



## Tropentag 2008

University of Hohenheim, October 7-9, 2008 in Stuttgart-Hohenheim  
International Conference on Research for Development in Agriculture and Forestry, Food and  
Natural Resource Management

Competition for Resources in a Changing World: New Drive for Rural Development.

### Northern Delta Lakes, Egypt: Constraints and Challenges

Sahar Fahmy Mehanna

National Institute of Oceanography and Fisheries, P. O. Box 182, Suez, Egypt.

sahar\_mehanna@yahoo.com

#### Introduction

Egypt derives its fish yield from three main resources; marine (Red and Mediterranean seas), inland (lakes and River Nile with its tributaries) and aquaculture (Fig. 1). These fisheries are one of our chief sources of wealth, if we give them due care, we can increase our national income and solve many of our problems mainly the food deficiency and unemployment. The lakes' fisheries play an important role in Egyptian economy, where they provide about 39% of harvested fish in Egypt (1980–2006).

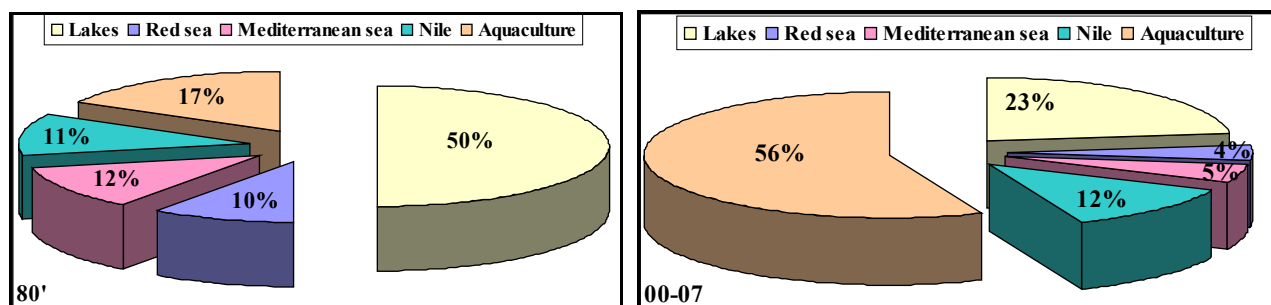


Fig. (1). Fisheries resources of Egypt during the 80' compared with that of the last eight years

The Egyptian Mediterranean coast exhibits six lakes or lagoons which are situated along the Nile delta coast (Northern Delta lakes: Manzala, Borollus, Edku and Mariut) and to the east of the Suez Canal (Port-Fouad and Bardawil). All of them, with the exception of Lake Mariut, are directly connected to the sea (Fig. 2). The Northern Delta lakes provide a rich and vital habitat for estuarine and marine fish and their regeneration, and have always been major areas of fish production in Egypt, where more than 75% of Egyptian lakes production was harvested from them. Also, they are internationally important sites for wintering water birds, providing valuable habitat for several hundred thousand birds. In recent years, many challenges are facing these lakes and lead to the depletion of fish production from them. The present study was done to evaluate the current status of Northern Delta lakes' fisheries. Fishery statistics over 20 years (1987-2006) were collected and analyzed. The maximum sustainable yield (MSY) and the relevant level of fishing effort ( $f_{MSY}$ ) were estimated. Also,  $2/3 f_{MSY}$ , as a target reference point was calculated. All challenges facing the sustainable development of these lakes were identified and some of practical solutions were advised.

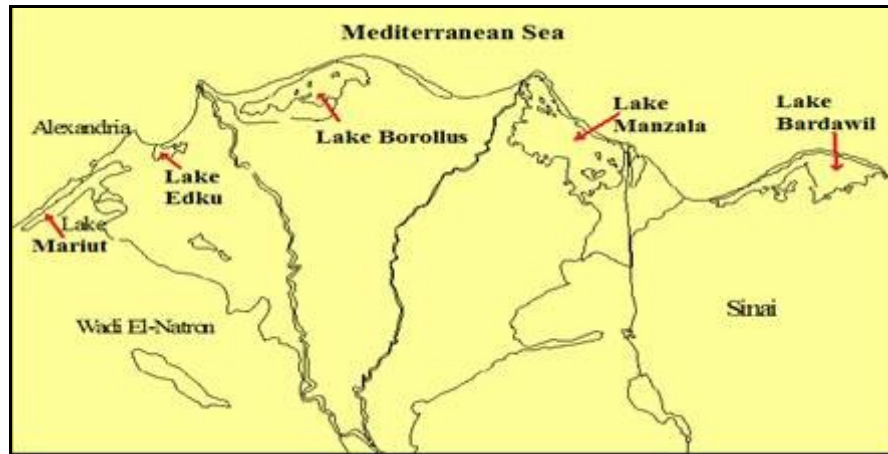


Fig. (2). Northern Delta Lakes

## Material and Methods

Fishery statistics of the four delta lakes during the period from 1987 to 2006 were obtained from the General Authority for Fish Resources Development. The vessel characteristics, type and size of fishing gears, number of fishing days, number of crews and the fishing locations with species caught were recorded from the field trips to the landing sites. These data were analyzed to estimate the catch per unit of fishing effort (CPUE) which was considered as a function of stock biomass. The logistic surplus production model of Schaefer (1954 & 1957) was applied to assess the fishery status of Northern Delta lakes. The MSY and the  $f_{MSY}$  were estimated according to the following equation:

$$dB_t/dt = rB_t - r/K * B_t^2$$

where  $B_t$  is the biomass of the stock at time  $t$ ,  $K$  is the carrying capacity of the habitat where the stock lives and  $r$  is the intrinsic rate of growth of the stock. Schaefer's model has  $K = -a/b$ ,  $MSY = aK/4$  and  $f_{MSY} = a/2$ .

## Results and Discussion

### Description of Northern Delta lakes

Lake	Area (Feddan)	Area (before 1950)	Mean production (ton)	Depth range (m)	Mean No. of boats
Manzala	90,000	350,000	62,000	0.7 – 2.00	6500
Borollus	70,000	220,000	48,000	0.4 – 2.00	8000
Edku	10,000	45,000	9,000	0.5 - 1.50	2500
Mariut	16,000	66,000	5,000	0.6 - 2.70	1700

It is worth mentioning that, Northern Delta lakes' water fluctuated from low salinity near outlets of drains and canals to brackish water over the most of their areas to saline water near their connections with the sea. Northern Delta lakes are the most polluted lakes in Egypt where they receive a large quantities of agricultural, industrial and municipal wastes through several drains and from factories around them (Maclaren, 1982; Bebars and El-Gammal, 1986; Moussa, 2003).

## **Fish Fauna**

The aquatic fauna of the Northern Delta lakes is a mix of freshwater and marine species. The freshwater fauna is dominated by tilapia species which make the majority of catch. Many Nile species also inhabit these lakes such as; *Hydrocynus forskalii*, *Lates niloticus*, *Cyprinus carpio*, *Barbus bynni*, *Clarias lazara*, *C. gariepinus*, *Bagrus bayad*, *Lates niloticus*. Several marine species tolerant of freshwater also found in the Delta lakes, including mullets, soles, seabream, seabass, meager, eels and shrimp. In recent years many fish species are disappeared from these lakes and all of these species are of marine origin.

## **Fishing methods**

The main fishing gears used in Northern Delta lakes are the surrounding net which is widely used and is known locally as El-Tara, the seine-hand catching combination, trammel net, frame net, hand catching, the basket traps, shrimp set net, mullet set net, hook and lines, El-Hosha and the bottom trawl (Khalil and El-Dawy, 2002 and El-Bokhty, 2004).

## **Maximum sustainable yield**

The application of Schaefer model (Fig. 3) revealed that, to obtain the MSY, the present level of fishing effort should be reduced by about 35% for the four Northern Delta lakes. Because, the target control is more conservative than threshold, and defines a desired rate of fishing and acceptable levels of stock biomass, the use of  $2/3 f_{MSY}$  as a target reference point is safer than the use of the limiting or threshold reference point ( $f_{MSY}$ ). To achieve the  $2/3 f_{MSY}$ , the present level of fishing effort should be reduced by about 57%, 43%, 44% and 47% for Manzala, Borollus, Edku and Mariut fisheries, respectively.

## **Conclusion**

All Northern Delta lakes are more or less facing the same challenges; pollution, habitat loss, declining of fish yield and fish quality, significant reduction in area, spreading of aquatic plants, Over-fishing, illegal fishing practices and illegal harvesting of fish fry, the blockage of Boughazes (connections with sea), eutrophication and the low awareness of fishermen about environmental issues and the importance of fisheries regulation measures.

## **Recommendations**

- Studying the biology, dynamics and life cycle of the commercial fishes of these lakes as this is an important step in establishing guidelines for fishery-regulation measures and construction a management policy for the rational exploitation of them.
- Controlling and optimizing the water quality of these lakes.
- Regulation of mesh sizes, controlling gear types used and prohibition the destructive ones and developing suitable fishing gear for shallow lakes as well as detecting the economic factors affecting the fishery.
- Monitoring salinities at various seasons and localities
- Stocking the lakes with sufficient and suitable fish fry species.
- Continuous clearance of Boughazes to exchange the water masses between the lakes and the open sea.

- Revision of fisheries laws and improving the system for collecting and compiling fisheries statistics
- Examining the water inflow of the agricultural drainage canals and different drains into the lakes regularly to control polluted water inflow into these lakes.
- Construction marine hatcheries to cover the excessive demand on fish fry and juveniles for aquaculture.

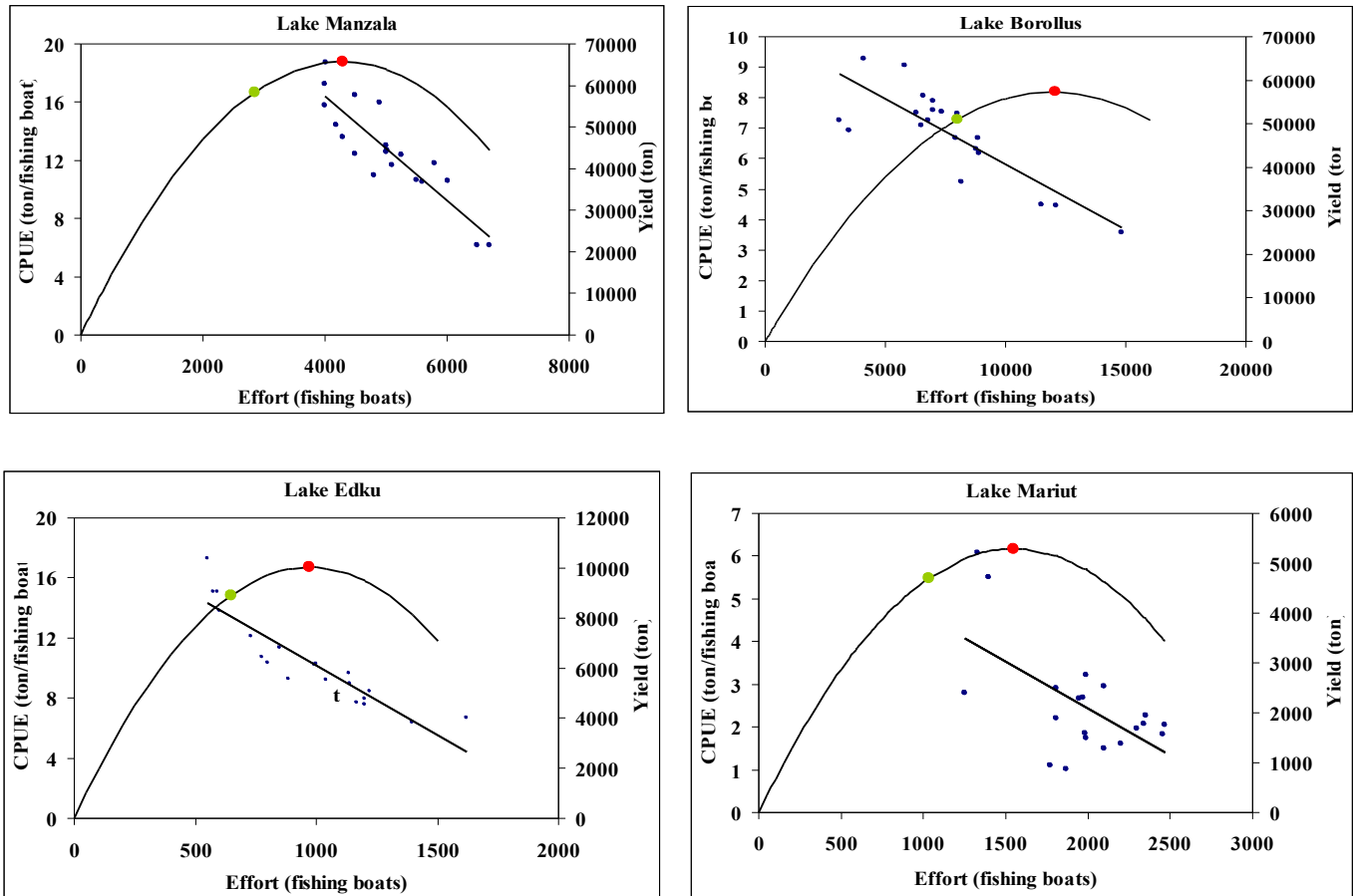


Fig. (3). Maximum sustainable yield from the Northern Delta Lakes

## References

- Bebars, I. M. and El-Gammal, F. I., 1986. Waste water reuse project, USAID: Fish biology studies. Final report.
- El-Bokhty, E. B., 2004. Biological and economical studies on some fishing methods used in Lake Manzala. Ph. D. Thesis, Fac. Sci. Tanta Univ. 264p.
- Maclaren, 1982. Lake Manzala study. Egy./76/ 001-07. Draft report to Arab republic of Egypt. Ministry of Development and New Communities and UNDP Scientists, Inc. Toronto, Canada. 12 volumes.
- Khalil, M.T. and El-Dawy, F.A., 2002. Ecological Survey of Borollus Natural Protectorate: Fishes and Fisheries. MedWetCoast Project, Egyptian Environmental Affairs Agency (EEAA), Cairo.
- Moussa, S. M., 2003. Impact of inorganic pollutants on aquatic environment and fish performance in Lake Borollus. Ph. D., Inst. Env. Stud. & Res., Ain Shams University, 210p.