

ECOLOGY OF THE FAMILY CHIRONOMIDAE (DIPTERA)
WITH PARTICULAR REFERENCE TO
THE NORTH-EASTERN HILL REGIONS OF INDIA

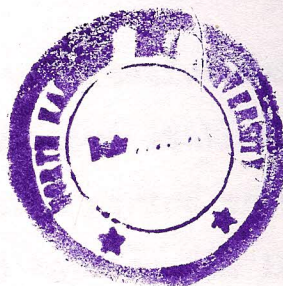
ABSTRACT

MANASHI DASS GUPTA

DEPARTMENT OF ZOOLOGY
SCHOOL OF LIFE SCIENCES

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THE NORTH-EASTERN HILL UNIVERSITY
SHILLONG - 793001
INDIA

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A detailed investigation on the population dynamics and the abiotic factors were carried out in two lentic and two lotic systems, from the hill regions of North East India with particular reference to the larvae of the family Chironomidae. The lentic systems undertaken were situated in the district of Garo Hills, of the State of Meghalaya, called the Tasek and the Chitmareng lakes. Both the lakes situated about 225 m above the sea level, were tectonic in origin. The Chitmareng lake is one-tenth the size of the Tasek lake. Only one station was chosen in the former and three in the latter. The lotic systems were the two major stream systems, Umkhrach and Umshirpi, originating at an altitude of about 1,500 m to 2,600 m in the general location of the greater Shillong plateau, again in the State of Meghalaya. Five stations were chosen on the stretch, from their origin to their joining of the other system. In addition the general water quality prevalent, was also considered in the choice of these stations.

Both quantitative and qualitative data were gathered for the Chironomid larvae at the various stations of both the lentic and the lotic systems for a total period of two and a half years. The time, was, however, divided between the lentic and the lotic systems. The lentic systems were analysed first, between the period February 1977 and June 1978, followed up immediately on the work on lotic systems from July 1978 to August 1979. In addition to the biotic analysis, a number of physico-chemical parameters were taken up simultaneously to indicate their effect on these biotic communities. Along with these long term investiga-

tions, emergence studies of adult Chironomids were taken up for a brief period of four months at one station for one of the lotic systems.

The results analyzed, have indicated, that the lentic systems possessed six genera under two sub-families, Tanypodinae and Chironominae. The total absence of the genus Chironomus at all the stations in the lentic systems was itself sufficient an indicator for the possible oligotrophic nature of the system. However, the general population, amounting to a maximum density of 1,500 larvae/m², irrespective of the genera, reflected the paucity of this fauna and indicated the low species diversity in such tropical situations. Of the six genera recorded in the present investigation in the lentic systems, the genus Tanypus was not only present at all the stations, but was also the dominant group. Further, it was this genus, in contrast to all the others, which showed a definite winter maxima and a summer minima. All the other genera wherever and whenever present in these lentic systems, showed a trend in the reverse. The physico-chemical factors on analysis revealed the usual trend of fluctuations as would normally be expected in a lentic system. This is indicated by the higher oxygen values during winter in contrast to the other factors and vice versa in summer. Both density-dependent and density-independent factors were seen to be in operation in the lentic systems for the population build up of the individual genus. Tanypus seemed to be a summer population not requiring higher oxygen levels but possibly greater depth and higher temperature. Moreover, as they are known to be carnivorous all other

genera predominantly are observed to be overwintering populations and in particular the genus Clinotanypus. There seemed to be a symbiotic relationship between the genus Tanypus and Clinotanypus in regard to the maximal utilization of these lentic systems.

In regard to the two lotic systems, again, there was a clear indication of the paucity and diversity of the Chironomid fauna. Though six genera were also present in these lotic systems, their composition were completely different from that of the lentic systems, except for the genus Tanypus, which also occurred but not to the extent as in the lentic systems. These six genera in the two lotic systems undertaken were seen in the different stations to comprise of distinct communities. However, the genus Chironomus played a major role in the establishment of such communities creating biotopes within the systems. Further, there was an increase in the abundance of this genus Chironomus as one traverses the length of the lotic systems from the headwaters downwards, with the total establishment of the genus Chironomus only at stations at lower altitudes with a total elimination of the other genera. As the physico-chemical parameters were also analysed, it did indicate that factors like siltation and lowering of oxygen levels, probably due to refuse joining the streams when it passes through urban areas, helped in the establishment of the genus Chironomus, known, not only, for its hardiness, but as an indicator of pollution also. Most genera revealed a single peak of abundance and in particular the genus Brillia, which was next only to the genus Chironomus in terms of abundance, with a summer maxima and winter minima. The genus

adding to this phenomenon. Moreover, the possibility of the

Chironomus, however, showed a bimodality in their trend of fluctuation with winter maxima and late spring or early summer minima, confirming the hardiness of that genera with an overwintering population, especially in the region under consideration where the mercury drops to a significant low level. There were, however, differences not only between the stations of the individual lotic systems, but also between the systems. It, therefore, necessitated to identify these not only as distinct biotopes, but the individual stations were habitats themselves with such differences as had been found in other similar systems though separated by geographical distances. One clear picture which emerged, was, that the Chironomid larvae in the present investigation seemed to recognize absolute boundaries and hence useful in stratification for quantitative sampling in future studies.

In addition to the general population studies of the larvae at the generic levels and the related physico-chemical parameters, the genus Chironomus occurring in the lotic systems were analyzed further into their age-class distribution and the seasonality of such stages. The general overwintering population of the genus Chironomus was identified by this analysis to comprise predominantly of the fourth instar larvae. The first three instars revealed summer peaks. The behaviour of the age grouping between the two lotic systems differed. The summer months, which in these regions is simultaneous with the monsoon, revealed the low abundances of the first two age-classes or instars probably due to the washing away by increased floods and the gradient adding to this phenomenon. Moreover, the possibility of the

shortening of the life cycle could also not be ruled out.

Finally, studies on the adult emergence for a brief period of four months indicated an increase in the females than the males. The peak periods of emergences, during the summer months, confirms the above contention from the studies of population dynamics, and the age-class for the establishment of an overwintering population of this genus Chironomus in the lotic systems of these regions.

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