AQUATIC HEMIPTERAN DIVERSITY AS INDICATORS OF MORE ENVIRONMENTAL EXTREMES: RELATION TO TOLERANT OF SOME PHYSICO-CHEMICAL CHARACTERISTICS OF WATER.

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ABSTRACT

Seven families of aquatic bug of order Hemiptera belonging to neoptera of division Exopterygota occur in Nilona dam, Yavatmal were recorded in the year 2011. Behavior is surprisingly diagnostic with reference to species diversity and nature. Observe their habit, habitat selection and nature of feeding. On the basis of the results the indicator values have been analyzed and it is clear that Water boatman and Water striders can be tolerating more acidic pH. The low D.O., high CO2 and high chloride concentration have been tolerated only by Giant water bug. The high turbidity concentration can be faced successfully by Water striders. Expect Pigmy water bug the second range of pH, D.O., CO2, Chloride and turbidity concentration have been almost tolerated by all species. The third range of all the parameters can easily be tolerated by all.

Keywords: Hemipteran diversity, Indicator value, Physico-chemical water parameters.

INTRODUCTION

Hemiptera or true bugs belong to the infraclass Neoptera division Exopterygota; their wings develop externally and can be folded over the dorsum. Only about 10% of all species of Hemiptera are associated with water, Hemipterans are paurometabolous, undergoing incomplete, gradual metamorphosis from egg to nymph to adult (Andersen 1982). Adult and nymphal hemipterans are predaceous, having mouthparts specialized for piercing and sucking the contents of their prey. They prey on a variety of aquatic insects, crustaceans and small fishes. There are even accounts of large aquatic hemipterans consuming vertebrates. The ecology of the aquatic Hemiptera is much better known, and it is probable that they are limnologically more significant than the beetles (Williams, *et al* 1992). Most hemipterans are either lentic or slow water lotic forms. They are all air breathers and as such are more tolerant of environmental extremes than most other insects (Mackie, 2001). Not all but some hemipterans have indicator value because their life does not depend entirely on water quality (Lloyd, 2003). In future presence or absence of species in the water bodies, it will be possible to understand approximate values of some physico-chemical parameters of water (Robin, 2007).

MATERIALS AND METHODS

Aquatic bugs were collected with the help of hand net from Nilona dam, Dist.Yavatmal, Maharashtra. Nilona is situated on east south of the Yavatmal. It is at 78^0 C, 8^0 E longitude and 20^0-23^0N latitude. The dam is surrounded by open hills, which drain water during monsoon. The main source of water is Waghadi River on which a dam is constructed. The submerge area is 594 acres. Early morning hours and late noon hours has fixed for collection since the bugs have noted to clinging on the rootlets of aquatic vegetation such as Hydrillla, Vallisneria, Chara and Eichhornea. Collected five or six numbers of each species were brought to the laboratory and kept in glass container of two liter capacity. For these experiments three glass containers were filled every time with different nature of water for every parameter like pH, D.O., CO2, Chloride and turbidity. The values have been tested by procedure described by Kodarkar (1992) and also guidelines given by APHA (1995) for to conformed different nature of water, if needed add laboratory chemicals before experiment. One species was released one time in the one container after observations remove it and if possible used for next container, same application was used for every parameter. Exposure period for every species was two minute.

RESULTS AND DISCUSSION

Five families Belostomatidae, Corixidae, Nepidae, Notonectidae and Pleidae are fully aquatic. Notonectidae, Pleidae swim upside down and three families Belostomatidae, Corixidae and Nepidae are the good swimmer, clingers or climbers (Table1). Two families Gerridae, Hydromatridae are surface dwellers or skaters and are thus semi aquatic (Table1). Most hemipterans are either lentic or slow water lotic forms. They are all air breathers and as are more significant than the bettles. While observing habit, habitat selection and nature of feeding their behavior is surprisingly diagnostic with reference to species diversity and nature. All the details have been mention in Table1. The result clearly indicates that Water boatman and Water striders tolerates extreme acidic pH i.e. 4 but remaining all try to survive and show unusual behavior which is mention in the observation table 2 and Figure1. The low D.O., CO2 and high Chloride concentration can be tolerate only by Giant water bug but rest of all six bug face much difficulty for their survival (Table 2 and Figure2, 3).

Table 1: Classification and characteristics of water bugs.

Family/Common name	Habit	Habitat	Nature of feeding
Gerridae/ Water striders(Wst)	Skims along on surface of water	Gregarious insects found skating on surface film.	Mosquito larvae,cladocera and etc.
Hydrometridae/ Water measure(Wm)	Skaters	Abundantly found on the margins on water bodies	Mosquito larvae, water fleas, tadpole and other aquatic insects.
Notonectidae/ Back swimmer(Bs)	Swim upside down from surface of the water	Lives underwater in a variety of wetland types.	Tadpole and small fishes.
Pleidae/ Pigmyback swimmer(Pbs)	Swim upside down(poor Swimmer)	They live among emergent aquatic weeds.	Feeds on daphnia.
Nepidae/ Water scorpion(Wsc)	Clinging and crackling to the aquatic plants	Lives underwater in a variety of wetland types.	Feeding on small insects and fleas.
Belostomatidae/ Giantwater bug(Gwb)	Clinging to aquatic plants	Submerging to aquatic weeds of dam	Feed on aquatic crustaceans, small fishes and amphibians.
Corixidae/ Water boatman(Wb)	Swim on the surface of water upside-down	Skimming on the surface of well plants	Eat tadpole, aquatic insects and even small fishes

Table 2: Effect of pH on Aquatic bug (Quantitative effects)

Aquatic bugs	pH (4)	pH(6)	pH(8)
Wst	Normal movement(100)	Normal movement(100)	Normal movement(100)
Wm	Try to escape (20)	Repeatedly steady (80)	Normal movement(100)
Bs	Abnormal behavior(40)	Frequently floating on surface(60)	Normal movement(100)
Pbs	Try to escape(20)	Frequently floating on surface(60)	Normal movement(100)
WSc	No activity(10)	Frequently floating on surface(60)	Normal movement(100)
GWb	Abnormal behavior(40)	Repeatedly steady(80)	Normal movement(100)
Wb	Normal movement (100)	Normal movement (100)	Normal movement(100)

Table 3: Effect of D.O. Conc. on aquatic bug (Quantitative effects)

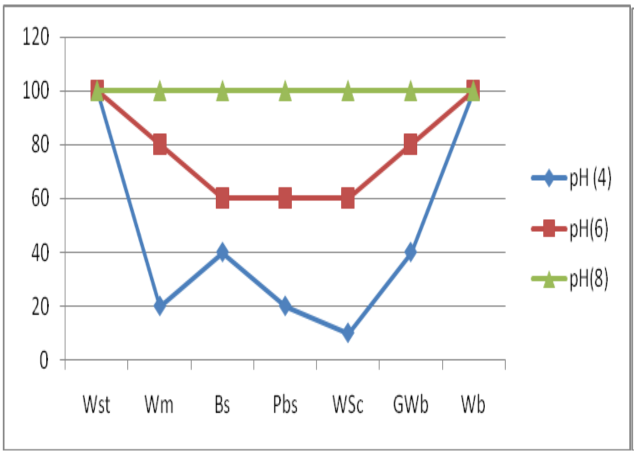
Aquatic bugs	D.O.(1mg/l)	D.O.(5mg/l)	D.O.(10mg/l)
Wst	Abnormal behavior(40)	Repeatedly steady(80)	Normal movement(100)
Wm	Try to escape(20)	Frequently floating on surface(60)	Normal movement(100)
Bs	Abnormal behavior(40)	Frequently floating on surface(60)	Normal movement(100)
Pbs	Try to escape(20)	Frequently floating on surface(60)	Normal movement(100)
WSc	Abnormal behavior(40)	Repeatedly steady(80)	Normal movement(100)
GWb	Normal movement(100)	Normal movement(100)	Normal movement(100)
Wb	Try to escape(20)	Frequently floating on surface(60)	Normal movement(100)

Table 4: Effect of CO2 Conc. on aquatic bug (Quantitative effects)

Aquatic bugs	CO2(45mg/l)	CO2(25mg/l)	CO2(5mg/l)
Wst	Abnormal behavior(40)	Frequently floating on surface(60)	Normal movement(100)
Wm	No activity(10)	Frequently floating on surface(60)	Normal movement(100)
Bs	Abnormal behavior(40)	Frequently floating on surface(60)	Normal movement(100)
Pbs	No activity(10)	Try to escape(20)	Normal movement(100)
WSc	No activity(10)	Repeatedly steady(80)	Normal movement(100)
GWb	Normal movement(100)	Normal movement(100)	Normal movement(100)
Wb	No activity(10)	Frequently floating on surface(60)	Normal movement(100)

Table 5: Effect of Chloride Conc. on aquatic bug (Quantitative effects)

Aquatic bugs	Chloride(300mg/l)	Chloride(200mg/l)	Chloride(100mg/l)
Wst	Repeatedly steady(80)	Normal movement(100)	Normal movement(100)
Wm	Repeatedly steady(80)	Normal movement(100)	Normal movement(100)
Bs	Repeatedly steady(80)	Normal movement(100)	Normal movement(100)
Pbs	Frequently floating on surface(60)	Normal movement(100)	Normal movement(100)
WSc	Abnormal behavior(40)	Normal movement(100)	Normal movement(100)
GWb	Normal movement(100)	Normal movement(100)	Normal movement(100)
Wb	Repeatedly steady(80)	Normal movement(100)	Normal movement(100)



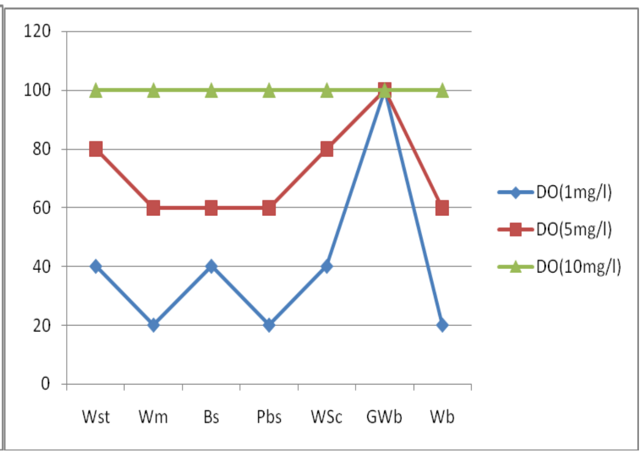
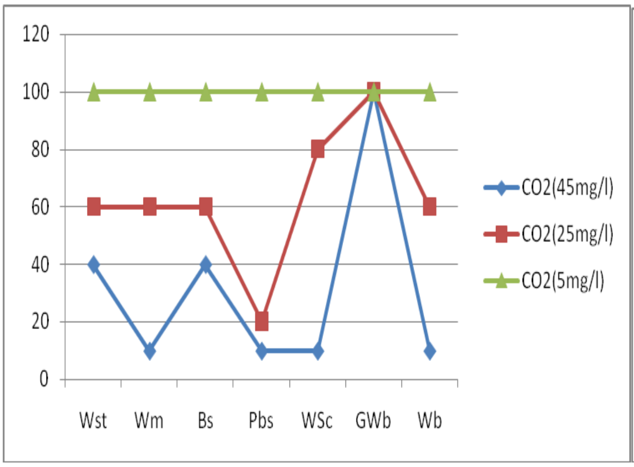


Fig. 1: Effect of pH on activities of aquatic Bug

Fig. 2: Effect of D.O. on activities of aquatic Bug



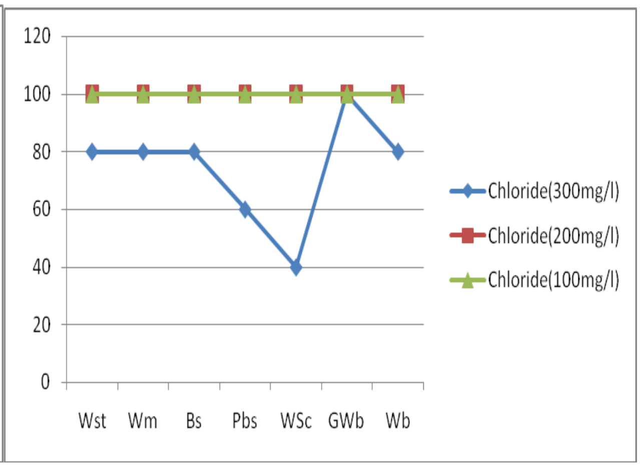


Fig. 3: Effect of Co2 on activities of aquatic Bug

Fig. 4: Effect of Chloride on activities of aquatic Bug

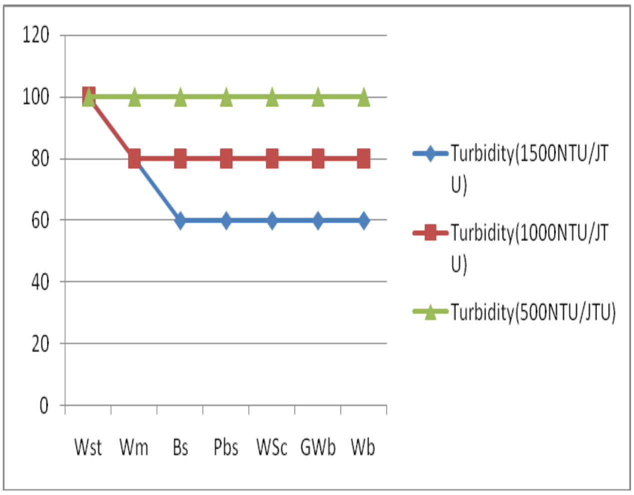


Fig. 5: Effect of turbidity on activities of aquatic Bug

Table 6: Effect of Turbidity Conc. on aquatic bug (Quantitative effects)

Aquatic bugs	Turbidity(1500 NTU/JTU)	Turbidity(1000 NTU/JTU)	Turbidity(500 NTU/JTU)
Wst	Normal movement(100)	Normal movement(100)	Normal movement(100)
Wm	Repeatedly steady(80)	Repeatedly steady(80)	Normal movement(100)
Bs	Frequently floating on surface(60)	Repeatedly steady(80)	Normal movement(100)
Pbs	Frequently floating on surface(60)	Repeatedly steady(80)	Normal movement(100)
WSc	Frequently floating on surface(60)	Repeatedly steady(80)	Normal movement(100)
GWb	Frequently floating on surface(60)	Repeatedly steady(80)	Normal movement(100)
Wb	Frequently floating on surface(60)	Repeatedly steady(80)	Normal movement(100)

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