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The fauna of the family Adelidae (Insecta, Lepidoptera, Adeloidea) from China

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Abstract

Ninety-eight species of the family Adelidae, belonging to three genera in two subfamilies, were recorded and described in China, with illustrations of the adults and their genitalia. Keys to subfamilies, genera and species are also provided. Twenty-four new species are described, nine species are newly recorded from China, and four new combinations are made. Ecological photos and DNA barcodes of some species are provided, and the phylogenetic analysis based on cytochrome c oxidase subunit I (COI) sequences are conducted. The new taxa are as follows: *Nemophora pseudalbiantennella* Liao, Hirowatari & Huang, **sp. nov.**, *N. badagongshana* Liao, Hirowatari & Huang, **sp. nov.**, *N. longlabiae* Liao, Hirowatari & Huang, **sp. nov.**, *N. quadrata* Liao, Hirowatari & Huang, **sp. nov.**, *N. basalistriata* Liao, Hirowatari & Huang, **sp. nov.**, *N. digitata* Liao, Hirowatari & Huang, **sp. nov.**, *N. duplicifascia* Liao, Hirowatari & Huang, **sp. nov.**, *N. hunanensis* Liao, Hirowatari & Huang, **sp. nov.**, *N. purpurata* Liao, Hirowatari & Huang, **sp. nov.**, *N. arcuatifasciata* Liao, Hirowatari & Huang, **sp. nov.**, *N. caeruliantenna* Liao, Hirowatari & Huang, **sp. nov.**, *N. xizangensis* Liao, Hirowatari & Huang, **sp. nov.**, *N. caerulea* Liao, Hirowatari & Huang, **sp. nov.**, *N. songgangensis* Liao, Hirowatari & Huang, **sp. nov.**, *N. conjugata* Liao, Hirowatari & Huang, **sp. nov.**, *N. latilobula* Liao, Hirowatari & Huang, **sp. nov.**, *N. longispina* Liao, Hirowatari & Huang, **sp. nov.**, *N. ganziensis* Liao, Hirowatari & Huang, **sp. nov.**, *N. jiajinshana* Liao, Hirowatari & Huang, **sp. nov.**, *N. litangensis* Liao, Hirowatari & Huang, **sp. nov.**, *N. tianpingshana* Liao, Hirowatari & Huang, **sp. nov.**, *N. triangulifascia* Liao, Hirowatari & Huang, **sp. nov.**, *N. yajiagengensis* Liao, Hirowatari & Huang, **sp. nov.**, and *N. bispina* Liao, Hirowatari & Huang, **sp. nov.** The newly recorded taxa from China are: *Nematopogon distinctus* Yasuda, 1957, *Adela nobilis* Christoph, 1882, *A. praepilosa* Hirowatari, 1997, *Nemophora albiantennella* Issiki, 1930, *N. chionites* (Meyrick, 1907), *N. smaragdaspis* (Meyrick, 1924), *N. trimetrella* Stringer, 1930, *N. optima* (Butler, 1878), and *N. bifasciatella* Issikii, 1930. The new combinations are *N. servata* (Meyrick, 1925) **com. nov.**, *N. diplophragma* (Meyrick, 1938) **com. nov.**, *N. chionella* (Caradja, 1935) **com. nov**., and *N. chrysocharis* (Caradja, 1938) **com. nov.**

Key words: DNA barcode, genitalia, morphology, new record, new species, phylogeny, taxonomy

Introduction

Adelidae Bruand, 1850, also named longhorned fairy moths because of its very long antennae, is a small primitive moth family that widely occurs in all zoogeographical regions except Antarctica and New Zealand (Heppner 1991; Janse 1945; Meyrick 1912a, b; Davis 1999). The family is considered as a member of the superfamily Adelioidea with the families Heliozelidae, Incurvariidae, Cecidosidae and Prodoxidae (van Nieukerken *et al*. 2011). However, for a long time, the superfamily name has been regarded as Incurvarioidea Spuler, 1898 (Common 1970; Dugdale 1974; Nielsen 1980; Davis 1999), Adeloidea Bruand, 1850 is a qualified superfamily name, and the former frequently used name is a junior synonym of Adeloidea (Razowski & Wojtusiak 1978; Kozlov 1997d; van Nieukerken *et al*. 2011; Cho 2015).

The family name Adelidae was first used in "Catalogue systématique et synonymique des Lépidoptères du département du Doubs (suite)" by Bruand (1850[1851]) based on *Adela schwammerdammella* (now as *Nematopogon schwammerdammella*) as type species. From the middle 19th century to the early 20th century, beautiful small moths with long antennae, usually longer than forewing length, were called 'longhorned fairy moths' and divided into two different groups. The first is the genus *Nemophora* Hübner, 1825 (now *Nematopogon*), which was thought to be related to *Incurvaria* Haworth, 1828 and *Lampronia* Stephens, 1829, and placed in the large family Tineidae. The other genera, *Nemotois* (now *Nemophora*) and *Adela*, were placed in a distinct family Adelidae (Herrich-Schäffer 1857; Heinemann 1870; Rebel 1901). However, some authors have placed all of these genera in the large family Tineidae (Stainton 1854; Meyrick 1895). Spuler (1910) considered that the above-mentioned genera consisted of a single family, Incurvariidae, with the genus *Incurvaria* (including *Lampronia*), which consists of two subfamilies, Incurvariinae and Adelinae. This arrangement has been used by several other authors, such as Diakonoff (1951), Bradley *et al*. (1972), Heath & Pelham-Clinton (1976), Common (1970), Razowski & Wojtusiak (1978). Meyrick (1912b) placed all the genera with long antennae in the family Adelidae, including six genera and 155 species, of which three large genera, *Ceromitia*, *Nemotois* (now *Nemophora*), and *Adela*, were divided into several groups. However, some authors still followed the view of a subfamily of Incurvariidae. Forbes (1923) accorded the Adelinae rank along with Prodoxinae and Incurvariinae based on similarities in mouthpart structure, wing venation, male genitalia, and especially the unique well-developed piercing ovipositor. Powell (1969) considered that adelid moths are closely related to the family Incurvariidae based on the structures of adults. The classification of Meyrick

(1912b) has been adopted by an increasing number of authors (Hirowatari 1997, 2005a; Kozlov 1997d, 2004b, 2016c; van Nieukerken *et al*. 2011; Pohl *et al*. 2019).

Meyrick (1912b) considered that Adelidae consists of several different evolutionary branches originating from a simple clade of the family Tineidae, and regarded *Adela* as the most primitive genus based on geographical distribution. However, this hypothesis was contrary to his interpretation of the primitive state of the maxillary palpi which has five segments, and is very similar to that of homoneurous Lepidoptera (Nielsen 1980). Nielsen (1980) conducted a preliminary cladistic phylogenetic analysis of the four major genera of Adelidae based on a large number of morphological examinations and evolutionary discussions. The monophyly of Adelidae is demonstrated based on three synapomorphies, including the long antennae, narrow and slender cloaca in females, and a high number of ovarioles per ovary (Nielsen 1980).

For the phylogeny of the family Adelidae, Nielsen (1980) first analyzed preliminary cladistic-phylogenetic relationships among the genera *Nematopogon*, *Nemophora*, *Adela*, and *Cauchas* based on morphological characters. Subsequently, phylogenetic studies including all Lepidoptera at the family/subfamily levels were carried out based on morphological and molecular data (Wiegmann *et al*. 2002; Kristensen *et al*. 2007; Mutanen *et al*. 2010; Regier *et al*. 2015; Bazinet *et al*. 2016; Mitter *et al*. 2017; Liao *et al.* 2023). The genetic relationships are still unclear in the family Adelidae and even contradictory in different analysis methods (Regier *et al*. 2015). To date, there have been no comprehensive phylogenetic analyses among all genera of Adelidae.

There are approximately 60 adelid species known in China belonging to two subfamilies and three genera (Hua 2005; Kozlov 1997b, c, e; Kozlov & Hirowatari 1997; Heppner 1992; Wang *et al*. 2000; Liao *et al*. 2021; Sun *et al*. 2022, 2023; Kozlov 2023b, c), but most belong to the largest genus *Nemophora* Hofmannsegg, 1798. Although several monophyletic species groups have been recognized, including the *N. hoeneella*, *N. askoldella*, *N. divina*, *N. kalshoveni*, *N. fluorites*, *N. sichuana*, *N. degeerella*, and *N. mediseorsa* groups, *etc.* (Kozlov & Hirowatari 1997; Kozlov 1995, 1997c, 2016b; Hirowatari 2007; Hirowatari *et al*. 2012; Liao *et al*. 2021; Sun *et al*. 2022, 2023), the taxonomic affinities of many species remain unclear, and clarification of their phylogenetic relationships is hampered by an acute shortage of materials suitable for DNA analysis (Kozlov *et al*. 2017). In addition, members in some species groups are very difficult to distinguish from external characteristics because of their extremely similar wing pattern and high variability within- and among-species. Recently, some cases of potential cryptic diversity have been discovered based on morphological and molecular evidence (Kozlov *et al*. 2017).

Based on specimens from museums and materials collected from the field, the adelid moths in China were examined and reviewed, with the distribution information and keys to the subfamilies, genera, and species in China.

Materials and methods

Taxon sampling

The adults were pinned and spread after they were killed using an aqueous solution of ammonium hydroxide. Genitalia was dissected, and scales were removed in 75% alcohol solution after water bath heating in 10% NaOH solution. Photographs of adults were taken with a Canon EOS 6D camera with a Canon EF 100 mm macro lens. The genitalia and other structures were examined using a Leica S8APO microscope and Leica DFC425 camera with LAS v4.9 software. Habitat photos were taken with a Canon EOS 70D camera with a Canon EF 100 mm macro lens. The terms used for morphological features follow Nielsen (1980, 1985) and Hirowatari (1997). To compare eye size, horizontal eye diameter (hd) and minimum distance between eyes in the dorsal view (md) were measured, and the eye size index, hd/md (Hirowatari 1997), was then calculated. Unless otherwise mentioned, the examined specimens were deposited at the Hunan Agricultural University, China (HUNAU).

Abbreviations of museums and institutions:

BMNH	The Natural History Museum, London, UK.
CAU	China Agricultural University, Beijing, China.
ELKU	Entomological Laboratory, Kyushu University, Fukuoka, Japan.
HUNAU	Hunan Agricultural University, Changsha, China.
KIZ	Kunming Institute of Zoology, Kunming, China.
MINGA	Muzeul de Istoria Naturală ‘Grigore Antipa’, Bucharest, Rumania.

NKU	Insect Collection of Nankai University, Tianjin, China.
OMNH	Osaka Museum of Natural History, Osaka, Japan.
OPU	Osaka Metropolitan University (formerly Osaka Prefecture University), Sakai, Japan.
SEHU	Systematic Entomology, Hokkaido University, Sapporo, Japan.
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.
ZMHB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.

DNA sequencing and Phylogenetic analysis

DNA was extracted from the legs of dry adult specimens, and the protocols for total DNA extraction and cytochrome c oxidase I gene (COI) barcode fragment (658 bp) amplification were performed following the methods described by Liao *et al*. (2019). The PCR products were recovered and cloned, and the positive plasmids were sequenced by Qingke Biotech Co. Ltd (Changsha, China). All the sequenced taxa and their collected information are shown in Table 1.

A total of 180 COI sequences (658 bp, Table S1) were downloaded from the NCBI (https://www.ncbi.nlm.nih.gov/) or BOLD systems (www.boldsystems.org) (Ratnasingham & Hebert 2007), and all sequences, including 53 new sequences of 34 species, were used for phylogenetic analysis. Among them, three sequences of the family Incurvariidae (*Vespina meridiana*, *Incurvaria* sp., and *Paraclemensia caerulea*) were used as outgroups (Liao *et al.* 2023). For phylogenetic analysis, maximum likelihood (ML) analysis was conducted using MEGA 11 software (Stecher *et al*. 2020). General Time Reversible model (GTR) and Gamma distributed with Invariant sites (G + I) were used in the phylogenetic analysis. Bootstrap analysis (Felsenstein 1985) was performed using the same heuristic search setting for 1,000 pseudoreplicates.

Taxonomy

Family Adelidae Bruand, 1850

Description. Body small, wing expanse usually 10–26 mm. Head rough on vertex, covered with dense scales and hairs; ocelli absent; face usually covered with smooth broad scales. Compound eyes small to extremely large; eyes dimorphic in most species of the genera *Adela* and *Nemophora* with that of male obviously enlarged, even complete close to each other dorsally, and usually with facets in upper 2/3 of eye outwardly enlarged (Fig. 1A). Antennae usually longer than forewing in both sexs, up to 3 × of forewing length in male but relatively short in female; antennae shorter in the genus *Cauchas*, usually 0.5–1.2 × forewing length in both sexes; scape slightly swollen in some males; flagellum slender, filiform, usually fully covered prostrate scales, slightly weak in ventral surface; some species of *Adela* and *Nemophora* thinckened with large and raised scales at basal part, especially in female; pecten usually present, but absent in *Cauchas*, *Adela* with 1–3 long anteriorly projecting hook-pegs on 8–10 of the flagellum, and *Nemophora* usually with a posteriorly projecting simple pecten on each segment of 2–7 flagellum (Fig. 1B). Pilifers present. Labrum and mandible usually vestigial (Fig. 1D). Proboscis usually elongate, well developed, 1.5–2.5 × length of labial palpus (Fig. 1C); reduced in some African *Ceromitia* species, about equal to labial palpus; basal part usually scaled laterally. Maxillary palpi 2–5-segmented, directed forwardly or folded; in *Nemophora*, *Adela*, and *Cauchas* obviously vestigial, short, usually only with 2–3 segments (Fig. 1F); but in *Nematopogon* very slender, 5-segmented, segment IV the longest and folded together with segment V. Labial palpi 3-segmented with variable length, usually directed anteriorly or upwardly (Fig. 1E); segments II and III usually rough and covered with long haris.

Laterocervical sclerites with slender, elongate, lateral processes. Metafurca with dorsal apophyses well developed, arising perpendicular from mesal lamella free from secondary arms of metafurcasternum (Fig. 3). Forewing slender, lanceolate or subovate; radial with 5 veins, R_3 and R_4 usually stalked or free, R_5 usually joining to costa before the apex, but terminating on termen below apex in the *Nematopogon* group; accessory cell present; base of M faint, rarely forked within cell; 1A+2A with short basal fork (Fig. 2). Hindwing lanceolate, usually without color markings; Rs stalked with M_1 or M_1 stalked with M_2, 1A+2A also with short basal fork (Fig. 2). Male frenulum of a single long stout bristle, usually accompanied by several smaller setae along costal margin; female frenulum consisting of 3–4 smaller bristles in a row along base of costa. Legs with tibial spur pattern of 0-2-4; epiphysis present (Fig. 4).

TABLE 1. Information of the specimens used for phylogenetic analysis

Sample ID	Species	Sex	Collection information
LCQ027	*Nemophora syfaniella*	♀	Jialingjiang source, Baoji, Shaanxi, 2010.VI.18, G.H. Huang leg.
LCQ040	*Nemophora syfaniella*	♀	Moxi Town, Luding, Ganzi, Sichuan, 2009.VII.18, G.H. Huang leg.
LCQ217	*Nemophora syfaniella*	♂	Xiaolongshan, Baihua Forest Farm, Tianshui, Gansu, 2010.VI.18, G.H. Huang leg.
LCQ704	*Nemophora lapikella*	♂	Mangshan N.N.R., Yizhang, Hunan, 2020.V.10, C.Q. Liao & M. Deng leg.
LCQ026	*Nemophora biprocessa*	♀	Mt. Tianpingshan, Badagongshan, Hunan, 2018.IV.26, C.Q. Liao leg.
LCQ033	*Nemophora biprocessa*	♂	Nanling N.N.R., Ruyuan, Guangdong, 2011.VI.4-5, G.H. Huang leg.
LCQ712	*Nemophora biprocessa*	♂	Shuangjiangkou, Jintongshan N.N.R., Chengbu, Hunan, 2020.V.07, C.Q. Liao leg.
SaY721	*Nemophora staudingerella*	♂	Kareigawa, Hayato, Kirishima, Kagoshima Pref., Japan, 2017.VI.17, Hirowatari *et al*. leg.
SaY716	*Nemophora staudingerella*	♂	Eniwa-keikoku, Banjiri, Eniwa-shi, Hokkaido, 18.VII.2018, S. Yagi leg.
LCQ020	*Nemophora tianpingshana*	♂	Mt. Tianpingshan, Badagongshan, Hunan, 2018.IV.26, C.Q. Liao leg.
SaY719	*Nemophora wakayamensis*	♂	Hikosan, Soeda, Tagawa, Fukuoka Pref., Japan, 2014.V.22, S. Yagi leg.
SaY718	*Nemophora polychorda*	♂	Kunigami-vill., Okinawa Pref., Japan, 2021.III.26, K. Goto *et al*. leg.
SaY711	*Nemophora ganziensis*	♂	Gaoersishan, Yajiang, Sichuan, 2004.VIII.5, M. Wang & L.S. Chen leg.
LCQ713	*Nemophora fluorites*	♂	Shuangjiangkou, Jintongshan N.N.R., Chengbu, Hunan, 2020.V.7, C.Q. Liao leg.
LCQ826	*Nemophora longiuga*	♀	Shuangjiangkou, Jintongshan N.N.R., Chengbu, Hunan, 2021.VI.5-6, C.Q. Liao leg.
LCQ703	*Nemophora tanakai*	♂	Mangshan N.N.R., Yizhang, Hunan, 2020.V.10, C.Q. Liao & M. Deng leg.
SaY715	*Nemophora optima*	♂	Ikinomatsubara, Nishi-ku, Fukuoka-shi, Fukuoka Pref., Japan, 2022.V.17, S. Yagi *et al*. leg.
LCQ706	*Nemophora bispina*	♂	Mangshan N.N.R., Yizhang, Hunan, 2020.V.10, C.Q. Liao & M. Deng leg.
LCQ001	*Nemophora albiantennella*	♂	Mt. Tianpingshan, Badagongshan, Hunan, 2018.IV.26, C.Q. Liao leg.
LCQ025	*Nemophora albiantennella*	♂	Mt. Tianpingshan, Badagongshan, Hunan, 2018.IV.26, C.Q. Liao leg.
LCQ008	*Nemophora albiantennella*	♂	Jialingjiang source, Baoji, Shaanxi, 2010.VI.19, G.H. Huang leg.
LCQ639	*Nemophora albiantennella*	♂	Mt. Tianpingshan, Badagongshan, Hunan, 2018.IVv.26, C.Q. Liao leg.
SaY717	*Nemophora albiantennella*	♂	Mt. Shakadake, Yabe, Yame-shi, Fukuoka Pref., Japan, 2020.V.5, K. Goto leg.
LCQ774	*Nemophora duplicifascia*	♀	Mt. Tianpingshan, Badagongshan, Hunan, 2020.VI.19-23, C.Q. Liao leg.
SaY706	*Nemophora duplicifascia*	♂	Longcanggou, Yingjing, Ya'an, Sichuan, 2016.VI.18-19, G.H. Huang leg.
SaY707	*Nemophora duplicifascia*	♀	Longcanggou, Yingjing, Ya'an, Sichuan, 2016.VI.23, G.H. Huang leg.

.....continued on the next page

TABLE 1. (Continued)

Sample ID	Species	Sex	Collection information
LCQ061	*Nemophora jiajinshana*	♀	Jiajinshan, Baoxin, Ya'an, Sichuan, 2018.VIII.13-15, J.Y. Qiu & H. Xu leg.
LCQ062	*Nemophora jiajinshana*	♂	Jiajinshan, Baoxin, Ya'an, Sichuan, 2018.VIII.13-15, J.Y. Qiu & H. Xu leg.
LCQ042	*Nemophora bifasciatella*	♂	Maoershan N.N.R., Guilin, Guangxi, 2003.VII.1, G.H. Huang leg.
LCQ055	*Nemophora bifasciatella*	♀	Hongliansi, Daweishan, Liuyang, Hunan, 2018.VII.8-9, J.Y. Qiu & H. Xu leg.
LCQ822	*Nemophora badagongshana*	♂	Mt. Tianpingshan, Badagongshan, Hunan, 2021.V.1-2, C.Q. Liao leg.
LCQ705	*Nemophora aurifera*	♂	Mangshan N.N.R., Yizhang, Hunan, 2020.v.10, C.Q. Liao & M. Deng leg.
LCQ058	*Nemophora decisella*	♂	Huameiguan, Liuba, Shaanxi, 2018.VIII.10-11, C.Q. Liao & G.H. Huang leg.
LCQ059	*Nemophora decisella*	♀	Jialingjiang source, Baoji, Shaanxi, 2018.VIII.13, C.Q. Liao & G.H. Huang leg.
LCQ628	*Nemophora decisella*	♂	Guniushan, Wuyunjie N.N.R., Taoyuan, Hunan, 2019.VI.24, C.Q. Liao leg.
SaY708	*Nemophora caeruliantenna*	♂	Chashan, Simao District, Pu'er, Yunnan, 2018.II.25, S.Y. Huang leg.
SaY709	*Nemophora caerulea*	♀	Jianfengling, Ledong Li Autonomous County, Hainan, 2014.V.21, M. Wang leg.
LCQ037	*Nemophora sakaii*	♂	Maoershan N.N.R., Guilin, Guangxi, 2007.V.1-5, L.S. Chen leg.
LCQ038	*Nemophora sakaii*	♂	Huangsang N.N.R., Suining, Hunan, 2018.VI.16, G.H. Huang, C.Q. Liao & S.Y. Liu leg.
LCQ823	*Nemophora sakaii*	♀	Yunxi Reservoir, Daoxian, Hunan, 2021.V.31, M. Deng leg.
LCQ773	*Nemophora hunanensis*	♂	Wuyunjie N.N.R., Taoyuan, Hunan, 2020.VI.3-9, C.Q. Liao leg.
LCQ726	*Nemophora hunanensis*	♂	Zhushan, Wuyunjie N.N.R., Taoyuan, Hunan, 2019.VI.15, H. Xu & C.Q. Liao leg.
LCQ772	*Nemophora purpurata*	♂	Zhushan, Wuyunjie N.N.R., Taoyuan, Hunan, 2019.VI.15, H. Xu & C.Q. Liao leg.
LCQ727	*Nemophora purpurata*	♂	Lanping, Wuyunjie N.N.R., Taoyuan, Hunan, 2020.V.21, C.Q. Liao leg.
LCQ825	*Nemophora conjugata*	♂	Huaping N.N.R., Longsheng, Guangxi, 2021.V.17-20, M. Deng leg.
LCQ775	*Nemophora basalistriata*	♂	Matoushan N.N.R., Ziyuan, Fuzhou, Jiangxi, 2020.VII.12, C.P. Liu leg.
LCQ711	*Nemophora assamensis*	♂	Shuangjiangkou, Jintongshan N.N.R., Chengbu, Hunan, 2020.V.07, C.Q. Liao leg.
LCQ248	*Nemophora askoldella*	♂	Guanyun Mountain Villa, Taiwan, 2010.VIII.12, G.H. Huang leg.
LCQ681	*Nemophora chionites*	♀	Mt. Tianpingshan, Badagongshan, Hunan, 2019.VIII.9, C.Q. Liao leg.
SaY714	*Nemophora umbripennis*	♂	Kyushu Univ., Motooka, Nishi-ku, Fukuoka-shi, Fukuoka, Japan, 2022.IV.22, S. Yagi leg.
SaY713	*Nemophora pruinosa*	♂	Yaka, Kin-cho, Kunigami-gun, Okinawa Pref., Japan, 2021.III.25, S. Yagi leg.
SaY712	*Nemophora trimetrella*	♀	Hikosan, Soeda-machi, 679m, Fukuoka Pref., Japan, 2021.V.15, S. Tomura leg.
LCQ715	*Nematopogon distinctus*	♀	Shuangjiangkou, Jintongshan N.N.R., Chengbu, Hunan, 2020.V.07, C.Q. Liao leg.

Abdomen with 8 segments in male and 7 in female, which are usually broader. Segment I usually vestigial, the middle of tergite I (T1) complete membranous; sternite I (S1) only a V- or U-shaped sclerite centrally. T7 and S7 of female triangular, with pointed tip. T8 of male near quadrate, with arcuate posterior margin; posterior margin of S8 concaved in the middle (Fig. 5). Male genitalia: Uncus well developed or vestigial. Vinculum well developed, usually V- or U-shaped. Valva triangular or near quadrate, without valvar pectinifer in *Adela*, *Cauchas*, *Nemophora* and partial *Ceromitia*, or with one or three valvar pectinifer in *Nematopogon*. Aedeagus with an elongate tube; cornuti usually present, apex sometimes also armed with large, exogenous spines or lamellae. Juxta slender, arrow-shaped (Fig. 6). Female genitalia: Ovipositor with a compressed, pointed apex usually minutely serrated along ventral keel. Apophyses posteriores and anteriores slender. Vestibulum membranous; vestibular usually well-developed, sclerotized. Bursa copulatrix and corpus bursae usually completely membranous, without signa (Fig. 7).

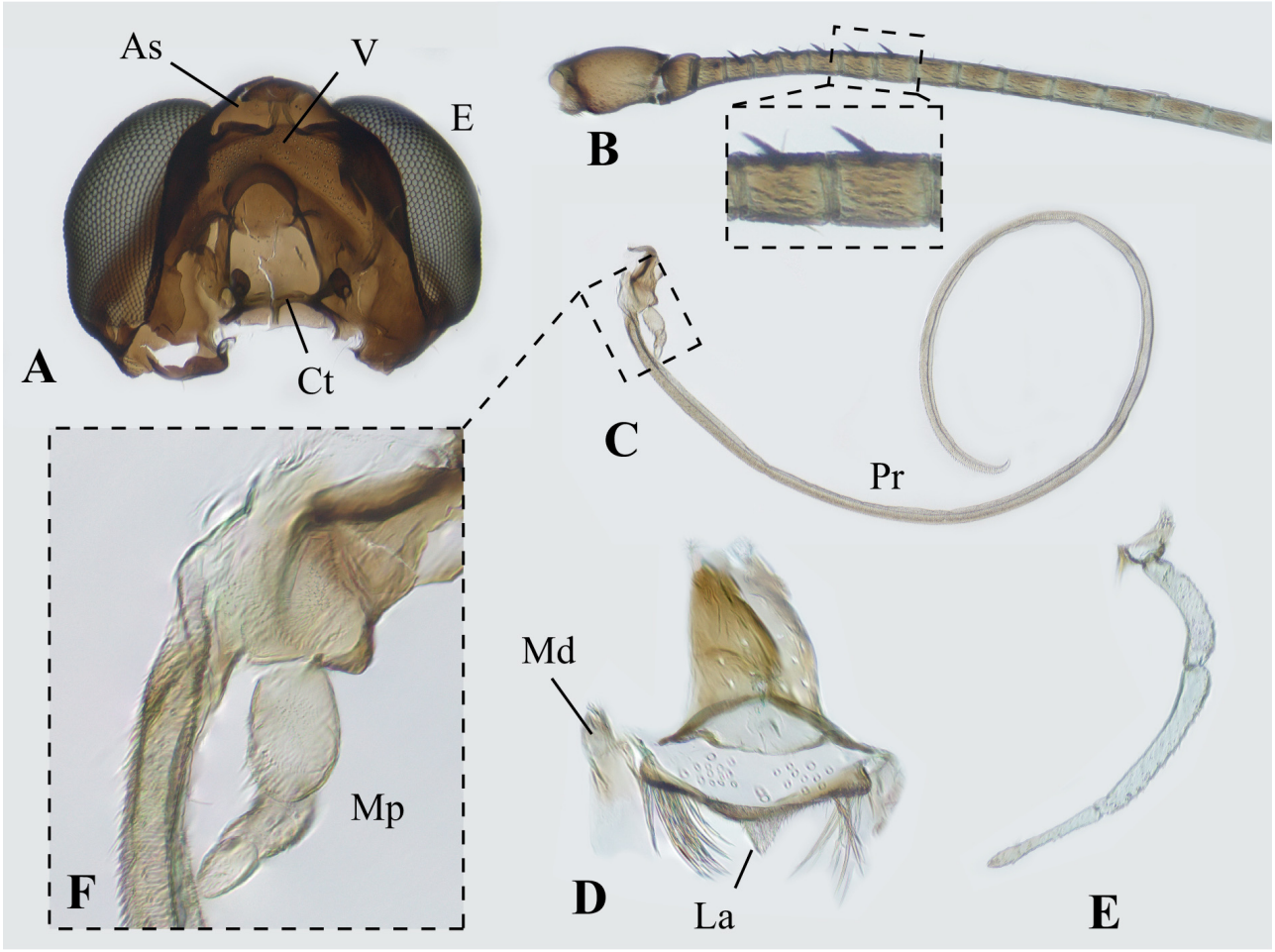

FIGURE 1. The head structure of Adelidae, *Nemophora badagongshana* **sp. nov.** (A. Head; B. Base of antenna and partial enlarged view of spines; C. Maxillar palpus and gelea; D. Labrum and mandible; E. Labial palpus; F. Partial enlarged view of maxillar palpus. Abbreviations: As. Antennal socket; Ct. Corporotentorium; E. Eye; La. Labrum; Md. Mandible; Mp. Maxillary palpus; Pr. Proboscis; V. Vertex).

Remarks. Adelidae is a widely distributed family that occurs in all geographical regions except Antarctica and New Zealand (Heppner 1991; Janse 1945; Meyrick 1912a, b; Davis 1999), mainly in the Palaearctic, Oriental, and Afrotropical regions; however, the distribution of each genus is not uniform. For example, most *Ceromiti*a occur in Africa, and the genus *Nemophora* mainly occurs in the Palaearctic and Oriental regions. However, the genera *Adela*, *Cauchas*, and *Nematopogon* were mainly distributed in the Palearctic region. At the species level, the vast majority of Adelidae species are distributed in a single geographical region, except for a few *Nemophora* species, which are widespread in China.

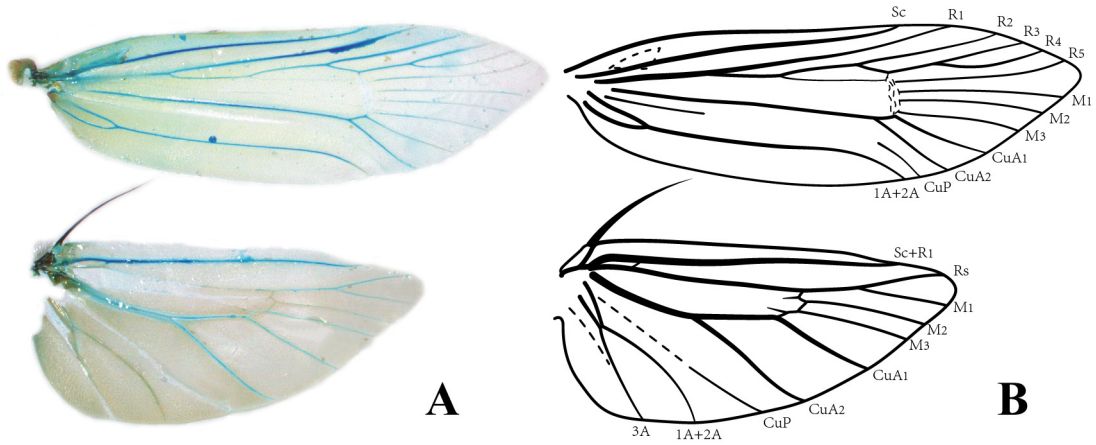

FIGURE 2. Wings venation of Adelidae, *Nemophora fluorites* (A. Venation of male; B. Diagram of venation. Abbreviations: Sc. Subcosta; R. Radius; M. Media; Cu. Cubitus; A. Anal vein).

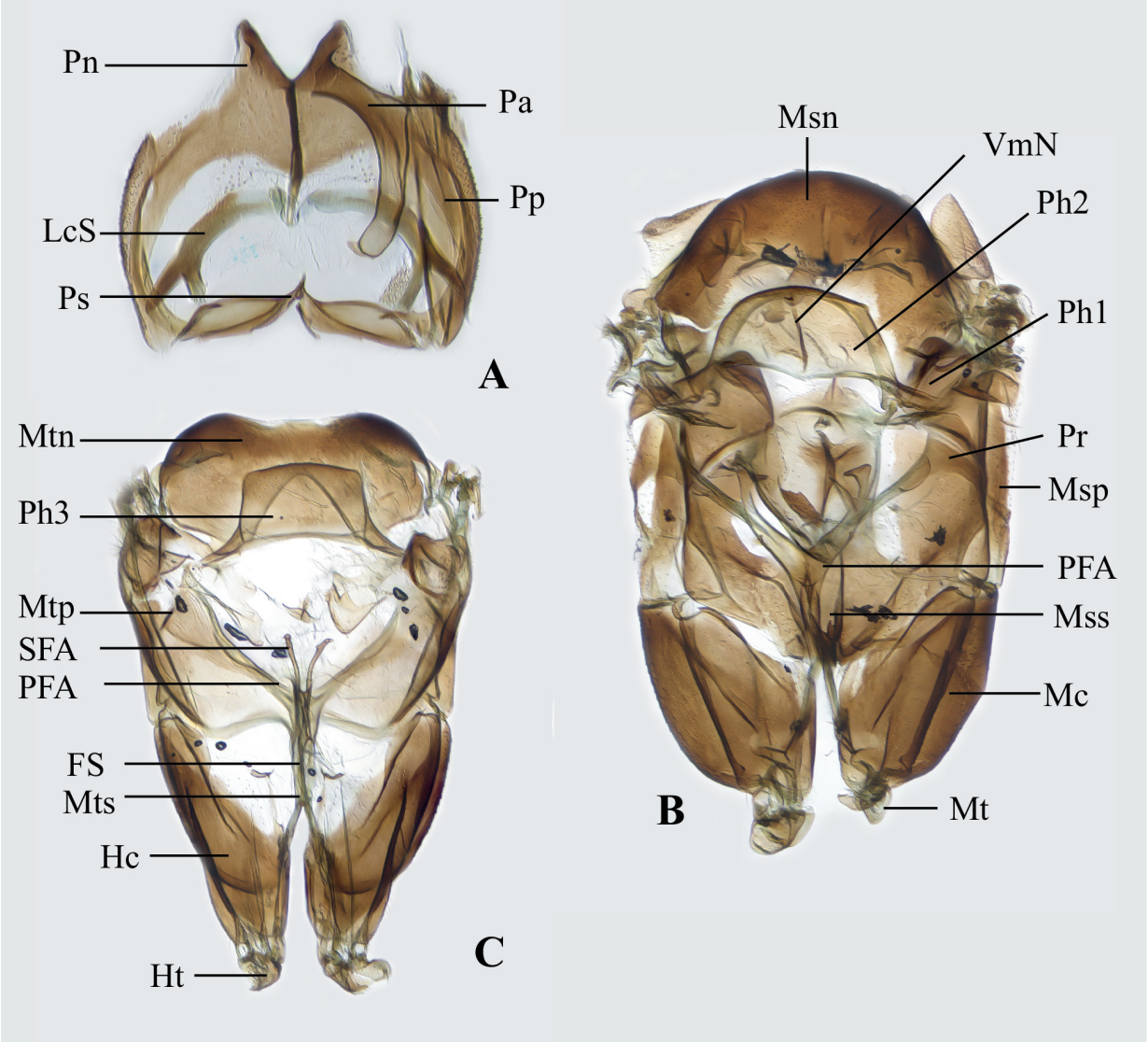

FIGURE 3. The thoracic structure of Adelidae, *Nemophora badagongshana* **sp. nov.** (A. Prothorax; B. Mesothorax; C. Metathorax. Abbreviations: FS. Furcal stem; Hc. Hindcoxa; Ht. Hindtrochanter; LcS. Laterocervical sclerite; Mc. Midcoxa; Msn. Mesonotum; Msp. Mesopleuron; Mss. Mesosternum; Mt. Midtrochanter; Mtn. Metanotum; Mtp. Metapleuron; Mts. Metasternum; Pa. Patagium; PFA. Primary furcal arm; Ph. Phragma; Pn. Pronotum; Pp. Propleuron; Pr. Preepisternum; Ps. Prosternum; SFA. Secondary furcal arm; VmN. Ventromedian notch).

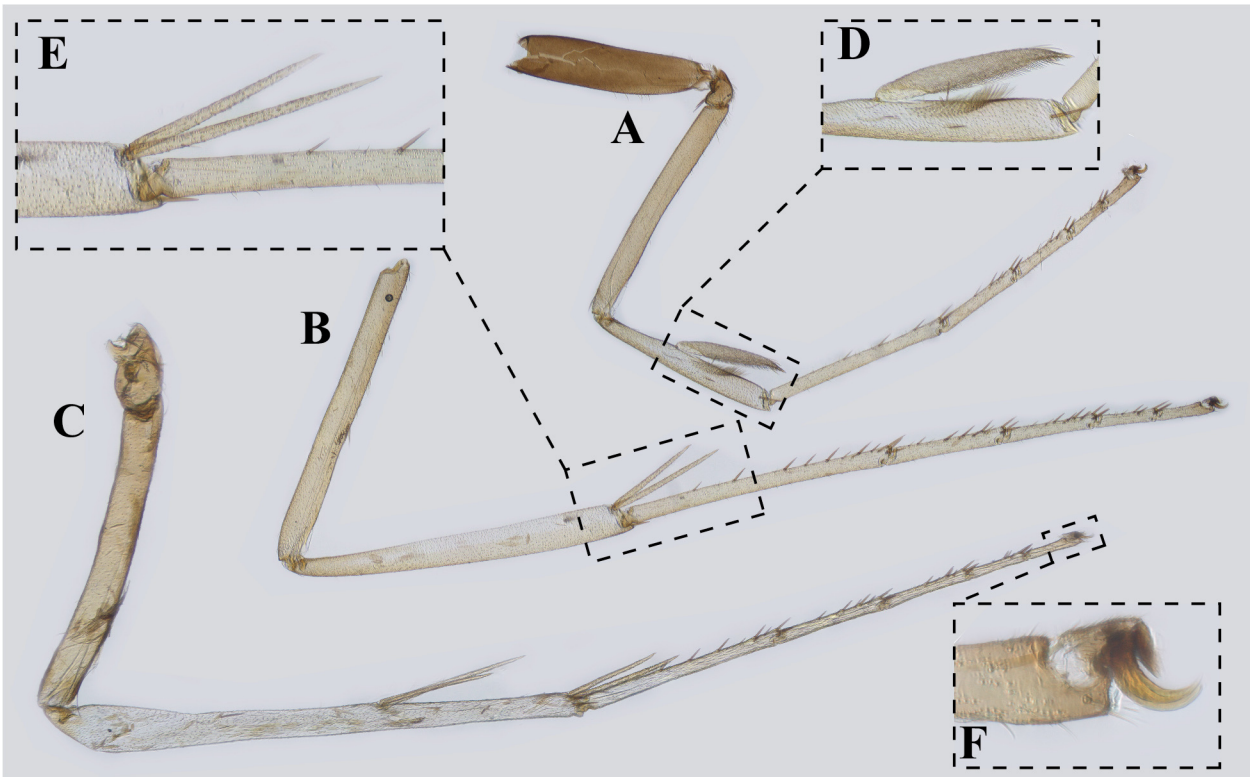

FIGURE 4. Legs of Adelidae, *Nemophora staudingerella* (A. Foreleg; B. Midleg; C. Hindleg; D; Epiphysis; E. Spur; F. Claw).

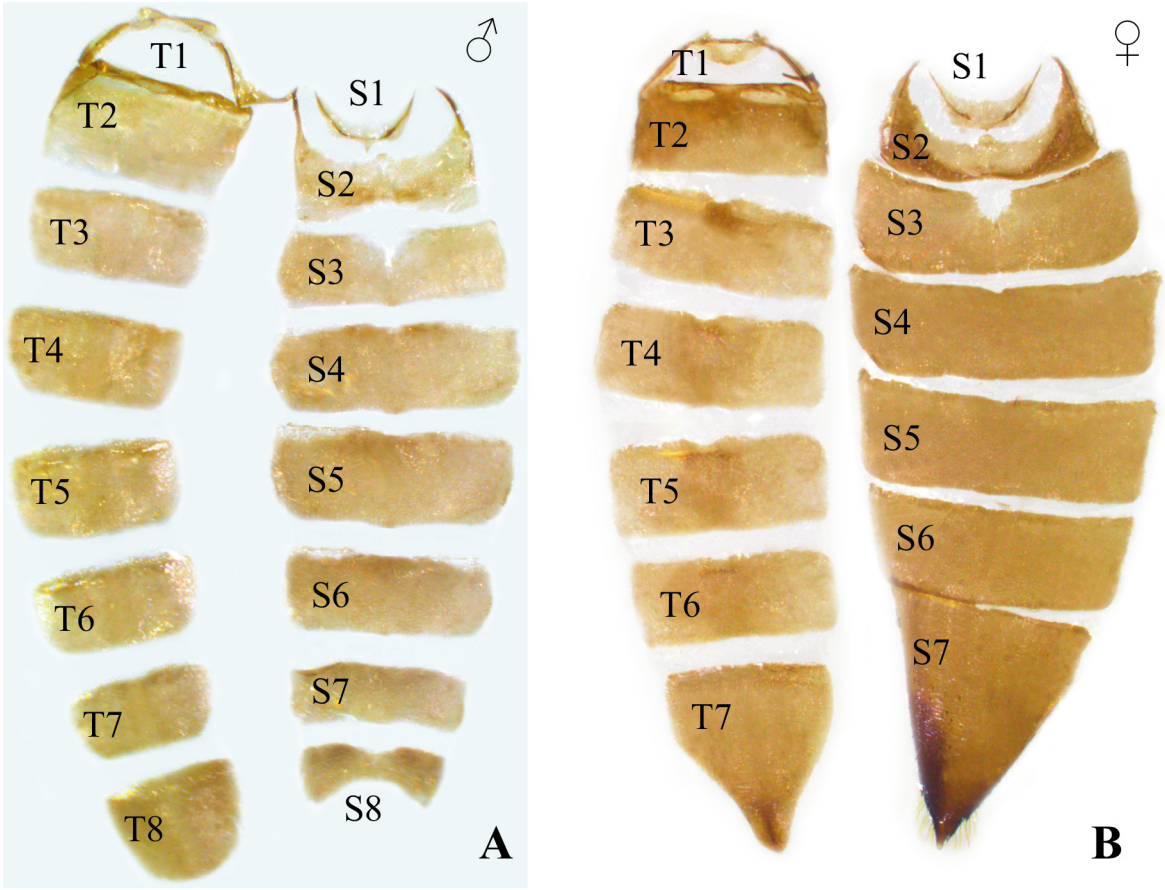

FIGURE 5. Abdominal structures of Adelidae (A. *Nemophora assamensis*, Male; B. *N. fluorites*, Female. Abbreviations: S. Sternum; T. Tergum).

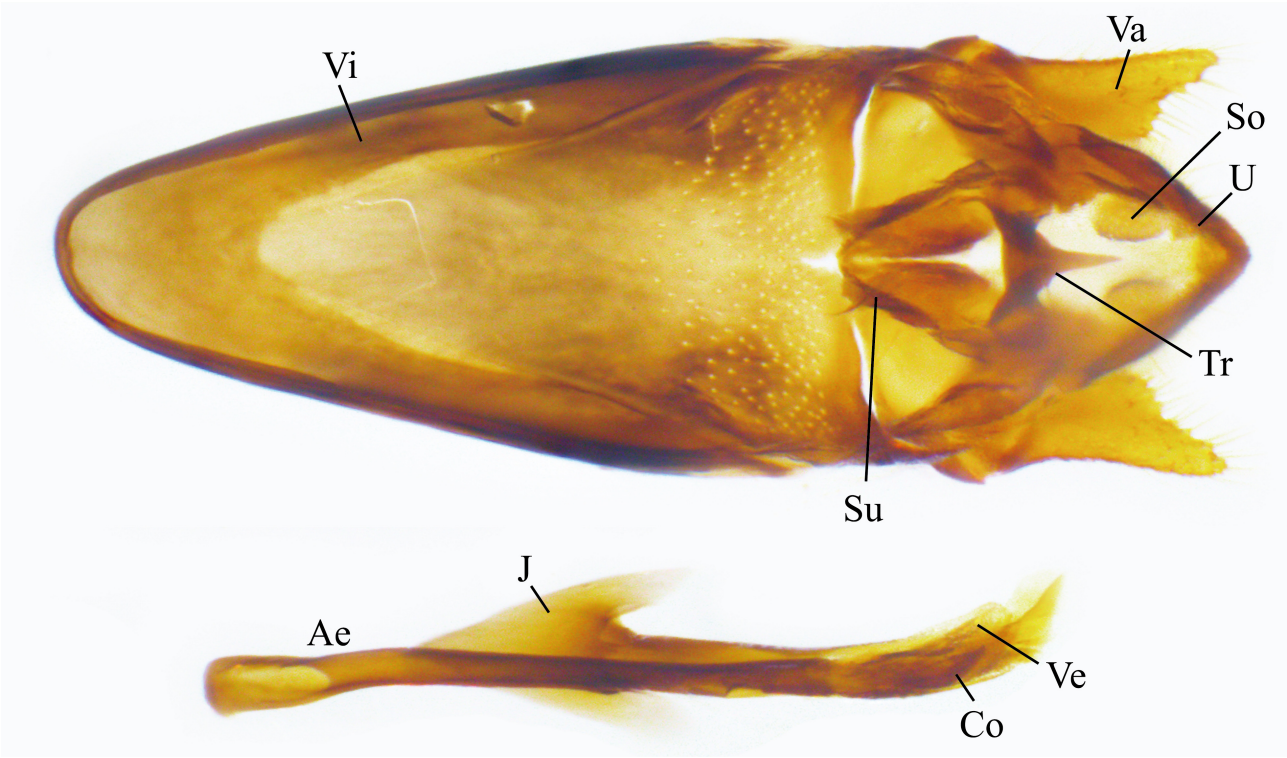

FIGURE 6. Male genitalia structures of Adelidae, *Nemophora assamensis* (Abbreviations: Ae. Aedeagus; Co. Cornutus; J. Juxta; So. Socius; Su. Suspensorium; Tr. Transtilla; U. Uncus; Va. Valva; Ve. Vesica; Vi. Vinculum).

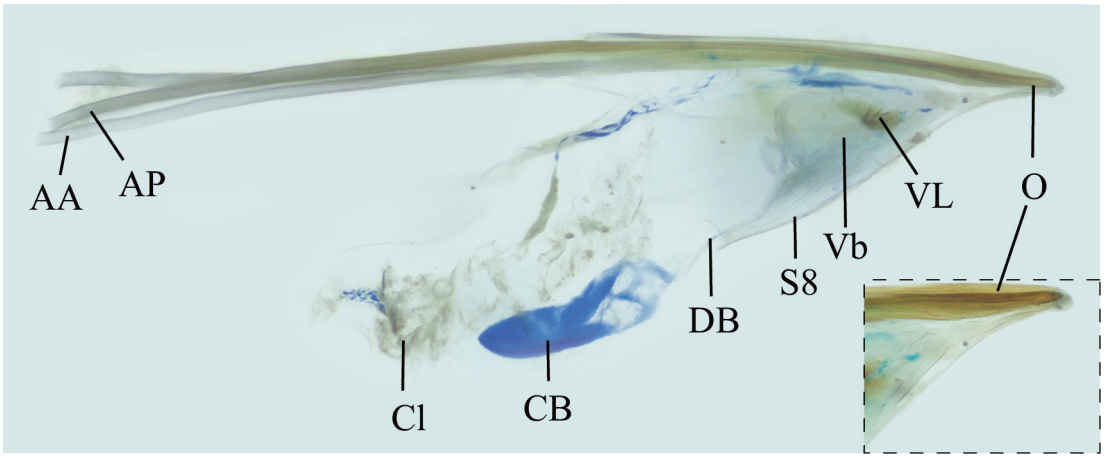

FIGURE 7. Female genitalia structures of Adelidae (*Nemophora basalistriata* **sp. nov.**) and partial enlarged view of ovipositor tip (Abbreviations: AA. Apophysis anterioris; AP. Apophysis posterioris; CB. Corpus bursae; Cl. Cloaca; DB. Ductus bursae; O. Ovipositor; S8. Sternum VIII; Vb. Vestibulum; VL. Vestibular lamella).

Key to subfamilies and genera of Adelidae in China

1 Maxillary palpi with 2–3 segments; partial basal flagellum of male with hooked-pegs or spines; valva without pectinifer 2/Adelinae

- Maxillary palpi with 4–5 segments; basal flagellum of male without hook-pegs or spines; valva with pectinifer . . . . . Nematopogoninae/*Nematopogon*

2 Hindwing with Rs and M_1 separate; male antenna with 1–3 long anteriorly projecting hook-pegs on 8–10 of flagellum . . . . . *Adela*

- Hindwing with Rs and M_1 stalked; male antenna with a short posteriorly projecting simple pecten on each segment of 2–7 flagellum. . . . . *Nemophora*

1. *Nematopogon* Zeller, 1839

Nematopogon Zeller, 1839: 185. Type species: *Nematopogon schwarziellus* Zeller, 1839: 185, by subsequent designation by Meyrick, 1912b: 2.

Nemophora Hübner, [1825] 1816: 417 (nom. praeocc.). Type species: *Phalaena* (*Tinea*) *swammerdamella* Linnaeus, 1758: 540, by subsequent designation by Meyrick, 1912b: 2.

Diagnosis. The head is rough-haired on vertex; the face with appressed hairs. The Antennae are filiform, approximately 2–3 times the forewing length; the scape is stout, flagellums without spines. Labial palpi are short, extended forward, with sparse scales. The maxillary palpi are long, 5-segmented, filiform, folded. The hind tibiae had rough or appressed hairs. The forewing is elongated, and the ground color is simple, usually brownish to dark brown mixed with some black scales and small white spots, without blight luster. The hindwing is more or less clothed with hairscales. The R_3 and R_4 of the forewing are usually stalked, and M_1 and M_2 of the hindwing are usually stalked.

Remarks. The genus consists of 16 known species worldwide, of which only three have been recorded in China, including *N. chalcophyllis* (Meyrick, 1935) (Zhejiang), *N. dorsiguttella* (Erschoff, 1877) (Northern China including Beijing), and *N. taiwanella* Kozlov, 2001 (Taiwan). On the basis of three known species, we added a newly recorded species from China, namely *N. distinctus* Yasuda, 1957.

Owing the very close external appearances of most *Nematopogon* species, there are usually only a few differences in the antennae (ring scales) and forewing (ground color, reticular markings, and white spots), which may be damaged by the lower quality of specimens or present a certain degree of intraspecific variations (Bryner & Huemer 2019). Therefore, the diagnostic characteristics of male genitalia are particularly important and are necessary for species identification. The number of valvar pectinifer in the male genitalia is a very important distinguishing character or can be used as the basis for the identification of species groups in the genus. For example, there is only one valvar pectinifer in *N. adansoniella*, *N. prolai*, *N. garganellus*, and *N. taiwanella*, *etc.* (Kozlov 2001; Bryner & Huemer 2019), and three in *N. dorsiguttella*, *N. robertella*, *N. stenochlora*, *etc.* (Hirowatari & Hirano 1995; Karsholt & Kozlov 2011; Ji *et al*. 2018). In addition, some other characteristics can be used for species identification, such as the number of pegs in the valvar pectinifer, the shape and number of cornuti in the tip of the aedeagus. Kozlov (2001) suggested that *N. taiwanella* along with *N. chalcophyllis* and *N. distinctus* form a monophyletic group based on the presences of a flap of valva, large cornutus of aedeagus, and well-developed vestibulum. According to the light and dark ringed antennae, the close similarity of male genitalia and DNA barcodes analysis, Bryner & Huemer (2019) defined the *N. adansoniella* complex as including three closely related species, namely *N. adansoniella*, *N. prolai*, and *N. garganellus*. Previous studies have shown that the genus *Nematopogon* can also be divided into some species groups.

Key to species of the genus *Nematopogon* in China

1 Forewing with white spots at the central dorsum and subapical angle; valva with three pectinifer internally . . *N. dorsiguttellus*
- Forewing without white spot; valva with only one pectinifer internally 2
2 Tip of flap pointed; pectinifer with about 45 pegs; aedeagus apex with a pair of curved barb shaped cornuti dorsolaterally . . . . . *N. distinctus*
- Tip of flap rounded; pectinifer with fewer than 35 pegs; aedeagus apex without a pair of curved barb shaped cornuti. 3
3 Pectinifer with fewer than 30 pegs; uncus with convex lateral margins; aedeagus with two cornuti; juxta with wide round arrow-head. . . . . *N. chalcophyllis*
- Pectinifer with 32–34 pegs; uncus with straight lateral margins; aedeagus with only one apical cornutus; juxta with pointed arrow-head . . . . . *N. taiwanella*

(1) ***Nematopogon chalcophyllis*** (Meyrick, 1935)

Nemotois chalcophyllis Meyrick, 1935: 96 (LT: China, Chekiang [Zhejiang], West-Tien-Mu-Shan [Mt. Tianmushan]).
Nematopogon chalcophyllis: Nielsen 1985: 35; Wu & Pan 2001: 535 (list); Hua 2005: 2 (list of China).

Diagnosis. This species differs from the closely related species *N. taiwanella* primarily in the genital structures, including valvar pectinifer with fewer than 30 pegs, uncus with convex lateral margins, aedeagus with two cornuti,

and juxta with a wide round arrow-head. Moreover, this species can also be distinguished by the female genitalia with a relatively wide tergite VIII (about 2.5 × as long as wide) and a prominent medial lobe in the hind margin.

Specimens examined. Not available in this study.

Distribution. China (Zhejiang).

Remarks. This species is endemic to China and is only known from the type locality (Zhejiang, Mt. Tianmushan) (Nielsen 1985; Kozlov 2001).

(2) ***Nematopogon distinctus*** Yasuda, 1957
(Plates I-1, XII-1, XXI-1, XXXI-4)

Nematopogon distincta Yasuda, 1957: 38, fig. 1 (TL: Japan, Honsyû [Honsyu], near Osaka); Park 1983: 107.
Nematopogon distinctus: Asano 2012: 117 (list of Nagoya University); Hirowatari 2013: 103, fig. 3-07-5,6 (Japan); Umetsu 2014: 4, fig. 2 (Japan, Akita Prefecture).

Diagnosis. This species is very similar to *N. taiwanella* but can be distinguished by the pointed tip of the valva, pectinifer with *ca.* 45 pegs, and aedeagus apex with a curved hook and a pair of curved barb-shaped cornuti dorsolaterally.

Specimens examined. [**Hunan**] 3♂1♀, Jintongshan National Nature Reserve, Nanshan National Park, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.20, C.Q. Liao leg.; 1♀, Jintongshan National Nature Reserve, Nanshan National Park, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.07, C.Q. Liao leg.; [**Guangdong**] 1♂, Nankunshan National Forest Park, Longmen County, Huizhou City, 2004.III.30, G.H. Huang leg.; [**Guangxi**] 1♂, Maoershan National Nature Reserve (1,500 m), Xing'an County, Guilin City, 2010.V.25–26, G.H. Huang leg. (HUNAU).

Distribution. China (**new record**: Hunan, Guangdong, Guangxi); Japan, Korea.

Remarks. This species was previously reported in Japan and Korea before (Yasuda 1957; Park 1983; Asano 2012; Hirowatari 2013; Umetsu 2014), and is now distributed in the Nanling Mountain system as a newly reported species from China in this study. This species is attracted by light traps at midnight (Plate XXXI-4).

One DNA barcode of *Nematopogon distinctus* is sequenced and shows 0.084–0.086 pairwise distances from three *N. stenochlora* specimens. Phylogenetic analysis shows that *N. distinctus* did not appear to the clade with all other *Nematopogon* species, but as an independent clade, although the bootstrap value was less than 50%.

(3) ***Nematopogon dorsiguttellus*** (Erschoff, 1877)

Nemophora dorsiguttella Erschoff, 1877: 343 (Type locality: Russia, Kachtak, Irkutsk); Erschoff 1892: 670, pl. XVI, fig. 2; Matsumura 1931: 1111, fig. 2329 (Japan); Matsumura 1932: 122, pl. 4, fig. 4 (list of Japan); Kozlov 1997d: 278 (Russian Far East).
Nematopogon dorsiguttella: Wang 2014: 6; Ji *et al*. 2018: 901, figs. 1h, 2g, 3e (Korea).
Nematopogon dorsigutella [sic!]: Yang 1977: 62, pl. 1, fig. 3 (China, Beijing); Hua 2005: 2 (list of China).
Nematopogon dorsiguttela [sic!]: Dubatolov 2007: 43 (Russia: Khabarovsk).
Nematopogon dorsigutellus: Hirowatari 2013: 103, fig. 3-07-3,4 (Japan); Umetsu 2014: 4, fig. 1 (Japan, Akita Prefecture); Yu 2015: 16 (China, Beijing).

Diagnosis. This species is one of the largest species in the genus *Nematopogon* and can be easily distinguished by the white mark near the middle of dorsum and a white subtornal mark at the forewing. Additionally, the valva in the male genitalia of this species has three pectinifers, while only one in the other Chinese species.

Specimens examined. Not available in this study.

Distribution. China (northern part, including Beijing); Russia, Japan, Korea.

Remarks. This species is widely distributed in the East Palearctic region, from the Russian Far East to Northern China and Japan.

(4) ***Nematopogon taiwanella*** Kozlov, 2001

Nematopogon taiwanella Kozlov, 2001: 41, figs. 1–7 (TL: China, Taiwan, Nantou); Shao *et al*. 2008: 550 (checklist of Taiwan).

Diagnosis. This species is very similar to *N. chalcophyllis* but can be distinguished by the following characters: the valvar pectinifer of male genitalia has 32–34 pegs; the relatively wider uncus with straight lateral margins; the aedeagus has only one long apical cornutus; and the juxta has a pointed arrow-head. In addition, this species has a relatively narrow tergite VIII in the female genitalia (approximately 3.6 × as long as wide) and an almost straight hind margin.

Specimens examined. Not available in this study.

Distribution. China (Taiwan).

Remarks. This species is endemic to Taiwan, China. Adults can be collected by light traps in open forest areas (Kozlov 2001).

2. *Adela* Latreille, [1796]

Adela Latreille, [1796]: 147. Type species: *Phalaena reaumurella* Linnaeus, 1758: 540, by subsequent monotypy.
Capillaria Haworth, 1828: 519. Type species: *Phalaena viridella* Scopoli, 1763: 250, by subsequent designation by Meyrick, 1912b: 8.
Dicte Chambers, 1873: 73. Type species: *Dicte corruscifasciella* Chambers, 1873: 74, by monotypy.

Diagnosis. The head is roungh-haired on vertex; the face is usually smooth. The antennae are long, about 1.2–3 times of forewing length, sometimes thickened with raised scales at the base; The 8–10 of flagellum usually with 1–3 long anteriorly projecting hook-pegs. The labial palpus is 3-segmented, moderate in length, with dense raised hairs; The 1st parpomere is short, the 2nd is long and slender, and the 3rd is very short. The maxillary palpus is rudimentary. The tibiae of forelegs apically have epiphyses; the hind tibiae are covered with dense hairs. R_3 and R_4 of the forewing are stalked, approximate or free. The M_1 and M_2 of the hindwing are stalked.

Remarks. The genus *Adela* Latreille, 1796 is clearly defined by the presence of hook-shaped, outwardly directed antennal pegs, which are considered autapomorphy (Nielsen 1980; Hirowatari 1997). To date, this genus consists of fewer than 50 species that are mainly confined to the Palearctic and Nearctic regions (Kozlov 2013). Hua (2005) recorded six *Adela* species in China, most of which were considered synonyms or transferred to the genus *Nemophora*. For example, *A. kukunorensis* and *A. aurantivasssella* (misspelling of *A. aurantibasella*) were considered synonyms of *N. amatella* and *N. decisella*, respectively (Kozlov & Robinson 1996a; Kozlov 2004a), and *A. disjunctella* and *A. syfaniella* were treated as members of *Nemophora* (Kozlov 1997b). Moreover, *A. suavis* has been considered as a synonym of *N. fluorites* (Kozlov 2023c), and two additional *Adela* species were recorded from China for the first time, namely *A. nobilis* and *A. praepilosa*. Thus, there are three *Adela* species distributed in China so far, all of which are recorded here. Due to the single type specimen of *A. sinica* that was completely damaged and the original descriptions by Yang (1977) lacking effective diagnosis and clear colorful photos, this species is not provided in the keys here.

Key to species of the genus *Adela* based on external morphology

1 Compound eyes of male relatively large, eye size index about 3.4; fore- and mid-tibiae without yellow rings . . . *A. praepilosa*
Compound eyes of male modereate in size, eye size index about 1.0; fore- and mid-tibiae with obvious yellow rings. . . . . *A. nobilis*

Key to species of the genus *Adela* based on male genitalia

1 Distal part of valva relatively narrow, inner process of distal valva small but prominent, not extending to the tip; sacculus expanding at middle . . . . . *A. praepilosa*

- Distal part of valva distinctly broad, inner process of distal valva wide and extending to the tip; sacculus expanding at basal 1/3 . . . . . *A. nobilis*

(5) ***Adela nobilis*** Christoph, 1882
(Plates I-3, XII-3)

Adela nobilis Christoph, 1882: 7 (TL: Russia, Vladivostok; BMNH); Meyrick 1912a: 10; Meyrick 1912b: 8 (E. Siberia); Matsumura 1931: 1110, fig. 2324 (Japan); Matsumura 1932: 127, pl. 4, fig. 24 (list of Japan); Hirowatari 1997: 272, figs. 2, 8 (redescription); Kozlov 1997d: 289; Ji *et al*. 2018: 897, figs. 1a, 1b, 2a, 3a (Korea).

Diagnosis. This species is similar to *A. praepilosa* Hirowatari, but can be characterized by the following characteristics: the fore- and hind-tarsi have distinct yellow rings; the male genitalia has prominently wide and short valva; and the extended basal part of the sacculus.

Specimens examined. [**Guangxi**] 2♂, Liangsui, 1,750 m, Maoershan National Nature Reserve, Guilin City, 1996.V.26, M. Wang leg. (HUNAU).

Distribution. China (**new record**: Guangxi); Russia, Korea.

Remarks. This species was first described by Christoph (1882) based on specimens from the Russian Far East and has been reported in some regions of Japan (Matsumura 1931, 1932; Issiki 1957; Okano 1959; Kuroko 1966; Moriuti 1982). However, Hirowatari (1997) examined the types of this species deposited in the BMNH and found that the Japanese representative has long been erroneously regarded as *A. nobilis* which is not distributed in Japan. This species has been recorded for the first time in China in this study.

(6) ***Adela praepilosa*** Hirowatari, 1997
(Plates I-2, XII-2)

Adela praepilosa Hirowatari, 1997: 282, figs. 5, 6C, 7C, 12, 14 (TL: Japan, Honshu, Nara Pref., Mt. Obakodake; OPU); Hirowatari 2013: 104, fig. 3-07-9,10 (Japan); Umetsu 2014: 5, fig. 4 (Japan, Akita Prefecture).
Adela nobilis Christoph, 1882 [misidentification]: Matsumura 1931: 1110; Matsumura 1932: 127, pl. 4, fig. 24; Issiki 1957: 12, pl. 1, fig. 23; Okano 1959: 277, pl. 183, fig. 6; Moriuti 1982: 1: 53, 2: pl. 1, figs. 24, 25.

Diagnosis. This species is similar to *A. nobilis*, but can be distinguished by the following characteristics: the yellowish long hairs of hind tibia, and the relatively long basal part of the ventral margin of valva in male genitalia.

Specimens examined. [**Taiwan**] 1♂, Cuifeng, Taibei County, 2009.II.15, L.Z., Shi leg. (HUNAU).

Distribution. China (**new record**: Taiwan); Japan.

Remarks. The adults of this species usually fly in late spring and visit the flowers *Rhododendron reticulatum* (Ericaceae) and *Acer* sp. (Aceraceae), and the males swarm above the flowers of *Spiraea thunbergii* (Rosaceae) in the sunlight (Hirowatari 1997). This species has been recorded for the first time in China in this paper.

(7) ***Adela sinica*** Yang, 1977

Adela sinica Yang, 1977: 63, pl. 1, fig. 2 (Type locality: Baihuashan, Beijing, China); Hua 2005: 2 (list of China); Wang 2014: 6 (sorting of Yang 1977).

Diagnosis. This species is similar to *A. nobilis*, but can be distinguished by the following characters: the antenna of the male is about three times the forewing length; the central fascia of forewing is relatively narrow and regular; the gold scales of the forewing apex are placed between R_3 and Cu_2; and the very long hairs on the hind legs.

Specimens examined. Not available in this study.

Distribution. China (Beijing).

Remarks. This species was described by Yang (1977) based on a single specimen from hazel trees, *Corylus* (Betulaceae), on Mt. Baihuashan, but the original paper did not provide detailed external characters, especially the male genitalia, and clear colorful photos. Additionally, since this species was first reported, there has been no related

information about it, and the type specimen deposited in CAU was completely damaged, leaving only the labels (Wang 2014).

3. *Nemophora* Hoffmannsegg, 1798

Nemophora Hoffmannsegg, 1798: 499. Type species: *Phalaena* (*Tinea*) *degeerella* Linnaeus, 1758: 540, by subsequent designation by Hampson, 1918: 388.
Nemotois Hübner, [1825] 1826: 416. Type species: *Tinea schiffermillerella* [Denis & Schiffermüller], 1775: 142, by subsequent designation by Fletcher, 1929: 146.
Nematois [sic!] Chambers, 1876: 103.
Elasmion Hübner, [1806, 1808], 1822: 6. Type species: *Elasmion ligulella* Hübner, [1808]: 6, nomen nudum; subsequently made nomenclaturally available as *Dichomeris ligulella* Hübner, 1818: 25, pl. [25], figs. 143, 144. Included in a work rejected for nomenclatural purposes by the International Commission on Zoological Nomenclature, 1966: 214. Placed on the *Official index of rejected and invalid generic names in zoology* as name no. 1836.
Epityphia Hübner, [1825]1826: 416, Type species: *Epityphia latreillella* Fabricius.
Eutyphia Hübner, [1825]1826: 416, Type species: *Nemotois degeerella* Linnaeus.
Nematopogon Zeller, 1839: 185, Type species: *Nematopogon schwarziella* Zeller.
Nemotophora Agassiz, 1847 nec Gry., 1840; Agassiz, 1864: 46, 247 (emend. *Nemophora* Hoffmannsegg).
Ucetia Walker, 1866: 1820, Type species: *Ucetia bifasciella* Walker.
Trichofrons Amsel, 1937: 134, Type species: *Adela pantherella* Guenée, 1849: 409, p. 4, fig. 11, by original designation.
Adela auctorum, partim (nec Latreille, 1802).

Diagnosis. The head is rough on vertex; the face is smooth. The antennae are long, about 2–3 × forewing length in male and more than 1.5 × in female, usually thickened with raised scales at the base; the 2–7 of flagellum usually both have a posteriorly projecting simple pecten. The labial palpus is 3-segmented, short to moderate in length, with dense raised hairs. The maxillary palpus is rudimentary. The tibiae of the forelegs have epiphysis apically; The hind tibiae are covered with dense hairs. The R_3 and R_4 of hindwing are usually stalked, approximate, or free. Rs and M_1 of the hindwing are usually stalked.

Remarks. The genus *Nemophora* consists of about 180 known species and more than 120 undescribed species (Kozlov 2020, 2023c; Liao *et al*. 2021; Sun *et al*. 2022, 2023). The genus is mainly distributed in Eurasia and has very high species diversity in Southeast Asia (Kozlov 2016b). Although some *Nemophora* species have been taxonomically revised (Kozlov 1995; Kozlov & Robinson 1996a), many species still have taxonomic problems with their generic status. For example, *Adela ommatella* Caradja, 1920 shares the same diagnosis as the *N. sichuana* species group, and *A. suavis* Caradja, 1921 is confirmed as a synonym of *N. fluorites* in this paper (see below). Thus, this genus requires more comprehensive taxonomic revision.

Here, we provided 91 *Nemophora* species from China, of which 24 were described as new species and the other nine as new records in China.

3.1 *Nemophora albiantennella* species group

Diagnosis. This species group can be distinguished by the following characters: the forewing color is uniform without fasciae, usually yellowish green, bronze, or copper with bright metallic luster; the completely fused base of valva; the suspensorium is very short, not reaching the base of valva; and the apex of aedeagus consists of dorsal and ventral lobes.

Remarks. Three species belong to the *albiantennella* species group. Among them, *N. insulariella* is distributed in Sakhalin, Russia (Kozlov 1997a), and *N. albiantennella* is a widespread species from northern China to the Russian Far East. In addition, *N. pseudalbiantennella* **sp. nov.** is a new and endemic species in Shaanxi Province, China.

Key to species of the *albiantennella* group based on external morphology

1 Tibiae of leg yellowish to brown; abdomen uniformly brown to dark brown . . . . . *N. albiantennella*
- Tibiae of leg black; abdomen most yellowish to brown with black apex . . . . . .*N. pseudalbiantennella* **sp. nov.**

Key to species of the *albiantennella* group based on male genitalia

1 Valva triangular, with straight lateral margins; suspensorium very small, distinctly far away from posterior margin of vinculum . . . . . *N. albiantennella*

- Valva nearly trapezoid, lateral margins concave basally; suspensorium relatively large, close to posterior margin of vinculum . . . . . *N. pseudalbiantennella* **sp. nov.**

(8) ***Nemophora albiantennella*** Issiki, 1930
(Plates I-4, XII-4, XXI-2)

Nemophora albiantennella Issiki, 1930: 431 (TL: Japan, Katayama, Gifuken; USNM); Moriuti 1982: (color photo); Hirowatari & Yamanaka 1996: 619, figs. 1–6 (biology); Kozlov 1997d (Russian Far East, synonym); Kobayashi 1998: 157, figs. 1–5 (embryogenesis); Asano 2012: 117 (list of Nagoya University); Hirowatari 2013: 104, fig. 3-07-15,16 (Japan); Ji *et al*. 2018: 898, figs. 1c, 2c, 3b (Korea).

Adela mitakeana Matsumura, 1931: 1110, fig. 2323 (TL: Honshu, Japan; SEHU); Razowski & Kumata 1985: 17 (Type catalog).

Nemotois mitakeana: Matsumura, 1932: 127, fig. 22 (list of Japan).

Diagnosis. This species is very similar to *N. insulariella* but can be distinguished by the yellow to brown hairs on vertex (dark brown to black in *N. insulariella*), the copper color of the forewing (brassy green to bronze tint in *N. insulariella*), the very long arrow-head about 3/4 × as long as juxta (1/2 × in *N. insulariella*), and the dense microtrichia on the dorsal lobe at the apex of aedeagus (smooth in *N. insulariella*).

Specimens examined. [**Hunan**] 38♂1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.IV.26, C.Q. Liao leg.; 2♂1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2007.V.11–13, L.S. Chen leg.; [**Shaanxi**] 12♂4♀, Jialingjiang source (1,400–2,100 m), Baoji City, 2010.VI.18–19, G.H. Huang leg. (HUNAU).

Distribution. China (**new record**: Hunan, Shaanxi); Russia, Japan, Korea.

Remarks. *Adela mitakeana* was first described by Matsumura and then transferred to the genus *Nemotois*, the synonym of *Nemophora* (Matsumura 1931, 1932). Finally, this species was reported as *Nemophora albiantennella* by Kozlov (1997d). This species has been recorded for the first time in China.

Hirowatari & Yamanaka (1996) reported the adult flying and feeding activity of this species and found Poaceae (*Poa trivialis* L. and *Lolium multiflorum* Lan.) as the host (oviposition) plant. The flower preferences of the adults were reported as *Brassiaca juncea* Hemsel (Brassicaceae), *Potentilla sundaica* Bl. (Rosaceae) and *Ranunculus japonicus* Thunb. (Ranunculaceae). However, the active flight of males in *N. albiantennella* was not regarded as swarming because they did not interfere with each other (Hirowatari & Yamanaka 1996). However, according to the first author's observation on Mt. Tianpingshan, there are more than 80 male adults of this species flying above a clump of grasses (Poaceae), which seems to be swarming, and some females resting on the grasses under low light conditions in the afternoon. It is interesting to note that the mating behavior of this species differs among the regional populations.

DNA barcodes of the five *N. albiantennella* specimens are generated. Four of them from China show no difference (pairwise distances: 0.000), but the Japanese specimen shows pairwise distances of 0.034 with the Chinese ones. The closest sequence to *N. albiantennella* is *N. bispina* **sp. nov.** (pairwise distances: 0.054).

(9) ***Nemophora pseudalbiantennella*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates I-5, XII-5)
LSID urn:lsid:zoobank.org:act:AE35D776-DD30-439B-B4F8-D16FE6E0A87E

Diagnosis. This species is very similar to *N. albiantennella* on the external characters but can be distinguished by the following features: the tibiae of the leg are black; the abdomen is most yellowish to brown with a black apex; the valva is nearly trapezoid, with lateral margins concave basally; and the suspensorium is relatively large, close to the posterior margin of vinculum.

Description. Male. Forewing 5.7–6.0 mm; wing expanse 12.2–12.9 mm.

Head with raised yellow hairs mixed with brown; face with smooth yellowish to brownish scales. Eyes small, widely separated dorsally; eye size index about 0.54 in male. Labial palpus moderate in length, with yellow scales and hairs; galeae covered with yellow scales laterally. Antenna smooth, basal 1/3 dark brown; apical part silvery white; 18.8–20.1 mm, 2.9–3.4 times as long as forewing. Legs yellow to brown with tibiae black; hind tibia covered with long light brown hairs. Tegula and thorax (dorsum) dark yellow to brown with golden metallic luster. Forewing brass to brown black yellow to brown with golden metallic luster; cilia dark brown. Hindwing and cilia dark brown. Abdomen yellowish to brown, apex black.

Female. Unknown.

Male genitalia. Uncus triangular, with a median keel. Vinculum moderate in length, about 2.3 times as long as valva. Valvae near trapezoid, lateral margins concave basally, ventral base completely fused; suspensorium triangular, relatively large, anterior part close to posterior margin of vinculum. Transtilla approximately equal width; median process long and pointed. Aedeagus slender, apical 2/5 slightly concaved dorsally; apex with smooth dorsal and ventral lobes; manica with minute spines. Juxta arrow-shaped; arrow-head pointed, lateral arms slender.

Holotype. [**Shaanxi**] ♂, Fenshuiling, Qinling Mountain, Xi'an City, 2019.VII.23, G.H. Huang leg. (HUNAU).

Paratypes. [**Shaanxi**] 4♂, same data as holotype (HUNAU).

Etymology. The specific epithet refers to the extremely similar in appearance between this new species and *N. albiantennella*.

Distribution. China (Shaanxi).

Remarks. This species is endemic to Qinling Mt., Shaanxi Province, China.

3.2 *Nemophora sichuana* species group

Nemophora sichuana group (Liao *et al*. 2021: 17)

Diagnosis. This species group is characterized by the typical forewing pattern and male genitalia with the following features: the valvae are ventrally separated; the sacculus is basally swollen to some degree with dense hairs; the apical portion of the aedeagus bears a weak lamellate keel dorsally; the manica has a patch of minute spines dorsally; and the forewing pattern is characterized by a subapical spot, transverse central fascia, and a pair of longitudinal basal striae.

Remarks. Hirowatari *et al*. (2012) described four Chinese *Nemophora* species, *N. sichuana*, *N. tenuimaculata*, *N. tadauchii*, and *N. kozlovi*, from the high mountainous areas of Yunnan and Sichuan, and considered that these species are closely related to *N. pruinosa* and *N. umbripennis* from the Ryukyus and mainland Japan, respectively. Liao *et al*. (2021) grouped these four species and one new species *N. zheduoshana* within the *sichuana* species group. The members of this species group inhabit the high mountainous areas of central China around the Himalayas, but there are some differences in their distribution. Some species may speciate allopatrically speciated at high elevations in their respective mountainous areas.

In addition, one species from Kazakhstan, namely *Adela ommatella* Caradja, 1920 deposited in MINGA, is very similar to the *N. sichuana* species group. The original description and the type species photograph show that the forewing has a narrow white transverse central fascia and a circular yellowish subapical spot (Caradja 1920). Therefore, this species may belong to the *sichuana* species group.

Key to species of the *sichuana* group based on external morphology

1	Central fascia of forewing complex forming a long transverse band	2
-	Central fascia of forewing discontinuous, represented by a pair of small spots	*N. tenuimaculata*
2	Forewing with short basal striae, not reaching the midpoint of central fascia	3
-	Forewing with long basal striae, beyond the midpoint of central fascia	4
3	Subapical spots of forewing circular; hindwing generally with small spots; abdomen yellow and white dorsally	*N. sichuana*
-	Subapical spots of forewing oval, stilliform; hindwing without small spots; abdomen black dorsally	*N. zheduoshana*
4	Male eyes moderate in size, eye size index about 1.0; forewing length 5.5–6.2mm; subapical spots oval	*N. tadauchii*
-	Male eyes small, eye size index 0.60–0.64; forewing length about 7.0 mm; subapical spots guttiform	*N. kozlovi*

Key to species of the *sichuana* group based on male genitalia

1	Valva triangular in ventral view	2
-	Valva nearly quadrate in ventral view	*N. tenuimaculata*
2	Valva bifurcated in lateral view	*N. tadauchii*
-	Valva not bifurcated in lateral view	3
3	Valva widely separated ventrally; sacculus slightly swollen basally	*N. zheduoshana*
-	Valva narrowly separated ventrally; sacculus distinctly swollen basally	4
4	Juxta with relatively small sickle-shaped arrow-head	*N. sichuana*
-	Juxta with large trapezoidal arrow-head.	*N. kozlovi*

(10) ***Nemophora kozlovi*** Hirowatari, Kanazawa & Liang, 2012
(Plate I-6)

Nemophora kozlovi Hirowatari *et al*., 2012: 103, figs. 1D, 6 (TL: China, Yunnan, Yulongxueshan; KIZ, OMNH).

Diagnosis. This species is the largest member of this species group. It can be characterized by larger size (*ca.* 14 mm wing expanse), the guttiform subapical spot of the forewing, and distinct swelling at the basal part of the sacculus in the male genitalia.

Specimens examined. [**Yunnan**] 1♂ (holotype), Baishui (2,775 m), Mt. Yulongxueshan, Lijiang Diqu, 1996. VIII.28, H. Shima & I. Kanazawa leg. (KIZ); 1♂, Mt. Habaxueshan (2,495 m), Deqing Tibetan Autonomous Prefecture, 1996.VIII.24 (OMNH).

Distribution. China (Yunnan).

Remarks. This species is endemic to Yunnan Province.

(11) ***Nemophora sichuana*** Hirowatari, Kanazawa & Liang, 2012
(Plates I-7, XII-6)

Nemophora sichuana Hirowatari *et al.*, 2012: 99, figs. 1A, 2, 3 (TL: China, Sichuan, Songpan, Jiuzhaigou; KIZ); Liao *et al*. 2021: 18, figs. 1B, D, F, 2B (wing venations, keys).

Diagnosis. This species differs from the others in the following characters: the relatively regular circular subapical spot; the hindwing usually has two white spots; the dorsal surface of the abdominal segments has a white ring; and the sickle-shaped arrow-head of juxta in the male genitalia.

Specimens examined. [**Sichuan**] 1♂ (holotype), Erdaoban (3,000m), Jiuzhaigou, Songpan County, Aba Tibetan Autonomous Prefecture, 1993.VIII.4, H. Shima & I. Kanazawa leg. (KIZ); 1♂, same data; 1♂1♀, Xinduqiao (3,750m), Kangding, Ganzi Tibetan Autonomous Prefecture, 1993.VIII.22; 4♂2♀, Yajiang County (3,100m), Ganzi Tibetan Autonomous Prefecture, 1993.VIII.23 (KIZ, OMNH); 2♂, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2009.VII.20, G.H. Huang leg.; 10♂, Yajiang County, Ganzi Tibetan Autonomous Prefecture, 2009.VII.22, G.H. Huang leg.; 1♂, Mt. Gaoersishan, Yajiang County, Ganzi Tibetan Autonomous Prefecture, 2004. VII.5, M. Wang & L.S. Chen leg. (HUNAU).

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan Province and is distributed at high elevations (3,000–3,750 m). Its distribution is wider than that of *N. tenuimaculata* and *N. zheduoshana* and overlaps with the latter (Liao *et al*. 2021). Some specimens vary slightly in the wing markings: the hindwing has two irregular white spots, sometimes is obvious, even absent (Hirowatari *et al*. 2012).

(12) ***Nemophora tadauchii*** Hirowatari, Kanazawa & Liang, 2012
(Plate I-8)

Nemophora tadauchii Hirowatari *et al*., 2012: 103, figs. 1C, 5 (TL: China, Yunnan, Habaxueshan; KIZ).

Diagnosis. This species is very similar to *N. sichuana* but can be distinguished by relatively large male eyes with *ca.* 1.0 of eye size index, and the bifurcate shape of the male valva in lateral view.

Specimens examined. [**Yunnan**] 1♂ (holotype), Mt. Habaxueshan (2,495 m), Deqing Tibetan Autonomous Prefecture, 1993.VIII.24, I. Kanazawa (KIZ); 4♂, same data (KZI, OMNH).

Distribution. China (Yunnan).

Remarks. This species is endemic to Yunnan Province and occurs at 2,500 m elevation on Mt. Habaxueshan, which is sympatric with *N. kozlovi*.

(13) ***Nemophora tenuimaculata*** Hirowatari, Kanazawa & Liang, 2012
(Plate II-1)

Nemophora tenuimaculata Hirowatari *et al*., 2012: 102, figs. 1B, 4 (TL: China, Yunnan, Habaxueshan; KIZ).

Diagnosis. The most typical distinguishing features of this species are the discontinuous central fascia and the slender oval subapical spot in the forewing. In the male genitalia, this species has a quadrate valva in the ventral view and a manica with a patch of heavy spines dorsally.

Specimen examined. [Sichuan] 1♂ (holotype), Xueshankou (3,400m), Jiuzhaigou, Jiuzhai, Aba Tibetan Autonomous Prefecture, 1993.VII.31, I. Kanazawa leg. (KIZ).

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan Province.

(14) ***Nemophora zheduoshana*** Liao, Hirowatari & Huang, 2021
(Plates II-2, XIII-1)

Nemophora zheduoshana Liao *et al*., 2021: 18, figs. 1A, C, E, 2A, 3 (TL: China, Sichuan, Kangding, Zheduoshan; HUNAU).

Diagnosis. This species is very similar to *N. sichuana* in the forewing pattern, but can differs from the latter by the following characters: the central fascia is slightly interrupted in the middle; the subapical spot is stilliform; the abdomen is dark brown to black uniformly; the eyes are relatively larger with *ca.* 0.78 of eye size index; the valva is widely separated in ventral view; and the sacculus is only slightly swollen in the basal part.

Specimen examined. [Sichuan] 1♂ (holotype), Zheduoshan (4,200 m), Kangding City, 2004.VIII.4, M. Wang & L.S. Chen leg. (HUNAU).

Distribution. China (Sichuan).

Remarks. Compared with other members of the *sichuana* species group, this species occurs in a mountainous locality with an elevation of approximately 4,200 m (Liao *et al*. 2021).

3.3 *Nemophora askoldella* species group

Nemophora askoldella group (Kozlov 1995: 461)

Diagnosis. The *askoldella* species group can be distinguished by the following features: the compound eyes are relatively large, eye size index is 0. 9–1.1 in male and 0.6–0.7 in female; the proximal segments of the male antenna are dorsolaterally covered with dark brown or blackish scales; the female antenna has a characteristic brush on flagellar segments 18–23; the female antenna is 1.1–1.3 × length of the forewing; the background color of the forewing is gray, randomly mixed with dark and light scales, hindwing base white and translucent; the forewing lacks longitudinal stripes, but the base of radial stem has small dark spots; the head light color, usually white, gray, or silver-gray.

Remarks. This species group includes five species: *N. griseella* (Walsingham, 1880) (India, Nepal, Myanmar), *N. ischnodesma* (Meyrick, 1928) (India, Myanmar), *N. cassiterites* (Meyrick, 1907) (India), *N. askoldella* (Millière, 1879) (China, Russia, Japan, Korea), and *N. chionites* (Meyrick, 1907) (India, Thailand). Here, *N. chionites* is first reported in southern China.

Key to species of the *askoldella* group based on external morphology

1 Forewing transverse central fascia approximately equal in width; labial palpus relatively short, not exceeding vertical eye diameter . . . . . .*N. askoldella*
- Forewing transverse central fascia twice as wide at costa than at termen; labial palpus very long, about 2 × vertical eye diameter . . . . . .*N. chionites*

Key to species of the *askoldella* group based on male genitalia

1 Vinculum relatively short, about 2.4 × as long as valva; lateral margin of valva nearly parallel to the central axis; suspensorium relatively short, slightly beyond posterior margin of vinculum . . . . . .*N. askoldella*
- Vinculum relatively long, about 2.6 × as long as valva; tip of valva distinctly oblique outwardly, lateral margin about 30-degree angle with the central axis; suspensorium long, far beyond posterior margin of vinculum. . . . . .*N. chionites*

(15) ***Nemophora askoldella*** (Millière, 1879)
(Plates II-4, XIII-2)

Adela askoldella Millière, 1879: 139 (TL: Russia, Primorye; BMNH); Millière 1881: 2, pl. 8, fig. 3; Rebel 1901: 244 (Ussuri); Caradja 1920: 175 (Amur).
Nemotois askoldella: Meyrick 1912b: 7 (E. Siberia); Matsumura 1931: 1111. fig. 2331 (Japan); Matsumura 1932: 122, pl. 4, fig. 6 (list of Japan).
Nemophora askoldella: Inoue 1954: 9 (Primorye, Honshu); Okano 1959: 277, pl.183, fig. 12 (Color photo of male) (Primorye, Honshu); Liu 1981: 9, pl.4, fig.18 (color photos) (NE China, E Siberia, Japan); Moriuti 1982 (1): 54, (2): 156, pl.1, fig. 30 (color photo) (Hokkaido, Honshu); Park & Kim 1986: 79, 81, fig.3.1 (Korea); Heppner 1992: 63 (Taiwan); Kozlov 1995: 469, figs. 7–8, 18, 35–39 (review); Hua 2005: 2 (list of China, in Incurvariidae); Shao *et al.* 2008: 550 (Checklist of Taiwan); Hirowatari 2013: 105, fig. 3-07-30,31 (Japan); Umetsu 2014: 5, fig. 8 (Japan, Akita Prefecture).
Odela [sic!] *irroratella* Christoph, 1882: 5 (Amurgebietes) (as junior synonym of *askoldella* Millière).
Elasmia purella Caradja, 1920: 175 (unavailable name published as junior synonym of *askoldella* Millière).
Nemotois niphites Meyrick, 1938: 28 (TL: China, Yunnan, Lijiang); Hua 2005: 2 (list of China).

Diagnosis. Compared to other species of the *askoldella* group, *N. askoldella* has a relatively short labial palpus, which is almost equal to the vertical diameter of the compound eyes, and the forewing transverse central fascia is approximately equal in width. Additionally, this species can also be distinguished by the relatively shorter vinculum, prominent lobe on the medial margin of valva, and lateral margins (viewed ventrally) that are posteriorly almost parallel to the central axis.

Specimens examined. [**Taiwan**] 4♂, Guanyun Mountain Villa, 2010.VIII.12, G.H. Huang & S.R. Liao leg. (HUNAU).

Distribution. China (Northeast, Yunnan, Hubei, Taiwan); Russia, Japan, Korea.

Remarks. These members of the *askoldella* group are sometimes misidentified with *N. askoledella* because of their unique wing pattern. Kozlov (1995) revised this species group and provided a detailed list of misidentifications and synonyms based on the examination and research on many specimens.

Male adults usually swarmed in the broad-leaved forests in the evening or rested at intervals between swarming sessions. Males were also observed feeding on the flowers of *Patrinia scabiosaefolia* Link. (Valerianaceae) (Kozlov 1985, 1995). Additionally, Liu (1981) reported that the larvae of this species damaged Apiaceae plants.

One DNA barcode of *N. askoldella* is generated and this sequence is closest to *N. chionites* (pairwise distances: 0.043). The phylogenetic tree shows *N. askoldella* and *N. chionites* obviously formed into a monophyletic clade, with a high bootstrap value (99%).

(16) ***Nemophora chionites*** (Meyrick, 1907)
(Plates II-3, XIII-3, XXI-3)

Nemotois chionites Meyrick, 1907: 990 (TL: India, Assam, Khasi Hills; BMNH); Meyrick 1912a: 9; Meyrick 1912b: 7; Clarke 1955: 84.

Nemophora chionites: Kozlov 1995: 471, figs. 9–10, 13, 19, 40–44 (review); Das & Singh 2022: 264; Kozlov 2023c: 21, figs. 19, 20, 80 (India).

Diagnosis. Compared to other species of the *askoldella* group, this species can be distinguished by its longer labial palpus (*ca.* twice of vertical eye diameter) covered with long dense hairs; the forewing transverse central fascia is twice as wide at costa than at termen; the relatively long vinculum (*ca.* 2.6 × as long as valva); lateral margins (viewed ventrally) posteriorly forming a near 30-degree acute angle with the central axis; and the long suspensorium which far beyond the posterior margin of vinculum.

Specimens examined. [**Hunan**] 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2014.VII.12–14, T. Hirowatari & G.H. Huang leg.; 7♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2019.VII.27–VIII.13, C.Q. Liao, M. Deng, B. Chen & S.J. Yi leg.; 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VII.17, C.Q. Liao & M. Deng leg.; [**Sichuan**] 4♂3♀, Longcanggou (1,400–1,500 m), Yingjing County, 2016.VI.18–19, G.H. Huang leg.; 2♂1♀, Longcanggou (1,500 m), Yingjing County, 2016.VI.23, G.H. Huang leg.; 1♂, Longcanggou (1,500 m), Yingjing County, 2017.VII.17–18, M. Wang leg.; 1♀, Nibashan, Yingjing County, 2009.VIII.28, G.H. Huang leg. (HUNAU).

Distribution. China (**new record**: Hunan, Sichuan); India, Thailand.

Remarks. This species has been newly recorded in China, and usually occurs from June to October. On Mt. Tianpingshan, Hunan, the female adults were observed flying or resting in low grasses near *Hydrangea* plants, but we could not observe its flower-visiting and oviposition behavior.

One DNA barcode of *N. chionites* is generated and this sequence is closest to *N. askoldella* (pairwise distances: 0.043).

3.4 *Nemophora hoeneella* species group

Nemophora hoeneella group (Kozlov & Hirowatari 1997: 87)

Diagnosis. This species group is characterized by the following features: the compound eyes are relatively large, with eye size index 0.9–1.1 in male and 0.6–0.7 in female; the basal part of the male antenna is dorsolaterally covered with dark brown or blackish scales, and basal 1/2 to 2/3 of the female antenna is covered with dense raised scales, but the remaining apical flagellum has light rings at the tip of each segment; the basal third of female forewing, except for the narrow zone along the costal margin, is lighter than the background wing color, while male forewing base is uniformly dark colored; the face has raised hairs; the transverse central fascia of the forewing is light color, very narrow; and the anellus at base of juxta has pair of articulated carinae.

Remarks. This species group was established by Kozlov & Hirowatari (1997) and includes four species: *N. marisella* from Japan, *N. hoeneella* from Hunan, *N. aritai* and *N. issikii* from Taiwan, China. Among them, *N. hoeneella* and *N. issikii* share the oblique central fascia of the forewing without lateral bands on each side. The former species possesses a pair of well-sclerotized processes and a dorsal lobe, but the later one cannot be defined whether it has this character because of no male adult has been found.

Key to species of the *hoeneella* group based on external morphology and male genitalia

1 Forewing central fascia straight, reaching costal margin at 1/2 to 4/7 . . . . . *N. aritai*
- Forewing central fascia oblique, reaching costal margin at 2/3 2
2 Body small, wing expanse 17–18 mm; forewing pale ochreous to light brown; central fascia approximately equal in width, except costal and posterior margins slightly narrow . . . . . *N. hoeneella*
- Body relatively large, wing expanse about 23 mm; forewing brownish-gray; central fascia wide, gradually narrow from costal to posterior margins . . . . . *N. issikii*

(17) ***Nemophora aritai*** Kozlov & Hirowatari, 1997

Nemophora aritai Kozlov & Hirowatari, 1997: 90, figs. 1, 10, 13–17 (TL: China, Taiwan, Nantou; OPU); Wang *et al*. 2000: 26; Shao *et al*. 2008: 550 (Checklist of Taiwan).

Diagnosis. This species can be distinguished by the following combined characters: the gray background color of the basal half of the forewing is densely suffused with brown scales; the presence of gray bands bordering the yellow central fascia of the forewing; the very narrow medial lobe of the valva; and the presence of a pair of strongly articulated carinae in the anellus at the base of juxta.

Specimen examined. Holotype ♂ in OPU.

Distribution. China (Taiwan).

Remarks. The type specimen was collected at about 1,800 m on the southern slope of Cuifeng, Taiwan, and several adults were observed swarming above the flowers of possibly *Quercus glauca* (Fagaceae) (Kozlov & Hirowatari 1997).

(18) ***Nemophora hoeneella*** (Caradja & Meyrick, 1935)

Nemotois honeella Caradja & Meyrick, 1935: 95 (TL: China, Hunan, Hoeng-Shan [Hengshan]; MINGA).
Nemophora hoeneella: Kozlov & Hirowatari 1997: 92, figs. 4, 12, 23–27 (New combination).

Diagnosis. This species differs from *N. aritai* and *N. marisella* by the oblique central fascia of the forewing and the long median lobe of valva in male genitalia; and differs from *N. issikii* by the dark brown forewing background color.

Specimens examined. Not available in this study.

Distribution. China (Hunan).

Remarks. Popescu-Gorj (1992) designated the lectotype and paralectotypes from a series of specimens collected in Hengshan, Hunan, China (as "Hoengshan" in original labels) by H. Höne. Moreover, Kozlov & Hirowatari (1997) also noted two additional specimens in MINGA and five in BMNH as paralectotypes. The species name presented in the original description is "*Nemotois höneella*" which was changed to "*Nemophora hoeneella*" and was considered a justified emendation (Kozlov & Hirowatari 1997).

(19) ***Nemophora issikii*** Kozlov & Hirowatari, 1997
(Plate X-1)

Nemophora issikii Kozlov & Hirowatari, 1997, Ent. Scand., 28: 95, figs. 5, 7 (TL: China, Taiwan, Sinsuiei [Chinshuiying]; USNM); Shao *et al*. 2008: 550 (Checklist of Taiwan).

Diagnosis. This species differs from *N. aritai* and *N. marisella* by the oblique central fascia of the forewing. and differs from *N. honeella* by the pale ochreous base of the forewing and relatively larger size.

Specimen examined. Holotype ♀ in USNM.

Distribution. China (Taiwan).

Remarks. Although this species was described based on a single female adult, the special structure of the female antenna is sufficient to make it as an independent species. The base of the female antenna is thickened by covering scales in many *Nemophora* species, but this character is well developed in this species, which is similar to *N. maxinae* from Thailand and Myanmar (Kozlov & Robinson 1996b). However, the latter species has no forewing central fascia and is thus distantly related to *N. issikii* (Kozlov & Hirowatari 1997).

3.5 *Nemophora aurifera* species group

Diagnosis. This species group can be distinguished by the following characters: the male eyes are moderate or relatively small, with eye size index less than 1; the forewing ground color is black with blue-purple luster, usually

scattered with many yellow scales apically; the transverse central fascia is usually placed at 1/3 of the forewing, narrow, light yellow to orange-yellow, both sides with narrow black margins; the sacculus of male genitalia usually expands medially but does not form an angular process; and the aedeagus is distinctly curved dorsally with asymmetrical or serrated apical lobes.

Remarks. This species group consists of twelve species, eight of which have been recorded in China. Among these, three species are described as new in this paper, namely *N. badagongshana* **sp. nov.**, *N. longlabiae* **sp. nov.**, and *N. quadrata* **sp. nov.** In addition, *N. associatella* (Zeller, 1839) is widely distributed in Europe, whereas *N. pruinosa* Hirowatari, 2005, *N. tenuifasciata* Hirowatari, 2005, and *N. umbripennis* Stringer, 1930 (Plate X-4) are only known in Japan. Due to their very similar external appearance, genital dissection is very important and necessary for identification in this group.

Key to species of the *aurifera* group based on external morphology and male genitalia

1 Body small, wing expanse 14–15 mm 2
- Body moderate, wing expanse 16–20 mm 4
2 Forewing central fascia yellow, wider, not interrupted in middle 3
- Forewing central fascia whitish, narrow straight, widely interrupted in middle . . . . . *N. limenites*
3 Forewing base without yellow stripe; central fascia approximately equal in width; abdomen dark brown dorsally and yellow ventrally . . . . . *N. tyriochrysa*
- Forewing base with longitudinal yellow stripe near costal margin; central fascia with anterior margin narrower than posterior margin; abdomen brown dorsally and bronze ventrally . . . . . *N. solstitiella*
4 Forewing central fascia obviously wide, distinctly curved outward in the middle . . . . . *N. servata*
- Forewing central fascia narrow, straight 5
5 Eyes large in male, eye size index about 7; labial palpus very long, more than vertical diameter of eyes, covered with dense long hairs; costal half of forewing central fascia about twice width as dorsal half . . . . . *N. longlabiae* **sp. nov.**
- Eyes small to moderate in size; labial palpus very short, with sparse short hairs; forewing central fascia equal in width, at most slightly wider somewhere. 6
6 Eyes moderate in male, eye size index about 3.8; median process of transtilla short, with distinctly wide base whose width equal to the length of median process . . . . . *N. badagongshana* **sp. nov.**
- Eyes small, eye size index about 1; median process of transtilla long, with narrow base whose width no more than half length of median process. 7
7 Forewing central fascia obviously broad, equal in width; subapical yellow scales occupied apical half of this area; valva with obvious basal process laterally; suspensorium trapezoidal . . . . . *N. aurifera*
- Forewing central fascia obviously narrow, slightly narrow at anterior margin; subapical yellow scales occupied apical 2/3 of this area; valva without basal process laterally; suspensorium almost quadrate . . . . . *N. quadrata* **sp. nov.**

(20) ***Nemophora aurifera*** (Butler, 1881)
(Plates II-6, X-2, XIII-4, XXII-1, XXX-5-9, XXXI-3, 5)

Tinachma (*Adela*) *fasciella*, Motschulsky (nec *fasciellus*, Fabr.), 1866, Bull. Soc. Nat. Mosc., p. 39.
Nemotois aurifera Butler, 1881: 592 (TL: Japan, Yokohama); Meyrick 1912a: 9; Meyrick 1912b: 7; Matsumura 1931: 1111, fig. 2332 (Japan); Matsumura 1932: 122, pl. 4, fig. 5 (list of Japan).
Nemophora aurifera: Hirowatari 2013: 106, fig. 3-08-3,4 (Japan); Umetsu 2014: 5, fig. 9 (Japan, Akita Prefecture); Fukuda & Kanai 2016: 18 (Japan, Kirishima Mt.).

Diagnosis. This species is similar to *N. quadrata* **sp. nov.** but can be distinguished by the relatively large male eyes with eye size index about 2.4; and the forewing transverse central fascia is yellow. In addition, this species has separated ventral base of valvae, and has trapezoidal suspensorium with anterior part distinctly beyond the posterior margin of the vinculum in ventral view.

Specimens examined. [**Hunan**] 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.IV.26, C.Q. Liao leg.; 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg.; 1♂2♀, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V.10, C.Q. Liao & M. Deng leg.; 1♀, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.IV.30, C.Q. Liao leg.; 2♀, Xiangsi Hotel, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V.14, C.Q. Liao leg.; [**Guangdong**] 1♂1♀, Nanling National Nature

Reserve, Ruyuan Yao Autonomous County, Shaoguan City, 2009.V.7, G.H. Huang leg.; 3♂, Nanling National Nature Reserve, Ruyuan Yao Autonomous County, Shaoguan City, 2011.VI.4–5, G.H. Huang leg.; 1♀, Nanling National Nature Reserve (1,000 m), Ruyuan Yao Autonomous County, Shaoguan City, 2003.VII.19, G.H. Huang & M. Wang leg.; 1♀, Nanling National Nature Reserve, Ruyuan Yao Autonomous County, Shaoguan City, 2006.V.31–VI.6, L.S. Chen leg.; 1♀, Nanling National Nature Reserve (1,050 m), Ruyuan Yao Autonomous County, Shaoguan City, 2005.VI.13, G.H. Huang, M. Wang & L.S. Chen leg.; 1♀, Maofengshan Forest Park, Guangzhou City, 2006.IV.16, M. Wang leg.; 1♀, Hengshitang Town (1,500 m), Shimentai National Nature Reserve, Yingde City, 2017.IV.29, T.T. Yu leg.; 2♂1♀, Nankunshan National Forest Park, Longmen County, Huizhou City, 2006.III.28, G.H. Huang leg.; [**Guangxi**] 1♂, Maoershan National Nature Reserve, Xing'an County, Guilin City, 2007.V.1–5, L.S. Chen leg.; 1♂, Maoershan National Nature Reserve (1,500 m), Xing'an County, Guilin City, 2010.V.25–26, G.H. Huang leg.; [**Sichuan**] 1♂, Yajiageng (1,200 m), Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2005.VI.19, G.H. Huang, L.S. Chen & J.X. Liu leg.; 1♀, Shimian County (2,050 m), Ya'an City, 2016.VII.10, T.T. Liu leg. (HUNAU).

Distribution. China (Hunan, Guangdong, Guangxi, Sichuan, Taiwan); Japan.

Remarks. Kato (2000) recorded this species on the plant *Pittosporum tobira* (Pittosporaceae) from Amami-Oshima Island, but Hirowatari (2005a) suggested that *N. tenuifasciata* or *N. marisella* may have been misidentified as *N. aurifera* because he could not find any *N. aurifera* from the Ryukyus. According to the first author's observation, this species nectared on the flowers of *Viburnum hanceanum* Maxim. (Caprifoliaceae) and also occurs in the surrounding plants (Plates XXX-5–9). Thus, we can collect them by insect net in the day time (Plate XXXI-3) and by light trap in the midnight (Plate XXXI-5).

A DNA barcode of one *N. aurifera* specimen is generated. This species is closest to *N. badagongshana* **sp. nov.** (pairwise distances: 0.048).

(21) ***Nemophora badagongshana*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates II-7, XIII-5, XXII-2)
LSID urn:lsid:zoobank.org:act:CEA796AC-BB9B-45AB-8815-0D81FCDD08B7

Diagnosis. This species is very similar to *N. aurifera* but can be distinguished by the relatively large eyes (eye size index about 3.8); the short vinculum (about 2.1 × as long as valva); and the anterior part of suspensorium at the same level as the posterior margin of the vinculum in ventral view.

Description. Male. Forewing about 9.2 mm; wing expanse about 18.5 mm.

Vertex covered with brownish to brownish-red hairs; face with dark brown scales medially and brownish hairs around compound eyes. Eyes large, close to each other dorsally; eye size index about 3.8. Labial palpus relatively long, covered with brownish to dark brown scales and hairs; galeae with yellow scales laterally. Antenna slender, about 24.5 mm, 2.7 × forewing length; scape brown with purple metallic luster; basal 1/6 black and most remaining apical segments light brown. Legs black with brownish inner surface; each base of middle and hind tarsi yellow; hind tibiae with brown to dark brown long hairs. Thoracic dorsum yellow to brown and tegula black, both with bronze metallic luster. Forewing lanceolate, ground color dark brown to black, with purple metallic luster; middle part with a yellow transverse fascia, approximately equal in width but slightly narrow at posterior margin; subapical area scattered with a lot of yellow scales; cilia dark brown to black with bronze metallic luster. Hindwing and cilia dark brown to black, costal area slightly light color. Abdomen dark brown to black.

Female. Forewing about 8.7 mm, wing expanse about 18.0 mm. Eyes small, eye size index *ca.* 0.58. Antenna short, about 11.6 mm, *ca.* 1.3 × forewing length; basal half stout with thickened black scales except inner surface near head with purple sacles; apical half slender and smooth, gray white. Others similar to male.

Male genitalia. Uncus semicircle, slightly beyond apex of valva, with weak median keel. Vinculum relatively short, about 2.1 × as long as valva; posterior margin near straight. Valva nearly trapezoidal in ventral and lateral views, with pointed apex; inner margins slightly concaved, lateral margins almost straight with obviously process basally; sacculus expanding at base and forming arcuate process with dense long hairs, basal part slightly swollen ventrally and nearly half fused basally; suspensorium nearly quadrate anteriorly and expanding posteriorly, anterior part at same level with posterior margin of vinculum in ventral view. Transtilla approximately equal in width; median process moderate and pointed, with distinct wide base which is approximately equal the length of median process.

Aedeagus slender; apical 2/5 curved dorsally; apical lobe concaved ventrally and expanded a slender lateral lobe; vesica with two rows of microtrichia dorsolaterally. Juxta arrow-shaped; arrow-head broad, lateral arms slender.

Holotype. [**Hunan**] ♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2021.V.1–2, C.Q. Liao leg. (HUNAU).

Paratypes. [**Hunan**] 1♂2♀, same data as holotype; 2♀, Huangliantai Village, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2021.IV.30, C.Q. Liao leg. (HUNAU).

Etymology. The specific epithet refers to the type locality, Badagongshan National Nature Reserve.

Distribution. China (Hunan).

Remarks. This species usually occurs in late April to May.

A DNA barcode of one *N. badagongshana* **sp. nov.** specimen is generated. This species was closest to two unidentificated German *Nemophora* species (GMGMK882, GMGMK898), with 4.6% pairwise distances. The phylogenetic tree shows *N. badagongshana* **sp. nov.** and *N. aurifera* appeared to be as monophyletic with a moderate bootstrap value (68%).

(22) ***Nemophora limenites*** (Meyrick, 1914)

Nemotois limenites Meyrick, 1914: 61 (TL: Formosa, Kankau [Taiwan, Pingdong]; BMNH); Hua 2005: 2 (list of China).
Nemophora limenites: Shao *et al*. 2008: 550 (Checklist of Taiwan); Heppner 1992: 63 (Checklist of Taiwan).
Nemotois limenitis [sic!]: Matsumura 1931: 1112, fig. 2336 (Taiwan); Matsumura 1932: 122, pl. 4, fig. 7 (China, Taiwan).

Diagnosis. This species is very similar to *N. aurifera* but can be distinguished by the following features: body size small, wing expanse about 14 mm; palpus short and whitish; antenna white, towards base shining dark purple-fuscous; forewing central fascia whitish, very narrow straight, widely interrupted in middle.

Specimens examined. Not available in this study.

Distribution. China (Taiwan).

Remarks. This species is endemic to Taiwan, including Pingtung, Tainan, and Nantou, and mainly occurs from April to May (Meyrick 1914; Matsumura 1931, 1932).

(23) ***Nemophora longlabiae*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates II-5, XIII-6)
LSID urn:lsid:zoobank.org:act:215BC7FB-56DB-4D4B-A973-10830F380C65

Diagnosis. This species is very similar to *N. aurifera* but can be distinguished by large eyes (eye size index about 7.1), long labial palpus with dense long hairs (more than the vertical diameter of compound eyes), and transverse central fascia with a wide costal half about twice the width of the dorsal half.

Description. Male. Forewing about 9.7 mm; wing expanse about 20.2 mm.

Vertex covered with brownish to black hairs; face with dark yellow scales medially and yellow hairs around compound eyes. Eyes very large, close to each other dorsally; eye size index about 7. Labial palpus very long, more than vertical diameter of compound eyes, covered with dense yellow brown and black hairs; galeae with brownish scales laterally. Antenna slender, about 25.0 mm, 2.6 × forewing length; scape brownish with golden metallic luster; basal 1/3 black and most remaining apical segments light brown. Legs dark brown to black; hind tibiae with brown to dark brown long hairs. Thoracic dorsum and tegula brown to dark brown, with bronze metallic luster. Forewing lanceolate, ground color dark brown to black, with bronze metallic luster; middle part with a yellow transverse fascia, costal half about twice width as dorsal half; subapical area scattered with some brown scales; cilia dark brown to black with bronze metallic luster. Hindwing and cilia dark brown to black, costal area slightly light color. Abdomen dark brown to black.

Female. Unknown.

Male genitalia. Uncus near semicircle, with weak median keel. Vinculum relatively slender, about 3.2 × as long as valva; posterior margin distinctly arcuate. Valva near trapezoid in ventral and lateral views, with pointed apex, far beyond uncus; inner margins slightly concaved, lateral margins distinctly concaved; sacculus expanding at apical 1/3 with a small process, basal part almost fused medially; suspensorium nearly trapezoid, anterior part

beyond posterior margin of vinculum in ventral view. Transtilla approximately equal in width; median process short and blunt. Aedeagus slender; apical 2/5 curved dorsally; apex with a broad smooth lobe ventrally and a pair of microechinate lobes laterally; vesica with a pair of long, strongly sclerotizated lamellates dorsolaterally and two rows of spines dorsally. Juxta arrow-shaped; arrow-head broad, lateral arms slender.

Holotype. [**Taiwan**] ♂, Wugongshan (1,000 m), Maolin District, Gaoxiong City, 2002.III.23, B. Tanaka & T. Mano leg. (HUNAU).

Paratypes. [**Taiwan**] 3♂, same data as holotype (HUNAU).

Etymology. The specific epithet is derived from the words *long* and *labia*, referring to the very long labial palpus.

Distribution. China (Taiwan).

Remarks. This species is endemic to Taiwan, China, and occurs in March.

(24) ***Nemophora quadrata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-1, XIV-1, XXII-3)
LSID urn:lsid:zoobank.org:act:42B741F2-E572-4AA3-9F4C-F8EACF08D344

Diagnosis. This species is similar to *N. aurifera* but can be characterized by the relatively small male eyes (eye size index about 1.1); the light color of the forewing transverse central fascia (white to light yellow); R_3 and R_4 of the forewing are stalked, and the suspensorium is nearly quadrate anteriorly and expands posteriorly, anterior part at the same level as the posterior margin of the vinculum in ventral view.

Description. Male. Forewing about 8.5 mm; wing expanse about 16.7 mm.

Vertex densely covered with brownish to brownish-red hairs; face with dark brown scales medially and brownish hairs around compound eyes. Eyes relatively large, eye size index about 1.3. Labial palpus relatively long, covered with brownish scales and dark brown hairs; galeae with yellow scales laterally. Antenna slender, about 22.4 mm, 2.6 × forewing length; scape brown with purple metallic luster; basal 2/5 black and most remaining apical segments light brown. Legs black with brownish inner surface; basal part of tibiae and tarsi yellow. Thoracic dorsum brown to black and tegula black, both with bronze metallic luster; thoracic sternum yellow. Forewing lanceolate, ground color dark brown to black, with purple metallic luster; middle part with a yellow transverse fascia, approximately equal in width but slightly narrow at anterior margin; subapical area scattered with a lot of yellow scales; cilia dark brown to black with bronze metallic luster. Hindwing and cilia dark brown to black, costal area slightly light color. Abdomen dark brown to black.

Female. Forewing about 7.3 mm, wing expanse about 15.0 mm. Eyes small, eye size index *ca.* 0.58. Antenna short, about 10.5 mm, *ca.* 1.4 × forewing length; basal half stout with thickened black scales except inner surface near head with purple sacles; apical half slender and smooth, gray white. Others similar to male.

Male genitalia. Uncus semicircle, approximately at same level with apex of valvae, with weak median keel. Vinculum relatively short, about 2.0 × as long as valva; posterior margin near straight. Valva nearly triangular in ventral view and trapezoidal in lateral view, with pointed apex; inner margins slightly concaved, lateral margins slightly concaved with process medially; sacculus expanding at base and forming a process with dense long hairs, basal part slightly swollen ventrally and fused basally; suspensorium almost quadrate, anterior part at same level with posterior margin of vinculum in ventral view. Transtilla distinctly wider in lateral part; median process moderate and pointed. Aedeagus slender; apical 2/5 very curved dorsally; apex divided into two slender lobes dorsally and ventrally; vesica with two rows of three small spines dorsolaterally. Juxta arrow-shaped; arrow-head broad, nearly quadrate, lateral arms long and slender.

Holotype. [**Hunan**] 1♂, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.7, C.Q. Liao leg. (HUNAU).

Paratypes. [**Hunan**] 11♂5♀, same data as holotype; 3♂2♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.VI.5–6, C.Q. Liao leg.; 2♂2♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.28–29, C.Q. Liao leg.; 1♂, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.23–24, M. Deng leg.; 1♂, Lanping Village, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2020. V.21, C.Q. Liao leg.; 1♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie

City, 2009.V.26–27, G.H. Huang leg.; [**Hainan**] 1♂1♀, Baishuiling Tropical Forest Reserve (600 m), Diaoluoshan National Nature Reserve, Lingshui Li Autonomous County, 2003.III.19–20, M. Wang leg. (HUNAU).

Etymology. The specific epithet is derived from the word *quadrate*, referring to the quadrate suspensorium and arrow-head of juxta.

Distribution. China (Hunan, Hainan).

Remarks. This species is distributed in Hunan and Hainan Provinces, which implies that it may be widely distributed in southern China. This species occurs from May to June in the Hunan population and in March in the Hainan population, which may be related to the local natural environment, especially temperature.

One DNA barcode of this species is sequenced and found to be closest to *N. decisella* and *N. assamensis* with pairwise distances of 0.051 and 0.052, respectively.

(25) ***Nemophora servata*** (Meyrick, 1925) **com. nov.**

Nemotois servata Meyrick, 1925: 383 (TL: China, Fukiens, Lienping [Fujian, Lianping]; MINGA); Caradja 1938b: 257 (China, Fujian); Hua 2005: 2 (list of China).

Diagnosis. This species differs from other species of the *aurifera* group by the following characters: wing expanse about 18 mm; male eyes enlarged, rather nearly close to each other dorsally; a slightly excurved relatively wide central fascia of forewing light ochreous-yellow, edged with a dark fuscous line on each side; and apical third of forewing with a patch of dark fuscous scales.

Specimens examined. Not available in this study.

Distribution. China (Fujian).

Remarks. This species is endemic to Fujian, China, and occurs in May.

(26) ***Nemophora solstitiella*** (Walsingham, 1900)

Nemotois solstitiella Walsingham, 1900: 584 (TL: India, Himachal Pradesh, Dharamshala; BMNH); Meyrick 1912a: 9 (India); Meyrick 1912b: 7; Meyrick 1924: 79.
Nemophora solstitiella: Kozlov 2023c: 40, figs. 50, 51, 99, 130, 160 (India, review).
Nemotois solstitiellus: Meyrick 1907: 991 [incorrect subsequent spelling].
Nemophora solstitiellus: Das & Singh 2022: 265 [incorrect subsequent spelling].
Nemotois zonoreas: Meyrick 1924: 79 (TL: India, Jammu and Kashmir, Killanmarg; BMNH); Meyrick 1933: 363; Clarke 1955: 331. Synonymized by Kozlov 2023c.

Diagnosis. This species differs from other species of the *aurifera* group by the absence of longitudinal yellow stripe near costal margin of forewing base. In addition, this species also similar to *N. tancrei* but can be distinguished by the matt frons, longer labial palpus and larger interocular index (Kozlov 2023c).

Specimens examined. Not available in this study.

Distribution. China (Taiwan); India, Pakistan.

Remarks. Kozlov (2023c) reported one male specimen of this species from Taiwan, China in USNM when he reviewed the fauna of the genus *Nemophora* of India and Sri Lanka. In addition, Kozlov (2023c) noted that this species was common at 2,100 m elevation and the adults were mostly observed around *Mentha spicata* (Lamiaceae).

(27) ***Nemophora tyriochrysa*** (Meyrick, 1935)

Nemotois tyriochrysa Meyrick, 1935: 94 (TL: China, Nanking [Nanjing], Oxhead Mountain; BMNH).
Nemotois tyriochysa [sic!]: Hua 2005: 2 (list of China).
Nemophora tyriochrysa: Kozlov 1997d: 282; Ji *et al*. 2018: 900, figs. 1f, 2e (Korea).

Diagnosis. This species can be characterized by the small body size with wing expanse about 14–15 mm; the basal 2/5 of the forewing has a yellow narrow transverse central fascia; the forewing base has a small blackish spot near costa; and the abdomen is blackish dorsally and yellow ventrally.

Specimens examined. Not available in this study.

Distribution. China (Jiangsu); Russia, Korea.

Remarks. This species was described by Meyrick (1935) based on specimens from Nanjing, China, and then Kozlov (1997d) reported its distribution in the Russian Far East. Recently, Ji *et al*. (2018) reported and redescribed this species from Korea.

3.6 *Nemophora diplophragma* species group

Diagnosis. This species group can be distinguished by the following characters: the male eyes are relatively large, close to each other dorsally, with eye size index 1.6–2.8; the forewing has a near triangular basal spot whose outer margin is more or less connected with anterior and posterior margins; the transverse central fascia is placed near half of the forewing, yellow to orange-yellow; the forewing ground color is black with blue-purple luster, usually scattered with many yellow scales apically; and the apex of aedeagus with a distinct point spine.

Remarks. This species group consists of three species, namely, *N. diplophragma* (Meyrick, 1938), *N. basalistriata* **sp. nov.**, and *N. digitata* **sp. nov.**, all of which are distributed in China. Among them, *N. diplophragma* has not been reported since it was first described based on a single specimen from Yunnan, China (Meyrick 1938). The other two species are new ones described in this study. This species group is very similar to the *Nemophora aurifera* group which shares the above characters 3 and 4. However, the large eyes in male and yellow basal spots are distinct diagnosis characters of this species group.

Key to species of the *diplophragma* group based on external morphology and male genitalia

1 Basal spot and transverse central fasciae of forewing both distinctly large and wide . . . . . *N. diplophragma*

\- Basal spot very small, triangular or linear; transverse central fasciae of forewing distinctly narrow 2

2 Forewing obviously narrow, forewing length about 3.2 × width; valva with acute apex; median process of transtilla very short; suspensorium small, anterior part not beyond posterior margin of vinculum in ventral view . . . . . .*N. duplicifascia* **sp. nov.**

\- Forewing obviously broad, forewing length about 2.8 × width; valva with rounded or quadrate apex; median process of transtilla very long; anterior part of suspensorium significantly beyond posterior margin of vinculum in ventral view 3

3 Triangular yellow spot of forewing base relatively large, exceeding to costal and posterior margins; transverse central fascia narrower on costal margin than posterior margin. . . . . .*N. digitata* **sp. nov.**

\- Triangular yellow spot of forewing base relatively small, not exceeding to costal margin; transverse central fascia narrower on posterior margin than costal margin . . . . . .*N. basalistriata* **sp. nov.**

(28) ***Nemophora basalistriata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-2, XIV-2, XXIII-1)
LSID urn:lsid:zoobank.org:act:91EFA659-E601-4EEE-9FCC-0CB5EFED09C3

Diagnosis. This species can be easily distinguished by the triangular yellow spot on the forewing base, by the legs dark brown to black except for the hind femurs yellow, and by the sacculus of valvae slightly expanding in middle but not forming an angular process.

Description. Male. Forewing about 8.6 mm; wing expanse about 18.0 mm.

Head covered with raised reddish-brown hairs; face with light yellow to brownish scales and reddish-brown hairs around eyes. Eyes large, relatively close to each other dorsally; eye size index about 1.6. Labial palpus moderate in length, covered with brownish scales and hairs; galeae with brown to dark brown scales laterally and little black basally. Antenna slender, about 22.3 mm, 2.6 × forewing length; basal 1/5 black and apical part light brown or gray. Legs dark brown to black with purple metallic luster; hind femur yellow, and tibiae with black long hairs. Thoracic dorsum and tegula dark brown to black, with brass metallic luster. Forewing lanceolate, ground color dark brown to black; base with a triangular yellow spot, sometimes exceeding to costal and posterior margins; middle part with a light yellow to pale brown transverse central fascia bordered on both sides by black bands, slightly curved at middle, costal margin slightly wider than posterior margin; disc of apical area with bright blue metallic luster, scattered with numerous yellow to brownish scales; cilia dark brown to black with blue metallic luster; vein R_3 and R_4 separated.

Hindwing and cilia dark brown to black; vein Rs stalked with M_1 at basal 1/3. Abdomen dark brown to black with yellow rings on each posterior margin.

Female. Forewing about 7.8 mm, wing expanse about 12.6 mm. Eyes small, eye size index *ca.* 0.6. Antenna short, about 12.6 mm, *ca.* 1.6 × forewing length; basal 1/3 stout with thickened scales which reddish brown in basal half and black in apical half; apical 2/3 slender which proximal tens of segments black to brown, and distal segments gray. Others similar to male.

Male genitalia. Uncus triangular, shorter than apex of valvae, with distinct median keel. Vinculum relatively slender, about 3.2 × as long as valva; posterior margin nearly straight. Valva triangular, rounded stout apically; lateral margins nearly straight; sacculus slightly expanded but not forming distinct process, separated at base ventrally; suspensorium nearly quadrate, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide medially and slightly narrow laterally; median process long and pointed, with concaved anterior margin. Aedeagus long and slender; basal 2/3 curved dorsally; apical portion with a slender lamellate and a concaved and serrated-margined lobe; vesica with a pair of slender cornuti dorsally. Juxta arrow-shaped; arrow-head relatively pointed, lateral arms long.

Female genitalia. Ovipositor pointed, with some minute teeth ventroposteriorly. Apophyses posteriores and anteriores long and slender, subequal in length. Vestibulum relatively large, membranous; vestibular lamella well developed, nearly reniform in ventral view. Bursa copulatrix relatively long, membranous.

Holotype. [**Sichuan**] ♂, Longchi (900 m), Dujiangyan City, 2017.VI.14–16, S. G.H. Huang leg. (HUNAU).

Paratypes. [**Sichuan**] 1♀, same data as holotype, G.H. Huang & M. Wang leg.; 1♂, same locality as holotype (950 m), 2016.VI.27, G.H. Huang leg.; 2♀, Longcanggou, Yingjing County, Ya'an City, 2017.VII.17–18, M. Wang leg.; 1♂, same locality (1,400 m), 2015.VIII.10–11, G.H. Huang leg.; 1♂, same locality, 2016.VII.1, T.T. Yu leg.; [**Jiangxi**] 5♂, Matoushan National Nature Reserve, Zixi County, Fuzhou City, 2020.VII.12, C.P. Long leg. (HUNAU).

Etymology. The specific epithet is derived from the words *basal* and *stria*, referring to the triangular basal stria at the base of the forewing.

Distribution. China (Sichuan, Jiangxi).

Remarks. This species is distributed in South China and occurs from June to July.

One DNA barcode of *N. basalistriata* **sp. nov.** is generated, and this sequence is closest to *N. conjugata* **sp. nov.** (pairwise distances: 0.064).

(29) ***Nemophora digitata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-3, XIV-3, XXIII-2)
LSID urn:lsid:zoobank.org:act:C1D9709B-490C-4B1C-A2C6-194C311C97AC

Diagnosis. This species is very similar to *N. basalistriata* **sp. nov.** because of the yellow basal stria of the forewing, but the yellow basal stria of this species is relatively large and connected with costal and posterior margins. In addition, this species can also be distinguished by the transverse central fascia of the forewing, which is slightly outwardly curved at the middle part, and the costal margin is slightly narrower than the posterior margin. In the male genitalia, this species is very unique in the valvae, which expand to form digitations at the middle of the sacculus and ventral bases.

Description. Male. Forewing 8.8–9.2 mm; wing expanse about 18.8 mm.

Vertex covered with raised yellow to brown hairs; face with yellow to brownish scales. Eyes large, relatively close to each other dorsally; eye size index about 3.3. Labial palpus moderate in length, covered with brownish scales and hairs; galeae with brown to dark brown scales laterally. Antenna slender, about 20.0 mm, 2.2 × forewing length; basal 1/4 dark brown to black and apical part light brown or gray. Legs dark brown to black; base of tarsi yellow brown; hind tibiae with brown long hairs. Thoracic dorsum and tegula dark brown to black, with brass metallic luster. Forewing lanceolate, ground color dark brown to black, with blue metallic luster; base with a nearly V- or Y-shaped yellow spot, expending from base to 1/6 of posterior margin, and bending dorsally to 1/4 of costal margin; middle part with a light yellow to brown transverse central fascia bordered on both sides by black bands, slightly curved outwardly at middle, costal margin slightly narrower than posterior margin; disc of apical area with bright blue metallic luster, scattered with numerous yellow to brownish scales; cilia dark brown to black with blue

metallic luster; vein R_3 and R_4 separated. Hindwing and cilia dark brown to black; vein Rs stalked with M_1 at middle. Abdomen dark brown to black.

Female. Forewing about 7.3 mm, wing expanse about 16.0 mm. Eyes small, eye size index *ca.* 0.7. Antenna short, about 11.7 mm, *ca.* 1.6 × forewing length; basal part stout with thickened black scales, apical part slender and smooth, gray-brown. Others similar to male.

Male genitalia. Uncus triangular, approximately at same level with apex of valvae, with distinct median keel. Vinculum relatively slender, about 3.5 × as long as valva; posterior margin distinctly arched. Valva nearly quadrate in ventral view and trapezoidal in lateral view, with truncated apex; sacculus distinctly expanding and forming a large digitate process at middle part, base also expanding a small digitate process ventrally and separated to each other; suspensorium nearly trapezoid, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and slightly narrow medially; median process long and pointed. Aedeagus long and slender; basal 2/3 curved dorsally; apical portion with a slender lamellate and several small spines apically; vesica with a pair of slender cornuti dorsally and two rows of microtrichia. Juxta arrow-shaped; arrow-head pointed, lateral arms short.

Female genitalia. Ovipositor pointed, ventral margin straight. Apophyses posteriores and anteriores long and slender, subequal in length. Vestibulum membranous; vestibular lamella well developed, nearly trapezoidal in ventral view. Bursa copulatrix short, membranous.

Holotype. [**Sichuan**] ♂, Qinglongxia (1,800 m), Kunming City, 2017.VI.19, G.H. Huang & M. Wang leg. (HUNAU).

Paratypes. [**Sichuan**] 1♂, same locality as holotype, 2017.VI.18, G.H. Huang & M. Wang leg.; 1♀, Longcanggou (1,500 m), Yingjing County, Ya'an City, 2017.VII20, G.H. Huang & M. Wang leg.; 1♀, Longcanggou (1,400 m), Yingjing County, Ya'an City, 2015.VIII.10–11, G.H. Huang leg.; 1♂, Longcanggou (1,500 m), Yingjing County, Ya'an City, 2016.VII.1, T.T. Yu leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin word *digitatus* (digitate), referring to the special digitate processes in each base and middle part of the valvae.

Distribution. China (Sichuan).

Remarks. This species is distributed in Southwest China and mainly occurs in July and August.

(30) ***Nemophora diplophragma*** (Meyrick, 1938) **com. nov.**
(Plate X-3)

Nemotois diplophragma Meyrick, 1938: 28 (China, Yunnan, Li-kiang [Lijiang]); Hua 2005: 2 (list of China).

Diagnosis. This species is unique by its distinct large eyes with eye size index about 2.8; the large basal spot of forewing; and the very wide central fascia of the forewing between 2/5 and 4/7 of forewing length.

Specimens examined. Paratype ♂ in BMNH.

Distribution. China (Yunnan).

Remarks. This species is endemic to Yunnan, China and occurs in September.

(31) ***Nemophora duplicifascia*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-4, XIV-4)
LSID urn:lsid:zoobank.org:act:00CABB4A-738D-4C29-BDEB-619F07719FE5

Diagnosis. This species is very similar to *N. basalistriata* **sp. nov.** and *N. digitata* **sp. nov.** because of its forewing pattern, but the yellow basal stria of this species presents a straight line, while it is nearly triangular in the other two species. In addition, this species also can be distinguished by the obviously narrow forewing (forewing length about 3.2 × width), by the forewing central fascia obviously wider in the posterior margin, and by the leg black except the distal part of each tarsi yellow. In the male genitalia, it also can be distinguished by the relatively short valva with acute apex, by the short median process of transtilla, and by the small suspensorium with anterior part near posterior margin of vinculum in ventral view.

Description. Male. Forewing about 6.0 mm; wing expanse about 13.0 mm.

Vertex covered with brownish hairs; face with dark brown scales and hairs. Eyes moderate in size, eye size index about 1.5. Labial palpus short, covered with yellow scales and brown hairs; galeae with yellow scales laterally. Antenna slender, about 22.0 mm, 3.7 × forewing length; basal 1/6 black dorsally and white ventrally; remaining apical flagellum white gray. Legs dark brown to black, with bronze metallic luster; base of each tarsus yellow. Thoracic dorsum and tegula black with bronze metallic luster. Forewing lanceolate, relatively narrow, length about 3.2 × width; ground color dark brown to black, with blight bronze metallic luster; basal 1/6 with a narrow straight yellow fascia, margined anteriorly and externally with black; middle part with a yellow transverse central fascia bordered on both sides by black bands, posterior margin slightly wider than anterior margin; disc of apical 1/4 scattered with numerous yellow scales; cilia dark brown to brownish red with bronze metallic luster. Hindwing and cilia dark brown to black, costal area slightly light color. Abdomen dark brown to black, with yellow to brownish rings on each segment.

Female. Forewing about 5.8 mm, wing expanse about 12.6 mm. Eyes small, eye size index *ca.* 0.6. Antenna short, about 7.5 mm, *ca.* 1.3 × forewing length; basal half stout with thickened black scales, apical part slender and smooth, black and white. Others similar to male.

Male genitalia. Uncus triangular, with distinct median keel. Vinculum slender, about 2.1 × as long as valva; lateral margins almost straight. Valva triangular, with acute apex; basal part with distinctly outward process laterally; sacculus distinctly expanding and forming a small digitate process medially; suspensorium small, anterior part near posterior margin of vinculum in ventral view. Transtilla wide laterall and slightly narrow medially; median process short and pointed. Aedeagus long and slender; basal 1/4 distinctly curved dorsally; apical portion with a large rounded lamellate; vesical with two rows of spines. Juxta arrow-shaped; arrow-head pointed, lateral arms long and pointed.

Holotype. [**Sichuan**] ♂, Longcanggou (1,400–1,500 m), Yingjing County, Ya'an City, 2016.VI.23, G.H. Huang leg. (HUNAU).

Paratypes. [**Sichuan**] 1♀, Longcanggou (1,400–1,500 m), Yingjing County, Ya'an City, 2016.VI.18–19, G.H. Huang leg. (ELKU); [**Hunan**] 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin word *duplici* (double) and *fascia*, referring to the forewing of this species with two transverse fasciae.

Distribution. China (Sichuan, Hunan).

Remarks. This new species is endemic to China and occurs in June.

DNA barcodes of three *N. duplicifascia* **sp. nov.** specimens are generated, and their intraspecific genetic distances ranges from 0.003 to 0.009. The closest sequence is *N. trimetrella* with a 0.046 pairwise distance.

3.7 *Nemophora sakaii* species group

Diagnosis. This species group can be distinguished by the following characters: the forewing is distinctly broad, length about 2.6–2.7 times of width; the transverse central fascia is usually placed at 1/3 of the forewing, light yellow to orange-yellow, both sides with narrow black margins; the half of forewing is not far away central fascia with an inconspicuous black transverse band; the suspensorium is nearly quadrate anteriorly and expanding posteriorly, anterior part is far beyond posterior margin of vinculum in ventral view; and the aedeagus is distinctly curved dorsally with asymmetrical or serrated apical lobes.

Remarks. This species group includes three species, namely *N. sakaii* (Matsumura, 1931), *N. hunanensis* **sp. nov.** and *N. purpurata* **sp. nov.**, of which the latter two are new species. This species group is similar to the *aurifera* and *diplophragma* groups, but it can be easily distinguished by the obviously broad forewing and an inconspicuous black transverse band on the transverse central fasciae of the forewing. In addition, *N. sakaii* is also similar to the *decisella* group in the forewing pattern, but it can be characterized by the central fascia of the forewing with narrow black margins on each side, and by the similar forewing pattern in male and female.

Key to species of the *sakaii* group based on external morphology and male genitalia

1 Male eyes moderate in size, eye size index about 1.2; forewing transverse central fascia obviously narrow 2
- Male eyes very large, eye size index more than 6; forewing transverse central fascia obviously broad . . . . . *N. sakaii*
2 Forewing transverse central fascia wider at middle than margins; valva with relatively pointed apex; suspensorium not beyond posterior margin of vinculum or at the same level . . . . . *N. purpurata* **sp. nov.**
- Forewing transverse central fascia broadest on costal margin and gradually narrow to posterior margin; valva with truncated apex; suspensorium far beyond posterior margin of vinculum . . . . . *N. hunanensis* **sp. nov.**

(32) ***Nemophora hunanensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-5, XIV-5)
LSID urn:lsid:zoobank.org:act:C1878949-1EBA-4ED8-B874-A5B99D60611B

Diagnosis. This species is very similar to *N. purpurata* **sp. nov.** but can be distinguished by the following characters: the transverse central fascia of the forewing is approximately equal in width and slightly narrow at the posterior margin; the valva of male genitalia is distinctly broad, with truncated apex and nearly straight lateral bases; the median process has a distinct wide base that is approximately equal to the length of the median process; and the anterior part of suspensorium is far beyond the posterior margin of the vinculum.

Description. Male. Forewing about 7.4 mm; wing expanse about 16.0 mm.

Vertex covered with brownish to brownish-red hairs; face with dark brown scales medially and brownish hairs around compound eyes. Eyes small, far away to each other dorsally; eye size index about 1.2. Labial palpus moderate in length, covered with brownish scales and hairs; galeae with yellow scales laterally. Antenna slender, about 22.5 mm, 3.0 × forewing length; scape brown with purple metallic luster; basal 1/6 black and most remaining apical segments light brown. Legs dark brown, with bronze metallic luster; base of tarsi brownish yellow; hind tibiae with brown to black long hairs. Thoracic dorsum and tegula brownish to dark brown, with bronze metallic luster. Forewing lanceolate, relatively broad, length about 2.7 × width; ground color dark brown to black, with blight purple metallic luster; basal 1/3 with an orange transverse fascia bordered on both sides by black bands, slightly wider at middle and narrowest at posterior margin; outer area not far away central fascia with an inconspicuous black transverse band; disc of apical area with bright purple metallic luster, scattered with numerous black scales; cilia dark brown to black with purple metallic luster. Hindwing and cilia dark brown to black, costal area slightly light color. Abdomen dark brown to black.

Female. Unknown.

Male genitalia. Uncus semicircle, not beyond apex of valva, with weak median keel. Vinculum relatively slender, about 2.9 × as long as valva; posterior margin distinctly arched posteriorly. Valva nearly trapezoidal in ventral and lateral views, with broad truncated apex; inner margins straight, lateral margins obviously protruded basally; sacculus expanding and forming angular process at middle part, basal part slightly swollen ventrally and nearly half fused basally; suspensorium nearly quadrate anteriorly and expanding posteriorly, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla approximately equal in width; median process long and pointed, with distinct wide base which is approximately equal the length of median process. Aedeagus slender; basal 1/5 curved dorsally; apical lobe concaved ventrally and with irregular serrations at periphery; vesica with two rows of microtrichia dorsolaterally. Juxta arrow-shaped; arrow-head broad, lateral arms slender.

Holotype. [**Hunan**] ♂, Wuyunjie Village, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2020.VI.3-9, C.Q. Liao leg. (HUNAU).

Etymology. The specific epithet refers to the type locality of this species, Hunan Province, China.

Distribution. China (Hunan).

Remarks. We have collected two specimens from Wuyunjie National Nature Reserve and preserved respective molecular material (see Table 1). Due to the losing of the specimen from Zhushan Village, this species was described based on a single male specimen from Wuyunjie Village of Wuyunjie National Nature Reserve.

Two DNA barcodes for *N. hunanensis* **sp. nov.** are generated, and their sequences show no differences. This species is closest to *N. purpurata* **sp. nov.** (pairwise distances: 0.025–0.028). The phylogenetic tree also shows that these two species (four specimens) formed a monophyletic clade, with a strong bootstrap value (98%).

(33) ***Nemophora purpurata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates III-6, XIV-6)
LSID urn:lsid:zoobank.org:act:F2796610-362A-4003-8CBC-B7A13BF873F3

Diagnosis. This species is very similar to *N. hunnanensis* **sp. nov.** which is difficult to distinguish based only on external appearances, but the forewing transverse central fascia of this species is usually wider at the middle and narrow at the costal and posterior margins. Additionally, this species can be distinguished by the following characters of the male genitalia: the apex of valvae is narrow and rounded, with lateral margins forming obvious angular processes; the median process of transtilla has a rather narrow base, width not beyond half of the median process length; and the anterior part of suspensorium is at the same level as the posterior margin of the vinculum in ventral view.

Description. Male. Forewing about 7.8 mm; wing expanse about 16.0 mm.

Vertex covered with brownish to brownish-red hairs; face with dark brown scales medially and brownish hairs around compound eyes. Eyes small, far away to each other dorsally; eye size index about 1.2. Labial palpus moderate in length, covered with brownish scales and hairs; galeae with yellow scales laterally and some black scales basally. Antenna slender, about 24.6 mm, 3.2 × forewing length; scape brown with purple metallic luster; basal 1/6 black and remaining apical part light brown to white. Legs dark brown to black; base of tarsi light brown; hind tibiae with brown to black long hairs. Thoracic dorsum and tegula dark brown to black, with brass metallic luster. Forewing lanceolate, relatively broad, length about 2.6 × width; ground color dark brown to black, with blight purple metallic luster; basal 1/3 with an orange transverse fascia bordered on both sides by black bands, slightly wider at middle and narrowest at posterior margin; sometimes interrupted by black scales of black bands at middle; outer area not far away central fascia with an inconspicuous black transverse band; disc of apical area with bright purple metallic luster, scattered with numerous black scales; cilia dark brown to black with purple metallic luster; vein R_3 and R_4 separated. Hindwing and cilia dark brown to black, costal area slightly light color; vein Rs stalked with M_1 at basal 1/7. Abdomen dark brown.

Female. Unknown.

Male genitalia. Uncus triangular, not beyond apex of valva, with weak median keel. Vinculum relatively slender, about 2.8 × as long as valva; posterior margin distinctly arched posteriorly. Valva triangular in ventral view and trapezoidal in lateral view, with rounded apex; inner margins nearly straight; sacculus expanding and forming angular process at middle part, basal part slightly swollen ventrally and nearly half fused basally; suspensorium nearly trapezoid, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process long and pointed, with narrow base. Aedeagus long and slender; basal 1/5 curved dorsally; apical lobe concaved ventrally and with irregular serrations at periphery; vesica with two rows of microtrichia dorsolaterally. Juxta arrow-shaped; arrow-head broad, lateral arms slender.

Holotype. [**Hunan**] ♂, Lanping Village, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2020.V.21, C.Q. Liao leg. (HUNAU).

Paratypes. [**Hunan**] 1♂, Linxianju Hotel, Zhushan Village, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2019.VI.15, H. Xu & C.Q. Liao leg.; [**Jiangxi**] 1♂, Wuyishan National Nature Reserve, Qianshan County, Shangrao City, 2007.VIII.28, M. Wang & X.L. Fan leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin word *purpura* (purple), referring to the forewing of this species with blight purple metallic luster.

Distribution. China (Hunan, Jiangxi).

Remarks. This species mainly occurs in the summer from June to August. There was some variation in the forewing pattern of the transverse central fascia. For example, the transverse central fascia of a male specimen from Lanping Village of Wuyunjie National Nature Reserve was interrupted by black scales of black bands in the middle.

Two DNA barcodes of *N. purpurata* **sp. nov.** are generated and their sequences show only 2 bp differences (pairwise difference, 0.3%). This species is closest to *N. hunanensis* **sp. nov.** (pairwise distances: 0.025–0.028). The phylogenetic tree also shows that these two species (four specimens) formed a monophyletic clade with a strong bootstrap value (99%).

(34) ***Nemophora sakaii*** (Matsumura, 1931)
(Plates V-1, XV-1, XXIII-3)

Nemotois sakaii Matsumura, 1931: 1113, fig. 2340 (TL: China, Formosa, Banshoryo [Taiwan, Gaoxiong]; SEHU); Matsumura 1932: 121, pl. IV, fig. 3 (Taiwan); Razowski & Kumata 1985: 23 (type catalogue); Wang *et al*. 2000: 17 (China, Taiwan).
Nemotois sasakii [sic!]: Hua 2005: 2 (checklist of China).

Diagnosis. This species differs from its congener by the broad central fascia of the forewing, and the large eye size in male adults with eye size index about 6.7. This species is also similar to *N. rubrofascia* but can be characterized by the stout base of the antenna with thickened scales (without thickened scales in *N. rubrofascia*); and the forewing central fascia is orange with gradually narrowing from the costal margin to the posterior margin (forewing central fascia bright red with approximately equal width in *N. rubrofascia*).

Specimens examined. [**Hunan**] 1♂, Huangsang National Nature Reserve, Suining County, Shaoyang City, 2018.VI.16, G.H. Huang, C.Q. Liao & S.Y. Liu leg.; 2♂1♀, Huangsang National Nature Reserve, Suining County, Shaoyang City, 2021.V.25–29, M. Deng leg.; 1♀, Yunxi Reservoir, Daoxian County, Yongzhou City, 2021.V.31, M. Deng leg.; [**Guangdong**] 1♂, Lengshuijiao (324 m), Potou Town, Lianping County, Heyuan City, 2021.VI.4, K.Y. Pan leg.; 1♂, Nanling National Nature Reserve (1,050 m), Ruyuan Yao Autonomous County, Shaoguan City, 2005. VI.13, G.H. Huang, M. Wang & L.S. Chen leg. (HUNAU).

Distribution. China (Hunan, Guangdong, Guangxi, Taiwan).

Remarks. This species occurs mainly from May to June. Although we did not examine the specimen from Guangxi Province, this species was believed to have occurred in the forest habitat of Damingshan National Nature Reserve (*ca.* 840 m) and could be attracted by light trap based on the photography records from Mr. Pi-Ning Zhou (per. comm.).

DNA barcodes of three *N. sakaii* specimens are generated and their sequences show 0.3–0.8% differences. This species is closest to *N. purpurata* **sp. nov.** (pairwise distances: 0.034–0.040).

3.8 *Nemophora decisella* species group

Diagnosis. This species group can be characterized by the following features: the male eyes are very large, close to each other dorsally; the base of antennae is stout with thickened scales, especially in female adult; the forewing has bright metallic luster, a conspicuous transverse central fascia placed in the middle, usually red, orange, or yellow; the foretibiae are covered with dense thickened scales apically; the ventral base of valvae is fused medially; the sacculus is expanded to form an angular process; and the apex of aedeagus is curved dorsally, with a pair of developed hook-shaped carinae near the apex laterally.

Remarks. Eight species belong to the *decisella species* group, namely *N. decisella* (Walker, 1863), *N. paradisea* (Butler, 1881), *N. smaragdaspis* (Meyrick, 1924), *N. cantharites* (Meyrick, 1928), *N. heteroxantha* Diakonoff, 1951, and *N. arcuatifasciata* **sp. nov.**, *N. caeruliantenna* **sp. nov.** and *N. xizangensis* **sp. nov.** as new species herein. Among them, *N. cantharites* occurs in the Philippines and *N. heteroxantha* in Java, but Kozlov & Robinson (1996a) considered that *N. heteroxantha* to be probably a synonym of *N. decisella*. The other four species have been recorded in China. Male adults of the *decisella* group have dominant large eyes, which may be closely related to the swamming behavior of adelid moths (Hirowatari & Nagaike 1998; Hirowatari *et al*. 2012). In addition, the *decisella* group differs from other species groups by the typical and conspicuous sexual dimorphism, not only in the antenna (length, color and morphology) and compound eyes (size in male), but also in the forewing color pattern (almost completely yellow in the forewing base of females, but the same color as the ground in males).

Key to species of the *decisella* group based on external morphology and male genitalia

1 Antenna basally with metallic blue scales . . . . . *N. caeruliantenna* **sp. nov.**
- Antenna basally without metallic blue scales. 2
2 Forewing transverse central fascia obviously arcuate outward at middle, which slightly form “3”-shaped . . . . . *N. arcuatifasciata* **sp. nov.**
- Forewing transverse central fascia broad, with almost straight margins 3

3 Forewing central fascia narrow, placed between basal 1/3 to 1/2; apex of valva distinctly rounded; transtilla narrower in lateral part, base of median process obviously narrow . . . . . *N. decisella*
- Forewing central fascia distinctly broad, placed between basal 1/3 to 2/3; apex of valva almost acute; transtilla wider in lateral part, base of median process broad. 4
4 Ground color of forewing and thorax both metallic brass; forewing transverse central fascia yellowish; uncus with a distinct median keel; vinculum relatively slender, length about 5.2 × width . . . . . *N. paradisea*
- Ground color of forewing and thorax both metallic blue or green; forewing transverse central fascia orange-red; uncus only with a weak median keel; vinculum relatively broad, length 4.2–4.4 × width. 5
5 Forewing transverse central fascia with outward curved margins; apex of valva digitate, slightly beyond uncus; anterior part of suspensorium at same level of posterior margin of vinulum . . . . . *N. smaragdaspis*
- Forewing transverse central fascia with almost straight margins; apex of valva pointed, not beyond uncus; anterior part of suspensorium far beyond posterior margin of vinculum . . . . . *N. xizangensis* **sp. nov.**

(35) ***Nemophora arcuatifasciata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates IV-5, XXIV-1)
LSID urn:lsid:zoobank.org:act:3FABFDC9-7D91-4AB6-B861-DD25DBBD3AF7

Diagnosis. This species is very similar to some species of this group, such as *N. decisella*, *N. paradisea*, and *N. smaragdaspis*, but can be distinguished by the following characters in female: the distal part of flagellum uniform yellow, while black and white in *N. decisella* and silvery white to light bronzy in *N. paradisea* and *N. smaragdaspis*; the color of the basal part is slightly lighter than forewing ground, but most yellow in the others which distinctly differs from forewing ground; the transverse central fascia is narrow, obviously arcuate outward at the middle, which slightly forms "3"-shaped, while broad with almost straight margins in the others.

Description. Female. Forewing about 9.0 mm; wing expanse about 18.4 mm.

Vertex densely covered with yellow to brownish hairs; face with dark brown scales and hairs. Eyes small, far away to each other dorsally; eye size index about 0.65. Labial palpus long, densely covered with dark brown hairs; galeae with brown scales laterally. Antenna slightly longer than forewing length, more than 10.2 mm; basal 2/3 covered with long scales forming a dense, tubular brush, generally brown to dark brown mixed with some black internally except apical part with long black scales dorsally; diameter of this brush approximately equal to vertical eye diameter; remaning distal part of flagellum slender, uniform yellow. Legs black with purple metallic luster, except tarsi dark brown. Thoracic dorsum and tegula dark brown to black, with brass metallic luster. Forewing lanceolate, relatively broad, length about 2.8 × width; ground color dark brown to black with blight purple metallic luster, except basal part near costal margin light color; a transverse dark brown fascia placed at basal 2/5 and bordered with a pair of narrow black-margined silvery-leaden bands on both sides, obviously arcuate outward at middle, slightly "3"-shaped; disc of apical area scattered with numerous scales shining bright silver gray luster; apical angle area with a small patch of dark yellow to brownish spot; cilia dark brownish red to black with purple metallic luster; vein R_3 and R_4 separated. Hindwing and cilia dark brown to black, margins obvious darker color; vein Rs stalked with M_1 at basal 1/5. Abdomen dark brown dorsally and black ventrally.

Male. Unknown.

Female genitalia. Apophyses posteriores and anteriores long and slender. Vestibulum membranous, except internal and dorsal part weakly sclerotized lamella. Bursa copulatrix short, slender, membranous.

Holotype. [**Hunan**] ♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2021.V.1–2, C.Q. Liao leg. (HUNAU).

Paratype. [**Jiangxi**] 1♀, Wuyishan National Nature Reserve, Qianshan County, Shangrao City, 2008.XI.22–25, L.S. Chen leg. (HUNAU).

Etymology. The specific epithet is derived from the words *arcuate* and *fascia*, referring to its forewing with the arcuate transverse central fascia.

Distribution. China (Hunan, Jiangxi).

Remarks. This species occurs in May and November.

(36) ***Nemophora caeruliantenna*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates IV-6, XV-2)
LSID urn:lsid:zoobank.org:act:ACB8F833-847D-468B-B3E9-6B4C2DF7A824

Diagnosis. This species is easily distinguishable from other congeners by its unique metallic blue forewing pattern With orange reddish central fascia and the metallic blue basal antenna.

Description. Male. Forewing about 10.0 mm; wing expanse about 20.5 mm.

Vertex densely covered with orange-reddish hairs; face with orange to brownish scales. Eyes large, close to each other dorsally; eye size index about 8.0. Labial palpus short, densely covered with brownish hairs; galeae with brownish scales laterally. Antenna slender, about 2.4 times of forewing length; basal 1/6 blue with metallic luster, the remaining apical part white. Legs brownish to dark brown except forelegs black; foretarsi yellow but mid- and hindtarsi black. Thoracic dorsum and tegula metallic blue with bright luster. Forewing relatively broad, length about 2.8 × width; ground color blueish-green mixed with numerous black scales, with blight green metallic luster especially apical area; a broad transverse orange reddish central fascia placed at basal 1/3 to 1/2, and margined with silvery-leaden fascia which are narrowly boarded with black; distal 1/3 metallic blue scattered with black scales near silvery-leaden fasciae; cilia dark brown. Hindwing entirely light brown; cilia brown. Abdomen dark brown to black.

Female. Unknown.

Male genitalia. Uncus near quadrate, with a weak median keel; apex distinctly curved downward. Vinculum near trapezoid, about 2.8 × valva; anterior margin acute, posterior margin projected medially. Valva short, triangular, covered with dense hairs; sacculus expanding and forming a pair of knife-shaped processes; suspensorium very small, anterior part at same level of posterior margin of vinculum. Transtilla slightly narrow in middle part; median process short and pointed. Aedeagus stout and slightly curved dorsally; apical portion with a pair of bent and strongly sclerotized carinae dorsolaterally; vesica with a patch of microtrichia. Juxta arrow-shaped; arrow-head long and broad, with short lateral arms.

Holotype. [**Yunnan**] ♂, Chashan (1,400 m), Simao District, Pu'er City, 2018.II.25, S.Y. Huang leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin word *caeruleus* (blue) and the structural word *antenna*, referring to its prominent blue basal antenna.

Distribution. China (Yunnan).

Remarks. This new species is endemic to China and occurs in February.

A DNA barcode of *N. caeruliantenna* **sp. nov.** is generated. This sequence is closest to the three *N. decisella* specimens (pairwise distances: 0.051–0.057).

(37) ***Nemophora decisella*** (Walker, 1863)
(Plates IV-1, X-5, 7, XV-3, XXIV-2, XXIX-1-4)

Nemotois decisella Walker, 1863: 505 (Type locality: Sumatra, Indonesia; BMNH); Meyrick 1912a: 8; Meyrick 1912b: 7.
Nemophora decisella: Diakonoff 1951: 173 (Java); Heppner 1992 (checklist of Taiwan); Robinson *et al*. 1994: 23, fig. 33, pl. 3, fig. 2 (Burma, Thailand, W Malaysia, Sumatra, Java, Anambas Is., Brunei, Kalimantan); Kozlov & Robinson 1996a: 42, figs. 2–5, 8, 9, 12–17 (review); Shao *et al*. 2008: 550 (Checklist of Taiwan); Koçak & Kemal 2010: 2 (checklist of Thailand).
Ucetia bifasciella Walker, 1866: 1821 (TL: Indonesia, Java; BMNH).
Nemotois bifasciella: Meyrick 1912a: 8 (Java; syn. *Adela sythoffi*); Meyrick 1912b: 7.
Nemophora bifasciella: Diakonoff 1951: 179 (female, Java).
Nemophora bifasciella irrorata Diakonoff, 1951: 179, figs. 25, 27, 30 (TL: Indonesia, E Java, Tengger Mts.; NML).
Adela imperialis Rebel, 1900: 187 (TL: Russia, Amur; NHMW, ZMB); Szent-Iványi 1945, 8(1): 9 (Hungary).
Nemotois imperialis: Meyrick 1912b: 7 (E. Siberia, Russia).
Nemaphora [sic!] *imperialis*: Gozmany 1965: 40 (Budapest).
Adela sythoffi Snellen, 1901: 77, pl. 5, fig. 4 (TL: Indonesia, W Java, Preanger; female; NML).
Nemotois sythoffi: Meyrick 1912a: 8 (as junior synonym of *N. bifasciella*).
Nemotois baibarana Matsumura, 1927: 7 (TL: Taiwan, China; EIHU); Matsumura 1931: 1111, fig. 2333 (female, Taiwan); Matsumura 1932: 123, pl. 4, fig. 8 (Formosa [Taiwan]); Razowski & Kumata 1985: 5 (Type catalog); Hua 2005: 2 (list of China).
Nemotois honei Meyrick, 1935, 94 (TL: China, Nanking [Nanjing]; BMNH); Hua 2005: 2 (list of China).
Adela aurantibasella Caradja, 1938a: 252 (Type locality: China, Shaowu; MINGA).
Adela aurantivasssella [sic!]: Hua 2005: 2 (list of China).

Diagnosis. This species is very similar to *N. paradisea* but can be distinguished by the following combined characters: the forewing central fascia is very narrow, placed between basal 1/3 to 1/2; the eye size index is about 6 in male adult; the apex of valva is relatively rounded; the sacculus has a distinct angular process in the middle; the suspensorium is far beyond the posterior margin of the vinculum; and the apex of aedeagus is an extremely bent forming wave.

Specimens examined. [**Hunan**] 1♂9♀, Guniushan Village (800 m), Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2019.VI.24, C.Q. Liao, C.J. Yang & Q.M. Wu leg.; 5♀, Xianchijie, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2020.VI.10–16, C.Q. Liao leg.; 1♂2♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg.; 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VII.5, C.Q. Liao & M. Deng leg.; 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.VIII.10–11, C.Q. Liao leg.; 1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2014.VIII.12–13, G.H. Huang leg.; [**Guangdong**] 1♂1♀, Nanling National Nature Reserve, Ruyuan Yao Autonomous County, Shaoguan City, 2008.VI.7, G.H. Huang leg.; 1♀, Jiulianshan, Lianping County, Heyuan City, 2018.V.18–19, M. Wang & F.H. Wei leg.; [**Sichuan**] 1♂, Shimian County, Ya'an City, 2016.VII.10, T.T. Yu leg; [**Shaanxi**] 1♂, Huameiguan, Liuba County, Hanzhong City, 2018.VIII.10–11, C.Q. Liao & G.H. Huang leg.; 1♀, Jialingjiang source, Baoji City, 2018.VIII.13, C.Q. Liao & G.H. Huang leg.; [**Zhejiang**] 1♀, Tianmushan, Hangzhou City, 2011.VII.8, G.H. Huang leg.; [**Fujian**] 1♀, Taiping Town, Nanping City, 2002.IV.4, G.H. Huang leg.; [**Hainan**] 1♂, Jianfengling National Nature Reserve, near Resort Hotel (900 m), Ledong County, 2004.V.21, M. Wang leg.; 1♂, Jianfengling National Nature Reserve, Ledong County, 2021.V.18, M.R. Li & G. Fu leg.; 1♀, Jianfengling National Nature Reserve, Ledong County, 2007.IV.23, M. Wang leg. (HUNAU).

Distribution. China (Hunan, Guangdong, Sichuan, Shaanxi, Hubei, Zhejiang, Jiangsu, Fujian, Hainan, Taiwan); Russia, Korea, Myanmar, Thailand, Indonesia, Malaysia, Brunei, *etc*.

Remarks. The distribution of this species is extremely wide, ranging from the northernmost Russian Khabarovsk region to Southeast Asia including Malaysia and Indonesia, and includes most areas of central and south China. Given its widespread distribution, this species may be distributed in the northeast of China.

Because of its wide geographical distribution, relatively large intraspecific variation and typical sexual dimorphism, this species has been described as having more than seven different specific names. Walker (1863) first described this species based on a single male specimen from Sumatra but incorrectly transposed the English descriptions and localities with *N. sinicella* (Meyrick, 1912). Walker (1866) estimated *Ucetia bifasciella* (= *Nemotois bifasciella*) based on a female specimen from Java, which incorrectly regarded it as a separate species because Walker misidentified the sex of type specimen of *N. bifasciella* (Kozlov & Robinson, 1996a). Many different species names have been named by different researchers based on specimens from the Russian Far East, Japan, China, and Southeast Asia, such as *Adela imperialis* Rebel, 1900, *Adela sythoffi* Snellen, 1901, *Nemotois baibarana* Matsumura, 1927, *Nemotois honei* Meyrick, 1935, *Adela aurantibasella* Caradja, 1938. After Kozlov & Robinson (1996a) examined a large number of type specimens, they synonymized several species names as above considering the combination of geographical variation in its external characteristics and sexual dimorphism. In addition, they also considered that *N. heteroxantha* established by Diakonoff (1951) based on female specimens from East Java (the type locality of *N. bifasciella irrorata*) is probably a synonym of *N. decisella*. In the original paper, when Diakonoff named *N. heteroxantha*, he also described *N. decisella* again and noted that this species became rarer due to the destruction of lowland forest habitat in Java after the war (Diakonoff 1951). Because no males of *N. heteroxantha* are known and females differ in some traits from *N. decisella*, *N. heteroxantha* was considered as an independent species (Kozlov & Robinson 1996a). According to Kozlov & Robinson (1996a), some characteristics of this species seem to change following latitudinal variation, for example, forewing length and male eye size are greater further south, but the relative width of the forewing yellow band decreases southwards, while the position of the central fascia becomes progressively closer to the middle of forewing.

This species mainly occurs in the summer, with high temperatures from May to August, and the earliest collection records can be up to the early spring of February. This species is distributed from lowlands to mountainous areas at altitudes of more than 2,000 meters and its main habitat is mountainous and virgin forests (Robinson *et al*. 1994; Kozlov & Robinson 1996a). However, the host plant of this species has not yet been reported. During a field survey in Wuyunjie Nature Reserve, Hunan in June 2019, the first author (C.Q. Liao) observed that the female adults of this species nectar the flowers of one Primulaceae plant, *Lysimachia* sp. (probably *L. clethroides* Duby) and ovipositing

at the base of unopened flower buds (Plates XXIX-1-4). Although laboratory rearing of the oviposited plants was ussuccessful, we believe that the host (oviposition) plant and nectar source of *N. decisella* should be *Lysimachia* sp.

DNA barcodes of three *N. decisella* specimens are generated, and their sequences show 0.5–0.9% differences. This species is closest to *N. sakaii* with pairwise distances of 0.043–0.051.

(38) ***Nemophora paradisea*** (Butler, 1881)
(Plates IV-2, X-6, XV-4)

Nemotois paradisea Butler, 1881: 592 (TL: Japan, Honshu); Meyrick 1912a: 8; Meyrick 1912b: 7 (Japan); Matsumura 1931: 1112, fig. 2337 (Japan); Matsumura 1932: 122, pl. 4, fig. 4 (Japan, Honshu).
Nemophora paradisea: Okano 1959; Moriuti 1982; Hirowatari & Nagaike 1998: 288, figs. 1–6 (biological notes); Hirowatari & Yamamoto 2004: 31, figs. 4–6, 9–10, 17–21 (male genitalia); Hirowatari 2013: 106, fig. 3-08-5,6 (Japan); Umetsu 2014: 6, fig. 10 (Japan, Akita Pref.); Yu 2015: 15 (China, Beijing, Hebei).

Diagnosis. This species is similar to *N. smaragdaspis* but can be characterized by the following features: the thoracic tergite, tegula and base of the forewing are metallic brass or brownish brass; the male eyes are relatively moderate, with an eye size index about 8; the aedeagus of male genitalia is slightly curved dorsally; and the female adults have yellow face, and basally yellow and apically dark brown antennae.

Specimens examined. [**Guangdong**] 1♀, Jiulianshan, Lianping County, Heyuan City, 2018.V.18–19, M. Wang & F.H. Wei leg; [**Sichuan**] 2♂, Longcanggou (1,400 m), Yingjing County, Ya'an City, 2015.VIII.10–11, G.H. Huang leg.; 1♂1♀, Longcanggou (1,500 m), Yingjing County, Ya'an City, 2016.VII.1, T.T. Yu leg.; [**Hainan**] 1♂, Yinggeling National, Baisha Li Autonomous County, 2005.IX.6, L.S. Chen leg. (HUNAU).

Distribution. China (Beijing, Hebei, Anhui, Guangdong, Sichuan, Hainan); Japan.

Remarks. This species was originally described by Butler (1881) based on Japanese specimens and has been reported in different regions of Japan and China. Kozlov & Robinson (1996a) revised *N. decisella* based on a large number of specimens and synonymized many scientific names, including *N. paradisea*. They also compared many characteristics among them and noted that some obvious differences were present in these specimens, especially in the male genitalia. In a biological study of this species, Hirowatari & Nagaike (1998) footnoted that this species is also distributed in South-east Asia and occurs sympatrically and simultaneously with *N. decisella* in some areas; thus, they considered this species to be a distinct species and tentatively retained the name *paradisea*. According to our own specimens, whether from the same or different localities, there are some obvious differences between these two species, especially the width of the forewing transverse central fascia and the shape of valva in the male genitalia. However, we did not examine the series of continuous characteristic variations. Thus, we retained the validity of this species *N. paradisea* before obtaining more evidence, especially molecular data.

Hirowatari & Nagaike (1998) studied the biological aspects of this species in detail and recorded its daily activity patterns and host plants. Male adults of this species usually swarm only in the evening around sunset and their mating behavior also occurs during this period. Female adults seem to nectar and oviposit eggs into flower buds of *Patrinia villosa* (Valerianaceae), which synchronizes with the flowering period of the host plant.

(39) ***Nemophora smaragdaspis*** (Meyrick, 1924)
(Plates IV-3, X-8, XV-5)

Nemotois smaragdaspis Meyrick, 1924: 79 (TL: India, Assam; BMNH); Clarke 1955: 287.
Nemophora smaragdaspis: Diakonoff 1951: 171; Hirowatari & Yamamoto 2004: 30, figs. 1–3, 7–8, 11, 12–16 (Japan); Hirowatari 2013: 106, fig. 3-08-7,8 (Japan); Ji *et al*. 2018: 900, figs. 1e, 2d (Korea); Das & Singh 2022: 265; Hirowatari *et al.* 2022: 391 (DNA barcode).

Diagnosis. This species is similar to *N. paradisea* but can be distinguished by the following characters: the thoracic tergite, tegula and base of the forewing are metallic green; the male eyes are very large, close to each other dorsally, with eye size index about 17; the aedeagus of male genitalia is strongly curved dorsally forming wave; and the face and antenna of female are dark brown.

Specimens examined. [**Guangxi**] 1♂1♀, Maoershan National Nature Reserve (1,500 m), Xing'an County, Guilin City, 2007.V.1–5, L.S. Chen leg. (HUNAU).

Distribution. China (**new record**: Guangxi); Japan, Korea, India.

Remarks. This species was not recorded in the last 80 years after the original description based on a single male from Assam, India until Hirowatari & Yamamoto (2004) discovered this species from Japan. They provided the male genitalia for the first time and compared it with the closely related species *N. paradisea* in detail. Ji *et al*. (2018) reported the Korean distribution of this species and noted some differences from the former descriptions of the color of the forewing background and transverse central fascia. This species has been recorded for the first time in China in this study.

Hirowatari & Yamamoto (2004) reported that this species occurs in an artificially managed grasslands dominanted by herbal plants, including Poaceae and Fabaceae. They observed that this species flies around sunset under low light intensity in the afternoon, but no detailed flying activity was reported. However, this species was considered to swarm male adults like *N. paradisea* because of the large eyes and flying patterns of the latter. In addition, *N. smaragdaspis* may utilize some herbaceous plants such as *Patrinia villosa* (Fabaceae) for ovipositing (Hirowatari & Yamamoto 2004). Subsequently, Murata & Shigenaga (2018) reported that females of *N. smaragdaspis* oviposit eggs into flower buds of *Lespedeza bicolor* (Fabaceae) in Japan. Hirowatari *et al.* (2022) reported a DNA barcode of *N. smaragdaspis* from Japan and discussed its phylogenetic relationships with *N. rubrofascia* and *N. chrysoprasias*. However, Kozlov (2023c) pointed out that the specimens collected in Japan possibly belonged, not to *N. smaragdaspis*, but to other undescribed species. So, further study is required to review the species belonging to this species group.

(40) ***Nemophora xizangensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates IV-4, XV-6, XXIV-3)
LSID urn:lsid:zoobank.org:act:EC92090C-AFBD-461C-8836-1114A5069B68

Diagnosis. This species is similar to *N. smaragdaspis*, but can be distinguished by the forewing ground color which is black with metallic blue luster, while the ground color is blue with blight metallic luster in *N. smaragdaspis*; and both sides of the forewing central fasciae are almost straight, but outward curved in *N. smaragdaspis*. In the male genitalia, the valva is short with a pointed apex (relatively long valva with the digitate apex in *N. smaragdaspis*), the anterior part of suspensorium is distinct far beyond the posterior margin of the vinculum (at the same level in *N. smaragdaspis*), and the paired lamellates of the aedeagus are relatively short and straight (rather long and strongly sinuate in *N. smaragdaspis*).

Description. Male. Forewing length 8.5–9.0 mm; wing expanse 19.0–20.0 mm.

Vertex densely covered with orange yellowish hairs; face with orange yellowish long scales. Eyes large, close to each other dorsally; eye size index about 7.5. Labial palpus short, densely covered with yellowish hairs; galeae with black scales laterally. Antenna slender, about 22.0 mm; scape stout, yellow to light brown; basal 1/6 of flagellum black innerly with metallic blue luster, the remaining apical part light gray to white. Legs brownish to dark brown except forelegs black; both tarsi and midspur yellow; hindtarsi with dark brown to black long hairs. Thoracic dorsum and tegula metallic blue with bright luster. Forewing lanceolate, ground color black and blue with blight blue metallic luster especially basal part; a broad transverse orange reddish central fascia placed at basal 1/3 to 1/2, and broadened with a pair of black-margined silvery-leaden bands on each side; cilia dark brown to black. Hindwing and cilia dark brown to black. Abdomen dark brown to black.

Female. Forewing about 7.0 mm; wingspan about 15.3 mm. Antenna about 7.0 mm; basal part obviously stout, densely covered with raised scales. Eyes relatively small, eye size about 0.8. Forewing central fasciae relatively narrow, placed from 1/3 to 1/2 of forewing. Others similar to male.

Male genitalia. Uncus triangular, with a weak median keel. Vinculum moderate in length, about 3.7 times as long as valva. Valvae triangular, with obviously acute apex; ventral base completely fused; inner margin straight; sacculus expanding outward and forming a prominently acute process medially; suspensorium subsquare, anterior part distinct far beyond posterior margin of vinculum, with abrupted or slightly concaved margin. Transtilla slightly narrow in middle part; median process short. Aedeagus stout and curved dorsally; apical portion with a pair of strongly sclerotized lamellates dorsolaterally; vesical with a patch of microtrichia. Juxta arrow-shaped; arrow-head long and pointed, with short lateral arms.

Female genitalia. Ovipositor pointed, with six serrated teeth ventroposteriorly. Apophyses posteriores and anteriores of subequal in length, relatively slender, 2.0 times as long as 7th tergite. Vestibulum with large sclerotized plate; a pair of vestibular lamellae sclerotized near attachment point of guy wire. Bursa copulatrix relatively long and slender, membranous.

Holotype. [**Tibet**] ♂, Pailong Country, Linzhi City, 2021.VI.7, H.L. Han, J. Wu & J.J. Fan leg. (HUNAU)

Paratypes. [**Tibet**] 3♂6♀, Dergong Village, Beibeng Country, Motuo County, Linzhi City, 2021.V.26–VI.4, H.L. Han leg. (HUNAU).

Etymology. The specific epithet was derived from the Chinese name, Xizang, of the type locality, Tibet Autonomous Region.

Distribution. China (Tibet).

Remarks. This new species is endemic to Tibet, China and usually occurs from May to June.

3.9 *Nemophora rubrofascia* species group

Diagnosis. This species group can be characterized by the following features: the compound eyes are very large in male, almost joining to each other; the basal part of the antenna is smooth in both sexes, without raised scales, at most present in the partial medial flagellum of female; the forewing has uniform metallic ground color, usually green, orange, or blue, with bright metallic luster; the forewing central fascia is very large and broad, margined with a silvery-leaden band which is narrowly boarded with black; the female and male adults are the same on the forewing pattern, without sexual dimorphism; and the terminal part of the phallus has a petal-like lamellate process.

Remarks. This species group consists of three species, namely *N. rubrofasia* (Christoph, 1882), *N. chrysoprasias* (Meyrick, 1907), and a new species *N. caerulea* **sp. nov.** This species group is very similar to the members of the *decisella* group because they both have bright colors and lusters on the forewing and thorax. Hirowatari *et al.* (2022) reported *N. chrysoprasias* from China and found that *N. chrysoprasias* is more closely related to *N. rubrofascia* but not *N. paradisea* and *N. smaragdaspis* based on morphological and molecular evidence. Apart from these characters, including antenna, male and female genitalia, and the absence of sexual dimorphism in the forewing pattern (Hirowatari *et al.* 2022), we also noticed an additional difference between these two groups in forewing pattern. Black-margined silvery-leaden bands on each side of the forewing central fascia are nonparallel and asymmetrical to each other, but parallel and symmetrical in the *decisella* group. In addition, the inside black lines near the forewing base only present anterior half, not extending to the posterior margin, but complete in that of the *decisella* group. Based on the above evidence, we established a new species group to accommodate these unusual species.

Key to species of the *rubrofascia* group based on external morphology

1	Forewing ground color mainly blue with metallic luster . . . . . *N. caerulea* **sp. nov.**
-	Forewing ground color not blue 2
2	Forewing ground color metallic green, scattered with numerous black scales; hindwing entirely white and semitransparent except black apex . . . . . *N. chrysoprasias*
-	Forewing ground color metallic brass wholely; hindwing uniformly light brown, not semitransparent . . . . . *N. rubrofascia*

(41) ***Nemophora caerulea*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates V-3, XXV-1)
LSID urn:lsid:zoobank.org:act:0258BB69-6A56-42EB-B50C-3A4A6EDF70F4

Diagnosis. This species differs from its congeners by the blue color of the forewing with bright metallic luster, while green in *N. chrysoprasias* and brass in *N. rubrofascia*. In addition, this species is also similar to *N. caeruliantenna* **sp. nov.**, but can be distinguished by the following characters: the forewing ground color is entirely dark blue, while bluish-green in *N. caeruliantenna* **sp. nov.**; the forewing central fasciae are orange yellowish, while orange reddish in *N. caeruliantenna* **sp. nov.**; and the hindwing is light brown in the basal half and black in the apical half, while entirely light brown in *N. caeruliantenna* **sp. nov.**

Description. Female. Forewing about 9.5 mm; wing expanse about 20.7 mm.

Vertex densely covered with orange yellowish hairs; face with orange scales and hairs. Eyes small, far away to each other dorsally; eye size index about 0.75. Labial palpus long, densely covered with yellow hairs; galeae with yellow scales laterally. Antenna slightly longer than forewing length; basal 1/4 covered with broader black scales mixed with some orange reddish scales basally; subsequent several flagellums black. Legs yellow to light brown, except apical tibiae and tarsi black. Thoracic dorsum and tegula dark blue, with blight metallic luster. Forewing lanceolate, relatively broad, length about 2.6 × width; ground color dark blue, the same as thorax, with blight metallic luster; a broad transverse central fascia orange yellowish, placed from basal 1/4 to 1/2 and bordered with a pair of narrow black-margined blue bands on both sides; subapical area with shining bright matellic luster; cilia dark blue with blight metallic luster. Hindwing light brown in basal half and black in apical half; cilia dark brown to black. Abdomen black.

Male. Unknown.

Female genitalia. Ovipositor pointed, with a barb-like tooth ventroposteriorly. Apophyses posteriores and anteriores of subequal in length, about 2.3 times of 7th tergite. Vestibulum membranous, a pair of vestibular lamellae near attachment point of guy wire. Bursa copulatrix very large, membranous.

Holotype. [**Hainan**] ♀, Jianfengling near Resort Hotel (900 m), Ledong Li Autonomous County, 2004.V.21, M. Wang leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin word *caeruleus* (blue), referring to its forewing ground color of blue with light metallic luster.

Distribution. China (Hainan).

Remarks. This species occurs in May and November.

One DNA barcode of *N. caerulea* **sp. nov.** (SaY709) is generated and the closest sequences are two specimens of *N. chrysoprasias* from China (pairwise distances: 0.058, 0.063). In addition, the phylogenetic analysis also shows that these two species formed a clade with a relatively high bootstrap value (81%).

(42) ***Nemophora chrysoprasias*** (Meyrick 1907)
(Plates V-2, X-9)

Nemotois chrysoprasias Meyrick, 1907: 992 (TL: India, Assam, Khasi Hills; BMNH); Meyrick 1912a: 8; Meyrick 1912b: 7, fig. 1; Clarke, 1955: 89.

Nematois [sic!] *chrysoprasias*: Showalter 1929: 72, pl. XV, fig. 14 (color photograph of a male).

Nemophora chrysoprasias: Das & Singh 2022: 264; Hirowatari *et al.* 2022: figs. 1–4 (China, redescription); Kozlov 2023c: 30, figs. 37, 38, 90, 122, 153 (India, Myanmar).

Diagnosis. This species is unique by the special forewing pattern with ground metallic green and orange central fascia, and by the hindwing almost completely translucent white.

Specimens examined. [**Yunnan**] 1♂1♀, Bailongtan (2,350 m), Midu County, Dali Bai Autonomous Prefecture, 2016.VII.23, G.H. Huang & M. Wang leg.; 1♀, Weixi Lisu Autonomous County (2,150 m), Diqing Tibetan Autonomous Prefecture, 2018.VII.24, S.F. Mo & Z.P. Miao leg. (HUNAU).

Distribution. China (Yunnan); India, Myanmar.

Remarks. This species has not been reported for more than a century since it was originally described in Assam, India. Recently, Hirowatari *et al*. (2022) newly reported the distribution of this species from Yunnan, China, and discussed its phylogenetic position with other related species. This species is more closely related to *N. rubrofascia* judging from the following characters: the male genitalia has a very long vinculum and a petal-like lamellate process of phallus apically; the female genitalia has a cup-like sclerotization of vestibulum, a pair of sclerites near the guy wire attachment point, and bifurcate membrane of the median part dorsally; the sexual dimorphism in the wing markings is absent; and the smooth basal part of the antenna lacks raised scales. In addition, the pairwise distances and phylogenetic tree based on COI sequences also support a close relationship between *N. chrysoprasisa* and *N. rubrofascia* (Hirowatari *et al*. 2022).

This species was obsevered swarming over small bushes on a side of trail in the forest (Kozlov 2023c).

(43) ***Nemophora rubrofascia*** (Christoph, 1882)
(Plate X-10)

Adela rubrofascia Christoph, 1882: 9 (TL: Russia, Chingan and Wladiwostok); Rebel 1901: 245 (catalog).
Nemotois rubrofascia: Matsumura 1931: 1112, fig. 2339 (Japan and Taiwan); Matsumura 1932: 121, pl. 4, fig. 2 (list of Japan).
Nemophora rubrofascia: Hirowatari 2005b: 8; Hirowatari 2013: 106, figs. 3-08-9,10; Umetsu 2014: 5, fig. 11 (Japan, Akita Prefecture); Fukuda & Kanai 2016: 18 (Japan, Kirishima Mt.).
Nemotois rubrifascia [sic!]: Meyrick 1912a: 8; Meyrick 1912b: 7; Meyrick 1914: 61 (Formosa [Taiwan], Eastern Siberia).

Diagnosis. This species is easily distinguished from other species of this group by its unique metallic brass of forewing ground color with golden luster orange central fascia.

Specimens examined. Specimens from China were not available in this study.

Distribution. China (Taiwan); Russia, Japan.

Remarks. This species is also very similar to *N. sakaii* (Matsumura, 1931) except for its related congeners, but it can be easily distinguished by the smooth basal antenna and asymmetrical margins of the forewing central fascia.

3.10 *Nemophora divina* species group

Nemophora divina group (Kozlov 1997e: 138)

Diagnosis. This species group can be characterized by the following features: the forewing base has a W-shaped light mark extending over 1/3 of the forewing length, or interrupted and formed into a small arcuate spot at the base and a line in the middle; the distal 1/3 of the forewing has pale light stripes that follow the direction of veins; the apical 1/3 of aedeagus is formed by the left wall only which forms a broad lobe; and the anellus with a pair of articulated carinae at the base of juxta.

Remarks. In addition to the above diagnosis, Kozlov (1997e) also characterized this species group by the basal 1/2 of female antennae with dense scale cover based on the adults of *N. assamensis*. However, we do not regard it as one of the diagnoses of this species group because this character is rather common in the family Adelidae, especially *Nemophora*.

Here, we place *N. trimetrella* Stringer, 1930 in the *divina* group because this species shares the above morphological diagnoses, especially in the male genitalia. Although the basal marking of the forewing does not form into W-shaped but a basal spot and a middle line, we consider this type to be an early evolutionary stage of the forewing pattern. In addition, we identified a new species belonging to this species group in Taiwan, China in this paper. Thus, the *divina* group consists of five species: *N. divina* (Caradja, 1939), *N. assamensis* Kozlov, 1997, *N. magnifica* Kozlov, 1997, *N. trimetrella* Stringer, 1930, and *N. songgangensis* **sp. nov.** Therefore, all members of this species group are found in China.

Key to species of the *divina* group based on external morphology

1 Forewing base with a large W-shaped marking 2
- Forewing base with an arcuate basal spot and a middle line . . . . . *N. trimetrella*
2 Forewing central fascia complete 3
- Forewing central fascia interrupted in the middle forming two spots 4
3 Forewing central fascia relatively broad and nearly equal in width; apex of forewing with 8 to 10 obvious and stout radial striae . . . . . *N. divina*
- Forewing central fascia slender and narrow in the middle; apex of forewing with 8 indistinct and slender radial striae . . . . . *N. songgangensis* **sp. nov.**
4 Proximal line of W-shaped basal mark of forewing broad, expanding along costal margin; distal line medially broken . . . . . *N. assamensis*
- Proximal line of W-shaped basal mark of forewing narrow, not expanding along costal margin; distal line unbroken . . . . . *N. magnifica*

Key to species of the *divina* group based on male genitalia

1 Apex of medial valvar lobe at 1/2 valvar length . . . . . *N. divina*
- Apex of medial valvar lobe at 4/5 valvar length 2
2 Valva longer than uncus, with smooth inner margin; suspensorium far beyond posterior margin of vinculum . . . *N. magnifica*
- Valva shorter than uncus, with serrate inner margin; suspensorium not far beyond posterior margin of vinculum 3
3 Anterior part of vinculum distinctly wide and rounded; lateral valvar margins (viewed ventrally) posteriorly form an distinct acute angle with lateral margins of vinculum. . . . . *N. assamensis*
- Anterior part of vinculum distinctly wide and rounded; lateral valvar margins (viewed ventrally) posteriorly almost parallel to lateral margins of vinculum 4
4 Uncus with week median keel; base of median process with two distinct anterior angles laterally; arrow-head of juxta short . . . . . *N. trimetrella*
- Uncus with distinct median keel; base of median process without anterior angles laterally; arrow-head of juxta slender and pointed . . . . . *N. songgangensis* **sp. nov.**

(44) ***Nemophora assamensis*** Kozlov, 1997
(Plates V-5, XI-1, XVI-1, XXXI-2, 8)

Nemophora assamensis Kozlov, 1997e: 140, figs. 2, 6, 13–17 (TL: India, Assam, Margherita; BMNH); Kozlov 2023c: 19, figs. 16, 78 (India).

Diagnosis. This species can be characterized by the incomplete central fascia of the forewing forming two large triangular yellow spots. In the male genitalia, this species can also be characterized by the short and near trapezoid valva with a narrowly pointed apex; the wide and rounded anterior part of the vinculum; and the wide and short arrow-head of juxta.

Description of female. Forewing 7.9–8.2 mm, wing expanse 16.0–17.0 mm. Antennae 8.5–9.0 mm, *ca.* 1.1–1.2 × as long as forewing; basal half stout, densely covered with black thick scales; apical half slender and white.

Female genitalia: Ovipositor pointed with straight ventral margin. Apophyses posteriores and anteriores long and slender, almost equal in length. Vestibulum membranous, dorsally with trapezoid sclerotized lamella. Bursa copulatrix slender, membranous.

Specimens examined. [**Hunan**] 1♂, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.28–29, C.Q. Liao leg.; 1♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.20, C.Q. Liao leg.; 2♂, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.7, C.Q. Liao leg.; [**Guangdong**] 1♂1♀, Yunkaishan Nature Reserve, Xinyi City, 2021.V.1–4, Z.H. Ye, J.J. Liu & Z.Z. Wang leg.; 1♂, Nankunshan National Forest Park, Longmen County, Huizhou City, 2006.III.28, M. Wang leg.; [**Guangxi**] 1♀, Maoershan National Nature Reserve, Guilin City, 2007.V.1–5, L.S. Chen leg.; [**Hainan**] 1♂1♀, Jianfengling National Nature Reserve, Ledong Li Autonomous County, 2007.III.27, M. Wang & L.S. Chen leg. (HUNAU).

Distribution. China (Hunan, Guangdong, Guangxi, Hainan, Yunnan); India.

Remarks. This species was described only by the male characters in the original paper by Kozlov (1997e). The female adults of this species are reported for the first time in this study. Recently, Kozlov (2023c) recorded it from Yunnan based on a series of photographs online. This species has a wide distribution range, from Assam in the west, Guangdong in the east and Hainan in the south. On Mt. Jintongshan, we observed the flower-visiting behavior of this species and collected some adult specimens by netting daytime and light trapping at night (Plates XIX-2, 8). In addition, we can also collect this species by insect net in the day time (Plate XXXI-8) and by light trap at midnight (Plate XXXI-2).

DNA barcode of one *N. assamensis* specimen is generated, and this sequence is closest to *N. conjugata* **sp. nov.** (pairwise distances: 0.046).

(45) ***Nemophora divina*** (Caradja, 1939)
(Plate XI-5)

Nemotois divina Caradja, 1939: 14 (China, Shansi, Mien-shan [Shanxi Prov., Ho Shan]; MINGA).

Nemotois divinia [sic!]: Hua 2005: 2 (list of China).
Nemophora divina: Kozlov 1997e: 139, figs. 5, 8–12 (review).

Diagnosis. This species can be easily distinguished by the continued transverse central fascia of the forewing and the apex of the medial valvar lobe at 1/2 valvar length.

Specimen examined. [Shanxi] 1♂, Holotype deposited in MINGA with the labels: "Mien-shan [Ho Shan] (Prov. Shansi [Shanxi]) / Mittlere Höhe ca. 1500 m / 13.6.1937. H. Höne"; "Nemotois / divina / Car. / Type"; "Romänia [along the left margin] / HOLOTYPE / Nemotois / divina / ♂ Car" (MINGA).

Distribution. China (Shanxi).

Remarks. The type specimen is deposited in MINGA with the antenna and legs absent. The abdomen was dissected by Mikhail Kozlov and the male genitalia are preserved in an ampoule. This species is endemic to Shanxi Province, and no collection has been recorded since its first description.

Diakonoff (1951) described a novel species, *Nemophora divina* Diakonoff, 1951, based on a Javanese specimen with type information "West Java, Mts. Gedé-Pangrango, Tjisarua Zuid Est., 1000 m, 21.v.1950, L.J. Toxopeus leg.". Diakonoff provided the male genitalia illustration and noted it as belonging to the *N. augantha* species group. This is a typical case of homonyms after Kozlov (1997e) was combined with this species. According to ICZN (1999: Art.60.3, Art. 72.7), Kozlov (2023a) proposed a new replacement name as *Nemophora diakonoffi* Kozlov, 2023 for *N. divina* Diakonoff, 1951.

(46) ***Nemophora magnifica*** Kozlov, 1997
(Plates V-6, XI-2, XVI-2)

Nemophora magnifica Kozlov, 1997e: 142, figs. 3, 4, 7, 18–22 (TL: China, Taiwan; USNM); Wang *et al.* 2000: 25; Hirowatari 2005a: 323, figs. 1K–L, 9, 15A–C (Ryukyus, Japan); Shao *et al.* 2008: 550 (Checklist of Taiwan); Hirowatari 2013: 107, fig. 3-08-16,17 (Japan).

Diagnosis. This species differs from other members of the *divina* group by the narrow and continued W-shaped basal stria of the forewing, by the relatively short vinculum (*ca.* twice as long as valva), and by broad suspensorium far beyond the posterior margin of vinculum.

Specimen examined. [**Yunnan**] 1♂, Bailongtan, Midu County, Dali City, 2017.VI.16, G.H. Huang & M. Wang leg. (HUNAU).

Distribution. China (Yunnan, Taiwan); Japan.

Remarks. This species was described by Kozlov (1997e) in Taiwan, China, and was placed in the *divina* species group with *N. divina* and *N. assamensis*. Hirowatari (2005a) reported this species in the Ryukyus with its male and female genitalia. The specimen from Yunnan in this paper shows a larger potential distribution in South China. In addition, Hirowatari (2005a) noted that body sizes from the Ryukyus (wing expanse: 15.0–15.4 mm) are apparently smaller than those from Taiwan, China (18–21 mm). The body size of our specimen from Yunnan Province (20.3 mm) is similar to that from Taiwan.

(47) ***Nemophora songgangensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates V-7, XVI-3)
LSID urn:lsid:zoobank.org:act:7EAF890A-7C52-4EE4-8BE5-F2BDBE49FA5B

Diagnosis. This species is very similar to *N. magnifica* but can be distinguished by the long forewing (about 4 × as long as width) and very small male eyes (eye size index only 0.4). From the male genitalia of this species, the inter margin of the valva has many serrations, and the arrow-head of the juxta is very slender and pointed.

Description. Male. Forewing about 10.0 mm; wing expanse about 19.0 mm.

Head with raised brownish to dark brown hairs; face with smooth brownish scales. Eyes small, widely separated dorsally; eye size index about 0. 4 in male. Labial palpus moderate in length, with brownish scales and hairs; galeae covered with brown scales laterally. Antenna about 15.8 mm, *ca.* 1.6 × as long as forewing; basal 1/3 dark brown to black; apical part silvery white. Legs yellow to brown with black tibiae apically; mid- and hind tibiae covered with

long brownish hairs. Tegula and thorax (dorsum) dark brown to black. Forewing ground color dark brown basally and black apically; base with a W-shaped yellow stria, proximal line of basal mark not expanding along costal margin; distal line unbroken; zone between medial and distal lines with oval silver-gray spot; middle part with a black-margined transverse central fascia unbroken, distinctly narrow and curved in middle; apical part with 8–10 dark brown to ochreous radial striae along veins mixed black scales among them; cilia dark brown to black with bronze luster; vein R_5 stalked with R_{3+4} at middle. Hindwing brown to dark brown except costal area yellow or light brown; cilia brown; Rs stalked with M_1 at middle. Abdomen dark brown to black.

Female. Unknown.

Male genitalia. Uncus triangular, with a distinct median keel. Vinculum moderate in length, about 2.0 times as long as valva. Valva triangular, slightly shorter than uncus with pointed apex; inter margin serrated and lateral margins slightly curved basally; ventral base not fused; suspensorium triangular, anterior part not beyond posterior margin of vinculum. Transtilla narrow in middle; median process short and stout. Aedeagus slender, moderate in length, apical 1/4 concaved dorsally; base of aedeagus swollen; manica with minute spines. Juxta arrow-shaped; arrow-head long and pointed, lateral arms slender.

Holotype. [**Taiwan**] ♂, Songgang, 2005.IV.26. (HUNAU).

Paratype. [**Taiwan**] 1♂, same data as holotype (HUNAU).

Etymology. The specific epithet is derived from the type locality Songgang.

Distribution. China (Taiwan).

Remarks. This species is endemic to Taiwan, China and usually occurs in April.

(48) ***Nemophora trimetrella*** Stringer, 1930
(Plates V-4, XI-4, XVI-4)

Nemophora trimetrella Stringer, 1930: 421. (Type locality: Japan, Yokohama; BMNH); Hirowatari 2001: 193, figs. 1–8 (immature stages); Hirowatari 2013: 107, figs. 3-08-13,14,15; Umetsu 2014: 6, fig. 12 (Japan, Akita Prefecture); Fukuda & Kanai 2016 (Japan, Mt. Kirishima).

Diagnosis. The typical distinguishing character of this species is three yellow striae placed at the forewing base, 1/3 and 2/3 of the forewing length, respectively; the basal stria is curved and exceeding with the costal margin, and the other two transverse bands are slightly curved. In the male genitalia, the valva has a distinctly narrow apex, and the ventral margin is obviously expanding to form a lobar process.

Specimens examined. [**Yunnan**] 1♂, Malipo County, Wenshan Zhuang and Miao Autonomous Prefecture, 2016.VI.26, G.H. Huang leg. (HUNAU); Syntype in BMNH.

Distribution. China (**new record**: Yunnan); Japan.

Remarks. This species occurs from May to July. Hirowatari (2001) reported the morphology and biology of immature stages and provided colored figures and immature illustrations. It is recorded here for the first time in China.

One DNA barcode of *N. trimetrella* (SaY712) from Japan is generated and the closest sequence is *N. assamensis* (pairwise distance: 0.037).

3.11 *Nemophora optima* species group

Diagnosis. This species group can be characterized by the following features: the compound eyes are very small, far away from each other, eye size index less than 0.5; the basal 2/3 of forewing ground color is yellow, with numerous black-margined silver-leaden fasciae; the apical 1/3 of forewing ground color is black, with some yellow radial striae; the basal 2/3 and apical 1/3 of the forewing are separated by two black-margined silver-leaden fasciae that are connected to each other or independent; and the vinculum is very long and slender, about 3.3 × as long as valva.

Remarks. The *optima* group consists of three species, namely *N. optima* (Butler, 1878), *N. augantha* (Meyrick, 1907), and one new species, *N. conjugata* **sp. nov.** from Guangxi, China herein. Among them, *N. augantha* (Plate XI-3) was only distributed in Assam, India and has not been reported since its original description. In addition, *N. optima* was originally described in Japan, and is first reported in China here.

Key to species of the *optima* group based on external morphology

1 Basal part of forewing with longitudinal and transverse black-margined silver-leaden striae. . . . . *N. conjugata* **sp. nov.**
- Basal part of forewing just with longitudinal black-margined silver-leaden striae, arraged in three lines at basal 1/3, 1/2 and 2/3 . . . . . *N. optima*

Key to species of the *optima* group based on male genitalia

1 Valva narrow apically; apex of uncus distinctly truncated ventrally; anterior part of suspensorium far beyond posterior margin of vinculum in ventral view; vesica of aedeagus without slender cornutus dorsolaterally . . . . . *N. conjugata* **sp. nov.**
- Apex of uncus curved ventrally; valva with distinct broad apex; anterior part of suspensorium at the same level of posterior margin of vinculum in ventral view; vesica of aedeagus with a pair of slender cornuti dorsolaterally . . . . . *N. optima*

(49) ***Nemophora conjugata*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VI-1, XVI-5)
LSID urn:lsid:zoobank.org:act:7B166E1F-AA99-4D8D-AE1E-B17E56CF6D5C

Diagnosis. This species is similar to *N. augantha* in the forewing pattern, but can be easily distinguished by the following characters: the longitudinal black-margined silver-leaden stria at basal 1/3 is very stout and broad, connecting anterior and posterior margins; and the subapical 8 fine radial striae do not reaching the outer margin of the forewing, with 5–6th striae connected to the inner yellow ground color. In addition, this species is also similar to *N. optima* in the male genitalia, but has a narrow valva apex, truncate median keel of the uncus, and strongly curved apex of aedeagus.

Description. Male. Forewing 8.8–10.0 mm; wing expanse 18.5–20.4 mm.

Vertex covered with yellow hairs mixed with brown; face with smooth brown scales, with blue metallic luster. Eyes very small, far away to each other dorsally; eye size index about 0.48. Labial palpus short, covered with brownish scales and hairs; galeae with yellow scales laterally. Antenna slender, 29.7–36.0 mm, about 3.5 × forewing length; basal 1/3 black and remaining apical segments light brown to gray. Legs yellow except apical tibiae and basal tarsi black with purple luster; hind tibiae with brown to dark brown long hairs. Thoracic dorsum and tegula brown, with purple metallic luster; anterior margin of mesosternum with yellow ring. Forewing lanceolate, ground color yellow to brownish; basal 1/4 with three black-margined silver-leaden longitudinal striae placed at costal, median and postcubitus veins, not reaching to central fascia; the costal and median striae extending from forewing base; posterior margin black at base; middle part with three black-margined silver-leaden transverse fasciae divided by yellow transverse bands, the second transverse fascia interrupted by the later leading to H- or K-shaped; subapical area with 8–9 yellow radial striae near reaching outer margin; the fifth and sixth radial striae connected basally and extending to, or sometimes cross, central fasciae; cilia dark brown to black, with purple metallic luster. Hindwing and cilia dark brown to black. Abdomen dark brown to black, each posterior margins of sternums yellow.

Female. Unknown.

Male genitalia. Uncus near trapezoidal, with distinct truncated median keel; dorsal part with an elongated longitudinal membranous window centrally. Vinculum slender, about 3.3 × as long as valva; posterior margin straight. Valva nearly trapezoidal, with rounded blunt apex; inner margins arcuate, lateral margins straight; sacculus distinctly expanding at middle part, basal part nearly fused medially, with dense hairs; suspensorium nearly trapezoidal, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla approximately equal in width; median process long and pointed. Aedeagus slender; apical 2/5 strongly curved dorsally; apical lobe well developed with obvious dorsal and ventral angles; vesica with a pair of angular carinae dorsolaterally. Juxta arrow-shaped; arrow-head long and pointed, lateral arms relatively short.

Holotype. [**Guangxi**] ♂, Huaping National Nature Reserve, Longsheng County, Guilin City, 2021.V.17–20, M. Deng leg. (HUNAU).

Paretypes. [**Guangxi**] 2♂, same data as holotype (HUNAU).

Etymology. The specific epithet originates from the Latin word *conjugatus* (conjugate), referring to the complete and conjugate striae at forewing base and middle part.

Distribution. China (Guangxi).

Remarks. This species is endemic to Guangxi Province, China, and occurs in May.

The DNA barcode of one *N. conjugata* **sp. nov.** specimen is generated and this sequence is closest to *N. assamensis* and *N. fasciella* both with 0.046 of pairwise distances.

(50) ***Nemophora optima*** (Butler, 1878)
(Plates VI-2, XVI-6)

Adela optima Butler, 1878: 62, pl. 40, fig. 6 (TL: Japan, Yokohama; BMNH).
Nemotois optima: Meyrick 1912a: 9; Meyrick 1912b: 7; Matsumura 1932: 126.
Nemophora optima: Kuroko 1961a: 49, pl. 5; Moriuti 1982: 1: 55, 2: pl. 1, fig. 34; Hirowatari 2005a: 327, fig. 1M (Ryukyus, Japan); Hirowatari 2013: 107, fig. 3-08-11,12 (Japan).

Diagnosis. This species is easily distinguished from other *Nemophora* species by the 5–6 black-margined silver-gray transverse stripes forming three lines at the basal 1/3, 1/2, and 2/3 of the forewing. In addition, this species has unique morphological characters as follows: the apex of the uncus is curved ventrally; the valva has a distinct broad apex; the anterior part of the suspensorium is at the same level as the posterior margin of the vinculum in ventral view; and the vesica of aedeagus has a pair of slender cornuti dorsolaterally.

Specimen examined. [**Sichuan**] 1♂, Hongshi Park, Gonggashan National Nature Reserve, Luding County, Ganzi Tibetan Autonomous Prefecture, 2016.VI.26, J.Y. Qiu & H. Xu leg. (HUNAU).

Distribution. China (**new record**: Sichuan); Japan.

Remarks. This species has been reported from many areas in Japan, but it is still very rare because few specimens have been collected. In this paper, this species was reported as a newly recorded species in China. Kuroko (1961) described the forewing pattern and male and female genitalia, and Hirowatari (2005a) also reported this species in the Ryukyus, Japan. For biological information, it can be determined that the adults fly at dusk and the female oviposit in the flower buds of *Ligustrum japonicum* Thunb. (Olaeaceae) (Sasaki *et al*. 2017).

One DNA barcode of *N. optima* from Japan is generated and this sequence is closest to a sequence of an unidentified *Nemophora* species (LCQ065, pairwise distances: 0.054).

3.12 *Nemophora fluorites* species group

Diagnosis. This species group can be distinguished by the following characters: the forewing base has some basal longitudinal striae; a pair of black-margined leaden transverse fasciae are approximated at the middle to form an X-shaped mark at the postdiscal area; the subapical area of the forewing is uniformly yellow, at most scattered with some black scales; and the suspensorium is large, far beyond the posterior margin of the vinculum.

Remarks. This species group consists of four species, two of which are described as new species, namely *N. latilobula* **sp. nov.** and *N. longispina* **sp. nov.**, in this paper. Among them, the distribution range of *N. fluorites* is the widest, from the west to Assam in India and the east to Taiwan in China. *N. tanakai* overlapped with the former in large areas of the distribution range. According to Hirowatari (2007) and collection by the authors here, these two species occur sympatrically to a great extent. *N. latilobula* **sp. nov.** is very restricted in distribution, whereas it is relatively widespread in *N. longispina* **sp. nov.** including central China. In terms of morphological features, the two new species seem to be different from the former two, especially the obvious small eyes in male and the unique male genitalia. For example, *N. latilobula* **sp. nov.** has distinctly rounded and broad valva, and *N. longispina* **sp. nov.** presents some extremely slender and developed spines in the apical part of the aedeagus dorsally, which may be their special autapomorphies. However, we still treated these two new species as members of the *fluorites* group because of the obvious basal longitudinal striae and X-shaped central fasciae of the forewing.

Key to species of the *fluorites* group based on external morphology

1 Pair of forewing central fasciae connected in middle; male eyes extremely large, eye size index more than 4 . . . . . *N. fluorites*
- Pair of forewing central fasciae not connected in middle; male eyes relatively small or very small, eye size index less than 3 2

2 Subapical yellow area of forewing with distinctly wide black frame; male eyes relatively large, eye size index about 2.6. . . . . *N. tanakai*
- Subapical yellow area of forewing without distinct frame; male eyes very small, eye size index less than 0.6 3
3 Forewing obviously narrow with about 3.7 times as long as width; subapical yellow area almost without black scales . . . . . *N. latilobula* **sp. nov.**
- Forewing obviously broad with about 3.2 times as long as width; subapical yellow area scattered with a vast of black scales . . . . . *N. longispina* **sp. nov.**

Key to species of the *fluorites* group based on male genitalia

1 Valva obviously rounded with blunt apex; vinculum narrowly tapered with pointed apex; aedeagus slender and straight . . . . . *N. latilobula* **sp. nov.**
- Valva typically triangular with pointed apex; vinculum broad and rounded; aedeagus relatively short and stout, basal part curved dorsally 2
2 Uncus quadrate, posterior part extremely curved to the inside ventrally; aedeagus with large spines apically. . . . . *N. longispina* **sp. nov.**
- Uncus triangular, posterior part slightly oblique ventrally; aedeagus without large spines apically 3
3 Posterior margin of vinculum with a circular membranous window area medially. . . . . *N. fluorites*
- Posterior margin of vinculum without a circular membranous window area. . . . . *N. tanakai*

(51) ***Nemophora fluorites*** (Meyrick, 1907)
(Plates VI-3, XI-7, 8, XVII-1, XXV-2)

Nemotois fluorites Meyrick, 1907: 991 (TL: India, Assam, Khasi Hills; BMNH); Meyrick 1912a: 9; Meyrick 1912b: 7; Meyrick 1914: 61 (Formosa [Taiwan]); Matsumura 1932: 126, pl. 4, fig. 18 (Formosa, Koshun [Taiwan, Pingdong]); Issiki 1922: 194; Clarke 1955: 143.

Nemophora fluorites: Wang *et al.* 2000: 11; Hirowatari 2007: 27, figs. 1, 2C–D, 3C–D, 5A–B, 6, 7 (Vietnam, review); Kozlov 2023c: 15, figs. 11, 12, 74, 113 (India).

Nemotois takamukuella Matsumura, 1932: 125, pl. 4, fig. 18 (TL: Japan, Kiushu, Yanagawa; SEHU); Razowski & Kumata 1985: 26 (Type catalog).

Nemophora takamukuella: Moriuti 1982: 56; Inoue 1954: 9; Kawamura 1984: 4.

Adela suavis Caradja, 1938a: 252 (TL: Lingping, Südchina [Lianping, Fujian]; MINGA); Popescu-Gorj 1992: 174; Hua 2005: 2 (list of China). Synonymized by Kozlov 2023c: 16.

Diagnosis. This species can be easily recognized and distinguished from other species in the *fluorites* group based on its external characters. The main diagnostic characters are the black-margined leaden transverse fascia approximated and dividing yellow in the middle to form an X-shaped mark at the postdiscal area; the tegula has distinctly purplish bronzy scales; the compound eyes are very large and close to each other dorsally; the eye size index in male is more than 4. In the male genitalia, this species can be distinguished by the pointed apex of the valva and the circular membranous window area in the posterior margin of the vinculum medially.

Specimens examined. [**Hunan**] 1♂, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.7, C.Q. Liao leg.; 1♂, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V10, C.Q. Liao & M. Deng leg.; [**Guangdong**] 2♀, Yunkaishan Nature Reserve, Xinyi City, 2021.V.1–4, Z.H. Ye, J.J. Liu & Z.Z. Wang leg.; [**Guangxi**] 1♀, Maoershan National Nature Reserve (1,500 m), Xing'an County, Guilin City, G.H. Huang leg.; [**Chongqing**] 3♀, Dawopu, Simianshan National Scenic Spot (971–1,037 m), 2016.V.16, J.P. Wan & X.L. Wei leg.; [**Taiwan**] 2♂, Gaofeng, 2005.VII.14.; 15♂, Wugongshan (1,000 m), Maolin Country, Gaoxiong City, 2002.III.23, B. Tanaka & T. Mano leg. (HUNAU, ELKU).

Distribution. China (Hunan, Guangdong, Guangxi, Chongqing, Fujian, Taiwan); India, Myanmar, Vietnam.

Remarks. This species was originally described in India by Meyrick (1907) and then reported in Vietnam and Myanmar by Hirowatari (2007). Its synonym, *N. takamukuella* Matsumura, 1932, was described from Japan, but Hirowatari (2007) considered that the type species was erroneously recorded in Japan and the specimen was probably from Taiwan. Matsumura (1932) listed this species with a male adult illustration (fig. 18), but the corresponding figure 21 is incorrect but *N. ahenea* Stringer, 1930. Caradja (1938a) described *Adela suavis* based on a female specimen from China. The holotype of *A. suavis* in MINGA is fixed with three labels: white paper "Adela / suavis Car / Type ♀", white paper "Lingping / Südchina /V.22 / H Höne" and white paper with red edge "HOLOTYPE /

Adela / suavis / Car / ♀ / ROMÄNIA" (Plate XI-8). The original description and type specimen obviously indicate that *A. suavis* Caradja, 1938 is an undoubted synonym of *N. fluorites*. Appart from our findings, this synonymy was currently pointed out by Kozlov (2023c).

Male adults of *N. fluorites* were observed swarming in Taiwan atop of *Castanopsis carlesii* and *Cyclobalanopsis* sp., and female adults were observed on flowers of *Pasania kawakamii* (Kozlov 2023c).

In this study, this species was recorded in mainland China for the first time. Based on the literatures and our new supplementary information, this species seems to be a widespread species in south Asia. One DNA barcode of *N. fluorites* is generated and this sequence is closest to *N. tanakai* (pairwise distance: 0.038).

(52) ***Nemophora latilobula*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VI-5, XVII-2, XXV-3)
LSID urn:lsid:zoobank.org:act:3A4611D3-6CCF-4E85-93D3-4E3D2CC3599D

Diagnosis. This species is relatively small in body size, and the forewing length is about 3.7 × as width. There is a black longitudinal stria at forewing base near costal margin, and most of subapical area is yellow. The male eyes of this species are much less than those of *N. fluorites* and *N. tanakai*, with an eye size index of only approximately 0.53. The most dominant characteristics of the species are the valva of male genitalia which are broad with rounded apex; the vinculum is gradually narrow to the tip; the aedeagus is slender and straight; and jthe uxta has a slender arrow-head.

Description. Male. Forewing 8.7–8.9 mm; wing expanse about 18.7 mm.

Head covered with raised yellow hairs; face with light yellow smooth scales, with metallic blue luster. Eyes small, widely separated dorsally; eye size index 0.53. Labial palpus moderate in length, *ca.* 1.5 × vertical eye diameter, covered with smooth yellow scales except dark brown apically; second segment sparsely with long black hairs ventrally. Galeae long, covered with yellow and brown scales laterally. Antenna about 2.7 × forewing length, smooth, mostly light brown with black basally. Thorax yellow to brown with metallic golden luster. Legs yellow to brown with purple luster; fore-femur, apical fore-tibia and all distal tarsi dark brown to black; hind-tibia yellow with long hairs. Forewing lanceolate, distinctly narrow, length about 3.7 times of width; ground color yellow, basal half with one subdorsal longitudinal, black-margined leaden fascia; costal margin mixed with dark brown to black scales; a pair of black-margined leaden transverse fascia approximated at middle, but not dividing yellow band between the fascia; apical margin mainly yellow mixed with a small amount of black scales; cilia black; vein R_3 stalked with R_4 at basal 2/5. Hindwing dark brown, apical part black; cilia light brown to dark brown; vein Rs stalked with M_1 at middle. Abdomen dark brown to black with black long hairs in genital segments.

Female. Forewing 7.3–7.6 mm, wing expanse about 16.0 mm. Head: with raised yellow hairs; face with smooth yellow scales. Eyes small, eye size index *ca.* 0.6; eye size index *ca.* 0.6. Antenna short, 8.2–8.7 mm; basal 2/3 with rough black scales, basally tinged with blue luster; apical 1/3 brown and smooth. Thorax: black dorsally and yellow laterally. Forewing: shorter and broader than male, length 3 times of width; color pattern very similar with male.

Male genitalia. Uncus pointed with a weak median keel. Vinculum very long and slender, about 3.2 × as long as valva. Valva nearly triangular, rounded and blunt apically; sacculus basally flattened with dense hairs; suspensorium triangular, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide in median and lateral parts; median process moderate, pointed. Aedeagus long and slender, nearly straight, approximately as long as vinculum; manica with a pair of long narrow lamellae dorsally and a patch of minute spines apically. Juxta arrow-shaped; arrow-head and lateral arms very long and narrow, pointed.

Female genitalia. Ovipositor pointed, with a barb ventroposteriorly. Apophyses posteriores and anteriores long and slender, subequal in length. Vestibulum narrow, membranous; a pair of vestibular lamellae small, sclerotized. Bursa copulatrix short and narrow, membranous.

Holotype. [**Sichuan**] ♂, Yajiageng (2,100 m), Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2005.VI.18, G.H. Huang, L.S. Chen & J.X. Liu leg. (HUNAU).

Paratypes. [**Sichuan**] 1♂ same data as holotype; 3♂2♀, Hongshi Park, Gonggashan National Nature Reserve, Luding County, Ganzi Tibetan Autonomous Prefecture, 2016.VI.23, J.Y. Qiu & H. Xu leg.; 1♀, Nibashan, Yingjing County, Ya'an City, 2009.VII.28, G.H. Huang leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin words *lati* (broad) and *lobula* (lobe), referring to the distinctly broad valva in the male genitalia.

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan, China, and may has a narrow distribution.

(53) ***Nemophora longispina*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VI-6, XVII-3, XXVI-1, XXIX-5, 6)
LSID urn:lsid:zoobank.org:act:D9CA32E7-941E-4B33-A0A9-F02006C4354A

Diagnosis. This species can be distinguished by the following characters: the forewing base has three obvious black-margined silver-gray longitudinal striae in male but absent in female; the forewing middle part has two black-margined silver-gray transverse fasciae forming X-shape, but not connected in the middle; the numerous yellow scales without obvious boundaries are scattered on the subapical area of the forewing; and the aedeagus of male genitalia has a pair of very slender lamellae dorsolaterally.

Description. Male. Forewing 9.7–9.9 mm; wing expanse about 20.1 mm.

Head covered with raised yellow hairs; face with light yellow smooth scales. Eyes small, widely separated dorsally; eye size index about 0.54. Labial palpus relatively short, *ca.* 1.5 × vertical eye diameter, covered with smooth yellow scales; second segment sparsely with long black hairs. Galeae long, covered with yellow scales laterally. Antenna about 35 mm, *ca.* 3.5 × forewing length, smooth; black basally with metallic blue luster, mostly light brown. Thoracic dorsum dark brown to black, tegula yellow with some black scales. Legs yellow to light brown with purple luster; femur, apical tibia and all distal tarsi dark brown to black; hind-tibia mixed with long yellow hairs. Forewing lanceolate, narrow, length about 3.2 times of width; ground color yellow, basal half with three (subcostal, median and subdorsal) longitudinal, black-margined leaden fascia; a pair of black-margined leaden transverse fascia approximated at middle, but not dividing yellow band between the fascia; apical margin mainly yellow mixed with many black scales externally; cilia dark brown to black; vein R_3 stalked with R_4 at basal 1/6. Hindwing dark brown, apical part black; cilia dark brown; vein Rs stalked with M_1 at basal 2/5. Abdomen black dorsally and yellow ventrally.

Female. Forewing 8.0 mm, wing expanse about 16.8 mm. Head: with raised yellow hairs; face with smooth yellow scales. Eyes small, eye size index *ca.* 0.5; eye size index *ca.* 0.52. Antenna short, 9.6–9.8 mm; basal 2/3 with rough black scales, basally tinged with blue luster; apical 1/3 light brown and smooth. Thorax: tegula and dorsum yellow. Forewing: color pattern very similar with male except basal half without longitudinal fascia.

Male genitalia. Uncus trapezoid, extremely inward bending. Vinculum very long and slender, about 2.5 × as long as valva. Valva triangular, acutely angled apically, fused ventrally; sacculus basally flattened with dense hairs; suspensorium quadrate, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide medially and slightly narrow laterally; median process short and blunt. Aedeagus short and stout; basal portion slightly curved ventrally; vesica with a patch of spine-like cornuti dorsally; manica with a pair of long narrow lamellae dorsolaterally and an irregular plate apically. Juxta arrow-shaped; arrow-head moderate in size, triangular and blunt, lateral arms short.

Female genitalia. Ovipositor pointed, apex with a small barb ventroposteriorly. Apophyses posteriores and anteriores long and slender, subequal in length. Vestibulum relatively large, membranous; vestibular lamella well developed, nearly V-shaped in ventral view. Bursa copulatrix short and narrow, membranous.

Holotype. [**Hunan**] ♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg. (HUNAU).

Paratypes. [**Hunan**] 6♂19♀, same data as holotype; 2♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.20, C.Q. Liao leg.; 3♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.28–29, C.Q. Liao leg.; 2♂4♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.VI.5–6, C.Q. Liao leg.; [**Guangxi**] 3♂, Mt. Maoershan, Xin'an County, Guilin City, 2003. VII.1, G.H. Huang leg. (HUNAU).

Etymology. The specific epithet is derived from the words *long* and *spine*, referring to the long spine-like lamellate and cornuti on the aedeagus.

Distribution. China (Hunan, Guangxi).

Remarks. Most of the type materials were collected in Shuangjiangkou Forest Farm by light trap. The habitats are rich in vegetation and humid environment near a small river which is similar to Mt. Tianpingshan. In addition, some female adults were observed visiting the flowers of *Castanea mollissima* Blume (Fagaceae) for nectar or staying on the leaf during the daytime in Shuangjiangkou (Plates XXIX-5–6).

(54) ***Nemophora tanakai*** Hirowatari, 2007
(Plates VI-4, XVII-4, XXVI-2)

Nemophora tanakai Hirowatari, 2007: 29, figs. 2A–B, 3A–B, 4, 5C–D, 8, 9 (TL: Vietnam, Vinh Phu Prov., Tam Dao; OPU, BMNH); Wang & Kishida 2011: 6, pl. 70, fig. 19 (China, Guangdong, Nanling); Wang *et al.* 2020: 2, pl. 3 (China, Guangdong, Shimentai).

Diagnosis. This species can be distinguished by the following combined characters: 1) pair of forewing central fasciae not connected in middle; 2) subapical yellow area of forewing with distinctly wide black frame; 3) tegula bronzy with metallic blue scales distally; 4) compound eyes of male relatively large and eye size index about 2.6; 5) apex of valva blunt and posterior margin of vinculum without membranous window area in male genitalia.

Specimens examined. [**Hunan**] 1♂, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V.10, C.Q. Liao & M. Deng leg.; [**Guangdong**] 1♂, Nanling National Nature Reserve (1,050 m), Ruyuan Yao Autonomous County, Shaoguan City, 2005.VI.13, G.H. Huang, M. Wang & L.S. Chen leg.; [**Yunnan**] 1♀, Qinglongxia (1,800 m), Kunming City, 2017.VI.18–19, G.H. Huang & M. Wang leg.; [**Taiwan**] 1♂, Anmashan (2,500 m), Taizhong City, 1997.VII.28, Y. Arita leg. (HUNAU); 3♂, Kaohsiung, Hsien, Liukwei, Taouang, Tengchih, (ca. 1,600 m), 1999.VII.30, Y. Arita leg. (OPU).

Distribution. China (Hunan, Guangdong, Yunnan, Taiwan); Vietnam.

Remarks. This species was described by Hirowatari (2007) in Vietnam, and has been reported in Guangdong, China (Wang & Kishida 2011; Wang *et al*. 2020). In this paper, we obtained additional specimens and more geographical information, which widely expanded its distribution ranges. This species, to a considerable extent, seems to have a sympatric distribution with *N. fluorites* and usually occurs simultaneously based on Hirowatari (2007) and our observations. Hirowatari (2007) observed this species nectaring on flowers of the probable *Castanopsis sclerophylla* (Fagaceae) and actively flying over the flowers together with *N. fluorites* during the daytime.
One DNA barcode of *N. tanakai* is generated, and this sequence is closest to *N. fluorites* (pairwise distances: 0.038).

3.13 *Nemophora bifasciatella* species group

Nemophora mediseorsa group (Sun & Li 2023: 485)

Diagnosis. This species group is characterized by the following characters: the very small body size, wing expanse of 10–15 mm; the eyes are very small, widely separated dorsally, with eye size index of 0.44–0.58; the forewing has a pair of black-margined bluish-leaden transverse central fasciae, which are separated by a yellowish to the brown band; the basal part of the sacculus is almost completely fused; and the apical part of the aedeagus has a slender keel dorsally. In addition, unlike most other adelid moths, the basal part of the female antenna of this species group is prominently slender without densely raised thick scales.

Remarks. *Nemophora bifasciatella* Issiki, 1930 was originally described in Japan. Based on the examination of types deposited in NMNH (Washington) and other more specimens, Hirowatari (1995) redescribed *N. bifasciatella* with descriptions of two other new related species from Japan, namely *N. sylvatica* and *N. stellata*. Recently, Sun & Li (2023) described four new species, namely *N. mediseorsa*, *N. longiuga*, *N. longissima*, and *N. mediangusa*, and established the *mediseorsa* species group. We consider that at least *N. bifasciatella* and *N. sylvatica* are closely related to the species described by Sun & Li (2023) though they did not refert to this point. Therefore, in the present study, we treat these species as the *bifasciatella* group, because *N. bifasciatella* is the oldest species in this group. Recently, Kozlov (2023c) reported the distribution of *N. mediseorsa* in India and described a new species, namely *N.*

manipurella, which obviously belongs to this species group. Here, we redescribe two species of them, *N. longiuga* and *N. longissima*, and roport *N. bifasciatella* from China for the first time.

Key to species of the *bifasciatella* group based on external morphology

1 Forewing without basal black speckle, outer fascia narrowed medially . . . . . *N. mediangusa*
- Forewing with basal black speckle, outer fascia separated medially 2
2 A pair of bluish-leaden transverse central fasciae both consecutive, near X-shaped; apical yellow scales area nearly round or oval . . . . . *N. bifasciatella*
- The outer bluish-leaden transverse central fascia usually separated at middle, near K-shaped; apical yellow scales radial. . . . 3
3 Forewing distinctly slender, length/width ratio about 4.2; basal 1/5 of forewing with a slightly wavy white transverse line . . 4
- Forewing relatively short, length/width ratio about 3.6; basal 1/5 of forewing without white transverse line . . . . . *N. longiuga*
4 Apical part of forewing with six yellow radial stripes . . . . . *N. mediseorsa*
- Apical part of forewing with four yellow radial stripes . . . . . *N. longissima*

Key to species of the *bifasciatella* group based on male genitalia

1 Vinculum extremely long and slender, about 4.6 times as long as valva; aedeagus with a very long and slender keel dorsally extending from middle of aedeagus . . . . . *N. longissima*
- Vinculum moderate in length, 2.9–3.3 times as long as valva; aedeagus with a short keel at apical 1/6 dorsally 2
2 Costa of valva extending a nearly rectangular lobe basally; apex of aedeagus with many large spines dorsally . . . . *N. longiuga*
- Costa of valva without additional lobe basally; apex of aedeagus without distinct spines 3
3 Phallus with hook-shaped process at distal 1/8; Vinculum distinctly short, about 2.2 × length of valva . . . . . *N. mediangusa*
Phallus without hook-shaped process at distal 1/8; vinculum relatively slender, more than 2.5 × length of valva. 4
4 Phallus with a short rod at subbasal area of suprazonal sheath . . . . . *N. bifasciatella*
- Phallus with belt of spines from near 2/5 to 1/9. . . . . *N. mediseorsa*

(55) ***Nemophora bifasciatella*** Issikii, 1930
(Plates VII-1, XVII-5, XXVI-3)

Nemophora bifasciatella Issiki, 1930: 431 (TL: Japan, Kawamata, Totigiken [= Kanto, Kinuonsen]; USNM): Issiki 1957: 13, pl. 2, fig. 32; Okano 1959: 277, pl. 183, fig. 17; Moriuti 1982: 55, pl. 1, fig. 36, pl. 236, fig. 1; Hirowatari 1995: 96, figs. 1–4, 9C, 10, 13E–G (review); Hirowatari 2013: 107, figs. 3-08-18,19,20; Sakagami 2022: 688, figs. 1–2.

Diagnosis. This species can be easily distinguished by the outer bluish-leaden transverse central fascia consecutive and apical yellow scales areas that are nearly round or oval. Additionally, the vinculum of the male genitalia is relatively slender, about 3.2 × as long as the valva.

Specimens examined. [**Hunan**] 2♀, Hongliansi, Daweishan, Liuyang City, 2018.VII.8–9, H. Xu & J.Y. Qiu leg.; 1♂, Mt.Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018. VII.22–31, C.Q. Liao & S.Y. Liu leg.; 3♂5♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2019.VII.27–VIII.13, C.Q. Liao, M. Deng, B. Chen & S.J. Yi leg.; 1♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.29, C.Q. Liao leg.; 2♂1♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VII.16–20, C.Q. Liao & M. Deng leg.; [**Guangxi**] 5♂, Damingshan (1,370 m), Nanning City, 1996.VIII.7, Y. Watanabe leg.; [**Sichuan**] 2♂, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2009.VII.20, G.H. Huang leg.; 10♂, Yajiang County, Ganzi Tibetan Autonomous Prefecture, 2009.VII.22, G.H. Huang leg.; 1♂, Gaoersishan Mt., Yajiang County, Ganzi Tibetan Autonomous Prefecture, 2004.VII.5, M. Wang & L.S. Chen leg. (HUNAU).

Distribution. China (**new record**: Hunan, Guangxi, Sichuan); Japan.

Remarks. This species ha been reported in the mountainous areas of Hokkaido, Honshu, Shikoku and Kyushu, Japan (Issiki,1952; Okano 1959; Moriuti 1982; Hirowatari 1995, 2013), and has recently reported in China here and seems to have a wider distribution.

Hirowatari (1995) noted that the male adults may be swarming in the evening twilight above the flowers of *Hydrangea paniculata* (Hydrangeaceae) and considered that the plant may be utilized as a nectar resource and

oviposition because of some females were also obtained from the flowers. Recently, Sakagami (2022) reported its oviposition behavior in the ovaries of *Hydrangea serrata* in Tottori Prefecture, Japan. The first author (C.Q. Liao) also collected some male and female adults from *Hydrangea* sp. but did not observe oviposition behavior. More observations and rearing information are needed to verify the larval host in China.

Two DNA barcodes of *N. bifasciatella* specimens are generated and their sequences show no differences. These sequences are closest to *N. bispina* **sp. nov.**, with a pairwise distances of 0.066.

(56) ***Nemophora longiuga*** Sun & Li, 2023
(Plates VII-2, XVII-6, XXVII-1)

Nemophora longiuga Sun & Li, 2023: 487, figs. 2, 3, 8, 11 (TL: China, Sichuan, Wenchuan; NKU).

Diagnosis. This species is very similar to *N. longissima* but can be distinguished by the following characters: the relatively short forewing with a length of about 3.6 × width, but distinctly slender with *ca.* 4.2 × width in *N. longissima*; the apical part of aedeagus has some developed big spines dorsally, but one long and slender keel in *N. longissima*; and the valva is bilobate, but simple in *N. longissima*.

Description. Male. Forewing 4.6–5.0 mm; wing expanse 10.0–10.8 mm.

Head with raised yellow to brown hairs; face with smooth brown scales. Eyes small, widely separated dorsally; eye size index about 0.58. Labial palpus moderate in length, with yellow to brown hairs; galeae covered with brown scales laterally. Antenna smooth, basal 1/3 dark brown; apical part silvery white; 16.2–18.8 mm, 3.5–3.7 times as long as forewing. Legs brown to dark brown; hind tibia brownish, covered with long light brown hairs. Tegula and thorax (dorsum) dark brown with purple metallic luster. Forewing yellow to brown with light golden luster; base to basal 2/5 with three longitudinal black-margined fascia at costal, median and dorsal area, respectively; a pair of black-margined bluish-leaden transverse fasciae present at postdiscal area, but the outer fascia separated at middle by yellowish scales which continue from yellowish transverse band between the fasciae forming long radial marking subapically; apical part black with golden metallic luster at outer margin; vein R_4 stalked with R_3 at basal 1/6. Hindwing dark brown; Rs stalked with M_1 at middle. Abdomen dark brown to black.

Female. Forewing 4.2–4.3 mm; wingspan 9.0–9.5 mm. Eye size index about 0.53. Antenna 1.3–1.4 times as long as forewing, entirely slender.

Male genitalia. Uncus relatively long, with a weak median keel. Vinculum moderate in length, about 3.3 times as long as valva. Valvae triangular, ventral base completely fused; costa split and extending a nearly rectangular lobe basally; sacculus basally slightly swollen, covered with dense hairs; suspensorium triangular, anterior part distinct beyond posterior margin of vinculum. Transtilla slightly narrow in middle part; median process very long and pointed. Aedeagus stout and straight; apical 1/4 with a patch of big spines and a distinctly large spine dorsally; manica with a patch of minute spines and a long keel dorsally. Juxta arrow-shaped; arrow-head shovel-like.

Female genitalia. Ovipositor pointed, with two distinct teeth ventroposteriorly. Apophyses posteriores and anteriores of subequal in length, relatively slender, 2.2 times as long as the 7th tergite. Vestibulum relatively large; vestibular lamella well-developed, subquadrate in ventral view. Bursa copulatrix short, membranous.

Specimens examined. [**Sichuan**] 6♂4♀, Longchi (900 m), Dujiangyan City, 2017.VI.14–16, G.H. Huang & M. Wang leg. (HUNAU); 1♂, Longchi (900 m), Dujiangyan City, 2017.VI.15, G.H. Huang & M. Wang leg.; 2♂1♀, Shimian County (2,050 m), Ya'an City, 2016.VII.10, T.T. Yu leg.; 7♂, Xilingxueshan (1,320 m), Dayi County, Chengdu City, 1996.VIII.3–7, Y. Watanabe leg. (HUNAU, ELKU).

Distribution. China (Sichuan).

Remarks. This species is endemic to partial areas of Sichuan province, China, but we consider that it should have a larger distribution range in medium and high elevation mountains based on its known distribution and altitude information.

One DNA barcode of *N. longiuga* is generated and this sequence is closest to *N. fluorites* (pairwise distances: 0.049).

(57) ***Nemophora longissima*** Sun & Li, 2023
(Plates VII-3, XVIII-1, XXVII-2)

Nemophora longissima Sun & Li, 2023: 488, figs. 4, 5, 9, 12 (TL: China, Sichuan, Chengdu; NKU).

Diagnosis. This species is very similar to *N. sylvatica* Hirowatari, 1995, but can be easily distinguished by the base of the forewing with three longitudinal black fasciae or connected forming a large patch, but just one longitudinal fascia in *N. sylvatica*; and the slender forewing is about 4.2 × width, but *ca.* 3.7 × width in *N. sylvatica*. In the male genitalia, this species has an extremely long vinculum, *ca.* 4.6 times as long as valva, but a relatively short vinculum in *N. sylvatic*a, just about 1.7 times as long as valva. The extremely long vinculum was the most significant diagnostic characteristics of this species.

Description. Male. Forewing 5.2–5.5 mm; wing expanse 11.3–12.0 mm.

Head with raised yellow hairs mixed some brown; face with smooth yellow scales, dorsal part near antennal socket with raised brown hairs. Eyes small, widely separated dorsally; eye size index about 0.84. Labial palpus moderate in length, with brown to black hairs; galeae covered with brown scales laterally. Antenna smooth, dark brown; 16.9–19.0 mm, 3.3–3.5 times as long as forewing; apical part silvery white. Legs brown to dark brown; hind tibia brownish, covered with long light brown hairs. Tegula and thorax (dorsum) dark brown with golden luster. Forewing yellow to brown with light golden luster; basal 1/3 with three longitudinal black fascia, but the boundaries among them indistinct, sometimes connected except some scattered yellow fasciae; a bluish-leaden transverse fascia cross these longitudinal fascia at basal 1/5; a pair of black-margined bluish-leaden transverse fasciae present in half to apical 1/5 area, but the outer fascia separated at middle by yellowish scales which continue from yellowish transverse band between the fasciae forming radial marking subapically; apex of forewing dark brown to black; vein R_5 stalked with R_{3+4} at middle. Hindwing brownish to dark brown; Rs stalked with M_1 at middle. Abdomen uniformly dark brown to black dorsally and yellow ventrally.

Female. Forewing 4.5–4.9 mm; wingspan 9.9–10.8 mm. Antenna 1.2–1.3 times as long as forewing, entirely slender.

Male genitalia. Uncus moderate in length, with a weak median keel. Vinculum very long and slender, about 4.6 times as long as valva. Valvae triangular with a slightly blunt apex, ventral base almost fused; sacculus basally straight; suspensorium trapezoidal, anterior part distinct beyond posterior margin of vinculum in ventral view. Transtilla slightly narrow in lateral part; median process very short and blunt. Aedeagus also very long and slender; basal 3/5 a little curved dorsally; apical part with a long and slender keel dorsally; manica with a patch of minute spines dorsally. Juxta arrow-shaped; arrow-head very long and pointed.

Female genitalia. Ovipositor pointed, with some small teeth ventroposteriorly. Apophyses posteriores and anteriores of subequal in length, relatively slender, 2.0 times as long as 7th tergite. Vestibulum relatively large; vestibular lamella well-developed, broad C-shaped in ventral view. Bursa copulatrix long, membranous.

Specimens examined. [**Hunan**] 2♂5♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg.; 1♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.V.20, C.Q. Liao leg.; [**Sichuan**] 16♂8♀, Nibashan, Yingjing County, Ya'an City, 2009.VII.27–28, G.H. Huang leg.; 12♂12♀, Longcanggou, Yingjing County, Ya'an City, 2015.VIII.10–11, G.H. Huang leg.; 4♂, Longcanggou, Yingjing County, Ya'an City, 2017.VII.17–18, M. Wang leg.; 2♂2♀, Longcanggou, Yingjing County, Ya'an City, 2017.VII.19, M. Wang leg. (HUNAU).

Distribution. China (Hunan, Sichuan).

Remarks. This species overlaps with *N. bifasciatella* in distribution, and these two species occur sympatrically and simultaneously in some areas, such as Mt. Tianpingshan, Badagongshan National Nature Reserve, Hunan province.

(58) ***Nemophora mediangusa*** Sun & Li, 2023

Nemophora apiciprocessa Sun & Li, 2023: 486, figs. 1, 7 (TL: China, Tibet, Linzhi, Pailong; NKU).

Diagnosis. This species is similar to its congeners, but can be distinguished by the forewing without a black speckle basally, by the outer fascia distinctly narrowed and not separated medially, and by the phallus with hook-shaped process at distal 1/8 of male genitalia (Sun & Li 2023).

Specimens examined. Not available in this study.

Distribution. China (Tibet).

Remarks. This species was described by Sun & Li (2023) based on specimens from Tibet, China.

(59) ***Nemophora mediseorsa*** Sun & Li, 2023

Nemophora mediseorsa Sun & Li, 2023: 489, figs. 6, 10 (TL: China, Guangxi, Leye; NKU); Kozlov 2023c: 18, figs. 14, 76, 115, 146 (India).

Diagnosis. This species is very similar to *N. longissima*, but can be distinguished by the forewing without a black speckle between M2 and the termen beyond the outer fascia, and by the absence of a process in the phallus (Sun & Li 2023).

Specimens examined. Not available in this study.

Distribution. China (Guangxi); India.

Remarks. This species was described by Sun & Li (2023) based on two specimens from Guangxi, China. And then Kozlov (2023c) reported the distribution of this species in Assam, India.

3.14 *Nemophora degeerella* species group

Nemophora degeerella group (Kozlov 1997b: 43).
Nemophora aurora group (Kozlov 1997c: 13).

Diagnosis. This species can be distinguished by the following characters: the ground color of the forewing is yellow to light brown; the dark markings of the forewing with mainly longitudinal striae; the forewing central fasciae consist of three transverse bands, the middle one yellow to light brown, the same as the ground color; the basal part of the forewing has some several black-margined bronze longitudinal stripes along the forewing veins, and some black lines situated between these stripes; the valva of male genitalia is simple, without additional lobe; the sacculus usually not swollen at the middle and fused basally; and the suspensorium is small, both sides are approximately parallel, anterior part is usually not beyond posterior margin of vinculum.

Remarks. Kozlov (1997b) firstly assigned the *degeerella* species group consisting of 16 species and indicated some differences between these representative species. Subsequently, based on a large examination of European *N. degeerella* specimens, Kozlov *et al*. (2017) separated and described two new cryptic species based on external morphology and molecular data: *N. deceptoriella* and *N. scopolii*. Recently, Sun *et al*. (2022) reviewed this species group and recognized 25 Chinese species, including 14 new species and three newly recorded species in China, and also provided the key and related illustrations. Additionally, two Japanese species, *N. sapporensis* (Matsumura, 1931) and *N. montana* Okano, 1957, obviously belongs to the *degeerella* species group and are usually treated as synonyms. According to two endemic species of Taiwan, namely *N. aurora* and *N. uncella*, Kozlov (1997c) established the *N. aurora* species group and considered that this species group is very similar to the *degeerella* group and shares some diagnostic characteristics described above. However, the monophyly of the *aurora* species group is supported by the dark brown lateral bands of the forewing fascia, with an internal zone formed by silver-gray glossy scales; and the valva medially has small basal swelling bearing a tuft of long setae on small oval depigmented spot. However, these two characters are atypical and seem to be their own autapomorphies. In addition, they share some diagnostic characteristics with other members of the *degeerella* group, thus we regarded these two Taiwanese species as members of this species group.

In this paper, we present all known Chinese species and described six additional new species, including *N. ganziensis* **sp. nov.**, *N. jiajinshana* **sp. nov.**, *N. litangensis* **sp. nov.**, *N. tianpingshana* **sp. nov.**, *N. triangulifascia* **sp. nov.**, and *N. yajiagengensis* **sp. nov.** Thus, as the largest species group of the genus *Nemophora*, the *N. degeerella* species group at least 45 species worldwide, and there are 36 species distributed in China to date.

Key to species of the *degeerella* group based on external morphology and male genitalia*

1 Except forewing central fascia, other markings (basal longitudinal stripes and apical radial striae) hardly clear, only indistinct black lines remaining at the base . . . . . *N. augites*
- Forewing pattern very distinct either basal longitudinal stripes or apical radial striae or spots 2
2 Forewing central fascia distinctly broken by lateral silver-gray bands at middle and formed into two large spots. 3
- Forewing central fascia not broken at middle and presented as a band 4
3 Two large spots of central fascia far away to each other; apical area of forewing yellow, with indistinct radial striae . . . . . *N. litangensis* **sp. nov.**
- Two large spots of central fascia close to each other; apical area of forewing dark brown, with very distinct radial striae . . . . . .*N. disjucterlla*
4 Subapical area of forewing with V- or U-shaped yellow spot but without radial striae; uncus obviously bent to inter side ventrally . . . . . .*N. recurvatifera*
- Subapical area of forewing with obvious radial striae; uncus oblique ventrally 5
5 Male eyes relatively large, eye size index about 1.8; subapical radial striae near costal margin connected basally forming triangular yellow spot . . . . . *N. triangulifascia* **sp. nov.**
- Male eyes very small, eye size index less than 1.0; subapical radial striae not formed triangular spot. 6
6 Subapical area of forewing ground color yellow, with black radial striae reaching to outer margin of forewing 7
- Subapical area of forewing ground color black, with yellow radial striae not reaching to outer margin of forewing. 14
7 Subapical radial striae of forewing far away from external silver-gray band of transverse central fascia 8
- Subapical radial striae of forewing basally connected with external silver-gray band of transverse central fascia 9
8 External silver-gray band of transverse central fascia complete; valva without obvious lobar process; vinculum shorter than 3 × length of valva . . . . . *N. aurora*
- External silver-gray band of transverse central fascia broken at middle, and part adjacent to the costal margin is hook-shaped in such a way that its distal part in some specimens is separated from the base and forms a distinct spot; vinculum longer than 3 × length of valva . . . . . *N. uncella*
9 Body large, wing expanse usually more than 24 mm. 10
- Body small to moderate, wing expanse usually less than 20 mm 11
10 Forewing central fascia broad, approximately equal in width; vinculum relatively short, anterior half gradually narrow . . . . . *N. tianpingshana* **sp. nov.**
- Forewing central fascia obviously narrow at middle; anterior half of vinculum rather slender, both sides approximately parallel . . . . . .*N. polychorda*
11 Forewing ground color dark brown; central fascia obviously narrow at middle . . . . . .*N. ganziensis* **sp. nov.**
- Forewing ground color yellow; central fascia slightly narrow at middle. 12
12 Subapical radial striae slightly indistinct, separated by a dark silver-gray longitudinal stria reaching apical angle of forewing . . . . . *N. yajiagengensis* **sp. nov.**
- Subapical radial striae conspicuous, without silver-gray longitudinal stria 13
13 Body relatively large, wing expanse about 19 mm; vinculum distinctly slender, about 2.7 × as long as valva, without transparent window . . . . . *N. syfaniella*
- Body small, wing expanse about 17.6 mm; vinculum very short, about 2.4 × as long as valva, with irregular oval transparent window medially . . . . . .*N. jiajingshana* **sp. nov.**
14 Body small, wing expanse about 15.7 mm; subapical radial striae of forewing dark brown, extending beyond than 2/3 of subapical area . . . . . .*N. amatella*
- Body moderate, wing expanse more than 20 mm; subapical radial striae of forewing yellow, not extending beyond 1/2 of subapical area 15
15 Antenna black basally and sliver-gray apically; vinculum rather slender, more than 2.6 × as long as valva . . . . . .*N. lapikella*
- Antenna black in whole length, no more than lighter color apically; vinculum relatively short, about 2.3 × as long as valva. . . . . *N. staudigerella*

*Note: most currently described new species by Sun *et al.* (2022) are not examined herein, detail key to these species see Sun *et al.* (2022).

(60) ***Nemophora amatella*** (Staudinger, 1892)
(Plates VII-4, XVIII-2)

Adela amatella Staudinger, 1892: 392 (TL: Lapponia finl., Kuusamo; ZMHB).

Nemophora amatella: Kozlov 2004b: 117 (checklist of Europe); Mukkala *et al*. 2005: 14 (W Finland); Dubatolov 2007: 43, fig. 1 (Russia: Khabarovsk); Anikin *et al*. 2009: 306 (list of Volgo-Ural region); Humala *et al*. 2009: 61 (Karelia); Gerstberger 2010: 131 (checklist of Europa); Hirowatari 2013: 108, fig. 3-09-3,4 (Japan); Jakovlev *et al*. 2014: 294 (list of Russian Karelia); Umetsu 2014: 6, fig. 17 (Japan, Akita Prefecture); Fukuda & Kanai 2016: 18 (Japan, Kirishima Mt.); Akulov *et al*. 2018: 7 (Russia: Krasnoyarsk Territory); Sun *et al.* 2022: 304, figs. 1, 2, 27, 48 (review); Kozlov 2023b: 98, figs. 3–6, 9–12, 15 (review).

Adela degeerella L. var. *amurensis* Hoffmann, 1893: 136 (TL: Finland, surroundings of Kuusamo).
Adela degeerella var. *amurensis* Alphéraky, 1897: 346 (TL: Russia, Kamtschatka).
Nemotois amurensis: Meyrick 1912a: 9; Meyrick 1912b: 8 (Siberia); Matsumura 1931: 1111, fig. 2330 (Japan); Matsumura 1932: 123, pl. 4, fig. 11 (list of Japan).
Nemophora amurensis: Kyrki 1981: 125–129 (Northern Europe); Liu 1981: 9, pl.4, fig.17 (color photos) (NE China, Japan); Park 1983 (Korea); Cai *et al*. 1994: 181, fig. 261 (China, Qinghai); Kozlov & Jalava 1994: 69 (list of the Kola Peninsula, Russia); Hua 2005: 2 (list of China, in Incurvariidae); Liu & Wang 2010: 601 (China, Jiangxi, Lushan); Park *et al*. 2011: 93 (Korea); Song *et al*. 2012: 266, fig. 1 (China, Jiangsu); Zhang 2013: 181, no. 356 (China, Hebei, Wulingshan, color figure); Wang & Lu 2015: 117, (China, Daxin'anling area, color figure).
Adela kukunorensis Sauber, 1899: 66 (TL: China, Qinghai, Kuku-nor area [Qinghai Lake]; Sauber's collection); Rebel 1901: 243 (catalog); Kozlov 1997d: 274–289 (Russia, Far East); Hua 2005: 2 (list of China).
Nemotois kukunorensis: Meyrick 1912a: 9 (Thibet [Tibet]); Meyrick 1912b: 8 (C. Asia).
Adela badioumbratella Sauber, 1899: 67 (TL: Kuku-nor area; Sauber's collection); Rebel 1901: 243 (catalog); Hua 2005: 2 (list of China)
Nemotois badioumbratella: Meyrick 1912a: 9 (Thibet [Tibet]); Meyrick 1912b: 8 (C. Asia).
Adela coreana Matsumura, 1931: 1109, fig. 2322 (TL: Korea, Koriku; SEHU); Razowski & Kumata 1985: 7 (Type catalog).
Nemotois coreana: Matsumura 1932: 125, pl. 4, fig. 16 (Korea).
Nemotois degeerella f. *ogasawarai* Matsumura, 1932: 123. Taf. 4, fig. 9 (TL: Japan, Iwate; SEHU); Razowski & Kumata 1985: 19 (Type catalog).

Diagnosis. This species is similar to *N. bellela* Walker, 1863 (Plate IX-6), but can be distinguished by the following characters: the transverse central fascia of forewing is distinctly broad, slightly covered in the middle; the subapical area of the forewing has 7–8 radial striae that are pointed apically and do not exceed to the outer margin; each abdominal segment has a yellowish ring posteriorly; and the vinculum is relatively short, only about 2.2 × length of the valva.

Specimens examined. [**Sichuan**] 2♂, Xindianzi, Yajiageng, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2019.VII.10, B. Chen & M. Deng leg. (HUNAU).

Distribution. China (Northern China, Sichuan); widely distributed in Asia, including Russian Siberia, Korea and Japan, and also in Northern Europe.

Remarks. This species has been collected for a long time in Northern Europe but was misidentified as *N. degeerella* until Kyrki (1981) revealed its true identity four decades ago. Kozlov (2004b) noted that the syntypes of this species (deposited in ZMHB) included two specimens of *N. amatella* and two specimens of *N. degeerella*. This species is very variable not only in external characters, including head color, the width of fascia, and length of apical yellow strips, but also in the melae genitalia, such as the shape of valva, uncus, and base of the aedeagus (Kozlov 2004b). Currently, Kozlov (2023b) redescribed and reviewed this species with figures of adults and male genitalia. He noted that *N. purpuratifera* and/or some other species described by Sun *et al.* (2022) may appear junior synonyms of *N. amatella*.

(61) ***Nemophora apiciprocessa*** Sun, Wang & Li, 2022

Nemophora apiciprocessa Sun, Wang & Li, 2022: 305, figs. 4, 29 (TL: China, Hubei, Pingbaying; NKU).

Diagnosis. This species is very similar to "*N. japonica*" (= *N. sapporensis*) but can be distinguished by the forewing with a black speckle at the base of Sc; the tegumen of male genitalia lacks a median ridge; the vinculum is slightly produced posteromedially; and the phallus has a belt of short spines and a banded process near the apex (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Hubei).

Remarks. This species was described by Sun *et al*. (2022) based on a single specimen from Hubei, China.

(62) ***Nemophora augites*** (Meyrick, 1938)

Nemotois augites Meyrick, 1938: 29 (TL: China, Yuennan [Yunnan], Li-kiang [Lijiang]; BMNH); Clarke 1955: 59; Popescu-Gorj 1992: 137; Hua 2005: 2 (list of China).

Nemophora augites: Kozlov 1997b: 43; Kozlov 2023b: 95, figs. 1, 7, 13 (Lectotype designated, redescription).
Nemophora amatella: Sun *et al.* 2022: 304, figs. 1, 2, 27, 48 (misidentification).

Diagnosis. This species is very similar to *N. amatella*, but can be distinguished by the following characters: 1) narrower forewing with narrowly rounded (nearly pointed) apex; 2) less expressed longitudinal stripes in the apical part of forewing; 3) longer vinculum, longer anterior processes of transtilla and absence of carinae in apical part of phallus (Kozlov 2023b).

Specimens examined. Not available in this study.

Distribution. China (Gansu, Guizhou, Hebei, Henan, Hubei, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Sichuan).

Remarks. Due to a 'nested' structure of the respective publication, this species was attributed to different original authors (Clarke 1955; Popescu-Gorj 1992; Kozlov 1997b; Sun *et al.* 2022). Kozlov (2023b) solved this problem and determined that the correct author of the name '*Nemotois augites*' is Meyrick alone. In addition, Kozlov (2023b) considered that a series of specimens named '*Nemophora amatella* (Studinger, 1892)' in Sun *et al.* (2022) practical belong to *N. augites*. Thus, *N. augites* has become one of the most common and widespread species of the *degeerella* species group (Kozlov 2023b).

(63) ***Nemophora aurora*** Kozlov, 1997
(Plate XI-9)

Nemophora aurora Kozlov, 1997c: 14, figs. 1, 3–7 (TL: China, Taiwan; USNM); Wang *et al*. 2000: 19–20 (Taiwan).

Diagnosis. This species is very similar to *N. uncella* but can be distinguished by the following characters: the external silver-gray band of forewing central fascia is complete; the vinculum of male genitalia is relatively short, less than 3 × length of valva; and the medial margin of valva distally lacks prominent lobe appearing laterally as a triangular process.

Specimen examined. Holotype ♂ in USNM.

Distribution. China (Taiwan).

Remarks. The habitat of this species is mainly evergreen forest dominated by oak trees, and the adults fly very high above the trees at 9–10 a.m. (Kozlov 1997c).

(64) ***Nemophora bifurcifascia*** Sun, Wang & Li, 2022

Nemophora bifurcifascia Sun, Wang & Li, 2022: 307, figs. 5, 30 (TL: China, Sichuan, E'mei, Baoguosi; NKU).

Diagnosis. This species is very similar to *N. bellela* (Walker, 1863) but can be distinguished by the forewing with six brown strips and the second stripe forked distally; the apex-rounded valva fused for basal 1/5 and convex at the middle on the ventral margin; and the phallus is uniformly wide distally (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Sichuan).

Remarks. This species was described by Sun *et al*. (2022) based on specimens from Sichuan, China.

(65) ***Nemophora biprocessa*** Sun, Wang & Li, 2022
(Plates IX-1, 2, XX-2)

Nemophora biprocessa Sun, Wang & Li, 2022: 307, figs. 6, 31 (TL: China, Jiangsu, Mt. Baohua; NKU).

Diagnosis. This species is very similar to *N. chalybeella* and *N. lapikella* but can be distinguished by the triangular median process of the transtilla, and by the phallus with two narrow processes and a banded process (Sun *et al.* 2022).

Specimens examined. [Jiangsu] 3♂2♀, Xianlin Campus, Nanjing Normal University, Nanjin City, 2021.IV.7, Q. Shi leg.; [**Hunan**] 4♂2♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.7, C.Q. Liao leg.; [**Guangxi**] 1♂2♀, Maoershan National Nature Reserve, Guilin City, 2017.V.1–5, L.S. Chen leg. (HUNAU).

Distribution. China (Jiangsu, Hunan, Guangxi).

Remarks. This species was described by Sun *et al*. (2022) based on a single male specimen collected from Mt. Baohua, Jiangsu, China. We also collected this species in Jiangsu, Hunan, and Guangxi Provinces, including male and female adults. The forewing pattern of specimens from Hunan and Guangxi showed some differences from that of specimens from the type locality: both sides of the forewing central fasciae are inwardly concaved, nearly X-shaped in the type locality's specimens, while nearly wavy in populations of Hunan and Guangxi; and the subapical radial striae are long, extending near the apex of the forewing in type locality's specimens, but relatively short and extending to half of the subapical area in populations of Hunan and Guangxi (Plate IX-1, 2).

Three DNA barcodes of different *N. biprocessa* populations from Hunan are generated, which showed relatively large intraspecific genetic distances (pairwise distances: 0.006–0.028).

(66) ***Nemophora borealis*** Sun, Wang & Li, 2022

Nemophora borealis Sun, Wang & Li, 2022: 309, figs. 7, 32 (TL: China, Shaanxi, Mt. Xinjia; NKU).

Diagnosis. This species differs from *N. amatella* by the tegumen with a triangular plate extending from posterior 3/5 to 1/4; the sacculus is narrowed to near the apex of the ventral margin; and the phallus has a pair of sclerotized belts and denticles (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Gansu, Hebei, Henan, Jilin, Ningxia, Shaanxi).

Remarks. This species was described by Sun *et al*. (2022) based on a series of specimens from multiple provinces in China.

(67) ***Nemophora chalybeella*** (Bremer, 1864)

Adela chalybeella Bremer, 1864: 92, pl. VII, fig. 25 (TL: Russia, Siberia).
Nemotois chalybeella: Meyrick 1912a: 10; Meyrick 1912b: 8 (E. Siberia).
Nemophora chalybeella: Kozlov 1997b: 43; Sun *et al*. 2022: 310, figs. 8, 9, 33, 49 (review).

Diagnosis. This species is similar to *N. lapikella* but can be distinguished by the forewing without a black speckle at the base; the male genitalia have a dome-shaped uncus, and the ventral margin of the valva is vertically straight from basal 1/4 to middle (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Beijing, Gansu, Hebei, Henan, Liaoning, Ningxia, Shaanxi, Shanxi, Sichuan, Tianjin); Russia, South Korea.

Remarks. This species was first recorded by Sun *et al*. (2022) based on a series of specimens from multiple provinces in China.

(68) ***Nemophora digitivalva*** Sun, Wang & Li, 2022

Nemophora digitivalva Sun, Wang & Li, 2022: 312, figs. 10, 34 (TL: China, Shaanxi, Huanglong County; NKU).

Diagnosis. This species is similar to *N. karafutonis* but can be distinguished by the digitate valva and triangular uncus; the tegumen lacks a plate; the spiniform median process of the transtilla; and the phallus lacks sclerotized belts (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Shaanxi, Ningxia).

Remarks. This species was described by Sun *et al*. (2022) based on a series of specimens from multiple provinces in China.

(69) ***Nemophora disjunctella*** (Caradja, 1927)
(Plate XI-10)

Adela disjunctella Caradja, 1927: 64. (Type locality: Szetschwan, Sunpanting [= Songpan, Sichuan, China]; MINGA); Hua 2005: 2 (list of China).
Nemophora disjunctella: Kozlov 1997a: 43; Sun *et al.* 2022: 312 (review).

Diagnosis. The biggest diagnostic character of this species from others is the transverse central fascia of the forewing, which is almost broken by lateral silver-gray bands at the middle and formed into two large spots. In addition, the subapical area of the forewing has seven black radial striae.

Specimens examined. Lectotype ♂ in MINGA, with label information as follows: "LECTOTYPE / Adela / disjunctella / ♂ Car. / Romänia DES. Dr. A. POPESCU - GORJ", "Adela / disjunctella/ Typen Car.", "Szetschwan / Sunpanting / Exp. Stötzner", and "34".

Distribution. China (Sichuan).

Remarks. This species was described based on two male specimens from Sichuan Province deposited in MINGA. The lectotype of this species was designated by Dr. Popescu-Gorj and its male genitalia were dissected by Mihail Kozlov (Dr. Mihai Stănescu, per. comm.). The locality "Sunpanting" of the type specimens presented in the collected label should be the current Songpan County, Aba Tibetan and Qiang Autonomous Prefecture, Sichuan. Since the original description by Caradja (1927), there have been no additional reports or redescriptions of this species to date.

(70) ***Nemophora ganziensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VII-5, XVIII-3)
LSID urn:lsid:zoobank.org:act:E7462D87-E2A1-4571-A217-56EDAAF3BFA9

Diagnosis. This species is similar to other species of this species group, but can be easily distinguished by the small size of body (wing expanse about 17.4 mm); the forewing ground color is distinctly dark brown with blue metallic luster; and the transverse central fascia of the forewing is obviously narrow in the middle part. In addition, the male genitatia of this new species are similar to *N. amatella* but has valva distinctly shorter than uncus and relatively longer vinculum about 2.4 times of the valva.

Description. Male. Forewing about 8.0 mm; wing expanse about 17.4 mm.

Vertex covered with black hairs mixed with yellow; face with smooth yellow scales. Eyes very small, far away to each other dorsally; eye size index about 0.4. Labial palpus short, covered with dark brown scales and black hairs; galeae with dark brown scales laterally. Antenna slender, 18.5 mm, about 2.3 × forewing length; basal 1/4 black, apical part light color. Legs yellow, but apical tibiae and whole tarsi dark brown to black; hind tibiae with brown to dark brown long hairs. Thoracic dorsum and tegula black, with blue metallic luster. Forewing lanceolate, ground color dark brown with blue metallic luster; basal 2/3 with four black-margined blue longitudinal striae placed at subcostal, radial, median and postcubitus veins, not reaching to central fascia except the first one; and three black lines placed between above striae; middle part with two black-margined blue transverse fasciae separated a yellow transverse broad band, which slightly narrow at middle; subapical area with 7–8 black radial striae reaching outer margin; cilia dark brown to black; vein R_3 separated with R_4. Hindwing and cilia dark brown to black; Rs stalked with M_1 at basal 1/5. Abdomen dark brown to black.

Female. Unknown.

Male genitalia. Uncus trapezoidal, with weak median keel. Vinculum moderate in size, about 2.4 × as long as valva. Valva triangular, with blunt apex; inner margins almost straight, lateral margins straight with a small process basally; sacculus distinctly expanding at basal part, nearly fused medially; suspensorium nearly quadrate, anterior part not beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median

process short and pointed. Aedeagus slender; basal 1/3 slightly curved dorsally; apical portion near spherical with sclerotized part ventrally and laterally at base, the remaining membranous; vesica with two rows of large spines dorsolaterally. Juxta arrow-shaped; arrow-head very long and slightly pointed, lateral arms relatively short.

Holotype. [**Sichuan**] ♂, Gaoersishan (4,000 m), Yajiang County, Ganzi Tibetan Autonomous Prefecture, 2004. VIII.5, M. Wang & L.S. Chen leg. (HUNAU).

Paratypes. [**Sichuan**] 1♂, same data as Holotype; 1♂, Zheduoshan (4,200 m), Kangding City, Ganzi Tibetan Autonomous Prefecture, 2004.VIII.4, M. Wang & L.S. Chen leg. (HUNAU).

Etymology. The specific epithet refers to the type locality, Ganzi Tibetan Autonomous Prefecture, Sichuan, China.

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan Province, China and occurs in August.

One DNA barcode of *N. ganziensis* **sp. nov.** is generated, and is closest to the three sequences of *N. syfaniella* specimens (pairwise distances: 0.034–0.038).

(71) ***Nemophora gaoligongshana*** Sun, Wang & Li, 2022

Nemophora gaoligongshana Sun, Wang & Li, 2022: 313, figs. 11, 12, 35, 50 (TL: China, Yunnan, Mt. Gaoligong, Nujiang; NKU).

Diagnosis. This species is similar to *N. polychorda* but can be distinguished by the forewing with six distinct yellowish-brown stripes from beyond the outer fascia to the apex; the tegumen has a triangular plate extending from the middle to the posterior 1/3; and the phallus has a pair of sclerotized belts running from distal 2/5 to 1/10 (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Yunnan).

Remarks. This species was described by Sun *et al*. (2022) based on specimens collected from Mt. Gaoligong, Yunnan, China.

(72) ***Nemophora jiajinshana*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VII-6, XVIII-4, XXVIII-3)
LSID urn:lsid:zoobank.org:act:30D6A456-D943-4F3D-BF49-931C03CFFBFA

Diagnosis. This species can be easily distinguished by the following characters: the small size with 17.6 mm wing expanse; the subapical area with 7 black radial striae reaching the outer margin; the abdomen is dark brown to black, ventral surface with yellow scales on each abdominal posterior margin; and the vinculum is very short, about 2.4 × as long as valva, and the middle part with an irregular near oval transparent window.

Description. Male. Forewing 8.2–8.4 mm; wing expanse about 17.6 mm.

Vertex covered with yellow hairs mixed with gray white; face with smooth yellow scales. Eyes very small, far away to each other dorsally; eye size index about 0.42. Labial palpus short, covered with yellow scales and brown hairs; galeae with yellow scales laterally. Antenna slender, 27.0–28.8 mm, about 3.4 × forewing length; basal part black, apical 1/3 slightly light color. Legs yellow except foreleg yellowish to blackish; hind tibiae with yellow long hairs. Thoracic dorsum and tegula borwn, with metallic gold luster. Forewing lanceolate, ground color pale yellow in basal 2/3 and yellow in apical 1/3; basal 2/3 with three broad black longitudinal striae and three narrow black lines both reaching to central fascia; middle part with two black-margined silver-gray transverse fasciae separated a yellow transverse broad band; subapical area with 7 black radial striae reaching to outer margin; cilia dark brown to black; vein R_3 stalked with R_4 at basal 2/5. Hindwing and cilia dark brown to black; Rs stalked with M_1 at middle. Abdomen dark brown to black, ventral surface with yellow scales on each abdominal posterior margin.

Female. Forewing about 6.4 mm, wing expanse about 14.0 mm. Eyes small, eye size index *ca.* 0.5. Antenna short, more than 8.1 mm; basal 2/3 black, stout, apical 1/3 slender, alternating black and white rings. Others similar to male.

Male genitalia. Uncus triangular, with distinct median keel. Vinculum very short, about 2.4 × as long as valva;

middle part with an irregular near oval transparent window; posterior margin slightly arcuate. Valva near trapezoid, with broad blunt apex; inner margins distinct arcuate, lateral margins slightly concaved; sacculus slightly expanding at basal 1/3, basal part fused medially; suspensorium nearly trapezoid, anterior part slightly beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process long and pointed, with slightly curved anterior margin. Aedeagus very slender; apical 1/3 curved dorsally; apical portion with a thin and long lobe; vesica with a patch of microtrichia dorsolaterally. Juxta arrow-shaped; arrow-head long and blunt, lateral arms long and narrow.

Holotype. [**Sichuan**] ♂, Jiajinshan (2,600 m), Baoxing County, Ya'an City, 2018.VIII.13–15, J.Y. Qiu & H. Xu leg. (HUNAU).

Paratypes. [**Sichuan**] 2♀, same data as holotype (HUNAU).

Etymology. The specific epithet refers to the type locality, Mt. Jiajinshan.

Distribution. China (Sichuan).

Remarks. This species is endemic to Mt. Jiajinshan, Sichuan Province, China and occurs in August.

DNA barcodes of two *N. jiajinshana* **sp. nov.** specimens are generated, and their sequences show no differences. This species is closest to *N. sakaii* (pairwise distances: 0.057–0.060).

(73) ***Nemophora karafutonis*** (Matsumura, 1932)

Nemotois karafutonis Matsumura, 1932: 124, pl. IV, fig. 13 (TL: Japan, Toyohara; SEHU).
Nemophora karafutonis: Kozlov 1997b: 43; Dubatolov 2007: 43 (Russia); Hirowatari 2013: 108, fig. 3-08-26, 27, 28 (Japan); Sun *et al*. 2022: 315, figs. 14, 37 (review).
Nemophora moriokensis Okano, 1957: 63, pl. 1, figs. 1, 2 (TL: Japan, North Honshu).
Nemophora karafutonis moriokensis (Okano, 1957): Umetsu 2014: 6, fig. 15 (Akita, Japan).

Diagnosis. This species can be distinguished by the tegumen having a triangular plate extending from the middle to the posterior 1/3; the uncus is dome-shaped; the median process of the transtilla is triangular; and the phallus has a pair of sclerotized belts in the distal 1/3 (Sun *et al.* 2022).

Specimens examined. Specimens from China were not available in this study.

Distribution. China (Liaoning); Japan, Russia, South Korea.

Remarks. This species was first recorded in China by Sun *et al*. (2022).

(74) ***Nemophora lapikella*** Kozlov, 1997
(Plates VIII-1, XVIII-5, XXVII-3)

Nemophora lapikella Kozlov, 1997b: 40, figs. 1–6 (TL: Southern Primorye, Khasan reg., Slavjanka, Russia; MZH); Wang *et al*. 2000: 23–24; Kozlov 2002: 96 (Japan, Kyushu, Kurodake); Dubatolov 2007: 43 (Russia: Khabarovsk); Shao *et al*. 2008: 550 (Checklist of Taiwan); Hirowatari 2013: 110, fig. 3-09-27; Sun *et al.* 2022: 316, figs. 15, 38 (review).

Diagnosis. Compared with other species of the *deggerella* group, this species can be distinguished by the conspicuous silver-gray longitudinal stria separating the subapical radial striae; the valva is distinctly short, not beyond the apex of the uncus; and the median process of the transtilla has narrow base.

Specimens examined. [**Hunan**] 2♂2♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VI.19–23, C.Q. Liao leg.; 1♂3♀, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2020.VII.5, C.Q. Liao & M. Deng leg.; 6♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2009.V.26–27, G.H. Huang leg.; 1♂, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V.10, C.Q. Liao & M. Deng leg.; 4♂, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2009.V.27, G.H. Huang leg.; 1♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.IV.26, C.Q. Liao leg.; [**Guangxi**] 4♂, Maoershan National Nature Reserve, Xing'an County, Guilin City, 1996.V.26, M. Sato leg. (HUNAU).

Distribution. China (Hunan, Guangxi, Hubei, Zhejiang, Shandong, Yunnan, Taiwan); Russia, Japan, Korea.

Remarks. Kozlov (1997b) described this species based on numerous specimens from different localities in

Russia, China, and Korea, and placed it in the *degeerella* species group with other 14 adelids species from South–eastern Asia. This species shares with four other species (*N. chalybeella*, *N. sapporensis*, *N. polychorda* and *N. staudingerella*) the glossy metallic iridescent spot on the forewing outside the central fascia, which is directed along the veins and usually positioned between Rs_4 and M_2; however, it can differ from other species by different features in external characters or male genitalia, such as the coloration of the male antenna or forewing pattern, pair of carinae on the ventral wall of the aedeagus, and the absence of a funnel-shaped structure at the tip of the aedeagus.

This species occurs from July to August in Russia but mainly occurs from June to July in China and Korea. Male adults are usually gregarious and swarming in the sunshine (Kozlov 1997b, 2002).

A DNA barcode of one *N. lapikella* specimen is generated. This species is closest to *N. syfaniella* (pairwise distances: 0.064–0.066).

(75) ***Nemophora latirectangula*** Sun, Wang & Li, 2022

Nemophora latirectangula Sun, Wang & Li, 2022: 317, figs. 16, 39 (TL: China, Hebei, Mt. Heilong; NKU).

Diagnosis. This species is similar to *N. amatella* but can be distinguished by the tegumen with a semicircular plate; and the ventral margin of the valva is roundly convex in the basal 1/5 and 1/3 (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Hebei).

Remarks. This species was described by Sun *et al*. (2022) based on specimens collected from Mt. Heilong, Hebei, China.

(76) ***Nemophora litangensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VIII-2, XVIII-6)
LSID urn:lsid:zoobank.org:act:CC307B9D-D3C3-4EB1-BA65-B53E175421D9

Diagnosis. This new species is very unique in having the transverse central fascia of the forewing almost completely interrupted at the middle and forming two large spots, the anterior one near quadrilateral and the posterior one near triangular. In addition, the forewing of this species is unique in the yellow subapical area, with some indistinct radial striae and basal half with two yellow longitudinal striae.

Description. Male. Forewing about 11.0 mm; wing expanse about 23.1 mm.

Vertex covered with black hairs mixed with pale yellow; face with smooth black scales. Eyes very small, far away to each other dorsally; eye size index about 0.5. Labial palpus short, covered with black and yellow hairs; galeae with yellow scales laterally. Antenna slender, 34.3 mm, about 3.1 × forewing length; black, apical part slightly light color. Legs dark brown to black with yellow inner surface of each tibia; hind tibiae with brown to dark brown long hairs. Thoracic dorsum and tegula dark brown to black, with purple metallic luster. Forewing lanceolate, length about 3.6 × width; ground color dark brown and black, with blue metallic luster on some places; basal half with two yellow longitudinal striae placed at subcostal and postcubitus veins; transverse central fasciae almost completely interrupted at middle and formed two large spots, which the anterior one near quadrilateral and the posterior one near triangular; subapical area with 7–8 black radial striae reaching outer margin, sometimes indistinct apically; cilia dark brown to black; vein R_3 stalked with R_4 at basal 2/3. Hindwing black except basal anterior part yellow; cilia dark brown to black; Rs stalked with M_1 at middle. Abdomen black dorsally and yellow to brownish ventrally.

Female. Unknown.

Male genitalia. Uncus triangular, with weak median keel. Vinculum moderate in size, about 2.5 × as long as valva. Valva triangular, with blunt apex; inner margins slightly curved, lateral margins nearly straight; sacculus distinctly expanding at basal part, close to each other, fused basally; suspensorium nearly quadrate, anterior part slightly beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process short and pointed, with a pair of broad anterior angles laterally. Aedeagus slender; basal 1/4 slightly curved dorsally; apical portion with a sclerotized bar ventrally; vesica with a lot of minute spinules dorsolaterally. Juxta arrow-shaped; arrow-head very long with blunt apex, lateral arms slender and short.

Holotype. [**Sichuan**] ♂, Litang County (3,800 m), Ganzi Tibetan Autonomous Prefecture, 2004.VIII.10, M. Wang & L.S. Chen leg. (HUNAU).

Paratype. [**Sichuan**] 1♂, same data as Holotype (HUNAU).

Etymology. The specific epithet refers to the type locality, Litang County, Ganzi Tibetan Autonomous Prefecture, Sichuan, China.

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan Province, China, and occurs in August.

(77) ***Nemophora ochsenheimerella*** (Hübner, [1813])

Tinea ochsenheimerella Hübner, [1813]: 53, fig. 259 (TL: Europe; BMNH).
Adela ochsenheimerella: Walker 1863: 500; Schütze 1899: 165; Rebel 1901: 245 (catalog); Küppers 1980: 277.
Nemotois ochsenheimerella: Meyrick 1912a: 10; Meyrick 1912b: 8 (C. Europe).
Nemophora ochsenheimerella: Zumkehr 1987: 21; Karsholt & Razowski 1996: 342; Shen & Liu 1999: 264 (China, Henan); Kozlov 2004b: 118 (checklist of Europe); Lesar & Govedič 2010: 45 (checklist of Slovenia); Hirowatari 2013: 108, fig. 3-09-5, 6, 7, 8, 9; Umetsu 2014: 6, fig. 16 (Japan, Akita Prefecture); Fukuda & Kanai 2016: 18 (Japan, Kirishima); Bryner 2020: 130, figs. 64–68 (biology).
Nemotois chibiana Matsumura, 1931: 1112, fig. 2334 (TL: Japan, Hokkaido; SEHU); Matsumura 1932: 126, pl. IV, fig. 20 (Japan); Razowski & Kumata 1985: 7 (Type catalog).
Nemophora japanalpina Yasuda, 1957: 38, fig. 2, 9, 10, 11 (TL: Japan, Honsyû [Honsyu]).

Diagnosis. This species can be easily distinguished by its characteristic V-shaped yellow spot on the distal part of the forewing. Although this species is very similar to *N. wakayamensis* and *N. recurvatifera*, it is very small with 10–15 mm of wing expanse (while more than 20 mm in the latter two species).

Specimens examined. Specimens from China were not available in this study.

Distribution. China (Henan); Japan, Central Europe including Austria, Belgium, Czech Republic, Denmark, France, Germany, Hungary, the Netherlands, Poland, Romania, Slovakia, Switzerland.

Remarks. This species is widely distributed in Central Europe and East Asia, and it was firstly recorded in China by Shen & Liu (1999). Bryner (2020) reported immature stages and related biology of this species and suggested that this species was associated with *Picea abies* and *Abies alba*.

(78) ***Nemophora parvaprocessa*** Sun, Wang & Li, 2022

Nemophora parvaprocessa Sun, Wang & Li, 2022: 318, figs. 17, 40 (TL: China, Shaanxi, Mt. Hua; NKU).

Diagnosis. This species is similar to *N. staudingerella* but can be distinguished by the inverted heart-shaped uncus; the sacculus reaches near the middle of the ventral margin; and the phallus lacks a sclerotized belt (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Shaanxi).

Remarks. This species was described by Sun *et al*. (2022) based on specimens collected from Mt. Hua, Shaanxi, China.

(79) ***Nemophora polychorda*** (Meyrick, 1914)
(Plates VIII-3, IX-3, XIX-1, XXVIII-1, XXX-1-4, XXXI-1, 6, 7)

Nemotois polychorda Meyrick, 1914: 61 (TL: Formosa, Kankau [Taiwan, Pingdong]; BMNH); Matsumura 1931: 1112, fig. 2338 (Taiwan); Matsumura 1932: 126, pl. 4, fig. 19 (Formosa [Taiwan]).
Nemotois polychroda [sic!]: Hua 2005: 2 (list of China).
Nemophora polychorda: Heppner 1992: 63 (Checklist of Taiwan); Wang *et al*. 2000: 13–14 (China, Taiwan); Hirowatari 2005a: 323, figs. 1I–J, 8, 14A–C (Ryukyus, Japan); Shao *et al*. 2008: 550 (Checklist of Taiwan); Hirowatari 2013: 110; Sun *et al.* 2022: 319 (review).

Diagnosis. This species differs from other species of the *degeerella* group by the following characters: the abdominal tergites are uniformly dark brown but sternites are dark brown in the anterior half and yellow posterior half; the middle and hind tarsi have yellow rings basally; the vinculum is relatively narrow and slender, about 2.3 × length of valva; and the whole length of aedeagus is nearly straight, with long and pointed apical sclerite.

Specimens examined. [**Hunan**] 1♂1♀, Xianchijie, Wuyunjie National Nature Reserve, Taoyuan County, Changde City, 2020.VI.10–16, C.Q. Liao leg.; 6♂7♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2021.VI.5–6, C.Q. Liao leg.; 4♂2♀, Shuangjiangkou, Jintongshan National Nature Reserve, Chengbu Miao Autonomous County, Shaoyang City, 2020.V.7, C.Q. Liao leg.; [**Chongqing**] 24♂, North slope of Jinfoshan, Nanchuan District (1,000 m), 2016.V.28, J.Y. Qiu leg.; [**Taiwan**] 2♂, Wugongshan (1,000 m), Maolin country, Gaoxiong City, 2002.III.23, B. Tanaka & T. Mano leg.; 2♂, Gaofeng, 2004. VI.10, M. Wang leg. (HUNAU); 10♂, Kenting Park, Pingdong County, 1982.III.14, S. Hashimoto leg. (ELKU).

Distribution. China (Hunan, Chongqing, Taiwan); Japan.

Remarks. Meyrick (1914) described this species based on Taiwanese specimens, and we report it from mainland China for the first time in this paper. The examined specimens were very large, with wing expanse rangeing from 25 to 30 mm in males, the same as that from Taiwan (Wang *et al*. 2000), while only 20–22 mm in representatives from the Ryukyus (Hirowatari 2005a). Male adults have been observed swarming over or around trees (Hirowatari 2005a). We also found that adults of the species usually rest on plant leaves or nectar on the flowers around the habitat (Plates XXX-1–4). In addition, we can also collect this species by insect net in the day time (Plates XXXI-6, 7) and by light trap at midnight (Plate XXXI-1).

A DNA barcode of *N. polychorda* from Japan is generated, and the closest sequence is *N. staudingerella* from Japan (pairwise distance: 0.044).

(80) ***Nemophora purpuratifera*** Sun, Wang & Li, 2022

Nemophora purpuratifera Sun, Wang & Li, 2022: 319, figs. 18, 41 (TL: China, Henan, Qihe; NKU).

Diagnosis. This species is similar to *N. degeerella* but can be distinguished by the tegumen with a triangular plate extending from middle to posterior 1/5; the inverted V-shaped uncus: and the phallus has denticles and sclerotized belts but without spines (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Henan).

Remarks. This species was described by Sun *et al*. (2022) based on a single specimen from Qihe, Henan, China.

(81) ***Nemophora ravidifera*** Sun, Wang & Li, 2022

Nemophora ravidifera Sun, Wang & Li, 2022: 321, figs. 19, 42 (TL: China, Hebei, Mt. Wuling; NKU).

Diagnosis. This species is similar to *N. schrenchki* but can be distinguished by the forewing with a round black spot near the base between Sc and the anterior margin of the cell; the tegumen lacks a median ridge; the valva is fused for basal 2/7; and the transtilla has a spiniform median process (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Hebei).

Remarks. This species was described by Sun *et al*. (2022) based on a single specimen collected from Mt. Wuling, Hebei, China.

(82) ***Nemophora recurvatifera*** Sun, Wang & Li, 2022
(Plates VIII-4, XIX-2)

Nemophora recurvatifera Sun, Wang & Li, 2022: 321, figs. 20, 21, 43, 51 (TL: Tibet, Linzhi, Pailong Village; NKU).

Diagnosis. This species is unique in the genus *Nemophora* by the V- or U-shaped yellow marking in the subapical area of the forewing. This species is very similar to *N. ochsenheimerella* (Hübner, 1813) from Europe and *N. wakayamensis* (Matsumura, 1931) from Asia, but can be easily distinguished by the forewing with a silvery gray streak along the anterior margin of the cell curved downward to CuP apically. The male genitalia is distinguished by the an inverted V-shaped uncus; and the phallus of male genitalia has an apical process curved at a right angle (Sun *et al.* 2022).

Specimens examined. [**Tibet**] 1♂, Pailong Country, Linzhi City, 2021.V.7, H.L. Han, J. Wu & J.J. Fan leg.; 1♂, 2 km ahead of Sangzhenka Village, Gedang Country, Motuo County, Linzhi City, 2021.V.25–30, J. Wu & J.J. Fan leg. (HUNAU).

Distribution. China (Tibet).

Remarks. This species was described by Sun *et al*. (1931) based on specimens from Pailong Village. We have collected this species from the same type locality and another place, Sangzhenka Village, Gedang Country.

(83) ***Nemophora sapporensis*** Matsumura, 1931

Nemotois sapporensis Matsumura, 1931: 1113, fig. 2341 (TL: Japan, Hokkaido, Sapporo; SEHU)
Nemophora sapporensis: Hirowatari 2013: 108, fig. 3-09-13,14,15,16,17,18,19 (Japan); Umetsu 2014: 6 (Japan, Akita Prefecture).
Nemophora montana Okano, 1957: 64, pl. 1, figs. 5, 6 (TL: Japan, Honshu, Hachimantai, Ôage-numam)
Nemophora japonica (nec. Stringer): Sun *et al*. 2022, figs. 13, 36 (review).

Diagnosis. This species can be distinguished by the forewing lacking a black speckle, the tegumen having a distinct median ridge, and the phallus having neither a belt of short spines nor a process (Sun *et al.* 2022).

Specimens examined. Holotype in BEHU and some Japanese specimens in OPU and ELKU were examined. Specimens from China were not available in this study.

Distribution. China (Guangxi, Henan, Shaanxi); Japan, Russia.

Remarks. Sun *et al.* (2022) recorded this species, as *N. japonica*, for the first time in China and redescribed its adult and male genitalia. *Nemphora japonica* is treated as a synonym of *N. staudingerella* in the present study (see the remarks section of *N. staudingerella*). Hirowatari (2013) indicated some variations of wing markings and male genitalia of *N. staudingerella* and *N. sapporensis* in Japan.

(84) ***Nemophora seorsifascia*** Sun, Wang & Li, 2022

Nemophora seorsifascia Sun, Wang & Li, 2022: 323, figs. 22, 44 (TL: China, Sichuan, Wenchuan County, Sanjiangcaoping Village; NKU).

Diagnosis. This species differs from other members of this species group by the following characters: the outer fascia of the forewing is separated by brownish yellow scales at anterior 2/5; each distal yellow stripe has a black dot at the base; and the vesica of the male genitalia has a cluster of spines (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Sichuan).

Remarks. This species was described by Sun *et al*. (2022) based on a single specimen from Wenchuan, Sichuan, China.

(85) ***Nemophora spinatibaltea*** Sun, Wang & Li, 2022

Nemophora spinatibaltea Sun, Wang & Li, 2022: 323, figs. 23, 45 (TL: China, Sichuan, Wenchuan County, Sanjiangcaoping Village; NKU).

Diagnosis. This species is similar to "*N. japonica*" (=*N. sapporensis*) but can be distinguished by the following characters: the forewing has a black line along the anterior margin of the cell; the uncus of the male genitalia is dome-shaped; and the phallus has sclerotized belts but without denticles (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Guizhou, Henan, Shaanxi).

Remarks. This species was described by Sun *et al*. (2022) based on specimens collected from multiple provinces in China.

(86) ***Nemophora staudingerella*** (Christoph, 1881)
(Plates VIII-6, IX-4, 5, XIX-4)

Adela staudingerella Christoph, 1881: 435, (TL: Russia, Wladiwostok); Rebel 1901: 245 (catalog).
Nemotois staudingerella: Meyrick 1912a: 9 (Ostsibirien); Meyrick 1912b: 8 (E. Siberia).
Nemophora staudingerella: Liu 1981: 9, pl.4, fig.19 (color photos) (NE China, Siberia, Japan); Cai *et al*. 1994: 181, fig. 261 (China, Qinghai); Hua 2005: 2 (list of China, in Incurvariidae); Dubatolov 2007: 44 (Russia: Khabarovsk); Hirowatari 2013: 110, fig. 3-09-20,21,22,23,24 (Japan); Umetsu 2014: 7, fig. 19 (Japan, Akita Prefecture); Yu 2015: 15 (China, Beijing); Kozlov 2016c: 33 (catalogue of Russian Far East); Fukuda & Kanai 2016: 18 (Japan, Kirishima Mt.); Sun *et al.* 2022: 326, figs. 24, 25, 46, 52 (review).
Nemophora japonica Stringer, 1930: 420 (TL: Japan, Kii, Mt. Iwawakisan; BMNH).
Adela suzukiella Matsumura, 1931: 1110, fig. 2326 (TL: Japan, Honshu; SEHU).
Nemotois suzukiella: Matsumura 1932: 125, pl. 4, fig. 15 (list of Japan).
Adela teshionis Matsumura, 1931: 1110, fig. 2327 (TL: Japan, Hokkaido, Teshio; SEHU); Razowski & Kumata 1985: 27 (Type catalog).
Nemotois teshionis: Matsumura 1932: 124, pl. IV, fig. 14 (list of Japan).

Diagnosis. This species is smaller in size, and the wing expanse is usually not larger than 20 mm. There is a large degree of variations on the subapical radial striae of the forewing, but the base of the striae is connected; the abdomen is dark brown dorsally and yellow ventrally. In addition, the valva has distinct narrow, slender tip, and is far beyond the uncus.

Specimens examined. [**Shaanxi**] 5♂2♀, Jialingjiang source, Baoji City, 2010.VI.18, G.H. Huang leg.; 2♂1♀, Fenshuiling, Qinling Mountain, Xi'an City, 2019.VII.23, G.H. Huang leg.; [**Sichuan**] 1♂, Guiyuan Garden (2,000 m), Donglashan Grand Canyon, Baoxing County, Ya'an City, 2011.VI.17, G.H. Huang leg.; 2♂, Xindianzi, Yajiageng, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2019.VII.10, B. Chen & M. Deng leg.; [**Yunnan**] 2♂, Zhoudian, 2004.VI.28, M. Wang & D.Y. Xin leg. (HUNAU).

Distribution. China (Heilongjiang, Liaoning, Jilin, Beijing, Hebei, Hubei, Shaanxi, Sichuan, Yunnan, Guizhou, Qinghai); Russia, Japan, Korea.

Remarks. This species is very variable in the forewing pattern, especially subapical radial striae from only one narrow linear stria to numerous radial striae that vary in length, usually not beyond half the distance between the external band and the outer margin of the forewing. Thus, it easily leads to misidentification based on different types of forewing patterns. For example, Matsumura (1931, 1932) once described this species as two independent species, namely *N. suzukiella* and *N. teshionis*. This species has a very wide geographical distribution from the Russian Far East to the Southwest of China and usually occurs from May to July.

In this paper, *Nemphora japonica* Stringer, 1930 is treated as a synonym of *N. staudingerella*, accepting the comments of Issiki (1957) and the treatment of Moriuti (1982). However, Kozlov (1997) treated *N. japonica* as a senior synonym of *N. sapporensis* Matsumura, 1931 and *N. montana* Okano, 1957. Although we did not dissect the syntype specimens of *N. japonica* (Plate IX-5), examination of some males from the same locality (Mt. Iwawakisan, Osaka) by the second author (Hirowatari) revealed that their male genialia was identical to that of *N. staudingellea.* As shown by Hirowatari (2013), the wing markings of some individuals of *N. staudingellea* from western Japan are very similar to those of *N. sapporensis*; therefore, Kozlov (1997) might regard *N. japonica* as a synonym of *N. sapporensis.*

Two DNA barcodes of *N. staudingerella* from Japan are generated, with an intraspecific pairwise distance of 0.023. The closest sequence is one barcode of *N. biprocessa* with a pairwise distance of 0.041.

(87) ***Nemophora syfaniella*** (Caradja, 1927)
(Plates VIII-7, IX-7-9, XIX-5, XXVIII-2)

Adela syfaniella Caradja, 1927: 63. (Type locality: Szetschwan, Tatsienlu [= Kangding, Sichuan, China]; MINGA); Hua 2005: 2 (list of China).
Nemophora syfaniella: Kozlov 1997b: 43; Sun *et al.* 2022: 327 (review).

Diagnosis. This species differs from other species by the following characters on forewing pattern: the four black longitudinal striae are present at the base; both sides of the central fascia have bronze bands approximately equal in width; and the subapical area has ten black radial striae connecting with the central fascia and outer margin.

Specimens examined. [**Sichuan**]1♂, Lectotype deposited in MINGA with labels as follows: "LECTOTYPE / Adela / syfaniella / ♂ Car. / Romänia DES. Dr. A. POPESCU - GORJ", "Adela / syfaniella / Typen Car.", and "Szetschwan / Tatsienlu / Exp. Stötzner" (MINGA); 1♂, "PARALECTOTYPE / Adela / syfaniella / ♂ Car. / Romänia DES. Dr. A. POPESCU - GORj", "Szetschwan, Sunpanting, exp. Stötzner", and "3" (MINGA); 1♂, "PARALECTOTYPE / Adela / syfaniella / ♂ Car. / Romänia DES. Dr. A. POPESCU - GORj", "Szetschwan, Sunpanting, exp. Stötzner", and "11" (MINGA); 1♂2♀, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2009.VII.18–20, G.H. Huang leg.; 1♂2♀, Jiajinshan (2,600 m), Baoxing County, Ya'an City, 2019. VIII.13–15, J.Y. Qiu & H. Xu leg.; 2♀, Xingou Village, Labahe Town, Tianquan County, Ya'an City, 2004.VII.15, L.S. Chen leg.; [**Hunan**] 1♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.IV.26, C.Q. Liao leg.; [**Shaanxi**] 1♀, Jialingjiang source, Baoji City, 2010.VI.18, G.H. Huang leg.; 6♂, Jialingjiang source (1,400–2,100 m), Baoji City, 2010.VI.18–19, G.H. Huang leg.; [**Gansu**] 1♂, Baihua Forest Farm, Xiaolongshan National Forest Park, Tianshui City, 2010.VI.18, G.H. Huang leg.; [**Yunnan**] 1♂, Zhoudian, 2004.VI.28, M. Wang leg.; 1♂, Weixi Lisu Autonomous County, Diqing Tibetan Autonomous Prefecture, 2016. VII.19, H.S. Wang leg. (HUNAU).

Distribution. China (Hunan, Shaanxi, Sichuan, Yunnan, Gansu).

Remarks. Caradja (1927) arranged specimens of *N. basiradiella* collected by Raddé (M. Korb) and described it as a new species, namely *Adela syfaniella*, and then there are no related reports and redescriptions about it.

Three DNA barcodes of *N. syfaniella* are generated with intraspecific pairwise distances of 0.002–0.014. This species is closest to *N. ganziensis* **sp. nov.** (pairwise distances: 0.034–0.038), *N. bellela* (pairwise distances: 0.034–0.040), and *N. amatella* (pairwise distances: 0.035–0.040).

(88) ***Nemophora tianpingshana*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VIII-8, XIX-6)
LSID urn:lsid:zoobank.org:act:E471C62B-08AC-4328-934F-9D7B6EC512C7

Diagnosis. This species is similar to *N. syfaniella* but can be easily distinguished by the larger body and long forewings with 24.5 mm of expanse and *ca.* 3.6 of length/width, while 20 mm of expanse and *ca.* 3.4 of length/width in *N. syfaniella*. In the male genitalia, this species has relatively shorter vinculum about 2.66 × valvar length, but about 2.75 × in *N. syfaniella*.

Description. Male. Forewing 11.8–12.0 mm; wing expanse about 24.8 mm.

Vertex covered with yellow hairs mixed with black; face with smooth yellow scales. Eyes very small, far away to each other dorsally; eye size index about 0.48. Labial palpus short, covered with brownish scales and black hairs; galeae with yellow scales laterally. Antenna slender, black, 36.5 mm, about 3.1 × forewing length. Legs yellow except apical tibiae black; hind tibiae with brown to dark brown long hairs. Thoracic dorsum and tegula yellow to brown, with purple metallic luster. Forewing lanceolate, ground color yellow to brownish; basal 2/3 with four black-margined silver-gray longitudinal striae placed at costal, radial, median and postcubitus veins, not reaching to central fascia; and three black lines placed between above striae; middle part with two black-margined silver-gray transverse fasciae separated a yellow transverse broad band; subapical area with 7 black radial striae reaching outer margin and two triangular spots placed at dorsum and hind angle; cilia dark brown to black, with purple metallic luster; vein R_3 stalked with R_4 at basal 1/3. Hindwing and cilia dark brown to black; Rs stalked with M_1 at basal 3/5. Abdomen black.

Female. Unknown.

Male genitalia. Uncus triangular, with weak median keel. Vinculum moderate in size, about 2.6 × as long as valva. Valva triangular, with blunt apex; inner margins slightly curved, lateral margins straight with a small process basally; sacculus distinctly expanding at basal 1/3, basal part nearly fused medially; suspensorium nearly quadrate, anterior part not beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process short and pointed, with a pair of distinct anterior angles. Aedeagus slender; basal 1/3 curved dorsally; a rounded dorsal lobe covered with minute spines and a smooth ventral lobe formed an arcuate slender bar; vesica with a pair of angular carinae dorsolaterally. Juxta arrow-shaped; arrow-head long and pointed, lateral arms relatively short.

Holotype. [**Hunan**] ♂, Mt. Tianpingshan, Badagongshan National Nature Reserve, Sangzhi County, Zhangjiajie City, 2018.IV.26, C.Q. Liao leg. (HUNAU).

Etymology. The specific epithet refers to the type locality, Mt. Tianpingshan.

Distribution. China (Hunan).

Remarks. This species is endemic to Hunan Province, China, and occurs in April.

One DNA barcode of *N. tianpingshana* **sp. nov.** is generated, and this sequence is closest to that of six *N. bellela* specimens (pairwise distances: 0.038–0.041).

(89) ***Nemophora triangulifascia*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VIII-5, XIX-3)
LSID urn:lsid:zoobank.org:act:5518E922-1351-4AF4-B038-4B758408C021

Diagnosis. This species is similar to *N. karafutonis moriokensis* but can be distinguished by the special triangular yellow spot positioned in near the costal margin of the subapical area, while 4–6 unclear brownish short longitudinal striae in *N. k. moriokensis*. Additionally, this species has relatively large eyes in male (eye size index about 1.8) and distinctly protruded lateral margins of the valva basally.

Description. Male. Forewing about 8.1 mm; wing expanse about 17.0 mm.

Vertex covered with yellow hairs; face with smooth yellow scales and brown hairs. Eyes moderate in size, eye size index about 1.8. Labial palpus short, covered with black and yellow hairs; galeae with brown scales laterally. Antenna slender, 23.2 mm, about 2.9 × forewing length; black, apical part slightly light color. Legs dark brown to black but yellow in each tarsi and hind tibiae; hind tibiae with yellow long hairs. Thoracic dorsum and tegula brownish to dark brown, with purple metallic lusters. Forewing lanceolate, ground color yellow basally and black apically; basal part with two black-margined silver gray longitudinal striae placed at anterior and posterior margins of cell, which the second stria abruptly bending forward and almost reaching to apex of the first stria; four black narrow lines placed between these two striae and posterior area; middle part with two black-margined silver gray transverse central fasciae which separated by a broad yellow band; subapical area with a large triangular yellow spot connected apical half of the outer central fascia, and many shadowy yellow scales vaguely formed into 7 radial striae almost reaching outer margin; cilia black. Hindwing and cilia dark brown to black. Abdomen dark brown except apex black.

Female. Unknown.

Male genitalia. Uncus triangular, with weak median keel. Vinculum moderate in size, about 2.6 × as long as valva. Valva triangular, with blunt apex; inner margins slightly curved, lateral margins nearly straight, with broad base obviously beyond the width of vinculum; sacculus distinctly expanding at basal part, close to each other, fused basally; suspensorium nearly trapezoid, relatively pointed anterior part far beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process long and pointed, with a pair of broad anterior angles laterally. Aedeagus slender; basal 1/4 and 3/4 slightly curved dorsally; apical portion with a pair of long sclerotized bar ventrally; vesica with two rows of spines dorsolaterally. Juxta arrow-shaped; arrow-head broad with blunt apex, lateral arms short.

Holotype. [**Tibet**] ♂, 2 km ahead of Sangzhenka Village, Gedang Country, Motuo County, Linzhi City, 2021. V.25–30, J. Wu & J.J. Fan leg. (HUNAU).

Etymology. The specific epithet refers to the special triangular yellow spot near the costal margin of the forewing subapex.

Distribution. China (Tibet).

Remarks. This new species is endemic to Tibet, China and occurs in May.

(90) ***Nemophora triuga*** Sun, Wang & Li, 2022

Nemophora triuga Sun, Wang & Li, 2022: 333, figs. 26, 47 (TL: China, Tibet, Nielamu County, Zhangmu Town; NKU).

Diagnosis. This species differs from its congeners by the following characters: 1) the distally digitate valva with three longitudinal ridges on the ventral surface; 2) the sacculus sclerotized medially; and 3) the vinculum elongate ovoid (Sun *et al.* 2022).

Specimens examined. Not available in this study.

Distribution. China (Tibet).

Remarks. This species was described by Sun *et al*. (2022) based on specimens collected from Zhangmu Town, Tibet, China.

(91) ***Nemophora uncella*** Kozlov, 1997

Nemophora uncella Kozlov, 1997c: 15, figs. 2, 8–12 (TL: China, Taiwan; USNM); Heppner 1992: (Checklist of Taiwan); Wang *et al*. 2000: 21–22; Shao *et al*. 2008: 550 (Checklist of Taiwan).

Diagnosis. This species is similar to *N. aurora* but can be characterized by the following features: the external silver-gray band of the forewing central fascia is broken in the middle; the part adjacent to the costal margin is hook-shaped in such a way that its distal part is parallel to the costal margin; the vinculum is long, more than 3 × the length of the valva; the medial margin of the valva distally has a prominent lobe appearing laterally as a triangular process.

Specimens examined. Not available in this study.

Distribution. China (Taiwan).

Remarks. Adults usually fly above the ground at 9–10 a.m. and 3–4 p.m. (Kozlov 1997c). Kozlov (1997c) also noted that this species feeds on the flowers of *Lithocarpus formosana*, *L. kawakamii* and *Castanopsis longicaudata* (Fagaceae).

(92) ***Nemophora yajiagengensis*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VIII-9, XX-1)
LSID urn:lsid:zoobank.org:act:95F9F6BB-3F05-40FD-8C61-F7E7A660D0BE

Diagnosis. This species is similar to *N. congruella* (Zeller, 1839) in the forewing pattern, but it can be easily distinguished by the following characters: the longitudinal striae of the forewing base do not reach the central fascia, while connecting with the central fascia in *N. congruella*; the both sides of the forewing central fascia are relatively straight, while wavy in *N. congruella*; and the subapical radial striae are black and narrow except the middle one broad, while uniform in size in *N. congruella*.

Description. Male. Forewing 7.6–7.7 mm; wing expanse about 16.1 mm.

Vertex covered with brown hairs; face with smooth brown scales. Eyes very small, far away to each other dorsally; eye size index about 0.46. Labial palpus short, covered with brownish scales and black hairs; galeae with yellow scales laterally. Antenna slender, black, 24.8–25.0 mm, about 3.2 × forewing length. Legs yellow except apical tibiae and tarsi blackish; hind tibiae with yellow to brown long hairs. Thoracic dorsum and tegula black. Forewing lanceolate, ground color pale yellow; basal 2/3 with four black-margined silver-gray longitudinal striae placed at costal, radial, median and postcubitus veins, not reaching to central fascia; and two black lines placed between them; middle part with two black-margined silver-gray transverse fasciae separated a yellow transverse broad band; subapical area with 10 black radial striae reaching outer margin and a silver-gray spot between the fourth and fifth striae; cilia dark brown to black. Hindwing and cilia dark brown to black. Abdomen black.

Female. Unknown.

Male genitalia. Uncus triangular, with weak median keel. Vinculum slender, about 3.1 × as long as valva; lateral margins distinct narrowed slowly and approximately parallel in anterior half; anterior margin rounded, posterior margin distinctly arcuate. Valva triangular, with blunt apex; inner margins slightly curved, lateral margins straight;

sacculus slightly expanding at middle part, basal part fused medially; suspensorium nearly quadrate, anterior part slightly beyond posterior margin of vinculum in ventral view. Transtilla wide laterally and narrow medially; median process short and pointed, with straight anterior margin. Aedeagus slender; apical 1/3 curved dorsally; apical portion with dorsal and ventral lobes; vesica with a pair of long slender carinae dorsolaterally originated from apical 2/5. Juxta arrow-shaped; arrow-head long and pointed, lateral arms slender.

Holotype. [**Sichuan**] ♂, Xindianzi, Yajiageng, Moxi Town, Luding County, Ganzi Tibetan Autonomous Prefecture, 2019.VII.10, B. Chen & M. Deng leg. (HUNAU).

Etymology. The specific epithet refers to the type locality, Yajiageng.

Distribution. China (Sichuan).

Remarks. This species is endemic to Sichuan Province, China and occurs in July.

A DNA barcode of *N. yajiagengensis* **sp. nov.** is generated. This species is closest to one of the *N. syfaniella* specimen (LCQ217) with 0.051 of pairwise distance.

(93) ***Nemophora yunnanica*** Kozlov, 2023

Nemophora yunnanica Kozlov, 2023b: 97, figs. 2, 8, 14 (TL: China, Yunnan, Lijiang; MINGA, NKU).
Nemotois augites: Meyrick 1938: 29 (partim); Popescu-Gorj 1992: 137 (partim); Sun *et al.* 2022: 306, figs. 4, 29 (misidentification).

Diagnosis. This species differs from *N. augites* by light yellowish-white frons and shorter vinculum with deep medial indentation on the distal margin. In addition, this species differs from *N. amatella* by the absence of bright yellow spots or wide stripes in the apical forewing, longer anellus and presence of carinae in apical part of phallus (Kozlov 2023b).

Specimens examined. Not available in this study.

Distribution. China (Yunnan).

Remarks. Kozlov (2023b) described this species based on the lectotype of '*Nemotois augites*' in MINGA and named it as '*Nemophora yunnanica*'. In addition, Kozlov (2023b) considered that four male specimens figured by Sun *et al.* (2022) under the name '*Nemophora augites* (Caradja *et* Meyrick, 1938)' are misidentification, and attributed them to the paratypes of *Nemophora yunnanica*.

Adults usually fly above the ground at 9–10 a.m. and 3–4 p.m. (Kozlov 1997c). Kozlov (1997c) also noted that this species feeds on the flowers of *Lithocarpus formosana*, *L. kawakamii* and *Castanopsis longicaudata* (Fagaceae).

3.15 Incertae sedis species

The genus *Nemophora* consists of many confirmed species groups including the species groups described above and other known or possible species groups, such as the *N. kalshoreni* group (Kozlov 2016a), *N. laurella* group (Kozlov 2016b), *N. fasciella* group (Kozlov 1997a) and a possible *N. decoratella* group (Kozlov 2020). In this study, we established some species groups that shared significant common autapomorphic characters. In addition, there are still many species whose species group status has not yet been defined. Here, we record six temporary incertae sedis species, of which *N. bispina* **sp. nov.** is described as a new species.

Key to incertae sedis species of the genus *Nemophora* based on external morphology and male genitalia

1 Forewing color uniformly dark brown to black, without other color markings . . . . . *N. bispina* **sp. nov.**
- Forewing with many colors and obvious markings 2
2 Forewing without central fascia, basal 3/4 scattered numerous long variegated stripes, with purple metallic luster . . . *N. raddei*
- Forewing with obvious central fasica at middle 3
3 Forewing ground color metallic green on basal half, with an oblique transverse black line at basal 1/4 and a Y-shaped black marking at half . . . . . *N. chrysocharis*
- Forewing ground color not green, without narrow transverse black lines 4

4 Forewing ground color metallic golden cupreous, base and half of forewing both with black transverse fasciae with purple luster . . . . . *N. ahenea*
- Forewing ground color dark brown, central fascia of forewing white; hindwing also white . . . . . *N. chionella*

(94) ***Nemophora ahenea*** Stringer, 1930
(Plate XI-6)

Nemophora ahenea Stringer, 1930: 422. (Type locality: Japan, Honsiu, Kii, Mt. Iwawakisan; BMNH); Issiki 1957: 13, pl. 2, fig. 30; Okano 1959: 277, pl. 183, fig. 14; Moriuti 1982: 1: 54, 2: pl, 1. Fig. 28 (color photos); Kozlov 1997d: (male genitalia); Hirowatari & Kametani 1999: 85, figs. 1–6 (mating behavior); Hirowatari 2000: 28, figs. 11-7, 12-1, 2 (biology); Wang *et al*. 2000: 5; Hirowatari 2005a: 312, figs. 1A–B, 4, 10A–C (revision of Ryukyu species); Hirowatari 2013: 104, fig. 3-07-17,18,19.

Diagnosis. The typical characters of this species are the blight metallic purple-red and bronze luster on the forewing, and blue-framed black striae on the base and middle part of the forewing.

Specimens examined. [**Taiwan**] 3♂ Nantou-Hsien, Lushan (1,800 m), 1996.VIII.5, T. Mano leg. (ELKU).

Distribution. China (Taiwan); Japan.

Remarks. This species was considered to have a sister-group relationship with *N. ochrocephala* Kozlov, 1997 by the large dark costal spot at the forewing base, the symmetrical carinae at the apex of aedeagus, and the prominent medial lobe of valva (Kozlov 1997d). Perhaps the similar forewing pattern and male genitalia may support these two species jointly, combining an additional species group.

Hirowatari (2005a) noted that this species presents some variations between different geographical population of mainland Japan and the Ryukyus, such as body size/wing expanse, metallic luster on the forewing, width of the forewing central fascia, and scale color of the basal antenna in female. Male adults were observed swarming above the flowers of *Stenactis annuus* (L.) Pers. (Asteraceae) and *Reynoutria japonica* Houtt. (Polygonaceae) (Hirowatari & Kametani 1999).

(95) ***Nemophora bispina*** Liao, Hirowatari & Huang, **sp. nov.**
(Plates VIII-11, XX-3)
LSID urn:lsid:zoobank.org:act:974E69FF-BD21-49ED-8749-EE742E7E2EEA

Diagnosis. This species is very similar to *N. violellus* (Stainton, 1851) based on the dominant eyes and uniformly brown to black ground color of forewing. But it can be distinguished by the following characters: 1) basal 1/7 of the antenna black and apical part black and white alternating; 2) dark brown to black hairs mixed with some whitish on vertex; 3) valva narrow and triangular, with small digitate process on each lateral base; 4) vinculum relatively long, about 3.4 × as long as valva; and 5) phallus with a pair of long sclerotized spines apically.

Description. Male. Forewing about 7.2 mm; wing expanse about 15.3 mm.

Head covered with raised dark brown to black hairs, mixed with some whitish hairs on vertex. Eyes very large, widely separated to each other dorsally; eye size index about 6.5. Labial palpus very long, *ca.* 1.9 × vertical eye diameter, covered with long black hairs mixed with some relative shorter whitish hairs. Galeae long, covered with dark brown scales laterally at base. Antenna slender, 17.2–18.8 mm, about 2.6 × forewing length; basal 1/7 with black and rough scales, apical part smooth, black and white alternating. Thorax dark brown with metallic golden luster. Legs dark brown to black; tarsi with white ring at each base. Forewing lanceolate, length about 3.1 times of width; ground color dark brown to black uniformly, with metallic golden and purple luster, especially apical part; cilia black with purple luster; vein R_3 separated with R_4. Hindwing dark brown, apical part black; cilia dark brown; vein Rs stalked with M_1 at basal 1/3. Abdomen dark brown to black with black.

Male genitalia. Uncus arched with a blunt median keel. Vinculum long and slender, about 3.4 × as long as valva. Valva narrow triangular in ventral view, with slightly pointed apex; each base with a dominant process laterally; sacculus completely fused to each other medially; suspensorium rounded, anterior part far beyond posterior margin of vinculum in ventral view. Transtilla narrow in median parts and broad in lateral parts; median process slender and pointed. Aedeagus long and straight, approximately 0.94 × vinculum length; apical 1/4 of manica with a pair of long sclerotized spines dorsolaterally. Juxta arrow-shaped; arrow-head wide, with widely rounded tip and wide short lateral arms.

Female. Unknown.

Holotype. [**Hunan**] 1♂, Mangshan National Nature Reserve, Yizhang County, Chenzhou City, 2020.V.10, C.Q. Liao & M. Deng leg. (HUNAU).

Paratype. [**Guangdong**] 1♂, Nanling National Nature Reserve, Ruyuan Yao Autonomous County, Shaoguan City, 2006.V.31–VI.6, L.S. Chen leg. (HUNAU).

Etymology. The specific epithet is derived from the Latin *bi-* (double) and *spina* (spine), referring to the two large spines of the phallus.

Distribution. China (Hunan, Guangdong).

Remarks. This species seems to belong to the *fasciella* species group because of the similar appearances, such as rather large eyes, long and densely hairy labial palpi, and uniform ground color of forewing. But the unique pair of long sclerotized spines of the phallus show a peculiar status of this species. Thus, we have temporarily designated this new species as an incertae sedis species which is close to the *fasciella* species group.

One DNA barcode of *N. bispina* **sp. nov.** is generated, and this sequence is closest to two *N. fasciella* specimens both with 0.048 of pairwise distances.

(96) ***Nemophora chionella*** (Caradja, 1935) **com. nov.**

Nemotois chionella Caradja, 1935: 95 (TL: China, Nanking [Nanjing], Lungtan [Longtan]; MINGA); Hua 2005: 2 (list of China).

Diagnosis. This species is characteristized by the black and white antennae, by the white central fascia of the forewing, and by the white hindwing.

Specimens examined. Not available in this study.

Distribution. China (Jiangsu).

Remarks. The species is endemic to Jiangsu, China and occurs in April. Three types were deposited in the MINGA.

(97) ***Nemophora chrysocharis*** (Caradja, 1938) **com. nov.**

Nemotois chrysocharis Caradja, 1938b: 257 (TL: China, Fukien [Fujian], Shaowu; MINGA): Hua 2005: 2 (list of China).

Diagnosis. This species is easily distinguished by the green ground color on the thorax and basal half of the forewing; the slightly oblique narrow transverse black line at the basal 1/4; and the Y-shaped black marking at half of the forewing.

Specimens examined. Not available in this study.

Distribution. China (Fujian).

Remarks. This species is endemic to Fujian, China and occurs in July.

(98) ***Nemophora raddei*** (Rebel, 1901)
(Plates VIII-10, XX-4)

Nemotois raddei Rebel, 1901: 243 (as n. nom. of *Adela raddeella*) (Amur.); Meyrick 1912a: 9; Meyrick 1912b: 7; Matsumura 1932: 125, pl. IV, fig. 17 (list of Japan).
Adela raddei: Matsumura 1931: 1110, fig. 2325 (Japan).
Nemophora raddei: Kuroko 1961b: 323, figs. 1–35 (life history); Hirowatari 2000: 26, fig. 11-2 (biology); Hua 2005: 2 (list of China, in Incurvariidae); Dubatolov 2007: 44 (Russia: Khabarovsk); Hirowatari 2013: 105, figs.3-07-20,21; Umetsu 2014: 5, fig. 6 (Japan, Akita Prefecture); Yu 2015: 15 (China, Beijing); Mishima 2016: 63 (Shimane Pre., Japan).
Nemotois raddeellus Christoph, 1882: 8 (praeocc.); Snellen 1884: 155, t. 8, f. 3, 3a (as nom. mut. propter *raddaëllum*).
Adela raddeella Christoph, 1882: 8 (TL: Amurgebietes, Raddefka).

Diagnosis. This species is easily distinguished from other species by the forewing, scattered with numerous long variegated stripes. In addition, the vertex and labial palpus were covered with dark brown to black long hairs.

Specimens examined. [**Taiwan**] 1♂, Wugongshan (1,000 m), Maolin Country, Gaoxiong City, 2002.III.23, B. Tanaka & T. Mano leg.; 1♂, Tengzhi (1,400 m), Taoyuan Country, Gaoxiong County, 2002.III.24, T. Mano leg.; [**Jilin**] 2♂, Zhuqueshan Park, Fengman District, Jilin City, 2021.V.10, C.H. Zhou leg. (HUNAU).

Distribution. China (Jilin, Beijing, Taiwan); Russia, Japan.

Remarks. The ovipositing host plants of this species have been reported to be *Castanea crenata* Sieb. (Fagaceae) and *Salix sieboldinana* Blume (Salicaceae), and their life histories have been described in detail (Kuroko 1961b; Hirowatari 2000; Yu 2015). The female adults lay eggs in the ovaries of the *Salix* and the first instar larvae feed on plant tissues. The second instar larvae produce portable cocoons utilized by catkin flowers of *Salix*, and then the larvae begin to feed on the ground and retrofit the cocoons with the dead leaves until pupation and emergence (Kuroko 1961b).

Discussion

There are 98 species of the family Adelidae in China belonging to two subfamilies and three genera, and 63 of them are endemic to China. Except for the rare genera *Adela* (four species) and *Nematopogon* (three species), the largest genus *Nemophora* includes 91 species belonging to the 14 species groups and six incertae sedis species. In the present paper, we have established 24 new species and have reported nine species for the first time in China. We generate 53 new DNA barcode sequences from 34 species for phylogenetic analysis. This has greatly enriched the species diversity and molecular data of the Chinese Adelidae fauna.

Adelid moths are distributed in most of the Chinese geographical regions except the Inner Mongolia-Xinjiang Region. Furthermore, it is highly consistent with the geographical types of plants in China, that is, the overall adelid species is gradually increased from desert to steppe to forest vegetation. This may be related to the stronger survival dependence of insects on the plant (Shen *et al.* 2013). The regions with the highest species richness were southwest, central and south China, such as Sichuan (26 species), Hunan (25 species) and Taiwan (22 species). In addition, there are more than 10 species of adelid moths distributed in Yunnan, Guangxi, and Shaanxi provinces and less than 10 species in other regions. Obviously, the Adelidae mainly occur in mountains and hilly areas, including the Qinling, Hengduan, and Nanling Mountains. For example, all 26 species reported in Sichuan Province occur in the mountainous areas in the west but almost not in the basin areas in the east. Overall, the distribution trend of the family Adelidae gradually increased from north to south and from west to east of China, which is similar to most other animals.

Based on COI barcodes of the genera *Nematopogon* and *Nemophora*, phylogenetic analysis (ML tree, Figs. 8–10) shows that two genera cluster into a monophytic clade with a strong bootstrap value (95%). In addition, the clades are also supported by very high bootstrap value (99%, 100% respectively). From the species group level, the *Nematopogon* species, *Ne. distinctus* (LCQ715), from China appears as a separate clade, which is incompatible with other European species. This topology is also consistent with the phylogenetic trees using other methods, indicating that there may be large differences between Asian and European species, at least in the COI barcodes. In addition, *Ne. garganellus*, *Ne. prolai* and *Ne. adansoniella* form a stable species group with 100% support, which agrees with the results of Bryner & Huemer (2019). Although the other clades don't support by relatively high bootstrap values, they also show a trend of aggregation, similar to the genus *Nemophora*. The *Nemophora sakaii* species group from China is strongly supported by molecular data (bootstrap value: 91%), and the *N. askoldella* and *N. divina* groups are also monophyletic with a relatively high bootstrap value (87% and 78%, respectively). The phylogenetic tree also shows some potential species groups, such as the clade of *N. metallica*, *N. pfeifferella*, *N. cupriacella*, and *N. raddaella* (77%) and the clade of *N. fasciella* and *N. minimella* (90%). Although the bootstrap value is lower than 50%, most species of the largest species group, the *degeerella* group, are clustered in a large clade, which are also present in other phylogenetic trees (Figs. S1, S2). The results show that DNA barcoding is a very mature and reliable method for species identification, especially for some similar species in external morphology and even difficultly identified species groups. For example, the *degeerella* species group contains the largest number of species (more than 30 species) and the most similar morphological characteristics (body size, forewing pattern and male genitalia), but there may still be some undescribed species or cryptic species in this group (Kozlov *et al*. 2017).

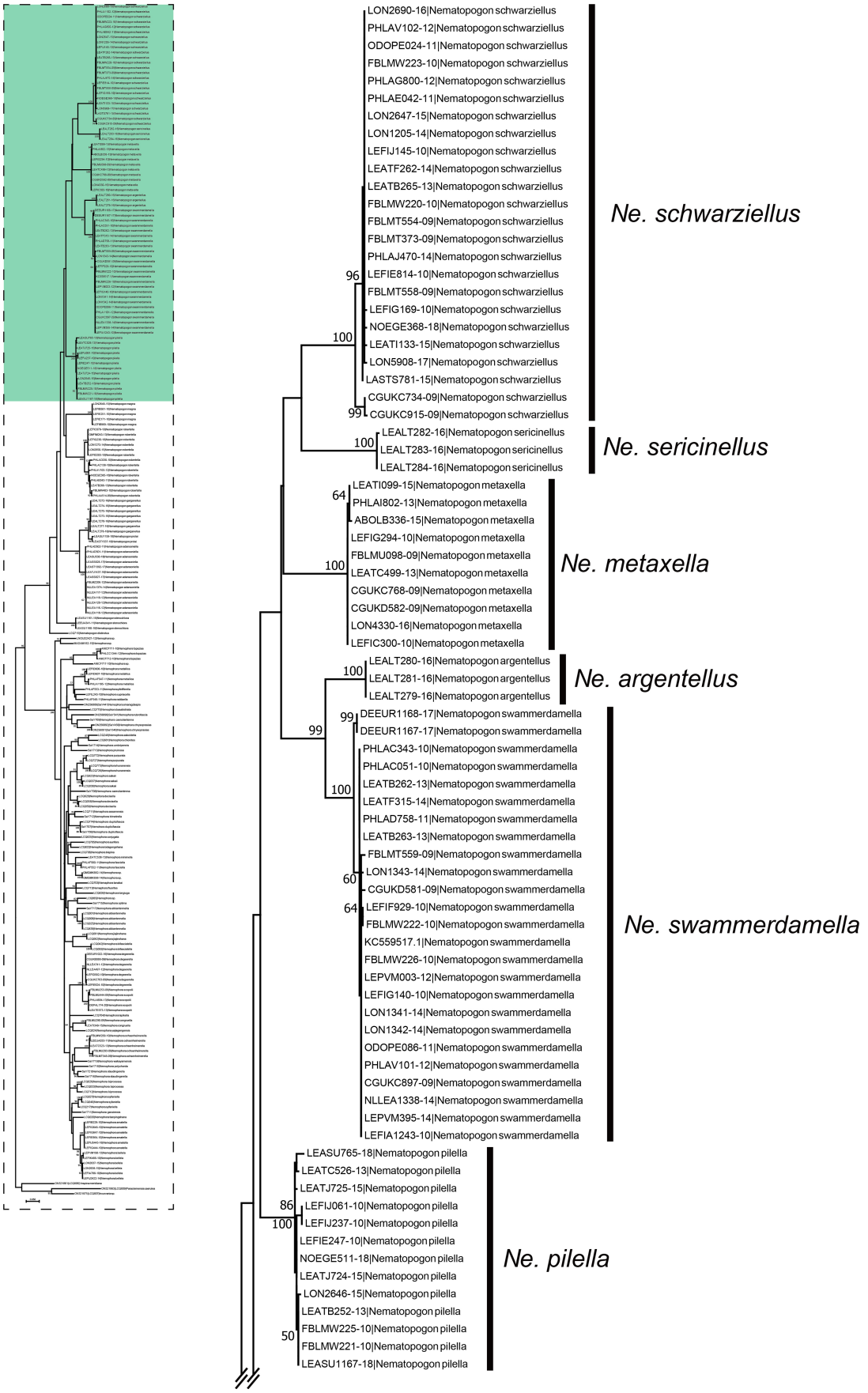

FIGURE 8. Phylogenetic tree from maximum likelihood analysis of the genera *Nemophora* and *Nematopogon* species based on COI barcodes (part 1). Numbers near each node are bootstrap value (%).

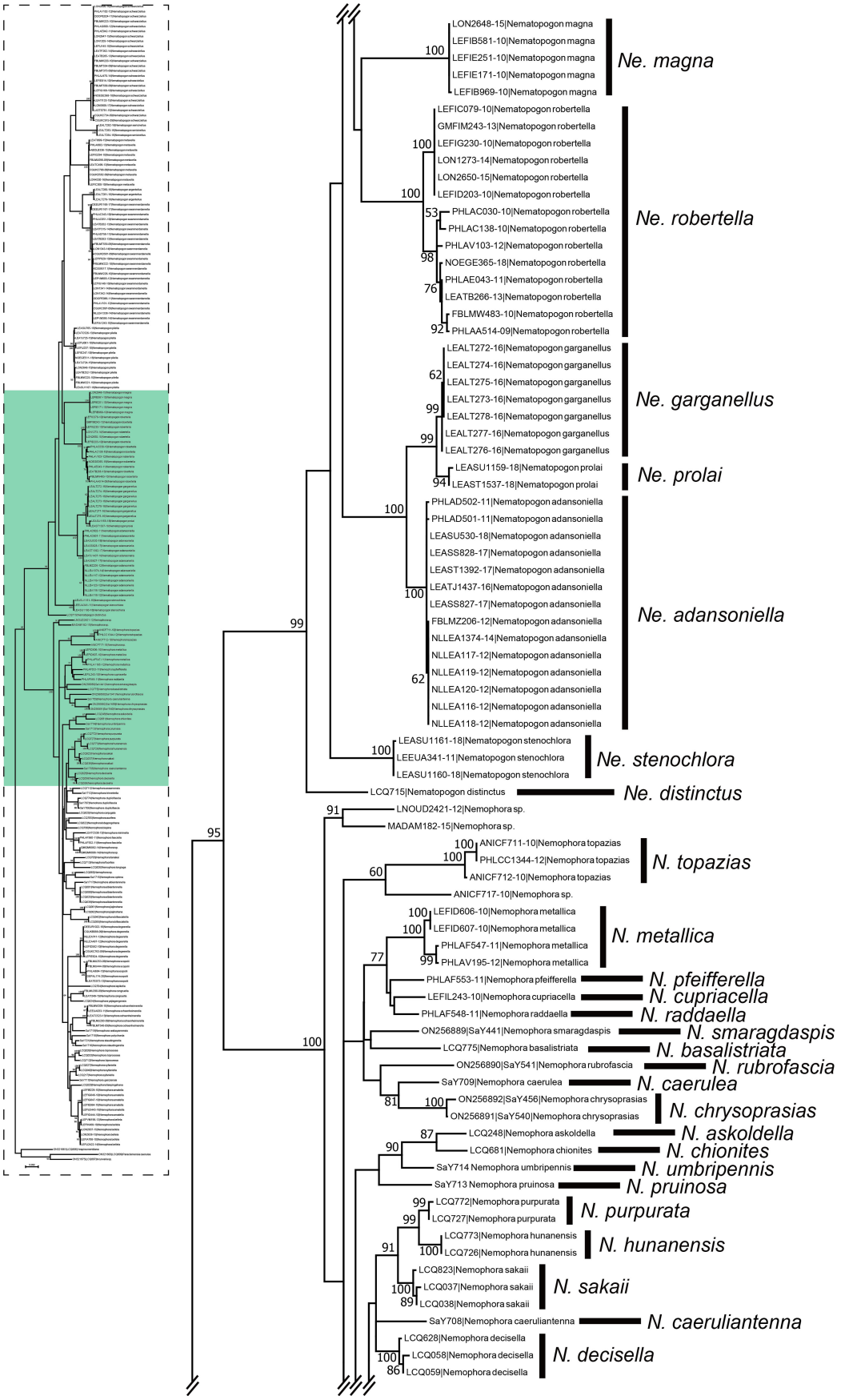

FIGURE 9. Phylogenetic tree from maximum likelihood analysis of the genera *Nemophora* and *Nematopogon* species based on COI barcodes (part 2). Numbers near each node are bootstrap value (%).

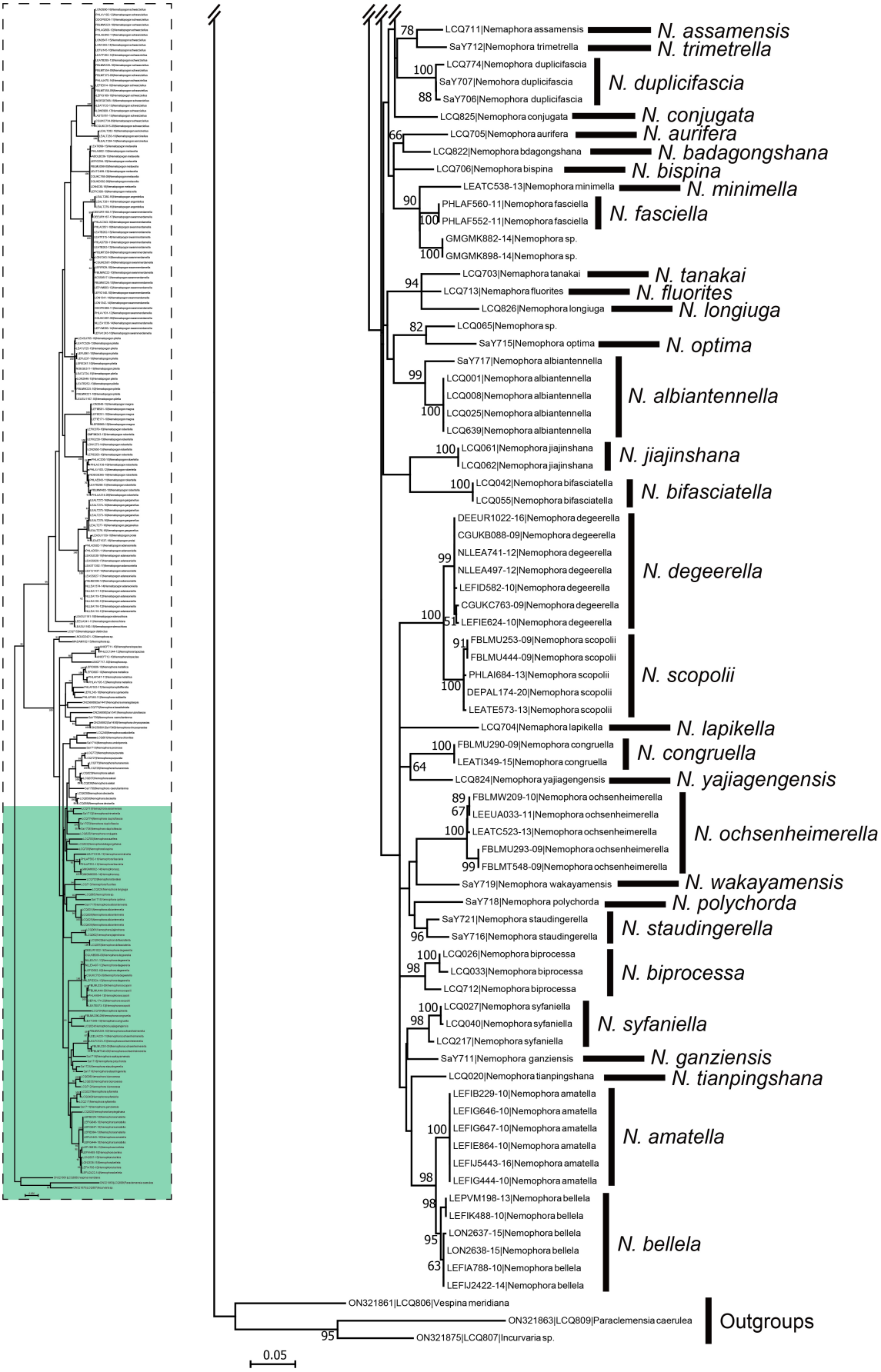

FIGURE 10. Phylogenetic tree from maximum likelihood analysis of the genera *Nemophora* and *Nematopogon* species based on COI barcodes (part 3). Numbers near each node are bootstrap value (%).

From the perspective of genetic distances, the mean interspecific genetic divergences of the genera *Nematopogon* and *Nemophora* are 0.090 ± 0.014 and 0.074 ± 0.016, respectively, and the mean intraspecific genetic divergences of them are 0.004 ± 0.007 and 0.005 ± 0.007, respectively. There is an obvious genetic gap, so-called "barcoding gap" (Meyer & Paulay 2005; Meier *et al*. 2008; Huemer *et al.* 2014), between interspecific and intraspecific genetic divergences in these two genera. Furthermore, the minimum interspecific genetic divergence in *Nematopogon* (0.015–0.020 between *Ne. prolai* and *Ne. garganellus*) and *Nemophora* (0.015–0.018 between *N. amatella* and *N. bellela*) are greater than most intraspecific distances (Table S2). However, a few species show relatively high intraspecific differences among different geographical populations. For example, northern European populations (Finland and Norway) of *Nematopogon robertella* show intraspecific distances of 0.026–0.029 with central and southern European populations (Germany, Austria, and Italy). Similarly, the intraspecific distances show 0.034 between the Chinese and Japanese populations of *Nemophora albiantennella* (Table S2). The relatively high intraspecific divergences show that these species may have large genetic differentiation due to long-term geographical isolation. Additionally, there is still great controversy about the mean or minimum interspecific values (Wiemers & Fiedler 2007; Hebert *et al*. 2004a, b; Meier *et al*. 2006, 2008). However, it is obvious that DNA barcodes are currently one of the most widely used and convenient methods, and the combination of more molecular data and more conclusive comparative morphological evidence for improving the reliability of species identification will be a research trend and direction in the future (Roe & Sperling 2007; Meiklejohn *et al*. 2013).

Checklist

As a result of the present study, the following checklist, including distribution information, is recognized in the family Adelidae in China.

Family Adelidae Bruand, 1850	
Subfamily Nematopogoninae Nielsen, 1985	
Genus *Nematopogon* Zeller, 1839	
Nematopogon chalcophyllis (Meyrick, 1935)	China (Zhejiang)
Nematopogon distinctus Yasuda, 1957	China* (Hunan, Guangdong, Guangxi); Japan, Korea
Nematopogon dorsiguttellus (Erschoff, 1877)	China (North part including Beijing); Russia, Japan, Korea
Nematopogon taiwanella Kozlov, 2001	China (Taiwan)
Subfamily Adelinae Bruand, 1850	
Genus *Adela* Latreille, [1796]	
Adela nobilis Christoph, 1882	China* (Guangxi); Russia, Korea
Adela praepilosa Hirowatari, 1997	China* (Taiwan); Japan
Adela sinica Yang, 1977	China (Beijing)
Genus *Nemophora* Hoffmannsegg, 1798	
***Nemophora albiantennella* species group**	
Nemophora albiantennella Issiki, 1930	China* (Hunan, Shaanxi); Russia, Japan, Korea
Nemophora pseudalbiantennella **sp. nov.**	China (Shaanxi)
***Nemophora sichuana* species group**	
Nemophora kozlovi Hirowatari, Kanazawa & Liang, 2012	China (Yunnan)
Nemophora sichuana Hirowatari, Kanazawa & Liang, 2012	China (Sichuan)
Nemophora tadauchii Hirowatari, Kanazawa & Liang, 2012	China (Yunnan)
Nemophora tenuimaculata Hirowatari, Kanazawa & Liang, 2012	China (Sichuan)
Nemophora zheduoshana Liao, Hirowatari & Huang, 2021	China (Sichuan)
***Nemophora askoldella* species group**	

Nemophora askoldella (Millière, 1879)	China (Northeast, Yunnan, Hubei, Taiwan); Russia, Japan, Korea
Nemophora chionites (Meyrick, 1907)	China* (Hunan, Sichuan); India, Thailand
***Nemophora hoeneella* species group**	
Nemophora aritai Kozlov & Hirowatari, 1997	China (Taiwan)
Nemophora honeella (Caradja & Meyrick, 1935)	China (Hunan)
Nemophora issikii Kozlov & Hirowatari, 1997	China (Taiwan)
***Nemophora aurifera* species group**	
Nemophora aurifera (Butler, 1881)	China (Hunan, Guangdong, Guangxi, Sichuan, Taiwan); Japan
Nemophora badagongshana **sp. nov.**	China (Hunan)
Nemophora limenites (Meyrick, 1914)	China (Taiwan)
Nemophora longlabiae **sp. nov.**	China (Taiwan)
Nemophora quadrata **sp. nov.**	China (Hunan, Hainan)
Nemophora servata (Meyrick, 1925) **com. nov.**	China (Fujian)
Nemophora solstitiella (Walsingham, 1900)	China (Taiwan); India, Pakistan
Nemophora tyriochrysa (Meyrick, 1935)	China (Jiangsu); Russia, Korea
***Nemophora diplophragma* species group**	
Nemophora basalistriata **sp. nov.**	China (Sichuan, Jiangxi)
Nemophora digitata **sp. nov.**	China (Yunan, Sichuan)
Nemophora diplophragma (Meyrick, 1938) **com. nov.**	China (Yunnan)
Nemophora duplicifascia **sp. nov.**	China (Sichuan, Hunan)
***Nemophora sakaii* species group**	
Nemophora hunanensis **sp. nov.**	China (Hunan)
Nemophora purpurata **sp. nov.**	China (Hunan, Jiangxi)
Nemophora sakaii (Matsumura, 1931)	China (Hunan, Guangdong, Guangxi, Taiwan)
***Nemophora decisella* species group**	
Nemophora arcuatifasciata **sp. nov.**	China (Hunan, Jiangxi)
Nemophora caeruliantenna **sp. nov.**	China (Yunnan)
Nemophora decisella (Walker, 1863)	China (Guangdong, Shaanxi, Zhejiang, Hubei, Hunan, Sichuan, Jiangsu, Fujian, Hainan, Taiwan); Russia, Japan, Korea, Myanmar, Thailand, Indonesia, Malaysia, Brunei, etc
Nemophora paradisea (Butler, 1881)	China (Beijing, Hebei, Anhui, Guangdong, Sichuan, Hainan); Japan
Nemophora smaragdaspis (Meyrick, 1924)	China* (Guangxi); Japan, Korea, India
Nemophora xizangensis **sp. nov.**	China (Tibet)
***Nemophora rubrofascia* species group**	
Nemophora caerulea **sp. nov.**	China (Hainan)
Nemophora chrysoprasias (Meyrick, 1907)	China (Yunnan); India, Myanmar
Nemophora rubrofascia (Christoph, 1882)	China (Taiwan); Russia, Japan
***Nemophora divina* species group**	
Nemophora assamensis Kozlov, 1997	China (Hunan, Guangdong, Guangxi, Hainan, Yunnan); India
Nemophora divina (Caradja, 1939)	China (Shanxi)
Nemophora magnifica Kozlov, 1997	China (Yunnan, Taiwan); Japan
Nemophora songgangensis **sp. nov.**	China (Taiwan)

Nemophora trimetrella Stringer, 1930	China* (Yunnan); Japan
***Nemophora optima* species group**	
Nemophora conjugata **sp. nov.**	China (Guangxi)
Nemophora optima (Butler, 1878)	China* (Sichuan); Japan
***Nemophora fluorites* species group**	
Nemophora fluorites (Meyrick, 1907)	China (Guangdong, Guangxi, Fujian, Hunan, Chongqing, Taiwan); India, Myanmar, Vietnam
Nemophora latilobula **sp. nov.**	China (Sichuan)
Nemophora longispina **sp. nov.**	China (Hunan, Guangxi)
Nemophora tanakai Hirowatari, 2007	China (Guangdong, Hunan, Yunnan, Taiwan); Vietnam
***Nemophora bifasciatella* species group**	
Nemophora bifasciatella Issikii, 1930	China* (Hunan, Guangxi, Sichuan); Japan
Nemophora longiuga Sun & Li, 2023	China (Sichuan)
Nemophora longissima Sun & Li, 2023	China (Hunan, Sichuan)
Nemophora mediangusa Sun & Li, 2023	China (Tibet)
Nemophora mediseorsa Sun & Li, 2023	China (Guangxi); India
***Nemophora degeerella* species group**	
Nemophora amatella (Staudinger, 1892)	China (Northern China, Sichuan); Russia, Japan, Korea, and North Europe
Nemophora apiciprocessa Sun, Wang & Li, 2022	China (Hubei)
Nemophora augites (Meyrick, 1938)	China (Gansu, Guizhou, Hebei, Henan, Hubei, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Sichuan)
Nemophora aurora Kozlov, 1997	China (Taiwan)
Nemophora bifurcifascia Sun, Wang & Li, 2022	China (Sichuan)
Nemophora biprocessa Sun, Wang & Li, 2022	China (Jiangsu, Hunan, Guangxi)
Nemophora borealis Sun, Wang & Li, 2022	China (Gansu, Hebei, Henan, Jilin, Ningxia, Shaanxi)
Nemophora chalybeella (Bremer, 1864)	China (Beijing, Gansu, Hebei, Henan, Liaoning, Ningxia, Shaanxi, Shanxi, Sichuan, Tianjin), Russia, South Korea
Nemophora digitivalva Sun, Wang & Li, 2022	China (Ningxia, Shaanxi)
Nemophora disjunctella (Caradja, 1927)	China (Sichuan)
Nemophora ganziensis **sp. nov.**	China (Sichuan)
Nemophora gaoligongshana Sun, Wang & Li, 2022	China (Yunnan)
Nemophora jiajinshana **sp. nov.**	China (Sichuan)
Nemophora karafutonis (Matsumura, 1932)	China (Liaoning); Japan, Russia, South Korea
Nemophora lapikella Kozlov, 1997	China (Hunan, Guangxi, Hubei, Zhejiang, Shandong, Yunnan, Taiwan); Russia, Japan, Korea
Nemophora latirectangula Sun, Wang & Li, 2022	China (Hebei)
Nemophora litangensis **sp. nov.**	China (Sichuan)
Nemophora ochsenheimerella (Hübner, [1813])	China (Henan); Austria, Belgium, Czech, Denmark, France, Germany, Hungary, Japan, Netherland, Poland, Romania, Slovakia, South Korea, Switzerland
Nemophora parvaprocessa Sun, Wang *et* Li, 2022	China (Shaanxi)
Nemophora polychorda (Meyrick, 1914)	China (Hunan, Chongqing, Taiwan); Japan
Nemophora purpuratifera Sun, Wang & Li, 2022	China (Henan)
Nemophora ravidifera Sun, Wang & Li, 2022	China (Hebei)
Nemophora recurvatifera Sun, Wang & Li, 2022	China (Tibet); Russia, Japan, Korea
Nemophora sapporensis (Matsumura, 1931)	China (Guangxi, Henan, Shaanxi); Japan, Russia

Nemophora seorsifascia Sun, Wang & Li, 2022	China (Sichuan)
Nemophora spinatibaltea Sun, Wang & Li, 2022	China (Guizhou, Henan, Shaanxi)
Nemophora staudingerella (Christoph, 1881)	China (Heilongjiang, Liaoning, Jilin, Beijing, Hebei, Hubei, Shaanxi, Sichuan, Yunnan, Guizhou, Qinghai); Russia, Japan, Korea
Nemophora syfaniella (Caradja, 1927)	China (Hunan, Shaanxi, Sichuan, Yunnan, Gansu)
Nemophora tianpingshana **sp. nov.**	China (Hunan)
Nemophora triangulifascia **sp. nov.**	China (Tibet)
Nemophora triuga Sun, Wang & Li, 2022	China (Tibet)
Nemophora uncella Kozlov, 1997	China (Taiwan)
Nemophora yajiagengensis **sp. nov.**	China (Sichuan)
Nemophora yunnanica Kozlov, 2023	China (Yunnan)
Incertae sedis species	
Nemophora ahenea Stringer, 1930	China (Taiwan); Japan
Nemphora bispina **sp. nov.**	China (Hunan, Guangdong)
Nemophora chionella (Caradja, 1935) **com. nov.**	China (Jiangsu)
Nemophora chrysocharis (Caradja, 1938) **com. nov.**	China (Fujian)
Nemophora raddei (Rebel, 1901)	China (Beijing, Jilin, Taiwan); Russia, Japan

Note: * indicates new record for China in this study.

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Supplementary Materials. The following supporting information can be downloaded at the DOI landing page of this paper. **Table S1.** Sequences obtained from online databases and used in the molecular phylogenetic analysis. **Table S2.** Intraspecific and interspecific pairwise p-distances in the COI barcode region.

Adult plates

Plate I

1. *Nematopogon distinctus* Yasuda, 1957 (a. male; b. female)
2. *Adela praepilosa* Hirowatari, 1997
3. *Adela nobilis* Christoph, 1882
4. *Nemophora albiantennella* Issiki, 1930 (a. male; b. female)
5. *Nemophora pseudalbiantennella* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
6. *Nemophora kozlovi* Hirowatari, Kanazawa & Liang, 2012
7. *Nemophora sichuana* Hirowatari, Kanazawa & Liang, 2012
8. *Nemophora tadauchii* Hirowatari, Kanazawa & Liang, 2012

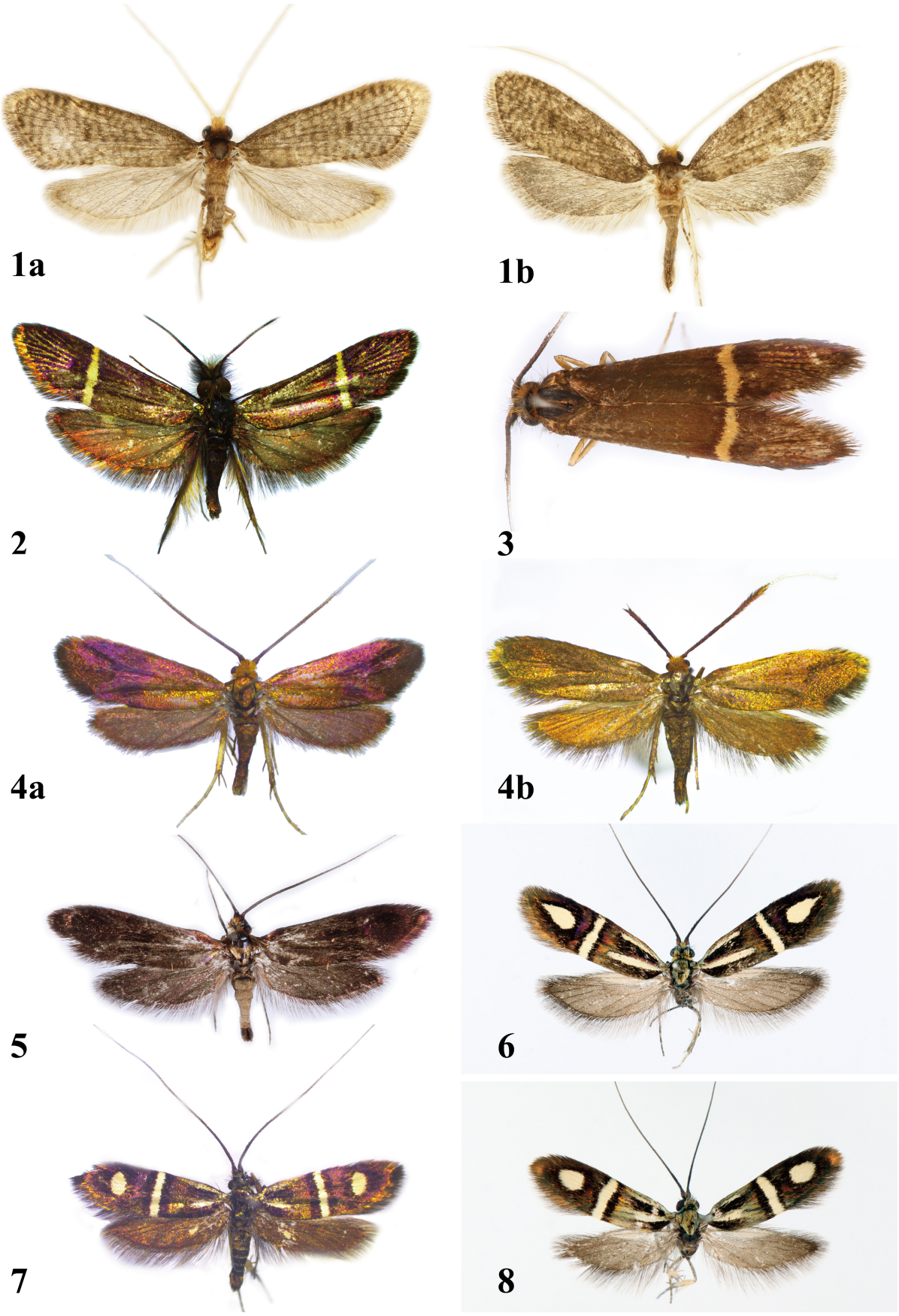

Plate I

Plate II

1. *Nemophora tenuimaculata* Hirowatari, Kanazawa & Liang, 2012
2. *Nemophora zheduoshana* Liao, Hirowatari & Huang, 2021
3. *Nemophora chionites* (Meyrick, 1907) (a. male; b. female)
4. *Nemophora askoldella* (Millière, 1879)
5. *Nemophora longlabiae* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
6. *Nemophora aurifera* (Butler, 1881) (a. male; b. female)
7. *Nemophora badagongshana* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)

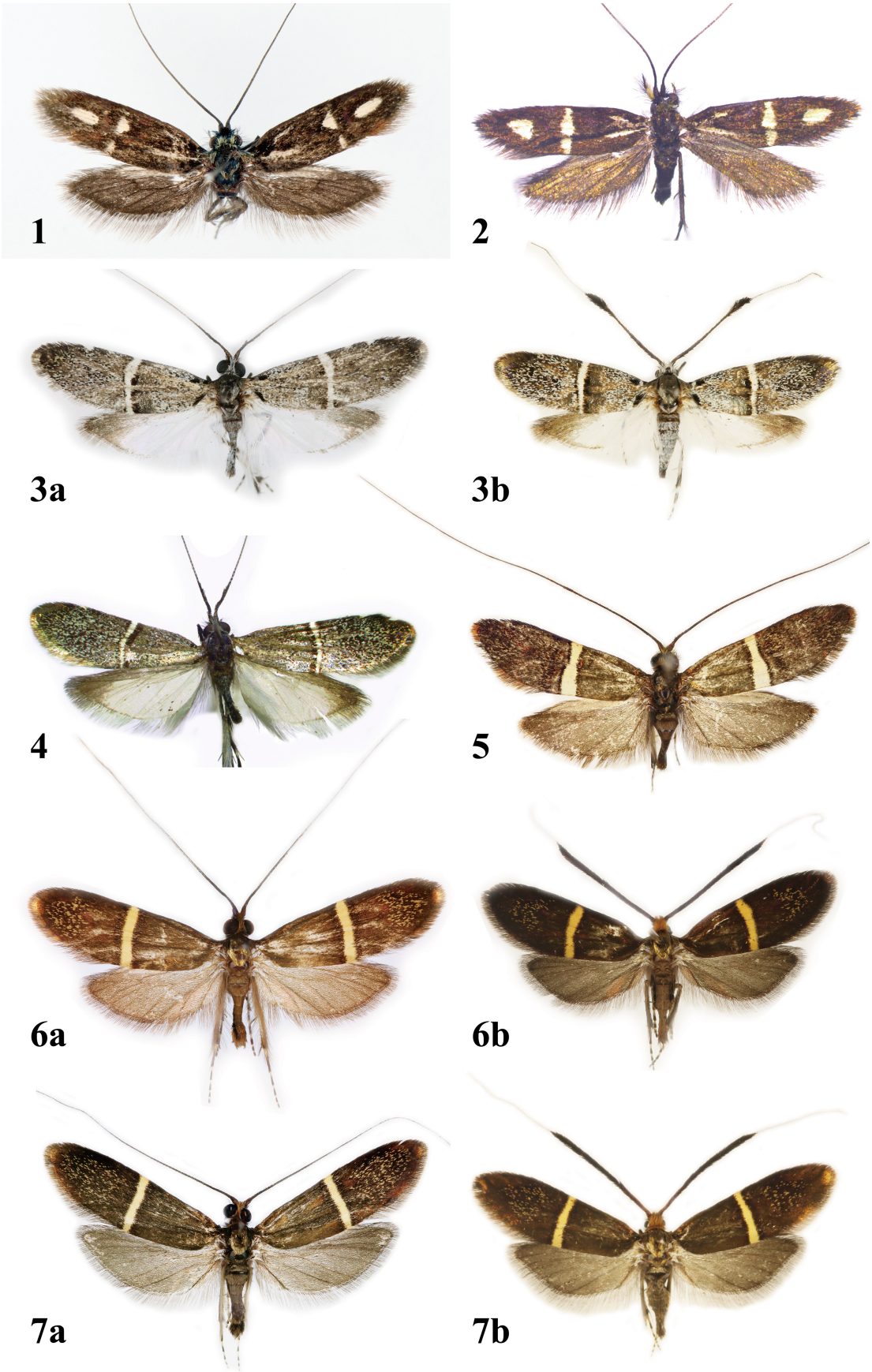

Plate II

Plate III

1. *Nemophora quadrata* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
2. *Nemophora basalistriata* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
3. *Nemophora digitata* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
4. *Nemophora duplicifascia* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
5. *Nemophora hunanensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
6. *Nemophora purpurata* Liao, Hirowatari & Huang, **sp. nov.**, paratype, male

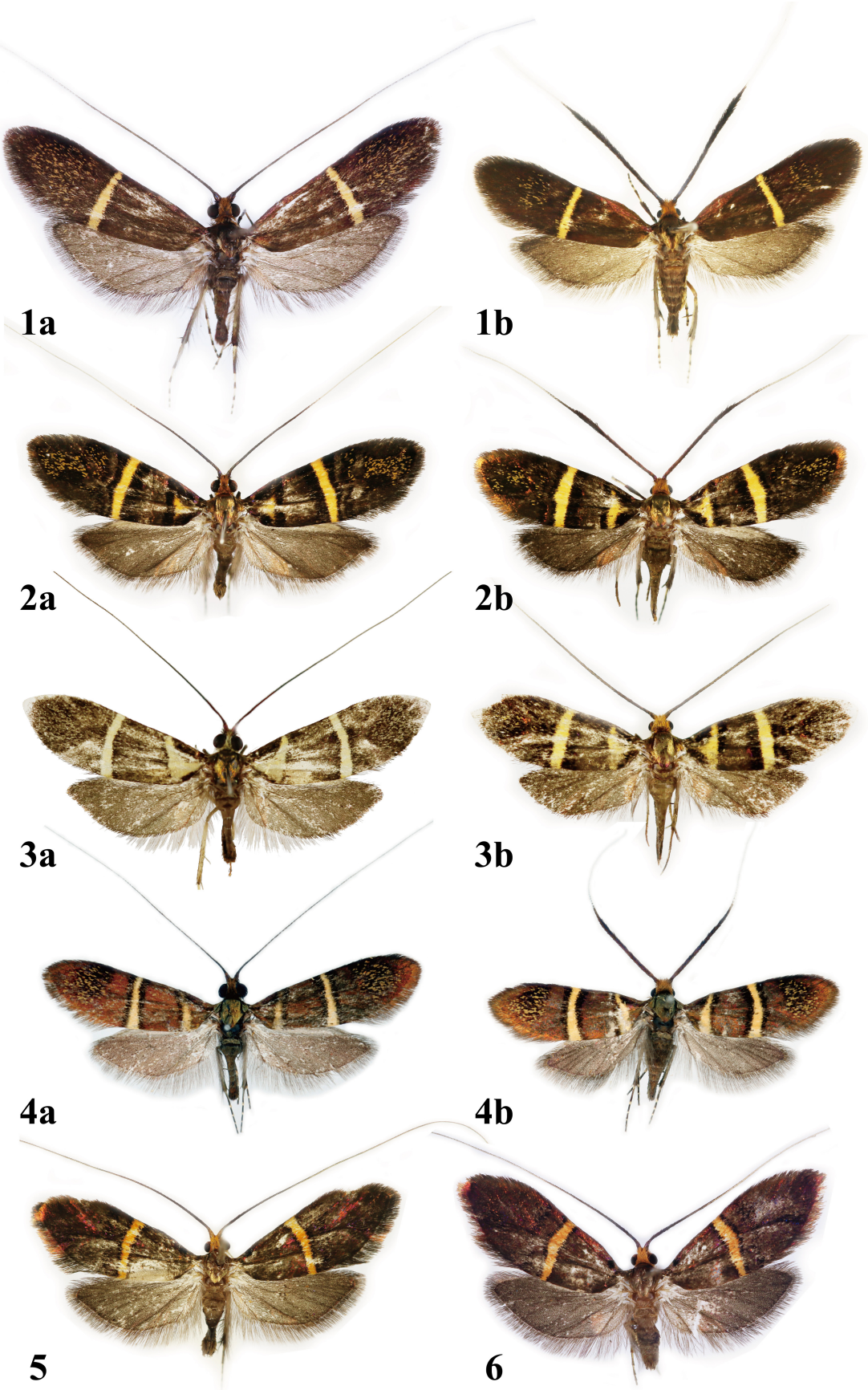

Plate III

Plate IV

1. *Nemophora decisella* (Walker, 1863) (a. male; b. female)
2. *Nemophora paradisea* (Butler, 1881) (a. male; b. female)
3. *Nemophora smaragdaspis* (Meyrick, 1924) (a. male; b. female)
4. *Nemophora xizangensis* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
5. *Nemophora arcuatifasciata* Liao, Hirowatari & Huang, **sp. nov.**, holotype, female
6. *Nemophora caeruliantenna* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male

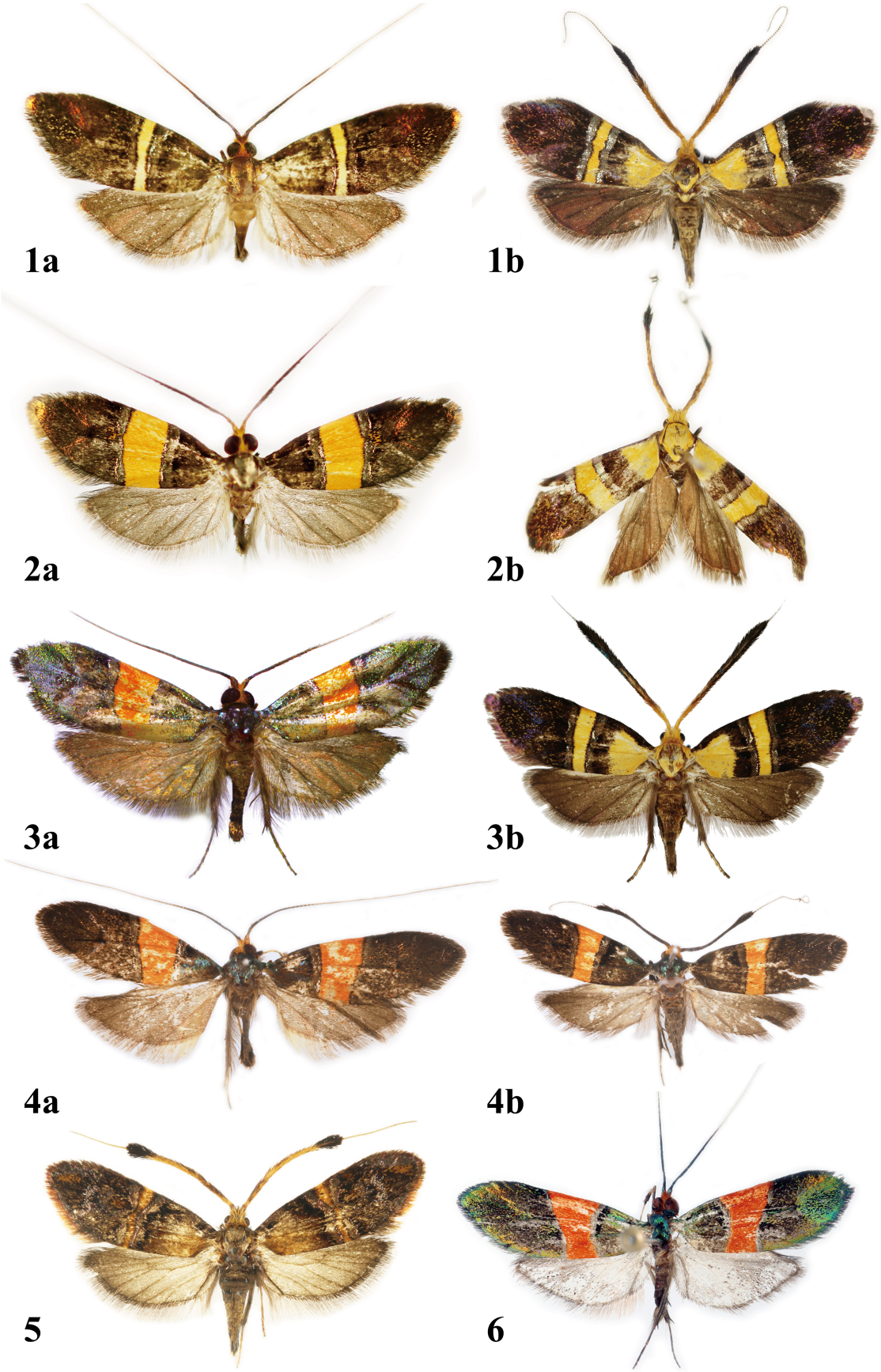

Plate IV

Plate V

1. *Nemophora sakaii* (Matsumura, 1931) (a. male; b. female)
2. *Nemophora chrysoprasias* (Meyrick, 1907) (a. male; b. female)
3. *Nemophora caerulea* Liao, Hirowatari & Huang, **sp. nov.**, holotype, female
4. *Nemophora trimetrella* Stringer, 1930
5. *Nemophora assamensis* Kozlov, 1997 (a. male; b. female)
6. *Nemophora magnifica* Kozlov, 1997
7. *Nemophora songgangensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male

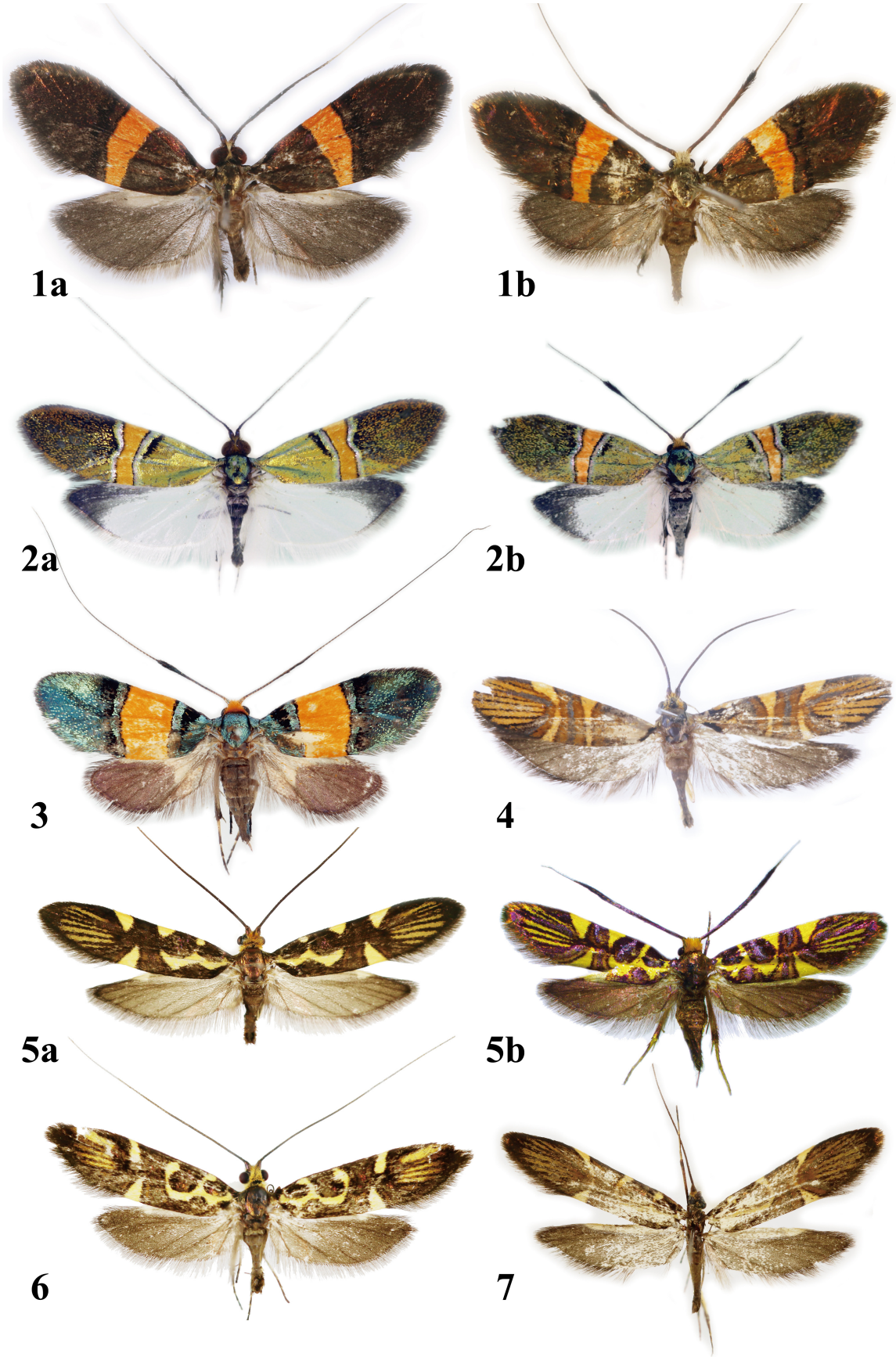

Plate V

Plate VI

1. *Nemophora conjugata* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
2. *Nemophora optima* (Butler, 1878)
3. *Nemophora fluorites* (Meyrick, 1907) (a. male; b. female)
4. *Nemophora tanakai* Hirowatari, 2007 (a. male; b. female)
5. *Nemophora latilobula* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)
6. *Nemophora longispina* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)

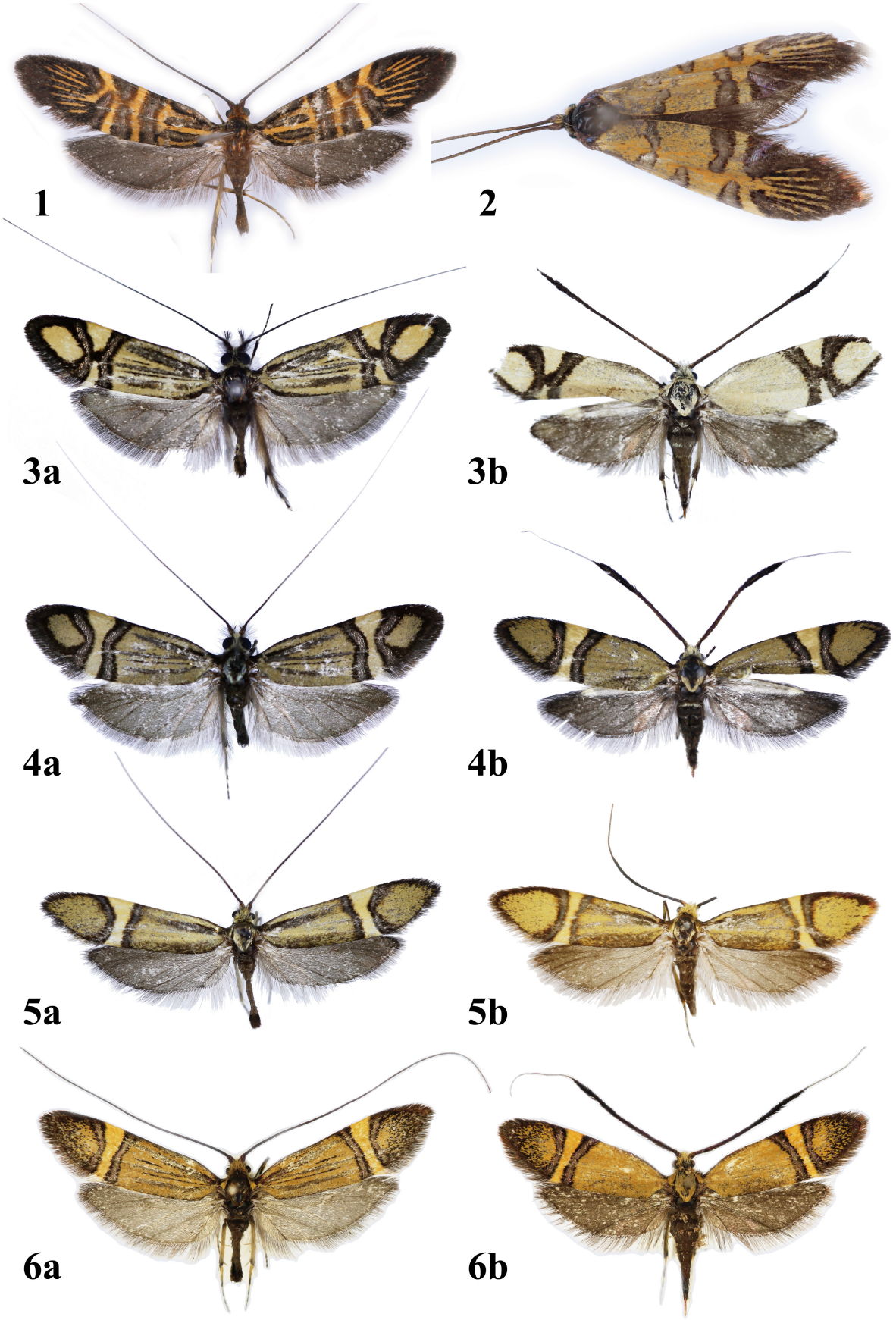

Plate VI

Plate VII

1. *Nemophora bifasciatella* Issikii, 1930 (a. male; b. female)
2. *Nemophora longiuga* Sun & Li, 2023 (a. male; b. female)
3. *Nemophora longissima* Sun & Li, 2023 (a. male; b. female)
4. *Nemophora amatella* (Staudinger, 1892)
5. *Nemophora ganziensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
6. *Nemophora jiajinshana* Liao, Hirowatari & Huang, **sp. nov.** (a. holotype, male; b. paratype, female)

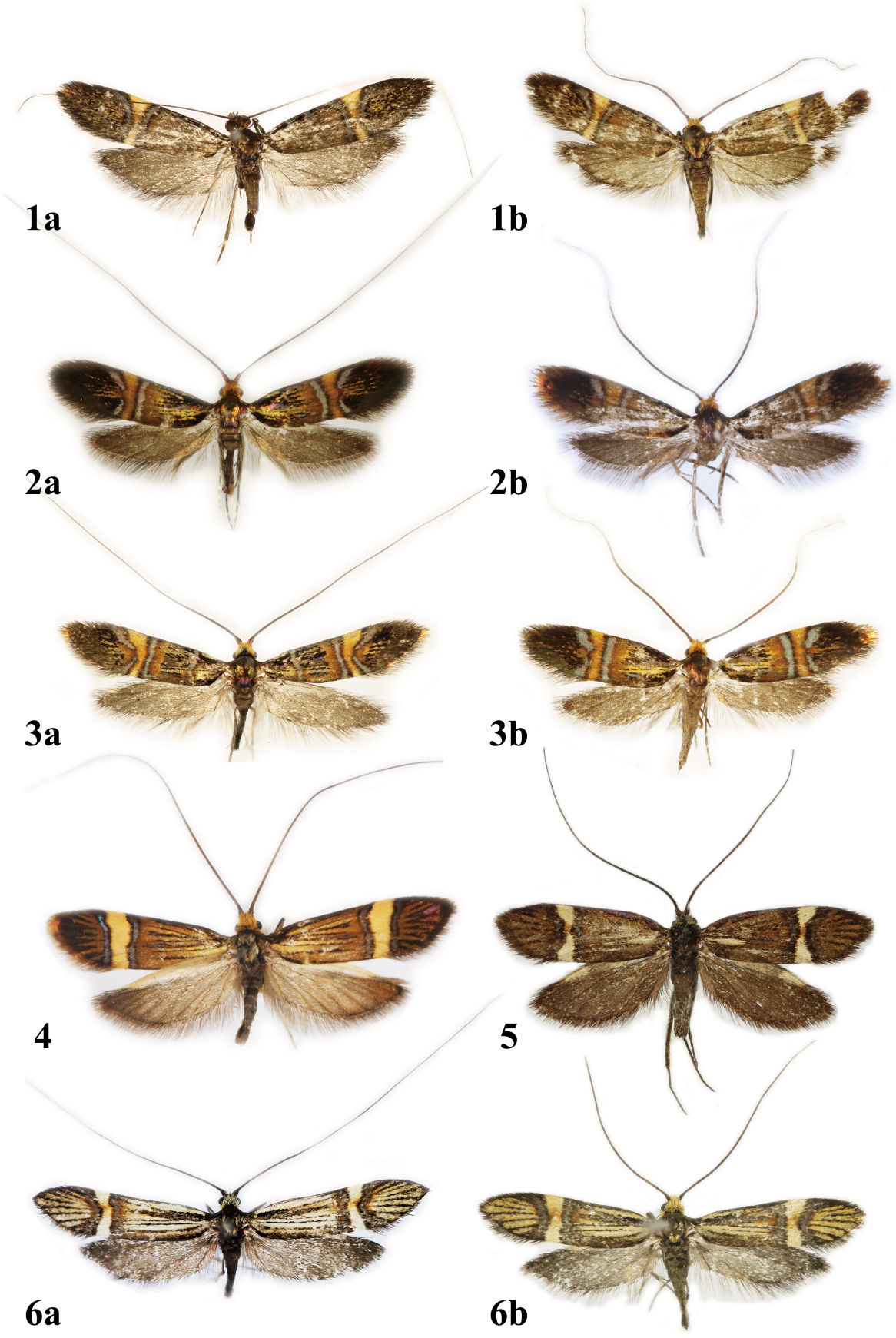

Plate VII

Plate VIII

1. *Nemophora lapikella* Kozlov, 1997 (a. male; b. female)
2. *Nemophora litangensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
3. *Nemophora polychorda* (Meyrick, 1914)
4. *Nemophora recurvatifera* Sun, Wang & Li, 2022
5. *Nemophora triangulifascia* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
6. *Nemophora staudingerella* (Christoph, 1881)
7. *Nemophora syfaniella* (Caradja, 1927)
8. *Nemophora tianpingshana* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
9. *Nemophora yajiagengensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male
10. *Nemophora raddei* (Rebel, 1901)
11. *Nemophora bispina* Liao, Hirowatari & Huang, **sp. nov.**, holotype, male

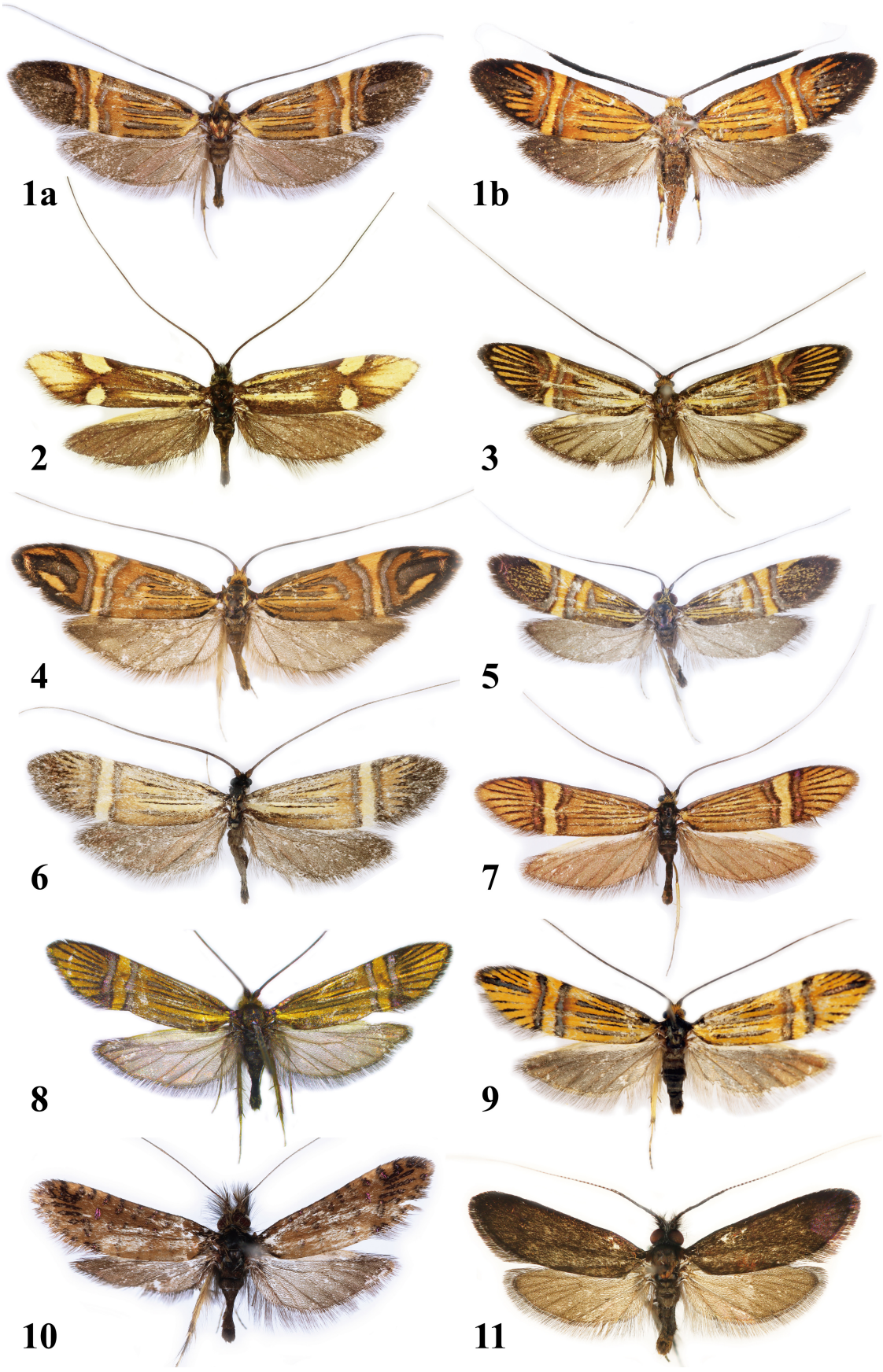

Plate VIII

Plate IX

1–2. *Nemophora biprocessa* Sun, Wang & Li, 2022 (1. Nanjing, Jiangsu; 2. Jingtongshan, Hunan; a. male; b. female)
3. *Nemophora polychorda* Meyrick, 1914, Paralectotype ♂
4. *Nemophora staudingerella* Christoph, 1881, Lectotype ♂
5. *Nemophora japonica* Stringer, 1930, Syntype ♂
6. *Adela bellela* Walker, 1863, Syntype ♂
7. *Adela syfaniella* Caradja, 1927, Lectotype ♂
8. *Adela syfaniella* Caradja, 1927, Paralectotype ♂
9. *Adela syfaniella* Caradja, 1927, Paralectotype ♂

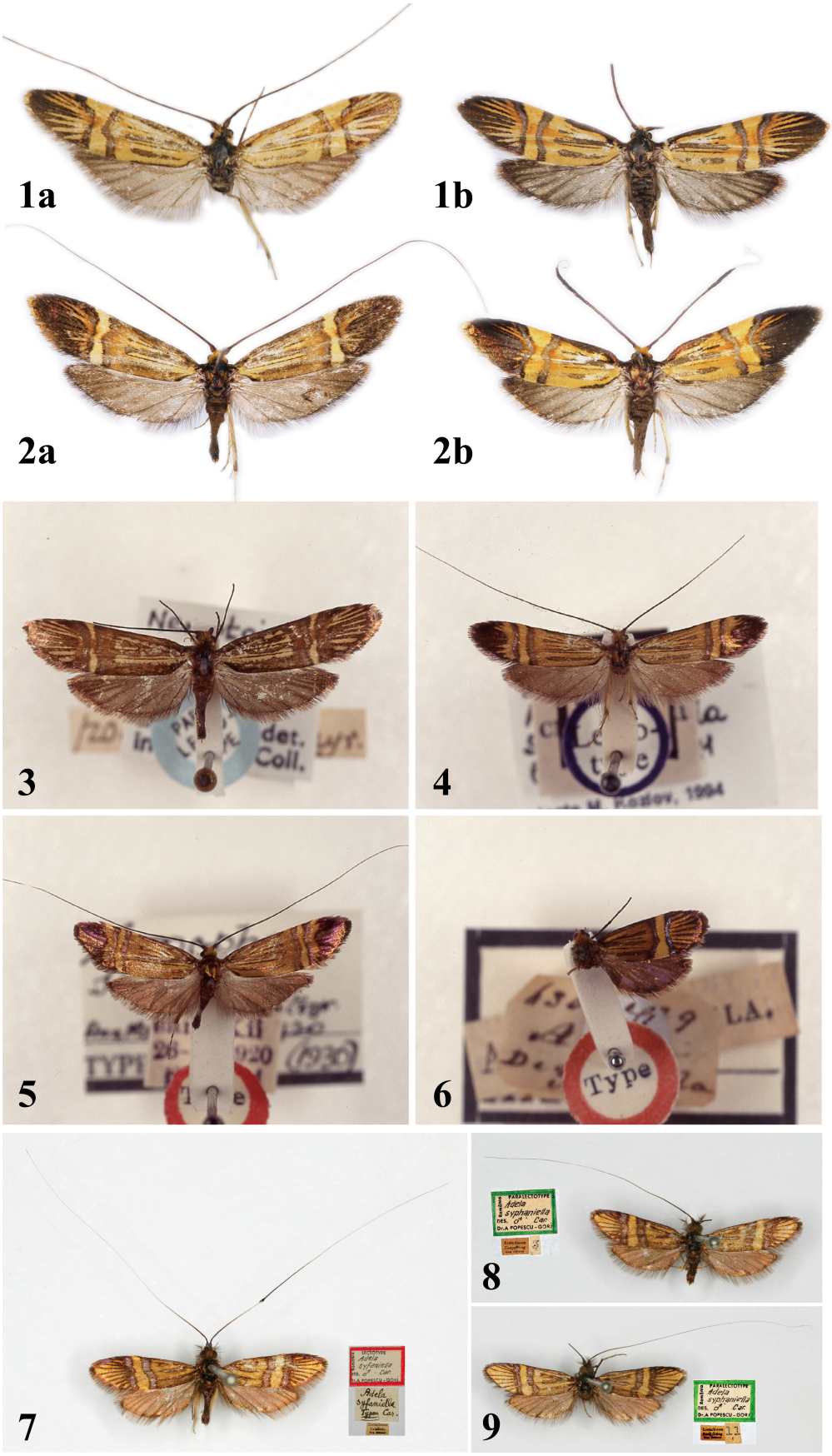

Plate IX

Plate X

1. *Nemophora issikii* Kozlov & Hirowatari, 1997, Holotype ♀
2. *Nemotois aurifera* Butler, 1881, Syntype ♂
3. *Nemotois diplophragma* Meyrick, 1938, Paratype ♂
4. *Nemophora umbripennis* Stringer, 1930, Syntype ♂
5. *Nemotois decisella* Walker, 1863, Syntype ♂
6. *Nemotois paradisea* Butler, 1881, Syntype ♂
7. *Adela aurantibasella* Caradja, 1938, Holotype ♀
8. *Nemotois smaragdaspis* Meyrick, 1924, Holotype ♂
9. *Nemotois chrysoprasias* Meyrick, 1907, Lectotype ♂
10. *Adela rubrofascia* Christoph, 1882, Lectotype ♂

Plate X

Plate XI

1. *Nemophora assamensis* Kozlov, 1997, Holotype ♂
2. *Nemophora magnifica* Kozlov, 1997, Holotype ♂
3. *Nemophora augantha* Meyrick, 1907, Lectotype ♂
4. *Nemophora trimetrella* Stringer, 1930, Syntype ♂
5. *Nemotois divina* Caradja, 1939, Holotype ♂
6. *Nemophora ahenea* Stringer, 1930, Syntype ♂
7. *Nemotois fluorites* Meyrick, 1907, Lectotype ♂
8. *Adela suavis* Caradja, 1938, Holotype ♀
9. *Nemophora aurora* Kozlov, 1997, Holotype ♂
10. *Adela disjunctella C*aradja, 1927, Lectotype ♂

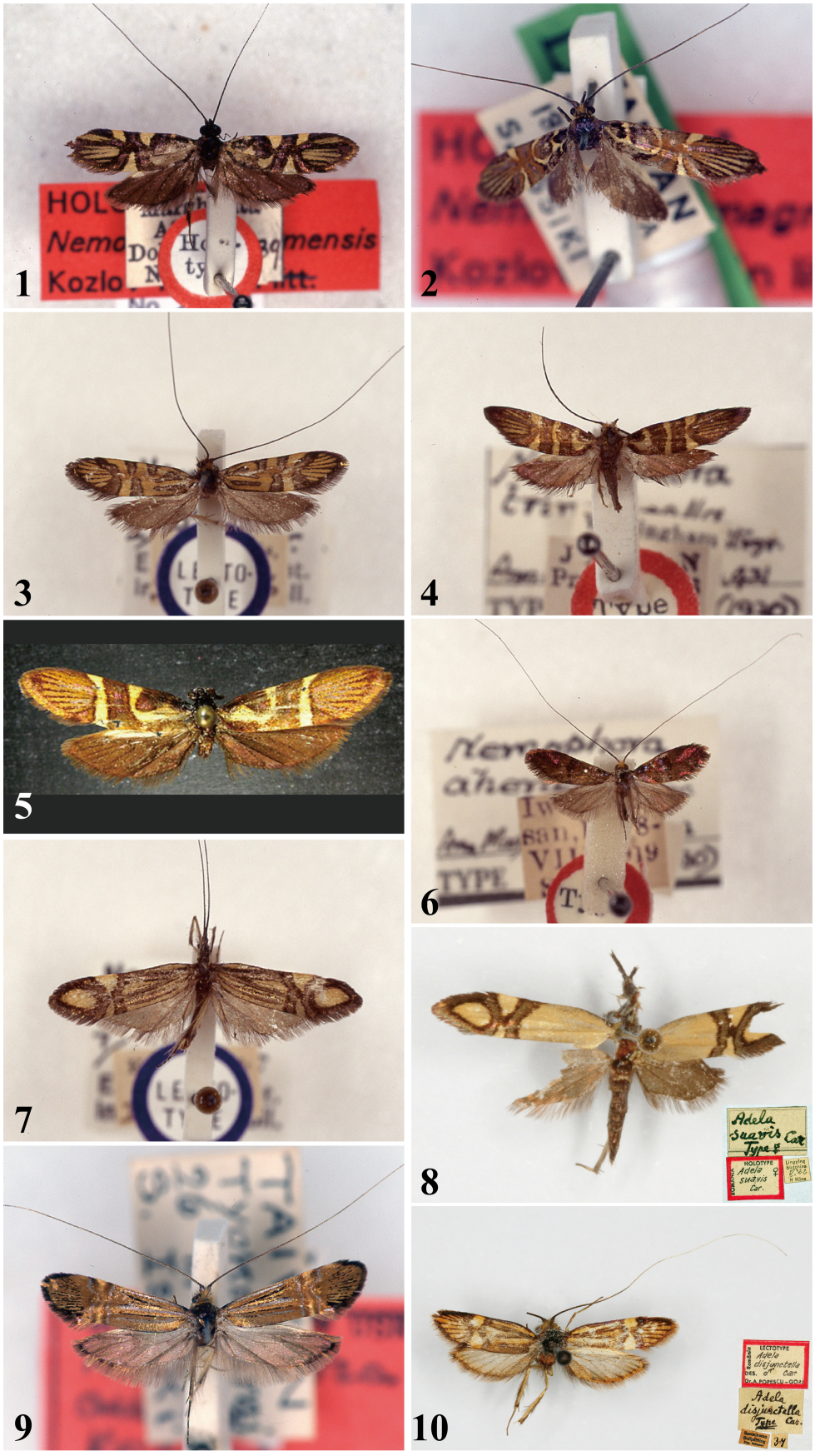

Plate XI

Male genitalia plates

Plate XII

1. *Nematopogon distinctus* Yasuda, 1957
2. *Adela praepilosa* Hirowatari, 1997
3. *Adela nobilis* Christoph, 1882
4. *Nemophora albiantennella* Issiki, 1930
5. *Nemophora pseudalbiantennella* Liao, Hirowatari & Huang, **sp. nov.**, holotype
6. *Nemophora sichuana* Hirowatari, Kanazawa & Liang, 2012

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. ventral view of juxta.

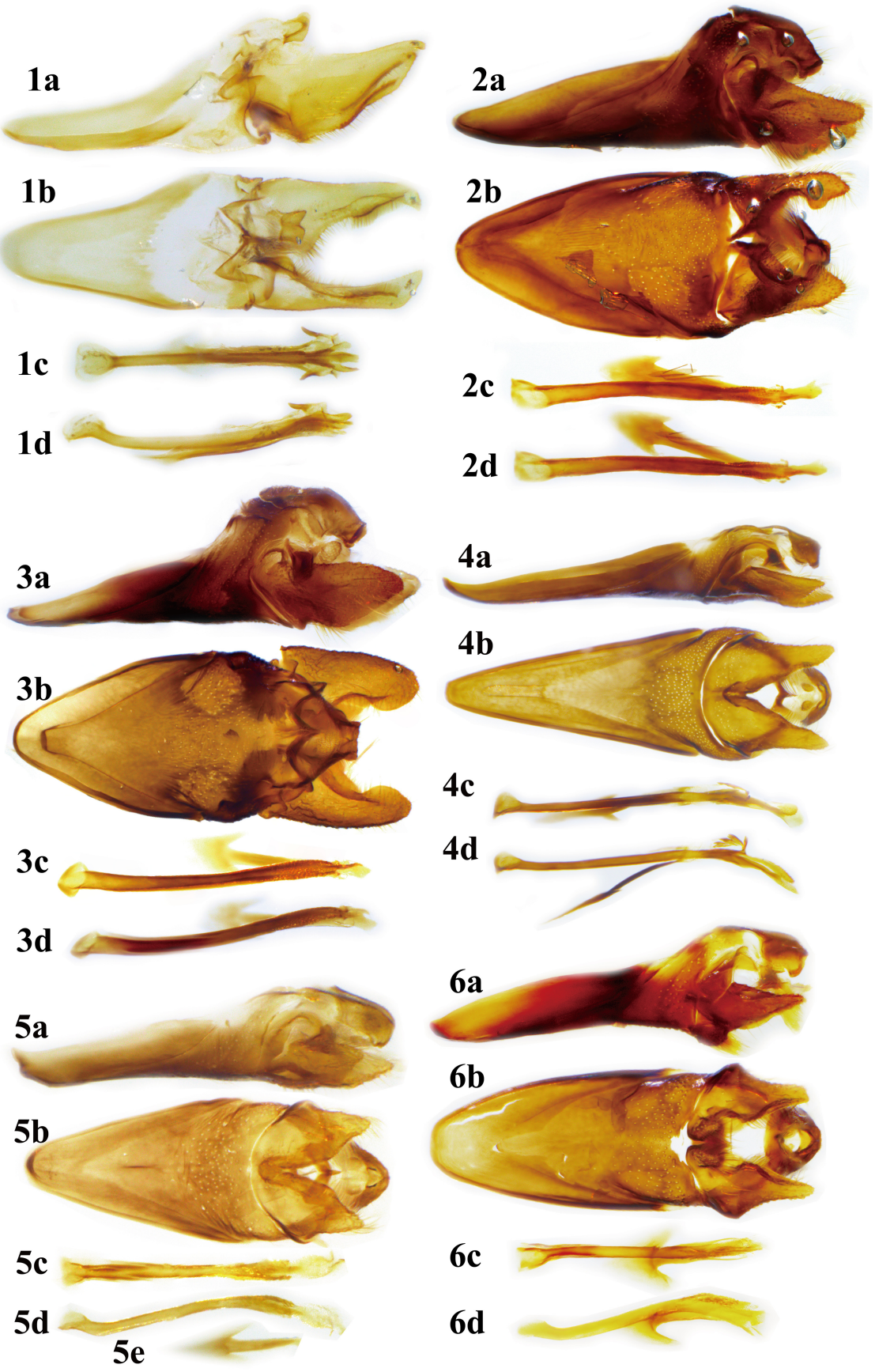
1a
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Plate XII

Plate XIII

1. *Nemophora zheduoshana* Liao, Hirowatari & Huang, 2021
2. *Nemophora askoldella* (Millière, 1879)
3. *Nemophora chionites* (Meyrick, 1907)
4. *Nemophora aurifera* (Butler, 1881)
5. *Nemophora badagongshana* Liao, Hirowatari & Huang, **sp. nov.**, holotype
6. *Nemophora longlabiae* Liao, Hirowatari & Huang, **sp. nov.**, holotype

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus.

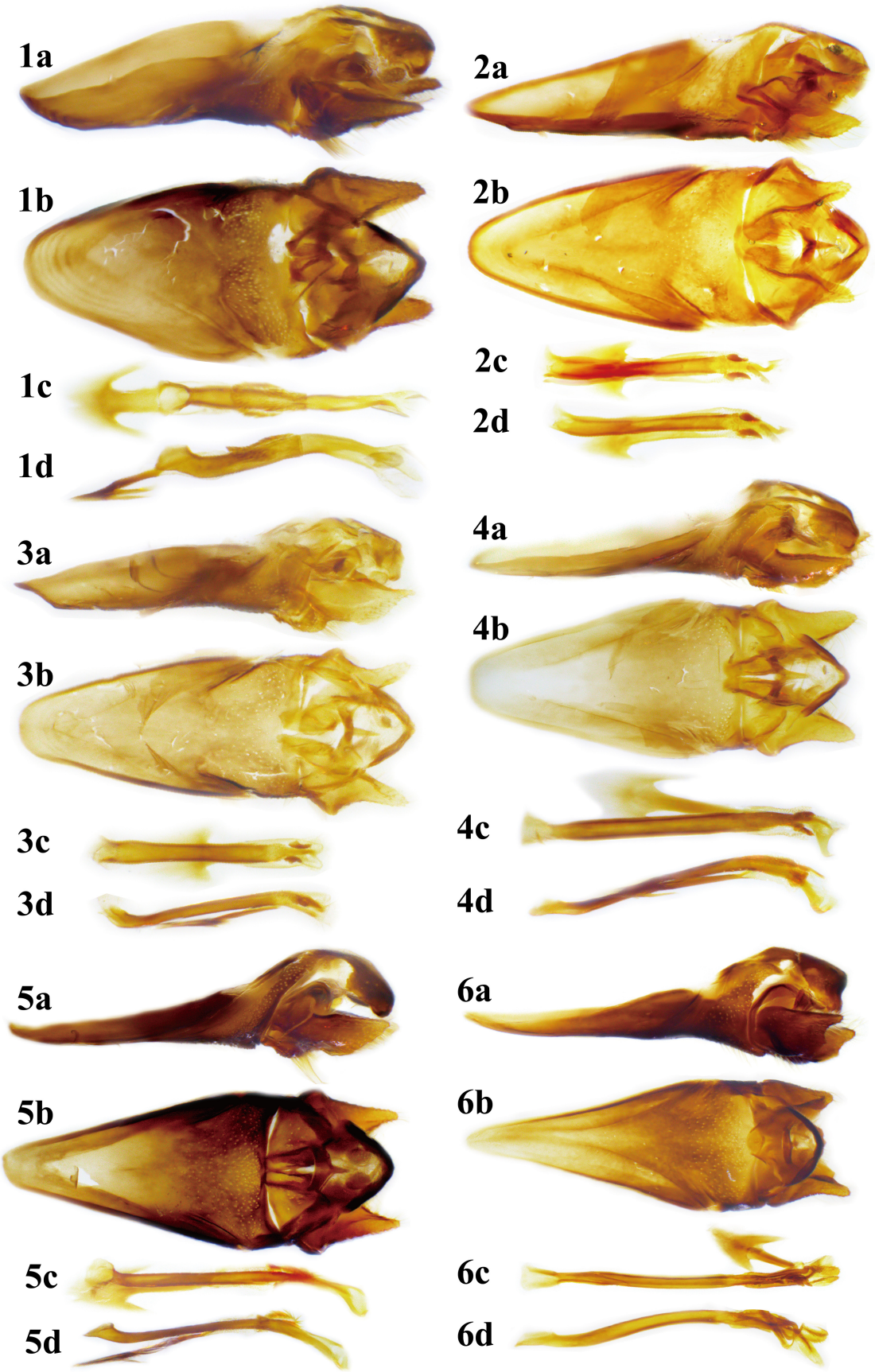

Plate XIII

Plate XIV

1. *Nemophora quadrata* Liao, Hirowatari & Huang, **sp. nov.**, holotype
2. *Nemophora basalistriata* Liao, Hirowatari & Huang, **sp. nov.**, holotype
3. *Nemophora digitata* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora duplicifascia* Liao, Hirowatari & Huang, **sp. nov.**, holotype
5. *Nemophora hunanensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype
6. *Nemophora purpurata* Liao, Hirowatari & Huang, **sp. nov.**, holotype

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. ventral view of juxta.

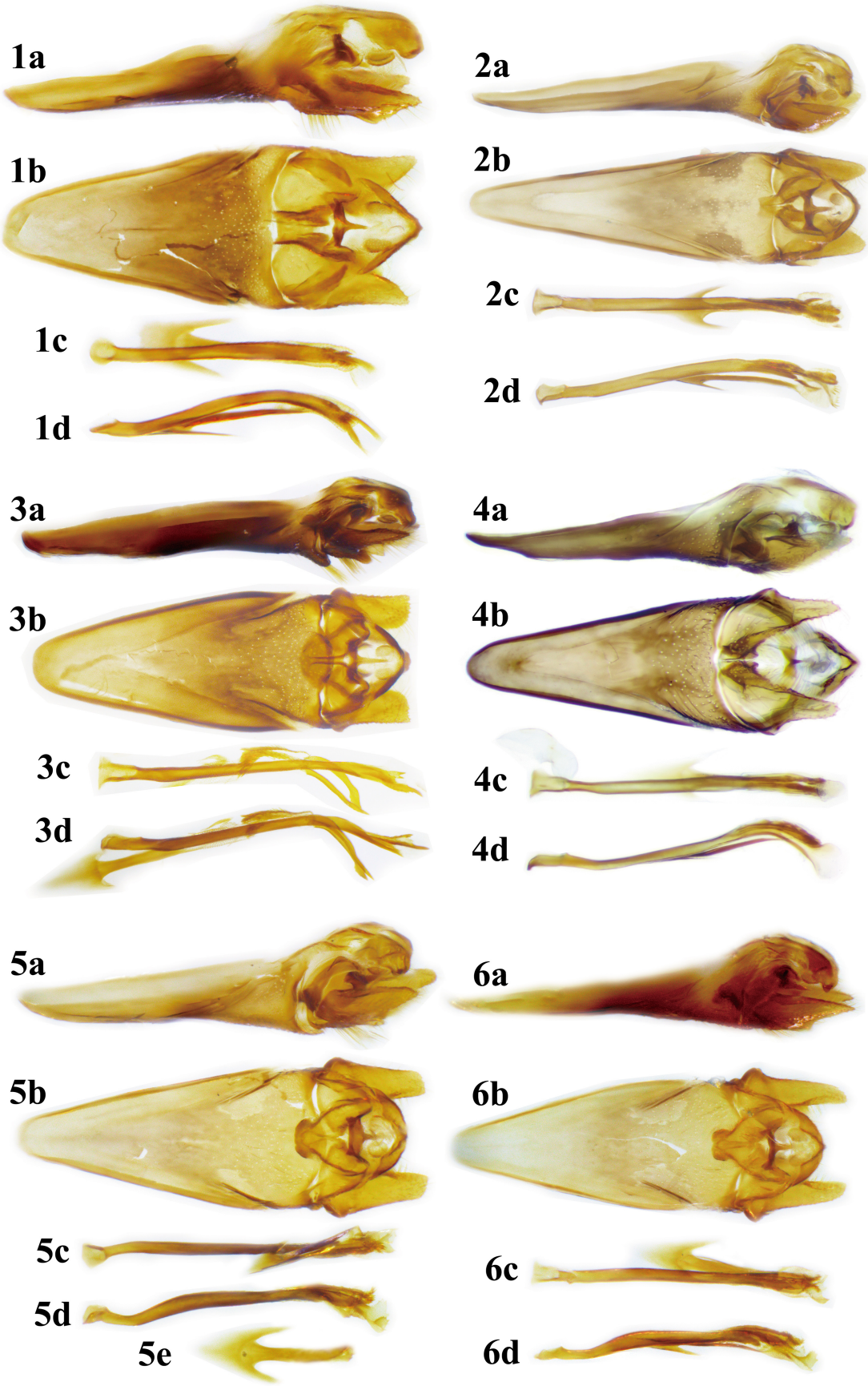
1a
1b
1c
1d
2a
2b
2c
2d
3a
3b
3c
3d
4a
4b
4c
4d
5a
5b
5c
5d
5e
6a
6b
6c
6d

Plate XIV

Plate XV

1. *Nemophora sakaii* (Matsumura, 1931)
2. *Nemophora caeruliantenna* Liao, Hirowatari & Huang, **sp. nov.**, holotype
3. *Nemophora decisella* (Walker, 1863)
4. *Nemophora paradisea* (Butler, 1881)
5. *Nemophora smaragdaspis* (Meyrick, 1924)
6. *Nemophora xizangensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. ventral view of juxta.

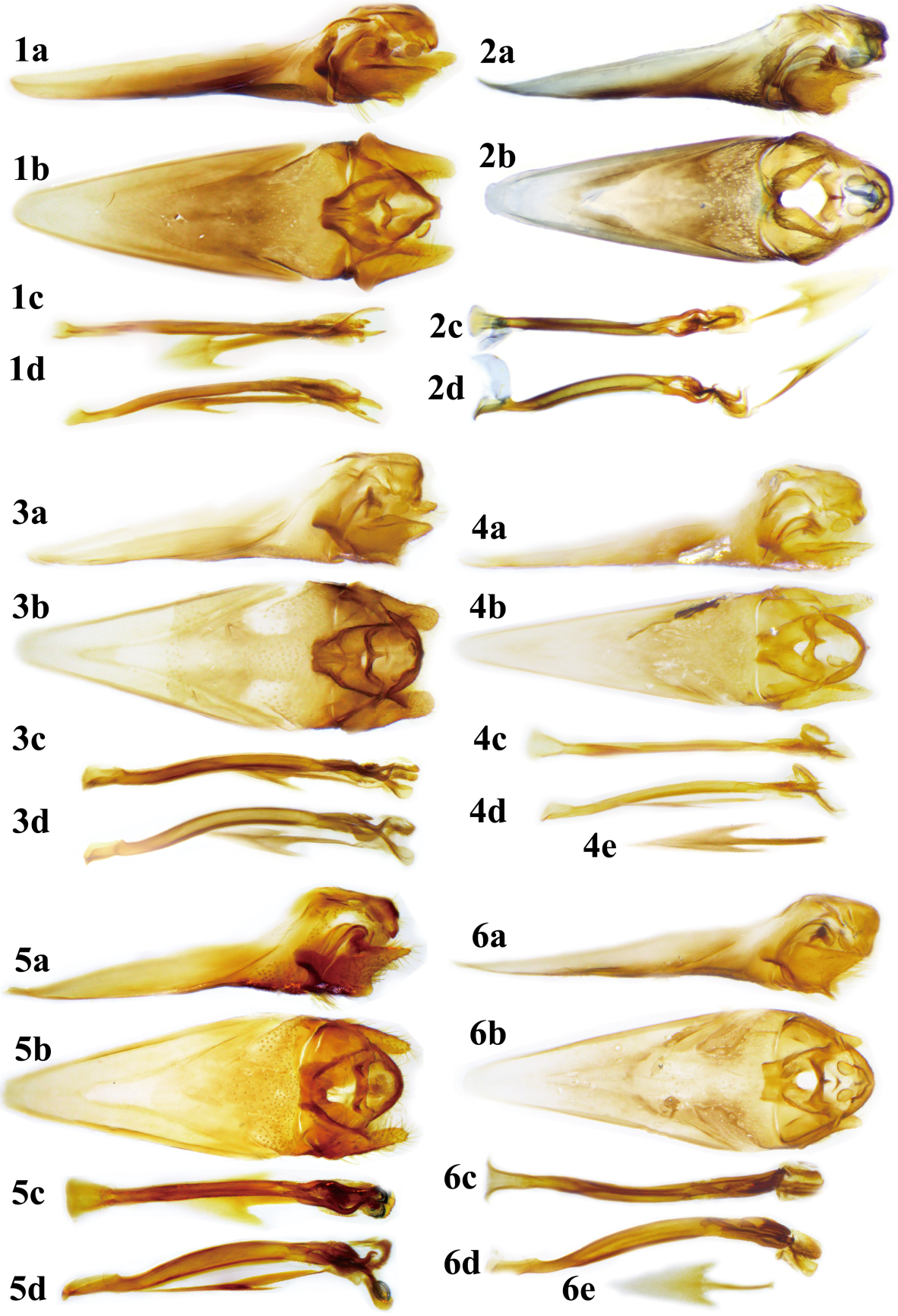
1a
2a
1b
2b
1c
2c
1d
2d
3a
4a
3b
4b
3c
4c
3d
4d
4e
5a
6a
5b
6b
5c
6c
5d
6d
6e

Plate XV

Plate XVI

1. *Nemophora assamensis* Kozlov, 1997
2. *Nemophora magnifica* Kozlov, 1997
3. *Nemophora songgangensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora trimetrella* Stringer, 1930
5. *Nemophora conjugata* Liao, Hirowatari & Huang, **sp. nov.**, holotype
6. *Nemophora optima* (Butler, 1878)

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. juxta.

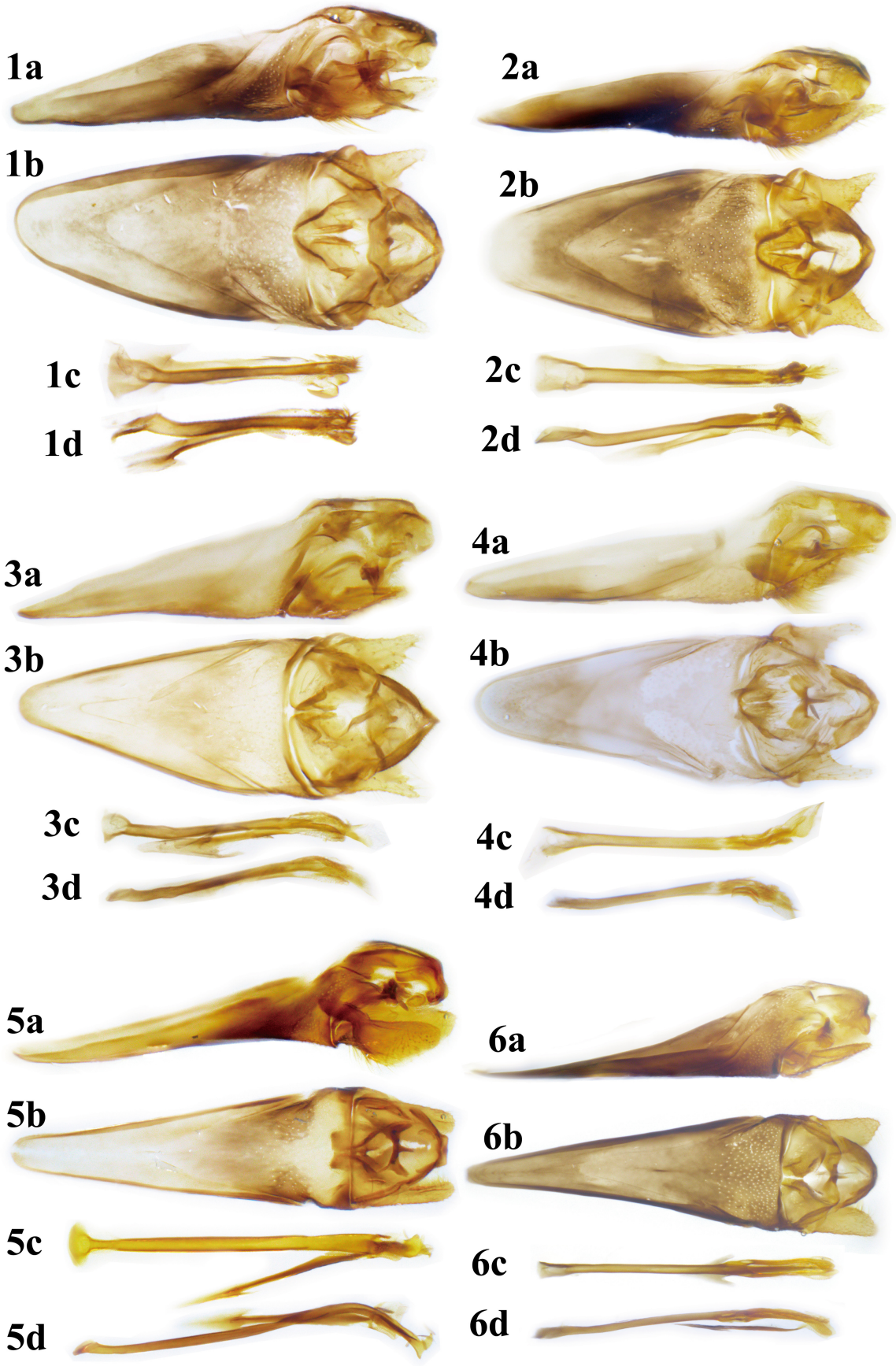

Plate XVI

Plate XVII

1. *Nemophora fluorites* (Meyrick, 1907)
2. *Nemophora latilobula* Liao, Hirowatari & Huang, **sp. nov.**, holotype
3. *Nemophora longispina* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora tanakai* Hirowatari, 2007
5. *Nemophora bifasciatella* Issikii, 1930
6. *Nemophora longiuga* Sun & Li, 2023

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. ventral view of juxta.


1a
1b
1c
1d
2a
2b
2c
2d
3a
3b
3c
3d
4a
4b
4c
4d
5a
5b
5c
5d
5e
6a
6b
6c
6d
6e

Plate XVII

Plate XVIII

1. *Nemophora longissima* Sun & Li, 2023
2. *Nemophora amatella* (Staudinger, 1892)
3. *Nemophora ganziensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora jiajinshana* Liao, Hirowatari & Huang, **sp. nov.**, holotype
5. *Nemophora lapikella* Kozlov, 1997
6. *Nemophora litangensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus; e. juxta.

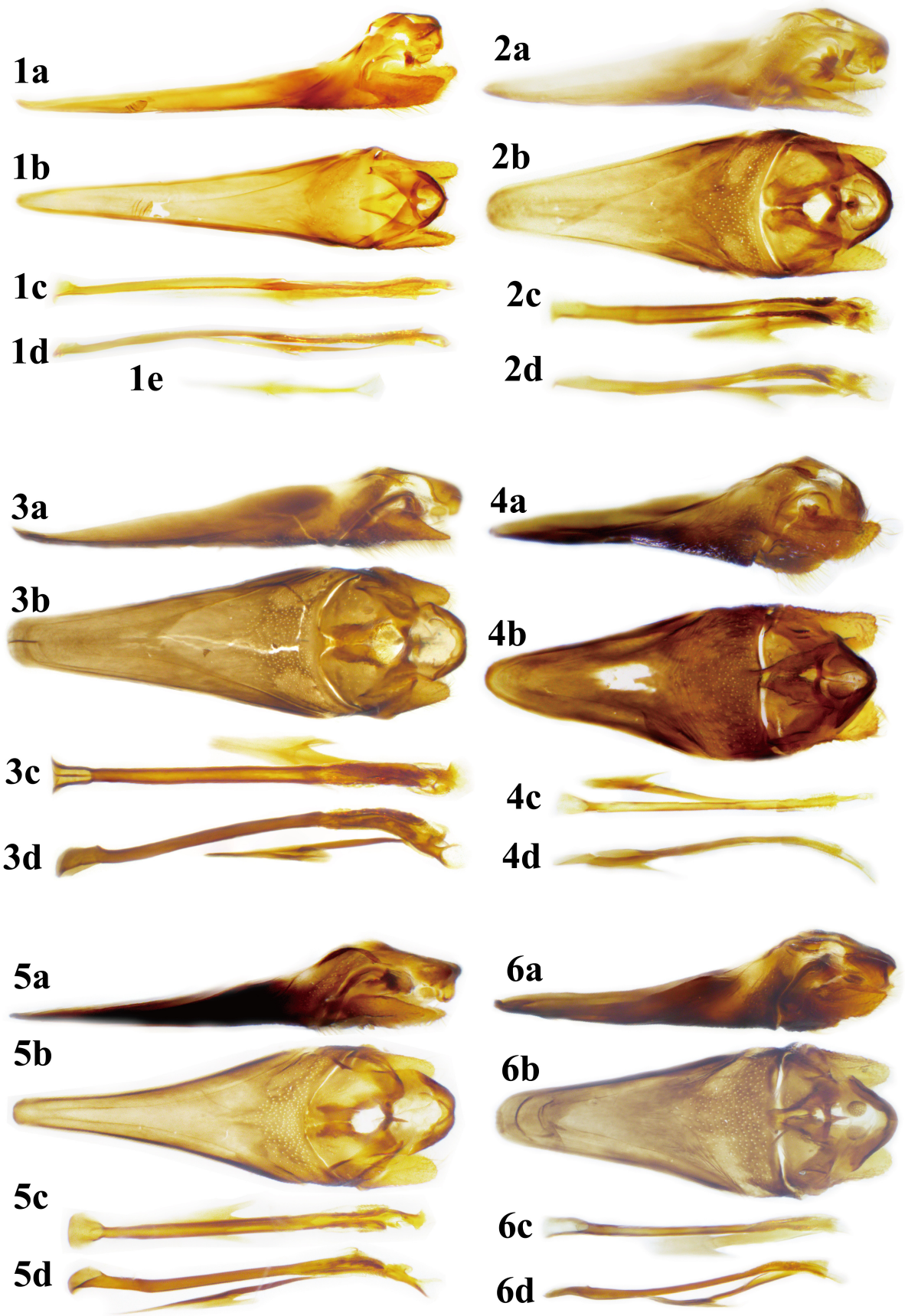
1a
1b
1c
1d
1e
2a
2b
2c
2d
3a
3b
3c
3d
4a
4b
4c
4d
5a
5b
5c
5d
6a
6b
6c
6d

Plate XVIII

Plate XIX

1. *Nemophora polychorda* (Meyrick, 1914)
2. *Nemophora recurvatifera* Sun, Wang & Li, 2022
3. *Nemophora triangulifascia* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora staudingerella* (Christoph, 1881)
5. *Nemophora syfaniella* (Caradja, 1927)
6. *Nemophora tianpingshana* Liao, Hirowatari & Huang, **sp. nov.**, holotype

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus.

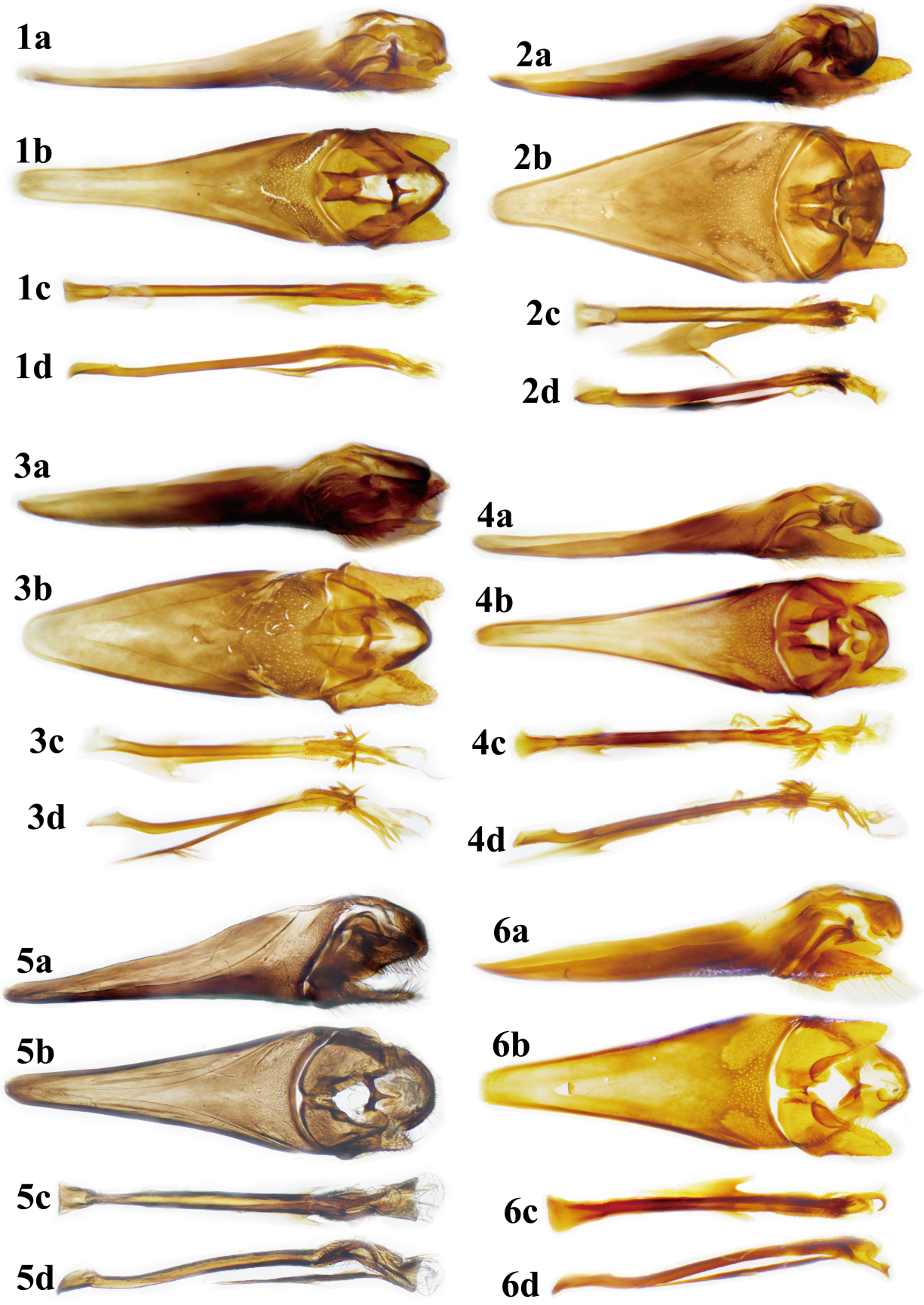

Plate XIX

Plate XX

1. *Nemophora yajiagengensis* Liao, Hirowatari & Huang, **sp. nov.**, holotype
2. *Nemophora biprocessa* Sun, Wang & Li, 2022
3. *Nemophora bispina* Liao, Hirowatari & Huang, **sp. nov.**, holotype
4. *Nemophora raddei* (Rebel, 1901)

Note: a–b. lateral (a) and ventral view (b) of male genitalia; c–d. dorsal (c) and lateral view (d) of aedeagus.

Plate XX

Female genitalia plates

Plate XXI

1. *Nemapotogon distinctus* Yasuda, 1957
2. *Nemophora albiantennella* Issiki, 1930
3. *Nemophora chionites* (Meyrick, 1907)

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

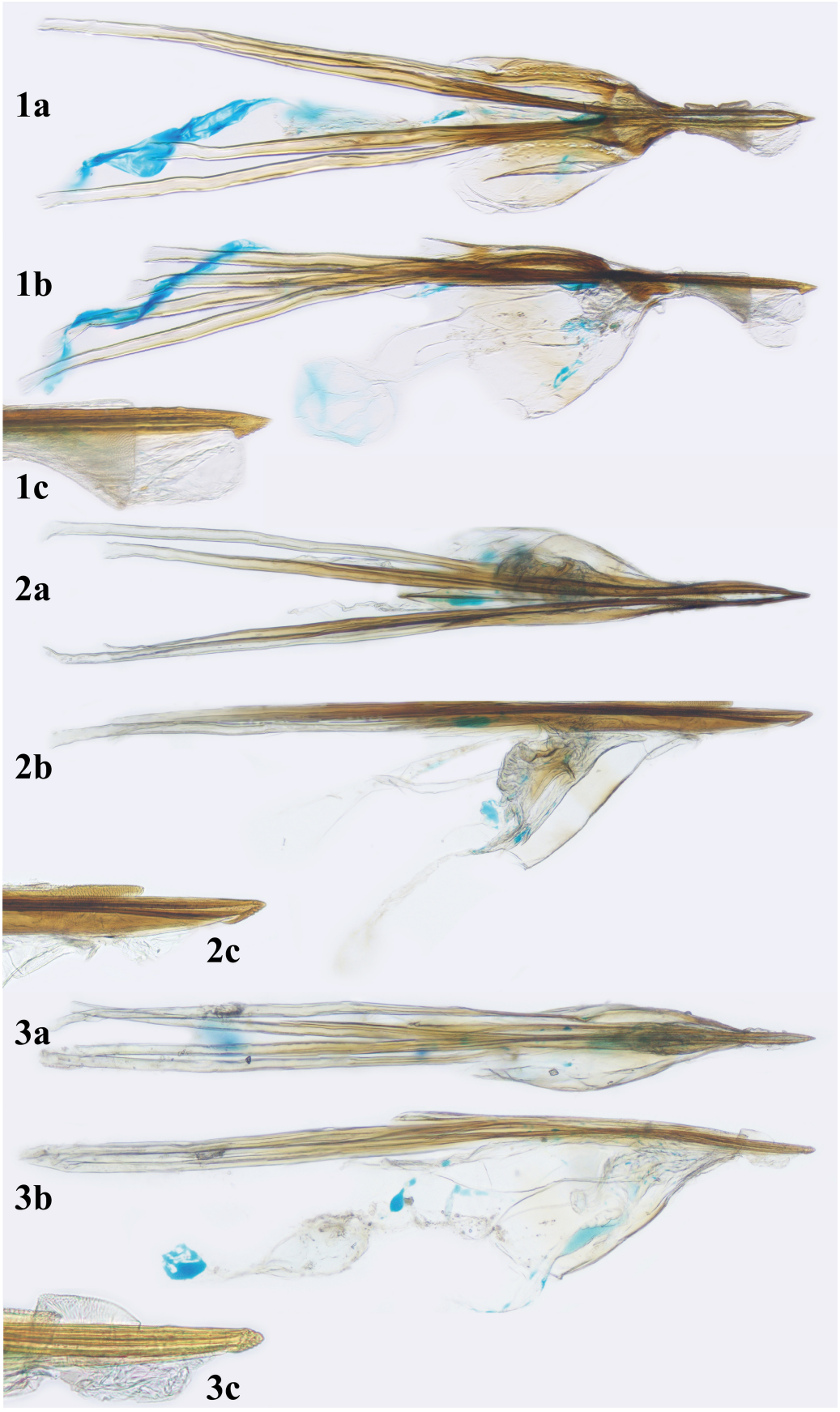

Plate XXI

Plate XXII

1. *Nemophora aurifera* (Butler, 1881)
2. *Nemophora badagongshana* Liao, Hirowatari & Huang, **sp. nov.**, paratype
3. *Nemophora quadrata* Liao, Hirowatari & Huang, **sp. nov.**, paratype

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

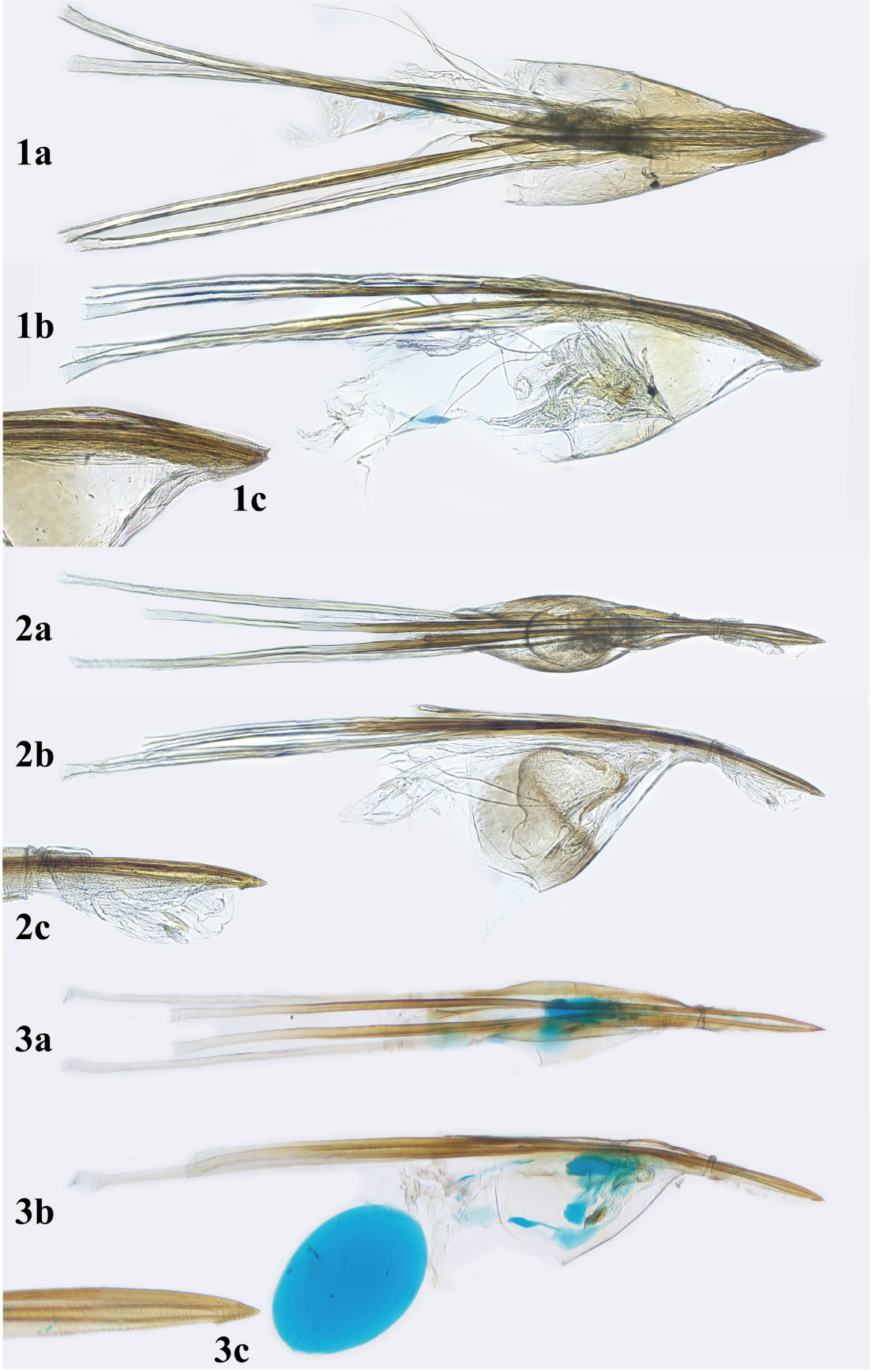

Plate XXII

Plate XXIII

1. *Nemophora basalistriata* Liao, Hirowatari & Huang, **sp. nov.**, paratype
2. *Nemophora digitata* Liao, Hirowatari & Huang, **sp. nov.**, paratype
3. *Nemophora sakaii* (Matsumura, 1931)

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

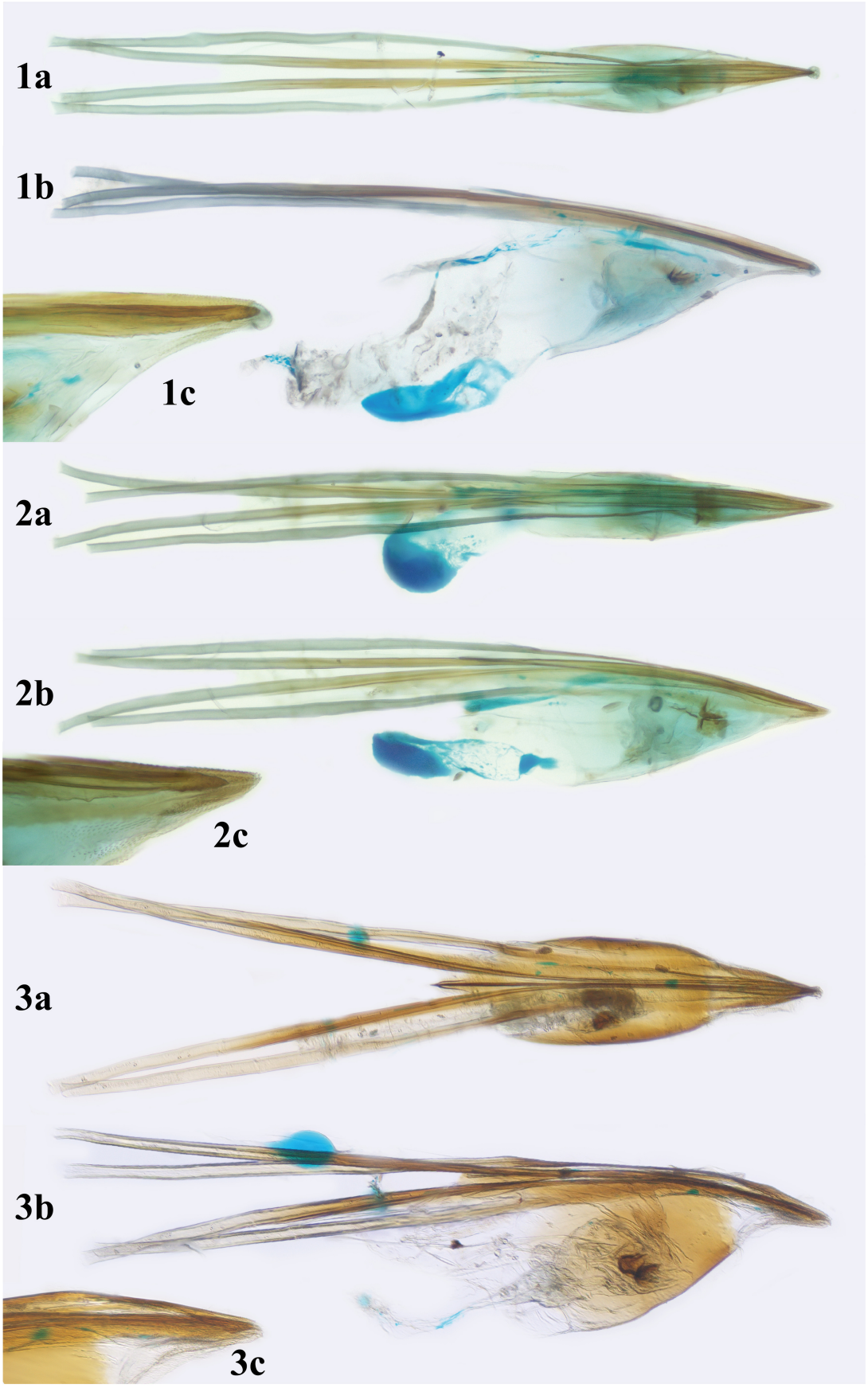

Plate XXIII

Plate XXIV

1. *Nemophora arcuatifasciata* Liao, Hirowatari & Huang, **sp. nov.**, holotype
2. *Nemophora decisella* (Walker, 1863)
3. *Nemophora xizangensis* Liao, Hirowatari & Huang, **sp. nov.**, paratype

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

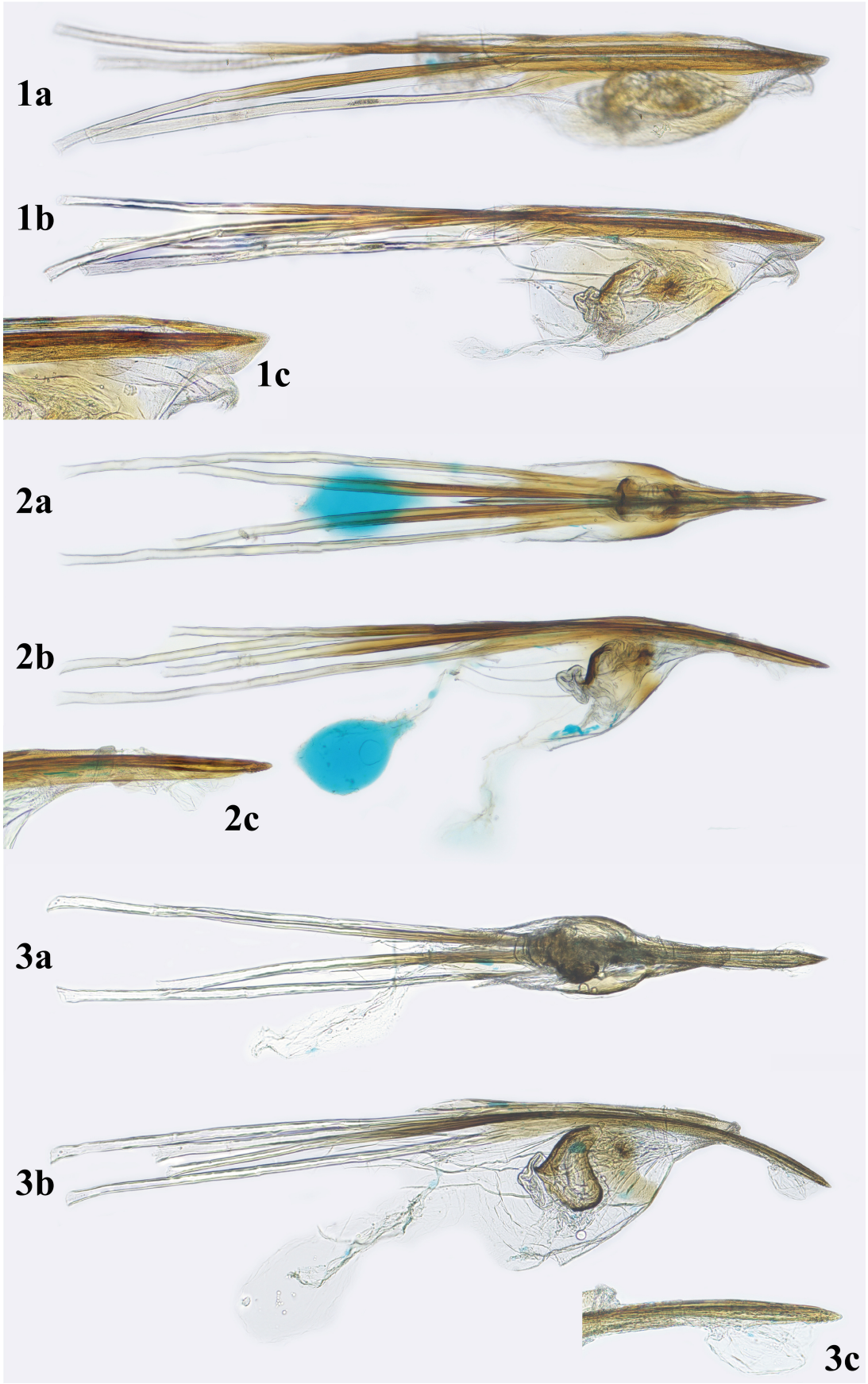

Plate XXIV

Plate XXV

1. *Nemophora caerulea* Liao, Hirowatari & Huang, **sp. nov.**, holotype
2. *Nemophora fluorites* (Meyrick, 1907)
3. *Nemophora latilobula* Liao, Hirowatari & Huang, **sp. nov.**, paratype
Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c–d. dorsal (c) and lateral (d) view of ovipositor enlarged.

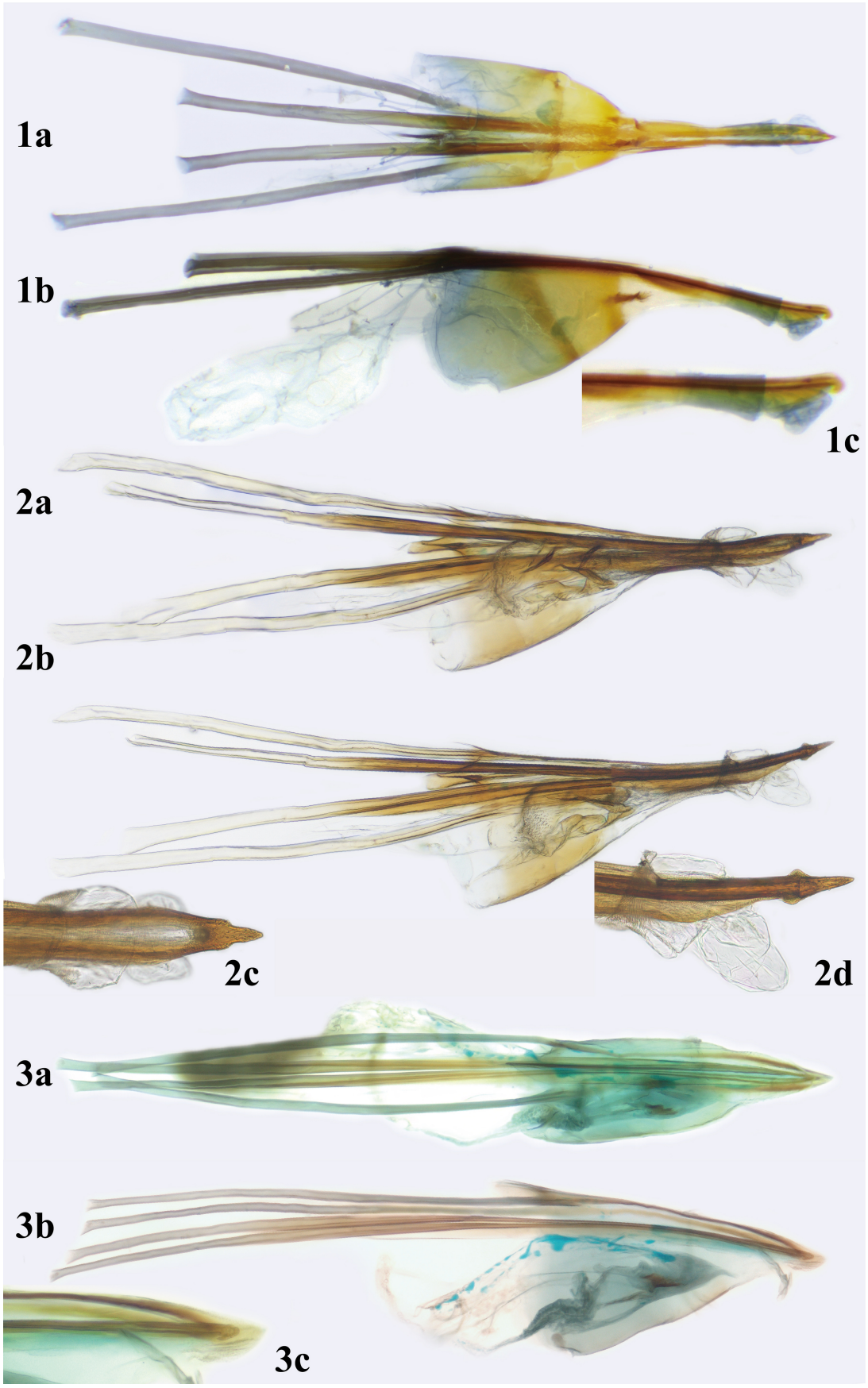

Plate XXV

Plate XXVI

1. *Nemophora longispina* Liao, Hirowatari & Huang, **sp. nov.**, paratype
2. *Nemophora tanakai* Hirowatari, 2007
3. *Nemophora bifasciatella* Issikii, 1930

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c–d. dorsal (c) and lateral (d) view of ovipositor enlarged.

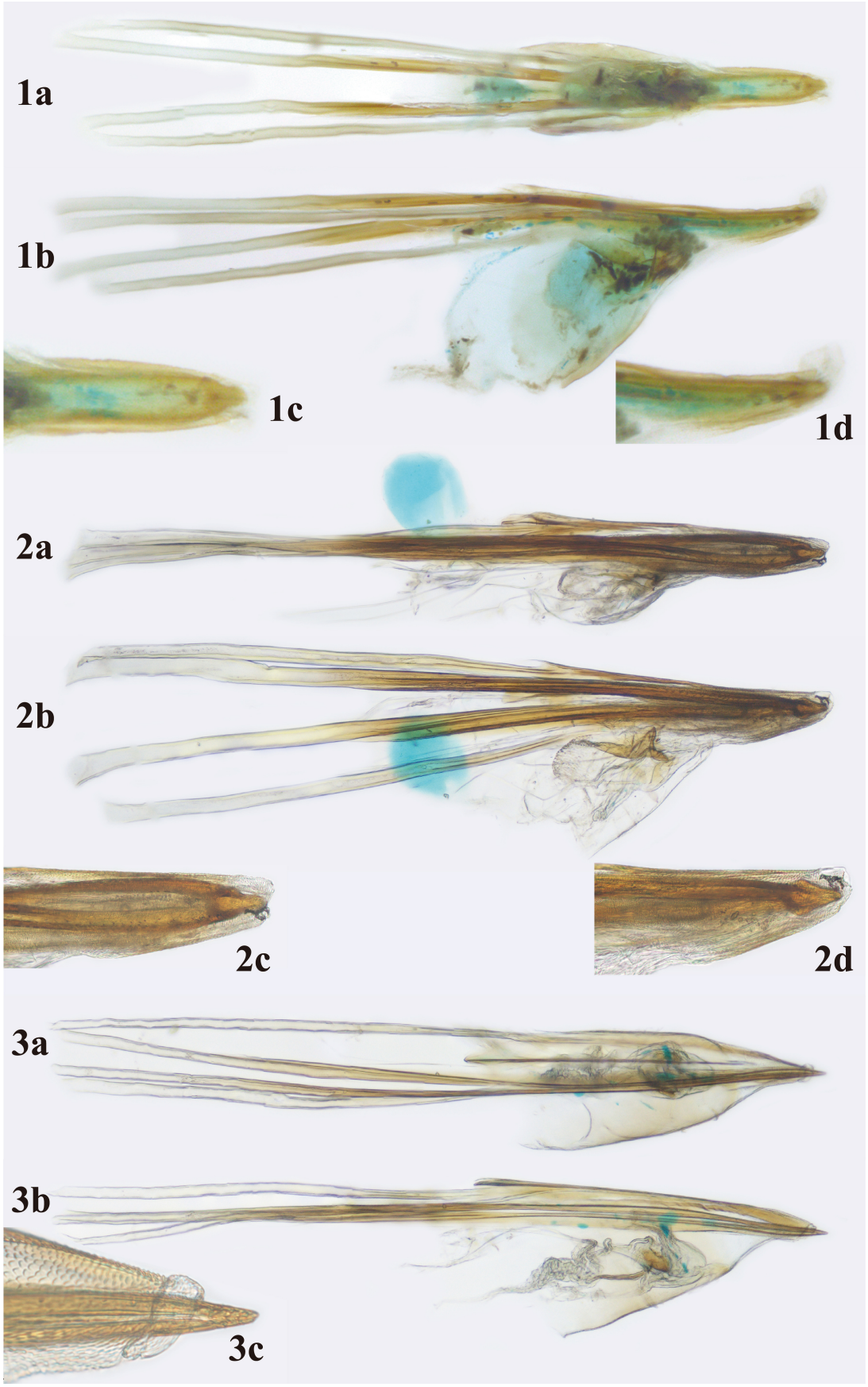

Plate XXVI

Plate XXVII

1. *Nemophora longiuga* Sun & Li, 2023
2. *Nemophora longissima* Sun & Li, 2023
3. *Nemophora lapikella* Kozlov, 1997

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

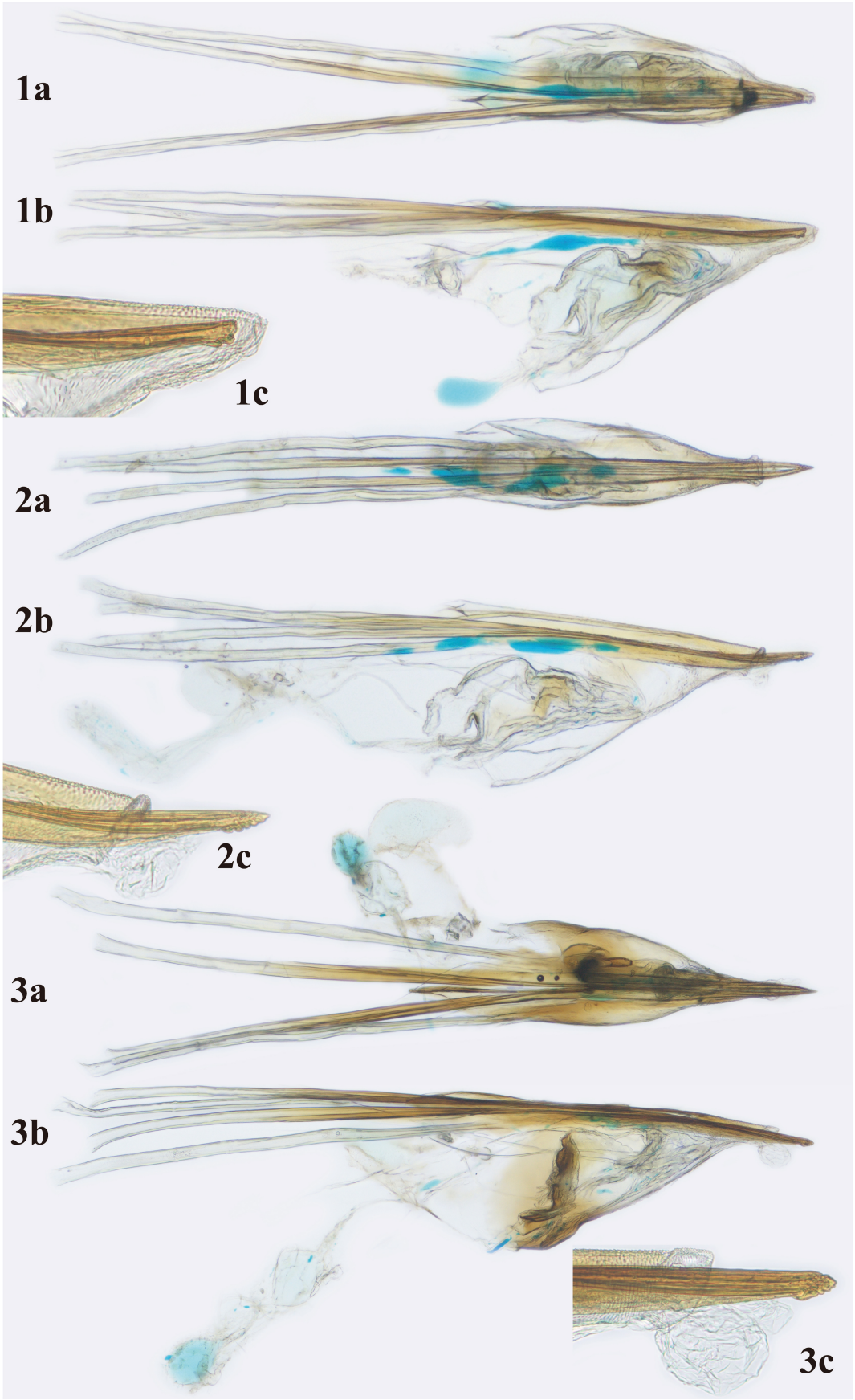

Plate XXVII

Plate XXVIII

1. *Nemophora polychorda* (Meyrick, 1914)
2. *Nemophora syfaniella* (Caradja, 1927)
3. *Nemophora jiajinshana* Liao, Hirowatari & Huang, **sp. nov.**, paratype

Note: a–b. dorsal (a) and lateral (b) view of female genitalia; c. lateral view of ovipositor enlarged.

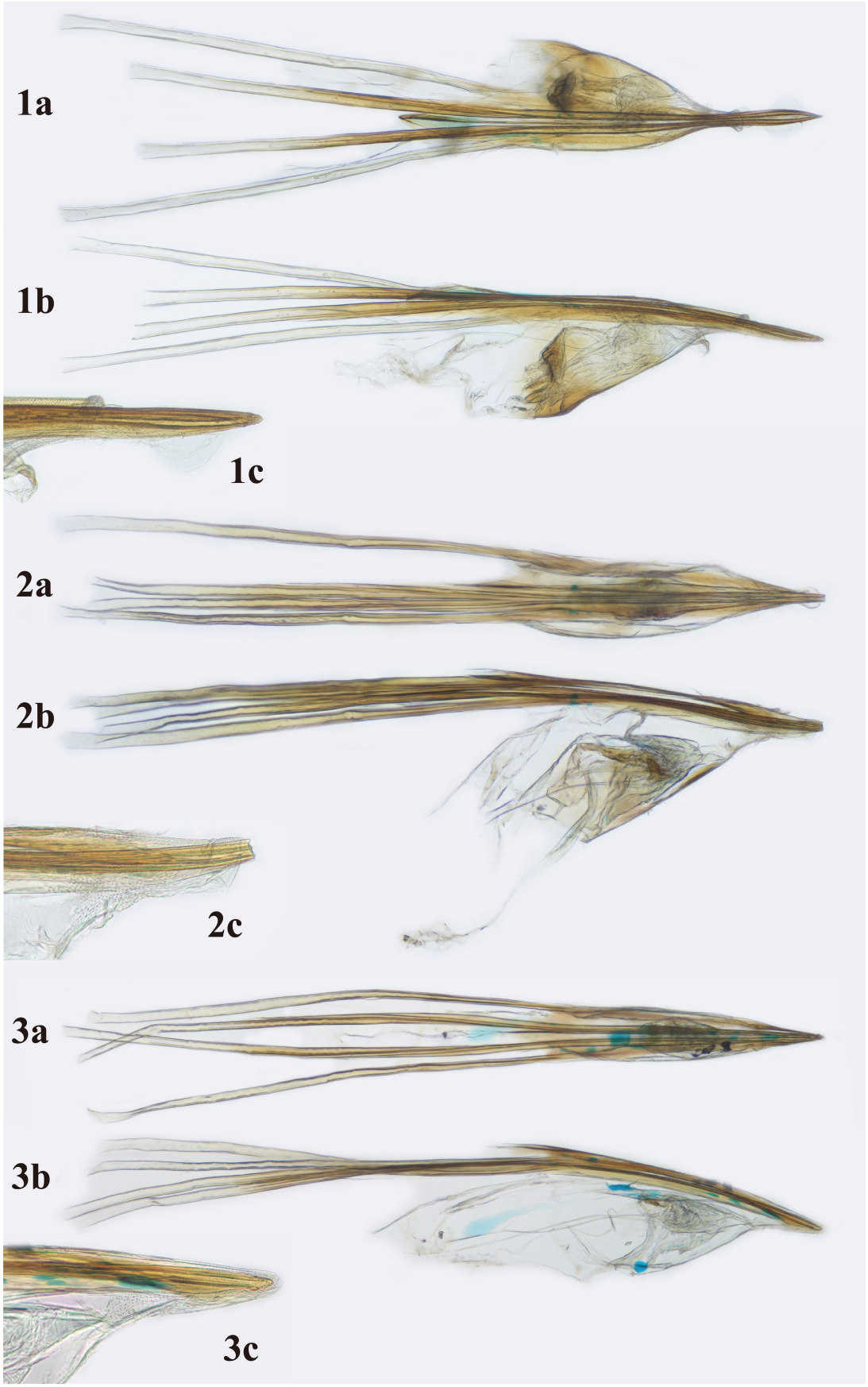

Plate XXVIII

Ecological plates

Plate XXIX

1–4. Female adult of *Nemophora decisella* (Walker, 1863) feeding and ovipositing on the flowers of *Lysimachia* sp.
5–6. Female adult of *Nemophora longispina* Liao, Hirowatari & Huang, **sp. nov**., paratype, resting on the leaf (5) and feeding on the flowers of *Castanea mollissima* Blume (6).

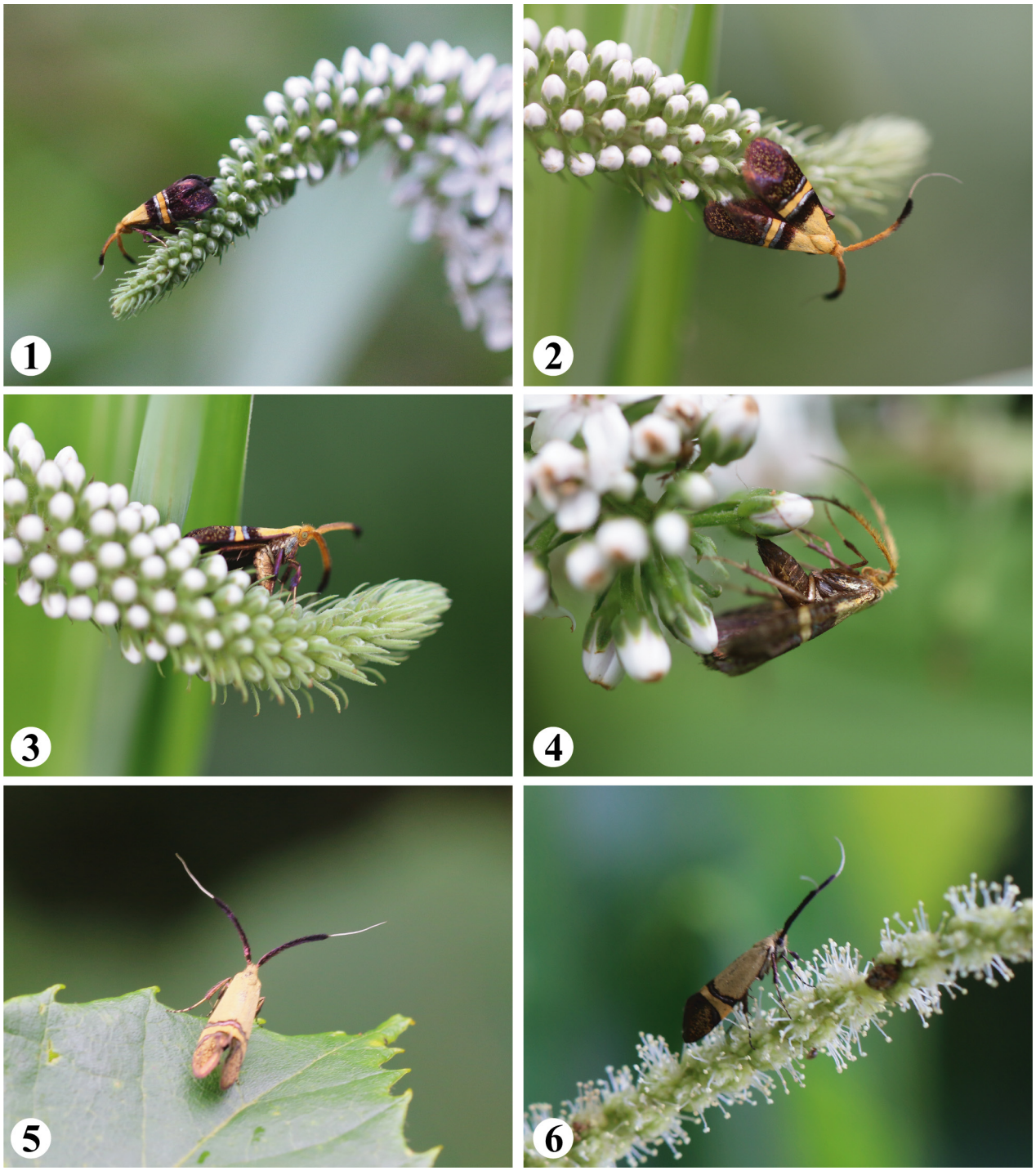

Plate XXIX

Plate XXX

1–4. Adults of *Nemophora polychorda* (Meyrick, 1914) resting on the leaves (1, 3: male; 2: female) and feeding on the flowers (4: male).
5–9. Adults of *Nemophora aurifera* (Butler, 1881) resting on the leaves (5: male; 6: female) and feeding on the flowers (7: female; 8, 9: male).

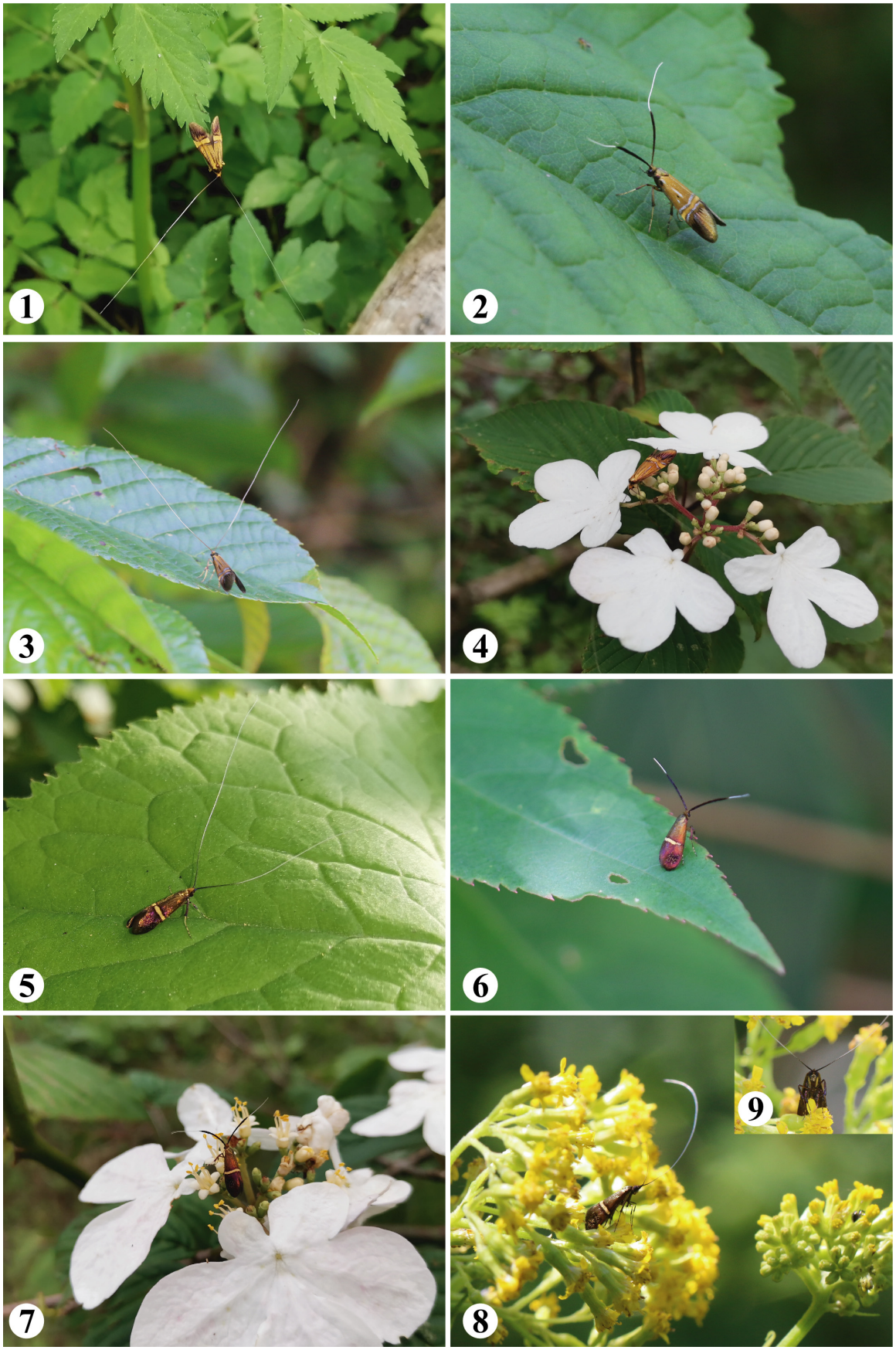

Plate XXX

Plate XXXI

1, 6, 7. Adults of *Nemophora polychorda* (Meyrick, 1914) by light trap (1: male) and by insect net (6: female; 7: male).
2, 8. Male adults of *Nemophora assamensis* Kozlov, 1997 by light trap (2) and insect net (8).
3, 5. Female adults of *Nemophora aurifera* (Butler, 1881) by light trap (3) and insect net (5).
4. Male adult of *Nematopogon distinctus* Yasuda, 1957 by light trap.

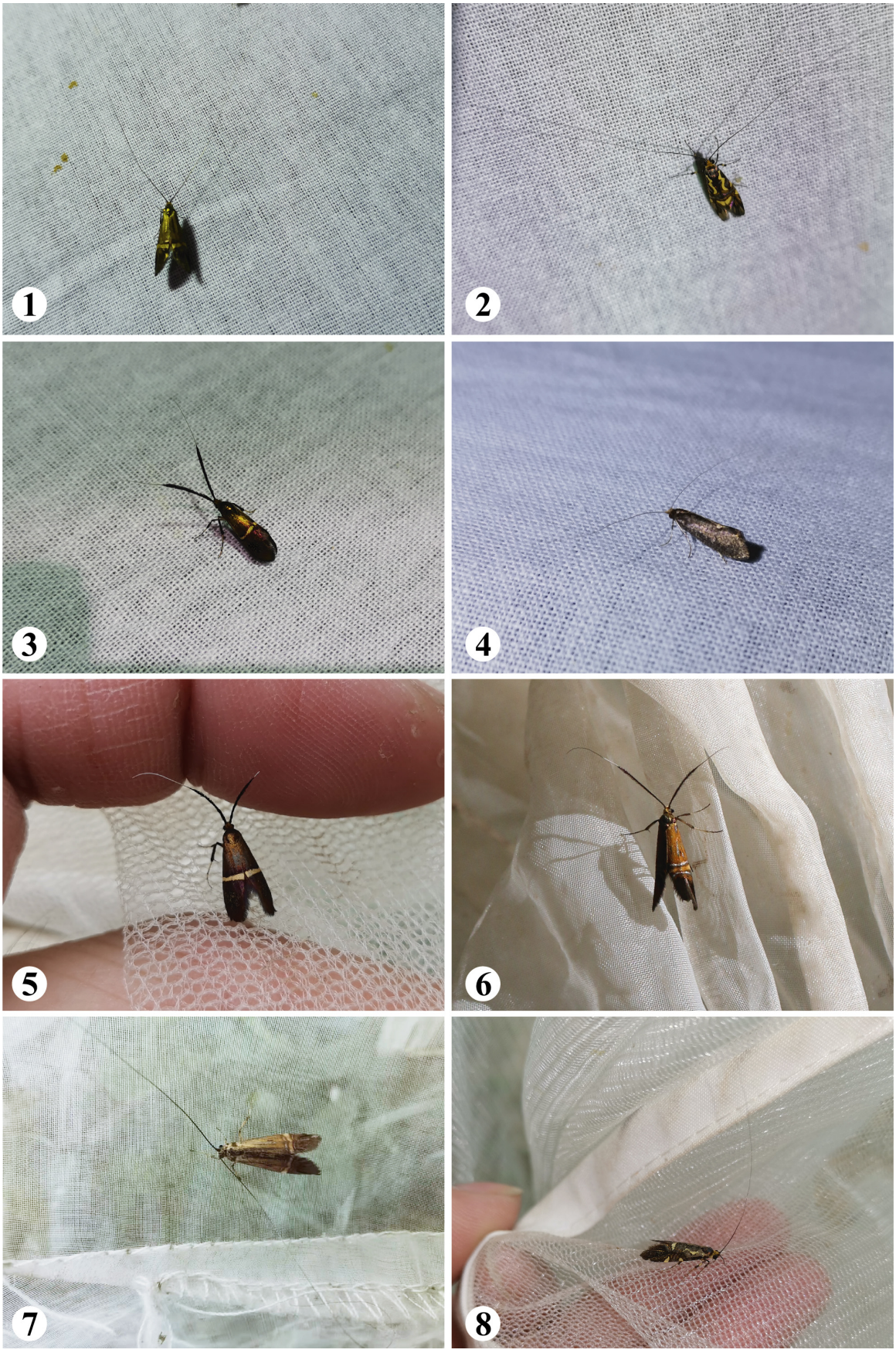

Plate XXXI