

# Two new species of *Drepanoctonus* Pfankuch, 1911 (Hymenoptera, Ichneumonidae) from the Oriental region

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Academic editor: Gavin Broad | Received 24 March 2021 | Accepted 20 May 2021 | Published 28 June 2021

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**Citation:** Zheng X-F, Reshchikov A, Liu J-X (2021) Two new species of *Drepanoctonus* Pfankuch, 1911 (Hymenoptera, Ichneumonidae) from the Oriental region. Journal of Hymenoptera Research 83: 1–19. <https://doi.org/10.3897/jhr.83.66400>

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## Abstract

Two new species of the genus *Drepanoctonus* Pfankuch, 1911 collected in natural habitats with Wild Tea (*Camellia sinensis* var. *assamica*) are described and illustrated: *D. rimdahli* Liu & Reshchikov, **sp. nov.** from Chiang Mai Province, Thailand and *D. chamagudao* Liu & Zheng, **sp. nov.** from Yunnan Province, China. *Drepanoctonus bicolor* Kusigemati, 1971 is recorded from China for the first time. An identification key to the species of the genus is provided.

## Keywords

*Camellia sinensis assamica*, Darwin wasps, Metopiinae, new species, parasitoids, Tea Fauna, Wild Tea

## Introduction

*Drepanoctonus* Pfankuch, 1911 is a small genus in the subfamily Metopiinae (Hymenoptera, Ichneumonidae), comprising six known species. Three species are known from the Palearctic region (*D. bicolor* Kusigemati, 1971, *D. tibialis* Pfankuch, 1911 and *D. tricoloratus* (Šedivý, 1971)), one from the Oriental region (*D. auritus* Chiu, 1962), one from the Afrotropical region (*D. bicinctus* (Benoit, 1961)), and one from the Australian region (*D. bifasciatus* (Brullé, 1846)) (Yu et al 2016; GBIF 2019) (Fig. 1A). The genus name derives from one of the earliest known host, *Watsonalla binaria* (Hufnagel, 1767) (Lepidoptera, Drepanidae), formerly named *Drepana binaria*, and literally means “the killer of *Drepana*” (Pfankuch 1911). To date, *Watsonalla binaria* (Hufnagel, 1767) is the only reliable host records for the European species *D. tibialis* (Pfankuch 1911, pers. comm. Bauer) (Fig. 1C). The other host records of the genus are only literally reported by some authors (Aubert 1965; Capek et al. 1982), but without any reliable evidence.

In the present study, two species are described as new to science: *Drepanoctonus chamagudao* Liu & Zheng, sp. nov. from Southwest China, and *Drepanoctonus rimdahli* Liu & Reshchikov, sp. nov. from Northern Thailand (Fig. 1B). They represent the first record of *Drepanoctonus* in continental China and Thailand respectively. In addition, *Drepanoctonus bicolor* Kusigemati, 1971 is recorded from China for the first time.

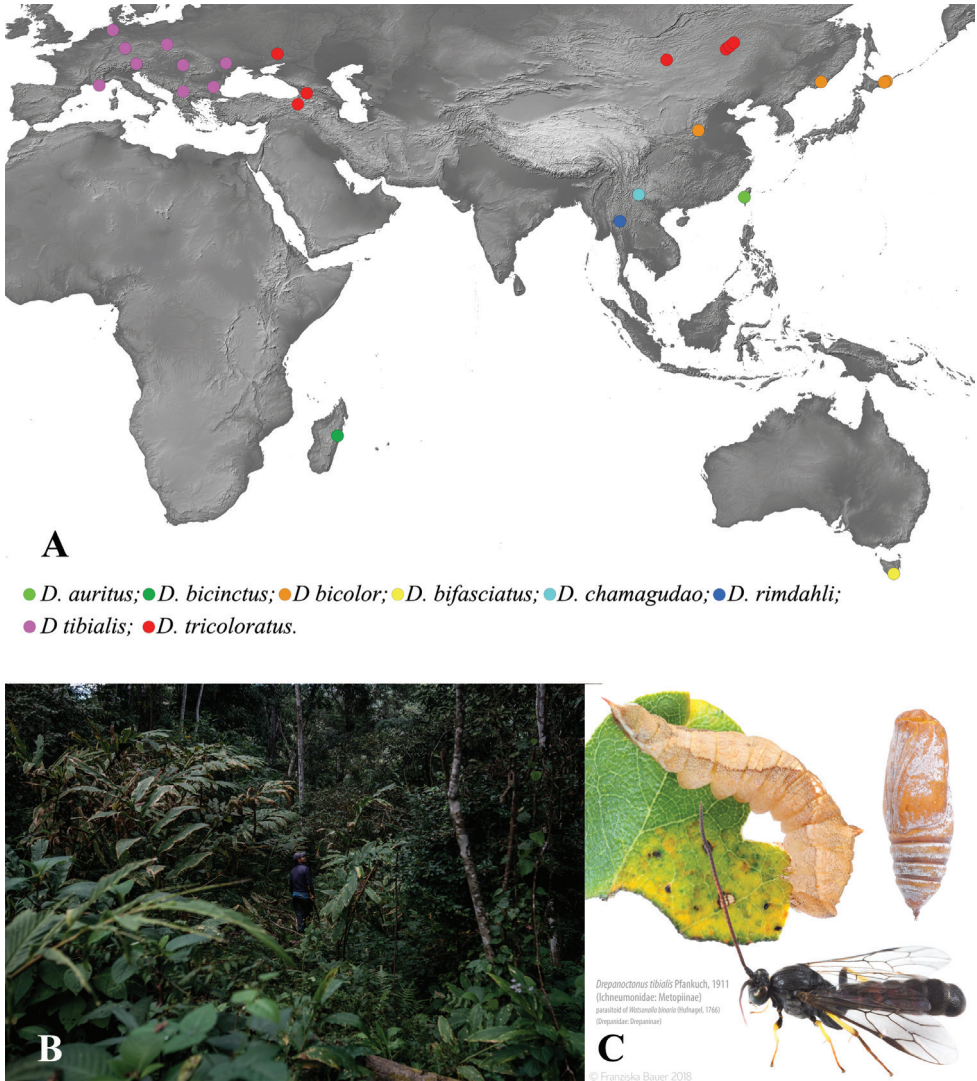
## Materials and methods

The specimens examined are deposited in the following institutions (curators in parenthesis):

- NHRS** Swedish Museum of Natural History, Stockholm (Hege Vårdal);
- QSBG** Queen Sirikit Botanic Garden, Chiang Mai (Wichai Srisuka);
- SCAU** Hymenopteran Collection of South China Agricultural University (Jing-Xian Liu);
- TARI** Taiwan Agricultural Research Institute (Chi-Feng Lee).

The specimens of *Drepanoctonus rimdahli* Liu & Reshchikov, sp. nov. were collected in Northern Thailand by Malaise trap during the “Tea Fauna” project (<http://teafauna.com>) in the understory of an old secondary forest with *Camellia sinensis* var. *assamica* (Masters) Kitamura (Fig. 1B). The Tea Fauna Project is focused on biodiversity associated with tea plants across their native range in the Eastern Himalaya Region, including Northern Thailand and Yunnan Province of China (Reshchikov et al. 2019). A single specimen of *D. chamagudao* Liu & Zheng, sp. nov. was collected using a sweep net in a shrub plant community (mainly *Ageratina adenophora* (Spreng.) R.M. King and H. Rob.) in Ailao Mountain (Ancient Tea Horse Road, Yunnan Province, China).

Specimens were examined using the Zeiss Stemi 508 stereomicroscope. Images were acquired digitally using the KEYENCE VHX-5000 Digital Microscope



**Figure 1. A** distribution of the genus *Drepanoctonus* Pfankuch, 1911 **B** type habitat of *D. rimdahli* Liu & Reshchikov, sp. nov. **C** *D. tibialis* Pfankuch, 1911 with its host, *Watsonalla binaria* (Hufnagel, 1767), Germany, Saxony, Radeburg-Berbisdorf, 18 Oct. 2016, ex. 25 May 2017, Franziska Bauer leg. (pers. comm. Bauer)

Imaging System, Leica S8APO Digital Microscope System and processed with Adobe Photoshop.

Morphological terminology and nomenclature of wing venation follows Broad et al. (2018). Abbreviations and morphological terms used in the text: T1–T7, refers to the metasomal tergites 1–7. POL = the shortest distance between the posterior lateral ocelli; OD = the longest diameter of a posterior lateral ocellus; OOL = the shortest distance between a posterior lateral ocellus and a compound eye.

## Molecular analysis

Genomic DNA of the new species was extracted from two females and one male using DNeasy Blood and Tissue Kit (Qiagen, Hilden, Germany), following a non-destructive DNA extraction protocol as described in Taekul et al. (2014). The LCO 1490 and HCO2198 primers (Folmer et al. 1994) were used to amplify the barcode region of the mitochondrial cytochrome oxidase subunit I (*COI*). PCRs were carried out using Tks Gflex DNA Polymerase (Takara) and amplified in a T100 Thermal Cycler (Bio-rad). Amplicons were sequenced on an Applied Biosystems (ABI) 3730XL by Sangon Biotech (Shanghai, China). Preliminary alignment was carried out by Geneious 11.0.3 and analyzed using MEGA X software. Following extraction voucher specimens were washed in 100% alcohol and deposited in NHRS, QSBG and SCAU. All the amplified sequences were deposited in GenBank.

## Results

Following the non-destructive extraction of DNA, the three specimens were identified as two new species: *Drepanoctonus chamagudao* sp. nov. (MW528531) and *Drepanoctonus rimdahli* sp. nov. (MW528532; MW528533; MW528534), as described below. These two distinct species are also supported by the *COI* sequences, pairwise percentage identify of the sequences was 84.4%–84.6% (interspecies distance between *D. chamagudao* sp. nov. and *D. rimdahli* sp. nov.), and 99.9%–100% (intraspecies distance of *D. rimdahli* sp. nov.).

## Taxonomy

### Order Hymenoptera

### Family Ichneumonidae

### Subfamily Metopiinae

### Genus *Drepanoctonus* Pfankuch, 1911

*Drepanoctonus* Pfankuch, 1911: 688. Type species: *Drepanoctonus tibialis* Pfankuch.

Designated by Horstmann, 1986. Monobasic.

*Zonopius* Benoit, 1961, 63: 305. Type species: *Zonopius bicinctus* Benoit. Original designation. Synonymized by Townes 1971.

**Generic diagnosis.** Fore wing length 6.0–9.0 mm. Body with punctures rather sharp and dense. Combined face and clypeus weakly convex; upper margin of face produced medially as an acute triangle between bases of antennae (except *D. rimdahli* sp. nov.). Pronotum posteriorly with a swelling just below its upper margin. Epicnemial carina with upper end far from the front edge of mesopleuron. Mesopleuron moderately convex.



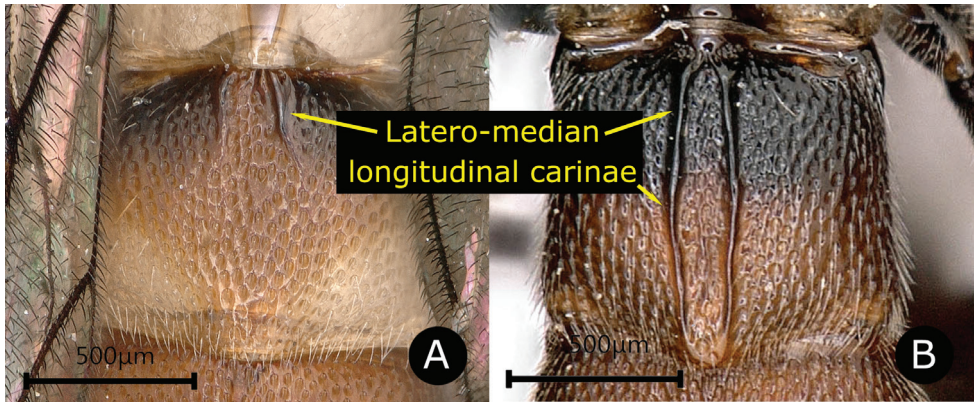
Propodeum rather short, latero-median longitudinal carinae complete, anterior transverse carina absent, area superomedia confluent with area basalis; posterior transverse carina complete or interrupted in the middle. Propodeal spiracle elongate. Spurs of middle tibia elongate, approximately equal in length. Fore wing with 1cu-a opposite or distad to M&RS, and 2rs-m nearly opposite to 2m-cu. T1 with an oblique baso-dorsal edge, with latero-median longitudinal carinae strong and sharp to apex. T2 usually with a pair of latero-median longitudinal carinae, either shortly present on base or reaching to posterior margin of tergite. T3 and T4 with or without a single weak, incomplete median longitudinal carina. Laterotergite of T2 vestigial, that of T3 narrowly wedge shaped, and that of T4 to T6 moderately wide and separated from their tergites by a crease (Townes 1971).

**Distribution.** Palaearctic, Oriental, Australian and Afrotropical regions (Fig. 1C).

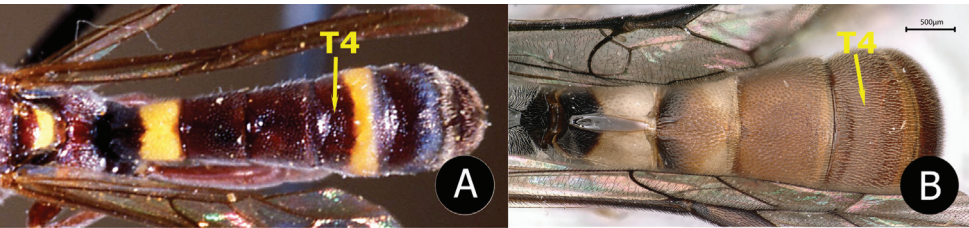
**Biology.** Parasitoids of Drepanidae (Lepidoptera) (Pfankuch 1911; Yu et al. 2016).

### Key to species of *Drepanoctonus* (modified from Tolkantiz, 1987)

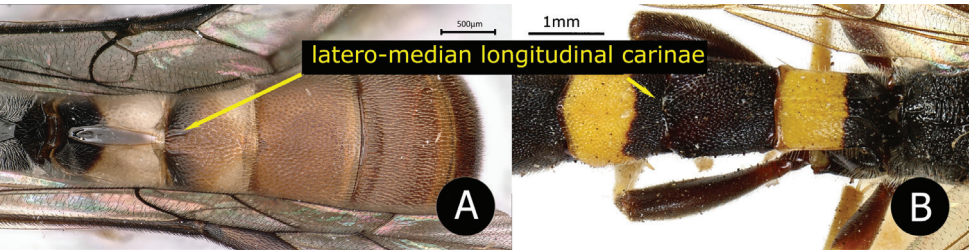
- 1 Latero-median longitudinal carinae of T2 either absent, only present on anterior 0.3 of the tergite, or present as foveolate lines (Fig. A) ..... 2
- Latero-median longitudinal carinae of T2 strong and reaching the posterior margin of the tergite (Fig. B) ..... 4



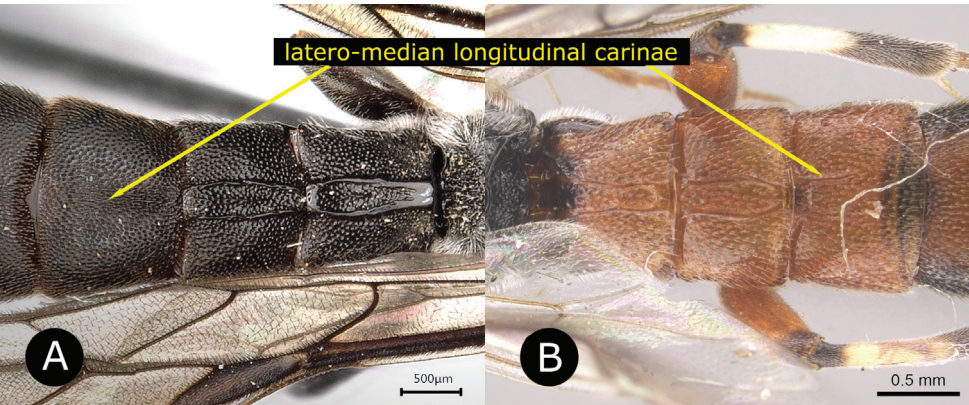
- 2 T2 medially with a pair of foveolate lines at base; T3 to T5 medially with a depressed triangular area at base; fore wing with 1cu-a oblique and almost opposite to M&RS; hind tibia entirely reddish brown without white or yellow band; upper margin of pronotum yellow; T4 with a yellow band posteriorly (Fig. A) ..... *D. bicinctus* (Benoit, 1961)
- T2 medially either without foveolate lines or carinae, or anteriorly with a pair of short latero-median longitudinal carinae; T3 to T5 without depressed triangular area at base; fore wing with 1cu-a distinctly distad of M&RS; hind tibia reddish brown with a sub-basal white or yellow band; upper margin of pronotum reddish brown or entirely black; T4 without a yellow band (Fig. B) ..... 3



- 3                      Upper margin of face not produced backward as inter-antennal projection; area superomedia of propodeum polished and glabrous; T2 with a pair of short latero-median longitudinal carinae on anterior 0.3 of tergite (Fig. A); T3 evenly reddish brown ..... *D. rimdabli* sp. nov.
- Upper margin of face produced backward forming an inter-antennal projection; area superomedia of propodeum with several transverse wrinkles; T2 without a pair of short latero-median longitudinal carinae (Fig. B); T3 posteriorly with a wide yellow band ..... *D. bifasciatus* (Brullé, 1846)



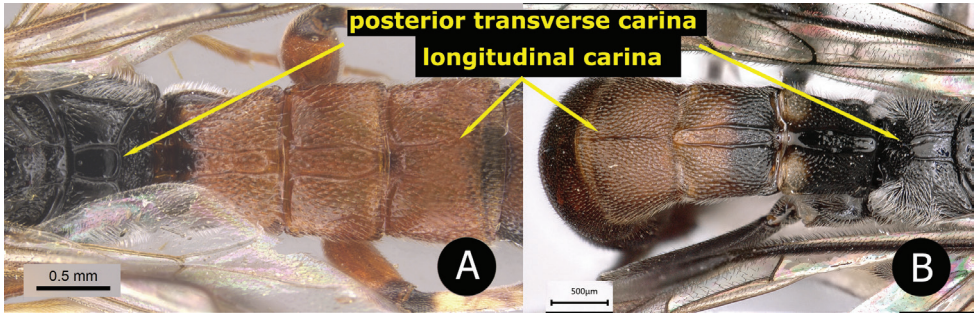
- 4                      T3 without latero-median longitudinal carinae (Fig. A) ..... 5
- T3 with latero-median longitudinal carinae (Fig. B) ..... 6



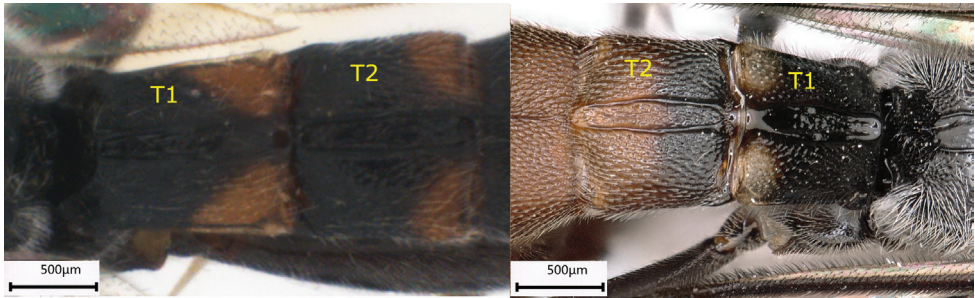
- 5                      T2 to T6 transverse, roughly wrinkled and punctate; metasoma black, T1 to T6 with their apical margins reddish–brown; femora black with apex yellow; all tibiae yellow ..... *D. tibialis* Pfankuch, 1911
- T2 to T6 not transverse, punctate; metasoma with T1 and T2 black, T3 to T6 reddish; femora entirely black, fore tibia reddish–brown, mid and hind tibia black ..... *D. bicolor* Kusigemati, 1971



- 6 Posterior transverse carina of propodeum complete (Fig. A); fore wing with 1cu-a opposite to M&RS; T3 with a pair of latero-median longitudinal carinae on anterior half (Fig. A), T4 without carina; T1–T3 usually red, T5 posteriorly with round white spot ..... *D. tricolorata* (Šedivý, 1971)
- Posterior transverse carina of propodeum incomplete, dorso-medially absent (Fig. B); fore-wing with 1cu-a distinctly distad of M&RS; both T3 and T4 with a single median longitudinal carina (Fig. B) ..... 7



- 7 Metasoma mainly blackish–brown, T1 with a pair of triangular yellow spots on latero-posterior corners; T2 with a yellow band on posterior 0.2–0.4 which is interrupted by latero-median longitudinal carinae (Fig. A).....  
..... *D. auritus* Chiu, 1962
- Metasoma mainly reddish, T1 black with a pair of yellow spots on latero-posterior corners, T2 with anterior half black and posterior half reddish (Fig. B) ..... *D. chamagudao* sp. nov.



*Drepanoctonus bicolor* Kusigemati, 1971

Fig. 2

*Drepanoctonus bicolor* Kusigemati, 1971, 250.

**Materials examined.** CHINA: 1 male, Shanxi province, Mt. Lishan, Xiahe Protection Area, 35°20.40'N, 112°32.41'E, 780 m, 22–25 Aug. 2012, Ren Ya-Jun leg. (SCAU).  
**New to China.**



**Figure 2.** *Drepanoctonus bicolor* Kusigemati, 1971, female **A** habitus, lateral view.

**Comments.** The specimen from China is slightly different from the holotype in having the third metasomal tergite blackish–brown and medially longitudinally convex, and the fourth tergite light reddish–brown (Fig. 2A).

**Distribution.** China (Shanxi Province), Russia, Japan.

***Drepanoctonus chamagudao* Liu & Zheng, sp. nov.**

<http://zoobank.org/49362125-03C8-440B-82F5-9C145BE214C9>

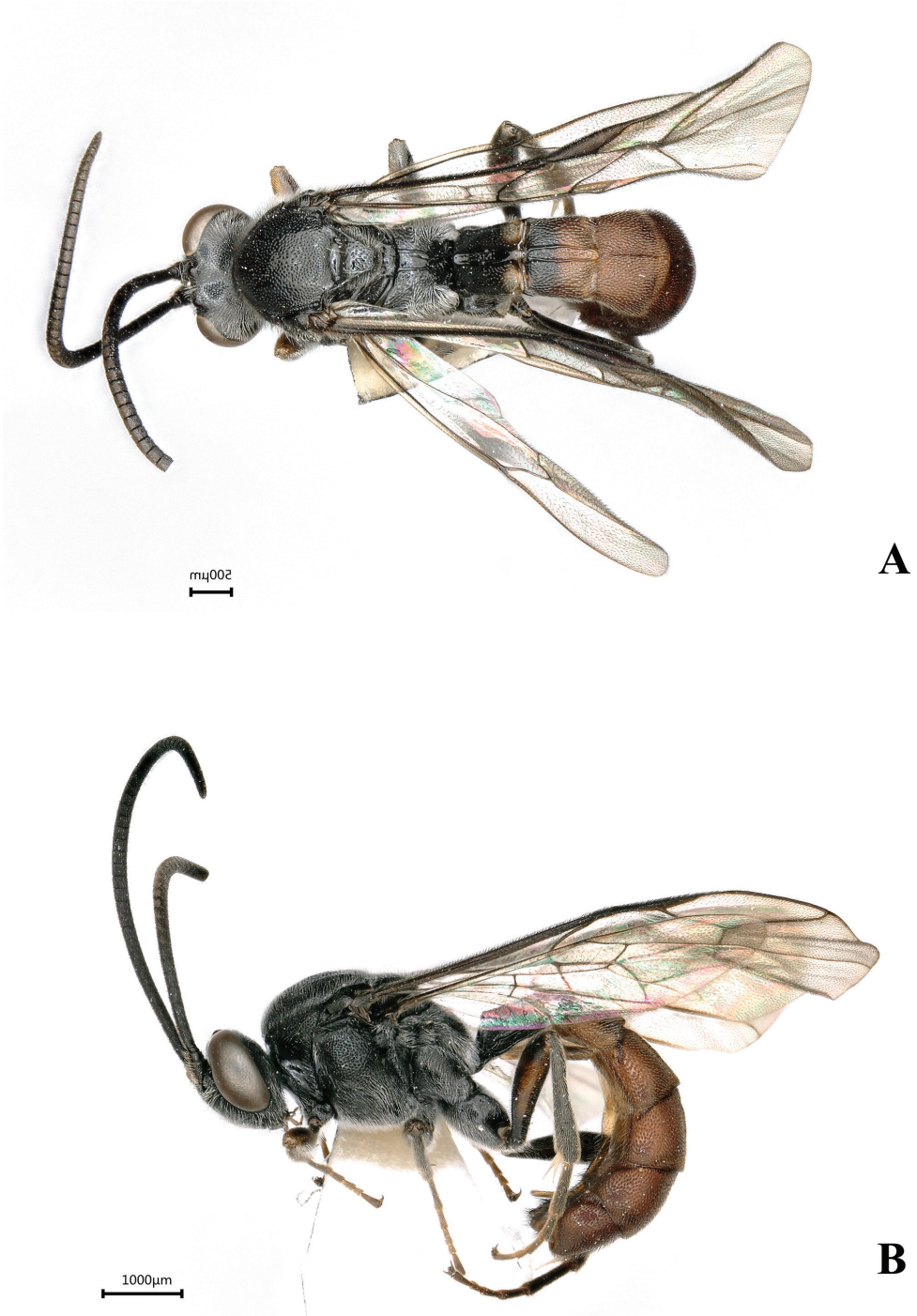
Figs 3, 4

**Materials examined. Holotype**, female. CHINA: Yunnan Province, Yuxi City, Xiping County, Mt. Ailao, Cha Ma Gu Dao, 98°53'43.38"N, 28°18'56.4984"E, 2538 m, 8. Aug. 2018, Zheng Xin-Fang leg., DNA voucher, SCAU 3013943, GenBank number: [MW528531](https://www.ncbi.nlm.nih.gov/nuotide/MW528531), (SCAU).

**Descriptions.** Female. Fore wing length 7.5 mm, body length 8.0 mm (Fig. 3).

**Head.** Combined face and clypeus densely and strongly punctate, densely setose, 0.7× as wide as high (Fig. 4A). Clypeus with transverse wrinkles. Mandible bidentate, with lower tooth as long as the upper one. Inner eye orbit weakly curved above antennal sockets. Vertex strongly vertical behind posterior ocelli, with minute punctures, densely setose. POL:OD:OOL=2:1.2:1. Temple strongly narrowed behind eyes in dorsal view (Fig. 4F), densely setose. Occipital carina complete and sharp. Antenna with 41 flagellomeres, first flagellomere 2.6× as long as its posterior width, 1.4× as long as the second, antenna weakly flattened from 9<sup>th</sup> flagellomere to apex.

**Mesosoma.** Pronotum strongly punctate and setose on upper half, more or less shiny and glabrous on lower half, with a row of short and transverse wrinkles along posterior margin. Epomia strong, reaching upper 0.8 of pronotum. Mesoscutum



**Figure 3.** *Drepanoctonus chamagudao* Liu & Zheng, sp. nov., female, holotype **A** habitus, dorsal view **B** habitus, lateral view.



strongly punctate and setose (Fig. 4C). Notaulus absent. Scutellum flattened, sparsely punctate, with lateral carinae present at base (Fig. 4C). Mesopleuron (Fig. 4D) strongly roundly convex, densely punctate, sternaulus weakly impressed; epicnemial carina with dorsal end distant from the front edge of mesopleuron, speculum very small and polished. Mesopleural suture weakly foveolate. Metapleuron sparsely punctate, lower part of metapleuron with several transverse wrinkles, juxtacoxal carina present, sub-metapleural carina complete. Propodeum short, dorsal lateral areas strongly punctate and setose, area superomedia polished and nearly impunctate, latero-median longitudinal carinae complete and parallel, dorsomedial section of posterior transverse carina absent (Fig. 4B); lateral longitudinal carina strong and complete; pleural area rugose-punctate, with dense and long setae, pleural carina strong and complete. Spiracle elongate,  $2.0\times$  as long as its median width, connected to pleural carina by a short carina.

**Wings.** Fore wing with 1cu-a distad of M&RS, separated from M&RS by  $0.67\times$  its own length, 2m-cu almost opposite to 2rs-m, 3rs-m absent. Hind wing with Cu & cu-a interrupted above the middle, distal abscissa of Cu weakly pigmented.

**Legs.** Fore and mid claws with 1–2 pectinate teeth at base. Mid tibial spurs nearly equal in length. Hind femur  $4.8\times$  as long as its maximum width, hind tibia  $5.8\times$  as long as its maximum width, hind tibial spurs equal in length,  $0.57\times$  as long as 1<sup>st</sup> segment of tarsus (Fig. 4G). Ratio of segments of hind tarsus as follows: 36: 18:12:7:12.

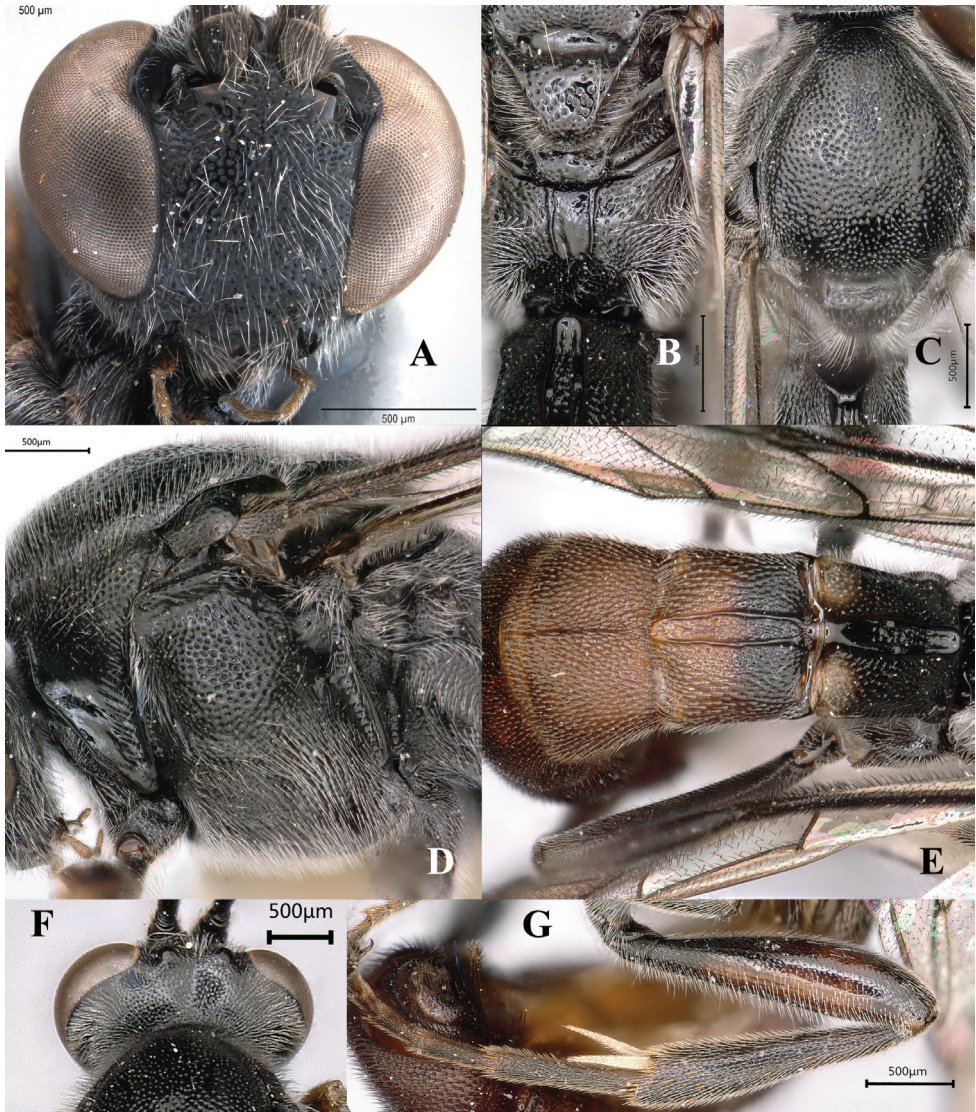
**Metasoma.** T1  $1.0\times$  as long as its apical width, punctate, latero-median longitudinal carinae strong, anterior base of T1 strongly oblique in lateral view, dorsolateral carina sharp and complete, spiracle located on anterior 0.3 of the tergite (Fig. 4E). T2 weakly transverse,  $0.9\times$  as long as its apical width, strongly punctate with a pair of latero-median longitudinal carinae reaching to posterior margin of tergite (Fig. 4E). T3 strongly punctate,  $0.78\times$  as long as apical width, with median longitudinal carina reaching to apical 0.8 of tergite (Fig. 4E). T4 transverse, strongly punctate, centrally with a median longitudinal carina, both ends of the carina distant from the margins of tergite. T5 strongly punctate, punctures of central area close to each other. T6 shallowly punctate. T7 very short. Ovipositor short,  $0.88\times$  as long as 1<sup>st</sup> segment of hind tarsus.

**Colour.** Head and mesosoma black, covered with whitish setae (Fig. 4A, F). Antenna black, 9<sup>th</sup> segment to the apex ventrally blackish–brown (Fig. 3A, B). Palpi blackish–brown. All coxae and trochanters black (Fig. 3B), fore leg dark brown with anterior sides of femur and tibia light brown; mid leg blackish–brown, anterior side of femur and ventral side of tarsus brown; hind leg black, anterior side of femur reddish–brown (excluding basal 0.3 which is black), tibial spurs whitish, ventral side of tarsus slightly tinged with reddish brown. First tergite black, with two yellowish white spots on posterior lateral corners, second tergite with anterior 0.4 black and posterior 0.6 reddish brown, the remaining tergites reddish brown (Fig. 3A). Wings hyaline, veins and pterostigma black (Fig. 3A).

**Male.** Unknown.

**Distribution.** China (Yunnan province).

**Comments.** This species is similar to *D. bicolor* (Fig. 2), but it differs from the latter in the presence of median longitudinal carina on T3 and T4 (Fig. 4E), the col-

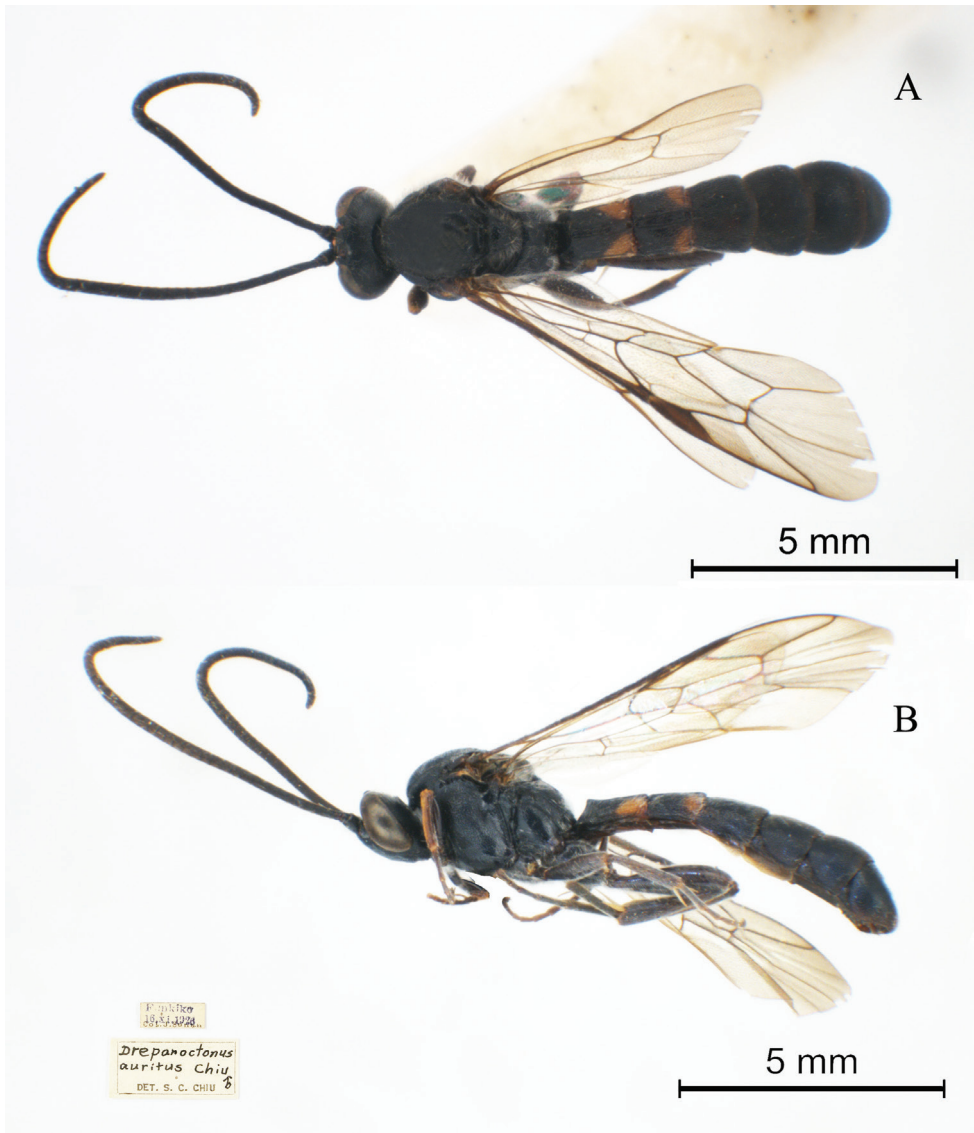


**Figure 4.** *Drepanoctonus chamagudao* Liu & Zheng, sp. nov., female, holotype **A** face **B** propodeum, dorsally **C** mesonotum **D** mesopleuron **E** T1–T3, dorsally **F** head, dorsally **G** hind leg, laterally.

ouration of the second tergite which is black on anterior half and reddish brown on posterior half, the colouration of the first tergite which has yellow spots on its posterior lateral corners (Fig. 3B).

It also very resembles *Drepanoctonus auritus* Chiu, 1962 (Fig. 5A, B), but can be separated from the latter by the colour pattern of its metasoma (Fig. 4E), T1 black with a pair of yellowish white spots on its posterior lateral corners, and the posterior half of T2 and following tergites reddish, hind femora with anterior sides reddish–brown (Fig. 4E).

**Etymology.** The species is named after the type locality, Chamagudao, which means the Ancient Tea Horse Road of Yunnan province.



**Figure 5.** *Drepanoctonus auritus* Chiu, 1962, female, holotype **A** habitus, dorsal view **B** habitus, lateral view.

***Drepanoctonus rimdabli* Liu & Reshchikov, sp. nov.**

<http://zoobank.org/442B0121-963C-49F1-8FAC-CEA1D81C3E60>

Figs 6, 7

**Materials examined.** *Holotype*, female, THAILAND: Chiang Mai, Mae Taeng, Pa Pae, 19°14'30.6"N, 98°30'14.1"E, old forest with *C. sinensis assamica*, Malaise trap (Dara#1), 04.V-25.V.2017, Monsoon Tea leg. (NHRS), DNA voucher, SCAU3013719, GenBank number: [MW528534](https://www.ncbi.nlm.nih.gov/nuclot/MW528534); *Paratypes*, 1 female, the same locality as holotype, Malaise trap (Dara#1), 12 Apr. – 03 May 2017, Monsoon Tea leg., DNA voucher,



SCAU 3013713, GenBank number: [MW528533](#), (QSBG); 1 male, the same locality as holotype, Malaise trap (Dara#1), 12 Apr. – 03 May 2017, Monsoon Tea leg., DNA voucher, SCAU 3013712, GenBank number: [MW528532](#)(QSBG).

**Description.** Holotype. Female, fore wing length 7.5 mm, body length 9.0 mm (Fig. 6A, B).

**Head.** Combined face and clypeus weakly convex,  $0.80\text{--}0.90\times$  as wide as high, densely and evenly punctate, lateral corner of clypeus weakly wrinkled (Fig. 7A); upper margin of face not produced medially as an acute triangle between bases of antennae. Lateral and posterior margins of antennal sockets developed into a low flange with weak earlike dorsolateral projections. Inner orbits of eye weakly concave above antennal sockets. Vertex strongly vertical behind posterior ocelli, with minute punctures, densely setose. POL:OD:OOL=2:1.2:1. Temple strongly narrowed behind eyes in dorsal view (Fig. 7C), densely setose. Occipital carina complete and sharp. Antenna with 37 flagellomeres, first flagellomere  $2.9\times$  as long as its posterior width,  $1.5\times$  as long as the second flagellomere, ventral side of 9<sup>th</sup> flagellomere to apex flattened, with sensilla plates.

**Mesosoma.** Pronotum with upper lateral corner finely punctate and densely setose, lower part polished with a row of transverse depressions. Epomia strong, reaching to upper 0.8 of pronotum. Mesoscutum with minute punctures, distance between punctures  $0.5\text{--}1.0\times$  the diameter of a puncture (Fig. 7D). Notaulus absent. Scutellum scattered with sparse punctures, lateral carina sharp, reaching to 0.6 of scutellum (Fig. 7B). Mesopleuron (Fig. 7E) strongly convex, with moderately dense minute punctures, separated from each other by  $1.0\text{--}2.0\times$  the diameter of a puncture; epicnemial carina with dorsal end far from the front edge of mesopleuron; speculum very small; mesopleural furrow weakly foveolate. Metapleuron (Fig. 7E) moderately convex, upper  $2/3$  with sparse minute punctures, anterior lower  $1/3$  with scattered, weak wrinkles, juxtacoxal carina incomplete, with only basal 0.6 present; submetapleural carina complete. Propodeum short, latero-median longitudinal carinae complete and gradually convergent from base to middle; area superomedia polished and glabrous, closed posteriorly; posterior transverse carina complete (Fig. 7B); dorsal lateral areas of propodeum densely setose, with minute punctures; pleural carina strong and complete; pleural area weakly rugose-punctate, densely setose. Spiracle elongate,  $2.0\times$  as long as its median width, connected with pleural carina by a short carina.

**Wings.** Fore wing with 1cu-a distad of M&Rs by  $0.5\times$  the length of 1cu-a, 2rs-m slightly reclivous, very slightly anterior of 2m-cu. Hind wing with Cu & cu-a interrupted on lower 0.4, distal abscissa of Cu distinct.

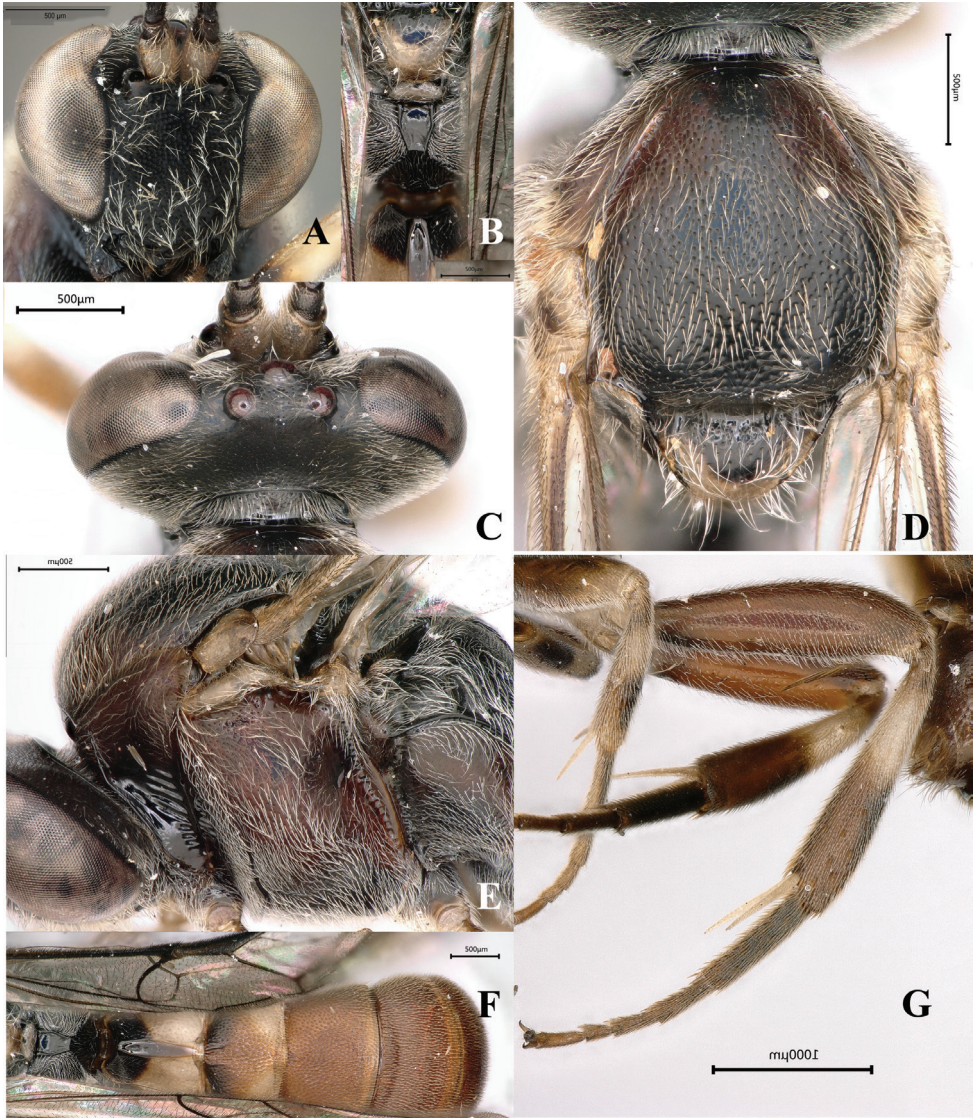
**Legs.** Mid tibial spurs equal in length and  $0.63\times$  the length of 1<sup>st</sup> segment of hind tarsus. Hind femur  $4.0\times$  as long as its maximum width (Fig. 7G); hind tibia  $0.53\times$  as long as its maximum width, with several bristles on posterior half, longest tibial spur  $0.88\times$  the length of 1<sup>st</sup> segment of hind tarsus. Ratio of segments of hind tarsus: 38:20:14:8:14.

**Metasoma.** T1  $1.25\times$  as long as its posterior width, latero-median longitudinal carinae weak but forming a longitudinal convex area, lateral area of T1 subpolished, with sparse minute punctures, dorsolateral carina complete and sharp (Fig. 7F). T2



**Figure 6.** *Drepanoctonus rimdabli* Liu & Reshchikov, sp. nov., female, holotype **A** habitus, dorsal view **B** habitus, lateral view **C** male paratype, lateral view.





**Figure 7.** *Drepanoctonus rimdabli* Liu & Reshchikov, sp. nov., female, holotype **A** face **B** propodeum, dorsally **C** head, dorsally **D** mesoscutum **E** mesopleuron **F** T1–T4, dorsally **G** hind leg, laterally.

moderately densely punctate,  $0.83\times$  as long as its apical width, without distinct carinae, but anteriorly and centrally with a pair of short stubs (Fig. 7F). T3 strongly punctate without any carinae (Fig. 7F). T4 with dense minute punctures, anterior  $0.3$  centrally with some short longitudinal wrinkles. T5 finely punctate. T6 polished, with sparse and minute punctures. Ovipositor  $1.2\times$  as long as  $1^{\text{st}}$  segment of hind tarsus, ventral valve with its anterior  $0.3$  weakly swollen.

**Colour.** Body with whitish setae. Head black (Fig. 7A, C). Antenna blackish–brown, scape whitish with lateral black marks. Pronotum with upper part dark red–

dish–brown, lower part black; mesoscutum black with anterior lateral corners dark reddish–brown; scutellum yellowish–white with a round black spot in anterior half; mesopleuron with upper 2/3 dark reddish–brown and lower 1/3 black, epicnemium black with upper 0.2 dark reddish–brown; subtegular ridge yellowish–white; metapleuron with upper half dark reddish–brown and lower half black; propodeum black. Metasoma reddish–brown, T1 yellowish–white with anterior 0.3 black and a longitudinal black stripe between mediodorsal carinae. T2 reddish brown with anterior corners black and posterior lateral corners yellowish–brown. Fore coxa and trochanter black with anterior side yellowish–white, fore femur brown with anterior side and apex yellowish–white, fore tibia yellowish–white, fore tarsus yellowish–brown; mid coxa black with anterior side yellowish–white, mid trochanter brown with anterior side white, mid femur brown, ventrally blackish–brown, apex of femur yellowish–white, mid tibia brown, with a sub-basal yellowish–white band, posterior 0.5 with outer margin blackish–brown, mid tarsus dark brown; hind coxa black with apex reddish–brown, hind trochanter yellowish–brown, hind femur reddish–brown, hind tibia brown with a sub-basal whitish band, hind tarsus blackish brown, hind tibial spur yellowish–white. Wings hyaline, tegula yellowish–white.

**Male.** (Fig. 6C) Similar to female. Fore wing length 6.5 mm, body length 8.5 mm. Combined face and clypeus moderately densely punctate, 3/4 as wide as high; POL:OD:OOL=3.5:2.25:1. Antenna with 38 flagellomeres, first flagellomere 2.6× as long as its posterior width, 1.5× as long as the second flagellomere. Hind femur 3.9× as long as its maximum width, longer spur of hind tibia 2/3 as long as 1<sup>st</sup> segment of hind tarsus. Ratio of segments of hind tarsus: 30:15:10:5:10. Head and mesosoma black. Antenna blackish–brown, scape yellowish–white with lateral blackish–brown marks. Metasoma reddish–brown, first tergite yellowish–brown, anterior 0.2 black, centrally with a longitudinal blackish–brown band between the latero-median longitudinal carinae. Tegula and subtegular ridge yellowish brown. All coxae black; fore trochanter blackish–brown, fore femur dark brown, fore tibia and tarsus yellowish–white. Mid trochanter brown with posterior half yellowish–white, mid femur brown, mid tibia brown with a sub-basal white band, mid tarsus yellowish–white. Hind leg brown, hind trochanter yellowish–white, hind tibia with a sub-basal whitish band, 1<sup>st</sup> segment of hind tarsus blackish brown. Wings hyaline, veins and pterostigma blackish–brown.

**Variation.** T2 of a female paratype, with a pair of short carinae on anterior 0.4 of tergite. Pronotum largely black with upper margin tinged with indistinct dark reddish–brown. Mesopleuron weakly marked with dark reddish–brown.

**Distribution.** Thailand (Chiang Mai).

**Comments.** This species can be separated from other species of the genus by the following combined characters: the upper margin of face not produced medially as an acute triangle between bases of antennae (Fig. 7A), T2 centrally with a pair of short stubs anteriorly, T3 and following tergites without carina (Fig. 7F).

**Etymology.** The species is named after Mr. Kenneth Rimdahl, the founder of Monsoon Tea, in recognition of his efforts in saving Thai forests.

## Discussion

In most species of *Drepanoctonus* the upper margin of the face is distinctly produced medially as an acute triangle between bases of antennae, and the upper side of the triangle is deeply grooved. This character is absent in *D. rimdahli* sp. nov., but we place this species in the genus *Drepanoctonus* because all other diagnostic characters match the generic description. Two species, *D. rimdahli* sp. nov. and *D. bicinctus*, have a pair of short stubs or incomplete latero-median longitudinal carinae on their second metasomal tergite (Fig. 7F), while the remaining species have a pair of strong and complete latero-median longitudinal carinae (Fig. 4E); this carina is completely absent in *D. bifasciatus*. Two species *D. chamagudao* sp. nov. and *D. auritus* have a single weak, incomplete, median longitudinal carina on T3 and T4 (Figs 3A, 4E, 5A, B), but these two species can be easily distinguished from each other by the colour pattern of metasoma.

Because of the lack of fresh material for the known species of *Drepanoctonus*, only the *COI* sequences of the two new species is available as an additional evidence for identification and future molecular analysis.

The scattered worldwide distribution of the genus *Drepanoctonus* (Fig. 1), is probably due to the lack of sampling (Yu et al. 2016; GBIF 2019).

## Acknowledgements

The authors are deeply grateful to the team of Monsoon Tea and its founder Kenneth Rimdahl for assistance in sampling in Northern Thailand; William Persson for type locality photography, Wang Peng for his kind help in field work in Yunnan; Ren Ya-Jun (South China Agricultural University) for collecting the specimens from Shanxi; Chi-Feng Lee (TARI), Simon van Noort (Iziko South African Museum), Agn  le Touret-Alby (MNHN) for their kind help and providing images of *Drepanoctonus* specimens; Franziska Bauer for the illustration of *D. tibialis* with its host and collecting information; Tony Hunter (World Museum, Liverpool, UK) for linguistic review of the manuscript; two reviewers, Filippo Di Giovanni (University of Pisa, Italy) and Mabel Alvarado (National University of San Marcos, Peru) for useful suggestions and review of our manuscript. This project was supported by the Natural Science Foundation of Guangdong Province (No.2021A1515010730, LJX), the Second Tibetan Plateau Scientific Expedition and Research Program (STEP), Grant No. 2019QZKK0402(AR), and Collaborative Innovation Center for Biodiversity and Conservation in the Three Parallel Rivers Region of China (AR).

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## Supplementary material I

### **fasta file of COI sequences of some species**

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Data type: sequence of COI

Explanation note: COI sequences of different individual specimens from the two new species.

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