

POSSIBLE POLLINATORS FOR TWO JAPANESE *PINGUICULA* SPECIES

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Keywords: Flower, Japanese *Pinguicula*, *P. macroceras*, *P. ramosa*, pollinator.

This short article documents floral visitors or possible pollinators for the flower of two Japanese *Pinguicula* species, *P. macroceras* Link and *P. ramosa* Miyoshi, presumably the first witness to be reported. It is widely believed that those *Pinguicula* flowers are basically pollinated by insects, but what kinds was previously unknown. The author has confirmed at some natural localities, floral visits of a sweat bee species on a flower of *P. macroceras* and of hoverflies and ocellate rove beetles on *P. ramosa* flowers.

The pollination of *Pinguicula* flowers is basically entomophilous (Wood & Godfrey 1957; Proctor *et al.* 1996; Fleischmann 2016) except a few species, e.g. *P. lusitanica* L. or *P. villosa* L., that might be autogamous (Torbjorn 2000; Heslop-Harrison 2004). Types of pollinators attracted may correlate with flower colors, spur length (Shimai 2017), or UV reflection patterns of the flowers (Gloßner 1992). However, only a few possible pollinators for *Pinguicula* have been reported; flies for *P. alpina* L. (Proctor *et al.* 1996), some butterfly species, bees, and a hoverfly for *P. moranensis* Kunth (Villegas & Alcalá 2017), thrips and beetles for *P. vallisneriifolia* Webb (Zamora 1999), bees for *P. vulgaris* L. (Heslop-Harrison 2004), bees (including bumble bees and honey bees) and hoverflies for some *Pinguicula* species from the southeastern U.S.A. (Annis *et al.* 2014; Fleischmann 2016), an empidid fly for *P. leptoceras* Rehb. (Fleischmann 2016), and for more information see Fleischmann (2016). Detailed studies on the Japanese *Pinguicula* species have been published by Komiya (1988) and Komiya and Shibata (1999), but no information on their pollinators is available today.

Studied localities

***P. macroceras*** JAPAN. Saitama: Chichibu, wet rock wall beside the Nakatsu-gawa River in the Nakatsu-kyo Gorge, near Deai bus stop, ca. 680 m alt., 10:30 a.m. (Japan Standard Time), 26 May 2018.

***P. ramosa*** JAPAN. Tochigi: [Site 1] Ashio (Nikko), volcanic rock wall below the summit of Mt. Koshin-zan, ca. 1,820 m alt., 11:00 a.m. (JST), 10 June 2017. [Site 2] Nikko, volcanic rock wall on the north-slope of Mt. Nantai-san, ca. 2,270 m alt., 10:30 a.m. (JST), 30 June 2018.

For *P. macroceras*, an unidentified sweat bee species of family Halictidae (pers. com., A. Fleischmann) visiting the flower was observed (Fig. 1 left). According to an entomologist, it is not possible to identify exact species due to a taxonomic issue (pers. com., T. Ide). In the case of *P. ramosa*, a hoverfly species, very likely *Eupeodes (Metasyrphus) bucculatus* (Rondani 1857), was observed at Mt. Koshin-zan (Fig. 1 right). Accurate identification of the species based on the captured image was, however, difficult since their heads and thoraxes had been partially covered by pollen grains (pers. com., T. Ide). Another possible pollinator for *P. ramosa* is an ocellate rove beetle (Staphylinidae subfamily Omaliinae), probably *Eusphalerum* sp. (identified by S. Nomura), observed at Mt. Nantai-san (Fig. 2). It seems that the beetle licks nectar in the spur without touching the stamen because of their small body size, but they pollinate by chance when crawling inside of the corolla. In general, it is not common to see insects visiting those *Pinguicula* flowers, suggesting that they

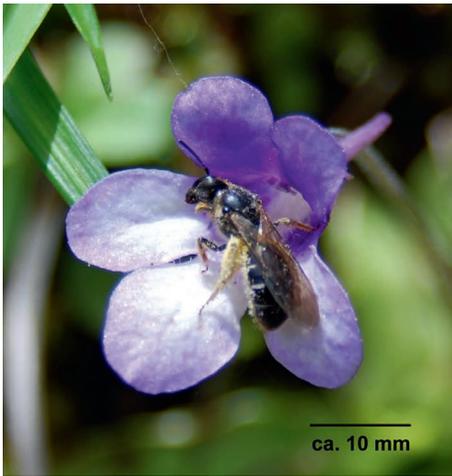


Figure 1: Unidentified sweat bee species on *P. macroceras* flower at Nakatsu-kyo Gorge (left); Hoverfly on *P. ramosa* flower at Mt. Koshin-zan (right).

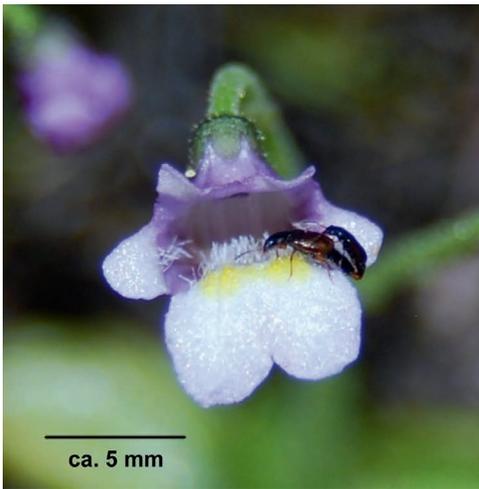


Figure 2: Mating ocellate rove beetles on *P. ramosa* flower at Mt. Nantai-san (left); ocellate rove beetle expanding wings on *P. ramosa* flower at Mt. Nantai-san (right).

are probably active only under specific conditions, e.g. weather, temperature, and the time of day, during a relatively short *Pinguicula* flowering season. The observed possible pollinators are seldom caught as prey by the plants (pers. obs., H. Shimai). It is possible that other insect species visit their flowers as reported by Shimai (2016). The localities of *Pinguicula* in Japan are mostly restricted to higher mountains or deep gorges (Komiya & Shibata 1999) normally difficult to access for periodical observations. Further studies are, however, required concerning the pollinators for *Pinguicula* as the entomological fauna changed at the locality, the author thinks that the *Pinguicula* population might possibly decline.

The author thanks to Drs. Shuhei Nomura and Tatsuya Ide, both at the National Museum of Nature and Science, Japan, and Andreas Fleischmann for identifying insect species. Also, thanks to the reviewers for valuable comments.

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