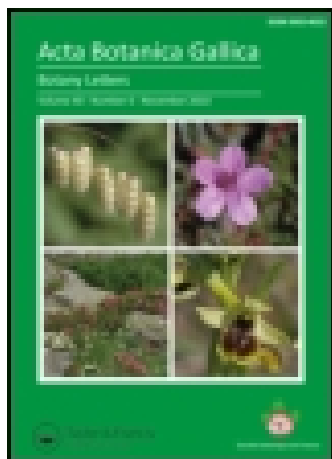


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Chorological and taxonomic notes on *Aquilegia ganboldii* Kamelin & Gubanov (Ranunculaceae) previously considered to be a Mongolian endemic

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(Received 8 March 2015; accepted 8 April 2015)

Abstract: The distribution of the enigmatic Mongolian *Aquilegia ganboldii* is confirmed for Russian South Siberia, North Korea and northeast China. It seems to be closely related to *Aquilegia oxysepala* var. *oxysepala* and *Aquilegia buergeriana*. A diagnostic key to *A. ganboldii* and related taxa is provided.

Keywords: *Aquilegia*; Ranunculaceae; distribution; taxonomy; Asia

Introduction

The genus *Aquilegia* L. comprises about 70 species distributed in temperate Eurasia and North America (Nold 2003). Taxonomically it is one of the most difficult genus with regard to systematics and diagnostics (Erst and Vaulin 2014), and recent molecular data do not support the sectional subdivision of *Aquilegia* based on the morphological characters (Fior et al. 2013).

The Asian species have been poorly investigated, including the enigmatic taxon *Aquilegia ganboldii* Kamelin & Gubanov, known from only one location in the Greater Khingan, Eastern Mongolia (Gubanov and Kamelin 1991; Gubanov 1996; FloraGreif 2010). The most diagnostic characters of *A. ganboldii* are: stems covered with both simple and glandular hairs; triternate basal leaves, which change shape along the stem to tripinnatifid leaves; milk-white or creamy flowers often turning yellowish when dry; somewhat acute tepals; obtusate sepals with hooked spur equalling the limb length.

The systematic position of *A. ganboldii* is still unclear. According to the protologue (Gubanov and Kamelin 1991), *A. ganboldii* is related to *Aquilegia karelinii* (Baker) O. & B. Fedtsch., *Aquilegia atrovinosa* Popov, *Aquilegia oxysepala* Trautv. & C.A. Mey. and *Aquilegia flabellata* Sieb. & Zucc. However, all of these species cannot be united into one group based on both morphological and molecular data (Bastida et al. 2010; Fior et al. 2013).

The aim of the present study is to describe the precise distribution pattern of *A. ganboldii* based on the

specimens re-examined, together with notes on the morphology of related species occurring in temperate Asia.

Material and methods

For the revision of *A. ganboldii* and related taxa the following herbarium collections were examined: LE, MHA, MW, NS, PE, CDBI, KUN, VLA, VGBI (acronyms are according to <http://sweetgum.nybg.org/ih/>), as well as the herbarium of the Zabaykalsky Pedagogical University (which has no acronym). The drawings of the flowers are prepared from the following specimens: *A. oxysepala* (specimen at NS-45678), *Aquilegia buergeriana* Siebold & Zucc. (PE-2346651) and *A. ganboldii* (PE-00105437).

Results

Aquilegia ganboldii was found to occur not only in Mongolia, but also in Russian South Siberia, northeast China and North Korea. In the herbaria visited it was identified as *A. oxysepala* s.l. The records of *A. ganboldii* are cited below (see also Figure 1).

[Mongolia]: Eastern Mongolia, western spur of Greater Khingan, Bayan-Cher-Ula Mountains, 46°40' N, 119°50' E, c.2000 m. 9.07.1987, *E. Ganbold* 1310 (LE-holotype!, iso-MW!); [China]: Jilin prov., Pinshi County, Heychishinen Distr., alt. 340 m, 13.06.1954, *Liou Tchen-ugo* 5856 (LE); Jilin prov. 27.06.1962, *Lin*

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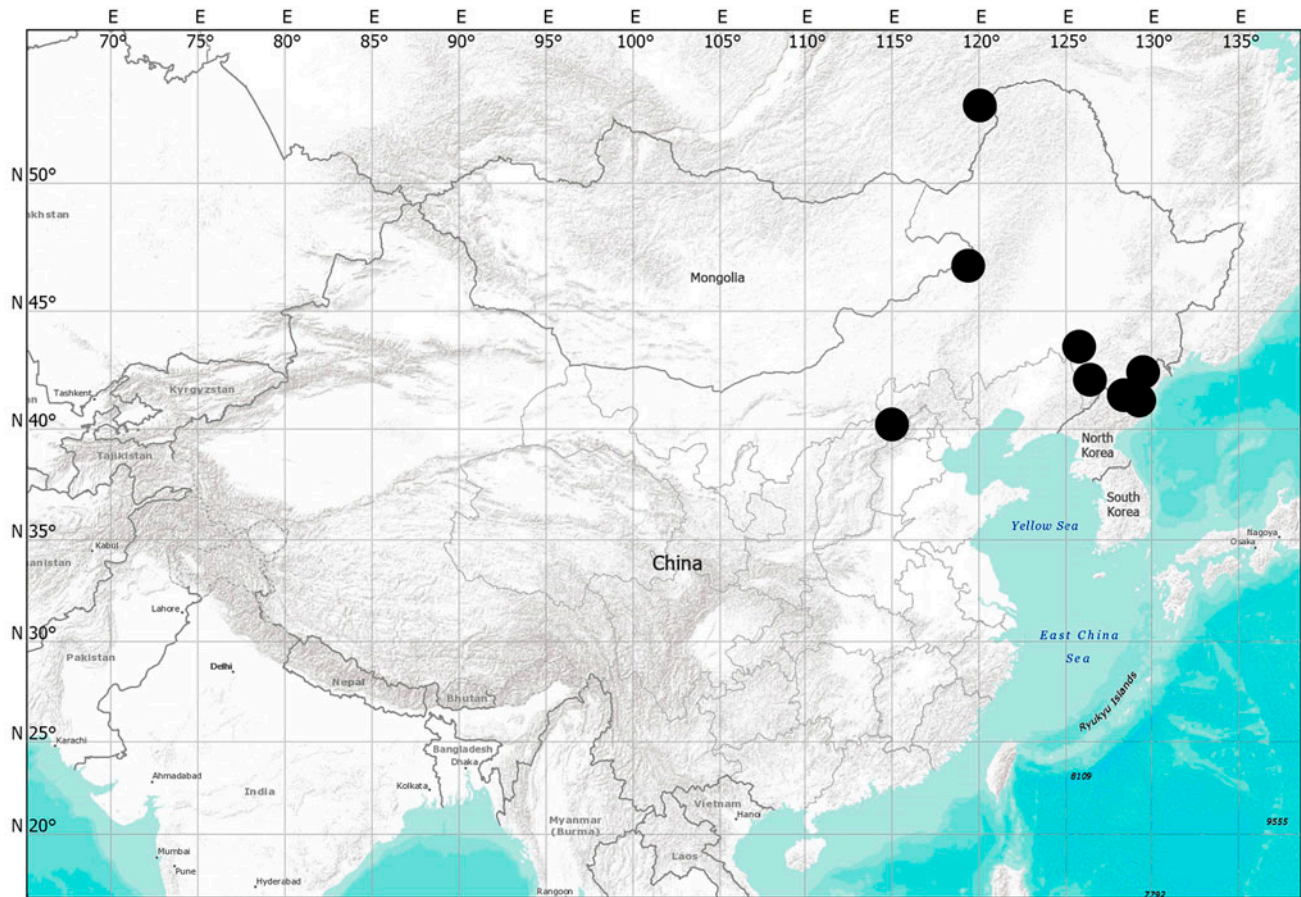


Figure 1. Map showing the location of the collection sites of *Aquilegia ganboldii* in Mongolia, Russia, China and North Korea.

Yang s.n. (PE-00105433); Jilin Changbai Mountains, 09.06.1963, *Expedition Team s.n.* (PE-00105437); Hebei [Hopei] prov., Wanping County, West Mountain, 05.06.1956, *Yang Chao s.n.* (PE-00105501); [North Korea]: prov. Cham-gion, fluvium Tumingan, distr. Musang, circa Czan-pen, 10.06.1897, *V. Komarov 668* (LE); prov. Cham-gion. Segelsu-Korani valley, 6 miles [9.7 km] from Envadi village, 16.06.1897, *V. Komarov s.n.* (LE); prov. Cham-gion, flumen Jalu-dsian, distr. Samsu, Ankubi-mura valley, left tributary of Yalu river, 25.06.1897, *V. Komarov s.n.* (LE); Pong Syup Joh, 29.07.1956, *anonym 177* (LE); [Russia]: Zabaykalsky kray, Gazimuro-Zavodsky distr., Uryupino Piquet, Budyumkan river, 27.06.2003, *O. Korzun s.n.* (Herbarium of the Zabaykalsky Pedagogical University).

Ecology and plant communities:

The most common habitats are associated with montane forest-steppes and forests dominated by *Betula platyphylla* Sukaczew, *Betula dahurica* Pall. or *Quercus*

mongolica Fisch ex Ledeb., at altitudes between 1000 and 1200 m above sea level.

IUCN Red List Category

Appropriate data on abundance and/or distribution of the taxon are lacking. It should be included in the Data Deficient (DD) as well as Not Evaluated (NE) categories of IUCN Red List categories (IUCN 2010) as there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

Discussion

Although *A. ganboldii* has not yet been included in molecular phylogeny, morphologically it seems to be closely related to *A. buergeriana* and the type variety of *A. oxysepala* (other varieties of this species do not belong to *A. oxysepala s.str.*: Erst & al. in preparation)

Table 1. List of the morphological differences between *Aquilegia ganboldii* Kamelin & Gubanov and other taxa cited as relatives (Gubanov and Kamelin 1991). The groups are named in accordance with the molecular phylogeny of Fior et al. (2013).

| Characters | <i>A. ganboldii</i> (closely related to "Group V") | <i>A. oxysepala</i> ("Group 5") | <i>A. buergeriana</i> ("Group 5") | <i>A. atrovinosa</i> ("Group 4") | <i>A. flabellata</i> ¹ | <i>A. karelinii</i> ("Group 4") |
|------------------------------|--|---|---|---------------------------------------|--|---|
| Pubescence of flowering stem | glandular | glandular | glandular | glandular | glabrous or covered with simple hairs | glandular |
| Leaf shape | ternate | ternate | bi-ternate | bi-ternate | ternate or bi-ternate | bi-ternate |
| Shape of leaf teeth | broad rounded-oblong | broad rounded-oblong | rounded-oblong | obtuse oblong | oblong | obtuse oblong |
| Flower diameter (cm) | 3–5 | 2.5–5 | 3–5 | 4–5 | 4.5–5.5 | 4–6 |
| Spur length (cm) | 1.5–2 | 1.5–2 | 1.4–1.9 | 2–2.2 | 0.8–2 | 1 |
| Lamina length (cm) | 1.5–2 | 1–1.3 | 1–1.5 | 2–2.8 | 1.3–1.6 | 0.9–1.1 |
| Sepal length (cm) | 2–3 | 2–3 | 0.5–2.4 | 2–2.5 | 2–3 | 1.8–2.4 |
| Flower colour | one colour: creamy or white | bi-coloured: sepal claret-red to violet, lamina yellowish-white | bi-coloured: sepal claret-red to violet, lamina yellowish-white | one colour: red-violet or blue-violet | bi-coloured: sepal blue, lamina white or yellowish-white | one colour: bright-lilac or claret-purple |
| Spur base | gibbous | gibbous | not gibbous | gibbous | gibbous | gibbous |
| Spur shape | curved | hooked, rarely curved | straight, rarely curved | hooked | hooked, rarely curved | hooked |
| Lamina/sepal ratio | < | < | = | = | < | < |
| Lamina/spur ratio | = | = | < | > | = | > |
| Lamina shape | convex | convex | convex | concave | flat | concave |
| Sepal tip | acuminate | acuminate | acuminate | acuminate | rounded | acuminate |
| Stamens | not exceeding the petals | not exceeding the petals | not exceeding the petals | slightly exceeding the petals | slightly exceeding the petals | slightly exceeding the petals |
| Anther colour | dark | dark | dark | yellow | yellow | yellow |
| Concrescence of follicles | fused midway | fused midway | fused midway | fused to the apex | fused basally | fused to the apex |
| Follicle pubescence | glandular | glandular | glandular | glandular | glabrous | glandular |

¹*Aquilegia flabellata* probably belongs to "Group 1" due to morphological affinity to *A. japonica* included in the molecular analysis.



Figure 2. Flowers: (A) *Aquilegia buergeriana* Siebold & Zucc. (photo by Robert Höck); (B) *Aquilegia ganboldii* Kamelin & Gubanov (photo by Oleg V. Korzun); (C) *Aquilegia oxysepala* Trautv. & C.A. Mey. (photo by Valentin V. Yakubov).

on the basis of the following important characters: peduncles and follicles covered with simple and glandular hairs; sepals brown, dark purple or white, equalling or longer than the petal limb; limbs overlapping, yellow or white, with obtuse apex; spurs equal to or slightly longer than the petal limbs, brown, dark purple or white, terminally straight or circinate, gibbous basally; stamens black, not protruding from the flower; and seeds with an almost smooth surface. Other species mentioned as relatives of *A. ganboldii* (Gubanov and Kamelin 1991) cannot be considered as closely related to *A. ganboldii*. *Aquilegia atrovinosa* and *A. karelinii* form sister clades within "Group IV", and *A. flabellata* Siebold & Zucc. is nested in "Group I" (Fior

et al. 2013). These taxa are also distinguished by a different morphology (see Table 1).

Key to *A. ganboldii* and the morphologically related taxa *A. oxysepala* and *A. buergeriana*

1. Spurs thin, elongated and not gibbous basally, slightly curved.....*A. buergeriana* (Figures 2A and 3)
- Spurs thick, basally gibbous, apically circinate.....2
2. Flowers white or yellowish-white (turning yellow when dry)*A. ganboldii* (Figures 2B and 4)
- Flowers bicoloured: sepals and spurs purple, petal limb yellow.....*A. oxysepala* var. *oxysepala* (Figures 2C and 5).



Figure 3. General view, sepal, petal and follicles of *Aquilegia buergeriana* Siebold & Zucc.



Figure 4. General view, sepal, petal and follicles of *Aquilegia ganboldii* Kamelin & Gubanov.

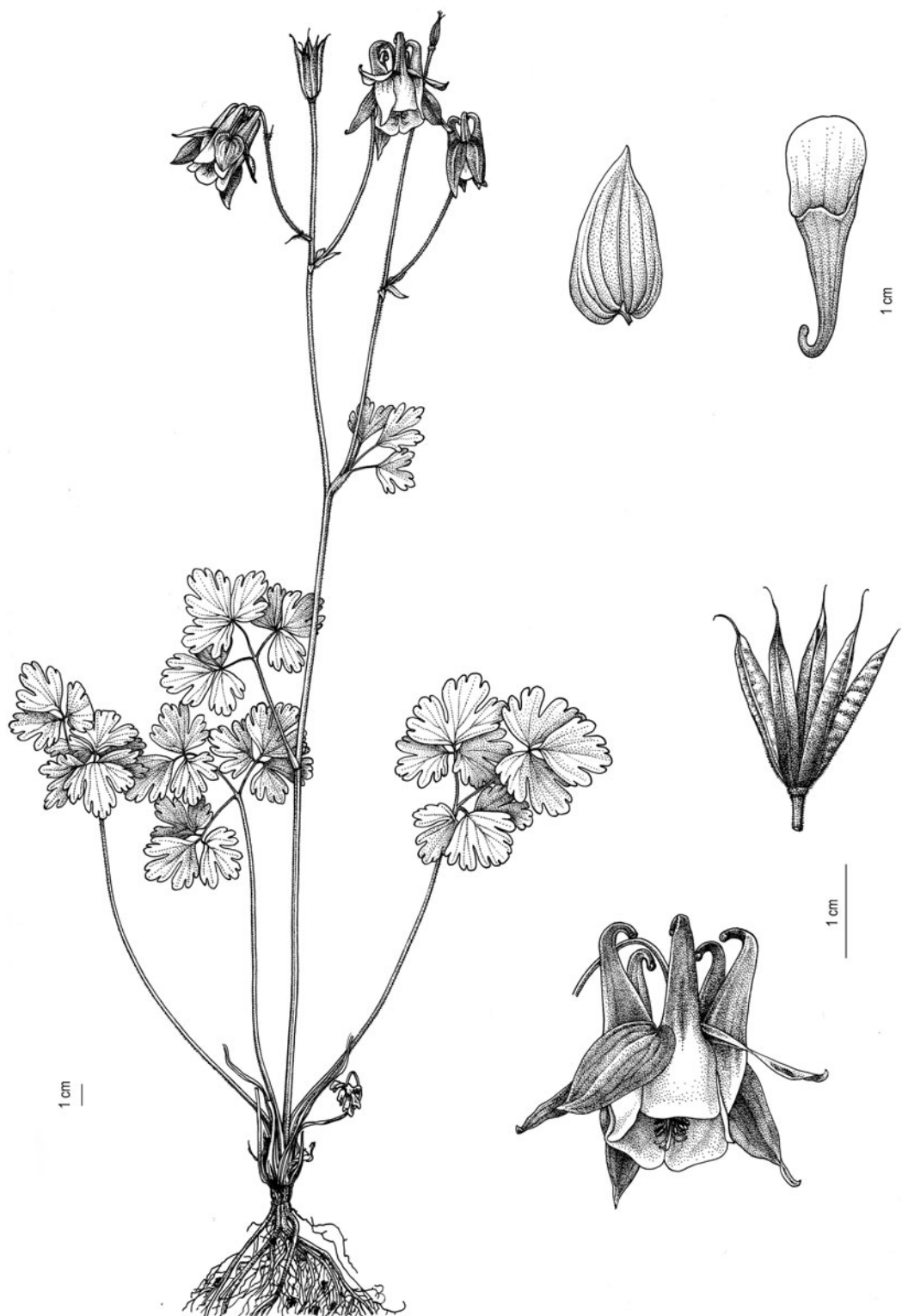


Figure 5. General view, sepal, petal and follicles of *Aquilegia oxysepala* Trautv. & C.A. Mey.

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References

- Bastida, J., J. Alcantara, P. Rey, P. Vargas, and C. Herrera. 2010. "Extended phylogeny of *Aquilegia*: The biogeographical and ecological patterns of two simultaneous but contrasting radiations." *Plant Systematics and Evolution* 284: 171–185.
- Erst, A., and O. Vaulin. 2014. "Phylogenetic relationships among North Asian species of the genus *Aquilegia* based on molecular markers." *Russian Journal of Genetics: Applied Research* 4 (1): 35–42.
- Fior, S., M. Li, B. Oxelman, R. Viola, S. A. Hodges, L. Ometto, and C. Varotto. 2013. "Spatiotemporal reconstruction of the *Aquilegia* rapid radiation through next-generation sequencing of rapidly evolving cpDNA regions." *New Phytologist* 198 (2): 579–592.
- FloraGREIF. 2010. *Virtual Flora of Mongolia*. <http://greif.uni-greifswald.de/floragreif/>. continuously updated.
- Gubanov, I. A. 1996. *Conspectus of flora of Outer Mongolia (vascular plants)*. Moscow: Valang.
- Gubanov, I. A., and R. Kamelin. 1991. "New species of vascular plants found in Mongolia." *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Otdel Biologicheskii [Bulletin of Moscow Society of Naturalists. Biological section]* 96 (6): 112–116.
- IUCN. 2010. *The IUCN red list of threatened species, version 2010.4*. IUCN Red List Unit, Cambridge, UK. Accessed 20 January 2012, <http://www.iucnredlist.org/>
- Nold, R. 2003. *Columbines: Aquilegia, Paraquilegia and Semiaquilegia*. Portland: Timber Press.