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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<=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<=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

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/m3 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
Tilapia affinis	Africa	Freshwater
Tilapia alcalica	Tanzania	Freshwater
Tilapia alcalica grahami	Kenya	Lake
Tilapia alcalica hilgendorf	Tanzania	Endemic
Tilapia alleni	S Africa	Freshwater
Tilapia amandine	Botswana	Aquaculture
Tilapia amphimelas	Tanzania	Freshwater, Lake
Tilapia andersoni	S. Rhodesia, Zambia	Fish culture in ponds
Tilapia arnoldi	Zambia	Aquaculture
Tilapia aurea	Namibia, Zambia, India	River, Lake
Tilapia bakossiorum	Africa, Bermin, Zambia, Cameroon	Lake, Aquaculture
Tilapia baloniin	Zambia	Aquaculture
Tilapia bemini	Africa, Bermin, Cameroon, Zambia	Lake, Aquaculture
Tilapia betsileanus	Zambia	Aquaculture
Tilapia bilineata	Zaire, Congo	Freshwater
Tilapia borkuana	Africa	Freshwater
Tilapia hornorum	Costa Rica	Freshwater
Tilapia boulengeri	Africa, Congo	Lake, river
Tilapia breviamanus	Africa	Aquaculture
Tilapia browni	Cameroon	Freshwater
Tilapia busumana	Africa, Central America	Freshwater, Lake
Tilapia buttikoferi	Africa	Aquaculture, river
Tilapia bythobates	Bermin, Bermin	Lake
Tilapia cabrae	Africa	Freshwater
Tilapia cancellata	East Africa	Freshwater
Tilapia cameronensis	East Africa	Freshwater
Tilapia caudomarginata	West Africa	Freshwater
Tilapia cessiana	Africa, Central America	Freshwater, River
Tilapia christyi	Africa	River
Tilapia chungruruensis	Africa	River
Tilapia coffea	Libraria	Freshwater
Tilapia congica	Africa	Aquaculture
Tilapia dageti	Africa, Central America	Freshwater
Tilapia dardennii	Tanzania	Freshwater
Tilapia deckerti	Cameroon	Freshwater
Tilapia descharienseei	S Africa	Freshwater
Tilapia discolour	Ghana	Freshwater
Tilapia esculenta	Tanzania, Uganda	Freshwater, Lake
Tilapia fasciata	Tanzania	Freshwater
Tilapia flavia	Bermin, Cameroon	Lake
Tilapia galilae	Egypt, Congo, Ghana, Cameroon, Uganda	Freshwater, Lake, River

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

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