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Research Article

VASCULAR MACROPHYTIC FLORA OF PEER PANJAL HIAMALYA OF JAMMU, JAMMU AND KASHMIR, INDIA

Mushtaq Ahmed* and Manjul Dhiman
Laboratory of Plant Taxonomy, Department of Botany, KL DAV PG College Roorkee, (HNB Central University Garhwal) Uttarakhand
**Author for Correspondence: ahmedmbot@gmail.com*

ABSTRACT
The present study includes the documentation of vascular aquatic macrophytes from the Peer Panjal range of Himalaya of Jammu, Jammu and Kashmir. The collection involves about 51 aquatic and semiaquatic plant species belonging to 34 genera and 26 families. This is the first documentation of aquatic macrophytes from this region. The complete list with photographs and necessary details are provided in the manuscript.

Keywords *Vascular, Macrophytes, Documentation, Peer Panjal Range, Checklist*

INTRODUCTION
Likewise the terrestrial flora aquatic flora also pay pivotal role in maintaining the normality of ecosystem. These are the photosynthetic organisms having various types of plant species and can be seen with naked eyes. These plant species are either permanently submerged complete whole life cycle inside the water body or in the areas of temporarily inundation. The high variability in this floristic diversity is due to various abiotic and biotic factors of the environment (1). The vascular macrophytic flora is represented by 33 orders and 88 families and 2,614 species in about 412 genera. The highest diversity was reported from Neotropics having about 984 species, Orient 664 species, Nearctic with 644 species, and Afrotropics having 614 species. Palearctic and Austalasia has 497 and 439 species respectively, while Pacific region and Oceanic islands has 108 species each, and with only a few species were reported from Antarctica with almost all confined to sub-Antarctic freshwater habitats (Chambers *et al.*, 2008). In India there are more than 600 species were reported from various sites of the country Cook (1996). The Jammu and Kashmir which is rich in perennial water resources and number of workers collected aquatic macrophytes from marshes and lakes of the state including (Moorcroft and Trebeck 1841), Royle (1833–1840) reported aquatic flora from this region and published in his *Illustrations of Botany of the Himalayan Mountains and Flora of Cashmere*. Rao (1961) listed 51 aquatic plant species from this region. The first comprehensive account on aquatic vegetation of Srinagar was given by Kaul and Zutshi (1967), wherein they listed 117 species of macrophytes. Stewart (1972) made the most extensive floristic studies in the region, recording more than 2,500 vascular plant species, including 159 aquatic plant species from Kashmir Himalaya. Kak (1990), based on his field surveys, reported 196 aquatic angiosperm species from Kashmir Himalaya, these species belong to 82 genera in 44 families. Shah *et al.*, 2019 collected about 234 species of macrophytes from whole state of Jammu and Kashmir including Ladakh. Ganie *et al.*, 2019 recorded about 191 species of aquatic macrophytes in their updated checklist of the macrophytes from the state, including both semiaquatic and aquatic plants belonging to 80 genera and 37 families. However this is the first documentation of aquatic vascular macrophytes from the Peer Panjal region of Jammu division including twin districts i.e. Rajouri and Poonch.

MATERIALS AND METHODS
The present study was carried out in the Peer Panjal range of Himalaya of Jammu, Jammu and Kashmir, rich in natural and perennial water resources. Extensive field survey was carried out focusing on mainly marshes, wetlands, streams, rivers, and other water bodies of the region from 2019-2021 followed by

photograph collection with the help of Nikon B500. The identification of the collected specimens were done involving the regional national and international floras, available literature (Stewart 1972; Cook CDK, 1996; Sekar KC, 2012; Shah *et al.*, 2014, Ganie *et al.*, 2019 & Shah *et al.*, 2019) and online herbaria *(https://wcvp.science.kew.org/;* and Flora of China) etc. The complete list with photographs and other necessary details are availed in the manuscript.

RESULTS

The present study explored a total of 51 species belonging to 34 genera and 26 families of aquatic and semiaquatic vascular macrophytes from Peer Panjal range of Jammu. The complete list of the collection is given in the below table 1.

Table 1: List of vascular aquatic macrophytes

S.No.	Species	Family
1	*Acorus calamus* L.	Acoraceae
2	*Alternanthera philoxeroides* Griseb.	Amaranthaceae
3	*Alternanthera sessilis* (L.) R. Br. ex DC	Amaranthaceae
4	*Ammania baccifera* L	Lythraceae
5	*Bacopa monnieri* (L.) Pennell	Plantaginaceae
6	*Bidens tripartita* L.	Asteraceae
7	*Bolboschoenus maritimus* (L.) Palla	Cyperaceae
8	*Cardamine impatiens* L.	Brassicaeae
9	*Ceratophyllum demersum* L.	Ceratophyllaceae
10	*Cyperus rotundus* L.	Cyperaceae
11	*Cyperus cyperiodes* (L.) Kuntze	Cyperaceae
12	*Cyperus difformis* L.	Cyperaceae
13	*Cyperus iria* L.	Cyperaceae
14	*Cyperus compressus* L.	Cyperaceae
15	*Cyperus distans* L.f.	Cyperaceae
16	*Echinochloa colonum* (L.) Link	Poaceae
17	*Eclipta prostrata* (Linn.) Mant	Asteraceae
18	*Epilobium parviflorum* (Schreb.) DC.	Onagraceae
19	*Epilobium hirsutum* (L) Gray	Onagraceae
20	*Epilobium royleanum* Hausskn.	Onagraceae
21	*Equisetum diffusum* Don	Equisetaceae

22	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae
23	*Ipomoea carnea* Jacq.	Convolvulaceae
24	*Kyllinga brevifolia*	Cyperaceae
25	*Lycopus europaeus* L.	Lamiaceae
26	*Marsilea quadrifolia* L.	Lamiaceae
27	*Mentha aquatic* L.	Lamiaceae
28	*Mentha arvensis* L.	Lamiaceae
29	*Mentha longifolia* (L.) Huds.	Lamiaceae
30	*Mentha spicata* L.	Lamiaceae
31	*Myosotis scorpioides* L	Boraginaceae
32	*Nasturtium officinale* W. T. Aiton	Brassicaceae
33	*Paspalidium germinatum* (Forssk.) Stapf	Poaceae
34	*Pedicularis punctata* L.	Orobanchaceae
35	*Phyla nodiflora* (L.) Greene	Verbenaceae
36	*Polygonum plebeium* R.Br., Prodr.	Polygonaceae
37	*Polygonum aviculare* L.	Polygonaceae
38	*Persicaria lapathifolia* (L.) Delarbre	Polygonaceae
39	*Portula oleracea* L.	Portulacaceae
40	*Potamogeton crispus* L.	Potamogetonaceae
41	*Potamogeton nodosus* Poir.	Potamogetonaceae
42	*Ranunculus trichophyllus* Chaix	Ranunculaceae
43	*Ranunculus muricatus* L.	Ranunculaceae
44	*Rorippa palustris* (L.) Besser	Brassicaceae
45	*Samolus valerandi* L.	Primulaceae
46	*Saggitaria sagittifolia* L.	Alismataceae
47	*Sium latijugum* C.B. Clarke	Apiaceae
48	*Veronica anagallis-aquatica* L.	Plantaginaceae
49	*Veronica anagalloides* Guss.	Plantaginaceae
50	*Veronica beccabunga* L.	Plantaginaceae
51	*Veronica chamaedrys* L.	Plantaginaceae

Figure 1. A. *Alternanthera philoxeroides* B. *Ammania baccifera* C. *Bacopa monnieri* D. *Bidens tripartite* E. *Bolboschoenus maritimus* F. *Cyperus rotundus* G. *Cyperus iria* H. *Cyperus difformis* I. *Eclipta prostrate* J. *Epilobium hirutum* K. *Lycopus europaeus* L. *Mentha longifolia* M. *Myosotis scorpioides* N. *Nasturtium officinale* O. *Phyla nodiflora* P. *Persicaria lapathifolia* Q. *Potamogeton nodosus* R. S. *Ranunculus trichophyllus* T. *Ranunculus muricatus* U. *Samolus valerandi* V. *Sium latijugum* W. *Veronica chamaedrys* X. Y. *Veronica anagalloides* Z. *Veronica anagallis-aquatica.*

DISCUSSION

The Peer Panjal range of Himalaya rich in biodiversity and natural water resources like streams, rivers, springs and ponds etc, hence rich in aquatic flora too. These natural sources of aquatic floras are diminishing with the time due to anthropogenic pressures like extraction of minerals, developmental projects deposition of solid wastes on the banks of water resources and number of other such disastrous acts of humans which are diminishing the aquatic flora. The region is devoid of any such documentation of aquatic macrophytes from the study area, and this is for the first time documentation has been carried out to explore the aquatic flora of the region. With the changing environment due to economic growth along with industrial revolution has led to the rise in demand of water besides creating disturbances in hydrological balances in water catchment areas. The rise in the industrial wastes in turn increased the water pollutants in the water bodies which diminished the quality of water. With the change in the quality there is vibrant changes in the aquatic vegetation of the water bodies, such changes has been reported for aquatic ecosystems form some other regions too (Ozimek 1978 and Heino *et al.*, 2009). The macrophytes are a vital component of wetland ecosystems sustaining several aquatic food chains in the water body. So the region is devoid of any such documentation for the aquatic macrophytic flora, so this study will be platform for all the future research and studies hereafter for different aspects. This will determine the quantitative as well as qualitative aspects of the water like quality of water, water borne plants inhabiting in the region etc.

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REFERENCES

Chambers PA, Lacoul P, Murphy KJ, Thomaz SM (2008). Global diversity of aquatic macrophytes in freshwater. *Hydrobiologia*, **595** 9–26

Cook CDK (1996). *Aquatic and wetland plants of India*. Oxford University Press, New Delhi.

Ganie AH, Rasheed S, Khuroo AA and Dar GH (2019). *An Updated Checklist of Aquatic Macrophytes in Jammu and Kashmir State*. G. H. Dar, A. A. Khuroo (eds.), Biodiversity of the Himalaya: Jammu and Kashmir State, Topics in Biodiversity and Conservation. Springer Nature Singapore. Pvt. Ltd. 18: 519-545.

Heino J, Virkkala R and Toivonen H (2009). Climate change and freshwater biodiversity: detected patterns, future trends and adaptations in northern regions. *Biological Reviews*, **84** 39–54.

Kaul V, Zutshi DP (1967). A study of aquatic and marshland vegetation of Srinagar. *Proc. Nat.Inst. Sci. India*, **33**(3–4), 111–127

Kak AM (1990). Aquatic and wetland vegetation of Kashmir Himalaya. *Journal of Economic and Taxonomic Botany* **14,** 1–14.

Moorcroft W, Trebeck G (1841). *Travels in the Himalayan Provinces* (1819–1835). 1–2 illustrated. John Murray, London.

Ozimek T (1978). Effects of municipal sewage on the submerged macrophytes of a lake littoral. *Ekologia Polska*, **26** 3-39.

Rao TA (1961). A further contribution to the flora of Jammu and Kashmir state. *Bull of Botanical Survey of India*, **11** 387–423

Royle JF (1833–1840). *Illustrations of Botany and other branches of the natural history of the Himalayan mountains and Flora of Cashmere.* Wm. H. Allen, London.

Shah MA, Reshi ZA (2014). Characterization of alien aquatic flora of Kashmir Himalaya: implications for invasion management. *Tropical Ecology*, **55**(2)143–157

Shah, AB, Reshi, ZA and Shah, MA (2014). *Clonal trait diversity in aquatic angiosperms of Kashmir Valley*, India. MPhil. Dissertation, University of Kashmir, Srinagar.

Shah AB, Reshi ZA and Shah MA (2019). Conspectus of aquatic macrophytic flora of Jammu & Kashmir State, India. *International Journal of Scientific Research in Biological Sciences*, 6,167-176.
Sekar KC (2012). Invasive Alien Plants of Indian Himalayan Region— Diversity and Implication. *American Journal of Plant Sciences*, 3, 177-184
Stewart RR (1972). *An annotated catalogue of the vascular plants of West Pakistan and Kashmir*. Fakhri Printing Press, Karachi.