# Management
# of
# Scombroid Fisheries

*Editors*


**N.G.K. Pillai**
**N.G. Menon**
**P.P. Pillai**
**U. Ganga**



**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE**
***(Indian Council of Agricultural Research)***
**Post Box No. 1603, Tatapuram P.O.**
**Kochi-682 014, India**

# Scombroid fishery of the Indian Ocean – an overview

**N.G.K.Pillai and U.Ganga**

*Central Marine Fisheries Research Institute, Kochi*

## ABSTRACT

In the Indian Ocean, scombroids comprising of tunas, billfishes, seerfishes and mackerels are an invaluable resource and their producer value is estimated to between 2 and 3 billion US dollars annually, besides the vast socio-economic benefits to the fishing nations. Of the three major groups of species, tunas account for the largest share of the total catch and also for the largest increase during the past 10 years. Seerfish catches attained record levels in 1998 while billfish catches have more than doubled since 1992 although the relative contribution of the group is still small. With the introduction of technologically advanced fishing fleets and techniques in the Indian Ocean, the intensity of exploitation of scombroids, especially tunas and billfishes have reached a new peak. An overview of the present status of scombroid fishery of the Indian Ocean is presented below.

## INTRODUCTION

The total annual landings of scombroids comprising of tunas, billfishes and seerfishes from the Indian Ocean (Fig.1) has reached 1.2 million metric tonnes in 1998 (Fig.2). This producer value was estimated to be around 3 billion

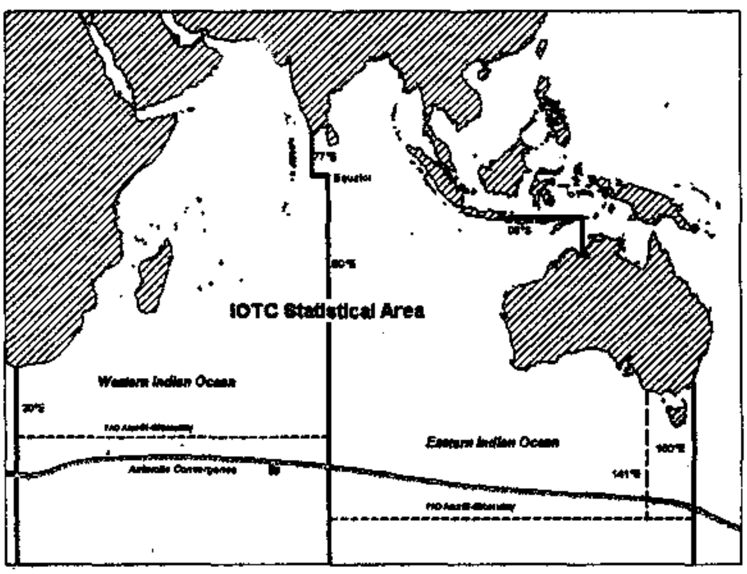


Fig1. Map of Indian Ocean showing FAO Statistical Area 51 (Western Indian Ocean) and Area 57 (Eastern Indian Ocean)

US dollars excluding the value addition by processing units and social benefits like employment and nutrition. Major scombroid species harvested from the sector are given below:

| Group | Species | Avg. Prodn. (1990-'98) (in tonnes) Indian Ocean | All Oceans |
|---|---|---|---|
| **Tunas** | | | |
| Oceanic | Yellowfin(YFT) *Thunnus albacares*; Skipjack (SKJ) *Katsuwonus pelamis*; Bigeye (BET) *T. obsesus*; Albacore (ALB) *T. alalunga* and Southern bluefin (SBF) *T. maccoyi.* | 736,000 | 3,383,000 |
| Neritic | Kawakawa (KAW) *Euthynnus affinis*; Frigate tuna (FRI) *Auxis thazard*; Bullet tuna (BLT) *A. rochei*; Longtail tuna (LOT) *T. tonggol* | | |
| **Seerfishes** | Kingseer (COM) *Scomberomorus commerson*, Spotted seer (GUT) *S. guttatus*; Streaked seer (STS) *S. lineolatus* | 146,000 | 572,000 |
| **Billfishes** | Sailfish (SFA) *Istiophorus platypterus*; Black marlin (BLM) *Makaira indica*; Blue marlin (BLZ) *Makaira mazara;* Striped marlin (MLS) *Tetrapturus audax*; Swordfish (SWO) *Xiphias gladius* | 59,000 | 178,000 |

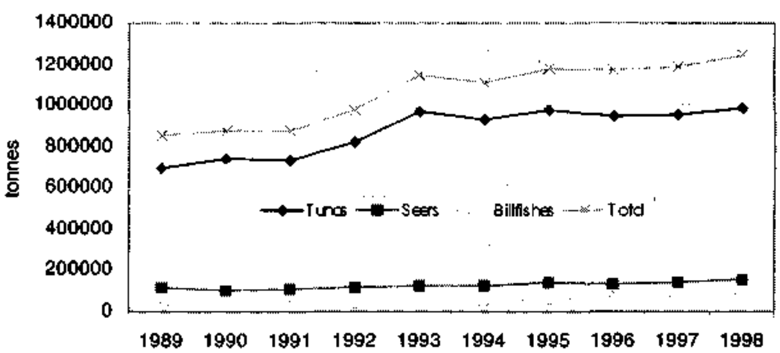


Fig.2. Group-wise catch trends in the Indian Ocean

The Indian Ocean differs from other oceans in that artisanal fisheries (using gill nets, pole and line and troll line) take as much catch as the industrialized fisheries (purse seine and longline fleets of >100 GRT and ultra freezing facility). The gear-wise catch from Indian Ocean during the 1989 –'98 period is given in Fig. 3.

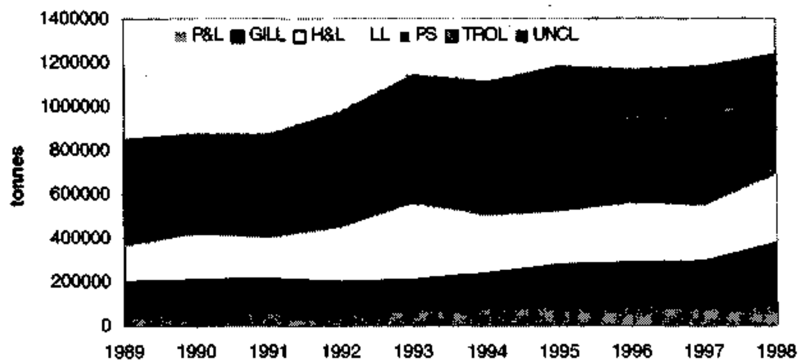


Fig. 3. Gear-wise catch trends in the Indian Ocean

## STATUS OF FISHERY

**Longline fishery:** Longlining started in 1952 in the western Indian Ocean and by mid 1970s had spread over most of the ocean. In 1998, Taiwan, Japan, Korea and Australia were the major fishing nations with a fleet of 343, 221, 60 and 37 vessels respectively (Anon., 2000). Longline catches have continued to increase during the decade with the catch in 1998 (310, 653 t) being second only to 1993 (355,110 t) which was an exceptional year. Of all industrialized fishing practices, longline gear produces the highest value as large pelagics, mainly tunas (YFT, BET, ALB and SBF) are caught which goes to the high-priced *Sashimi* market.

**Purse seine fishery:** Purse seining started in the early 1980s mainly by the French and Spanish fleets. In 1998, the major fishing nations were Australia, Spain and France with 36, 22 and 20 vessels respectively, the others being Japan (4 vessels) and Mauritius (1 vessel). The record purse seine catch was in 1995 (422,675 t) after which it showed a decline and was estimated at 353,495 t in 1998. The fishery is most active between latitudes 10°S and 5°N, especially around Seychelles Islands. The hydrological conditions in the Indian Ocean were affected by ENSO (*El nino*) in 1998 which modified the normal pattern of fishing with many vessels moving to eastern Indian Ocean (Anon., 2000). Thus there was a significant increase in the purseseine catch of 1998 in the eastern Indian Ocean while it dropped considerably in the western Indian Ocean as shown in Table 1.

Table 1. Gear-wise contribution from the western Indian Ocean to total scombroid catches (tunas, billfishes and seerfishes) of the Indian Ocean

| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| **P&L** | 99.4 | 99.5 | 99.9 | 100.0 | 100.0 | 99.9 | 98.5 | 100.0 | 99.1 | 97.1 |
| **GILL** | 87.6 | 89.8 | 90.3 | 92.2 | 92.5 | 92.8 | 94.1 | 94.4 | 95.7 | 89.7 |
| **H&L** | 99.0 | 97.8 | 96.4 | 92.4 | 96.3 | 98.9 | 97.9 | 98.8 | 98.7 | 98.9 |
| **LL** | 45.9 | 46.2 | 47.9 | 56.7 | 67.1 | 47.5 | 51.6 | 53.2 | 56.6 | 60.0 |
| **PS** | 92.8 | 91.8 | 91.2 | 91.2 | 85.5 | 79.1 | 81.1 | 81.6 | 82.5 | 71.2 |
| **TROL** | 98.3 | 98.3 | 97.7 | 98.4 | 98.0 | 97.1 | 97.9 | 97.9 | 97.3 | 97.8 |
| **UNCL** | 62.5 | 70.7 | 61.1 | 67.9 | 60.6 | 63.6 | 61.8 | 54.5 | 54.5 | 45.8 |

A floating FAD (Fish Aggregating Device) fishery in the Indian Ocean was initiated by Japanese purse seines which was soon adopted by European vessels. Initially the movements of these FADs were tracked using radio direction finder but technological advancements today permit GPS with radio and satellite communication to locate their precise position continuously. Concern has been voiced about the negative effects of this kind of fishing on the productivity of important tropical tuna resources like the bigeye and yellowfin due to the high percentage of juveniles in the catch (Anon.,2000b).

**Artisanal fishing gears:** Pole and line (using baits), trolls, hand lines and gill nets are the major artisanal gears used in the Indian Ocean. Gillnet catches have shown a steady increase since 1992 to reach 262,762 t in 1998 which was 37% higher than that of the previous year. Pole and line catches have increased slowly over the decade attaining record level in 1998 (110,707t) and virtually the entire catch was from Maldives.

**Gear-wise catch composition:** An analysis of the species composition by gear shows that pole and line, purse seine and longline fishing catch mainly tunas. Seerfishes are caught mainly in trolls besides significant catches from the gill net and handline fisheries. Billfishes are taken mainly by longline, handline and gill net fisheries and form a small proportion of troll catches.

**Tuna fisheries:** Tunas account for the largest share of the total scombroid catches from the Indian Ocean and have shown a substantial increase of 41% during the 10 year period from 1989-'98. The western Indian Ocean sector contributes the majority of the tuna caught (69%) and rest by the eastern sector. The *El nino* phenomenon observed in 1998 created hydrological conditions that caused the purseseine fishing fleet to shift to the eastern Indian Ocean from the western sector. The tuna catches from eastern Indian Ocean which had stabilized around 240,000 t since 1994 reached about 280,000 t in 1998. Species-wise and area-wise catch trends of tuna in the Indian Ocean are shown in Figs. 4 and 5.

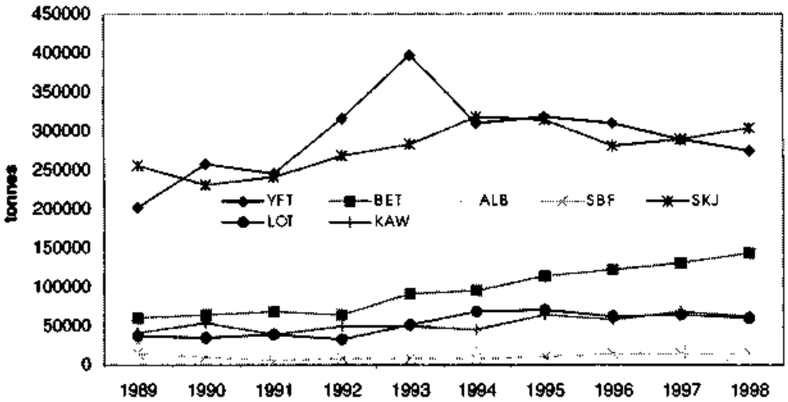


Fig. 4. Species-wise tuna catch in the Indian Ocean

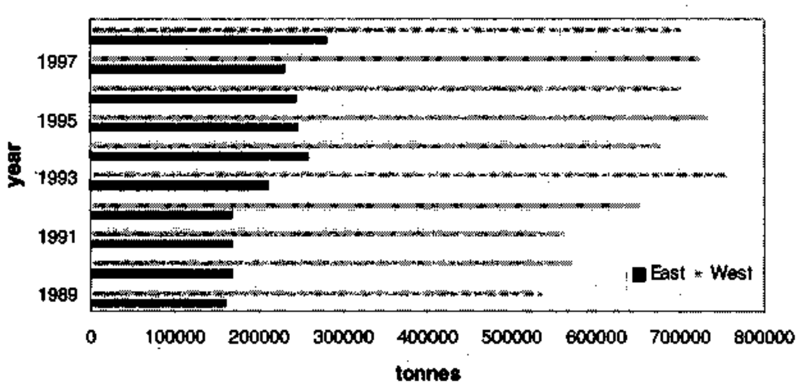


Fig. 5. Area-wise tuna catches in the Indian Ocean

SKJ: In 1998, following two years of reduced catches, SKJ catch increased to over 300,000 t. In the eastern Indian Ocean, they were the highest recorded to date, at close to 50,000 t. It appears that there was a very strong year class of skipjack in the Indian Ocean, possibly as a result of better larval survival during the *El nino* event of 1997-'98 (Ardill, 2001).

YFT: Landings registered a decline to 274,520 t (1998) compared to 397,651t in 1993. Yellowfin tuna catches showed a declining trend since 1996 in the western Indian Ocean while in the eastern sector, catches were 40% higher in 1998 compared to the previous year.

BET: Bigeye tuna catches showed a steady increase since 1992 (64,324 t) with an harvést of about 145,000 t in 1998. Most of the catch in weight is of large fish caught by longlines and intended for the *Sashimi* market.

ALB: Albacore landings declined after the oceanic drift net fishery in the southern Indian Ocean closed in 1992 following the 1991 UN General Assembly Resolution 46/215. However, since 1996, they are showing an increasing trend. The production in 1998 was about 41,000 t compared to an average production of 23,491 t during 1989-'95 period. Almost the entire catch was made by longliners operating in the region.

SBF: The catch of the southern bluefin tuna which showed a significant decline until 1993 (7,733 t) has doubled since then with a catch of 14,811 t in 1998. This temperate tuna which was intensely exploited until the early 80s and still shows signs of overexploitation is under the Management of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The observed catch fluctuations are also partly a consequence of shifts of effort between the Indian, Atlantic and Pacific Oceans by the distant water fishing fleets. In 1991 with the decline in catches in the Indian Ocean, vessels moved to the other southern oceans with the fleets targeting SBF returning to Indian Ocean after 1993.

LOT: Landing of the longtail tuna, a coastal species increased considerably between 1992 to 1995 (Avg. 267,665 t) and subsequently showed a decline, with average catches during 1996-'98 period being 254,153 t. A major part of the landing was from the Islamic Republic of Iran and Thailand.

KAW: Kawakawa which is another important coastal species also showed an increase in landings since 1995 with a production of 63,509 t in 1998, compared to 35,000 t in 1988.

Until the middle of 1990s, catches of tunas were between five and ten percent higher than artisanal catches but today artisanal catches constitute half of the total tuna catches in the region. Oceanic tunas are mostly taken by Far Seas fishing fleet, while countries bordering Indian Ocean caught almost all the neritic tunas.

Table 2. Country - wise catch trends of oceanic tunas from the Indian Ocean in 1997

| Country | YFT | SKJ | BET | ALB | SBF | TOTAL |
|---|---|---|---|---|---|---|
| Spain | 58589 | 60087 | 15385 | 997 | - | 135058 |
| Maldives | 18619 | 69015 | - | - | - | 87634 |
| Taiwan | 29105 | 59 | 41601 | 15204 | 593 | 86562 |
| France | 31853 | 31418 | 7884 | 851 | | 72006 |
| Indonesia | 3805 | 24347 | 27295 | 2918 | 235 | 58600 |
| Japan | 17238 | 6717 | 19192 | 3120 | 4452 | 50719 |
| Sri Lanka | 12889 | 22754 | 491 | - | 68 | 36202 |
| Iran | 21541 | 5000 | 27 | - | - | 26568 |
| Korea | 3642 | - | 10206 | 102 | 1583 | 15533 |
| India | 4106 | 6096 | - | - | - | 10202 |
| Seychelles | 1352 | 6819 | 925 | - | - | 9096 |
| Comoros | 5310 | 2070 | 30 | - | - | 7410 |
| Australia | 303 | 13 | 56 | 2 | 4833 | 5227 |
| Mauritius | 1095 | 3055 | 546 | 7 | 0 | 4703 |

*(Source: IOTC data summary No.20)*

**Seerfish fishery:** Total seerfish catches in 1998 attained record levels close to 160,000 t while the lowest catch recorded was in 1990-'91 period (average 107,000 t). Catches are almost exclusively from artisanal fisheries of coastal countries in particular those with extensive shelf area like India (54,871 t; 34.4%), Indonesia (21,014 t; 13.2%) followed by Pakistan (7.7%), Madgascar (7.5%) and United Arab Emirates (6.3%).

Narrow barred Spanish mackerel (King Seer), *Scomberomorus commerson* amounts to two thirds of the total seerfish catch followed by the spotted seer *S.guttatus* (Fig.6). The streaked seer and Wahoo formed only nominal catches. However, catches of Wahoo, may be under-reported for the region because the species which form a by-catch of the purse seiners and longliners is generally discarded. In the eastern Indian Ocean, catches have doubled over the decade, from 13,547 t (1989) to 25,844 t (1998), but still amount to only half those of the western Indian Ocean. In the western sector, landings of the species has not varied significantly since 1995, having stabilized around 80,000 t (Fig. 7 ).

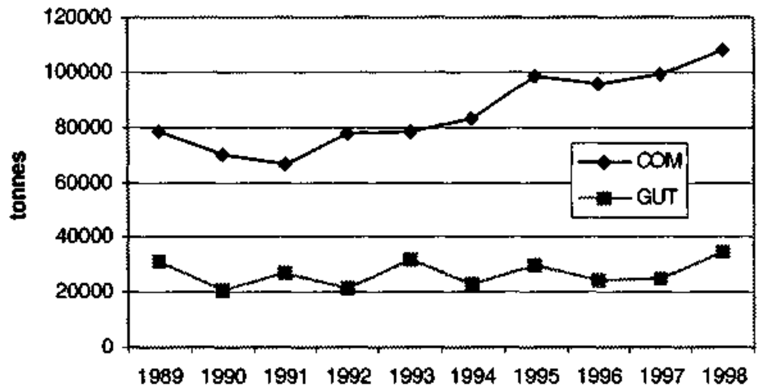


Fig.6. Species-wise seerfish catch in the Indian Ocean

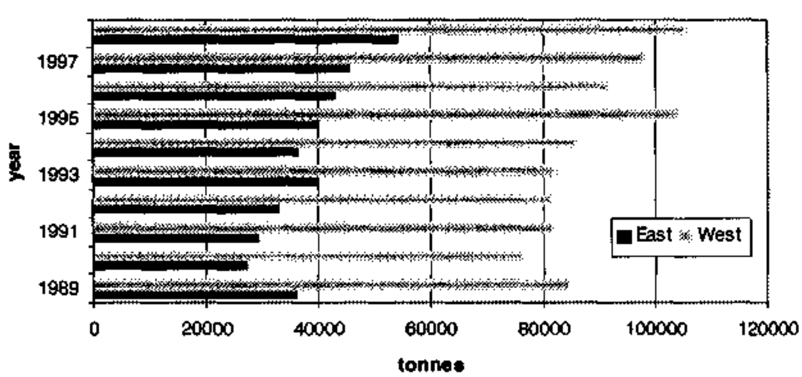


Fig.7. Area-wise seerfish catches in the Indian Ocean

**Billfish Fishery:** Billfish landings in 1998 have been highest on record at 82,625 t having more than doubled from the early 90s when catch levels were about 30,000 t. (Fig.8). However the relative contribution of the group to the total Indian Ocean scombroid catch is still small. Sri Lanka and Taiwan dominate billfish landings with only small quantities reported by other countries. Sri Lankan catches are largely marlins and the increased landings are related to the development of a domestic fleet that is operating further offshore. Taiwanese and French catches are mainly of sword fish.

Billfish catches in the western Indian Ocean are presently four times than those of the eastern basin, mainly due to the development of fisheries targetting sword fish (Fig. 9). The increased landings of billfishes may also be partly attributed to the reduction in discards by the industrial fleet of Taiwan and France as a result of the improving market for these species due to the bad situation of fisheries in the Atlantic Ocean.

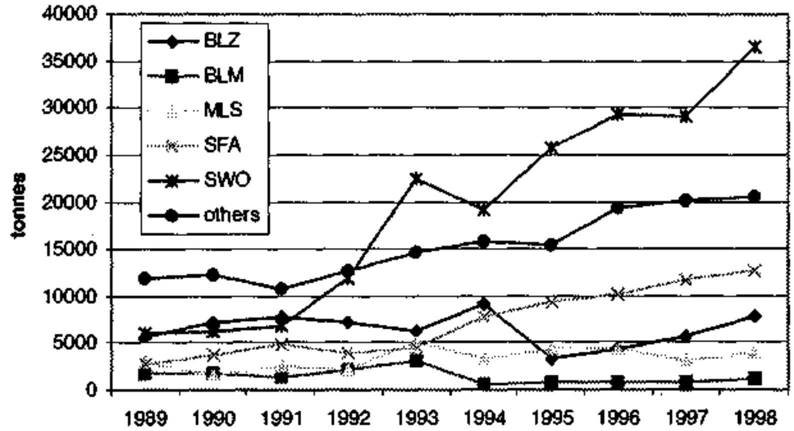


Fig.8. Species-wise billfish catch in the Indian Ocean

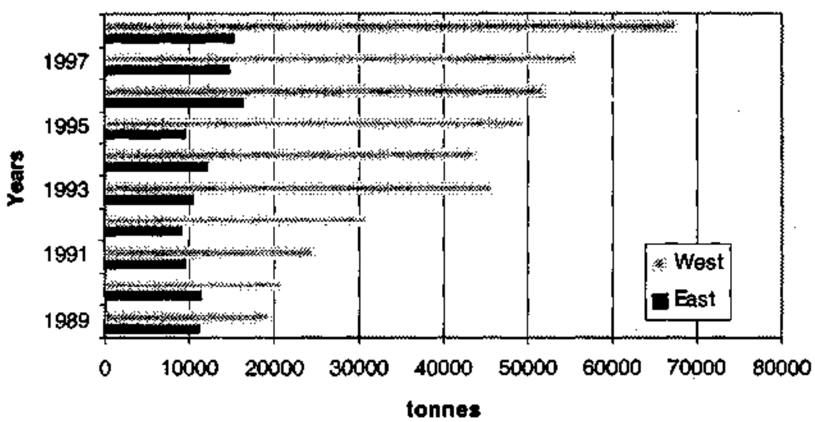


Fig.9. Area-wise billfish catches in the Indian Ocean

**Mackerel fishery:** Mackerels are an important 'small pelagic' scombroid resource of the Indian Ocean. In the western Indian Ocean, catches show wide annual fluctuation having peaked in 1971 (200,000 mt) dropping to a low of 37,000 t (1974) and rising again to a peak of 260,000 mt (1996). In the eastern Indian Ocean, catches have been showing an increasing trend since the 90s. Major producing countries are India, Indonesia, Thailand and Malaysia. The Indian mackerel (*R.kanagurta*) was the sole species contribution to fishery along the Indian coast while the mainstay of the fishery in other countries of the region was constituted mainly by *R.brachysoma* and *R.faughni*. Purse seines, ring seines, gill nets and trawls are the major gears employed in this fishery which is an important contributor to the nutritional and socio-economic security of the coastal fishing population.

## ISSUES AND NEEDS

Illegal, unreported and unregulated fishing (IUU) defined as 'fishing in areas under national jurisdiction without the authorization of the coastal state and which undermines conservation and management' is a major problem. The purse seine and longline fleets of the Distant Water Fishing Nations (DWFN) like France, Spain, Russia, Taiwan, Korea and Japan are mostly indulging in IUU in the Indian Ocean. It is estimated that there are about 19 such purse seine units operating in 1999 (Anon., 2000a). A sizeable number of longlines are also reported to be operating and monitoring this fleet has become very difficult as these vessels continuously move from one port to another and reflag accordingly and often land catches away from the Indian Ocean region (Anon., 2000 b). The Indian Ocean Tuna Commission (IOTC) which came into force on March 27th 1996 with 20 member countries, aiming at appropriate management, conservation and utilization of tuna and tuna- like fish stocks of the Indian Ocean, has given serious attention to this problem.

Tagging remains one of the most powerful tools to obtain information on biology, stock structure and fisheries interaction while effectively complementing and boosting capabilities of the coastal nation through improvement of fishery statistics and fishery management decisions (IPTP,1991). Large scale tuna tagging programmes have been conducted in all major tuna fisheries with the exception of Indian Ocean. According to Fonteneau *et al.* (2000) in view of the spectacular increase of the tuna catches of the Indian Ocean during the past 15 years, such programmes that will allow a reliable assessment of the stock status need to be given priority in this region also. Besides, the vast and rapid technological advancements occuring in the tuna fishery of the region, warrant monitoring the FAD associated fishery and evaluation of the increasing efficency of the purse seiners.

## CONCLUSION

The UN Convention on Law of the Sea (UNCLOS) which came into force in 1994 provides all maritime nations sovereign rights within 200 nautical miles boundary known as the Exclusive Economic Zone (EEZ). The provisions of the EEZ (articles 55-75) elaborate on the conservation and management of fisheries, emphasizing the concept of maximum sustainable yield (MSY) and optimum utilization and mentions of providing access to other states and their fishermen to 'surplus' fish stock (*i.e.*, that part of allowable catch not harvested by coastal state concerned (Jagota, 1998). It has therefore become inevitable for all coastal states including India to understand the types of fish resources, their abundance, sustainable harvest levels, and, based on scientific data, devise appropriate strategies for their sustained exploitation and management. In the Indian EEZ while the coastal zone upto 50 m depth is intensively exploited, oceanic resources like tunas, and billfishes are hardly exploited by the Indian fishing fleet. At the same time, distant water fishing fleets continue to intrude into Indian EEZ for harvesting high unit value scombroid fishes, especially tunas. It is therefore in the economic interest of the nation to devise strategies at the earliest for successfully harvesting the rich scombroid resources of its EEZ in a sustainable manner.

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