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A Supplement to the Fauna of Rhipiceridae (Coleoptera) of Taiwan, and Notes on the Seasonal Occurrence of *Sandalus sauteri sauteri* Emden

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Abstract. This study is a supplement to the fauna of Rhipiceridae in Taiwan. In addition to the three documented *Sandalus* species, we added an undetermined species from Kinmen Island - Rooted in specimen examination, observation, citizen science, and literature, this study aims to provide records of the distribution and phenology of each species. Biological notes based on field observation are provided where possible. The available data indicates that *Sandalus sauteri sauteri* Emden has two seasonal occurrences: spring to early summer and fall, while other species have a single seasonal occurrence or show no clear pattern due to insufficient data. A number of *S. sauteri sauteri* were found and collected concurrently in a water tank in southern Taiwan in the early October, 2021. All 24 individuals were male, and may had drowned not long before being collected. It is likely that they were attracted to the water tank by the reflective polarized light while flying in the forest. This new finding suggests an emergence peak of *S. sauteri sauteri* in early October, which is later than the local cicada seasons and may not overlap with the latter. The phenomenon observed is largely congruent with the behavioral ecology of the Nearctic *Sandalus niger* Knoch.

Key word: Distribution, phenology, Kinmen Island, citizen science, polarized light, cicada

Introduction

Rhipiceridae is a small and poorly studied beetle family (Young & Katovich, 2002). Beetles from this family are known as cicada parasite beetles in English because their larvae are ectoparasitoids of underground cicada nymphs (Craighead, 1921; Elzinga, 1977; Moulds, 1990; Lawrence, 2016). The family is distributed in all major zoogeographic realms, though is absent from the Hawaiian Islands and New Zealand (Katovich, 2002). It comprises two subfamilies, Sandalinae (nearly globally distributed except Australia) and Rhipicerinae (Australia & South America), with eight genera and over 80 documented species (Jin et al., 2013; Lawrence, 2016). Among them, three genera and 15 species are known in Asia, namely *Arrhaphipterus* Schaum (5 spp. in West Asia and Arabian Peninsula), *Chamoerrhipes* Latreille (1 sp. in Arabian Peninsula), and *Sandalus* Knoch (Wurst, 2006; Hallan, 2011). *Sandalus* can be found in all continents of the world except Australia, including 9 species in East and Southeast Asia (China, India, Japan, Myanmar, Taiwan), 14 in Africa (Hallan, 2011), 5 in North America (Schnepp & Powell, 2018), and 13 in Mexico and South America (Pic, 1925; Emden, 1931; Blackwelder, 1944). This genus is likely to be in need of a taxonomic revision.

Research of Rhipiceridae in Taiwan is scarce. Emden (1924) described *Sandalus sauteri* Emden as the first representative species in Taiwan. Miwa (1928) reviewed the rhipicerid fauna (including current Callirhipidae) in the Imperial Japan, with *S. sauteri* in Taiwan and *S. segnis* Lewis in Japan. There had been a long research gap since then until Lee et al. (2005) revised the taxonomy of *Sandalus* in Taiwan and Japan, in which the authors noted three species in Taiwan and its southeastern islet Lanyu. *Sandalus segnis* appears in Japan and northeastern Taiwan; *Sandalus taiwanicus* Lee, Satô & Sakai is endemic to Taiwan, mainly in the southern areas of the island; *Sandalus sauteri* Emden lives in Taiwan main island and Island Ishigaki of Japan, while *S. sauteri lanyuensis* Lee, Satô & Sakai is restricted to Lanyu.

The collecting records of rhipicerids are usually rare and scattered, making it difficult to study the ecology and behavior of the family. The beetles (especially females) are occasionally spotted on tree trunks in forests in the day time, and can be collected by various traps (light, Malaise, flight interception, Lindgren funnel, chemicals) in small numbers (Fukuda, 1969; Kurosawa, 1985; Mizota & Imasaka, 1997; Iwai et al., 2001; Ohki, 2014; Freese, 2019). About a dozen *Sandalus niger* Knoch were collected following a brood of periodic cicadas (*Magicicada septendecula* Alexander & Moore) in North America (Young, 1956). Through five years of local observation, Elzinga (1977) noted the consistent appearance of *S. niger* in the fall.

In this paper we provide new information, including an undetermined species from Kinmen Island, to the fauna of Rhipiceridae in Taiwan. We focus on the geographical and phenological distribution of each species rather than their taxonomic identification

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which will be treated in a separate paper. An early October (2021) observation of *S. sauteri sauteri* in unusually high numbers in Southern Taiwan is also reported and discussed.

Material and methods

Rhipicerid specimens in Ong's personal and his friends' collection (ONG), Bin-Hong Ho's (何彬宏) personal collection (HO), and of Taiwan Agriculture Research Institute (TARI), National Museum of Natural Science (NMNS) and Taiwan Forest Research Institute (TFRI) were examined. Additional records were obtained from the internet or personal communication without specimen examination, provided that the image quality was sufficient, or the observer was regarded as experienced able to reliably make species determinations. We communicated with the collectors or observers to collect biological information of rhipicerids whenever possible. The names of localities and collectors are transliterated in Chinese and occur in parentheses when they appear for the first time. Geographical and phenological distributions of each species were presented based on data from all sources.

In early October, 2021, Jeng and his colleagues found and collected more than 20 rhipicerids concurrently during a field trip in south Taiwan. We reported our observation of this unusual event, including the identification of the beetles, as well as the ecological nature of the collecting site. Frogs observed at this collection site were identified by Dr. Chi-Shun Wu from Chinese Culture University (巫奇勳，中國文化大學), Taipei City.

Results

1. Supplement to the Rhipicerid Fauna of Taiwan

***Sandalus sauteri sauteri* Emden**

(Figs 1a, 2a-b)

Sandalus sauteri Emden, 1924: 28. – Miwa, 1928: 374; Lee et al., 2005: 440 (lectotype designation, adding to Japanese fauna).
Sandalus takizawai Nakane, 1985: 35. – Lee et al., 2005: 440 (syn.)

Material examined:

Taoyuan City: 1♀, Fuxing, Sileng (桃園市復興區，四稜), 22.VII.2017, Chen CL (陳昭良)(HO); **Taichung City:** 1♀, Heping, Baxianshan Recreation Forest (臺中市和平區，八仙山森林遊樂區), 24.V.2017, Liao CA (廖志安)(NMNS); 1♀, Heping, Liyang (林務局麗陽工作站), 9.VI.2015, on tree trunk of *Celtis sinensis* (朴樹), Shih SY (施欣言)(ONG); 1♀, same data except from entry of Malunshan hiking trail (馬崙山登山口), flying ex by net (ONG); **Changhua County:** 1♀, Shetou, Qingshuiyan (彰化縣社頭鄉，清水岩), 17.V.2015, on tree trunk, Jiang LW (蔣莉葳)(ONG); **Nantou County:** 1♀, Yuchi, Lianhuachi (南投縣魚池鄉，蓮花池), 9.X.2009, Fan YB (范義彬)(TFRI); 1♀, Puli, Nanshanxi (埔里鎮，南山溪), 10.VII.2010, Wang YT (王宇堂)(NMNS); **Chiayi County:** 1♀, Fanlu, Shanhuangmahu (嘉義縣番路鄉，山黃麻湖), 15.V.2015, overturned on road at night, Ong U (NMNS); **Tainan City:** 1♂, Nanxi, Meiling (臺南市楠西區，梅嶺), 25.IX.2016, Chen JF (陳家鋒)(NMNS); 24♂♂, Meiling, Jeng ML, Yang WT & Lai YW (鄭明倫、楊萬琮、賴郁雯)(NMNS); 1♀, Dongshan, Kantoushan (東山區，崁頭山), 2.VI.2010, daytime on tree trunk, Ong U (ONG); 1♀, same locality, 17.IV.2015, overturned on road at night, Ong U (ONG); **Kaohsiung City:** 2♀♀ & 1♀, Taoyuan, Baolai (高雄市桃源區，寶來), 4 & 18.VI.2011, daytime on tree trunk, Ong U (ONG, NMNS); **Pingtung County:** 1♀, Wutai, Jiamu (屏東縣霧台鄉，佳暮), 10.V.2015, netting on *Ulmus parvifolia* (榔榆樹), Chung YT (鍾奕霆)(TARI); 1♀, Chunri, Dahanshan (春日鄉，大漢山), 24.II.2015, Chung YT (TARI); 1♀, Shizi, Shuangliu Recreation Forest (獅子鄉，雙流森林遊樂區), 15.VI.2014, Liu TY(劉廷彥)(TARI); 1♂, Shizi, Lilongshan (里龍山), 10.VI.2014, Chen JC (陳榮章) (TARI); 1♀, Hengchun, Kenting Recreation Forest (恆春鎮，墾丁森林遊樂區), 22.X.2014, canopy bagging, Lan YC (藍艷秋)(NMNS); 1♀, same data except from Sheding (社頂), 23.X.2014, by net (NMNS); 1♀, Kenting, 25.VII.2016, Chung YT (TARI); **Hualian County:** 1♀, Xiulin, Panshi (花蓮縣秀林鄉，磐石), 16.VII.2020, dead body on forest trail, Huang D (黃福盛)(ONG); **Taitung County:** 1♀, Zhiben (臺東縣卑南鄉，知本), 11.V.2018, overturned on road at night, Huang YT (黃耀霆)(NMNS); 1♂, Taimali (太麻里鄉), 7.IX.2005, Fan YB (TFRI).

Additional records:

New Taipei City: 1♀, Bali, Bali junior high school (新北市八里區，八里國中), 23.VI.2017, Chi PW (紀博瑋); **Nantou County:** 1♀, Lugu, Xitou (南投縣鹿谷鄉，溪頭), 27.VI.2014, Chen YF (陳陽發); 1♂ & 1♀, Renai, Huisun Forest (仁愛鄉，惠蓀林場),

9-15.VI.2018, FIT, Liang WR (梁維仁); **Tainan City:** 1♀, Baihe, Dadongshan (臺南市白河區，大凍山), 28.IX.2020, Hsiao SH (蕭聖翰); **Pingtung County:** 1♂, Hengchun, Kenting Recreation Forest, 24.I.1988, Chiang CF (江志芬).

Biological note: An amateur entomologist Huang BH (黃博鴻) mentioned that he collected a number of rhipicerids in Tianzhong (彰化縣田中鎮) from May to July, 2005-2006. Most of them were females. Unfortunately, there is no existing specimen or exact records. The species is most likely *S. sauteri sauteri* according to the distribution pattern.

Distribution in Taiwan: Widespread in Taiwan main island (Fig. 3, red pentagons), from low hills to about 1500m in elevation. Adult season: January and February (sporadic), April-June, September to October.

Sandalus sauteri lanyuensis Lee, Satô & Sakai
(Figs 1b, 2c)

Sandalus sauteri lanyuensis Lee et al., 2005: 440.

Material examined:

Taitung County: 1♂, Lanyu, 26.IV.2015, on spider's web, Shih SY (NMNS); 1♂, Lanyu, 28.IV.2021, sweeping net on tall trees, Ong U (ONG); 1♂ & 1♀, Lanyu, Cross-Island Road (蘭嶼中橫), 20.IV.2021, Huang D (ONG); 2♀♀, Lanyu, 14.IV.2013, Chung YT (TARI); 1♂, Lanyu, 07.IV.2015, Chung YT (TARI); 1♀, Lanyu, 03.V.2021, Chung YT (TARI).

Additional records:

Taitung County: 1♀, Lanyu, 06.IV.2014, on tree trunk, Lin HY (林翰羽); 2♂♂ & 1♀, Lanyu, Xiaotianchi (小天池), 04.IV.2018, FIT, Ho BH.

Remarks: Females of this subspecies was not known yet in Lee et al. (2005). Herein we show the habitus with high-quality image for the first time.

Biological note: Dash Huang found a female on a tree on the Cross-Island road in a sunny morning of April, 2021. Soon after picking the female up, Huang was hit by a male rhipicerid flying nearby. Huang then put the female in the center of an open umbrella to see if she can attract more males. Several males did approach in the following five minutes but none flew directly to the umbrella. It is unclear if the males were attracted by the pheromone released by the female, or simply because the place is a flying pass due to the air flow.

Distribution in Taiwan: Lanyu (Orchid Is.) (Fig. 3, brown pentagon).

Adult season: March to early May.

Sandalus segnis Lewis
(Fig. 2d)

Sandalus segnis Lewis, 1887: 316. – Miwa, 1928: 374; Lee et al., 2005: 441 (lectotype designation, adding to Taiwanese fauna).
Sandalus semitestaceus Pic, 1906: 1. – Jakobson, 1913: 729 (syn.)

Material examined:

Nantou County: 1♀, Xinyi, Renlun forest trail (信義鄉，人倫林道), VI.2010, planted forest, pitfall, Lin LK (林良恭，計畫主持人)(HO); **Chiayi County:** 1♀, Zhuqi, Dadongshan hiking trail (竹崎鄉，大凍山步道), 14.IV.2021, Yeh LW (葉人瑋)(HO).

Remarks: This is the only *Sandalus* species in Japan main islands (Honshu and Hokkaido) (Kurosawa, 1985). Lee et al. (2005) added it to the Taiwan fauna based on a male specimen from Fushan Botanical Garden (宜蘭縣員山鄉，福山植物園). We found two female specimens from central Taiwan but no male. We followed the diagnosis by Lee et al. (2005) to identify the females and presented them herein for the first time.

Distribution in Taiwan: The record of the species in Taiwan is still scarce, only known from limited localities in NE and central Taiwan (Fig. 3, white triangles), from low hills to about 1500m high.

Adult season: March, April and July (see discussion).

Sandalus taiwanicus Lee, Satô & Sakai
(Figs 1c-e, 2e)

Sandalus taiwanicus Lee et al., 2005: 441.

Material examined:

Pingtung County: 2♂♂, Hengchun, Kenting Recreation Forest, 13.I-16.II.2005. Malaise trap, Lin CS & Yang WC (林政行 & 楊萬琮); 2♂♂, same data except 16.II-10.III.2005; 1♂, same data except 12.IV-10.V.2005 (NMNS). 1♂, Chunri, Dahanshan, 05.V.2009, daytime, Chung YT (NMNS); 1♂, Dahanshan, 28.IV.2012, Tsou MH (曹美華)(NMNS); 1♂, Dahanshan, 07.VI.2009, Chung YT (TARI); 2♂♂, Dahanshan, 04.IV.2010, flying exs by net, Ho KT (何坤達)(ONG); 1♀, Dahanshan, 26.III.2013, Lee CF (李奇峰)(TARI); 1♀, Dahanshan, 19.VI.2013, Chen JF (ONG); 1♂ & 1♀, Dahanshan, 06.IV.2015, Chung YT (TARI); 1♂, Dahanshan, 08.IV.2016, Chung YT (TARI); 1♂, Dahanshan, 04.IV.2017, Chung YT (TARI); 2♂♂, Dahanshan, 18.IV.2018, Lee CF (TARI); 3♂♂ & 1♀, Dahanshan, 28.III.2019, Chung YT (TARI); 1♀, Dahanshan, 23.IV.2021, Chung YT (TARI); 1♂, Dahanshan, 10.V.2021, Chung YT (TARI); **Taitung County:** 4♂♂, Beinan, Lijia forest trail (臺東縣卑南鄉，利嘉林道), 02.VI.2009, flying exs by net, Ong U (ONG).

Additional records:

Pingtung County: 1♂, Dahanshan, 25.III.2017, sweeping on tall trees in daytime, Tu CY (涂承諺).

Distribution in Taiwan: S and SE Taiwan (Fig. 3, yellow circles), from low hills to about 1600m high. It is not common to see sympatric distribution of different *Sandalus* species in Taiwan. This species is found sympatric with *S. sauteri sauteri* in Dahanshan and Kenting. The former species is much dominant in Dahanshan where the latter species is more common in Kenting.

Adult season: January or February to mid June.

Sandalus sp.
(Figs 1f, 2f)

Material examined:

Kinmen County: 1♀, Kinmen Is., 01.VII.1997, Chou WI (NMNS); 1♀, Kinmen Is., Jinning, Taiwushan (金門縣金寧鄉，太武山), 13.VI. 1995, Chou WI (NMNS); 1♀, Kinmen Is., Jincheng, Gugang (金城鎮，古崗), 12.VI.1999, Chou WI (NMNS); 1♂, Kinmen Is., 11.V.2009, Liao SR (廖士睿)(ONG); 1♂, Kinmen Is., 18.IV.2014, Chung YT (TARI); 4♀♀, Kinmen Is., 16.IV.2016, daytime on tree trunk, Ong Uika (王惟加)(ONG & TARI); 1♀, Kinmen Is., Jinning, 16.VI.2016, Ong U (TARI).

Additional Records:

Kinmen County: 1♀, Kinmen Is., Jinning, Zhongshan Woods (中山紀念林), 31.V.2015, Tyus Ma (馬承漢); 5♀♀, same locality, 15.VI.2016, pitfall, Lin WL (林暐倫); 1♀, Jinsha, Mashan (金沙鎮，馬山觀測所), 25.VI.2016, Liou RH (劉人豪); 1♀, Kinmen Is., Jinhu, Botanical Garden (金湖鎮，植物園), 10.VI.2016, daytime, ovipositing on tree trunk, Yu SF (余素芳); 1♀, Kinmen Is., Botanical Garden, 24.VI.2016, daytime on tree trunk of *Casuarina equisetifolia* (木麻黃), Shi LC (施禮正).

Remarks: This species has been known since late 1990s, largely on females. We presented the habitus images of both sexes of this species for the first time. It differs from the other species in Taiwan and Japan, and its taxonomy will be treated in a separate paper.

Distribution in Taiwan: Kinmen Island (Fig. 3, orange hexapedals).

Adult season: Mid April to late June (or very early July).

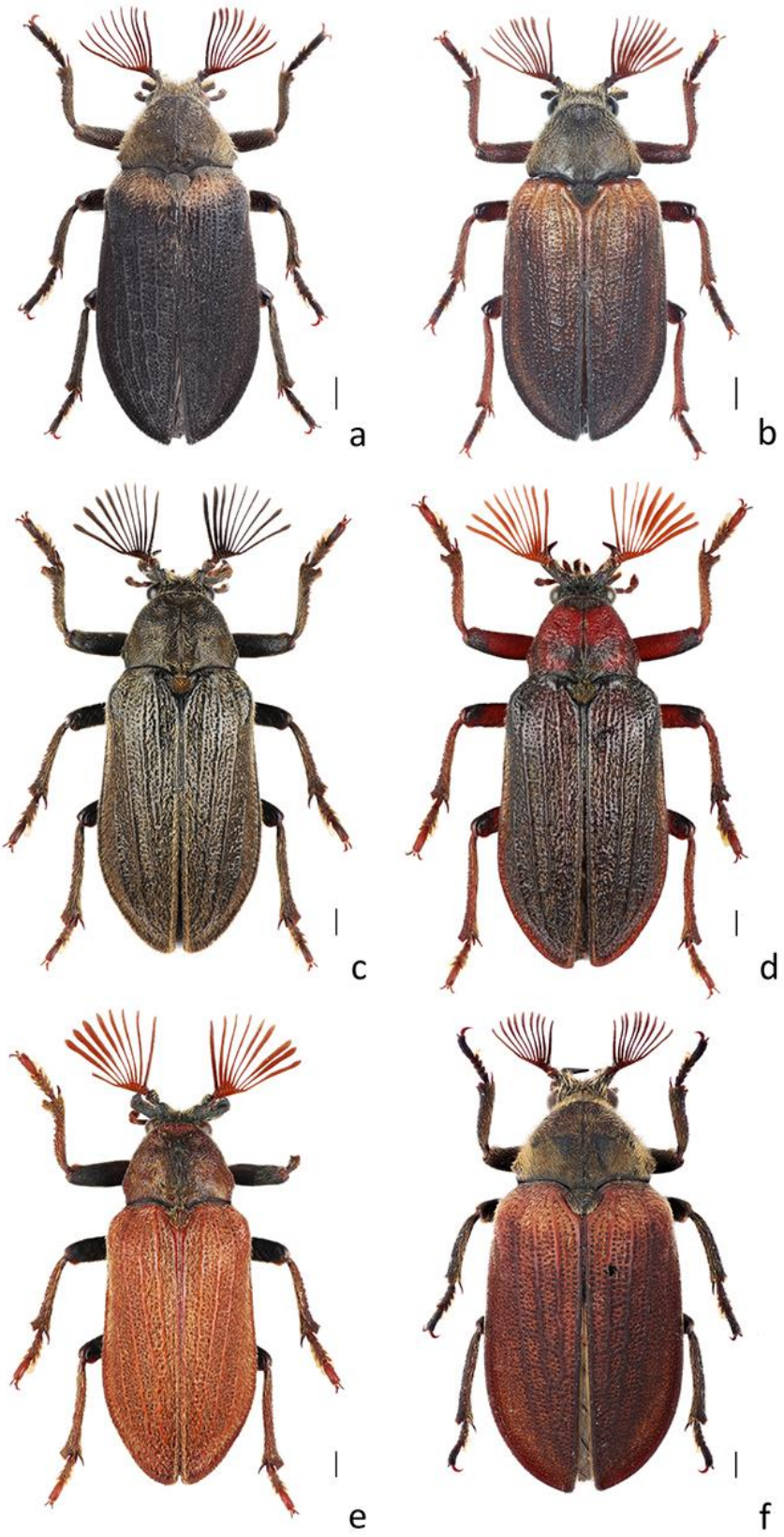

Figure 1. Habitus of males of *Sandalus* species in Taiwan and its islets: a. *S. sauteri sauteri* Emden; b. *S. sauteri lanyuensis* Lee, Satô & Sakai; c-e. *S. taiwanicus* Lee, Satô & Sakai, color variation; f. *S.* sp. from Kinmen Island. Scale bar = 1 mm.

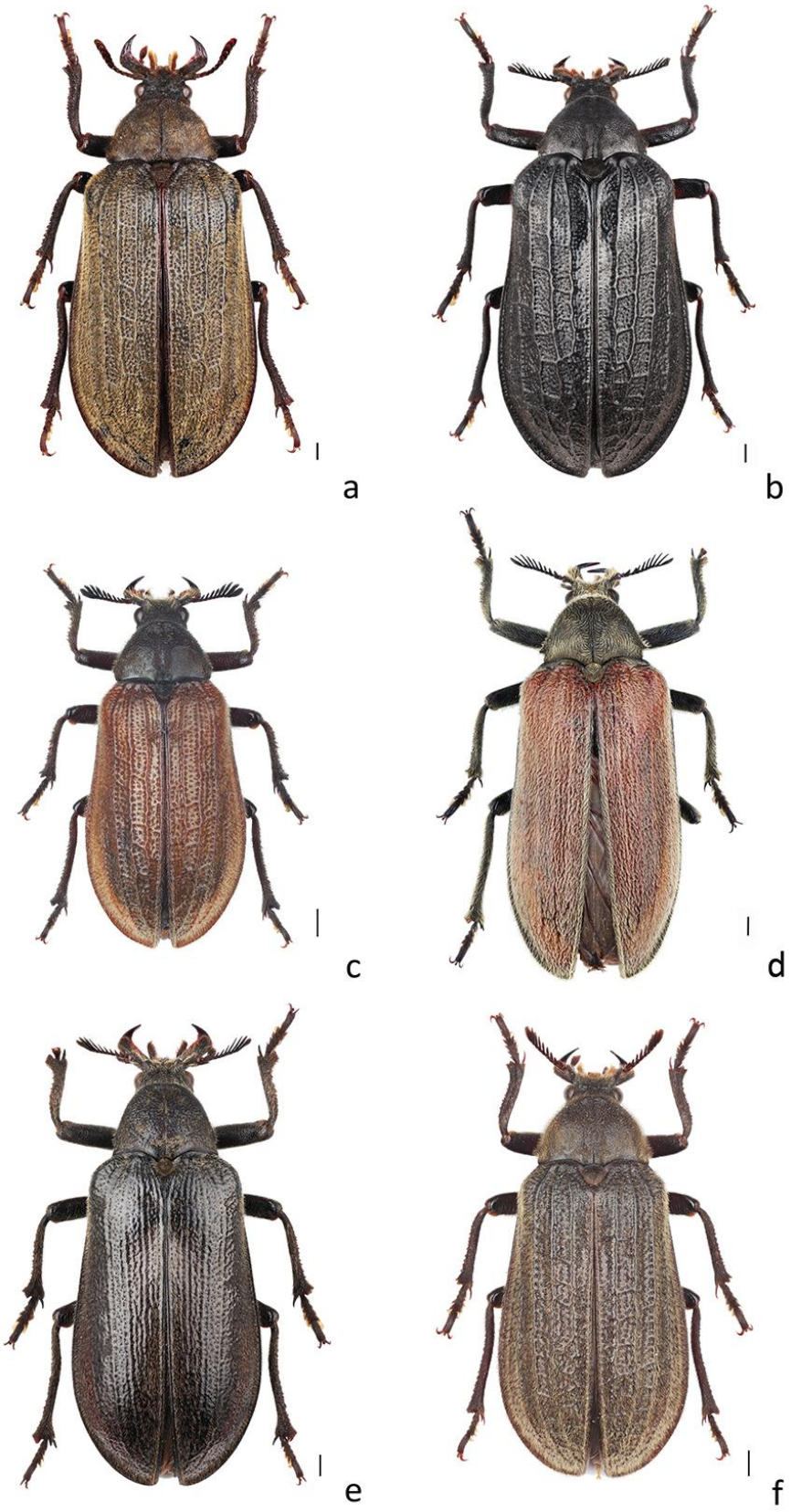

Figure 2. Habitus of females of *Sandalus* species in Taiwan and its islets: a-b. *S. sauteri sauteri* Emden, pubescence variation; c. *S. sauteri lanyuensis* Lee, Satô & Sakai; d. *S. segnis* Lewis; e. *S. taiwanicus* Lee, Satô & Sakai; f. *S.* sp. from Kinmen Island. Scale bar = 1 mm.

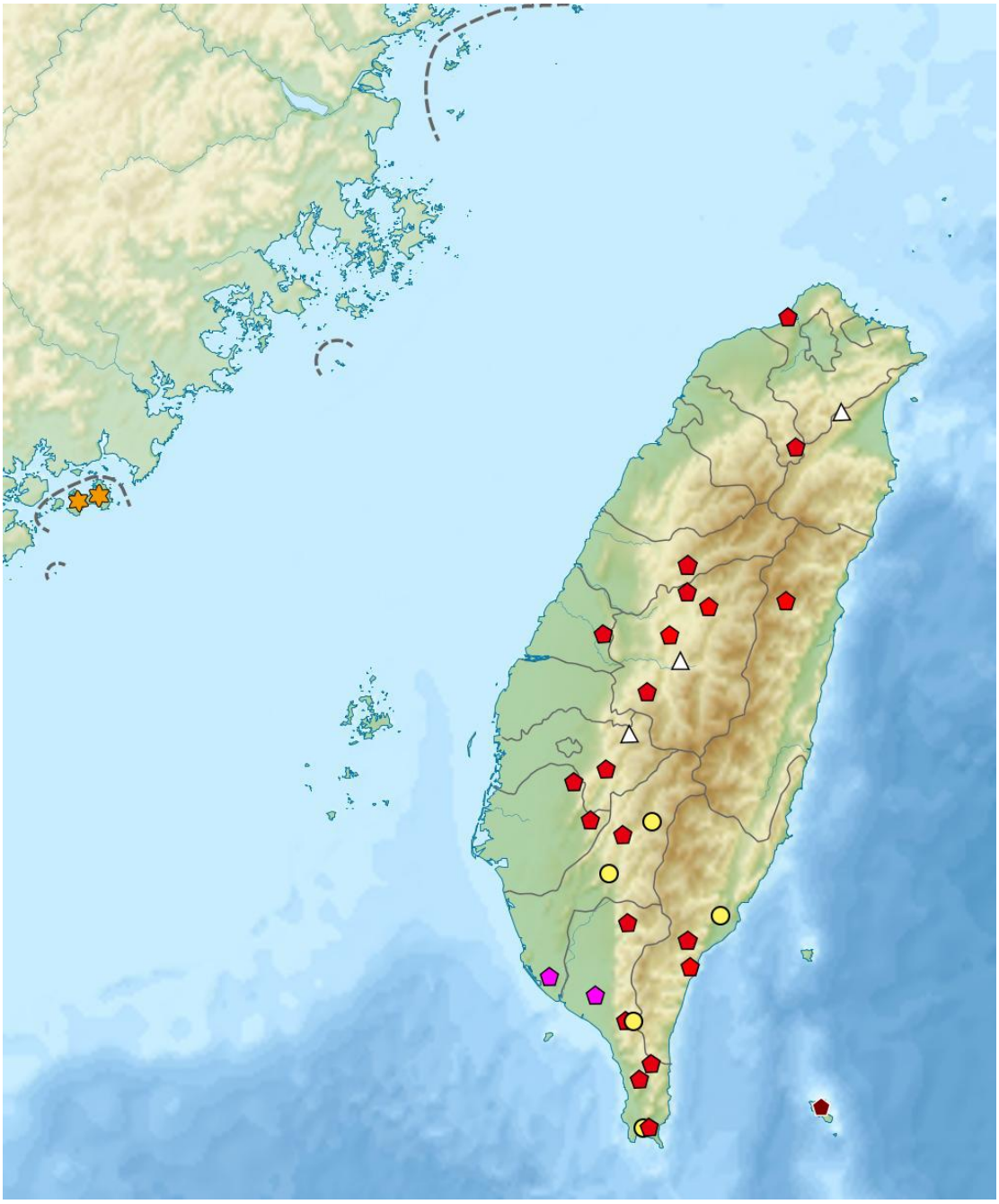

Figure 3. The geographical records of *Sandalus* species in Taiwan. Red pentagons: *S. sauteri sauteri* Emden; purple pentagons: same, records before 1930 (Hoozan 鳳山 and Raisha 來義); brown pentagon: *S. sauteri lanyuensis* Lee, Satô & Sakai; white triangles: *S. segnis* Lewis; yellow circles: *S. taiwanicus* Lee, Satô & Sakai; orange hexapedals: *S.* sp. of Kinmen Island. The top symbol means its represented species is the dominant one when two symbols are overlapped. (Basemap: Uwe Dedering, @ Wikipedia, CC BY-SA 3.0)

2. Unusually Abundant Occurrence of *S. sauteri sauteri*

On October 6, 2021 we collected 24 rhipicerids concurrently in a cement water tank in Meiling, Tainan City. All were *S. sauteri sauteri* and male, identified by microscopic examination.

Observation: The water tank is open-topped, on the east side of the mountain ridge, and about 30 meters lower than the ridge (Fig. 4). It is located in a semi-open area nearby a neglected shed on a track in an intact secondary forest (elevation 1000m). The tank was about 1.5 meters high with a diameter of 3 meters. It was full of rainwater then but nearly empty two months ago. We inspected the water tank on a warm, partially cloudy afternoon (around 15:00). Four rhipicerids were alive then and struggling on the water surface (Fig. 5), while the remaining 20 were dead or nearly so, but their bodies still intact. In addition to rhipicerids, other insects (coccindellids (*Calvia* sp.), elaterids, scarabaeids, earwigs etc.) and two dead Moltrecht's tree frogs (*Zhangixalus moltrechti* (Boulenger)) and a foam nest were present in the tank. No cicada singing was detected at this site.

The water level dropped to only 20-30cm deep and no drowned beetles were observed inside the tank when we revisited this site in November 19, 2021.

Figure 4. Overview of the water tank and its surrounding environments (Meishan, Tainan) in early October, 2021.

Figure 5. A living male of *Sandalus sauteri sauteri* struggling in the water tank.

Discussion

Among the nine named species of *Sandalus* in Asia, only those from Taiwan and Japan are better studied taxonomically (Lewis 1887; Emden, 1924; Miwa, 1928; Sakai & Sakai, 1981; Nakane, 1985; Ohno, 1995; Lee et al. 2005). However, the biology and phenology of the species in Taiwan have remained obscure owing to insufficient data (only 24 records (specimens) in the literature, see Emden, 1924; Miwa, 1928; Lee et al. 2005). The geographical and phenological distribution of *Sandalus* species in Taiwan is better understood with the additional of 110+ newly checked specimen records or observations in this study.

Sandalus sauteri sauteri has a broad distribution in the Taiwan main island, from low hills like Bali, Kenting and Shetou to mountainous forests about 1500m high in Xueshan, Alishan and Central Mountain Ranges. It has two seasonal occurrences, in late spring to early summer and in the fall. The other species each shows a trend with a single occurrence, usually in spring to summer or spring alone. It is uncertain as to whether this is due to the bias of collecting activities in different seasons or a true phenology. Records of *S. segnis* in Taiwan are still scarce, only in March, April and July. We are not sure if it is a continuous or separate seasonal occurrence. This species emerges from May to July in Japan (Fukuda, 1969; Kurosawa, 1985; Ohya et al., 1988, Iwai et al., 2001; Ohki, 2014), showing a more or less one-peaked occurrence (see Ohya et al., 1988).

Citizen Science is helpful in understanding the species distribution and phenology by providing abundant and widespread records. For example, on the basis of nearly 750 records uploaded by over 600 participants, iNaturalist (2021) demonstrates a clear seasonal peak of *S. niger* in September and October in America. In the present study, many amateurs and students also made significant contributions.

It is unusual to see two dozens of rhipicerids concurrently in a water tank. Water surfaces are known to attract or repel flying insects for various reasons (Schwind, 1991; Heinloth et al., 2018). Many insects used celestial polarized light for basic orientation. In addition to sunlight and moonlight, light reflecting off a reflective surface (e.g., water, leaves and flowers) represents another important source of polarized light in the nature (Wehner, 2001). The drowned rhipicerids were likely attracted by the horizontally polarized light reflection of the tank water while flying. This may have occurred not long before collection as some beetles were still active, and the dead ones had not decomposed. Our observation is consistent with Elzinga (1977) that the Nearctic *S. niger* takes flight only in the warm, partially cloudy to sunny afternoon for a few days in its adult life.

The reason why only males presented in the water tank is unclear. Three non-exclusive explanations are inferred:

1. It’s early in the adult season, and females are still scarce.
2. Males fly more actively than females do.
3. Behavioral responses to reflected polarized light are sexually dependent.

Elzinga (1977) reported that males of *S. niger* do not feed, and live only about three days after emerging from the soil. They fly eagerly and continuously in the forests to search potential mates while females are usually motionless, staying on the tree trunks. Shinkai (2008) reported a similar observation on the Japanese *S. segnis* in a planted cedar forest. The second explanation above is thus more likely the case if *S. sauteri sauteri* shares similar behavioral ecology with the other species. This may also explain the

extreme sexual ratio (166 ♂ vs 1 ♀) of *S. segnis* collected by the hanging traps in Japan (Ohya et al., 1988). Interviews with the collectors also largely validate this sexual difference of movement for *Sandalus*.

Previously sporadic record collections of *S. sauteri sauteri* are from March to June (Lee et al., 2005). Our finding reveals another emergence peak of the species in early October in Meiling. Meanwhile, we noticed no cicada singing in the scene. This suggests that the fall occurrence of *S. sauteri sauteri* might be later than that of their host cicadas, or even without overlap with the latter. This is largely congruent with the observation of Elzinga (1977) on *S. niger* which appears from late September to mid-October in Kansas when the seasons of cicadas have ended. The females of *S. niger* lay eggs soon after mating, but the triungulin larvae do not hatch until the next spring or summer in the natural habitat (Elzinga, 1977). Therefore, the seasonal appearence of rhipicerids and their host cicadas need not be overlapping. Further study on the phenology of *S. sauteri* and the correlation between the beetles and local cicadas is needed. The water tank in Meiling may serve as a good site for long-term monitoring.

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臺灣產蟬寄甲科（鞘翅目）補遺，並記錄紹達杉蟬寄甲在本島的發生季節

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摘要: 本報告為臺灣產蟬寄甲科 (Rhipiceridae) 相之補遺，除既知的三種杉蟬寄甲 (*Sandalus*)，增列金門產的一個同屬未定種。藉由公民科學家的參與，我們蒐集整理 110 餘件新獲得之標本或目擊資料，加上文獻紀載，以進一步了解各個物種的分布與物候，並盡可能提供生物資訊。根據所得資料，紹達杉蟬寄甲指名亞種 (*S. sauteri sauteri*) 一年具有兩個發生季，其餘物種為單一發生季或因資料不足無法判定。2021 年 10 月初在南臺灣山區一處露天人工水池採得 24 隻落水的紹達杉蟬寄甲雄蟲，我們推測雄蟲落水原因可能是在林間飛行時受到水面反射之偏振光吸引所致。根據現場狀況研判蟬寄甲落水時間不很久，顯示本種在 10 月初於當地有一波羽化高峰，且晚於蟬的發生季。我們觀察到的現象與先前關於北美產的黑杉蟬寄甲的行為生態研究大致相符。

關鍵詞: 分布、物候、金門島、公民科學、偏振光、蟬