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The Mauritius purse seine fishery since 2013

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Abstract

The purse seine fishery in Mauritius restarted in 2013 after an absence of 12 years. In 2016, the Mauritian purse seine fishery produced 11721.95 tons of fish with a fleet having a carrying capacity of 5334t. The lowest catch was recorded in 2013 with a production of 855 t and was due to starting of fishing operations of only one vessel in the month of October. Two categories of purse seiners were in operation: there were three small purse seiners with a GT of 678 each and two large freezer purse seiners with a GT of 2667 each. The average catch for these small purse seiners decreased to 75 tonnes per vessel in 2015 due to a decrease in the number of small purse seiners in operation. The majority of the catch of these small purse seiners was skipjack (81.23%), followed by yellowfin (8.91%) and albacore tuna (0.10%). The miscellaneous species represented 9.76 % of the total catch and comprised mainly of mackerel (Decapterus spp) and rainbow runner. This paper focuses mainly on the catch records between 2014 and 2016 for the two large purse seiners. Yellowfin tuna was the predominant species varying between 56-63 % of the total catch followed by lower skipjack tuna catches (29-32%). The proportion of bigeye tuna was the lowest among the tropical species with a percentage varying between 4-14%. The catch obtained on log school was slightly higher (51.57-56.74%) as compared to that obtained on free schools (43.26-48.43and the number of sets deployed on free school was lower (30.23-42.79%) than those deployed on log schools (57.21-69.77%). Furthermore the high occurrence of yellowfin tuna in the total catch may be attributed to the harvesting of both large yellowfin tuna on free school and large catches of smaller yellowfin on log associated schools. A breakdown of the size composition of yellowfin tuna showed that, on average, 42.64 % of the catch comprised of yellowfin of size 10-40 kg and were harvested on log associated schools. 27.72 % of the yellowfin catch comprised of fish size greater than 60 kg and was obtained on free school. The remaining 29.36 % of yellowfin comprised of fish of size 40-60 kg and was harvested from both log associated and free school with the majority being from free school (60 %). A total effort 1383 sets were deployed with 1146 positive sets for the period 2014-2016. Null sets on free swimming fish schools had a higher representation (28.09%) as compared to those on log associated school (10%).

1. Introduction

The island of the Republic of Mauritius located in the South West Indian Ocean (Latitudes19°58.8' and 20°31.7' South and Longitudes 57°18.0' and 57°46.5' East) is endowed with an Exclusive Economic Zone (EEZ) of 1.9 million square kilometres. Due to its geographical position, conducive port infrastructures and dry-docking facilities Mauritius is a regional hub for maritime traffic. Fisheries and ancillary activities (shipping agencies, port

activities, logistics, vessel repairs, shipping and financial services, and crew expenditures) account for about 1.5 per cent of GDP.

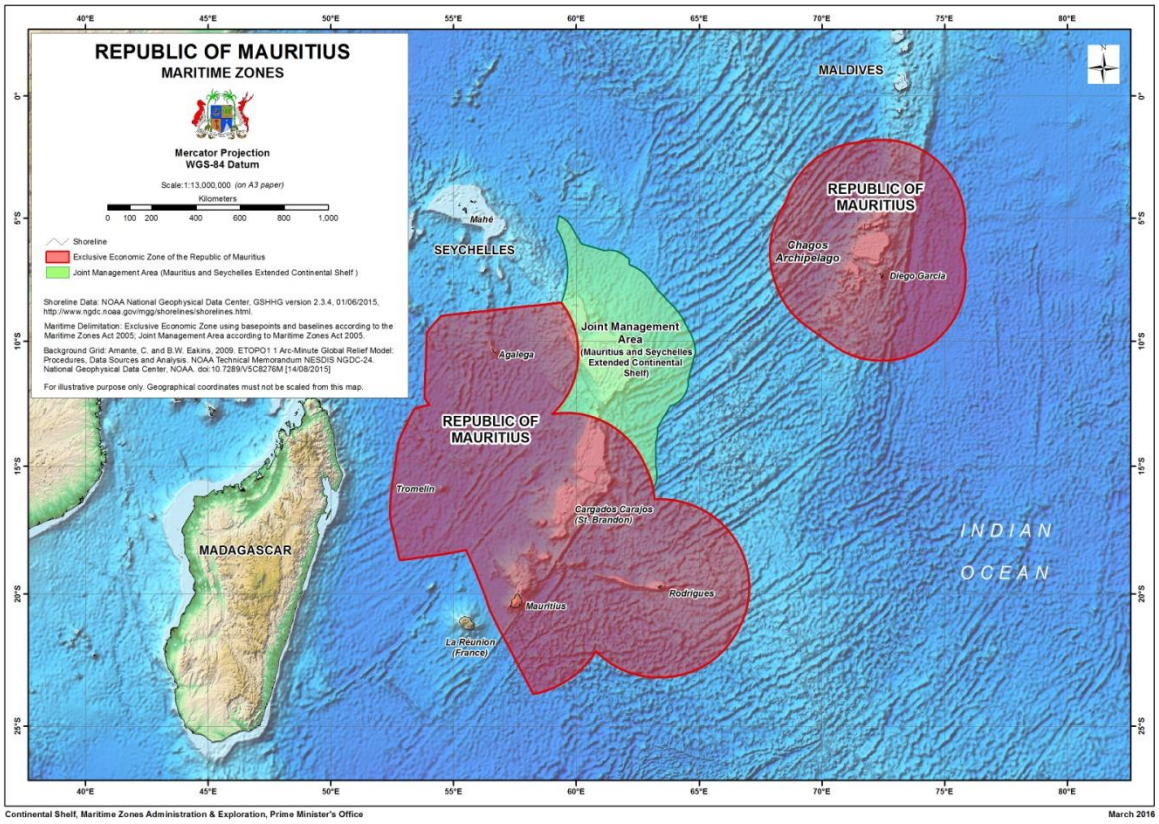

Figure 1: Map of the maritime zones of Mauritius.

Mauritius has been involved in the purse seine fishery since 1979. One Mauritian purse seiner started operating in the Indian Ocean in 1979. This was followed by two other vessels during the late 1980s and early 1990s. However, Mauritius-flagged vessels have not been operating in the purse seine fishery since the year 2000.

After an absence of 13 years, the Mauritian purse seine fishery was re-launched with the coming into operation of one Mauritius-flagged vessel in October 2013. The following year there were seven Mauritius-flagged purse seiners in operation and the purse seine fleet consisted of two categories of vessels namely two super freezers with GT of 2667 tons and LOA of 90m each and five smaller purse seiners with a GT of 678 t and LOA 49.56m each. It is to be noted that out of the five smaller purse seiners that were under Mauritius flag in 2015, only two vessels were partially in operation. All the five small purse seine vessels were deregistered in February 2016.

The details of the purse seine fleet for the period 2013-2016 are given in table 1.

Year	Gear	Number of vessels	GT	LOA (m)
2013	Purse seine	1	2660	90
2014	Purse seine	7	678-2667	49.56-90
2015	Purse seine	7	678-2667	49.56-90
2016	Purse seine	2	2667	90

Table 1: Details of the purse seine fleet

2. Catch of the Mauritius Flagged purse seiners

The catch of the purse seine vessels have been divided into two categories: (i) the catch of the smaller purse seiners; and (ii) the catch of the large purse seine freezer vessels.

2.1 Catch of the small purse seiners

The five small purse seiners which were operational in 2014 reported a total catch of 1149t out of which skipjack tuna was the major component (80%). In 2015, only two vessels reported a catch of 151t again with skipjack representing the major part of the catch (87%). The three other small purse seiners did not report any catch and all the five vessels were eventually deregistered from the Mauritius Register of vessels in February 2016.

Species	Catch (t)	
	2014	2015
YFT	104.664	10.7
SKJ	925.9404	132
ALB	0	1.5
Others (Wahoo, doplphin fish, Mackerels (Trachurus), Rainbow runner, Sailfish	118.86	7.2

Table 2: Catch composition of the small purse seiners

The total amount of tuna caught by these purse seiners during the period October 2013-December 2016 amounted to around 30,000t with the major part of the catch consisting of yellowfin tuna (60%) followed by skipjack (31%) and Bigeye (8%). The remainder of the catch consisted of by-catch such as dolphinfish, triggerfish and marlins. Table 3 shows the catch by species of the two large purse seiners for the years 2013 to 2016.

Species	Catch (t)				
	2013	2014	2015	2016	Total
YFT	352	4739.03	5406.2	7404.07	17901.3
SKJ	476	2205.84	2700	3788.18	9170.02
BET	27	531.552	1421.5	529.707	2509.76
ALB		47.964	78	54.5046	180.469
Dorade			0.8		0.8
Baliste			0.5		0.5
Marlin		0.1	3.86		3.96
Triggerfish		0.4	0.1		0.5

Table 3: Catch Composition of the large purse seiners

As only one purse seiner operated for a short period in 2013, the catch of this purse seiner will not been taken into consideration for the remainder of this paper. This paper will focus mainly on the catch of the three main tropical tuna species of the two large purse seiners for the years 2014, 2015 and 2016. The catch composition for the three main species is given in Figure 2.

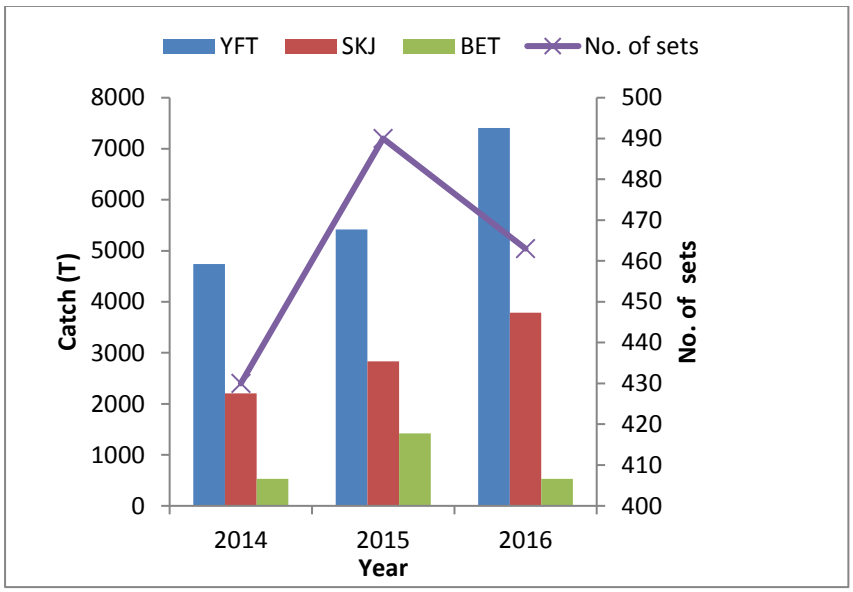

Figure 2: Catch composition of the three main species for the large purse seiners

For the three years, yellowfin tuna was the dominant species comprising 61% of the catch followed by Skipjack tuna (30.5%) and Bigeye (8.5%).

2.3 Catch on free swimming school and associated school.

2.3.1 Catch on artificial logs

The artificial log catches has increased from 2014 with catch levels of 3125.52 tons to 5686.51 tons recorded in 2016. For the years 2015 and 2016, although there was no big difference in the effort, 250 set for 2015 and 246 sets for 2016, there was a difference of 865t in the catch harvested.

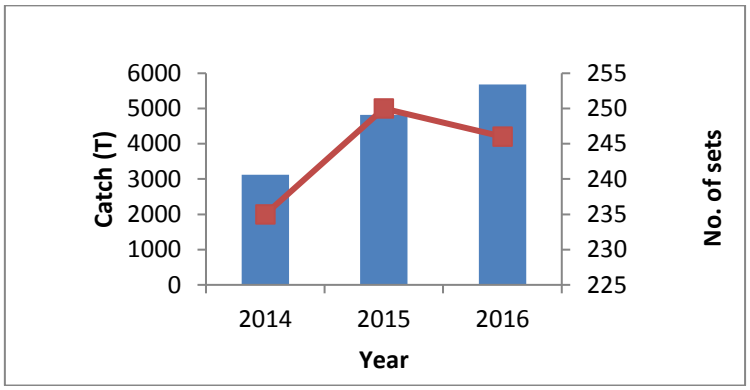

Fig 3: Catch on artificial logs

2.3.2 Catch on Natural logs

The catch trend for the natural log was different with a decrease of 54.77 % noted from 2014 to 2016. A similar trend was observed for the effort which dropped from 65 sets in 2014 to 14 in 2016.

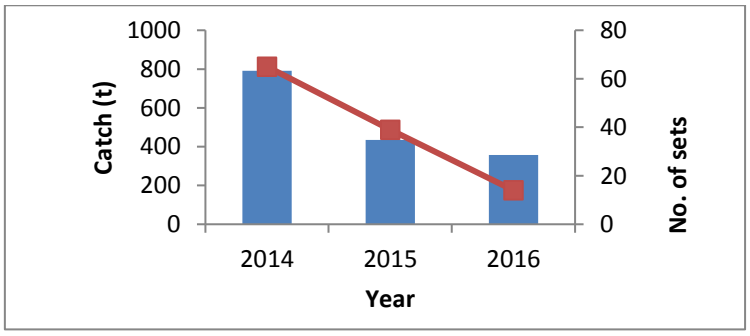

Fig 4: Catch on natural logs

2.3.3 Catch on free school

The catch of free swimming school also showed an increasing trend with a difference of 45.33 % between 2014 and 2016 catches. For the free swimming schools, it was observed that

increasing catch trends was accompanied by corresponding increase effort (from 130 to 203 sets).

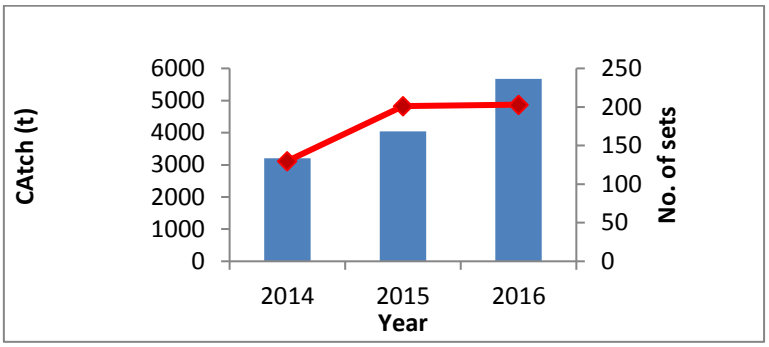

Fig 5 : Catch on free school

2.4 Species composition on the different types of sets.

2.4.1 Yellowfin tuna

Figure 6 compares the catch of yellowfin tuna on the free schools, natural and artificial logs.

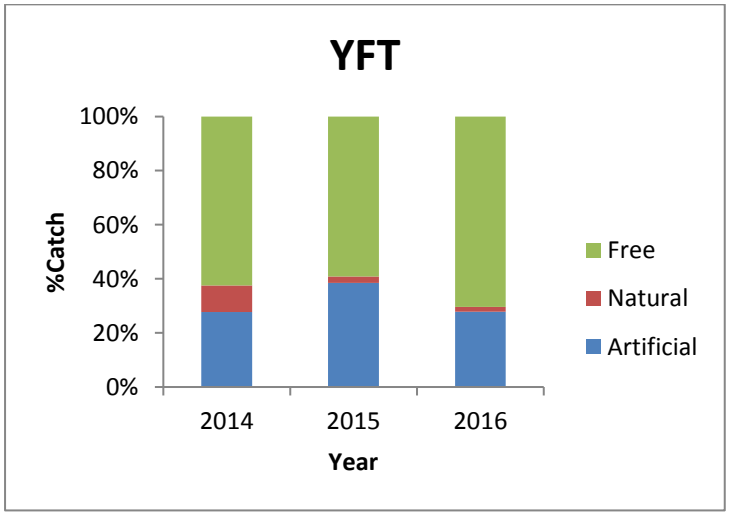

Figure 6: Occurrence of yellowfin in free school and log associated school

From Fig 6 it can be seen that the majority of the yellowfin tuna (59.13-70.42%) were derived from the free swimming schools. Since free schools are composed of large yellowfin tuna, the main yellowfin catches would consist of large individuals. Moreover the size range (Table 4) also indicate the presence of large yellowfins in the total catch with 58% of the yellowfin of size of more than 40 kg caught on free school.

Size Range (kg)	% of total Yellowfin
<10	20
10≤yft<20	17
20≤yft<40	5
40≤yft<60	30 (out of which 60% were caught on free school)
yft≥60	28 (all were from free School)

Table 4: Size range of yellowfin Tuna

2.4.2 Skipjack tuna

Figure 7 gives an indication of the catch of skipjack tuna made on free schools, natural and artificial logs.

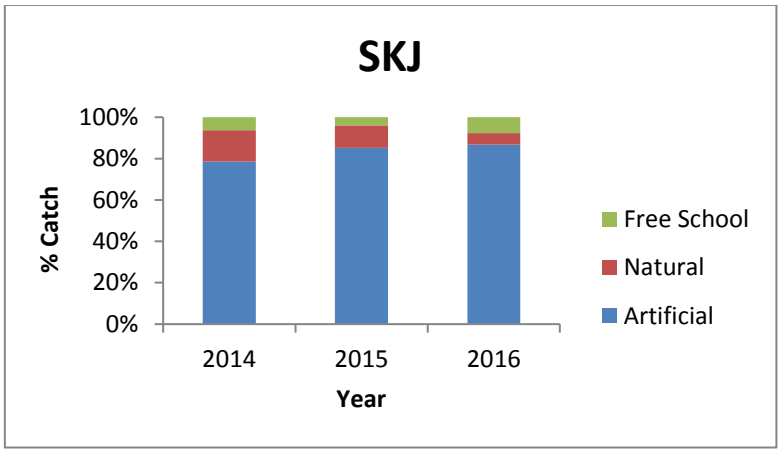

Figure 7 : Occurrence of skipjack in free school and log associated school

Most of the skipjack caught by the two purse seiners were on artificial FADs. In 2014, 84% of the skipjack caught was on artificial FADs and this tendency was maintained in 2015 as well as 2016 (87%). This contrasts with the catch of skipjack on free schools (from 5% in 2014 to 8% in 2016) and on natural logs (from 5% in 2014 to 11% in 2016). The size composition reported in logbooks was categorized into two groups namely category "1.5- 2.5 kg" and "2.5-5 kg". It was found that the skipjack catch comprised of 83% of size 1.5-2.5 kg and 17% of skipjack of size 2.5-5kg (Table 5).

Size Range (kg)	% of total Skipjack
1.5≤skj< 2.5	83
2.5≤skj≤ 5	17

Table 5 Size range of skipjack tuna

2.4.3 Bigeye tuna

Figure 8 compares the catches of Bigeye tuna on free schools and logs.

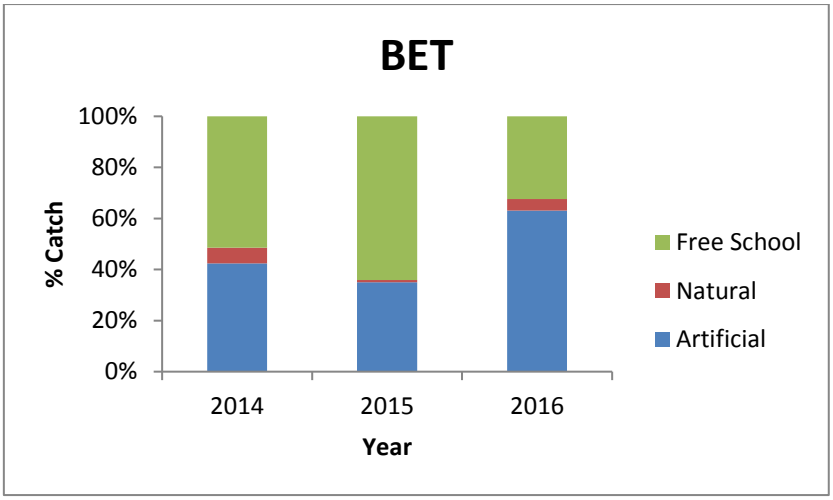

Figure 8: Occurrence of bigeye tuna in free school and log associated school

Whilst for the years 2014 and 2015, the majority of the Bigeye tuna was caught on free schools (51% and 64% respectively), in 2016, a greater percentage of Bigeye tuna was caught on artificial FADs (63%). On natural logs, the catch of Bigeye tuna was quite low.

3. Purse seine fishing effort (Number of sets deployed)

3.1 Distribution of the deployment of sets.

The total number of sets deployed by the two purse seiners for the period 2014-2016 was 1383. The distribution of the deployment of sets was higher for the log associated school with a total of 849 sets being deployed as compared to 534 sets deployed on free school. Figure 9 shows the number of sets on free school and log schools.

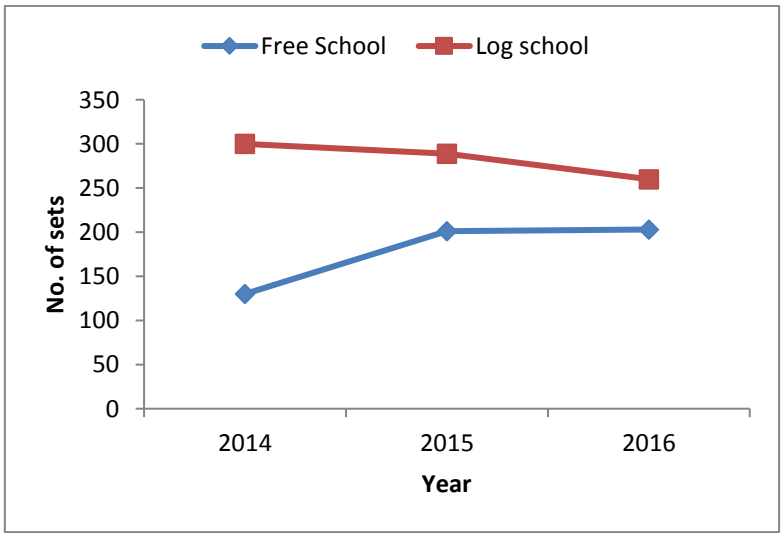

Figure 9: Number of sets deployed based on school type

3.2 Successful and unsuccessful sets

Figure 10 shows the number of positive and null sets effected by the two vessels during the three years.

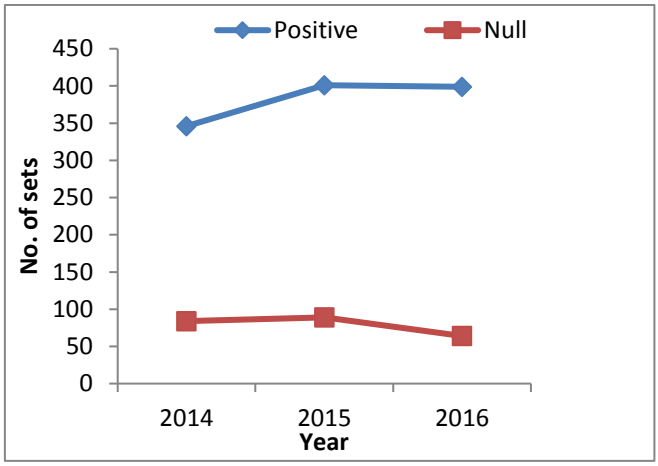

Figure 10: Total number of positive and negative sets

Successful fishing was represented by the percentage of positive sets in the total number of sets deployed. The rate of successful sets varied between 80.47-86.18 % representing a peak (86.18%) in 2016. The % of unsuccessful sets was low varying between 13.82-19.53%.

Figure 11 illustrates the catch per set for each fishing technique of the purse seiners.

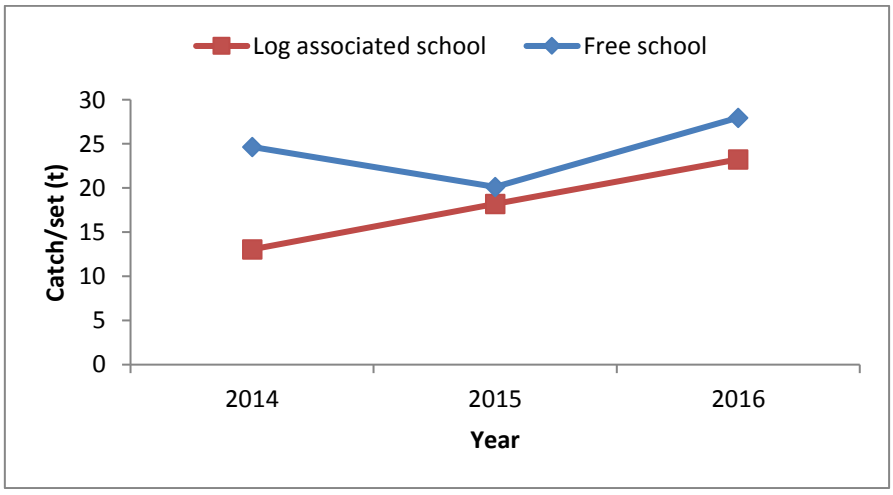

Figure 11: Catch rates (catch per set) for free swimming schools and log associated schools

The catch rate (catch per set) for the free swimming school ranged between 20 to 25 t and as compared to a range of 13 to 23t for log associated schools. The catch rates for the log

associated schools were low despite increasing effort on log associated schools (849 sets) as compared to free school. On the other hand, a higher catch rate was obtained for free swimming school although the number of sets deployed on free schools was relatively lower (534 sets). This increasing effort in the FAD fishery accompanied by reduced catch/set could be due to a decline of tuna on FADs because of increase in the number of FADS in the region thereby causing a large dispersion of tunas among FADS.

3.3 Successful and unsuccessful sets on school type

Figure 12 shows the percentage of positive and negative sets on free schools and on logs.

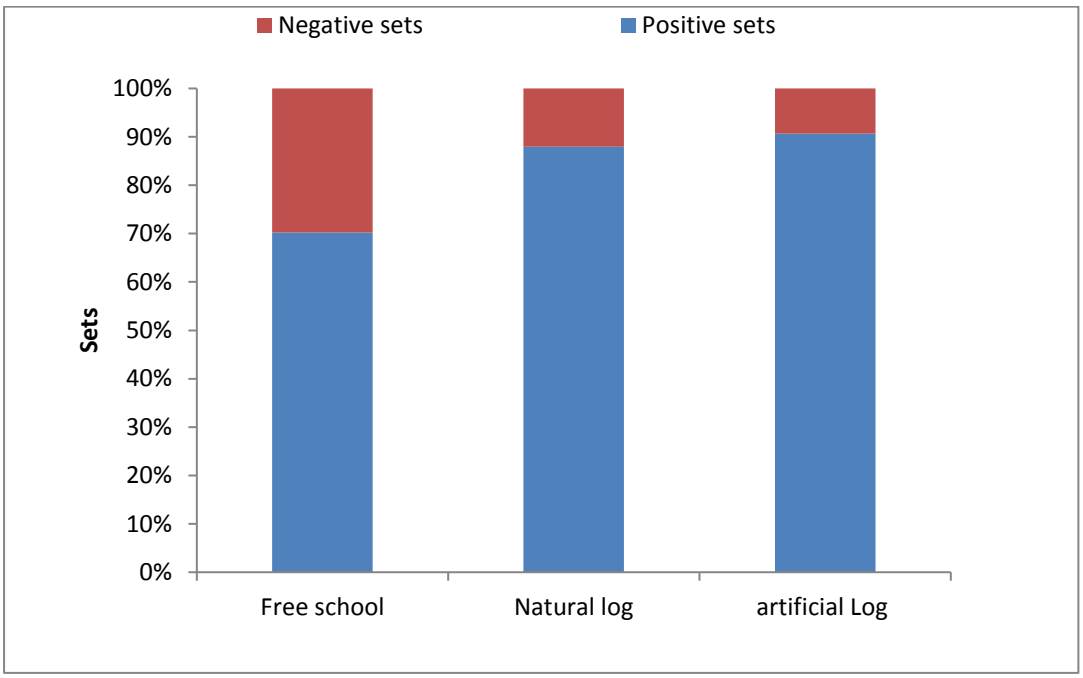

Figure 12: Percentage of negative and positive sets on each school type.

Out of 534 sets effected on free schools, 384 were positive (72%) and 150 resulted in negative sets (28%). On Natural logs 88% of the sets were successful as compared to 12% null sets and on artificial logs the percentage of successful sets was 90%. Overall, these results show that the fishing success is higher for log associated schools. This high success rate could explain the large deployment of sets on FADs as compared to deployment of sets on free schools as shown in figure 9.

4. Length frequency

4.1 Yellowfin Tuna

A total of 4234 yellowfin were sampled during the three year period. A distribution range from 36cm to 182cm was observed with the majority of the fish consisting of larger size fish measuring more than 100cm. This distribution supports the observation made on the catches of yellowfin originating from free schools. The yellowfin distribution had a mode at 138 cm and mean of 114 cm.

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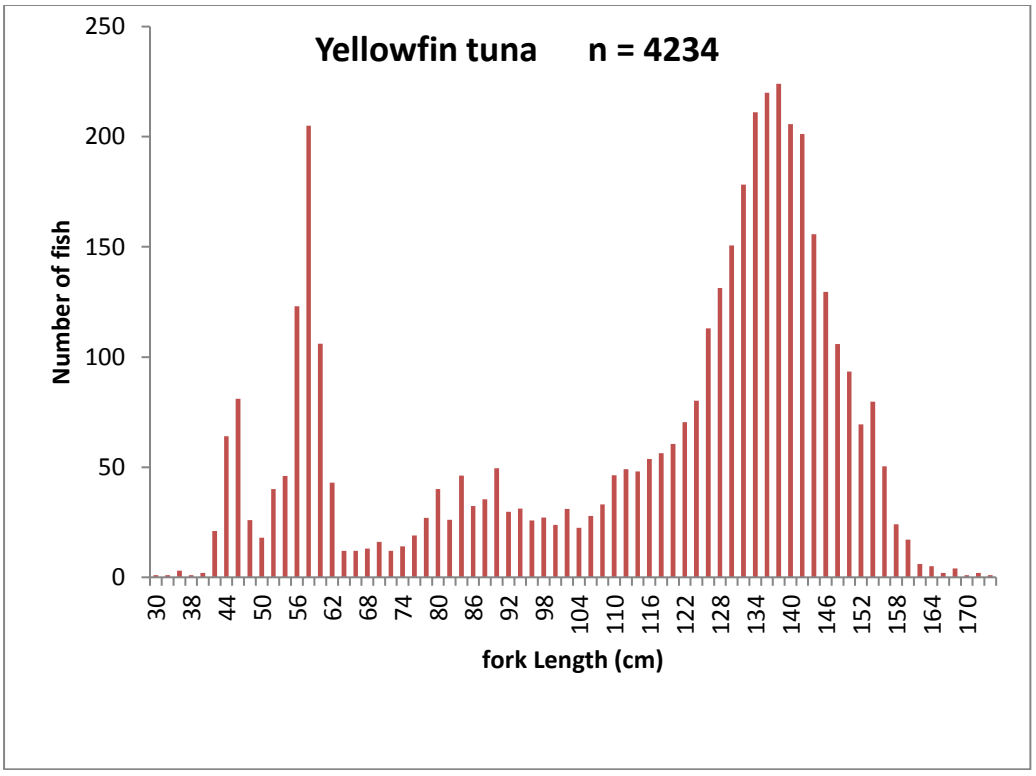

Figure 13: length frequency distribution of yellowfin tuna

4.2. Skipjack Tuna

A total of 920 skipjack tuna were sampled. The majority of the fish ranged from 45 to 64 cm. The frequency distribution showed a mode at 53 cm. The mean size of the skipjack sampled was 55 cm.

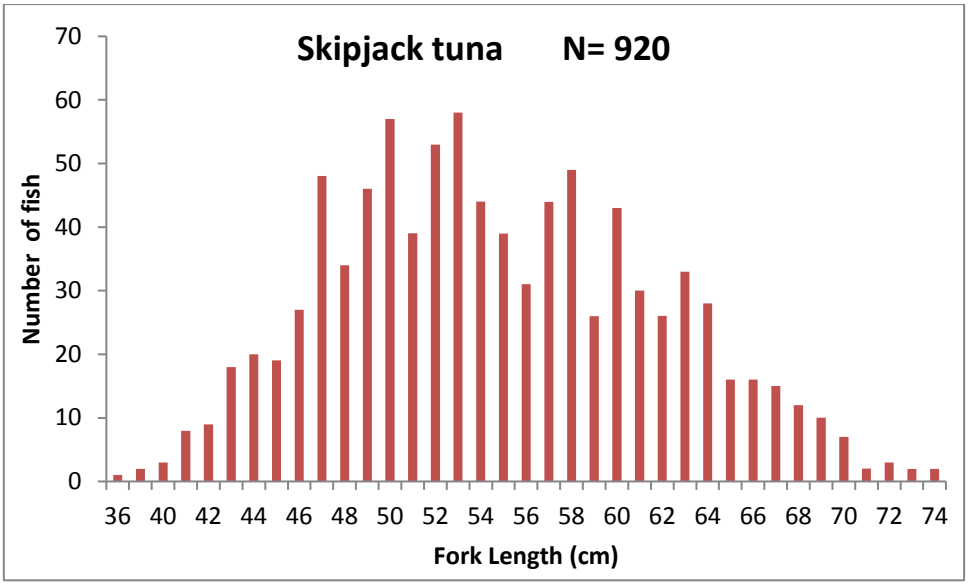

Fig 14: Length Frequency distribution of Skipjack tuna

4.3 Bigeye Tuna

A total of 231 bigeye tuna were sampled. Bigeye tuna showed a bimodal distribution with two peaks occurring at 58 cm and 150 cm respectively and with a mean of 105 cm.

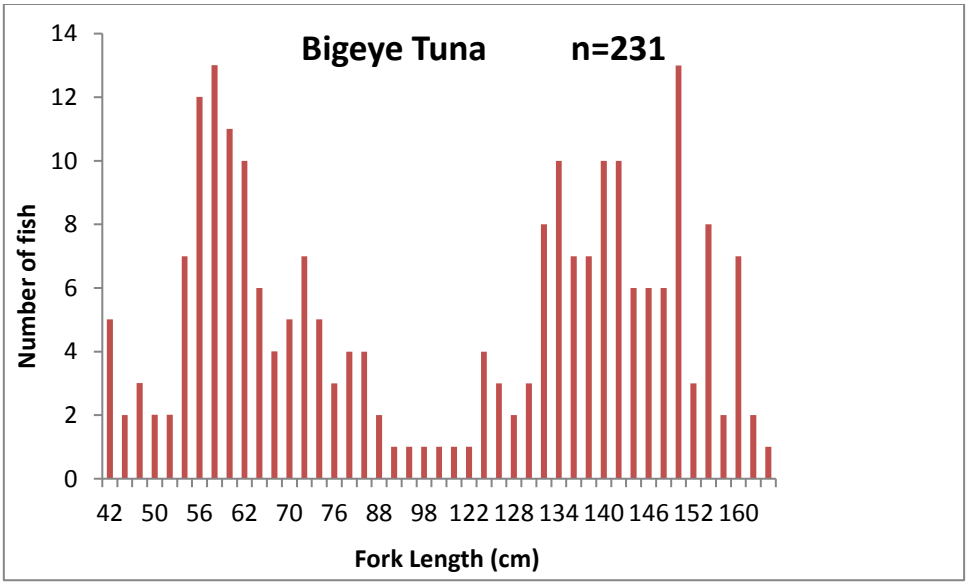

Fig 15: Length frequency distribution of bigeye tuna

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