CHECKLIST OF TUNNELLING DUNG BEETLES (COLEOPTERA: SCARABAEIDAE) IN LAI CHAU PROVINCE WITH THE FIRST REPORT OF NEW PROVINCIAL RECORDS

Bui Van Bac[1]

[1]*Vietnam National University of Forestry*

SUMMARY

Dung beetles (Coleoptera, Scarabaeidae) are recognised as good indicators in many tropical forests, but little is known about their community composition in tropical karst ecosystems. This study investigated the species composition of tunnelling dung-beetles inhabiting arable land of karst ecosystems in Lai Chau province. Tunnellers were by far the dominant functional group of dung beetles in these ecosystems. The dung-beetle sampling was conducted in the rice, corn and tea fields of karst ecosystems in Sin Ho district and Lai Chau city. A total of 45 baited pitfall traps were deployed to collect tunnelling dung-beetles between August and November 2019. Nine tunnelling dung-beetles were recorded during the dedicated surveys of this study, increasing the number of tunnelling dung-beetles known to date to 16 species in Lai Chau province. Of which, two species, *Synapsis tridens* Sharp, 1881 and *Liatongus gagatinus* (Hope, 1831) were recorded for the first time in Lai Chau. In the following, I re-described these two species, including detailed illustrations and morphometrics of both sexes. At the same time, updated data on the distribution and habitat notes of the two tunnelling dung-beetles were given. The first checklist of tunnelling dung beetles (Coleoptera: Scarabaeidae) in Lai Chau province was also complied.

Keywords: Dung beetles, new provincial records, species checklist, tunnellers.

1. INTRODUCTION

The term "dung beetles" denotes beetle species of three families: Scarabaeidae, Aphodiidae and Geotrupidae (Coleoptera: Scarabaeoidea) (Hanski & Cambefort, 1991; Scholtz et al., 2009). Currently dung beetles comprise around 7000 described species, commonly divided into three functional groups, namely rollers, dwellers and tunnellers according to their distinct nesting and breeding behaviour. The rollers habitually produce dung balls from animal dung, then they roll these balls to translocate these resources to suitable new places. Most rollers belong to the subfamily Scarabaeinae. The dwellers comprise beetles of the subfamily Aphodiinae that feed and reproduce either within dung pats or at the interface between the dung pat and soil surface. The tunnellers typically dig tunnels below dung pats to store dung resources for their feeding and breeding activities. In terms of taxonomy, the tunnellers belong to the subfamilies Geotrupinae and Scarabaeinae (Scholtz et al., 2009; Inward et al., 2011; Nervo et al., 2014). These three functional groups show patterns of predominance according to geographic region. For example, the dwellers, especially in the genus *Aphodius*, are characteristic dung-beetle species in north temperate regions, while tunnellers are dominant in tropical regions (Hanski & Cambefort, 1991; Davis et al., 2001; Hayes et al., 2009; Shahabuddin et al., 2005).

In contrast to the comprehensive knowledge on dung-beetle taxonomy in north and south temperate regions, there is limited understanding of the taxonomy of dung beetles in the tropics, particularly in SE-Asia. Only few identification keys and species lists exist, mostly outdated, such as Paulian (1945), Balthasar (1963a, b), Ochi (1992) and Kabakov and Napolov (1999). In Vietnam, the dung-beetle fauna inhabiting tropical meadows and forests of karst ecosystems in Thanh Hoa and Cao Bang provinces were reviewed taxonomically and ecologically. Yet, there is still an incomplete understanding of dung beetles in other habitats over limestone in Vietnam. During the course of my examination on tunnelling dung-beetles collected in arable land in Sin Ho district and Lai Chau city (Lai Chau province), I discovered two new records of tunnelling dung-beetles from Lai Chau

province. In the following, I re-described these species, including detailed illustrations of both sexes. In addition, I compiled a checklist of all tunnelling dung-beetles known to date in Lai Chau province, together with updated data on the distribution and habitats.

2. RESEARCH METHODOLOGY

2.1. Dung-beetle sampling and identification

The field research was conducted in corn, rice and tea fields over limestone in Sin Ho district and Lai Chau city (Lai Chau province) between August and November 2019. Baited pitfall traps were used to collect dung beetles. The trapping protocol followed Bui et al. (2019). Briefly, 15 traps were placed at regular intervals of 150 m at each arable land. Each trap consisted of a 5-liter plastic bucket buried to its rim in the soil, filled with 70% ethanol, and baited with 300 grams of fresh buffalo dung. The trapped dung beetles were removed from the traps after 72 hours of trap exposure and preserved in 70% ethanol until examination in the lab.

Dung-beetle species were identified according to the keys and species lists of Bui et al. (2018), Bui and Bonkowski (2018), Kabakov and Napolov (1999), Balthasar (1963a, b).

2.2. Specimens examined

All specimens examined for this study are now deposited in the Vietnam National University of Forestry, Vietnam (curator: Bui Van Bac). Seven examined specimens of *Synapsis tridens* bear the same label data: Lai Chau prov. | Sin Ho district | arable land | baited pitfall traps | Lau A Cho leg. Eight specimens of *Liatongus gagatinus* were examined. Of which, four male specimens and one female specimen bear the same label data: Lai Chau prov. | Sin Ho district | arable land | baited pitfall trap | Lau A Cho leg; two male specimens and one female specimen were labelled as: Lai Chau prov. | Lai Chau city | arable land | baited pitfall trap | Ngo Minh Tuan leg.

2.3. Morphometrics

Measurements were taken with a digital caliper and from photographs taken through a digital microscope. The following morphometric traits were measured:

BoL	Body length from anterior margin of clypeus to posterior margin of elytra
BoW	Maximum body width
HeadL	Head length from anterior most point of clypeus to posterior margin of head
HeadW	Maximum head width
PronL	Maximum pronotum length
PronW	Maximum pronotum width
ElyL	Elytra length from apex to base
ProTiL	Protibia length
ProTiW	Maximum protibia width
ProTiSL	Protibial spur length
MesoTiL	Mesotibia length
MesoTiW	Maximum mesotibia width
1st MesoTiSL	1st mesotibial spur length (longest spur)
2nd MesoTiSL	2nd mesotibial spur length (shortest spur)
MetaTiL	Metatibia length from proximal constriction to apex
MetaTiW	Maximum metatibia width
MetaTiSL	Metatibial spur length
MetaTaL	Metatarsus length
MetaTa1L	Metatarsomere 1 length
MetaTa1W	Metatarsomere 1 width
MetaTa5W	Metatarsomere 5 width

Ranking of the density of punctures on the surface of elytra, pygidium and pro-, meso- and metafemora as: Contiguous punctures - distance between punctures: 0; very dense punctures - distance between punctures: < 1x diameter of the puncture; dense punctures - distance between punctures: 1–2x diameter of the puncture; sparse punctures - distance between punctures: >2x diameter of the puncture. The elytral punctures were measured at the middle of the second elytral interval, the pygidial punctures were measured at middle, and the femoral punctures were also measured at middle.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Checklist of tunnelling dung-beetles in Lai Chau province

A total of nine tunnelling dung-beetle species were collected in the arable land of tropical karst ecosystems in Sin Ho district and Lai Chau city (Lai Chau province) between August and November 2019 (Table 1). This finding increased the number of tunnelling dung-beetle species known to date in Lai Chau province to 16 species. The surveys revealed two new records for Lai Chau province, including *Synapsis tridens* (Sharp, 1881) and *Liatongus gagatinus* (Hope, 1831). In the following, I re-described these two new records including detailed illustrations of both sexes.

Table 1. Checklist of tunnelling dung-beetles in Lai Chau province

TT	Taxon	Recorded species in this study		Recorded species in Lai Chau according to Kabakov and Napolov 1999	New records
		Sin Ho District	Lai Chau City		
1	*Catharsius molossus* (Linnaeus, 1758)	+	+	+	
2	*Copris* (*Microcopris*) *reflexus* (Fabricius, 1787)	+	+	+	
3	*Copris* (*s. str.*) *magicus* Harold, 1881	+	+	+	
4	*Liatongus vertagus* Fabricius, 1798	+	+	+	
5	*Liatongus gagatinus* (Hope, 1831)	+	+		+
6	*Oniticellus cinctus* (Fabricius, 1775)			+	
7	*Onitis falcatus* (Wulfen, 1878)	+	+	+	
8	*Onitis subopacus* Arrow, 1931			+	
9	*Onthophagus* (*gibbonthophagus*) *rectecornutus* Lansberge, 1963			+	
10	*Onthophagus* (*gibbonthophagus*) *luridipennis* Bohemann, 1858	+	+	+	
11	*Onthophagus* (*Paraphanaeomorphus*) *trituber* (Wiedeman, 1823)			+	
12	*Onthophagus* (*Parascatonomus*) *muticifrons* (Endrödi, 1973)			+	
13	*Onthophagus* (*s. lato*) *orientalis* Harold, 1868	+	+	+	
14	*Paragymnopleurus* (*sinuatus*) *productus* Sharp, 1875			+	
15	*Paragymnopleurus melanarius* Harold, 1867			+	
16	*Synapsis tridens* Sharp, 1881	+	+		+

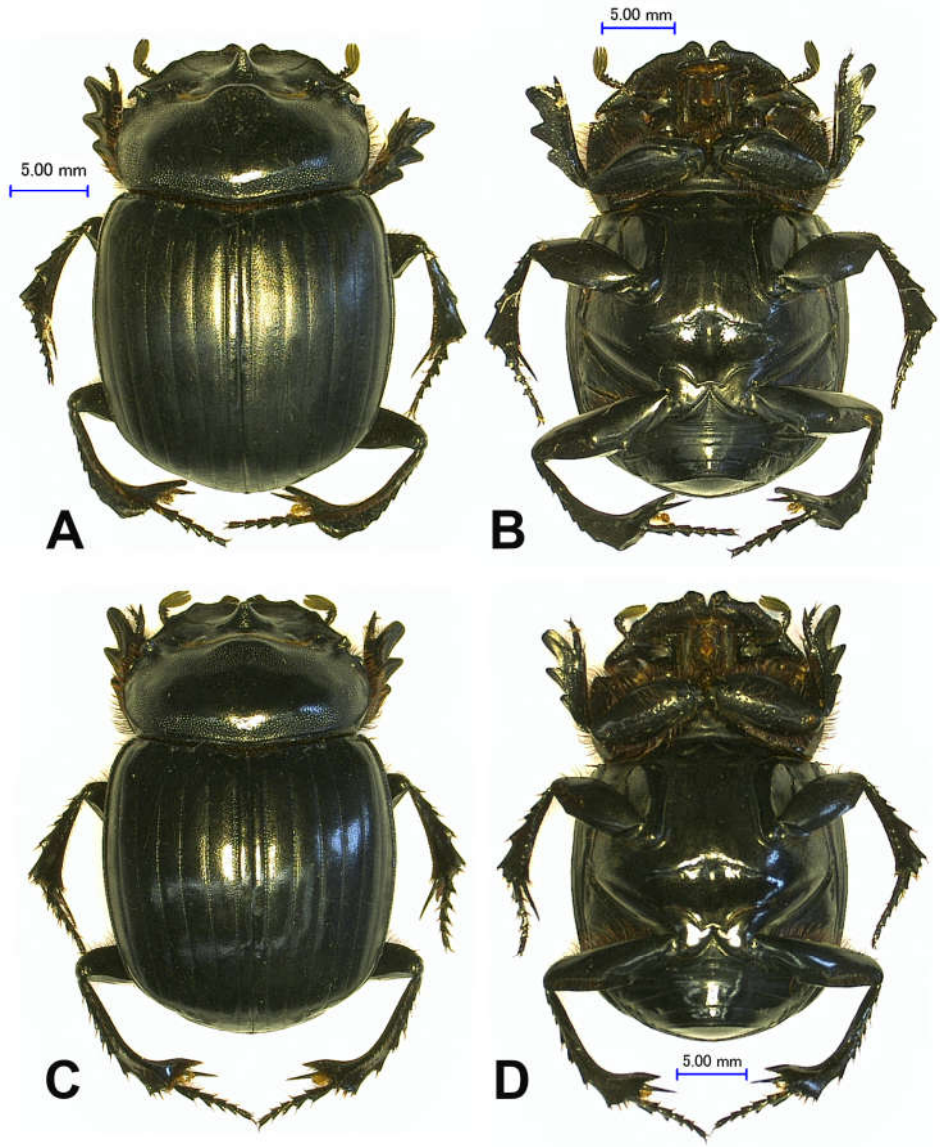
3.1.2. Re-description of two new provincial records

a. *Synapsis tridens* Sharp, 1881

Synapsis tridens Sharp, 1881: xcii (original description).

Figures 1 A–D

Morphometrics: Table 2



Figures 1. Male specimen (A, B) and female specimen (C, D) of *Synapsis tridens*. A, C, habitus, dorsal view; B, D, habitus, ventral view

Specimens examined. VIETNAM, Vietnam National University of Forestry (VNUF): Seven specimens with same label data: Lai Chau prov. | Sin Ho district | arable land | baited pitfall traps | Lau A Cho leg.

Diagnoses: Clypeal surface strongly rugose. Frons bears one distinct horn; horn apex sparsely punctate, while horn base strongly rugose. Genae apex pointed and slightly downwards curved. Surface of pronotum bears coarse punctures at sides, base and anterior areas, but smooth in middle; pronotal sulcus absent; anterolateral margins of pronotum bear three teeth. Anterior angles of prothorax without excavation on ventral side. Elytral striae shallow and indistinctly punctate.

Re-description of males

Body length 18 – 18.4 mm, body width 11 – 11.3 mm. Colour: Whole dorsal surface black and glabrous; ventral surface shiny black on thorax, abdomen and femora, and black on head. Macrosetae upon legs and pronotal margins reddish brown. Mouthparts, maxillary palpi and tarsi reddish brown. Antennae brown; antennomeres IV–VI darker than other antennomeres.

Head broad (HeadL 3.7 – 4.0 mm, HeadW 7.4 – 7.6 mm), extremely rugose anteriorly, hind part granular. Anterior margin of clypeus deeply notched and bluntly bilobed; lobes

produced, forming long, curved and sharply pointed processes. Genae expanded and distinctly separated from clypeus by well-defined suture; genae apex pointed and slightly downwards curved; surface of genae coarsely, closely, deeply and evenly punctate. Frons bears one distinct horn; horn apex sparsely punctate, while horn base strongly rugose. Antennae with nine antennomeres; length of antennomere I equal in length to antennomeres II–VI combined.

Pronotum transverse, 4.8 – 5.0 mm long, and 9.7 – 10.1 mm wide, widest in middle; pronotal disc smooth and shiny in middle, but deeply and coarsely punctate on sides, base and third anterior areas; pronotal sulcus indistinct. Area behind anterior margin of pronotum possesses one slightly blunt prominence. Anterolateral margins of pronotum bear three teeth. Two lateral carinae on each side of pronotum clearly distinct; margin of outer carina rounded, and bear long and dense reddish brown macrosetae; area between carinae smooth.

Anterior angles of prothorax flat, and shallowly and sparsely punctate on ventral side. Prosternum smooth and shiny.

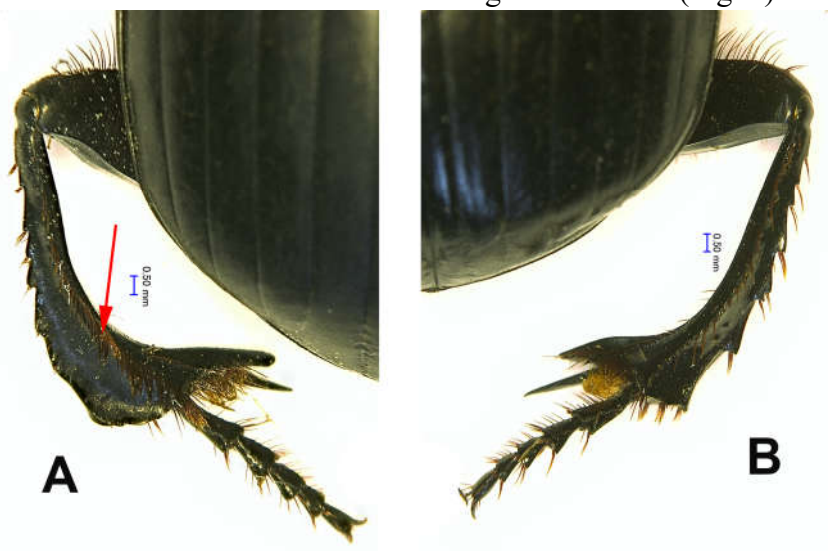
Elytra (ElyL 11.1 – 11.5 mm) opaque and shallowly striate; elytral striae indistinctly punctate; elytral intervals nearly flat and indistinctly punctuate.

Mesepisternum and metepisternum flat and weakly punctate. Meso-metaventrum plate almost smooth, with posterior median weak groove; surface of sides and anterior part sparsely and shallowly punctate.

Legs. Protibia (ProTiL 3.3 – 3.4 mm, ProTiW 2.3 – 2.4 mm, ProTiSL 1.2 – 1.3 mm) tridentate, terminal tooth as long as protibial spur and nearly as long as protibial tarsus. Mesotibia (MesoTiL 3.3 – 3.6 mm, MesoTiW 1.3 – 1.4 mm, 1stMesoTiSL 2 – 2.1 mm, 2ndMesoTiSL 0.9 – 1 mm) and metatibia (MetaTiL 5.8 – 5.9 mm, MetaTiW 1.2 – 1.3 mm, MetaTiSL 1.5 – 1.6 mm) bear red scanty macrosetae; spurs sharp. Mesotibia gently curved and moderately broad at posterior end, while metatibia extremely curved and strongly broad at posterior end. Ventral surface of femora indistinctly punctate; metafemora bear one sharp tooth at posterior margin. Metatarsomeres nearly similar in size (MetaTaL 3.6 – 3.7 mm, MetaTa1L 1.0 – 1.1 mm, MetaTa1W 0.6 – 0.7 mm, MetaTa5W 0.3 mm).

Abdomen and pygidium. Abdominal sternites opaque, sparsely and shallowly punctate, and narrower at midline. Pygidium weakly rugose.

Sexual dimorphism. Males differ from females by metatibia with long and dense fringe of red setae (Fig. 2).



Figures 2. Metatibia with long and dense fringe of red setae in males (A) and metatibia without fringe of red setae in females (B)

Distribution and habitats: India, China, Bengal, Laos, Myanmar, Thailand, Vietnam (Arrow, 1931; Balthasar, 1963a; Zidek & Pokorny, 2010; Bui & Bonkowki, 2018). In Vietnam, *Synapsis tridens* was found in high elevation tropical forests in Sa Pa (Lao Cai province), Muong Xen (Nghe An province), Son-Ba-Muoi (Thanh Hoa province), Pia Oac (Cao Bang province) by Kabakov and Napolov (1999) Bui and Bonkowski (2018) and Bui et al. (2019). This study revealed a new habitat of *Synapis tridens*, being agricultural land in Sin Ho district (Lai Chau province).

b. *Liatongus gagatinus* (Hope, 1831)

Liatongus gagatinus Hope: 22 (original description).

Figures 2 A, B

Morphometrics: Table 2

Specimens examined. VIETNAM, Vietnam National University of Forestry (VNUF): Eight specimens. Four male specimens and one female specimen with same label data: Lai Chau prov. | Sin Ho district | arable land | baited pitfall trap | Lau A Cho leg. Two male specimens and one female specimen labelled: Lai Chau prov. | Lai Chau city | arable land | baited pitfall trap | Ngo Minh Tuan leg.

Diagnoses: Antennae with eight antennomeres. Maxilla short, with broad terminal membranous lobe. Mentum transverse and broadly bilobed. Each labial palps consists of three segments: segment I short, segment II elongate and segment III minute. Scutellum present, very small. Posterior margin of elytra without fringe of bristles or setae. Metasternum sparsely punctate. Pygidium without a sharp ridge parallel to the base.

Re-description

Body length 12.7 – 13.6 mm, body width 7.4 – 7.6 mm. Colour: Head and prothorax shiny black. Elytra surface opaque. Legs reddish-black. Mouthparts, maxillary palpi and macrosetae upon legs and pronotal margins reddish brown. Antennae brown; antennal club darker than other antennomeres. Outer margins of pygidium and abdomen red.

Head broad (HeadL 1.9 mm, HeadW 1.2 – 1.5 mm) and rugose anteriorly. Anterior margin of clypeus shallowly and widely notched; clypeal surface minutely punctate. Genae rectangular, distinctly separated from clypeus by well-defined suture; most surface of genae smooth, except for small areas in middle sparsely and weakly punctate. Frons very smooth and shiny and strongly separated from clypeus by one sharp carina; posterior carina dilated and produced at angles, forming a pair of short diverging and backwards curved horns. Antennae with eight antennomeres; antennal club darker than other antennomeres

Pronotum transverse, 5.9 – 6.1 mm long, and 7.6 – 7.8 mm wide, widest in middle; anterior part of pronotum retuse in middle and slightly hollowed at each side; pronotal surface weakly punctate on anterior part and sides, and deeply and densely punctate in middle and base. Pronotal disc with distinct median sulcus; sulcus not extending to pronotal anterior margin. Margin of outer carina rounded and without macrosetae.

Elytra very short (ElyL 5.3 – 5.5 mm) and deeply sulcate. Elytra deeply striate; striae evenly and shallowly punctate. Elytral intervals relatively convex, microscopically sculptured, and minutely and sparsely punctate.

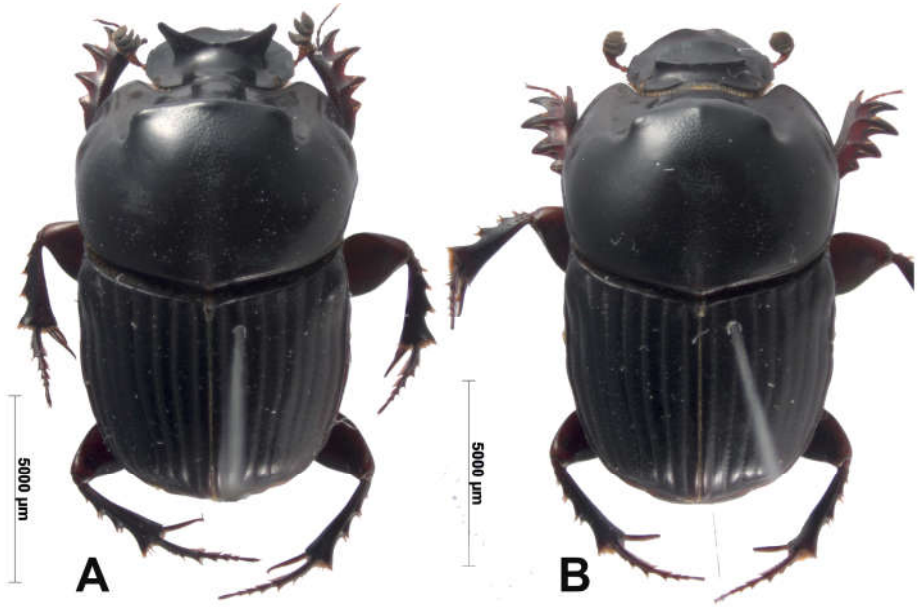
Meso-metaventrum plate almost smooth and shiny in middle, and opaque and granulate on sides.

Legs. Protibia (ProTiL 2.4 – 2.5 mm, ProTiW 1.4 – 1.6 mm, ProTiSL 0.7 – 0.8 mm) bear four strong and sharp teeth; protibial spur very short. Mesotibia (MesoTiL 2.5 – 2.6 mm, MesoTiW 1.0 – 1.1 mm, 1stMesoTiSL 1.2 – 1.3 mm, 2ndMesoTiSL 0.5 – 0.6 mm) and metatibia (MetaTiL 2.6 – 2.9 mm, MetaTiW 0.9 – 1.1 mm, MetaTiSL 1.3 – 1.4 mm) possess sharp spurs. Mesotibia moderately broad at posterior end. Ventral surface of femora indistinctly punctate; Metatarsomere 1 as long as Metatarsomere 2 – 5 combined (MetaTaL 2.5 –

2.6 mm, MetaTa1L 1.2 – 1.3 mm, MetaTa1W 0.2 – 0.3 mm, MetaTa5W 0.1 mm).

Abdomen and pygidium. Abdominal sternites and pygidium opaque, sparsely and shallowly punctate.

Sexual dimorphism. Males differ from females due to possessing a shorter and weakly punctate clypeus. The posterior carina of males are dilated and produced at the angles, forming a pair of short diverging, sharp and backwards curved horns, while the posterior carina of females are not produced at the angles.



Figures 3. Dorsal habitus of male specimen (A) and female specimen (B) of *Liatongus gagatinus*

Distribution and habitats. *Liatongus gagatinus* has wide distribution from Kashmir, North and Central India, Assam, Burma to Laos and North Vietnam (Balthasar, 1963b) This species was known for the first time in Vietnam from specimens collected from Lao Cai province at an elevational range of 900 – 2000 m (a.s.l.) in Sa Pa and Dong Pao (Kabakov & Napolov 1999). Recently, we found the population of this species in meadows of karst ecosystems in Cao Bang province (Bui et al., 2019). The herein presented specimens constitute a new record for Lai Chau province.

Table 2. Morphometrics of *Synapsis tridens* (Sharp, 1881) and *Liatongus gagatinus* (Hope, 1831) (in mm)

No.	Traits	*Synapsis tridens*		*Liatongus gagatinus*	
		Male specimens (n = 3)	Female specimens (n = 4)	Male specimens (n = 6)	Female specimens (n = 2)
1	BoL	18–18.4	17.2–18.5	12.7–13.6	12.4–12.5
2	BoW	11–11.3	9.9–11.8	7.4–7.6	7.0–7.4
3	HeadL	3.7–4.0	3.5–4.0	1.9	1.2–1.5
4	HeadW	7.4–7.6	6.9–7.5	3.9–4.1	3.9
5	PronL	4.8–5.0	4.6–5.1	5.9–6.1	5.2–5.4
6	PronW	9.7–10.1	8.9–10.2	7.6–7.8	6.9–7.4
7	ElyL	11.1–11.5	10.8–11.8	5.3–5.5	5.3–5.6
8	ProTiL	3.3–3.4	3.1–3.3	2.4–2.5	2.4
9	ProTiW	2.3–2.4	2.2–2.4	1.4–1.6	1.3
10	ProTiSL	1.2–1.3	1.1–1.5	0.7–0.8	0.6

No.	Traits	*Synapsis tridens*		*Liatongus gagatinus*	
		Male specimens (n = 3)	**Female specimens (n = 4)**	**Male specimens (n = 6)**	**Female specimens (n = 2)**
11	MesoTiL	3.3– 3.6	3.3–3.9	2.5–2.6	2.3–2.5
12	MesoTiW	1.3–1.4	1.1–1.5	1.0–1.1	1.0
13	1st MesoTiSL	2–2.1	1.7–2.2	1.2–1.3	0.9–1.1
14	2nd MesoTiSL	0.9–1.0	0.8–1.2	0.5–0.6	0.6
15	MetaTiL	5.8–5.9	5.5–6.0	2.6–2.9	2.5–2.7
16	MetaTiW	1.2–1.3	1.1–1.4	0.9–1.1	1.0
17	MetaTiSL	1.5–1.6	1.3–1.7	1.3–1.4	1.2–1.4
18	MetaTaL	3.6–3.7	3.5–4.0	2.5–2.6	2.8–2.9
19	MetaTa1L	1.0–1.1	1.0–1.2	1.2–1.3	1.2–1.4
20	MetaTa1W	0.6–0.7	0.5–0.8	0.2–0.3	0.2
21	MetaTa5W	0.3	0.3–0.4	0.1	0.1

3.2. Discussion

Both *Synapsis tridens* and *Liatongus gagatinus* were originally described with some text lines and lacking pictorial descriptions of the main morphological characters. Although the two species were re-described by Balthasar (1963 a, b), details on their intraspecific morphological variation are still lacking. Additionally the lack of illustrations of these species poses a major challenge for the practical identification. Therefore I provided detailed measurements of numerous morphological traits of the two species based on a series of examined individuals along with the photographs. This detailed morphological description intents to enable a reliable identification of species boundaries.

4. CONCLUSIONS

Nine tunnelling dung-beetles were recorded during the dedicated surveys of this study, increasing the number of known species of tunnelling dung beetles in Lai Chau to 16 species. The two species: *Synapsis tridens* (Sharp, 1881) and *Liatongus gagatinus* (Hope, 1831) are new records for Lai Chau province. The detailed photographic guide of these two species may be broadly useful for both specialists and non-specialists in the identification. Updated data on the distribution and habitat notes of the tunnelling dung-beetle species may contribute to our understanding of the evolution and ecology of these species.

Acknowledgements

I would like to thank Mr. Lau A Cho and Mr. Ngo Minh Tuan from the Lai Chau Provincial Forest Protection for sending their dung-beetle collections to examine.

REFERENCES

1. Arrow, G. J. 1931. *The fauna of British India, including Ceylon and Burma. Coleoptera Lamellicornia. Part III (Coprinae)*. Taylor and Francis, London, 428 pp.

2. Balthasar, V. 1963a. *Monographie der Scarabaeidae und Aphodiidae der Palaearktischen und Orientalischen Region. Coleoptera: Lamellicornia. Band 1. Allgemeiner Teil, Systematischer Teil: 1. Scarabaeinae, 2. Coprinae (Pinotini, Coprini)*. Verlag der Tschechoslowakischen Akademie der Wissenschaften, Prag., 391 pp.

3. Balthasar, V. 1963b. *Monographie der Scarabaeidae und Aphodiidae der palaearktischen und orientalischen Region. Coleoptera: Lamellicornia. Band 2. Coprinae (Onitini, Oniticellini, Onthophagini)*. Verlag der Tschechoslowakischen Akademie der Wissenschaften, Prag., 627 pp.

4. Bui, V. B. & Bonkowski, M. 2018. *Synapsis puluongensis* sp. nov. and redescription of *Synapsis horaki* (Coleoptera: Scarabaeidae), with a key to Vietnamese species. *Acta Entomologica Musei Nationalis Pragae* **58** (2), 407–418. doi:10.2478/aemnp-2018-0032.

5. Bui, V. B., Dumack, K. & Bonkowski, M. 2018. Two new species and one new record for the genus Copris (Coleoptera: Scarabaeidae: Scarabaeinae) from Vietnam with a key to Vietnamese species. *Eur. J. Entomol*. **115**, 167–191.

6. Bui, V. B., Ziegler, T. & Bonkowski, M. 2019. Morphological traits reflect dung beetle response to land use changes in tropical karst ecosystems of Vietnam. *Ecological Indicators* **108**, 1–9.

7. Davis, A. J., Holloway, J. D., Huijbregts, H., Krikken, J., Kirk-Spriggs, A. H. & Sutton, S. L. 2001. Dung beetles as indicators of change in the forests of northern Borneo. *Journal of Applied Ecology* **38**, 593–616. doi:10.1046/j.1365-2664.2001.00619.x.

8. George, R. G. 1831. The Zoological Miscellany Zool. Miscell. 40pp.

9. Hanski, I. & Cambefort, Y. 1991. *Dung Beetle Ecology*. Princeton University Press, Princeton, 481 pp.

10. Hayes, L., Mann, D. J., Monastyrskii, A. L. & Lewis, O. T. 2009. Rapid assessments of tropical dung beetle and butterfly assemblages: contrasting trends along a forest disturbance gradient. *Insect Conservation and Diversity* **2**,194–203.

11. Inward, D. J. G., Davies, R. G., Pergande, C., Denham, A. J. & Vogler, A. P. 2011. Local and regional ecological morphology of dung beetle assemblages across four biogeographic regions. *Journal of Biogeography* **38**, 1668–1682. doi:10.1111/j.1365-2699.2011.02509.x.

12. Kabakov, O. N. & Napolov, A. 1999. Fauna and ecology of Lamellicornia of subfamily Scarabaeinae of Vietnam and some parts of adjacent countries: South China, Laos, and Thailand. *Latvijas Entomologs* **37**, 58–96.

13. Nervo, B., Tocco, C., Caprio, E., Palestrini, C. & Rolando, A. 2014. The effects of body mass on dung removal efficiency in dung beetles. *PLoS ONE* **9**(9): e107699. doi:10.1371/journal.pone.0107699.

14. Ochi, T. 1992. Studies on the coprophagous scarab beetles from East Asia. 1. (Coleoptera: Scarabaeidae). *Giorn. Ital. Entomol.* **6**, 9–14.

15. Paulian, R. 1945. *Faune de l'Empire Français III. Coléopt!res Scarabéides de l'Indochine. Première partie*. Paris, Libraire Larose, 225 pp.

16. Scholtz, C. H., Davis, A. L. V. & Kryger, U. 2009. *Evolutionary biology and conservation of dung beetles*. Pensoft Publisher, Bulgaria, 565pp.

17. Schulze, C. H. & Tscharntke, T. 2005. Changes of dung beetle communities from rainforests towards agroforestry systems and annual cultures in Sulawesi (Indonesia). *Biodiversity and Conservation* **14**, 863–877.

18. Sharp, D. 1881. Note sur l'Ateuchus tmolus Fisch. Avec description d'une espèce nouvelle du genre Synapsis. *Annales de la Société Entomologique de Belgique* **25**, xci–xcii.

19. Zidek, J. & Pokorny, S. 2010. Review of Synapsis Bates (Scarabaeidae: Scarabaeinae: Coprini), with description of a new species. *Insecta Mundi* **142**, 1–21.

DANH LỤC CÁC LOÀI BỌ HUNG ĐÀO HANG (COLEOPTERA: SCARABAEIDAE) TẠI TỈNH LAI CHÂU CÙNG VỚI BÁO CÁO ĐẦU TIÊN VỀ NHỮNG LOÀI ĐƯỢC GHI NHẬN MỚI TẠI KHU VỰC

Bùi Văn Bắc[1]

[1]*Trường Đại học Lâm nghiệp*

TÓM TẮT

Bọ cánh cứng ăn phân (Coleoptera, Scarabaeidae) được biết đến là nhóm sinh vật chỉ thị sinh học hiệu quả trong nhiều khu rừng nhiệt đới, nhưng rất ít nghiên cứu về thành phần loài của chúng ở hệ sinh thái núi đá vôi. Nghiên cứu này được thực hiện để xác định thành phần loài của nhóm bọ hung "đào hang" sinh sống trên vùng đất trồng trọt của hệ sinh thái núi đá vôi ở tỉnh Lai Châu. Nhóm bọ hung đào hang là một nhóm chức năng của quần xã bọ hung chiếm ưu thế trong các hệ sinh thái núi đá vôi. Các đợt điều tra thu bắt bọ hung được tiến hành trên các cánh đồng lúa, ngô và chè của hệ sinh thái núi đá vôi tại huyện Sìn Hồ và thành phố Lai Châu. Tổng cộng 45 bẫy đã được triển khai để thu thập bọ hung đào hang trong khoảng thời gian từ tháng 8 đến tháng 11 năm 2019. Chín loài bọ hung đào hang đã được thu thập trong các cuộc khảo sát, nâng tổng số loài bọ hung đào hang được biết đến nay lên 16 loài ở tỉnh Lai Châu. Trong đó, hai loài, *Synapsis tridens* (Sharp, 1881) và *Liatongus gagatinus* (Hope, 1831) đã được ghi nhận lần đầu tiên ở Lai Châu. Tiếp theo, bài viết đã mô tả lại hai loài này, bao gồm hình ảnh minh họa chi tiết và đặc điểm kích thước hình thái của cả hai giới. Đồng thời, dữ liệu về phân bố và sinh cảnh của hai loài này được cập nhật. Danh lục loài đầu tiên về bọ hung đào hang (Coleoptera: Scarabaeidae) ở tỉnh Lai Châu cũng đã được biên soạn.

Từ khóa: Bọ hung, danh lục loài, đào hang, ghi nhận mới.

Received : 24/4/2020
Revised : 07/7/2020
Accepted : 14/7/2020