

# *Gymnaconitum*, a new genus of Ranunculaceae endemic to the Qinghai-Tibetan Plateau

Wei Wang,<sup>1</sup> Yang Liu,<sup>2</sup> Sheng-Xiang Yu,<sup>1</sup> Tian-Gang Gao<sup>1</sup> & Zhi-Duan Chen<sup>1</sup>

<sup>1</sup> State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, P.R. China

<sup>2</sup> Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269-3043, U.S.A.

Author for correspondence: Wei Wang, wangwei1127@ibcas.ac.cn

**Abstract** The monophyly of traditional *Aconitum* remains unresolved, owing to the controversial systematic position and taxonomic treatment of the monotypic, Qinghai-Tibetan Plateau endemic *A.* subg. *Gymnaconitum*. In this study, we analyzed two datasets using maximum likelihood and Bayesian inference methods: (1) two markers (ITS, *trnL-F*) of 285 Delphinieae species, and (2) six markers (ITS, *trnL-F*, *trnH-psbA*, *trnK-matK*, *trnS-trnG*, *rbcL*) of 32 Delphinieae species. All our analyses show that traditional *Aconitum* is not monophyletic and that subgenus *Gymnaconitum* and a broadly defined *Delphinium* form a clade. The SOWH tests also reject the inclusion of subgenus *Gymnaconitum* in traditional *Aconitum*. Subgenus *Gymnaconitum* markedly differs from other species of *Aconitum* and other genera of tribe Delphinieae in many non-molecular characters. By integrating lines of evidence from molecular phylogeny, divergence times, morphology, and karyology, we raise the monotypic *A.* subg. *Gymnaconitum* to generic status.

**Keywords** *Aconitum*; Delphinieae; *Gymnaconitum*; monophyly; phylogeny; Qinghai-Tibetan Plateau; Ranunculaceae; SOWH test

**Supplementary Material** The Electronic Supplement (Figs. S1–S8; Appendices S1, S2) and the alignment files are available in the Supplementary Data section of the online version of this article (<http://www.ingentaconnect.com/content/iapt/tax>).

Received: 30 Sep. 2012; revision received: 22 Apr. 2013; accepted: 30 June 2013. DOI: <http://dx.doi.org/10.12705/624.10>

## ■ INTRODUCTION

Ranunculaceae represent one of the earliest-diverging lineages among the eudicots (APG III, 2009; Sun & al., 2011) and consists of 59 genera with about 2500 species (Tamura, 1995). The family contains many genera of pharmaceutical and horticultural interest, such as *Aquilegia* L., *Coptis* Salisb. and *Delphinium* L. (W.T. Wang, 1979; Peng & al., 2006). In the past two decades, tremendous progress has been made in our understanding of phylogenetic relationships in Ranunculaceae at various taxonomic levels by using DNA sequence data. The subfamily- and tribe-level classification system of Ranunculaceae has recently been updated (W. Wang & al., 2009), with recognition of five subfamilies: Glaucidoideae, Hydrastidoideae, Coptidoideae, Thalictroideae, and Ranunculoideae (including ten tribes). Meanwhile, twelve genera accepted by Tamura (1995) have been synonymized with six other genera, and four genera not recognized by Tamura (1995) have been reinstated based on molecular data (Table 1). The circumscriptions of only a few genera in Ranunculaceae remain controversial and need to be further clarified, such as *Aconitum* L.

*Aconitum* is a member of tribe Delphinieae, which also contains *Aconitella* Spach, *Consolida* (DC.) S.F. Gray, and *Delphinium*. Based on molecular evidence, *Aconitella* and *Consolida* are embedded within *Delphinium* (Luo, 2003; Jabbour & Renner, 2011a, 2012a); *Delphinium* subg. *Staphisagria*

(DC.) Peterm. is the earliest-diverging lineage within the tribe (Jabbour & Renner, 2011a, 2012a) and has been raised to generic status (Jabbour & Renner, 2011b). Thus, Jabbour & Renner (2012a) considered that tribe Delphinieae contained three genera: *Aconitum*, *Delphinium* (containing *Aconitella* and *Consolida*), and *Staphisagria* J. Hill. However, the monophyly of *Aconitum* remains unresolved. This genus comprises about 300 species distributed in three subgenera, *A.* subg. *Lycocotnum* (DC.) Peterm., subg. *Aconitum* (Stapf.) Rapaics, and subg. *Gymnaconitum* (Stapf.) Rapaics (Tamura, 1995). *Aconitum* subg. *Gymnaconitum* contains only one species, *A. gymnandrum* Maxim. (Fig. 1), and is endemic to the Qinghai-Tibetan Plateau (Fig. 2). Based on root characters and life cycle, Stapf (1905) first erected a section for this species. Rapaics (1907) further raised it to subgeneric rank, which has been accepted by all subsequent authors (e.g., W.T. Wang, 1979; Tamura, 1995). Molecular phylogenetic studies at the population level (L. Wang & al., 2009) or sampling multiple accessions of the species (Jabbour & Renner, 2012a) have indicated that *A. gymnandrum* is monophyletic. The species exhibits some unique traits, such as clawed sepals (Fig. 1B), large fan-shaped petaline labia (Fig. 1C), exposed stigmas (Fig. 1B, C), and many carpels (Fig. 1D), which are not found in other species of *Aconitum* and other genera of tribe Delphinieae (W.T. Wang, 1979; Tamura, 1995). Thus, the taxonomic position of the subgenus is a key element in

determining the monophyly of *Aconitum* (Xiao & al., 1984, 2006). The phylogenetic position of *A. subg. Gymnaconitum* has been investigated with various non-molecular characters, including phytochemical (Xiao & al., 1984), cytological (Shang, 1985), anatomical (Li & al., 1991; Yang, 1990), as well as palynological characters (Xi, 1993). However, the subgenus has both primitive and advanced features in terms of phytochemistry and morphology (Xiao & al., 2006). Luo (2003) first used molecular data (plastid *trnL-F* and nuclear ITS) to investigate the monophyly of *Aconitum*, where 23 species of tribe Delphinieae (*Aconitum* represented by 16 species) were sampled and *Delphinium subg. Staphisagria* was not included. In her neighbour joining analysis, *Aconitum subg. Gymnaconitum* was sister to the clade including *A. subg. Lycoctonum* and subg. *Aconitum*, *Delphinium* and *Consolida* with weak support (Luo, 2003). Based on plastid (*trnL-F*, *trnK-matK*, *trnS-trnG*) and nuclear (ITS) sequences, Jabbour & Renner (2011a) found a monophyletic *Aconitum* (represented by eight species) with 55% bootstrap support and resolved *A. subg. Gymnaconitum* as basalmost in *Aconitum*. However, *A. subg. Gymnaconitum* was identified as the second-diverging lineage in tribe Delphinieae with poor support by using *trnL-F* and ITS data and sampling 185 species of the tribe, of which 57 were from *Aconitum* (Jabbour & Renner, 2012a). Importantly, when the taxon sampling was reduced from 185 to 73 species of tribe Delphinieae, *A. subg. Gymnaconitum* was supported as sister to a broadly defined *Delphinium* (including *Consolida* and *Aconitella*; Jabbour & Renner, 2012a). Thus, these studies indicate that different taxon and character sampling schemes can affect the phylogenetic position of *A. subg. Gymnaconitum*.

In this study, two different data matrices were constructed with more extensive taxon and character sampling schemes. Using these data, our goals are to investigate the monophyly of *Aconitum*, and then to clarify the phylogenetic position and taxonomic treatment of *A. subg. Gymnaconitum* in tribe Delphinieae.

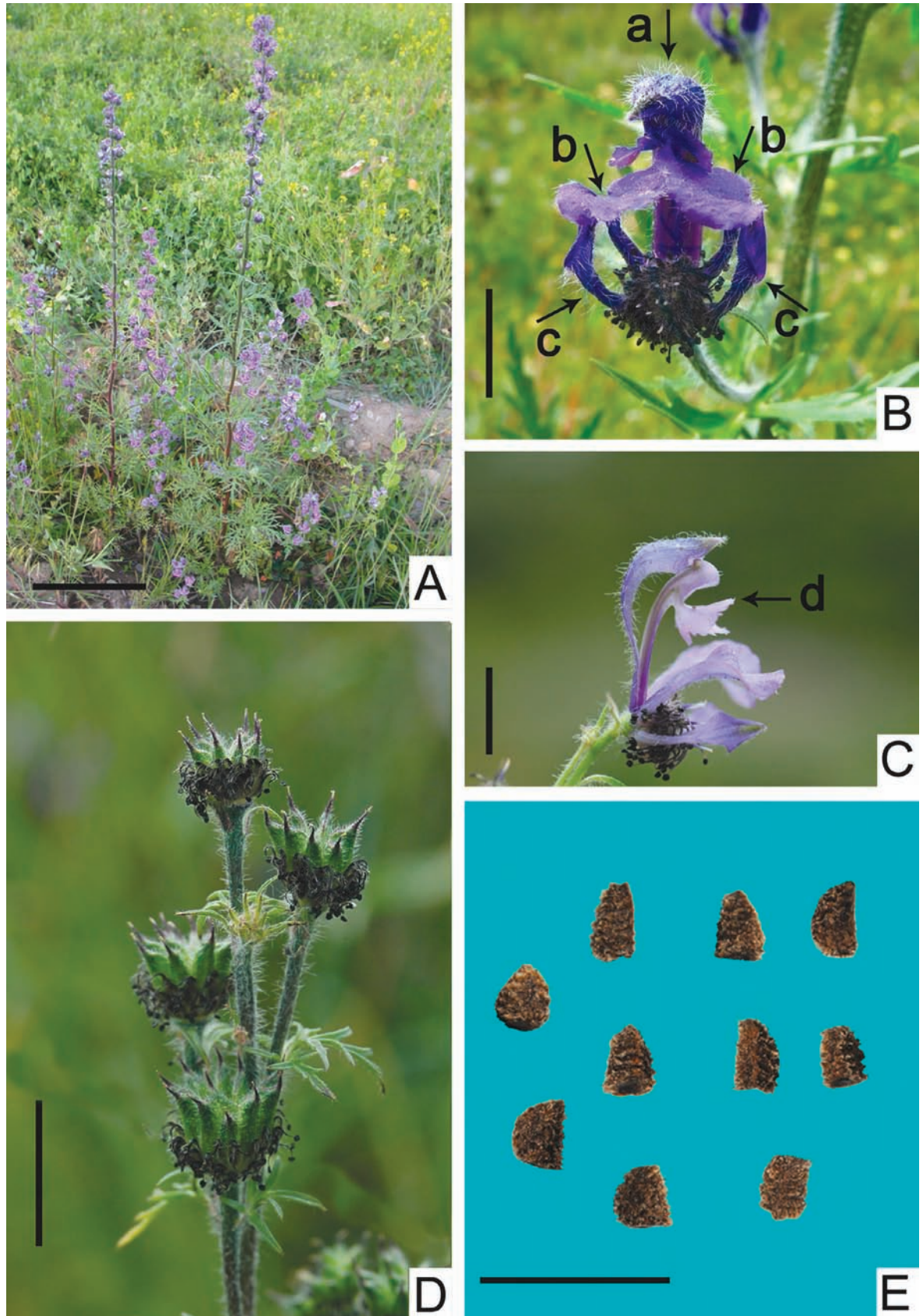
## ■ MATERIALS AND METHODS

**Data matrices.** — Two data matrices were constructed for phylogenetic analyses. (1) A two-marker dataset (ITS and *trnL-F*) which is an extension of the recent two-marker dataset of Jabbour & Renner (2012a), which included 185 species of tribe Delphinieae. Our present matrix sampled 285 species of the tribe, of which 97 are of ca. 300 of *Aconitum*, 161 are of ca. 320 of *Delphinium*, 6 are of ca. 10 of *Aconitella*, and 21 are of ca. 40 of *Consolida* (Tamura, 1995; Electr. Suppl.: Appendix S1). For *Aconitum* and *Delphinium*, we followed the subgeneric classifications of Tamura (1995). In *Aconitum*, subgenus *Lycoctonum* contains ca. 40 species, of which 18 were included, subgenus *Aconitum* contains ca. 250 species, of which 78 were included, and *A. gymmandrum* as the only species of subgenus *Gymnaconitum* was included. *Delphinium* consists of three subgenera, subg. *Delphinastrum* (DC.) Peterm. (ca. 300 spp.), subg. *Staphisagria* (DC.) Peterm. (3 spp.), and subg. *Delphinium* W.T. Wang (ca. 18 spp.), of which 143, 3, and 15 species were included, respectively. (2) The second dataset was a six-marker dataset (ITS, *trnL-F*, *trnH-psbA*, *trnK-matK*, *trnS-trnG*, *rbcL*) containing 32 Delphinieae species with at least four of the above sequences (Electr. Suppl.: Appendix S2). Although taxon sampling density in this dataset was lower than that in the two-marker dataset, all representative genera and subgenera of Tamura (1995) and major lineages of Jabbour & Renner (2012a) in tribe Delphinieae were included. Following W. Wang & al. (2009), we selected *Nigella damascena* L. (Nigelleae) and *Megaleranthis saniculifolia* Ohwi (Adonideae) as outgroups for these two datasets. The study did not generate new data, and all DNA sequences were obtained from GenBank. The authorities, herbarium vouchers, localities, and accession numbers of species sampling are listed in Appendices S1 and S2 (Electr. Suppl.).

**Phylogenetic analysis.** — Sequences were aligned using the default parameters in ClustalX v.1.83 (Thompson & al., 1997) and manually adjusted with BioEdit v.5.0.9 (Hall, 1999). For the six-marker dataset, phylogenetic analyses were initially

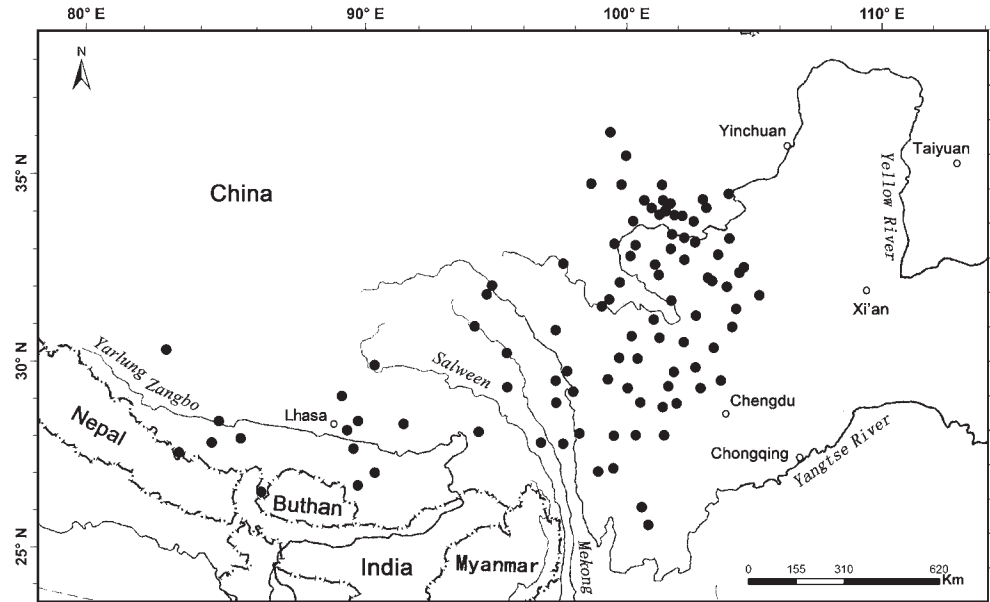
**Table 1.** Newly delimited or resurrected genera after Tamura (1995).

Newly delimited or recognized genera	Genera of Tamura (1995)	Studies
<i>Actaea</i>	<i>Actaea</i> , <i>Souliea</i> , <i>Cimicifuga</i>	Compton & al. (1998)
<i>Anemone</i>	<i>Anemone</i> , <i>Hepatica</i> , <i>Pulsatilla</i> , <i>Knowltonia</i> , <i>Oreithales</i> , <i>Barneoudia</i>	Hoot & al. (2012, and references therein)
<i>Clematis</i>	<i>Clematis</i> , <i>Archiclematis</i> , <i>Naravelia</i>	Xie & al. (2011)
<i>Coptidium</i>	—	Emadzade & al. (2010)
<i>Delphinium</i>	<i>Delphinium</i> , <i>Consolida</i>	Jabbour & Renner (2011a, 2012a)
<i>Ficaria</i>	—	Emadzade & al. (2010)
<i>Paropyrum</i>	—	W. Wang & Chen (2007)
<i>Ranunculus</i>	<i>Ranunculus</i> , <i>Aphanostemma</i>	Emadzade & al. (2010)
<i>Staphisagria</i>	—	Jabbour & Renner (2011b)
<i>Trollius</i>	<i>Trollius</i> , <i>Megaleranthis</i>	W. Wang & al. (2010)



**Fig. 1.** *Aconitum gymmandrum*. **A**, plants and habitat; **B**, frontal view of a flower showing upper sepal (a), lateral sepals (b), and lower sepals (c); **C**, lateral view of a flower showing petals (d); **D**, carpels; **E**, seeds. — Scale bars: A = 10 cm; B, C = 1 cm; D = 1.5 cm; E = 5 mm.

**Fig. 2.** Geographical distribution of *Aconitum gymnandrum* (solid circles).



conducted for individual regions of the cpDNA data using maximum likelihood (ML). No significant bootstrap support (exceeding 70%) for conflicting nodes was evident among individual chloroplast markers, five plastid datasets were thus combined (referred to as cpDNA data). Detailed analyses were conducted using ML and Bayesian inference (BI) for the combined two- and six-marker datasets as well as for each of the two genome datasets. The ML and BI analyses were conducted in RAxML v.7.2.6 (Stamatakis, 2006) and MrBayes v.3.1.2 (Ronquist & Huelsenbeck, 2003), respectively.

RAxML was conducted with the GTR+ $\Gamma$  substitution model for each region, and the fast bootstrap option, using 1000 replicates. For BI analyses, each DNA region was assigned its own model of nucleotide substitution, as determined by the Akaike information criterion (AIC) in Modeltest v.3.7 (Posada & Crandall, 1998). Four Markov chain Monte Carlo chains were run, sampling one tree every 1000 generations for 50,000,000 generations, starting with a random tree. Stationarity of the runs was assessed using Tracer v.1.5 (Rambaut & Drummond, 2009). A majority-rule (>50%) consensus tree was constructed after removing the burn-in period samples (the first 25% of sampled trees). Posterior probabilities (PP) were estimated by sampling trees from the PP distribution.

**Swofford-Olsen-Waddell-Hillis test.** — We used a parametric bootstrapping likelihood ratio test, the Swofford-Olsen-Waddell-Hillis (SOWH) test (Goldman & al., 2000), to assess the monophyly of traditional *Aconitum*. The SOWH test has been found to have more power and lower occurrence of type I error than other hypothesis testing methods when model parameters are accurately provided (Goldman & al., 2000; Buckley, 2002). For each of the two combined datasets, we first constrained all taxa of traditional *Aconitum* as monophyletic, and then optimized the tree in RAxML (GTR+ $\Gamma$  model, partitioned by DNA region). Based on tree topology, branch lengths and tree scores generated from the above step, we simulated 100

replicate datasets using Seq-Gen v.1.3.2 (Rambaut & Grassly, 1997). For each simulated dataset, ML searches were conducted fully optimized or under constrained conditions. The InL differences ( $\Delta$ InL) were then calculated and used for evaluating the significance of the difference between the best tree and the constrained tree based on the original data. A detailed description of the SOWH test can be found in Liu & al. (2012).

## RESULTS

**Two-marker dataset.** — The aligned *trnL-F* sequences were 1512 nucleotides long. We excluded 42 ambiguous sites located in one region (804–845) from the phylogenetic analyses. The tree generated by the ML analysis (Electr. Suppl.: Fig. S1) was highly congruent with those retrieved with the BI analysis (Electr. Suppl.: Fig. S2), except for containing some weakly supported nodes (BS < 70%). The aligned matrix of ITS sequences had a length of 681 characters. ML and BI analyses resulted in highly congruent trees (Electr. Suppl.: Figs. S3, S4). Relationships among the genera and subgenera revealed from the *trnL-F* data were consistent with those from the ITS data. The combined *trnL-F* and ITS dataset consisted of 2151 characters, obtained from 287 accessions. The ML tree is shown in Fig. 3 and in Fig. S5 (Electr. Suppl.). *Delphinium* subg. *Staphisagria* is the earliest-diverging lineage in tribe Delphinieae. *Aconitum* subg. *Aconitum* and subg. *Lycotconum* form a clade (here named *Aconitum* s.str.) with strong support (BS 99%, PP 1.00). *Aconitum* subg. *Gymnaconitum* is sister to the clade containing *Consolida* (sensu Tamura, 1995; including *Aconitella*) and *Delphinium* subg. *Delphinium* and subg. *Delphinastrum* (BS 65%, PP 0.97). The monophyly of *D.* subg. *Delphinium* is not supported. Relationships among the genera and subgenera revealed by the BI analyses (Electr. Suppl.: Fig. S6) were identical to those from the ML analysis.

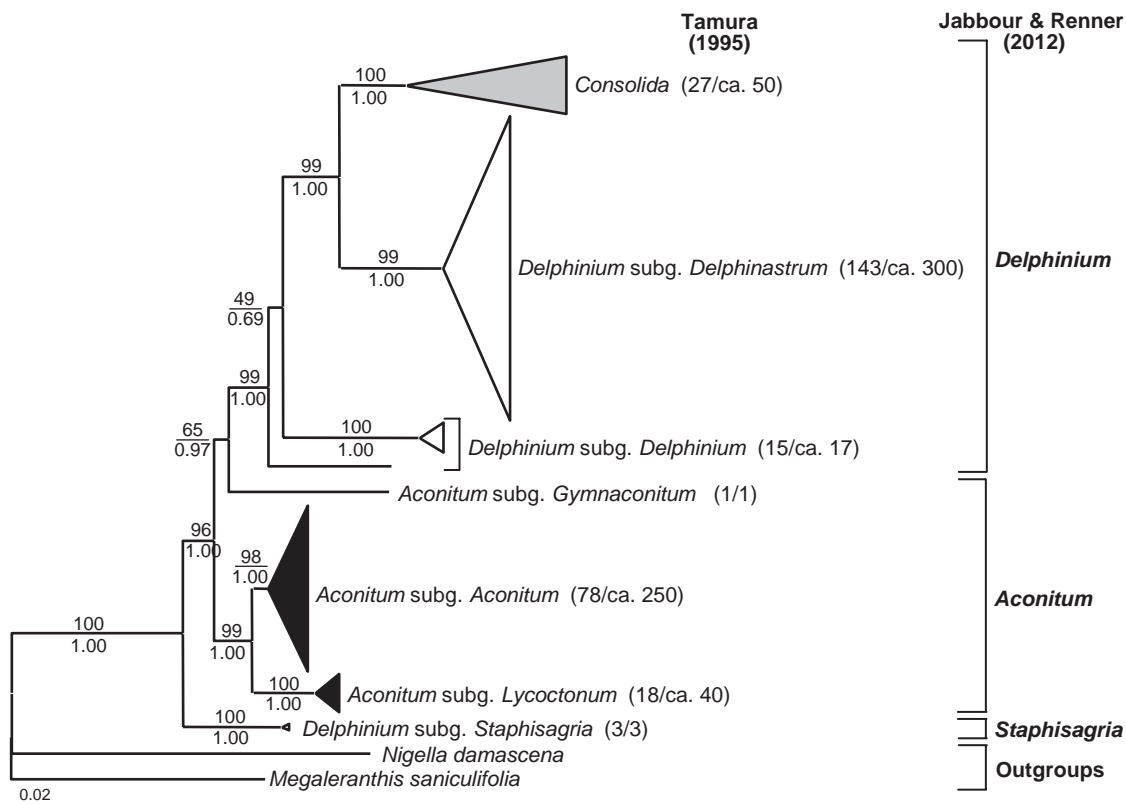
**Six-marker dataset.** — The aligned *trnL-F*, *trnH-psbA*, *trnK-matK*, and *trnS-trnG* matrices comprised 1331, 436, 1548, and 960 nucleotides, respectively. Correspondingly, one difficult-to-align region encompassing 38 sites (696–733) in the *trnL-F* dataset, one encompassing 50 sites (387–436) in the *trnH-psbA* dataset, three encompassing 56 sites (277–291, 432–440, and 680–711) in the *trnK-matK* dataset, and two encompassing 45 sites (532–540 and 652–687) in the *trnS-trnG* dataset were excluded from the analyses. The aligned ITS and *rbcL* datasets had 670 and 1262 positions, respectively. Relationships within tribe Delphinieae revealed by the cpDNA data (Electr. Suppl.: Fig. S7) were identical with those from the ITS data (Electr. Suppl.: Fig. S8). The combined six-marker dataset consisted of 6018 characters, obtained from 34 accessions. ML and BI analyses resulted in identical topologies (Fig. 4). Patterns of relationships at the generic and subgeneric levels were identical with those obtained from the two-marker dataset, but support for *Aconitum* subg. *Gymnaconitum* as sister to the clade containing *Consolida* and *Delphinium* subg. *Delphinium* and subg. *Delphinastrum* increased notably (BS 73%, PP 1.00).

**SOWH test.** — For the two-marker dataset, the SOWH test indicated that constraining traditional *Aconitum* as monophyletic yielded an ln-likelihood that is 13.0 units worse than the unconstrained optimal tree (Fig. 5). This difference is

significant at the 0.05 level (9.0 units). The six-marker dataset yielded a difference of 8.9 units, which is highly significant at the 0.01 level (4.0 units; Fig. 5). The SOWH test indicated that the monophyly of traditional *Aconitum* should be rejected.

■ **DISCUSSION**

All analyses based on our two- and six-marker datasets support the division of tribe Delphinieae into four major clades, *Staphisagria*, *Aconitum* s.str., *A.* subg. *Gymnaconitum*, and a broadly defined *Delphinium* (including *Consolida* and *Aconitella*), with *Staphisagria* as sister to the remaining Delphinieae. Subgenera *Aconitum* and *Lycocotnum* of *Aconitum* s.str., *Delphinium* subg. *Delphinastrum*, and *Consolida* (sensu Tamura, 1995; including *Aconitella*) are all strongly supported as monophyletic. These results are consistent with previous studies (Jabbour & Renner, 2011a, 2012a). Whereas Jabbour & Renner (2011a) found *D.* subg. *Delphinium* to be monophyletic with poor bootstrap support, our two- and six-marker datasets indicate that *Consilida* (sensu Tamura, 1995) is embedded within *D.* subg. *Delphinium* with weak support (Figs. 3, 4), which is congruent with the result of Jabbour & Renner (2012a). Importantly, our analyses further indicate



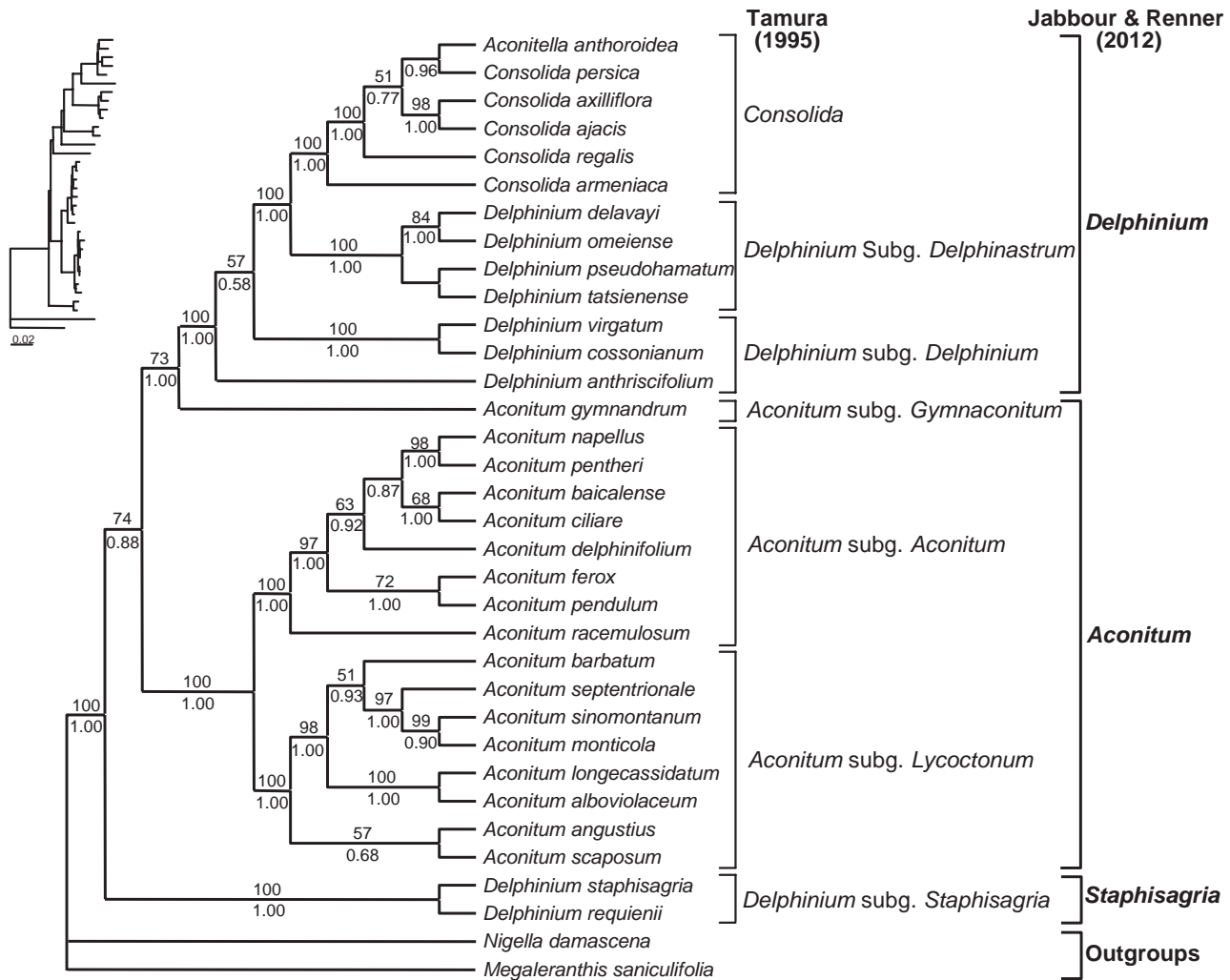
**Fig. 3.** Phylogenetic relationships in tribe Delphinieae obtained from an ML analysis of the two-marker dataset. Numbers above and below branches are bootstrap values and Bayesian posterior probabilities, respectively. Numbers alongside generic or subgeneric names represent the proportion of species we sampled relative to the total species number of each group. Classifications by Tamura (1995) and Jabbour & Renner (2012a) are shown on the right. For the expanded version see Fig. S5 in the Electronic Supplement.

that traditional *Aconitum* is not monophyletic, and that *A.* subg. *Gymnaconitum* and *Delphinium* (sensu Jabbour & Renner, 2012a) form a clade (Figs. 3, 4). To further clarify the phylogenetic position and taxonomic status of *A.* subg. *Gymnaconitum* in tribe Delphinieae, we present molecular, morphological and karyological evidence.

**Molecular evidence.** — Our phylogenetic analyses based on two- and six-marker datasets indicate that *Aconitum* subg. *Gymnaconitum* and *Delphinium* (sensu Jabbour & Renner, 2012a) grouped together (Figs. 3, 4). Thus, traditional *Aconitum* is not monophyletic. When a phylogenetic tree conflicts with the traditional concept of taxa (or an a priori hypothesis), it is important to investigate if this concept lies within the range of possibilities supported by the data, which requires hypothesis testing. In our study, the SOWH tests support the exclusion of subgenus *Gymnaconitum* from *Aconitum* (Fig. 5). Based on Bayesian relaxed-clock analyses, Jabbour & Renner (2012a) suggested that tribe Delphinieae rapidly diversified into four

lineages, i.e., *Staphisagria*, *A. gymnanthrum*, *Aconitum* s.str., and *Delphinium*, in a narrow window of time (32.3–27.24 Ma). Thirteen accessions (ITS) of *A. gymnanthrum* grouped together and supported this species as monophyletic (Jabbour & Renner, 2012a). Sampling 23 populations, L. Wang & al. (2009) found that *A. gymnanthrum* only began to diversify at the population level in the early Pleistocene (1.45 Ma). Thus, although *A. gymnanthrum* is a relatively ancient lineage in tribe Delphinieae, its population-level diversity originated more recently. When compared to the other three lineages, *A.* subg. *Gymnaconitum* should therefore be regarded as a distinct taxon in tribe Delphinieae.

**Morphology.** — *Aconitum* subg. *Gymnaconitum* differs markedly from *Aconitum* s.str. in having an annual or biennial habit (vs. perennial or pseudoannual), clawed sepals (vs. clawless), large flabellate petaline labia (vs. small, not flabellate), 6–13 carpels (vs. 3–5), and subglobose seeds (vs. subpyramidal). The epidermal cells of the seeds of *A.* subg.



**Fig. 4.** Phylogenetic relationships in tribe Delphinieae obtained from an ML analysis of the six-marker dataset. An ML phylogram is shown in the upper left hand corner. Numbers above and below branches are bootstrap values and Bayesian posterior probabilities (50%), respectively. Classifications by Tamura (1995) and Jabbour & Renner (2012a) are shown on the right.

*Gymnaconitum* are round (Yang, 1990), whereas those in *Aconitum* s.str. are rectangular (Cappelletti & Poldini, 1984). Microstructural features of seed surfaces have been considered to be less subject to environmental pressures than other morphological traits (Barthlott, 1984). Although *A.* subg. *Gymnaconitum* and *Delphinium* (sensu Jabbour & Renner, 2012a) form a clade (Figs. 3, 4), the two lineages differ in many morphological characters, such as the upper sepal (no spur vs. long spur), petals (stalked vs. sessile), staminodes (absent vs. present), and carpels (many vs. several). A comparison of morphological characters in tribe Delphinieae is shown in Table 2. Based on these characters, subgenus *Gymnaconitum* should neither be part of traditional *Aconitum* nor be merged with a broadly defined *Delphinium*.

**Karyology.** — Based on plants collected from Qinghai, Shang (1985) first reported that *A. gymnandrum* has a karyotype formula of  $2n = 16 = 12m + 4sm$ . Recently, Yuan (2006) reported a karyotype formula of  $2n = 16 = 6m + 10sm$  for this species from Sichuan. These two formulas are essentially similar when carefully comparing the ratio of the two arms of each chromosome between two populations (Yuan, 2006). In *Aconitum* s.str., the majority of species have only one or two pairs of m-chromosomes. Only *A. chrysotrichum* W.T. Wang and *A. crassiflorum* Hand.-Mazz. have karyotype formulas of  $2n = 32 = 12m + 20sm$ . Some species also have st-chromosomes (Shang & Li, 1984; Verlaque & Aboucaya, 2001; Yang, 2001; Yuan, 2006, and references therein). *Staphisagria* and *Delphinium* (sensu Jabbour & Renner, 2012a) have a higher proportion of st- and/or t-chromosomes (Hong, 1986; Simon & al., 1995; Verlaque & Aboucaya, 2001; Yang, 2001; Bosch & al., 2002; Yuan, 2006). Thus, *A.* subg. *Gymnaconitum* has the most symmetric karyotype in tribe Delphinieae.

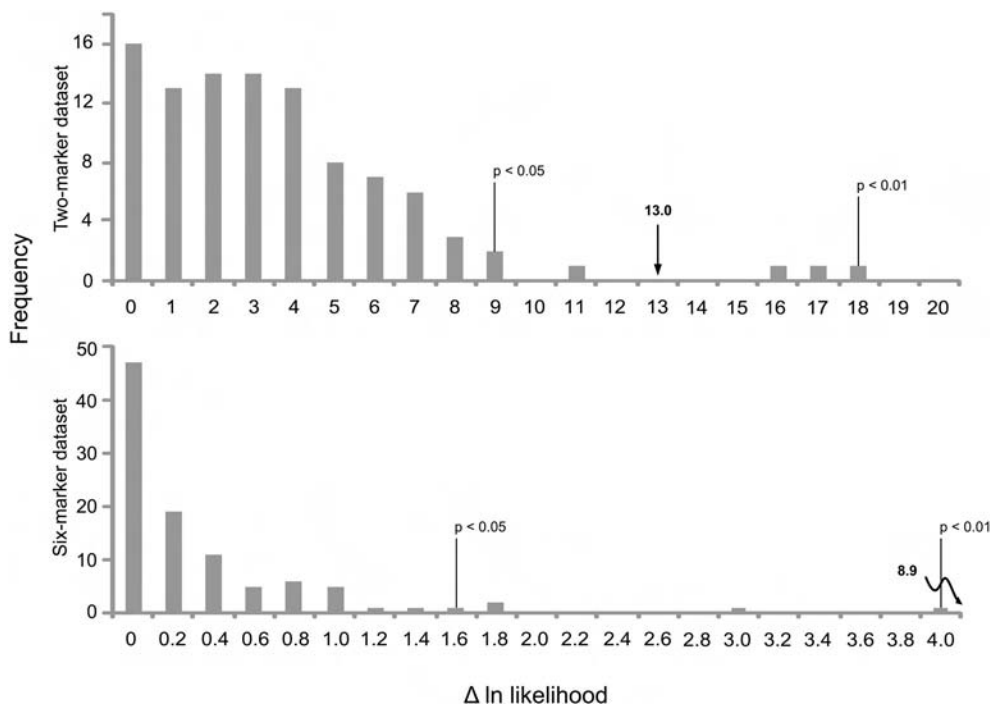
Based on above evidence, we raise *A.* subg. *Gymnaconitum* to generic status, *Gymnaconitum*, below. Tribe Delphinieae now contains four genera: *Staphisagria*, *Aconitum*, *Gymnaconitum*, and *Delphinium*.

## ■ TAXONOMY

***Gymnaconitum* (Stapf) Wei Wang & Z.D. Chen, stat. nov. ≡ *Aconitum* sect. *Gymnaconitum* Stapf in Ann. Roy. Bot. Gard. Calcutta 10: 178. 1905 ≡ *Aconitum* subg. *Gymnaconitum* (Stapf) Rapaics in Növényt. Közlem. 6: 139. 1907 – Type: *Gymnaconitum gymnandrum* (Maxim.) Wei Wang & Z.D. Chen.**

*Gymnaconitum* differs from *Aconitum* s.str. in having an annual or biennial habit (vs. perennial or pseudoannual), clawed sepals (vs. clawless), large flabellate petaline labia (vs. small, not flabellate), 6–13 carpels (vs. 3–5), subglobose seeds (vs. subpyramidal), and round cells in the seed epidermis (vs. rectangular). It is closely related to *Delphinium* sensu Jabbour & Renner, but differs markedly from the latter in the upper sepal (no spur vs. long spur), petals (stalked vs. sessile), staminodes (absent vs. present), and number of carpels (many vs. several).

***Gymnaconitum gymnandrum* (Maxim.) Wei Wang & Z.D. Chen, comb. nov. ≡ *Aconitum gymnandrum* Maxim. in Bull. Acad. Imp. Sci. Saint-Petersbourg, ser. 3, 23(2): 308. 1877 – Lectotype (designated by Grubovskaya-Borodina in Grubov 2000: 189): CHINA. Qinghai Prov., vicinity of Datong River, 14/26 Jul 1872, N.M. Przewalski s.n. (LE [digital image!]).**



**Fig. 5.** Histogram of the distribution of 100 replicates of the SOWH test of the monophyly of traditional *Aconitum*. Significance levels of 1% and 5% and the observed log-likelihood difference are shown in the chart.

**Table 2.** Morphological comparison of *Aconitum gymnandrum*, *Aconitum* s.str., *Staphisagria*, and *Delphinium* (including *Consolida*; Jabbour & Renner, 2012a).

Character	<i>Aconitum gymnandrum</i>	<i>Aconitum</i> s.str.	<i>Staphisagria</i>	<i>Delphinium</i>
Habit <sup>a,b,c</sup>	Annual or biennial	Perennial or pseudoannual	Annual or biennial	Annual or perennial
Sepals <sup>a,b,d,e</sup>	Clawed, upper sepal not spurred	Clawless, upper sepal not spurred	Clawless, upper sepal spurred	Clawless, upper sepal spurred
Petals <sup>a,b,d,e</sup>	Stalked, lip large, flabellate	Stalked, lip not flabellate	Clawed, lip not flabellate	Sessile, lip not flabellate
Staminodes <sup>b</sup>	Absent	Absent	Present	Present
Stigma <sup>a,b</sup>	Exposed	Not exposed	Not exposed	Not exposed
No. of carpels <sup>a,b</sup>	6–13	3 (6–8) or 3–5 (–9)	3	3 (4–10) or 1
Seed shape <sup>f,g</sup>	Subglobose	Subpyramidal	Sector-sphaeroidal	Subpyramidal to subglobose
Seed size <sup>b,f</sup>	1.5 mm	1.5–3.5 mm	>3.0 mm	1.0–3.5 mm
Seed surface <sup>f,g</sup>	Lamellae	Lamellae or wings	Reticulate	Lamellae or wings
Epidermal cells of seeds <sup>f,g,h,i</sup>	Round	Rectangular	Digitiform	Rectangular

<sup>a</sup>Tamura (1995); <sup>b</sup>W.T. Wang (1979); <sup>c</sup>Jabbour & Renner (2012a); <sup>d</sup>Luo & Yang (2005); <sup>e</sup>Jabbour & Renner (2012b); <sup>f</sup>Ilarslan & al. (1997); <sup>g</sup>Constantinidis & al. (2001); <sup>h</sup>Yang (1990); <sup>i</sup>Cappelletti & Poldini (1984)

= *Aconitum gymnandrum* f. *leucanthum* W.T. Wang in Acta Phytotax. Sin., Addit. 1: 97. 1965 – Holotype: CHINA. Sichuan Prov., Kangding, Xinduqiao, 21 Jul 1963, K.C. Kuan & W.T. Wang 869 (PE no. 00025217!).

*Note.* – The type locality of *A. gymnandrum* was listed as “Chinae prov. Kansu” in the protologue. The provincial name Kansu is equivalent to Gansu. Nonetheless the type locality, as inferred from the lectotype “China occidentalis. Terra Tangutorum (prov. Kansu). Declivio australi jugi a fl. Tetung meridiem versus”, is now situated in Qinghai Province and has not been included within Gansu Province since the early twentieth century.

*Icon.* – Institute of Botany, Chinese Academy of Sciences (1972: fig. 1396); W.T. Wang (1979: fig. 77, 1–3).

*Distribution and habitat.* – China (Xizang [Tibet], W Sichuan, Qinghai, and S Gansu). Alpine grassy and sandy slopes, grasslands; 1550–3800 m.

*Representative specimens examined.* – CHINA. **Xizang** (Tibet): Lasa, J.S. Yang 53 (KUN); Lhünze, Qinghai-Tibet Exped. 2902 (PE); Tingri, R.F. Huang CG89-768 (HNWP); Jomda, Qinghai-Tibet Exped. 2006 (PE, KUN); Ngamring, Qinghai-Tibet 7312 (PE, KUN); Bomê, Qinghai-Tibet Science Exped. 12582 (PE); Qamdo, Biological Institute Xizang Exped. 2223 (HNWP); Riwuqê, Qinghai-Tibet Exped. 12971 (PE, KUN); Konjo, Qinghai-Tibet Exped. 12582 (PE, KUN, HNWP); Nagqu, D.D. Tao 10843 (PE, KUN); Cona, C.Y. Wu & al. 75-911 (PE, HNWP, KUN); Yadong, Qinghai-Tibet Exped. 74-2579 (PE). **Sichuan:** Xiangcheng, Qinghai-Tibet Exped. 4856 (KUN); Kangding, S. Jiang 6412 (PE, KUN);

Muli, S.G. Wu 2891 (PE, KUN); Songpan, W.P. Fang 4013 (NAS, IBSC, LBG); Litang, H.J. Wang 8257 (WUK); Garze, J.S. Yang 119 (PE, KUN); Shiqu, Y.H. Wu 29571 (HNWP); Sertar, Y.H. Wu 30808 (HNWP); Zoige, Sichuan Med. Exped. 20340 (NAS); Maoxian, S. Jiang & J.C. Li 6835 (PE, KUN); Dawu, S. Jiang & C.J. Jin 2111 (PE, KUN); Ngawa, J.S. Yue 64089 (NAS); Barkam, Z.R. Zhang 22623 (PE, KUN, NAS); Heishui, X. Li 73313 (PE, IBSC). **Qinghai:** Jigzhi, Y.H. Wu 26432 (HNWP); Ledu, Qinghai-Gansu Exped. 1716 (PE, HNWP); Huzhu, Loess Exped. 5370 (WUK); Gonghe, X.S. Wang 149 (HNWP); Xinghai, Z.B. Wang 20280 (WUK, HNWP); Gangca, S.X. Wang 118 (HNWP); Tongren, Y.H. Wu 32394 (HNWP); Tongde, Y.H. WU 21482 (HNWP); Nangqen, Y.C. Yang 01188 (PE, HNWP); Jainca, L.H. Tang & L.N. Sun 733 (HNWP); Pingan, Y.H. Wu & al. 4218 (HNWP); Xunhua, Y.H. Wu 28492 (HNWP); Qumarlêb, R.F. Huang 156 (HNWP); Zadoi, S.W. Liu 302 (HNWP, WUK); Golog, W.Y. Wang 27291 (HNWP); Minhe, T.N. Ho 572 (HNWP); Zekog, S.W. Liu & D.S. Luo 1584 (HNWP), B.Z. Guo 25756 (HNWP); Maqen, T.N. Ho & al. 436 (PE, HNWP); Baima, Y.H. Wu 26078 (HNWP); Gade, Y.H. Wu 25729 (HNWP); Qilian, T.N. Ho 3223 (HNWP); Xining, Z.H. Zhang & al. 0776 (HNWP); Guinan, Y.H. Wu 21003 (HNWP); Menyuan, T.S. Ying & al. 26931 (PE, KUN). **Gansu:** Lintan, Yellow River Exped. 3303 (PE, NAS, KUN); Lanzhou, Y.Q. He 4378 (WUK); Tianzhu, Y.Q. He 4554 (WUK); Kangle, Taohe Exped. 95 (KUN); Jingtai, Z.Y. Yu & Y.P. Xu 3127 (WUK); Yuzhong, Yellow River Exped. 3031 (PE, WUK); Maqu, Y.H. Wu 31750 (HNWP); Zhugqu, B.Z. Guo 5606 (WUK).



## ■ ACKNOWLEDGEMENTS

We sincerely thank Prof. Pei-Gen Xiao and An-Ming Lu for their helpful suggestions; Dr. Hong-Lei Li and Cai-Fei Zhang for sequence and literature collections; Dr. Lily R. Lewis for her carefully reading the manuscript and helpful suggestions; the curators of HNWP, KUN, NAS, PE and WUK for accessing to their specimens; Dr. Irina Illarionova (LE) for providing digital type images. The UConn Bioinformatics Facility (USA) provided computing resources for the Bayesian and maximum likelihood analyses performed in this study. This research was supported by National Natural Science Foundation of China (grants 31270269, 30800059 and 30990241 to WW, and 31061160184 to ZDC).

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Vol. 62 (4) • August 2013

# TAXON

International Journal of Taxonomy, Phylogeny and Evolution

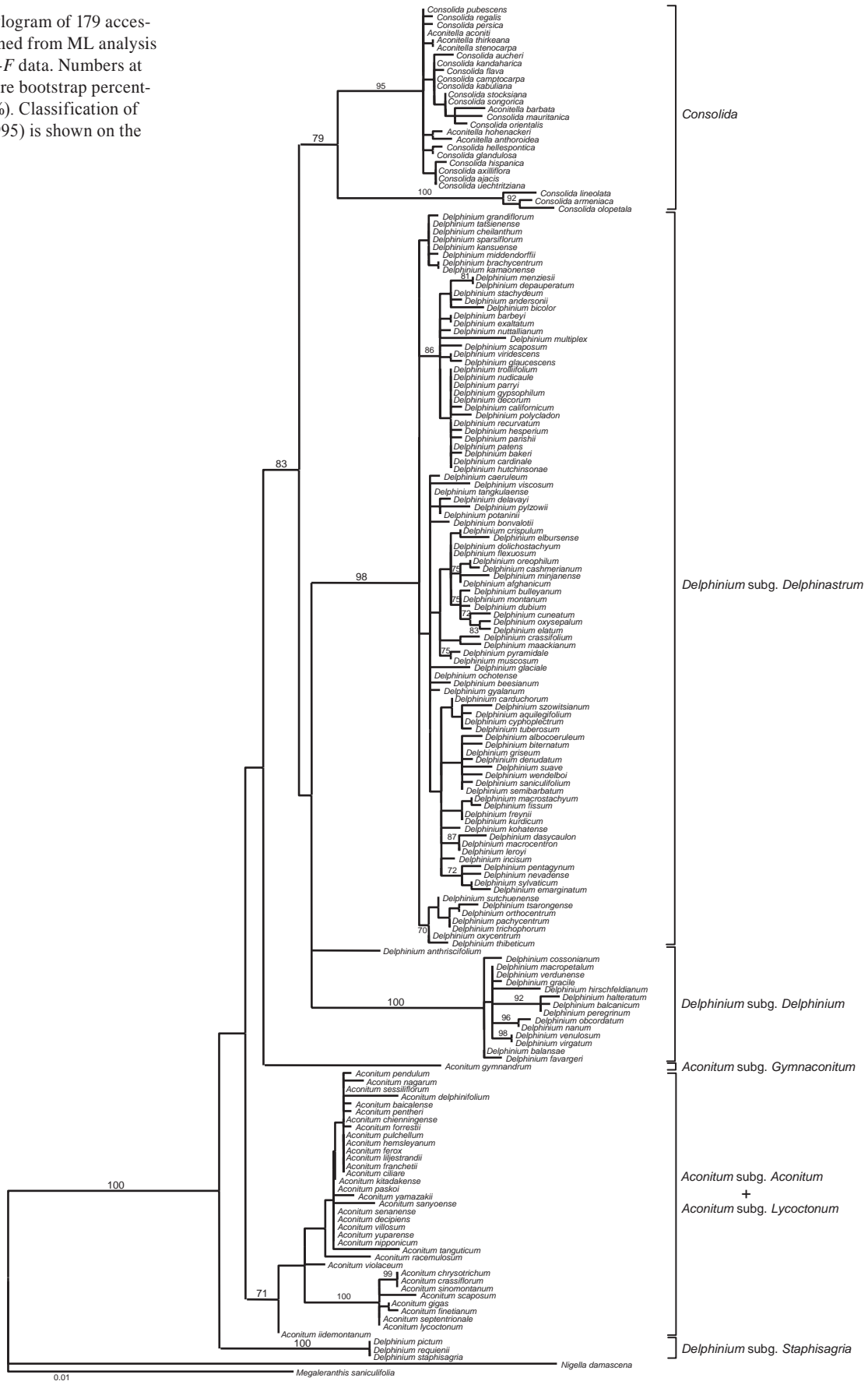
Electronic Supplement to

## ***Gymnaconitum*, a new genus of Ranunculaceae endemic to the Qinghai-Tibetan Plateau**

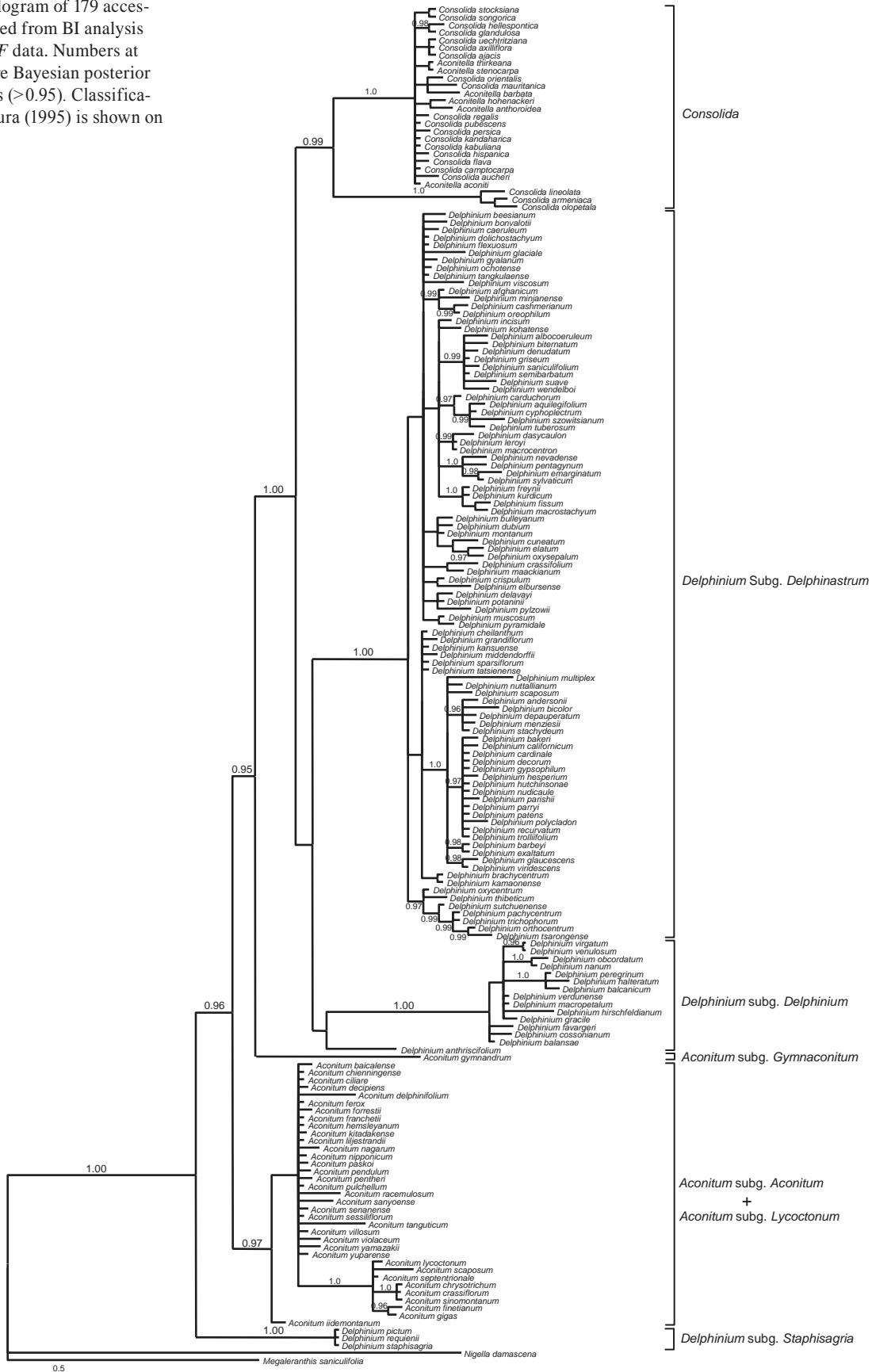
Wei Wang, Yang Liu, Sheng-Xiang Yu, Tian-Gang Gao & Zhi-Duan Chen

*Taxon* 62: 713–722

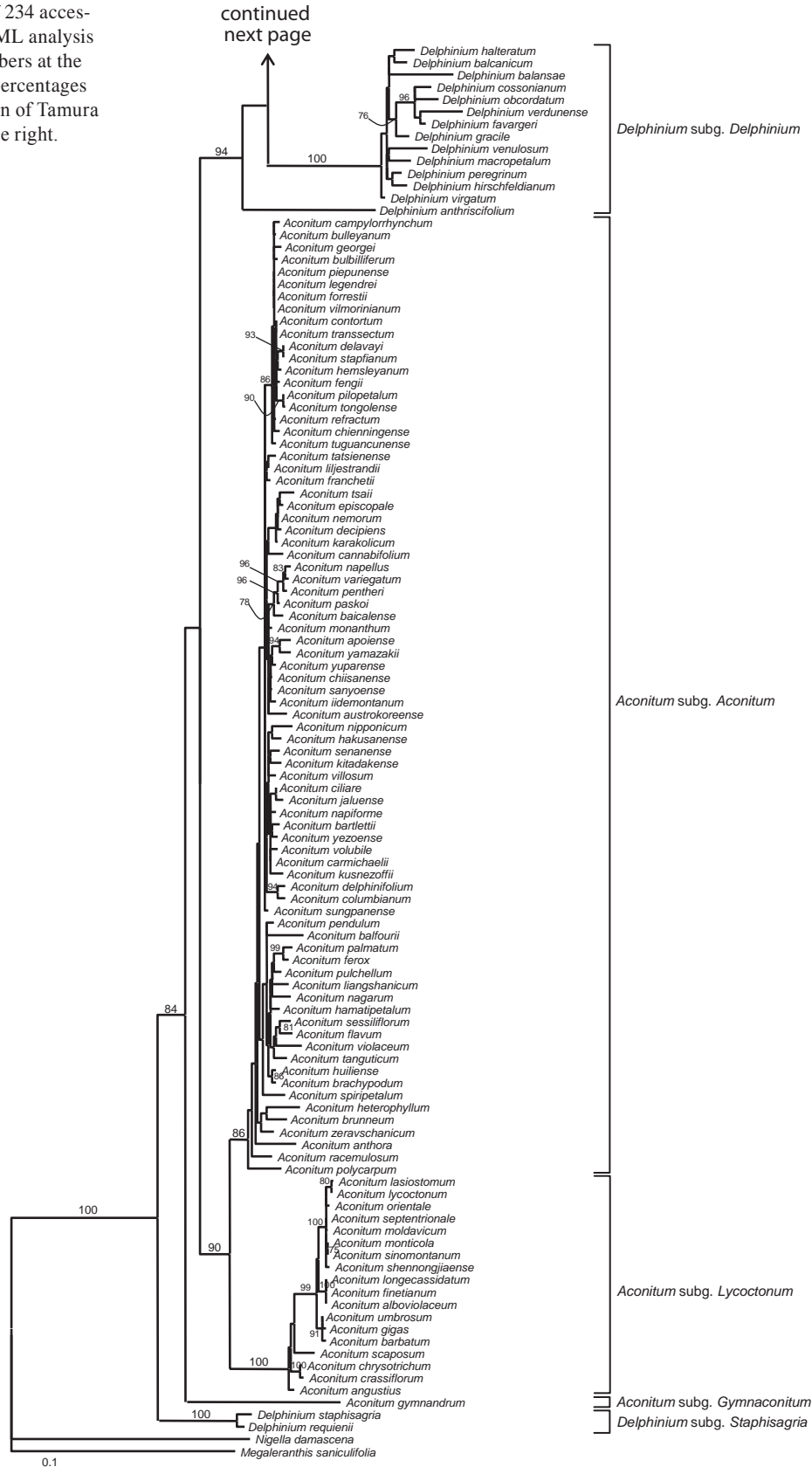
**Fig. S1.** Phylogram of 179 accessions obtained from ML analysis of the *trnL-F* data. Numbers at the nodes are bootstrap percentages (>70%). Classification of Tamura (1995) is shown on the right.

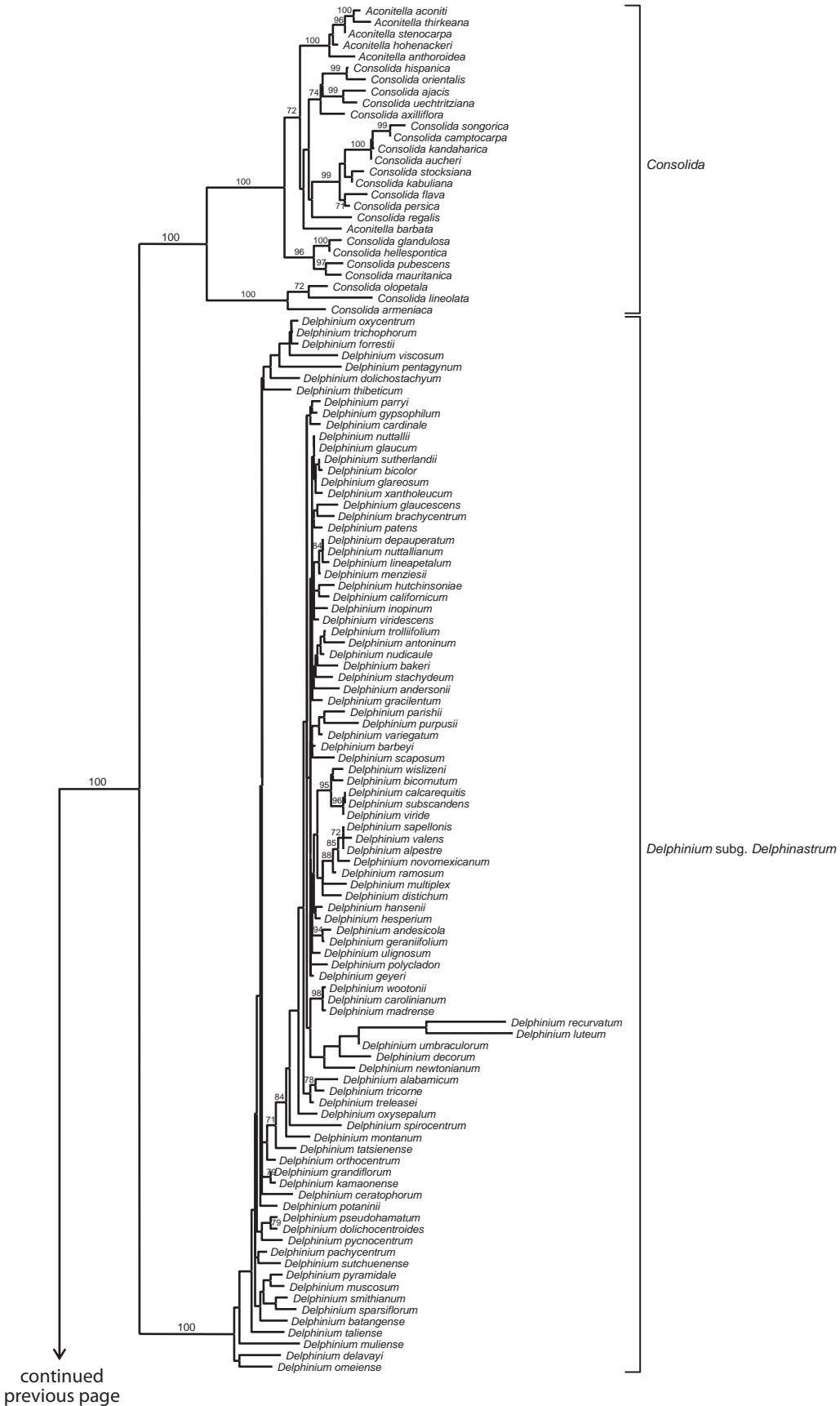


**Fig. S2.** Phylogram of 179 accessions obtained from BI analysis of the *trnL-F* data. Numbers at the nodes are Bayesian posterior probabilities (>0.95). Classification of Tamura (1995) is shown on the right.

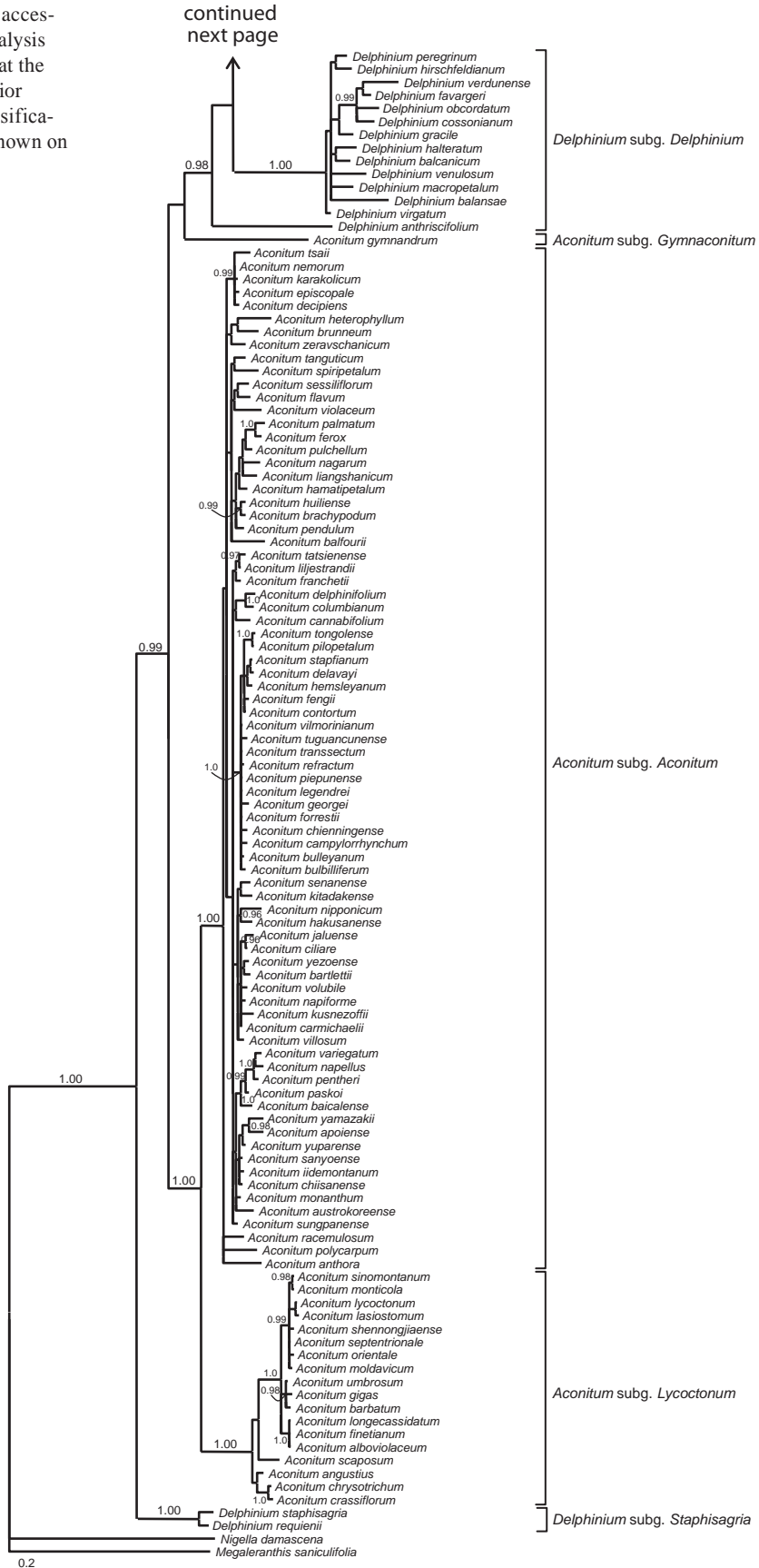


**Fig. S3.** Phylogram of 234 accessions obtained from ML analysis of the ITS data. Numbers at the nodes are bootstrap percentages (>70%). Classification of Tamura (1995) is shown on the right.





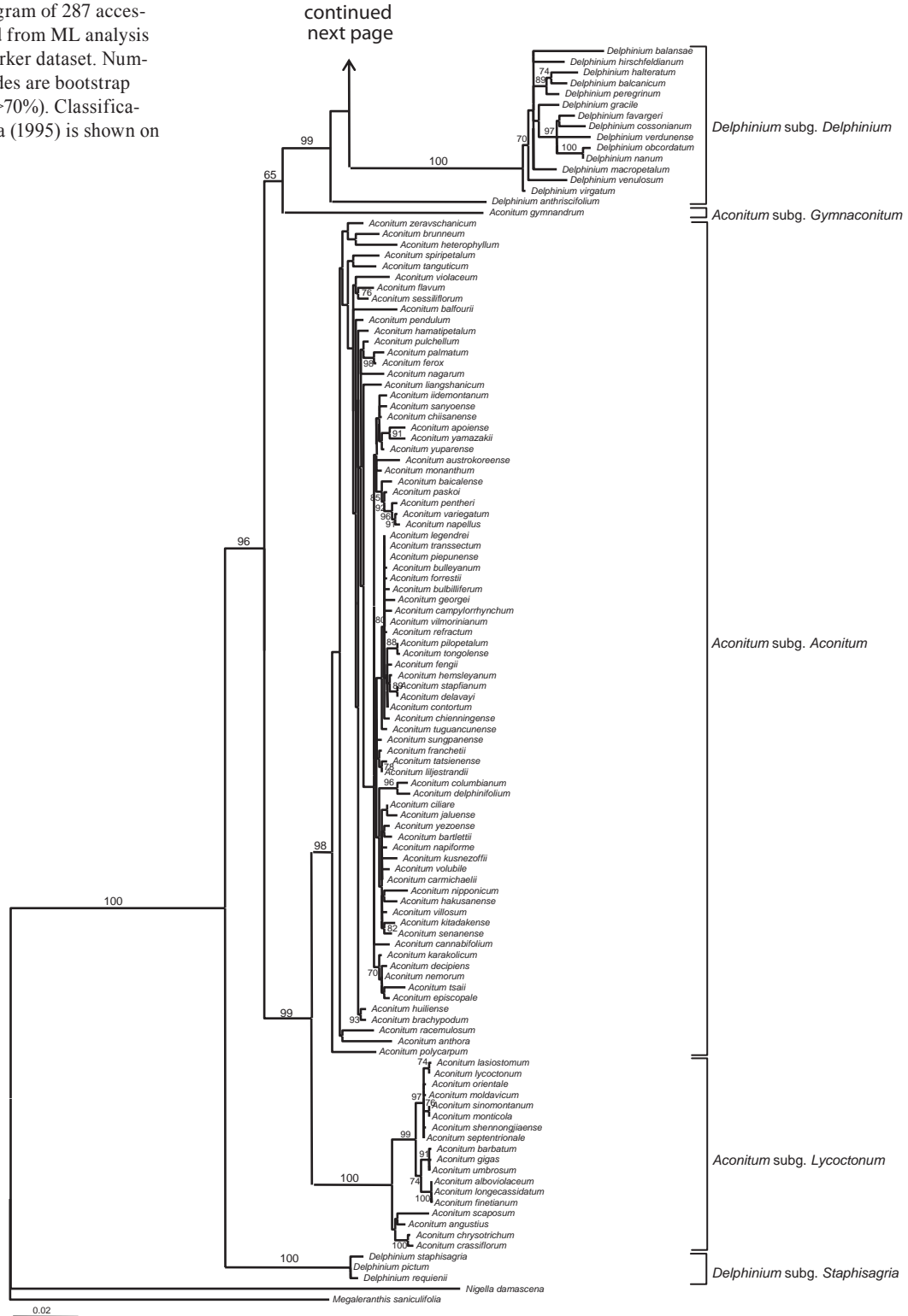
**Fig. S4.** Phylogram of 234 accessions obtained from BI analysis of the ITS data. Numbers at the nodes are Bayesian posterior probabilities (>0.95). Classification of Tamura (1995) is shown on the right.

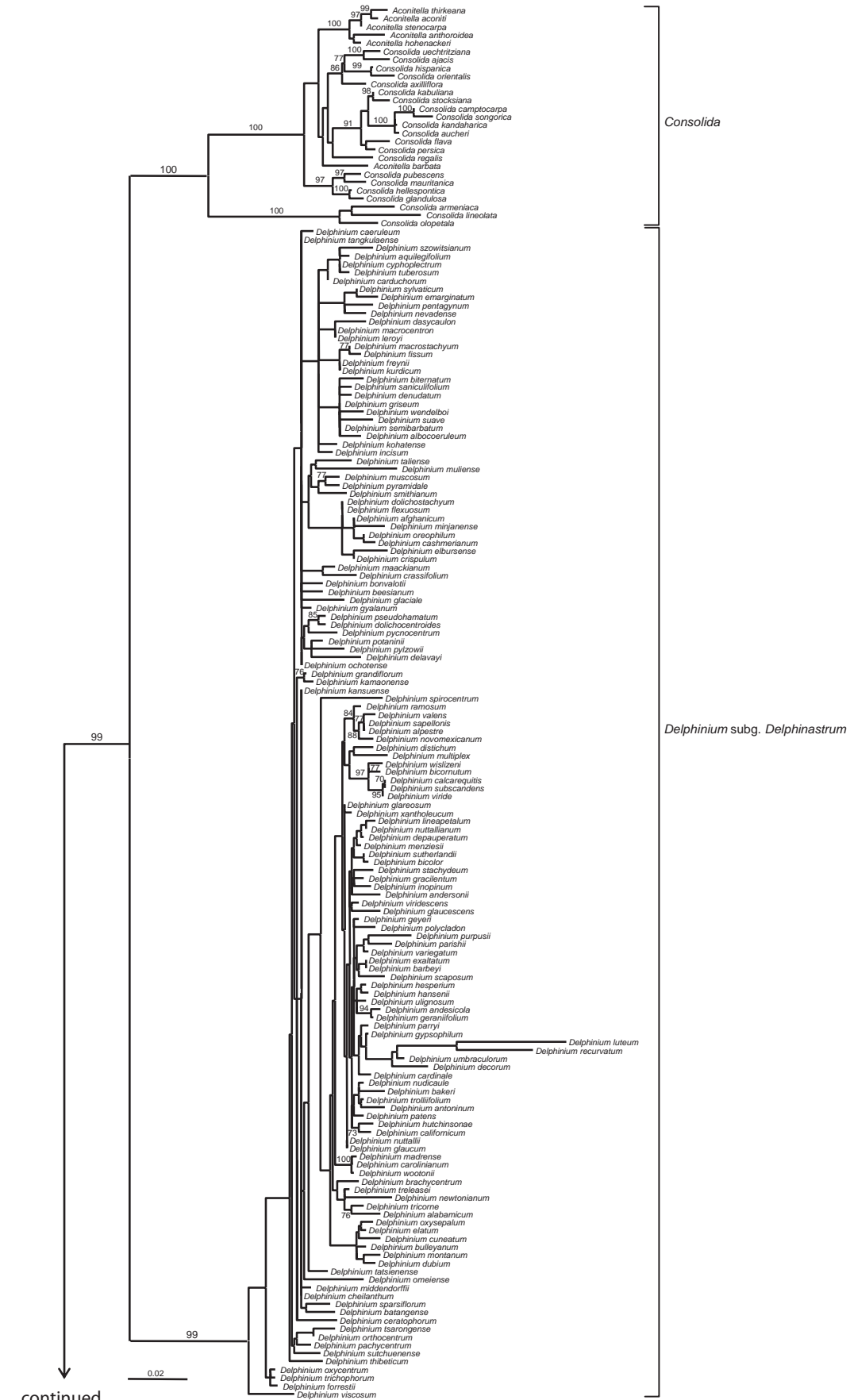






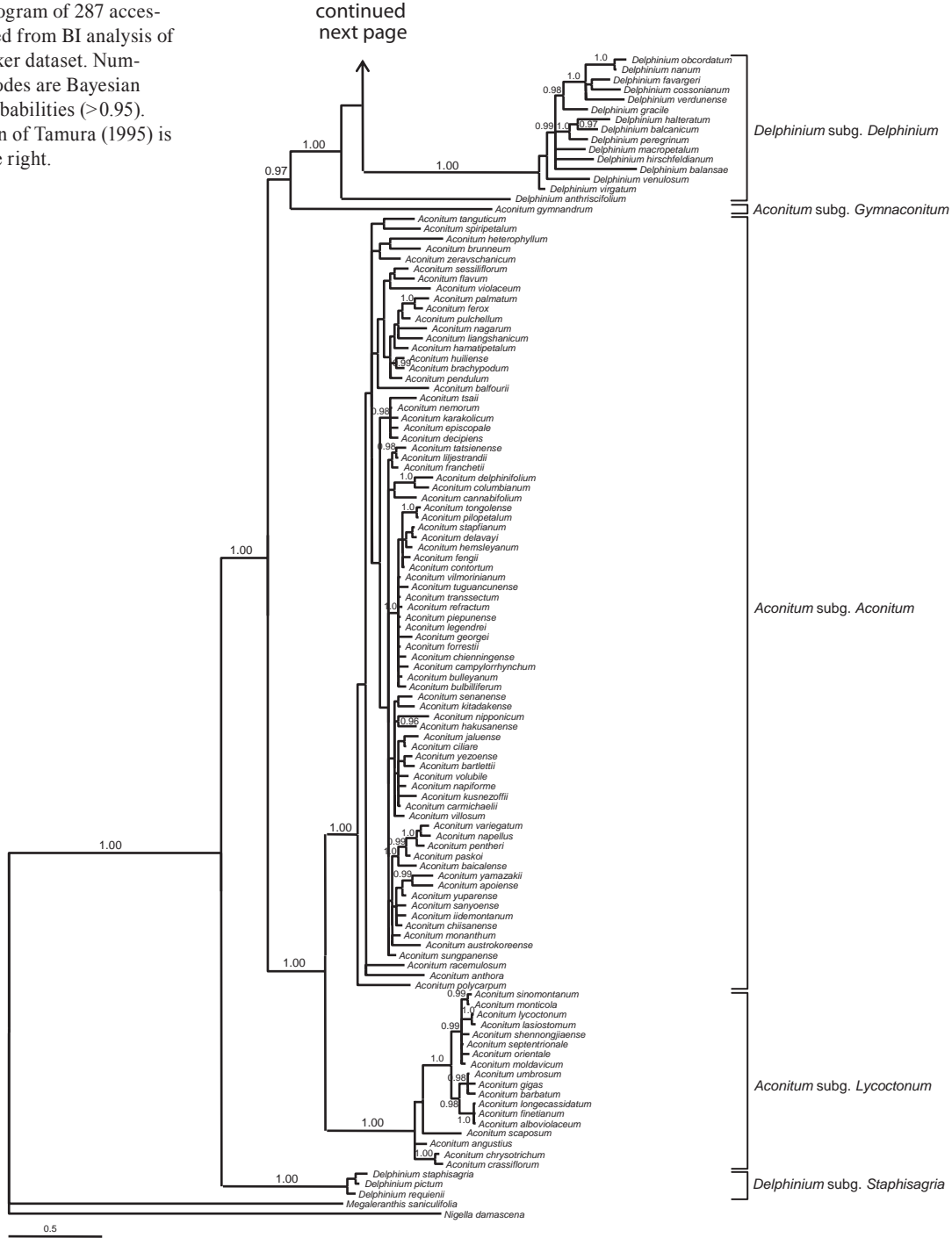
**Fig. S5.** Phylogram of 287 accessions obtained from ML analysis of the two-marker dataset. Numbers at the nodes are bootstrap percentages (>70%). Classification of Tamura (1995) is shown on the right.

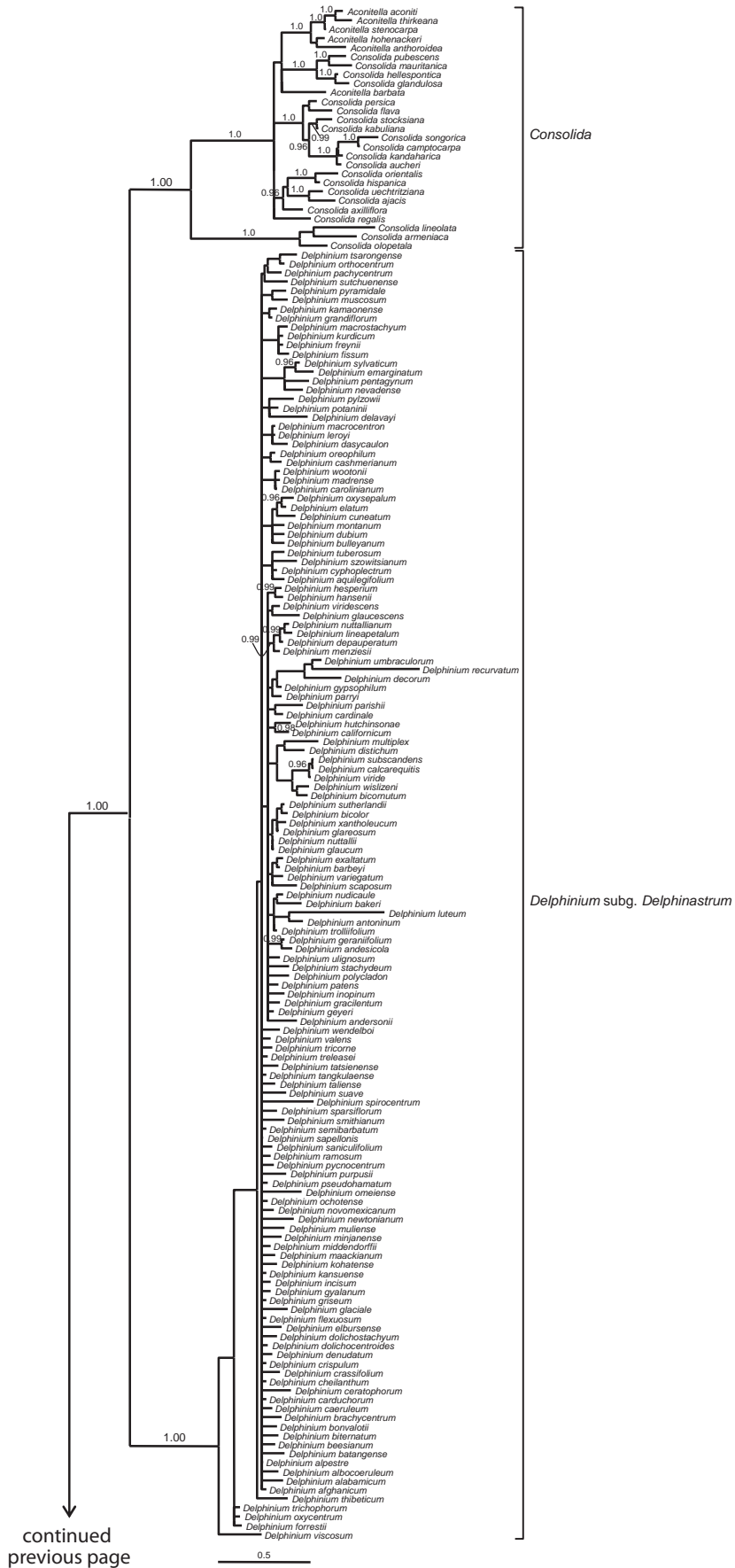




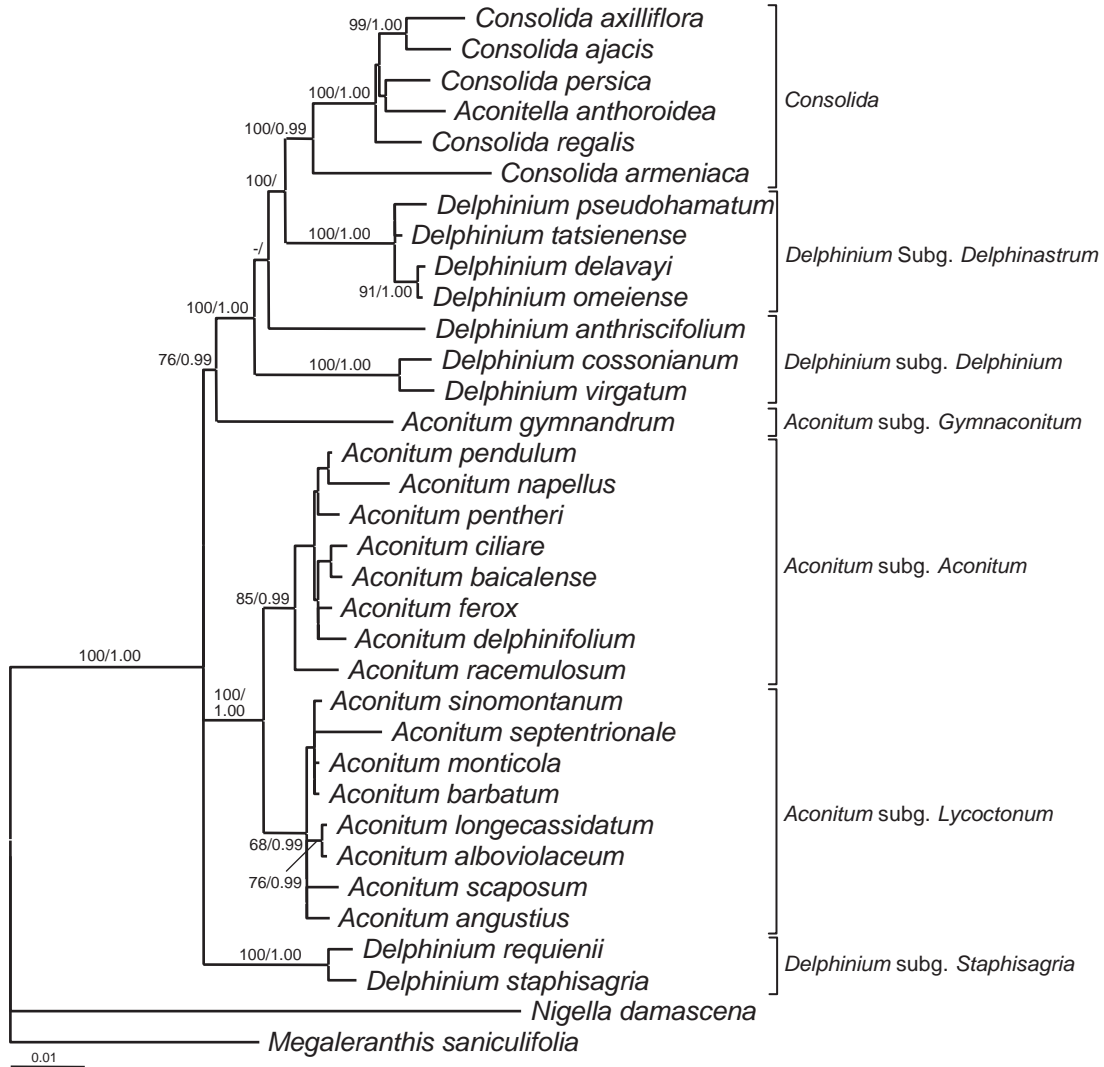
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**Fig. S6.** Phylogram of 287 accessions obtained from BI analysis of the two-marker dataset. Numbers at the nodes are Bayesian posterior probabilities (>0.95). Classification of Tamura (1995) is shown on the right.

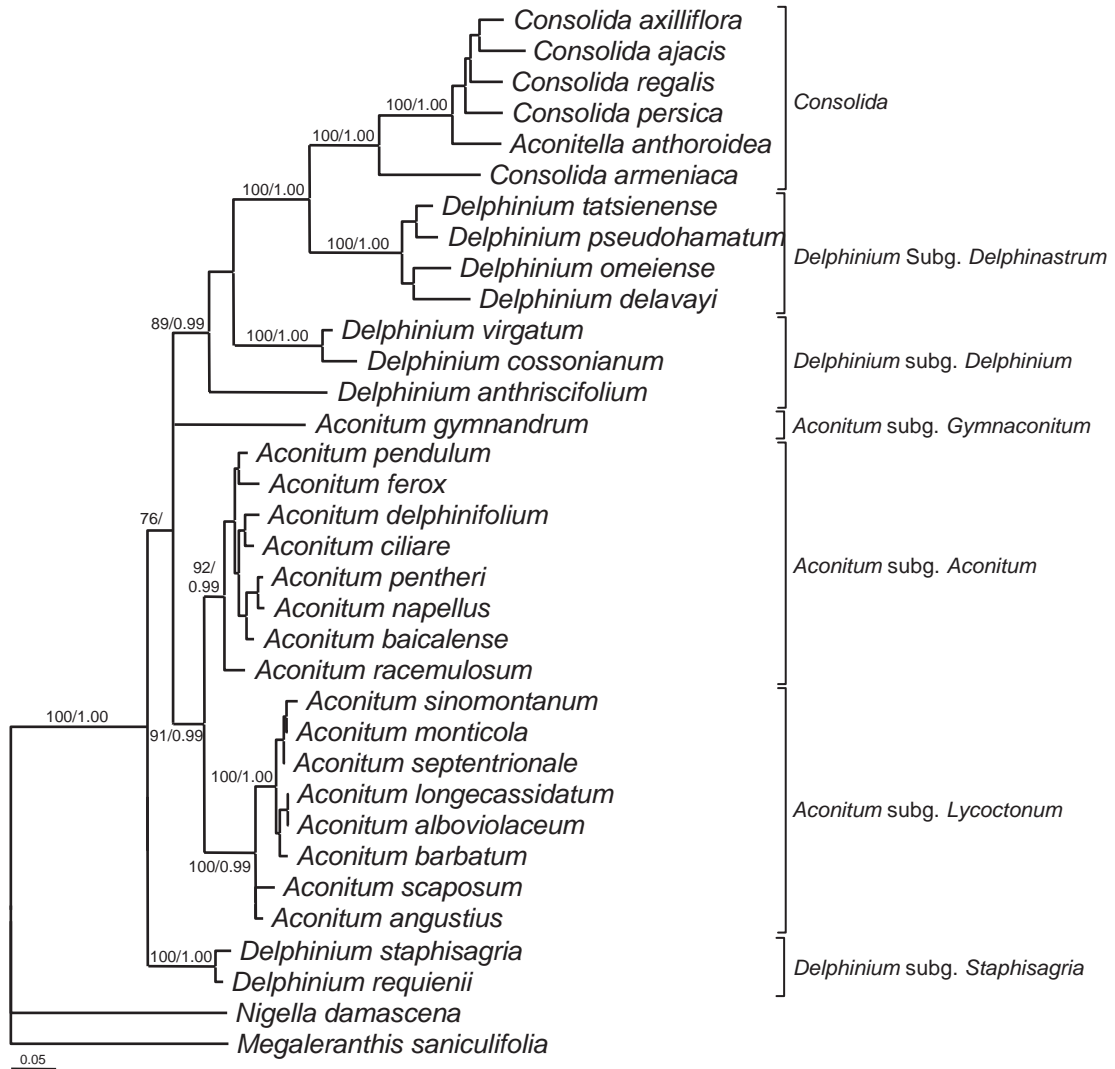




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**Fig. S7.** Phylogram of 34 accessions obtained from ML analysis of the cpDNA data. Numbers at the nodes are bootstrap percentages (>70%) and Bayesian posterior probabilities (>0.95), respectively. “-” indicates node not supported. Classification of Tamura (1995) is shown on the right.



**Fig. S8.** Phylogram of 34 accessions obtained from BI analysis of the ITS data. Numbers at the nodes are bootstrap percentages (>70%) and Bayesian posterior probabilities (>0.95), respectively. Classification of Tamura (1995) is shown on the right.

**Appendix S1.** Species and GenBank accession numbers for the datasets of two markers. “–” indicates missing data. Subgeneric classifications of *Aconitum* and *Delphinium* are based on Tamura (1995).

Genus and/or subgenus (number of species studied/number of species in genus and/or subgenus); Species, voucher, locality, and GenBank accession: ITS and trnL-F.

INGROUPS: *Aconitella* Spach (6/~10): *A. aconiti* (L.) Soják, *Buttler 20006* (M), Turkey: Konya, JF331874, JF331679; *A. anthoroidea* (Boiss.) Soják, *Rechinger 42468* (M), Iran: Kurdistan, JF331875, JF331680; *A. barbata* (Bunge) Soják, *Podlech 11320* (M), Afghanistan: Baghlan, JF331876, JF331681; *A. hohenackeri* (Boiss.) Soják, *Nydegger 44486* (MSB), Turkey: Erzurum, JF331877, JF331682; *A. stenocarpa* (Hossain & P.H. Davis) Soják, *Buttler 20012* (M), Turkey: Konya, JF331878, JF331685; *A. thirkeana* (Boiss.) Soják, *Buttler & Erben 17987* (M), Turkey: Eskişehir, JF331879, JF331686; *Aconitum* L. (97/~300): **subg. *Lycocotnum*** (DC.) Peterm. (18/~40): *A. albobolaceum* Kom., *Yangqe0171* (PE), China: Hebei, JF975786, –; *A. angustius* W.T. Wang, *Yangqe0185* (PE), China: Anhui, JF975796, –; *A. barbatum* var. *puberulum* Ledeb., *Yangqe0206* (PE), China: Hebei, JF975804, –; *A. chrysotrichum* W.T. Wang, *Y. Luo 358* (PE), China: Sichuan, AY164642, AY164649; *A. crassiflorum* Hand.-Mazz., *Y. Luo 365* (PE), China: Sichuan, AY150230, AY150245; *A. finetianum* Hand.-Mazz., *Q.E. Yang s.n.* (PE), China: Jiangxi, AY164643, AY164650; *A. gigas* H. Lévl. & Vaniot, *180011* (KANA), Japan: Hokkaido, AB004963, D86453; *A. lasiostomum* Rchb., 58429 (I), Rumania, AF216534, –; *A. longecassidatum* Nakai, *Yangqe0198* (PE), China: Anhui, JF975809, –; *A. lycocotnum* L., *M. Baltisberger & A. Widmer 13345* (ZT), Romania: Zarnasti, AF216537, *Soininen & al.* (2009), Norway, GQ244533; *A. moldavicum* Hacq., *J. Sarbu 42108* (I), Rumania, AF216535, –; *A. monticola* Steinh., *Yangqe0191* (PE), China: Hebei, JF975813, –; *A. orientale* Mill., *B. Neuffer* (OSBU), Russia: Teberda, AF216556, –; *A. scaposum* Franch., *Y. Luo 327* (PE), China: Sichuan, AY150231, AY150246; *A. septentrionale* Koelle, *Yarosh & Maslin ZZT5* (ZT), Russia: Ural, AF216552, *Dietrich 5808* (M), Norway, JF331730; *A. shennongjiaense* Q. Gao & Q.E. Yang, *Yangqe0220* (PE), China: Hubei, JF975819, –; *A. sinomontanum* Nakai, *Y. Luo 333* (PE), China: Sichuan, AY150232, AY150247; *A. umbrosum* (Korsh.) Kom., *Yangqe0163* (PE), China: Jilin, JF975825, –; **subg. *Aconitum*** (Stapf.) Rapaics (78/~250): *A. anthera* L., *Utelli & Horat 14417* (ZT), France: Hautes-Pyrénées, AF216547, –; *A. apoienense* Nakai, *180075* (KANA), Japan: Hokkaido, AB004936, –; *A. austro-koreense* Koidz., *Pak, Choi & Lee 4540*, Korea: Taegu, AB020351, –; *A. baicalense* Turcz. ex Rapaics, *19027196* (TNS), Russia: Siberia, AB004941, –; *A. baicalense* Turcz. ex Rapaics, *Zedtwitz 1936* (M), Russia: Transbaikal, –; JF331723; *A. balfourii* Stapf, *Devarumath & al.* (2004, unpub.), India, AJ717337, –; *A. bartlettii* Yamamoto, *ITO Aco3*, China: Taiwan, AB004946, –; *A. brachypodum* Diels, *F.M. Zhang 00-007* (PE), China: Yunnan, AY189789, –; *A. brunneum* Hand.-Mazz., *Yang 92025* (PE), China: Sichuan, AY571344, –; *A. bulbiflorum* Hand.-Mazz., *Y. Luo & Y.S. Chen 548* (PE), China: Sichuan, AY571360, –; *A. bulleyanum* Diels, *F.M. Zhang 00-016* (PE), China: Yunnan, AY189798, –; *A. campylorrhynchum* Hand.-Mazz., *Y. Luo & Y.S. Chen 528* (PE), China: Sichuan, AY571359, –; *A. cannabifolium* Franch. ex Finet & Gagnep., *1391652* (PE), China: Anhui, AY189801, –; *A. carmichaelii* Debx., cult. Beijing Bot. G. (PE), AY571352, –; *A. chienningense* W.T. Wang, *Y. Luo 353* (PE), China: Sichuan, AY164646, AY164653; *A. chiisanense* Nakai, *Kita 951000* (TNS), Korea: Kyongsangnando, AB0049501, –; *A. ciliare* DC., *Kita 951120*, Japan: Kumamoto, AB004952, *Herrmann 238* (M), China: Jilin, JF331724; *A. columbianum* Nutt., *N. Tspoura 22* (WS), U.S.A.: Idaho, AF258683, –; *A. contortum* Finet & Gagnep., *F.M. Zhang 00-019* (PE), China: Yunnan, AY189788, –; *A. decipiens* Vorosch & Anfalov, *Wakab & al. 9327102* (TNS) Russia: Siberia, AB004955, D86446; *A. delavayi* Franch., *Zhang & Ge* (2002, unpub.), no locality, AY189785, –; *A. delphinifolium* DC., *Wells 1777* (WS), U.S.A.: Alaska, AF258681, *Lang s.n.* 28.07.1996 (M), no locality, JF331725; *A. episcopale* H. Lev., *Y. Luo & Y.B. Luo 389* (PE), China: Sichuan, AY189794, –; *A. fengii* W.T. Wang, *F.M. Zhang 00-003* (PE), China: Yunnan, AY189799, –; *A. ferox* Wall, *Minaki & al. 9100909* (TI), Nepal: Mt. Shiwapuri, AB004961, *J. Pcelt 29* (M), Nepal: Khumbu, JF331726; *A. flavum* Hand.-Mazz., *Q.E. Yang 9501* (PE), China: Qinghai, AY571357, –; *A. forrestii* Stapf, *F.M. Zhang 10005* (PE), China: Sichuan, AY164644, AY164651; *A. franchetii* Finet & Gagnepain, *Y. Luo 390* (PE), China: Sichuan, AY150236, AY150251; *A. georgei* Comber, *F.M. Zhang 00-012* (PE), China: Yunnan, AY189792, –; *A. hakusanense* Nakai, *180097* (KANA), Japan: Ishikawa, AB004964, –; *A. hamatipetalum* W. T. Wang, *Y. Luo & Y.S. Chen 482* (PE), China: Yunnan, AY571355, –; *A. hemsleyanum* E. Pritz. ex Diels, *Y. Luo 386* (PE), China: Sichuan, AY189793, AY150252; *A. heterophyllum* Wall, *Balasubramani & al.* (2011, unpublished), India, JF440340, –; *A. huiliense* Hand.-Mazz., *Y. Luo & Y.S. Chen 553* (PE), China: Sichuan, AY571362, –; *A. iide-montanum* Kadota, *Kita & Ueda, 191948* (KANA), Japan: Yamagata, AB004970, D86456; *A. jaluense* Komarov, *ITO Aco3* (no voucher), Korea: Kangwonda, AB004973, –; *A. karakolicum* Rapaics, *D.Y. Tan A002* (PE), China: Xinjiang, AY571358, –; *A. kitadakense* Nakai, *191938* (KANA), Japan: Yamanashi, AB004977, D86463; *A. kusnezoffii* Rchb., *Q.E. Yang s.n.* (PE), China: Inner Mongolia, AY571346, –; *A. legendrei* Hand.-Mazz., *Y. Luo & Y.S. Chen 448* (PE), China: Sichuan, AY571354, –; *A. liangshanicum* W.T. Wang, *Y. Luo & Y.S. Chen 450* (PE), China: Sichuan, AY571364, –; *A. liljestrandii* Hand.-Mazz., *Y. Luo & Y.B. Luo 344* (PE), China: Sichuan, AY164645, AY164652; *A. monanthum* Nakai, *S. Ge 008* (PE), China: Jilin, AY189803, –; *A. nagarum* Stapf, *Y.B. Luo 468* (PE), China: Yunnan, AY571347, *Kadota 21473* (TNS), China: Yunnan, D86450; *A. napellus* L., *Utelli & Soliva 14412* (ZT), Italy: Lago di Como, AF216544, –; *A. napiforme* Lev. & Vnt., *180103* (KANA), Japan: Nagano, AB004988, –; *A. nemorum* Popov, *D.Y. Tan A001* (PE), China: Xinjiang, AY571361, –; *A. nipponicum* Nakai, *180103* (KANA), Japan: Nagano, AB004989, D86462; *A. palmatum* D. Don., *Devarumath & al.* (2004, unpub.), India, AJ717340, –; *A. paskoi* Vorosch., *Wakabayashi & al. 9327216* (TNS), Russia: Siberia, AB004997, D86443; *A. pendulum* Busch, *Y. Luo & Y.B. Luo 411* (PE), China: Sichuan, AY150235, *D. Boufford & al. 40471* (MSB), China: Sichuan, JF331728; *A. penterii* Hayek, *D. Podlech & W. Lippert 26275* (ZT), Serbia, JF331905, JF331729; *A. piepunense* Hand.-Mazz., *F.M. Zhang 00-001* (PE), China: Yunnan, AY189800, –; *A. pilopetalum* W.T. Wang & L.Q. Li, *Y. Luo & Y.B. Luo 364* (PE), China: Sichuan, AY571343, –; *A. polycarpum* Chang ex W.T. Wang, *Y. Luo & Y.S. Chen 494* (PE), China: Yunnan, AY571356, –; *A. pulchellum* Hand.-Mazz., *Y. Luo & Y.B. Luo 362* (PE), China: Sichuan, AY164647, AY164654; *A. racemulosum* Franch., *Y. Luo & Y.B. Luo 360* (PE), China: Sichuan, AY150233, *Wang Wei 081* (PE), China: Chongqing, FJ626533; *A. refractum* (Finet & Gagnep.) Hand.-Mazz., *Y. Luo & Y.B. Luo 406* (PE), China: Sichuan, AY571349, –; *A. sanyoense* Nakai, *180095* (KANA), Japan: Kyoto, AB005002, D86263; *A. senanense* Nakai, *191943* (KANA), Japan: Yamanashi, AB005006, D86461; *A. sessiliflorum* (Finet & Gagnep.) Hand.-Mazz., *Y. Luo 396* (PE), China: Sichuan, AY164648, AY164655; *A. spiripetalum* Hand.-Mazz., *Y. Luo & Y.B. Luo 393* (PE), China: Sichuan, AY571345, –; *A. stapfianum* Hand.-Mazz., *Zhang & Ge* (2002, unpublished), no locality, AY189786, –; *A. sungpanense* Hand.-Mazz., *H.Z. Kong k1001* (PE), China: Shaanxi, AY189795, –; *A. tanguticum* (Maxim.) Stapf, *Y. Luo & Y.B. Luo 309* (PE), China: Sichuan, AY150234, AY150249; *A. tatsienense* Finet & Gagnep., *Y. Luo & Y.B. Luo 384* (PE), China: Sichuan, AY571348, –; *A. tongolense* Ulbr., *Y. Luo & Y.B. Luo 375* (PE), China: Sichuan, AY571350, –; *A. transsectum* Diels, *F.M. Zhang 00-011* (PE), China: Yunnan, AY189791, –; *A. tsaii* W.T. Wang, *F.M. Zhang 00-014* (PE), China: Yunnan, AY189784, –; *A. tuguanense* Q.E. Yang, *Zhang & Ge* (2002, unpub.), China, AY189782, –; *A. variegatum* L., *A.B. Utelli 14428* (ZT), Switzerland: Bergell, AF216549, –; *A. villosum* Rchb., *9237144* (TNS), Russia: Siberia, AB005010, D86442; *A. vilmorinianum* Kom, *Zhang & Ge* (2002, unpub.), China, AY189787, –; *A. violaceum* Jacquem. ex Stapf, *Devarumath & al.* (2004, unpub.), India, AJ717338, *Valentini & al.* (2009), no locality, EU326032; *A. volubile* Muhl., *S. Ge 004* (PE), China: Jilin, AY189802, –; *A. yamazakii* Tamura & Namba, *180040* (KANA), Japan: Hokkaido, AB005012, D86260; *A. yezoense* Nakai, *180045* (KANA), Japan: Hokkaido, AB005018, –; *A. yuparense* Takeda, *180022* (KANA), Japan: Hokkaido, AB005019, D86262; *A. zeravschanicum* Steinb., *Kita 9532187* (TNS), Kirghiz, AB005022, –; **subg. *Gymnaconitum*** (Stapf.) Rapaics (1/1): *A. gymndrum* Maxim., *Y. Luo 326* (PE), China: Sichuan, AY150238, AY164651; ***Consolida*** (DC.) S.F. Gray (21/~40): *C. ajacis* (L.) Schur, *Mexmüller 8524* (M), Germany: Bavaria, JF331880, JF331687; *C. armeniaca* (Stapf ex Huth) Schröd., *Nydegger 16993* (MSB), Turkey, JF331883, JF331690; *C. aucheri* (Boiss.) Iranshahr, *Podlech & Jarmal 28879* (MSB), Afghanistan: Kandahar, JF331884, JF331691; *C. axilliflora* (DC.) Schrödinger, *Brachfeld & Graben 42414* (MSB), Turkey: Anatolia, JF331885, JF331692; *C. camptocarpa* (Fisch. & C.A. Mey.) Nevski, *Rusanovitsch & Kramarenko 14029* (M), Kazakhstan: Taldy-Kurgan, JF331886, JF331694; *C. flava* (DC.) Schrödinger ex Hand.-Mazz., *Rechinger 148* (M), Iraq: Haswa desert, JF331887, JF331695; *C. glandulosa* (Boiss. & A. Huet) Bornm., *Nydegger 16741* (M), Turkey: Anatolia, JF331888, JF331696; *C. hellespontica* (Boiss.) Chater, *Nydegger 44206* (MSB), Turkey: Konya, JF331889, JF331697; *C. hispanica* (Willk. ex Costa) Greuter & Burdet, *Angerer s.n.* 25.7.1984 (M), Germany: Bavaria, JF331890, JF331698; *C. kabuliana* (Akhtar) Iranshahr, *Volk 2630* (M), Afghanistan: Kabul, JF331891, JF331700; *C. kandaharica* Iranshahr, *Podlech 22009* (MSB), Afghanistan: Farah, JF331892, JF331701; *C. lineolata* Hub.-Mor. & C. Simon, *Nydegger 13313* (MSB), Turkey, JF331893, JF331703; *C. mauritanica* (Coss.) Munz, *Podlech 47566* (MSB), Morocco: Er-Rachidia, JF331894, JF331704; *C. olopetala* (Boiss.) Hayek, *Nydegger 43795* (MSB), Turkey: Erzincan, JF331895, JF331706; *C. orientalis* (J. Gay) Schrödinger, *Parishani 14382* (M), Iran:



## Appendix S1. Continued.

Isfahan, JF331896, JF331707; *C. persica* (Boiss.) Schroedinger, *Rechinger 42445* (M), Iran: Kurdistan, JF331897, JF331708; *C. pubescens* (DC.) Soó, *Lambinon 79E568* (MSB), Spain: Zaragoza, JF331899, JF331710; *C. regalis* Gray, *Hertel 6560* (M), Austria: Parndorf plain, JF331900, JF331714; *C. songorica* Nevski, *Karelin & Kirilloff 1165* (MSB), Kazakhstan, JF331902, JF331719; *C. stocksiana* (Boiss.) Nevski, *Volk 1585* (M), Afghanistan: Kabul, JF331903, JF331720; *C. uechtritziana* (Huth) Soó, *Rechinger 21108* (M), Greece: Epirus, JF331904, JF331722; ***Delphinium* L.** (161/~320): **subg. *Delphinastrum* (DC.) Peterm.** (143/~300): *D. afghanicum* Rech. f., *Grözbach 1* (MSB), Afghanistan: Takhar, –, JN573529; *D. alabamicum* Kral, *Bryson 3150* (GA), U.S.A.: Alabama, AF258756, –, *D. albocoeruleum* Maxim., *Trippner 191* (M), China: Kansu, –, JN573530; *D. alpestre* Rydberg, *Hogan 2923* (COLO), U.S.A.: Colorado, AF258733, –, *D. andersonii* A. Gray, *Richter 7* (WS), U.S.A.: Oregon, AF258773, AF258647; *D. andescicola* Ewan, *Fishbein 618* (ARIZ), Mexico: Sonora, AF258725, –, *D. antoninum* Eastw., *Jokerst 2433* (CHSC), U.S.A.: California, AF258691, –, *D. aquilegifolium* (Boiss.) Bornm., *Manutsheri 1066* (MSB), Iran: Mazandaran, –, JN573531; *D. bakeri* Ewan, *Snow 1230* (RPBG), U.S.A.: California, AF258697, AF258652; *D. barbeyi* Huth, *Siplivsky & Beck 4314* (WS), U.S.A.: Colorado, AF258709, AF258639; *D. batangense* Finet & Gagnep., *Yangqe0036* (PE), China: Yunnan, JF976224, –, *D. beesianum* W.W. Sm., *Farrer & Purdom 237* (M) China: Kansu, –, JN573532; *D. bicolor* Nutt., *P. Soltis 2383* (WS), U.S.A.: Idaho, AF258711, AF258653; *D. bicornutum* Hemsl., *Mendoza 1905* (ARIZ), Mexico: Chihuahua, AF258701, –, *D. biternatum* Huth, *D. Podlech 15909* (M), Afghanistan: Baghlan, –, JN573533; *D. bonvalotii* Franch., *Wang Wei 030* (PE), China: Guizhou, –, FJ626542; *D. brachycentrum* Ledeb., *Voron & Derviz-Sokolova s.n. 1967* (M), Russia: Magadan, –, JN573534; *D. bulleyanum* Forrest ex Diels, cult. Munich Bot. G., China: Yunnan, –, JN573535; *D. caeruleum* Jacquem., *J. Pcelt s.n. 19.09.1962* (M), Nepal: Khumbu, –, JN573536; *D. calcarequitis* Standl., *Ferguson* (ARIZ), Mexico: Chihuahua, AF258719, –, *D. californicum* Torr., *San Mateo s.n.* (RPBG), U.S.A.: California, AF258713, AF258640; *D. cardinale* Hook., *Mort 1374* (no voucher), U.S.A.: California, AF258740, AF258648; *D. carduchorum* Chowdhuri & P.H. Davis, *Vogel s.n. 16.08.1968* (M), Turkey: Hakkari, –, JN573537; *D. carolinianum* subsp. *vimineum* (D. Don) M.J. Warnock, *Thomas 154175* (WS), U.S.A.: Louisiana, AF258720, –, *D. cashmerianum* Royle, *Anders 8118* (MSB), Afghanistan: Badakhshan, –, JN573538; *D. ceratophorum* Franch., *Yangqe0023* (PE), China: Yunnan, JF976226, –, *D. cheilanthum* Fisch. ex DC., *Leuchtenb s.n.* (M), Russia: Siberia, –, JN573539; *D. crassifolium* Schrad. ex Spreng., *Boyko & Starch s.n.* (M), Russia: Amur, –, JN573540; *D. crispulum* Rupr., *K.H. Rechinger 57118* (M), Azerbaijan: Mt. Sahand, –, JN573541; *D. cuneatum* Steven ex DC., *Litvinov 7219* (MSB), Russia: Samara, –, JN573542; *D. cypholepctrum* Boiss., *S. Zarre & Zarrei 1042* (MSB), Iran: Bushehr, –, JN573543; *D. dasycaulon* Fresen, *Mbala 592* (M), Zambia, –, JN573544; *D. decorum* Fisch. & C.A. Mey., *J. Koontz 63* (WS), U.S.A.: California, AF258744, AF258631; *D. delavayi* Franch., *McBeath & al. CLD0895* (UCBG), China: Yulong Shan, AF258705, AF258659; *D. denudatum* Wall., *D. Podlech 31929* (MSB), Afghanistan: Ghazni, –, JN573546; *D. depauperatum* Nutt., *Richter 59* (WS), U.S.A.: Oregon, AF258689, AF258656; *D. distichum* Geyer ex Hooker, *Fishbein 3460* (WS), U.S.A.: Washington, AF258774, –, *D. dolichocentroides* W.T. Wang, *Yangqe0025* (PE), China: Yunnan, JF976231, –, *D. dolichostachyum* Chowdhuri & P.H. Davis, *Thoma s.n.* (M), Turkey: Munzur-Gebirge, JN573516, JN573547; *D. dubium* (Rouy & Fouc.) Pawl., *H. Merxmüller & Wiedmann 285/64* (M), Italy: Cuneo, –, JN573548; *D. elatum* L., *Skvortsov & al. 10597* (M), Russia: Ural, JN5735179, JN573544; *D. elbursense* Rech. f., *Manutsheri 983* (MSB), Iran: Gilan, –, JN573550; *D. emarginatum* C. Presl, *H. Ross 303* (M), Italy: Blermo, –, JN573551; *D. exaltatum* Aiton, *Bright 18948* (WS), U.S.A.: Pennsylvania, –, AF258651; *D. fissum* Waldst. & Kit., *K.H. Rechinger 21506* (M), Greece: Epirus, –, JN573552; *D. flexuosum* M. Bieb., *Gagnide & al. 887* (MO), Georgia: Khevi, –, JN573553; *D. forrestii* Diels, *Yangqe0020* (PE), China: Yunnan, JF976232, –, *D. freynii* Huth, *G. Fayvush 1631* (M), Armenia: Vayotsdzor, –, JN573554; *D. geraniifolium* Rydberg, *Wallace s.n.* (ARIZ), U.S.A.: Arizona, AF258765, –, *D. geyeri* Greene, *Nelson & Nelson 6702* (WS), U.S.A.: Wyoming, AF258762, –, *D. glaciale* Hook. f. & Thomson, *Miyamoto & al. 9592453* (MO), Nepal: Sagarmatha, –, JN573555; *D. glareosum* Greene, *Grable 5772* (WS), U.S.A.: Washington, AF258764, –, *D. glaucescens* Rydberg, *Hitchcock & Sutherland 2351* (WS), U.S.A., Idaho, AF258754, AF258645; *D. glaucum* S. Watson, *Cheatham s.n.* (WS), U.S.A.: Oregon, AF258739, –, *D. gracilentum* Greene, *Warnock s.n.* (WS), U.S.A.: California, AF258763, –, *D. grandiflorum* L., *Erschine & al. SICH205* (UCBG), China: Sichuan, AF258761, AF258630; *D. griseum* Gilli, *Volk 1873* (M), Afghanistan: Kabul, –, JN573556; *D. gyalanum* C. Marquand & Airy Shaw, cult. Munich Bot. G., China: Tibet, –, JN573557; *D. gypsophilum* Ewan, *Koontz 36* (WS), U.S.A.: Washington, AF258721, AF258633; *D. hansenii* Greene, *Warnock s.n.* (WS), U.S.A.: California, AF258760, –, *D. hesperium* A. Gray, *Raiche 20005* (UCBG), U.S.A.: California, AF258772, AF258634; *D. hutchinsoniae* Ewan, *94.123* (RPBG), U.S.A.: California, AF258750, AF258641; *D. incisum* Wall., *J. Pcelt s.n.* (M), Nepal: Okhaldunga, –, JN573558; *D. inopinum* (Jepson) H.F. Lewis & Epling, *Grable 11320* (WS), U.S.A.: California, AF258749, –, *D. kamaonense* Huth, *Yangqe0048* (PE), China: Sichuan, JF976235, *Wuendish 303* (MSB), Nepal: Langtang, JN573559; *D. kansuense* W.T. Wang, *Q.E. Yang & Q. Yuan 386* (IBSC), China: Fin'an, –, JN573560; *D. kohatense* (Brühl) Munz, *Anders 3567* (MSB), Afghanistan: Paktia, –, JN573561; *D. kurdicum* Boiss. & Hohen., *K.H. Rechinger 11017* (M), Iraq: Erbil, –, JN573562; *D. leroyi* Franch. ex Huth, *Richards 25743* (M), Tanzania: Arusha, –, JN573563; *D. lineapetalum* Ewan, *Fishbein 3211* (WS), U.S.A.: Washington, AF258771, –, *D. luteum* A. Heller, *Guggolz 1542* (WS), U.S.A.: California, AF258777, –, *D. maackianum* Regel, *Zedtwitz s.n.* (M), Russia, –, JN573565; *D. macrocentron* Oliv., *W. Rauh 410* (M), Kenya, –, JN573566; *D. macrostachyum* Boiss. ex Huth, *K.H. Rechinger 43020* (M), Iran: Kurdistan, –, JN573568; *D. madrense* S. Watson, *Warnock 2252* (LL), U.S.A.: Texas, AF258712, –, *D. menziesii* de Candolle, *Richter 5* (WS), U.S.A.: Oregon, AF258755, –, *D. middendorffii* Trautv., *Korol. & Rjab. 6025* (M), Russia: Magadan, –, JN573569; *D. minjanense* Rech. f., *Breckle 2998* (MSB), Afghanistan: Kunar, –, JN573570; *D. montanum* DC., *Kalheber 85-2044* (M), France: Pyrénées Orientales, JN573518, N573571; *D. muliense* W.T. Wang, *Yangqe0025* (PE), China: Yunnan, JF976237, –, *D. multiplex* (Ewan) C.L. Hitchc., *Hitchcock & Muhllick s.n.* (WS), U.S.A.: Washington, AF258714, AF258654; *D. muscosum* Exell & Hillc., *A. Kress s.n.* (M), –, JN573519, JN573572; *D. nevadense* Kunze, *Bertel 11109* (M), Spain: Granada, –, JN573574; *D. newtonianum* D.M. Moore, *Retzig 1145* (GA), U.S.A.: Arkansas, AF258742, –, *D. novomexicanum* Wootton, *Worthington 4771* (ARIZ), U.S.A.: New Mexico, AF258718, –, *D. nudicaule* Torr. & A. Gray, *J. Koontz 96-20* (WS), U.S.A.: California, AF258728, AF258638; *D. nuttallianum* Pritz., *Strickler 912-6* (WS), U.S.A.: Washington, AF258688, AF258646; *D. nuttallii* A. Gray, *K. Karoly s.n.* (OR), U.S.A.: Oregon, AF258746, –, *D. ochotense* Nevski, *Soininen & al.* (2009), Norway, –, GQ244830; *D. omeiense* W.T. Wang, *Yangqe0043* (PE), China: Sichuan, JF976239, –, *D. oreophilum* Huth, *Vassiljeva s.n.* (M), Uzbekistan, –, JN573576; *D. orthocentron* Franch., *Y. Luo 323* (PE), China: Sichuan, AY150242, AY150257; *D. oxycentrum* W.T. Wang, *H.Z. Kong 98-329* (PE), China: Yunnan, AY150240, AY150255; *D. oxysepalum* Pax & Borbás, *Angerer s.n.* (M), Slovakia, JN573522, JN573577; *D. pachycentrum* Hemsl. ex Brühl, *Y. Luo 311* (PE), China: Sichuan, AY150243, AY150258; *D. parishii* A. Gray, *Richter 53* (WS), U.S.A.: California, AF258716, AF258635; *D. parryi* A. Gray, *Edwards s.n.* (RPB), U.S.A.: California, AF258694, AF258636; *D. patens* Benth., *Richter 11* (WS), U.S.A.: California, AF258734, AF258658; *D. pentagynum* Lam., *Lewalle 10967* (MSB), Morocco: Rabat, JN573523, JN573578; *D. polycladon* Eastw., *R.C. Bacigalupi 6508* (WS), U.S.A.: California, AF258743, AF258642; *D. potaninii* Huth, *Yangqe0005* (PE), China: Sichuan, JF976245, –, *D. potaninii* Huth, *Q.E. Yang & Q. Yuan 805* (IBSC), China: Zhuxi, –, JN573579; *D. pseudohamatum* W.T. Wang, *Yangqe0027* (PE), China: Sichuan, JF976246, –, *D. purpusii* Brandegee, *Shevock 12032* (RSA), U.S.A.: California, AF258747, –, *D. pycnocentron* Franch., *Yangqe0055* (PE), China: Yunnan, JF976249, –, *D. pylzowii* Maxim., *Farrer & Purdom 253* (M), China: Kansu, –, JN573580; *D. pyramidale* Royle, *A. Kress s.n.* (M), –, JN573524, JN573581; *D. ramosum* Rydb., *Hogan 3563* (COLO), U.S.A.: Colorado, AF258687, –, *D. recurvatum* Greene, *Brown s.n.* (WS), U.S.A.: California, AF258775, AF258632; *D. saniculifolium* Boiss., *K.H. Rechinger 3838* (M), Iran: Kerman, –, JN573583; *D. sapellonis* Cockerell, *Lowery 1877* (WS), U.S.A.: New Mexico, AF258708, –, *D. scaposum* Greene, *Joyce 136* (WS), U.S.A.: Arizona, AF258732, AF258649; *D. semibarbatum* Bien. ex Boiss., *Belianina & al. 9174* (MSB), Russia: Kuhitang Mtns, –, JN573584; *D. smithianum* Hand.-Mazz., *Yangqe0050* (PE), China: Sichuan, JF976250, –, *D. sparsiflorum* Maxim., *Trippner s.n.* (M), China: Kansu, JN573525, JN573585; *D. spirocentrum* Hand.-Mazz., *Yangqe0022* (PE), China: Yunnan, JF976253, –, *D. stachydeum* (A. Gray) Tidestr., *Richter 61* (WS), U.S.A.: Oregon, AF258684, AF258643; *D. suave* Huth, *Peers s.n.* (MSB), Pakistan: Chitral, –, JN573586; *D. subsandens* Ewan, *Correll & Gentry 23019* (LL), Mexico: Chihuahua, AF258710, –, *D. suchuenense* Franch., *D. Boufford & al. 39837* (MSB), China: Sichuan, JN573526, JN573587; *D. sutherlandii* M.J. Warnock, *Bjork 1187* (WS), U.S.A.: Idaho, AF258693, –, *D. sylvaticum* Turcz., *Lager s.n.* (G), Algeria: Kabylia, Alger, –, JN573588; *D. szowitzianum* Boiss., *K.H. Rechinger 43500* (M), Azerbaijan: Khalkal, –, JN573589; *D. taliense* Franch., *Yangqe0009* (PE), China: Yunnan, JF976257, –, *D. tangkulaense* W.T. Wang, *Q.E. Yang & Q. Yuan 409* (IBSC), China: Madoi, –, JN573590; *D. tatsienense* Franch., *Yangqe0033* (PE), China: Sichuan, JF976259, *A. Kress s.n.* (M), China, JN573591; *D. thibeticum* Finet & Gagnep., *Yangqe0014* (PE), China: Yunnan, JF976263, *Rock 17338* (M), China: Yunnan, JN573592; *D. treleasei* Bush ex K.C. Davis, *Brooks 14186* (GA), U.S.A.:

## Appendix S1. Continued.

Missouri, AF258768, –; *D. trichophorum* Franch., *Yangq0016* (PE), China: Sichuan, JF976266, *D. Boufford & al. 39746* (MSB), China: Sichuan, JN573593; *D. tricorne* Michx., *Vincent 7734* (WS), U.S.A.: Ohio, AF258770, –; *D. trolliifolium* A. Gray, *Edwards s.n.* (RPBG), U.S.A.: California, AF258686, AF258650; *D. tsarongense* Hand.-Mazz., *Handel-Mazzetti 7934* (M), China: Tibet, –, JN573594; *D. tuberosum* Aucher ex Boiss., *K.H. Rechinger 47131* (M), China: Sichuan, –, JN573595; *D. uliginosum* Curran, *Grable 11242* (WS), U.S.A.: California, AF258766, –; *D. umbracolorum* F.H. Lewis & Epling, *Warnock s.n.* (WS), U.S.A.: California, AF258752, –; *D. valens* Standl., *Nesom 7135* (LL), Mexico: Nuevo Leon, AF258703, –; *D. variegatum* Torr. & A. Gray, *Richter 14* (WS), U.S.A.: California, AF258724, –; *D. viride* S. Watson, *Nesom 4969* (TEX/L), Mexico: Chihuahua, AF258685, –; *D. viridescens* Leiberg, *Naas & Naas 4019* (WS), U.S.A.: California, AF258736, AF258644; *D. viscosum* Hook. f. & Thomson, *J. Pcelt s.n.* (M), Nepal: Okhaldunga, JN573528, JN573597; *D. wendelboi* Iranshahr, *Anders 6143* (MSB), Afghanistan: Baghlan, –, JN573598; *D. wislizeni* Engelm., *Trauba s.n.* (ARIZ), Mexico: Sonora, AF258735, –; *D. wootonii* Rydb., *Fishbein 376a* (ARIZ), U.S.A.: Arizona, AF258690, –; *D. xantholeucum* Piper, *Hitchcock 17293* (WS), U.S.A.: Washington, AF258695, –; **subg. Staphisagria** (DC.) Peterm. (3/3): *D. pictum* Willd., *Rumsey 15012* (M), Balearic Islands: Majorca, –, JF331741; *D. requienii* DC., *Gavelle s.n.* (M), France: Porquerolles Island, JF331742, JN573582; *D. staphisagria* L., *Vitek 02-205* (M), Greece: Crete, JF332022, JF331743; **subg. Delphinium** W.T. Wang (15/–18): *D. anthriscifolium* Hance, *D. Podlech 55468* (MSB), China: Shanxi, JF331919, JF331731; *D. balansae* Boiss. & Reut., *Sammet & Illitz s.n.*, 1991 (MSB), Morocco: Marrakech, JF331931, *Podlech 55412* (MSB), China: Shanxi, JF331732; *D. balcanicum* Pawl., *Rösler 6570* (M), Serbia, JF331945, JF331733; *D. cossonianum* Batt., *D. Podlech 46655* (MSB), Morocco: Meknes, JF331955, JF331734; *D. favargerii* C. Blanché, Molero & Simon Pall., *Jury & Ait Lafkih 19781* (M), Morocco: Middle Atlas, JF331965, JF331735; *D. gracile* DC., *Lambinon 79/E/534* (MSB), Spain: Teruel, JF331977, JF331736; *D. halteratum* Sibth. & Sm., *Dunkel MTB3647.4* (M), Italy: L'Aquila, JF331982, JF331737; *D. hirschfeldianum* Heldr. & Holz. ex Boiss., *No author 1604* (M), Greece: Mykonos, JF331988, JF331738; *D. macropetalum* DC., *D. Podlech 55412* (MSB), Morocco, JF331996, JF331739; *D. nanum* DC., *Zubizarreta 42606* (M), Spain: Marbella, JN573520, JN573573; *D. obcordatum* DC., *Nowotny 61.12.18* (M), Spain: Torremolinos, JN573521, JN573575; *D. peregrinum* L., *Franzén & al. 870* (M), Macedonia, JF332001, JF331740; *D. venulosum* Boiss., *Nydegger 15452* (MSB), Turkey, JF332024, JF331744; *D. verdunense* Balb., *Krachs & Koepff 3814* (MSB), Morocco: Meknes, JN573527, JN573596; *D. virgatum* Poir., *S. Zarre 53* (MSB), Turkey: Kayseri, JF332030, JF331745. — OUTGROUPS: *Megaleranthis saniculifolia* Ohwi, *K. Heo 550* (KWNW), Korea, AY515399, *Won JY 950520* (PE), HQ440188; *Nigella damascena* L., cult. Mainz Bot. G. No. 041773 (MJG), EU699446, *Luo & al.* (2002, unpub.), AY150260.

Appendix 2. Species, their sources, localities, and GenBank accession numbers for the datasets of six markers (ITS, *trnL-F*, *trnH-psbA*, *trnK-matK*, *trnS-trnG*, *rbcL*). “–” indicates missing data. Subgeneric classifications of *Aconitum* and *Delphinium* are based on Tamura (1995).

INGROUPS: **Aconitella** Spach: *A. anthoroidea* (Boiss.) Soják, *Rechinger 42468* (M), Iran: Kurdistan, JF331875, JF331680, –, JF331747, JF331811, JF331666; **Aconitum** L.: **subg. Lycocotium** (DC.) Peterm.: *A. albiviolaceum* Kom., *Yangq0171* (PE), China: Hebei, JF975786, –, JN043735, JF953007, –, JF940640; *A. angustius* W.T. Wang, *Yangq0185* (PE), China: Anhui, JF975796, –, JN043745, JF953017, –, JF940650; *A. barbatum* var. *puberulum* Ledeb., *Yangq0206* (PE), China: Hebei, JF975804, –, JN043753, JF953025, –, JF940657; *A. longecassidatum* Nakai, *Yangq0198* (PE), China: Anhui, JF975809, –, JN043759, JF953031, –, JF940663; *A. monticola* Steinb., *Yangq0191* (PE), China: Hebei, JF975813, –, JN043764, JF953035, –, JF940668; *A. scaposum* Franch., *Y. Luo 327* (PE), China: Sichuan, AY150231, AY150246, *Yangq0168* (PE), China: Gansu, JN043769, JF953039, –, JF940674; *A. septentrionale* Koelle, *Yarosh & Maslin ZZT5* (ZT), Russia: Ural, AF216552, *Dietrich 5808* (M), Norway, JF331730, *Yarosh & Maslin ZZT5* (ZT), Russia: Ural, AF216575, *Dietrich 5808* (M), Norway, JF331795, JF331859, JF331678; *A. sinomontanum* Nakai, *Y. Luo 333* (PE), China: Sichuan, AY150232, AY150247, *Yangq0166* (PE), China: Hebei, JN043775, JF953043, –, JF940678; **subg. Aconitum** (Stapf.) Rapaics: *A. baicalense* Turcz. ex Rapaics, *19027196* (TNS), Russia: Siberia, AB004941, *Graf Zedtwitz 1936* (M), Russia: Transbaikal, JF331723, –, JF331788, JF331852, –; *A. ciliare* DC., *Kita 951120*, Japan: Kumamoto, AB004952, *Herrmann 238* (M), China: Jilin, JF331724, –, JF331789, JF331853, –; *A. delphinifolium* DC., *Wells 1777* (WS), U.S.A.: Alaska, AF258681, *Lang s.n.* 28.07.1996 (M), no locality, JF331725, –, JF331790, JF331854, –; *A. ferox* Wall, *Minaki & al. 9100909* (TI), Nepal: Mt. Shiwapuri, AB004961, *J. Pcelt 29* (M), Nepal: Khumbu, JF331726, –, JF331791, JF331855, –; *A. napellus* L., *Utelli & Soliva 14412* (ZT), Italy: Lago di Como, AF216544, –, AF216567, *zpl 01675* (MIB), Italy: Lombardy, FN668831, –, *S. Hoot 926* (UWM), no locality, EU053898; *A. pendulum* Busch, *Y. Luo & Y.B. Luo 411* (PE), China: Sichuan, AY150235, *D. Boufford & al. 40471* (MSB), China: Sichuan, JF331728, –, JF331793, JF331857, –; *A. pentheri* Hayek, *D. Podlech & W. Lippert 26275* (M), Serbia, JF331905, JF331729, –, JF331794, JF331858, –; *A. racemosum* Franch., *Y. Luo & Y.B. Luo 360* (PE), China: Sichuan, AY150233, *Wang Wei 081* (PE), China: Chongqing, FJ626533, –, FJ626484, –, AY954488; **subg. Gymnaconitum** (Stapf.) Rapaics: *A. gymnandrum* Maxim., *Y. Luo 326* (PE), China: Sichuan, AY150238, JF331727, *LIDZ-1287* (KUN), no locality, GQ337734, *Dickore 9111* (MSB), China: Xizang, JF331792, JF331856, JF331677; **Consolida** (DC.) S.F. Gray: *C. ajacis* (L.) Schur, *Merxmüller 8524* (M), Germany: Bavaria, JF331880, JF331687, *M. Baltisberger & D. Frey (ZT)*, cult. in Zurich, AF216578, *Merxmüller 8524* (M), Germany: Bavaria, JF331754, JF331818, JF331667; *C. armeniaca* (Stapf ex Huth) Schröd., *Nydegger 16993* (MSB), Turkey, JF331883, JF331690, –, JF331757, JF331821, JF331672; *C. axilliflora* (DC.) Schrödinger, *Brachfeld & Graben 42414* (MSB), Turkey: Anatolia, JF331885, JF331692, –, JF331759, JF331823, JF331669; *C. persica* (Boiss.) Schroedinger, *Rechinger 42445* (M), Iran: Kurdistan, JF331897, JF331708, –, JF331773, JF331837, JF331673; *C. regalis* Gray, *Hertel 6560* (M), Austria: Parndorf plain, JF331900, JF331714, –, JF331778, JF331842, JF331671; **Delphinium** L.: **subg. Delphinastrum** (DC.) Peterm.: *D. delavayi* Franch., *McBeath & al. CLD0895* (UCBG), China: Yulong Shan, AF258705, AF258659, *Yangq0002* (PE), China: Yunnan, JN044403, –, –, JF941393; *D. omeiense* W.T. Wang, *Yangq0043* (PE), China: Sichuan, JF976239, –, JN044414, JF953657, –, JF941405; *D. pseudohamatium* W.T. Wang, *Yangq0027* (PE), China: Sichuan, JF976246, –, JN044420, JF953659, –, JF941413; *D. tatsienense* Franch., *Yangq0033* (PE), China: Sichuan, JF976259, JN573591, JN044434, JF953662, –, JF941426; **subg. Staphisagria** (DC.) Peterm.: *D. requienii* DC., *Gavelle s.n.* (M), France: Porquerolles Island, JF331742, JN573582, –, JF331806, JF331870, JF332021; *D. staphisagria* L., *Vitek 02-205* (M), Greece: Crete, JF332022, JF331743, –, JF331807, JF331871, –; **subg. Delphinium** W.T. Wang: *D. anthriscifolium* Hance, *D. Podlech 55468* (MSB), China: Shanxi, JF331919, JF331731, –, JF331796, JF331860, JF331674; *D. cossonianum* Batt., *D. Podlech 46655* (MSB), Morocco: Meknes, JF331955, JF331734, –, JF331799, JF331863, JF331675; *D. virgatum* Poir., *S. Zarre 53* (MSB), Turkey: Kayseri, JF332030, JF331745, –, JF331809, JF331873, –. — OUTGROUPS: *Megaleranthis saniculifolia* Ohwi, *K. Heo 550* (KWNW), Korea, AY515399, *Won JY 950520* (PE), HQ440188, *K.J. Kim s.n.* (BCI), NC\_012615, NC\_012615, NC\_012615, *Nigella damascena* L., cult. Mainz Bot. G. No. 041773 (MJG), EU699446, *Luo & al.* (2002, unpub.), AY150260, –, *Wang Wei Seed1* (PE), China: Yunnan, FJ626504, –, FJ626586.