BIO-ECONOMIC STUDY OF THE EGYPTIAN SPONGE FISHERIES

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ABSTRACT

The Egyptian commercial sponges are considered the best all over the world because of the suitable environmental factors along the west coast of Alexandria to Libia borders.

The Egyptian commercial sponge catch supplies Egyptian national income with average of about 0.274 Million Egyptian Pound/year.

A sharp decrease in the annual catch in sponge fisheries was recognized in 1987.

A total of about 5663 Kilograms were obtained in 1986, droped suddenly to about 1087 Kilograms in 1987 and reached about 610 Kilograms only in 1992. (all the catch goes into international trade).

The purpose of this paper is to evaluate the present status of Egyptian Mediterranean commercial sponge beds Biologically and Economically to give recommendations in order to maintain these beds. Descriptive economical analysis and quantitative economical analysis has been adopted in the study according to the data published by the central Agency of Public Mobilization and Statistics (CAPMAS) in Egypt for the period of study (1980-1995) and forecasting the sponge Production to the year 2005, in addition to the studies related to the research's subject.

The observations of the Divers all over the area investigated from west of Alexandria to El-Salloum and the symptoms of the infection were discussed. The study has revealed some recommendations for developing sponge Fisheries in Egypt.

INTRODUCTION

Egyptian Mediterranean coast is considered an important water resource for Producing sponge of High quality. The Egyptain commercial sponges are considered the best all over the world for the good environment along the western coast from Agami to Lybian borders. The Egyptian national income were supplied with about L.E. 0.274 million annually From sponge export during the period (1980-1995). Sponge export trade in Egypt is a source of foreign exchange as well, it contributed in the period of study about L.E: 0.245 million annually in hand currency.

Three different sponge species of high world demand are produced in the front of the northern – west coast of Egypt namely; Turkey cup, Honey comb. and Zimocca.

A sharp decrease in the annual catch of the Egyptian commercial sponge fisheries was recognized in 1987. A total of about 5663 Kilogram were obtained in 1986, dropped suddenly to about 1087 Kilogram in 1987 (under the same fishing conditions, the same numbers of fishing vessels and divers) and reached about 615 Kilogram only in 1992. Accordingly the main purpose of the study is to evaluate the present status of Egyptian Mediterranean commercial sponge fisheries from the bio-economic point of view, in order to maintain the sponge beds and to give recommendations to develop its fisheries.

Aim of study : The study aims to;
(1) Identify the principal features of Egyptian sponge.
(2) Evolution the Egyptian sponge capacity during the period of study (1980-1995) , and forecasting magnitude in the near future (2005).
(3) The biological observations for the status of Egyptian sponge beds after 1987 (the year of drop) till 1992(the year of recovery).
(4) Development Means for Egyptian sponge fisheries.

MATERIALS AND METHODS

The materials consisted of official data published by the Central Agency of public Mobilization and Statistics (CAPMAS) in Egypt for the period of study (1980-1995) in addition to studies related to research's Subject. Descriptive economical analysis has been adopted to identify the principal Features for Egyptian sponge, the biological observations for the status of Egyptian sponge Fisheries along the west coast of the Mediterranean water area between Atsha 9 K. M. west of Alexandria till El Salloum yearly (1986-1989) using Fernez apparatus during the sponge Fishing Seasons (May – November). In addition to the observations and Reports of the Divers of the Fishing Company during the spong Fishing Season In 1987 were summerized . Also, in addition to the observations gathered by El-Beshbeeshy, 1992 about sponge recruits .

Quantitative economical Analysis has been adopted in the study. Secular trend of the Egyptian Production sponge capacity has been estimated for the period 1980-1995.

Parabolic curve statistical Model has been estimated. Multiple Regression Models were Adopted. using Linear, double log, and Semi log models.
Statistical and arithmetical methods using the Parabolic curve for estimating annual growth rate as shown in the following equation :

$$Y = A \pm B X \pm C X^2$$

Where A, B, C = Equation Parameters, and X = time
The forecast Model was smoothed to estimate the Sponge Production in the future. Other statistical indices and Parameters have also been used, The statistical tests for goodness of fitness were expressed by T-test, F-test. Adjusted correlation determination (R^{-2}) for Parabolic curve. Detailed explanation of the above presented statistical and arithmetical Methods can be found in (Anderson,1971) and (Snedecor 1967). Data processing has been made using an original computer Programes (TSP).

RESULTS AND DISCUSSION

1- The principal Features of Egyptian sponge:

The Egyptian commercial sponges are considered the best all over the world. Egyptian Mediterranean coast is an important water resource for producing sponge of high quality in front of the north –west cost from Agami to lybian borders. Sponge is a marine animal lives in coloinies at depths between 30-50m (Aleem,1964). Sponge has many forms or shapes, some of it are slim, flat and roundy shape (honey comb) others has cup shape (Turkey cup), and others are irregular (Zimocca). The sponge vessel has a number of 6 crew in addition to 4-6 divers .

The commercial Egyptian Mediterranean sponge comprises 3 types (fall in 5 species) namely, turkey cup which comprises three species: *Spongia officinalis* L.ssp. adriatica Schmidt, 1862- *Spongia agarcinia* (Pallas, 1766)- *Spongia officinalis* L. ssp. mollissima Schmidt, 1862; Honey comb which comprises one species, *Hippospongia communis* (Lamark,1813)and zimocca which also comprises one species, *Spongia zimocca* (Schmidt, 1862). The commercial sponges are used mainly for the bath purposes specially the Honey comb type, they were used as a medication for numerous diseases, Turkey cup type used in jewels industries & for polishing precious leather. Nowadays the commercial sponges have a great value in make-up industries, internal coating of space ships and explosives industries.(Aleem,1961).

The sponge production season is 6 months (180 day). (A wad & Ebid, 1988) showed that sponge production start from May to October every year. The production reached its maximum in September. The sponge production is high at Summer and low at spring this may due to the high water temperature at Summer which lead to improving the biological and economical factors which related to sponge fisheries.

2- Production Capacity of Sponge Fisheries and Export Trade:

1- As it is seen from Table (1) and illustrated by fig.(1), production of sponge fisheries oscillated from year to year during the period of investigation. (1980-1995).It reached a maximum of about5670 Kg in 1985 and a minimum of about 184kg in 1994 with decreasing rate of about 96%. The annual average was about 2728 kg. The annual average of sponge income was about 274 thousand pounds during the period of study (1980-

1995), foreign trade of sponge as illustrated in Table (1) reached a maximum of about 7529 Kg in 1984, and a minimum of about 184 Kg in 1994. Generally The sponge export represents about 100% of sponge production. The annual export sponge during the period of study (1980-1995) was about 2.8 Ton, this amount was higher than annual production (2.7 Ton) due to the export of a part of sponge strategic stock of former years

2-Three endemic sponge species in Egyptian Med. Fisheries .The species can be arranged.as to production capacity in decreasing order as follows Honey comb, Turkey cup and zimocca.

Honey comb come first with an average contribution of about 1236kg (45.3%) Annually. Followed by Turkey cup with average contribution of about 885kg (32.4%) annually. Zimocca hold the third place with average contribution of about 607 kg (22.3%) annually.

3-sponge production of Egyptian Med. fisheries approximated with parabolic curve was characterized by decreasing trend with decreasing increments. A minimum took place in 1998 and next shows an increasing trend with increasing increments.
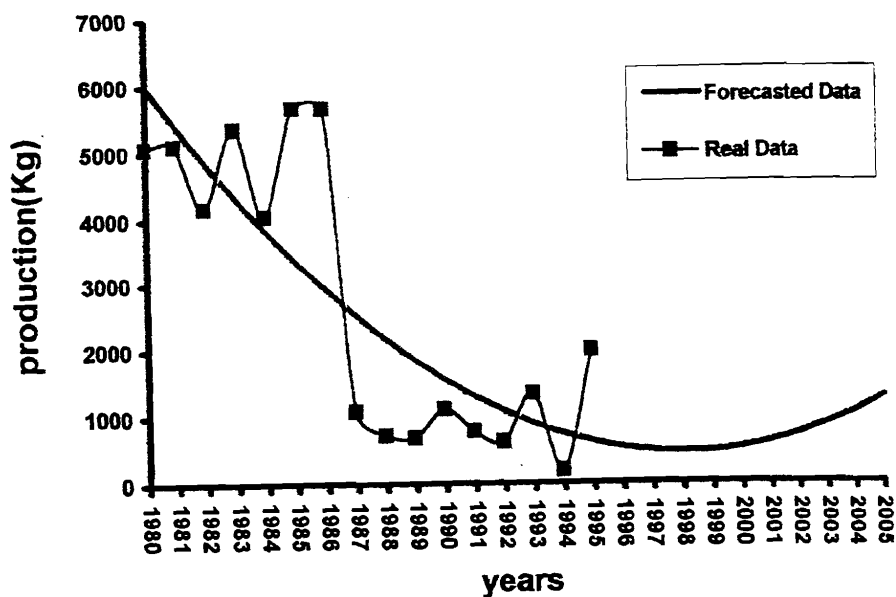
Fig. (1): Secular trend of Egyptian sponge Production during the period (1980-2005)

Table (1): Economic Aspects of Sponge Fisheries In A.R.E during the Period 1980-1995.

Year	Species (Kg)			Total		Number of vessels	Average catch Per vessel	Exports	
	Turky Cup	Hany comb	Zimoca	Kg	Value (L.E)			Kg	Value (L.E)
1980	1277	2415	1371	5063	134863	7	723.3	6199	158170
1981	2492	1996	613	5101	198021	7	728.7	4846	200762
1982	1019	2469	686	4174	162035	8	521.8	4738	177202
1983	2633	2037	693	5363	288957	8	670.7	4638	198153
1984	1034	2189	823	4046	351710	7	578.0	7529	263524
1985	2017	2689	964	5670	357860	10	567.0	3616	145410
1986	2016	2678	969	5663	254432	9	629.2	5361	396152
1987*	284	703	100	1087	14566	9	120.8	3007	302477
1988	222	387	122	731	21999	5	146.2	991	31382
1989	54	412	226	692	269430	5	138.4	666	258870
1990	291	257	574	1122	364738	6	187.0	400	155600
1991	35	450	302	787	318604	5	157.4	-**	-
1992	124	334	157	615	306264	5	123.0	605	300389
1993	197	186	962	1345	632415	3	448.3	1333	626643
1994	137	23	24	184	80004	3	61.3	184	80004
1995	323	547	1126	1996	626614	3	665.3	1996	626614
Average	884.7	1235.8	607.0	2727.5	273907	6	404.1	2772.8	245084.5
%	32.4	45.3	22.3	100.0	-	-	-	-	-

*Decreasing According to Parastica Fungi.
**No Exported Amount due to the Explanation of the catch in order to Identify the Pathologenic case.
Source : Collected and Computed from :
    The Central Agency for public Mobilization and statistics (CAPMAS).
    Year-Book of Fishery statistics (1980-1995). Cairo, Egypt. 1997.

Table (2), Fig. (1), According to the Following equation:

$$Y = 6645.95 - 649.71\ X + 17.059\ X^2$$
$$(5.728) \qquad (-2.065) \quad (0.948)$$

$$R^{-2} = 0.6021 \qquad\qquad F = 12.350$$
$$Sig = 0.001$$

Where (Y) Estimated Production (Kg) ,
(X) Successive years (Time)

Marginal increment decreased From -22.6% in 1980 To 0.0% in 1998 in relation to the mean catch, with this in mind , it can be predicted that sponge production will continue to increase after 1998 due to the fact that it was characterized by a relatively high variability (C.V.%= 80.3) Table (2). Under the prevailing fishing conditians sponge Production is estimated to reach about 1285 Kg. by the year 2005.

The sponge Production of Egyptian Med. Fisheries was found in this study to be determined by the effect of each of the following economic factors.

Ex-vessel price of sponge (X_1) , Number of vessels (X_2). The Following statistical Model (Power model) was selected :

$$Log\ y = -Log\ 1.6566 + 0.4560 Log\ X_1 + 2.039\ X\ Log\ X_2$$
$$(2.765) \qquad\qquad (4.623)$$

$$R^{-2} = 0.60 \qquad F = 12.321 \qquad Sig. \simeq 0.001$$

Where (Y) = sponge Production (Kg) , $X_1 =$
Ex-vessel price (L.E/Ton) , X_2 (Number of vessels)

Table (2): Annual Increment of sponge fisheries In A.R.E. and it's Forecasting during the period 1980-2005

Year	Production (Kg)	Estimated values	Annual Increment ($\pm$ %)
1980	5063	6013.3	-22.6
1981	5101	5414.4	-21.3
1982	4174	4850.4	-20.1
1983	5363	4320.1	-18.8
1984	4046	3823.9	-17.6
1985	5670	3361.8	-16.3
1986	5663	2933.9	-15.1
1987	1087	2540.0	-13.8
1988	731	2180.3	-12.6
1989	692	1854.8	-11.3
1990	1122	1563.3	-10.1
1991	787	1305.9	-8.8
1992	615	1086.6	-7.6
1993	1345	893.6	-6.3
1994	184	738.6	-5.1
1995	1996	617.7	-3.8
Average	**2727.5**	-	-
C.V %	**80.3**		
1996	-	530.9	-2.6
1997	-	478.3	-1.3
1998	-	459.8	0.0
1999	-	475.4	+1.2
2000	-	525.1	+2.4
2001	-	608.9	+3.4
2002	-	726.8	+4.9
2003	-	878.9	+6.2
2004	-	1065.1	+7.5
2005	-	1285.4	+8.7

Source : Collected and Computed from :
        The Central Agency for Public Mobilization and Statistics
(CAPMAS). Year-Book of Fishery Statistics (1980-1995). Cairo, Egypt. 1997.

From the above equation, it can be seen that:

(1) Increasing Ex-vessel price of Ton of Sponge (X_1) by 10% is estimated to increase sponge production by about 4.6%

(2) Increasing number of vessels (X_2) by 10% is estimated to increase the sponge production by about 20.4%

(3) About 60% of variability in sponge production is closely associated with the above two factors. but the number of vessels was the most effective factor in sponge production.

(4) The equation was significant at probability level (P= 0.001).

2- The biological observations For   the status of Egyptian sponge fisheries from 1980 – 1989 :

The well trained   Divers of the fishing company in Alexandria have surveyed the area between Atsha 9 K. M. west of Alexandria till El Salloum (1986-1989) using Fernez apparatus during the sponge Fishing seasons (May – November).

The observations of the Divers of the Fishing Company during the sponge fishing season in 1987 can be summarized as follows :

- Presence of white film covering the sponge body & even all the sponge-bed .
- Deterioration of sponge flesh.
- Presence of bad smell .
- Absence of new recruits.
- Absence of environmental plants (Yaghro).
- The Samples within the Zone from Sidi Abdel Rahman (70 Miles) to Marsa Matrouh (100 Miles) showed the infection of about 50% of the sponge beds.
- From Marsa Matrouh to Sidi Barrani showed the infection in smaller scale (about 25%).
- The high infection was recognized in the Region between Atsha & Sidi Abdel Rahman(about 100%).
- The new recruits from the sponge catch of 1992 showed very little sizes (about 1/10 the normal commercial size)

Authors have also been informed by the Fishing Company & the Greek Sponge-team   in Greece, that this disturbance or infection has first appeared in

Spain in 1984, then it moves eastwards to Italy, Greece & Cyprus and southwards to Tunis, till it reached Egypt in 1987. It is interesting to say that the sponge beds in Lybia was not infected.

In 1987 a contact was done with the Greek side , in order to bring experts to take healthy & diseased sponge for analysis in Greece. (Soleiman, 1987) in his unpublished Report has tested samples of diseased sponges. by chemical, biochemical & bacteriological Analysis, he found that all these Parameters were insignificant ,i.e they have no any influence on these disturbance. by his examination for fungi-disease, he attributed the sharp decrease in the sponge production in 1987 to a special fungus "Saprolengia parasitica" , which belongs to the Division Mastigomycota and stated , these fungus causes the disease so-called "water mold" .

The Greek Delegation were not convinced that the cause due to that fungus, furthermore they commented, that these fungus never live in sea water. However, the great majority of marine fungi seem to be Ascomycetes, particularly Pyrenomycetes. Most of these have been found on wood submerged in the sea but a few are parasites of seaweeds (Ingold, 1961). One of the most common of these is Mycosphaerella ascophylli which is an endophyte in the abundant fucoid Ascophyllum nodosum (Ingold, 1961).

As it mentioned above, it is not only the commercial sponge beds which were affected, but the environmental plants around the sponge beds also were vanished ,i.e the posidonia, Zostera & Caulerpa. These environmental plants exists where-ever the commercial sponge beds are found. These environmental plants are very important for the growth of commercial sponges due to the abundance of nutritive elements in the water around these plants (Paget,1922).

It is now clear, that we are dealing with a general Phenomenon, which not only exist in Egypt, but also in the several Mediterranean countries, for that reason it may cause disturbance in the ecosystem, In the same time, it seem from the observations of the Divers during 1992 and from authors observations to the new recruits in the same year, that these disturbance or infection is vanished in 1992 from Egyptian sponge fisheries . based upon the very little size of the new recruits which were investigated in 1992, it is about 1/10 the normal commercial size.

4- Development Means for Egyptian Sponge Fisheries :

To develop the Egyptian sponge Fisheries, the study has revealed the following recommendations :

1- To conserve and keep sponge fisheries from sidi Abdel Rahman to El-salloum and the region from Atsha to sidi Abdel Rahman in order to restore the normal activity of sponge beds.

2- To carry out a general survey on the whole area of sponge fisheries to be sure that the fisheries are now totally intact.

3- In the same time to coorperate with all the Arabic countries, which have sponge fisheries, like Lybia, Tunis, Algeria & Syria and with the European countries, which also lies within the Mediterranean sea (Greece, Cyprus, Spain & Italy) in order to stand about what they have done to overcome this Problem, and how to prevent that danger in the future.

4- It is also necessary, that the Arabic countries within the Red sea (Egypt, Sudan, Saudi Arabia & Yemen) cooperate togther in the field of sponge fisheries. It is true that the quality of the commercial sponges in the Red Sea are not high like those in the Mediterranean, but by this way a new underexploited arabic aquatic resource can be utilized.

5- Encouraging the private sector to enter the field of sponge fishing and setting up co-operatives for the workers in this sector .

6- Working at cultivating sponge as some developed countries like Japan where the suitable environmcntal condtions for cultivating is available in Egyptian off-shore marine waters

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