NIGHTTIME VISITS TO MALE FLOWERS OF A WILD GRAPEVINE BY SOME OEDEMERID BEETLES (COLEOPTERA: OEDEMERIDAE) ON MIYAKE ISLAND[1]

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ABSTRACT: We report that some oedemerid beetles and longicorn beetles visited male flowers of the wild grapevine *Vitis ficifolia* var. *izuinsularis* on Miyake Island, off southeastern Honshu Island, Japan. We collected those beetles by beating inflorescences at night, though we had previously found no insects on the inflorescences in the daytime. We also used light traps to collect insects from the vicinity of inflorescences, and trapped many other insect species in addition to oedemerid beetles. Our results suggest that some oedemerid beetles are promising candidates as effective pollinators of the wild grapevine.

KEY WORDS: Miyake Island, Poisonous beetle, Pollinator, *Vitis*

INTRODUCTION

Vitis ficifolia var. *izuinsularis* (Tsuyama) H. Hara is a wild grapevine species distributed on the islands of the Izu archipelago, Japan. As a salinity-tolerant coastal species, it is suitable for use as rootstocks for grapevine cultivars in coastal and desert vineyards (Matsui 1989). Because it is dioecious, like other wild *Vitis* species, fertilization occurs when pollen grains are transferred from a stamen of a male plant to the pistil of a female plant (Matsui 1989). Revealing the pollination mechanism of wild *Vitis* species may contribute to the development of improved technologies for breeding and cultivating grapevine cultivars. However, the insect pollinators of wild *Vitis* are unknown. As a first step to clarify the pollination system of wild *Vitis*, we investigated and identified insects visiting male flowers of *V. ficifolia* var. *izuinsularis*.

METHODS

Field research was carried out from 14 to 16 July and from 28 to 30 August 2012 around the northwest coast of Miyake Island, Tokyo Prefecture, Japan. Weather conditions were cloudy and sometimes clear in both research periods. Three male *V. ficifolia* var. *izuinsularis* grapevines were surveyed, and the research was carried out while they were in flower.

We used a beating method to determine which insect species were visiting the inflorescences. We beat 10 different inflorescences on each plant with a rod. The insects dislodged by the beating fell into an insect net and were transferred into sample tubes (φ2.5 cm × 6.0 cm high). Because the vines of two neighboring

[1] Received on April 27, 2015. Accepted on June 30, 2015.

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Mailed on October 15, 2015

male plants were intertwined, we pooled the results for the three plants. The beating was carried out between 21:00 and 21:30 Japan Standard Time (JST) on 14 July, between 20:00 and 20:40 JST on 15 July, and between 21:00 and 21:30 JST on 28 August. We also collected insects from the vicinity of the plants by setting light traps near them. Each light trap consisted of transparent plastic panels, two plastic cups, a clothes hanger, and a small fluorescent battery-powered chemical lamp (fluorescent tube, 4 W, FL4BL, Toshiba; lamp, SF343FDK, Fujitsu). Insects attracted to the fluorescent light flew against the transparent panels and fell into the plastic cups. We set two light traps at 22:00 JST on 14 July, one light trap at 22:00 JST on 15 July, and one at 21:00 JST on 28 August. The next morning, we collected the trapped insects and transferred them into sample tubes. All insects were identified as to species and sex by using guide books (Hayashi et al., 1984, Kurosawa et al., 1985).

RESULTS AND DISCUSSION

Most of the insects collected by the beating were coleopterans (Table 1). The largest number of collected individuals (all females) belonged to the oedemerid species *Eobia ambusta* Lewis. Among other Oedemeridae species, one *Eobia cinereipennis* (Motschulsky) specimen and two *Xanthochroa caudata* Kôno specimens were collected. The second largest number of collected individuals were longicorn beetles, *Ceresium holophaeum* Bates. Most of collected beetles were males. Flower-visiting behaviors of Japanese Ceresium beetles were recently reported on a native orchid, *Vanda falcata* Thunb. (Suetsugu et al., 2015). Other than coleopterans, a small cricket, *Ornebius bimaculatus* (Shiraki) and an earwig, *Forficula hiromasai* Nishikawa (one specimen of each), both known coastal species, were also collected.

Most of the insects collected in the light traps were also coleopterans (Table 2). The most abundant species was a scarabaeid beetle, *Maladera castanea* (Arrow), and a click beetle, *Melanotus lagetus* Kishii. Most individuals of these two species were males, and both species had been previously collected by light traps on Miyake Island (Makihara et al., 2006). Five species were collected both by beating and in the light traps. Among those species, all individuals of the two oedemerid species, *Eobia ambusta* and *E. cinereipennis*, were females. Probably, they visited to feed on pollen grains of the flowers (Kevan and Baker 1983). Specimens of the leaf beetle *Acrothinium gaschkevitchii* (Motschulsky) were also collected by both methods. *Acrothinium gaschkevitchii* is a known pest of cultivated grapevines (Ozono 2014); therefore, it is likely that the collected individuals were visiting the *V. ficifolia* var. *izuinsularis* inflorescences to forage. Another leaf beetle species, *Cryptocephalus perelegans* Baly, which feeds on oaks (Ozono 2014), was also collected by both methods, and it is noteworthy that individuals of this species were widely observed on the island in July and August 2012.

These results indicate that individuals of several oedemerid species and longicorn beetles visited the male inflorescences of *V. ficifolia* var. *izuinsularis* at night. A few studies have reported the flower-visiting behaviors of Oedemeridae. For example, Yokoi et al. (2008) observed *Oedemeronia lucidicollis* (Motschulsky) visiting the flowers of several plant species, and Tomimatsu and Ohara (2003) reported that *Oedemerina concolor* Lewis visits *Trillium camschatcense* Ker Gawler. However, these two studies were carried out in the daytime, whereas this study revealed nighttime flower-visiting behaviors of oedemerids. Many oedemerids are attracted to streetlights and houselights at night (Kurosa 1958), which suggests that they actively migrate during the night. Therefore, we propose that more studies should investigate the nighttime flower-visiting behaviors of oedemerids.

At the same time we collected flower-visiting insects around the research site in the daytime by normally using an insect net for another research (Kishi et al., unpublished). Although we collected various insects, including the bees *Hylaeus insularum insularum* Yasumatsu & Hirashima and *H. hirashimai* Ikudome from inflorescences of *Ampelopsis brevipedunculata* var. *glabrifolia* Honda (Vitaceae) at the research site, we collected no insects from *V. ficifolia* var. *izuinsularis* (Kishi et al., unpublished). The present result, together with this observation, suggests that insect pollination of *V. ficifolia* var. *izuinsularis* usually occurs at night. We also noted that the inflorescences of *V. ficifolia* var. *izuinsularis* have a stronger odor at night than in the daytime.

Our results suggest that some oedemerid beetles are candidates to be effective pollinators of *V. ficifolia* var. *izuinsularis* on Miyake Island. Six wild species of the genus *Vitis* are known in Japan (Matsui 1989). In one wild grapevine, *V. coignetiae* Pulliat ex Planch., pollen is known to be transferred mainly by bees and flies (Okamoto et al., 2008). However, no pollinating bees or flies were identified in this study, and our understanding of pollinating insects in wild *Vitis* species remains incomplete. More surveys are needed to identify the insect pollinators of wild *Vitis* grapevines.

ACKNOWLEDGEMENTS

We thank Dr. Tetsuro Yoshikawa and Ms. Nasa Sakura for their assistance with this research. We thank Dr. Hiroyoshi Higuchi, who allowed us to use Institute of Island Biology on Miyake Island for laboratory experiments and to carry out field research around it. This study was financially supported in part by the Environment Research and Technology Development Fund (Project code D-1106), Ministry of the Environment, Japan.

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Table 1. Insects collected by beating method from *Vitis ficifolia* var. *izuinsularis*.

Order, Family	Species	Total	14-July	15-July	28-Aug
Coleoptera					
Scarabaeidae	*Blitopertha orientalis*	1♂	1♂		
Oedemeridae	*Xanthochroa caudata*	2♂			2♂
	Eobia cinereipennis	1♀	1♀		
	Eobia ambusta	15♀	7♀	7♀	1♀
Cerambycidae	*Ceresium holophaeum*	2♀9♂	1♀2♂	1♀7♂	
Chrysomelidae	*Cryptocephalus perelegans*	1♂		1♂	
	Acrothinium gaschkevitchii	1♂		1♂	
Orthoptera					
Mogoplistidae	*Ornebius bimaculatus*	1♀			1♀
Dermaptera					
Forficulidae	*Forficula hiromasai*	1♀		1♀	
Hymenoptera					
Eumenidae	*Anterhynchium flavomarginatum*	1♀		1♀	

Table 2. Insects collected by light traps around *Vitis ficifolia* var. *izuinsularis*. An asterisk (*) indicates the species that were also collected by beating method.

	Species	Total	14th-July-1	14th-July-2	15th-July	28th-Aug
	Coleoptera					
	Cicindela elisae	2♀2♂				2♀2♂
	Chlaenius tetragonoderus	1♂	1♂			
	Aegus laevicollis	1♀				1♀
	Maladera orientalis	1♂				1♂
	Maladera secreta	2♀2♂				2♀2♂
	Maladera castanea	12♀18♂	2♀	1♂	2♀1♂	8♀16♂
	Blitopertha orientalis	2♀	2♀			
	Anomala japonica var. *izuensis*	8♀4♂		3♀1♂	4♀2♂	1♀1♂
	Anomala schoenfeldti	5♂	3♂	1♂	1♂	
	Melanotus legatus masakianus	2♀28♂	20♂	6♂	2♀2♂	
	Melanotus senilis	3♂		3♂		
	Harmonia axyridis	1♂		1♂		
	Platydema subfascia	1♀		1♀		
	Tetraphyllus lunuliger	1♂				1♂
	Mordellistena comes	1♂		1♂		
	Mordellistenini sp.	4♂			4♂	
*	*Eobia cinereipennis*	3♀		3♀		
	Eobia fuscipennis	3♀		3♀		
*	*Eobia ambusta*	5♀	1♀	3♀	1♀	
	Xanthochroa hilleri	1♀	1♀			
*	*Ceresium holophaeum*	1♂			1♂	
	Ceresium fuscum	1♀		1♀		
	Anoplophora malasiaca	1♂		1♂		
	Glenea chlorospila	1♂	1♂			
*	*Cryptocephalus perelegans*	1♂			1♂	
	Basilepta fulvipes	1♂		1♂		
*	*Acrothinium gaschkevitchii*	2♂		2♂		
	Monolepta pallidula	2♀1♂		2♀1♂		
	Hemiptera					
	Lygocoris sp.	2♀			2♀	
	Physopelta cincticollis	3♀2♂	3♀2♂			
	Plautia crossota stali	2♀	1♀	1♀		
	Nezara antennata	1♀	1♀			
	Tartessus ferrugineus	1♀				1♀
	Lepidoptera					
	Pyralidae sp.	1			1	