

Polygala longifolia Poir. (Polygalaceae, Fabales), the first record in the flora of Bhutan

Sonam Tobgay^{1*}, Karma Wangchuck¹ & Tshering Nidup²

¹Department of Environment and Life Science, Sherubtse College, Royal University of Bhutan, Kanglung, 42007, Trashigang, Bhutan; ORCID: ST <https://orcid.org/0000-0001-8487-6699>; KW <https://orcid.org/0000-0002-6513-3467>

²School of Environment and Rural Science, Faculty of Science, Agriculture, Business and Law, University of New England, Armidale, Australia; ORCID: <https://orcid.org/0000-0001-8802-0345>

* corresponding author (e-mail: sonamtobgay.sherubtse@rub.edu.bt)

Abstract. We report *Polygala longifolia* Poir. as a new record, confirming that it is a component of the flora of Bhutan. The specimen was observed thriving on dry slopes in Chir pine forest (27.36655°N, 91.58034°E, altitude 1760 m) in eastern Bhutan. In this report, a comprehensive overview of the species' distribution is made. A detailed description of the specimen collected is provided, including phenological details.

Key words: *Polygala*, Bhutan, new record, distribution

1. Introduction

Bhutan is one of the most species-rich countries in the Eastern Himalayan Biodiversity hotspot region. The country, envisioned to protect its rich flora and fauna, ensures to contribute to global biodiversity conservation endeavours. While numerous species have garnered the attention of scientists, many others are still waiting for discoveries and comprehensive studies. Over the past 2 decades, the increased enthusiasm and explorations of botanists and foresters, concerning biodiversity discoveries and nature conservation in the country, have helped in finding and reporting new species, bringing a positive impact on biodiversity conservation efforts.

The genus *Polygala* Linnaeus (1753:701) belongs to the family Polygalaceae. The large number of species in the genus was earlier viewed as monophyletic (Person 2001), but Pastore *et al.* (2019) report the genus to be paraphyletic with 2 distinct clades: (a) the Old World Clade with 339 species, and (b) the New World Clade with 213 species, suggesting a total number of species around 552. Later, Pastore *et al.* (2023) segregated New World Clade *Senega* and classified it as a new genus *Senega*, based on phylogeny and morphological

characteristics. The genus *Senega* includes 229 species: 213 that were previously placed within *Polygala* in the New World Clade and 16 new ones.

Pastore *et al.* (2019) suggest that the origin and diversification of the ancestral Polygalaceae occurred during the Late Cretaceous period, some 84 million years ago (mya), much earlier than predictions by Forest *et al.* (2007) who thought that they occurred in the same epoch, but ca. 65.5 mya. In South America, the diversification of the *Polygaleae* clade also emerged during the Late Cretaceous period, 76 mya. Ancestors of the Old World *Polygala* and SECHP (*Salomonial*/*Epirixanthes*/*Polygala* subg. *Chodatia*/*Heterosamara*/*Polygaloides*) clades appeared in southern Africa and Asia during the Eocene epoch. The New World Clade of *Polygala* (now *Senega*) also emerged during the Eocene, in South America. Thus the diversity of ancestry of *Polygala* points to southern Africa and Asia. Today species of this large genus and their allies remain globally distributed in tropical, subtropical, and temperate regions, found in all the countries except New Zealand and Polynesia (Hassler 2004-2023; Kerrigan 2008). Some species of *Polygala* in places like Australia have been problematic as a weed (Kerrigan 2012), whereas several are valued as ornamental plants (Simpson 2010).

Some species have long been used as an essential ingredient in traditional medicine (Lacaille-Dubois *et al.* 2019).

Tan (1991) reported on the Polygalaceae from Bhutan in the *Flora of Bhutan* (vol. 2, part 1), which includes 3 genera: *Polygala* L., *Salomonina* Loureiro, and *Epirixanthes* Blume. A total of 11 species of *Polygala* L. are described, of which only 6 species (*P. tatarinowii* Regel, *P. furcata* Royle; *P. arillata* D.Don; *P. karensium* Kurz; *P. sibirica* L; and *P. persicariifolia* D.C) were based on specimens collected from Bhutan. The other 5 species (*P. tricholopha* Chodat; *P. crotarioides* D.C; *P. longifolia* Poir; *P. linarifolia* Willdenow; and *P. glomerata* Loureiro) were described from the neighbouring Indian states of Sikkim and West Bengal (Darjeeling). *Polygala longifolia* described in the *Flora of Bhutan* is based on a specimen collected from the Great Rungit Valley in Darjeeling, at an elevation of 240 m, with a flowering season from September to November.

Polygala longifolia is placed in the section *Polygala* (Adema 1996). The present-day distribution of this species ranges from South Central China, India, and Southeast Asia to northern and western regions of Australia (Press *et al.* 2000; POWO 2024).

2. Synonyms

Polygala abyssinica var. *intercedens* Domin in Biblioth. Bot. 22(89): 855 (1927); *Polygala discolor*

Buch.-Ham. ex D.Don in Prodr. Fl. Nepal.: 199 (1825); *Polygala leptalea* DC. in Prodr. 1: 325 (1824); *Polygala leptalea* var. *australiensis* Domin in Biblioth. Bot. 22(89): 855 (1927); *Polygala oligophylla* DC. in Prodr. 1: 325 (1824); *Polygala pyramidalis* H.Lév. in Fl. Kouy-Tchéou: 317 (1915); *Polygala riukiensis* Ohwi in J. Jap. Bot. 12: 661 (1936).

3. Taxonomic description

Polygala longifolia Poirét in Lamarck, *Encyclopedie Methodique, Botanique*. 5: 501 (1804).

Type: Cette plante a été rapportée par Commerson de l'île de Java (v.s. in herb. Lamarck); Holo: P-LA n.v.; Iso: FI n.v.; fide

Description: Annual herb, 20-50 cm (up to 80 cm). Stems erect, slender, simple or sparingly branched, often branches confined to upper parts of plants, striate, glabrous, crispate-puberulent at inflorescence only. Stem base tinged maroon. Plants often leafless or with only a few leaves. Leaves $\pm$ sessile or petioles up to 1.5 mm long; leaf blade elliptic-linear or linear to lanceolate, 10-35 mm $\times$ 1-2 (-4) mm, apiculate, green, subglabrous. Inflorescence raceme, terminal, 3-8 cm. Bracts and bracteoles ovate-lanceolate, ciliate, caducous. Flowers lilac or rose pink, with maroon veins, drying white; pedicels very short $\sim$ 0.5 mm. Outer sepals ciliolate in bud, ovate, 1.5-2 mm, obtuse, white-margined; inner sepals rounded-ovate, $\pm$ symmetrical, 3-4 mm, 3-veined,



Fig. 1. Specimen of *Polygala longifolia* from Bhutan

Explanations: A – mature seed and a single flower, B – front view of an open flower, C – terminal raceme, D – entire plant in situ, E – dried specimen of *P. longifolia*

glabrous to sparsely ciliolate, persistent. Upper petals and staminal sheath glabrous. Keel petal with laciniate crest. Filaments free in upper $\frac{1}{3}$. Style strongly curved. Capsule narrowly winged, broadly elliptic-oblong, ca. 2.5 mm $\times$ 3 mm, emarginate, green, glabrous. Seeds oblong-ellipsoid, 2 mm $\times$ 1 mm, black, sericeous; aril small, unequally 3-lobed.

Phenology: Flowering and fruiting June-November.

Ecology: Growing on dry sunny slopes in the Chir pine forest on dry clay-loamy soil. Accompanied by abundant *Cymbopogon flexuosus* (Nees ex Steud.) W. Watson and *Osbeckia nepalensis* Hook.

Specimen examined: Bhutan, Trashigang, Bartsham, Muktangkhari 27.36655°N, 91.58034°E, altitude 1760 m (Fig. 1).

Distribution: Bhutan, Himalayas (Kashmir to Nepal), India, Sri Lanka, Myanmar, Thailand, Indochina, China, Malaysia, Australia.

Author Contributions:

Research concept and design: S. Tobgay

Collection and/or assembly of data: S. Tobgay, T. Nidup

Data analysis and interpretation: K. Wanhchuck

Writing the article: S. Tobgay, K. Wanhchuck

Critical revision of the article: T. Nidup

Final approval of article: S. Tobgay

References

- ADEMA F. 1966. A review of the Herbaceous species of *Polygala* in Malesia (Polygalaceae). *Blumea: Biodiversity, Evolution and Biogeography of Plants* 14(2): 253-276.
- FOREST F., CHASE M. W., PERSSON C., CRANE P. R. & HAWKINS J. A. 2007. The role of biotic and abiotic factors in evolution of ant dispersal in the milkwort family (Polygalaceae). *Evolution* 61(7): 1675-1694. <https://doi.org/10.1111/j.1558-5646.2007.00138.x>
- HASSLER M. 2004-2023. World Plants. Synonymic Checklist and Distribution of the World Flora. Version 16.1; last update June 16th, 2023. www.worldplants.de. Retrieved on 08 July, 2023
- KERRIGAN R. 2008. A taxonomic review of *Polygala* L. in northern Australia. Masters (Research) thesis, James Cook University.
- KERRIGAN R. A. 2012. A treatment for *Polygala* of northern Australia. *Australian Systematic Botany* 25(2): 83-137. <http://dx.doi.org/10.1071/SB08032>
- LACAILLE-DUBOIS M. A., DELAUDE C. & MITAINE-OFFER A. C. 2019. A review on the phytopharmacological studies of the genus *Polygala*. *Journal of Ethnopharmacology* 249, 112417. <https://doi.org/10.1016/j.jep.2019.112417>
- PASTORE J. F. B., ABBOTT J. R., NEUBIG K. M., VAN DEN BERG C., MOTA M. C. D. A., CABRAL A. & WHITTEN W. M. 2019. Phylogeny and biogeography of *Polygala* (Polygalaceae). *Taxon* 68(4): 673-691. <https://doi.org/10.1002/tax.12119>
- PERSON C. 2001. Phylogenetic Relationships in the Polygalaceae Based on Plastid DNA Sequences from trnL-F Region. *Taxon* 50(3): 763-779.
- POWO 2024. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:691760-1>. Retrieved on 20th June 2024.
- PRESS J. R., SHRESTHA K. K. & SUTTON D. A. 2000. Annotated Checklist of the Flowering Plants of Nepal. London, Natural History Museum.
- SIMPSON M. G. 2010. Diversity and Classification of Flowering plants: Eudicots. In: M. G. SIMPSON (ed.). *Plant Systematics*, 2nd ed., pp. 275-448. Academic Press. <https://doi.org/10.1016/B978-0-12-374380-0.50008-7>
- TAN K. 1991. Polygalaceae. In: A. J. C. GRIERSON & D. G. LONG (eds.). *Flora of Bhutan*, vol. 2(1), pp. 42-53. Royal Botanic Garden, Edinburgh.