New species and new records of *Tinodes* Curtis (Trichoptera: Psychomyiidae) from Dabie Mountains, East-central China

Shuang Qiu, Yun-jun Yan*  

*Corresponding author.  
E-mail address: yanyunjun@hust.edu.cn (Y.-j. Yan).

**ARTICLE INFO**  
Keywords:  
Oriental biogeographic region  
Caddisfly  
Morphology  
Tinodinae

**ABSTRACT**  
We describe a new *Tinodes*, *T. stamen* sp. nov., collected in the Dabie Mountains, East-central China and report four new records, *T. ventralis* Li & Morse, 1997; *T. cryptophallicata* Li & Morse, 1997; *T. harael* Malicky, 2017; and *T. sartael* Malicky, 2017, from Dabie Mountains. Moreover, we illustrate infraspecific variability in *T. ventralis*, and the recently described *T. harael*, and *T. sartael* from the Dabie Mountains region.

**Introduction**  
The genus *Tinodes* Curtis, 1834 belongs to the subfamily Tinodinae (Trichoptera: Psychomyiidae). Currently, this subfamily also includes the genera *Lype* McLachlan, 1878; *Padangpsyche* Malicky, 1993; and *Trawapsyche* Malicky, 2004b (Li & Morse, 1997a; Malicky, 2004b). Among these, *Tinodes* is the largest genus with 281 species, and is widely distributed across all biogeographic regions with exception of the Neotropical Region (Holzenthal et al. 2007; Morse, 2017). Congruent with the highest species-level diversity of Trichoptera in general, the highest diversity of *Tinodes* is found in the Oriental Region (134 of 281 species; de Moor & Ivanov, 2007; Morse, 2017). As the Oriental Region stretches i.a. across half of the area of the People’s Republic of China, it is reasonable to expect a high species-level diversity of *Tinodes*. However, only 8 species were hitherto reported from China (Yang et al., 2016). This is likely caused by the lack of faunistic studies, as in the past twenty years, 66 *Tinodes* species were published from the Oriental region, including the Philippines (4 species, Mey, 1998a; 4 species, Mey, 1998b), Vietnam (4 species, Johanson & Olah, 2008), Malaysia (5 species, Malicky, 2009; 3 species, Johanson & Olah, 2008), Indonesia (7 species, Malicky et al. 2011), Taiwan (12 species, Malicky, 2014), and others, but only three species were reported from China (Malicky 2012, 2017). Besides China, India, Thailand and Pakistan are also areas to be investigated further as they may reveal new species of *Tinodes*, particularly since many *Tinodes* species were previously discovered in these countries (Malicky & Chantaramongkol, 1989; Schmid, 1961; Schmid, 1972). Here, we describe a new Oriental species from the Dabie Mountains, East-central China. Given that *Tinodes* is a large genus with a poorly resolved phylogeny and the relationship between the majority of species is still unknown, we were not able to provide species groups for the species presented in the descriptions, but only suggest some similar species for differential diagnostics.

**Materials and methods**  
All adult specimens were collected at night with light sheet traps during 2014–2015 and were preserved in 96% ethyl alcohol. Holotypes are deposited in Nanjing Agricultural University (NJAU), Nanjing City, Jiang-su Province, P. R. China; paratypes and other material are deposited in NJAU or Huazhong University of Science and Technology (HUST), Wu-han City, Hu-bei Province, P. R. China. A few specimens were dissected for illustration: the abdomens were removed and water-bath heated in 10% KOH in order to clean all the non-chitinized tissues. The cleaned specimens were put in glycerin and observed under a dissection microscope. Either an eyepiece with grid or a camera lucida was used to obtain pencil drawings. The hand drawings were then scanned and traced using Adobe Illustrator CS6© (version 19.0.0 (64-bit), Adobe Systems Inc.). The terminology of male genitalia follows Li and Morse (1997b), terminology of wing venation follows Schmid (1998).

**Species descriptions**  
The specimens collected are characterized as *Tinodes* spp. as they clearly show the genus-specific characters delineated in Li and Morse (1997b). However, we found our specimens to slightly deviate from...
This: in our specimens, the R₁ of each hind wing is long, fused with Sc at about 0.5 wing length (Fig. A), as in *T. asangha* Schmid, 1961, *T. fulvus* Johanson, 2001, *T. tricalcaratus* Kimmins, 1955 and *T. igok* Kimmins, 1955. However, according to the original illustration of *T. ventralis* Li and Morse, 1997 (1997b), R₁ of hind wings are fused with Sc at the basis of wings, as in *T. ashigaraensis* Kobayashi, 1971, *T. waeneri* (Linnaeus, 1758) (wing veins re-illustrated by Malicky (2004a)). Moreover, in our specimens, the R₁ of *T. ventralis* is not fused with Sc until it reached 0.5 hind wing length. It seems that this character varies in this genus. This might be a reason for not using this character to characterize the genus. We also find species in which these two veins not fused at all, like *Tinodes malickyi* Johanson, 2001. These variations of wing venations patterns could be useful for cladistics analysis of the genus *Tinodes* and as additional morphological characters to identify species of this genus.

As the original descriptions of *T. harael* and *T. sartael* are in German, we provide full descriptions of these species to facilitate future taxonomic studies.

**Tinodes stamen** Qiu, sp. nov. (Fig. B)


Paratypes: P. R. China, Hu-bei Province: Same data as holotype, 6 males (3 in NJAU, 3 in HUST).

Diagnosis: This species resembles *Tinodes caolana* Johanson and Oláh, 2008, but can be distinguished by: (1) Basis of phallic sheath processes narrow in *T. stamen* (basis of phallic sheath processes expanded in *T. caolana*); (2) phallic sheath processes of *T. stamen* without setae (phallic sheath processes of *T. caolana* bearing setae); (3) phallic guide of *T. stamen* narrow in lateral view (phallic guide of *T. caolana* stout in lateral view); and (4) harpagones of *T. stamen* much smaller than coxopodites (harpagones of *T. caolana* about half as large as coxopodites in lateral and dorsal views).

Description: Body brown, wings brown, wing length 5.0–5.6 mm each (n = 7).

Male genitalia: Tergum IX narrow in lateral view, triangular in dorsal view. Sternum IX 1.5 times as wide as length in ventral view, slightly concave ventrally in lateral view. Segment X wide in lateral view, expanded apically in dorsal view. Superior appendages each long, triangular in lateral view. Phallic guide not fused with coxopodites, slightly curved ventrad in lateral view, bifid and curved mesad in ventral view, with apex hooked backward; phallic guide apodeme as long as phallic guide in lateral view. Coxopodites fused proximally, with small concavity laterally at one third of their length from bases in ventral view, with short, wide protuberance close to base of each harpagone. Harpagones short, projection mesad, tips pointed. Phallus straight and fused with phallic sheath processes proximally, distal third curved ventrad and apex curved caudad. Phallic sheath processes curved ventrolateral at apex, between them developed median process also curved ventrad at apex; additional ventral processes extended beneath median process.

Etymology: Latin noun *stamen*, or English “stamen”, referring to the long and back curved phallic guide, for it looks like a pair of stamens in ventral view.

Distribution: This species has been found in Hong-an County, Hu-bei Province, P. R. China (Fig. F). The distribution in other provinces is unknown.
Other records

_Tinodes cryptophallicata_ Li and Morse, 1997, new record.

Specimen examined: P. R. China, An-hui Province, Qian-shan County, Ban-cang village, 31.0017°N 116.5419°E, 502 m, 03.10.2015, leg. QS, Han Xin-feng; Hu-bei Province, Ma-cheng City, Shi-zi-feng, 31.3876°N, 115.3276°E, 578 m, 23.08.2015, leg. QS, Duan He-wei (DH-w) (HUST).

This species was previously reported from Vinh Phuc Province, Vietnam (Olah and Malicky, 2010) and Jiang-xi Province, China; here we additionally report this species from An-hui Province and Hu-bei Province, China.

_Tinodes furcatus_ Li and Morse, 1997.

Material examined: P. R. China, Hu-bei Province, Hong-an County, Tian-tai-shan. 31.5729°N 114.6127°E, 574 m, 23.08.2015, leg. QS, JS, 1 male (HUST); Luo-tian County, Tian-tang-zhai, 31.0993°N 115.7337°E, 518 m, 15.07.2014, leg. QS, Yan Yun-jun (YY-j), 1 male (HUST); Ma-cheng City, Shi-zi-feng, 31.3876°N, 115.3276°E, 578 m, 23.08.2015, leg. QS, DH-w (HUST).

This species was previously reported from Hu-bei Province, Jiang-xi Province and Si-chuan Province, China; and Province Almaty, Kazakhstan (as _Tinodes furcata_ (Olah, 2010).
**Tinodes harael** Malicky, 2017, new record (Fig. C).

Holotype: Male, P. R. China, He-nan Province, Luo-shan County, Mount Ling-shan, 31°54’ N, 114°13’ E, 300–500 m, 25.5.1999, leg. Kyselak. Paratype: 1 male, same data as holotype.

Material: 1 male, P. R. China, Hu-bei Province, Ma-cheng city, Shi-zi-feng, 31.3876° N, 115.3276° E, 578 m, 23.08.2015, leg. QS, DH-w (deposited in NJAU).

**Diagnosis:** The superior appendages and phallic sheath processes of the male genitalia of this species look similar to those of *Tinodes aravil* Terra and Gonzalez, 1992, but can be distinguished by: (1). Phallic sheath process each with five spines in *T. harael* (phallic sheath process each with over ten spines in *T. aravil*); (2) phallus with pair of dorsal and ventral lobes in *T. harael* (phallus without lobes in *T. aravil*); (3) coxopodite of *T. harael* round in ventral view (coxopodites of *T. aravil* rectangular in ventral view). The inferior appendages of the species look similar to those of *T. cheran* Malicky 2009, with the following differences are as follows: (1) Phallic guide of *T. harael* with a pair of small ventral branches (phallic guide of *T. cheran* without small ventral branches); and (2) phallic guide of *T. harael* forked in ventral view (phallic guide of *T. cheran* not forked in ventral view).

**Description:** Body grayish brown, wings light brown, forewing length 3.7 mm each (n = 1).

**Male genitalia:** Tergum IX long triangular in dorsal view. Sternum IX rectangular, slightly expanded medially and concave posteriorly in ventral view. Tergum X seemingly fused with tergum IX, abruptly acuminate in dorsal view. Superior appendages long and slender, twig-like. Phallic sheath processes each about as long as phallus, pointing posteriorly proximally and arching gradually caudad in lateral view, slightly expanded in the distal quarter, each with two dorsal spines, one short ventral spine, one large subapicoventral spine and one short apical spine. Phallic guide fused with coxopodites, forked in lateral and ventral views, with dorsal branch curved sharply dorsal proximally and arching gradually ventrad distally, apices slightly notched; ventral branch small, digitiform and projecting posteriorly; phallic guide apodeme longer than sternum IX in lateral view. Coxopodites fused at basal half, round in ventral view, each with two short mesal lobes. Harpagoes short, with two short apical spines. Phallus wider than phallic sheath process, with ventral lobe and pair of dorsal lobes at half of its length; dorsal lobes oval in lateral view, semicircular in dorsal view, fused with each other proximally; ventral lobe flat, not visible in dorsal view; phallus slightly curved ventrad at apex and split distally, with few membrane extended form split.

**Distribution:** This species occurs in the Dabie Mountains region (Fig. F). The holotype was found in He-nan Province, here we additionally report this species from Hu-bei Province.

**Tinodes sartael** Malicky, 2017, new record (Fig. D).

Holotype: Male, P. R. China, He-nan Province, Luo-shan County, Mount Ling-shan, 31°54’ N, 114°13’ E, 300–500 m, 25.5.1999, leg. Kyselak. Paratype: 1 male, same data as holotype.

Material: 2 males, P. R. China, Hu-bei Province, Wu-han City, Huang-pi, Jin-li-gou, 31.2746° N 114.2134° E, 297 m, 12.08.2015, leg. QS, Liu Yan-rong (LY-r) (deposited in NJAU); 1 male, Ma-cheng City,
Diagnosis: The inferior appendages of male genitalia of the species are similar to those of *Tinodes tejita* Schmid, 1972, with the following differences: (1) phallic guide of *T. sartael* wider in lateral view than in ventral view (phallic guide of *T. tejita* wider in ventral view than lateral view); (2) coxopodites of *T. sartael* each with a dorsal process curving ventrad, folding over each harpago (coxopodites of *T. tejita* each with small dorsal process, not folding over each harpago); and (3) ventral processes of coxopodites thin in lateral view, with small lobes in ventral view (ventral processes of coxopodites stout in lateral view, without lobes in ventral view). The phallus and phallic sheath processes look similar to those of *T. cincibilus* Malicky and Chantaramongkol, 1993, but can be distinguished by: (1) phallus of *T. sartael* much longer than each phallic sheath process (phallus of *T. cincibilus* about as long as each phallic sheath process); (2) phallic sheath processes fused with phallus in *T. sartael* (phallic sheath processes not fused with phallus in *T. cincibilus*); and (3) phallus of *T. sartael* with long dorsal processes (no dorsal processes on phallus in *T. cincibilus*).

Description: Legs and thorax grayish brown, abdomen white, wings light brown, forewing length 3.5 mm (n = 2).

Male genitalia: Tergum IX pentagonal in dorsal view, narrow in lateral view. Sternum IX concave posteriorly in ventral view. Superior appendages each long and slender, digitiform, pointing dorsally and curved caudad in lateral view. Phallic guide fused with coxopodites, broad and truncate at apex, with phallic guide apodeme much longer than sternum IX, in lateral view paddle-shaped. Coxopodites fused at basal half, twice as long as wide in ventral view, with small acute mesal protuberances subapically; ventral processes of coxopodites stout in lateral view, without lobes in ventral view. The phallus and phallic sheath processes about half as long as phallus and fused with phallus, each...
bearing two long spines apically. Phallus curved posteroventrud with well-developed dorsal process medially, phallus expanded after half of its length and gradually tapering, apex tubular; conjunction of dorsal process very thin, in lateral view gradually expanded dorsally from base to middle, abruptly narrowed and hooked dorsad at apex, with wide, shallow groove dorsally and pair of long spines at about middle of length.

Distribution: This species occurs in the Dabie Mountains region (Fig. F). The holotype was found in He-nan Province and we report this species also from Hu-bei Province. *Tinodes ventralis* Li and Morse, 1997a, b, new record (Fig. E).

Material examined: P. R. China, Hu-bei Province, Luo-tian County, Tian-tang-zhai, 31.0993°N 115.7337°E, 518 m, 15.07.2014, leg. QS, YY-j, 1 male (HUST); Ma-cheng City, Shi-zi-feng, 31.3876°N, 115.3276°E, 578 m, 23.08.2015, leg. QS, DH-w (HUST).

This species has been reported from China, Si-chuan Province and now is known also from Hu-bei Province.

We provide additional characters for more precise delineation of this species: phallic guide fused with coxopodites and the two branches of the phallic guide are proximally fused ventrally, and are then completely fused distally, forming an angular concavity on the phallic guide in ventral view (Fig. E2, 4). In addition, we observed the phallic sheath processes not single structures as shown in the original description, but with two lobes (Fig. E1, 3), the dorsal lobes are smaller and the ventral lobes are prominent, indicating that this structure varies to some extent in this species.

**Conflict of interest**

No conflict of interest.
Acknowledgments

We are grateful to Prof. Sun and Prof. Yang from Nan-jing Agriculture University, Nan-jing City, Jiang-su Province, and Dr. Morse of Clemson University, Clemson, South Carolina, for their valuable instructions on Trichoptera taxonomy and support during reference collection. Thanks to all the people mentioned above for helping us with field works during 2014–2015. We also appreciate the comments from two anonymous reviewers and the editor that help us to get this manuscript published.

References

Li, Y.-W., Morse, J.C., 1997a. Phylogeny and classification of Psychomyiidae (Trichoptera) genera. In: Proceedings of the 8th International Symposium on Trichoptera taxonomy and support during reference collection. Thanks to all the people mentioned above for helping us with field works during 2014–2015. We also appreciate the comments from two anonymous reviewers and the editor that help us to get this manuscript published.

Fig. F. Distribution of Tinodes species in Dabie Mountains. Black line = provincial boundaries; bitmapped area = Dabie Mountain region; black spots = cities; stars = sampling sites.

Fig. F. Distribution of Tinodes species in Dabie Mountains. Black line = provincial boundaries; bitmapped area = Dabie Mountain region; black spots = cities; stars = sampling sites.

Fig. F. Distribution of Tinodes species in Dabie Mountains. Black line = provincial boundaries; bitmapped area = Dabie Mountain region; black spots = cities; stars = sampling sites.

Fig. F. Distribution of Tinodes species in Dabie Mountains. Black line = provincial boundaries; bitmapped area = Dabie Mountain region; black spots = cities; stars = sampling sites.


