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PROSPECTS FOR FISHERY STATISTICS FROM LAKE MANZALAH (EGYPT)

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ABSTRACT

Since Lake Manzalah production was exposed to the same disturbance and changeable that takes place in all Egyptian aquatic habitats, the present review reflect a comparison of fishery statistics of the General Authority of Fish Resources Development (GAFRD) with the real state of Lake Manzalah which undergoing continuous and pronounced changes in their physical,chemical and biological characters through the period from 1962 to 2006. Fishery statistics of lake Manzalah during the period from 1962 – 2006 were obtained from two sources, GAFRD and National Institute of Oceanography and Fisheries (NIOF). Also the qualitative and quantitative fish productions were recorded during the field trips to the major landing sites by asking fishermen. Fisheries statistics of GAFRD and NIOF were greatly different. According to the fisheries statistics of GAFRD, the total fish production of Lake Manzalah increased gradually through the last 44th years (from 1962 to 2006),although, during the last decade the area of Lake Manzalah has been reduced from 407x10^3 feddans in the early 1900 to 213 x10^3 in 1979 to 90 x10^3 feddans in 2009. The Lake has been gradually transformed from a brackish environment to eutrophic freshwater in response to increased freshwater inputs and nutrient loading associated with agricultural, reclamation and urban waste disposal .*Tilapia* constituted the major group (68.73 %) in the Lake catch throughout the last 44 th years, followed by mullet (8.11 %) and cat fish (7.77 %).It is worthwhile to mention that crustacean fisheries constitute 2.81 % of the total annual catch. In conclusion, it must be give more attention to our fisheries statistics for the clear differentiation among different statistic resources concerning the actual Lake area as well as the actual fish production as a whole and as a species .It is very necessary to know the actual state of the Lake, in order to search on the suitable methods for maintenance, recovery and development the rest part of the Lake.

Key words: Lake Manzalah, Fisheries statistics, General Authority of Fish Resources Development

INTRODUCTION

Lake Manzalah,the most important Lake of Egypt, either in the biodiversity and production. Due to particular position and hydrography of the Lake, it contributed about 50 % of the total annual fish catch of Egypt during the most recent years. Also, it produced the commercial and the most edible fish species. For example, the mullet fishery of the Lake gave 60-80% of the annual yield of mullets during 1962-1968 **[Bishai & Youssef (1977)]**.

Lake Manzala is the largest of the Egyptian Delta lakes. It is clear that a continuous reduction in Lake area, as a result of extensive agricultural reclamation activities on the southern and southwestern sides of the Lake, the expansion of hosha settlements on the islands have further reduced the open-water area, different rods, construction and establishment of different projects on land cutting from the Lake. Its area is now around 700 km^2 (about 165 $x10^3$ feddans) **[Ahmed *et al.*, (2009) and Ayache *et al.*, (2009)]** and includes a large number of islands that reduce the area of open water to less than 500 km^2.

Despite the importance of the Lake to the country's fisheries many detailed studies were carried out on hydrology, chemistry and fisheries of the Lake **[Paget (1922); Montasir (1937); El-Maghraby *et al.*, (1963); Wakeel & Wahby (1970a&b); Wahby (1972); Wahby *et al.*, (1972); Bishai & Youssef (1977); Bishara (1973); Youssef (1973); Wahby & Bishara (1977); Shaheen & Youssef (1978); Khalil & Salib (1986); El- Ghobashy (1990); Shalloof (1991); Khalil (1990); Shalloof & El-Bokhty (2006); Kraiem *et al.*, (2009) and Ramussen *et al.*, (2009)]**.

Most studies on the Lake recognized that, it represent a dynamic system that has been undergoing continuous and pronounced changes from a brackish environment **[Fouad (1926) and Bishai & Youssef (1977)]** to eutrophic freshwater **[Shaheen & Youssef (1978)]** in response to increases freshwater inputs and nutrient loading associated with agricultural and reclamation and urban waste disposal **[Khalil (1990)]**. In Lake Manzalah the ichthyofauna displays a more freshwater affinity with tilapia, the dominant group of species. Otherwise, overall fish production from the Lake is regulated by variations in fishing activities, local environments and seasonal conditions.A decrease in fish production was noted over recent years and this attributed to deteriorating ecological conditions. A variety of factors are implicated including sea communication problems, reduction of the fresh water supply and increase of pollution causing eutrophication. In addition, over fishing with a continuing increase of fishing effort units, contributes to fisheries decline **[Kraiem *et al.*, (2009)]**.

Lake Manzalah production was exposed to the same disturbance and changeable that takes place in all Egyptian aquatic habitats. The natural fishery resources in Egypt are contaminating and declining; there is a need to considerably increase seafood production through safe and high-quality fishery products to bridge the widening gap between demand and supply **[EL-Gawady (2002)]**.

The present investigation reflectS the contradictions in fisheries statistics of the GAFRD with the real state of Lake Manzalah through the period from 1962 to 2006, as revealed in all the previous studies. It is very necessary to know the actual state of the

Lake, in order to search on the suitable methods for maintenance, recovery and development the rest part of the Lake.

The source of data:

Fishery data of the Manzalah Lake during the period from 1962 – 2006 were obtained from two sources, the General Authority of Fish Resources Development (GAFRD) and National Institute of Oceanography and Fisheries(NIOF). Also the qualitative and quantitative fish productions were recorded during the field trips to the major landing sites by asking fishermen. Data on the lake area, phosphate, nitrate and salinity were collected from the previous studies.

The area of Lake Manzalah was declined from 407 $x10^3$ feddans at the beginning of 20^{th} century to about 100 $x10^3$ feddans at the beginning of 21^{th} century table (1). The Lake has been gradually transformed from a brackish environment to eutrophic freshwater **[Abdel-Baky & El- Serafy (1990)].**

Table (1): Morphological parameters of Lake Manzala during the period (1907 – 2009).

References		Lake area	Phosphate (mg/L)	Nitrate (mg/L)	Salinity (gm/L)
1907	Fouad , 1926	407000			
1924	Fouad , 1927				16.7
1933	Faouzi, 1935				24.0
1949	Wakeel and Wahby, 1970	350000			9.0
1962	Bishara, 1973	300000	0.047	0.328	8.3
1967	Youssef, 1973		0.052	0.366	7.4
1973	Shaheen and Youssef, 1978				4.1
1979	Maclaren Inc. , 1981	213000	0.129	0.627	2.9
1982	Dowidar & Abdel Moati, 1983		3.55	4.668	2.2
1985	Khalil, 1990		0.155	0.548	2.8
1988	El-Ghobashy, 1990		2.078	0.631	2.5
1997	Abdel-hamid *et al.*,1997	192000			
2004	Nafea,2005		6	8	
2005	Shakweer, 2005		3.065	1.810	
2004	Kraiem *et al.* , 2009	<120000			
2009	General Authority of Fish Resources Development	90000			

According to the fisheries statistics of GAFRD, the total fish production of Lake Manzalah increased gradually through the last 44 years (from 1962 to 2006). The more observed increase was observed at the most recent 20^{th} years. This increasing tendency is well expressed by a linear function of the type: $Y= 1252.6 X + 14201$,

where Y is the annual catch and X is the time in years. This relationship is positive and significant (r = 0.8299) - Fig. (1).

Concerning qualitative and quantitative composition of annual catches of Lake Manzalah, it can be inferred that there are a gradual increased in various fish groups. *Tilapia* constituted the major group (68.73 %) in the catches throughout the last 44 years, followed by mullet (8.11 %) and cat fish (7.77 %). The annual catch of fresh and marine carnivorous fishes represented a minor portion of the total catch (2.26 and 1.64% respectively). It is worthwhile to mention that crustacean fisheries constitute 2.81 % of the total annual catch Table (2).

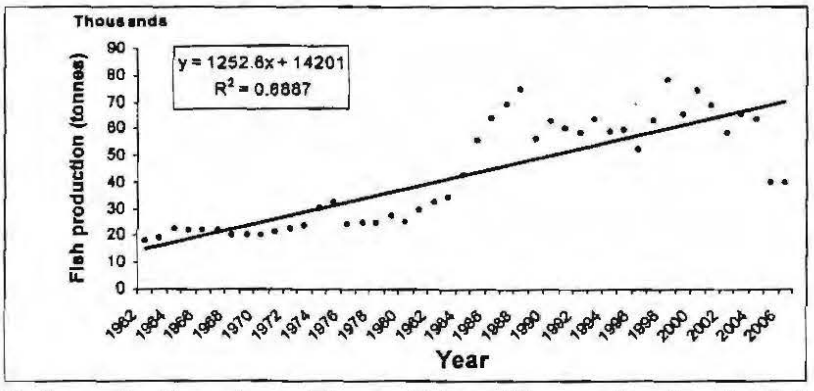

Fig. (1): Regression line and correlation coefficient of the annual total catch at Lake Manzalah (1962- 2006).

Table (2): Qualitative and quantitative composition of annual catches of different species from Lake Manzalah during the period 1962- 2006 according to GAFRD.

Species	Total production	%
Tilapia	1330266	68.73
Mullet	156950	8.11
Cat fish	150370	7.77
Other fresh	43749	2.26
Other marine	31781	1.64
Crustacean	54456	2.81
Eel	13298	0.69
Other type	154591	7.99
Total	1935461	100.00

In respect to the annual catch of the different fish groups, a great fluctuation was shown. The regression analysis of the annual catch Figs. (2, 3, 4, 5, 6, 7, 8 and 9) revealed a significant positive correlation for all fish groups.

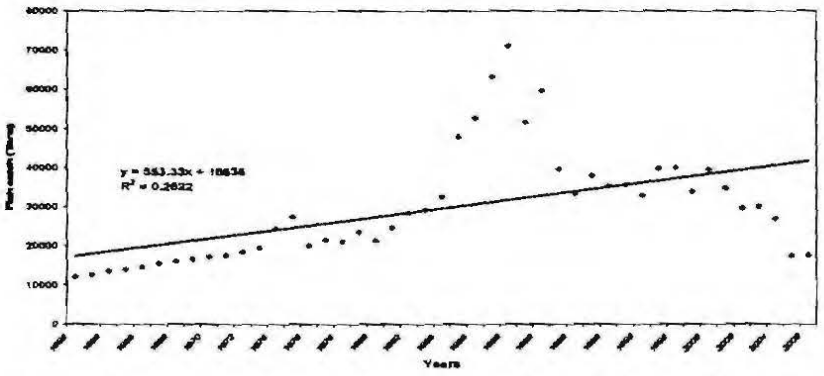

Fig. (2): Regression line and correlation coefficient of the annual total catch of *Tilapia* at Lake Manzalah (1962- 2006).

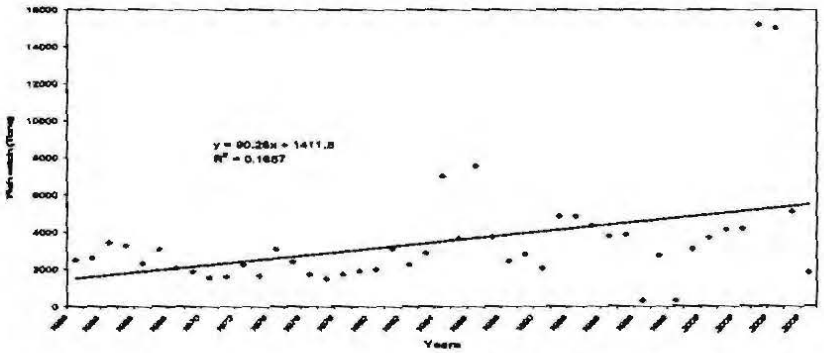

Fig. (3): Regression line and correlation coefficient of the annual total catch of mullet at Lake Manzalah (1962- 2006).

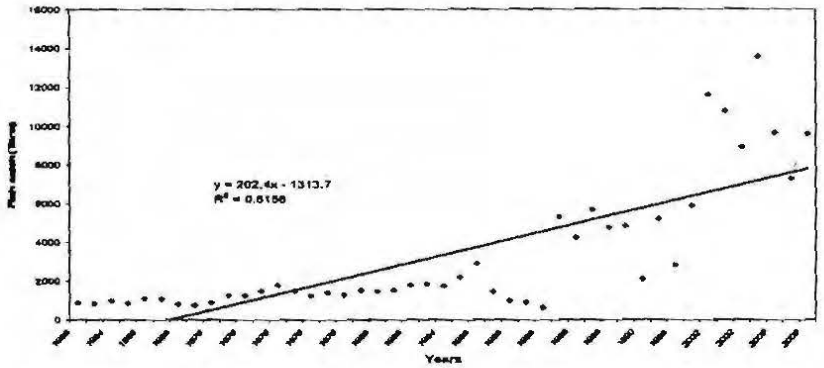

Fig. (4): Regression line and correlation coefficient of the annual total catch of cat fish at Lake Manzalah (1962- 2006).

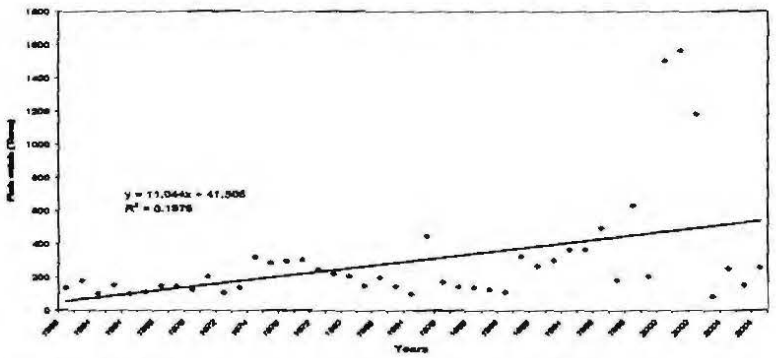

Fig. (5): Regression line and correlation coefficient of the annual total catch of eels at Lake Manzalah (1962- 2006).

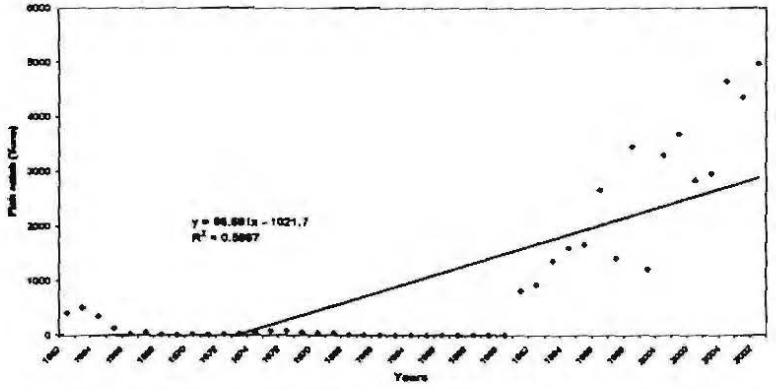

Fig. (6): Regression line and correlation coefficient of the annual total catch of other fresh fish at Lake Manzalah (1962- 2006).

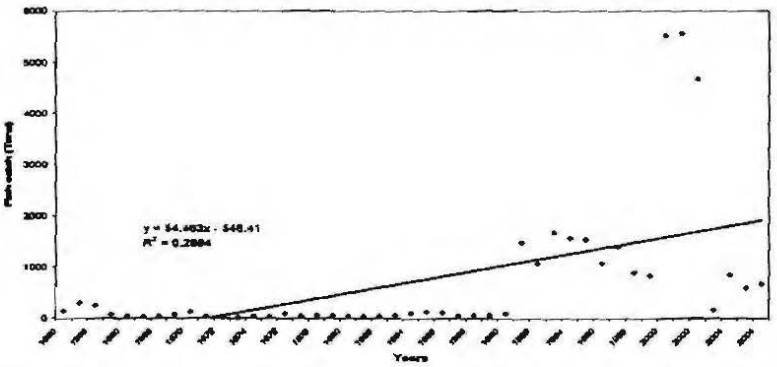

Fig. (7): Regression line and correlation coefficient of the annual total catch of other marine fish at Lake Manzalah (1962- 2006).

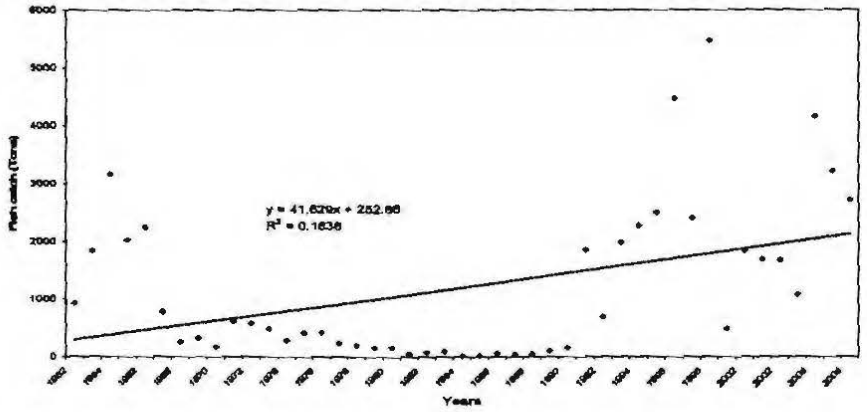

Fig. (8): Regression line and correlation coefficient of the annual total catch of Crustacean at Lake Manzalah (1962- 2006).

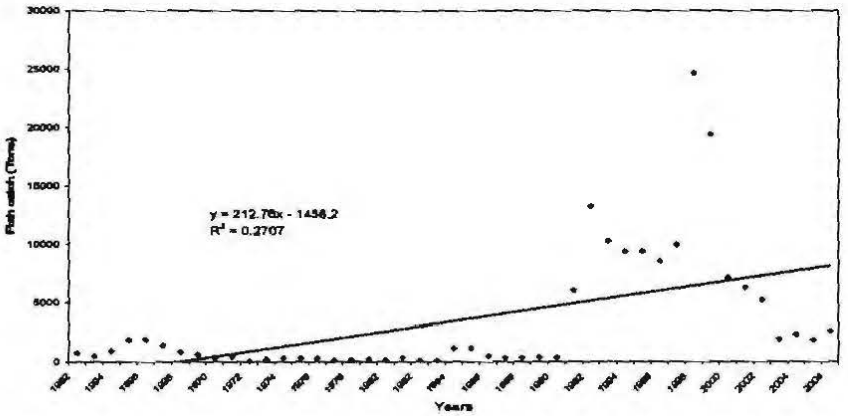

Fig. (9): Regression line and correlation coefficient of the annual total catch of other type at Lake Manzalah (1962- 2006).

Regarding to the comparison between the fisheries statistics GAFRD and that of NIOF, it is indicated that there are a great differences between the two sources Fig. (10). The data collected from the fishermen during the field trips to the major landing sites, are highly declined, not exceed than 20000 tons from the total Lake area, in spite to the dominant of small size of tilapia and disappearance of the other fish groups.

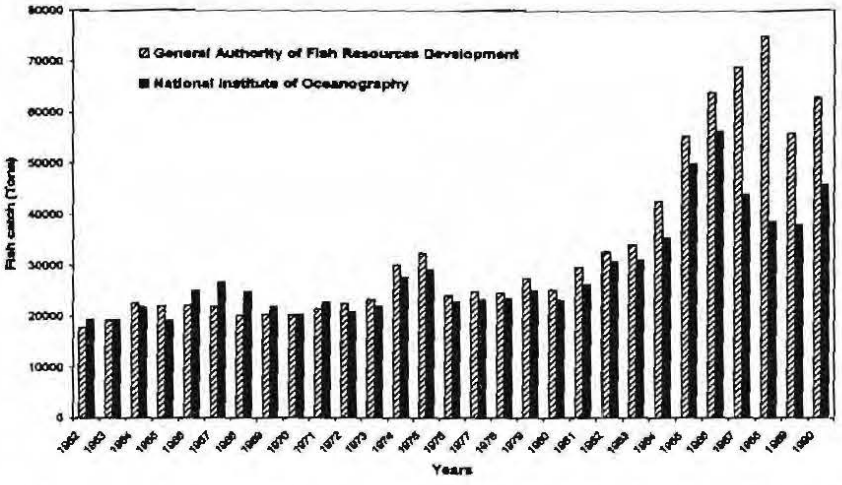

Fig. (10): Comparison between the fisheries statistics of GAFRD and that of NIOF during the period from 1962- 1990.

DISCUSSION

Fisheries statistics of the General Authority of Fish Resources Development cleared the increasing production of Lake Manzala throughout the period from 1962 to 2006. There is confusion in these statistics due to the following events:-

Lake fisheries:

Fish production of Lake Manzalah, was exposed to the same disturbance and changeable that take place in all Egyptian aquatic habitat. **[EL- Gawady (2002)].** In Lake Manzalah the ichthyofauna displays a more freshwater affinity with tilapia, the dominant group of species. A decrease in fish production was noted over recent years and this is attributed to deteriorating ecological conditions. A variety of factors are implicated including sea communication problems, reduction of the fresh water supply and increase of pollution causing eutrophication. In addition, over fishing with a continuing increase of fishing effort units, contributes to fisheries decline **[Kraiem *et al.*, (2009)].** Other result reflected that fish production from the lake increased strongly over the last 10th years. The increase in catch is the result of more intensive catching effort rather than the results of improved productivity. The catch composition clearly shifted from mainly euryhaline and marine into fresh and brackish species, particularly tilapias and the diversity of fishes decreased according to the problems in the Lake **[Nafea (2005)].**

The common fish groups were greatly affected by the big changeable in the Lake. Mugilidae is a widespread fish family in Egyptian water where the group is an important component of fish production **[Kraiem *et al.*, (2009)].**The total mullet catch of Lake Manzala during 1962-1968 constitutes more than 60% of the country's yield of

mullet reaching 80% during 1967 **[El-Zarka (1968)]**. Mullet declined from 65% of the total catch during the 1920's to only 2.2% during the early 1980's. As a result of fisheries management and development programs from 1989 to 1993, mullet production increased to 9.2% of the total catch **[Khalil (1997)]**. The marine fish here represent only 5% of the fish production, amongst which mullets account for about 1% **[Kraiem *et al.*, (2009)]**. The Egyptian production of crustaceans and mollusks has been shrinked also from 73 to 19 ton from years 1986 to 1992, respectively **[FAO (1996)]**.

A progressive increase of eutrophication and pollution of Lake water lead to disappearance of predacious fish and an increase in the biomass of the small size fish **[Maclaren (1981); Dowidar & Abdel-Moati (1983); Dowidar & Hamza (1983); Toews & Ishak (1984); Abdel-Baky & El-Ghobashy (1990) and El-Serafy & Abdel-Baky (1990)]**. Lake Manzala includes about 70-80 % tilapia, the catch of *Oreochromis aureus* comprises approximately 50% of the cichlid fish of Lake Manzalah **[Abdel-Baky & El-Serafy (1990) and Nafea (2005)]**.

Lake area:

It is clear that a continuous reduction in Lake area , as a result of extensive agricultural reclamation activities on the southern and southwestern sides of the Lake, the expansion of Hosha settlements on the islands have further reduced the open-water area, different rods and construction and establishment of different projects on land cutting from the Lake. According to the previous studies Lake area exposed to drastic reduction, where it was $407x10^3$ feddans **[Fouad (1926)]**, 350x103 **[Wakeel & Wahby (1970)]**, $300x10^3$ **[Bishara (1973)]**, 213x103 **[Maclaren (1981)]** and less than $120x10^3$ **[Kraiem *et al.*, (2009); Abdel-hamid *et al.*, (1997); Ahmed *et al.*, (2000); Zyadah *et al.*, (2004) and Zyadah (2005)]**, stated that Lake Manzala was exposed to many human activities, among these are construction of Damietta / Portsaid rod and dryness of large areas, which led to shrinkage of the Lake's area from 770 $x10^3$ feddans to 192 $x10^3$ feddans only. Also, Hosha and fish farms in the Lake had been dramatically increased **[Maclaern (1981)]**.

The present study revealed that the open fish proper declined to about 90 $x10^3$ feddans (GAFRD). Analysis of satellite imagery by **[El-Banna & Frihy (2008)]**, revealed that 48 km^2 of fish ponds have been established in the area around the mouth of the Damietta branch of the Nile, with a major part being located in the Mussallas and in Lake Manzalah to the immediate south of this area. However, their study only considered the Northwestern part of Lake Manzalah. **[Toews (1986)]** reported a fish farm area of 46 km^2 in the Mussallas and approximately 150 km^2 of earth ponds (known locally as Hosha) within the main lake.

Lake pollution:-

The pollution disturbs the natural balance in the water bodies. It is clear that there are great exchanges in the ecosystem of Lake Manzalah. Many studies on the Lake begin at 1900's year are documented that there are a huge substitute in their physicochemical characters. The Lake is considered the most polluted Lake in Egypt. **[Saad (2003)]**, during his study on the Nile Delta Lakes stated that eutrophication, as well as occurrence of metal and pesticide contaminants constituted in these lakes problems of increasing concern. The levels of pollution in these lakes are lake Mariut >

Lake Manzalah > Lake Edku> Nozha Hydrome > Lake Brollus. There are many indications for pollution in the Lake Manzalah. There were a slightly bacterial contamination (high B.O.D.) and urban (increased Cl and PO_4) and industrial pollution (high Ba, PO_4, SO_4 and C.O.D.) **[Abdel-Hamid & El-Zareef (1996); Abdel-hamid et *al.*, (1997) and El-Hady (2008)]** reported that biochemical contents of phytoplankton could be ranked as biomarker of pollution in Lake Manzalah.

The Lake Manzalah faced drastic problems that retarded its environmental and fisheries development. The most serious one is the discharge of waste water **[Shakweer (2005)]**. It receives a large quantity of agricultural, industrial and municipal wastes through several drains and from factories around them **[Maclaren (1981) and Abdel-hamid *et al.*, (1997)]**. Approximately 6525 million cubic meters/year are sewage and agro-industrial wastes **[Abdel-Daiem (1995)]**. Most effluents discharged to the Lake are complex mixtures of a large number of different harmful agents that cause changes in the lake water quality. Drops in dissolved oxygen and increase in ammonium concentrations were detected in the area affected by sewage drains **[Abel (1989); El-Gawady (2002); Zalat & Vildary (2005&2007); Ramdani *et al.*, (2009) and Rasmussen *et al.*, (2009)]**.

The exchanges in Lake environment, may be responsible for deteriorating fish production (quality and quantity) from the Lake, as well as for damaging human health (consuming polluted fish and depending on contaminated water for different human activities) **[Eisa & Yassin (1994); Abdel-hamid & El-Zareef (1996) and Abdel-hamid *et al.*, (1997)]**. Pollution has a negative effect on the productivity. The drain water reaching Manzalah Lake may contain certain pollutants (pesticides and herbicides) which may suppress the development of high phytoplankton **[Dowidar & Hamza (1983)]**. Fish infection by various parasites increases in polluted and highly eutrophied water and this in turn may lead to reduction of condition and growth rate of fish **[El-Bolock & Koura (1961) and Abdel-Baky (1989)]**.

The Lake water and sediments are suffering from heavy metals pollution. As stated by **[Abdel-hamid *et al.*, (1997)]**, the pollution of water by heavy metals affected also sediment contents of these metals, which would return to the overlying water or downward into deeper sediments through interstitial water. The aquatic pollution with heavy metals affects all forms of life, particularly the higher fauna which may accumulate these metals in toxic levels for human consumers besides the negative impacts on the aquatic organisms themselves. In Lake Manzalah, increased levels of Cd, Hg, and Pb are estimated in the bodies of fish, shrimp and crab **[Abdel-hamid & Gawish (1998)]**.Man could also affected by the toxic levels of these elements via polluted waters and fishes **[Abdel-hamid *et al.*, (1997)]**.

Questionnaire:

The data collected during the field trips to the major landing sites, insist that Fishermen opinion was opposite to the official fisheries statistics. Where as, an extremely decline in qualitative and quantitative fish production of Lake Manzalah was the certainty. In spite of the dominant of small size of tilapia and disappearance of the other fish groups, the actual fish production from the Lake was very less than official recorded data. Fishermen suffering from rare in their fish catch and many of them leave their work in the lake to other jobs. Small size of *Oreochromis aureus* was the dominant

in catch. The different fish groups which are spread in the past disappeared now. Extend of illegal methods of fish catch, Hoshas and Centers of power which constrict on a great area of the Lake. Increase of fish mortality due to change in water quality.

In conclusion, from the forgoing presentation, it could be concluded that it is a must to give more attention to our fisheries statistics for the clear differentiation among different statistic resources concerning the actual Lake area as well as the actual fish production as a whole and as a species. On these actual statistics would depend all steps of reclamation, development and improvements. For the newly projects of Lake developments, either local or with international participants, we are in need for real data on this Lake from the view points of geography, limnology, fisheries .....etc.

With the expected increases in urbanization, industrialization and socio-economic activities following the increase in population, it is strongly recommended that the existing pollution control policies and measures covering legislation, standards, criteria, waste minimization, effluent treatment, monitoring, education and public awareness should be enforced, especially before new industries are established, in order to increase opportunities of the socio-economic development of the country. It is essential need to combat pollution hazard in the lake.

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الملخص العربى

الإنتاج السمكى من بحيرة المنزلة (جمهورية مصر العربية)
دراسة نقدية عن إنتاجها إحصائيا

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تعتبر بحيرة المنزلة من أهم بحيرات مصر الشمالية حيث يشكل إنتاجها كماً لابأس به من إنتاج جمهورية مصر العربية. وقد تعرضت بحيرة المنزلة - كما يُلاحظ فى معظم بحيرات مصر- فى الحقبة الأخيرة إلى عدة تغيرات فى خواصها الطبيعية والكيميائية والبيولوجية. فقد تقلصت مساحة تلك البحيرة تدريجيا من ٤٠٧ ×١٠^{٣} فدان فى مقتبل عام ١٩٠٠ إلى ٢١٣ ×١٠^{٣} فدان عام ١٩٧٩ حتى بلغت الآن (عام ٢٠٠٩) حوالى ٩٠ ×١٠^{٣} فدان فقط وذلك نتيجة لتجفيف مساحات شاسعة منها بغرض الزراعة وشق الطرق وإنشاء الحوش وكذا المزارع السمكية الخاصة. كما تحولت طبيعة المياة فيها من مياه شروب إلى مياة عذبة نتيجة للكم الكبير من مياة الصرف الصحى والزراعى وكذا الصناعى التى تصب بها، مما أدى إلى تلوثها بكل هذه المخلفات وندرة أنواع الأسماك البحرية الجيدة والتى كانت موجودة بها من قبل وتفوق عائلة البلطى على الأنواع الأخرى بها .وبالرغم من تلك الظروف السيئة التى تعرضت لها بحيرة المنزلة فقد ذكرت إحصائيات الهيئة العامة لتنمية الثروة السمكية زيادة إنتاج البحيرة تدريجيا من الأسماك خلال ٤٤ سنة مضت (١٩٦٢- ٢٠٠٦) بما لايتناسب إلى مالت إليه ظروف البحيرة. كما وجد إختلاف كبير بين إحصائيات الهيئة العامة لتنمية الثروة السمكية والمعهد القومى لعلوم البحار والمصايد.وعند النزول لأرض الواقع وسؤال الصيادين بالمنطقة وجد إختلاف كمى ونوعى عن البيانات المعلنة رسميا- وقد نوقشت تلك الظروف السابقة فى هذه الدراسة و التى خلصت الى ضرورة الإهتمام بالإحصائيات الخاصة بالبحيرة والأخذ فى الإعتبار المساحة الفعلية للبحيرة ووجود آلية للمحافظة عليها وإسترداد وتنمية القلة الباقية من بحيرة المنزلة.