Aquatic entomofauna of Papanash lake, Bidar, Karnataka, India.

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Abstract

In the Bidar district of Karnataka, India, in Papanash Lake, research was done on the aquatic insect species. It took place between January to December of 2024. During this time, aquatic insects were represented by 19 species from 10 families of 4 orders, were Hemiptera being the major order with 10 species and 7 families followed by order Odonata having 4 species with 2 families.

Key words: Aquatic entomofauna, Bidar, Hemiptera, Papanash lake.

Introduction

All life on Earth depends on water, which is universally recognized as a vital and valuable natural resource. Because it affects water quality and restricts the use of water for different resources, water pollution is global issue Sarikar and Vijaykumar (2024). Aquatic ecosystems sustain significant ecosystem services and have high levels of biodiversity (Shah et al. 2020). Aquatic insects including shredders, scrapers filter feeders and predators play key role in nutrient recycling Sarikar and Vijaykumar (2024). Since aquatic insects are a major source of food for many invertebrates their disappearance could have impact on the overall population within the biological system (Sharma et al. 2020). Because of their diversity, ecological importance, and influence on human health, agriculture, and natural resources, insects are unique among fauna. Approximately 7,50,000 insect species are known to exist, accounting for three-fourths of all plant and animal species on Earth Sarikar and Vijaykumar (2023). Eight main insect orders spend at least a portion of their life cycle in freshwater ecosystem (Hasan et al. 2016). Around the world aquatic insects are one of the most often utilized groups in biological water quality assessment and have been employed as bioindicators Sarikar and Vijaykumar (2022). Many researchers have examined the number of phytoplankton and zooplankton in various freshwater bodies. Research in Karnataka's northern part was restricted to Gulbarga region alone, but no research on the variety of aquatic insect life in Papanash lake has been done. The goal of the current study is to investigate the aquatic insect fauna and abundance in the Bidar district of Papanash Lake.

Material and methods

Study area

The district headquarters of Karnataka Bidar are situated above 55 meters mean sea level at latitudes 17°55 North and longitudes 77°32 East. The temperature ranges from 9°C to 44°C, indicating a semi-arid climate. Located on the western sipde of the nearby Papnash temple, the perennial Papnash lake was chosen for the study. It covers 0.225 square kilometres, and during the dry season, the water depth in the pond reaches a maximum of 0.75 meters, with an average of 2.1 meters Shiddamallayya and Pratima (2007). (Figure. 1)

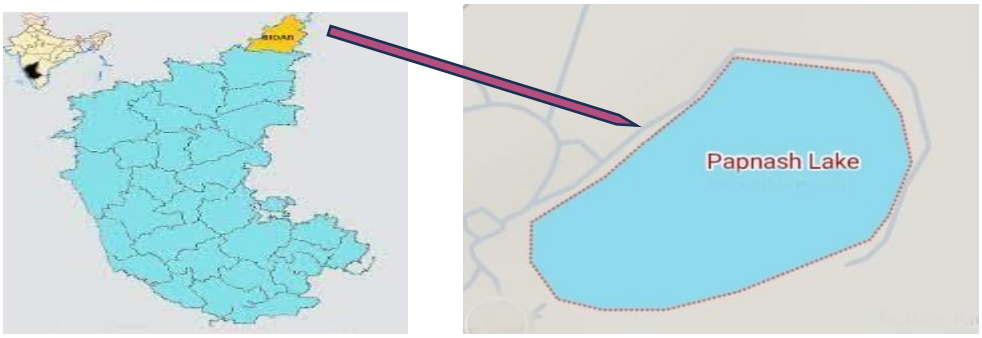

Figure 1. Map of India showing Papnash lake in Bidar district in Karnataka state

Methodology

Aquatic insects sampling took place between January to December 2024. Traditionally, sampling had been carried out once a month. Insects within the study areas were collected using dipnet and sweep net techniques. Throughout the sampling time, samples were taken from every station, and all of the sorted samples were put in white trays to be sorted. Using the taxonomic keys developed by Dudgeon (1999), Thirumalai (1989), Subramanian, and Sivaramakrishnan (2005) the contents of the samples were placed into labelled vials and kept in 75% ethanol. They were then examined under a stereo zoom microscope and identified down to the family level.

Result and discussion

The current study reported orders of aquatic insects (Hemiptera, Coleoptera, Odonata, Diptera), families (Belostomatidae, Nepidae, Notonectidae, Pleidae, Gerridae, Corixidae and Mesoveliidae of the order Hemiptera; Libelluidae, Coenagrionidae of the order Odonata; Dytiscidae, of order Coleoptera; Chironomidae, Culicidae of order Diptera). It was noticed that the number of species of order Hemiptera was recorded highest (10) followed by order Odonata (4) followed by the order Coleoptera (3) and order Diptera (2) (Table, 1). Similarly, 14 hemipteran species were identified by Das and Gupta from a temple pond in Cachar district, Assam.

Table 1. Aquatic entomofauna collected in Papnash lake during the study period

Order	Family	Species
Hemiptera	Belostomatidae	*Lethocerus indicus* (Lepeletier and Serville, 1825)
		Diplonychus rusticus (Fabricius, 1781)

	Nepidae	*Laccotrephes sp.* (Stal, 1866)
		Ranatra sp. (Fabricius, 1790)
	Notonectidae	*Anisops sp*. (Kirkaldy, 1904)
		Enithares sp. (Spinolla, 1837)
	Pleidae	*Paraplea frontalis* (Fieber, 1844)
	Gerridae	*Gerris sp.* (Fabricius, 1775)
	Corixidae	*Micronecta sp.* (Kirkaldy, 1897)
	Mesoveliidae	*Mesovelia vittigera* (Horvath, 1904)
Odonata	Libellulidae	*Pantala flavescens* (Fabricus, 1798)
		Trithemis aurora (Burmeister, 1839)
	Coenagrionidae	*Pseudogrion sp.* (Selys, 1876)
		Ischura sp. (Charpenteir, 1840)
Coleoptera	Dytiscidae	*Laccophilus sp.* (Leach, 1817)
		Dineutus sp. (Macleay, 1825)
		Berosus sp. (Leach, 1817)
Diptera	Chironomidae	*Chironomus sp.* (Meigen, 1803)
	Culicidae	*Culex sp.* (Linnaeus, 1758)

Habitat, Characteristics and Distribution of aquatic insect in Papnash lake

Order – Hemiptera

Species - *Lethocerus indicus* (Lepeletier and Serville, 1825)

Family - Belostomatidae

Habitat - The upper surface of slowly flowing bodies of water is home to Lethocerus indicus.

Characteristics - A member of the Belostomatidae family, and exhibits both adult and nymphal traits. Adults are roughly 5–7 cm long, with a pair of short, strap-like appendages at the tip of the abdomen that are glossy and typically brownish black. The head, mid, and length legs is rather flattened

Distribution - India, Sri Lanka, Thailand, Pakistan, and Japan.

Species - *Diplonyhus rusticus* (Fabricius, 1871)

Family - Belostomatidae

Habitat - Upper surface of slow-moving bodies of water both nymph and adult.

Characteristics - Features of the smaller species include an ovoid body that is less than 20 mm long, oval to rounded, medium brown, eyes that converge, and a narrower distribution of fine hairs on the abdomen's anterior and lateral stripes.

Distribution - Thailand, Pakistan, China, Myanmar, and India. Banerjee (2024).

Species - *Laccotrephes sp.* (Stal, 1866)

Family - Nepidae

Habitat - Upper surface of slow-moving water bodies.

Characteristics - Body flattened and elongated sub oval, around 4-5 in length, with the anterior coxae broadly distributed and the hind coxae widely separated.

Distribution- China, Japan, Taiwan, India, Nepal, and Pakistan

Species - *Ranatra sp.* (Fabricius, 1790)

Family - Nepidae

Habitat - The upper surface of slow-moving water bodies.

Characteristics - Approximately 3–4 cm for adults, 21–27 mm for adults. respiratory siphon, 16–22 mm long, medium brown in colour. Vertex of the head slightly elevated above the dispersion of eyes

Distribution- Malaysia, Sumatra, Borneo, India, and Pakistan. (Lundblad *et al.* 1933).

Species - *Anisops sp*. (Kirkaldy, 1904)

Family - Notonectidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - The antennae of Notonectidae are 0.7 cm long, with a three-segmented cephalic projection in dorsal view that is acuminate at the apex and extends in front of the eye for at least half of the frons' length.

Distribution - India, Java, Singapore, Negeri, and Sri Lanka.

Species - *Enithares sp.* (Spinolla, 1837)

Family - Notonectidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - The benthic zone & top features: extended or hemispherical hindlegs, long and our-like and fringed, elongated body, and forelegs and femora that are not flattened.

Distribution - India, Taiwan, Singapore, and Sri Lanka

Species - *Paraplea frontalis* (Fieber, 1844)

Family - Pleidae

Habitat - The adult and nymphal characteristics of the Paraplea frontalis family pleidae inhabit the upper surface of the slow morning water body

Characteristics - Forelegs and femora not flattened elongate, hind legs long and one fringed with hairs.

Distribution -Taiwan, Singapore, Sri Lanka, and India. Nieser and Chen (1999).

Species - *Gerris sp.* (Fabricius, 1775)

Family - Gerridae

Habitat - The upper surface of slow-moving water bodies

Characteristics - Adults and nymphs are 17 cm long, with sinuate dorsal inner borders of the eyes and a small pronotum with a single central stripe or no hind that is no longer than 3.2 times the length of the first tarsal segment.

Distribution - Thailand, Vietnam, Sri Lanka, China, Myanmar, and India.

Species - *Micronecta sp.* (Kirkaldy, 1897)

Family - Corixidae

Habitat - The benthic region and top surface of water bodies

Characteristics - The lateral borders of the hemelylra have an intact brown stripe, the mouthparts are blunt and beak-like, and the tarsus of the forelegs has been altered to resemble a scoop.

Distribution - Thailand, Myanmar, Sri Lanka, and India

Species - *Mesovelia vittigera* (Horvath, 1904)

Family - Mesoveliidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - Generally elongate surface-dwelling insects with four segments longer than their head and no ocelli, adult tarsi have three segments and apical clams that are 3.3 mm long.

Distribution - They are found in India, Australia, Malaysia, and Sri Lanka Das and Gupta (2010).

Order Coleoptera

Species - *Laccophilus sp.* (Leach, 1817)

Family - Dytiscidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - The length of dytiscidae varies from 1 to 40 mm. They have dim yellow, green, or bronze markings, yet they are glossy and typically black or brownish-black. The antennae are lengthy and thread-like, with eleven segments. The unusually big hind coxae

cause the second and third legs to be widely apart. *Laccophilus sp*. has widely distributed, common hind tibiae spines that are split at the tip and typically measure 3 to 6 mm in length.

Distribution - They are found in Europe, Nearctic, North Africa and the Oriental region**.**
Species - *Dineutus sp.* (Macleay, 1825)

Family - Dytiscidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - *Dineutus sp.* are identified by their bigger size (>8 mm), widely spaced dorsal and ventral compound eyes, nonpubescent pronotum and elytra, hidden scutellum, and smooth or weak elytra. absence of a median longitudinal row of setae in the final two abdominal sternites and indistinct striae.

Distribution - China, Japan, Taiwan, India, Nepal, and Pakistan

Species - *Berosus sp*. (Leach, 1817)

Family - Dytiscidae

Habitat - The upper surface of slow-moving water bodies

Characteristics - Adults are a unique species. by their brown to yellowish-brown coloring and moderately small size (2–7); the prototum's outline is not continuous with that of the elthra; the sctellum is longer than wide; the meso and metasternum lack a ventral keel that is produced into a posterior spine; the middle and tibiae and tarsi have a well-developed fringe of long natatory setae, and the basal tarsomere are shorter than those of the second.

Distribution - Thailand, Myanmar, Sri Lanka, and India

Order Odonata

Species - *Pantala flavescens* (Fabricus, 1798)

Family - Libellulidae

Habitat - Observed flying over fields, ponds, lakes and slow-moving rivers.

Characteristics – This dragonfly is really huge. Its wings feature an orange stigma and adult yellow-orange.

Distribution - Malaysia, Sumatra, Borneo, India, and Pakistan

Species - ***Trithemis aurora* (Burmeister, 1839)**

Family - Libellulidae

Habitat - Observed near lakes, ponds and slow-moving rivers

Characteristics – This dragonfly is really huge. Its wings feature an orange stigma and adult yellow-orange.

Distribution - Thailand, Myanmar, Sri Lanka, and India

Species - *Pseudogrion sp.* (Selys, 1876)

Family - Coenagrionidae

Habitat – Slow-moving waters

Characteristics Caudal gills are shorter than the abdomen in Pseudogrion sp., three antennal segments are shorter than the second, and three to five premental setae are often located on either side of the mentum's midline. In pseudogrion sp., the caudal gills are uniform and rounded at the back, the posterior corners of the head flare, and there are less than six palpal setae per labial pillow. the ends; the media caudal gill's nodal spine resembles that of the lateral caudal gills.

Distribution - They are found in India, Australia, Malaysia, and Sri Lanka

Species - *Ischura sp.* (Charpenteir, 1840)

Family - Coenagrionidae

Habitat - Slow-flowing rivers and streams

Characteristics - Body length 27-35m and a wing of approximately, hind wings measure 14-20m. The antennae of the species lack a district apical spine at the fourth flagellar segment. The caudal lamellae have strongly pointed apices and are wider in the centre.

Distribution - Taiwan, Singapore, Sri Lanka, and India

Order Diptera

Species - *Chironomus sp.* (Meigen, 1803)

Family - Chironomidae

Habitat - Found near rivers, streams and benthic region

Characteristics – Adult Chironomus is a midge, with a notch in the middle of the pronotum, a pair of small tubercles on the head above the antennal bases, an antennal flagellum with 11 segments. Their length varies from 5 to 13 mm. red colour, larvae typically have tubes on the bottom of the abdominal segment.

Distribution - Japan, Taiwan, India, Nepal, and Pakistan

Species – *Culex sp.* (Linnaeus, 1758)

Family - Culicidae

Habitat - Found near rivers, streams and benthic region

Characteristics – After hatching, they develop into larvae, which feed, mature, and molt before becoming pupae. The grown pupa floats at the water’s surface and gives birth to the adult mosquito. Adult mosquitoes can live anywhere from one week to approximately one month. Length varies from ¼ to 3/8 inch long.

Distribution - China, Japan, Taiwan, India, Nepal, and Pakistan

Conclusion

According to the study, Papanash Lake is home to a diverse range of aquatic entomofauna. running into human-caused disruptions. The diversity and number of aquatic insects in Bidar's freshwater bodies are not well documented. Consequently, it is essential to conduct ongoing research and census activity about the taxonomy and variety of aquatic insects, so that future researchers can use this knowledge as baseline information for their studies and conservation efforts.

References

Banerjee, S. Kumar, D. Jaiswal, D. Madasamy, K. & Sulthana, S. R. (2025). Water Bugs (Insecta: Hemiptera) of Papikonda National Park, Andhra Pradesh with a New Record to India. Records of the Zoological Survey of India, 124(1S), 453–462. https://doi.org/10.26515/rzsi/v124/i1S/2024/172754

Das, K. & Gupta, S. (2010). Aquatic Hemiptera community of agricultural fields and rain pools in Cachar District, Assam, North East India. Assam University Journal of Science and Technology, 5(1), 123-128.

Dudgeon, D. 1999. Tropical Asian streams: zoobenthos, ecology and conservation. Hong Kong University Press.

Hasan, I. Haloi, D. J. Chetri, S. & Begum, S. (2016). Biodiversity of aquatic insect population in three permanent ponds of Guwahati, Assam, India. International Journal of Fisheries and Aquatic Studies, 4(6), 271-275.

Lundblad, O. 1933. XLIV.—Some new or little-known Rhynchota from China. Annals and Magazine of Natural History, 12(70), 449-464.

Nieser, N. & Chen, P. 1999. Sixteen new species of Nepomorpha (Heteroptera) mainly from Sulawesi (Indonesia). Tijdschrift voor Entomologie, 142(1-2), 77-123.

Sarikar S. & Katepaga V. 2023. Taxonomic orders societal significance and Threat of Aquatic insects. Indian Journal of Natural Sciences, 14 (78), 55788- 55796.

Sarikar, S. & Vijaykumar, K. 2022. Assessment of water quality index and non-carcinogenic risk for ingestion of nitrate for drinking purpose of Bhosga Reservoir, Karnataka, India. Curr World Environ, 17(2), 467-479.

http://dx.doi.org/10.12944/CWE.17.2.18

Sarikar, S. & Vijaykumar, K. 2022. Monitoring of water quality using aquatic insects as biological indicators in Bhosga reservoir, Karnataka, India. Advances in Zoology and Botany, 10(4), 82-92. https://doi.org/: 10.13189/azb.2022.100402

Sarikar, S. Wankhede, S. & Sarikar, S. 2024. A comparative study on water quality and microbial conditions of open well and bore well water from a selected area of

Kalaburagi City, Karnataka, India. The holistic approach to environment, 14(4), 136-144. *https://doi.org/10.33765/thate.14.4.3*

Shah, A. A. Woods, H. A. Havird, J. C. Encalada, A. C. Flecker, A. S. Funk, W. C. & Ghalambor, C. K. 2021. Temperature dependence of metabolic rate in tropical and temperate aquatic insects: support for the climate variability hypothesis in mayflies but not stoneflies. Global Change Biology, 27(2), 297-311.

https ://doi.org/:10.1111/gcb.15400

Sharma, K. Lodhi, R. K. & Rao, R. J. 2020. Study on diversity of aquatic insects in ramaua reservoir of gwalior district (MP).". International Journal of Research-granthaalayah, 8(2), 140-146. https://doi.org/10.29121/granthaalayah.v8.i2.2020.198

Shiddamallayya, N. & Pratima, M. 2007. A study on phytoplankton community of Papnash pond, Bidar, Karnataka, India. Ecology Environment and Conservation, 13(2), 367.

Subramanian, K. A. & Sivaramakrishnan, K. G. 2005. Habitat and microhabitat distribution of stream insect communities of the Western Ghats. Current Science, 976-987.

Thirumalai, G. 2004. A checklist of aquatic and semi-aquatic Hemiptera (Insecta) of Karnataka. Records of the zoological Survey of India, 57-72.

https://doi.org/10.26515/rzsi/v102/i1-2/2004/159528.