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IDENTIFICATION AND MISIDENTIFICATIONS IN THE GENUS *INUROIS* (LEPIDOPTERA: GEOMETRIDAE) WITH DESCRIPTION OF A NEW SPECIES

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Summary. The article considers the history of descriptions and misidentifications in the genus *Inurois* Butler, 1879 (Lepidoptera: Geometridae). A catalogue of species of the genus with notes, a key to species from *I. punctigera* and *I. tenuis* species-group by the wing pattern and by the male genitalia are given. Based on morphological and genetic data a new species, *Inurois pseudopunctigera* **sp. n.**, is described from the continental East Asia.

Key words: geometer moths, *Inurois*, catalogue, identifications, taxonomy, new species, East Asia.

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Резюме. В статье рассмотрена история описаний и ошибочных идентификаций в роде *Inurois* Butler, 1879 (Lepidoptera: Geometridae), дан каталог распространения видов рода с примечаниями, приведена определительная таблица видов из групп видов *I. punctigera* и *I. tenuis* по рисунку крыльев и гениталиям самца. На основании морфологических и генетических данных из континентальной части Восточной Азии описан новый вид *Inurois pseudopunctigera* **sp. n.**

INTRODUCTION

The genus *Inurois* Butler, 1879 includes a series of species of “winter” geometrid moths, deeply specialized in the activity of adults in the cool season of the year with average daily temperatures close to 0° C. The moths are active in late twilight and at night. According to the author's observations in the Russian Far East, they are able to fly at air temperatures down to –4° C with snow falling. Males have a raised cover of scales on the wings, making them look velvety and translucent. Unlike the vast majority of other geometrids, only together with other Alsophilini and the same “winter” Ennominae – Palearctic *Pterotocera* Staudinger, 1882 and *Chemerina* Boisduval, 1840, as well as Nearctic *Paleacrita* Riley, 1876, moths of *Inurois* at rest fold their wings flat over the abdomen in four widely overlapping layers, obviously for keeping warm. In females, the wings are so deeply reduced that their rudiments do not protrude above the scaly cover of the thorax.

Most moths of different species of *Inurois* have a similar external structure and wing pattern, combined with great variability in size and colour in different individuals. Some species can be accurately identified by the male genitalia only, which are small and differ mainly in subtle features of the phallus. This has led to a series of erroneous identifications, frequently occurring in various publications.

This publication aims to point out misidentifications in the genus *Inurois*, to give a key to species and to describe a new species.

MATERIAL AND METHODS

The most of examined material is deposited in the Laboratory of Entomology of the Federal Scientific Center of the East Asia Terrestrial Biodiversity (Vladivostok), including a number of moths from Japan and Korea, kindly provided by colleagues from these countries. Also, some specimens from the Zoological Institute (St. Petersburg) and the type specimens from the Staudinger collection in the Museum für Naturkunde (Berlin) were examined.

For genitalia slide preparation, each specimen was prepared by boiling the abdomen in 10% KOH or by incubation in 15% KOH at 90° C. Genitalia of barcoded specimens were mounted after leaching of tissues in working solution of Proteinase K. For the type specimens, the samples were cleaned and dehydrated with 99% ethanol, stained with Chlorazol Black (if it was necessary) and mounted on slides in Euparal Mountant. Original photographs of the genitalia were taken with a stereomicroscope Olympus SZX16 and digital camera Olympus DP74, and stacked using Helicon Focus software. The final illustrations were processed using Adobe® Photoshop® software.

Total genomic DNA was extracted from abdomen following the protocol “Purification of Genomic DNA from insects” appended to Qiagen DNeasy Blood & Tissue Kit (Qiagen GmbH, Hilden, Germany). DNA sequences across the target region, the “barcoding” target region mtCOI, were amplified by PCR and analyzed by Sanger

sequencing protocol. Polymerase chain reaction (PCR) was performed using the forward and reverse primers LCO1490 and HCO2198 (after Folmer *et al.*, 1994). Other details of genetic processing of the samples see Ponomarenko & Chernikova (2018). The obtained sequences were aligned and analyzed with the software packages FinchTV 1.4.0. and MEGA-7 (Kumar *et al.*, 2016). The divergence (evolutionary distance) between the sequences was estimated by the Pairwise Distance method, using the Kimura 2-parameter model (Kimura, 1980), and the results were presented in a matrix and tree p-distances.

Abbreviations. Museums and institutions: BMNH – The Natural History Museum, London, Great Britain; FSCB – Federal Scientific Center of the East Asia Terrestrial Biodiversity, Vladivostok, Russia; IZBE – Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Tartu, Estonia; KUK – Kyushu University, Kyushu, Japan; MNB – Museum für Naturkunde zu Berlin, Germany; NSMT – National Science Museum (Natural History), Tokyo, Japan; ZIN – Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia. Data bases: BIN – Barcode Index Number; BOLD – Barcode of Life Data; GBIF – Global Biodiversity Information Facility.

The holotype and part of paratypes of new species are deposited in ZIN. Rest paratypes and other specimens are kept in FSCB.

HISTORY OF DESCRIPTIONS AND MISIDENTIFICATIONS

The first described and type species of the genus is *Inurois tenuis* Butler, 1879 from Japan. The second was *Anisopteryx membranaria* Christoph, 1881 from the Russian Far East. In Wytsman's "Genera Insectorum" both of these species are cited in the genus *Inurois* (Prout, 1910). In the 4th volume of Seitz's "The Macrolepidoptera of the World" the genus *Inurois* was rejected and both species are transferred to the genus *Alsophila* Hübner, [1825] (Prout, 1912). Later in "Additions and Corrections to Volume 4" of the same book Prout synonymized *membranaria* with *tenuis*, referring to the figure in tab. 2, erroneously captioned as "*membranaria*". He also proposed a new name "*A[lsophila] punctigera* nom. nov." for "*membranaria* Leech nec Christ.", referring to the description of "*A. membranaria*" on page 2 and to image of the moth on tab. 2 captioned as "*tenuis*". Notable, German edition of the "Additions and Corrections" (as "Berichtigungen und Zusätze") was published in "20.XI.1915" (Prout, 1915) whereas the English edition was published 5 years later, in "30.XIII.1920" (Prout, 1920). As a result, in a series of publications the name *Alsophila punctigera* Prout, 1915, was erroneously attributed to 1920 (Inoue, 1944, 1954, 1977, 1982; Viidalepp, 1986; Beljaev, 1996; Kim & Shin, 1996; Nakajima, 1998; Nakajima & Wang, 2014; Beljaev, 2016). Moreover, as the diagnosis of this species was published in 1912, the name also sometimes was attributed to 1912 (Viidalepp, 1976; Viidalepp, 1996). Thereby, the inventory of species of the genus *Inurois* began with a series of confusions, which led to numerous misidentifications.

First report of "*A.[anisopteryx] tenuis* Btl." from the Russian Far East (Kurentzov, 1937) is based on misidentification of *Inurois brunneus* Viidalepp, 1986 (specimen examined: ♂, "Сучанский район, Тигровое [=Partizanskii district, Tigrovoy], 29.X.1922, А. Куренцов [A. Kurentzov leg.]"; "*Anisopteryx tenuis* Butler, Djakonov det."; ZIN), possibly, in result of similarity in straight and smooth transverse lines on the forewings with the figure of "*tenuis*" in Prout (1912–1916; 1912–1920).

The first revision of the Japanese species of the genus was undertaken by Inoue (1944). Here the author accepted *Inurois* as a subgenus of *Alsophila*, described a new species “*Alsophila (Inurois) fumosa*” and considered three other species, however, all in an erroneous interpretation, also due to erroneous captions of the figures in Prout (1912): “*Alsophila (Inurois) tenuis*” (= *Inurois punctigera* (Prout, 1915) in the current treatment), “*Alsophila (Inurois) punctigera*” (= *Inurois fletcheri* Inoue, 1954) and “*Alsophila (Inurois) membranaria*” (= *I. tenuis*). Single examined specimen of *Inurois* from Korea Inoue (1944, 1946) also associated with “*Alsophila (Inurois) membranaria*” (= *I. tenuis*). However, up to present time distribution of *I. tenuis* in Korea is not confirmed; probably, this record should be referred to true *I. membranaria* or *Inurois viidaleppi* Beljaev, 1996 (see below).

Later, Inoue (1950, 1954) restored the generic status of *Inurois* and partially corrected previous errors, restoring the correct understanding of *I. punctigera*, and described a new species *I. fletcheri* based on the previous erroneous treatment of “*Alsophila (Inurois) punctigera*”. However, here he retained the synonymy of *I. tenuis* and *I. membranaria*, following to Prout (1915). Then, Inoue (1974) described two species from Japan, namely *Inurois asahinai* Inoue, 1974 and *Inurois kyushuensis* Inoue, 1974, which are close to *I. fletcheri*. This interpretation of the *Inurois* species was fixed in the “Catalogue of the Geometridae of Japan” (Inoue, 1977) and in the famous “Moths of Japan” (Inoue, 1982).

There were two important events in the taxonomy of the genus *Inurois* in 1986. Inoue (1986) designated the lectotype of *I. membranaria*, erased this name from the synonymy with *I. tenuis*, and synonymised it with *I. punctigera*, based on the “shape of wings, ground colour and course of postmedial line of forewing”. Thus, Inoue actually returned to consideration of *I. membranaria* by Leech (1898) and Prout (1912) before the description of *I. punctigera*.

Independently, Viidalepp (1986), in his review “Subfamily Alsophilinae of the fauna of the USSR”, retained the synonymy of *I. tenuis* and *I. membranaria*, described two new species (*Inurois brunneus* Viidalepp, 1986 and *Inurois ussuriensis* Viidalepp, 1986), and published materials on *I. fletcheri* and *I. punctigera*, which he previously reported from the Russian Far East without data (Viidalepp, 1976). Regarding to the species, “*Inurois punctigera*” (*sensu* Viidalepp), judging by the “large rounded discal punctures on the forewings and hindwings” and the drawing of the aedeagus (Viidalepp, 1986) corresponds to *I. pseudopunctigera* sp. n., describing below. The single moth of *I. fletcheri* cited by Viidalepp (1986) has not been found. However, it also belonging to the new species, based on the author's note that this specimen “distinguishes by characteristic impressions of the lateral margins of the uncus” and from the shape of aedeagus (Viidalepp, 1986: fig. 22), which does not conform to the true aedeagus of *I. fletcheri* (Inoue, 1974: fig. 1; Nakajima, 1992: fig. 28; Nakajima, 1998: fig. 224). The photo of “*Inurois fletcheri*” from Shaanxi in the “Iconographia Heterocerorum Sinecorum” (Zhu, 1981) also seems to correspond to *I. pseudopunctigera*. To the present, *I. fletcheri* has not yet been reliably found either in the Russian Far East or in continental East Asia as a whole.

Nakajima has made a huge contribution to the knowledge of the ecology and morphology of “winter” moths, including the genus *Inurois*, mainly summarized in his remarkable work “A Taxonomical and Ecological Study of the Winter Geometrids Moths from Japan” (Nakajima, 1998). His taxonomic contribution to this genus consists of the description of three new species, *Inurois minutulus* Nakajima et Kudo, 1987, *Inurois kobayashii* Nakajima, 1992, and *Inurois nikkoensis* Nakajima, 1992. The modern interpretation of the species composition in *Inurois* by Japanese authors is based on the system adapted by this author (Nakajima, 2011), in which *I. membranaria* is considered a senior synonym of *I. punctigera*.

Beljaev (1996) stated that the synonymy of *I. membranaria* with *I. tenuis* is not justified, *I. membranaria* is an independent species, and *I. tenuis* is absent in the Russian Far East. *I. ussuriensis* is a junior synonym of *I. membranaria*, and “*Inurois membranaria*” (*sensu* Viidalepp) is an undescribed species, which was named *Inurois viidaleppi* Beljaev, 1996. In addition, *I. punctigera* has been restored from synonymy with *I. membranaria*, however, based on an erroneous interpretation of the taxon “*Inurois punctigera*” (*sensu* Viidalepp).

In the same year, Kim & Shin (1996) published “Review of the Winter Geometrid Moths in Korea”, in which the authors followed the treatment of the genus *Inurois* by the “Moths of Japan” (Inoue, 1982). As a result, materials on “*Inurois punctigera*” turned out to be a mixture of actual *I. punctigera*, *I. membranaria* and *I. pseudopunctigera*, and materials on “*Inurois tenuis*” – be a mixture of *I. membranaria* and *I. viidaleppi*. In the illustrations, “*I. punctigera*” in fig. 5 corresponds to *I. pseudopunctigera*, in fig. 6 – to true *I. punctigera* and in fig. 42 – to *I. membranaria*; “*Inurois tenuis*” in fig. 10 corresponds to *I. membranaria* and in fig. 45 – to *I. viidaleppi*; identification of females of these species based on the illustrations in the article is difficult. In “The Geometrid moths of Korea” (Kim *et al.*, 2016), judging by the photos of moths, *I. membranaria* and *I. viidaleppi* are identified correctly, and “*Inurois punctigera*” corresponds to *I. pseudopunctigera*.

In the catalogue “Geometrid Moths of the World” (Parsons *et al.*, 1999), which was published much later than Inoue (1986) proposed the synonymy of *I. membranaria* and *I. punctigera*, the validity of the latter name is retained, and *I. membranaria* is considered as a synonym of *I. tenuis*; thus, the concept of these species is in accordance to Prout (1915).

In the first edition of the “Catalogue of the Lepidoptera of Russia” (Mironov *et al.*, 2008), the species composition of the genus *Inurois* is presented according to Beljaev (1996). In the volume 2 of the “Annotated Catalogue of the Insects of Russian Far East” (Beljaev, 2016), the mistake with the identification of “*Inurois punctigera*” (*sensu* Viidalepp) was corrected and the taxon was listed as “*Inurois* sp.” with an accompanying commentary. In the second edition of the “Catalogue of the Lepidoptera of Russia” (Beljaev & Mironov, 2019, 2021), on the advice of the editor, this taxon was again listed as *I. punctigera*, but with remark that presence of the taxon in the Russian Far East is doubtful.

In the “Winter geometrid moth of the Jialingjiang Headwaters” (Nakajima & Wang, 2014) the illustrations of both, “*Inurois membranaria*” (figs 14, 15, 34) and “*Inurois punctigera*” (figs 16, 35) belong to *I. pseudopunctigera*. In the note to “*Inurois punctigera*” that “discocellular spot of forewing is very small, while it is large in *I. membranaria*” the authors accepted intraspecific contrast difference in the size of discal spots as specific, similarly to that did Viidalepp (1986).

In the most correct form the *Inurois* species composition is given by Yamamoto *et al.* (2016). While the article is not taxonomic, but it provides a molecular phylogeny of all known species of the genus, which supports the independence of species in the group *I. membranaria*, *I. punctigera* and *I. pseudopunctigera*, and the independence, although closely related, of the species in the group *I. tenuis*, *I. fumosa* and *I. viidaleppi*. In addition, it shows *I. minutulus*, *I. kyushuensis* and *I. kobayashii* are not differentiated genetically from *I. asahinai*, and the *I. nikkoensis* is not genetically differentiated from *I. fletcheri*. However, they have clear distinctions in the male genitalia according to Nakajima (2011).

CATALOGUE OF SPECIES

Genus *Inurois* Butler, 1879

Inurois Butler, 1879: 445.

Type species: *Inurois tenuis* Butler, 1879, by monotypy.

REMARKS. The genus *Inurois* currently includes 13 species, including the newly described one. All of them inhabit deciduous broad-leaved and mixed forests in East Asia. Order of species below is based on the molecular phylogeny of the genus (Yamamoto *et al.*, 2016) and morphological affinity. The *Inurois fletcheri* species-group is probably monophyletic, but with some question to *I. brunneus*, which genetically associates with *I. pseudopunctigera*, while shares most structural characters with other members of this group. The *Inurois punctigera* species-group consists of two probably sister species. The *Inurois tenuis* species-group has clear monophyletic "core" and consists of *I. tenuis*, *I. viidaleppi* and *I. fumosa*. One species, *I. membranaria*, shares many features in appearance and genitalia with the previous three species, but in the molecular phylogeny unexpectedly clusters with Japanese species of *I. fletcheri* species-group. Probably molecular clustering of *I. brunneus* and *I. membranaria* in conflict with morphology could be result of a "long branch attraction", as both species are most deviated morphologically from their potential relatives. Nevertheless, the monophyly of these species-groups cannot be considered proven. So, they couldn't be considered as potential taxa in current phylogenetic paradigm, and accepted here as working tool.

In the catalogue, valid name, nominal genus of original combination (in square brackets), citation of original description, location of the holotype, type locality, synonyms, distribution and note, when it necessary, are given.

***Inurois fletcheri* species-group**

***Inurois asahinai* Inoue, 1974**

Inurois asahinai Inoue, 1974: 65, figs 2, 5. Holotype ♂ (BMNH). Type locality: Japan, Gumma Prefecture, Mikaboyama, 750 m.

DISTRIBUTION. Russia (SW Sakhalin), Japan (Hokkaido, Honshu, Shikoku, Kyushu).

***Inurois kyushuensis* Inoue, 1974**

Inurois kyushuensis Inoue, 1974: 66, figs 3, 6–8. Holotype ♂ (KUK). Type locality: Japan, Oita Prefecture, Kuju Mountains, Daisen-zan.

DISTRIBUTION. Japan (Kyushu).

***Inurois minutulus* Nakajima et Kudo, 1987**

Inurois fletcheri minutulus Nakajima & Kudo, 1987: 13, 15, figs 2–7, 13. Holotype ♂ (NSMT). Type locality: Japan, Izu Islands, Oshima Island, Sakurakabu, 200 m.

DISTRIBUTION. Japan (Izu Island).

***Inurois kobayashii* Nakajima, 1992**

Inurois kobayashii Nakajima, 1992: 211, figs 4–6, 26, 35. Holotype ♂ (NSMT). Type locality: Japan, Shizuoka Prefecture, Izu, Shuzenji, 200 m.

DISTRIBUTION. Japan: (Honshu: Izu Peninsula).

***Inurois fletcheri* Inoue, 1954**

Inurois fletcheri Inoue, 1954: 37. Holotype ♂ (BMNH). Type locality: Japan: Yokosuka, Funakoshi.

DISTRIBUTION. Japan (Hokkaido, Honshu, Shikoku, Kyushu).

***Inurois nikkoensis* Nakajima, 1992**

Inurois nikkoensis Nakajima, 1992: 210, figs 1–3, 25, 34, 43. Holotype ♂ (NSMT). Type locality: Japan, Tochigi Prefecture, Nikko, Yumoto, 1500 m.

DISTRIBUTION. Japan (Hokkaido, Honshu).

***Inurois brunneus* Viidalepp, 1986**

Inurois brunneus Viidalepp, 1986: 68, figs 23–25. Holotype ♂ (IZBE) Type locality: Russia, Primorskii Krai, Kedrovaya Pad Natural Reserve.

DISTRIBUTION. Russia (S Amurskaya Oblast, Primorskii Krai), S Korea.

***Inurois punctigera* species-group**

***Inurois punctigera* (Prout, 1915)**

Figs 1, 25, 26

Alsophila punctigera Prout, 1915: 414, pl. 3: a (as *tenuis*). Lectotype ♂ (BMNH), designed by Inoue, 1954: 37. Type locality: Japan, Yokohama.

DISTRIBUTION. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima), S Korea.

***Inurois pseudopunctigera* sp. n.**

Inurois pseudopunctigera sp. n. (see below). Type locality: Russia, Primorskii Krai.

DISTRIBUTION. Russia (S Khabarovskii Krai, Jewish Autonomous Oblast, Primorskii Krai), S Korea, China (Shaanxi, Sichuan, Jiangsu).

***Inurois tenuis* species-group**

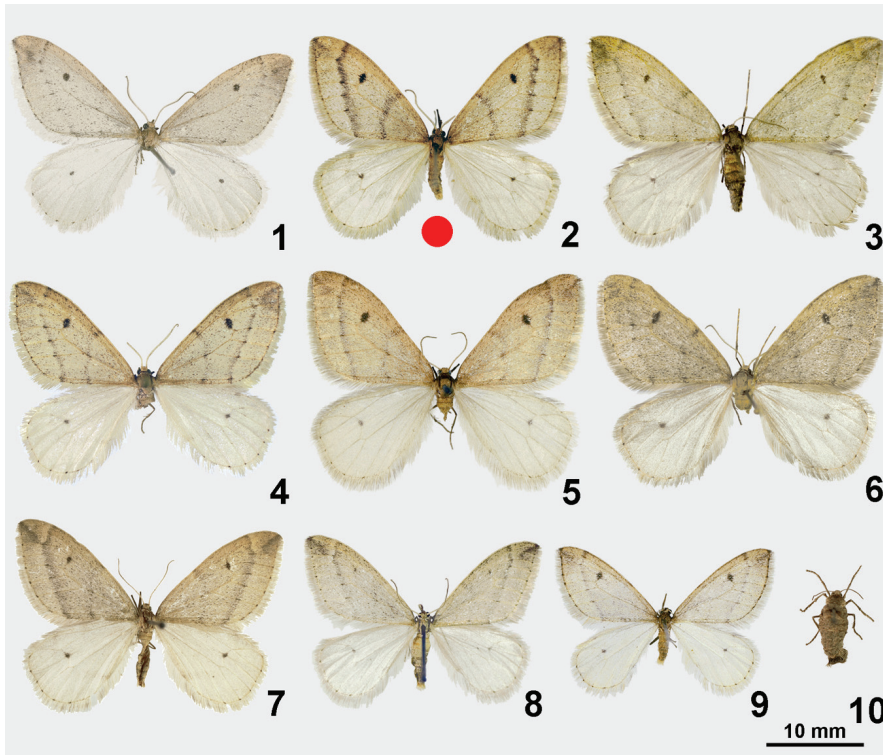
***Inurois membranaria* (Christoph, 1881)**

Figs 11–15, 33–36

Anisopteryx membranaria Christoph, 1881: 73. Lectotype ♂, labelled as “Nikolsk 77 Christ.” (MNB), designed by Inoue, 1992: 46. Type locality: Russia, Primorskii Krai, vicinity of Ussuriisk.

Inurois ussuriensis Viidalepp, 1986: 66, figs 12–16. Holotype ♂ (IZBE). Type locality: Russia, Primorskii Krai, Kievka.

DISTRIBUTION. Russia (S Amurskaya Oblast, S Khabarovskii Krai, Primorskii Krai), S Korea.



Figs 1–10. Moths of *Inurois punctigera* species-group (1–9 – males, 10 – female). 1 – *I. punctigera* (S Korea, Jeonnam-do, Mt. Mu Dung [Mt. Mudeungsan], 30.XII.1994, Zheng Xiantian leg.); 2–10 – *I. pseudopunctigera* sp. n.: 2 – holotype, Vladivostok, Bolshaya Sedanka River; 3–10 – paratypes: 3 – ditto, Sadgorod, genetic voucher V-MP-525; 4 – ditto, Sadgorod, genetic voucher V-MP-526; 5–7 – ditto, Sadgorod; 8, 9 – ditto, Bolshaya Sedanka River; 10 – ditto, Sadgorod.

***Inurois tenuis* Butler, 1879**

Figs 19, 41, 42

Inurois tenuis Butler, 1879: 445. Syntypes ♂, ♀ (BMNH). Type locality: Japan, Yokohama.

REMARKS. In the original description, the wingspan is given for male and female, which is impossible for this species; apparently the larger specimen was mistaken for a female.

DISTRIBUTION. Japan (Hokkaido, Honshu, Kyushu, ?Tsushima). Record from Tsushima needs to be tested on the misidentification of *I. viidaleppi* or true *I. membranaria*, since for pair closely related geometrids, the cases are known when the continental species inhabits these islands, but not Japanese vicariant.



Figs 11, 12. *Inurois membranaria*, type specimens. 11a – lectotype, male; 11b – labels; 12a – paralectotype, male, 12b – labels.

Inurois viidaleppi Beljaev, 1996

Figs 20, 21, 37–40

Inurois viidaleppi Beljaev, 1996: 60, figs 15, 16. Holotype ♂ (ZIN). Type locality: Russia: Vladivostok.

DISTRIBUTION. Russia (S Amurskaya Oblast, S Khabarovskii Krai, Primorskii krai), S Korea.

Inurois fumosa (Inoue, 1944)

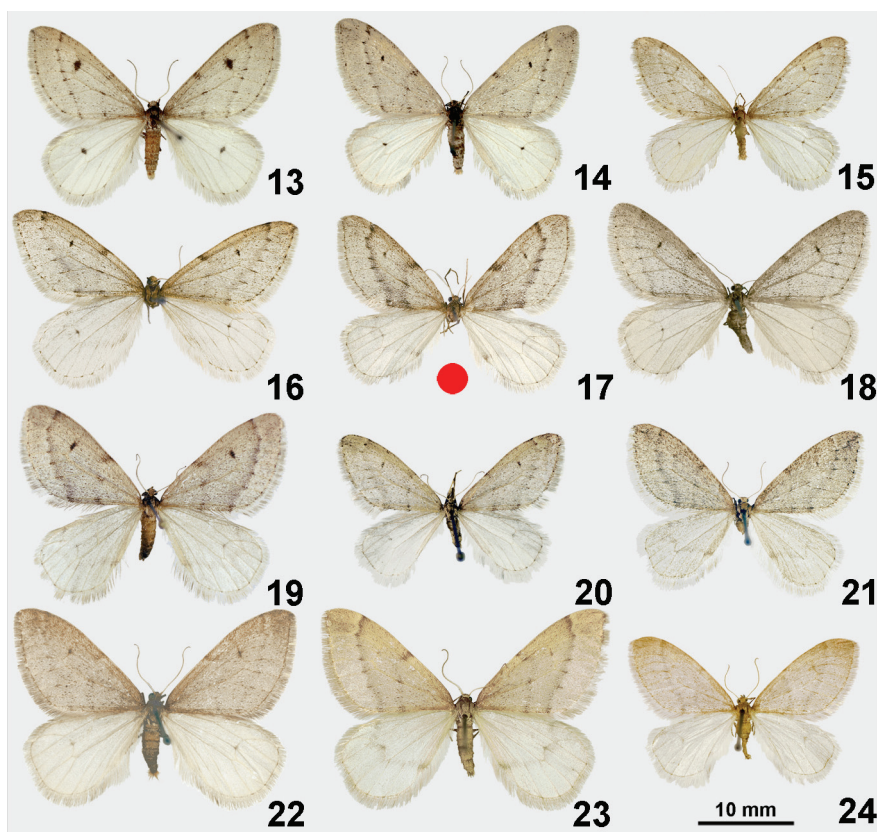
Figs 16–18, 43, 44

Alsophila (*Inurois*) *fumosa* Inoue, 1944: 58, pl. 3, figs 14, 15; pl. 4, fig. 17; pl. 6, fig. 12; pl. 7, fig. 12; pl. 8, fig. 12. Syntypes 43 ♂ (BMNH). Type localities: Russia, Vladivostok and Partizansk; Japan, Kyoto Prefecture, Kurama; Hokkaido, Sapporo; Takao-san; Yamagata Prefecture, Yamagata.

REMARKS. The syntypes include specimens from Japan and the Russian Far East. Lectotype is not designated still. However, the designation of the lectotype does not seem necessary, since no significant difference between insular and continental populations was found either morphologically or genetically.

The photo of specimen “GWOTQ471-16 {*Operophtera*}” from Sichuan In BOLD (2022a) database shares “barcode” (BIN BOLD: AAD1544) with *I. fumosa*, true *I. membranaria* and *I. viidaleppi*, but on appearance it conforms to *I. fumosa*.

DISTRIBUTION. Russia (S Amurskaya Oblast, S Khabarovskii Krai, Primorskii krai), S Korea, Japan (Hokkaido, Honshu, Shikoku, Kyushu), China (Shaanxi, ?Sichuan, Taiwan).



Figs 13–24. Moths of *Inurois tenuis* species-group, males. 13–15 – *I. membranaria* (13, 14 – Vladivostok, Akademgorodok, 15.III.1995, E. Beljaev leg.; 15 – ditto, Bolshaya Sedanka River, 20.III.2002, E. Beljaev leg.); 16 – *I. tenuis* (Japan, Hokkaido, Miwa, 15.IV.1992, S. Kawahara leg.); 17–21 – *I. viidaleppi* (17 – holotype, Vladivostok, Akademgorodok, 15.III.1995, E. Beljaev leg.; 18 – Amurskaya Oblast, vicinity of Blagoveshchensk, 6.IV.1997, A. Kuzmin leg.; 19, 20 – Vladivostok, Bolshaya Sedanka River, 30.III.2002, E. Beljaev leg.; 21 – Vladivostok, ridgeline between middles of the rivers Chernaya Rechka and Malaya Sedanka, 11.III.1998, E. Beljaev leg.); 22–24 – *I. fumosa* (Vladivostok, Sadgorod, 23.X.1996, E. Beljaev leg.).

Key to species from the *Inurois punctigera* and *Inurois tenuis* species-groups

Species from these groups are highly variable in size, intensity of coloration and wing pattern, at that individual features in different individuals may overlap with other species. For example, the wing pattern of unrelated *I. punctigera* and *I. membranaria* is almost identical, which was the reason that they were confused with each other for a long time. The key by appearance is given for the most typical forms, but it does not guarantee correct identification of all specimens. For accurate identification, it is necessary to use the key by

the male genitalia. Most appreciate identification characters are in size and shape of apical processes of aedeagus, cornutus on vesica and dorsal processes of valva; designations of the most important genital structures see on Figs 29–31. A key for the females is not offered due to their insufficient knowledge.

Species from *I. fletcheri* species-group is characterized by forewing with postmedial transverse line going to the costa at sharp angle and by aedeagus with left apical process short, barely reaching the bottom of medial notch of the base of right process, or this process falcate apically. A key to Japanese species from this group see in Hashimoto (1998). In distinction from previous ones, species from *I. punctigera* and *I. tenuis* species-groups possess the forewing with postmedial transverse line going to the costa at about perpendicular and the aedeagus with left apical process more long, always straight and strongly exceed the bottom of medial notch of the base of right process. Keys to species of *I. punctigera* and *I. tenuis* species-groups are given below.

Key to species by appearance

- 1 On a general look, the main tone of the background of the wings is yellow-brownish, with grey tint; forewing with usually with distinct apical stroke and with apical spot lighter than neighbouring area of terminal area (*Inurois punctigera* species-group) 2
- On a general look, the main tone of the background of the wings is grey, with yellowish, brownish or pink a tint.; forewing usually with terminal area coloured more or less evenly, without apical or with vague stroke, apical spot lacking or indistinct (*Inurois tenuis* species-group) 3
- 2 Antenna at the middle with the cilia about as long as 1.5 segments of antenna; forewing with discal spot bright-black, distinct, usually large; postmedial transverse line distinct, black marginal dots on the ends of veins and strokes on postmedial line bright, prominent; ground colour of wings greyish-yellow (Fig. 1) ***Inurois punctigera***
- Antenna at the middle with the cilia about as long as 2 segments of antenna; forewing with discal spot dark-grey or not bright-black, with fuzzy edges, highly variable in size; transverse lines variable in width, fuzzy along inner edge, black marginal dots and strokes on veins not bright; ground colour of wings greyish-light-brown (Figs 2–9) ***Inurois pseudopunctigera***
- 3 Forewing with postmedial line almost straight, black strokes on veins bright-black and situate at the centre of the line; discal spot distinct, bright-black, usually large (Figs 11–15) ***Inurois membranaria***
- Forewing with postmedial line serrated, with significant incurving between the veins CuA2 and A2; black strokes on veins subdued and situate along outer margin of the line; discal spot usually dot- or stroke-like, subdued 4
- 4 Forewing on costa with prominent blackish blots at the beginning of antemedial and postmedial lines; postmedial line distinctly serrate (Fig. 16) ***Inurois tenuis***
- Forewing on costa without dark blots; postmedial line weakly serrate 5
- 5 Wings grey with brownish-yellow tint; forewing with discal spot and postmedial line usually distinct; imago fly at the beginning of year (Figs 17–21) ***Inurois viidaleppi***
- Wings grey with pink tint, usually more distinct along transverse lines; forewing with discal spot usually indistinct and postmedial line usually vague; imago fly at the end of year (Figs 22–24) ***Inurois fumosa***

Key to species by the male genitalia

- 1 Uncus moderately large, with width less than length of dorsobasal process of valva; dorso-basal process of valva sharply pointed; juxta strongly exceed the level of dorsal articulation of valva with vinculum (*Inurois punctigera* species-group) 2
- Uncus very large, with width in the base exceed the length of dorsobasal process of valva; dorsobasal process of valva blunted apically; juxta slightly exceed the level of dorsal articulation of valva with vinculum (*Inurois tenuis* species-group) 3
- 2 External portion of aedeagus about 3 time longer of its internal portion; right apical process of aedeagus wide, knife-like; left apical process long, exceeds the half of length of the right process; valva with dorso-basal process straightened in distal half and with distal margin between the base of dorso-distal process and apical knob almost straight (Figs 25, 26) *Inurois punctigera*
- External portion of aedeagus about 2 time longer of its internal portion; right apical process of aedeagus narrow, subulate; left apical process short, not reaches the half of length of the right apical process; valva with dorso-basal process more or less gently arched up to the top and with distal margin possesses more or less distinct hump ventrad of the base of dorso-distal process (Figs 27–31) *Inurois pseudopunctigera*
- 3 Cornutus on vesica large, almost as large as right apical process of aedeagus; juxta with median excision reaching approximately the level of deviation of lateral process of juxta and with ventral portion narrow, finger-like (Figs 33–36) *Inurois membranaria*
- Cornutus on vesica small, much smaller than right apical process of aedeagus; juxta with median excision reaching scientifically ventral of the level of deviation of lateral process of juxta and with ventral portion cuneiform 4
- 4 Aedeagus with right apical process almost straight or slightly arched; cornutus on vesica very small, with free portion comparatively wide conic; juxta with ventral portion wide wedge-shaped (Figs 43, 44) *Inurois fumosa*
- Aedeagus with right apical process somewhat falcate apically; cornutus on vesica larger, with free portion narrow claw-like; juxta with ventral portion narrow wedge-shaped 5
- 5 Uncus rounded, without prominent pyramidal protrusion at the base of distal process of uncus; aedeagus with left apical process moderately thin, about as wide as cornutus on vesica (Figs 41, 42) *Inurois tenuis*
- Uncus with prominent pyramidal protrusion at the base of distal process of uncus; aedeagus with left apical process very thin, slender than cornutus on vesica (Figs 37–40) *Inurois viidaleppi*

DESCRIPTION OF A NEW SPECIES

Inurois pseudopunctigera Beljaev, sp. n.

<https://zoobank.org/NomenclaturalActs/61CF697D-889F-432A-BB4C-5B16041C6EBE>

Figs 2–10, 27–32

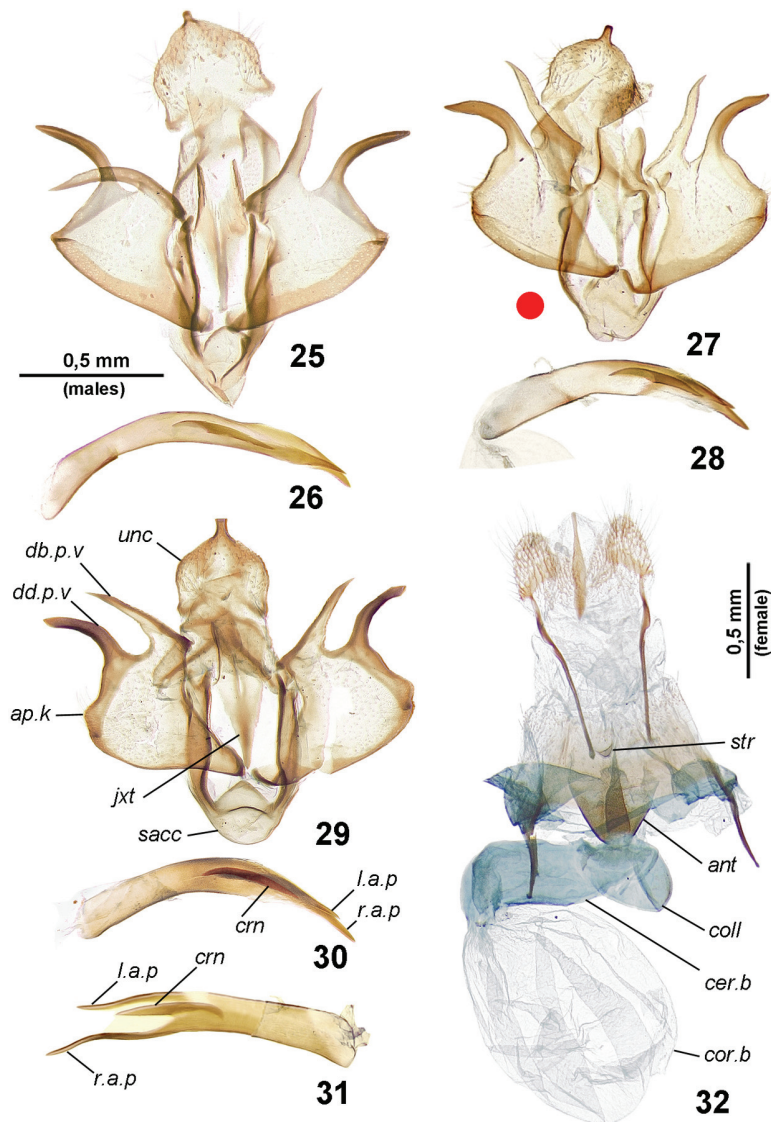
Inurois punctigera, nec (Prout, 1915): Viidalepp, 1976: 843 (part.: “Priamyrye, Primorye”) Viidalepp, 1986: 66 (part.: “Yuzhnoe Primorye”), fig. 19; Beljaev, 1996: 60; Kim & Shin, 1996: 315 (part.), fig. 5; Mironov *et al.*, 2008: 204; Nakajma & Wang, 2014: 50, figs 16, 35; Kim *et al.*, 2016, fig. 290; Beljaev & Mironov, 2019: 252.

Inurois fletcheri, nec (Inoue, 1954): Viidalepp, 1976: 843 (part.: “Primorye”); Viidalepp, 1986: 66 (part.: “Yuzhnoe Primorye”), fig. 22; ? Zhu, 1981: 113, pl. 29, fig. 760; Beljaev, 1996: 38; Viidalepp, 1996: 12 (part.: “S Primorye”).

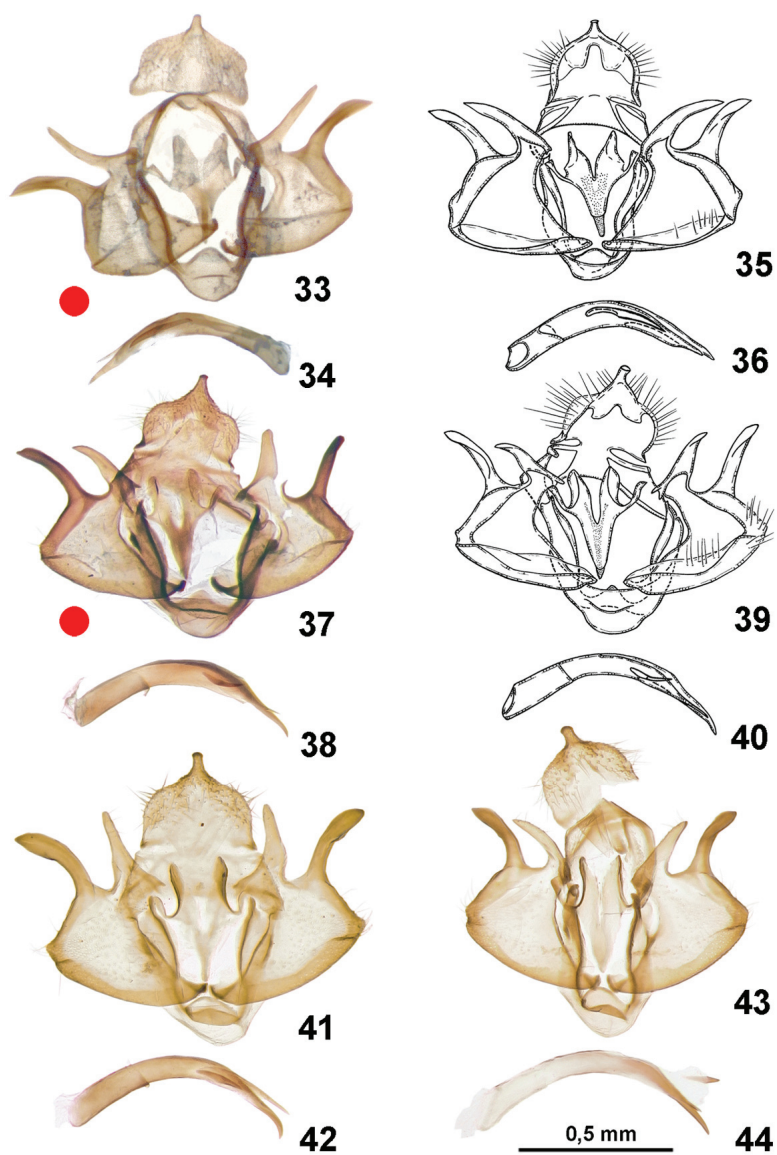
Inurois membranaria, nec (Christoph, 1881): Viidalepp, 1996: 11 (part.: “Amur River basin, Primorye”); Nakajma & Wang, 2014: 50, figs 14, 15, 34.
Inurois sp.: Beljaev *et al.*, 2010: 312; Vasilenko *et al.*, 2013: 304; Beljaev, 2016: 578; Yamamoto *et al.*, 2016: 49.
Inurois GWOTQ472-16: BIN BOLD: ACV9571 {*Inurois*}, ID-unpublished, China, Sichuan.

TYPE MATERIAL. Holotype – ♂, **Russia**: Primorskii Krai, Vladivostok, upper stream of Bolshaya Sedanka River, fir-broad-leaved forest, at the light, 43°11'30"N, 132°03'05"E, 29.X 2000, E.A. Beljaev leg., genital slide: Beljaev 2022-004 (ZIN). Paratypes: **Russia**: Primorskii Krai: Vladivostok, Akademgorodok, at the light, 43°11'29.08"N, 131°55'13.65"E, 5.XI 1992, 1♂; Vladivostok, Sadgorod, oak forest, at the light, 43°14'57"N, 132°02'01"E, 17, 18.X 1992, 2♂; the same locality, 23.X 1992, 8♂; the same locality, 23, 25.X 1992, 2♂; the same locality, 26.X 1992, 6♂; the same locality, 28.X 1992, 14♂, 1♀; the same locality, 18.X 1996, 6♂; the same locality, 21.X 1996, 2♂; the same locality, 23.X 1996, 8♂; the same locality, 30.X.2019, 6♂, including 2 barcoded; Vladivostok, upper stream of Bolshaya Sedanka River, fir-broad-leaved forest, at the light, 43°11'30"N 132°03'05"E, 29.X 2000, 3♂; ditto, 24.X 2009, 1♂; all E.A. Beljaev leg. (FSCB, ZIN).

OTHER MATERIAL EXAMINED. **Russia**: Primorskii Krai: “Уссур. край, Сучан, 27.ix 1932 Палшков” [Primorskii Krai, Partizansk, 1♂, Palshkov leg.] (ZIN). Materials by A.I. Kurentzov: Ussuriiskii (=Suputinskii) Nature Reserve, ~ 43°39'8"N 132°25'E: “п. Супутинка, дол. см. т. [upper Komarovka (Suputinka) River, mixed valley taiga], 22.X.1934”, 1♂; “Суп. зап., 26.X.1966, Д. Кононов [D.G.Kononov leg.]”, 1♂; “Суп. 3. К-III [cedar (*Pinus koraiensis*)-broad-leaved forest], 24.X.1968”, 1♂; Ussuriiskii Nature Reserve, Kamenska River, Komarovo-Zapovednoe, 43°38'46"N 132°20'45"E: “р. Км. на свет [at light], 14.X.1933”, 1♂; “р. Км. на свет [at light], 23.X.1936”, 1♂; “р. Км. веч. [in the evening] т. - 3,5 [-3,5°C], 27.X.1936”, 1♂; “р. Км. свет [at light], 20.X.1949”, 1♂; “Прим. край, Суп. з-к., 20.X.195- [the last digit not written]”, 1♂; Ussuriiskii Nature Reserve, Egerskii spring, 43°38'55"N 132°27'46"E: “Егер., 20.X.1936”, 1♂; “Егерск. свет [at the light], 8.X.1934”, 1♂; Ussuriiskii Nature Reserve, probably vicinity of winter hut (zimovye) at the mouth of Mironov spring, 43°38'42"N 132°26'42"E: “Зим. см.д.т. [mixed valley taiga], 8.X.1934”, 1♂; “Зимов. ясеневое - заболоч. днем [waterlogged ash forest, in the daytime], 9.X.1934”, 1♂; “Зим. Кедр. скл. вечером [cedar (*Pinus koraiensis*) slope, in the evening] 20.X.1934”, 1♂; “Верх. р. Канихезы, ел.-пихт. лес на свет” [upper Kanikheza River, exact location not established, spruce-fir forest, at the light], 30.IX.1957, 1♂, unknown leg. Other collectors: Arsenyev, 25.X.1999, 1♂, S.V. Veriga leg.; Arsenyev, “Yunnanka”, at the light, 44° 9'4"N 133°17'4"E, 20-27.X.2000, 4♂, S.V. Veriga leg.; 17 km W of Pokrovka, plateau in Orlikha River basin, oak sparse forest, at the light, 43°56'37"N 131°25'13"E, 25, 26.X.2003, 10♂, 1♀, E.A. Beljaev leg.; 20 km SE Ussuriisk, Gornotayozhnoe, in the day time on tree trunks, 43°42'00"N 132°09'00", 29.X.1994, 3♂, E.A. Beljaev leg.; Vladivostok, Akademgorodok, 43°11'29.08"N 131°55'13.65"E: “г. Владивосток, 13 км. на свет [at the light], 1.X.1962, Коновалова [Z.A. Konovalova leg.]”, 1♂; Vladivostok, ~43°19'54"N 131°25'29"E, 20.X. 1993, 1♂, A.B. Marynenko leg.; 30.X.1994, 1♂, A.A. Kuzmin leg.; Litovka mount., 6,4 km SSE of Anisimovka, 514 m.a.s.l., coniferous-deciduous forest, 43°06'52"N 132°47'36"E, 22, 24.X.1998, 2♂, E.A. Beljaev leg.; 8 km N of Zanadvorovka, Ponin stream, fir (*Abies holophylla*)-broad-leaved forest, at the light, 43°21'36"N 131°36'57"E, 27.X.2003, 6♂, E.A. Beljaev leg.; 6 km NW of Zanadvorovka, oak-broad-leaved forest, at the light, 43°20'46"N 131°33'47"E, 23.X.2008, 1♂, E.A. Beljaev leg.; ditto, air temperature up to -4°C, 6.X.2008, 3♂, E. Beljaev leg.; ~ 16 km W of Zanadvorovka, ~43°19'54"N 131°25'29"E, 3.XI.1996, 2♂,



Figs 2–32. Male (25–31) and female (32) genitalia of *Inurois punctigera* species-group. 25, 26 – *I. punctigera* (S Korea, Jeonnam-do, Mt. Mu Dung [Mt. Mudeungsan], 30.XII.1994, Zheng Xiantian leg.); 27–32 – *I. pseudopunctigera* sp. n. (27, 28 – holotype; 28–31 – paratypes, Vladivostok, Sadgorod; 32 – Primorskii Krai, Orlikha River). 25, 27, 29 – genital segment, ventral view; 26, 28, 30 – phallus, lateral view; 31 – phallus, dorsal view; 32 – genitalia and ovipositor, vernal view. *ant* – antrum, *ap.k* – apical knob of valva, *cer.b* – cervix bursae, *coll* – colliculum, *cor.b* – corpus bursae, *crn* – cornutus, *db.p.v* – dorsobasal process of valva, *dd.p.v* – dorsodistal process of valva, *jxt* – juxta, *l.a.p* – left apical process of aedeagus, *r.a.p* – right apical process of aedeagus, *sacc* – saccus, *str* – sterigma, *unc* – uncus.



Figs 33–44. Male genitalia of *Inurois tenuis* species-group. 33–36 – *I. membranaria* (33, 34 – paralectotype (slide by Inoue); 35, 36 – Vladivostok, Akademgorodok); 37–40 – *I. viidaleppi* (37, 38 – holotype; 39, 40 – ditto, drawing); 41, 42 – *I. tenuis* (Japan, Hokkaido, Miwa, 15.IV.1992, S. Kawahara leg.); 43, 44 – *I. fumosa* (Vladivostok, Akademgorodok, 15.XI.1998, E. Beljaev leg.); 33, 35, 37, 39, 41, 43 – genital segment, ventral view; 34, 36, 38, 40, 42, 44 – phallus, lateral view. (Figs 35, 36, 39, 40 are given from Beljaev, 1996).

Yu.A.Cistjakov leg.; Kedrovaya Pad Nature Reserve, 43°5'41.35"N 131°33'44.45"E: "Кедровая падь ДК [D.G. Kononov leg.], 22.X.1960" 1♂; "Кедр. падь, 3.XI.1973, Кононенко [V.S. Kononenko leg.]", 1♂; 13 km SW Slavyanka, Ryazanovka 42°47'37"N, 131°15'08"E, 24.X.1992, 1♂, E.A. Beljaev leg.; 36 km S of Slavyanka, Telyakovskogo Bay, oak-broad-leaved forest, at the light, 42°34'44"N 131°12'43"E, 29, 30.X.2003, 2♂, E. A. Beljaev leg. (all FSCB).

DIAGNOSIS. On facies and in genitalia the new species is similar to *I. punctigera*, but ground colour of wings is usually more intensive brown and black elements in the wing pattern are less bright and slightly fuzzy along the edges. In the male genitalia, right apical process of aedeagus is much narrower, subulate, and left apical process is much shorter, not reaches the half of length of the right apical process; external portion of aedeagus is much shorter, only about 2 time longer of its internal portion; valva with dorsobasal process more or less gently arched up to the top and with distal margin possesses more or less distinct hump ventrad of the base of dorso-distal process; succus shorter.

DESCRIPTION. Male (Figs 2–9). Wingspan 22–30 mm. Palpae moderately short, about as long as 1/2 of the eye diameter, with second segment oval, somewhat longer than first segment. Proboscis very short, rudimentary. Frons covered with appressed greyish brown scales. Antennae dentate, with moderate fasciculate ciliation, at the middle of antenna the cilia about as long as 2 segments of antenna. Patagia and tegula garish-light brown, concolorous with thorax and abdomen. Hindtibia with a pair of median spurs present. Fore wings are light greyish-brown, sparsely dusted with blackish scales, black elements of the wing pattern somewhat greyish, moderately contrasting and fuzzy along the edges; antemedial line rounded, blackish points on veins crossing the line weak or almost invisible; postmedial transverse line is smooth or, rarely, slightly wavy, departs from the costal edge of the wing about perpendicular and usually sharply curved outward at the vein M1, blackish points on veins crossing the line moderately distinct or weak; discal spot vary from a small point to a large oval spot; apical triangular light fleck is usually distinct, widely shaded by dark posteriorly. Hind wings are slightly paler, discal spot dot-like, single postmedial line strongly fuzzy or almost invisible.

Male genitala (Figs 27–31). Uncus is lobe-like with prominent lateral narrowing near the base, moderate by size, its width in the base about the length of dorsobasal process of valva. Valva with a pair of long pointed dorsal process, dorso-basal one is somewhat shorter and much narrower of dorso-distal process, dorso-distal one is gently arched; ventral edge of valva is rounded. Juxta narrow finger-like basally, dorsal lobes of juxta moderate. Aedeagus 1.0–1.1 mm in length, almost twice as long as length of ventral margin of valva, cylindrical in basal half and conic in distal half, right apical process of aedeagus narrow and long, sharply pointed, subulate, left apical process of aedeagus similar by shape, but somewhat narrower and much shorter of the right one. Cornutus in aedeagus large, as big as left apical process of aedeagus, more than 2 time as long as the diameter of aedeagus. Saccus moderately large.

Female (Fig. 10). Body length 6 mm (dry specimen). Head, thorax and abdomen dark-grey, abdomen ventrally off-white. Hind tibia smoothly dilated distally, with a pair of distal spurs only. Anal tuft composed with mixed long blackish scales of two types: hair-like, and flat very narrow, sharply pointed. Composition of anal tuft scales not differs from that of *I. punctigera* (see Nakajima, 1992: fig. 45, as “*I. membranaria*”). Abdomen with tympanal organs lacking.

Female genitalia (Fig. 32). Papillae anales small, simple. Ventral plate between the anal papillae bar-like, dense, long and comparatively wide. Anterior apophyses approximately twice shorter of posterior ones. Genital segment with ventral area membranous, in postvaginal area with small conic semisclerotized hollow (sterigma), rounded on bottom and placed greatly posterior of ostium. Antrum (“sterigma” of Nakajima, 1992) is in shape of wide and short truncated cone with almost straight lateral sides, and with dorsal wall bulging ventrally in form of wide longitudinal groove. Colliculum (inflation of ductus bursae just anterior of antrum) slightly bilobed, cervix bursae (rest anterior portion of ductus bursae) long and wide, departs from colliculum at right angle, corpus bursae broad oval, membranous. The antrum and sterigma are similar to those of *I. punctigera* (see Nakajima, 1992, fig. 40, and Nakajima, 1998, fig. 274, both as “*I. membranaria*”), but the latter possess less prominent dorsal bulging of antrum and rounded colliculum. However, it is unclear are these differences diagnostic or result of different mounting of the genitalia on slides.

GENETICS. COI “barcode” p-distances between populations from Vladivostok (4 specimens) (Table 1) and from vicinity of Zanadvorovka (5 specimens) (Table 2) vary from 0.00% up to 0.80%; both sets include specimens with large and small discal spots on the wings. In BOLD, maximum intraspecific p-distance in set included the samples from vicinity of Zanadvorovka and specimen from Sichuan (ID-unpublished) is 1.17%, and p-distance to nearest neighbor, “*Inurois fletcheri*” (ID-unpublished and origin is not indicated), is 4.49%.

REMARKS. Specimen in BOLD (2022b) database “GWOTQ472-16{Inurois}” from Sichuan well conforms to Russian ones by appearance and close genetically (BIN BOLD: ACV9571). In GBIF, 5 moths of “*Inurois membranaria* Christoph, 1880”, including 1 female, photographed by Shi Qi in Nanjing (iNaturalist, 2022: GBIF ID 3456340597, 3415969337, 3415613449 and 3415527251), on appearance well conforms to *I. pseudopunctigera*. Judging from these photos and the photos in BOLD and in Nakajima & Wang (2014), the Chinese specimens in wing pattern differ by stronger arched antemedial transverse line on costal area of the forewing and, probably, by more dense greyish suffusion. But in the male genitalia (Nakajima & Wang, 2014: figs 34, 34a, 35, 35a) there are no noticeable differences from Russian specimens. The photo of “*Inurois fletcheri*” from Shaanxi in Zhu (1981) somewhat indistinct but also seems to represent *I. pseudopunctigera*; to be sure, the specimen must be examined.

DISTRIBUTION. Russia (S Khabarovskii Krai NE up to Komsomolsk-na-Amure), Jewish Autonomous Oblast, Primorskii Krai), S Korea (except islands), China (Shaanxi, Sichuan, Jiangsu); evidently, it also inhabits at least N Korea and eastern territories of NE China.

Table 1. List of original mtDNA COI sequences of *Inurois pseudopunctigera*.

Specimens	Sequence
<i>Inurois pseudopunctigera</i> ♂, voucher V-MP-517, fixed in alcohol (FSCB, Vladivostok), mitochondrial Cytochrome Oxidase Subunit 1 5' Region, partial cds, 713 bp; collection data: Russia, Vladivostok, Sadgorod, 43°14'57"N 132°02'01"E, 27.X.2019, E.A. Beljaev leg.	TTGGTCAACAAATCATAAAGATATTGGAACATTATATTTTAT TTTCGGAATTTGAGCAGGAATAGTAGGAACCTTCATTAAGATT ATTAATCCGAGCTGAATTAGGGAATCCGGGTCATTAATTGG AGACGACCAAAATTTATAATACTATTGTAACAGCCCCATGCTTT TATTATAATTTTTTTTATGGTTATACCAATTATAAATTGGTGGA TTTGGTAATTGATTAGTGCCATTAATATTGGGCGCCCCAGAT ATAGCTTTCCACGAATAAATAATATAAGATTTTGATTATTG CCCCCTTCATTAACCTTTTAATTTCAAGAAGAATTGTAGAAA ATGGAGCTGGAACAGGATGAACAGTTTACCCCCCTATCTT CCAATATTGCTCACGGAGGTAGAGCAGTAGATTTAGCTATTT TTCTCTTCATTTAGCTGGTATTTCTCCATTTTAGGAGCTATT AATTTTATTACCACAATTATTAATATACGATTAATAAATTTAT CTTTTGACCAAATACCTTTATTTGTTTGATCTGTTGGAATTAC AGCTTTTTTATTACTATCATTACCAGTATTAGCTGGAGCT ATTACTATATTATTAACAGATCGAAATTTAAATACATCATTTT TTGATCTGCTGGAGGAGGAGATCCTATTTTATACCAACATT TATTTTGATTTTTTGGTCCACCTGGAAGTTTAA
<i>Inurois pseudopunctigera</i> ♂, voucher V-MP-518, fixed in alcohol (FSCB, Vladivostok), mitochondrial Cytochrome Oxidase Subunit 1 5' Region, partial cds, 713 bp; collection data: Russia, Vladivostok, Sadgorod, 43°14'57"N 132°02'01"E, 27.X.2019, E.A. Beljaev leg.	TTGGTCAACAAATCATAAAGATATTGGAACATTATATTTTAT TTTCGGAATTTGAGCAGGAATAGTAGGAACCTTCATTAAGATT ATTAATCCGAGCTGAATTAGGGAATCCGGGTCATTAATTGG AGACGACCAAAATTTATAATACTATTGTAACAGCCCCATGCTTT TATTATAATTTTTTTTATGGTTATACCAATTATAAATTGGTGGA TTTGGTAATTGATTAGTGCCATTAATATTGGGCGCCCCAGAT ATAGCTTTCCACGAATAAATAATATAAGATTTTGATTATTG CCCCCTTCATTAACCTTTTAATTTCAAGAAGAATTGTAGAAA ATGGAGCTGGAACAGGATGAACAGTTTACCCCCCTATCTT CCAATATTGCTCACGGAGGTAGAGCAGTAGATTTAGCTATTT TTCTCTTCATTTAGCTGGTATTTCTCCATTTTAGGAGCTATT AATTTTATTACCACAATTATTAATATACGATTAATAAATTTAT CTTTTGACCAAATACCTTTATTTGTTTGATCTGTTGGAATTAC AGCTTTTTTATTACTATCATTACCAGTATTAGCTGGAGCT ATTACTATATTATTAACAGATCGAAATTTAAATACATCATTTT TTGATCTGCTGGAGGAGGAGATCCTATTTTATACCAACATT TATTTTGATTTTTTGGTCCACCTGGAAGTTTAA
<i>Inurois pseudopunctigera</i> ♂, voucher V-MP-518, dry pinned specimen (FSCB, Vladivostok), mitochondrial Cytochrome Oxidase Subunit 1 5' Region, partial cds, 642 bp; collection data: Russia, Vladivostok, Sadgorod, 43°14'57"N 132°02'01"E, 30.X.2019, E.A. Beljaev leg.	CTTCATTAAGATTATTAATCCGAGCTGAATTAGGGAATCCTG GGTCATTAATTGGAGACGACCAAAATTTATAATACTATTGTAA CAGCCATGCTTTTATTATAATTTTTTTTATGGTTATACCAAT TATAATTGGTGGATTGGTAATTGATTAGTGCCATTAATATTG GGCGCCCGAGATATAGCTTTCCACGAATAAATAATATAAGA TTTTGATTATTGCCCTTCATTAACCTTTTAATTTCAAGAA GAATTGTAGAAAATGGAGCTGGAACAGGATGAACAGTTTAC CCCCCTATCTTCCAATATTGCTCACGGAGGTAGAGCAGTA GATTTAGCTATTTTTCTCTTCATTTAGCTGGTATTTCTTCCAT TTTAGGAGCTATTAATTTTATTACCACAATTATTAATATACGA TTAAATAATTTATCTTTTGACCAAATACCTTTATTTGTTTGAT CTGTTGGAATTACAGCTTTTTTATTACTATCATTACCAGT ATTAGCTGGAGCTATTACTATATTATTAACAGATCGAAATTT AAATACATCATTTTTTGATCTGCTGGAGGAGGAGATCCTAT TTTATACCAACATTTATTTTGATTTTTTGGTCCACCTGGAAGT TTAA

Table 1. Continued.

Specimens	Sequence
<i>Inurois pseudopunctigera</i> ♂, voucher V-MP-518, dry pinned specimen (FSCB, Vladivostok), mitochondrial Cytochrome Oxidase Subunit 1 5' Region, partial cds, 713 bp; collection data: Russia, Vladivostok, Sadgorod, 43°14'57"N 132°02'01"E, 30.X.2019, E.A. Beljaev leg.	TTGGTCAACAAATCATAAAGATATTGGAACATTATATTTTAT TTTCGGAATTTGAGCAGGAATAGTAGGAACCTCATTAAAGATT ATTAATCCGAGCTGAATTAGGGAATCCTGGGTCATTAATTGG AGACGACCAAAATTTATAACTATTGTAAACAGCCCATGCTTT TATTATAATTTTTTTTATGGTTATACCAATTATAATTGGTGGA TTTGGTAATTGATTAGTGCCATTAATATTGGGCGCCCCAGAT ATAGCTTCCCACGAATAAATAATATAAGAGTTTGATTATTG CCCCCTTCATTAACCTTTTAATTTCAAGAAGAATTGTAGAAA ATGGAGCTGGAACAGGATGAACAGTTTACCCCCCTATCTT CCAATATTGCTCACGGAGGTAGAGCAGTAGATTTAGCTATTT TTCTCTTCATTTAGCTGGTATTTCTCCATTTTAGGAGCTATT AATTTTATTACCACAATTATTAATATACGATTAATAAATTTAT CTTTTGACCAAATACCTTTATTTGTTTGATCTGTTGGAATTAC AGCTTTTTTATTATTACTATCATTACCAGTATTAGCTGGAGCT ATTACTATATTATTAACAGATCGAAATTTAAATACATCATTTT TTGATCCTGCTGGAGGAGGAGACCCTATTTTATACCAACATT TATTTTGATTTTTTGGTCCACCTGGAAGTTTAA

Table 2. GenBank accessions of sequences of *Inurois pseudopunctigera* specimens analysed in Yamamoto *et al.* (2016).

Organism	Collection locality	COI, partial cds, 900 bp linear DNA	EF-1, partial cds, 926 bp linear DNA	Tektin, partial cds, 702 bp linear DNA	ArgK, partial cds, 415 bp linear DNA
<i>Inurois</i> sp. F1287_sp	Russia, Primorskii Krai, 6 km NW of Zanadvorovka, 43°20'46" N 131°33'47" E, 4- 6.X.2008, E. Beljaev leg.	AB980845	AB553259	AB553173	AB553069
<i>Inurois</i> sp. F1288_sp	ditto	AB980846	AB553260	AB553174	AB553070
<i>Inurois</i> sp. F1289_sp	ditto	AB980847	AB553261	AB553175	AB553071
<i>Inurois</i> sp. F1291_sp	ditto	AB980848	AB553262	AB553176	AB553072
<i>Inurois</i> sp. F1292_sp	ditto	AB980849	AB553263	AB553177	AB553073

BIONOMICS. In the Russian Far East, the moths are usually numerous in broad-leaved and mixed forests, emerges from pupae after first ground frosts. In the Primurye (Khabarovskii Krai, Jewish Autonomous Oblast) moths fly during the 2 first decades of October with peak at the middle of the month. In mountains of the south of Primorskii Krai they also start to fly from early October, but in lowlands from the mid of October and along the southern coast – from the late October, and fly up to mid November with peak at end of October – early November. In mountains of Shaanxi (about 2000 m above sea level) the moths were collected in beginning of November (Nakajima & Wang, 2014), similar to that in the south of Primorskii Krai, and in the lowland of Jiangsu (Nanjing) they were occurred in beginning January (iNaturalist, 2022). In Primorskii Krai an active flight of the moths was observed at night at air temperatures down to -4°C , but after a warm and sunny day. Wintering eggs. Larvae probably develop on various deciduous woody plants.

CONCLUSION

Currently, the genus *Inurois* includes 13 East Asian species distributed from Sakhalin and the Amur region in the north to Sichuan and Taiwan in the south. But most species inhabit only the northern part of the general range of the genus – the south of the Russian Far East, Korea and Japan. A large series of erroneous identifications in this genus is explained by a combination of the external similarity of moths with their significant variability in the intensity of the ground colour of the wings and elements of the wing pattern in different species. Male genitalia in the genus also have a uniform structure, differing mainly in the small structures of aedeagus. However, the identification of moths by male genitalia allows accurate delimitation of species, which is supported by molecular studies. Despite their extremely slender body and low motor activity, the moths are highly cold-resistant, retaining the ability to fly at night at negative air temperatures.

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