INTRODUCTION

The Tilapias belong to the family Cichlidae. Three genera are well-known namely *Oreochromis*, *Tilapia* and *Sarotherodon*, of which Nile Tilapia belongs to genus *Oreochromis.* This species is naturally distributed in Palestine, the Nile River as well as most part of African river and lakes. It was introduced in the Philippines in 1972. Its rising popularity is due to their hardiness, resistance to disease, ease to breeding, reasonable growth rate, good taste, and tolerance to a wide range of environmental conditions including temperature and salinity.

Taxonomic Position of the Tilapias

Most Tilapias species of the tribe Tilapinii now being used in aquaculture were grouped initially into one genus, Tilapia. The species within this genus were later classified according to differences in their mode of reproduction (Low McConnel, 1959; Trewavas, 1973, 1978, 1982). Species which evolved as substrate spawner but guard their eggs were retained in the genus tilapia while those which orally rear their clutches were grouped into a new species Sarotherodon. Classification of the three genera *Tilapia*, *Sarotherodon* and *Oreochromis* was based largely on the differences on their reproduction, feeding habits and biogeography.

Genus *Tilapia* (Substrate Spawners)

Both parents guard, protect, aerate the brood, and help move clutch to different nest sites. Fry at first feeding are 4-6 mm and show feeble swimming ability. Fry survival relatively low. *(Ex: Tilapia zillii)*

Genus *Sarotherodon* (Paternal/biparental)

Both parents stay close to each other. Eggs and fry brooded in oral cavity up until they are ready for released. Fry are between 7-9 mm at first feeding, well developed fins for swimming. Fry survival high. *(Ex: Sarotherodon melanotheron)*

Genus Oreochromis (Maternal)

Female solely involved in broad care. After spawning, female leaves nest to rear her clutch in safety. Fry brooded up until free swimming. There is an external period of care during which fry seek shelter in buccal cavity for safety. First feeders have well-developed fins for swimming. Fry survival high. *(Ex: Oreochromis niloticus, Oreochromis massambicus, Oreochromis aureus, Oreochromis spilurus)*

Sex Identification

Sex identification of tilapia is relatively simple. The male has two openings just in front of anal fin. The large opening is the anus and the smaller opening at the tip is the urogenital pore. The female has three openings: the anus, the genital pore, and the urinary pore. The genital papilla is usually smaller in the female. Tilapia can be sexed when it has attained the weight of 15 grams. Application of ink or dyes to the papillae may increase the accuracy of sexing and may allow sexing of smaller fish. By rubbing ink along the papillae of the tilapia, sexes can be readily distinguished.

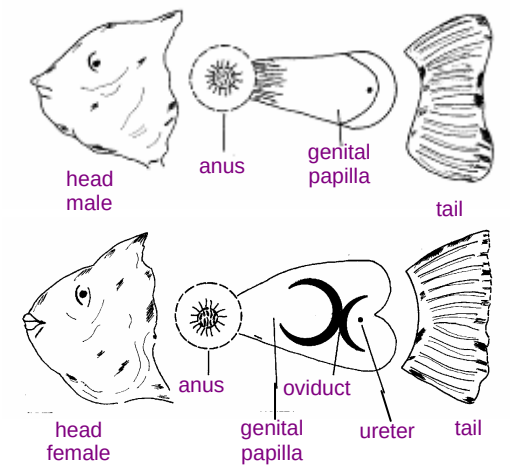

Figure 1. *Sex differentiation of male and female tilapia*

Spawning

The Nile Tilapia is a mouth-brooder. Mouthbrooding is an advanced reproductive tactic, a form of intensive care whereby the seed can be protected from the outside world until their development is more advanced. The male establishes a territory and builds a round nest in the pond bottom. (Usually the diameter of a nest is 30 – 60 cm. The size of the nest is correlated to the size of the male.) The female enters the nest and lay the eggs. The eggs are fertilized by male. The female then collects and incubates the eggs in her mouth. The eggs are yellow in color. Eggs hatch in about five to seven days. After hatching the fry remain in the mouth of the female for another 4-7 days. The fry begin to swim freely in schools, but may return to the mouth of the mother when threatened. Females do not feed during incubation or the brooding period. (Fig. 2)

Female spawn every four to six week, but may spawn sooner if the eggs are removed. The number of eggs per spawning is related to the size of the female. A female of about 100 grams may produce approximately 100 eggs per spawning while a female weighing 100-600 g can produce 1,000-1,500 or more per spawning (Hepher and Prugunin, 1981).

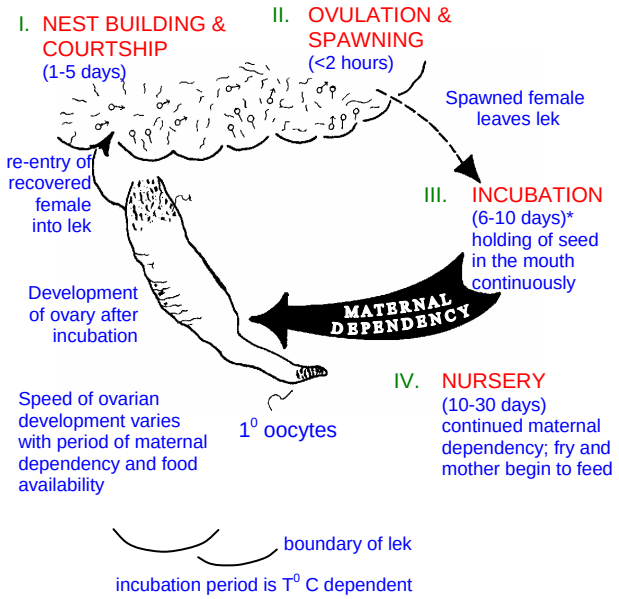

Figure 2. *Natural Reproductive Cycle of Oreochromis spp. (Adapted from AIT Hand-out "The Nile Tilapia: Techniques for mass Fingerling Production and Grow-out, 1992)*

Growth of Tilapia

Growth of tilapia is dependent on stocking rates, food supply and water quality. Males grow faster by 10-20 % than females. The growth of fish will be drastically reduced if fingerling production is not controlled. The growth of tilapia is directly related to the amount of food available in the pond.

Feeding Habits

For their sustenance, newly hatched fry depend on their yolk sacs until consumed. Then, they eat the smallest phytoplankton present in the pond. As the fry become bigger, they eat larger organisms and supplemental feeds such as rice-bran, fishmeal and others. Tilapia feed on a variety of phytoplankton as their primary food items. They are cannibalistic and will feed on their fry if food is not abundant. The tilapia has a short esophagus leading to a small sac-like stomach with an exceptionally long intestine (4x the body long). The *O. niloticus* has firm pharyngeal teeth set on a triangular blade. Its role is to prepare food for digestion, shredding the coarser materials and breaking some of the cell walls before passing it on to the stomach.

Temperature Tolerance

Tilapia cannot tolerate a temperature below 10^0 C. Temperature at mid-20s, however, could still suppress growth. Low temperature is usually felt in upland areas, but this is normally not a problem in the tropics. *Oreochromis aureus* shows better growth tolerance at a lower temperature as compared to other tilapia species.

All tilapias can tolerate high water temperature. However, too much handling at high temperature could result in high mortality.

Salinity Tolerance

Most tilapias are relatively euryhaline (can tolerate a wide range of salinities). *Oreochromis niloticus* can tolerate sea water if properly acclimated. It appears that the spawning of this species may be suppressed at salinities between 15 and 35 parts per thousant (ppt). However, their growth in these salinities is not similar to that in freshwater.

Oreochromis massambicus can tolerate salinity changes much better than *Oreochromis niloticus*, and can reproduce at high salinities. *Oreochromis aureus* seems to be a little more euryhaline than *O. niloticus*, but not as tolerant as *O. mossambicus.*

Water Quality

Tilapias are extremely hardy fish and can withstand adverse water conditions. However, good water management is the key to successful fingerling and food fish production. The water quality should be monitored regularly to find out the condition of the fish.

Table 1. *Environmental conditions favorable for tilapia growth*

Parameter	Level	Comments
Temperature	25 – 30 ^{0}C	Optimum for reproduction and growth
DO (mg/L)	3	Minimum for optimum growth
Salinity (ppt)	10 – 15	Favor growth
pH	6.5 – 9	Optimum for primary reproduction
CO_2 (mg/L)	20	
Total ammonia (mg/L)	0.02 – 0.5	
Turbidity	30 – 35	Silt can damage
Water current	20	For intensive culture flow-trough system

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BASIC BIOLOGY OF TILAPIA

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