

## PHRYMACEAE

透骨草科 *tou gu cao ke*

Hong Deyuan (洪德元)<sup>1</sup>; Jun Wen (文军)<sup>2</sup>

Herbs, annual or perennial [or subshrubs to shrubs], erect, prostrate, creeping to ascending. Stems 4-angular or winged or terete, occasionally highly reduced. Stipules absent. Leaves simple, opposite; leaf blade margin serrate or entire or variously toothed. Inflorescences a terminal [or axillary] spike [or a terminal raceme or a cyme] or flowers solitary and axillary. Flowers perfect, with [or without] a bract and a bracteole. Calyx connate, 5-lobed or dentate; lobes usually less than 1/3 of calyx length. Corolla connate, tubular or cylindric, 2-lipped; lower lip with 3 imbricate lobes; upper lip 2-lobed. Stamens [2 or]4, inserted in corolla tube or exerted, anterior 2 longer; anthers longitudinally dehiscent. Gynoecium of 2 connate carpels; ovary superior, 1- or 2-locular; stigma broadly 2-lobed to 2-lipped, receptive only on inner surface and close together upon contact. Fruit an achene (in *Phryma*), loculicidal capsule (e.g., in *Mimulus* Linnaeus) [or occasionally berrylike (in *Leucocarpus* D. Don)]. Seeds numerous, rarely to 1, with an oblong embryo; endosperm scanty.

About 14 genera and 150 species: worldwide, especially well developed in W North America and Australia; two genera and six species (four endemic) in China; one species treated here, one genus and five species previously treated in Fl. China 18 (see comment below).

Z. Yu Li (in FRPS 70: 314–317. 2002) treated Phrymaceae to include only the genus *Phryma*, but recent studies have shown that the family should include a number of genera previously considered to be part of Scrophulariaceae. For China Phrymaceae now includes *Mimulus* with five species (four endemic), which has already been treated for the *Flora of China* in Scrophulariaceae (D. Y. Hong & N. H. Holmgren, Fl. China 18: 40–41. 1998), and *Phryma* with a single species. Two additional genera from Scrophulariaceae in China, *Mazus* Loureiro and *Lancea* J. D. Hooker & Thomson, were included in Phrymaceae by P. R. Beardsley and R. G. Olmstead (Amer. J. Bot. 89: 1093–1102. 2002), but we have excluded these two genera from Phrymaceae (see B. Oxelman et al., Taxon 54: 411–425. 2005; Z. Xia et al., Amer. J. Bot. 96: 519–530. 2009).

Yang Han-pi. 1979. *Mimulus*. In: Tsoong Pu-chiu & Yang Han-pi, eds., Fl. Reipubl. Popularis Sin. 67(2): 164–172; Li Zhenyu. 2002. Phrymaceae. In: Hu Chiachi, ed., Fl. Reipubl. Popularis Sin. 70: 314–317.

### 1. PHRYMA Linnaeus, Sp. Pl. 2: 601. 1753.

透骨草属 *tou gu cao shu*

*Leptostachia* Adanson (1763), not *Leptostachya* Nees (1832, nom. cons. prop.).

Herbs, perennial, erect. Stems 4-angular. Stipules absent. Leaves simple, opposite; leaf blade margin serrate. Inflorescences a terminal [or axillary] spike. Flowers perfect, each with a bract and a bracteole. Calyx connate, tubular, 5-ribbed; limb 2-lipped; abaxial lip with 2 short triangular lobes; adaxial lip with 3 apically ± hooked long subulate lobes. Corolla connate, tubular-funnelform; limb 2-lipped; abaxial lip larger, patent, with 3 imbricate lobes; adaxial lip erect, margin subentire but apically emarginate or shallowly 2-lobed. Stamens 4, inserted in corolla tube, anterior 2 longer; filaments filiform; anthers dorsifixed, cells parallel, not convergent at apex, longitudinally dehiscent. Gynoecium pseudomonomerous (2-carpellate with 1 carpel reduced developmentally); ovary superior, 1-locular, with basal placentation and 1 orthotropous ovule; style single, apical, elongate; stigma 2-lipped. Fruit an achene, enveloped in persistent calyx, 1-seeded. Seeds with an oblong embryo; endosperm thin, with 2 layers of cells.

One species: E and S Asia, E North America.

**1. *Phryma leptostachya*** Linnaeus subsp. **asiatica** (H. Hara) Kitamura, Acta Phytotax. Geobot. 17: 7. 1957.

透骨草 *tou gu cao*

*Phryma leptostachya* var. *asiatica* H. Hara, Enum. Sperm. Jap. 1: 297. 1948; *P. asiatica* (H. Hara) O. Degener & I. Degener; *P. esquirolii* H. Léveillé; *P. humilis* Koidzumi; *P. leptostachya* var. *humilis* (Koidzumi) H. Hara; *P. leptostachya* var. *melanostachya* Kitagawa; *P. leptostachya* var. *nana* (Koidzumi) H. Hara; *P. leptostachya* var. *oblongifolia* (Koidzumi) Honda; *P. nana* Koidzumi; *P. oblongifolia* Koidzumi.

Herbs, perennial, (10–)30–80(–100) cm tall. Stems simple or sometimes with apical branches bearing inflorescences, erect,

4-angular, apically pubescent or rarely subglabrous. Leaves petiolate or sometimes apical ones sessile; petiole to 4 cm, puberulent; leaf blade ovate-oblong, ovate-lanceolate, ovate-elliptic, ovate-triangular, or broadly ovate, 1–16 × 1–8 cm, herbaceous, both surfaces puberulent and sometimes more densely so along veins, secondary veins 4–6 on each side of midvein, base cuneate, rounded, or truncate but often decurrent for middle and basal leaves, margin serrate, dentate, or crenulate, apex acuminate, acute, or rarely subrounded. Spikes terminal or axillary, puberulent; peduncle 3–20 cm; inflorescence axis 10–30 cm; bracts subulate to linear, 1–2.5 mm. Pedicel short, erect at anthesis but later reflexed; bracteoles 2, at base of pedicel, subulate to linear, 0.5–2 mm. Calyx tubular, 5-ribbed, puberulent

<sup>1</sup> State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, 20 Nanxincun, Xiangshan, Beijing 100093, People's Republic of China.

<sup>2</sup> United States National Herbarium, Department of Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012, U.S.A.

outside; tube 2.5–3.2 mm at anthesis; abaxial teeth 2, triangular, ca. 0.3 mm; adaxial teeth 3, subulate, 1.2–2.3 mm, apex  $\pm$  hooked. Corolla light purplish, pale red, to white, tubular-funneliform, 6.5–7.5 mm, glabrous outside; tube 4–4.5 mm, ca. 1.5 mm broad at mouth, inside anteriorly puberulent; limb 2-lipped; abaxial lip 2.5–3 mm, apex 3-lobed with central lobe larger; adaxial lip erect, 1.3–2 mm, apex 2-lobed. Stamens inserted in corolla tube 2.5–3 mm from base, glabrous; filaments filiform, 1.5–1.8 mm, anterior 2 longer; anthers reniform-spherical, 0.3–0.4  $\times$  ca. 0.5 mm. Gynoecium glabrous; ovary obliquely oblong-lanceolate, 1.9–2.2 mm; style 3–3.5 mm; stigma 2-lipped, basal lip longer and oblong. Achene long ellipsoid, enveloped in persistent clavate calyx; persistent calyx tube 4.5–6 mm. Fl. Jun–Oct, fr. Aug–Dec.

Moist ravines, forests, roadsides, mountain slopes, hillsides; 300–2800 m. Anhui, Chongqing, Fujian, S Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang (Bomi, Gyirong), Yunnan, Zhejiang [Bhutan, N India, Japan, Kashmir, Korea, Nepal, N Pakistan, Russia (Far East), N Vietnam].

*Phryma leptostachya* subsp. *leptostachya* occurs in North America, from SE Canada to SE United States, W to South Dakota. The two intercontinental subspecies are morphologically highly similar, with the North American typical subspecies different in general from subsp. *asiatica* by having calyx tube 2–2.2 mm, adaxial calyx teeth nearly as long as calyx tube at anthesis, and adaxial corolla lip entire or emarginate. Yet they are genetically highly distinct (Z. Nie et al., Amer. J. Bot. 93: 1343–1356. 2005).