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Increased Billfish by-catches of the Seychelles Industrial Longline Fishery

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Abstract

Billfishes are incidental catches of Seychelles industrial longline fishery primarily targeting bigeye tuna. On average billfishes comprising of swordfish, marlins and sailfish accounted for 14% of the total catch of that fishery per year, since 2011 to 2016. Billfish catches exhibits a progressive drop from 2003 to 2011 followed by a sharp increased in catches in 2012 where the total catch increased by over 200% to reach a peak of 2,199Mt. Since 2013 total catches of billfishes has continuously increasing to reach a record of 3,244Mt in 2016. The recent increases in catches of billfishes is noticeable in both swordfish and marlins catches with swordfish catches averaging to 1274Mt compared to 486Mt and 920Mt during the period 2008-2011 (the piracy threat period) and 2001-2007 respectively. Similarly marlin catches averaged to 1,013Mt per year over the last five years compared to 216Mt during the period (2008-2011) and 180Mt during the period (2001-2007).

1. Introduction

Billfishes are incidental catches of Seychelles (SYC) industrial longline fishery primarily targeting bigeye tuna. The Seychelles registered distant-water tuna longline fishing fleet started operating in 1999 with 6 vessels registered increasing to 46 vessels registered in 2016. Major target species of this fleet is bigeye tuna but in recent years billfishes and species reported as ‘Others’ has been on the increase.

This paper review available statistics on billfishes in the Seychelles industrial Longline fleet and presents an analysis and the recent increases of billfish catches, catches rate and geographical catches distribution.

2. Fleet Composition

In 2016, the Seychelles industrial longline fleet consisted of 46 registered vessels, with an average capacity of 456.6 Gross Tonnage and an average length overall (LOA) of 48m (Table 1). The fleet started operation in 1999 and the fleet sizes increased sharply to reach a record of 48 vessels registered in 2003, but has since then remained more or less stable averaging to around 30 vessels registered per year until 2014. During the last two years the number of vessels increased sharply to 45 and 46 vessel registered for the year 2015 and 2016 respectively. The mean LOA and GT of the vessels have remained consistent since the beginning of the fishery but has decreased over the last 2 years with 14 smaller vessels joining the fleet.

Table 1: Main characteristics of the Seychelles industrial longline fleet, years 2001 - 2016.

| Year | Vessel (Number) | Average LOA (m) | Average GT (Mt) |
|------|--------------------|--------------------|--------------------|
| 2001 | 47 | 50.2 | 552.0 |
| 2002 | 42 | 50.7 | 556.8 |
| 2003 | 48 | 51.0 | 544.9 |
| 2004 | 33 | 50.8 | 533.7 |
| 2005 | 27 | 51.9 | 518.7 |
| 2006 | 28 | 51.9 | 521.3 |
| 2007 | 27 | 51.6 | 521.3 |
| 2008 | 27 | 52.9 | 524.2 |
| 2009 | 27 | 53.2 | 527.9 |
| 2010 | 27 | 52.8 | 535.7 |
| 2011 | 24 | 52.9 | 540.2 |
| 2012 | 32 | 53.6 | 552.3 |
| 2013 | 32 | 53.2 | 551.2 |
| 2014 | 36 | 52.2 | 542.3 |
| 2015 | 45 | 48.12 | 456.6 |
| 2016 | 46 | 48.12 | 456.6 |

3. Catch and Effort

Table 1 summarized the total catch and effort of the Seychelles Industrial longline fleet for the years 2001 to 2016.

The total effort exerted by the fleet has been on an increasing trend reaching a peak of 33 million hooks in 2016 (figure 1) corresponding to an increase in number of vessels registered (Table 1). Over the last 10 years, the mean hooks per set have fluctuated between 3000 and 3400 hooks per set averaging to 3221 hooks per set (figure 2).

With some fluctuations, the bigeye tuna remained the dominant species caught by the Seychelles longline fleet, accounting for 48% of the total catch between 2001 and 2016. Yellowfin and swordfish are the second and third most dominant species, comprising 18% and 10% of the total catch, followed by species recorded as “Others” (11%) (which included oilfish and other unidentified species). This is a new fishery with significantly lower catchability for tunas (Hoyle et al. 2015b). Albacore, marlin and shark accounted for 7%, 4% and 2% respectively. There has been an apparent reduction in catches between 2008 and 2011 (Figure 3), due to the piracy in the West Indian Ocean.

Table 2: Yearly catch (Mt) of the Seychelles industrial longliners, years 2001 - 2016

| Year | Number of Hooks (1000) | Number of Sets | BET | YFT | ALB | SWO | MAR | SHK | SFA | OTH | Total catch (t) |
|------|------------------------|----------------|--------|-------|-------|-------|-------|-----|-----|-------|-----------------|
| 2001 | 6,597 | 1993 | 872 | 403 | 869 | 422 | 98 | 0 | 124 | 337 | 3,126 |
| 2002 | 8,613 | 2801 | 1,814 | 548 | 878 | 799 | 143 | 9 | | 329 | 4,521 |
| 2003 | 19,470 | 5254 | 3,595 | 1,208 | 2,336 | 1,589 | 268 | 286 | 0 | 211 | 9,494 |
| 2004 | 18,983 | 5783 | 5,624 | 3,322 | 62 | 1,234 | 260 | 170 | 6 | 122 | 10,799 |
| 2005 | 20,724 | 6309 | 5,375 | 7,369 | 139 | 982 | 209 | 190 | 2 | 86 | 14,350 |
| 2006 | 17,396 | 5567 | 3,834 | 2,763 | 92 | 722 | 150 | 139 | 0 | 674 | 8,374 |
| 2007 | 18,867 | 5795 | 4,511 | 1,775 | 303 | 690 | 134 | 137 | 0 | 1,091 | 8,642 |
| 2008 | 14,850 | 4672 | 4,009 | 580 | 765 | 559 | 205 | 57 | | 620 | 6,795 |
| 2009 | 19,884 | 6044 | 4,119 | 468 | 339 | 581 | 160 | 257 | 13 | 2,391 | 8,329 |
| 2010 | 17,629 | 5325 | 3,384 | 527 | 669 | 409 | 214 | 282 | 11 | 1,162 | 6,659 |
| 2011 | 16,334 | 5141 | 4,082 | 1,184 | 492 | 396 | 285 | 283 | 18 | 827 | 7,566 |
| 2012 | 19,562 | 6321 | 10,749 | 1,220 | 37 | 1,082 | 1,109 | 389 | 7 | 523 | 15,116 |
| 2013 | 23,477 | 7327 | 6,193 | 1,177 | 283 | 945 | 564 | 392 | 10 | 1,867 | 11,431 |
| 2014 | 21,585 | 6695 | 5,260 | 1,643 | 127 | 965 | 687 | 583 | 4 | 1,420 | 10,689 |
| 2015 | 22,822 | 6704 | 5,834 | 2,306 | 88 | 1,621 | 1,238 | 436 | 13 | 982 | 12,518 |
| 2016 | 33,001 | 10436 | 5,093 | 2,564 | 188 | 1,759 | 1,468 | 469 | 17 | 2,927 | 14,486 |

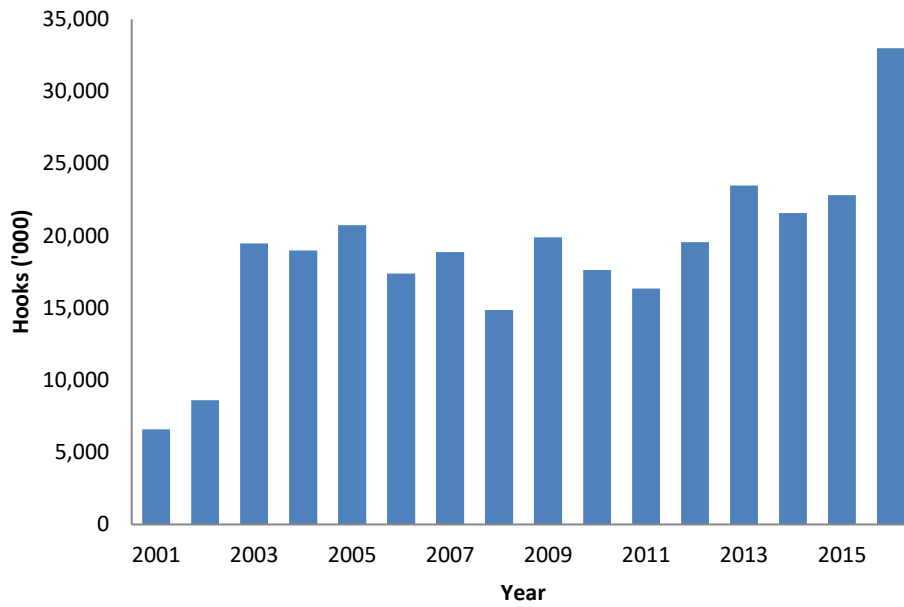


Figure 1: Yearly Effort (1000 hooks) of the Seychelles industrial longliners, years 2001 – 2016

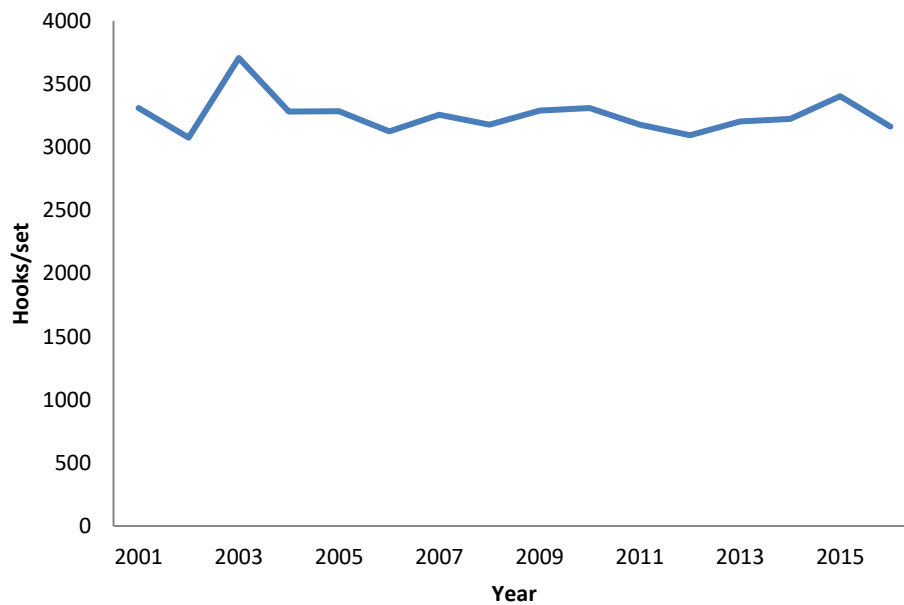


Figure 2: Mean Hooks per set of the Seychelles industrial longliners, years 2001 – 2016

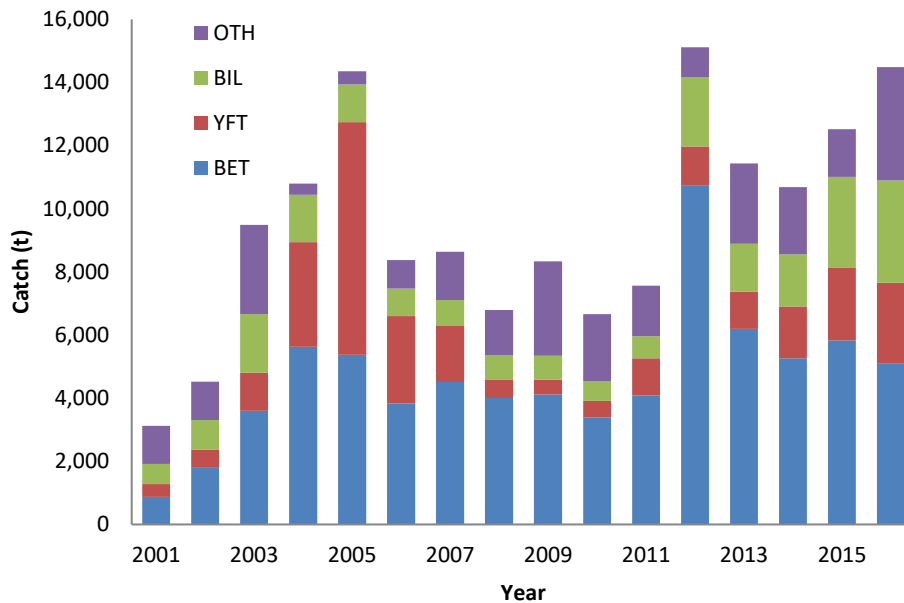


Figure 3: Catches (t) of the Seychelles industrial longliners, years 2001 – 2016

4. Billfish Catches

Table 4 shows the billfish catches by species for the years 2001 to 2016. It must be noted that since 2009, the logbook used by the Seychelles industrial longline fleet was amended to include disaggregated billfish species. Hence prior to 2009 most marlin species were grouped as marlins nei.

Figure 4 reveals a progressive drop in the total catch of billfishes from 2003 to 2011 followed by a sharp increased in catches in 2012 where total catches of billfishes increased by over 200% to reach a peak of 2,199 Mt. Since 2013 total catches of billfishes has continuously increasing to reach a record of 3,244 Mt in 2016.

It is worth noting that in 2012, marlin catches was the highest of billfish catches replacing swordfish as the dominant billfish species of the Seychelles industrial longliners with a record catch of 1,079 Mt. The main marlin species reported were black marlin, blue marlin and striped marlins. The catches of marlin average to 180 Mt per year from the year 2011 to 2007 and accounted for around 16% of total billfish catches. During the piracy period (2008-2011) the average catch increased to 216 Mt per year representing around 31% of the total billfish catches but during the last 5 years the marlin average catches has increased exceptionally to an average of 1,013 Mt per year. Marlin catches accounted for around 43% of total billfish catches during the last 5 years.

The average catch of swordfish prior to the piracy period is estimated at 920 Mt per year representing 81% of total billfish catches and decreased to a mere 486 Mt per year during the piracy

period, accounting for around 68% of the billfish catches. During the last 5 years, catches of swordfish averaged to 1,274 Mt per year accounting for 56% of total billfish catches.

Table 4. Yearly catches (Mt) of Billfish by the SYC industrial longliners, 2001 - 2016.

| Year | SWO | SFA | Marlin | | | | MAR Total | Total catch (t) |
|------|-------|-----|--------|-----|-----|-----|--------------|--------------------|
| | | | BLM | MLS | BUM | MAR | | |
| 2001 | 422 | 124 | 92 | 4 | | 1 | 98 | 644 |
| 2002 | 799 | | 120 | 11 | 9 | 3 | 143 | 942 |
| 2003 | 1,589 | 0 | 70 | | 1 | 197 | 268 | 1,858 |
| 2004 | 1,234 | 6 | 10 | | | 250 | 260 | 1,499 |
| 2005 | 982 | 2 | | 1 | | 208 | 209 | 1,192 |
| 2006 | 722 | 0 | | | | 150 | 150 | 873 |
| 2007 | 690 | 0 | | | | 134 | 134 | 825 |
| 2008 | 559 | | | | | 205 | 205 | 764 |
| 2009 | 581 | 13 | 43 | 11 | 4 | 102 | 160 | 755 |
| 2010 | 409 | 11 | 130 | 70 | 15 | | 214 | 634 |
| 2011 | 396 | 18 | 178 | 66 | 41 | | 285 | 699 |
| 2012 | 1,082 | 7 | 577 | 477 | 55 | | 1,109 | 2,199 |
| 2013 | 945 | 10 | 357 | 178 | 29 | | 564 | 1,519 |
| 2014 | 965 | 4 | 570 | 88 | 29 | | 687 | 1,655 |
| 2015 | 1,621 | 13 | 1,150 | 70 | 18 | | 1,238 | 2,872 |
| 2016 | 1,759 | 17 | 976 | 372 | 120 | | 1,468 | 3,244 |

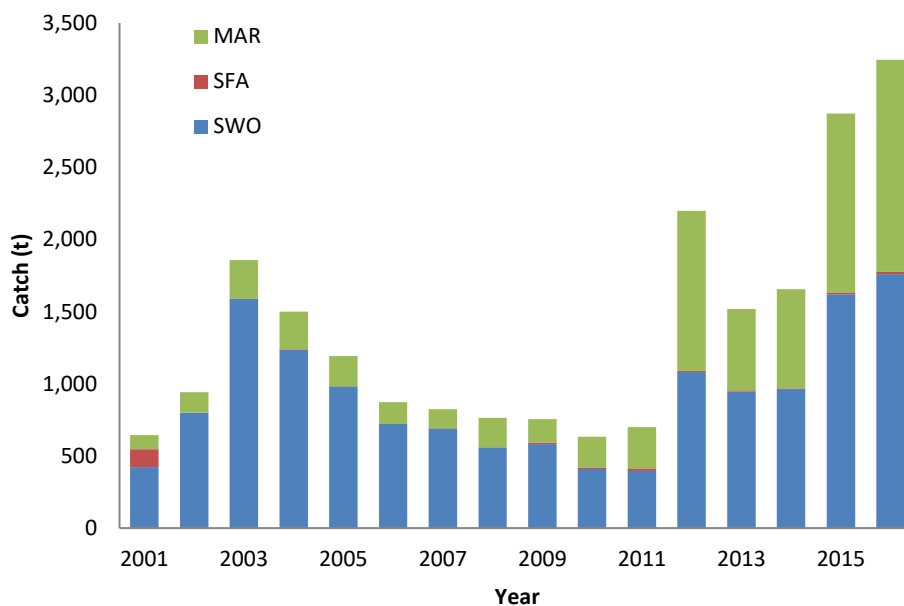


Figure 4: Bill fish catches (t) of the Seychelles industrial longliners, years 2001 – 2016

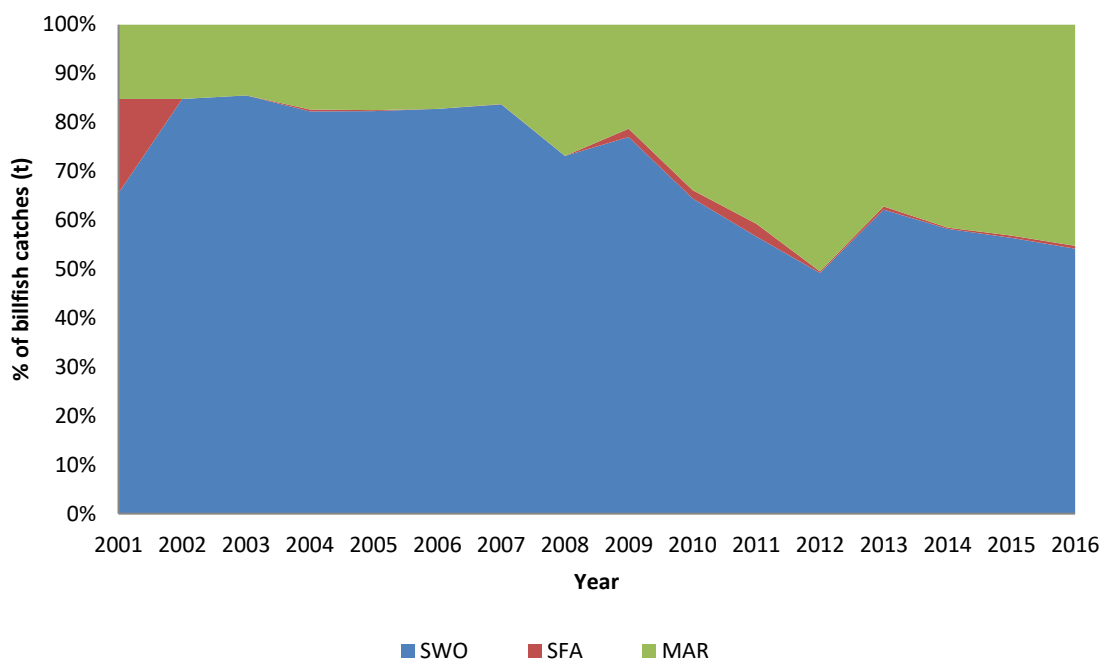


Figure 5: Percentage of billfish catches (t) of the Seychelles industrial longliners, years 2001 – 2016

5. Catch Rate

The overall catch rates for the Seychelles industrial longliners has been more or less stable with slight fluctuations between 2001 and 2011 averaging to 0.49 Mt/1000 hooks with the exception of a peak of 0.69 Mt/1000 hooks in 2005. A record catch rate of 0.77 Mt/1000 hooks was estimated for the year 2012 and since then the catch rate has remain stable averaging to 0.49 Mt/1000 hooks.

The catch rate for swordfish has been on a decreasing trend since 2002 from 0.09 Mt/1000 hooks to a mere 0.02 Mt/1000 hooks in 2011. Since then the catch rate has increased to reach 0.07 Mt/1000 hooks in 2015 averaging to 0.05 Mt/1000 hooks during the last 5 years (figure 7).

The catch rate for marlins has been more or less stable for the period 2001 to 2011 averaging to 0.01 Mt/1000 hooks and has increased sharply to 0.06 Mt/1000 hooks in 2012. The average catch rate for marlin over the last 4 years is estimated at 0.004 Mt/1000 hooks.

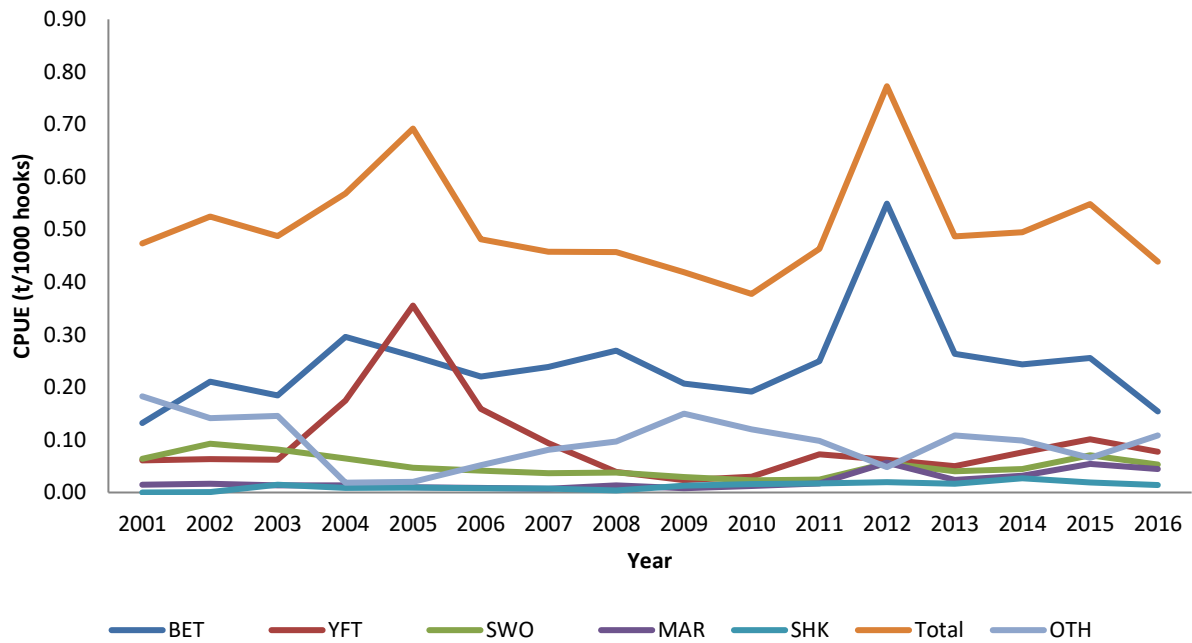


Figure 6: Catch rate (Mt/1000 hooks) of the SYC industrial longliners, 2001-2016

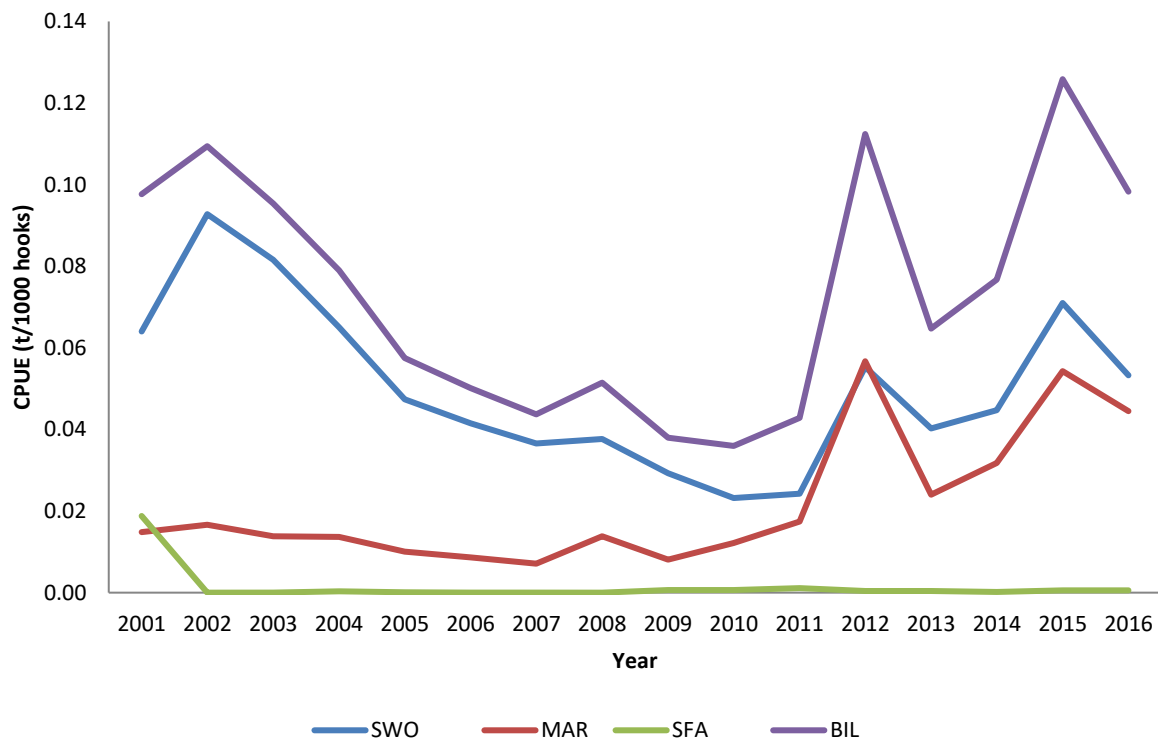
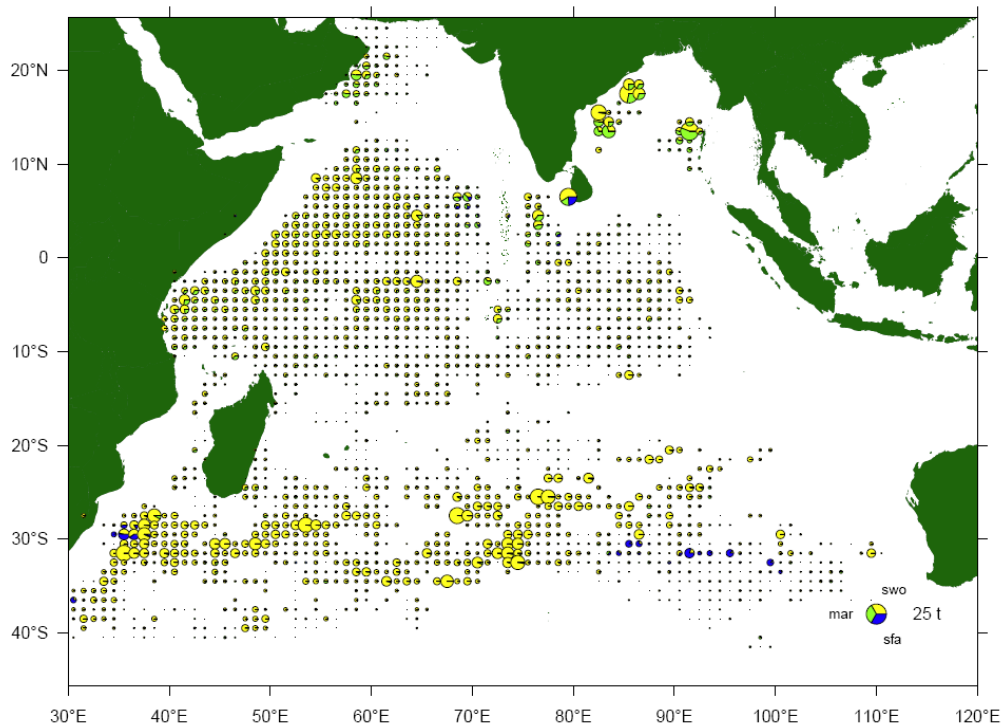


Figure 7: Catch rate (Mt/1000 hooks) of billfish catches of the SYC industrial longliners, 2001 - 2016.

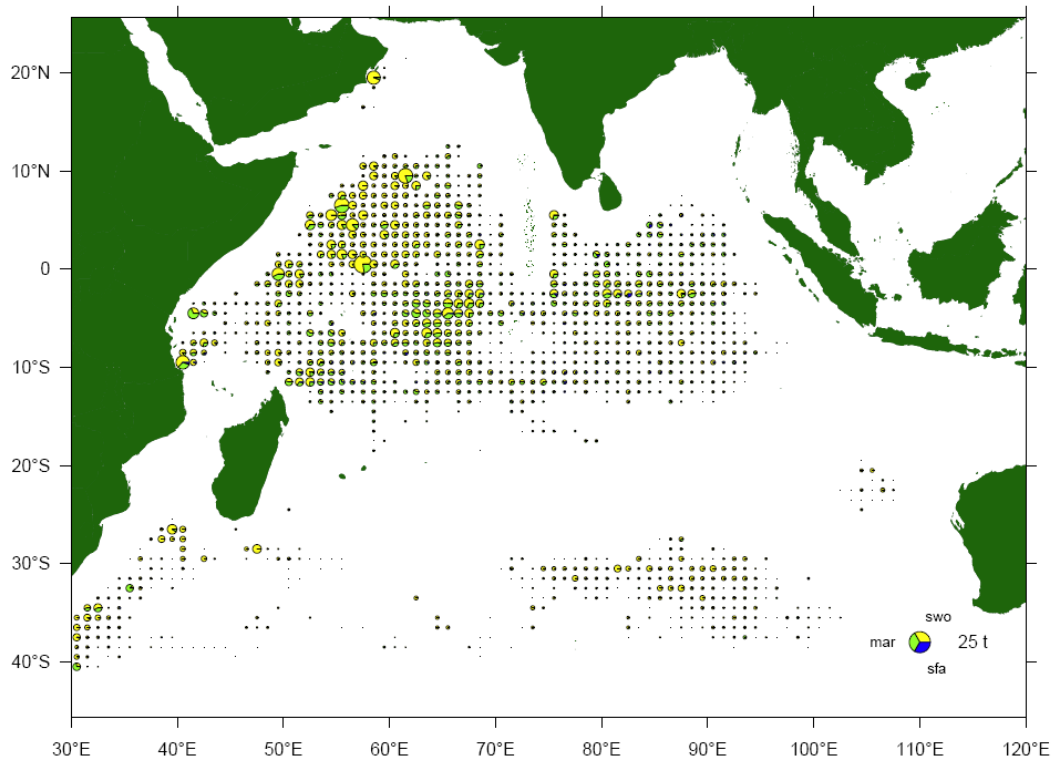
6. Fishing Ground

The Seychelles fleet has been fishing mostly in the western equatorial region, with majority of the effort concentrating between 10° north and 15° south latitude, and between 40° East and 70° east longitude, where the catches have been dominated by BET and YFT. The billfish fishery of the Seychelles industrial longline fleet are caught mostly in the same area as BET and YFT but extending between 30°S and 40°S.

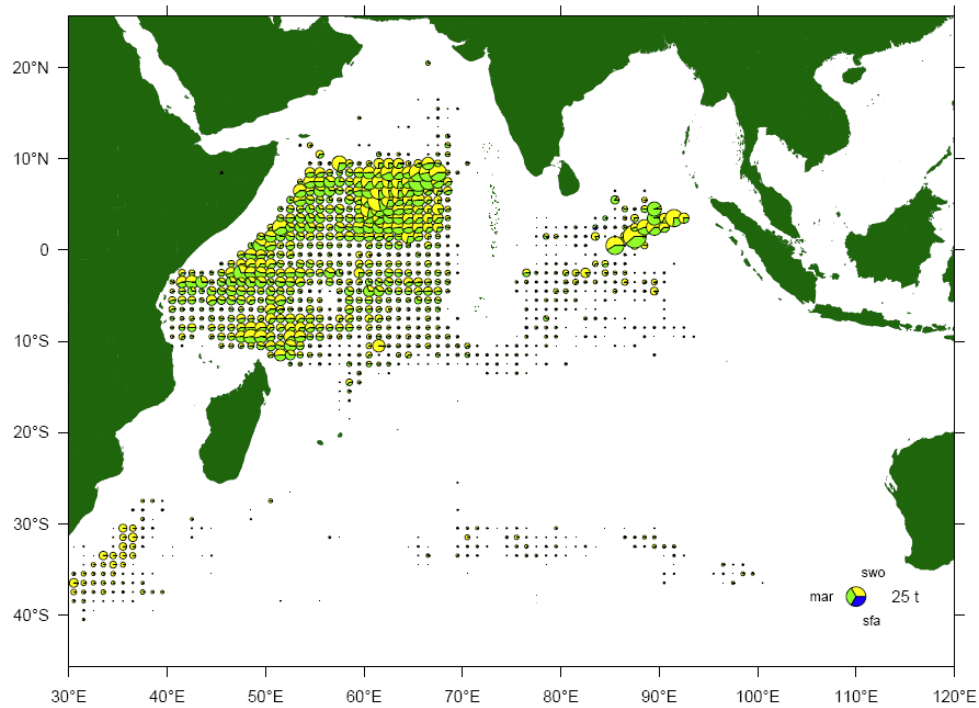
During the period 2001 to 2007 catches of billfishes were also recorded above 40° North and further east between 70° East and 90° East (map 1). During the piracy period between 2008 and 2011 reduced catches of billfish were observed in all areas (map2). Over the last 5 years increased billfishes was primarily caught between 10° north and 10° south and between 40° east extending to 90° east (map 3). Yearly maps shows similar pattern over the last years (maps 4 to 8)



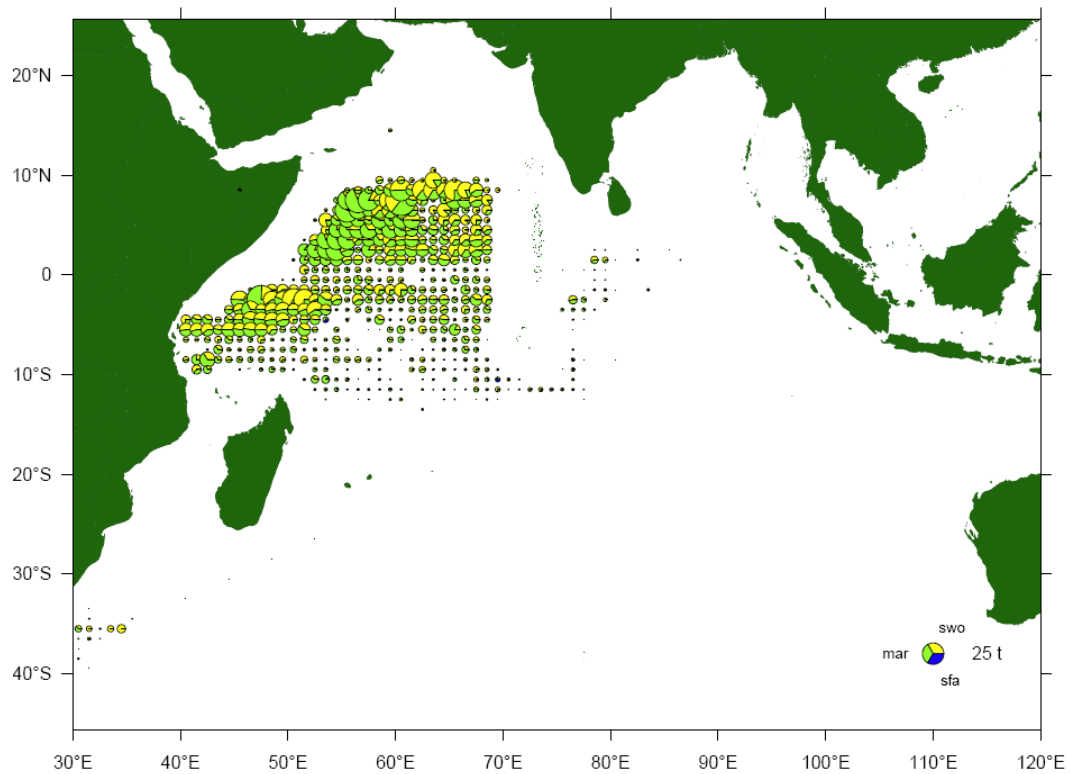
Map 1. Fishing area of billfish catches of SYC industrial longliners, years 2001 - 2017.



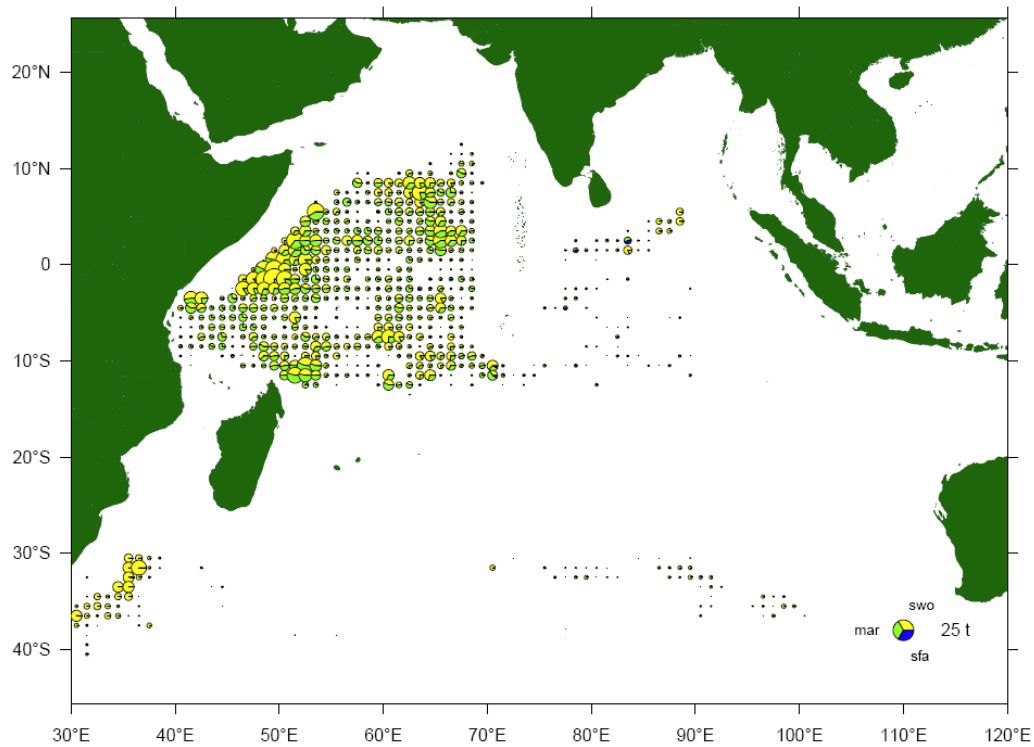
Map 2. Fishing area of billfish catches of SYC industrial longliners, years 2008 - 2011.



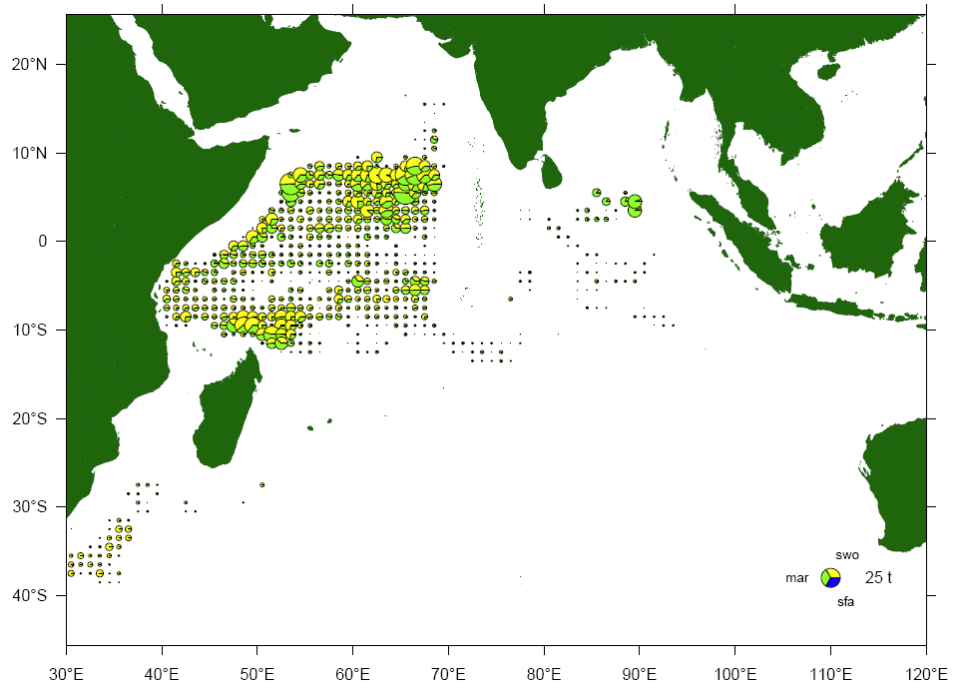
Map 3. Fishing area of billfish catches of SYC industrial longliners, years 2012 - 2016.



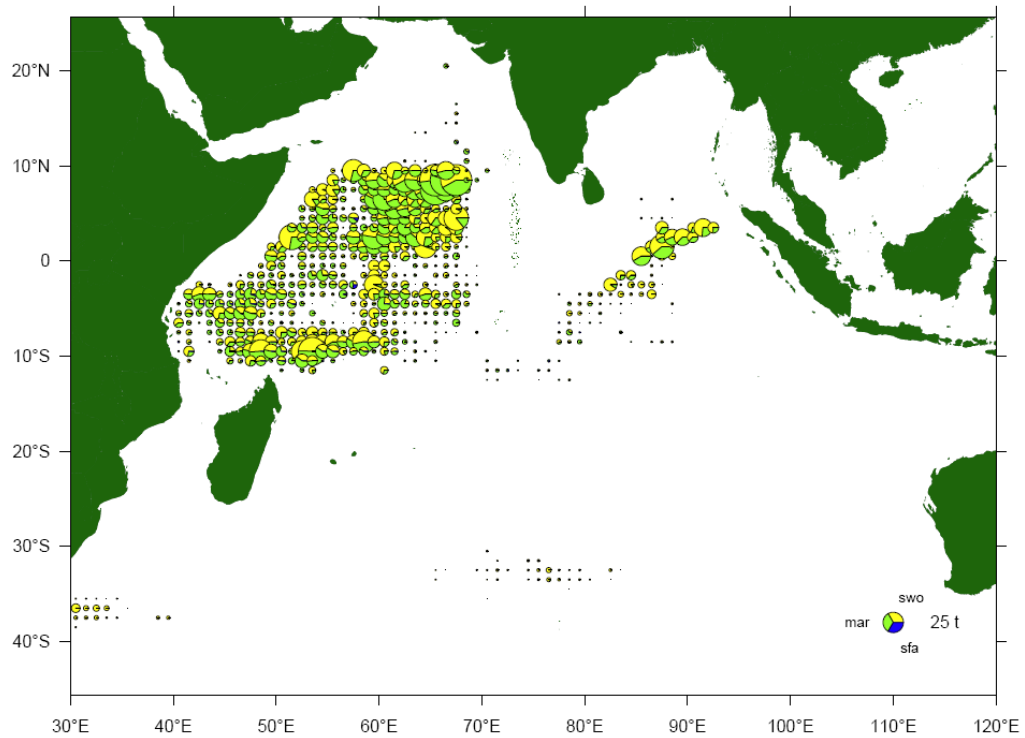
Map 4. Fishing area of billfish catches of SYC industrial longliners, year 2012.



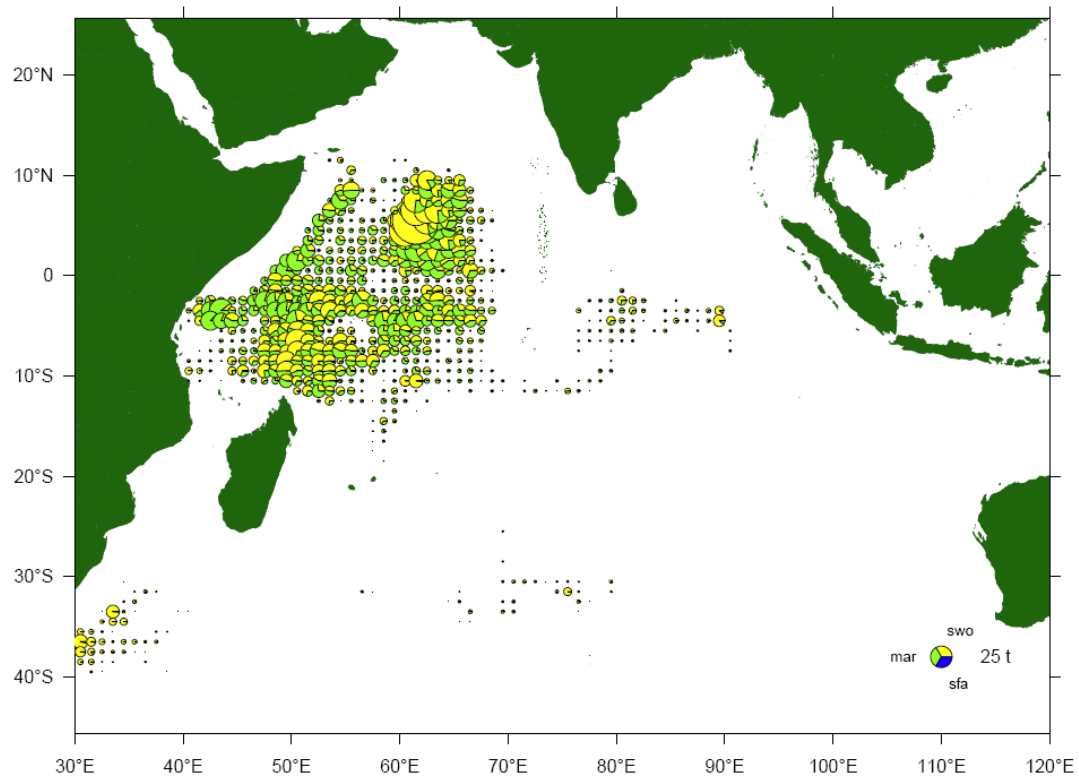
Map 5. Fishing area of billfish catches of SYC industrial longliners, year 2013.



Map 6. Fishing area of billfish catches of SYC industrial longliners, year 2014.



Map 7. Fishing area of billfish catches of SYC industrial longliners, year 2015.



Map 8. Fishing area of billfish catches of SYC industrial longliners, year 2016.

7. References

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