

Myriophyllum exasperatum (Haloragaceae), a new species from China

Wang Dong¹, Yu Dan^{1*} & Li Zhen-yu²

¹ Department of Botany, College of Life Sciences, Wuhan University, Wuhan 430072, People's Republic of China

² Laboratory of Systematic & Evolutionary Botany, Institute of Botany, the Chinese Academy of Sciences, Beijing 100093, People's Republic of China

* Corresponding author: yudan01@public.wh.hb.cn

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A new species of *Myriophyllum* from southern China, *M. exasperatum* D. Wang, D. Yu & Z.Y. Li, is described and illustrated. Features that distinguish the new species are: stems robust, submerged leaves pectinate with 9–13 filiform pinnae; floral bracts mostly spathulate, with 2–4 short teeth on each margin in distal half and obtuse tips; bracteoles simple, broadly lanceolate to ovate, with 4–6 short teeth on each margin and acute tips; flowers uniformly hermaphrodite, sepals orbicular 0.1–0.2 mm long and wide, petals spreading but not recurved-circinate 1.5–1.8 mm long, stamens 8, anthers truncate 1.3–1.4 mm long; and fruits quadrangular, 1.8–1.9 mm long and 1.9–2.0 mm wide, each mericarp laterally flattened with a sharp longitudinally ridge on dorsal surface, finely tuberculate on both ridges and furrows. The new species is most similar to *M. tuberculatum* from India, Pakistan and Malaysia, to a lesser extent to both *M. muricatum* from Australia and New Zealand, and *M. indicum* from Ceylon and south Deccan.

Key words: Haloragaceae, *Myriophyllum*, taxonomy

Introduction

The genus *Myriophyllum* (Haloragaceae) is almost cosmopolitan. However, the distribution of ca. 60 species has three main centers: Australasia, North America and India/Indo-China (Orchard 1985, 1990). To date ten taxa including nine species and one variety have been recorded

from China (Yan 1983, Li & Heish 1996, Wan 2000, Yu *et al.* 2001): *M. alterniflorum*, *M. aquaticum*, *M. dicoccum*, *M. humile*, *M. spicatum*, *M. tetrandrum*, *M. tuberculatum*, *M. ussuriense*, *M. verticillatum*, and *M. spicatum* var. *muricatum*. Recent collections in Guangxi Province, southern China, have led to the discovery of several populations in which the plants

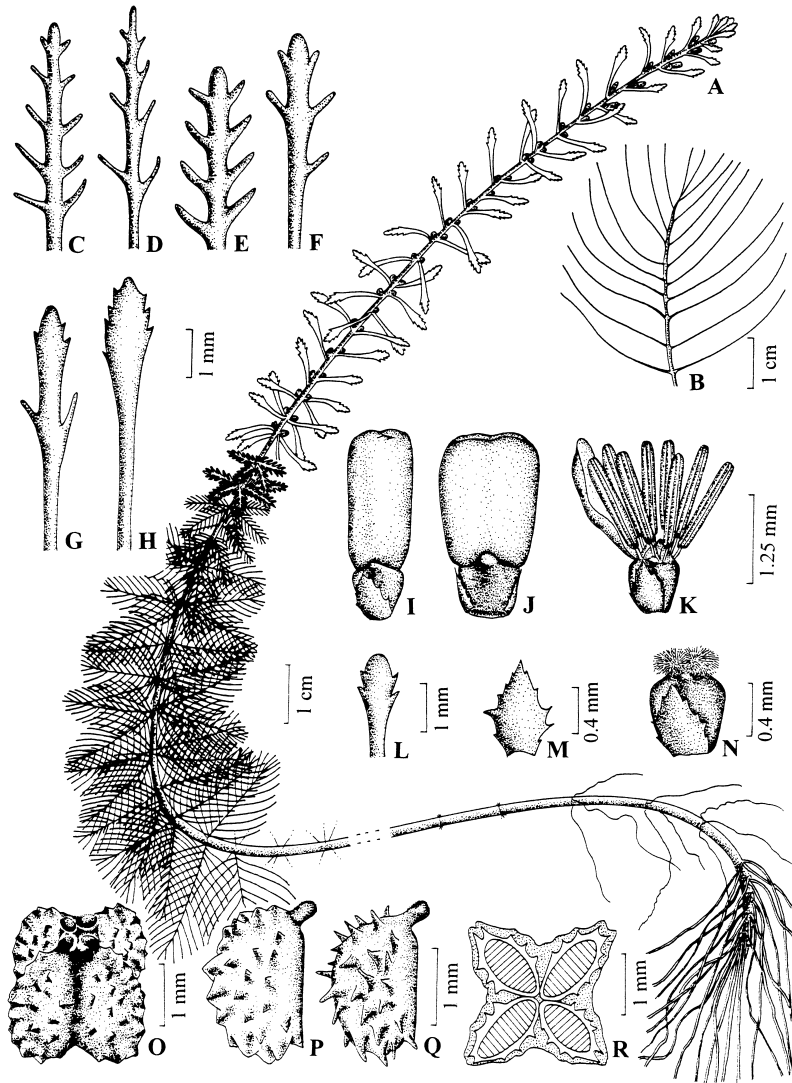


Fig. 1. *Myriophyllum exasperatum* (from the holotype). — **A:** Habit. — **B:** Submerged leaf. — **C–H:** Emergent leaves. — **I and J:** Hermaphrodite flower before anthesis and bracteoles. — **K:** Hermaphrodite flower, showing four stigmas and eight stamens. — **L:** Floral bract. — **M:** Bracteole. — **N:** Immature fruit. — **O:** Mature fruit. — **P:** Lateral view of mature mericarp (with exocarp). — **Q:** Lateral view of mature mericarp (no exocarp). — **R:** Diagrammatic transverse section of mature fruit.

possessed features that were quite different from the other known species in *Myriophyllum*. Field studies of living plants, and observation of cultivated plants, have enabled us to confirm a new species, which is described below. This species is a supplement to the *Flora Reipublicae Popularis Sinicae* vol. 53(2) (Wan 2000).

Myriophyllum exasperatum D. Wang,
D. Yu & Z.Y. Li, *sp. nova* (Figs. 1 and 2)

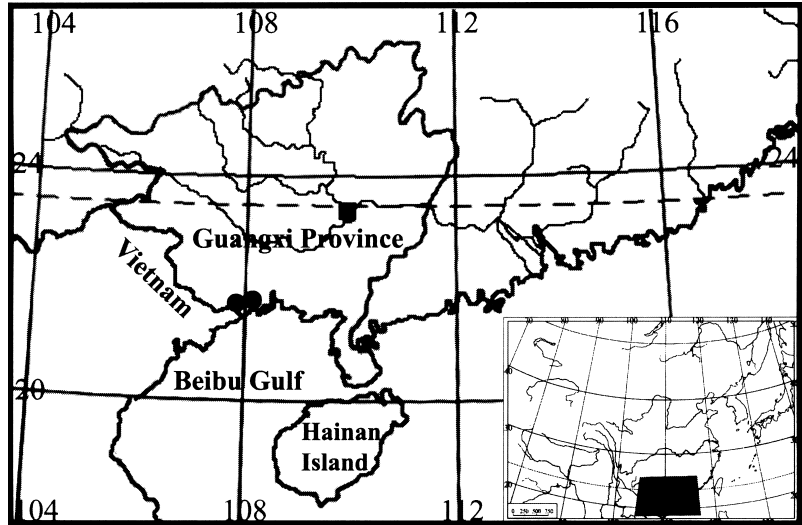
Haec species Myriophyllo tuberculato Roxb.
affinis, sed floribus omnibus hermaphroditis,

staminibus 8 et petalis non recurvo-circinatis differt.

TYPE: China. Guangxi: Dongxing City (N of the Beibu Gulf), ca. 13 km NE of the city, common, growing in lentic waters of 0.6–1.2 m deep, 21°36'692"N, 108°04'696"E, 26.5 m alt., 20.XI.2001 D. Wang 1316 (holotype WH, isotype PE).

Stout aquatic herbs, perennial. Stems robust, reddish-brown, 60–135 cm long, (3)–4–5(–7) mm in diameter, rooting only at base, sparsely branched, upper part usually emergent. Leaves dimorphic. Submerged leaves in whorls of (4)–5–6 (sometimes pseudo-whorled near water

Fig. 2. Distribution of *Myriophyllum exasperatum*. Dots denote collections by the first author, square denotes a collection by other collectors.



surface), broadly ovate to suborbicular in outline, 4.5–5.5(–6) cm long, 4–4.5 cm wide, pectinate with (7–)9–11(–12) filiform pinnae, pinnae 2.2–2.8 cm long. Emergent leaves in lower parts like submerged ones but smaller, pinnate with 4–7 pinnae; upper ones usually alternate, sometimes opposite, whorled to pseudo-whorled, linear to spatulate, 1.5–15 mm long, 2–2.5(–3) mm wide (widest towards tip), with 2–4 short teeth on each margin in distal half and obtuse tips. One purplish black scale hair 0.4–0.6 mm long lateral to base of emergent leaves on each side. Inflorescence a simple spike, 13–31 cm long, with hermaphrodite flowers borne in axils of floral bracts, in whorls of (4–)5–6 and each flower subtended by two bracteoles. Bracts leaf-like, bracteoles slightly brown, broadly lanceolate to ovate, 0.8–0.9 mm long, 0.4–0.6 mm wide, with 4–6 short teeth on each margin and acute tips. Flowers sessile, hermaphrodite, 4-merous; sepals 4, orbicular, small, 0.1–0.2 mm long and wide, entire; petals 4, white and pinkish at apex, 1.5–1.8 mm long, 0.5–0.6 mm wide, hooded, not keeled, spreading and not recurved-circinate, caducous; stamens 8, filaments elongating to 0.6–0.7 mm long at anthesis; anthers linear-oblong, 1.3–1.4 mm long, 0.2–0.25 mm wide, truncate; styles 4, short, 0.2 mm long; stigmas pinkish to white after anthesis, shortly fimbriate; ovary 4-locular, cubic, 0.7–0.8 mm long, 0.6–0.7 mm wide. Fruits sessile, reddish brown

to olive brown, quadrangular, 1.8–1.9 mm long, 1.9–2 mm wide, cruciform in horizontal cross-section; mericarps tardily separating, finely tuberculate, each mericarp laterally flattened and with a longitudinally dorsal tuberculate ridge. Exocarp membranous. Endocarp woody, with numerous short spines on rounded portion and 2 staggered rows of spines forming ridges. Exocarp on old fruits rotting, revealing spinous endocarp.

ETYMOLOGY. The specific epithet refers to the finely tuberculate fruits of this species.

DISTRIBUTION, HABITAT AND ECOLOGY. The new species is known from Guangxi Province, southern China. The collection sites of the first author and other collectors are shown in Fig. 2. The first author collected *M. exasperatum* in a series of waters northeast of Dongxing City, which is near Vietnam and located in the northern coast of the Beibu Gulf. *Myriophyllum exasperatum* was found growing in both the lotic and lentic waters to 0.7–1.5 m deep, in slowly flowing rivers and streams, and it was intermixed with *Ammannia myriophylloides*. *Potamogeton octandrus* was also a common associate at one location. At the second location, several kilometers northeast of the first locality, *M. exasperatum* grew in stagnant waters and was associated with *M. dicocum*, *Ammannia myriophylloides*, *Philydrum*

lanuginosum, *Utricularia exoleta*, *U. aurea*, *Hydrilla verticillata*, *Blyxa japonica*, *Jussiaea repens*, etc. In nature, plants can persist as a terrestrial growth form for only a brief period.

PHENOLOGY. Based on our monthly fieldwork and from the survey of the collections, we concluded that flowering occurs from August to November, and fruiting from October to December.

Discussion

Myriophyllum exasperatum is closely allied to *M. tuberculatum* from India, Pakistan and Malesia, and less to both *M. muricatum* from Australia and New Zealand and *M. indicum* from Ceylon and south Deccan. *Myriophyllum exasperatum* shares with *M. tuberculatum* most features (particularly in its size, general habit, ecology and fruit shape) but differs in having uniformly hermaphrodite flowers, petals that are spreading but not recurved-circinate, and in having eight instead of four stamens. In respect to the number of stamens, the new taxon bears the same relationship to *M. tuberculatum* as *M. indicum* does to *M. tetrandrum*. Also, *M. exasperatum* is morphologically similar to *M. muricatum*. Several characters, however, separate them. In *M. exasperatum* (1) submerged leaves are pectinate with (7–)9–11(–12) filiform pinnae, (2) floral bracts subtending the flowers have 2–4 short acute teeth on each margin in distal half and obtuse tips, (3) bracteoles are broadly lanceolate to ovate, 0.8–0.9 mm long, (4) petals are 1.5–1.8 mm long, (5) anthers are 1.3–1.4 mm long, truncate, non-apiculate, and (6) fruits are quadrangular in outline, 1.8–1.9 mm long and 1.9–2.0 mm wide, mericarps are not winged, each with a sharp, longitudinally dorsal tuberculate ridge. In *M. muricatum* (1) submerged leaves are pectinate with 25–35 filiform pinnae, (2) floral bracts subtending the flowers have 10–12 short acute lobes on each margin in distal half and acute tips, (3) bracteoles are lanceolate to ovate, 0.8–1.4 mm long, (4) petals 2.0–2.4 mm long, (5) anthers are 1.5–2.0 mm long, apiculate, and (6) fruits are depressed globular in outline, 2.4–3.4 mm long and 3.3–4.8 mm wide, mericarp with a well-developed dorsal wing. Moreover, these two taxa are well separated also in dis-

tribution, since *M. exasperatum* exhibits strong warm temperate and tropical affinities.

Myriophyllum exasperatum differs from *M. indicum* by simple, broadly lanceolate to ovate (vs. pinnate or digitate) bracteoles; somewhat shorter anthers, 1.3–1.4 mm (vs. 1.5–1.8 mm) long; uniformly hermaphrodite flowers (vs. usually have both hermaphrodite and staminate flowers); and fruits that are quadrangular (vs. globular) and finely tuberculate (vs. finely tuberculate or usually smooth), each mericarp with a sharp longitudinally dorsal ridge (vs. rounded on the back, no ridges).

Observations of *Myriophyllum exasperatum* both in field and cultivated plants revealed that the new taxon has a great degree of variability in its emergent leaf morphology (as shown in Fig. 1C–H). The upper stems of *M. exasperatum* are usually emergent, the emergent floral leaves in flowering/fruiting phase are green, linear and spatulate in outline, and have obtuse tips and 2–4 short teeth on each margin in distal half. In contrast, the vegetative emergent leaves are slightly reddish brown and all pinnately divided to the top of the stems. Petals spread in and after anthesis are caducous but do not become recurved-circinate (vs. finally recurved-circinate in *M. tuberculatum*). A part of the submerged petiole adjacent to the stem persists and enlarges while the submerged leaf segments decayed. The persistent part becomes papillae-like, 0.1–0.25 mm long.

Myriophyllum exasperatum is one of the most robust of all *Myriophyllum* species, being rivaled in China only by *M. verticillatum* and the exotic *M. aquaticum*. Sometimes the stem diameter can be 6–7 mm, particularly in the lower parts.

ADDITIONAL SPECIMENS EXAMINED (paratypes). **China.** Guangxi: Dongxing, 21°36'692"N, 108°04'696"E, 24.VIII.2001 D. Wang & Y. M. Huang 933 & 944 (WH), 20.XI.2001 D. Wang 1329 & 1348 (WH); Guiping, 23°32'707"N, 110°35'249"E, 28.XI.2001 Z. Q. Li, Y. Q. Yang & Y. K. Li 1100116 (WH).

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