

CATCH EFFORT ANALYSIS OF EGYPTIAN MARINE WATERS

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ABSTRACT

This paper is devoted to Egyptian marine fisheries. Time-Series analysis has been adapted. Trend approximation has been given by using mathematical equations of straight line, as well as curvilinear of higher orders.

Results of the study has revealed similarities in Mediterranean and Red Sea Egyptian fisheries with respect to trends of its catches for the period of study (1970-1988). Only periodic decrease of the catch in 1975 and 1985 was less pronounced in the Red Sea compared to the Mediterranean. The trends of CPUE has been found quite different and in favor of Red Sea fisheries.

It was found that the fishing effort is 37 % higher in the Red Sea than in the Mediterranean, while the catch per fisherman is 286 % higher, and the catch per unit of area is 344 % higher. The productivity of the Mediterranean has been found in the study 2.5 times lower than of the Red Sea.

INTRODUCTION

Marine fishery of Egypt embraces two seas: the Mediterranean and Red Sea.

The Egyptian Mediterranean sea coast is about 1100 km in length. The fishing grounds along this coast can be divided into three distinct zones: Western, Central and Eastern, but most fishing operations are concentrated in the Central Zone, between Alexandria and Port-said (El-Zarka 1985). As regards the Red Sea and the Gulf of Suez, out of over 700000 km² only 25864 km² are considered fishing grounds (El-Zarka 1985). There are also a few other, smaller fishing grounds.

MATERIAL AND METHODS

Materials consisted of catch statistics for the period 1970-1988 obtained from the central Agency for Public Mobilization and Statistics in Egypt.

Time-Series analysis has been adopted in this study (Spiegel, 1980) and (Kildiszew, 1976). Trend approximation has been given by using mathematical equation of Straight line, as well as, Curvilinear of higher orders.

RESULTS AND DISCUSSION

Fish landings from marine fishery in Egypt amounted in 1960-1988 to 26.37 thousand tons/year on the average, in this 13.43 thousand tons (50.9 %) from the Red Sea, i.e. the share of the two seas was almost the same. Also average increments of the fish catch were similar, 897 tons annually or 6.68 % in relation to the average level in the Mediterranean, and 914 tons or 7.06 % in relation to the average level in the Red Sea. In the five recent years (1984-1988) average annual catch amounted to 20.18 thousand tons in the Mediterranean, and 20.06 thousand tons in the Red Sea.

These similarities are also noted when the trends of catches are analysed more in detail. Approximation of the fish catches with a 4-degree curve (quadratic equation) yielded almost the same trends for the two seas. Only periodic decrease of the catch in 1975 and 1985 was less pronounced in the Red Sea compared to the Mediterranean (Fig. 1 and 2).

It is most interesting that the catch trends are almost similar in the two seas, while trends of the fishing effort are quite different. The fishing effort has been expressed as the number of fishermen fishing each year in the two seas (Fig. 3 and 4).

The differences refer to the average number of fishermen in the two seas as well as the average increments of this number (approximated with a straight line and the level of these two parameters in the five recent year (Tab. 1).

Taken into account that number of fishermen differs considerably in the two seas, while the total catch is almost the same, we may immediately conclude that the Red Sea must be much more productive than the Mediterranean.

Long-term trends of the number of fishermen in the two seas are presented in Figs. 3 and 4. In very general terms they conform to the trends of catches, although catch decrease in the Mediterranean in 1985 was not reflected in a respective decrease of the fishing effort (Fig. 1 and 3).

Trends of the most important index, i.e. of the catch per unit of effort (catch per fisherman in this case) are presented in Fig. 5 and 6, and its general characteristics in Tab. 2.

It is immediately noticeable from Table 2 that the two seas differ considerably. The same can be concluded from the trends presented in Fig. 5 and 6. In the Mediterranean Sea trend of the catch per fisherman was best approximated by a 4th-degree curve ($r = 0.824$, $p < 0.001$, Fig. 5), expressed by the equation:

$$Y = 1.0687 - 0.362 x + 0.0804 x^2 - 0.0065 x^3 + 0.00017 x^4$$

where: Y - Catch per fisherman,
X - Consecutive years (1, 2, 3....etc).

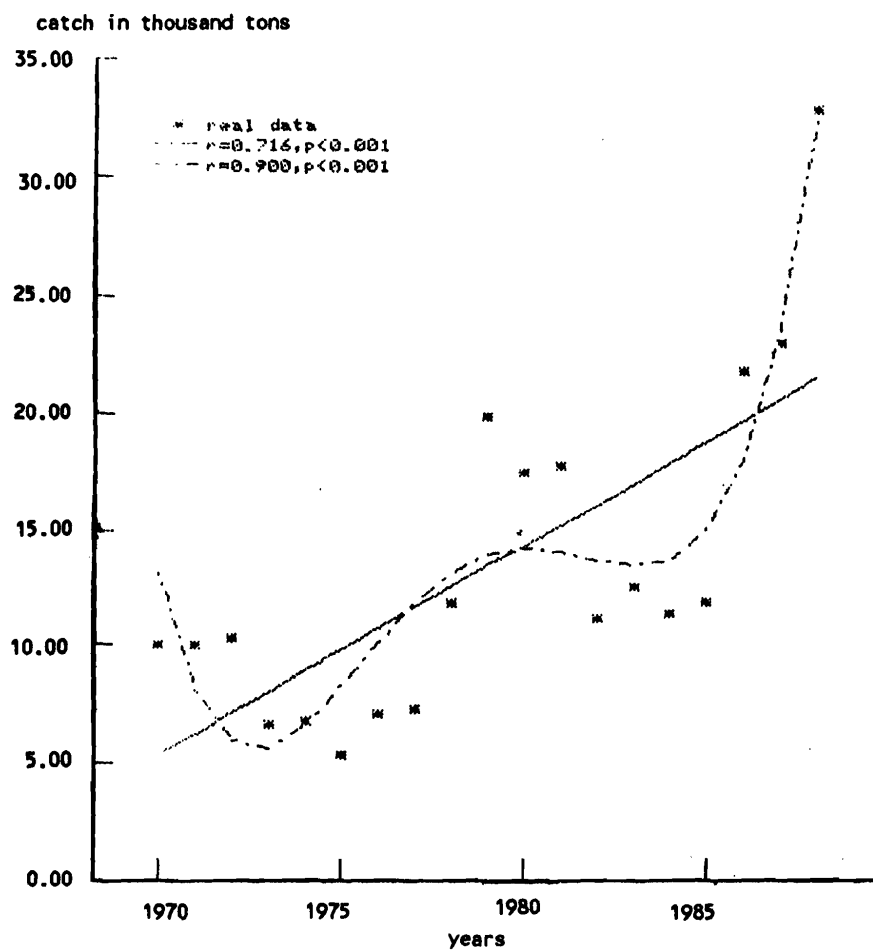


Fig. 1
 Fisheries in Mediterranean Sea
 Trends of catches

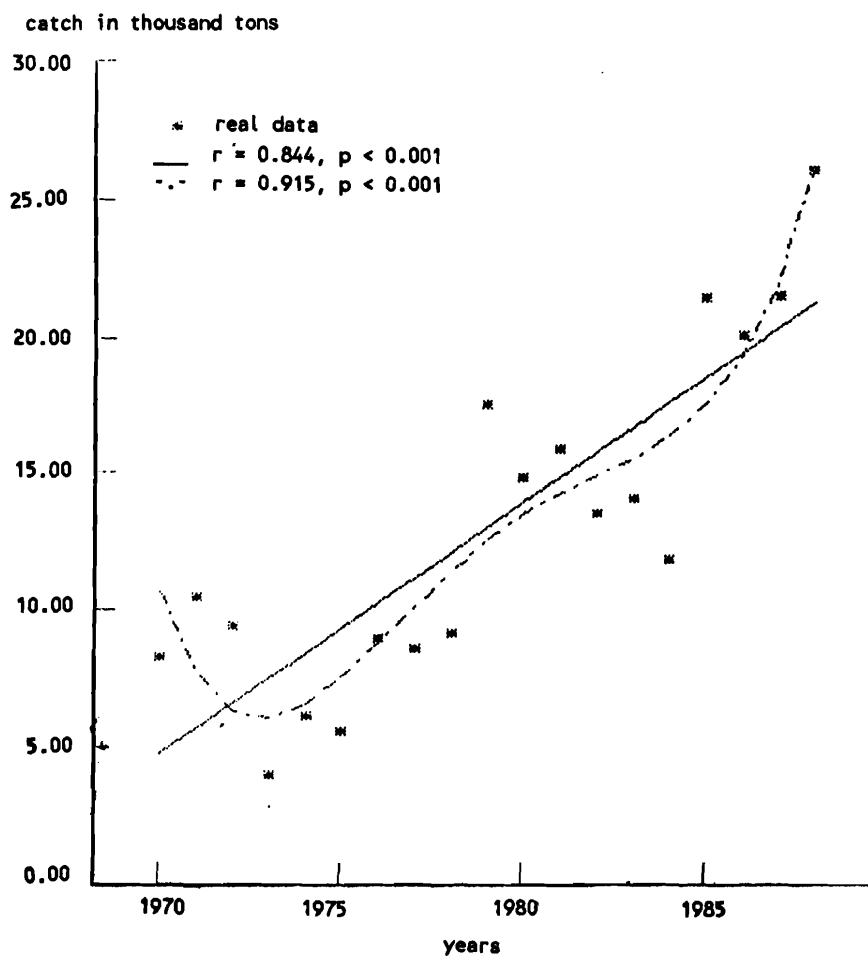


Fig. 2
 Fisheries in Red Sea
 Trends of catches

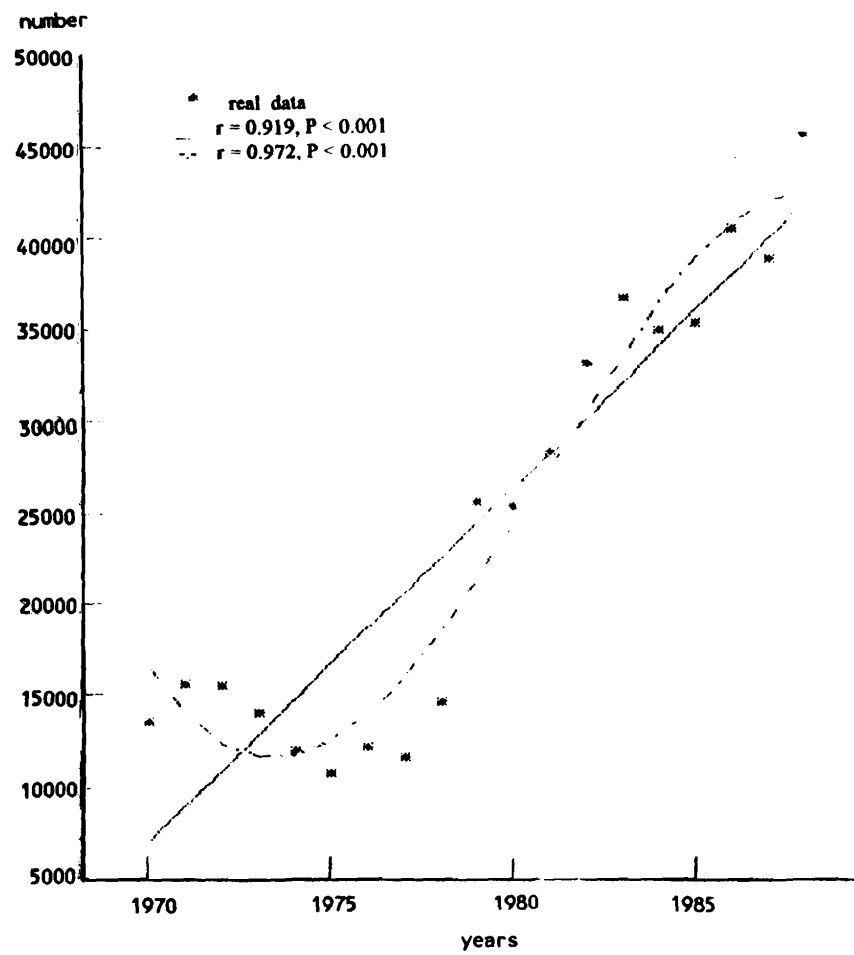


Fig. 3
 Mediterranean Sea
 Number of fishermen

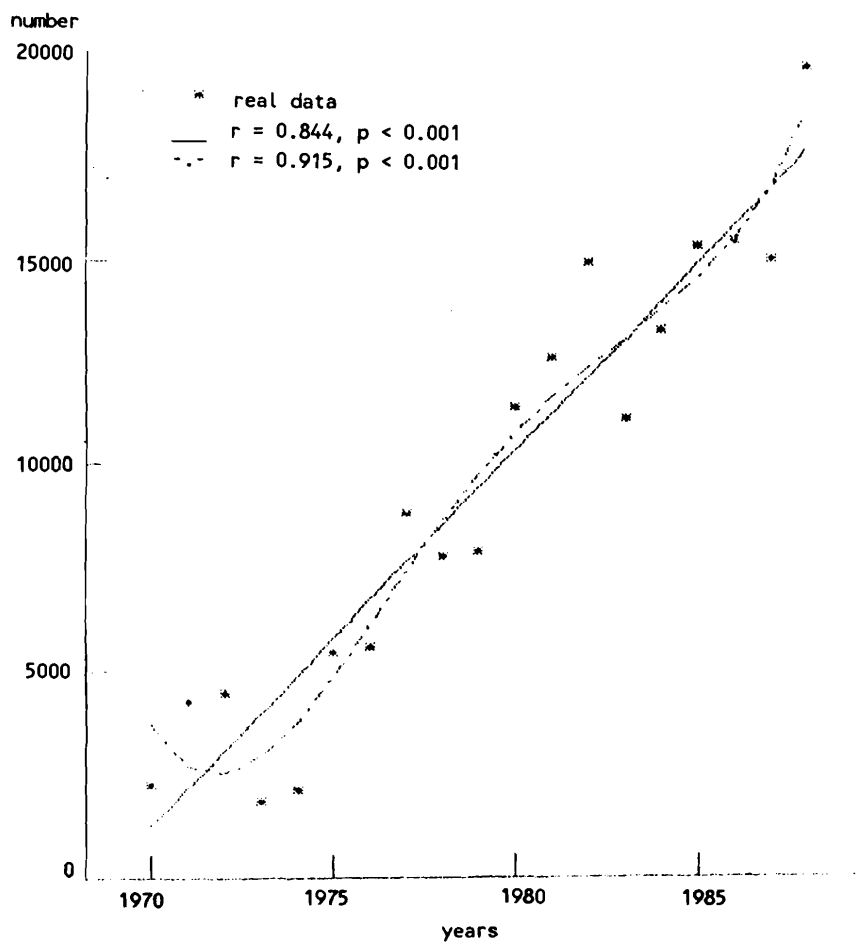


Fig. 4
Red Sea
Number of fishermen

Table 1.
 Characteristics of the fishing effort (number of fishermen)
 in the Mediterranean and the Red Sea.

C a t c h p e r f i s h e r m a n						
1970-1988			1970-1988			
	average Kg	annual incre- ment		average Kg	annual incre- ment	
		absolute	%		absolute	%
Mediterranean						
Sea:	575	n.s.	n.s.	507	75	15.7
Red Sea:	1644	86	-5.2	1269	18	1.4

n.s. - not significant statistically

Table 2.
 Characteristics of the catch per unit of effort
 in the Mediterranean and the Red Sea.

N u m b e r o f f i s h e r m e n						
1970-1988			1970-1988			
	average	annual incre- ment		average	annual incre- ment	
		absolute	%		absolute	%
Mediterranean						
Sea:	24308	1910	7.9	38694	1714	4.7
Red Sea:	9397	903	9.6	15656	1068	7.1

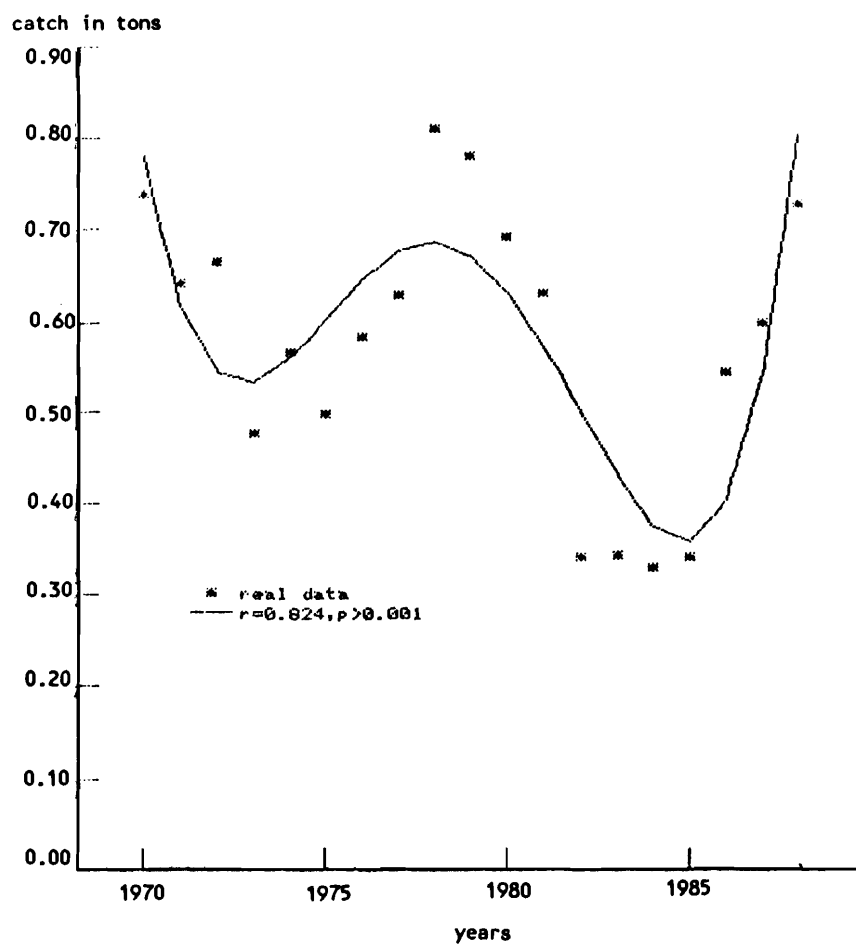


Fig. 5
Mediterranean Sea
Catch per fisherman

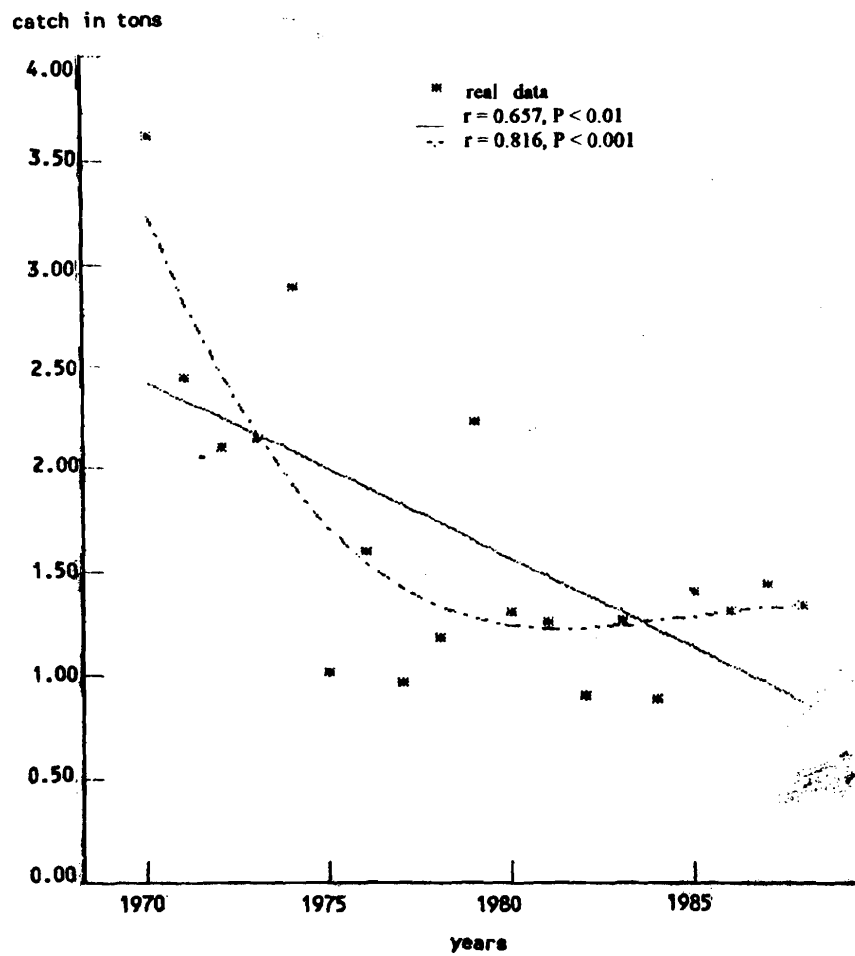


Fig. 6
 Red Sea
 Catch per fishermen

On the other hand, in the Red Sea the best approximation was obtained with a 3rd-degree curve ($r = 0.816$, $p < 0.001$, Fig. 6), expressed by the equation.

$$Y = 3.7189 - 0.517 x + 0.0345 x^2 - 0.00073 x^3$$

Average catch per fisherman in the Mediterranean Sea in 1970-1988 was exceptionally low (575 kg/year), almost 3 times lower than in the Red Sea (1644 kg/year). Also it did not show clear trend (Fig. 5) contrary to the Red Sea, in which catch per fisherman showed a generally decreasing trend, but remained at a more or less stable level in the recent years (Fig. 6).

Usually, in case of sea fishery, no attention is paid to area. However, in some cases it is useful to take this parameter into consideration. According to El-Zarka (1985) and Fattouh (1989), the area of marine fishing grounds amounted to 1437 thousand ha in the Mediterranean, and to 404.8 thousand ha in the Red Sea.

If we express the fishing effort in terms of the number of fishermen per 1000 ha of the fishing grounds, it appears that the average annual fishing effort amounted to 16.92 fishermen/1000 ha in the Mediterranean, and to 23.21 fishermen/1000 ha in the Red Sea. Hence, we can make a following comparison:

	Number of fishermen per 1000 ha	Catch per fisherman in kg	Catch per 1 ha in kg
Mediterranean Sea	16.92	575	9.3
Red Sea	23.21	1644	32.0

This comparison shows that the fishing effort is 37 % higher in the Red Sea than in the Mediterranean, while the catch per fisherman is 286 % higher, and the catch per unit of area is 344 % higher.

1 ha = 2.3 Feddan.

Simplifying the problem, i.e. assuming that the relations in question are of a linear character, productivity of the two seas can be estimated. And thus, fish catches from the Red Sea are:

- About 3 times higher than in the Mediterranean if catch per fisherman is taken into account ($1644 / 575 = 2.9$),
- About 2.5 times higher than in the Mediterranean if catch per unit of area is taken into consideration. Calculations in this case are as follows:

In the Red Sea about 32 kg/ha are caught with the fishing effort of 23.21 fishermen/1000 ha. If the fishery productivity of the Mediterranean was the same as of the Red

Sea, the fishing effort of 16.92 fishermen/1000 ha should yield 23.33 kg/ha [(32.0 * 16.92) 23.21 = 23.33]. In reality, however, catch in the Mediterranean amounts to only 9.3 kg/ha. Hence, productivity of the latter is 2.5 times lower than of the Red Sea (23.33 9.3 = 2.5).

The two estimates yield very similar results. Hence, it may be assumed that they are true, and that the Red Sea is more productive than the Mediterranean, or else quality of its environment is better. Notwithstanding this, trend of the catch per fisherman in the Red Sea (Fig. 6), and especially its character in the recent years (since about 1980) shows that the fishing effort (number of fishermen) in this sea should be about 15000 and should not exceed 20000 fishermen. This conclusion results from the fact that since 1980 catch per fisherman did not increase (Fig. 6) although the fishing effort continued to increase (Fig. 4). Most probably, the fishing effort of about 15000 fishermen (average value for the period 1984-1988, Tab. 1) represents an optimum corresponding to the highest sustainable yield (Royce 1972). Contrary to this, in the Mediterranean Sea the fishing effort (number of fishermen) could well be increased. Average catch per fisherman in this sea is very low, and comparison of the two trends (i.e. of the fishing effort and of the catch per fisherman, Figs. 3 and 5) reveals that increasing fishing effort does not limit catch per fisherman, especially in the recent years, i.e. that the highest sustainable yield has not been reached as yet.

On the other hand, it is worth considering whether increase of the fishing effort (number of fishermen) in the Mediterranean Sea is economically feasible. Catch per fisherman in this sea is unproportionally low (575 kg/year on the average).

REFERENCES

- El-Zarka, S.E. 1985. A review of the Organization of agricultural and fisheries research, technology and development in Egypt. Annex VI, Research in fisheries. F. A. O., Rome, pp. 65.
- Kildiszew, g., Frenkel A, 1976. Analiza szeregów czasowych prognozownie. PWE, Warszawa, pp. 127.
- Royce W.F., 1972. Introduction to fishery sciences. Academic press, New York and London.
- Sherif Fattouh, 1989. Analysis of the Fishery production in Lake Edku (Egypt), and the prospects for its Development PH.D Thesis. A. R. T. Olsztyn, Poland.
- Spiegel, M.R. 1980. Theory and Problems of Probability and Statistics. Schaum's Outline Series, Mc Grow-Hill Book Company, pp. 372.
- The Central Agency for Public Mobilization and Statistics, (CAPMAS): 1970-1988. Year-Book of Fishery Statistics, Cairo, Egypt.