

# Three new species of the *Macrophya maculitibia* group (Hymenoptera, Tenthredinidae) with a key to known species from China

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## Abstract

The *Macrophya maculitibia* group is proposed and defined. Five species are reported from China, among them three new species, *Macrophya longifossa* sp. n., *M. motuoa* sp. n., and *M. yunnana* sp. n., and two known species, *M. maculitibia* Takeuchi, 1933, and *M. jiuzhaina* Chen & Wei, 2005. A key to the Chinese species of the *M. maculitibia* group is

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## Key Words

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## Introduction

*Macrophya* Dahlbom, 1835, the third largest genus in the subfamily Tenthredininae (Hymenoptera: Tenthredinidae) contains 301 species worldwide (Li et al. 2018a, b, c, d, 2019; Liu et al. 2018, 2019; Xie et al. 2018). In China, 162 *Macrophya* species have been recorded (Li et al. 2018a, b, c, d, 2019; Liu et al. 2018, 2019; Xie et al. 2018).

In the *Macrophya maculitibia* group, two species, *M. maculitibia* Takeuchi, 1933 from Heilongjiang and Jilin provinces, and *M. jiuzhaina* Chen & Wei, 2005 from Sichuan Province, have been reported in China. In the present paper, three new species of the *Macrophya maculitibia* group are described and illustrated from China: *M. longifossa* sp. n., *M. yunnana* sp. n., and *M. motuoa* sp. n. All Chinese species are with similar general morphology and

external genitalia characteristics, forming a peculiar species group of *Macrophya*. Previously, we have found the characteristics of this group, but it has not been proposed. From its geographical distribution in China, we think that additional new species remain to be discovered, though we do not expect the number of species to increase significantly, as the *M. maculitibia* group is relatively small. According to the available data, species in this group are mainly distributed in the southwest, northwest, and northeast of China, while *M. maculitibia* Takeuchi, 1933 is also found in Siberia, Korea, and Japan. Therefore, the *Macrophya maculitibia* species group is here proposed and defined, and three new species from China are described. Its description is a necessary part of a broader effort to review all *Macrophya* species in China. A key to the five species in this group found in China is provided.

## Materials and methods

The specimens were examined with a Motic-SMZ-171 stereomicroscope. Adult images were taken with a Nikon D700 digital camera and focus-stacked using Helicon Focus (HeliconSoft, Kharkiv, Ukraine). All images were further processed with Adobe Photoshop CS 11.0.

Morphological descriptions of these new species are based on the holotype. The terminology of genitalia follows Ross (1945) and the general morphology follows Viitasaari (2002), although for a few terms (e.g., middle fovea and lateral fovea) we follow Takeuchi (1952).

The specimens examined in this study, including the holotype and paratypes of three new species, are deposited in the Insect Collection of Central South University of Forestry and Technology, Changsha, Hunan, China (CSCS).

### Abbreviations:

- OCL** The distance between the lateral ocellus and the occipital carina, or the hind margin of the head where this carina would be if it were developed (Benson 1954).
- OOL** The distance between the eye and the lateral ocellus.
- POL** The distance between the mesal margins of the 2 lateral ocelli.

## Results

### *Macrophya maculitibia* group

**Remarks.** Body black without metallic luster; posterior margin of metepimeron with a distinct appendage, appendage strongly elongated and polished, without long hairs; antennae and all trochanters black entirely; lancet narrow and long, with 20–21 serrulae, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 12 or so distal teeth, subbasal teeth somewhat small and clear. This species group is a small lineage of *Macrophya* and is very close to the *Macrophya imitator* group but can be distinguished from the latter by having the posterior margin of metepimeron straight or slightly concave and the metepimeral appendage differentiated, but not elongated, at least partly punctured and evenly pilose, and without basin.

**Description.** Body slender; black, always with a few white maculae on mandibles and subbasal part on dorsal

side of hind tibia; sometimes with a few white maculae on anterior of fore femur and anterior largely of fore tibia; stigma and veins black; usually apical 1/3 of below stigma with smoky macula; clypeus slightly broader than the shortest distance between lower inner orbits; lateral margins convergent forwards, anterior margin shallowly incised to approximately 1/5–1/4 length of clypeus, apex of lateral lobe obtuse; malar space narrower than diameter of an ocellus; postocellar area broader than long; antenna slender, antennomere III clearly longer than antennomere IV, as long as antennomeres IV–V together; mesoscutellum rounded and elevated; mesoscutellar appendage with a high and acute middle carina; posttergite with a low and short middle carina; dorsal margin of mesepimeron with a distinct platform, as broad as diameter of an ocellus; posterior margin of metepimeron with a distinct appendage, appendage strongly elongated and polished, without long hairs and basin; anal cell of fore wing shortly constricted at approximately basal 1/4, with a long spot-like vein; anal cell of hind wing petiolate; inner spur of hind leg slightly longer than 1/2 length of metabasitarsus, metabasitarsus always slender, slightly longer than following four tarsomeres together; claw with inner tooth slightly shorter than outer tooth; dorsal side of head densely punctured; mesoscutellum densely or somewhat densely punctured; abdominal terga without reticulate microsculpture; penis valve longer than broad, harp narrow towards apex, ergot short.

So far, the *M. imitator* group is the second largest group in *Macrophya*, with 17 species, which are all present in China: *M. bui* Wei & Li, 2012, *M. changbaina* Li, Liu & Heng, 2015, *M. circulotibialis* Li, Liu & Heng, 2015, *M. curvatisaeta* Wei & Li, 2010, *M. curvatithea* Li, Liu & Heng, 2015, *M. flactoserrula* Chen & Wei, 2002, *M. funiushana* Wei, 1998, *M. imitoides* Wei, 2007, *M. imitator* Takeuchi, 1937, *M. jiaozhaoae* Wei & Zhao, 2010, *M. kangdingensis* Wei & Li, 2012, *M. nigromaculata* Wei & Li, 2010, *M. omeialpina* Li, Jiang & Wei, 2018, *M. parimitator* Wei, 1998, *M. postscutellaris* Malaise, 1945, *M. semipunctata* Li, Liu & Wei, 2018, and *M. weni* Wei, 1998 (Li et al. 2018d). Among them, *M. imitator* Takeuchi is also distributed in Japan, Korea, and East Siberia (Takeuchi 1937), and *M. postscutellaris* Malaise is also distributed in Myanmar (Malaise 1945). This two species groups are easily to be distinguished by the key to species groups worldwide by Li et al. (Li et al. 2018d).

The *M. maculitibia* species group includes two known species and three new species described here. They can be separated by the following key.

### Key to the Chinese species of the *Macrophya maculitibia* group

- 1 Basal 2/3 of fore wing hyaline, apical 1/3 of below stigma with smoky macula (Figs 1, 2, 21, 37) ..... 2
  - Fore wing hyaline, without smoky macula (Figs 13, 29) ..... 4
- 2 Metepimeronal appendage somewhat narrow and long, very shiny and smooth, without punctures or long hairs (Fig. 25); mesoscutellum higher than top of mesonotum. China (Jilin, Liaoning), Siberia, Japan, North Korea ..... *M. maculitibia* Takeuchi, 1933
  - Metepimeronal appendage usually broad and shallow, less shiny, with somewhat dense fine punctures and long hairs; mesoscutellum as high as top of mesonotum ..... 3

- 3 Postocellar area 1.9× broader than long (Fig. 38); metepimeronal appendage 3× as long and twice as broad as the diameter of median ocellus (Fig. 41); apical margin of ovipositor sheath slightly roundish and acute in lateral view; middle serrulae of lancet in female each with two proximal and 6–11 distal teeth (Fig. 44). China (Yunnan)....*M. yunnana* sp. n.
- Postocellar area 2.3 × broader than long (Fig. 3); metepimeronal appendage larger, 4× as long and 3× as broad as the diameter of median ocellus (Fig. 6); apical margin of ovipositor sheath rounded and somewhat obtuse in lateral view; middle serrulae of lancet in female each with two proximal and 10–13 distal teeth (Fig. 9). China (Gansu, Shaanxi, Ningxia, Hubei, Sichuan) .....*M. jiuzhaina* Chen & Wei, 2005
- 4 Metepimeronal appendage broad and large, apical margin rounded, longer than broad (Fig. 16); malar space 0.5× diameter of median ocellus (Fig. 15); subapical antennomeres dilated, somewhat broader than pedicel (Fig. 17); anterior 2/5 of katepimeron smooth and shiny (Fig. 16); mesoscutellum without peak and carina, as high as top of mesonotum. China (Ningxia, Shaanxi) .....*M. longifossa* sp. n.
- Metepimeronal appendage somewhat narrow and small, nearly triangular, apical margin somewhat rounded, as long as broad (Fig. 33); malar space 0.8× diameter of median ocellus (Fig. 31); subapical antennomeres slightly dilated, slender than pedicel (Fig. 32); anterior margin of katepimeron narrow and smooth (Fig. 33); posterior of mesoscutellum with a peak, middle carina and lateral carina just visible, higher than top of mesonotum. China (Tibet).....*M. motuoa* sp. n.

### *Macrophya jiuzhaina* Chen & Wei, 2005

Figures 1–12

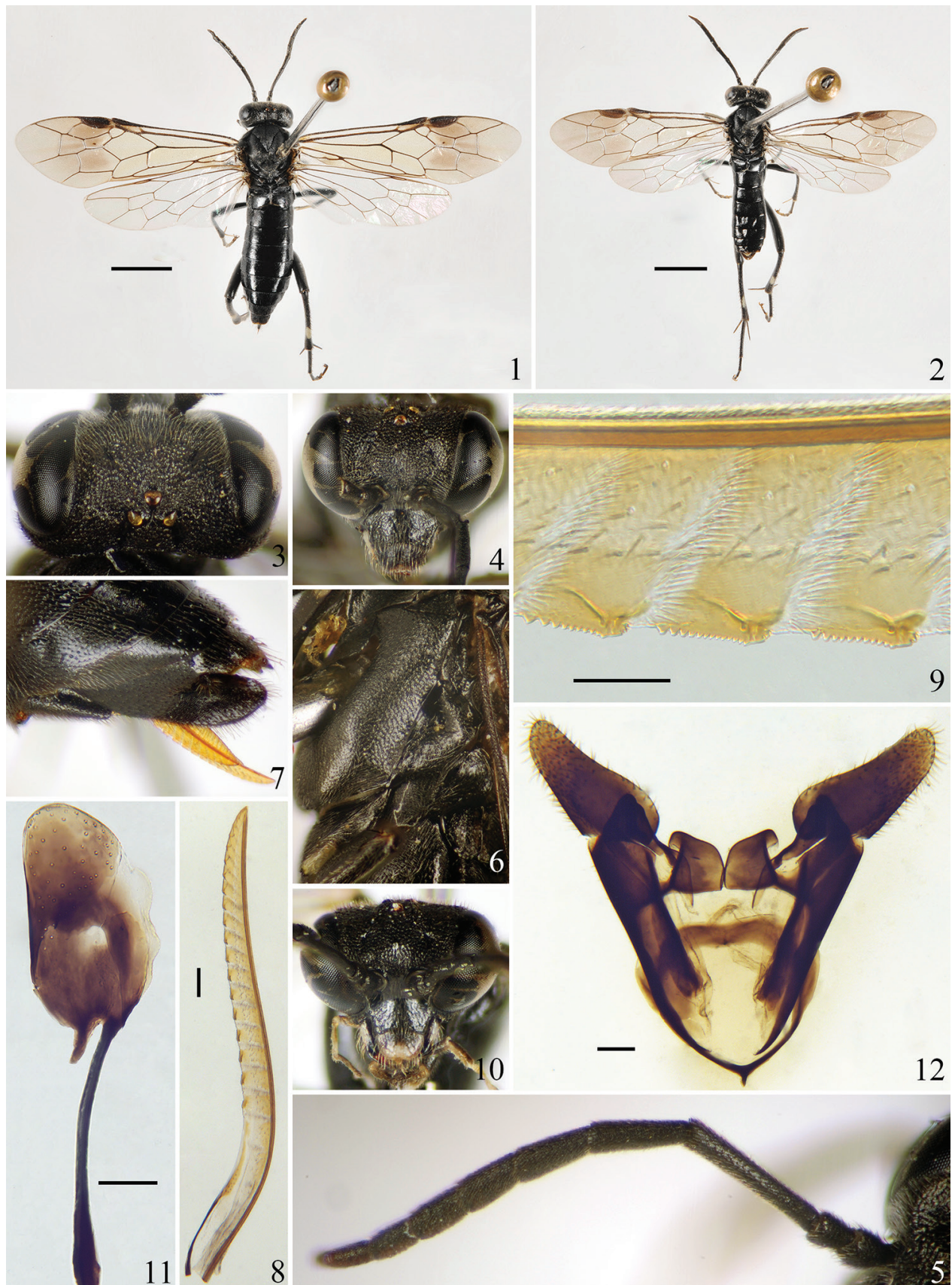
*Macrophya jiuzhaina* Chen and Wei 2005: 86.

**Material examined.** China: Gansu Province: 7♀, Mt Taizishan, Diaoqi Forest Farm, Linxia City, 35°14.202'N, 103°25.314'E, 2500 m, 10.vii.2010, leg. Zejian Li & Xiaohua Wang; Shaanxi Province: 3♀, CSCS14075, Mt taibaishan, Kaitianguan, Mei County, 34°00.572'N, 107°51.477'E, 1852 m, 05.vi.2014, leg. Mengmeng Liu & Ting Liu, Ethylacetate; Shaanxi Province: 1♀, CSCS14134, Foping County, Sanguanmiao, 33°39.000'N, 107°48.000'E, 1529 m, 20.vi.2014, leg. Liwei Qi & Weinan Kang, Ethylacetate; Shaanxi Province: 2♀, CSCS14080, Mei County, Mt Taibaishan, Kaitianguan, 34°00.572'N, 107°51.477'E, 1852 m, 20.vi.2014, leg. Mengmeng Liu & Ting Liu, Ethylacetate; Shaanxi Province: 1♀, CSCS14104, Taibai County, Mt Qingfengxia, diertingchechang, 34°0.713'N, 107°26.167'E, 1792 m, 11.vi.2014, leg. Meicai Wei, KCN; Shaanxi Province: 1♀, CSCS14127, Foping County, Liangfengyading, 33°41.117'N, 107°51.250'E, 2128 m, 18.vi.2014, leg. Liwei Qi & Weinan Kang, Ethylacetate; Shaanxi Province: 1♀, CSCS17099, Mt Taibaishan, Kaitianguan, 34°0'33.79"N, 107°51'33.72"E, 1815 m, 19.vi.2017, leg. Meicai Wei & Hannan Wang, Ethylacetate; Shaanxi Province: 2♀, CSCS18055, Mt Taibaishan, Kaitianguan, Mei County, 34°0.572'N, 107°51.477'E, 1852 m, 10.vi.2018, leg. Kaiwen Gao, Ethylacetate; Ningxia Province: 1♀, Mt Liupanshan, Elonghe, 35°23.380'N, 106°20.701'E, 1945 m, 06.vii.2008, leg. Fei Liu; Ningxia Province: 2♀, Mt Liupanshan, Xixia, 35°29.604'N, 106°18.777'E, 1974 m, 1~2.vii.2008, leg. Fei Liu; Hubei Province: 1♀, CSCS11022, Mt Shennongjia, Guitouwan, Yichang City, 31°28.439'N, 110°08.872'E, 2150 m, 25~28.v.2011, leg. Zejian Li; Hubei Province: 1♀, CSCS15140, Mt Shennongjia, Banbiyan, 31°26.053'N, 110°14.021'E, 2650 m, 02.viii.2015, leg. Wei Xiao, Ethylacetate; Sichuan Province: 1♀, Jinding, Mt Emeishan, 3000 m, 18.vii.2001, leg. Meicai Wei; Sichuan Province: 1♀, Longlongba,

Daocheng County, Yading, 3760 m, 22.vii.2005, leg. Hu Zhou; Sichuan Province: 2♀, Mt Hailuoguo, Luding County, 2600–2700 m, 17.vii.2003, leg. Wei Xiao; Sichuan Province: 1♀, Mt Emeishan, Leidongping, 29°32.540'N, 103°19.638'E, 2458 m, 29.vii.2008, leg. Deming Wang; Sichuan Province: 7♀, Mt Hailuoguo, Luding County, 3000–3100 m, 18.vii.2003, leg. Weixing Liu; Sichuan Province: 2♀, Mt Emeishan, Leidongping, 29°32.476'N, 103°19.890'E, 2400 m, 25~26.vii.2006, leg. Meicai Wei & Yihai Zhong; Sichuan Province: 6♀, 8♂, Mt Emeishan, Leidongping, 29°546'N, 103°327'E, 2350 m, 07.vii.2009, leg. Meicai Wei & Gengyun Niu; Sichuan Province: 2♀, Mt Hailuoguo, Luding County, 29°603'N, 102°076'E, 2200 m, 03.vii.2009, leg. Gengyun Niu; Sichuan Province: 1♀, Mt Hailuoguo, Luding County, 29°600'N, 102°000'E, 2900 m, 30.vi.2009, leg. Yihai Zhong; Sichuan Province: 3♀, CSCS142304, Wenchuan County, Wolong Town, Dengshenggou, 31°58.677'N, 103°6.533'E, 2200 m, 16.viii.2014, leg. Wei Xiao & Yilin Xiao, Ethylacetate; 3♀, CSCS142302, Wenchuan County, Wolong Town, Dengshenggou, 31°58.677'N, 103°6.533'E, 2200 m, 16.viii.2014, leg. Liwei Qi, Ethylacetate; Sichuan Province: 1♀, CSCS142305, Wenchuan County, Wolong Town, Yinchanggou, 31°58.333'N, 103°6.967'E, 2188 m, 16.viii.2014, leg. Liwei Qi, Ethylacetate; Sichuan Province: 5♀, CSCS16201, Menghuocheng, Shimian County, 28°53'23"N, 102°21'17"E, 2591 m, 25.vii.2016, leg. Hannan Wang, Ethylacetate; Sichuan Province: 1♀, CSCS16199, Menghuocheng, Shimian County, 28°53'23"N, 102°21'17"E, 2591 m, 23.vii.2016, leg. Hannan Wang, Ethylacetate.

**Diagnosis.** The species is similar to *M. maculitibia* Takeuchi, 1933 in general morphological characteristics: body and legs mainly black; lancet narrow and long, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 9–13 distal teeth, subbasal teeth somewhat small and clear in both, but can be distinguished from the latter in having metepimeronal appendage less shiny than the latter, broad and large, with dense and fine punctures and some long hairs; postocellar area





**Figures 1–12.** *Macrophya jiuzhaina* Chen & Wei, 2005 1 Adult female, dorsal view 2 Adult male, dorsal view 3 Head of female, dorsal view 4 Head of female, anterior view 5 Antenna of female, lateral view 6 Mesopleuron and metapleuron of female; 7 Ovipositor sheath, lateral view 8 Lancet 9 The 8<sup>th</sup>–10<sup>th</sup> middle serrulae 10 Head of male, anterior view 11 Penis valve 12 Gonoforceps. Scale bars: 2 mm (1, 2); 100 µm (8, 11, 12); 50 µm (9).

2.3× broader than long; antenna as long as head and thorax together; mesoscutellum elevated, rounded, as high as top of mesonotum. *M. maculitibia*: metepimeronal appendage very shiny than the former, somewhat narrow and smooth, without punctures or long hairs; postocellar area 2.5× broader than long; antennae somewhat longer than head and thorax together; mesoscutellum elevated, somewhat higher than top of mesonotum.

**Variability.** Some female specimens with hind tibia entirely black, dorsal side without a small white macula subapically. This macula is described as present in the original description (Chen et al. 2015).

**Host plants.** Unknown.

**Distribution.** China (Gansu, Shaanxi, Ningxia, Hubei, Sichuan).

### *Macrophya longifossa* sp. n.

<http://zoobank.org/DC548309-0BAB-4574-848F-4D1BFEBEFBEA>

Figures 13–20

**Diagnosis.** This new species is similar to *M. jiuzhaina* Chen & Wei, 2005 in general morphological characteristics: body and legs mainly black; lancet narrow and long, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 5–13 distal teeth, subbasal teeth somewhat small and clear in both, but can be distinguished from the latter by the following: malar space 0.5× diameter of median ocellus; subapical antennomeres dilated, slightly broader than pedicel; apical part of fore wing without smoky macula; anterior 2/5 of katepimeron smooth and shiny; metepimeronal appendage broad and shallow, 4.5× as long and 3× as broad as diameter of median ocellus; fore wing hyaline, below stigma without smoky macula. *M. jiuzhaina*: malar space 0.7× diameter of middle ocellus; subapical antennomeres not dilated, slightly slender than pedicel; apical 1/3 of fore wing with smoky macula, basal 2/3 hyaline; anterior margin of katepimeron narrow and smooth; metepimeronal appendage slightly smaller than the former, 4× as long and 3× as broad as diameter of median ocellus; basal 2/3 of fore wing hyaline, apical 1/3 below stigma with smoky macula.

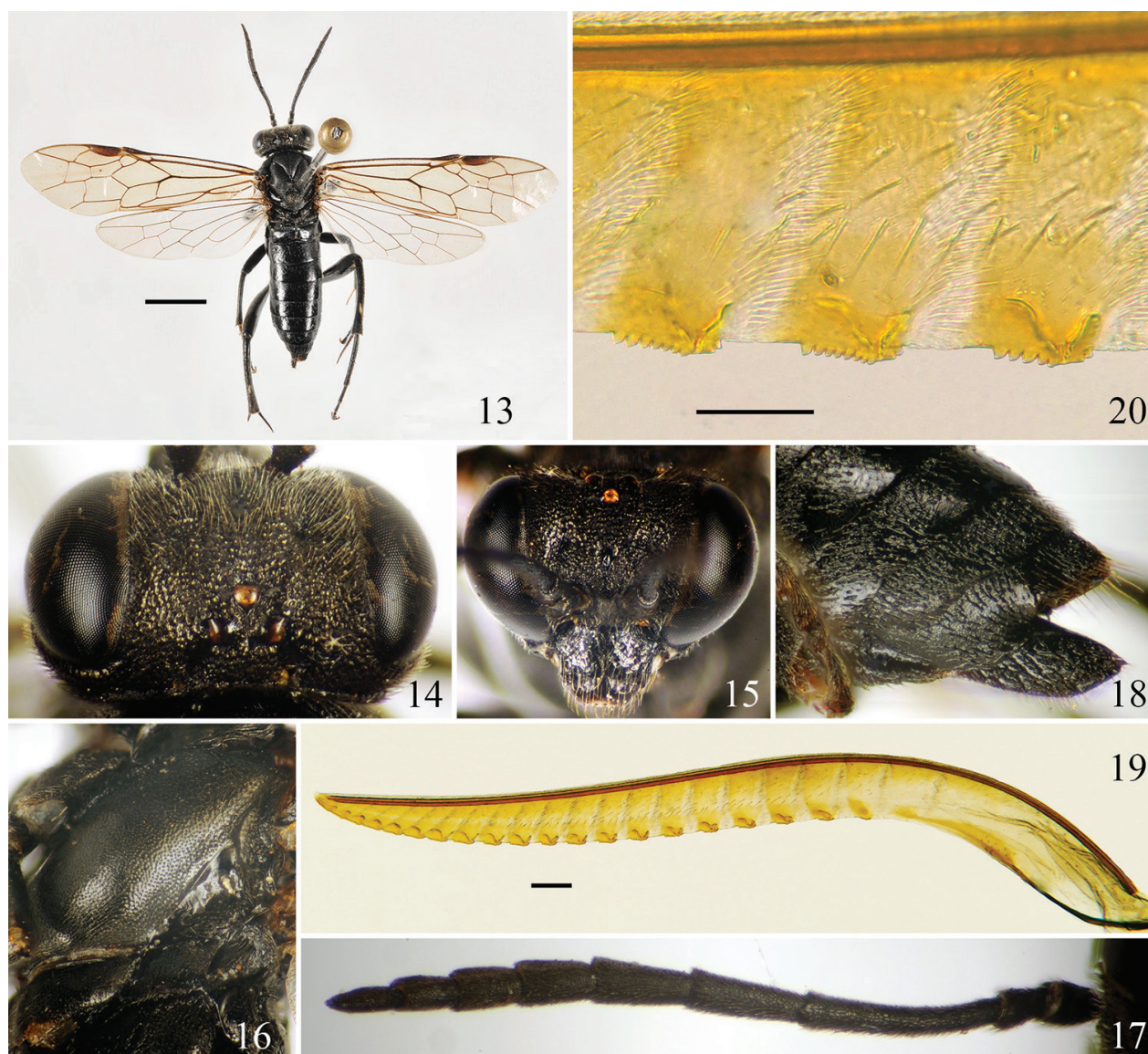
**Description.** Holotype: female. Body length 9.5 mm. Body and legs black, following parts white: basal half of mandibles, apex in anterior surface of fore femur, anterior surface of fore tibia, subbasal part on dorsal side of hind tibia. Body hairs pale brown, setae on sheath black brown. Wings hyaline, without smoky macula, stigma and veins black brown (Fig. 13).

Dorsum of head somewhat shiny; frons with somewhat dense and rugose punctures, without smooth interspaces between punctures (Fig. 14); labrum and clypeus somewhat polished, with sparse and shallow punctures, microsculpture fine. Mesonotum somewhat shiny, punctures on mesonotum smaller and finer than punctures on head, without smooth interspaces between punctures, with fine but distinct microsculpture; punctures on mesoscutellum somewhat large and rugose, microsculpture just visible; metascutellum with some indistinct punctures and microsculpture; mesepisternum densely punctured, interspaces with fine microsculpture, upper 1/3 with somewhat large punctures, lower 2/3 with minute punctures; anepimeron dull, punctures and wrinkles rugose; anterior 2/5 of katepimeron smooth and shiny, without punctures or microsculpture, posterior 3/5 of katepimeron coarsely punctured and rugose; lateral region of metepisternum dull, minutely and densely punctured, microsculpture fine; metepimeron somewhat shiny, depressed area of metepimeron weakly punctured, elevated part of metepimeron coarsely punctured; metepimeronal appendage with fine punctures and microsculpture; anterior with a distinct smooth and obtuse carina (Fig. 16). All abdominal terga shiny, center of abdominal tergum I with fine microsculpture, lateral sides with distinct punctures; other abdominal terga with fine microsculpture and very sparse but distinct punctures. Hind coxa and outer side of hind femur somewhat shiny, with slightly dense minute punctures, interspaces between punctures with fine microsculpture. Surface of sheath with fine punctures and faint microsculpture.

Anterior margin of labrum truncate; clypeus somewhat elevated in lateral view, broader than distance between the shortest distance between lower inner orbits; lateral sides convergent forwards, anterior margin shallowly incised to nearly 1/5× length of clypeus, lateral corner subquadrate, apical margin short and obtuse (Fig. 15); malar space 0.5× diameter of median ocellus; frons flat, as high as top of eyes in lateral view; middle fovea shallow and fine; lateral foveae slightly deep, furrow-like; interocellar furrow distinct, postocellar furrow indistinct; POL: OOL: OCL = 6: 15: 8; postocellar area slightly elevated, not higher than top of eyes, approximately 2.3× broader than long (9: 4), lateral furrows deep and divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, as long as head and thorax together, 0.8× length of abdomen; antennomere II 1.4× as long as broad (24: 17), antennomere III 1.7× as long as antennomere IV (19: 11), slightly shorter than antennomeres IV and V together (95: 103), subapical antennomeres dilated and slightly broader than pedicel, weakly compressed, the ratio of antennomeres IV–IX = 55: 48: 35: 32: 30: 33 (Fig. 17). Mesoscutellum elevated roundish, posterior with fine peak, lateral sides with fine carina, without middle carina, as high as top of mesonotum; mesoscutellar appendage with a high and acute middle carina, metascutellum with a low and short middle carina; dorsal-posterior platform of mesepimeron as broad as diameter of median ocellus; metepimeronal appendage broad and large, approximately 4.5× as long and 3× as broad as diameter of median ocellus; mesopleuron and metapleuron as in Figure 16; distance between cenchri twice as broad as a cenchrus. Inner spur of hind tibia 0.7

Anterior margin of labrum truncate; clypeus somewhat elevated in lateral view, broader than distance between the shortest distance between lower inner orbits; lateral sides convergent forwards, anterior margin shallowly incised to nearly 1/5× length of clypeus, lateral corner subquadrate, apical margin short and obtuse (Fig. 15); malar space 0.5× diameter of median ocellus; frons flat, as high as top of eyes in lateral view; middle fovea shallow and fine; lateral foveae slightly deep, furrow-like; interocellar furrow distinct, postocellar furrow indistinct; POL: OOL: OCL = 6: 15: 8; postocellar area slightly elevated, not higher than top of eyes, approximately 2.3× broader than long (9: 4), lateral furrows deep and divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender, as long as head and thorax together, 0.8× length of abdomen; antennomere II 1.4× as long as broad (24: 17), antennomere III 1.7× as long as antennomere IV (19: 11), slightly shorter than antennomeres IV and V together (95: 103), subapical antennomeres dilated and slightly broader than pedicel, weakly compressed, the ratio of antennomeres IV–IX = 55: 48: 35: 32: 30: 33 (Fig. 17). Mesoscutellum elevated roundish, posterior with fine peak, lateral sides with fine carina, without middle carina, as high as top of mesonotum; mesoscutellar appendage with a high and acute middle carina, metascutellum with a low and short middle carina; dorsal-posterior platform of mesepimeron as broad as diameter of median ocellus; metepimeronal appendage broad and large, approximately 4.5× as long and 3× as broad as diameter of median ocellus; mesopleuron and metapleuron as in Figure 16; distance between cenchri twice as broad as a cenchrus. Inner spur of hind tibia 0.7





**Figures 13–20.** *Macrophya longifossa* sp. n., ♀, holotype **13** Female adult, dorsal view **14** Head of female, dorsal view **15** Head of female, anterior view **16** Mesopleuron and metapleuron of female **17** Antenna of female, lateral view **18** Ovipositor sheath, dorsal view **19** Lancet **20** The 8<sup>th</sup>–10<sup>th</sup> middle serrulae. Scale bars: 2 mm (**13**); 100 µm (**19**); 50 µm (**20**).

times length of metabasitarsus (43 : 60); metabasitarsus slender, approximately 1.1× length of following four tarsomeres together (12 : 11); claw with inner tooth slightly shorter than outer tooth. Ovipositor sheath slightly shorter than metabasitarsus (14 : 15), apical sheath longer than basal sheath (29 : 25), apical margin slightly acute and somewhat rounded in lateral view (Fig. 18). Fore wing with vein cu-a joining cell 1M in basal 1/3, vein 2r joining cell 2Rs in apical 1/5, cell 2Rs slightly shorter than cell 1Rs, vein 2r-m slightly oblique, anal cell with a long spot-like vein; petiole of anal cell in hind wing as long as vein cu-a. Lancet with 21 serrulae (Fig. 19), serrulae oblique and weakly protruding, middle serrulae each with two proximal and 5–8 distal teeth, subbasal teeth slightly large and few, annular spine bands narrow, the 8<sup>th</sup>–10<sup>th</sup> middle serrulae as in Figure 20.

**Male.** Unknown.

**Type material.** **Holotype**, ♀, China: Shaanxi Province: Chang'an Region, Jiwozi, 33°51.319'N, 108°49.193'E, 1765 m, 27.vi.2008, leg. Xun Zhu. **Paratypes**, Ningxia Province: 3♀, CSCS17109, Guyuan City, Jingyuan County, Erlonghe, 35°18'59"N, 106°21'3"E, 2176m, 30.vi.2017, leg. Meicai Wei & Hannan Wang, Ethylacetate; Ningxia Province: 1♀, CSCS17110, Guyuan City, Jingyuan County, Yehegu, Waigou, 35°29'53"N, 106°13'22"E, 2281 m, 01.vii.2017, leg. Meicai Wei & Hannan Wang, Ethylacetate; Ningxia Province: 1♀, CSCS17107, Guyuan City, Jingyuan County, Sutai Forest Farm, 35°27'23"N, 106°12'2"E, 2281m, 28.vii.2017, leg. Meicai Wei & Hannan Wang, Ethylacetate.

**Host plants.** Unknown.

**Distribution.** China (Ningxia, Shaanxi).



**Etymology.** The specific name is derived from two Latin words “*longus*” and “*fossa*” referring to the long and large fossa of the metepimeronal appendage.

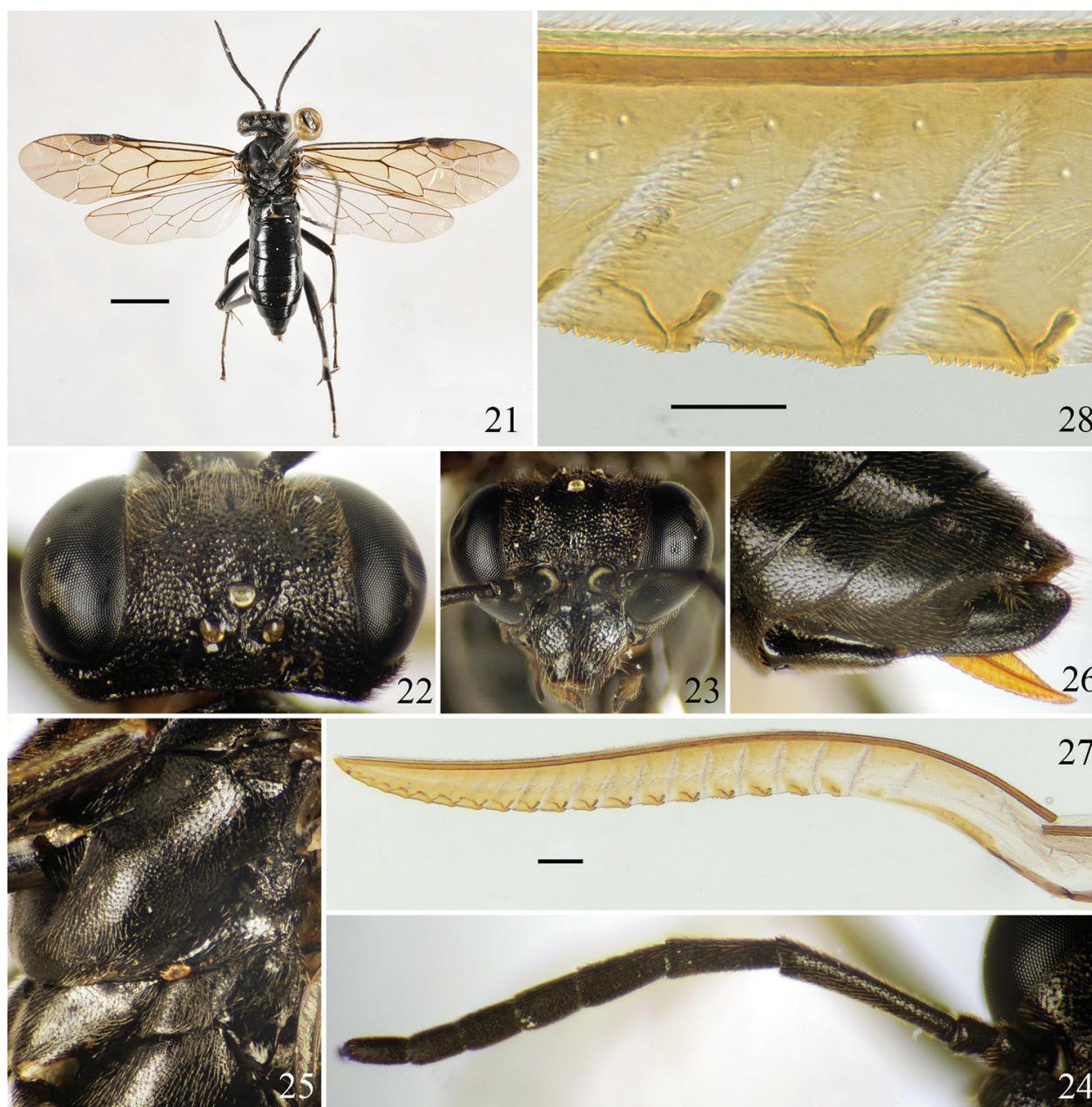
***Macrophya maculitibia* Takeuchi, 1933**

Figures 21–28

*Macrophya maculitibia* Takeuchi 1933: 27–28.

**Material examined.** China: Jilin Province: 2♀, Mt Changbaishan, 1300 m, 02.vii.1999, leg. Meicai Wei & Haiyan Nie; Jilin Province: 3♀, Mt Changbaishan,

Huangsongpu Forest Farm, 42°10.979'N, 128°10.278'E, 1145 m, 24.vii.2008, leg. Gengyun Niu & Yuan Zhang; Jilin Province: 3♀, Mt Changbaishan, Wenquanpubu, 42°02.673'N, 128°03.540'E, 1866 m, 23.vii.2008, leg. Meicai Wei & Gengyun Niu; Jilin Province: 5♀, Mt Changbaishan, Dixiasenlin, 42°05.264'N, 128°04.489'E, 1600 m, 26.vii.2008, leg. Meicai Wei & Yuan Zhang; Jilin Province: 1♀, Mt Changbaishan, 05.viii.2008, leg. Maoling Sheng; Jilin Province: 6♀, CSCS12140, Mt Changbaishan, Changbaipubu, Baihe Town, 42°02.962'N, 128°03.372'E, 1850 m, 25.vii.2012, leg. Zejian Li & Jigang Jiang; Jilin Province: 3♀, CSCS12142, Mt Changbaishan, Huangsongpu Forest Farm, Baihe Town,



**Figures 21–28.** *Macrophya maculitibia* Takeuchi, 1933 **21** Female adult, dorsal view **22** Head of female, dorsal view **23** Head of female, anterior view **24** Antenna of female, lateral view **25** Mesopleuron and metapleuron of female **26** Ovipositor sheath, dorsal view **27** Lancet **28** The 8<sup>th</sup>–10<sup>th</sup> middle serrulae. Scale bars: 2 mm (**21**); 100 µm (**27**); 50 µm (**28**).

42°14.107'N, 128°10.704'E, 1030 m, 27.vii.2012, leg. Zejian Li & Mengmeng Liu; Jilin Province: 2♀, CSCS12126, Mt Changbaishan, Huangsongpu Forest Farm, Baihe Town, 42°14.107'N, 128°10.704'E, 1030 m, 20.vii.2012, leg. Zejian Li & Mengmeng Liu; Jilin Province: 2♀, CSCS12129, Mt Changbaishan, Huangsongpu Forest Farm, Baihe Town, 42°14.107'N, 128°10.704'E, 1030 m, 21.vii.2012, leg. Jigang Jiang & Lanlan Deng; Jilin Province: 2♀, CSCS12134, Mt Changbaishan, Huangsongpu Forest Farm, Baihe Town, 42°14.107'N, 128°10.704'E, 1030 m, 23.vii.2012, leg. Zejian Li & Mengmeng Liu; Jilin Province: 1♀, CSCS12139, Mt Changbaishan, Daxitaihe, Baihe Town, 42°13.796'N, 128°11.808'E, 1035 m, 24.vii.2012, leg. Jigang Jiang & Lanlan Deng; Jilin Province: 1♀, CSCS14194, Mt Changbaishan, Fanghuoliaowangta, 42°04'58"N, 128°13'43"E, 1400 m, 09.vii.2014, leg. Biao Chu, Ethylacetate; Jilin Province: 1♀, CSCS14191, Mt Changbaishan, Dixiasenlin, 42°05'10"N, 128°04'26"E, 1600 m, 05.vii.2014, leg. Biao Chu, Ethylacetate; Jilin Province: 1♀, CSCS14190, Mt Changbaishan, Changbaipubu, 42°02'30"N, 128°03'30"E, 1900 m, 05.vii.2017, leg. Biao Chu, Ethylacetate; Jilin Province: 1♀, CSCS14192, Erdaobaihe Town, Daxitaihe, 42°13'04"N, 128°10'50"E, 1060 m, 08.vii.2014, leg. Biao Chu, Ethylacetate; Liaoning Province: 1♀, Gaolingzi, 02~05.viii.1955, Chinese Academy Sciences; Liaoning Province: 1♀, Gaolingzi, 20.vii.1954, Chinese Academy Sciences.

**Diagnosis.** The species is similar to *M. jiuzhaina* Chen & Wei, 2005 in general morphology characteristics which are body and legs mainly black; lancet narrow and long, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 9–13 distal teeth, subbasal teeth somewhat small and clear in both, but can be distinguished from the latter in having metepimeronal appendage very shiny, somewhat narrow and smooth, without punctures or long hairs; postocellar area  $2.5 \times$  broader than long; antennae somewhat longer than head and thorax together; mesoscutellum elevated, somewhat higher than top of mesonotum. *M. maculitibia*: metepimeronal appendage less shiny, broad and large, with dense and fine punctures and some long hairs; postocellar area  $2.3 \times$  broader than long; antenna as long as head and thorax together; mesoscutellum elevated, rounded, as high as top of mesonotum.

**Host plants.** Unknown.

**Distribution.** China (Jilin, Liaoning), Siberia, North Korea, Japan.

### *Macrophya motuo* sp. n.

<http://zoobank.org/9643BB46-2FEB-4B06-93D6-80F30BF6EC7E>

Figures 29–36

**Diagnosis.** This new species is similar to *M. jiuzhaina* Chen & Wei, 2005 in general morphological characteris-

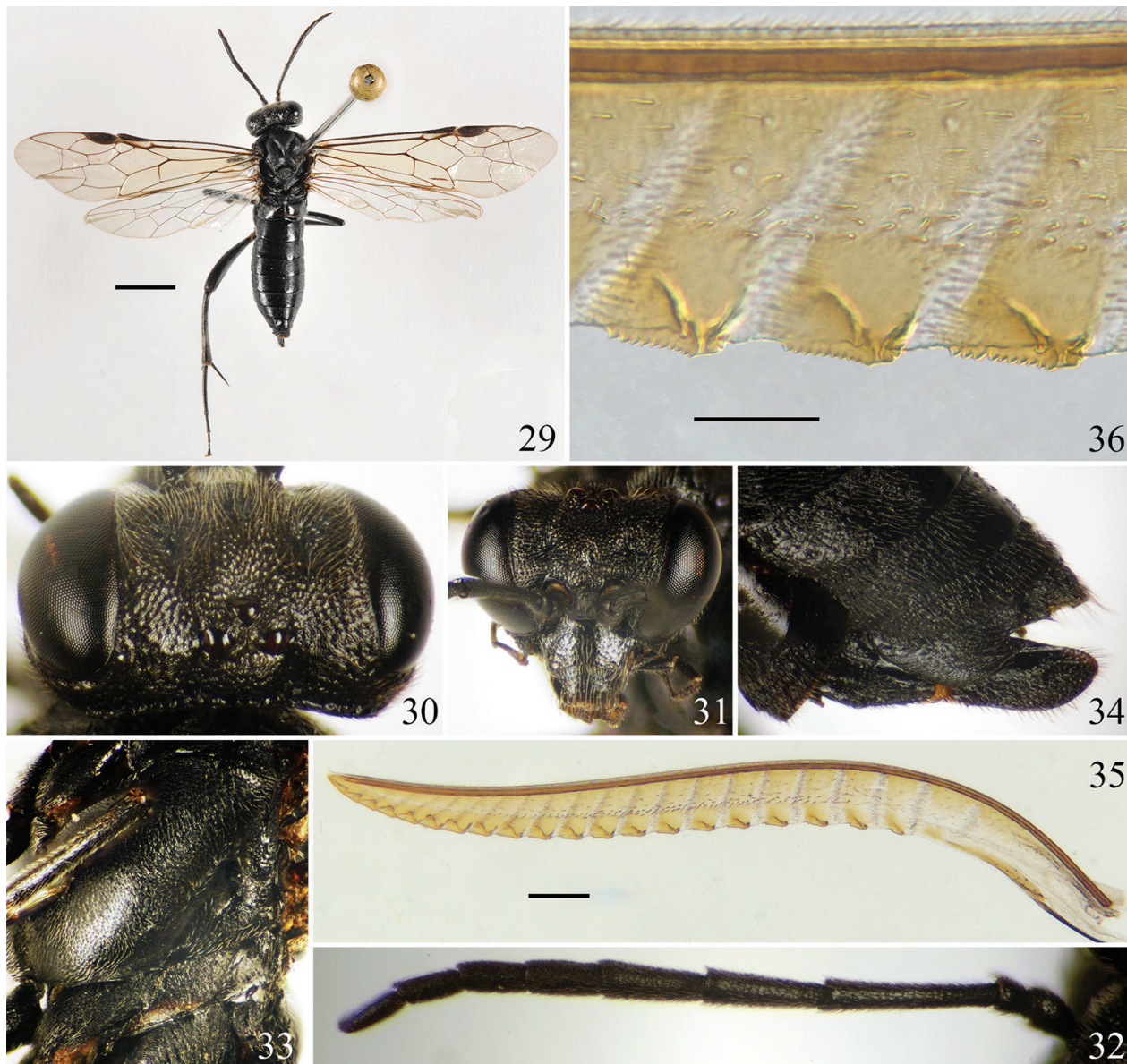
tics: body and legs mainly black; lancet narrow and long, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 10–13 distal teeth, subbasal teeth somewhat small and clear in both, but can be distinguished from the latter by the following: postocellar area  $2 \times$  broader than long; metepimeronal appendage somewhat narrow and small, nearly triangular, apical margin slightly roundish,  $2.5 \times$  as long and broad as diameter of median ocellus; mesoscutellum distinctly elevated, posterior with a peak, lateral sides and center with slightly distinct carina, slightly higher than top of mesonotum; fore wing hyaline, below stigma without smoky macula. *M. jiuzhaina*: postocellar area  $2.3 \times$  broader than long; metepimeronal appendage broad and shallow, not triangular,  $4 \times$  as long and  $3 \times$  as broad as diameter of median ocellus; posterior of mesoscutellum without a peak, center without a middle carina, with fine lateral carinae, as high as top of mesonotum; basal 2/3 of fore wing hyaline, apical 1/3 below stigma with smoky macula.

**Description.** Holotype: female. Body length 9.5 mm. Body and legs black; following parts white: basal half of mandibles, anterior surface of fore femur partly and subbasal part in dorsal side of hind tibia. Body hairs pale brown, setae on sheath hairs pale black-brown. Wings hyaline, without smoky macula, stigma and veins black brown. (Fig. 29)

Dorsum of head shiny, frons with somewhat dense and rugose punctures, interspaces between punctures narrow, with fine microsculpture (Fig. 30); labrum and clypeus somewhat shiny, punctures on labrum sparse, punctures on clypeus somewhat dense, punctures largely shallow and flat. Dorsum of mesonotum somewhat shiny, punctures on mesonotum minutely and densely punctured, without smooth interspaces between punctures, with fine microsculpture; punctures on mesoscutellum somewhat large and rugose; mesoscutellar appendage dull, with indistinct punctures and microsculpture faint; mesepisternum somewhat shiny, minutely and densely punctured, interspaces with fine microsculpture; anepimeron dull, wrinkles rugose; anterior 1/5 of katepimeron smooth and shiny, without punctures or microsculpture; posterior 4/5 of katepimeron with distinct punctures and microsculpture; lateral region of metepisternum dull, with fine punctures and microsculpture; metepimeron somewhat shiny, depressed area of metepimeron with sparse and fine punctures, microsculpture faint; metepimeronal appendage somewhat shiny, with fine punctures and indistinct microsculpture, anterior with a smooth and obtuse carina (Fig. 33). All abdominal terga shiny, center of abdominal tergum 1 with fine microsculpture, lateral sides with distinct punctures; other abdominal terga with fine microsculpture and very sparse but distinct punctures. Hind coxa and outer side of hind femur somewhat shiny, with somewhat dense minute punctures, interspaces between punctures with fine microsculpture. Surface of sheath with fine punctures and faint microsculpture.

Anterior margin of labrum more or less truncate; clypeus slightly elevated in lateral view, broader than dis-





**Figures 29–36.** *Macrophyta motuoa* sp. n., ♀, holotype **29** Female adult, dorsal view **30** Head of female, dorsal view **31** Head of female, anterior view **32** Antenna of female, lateral view **33** Mesopleuron and metapleuron of female **34** Ovipositor sheath, dorsal view **35** Lancet **36** The 8<sup>th</sup>–10<sup>th</sup> middle serrulae. Scale bars: 2 mm (**29**); 100 μm (**35**); 50 μm (**36**).

tance between the shortest distance between lower inner orbits; lateral sides convergent forwards, anterior margin shallowly incised to approximately  $1/5\times$  length of clypeus; lateral corner subquadrate, apical margin short and obtuse (Fig. 31); malar space  $0.8\times$  diameter of median ocellus; frons flat, as high as top of eyes in lateral view; middle fovea shallow and fine; lateral foveae slightly deep, furrow-like; interocellar furrow distinct, postocellar furrow indistinct; POL : OOL : OCL = 3 : 7 : 4; postocellar area slightly elevated, not higher than top of eyes, approximately  $2\times$  broader than long (17 : 8), lateral furrows deep and divergent backwards; head narrowed behind eyes in dorsal view, occipital carina complete. Antenna slender,  $1.1\times$  longer than head and thorax together,  $0.8\times$  longer than abdomen; antennomere II  $1.2\times$  longer than broad (6 : 5), antennomere III  $1.4\times$  as long as anten-

nomere IV (17 : 12),  $0.8\times$  as long as antennomeres IV and V together (17 : 22), subapical antennomeres not dilated and slightly narrower than pedicel, weakly compressed, the ratio of antennomeres IV–IX = 60 : 50 : 40 : 33 : 30 : 32 (Fig. 32). Mesoscutellum distinctly elevated, posterior with a peak, lateral sides and center with weak carina, slightly higher than top of mesonotum; mesoscutellar appendage with a high and acute middle carina, metascutellum with a low and short middle carina; dorsal-posterior platform of mesepimeron as broad as diameter of median ocellus; metepimeronal appendage narrow and small, nearly triangular, apical margin roundish, approximately  $2.5\times$  as long and broad as diameter of median ocellus; mesopleuron and metapleuron as in Figure 33; distance between cenchri  $2\times$  as broad as a cenchrus. Inner spur of hind tibia  $0.7\times$  length of metabasitarsus (7 : 10); metab-

sitarsus slender,  $1.1 \times$  length of following four tarsomeres together (15 : 14); claw with inner tooth slightly shorter than outer tooth. Ovipositor sheath slightly shorter than metabasitarsus (11 : 12), apical sheath slightly longer than basal sheath (9 : 7), apical margin somewhat narrow and rounded in lateral view (Fig. 34). Fore wing with vein cu-a joining cell 1M in basal 1/4, vein 2r joining cell 2Rs in apical 1/5, cell 2Rs as long as cell 1Rs, vein 2r-m slightly oblique, anal cell with a short vein and slightly shorter than vein 1r-m; petiole of anal cell in hind wing as long as vein cu-a. Lancet with 20 serrulae (Fig. 35), serrulae oblique and flat, middle serrulae each with two proximal and 10–11 distal teeth, subbasal teeth slightly small, annular spine bands narrow, the 8<sup>th</sup>–10<sup>th</sup> middle serrulae as in Figure 36.

**Male.** Unknown.

**Type examined.** **Holotype**, ♀, China: Tibet: Motuo County, Hanmi, 29°22'N, 95°07'E, 2180 m, 16.vi.2009, leg. Zejian Li. **Paratypes**, Tibet: 3♀, CSCS142261, Linzhi District, Motuo County, 44K, 29°42.1'N, 95°33.967'E, 2730 m, 20.vii.2014, leg. Liwei Qi, Ethylacetate; Tibet: 1♀, CSCS142263, Linzhi District, Motuo County, 44K, 29°42.1'N, 95°33.967'E, 2730 m, 20.vii.2014, leg. Wei Xiao & Yilin Xiao, Ethylacetate.

**Host plants.** Unknown.

**Distribution.** China (Tibet).

**Etymology.** The specific name is derived from the locality of the new species which is Motuo County, Tibet in China.

### *Macrophya yunnana* sp. n.

<http://zoobank.org/38454BEC-CC06-426B-80B8-CC7A18077800>

Figures 37–44

**Diagnosis.** This new species is very similar to *M. jiuzhaina* Chen & Wei, 2005 in general morphological characteristics: body and legs mainly black; basal 2/3 of fore wing hyaline, apical 1/3 of below stigma with smoky macula; metepimeronal appendage usually broad and shallow, less shiny, with somewhat dense fine punctures and long hairs; mesoscutellum as high as top of mesonotum; lancet narrow and long, serrulae somewhat oblique, almost linear, middle serrulae each with 2 proximal and 6–13 distal teeth, subbasal teeth somewhat small and clear in both, but can be distinguished from the latter by the following: postocellar area  $1.9 \times$  broader than long; metepimeronal appendage  $3 \times$  as long and twice as broad as diameter of median ocellus; apical margin of ovipositor sheath somewhat rounded and acute in lateral view; middle serrulae of lancet in female each with two proximal and 6–11 distal teeth. *M. jiuzhaina*: postocellar area  $2.3 \times$  broader than long; metepimeronal appendage  $4 \times$  as long and  $3 \times$  as broad as diameter of median ocellus;

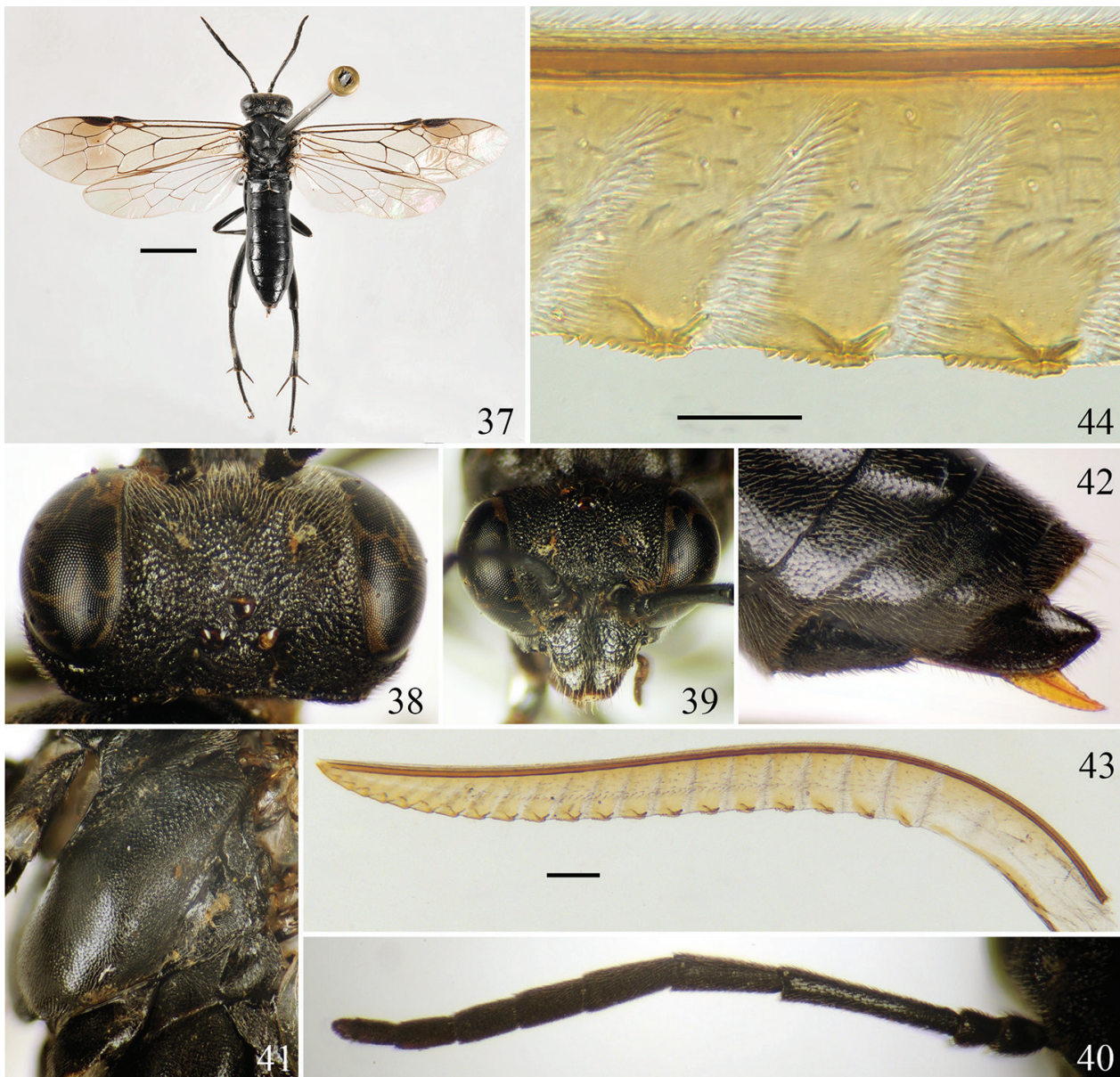
apical margin of ovipositor sheath rounded and slightly obtuse in lateral view; middle serrulae of lancet in female each with two proximal and 10–13 distal teeth.

**Description.** Holotype: female. Body length 9.5 mm. Body and legs black; following parts white: basal half of mandibles, apical half on anterior surface of fore femur, anterior surface largely of fore tibia, subbasal part of dorsal side of hind tibia. Body hairs pale brown; setae on sheath black-brown. Wings largely hyaline, apical 1/3 of fore wing with smoky macula, stigma, and veins black-brown. (Fig. 37)

Dorsum of head somewhat shiny, frons rugose with dense punctures, interspaces with fine microsculpture (Fig. 38); labrum and clypeus somewhat shiny, punctures on labrum sparse, punctures on clypeus more dense, punctures largely shallow and flat, microsculpture fine. Dorsum of mesonotum somewhat shiny, punctures on mesonotum minute and dense, interspaces with fine microsculpture; mesoscutellum rugose with somewhat large punctures; mesoscutellar appendage somewhat shiny, with indistinct punctures and weak microsculpture; metascutellum dull, with distinct microsculpture; mesepisternum somewhat shiny, with minute and shallow punctures, interspaces with fine microsculpture; anepimeron dull, wrinkles rugose; anterior 1/5 of katepimeron smooth and shiny, without punctures or microsculpture; posterior 4/5 of katepimeron with distinct punctures and microsculpture; lateral region of metepisternum somewhat shiny, with fine punctures and microsculpture; metepimeron somewhat shiny, depressed area of metepimeron with sparse and fine punctures, microsculpture faint; metepimeronal appendage somewhat shiny, with fine punctures and indistinct microsculpture, anterior with a smooth and obtuse carina (Fig. 41). All abdominal terga shiny, center of abdominal tergum 1 with fine microsculpture, lateral sides with distinct punctures; other abdominal terga with very sparse and distinct punctures, microsculpture fine but distinct. Hind coxa and outer side of hind femur somewhat shiny, with slightly dense and minute punctures, interspaces between punctures with fine microsculpture. Surface of sheath with fine punctures and indistinct microsculpture.

Anterior margin of labrum more or less truncate; clypeus slightly elevated in lateral view, broader than distance between the shortest distance between lower inner orbits; lateral sides convergent forwards, anterior margin shallowly incised to approximately  $1/5 \times$  length of clypeus; lateral corner of clypeus subquadrate, apical margin of lateral lobes short and obtuse (Fig. 39); malar space  $0.6 \times$  diameter of median ocellus; frons flat, as high as top of eyes in lateral view; median fovea shallow and fine; lateral foveae slightly deep, furrow-like; interocular furrow distinct, postocellar furrow indistinct; POL : OOL : OCL = 3 : 7 : 4; postocellar area slightly elevated, not higher than top of eyes, approximately  $1.9 \times$  broader than long (15 : 8), lateral furrows deep and divergent backwards; head narrowed behind eyes in dorsal view,





**Figures 37–44.** *Macrophya yunnana* sp. n., ♀, holotype **37** Female adult, dorsal view **38** Head of female, dorsal view **39** Head of female, anterior view **40** Antenna of female, lateral view **41** Mesopleuron and metapleuron of female **42** Ovipositor sheath, dorsal view **43** Lancet **44** The 8<sup>th</sup>–10<sup>th</sup> middle serrulae. Scale bars: 2 mm (**37**); 100 μm (**43**); 50 μm (**44**)

occipital carina complete. Antenna slender, 1.3× longer than head and thorax together, 0.9× longer than abdomen; antennomere II 1.3× longer than broad (23 : 18), antennomere III 1.7× as long as antennomere IV (92 : 55), as long as antennomeres IV and V together (92 : 105), subapical antennomeres slightly dilated and broader than pedicel, weakly compressed, the ratio of antennomeres IV–IX = 55 : 50 : 36 : 32 : 30 : 33 (Fig. 40). Mesoscutellum elevated, rounded, posterior with a faint peak, lateral sides and center with indistinct carina, as high as top of mesonotum; mesoscutellar appendage with a high and acute median carina, metascutellum with a low and short middle carina; dorsal-posterior platform of mesepimeron as broad as diameter of median ocellus; metepimeronal appendage somewhat broad and shallow, apical margin

round, approximately 3× as long and 2× as broad as diameter of median ocellus; mesopleuron and metapleuron as in Fig. 41; distance between cenchri 2× as broad as a cenchrus. Inner spur of hind tibia 0.7× length of metabasitarsus (20 : 29); metabasitarsus slender, 1.1× length of following four tarsomeres together (29 : 26); claw with inner tooth slightly shorter than outer tooth. Ovipositor sheath slightly shorter than metabasitarsus (55 : 58), apical sheath slightly longer than basal sheath (31 : 21), apical margin somewhat narrow and rounded in lateral view (Fig. 42). Fore wing with vein cu-a joining cell 1M in basal 1/4, vein 2r joining cell 2Rs in apical 1/3, cell 2Rs slightly longer than cell 1Rs, vein 2r-m slightly oblique, anal cell with a short long spot-like vein; petiole of anal cell in hind wing as long as vein cu-a. Lancet with 21 ser-

ulae (Fig. 43), serrulae oblique and flat, middle serrulae each with two proximal and 6–11 distal teeth, subbasal teeth slightly small, annular spine bands narrow, the 8<sup>th</sup>–10<sup>th</sup> middle serrulae as in Figure 44.

**Male.** Unknown.

**Type material.** **Holotype**, ♀, China: Yunnan Province: Mt Yulongxueshan, Lijiang City, 2700–3100 m, 25.vii.2004, leg. Wei Xiao. **Paratypes**, Yunnan Province: 1♀, Xiaozhongdian, Xianggelila City, 3000 m, 19.vii.2004, leg. Wei Xiao; Yunnan Province: 1♀, Mt Baixueshan, Deqin County, 28°443'N, 98°950'E, 3471 m, 19.vi.2009, leg. Yihai Zhong; Yunnan Province: 1♀, Mt Daorensan, Yunlong County, 25°32.893'N, 99°11.267'E, 2265 m, 03.vi.2009, leg. Zejian Li.

**Host plants.** Unknown.

**Distribution.** China (Yunnan).

**Etymology.** The specific name is derived from the locality of the new species which is Yunnan Province in Southwest China.

## Discussion

The *Macrophya maculitibia* group is a medium-sized species group in the genus *Macrophya* Dahlbom, 1835. At present, there are five species including three new species from China in this group: *M. jiuzhaina* Chen & Wei, 2005, *M. longifossa* sp. n., *M. maculitibia* Takeuchi, 1933, *M. yunnana* sp. n., and *M. motuo* sp. n. (Chen et al. 2005; Takeuchi 1933). The species hosts of this group are unknown. The *M. maculitibia* group was proposed in a book by Li et al. (2018d) but not reviewed due to a limit on the number of words. With the new material now available, three new species are described and reported, as well as a key is presented to all known Chinese species.

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We are deeply grateful to Spencer K. Monckton and Professor Maoling Sheng for valuable comments and suggestions. This research was partly supported by the Natural Science Foundation of Zhejiang Province (LY18C040001) and the National Natural Science Foundation of China (31672344, 31501885).

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