# PRILIMINARY CATCH ESTIMATES OF TUNA AND TUNA LIKE SPECIES IN SRI LANKA JUST AFTER THE TSUNAMI

## INTRODUCTION

Sri Lanka is one of the oldest and most important tuna producing island nations in the Indian Ocean (FAO, 1985). History of tuna fishery extended far beyond the 1960's and the most effective phase of development began in the early 1980's with the introduction of offshore multi-day boats. Since then tuna fishing activities rapidly expand both in coastal and offshore range (Maldeniya and Amarasooriya, 1998). At present fishery for tuna and tuna like species is the major component of large pelagic fisheries in the country.

Exploration and exploitation of the fishery resources in the Indian Ocean area over the past three decades have shown that the tuna resources in Sri Lanka consist of several species. They are skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obsesus*), kawakawa (*Enthynnus affinis*), frigate tuna (*Auxis thazard*) and bullet tuna (*Auxis rochei*). The latter three species are generally considered to be insular and with localized migratory habits. Among tuna species, skipjack dominated in offshore areas, followed by yellowfin tuna (Samaraweera and Amarasiri, 2004). It has been reported that tuna fishing has undergone many changes over the past few years. Exports of chilled large tunas, such as yellowfin and bigeye, have become an attractive venture in recent years specially in export market.

Gillnets alone or in combination with other gears, are the main fishing gear used in tuna fisheries from its beginning. The troll lines, hand lines, ring net and purse seines are the other gear combinations that frequently carried out with gillnet cum longline operations. Pole and line fishery has also being practiced in seasonally by targeting coastally inhabitant skipjack tuna in south and east coast of Sri Lanka (Maldeniya and Amarasooriya, 1998).

The catch of billfish (tuna like fish) in the offshore fishery is generally considered as secondary to the tunas or as a by-catch. Marlins and billfish come under this category and similar fishing gears are used to exploit them (Campbell *et al.*, 1998).

## METHODOLOGY

### A. Data Collection

The data collection was done according to the newly implemented sampling programme which is a collaborative activity of Indian Ocean Tuna Commission (IOTC), Overseas Fisheries Cooperation Foundation (OFCF) and National Aquatic Resources Research and Development Agency (NARA). This programme was introduced in early December 2004 and 2005 data were used for this analysis.

Data were collected by random port sampling. Sampling stratification mainly consists of spatial strata (landing sites), technical information (vessel categories and gear types) and temporal information (months). The coast line is divided into seven statistical zone (Figure 1) and 18 data collectors (12 veterans and 6 recruited by under the IOTC / OFCF programme) have been assigned to cover these zones. Total sampling was carried out in major landing sites while effort data was collected in the minor landing sites. Sites are visited on rotational basis according to the time table provided. Daily effort data catch and effort data and biological data were collected in the landing sites.

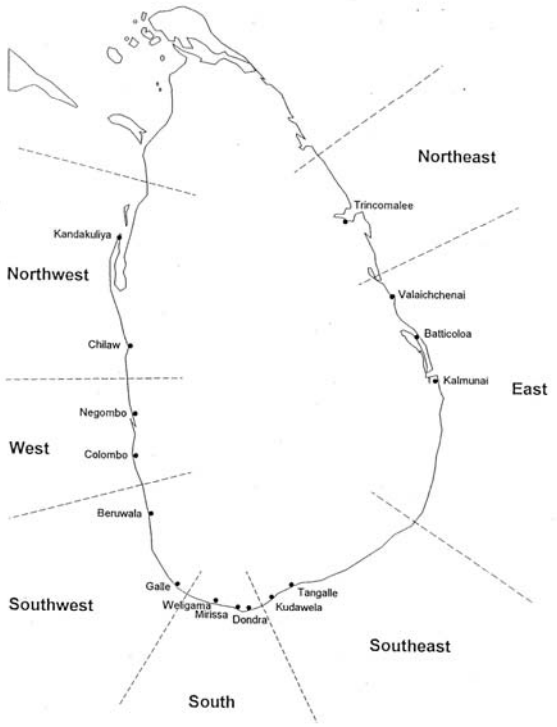


Figure 1. Principal statistical zones and major landing sites

## B. Data Analysis

### *1. Offshore fishery*

Following steps were carried out to estimate the offshore fishery production.

**Step 1:** Daily landing estimate at one landing site for a given boat category (Cd) :

$$Cd = \left( \sum_{b=1-n} Cb \right) * \frac{N}{n}$$

Cd : Landing of species on sampling day per boat type

n : Number of vessels sampled on sampling day

N: Number of vessels operating on sampling day

**Step 2:** monthly landing estimate by boat category at a landing site (Cm):

$$Cm = \left( \sum_{b=1-Nds} Cd \right) * \frac{Nl}{Nds}$$

Cd: daily landing on sample day

Nl: Number of landing days in that month

Nds: Number of days sampled

**Step 3 :** When it observes empty strata substitution were made.

**Step 4 :** Annual landing estimate by boat category at a landing site

***2. Coastal fishery***

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Cd: daily landing on sample day

Nl: Number of landing days in that month

Nds: Number of days sampled

**Step 3 :** Monthly catches are summed to obtain the annual landings by boat category at a landing site.

As all the estimates based on fishing effort data sticker programme was started to estimate the actual number of multiday boats in Sri Lanka with financial and technical support of IOTC / OFCF.

## RESULTS

### 1. Fishing Effort

Total offshore fishing effort (number of landings) was estimated by considering major statistical zones (Table 1). Total landings were comparably low in January and February in all the landing sites compared with the other landing sites. The highest landings were recorded in southeast statistical zone in all the months except in January and February while the lowest landing was in North-western statistical zone. Seasonal changes of total landings could be observed and this seems to be associated with the monsoon pattern of the country.

Table 1 : Monthly variation of total offshore effort

| Statistical Zone | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| West | 289 | 377 | 497 | 459 | 431 | 402 | 390 | 441 | 479 | 475 | 492 | 506 |
| North west | 62 | 73 | 112 | 117 | 105 | 111 | 41 | 56 | 61 | 72 | 69 | 70 |
| Southeast | 403 | 459 | 720 | 710 | 716 | 700 | 683 | 722 | 786 | 822 | 815 | 835 |
| South | 460 | 476 | 615 | 633 | 647 | 650 | 654 | 694 | 702 | 702 | 699 | 715 |
| Southwest | 230 | 259 | 337 | 358 | 380 | 393 | 437 | 423 | 474 | 498 | 509 | 533 |
| Northeast | 119 | 119 | 119 | 137 | 182 | 188 | 171 | 141 | 136 | 107 | 102 | 102 |

### 2. Fishery Production

#### 2.1 Skipjack tuna

**a.** Offshore production

Monthly variation of total offshore skipjack tuna catches are summarised in figure 1. Estimated total offshore production was 25,773.81 tones. Production increased gradually from January to July with having peak production in July (4248.47 t) and then it decreased and remained more or less steady level during the rest of period.

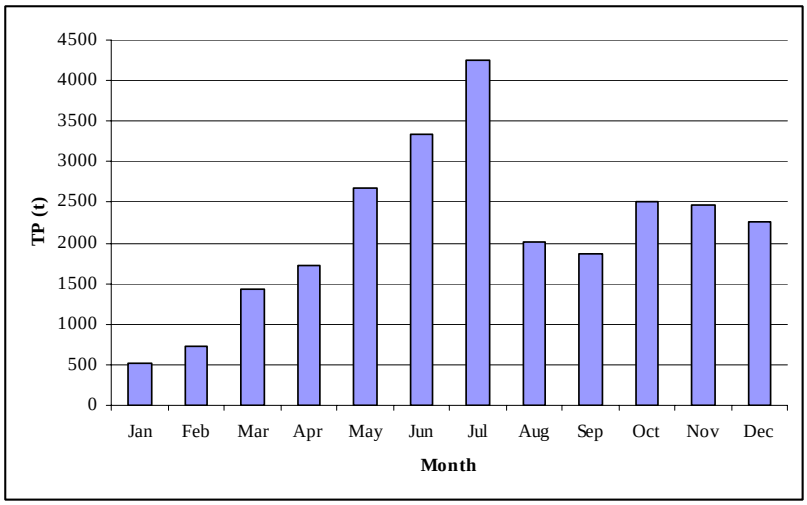


Figure 1 : Variation of total offshore skipjack production

Total offshore skipjack tuna production was compared according to the major statistical zones (Figure 2). Maximum skipjack tuna production was reported from Southern statistical zone followed by southwest statistical zone while the minimum production was in north-western statistical zone. The peak skipjack production period in Southern (Southwest, South and southeast statistical zones) and western coast (west and northwest statistical zones) was in July and June respectively while it was September in Northeast statistical zone.

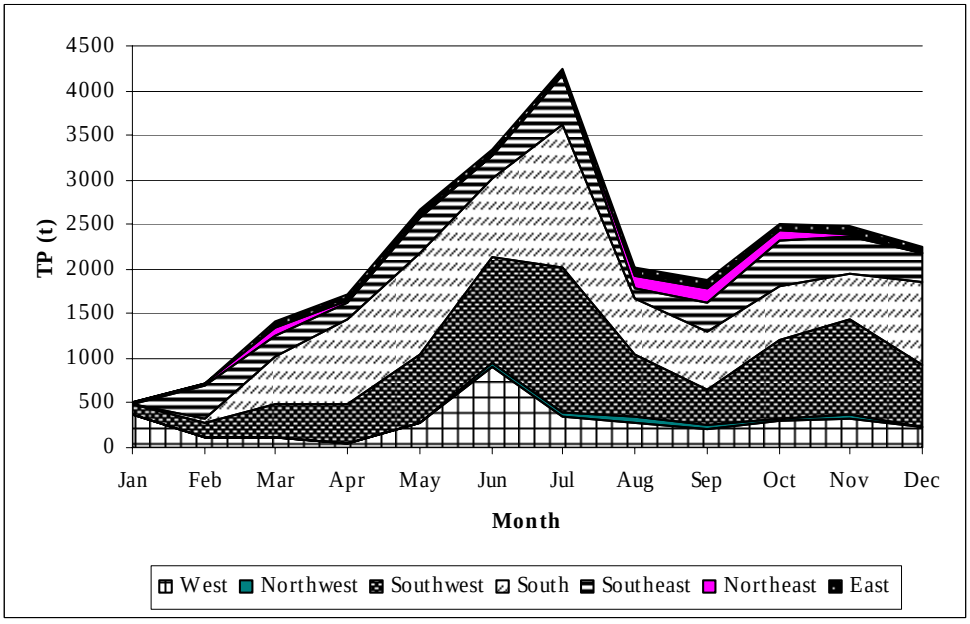


Figure 2: Offshore Skipjack tuna production according to the statistical zones

**b.** Coastal production

The estimated coastal skipjack tuna production was 6728.79 tones and it accounted for ¼ of the total offshore production. The highest production was reported in August followed by September (figure 3). Due to the effect of Tsunami, very few coastal boats were operated in early two months and this badly affected to the production.

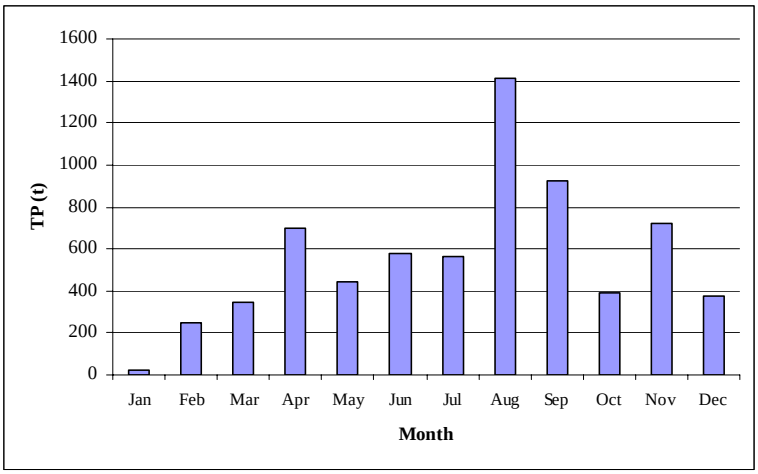


Figure 3 : Variation of total coastal skipjack production

The highest production and the lowest production were reported in South and north-west statistical zone respectively (figure 4). The peak production was reported in September in the Southern zone while it was August in southwest, southeast and eastern statistical zones. In northeast and northwest the production was very small and restricted to one month.

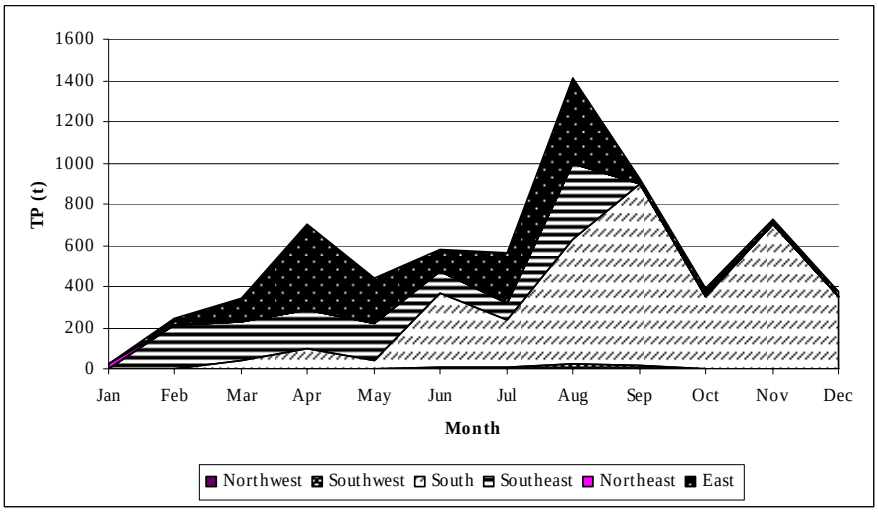


Figure 4 : Coastal Skipjack tuna production according to the statistical zone

## 2.2 Yellowfin tuna

### a. Offshore Production

The estimated figure for offshore yellowfin tuna production was 15,130.83 tones and the highest production was in March (Figure 5). Total production has remained more or less steady level from the rest of year except in January.

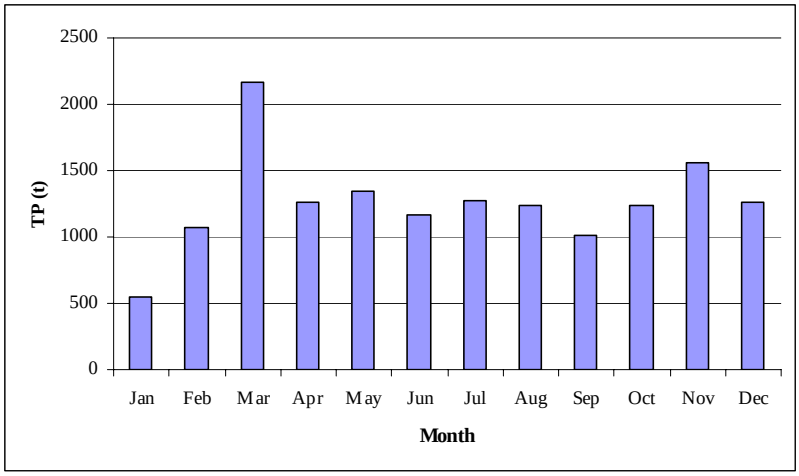


Figure 5 : Variation of total offshore yellowfin tuna production

The highest and lowest yellowfin tuna production was reported in South and Northeast statistical zone respectively (Figure 6). Though peak production period ranged from January to May in Southern (Southwest, South and southeast statistical zones) and western (west and northwest) coast, the highest production was in April in all the zones within these coasts. The peak production started in May and extended up to September in north-eastern statistical zone by giving maximum production in July.

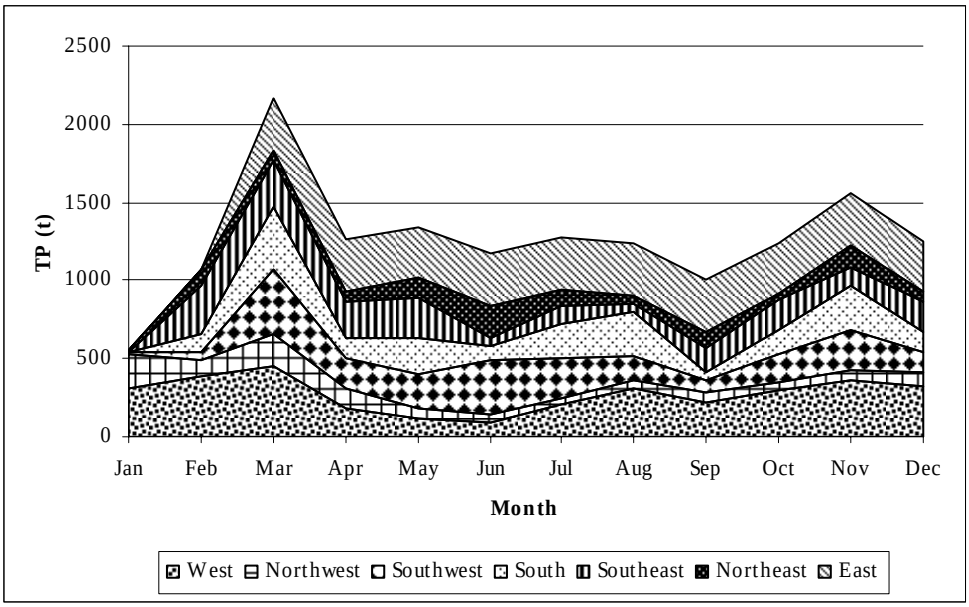


Figure 6 : Offshore yellowfin tuna production according to the statistical zone

**b.** Coastal production

Compared with the offshore production, coastal yellowfin production was very low and it accounted for 3,644.40 tones (Figure 7). Though it is impossible to see any clear trend in the production, two peak production periods could be observed in July and March. However the production was really low from September to November when compared with the rest of the period.

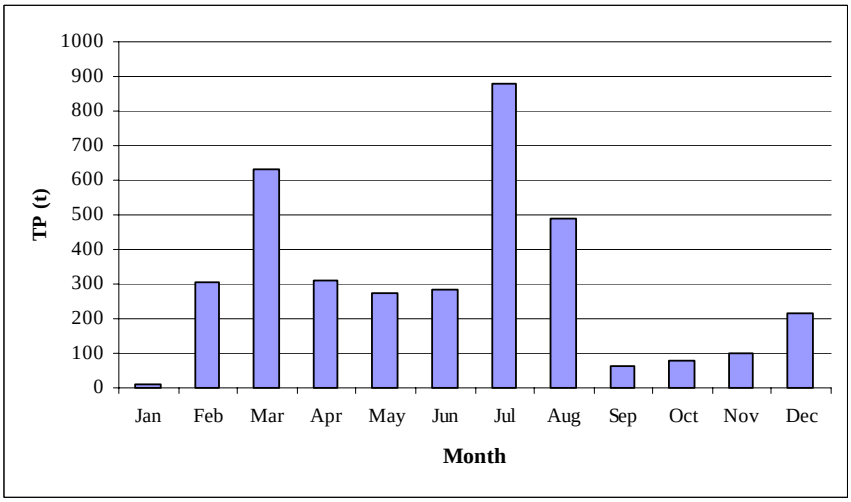

Figure 7 : Variation of total offshore yellowfin tuna production

The highest yellowfin tuna production was reported in Eastern statistical zone followed by south and south east statistical zones (figure 8). The highest production was reported in July in South, southwest and northeast statistical zones while it was in March in Northwest and east zones. Compared with the other statistical zones in southern coast, relatively high production was evident in southeast statistical zone from February to May and it has given its highest production in February also.

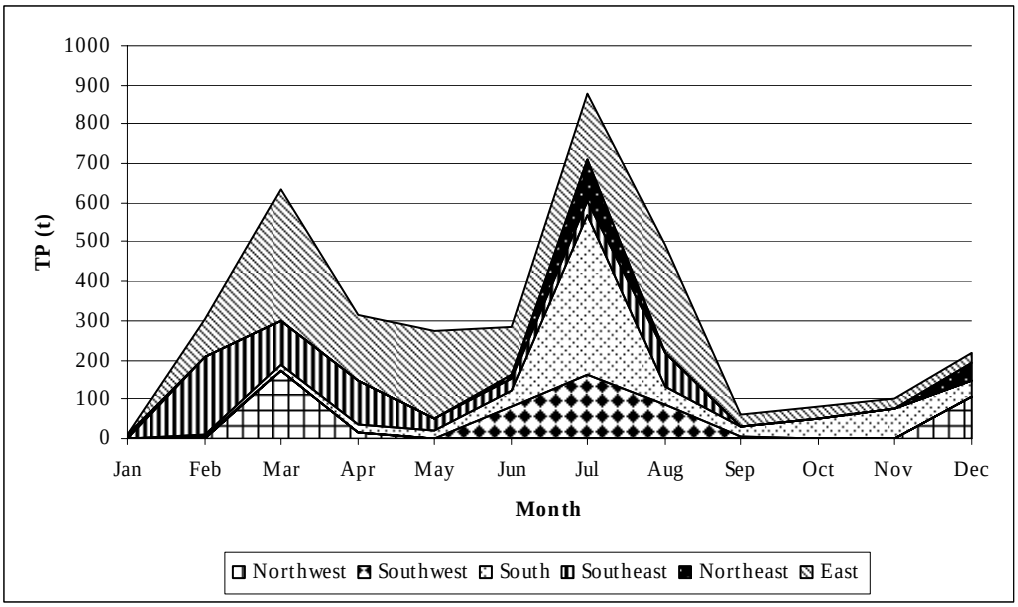


Figure 8 : Coastal yellowfin tuna production according to the statistical zone

## 2.3 Other tunas

### a. Offshore Production

Other tuna category includes Bigeye tuna, Frigate tuna, Bullet tuna and Kawakawa. The estimated total production was 2,255.76 tones and it gradually increased from January to July and then it declined (Figure 9). The maximum production was reported in July and the minimum was in February.

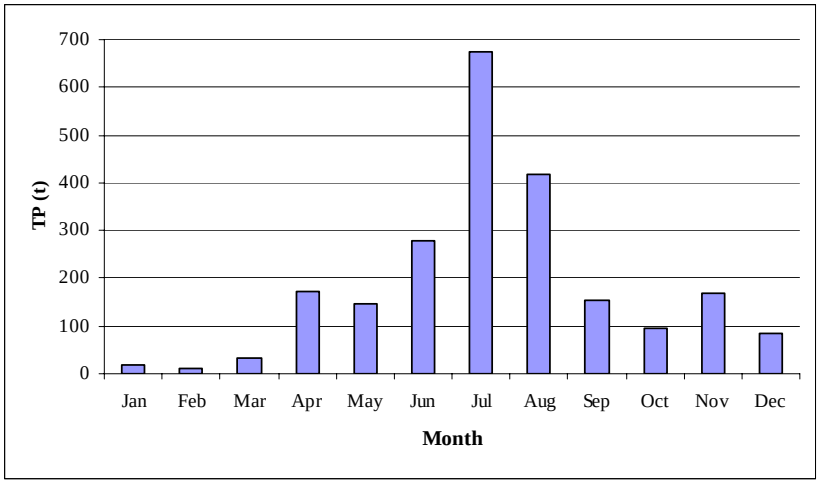


Figure 9 : Total production of offshore other tuna verities

The highest production was from southeast followed by western statistical zone while the lowest production was from northeast region (figure 10). In southern coast (Southwest, South and southeast statistical zones) July was the peak production period for other tuna varieties while it was November and September in Western and northwestern zones respectively.

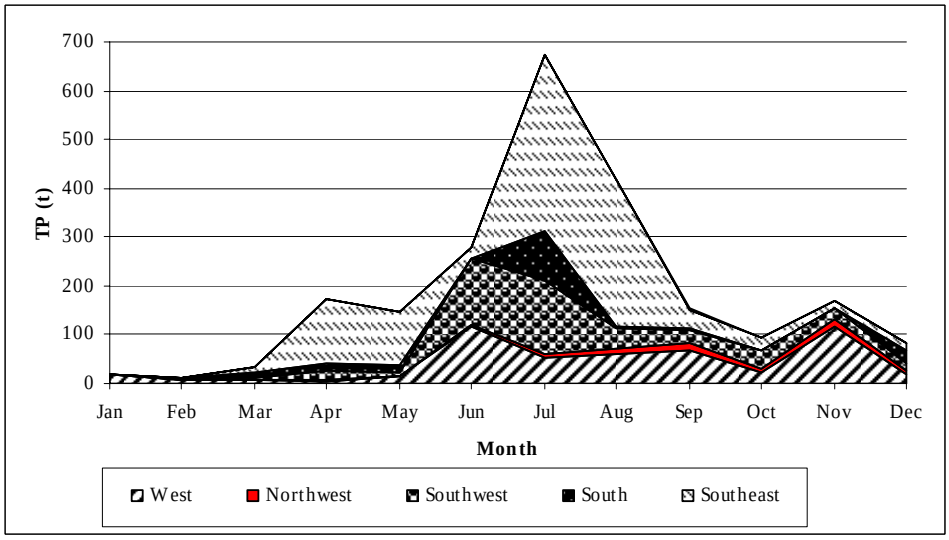


Figure 10 : Total production of offshore other tuna verities according to statistical zones

### b. Coastal Production

The estimated figure was 2,840.49 tones and it was higher than the offshore production. The peak production was in August and the lowest production was in November (Figure 11)

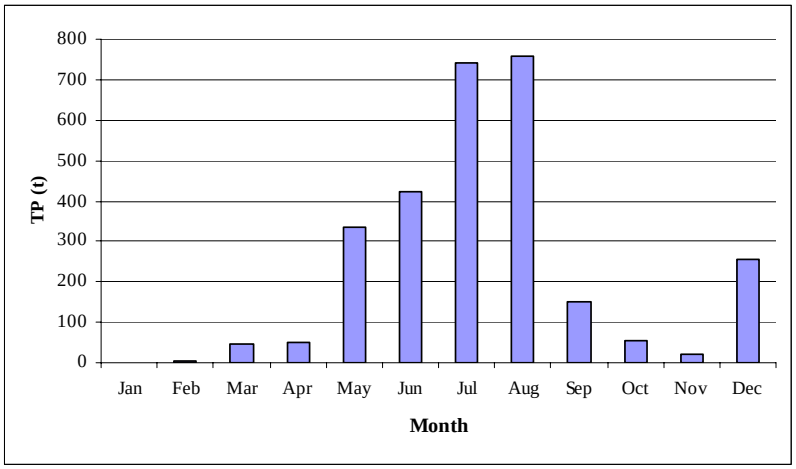


Figure 11 : Total production of coastal other tuna verities

Eastern statistical zone has reported the highest production while northwestern zone reported the lowest. August was the peak production period in southern coast () while it was July in east and northeast regions.

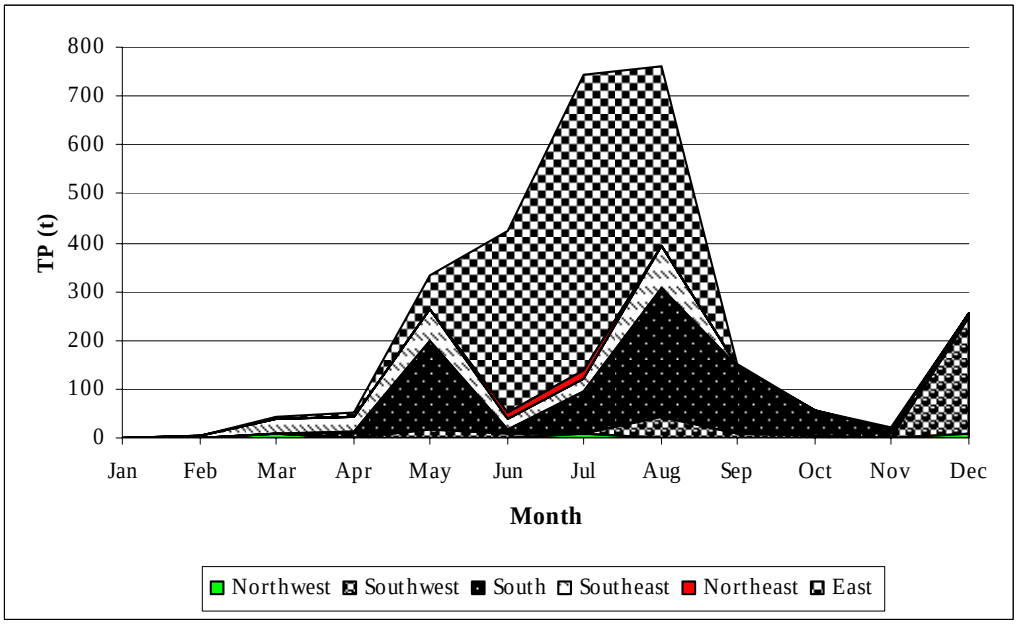

Figure 12 : Total production of coastal other tuna verities according to statistical zones

## 2.4. Swordfish

**a.** Offshore production

The estimated total swordfish production was 694.86 tones. The production increased from January to March and then it declined gradually till September. Again it increased and showed the highest production in November (Figure 13).

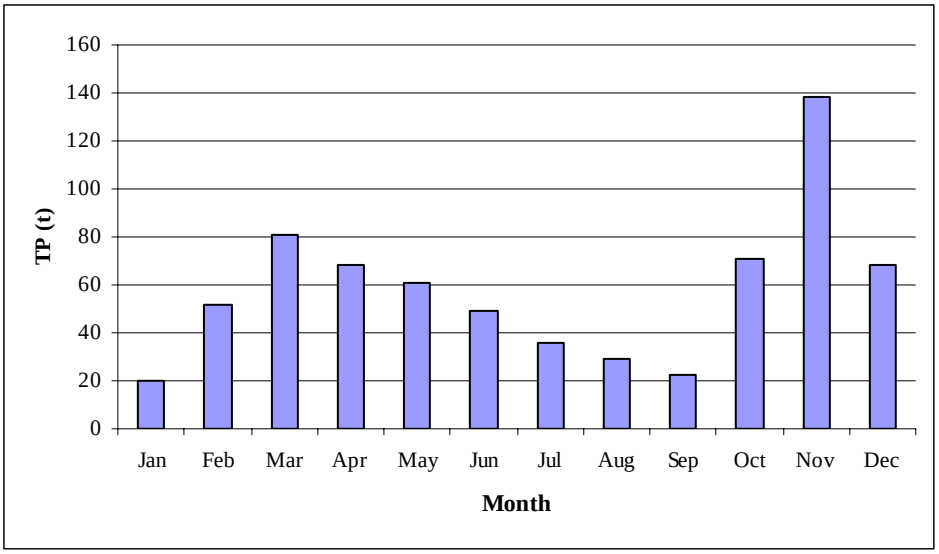


Figure 13 : Variation of total swordfish production in offshore waters

The highest production was reported from western zone followed by northwest and northeast statistical zones (Figure 14). November was the peak production period in west, south and southeast while it was May in Northeast, April in northwest and March in Southwest.

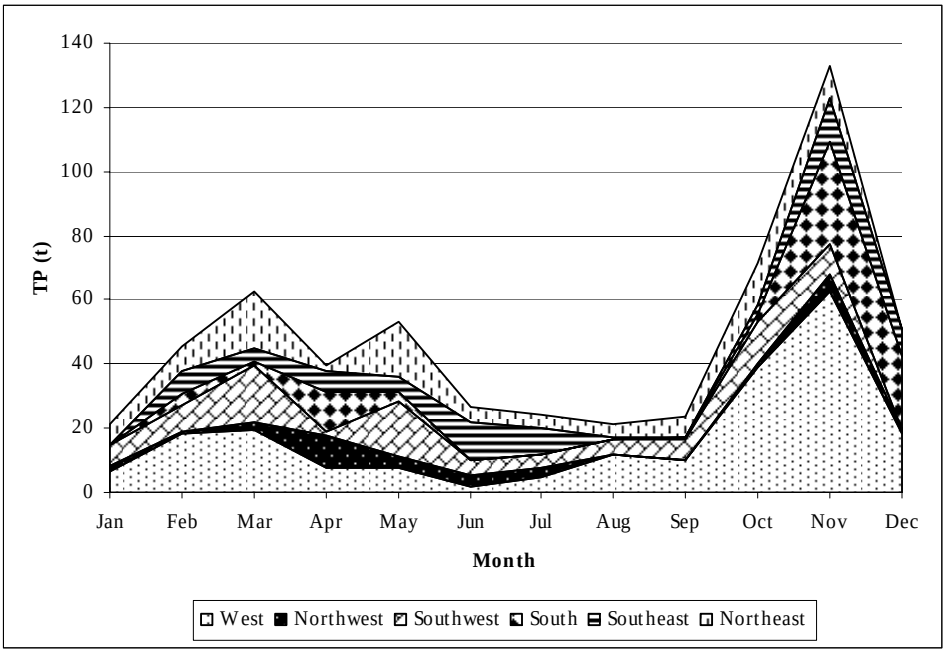


Figure 14 : Total SWO production in offshore waters according to statistical zones

**b.** Coastal production

The estimated coastal production was 129.56 tones and production restricted only up to August (Figure 15). The peak production was in May and there was considerably higher production in March and April too.

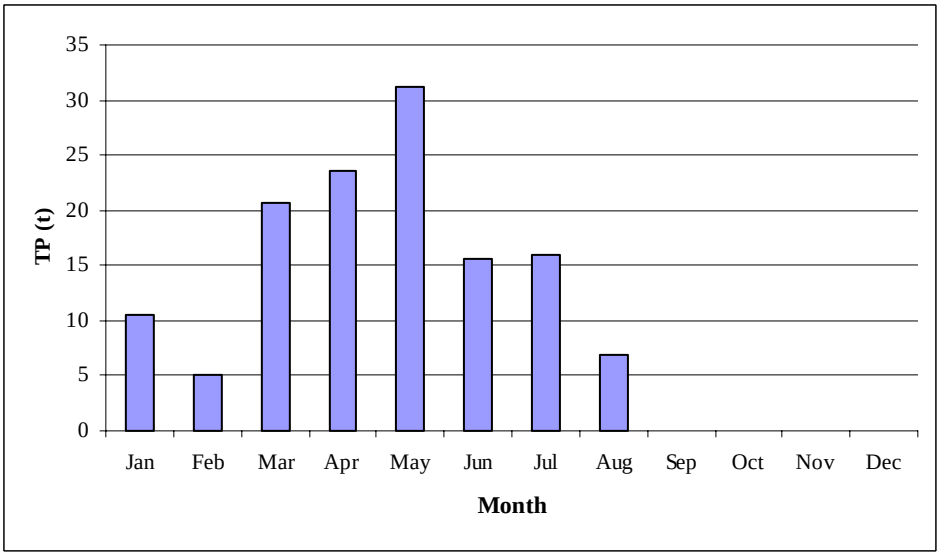


Figure 15 : Variation of total swordfish production in coastal waters

The highest production was reported in eastern statistical zones and none of the production was reported from southeast and southwest statistical zones. East coast is the favorable zone for sword fish and favorable season extends from February to August with having peak in the May.

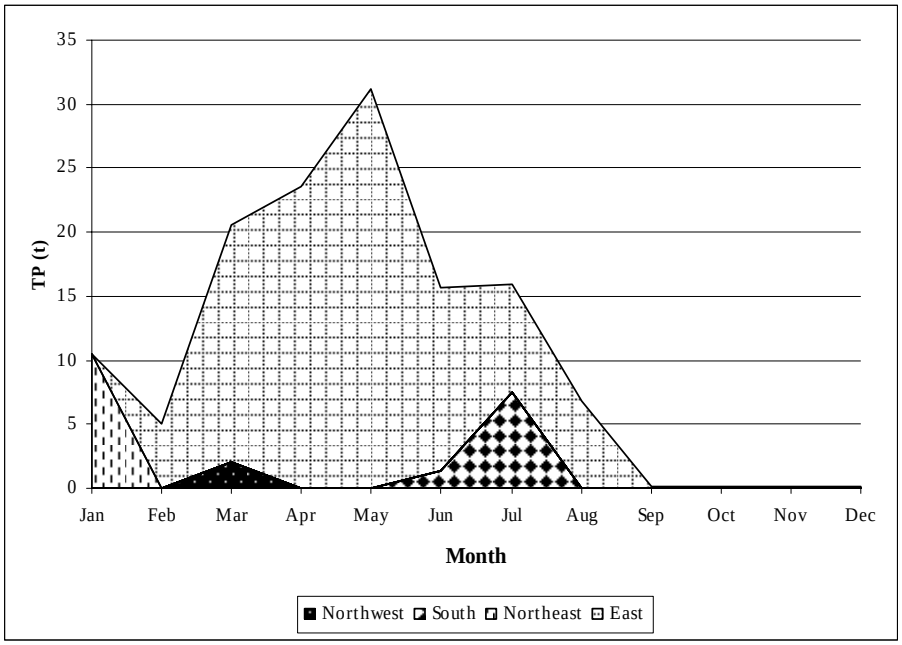


Figure 16 : Total SWO production in coastal waters according to statistical zones

## 2.5. Marlins

a. Offshore Production

The estimated figure for offshore marlin production was 1536.01 tones. The production period extends throughout the year but lower production was evident in January, October and November when compared with rest of the period (Figure 17).

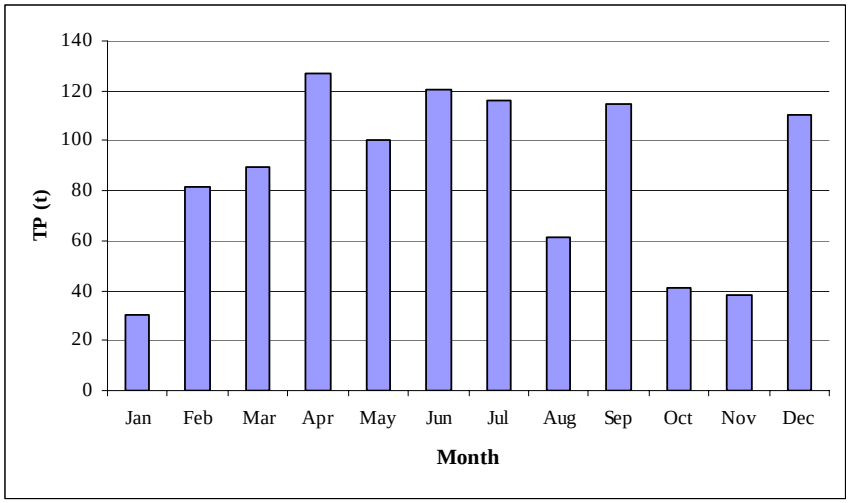


Figure 17 : Variation of total MAR production in offshore waters

The maximum production was reported in southern statistical zone followed by southwest and southeast statistical zones (Figure 18). Peak production period also vary with according to the statistical zones and it was July in South, May in Southwest and September in southeast.

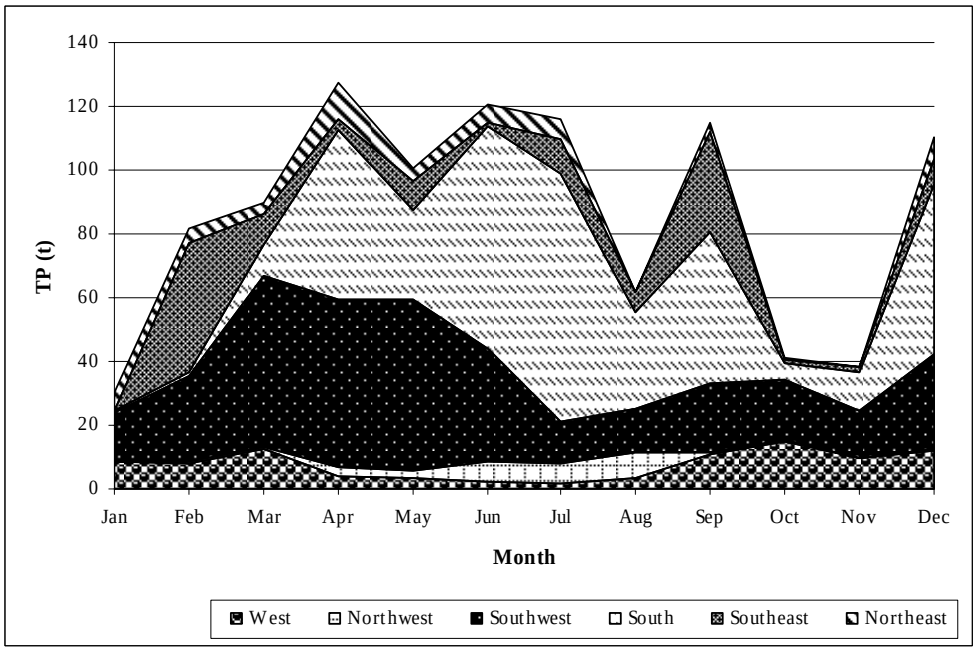


Figure 18 : Total MAR production in offshore waters according to statistical zones

c. Coastal production

Coastal production was limited to certain months of the year and estimated figure was 2667.67 tones (Figure 19).Maximum production was in August while the lowest was in September.

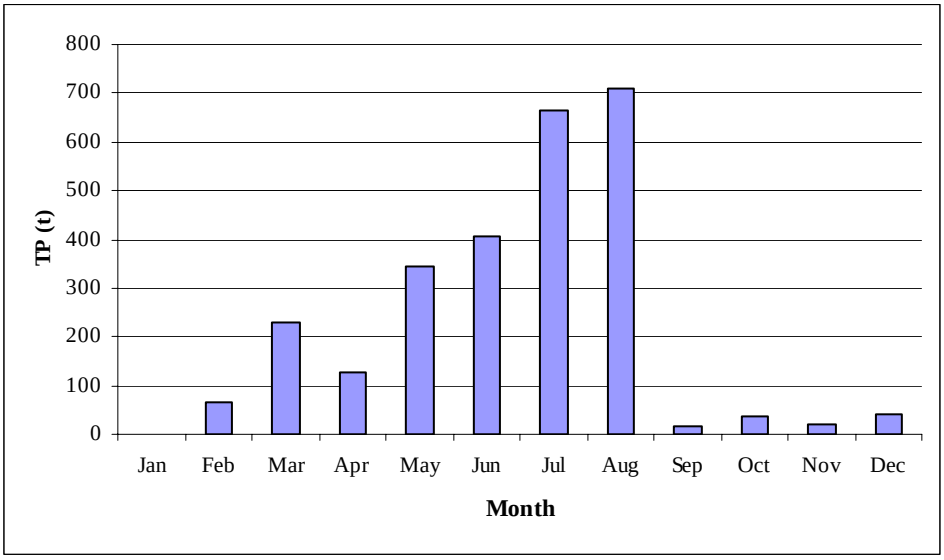


Figure 19 : Variation of total Marlin production in coastal waters

The highest coastal MAR production was in Eastern statistical zone and none of the catch records were from south and southeast region (figure 20). Though there was year around production in eastern coast, favourable season extended from February to August.

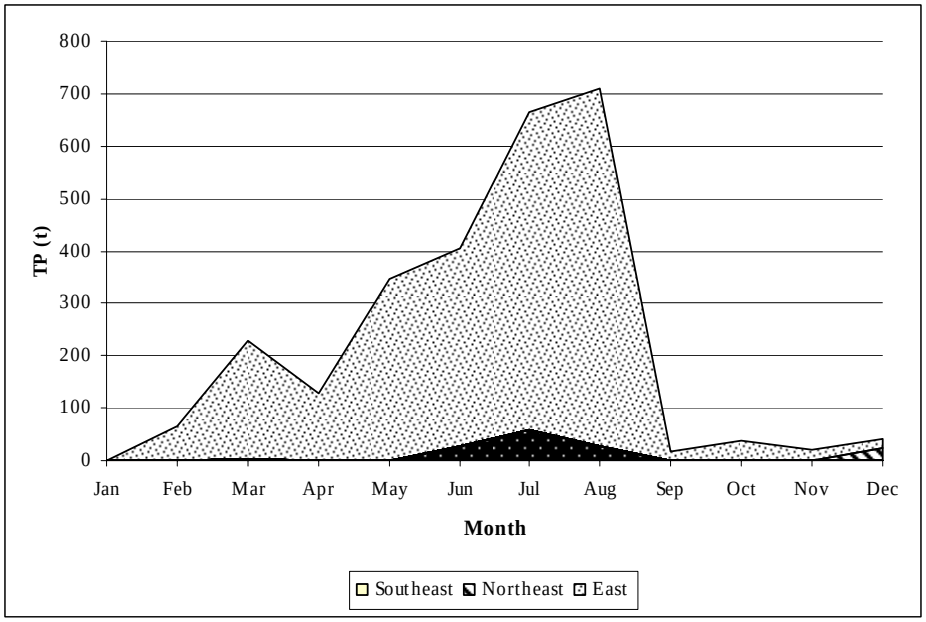


Figure 18 : Total MAR production in coastal waters according to statistical zones