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## The biennial growth model, database and population dynamics of *Tilapia* spp in tropic of West Bengal

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### Abstract

*Tilapia mossambica* is a promising species in the tropic of West Bengal condition and extendable in sub-tropical condition. Biannual logarithmic growth model  $Y = 190.84LN(X) - 48.57$ ,  $R^2 = .067$   $X \leq 2$  any real number of fish age in the month, Y indicates the gram weight is studied and found under tropical pocket of Beel water of West Bengal condition. The species has multiple breeding periods may breed even four times in a year once found suitable condition and hence four different population dynamics were found. Ecologically *Tilapia* has auto stock model, controlling sex ratio, size dependency, possible organic feed, controlled growth and further popular due to their resistance and hardiness in ecological conditions, good species association viz. with *Macrobrachium rosenbergii*, possible enrichment and over all the good sustainability. The statistical variation of fish genders and their ratio estimation are due to ecological condition. Female (f) to male (m) f/m ratio is more under favourable conditions is the note of this abstract.

**Keywords:** Fish Genders, Biannual growth model, Population dynamics, *Tilapia mossambica*,. Species association.

### 1. Introduction

By now *Tilapia* spp become an important exotic species in Indian capture as well as in culture fisheries. Informatics on stocking rate, species distributions, habitats and fish yield of *Tilapia* sp. is developed using comprehensive searching. This may considered as ecological database of *Tilapia* spp. The informatics are brief, precise and gives us a reference of the futuristic species among fish lovers. Further, this can be used as an input for developing fisheries data mining for finding species association with *Tilapia*. Such a species database of *Tilapia* sp. across the inland water-bodies and their distribution are communicated. Today geographical information systems are used as a tool for predicting fish yield in tropics supported by *De Silva et al.* (2001). If such a system is developed on *Tilapia* spp to be found as widely distributed, and an important fish species around the inland water bodies. The species are mostly available in the tropics of Africa, Asia as well as in Central America. Although the origin of the species is Africa. A strategic reassessment of fish farming potential in Africa was conducted by Aguila and Nath (1998). By now the species are spread in many continents like Asia and become exotic species to native in many countries. Fishery enhancement and geography and its constraints on inland fishery enhancements by Kapetsky (1998) is highlighted. A strategic assessment of warm-water fish farming potential in Africa and aquaculture potential was assessed by Kapetsky (1994). The species in general are hardy and survive even in adverse water environments. The species can survive and breed in water bodies where dissolve oxygen contents is lesser. One hundred and fifty six species are identified and communicated in this research article and these are all mostly planktivores species suitable in our tropic and may be in subtropics even. Water-quality requirements of these species, in most cases, are found very wide with high dispersion i.e. range is more, and these species may be termed as fisheries species for the future.

### 2. Materials and Method

*Tilapia mossambica* is stocked in marginal experimental water of Beel pocket and observed for more than one year (3) and biennial growth model is estimated as Biannual logarithmic growth model  $Y = 190.84LN(X) - 48.57$ ,  $R^2 = .067$   $X \leq 2$  any real number of fish age in month High stocking rate is often followed and such process is found sustainable in a congenial and phytoplankton dominated water bodies. It is found that phytoplankton

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concentration may depend on the input of manures. *Tilapia* species can survive and breed even under moderate to low dissolve-oxygen level as often species take oxygen through mouth-cavity from upper water-column. Experimental site has definite inlet and outlets and outgoing water is used in paddy cultivation. Ecological and habitat viz. origin of *Tilapia spp* are kept in the form of a database of relational platform (Table 1).

Possible chance of species enrichment is the process of environmental enrichment, all required micro and macro nutrient elements for the species may obtained from wider sources of natural substances. Modelling stocking density and fish yield, which may be @50 kg/m<sup>3</sup> under congenial water condition. However, it is found that water quality parameters required for the species is wide. Individual species growth rate for the species *Tilapia mossambica* is mentioned. Gender statistics were observed in the same ecology with variable water dimension and based on the dimension variable female and male species were found. Female(f) to male(m) f/m is more under favourable condition is their basic science and for all.

### 3. Results and Discussion

Database (Table-1) as such is a reference for fish lovers, fisheries managers and fisheries extension personnel. Every species might be considered as an important and good for tropical or subtropical fisheries. There is a provision in the system that the data can be made for a fisheries extension purpose and entertainment generation in natural water as well. A few species are having excellent aquaculture potentiality and can be imported in geographic locations for fisheries enhancement as *Tilapia* is a species of fisheries in the future. This research focuses on the respective preferred species, with initial emphasis on the tilapias and the carps, whereas the activities in which the individual member countries participate depend upon their needs and resources. Exchange of improved breeds either for evaluation followed by direct use in fisheries, or for utilization in breeding programs for incorporating specific useful traits is guided by the policies of the individual member countries. Fisheries partners and others collate and disseminate information on fish genetic resources, through global databases and CD-ROMs, including documentation for the conservation of local knowledge pertaining to fish genetic resources in tropical and subtropical fisheries.

**Table 1:** List *Tilapia sp.* and their distributions and habitats.

Species Name	Distribution	Habitat
<i>Tilapia affinis</i>	Africa	Freshwater
<i>Tilapia alcalica</i>	Tanzania	Freshwater
<i>Tilapia alcalica grahami</i>	Kenya	Lake
<i>Tilapia alcalica hilgendorf</i>	Tanzania	Endemic
<i>Tilapia alleni</i>	S Africa	Freshwater
<i>Tilapia amandine</i>	Botswana	Aquaculture
<i>Tilapia amphimelas</i>	Tanzania	Freshwater, Lake
<i>Tilapia andersoni</i>	S. Rhodesia, Zambia	Fish culture in ponds
<i>Tilapia arnoldi</i>	Zambia	Aquaculture
<i>Tilapia aurea</i>	Namibia, Zambia, India	River, Lake
<i>Tilapia bakossiorum</i>	Africa, Bermin, Zambia, Cameroon	Lake, Aquaculture
<i>Tilapia baloniin</i>	Zambia	Aquaculture
<i>Tilapia bemini</i>	Africa, Bermin, Cameroon, Zambia	Lake, Aquaculture
<i>Tilapia betsileanus</i>	Zambia	Aquaculture
<i>Tilapia bilineata</i>	Zaire, Congo	Freshwater
<i>Tilapia borkuana</i>	Africa	Freshwater
<i>Tilapia hornorum</i>	Costa Rica	Freshwater
<i>Tilapia boulengeri</i>	Africa, Congo	Lake, river
<i>Tilapia breviamanus</i>	Africa	Aquaculture
<i>Tilapia browni</i>	Cameroon	Freshwater
<i>Tilapia busumana</i>	Africa, Central America	Freshwater, Lake
<i>Tilapia buttikoferi</i>	Africa	Aquaculture, river
<i>Tilapia bythobates</i>	Bermin, Bermin	Lake
<i>Tilapia cabrae</i>	Africa	Freshwater
<i>Tilapia cancellata</i>	East Africa	Freshwater
<i>Tilapia cameronensis</i>	East Africa	Freshwater
<i>Tilapia caudomarginata</i>	West Africa	Freshwater
<i>Tilapia cessiana</i>	Africa, Central America	Freshwater, River
<i>Tilapia christyi</i>	Africa	River
<i>Tilapia chungruruensis</i>	Africa	River
<i>Tilapia coffea</i>	Libraria	Freshwater
<i>Tilapia congica</i>	Africa	Aquaculture
<i>Tilapia dageti</i>	Africa, Central America	Freshwater
<i>Tilapia dardennii</i>	Tanzania	Freshwater
<i>Tilapia deckerti</i>	Cameroon	Freshwater
<i>Tilapia deschariensei</i>	S Africa	Freshwater
<i>Tilapia discolour</i>	Ghana	Freshwater
<i>Tilapia esculenta</i>	Tanzania, Uganda	Freshwater, Lake
<i>Tilapia fasciata</i>	Tanzania	Freshwater
<i>Tilapia flavia</i>	Bermin, Cameroon	Lake
<i>Tilapia galilae</i>	Egypt, Congo, Ghana, Cameroon, Uganda	Freshwater, Lake, River

<i>Tilapia gefuensis</i>	Congo, Zaire	Freshwater
<i>Tilapia girigan</i>	Kenya, Tanzania	Freshwater, Lake
<i>Tilapia grahami</i>	Kenya	Lake
<i>Tilapia grandoculis</i>	Tanzania	Lake
<i>Tilapia guieensis</i>	Europe	Freshwater
<i>Tilapia guinasana</i>	Namibia	Freshwater
<i>Tilapia guineensis</i>	Central America, Congo, Liberia, Zaire	Freshwater
<i>Tilapia gutturosa</i>	Bermin, Cameroon, Bermin	Lake
<i>Tilapia haugi</i>	Africa	Lake
<i>Tilapia heudelotii</i>	Congo, Zaire, Senegal, Zaire	Freshwater
<i>Tilapia honorum</i>	Florida, Namibia	Freshwater, River
<i>Tilapia hunteri</i>	Tanzania	Freshwater
<i>Tilapia hybrid</i>	Africa	Ponds
<i>Tilapia umbrifera</i>	Bermin, Cameroon	Lake
<i>Tilapia jipe</i>	Bermin, Kenya, Tanzania	Freshwater, Lake
<i>Tilapia joka</i>	Senegal	Freshwater
<i>Tilapia kafuensis</i>	S. Rhodesia	Fish culture in ponds
<i>Tilapia karomo</i>	Congo, Tanzania, Zaire	Freshwater
<i>Tilapia karongae</i>	Malawi, Tanzania	Freshwater
<i>Tilapia lateralis</i>	Africa	Freshwater
<i>Tilapia lateralis</i>	Africa	Freshwater
<i>Tilapia lateralis</i>	Africa	Freshwater
<i>Tilapia lauko sierra leone</i>	Africa	Aquaculture
<i>Tilapia lemasoni west</i>	Senegal	Freshwater
<i>Tilapia leonensis</i>	Africa	Freshwater
<i>Tilapia lepidura</i>	Congo, Zaire	Lake, river
<i>Tilapia leucostica</i>	Africa	Freshwater
<i>Tilapia leucosticte</i>	Congo, Tanzania, Uganda, Zaire	Freshwater, Lake
<i>Tilapia liberiensis</i>	Africa	Freshwater
<i>Tilapia lidole</i>	Africa	Freshwater
<i>Tilapia linnellii</i>	Cameroun	Freshwater
<i>Tilapia lohbergeri</i>	Cameroun	Freshwater
<i>Tilapia louka</i>	Africa, Central America	Freshwater
<i>Tilapia lucullae</i>	Africa	Freshwater
<i>Tilapia macrochir</i>	Africa	Pond culture
<i>Tilapia mackeani</i>	Zimbabwe	River
<i>Tilapia maclaren</i>	Bermin, Cameroon	Lake
<i>Tilapia macrocentra</i>	Africa	Freshwater
<i>Tilapia macrocephala</i>	Africa	Freshwater
<i>Tilapia macrochir</i>	Congo, S Rhodesia, Zaire, Zambia	River, Aquaculture
<i>Tilapia macrochir okavango</i>	Botswana	Freshwater
<i>Tilapia margaritacea</i>	Cameroun	Freshwater
<i>Tilapia mariae</i>	Africa, Central America	Freshwater
<i>Tilapia melanopleura</i>	Zimbabwe, S Rhodesia	Freshwater, Aquaculture
<i>Tilapia melanotheron</i>	Tropical	Brackish water
<i>Tilapia microlepis</i>	Tanzania	Freshwater
<i>Tilapia monody</i>	Nigeria	Freshwater
<i>Tilapia mortimeri</i>	Central Africa, Zambia	Aquaculture
<i>Tilapia mossambica</i>	Namibia, Puerto Rico, S Rhodesia	Aquaculture, Lake
<i>Tilapia multifasciata</i>	West Africa	Freshwater
<i>Tilapia mvogo</i>	Cameroun	Freshwater
<i>Tilapia nadinae</i>	Tanzania	Lake
<i>Tilapia natalensis</i>	Zimbabwe	Freshwater
<i>Tilapia nigra</i>	Africa	Aquaculture
<i>Tilapia nigripinnis</i>	Africa	Freshwater
<i>Tilapia nilotica</i>	Congo, Egypt, Namibia, Uganda, Zaire	Lake, River
<i>Tilapia nilotica nilotica</i>	Congo, Zaire	Lake, river
<i>Tilapia nilotica regain</i>	Congo, Zaire	Freshwater
<i>Tilapia nilotica upembae</i>	Congo, Zaire	Freshwater
<i>Tilapia ogowensis</i>	Cameroun	Freshwater
<i>Tilapia sparrmanii</i>	Namibia	Freshwater
<i>Tilapia aurea</i>	Egypt	Freshwater
<i>Tilapia ovalis</i>	Africa	Freshwater
<i>Tilapia pangani</i>	Kenya, Tanzania	Freshwater, Lake
<i>Tilapia pappenheimi</i>	Africa	Fresh water
<i>Tilapia philander</i>	Egypt	Mouth brooder
<i>Tilapia placida</i>	Malawi	Freshwater
<i>Tilapia pleuromelas</i>	Africa	Freshwater

<i>Tilapia pleurotaenia</i>	Africa	Fresh water
<i>Tilapia polyacanthus</i>	Zaire	River
<i>Tilapia polycentra</i>	Africa	Freshwater
<i>Tilapia guineensis</i>	Nigeria	Lagoon
<i>Tilapia rendalli</i>	Africa	Freshwater
<i>Tilapia rangii</i>	Africa	Freshwater
<i>Tilapia regain</i>	Africa	Freshwater
<i>Tilapia rendalli</i>	Africa, Central America	Lake, Aquaculture
<i>Tilapia rheophila</i>	West Africa	River
<i>Tilapia rubropunctata</i>	Tanzania	Lake
<i>Tilapia rukwaensis</i>	Tanzania	Freshwater
<i>Tilapia rumsayi</i>	South Africa	Freshwater
<i>Tilapia ruvumae</i>	Tanzania	Freshwater
<i>Tilapia ruwet zambezi</i>	Zambia	Flood plain
<i>Tilapia saka</i>	Lake Malawi, Africa	Lake
<i>Tilapia salinicola</i>	Congo, Zaire	Aquaculture
<i>Tilapia sanagaensis</i>	South Cameroun and Gabon	Freshwater
<i>Tilapia schwebischi</i>	Congo, Cameroon, Zaire	Freshwater
<i>Tilapia rendalli</i>	Malawi	Freshwater
<i>Tilapia shariensis</i>	Africa,	Freshwater
<i>Tilapia sherry</i>	Africa	Freshwater
<i>Tilapia simonis simonis</i>	Asia, Israel	Freshwater
<i>Tilapia snyderi</i>	Cameroun, Bermin	Lake, Freshwater
<i>Tilapia sparmani</i>	Congo, I. Coast, Madagascar, Zambia	Lake, Aquaculture
<i>Tilapia spilurus</i>	Africa	Freshwater
<i>Tilapia spongotroktis</i>	Lake Bermin	Freshwater
<i>Tilapia squamipinnis</i>	Africa, Tanzania	Freshwater
<i>Tilapia steindachneri</i>	Africa, freshwater fish	Freshwater
<i>Tilapia stormsi</i>	Zaire	Freshwater, River
<i>Tilapia swierstrae</i>	Southern Africa	Freshwater
<i>Tilapia tanganicae</i>	Africa, Congo, Tanzania, Zaire	Freshwater
<i>Tilapia tholloni</i>	Central America, Congo, East Africa	Freshwater, River
<i>Tilapia tholloni congica</i>	Congo, Zaire	Freshwater
<i>Tilapia tholloni tholloni</i>	Congo, Zaire	Freshwater
<i>Tilapia thysi</i>	Bermin, Cameroon, Bermin	Lake
<i>Tilapia tnyongana</i>	Volta river, freshwater fish	Freshwater
<i>Tilapia trematocephala</i>	Tanzania	Freshwater
<i>Tilapia upembae</i>	Tanzania	Freshwater
<i>Tilapia urolepis</i>	Tanzania	Freshwater
<i>Tilapia variabilis</i>	Africa, Tanzania, Congo, Uganda	River, Lake
<i>Tilapia volcani</i>	Africa	Freshwater
<i>Tilapia walteri</i>	Africa, Central America	Freshwater
<i>Tilapia woosnami</i>	Africa	Freshwater, Lake
<i>Tilapia zilli</i>	Congo, Egypt, Zaire, Namibia	Freshwater
<i>Tilapia zilii</i>	Northern Tanzania	Freshwater
<i>Tilapia ziriver</i>	Namibia	River
<i>Tilapia, Tanzania</i>	Tanzania	Freshwater

#### 4. Conclusions

Ecologically *Tilapia* has auto stock model, controlling sex ratio, size dependency, possible organic feed, controlled growth model and further popular due to their resistant and hardiness in ecological conditions, good species associations, possible enrichment and over all the sustainability may be possible, The statistical variation of fish genders and their ratio estimation are due to ecological condition. Female(f) to male(m) f/m is more under favourable conditions

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