



Research article

## An Annotated Checklist of the Cladocera (Crustacea: Branchiopoda) of Bangladesh Based on Published Records

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### ABSTRACT

This study presents an updated and annotated checklist of freshwater Cladocera (Crustacea: Branchiopoda) of Bangladesh based on published records from 1983 to 2025. A total of 61 cladoceran taxa were documented, comprising 40 species-level and 21 genus-level records, distributed across 25 genera and 10 families. Chydoridae (31.15%) and Daphniidae (26.23%) were the most taxonomically dominant families, followed by Bosminidae and Moinidae (each 9.84%) and Sididae (8.20%), reflecting patterns typical of South Asian freshwater ecosystems. Marked spatial variation in reported richness was evident, with Chattogram showing the highest diversity, while several districts remain poorly studied. The frequent occurrence of genus-level records highlights limitations in earlier taxonomic resolution and uneven research effort. This checklist provides a standardized baseline for cladoceran biodiversity in Bangladesh and underscores the need for systematic surveys and integrative taxonomic approaches.

### Introduction

Zooplankton are a fundamental link in transforming energy from producers to consumers, playing a crucial role as efficient filter feeders on phytoplankton and as a food source for various invertebrates, fish, and their larvae (Saler & Selamoglu, 2020). They are considered one of the best indicators of biological productivity and the ecological condition of aquatic habitats (Roy et al., 2008). These organisms include protozoa, cladocerans, copepods, and rotifers, which can serve as indicators of water quality. The study of zooplankton is essential in fisheries, aquaculture, and paleolimnological research (Guy, 1992). They are widely recognized as pollution indicator organisms in aquatic environments (Lomartire et al., 2021). Zooplankton distribution is not homogeneous; some species are predominantly found in littoral waters, while others are restricted to selected limnetic waters (Mandal & Mukherjee, 2011).

Cladocera, a group of microcrustaceans, are key components of aquatic ecosystems and play an important role in ecosystem functioning (Geraldes & Boavida, 2004). Owing to their feeding habits, they influence the dynamics of phytoplankton, bacterioplankton, and protozoa, as well as the availability of detrital resources. Cladocerans form an important link in aquatic food webs, serving as prey for predatory copepods, aquatic insect

larvae, fish fry, and adult planktivorous fish (Dole-Olivier et al., 2000; Tessier et al., 2001; Sommer et al., 2003).

The study of Cladocera dates back to the second half of the seventeenth century, when O. F. Müller initiated research on this group (Frey, 1982). In 1829, the taxon was recognized as an independent group by Latreille (Fryer, 1987). Intensive taxonomic and faunistic investigations, however, began between 1840 and 1870, a period characterized by limited species differentiation, a pattern also observed in studies of other freshwater microinvertebrates. This development occurred relatively late compared with taxonomic studies of other organisms such as insects, birds, and mammals. Cladocera taxonomy gained greater attention during the 1970s, driven by increasing interest in documenting local faunas, providing detailed morphological descriptions, and conducting genetic studies (Korovchinsky, 1997).

Bangladesh's rich mosaic of aquatic habitats—including rivers, haors, beels, ponds, and floodplains—provides suitable environments for diverse cladoceran communities. Cladocerans play a central role in freshwater food webs: they are major grazers of phytoplankton and an important prey source for fish, facilitating energy transfer to higher trophic levels and supporting secondary production (Sarma et al., 2005). In particular, genera such as *Daphnia* and *Moina* are not only ecologically important

### ARTICLE INFO

#### Article timeline:

Date of Submission:

14 May, 2025

Date of Acceptance:

14 April, 2026

Article available online:

23 April, 2026

#### Keywords:

Cladocera

Freshwater Zooplankton

Annotated Checklist

Distribution

Bangladesh

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but are also widely used in aquaculture and fisheries as live feed, highlighting their economic importance (Rottmann et al., 1992; Lavens & Sorgeloos, 1996).

Despite their importance, comprehensive and updated checklists of cladoceran species in Bangladesh are lacking. This taxonomic and faunistic knowledge gap limits our understanding of aquatic biodiversity, ecosystem functioning, and the impacts of environmental change. The absence of a verified species checklist has direct implications for both research and commercial sectors. Inaccurate or outdated biodiversity data hinder effective monitoring of ecosystem health, the development of sustainable aquaculture practices, and the optimization of zooplankton production for fisheries.

Addressing this research gap is critical to advance aquatic biodiversity studies in Bangladesh, informing conservation and management strategies, and supporting economically vital industries. An updated, species-level inventory will not only enhance local ecological knowledge but also contribute to global understanding of freshwater zooplankton diversity, especially in underrepresented tropical regions.

## Materials and Methods

### Literature Search and Data Selection

A systematic literature review was conducted to compile published records of Cladocera from Bangladesh covering the period 1983–2025. Literature searches were performed using multiple sources, including Google Scholar, Web of Science, and Scopus, as well as local and regional journals not consistently indexed in international databases. Additional records were identified through backward citation tracking of relevant articles. Search terms included combinations of keywords such as “Cladocera,” “zooplankton,” “Branchiopoda,” “freshwater zooplankton,” “Bangladesh,” and family- or genus-level names (e.g., *Daphnia*, *Moina*, *Chydorus*). Searches were conducted in English, as the vast majority of relevant publications from Bangladesh are available in this language.

### Inclusion and Exclusion Criteria

Publications were included if they (i) reported the occurrence of Cladocera taxa within Bangladesh, (ii) provided identifiable taxonomic names at either species or genus level, and (iii) were published in peer-reviewed journals, books, or authoritative monographs. Grey literature such as theses, unpublished reports, and

conference abstracts was excluded to ensure data reliability and consistency. Records lacking sufficient taxonomic information or clear geographic attribution were also excluded. When multiple publications reported the same taxon from the same locality, records were consolidated to avoid duplication. Entries marked as ‘Data Unavailable’ in the tables indicate cases where the original published source did not report specific waterbody information, rather than inaccessibility of the source.

### Taxonomic Standardization and Synonymy Resolution

All taxonomic names were standardized to current valid nomenclature using the Freshwater Animal Diversity Assessment (FADA, 2013) checklist and the World checklist of freshwater Cladocera (Kotov et al., 2025). When conflicting identifications or outdated names occurred in the source literature, the most recently accepted taxonomic status was adopted. Records identified only to genus level in the original publications were retained as genus-level taxa and were not treated as confirmed species-level identifications. Original identifications were not reinterpreted and are reported as published, reflecting limitations in historical taxonomic resolution. Due to inconsistent reporting, data on first records, locality counts, and explicit confidence levels could not be standardized; taxonomic confidence is therefore indicated by species-level versus genus-level records.

### District-level Synthesis of Distribution Records

District-wise occurrence of recorded Cladocera taxa was summarized based on published locality information reported in the reviewed literature. Records were grouped by administrative district to identify areas of relatively high, moderate, and low reported richness across Bangladesh. Because locality information was inconsistently reported across historical sources, district-level patterns are presented as a qualitative textual synthesis rather than a spatial map.

## Results and Discussion

### Overview of Bangladeshi Cladocera

A total of 40 taxa identified to species level have been documented from Bangladesh. When 21 additional genus-level records are included, the checklist comprises 61 recorded cladoceran taxa, representing 25 genera and 10 families (Tables 1–4).

**Table 1:** Checklist of Cladocera taxa belonging to the family Chydoridae

CLADOCERA	WATERBODY	AUTHORS
<b>CHYDORIDAE</b>		
<i>Alona rectangula</i>	Lake, Wetland	Bhouyain (1983); Biswas & Panigrahi (2015)
<i>Alona intermedia</i>	Lake	Bhouyain (1983)
<i>Alona quadrangularis</i>	Wetland	Biswas & Panigrahi (2015)
<i>Alona costata</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Alona guttata</i>	Pond	Islam et al. (2020)
<i>Alonella</i> sp.	Wetland, Pond	Biswas & Panigrahi (2015); Islam et al. (2022); Hosain et al. (2014)
<i>Camptocercus macrurus</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Camptocercus</i> sp.	Data unavailable	Chakraborty (2023)

<i>Chydorus sphaericus</i>	Lake	Bhouyain (1983)
<i>Chydorus globosus</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Chydorus</i> sp.	Pond, River, Oxbow lake	Hosain et al. (2014); Khan & Abdul Bari (2019); Ahsan et al. (2012)
<i>Kurzia latissima</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Oxyurella tenuicaudis</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Oxyurella</i> sp.	Data unavailable	Chakraborty (2023)
<i>Pleuroxus hamulatus</i>	Lake	Bhouyain (1983)
<i>Pleuroxus trigonellus</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Pleuroxus</i> sp.	Pond	Hosain et al. (2014)
<i>Leydigia acanthocercoides</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Leydigia</i> sp.	Data unavailable	Bhouyain & Asmat (1992)

**Note:** Taxonomic confidence is inferred from species- or genus-level records due to inconsistent reporting in the original literature.

**Table 2:** Checklist of Cladocera taxa belonging to the family Bosminidae

CLADOCERA	WATERBODY	AUTHORS
<b>BOSMINIDAE</b>		
<i>Bosmina</i> sp.	Wetland, Pond, River, Estuary, Oxbow lake	Roy et al. (2010); Mozumder et al. (2015); Sharif & Hoque (2017); Sharif et al. (2016)
<i>Bosmina longispina</i>	River	Mojumder & Bhuyan (2020)
<i>Bosmina longirostris</i>	River	Mojumder & Bhuyan (2020)
<i>Bosmina coregoni</i>	Lake, Pond	Bhouyain (1983); Islam et al. (2020)
<i>Bosminopsis deitersi</i>	Lake	Bhouyain (1983)
<i>Bosminopsis</i> sp.	Pond	Khan & Abdul Bari (2019)

**Note:** Taxonomic confidence is inferred from species- or genus-level records due to inconsistent reporting in the original literature.

**Table 3:** Checklist of Cladocera taxa belonging to the family Daphniidae

CLADOCERA	WATERBODY	AUTHORS
<b>DAPHNIIDAE</b>		
<i>Ceriodaphnia cornuta</i>	Pond, River	Islam et al. (2020); Mojumder & Bhuyan (2020)
<i>Ceriodaphnia reticulata</i>	Pond	Naz & Najia (2009)
<i>Ceriodaphnia laticaudata</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Ceriodaphnia pulchella</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Daphnia similis</i>	Lake, Wetland	Bhouyain (1983); Biswas et al. (2015)
<i>Daphnia lumholtzi</i>	Lake, Pond, River, Oxbow lake	Reema et al. (2024); Mozumder et al. (2010); Mojumder et al. (2020)
<i>Daphnia carinata</i>	Wetland	Biswas & Panigrahi (2015)
<i>Daphnia pulex</i>	Wetland	Biswas & Panigrahi (2015)
<i>Daphnia parvula</i>	Pond	Naz & Najia (2009)
<i>Daphnia longispina</i>	Pond	Naz & Najia (2009)
<i>Daphnia magna</i>	Pond	Akther et al. (2016)
<i>Daphnia</i> sp.	Pond, River, Estuary	Haque et al. (2018); Hossain et al. (2020)
<i>Scapholebris kingi</i>	Lake	Bhouyain (1983)
<i>Scapholebris</i> sp.	Pond	Khan et al. (2020)

<i>Simocephalus serrulatus</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Simocephalus</i> sp.	Lake, Pond	Bhouyain (1983); Khan et al. (2020)

**Note:** Taxonomic confidence is inferred from species- or genus-level records due to inconsistent reporting in the original literature.

† *Daphnia magna* — Primarily Palearctic in distribution; its reported occurrence in Bangladesh is based on published records and requires confirmation.

**Table 4:** Checklist of Cladocera taxa belonging to the families Moinidae, Sididae, Macrothricidae, Podonidae, Ilyocryptidae, Leptodoridae, and Polyphemidae recorded from Bangladesh

CLADOCERA	WATERBODY	AUTHORS
<b>MOINIDAE</b>		
<i>Moina brachiata</i>	Lake, Pond	Reema et al. (2024); Naz et al. (2009)
<i>Moina micrura</i>	Wetland, Pond, River	Sultana et al. (2023)
<i>Moina macrocopa</i>	Pond, River	Sultana et al. (2023)
<i>Moina irrasa</i>	Pond	Naz et al. (2009)
<i>Moina</i> sp.	Wetland, Pond, River, Estuary, Oxbow lake	Mozumder et al. (2015); Haque et al. (2018); Rahman et al. (2006)
<i>Moinodaphnia</i> sp.	Pond	de Magny et al. (2011)
<b>SIDIDAE</b>		
<i>Diaphanosoma leuchtenbergianum</i>	Pond, River	Reema et al. (2024); Naz et al. (2009)
<i>Diaphanosoma brachyurum</i>	Pond, River	Islam et al. (2020)
<i>Diaphanosoma</i> sp.	Pond, River, Estuary, Oxbow lake	Hossain et al. (2020); Sultana et al. (2023); Mozumder et al. (2010)
<i>Penilia</i> sp.	Estuary	Sharif & Hoque (2017)
<i>Sida</i> sp.	Pond	Islam et al. (2022)
<b>MACROTHRICIDAE</b>		
<i>Drepanothrix dentata</i>	Pond	Naz et al. (2009)
<i>Macrothrix laticornis</i>	Lake	Bhouyain (1983)
<i>Macrothrix rosea</i>	Data unavailable	Bhouyain & Asmat (1992)
<i>Macrothrix</i> sp.	Pond, River	Khan et al. (2020); Ahsan et al. (2012)
<b>PODONIDAE</b>		
<i>Evadne</i> sp.	Estuary	Sarker et al. (2023)
<b>ILYOCRYPTIDAE</b>		
<i>Ilyocryptus</i> sp.	River, Estuary	Sharif & Hoque (2017); Sharif et al. (2016)
<b>LEPTODORIDAE</b>		
<i>Leptodora</i> sp.	Pond	Chakraborty (2023)
<b>POLYPHEMIDAE</b>		
<i>Polyphemus pediculus</i>	Pond	Naz et al. (2009)
<i>Polyphemus</i> sp.	Wetland	Biswas & Panigrahi (2015); Chakraborty (2023)

**Note:** Taxonomic confidence is inferred from species- or genus-level records due to inconsistent reporting in the original literature.

† *Polyphemus pediculus* — A Holarctic species; its reported occurrence in Bangladesh is biogeographically unusual and requires verification.

#### Familywise Composition of Cladocera

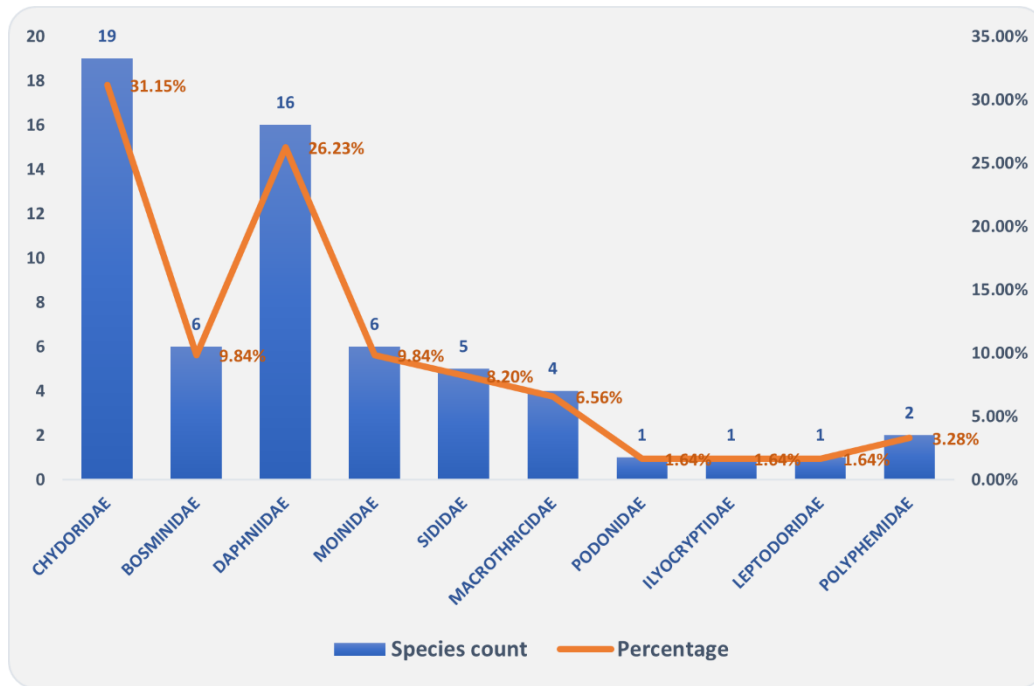
Based on a total of 61 recorded cladoceran taxa (including both species- and genus-level records), the family Chydoridae represented the highest proportion, comprising 19 taxa (31.15%), of which 13 were identified to species level and 6 to genus level. This was followed by

Daphniidae, with 16 taxa (26.23%), including 13 species-level and 3 genus-level records.

Both Bosminidae and Moinidae contributed 6 taxa each (9.84%), with 4 species-level and 2 genus-level records per family. Sididae accounted for 5 taxa (8.20%), comprising 2 species-level and 3 genus-level records, while Macrothricidae included 4 taxa (6.56%), of which 3

were identified to species level and 1 to genus level. The remaining families were sparsely represented: Podonidae, Ilyocryptidae, and Leptodoridae each contributed a single

genus-level record (1.64% each), whereas Polyphemidae comprised 2 taxa (3.28%), including one confirmed species-level and one genus-level record (Figure 1).



**Figure 1:** Family-wise percentage distribution of Cladocera taxa recorded in Bangladesh

The numerical dominance of Chydoridae and Daphniidae in Bangladesh is consistent with patterns reported from neighboring countries such as India, Nepal, and Myanmar, where these families similarly dominate freshwater cladoceran assemblages (Gogoi et al., 2018; Padhye & Dumont, 2021). This concordance indicates that the observed family-level composition reflects broader South Asian biogeographical patterns rather than a country-specific anomaly.

The relatively high proportion of genus-level records, particularly within Chydoridae and Sididae, highlights limitations in species-level resolution in earlier studies. This likely results from the morphological complexity of small-bodied taxa, limited diagnostic detail in older literature, and sampling bias toward littoral and benthic habitats where chydorids are most abundant (Dole-Olivier et al., 2000; Damme et al., 2013; Adamczuk, 2022).

#### District-wise Distribution of Recorded Cladocera Taxa

In addition to family-level patterns, published records indicate clear variation in reported Cladocera richness among districts in Bangladesh. Chattogram shows the highest documented richness ( $\geq 15$  taxa), likely reflecting both genuine diversity and greater research effort. Noakhali, Jhenaidah, and Rajshahi exhibit moderate richness (8–14 taxa), whereas several districts—including Dinajpur, Mymensingh, Tangail, Dhaka, Manikganj, Munshiganj, Chandpur, Khulna, Barisal, and Bhola—report low richness (1–7 taxa). Districts lacking published records highlight substantial geographic gaps in sampling.

Two taxa reported from Bangladesh—*Daphnia magna* and *Polyphemus pediculus*—warrant cautious interpretation. *Daphnia magna* is primarily a temperate Palearctic species and is rarely documented from tropical South Asia. Its record from Dinajpur (Akther et al., 2016) may reflect misidentification or the presence of a closely related taxon, as confusion within the *Daphnia magna* species complex is well documented.

Similarly, *Polyphemus pediculus* is a Holarctic species, and its reported occurrence in Bangladesh is biogeographically unusual. These records are retained here as published reports but should be considered provisional until confirmed through detailed morphological re-examination and molecular analyses.

Overall, these patterns should be interpreted cautiously, as uneven research intensity strongly influences the apparent distribution of cladoceran diversity and reinforces the need for targeted surveys to refine national biodiversity estimates.

#### Conclusion

This study presents an updated and annotated checklist of freshwater Cladocera of Bangladesh based on published records from 1983 to 2025, documenting 40 taxa identified to species level and 21 additional genus-level records, resulting in a total of 61 recorded cladoceran taxa across 25 genera and 10 families. Chydoridae and Daphniidae were the most taxonomically represented families, consistent with patterns reported from other South Asian countries. Spatial variation in reported richness reflects both ecological heterogeneity and uneven research effort,

with several regions remaining poorly documented. The frequent occurrence of genus-level records highlights limitations in historical species-level resolution and underscores important taxonomic and geographic knowledge gaps. Overall, this checklist provides a transparent baseline for future research and emphasizes the need for systematic field surveys, improved morphological resolution, and molecular approaches to refine species identities and strengthen freshwater biodiversity assessments in Bangladesh.

### Acknowledgement

The authors gratefully acknowledge all researchers whose studies provided the foundation for this checklist. The

authors thank the reviewers for their constructive comments, which improved the manuscript. This study received no specific funding.

### Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

### Data Availability

The data supporting the findings of this study are derived from published sources and are included within this article and its tables.

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