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PRELIMINARY SURVEY OF THE DIVERSITY OF INSECTS OF HADEJIA- NGURU WETLANDS

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Abstract: Threats to the aquatic ecosystem by human activities constitute threats to the biodiversity of such ecosystem, which affect the quality of human life in the wetland area, either directly or indirectly. The Hadejia-Nguru wetlands consist of several temporary and permanent floods and drylands. Aquatic insects and the aquatic stages of some terrestrial insects were sampled using water net, plankton net, sweep net, pitfall traps and pooters from seven locations in the wetland. Collected insects were identified using several keys. Twenty species of aquatic insects belonging to seven orders were recorded. With the highest diversity observed at Nguru Lake which is a permanent water body. The order hemiptera is the most represented taxa in the wetland. Factors such as draught, pollution, macrophyte cover, nature of substratum were implicated as affecting the diversity and species richness of the aquatic insects in the wetland. It was recommended that the present survey be extended to cover a seasonal and spatial study of the insects, as well as investigating the interaction within and between species, in order to establish vital links among insects and other organisms that inhabit the wetland.

Keywords: Diversity, Ecosystem, Hemiptera, Macroinvertebrates,

INTRODUCTION

Insects are important components of food chains and webs of the aquatic ecosystem. They play a key role in maintaining ecological balance in this system. Aquatic insects account for more than 80% of taxa in freshwater macro invertebrates (Briers and Briggs, 2005). Insects also contribute food for many other aquatic organisms, including some Macro invertebrates, amphibians and water birds. Many species including mayfly nymphs are avidly eaten by many species of fish (Boorman, 1981) and thus contribute towards fish production and the economy of wetland areas. Insects also contribute food for many other aquatic organisms, including some Macro invertebrates, amphibians and water birds. Some insects like dragonflies and stoneflies are voracious predators, especially at the aquatic nymphal stages. These insects feed on mosquito larvae and other insects and arthropods, and so have considerable potentials for biological control by reducing the populations of the pests. Generally, the diversity of invertebrates, including insects is much higher in the aquatic system than in terrestrial environment (Egborge, 1993). According to Boorman (1981) the presence of nymphs of dragonflies, mayflies, and damselflies in water bodies is an indication of absence of pollution. Since these insects are intolerant of moderate to high levels of pollution. Threats to the aquatic ecosystem resulting from pollution, draught, introduction of industrial wastes and pesticides among others constitute threats to the biodiversity of such ecosystem. As in other ecosystems, insects of the wetlands affect the quality or standard of human life in the wetland area, either directly or indirectly. This survey was designed to investigate the biological diversity of aquatic (water dependent) and water related insects of the Hadejia – Nguru wetlands (HNW).

METHODOLOGY

The main objective of this survey is to produce an inventory of the aquatic and water related insects of the HNW. Therefore, the techniques adopted are essentially to provide qualitative rather than quantitative data.

STUDY AREA

The Hadejia – Nguru wetlands lies between latitudes 12°10N and 13°N and longitudes 10° 15E and 11° 30E. Since this is a preliminary survey, seven (7) permanent water bodies were selected for collection of samples. Details of geographical locations and activities of the site are provided in Appendix 1.

SAMPLING AQUATIC INSECTS

Aquatic insects and the aquatic stages of some terrestrial insects were sampled using water net and in some occasions plankton net (Williams, 1987). The water net is a smaller version of the sweep net, having a stronger and more rigid frame with a diameter of 15cm and a smaller bag of about 20cm depth. The water net was dipped repeatedly into water bodies and dragged through submerged and floating vegetation where samples were collected. The net was also dug into the mud or sand at the bottom of water bodies to collect benthic organisms as well as those attempting to escape capture following disturbance of the water. The insects collected were preserved in 10% formalin.

Sampling Ground Insects near Water Bodies

Crawling insects and those resting on the ground near water bodies were sampled using pitfall traps as described by Chinery, (1976). Depending on the size of insects Pooters are also used as described by MAFF (1986).

Sampling Insects on Vegetation and Walls

The sweep net method of collecting flying insects during flight (Chinery, 1976) was used. The sweep net consisted of an adjustable handle (2 – 3m long) a round frame of about 40cm in diameter and a bag of mosquito net. Adult mosquitoes resting on walls and other surfaces were captured using an aspirator as described by Service (1980).

Identification of Insects

Specimen of Insects collected from various sites were identified using keys in Reid (1989), Richards and Davies (1977) and Rosenzweig (1995). The species identification was confirmed at the Entomology Museum of the Department of Crop Protection of the Institute of Agricultural Research, Ahmadu Bello University Zaria.

RESULT AND DISCUSSION

Twenty species of aquatic insects belonging to seven orders were observed during the survey of the HNW. This is much lower than the 52 species of aquatic and water related insects recorded in the same wetland by Molta (1997). This decrease may not be unconnected with the increased human activities within the wetlands. This is because, according to Heino *et al;* (2007) the assemblage composition of both stream and Lake Macroinvertebrates has been found to be determined by multiple variables, ranging from local habitat characteristics to regional climate and geographical factors. The most obvious change in the HNW since 1997 is the proliferation of aquatic macrophytes. And localized changes in environmental conditions (e.g Substratum, Particle size, Macrophyte cover) disrupt expected species richness (Heino and

Paasivirta, 2008). There are variations in species diversity in the different sites sampled. Nguru Lake has the highest diversity, where all the seven orders of insects observed are represented. Kirikasamma Flood is having six orders. Baturiya, Maikintari Flood and Dagona were each having five orders while Tukuikwi Flood and Hadejia barrage were having four and three orders respectively (Appendix 2). Biodiversity patterns exhibited by aquatic insect assemblages are complex. This complexity is seen in the environmental relationships of both species richness and assemblage composition (Heino, 2009). Species richness is typically positively related to habitat complexity in terms of substratum and plant cover in water bodies (Heino and Korsu, 2008). The seven sampling sites had different types of vegetation cover, although all the sites are infested with *Typha latifolia*, but to different degrees of complexity. Another factor that is responsible for the species richness at Nguru Lake is permanence of the water body. According to Urban (2004) permanent ponds typically support higher numbers of species than temporary ponds, and diversity increases with increasing degree of permanency. This view is further corroborated by Lake (2003) who opines that another form of disturbance affecting aquatic insects is draught. Studies showed that temporary streams support fewer species of insects than permanent streams. This is because drying out of streams present severe challenges to the life history of aquatic insects.

The order Hemiptera is the most widely occurring order of insects in the wetland. Members of this order were present in the entire sites surveyed. The insects observed include some predaceous hemipterans such as *Macrocoris convexans* and *Micronecta* sp that feed on other aquatic insects, young frogs and tadpoles (Fitter and Manuel, 1986). Therefore, they have the potential for biological control of noxious insects including mosquito larvae that mature into vectors of human diseases such as malaria, yellow fever, and filariasis. However, *Macrocoris convexans* is an established predator of small fishes and other invertebrates. Therefore, it can reduce fish production of water bodies. This is of great significance for the wetland, which is famous for fish production (Hollis *et al*; 1993).

CONCLUSION

Changes to the HNW ecosystem, as a result of anthropogenic activities like eutrophication due to application of chemical fertilizers, disrupting the flow of rivers and streams in the wetland and introduction of exotic species of aquatic macrophytes have adversely affected the species richness of aquatic and water related insects and the overall ecological balance of the wetland.

RECOMMENDATIONS

The list of aquatic and water related insects produced during this short survey are by no means exhaustive. Therefore, for a full inventory of the insects and for effective conservation of biological diversity of the Hadejia – Nguru wetlands it is important that the present survey be extended to cover a seasonal and spatial study of the insects, as well as investigating the interaction within and between species, in order to establish vital links among insects and other organisms that inhabit the wetland. This has unknown consequences for fish and water fowl that prey on whose organism and for the overall ecological balance of the wetland.

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Appendix 1: Specific Locations of Sampling Sites used in the Survey

Site	Geographical co-ordinates	Elevation
Baturiya (BTR)	12° 27.889'N, 10° 17.958E	362m
Hadejia Barrage (HDB)	12° 26.343'N, 10° 01.905'E	358m
Maikintari Flood (MKF)	12° 38.959'N, 10° 13.750E	349m
Kirikasamma flood (KKF)	12° 40.631'N, 10° 15.099E	347m
Tukwikwi Flood (TKF)	12° 49.258'N, 10° 20.939E	344m
Nguru Lake (NGL)	12° 50.448'N, 10° 24.037E	345m
Dagona (DGN)	12° 50.640'N, 10° 45.152E	348m

Appendix 2: Number of Species of Aquatic Insects observed at the Sampling Sites.

Insect order	**Numbers of Species at Different Sites**						
	BTR	HDB	MKF	KKF	TKF	NGL	DGN
Coleoptera	2	1	2	3	1	3	2
Diptera	1	1	1	1	0	2	1
Ephemeroptera	1	0	0	1	0	1	0
Hemiptera	2	2	3	4	2	5	3
Odonata	2	0	1	0	0	2	1
Placoptera	0	0	0	1	1	1	0
Zygoptera	0	0	1	1	1	1	1
Total	**8**	**4**	**8**	**11**	**5**	**15**	**8**

KEY
BTR - Baturiya
HDB - Hadejia Barrage
MKF - Maikintari Flood
KKF - Kirikasamma Flood
TKF - Tukwikwi Flood
NGL - Nguru Lake
DGN - Dagona

Appendix 3: Aquatic Insects observed at Hadejia – Nguru Wetlands

Order	Family	Species
Coleoptera	Hydrophilidae	*Hydrobiomorpha sp*
		Sternolophus rufipes
Diptera	Chironomidae	*Chironomus sp.*
	Culicidae	*Anopheles gambiae*
		A. maculipalis
		A. pharoensis
		A. squamosis
		Culex pipiens quinquefasciatus
		C. pipiens fatigans
Ephemeroptera		*Nymphs*
Hemiptera	Corixidae	*Corixa sp*
	Nepidae	*Ranatra vicina*
	Notonectidae	*Macrocoris convexans*
		Micronecta sp.
Odonata	Libellulidae	*Crocothemis erythraea*
		Diplacodes Lefebrei
		Philonomon luminans
		Tetrathemis imitata
Placotera		*Nymphs*
Zygoptera		*Nymphs*

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