

THE STATE OF GONADS OF GREY MULLET *MUGIL SALIENS* RISSO  
*MUGIL CAPITO* CUV. LEAVING THE EGYPTIAN LAKES  
FOR SPAWNING IN THE MEDITERRANEAN SEA.

KH. A. HUSSEIN AND A.A. AIASS.

Institute of Oceanography and Fisheries, Alexandria.

ABSTRACT

The examined ovaries of female *Mugil saliens* and *M. capito* were obtained during the period of lake-sea migration for spawning. As many other catadromus fishes inhabiting the Egyptian northern delta lakes, *M. saliens* and *M. capito* were shown to leave the lake in the period of pre-spawning with nearly ripe ovaries (stage IV of maturation).

Classification of the nearly ripe condition into three distinguished stages viz. IVa, IVb, and IVc, revealed that the mesohaline species *M. saliens* leaves the lake with less developed ovaries (stage IVa). *M. capito*, on the other hand, which is more tolerant to the variations in water salinity, leaves the lake with more developed ovaries (stage IVb and IVc). On attaining such degree of ovarian development *M. capito* was considered as a candidate for induced spawning.

INTRODUCTION

Three species of grey mullets, viz. *Mugil cephalus* (Linn.), *Mugil capito* (Cuv.) and *Mugil saliens* (Risso) enter the Egyptian northern lakes from the Mediterranean Sea for feeding. The first two species are purely euryhaline, whereas the last species is mesohaline, i.e. it lives in the region of mixed water near the opening connecting the lake with the sea. The salinity in this region is variable, depending on the direction of wind and consequently on the direction of water movement.

*Mugil* species migrate in the opposite direction, i.e. from the lakes to the Mediterranean Sea at their specific spawning season, whence the gonads are still not ripe. The gonads of *Mugil saliens* and *Mugil capito* living in natural environment in Egyptian lakes, show consequent changes before leaving the lake to the sea. Such changes are controlled by the ecological factors in the lake.

The newly hatched fry move from the spawning area in the open sea to the shallow waters with high concentrations in the region connecting

the lake with the sea (El-Zarka, El-Maghraby and Hussein, 1970; Hussein, 1969,1972,1974).

The gradual annual decrease in the catch of mullets in the Egyptian lakes and also the construction of many governmental and private fish farms, inevitably necessitate an intensive production of fish seeds by induced spawning. However, before carrying out hormonal injection to stimulate the ripeness and ovulation of the eggs, the state of the fish gonads should be accurately known.

The present work was therefore undertaken to determine histologically the maturation stage of females *M. saliens* and *M. capito* at the periods of their exodus to the sea for spawning and to determine consequently their reliability for hormonal injection.

#### MATERIAL AND METHODS

The ovaries of *M. capito* were collected from lake Manzalah from June, 1974 to December, 1978. Ovaries of *M. saliens* were collected from lake Burrollos (Fig. 1) from June to October, 1977. Ovaries were fixed in Bouin

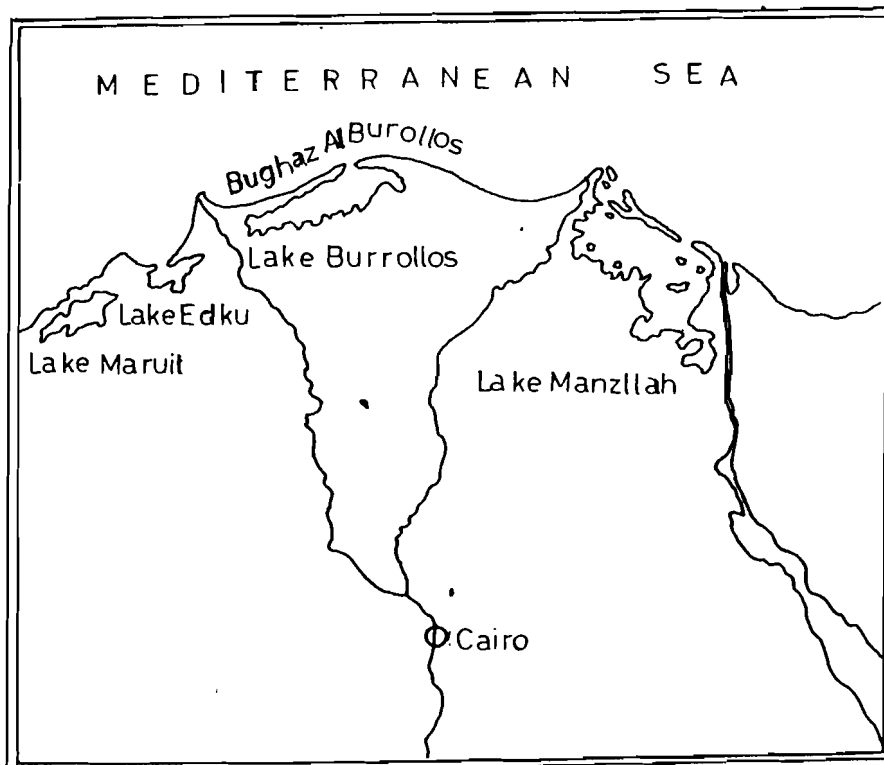


Fig. 1. The northern delta lakes.

solution. Embedding was carried out in paraffin wax and sections, 6-8  $\mu$  thick, were prepared. Sections were stained with Heidenhain iron haematoxylin. Micro-photographs were taken by microscope at powers 20 x 7 and 90 x 7. Ovaries were extricated from 24 samples of *M. saliens* and 30 of *M. capito* for examination.

## RESULTS

*M. saliens* and *M. capito* are fishes with one spawning, i.e. the female sheds the ripe eggs only once in the annual sexual cycle.

The examined ovaries of *M. saliens* belong to IV stage of maturation. Ovaries are distended with the oldest eggs which are 0.43 mm. in diameter (Fig.2). Nucleus fills a considerable part of the oocyte and is central in



Fig. 2. Section in the ovaries of *M. saliens*, ova in stage IV of maturation. ( Magnification, 20 X 7 ).

position. Nucleoli (8-10 in number) are distributed at the periphery of the nucleus.

The cytoplasm is occupied with yolk granules intermingled with vacuoles denoting the presence of fat droplets. The outer thin layer of cytoplasm directly below the oocyte sheath is free from any trophic substance. The cover of the oocyte is well developed, formed of a thin connective tissue

layer and one layer of epithelial cells. Zona radiata is 10-15  $\mu$  thick and lies beneath the epithelial follicle (Fig. 3).



Fig. 3. A magnified ovum of *M. saliens* in stage IV a of maturation. ( Magnification, 90 X 7 ).

The ovaries of *M. capito* belong to stage IV b and IV c.

In IV b stage: the oocytes have large vacuoles representing fat droplets (Fig. 4), near and around the nucleus which is still in the center. The nucleoli are distributed close to the periphery.

In IV c stage: the droplets of fat become larger than in the previous stage (Fig. 5). From 5 to 6 large and fused fat droplets are lying around the nucleus. The nucleus begins to move to the periphery, i.e. towards the cover of the oocyte. The nucleoli are peripheral and also in the center of the nucleus. Patches of homogenous yolk are formed between fat droplets.

#### DISCUSSION AND CONCLUSION

The histological examination of the gonads of *M. saliens* collected from Lake Burolos and that of *M. capito* in Lake Manzalah before leaving



Fig. 4. Section in the ovaries of *M. capito*, oocytes in stage 4 b of maturation. ( 20 X 7 ).

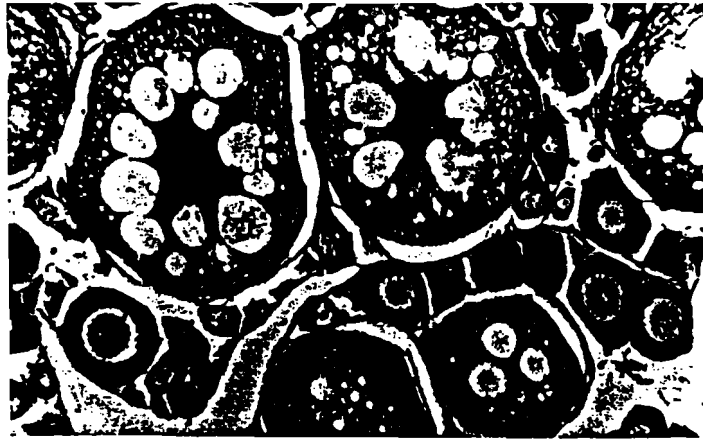


Fig. 5. Section in the ovaries of *M. capito*, oocytes in stage 4 c of maturation. ( 20 X 7 ).

the feeding grounds for spawning in the sea show that:

1- All ovaries of **M. saliens** were in stage IV a of maturation as the oocytes are filled with granules of yolk and small fat droplets and with central nucleus.

2- All ovaries of **M. capito** belong to stage IV b and c. In b begins the process of fusion of fat droplets and also the yolk granules, i.e. this period in stage IV is characterised by the beginning of homogeneity. Nucleus is still in the center of the oocyte.

In IV c, the fusion of fat droplets continues and thus they become larger. The yolk granules also continue the process of homogeneity. The nucleus begins to move towards the periphery.

Comparing with the results of Jetinev et al (1974), **Mugil saliens** leave the estuaries of the Black Sea with more developed gonads than in the Egyptian Lakes, as most of the females migrate to the Black Sea with ovaries in stage of maturation IV a and IV b and some are even in stage IV c. This may be due to the narrow difference in salinity between the estuaries (11‰) and Black Sea (16-17 ‰), as compared with the salinity difference between the Egyptian Lakes (not more than 5‰) and the Mediterranean Sea (37-38 ‰).

Among females migrating from estuaries to Black Sea, only those of stage IV c responded to hypophysial injection, while females of stage IV a and IV b died after injection (Jetinev et al ,1974).

**M. Capito** leave the Egyptian Lakes in stage IV b and IV c of gonad's maturation and thus in a more advanced condition than in **M. saliens**. Thus according to the results of Jetinev et al. (1974) **M. capito** is suitable for induced spawning.

#### SUMMARY

Ovaries of **M. saliens** leaving Lake Burullus for spawning in the Mediterranean Sea belong to stage IV a, as the oocytes are filled with yolk granules and small fat droplets and with central nucleus.

Gonads of migrating **M. capito** are more developed and belong to stage IV b and IV c. The former is characterised by larger fat droplets and oval central nucleus. At this period begins the yolk homogeneity. In IV c, fat droplets become larger comprising 5 to 6 masses lying around the nucleus. The nucleus begins its migration towards the covering layer of the oocyte. Homogenous yolk patches intermingles fat droplets. Therefore according to conclusion of Jetinev et al., (1974), **M. capito** is suitable for hormonal injection for receiving ripe sexual cells, which may be necessary for fish culture development. On the reverse, **M. saliens** may not be suitable for this purpose.

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