

A PRELIMINARY ANALYSIS ON MIXING OF SPECIES WITHIN SCHOOLS FISHED BY
TEMA-BASED JAPANESE BAITBOAT FLEET DURING 1979 AND 1980

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SUMMARY

Species composition and frequency of occurrence by mixture type of species and association type of schools with biotic and abiotic objects were studied based on detailed observation obtained from sample boats of Tema-based Japanese baitboat fleet. Ubiquitous appearance of undersized yellowfin and bigeye over the entire baitboat fishing grounds were confirmed. It was also confirmed that mixed catches of these undersized fishes with skipjack were very small in amount compared with the catches of target skipjack. In conclusion, it seems that there will be little possibility for the Tema-based baitboat fleet to avoid taking of the undersized fishes no matter how operating on specific types of mixing of species or association types.

RESUME

La composition par espèces et la fréquence de la présence d'espèces mélangées, ainsi que l'association de certains types de bancs avec des corps étrangers (biotiques ou abiotiques), ont été étudiés en se basant sur des observations détaillées obtenues à partir de l'échantillonnage de canneurs japonais basés à Tema. La présence simultanée d'albacores et thons obèses hors taille dans tous les lieux de pêche à l'appât vivant a pu être confirmée. Il a également pu être constaté que les prises de ces poissons hors taille mélangés avec du listao étaient peu volumineuses par rapport à celles du listao en tant qu'espèce-cible. En conclusion, il semble difficile que la flottille de canneurs basée à Tema puisse éviter de capturer des poissons hors taille, quelle que soit la méthode utilisée pour viser certains types de mélanges d'espèces ou de bancs associés à des corps étrangers.

RESUMEN

Se aplicaron observaciones detalladas obtenidas por muestreo de barcos de la flota japonesa de cebo con base en Tema para estudiar la composición por especies de los cardúmenes, frecuencia de diferentes tipos de bancos mixtos y la asociación de los cardúmenes con objetos bióticos y abióticos. Se confirmó la presencia continua de rabil y patudo de pequeña talla en todos

los caladeros de los barcos de cebo, así como el que su captura mixta con el listado era muy escasa en comparación con el porcentaje de listado obtenido. En conclusión, hay muy pocas posibilidades de que la flota de cebo con base en Tema pueda conseguir evitar la pesca de peces de pequeña talla, tanto si sus operaciones se dirigen a especies mixtas como asociadas.

Introduction

It has become needed to collect detailed fishery information on species composition, amount of catches and size of fishes taken within schools and their areal-seasonal variations for juvenile tropical tunas in the Atlantic Ocean, because this type of information is one of essential factors to successful conservation of stocks exploited by multi-species and multi-gear fisheries.

There are some studies of such subjects on purse seine catches (Levenez et al., 1980, Bard, 1980) but only fragmentary on baitboat catches (Kwei and Mensah 1979). Since 1979, in addition to routinely recorded logbooks of daily catch and effort by fishing vessel, a new logbook format has been distributed to the Japanese Tema-based baitboats to collect detailed information by single operation, or on school-basis, on catch by size category, length measurements and association type of school.

Specification of the new information used

Among the items to be recorded in the new format, the following two entries are specific to the present analysis:

1. Estimated catch in 0.1 metric ton by species and size category on school basis.

Yellowfin and bigeye: $\begin{cases} \text{GG} > 13.6 \text{ Kg} \\ \text{R1} = 13.6 - 3.2 \text{ Kg} \\ \text{R2} < 3.2 \text{ Kg} \end{cases}$, Skipjack: $\begin{cases} \text{R1} > 1.8 \text{ Kg} \\ \text{R2} < 1.8 \text{ Kg} \end{cases}$

2. Types of schools associated with biotic or abiotic objects such as bird flocks and drifting logs.

The information has been compiled at the Far Seas Fisheries Research Laboratory for various investigations.

Results

1. The data derived from two boats were consistent in reported contents and judged to be eligible for the present study, consisting of 1,399 successful operations during the period from April 1979 to July 1980.

2. In Figure 1, the distribution of species composition of the baitboat catch, subdivided by sizes over and under 3.2 Kg for yellowfin and bigeye tunas, are shown by month and 1° x 1° squares. The share of skipjack in the catch was overwhelming in overall areas and in every month, although it is not clear from the figure due to the difference in the scale given for skipjack, i.e., ten times as much as that for yellowfin and bigeye. It is also pointed out that smaller yellowfin than 3.2

Kg were being caught more frequently in a relatively large amount than their larger-sized counterparts in the entire spatio-temporal ranges of the sampled areas. Although there are some exceptional occasions where the larger sized yellowfin or bigeye were taken much more than the under-sized fishes, the examination of the length measurement data revealed that the larger fishes in such cases were only slightly above 3.2 Kg. Therefore, hereafter, no breakdown of yellowfin and bigeye catches by size was taken into account.

3. Figure 2-a and Table 1 show monthly occurrence in the frequency of the operations by the type of mixing of species. During the total period studied, pure skipjack schools are most commonly encountered, followed by yellowfin + skipjack, yellowfin + bigeye + skipjack and bigeye + skipjack types in descending order. Pure yellowfin and pure bigeye or yellowfin + bigeye types occurred seldom. Although it is difficult to find apparent seasonal patterns in the occurrence by type of mixing of species, percentage of skipjack catch to the total tends to show moderated decrease from September to January and temporarily in March and April of 1980. The first decreasing trend is consistent with the findings reported by Marcille and Armada (1979) and Suzuki (1980). On the other hand, the second one might be caused by sampling bias.

4. One of possible reasons why the degree of decreases remain somewhat moderate in comparison to the ratio of occurrence of pure skipjack schools will be explained by the fact that considerably larger amount of skipjack catch in the mixed species schools was taken per school than in the pure skipjack schools. In most cases, it seems that the more various species found mixed in a school, the larger the amount of the resultant catches.

5. Frequency distributions of the operations classified by association type of schools are shown in Table 2 and Figure 4-a. There is ambiguity in definition of the school type associated with some objects. For example, "bird flock" school is often associated with other objects such as sharks at the same time. In this study, the identification of the school type was solely dependent upon the judgement of the fishermen, which was entered into the entry of the format. Furthermore, when school type was described as "birds and sharks", it was classified as shark associated school. Bird flock schools were predominant in most of the period surveyed while secondary frequent shark schools showed obvious decrease from the end of 1979 (Fig. 4-a).

6. Frequency distribution by association type and mixing type of species (Fig. 4b-d) show that the dominant two association types, "bird flock" and "sharks" occurred more or less in the similar way for pure skipjack, yellowfin + skipjack and yellowfin + bigeye + skipjack types, whereas log or ship associated types appeared more frequently in yellowfin + skipjack and yellowfin + bigeye + skipjack types. It is inferred that the average catches per unit operation from log and ship associated schools are higher than those of other types (Fig. 5 and the last row of Table 2). It may be that catches of small yellowfin and bigeye could be reduced by avoiding log and ship associated schools, but the reduction will not be substantial because of fewer occurrence of this type as well as relatively small proportion of the small tunas caught mixed in this type. More important to be pointed out is that this is possible only through substantial sacrifice of the larger loss of skipjack as already mentioned due to larger catches of skipjack in the mixed species schools.

References

- Bard, F.X. 1980: "Etude de la composition spécifique des bancs de thonidés tropicaux pêchés par la flottille FISM en 1978-1979", document submitted to the Working Group on Juvenile Tropical Tunas held in Brest, France (WGJTT/80/10).
- Kwei, E.A. and M.A. Mensah 1979: "The bigeye size regulation issue", ICCAT Coll. Vol. Scie. Paper, 8(1), p. 108-119.
- Levenez, J.J., A. Fonteneau and R. Regalado 1980: "Evolution numérique et pondérale des calées de la flottille de senneurs FISM ayant débarqué à Abidjan de Janvier 1976 à Juillet 1979", ibid., 9(1), p. 92-101.
- Marcille, J. and N. Armada 1979: "Les prises de jeunes albacores et patudos dans l'Atlantique orientale tropical conséquences en matière d'aménagement", ibid., p. 212-229.
- Suzuki, Z. 1980: "An aspect on catch of three major species, skipjack, yellowfin and bigeye tunas, taken by the Japanese baitboat fleet based in Tema 1969-1978", ibid., 9(1), p. 255-262.

Captions for figures

- Fig. 1. Distribution of monthly catches by species and size category taken by sample boats of Tema-based Japanese baitboat fleet from April 1979 to July 1980.
- Note difference in catch scales for skipjack and for yellowfin and bigeye. The catches of yellowfin and bigeye under 3.2 Kg are shown in black bars.
- Fig. 2. Monthly frequency of operations classified by mixing type of species (a) and percentage of skipjack catch to the total (b) for sample boats of Tema-based Japanese baitboat fleet.
- Fig. 3. Monthly catch per operation classified by mixing type of species for the sample boats of Tema-based Japanese baitboat fleet.
- Fig. 4. Monthly frequency of operations classified by association type of schools (a) and further breakdown by major mixing types of species (b-d) for sample boats of Tema-based Japanese baitboat fleet.
- Fig. 5. Monthly catch per operation classified by mixing type of species and by association type of schools for sample boats of Japanese Tema-based baitboat fleet.

Table 1. Monthly frequency of operations classified by mixing type of species within schools for sample boats of Tema-based Japanese baitboat fleet

Month	Yellowfin		Bigeye skipjack		YF+BE	YF+SJ	BE+SJ	YF+BE+SJ	Total
	(YF)	(BE)	(SJ)	(BE)					
1979	4		65		3	8	5	81	
	5		34		4	4	4	42	
	6		80		38	1	3	122	
	7		97		35	4	6	142	
	8	1	105		62	10	27	205	
	9		31		50	1	8	90	
	10	2	21		38	1	17	79	
	11	1	37		28	1	1	68	
	12		39	1	29	5	25	100	
1980	1	1	44		39	1	24	109	
	2	1	28		26	3	10	68	
	3	3	21		45	1	4	74	
	4		18		9	3	26	56	
	5		25		54		1	80	
	6		15		19		1	35	
	7		17		18	2	11	48	
Total (A)	9	1	677		1	497	41	173	1399
Total catch(B) (100 Kg)	52	1	6445		3	7154	643	4214	18512
(B)/(A)	6	1	10		3	14	16	24	13

Table 2. Monthly frequency of operations classified by association type of schools for sample boats of Tema-based Japanese baitboat fleet

Month	Bird flock	Sharks	School fish		Logs or boats	No information	Total
			(No associations)	(No associations)			
1979	4	21	50	0	0	10	81
	5	13	20	2	0	7	42
	6	33	67	1	12	9	122
	7	46	76	0	12	8	142
	8	108	83	4	5	5	205
	9	37	44	0	9	0	90
	10	41	30	0	5	3	79
	11	59	5	0	4	0	68
	12	78	16	4	0	2	100
1980	1	79	15	0	15	0	109
	2	58	7	1	1	1	68
	3	54	0	3	0	17	74
	4	45	4	1	6	0	56
	5	55	16	8	1	0	80
	6	30	5	0	0	0	35
	7	48	0	0	0	0	48
Total (A)	805	438	24		70	62	1399
Total catch(B) (100 Kg)	9194	6231	348		1814	926	18512
(B)/(A)	11	14	15		26	15	13

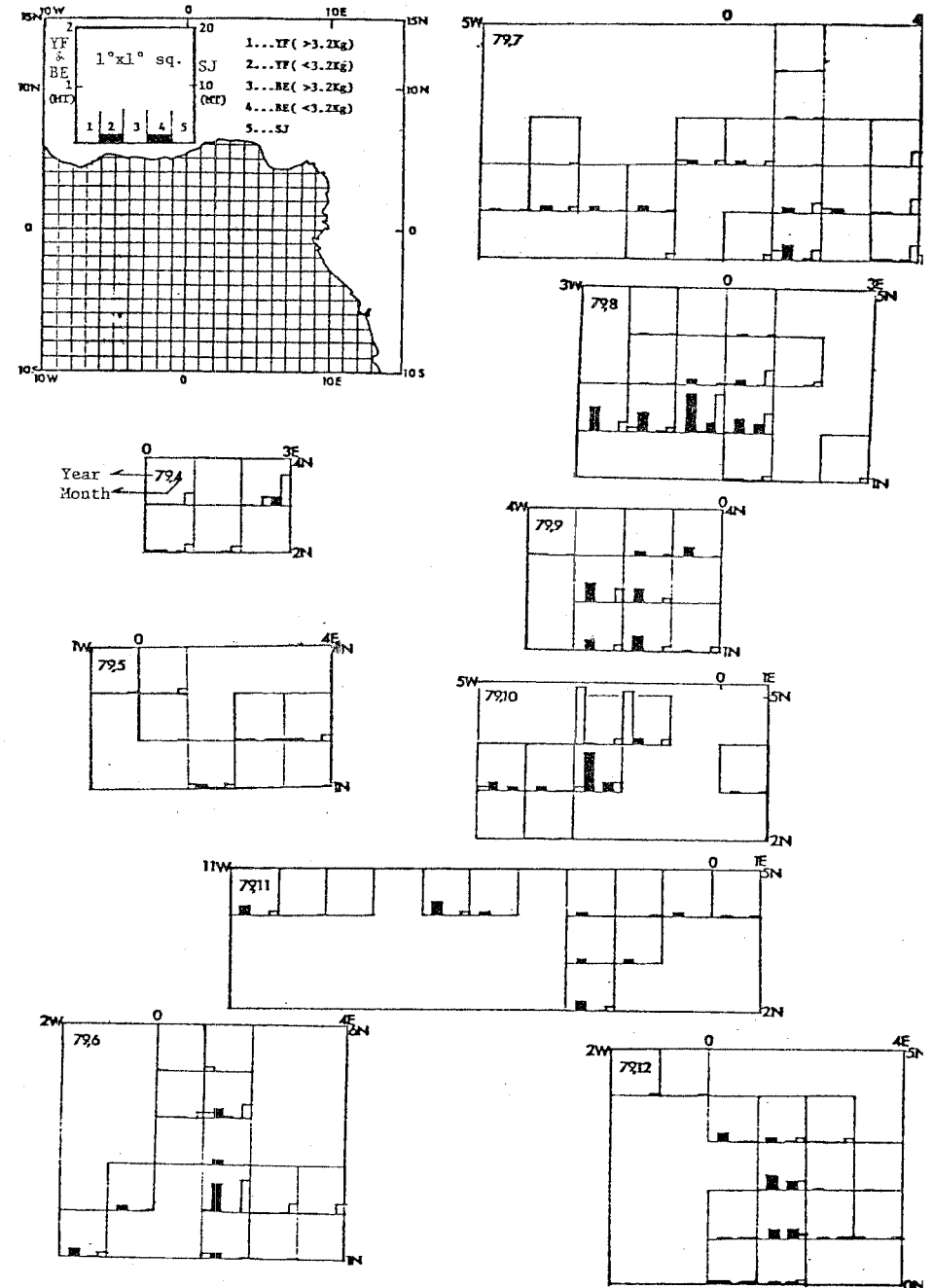


Fig. 1

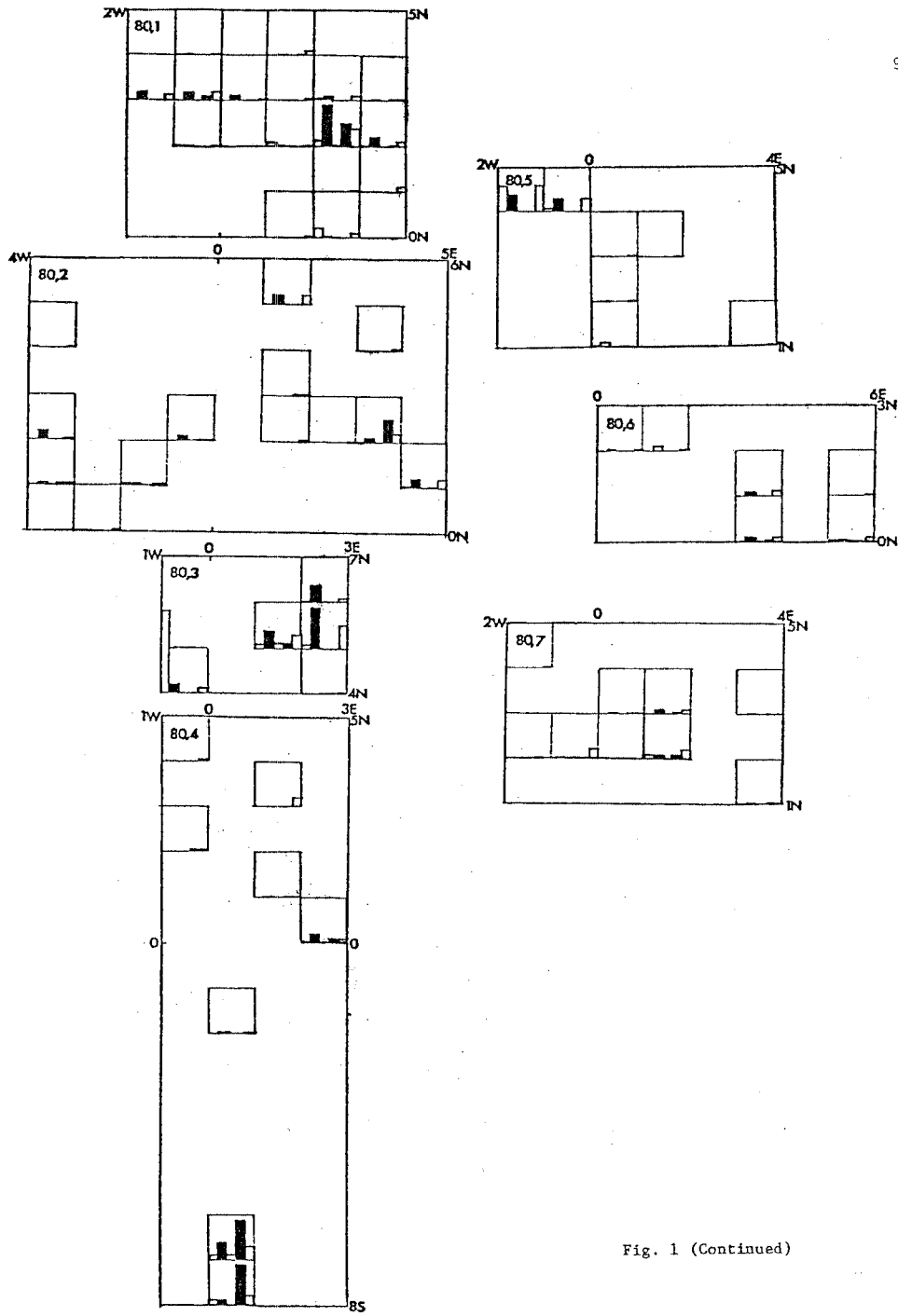


Fig. 1 (Continued)

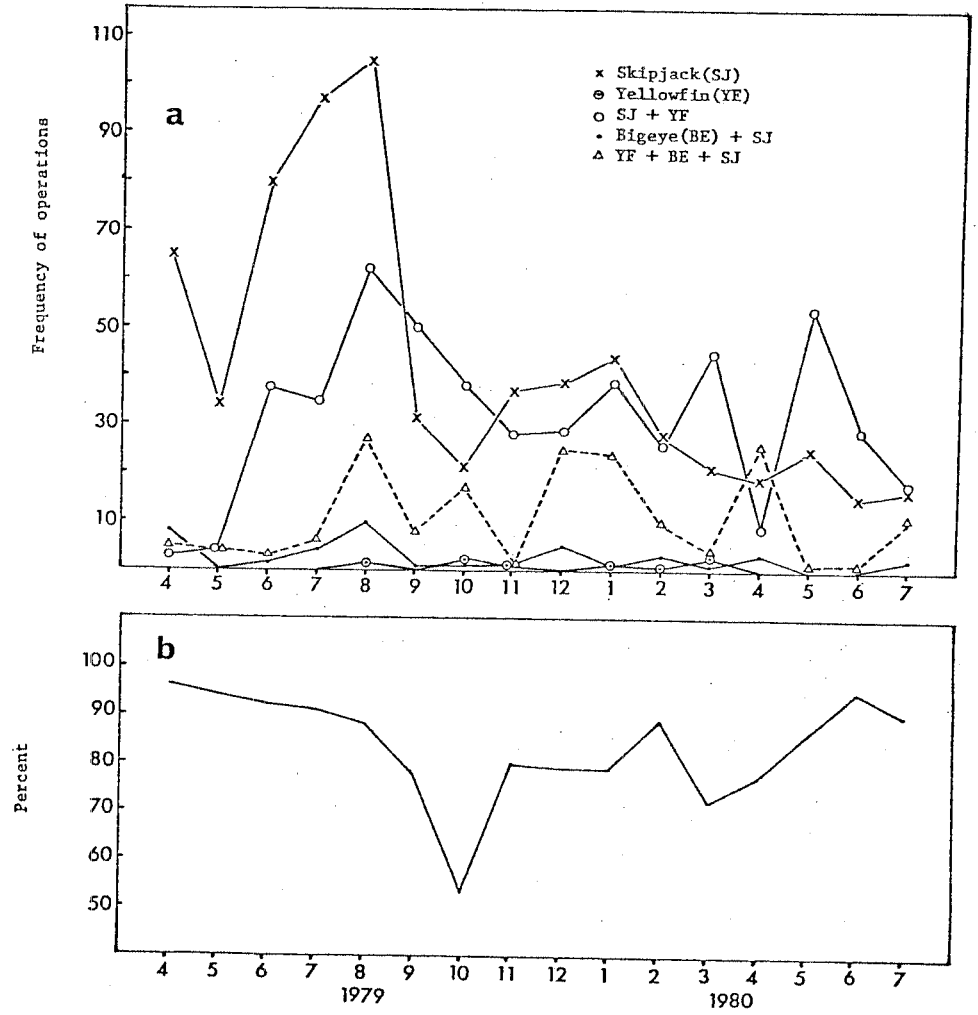


Fig. 2

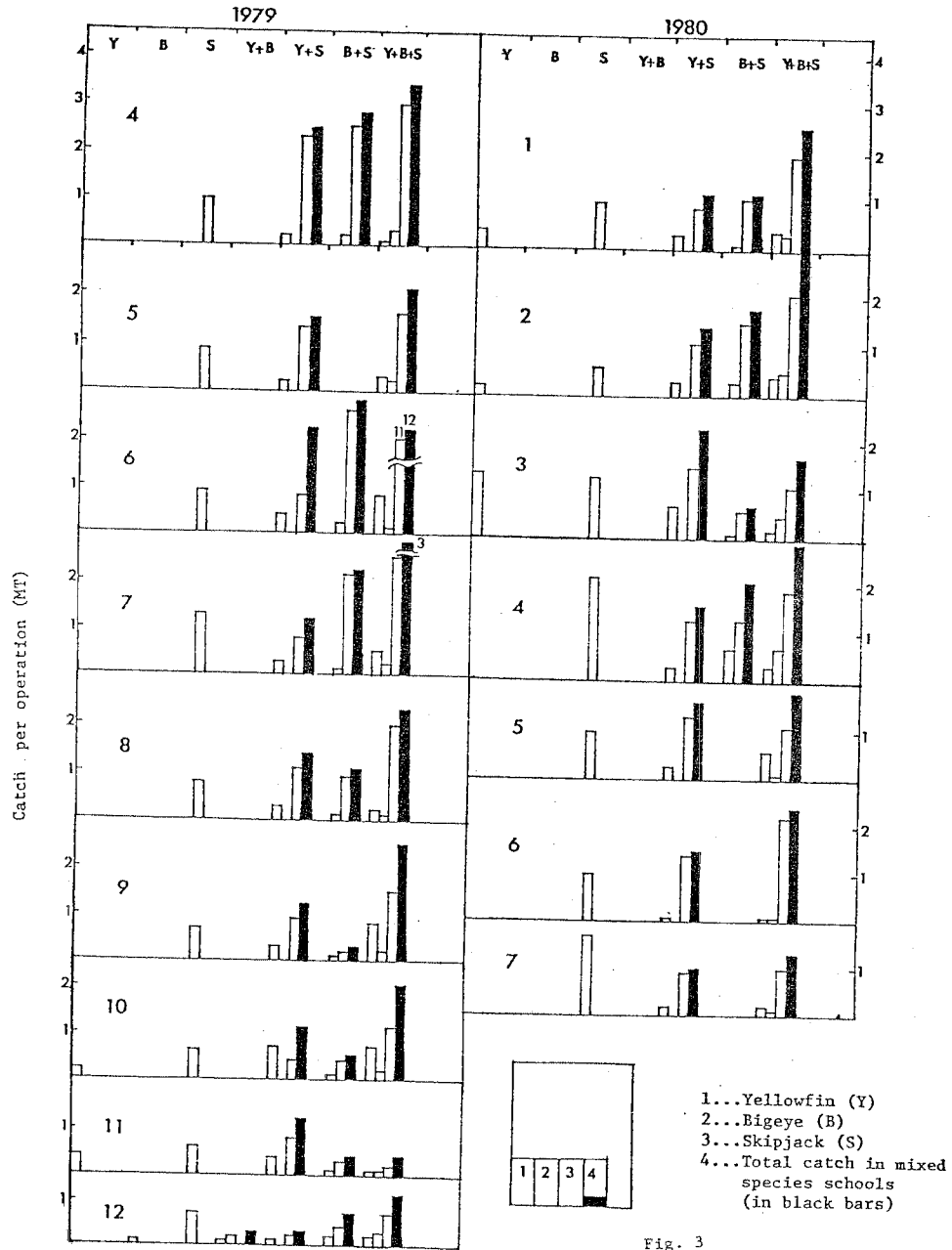


Fig. 3

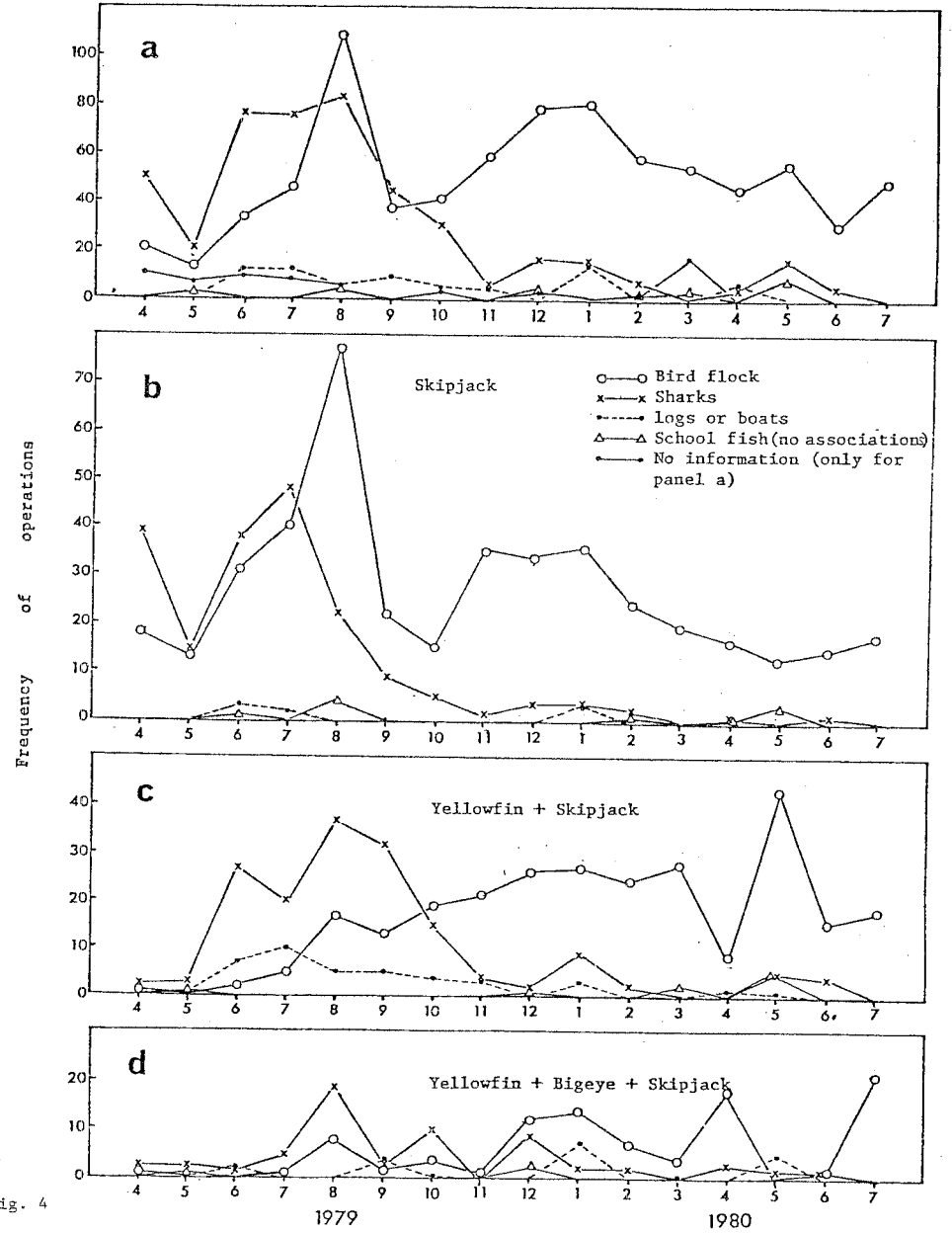


Fig. 4

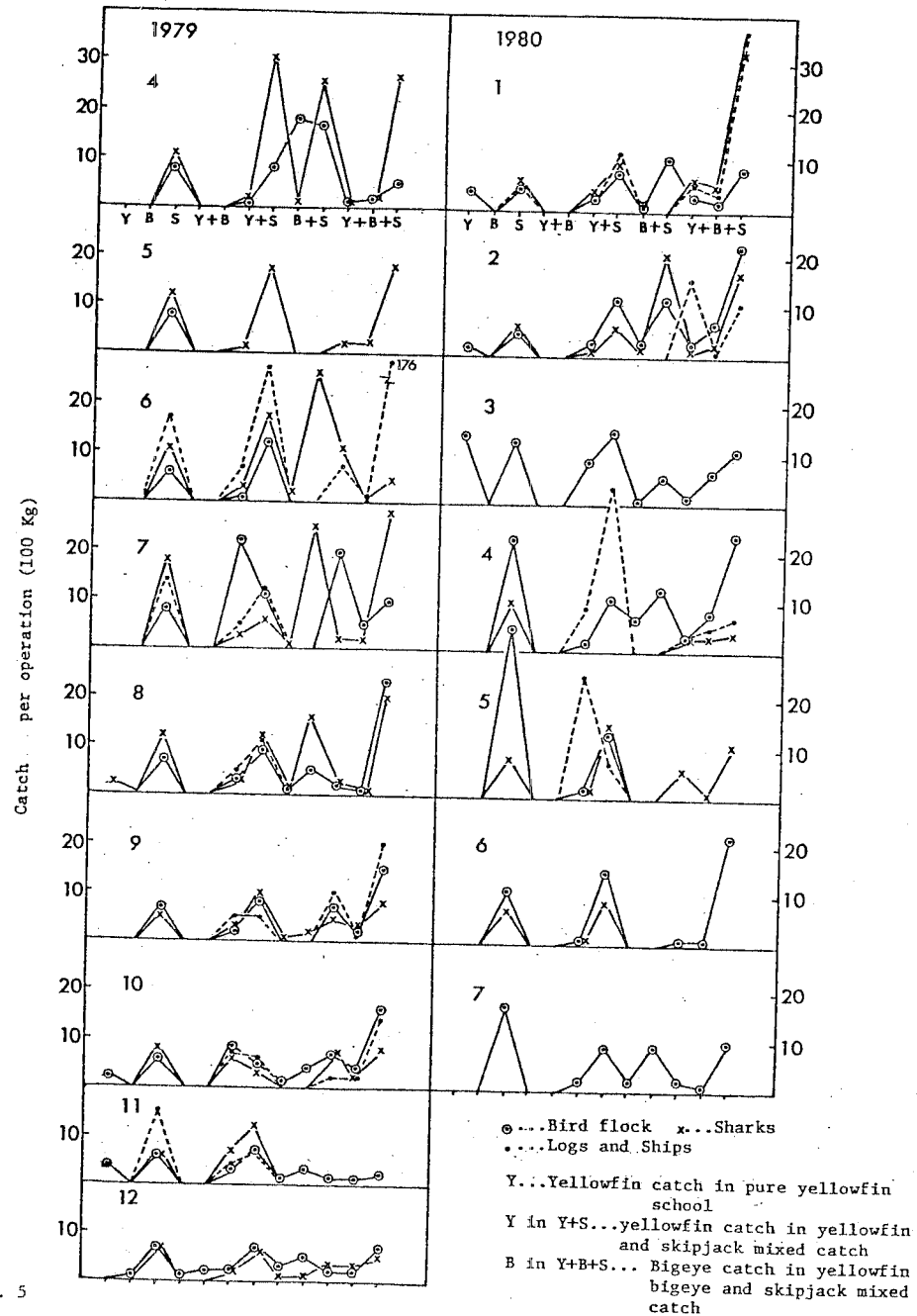


Fig. 5