REVIEW OF FISHERIES TRENDS FOR TROPICAL TUNA SPECIES

PREPARED BY: IOTC SECRETARIAT, 3 OCTOBER 2011

PURPOSE

To provide the Working Party on Tropical Tunas (WPTT) with a range of fishery indicators, including catch and effort trends, for fisheries catching tropical tuna species in the IOTC Area of Competence.

BACKGROUND

Prior to each WPTT meeting the Secretariat develops a series of maps, figures and tables that highlight historical and emerging trends in the fisheries data held by the Secretariat. This information is used during each WPTT meeting to inform discussions around stock assessment and in developing advice to the Scientific Committee.

RECOMMENDATION

That the Working Party on Tropical Tunas **NOTE** the range of fishery indicators provided in this paper, and to inform the Secretariat if variations of the indicators or new indicators are required to aid the WPTT in developing its advice to the Scientific Committee.

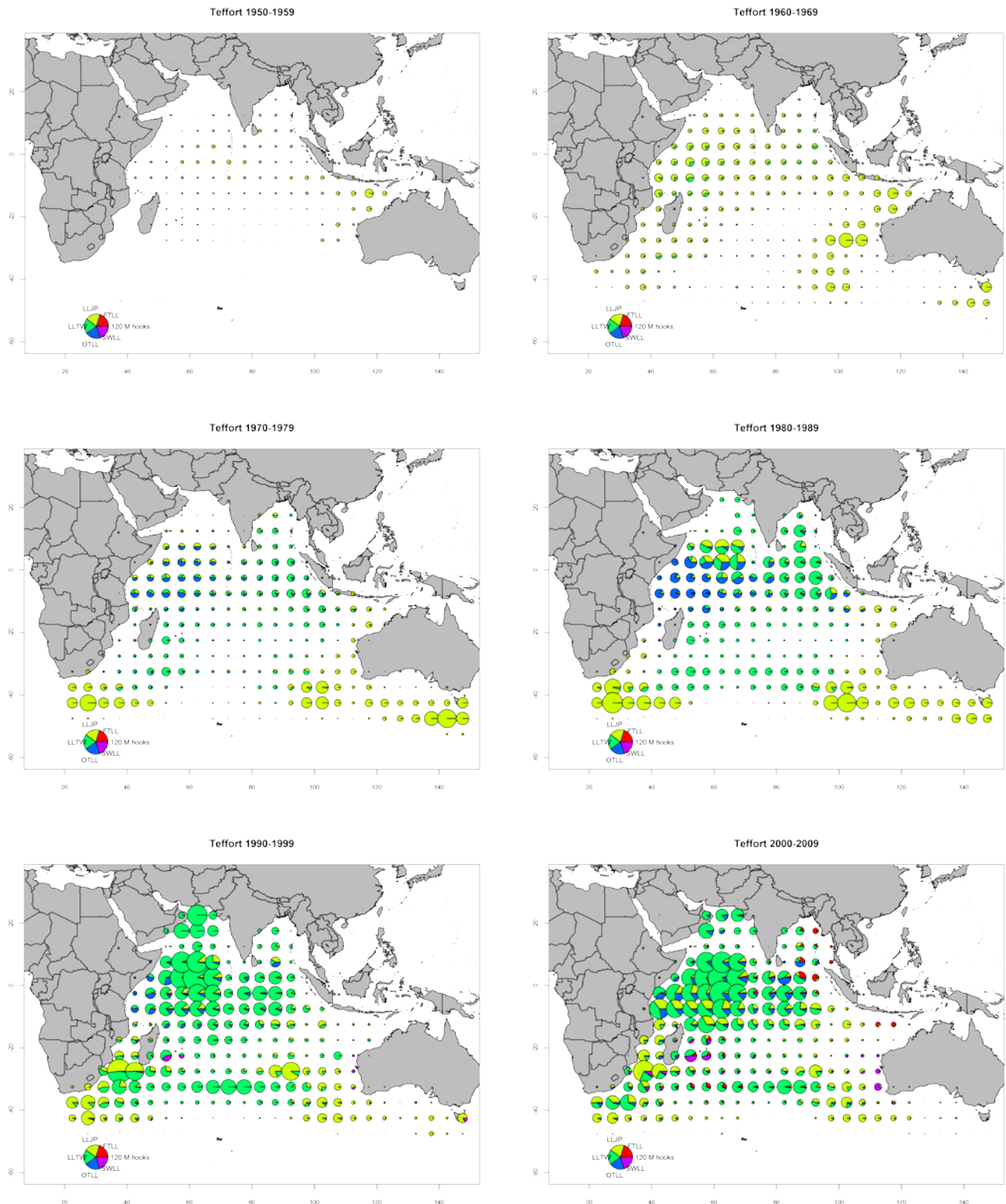# 1. EFFORT

a) *Longline*

Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, by decade and main fleet (1950-2009):

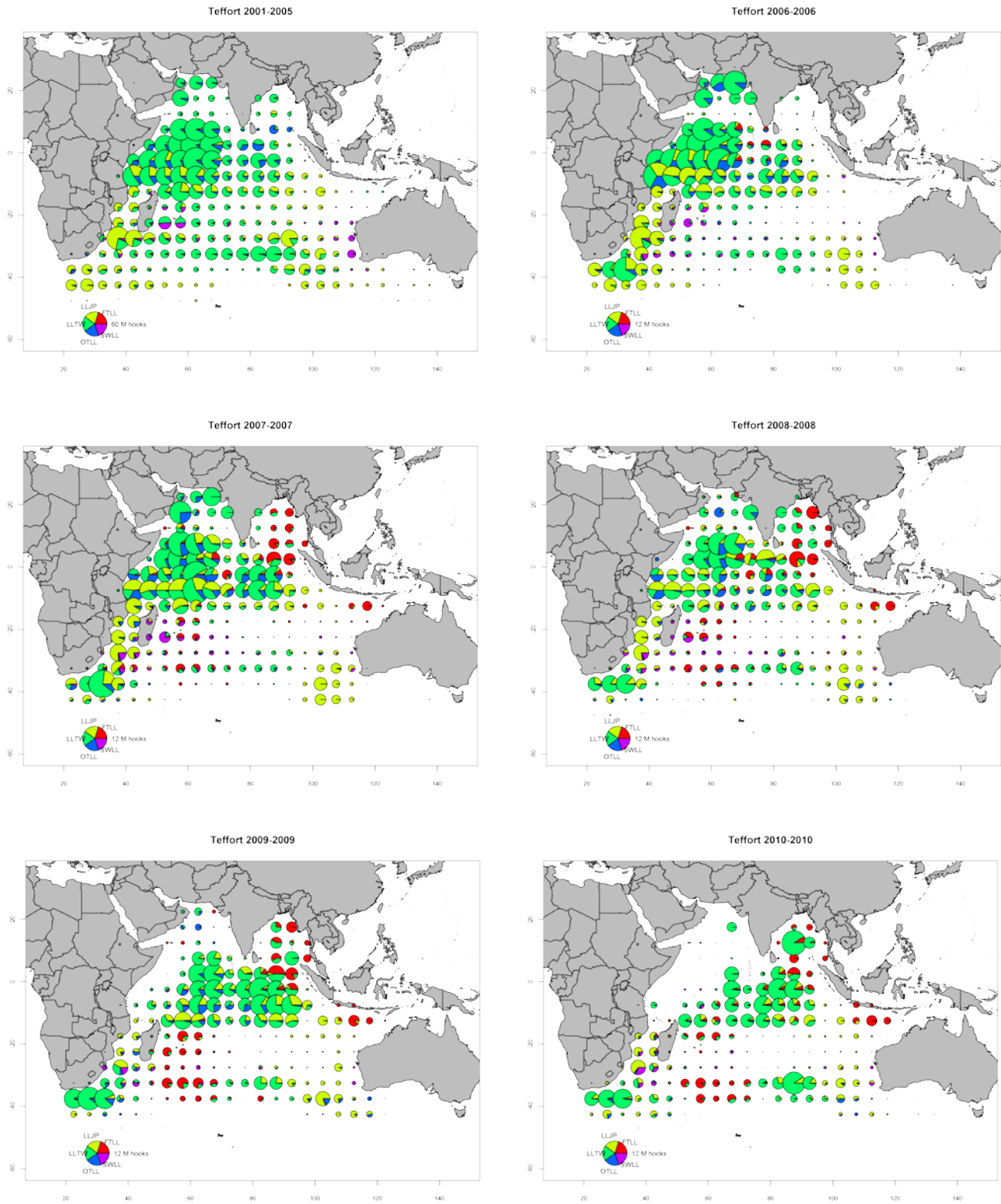Deep-freezing longliners from Japan (LLJP (light green)) and Taiwan,China (LLTW (dark green))

SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)

FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)

OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)

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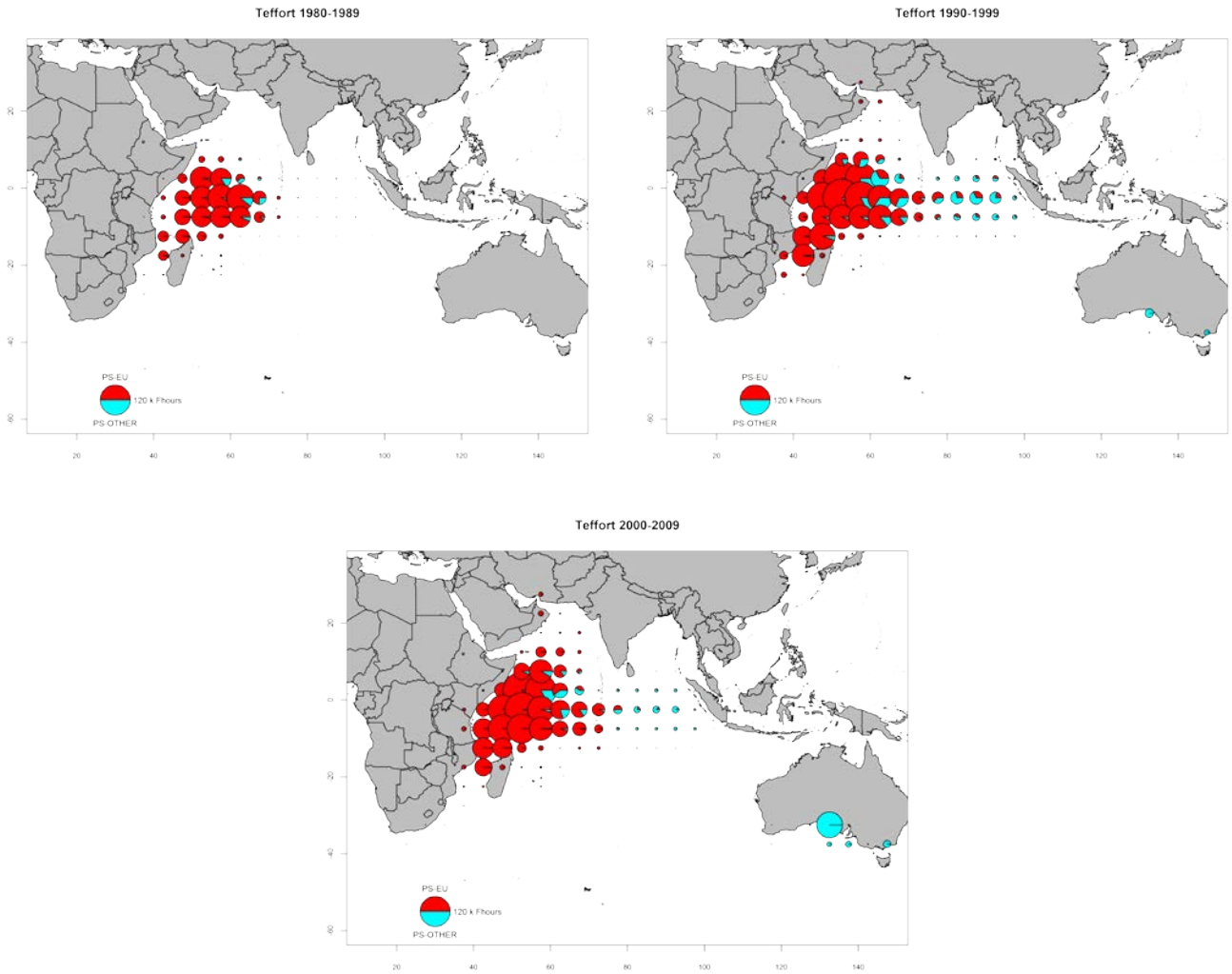
Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, for 2001-05 and 2006-10, by year, quarter, and main fleet:
Deep-freezing longliners from Japan (LLJP (light green)) and Taiwan,China (LLTW (dark green))
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)
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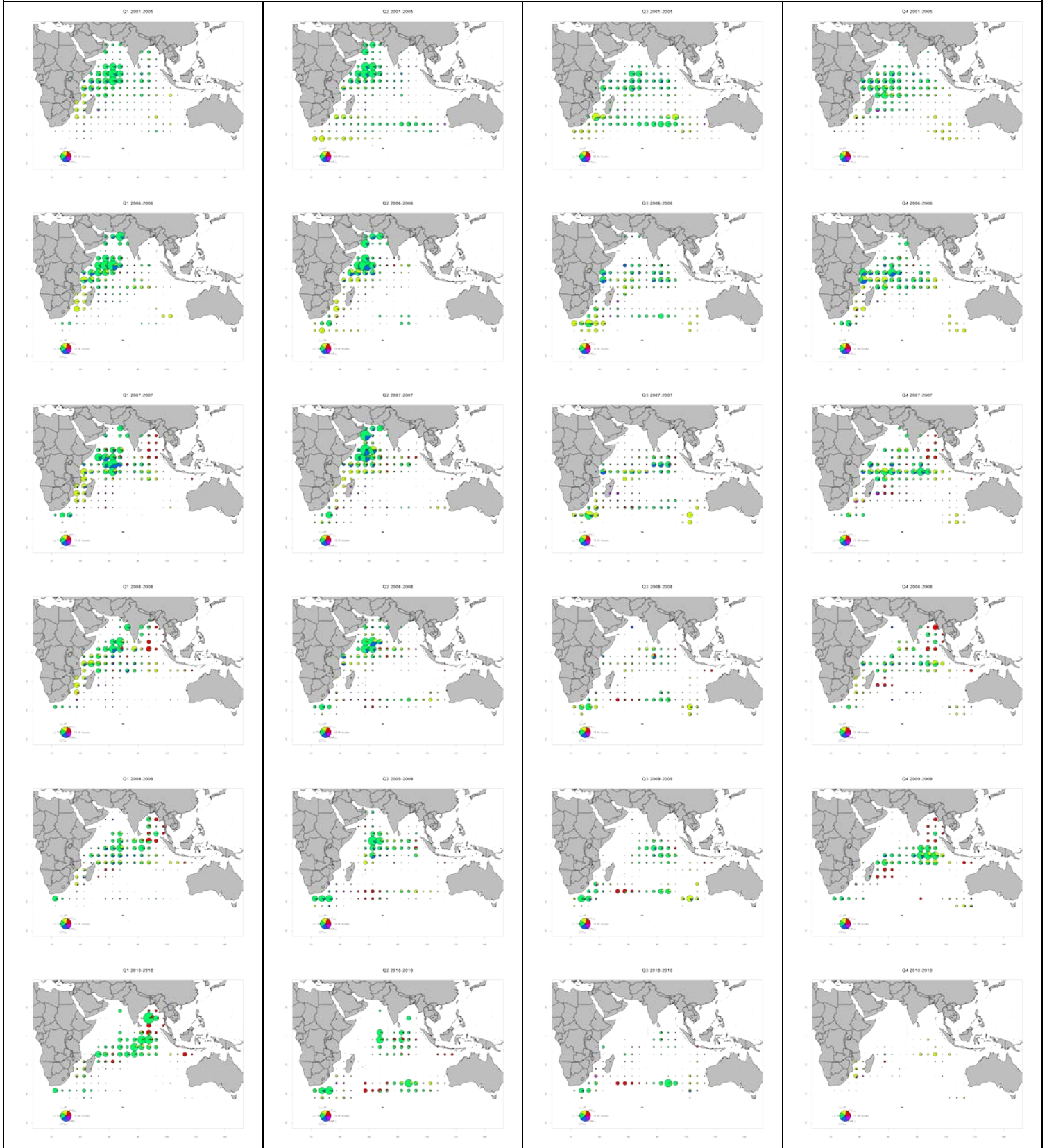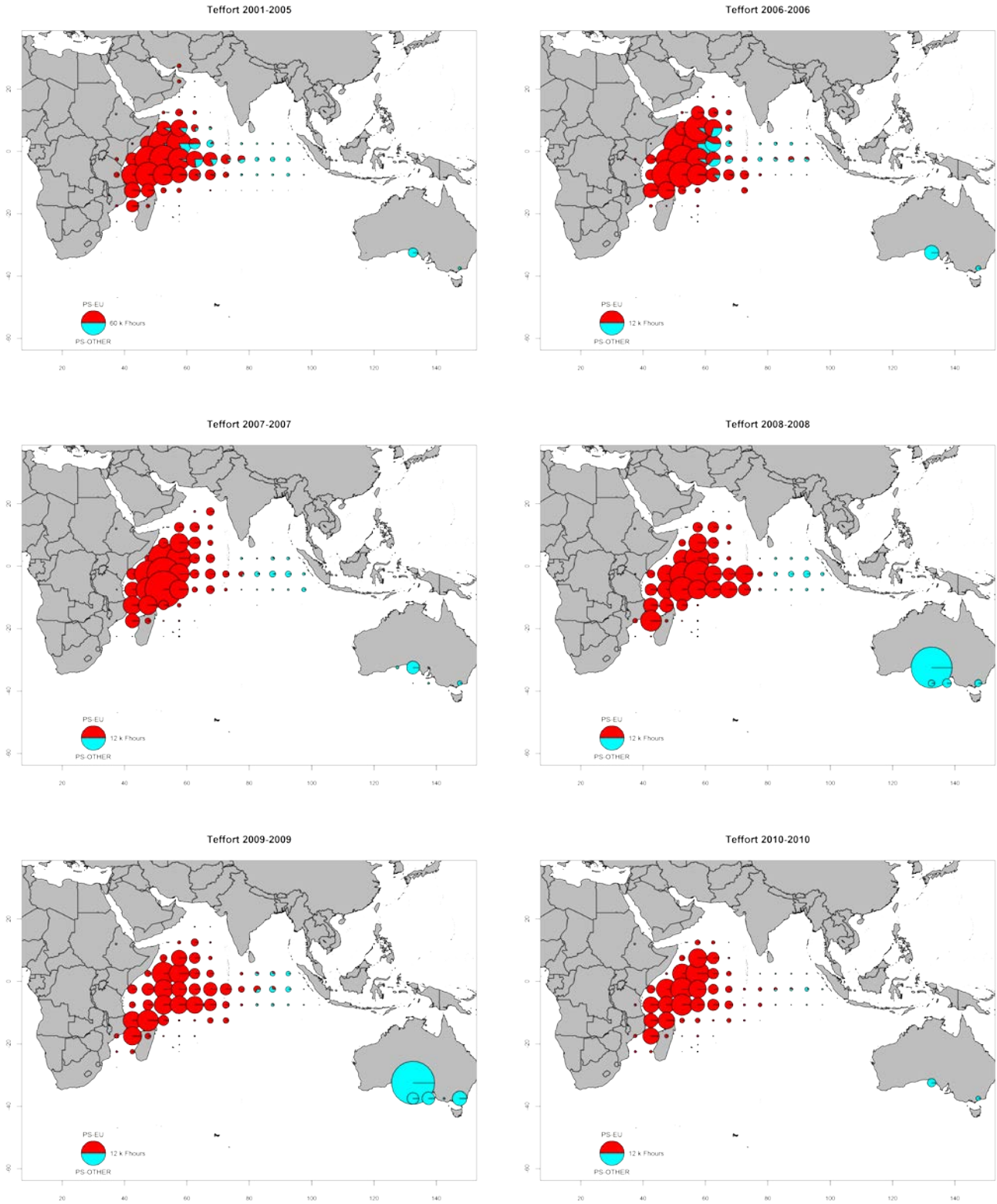
b) *Purse seine*

Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), by decade and main fleet (1980-2009):
PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)
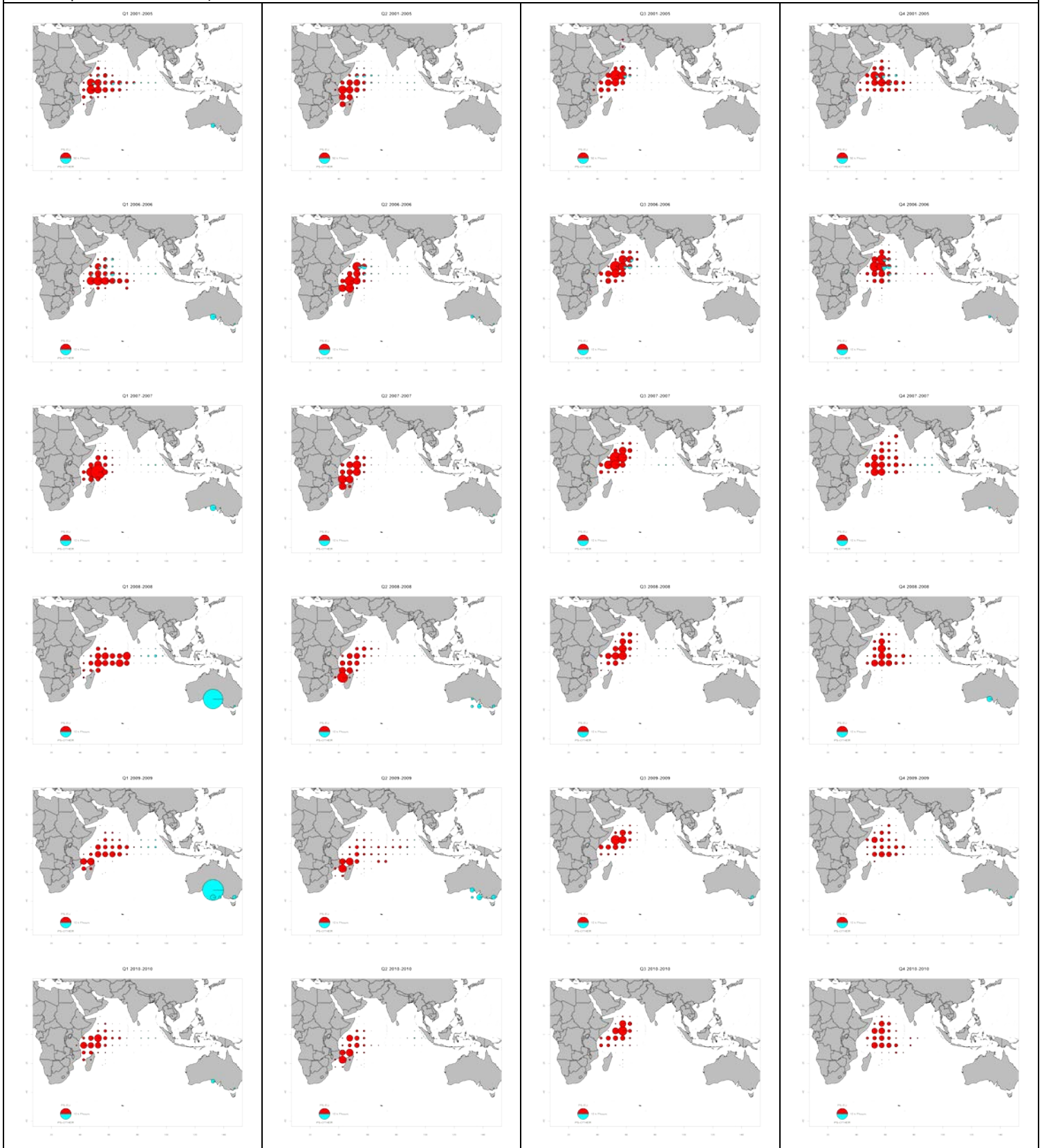PS-OTHER (green): Industrial purse seiners from other fleets (includes Australia, Japan, Mauritius and purse seiners of Soviet origin) (excludes effort data for purse seiners of Iran)

Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), for 2001-05 and 2006-10, by year, and main fleet:

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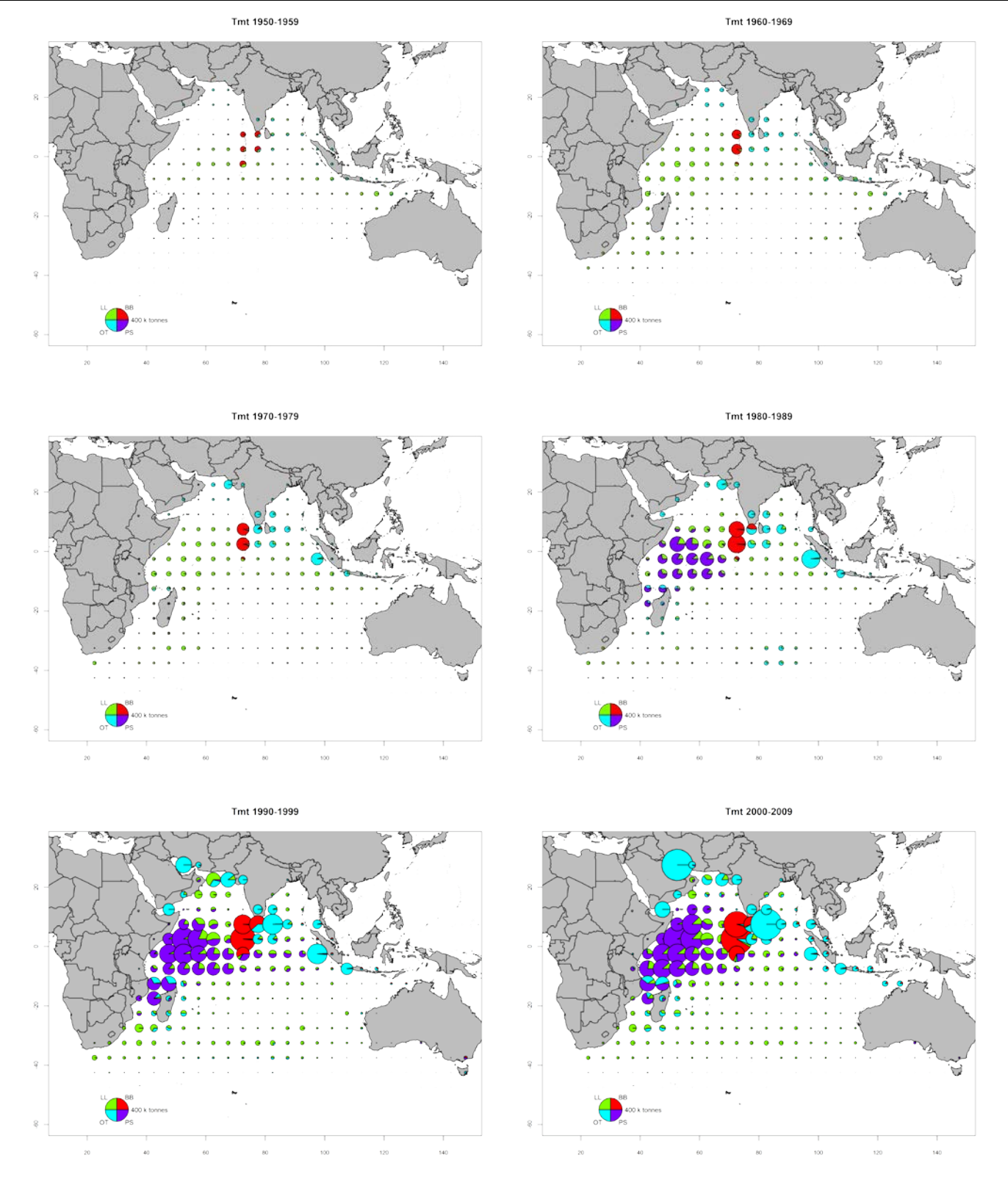## 2. TIME-AREA CATCHES

a. Major species: By gear

Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated by gear and decade (1950-2009):

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine (PS, purple) from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets.

Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

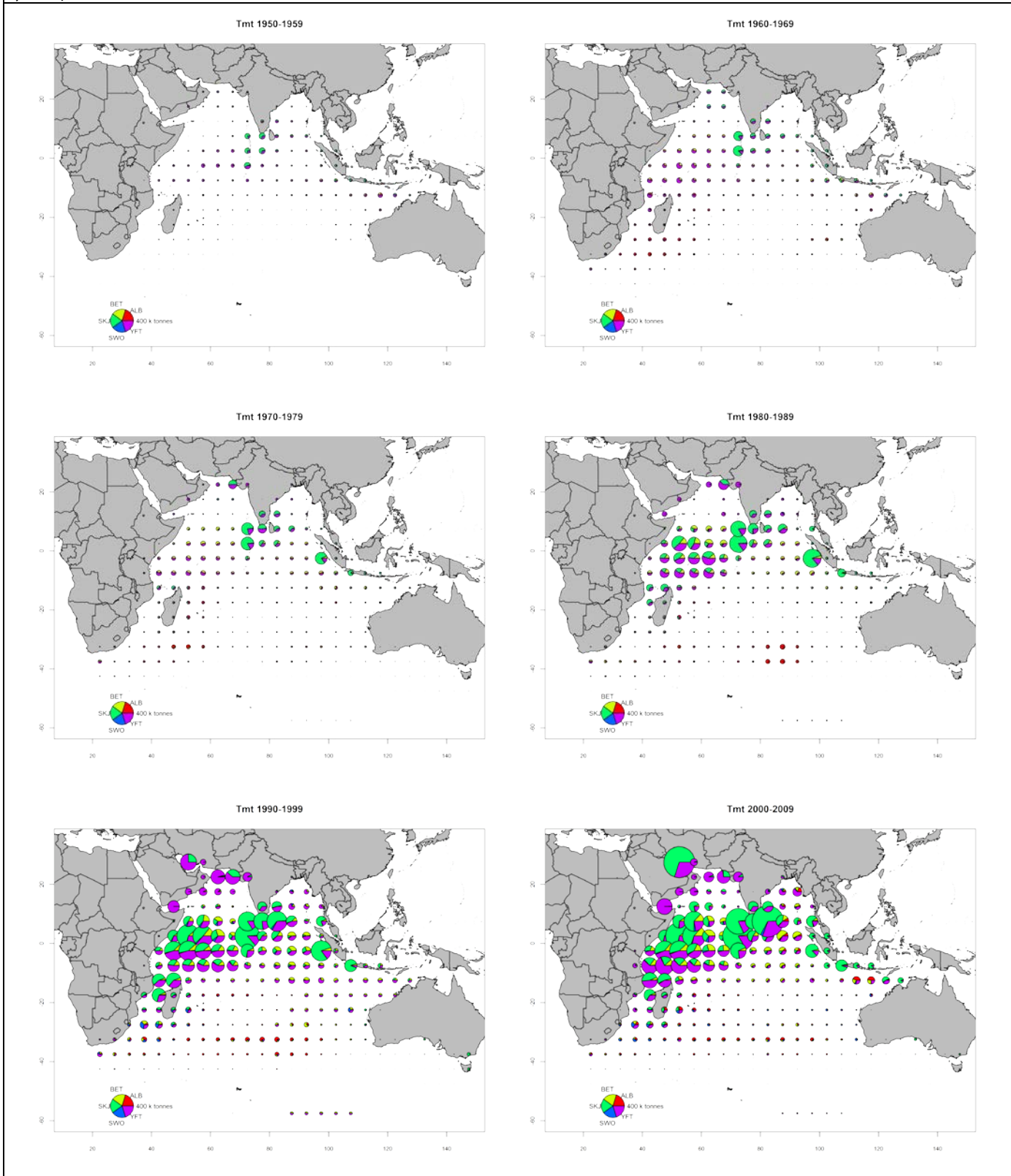Other fleets (OTHR, blue): other fleets, especially small-scale fisheries operating in coastal waters.

Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated for 2001-05 and 2006-10, by year and gear:

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Tmt 2001-2005

Tmt 2006-2006

Tmt 2007-2007

Tmt 2008-2008

Tmt 2009-2009

Tmt 2010-2010
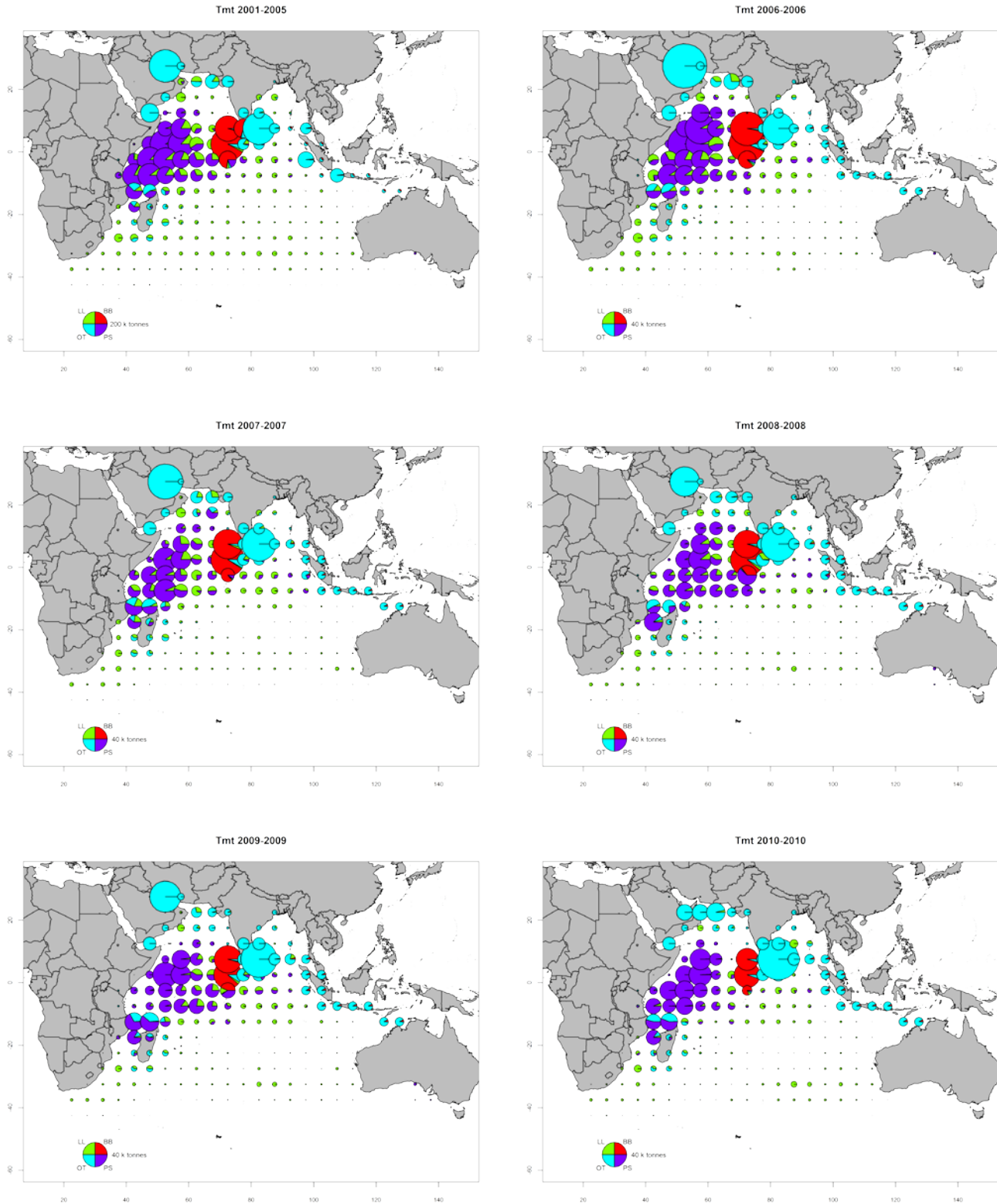
b. Major species: By species

Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated by species and decade (1950-2009):
Albacore (ALB, red); yellowfin tuna (YFT, purple); swordfish (SWO, dark blue); skipjack tuna (SKJ, bright green); bigeye tuna (BET, light yellow)

Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated for 2001-05 and 2006-10, by year and species:

Albacore (ALB, red); yellowfin tuna (YFT, purple); swordfish (SWO, dark blue); skipjack tuna (SKJ, bright green); bigeye tuna (BET, light yellow)
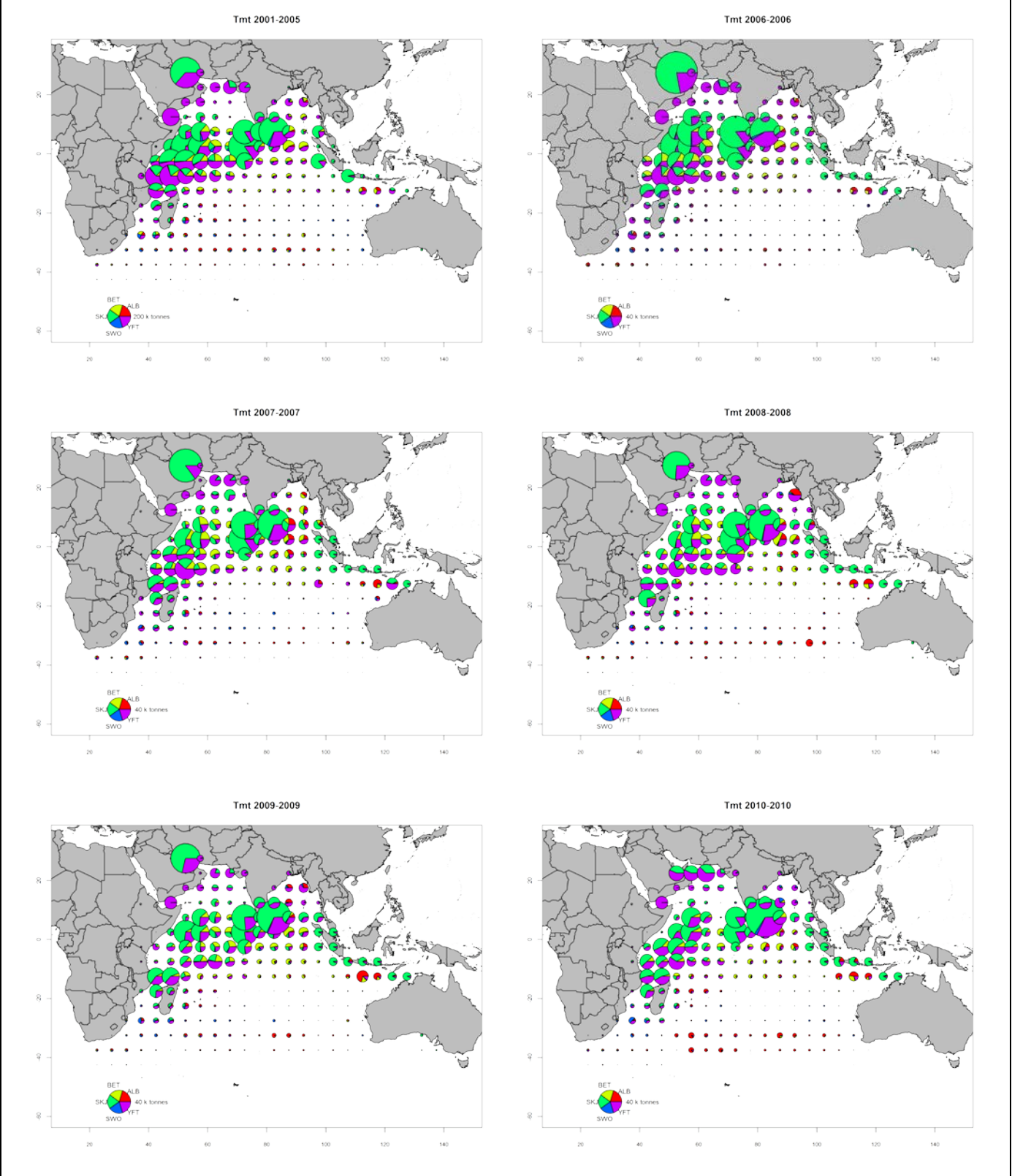
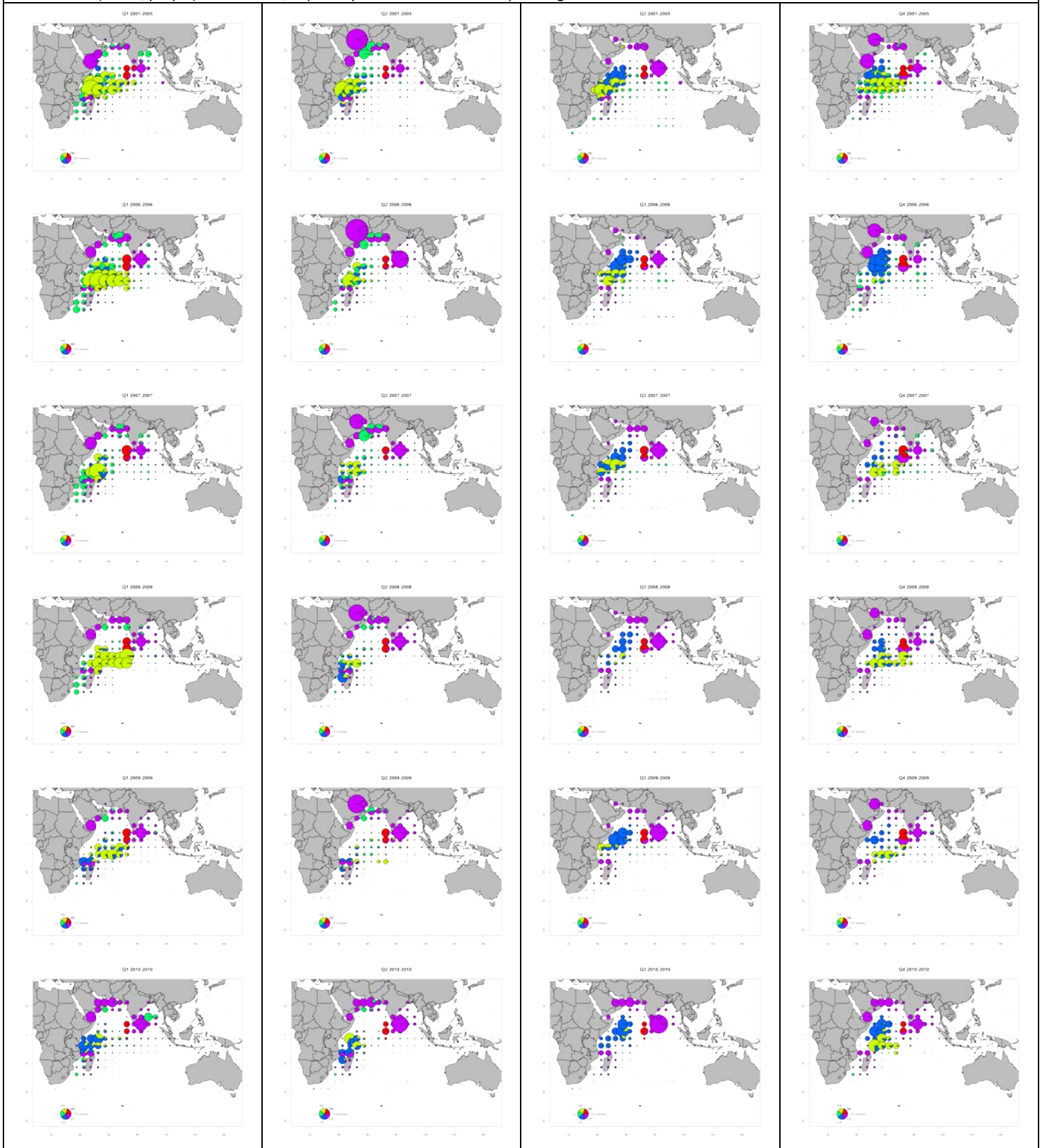## c. Yellowfin tuna (YFT): Recent catches

Time-area catches (total combined in tonnes) of YFT estimated for 2001-05 and 2006-10, by year, and quarter:
Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.
Purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on free-swimming (FS, dark yellow) or associated (LS, dark blue) schools.
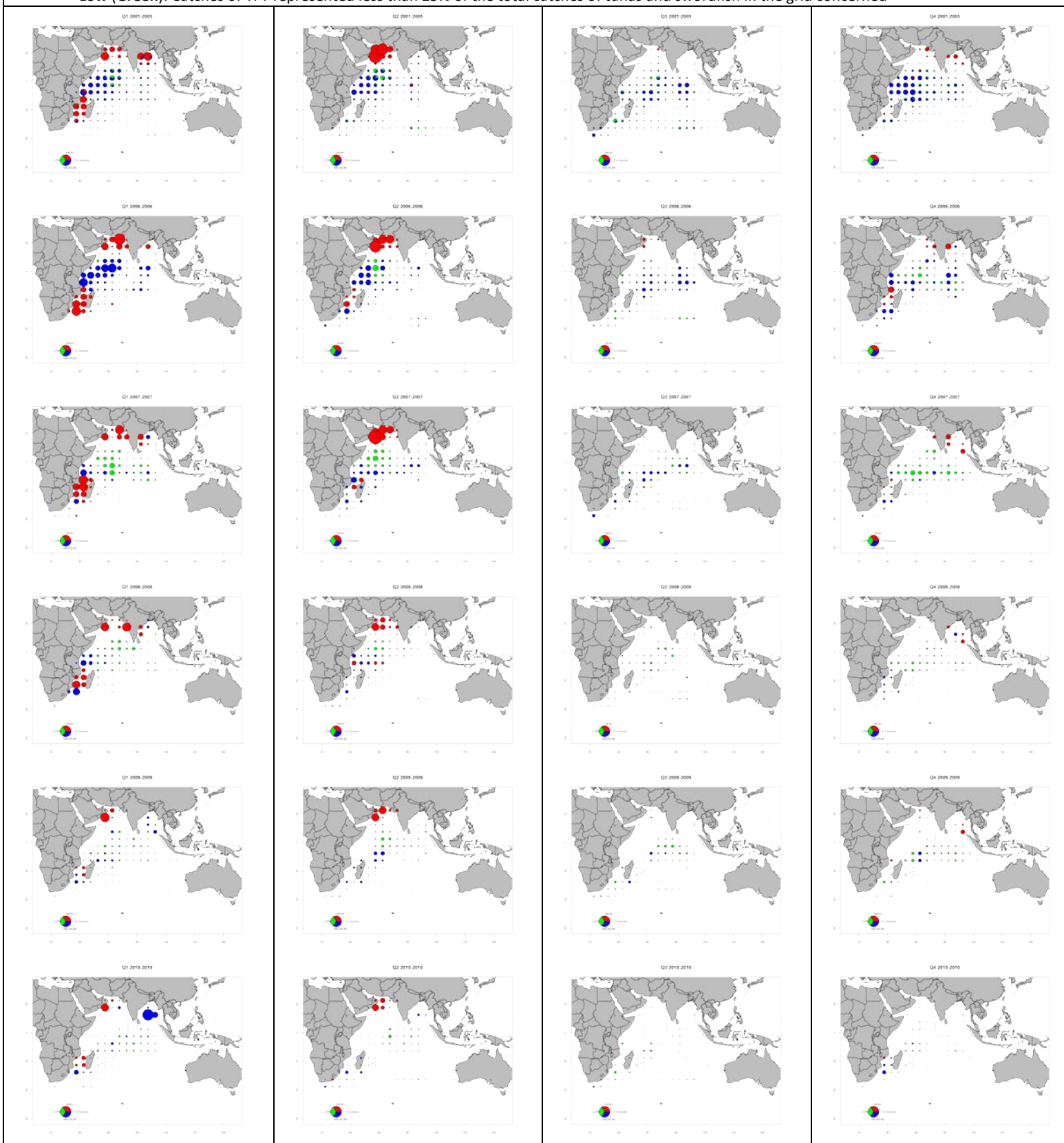Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.
Other fleets (OTHR, purple): other fleets, especially small-scale fisheries operating in coastal waters.
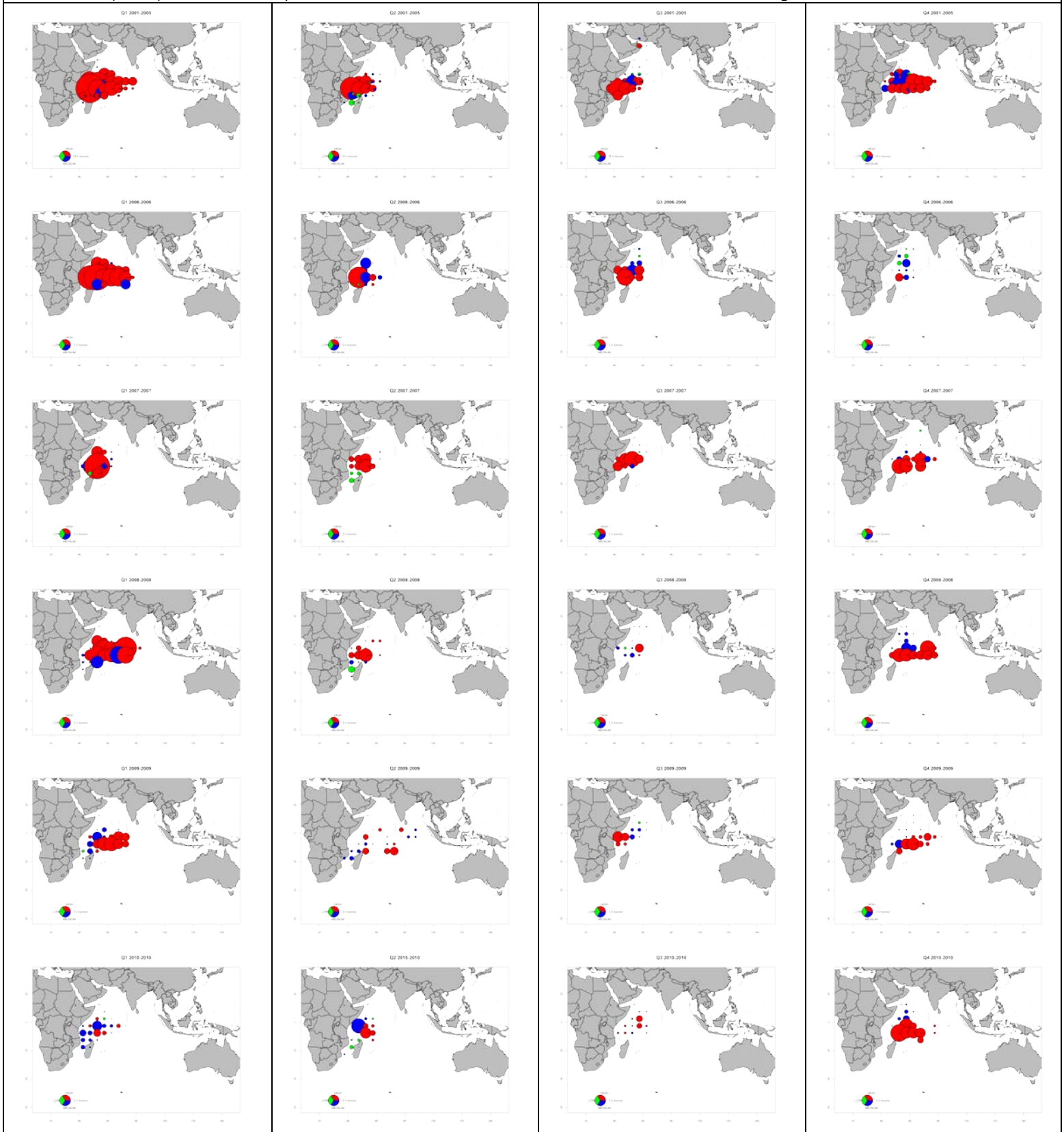
d. Yellowfin tuna (YFT): Main Fishing Areas

Catches of yellowfin tuna (YFT) taken by longline vessels by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of YFT represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of YFT represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of YFT represented less than 25% of the total catches of tunas and swordfish in the grid concerned
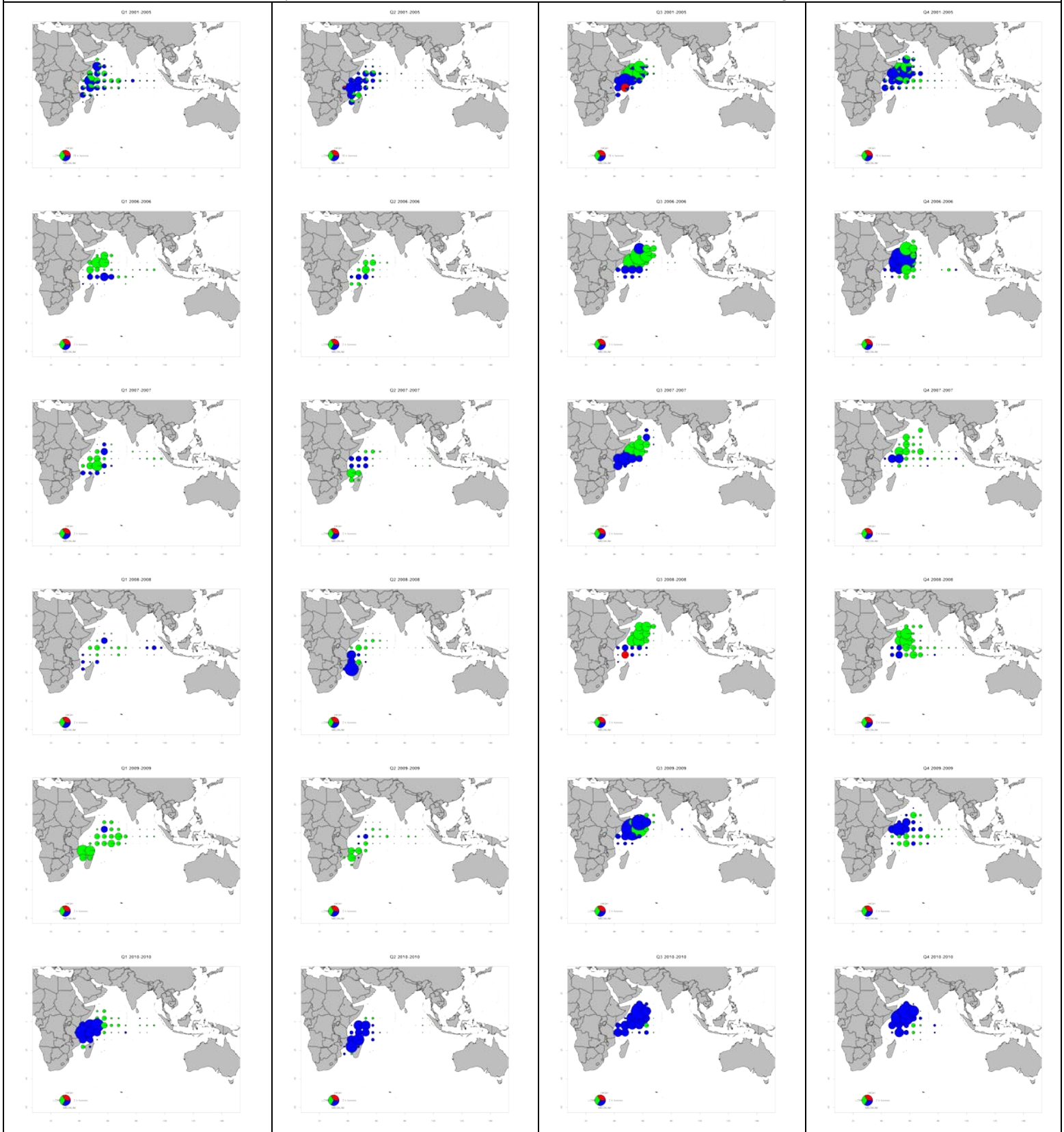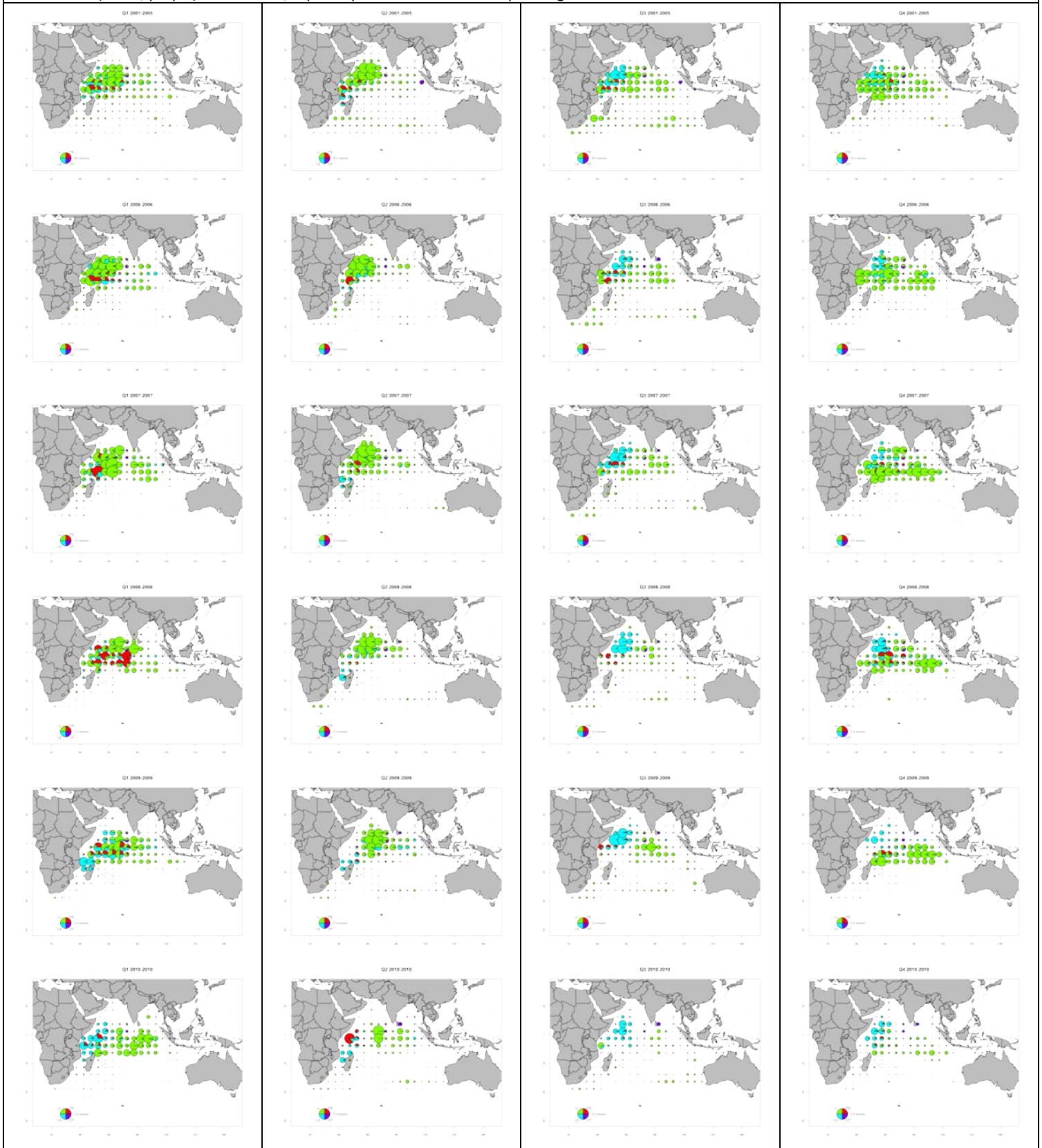
Catches of yellowfin tuna (YFT) taken by purse seine vessels on free swimming schools by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

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Catches of yellowfin tuna (YFT) taken by purse seine vessels on associated schools by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of YFT represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of YFT represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of YFT represented less than 25% of the total catches of tunas and swordfish in the grid concerned

e. Bigeye tuna (BET): Recent catches

Time-area catches (total combined in tonnes) of BET estimated for 2001-05 and 2006-10, by year, and quarter:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine: industrial tuna purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on free-swimming (FS, red) or associated (LS, light blue) schools.
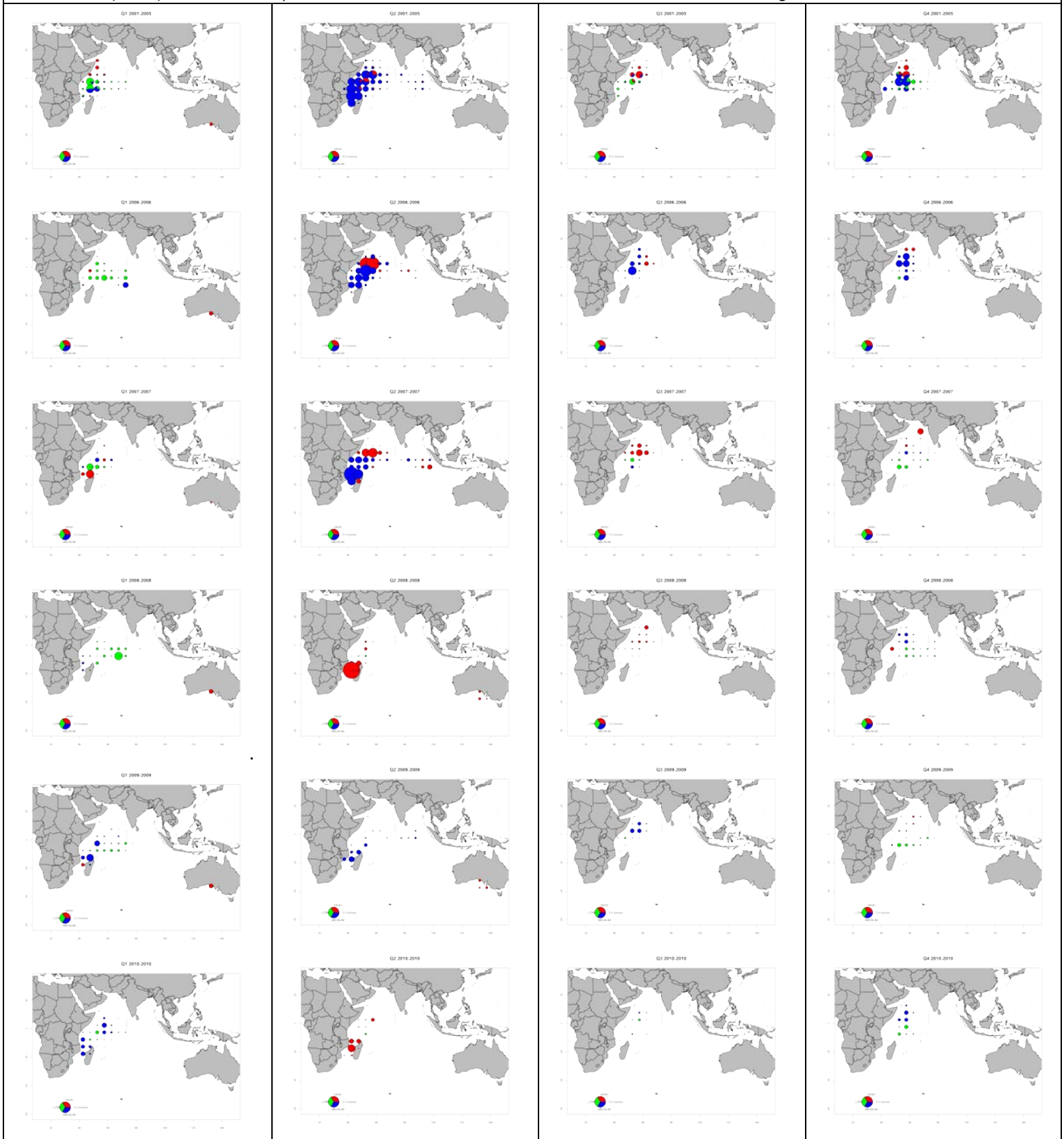
Other fleets (OTHR, purple): other fleets, especially small-scale fisheries operating in coastal waters.

f. Bigeye tuna (BET): Main Fishing Areas

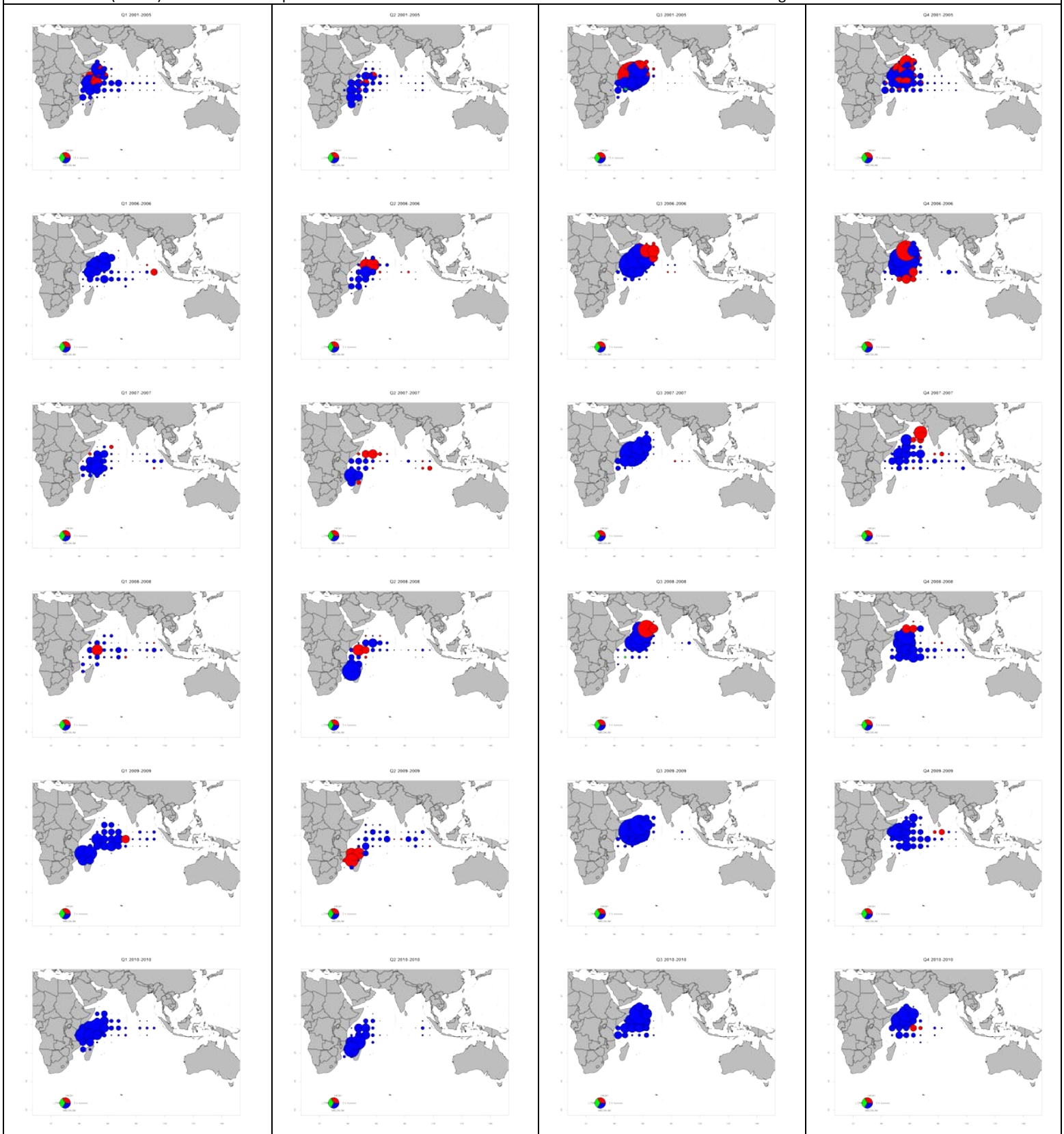Catches of bigeye tuna (BET) taken by longline vessels by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

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- **Medium** (**Blue**): Catches of BET represented 25-75% of the total catches of tunas and swordfish in the grid concerned
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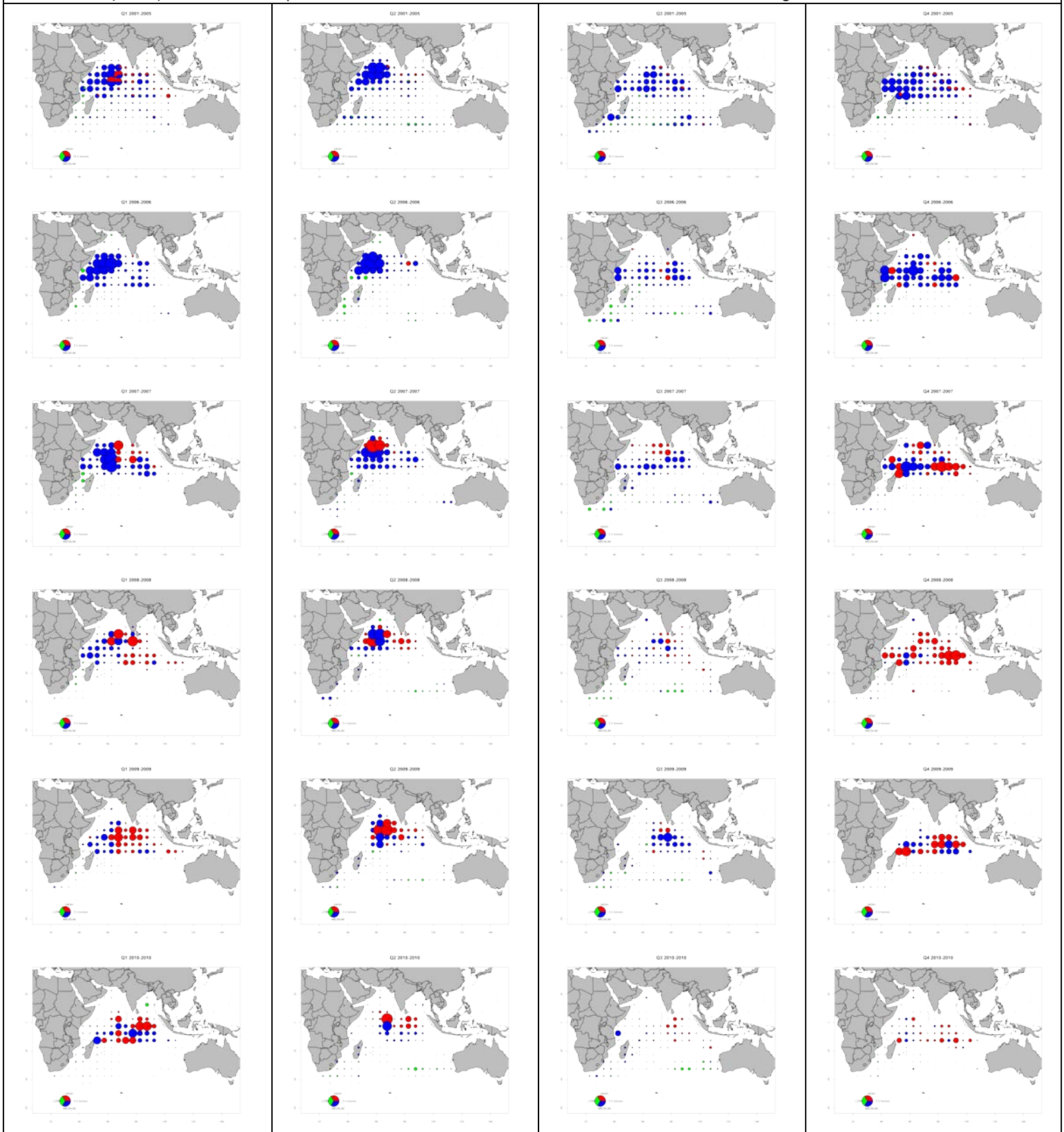
g. Skipjack tuna (SKJ): Recent catches

Time-area catches (total combined in tonnes) of SKJ estimated for 2001-05 and 2006-10, by year, and quarter:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine: industrial tuna purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on free-swimming (FS, bright green) or associated (LS, light blue) schools.

Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

Other fleets (OTHR, purple): longline and other fleets, especially small-scale fisheries operating in coastal waters.
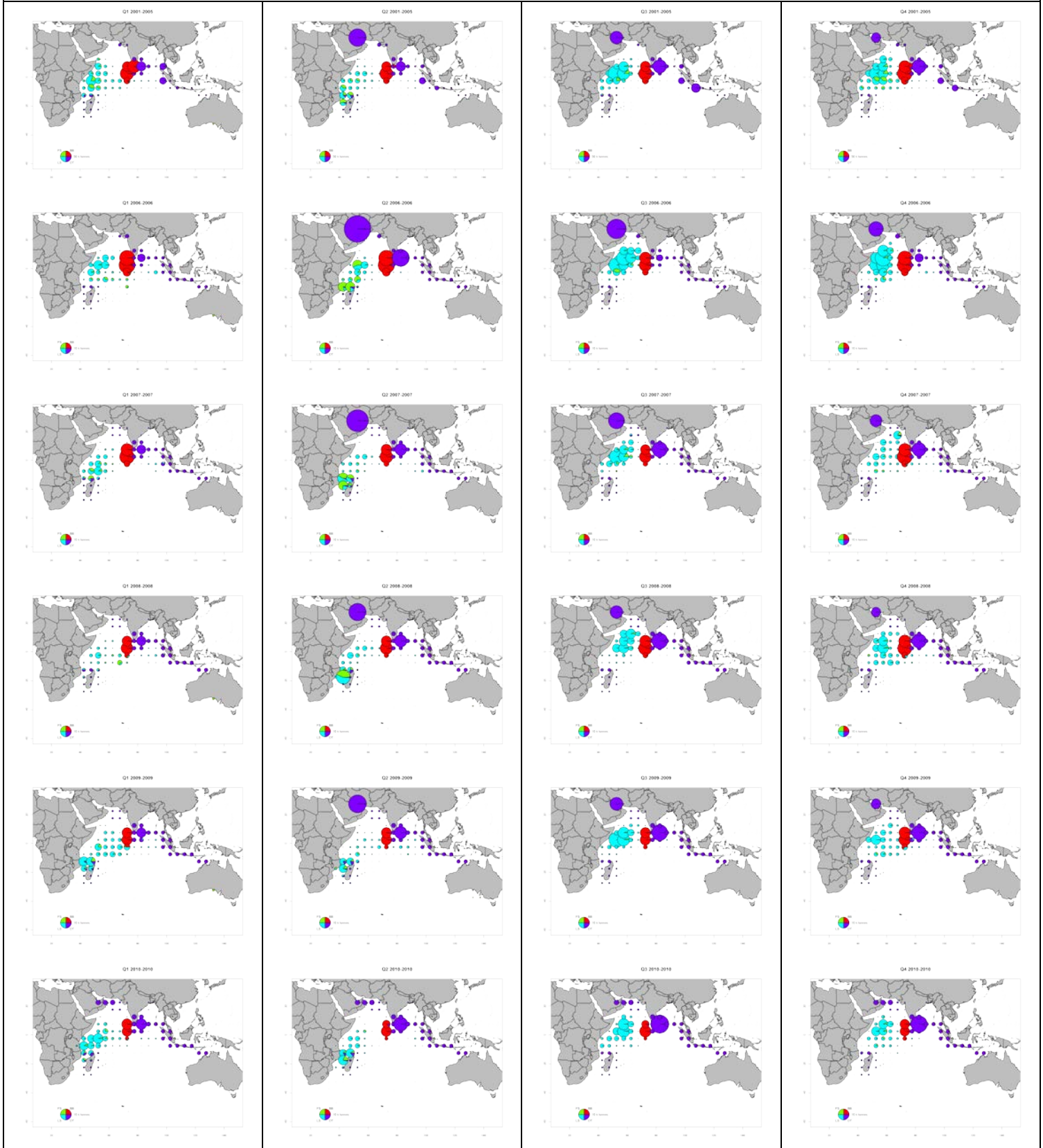
h. Skipjack tuna (SKJ): Main Fishing Areas

Catches of skipjack tuna (SKJ) taken by purse seine vessels on free swimming schools by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of SKJ represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of SKJ represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of SKJ represented less than 25% of the total catches of tunas and swordfish in the grid concerned

Catches of skipjack tuna (SKJ) taken by purse seine vessels on associated schools by year, quarter and 5 degree square grid, for the years 2006-10. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of SKJ represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of SKJ represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of SKJ represented less than 25% of the total catches of tunas and swordfish in the grid concerned
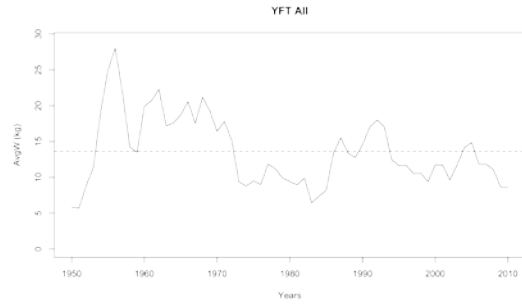
3. AVERAGE WEIGHT
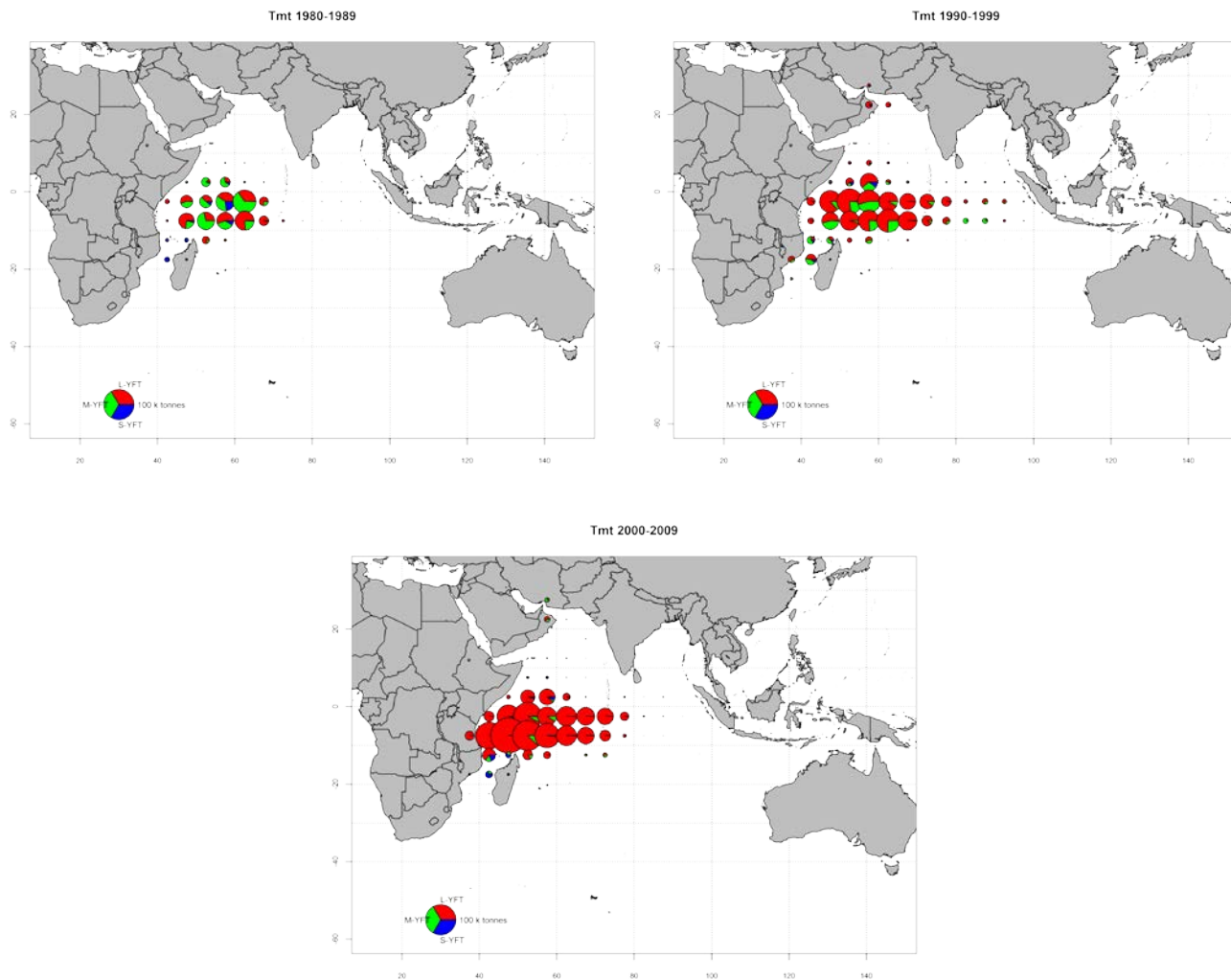
a. Yellowfin tuna (YFT)

Average weight of yellowfin tuna (YFT) taken by:
- All fisheries combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Longlines from Japan (mid left) and Taiwan,China (mid right)
- Pole-and-line from Maldives and India (bottom left)
- Gillnets from Sri Lanka, Iran, and other countries (bottom right)
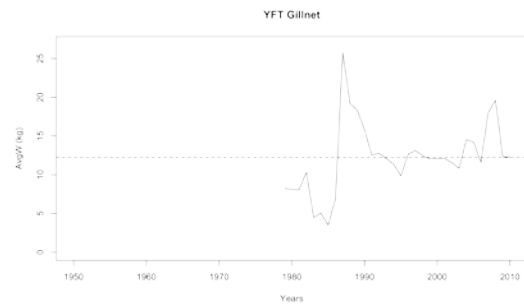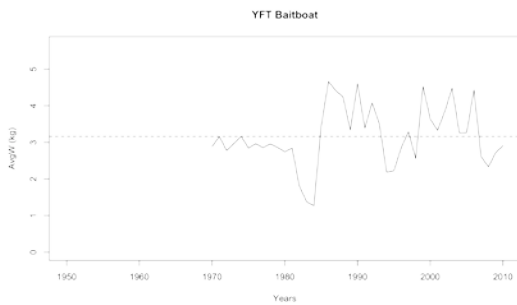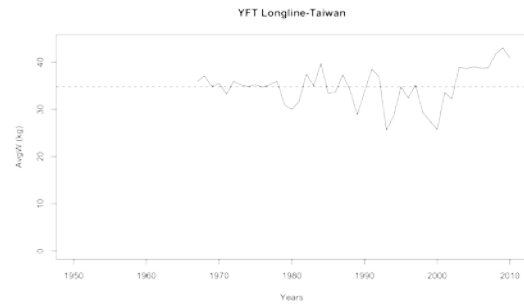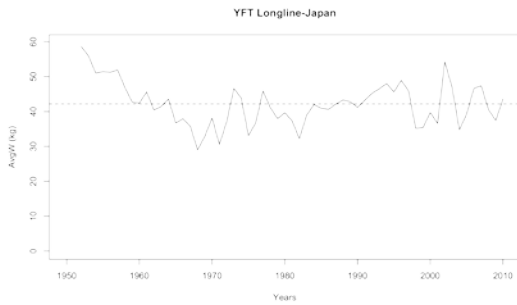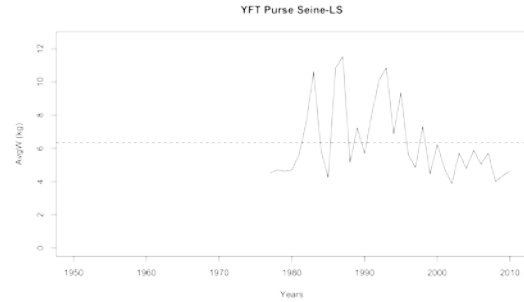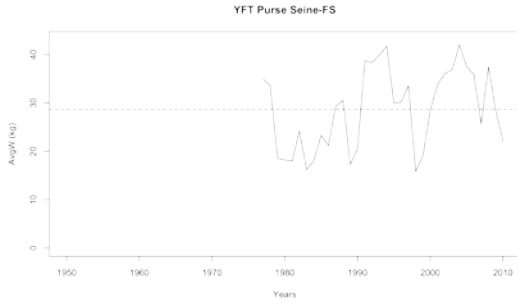
Catches (in metric tons) of yellowfin tuna (YFT) for the purse seine fishery on free-swimming schools for three different periods and types of weight:

- S-YFT (blue): Catches from strata in which the average weight estimated from the CAS is lower then 10kg
- M-YFT (green): Catches from strata in which the average weight estimated from the CAS is between 10kg and 30kg
- M-YFT (green): Catches from strata in which the average weight estimated from the CAS is 30kg or greater

Tmt 1980-1989

Tmt 1990-1999

Tmt 2000-2009

b. Bigeye tuna (BET)

Average weight of bigeye tuna (BET) taken by:
- All fisheries combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Longlines from Japan (mid left) and Taiwan,China (mid right)
- Other fisheries (artisanal) (bottom)

BET All

BET Purse Seine-FS

BET Purse Seine-LS

BET Longline-Japan

BET Longline-Taiwan

BET Artisanal
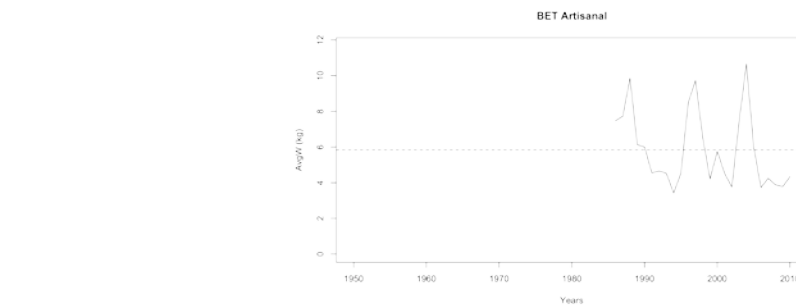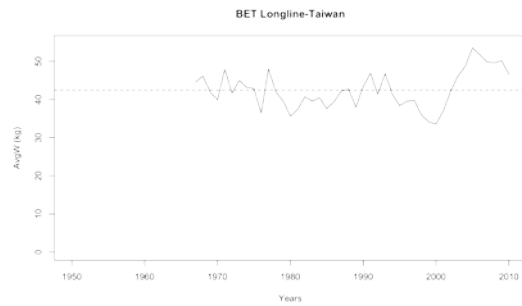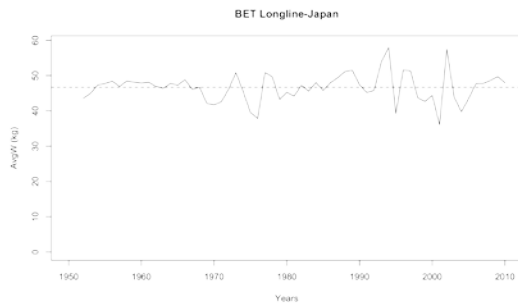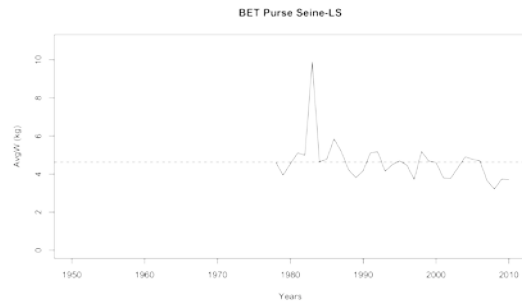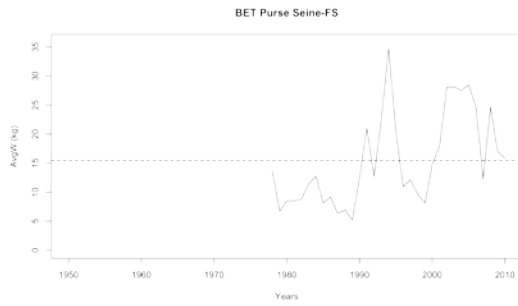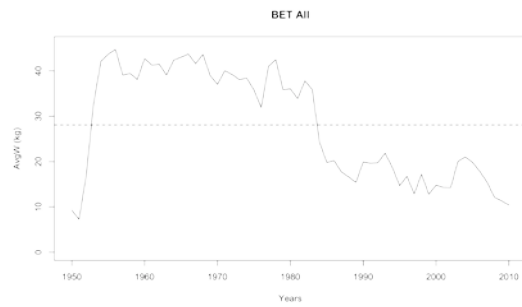
c. Skipjack tuna (SKJ)

Average weight of skipjack tuna (SKJ) taken by:
- All fleets combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Pole-and-line from Maldives and India (bottom left)
- Gillnets from Sri Lanka, Iran, and other countries (bottom right)
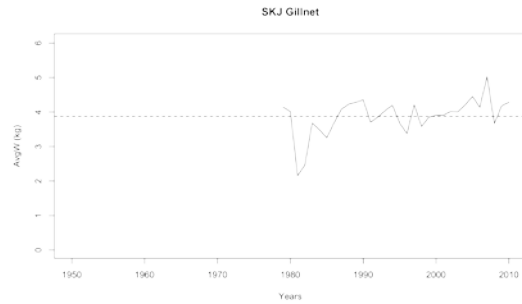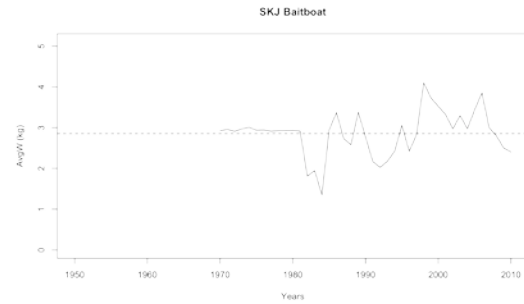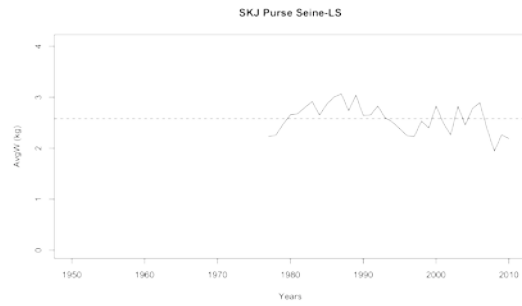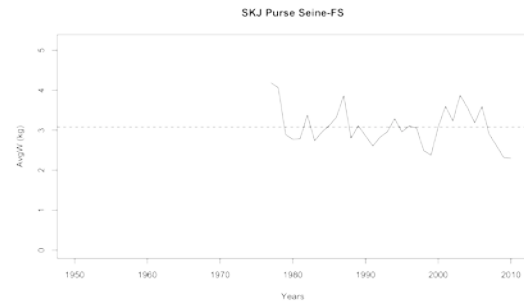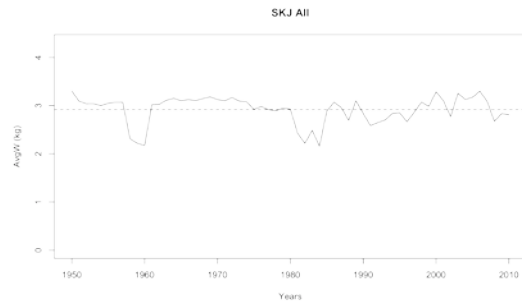
4. CATCH PER SIZE CLASS
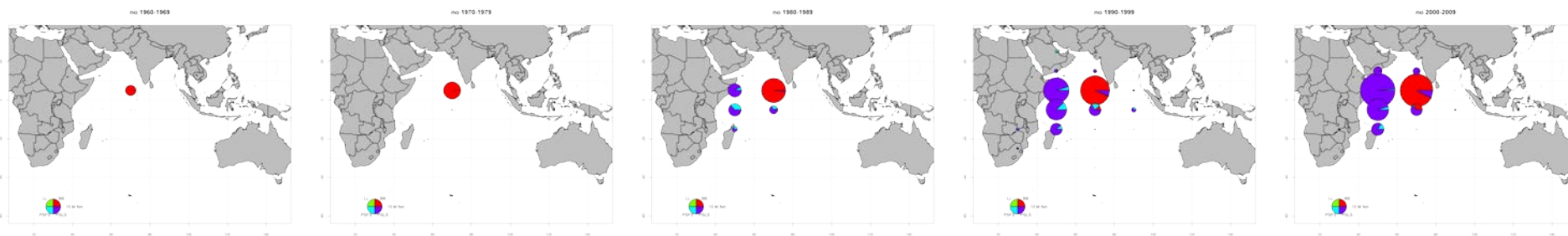
a. Yellowfin tuna (YFT)

Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of YFT for which the weight estimated is 30kg or greater
- **Medium size** (**Green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Small size** (**Blue**): Catches of YFT for which the weight estimated is under 30kg
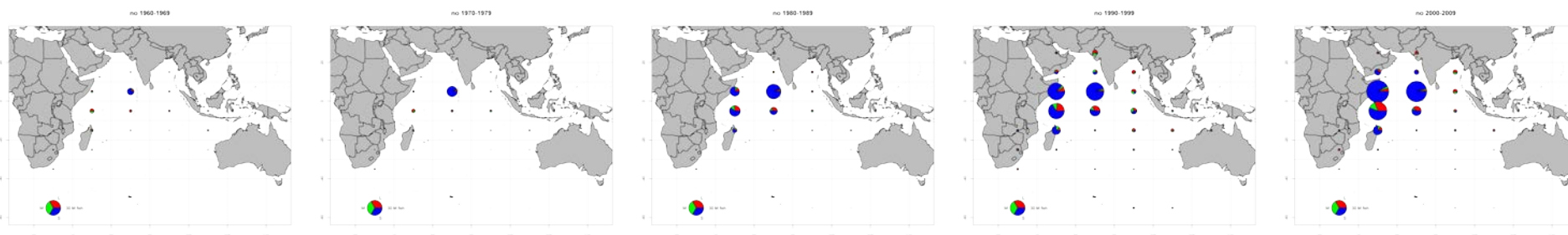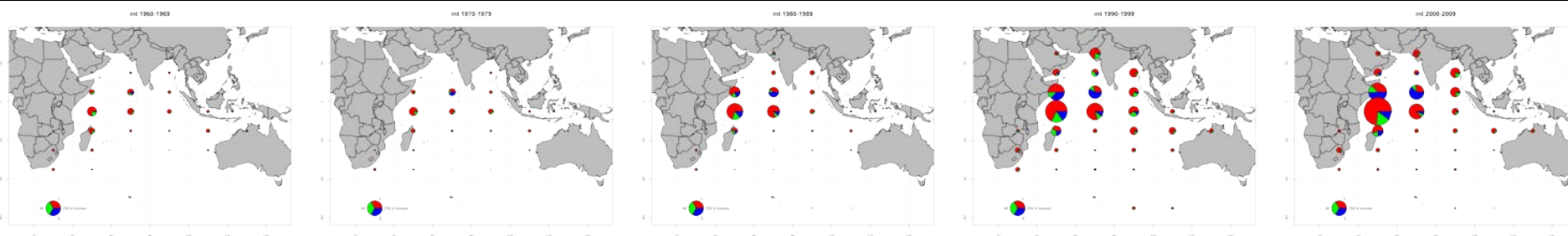
Total catches of yellowfin tuna (YFT) of very small size (under 5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and fishery, including:

- **BB** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Purple**): Industrial purse seiners on associated schools (e.g. FAD)
- **PSFS** (**Light blue**): Industrial purse seiners on free-swimming schools
- **LL** (**Green**): Industrial longline fisheries

b. Bigeye tuna (BET)

Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of BET for which the weight estimated is 30kg or greater
- **Medium size** (**Green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Small size** (**Blue**): Catches of BET for which the weight estimated is under 30kg

Total catches of bigeye tuna (BET) of very small size (under 5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and fishery, including:
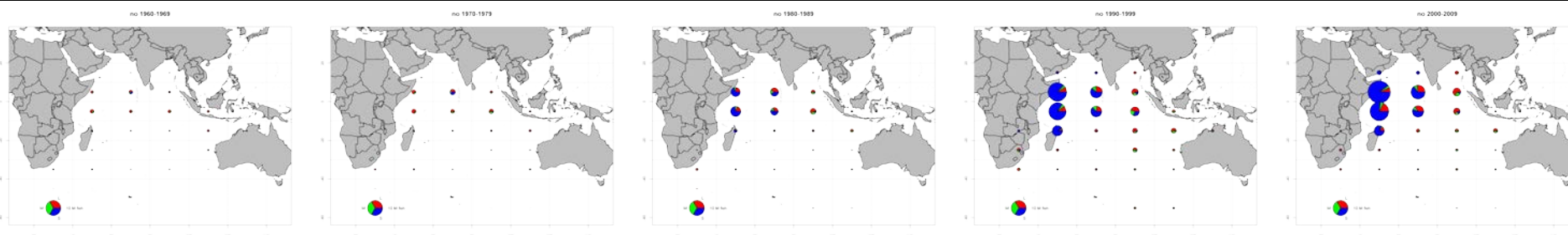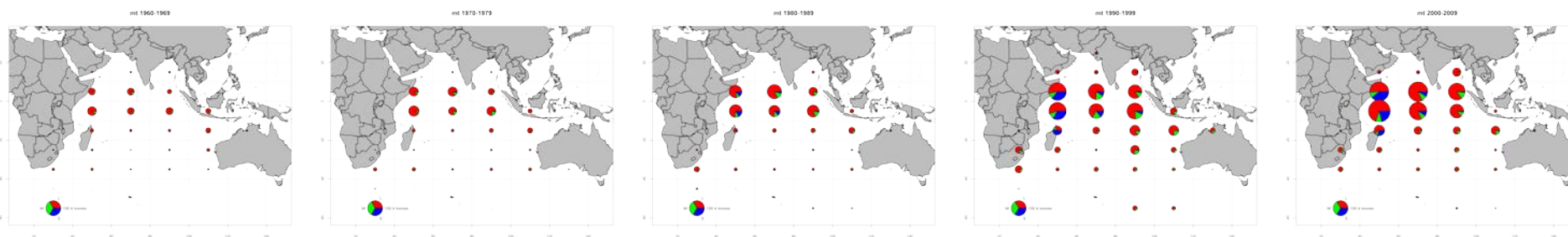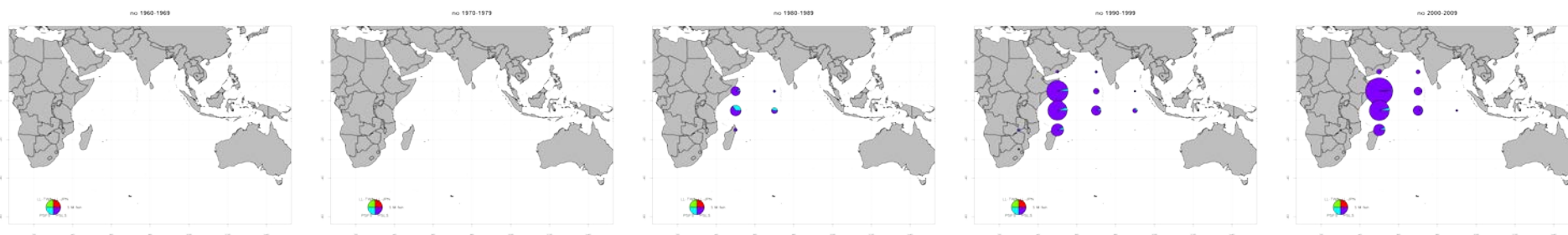
- **LL-TWN** (**Green**): Industrial longline fisheries
- **LL-JPN** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Purple**): Industrial purse seiners on associated schools (e.g. FAD)
- **PSFS** (**Light blue**): Industrial purse seiners on free-swimming schools

c. Skipjack tuna (SKJ)

Total catches of SKIPJACK TUNA (SKJ) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of SKJ for which the weight estimated is 5kg or greater
- **Medium size** (**Green**): Catches of SKJ for which the weight estimated is between 3kg and 5kg
- **Small size** (**Blue**): Catches of SKJ for which the weight estimated is under 3kg

Total catches of skipjack tuna (SKJ) of very small size (under 1.5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1960-2009. Catches are presented by decade, 10 latitude by 20 longitude area and fishery, including:
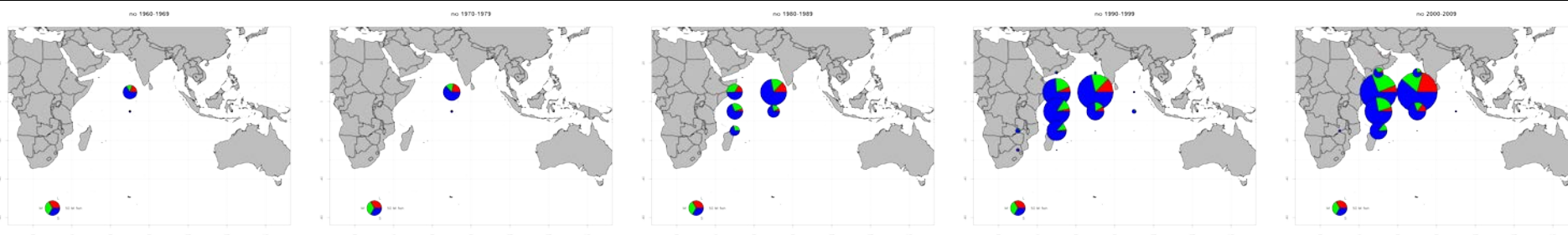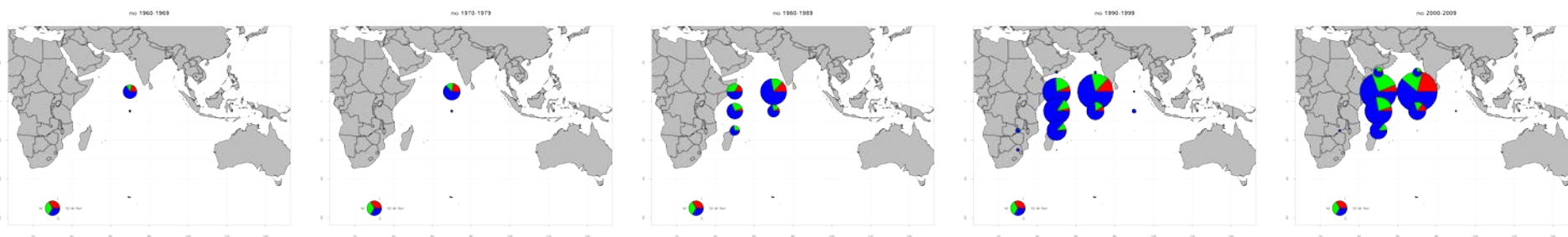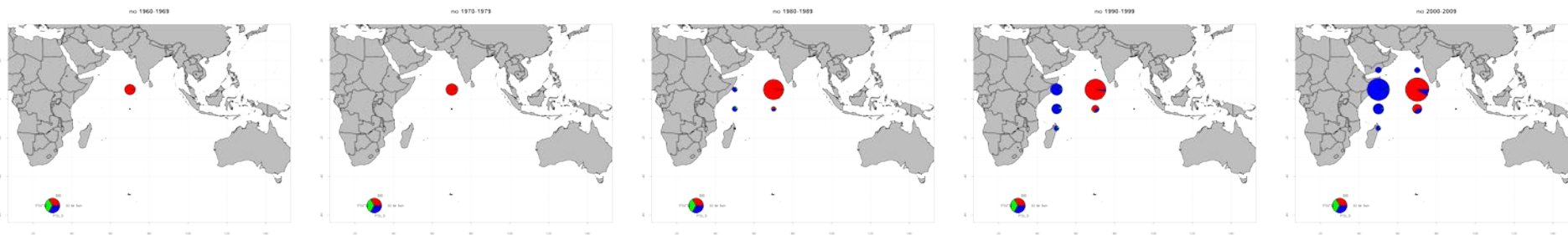
- **BB** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Blue**): Industrial purse seiners on associated schools (e.g. FAD)
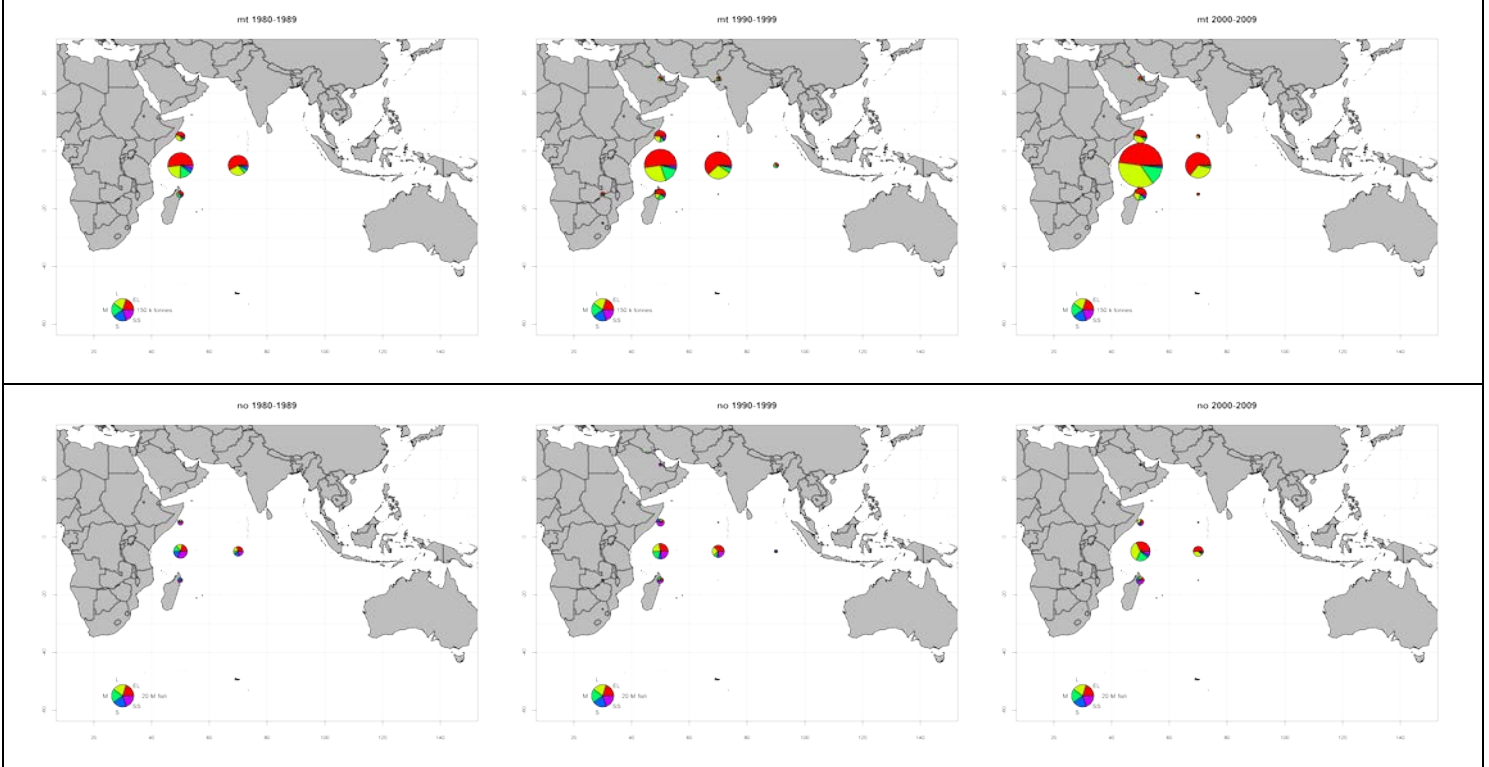- **PSFS** (**Green**): Industrial purse seiners on free-swimming schools
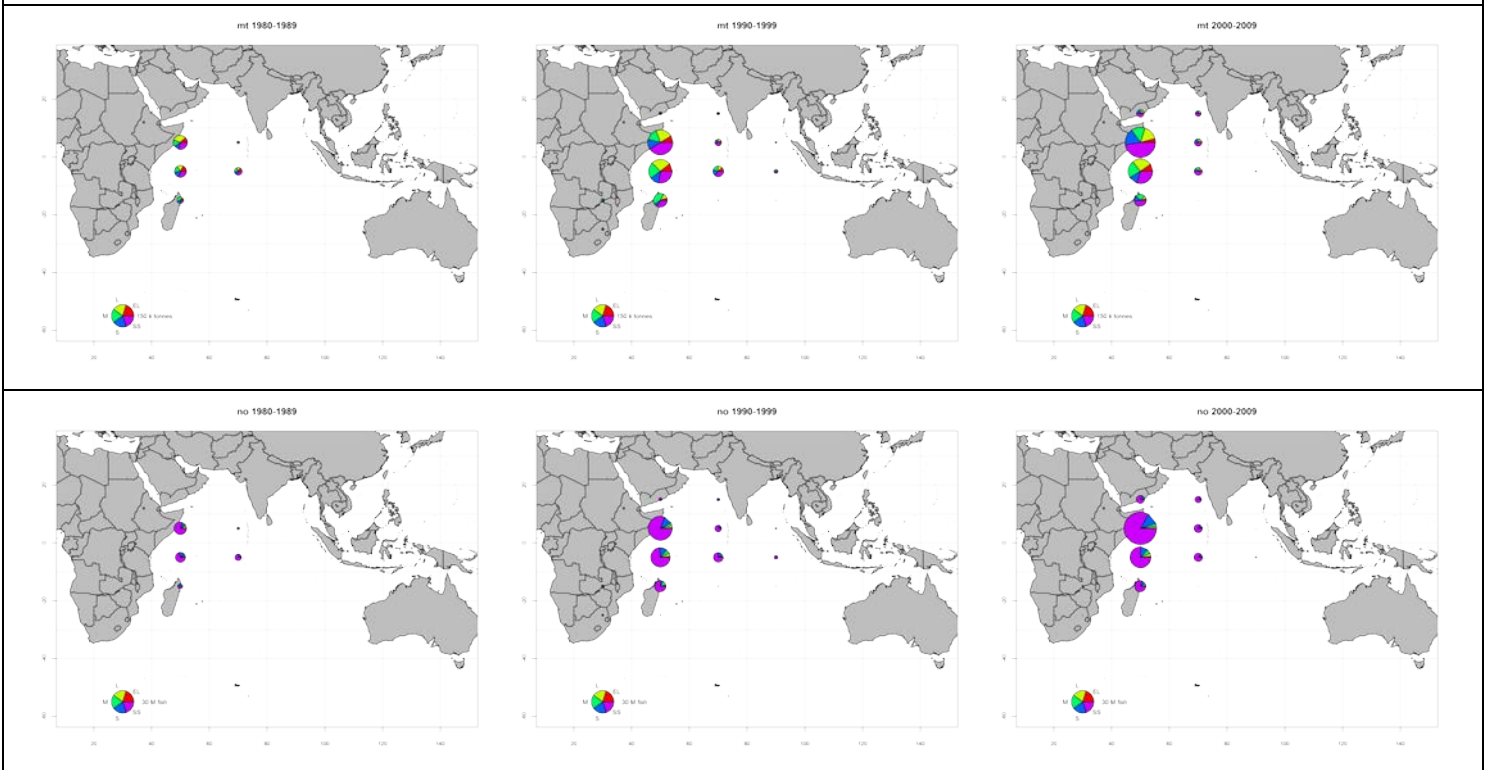
d. By fishery: Yellowfin tuna (YFT)

Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1980-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of YFT for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of YFT for which the weight estimated is between5 and 15kg
- **Medium size** (**M**; **green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Large size** (**L; yellow**): Catches of YFT for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of YFT for which the weight estimated is 45kg or greater
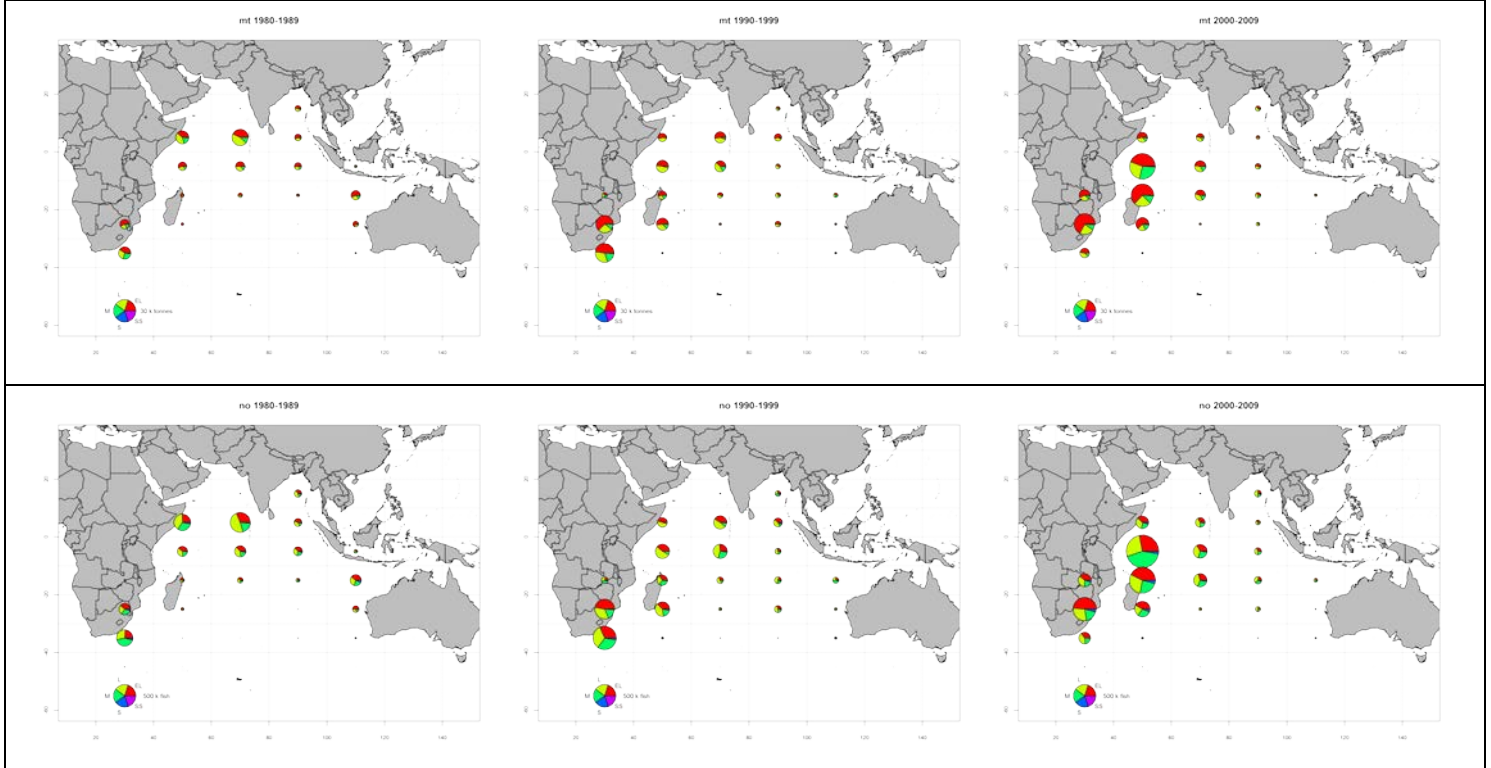
Free-swimming schools
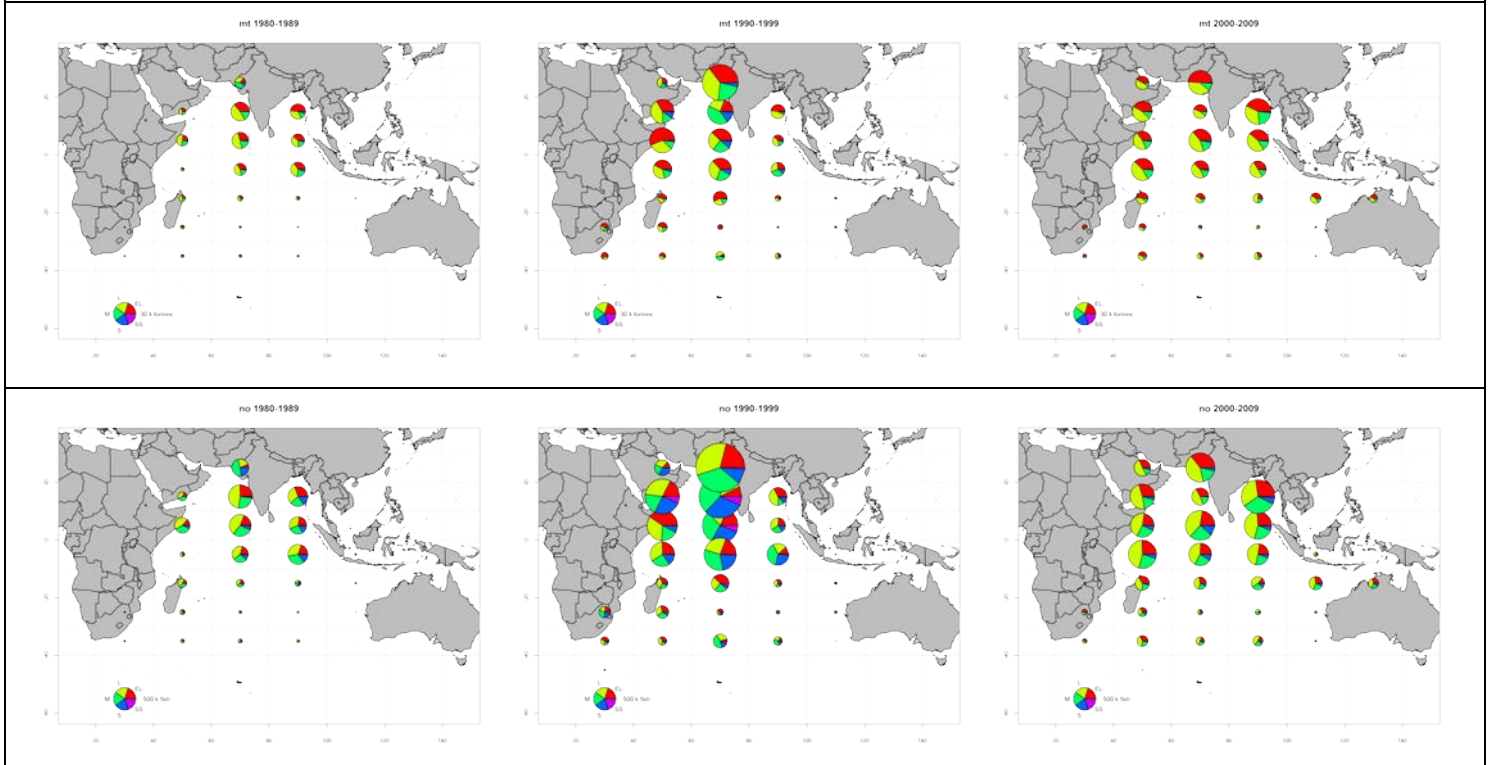

Associated schools

Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of industrial longliners of Japan (top two rows) and Taiwan,China (bottom two rows) for 1980-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of YFT for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of YFT for which the weight estimated is between5 and 15kg
- **Medium size** (**M**; **green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of YFT for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of YFT for which the weight estimated is 45kg or greater

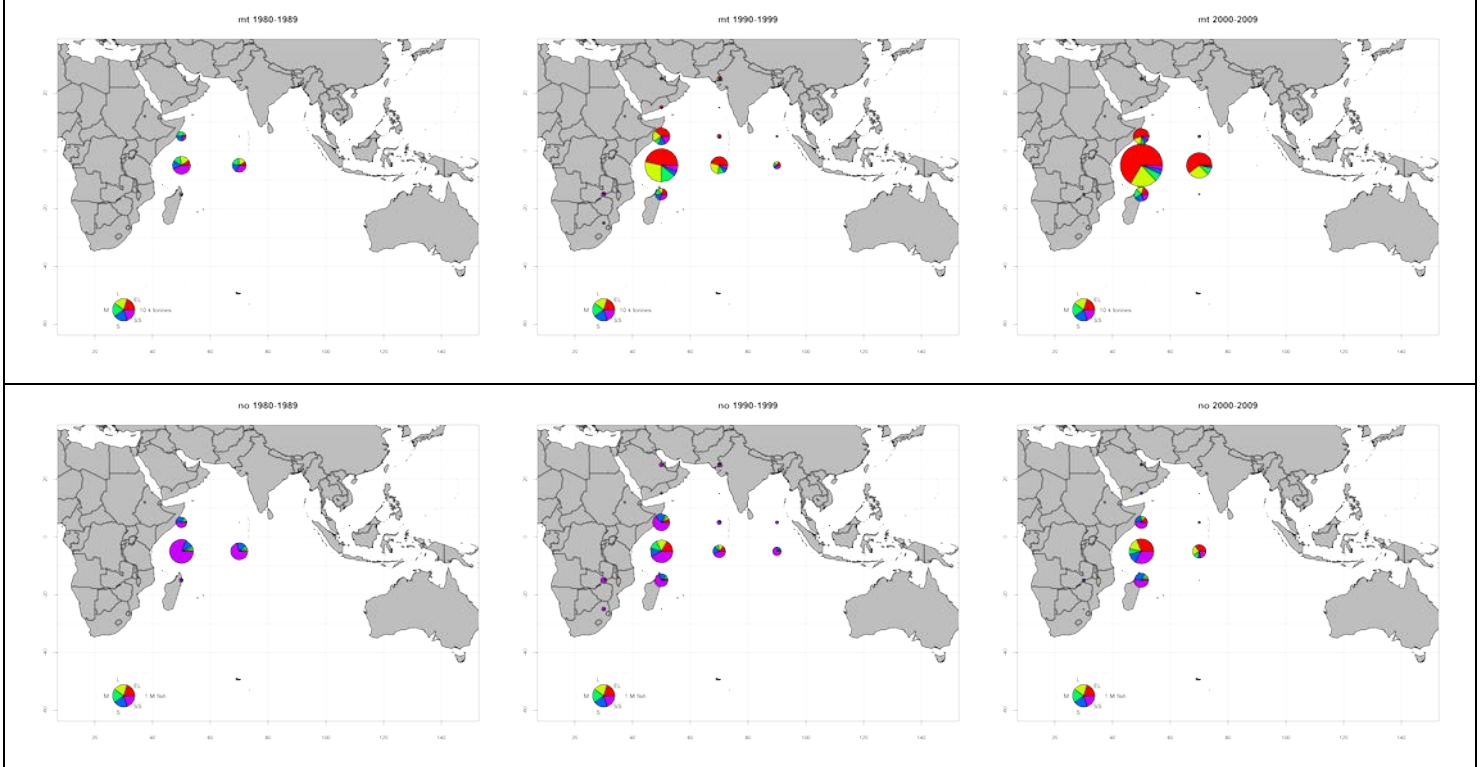## Longline Japan

Longline Taiwan,China
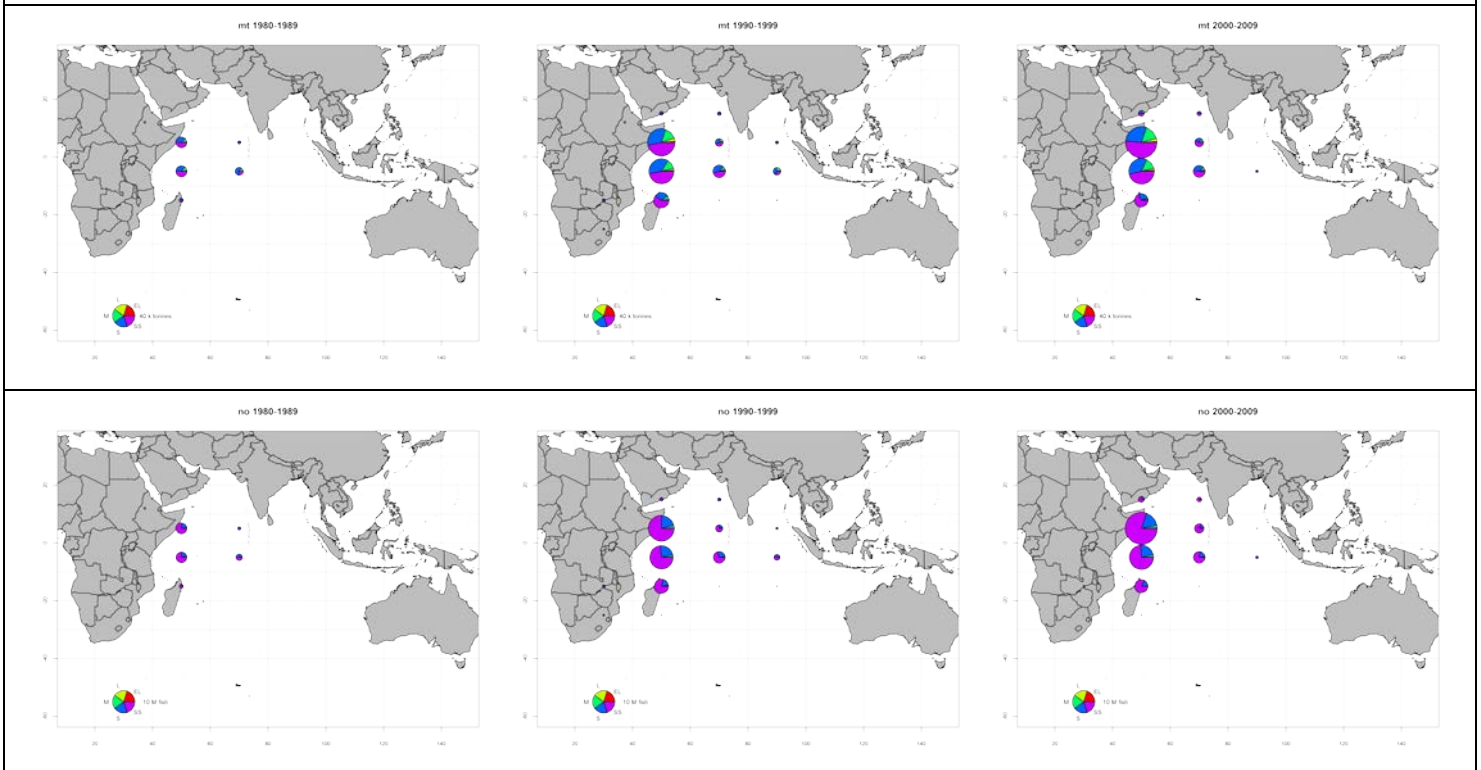
e. By fishery: Bigeye tuna (BET)

Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1980-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of BET for which the weight estimated is under 5kg
- **Small size** (**S; blue**): Catches of BET for which the weight estimated is between5 and 15kg
- **Medium size** (**M; green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Large size** (**L; yellow**): Catches of BET for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL; red**): Catches of BET for which the weight estimated is 45kg or greater
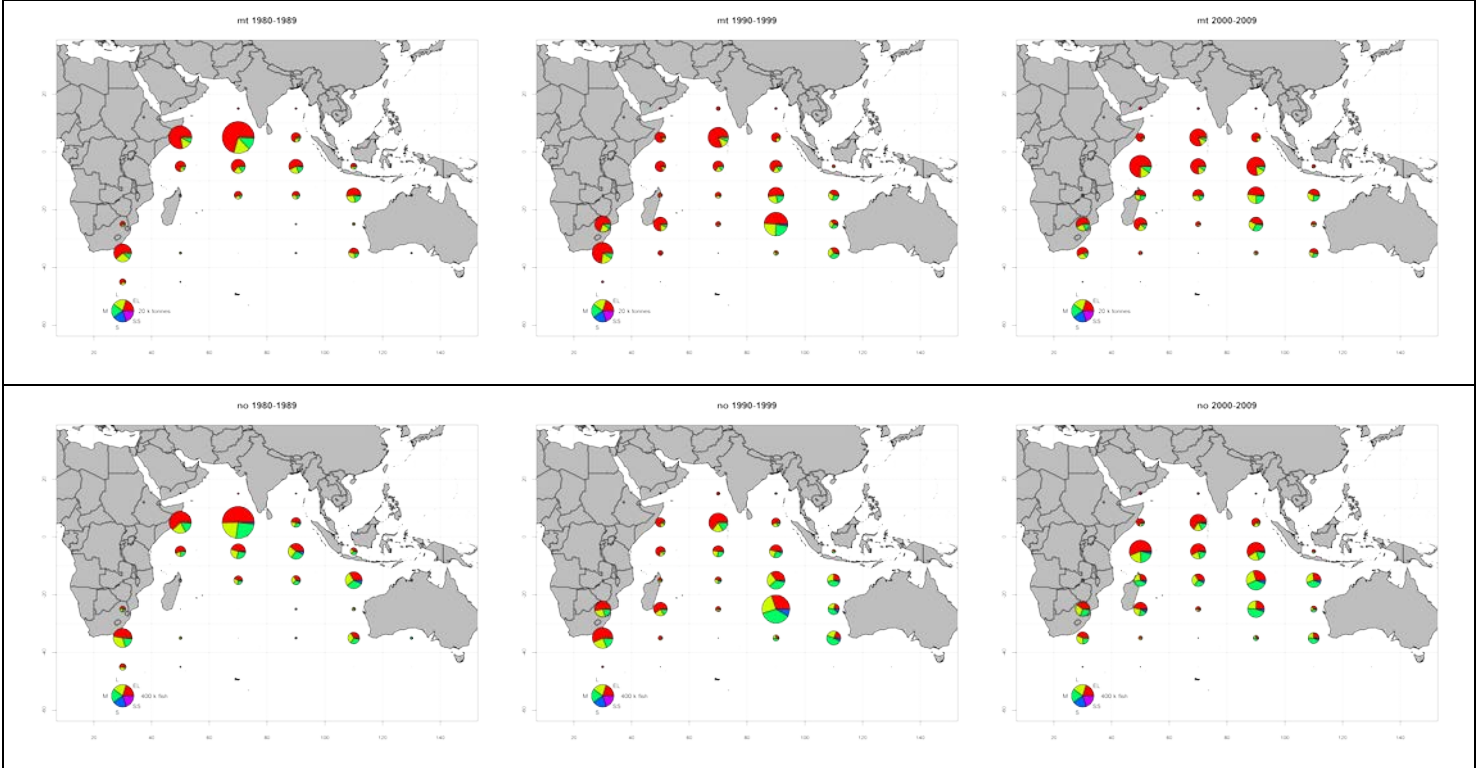
Free-swimming schools
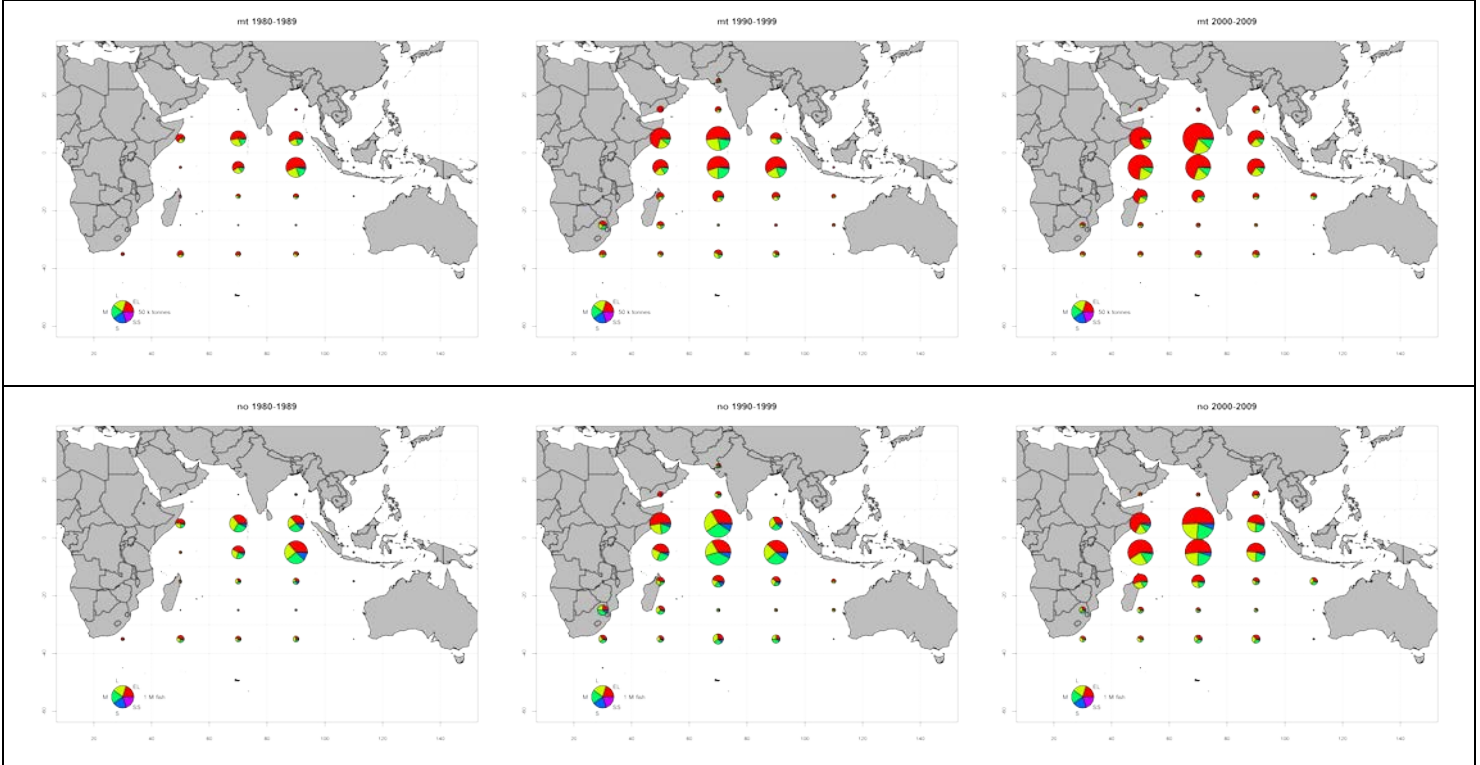

Associated schools

Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of industrial longliners of Japan (top two rows) and Taiwan,China (bottom two rows) for 1980-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of BET for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of BET for which the weight estimated is between 5 and 15kg
- **Medium size** (**M**; **green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of BET for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of BET for which the weight estimated is 45kg or greater

Longline Japan
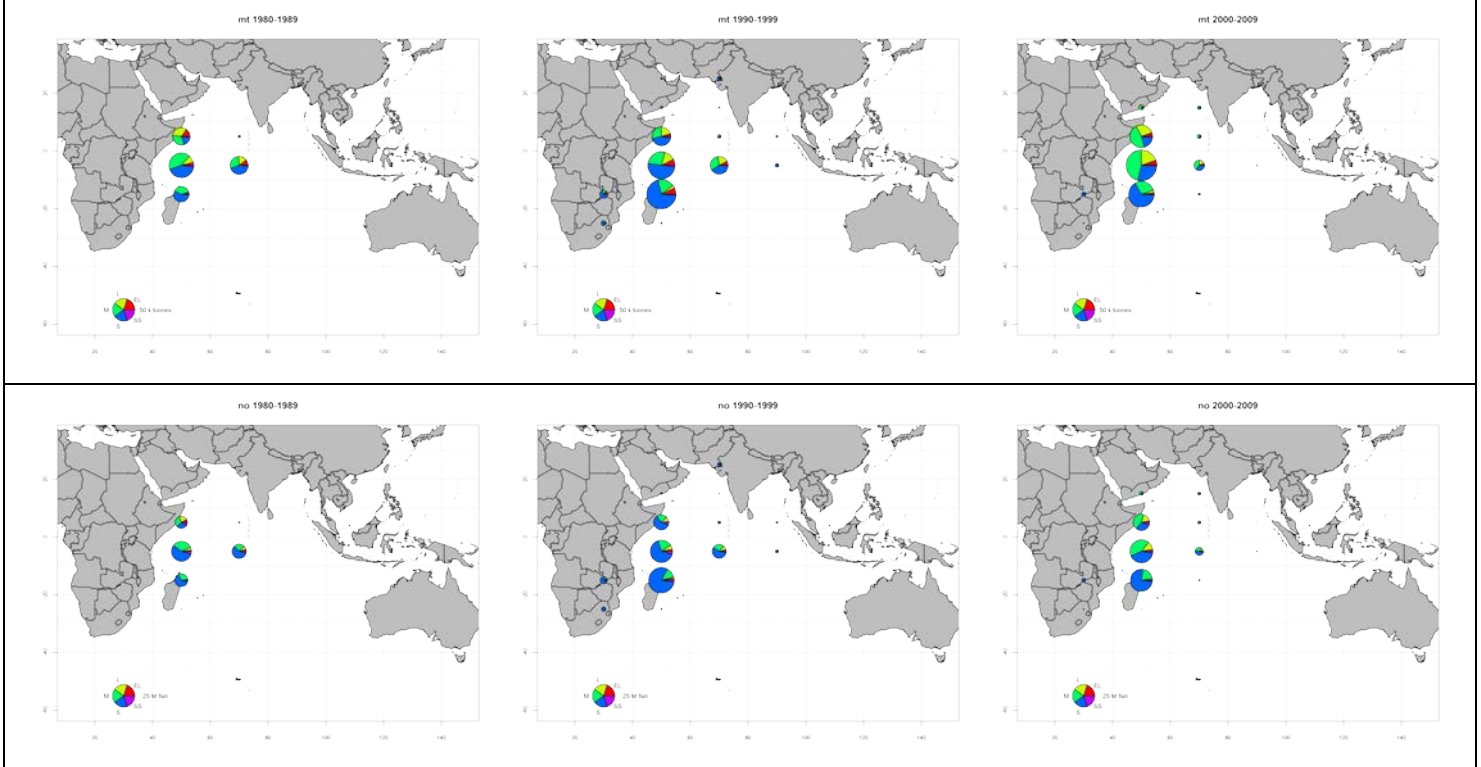

Longline Taiwan,China
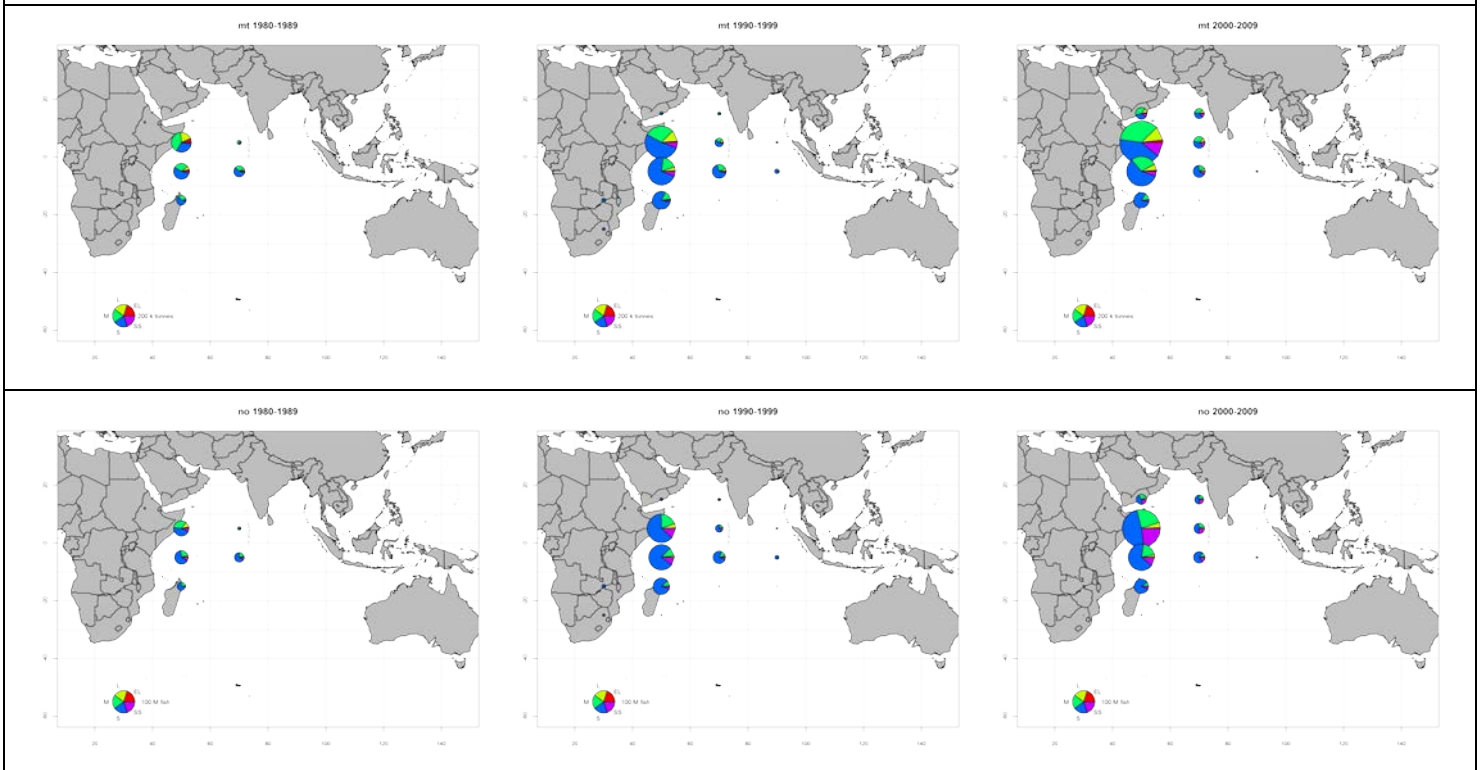

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f. By fishery: Skipjack tuna (SKJ)

Total catches of SKIPJACK TUNA (SKJ) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1980-2009. Catches are presented by decade, 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of SKJ for which the weight estimated is under 1.5kg
- **Small size** (**S; blue**): Catches of SKJ for which the weight estimated is between 1.5 and 3kg
- **Medium size** (**M; green**): Catches of SKJ for which the weight estimated is between 3kg and 5kg
- **Large size** (**L; yellow**): Catches of SKJ for which the weight estimated is between 5kg and 7kg
- **Very large size** (**EL; red**): Catches of SKJ for which the weight estimated is 7kg or greater
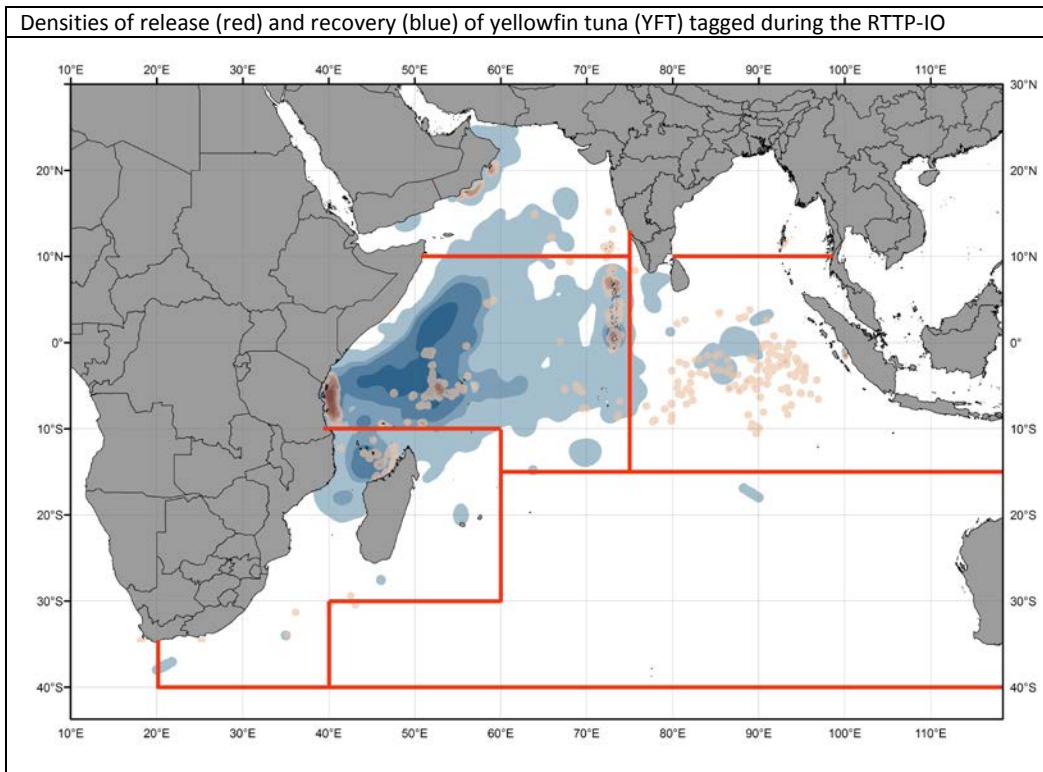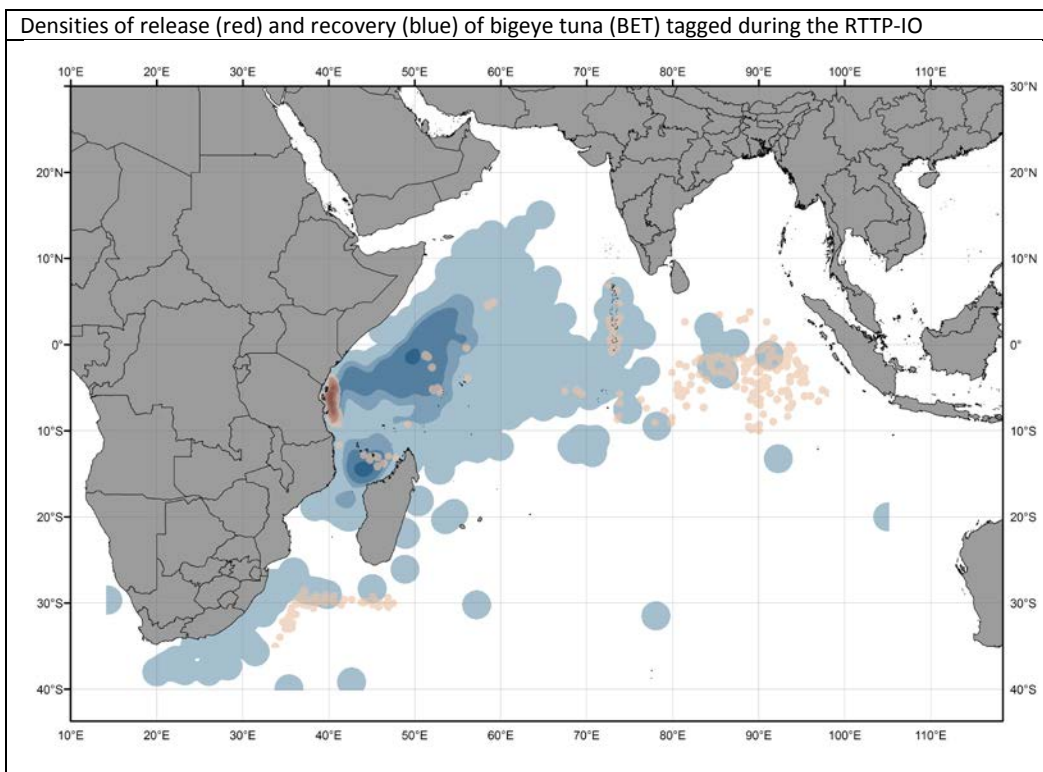
Free-swimming schools

Associated schools

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5. TAGGING DATA

a. Yellowfin tuna (YFT)

Densities of release (red) and recovery (blue) of yellowfin tuna (YFT) tagged during the RTTP-IO

b. Bigeye tuna (BET)

Densities of release (red) and recovery (blue) of bigeye tuna (BET) tagged during the RTTP-IO

c. Skipjack tuna (SKJ)

Densities of release (red) and recovery (blue) of skipjack tuna (SKJ) tagged during the RTTP-IO