International Journal of Mosquito Research

ISSN: **2348-5906**
CODEN: **IJMRK2**
IJMR 2018; 5(6): 01-04

Received: 01-09-2018
Accepted: 02-10-2018

Bhubaneshwari Devi Moirangthem
Laboratory of Entomology,
P.G. Department of Zoology
D.M. College of Science, Imphal,
Manipur, India

Salam Noren Singh
Department of Statistics, Imphal
College Imphal, Manipur, India

Dhananjoy Chingangbam Singh
Laboratory of Entomology,
P.G. Department of Zoology
D.M. College of Science, Imphal,
Manipur, India

Correspondence
Salam Noren Singh
Department of Statistics, Imphal
College Imphal, Manipur, India

Lutzia tigripes (Diptera: Culicidae, Metalutzia) for the mosquito larval control: A new prospect of mosquito control

Bhubaneshwari Devi Moirangthem, Salam Noren Singh and Dhananjoy Chingangbam Singh

Abstract
The control of mosquitoes causing nuisance as well as carrier of dreaded diseases with predacious mosquito larvae had been the focus of the present paper. The larvae of species *Lutzia* were collected from breeding ground from the previously known site and smallest I instar larval stages were collected and fed on larvae of other species of mosquitoes for different larval stages. The 1st instar of this species started with consuming the skin cast and later stage started consuming the live larvae of other species of *Culex, Armigeres, Aedes* etc. hence actual reading started from II stage larva. When they are 3 days old, II stage a single larva consume 8 larvae in 48 hours before they enter the next II stage, III stage consume 14 larvae and IV stage consume 20 live larvae of *Culex*. Depending the size of larvae, the time of consuming a single larva of II stage of larva of *Lutzia* varies e.g. *Culex* larva consumed in around 10 minutes while the bigger larvae like that of *Armigeres obturbans* required at least 15 minutes to consume whole of larva. Smaller larvae like that of *Aedes albopictus* required only 6 minutes to consume. Till now there is no known literature of this species acting as carrier of certain mosquito borne disease besides this species did not bite humans, it can be safely argued that this species could be reared and released in spots where the other mosquitoes assumed to breed. The perspective of this boon of nature's larvicides to control or limit certain mosquitoes if utilized after thorough knowledge of bionomics and efficacy, would be much ecofriendly and cost free for controlling the menace of mosquitoes.

Keywords: Manipur, India, mosquitos, *Lutzia tigripes*, predacious larvae, larvicides

1. Introduction
Due to climate change, the problem in combating the mosquitoes and their effect is rather ineffective and there is need for urgent steps to minimize their effect. Besides the natural and artificial chemicals, the cannibalistic nature of *Lutzia* is very important. About 95% of mosquito species are restricted to fresh water [1] and feed generally on aquatic microorganisms such as bacteria, diatoms and algae and detritus. But some larvae from subfamily *Toxorhynchitine* and genus *Lutzia* are predatory and feed on invertebrates and other mosquito larvae [2]. Lutzia was first established by Frederick Vincent Theobald in1903 as distinct genus for a Mexican species *Lutzia bigotii* [3]. But latter Tanaka had divided the sub-genera into *Lutzia, Metalutzia* and *Insulultzia* [4]. At the moment there are eight extant species under the genus *Lutzia*. They are lone species under *Lutzia shinonagai* [5], two species under subgenus *Lt. allostigma* Howard, Dyar and Knab, *Lt. bigotii* (Bellardi, 1862), and five species under *Metalutzia* Tanaka: *Lt. agranensis* Singh and Prakash 2008, *Lt. fuscana* (Wiedemann, 1820), *Lt. halifaxii* (Theobald, 1903), *Lt. tigripes* (de Grandpre and de Charmoy, 1901), *Lt. vorax* Edwards, 1921 [6]. From India according to Tyagi [6] reported four species of subgenus *Metalutzia* viz., *Lt. agranensis*, *Lt. fuscana*, *Lt. halifaxii* and *Lt. vorax.* Out of reported 111 mosquito species 83 are *Culcine* mosquitoes under 13 genera [7] but no name mention of *Lutzia* from the mosquito diversity of Manipur.

In the present study the efficacy of larvae was analyzed in the light of the statistics. The prospect of this species as biological control is thoroughly study. The perspective of this boon of nature's larvicides to control or limit certain mosquitoes if utilized after thorough knowledge of bionomics and efficacy, would be much ecofriendly and cost free for controlling the menace of mosquitoes.

Further studies on the prey preferences could through lights on the importance of the larvae for controlling particular species and obviously the particular disease.

2. Materials and Methods

Larval stages of mosquito were collected from three breeding ground of Urembam, Imphal West during 13th April and 21st April, 2018. The immature larval stages were reared with appropriate foods in beakers till the emergence of adults and identification of the species was done from larvae, pupa and adults (female + male individuals). The identification keys followed in present studies included: Darsie [3], Lane [8], Bram [9], Tanaka [5], Hopkins [10].

Fig 1: *Lutzia tigripes* larvae capturing the *Culex* larva (left) and adult male (right)

3. Results

The observation of consumption of larvae starts from 2nd instar since the 1st instar consumed only the cast skin. A single larva of *Lutzia tigripes* consumed 400 to 500 larvae of *Culex* with an average of 40 to 50 larvae a day (Table 1). The larvae of *Lutzia tigripes* were effectively feeding on any mosquito larvae of any species by chewing. The duration of each meal varied according to the size of larvae or species e. g. *Armigeres* sp. were fairly bigger than most of species of the *Culex* sp. while *Aedes* were intermediates. The duration of meal was ranging between 7 to 12 minutes for different species and size of the larvae. Each instar consumed in average of 156 larvae consuming 456 to 528 in all ((Table 1). The replication of four shows fairly constant rate of consumption and consistent structures (fig. 2).

Table 1: The table showed the number of mosquito larvae, *Culex* sp. consumed in hours for each instar in four replicates/reading of a single *Lutzia tigripes* in the laboratory condition.

		No. of larvae consume		
Instar	**I**	**II**	**III**	**IV**
1st	0	0	0	0
2nd	96	96	72	48
3rd	120	144	144	168
4th	240	288	240	240
Total	456	528	456	456

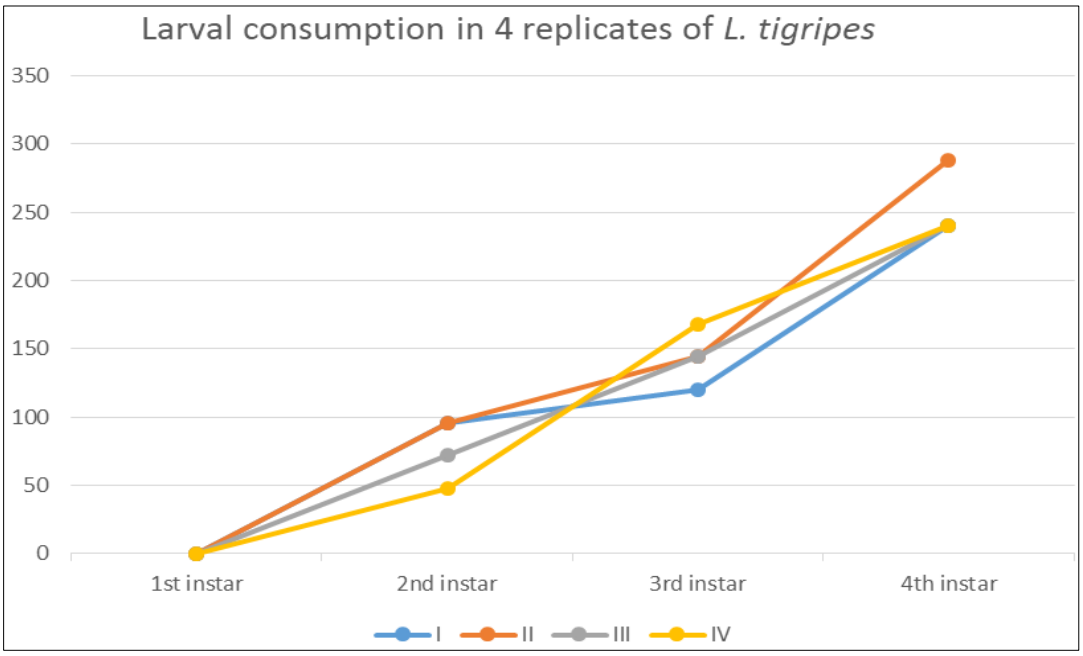

Fig 2: The efficacy of *Lutzia tigripes* base on data of table 1.

4. Discussion

Base on the available data there are 111 species of mosquitos, 83 species are *Culcine* under 13 genera from Manipur [7] in which seven species are new reports from the state. The present report of the *Lutzia* species from the state is first of its kind.

The genus *Lutzia* Theobald is a small genus with only seven [11] or eight species [12]. It was originally described as a genus by Theobald (1903) but reduced to a subgenus of *Culex* by Edwards (1932). Now it is elevated again to generic rank by Tanaka [5]. He also created three new subgenera, i.e., *Metalutzia* Tanaka for the Asian, African and Australasian species, the monotypic subgenus *Insulalutzia* Tanaka for *Lt. shinonagai* Tanaka, Mizusawa and Saugstad, while the subgenus *Lutzia* Theobald applies to the two Neotropical species. He likewise removed *Lt. vorax* (Edwards) from synonymy with *Lt. halifaxii* Theobald. All these changes were based on the morphology of the pupa [3]. From India according to Tyagi [6] reported four species of of subenus *Metalutzia* viz., *Lt. agranensis*, *Lt. fuscana*, *Lt. halifaxii* and *Lt. vorax*. *Lt. fuscana* has been reported from Kolkata [13] and Rajasthan [14].

Report of this predacious mosquito from Manipur is unexpected as this species is exclusively for the Afrotropical region. Four species of the subspecies of *Lutzia* (*Lt.*) are reported but not the *Lt. tigripes* from India. Is this the remnant of the Pangea or any introgression of the local species will be very valuable question to answer for academic as well as the bio-geographic point of view in future. Further studies on the larvae and adult mosquitoes of the subgenera *Metalutzia* from more study sites and through molecular as well as cytogenetic studies will be more concrete evidenced of the occurrence of the predacious mosquito from Manipur. In future controlling of the virus borne mosquito could be attempted studies through thorough bionomic studies of the species.

The predatory preferences of *L. tigripes* reported by Himmat [14] and Jeyanthini and Vinobaba [15] included *Aedes* and *Chironomus. Culex* species were at the bottom. The present study was done mainly with the larvae of *Culex* species but study included the different species like *Aedes, Armigeres, Pseudoculex* etc to test whether they are eaten by the larvae. But in future the prey preference would be much better.

The use of predatory larvae/insects is a safe means where use of chemicals or insecticides are not possible as water is used as potable. Limited available of water and very less available breeding containers as a result of that species of mosquito show niche sharing which might have changed this predatory species feeding preference from *Culex* to *Aedes* species or any other species. Therefore, the predatory species becomes more targeted in absence of large outdoor breeding sources [14]. Introduction of prey comes under environmental management strategies that can reduce or eliminate vector breeding through use of biological controls that target and reduce vector larvae without generating the ecological impacts of chemical use. The approach is cost-effective, ecological balanced and sustainable for vector control if used in this type of climatic condition where mostly outdoor breeder larvae are restricted in pockets. The fig. 2. shows that the increase of efficacy with increase in the stage of larvae as reported by Appawu *et al*. [16] Jin *et al*. [17] argued that the predatory larvae attack on most on its equal sized prey larvae attacking them at the joint of head and thorax but in present study there is no precision attack but random (fig. 2 left at the tail region). Ikeshoji [18] used larvae of *Lutzia* (Metalutzia) *fuscana* to control *Cx quinquefasciatus* larvae in small ditches in simulated field conditions.

5. Conclusion

Lt. tigripes from Manipur, India is an unexpected but might be remnant of the Pangea. The larvae of this species could be used to control the pathogenic vectors at specific sites. Depending the size of larvae, the time of consuming a single larva of II stage of larva of *Lutzia* varies e.g. *Culex* larva consumed in around 10 minutes while the bigger larvae like that of *Armigeres obturbans* required at least 15 minutes to consume whole of larva. Smaller larvae like that of *Aedes albopictus* required only 6 minutes to consume. Till now there is no known literature of this species acting as carrier of certain mosquito borne disease besides this species did not bite humans, it can be safely argued that this species could be reared and released in spots where the other mosquitoes assumed to breed. The perspective of this boon of nature's larvicides to control or limit certain mosquitoes if utilized after thorough knowledge of bionomics and efficacy, would be much ecofriendly and cost free for controlling the menace of mosquitoes. Further studies on the prey preferences could through lights on the importance of the larvae for controlling particular species and obviously the particular disease.

6. Acknowledgement

We are indebted to the Principal and HOD, P. G. Department of Zoology, D M College of Science, Imphal for providing laboratory facilities. The authors are also thankful to the Ministry of Science and Technology, Department of Biotechnology, GOI for the financial assistance under No. BT/IN/Indo-US/ Foldscope/39/2015 dated 20/03/2018.

7. References

1. Grueber WB, Bradley TJ. The evolution of increased salinity tolerance in larvae of *Aedes* mosquitoes: A phylogenetic analysis, physiological Zoology. 1994; 67(3):566-579.
2. Rajasekharan PT, Chowdaiah BN. Biological markers in feeding experiments of mosquito larvae (*Culex* (*Lutzia*) *raptor*). Experientia. 1972; 28:981.
3. Darsie Richard F Jr. Description of the pupae of three species of the genus *Lutzia*, a comparison of new and old world pupae, and a key to pupae and larvae of the genus (Diptera: Culicidae). Proceedings of Entomology Society Washington. 2006; (108, 1):145-154.
4. Tanaka K, Mizusawa K, Saugstad ES. A revision of the adult and larval mosquitoes of Japan (including the Ryukyu Archipelago and the Ogasawara Islands) and Korea (Diptera: Culicidae). Contributions of the American Entomological Institute. 1979; 16:1-987.
5. Tanaka K. Studies on the pupal mosquitoes of Japan (9) Genus Lutzia. with establishment of two new subgenera, Metalutzia and Insulalutzia (Diptera, Culicidae). Japanese Journal of Systematic Entomology. 2003; 9:159-169.
6. Tyagi BK, Munirathinam A, Venkatesh A. A catalogue of Indian mosquitoes. International Journal of Mosquito Research. 2015; (2-2):50-97.
7. Dutta P, Khan SA, Sharma CK, Mahanta J. Biodiversity of mosquitoes in Manipur State and their medical significance. Journal of Environmental biology. 2005; (25-3):531-538.
8. Lane J, Neotropical Culicidae. 2 Volumes, Sao Paulo, Brazil. 1112 pp. Penn, G. H. 1949. Pupae of the mosquitoes of New Guinea. Pacific Science. 1953; (3):3-85.
9. Bram RA. Contributions to the mosquito fauna of Southeast Asia-II. The genus Culex in Thai- land (Diptera, Culicidae). Contributions of the American Entomological Institute. 1967(2-1):1-296.
10. Hopkins GHE. Mosquitoes of the Ethiopian Region I-Larval Bionomics of Mosquitoes and Taxonomy of Culicine Larvae. Second Edition. British Museum (Natural History), 1952, 355.
11. Theobald FV. A monograph of Culicidae or Mosquitoes III, London. 1903; xv:I-354.
12. https://en.wikipedia.org/wiki/Lutzia
13. Mahir Kumar Pramanik, Gautam Aditya. Immatures of *Lutzia fuscanus* (Wiedemann, 1820) (Diptera: Culicidae) in rice fields: implications for biological control of vector mosquiotes. Asian Pacific of Tropical Medicine. 2009; (2-3):29-34.
14. Himmat Singh, Robin Marwal, Anusha Mishra, Karam Vir Singh. Predatory habits of *Lutzia* (*Metalutzia*) *fuscana* (Wiedmann) (Diptera: Culicidae) in the arid

environments of Jodhpur, western Rajasthan, India. Arthropods. 2014; 3(1):70-79.
15. Jeyanthini P, Vinobaba M. Feeding preference of the predatory larvae of genus *Lutzia* (Diptera: Culicidae) Proceedings of the Third International Symposium, SEUSL: Oluvil, Sri Lanka, 2013, 6-7.
16. Appawu MA, Dadzie SK, Quartey SQ. Studies on the feeding behaviour of larvae of the predaceous mosquito *Culex* (*Lutzia*) *tigripes* Grandpre and Chamoy (Diptera: Culicidae). Insect Science and its Application, 2000; 20(4):245-250.
17. Jin LQ, Luo JM, Fu YC *et al*. Prey and feeding behavior of larval *Culex* (*Lutzia*) *fuscanus* (Diptera: Culicidae) in Shantou, Guangdong Province, China. Journal of Medical Entomology. 2006; 43(4):785-786.
18. Ikeshoji T. Bionomics of *Culex* (*Lutzia*) *fuscanus*. Japanese Journal of experimental Medicine. 1966; 36:321-334.