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Keeping Quality of Imported Dried Fish

By

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Introduction

From 80% to 90% of the dried fish consumed in Sri Lanka is imported and, until recently, the Co-operative Wholesale Establishment (C.W.E.), a state-owned enterprise, was the sole importer. On arrival at the Colombo Port the dried fish is transported by road to the C.W.E. Stores at Welisara. There, each bundle is inspected for quality visually, and depending on the moisture content, texture, presence of bacterial pinking, mould growth, etc., the inspector imposes a quality cut.

A series of experiments were carried out to determine (1) whether objective tests could be used to back up the visual inspection system currently used at the C.W.E. store, (2) whether the imported fish meets the proposed Sri Lankan standards, (3) the shelf life of imported dried fish, and (4) whether the storage life of low quality dried fish can be extended by redrying.

Materials and Methods

Fish Samples

The samples of dried fish listed in Table 1 were taken from the C.W.E. Stores on 1.6.78. The quality cut imposed on samples is also shown in Table 1.

The dried fish were produced in Pakistan and shipped to Sri Lanka in two consignments. The first was unloaded at the Colombo wharf on 3.5.78 and arrived at the C.W.E. Stores on 10.5.78, and the second consignment was unloaded on 22.5.78 and arrived at the stores on 23.5.78.

Redrying

Samples were redried in a mechanical kiln at 45° C for 6 hrs.

Storage

Samples were packed in hessian bags, stiched up and stored at ambient temperatures (28–30° C).

Sensory inspection of Quality

The texture and moisture content were assessed by touch and the extent of bacterial pinking and mould attack were recorded. The degree of insect infestation was assessed and in some samples the weight loss was determined. The odour of the samples was also noted.

Salt content

Salt was determined as chloride where the ions are precipitated by silver nitrate and the excess silver ions are determined by titration with potassium thiocyanate (Pearson, 1970). All analyses were performed in duplicate.

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Miosture content

Duplicate samples (2g) were dried in a convection oven at 105° C/24 h. The weight loss was taken as due to evaporation of water.

Bacteriological analysis

A sample weighing about 10g was chopped aseptically into small pieces and weighed into a sterile blender jar (MSE homogeniser). After the addition of 90 ml sterile saline water (9g sodium chloride and 1g. peptone per 1,000ml), the contents were homogenised for 2 minutes. Sampling was carried out either in triplicate or in duplicate for each species of fish.

(*a*) *Total counts.*—These were made according to standard procedure of serial decimal dilution where diluted aliquots (1ml) were mixed with molten Plate Count Agar (Difco). The plates were incubated at 30° C/72 h.

(*b*) *Coliform counts.*—These were carried out by inoculating in triplicate, tubes of MacConkey Broth with diluted aliquots (1ml) and incubating at 37° C/48 h. The production of acid and gas at 37° C in MacConkey Broth was considered as positive for Coliforms. Enumeration of Coliforms was by the Most Probable Number (MPN) method.

Results

The salt content of the dried fish samples is shown in Table 1. For each fish species the samples on which a quality cut was imposed had a lower salt content than those without a quality cut.

Table 2 gives the proposed Ceylon standard for dried fish (PCSFDF). With the exception of Sprats, which were dried unsalted, the salt content meets the specifications of the standard.

Table 3 and 4 give the moisture content of the various samples before and after redrying and/or storage together with the shelf life. The moisture content of salted dried fish with a quality cut (WQC) was always greater than that without quality cut (WOQC). Comparison with the PCSFDF shows that all the imported dried fish examined except sprats exceeded the stipulated maximum moisture content. Even after redrying, only two samples, viz., Leatherskin (WOQC) and Yellow Fin Tuna (WOQC) met the requirements of the standard.

With the exception of Shark fillets (WQC) the loss in moisture content during redrying was quite small. Although all redried samples took up moisture again on storage, there was wide variation. The moisture content of the non-redried fish on the other hand showed much smaller changes during storage.

The redried fish except shark (WQC) and Leatherskin (WOQC) had a longer storage life than untreated samples. On an average the shelf life of the dried fish samples was prolonged by about 12 days on redrying.

Table 5 gives the total plate count (TPC) of dried fish and redried fish at the beginning of the storage period. The results are very variable and it is impossible to draw any firm conclusion.

Table 6 gives a visual assessment of microbial spoilage at end of storage. It may be seen that all samples including those that have been redried show bacterial pinking and/or mould growth at the end of their storage life.

Symbols used in the Graphs

T	=	Tuna
M	=	Magara (Shark fillet).
K	=	Katta (Leatherskin).
C	=	Catfish
S	=	Sprats
D	=	Redried samples
W	=	Dried samples (as brought from Welisara) i.e., Not redried.
Suffix A	=	Fish without quality cut.
Suffix B	=	Fish with quality cut.
W.Q.C.	=	With quality cut.
W.O.Q.C.	=	Without quality cut.
e.g. T_A W	=	Tuna, without quality cut, non-redried.

TABLE 1

SPECIES OF FISH USED IN EXPERIMENT AND THEIR SALT CONTENTS

	Scientific Name	*Common Name*		*Quality*		*% Salt*
		English	*Sinhalese*	*Cut*		*(Dry basis)*
1.	*Chorinemus Lysan*	Leatherskin	Kattava	0%		21.9
				15%		18.1
2.	*Carcharhinus* spp.	Large shark Fillets	Mora	0%		20.6
	Scoliodon spp.	Small shark Fillets	Kirimora	10%		16.7
3.	*Thunnus macropterus*	Yellow fin Tuna	Kelawalla	0%		20.3
4.	*Euthynnus affinis*	Mackerel Tuna	Atavalla	15%		19.0
5.	*Anchoviella* spp.	Sprats	Halmassa	0%		2.0
6.	*Tachysurus* spp.	Catfish	Anguluwa	20%		16.1

TABLE 2

PROPOSED CEYLON STANDARD FOR DRIED FISH

Group	*Description*	*Moistute (%) Maximum*	*Salt (% dry basis)*		*TPC (per g.)*	*Coliform Count*
			Minimum	*Maximum*		
A	Large fish (> 15 cm)	35	12	30	10,000	Less than 10/g
B	Medium fish (7 to 15 cm)	30	10	30	50,000	Less than 10/g
C	Small fish (< 7 cm)	20	4	16	100,000	Less than 10/g

TPC = Total plate count

TABLE 3

CHANGE IN MOISTURE CONTENT DURING STORAGE AND SHELF LIFE OF DRIED FISH

Sample	*Moisture content (%)*			*Shelf life (days)*
	Initial	*Final*	*Moisture*	
Shark WOQC	49.3	51.7	2.4	36
Shark WQC	52.5	47.8	−4.7	63
Leatherskin WOQC	33.4	40.9	7.5	50
Leatherskin WQC	47.1	48.8	1.7	50
Yellow Fin Tuna WOQC	39.4	40.5	1.1	50
Mackerel Tuna WQC	49.0	45.7	−3.3	36
Catfish WQC	48.4	50.4	1.6	36
Average	45.6	46.5	0.9	45.9

WOQC = Without quality cut.
WQC = With quality cut.

TABLE 4

CHANGE IN MOISTURE CONTENT DURING RE-DRYING AND STORAGE AND SHELF LIFE OF DRIED FISH

Sample	Moisture content %			*Shelf life (days)*
	Before drying	*After drying*	*After storage*	
Shark WOQC	49.3	39.3(−10.0)	39.6 (0.3)	47
Shark WQC	52.5	31.5(−21.0)	47.0 (15.5)	63
Leatherskin WOQC	33.4	27.9*(−5.5)	44.3 (16.4)	47
Leatherskin WQC	47.1	40.4 (−6.7)	48.4 (8.0)	63
Yellow Fin Tuna WOQC	39.4	28.0*(−11.4)	49.7 (21.7)	63
Mackerel Tuna WQC	49.0	44.1 (−4.9)	50.0 (5.9)	74
Catfish WQC	48.4	43.1 (−5.3)	52.9 (9.8)	47
Average	45.6	36.3 (−9.3)	47.4 (11.1)	57.7

Figures in brackets indicate changes in moisture content.
* Conforms to proposed Ceylon Standard.

TABLE 5

TOTAL PLATE COUNT OF DRIED FISH AT THE BEGINNING OF STORAGE

Sample	*Fish without quality cut*		*Fish with quality cut*	
	Non-redried	*Redried*	*Non-redried*	*Redried*
Shark fillet	8,366*	230,000	1,617*	7,600*
Leatherskin	93,967	1,733*	1,617*	3,917*
Yellow Fin Tuna	145,500	52,667	—	—
Sprats	53,965	—	—	—
Mackerel Tuna	—	—	913*	14,600
Catfish	—	—	2,217*	117,400

* Confirms to proposed Ceylon Standard.

TABLE 6

VISUAL ASSESSMENT OF MICROBIAL SPOILAGE AT END OF STORAGE LIFE

	Non-redried fish		*Redried fish*	
Sample	*WOQC*	*WQC*	*WOQC*	*WQC*
Shark	P	P	P+M	M
Leatherskin	P	P	P	P
Yellow Fin Tuna	M	—	P+M	—
Mackerel Tuna	—	M	—	M
Catfish	—	P	—	P

P = Pink bacteria

M = Moulds

WOQC = Without quality cut.

WQC = With quality cut.

TABLE 7

SAMPLES WHICH MEET COLIFORM SPECIFICATION IN PROPOSED STANDARD

	Non-redried		*Redried*	
Species	*WOQC*	*WQC*	*WOQC*	*WQC*
Shark fillet	X	O	X	O
Leatherskin	O	O	O	O
Yellow Fin Tuna	X	—	X	—
Mackerel Tuna	—	O	—	O
Catfish	—	O	—	O
Sprats	X	—	—	—

O = Conforms to standard (i.e. <10 coliforms/g)

X = Does not conform to standard

WOQC = Without quality cut

WQC = With quality cut

TABLE 8

WEIGHT LOSS IN UNSALTED DRIED SPRATS DURING STORAGE

Storage Period (days)	4	21	36	50
Weight of Sprats (g)	200.0	160.0	92.8	53.0
Weight loss (g)	0	40.0	107.2	147.0
%	0	20.0	53.6	73.5

Fig 1: CHANGE IN MOISTURE CONTENT OF DRY FISH

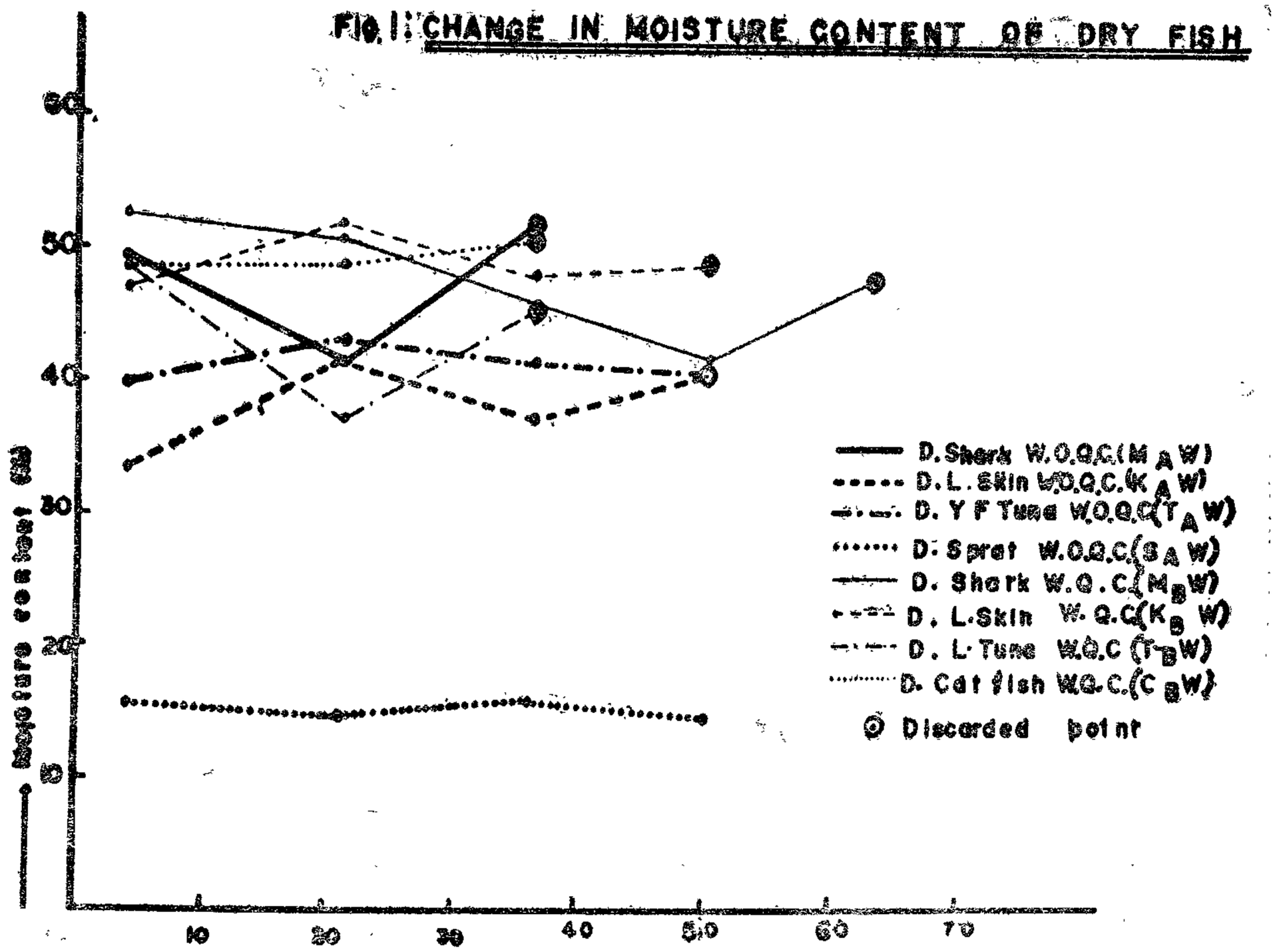

Fig 2: CHANGE IN MOISTURE CONTENT OF RE-DRIED FISH

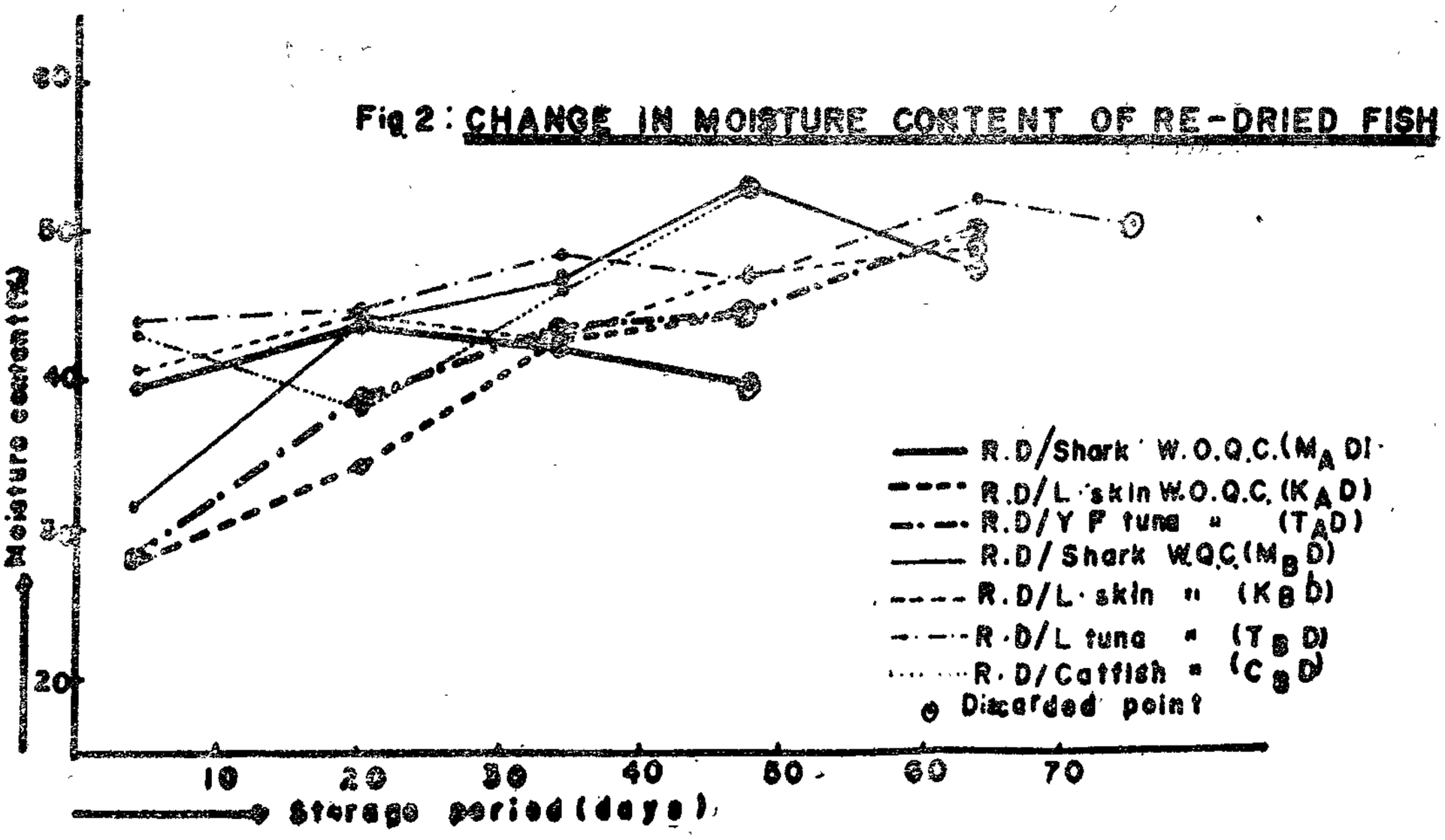

Fig.3: CHANGES IN TPC OF DRIED SHARK

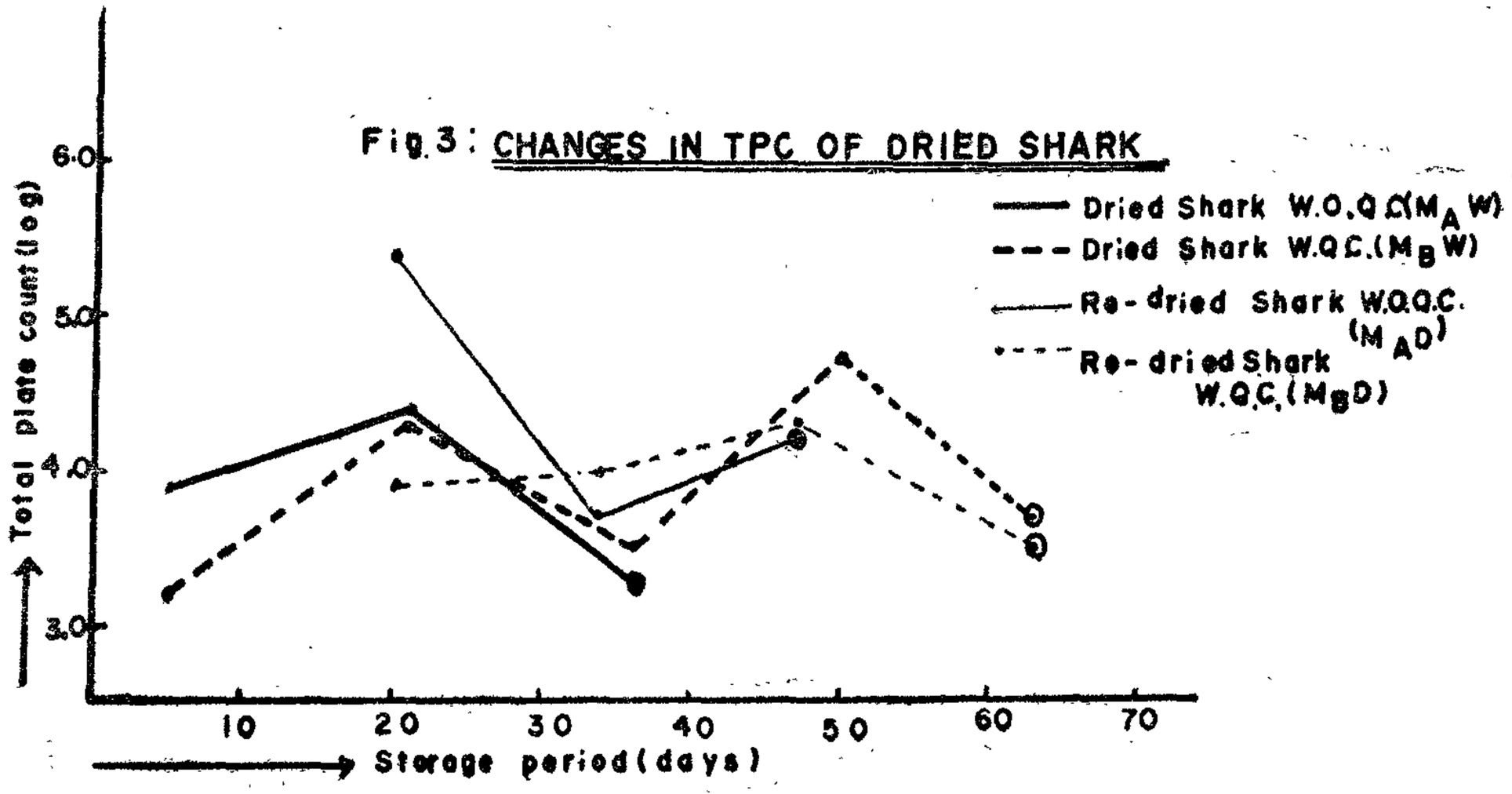

FIG.4: CHANGES IN TPC OF DRIED LEATHER-SKIN

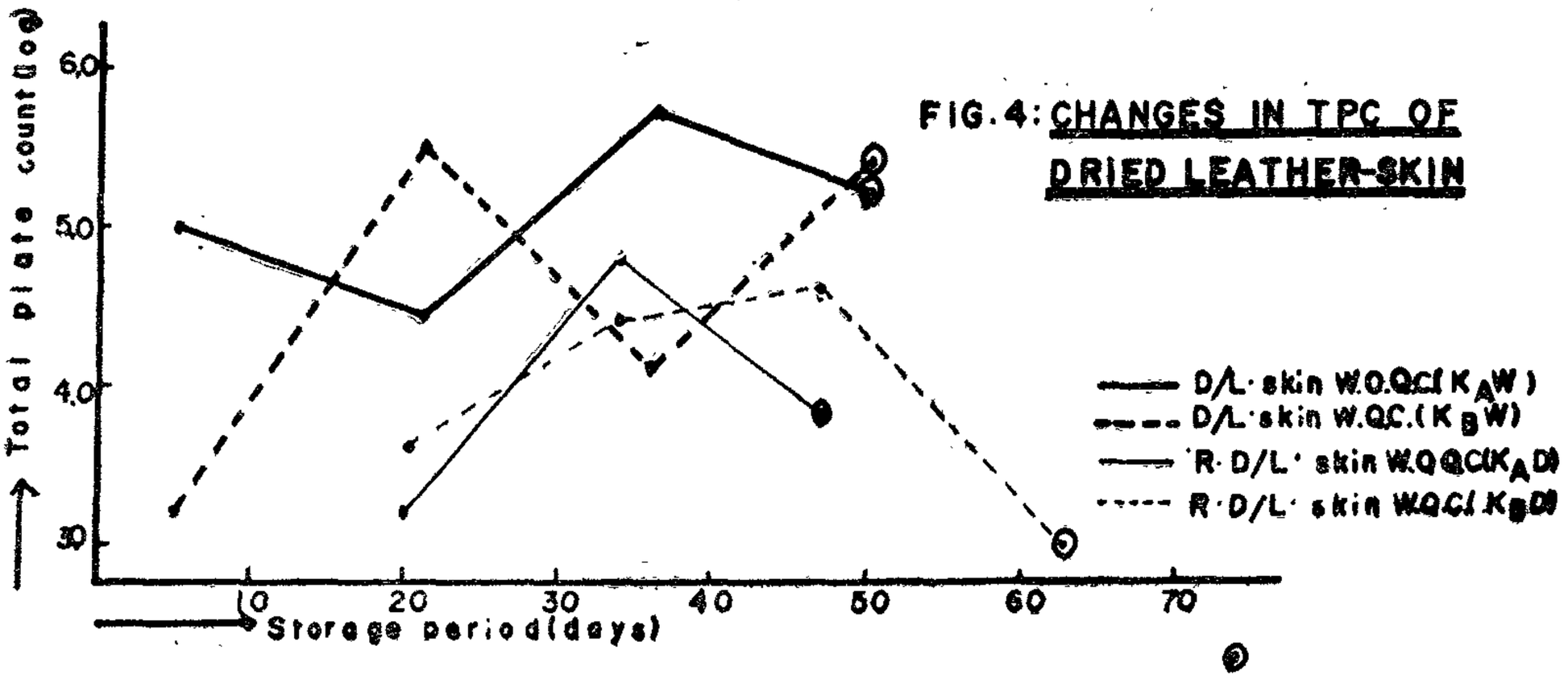

FIG.5: CHANGE IN TPC OF DRIED TUNA

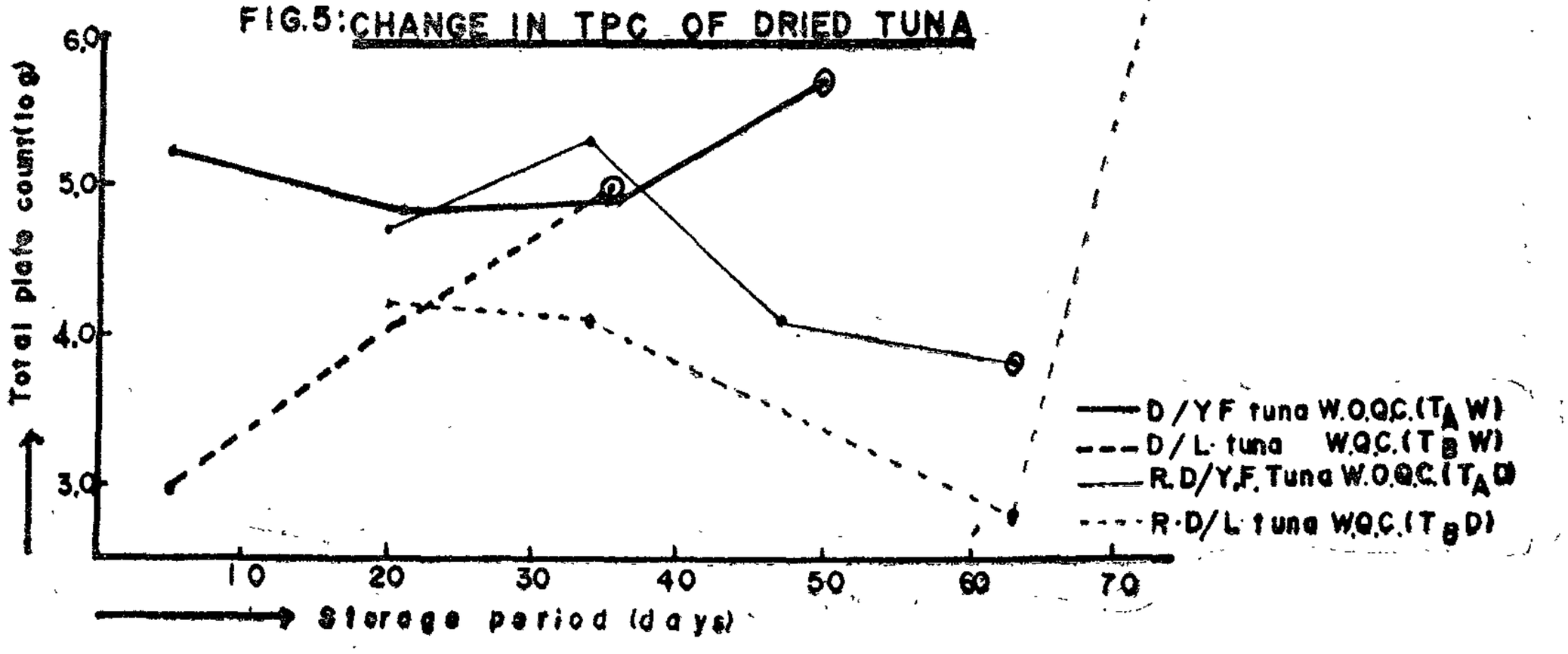

Fig. 6: CHANGES IN TPC OF NON-REDRIED FISH

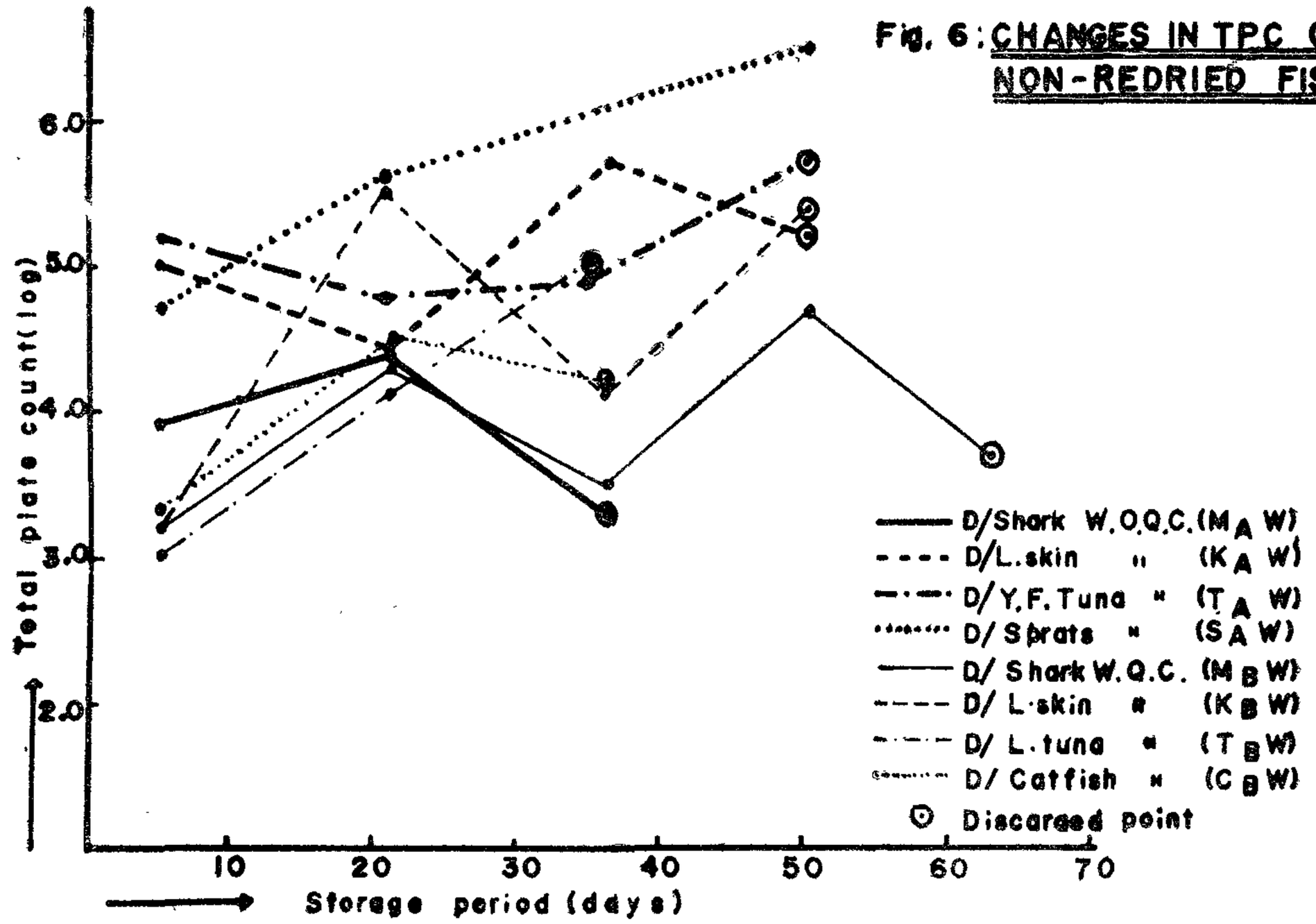

Fig.7: CHANGES IN TPC OF RE-DRIED FISH