Available Online at http://www.journalajst.com

ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 6, Issue 03, pp. 1205-1210, March, 2015

RESEARCH ARTICLE

MACROPHYTE PREFERENCE AND AQUATIC ENTOMOFAUNAL DIVERSITY OF KAPLA BEEL, A FRESH WATER WETLAND OF BARPETA DISTRICT OF ASSAM, INDIA

***Alakesh Barman and Binode Kumar Baruah**

Department of Zoology, Cotton College, Guwahati, India

ARTICLE INFO

Article History:
Received 17th December, 2014
Received in revised form
10th January, 2014
Accepted 05th February, 2015
Published online 31st March, 2015

Key words:
Aquatic insect,
Kapla Beel.

ABSTRACT

The Present study on Insect resources of Kapla Beel revealed presence of diverse insect fauna in the wetland. A total of 34 insect species were identified comprising of 5 families order Coleoptera with 20 genera, 6 families of Hemiptera with 8 genera, 2 families of Odonata with 2 genera, 2 families Diptera with 2 genera and 1 family of Ephemeroptera with 2 genera. Coleoptera was recorded in highest number followed by Hemiptera, Odonata, Diptera and Ephemeroptera respectively. The order Coleoptera composed of 59%, Hemiptera composed of 23% and Diptera, Ephemeroptera and Odonata composed of 2% each of the total recorded aquatic insect species. Study on the macrophyte diversity of the wetland revealed presence of 37 species. Out of which 8 species were submerged, 15 species were emergent and 14 species were found floating. Of these 19 macrophyte species were observed as host of aquatic insects. The study showed that 17 species of Coleoptera, 7 species of Hemiptera, 1 species each of the order Diptera, Odonata and Ephemeroptera were found associated with macrophytes.

INTRODUCTION

Of the great variety of insects, aquatic forms, though of less variety, are important constituent of freshwater ecosystem. While some of these insects may be beneficial to human being, few others are quite harmful (Ahemd, 1983). Aquatic insects form an important component of the food chain and energy flow pathways and comprise of a high proportion of biomass in fresh water. Aquatic macrophyte plays a vital role in aquatic ecosystem. They can alter the physical condition of water bodies and increase in the heterogeneity of that habitat for aquatic macro invertebrate.

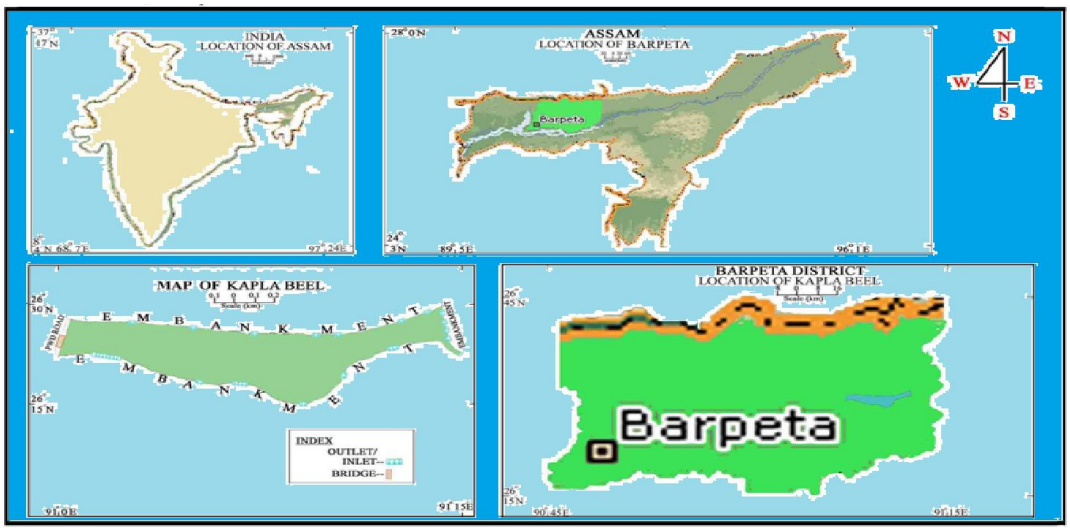
The distribution of this macorinvertebrate community seems to be influenced by habitat preference of the species for food, shelter and protection. Studies on the aquatic insects were reported by Tonapi (1954), Pennak(1978) Ahemd (1983), Mishra (1984), Thirumalai (1999), Bhattacharya (1998), Deepa and Rao (2007), Kalita (2008), Das and Gupta (2010) and Hazarika and Goswami (2009). Study on association of aquatic insect with macrophyte reported by Srivastav (1959), Roy and Munshi (1978), Bhattchacharya and Gupta (1991) Bhattacharya (1998), Khan and Ghosh (2001), Kalita (2008) and Hazarika and Goswami (2009, 2010). Till date no work has been reported on aquatic Insects of Kapla Beel; therefore the present study was undertaken to assess the aquatic insects population of Kapla Beel.

****Corresponding author: Alakesh Barman***
Department of Zoology, Cotton College, Guwahati, India

MATERIALS AND METHODS

Kapla Beel is a perennial freshwater wetland is located at Barpeta district, Assam. Geographically it lies at the intersection of 26°15′–26°30′ N latitude and 9l°0′–91°15′ E longitude covering an area of about 91 hectares. It is about 120 Km away towards west from the Guwahati, the capital of Assam Kapla Beel connected with Nakhanda river through various channels. The Nakhanda remain connected with river Brahmaputra through a tributary of Manah called chawlkhowa river. In lean season (Oct- April) the Beel is delinked from the river.

The study was carried out for a period of two years (2010–2012), covering three seasons pre monsoon (March-May), monsoon (July-September) and post monsoon (November-January) seasons of a year. For sampling the Beel area is arbitrarily divided into five zones namely North zone, South zone, East Zone, West Zone and Central zone Samples were collected randomly at the above mentioned zone using hand operated nets of varying sizes. Macrophytes associated insects were collected with help of hand operated 'D' framed sweep net of the size of 50 cm length, 25 cm maximum breadth of the 'D' with mesh size of approximately 200µ. Ekaman dredge was used to sample aquatic insect and macrophyte of soft sediments in deep water. The individuals of each species were sorted, counted and noted down. The collected samples preserved in 70% ethanol in glass vial. The macrophyte species are preserved in herbarium. Insect were identified with the help of a simple dissecting microscope and a compound



Map 1. Location map of Kapla Beel (Source: Deka, 2009)

microscope. The macrophytes were also collected from the above mentioned five sampling sites of Kapla Beel for a period of two year (2010-2012) covering pre monsoon, monsoon, post monsoon of each year by Quadrate method of random sampling (Ludwig and Reynold, 1988). The following methodologies were followed for the present study:

(i) Study on the macrophyte following Needham and Needham (1966) and Burche(1991)
(ii) Identification and taxonomy following the methodology of Needham and Needham (1966), Winterbourn (1981), Bal & Basu (1994a, 1994b), Biswas and Mukhopadyaya (1995), Khan and Ghosh (2001), Subramanium (2005), Epler (2006), Subramanium & Sivakrishnan (2007) and Subramanium (2009)
(iii) Dominant status of insects were determined by following Engelmann's scale (1978).

RESULTS AND DISCUSSION

A total of 34 aquatic insects were identified which comprised of 5 families of order Coleoptera with 20 genera, 6 families of Hemiptera with 8 genera, 2 families of Odonata with 2 genera, 2 families Diptera with 2 genera, 1 families of Ephemeroptera with 2 genera. Coleoptera were recorded in highest number followed by Hemiptera, Odonata, Diptera and Ephemeroptera respectively. The order Coleoptera composed of 59%, Hemiptera composed of 23% and Diptera, Ephemeroptera and Odonata composed of 6% each of the total recorded aquatic insects species (Fig: 1).

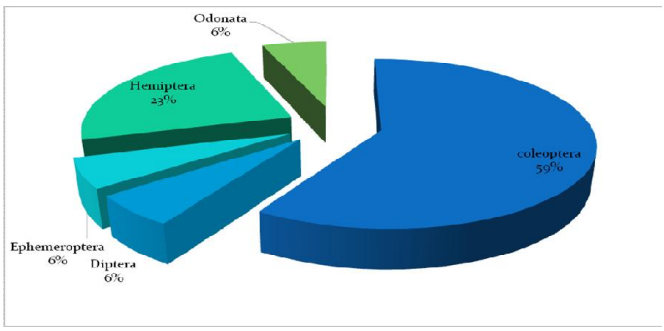


Fig. 1. Percentage of Different Orders of aquatic insect of Kapla Beel

During the study period it was observed that most of the aquatic insects were abundant during post monsoon and lowest in the monsoon. According to the Engelmann's scale (Engelmann 1978) the dominant species is *Chironomous sp.* during 2010-2011 while *Culex sp. and Chironomous sp.* Were dominant during the study period of 2011-2012. In the wetland 1 species were found dominant, while 3 were subdominant, 29 were recedent and 1 subrecedent during the study period 2010-2011. While during the period of 2011-2012 it was observed that 2 species were dominant, 2 were subdominant, 30 were recedent and there was no subrecedent species (Table 1 and 2). Study on the macrophyte diversity of the wetland revealed 37 species (Table 3). Out of which 8 species were submerged, 15 species were emergent and 14 species were found floating. Of these 19 species were observed as host of aquatic insect. Most of the macrophyte species were occupied by Coleoptera with 17 species followed by Hemiptera with 7 species, Orthoptera with 2 species, Diptera, Odonata and Ephemeroptera with 1 species each respectively. Highest number of aquatic insect species were recorded from *Eichhornia crassipes.*

16 species were recorded from this species followed by *Hydrilla verticellata*, *Vallisneria spiralis, Ceratophylum demersum,* with 9 species, *Nelumbo nucifera, Sagittaria sagittifolia, acorus calamus*, *Juncus conglomeratus*, with 3 species, *Typha sp., Lemna minor, Equisetum palustre, Potamogeton natans* by 2 species, *Lythrum salicaria*, *Elodea Canadensis Spirodella polyrrhiza* and *Butomus umblellatus* with 1 species. Preference of *Eichhornia crassipes* by most of the aquatic insect implies that it offers adequate shelter, place for hide from almost all kind of predator. The aquatic insect occupies all the parts of the this particular kind of host. It is also observed that insect are mainly found associated with emergent and submerged vegetation where as least number found in floating macrophyte. It is found that Coleoptera and Hemiptera species use these macrophytes for shelter, few use them as food and few species exploit them as egg laying. Odonata, Diptera and Ephemeroptera use mainly submerged and emergent macrophyte as shelter for their larval stages. It was observed that nymph of dragonflies collected from the root *Eichhornia crassipes* showing mimicry with colour of the root, to escape the predator.

Table 1. Dominance status of different species of aquatic insects in Kapla Beel for the period of 2010-2011

Order	Family	genus/species	Number	RA %	Dominance Status
Coleoptera	Carabidae	*Chlaenius sp.*	40	1.70	Recedent
		Casnoidea sp.	27	1.15	Recedent
	Dyticsidae	*Hydrovatus sp*	71	3.02	Recedent
		Hydatics fabricii fabricii (Machley)	51	2.17	Recedent
		Laccophilus anticatus anticatus Sharp	62	2.64	Recedent
		Laccophilus inefficiens (Walker)	56	2.38	Recedent
		Laccophilus sp.	79	3.36	Subdominant
		Clypeodytes sp.	48	2.04	Recedent
		Cybister sp.	56	2.38	Recedent
	Gyrinidae	*Dineutus (Spinosodineutus) unidenttatus (Aube)*	60	2.55	Recedent
		Cercyon sp.	53	2.25	Recedent
		Hydrophilus olivaceus Fab	68	2.89	Recedent
		Sternolophus rufipes (Fab.)	68	2.89	Recedent
		Amphiops sp.	62	2.64	Recedent
		Helochares sp.	75	3.19	Recedent
		Enochrus sp.	63	2.68	Recedent
		Laccobius sp.	59	2.51	Recedent
	Noteridae	*Hydrcanthus sp.*	24	1.02	Subrecedent
		Neohydrocoptus subvittulus (Mots.)	69	2.93	Recedent
		Canthydrus laetabilis (Walker)	55	2.34	Recedent
Diptera	Culicidae	*Culex sp.*	227	9.65	Subdominant
	chironomidae	*Chironomous sp.*	247	10.50	Dominant
Ephemeroptera	Baetidae	*Baetis sp.*	43	1.83	Recedent
		Cloeon sp.	33	1.40	Recedent
Hemiptera	Gerridae	*Gerris gracilicornis* Horvath	170	7.23	Subdomonant
	Belostomatidae	*Lethocerus indicus* Lepeleiter & Serville	42	1.79	Recedent
		Diplonychus rusticus Fabricius	62	2.64	Recedent
	Nepidae	*Laccotrephes sp*	59	2.51	Recedent
		Ranatra sp.	50	2.13	Recedent
	Corixidae	*Micronecta scuttellaris scuttellaris* Stal	63	2.68	Recedent
	Hydrometridae	*Hydrmetra greeni*	50	2.13	Recedent
	Pleidae	*Plea liturata* Fiebr	59	2.51	Recedent
Odonata	Libellulidae	*Orthetum sp*	49	2.08	Recedent
	Coenagrionidae	*Ischnura sp.*	52	2.21	Recedent

RA <1 = Subrecedent; 1.1-3.1 = Recedent; 3.2-10% Subdominant; 10.1-31.6 = Dominant and >31.7% = Eudominant

Table 2. Dominance status of different species of aquatic insects in Kapla Beel for the period of 2011-2012

Order	Family	genus/species	Number	RA %	Dominance Status
Coleoptera	Carabidae	*Chlaenius sp.*	39	1.62	Recedent
		Casnoidea sp.	31	1.29	Recedent
	Dyticsidae	*Hydrovatus sp*	70	2.91	Recedent
		Hydatics fabricii fabricii (Machley)	71	2.95	Recedent
		Laccophilus anticatus anticatus Sharp	53	2.20	Recedent
		Laccophilus inefficiens (Walker)	63	2.62	Recedent
		Laccophilus sp.	80	3.32	subdominant
		Clypeodytes sp.	60	2.49	Recedent
		Cybister sp.	60	2.49	Recedent
	Gyrinidae	*Dineutus (Spinosodineutus) unidenttatus (Aube)*	52	2.16	Recedent
		Cercyon sp.	52	2.16	Recedent
		Hydrophilus olivaceus Fab	57	2.37	Recedent
		Sternolophus rufipes (Fab.)	53	2.20	Recedent
		Amphiops sp.	61	2.53	Recedent
		Helochares sp.	71	2.95	Recedent
		Enochrus sp.	72	2.99	Recedent
		Laccobius sp.	66	2.74	Recedent
	Noteridae	*Hydrcanthus sp.*	28	1.16	Recedent
		Neohydrocoptus subvittulus (Mots.)	62	2.57	Recedent
		Canthydrus laetabilis (Walker)	56	2.32	Recedent
Diptera	Culicidae	*Culex sp.*	250	10.38	Dominant
	chironomidae	*Chironomous sp.*	260	10.79	Dominant
Ephemeroptera	Baetidae	*Baetis sp.*	34	1.41	Recedent
		Cloeon sp.	27	1.12	Recedent
Hemiptera	Gerridae	*Gerris gracilicornis* Horvath	179	7.43	Subdominant
	Belostomatidae	*Lethocerus indicus* Lepeleiter & Serville	45	1.87	Recedent
		Diplonychus rusticus Fabricius	62	2.57	Recedent
	Nepidae	*Laccotrephes sp*	60	2.49	Recedent
		Ranatra sp.	61	2.53	Recedent
	Corixidae	*Micronecta scuttellaris scuttellaris* Stal	63	2.62	Recedent
	Hydrometridae	*Hydrmetra greeni*	55	2.28	Recedent
	Pleidae	*Plea liturata* Fiebr	57	2.37	Recedent
Odonata	Libellulidae	*Orthetum sp*	44	1.83	Recedent
	Euphoidae	*Torrent dart*	55	2.28	Recedent

RA <1 = Subrecedent; 1.1-3.1 = Recedent; 3.2-10% Subdominant; 10.1-31.6 = Dominant and >31.7% = Eudominant

Table 3. Macrophyte Species of Kapla Beel

Macrophyte Type	Macrophyte Species
Submerged	*Potamogeton crispus* L.
	Potamogeton pectinatus L.
	Vallisneria spiralis L.
	Hydrilla verticellata (L.F.) Royle.
	Elodea canadensis Michaux.
	Ceratophylum demersum L.
	Callitriche hermaphroditica L.
	Chara sp.
Emergent	*Acorus calamus* L.
	Butomus umblellatus L.
	Juncus conglomeratus L.
	Sagittaria sagittifolia L.
	Typha latifolia L.
	Typha angustifolia L.
	Sparganium erectum L.
	Oryza sativa L.
	Lythrum salicaria L.
	Lysimachia nummularia L.
	Mentha aquatica L.
	Scutellaria galericulata L.
	Ipomea sp.
	Equisetum palustre L.
	Equisetum fluviatile L.
Floating	*Lemna minor L.*
	Lemna polyrrhiza L.
	Spirodella polyrrhiza (L)schleid
	Wolffia arrhiza wimn.
	Potamogeton natans L.
	Hydrocharis morsus ranae L.
	Nelumbo nucifera
	Polygonum amphibium L.
	Trapa bispinosa L.
	Eichhornia crassipes (Mart) solms.
	Azolla pinnata R.Br.
	Salvinia natans Allioni Hoffm.
	Salvinia cuculata Roxb.
	Littorella uniflora (L) Aschers.

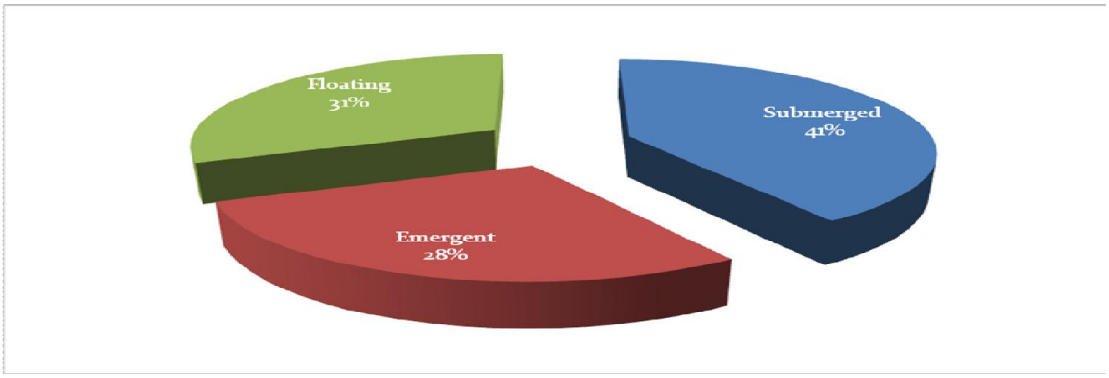


Fig. 2. Percentage of different type of macrophyte occupied by aquatic insects

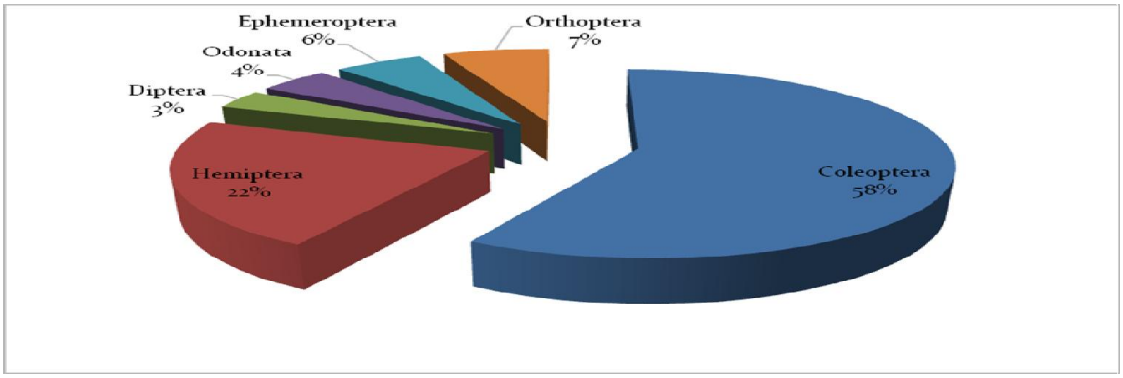


Fig. 3. Percentage of different order of aquatic insects associated with macrophyte species

Table 4. Number of aquatic insect associated with different species of macrophyte

Macrophyte Species	Insect orders				
	Coleoptera	Hemiptera	Diptera	Odonata	Ephemeroptera
Acorus calamus L.	3	0	0	0	0
Juncus conglomeratus L.	3	0	0	0	0
Sagittaria sagittifolia L.	5	0	0	0	0
Typha latifolia L.	2	0	0	0	0
Typha angustifolia L.	2	0		0	0
Oryza sativa L.	3	0	0	0	0
Lythrum salicaria L.	1	0	0	0	0
Equisetum sp. L.	2	0	0	0	0
Vallisneria spiralis L.	5	3			1
Hydrilla verticellata (L.F.) Royl	3	3	1	1	1
Elodea canadensis Michaux.	1	0	0	0	0
Ceratophylum demersum L.	5	2	0	1	1
Nelumbo nucifera	5	3	0	0	0
Chara sp.	1	3	1	1	1
Eichhornia crassipes (Mart) solms.	10	2	1	1	1
Lemna sp.	1	1	0	0	0
Spirodella polyrrhiza (L)schleid	1	0	0	0	0
Butomus umblellatus	0	1	0	0	0
Potamogeton sp.	0	2	0	0	0

Larvae of some Coleoptera and Diptera rely on the intracellular air spaces for respiration and thus limited in their distribution by that of their macrophyte host. In the similar study of aquatc insects of deepor beel (a Ramsar Site) revealed presence of 25 species (Saikia, 2007). Hazarika and Goswami (2010) recorded 43 species of aquatic insects in two fresh water ponds located on Guwahati while Kalita and Goswami (2008) recorded 37 species of aquatic insects. Present study revealed 34 species of 5 different order. During the study period it was observed that most part of the wetland was occupied by emergent, floating and submerged type of aquatic vegetation. Aquatic insects were found associated with all these kind of vegetation.

The study recorded 27species of aquatic insects found associated with different species of macrophyte. Kalita and Goswami recorded 30 insect species associated with macrophyte. Bhattacharya *et al.* (1998) recorded 73 insect species associated with macrophyte from fresh water wetland of West Bengal. The significance of macrophytes in the distribution and abundance of freshwater insects has been established. A diverse flora is found to be responsible for greater assembling and establishment of stable insect communities. It was found in the observation that Coleoptera and Hemiptera were heavily dependent on macrophyte of the beel. The qualitative dominance of Coleoptera and Hemiptera over other group in the fresh water wetland recorded by Roy *et al*. (1991) and Kalita (2008). The study on macrophyte reveal 37 species and most of the macrophyte species were perennial in nature. Quantitatively the *Eichhornia crassipes* was the most enduring species of macrophyte community. 34 species of aquatic insects were recorded form the wetland. Out of which Coleoptera composed 59%, Hemiptera composed of 23% and Diptera, Ephemeroptera and Odonata composed of 6%.

REFERENCES

Ahmed, A. and K. Ziauddin, 1983. Studies on the Ecology of aquatic Insects With special reference to fish Pond, Ph. D. thesis North eastern Hill University, Meghalaya, India.

Bal, A. and R.C. Basu, 1994a. Insecta: Hemiptera: Mesovelidae, Hydrometridae, Veliidae and Gerridae, pp. 511-534. In: State fauna Series 3: *Fauna of West Bengal, Part 5,* Zoological Survey of India, Culcutta.

Bal, A. and R.C. Basu, 1994b. Insecta: Hemiptera: Belostomatidae, Nepidae, Notonectidae and Pleidae, pp. 535-558 In: State fauna Series 3: *Fauna of West Bengal, Part 5,* Zoological Survey of India, Culcutta.

Bhattacharya, D K. 1998. Insect fauna associated with large water hyacinth in freshwater wetlands of West Bengal. Biodiversity and Environment, Proceedings of the National Seminar on Environmental Biology, Daya Publishing House, Delhi, 145-147pp.

Bhattacharya, D. K. and Gupta, B., 1991. Freshwater wetland inhabiting insects West Bengal. Env.& ecol. 9(4): 995-998

Biswas, S. and P. Mukhopadhyay, 1995. Insecta: Coleoptera: Hydrophilidae. In: State fauna Series 5: Fauna of West Bengal, Part 6a, Zoological Survey of India, Calcutta. pp. 143-168.

Burche, E.M. 1991. A hand book of water plant, orient enterprise, Dehradun

Das, K. and Gupta, S. 2010. Aquatic Hemiptera Community of Agricultural Fields and Rain Pools in Cachar District, Assam, North East India, Assam University Journal of Science & Technology: Biological and Environmental Sciences Vol. 5 Number I 123-128, 2010

Deka, R. M., Baruah, B. K. and Kalita, J. 2009. Study On Some Ecological Aspects Of Kapla Beel, A Freshwater Wetland In Barpeta District, Assam. Ph. D Thesis Gauhati University, Assam, India

Deepa, J. and Rao, C. A. N. 2007. Aquatic Hemiptera of Pochram Lake, Andhra Pradesh, 2005, Print Journal 1822 (12) - 2937-39

Engelmann, H.D. 1978. Zur Dominanzklassifikazierung von Bodenarthropoden. *Pedobilogia* 18: 378–380

Epler, J H. 2006. Identification Manual For The Aquatic and Semi-Aquatic Heteroptera of Florida, Division of Water Resource Management, Florida Department of Environmental Protection.

Hazarika, R. and Goswami, M. M. 2009. Studies On aquatic Insect of Fish Pond Ecosystem with special Reference to Hemiptera, Ph. D Thesis Gauhati University, Assam, India.

Hazarika, R. and Goswami, MM. 2010. Aquatic Hemiptera of Gauhati University, Guwahati, Assam, India. *Journal of Threatened Taxa*, March 2010 | 2(3): 778-782.

Kalita, G. 2008. Ecology and Distribution of macro invertebrate enmeshed fauna in Deepar wetland of Assam, India. Ph.D. Thesis Gauhati University, Guwahati, Assam, India.

Khan, R.A. and Ghosh, L.K., 2001. Faunal Diversity of Aquatic insects in Freshwater Wetlands of South eastern We4st Bengal, Occasional Paper No. 194, Records of Zoological Survey of India

Ludwig, J. A. and Reynold, J. E. 1988. Statistical ecology–A premier on methods and computing. *Wily Inter science Publications*

Mishra, N. A. B. Saxena, 1984. The effect of sewage on special reference to aquatic Insect in the river Kshipra (India) *Int. J. Env. Studies,* 23, 191- 208.

Needham, G. J. and Needham, P. R. 1996. A Guide to freshwater biology. 5th edition. Holdon Day Inc. Sanfransisco.

Pennak, R.W. 1978. Freshwater Invertebrate's of the United States, 2nd edn. John Wiley and Sons, Inc. New York, 803 pp.

Roy, S.P. and Munshi, J.S.D., 1991. Freshwater aquatic beetle (coleoptera) of Bhagalpur (Bihar). Proc. IVth all india Zool. Congr. Bodh-Gaya

Saikia, P. K. 2007. Faunal Diversity Of Deepor Beel Ramsar Site, Kamrup, Assam, ENVIS Assam, Centre for State Environment Related Issues Assam Science Technology and Environment Counci: October to December, 2007.

Srivastav, V.K. 1959. Studies on the aquatic vegetation and their role in breeding and development of some insect. Nat. Acad. Sci. India (Allahbad) Annual No. 69.

Subramanium, K. A. 2005. Dragonflies and Damselflies of Peninsular India-A field guide.

Subramanium, K. A. 2009. India-a lifescape dragonflies of india a field guide, Published by Vigyan Prasar, Department of Science and Technology.

Subramanium, K. A. and Sivaramakrishnan, K. G. 2007. Aquatic Insects of India-A field guide, Ashoka Trust for Research in Ecology and Environment (ATREE) Small Grants Programme.

Subramanium, K. A. 2009. India-a lifescape dragonflies of india a field guide, Published by Vigyan Prasar, Department of Science and Technology.

Thirumalai, G. 1999. Aquatic and semi aquatic Heteroptera of India, Indian Association of Aquatic Biologist (IAAB) publication No. 7: 1-74

Tonapi G T. 1954. Studies on the aquatic insect fauna of poona (Aquatic Heteroptera), *Proceedings of National Institute of Science*

Winterbourn, M. J. and Gregson, K. L. D. 1981. Guide to the aquatic insects of New Zealand. *Entomol. Soc. Nz. Bull.*: 5:1-80.

****