SAC-08-07b

A preliminary metadata analysis of large-scale tuna longline fishery data in the eastern Pacific Ocean: a precursor to Ecological Risk Assessment

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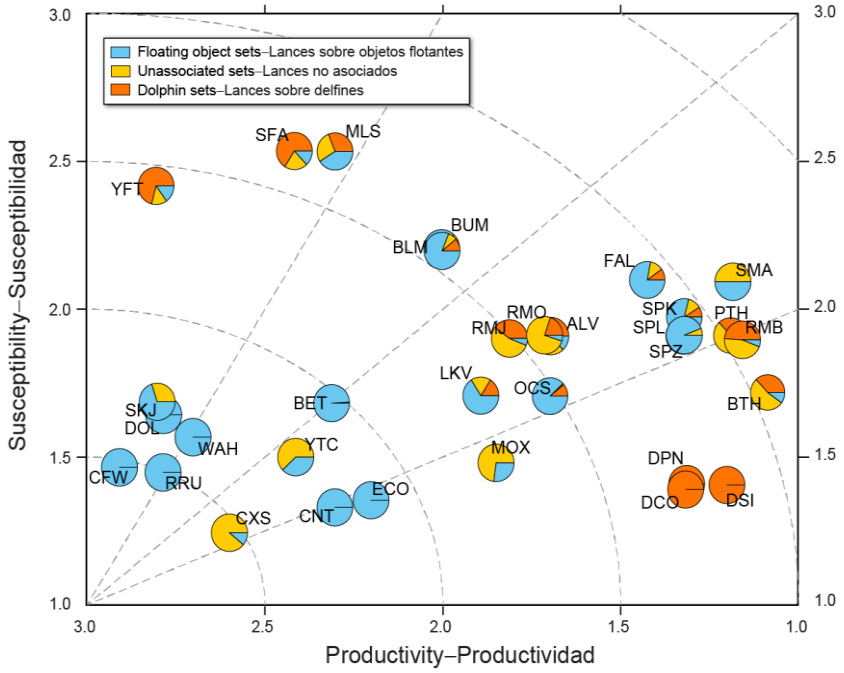
CIAT
IATTC

8ª Reunión del Comité Científico Asesor
8th Meeting of the Scientific Advisory Committee

Introduction

- IATTC is responsible for ensuring the sustainability of tuna, tuna-like species and associated species.
- To begin to assess ecological sustainability, IATTC staff undertook a preliminary PSA for the purse seine fishery (Class 6)
  - 100% observer coverage, bycatch composition well documented
- SAC requested other fisheries be assessed



Group	Species code	Common name
Tunas	YFT	Yellowfin tuna
	BET	Bigeye tuna
	SKJ	Skipjack tuna
Billfishes	BUM	Blue marlin
	BLM	Black marlin
	MLS	Striped marlin
	SFA	Indo-Pacific sailfish
Dolphins	DSI	Spinner dolphin
	DPN	Spotted dolphin
	DCO	Common dolphin
Large fishes	DOL	Common dophinfish
	CFW	Pompano dolphinfish
	WAH	Wahoo
	RRU	Rainbow runner
	MOX	Ocean sunfish
	CXS	Bigeye Trevally
	YTC	Yellowtail amberjack
Rays	RMB	Giant manta ray
	RMJ	Spinetail manta
	RMO	Smoothtail manta
Sharks	FAL	Silky shark
	OCS	Ocean whitetip shark
	SPL	Scalloped hammerhead
	SPZ	Smooth hammerhead
	SPK	Great hammerhead
	BTH	Bigeye thresher shark
	PTH	Pelagic thresher shark
	ALV	Common thresher shark
	SMA	Shortfin mako shark
Small fishes	CNT	Ocean triggerfish
	ECO	Bluestriped chub
Turtles	LKV	Olive Ridley turtle

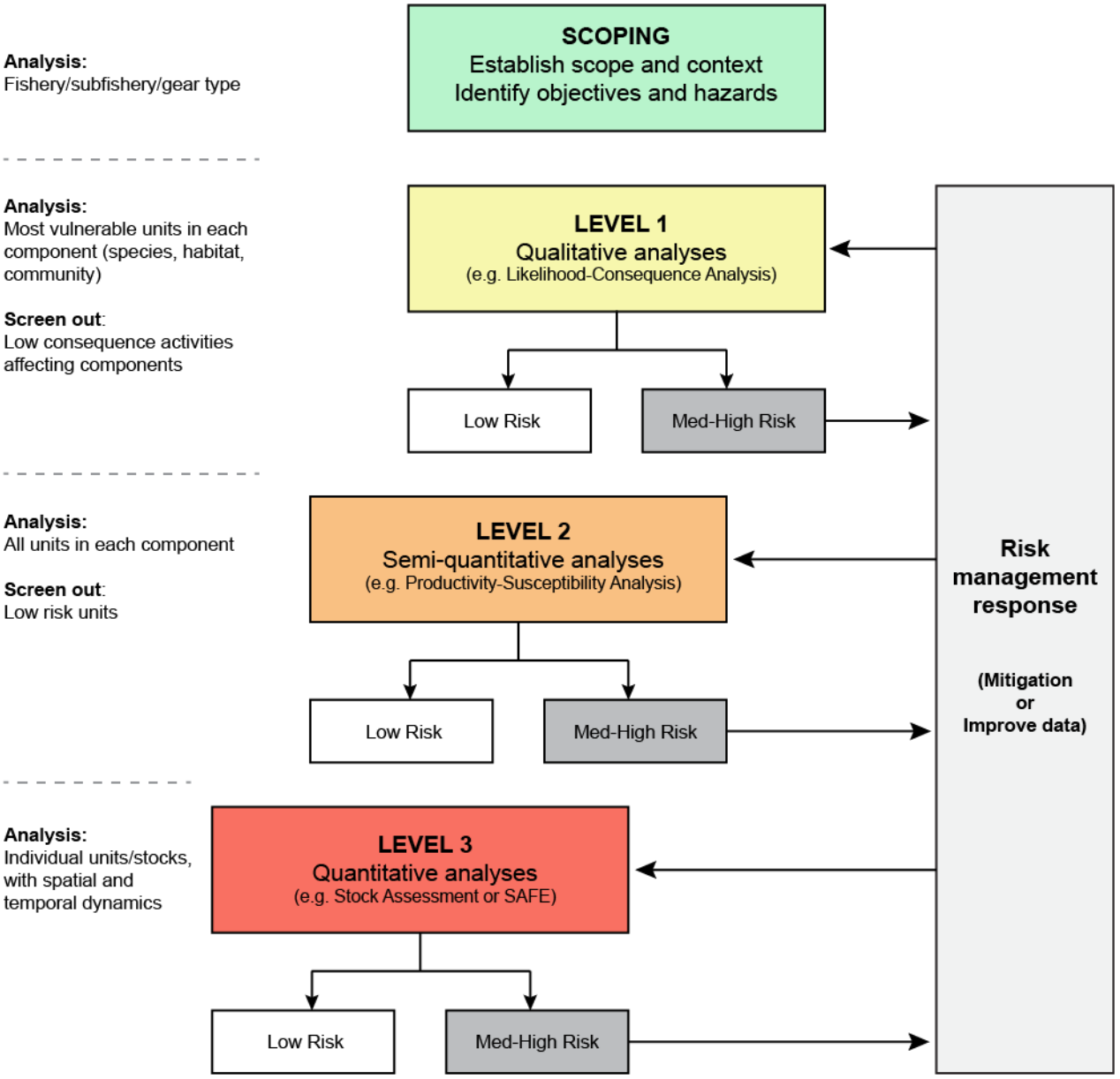
Ecological Assessments

- EPO fisheries requiring assessment
  - Purse seine (Class 6 - “Industrial”) – Preliminary PSA complete
  - Purse seine (Class 1-5)
  - Large scale tuna longline (“industrial”, “high-seas”, “distant-water”)
  - Artisanal (longline, gillnet)
  - Troll
  - Harpoon
  - Recreational

EPO Longline Fishery

- EPO longline fisheries interact with many species
  - Tunas and billfishes
  - Sharks - some of conservation concern silky and oceanic whitetip
  - Sea turtles
  - Seabirds
  - Marine mammals
- Previously believed assessment not possible due to unreliable data
- Flexible new approaches to ERA can utilize a range of data sources
- At a minimum, even simple ERA methods can identify potential species/groups of concern and key data gaps.

ERAEF Framework



Definition of the EPO longline fishery

- EPO longline fishery is diverse and complex
- Artisanal 'coastal' longline fishery
  - Small vessels (<10 m), limited hold capacity, little refrigeration, trips days to weeks
  - Target sharks and dorado
- Artisanal "oceanic-artisanal" fleet
  - Small vessels (<15m) fishing high seas from motherships, trips weeks to months
  - Target tuna, billfish, and sharks
- **Large-scale tuna longline fishery** ("industrial", "high-seas", "distant-water")
  - Large vessels >24m LOA with large hold capacity, trips many months, possibly years
  - Targets tuna and billfish
  - Required to submit catch and effort data to IATTC and have 5% observer coverage.

Objectives

1. To describe available longline data held by the IATTC that can be used in Ecological Risk Assessment,
2. Describe the catch and effort dynamics of the fishery, including the spatial and temporal distribution,
3. Describe the species composition of the reported catch (retained and discarded),
4. Analyze catch trends for tunas and billfishes, and common shark and teleost bycatch species,
5. Identify gaps and potential biases in IATTC longline data, and make recommendations for improving data quality, including assisting CPCs in meeting their obligations under applicable resolutions.

Methods

- Considered only data submitted to IATTC by CPCs
  - CPC annual observer reports used to supplement species list
- Used “Level 3” 5°x5° data (some 1°x1° records aggregated) (C-03-05)
- CPCs report catches in numbers, weights, numbers & weights
- We report in numbers only
  - Weights converted to numbers from LL records with weight & numbers
- “Catch” here refers to retained + discards
- Taxonomic groupings were disaggregated as far as possible
  - e.g. “Istiophoridae/Xiphiidae” and “Elasmobranchii”
  - Group numbers divided by % contribution to the catch by constituent species.
- Nominal CPUE used: catch / effort (thousands of hooks)

Results – Description of the LSTLF fleet

- IATTC LSTLFV List includes 1,306 vessels from 17 CPCs
- Some basic vessel information incomplete
- No indication of whether a vessel is active

CPC	Number of vessels	Length (m)		Capacity (m^3)		Capacity (t)	
		Range	Mean	Range	Mean	Range	Mean
	Número de buques	Eslora (m)		Capacidad (m^3)		Capacidad (t)	
		Rango	Promedio	Rango	Promedio	Rango	Promedio
China	373	29.1-57.3	42.7	196-802	429.7	5-720	217.9
Japan-Japón	235	30.2-61.5	47.9	34-872	477.2	-	-
Korea-Corea	191	32.6-51.2	48.4	263-850	539.1	196-350	297.5
Chinese Taipei-Taipei Chino	153	25.1-63.2	43.8	62-3548	497.3	24-677	448.3
EU (Spain)-UE (España)	127	24.5-55.0	33.0	99-627	357.1	14-442	179.5
Panama-Panamá	65	24.0-91.5	29.5	79-446	203.7	40-360	206.8
Vanuatu	49	25.2-59.2	47.9	102-883	514.4	266-505	404.8
United States-Estados Unidos	38	24.1-29.9	25.7	18-4790	344.6	9-124	43.4
Ecuador	15	24.4-56.5	47.2	66-1003	485.1	186-242	214.0
Mexico-México	15	24.0-46.8	31.4	90-152	121.8	10-320	102.8
France-Francia	14	24.8-33.3	25.4	-	-	-	-
Costa Rica	12	24.0-30.0	25.1	78-78	78.0	72-72	72.0
EU (Portugal)-UE (Portugal)	10	28.6-50.8	39.8	351-546	448.5	180-180	180.0
Belize-Belice	4	26.5-27.6	27.0	30-75	50.8	30-75	41.3
Kiribati	3	49.2-49.2	49.2	487-493	491.0	-	-
Nicaragua	1	24.0	24.0	-	-	-	-
Peru-Perú	1	52.4	52.4	-	495.0	-	292.0

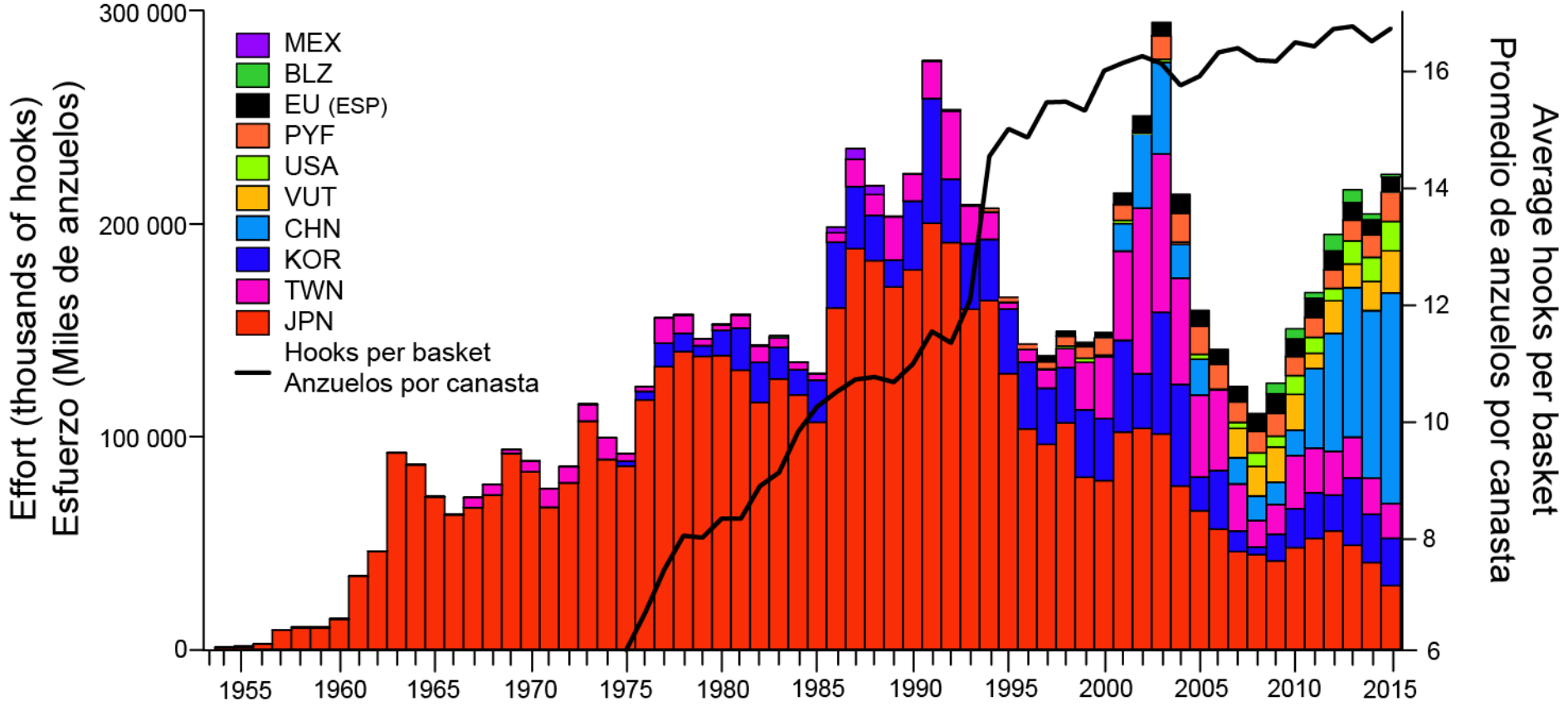
Results – Description of data records

- 10 CPCs have submitted data to the IATTC
- Submissions range from 62 years (Japan) to 7 years (Belize)
- 82,053 records describe catch and effort – aggregated per month/grid
  - 66.7% in numbers, 9.7% in weights, 22.6% numbers & weight, 1% no data.
- No. hooks recorded for all but 62 records
- Only 1,385 (1.6%) records include number of sets per record
- Only USA and Vanuatu recorded number of vessels per record
- Often unknown if records were a sample or total estimates

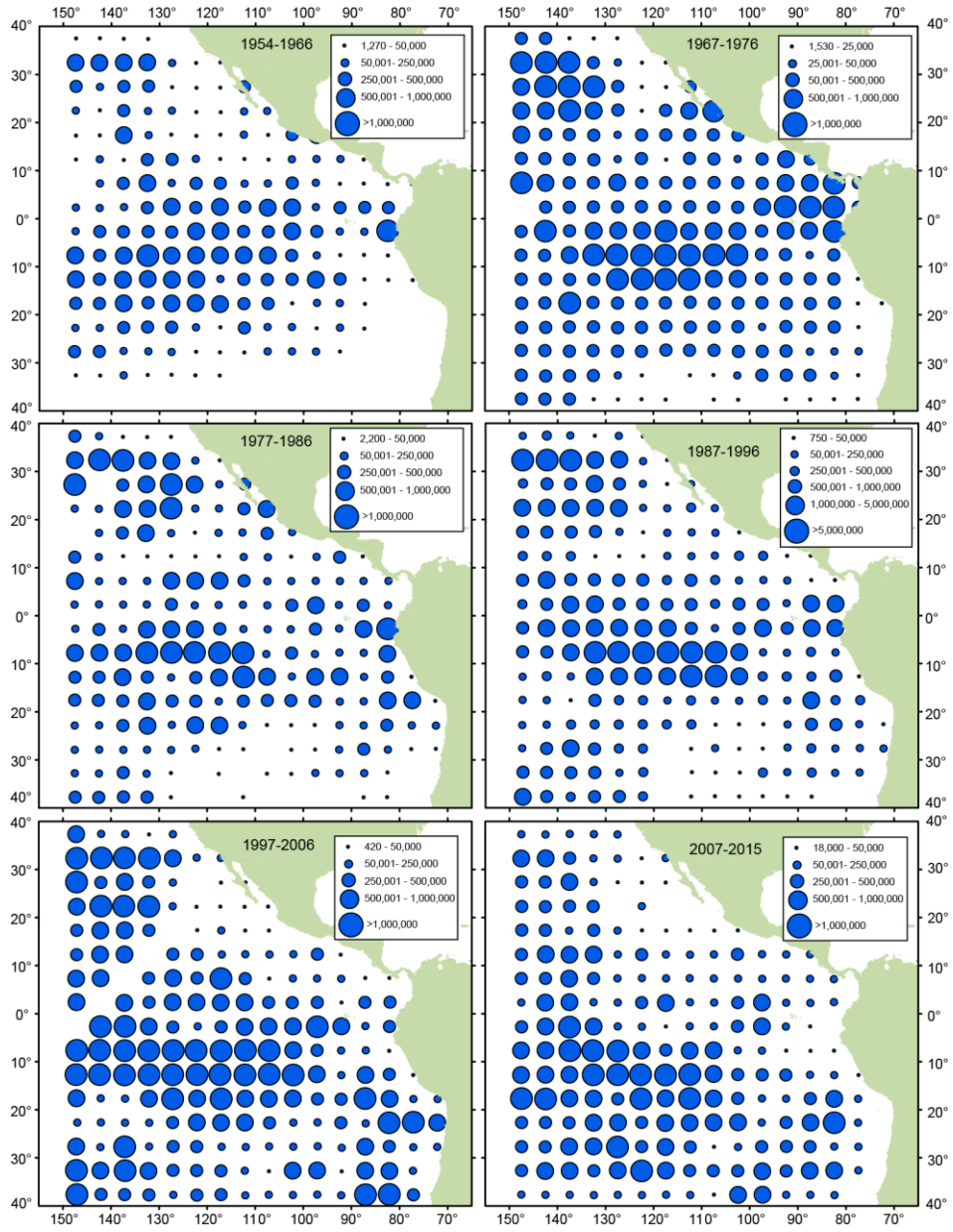
CPC	Years	
	Range	Number
	Años	
	Rango	Número
Japan-Japón	1954–2015	62
Chinese Taipei-Taipei Chino	1964–2015	52
Korea-Corea	1975–2015	41
United States-Estados Unidos	1991–2015	25
French Polynesia-Polinesia Francesa	1992–2015	24
EU (Spain)-UE (España)	1997–2015	19
China	2001–2015	15
Mexico-México	1980–1989	10
Vanuatu	2007–2015	9
Belize-Belice	2009–2015	7

Annual Effort by Flag

- Effort peaked at 295 million hooks in 2003, then a rapid decline
- Effort increased rapidly since 2008, mainly due to China
- Mean HPB increased since 1992 – implies deep sets (bigeye)



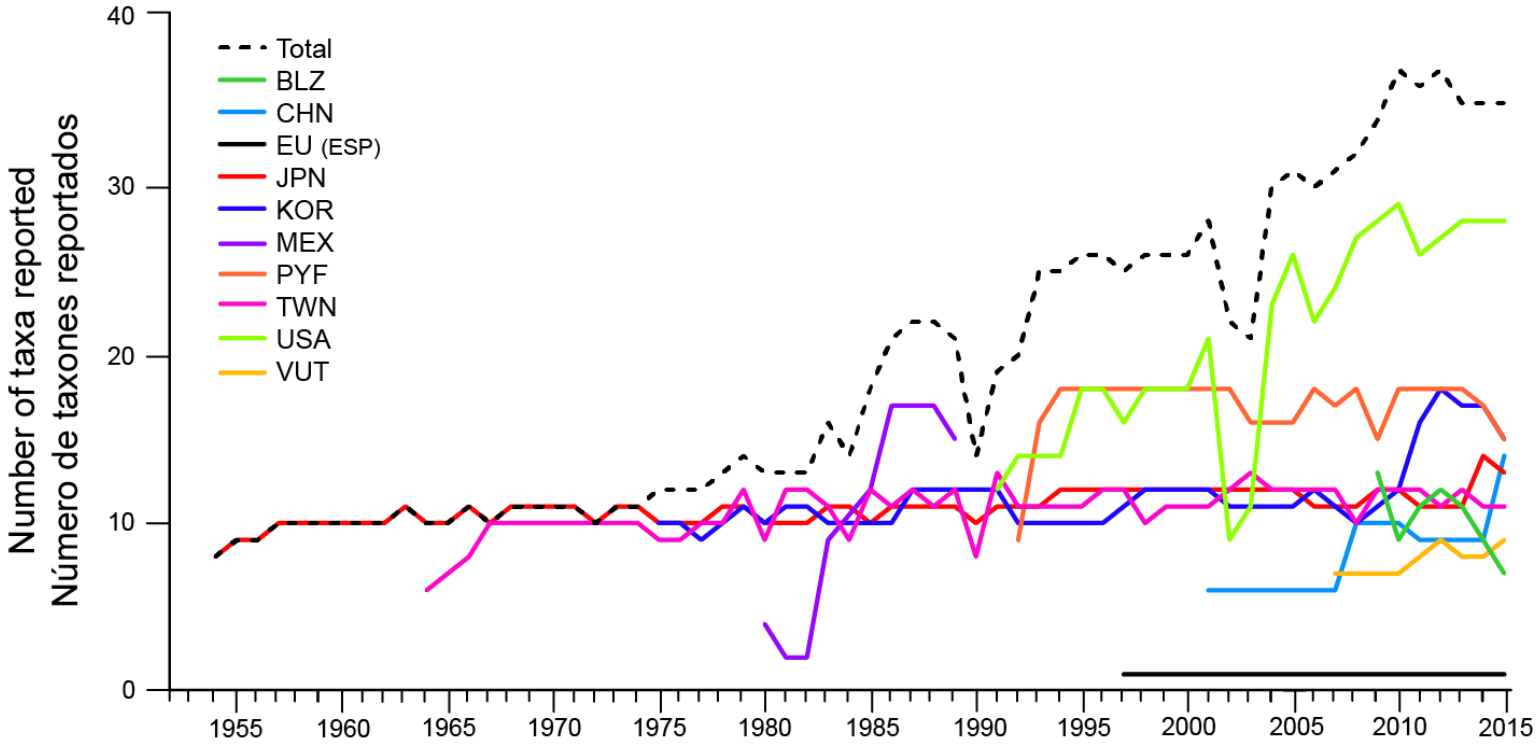
Distribution of effort (1 000s hooks)



- PSA requires definition of the spatial extent of the fishery relative to distribution of impacted species
- Effort distribution varied through time
- 2007-2015 effort in most grids, but mostly 0-20°S and NW region

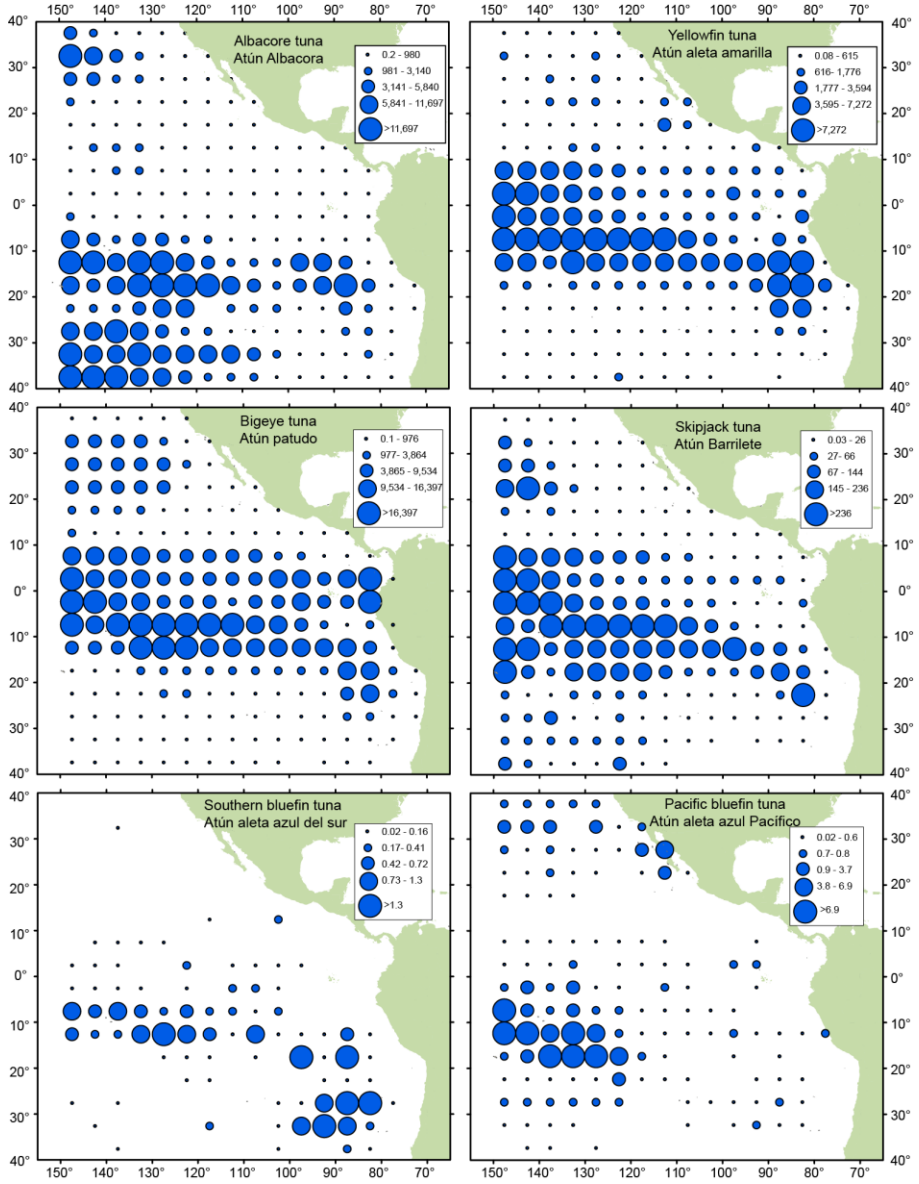
Results – Reported species interactions

- Interactions with 49 taxa reported
  - 30 from IATTC database; 19 additional from CPC annual observer reports
- No submitted data records contained interactions with:
  - Seabirds, sea turtles and marine mammals
- Taxa reported increased from 9 to 39
- Some CPCs appear to report only economically important species

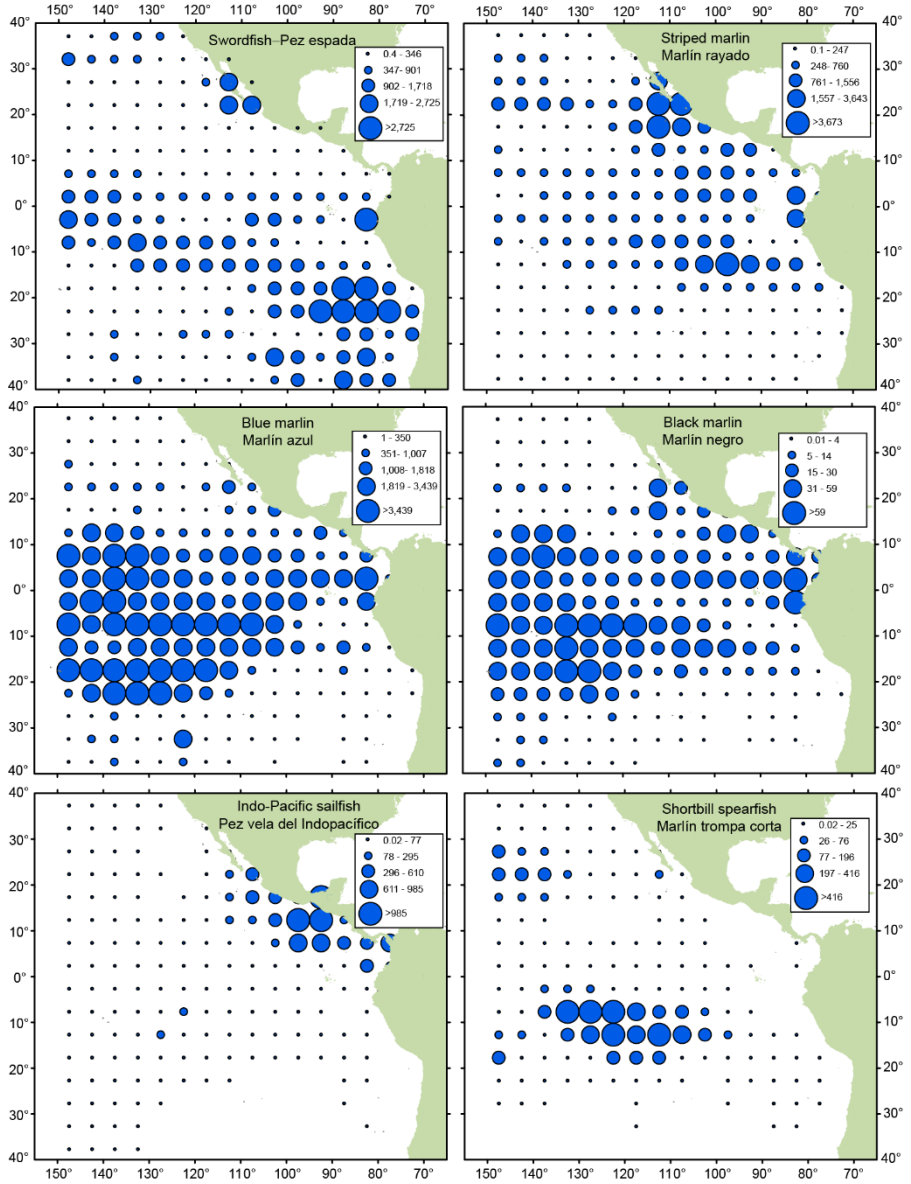


Distribution of tuna and billfish catches

Tunas

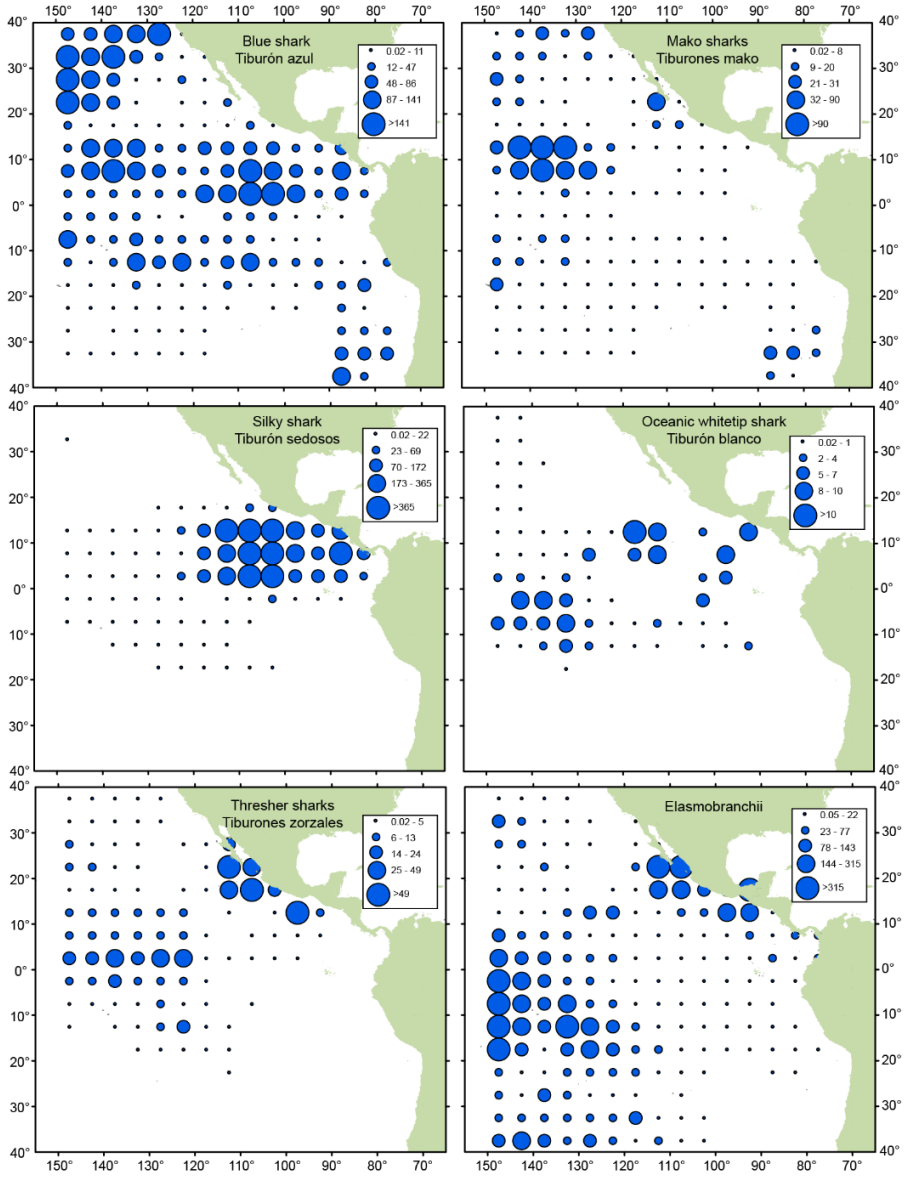


Billfishes

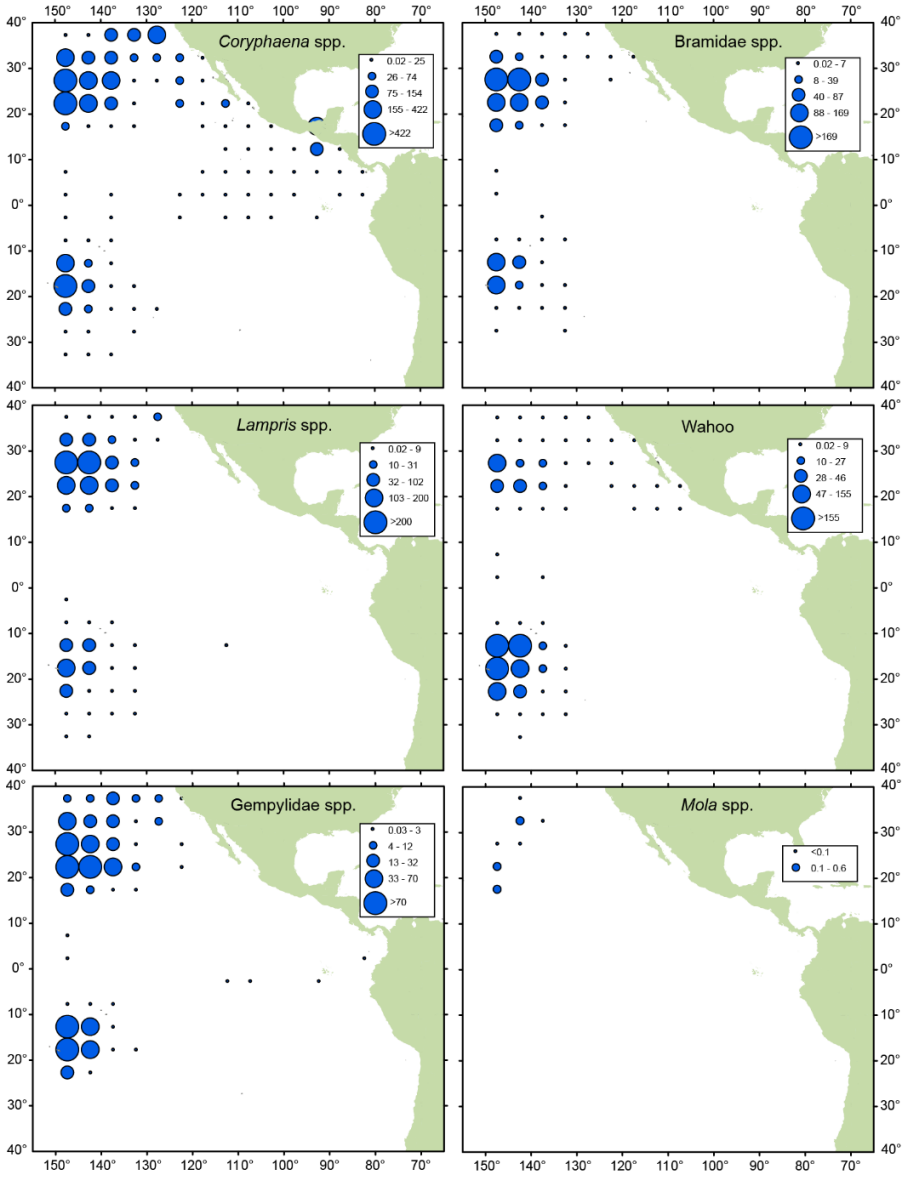


Distribution of sharks and large fishes

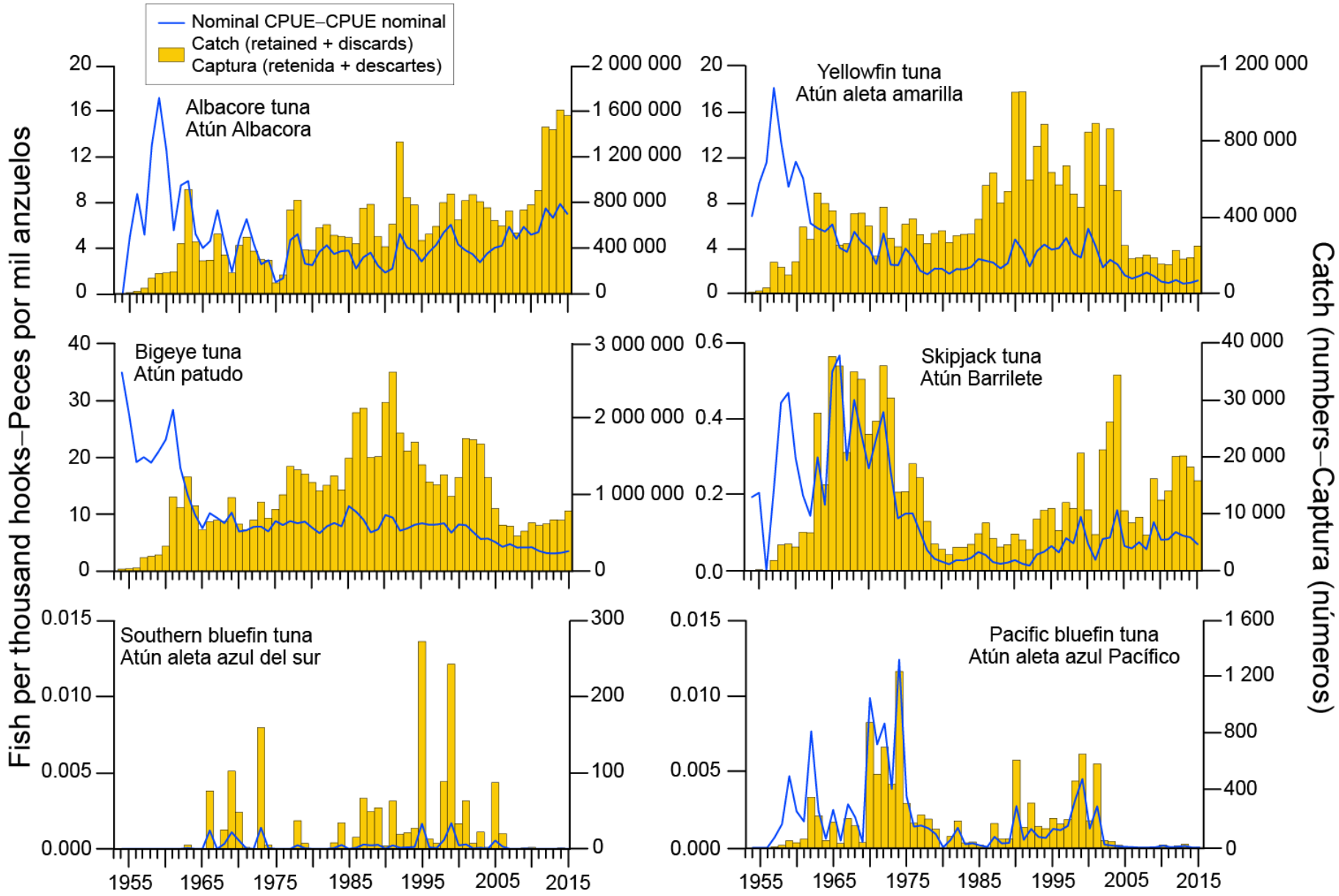
Sharks



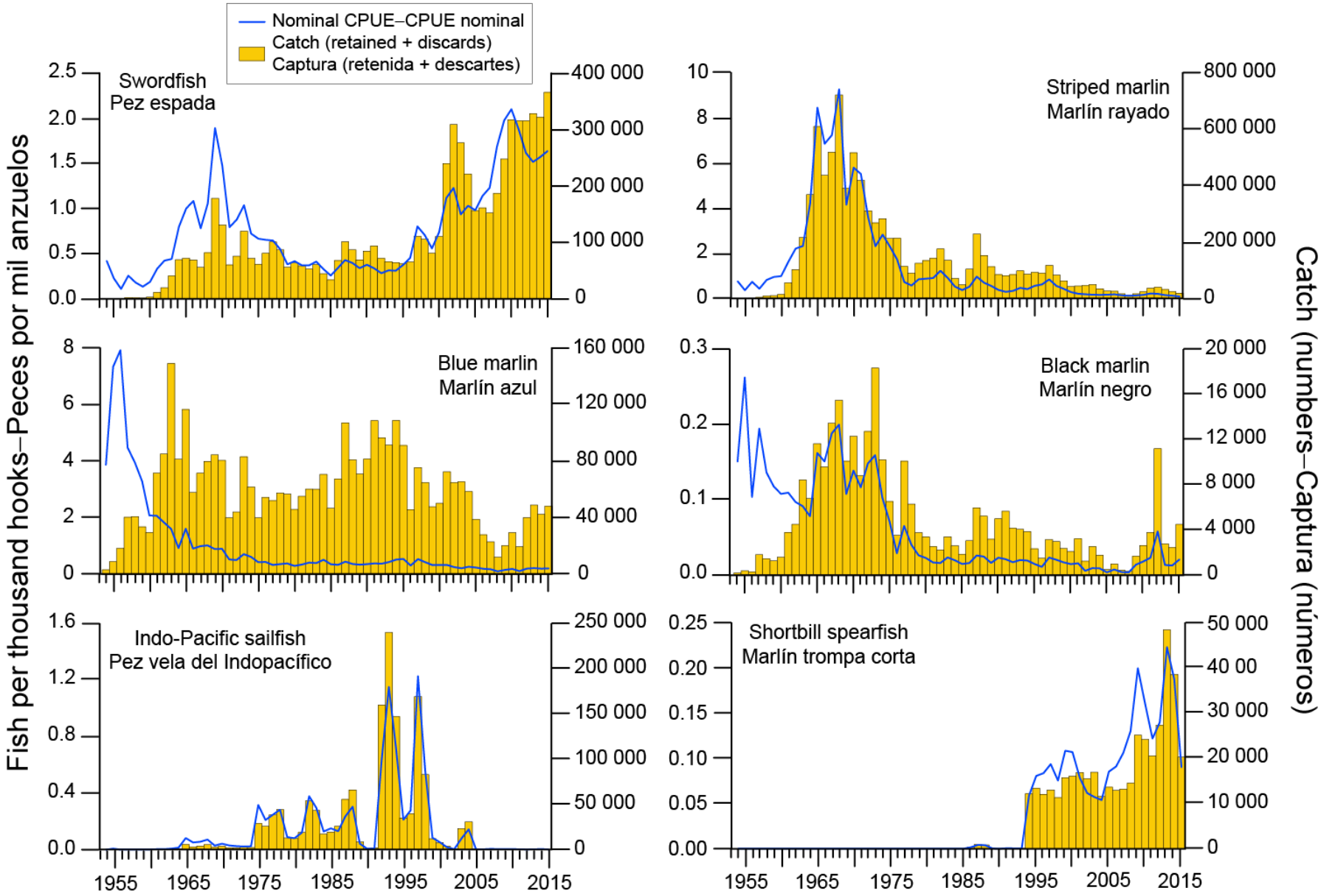
Large fishes



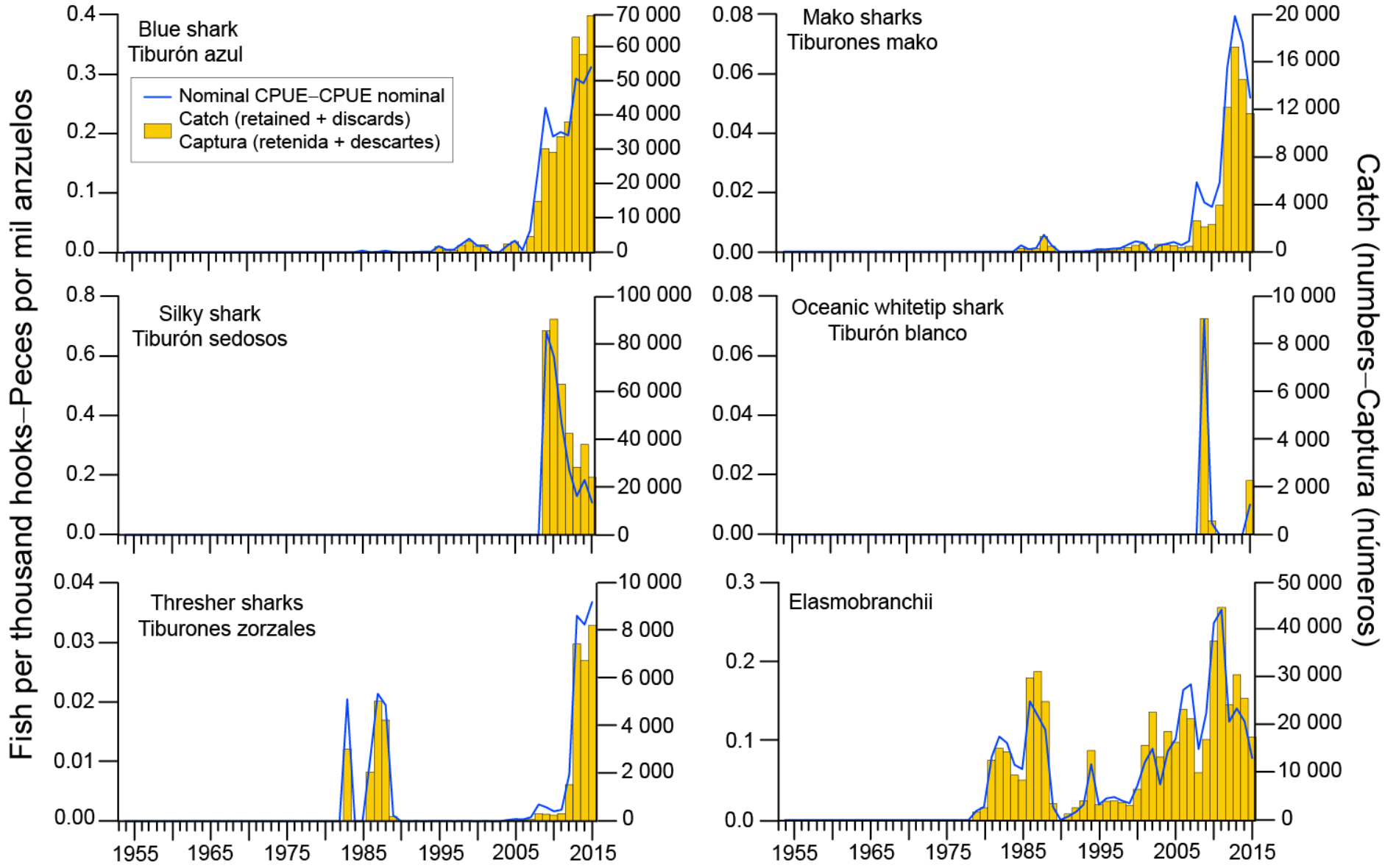
Nominal catch and CPUE - Tunas



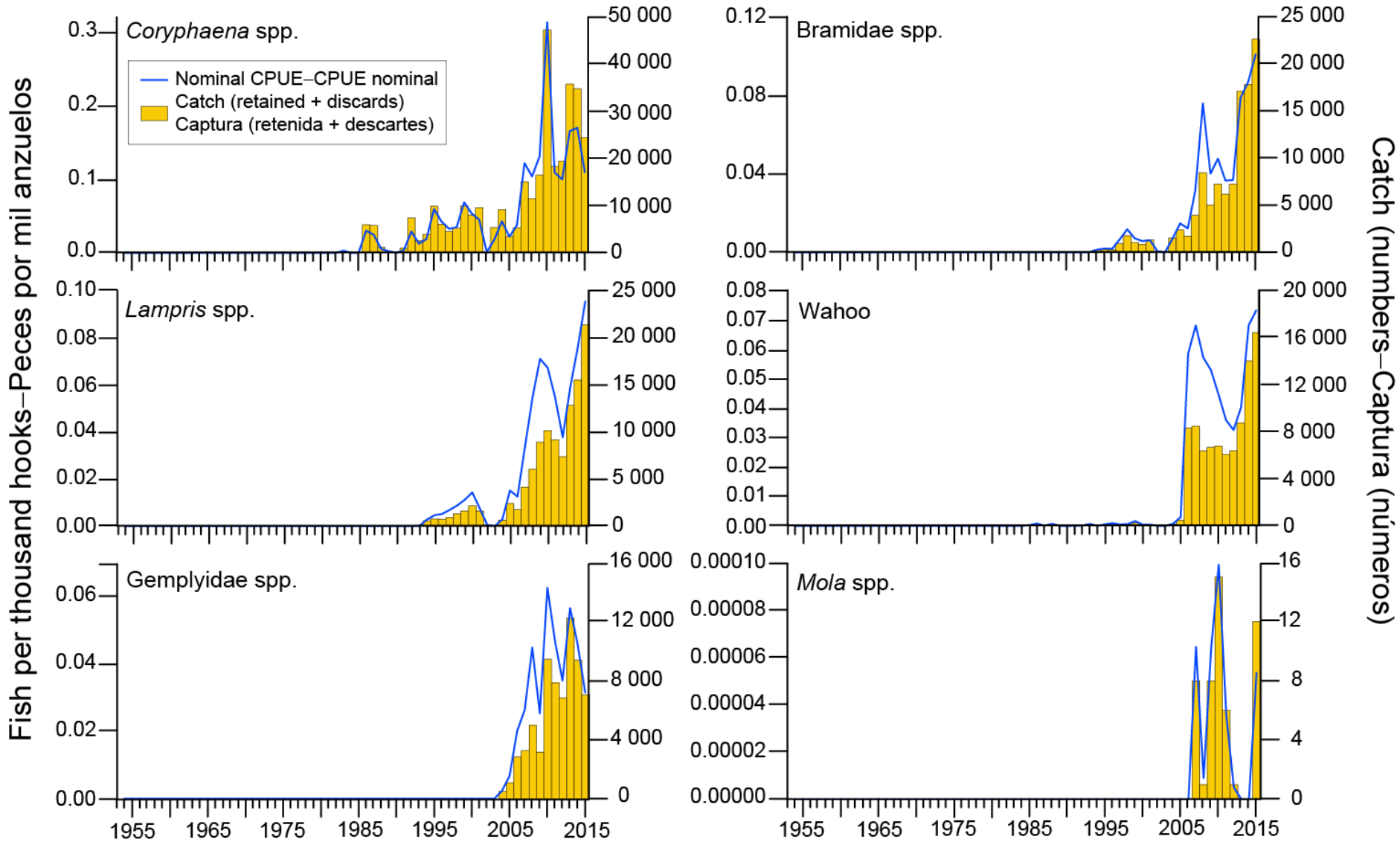
Nominal catch and CPUE - Billfishes



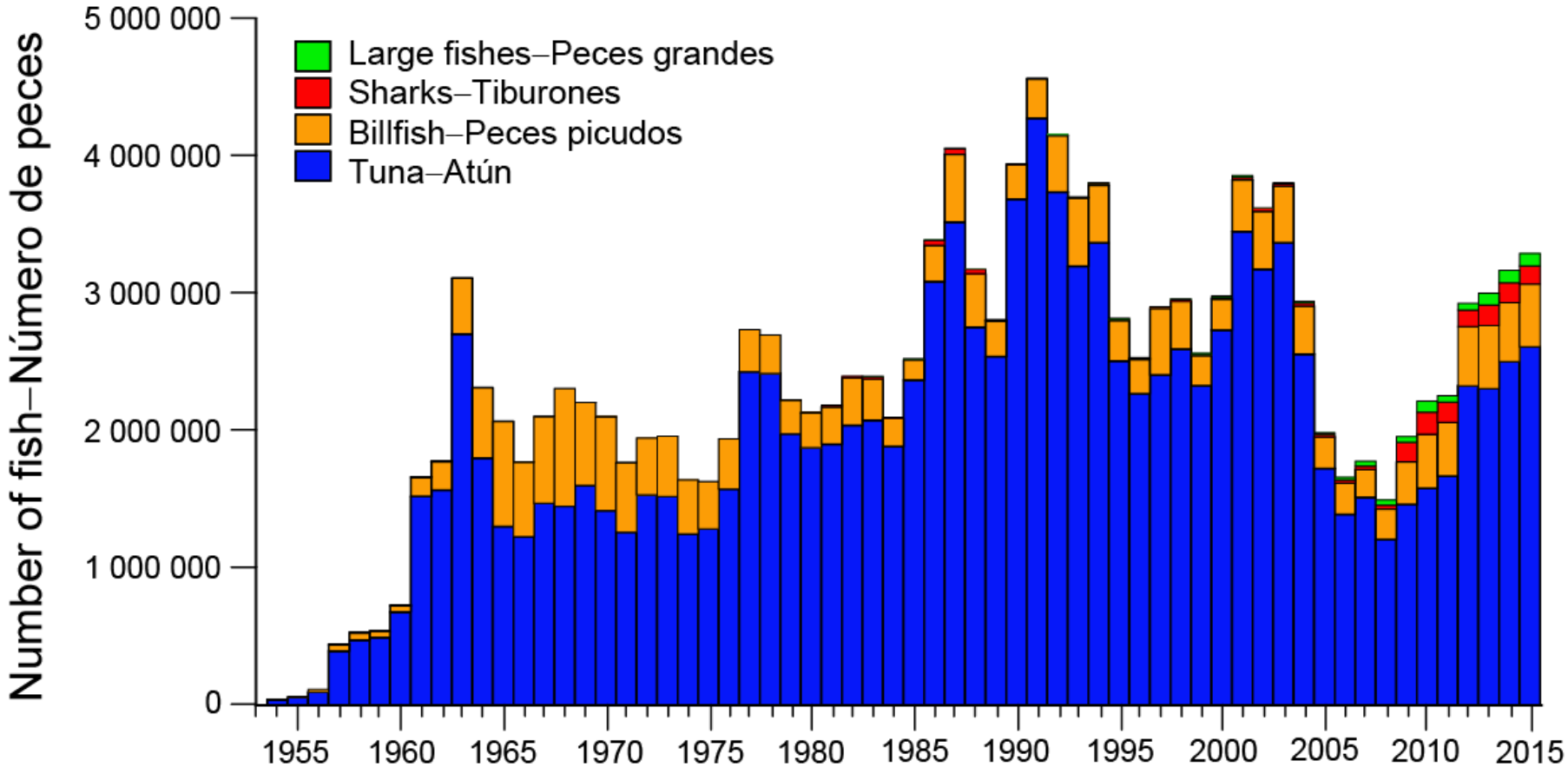
Nominal catch and CPUE - Sharks



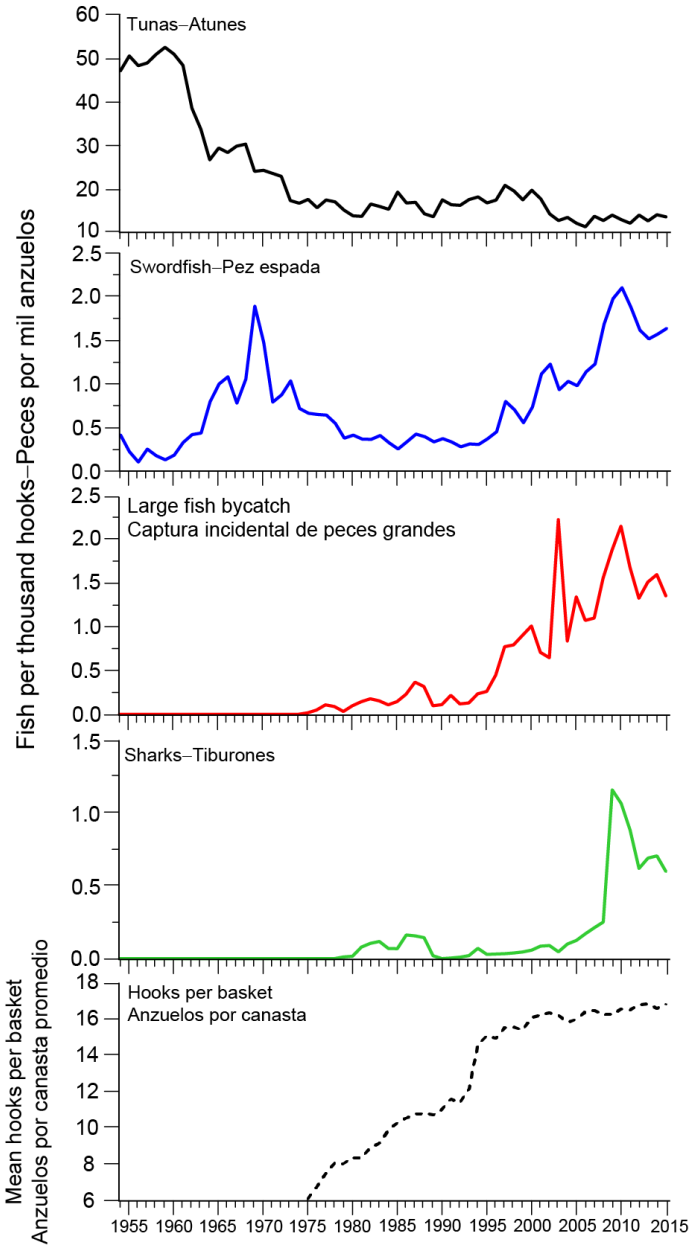
Nominal catch and CPUE – Large fishes



Annual catches by species group

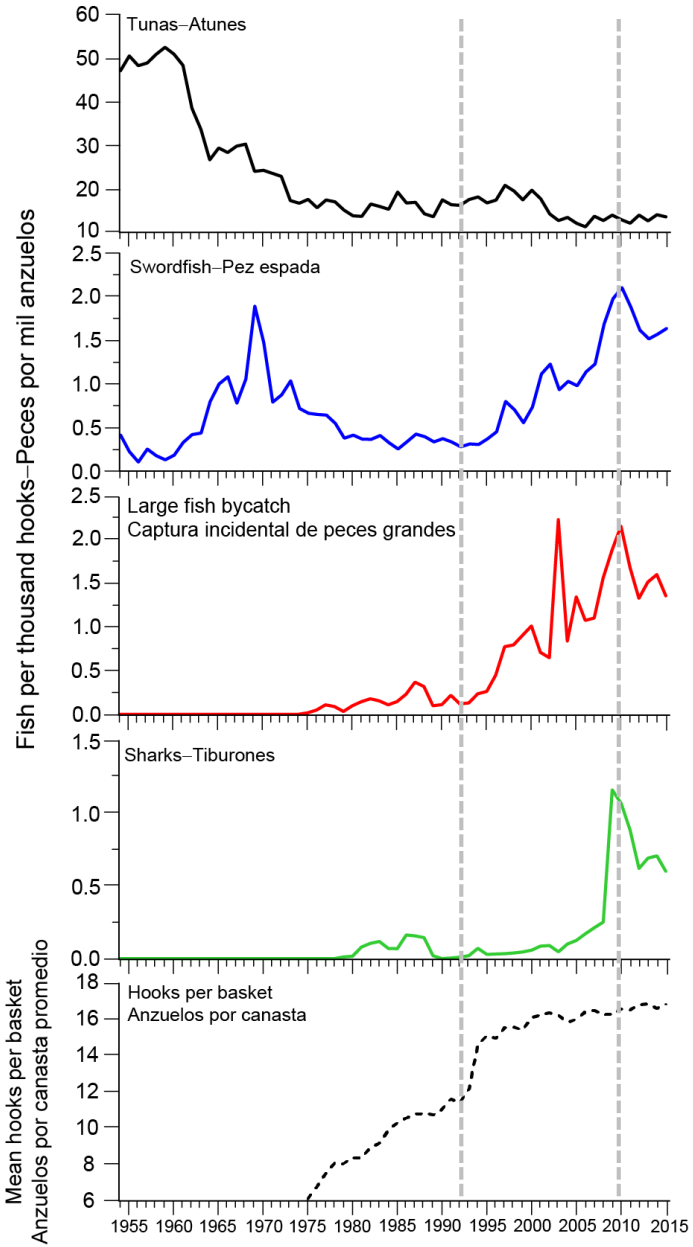


A changing fishery?



- Decline in reported tuna catch from ~2000

A changing fishery?



- Decline in reported tuna catch from ~2000
- Increases in CPUE from 1993 for:
  - Swordfish
  - Epipelagic sharks (blue, mako, thresher)
  - Epipelagic fish (dorado, wahoo)
  - Mesopelagic fish (opah, escolar, pomfrets)
- Increase in HPB from 1993
  - 11 HPB (1993) to 17 (2015)
- Bach and Fonteneau (2005) observed increase in HPB, 9-14 in 1992 to 20 from 1993 in western Indian Ocean
  - BET to YFT in response to market drivers
- HPB poor proxy for set depth

Conclusions and recommendations

- CPCs greatly improved quality of data reporting over the past ~10 years
- However, many improvements needed to maximize usefulness of data for ERA, stock assessment and management
- Improve basic information on number of active vessels by CPC
- Annual observer data reports provide insufficient information to determine observer coverage and total catch/effort for expansions
  - Mis-match of submitted data and annual data summaries
- Improve species-specific reporting:
  - Avoid using aggregated taxonomic group codes
  - “Elasmobranchii” constituted 26% of annual shark catches for past 5 years
  - “Istiophoridae/Xiphiidae” ~10% of annual billfish catch
  - Observers should be able to identify fresh specimens

Conclusions and recommendations

- Recommend CPCs submit “Level 1” (C-03-05) operational data to improve:
  - Characterization of fleet dynamics (deep set vs shallow set; areas fished)
  - Distribution models for data-limited species (quantify overlap with fishery)
  - Estimates of total effort and species-specific catch by the fleet
  - Standardization of CPUE for target and bycatch species for stock assessment and ERA
  - CPCs may already have these data – request to re-submit “Level 1” data retrospectively

- CPCs encouraged to increase observer coverage from 5% to at least 20% to improve the *representativeness* of data
  - Deep set and shallow set
  - Improve spatial and temporal coverage
  - Account for catch and effort variability between vessels

Questions