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Discovery of a bagworm devouring an orb web

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Abstract

The intentional consumption of spider silk, which is composed of proteins, by a non-spider organism, has not been observed, and consumption by non-owner spiders has only rarely been observed. Here, we report the discovery of a bagworm, likely *Bambalina* sp. (Lepidoptera: Psychidae: Oiketicinae), eating an orb web constructed by a juvenile *Plebs sachalinensis* (Araneidae), whilst moving from side to side from below. This rather adapted behaviour implies regular silk eating by bagworms, but possibly as an emergency food source, considering the date observed.

Keywords: Araneidae • *Bambalina* • Oiketicinae • *Plebs sachalinensis* • Psychidae • silk eating

Spider silks, which are composed of several proteins belonging to the fibroins (Foelix 2010; Asakura & Miller 2014), are frequently eaten by web owners for recycling purpose (Townley & Tillinghast 1988; Opell 1998), but are seldom be exploited for food by other organisms. Only some kleptoparasitic spiders in the genus *Argyrodes* are known to eat their host's web silk among the order Araneae (Whitehouse 1986, 2011; Vollrath 1987; Shinkai 1988; Grostal & Walter 1997; Higgins & Buskirk 1998; Tso & Severinghaus 1998; Whitehouse *et al*. 2002; Miyashita,

Figs. 1–5: **1** the bagworm, *Bambalina* sp. intruding into the orb web by climbing onto one of the lower frame lines; **2** the bagworm reaching the point below the orb; **3** the bagworm eating the orb web from below; **4** the bagworm devouring the orb web, moving from side to side as the spider escapes to the periphery of the web; **5** the bagworm climbing up the upper frame line stretched to the eave.

Maezono & Shimazaki 2004; Kerr 2005). This is called silk eating or silk theft. Although many non-spider taxa exploit spider webs for stealing prey items or resting (Nentwig & Heimer 1987), intentional silk-eating has not previously been observed.

Here, we report the discovery of a bagworm, probably *Bambalina* sp. (Lepidoptera: Psychidae: Oiketicinae), devouring an orb web built by a juvenile *Plebs sachalinensis* (Saitō, 1934) (Araneidae) with rather adapted behaviours. Although this finding has been previously reported in Japanese in the Bulletin of Tokyo Spider Study Group (Koshidaka 2017), we intend to introduce this finding to the international scientific community, due to its novelty.

The observation took place in the Forest of Kiryu Nature Observation (36°26′38″N 139°19′42″E), Kawauchi Town, Kiryu City, Gunma Prefecture, Japan on 17 April 2017 by NK. The orb web was connected by long frame lines to substrates at three points, which were the eave (upwards) and wall (sidewards) of an adjoining building, and a tree (sidewards), forming an upward-facing triangle. Distance from the point attached to the wall to the hub of the web was roughly 1 m.

The bagworm wandered around the wall to which the web was connected, detected the frame line attached to the wall, and then climbed along it towards the base of the triangle (Fig. 1). Climbing to the point below the orb took roughly 10 minutes (Fig. 2) after which the bagworm began eating the orb web from below (Fig. 3), moving from side to side as the spider escaped to the periphery of the web (Fig. 4). Over the next 20 minutes, the bagworm consumed silk from the orb, leaving one frame line stretched between the eave and the wall. The spider did not react to the bagworm, and stayed aloof before eventually abandoning the web. The bagworm finally climbed the upper frame line to leave (Fig. 5) following consumption.

Most species of the Oiketicinae, to which *Bambalina* belongs, are conspicuously polyphagous defoliators with a broad range of host plants (Rhainds, Davis & Price 2009), indicating that non-toxic spider silks and webs can be foods for bagworms. However, intruding into and eating an orb web had never before been recorded. It is worth noting that the bagworm exhibited adapted behaviours in its consumption of the orb web, leaving only one frame line, the base structure of the web, which the bagworm climbed up. This adaptation implies that bagworms might usually eat orb webs under certain conditions. Considering the date the behaviour was observed (17 April) is a period with fewer green leaves, silk eating by bagworms might be a form of emergency behaviour.

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