

Biological Notes on Celeuthetine Weevils of the Genus *Ogasawarazo*, Subgenus *Ogasawarazo* (Coleoptera, Curculionidae, Entiminae) Endemic to the Ogasawara Islands, Tokyo, Japan

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Abstract Host plants and habitat of the adults of some celeuthetine weevils of the subgenus *Ogasawarazo* KÔNO, 1942 were surveyed on Chichijima and Hahajima Islands of the Ogasawara Islands, Tokyo, Japan. At least ten species in ten families were recorded as host plants based on the observation of feeding scars made by adult weevils on leaves, and some information on their habitat was gathered for the conservation of *Ogasawarazo* weevils.

Introduction

Celeuthetine weevils of the genus *Ogasawarazo* KÔNO, 1942 are extant and endemic to the Ogasawara Islands, Tokyo, a World Natural Heritage site. In a recent taxonomic study, the genus was divided into two subgenera, *Ogasawarazo* and *Ogasawarazodes* MORIMOTO, 2015, and a total of eight species and ten subspecies from the islands were recognized (MORIMOTO, 2015). As in the land snail genus *Mandarina* (CHIBA, 2010), the genus *Ogasawarazo* on the Ogasawara Islands may have undergone adaptive radiation.

Members of the subgenus *Ogasawarazodes* have typically been collected by sifting litter and are regarded as being soil dwelling. On the other hand, members of the subgenus *Ogasawarazo* have been collected by sweeping and beating vegetation and are regarded as being arboreal. In total, six species and five subspecies of the subgenus *Ogasawarazo* were identified on the islands (MORIMOTO, 2015). However, recently, the areas inhabited by and populations of *Ogasawarazo* (*Ogasawarazo*) species have rapidly decreased on Chichijima and Hahajima Islands. Some species have not been found in recent years despite continuous surveys, and this decrease is probably due to active predation by an invasive lizard, the green anole, *Anolis carolinensis*, while weevils are commonly encountered on islands uninhabited by the lizard (MORIMOTO, 2015).

In the Japanese Red Data Book, three species, *Ogasawarazo* (*Ogasawarazo*) *hahajimaensis* *hahajimaensis* MORIMOTO, 1981 (= *O. rugosicephalus hahajimaensis* MORIMOTO, 1981), *O. (O.) mater mater* MORIMOTO, 1981 and *O. (O.) rugosicephalus rugosicephalus* (KÔNO, 1928), have been identified as endangered species (Tokyo Metropolitan Government, 2014; Ministry of the Environment of Japan, 2015). However, little is known about the biology of *Ogasawarazo* (*Ogasawarazo*), apart from that the adult weevils have been collected on leaves of evergreen trees shaded by the forest canopy, at sunny forest edges or on sunny summits, and that they appear from mid-May to July. As for the identity of plants from which adults were collected, very little information is available, except that adults of *O. (O.) anejimaensis* MORIMOTO, 2015, which was formerly treated as a conspecific under *O. (O.) mater* MORIMOTO, 1981, were found on *Syzygium chleyeraefolium* (Himefutomomo in Japanese; Myrtaceae) and *Terminalia catappa* (Momotamana in Japanese; Combretaceae) on Anejima, Imoutojima and Meijima Islands and *O. (O.) rugosicephalus rugosicephalus* (KÔNO, 1928) were found on an



Figs. 1 & 2. *Ogasawarazo (Ogasawarazo) mater griseus* MORIMOTO, 2015 and its feeding scars. — 1, Mating adults on a leaf of *Ardisia sieboldii* found on Mt. Chibusayama, Hahajima Is.; 2, adult feeding scars on a leaf of *A. sieboldii* found on Mt. Chibusayama, Hahajima Is.

Table 1. Adult food plants of *Ogasawarazo (Ogasawarazo)* species.

Adult host plant (Family)	Locality	
	Chichijima Is.	Hahajima Is.
<i>Ardisia sieboldii</i> (Primulaceae)	●	●
<i>Bischofia javanica</i> † (Phyllanthaceae)		●
<i>Cinnamomum pseudopedunculatum</i> * (Lauraceae)	●	
<i>Elaeagnus rotundata</i> * (Elaeagnaceae)	●	
<i>Elaeocarpus photinifolius</i> * (Elaeocarpaceae)	●	●
<i>Melicope grisea</i> * (Rutaceae)		●
<i>Psidium littorale</i> † (Myrtaceae)	●	
<i>Psychotria boninensis</i> * (Rubiaceae)	●	
<i>Schima mertensiana</i> * (Theaceae)	●	●
<i>Syzygium cleverifolium</i> var. <i>microphyllum</i> (Myrtaceae)		●

*Endemic species to the Ogasawara Islands.

†Introduced and invasive alien species.

Figs. 3–10. Adult feeding scars of *Ogasawarazo (Ogasawarazo)* species. — Fig. 3, Adult feeding scars on a leaf of *Schima mertensiana* found on Mt. Tsuitateyama, Chichijima Is.; 4, adult feeding scars on leaves of *Psidium littorale* found on Mt. Tsuitateyama, Chichijima Is.; 5, adult feeding scars on leaves of *Psychotria boninensis* found on Mt. Tsuitateyama, Chichijima Is.; 6, adult feeding scars on leaves of *Elaeagnus rotundata* found on Mt. Tsuitateyama, Chichijima Is.; 7, adult feeding scars on leaves of *Cinnamomum pseudopedunculatum* found on Mt. Tsuitateyama, Chichijima Is.; 8, adult feeding scars on leaves of *Bischofia javanica* found on Mt. Chibusayama, Hahajima Is.; 9, adult feeding scars on a leaf of *Elaeocarpus photinifolius* found on Higashiyama, Hahajima Is.; 10, adult feeding scars on leaves of *Syzygium cleverifolium* var. *microphyllum* found on Omotohama, Hahajima Is.



introduced weed, *Bidens pilosa* var. *radiata* (Tachiawayuki-sendangusa in Japanese; Asteraceae) on Anijima Is. (KARUBE *et al.*, 2004; MORIMOTO, 2015). Furthermore, no information is available on habitats, host plants, and immature stages of *Ogasawarazo* (*Ogasawarazo*) species. Increasing the body of knowledge on the biology of these endemic and endangered weevils on the Ogasawara Islands is an important first step for their conservation. In this paper, we report adult food plants of some *Ogasawarazo* (*Ogasawarazo*) species based on the observation of feeding scars made by adult weevils on leaves, with some information on their habitats.

Materials and Methods

Field observations were conducted to identify adult host plants of *Ogasawarazo* (*Ogasawarazo*) species at one site on Chichijima Is. and four sites on Hahajima Is. of the Ogasawara Islands in July 2012 and February, March and September 2017 as follows: Mt. Tsuitateyama on Chichijima Is. and Kitamura, Sekimon-area (Sekimon-iriguchi to Mt. Sakaigatake) and Mt. Chibusayama (Choukiyama- and Kensakiyama-routes) and Omotohama on Hahajima Is. Findings from a recent study (MORIMOTO, 2015) showed that *Ogasawarazo* (*Ogasawarazo*) *rugosicephalus rugosicephalus* (KÔNO, 1928) occurs within Chichijima Is. in the area of Mt. Tsuitateyama and two species (one with three subspecies), *O. (O.) mater mater* MORIMOTO, 1981, *O. (O.) mater griseus* MORIMOTO, 2015, *O. (O.) mater rufipes* MORIMOTO, 1981, and *O. (O.) hahajimaensis hahajimaensis*, are known to occur within Hahajima Is. around Mt. Chibusayama. Among the species around Mt. Chibusayama, *O. (O.) mater mater* MORIMOTO, 1981 and *O. (O.) hahajimaensis hahajimaensis* have not been collected recently. In the Sekimon-area, two species, *O. (O.) mater* including three subspecies and *O. (O.) hahajimaensis*, are known to occur around Mt. Chibusayama, but only two of the three subspecies of *O. (O.) mater* (*O. (O.) mater griseus* and *O. (O.) mater rufipes*) are found in recent years and *O. (O.) hahajimaensis hahajimaensis* is replaced by another subspecies, *O. (O.) hahajimaensis sekimonensis* MORIMOTO, 2015. In Kitamura, *O. (O.) mater mater* and *O. (O.) hahajimaensis sekimonensis* are known to occur while in Omotohama only *O. (O.) mater rufipes* is known to occur (MORIMOTO, 2015).

As adult weevils of *Ogasawarazo* (*Ogasawarazo*) species leave characteristic feeding scars on the upper surface of leaves (Figs. 1 & 2), adult host plants were identified based on the observation of feeding scars on leaves. Binoculars were used to observe feeding scars left on the leaves of tall trees.

Japanese name (abbreviated and identified as JN) of plants and the family name are given in parentheses after the scientific name.

Results and Discussion

As a result, feeding scars of *Ogasawarazo* (*Ogasawarazo*) species were confirmed on a total of ten plant species belonging to ten families; seven on Chichijima Is. and six on Hahajima Is., respectively (Table 1).

Feeding scars likely to be from adults of *O. (O.) rugosicephalus rugosicephalus* were found on the leaves of various plants around Mt. Tsuitateyama on Chichijima Is.: *Ardisia sieboldii* (JN: Moku-tachibana; Primulaceae), *Schima mertensiana* (JN: Munin-himetsubaki; Theaceae), *Psidium littorale* (JN: Kibanjirô; Myrtaceae), *Psychotria boninensis* (JN: Ôshiratamakadura; Rubiaceae), *Elaeagnus rotundata* (JN: Ogasawaragumi; Elaeagnaceae), *Cinnamomum pseudopedunculatum* (JN: Koyabunikei; Lauraceae), and *Elaeocarpus photinifolius* (JN: Shimahorutonoki; Elaeocarpaceae). Among these, adult feeding scars were most frequently encountered on leaves of *Ardisia sieboldii* inhabiting nearly flat or gently sloping terrain in forests. Adult feeding scars were observed on leaves up to about 7 to 8

m above ground level.

On Hahajima Is. in the Sekimon area, feeding scars likely to be from adults of *O. (O.) mater griseus*, *O. (O.) mater rufipes* or *O. (O.) hahajimaensis sekimonensis* were mainly found on *Ardisia sieboldii* and *Schima mertensiana*. In addition to the host plants identified on Hahajima Is., adult feeding scars were found on leaves up to about 10 m above ground level. In the area around Mt. Chibusayama, adult feeding scars likely to be from *O. (O.) mater griseus* or *O. (O.) mater rufipes* were also found on *Melicope grisea* (JN: Ôbashirotetsu; Rutaceae; Table 1; Figs. 3–7; see TOYODA, 2003: 58 for photo of feeding scars) and an invasive alien tree species, *Bischofia javanica* (JN: Akagi; Pyllanthaceae; Fig. 8). On Kitamura and Omotohama, feeding scars likely to be from adults of *O. (O.) mater mater* or *O. (O.) hahajimaensis sekimonensis* and *O. (O.) mater rufipes* were found on *Elaeocarpus photinifolius* (JN: Shimahorutonoki; Elaeocarpaceae; Fig. 9) and *Syzygium cleyerifolium* var. *microphyllum* (JN: Adekumodoki; Myrtaceae; Fig. 10), respectively. Thus, adult weevils of these species utilize a wide range of unrelated plants from endemic to introduced species and are regarded as being polyphagous in feeding habit, which is consistent with what is generally known for other entimine weevils.

Feeding scars were frequently encountered on leaves of small shrubs to tall trees of *Ardisia sieboldii* inhabiting nearly flat or gently sloping areas of mountainous forests on both islands. *Ardisia sieboldii* is known to prefer mesic habitats with thick soil and fertile lands (TOYODA, 2003). Such environments may also be preferred habitat for larvae and serve as pupation sites for entimine weevils commonly, and these sites have become important places for the conservation of some *Ogasawarazo* species. Though the adults of *Ogasawarazo* (*Ogasawarazo*) species are regarded as being polyphagous, they might show preferences in the adult stage for host plants that differ by island and are influenced by the differences in vegetation among islands (NAGANO, unpubl.). Further surveys on each island will be required to understand the habitat and hosts of adults as well as larvae of weevils of the genus *Ogasawarazo*, especially of the nominotypical subgenus, on different islands for the conservation of these endangered species. For these purposes, feeding scars are one of the most important cues for looking for, and confirming, the presence of *Ogasawarazo* (*Ogasawarazo*) weevils.

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要 約

小島弘昭・永野 裕：小笠原固有のヒメカタゾウムシ属ヒメカタゾウムシ亜属（鞘翅目ゾウムシ科クチブトゾウムシ亜科）の生態的知見。——ヒメカタゾウムシ亜属成虫の加害植物ならびに生息環境に関する新知見をまとめて報告した。加害植物の調査は主に本亜属の成虫が残した特徴的な食害痕をもとに行い、モクタチバナを中心に少なくとも10科10種におよぶ幅広い植物を成虫が利用している実態が明らかとなった。また、そのような食害痕が見つかる場所は、地形がほぼ平坦か傾斜が緩やかな場所であった。

References

- CHIBA, S., 2010. Species diversity and conservation of *Mandarina*, an endemic land snail of the Ogasawara Islands. Pp. 117–125. In OKOCHI, I., & K. KAWAKAMI (eds.), *Restoring the Oceanic Island Ecosystem. — Impact and Management of Invasive Alien Species in the Bonin Islands*. xi + 216 pp. Springer, Tokyo.
- KARUBE, H., M. TAKAKUWA, S. SUDA, K. MATSUMOTO, T. KISHIMOTO, N. NAKAHARA, H. NAGASE & W. SUZUKI, 2004. List of insects collected in the Ogasawara Islands mainly through the special research expedition organized by the Kanagawa Prefectural Museum of Natural History during 1997–2003. *Research Report of the Kanagawa Prefectural Museum, Natural History, Odawara*, (12): 65–86.
- MORIMOTO, K., 2015. Tribe Celeuthetini. Pp. 203–251 & 614–625. In MORIMOTO, K., T. NAKAMURA & K. KANNŌ, 2015, *The Insects of Japan*, 4. Curculionidae: Entiminae (Part 2) (Coleoptera). 758 pp. Touka Shobo, Fukuoka (In English and Japanese.)
- Ministry of the Environment of Japan, 2015. *Red Data Book 2014. – Threatened Wildlife of Japan*, 5. Insecta. xxxix + 509 pp. + 8 pls. Gyosei, Tokyo. (In Japanese, with English title and summary.)
- Tokyo Metropolitan Government, 2014. *Red Data Book Tokyo 2014: Islands version*. 634 pp. Natural Environment Division, Bureau of Environment, Tokyo. (In Japanese, with English title.)
- TOYODA, T. (ed.), 2003. *Flora of Bonin Islands*. Second edition (enlarged & revised). 522 pp. Aboc-sha, Kamakura. (In Japanese, with English title.)

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