

TWS/90/61

EXPERT CONSULTATION ON STOCK ASSESSMENT OF TUNAS  
IN THE INDIAN OCEAN

2 - 6 July 1990 - Bangkok, Thailand

RESULTS OF THE TAGGING OPERATIONS CONDUCTED WITHIN THE  
REGIONAL TUNA PROJECT (INDIAN OCEAN COMMISSION)  
IN 1988 AND 1989

by

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SUMMARY

The tagging program undertaken by the Regional Tuna Project (Indian Ocean Commission) was not very successful (955 tunas tagged), in regards of the investments made: 5 tagging cruises from a chartered purse-seiner. Despite the small number of recoveries observed (n=13), some interesting hypothesis can still be formulated : growth rates of skipjack and bigeye tuna are similar to those observed in the Atlantic Ocean, tunas exploited in the western part of the Indian Ocean belong to a single stock.

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The Comoros Islands area, which appears to be located on an important migratory route, and the use of small, locally based embarcations to perform tagging operations all year round on a regular basis, should be considered as a major object of a new tagging program, at least if the costly chartering of an industrial bait-boat is not considered for the near future.

Due to its immediate efficiency in enhancing the knowledge on stock structure and several biological parameters, intensive tagging operations should still be considered as a priority in the Indian Ocean.

### RESUME

Les résultats du Programme de marquage (1988-1989) entrepris dans le cadre du Projet Thonier Régional de la Commission de l'Océan Indien peuvent apparaître comme décevants (955 thons marqués) compte-tenu des efforts consentis: 5 campagnes de marquage à partir d'un senneur loué par le Projet. Le faible nombre de poisson marqués recapturés (n=13), permet cependant d'avancer un certain nombre d'hypothèses intéressantes: taux de croissance du listao et du patudo similaires à ceux observés dans l'Atlantique, unicité du stock exploité dans l'Ouest de l'Océan Indien. La zone des Comores, important lieu de passage de migrations, et l'utilisation d'embarcations légères pour pratiquer des marquages en routine, devraient être, à défaut d'utilisation de moyens navigants coûteux à vaste rayon d'action, les objectifs et moyens à favoriser dans l'élaboration d'un nouveau programme de marquage dont l'intérêt reste prioritaire dans la région.

## 1. INTRODUCTION

Tagging operations were scheduled by the Regional Tuna Project ("Commission de l'Océan Indien") within the "Association Thonière" organisation.

The medium sized purse seiner "MASCAROI", was chartered for two years (September 1987 - September 1989), and among the other tasks devoted to this vessel (exploratory fishing, plankton, oceanographical surveys and mooring of Fish Aggregating Devices) 5 tagging cruises were performed.

The results of these tagging operations and of the recoveries observed until June 1990 are presented in this paper.

## 2. METHOD AND MATERIAL

Five tagging cruises were undertaken by the "MASCAROI" and some occasional taggings were also made from small embarcations around the Comoros Islands (Table 1).

During the 5 cruises of the "MASCAROI" pole and line method with live bait was used to catch the tunas to be tagged. All fishes were measured (fork length in centimeters) before release. Classical vinyl dart tags were used for all the tagging operations. During the occasional taggings conducted in Comoros Islands trolling lines and artificial lures were used, and the fishes were also measured before release. In order to record recoveries of tagged fishes a wide publicity was done in all the countries of the area, and outside the area in the main harbours where industrial and artisanal unloadings of tunas exist. Specially designed T-shirts were offered as rewards for every recapture of tagged fishes.

## 3. TAGGING DATA

As summarized in Table 1, 955 fishes (419 yellowfin tunas, 359 skipjacks, 175 Bigeye and 2 dolphins) were tagged. Most of the fishes (841) were tagged in the North western part of Madagascar, and around Comoros Islands, in the northern part of the Mozambique Channel (Figure 1). Some 114 fishes, (103 yellowfin, 9 skipjack and 2 dolphins) were also tagged during the second cruise of the "MASCAROI" around Réunion Island, in the vicinity of Fish Aggregating Devices.

The size frequency distributions of the tagged fishes are shown in Figure 2.

#### 4. RESULTS : recaptures, growth rate, migrations

The recovery rate (13 fishes, i.e. 1,4 %) as observed by June 1990 is low (Table 1), and not much can be deduced from these data. Among the 13 recaptures, 7 were observed after a significant number of days at sea, more than 3 months (Table 2); this is a rather good and exceptional result in regard to the small number of tagged fishes and some interesting observations can be suggested from these data.

Due to the reduced number of data it is not possible to be conclusive on the growth rates observed for the 3 species, nevertheless these preliminary estimations (yellowfin : 26.0 cm/year, skipjack : 9.5 cm/year, bigeye : 26 cm/year) are in agreement with the mean growth rates observed in the Atlantic Ocean (CAYRE *et al.*, 1988) and in the Indian Ocean (STEQUERT *et MARSAC*, 1986) for fishes of the same sizes.

The 4 important migrations (Table 2, Figure 3) observed (more than 500 nautical miles), tend to confirm the hypothesis stating that the tropical tunas (yellowfin, skipjack and bigeye) actually exploited in the south western part of the Indian Ocean (including the Mozambique Channel) by industrial and artisanal surface fisheries come from the same stocks.

In Comoros Islands area 151 tunas (10 yellowfin, 35 skipjack, 106 bigeye) were tagged in the vicinity of Fish Aggregating Devices; none of these fishes were recaptured in the few days following tagging operation despite an important fishing effort locally applied by an artisanal fishery (CAYRE *et al.*, 1990). This observation joined to sonic tagging experiments allowed to make the hypothesis of a high migratory flow and turnover of tunas through the Comoros area (CAYRE, 1990). This hypothesis seems to be supported by the important migration observed for two of the 151 tunas, tagged in this area (Figure 3).

As can be seen from Table 1, most of the recoveries come from fishes tagged during the second tagging cruise of the "MASCAROI"; it should be noted that among these 10 recoveries, 6 come from the 115 fishes tagged around Réunion Island in the vicinity of FAD. These 6 recaptures were observed less than 10 days after tagging, at the same place as the tagging was done (i.e. close to a FAD). This recovery rate (5.2%) is rather high compared to the one (1.3%) observed in Comoros Islands area where 151 tunas were tagged also around FAD, and where only two were recaptured despite the effort directed on tunas which is much more important there than in La Réunion Island. These observations lead to point at two different situations prevailing in Réunion Island and Comoros Islands. La Réunion Island area which is located at the border of the distribution area of tropical tunas appears as a summer resting zone for tunas, characterized by a seasonal and weak abundance of tunas, variable from year to year. On the contrary the Comoros Islands area appears as a place where a migratory flow of tunas occurs all year round, with some seasonal fluctuations, and is characterized by a fair local abundance and by a short residence time of fishes, even around FAD.

## 5. CONCLUSION

The tagging program of the Regional Tuna Project was not very successful because of the low number of fishes tagged (n=955). This can be explained by several technical factors: inadequacy of the boat chartered by the Project (purse-seiner) to fish with pole and line; low experience of the crew in that fishing method; other more hypothetical reasons have been suggested to explain the unsuccessful tagging cruises: repulsive sounds made by the "MASCAROI", recent changes in the behaviour of the fishes (small and fast running schools). Due to the geographical limitation of the places where small pelagic fishes can be fished in abundance for bait (area restricted to the North western coast of Madagascar), a special care in the choice of the type of a future chartered vessel should be taken. Actually the use of small local embarcations to perform taggings all year round seems to be less costly and more efficient. This tactic should be recommended at least in areas where a regular local abundance of tunas exist. The Comoros Islands area, where occurs an important migratory flow of tunas affecting the stock actually exploited in the western part of the Indian Ocean, should be considered with a special attention for such tagging operations.

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CRUISE	DATE	TAGGINGS				T O T A L	RECAPTURES				T O T A L
		YF	SJ	BE	OTH		YF	SJ	BE	OTH	
MASCARDI 1	April 1988	9	93	7		109	-	1	-	-	1
MASCARDI 2	Oct. 1988	353	93	49	2	497	6	3	-	1	10
MASCARDI 3	Jan. 1989	27	78	107		212	1	-	1	-	2
MASCARDI 4	April 1989	18	3	3		24	-	-	-	-	
MASCARDI 5	July 1989	6	84	9		99	-	-	-	-	
COMOROS	May to Nov 1989	6	8	0		14	-	-	-	-	
	T O T A L	419	359	175	2	955	7	4	1	1	13

TABLE 1 : Numbers of tagged fishes (T. albacares = YF, K. pelamis = SJ, T. obesus = BE, Coryphaena sp. = OTH), and observed recaptures until June 1990.

Species	Size at tagging (FL, cm)	Days at sea	Mean annual growth rate (cm/year)	Distance travelled (miles)
YF	67	252	22.8	?
YF	73	460	29.3	840
SJ	52	140	8.0	650
SJ*	53*	243?*	.....	.....
SJ*	40*	400?*	.....	.....
SJ	52	146	11.0	520
BE	73	365	26.0	730

\* These recaptures were recently reported and recoveries data have to be checked

TABLE 2 : Recapture of tagged fishes ( YF = yellowfin, SJ = skipjack, BE Bigeye) observed after more than 30 days at sea, and corresponding results: mean annual growth rate, apparent distance travelled.



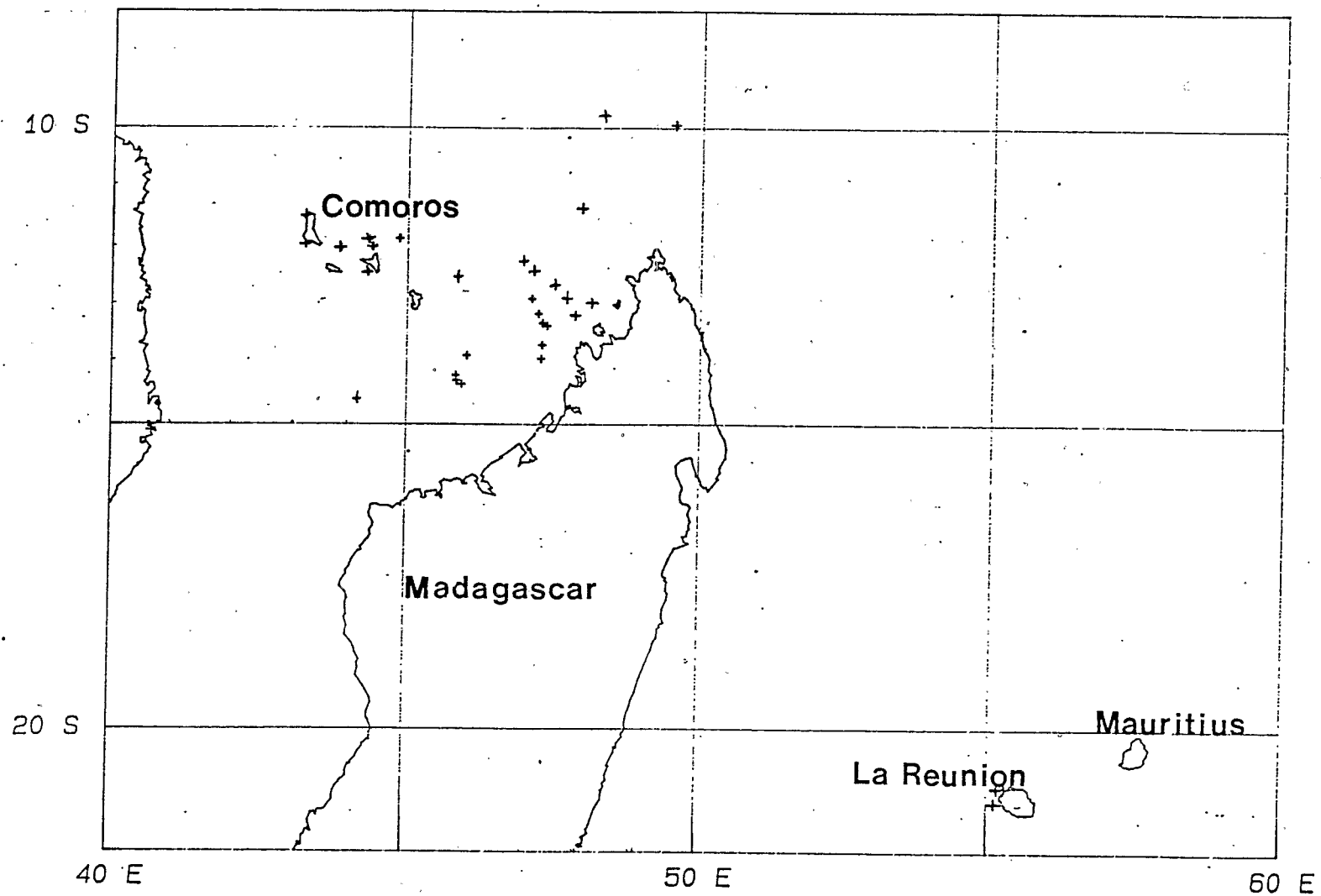
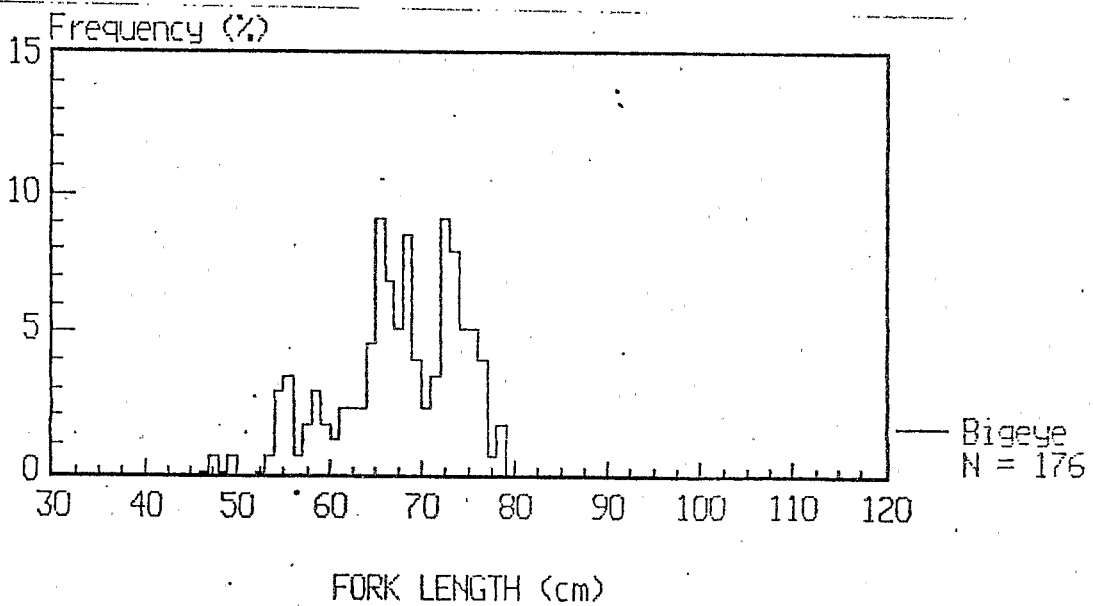
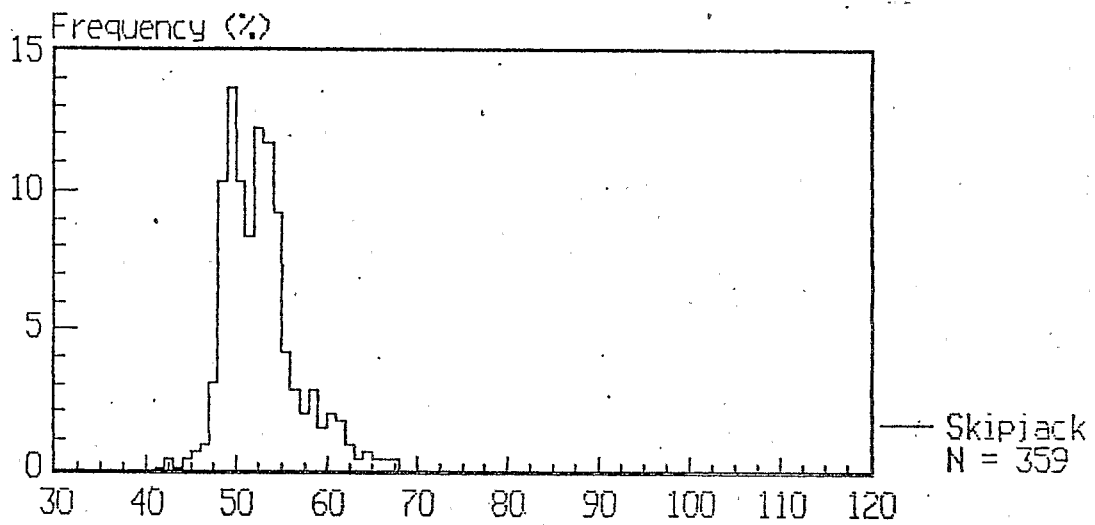
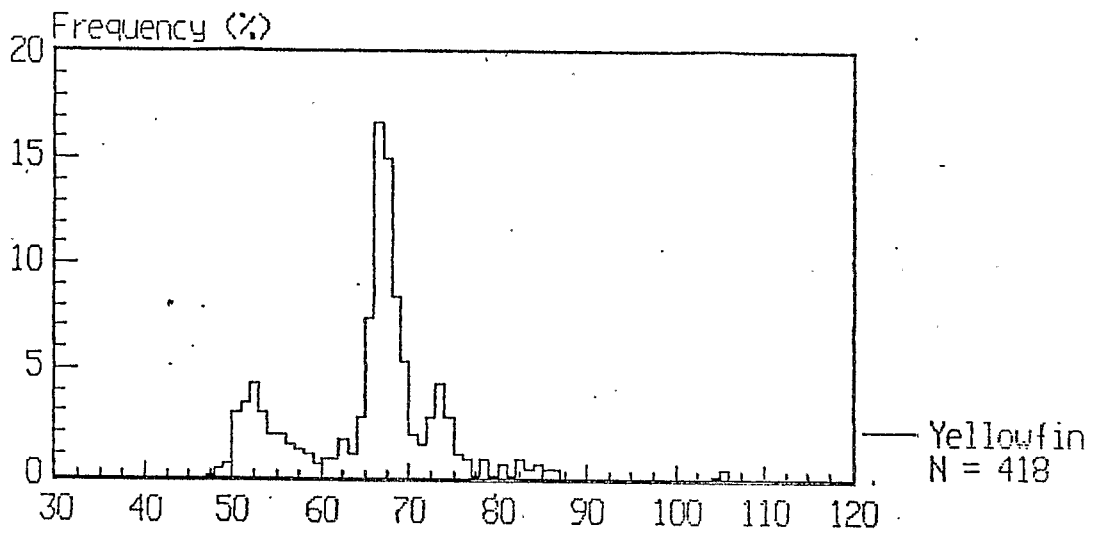


FIGURE 1 : Locations (+) of the tagging operations conducted during  
===== 1988 and 1989 within the Regional Tuna Project

FIGURE 2: Size frequency distributions of the tunas (*T.albacares*, *K.pelamis*, *T.obesus*) tagged during the 1988-1989 Regional Tuna Project.



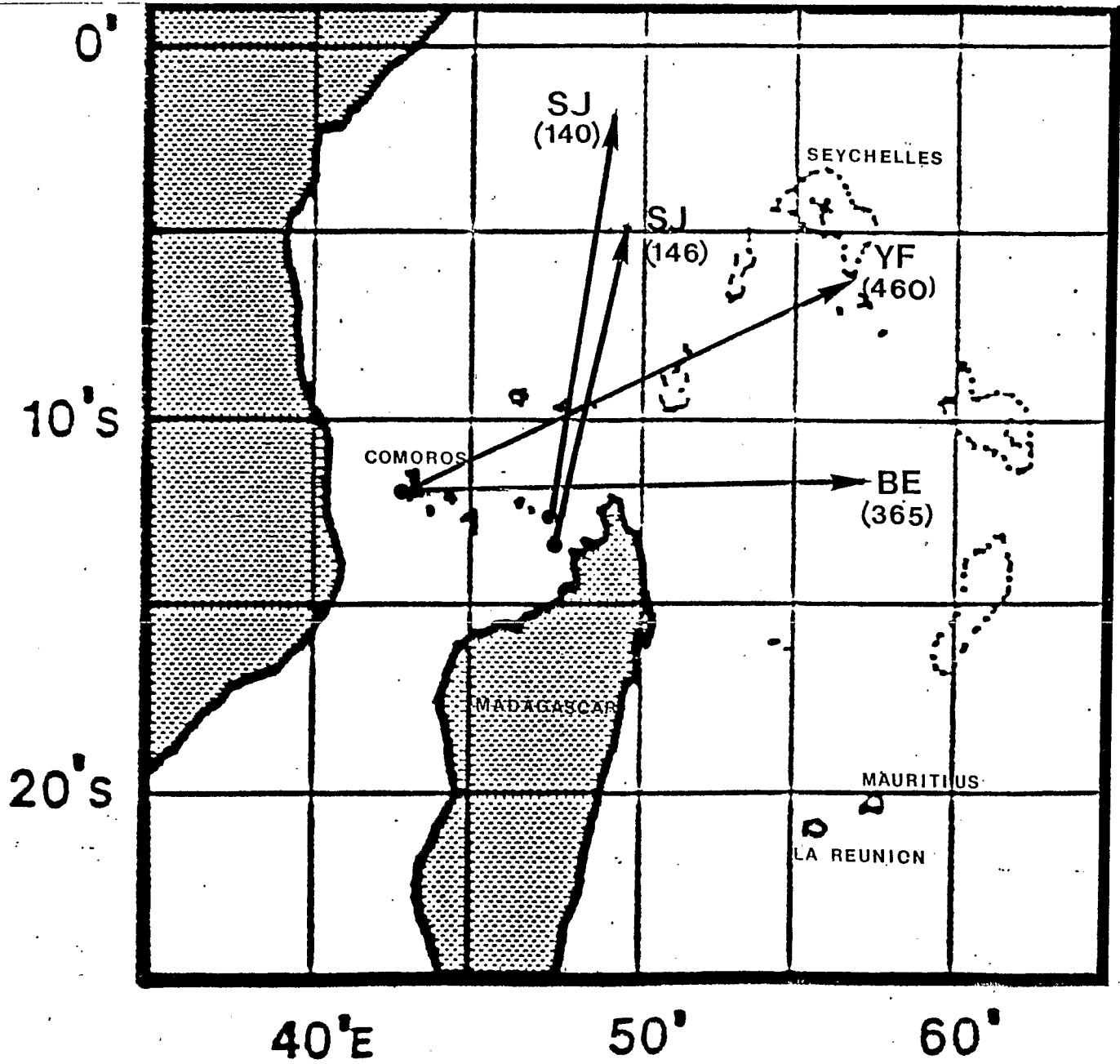


FIGURE 3 : Apparent migrations of the tagged fishes (SJ = skipjack, BE = bigeye tuna); number of days at sea after tagging are given in brackets for each fish.