DISTRIBUTION AND ABUNDANCE OF TWO DIPTERAN AQUATIC - LARVAE IN NORTHERN LAKE VICTORIA

BY

GODFREY •• MBAHINZIREKI

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UFFRO Jinja.

ABSTRACT

Initial findings on the distribution and abundance of two dipteran larvae in an ecologically and environmentally changed northern Lake Victoria are presented Results suggest that density of Chironomid larvae seem to have gone up about four-fold since the pre-perch era and that of chaoborid larvae maintained at more or less the same level. Possible reasons for this increase are proposed. Inshore stations held higher densities of larvae when compared with the offshore station of Bugaia. Type of the sediment and physico-chemical factors seem to influence the production and distribution of the insect larvae in the lake. Body length did not suggest anything conclusive yet as the identity of the individual larval groupsis still unclear. More work remains to be done.

INTRODUCTION

Recent studies on the benthic fauna of the northern Lake Victoria ave revealed the existance of Chironomid and Chaoborid larvae in substantial quantities. The two groups of insect larvae were singled out of many other zoobenthos that are found in the lake because they are most common, abundant, (Mbahinzireki, 1991) and important in the Iisheries. Examination of the gut contents of many fish specimens from the lake shows that larvae of these insect groups constitute a 3ignificant proportion of the total food items consumed.

Therefore, like many other aquatic invertebrates, the larvae are important in the foodweb of the lakes ecosystem. They are also important converters of organic materials into animal protein for use by organisms at higher trophic levels including fish.

Despite the demonstrated importance of these invertebrates, there are hardly any previous studies on them to compare with. The information available on work by Macdonald (1956) and Tjonneland (1962) mainly refers to the biology and flight activities, respectively, of the African midge. Yet, the current information refers to studies conducted on the lake long after it has undergone some environmental and ecological changes

The introduction of the exotic fish species, namely the Nile perch and Nile tilapia in L.Victoria more than two decades ago has given rise to other ecological changes in the lake. These include reduction in fish stocks, fish species diversity and trophic groups. As a result most of the native fish species have declined to near extinction (Ogutu-Ohwayo 1990).

Furthermore, the lake basin itself is undergoing considerable changes as a result of increasing human population, hence increased human activity in form of land and water use for agriculture, recreation, urbanisation and industrialisation. There is some evidence to suggest that the lake is becoming eutrophied as indicated by frequent algal blooms, localised fish kills, anoxia in bottom waters and high nutrient input through effluents and precipitation (Reeky & Bugenyi, 1989). All these activities are having great impact on the functioning of the ecosystem and any investigations carried out on the lake have to take into account of such dynamic changes

The present paper attempts to provide some information on the present status regarding distribution and abundance of Chironomid and Chaoborid larvae in the changing ecosystem of L.Victoria.

MATERIALS AND METHODS

(a) Sampling

Most of the inshore stations (10-28m) of the lake, namely Napoleon Gulf, Buvuma Channel and Pilkington Bay and, the offshore deep station of Bugaia (60-65m), Fig.1, were sampled at least once a month. Sediment samples were collected using the Ponar Grab, whose ~~the~~ grabbing surface area is 262.5 square cm.

At each station, the following activities were carried out:

(i) Measurement of the lake depth using the Hydrolab or simply by sounding;

ii) Measurement of temperature and dissolved Oxygen with the Hydrolab;

iii) Collecting two samples of the bottom sediment, noting the nature and type of the sediment;

iv) Washing the sediment in a sievenet of 400 Um mesh size;

v) Preservation of the recovered animal specimens in 10% formalin.

(b) Treatment of the sample in the laboratory.

The animals were sorted by taxon and identified as far as possible using a stereo microscope of X30 magnification. All the specimens of each taxon were counted to compute their densities and total length of Chironomid larvae from each sample was measured on a millimetre graph paper. Each taxon was finally stored separately in 5% formalin.

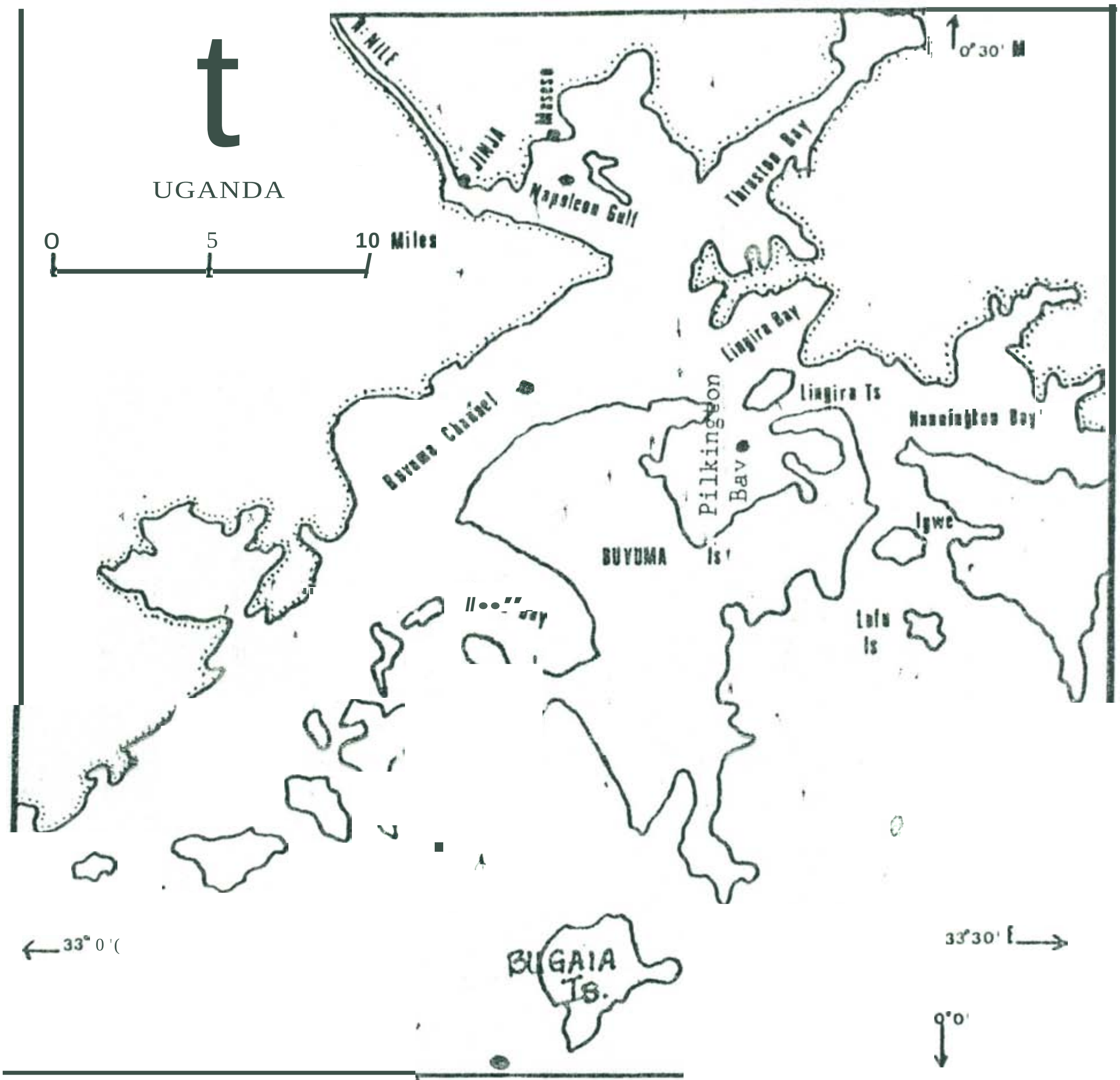

FIG. 1: Northern Lake Victoria showing sampling sites.

RESULTS'

Tables 1 and 2 present densities of Chironomid and Chaoborid larvae per square metre, respectively. The results so far show that the larval organisms are well represented in almost every sediment *sample* taken from the various stations. Densities of Chironomid larae fluctuated between ~~22~~ 200 and 4600 individuals per m^2 in the inshore lake sediment and, between around 20 and 250 individuals per square metre, rarely exceeding 500 larvae per square metre in the offshore station. A high density of 2057 was recorded in May, 91 in Bugaia. Chaoborid larvae densities varied between 38 and around 1600 individuals per metre squared in inshore stations; highest record of 3296 being registered in July, 90, in Buvuma Channel. Like in the case of Chironomid larvae, offshore waters of Bugaia registered the lowest amount of Chaoborid larvae, between 19 and 100, rarely exceeding 150 larvae per square metre.

The tables also show that there are several months which were not sampled.

Figure 2 shows fivej raPhs of the body lengths of Chironomid larvae collected from Pilkington Bay during certain months of 1991. In anyone sample taken and at anyone time, almost all the size groups were well represented. Most of their total length sizes ranged between 3 and 16mm.

DISCUSSION

The initial research findings show that substantial quantities of Chironomid and Chaoborid larvae abound mostly in the inshore sediments of the northern lake. The two groups of dipteran larvae are so common that they are found in almost every sample of sediment taken at anyone time. Their densities fluctuate within certain limits whose levels and influencing factors are yet to be determined

Inshore lake bottom is richer in larvae Compared with the deep offshore station of Bugaia. The tables also seem to suggest that the period from the month of May to August, a period of complete mixing yields high quantities of these larvae and get poorer towards the end of the year. More investig3tions are needed in order to confirm the assertion.

There are a few evidences to suggest that the two insect larvae, particularly those of Chironomid have increased in densities over time. Macdonald (1956) reports that he estimated an average density of 1000 and 2000 - 2500 of Chrronomid and Chaoborus larvae, respectively per square metre in Ekunu Bay (Lingira bay). Chironomid larvae are presently more abundant than the Chaoborid larvae which become planktonic during the night. Analysis of stomach contents of the catfish, Synodontis afrofischeri, caught in the Napoleon Gulf last year revealed that over 80% of the food content was contributed by larvae and pupae (10%) of Chironomidae. The Nile tilapia, a well - known phytodetritus feeder is presently reported to in-corporate a good amount of Chironnomid larvae in its diet (Balirwa, 1989)

Further evidence is given by the frequent masses of lakeflies which are seen moving over the lake, a phenomenon which was rare in the past.

The increase in insect larvae may partly be explained by a few ecological changes that have taken place in the lake in the recent past. The decline in the cichlid haplochromines, some of which were insectivorous and, other carnivorous catfishes has also led to the reduction of predation pressure. Haplochromines used to constitute a large proportion of the lakes ichthyomass (Kudhongania and Cordone, 1974) before the 80's. Although the juvenile Nile perch often feed on these insect larvae, the bulk of their diet is mainly Caridina nilotica as shown by examined stomach contents. Yet, to date over 70% of the lake's ichthyomass is Lates niloticus. It can also be argued that increased phytobiomass and that of Zooplankton has favoured increased production of the larvae as most of them are carnivores and detritivores. However, increased anoxic conditions of the deeper layers of lake may have affected the biomass of Chaoborid larvae which are sensitive to low levels of dissolved Oxygen but with low effects on Chironomid larvae.

All possible factors affecting the distribution and abundance of the benthic fauna are not yet fully investigated and understood. However, the type of the bottom sediment seems to affect the distribution and abundance of the larvae. For instance, the density of Chironomid larvae was generally low in hard rocky bottom, gravel and compact sandy bottom, higher in loose sandy bottom and, far higher in soft mud. The bottom substrate of most stations sampled, especially those in bays is mostly soft mud. This could account for the observed high quantities of Chironomid larvae in those areas. Certain localities of the bottom in Napoleon Gulf and Buvuma Channel have hard gravel substrata or sometimes loose sand. The lake bed of Bugaia waters consists of hardened sandy rock and therefore relatively poor in benthic fauna. On a few occasions sediment samples of this station contained none of these larvae. This finding may have some implication in the distribution of the bottom feeding fish species in these waters. Fish may be scarce.

It should be pointed out that compared to other lakes, like Albert and Kyoga, whose benthic fauna are being investigated, L. Victoria is by far richer in the larvae of the two insects (Mbahinzireki, unpublished data).

Not much can be concluded at this stage, on the various length sizes represented in the samples of the Chironomid group. The various size-classes may be representing particular instars of the various species or that the group is simply a continuous breeder. This problem can only be overcome after the larvae have been identified into their genera/species. However, at least 4 to 5 genera of Chironomidae are common, namely, Chironomus, Tanypus, Forcipomyia, procladius and Ablabesmyia. There could be more genera in the lake as reported by Freeman and Cranston (1980). Macdonald (op. cit.) could only recognise two species of Chaoborus, C. anomalus and C. species B in Lake Victoria.

More work remains to be done in order to fully understand the biology and ecology of the benthic insect fauna and how their distribution and abundance could influence the produdtion of fish in the lake. There are still gaps to fill especially in respect to production, seasonality and taxonomy. Such knowledge would help in formulation of management and development policies for the new and altered fisheries of L.Victoria

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Table. 1. Densities of Chironomid larvae (individuals/m^2) collected from various stations during various months of 1990/9

Station	Year	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
NAP. GULF(12-17m)	1990	*	*	191	•	4248	2337	*	*	*	-	*	*
	1991	*	781	•	•	1991	1734	943	381	•	*	*	572
BUVUMA CHAN.(22-28m)	1990	•	•	•	•	•	•	4629	895	•	•	•	•
	1991	•	3962	*	*	•	591	200	443	•	•	*	
PILKI-NGTON BAY(10m)	1990	*	*	*	*	*	*	3391	*	?10	*	*	•
	1991	*	*	•	•	1104	4534	1962	476	*	2686	*	•
BUGAIA (60-65m)	1990	•	*	•	•	•	*	756	19	248	57		
	1991	19	*	•	-	2057	172	19	*	229	-	114	

• No sample taken

No specimen recovered in the samples

Table 2. Densities of Chaoborid larvae

	1990	*	*	*	*	*	*	25	57	59		152	19
BUGAIA (60-65m)	1991	29	*	*		38	229	76	*		19	19	

No Specimen recovered *: No sample taken