Description of a new species belonging to the genus *Sarmydus* Pascoe from Taiwan island, China
(Coleoptera, Cerambycidae, Prioninae)
(6th contribution to the study of genus *Sarmydus* Pascoe, 1867)

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Abstract. A new species of *Sarmydus* Pascoe, 1867, *S. lii* n. sp., is described from the Taiwan island in Eastern China. *S. lii* n. sp. is illustrated and compared with its closest relative species up to now within the genus. An actualized check-list of the species composing the genus *Sarmydus* is provided.

Résumé. Une nouvelle espèce du genre *Sarmydus* Pascoe, 1867, *S. lii* n. sp., est décrite de l’île de Taiwan située au large de l’Est de la Chine. *S. lii* n. sp. est illustrée et comparée avec les espèces relatives les plus proches jusqu’à maintenant au sein du genre. Une liste actualisée des espèces composant le genre *Sarmydus* est fournie.

Keywords. Taxonomy, Coleoptera, Cerambycidae, Prioninae, *Sarmydus*, *S. lii* n. sp., new species, Palearctic region, China, Taiwan.

The genus *Sarmydus* Pascoe, 1867 currently comprises 9 species after 7 species have been described in the 13 last years (DRUMONT, 2006; DRUMONT & WIEGEL, 2010; DRUMONT, 2011; DRUMONT & BI, 2014; DRUMONT & BI, 2017; MAJUMDER et al., 2019), most of the species composing the genus having been described from China. It should be divided into two groups based on the structure of surface of dorsal part of the pronotum (DRUMONT, 2006 and 2010). The first group, called the "subcoriaceus" group, has the pronotal surface covered with puncturation composed of shallow depressions, while the second group, called the "antennatus" group, is characterised by the dorsal surface of the pronotum being covered with small tubercles.

By continuing the study of the specimens of the genus *Sarmydus* inhabiting China, we come across a series of exemplars from the island of Taiwan which exhibits characters that doesn’t fit with any of the known species. Only the species *S. antennatus* Pascoe, 1867 has been previously reported from Taiwan (CHOU, 2004; DRUMONT & KOMIYA, 2010). By comparison with a large series of *S. antennatus* coming from Borneo Island (typical locality of *S. antennatus* located in Sarawak state of East Malaysia), we can exclude the belonging of the representatives from Taiwan to this species. This fact was also supported by genetic analyses we have undertaken on the genus *Sarmydus* since 10 years.

Based on our observations, we considered the *Sarmydus* exemplars from Taiwan island as undescribed species and we described it here under the name *S. lii* n. sp.. The description of this new species is given below in this paper and the habitus illustrated. A comparison with *S. antennatus* Pascoe, 1867 and *S. loebli* DRUMONT & WIEGEL, 2010, its closest taxa inside the genus *Sarmydus* is provided.

Collections examined and abbreviations

ADC : collection Alain DRUMONT, Brussels, Belgium;
CBWX : collection of Wen-Xuan Bi, Shanghai, China;
CCCC : collection of Chang-Chin CHEN, Tianjin, China;
CRC : collection Claude RIPAILLE, Lias, France;
Sarmydus lii n. sp. (figs 3, 4, 5c & 6b)

Type material: Holotype ♂: China, C. Taiwan, near Tsau Ping Tou, 23.56N.-120.88E., alt. 1200 m, by FIT [Flight Interception Trap], 14-VIII/1-X-2016, C.-L. Li leg., deposited in the Taiwan Agriculture Research Institute, Taichung, Taiwan. The holotype was collected (see fig. 7) under a project in the name of "Altitudinal patterns of species richness and distribution of dung beetles in Taiwan, grant 106-B3 to Chun-lin Li from the Experimental Forest, National Taiwan University".

Paratypes: 43♂♂ and 3♀♀; all coming from China, Taiwan island: 1♂, Nantou county, Nanshanshi, 9-VII-1990, BC-TB7517 (ADC); 1♂, same locality, 25-VI-2000 (ADC); 1♂, same locality, 8/10-VII-2000, BC-TB7518 (ex ADC, deposited in RBINS); 1♂, Miaoli county, 21-VIII-2007, leg. local collectors (ADC); 1♂, same locality, 23-VIII-2010, leg. local collectors (CRC); 1♂, Wu-Lat, 21-VI-1985, leg. local collectors (ADC); 1♂, Nantou county, env. Yuchi, Sun Moon Lake, 1500 m, 9-VI-1994 (JDC); 1♂, Hsinchou county, Jianshi village, 1450 m, 21-VII-2007, leg. local collectors, CTBB-2219 (ADC); 1♂, same locality, 26-VII-2014, leg. local collectors, CTBB-2217 (ADC); 1♂, same locality, 26-VII-2014, leg. local collectors, CTBB-2218 (ex ADC, deposited in RBINS); 1♂, same locality, 10-VII-2016, leg. local collectors, CTBB-2216 (ADC); 1♂, Hsinchou county, env. Jianshi township, 590 m, 24°43′51″N, 121°13′14″E, 7-VI-2018, leg. Jaroslav Dalíhod (PRC); 1♂, Wufeng county, env. Wufeng township, 18-V-2005, leg. local collectors (ADC); 1♂, Gaoxing, Tengzhi, 21-VII-1996, leg. WEN-I-CHOU (CBWX); 2♀♀, Jianan, Yunfneg, 1545 m, 8-IX-2007, leg. WEN-I-CHOU (CBWX); 2♀♀, Yilan, NanAo, 35 mm, 22-VI-2003, leg. Yi Ting Chung (CCCC); 1♂, KaoHsiung, TaoYuan, TienChih, 2250 m, 22-VII.2006, leg. Yi Ting Chung (CCCC); 1♂, KaoHsiung, Tao Yuan, Erh Chl Yuan, Teng Jhih National Forest Recreation Area, 1600 m, 20-VIII-2008, leg. Yi Ting Chung (CCCC); 1♂, same locality, 11-VIII-2013, leg. Po Hsin Kuo (CCCC); 1♂, 1♀♀, same locality, 26-VII-2009, leg. Po Hsin Kuo (CCCC); 1♂, KaoHsiung, TaoYuan, ShihShan forest road, 1650 m, 26-VII-2019, leg. Po Hsin Kuo (CCCC); 1♂, KaoHsiung, Tao Yuan, Tung Teng Jhih Shan, 1600 m, 7-VIII-2016, leg. Po Hsin Kuo (CCCC); 1♂, KaoHsiung, Liu Kuei, Feng Kang forest road 1600 m, 9-IX-2017, leg. Yi Ting Chung (CCCC); 2♀♀, New Taipei City, Wu Lai, 900 m, 12-VI-1998, leg. WEN HSIN LIN (CCCC); 1♂, New Taipei City, Kung Liao, 294 m, 28-V-2002, leg. DR SHU PING WU (CCCC); 1♂, New Taipei City, Ping Lin, Chian Shan Hu, 400 m, 1-VI-2006, leg. WEN I CHOU (CCCC); 1♂, Taitung, Pei Nan, Li Chia forest road, 1250 m, 2-VIII-2005, leg. DR SHU PING WU (CCCC); 1♂, Nantou, Pu Li, Pen Pu Hsi, 550 m, 20-IX-2006, leg. CHIN WEN LO (CCCC); 1♂, same locality, 1-V-2008, leg. CHANG CHIN CHEN (CCCC); 1♂, Pingtung, Tai Wu, Pei Ta Wu Shan, 1200 m, 6-VIII-2016, leg. Yi Ting Chung (CCCC); 1♂, same locality, 20-VIII-2016, leg. Yi Ting Chung (CCCC); 1♂, 1♀♀, same locality, 28-IX-2017, leg. Yi Ting Chung (CCCC); 1♂, Urai, 8/10-VI-1963 (ZKC); 1♂, Nanshan, V-1999 (ZKC); 1♂, Hassenschans, 16-VI-1990 (ZKC); 1♂, Taiyung county, Fuxing township, 11-VI-2015, leg. local collectors (ADC); 2♀♀, same locality, 18-VI-2015, leg. local collectors (ADC); 1♀♀, same locality, 28-VII-2015, leg. local collectors (ADC); 1♂, same locality, 6-VIII-2015, leg. local collectors (ADC).
Figs 1-4. *Sarmydus* spp., habitus, dorsal view. **Fig. 1.** *S. loebli*, male, 18.5 mm (Laos, Hua Phan province). **Fig. 2.** *S. antennatus*, male, 20 mm (Borneo, Sabah state). **Fig. 3.** *S. lii* n. sp., paratype male, 21 mm. **Fig. 4.** *S. lii* n. sp., paratype female, 20.5 mm. (Pictures and arrangement of the plate by N. Mal).
Description

Male (fig. 3). Habitus. Relatively small species compared to the related species *antennatus*, generally quite light in color with well-defined ribs but sometimes of a darker shade, oblong abdomen, slightly enlarged at the center, elytral width equal to half the height at the center, head and pronotum of the same color, ranging from reddish brown to dark brown, antennas remaining in the general color, legs of a reddish-brown color.

Head. Frons and vertex almost hairless with a strong granulosity, forehead with a fairly pronounced depression in front of the antennal tubercles dotted with sparse golden long hairs at the junction with the clypeus, edge of the clypeus notched in the middle, antennal tubercles extended down by a small carinae along the front-genal suture; interocular space equal to about half the width of the upper lobe, separated in the longitudinal direction by a shallow groove. Mandibles strongly punctuate, forming an inward curve at half their length with a slight boss at the outer corner and an inner-side tooth at the base of the right mandible.

Antennae. Eleven segmented of a length not reaching or barely reaching the elytral apex in males and 2/3 of the elytral length in females. Scape rather short, longitudinally angular on the upper side with a high surface vermiculation and the presence of short hair, third article strongly flattened in the middle, subparallel with thin longitudinal fairings and a smoother zone with strong punctuation towards the base, length of the 3rd segment equal to the height of the pronotum, all segments of uniform color close to the elytral color with some scattered hairs and bearing a small spine pointing downwards towards the inside of the apex, on the outside the apex has a right angle or slightly open and not acute as in *antennatus* articles. The relative length of the segments IV to X compared to the previous one is: 0.8 for the 4th and 0.9 on average for the following ones, this value reaching 1.5 for the 11th which is spatulated towards the end.

Pronotum of the same color as the head, coarsely granulated and covered with long fairly dense hairs on the periphery of the disc, trapezoidal in shape, twice as wide as high above the lateral spines which are straight and slightly downwardly directed, almost hairless disc with a slight central depression bordered on both sides by a fairly clear protuberance, base of the lateral spine connecting the posterior edge in an oblique line, almost straight posterior edge without obvious rounding in the central part as in *antennatus*. The anterior part of the pronotum is more swollen and includes most part of the lateral tooth.

Scutellum rather elongated, finely granular with a rounded apex and bordered by a fringe of golden hairs.

Elytrae. Elytral puncture between the costae rather strong and regular, slightly more erased as it approaches the apex, borders with a short fringe of golden hairs denser towards the rounded elytral apex. Each elytron furnished with three clear costae, the first two appearing near the elytral base and the third one after the humeral zone. The first shorter rib connects to the elytral suture just before the apex and to the second longer rib through one or more interconnecting ribs. The third rib is parallel to the elytral border and connects to the second before the end. On some specimens, an inconspicuous and short rib appears between the 2nd and the 3rd and connects to the 2nd towards the end. Elytral suture and borders with a thinner darker line.
Legs of elytral color or slightly darker, moderately curved tibias that widen clearly towards the apex, tibias and lower side of the femurs covered with fairly dense golden hair, last tarsus article of the middle and posterior legs shorter than the first article in male (longer in females).

Underside with prosternum, metasternum, metepisternum and sternites finely punctuate and covered by long golden bristles, metepisternum of triangular shaping with rear edge beveled, prosternal process covered with golden pubescence and with a rounded and bulbous apex, last sternite slightly indented in the male.

Fig. 5. Sarmydus spp., right antenna, dorsal view; a. *S. loebli*, male (Laos, Hua Phan province); b. *S. antennatus*, male (Borneo, Sabah state); c. *S. lii* n. sp., paratype male. (Pictures by N. MAL, arrangement of the figure by C. RIPAILLE).

Fig. 6. Sarmydus spp., right metatarsus, dorsal view; a. *S. antennatus*, male (Borneo, Sabah state); b. *S. lii* n. sp., paratype male. (Pictures by N. MAL, arrangement of the figure by C. RIPAILLE).
Size (body length measured from the clypeus to the apex of elytra). Males (average: 18.78 +/- 3.24 mm, min: 13 mm, max: 24.8 mm, n = 20 exemplars; holotype: 17.5 mm), female (average: 24.57 +/- 4.96 mm, min: 20.5 mm, max: 30.1 mm, n = 3 exemplars).

Female (fig. 4). The female description corresponds to that of the male with the mandibles less strong, the antennal length shorter (roughly the 2/3 of elytral length), scape less stocky, narrower antennary segments, the 3rd longer than in males, the femurs thinner and the 4th article of the tarsus longer.

Diagnosis and genetic approach (Barcoding)

Based on DRUMONT (2006, 2010), the new species, Sarmydus lii n. sp. belongs to the "antennatus" group which includes the species antennatus PASCOE, 1867, loebli DRUMONT, & WEIGEL, 2010, paukstadtorum DRUMONT, 2011, pand Drumont & BI, 2017 and nicobarensis MAJUMDER, DRUMONT & CHANDRA, 2019. Inside this group, the new species is closer to S. loebli which was described from the Yunnan province in Western China but is distinguishable from the latter by a combination of the following characteristics:

- S. loebli has a clear and well-marked darker area at the apex of antenna articles that does not exist at all in S. lii n. sp.;
- males of S. loebli has antennal articles with an acute apex on the outer side while the outer angle is more rounded and less projected in S. lii n. sp. (when comparing specimens of the same size);
- the anterior part of the pronotum is rather oblique and rounded in S. loebli, leaving the lateral tooth well clear while the pronotum in S. lii n. sp. is more swollen in the anterior part and includes most part of the lateral tooth.

As S. lii n. sp. and S. loebli are very close species, we have undertaken a genetic study of these species and a number of specimens have been submitted to have a part of COI gene sequenced. This DNA fragment of the mitochondrial genome has been proposed by HERBERT et al. (2003 a & b) as a useful genetic marker (also known as DNA barcode) able to allow for the identification of species (HAJIBABAEI et al., 2006). The Sarmydus sequences have been obtained at the Canadian Centre for DNA Barcoding (CCDB, University of Guelph, Ontario, Canada) under the standard protocols used for these insects and by using the primers LepF1 and LepR1 (HERBERT et al., 2004) to amplify and to sequence in a bidirectional manner the target fragment of the gene.

The barcodes were obtained for three male specimens (CTBB-2216, CTBB-2217 and CTBB-2218, see list of paratypes for further data) of Sarmydus lii n. sp. from Taiwan and compared to the holotype of S. loebli collected in Yunnan province as well as to 3 exemplars of S. loebli from Laos (Hua Phan province, Phou Phan (Mt), env. Ban Saleui, 2060 m, VII-2010, leg. Steeve COLLARD; see DRUMONT et al., 2018). Comparison of the COI sequences revealed a divergence degree of 16.47% between S. loebli and S. lii n. sp. (the distances corrected according to the model KIMURA with 2-paramater [K2P] as suggested in BOLD).

The genetic difference recorded, despite having been obtained on a few specimens, is greater than the 2-3% generally admitted allowing a specific separation. This result also confirms and validates without any doubt the morphological differences we have observed between the two species, even if they seem to be weak in a first approach. This difference observed between S. loebli and S. lii n. sp. is in
the same range as the differences recorded in previous genetic analyses in the genus Sarmydus [22.5% between S. loebli and S. antennatus in DRUMONT & WEIGEL (2010), 20.4% between S. paukstsdotorum and S. antennatus in DRUMONT (2011) or 19.96% between S. loebli and S. panda in DRUMONT & BI (2017)].

This study has also revealed that the species S. antennatus (previously recorded as the only species occurring in Taiwan) is not present on the island and as, in fact, all Taiwanese specimens belong to the new species S. lii n. sp., we have to underline the differences existing between the two species. S. lii n. sp. can be distinguished from S. antennatus PASCOE, 1867 by the following morphological characters:

- in S. lii n. sp., the last 7 antennal articles are of a substantially homogeneous color while S. antennatus exhibits clearly lighter last articles;
- in S. lii n. sp., the lateral spine of the pronotum is positioned higher than in S. antennatus and the hairiness is less important around the disc than in S. antennatus;
- in S. lii n. sp., the last tarsus article of the middle and posterior legs is shorter than the first article in males (longer in S. antennatus) (figs 6 a & b);
- in S. lii n. sp., the apex on the external side of the antennal segments is more rounded and does not show an acute angle as in S. antennatus.

Comparison of the COI sequences revealed a divergence degree of 24.09% between S. lii n. sp. and three males of S. antennatus originating from Borneo island, Sabah state (the distances corrected according to the model Kimura with 2-paramater [K2P] as suggested in BOLD). This important genetic difference confirms and underlines the morphological differences we have observed between the two species.

Fig. 7. Type locality of Sarmydus lii n. sp., in central Taiwan, near Tsau Ping Tou, showing the flight interception trap setup on the site where the holotype was collected. (Picture by I-CHIEH WANG).
Distribution and phenology
So far only known from the Taiwan island in Eastern China where *S. lii* n. sp. can be collected from the beginning of May to late September, and to altitudes between 35 and 2250 meters.

Etymology
The new species is named after our Taiwanese colleague Chun-Lin Li, specialist of the members of the Melolonthinae subfamily (Coleoptera, Scarabaeidae) of the Oriental fauna.

Actualized list of species comprised within the genus *Sarmydus* *Pascoe*

"antennatus" group
- *Sarmydus antennatus* *Pascoe*, 1867
- *Sarmydus loebli* *Drumont & Weigel*, 2010
- *Sarmydus paukstadtorum* *Drumont*, 2011
- *Sarmydus panda* *Drumont & Bi*, 2017
- *Sarmydus nicobarensis* *Majumder, Drumont & Chandra*, 2019
- *Sarmydus lii* *Drumont & Ripaille* n. sp.

"subcoriaceus" group
- *Sarmydus subcoriaceus* (Hope, 1831) (*Prionus*)
- *Sarmydus fujishiroi* *Drumont*, 2006
  = *Sarmydus trichodes* *Feng & Chen*, 2006 (synonymy proposed by *Drumont et al.*, 2010)
- *Sarmydus cheni* *Drumont & Bi*, 2014
- *Sarmydus dulongensis* *Bi & Drumont*, 2017

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References


