

Two new species of the newly recorded subgenus *Tropidodynerus* Blüthgen (Hymenoptera, Vespidae, Eumeninae) from China, with a key to the known species

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Abstract

The genus *Tropidodynerus* Blüthgen is newly recorded from China and two new species of the genus are described and illustrated, namely *Tropidodynerus* (*Tropidodynerus*) *liupanshanensis* sp. n. from Ningxia, China and *T. (T.) concavus* sp. n. from Hebei, China. In addition, a key to all known species of the subgenus *Tropidodynerus* is updated. Type specimens of these two new species are deposited in Hebei University and Chongqing Normal University.

Keywords

Hymenoptera, Eumeninae, *Tropidodynerus*, new record, new species, China

Introduction

The genus *Tropidodynerus* includes five species with three subspecies worldwide, belonging to two subgenera, namely *Tropidodynerus* and *Tropidepipona* (van der Vecht and Carpenter 1990; Girish Kumar et al. 2013). So far, the subgenus *Tropidepipona* only occurs in the Oriental Region, and the subgenus *Tropidodynerus* is distributed in the Palearctic Region (Blüthgen 1939; Kurzenko 1977; Giordani Soika 1994; Guse-

nleitner 1998, 2007a, 2007b; Borsato 2006). No species of the genus was recorded from China. In our study of the eumenine wasps from China, two species of the subgenus *Tropidodynerus* were collected and recognized, which are new to science. In the present paper, these two new species are described and illustrated in detail, and a key to the worldwide species of the subgenus *Tropidodynerus* is updated. The key was produced based on both the examination of specimens and the information extracted from literature.

Materials and methods

The specimens examined are deposited in the Institute of Entomology and Molecular Biology, Chongqing Normal University, Chongqing, China (CQNU) and College of Life Sciences, Hebei University, Baoding (HBU), respectively. Descriptions and measurements were made under a stereomicroscope (Nikon SMZ1500), and all figures were taken with a stereomicroscope (LEICA EZ4HD) attached to a computer using Leica Application Suite version 2.1.0 software. The ratios used throughout the descriptions were measured in the same amplifying multiple of stereomicroscope. All measurements were taken as the maximal length of body parts measured. Body length was measured from the anterior margin of head to the posterior margin of metasomal tergum 2. For the density description of punctures, “sparsely” means that the intervals between are larger than diameter, “moderately” means equal to diameter, and whereas “densely” means less than diameter. The abbreviations used in the text are shown as follows: A1 for antennal segment 1, A2 for antennal segment 2, POD for postocellar distance, OOD for the minimum distance between the compound eye and posterior ocellus; T1 for metasomal tergum 1, T2 for metasomal tergum 2, S1 for metasomal sternum 1, S2 for metasomal sternum 2, and so on. Terminology principally follows Terminology principally follows Carpenter (1982) and Carpenter and Cumming (1985).

Taxonomy

Tropidodynerus Blüthgen, 1939

Tropidodynerus Blüthgen, 1939: 259, 260; Carpenter 1986: 87; van der Vecht and Carpenter 1990: 59; Girish Kumar et al. 2013: 163.

Type species. *Hoplomerus interruptus* (Brullé, 1832) = *H. mandibularis* Morawitz, 1885 (= *Polistes interrupta* Brullé, 1832), by original designation (confirmed by Blüthgen 1941: 306).

Diagnosis. Without cephalic fovea in female; vertex weakly longitudinally rugose; mesosoma and tempora with very fine pubescence, anterior face of pronotum without

foveae; tegula very short and its posterior lobe rounded; parategula elongated and its apex distinctly surpassing the apex of tegula; apical segments of antennae coiled in male; submarginal carina and valvula of propodeum not produced; mid tibia with one spur; forewing with second submarginal cell and not petiolate; metasoma sessile, S3–S7 with conspicuous fringe of setae in male.

Distribution. Oriental and Palearctic Regions.

Key to the subgenera of *Tropidodynerus*

- 1 Labial palpi 3-segmented; propodeum completely rounded at side, dorsal surface strongly convex; the Oriental Region (Giordani Soika 1994; Girish Kumar 2013)..... **subgenus *Tropidepipona***
- Labial palpi 4-segmented; propodeum somewhat rounded at side, dorsal surface not convex; the Palearctic Region (Giordani Soika 1994; Girish Kumar 2013).....**subgenus *Tropidodynerus***

Tropidodynerus (Tropidodynerus) liupanshanensis Li & Chen, sp. n.

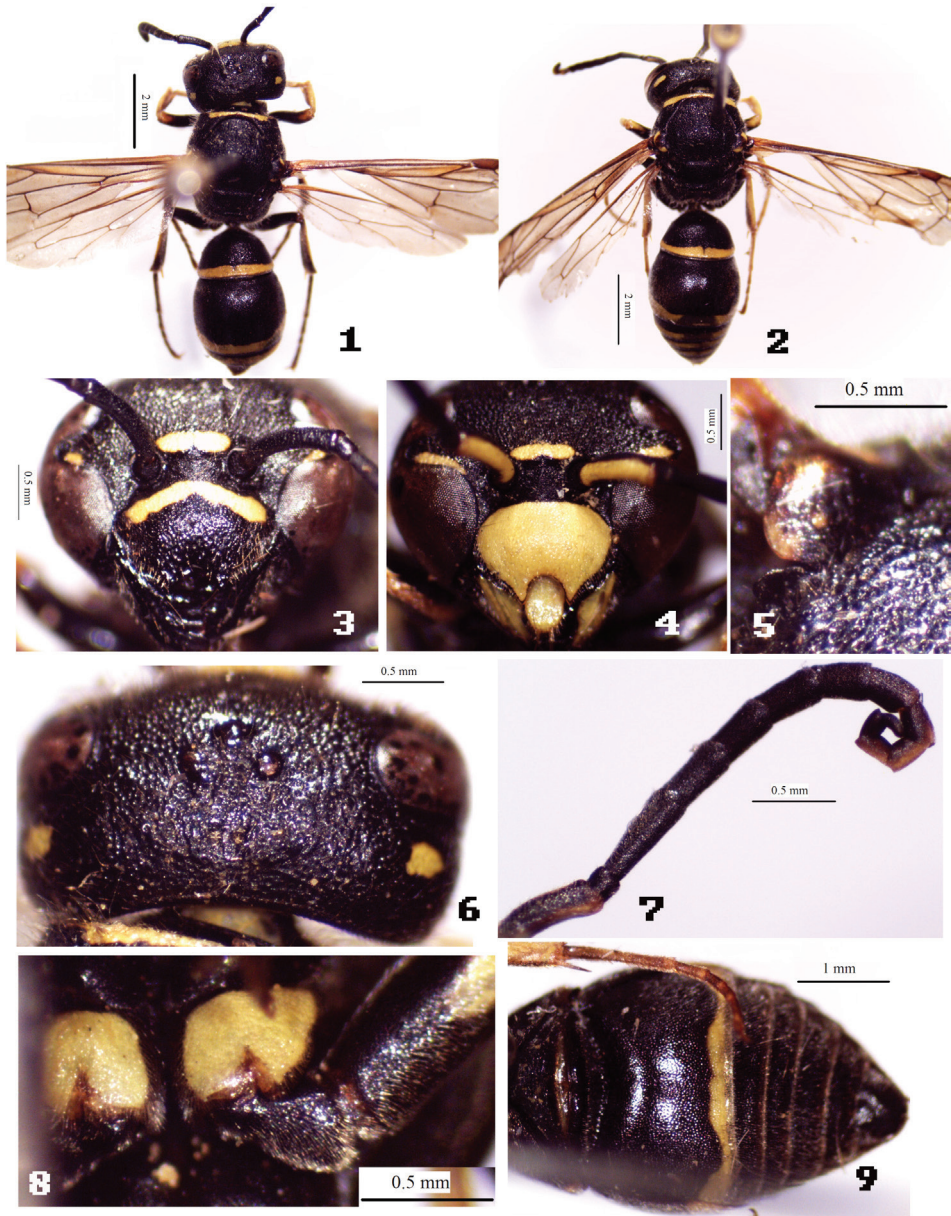
<http://zoobank.org/22BF1014-5536-4EA2-A869-27B6E720BF1D>

Figs 1–9

Material examined. Holotype ♀, China, Ningxia Hui Autonomous Region, Guyuan City, Jingyuan County, Liupanshan, Xixia Forest, 35°29'40.22"N, 106°17'42.40"E, 2107m, 27.VI.2008, Feng Yuan, No. 1004046 (HBU). Paratype: 1♂, China, Ningxia Hui Autonomous Region, Guyuan City, Jingyuan County, Liupanshan, Erlong River, 35°21'11.95"N, 106°20'29.28"E, 2300m, 5–6.VII.2009, Hongfan Ran & Shanshan Zhang, No. 1004047 (CQNU).

Description. Female (Figs 1, 3, 5–6): body length 8.0 mm, forewing length 8.5 mm. Black, with the following parts yellow: a basal band of clypeus (Fig. 3), a large transverse interantennal spot, a small mark approaching the middle of inner orbits on the lower side of eye, postocular spot (Fig. 6), a thin band on dorsal surface of pronotum (Fig. 1), small spots on tegula anteriorly and posteriorly, elongated spots on dorsal faces of all tibiae, a broad apical band on each of T1–T4, and a thinner apical band on S2; tibiae except yellow spots and all tarsi dark brown. Wings slightly brownish.

Head. In front view, head much wider than long, its width 1.40× length; clypeus (Fig. 3) somewhat convex, with dense punctures, those on apex mostly so elongated as to forming thin and irregular longitudinal striations, clypeal width 1.60× its length, total width: apical width = 4.0: 1.5, apex deeply emarginated, apical width: depth of emargination = 1.5: 0.7, interantennal space convex, without median carina; punctures on frons thick and reticulate; ocular sinus with sparser punctures; POD: OOD = 12: 21, diameter of anterior ocellus as long as the distance between anterior ocellus and posterior ocelli; vertex punctured, punctures somewhat weaker than those on frons; cephalic fovea obsolete; occipital carina strong only on sides.



Figures 1–9. *Tropidodynerus* (*Tropidodynerus*) *liupanshanensis* sp. n. **1** habitus of holotype (dorsal view), ♀ **2** habitus of one paratype (dorsal view), ♂ **3** clypeus, ♀ **4** clypeus, ♂ **5** parategula (lateral view), ♀ **6** vertex (dorsal view), ♀ **7** antennae (lateral view), ♂ **8** mid coxa (ventral view), ♂ **9** metasoma (ventral view), ♂.

Mesosoma. Anterior face of pronotum sparsely punctate, pronotal carina obsolete at middle, present and somewhat strong at its shoulder, and stopping abruptly below shoulder, the carina of lateral face well developed, somewhat arced, and not joining the

carina of shoulder; punctures on mesosoma generally larger than those on head and metasoma; posterior face and lateral side of pronotum, mesoscutum, mesopleuron, and scutellum strongly punctured, punctures mostly so elongated as to forming irregular and reticulate striations; punctures on metanotum comparatively sparser; scutellum not convex; metanotum inclined; epicnemial carina of mesopleuron obsolete, present only on the lower side; dorsal surface of propodeum not convex, weakly punctured and with thin reticulate rugae, vertical median area somewhat concave, with thin, wavy, transverse rugae and a median carina, lateral side on the upper half with dense thin, long, and transverse rugae, on the lower half coriaceous and with indistinct rugae; posterior lobe of tegula rounded at the apex; apex of parategula reaching far beyond the apex of tegula (Fig. 5).

Metasoma. In dorsal view, T1 domed, its width $1.89 \times$ length and $0.80 \times$ width of T2, T1 and T2 without apical lamellae; the narrow basal part of S1 coriaceous, posterior area of S1 with reticulate rugae and lateral carina; punctures on metasoma distinctly weaker than those on other portions of the body; punctures on T1 bigger than those of other terga; punctures on T2 at posterior area sparser; punctures on S2 bigger and sparser than those on T2; visible part of T3–T6 and S3–S6 coriaceous and with minute punctures; the apical yellow bands on T3 and T4 not extending to lateral margins, the band on T4 shorter than that of T3.

Male (Figs 2, 4, 7–9). Body length 7.0 mm, forewing length 8.5 mm. Punctures, setae, and coloration similar to female except as follows: clypeus (Fig. 4) entirely, most of mandible on the outside, labrum, ventral surface of antennal scape, all tibiae except ventral sides, dorsal sides of fore and mid tarsi I, ventral side of mid coxa (Fig. 8), apex of mid femur ventrally, and apical bands on T1–T5 yellow; in front view, width of head $1.37 \times$ its length; POD: OOD = 13: 22, diameter of anterior ocellus almost equal to the distance between anterior and posterior ocella; clypeus densely punctured, punctures on apex normal and not elongated, width of clypeus $1.38 \times$ length, total width: apical width = 4.5: 1.4, apical emargination deeper than that in female, width: depth of emargination = 1.5: 0.9; antenna (Fig. 7), apical segments coiled; the mark in eye incision (Fig. 4), postocular spot and elongated spots on dorsal faces of all tibia larger than those in female; a small yellow spot on the left upper part of mesepisternum; tarsi except yellow parts ferruginous to brown; in dorsal view, width of T1 $2.07 \times$ its length and $0.81 \times$ width of T2; apical bands on T2 and T3 pale and pellucid at the middle, the band on T5 shorter than those on T1–T4; the band on dorsal surface of pronotum wider than that in female; other characters same as those in female.

Recognition. The species resembles *T. fertoni* (Dusmet, 1925) in scutellum and metanotum black, and propodeum without a sharp edge at the transition of dorsal surface to lateral side. It differs from *T. fertoni* and all other members of the genus by the following character combination: clypeal apex deeply emarginated in female, in male clypeal width: apical width = 4.5:1.4, apical width: depth of emargination = 1.5:0.9, the band on dorsal surface of pronotum comparatively thinner; T1–T5 and S2 with apical yellow bands, respectively.

Distribution. China (Ningxia).

Etymology. The specific name *liupanshanensis* is the Neolatin adjective, with reference to the region from which the type specimens were collected.

***Tropidodynerus (Tropidodynerus) concavus* Li & Chen, sp. n**

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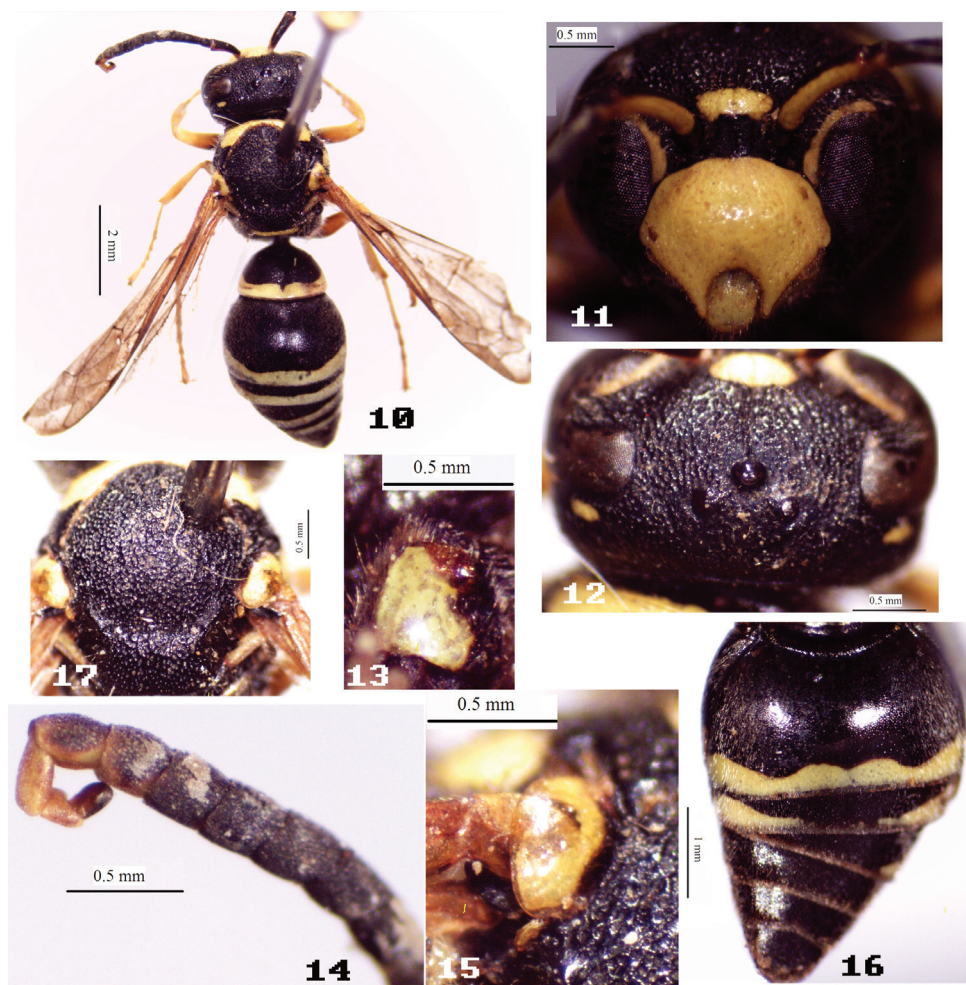
Figs 10–17

Material examined. Holotype, ♂, China, Hebei Province, Zhangjiakou City, Zhuolu County, Yangjiaping Forest, 39°58'22.28"N, 115°23'36.38"E, 908m, 6–10.VII.2004, unspecified collector, No. 1004048 (HBU).

Description. Male (Figs 10–16): Body length 7.5 mm, forewing length 7.0 mm. Black, with yellow and ferruginous markings. Yellow markings as follows: entirely clypeus, mandible except apex, labrum, a band along inner orbits on the lower side of eye (Fig. 11), ventral surfaces of antennal scape and pedicel, a large transverse interantennal spot, a small postocular spot (Fig. 12), a broad band on dorsal surface of pronotum (Fig. 10), tegula, a large spot at the upper part of mesepisternum, metanotum, ventral surface of mid coxa, a apical broad band on each of T1–T5 (Fig. 10) and S2, a apical broad interrupted band on S3, and a long transverse spot on lateral side of S4 (Fig. 16); ventral surfaces of A3–A10, whole A11–12, apex of parategula, and apexes of all femora to apical tarsi yellow brown; mid and hind femora except apexes largely ferruginous; Wings slightly brownish.

Head. In front view, head much wider than long, width $1.25 \times$ length; clypeus with sparsely irregular punctures (Fig. 11) and distinctly convex, its apex deeply emarginated and U-shaped, width of clypeus $1.18 \times$ length, apical width: depth of emargination = 1.5: 1.36, width of clypeus: apical width = 4.5: 1.27; antenna (Fig. 14), apical segments coiled; interantennal space slightly convex, with median carina; frons with moderately thick punctures and reticulate; POD: OOD = 20: 22; the diameter of anterior ocellus somewhat smaller than the distance between anterior and posterior ocella; punctures on vertex sparser than those on frons.

Mesosoma. Anterior face of pronotum coriaceous and with minute punctures, pronotal carina complete at the middle and its shoulder, stopping abruptly below shoulder, and its lateral face well developed, somewhat bending, and not joining the carina of shoulder; punctures on pronotum sparser than those on other parts of mesosoma, the distances between punctures almost equal to the diameter, punctures on lateral side of pronotum comparatively denser and stronger; mesoscutum, mesopleuron, and scutellum strongly punctured, punctures distinctly dense and mostly so connected as to forming reticulate striations (Fig. 17); scutellum somewhat convex; metanotum smooth, with sparse punctures and inclined; epicnemial carina of mesopleuron absent on the upper half, present and strong on the lower half; propodeum impunctate, dorsal surface not convex and wholly with dense oblique rugae, vertical median area concave, somewhat deep, and with a median carina; the whole vertical and lateral sides of pro-



Figures 10–17. *Tropidodynerus* (*Tropidodynerus*) *concavus* sp. n. **10** habitus of holotype (dorsal view), ♂ **11** clypeus, ♂ **12** vertex (dorsal view), ♂ **13** mid coxa (ventral view), ♂ **14** antennae (lateral view), ♂ **15** parategula (lateral view), ♂ **16** metasoma (ventral view), ♂ **17** mesoscutum and scutellum (dorsal view).

podeum with densely thin, long and transverse rugae; posterior lobe of tegula rounded at the apex; apex of parategula reaching far beyond the apex of tegula (Fig. 15); mid coxa concave ventrally (Fig. 13).

Metasoma (Fig. 16). In dorsal view, T1 domed, width $2.16 \times$ length and $0.76 \times$ width of T2; T1 and T2 without apical lamellae; S1 coriaceous, posterior area with faint transverse rugae, lateral carina obsolete; punctures on metasoma distinctly minuter and denser than those on other parts of the body; punctures on T1 somewhat bigger and sparser than those on other terga, with interspaces in average as long as the diameter of the punctures; punctures on T2 denser than those on S2, and visible part of T3–T7 and S3–S7 somewhat weaker.

Female. Unknown.

Recognition. The species resembles *T. flavus* (Lepeletier, 1841) in metanotum yellow, propodeum without a sharp edge at the transition of dorsal surface to lateral side, and apical bands on T2 and T3 not interrupted. It differs from *T. flavus* and all other members of the genus by the following character combination: total width of clypeus: apical width = 4.5: 1.27, apical width: depth of apical concavity = 1.5: 1.36, scutellum black, and mid coxa concave ventrally.

Distribution. China (Hebei).

Etymology. The specific name is the Latin adjective *concavus*, with reference to mid coxa concave ventrally in male.

Key to the world species of the subgenus *Tropidodynerus* Blüthgen

Males

- 1 Propodeum with a sharp edge at the transition of dorsal surface to lateral side, extending downwards to metasomal fossa; apical bands on T2 and T3 widely interrupted in the middle, rarely complete (Gusenleitner 1998, 2007) *T. (T.) interruptus* (Brullé, 1832)
- Propodeum without a sharp edge at the transition of dorsal surface to lateral side, forming only a dull corner or almost complete; apical bands on T2 and T3 not interrupted or at most pale and pellucid in the middle.....2
- 2 Scutellum and metanotum black3
- At least metanotum yellow.....4
- 3 Clypeal total width: apical width = 4.5: 1.4, apical width: depth of apical concavity = 1.5: 0.9; the band on dorsal surface of pronotum thinner; T1–T5 and S2 with apical yellow bands, without lateral spots (Fig. 2)..... *T. (T.) liupanshanensis* sp.n.
- Clypeal total width: apical width = 4.5: 1.9; apical width: depth of apical concavity = 1.5: 0.7; the band on dorsal surface of pronotum broad; T1–T6 with apical yellow bands, S2–S4 with lateral yellow spots (Gusenleitner 2007)..... *T. (T.) fertoni* (Dusmet, 1925)
- 4 Clypeal total width of clypeus: apical width = 4.5: 1.27, apical width: depth of apical concavity = 1.5: 1.36; scutellum black; mid coxa concave ventrally (Fig. 13)..... *T. (T.) concavus* sp. n.
- Clypeal total width: apical width = 4.5:1.5; apical width: depth of apical concavity = 1.5: 1.0; scutellum with two large yellow or brown yellow spots; mid coxa normal (Gusenleitner 1998, 2007) *T. (T.) flavus* (Lepeletier, 1841)

Females

- 1 Propodeum with a sharp edge at the transition of dorsal surface to lateral side, extending downwards to metasomal fossa; apical bands on T2 and T3 widely

- interrupted in the middle, rarely complete (Gusenleitner 1998, 2007) *T. (T.) interruptus* (Brullé, 1832)
- Propodeum without a sharp edge at the transition of dorsal surface to lateral side, forming only a dull corner or almost complete; apical bands on T2 and T3 not interrupted or at most pale and pellucid in the middle.....2
- 2 Scutellum and metanotum with large yellow to brownish yellow spots (Gusenleitner 1998, 2007)..... *T. (T.) flavus* (Lepelletier, 1841)
- Scutellum and metanotum black3
- 3 Clypeal apex deeply emarginated (Fig. 3)..... *T. (T.) liupanshanensis* sp.n.
- Clypeal apex somewhat emarginated (Gusenleitner 1998, 2007) *T. (T.) fertoni* (Dusmet, 1925)

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