

Original Article

Three first records of stick insects attacking plants (Insect: Phasmida) in Tibet

Três primeiros registros de insetos-pau atacando plantas (Insect: Phasmida) no Tibet

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Abstract

Except for a few stick insects that are economically valuable, most species be considered to be forest pests, so it is extremely important to obtain plant host-use information of more stick insects. In this paper, the plant hosts of three species of stick insects were recorded for the first time. We also discovered these stick insects can feed upon the flowers or leaves of plants. *Lopaphus unidentatus* (Chen & He, 1995) (Phasmida: Lonchodidae) attacked *Hypericum choisianum* Wall. ex N. Robson, 1973 (Hypericaceae), *Leurophasma dolichocercum* Bi, 1995 (Phasmida: Aschiphasmataidae) attacked *Antenoron filiforme* (Thunb.) Roberty & Vautier, 1964 (Polygonaceae) and *Megalophasma granulatum* Bi, 1995 (Phasmida: Lonchodidae) attacked *Debregeasia orientalis* C. J. Chen, 1991 (Urticaceae). Finally, we were lucky enough to also obtain photographs of them mating and feeding.

Keywords: attacking of flowers, hosts, mating pictures, walking sticks, Tibet.

Resumo

Exceto por alguns insetos-pau que são economicamente valiosos, a maioria das espécies pode ser considerada praga florestal, por isso é extremamente importante obter informações sobre o uso de hospedeiros de plantas de mais insetos-pau. Neste artigo, as plantas hospedeiras de três espécies de bicho-pau foram registradas pela primeira vez. Também descobrimos que esses bichos-pau podem se alimentar de flores ou folhas de plantas. *Lopaphus unidentatus* (Chen & He, 1995) (Phasmida: Lonchodidae) atacou a parede de *Hypericum choisianum* Wall. ex N. Robson, 1973 (Hypericaceae), *Leurophasma dolichocercum* Bi, 1995 (Phasmida: Aschiphasmataidae) atacou *Antenoron filiforme* (Thunb.) Roberty & Vautier, 1964 (Polygonaceae) e *Megalophasma granulatum* Bi, 1995 (Phasmida: Lonchodidae) atacou Chen, 1991 (Urticaceae). Finalmente, tivemos a sorte de também obter fotos deles se acasalando e se alimentando.

Palavras-chave: ataque de flores, hospedeiros, fotos de acasalamento, bengalas, Tibet.

1. Introduction

Except for those few species of stick insects that humans value (Eg. *Phyllium celebium*, *P. siccifolium* and *P. sinensis* and so on), most are considered pests (Eg. *Rhaphophasma modestum*, *Ramulus pingliense* and *Sinophasma largum* and so on) that harm plants (Chen, 2008; Xu et al., 2013). Specifically, these insects can cause leaves to become yellow by eating more than half of their surface area, which could lead to a plant's death after many leaves have turned yellow, notable examples of this herbivores are *Rhaphophasma modestum* Brunner von Wattenwyl, *Ramulus pingliense* (Chen and He, 1991), *R. intersulcatus* (Chen and He, 1991), *Sinophasma largum* (Chen and Chen, 1998), and *S. brevipenne* Günther, 1940.

They can feed as nymphs or adults to harm trees, such as *Quercus* spp. (Fagaceae), *Castanea* spp. (Fagaceae), *Betula* spp. (Betulaceae), *Broussonetia* spp. (Moraceae) and so on (Chen, 1993, 2008; Chen and Chen, 1997, 1998; Xu et al. 2013). In China, records of stick insects defoliating trees began in 1985, with published records from Jiangxi Province in 1989, from an total area of ca. 3000 ha (Ding, 1991); from Guangdong Yingde, in total ca. 3500 ha, from 1988 to 1990 (Chen et al., 1994); from Hubei Badong in total ca. 400 ha in 2005 (Tian et al., 2006); from Guizhou Province, in total ca. 30 000 ha, from 2009 to 2011 (Xu et al., 2013); Hubei Province, in total ca. 70 000 ha, from 2004 to

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2015 (Zhang et al., 2016), and; from Fujian Province, in total area ca. 1900 ha, from 2010 to 2019 (He et al., 2019).

2. Materials and Methods

Photographs were collected from Bome in 22-31-July-2020 through Nikon D5300, and insect specimens deposited in the Entomological Specimen Room of College of Forestry from Guizhou University, China. Photos are grouped and annotated with Adobe Photoshop CS6 (version 6.2). Plants' identification was by botanists Mr. An Mingtai.

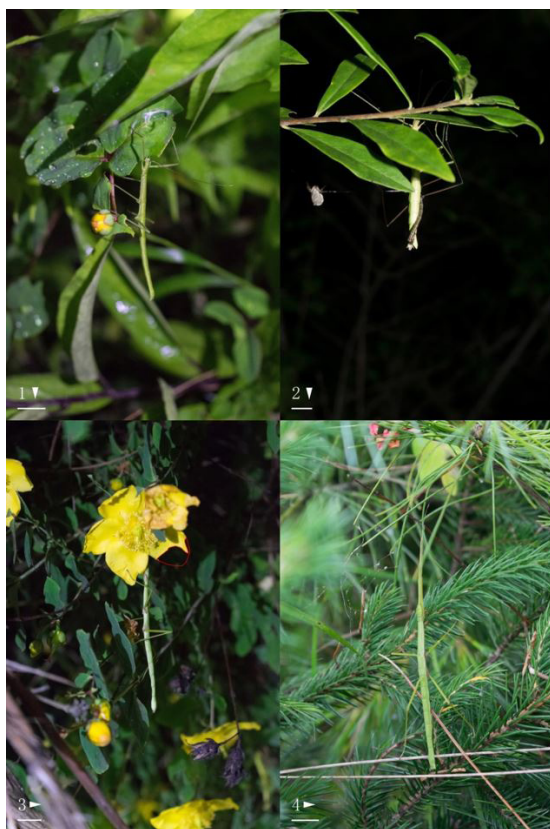
3. Records

3.1. First record of leaf-eating *Lopaphus unidentatus* (Lonchodidae) attacking *Hypericum choisianum* (Hypericaceae) flowers and leaves

(Figures 1-5)

Location: 95°43'27.17"N, 29°52'9.36"E, KaDa, ZhaMu, Bome, Tibet

Description: For *Lo. unidentatus* is Chen & He made the morphological characteristics records of it for the first time, in 1995 (Chen and He, 1995). This stick insect is distributed in Tibet and Yunnan of China, but there has been no report yet of its host(s) plants. Through a field survey, we found this stick insect species eats *H. choisianum* leaves and flowers, the latter a form of herbivory not documented in previous surveys and reports. Nonetheless, if *Lo. unidentatus* populations can increase in size to form disastrous outbreaks, this would not good well for the flowers of *H. choisianum* and this plant's reproduction. Adults of *Lo. unidentatus* were observed to feed from the edges of *H. Choisianum* flowers and leaves, down to the petioles, but they can also eat the bud parts. In addition, we found in our investigation that if *H. choisianum* and *Picea asperata* occurred together, then *Lo. unidentatus* would hang under the needle leaves of *P. asperata* during the daytime, and then proceed to feed on *H. choisianum* during the nighttime. Accordingly, we were able to find more *Lo. unidentatus* because of this discovery of its hang under the needle leaves of *P. asperata*.



Figures 1-4. Ecological photos of *Lopaphus unidentatus*. (1) *Lo. unidentatus* attacking a *Hypericum choisianum* leaf, ♀; (2) Mating photo of *Lo. unidentatus*, ♂♀; (3) *Lo. unidentatus* attacking a *Hypericum choisianum* flower, ♀, the red-lined portion is the estimated feeding area; (4) In situ photo of *Lo. Unidentatus*, ♀. Scale bars = 10 mm. The arrow points to the ground.



Figures 5-8. Ecological photos of *Lopaphus unidentatus* and *Leurophasma dolichocercum*. (5) In situ photo of *Lo. unidentatus*, ♀; (6) In situ photo of *Lo. unidentatus*, ♂; (7) In situ photo of *Le. dolichocercum*, ♀; (8) Host plant photo of *Le. Dolichocercum*, the red-lined portion is the estimated feeding area. Scale bars = 10 mm. The arrow points to the ground.

3.2. First record of *Leurophasma dolichocercum* (*Aschiphasmatidae*) attacking *Antenoron filiforme* (*Polygonaceae*) leaves

(Figures 6-10)

Location: 95°19'14.67"N, 29°18'39.29"E and 95°19'2.81"N, 29°19'0.10"E, Medog, Bome, Tibet

Description: *Le. dolichocercum* is a species unique (endemic) to China. It was first recorded by Bi Daoying in 1995 (Bi 1995), but its host plant(s) had not been reported on before. In carrying out the field investigation, we found that *Le. dolichocercum* takes *A. filiforme*, two or three *Le. dolichocercum* adults are often found on a branch of *A. filiforme*. Individuals of *Le. dolichocercum* will start eating plant tissue from the edge of *A. filiforme*'s leaves, or remain along the midrib of mature leaves. In this investigation, we also found that *Le. dolichocercum* had a very strong jumping ability. When stimulated (poked), or about to be stimulated, they would quickly jump into the air from the front or back of the roosting leaves or stem, falling to the ground and quickly disappearing into the weedy vegetation. Additionally, we find that *Le. dolichocercum* is capable of securing shelter from rain. When it rains, they will seek out dry places as rain shelter, such as the underside of a

grass blade of golden thread or the bottom of a stalk, or even crawl under a human house to avoid getting wet.

3.3. First record of *Megalophasma granulatum* (*Lonchodidae*) attacking *Debregeasia orientalis* (*Urticaceae*) leaves

(Figures 11-15)

Location: 95°18'1.09"N, 29°19'20.64"E and 95°10'12.97"N, 29°14'24.58"E. Medog, Bome, Tibet.

Description: *M. granulatum* was described (Bi, 1995). Yet no information about its host appears in the literature. Our investigation revealed that it feeds on *D. orientalis* leaves in our investigation.

4. Mating of Stick Insects

(Figures 2, 11, 13, 16)

Description: Their mating position is the male on the back of the female, but the mating position of *Lo. unidentatus* and *Le. dolichocercum* is the male's abdomen is bent from the middle area of the abdomen of the male to the ventral, make their genitals to contact and mate (Figures 2, 11). And the mating position of *M. granulatum* is the male's abdomen is bent from the apex of the abdomen



Figures 9-12. Ecological photos of *Leurophasma dolichocercum* and *Megalophasma granulatum*. (9-10) In situ photo of *Le. dolichocercum*, ♀; (11) Mating photo of *Le. dolichocercum*, ♂♀; (12) Ecological photo of *Megalophasma granulatum*, ♀. Scale bars = 10 mm. The arrow points to the ground.



Figures 13-16. Ecological photos of *Megalophasma granulatum*. (13), (16) Mating photos of *M. granulatum*, ♂♀; (14) In situ photo of *M. granulatum*, ♂; (15) *M. granulatum* attacking leaves of *Debregeasia orientalis*. Scale bars = 10 mm. The arrow points to the ground.

of the male to the ventral, make their genitals to contact and mate (Figures 13, 16). These two mating positions are also the way most stick insects mate.

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