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ANT BROOD BANDITRY BY THE JUMPING SPIDER, *SILER SEMIGLAUCUS* (SIMON, 1901)

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ABSTRACT

The salticid spider, *Siler semiglaucus* (Simon, 1901) was observed regularly snatching, feeding on, and waiting in ambush for ant brood being carried by ant workers. Colony highways of the ant *Dolichoderus thoracicus* (Smith, 1860), on coconut trees in Thailand were found to be permanently attended by *S. semiglaucus* individuals of both sexes and juveniles, operating as brood bandits. Repeated independent observations of banditry over an eight month period indicated that the behaviour is routine in this population. The behaviour can be situated in the context of spider nutritional ecology and kleptoparasitism.

Keywords: ant brood, kleptoparasitism, myrmecophagy, Salticidae

INTRODUCTION

Spider-ant associations assume a variety of different forms that range from morphological and behavioural mimicry, to being guests and close associates of ant colonies, to being ant predators of varying degrees of specialization (CUSHING, 2012; JACKSON & NELSON, 2012). Following on from previous observations of prey snatching from ants (BHATTACHARYA, 1936; II, 1977; JACKSON *ET AL.*, 2008), as well as specifically ant brood snatching (NAKAHIRA, 1955; JO, 1964; II, 1977; WANLESS, 1978), this paper describes observations from Thailand of banditry by the South and Southeast Asian salticid, *Siler semiglaucus* (Simon, 1901). Although *S. semiglaucus* has always been recognized as an ant-associate, traditionally it has been described and studied only as a predator and sometimes prey (NELSON *ET AL.*, 2004) of adult ants (JACKSON & VAN OLPHEN, 1992). However, its congeneric sister species, *S. cupreus* Simon, 1889, has been described stealing ant larvae (NAKAHIRA, 1955; JO, 1964); thus, the behaviour is phylogenetically congruent. Both GROB (2015) and KULKARNI and JOSEPH (2015) have recently reported brood theft by *S. semiglaucus* in Thailand and India, respectively. Although unelaborated, these observations confirm the occurrence of the behaviour in widely separated Asian populations; thus, the behaviour is not a localized phenomenon. The temporal scale provided here as well as further general observations provide contextual support for recognizing *S. semiglaucus* as routine kleptoparasites of ant colonies in Thailand.

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MATERIALS AND METHODS

Siler semiglaucus was identified with reference to SIMON (1901), PRÓSZYŃSKI (1985), PENG *ET AL*. (1993), KOH & MING (2014) and KULKARNI & JOSEPH (2015). Systematics follows the WORLD SPIDER CATALOG (WSC, 2018). Males were distinguished from females by the presence of a bottle-brush (HILL, 2009) on Legs I (LI). Ants were identified by Dr. Weeyawat Jaitrong (National Science Museum, Pathum Thani, Thailand). Observations were made in central-eastern Thailand, in the vicinity of Huay Yai, Bang Lamung, Chonburi. A line of coconut trees (*Cocus nucifera* Linnaeus, 1753) at the edge of a small orchard of jackfruit trees (*Artocarpus heterophyllus* Lamarck, 1789) with unmanaged trees and undergrowth on the other side was found to be occupied by a small population of *S. semiglaucus*. Coconut trees were relatively young with a height of ca. 2.5–3.0 m. Fronds from the lower crown of two trees had been damaged at their base and/or keel, causing them to partially collapse on to the ground and make a leaning bridge to the tree trunks. These and other bent, low lying fronds were most often observed as ant highways with the rachises of the fronds serving as direct pathways to the tree trunks. When damaged fronds died and lost their colour, highways remained active unless disturbance caused fronds to separate from the trees and lose their connection to the tree trunks. Ant colonies seemed to be largely arboreal with major traffic, including brood, moving up fronds or up tree trunks. However, ants were also observed in the nodes (pinnae) of some fronds and moving larvae between these nodes and the main highways of the rachises. A longitudinal approach was used to assess the relative consistency of snatching and snatching-associated behaviours. Repeated observations were made over an eight month period from May to October 2014. Ant traffic, fronds, and tree trunks were searched for spiders. Interactions with ants and the occurrence of snatching behaviour were observed, photographed, and noted.

RESULTS AND DISCUSSION

Ant colonies belonged to the species, *Dolichoderus thoracicus* (Smith, 1860). In 35 visits to the study site over eight months, brood snatching events were independently observed on visits in five separate months (Table 1). Brood snatching was performed by females, males, and juveniles (see Fig. 1). All snatched prey observed were ant larvae as determined by their shape (plump elongated capsules without appendages), size (¼ – ¾ salticid body size) and colouration (whitish-translucent). No predation of adult ants was observed over the same time period, although after a day in the absence of ant brood, a captured adult female spider killed and cached an adult ant in silk. On all but 2 visits, *S. semiglaucus* were observed either patrolling or waiting in ambush on, or next to, ant colony highways. When ant traffic was low, the spiders patrolled by moving up and down the fronds, investigating channels in the fronds, and generally engaging in searching behaviours. When there was ant traffic they adopted stationary observation and ambush positions next to the ant highway (Fig. 2).

Although theft events were brief, *S. semiglaucus* were observed devoting substantial amounts of time (all visits except for the two in which no salticids were observed) to preparative activities connected to brood theft (Table 1). Brood theft itself assumed the form of lightning raids on ant traffic. Incursions into ant traffic were rapid in-and-out attacks. All prey capture observations coincided with medium to heavy ant highway traffic (with brood) (see Table 1 for traffic designators). On two of the observations of heavy traffic (28/5/14 and

Table 1. Observations of *Siler semiglaucus* patrolling and performing bandit raids around ant colony highways of *Dolichoderus thoracicus* (rows in bold indicate independent brood snatch observations).

Date	Survey time	Life-stage*	Tree	Snatch? (Y/N)	Additional observations (patrol and feed location, ant traffic)**
19-03-14	**09.16**	**F**	**3**	**Y**	**Patrol trunk highway; palm husk, brood cached?; heavy traffic**
31-03-14	12.40	M	3	N	Patrol palm husk; no ant traffic
01-04-14	15.40	F	3	N	Patrol palm husk wandering; no ant traffic
02-04-14	11.57	M	3	N	Patrol palm husk wandering; low traffic
27-04-14	**09.44**	**M, F**	**2**	**Y**	**Patrol frond highway; both snatch and eat at frond node; heavy traffic**
28-04-14	**10.03**	**F**	**2**	**Y**	**Patrol frond highway; snatch and eat at frond node; heavy traffic**
29-04-14	**09.36**	**F**	**2**	**Y**	**Patrol frond highway; snatch and eat at frond node; heavy traffic**
01-05-14	12.36	F	1	N	Patrol frond highway and nodes; medium traffic
02-05-14	09.23	F	1	N	Patrol frond highway; medium traffic
07-05-14	09.43	2 juv	2, 3	N	Patrol trunk highway; heavy traffic
20-05-14	09.18	1 juv	2	N	Patrol frond nodes; field injury in juv male – left L1 size dimorphic
21-05-14	**09.33**	**juv**	**1**	**Y**	**Patrol frond highway; snatch and eat at frond node; heavy traffic**
26-05-14	09.57	3 juv	1	N	Patrol frond highway and nodes; low traffic
26-05-14	12.11	M	1	N	Patrol frond highway and nodes; low traffic
28-05-14	11.50	-	-	-	Heavy traffic but no spiders observed
04-06-14	12.28	M	1	N	Patrol frond highway and nodes; medium traffic
23-07-14	09.18	-	-	-	Heavy traffic but no spiders observed
14-08-14	15.17	F	1	N	Patrol frond highway and nodes; low traffic
15-08-14	**15.26**	**F**	**1**	**Y**	**Patrol frond highway; snatch and eat at frond node; medium traffic**
22-08-14	14.41	M	1	N	Patrol frond highway and nodes; low traffic
27-08-14	**15.12**	**F**	**3**	**Y**	**Patrol frond highway; snatch and eat at frond node; medium traffic**
28-08-14	15.20	M	1	N	Patrol frond highway; low traffic
29-08-14	15.09	F	3	N	Patrol frond highway and nodes; low traffic
01-09-14	15.20	F	1	N	Patrol frond highway and nodes; medium traffic
02-09-14	11.46	juv	1	N	Patrol frond highway; medium traffic
11-09-14	15.18	juv	4	N	Patrol frond highway; heavy traffic
23-09-14	11.19	F	1	N	Patrol frond highway; heavy traffic
31-10-14	15.15	F	3	N	Patrol frond highway; medium traffic

* Males identified by the presence of a setal "bottle-brush" on L1 (see Hill, 2009).

** Ant traffic designations from snapshot photographs of #ants simultaneously travelling on a 30 cm stretch of highway, where no traffic = 0; low traffic = < 5; medium = 5–15; heavy traffic = > 15. (Thresholds are weighed quite low but essentially designed to delineate the potential availability of brood in transport trains at the upper end of the scale.)

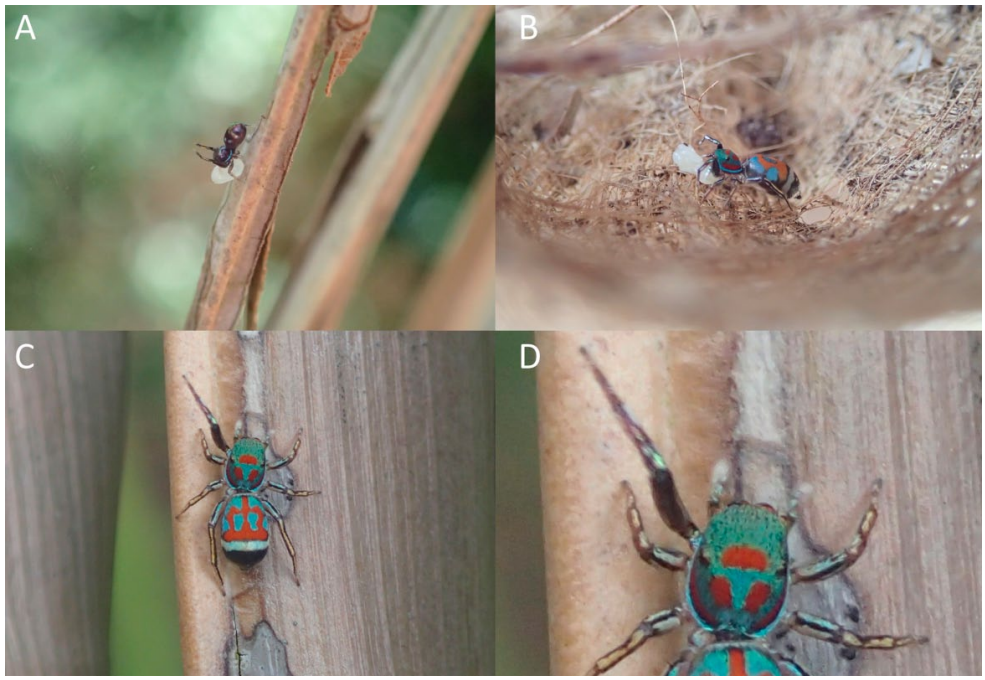

Figure 1. *Siler semiglaucus* ant brood bandits: (A) Juvenile with snatched ant larvae (note relative proportions of larval to salticid body size); (B) adult female in husk of palm frond with snatched ant larvae; (C) adult female with missing right LI; and (D) close-up of the same individual.

23/7/14) no spiders were observed. This was unusual and it is impossible to determine if it was because salticids had recently snatched brood, were avoiding traffic of more extreme densities, or some other reason.

Over the observation time frame, at least one juvenile was observed to have size-dimorphic LIs, with one leg growing back after an injury. An adult female with a permanently missing LI (presumably the injury occurred after the final moult or at a sub-adult stage too close to the final moult for regeneration to occur) was also observed (Figs. 1C, D). As stolen brood are carried with the LIs, these observations might indicate ant defense against brood banditry. But note also the LIs are actively used in numerous other contexts (see below). The feat performed by juvenile *S. semiglaucus* is particularly noteworthy because brood parcels were almost three quarters of juvenile spider body length (Fig. 1A).

One set of *S. semiglaucus* behaviours should be highlighted as still enigmatic, another as indicative of behavioural disguise. First, the up-down waving and saluting of LIs has been noted in this species as a reasonably reliable identification characteristic (KOH & MING, 2014). The overall visual impression of the behaviour is that it is reminiscent of insect antennal waving. These leg movements are also often associated with a bobbing up and down of the abdomen, and with similar alternating up-and-down movements of the pedipalps (females, juveniles) or palps (males). The significance and relative connectedness of all three sets of movements is unclear. These movements were observed in many different situations so there is no obvious contextual element that stands out in isolation. Although they might be used

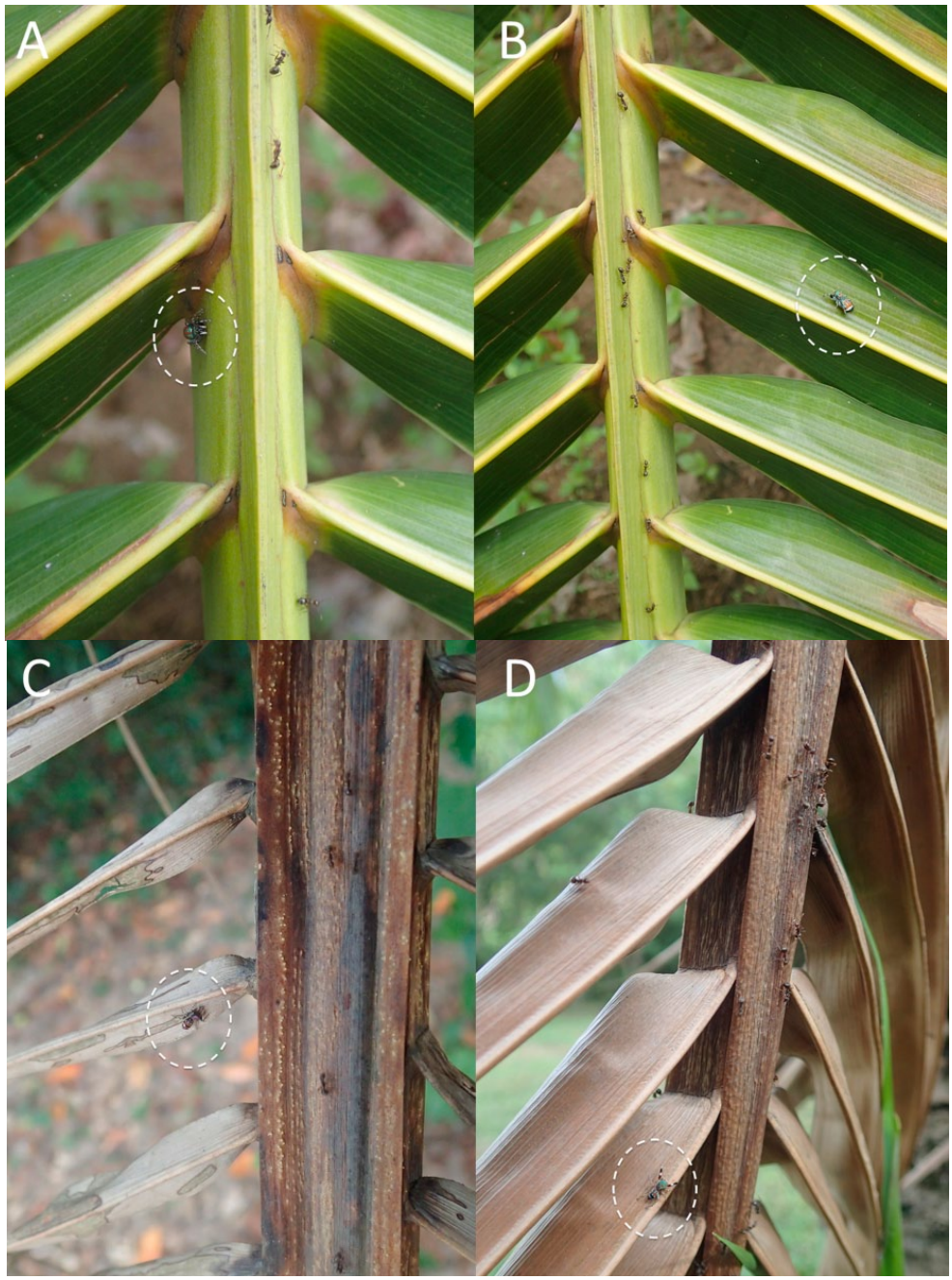

Figure 2. Examples of ambush positions (A–D) adopted by *Siler semiglaucus* (white dashed circles) for snatching ant brood from ant highways.

Figure 3. *Siler semiglaucus* defuses ant interest in its presence by (A–C) retreating with a small backward jump; or, by (D and E) turning its back on ant activities, specifically a highway with medium ant traffic.

in different ways in different contexts, in a hunting and feeding context these movements suggest a general state of active situational presence.

In their interactions with adult ants, both predatory preparations (e.g. patrolling and ambush waiting) and predation itself (brood theft) employed some kind of behavioural concealment. After brood snatching, salticids moved to a discrete area without ants (e.g. node of palm frond, palm husk, empty rachis) and fed on the brood by sucking out the contents. Feeding lasted ca. 5–10 minutes. Feeding was mostly immediate, but in some instances the salticid carried the brood parcel around and searched for a site before stopping to feed. During patrolling and waiting in ambush, salticids routinely gave way to ants. Whether or not they were on the highway or the nodes of fronds, salticids were always observed to move out of the way of ant trains or passing individuals. When approached by individual ants investigating their presence they retreated with short, backward jumps (Figs. 3A–C). Another behaviour

was seen both in a captured female presented with an agitated ant for prey, and in salticids watching heavy traffic from an ambush position. In both situations, the salticids were observed to turn their backs on the ants. This seemed to reduce ant interest in their presence because the ants resumed their previous activities. Figure 3D, E shows a female salticid being investigated by two ants from the highway and then turning her back.

Longitudinal observations of this central-eastern Thai population of *S. semiglaucus* show that brood snatching is routinely incorporated into the foraging strategies of all active life stages. Likewise, GROB's (2015) separate observation provides important corroboration that this behaviour is not limited to this population. Although *S. semiglaucus* regularly hunts ant brood they also are capable of catching adult ants. I have seen this spider species elsewhere in Thailand not obviously connected to an ant colony; however, in this population they evidently grow up and live on the edges of the ant highways as resident bandits. The surrounding area was surveyed intensively over a year and no other populations of *S. semiglaucus* were found. This permanent attendance of colony highways suggests they can be classified as kleptoparasites, although it should be emphasized that they are parasitizing the ant colony as a superorganism, not individual ants. The relative permanence of this relationship is attested to by the longitudinal nature of these observations. As wandering hunters, there might not be many salticids whose home and foraging patch could be so consistently and accurately pinpointed over this kind of time period.

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