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COMPARATIVE EFFICIENCY OF MONOFILAMENT AND MULTIFILAMENT NYLON TRAMMEL NETS IN THE EGYPTIAN DELTA LAKES (LAKE EDKU)

A.A. ALSAYES

National Institute of Oceanography and Fisheries, Kayet Bey Alexandria - Egypt.

ABSTRACT

Synthetic fibres became widely used in the Egyptian lake fisheries several years ago, but in the form of multifilaments. Recently, monofilament nets have been introduced to replace gradually the multifilament nets. It is attempted in the present investigation to compare between the fishing powers of mono-and multifilament trammel nets in Lake Edku.

Recommendations are made for the introduction of monofilament material on a wider scale in the lake trammel net fishery in Egypt, due to their advantages over the multifilament material.

It is found that the efficiency ratio (in weight) of the monofilament trammel nets ranged between 1.20 in case of nets with stretched mesh size of 6.13 cm to about 1.35 in case of nets with mesh size of 5.00 cm.

INTRODUCTION

The introduction of monofilament as a material for fabrication of gill and trammel nets has raised some imagined problems between the fisheries authorities in various parts of the world. Some afraid that the use of monofilament material would result in smaller fish of some species being delivered by the fishermen. In management, it was suspected that the monofilament nets would exploit the commercial stocks due to their higher efficiency if compared by multifilament nets and the problem of overfishing seemed to be imminent. In research, the relative efficiencies of mono-and multifilament nylon nets are most important if catch per gill or tramel net is being used in any long-term management or research project.

The use of monfilament nets in the Northern Delta Lakes of Egypt became nearly common in the last few years of eighteens. Various opinions were expressed concerning the strength, handling qualities, efficiency, selectivity, etc. of this material, but there were apparent advantages attractive to the fishermen. Experimental fishing was therefore undertaken by the National Institute of Oceanography and Fisheries Laboratories to determine whether different manaqement requlations were necessary in the

fisheries, where this gear might be used. The relative efficiency and selectivity of mono-and multifilament nylon trammel nets currently used by the local fishermen was examined in one of the Northern Delta Lakes namely Lake Edku during the summer season of 1990.

Though efficiency and suitability of monofilament twine against multifilament one as a fishing gear material are still controversal, Molin (1959); Blaxter et al (1963); Shimozaki (1963); Steinberg (1963); Tran-Van-Tri and Ha-Khac-Chu (1963); and Khan et al (1975).

It is obvious that the efficiency of monofilament gill nets for a given species of fish and area of fishing has been thus discussed elsewhere. The suitability of the twine and its efficiency as a fish net material for the Egyptian waters and grounds have not yet been studied systematically. In this concern, the present work presents the results of comparative fishing conducted with mono-and multifilament trammel nets, the most common fishing gear used in the Northern Delts Lakes.

Material and Methods

To study the fishing power of mono-and multifilament trammel nets, comparative fishing operations has been carried out. Arrangements were made to have a commercial operator to conduct the experimental fishing undertaken in the present investigation. Twelve units of monofilament trammel nets and a similar number of multifilament nets were being used during the experiments which were carried out in Lake Edku during the summer season of 1990. Table (1) gives the main design characteristics of the trammel nets unit used.

The efficiency of any snaring gear is mainly governed by two characteristics i.e., mesh size and visibility and transparency under water. When comparing the efficiency of mono-and multifilament trammel nets in the present investigation, the above two mentioned factors were taken into consideration. Therefore, it was essential to manufacture two net sets from both mono-and multifilament nylon twines with two different mesh sizes. The first set is denoted as group (A), while the second was as group (B). On the other hand, the visibility of net under water is highly corresponding to the differences in the mechanical or physical properties of mon-and multifilament twines used for net making with special reference to their diameters.

All the units listed in Table (1) were used for fishing together in two sets. Each set was used in each operation overnight and the catch was collected at early morning. The catch of each mono-and multifilament nets was separated very carefully. The length of each fish was measured in mm, while the weight was measured to the nearest gram by the use of a spring balance.

Table (1)

Design characteristics of the experimental trammel nets used during the course of investigation.

Specification	Monofilament	Multifilament
Group A		
Mesh size of inner layer (cm) (Stretched)	5.0	5.2
Mesh size of outer layer (cm) (Stretched)	15.2	15.5
No. of units used	8	8
Length of each unit (met)	25	25
Depth of net (cm)	90	90
Twine diameter of inner layer	0.12 mm	Td 110/3
Twine diameter of outer layer	0.18 mm	Td 110/3
Group B		
Mesh size of inner layer (cm) (Stretched)	6.13	6.0
Mesh size of outer layer (cm) (Stretched)	18.00	18.3
No. of units used	4	4
Length of each unit (met)	25	25
Depth of net (cm)	90	90
Twine diameter of inner layer	0.12 mm	Td 110/3
Twine diameter of outer layer	0.18 mm	Td 110/3

Fishing with the experimental nets was carried out in different parts of the lake taking into consideration the expected variations in species and length compositions from one locality to another. Group (A) was operated for 10 fishing operations, while group (B) was used in 9 fishing operations during the course of the experiment.

RESULTS AND DISCUSSION

Table (2) gives the numbers and weights of fish caught by mono-and multifilament nylon trammel net group (A) from Lake Edku. It can be observed from Table (2) that **Oreochromis aureus** and **Tilapia zillii** dominated the experimental catch of both mon-and multifilament nets. It is worth mention,

Table (2)

Numbers and weight of fish caught by monofilament and multifilament nylon trammel nets (group A) from Lake Edku (Percentage of number, weight in Parenthesis).

Fish species	Monofilament		Multifilament		Total		Efficienay ratio	
	No	wt.Kg	No	wt.Kg	No	wt.Kg	No	wt.Kg
O. aureus	276	10.700	258	9.770	534	20.47	1.070	1.095
	(51.68)	(52.27)	(48.32)	(47.73)	-	-	-	-
T. zillii	155	4.050	179	4.680	334	8.730	0.866	0.865
	(46.41)	(46.39)	(53.59)	(53.61)	-	-	-	-
O. nilotica	5	0.765	-	-	5	0.765	-	-
	(100)	(100)	-	-	-	-	-	-
T. galilaea	21	0.995	12	0.535	33	1.530	1.750	1.860
	(63.64)	(65.03)	(36.36)	(34.97)	-	-	-	-
Mugil cephalus	20	1.210	14	0.580	34	1.790	1.429	2.086
	(58.82)	(67.60)	(41.18)	(32.40)	-	-	-	-
Liza ramada	6	0.260	-	-	6	0.260	-	-
	(100)	(100)	-	-	-	-	-	-
Morone labrax	57	4.000	31	2.670	88	6.670	1.839	1.498
	(64.77)	(59.97)	(35.33)	(40.03)	-	-	-	-
Clarias lazera	14	4.005	15	3.370	29	7.375	0.933	1.188
	(48.28)	(54.31)	(51.72)	(45.69)	-	-	-	-
Total	554	25.985	527	21.605	1081	47.590	1.051	1.203

that these two fish species comprise the most dominant fish populations in Lake Edku. The results suggested that the efficiency ratio of mono-and multifilament nets of group (A) by number and weight is more than one in all cases except of **T. zillii**. This means that the monofilament nylon trammel nets are more efficient than multifilament ones in case of group (A). The higher efficiency is more obvious in cases of **Mugil cephalus** and **T. galilaea**. Comparison can not be detected in cases of **Oreochromis niloticus** and **Liza ramada (Mugil capito)** due to the absence of these two species in the catch of multifilament tramel nets.

The numbers and weights of fish caught by group (B) of the experimental nets are given in Table (3). It is noticed that O. aureus, Morone labrax and Clarias lazera constituted the major part of the catch for this set of nets. T. zillii constituted a minor part if compared by the corresponding part in the catch of group (A). This may be due to the wider meshes of group (B).

It is obvious that the efficiency ratio of group (B) nets is more than one except in cases of M. labrax and T. galilaea. This indicates that the mono-filament nets of group (B) were more catchable either by number or weight if compared by multifilament nets of this group of nets.

Table (3)

Number and weight of fish caught by monofilament and multifilament nylon trammel nets (group B) from Lake Edku.

Fish species	Monofilament		Multifilament		Total		Efficiency ratio	
	No	wt.Kg	No	wt.Kg	No	wt.Kg	No	wt.Kg
O. aureus	90	4.400	74	3.730	164	8.130	1.216	1.180
	(54.88)	(54.12)	(54.12)	(54.88)	-	-	-	-
T. zillii	20	0.760	17	0.680	37	1.440	1.176	1.118
	(54.05)	(52.78)	(45.92)	(47.22)	-	-	-	-
O. niloticа	3	0.340	-	-	3	0.340	-	-
	(100)	(100)	-	-	-	-	-	-
T. galilaea	3	0.195	3	0.220	6	0.415	1.000	0.886
	(50.0)	(46.99)	(50.0)	(53.01)	-	-	-	-
Mugil cephalus	10	0.700	5	0.330	15	1.030	2.000	2.121
	(66.67)	(67.96)	(33.33)	(32.04)	-	-	-	-
Liza ramada	7	0.410	5	0.300	12	0.710	1.400	1.367
	-	-	-	-	-	-	-	-
Morone labrax	47	4.000	49	4.240	96	8.240	0.959	0.943
	(48.96)	(48.54)	(51.04)	(51.46)	-	-	-	-
Clarias lazera	15	3.660	6	1.250	21	4.910	2.500	2.928
	(71.43)	(74.54)	(28.57)	(25.46)	-	-	-	-
Total	195	14.465	159	10.750	354	25.215	1.226	1.346

The efficiency ratio of the total catch of the two types of nets indicates that the monofilament nets catch is more than that of the multifilament nets by about 20 % of weight in general case of group (A) which is considered as legal mesh size for catching grey mullet and the other marine species. In case of group (B) of nets which have wider mesh sizes, it is found that the monofilament nets are more efficient than multifilament ones by about 30 % of weight, when the total catches of both types of nets are compared.

The main factor for the comparatively higher efficiency of the monofilament net is mainly the transparency of its twines (Molin, 1959 & Steinberg, 1963). The transparency of the water plays an important role in increasing the efficiency of these nets. Transparency of the net material makes monofilament less visible for the fish in the clear water.

Lake Edku as it is the case in most Northern Delta Lakes is relatively turbid due to the wave action in such shallow lakes (Botros et al, 1973). Therefore, it is difficult to find a big difference between the catches of and multifilament nets in this lake, as it is obvious in Tables (2,3 and 4).

The good elasticity of monofilament net material resulting in better gilling, may have played an important role in increasing the efficiency of monofilament nets through the course of this investigation.

Species and size compositions of the catch of mono-and multifilament trammel nets :

The results indicate that the catch composition remains the same in respect of both groups of nets (Figs. 1 and 2). This means that the species composition of fish populations in Lake Edku would not be affected if a complete substitution of multifilament nets by monofilament one may occur.

When taking in consideration the size composition of various fish species caught by the experimental nets Table (4), and the length frequency distributions of the most dominant fish species in the experimental catch (Figs. 3-6), it can be seen that the average lengths of **O. aureus, T. zillii** and **Morone labrax** caught by either mono-or multifilament nets remained the same if either group (A) or group (B) of the experimental nets is used for fishing. The average lengths of the less common species caught by the two types of nets does not show considerable differences.

This leads to the conclusion that the size composition of the various fish species populations in Lake Edku will remain the same if the monofilament trammel nets would be used on a larger scale instead of the multifilament ones.

Table (4)

Lengths and weights of various fish species caught by the experimental nets from Lake Edku (1990).

Type of net	O. aureus					T. zillii				
	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)
Group (A)										
Momofilament	10.5	17.5	13.53	276	10700	8.5	16.5	11.25	155	4050
Multifilament	10.5	16.5	13.39	258	9770	9.5	16.5	11.33	179	4680
Group (B)										
Momofilament	12.5	18.5	14.50	90	4400	10.2	15.3	12.53	20	760
Multifilament	12.5	17.5	14.61	74	3730	11.0	15.2	12.86	17	680

Table 4 (Cont.)

O. niloticus					T. galilaea					M. cephalus				
Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)
13.4	24.1	15.8	5	765	11.7	16.9	13.94	21	995	15.1	23.8	17.65	20	1210
-	-	-	-	-	11.9	15.8	13.27	12	535	14.1	20.4	16.63	14	680
13.5	22.0	18.5	3	340	12.9	16.5	15.2	3	195	16.6	20.5	18.32	10	700
-	-	-	-	-	14.5	15.8	15.2	3	220	16.0	19.0	17.84	5	330

Table 4 (cont.)

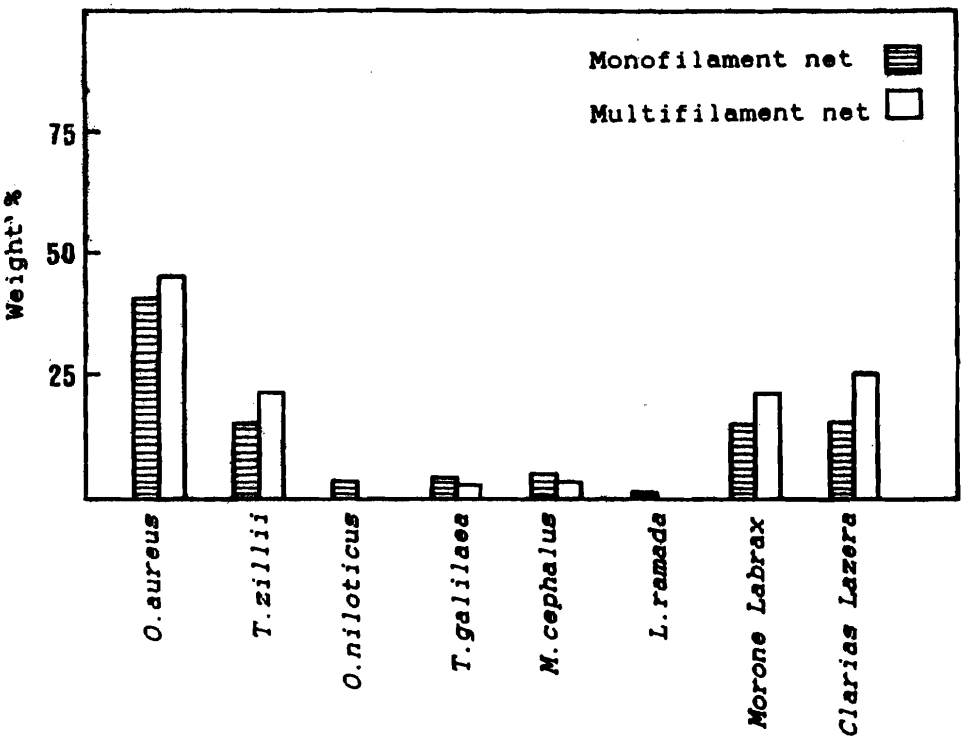
Liza ramada					Morone labrax							Clarias laxera		
Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)	Mini. length (cm)	Max. length (cm)	Av. length (cm)	Total No.	Total wt. (gm)
11.5	20.8	15.95	6	250	8.5	23.5	18.96	57	4000	23.8	47.2	33.76	14	4005
-	-	-	-	-	10.5	25.5	19.40	31	2670	24.8	42.4	30.43	15	3370
14.7	21.5	18.54	7	410	14.50	23.5	20.31	47	4000	24.5	42.0	32.03	15	3660
14.3	22.0	18.80	5	300	14.50	22.5	20.21	49	4240	24.4	36.5	30.75	6	1250

Table 4 (cont.)

	Total number	% number	Total weight	% weight
	554	51.25	25985	54.48
	527	48.75	21605	45.52
	195	55.08	14465	57.37
	159	44.92	10750	42.63

Fig. (1)

Species composition of catch taken by group (A) from Lake Edku (1990).



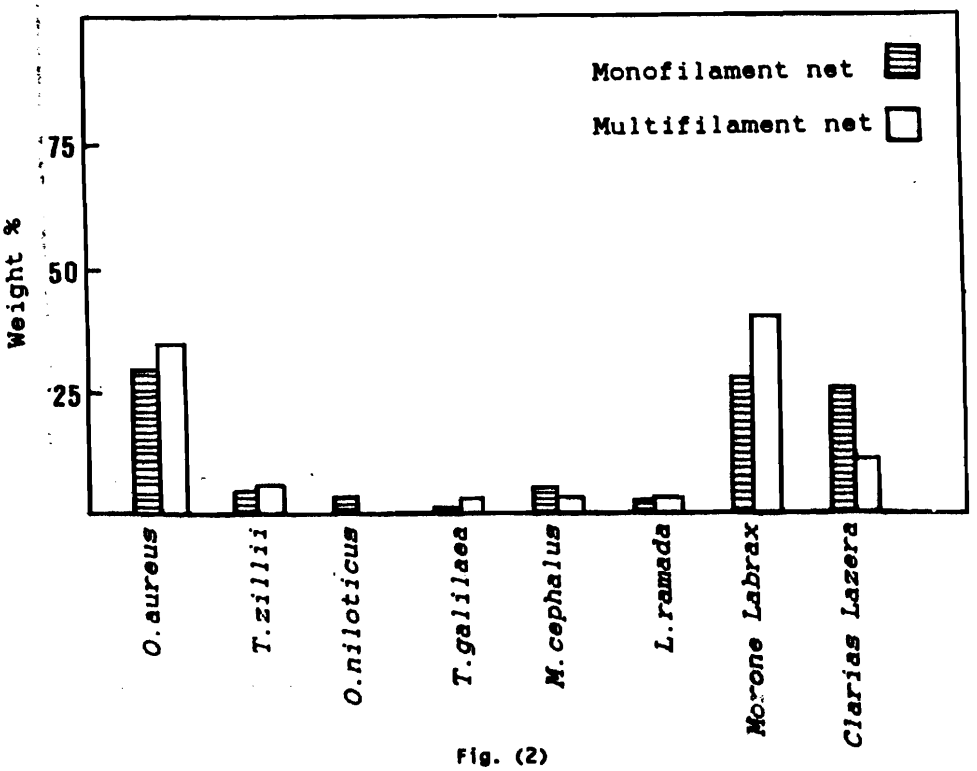


Fig. (2)

Species composition of catch taken by group (B) from Lake Edku (1990).

Advantages of monofilament trammel nets experiment in Lake Edku :

While carrying out the present ivestigation, the following advantages of monofilament nets were observed :

1. The gilled or entangled fish can be easily released from monofilament net than from multifilament one without excess damage to the fish.

2. Best natural mesh opening is obtained in water owing to the stiffness of monofilament material.

3. The transparency of monofilament net reduces its visibility underwater, whereas multifilament net gives a brilliant reflection. This factor increases the catchability of the monofilament net.

4. Less entangling of the netting with floats and sinkers.

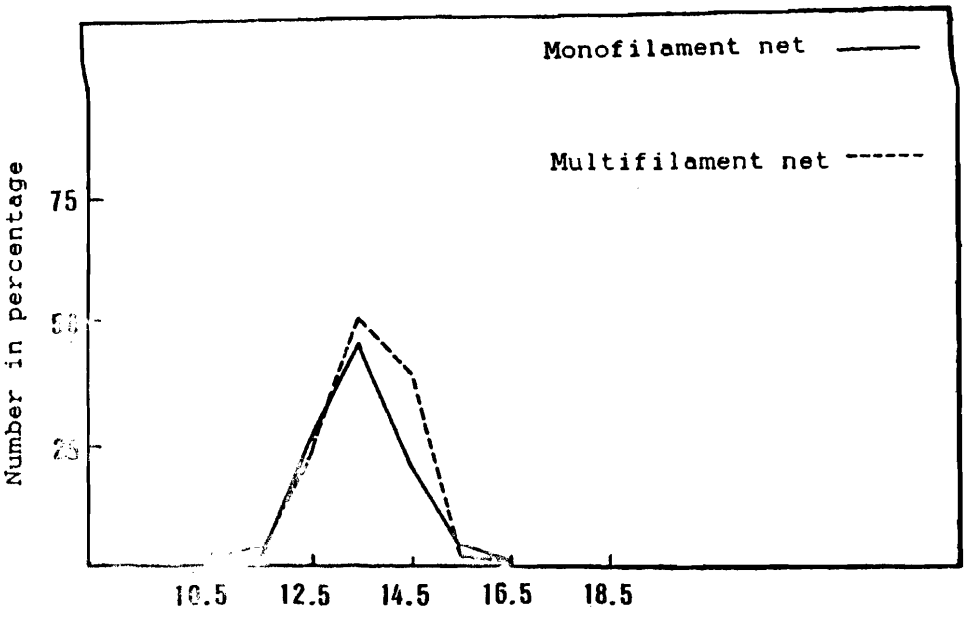


Fig. (3)

Size composition of O. aureus caught by group (A) from Lake Edku.

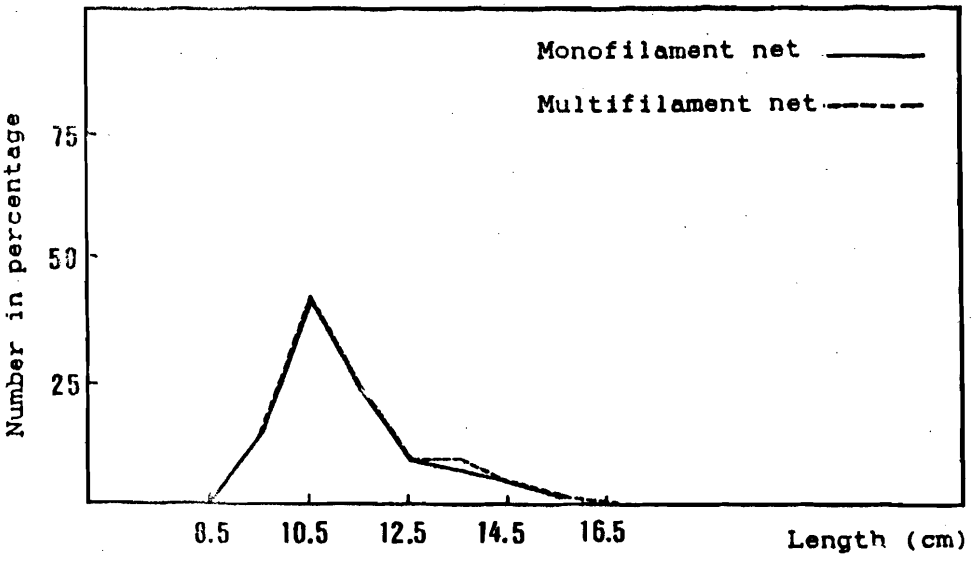


Fig. (4)

Size composition of T. zillii caught by group (A) from Lake Edku.

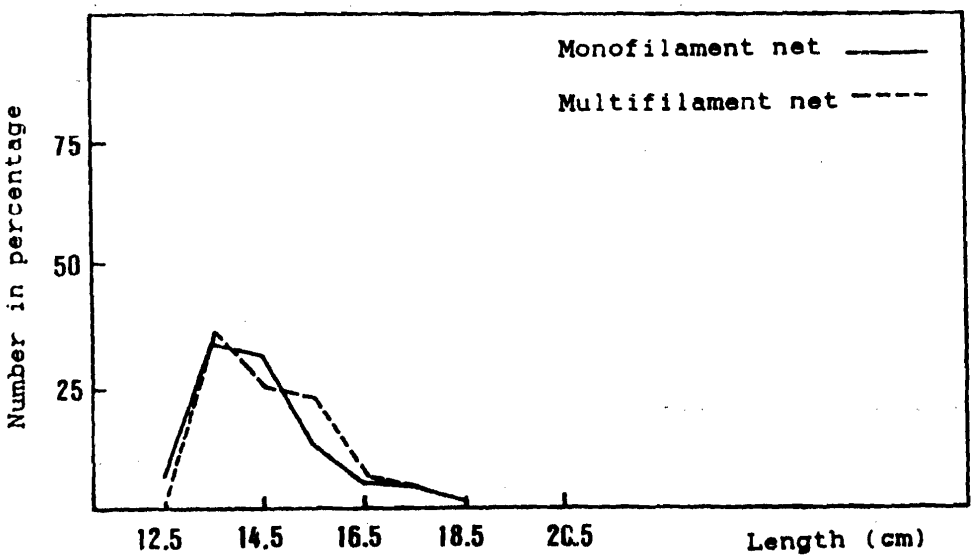


Fig. (5)

Size composition of O. aureus caught by group (B)
from Lake Edku.

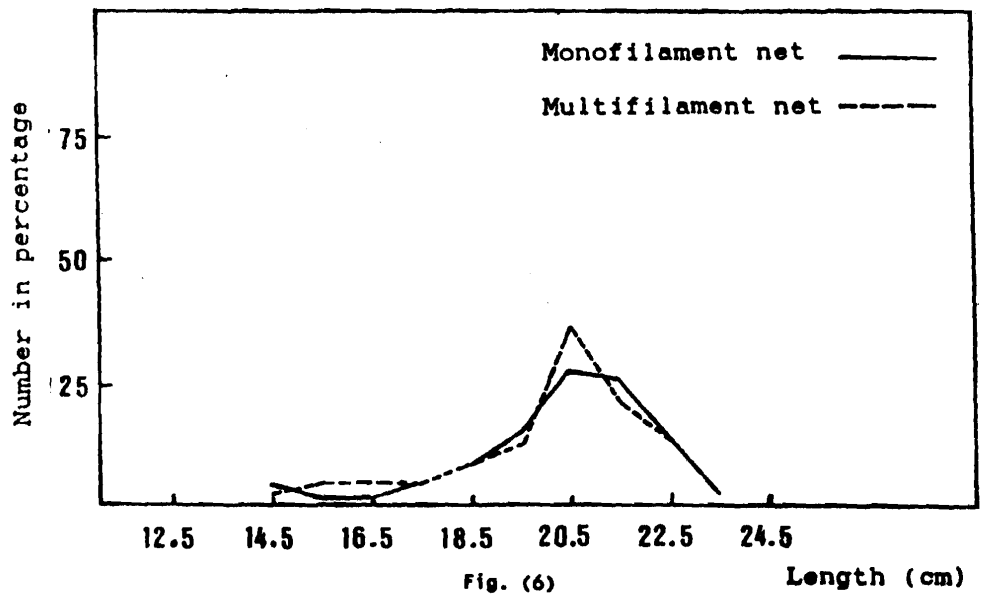


Fig. (6)

Size composition of Morone labrax caught by group (B)
from Lake Edku.

5. Less adherence of dirt e.g. natural particles, sea weeds as well as easier cleaning.

On the otherhand, the following disadvantages have to be taken in consideration :

1. Monofilament material is much stiffer and therefore more bulky which leads to storage problems on small crafts used in Lake Edku.

2. Damaged nets are somewhat more difficult to repair.

3. The monofilament netting tends to blow around more than the multifilament netting and this may slow down the fishing operation.

Conclusions and Recommendation :

(1) Analysing the results and general observations showing merits and demerits of monofilament for tramel netting in the Northern Delta Lakes in general and specially Lake Edku, it can be concluded that the introduction of such material would increase the catch. This may increase the turnover and hence increase individual fishermen's income. Further replacement of multifilament nets by monofilaments is therefore strongly recommended inspite of their less important disadvantages. Such process must be encouraged by the fisheries authorities in Egypt.

(2) Comparing the species and size compositions of fish caught by mono-and multifilament nets in Lake Edku indicate that there is no significant difference in either the species or size compositions of both nets. This may lead to the conclusion that replacement of multifilament nets by monofilament ones would not affect the species or size composition of the various fish population in lake Edku.

(3) Comparing the fishing powers of mono-and multifilament trammel nets in Lake Edku, it can be concluded that the problem of overfishing is not expected when monofilament trammel net becomes common as an artisanal fishing method in the lake. Further management regulations are not therefore necessary in this concern.

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