Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

Status of IOTC databases for Billfish species

IOTC Secretariat

Outline

Documents covered:

IOTC–2011–WPB09–06	Review of the statistical data available for the billfish species
IOTC–2011–WPB09–07	Preparation of data input files for the stock assessments of Indian Ocean Swordfish
IOTC–2011–WPB09–08	Review of fishery trends for billfish species

- Main activities during the last year
- Catch trends and main fisheries
- Status of fisheries statistics at the Secretariat
  - Swordfish
  - Marlins
  - Sailfish
- Summary of main data issues
- Future Plans
- Preparation of data for the assessments of Swordfish

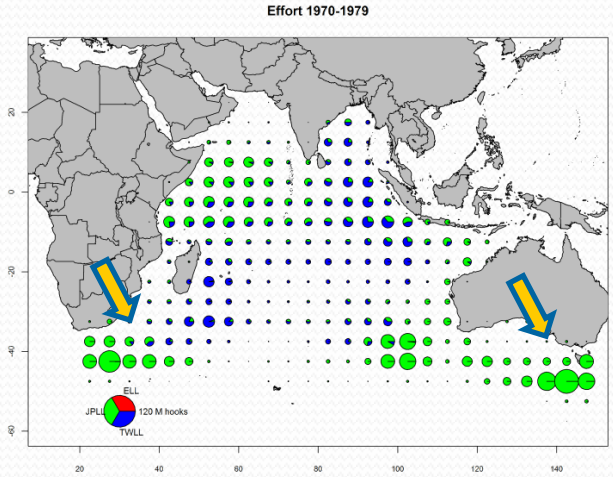
Data Section: Main activities

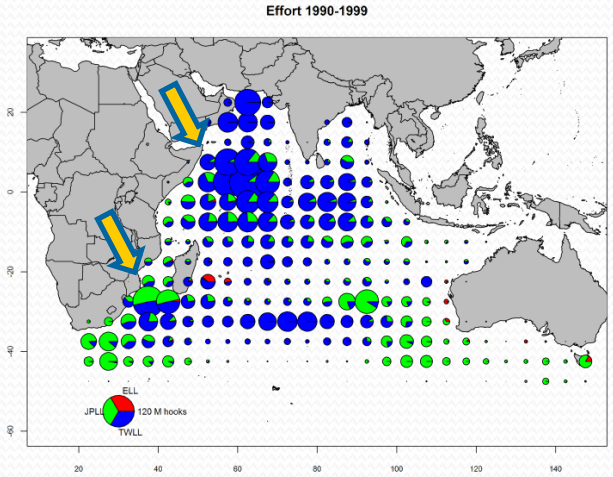
- Data acquisition, verification, maintenance, dissemination
- Preparation of datasets and reports for IOTC Meetings, including alternative catch series for swordfish
- Data transfer to new IOTC Database ongoing…
- New position created (to be effective by end of 2011):
  - Fisheries statistician (data section)
- Data reviews leading to important changes in the historical catches of some countries (India, Indonesia)
- Activities in relation with IOTC-OFCF Project Phase III (2010-2012)
- Activities in relation with IOTC Pilot Project to assess reporting systems for small-scale fisheries in the Indian Ocean
  - Countries: Comoros, Indonesia, Iran, Kenya, Sri Lanka

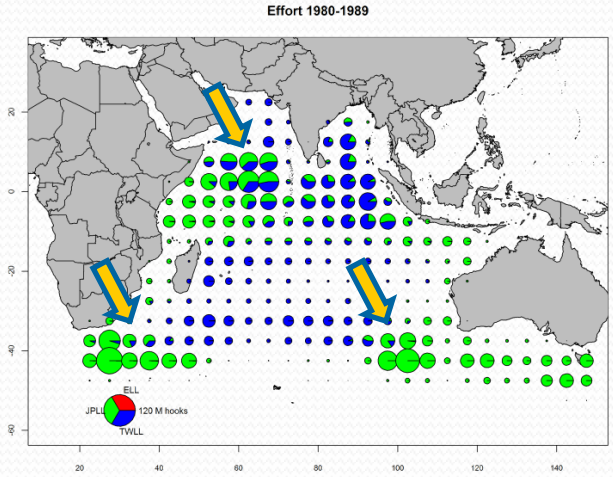
Effort main longline fleets

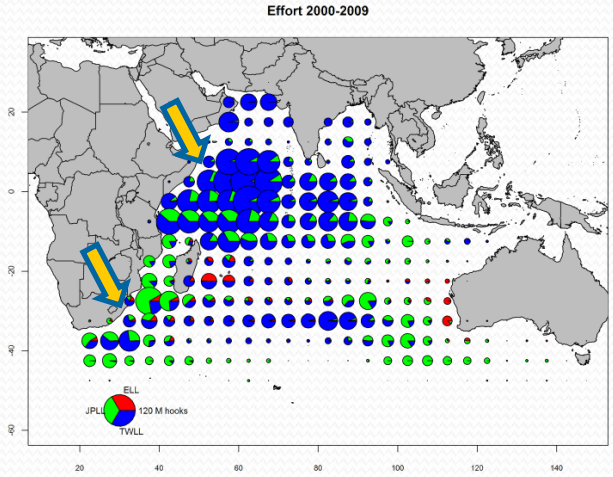
By decade 1970-2009

- **Taiwan,China**: Western equatorial (tropical tunas and swordfish) and Southern Indian Ocean (albacore)
- **Japan**: Western and Southern Indian Ocean (tropical tunas)
- **EU-Spain**: Southwestern Indian Ocean (swordfish)



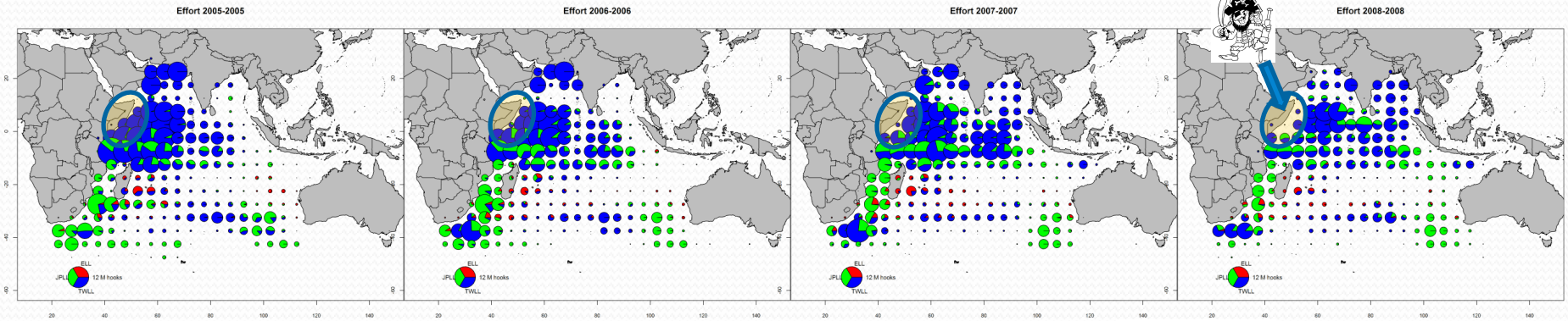




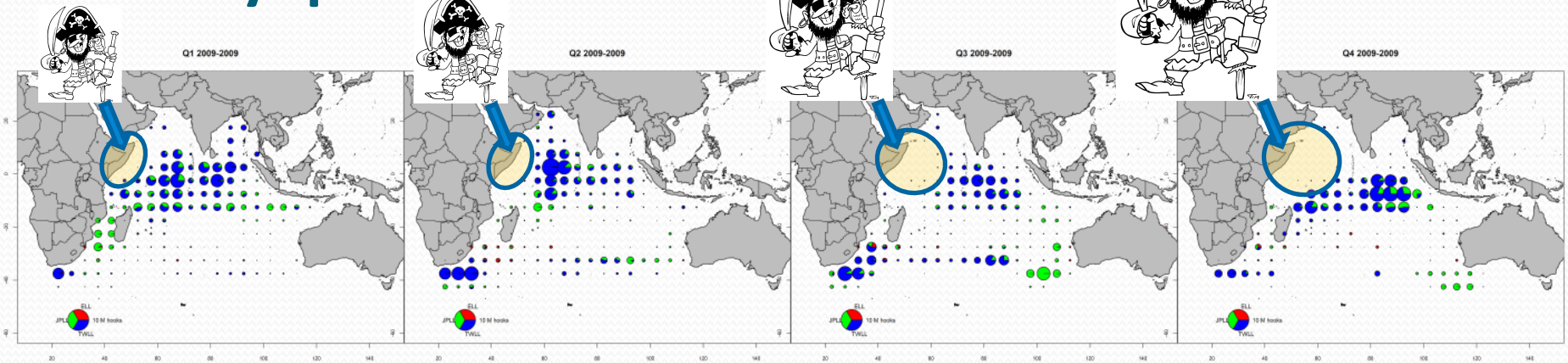


Effort main longline fleets

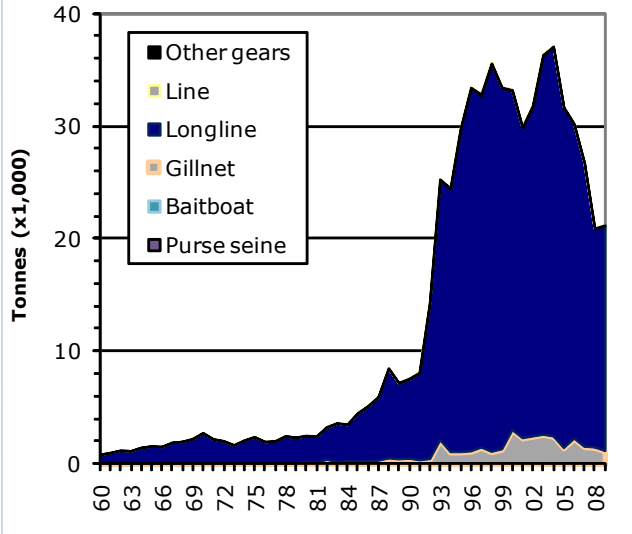
2005-08 by year

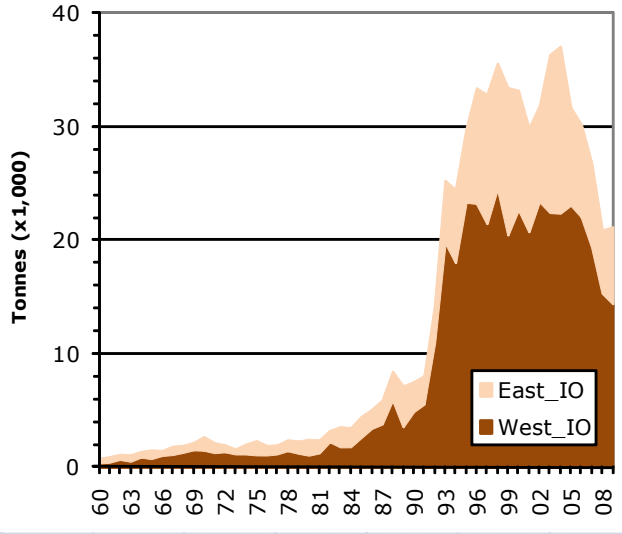


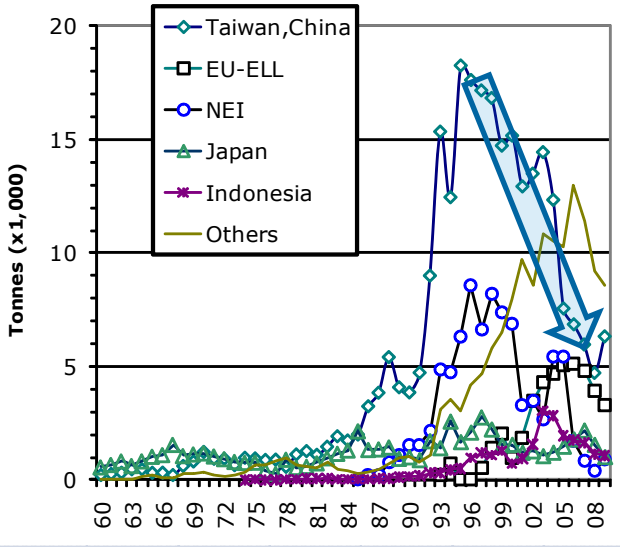
2009 by quarter



Catch trends: Swordfish





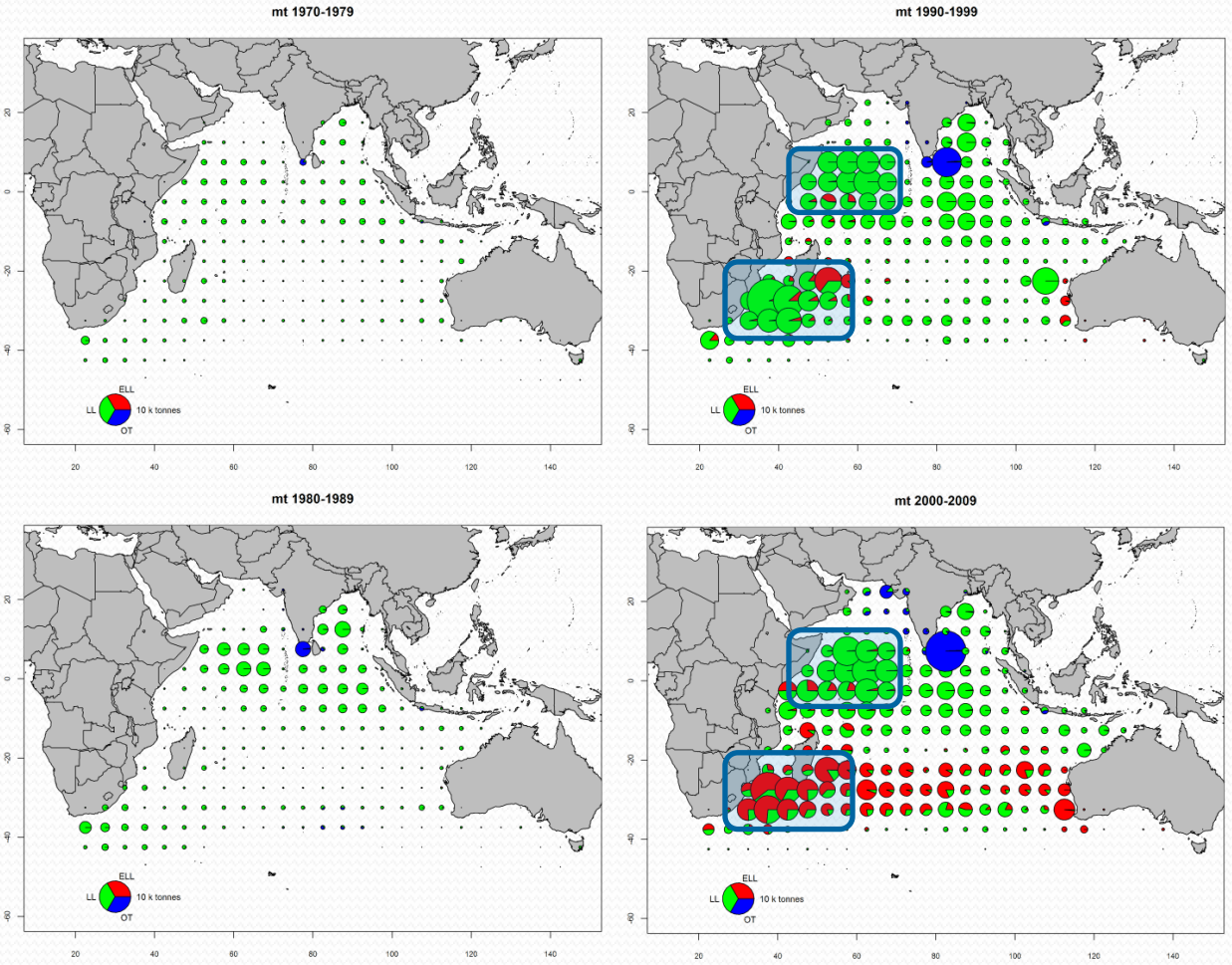


- Longline (95%) and Gillnet (5%)
- 70% catches in the western Indian Ocean
- Taiwan (≈20%-50%), EC (≈10%-30%), Japan, Indonesia, Sri Lanka, NEI
- Taiwan swordfish catch large drop: drop in number of active deep-freezing LL vessels (and pirates?)

SWO catch by area all fleets

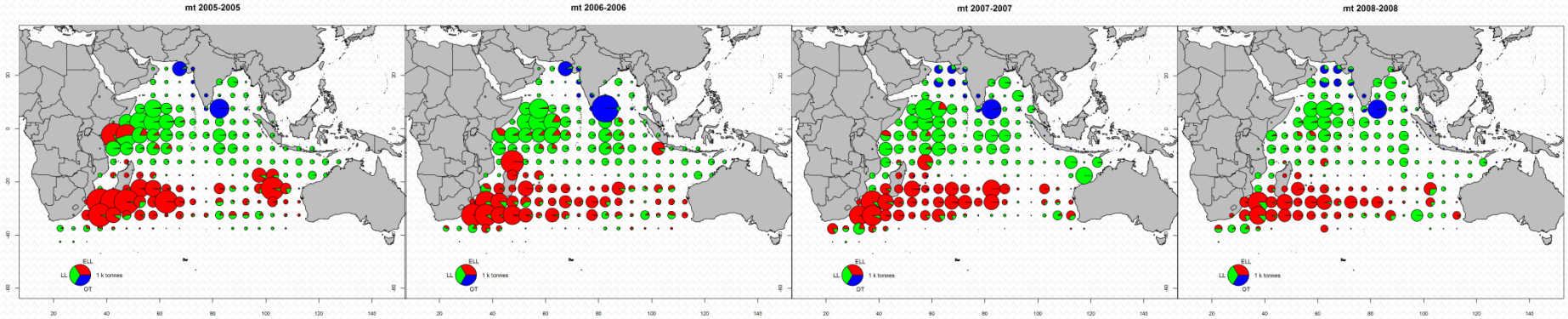
By decade 1970-2009

- **Swordboats**: Southwest and southern Indian Ocean (EU, Australia, Reunion)
- **Longline**: Western Indian Ocean (Japan and Taiwan,China)
- **Other**: Waters around Sri Lanka and Arabian Sea (Sri Lanka, Pakistan)

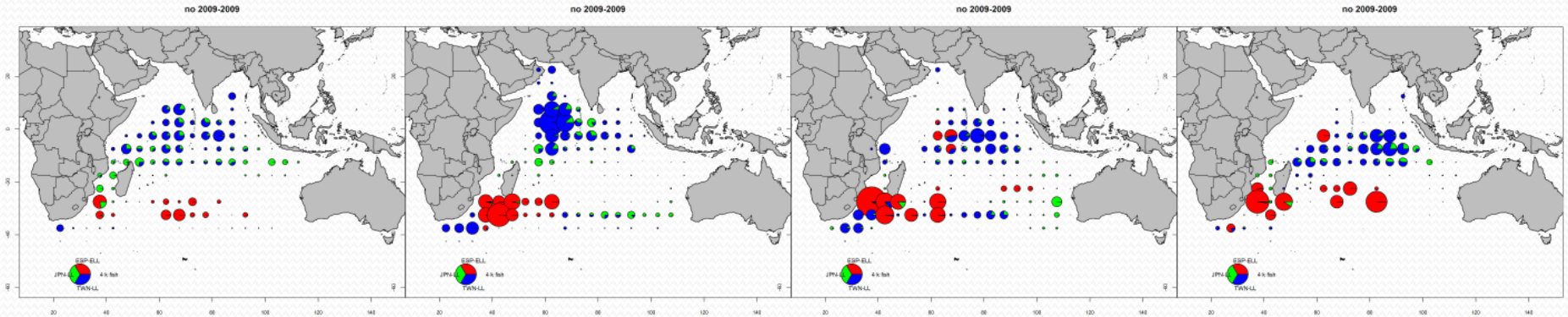


SWO catch by area

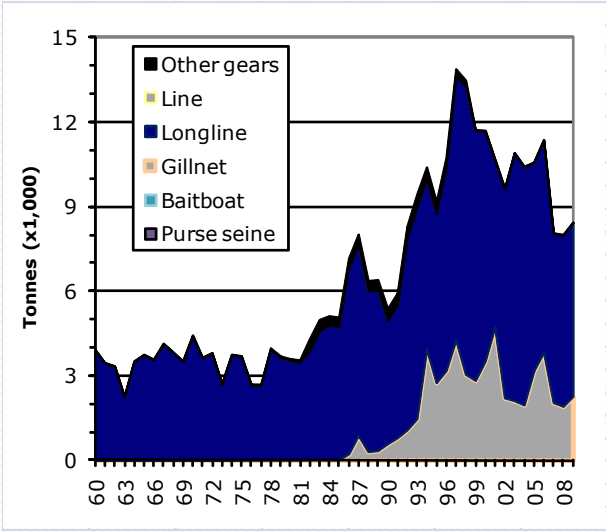
2005-08 by year (all fleets)

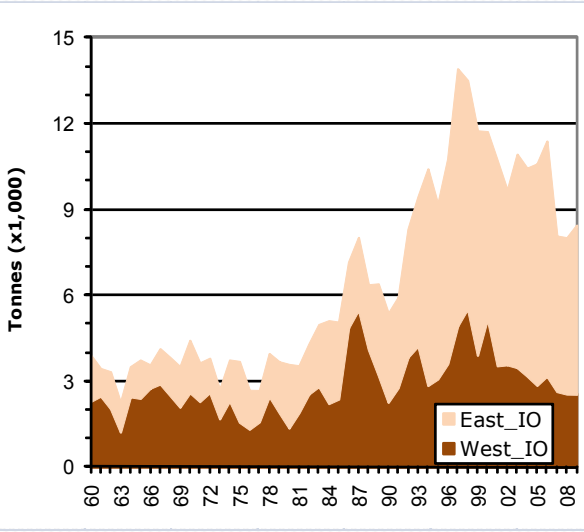


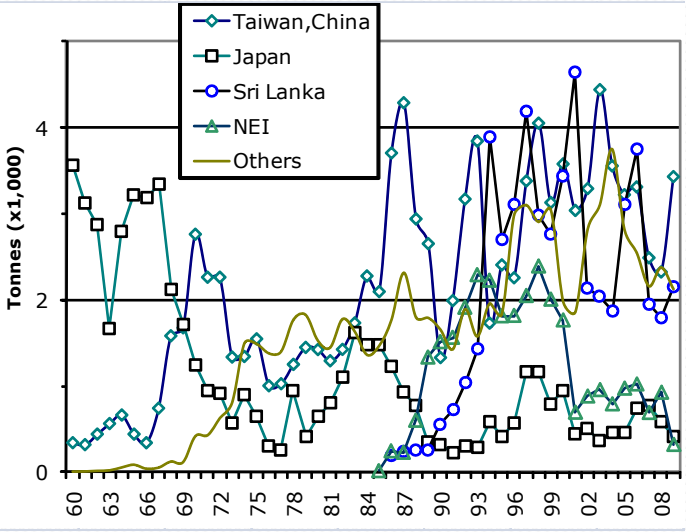
2009 by quarter (main fleets)



Catch trends: Blue marlin





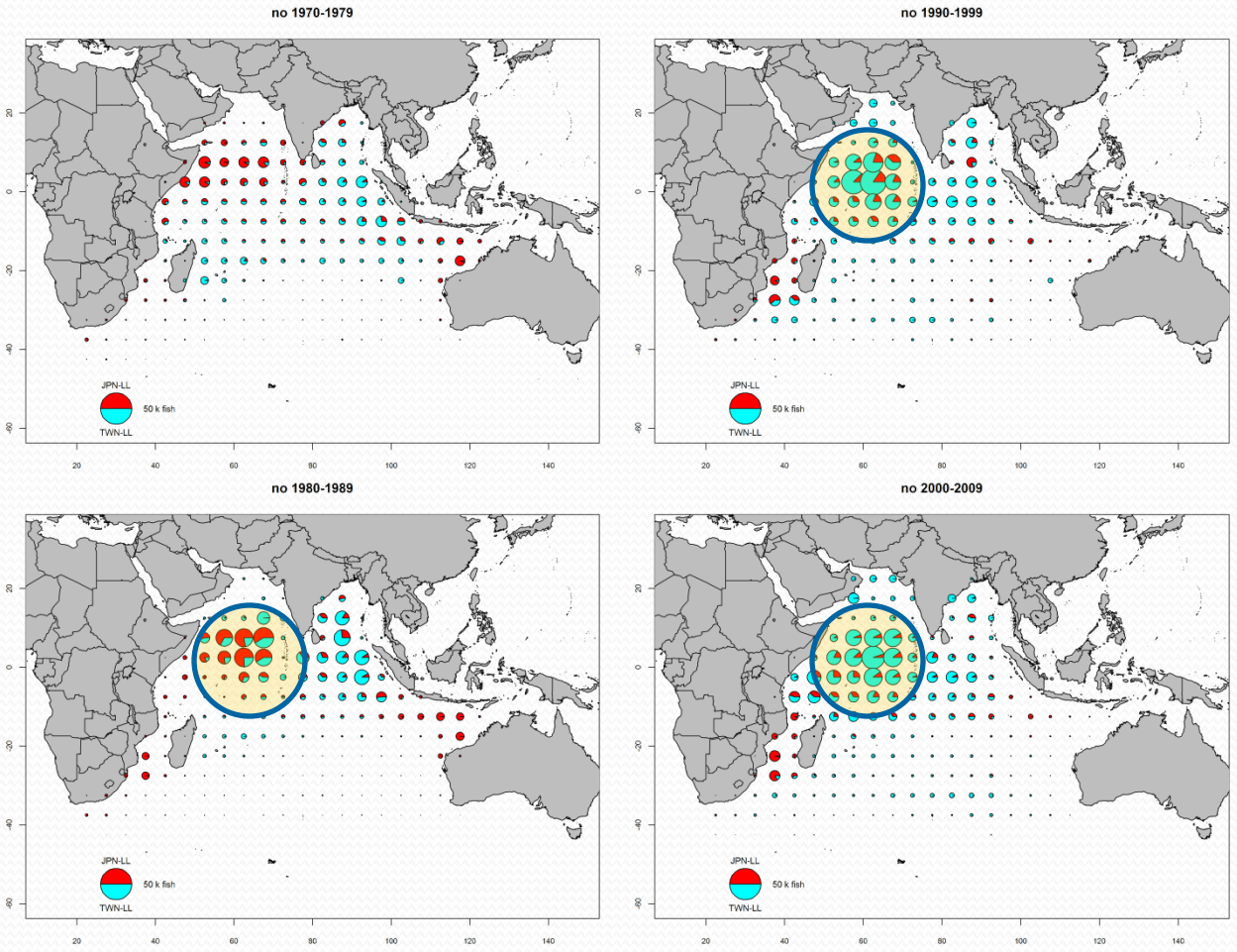


- Industrial and artisanal fisheries
- Longline (70%) and Gillnet (30%)
- Most catches in the East (70%)
- Taiwan,China (32%), Sri Lanka (27%), Indonesia (15%), India (5%), Japan, NEI
- Drop in catches in recent years

BUM catch by area main fleets

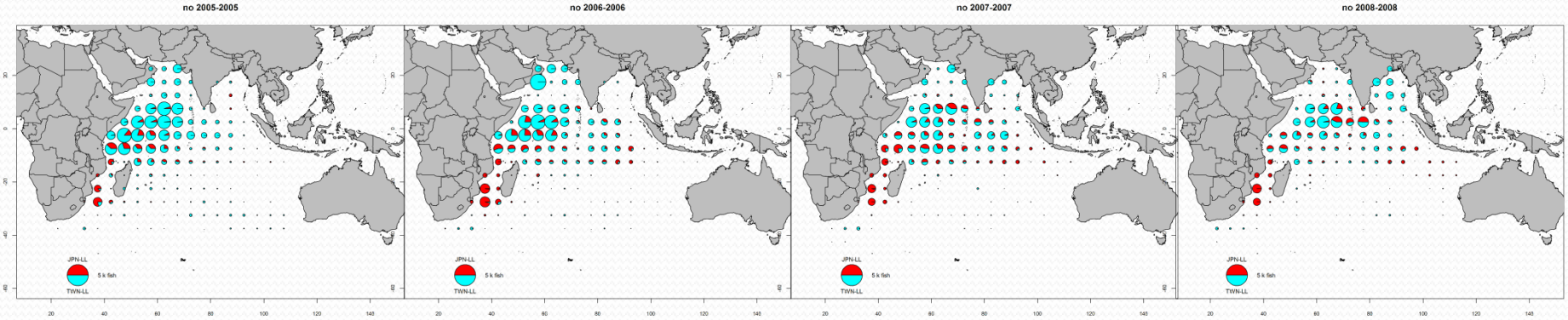
By decade 1970-2009

- **Longline**: Western equatorial Indian Ocean (Japan and Taiwan,China)

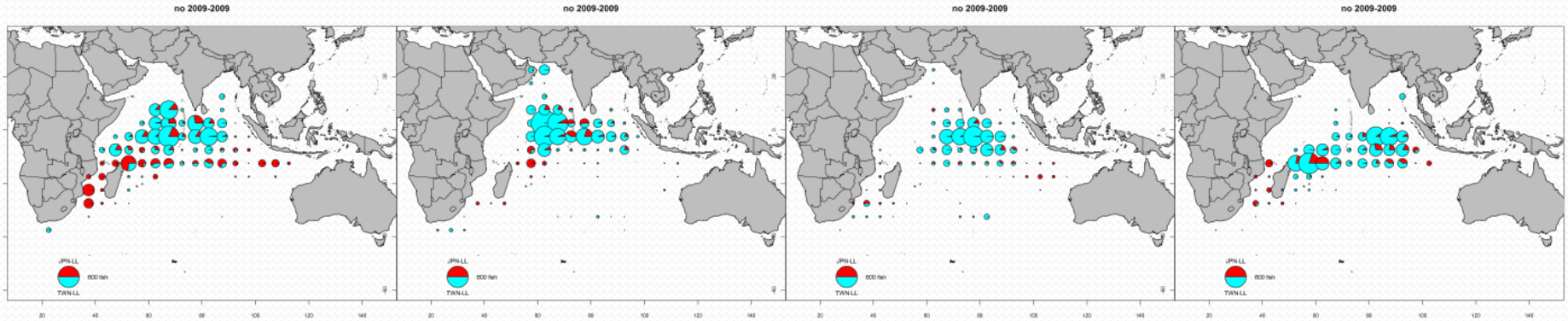


BUM catch by area main fleets

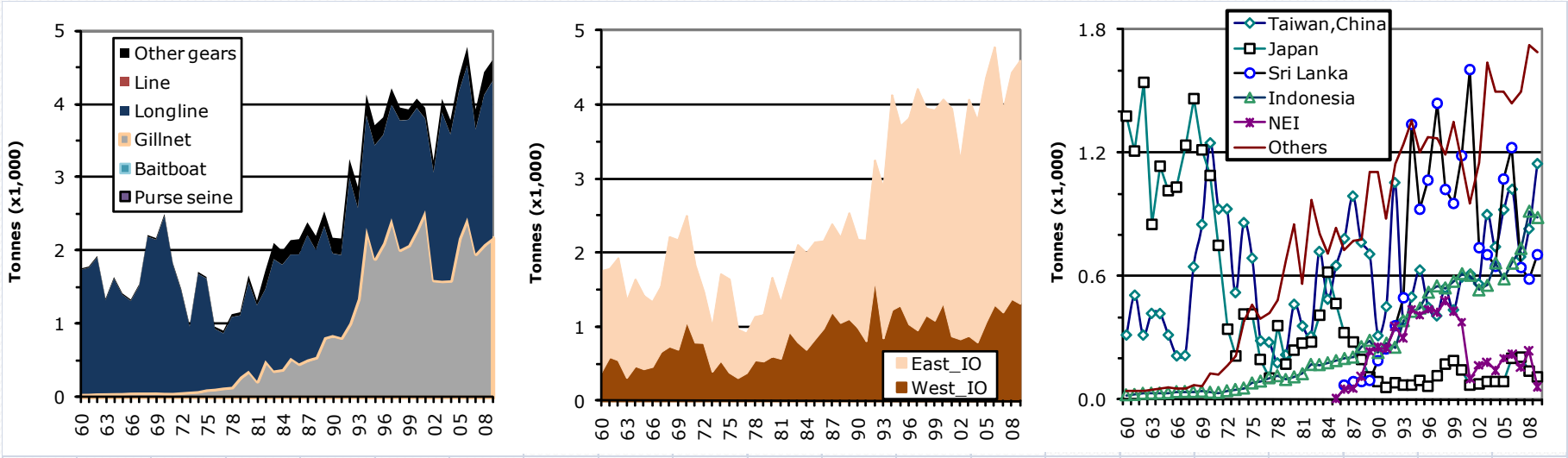
2005-08 by year



2009 by quarter



Catch trends: Black marlin

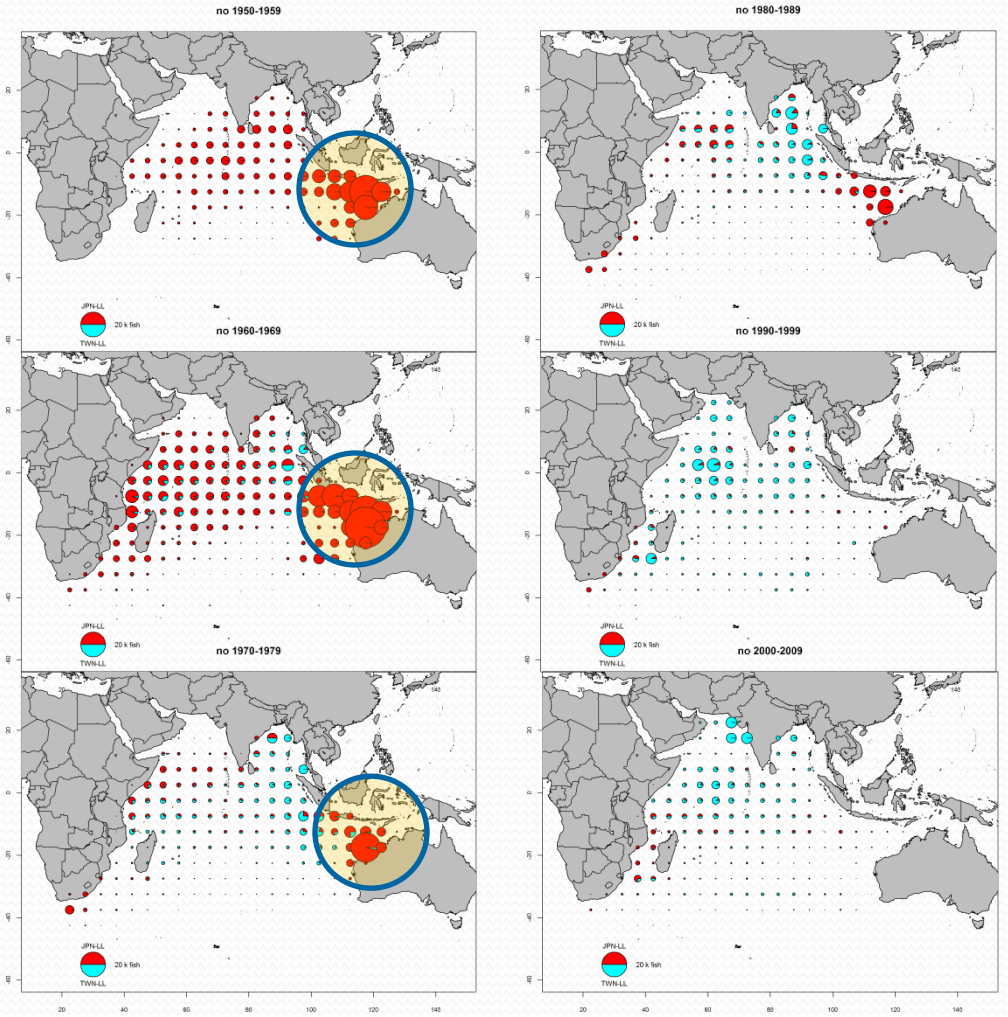


- Industrial and artisanal fisheries
- Longline (45%) and Gillnet (49%)
- Most catches from the East (72%)
- Indonesia (26%), Sri Lanka (19%), Taiwan,China (10%), India (9%), Japan, NEI
- Catches show an increasing trend (longline)

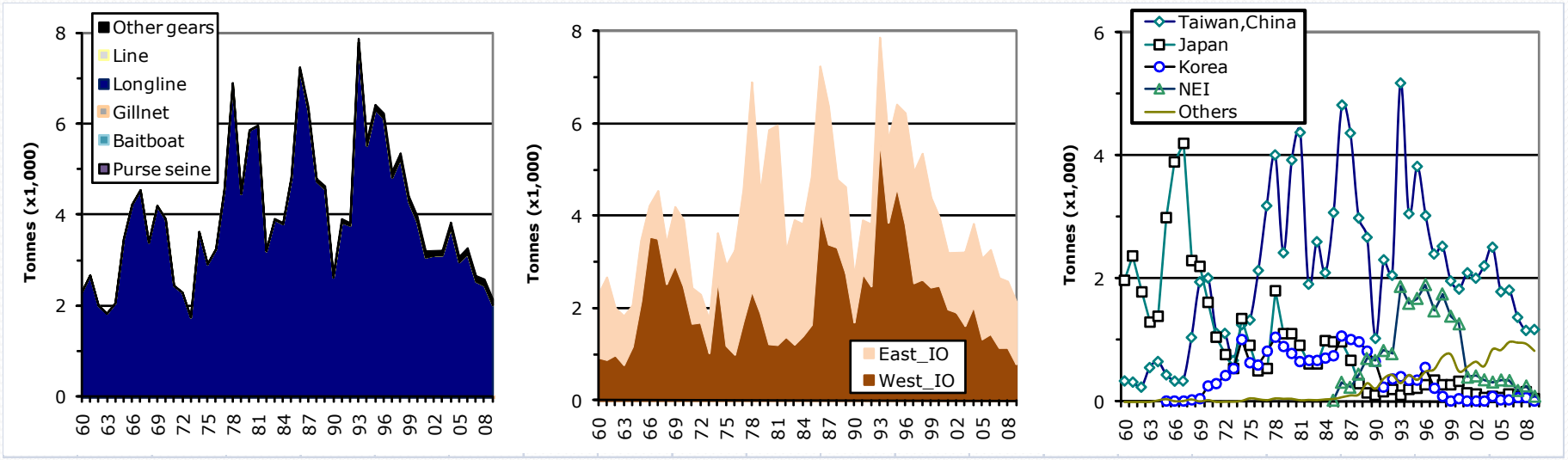
BLM catch by area main fleets

By decade
1950-2009

- **Japan**: Northwest Australia (1950-80); vessels licensed to fish within AUS EEZ (not since then); drop in catches since then.
- **Taiwan,China**: Different areas depending on the year and access agreements existing at the time
- Other fleets (not shown): Important catches off **Indonesia**, **India**, **Sri Lanka** and other coastal areas.



Catch trends: Striped marlin

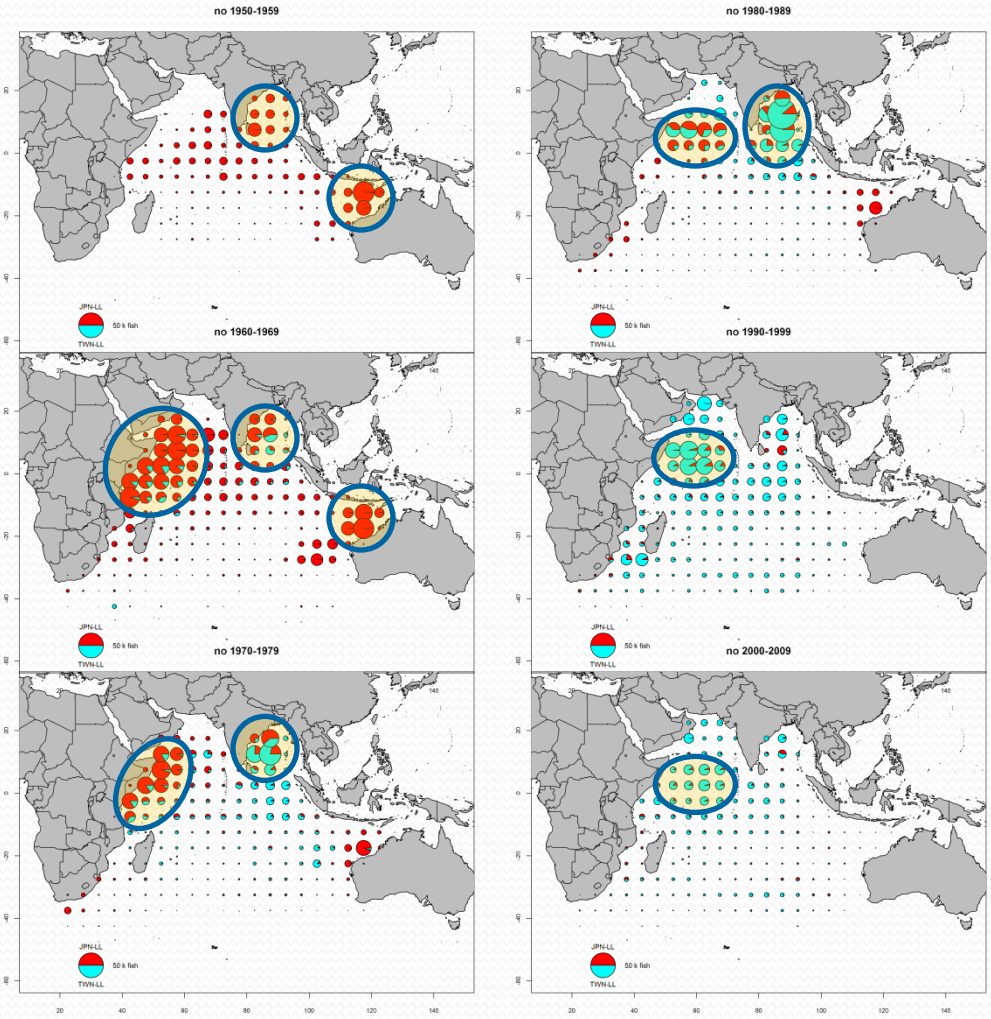


- Industrial fisheries: Longline (95%)
- Similar catches by area
- Taiwan (53%), Indonesia (13%), India, Japan, NEI
- Drop in catches since the mid-90's (especially in the West Indian Ocean)

MLS catch by area main fleets

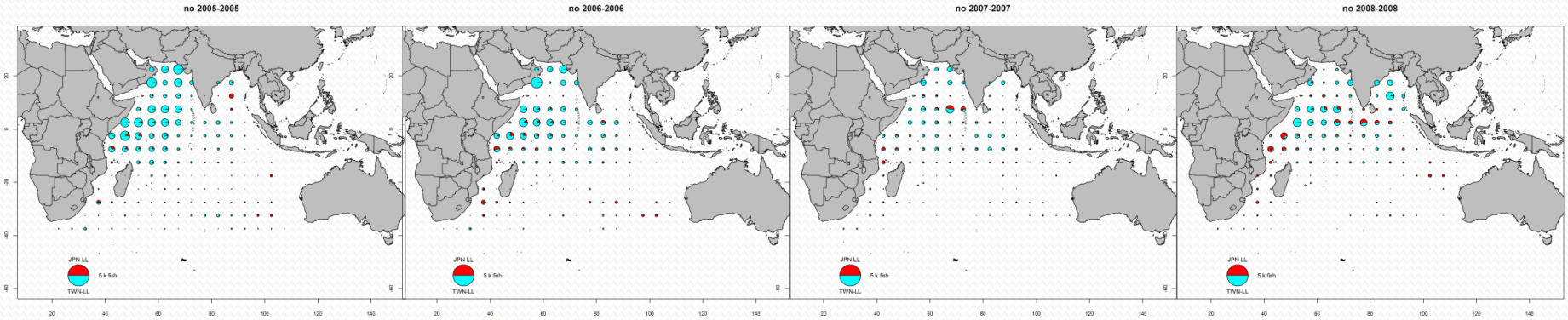
By decade
1950-2009

- **Longline**: Northwest Australia (up to 1970's),Western equatorial Indian Ocean, Bay of Bengal (Japan and Taiwan,China)
- Different areas depending on the year and access agreements existing at the time

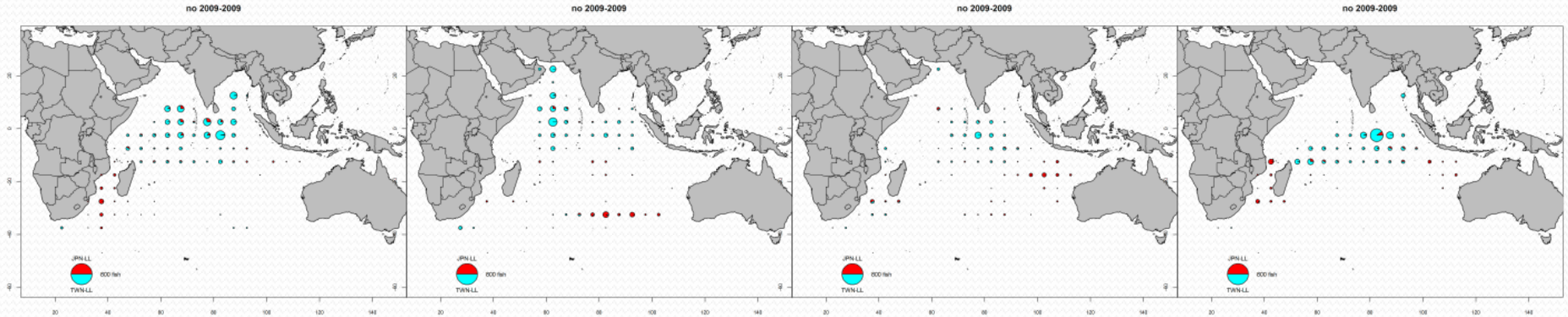


MLS catch by area main fleets

2005-08 by year

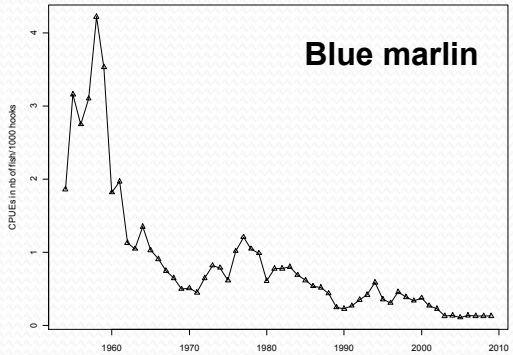


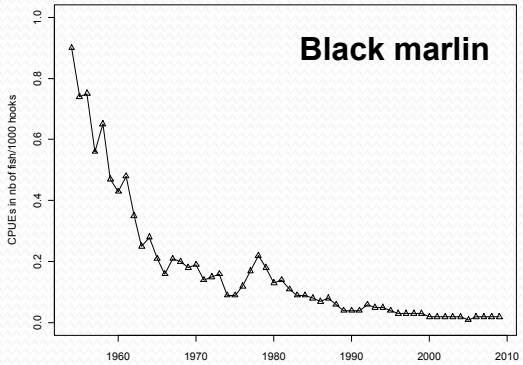
2009 by quarter

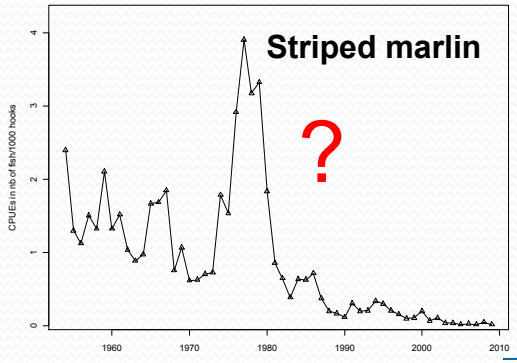




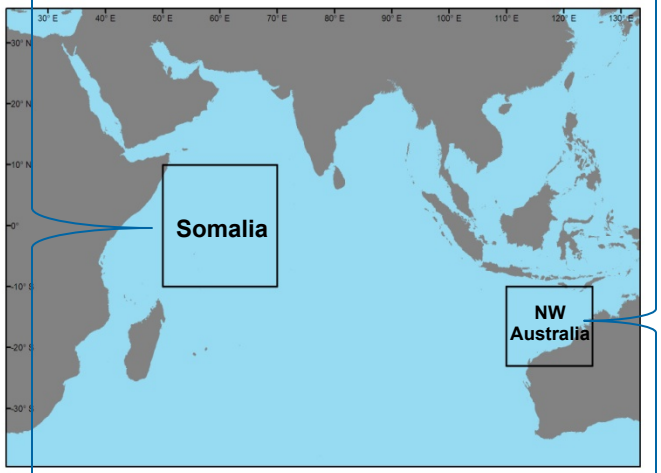
Marlins: Nominal CPUE trends Japan



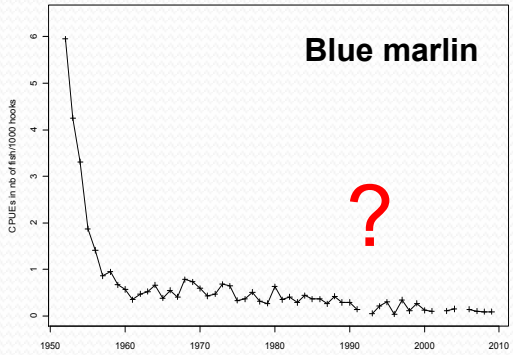


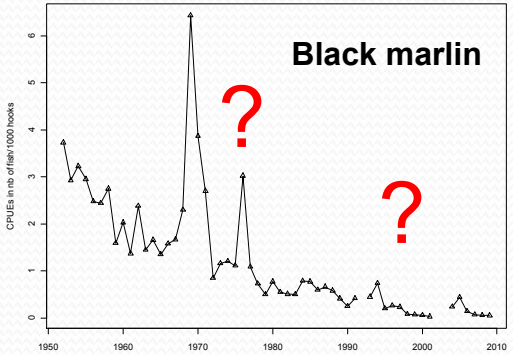


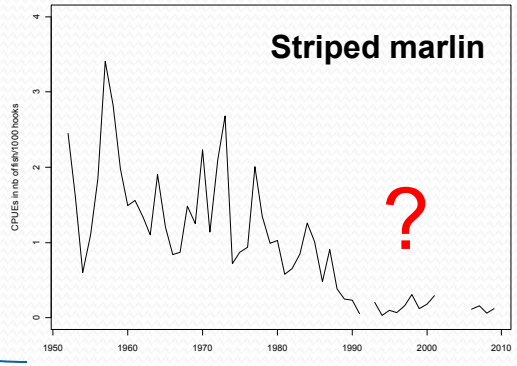
- **Somalia**: Drop in effort in recent years due to piracy



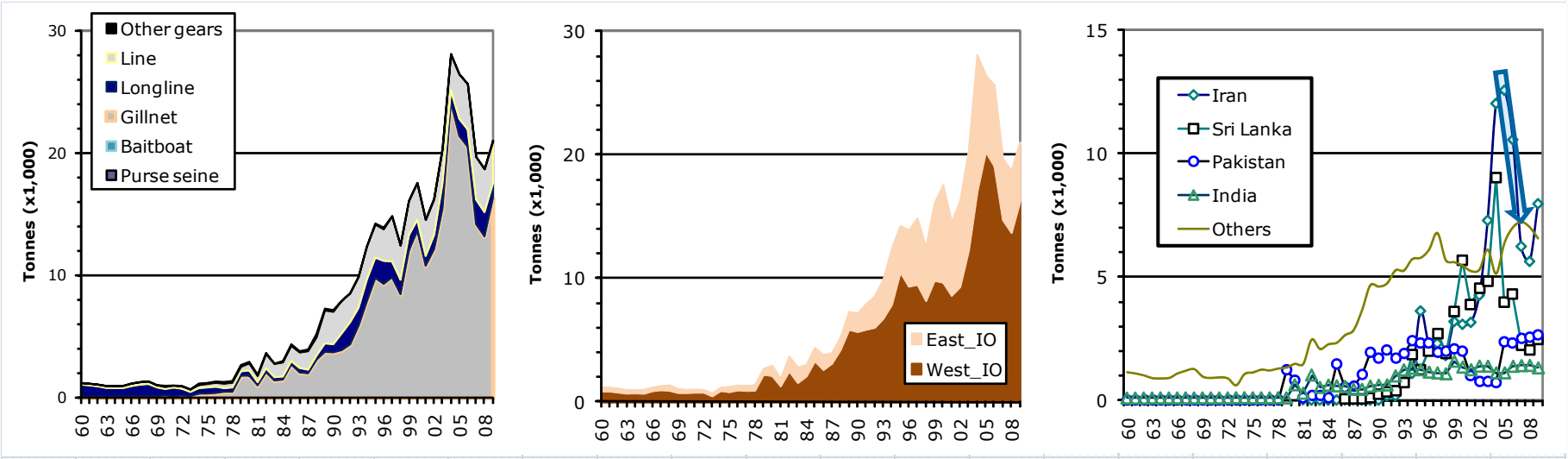
- **Northwest Australia**: Little effort in the area since the mid-80s (access agreement discontinued in the late-70s)







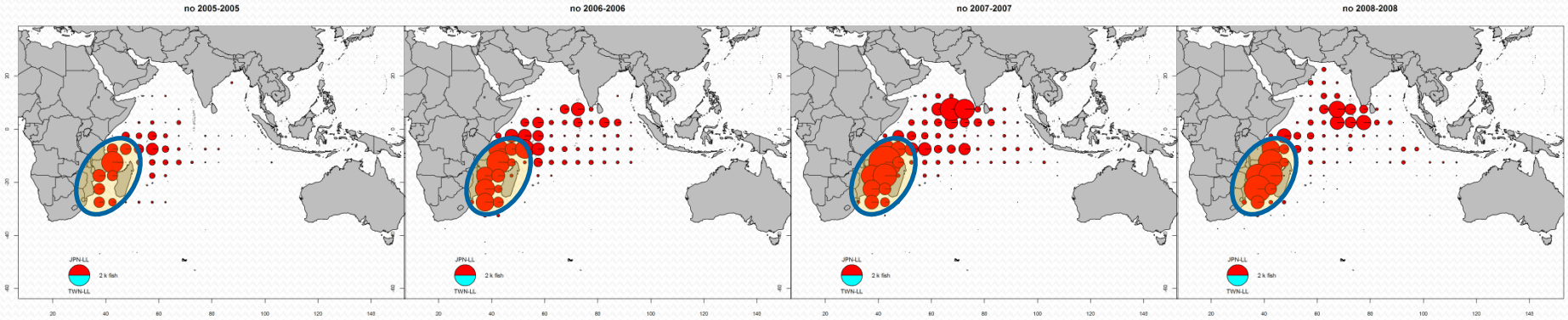
Catch trends: IP sailfish



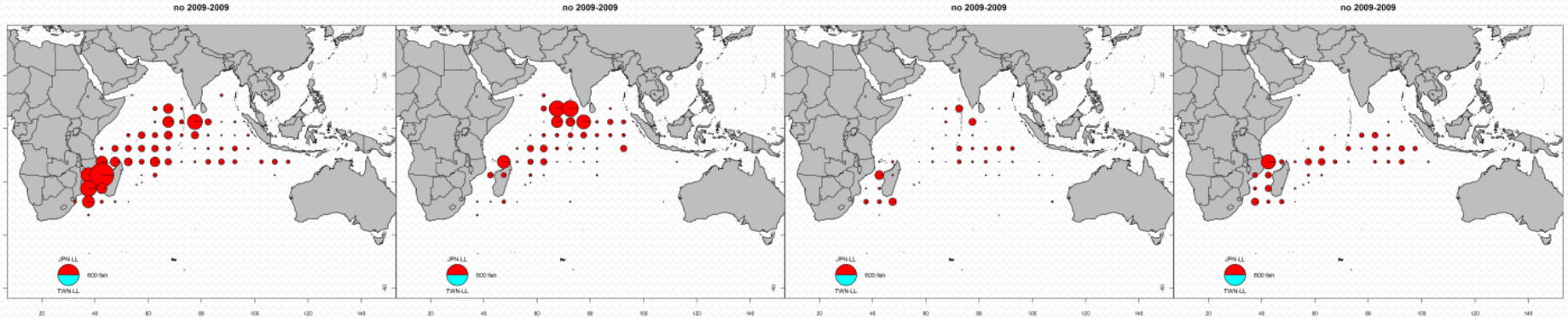
- Mostly artisanal fisheries
- Gillnet (77%), longline (7%), hand line, trolling (16%)
- Higher catches in the West (75%)
- Iran(39%), Sri Lanka(14%), Pakistan(11%), India(7%)
- Drop in catches in recent years (Iran, Sri Lanka)

SFA catch by area Japan LL

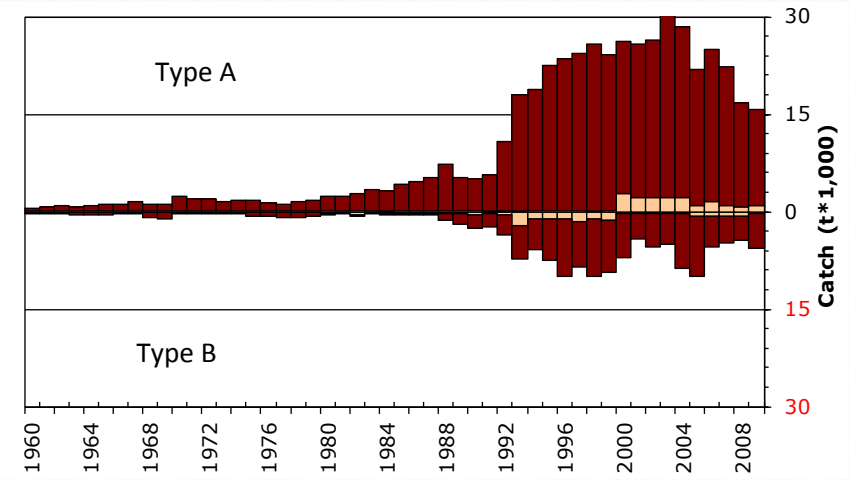
2005-08 by year

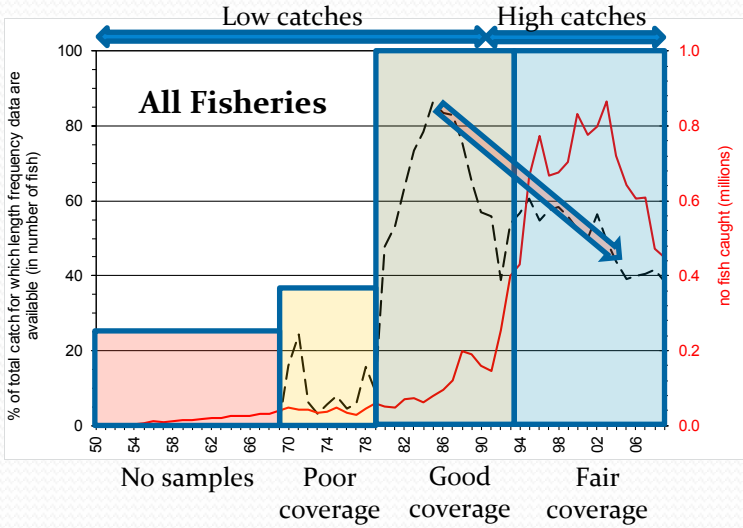


2009 by quarter



Data Status: Swordfish (i)





- *Retained catches*: uncertain for **Iran**, **Pakistan**, **Sri Lanka**, **NEI**, **India** and **Indonesia** (recent)
- *Discards* Low, unknown for the gillnet fishery of Iran
- *CPUE series*: not available for fresh-tuna longliners (before 2007) and drifting gillnets
  - Poor quality or not available for artisanal fisheries
- *Trends in average weight*: only available for Japan before 1980; cannot be derived for most artisanal fisheries; not available by sex
- *Catch-at-Size*: compromised due to the paucity of the size data from some fisheries (**Iran**, **Pakistan**, **NEI**, **India** and all **artisanal**) and the lack of **sex-ratio** information. The samples available from the main fleets may not be representative of the fisheries.
- *Catch-at-Age*: Estimates compromised due to the above issues

Data Status: Swordfish (ii)

NC	Source	Catch units	Resolution	Raised
JPN	Landings	MT	Year IO basin	Yes
TWN				

CE	Source	Catch units	Resolution	Raised
JPN	Logbooks	#	Year-Month-5°square Area	Yes
TWN		# & kg		No

SF	Source	Unit Measur.	Resolution	Raised
JPN	Fishermen Observers	GGT EFL	Year-Quarter-10°Lat*20°Lon Area	No
TWN	Fishermen	LJFL		

- **Estimation of alternative series of catches for swordfish(i):**
  - Data used: datasets provided by Japan and Taiwan,China:
    - Nominal catch (**NC**): Total catch of swordfish in weight (metric tons) by fleet, gear, year and Indian Ocean basin (East-West)
    - Time-area catches (**CE**): Catches of swordfish (in numbers and/or weight) by month and five degrees square grid
    - Size frequency data (**SF**): Number of swordfish sampled by size class bin (length or weight), quarter and 10° Latitude by 20° Longitude area

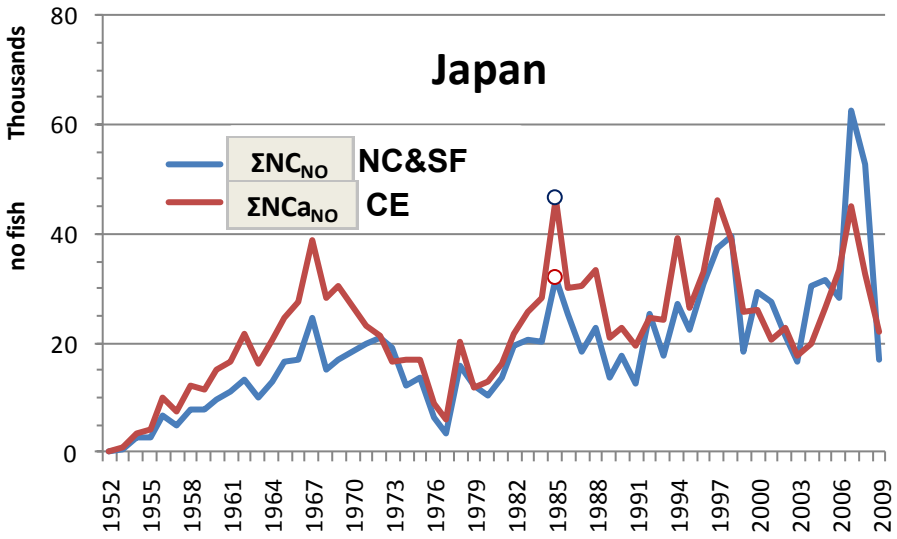
Data Status: Swordfish (iii)

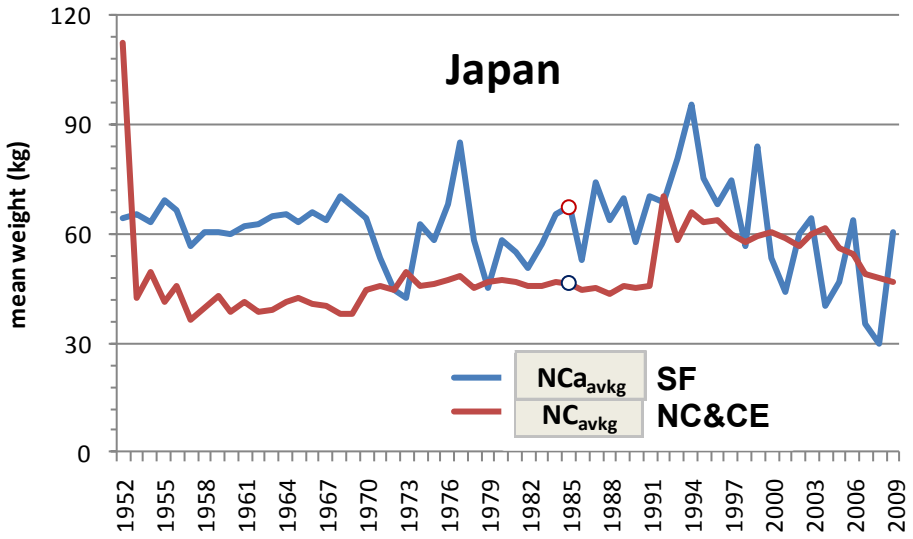
- **Estimation of alternative series of catches for swordfish(ii):**
  - Main assumptions:
    - **NC represents the best estimates of total catch of swordfish in weight** by JPN and TWN LL fleets
    - **CE represents an unbiased sample of the distribution of the catches [and effort] in time and space** by JPN and TWN LL fleets
    - **SF represents an unbiased sample of the distribution of sizes of swordfish caught in time and space** by JPN and TWN LL fleets
  - If the above is true:
    - **Average weights derived by**:
      - **JPN**: **Using total catches in weight** (NC) **and total catches in number** (CE), aggregated by year
      - **TWN**: Using **catches in weight** (CE) and **catches in number** (CE), aggregated by year
    - **Shall be equal or similar to average weights derived from the size frequency data** (SF) available for each fleet

Example

Data Status: Swordfish (iv)

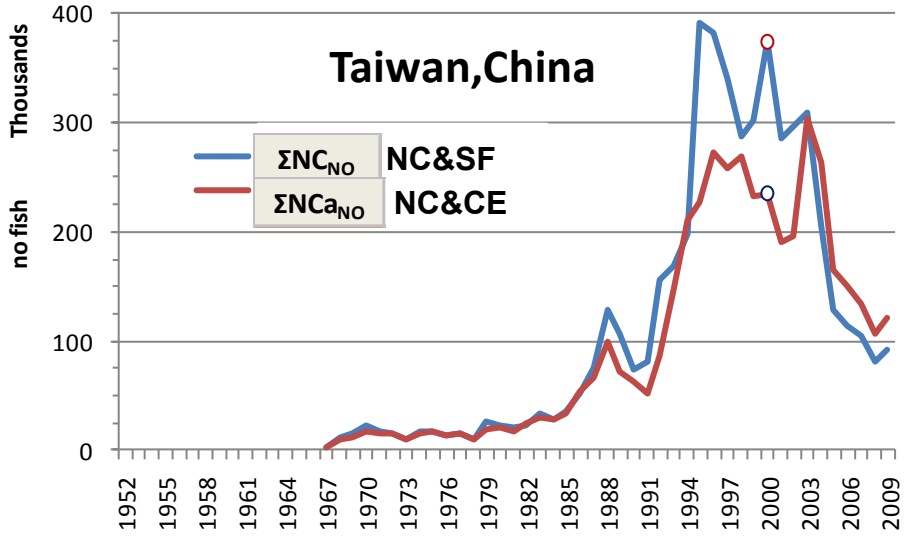
- **Estimation of alternative series of catches for swordfish(iii):**
  - Results(i): Number of fish and average weight estimated
    - Longline Japan

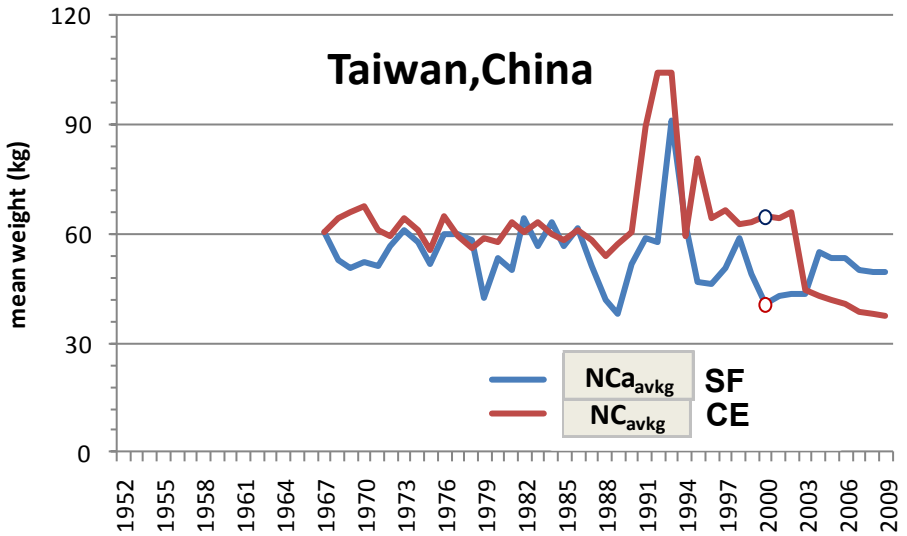




Data Status: Swordfish (v)

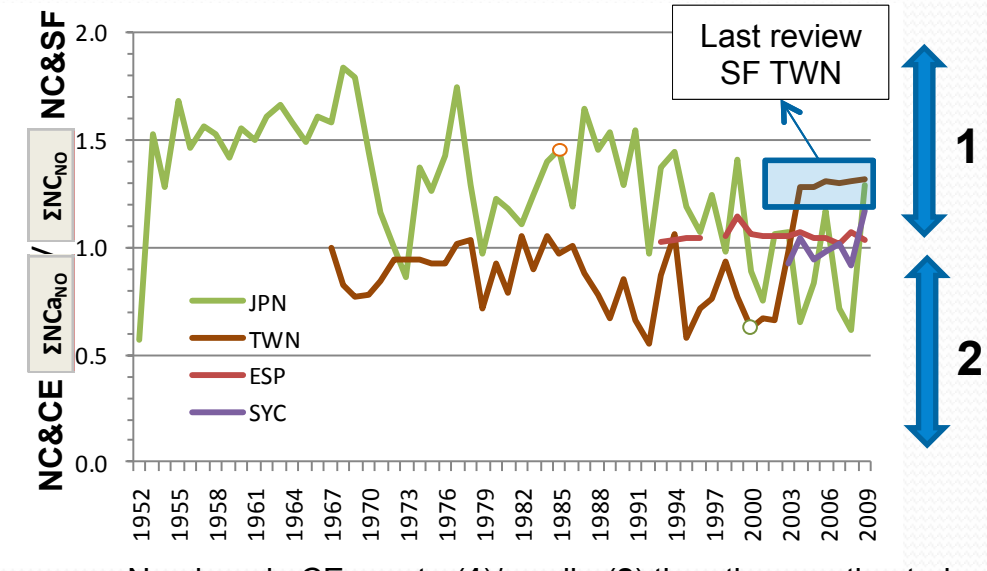
- **Estimation of alternative series of catches for swordfish(iv):**
  - Results(ii): Number of fish and average weight estimated
    - Longline Taiwan,China





Data Status: Swordfish (vi)

- **Estimation of alternative series of catches for swordfish(v):**
  - Results(iii): Index (ΣNCa_{NO}) / (ΣNC_{NO}) estimated for Japan, Taiwan,China, EU-Spain and Seychelles



Numbers in CE greater(**1**)/smaller(**2**) than those estimated using average weights derived from SF

- Japan:
  - Before 2000: Number of SWO estimated from samples higher than total numbers caught reported
  - 2000 and after: no clear trend
- Taiwan,China:
  - Before 2004:Number of SWO estimated from samples lower than total numbers caught reported
  - 2004 and after: numbers higher (1.3)
- Spain & Seychelles: Values consistent (≈1)

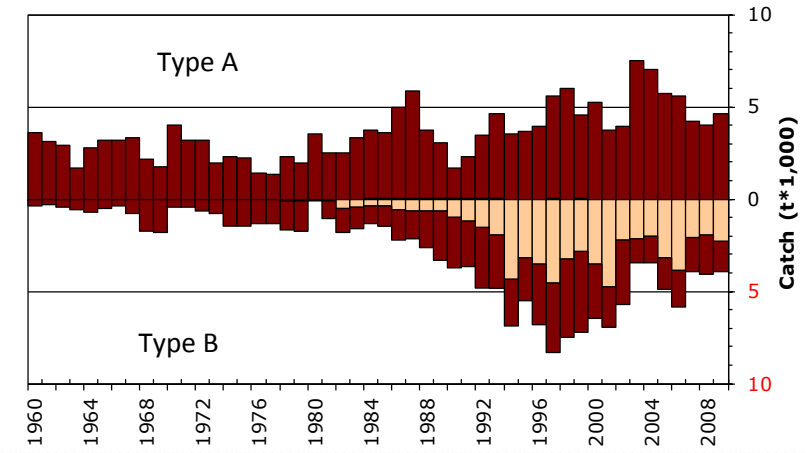
Data Status: Swordfish (vii)

- **Estimation of alternative series of catches for swordfish (vi):**
  - What are the options then?

Believe	Use Catches in weight (similar options apply to catch in number)
NC & SF	• **Total catches in weight (NC), as provided by JPN and TWN** • **Samples of SWO, as provided by JPN and TWN (SF)**
CE & SF	• Total catches in weight estimated using total numbers derived from CE and average weights estimated from SF • Samples of SWO, as provided by JPN and TWN (SF)
NC & CE	• Total catches in weight (NC), as provided by JPN and TWN • Average weights estimated using total catches in weight (NC or CE) and total catches in number derived from CE

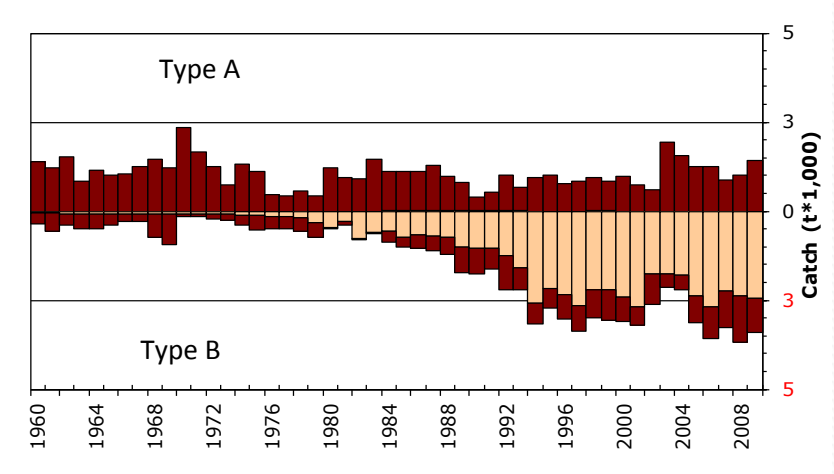
  - The Secretariat used NC & SF; is this correct ?
    - Only if we assume that CE data are biased: the catches that we would obtain using total numbers derived from CE and average weights derived from SF would be higher (JPN) or lower (TWN) for most years.
      - **But then what about CPUE????**

Data status: Blue marlin



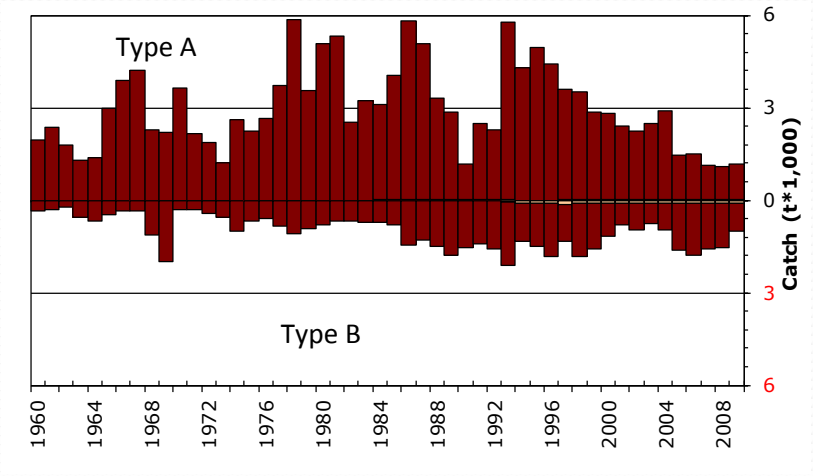
- *Retained catches*: poorly known for drifting gillnets (**Iran, Pakistan, Sri Lanka**) and some longline fisheries (aggregated or not reported)
- *Discards* not known for driftnets and longline fisheries
- *CPUE series*: available for some longline fisheries (Japan, Taiwan,China)
  - Poor quality or not available for some longline and most small-scale fisheries
- *Trends in average weight*: not available before 1970 for most industrial fisheries; cannot be derived for most artisanal fisheries; not available by sex
- *Catch-at-Size*: not available as insufficient length frequency data (artisanal)
- *Catch-at-Age*: [sex]-length-age keys not available for the Indian Ocean

Data status: Black marlin



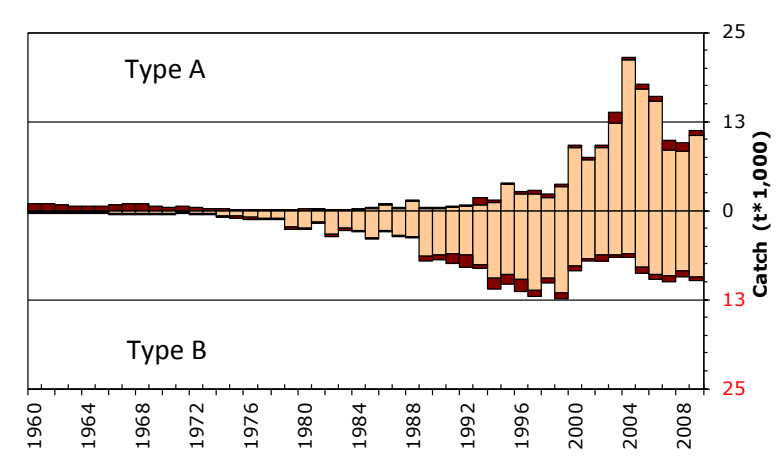
- *Retained catches*: poorly known for drifting gillnets (**Iran, Pakistan, Sri Lanka**), some longline and most artisanal fisheries (aggregated or not reported)
- *Discards* not known for driftnets and longline fisheries
- *CPUE series*: available for some longline fisheries (Japan, Taiwan,China)
  - Inaccurate or not available for some longline and most sport and artisanal fisheries
- *Trends in average weight*: not available before 1970 for most industrial fisheries; cannot be derived for most artisanal fisheries; not available by sex
- *Catch-at-Size*: not available as insufficient length frequency data (artisanal)
- *Catch-at-Age*: [sex]-length-age keys not available for the Indian Ocean

Data status: Striped marlin



- *Retained catches*: Well known for main longline fisheries (Japan, Taiwan,China); poorly known for driftnet fisheries (**Iran, Pakistan, Sri Lanka**)
- *Discards* not known for driftnets and longline fisheries
- *CPUE series*: available for some longline fisheries (Japan, Taiwan,China)
- *Trends in average weight*: not available before 1970 for most industrial fisheries; not available by sex; sample sizes are usually low (Japan)
- *Catch-at-Size*: not available
- *Catch-at-Age*: not estimated

Data status: IP sailfish



- *Retained catches*: poorly known for some artisanal fisheries (aggregated or not reported) and most industrial fisheries
- *Discards* unknown for most industrial fisheries, mainly longliners
- *CPUE series*: available for the sport fishery of Kenya; not reliable for most industrial fisheries (incomplete catches)
- *Trends in average weight*: not available before 1970 and sample sizes very low since then; not available by sex
- *Catch-at-Size*: not available as insufficient length frequency data (artisanal)
- *Catch-at-Age*: not estimated due to the paucity of length data

Summary of main data issues	Imp	Actions	Follow-up
CE from ARTISANAL and SPORT fisheries • *Poor species breakdown for billfish caught in **Sri Lanka** (coastal and offshore fisheries)*	H	Planned Samp+DB	Sec-OFCF
• *Uncertain catches from the artisanal fisheries of Indonesia and India (no CE data)*	M	Ongoing Rept.Sys.	Secret.
• *Lack of data from most Sport fisheries*	M	Planned Project.Prop.	Secret.
CE from Industrial fisheries • *Very incomplete data from the driftnet fisheries of Iran and Pakistan*	H	Planned Samp+DB	Sec-OFCF
• *Uncertain catches of swordfish and marlins for the longline fisheries of the Republic of Korea and Indonesia*	M	None	Sec-OFCF
• *Very incomplete catches for the longline fisheries of India*	M	None	Secret.
SF from All fisheries • *Low sampling coverage and non-representativeness of samples for the longline fisheries of Japan and Taiwan,China*	H	None	National Admins.
• *Lack of size data from the driftnet fisheries of Iran and Pakistan*	H	Planned Samp+DB	Sec-OFCF
• *Biased length samples for the gillnet/longline fishery of Sri Lanka*	H	Planned Samp+DB	Sec-OFCF
• *Lack of size data for the longline fisheries of India, Oman and Taiwanese fresh-tuna longliners*	M	None	National Admins.
• *Lack of size data from the artisanal fisheries of India and Indonesia*	M	Ongoing Rept.Sys.	Secret.
Lack of Biological Data for some billfish species	M	Planned Project.Prop.	Secret.

IOTC Data Section: Future Plans

- Support to field activities in coastal countries:
  - **IOTC-OFCF Project** Phase III:
    - Concluded May 2011**:** Census small-scale fisheries in **Comoros**
    - Planned July 2011: Strengthening of data management system for the fisheries in **Sri Lanka** and **Iran**
    - Planned March 2012: Workshop on the estimation of catches from the artisanal fisheries of **Indonesia**
    - Under consideration: Follow-up **Indonesia**'s data collection and processing systems for longline fisheries
  - **IOTC Secretariat**: Use of accumulated funds to:
    - **Assist the implementation of sampling programmes** in developing countries of the Indian Ocean so as the minima levels of coverage for artisanal fisheries set by the Commission (5% of levels of activity) can be achieved
    - Carry out a study to **assess the feasibility of close-to-real-time reporting of catches** (in particular **YFT** and **BET**) **by month** for small-scale fisheries in the Indian Ocean

    So far:
    - Ongoing (1 year)**:** Sampling survey for catch, effort and size data and new data management system in **Comoros**
    - Ongoing: Consultant (Dr. Guillermo Moreno) assessing the Status of data collection and reporting systems for artisanal fisheries in the region, in particular the fisheries in [**Comoros**], **India**, **Indonesia**, [**Iran**], **Kenya**, **Madagascar**, **Maldives**, **Oman**, [**Pakistan**], **Tanzania**, [**Yemen**]
    - **Planned:** Sampling survey for catch, effort and size data for gillnet fisheries in **Iran**
    - **Under consideration (NARA):** Sampling survey for catch, effort and size data in **Sri Lanka**

    Other activities may be initiated depending on identification of additional funds

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

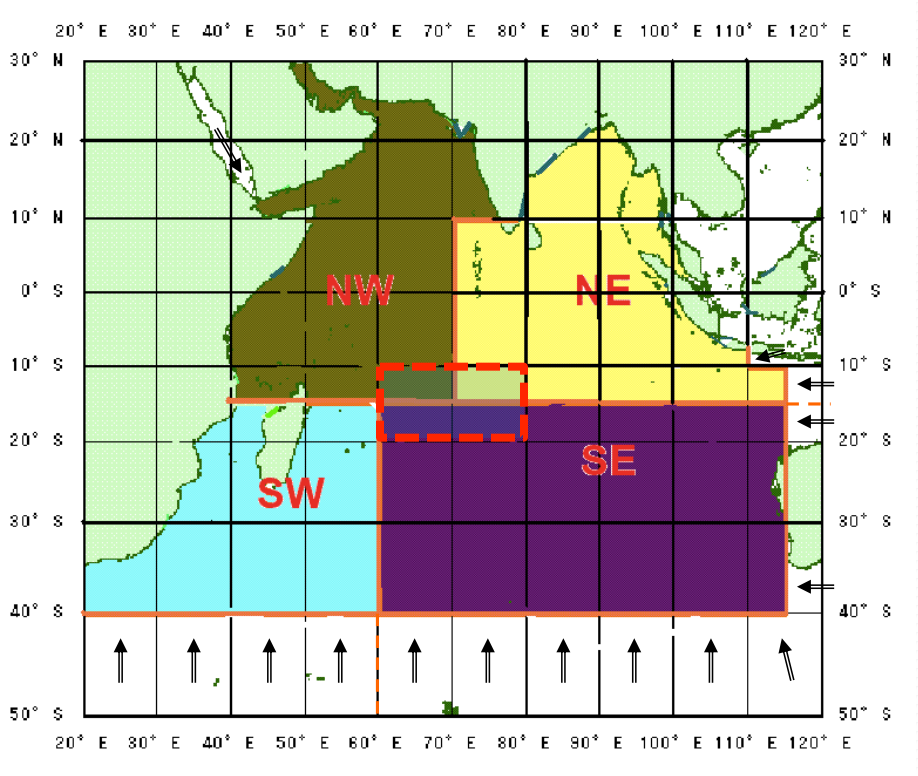
Thanks for your attention

Swordfish Stock Assessments

- Preparation of datasets:
  - Stock assessment models using length frequency samples
  - Stock assessment models using estimates of Catch-At-Size (CAS)
  - Stock assessment models using estimates of Catch-At-Age (CAA)

- Including:
  - Estimates of total catch of swordfish in weight and number by Assessment Fishery, Year, Quarter and Assessment Area
  - Tables containing samples and estimates of CAS and CAA for the above strata

Areas used for the assessment



Length frequency samples for Japan and Taiwan longline fleets had to be broken by area for 10° lat*20° lon areas overlapping assessment areas (e.g. area shown in red)

Assessment fisheries

Fishery	*Description*	*Total Catch 50-09*	*% 50-09*	*% 05-09*
ALGI	Contains data for all gillnet, trolling and other minor artisanal fisheries	36,012	**6**	**6**
AUEL	Contains data for the longline fishery of Australia (target is SWO)	11,763	**2**	**1**
EUEL	Contains data for EU longliners plus other longliners assimilated to EU longliners, all targetting SWO	83,779	**13**	**37**
ISEL	Contains data for the semi-industrial longline fleets operating in Reunion, Mayotte, Madagascar, Mauritius and the Seychelles, which also target SWO	27,395	**4**	**6**
JPLL	Contains data for the longline fishery of Japan plus other fleets assimilated to the Japanese fleet (e.g. South Korea, Thailand, Oman)	76,747	**12**	**7**
TWFL	Contains data for the fresh-tuna longline fleets of Taiwan and Indonesia, plus other fresh-tuna longline fleets assimilated to those and all sport fisheries and fleets operating hand lines	47,653	**8**	**10**
TWLL	Contains data for the large scale tuna longline fleet of Taiwan plus other longline fleets assimilated to the Taiwanese fleet (a component of the Taiwanese fleet may target SWO)	348,842	**55**	**33**

Main needs

- Clarify issues concerning total catch of drifting gillnets (**Iran**, **Pakistan**) and longlines of **Indonesia** and **India**
- Clarify issues concerning representativeness of CE and SF data for the longline fisheries of **Japan** and **Taiwan,China**
- CPC's to increase length data collection and reporting to the IOTC
  - **Japan** to resume size sampling on commercial vessels
  - **Taiwan** to collect size data from fresh tuna longliners
  - **Japan** and **Taiwan** to provide historical SF data by month and 5x5 area
  - **Iran** and other countries having artisanal fisheries, gillnet in particular, to collect and report size data to the IOTC
  - CPC's to collect data on swordfish length by sex (sex-ratio)
- IOTC Secretariat to revisit the estimation of CAS
  - Substitution scheme and minimum sample number