



## Studies of the Genus *Thyreus* Panzer (Hymenoptera: Apidae: Apinae) with Six New Records from Vietnam

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**ABSTRACT:** Nine species of the genus *Thyreus* Panzer, 1806 (Hymenoptera: Apidae: Apinae) from Vietnam are presented. Three species, *Thyreus himalayensis* (Radoszkowski, 1893), *T. histrio* (Fabricius, 1775) and *T. massuri* (Radoszkowski, 1893) are reconfirmed to occur in Vietnam. Six species, *T. abdominalis* (Friese, 1905), *T. centrimacula* (Pérez, 1905), *T. ceylonicus* (Friese, 1905), *T. decorus* (Smith, 1852), *T. medius* (Meyer, 1921) and *T. regalis* Lieftinck, 1962 are newly recorded for the Vietnamese fauna. A redescription of *T. abdominalis rostratus* is provided. Keys to both sexes of all recorded species are given with illustrations.

**Keywords:** Hymenoptera, Apidae, *Thyreus*, new records, Vietnam.

### INTRODUCTION

*Thyreus* Panzer, 1806 is distributed in Central and South Asia, Europe, Africa and Oceania (Ascher & Pickering, 2016). This genus comprises 111 described species worldwide, with 13 species recorded in southeastern Asia. A total of 83 species of this genus are recognized in the Palearctic and Indo-Australian areas after revision (Ascher & Pickering, 2016). Forty species are recorded in sub-Saharan Africa after the revision by Eardley (1991). Revisions of the genus *Thyreus* in Indo-Australia, the Palearctic and Spain were conducted by Lieftinck (1958, 1959, 1962), Lieftinck (1968) and Vergés (1967), respectively.

In *Thyreus*, body size is greatly dependent on environmental conditions. In the female, the main characteristics used to differentiate species include color, size and confluence or interruption of hair patches on the thorax. However, in the male, classification is also based on the same characters as in the female as well as characters such as presence or absence of a tooth on the hind femur, shape of a modified middle tibia and genitalia.

All species of *Thyreus* are considered to be cleptoparasites of other bees belonging to the genera *Amegilla* and *Anthophora*. Species numbers of these genera are greater than *Thyreus* in all countries where they co-occur, hence individual species of *Thyreus* may not be limited to single host species (Lieftinck, 1962).

In Vietnam, studies on the Apidae fauna in general and the genus *Thyreus* in particular are very limited. Up to now, only four species of this genus have been recorded

here (Ascher & Pickering, 2016, Khuat et al., 2012 and Le, 2008): *Thyreus cyathiger* Lieftinck, 1962, *T. himalayensis* (Radoszkowski, 1893), *T. histrio* (Fabricius, 1775) and *T. massuri* (Radoszkowski, 1893). In this study, six newly recorded species are added to the list of *Thyreus* in Vietnam.

### MATERIALS AND METHODS

The material examined is deposited in the collections of the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam. Observations of morphological and color characters were made on pinned and dried specimens under a stereoscopic dissecting microscope. Body length is the combined length of the head, mesosoma and first two metasomal segments.

Photographic images were made with the Leica M80 Stereo Microscope, using LAS exclusive microscopy software (LAS EZ 3.1.1); the plates were edited with Photoshop CS6.

The acronyms of the museums/institutions in which the type material is deposited are as follow:

BM: British Museum (Natural History), London (I. H. H. Yarrow).

MP: Muséum National d'Historie Naturelle, Paris (Madelle S. Kelner-Pillault).

OUM: Oxford University Museum, Hope Department of Entomology, Oxford (E. Taylor and G. Varley).

USNM: United States National Museum, Washington D. C. (K. V. Krombein).

MB: Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt Universität, Berlin (G. Steinbach). Abbreviations are used to denote the white or blue patches existing on the different parts of the mesosoma in this paper follow Lieftinck, 1962: *lpn*: lateral pronotum, *deps*: dorsal episternum, *hypm*: hypoepimeral area, *als*: antero-lateral mesoscutum, *ms*: median mesoscutum, *mls*: medio-lateral mesoscutum, *plsa*: anterior posterolateral mesoscutum, *pls*: postero-lateral mesoscutum, *t*: tegula, *ps*: parascutellum, *s*: scutellum.

The abbreviations S, T, NP and NR refer to numbered metasomal sterna, metasomal terga, National Park and Nature Reserve, respectively.

The rest of the morphological terminology follows Michener, 2007.

## RESULTS AND DISCUSSION

Oder: Hymenoptera

Family: Apidae

Subfamily: Apinae

Tribe: Melectini

Genus: *Thyreus* Panzer, 1806

*Crocisa* Jurine, 1801: 164. Type species:

*Nomada scutellata* Jurine, 1801

*Thyreus* Panzer, 1806: 263. Type species:

*Nomada scutellaris* Fabricius, 1781

*Crocisa* Jurine, 1807: 239. Type species:

*Nomada histrio* Fabricius, 1775

**Diagnosis.** A diagnosis for the genus *Thyreus* was given by Bingham, 1897 under the genus name *Crocisa*, as follows:

Body small and blue or white patches present. Labrum bent downwards at an angle to the margin of the clypeus. Mandibles narrow, simple, acute at apex. Labial palpus 5-jointed, the basal joint elongate, the 2nd less than half the length of the basal joint, the 3rd half the length of the 2nd, the apical two joints minute. Maxillary palpus 2-jointed. Mesosoma short, scutellum flat, produced into a plate posteriorly and emarginated. Wings broad, fore wing with the radial cell narrow, rounded at base and apex. Metasoma conical and acute at apex.

### Key to the females of Vietnamese species of *Thyreus* Panzer

(Characteristics of *T. abdominalis rostratus*, *T. cyathiger*, *T. histrio* and *T. medioides* were taken from Friese, 1905 and Lieftinck, 1962).

1. Light white pubescence. Lateral bare patch of T1 with L-shaped ..... *histrio*  
- Light pubescence with various tints of blue. Lateral bare patch of T1 differently shaped than above ..... 2
2. Metasomal terga with slightly metallic-purplish pubescence and T1 pubescence with greenish lustre. A bare patch of T1 V-shaped (as Fig. 8d) ..... *medioides*  
- Metasomal terga without metallic purplish pubescence. A bare patch of T1 not V-shaped ..... 3

3. T2-3 with paired, lateral, rounded blue patches  
*ceylonicus lilacinus*  
- Blue patches on each side T2-3 not round ..... 4
4. *ms* long, extending posteriorly beyond *mls* ..... 5  
- *ms* short, extending posteriorly to mid length of *mls* ..... 6
5. Patches on thorax rather small and narrow. Blue transverse bands of T2-4 straight, slightly interrupted medially ..... *abdominalis rostratus*  
- Patches on thorax larger and thicker. Blue transverse bands of T2-4 slightly curved, widely interrupted medially ..... 6
6. A bare patch at the central area of T1 cup-shaped ..... *cyathiger*  
- A bare patch at the central area of T1 not cup-shaped ..... 7
7. Blue transverse band on T3 not divided ..... 8  
- Blue transverse band on T3 divided into two unequal lateral spots ..... 9
8. A bare patch at the central area of T1 shaped as in Fig. 9E ..... *regalis*  
- A bare patch at the central area of T1 not shaped as in Fig. 9E ..... 10
9. *plsa* and *pls* confluent around tegula; *ps* present (Fig. 5b). A bare patch at the central area of T1 anvil-shaped and often wider than in the male (Fig. 5c), lateral bare patch on T1 not crescent-shaped ..... *himalayensis*  
- *plsa* and *pls* nearly confluent, *ps* absent (Fig. 2e). A bare patch at the central area of T1 not anvil-shaped (Fig. 2h), lateral bare patch of T1 crescent-shaped (Fig. 2f) ..... 10
10. *als*, *hypm* and *plsa* not confluent (Fig. 4b). Blue transverse band on T1 not interrupted midbasally and midapically; blue transverse bands on S2-4 only slightly interrupted medially (Fig. 4d). Outer surface of hind tibia with blue pubescence ..... *decorus*  
- *als*, *hypm* and *plsa* confluent (Fig. 7b). Blue transverse band on T1 slightly and equally interrupted mid basally and midapically; blue transverse bands on S2-4 more widely interrupted medially (Fig. 7c). A half of hind tibia from base with bluish white pubescence ..... *massuri*

### Key to the males of Vietnamese species of *Thyreus* Panzer

(Characteristics of *T. cyathiger*, *T. decorus* and *T. regalis* were taken from Cockerell, 1920 and Lieftinck, 1962).

1. Light white pubescence. Lateral bare patch on T1 L-shaped (Fig. 6b)  
- Light pubescence with various tints of blue. Lateral bare patch on T1 differently shaped ..... 2
2. *ms* long, extending posteriorly to or beyond apical margin of *mls*  
- *ms* short, extending posteriorly to mid length of *mls* ..... 4

3. *als, plsa* confluent. T1 blue with a bare patch at the central area of T1, blue transverse band on T1 slightly interrupted midbasally and midapically (as female, Fig. 7c) or with small paired leaf-shaped bare patches (Fig. 7f). Blue transverse bands on T3-5 not interrupted or very slightly interrupted medially (Figs. 7c, 7f)  
.....*massuri*  
- *als, plsa* not confluent. Remaining characters not as above ..... 5
4. *als, plsa* and *pls* not confluent, or *plsa* and *pls* nearly confluent ..... 6  
- *als, plsa* not confluent; *plsa* and *pls* confluent ..... 7
5. *plsa, pls* not confluent. A bare patch at the central area of T1 rather broad. Blue transverse bands on T2-5 narrower than the black space separating them  
- *plsa* and *pls* confluent. A bare patch at the central area of T1 smaller. Blue transverse bands of T2-5 larger than the black space separating them
6. Lateral bare patch on T1 crescent-shaped (as Fig. 2f). A bare patch at the central area of T1 not cup-shaped. Outer surface of hind basitarsus and all tarsal segments with black pubescence ..... *centrimacula*  
- Lateral bare patch on T1 not crescent-shaped. A bare patch at the central area of T1 cup-shaped. Outer surface of hind basitarsus with blue and black pubescence ..... *cyathier*
7. A bare patch at the central area of T1 anvil-shaped and often small (Fig. 5f). Apical lobes of S7 strongly divaricate, subparallel sides with round apex, basal half of inner margin alongside emargination entire and devoid of microsetae ..... *himalayensis*  
- A bare patch at the central area of T1 differently shaped. Apical lobes of S7 broad, notch separating them narrow, inner margin alongside emargination fringed with microsetae ..... *ceylonicus lilacinus*
8. Blue transverse bands on T2-4 straight, narrowly interrupted medially ..... *abdominalis rostratus*  
- Blue transverse bands on T2-4 slightly curved, widely interrupted medially ..... 9
9. A bare patch at the central area of T1 shaped as in Fig. 9E but smaller ..... *regalis*  
- A bare patch at the central area of T1 V-shaped, with two branches slightly curved (Fig. 8d) ..... *medius*

#### *Thyreus abdominalis* (Friese, 1905)

*Crocisa abdominalis* Friese, 1905: 184-185, Java: , holotype *C. sordida* Ckll., labelled: Soekaboemi, III. 25. 09 Java, Bryant & Palmer coll., Type USNM no. 20718, *C. sordida* Ckll. Type, det. T. D. A. Cockerell (USNM).

*Thyreus abdominalis* Lieftinck, 1962: 57-70.

*Thyreus abdominalis* is a widely distributed species, has been recorded from the Himalayan States to eastern

China, down through Malaya to Borneo and beyond Java eastwards as far as the island of Flores, in the Lesser Sunda chain (Lieftinck, 1962).

The species comprises four sub species in the world: *T. abdominalis abdominalis* (Friese, 1905); *T. a. austrosunsanus* Lieftinck, 1962; *T. a. rostratus* (Friese, 1905); *T. a. simulator* Lieftinck, 1962.

#### *Thyreus abdominalis rostratus* (Friese, 1905) (Figs 1a-f)

*Crocisa rostratus* Friese, 1905: , holotype *C. rostratus* Friese, labelled: Sumatra Geb. 1886, H. Forbes (written), with red type label, *C. rostratus* Fr. , det. H. Friese 1904 (ZMB).

This subspecies is known to occur in Sumatra, Borneo, Malay States, Burma, Assam, Himalayan States (Lieftinck, 1962) and is newly recorded for Vietnamese fauna. The male of this subspecies was described very briefly by Friese (1905); it is redescribed below with detailed illustrations.

**Material examined.** Kon Tum: 1 , Pa Sy waterfall, Dak Long, Kon Plong, 14°36'02.6"N; 108°15'24.2"E, 1104m, 30.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ.

**Redescription. Male.** Body length: 10.5 mm, fore wing length: 12 mm. Antenna slender, final flagellar segment longest, remaining flagellar segments subequal in length. Side of scutellum undulated (Fig. 1b). Middle tibia short and flat (Fig. 1d). Apex of T7 nearly truncated, slightly undulated with lateral corner acute (Fig. 1c).

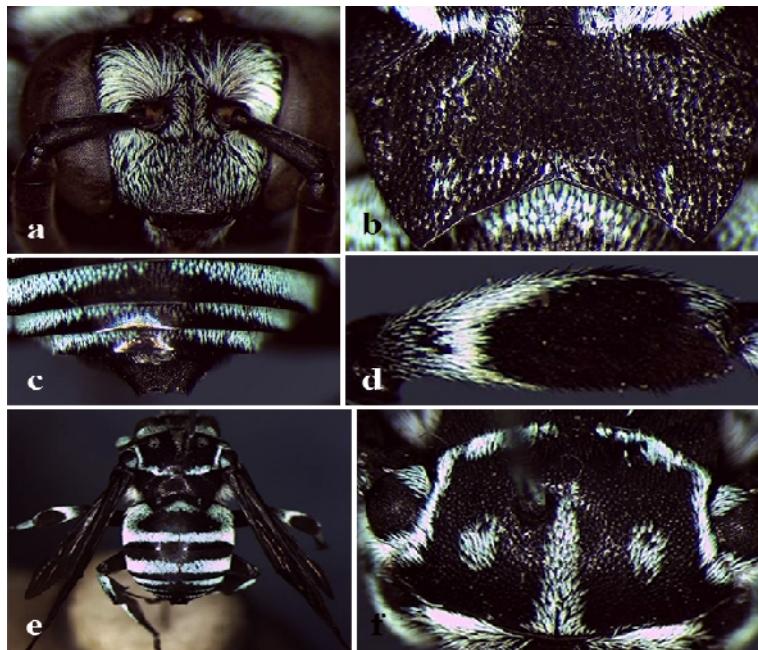
Fore wing dull and dark except submarginal cells and apex of marginal cell milky white.

Supraclypeal area, paraocular area from apical margin to over antennal socket and genal area with long, light blue, dense and soft pubescence. Side of clypeus with shorter and sparser pubescence. The central area of clypeus and sides of labrum with short, much sparser pubescence. The central area of labrum with scanty pubescence. Outer surface of antennal socket with white and long feather.

Mesosoma black with light blue patches as follows (Fig. 1f): *lpn* present, prominent and separated medially by a space narrower than its width; *als* ill-defined; *ms* present and prominent, extending posteriorly beyond apical margin of *mls*; *mls* present and defined; *plsa* present and confluent with *pls*; *pls* present, large, separated medially by a space much smaller than its width; *t* present at both basal and apical margin; *ps* and a patch above median notch of scutellum ill-defined; *s* absent. Mesoscutellum medially with white, long and dense pubescence protruding from beneath.

Legs black with black pubescence and with light blue pubescence as follows: outer surface of middle coxa and hind coxa with sparse pubescence, hind trochanter and outer surface of middle femur with sparser pubescence, outer surface of middle tibia with dense pubescence at basally and with sparser pubescence on anterior margin (Fig. 1d), outer surface of hind tibia with sparse

pubescence and pubescence much sparser at apical margin, hind basitarsus and hind tarsi with bristles. T1 with light blue patches except a broad bare patch in the middle, light blue transverse bands of T2-4 straight and slightly interrupted medially, light blue transverse bands of S2-4 widely interrupted medially.



**Fig. 1.** Characteristics of *Thyreus abdominalis rostratus*, male (a. Head frontal view; b. Scutellum dorsal view; c. T4-7 dorsal view; d. Right middle tibia dorsal view; e. Habitat dorsal view; f. Mesosoma dorsal view).

***Thyreus centrimacula* (Pérez, 1905) (Figs. 2a-h)**

*Crocisa centrimacula* Pérez, 1905: 32, Japan: , holotype *C. centrimacula* J. Pérez, labelled: Nippon moyen, Env. De Tokio et Alpes de Nikko, J. Harmand 1901/Type (red print), *Crocisa centrimacula* Pérez (red, J. Pérez' writing) (MP).

*Thyreus centrimacula* Lieftinck, 1962: 146-152.

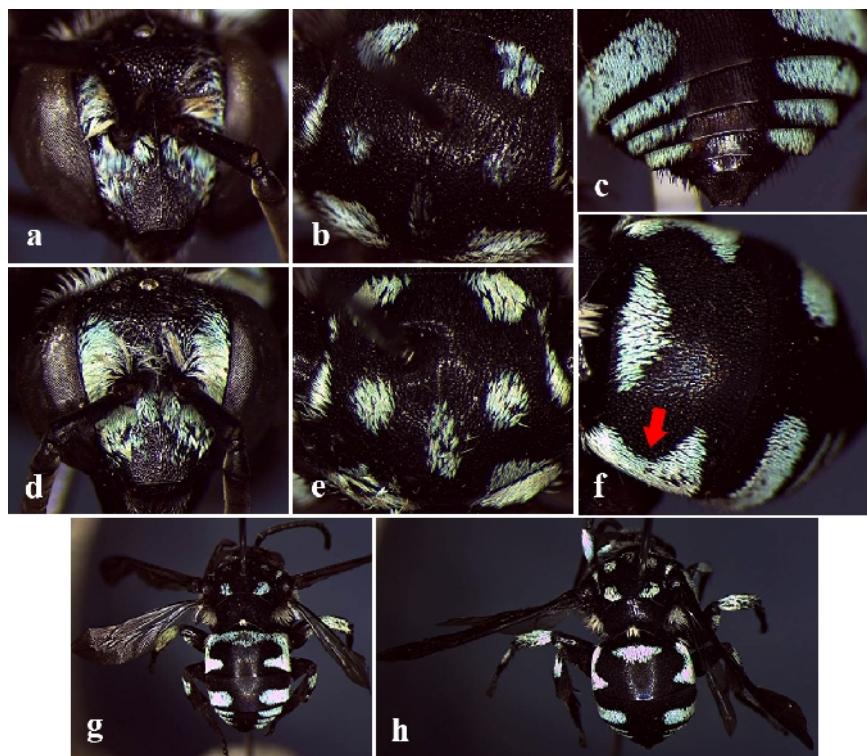
*Thyreus centrimacula* has been recorded from Japan, China, Korea and Taiwan (Ascher & Pickering, 2016; Lieftinck, 1962). This species is newly recorded for the Vietnamese fauna.

**Material examined:** **Ha Giang:** 1 , Dong van town, Dong Van, 22°07'16.6"N, 105°05'39.5"E, 1081m, 12.vii.2015, Nguyen DD, Nguyen MP, Nguyen CQ; **Cao Bang:** 1 , Thanh Cong, Nguyen Binh, 22°32'29.7"N, 105°52'51.7"E, 8.viii.2012, Kojima J, Nugroho H & IED-c; **Lao Cai:** 2 , Liem Phu, Van Ban, 14.v.2014, Tran Tuan Van; **Lang Son:** 1 , Cai Kinh, Huu Lung, 22°39'42.9"N, 106°15'36"E, 28m, 24.x.2015, Nguyen LTP, Nguyen DD, Truong LX, Tran NT; 1 , Cai Kinh, Huu Lung, 22°39'42.9"N, 106°15'36"E, 28m, 24.xi.2015, Nguyen LTP, Nguyen DD, Tran NT.

**Remarks. Male.** T7 narrowed strongly towards apex, margin not raised (Fig. 2c). Apical margin of S5 broad, black fringed transversely with short and dense pubescence. S6 somewhat produced medially but apex rounded, apical margin with black, shorter and sparser pubescence than in S5. *plsa* short and not confluent with *pls* and distance between *pls* patches larger than in the female (Fig. 2b).

**Female.** Pygidial plate tongue-shaped, narrowed towards apex, its surface flat and straight in laterally. Mesosoma with light blue patches as follows (Fig. 2e): *ms* extending posteriorly to about mid length of *mls*; *plsa* present, thin and nearly confluent with *pls*; *t*, *ps* and *s* absent. Mesoscutellum medially with white, long and dense pubescence protruding from beneath. Outer surface of about anterior half of hind tibia with light blue and dense pubescence; outer surface of hind basitarsus with blue pubescence mixed with sparse black setae.

Lateral bare patch of T1 with crescent-shaped (Fig. 2f), lateral blue transverse band of T3 divided into two unequal spots.



**Fig. 2.** Characteristics of *Thyreus centrimacula* (a. Head frontal view, male; b. Mesosoma dorsal view, male; c. T2-7 dorsal view, male; d. Head frontal view, female; e. Mesosoma dorsal view, female; f. T1 lateral view, female; g. Habitat dorsal view, male; h. Habitat dorsal view, female).

***Thyreus ceylonicus* (Friese, 1905)**

*Crocisa ceylonicus* Friese, 1905: 2, 4 & 8, Ceylon: , Ceylon, coll. O. Sichel 1867 (MP), female (sine patria), Rothney coll. (OUM).

*Thyreus ceylonicus* Lieftinck, 1962: 132-146.

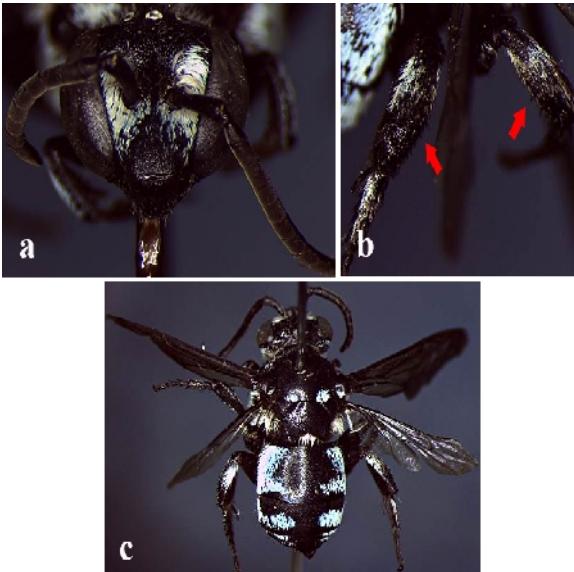
*Thyreus ceylonicus* is known to occur in Sri Lanka, India, Burma, Thailand, Malay States, Riouw Archip, Sumatra, Bangka I., Pulu Babi, Strait Sunda Island and Java (Ascher & Pickering, 2016; Lieftinck, 1962), but has not previously been collected in Vietnam. This species comprises eight subspecies: *T. ceylonicus andamanensis* (Meyer, 1921), *T. ceylonicus anguliger* (Cockerell, 1919), *T. ceylonicus ceylonicus* (Friese, 1905), *T. ceylonicus dives* Lieftinck, 1962, *T. ceylonicus lampides* Lieftinck, 1962, *T. ceylonicus lilacinus* Cockerell, 1919, *T. ceylonicus locuples* Lieftinck, 1962 and *T. ceylonicus nereis* Lieftinck, 1962.

In this study, we collected only one female specimen of *T. ceylonicus lilacinus* (Cockerell, 1919).

***Thyreus ceylonicus lilacinus* (Cockerell, 1919) (Figs. 3a-c)**

*Crocisa lilacina* Cockerell, 1919: 184, Java: , holotype *C. lilacina* Ckll., labelled: Buitenzorg, Java, 3.09, Bryant & Palmer coll., *C. lilacina* Ckll., Type,

det. T. D. A. Cockerell, USNM Type no. 20717 (USNM).



**Fig. 3.** Characteristic of *Thyreus ceylonicus lilacinus*, female (a. Head frontal view; b. Middle tibia and hind tibia; c. Habitat dorsal view).

*Thyreus ceylonicus lilacinus* Lieftinck, 1962: 141-145. *Thyreus ceylonicus lilacinus* is known to occur in Burma, Thailand, Malay States, Riouw Archip, Sumatra, Bangka I., Strait Sunda islands and Java (Lieftinck, 1962). This subspecies is newly recorded for the Vietnamese fauna.

**Material examined:** Dak Lak: 1 ♂, rock springs, Chu Yang Sin NP, Krong Kmar, Krong Bong, 12°26'0.07"N, 108°20'22.9"E, 822m, 3.v.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ.

**Remark. Female.** Middle tibia and hind tibia armed with projecting sharp spines (Fig. 3b). A bare patch at the central area of T1 roof-shaped (Fig. 3c). Gastral tergites non-metallic, with delicate lilac-blue pubescence.

#### *Thyreus decorus* (Smith, 1852) (Figs. 4a-d)

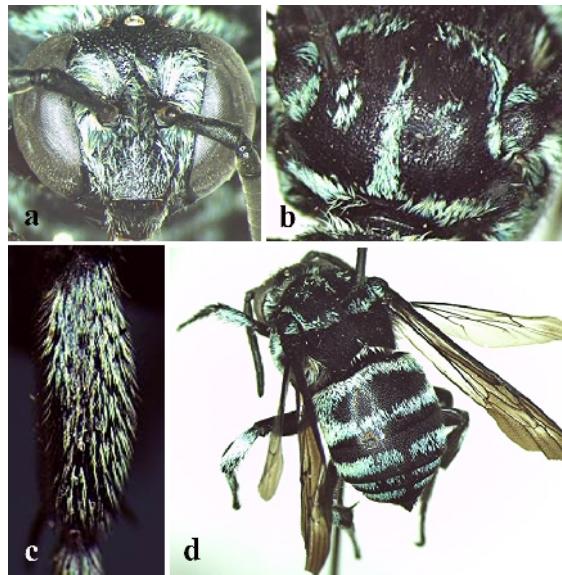
*Crocisa decora* Smith, 1852: 41, China: ♂, lectotype *Crocisa decora* F. Smith, with white disk: 'Shanghai', and 'Tein tung' (blue), Smith coll., pres. by Mrs. Farren-White 99-303, *Crocisa emarginata* Lep. (printed) (BM).

*Thyreus decorus* Lieftinck, 1962: 72-78.

*Thyreus decorus* has been recorded from Germany, India, China, Hongkong, Korea, Japan, Taiwan, Thailand, Himalayan States and Assam (Ascher & Pickering, 2016; Lieftinck, 1962). For this study, four female specimens were collected in Vinh Phuc and Gia Lai provinces. This species is recorded from Vietnam for the first time.

**Material examined:** Vinh Phuc: 1 ♂, Tam Dao NP, 21°26'N, 105°37'E, 400m, 20.viii.2005, J Kojima; Gia Lai: 1 ♂, Trai Dam, Kon Chu Rang NR, Son Lang, K Bang, 14°28'57.9"N, 108°30'59.8"E, 860m, 27.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ, 2 ♂♂, Dak Phan riverside, KBang, 14°28'09.8"N, 108°32'02.3"E, 900m, 28.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ.

**Remark. Female.** Mesosoma with pale blue patches as follows (Fig. 4b): *ms* extending posteriorly beyond apical margin of *mls*; *plsa* prominent and confluent with *pls*; *pls* large, separated medially by a space much smaller than its width; *t* present both at basal and apical margin; *ps* ill-defined; *s* absent. A patch anterior to the median notch of mesoscutellum ill-defined. Mesoscutellum medially with white, long and dense pubescence protruding from beneath. Outer surface of anterior half of hind tibia with pale blue and denser pubescence than on the remaining parts (Fig. 4c). Patch of T1 with blue pubescence at lateral margins except a broad bare patch in the middle; blue transverse bands of T2-4 slightly interrupted medially (Fig. 4d).



**Fig. 4.** Characteristics of *Thyreus decorus*, female (a. Head frontal view; b. Mesosoma dorsal view; c. Right hind tibia dorsal view; d. Habitat dorsal view).

#### *Thyreus himalayensis* (Radoszkowski, 1893) (Figs. 5a-f)

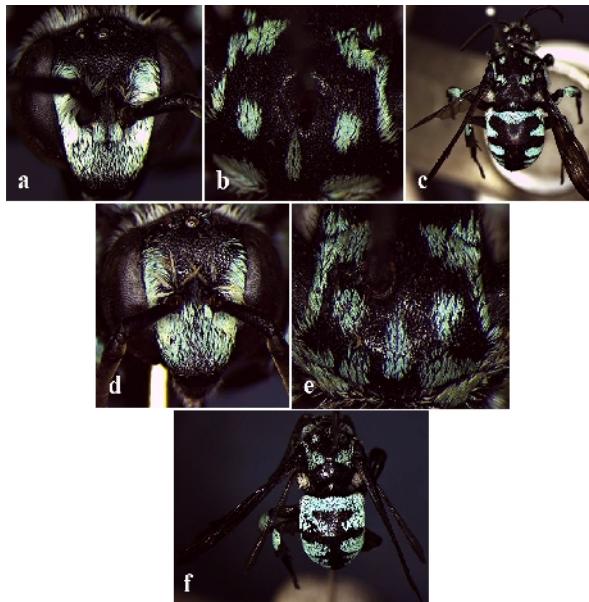
*Crocisa himalayensis* Radoszkowski, 1893: 17, Himalayan States: (diss.), holotype *C. himalayensis* Rad., labelled: coll. Radosz (printed), HIMAL. (old print), *Himalayensis* Rad., in Radoszkowski's writing, *C. emarginata* typ. Ex Lep. (sic!), det. H. Friese 1908 (ZMB).

*Thyreus himalayensis* Lieftinck, 1962: 121-132.

*Thyreus himalayensis* is distributed very widely and known to occur in Himalayan States and Assam, Bruma, Germany, India, China, Japan, Indochina, Thailand, Taiwan, Malay States, Bangka I., Karimundjawa Is, Singapore, Java and Indonesia (Ascher & Pickering, 2016; Lieftinck, 1962). In Vietnam, *T. himalayensis* has been recorded from Bac Giang and Ninh Thuan provinces (Ascher & Pickering, 2016). In this study, it was collected in Cao Bang, Bac Kan, Son La, Thua Thien Hue, Kon Tum, Gia Lai, Dak Lak, Dak Nong and Lam Dong provinces. This allows us to conclude that *T. himalayensis* is widely distributed throughout Vietnam.

**Material examined.** Cao Bang: 1 ♂, Thanh Cong, Nguyen Binh, 22°32'29.7"N, 105°52'51.7"E, 8.viii.2012, Kojima J, Nugroho H & IED-c; Bac Kan: 1 ♂, Kim Hy NP, Lang San, Na Ri, 22°19'22.6"N; 105°54'24"E, 4.viii.2012, Kojima J, Nugroho H & IED-c;

**Son La:** 1 , Muong Lum, Yen Chau, 21°01'03.9"N, 104°29'59.5"E, 798m, 19.vi.2015, Nguyen DD; 1 , Nam Pam, Muong La, 660m, 25.vii.2009, Nguyen LTP, Pham PH & Kojima J; **Bac Giang:** 1 , Thon Thac, An Lac, Son Dong, 21°20'15"N, 106°56'29"E, 4.vi.2015, Nguyen LTP, Nguyen DD, Tran DD; **Thua Thien Hue:** 1 , A Roang, A Luoi, >700m, 22.vii.2004, ISD-c; **Quang Nam:** 1 , Phuoc My, Phuoc Son, 670m, 28.vii.2004, ISD-c; **Kon Tum:** 1 , Ngoc linh NR, Dak Choong, Dak Gle, 15°10.8"N, 107°49"E, 849m, 10.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP; 1 , Sa Son, Sa Thay, 18°47'24.5"N, 104°58'46.5"E, 729m, 25.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ; 1 , Pa Sy waterfall, Dak Long, Kon Plong, 14°36'02.6"N, 108°15'24.2"E, 1104m, 30.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ; **Gia Lai:** 1 , 1 , Nga ba Ha Lam, gan thon 4, Son Lang, KBang, 29.iv.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ; 1 , Ia GLai, Chu Se, 2.v.2011, ISD-c; **Dak Lak:** 1 , 1 , Chu Yang Sin NP, Krong Kmar, Krong Bong, 12°25'02.8"N, 108°22'30.8"E, 1081m, 4.v.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ; 1 , Chu Yang Sin NP, Krong Kmar, Krong Bong, 12°27'05.3"N, 108°20'24.3"E, 744m, 5.v.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ; 2 , Eo So NR, Ea So, Ea Kar, 13°01'24.5"N, 108°33'13.6"E, 264m, 14.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP;



**Fig. 5.** Characteristics of *Thyreus himalayensis* (a. Head frontal view, female; b. Mesosoma dorsal view, female; c. Habitat dorsal view, female; d. Head frontal view, male; e. Mesosoma dorsal view, male; f. Habitat dorsal view, male).

**Dak Nong:** 1 , Ta Dung, Dak Som, Dak Glong, 11°51'24.7"N, 107°59'44.6"E, 1014m, 17.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP; 1 , Ta Dung NR, Dak Som, Dak Glong, 11°50'16"N, 107°59'17.4"E, 791m, 17.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP; **Lam Dong:** 1 , 1 , Cu Lan village, Da Lat, 10.v.2016, Nguyen LTP, Nguyen DD, Tran NT & Nguyen CQ.

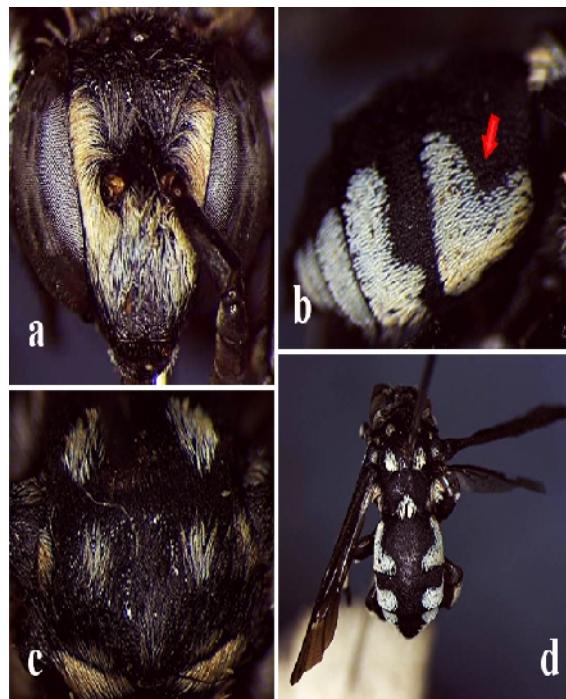
***Thyreus histrio* (Fabricius, 1775) (Figs. 6a-d)**

*Nomada histrio* Fabricius, 1775: 388-389, India: , holotype *C. chionotricha* Ckll., labeled: Coimbatore, south India, T. v. R. coll. 7. II. 1913, *Crocisa chionotricha* Ckll. Type, det. T. D. A. Cockerell (BM).

*Thyreus histrio* Lieftinck, 1962: 11-14.

This species is known to occur in Malawi, India, Sri Lanka and Burma (Ascher & Pickering, 2016). In Vietnam, *T. histrio* has been recorded in Vinh Phuc province, as *Crocisa histrio* and *T. histrio* by Le (2008). However, in fact, they are just one species because *T. histrio* is a synonym of *C. histrio*. This species has also been recorded in Phu Tho province by Khuat *et al.* (2012).

**Material examined. Dak Lak:** 1 , Ea So NR, Ea So, Ea Kar, 13°01'24.5"N, 108°33'13.6"E, 261m, 14.iv.2015, Nguyen LTP, DD Nguyen & MP Nguyen.



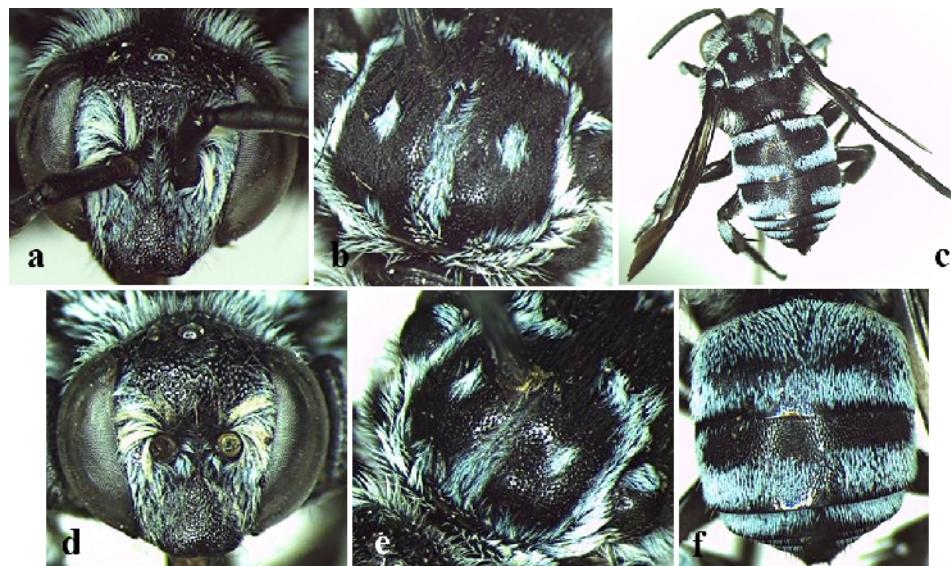
**Fig. 6.** Characteristics of *Thyreus histrio*, male (a. Head frontal view; b. T1 lateral view; c. Mesosoma dorsal view; d. Habitat dorsal view).

***Thyreus massuri* (Radoszkowski, 1893) (Figs. 7a-f)**  
*Crocisa Massuri* Radoszkowski, 1893: 169-170, , holotype *Crocisa ridleyi* Ckll., labelled: Penang, H. N. Ridley, 1900-111 (printed), *Crocisa ridleyi* Ckll. Type, det. T. D. A. Cockerell (BM).

*Thyreus massuri* Lieftinck, 1962: 89-96.

*Thyreus massuri* is known to occur in India, Assam, Burma, Thailand, Indochina, China, Malaysia and Sumatra (Ascher & Pickering, 2016; Lieftinck, 1962). In Vietnam, this species has been recorded from Yen Bai, Quang Ninh, Lam Dong and Khanh Hoa provinces by Ascher & Pickering (2016).

**Material examined.** **Tuyen Quang:** 1 , Son Phu RS, Na Hang NR, Na Hang, 22°21'07"N, 105°25'34.7"E, 264m, 9.vi.2015, Nguyen LTP, Nguyen DD, Truong LX; 1 , Road to Ban Bung, Na Hang NR, Na Hang, 22°16'59.5"N, 105°26'01"E, 369m, 11.vi.2015, Nguyen LTP, Nguyen DD, Truong LX; **Vinh Phuc:** 1 , 2 , Me Linh station, Phuc Yen, 25.v.2013, Dang Hoa Thi; **Dak Lak:** 1 , Ea So NR, Ea So, Ea Kar, 13°01'24.5"N, 108°33'13.6"E, 264m, 11.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP.



**Fig. 7.** Characteristics of *Thyreus massuri* (Head frontal view, female; b. Mesosoma dorsal view, female; c. Habitat dorsal view, female; d. Head frontal view, male; e. Mesosoma dorsal view, male; f. Gaster dorsal view, male).

#### ***Thyreus medius* (Meyer, 1921) (Fig. 8a-d)**

*Crocisa media* Meyer, 1921: 140, 143, Burma: , lectotype *C. media* Meyer, labelled: Rangoon Distr., vi. 1887, Coll. Bigham (printed, yellow), with red type label and *Crocisa media* n. spec. Type, det. Dr. R. Meyer (ZMB).

*Thyreus medius* Lieftinck, 1962: 112-121.

*Thyreus medius* is known to occur in Burma and India (Ascher & Pickering, 2016; Lieftinck, 1962). This species is newly recorded for the Vietnamese fauna.

**Material examined.** **Dak Nong:** 1 , Ta Dung NR, Dak Som, Dak Glong, 11°50'16"N, 107°9'17.4"E, 791m, 17.iv.2015, Nguyen LTP, Nguyen DD & Nguyen MP.

**Remark. Male.** Scutellum slightly concave, shaped as Fig. 8b. T7 with shaped as Fig. 8c. A bare patch at the central area of T1 with V-shaped (Fig. 8d). Gastral tergites with low metallic purplish pubescence and T1 with green luster pubescence.

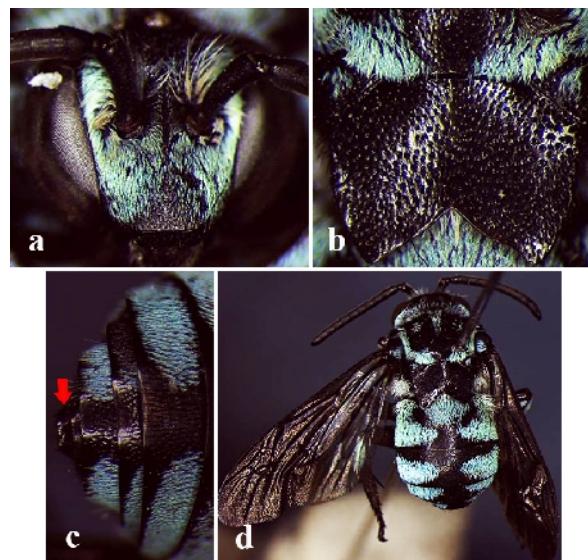
#### ***Thyreus regalis* Lieftinck, 1962 (Figs. 9a-e)**

*Thyreus regalis* Lieftinck, 1962: 82-86, Burma: (diss.), holotype, Burma, Carin Cheba, 900-1100 m, June 1888, L. Fea (MCG).

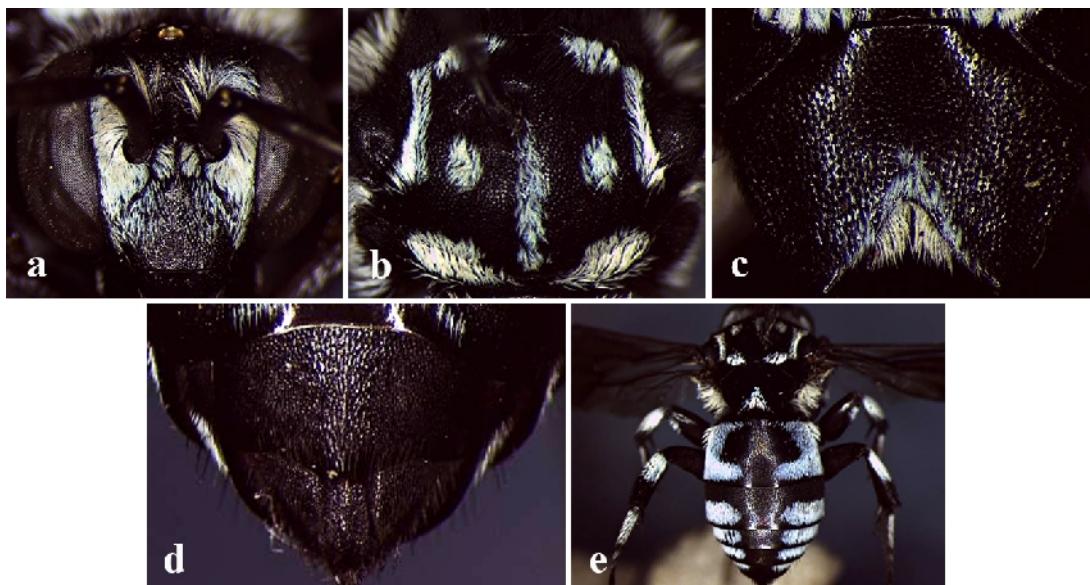
*Thyreus regalis* is only known to occur in Burma (Ascher & Pickering, 2016). This species is newly recorded for the Vietnamese fauna.

**Material examined.** **Vinh Phuc:** 1 , Me Linh Station, Phuc Yen, 10-11.vi.2014, Dang HT, Tran DD & Nguyen DT.

**Remark. Female.** Plate relatively narrowed towards apex, apex round, surface flat, straight on each side. S5 posteriorly produced (Fig. 9d). ms long, extending posteriorly beyond apical margin of mls, mls round. als and plsa not confluent, plsa and pls confluent, pls large (Fig. 9b), a blue patch above median notch of scutellum present (Fig. 9c). A bare patch at the central area of T1 broad, shaped as Fig. 9e, slightly interrupted at midbasal margin, widely interrupted at midapical margin, blue transverse bands of T2-4 widely interrupted medially.



**Fig. 8.** Characteristics of *Thyreus medius*, male (a. Head frontal view; b. Scutellum dorsal view; c. T4-7 dorsal view; d. Habitat dorsal view).



**Fig. 9.** Characteristics of *Thyreus regalis*, female (a. Head frontal view; b. Mesosoma dorsal view; c. Scutellum dorsal view; d. S5 ventral view; e. Habitat dorsal view).

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