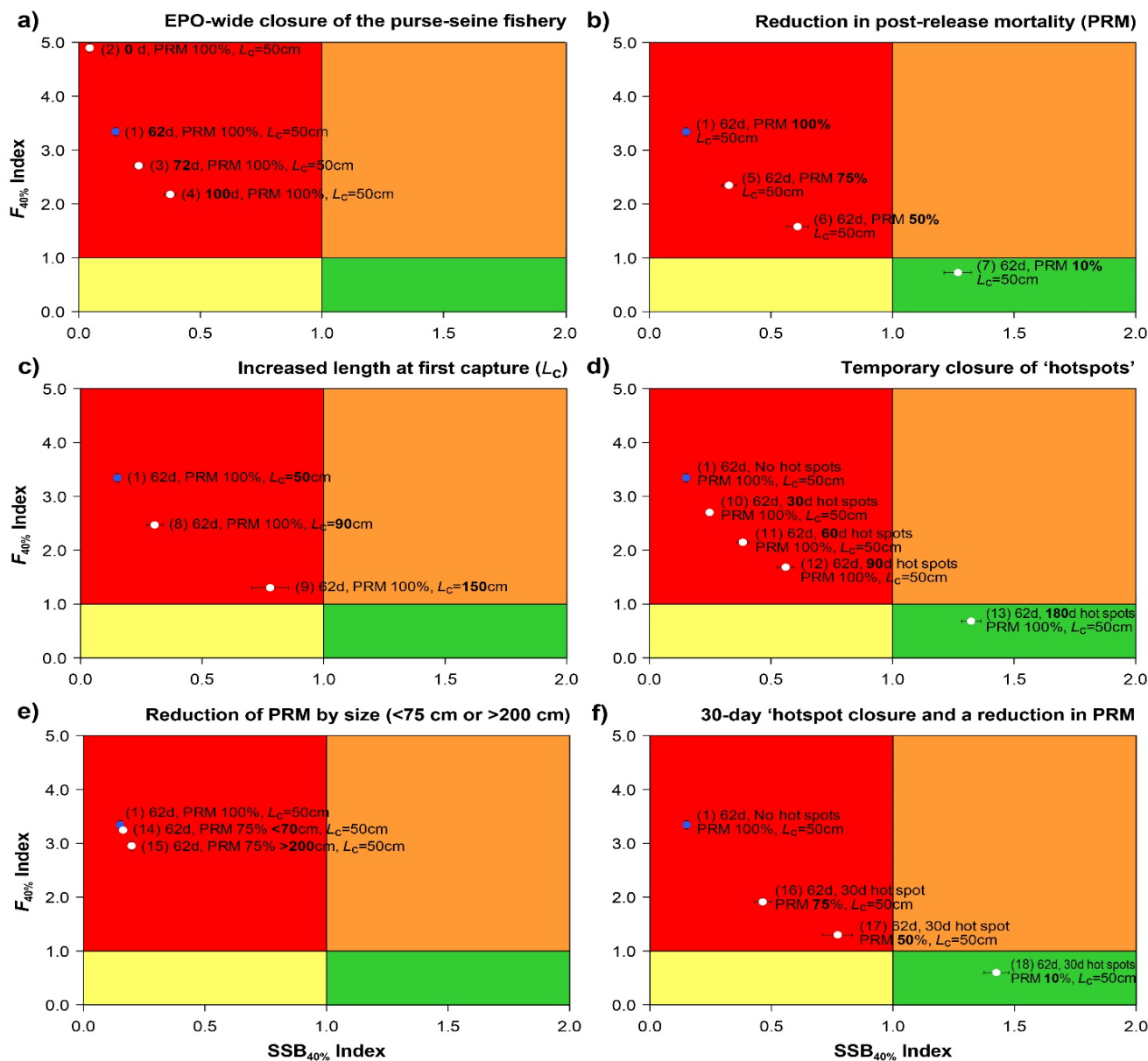
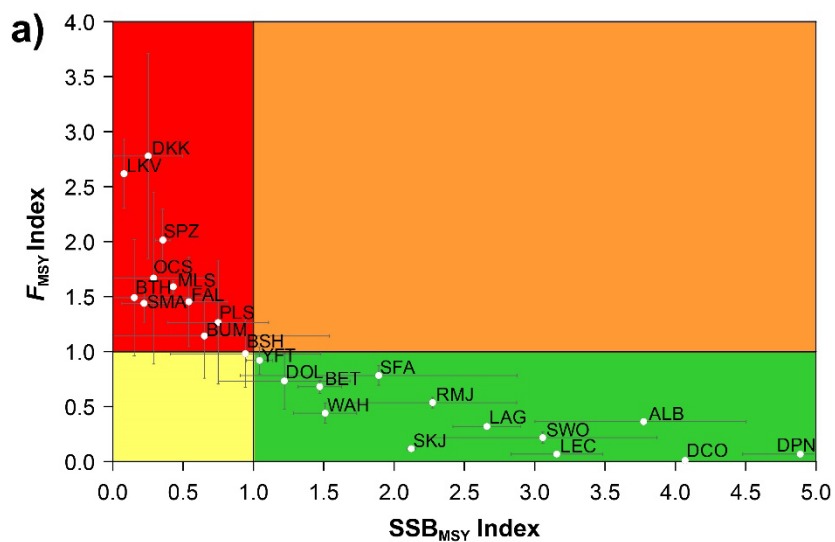
PSA:

limitations (e.g. no reference points, no cumulative impacts)

EASI-Fish: 'what if' scenarios (BYC-09-01)

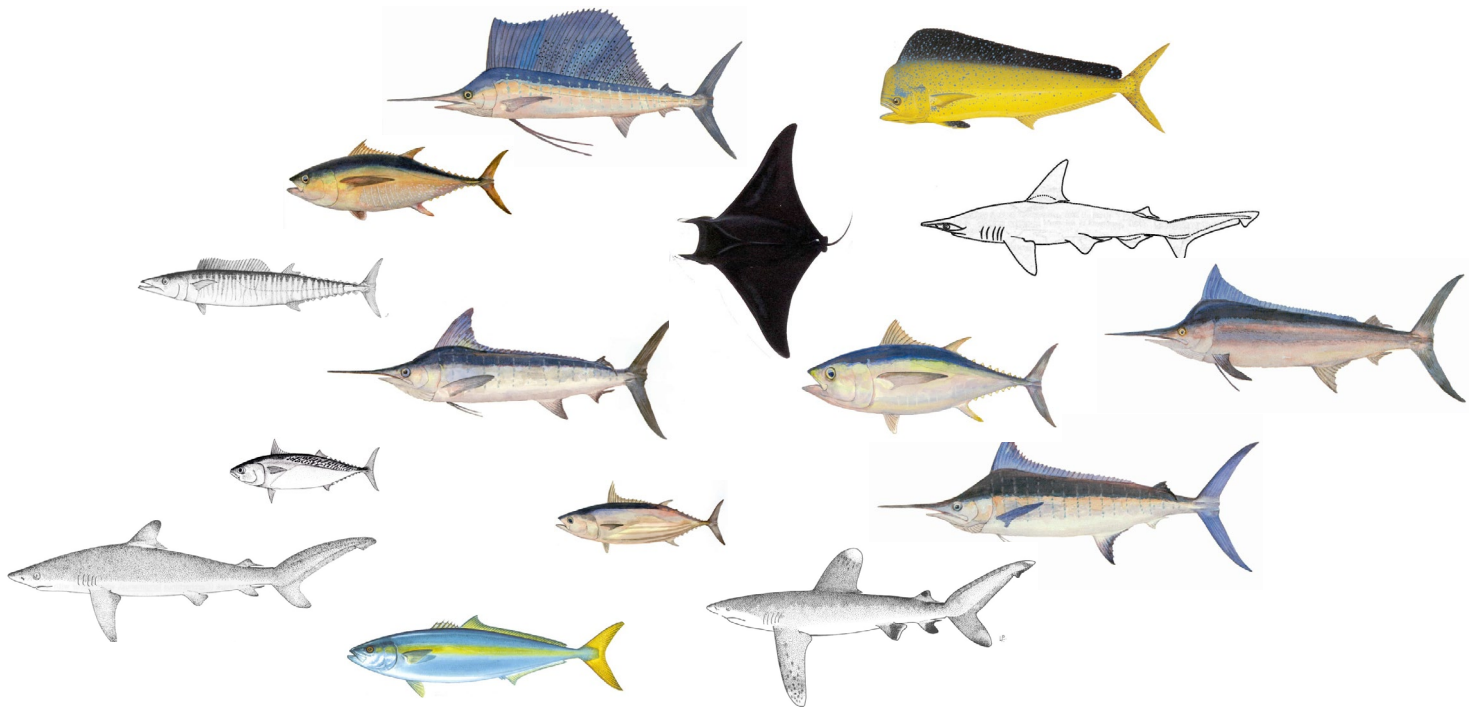
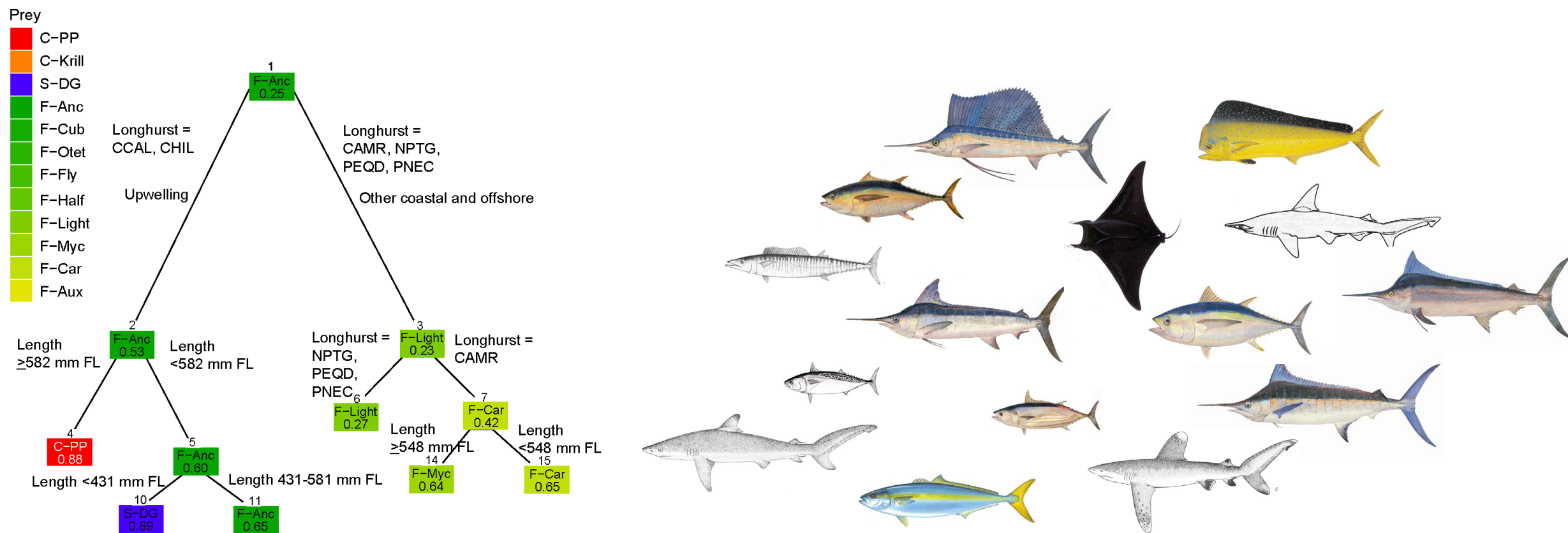


EASI-Fish: addresses PSA limitations

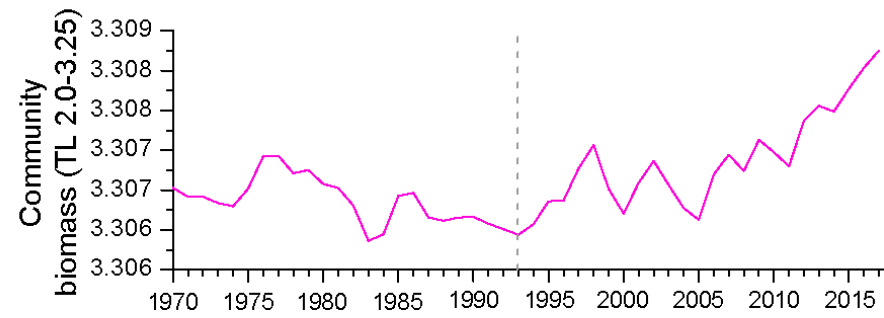
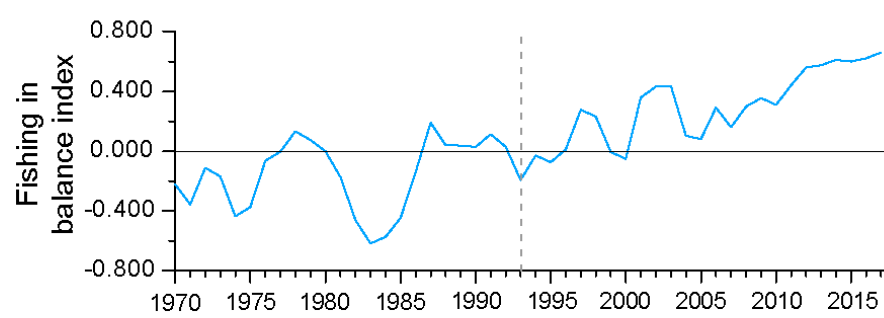
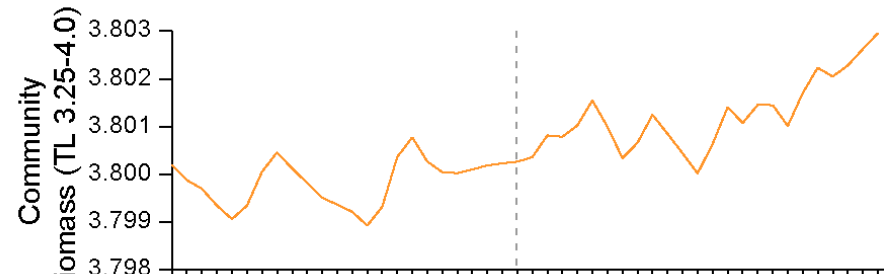
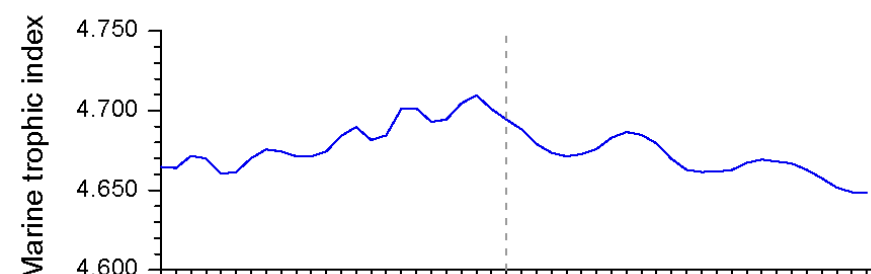
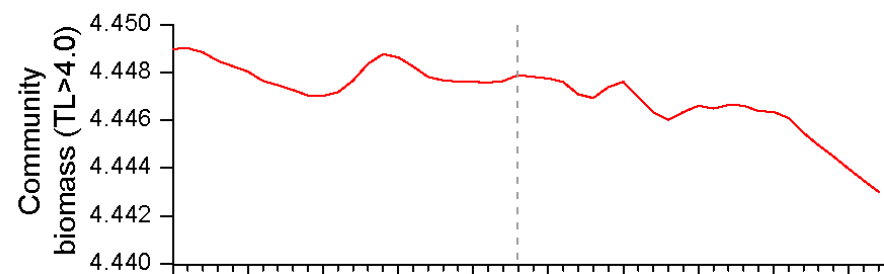
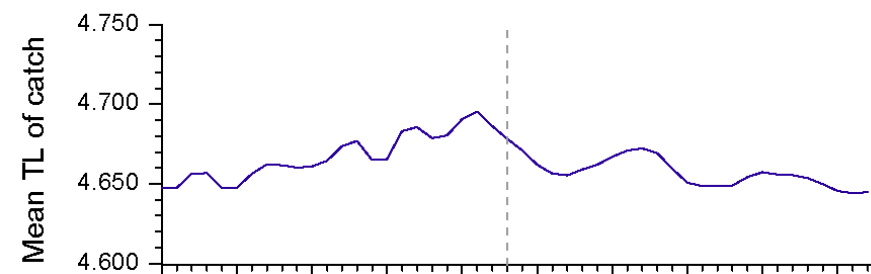
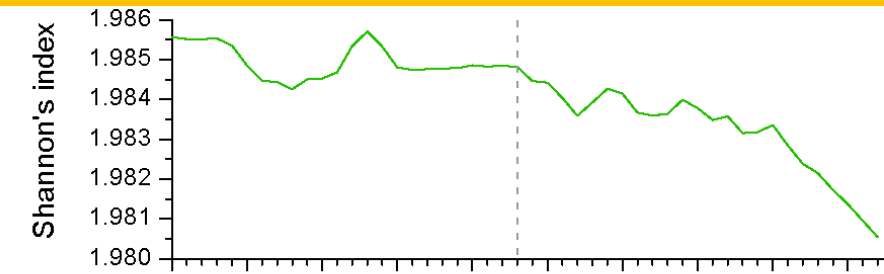
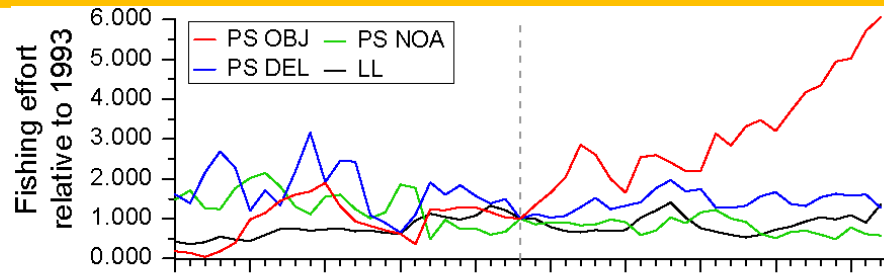


Trophic interactions

- Improving parameter estimates in ecosystem models
 - Diet matrices (e.g. **Project O.1.b**: quantifying spatial and ontogenetic variation in feeding ecology of SKJ)
 - Trophic sampling proposal (**Project O.1.a**)
 - Experiments for estimating Q/B ratio (**SAC-10 INF E, Project O.1.c**)



Ecosystem modeling: ecological indicators (see SAC-10-15)



Year

Summary of reporting improvements

- Reporting of non-target species
 - Summarize current catches (now including longline) of key taxonomic groups
 - Time series provides greater transparency of catches
- Reporting of environmental indicators
 - Assists in explanation of changes in catch
- Improving ERAs for prioritizing vulnerable species for mitigation and research
 - Simulating conservation and management measure (CMM) scenarios (mobulids, [BYC-09-01](#))
- Improving knowledge of trophic interactions to better parameterize ecosystem models
 - Continuation of analysis of available diet data
 - Literature review of methods for estimating Q/B ([SAC-10 INF-E](#))
- Inclusion of ecological indicators for monitoring ecosystem changes
 - Updating fishing and community-based indicators
 - Simulations of potential effects of FAD fishing on community structure ([SAC-10-15](#))

Future research and positive steps toward EAF

- Comparison of ecosystem reporting, IATTC's progress and recommendations (**SAC-10 INF-B**)
- Further develop EASI-Fish (**Projects L.1.a and L.1.b**)
 - Progressively analyze more species impacted by EPO fisheries
 - Develop habitat models to determine species overlap
- Ecosystem modeling (**Project O.2.b**)
 - Annually update model to provide ecological indicators to monitor ecosystem integrity
- Develop fishery-dependent ecological sampling program (**Project proposal O.1.a**)
 - Collect new data to update diet matrix in ecosystem model
- Prey consumption rates, gastric evacuation and daily ration (**Project O.1.c**)
 - Recommendation of methods to estimate Q/B to parameterize ETP ecosystem model



Questions