

the Pithoragarh District, we collected *Vittaria himalayensis* Ching from near Munsyari (Kalamuni 3000 m) which is a new record for the western Himalayas.

A genus of about 80 species⁵, *Vittaria* J. Smith, is widely distributed in the tropical parts of the world. In the western Himalayas it is so far known to be represented by only one species, *V. flexuosa* Fee¹⁻⁷ but in the eastern Himalayas the genus is represented by as many as seven species. Of these *V. doniana*, *V. himalayensis* and *V. ophipogonoides* were recorded for the first time from the Indian part of the Himalayas⁵. Most of the species are epiphytes or lithophytes. The fronds are simple, fleshy with two rows of marginal or intramarginal linear coenosori.

Presently the two species of the region are described. Key to the species:

1a. Fronds erect, small, less than 25 cm long; sori half way between the margins and the midrib; rhizome scales with cuneate or obtuse base

V. himalayensis

1b. Fronds pendent, large, 30–50 cm long; sori near the margins; rhizome scales with cordate base

V. flexuosa

1. *V. himalayensis* Ching, *Sinensia*, 1, 190, f. 5B, 1931.

Rhizome creeping or suberect, densely covered with linear, pale yellow scales; lamina simple, linear, broad in the middle, gradually tapering towards both ends, 8–25 × 0.3–0.5 cm, leathery, apex acute, midrib restricted to the central part of lamina; veins simple, oblique; sori intramarginal, in grooves, half way between margin and midrib; spores 62 × 32 μ (figures 1–4).

Specimens examined: PUN 4184, Punetha 584, 585.

2. *V. flexuosa* Fee, 3 me. Mem., 16, 1851–52.

Rhizome short, creeping, densely scaly; stipe 0.5–1 cm long; lamina simple, linear, coriaceous, 25–50 × 0.3–0.5 cm, wide at the middle, gradually narrowed towards both ends, apex acute, a distinct midrib is present from the base to the apex; veins simple, immersed, parallel; sori intramarginal, in shallow furrows, near to margins, spores 100 × 50 μ (figures 5–8).

Although some earlier workers^{2,3} described the north Himalayan *V. flexuosa* Fee as *V. lineata* (L.) J. Smith, Bir⁵ clarified that the Himalayan fern is *V. flexuosa* Fee and that *V. lineata* (L.) J. Smith is a tropical American species.

In Pithoragarh District it is very common at Didihat (1700 m), Gini (2200 m) and Kalamuni (2800 m). Specimens examined: PUN 4185; Punetha 324, 325, 586, 587, 588, 589, 590.

The authors are thankful to Prof. S. S. Bir, Department of Botany, Punjabi University, Patiala for confirming the identity of the species, for perusal of the manuscript and for encouragement. Financial help provided by UGC, New Delhi is also gratefully acknowledged.

21 July 1987; Revised 22 September 1987

1. Clarke, C. B., *Trans. Linn. Soc. London, II Bot.*, 1880, 1, 574.
2. Beddome, R. H., *A Handbook to the Ferns of British India, Ceylon and Malaya Peninsula with suppl.*, Thacker Spink & Co., Calcutta, 1892.
3. Hope, C. W., *J. Bombay Nat. Hist. Soc.*, 1904, 15, 103.
4. Duthie, J. F., *Cat. Plants of Kumaon*, 1906 (Reprint) Bishen Singh and Mahendra Pal Singh, Dehradun, 1974.
5. Bir, S. S., *Res. Bull. (N. S.) Punjab Univ.*, 1962, 13, 15.
6. Dhir, K. K., *Bibliotheca Pteridologica*, Band 1, J. Cramer, Vaduz, 1979.
7. Bir, S. S., Satija, C. K., Vasudeva, S. M. and Goyal, P., *Pteridophytic Flora of Garhwal Himalaya*, Jugal Kishore & Co., Dehradun, 1983.

LONG-STYLED FORM OF WATER HYACINTH IN INDIA

BRIJ GOPAL

School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110 067, India

WATER hyacinth (*Eichhornia crassipes* (Mart.) Solms), the most troublesome aquatic weed, is a tristylous species of family Pontederiaceae¹. The mid-styled form is widely distributed throughout the tropics and subtropics where it was introduced from its native home in South America². The short-styled form is so far known only from Amazonia in Brazil. The long-styled form has been found in many places both in its native and adventive range except Australia². In India, the long-styled form was first reported from Madras and Bangalore by Haldane³ who called for more field surveys to assess the distribution of the three forms. Later, Das⁴ reported it from Sagar and Bhopal in Madhya Pradesh, and Reddy and Bahadur⁵ collected this form from a



Figure 1. Long-styled flowers of water hyacinth.

canal and a tank in Warangal (Andhra Pradesh). All these reports recorded that the long-styled form grew mixed with the mid-styled form and that their individuals numbered only 2–4% of the total population^{4,5}.

During recent field trips the present author found a pure population of long-styled form (figure 1) growing in Delhi (roadside waterbody between Ring road and railway line, behind Zoological Gardens). The plants were profusely flowering. Interestingly, the adjacent water bodies had exclusively mid-styled plants. Another recent visit to Bhopal revealed that the water hyacinth population in the Lower Lake of Bhopal was also purely long-styled. In both localities, not a single inflorescence with mid-styled flowers could be found out of several hundred examined at each site.

The presence of pure long-styled populations in India raises some important questions concerning their introduction and the breeding biology of the species. There is no evidence, direct or indirect, to explain the occurrence of pure long-styled populations on the basis of separate introductions in India. In Sri Lanka, where the long-styled form is a

predominant² (and that too in the adventive range of the species), water hyacinth was, of course, introduced independently from that in India.

Studies on the breeding system in waterhyacinth^{6,7} (and other tristylous members of Pontederiaceae) suggest that long-style is a recessive character and mid-style a dominant character. Long-styled plants have been shown to segregate from heterozygous mid-styled plants^{6,7}. Such a segregation explains well the presence of a few long-styled plants among the mid-styled population but cannot account for the development of pure population. Pure long-styled populations have been reported earlier from Florida besides Brazil. However, no attempt has been made to explain their development. The possibility of their developing from a single individual cannot be ruled out but is only remote.

The objective in reporting the observations is thus to highlight the need for thorough field surveys throughout the country, and for intensive studies on the breeding system and possible differences in the ecological responses of the two forms of water hyacinth.

10 August 1987

1. Barrett, S. C. H., *Biotropica*, 1977, **9**, 230.
2. Gopal, B., *Water hyacinth*, Elsevier, Amsterdam, 1987.
3. Haldane, J. B. S., *J. Bombay Nat. Hist. Soc.*, 1960, **57**, 243.
4. Das, R. R., Ph.D. thesis, Banaras Hindu University, Varanasi, 1968.
5. Reddy, N. P. and Bahadur, B., *J. Indian Bot. Soc.*, 1977, **56**, 299.
6. Mulcahy, D. L., *Bull. Torrey Bot. Cl.*, 1975, **102**, 18.
7. Barrett, S. C. H., *Evolution*, 1979, **33**, 499.