

NOTES ON THE DISTRIBUTION AND SEXUAL POLYMORPHISM
OF *SAUSSUREA CONTROVERSA* AND *S. STUBENDORFFII* (ASTERACEAE)

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Distribution of two species of the type section of the genus *Saussurea* DC. was clarified. *S. controversa* DC. is reported here for the first time for the flora of China, *S. stubendorffii* Herd. is new for the Tomsk Region of Russia. For the first time, gynodioecy-gynomonoecy sexual system was described for these species, and it was found that in natural populations of *S. controversa* and *S. stubendorffii* female, hermaphroditic and gynomonoecious plants, bearing both types of flowers, are present.

Key words: Asteraceae, *Saussurea*, gynodioecy, gynodioecy, new records, sexual polymorphism, Tomsk Region of Russia, China.

For citation: Pyak E.A., Yusupovsky D.V., Pyak A.I. 2024. Notes on the distribution and sexual polymorphism of *Saussurea controversa* and *S. stubendorffii* (Asteraceae). *Rastitel'nyj Mir Aziatskoj Rossii = Flora and Vegetation of Asian Russia*. 17(2):152–155. DOI: 10.15372/RMAR20240207

Saussurea DC. is one of the largest genera in the tribe Cardueae Cass. of Asteraceae (Herrando-Moraira et al., 2019), with about 450 species of perennial, biennial herbs and subshrubs. The genus is widely distributed in temperate and subarctic regions of Asia, stretching from the Arctic to Southeast Asia, with only about 9–10 species distributed in Europe and 5–6 species distributed in North America (Lipschitz, 1979; Serykh et al., 1997; Smirnov et al., 2018) and with the center of species richness and greatest morphological diversity in the Sino-Himalaya and adjacent regions (Xu et al., 2019). The genus displays considerable polymorphism, high level of phenotypic plasticity and has adapted to a wide variety of habitats, the species can be found at all altitudes from about 100 m to the altitude limit of vascular plants (Wang et al., 2009). As a result of a critical review of herbarium collections, as well as expeditionary studies of the genus *Saussurea* in the Altai-Sayan region, we clarified here geographical distribution and sexual system of two species.

Saussurea controversa DC., 1810, Ann. Mus. Natl. Hist. Nat. 16: 199.

Herbs perennial, 25–100 cm tall. Root collar covered with remains of petioles of previous year's leaves. Stems solitary, erect, simple or apically branched, more or less arachnoid hairy, usually dark-colored. Leaves bicolored, adaxially green, glabrous or sparsely flocculose-arachnoid hairy along the veins, abaxially white-tomentose. Lower stem leaves long petiolate, with cordate, ovate-triangular or ovate-oblong leaf blade, attenuate-acuminate, deeply cordate at base, 5–17 cm 2.5–9 cm. Middle stem leaves short-petiolate, with

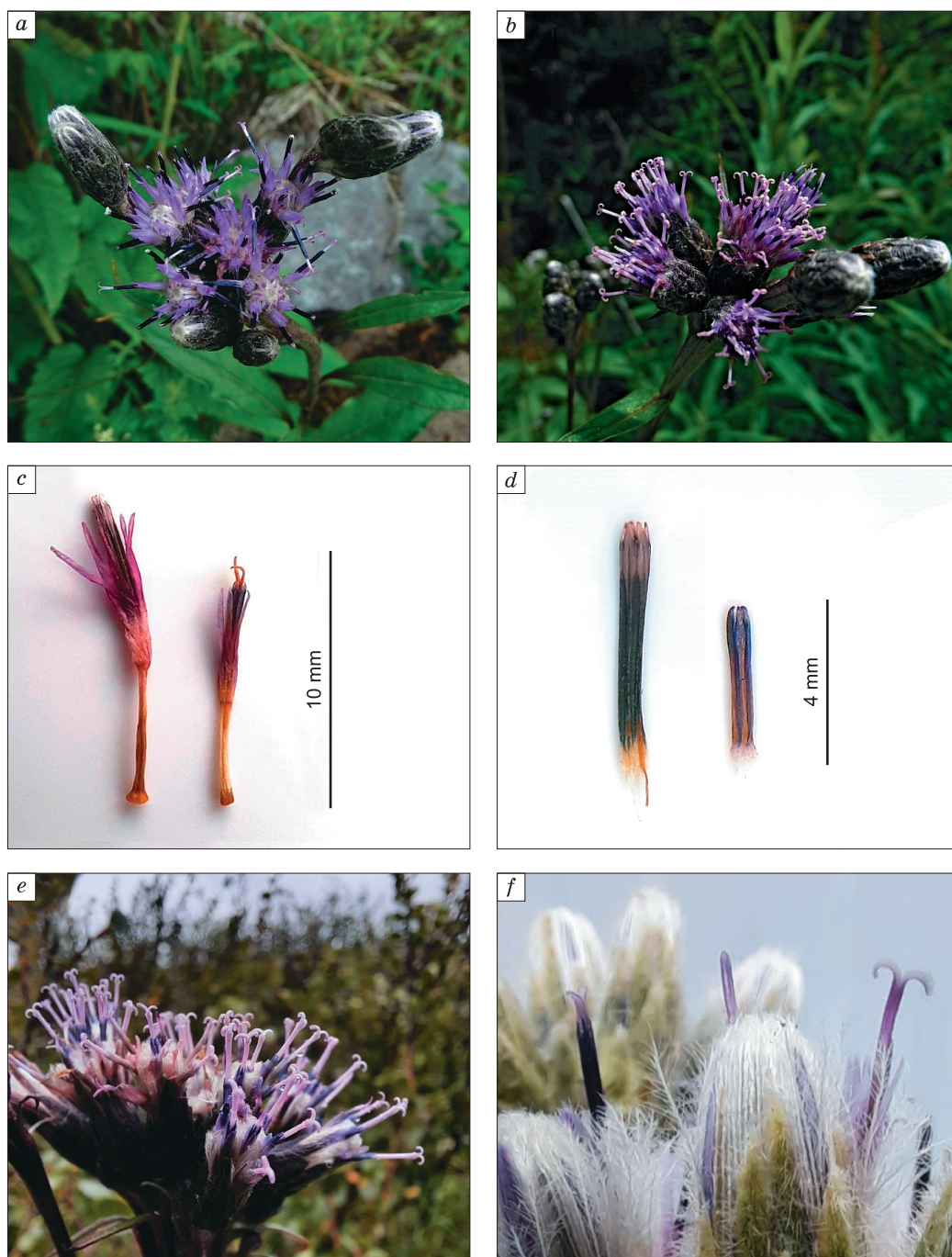
obtuse, sometimes weakly not equilateral (but not cordate) base. Upper stem leaves narrow-lanceolate, sessile. Capitula 1–1.5 cm long (including florets) and 0.8–1 cm wide, in a dense corymbiform synflorescence or in more or less numerous terminating corymbiform inflorescence, forming lax paniculate synflorescence. Involucre arachnoid hairy, imbricate. Phyllaries usually dark-colored; outer row broadly ovate, short-acuminate; inner row oblong, apex obtuse, densely pubescent. Receptacle densely covered with persistent whitish subulate-filiform bristles to 5 mm long. Florets lilac-violet, ca. 1.2 cm long. Anther dark-colored. Pappus of two series, inner row of many straw-colored plumose bristles connated at base, outer bristles less numerous, scabrid, unequal. Achene straw-colored, glabrous.

Sexual system: polymorphic: gynodioecy-gynomonoecy.

Distribution. Russia, Kazakhstan, Mongolia, China.

Specimens examined: China, Xinjiang-Uygur Autonomous Region, 48°43'8.26" N 86°59'15.48" E, 19 VIII 2014, fl., No. 2429361, 2429362, 2463257, 2429363, Y. Chen, X. Yuan (PE 02065030, PE 02065029, PE 02052774, PE 02040553) (Electron. applicat., fig. 1–4).

Notes. *S. controversa* is a common and widespread species in the Russian and Kazakh parts of the Altai Mountains (Lipschitz, 1979; Serykh et al., 1997; Smirnov et al., 2018), the new record of this species from the Chinese part of Altai Mountains and from the similar habitat looks very logical. Four specimens of *S. controversa* preserved in PE was misidentified as *S. alpina* (L.) DC.



Sexual polymorphism of *Saussurea controversa* and *S. studendorffii*:

a – hermaphroditic plant of *S. controversa*; *b* – female plant of *S. controversa*; *c* – perfect (on the left) and female (on the right) flower of *S. studendorffii*; *d* – anther tube of perfect (on the left) flower and reduced sterile anther tube of female (on the right) flower of *S. studendorffii*; *e* – female plant of *S. studendorffii*; *f* – gynomonoeious plant of *S. studendorffii*.

Половой полиморфизм *Saussurea controversa* и *S. studendorffii*:

a – гермафродитное растение *S. controversa*; *b* – женское растение *S. controversa*; *c* – обоеполый (слева) и женский (справа) цветки *S. studendorffii*; *d* – пыльник обоеполого цветка (слева) и редуцированный стерильный пыльник женского цветка (справа) *S. studendorffii*; *e* – женское растение *S. studendorffii*; *f* – гиномоноэцичное растение *S. studendorffii*.

S. stubendorffii Herd., 1868, Bull. Soc. Imp. Naturalistes Moscou 41: 26.

Herbs perennial, 30–70(80) cm tall. Root collar covered with remains of petioles of previous year's leaves. Stem erect, sparsely pubescent or glabrous, ribbed, apically branched or simple; usually wingless, sometimes narrow-winged due to decurrent leaves. Leaves lanceolate, oblong-lanceolate or almost ovate, green and scabrous above, more or less densely grayish or whitish flocculose-arachnoid hairy. Basal and lower stem leaves 2.5–3 cm wide, persistent at anthesis, petiolate, distinctly toothed; middle and upper leaves narrow linear or linear-lanceolate, sessile. Capitula on pubescent peduncles, in more or less numerous terminating corymbiform inflorescence; individual corymbs usually unequal in height, forming more or less lax paniculate synflorescence. Capitula ca. 1.5 cm long. Involucre cylindrical, imbricate, 4- or 5-rowed; phyllaries green or dark-colored, covered with long white trichomes; outer row ovate, subacute, inner row linear-lanceolate, acuminate. Receptacle densely covered with persistent whitish subulate-filiform bristles to 6 mm long. Florets purple, ca. 1.2 cm long. Anther dark-colored. Pappus of two series, inner row of many straw-colored plumose bristles connated at base, outer bristles less numerous, scabrid, unequal. Achene straw-colored, glabrous.

Sexual system: polymorphic: gynodioecy-gynomonoecy.

Distribution. Russia, Mongolia.

Specimens examined: Russia, Tomsk Oblast, Shegarsky district, 4 km N from the Kulmany Village, 26–27 VII 1969, fl., N.F. Vylzan, V.E. Dobychin et al. (TK-006548; TK-006549). (Electron. applicat., fig. 5, 6).

Notes. *S. stubendorffii* is distributed in Western and Eastern Siberia (Lipschitz, 1979; Serykh et al., 1997; Smirnov et al., 2018), as well as in Northern Mongolia (Baasanmunkh et al., 2022). The recent discovery of the species on the territory of the Verkhne-Tazovsky Nature Reserve in the eastern part of the Yamalo-Nenets Autonomous Okrug (Beldiman et al., 2019) made it possible to clarify the northwestern border of the species range. The discovery of the species in the Tomsk region allows us to further clarify the western limit of the distribution of the species. Two specimens of *S. stubendorffii* preserved in TK were misidentified as *S. latifolia* Ledeb. and *S. parviflora* (Poir.) DC.

Until now, it was believed that all species of the genus *Saussurea* have only bisexual tubular flowers, and all representatives of the genus are hermaphroditic plants (Bremer, 1994; Torices et al., 2010). However, in the territory of the Altai-Sayan region, we found hermaphroditic (Figure, *a*), female (Figure, *b*, *e*) and gynomonoecious (Figure, *f*) plants in natural populations of *S. controversa* and *S. stubendorffii*, thus, these species can be described as truly gynomonoecious.

gynodioecious. Gynomonoecy-gynodioecy is a rare polymorphic sexual system which is characterized by the coexistence of female, hermaphroditic and gynomonoecious (bearing both types of flowers) individuals (Desfeux et al., 1996). In gynomonoecious individuals of both species, female flowers are few and arranged in the outer rows, while perfect flowers are more numerous and placed in the center of capitula. Female flowers in *S. controversa* and *S. stubendorffii* are smaller than hermaphroditic ones, their anthers are reduced, and therefore the tube formed by five fused reduced anthers is short, grayish due to the loss of color saturation, barely protruding from the corolla (Figure, *c*, *d*).

Acknowledgements. The research was supported by the grant of the Russian Science Foundation (project No. 23-24-00400).

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ЗАМЕТКИ О РАСПРОСТРАНЕНИИ И ПОЛОВОМ ПОЛИМОРФИЗМЕ *SAUSSUREA CONTROVERSA* И *S. STUBENDORFFII* (ASTERACEAE)

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Было уточнено распространение двух видов типовой секции рода *Saussurea* DC.: *S. controversa* DC. здесь отмечается впервые для флоры Китая, *S. stubendorffii* Herd. – впервые для флоры Томской области. Для этих видов впервые описана гинодиэция-гиномоноэция, и установлено, что в природных популяциях *S. controversa* и *S. stubendorffii* присутствуют особи с женскими и гермафродитными цветками, а также растения, имеющие в соцветии оба типа цветков.

Ключевые слова: Asteraceae, *Saussurea*, гинодиэция, гиномоноэция, находки, половой полиморфизм, Томская область, Россия, Китай.

Для цитирования: Пяк Е.А., Юсуповский Д.В., Пяк А.И. Заметки о распространении и половом полиморфизме *Saussurea controversa* и *S. stubendorffii* (Asteraceae). *Растительный мир Азиатской России*. 17(2): 152-155. DOI: 10.15372/RMAR20240207

Благодарности. Исследование выполнено при поддержке гранта Российского научного фонда, проект № 23-24-00400.

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Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.

Conflict of interest. The authors declare no conflict of interest.

Поступила в редакцию / Received by editor 04.03.2023

Принята к публикации / Accepted for publication 25.03.2024

Electronic application (Herbarium specimens of *Saussurea* species from new localities) see the link:
https://sibran.ru/journal/Electron_pril_Pyak_2_2024.pdf

Электронное приложение (Гербарные образцы видов рода *Saussurea* из новых местонахождений) см. по ссылке:
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