

Short Report

Attraction of both male and female *Protaetia orientalis* (Cetoniinae, Scarabaeidae) to *Luisia teres* (Orchidaceae) in Kagoshima, southern Kyushu, Japan

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Abstract: The pollination vectors of the *Luisia teres* orchid were studied in situations where the cupreous chafer *Protaetia pryeri*, the sole known pollinator, is scarce. Observations were made on a transplanted orchid in Okayama, southwestern Honshu, Japan, and two wild sites in Kagoshima, southern Kyushu. Another chafer, *P. orientalis*, visited the orchid at all observation sites, which indicates its probable role as a pollinator. Both male and female chafers were attracted to the orchid.

I. Introduction

The natural range of *Luisia teres* (Thunb.) Blume (Orchidaceae) extends from southern China to northern Vietnam and temperate East Asia (POWO 2023). In Japan, this orchid species is distributed in southern Kinki of Honshu, Shikoku, Kyushu and further south through the Ryukyu Islands (Ono et al. 1997), and listed as Near Threatened (NT) in the Red List 2020 (Ministry of the Environment, Japan 2020). Tetsu & Suetsugu (2015) provided the first report on its pollinators based on observations of a living plant brought from Kagoshima Prefecture, Kyushu, to Sanda City in Hyogo Prefecture, southwestern Honshu.

Tetsu & Suetsugu (2015) reported *Protaetia brevitarsis* (Cetoniinae, Scarabaeidae) as a pollinator of *L. teres*. They also mentioned two scarab beetles (Scarabaeidae), *Anomala albopilosa* (known as the green chafer or white-haired leaf chafer, Rutelinae) and *Rhomborrhina japonica* (drone beetle, Cetoniinae) as possible pollinators. *Anomala albopilosa* was observed visiting the orchid, feeding on the petals and carrying pollen on its frons. *Rhomborrhina japonica* was captured in the neighborhood and tested on the orchid flower to be attracted to it. However, Tetsu and Suetsugu (2015) sexed none of the beetles.

In Okinawa Prefecture of the Ryukyu Islands, adult *P. pryeri pryeri* (cupreous polished chafer) was observed flying toward, hovering around, and landing on *L. teres* during its flowering season (Araki et al. 2016). The detailed study of the

chafer and the orchid revealed all of the chafers attracted to the orchid were males, while both males and females were caught when banana traps were placed nearby. Cotton balls soaked in the orchid flower extract and placed on fern leaves attracted many adult male *P. pryeri*. Later, Wakamura et al. (2020) showed that the flower extract contained the same substance as the sex pheromone emitted by the female *P. pryeri*.

However, the pollinator chafer *P. pryeri* is a rare species in Kyushu, Shikoku, and Kinki (Wakayama Prefecture), although its distribution barely reaches southern Kyushu and recent collection records have been accumulated (e.g., Nakamine 2023). The present study attempted to solve this mystery, i.e. how this orchid is pollinated in Kyushu, Shikoku, and Kinki, where *P. pryeri* is rare.

II. Materials and Methods

In late April 2023, a living plant of *Luisia teres* that had fallen to the ground under a *Cinnamomum camphora* in Kagoshima City, southern Kyushu was collected. It must have fallen due to heavy rain or strong wind. The plant was tied to a branch of *Quercus phillyraeoides* planted in Okayama City, southwestern Honshu for observation of the visitors. Following the sightings of visiting chafers in Okayama in July 2023, probable pollinators were searched on natural growths of *L. teres* on *C. camphora* at two sites (north and south) in Kagoshima City on weekends in the same month.

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Fig. 1. *Protaetia orientalis* on *Luisia teres* on a camphor tree. Photo by A. Nakamine, July 23, 2023.

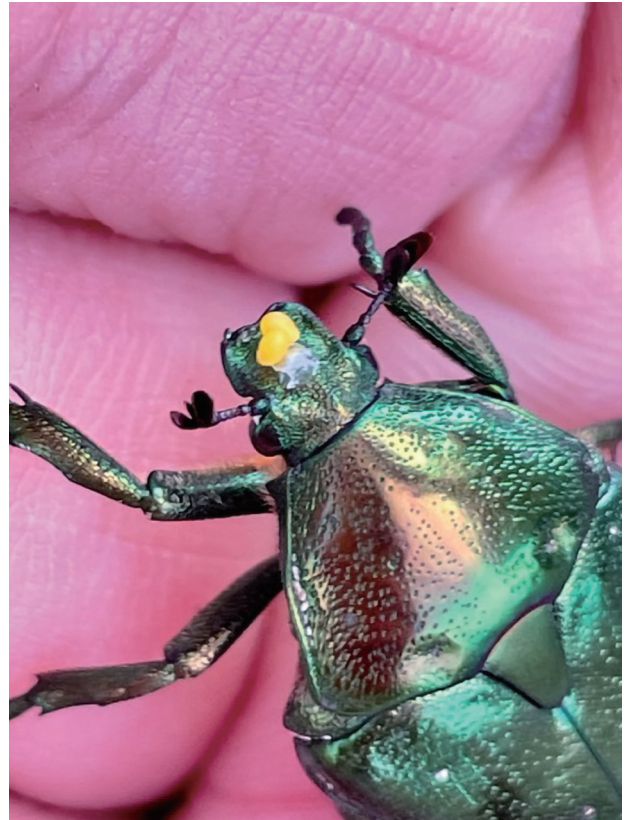


Fig. 2. Pollinia of *Luisia teres* attached to the frons of the chafer. Photo by A. Nakamine, July 23, 2023.

III. Results

In Okayama City, on July 10, the *Luisia teres* tied to *Quercus phillyraeoides* was flowering. On July 12, a male *Rhomborrhina japonica* came to a flower and was caught. On July 13, a beetle probably *Protaetia orientalis* visited a flower, but it was sensitive and flew away before capture. On July 14, at 13:25, a male *P. orientalis* visited the orchid and was caught. On July 16, after 10:00, three *P. orientalis* were observed on the orchid. Two of them soon flew away, but the remaining one, which failed in its flight, fell to the ground and turned out to be a female. Although *P. brevitarsis* was found in large numbers together with *P. orientalis* and *R. japonica* on a sap-flowing *Q. variabilis* about 1 km of the site, *P. brevitarsis* was not observed on the orchid. In addition, ants (*Lasius japonicus*) were observed visiting the orchid's flowers, although they were unlikely to pollinate without carrying pollinia.

In Kagoshima City, on July 17, a female *P. orientalis* was caught on *L. teres* growing on *Cinnamomum camphora* at the south site (by K.N.). On July 23, both sites in Kagoshima City were checked, and a *P. orientalis* on *L. teres* (Fig. 1) was observed at the north site (by A.N.). It had pollinia attached to its frons (Fig. 2).

At least the plant of *L. teres* transplanted in

Okayama City (Fig. 3) bore swollen fruits when inspected after attracting the chafers.

IV. Discussion

The present observations suggest that both male and female *Protaetia orientalis* are attracted to the orchid *Luisia teres*. These beetles likely act as pollinators for the orchid. Tetsu & Suetsugu (2015) identified one of the pollinators for this orchid was *P. brevitarsis*, with a metallic green ground color. However, its color shown in the photograph is different from the metallic brown color, typical of *P. brevitarsis*. *Protaetia orientalis*, whose ground color is a metallic green, may have been misidentified as *P. brevitarsis*. Nevertheless, both are congeneric with *P. pryeri*.

Although Arakaki et al. (2016) and Wakamura et al. (2020) concluded that the orchid attractant is a chemical mimic of the sex pheromone of female *P. pryeri*, Tetsu & Suetsugu (2015) and the present observations suggest that *L. teres* lures a wide range of male and female cetonine beetles that pollinate the orchid. Incidentally, Arakaki et al. (2016) added the attraction of a male *P. ishigakia* by the orchid. If the female sex pheromone theory of Arakaki et al. (2016) and Wakamura et al. (2020) is correct, the range of chafer species attracted by the pheromone



Fig. 3. Swollen fruit of *Luisia teres* after attracting the chafers in Okayama. Photo by H. Takasaki, July 16, 2023.

needs to be expanded. In addition, both males and females of sap-feeding cetoniine chafers are attracted to the scent of *L. teres*, which does not necessarily function as a female sex pheromone alone. The attractant pheromone, if synthesized and artificially modified, could be used as a pest control bait as some cetoniine chafers, including *P. pryeri*, are agricultural pests.

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高崎浩幸・中峯浩司・中峯敦子:鹿児島市におけるシロテンハナムグリ (*Protaetia orientalis*) 雌雄の *Luisia teres* (ラン科) への誘引

要約

ポウラン (*Luisia teres*) について、これまでに確認されている唯一の送粉者であるリュウキュウツヤハナムグリ (*Protaetia pryeri*) が稀である場合の送粉者を調査した。本研究の結果では、移植した岡山市および自生地の鹿児島市 2 ヵ所において同属のシロテンハナムグリ (*P. orientalis*) がこのランに誘引された。しかもオスもメスも誘引され、このランの受粉媒介者である可能性が高い。

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