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A study on the taxonomy and distribution of *Brahmaea certhia* species group (Lepidoptera: Brahmaeidae) using an integrative approach and websites data

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The article is dedicated to Sergey Yuryevich Storozhenko, an outstanding researcher of orthopteroid insects, in memory of joint scientific expeditions with the first author to the wilds of the Ussuri region. The amazing appearance of brahmin moth, when, softly rustling its enormous wings, like a forest spirit, it majestically appears from the darkness of the night forest at the light of a lamp, vividly reminds to the first author the travels of our youth, spending the night by the fire in the deep taiga among the tracks of tigers, and the expectation of a wonderful discovery that will surely await us on our way.

Abstract

This paper reviews the taxonomy and distribution of East Asian moths from *Brahmaea certhia* species group (Lepidoptera: Brahmaeidae), using an integrative approach and extensive involvement of websites data. A review of the taxonomic history of this group is given. Based on the correlation of morphological and genetic data on the 'barcode' fragment of COI gene, the presence of two species in this group is substantiated, *Brahmaea certhia* (Fabricius, 1793) and *Brahmaea tancrei* Austaut, 1896, the second of which is represented by two subspecies, *Brahmaea tancrei tancrei* Austaut, 1896 and *Brahmaea tancrei diastemata* (Zhang & Yang, 1993). The morphological differences between these taxa are analysed and keys to the species and subspecies are given. The distribution of each taxon is specified and their brief ecological characteristics are reviewed. Some comments on the systematics of the genus *Brahmaea* Walker, 1855 as a whole are made. The following nomenclature acts are proposed: *Brahmaea certhia* (Fabricius, 1793) = *Saturnia lunulata* Bremer & Grey, 1853, **stat. resurr.**, *Saturnia undulata* Bremer & Grey, 1853, **stat. resurr.**, *Brahmaea carpenteri* Butler, 1883, **stat. resurr.**, *Brahmaea bicolor* Matsumura, 1921, **stat. resurr.**, *Brahmaea separata* Yang & Zhang, 1994, **syn. nov.**, *Brahmaea recta* Yang & Zhang, 1994, **syn. nov.**, *Brahmaea goniata* Zhang & Yang, 1994, **syn. nov.**; *Brahmaea tancrei tancrei* Austaut, 1896, **stat. resurr.** = *Brahmaea magnificentia* Bryk, **stat. resurr.**, *Brahmaea jilinensis* Zhang, 1988, **syn. nov.**; *Brahmaea tancrei diastemata* (Zhang & Yang, 1993), **stat. nov.**

Key words: brahmin moths, morphology, DNA barcoding, electronic resources, new synonymy, systematics, ecology, East Asia

Introduction

The family Brahmaeidae includes medium-sized, large and very large, predominantly nocturnal moths, whose general range covers the temperate, subtropical and tropical zones of Europe, Asia and Africa. Based on molecular genetic data analysis, the family Lemoniidae has been relatively recently synonymised with Brahmaeidae (Zwick 2008: 200), although their moths and larvae are very different in appearance. Taking into account the former Lemoniidae, the family Brahmaeidae currently comprises 68 species in six genera (Rajaei *et al*. 2023).

The taxonomic structure within the family cannot be considered established. Currently, the family Brahmaeidae is most often considered without subdividing it into subfamilies. Some authors distinguish two subfamilies—

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Brahmaeinae and Lemoniinae. Antoshin & Zolotuhin (2011: 19; 2013: 173) attribute the validation of the subfamily Lemoniinae in Brahmaeidae to the publication by Zwick with co-authors (Zwick *et al*. 2008), however, in fact, the Lemoniinae was not discussed or proposed in it. Therefore, validation of the subfamily Lemoniinae has to be attributed to Antoshin & Zolotuhin (2011). According to different authors, Lemoniinae includes the genus *Lemonia* Hübner, 1820 only (De Prins & De Prins 2011–2023; Aarvik *et al*. 2017; Prozorov *et al*. 2022a; Prozorov *et al*. 2022b), or genera *Lemonia* and *Sabalia* Walker, 1865 (Paukstadt & Paukstadt 2022).

Based on the molecular phylogenies of Lepidoptera, which include different representatives of Brahmaeidae (Zwick 2008; Regier *et al*. 2013; Heikkilä *et al*. 2015; Hamilton *et al*. 2019), the family consists of two alternative phylogenetic lineages: African—West Eurasian with the genera *Dactyloceras* Mell, 1930 (including subgenus *Shinocksiceras* Bouyer, 2002), *Spiramiopsis* Hampson, 1901, *Sabalia* and *Lemonia*; and trans-Eurasian, with the genus *Brahmaea* Walker, 1855 (including subgenus *Brahmophthalma* Mell, 1928). Genus *Calliprogonos* Mell & Hering in Mell, 1937, from central China, has morphological features common with *Dactyloceras* (Mell 1937; Sauter 1986; Naumann, 2009) in the reduction of one of the Rs veins on the forewings and bilobed uncus in the male genitalia. On the other hand, the valvae of *Calliprogonos miraculosa* Mell, 1937 resemble those of *Brahmaea japonica* Butler, 1873 by the position and shape of the harpe. However, the states of these similarities are not clear—synapomorphic, symplesiomorphic or homoplastic. The results of COI DNA barcoding show a closest relationship of *Calliprogonos miraculosa* with *Dactyloceras* spp. (Naumann 2009), however it can be a result of a long branch attraction taking into account the general strong morphological difference between these taxa. Considering the results of molecular phylogenetic studies, the subfamily Brahmaeinae in the current volume looks paraphyletic and 'illegitimate' from the phylogenetic point of view. As a result, in view of the lack of a robust phylogeny of Brahmaeidae, till now it seems premature to recognise subfamilies in Brahmaeidae, as it was offered by Lemaire & Minet (1998) based on the morphology.

The Eurasian lineage of Brahmaeidae consists of a single genus *Brahmaea* subdivided into two subgenera: *Brahmaea (Brahmaea)*, and *Brahmaea (Brahmophthalma)*. At present, the nominative subgenus includes nine species, disjunctively distributed in the south-temperate and semi-subtropical zones from Italy in the west to Korea in the east, and the second subgenus includes 12 species, distributed in the subtropics and tropics of East, Southeast, and South Asia (Paukstadt & Paukstadt 2022). In the subgenus *Brahmaea*, the *Brahmaea certhia* species group is distinguished (Zolotuhin 2016; Paukstadt & Paukstadt 2021b, 2021c), which currently includes six East Asian species. However, the validity of five of them requires revision.

Only one species of the genus *Brahmaea*, belonging to the *Brahmaea certhia* species group, is distributed in the Russian Far East (Fig. 1). From the its first find here in the middle of the 19th century (Ménétriès 1859), it has changed the Latin species name four times: at first it was *Brahmaea lunulata* (Bremer & Gray, 1853) (Ménétriès 1859; Staudinger & Wocke 1871; Graeser 1888; Staudinger 1879, 1892; Austaut 1896), then it became *Brahmaea certhia* (Leech 1898; Staudinger 1901; Seitz 1911; Strand 1913; Moltrecht 1929; Mell 1930; Kurentzov 1936, 1965; Shchetkin 1984; Kozlov 1985; Kuznetzov & Stekolnikov 1985), after which it became *Brahmaea tancrei* Austaut, 1896 (Tschistjakov 1992, 1999, 2009; Bidzilya & Klyuchko 1994; Peters 1998; Ignatenko 2000; Kuznetzov & Stekolnikov 2001; Dubatolov & Dolgikh 2007, 2011; Zolotuhin 2008; Dubatolov 2009; Averin *et al*. 2012; Barma 2012), and is now again referred to as *Brahmaea lunulata* (Zolotuhin 2016, 2019; Sinev 2019; Paukstadt & Weritz 2021a; Dubatolov 2020; Koshkin 2023). However, the name *Brahmaea tancrei* has partially remained in valid use (Höge & Renner 2023; also, biodiversity websites: BOLD 2025; GBIF 2025; Insecta.pro 2025; Lepiforum 2025).

Our examination of the holotype of *Saturnia lunulata* Bremer & Gray, 1853 revealed a discrepancy between the treatment of this taxon by Zolotuhin (2016) and its actual status, which leads to a significant reorganisation of the nomenclature of names in the *Brahmaea certhia* species group. The purposes of this article are to sort out the history of names in this group of brahmaeids, to establish the valid name for the Far Eastern species, to assess the taxonomic status of some taxa described from China, and to clarify the distribution end ecology of these moths.

Historical overview

Publications mentioned the taxa of the *Brahmaea certhia* species group are summarised in historical order in Table 1. It contains almost exhaustive European and Russian literature, as well as key publications from China, South Korea and Japan.

Historically, from the end of the 18th century until the last quarter of the 20th century, in the European and Russian literature there was only one widely recognised East Asian species in the considered group of brahmin moths. It was believed that it widespread in the south of the Russian Far East, on the Korean Peninsula, and, partially, in North, Central and East China. Nomenclaturally available, this species was first described as *Bombyx certhia* Fabricius, 1793, based on the description and illustration of ‡*Phalena* [sic!] *maxima* Petiver, 1702 (prelinnean name; the date follows the Paukstadt & Paukstadt 2021b) (Petiver 1702–1706: 27; Petiver 1709: pl. 18, fig. 3). The type locality of the taxon is traditionally accepted as "Chusan" (Zhoushan Island on the extreme east of Zhejiang province, China), although Petiver writes that "This … moth, Mr. James Cuninghame sent from Chusan" (Petiver 1702–1706: 27), which is not a direct indication of the place of collection of the specimen. However, it is true that J. Cuninghame, a Scottish botanist and surgeon, collected on the Island of Chusan in 1700–1702 (Jarvis & Oswald 2015). Although the type of *Bombyx certhia*, which was supposed to be housed in the Natural History Museum (London), has not been found (Butler 1880), there is no doubt that the modern understanding of this species corresponds to the original. The GBIF (2025), BOLD (2025) and iNaturalis (2025) databases contain numerous photographs of moths of *Brahmaea certhia* from the neighboring Chinese provinces of Zhejiang and Jiangsu, including a photograph from Zhoushan Island (iNaturalist.org, observation 27000824). There is also a photograph of a moth from Ningbo, a city on the mainland located just directly opposite the Zhejiang Island (Flickr, https://www.flickr.com/photos/16504650@N00/345875321) that almost matches the image in Petiver (1709).

More than half a century later, *Saturnia lunulata* Bremer & Gray, 1853 (Bremer & Gray 1853a) was described based on a single specimen collected in China in the vicinity of Beijing, without mentioning of *Bombyx certhia*. Almost immediately, based on the same specimen, it was newly described under another name as *Saturnia undulata* Bremer & Gray, 1853 (Bremer & Gray 1853b). This redescription was accompanied by the comment as follow: "In den "Etudes entomologiques, redigees par Victor de Motschulsky" wo wir die Diagnosen der hier als neu beschriebenen Schmetterlinge zuerst besannt machten, haben sich durch unbegreifliche Irrthümer einige unpassende Namen eingeschlichen, welche hier berichtigt sind" [In the "Etudes entomologiques, rédigées par Victor de Motschulsky", where we first made the diagnoses of the lepidopterans described here as new, some inappropriate names have crept in through incomprehensible errors, which are here corrected] (Bremer & Gray, 1853b: 23). Based on this statement, the name *Saturnia undulata* Bremer & Gray, 1853 is an unjustified emendation of *Saturnia lunulata* Bremer & Gray 1853 and it is a junior objective synonym of the latter (ICZN 1999: article 33.2.3.). The type specimen of *Saturnia lunulata* was well illustrated in colour (Bremer & Gray, 1853b: pl. 5, fig. 3; Ménétriès 1863: pl. 15, fig. 5), allowing accurate identification of the moths.

Shortly, F. Walker (1855) introduced the genus name *Brahmaea*, based on the name *Bombyx certhia*. However, he misidentified the type species of the genus with *Bombyx wallichii* Gray, 1831. This misidentification was revealed by Butler (1880), but it was officially corrected nomenclaturally in 1992 only (see ICZN 1991: Case 2737; 1992: Opinion 1698).

Ménétriès (1859) was the first to use the binomen "*Brahmaea lunulata*" for *Saturnia lunulata*. The name *Brahmaea lunulata* was used in the status of a separate species until the end of the 19th century (Ménétriès 1859, 1863; Staudinger & Wocke 1871, as *Saturnia lunulata*; Staudinger 1878/1879, 1892; Graeser 1888; Fixsen 1887; Austaut 1896). However, as early as 1880, A.G. Butler synonymised *Brahmaea lunulata* with *Brahmaea certhia* based on images of the former taxon in Bremer & Gray (1853b) and Ménétriès (1863) (Butler 1880). Initially, only British authors followed this decision (Kirby 1892; Leech 1889, 1898), but since the beginning of the 20th century this synonymy has been widely accepted. The names *lunulata* and *undulata* were subordinated to *Brahmaea certhia* in different statuses: as a synonym (Staudinger & Rebel 1901; Strand 1913, *undulata* only; Conte 1911; Mell 1930; Bryk 1949; Kozlov 1985), as an intraspecific form or aberration (Seitz 1911; Strand 1913, *lunulata* only), or as a subspecies (Moltrecht 1929; Kurentzov 1939, 1965; Kuznetzov & Stekolnikov 1985).

It should be noted that in the second edition of the "Catalog der Lepidopteren des europäischen Faunengebiets", O. Staudinger indicates only "Amur" for the distribution of *Brahmaea lunulata*, with a reference to Ménétriès (1859) and without mentioning the Chinese origin of the type of this taxon (Staudinger & Wocke 1871: 70, as *Saturnia lunulata*). Later, Staudinger received from H. Christoph four specimens of *Brahmaea* from "Amur", which he considered as "der ächten [echten – genuine] *Br. Lunulata* Br." (Staudinger 1879: 359). Graeser (1888) also accepted moths of *Brahmaea* from Amur and Ussuri regions as *lunulata*. Thus, the German authors formed their notion on "*Brahmaea lunulata*" on the basis of moths obtained from the territory of the Russian Far East, which determined the understanding of this taxon by most authors for many years to come.

In 1896, J.L. Austaut described the taxon "*Br.*[*ahmaea*] *Lunulata* Brermer, variété *Tancrei* Austaut" based on specimens originating from the Amur River basin (*i.e.*, moths from where Staudinger considered "genuine *Br. Lunulata* Br."). Austaut writes: "L'espèce la plus anciennement connue est celle qui a été aigurée pour la première fois, sous le nom de *Lunulata,* par Bremer … . J'ai sous les yeux … trois mâles de *Lunulata* provenant de deux sources différentes, mais capturés cependant dans la même région sibérienne, mentionnée plus haut [dans les régions qu'arrose le fleuve Amour, au sud-est de la Sibérie]. L'un de ces exemplaires ... ressemble assez exactement à la forme de Bremer et à celle do Ménétriès; c'est-à-dire qu'il est caractérisé par deux grandes taches jaunâtres ovalaires, bien écrites, qui interrompent chez cette espèce la bande brune médiane des premières ailes, vers son tiers supérieur, bien que cependant la teinte générale de ce sujet soit plus fauve, plus rougeâtre, et, par conséquent, plus brillante que celle des spécimens figurés. Les deux autres exemplaires sont, au contraire, bien différents de celte forme typique; et je pense qu'ils appartiennent à une variété spéciale, peut-être à une race géographique qu'il est utile de faire connaître et que je désignerai sous le nom de *Tancrei*, comme témoignage de gratitude envers l'aimable et savant lépidoptériste, M. Rudolf Tancré" (Austaut 1896: 96). [The oldest known species [in the genus *Brahmaea*] is that which was first described, under the name *Lunulata*, by Bremer … . I have before my eyes … three males of *Lunulata* coming from two different sources, but captured nevertheless in the same Siberian region, mentioned above [in the regions watered by the Amur River, in the south-east of Siberia]. One of these specimens is … resembles quite exactly the form of Bremer and that of Ménétriès; that is to say, it is characterised by two large oval yellowish spots, well written, which interrupt in this species the median brown band of the first wings, towards its upper third, although the general tint of this subject is more tawny, more reddish, and, consequently, more brilliant than that of the specimens figured. The two other specimens are, on the contrary, very different from this typical form; and I think that they belong to a special variety, perhaps to a geographical race which it is useful to make known and which I will designate under the name of *Tancrei*, as a testimony of gratitude towards the kind and learned lepidopterist, Mr. Rudolf Tancré]. The following text provides a detailed description of two specimens of *Brahmaea lunulata* var. *tancrei* obtained from Tancré, in comparison with a moth obtained from the "different source".

It follows from the text that Austaut did not mention the name *Brahmaea certhia*, may be, considering it in the Walker's (1855) sense; that he had three moths from two different sources, from which one specimen was match to the images of *Brahmaea lunulata* (=*Brahmaea certhia*, see below), and the other two, described as "var. *tancrei*" ("variety, or geographical race"), corresponded to the moths living in the Russian Far East. So, although the types of "var. *tancrei*" have not yet been revised, there is no doubt about the identification of the taxon described by Austaut.

Austaut does not disclose the source of the first specimen and attributes the origin of all his moths to the Amur River basin. However, the northern range limit of *Brahmaea certhia* passes significantly south of this territory (see below). Therefore, this specimen could have originated from Northern or Eastern China. The place of collection of the specimens of "var. *tancrei*" obtained from Tancré can be assumed on the basis of a document stored in the Khabarovsk Regional Museum named after N.I. Grodekov (Khabarovsk, Russia) and published by E.V. Novomodny, who studies the history of entomological research in the Russian Far East. This document shows that the Cossack Alexei Kobyzov (also Kobosov), who lived in the village of Radde, collected lepidopterans and beetles in the Lesser Khingan Mountains and sent them to Rudolf Tancré at least between 1889 and 1899. Around the same time, the Cossack Vladimir Epifantsev collected lepidopterans in the vicinity of Radde to sell to a "German" (Novomodnyi 2018; Novomodnyi & Shergalin 2019, in Russian). Since the specimens described by Austaut as *Brahmaea certhia* var. *tancrei* in 1896 were probably received by Tancré within this time period, it can be assumed that the type locality for this taxon is the vicinity of the Radde village located in the Lesser Khingan mountain range at the northern coast of the Amur River. It is possible that these materials were (partially?) sent to Tancré via Wilhelm Eugen Rückbeil, who "settled in Blagoveshchensk and sent lepidopterans to Mr. Tancré from there … almost every year" (Staudinger 1892: 89, in German). This assumption is supported by the fact that Staudinger (1892: 325) lists "Rückbeil bei Blag.[oweschtschensk]" among the collection points of "*Brahmaea lunulata*", provided that since then there have been no other reliable indications of the presence of this species in the vicinity of this city. An additional argument in favor of the fact that the type "var. *tancrei*" originates from the Amur region is the description by Austaut (1896: 96) of the form of postmedial band packet on the hindwing: "Quant aux ailes postérieures, ... la ligne blanchâtre, qui la sépare dy la zone ondulée, offre un mouvement plus sinueux aux approches du bord abdominal". [As for the hindwings, ... the whitish line, which separates it [basal part of the wing] from the wavy

area, offers a more sinuous movement as it approaches the abdominal edge]. This shape of the line corresponds to that in the Amur—Dongbei—Korean moths, and not match to that in moths from the North Chinese populations of the same species (see Table 3).

The name *tancrei* was almost forgotten for a long time. After its introduction in 1896, it was mentioned only three times until 1987: by Strand (1913, as "*Brahmaea certhia* var. *tancrei*"), by Mell (1930, as "*Brahmaea certhia* subsp. *tancrei*") and Bryk (1949, as a species "*B. tancrei*", but without the discussion of its taxonomic status). The name was omitted from such important publications as the Catalogue der Lepidopteren des Palaearctischen Faunengebietes (Staudinger & Rebel 1901), The Macrolepidoptera of the World (Seitz 1911), and Essai de Classification des Lépidoptères producteurs de Soie (Conte 1911). However, Conte is the first to mention a second species of *Brahmaea* from China (from Shanghai), which he identified as *Brahmaea ledereri*, described from Turkey.

Mell (1930: 353) first proposed to consider *tancrei* as "geographische Rasse der Art", but nomenclaturally left the taxon at the rank of subspecies "*Brahmaea certhia tancrei*".

Bryk (1949) described a new species of brahmin moths from North Korea, *Brahmaea magnificentia* Bryk, 1949, mentioning, however, that it may be a subspecies of *Brahmaea tancrei*. He gave the latter taxon as a species without further explanation. He also noted that *Brahmaea ledereri* by Conte (1911) from Shanghai may be *Brahmaea magnificentia*, based on the presence of a light antennae and a narrowed median band in both species. The description of this taxon has not been widely accepted, as well as the actual arising of *Brahmaea tancrei* to the species rank.

In China, Chu & Wang (1977) and Yang (1978) reported four or two (respectively) species in the *Brahmaea certhia* group, but the application of names to them was incorrect in most cases. In total, six species were described in this group by Chinese authors: *Brahmaea porphyria* Chu & Wang, 1977, *Brahmaea jilinneus* Zhang, 1988, *Brachyghatha diastemata* Zhang & Yang, 1993, *Brahmaea separata* Yang & Zhang, 1994 (Zhang & Yang 1994a), *Brahmaea recta* Yang & Zhang, 1994 (Zhang & Yang 1994a), and *Brahmaea goniata* Zhang & Yang, 1994 (Zhang &Yang 1994b). They were described mainly in comparison with "*Brahmaea certhia*" (in different understandings, including the those coinciding with true *Brahmaea tancrei*), or in comparison with each other. The use of these taxa has not gone beyond the limits of Chinese entomological literature.

In South Korea, Yoon (1985) reported the presence of two species of brahmin moths with different larvae and the male genitalia: *Brahmaea certhia* and a not determined taxon with discussed name. Based on this report, Owada (1987; see also Sugi 1987) applied tentatively to the second species the name *Brahmaea tancrei*. Since the Owada's and Sugi's publications, the name *Brahmaea tancrei* has become widely used as a valid name for brahmin moths of a certain species distributed in Korean Peninsula and Northeast China (Nässig & Paukstadt 1990; Paukstadt & Ragus 1990; Yoon 1991; Park *et al*. 1999; Park *et al*. 2001; Lee *et al*. 2011; Lee 2015) and the Russian Far East (see references above).

It should be noted that one of the reasons for the long-standing confusion with the names in the *Brahmaea certhia* species group was the image of "*Brahmaea certhia*" by Seitz (1911). Yang (1978) has already pointed out the inconsistency of this image to the true *Brahmaea certhia*. Indeed, an analysis of the wing pattern of the moth on the figure "35b *certhia*" allows to conclude that it most likely depicts a female of *Brahmaea ledereri* Rogenhofer, 1873, in Rogenhofer & Mann 1873.

In 2016, contrary to previous authors, V. Zolotuhin excluded *Brahmaea lunulata* from synonyms with *Brahmaea certhia* and proposed a series of nomenclatural changes in the *Brahmaea certhia* species group, including synonymisation of *Brahmaea tancrei* with *Brahmaea lunulata carpenteri* Butler, 1883 (Zolotuhin 2016). He based these taxonomic decisions on a study of "about 300 specimens of moths *Brahmaea* in different museums in different countries" (Zolotuhin 2016: 4, in Russian) (however, without citing most of the studied materials). Including, he studied and published photographs of holotypes of *Brahmaea carpenteri* Buter, 1883 (Zolotuhin 2016: pl. 2, fig. 3), *Saturnia lunulata* Bremer & Gray, 1853 (Zolotuhin 2016: pl. 2, fig. 4), *Brahmaea bicolor* Matsumura, 1921 (Zolotuhin 2016: pl. 2, fig. 5), and *Brahmaea magnificentia* Bryk, 1949 (Zolotuhin 2016: pl. 2, fig. 6).

As a result of his study, Zolotuhin concluded that the features of colouration and wing pattern in this taxonomic group do not allow to distinguish closely related species. Based on the study of the COI barcode fragment, he supported the taxonomic independence of two species: *Brahmaea certhia* and *Brahmaea lunulata*, dividing the latter into two subspecies: *Brahmaea lunulata lunulata* and *Brahmaea lunulata carpenteri*. The proposed system of the *Brahmaea certhia* species group (Zolotuhin 2016: 7) is shown below (originally in Russian, and here it is given with some reductions):

***Brahmaea certhia* (Fabricius, 1793)**

Phalaena Certhia Fabricius, 1793. T.l.: [China, Zhejiang Province, Zhoushan Island] "Island of Chusan".

=*Brahmæa petiveri* Butler, 1866. T.l.: [China, Zhejiang Province, Zhoushan Island] "Island of Chusan", junior objective synonym.

=*Brahmaea porphyria* Chu & Wang, 1977, **syn. n.** T.l.: "China, Chekiang [Zhejiang], Tienmushan".

Distribution: most of China (reliably known from the provinces of Zhejiang, Jiangxi, Liaoning, Yunnan, Shaanxi), South Korea.

***Brahmaea lunulata* (Bremer & Grey, [1853] 1852), stat. rev.**

***Brahmaea lunulata lunulata* (Bremer & Grey, [1853] 1852), stat. rev**.

Saturnia lunulata Bremer & Grey, [1853] 1852. T.l.: "aux environs de Pekin".

=*Saturnia undulata* Bremer & Grey, 1853 T.l.: "aux environs de Pekin", junior objective synonym.

Distribution: East China, also reaches the provinces of Shaanxi and Sichuan.

***Brahmaea lunulata carpenteri* Butler, 1883, stat. n.**

Brahmaea carpenteri Butler, 1883. T.l.: "Korea, Chosan, Harbour".

=*Brahmæa Lunulata* Bremer, var. *Tancrei* Austaut, 1896. T.l.: [qu'arrose le fleuve Amour, au sud-est de la Sibérie].

=*Brahmaea bicolor* Matsumura, 1921. T.l.: [Korea].

=*Brahmaea magnificentia* Bryk, 1949. T.l.: "Korea, Shuotsu".

Distribution: East of the Russian Federation (East Siberia, Amur Region, Primorye), North Korea, South Korea, North China.

The synonymy proposed by Zolotuhin was adopted in a number of fundamental works (Kitching *et al*. 2018; Sinev 2019; Paukstadt & Paukstadt 2021b, 2021c, 2021e, 2022).

The following should be noted regarding the system by Zolotuhin. Fabricius (1793) introduced the name *certhia* as the binomen "*Bombyx certhia*", but not "*Phalaena certhia*". The holotypes of the taxa were identified by geographic association of their type localities with the corresponding clades of the COI tree, without morphological identification. Yang (1978) was the first to synonymise *Brahmaea porphyria* and *Brahmaea certhia*. *Brahmaea lunulata tancrei*, *Brahmaea bicolor* and *Brahmaea magnificentia* have never been synonymised with *Brahmaea carpenteri* before, and so their reference in this status should be considered as new synonyms. There are no reasons for the indication of "Korea" as the type locality for *Brahmaea bicolor*. The Beijing area is traditionally considered to be North China rather than East China. The inclusion of East Siberia in the distribution of "*Brahmaea lunulata carpenteri*" is clearly based on mislabelling of the moths (see below).

Thus, Zolotukhin made nomenclatural decisions based on molecular genetic analysis of non-type specimens of taxa and without establishing their morphological accordance either with each other or with the genetically studied samples. Having studied the publications, internet sources and available collections on *Brahmaea certhia* species group, including the holotype of *Saturnia lunulata*, we did not agree with Zolotukhin's conclusion about the impossibility of species determination in this taxonomic group by external characters. Since the molecular COI phylogeny published by Zolotuhin (2016: fig. 4) does not allow associating terminal branches of the tree with specific moths or with the data in Barcode of Life Data Systems (BOLD) or GenBank (NCBI), we conducted a new genetic study of the group based on the BOLD database.

Materials and methods

In present study the collection materials on brahmin moths stored in the Zoological Institute of the Russian Academy of Sciences (St. Petersburg) (ZIN, 113 specimens) and in the Bioresource collection (registration number 2797657) of Federal Scientific Center for Biodiversity of Terrestrial Biota of East Asia, Far Eastern Branch of the Russian Academy of Sciences (Vladivostok) (FSCB, 30 specimens) are used. Photographs of the brahmin moths posted on various biodiversity websites (GBIF 2025, iNatiralist 2025, Macroclub.ru 2025, Insecta.pro 2025, Jpmoth 2024), and on image hosting services Flickr (posts by Pittaway 2007, Wang 2014, and Yun 2014) and Tistory (posts by

Eolingbul 2019, and Park 2017), taken from unreared moths, accompanied by the location and date of observation (180 observations totally) (Tabs 4, 6, 8) were also used extensively in the study. Also, several personal observations of brahmin moths by first author were involved.

The photographs of collection moths were captured by second author with a Canon 5D Mark IV digital camera equipped with a Canon MP-E 65mm f/2.8 1-5x macro lens and Canon Macro Twin Lite MT-26EX-RT, flash, and Helicon stacking software (Helicon Focus 7.03). He also performed the photographs of the male and female genitalia preparations in glycerin, using a Nikon SMZ25 stereoscopic microscope, Nikon DS-Ri2 camera and NIS-Elements BR software.

Morphological terms are traditional for the order Lepidoptera. Wing venation nomenclature is based on Wootton's (1979) system, which was adopted for Lepidoptera by Kristensen (2003). The structures of the copulatory apparatus (genitalia) are named according to the dictionary of Klots (1970) with additions proposed by Kuznetzov & Stekolnikov (2001) and Kristensen (2003).

Phylogenetic analysis was performed based on selected sequences of *Brahmaea* samples taken from the Barcode of Life Data System (BOLD) (Biodiversity Genomics Centre, University of Guelph, Ontario, Canada) (most samples) and National Institute of Biological Resources (NIBR) (Incheon, South Korea) (two samples) genetic databases. For the *Brahmaea certhia* species group all available samples (47 sequences) were included in the analysis. For the final analysis the samples with the standard nucleotide sequence length of COI barcode fragment (658 bp; for except two only: SARBB1309-09, *Brahmaea tancrei* from "Sakha-Yakutiya"—614 bp, and NSSD5998-21, "*Brahmaea porphyria*" from Shandong—654 bp) and from various geographic regions were selected (29 sequences in total). For comparison, the analysis of the nucleotide sequences of the rest species of the genus *Brahmaea* were involved based on the same criteria of selection: standard nucleotide sequence length (658 bp) and various geographic regions (46 sequences) (Tabs 5, 7, 9, 10). For the subgenus *Brahmaea* (*Brahmaea*), the identification of each sample was verified based on the photographs of moths in BOLD, for the subgenus *Brahmaea* (*Brahmophthalma*), verification of the sample identifications in BOLD was not performed.

MEGA 12 software (Kumar *et al*. 2024; http://www.megasoftware. net) was used to determine the nucleotide composition, to calculate the genetic distances, to select the optimal nucleotide substitution model, and to perform phylogenetic reconstructions. The best nucleotide substitution model with the lowest Bayesian information criterion scores was calculated as GTR+G+I: General Time Reversible model with a discrete gamma distribution (G) and the assumption that a certain fraction of sites are evolutionarily invariant (I). The phylogenetic trees were reconstructed by distance method (neighbor-joining, NJ) and likelihood method (maximum likelihood, ML). For the construction of the NJ tree, we used Kimura 2-parameter model with pairwise deletion of missing data (in accordance with standard BOLD protocol: Hebert *et al*. 2003). The genetic pairwise distance (p-distance) was computed using the Kimura 2-parameter model protocol + G + pairwise deletion of missing data. For the construction of ML tree, we used the nucleotide substitution model GTR+G+I, using all sites. The resulting topology was evaluated by bootstrap test with 1000 replicates.

Translations from Russian, German, French, Chinese, Korean and Japanise into English were performed by first author with help by Google Translate software.

Results

Moths of *Brahmaea certhia* species group are divided into two distinct morphotypes, corresponding to the two senior names in each group of moths—*Brahmaea certhia* and *Brahmaea tancrei*. Both morphotypes differ in an extensive series of alternative characters, most of which (in various combinations) have been repeatedly published by different authors. We tested these alternative characters on the material and supplemented with several original differences (Table 2). In the Table 2, the characters are given in a modern interpretation and accompanied by an indication of the authors who proposed this character, and, if necessary, an indication of the name of the taxon to which it was applied, if it differs from the name of the taxon in the title of the corresponding table column.

A review of the characters showed that the width of the band packets and the number of lines in them, as well as the width of the medial field, sometimes used to identify of brahmin moths (Mell 1930; Bryk 1949; Yang 1978; Zhang & Yang 1993) are not stable and cannot serve to distinguish of species, in agreement with the opinion of Zolotukhin (2016). It was discovered that in *Brahmaea tancrei tancrei* veins Rs1–Rs2 can be completely fused

to each other (1♂, Ussuriiskii Nature Reserve, Egerskii Kluch, 07/21/1966, FSCB), which is characteristic of the brahmin moth from the genera *Calliprogonos*, *Dactyloceras* and *Sabalia*. Contrary to the opinion of Bryk (1949, for *Brahmaea magnificentia*), *Brahmaea tancrei* has on the wings a slate blue sheen just like *Brahmaea certhia*, but it is noticeably weaker and usually visible only in fresh live moths (Figure 1).

Thus, in East Asia there are two morphologically clearly distinct taxa, the senior names for which are *Brahmaea certhia* and *Brahmaea tancrei*. The holotype of *Brahmaea lunulata* corresponds to all the external features of *Brahmaea certhia*, therefore, the synonymy of these two names should be restored. Based on the same criterion, the synonymy of the names *Brahmaea carpenteri* and *Brahmaea bicolor* with *Brahmaea certhia* should also be restored. Accordingly, *Brahmaea tancrei* is restored to the rank of species, and *Brahmaea magnificentia* is transferred from the synonymy of *Brahmaea lunulata carpenteri* to the synonymy of *Brahmaea tancrei*.

In addition, *Brahmaea tancrei* has two allopatric closely related morphotypes, one of which is distributed in the southern part of continental Russian Far East, in the east of Northeast China, in North Korea and in South Korea, and the other—in Northern and eastern Southwestern China. The first morphotype clearly correlates with the nominotypical form *Brahmaea tancrei*, and the second one was described as *Brachygnatha diastemata* Zhang & Yang 1993. Nässig (1994) treated this name as a taxon or synonym within the *Brahmaea tancrei* group. Zototukhin (2016) indicated *Brachygnatha diastemata* as a synonym of *Brahmaea lunulata lunulata*, but did not designate this synonymy as new. Paukstadt & Paukstadt (2021b, 2021c, 2021e, 1922) give this name in the same status. Table 3 shows the diagnostic characters of the morphotypes in the *Brahmaea tancrei*.

Having selected the most prominent of the considered characters (Tables 2 and 3), we propose the following morphological key to moths from *Brahmaea certhia* species group.

Key to species and subspecies in the *Brahmaea certhia* species group

1. Head unicolourous brownish black; flagellum and pectinae of antenna brownish black; short, rounded, almost wide as long; forewing dorsally with light lines of antemedial band packet between the Rs and M1 veins separating into sickle-shaped, hook-shaped or / and spot-shaped fragments; forewing and hindwing ventrally in basal portion with oblique light lines and spots; forewing with fork of veins Rs1–Rs2 long, starting into median field of wing basal to the postmedial band packet and in length reaching no less than 2/3 length of Rs3–Rs4 fork; abdomen dorsally with transverse intersegmental stripes of ochre-yellow scales; in male genitalia median dilation of gnathos bilobate with large teeth on lobes dorsally, valva oblong, length of valva along dorsal margin approximately twice as width of valval base along vinculum, harpe (apex of sacculus) wide lamellar . . . . . ***Brahmaea certhia***

– Head brownish black with transversal band of yellow scales between scapi; flagellum and pectinae of antenna light brownish yellow; labial palpus with third segment almost twice as long as wide; forewing dorsally with uninterrupted light lines of antemedial band packet between the Rs and M1 veins; forewing and hindwing ventrally in basal portion uniformly black, without light lines or spots; forewing with fork of veins Rs1–Rs2 short, starting into postmedial band packet of wing and in length reaching no more than ½ length of Rs3–Rs4 fork, rarely Rs1 and Rs2 completely fused; abdomen dorsally black, without light intersegmental scales; in male genitalia median dilation of gnathos entire, spatulate, without visible serrations, valvae triangular, widened towards base, length of valva along dorsal margin no more than 1.5 times greater than width of valval base along vinculum, harpe (apex of the sacculus) in form of narrow, oblong process . . . . . ***Brahmaea tanctei*** (**2**)

2. In forewing dorsally postmedial band packet between veins CuA2 and 1A+2A with prominent notch comparable in depth to its width between these veins; first (proximal) line of this packet between vein 1A+2A and posterior margin of wing usually slightly convex or almost straight, without tooth on vein 1A+2A; in hindwing dorsally inner margin of postmedial band packet veins CuA2 and anal margin of wing usually strongly inclined outward; in male genitalia median dilation of gnathos with convex or straight posterior margin, process of harpe long and directed dorsally . . . . . ***Brahmaea tancrei tancrei***

– In forewing dorsally postmedial band packet between veins CuA2 and 1A+2A with shallow notch, significantly smaller than its width between these veins; first (proximal) line of this packet between vein 1A+2A and posterior margin of wing usually slightly concave and with small tooth on vein 1A+2A; in hindwing dorsally inner margin of postmedial band packet between veins CuA2 and anal margin of wing usually curved weakly or almost straight; in male genitalia median dilation of gnathos with shallow notch on posterior margin, process of harpe short and deflected medially . . . . . ***Brahmaea tancrei diastemata***

As for the genetic part of the study, all available moth photographs from the Public Data Portal of BOLD database were re-identified in accordance with the accepted morphological criteria. As a result, in particular, it was established that that all samples from the vicinity of Beijing, identified in BOLD as *Brahmaea certhia*, correspond to *Brahmaea tancrei diastemata*, whereas specimens of true *Brahmaea certhia* from Beijing are not represented.

The resulting COI tree is shown on the Figure 18. The branch topology in ML and NJ trees was completely consistent with minor differences in the values of bootstrap support, therefore, only the latter tree is shown. In

the tree, species from the subgenus *Brahmaea* (*Brahmaea*) is clustered together clearly and with the maximum support by the bootstrap value (cluster 1). Species from the subgenus *Brahmaea* (*Brahmophthalma*) is also clustered together, but a bootstrap value for this branch was not offer in the MEGA 12 program (cluster 2). In contrast to the NJ tree, in the ML tree the cluster 2 received a bootstrap value of 100%, while for the cluster 1 this parameter was not indicated. Between the clusters 1 and 2, the general range of p-distances between sequences (total 1440 values of pairwise comparisons) lies within the interval 10.27–15.54%. The largest number of the p-distance values are in the interval 11.00–14.00%, which covers 86.2% of all pairwise comparisons. Presumably, this genetic distance can be considered sufficient at the generic level, but this question is beyond the scope of this publication.

The pairs of well-defined 'good' species in the subgenus *Brahmaea* (*Brahmaea*) are ranged in ascending order of p-distance as follows: in the pair *Brahmaea tancrei—Brahmaea certhia* (clusters 3 and 4) p-distances are in the interval of 6.52–7.32%, in the pair *Brahmaea europaea* (cluster 3)—branch *Brahmaea ledereri* + *Brahmaea christophi* Staudinger, 1879 (cluster 6)—6.52–7.49%, in the pair *Brahmaea certhia* (cluster 4)—*Brahmaea europaea* (cluster 3)—6.70–7.08%, in the pair *Brahmaea tancrei* (cluster 3)—*Brahmaea europaea* (cluster 3)—7.01–8.02%, in the pair *Brahmaea tancrei* (cluster 3)—branch *Brahmaea ledereri* + *Brahmaea christophi* (cluster 6)—8.00–9.53%, and in the pair *Brahmaea certhia* (cluster 4)—branch *Brahmaea ledereri* + *Brahmaea christophi* (cluster 6)—9.31–9.92%.

Accordingly, the pairs *Brahmaea tancrei—Brahmaea certhia*, *Brahmaea certhia—Brahmaea europaea*, and *Brahmaea europaea*—branch *Brahmaea ledereri* + *Brahmaea christophi* demonstrate minimal and very similar p–distances (in the interval ~ 6,5–7.0%). The pair *Brahmaea certhia*—branch *Brahmaea ledereri* + *Brahmaea christophi* is most diverged from each other (almost up to 10%). However, all distances are so close and the nodes linking these clusters have such low bootstrap value (59–61%) that they should be considered approximately equidistant from each other for the barcoding fragment of COI gene. The approximately equal genetic distances between the main lineages of the subgenus correlate with the mosaic distribution of morphological characters in the male genitalia, which does not allow easy identification of probable synapomorphies of these lineages.

In the subgenus *Brahmaea (Brahmophthalma)*, basal nodes between the well-defined 'good' species are also with low bootstrap value varying from 23 to 56%. The pairs of them are ranged in ascending order of p-distances as follow: in the pair *Brahmaea wallichii* (cluster 7)—*Brahmaea hearseyi* species group (cluster 11) p-distances are in the interval 6.10–8.63%, in the pair *Brahmaea wallichii* (cluster 7)—*Brahmaea japonica* (cluster 8)—6.15–7.49%, in the pair *Brahmaea japonica* (cluster 8) –*Brahmaea hearseyi* species group (*sensu* Paukstadt & Paukstadt 2021a) (cluster 11)—6.85–7.81%, in the pair *Brahmaea ardjoeno* (cluster 10)—*Brahmaea hearseyi* species group (cluster 11)—6.98–7.94%, in the pair *Brahmaea celebica* (cluster 9) *Brahmaea hearseyi* species group (cluster 11)—7.06–9.00%, in the pair *Brahmaea wallichii* (cluster 7)—*Brahmaea ardjoeno* (cluster 10)—7.46–10.31%, in the pair *Brahmaea japonica* (cluster 8)—*Brahmaea celebica* (cluster 9)—7.63–8.20%, in the pair *Brahmaea japonica* (cluster 8)—*Brahmaea ardjoeno* (cluster 10)—8.83%, in the pair *Brahmaea wallichii* (cluster 7)—*Brahmaea celebica* (cluster 9)—9.15–10.79%, and in the pair *Brahmaea celebica* (cluster 9)—*Brahmaea ardjoeno* (cluster 10)—9.88–10.79%.

Thus, in this subgenus, the most pairs of 'good' species have ranges of p–distances are similar to that in the previous subgenus, excepting the *Brahmaea ardjoeno* and *Brahmaea celebica* from Java and Sulawesi islands, which have greatest genetic distances with each other and with *Brahmaea wallichii* noticeably exceed 10%. Also, notably, three pairs of clusters (7–9, 7–10, and 9–10) in the subgenus have maximum p-distances that exceed the minimum p-distances between the subgenera (clusters 1 and 2). Probably, this is the reason for the lack of bootstrap value for the cluster 2.

In the groups of close related species, the p-distances between samples of *Brahmaea ledereri* and *Brahmaea christophi* are in the range of 3.21–3.56% (clusters 14 and 15). Close to the previous values of p-distances are those observed among the included samples of *Brahmaea wallichii* (cluster 8). The cluster of this species is divided into three sub-trees with significant p-distances: the cluster with a predominantly Chinese—Indochinese origin of specimens (cluster 16), the cluster with Himalayan origin of specimens (cluster 18), and the Taiwanese subspecies *Brahmaea wallichii insulata* (cluster 17), the distances between them are in the range of 2.89 to 4.59%. It is possible that several 'cryptic' species are hidden under the name *Brahmaea wallichii*.

Between *Brahmaea hearseyi*, *Brahmaea loeffleri* and the "*Brahmaea* sp." from the Philippines (? *Brahmaea naessigi* Naumann & Brosch, 2005, or *Brahmaea paukstadtorum* Naumann & Brosch, 2005) p-distances are in the range of 1.08–2.22% (clusters 19–21), *i.e.* have lower values than within the *Brahmaea wallichii* cluster. It is

possible that it would be more appropriate to consider *Brahmaea loeffleri* and *Brahmaea* sp. from the Philippines as subspecies of *Brahmaea hearseyi*, taking into account their geographical allopathy and the weak morphological differences between them. Earlier, Holloway (2011: Note 79) expressed opposition to the division of *Brahmaea hearseyi* into a series of separate species proposed by Naumann & Brosch (2005).

P-distances between samples from the Amur—Dongbei—Korean and North Chinese populations of *Brahmaea tancrei* are in the range of 0.66–1.72% (clusters 12 and 13) and have a lower value than between the *Brahmaea ledereri* and *Brahmaea christophi* (clusters 14 and 15), and between the samples of *Brahmaea wallichii*. On that basis, we support the subspecific taxonomic rank of North Chinese populations of *Brahmaea tancrei* as *Brahmaea tancrei diastemata*.

As to intraspecific genetic variability, *Brahmaea tancrei tancrei* and *Brahmaea tancrei diastemata* demonstrates inner genetic divergency from 0% and 0.15% (mostly) up to 0.33%, 0.46% and 0.62%. *Brahmaea certhia* possesses highly homogeneous barcoding nucleotide sequence of COI gene through all its area, having p-distances 0% or 0.15% between all Chinese and Korean specimens, except the sample SARBB939-09 from Shaanxi, which maximum distance reaches 0.31%. Of particular note is the *Brahmaea certhia* sample SARBB1306-09 from southern Yunnan with 0% genetic distance, although its collecting place located more than 1200 km south from the nearest known locality of this species and is isolated by the high mountains of the Yungui Plateau and Ailao Ridge. The sources of such homogeneity deserve special study.

To summarize the results of the genetic study, we confirm the division of the genus *Brahmaea* into 2 subgenera, although *Brahmophthalma* probably deserves the generic rank, given the genetic distances and morphological differences from the nominotypical subgenus. Morphologically well-differentiated species in both subgenera have approximately equal genetic distances (by barcoding fragment of mtCOI gene) of about 6–8%, sometimes up to 10% and more, and do not form a robust phylogenetic tree. Accordingly, we support current status of the names *Acanthobrahmaea* Sauter, 1967 (type species *Brahmaea europaea* Hartig, 1963), *Brachygnatha* Zhang & Yang, 1993 (type species *Brachygnatha diastemata* Zhang & Yang, 1993) and *Transbrahmaea* Zolotuhin, 2016 (type species *Brahmaea christophi* Staudinger, 1879) as synonyms of *Brahmaea (Brahmaea)* Walker, 1855. Possible sister relationship between the *Brahmaea tancrei* and *Brahmaea certhia* has a weak genetic support on the neglected bootstrap value level (based on barcoding fragment), so the *Brahmaea certhia* (Fabricius, 1793) species group cannot be considered as a 'legitimate' taxon. However, we retain it as a non-taxonomical convenient tool for indication of the geographic group of species.

P-distances of about 3–4% should be treated as a threshold for delimitation of a species level in the genus *Brahmaea*. This suggests a need for revision of *Brahmaea wallichii*, which in current understanding probably represents a group of closely related species. Groups of closely related allopatric populations from different territories, which can be diagnosed morphologically but have low genetic divergence on barcoding COI fragment of about 1–2%, cause some difficulties in interpreting their taxonomic rank. In our opinion, such forms are more appropriately considered as subspecies, especially given the possibility of hybridisation in *Brahmaea* even between 'good' species (*e.g.*, between *Brahmaea tancrei* and *Brahmaea certhia*: Paukstadt & Weritz 2021; Höge & Renner 2023). Therefore, we support the subspecific delimitation of Amur—Dongbei—Korean and North Chinese populations of *Brahmaea tancrei*.

To summarise both the results of the morphological, genetic and nomenclature studies, we propose new annotated catalogue of *Brahmaea certhia* species group. The catalogue includes only references to nomenclatural synonyms. For other literary sources on species, see Table 1. Abbreviations: **stat. nov.**—*status nova*, **stat. resurr.**—*status resurrectus*, **syn. nov.**—*synonym nova*, T.l.—type locality; T.s.—type species, T.s.l.—type specimen(s) location.

Family Brahmaeidae Swinhoe, 1892

Genus *Brahmaea* Walker, 1855

Brahmaea Walker, 1855: 1315. T.s.: *Bombyx certhia* Fabricius, 1793, designated by Hampson (1893: 29) (ICZN 1991: Case 2737; ICZN 1992: Opinion 1698).

Subgenus *Brahmaea* (*Brahmaea*) Walker, 1855

Acanthobrahmaea Sauter, 1967: 126. T.s.: *Brahmaea europaea* Hartig, 1963. Latest resurrecting of synonymous status by Paukstadt & Paukstadt (2021d: 353).

Brachygnatha Zhang & Yang, 1993: 48. T.s.: *Brachygnatha diastemata* Zhang & Yang, 1993. Junior subjective synonym of *Brahmaea*. Synonymised by Nässig (1994: 355).

Transbrahmaea Zolotuhin, 2016: 9. T.s.: *Brahmaea christophi* Staudinger, 1879. First mention of this name in the status of junior synonym is in Kitching *et al*. (2018: line 774). Paukstadt & Paukstadt (2021: 352) confirmed *Transbrahmaea* as synonym of *Brahmaea*.

[*Brahmaea certhia* species group]

Brahmaea tancrei tancrei Austaut, 1896, stat. resurr.

(Figs 1–3, 9, 12, 14)

Brahmaea lunulata var. *tancrei* Austaut, 1896: 98. T.l.: du'arrose le fleuve Amour, au sud-est de la Sibérie [? Russia, Evreiskaya A.O., vicinity of Radde village]. T.s.l.: unknown (Paukstadt & Paukstadt 2021b).

Brahmaea magnificentia Bryk, 1949: 22, **stat. resurr.** T.l.: Nordkorea, Shuotsu [Kyŏngsŏng, North Hamgyong, North Korea]. Junior subjective synonym of *Brahmaea tancrei tancrei*. T.s.l.: Naturhistoriska Riksmuseet, Stockholm, Sweden. Holotype photographs: Swedish Museum 2015: figs [1, 2] (moth), [3] (labels), [4] (male genitalia); Zolotuhin 2016: [pl.] 2, fig. 6. First synonymisation: Yoon 1991: 29.

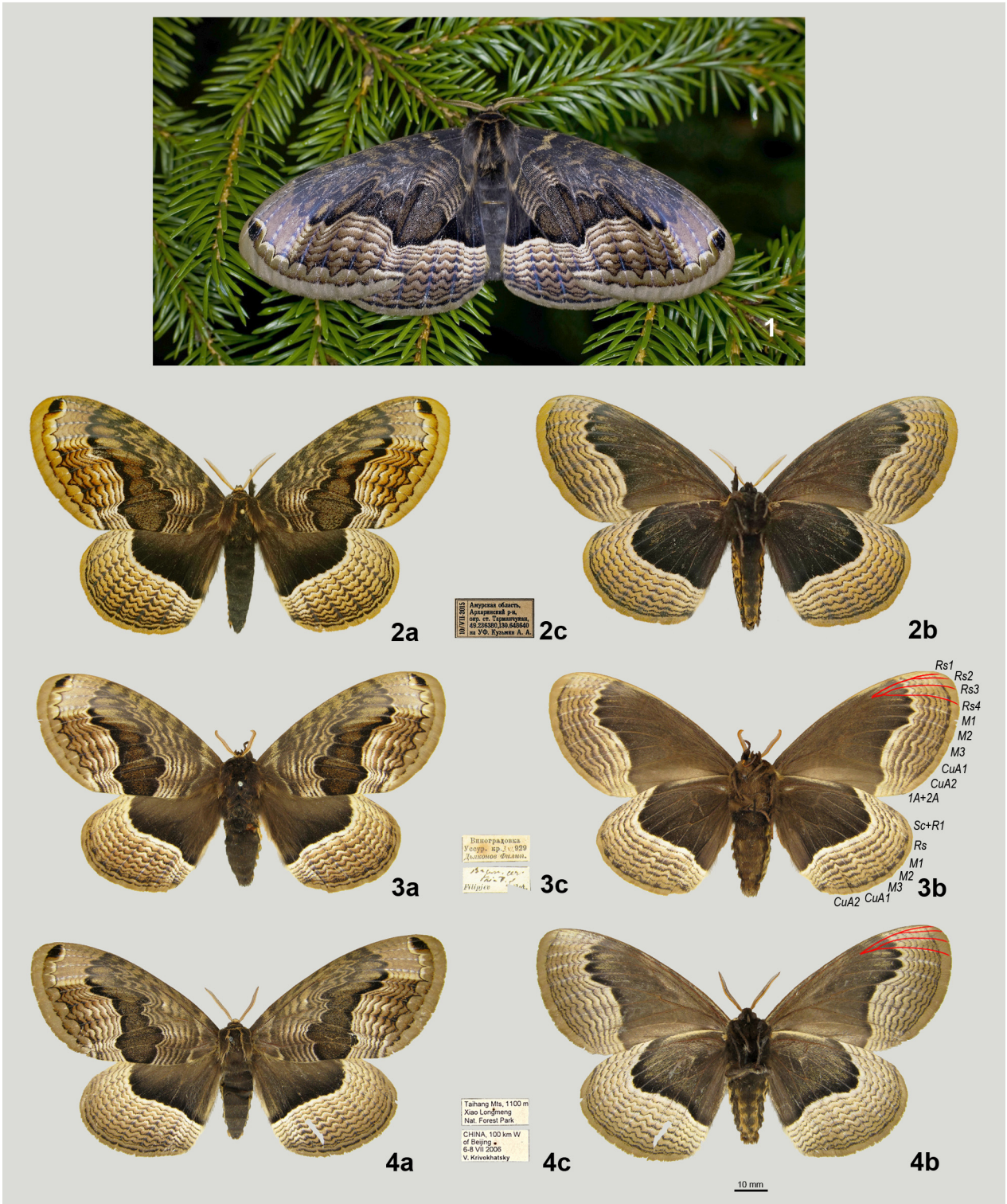
Brahmaea jilinensis Zhang, 1988: 229, figs 1 (moth), 2 (male genitalia), 3 (uncus), 4 (valva), 5 (cornuti) [holotype], **syn. nov.** T.l.: [China], Jilin, Huinan. Junior subjective synonym of *Brahmaea tancrei tancrei*. T.s.l.: Entomological Museum of the Jilin Agricultural University.

Material examined. ZIN: Russia: Khabarovskii Krai: 1♀, Schrenk. | Amur | coll. Acad. Petrop.; 1♂, 2903 | Ussuri | coll. A. Meinhardt; 1♂, St. Kozakevicheva nizh. tech. Usuri Bykov 91. | 17 [the date illegible] [Kozakevichevo, 48°16′N 134°44′E, Bykov leg.]; 1♂, Ussuriyskaya zh.d. St. Vyazemskaya E. Borzov | kol. Chetverikova [Vyazemskii, 47°32′N 134°45′E, E. Borzov leg., Chetverikov col.]. **Primorskii Krai:** 1♂, Primorskiy kray Pozharskiy rayon s. Verkhniy Pereval Nikiforova 17.07.[1]990 [Verkhnii Pereval viilage, 46°34′N 134°40′E, O. Nikiforova leg.]; 3♂, 1♀, Primor'ye, Novopokrovka, na ostrove po r. Iman, 35 verst ot der. Kartun Buyanova 24.07.1913 [Novopokrovka, on the island on the Iman river 45°51′N 134°29′E, Buyanova leg.]; 1♂, Yevseyevka, Prim. obl. Shingarev". 12.06.[1]910 | *Bram. certhia* F ♂ Filipjev det. [Yevseyevka, 44°24′N 132°53′E, Shingarev leg.]; 3♂, Vinogradovka, Ussur. kr. 11-12.07.[1]929 D'yakonov Filip. / 4y lug | *Bram. certhia* F ♂ Filipjev det. [Vinogradovka, 43°45′N 132°57′E, fourth meadow, A.M. Djakonov & N.N. Filipjev leg.]; 1♂, Vinogradovka, Ussur. kr. 3.06.[1]929 D'yakonov Filip. / Pad' Kalugina na svet | *Bram certhia* F ♂ Filipjev det. [Vinogradovka, 43°45′N 132°57′E, Pad′ Kalugina, on light, A.M. Djakonov & N. N. Filipjev leg.]; 8 ♂, 1♀, Primorsk. kray s. Muraveyka 22, 25, 27, 28.06.[19]77 Brameya Kaabak / Brameya | iz kollektsii L.V. Kaabaka [Muraveyka, 43°50′N 133°13′E, L.V. Kaabak leg. & coll.]; 3♀, Nikol′sk-Ussur Baran. polig. Andriyevskiy [1]913 [Banivurovo vicinity, 43°42′N 131°58′E, Andriyevskii leg.]; 2♂, 1♀, GTS, okr. Ussuriyska Primorskiy kray Sinev S.Yu. 14.07.1982, 18.07.1985 [Gorno-Tayezhnaya Station, 43°42′N 132°09′E, S.Yu. Sinev leg.]; 1♂, Primorskiy kray 20 km V Ussuriyska Gornotayezhnoye svet Sinov 8.07.[1]985 [Gorno-Tayezhnaya Station, 43°42′N 132°09′E, S.Yu. Sinev leg.]; 1♂, Kondratenk. sr. t. r. Suputinki Samoylov 14.06.[1]934 [Kondratenkovka, 43°37′N 132°09′E, Samoilov Leg.]; 1♂, Primor'ye Suputinskiy zapovednik na svet PRK 21.07.1964 Kolomiyets | iz kollektsii V.V. Dubatolova (Novosibirsk) [Ussuriiskii Nature Reserve, 43°38′N 132°20′E, Kolomiyets leg., V.V. Dubatolov coll.]; 1♂, Bramea 30.06.[19]35 Zimov. kl. [Ussuriiskii Nature Reserve, Zimoveinyi Kluch, A.I. Kurentsov leg.]; 1♂, Suchanskii rayon—[19]22 g. Kurentsov | 1040 Bram. certhia F ♀ N Filipjev det. [territory between Anisimovka and Tigrovoi, A.I. Kurentsov leg.]; 2♂, 1♀, Ussur. kray Suchan ist. r. Sitsy Kurentsov 20, 23.06, 14.07.[19]28 | *Bram. certhia* F ♂ Filipjev det. [Tigrovoi vicinity, sources of the river Tigrovaya, ~43°08′N 132°50′E, A.I. Kurentsov leg.]; 1♂, Ussuri mer. Distr. Sutshanensis loc. Derzhanovo A. Kurentsov | kol. Chetverikova [Tigrovoi vicinity, vanished Derzhanovo settlement, 43°10′N 132°50′E, A.I. Kurentsov leg., Chetverikov coll.]; 1♂, Suchanskiy rayon Fanza 15.06.[19]22 A. Kurentsov". | 1040 Br. certhia F ♂ NF det. | *Brahmaea certhia* F. / mikr. prep. 13804 ♂ [Tigrovoi vicinity, vanished Ruch'i settlement, 43°10′N 132°50′E, A.I. Kurentsov leg.]; 3 ♂, 2♀, Suchanskiy rayon s. Tigrovoye 20, 25.06, 11, 30.07.[19]22 A. Kurentsov | 1040 *Br. certhia* F ♂ NF det. [Tigrovoi, 43°11′N 132°54′E, A.I. Kurentsov leg.]; 1♀, Suchanskiy rayon s. Tigrovoye 6.06.[19]22

A. Kurentsov | 1040 Bram. certhia F ♀ NF det. | Brahmaea certhia F. / mikr. prep. 13804 ♀ [Tigrovoi, 43°11′N 132°54′E, A.I. Kurentsov leg.]; 1♂, Primorskiy kr. Tigrovoy Chistyakov 23.06.1975 | Brahmaea certhia lunulata Brem. Grey [Tigrovoi, 43°11′N 132°54′E, Yu.A. Tschistjakov leg.]; 1♀, Suchanskiy rudn. Ussur. kr. Dolgikh 10.07. [year missing] [Partizansk, 43°08′N 133°08′E, Dolgikh leg.]; 1♀, Ussur. kr. Suchansk. Rudnik 20.06.[1]913 M. Kazantseva | *Br. certhia* F ♂ Filipjev det. 1924 06.21 [Partizansk, 43°08′N 133°08′E, M. Kazantseva leg.]; 2♂, 1♀, Suchanskiy rudnik Ussur. kr. Palshkov 18.06.[1]931, 28.06., 15.07.[1]936 [Partizansk, 43°08′N 133°08′E, Palshkov leg.]; 1♀, Wladiwostock | coll. Dieckmann (Graeser legit) ; 1♂, Wladiwostock / Rieck | coll Dieckmann (Graeser legit) | Kol. Vel. Kn. Nikolaya Mikhaylovicha; 1♂, Okr. Vladivostoka Moltrekht [Vladivostok suburb, A. Moltrekht leg.]; 1♂, Okr. Vladivostoka, Okeanskaya A. Zagulajev 4.06.[1]952 / na svet [Vladivostok, Okeanskaya, 43°14′N 132°00′E, at light, A.K. Zagulajev leg.]; 2♂, Ussuri merid. Sedanka 26.06.1928 | Kollektsiya A.A. Bundelya | Brahmea certhia F [Vladivostok, Sedanka, 43°12′N 131°57′E, A.A. Bundel coll.]; 1♀, Vladivostok Sedanka 1916.08. Kriger-Voynovsk. | *Bram. certhia* F ♂ Filipjev det. [Vladivostok, Sedanka, 43°12′N 131°57′E, Kriger-Voynovskii leg.]; 1♀, Sedanka Ussur. kr. 5.07.[1]919 Kriger-Voynovsk. | *Bram. certhia* F ♂ N. Filipjev det. [Vladivostok, Sedanka, 43°12′N 131°57′E, Kriger-Voynovskii leg.]; 1♀, Vladivostok II Rechka 26.07.1913. Cherskiy [Vladivostok, Vtoraya Rechka, 43°10′N 131°55′E, Cherskiy leg.]; 1♂, Russk. ostr. Ussur. kr. 1914 g. Kriger-Voynovsk. | *Br. certhia* F ♂ Filipjev det. [Vladvostok, Russkii Island, 43°00′N 131°50′E, Kriger-Voynovskii leg.]; 1♀, 1925 07.28 Ussuri mer. Insula Rossica A. Shorygin | kol. Chetverikova [Vladivostok, Russkii Island, 43°00′N 131°50′E, Shorygin leg., Chetverikov coll.]; 1♂, 2♀, Primorskiy kr. zap. Kedrovaya pad' na svet L'vovskiy 22, 28.07.1988, [Kegrovaya Pad Nature Reserve, 43°05′N 131°30′E, A.L. Lvovskiy leg.]; 1♀, Yuzhnoye Primor'ye, zapov. Kedrovaya pad' Filippova 07-08.1975 [Kegrovaya Pad Nature Reserve, 43°05′N 131°30′E, Filippova leg.]; 1♀, Primorskiy kr. zap. Kedrovaya pad' svet Sinev 29.07.1988 [Kegrovaya Pad Nature Reserve, 43°05′N 131°30′E, S.Yu. Sinev leg.]; 1♂, Primorskiy kray Kedrovaya pad' V. Zlobin 07.1983 [Kegrovaya Pad Nature Reserve, 43°05′N 131°30′E, V. Zlobin leg.]. **China:** 1♂, St. Imyan'po Man'chzhur. Yemel'yanov 18.07.[1]91 [Heilongjiang, Yimianpo, 45°03′N 128°03′E, Yemel'yanov leg.]; 1♀, St. Pogranichnaya, Vostochn.-Kitaysk. dor. 1910 Martenson | coll. Acad. Petrop. [Heilongjiang, Suifenhe, 44°23′N 131°09′E, Martenson leg., Acad. Petrop. coll.]. **FSCB: Russia: Primorskii Krai:** 1♂, Roshchino, 45°54′N, 134°53′E, 12.07.1967, L.A. Ivliev leg.; 1♂, Ugodinza [Pshenitsyno], 44°05N 133°39′E, 28.05.1957, D.G. Kononov leg.; 1♂, Barabash-Levada, 44°45′N 131°25′E, 15.06.1978; 1♂, Gorno-Tayezhnaya Station, 43°42′N 132°09′E, 9.06.1956, A.I. Kurentsov leg.; 1♂, Ussuriiskii Nature Reserve, 43°38′N 132°20′E, valley broadleaf forest, 11.06.1950; 1♂, Ussuriiskii Nature Reserve, Egerskii Kluch, 43°38′N 132°27′E, 22.06.1966, D.G. Kononov leg.; 3 ♂, *ditto*, *Pinus koraiensis*—broadleaf forest, 20.07.1966; 3♂, *ditto*, 21.07.1966; 1♂, *ditto*, 22.07.1966; 1♀, *ditto*, 1.08.1966; 2♂, 1♀, Ussuriiskii Nature Reserve, Zimoveinyi Kluch, 43°38′N 132°26′E, 30.06.1968; 1♂, *ditto*, 3.07.1968;1♂, Kangauz station [Anisimovka], 43°10′N 132°47′E, 1.07.1967; 1♂, Anisimovka vicinity 43°10′N 132°47′E, 23.06.1975 Yu.A. Tschistjakov leg.; 1♂, Tigrovaya station, 43°11′N 132°54′E, 28.06.1921, A.I. Kurentsov leg.; 2♂, Tigrovoi, 43°11′N 132°54′E, 18.07.1989, Yu.A. Tschistjakov; 1♂, Chandalaz [Livadiiskii ridge], 16.06.1964; 1♂, Vladivostok, Okeanskaya station, 43°14′N 132°00′E, 1965 [no exact data], Z.A. Konovalova leg.; 1♂, Vladivostok, Akademicheskaya, 43°11′N 131°55′E, 15.07.1969, Z.A. Konovalova leg.; 1♂, Kedrovaya Pad Nature Reserve, 43°05′N 131°30′E, 18.06.1976, Yu.A. Tschistjakov leg. **A.A. Kuzmin private collection: Russia: Amurskaya Oblast:** 2♂, Tarmanchukan station vicinity, 49°14′11″N 130°38′05″E, at light, 10.07.2010, A.A. Kuzmin leg. **Additional visual observations by E.A. Beljaev: Khabarovskii Kra**i: 1♂, Imeni Lazo Raion, the upper left tributary of the Akhbio river, 47°00′60″N 136°27′56″E, 800 m a.s.l., 2.08.2007; 1♂, **Primorskii Krai:** 1♂, Chuguevskii Raion, 16 km SE of Yasnoe village, Ussuri river, 43°36′N 134°06′E, 09.07.2013; Khasanskii Rayon, Ryazanovka river, 17.vii.1997. **Moth web photographs:** Table 4. **Molecular samples:** Table 5.

Taxonomic notes. Evidently, Yoon (1991) was the first to synonymise *Brahmaea tancrei* and *Brahmaea magnificentia*, but it was widely overlooked because it was published in Korean. Here we support this synonymy. According to the original description, *Brahmaea jilinensis* is morphologically completely consistent with the specimens of *Brahmaea tancrei tancrei* from the Russian Far East and have to be considered its junior subjective synonym also.

In Zolotuhin (2016), the male genitalia on fig. 10: "*B. l. carpenteri* Butl., 1883, Korea (MWM 29321)", morphologically deviate greatly from the typical *Brahmaea tancrei tancrei* in having uncus wide and clearly biapical, valvae wide and with vestigial harpe (Fig. 16), that is similar to the characters of *Brahmaea certhia*. It is possible that this moth is a natural hybrid of these species.



FIGURES 1–4. Adults of *Brahmaea tancrei*. 1—*Brahmaea tancrei tancrei* in nature on the branch of spruce *Picea jezoensis* (Siebold & Zucc.) Carrière in Russia, Amurskaya Oblast, Tarmanchukan. The located in the Lesser Khingan mountain range, from the area of probable type locality of the taxon (photo by A.A. Kyzmin, Blagoveshchensk, Russia); 2—*Brahmaea tancrei tancrei*, Russia, Tarmanchukan (coll. of A.A. Kyzmin, Blagoveshchensk, Russia); 3—*Brahmaea tancrei tancrei*, Russia, Promorskii Krai, Vinogradovka (ZIN); 4—*Brahmaea tancrei diastemata*, China, Beijing (ZIN). a—moth, dorsal view; b—moth, ventral view; c—labels. On the figure 3b veins, discussed in the text, are designated. On the figures 3b and 4b, on the left forewing Rs veins are highlighted in red.

Distribution. Southeast of Russian Federation (extreme southeast of Amurskaya Oblast, Evreiskaya A.O., south of Khabarovskii Krai, Primorskii Krai), Northeastern China (east of Heilongjiang, east of Jilin, northeast of Liaoning), North Korea, South Korea (mountains) (Fig. 19).

The BOLD samples SARBB1309-09 and SARBB1310-09 from "Russia, Sakha-Yakutiya Republic, Inkagirskoje Pioskogorie" [evidently, Yukagirskoye Ploskogorye (Yukaghir Highlands), 66°25′0″N, 154°0′0″E] are undoubtedly mislabeled. The region is located on the Arctic Circle in the tundra and forest-tundra zones, where these moths cannot live. The sample SARBB943-09 from "Vietnam, Lai Chau" (originally determined as "*Brahmaea certhia*"), the samples LTOL202-07 (larva) and LTOL312-07 (pupa) from "China, Shanghai", and sample LTOL892-08 (larva) from "China" are clustered together with samples from Russia, North Korea and South Korea, and they must belong to *Brahmaea tancrei tancrei*. The region of origin of these samples is probably indicated incorrectly. The characters of moths of the sample SARBB943-09 from "Vietnam" also correspond well to those of *Brahmaea tancrei tancrei*.

Ecology and preimaginal stages. In Russia, the species develops in one generation per year. In nature, in Primorskii Krai moths occur from late May to beginning of August (original data), and on the Amur river—from mid-June to beginning of August (Dubatolov & Dolgikh 2007). Judging from the literature and internet data, in South Korea the species also develops in one generation (Yoon 1991), and moths fly at the similar period as in Primorskii Krai. In Russia, the species clearly prefers mesophilic coniferous-broadleaf valley and low mountain forests, but moths were occasionally found at altitudes of up to 800 m a.s.l. in the Sikhote-Alin ridge in the belt of boreal coniferous forests. The north-easternmost known location of *Brahmaea tancrei tancrei* (also the northernmost) is in the Kiselevka village (51°24′N 138°59′E) in Lover Amur, the north-westernmost location is in the vicinity of the Tarmanchukan station (49°14′N 130°48′E) in the Middle Amur area in the Lesser Khingan Mountains. Both localities are characterised by severe winters with average January temperatures below -25 °C and absolute minimums down to -45 °C … -50 °C. In South Korea it is a mountain species which occurs in the south of the country at altitudes above 400 m a.s.l. (based on the iNatiralist website data).

Larvae feed on *Fraxinus mandshurica* Rupr., *Fraxinus rhynchophylla* Hance and *Syringa amurensis* Rupr. (Graeser 1888; Kozlov 1985; Tschistjakov 1992), but in culture larvae prefer leaves of the last species (personal observation by the first author). In South Korea, feeding of larvae on *Ligustrum obtusifolium* Siebold & Zucc. was indicated (Yoon 1991; Lee 2015). Pupation occurs in plant litter on the soil without a cocoon under some cover (usually deadwood). Egg, larva and pupa are described in detail in literatures (Kozlov 1985; Owada 1987; Paukstadt & Ragus 1990; Yoon 1991; Lee 2015; Paukstadt & Paukstadt 2017b).

Brahmaea tancrei diastemata (Zhang & Yang, 1993), stat. nov.

(Figs 4, 10, 15)

Brachygnatha diastemata Zhang & Yang, 1993: 49 (Chinese), 50 (English), figs 1 (male genitalia), 2 (gnathos), 5 (moth dorsally), 6 (moth ventrally) [holotype]. T.l.: [China], Shaanxi, Taibaishan, Haoping. T.s.l.: Insect Collection of the Beijing Agricultural University.

Material examined. ZIN: China: 1♀, 100 km W of Beijing 6–8 VII 2006 V. Krivokhatsky | Taihang Mts., 1100 m Xiao Longmeng Nat. Forest Park [Beijing, Xiaolongmen, 39°57′N 115°29′E, V. Krivokhatsky leg.]. **Moth web photographs:** Table 6. **Molecular samples:** Table 7.

Distribution. China (Hebei, Beijing, Shanxi, Shaanxi, Sichuan; Chu & Wang (1977) indicated Zhejiang (Tianmushan) for "B*rahmaea ledereri*", Zhangn *et al.* (1999) also indicated Ningxia for "*Brachygnatha*"; the mention of "*Brahmaea ledereri*" from Shanghai by Conte (1911) may refer to *Brahmaea tancrei diastemata*, but it is unlikely that this specimen could have been collected directly in Shanghai) (Fig. 19).

Ecology and preimaginal stages. From the literatures and internet data, moths occur from end of April to mid-August, and possibly the subspecies develops in two generations per year. Mountain subspecies, observed on elevations from 800 up to 2750 m, mostly—900–1600 m a.s.l. The physical-geographical boundary separating the areas of *Brahmaea tancrei tancrei* and *Brahmaea tancrei diastemata* is the Liaohe Plain in Liaoning Province.

Data on the preimaginal stages are insufficient. Yang (1978) noted that larvae of "*Brahmaea undulata*" (=*Brahmaea tancrei diastemata*) were collected in Baihushan (Beijing) from the *Syringa oblata* Lindl. Zhu & Wang (1983) briefly described larva of "*Brahmaea christophi*" (=*Brahmaea tancrei diastemata*) from the same locality:

"The larvae are lighter in colour than the above species [*Brahmaea certhia*], almost white with light black spots, with bright red spots on the back of the third segment, and red spiracles; the larvae live scattered in shaded and moist places, and damage the genus *Fraxinus* L. in July and August. The pupa is black and thick, with two tubercles on the back of the chest, and pupates in mosses or under stones" (Zhu & Wang 1983: 414, in Chinese). This description corresponds to *Brahmaea tancrei*. However, description of larva of "*Brahmaea ledereri*" from Xitianmushan (Zhu & Wang 1983: 415) corresponds to *Brahmaea certhia*, whereas the photograph of the moth (Zhu & Wang 1983: fig. 2987) agrees with *Brahmaea tancrei diastemata*.

Brahmaea certhia (Fabricius, 1793)

(Figs 5–8, 11, 13, 17)

Bombyx certhia Fabricius, 1793: 412. T.l.: Island of Chusan [China, Zhejiang Province, Zhoushan Island], based on the image of moths in Petiver 1709: tab. 18, fig. 3 (moth). T.s.l.: Natural History Museum (London), but the specimen was not found (Butler 1880: 189).

Saturnia lunulata Bremer & Grey, 1853 (Bremer & Grey 1853a): 64, **stat. resurr.** T.l.: aux environs de Pekin [China, Beijing vicinity]. Junior subjective synonym of *Brahmaea certhia*. T.s.l.: Zoological Institute of the Russian Academy of Sciences. St. Petersburg, Russia. Holotype image: Ménétriès 1863: pl. 15, fig. 5 (moth, as *Brahmaea lunulata*). Holotype photograph: Zolotuhin 2016: [pl.] 2, fig. 4).

Saturnia undulata Bremer & Grey, 1853 (Bremer & Grey 1853b): 16, pl. 5, fig. 3 (moth) [holotype], **stat. resurr.** Unnecessary replacement name and junior objective synonym of *Saturnia lunulata*, junior subjective synonym of *Brahmaea certhia*.

Brahmaea petiveri Butler, 1866: p. 120, fig. 3 (moth) [reproduction of the Petiver's figure]. T.l.: Island of Chusan [China, Zhejiang, Zhoushan Island]. Junior objective synonym of *Brahmaea certhia*.

Brahmaea carpenteri Butler, 1883: 114, **stat. resurr.** T.l.: Corea, Chosan Harbour [South Korea, Busan Port]. Junior subjective synonym *Brahmaea certhia*. T.s.l.: Tatural History Museum, London. Holotype photograph: Zolotuhin 2016: [pl.] 2, fig. 3.

Brahmaea bicolor Matsumura, 1921: 935, pl. 64, fig. 1 (moth) [holotype], **stat. resurr.** T.l.: Formosa [Taiwan Island] [mainland China?]. Junior subjective synonym of *Brahmaea certhia*. T.s.l.: Entomological department of the Sapporo University, Japan. Holotype photograph: Zolotuhin 2016: [pl.] 2, fig. 5.

Brahmaea porphyria Chu & Wang, 1977: 83, 84, fig. 4 (moth) [not indicated holotype or paratype]. T.l.: China, Chekiang [Zhejiang], Tienmushan [Tianmushan]. Junior subjective synonym of *Brahmaea certhia*. T.s.l.: Insect Museum of Peking Institute of Zoology (Insect Collection of the Institute of Zoology), Academia Sinica. First synonymisation: Yang 1978: 426.

Brahmaea separata Yang & Zhang in Zhang & Yang, 1994 (1994a): 112, figs 1 (uncus), 2 (valva), 5 (moth dorsally), 6 (moth ventrally) [holotype], **syn. nov.** of *Brahmaea certhia*. T.l.: [China], Hubei, Wuchang. T.s.l.: Insect Collection of Beijing Agricultural University.

Brahmaea recta Yang & Zhang in Zhang & Yang, 1994 (1994a): 112, figs 3 (uncus), 4 (valva), 7 (moth dorsally), 8 (moth ventrally) [holotype], **syn. nov.** of *Brahmaea certhia*. T.l.: [China], Zhejiang, Xitianmushan [West Tianmu Mountain, Tianmushan]. T.s.l.: Insect Collection of Beijing Agricultural University.

Brahmaea goniata Zhang &Yang, 1994 (Zhang &Yang 1994b): 276, figs 1 (moth dorsally), 2 (moth ventrally), 3 (valva), 4 (uncus) [not indicated holotype or paratype], **syn. nov.** of *Brahmaea certhia*. T.l.: [China], Shaanxi, Zhenan. T.s.l.: Insect Collection of Beijing Agricultural University.

Material examined. ZIN: China: 1♂, Berg Paoschan b.[ei] Nanking, China sept. or. | Kollektsiya A.A. Bundelya [Jiangsu, Jurong, Baohua Mountain, 32°08′N 119°06′E, A.A. Bundel coll.]; 1♂, 39. | coll. O. John [China, locality unknown]. **North Korea:** 1♂, Pung Tung / 20.06.[18]84 Herz | Kol. Vel. Kn. Nikolaya Mikhaylovicha [? Nung-dong, 38°23′N 127°38′E, ~ 4 km SE of Kimhwa-up, 38°25′N 127°36′E, Grand Duke Nikolai Mikhailovich coll.]. **Moth web photographs:** Table 8. **Molecular samples:** Table 9.

Taxonomic notes. *Brahmaea separata* and *Brahmaea recta* are described based on the single specimens, slightly deviating from the typical moths of *Brahmaea certhia* in the wing pattern. But they have all the key diagnostic characters of the species both in external features and in the structure of the male genitalia. *Brahmaea goniata*, judging by the description and illustrations, is a typical *Brahmaea certhia*. Therefore, we synonymise *Brahmaea separata*, *Brahmaea recta* and *Brahmaea goniata* with *Brahmaea certhia*.

For *Brahmaea bicolor* Matsumura, 1921, the type locality was originally indicated as "Formosa" with remarks that "exact habitat being not well known" (Matsumura 1921: 936). However, there is no other data on the *Brahmaea certhia* from Taiwan Island. Zolotuhin (2016) proposed "Korea" as a type locality for the Matsumura's taxon, but here are no reasons for this decision. The holotype has on the forewing a rather deep notch of postmedial pocket of bands between the veins CuA2–1A+2A, which is typical for moths from continental China, but in moths from South

Korea this notch is noticeably less deep. It is possible that the type specimen could have been brought to Taiwan from China by a ship with goods, since similar modern introduction of *Brahmaea certhia* to South Korea probably from China is known (Kang *et al*. 2019).

Distribution. China (south of Liaoning, Hebei, Beijing, Shandong, Shaanxi, Jiangsu, Hubei, Anhui, Zhejiang, Shanghai, Yunnan; Leech (1898) and Mell (1930) reported this species from northwest Jiangxi, from "Kiukiang" (Jiujiang) and "Kuling" (Guling) respectively; Yang (1978) indicated also Henan), south of North Korea, South Korea (except Ulleungdo and Jeju) (Fig. 19).

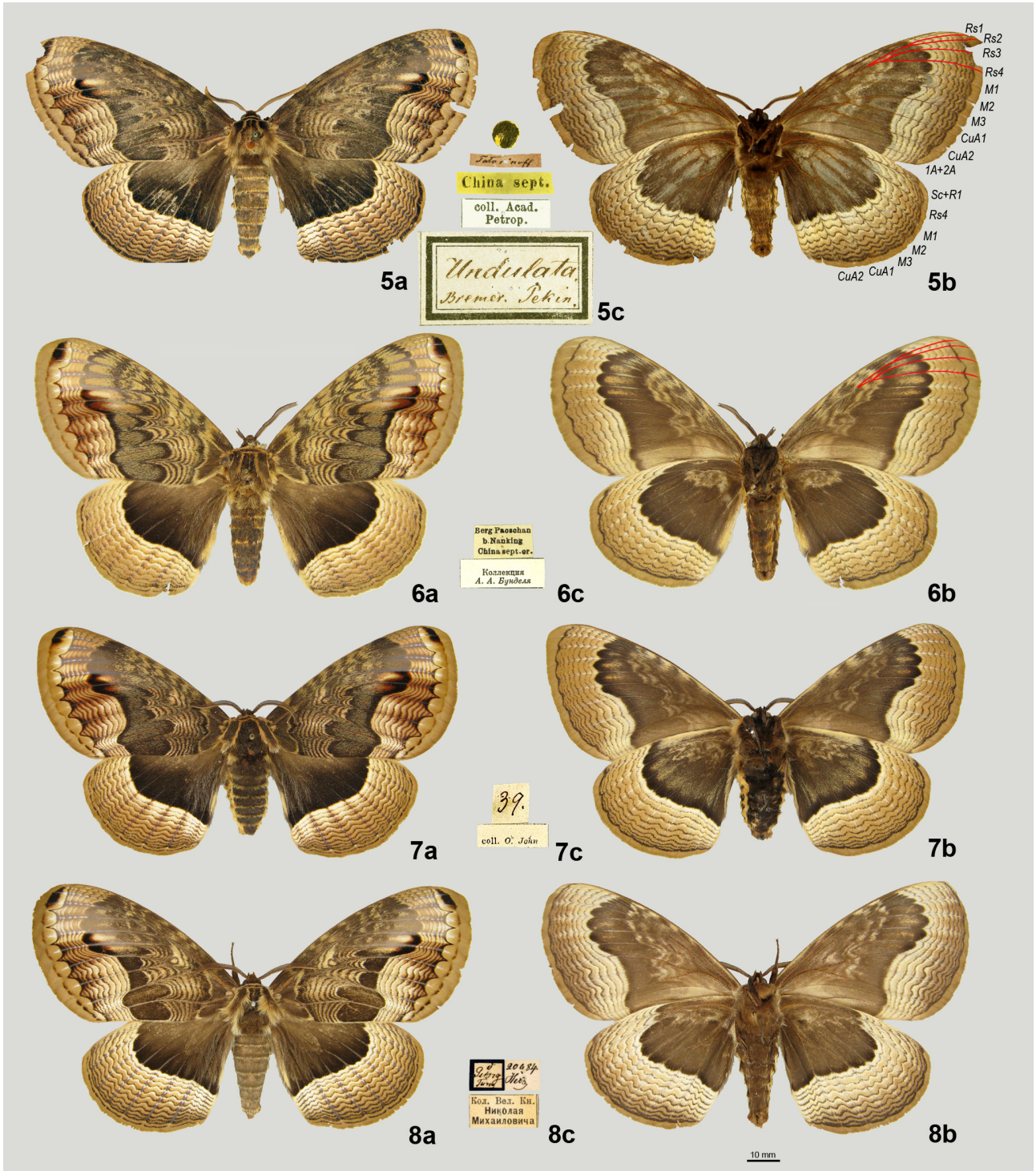
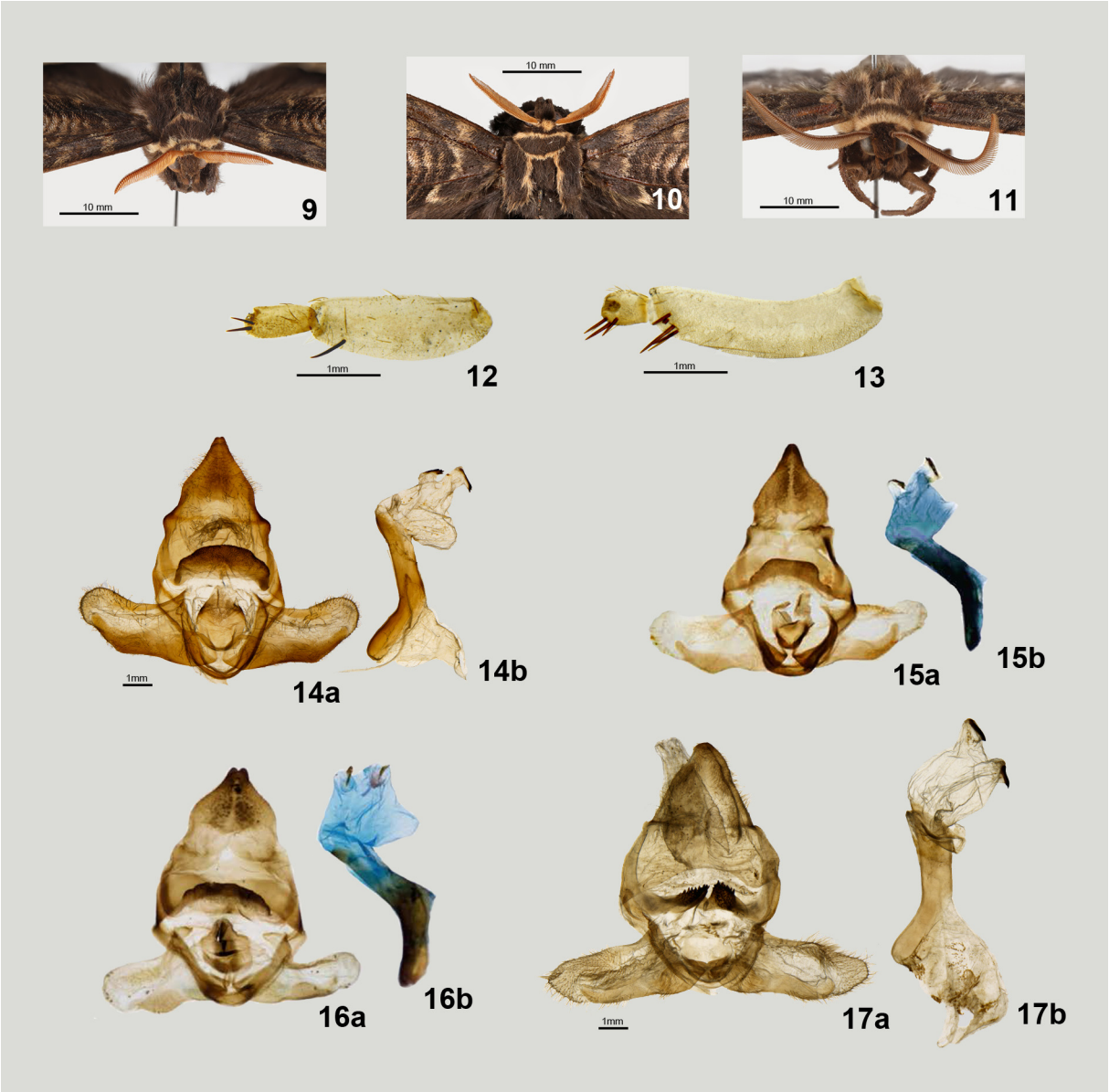


FIGURE 5–8. Adults of *Brahmaea certhia*. 5—*Saturnia lunulata* Bremer & Grey, 1853, holotype, China, Beijing (ZIN); 6—China, Nanking (ZIN); 7—«39» [China] (ZIN); 8—North Korea, «Pung Tung» (ZIN). a—moth, dorsal view; b—moth, ventral view; c—labels. On the figure 5b veins, discussed in the text, are designated. On the figures 5b and 6b, on the left forewing Rs veins are highlighted in red.

Ecology and preimaginal stages. From the literatures and internet data, in China the moths were recorded from mid-March to early September, which is consistent with Mell's (1930) reports of 2–3 generations of *Brahmaea certhia* in Shanghai (citing a written communication from Höne). In South Korea, moths were recorded from late May to late August, and the species develops in two generations (Yoon 1991). Based on the iNatiralist website data, the species occurs from plains to mid-mountains mostly up to 400–500 m a.s.l., in China on the south of its area up to 800 m a.s.l. in Ningbo (iNatiralist observation 18707388) and at 1500 and 2400 m s.a.l. in Yunnan (BOLD sequences ID SARBB937-09 and SARBB1306-09). Mell (1930) reported this species from "Kuling [Guling], 1200 m" (northwest Jiangxi). The northern border of *Brahmaea certhia* distribution is located near the line Beijing—Liaodong—Pyongyang—Wonsan, which runs approximately along 39°–40° north latitude. These areas are characterised by moderately cold winters with average January temperatures of -3 °C … -5 °C and absolute minimums of not lower than -20 °C … -25 °C.



FIGURES 9–17. *Brahmaea tancrei* and *Brahmaea certhia*, morphological structures. 9–11—head; 12, 13—labial palpus, second and third segments, lateral view; 14–17—male genitalia. 9, 12, 14—*Brahmaea tancrei tancrei*: 9—Russia, Promorskii Krai, Uglovaya (ZIN); 12, 14—Russia, Primorskii Krai, Novopokrovka (ZIN). 10, 15—*Brahmaea tancrei diastemata*: 10—China, Beijing (ZIN), 15—«*B. l. lunulata* Brem. et Grey, [1853], China: Beijing (MWM 29324) (after Zolotuhin 2016, fig. 7). 11, 13, 17—*Brahmaea certhia*: 11—*Saturnia lunulata* Bremer & Grey, 1853, holotype, China, Beijing (ZIN); 13, 17—«39» [China] (ZIN). 16—«*B. l. carpenteri* Butl., 1883, Korea (MWM 29321)» (after Zolotuhin 2016, fig. 7)—possible hybrid *Brahmaea tancrei tancrei* x *Brahmaea certhia*.

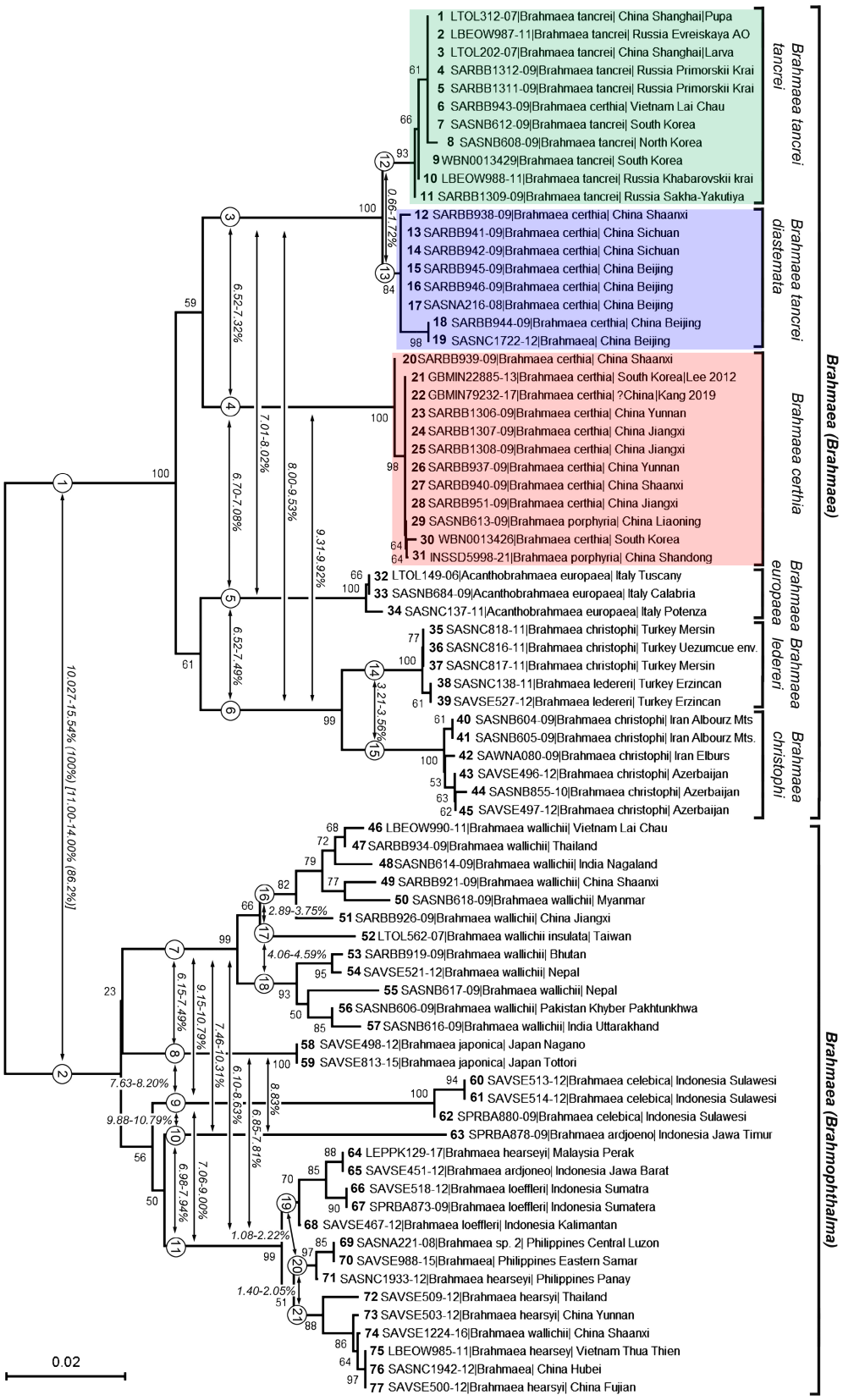


FIGURE 18. Neighbor-joining optimal tree of species from the genus *Brahmaea* based on sequences of COI 5'region (built with MEGA 11; Kimura 2-parameter model; bootstrap value, 1000 replications). Numerals in circles on branches are numbers of nodes discussed in the text. Numbers in bold at the top of terminal clades correspond to numbers of samples in the Tables 5, 7, 9 and 10. Arrows with percentage indicators are p-distances between the nodes. Coloured fields mark the taxa of *Brahmaea certhia* species group.

FIGURE 19. Distribution of taxa of *Brahmaea certhia* species group. Red circles—collection localities of *Brahmaea certhia*, green circles—collection localities of *Brahmaea tancrei tancrei*, blue circles—collection localities of *Brahmaea tancrei diastemata*. Circles with a yellow center are the collection sites of BOLD samples which have precise location data. White circles with numbers indicate the type localities: 1—*Bombyx certhia* Fabricius, 1793, and *Brahmaea petiveri* Butler, 1866; 2—*Saturnia lunulata* Bremer & Grey, 1853; 3—*Brahmaea carpenteri* Butler, 1883; 4—*Brahmaea lunulata* var. *tancrei* Austaut, 1896; 5—*Brahmaea bicolor* Matsumura, 1921; 6—*Brahmaea magnificentia* Bryk, 1949; 7—*Brahmaea porphyria* Chu & Wang, 1977; 8—*Brahmaea jilinensis* Zhang, 1988; 9—*Brachygnatha diastemata* Zhang & Yang, 1993; 10—*Brahmaea separata* Yang & Zhang, 1994; 11—*Brahmaea recta* Yang & Zhang, 1994; 12—*Brahmaea goniata* Zhang &Yang, 1994.

Egg, larva and pupa are described in detail in literatures (Mell 1930; Owada 1987; Heo 2012; Paukstadt & Paukstadt 2017a; Wu 2017). In China larvae feed on *Ligustrum japonicum* Thunb., "*Ligustrum ibota amurense* Carr." (=*Ligustrum obtusifolium* Siebold & Zucc.) (Mell 1930), *Ligustrum lucidum* W. T. Aiton and *Ligustrum quihoui* Carrière (Wu 2017), in South Korea on *Ligustrum obtusifolium* Siebold & Zucc., *Syringa oblata* subsp. *dilatata* (Nakai) P.S. Green & M.C. Chang, *Forsythia koreana* Nakai and *Fraxinus rhynchophylla* Hance (Yoon 1991; Heo 2012). Yoon (1991) noted that after eating all the leaves on the typical host plants, the larvae then ate leaves on the shrubs of *Euonymus japonicus* Thunb., growing around them.

Conclusion

Based on the morphology and analysis of barcoding fragment of COI gene, we recognise three taxa in the *Brahmaea certhia* species group: two species—*Brahmaea certhia*, and *Brahmaea tancrei*, and in the last species two subspecies—*Brahmaea tancrei tancrei* and *Brahmaea tancrei diastemata*. Contrary to the previous opinion (Zolotuhin 2016), these taxa clearly differ not only in the genital structures, but also in external morphological features. Correct identification of the moth generally does not cause difficulties and is possible even from a single forewing or hindwing. As a result, many identifications of the moth photographs on websites were corrected in this paper.

Identification and reidentification of about 350 moths, including barcoded specimens and other web photographs accompanied by the localisation and date, allowed us to estimate the variability of external morphology in *Brahmaea certhia* species group and to clarify the characters for delimitation of the taxa and their distribution. Reliable association of the nomenclatural types of taxa with other specimens, included barcoded ones, necessitated a revision of synonymy in the *Brahmaea certhia* species group as follows: *Saturnia lunulata* Bremer & Grey, 1853, *Saturnia undulata* Bremer & Grey, 1853, *Brahmaea carpenteri* Butler, 1883 and *Brahmaea bicolor* Matsumura, 1921 are re-established as junior subjective synonyms of *Brahmaea certhia* (Fabricius, 1793), **status resurrected**; *Brahmaea separata* Yang & Zhang, 1994, *Brahmaea recta* Yang & Zhang, 1994, and *Brahmaea goniata* Zhang &Yang, 1994 are designated junior subjective synonyms of *Brahmaea certhia* (Fabricius, 1793), **new synonymy**; *Brahmaea lunulata tancrei* Austaut, 1896 is removed from synonymy under *Brahmaea carpenteri* Butler, 1883, and re-elevated to species rank: *Brahmaea tancrei* Austaut, 1896, **status resurrected**; *Brahmaea magnificentia* Bryk, 1949 and *Brahmaea jilinensis* Zhang, 1988, are designated as junior subjective synonyms of *Brahmaea tancrei tancrei* Austaut, 1896, **new synonymy**; *Brachyghatha diastemata* Zhang & Yang, 1993 is assigned to *Brahmaea tancrei* in subspecies rank: *Brahmaea tancrei diastemata* (Zhang & Yang, 1993), **new status**.

Ecologically, *Brahmaea certhia* and *Brahmaea tancrei* have a similar preference for mixed and broadleaf woodland landscapes and similar larval host plants, all of which belong to the family Oleaceae. However, they highly differ in their climatic preferences. *Brahmaea certhia* is not distributed north of 40° north latitude. It inhabits lowlands and low mountains in northern subtropics and most southern zone of temperate belt with average January temperatures not lower than -5 °C. The area of *Brahmaea tancrei tancrei* reaches 51° north latitude. The subspecies inhabits territories, where average January temperatures can reach -25 °C and below, and in the south of its area it lives in mountains. Another subspecies, *Brahmaea tancrei diastemata*, has general range similar to that of *Brahmaea certhia* in China, but prefers high mountain habitats above 800 m a.s.l. Thus, although the general ranges of *Brahmaea certhia* and *Brahmaea tancrei* overlap on the Korean Peninsula and in China, they prefer different altitudinal zones.

Based on the molecular-phylogenetic study of COI barcoding fragment of all available species of the genus *Brahmaea*, we confirm its subdivision into two subgenera—*Brahmaea* (*Brahmaea*) and *Brahmaea* (*Brahmophthalma*), although the latter likely deserves the generic rank. In the genus, p-distances between 'good' species are in the range of about 7–8%, and between closely related species they are about 3–4%. Genetic distances from 0.7% to 2% likely to be treated as subspecific. Surprisingly, *Brahmaea certhia* is highly homogeneous genetically through its area (based on mtCOI fragment), having 0% p-distance between almost all Chinese and Korean examined moths. Under the name *Brahmaea wallichii*, possibly, several 'cryptic' species are hidden, since intraspecific p-distances between the moths from different regions reach values from 2.9 to 4.6% (rounded).

In the subgenus *Brahmaea* (*Brahmaea*), we support current status of the names *Acanthobrahmaea* Sauter, 1967 (type species *Brahmaea europaea* Hartig, 1963), *Brachygnatha* Zhang & Yang, 1993 (type species *Brachygnatha*

diastemata Zhang & Yang, 1993) and *Transbrahmaea* Zolotuhin, 2016 (type species *Brahmaea christophi* Staudinger, 1879) as synonyms of *Brahmaea (Brahmaea)* Walker, 1855. The interpretation of *Brahmaea certhia* species group as a probable sister pair of species is also lacks robust genetic support. However, we retain it as a non-taxonomical convenient tool for indication of the geographic group of species.

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TABLE 1. Annotated list of references on the *Brahmaea certhia* species group in order of the date of publication.

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Fabricius 1793:	p. 412: *Bombyx certhia* [sp. n.] (China: "Island of Chusan")		
Bremer & Grey 1853a:	p. 64: *Saturnia lunulata* [sp. n.] (China: "Pekin")		
Bremer & Grey 1853b:	p. 16, pl. 5, fig. 3: *Saturnia undulata* [nom. n.] (China: "Pekin")		
Ménétriès 1859:		pp. 7, 55: *Brahmaea lunulata* (Russia: "à l'emouchure de l'Oussouri" [Khabarovskii Krai: the mouth of the Ussuri River])	
Ménétriès 1863:	pl. 15, fig. 5: *Brahmaea lunulata*		
Butler 1866a:	p. 120, fig. 3: *Brahmaea petiveri* sp. n. (China: "Island of Chusan")		
Butler 1866b:	p. 458: *Brahmaea petiveri*, [syn. n.] of *Brahmaea lunulata.*		
Staudinger & Wocke 1871:	p. 70: *Saturnia lunulata* (part.: reference of the original description)	p. 70: *Saturnia lunulata* (part., "Amur", reference of Ménétriès 1859).	
Staudinger 1878/1879:		p. 359: *Brahmaea lunulata* (Russia: "Amur")	
Butler 1880:	p. 188: *Brahmaea lunulata* [syn. n.] of *Brahmaea certhia*		
Butler 1883:	p. 114: *Brahmaea carpenteri* sp. n. (South Korea: "Chosan, Harbour" [Busan Port])		
Fixsen 1887:	p. 345: *Brahmaea lunulata* (North Korea: "Pung-Tung") [? Nŭng-dong, 38°23′N 127°38′E, ~ 4 km SE of Kimhwa-up, 38°25′N 127°36′E]		
Graeser 1888:		p. 135: *Brahmaea lunulata* (Russia: "Chabarowka", "Wladiwostok"	
Leech 1889:	p. 635: *Brahmaea certhia* [no original data].		
Kirby 1892:	p. 723: *Brahmaea certhia* (=*Saturnia lunulata*, *Saturnia undulata*, *Brahmaea petiveri*) (North China); *Brahmaea carpenteri* (Korea)		
Staudinger 1892:		p. 325: *Brahmaea lunulata* (Russia: "Amur", "Blagoweschtschensk", "Raddefka", "Chabarowka", "Bikin", "Wladiwostok")	

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Austaut 1896:		p. 98: *Brahmaea lunulata* var. *tancrei* var.n. (Russia: "qu'arrose le fleuve Amour" [? Radde])	
Leech 1898:	p. 269: *Brahmaea certhia* (part.: Korea; Northern and Central China, "Kiukiang" [Jiangxi: Jiujiang])	p. 269: *Brahmaea certhia*, (part.: Russia: "Amurland")	
Staudinger & Rebel 1901:	p. 128: *Brahmaea certhia* (part.: Korea, China)	p. 128: *Brahmaea certhia* (part.: "Amur", "Ussuri")	
Seitz 1911:	p. 227: *Brahmaea certhia* F. (= *undidata* Brem. & Grey, *petiveri* Butl.) (part.: North and Central China) [fig. 35c: *certhia* apparently depicts a female of *Brahmaea ledereri*]; p. 227: [ab.?] *lunulata*: "such as may occur everywhere among typical specimens"	p. 227: *Brahmaea certhia* (part.: Russia: "Amurland»); p. 227: *Brahmaea certhia carpenteri* [?]: "is the often somewhat smaller form from Corea, which is not sharply separated")	
Conte 1911:	p. 81, pl. 14, fig. 1: *Brahmaea certhia* (China, Korea: "Nord de la Chine, Corée, île de Chusan"); *Brahmaea carpenteri* [syn. n.]		p. 81: *Brahmaea ledereri* [?] (part.: China: "Shang-Haï" [Shanghai])
Strand 1913:	p. 3: *Brahmaea certhia* (part.: China: "Chusan"; South Korea: "v. *Carpenteri* Butl. 1883")	p. 3: *Brahmaea certhia* v. *tancréi* (Russia: "Amur")	p. 4: *Brahmaea ledereri* [?] (part.: China: Shanghai)
Matsumura 1921:	934 (Japanese), 935 (English), pl. 64, fig. 1: *Brahmaea bicolor* sp. n. ("Taiwan" [continental China?])		
Moltrecht 1929:		p. 35: *Brahmaea certhia lunulata* (Russia: "Ussuri region")	
Mell 1930:	337, 342, 344, 346, 349, figs 6, 7 (pupa), 8 (wing venation, male), 28 (valva and uncus): *Brahmae*a certhia (China: Shanghai, Kuling, Mokanshan) p. 350: =*Saturnia lunulata*, *Saturnia undulata*, *Brahmaea petiveri*, *Brahmaea carpenteri*	pp. 350, 353: *Brahmaea certhia* tancrei— "geographische Rasse der Art" [geographical race of the species] (Russia: "Amurgebiet", "Ussuri", "Wladiwostok", "Chili" [China, Jilin City])	
Kurentsov 1939:		p. 162: *Brahmaea certhia lunulata* (Russia: south of Far East)	
Bryk 1949:	pp. 22, 23: *Brahmaea certhia* (Korea: "Pung-Tung", "Fusan" [Busan]; China: Shanghai)	p. 22: *Brahmaea magnificentia* sp. n. ("Nordkorea, Shuotsu" [North Korea: Kyŏngsŏng])	p. 26: *Brahmaea ledereri*, Conte (1911) (China: Shanghai) ?= *Brahmaea magnificentia*

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Kurentsov 1965:		p. 23, fig. 10: *Brahmaea certhia lunulata* (Russia: south of Far East)	
Chu & Wang 1977:	pp. 83 (Chinese), 84 (English), fig. 4 (moth): *Brahmaea porphyria* sp. n. (China: Zhejiang, Jiangxi, Shanghai, Jiangsu: Wuxi)	p. 83, fig. 1 (moth): *Brahmaea certhia* (China: Heilongjiang: Yichun, Dailing)	p. 83, fig. 2 (moth): *Brahmaea christophi* (China: Beijing: Baihuashan); 83, fig. 3: *Brahmaea ledereri*: (China: Zhejiang: Tianmushan)
Yang 1978:	p. 426, text fig. 71 (wing venation), pl. 28, fig. 2 (moth): *Brahmaea certhia* (China: Beijing, Henan, Jiangsu, Zhejiang, Shandong, Hubei, Jiangxi, Anhui); = *Brahmaea petiveri*, *Brahmaea porphyria* syn. n.		p. 427, pl. 28, fig. 1 (moth): *Brahmaea undulata* (China: Beijing)
Nässig 1980:	p. 89: *Brahmaea certhia* (part.: China); fig. 3 (moth): *Brahmaea certhia* (China: Schanghai)	p. 89: *Brahmaea certhia* (part.: "Amurgebiet")	
Gromyko 1982:		p. 180: *Brahmaea certhia lunalata* [*sic*!] (Russia: Primorskii Krai: Sikhote-Alinskii Narure Reserve)	
Zhu & Wang 1983:	p. 415, fig. 2988: *Brahmaea porphyria* (China: Zhejiang, Jiangxi)	p. 414, fig. 2986: *Brahmaea certhia* (China: Heilongjiang: Yichun, Dailing)	p. 414, fig. 2985: *Brahmaea christophi* (China: Beijing: Baihuashan); p. 415, fig. 2987: *Brahmaea ledereri* (Xitianmushan, Zhejiang)
Shchetkin 1984:		p. 280–281, fig. (distributional map): *Brahmaea certia* [the applied figure of moths is a copy of the figure of "*Brahmaea certhia*" (=? *Brahmaea ledereri*) in Seitz 1911: pl. 35: c; the distributional map is partially incorrect]	
Kozlov 1985:		p. 106, figs. 2 (male and female genitalia), 3–5 (egg, larvae, pupa): *Brahmaea certhia* (Russia: S Primorskii Krai)	
Kuznetzov & Stekolnikov 1985:		p. 21, fig. 9b: *Brahmaea certhia lunulata* (Russia: S Primorskii Krai: Gornotaezhnoe)	

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Yoon 1985:	p. 36: *Brahmaea certhia* (South Korea, Seoul vicinity, short description of larva)	p. 37: "it corresponds to *magnificentia* in Bryk (1949) and *certha*(!) in the Atlas of Moths of the Chinese Academy of Sciences (1983), but it has many similar features to *christophi*" (in Korean) (South Korea, Gangwon-do, Mt. Seorak, short description of larva)	
Owada 1987:	p. 121, pl. 51, figs. 11–14 (eggs, larvae): *Brahmaea certhia* (South Korea, Seoul vicinity; distributed from southern China to the Korean peninsula, and in Korea, this species lives in the plains and low mountains; the larvae seem to eat any plant in the Oleaceae family, including *Forsythia*) (in Japanese)	p. 121, pl. 51, figs. 8–10: *Brahmaea tancrei* (South Korea, Mt. Seoraksan; distributed in mountainous areas in Korea, central and northern China, and southern Primorskii Krai; the scientific name that should be applied to this species is still under discussion) (in Japanese)	
Sugi 1987:	p. 279: *Brahmaea certhia* (South Korea)	p. 279: *Brahmaea tancrei*, "the name may be valid, but the application is tentative" (South Korea)	
Zhang 1988:		pp. 229 (Chinese), 230 (English), figs 1 (moth), 2–5 (male genit.): *Brahmaea jilinneus* sp. n. (China: Jilin: Huinan)	
Nässig & Paukstadt 1990:	p. 120: *Brahmaea certhia*.	p. 120: *Brahmaea tancrei*, "*sensu* Sugi *et al*., 1987".	
Paukstadt & Ragus 1990:	pp. 1–30, figs 1 (distributional map), 16, 17 (moth): *Brahmaea certhia* (China)	pp. 1–30, figs 1 (distributional map), 2–8 (larvae), 9–11 (pupa), 12–15 (moths), 18–27 (aberrant moths), 28–29 (male genitalia): *Brahmaea tancrei* (South Korea)	
Yoon 1991:	pp. 29–40, fig. 3 (left) (larva): *Brahmaea certhia*	p. 29–40 fig. 2, 3 (right) (larvae): *Brahmaea tancrei* (=*Brahmaea magnificentia*)	
Tschistjakov, 1992:		p. 139: *Brahmaea tancrei* (Russia: Amurskaya Oblast: Kundur)	

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Zhang & Yang 1993:	p. 42, figs 3 (male genitalia), 4 (gnathos): *Brahmaea* [*certhia*]	p. 50: *Brachyghatha jilinensis* comb. n.	pp. 48 (Chinese), 51 (English), figs 1 (male genit.), 2 (gnathos), 5–6 (moth): *Brachyghatha diastemata* sp. n. (China: Shaanxi: Taibaishan: Haoping Temple)
Bidzilya & Klyuchko 1994:		p. 27: *Brahmaea tancrei* (Russia, Lazovskii Natire Reserve)	
Zhang & Yang 1994a:	p. 111, figs 1 (uncus), 2 (valva), 5, 6 (moth): *Brahmaea separata* sp. n. (China: Hubei: Wuchang); p. 111, fig. 3 (uncus), 4 (valva), 7, 8 (moth): *Brahmaea recta* sp. n. (China: Zhejiang: Xitianmushan)		
Zhang & Yang 1994b:	pp. 275 (Chinese), 277 (English), figs. 1, 2 (moth), 3 (valva), 4 (uncus): *Brahmaea goniata* sp. n. (China: Shaanxi: Zhenan; Henan: Lingba; Zhejiang, Xitianmushan).		
Nässig 1994:	p. 356: *Brahmaea certhia* ("this species is known from southern China")		
Peters 1998:		p. 173, fig. 1 (moth): *Brahmaea tancrei* (Russia: "Amurland")	
Park *et al*. 1999:	p. 175, + fig. of the male genitalia; pl. 14, fig. 94: *Brahmaea certhia* (North Korea and South Korea)	p. 177, + fig. of the male genitalia; pl. 15, fig. 95: *Brahmaea tancrei* (North Korea and South Korea)	
Zhang *et al*. 1999:	p. 38: *Brahmaea certhia*, *Brahmaea porphyria*, *Brahmaea separata*, *Brahmaea recta*, *Brahmaea goniata*; fig. 1A, wing venation: *Brahmaea* [the figure is redrawn from Mell 1930: fig. 8, *Brahmaea certhia*]; fig. 1A, gnathos: *Brahmaea* [*certhia*] [from Zhang & Yang, 1993: fig. 4] fig. 1A, valva: *Brahmaea* [*recta*] [from Yang & Zhang, 1994a: fig. 4]; fig. 2A, moth *Brahmaea* [*separata*] [from Yang & Zhang, 1994a: figs 7, 8]	p. 38: *Brachyghatha jilinneus*; fig. 1B, valva: *Brachyghatha* [*Brahmaea tancrei*]	p. 38: *Brachyghatha diastemata*; fig. 1B, wing venation: *Brachyghatha* [*diastemata*; the figure is redrawn from Mell 1930: fig. 10, *Brahmaea ledereri*, fork Rs1–Rs2 shortened]; fig. 1B, gnathos: *Brachyghatha* [*diastemata*, from Zhang & Yang, 1993: fig. 2]; fig. 2B, moth: *Brachyghatha* [*diastemata*, from Zhang & Yang, 1993: figs 5, 6]

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Tschistjakov 1999:		p. 631, figs. 372,*1* (male genitalia), 372,*2* (male genitalia), 372,*3* (female genitalia), 373,*1* (moth): *Brahmaea tancrei* (Russia: south of RFE)	
Ignatenko 2000:		p. 88: *Brahmaea tancrei* (Russia: Amurskaya Oblast: Kundur)	
Naumann 2000:			cover illustration: *Brahmaea* cf. *certhia* (China)
Park *et al*. 2001:	p. 177, pl. 3, fig. 1 (moth): *Brahmaea certhia* (North Korea: Mt. Kumgang-san [the image is same as in Park *et al*. 2001: pl. 14, fig. 94])	p. 177, pl. 2, fig. 17 (moth): *Brahmaea tancrei* (North Korea: Mt. Kumgang-san)	
Kuznetzov & Stekolnikov 2001:		p. 364, fig. 131b: *Brahmaea tancrei* (Russia: Primorskii Krai).	
Dubatolov & Dolgikh 2007:		p. 113: *Brahmaea tancrei* (Russia: Khabarovskii Krai: Nature Reserve Bolshekhekhtsyrskii, Kazakevichevo, Bychykha)	
Zolotuhin 2008:		pp. 230, 340: *Brahmaea tancrei* (Russia: south of Far East)	
Dubatolov 2009:		p. 234*: Brahmaea tancrei* (Russia: Khabarovskii Krai: Lidoga, Innokentyevka, Kiserlevka, Malyzhma)	
Tschistjakov 2009:		p. 27: *Brahmaea tancrei* (Russia, Lazovskii Natire Reserve)	
Dubatolov & Dolgikh 2011:		p. 190: *Brahmaea tancrei* (Russia: Khabarovskii Krai: Nature Reserve Bolshekhekhtsyrskii)	
Lee *et al*. 2011:		p. 182: *Brahmaea tancrei* (South Korea: Gangwon-do)	
Heo 2012:	p. 281 (moths, larvae): *Brahmaea certhia* (Korea: Seoul)		
Averin *et al.* 2012:		p. 127: *Brahmaea tancrei* (Russia: Evreiskaya A.O.: Nature Reserve Bastak)	

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Lee 2015:		p. 141: *Brahmaea tancrei* (moth, larva) (South Korea: Gangwon).	
Zolotuhin 2016:	p. 7, figs 5, 6 (male genitalia), [pl.] 2, fig. 9 (moth): *Brahmaea certhia*; p. 7, [pl.] 2, fig. 1: *Brahmaea petiveri*; p. 7, [pl.] 2, fig. 4 (holotype): *Saturnia lunulata*; p. 7, [pl.] 2, fig. 2: *Saturnia undulata*; p. 7, [pl.] 2, fig. 3 (holotype): *Brahmaea carpenteri*; p. 7, [pl.] 2, fig. 5 (holotype): *Brahmaea bicolor*; [pl.] 2, fig. 6 (holotype): *Brahmaea magnificentia*; p. 7: *Brahmaea porphyria*, "syn. n."	p. 7: *Brahmaea lunulata* var. *tancrei*; p. 7, [pl.] 2, fig. 6 (holotype): *Brahmaea magnificentia*; p. 7, figs 1–3 (fore wings), 9, 10 (male genitalia): *Brahmaea lunulata carpenteri*	p. 7, figs 7, 8 (male genitalia), [pl.] 2, fig. 7, 8 (moths): *Brahmaea lunulata lunulata* (Eastern China, Shaanxi, Sichuan)
Paukstadt & Paukstadt 2017a:	pp. 49–69, figs. 1–2 (eggs), 3–43 (larvae), 44–50 (pupae): *Brahmaea certhia* (China: Jiangsu)		
Paukstadt & Paukstadt 2017b:		pp. 74–88, figs. 1–2 (eggs), 3–21 (larvae): *Brahmaea tancrei* (Russia: "?Sacha")	
Wu 2017:	pp. 273–275 (moths, pupae, larvae): *Brahmaea porphyria* (southwest, east and central provinces of China)		
Lee 2018:	p. 85: 1946. *Brahmaea certhia* (South Korea, Baeknyeong Island, Daecheong Island)		
Zolotuhin 2019:		pp. 284, 388: *Brahmaea lunulata carpenteri* (Russia: south of Far East)	
Sinev 2019:		cover illustration: *Brahmaea lunulata* (Russia: Primorskii Krai)	
Dubatolov 2020:		p. 497: *Brahmaea lunulata* (Russia: Khabarovskii Krai: Lidoga, Bogbasu, Nilo)	
Paukstadt & Aussem 2021:	p. 655, figs 1–2 (moth): *Brahmaea certhia* (China: Jiangsu)		

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TABLE 1. (Continued)

Reference	*Brahmaea certhia*	*Brahmaea tancrei tancrei*	*Brahmaea tancrei diastemata*
Paukstadt & Paukstadt 2021b:	pp. 257, 258, 260, 262: *Brahmaea certhia*, *Brahmaea lunulata* [part.: name-bearing type], *Brahmaea lunulata carpenteri* [part.: name-bearing type], *Brahmaea goniata*, *Brahmaea recta*, *Brahmaea separata*; p. 280, 281, 284: ‡P*halena maxima*; p. 285, 286: *Brahmaea petiveri*; p. 291, 292: *Brahmaea porphyria*; map 1 [type localities of the taxa enumerated above]	map 1 [type localities of *Brahmaea tancrei* and *Brahmaea magnificentia*, as synonyms of *Brahmaea lunulata carpenteri*]; *Brahmaea jilinensis.*	map 1 [type localities of *Brahmaea diastemata*, as synonym of *Brahmaea lunulata*].
Paukstadt & Paukstadt 2021c:	pp. 301, 303: *Brahmaea lunulata* [part.: name-bearing type]; p. 315, 317: *Brahmaea undulata*; p. 324, 325: *Brahmaea lunulata carpenteri* [part.: name-bearing type]; p. 337, 338: *Brahmaea bicolor* [as synonym of *Brahmaea lunulata carpenteri*]; p. 342, 343: *Brahmaea goniata*; p. 344, 345: *Brahmaea recta*; p. 346: *Brahmaea separata*	pp. 324, 325: *Brahmaea lunulata carpenteri* [=*Brahmaea tancrei tancrei*, *Brahmaea magnificentia*]; p. 330, 331: *Brahmaea tancrei* [as synonym of *Brahmaea lunulata carpenteri*]; p. 339, 340: *Brahmaea magnificentia* [as synonym of *Brahmaea lunulata carpenteri*]; p. 340, 341: *Brahmaea jilinensis*	pp. 322, 323: *Brahmaea diastemata* [as synonym of *Brahmaea lunulata*]
Paukstadt & Paukstadt 2021e:	p. 663: *Brahmaea certhia, Brahmaea lunulata* [part.: name-bearing type], *Brahmaea lunulata carpenteri* [part.: name-bearing type], *Brahmaea goniata*; *Brahmaea recta*; *Brahmaea separata*	p. 663: *Brahmaea lunulata carpenteri* [=*Brahmaea tancrei*, *Brahmaea magnificentia*]; *Brahmaea jilinensis*]	p. 663: *Brahmaea lunulata* [part.: =*Brahmaea diastemata*]
Paukstadt & Weritz 2021a:	p. 638, figs 1–3 (moths): *Brahmaea certhia* (North China)	p. 638, figs 4–6 (moths): *Brahmaea lunulata carpenteri* (Russia: “E Siberia”)	
Paukstadt & Paukstadt 2022:	p. 75–76: *Brahmaea certhia*, *Brahmaea lunulata* [part.: name-bearing type], *Brahmaea lunulata carpenteri* [part.: name-bearing type], *Brahmaea goniata*; *Brahmaea recta*, *Brahmaea separata.*	p. 75: *Brahmaea lunulata carpenteri* [=*Brahmaea tancrei*, *Brahmaea magnificentia*]; *Brahmaea jilinensis*	p. 75: *Brahmaea lunulata* [part.: =*Brahmaea diastemata*]
Höge & Renner 2023:	p. 1, pl. 5 (moths): *Brahmaea certhia* (China: Jiangsu: Zhangjiagang); pl. 6: *Brahmaea certhia* (aberrations)	p. 1, pl. 1: *Brahmaea tancrei* (“Mischung Süd Korea und Russland Far East” [mixture of South Korea and Russia Far East]), pl. 2–4: *Brahmaea tancrei* (aberrations)	
Koshkin 2023:		p. 190: *Brahmaea lunulata* (Russia: Evreiskaya A.O.: Nature Reserve Bastak)	

TABLE 2. Diagnostic characters of *Brahmaea certhia* and *Brahmaea tancrei*.

Morphological structure	Alternative characters	
	Brahmaea certhia	*Brahmaea tancrei*
Labial palpae:	third segment short, rounded, almost wide as long (Bryk 1949)	third segment almost twice as long as wide (Bryk 1949, *B. magnificentia*)
Head:	unicolourous brownish black (Bryk 1949; Yang 197; Zhang & Yang 1993)	brownish black with transversal band of yellow scales between scapi (Bryk 1949; Yang 1978, *B. undulata*; Zhang & Yang 1993, *B. diastemata*)
Antennae:	uniformly blackish brown (Mell 1930; Bryk 1949; Yang 1978; Zhang & Yang 1993); scapular tufts of scales do not stand out from the black colour of head; lateral pectinae of flagellum become shorter gradually approximately from half of length of antenna, ventral processes of flagellum protruding between pectinae decrease in size from the base to apex of flagellum (Bryk 1949)	uniformly light brownish yellow (Mell 1930; Bryk 1949, *B. magnificentia*; Yang 1978, *B. undulata*; Zhang & Yang 1993, *B. diastemata*); scapular tufts of scales yellow; lateral pectinae of flagellum decrease in length only at apex, ventral processes of flagellum protruding between pectinae not decrease in size along flagellum (Bryk 1949, *B. magnificentia*; Zhu & Wang 1983, *B. christophi*)
Thorax:	tegulae and patagia with a wide border of bright ochre-yellow scales (Austaut 1896, *B. lunulata*; Mell 1930; Bryk 1949; Yang 1978)	tegulae and patagia with a narrow border of dull brown-yellowish scales (Austaut 1896; Mell 1930; Bryk 1949, *B. magnificentia*; Yang 1978, *B. undulata*)
Abdomen:	dorsally black brown with an ochre-yellow intersegmental spaces, laterally with wide (2–5 mm) longitudinal ochre yellow band with narrow black rings around spiracles (Austaut 1896, *B. lunulata*; Mell 1930; Bryk 1949; Chu & Wang 1977, *B. porphyria*; Yang 1978; Zhu & Wang 1983, *B. porphyria*; Zhang & Yang 1993)	dorsally uniformly black brown, without lightening of intersegmental spaces, laterally with narrower (up to 2 mm) longitudinal brownish yellow band with constriction intersegmentally and with large black brown closed, pointed triangles around spiracles (Austaut 1896; Mell 1930; Bryk 1949, *B. magnificentia*; Chu & Wang 1977, *B. crerthia*; Yang 1978, *B. undulata*; Zhu & Wang 1983, *B. certhia*, *B. christophi* and *B. ledereri*; Zhang & Yang 1993, *B. diastemata*)
Forewings:	wider, costal margin in distal half more convex, wing apex more rounded, outer margin less oblique (Austaut 1896, *B. lunulata*)	less wide, costal margin in distal half less convex, wing apex less rounded, outer margin more oblique (Austaut 1896)
Forewing dorsal pattern:	area of the posterio-distal angle of discal cell (opposite the bases of the veins M3 and CuA1) with small bright spot in form of open external ring ('eye'), or a 'blind' spot of oval or irregular shape, more or less separated from the adjacent transverse lines (original character)	this area of the posterio-distal angle of discal cell without isolated elements of the wing pattern (original character)
	light lines of antemedial band packet strongly sinuous and dentate, nearly cut on veins, in anterior part of wing in cells between the Rs and M1 veins separated into sickle-shaped, hook-shaped or / and spot-shaped fragments (Bryk 1949)	light lines of antemedial band packet less sinuous, continuous, on the veins only slightly thinned (Bryk 1949, *B. magnificentia*)
	on veins M2–CuA2 outer margin of antemedial band packet with long, sharp teeth, usually reaching half or more width of medial field of wing (Austaut 1896, *B. lunulata*; Mell 1930)	on veins M2–CuA2 outer margin of antemedial band packet with relatively short teeth, usually not reaching half width of the medial field of wing (Austaut 1896; Mell 1930)

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TABLE 2. (Continued)

Morphological structure	Alternative characters	
	Brahmaea certhia	*Brahmaea tancrei*
	between the veins M1–M3 medial field of wing usually with 1–2 large, sharply visible light strokes much brighter than the adjacent transverse lines (Austaut 1896, *B. lunulata*; Chu & Wang 1977, *B. porphyria*)	between the veins Rs4–M3 medial field of wing usually with 3 pale strokes not standing out in comparison with the adjacent transverse lines (Austaut 1896; Chu & Wang 1977, *B. certhia*)
	subapical black spot long and narrow, elliptical or narrowly oval, usually twice as long as its width (Austaut 1896, *B. lunulata*; Mell 1930; Bryk 1949)	subapical black spot relatively short and wide, rounded-rhomboid or oval, usually no more than 1.5 times longer than its width (Austaut 1896; Mell 1930; Bryk 1949, *B. magnificentia*)
	at base of wing M-shaped black basal spot of approximately equal length along anterior and posterior margins of wing (Yang 1978) [note: the character is not reliable, in serial material it appears only as a tendency]	at base of wing M-shaped black basal spot significantly protruding at posterior margins of wing (Yang 1978, *B. undulata*)
Forewing ventral pattern:	basal half of wing with oblique light lines, partially repeating pattern of dorsal side of wing (Austaut 1896, *B. lunulata*; Mell 1930; Yang 1978; Paukstadt & Ragus 1990)	basal portion of wing uniform black, without light lines or spots (Austaut 1896; Mell 1930; Yang 1978, *B. undulata*; Paukstadt & Ragus 1990)
Hindwing dorsal pattern:	shape of inner margin of postmedial band packet close to arcuate: between veins M1–M2 broadly roundedly incurved, and between vein CuA and anal margin of wing slightly excurved or almost straight (Austaut 1896, *B. lunulata*)	shape of inner margin of postmedial band packet close to sinuous: between veins M1–M2 deeply curved inward and between veins CuA2 anal margin of wing prominently curved outward (Austaut 1896) [note: the character is typical for *B. tancrei tancrei*, in *B. tancrei diastemata* the shape of the postmedial band packet is similar to that in *B. certhia*]
	in postmedial band packet first proximal light line (first from the base of the wing) thinner than second line (Bryk 1949) [note: this line is usually, but not always, thinner than the second line]	in postmedial band packet first proximal light line wider than second line (Bryk 1949, *B. magnificentia*) [note: this line is also can be equal in width to the second line]
Hindwing ventral pattern:	basal portion of wing in anterior half of discal cell and in area of base of veins Rs—M3 with group of light spots of irregular shape (Austaut 1896, *B. lunulata*; Mell 1930)	basal portion of wing black, without light spots (Austaut 1896; Mell 1930; Paukstadt & Ragus 1990)
	first proximal line of postmedial band packet [usually] with prominent teeth on veins at least on Sc+R1, Rs and M1 (Bryk 1949)	first proximal line of postmedial band packet almost smooth or slightly wavy, without pronounced teeth on veins (Bryk 1949, *B. magnificentia*)
Forewing venation:	fork of veins Rs1–Rs2 long, starting into median field of wing basal to the postmedial band packet and in length reaching no less than 2/3 length of Rs3–Rs4 fork (Bryk 1949; Zhang & Yang 1993)	fork of veins Rs1–Rs2 short, starting into postmedial band packet of wing and in length reaching no more than ½ length of Rs3–Rs4 fork (Bryk 1949, *B. magnificentia*; Zhang & Yang 1993, *B. diastemata*)

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TABLE 2. (Continued)

Morphological structure	Alternative characters	
	Brahmaea certhia	*Brahmaea tancrei*
	at outer margin of wing distance between veins Rs1–Rs3 significantly larger than distance between veins Rs3–Rs4 [note: this is correlatively associated with the greater length of the subapical black spot] (original character)	at outer margin of wing distance between veins Rs1–Rs3 approximately equal to distance between veins Rs3–Rs4 [note: this is correlatively associated with the shorter length of the subapical black spot) (original character)
Male genitalia:	median dilation of gnathos bilobate (Paukstadt & Ragus 1990) with large teeth on lobes dorsally, valvae oblong, harpe (apex of sacculus) wide lamellar, cornuti with weakly expressed apical teeth (Zolotuhin 2016); valvae relatively longer: length of the valva along dorsal margin approximately twice as width of valval base valva along vinculum (n = 3) (original character) [note: narrowing of the valvae towards the base and their laid out like a "house" on a glass slide, stated by Zolotuhin (2016) as characteristic for *B. certhia*, depend from manner of spreading of the genitalia at mounting and cannot be considered as a character of this species]	median dilation of gnathos entire (Paukstadt & Ragus 1990), spatulate, without visible serrations dorsally; valvae triangular, widened towards the base, harpe (apex of the sacculus) in form of narrow, oblong process, cornuti with distinct distal teeth (Zolotuhin 2016, *Brahmaea lunulata*); length of valva along dorsal margin no more than 1.5 times greater than width of valval base along vinculum (n = 6) (original character)

TABLE 3. Diagnostic characters *Brahmaea tancrei tancrei* and *Brahmaea tancrei diastemata*.

Morphological structure	Alternative characters	
	Brahmaea tancrei tancrei	*Brahmaea tancrei diastemata*
Forewing dorsal pattern:	postmedial band packet between veins CuA2 and 1A+2A with prominent notch comparable in depth to its width between these veins; first (proximal) line of this packet between vein 1A+2A and posterior margin of wing usually slightly convex or almost straight, without tooth on vein 1A+2A (original character)	postmedial band packet between veins CuA2 and 1A+2A with less deep notch, significantly smaller than its width between these veins; first (proximal) line of this packet between vein 1A+2A and posterior margin of wing usually slightly concave and with small tooth on vein 1A+2A (original character)
Hindwing dorsal pattern:	first (proximal) line of postmedial band packet not separated distantly from other lines (Zhang & Yang 1993, *Brachygnatha jilinensis*)	first (proximal) line of postmedial band packet separated from the other lines (Zhang & Yang 1993, *Brachygnatha diastemata*) [note: this character is not reliable, is present only in the holotype and, evidently, it is a rare aberration]
	inner margin of postmedial band packet veins CuA2 and anal margin of wing strongly inclined outward (Zhu & Wang 1983, *B. certhia*) [note: this character is not much reliable, there are exceptions]	inner margin of the postmedial band packet between veins CuA2 and anal margin of wing curved weakly or almost straight (Zhu & Wang 1983, *B. christophi* and *B. ledereri*) [note: this character is not much reliable, there are exceptions]

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TABLE 3. (Continued)

Morphological structure	Alternative characters	
	Brahmaea tancrei tancrei	*Brahmaea tancrei diastemata*
Male genitalia:	uncus with notch on apex (Zhang & Yang 1993, *Brachygnatha jilinensis*)	uncus with pointed apex (Zhang & Yang 1993, *Brachygnatha diastemata*) [note: the character is not reliable; probably the authors did not see a notch on the apex of the uncus due to the orientation of the uncus apex on a glass slide towards the observer]
	median dilation of gnathos with convex or straight posterior margin (original character)	median dilation of gnathos with less deep notch on posterior margin (original character)
	process of harpe long and directed dorsally (Zhang & Yang 1993, *Brachygnatha jilinensis*)	process of harpe short and deflected medially Zhang & Yang 1993, *Brachygnatha diastemata*)

TABLE 4. Verified samples of *Brahmaea tancrei tancrei* on websites.

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea lunulata*	Russia, Evreiskaya A.O., Obluchye	18.06.2020	https://www.inaturalist.org/observations/50022838
iNatiralist	*Brahmaea lunulata*	Russia, Evreiskaya A.O., Bira	14.07.2022	https://www.inaturalist.org/observations/126165037
iNatiralist	*Brahmaea certhia*	Russia, Evreiskaya A.O., Bastak Nature Reserve	6.07.2003	https://www.inaturalist.org/observations/263499650
iNatiralist	*Brahmaea lunulata*	Russia, Khabarovskii Krai, Nanaiskii Rayon, Naykhin	11.07.2018	https://www.inaturalist.org/observations/202902078
GBIF	*Brahmaea lunulata*	Russia, Khabarovskii Krai, Solnechnyi Rayon, Gornyi	21.07.1973	https://www.gbif.org/ru/occurrence/3023329025
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai	16.06.2015	https://macroclub.ru/gallery/showphoto.php?photo=207607
Macroclub.ru	*Brahmaea certhia*	Russia, Primorskii Krai	30.06.2011	https://macroclub.ru/gallery/showphoto.php?photo=64420
Macroclub.ru	*Brahmaea certhia*	Russia, Primorskii Krai	17.07.2011	https://macroclub.ru/gallery/showphoto.php?photo=65617
Macroclub.ru	*Brahmaea tancrei*	Russia, Primorskii Krai, Dal'negorsk	31.07.2013	https://macroclub.ru/gallery/showphoto.php?photo=117834
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai, Dal'negorsk	22.07.2016	https://macroclub.ru/gallery/showphoto.php?photo=228387
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Dal'negorsk	24.07.2016	https://www.inaturalist.org/observations/50849729

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TABLE 4. (Continued)

Website	Species name on the website	Location	Observation date	Link
Insecta.pro	*Brahmaea tancrei*	Russia, Primorskii Krai, Kavalerovskii Rayon, 7 km from Vysokogorsk	15.07.2014	https://insecta.pro/gallery/32871
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Mikhailivskii Rayon, Otradnoe	19.06.2019	https://www.gbif.org/ru/occurrence/4425852522
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Ussuriiskii Rayon, Kamenushka	21.07.1980	https://www.gbif.org/ru/occurrence/3023329371
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Ussuriiskii Rayon, Kamenushka	24.06.2016	https://www.inaturalist.org/observations/184384328
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Ussuriiskii Rayon, Kamenushka	17.07.1991	https://www.gbif.org/ru/occurrence/3023229296
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Shkotovskii Rayon, Kangauz	26.06.1974	https://www.gbif.org/ru/occurrence/3023180092
Insecta.pro	*Brahmaea tancrei*	Russia, Primorskii Krai, Shkotovskii Rayon	17.07.2010	https://insecta.pro/gallery/9037
Insecta.pro	*Brahmaea tancrei*	Russia, Primorskii Krai, Shkotovskii Rayon	10.07.2015	https://insecta.pro/gallery/49999
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai, Shkotovskoe Plateau	19.07.2015	https://macroclub.ru/gallery/showphoto.php?photo=209392
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Shkotovskii Rayon Anisimovka	12.07.2021	https://www.inaturalist.org/observations/104664512
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Shkotovskyii Rayon Anisimovka vicinity	27.06.2023	https://www.inaturalist.org/observations/170438793
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Shkotovskii Rayon Anisimovka vicinity	10.07.2016	https://www.inaturalist.org/observations/170438793
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Shkotovskii Rayon Anisimovka vicinity	19.07.2022	https://www.inaturalist.org/observations/127186208

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TABLE 4. (Continued)

Website	Species name on the website	Location	Observation date	Link
Insecta.pro	*Brahmaea tancrei*	Russia, Primorskii Krai, Partizanskii Rayon, Tigrovoye	5.07.2015	https://insecta.pro/gallery/50002
Insecta.pro	*Brahmaea tancrei*	Russia, Primorskii Krai, Khasanskii Rayon, Kravtsovka	1.07.2014	https://insecta.pro/gallery/32869 (=https://www.inaturalist.org/observations/225278072)
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Khasanskii Rayon, Kravtzovka	1.07.2014	https://www.inaturalist.org/observations/225278072
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Khasanskii Rayon, Kravtzovka	1.6.2025	https://www.inaturalist.org/observations/285842258
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Barabash	9.07.2020	https://www.inaturalist.org/observations/52469579
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Barabash	9.06.2020	https://www.inaturalist.org/observations/52351477
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Khasanskii Rayon, Ovchinnikovo	18.07.2023	https://www.inaturalist.org/observations/86112523
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Kedrovaja Pad Nature Reserve	21.06.1974	https://www.gbif.org/ru/occurrence/3023183059
GBIF	*Brahmaea lunulata*	Russia, Primorskii Krai, Kedrovaja Pad Nature Reserve	16.06.1974	https://www.gbif.org/ru/occurrence/3023335029
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Kedrovaya Pad Nature Reserve	19.08.2005	https://www.inaturalist.org/observations/11990994
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Vladivostok	22.06.2018	https://www.inaturalist.org/observations/109917726
iNatiralist	*Brahmaea lunulata*	Russia, Primorskii Krai, Popova Island	5.08.2019	https://www.inaturalist.org/observations/194645306
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	Russia, Primorskii Krai, Volchenetz vicinity	29.06.2019	https://www.inaturalist.org/observations/227261003
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai, Nakhodka	19.07.2015	https://macroclub.ru/gallery/showphoto.php?photo=216290
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai, Nakhodka	23.07.2016	https://macroclub.ru/gallery/showphoto.php?photo=228477
Macroclub.ru	*Brahmaea*	Russia, Primorskii Krai, Nakhodka	14.07.2018	https://macroclub.ru/gallery/showphoto.php?photo=257479
Insecta.pro	*Brahmaea certhia*	«Korea», (no locality)	25.07.2011	https://insecta.pro/ru/gallery/23263

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TABLE 4. (Continued)

Website	Species name on the website	Location	Observation date	Link
GBIF	*Brahmaea tancrei*	South Korea, (no locality)	Emerged 23.03.1990 (indoors)	https://www.gbif.org/ru/occurrence/4131060271
iNatiralist	*Brahmaea lunulata*	South Korea, Gangwon-do, Inje	15.06.2023	https://www.inaturalist.org/observations/168072742
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Inje	4.08.2019	https://www.inaturalist.org/observations/30107724
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Inje-gun, Girin-myeon	19.07.2024	https://www.inaturalist.org/observations/230918568
Tistory (Eolingbul 2019)	*Brahmaea tancrei*	South Korea, Gangwon-do, Inje-gun, Girin-myeon	31.07.2019	https://lambsppk.tistory.com/5865480
Tistory (Park 2017)	no Latin name	South Korea, Gangwon-do, Taegisan	27.07.2017	https://ecochulwoo.tistory.com/2010
Tistory (Park 2017)	no Latin name	South Korea, Gangwon-do, Inje-gun, Jindong-ri	8.08.2019	https://ecochulwoo.tistory.com/2010
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	South Korea, Gangwon-do, Pyeongchang	22.06.2005	https://www.inaturalist.org/observations/9456898
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Pyeongchang	6.08.2020	https://www.inaturalist.org/observations/55541214
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	South Korea, Gangwon-do, Hwacheon	5.08.2024	https://www.inaturalist.org/observations/234678876
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Seoraksan-ro, Sokcho-si	4.07.2019	https://www.inaturalist.org/observations/58850481
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	South Korea, Gyeonggi-do, Gapyeong	28.05.2001	https://www.inaturalist.org/observations/168050271
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Geochang, Gajo-myeon	16.07.2023	https://www.inaturalist.org/observations/173199431
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	South Korea, Jeollabuk-do, Muju	10.06.2019	https://www.inaturalist.org/observations/149061983
iNatiralist	*Brahmaea certhia*	South Korea, Jeollanam-do, Gurye	18.06.2024	https://www.inaturalist.org/observations/223697676
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	China, Heilongjiang, Mudanjiang, Linkou	19.07.2023	https://www.inaturalist.org/observations/174427560

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TABLE 4. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea lunulata* ssp. *carpenteri*	China, Heilongjiang, Mudanjiang, Linkou	18.07.2023	https://www.inaturalist.org/observations/174427846
iNatiralist	*Brahmaea certhia*	China, Heilongjiang, Mudanjiang, Suifenhe	30.05.2025	https://www.inaturalist.org/observations/285474944
iNatiralist	*Brahmaea certhia*	China, Heilongjiang, Mudanjiang, Suifenhe	7.06.2025	https://www.inaturalist.org/observations/288419800
Flickr (Wang 2014)	*Brahmaea porphyrio*	China, Jilin Province, Erdaobaihe	no date	https://www.flickr.com/photos/105015136@N07/15422753818

TABLE 5. Molecular samples of of *Brahmaea tancrei tancrei*.

No	Sequence ID	Species name of the specimen in the database	Region of specimen origin	Collection date	BOLD BIN
1	BOLD:LTOL312-07* (pupa)	*Brahmaea tancrei*	China, Shanghai [?]	01.01.1995	AAC0019
2	BOLD:LBEOW987-11*	*Brahmaea tancrei*	Russia, Evreiskaya A.O.	08.06.2010	AAC0019
3	BOLD:LTOL202-07* (larva)	*Brahmaea tancrei*	China, Shanghai [?]	06.06.1995	AAC0019
4	BOLD:SARBB1312-09*	*Brahmaea tancrei*	Russia, Primorskii Krai, Vladivostok	24.03.1993	AAC0019
4	BOLD:SARBB1311-09*	*Brahmaea tancrei*	Russia, Primorskii Krai, Vladivostok	02.04.1993	AAC0019
6	BOLD:SARBB943-09*	*Brahmaea certhia*	Vietnam, Lai Chau [?]	05.10.1994	AAC0019
7	BOLD:SASNB612-09*	*Brahmaea tancrei*	South Korea (no locality)	15.03.1995	AAC0019
8	BOLD:SASNB608-09*	*Brahmaea tancrei*	North Korea, Chagang	10.06.2009	AAC0019
9	NIBR:WBN0013429	*Brahmaea tancrei*	South Korea, Gangwon-do	22.06.2005	–
10	BOLD:LBEOW988-11*	*Brahmaea tancrei*	Russia, Khabarovskii Krai, Bikin	01.07.2008	AAC0019
11	BOLD:SARBB1309-09*	*Brahmaea tancrei*	Russia, Sakha-Yakutiya Republic [?]	01.05.2009	AAC0019
–	BOLD:SARBB1310-09*	*Brahmaea tancrei*	Russia, Sakha-Yakutiya Republic [?]	02.05.2009	AAC0019
–	BOLD:LEPPK006-13*	*Brahmaea tancrei*	Russia, Primorskii Krai, Kamenushka	21.07.2013	AAC0019
–	BOLD:SASNA215-08*	*Brahmaea certhia*	Russia, Primorskii Krai (no locality)	24.07.1986	AAC0019
–	BOLD:SASNC2467-12*	*Brahmaea*	Russia, Primorskii Krai (no locality)	21.07.2012	AAC0019
–	BOLD:SARBB1314-09*	*Brahmaea tancrei*	South Korea (no locality)	17.04.1990	AAC0019
–	BOLD:LTOL892-08* (larva)	*Brahmaea tancrei*	China [?] (no locality)	01.04.1994	AAC0019

Notes. Number of a sample in the first column corresponds to the number on the Figure 18. Dash indicates a sample not included in the tree. Asterisk at the Sequence ID marked the presence of a photograph of the specimen on the database. The collection dates for March and April cannot belong to moths collected in the nature.

TABLE 6. Verified samples of *Brahmaea tancrei diastemata* on websites.

Website	specimen name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Hebei, Chengde	24.07.2021	https://www.inaturalist.org/observations/98854441
iNatiralist	*Brahmaea certhia*	China, Beijing, Miyun	23.07.2018	https://www.inaturalist.org/observations/126488953
iNatiralist	*Brahmaea certhia*	China, Beijing, Miyun	2.08.2022	https://www.inaturalist.org/observations/153155106
iNatiralist	*Brahmaea certhia*	China, Beijing, Huairou	5.08.2023	https://www.inaturalist.org/observations/178187469
iNatiralist	*Brahmaea certhia*	China, Beijing, Huairou	7.08.2021	https://www.inaturalist.org/observations/221967562
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Beijing, Huairou	29.07.2019	https://www.inaturalist.org/observations/249043276
iNatiralist	*Brahmaea certhia*	China, Beijing, Yanqing	25.5.2022	https://www.inaturalist.org/observations/269432541
iNatiralist	*Brahmaea certhia*	China, Beijing, Yanqing	27.7.201	https://www.inaturalist.org/observations/266704068
iNatiralist	*Brahmaea certhia*	China, Beijing, Baihua Mountain National Nature Reserve, Fangshan	10.07.2022	https://www.inaturalist.org/observations/239921881
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Beijing, [Mentougou / Fangshan]	–.07.2023	https://www.inaturalist.org/observations/221107526
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	19.06.2019	https://www.inaturalist.org/observations/66694298
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	24.06.2023	https://www.inaturalist.org/observations/191739825
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	14.08.2022	https://www.inaturalist.org/observations/131081038
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	25.07.2020	https://www.inaturalist.org/observations/54226742
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	6.08.2024	https://www.inaturalist.org/observations/234086935
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Beijing, Mentougou	2.08.2024	https://www.inaturalist.org/observations/233862791
iNatiralist	*Brahmaea certhia*	China, Beijing, Mentougou	5.5.2007	https://www.inaturalist.org/observations/250868440
Flickr (Yun 2014)	*Brahmaea christophi* or *Brahmaea certhia*	China, Beijing, Baihuashan	19.04.2014	https://www.flickr.com/photos/stray_bird726/13930952444
iNatiralist	*Brahmaea certhia*	China, Shanxi, Changzhi	23.06.2023	https://www.inaturalist.org/observations/170455978

TABLE 7. Molecular samples of *Brahmaea tancrei diastemata*.

No	Sequence ID	Species name of the specimen in the database	Region of specimen origin	Collection date	BOLD BIN
12	BOLD:SARBB938-09*	*Brahmaea certhia*	China, Shaanxi Taibaishan, Tsinling-Mts.	«05.01.1999» [? 01.05.1999]	AAC0019
13	BOLD:SARBB941-09*	*Brahmaea certhia*	China, Sichuan, Daxueshan	07.07.1999	AAC0019
14	BOLD:SARBB942-09*	*Brahmaea certhia*	China, Sichuan, Daxueshan	07.07.1999	AAC0019
15	BOLD:SARBB945-09*	*Brahmaea certhia*	China, Beijing, Mentougou	01.08.2000	AAC0019
16	BOLD:SARBB946-09*	*Brahmaea certhia*	China, Beijing, Mentougou	01.08.2000	AAC0019
17	BOLD:SASNA216-08*	*Brahmaea certhia*	China, Beijing, Mentougou	01.08.2000	AAC0019
18	BOLD:SARBB944-09*	*Brahmaea certhia*	China, Beijing, Mentougou	01.08.2000	AAC0019
19	BOLD:SASNC1722-12*	*Brahmaea*	China, Beijing, Donglingshan	26.07.2011	AAC0019
–	BOLD:GBGL14315-14	*Brahmaea christophi*	China, Beijing (Liu *et al*., 2014)	no date	AAC0019
–	BOLD:GBGL14316-14	*Brahmaea christophi*	China, Beijing (Liu *et al*., 2014)	no date	AAC0019
–	BOLD:GBMNC49195-20	*Brahmaea christophi*	China, Beijing, mountain conservation zones and natural parks (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49196-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49197-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49198-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49199-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49200-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49201-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49202-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49203-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49204-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49205-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49206-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49207-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49208-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49209-20	*Brahmaea christophi*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49210-20	*Brahmaea porphyrio*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49212-20	*Brahmaea wallichii*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC49213-20	*Brahmaea wallichii*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC51007-20	*Zanclognatha lunalis*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019
–	BOLD:GBMNC53055-20	*Anticypella diffusaria*	China, Beijing (Hao *et al*. 2020)	no date	AAC0019

Note. Number of a sample in the first column corresponds to the number on the Figure 18. Dash indicates a sample not included in the tree. Asterisk at the Sequence ID marked the presence of a photograph of the specimen on the database.

TABLE 8. Verified samples of *Brahmaea certhia* on websites.

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Gangneung	11.07.2024	https://www.inaturalist.org/observations/228601560
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Gangneung	14.07.2007	https://www.inaturalist.org/observations/168050626
iNatiralist	*Brahmaea certhia*	South Korea, Gangwon-do, Goseong	30.06.2023	https://www.inaturalist.org/observations/170247431
iNatiralist	*Brahmaea certhia*	South Korea, Gyeonggi-do, Uiwang	14.07.2024	https://www.inaturalist.org/observations/241581366
iNatiralist	*Brahmaea certhia*	South Korea, Incheon, Ongjin-gun	3.08.2019	https://www.inaturalist.org/observations/30308551
iNatiralist	*Brahmaea certhia*	South Korea, Seoul, Inheon Airport	24.07.2024	https://www.inaturalist.org/observations/231619733
iNatiralist	*Brahmaea certhia*	South Korea, Gyeonggi-do, Uijeongbu-si	27.06.2023	https://www.inaturalist.org/observations/182900020
iNatiralist	*Brahmaea certhia*	South Korea, Gyeonggi-do, Uijeongbu-si	21.07.2019	https://www.inaturalist.org/observations/30372251
iNatiralist	*Brahmaea certhia*	South Korea, Gyeonggi-do, Pocheon	31.08.2024	https://www.inaturalist.org/observations/238942577
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Seosan	1.08.2018	https://www.inaturalist.org/observations/15017949
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Asan	2.07.2022	https://www.inaturalist.org/observations/124367851
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Asan	27.07.2022	https://www.inaturalist.org/observations/128151389
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Asan	22.07.2022	https://www.inaturalist.org/observations/127420462
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Asan	6.08.2021	https://www.inaturalist.org/observations/90220822
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Asan	3.08.2021	https://www.inaturalist.org/observations/89826843
iNatiralist	*Brahmaea certhia*	South Korea, Gyeonggi-do, Ansoeng	16.08.2020	https://www.inaturalist.org/observations/56598481
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	19.06.2024	https://www.inaturalist.org/observations/223724042
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	5.07.2014	https://www.inaturalist.org/observations/69120955

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TABLE 8. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	25.07.2019	https://www.inaturalist.org/observations/35220120
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	24.06.2017	https://www.inaturalist.org/observations/47221595
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	7.07.2019	https://www.inaturalist.org/observations/38460279
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	15.07.2017	https://www.inaturalist.org/observations/49202739
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	19.07.2015	https://www.inaturalist.org/observations/67330490
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	23.07.2022	https://www.inaturalist.org/observations/127470817
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongnam-do, Cheonan	22.06.2020	https://www.inaturalist.org/observations/65296157
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongwon	18.06.2022	https://www.inaturalist.org/observations/122272029
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongwon	12.07.2024	https://www.inaturalist.org/observations/228758535
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongju	3.07.2023	https://www.inaturalist.org/observations/171022739
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongju	6.06.2024	https://www.inaturalist.org/observations/221688928
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongju	16.06.2003	https://www.inaturalist.org/observations/168050624
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Jecheon	11.07.2020	https://www.inaturalist.org/observations/52672210
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Cheongju	6.07.2019	https://www.inaturalist.org/observations/136660725
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Uljin	9.07.2024	https://www.inaturalist.org/observations/234651168

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TABLE 8. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Pohang	23.06.2020	https://www.inaturalist.org/observations/66071997
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Yeongcheon	2.08.2019	https://www.inaturalist.org/observations/31524920
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Daegu, Dalseo	23.07.2023	https://www.inaturalist.org/observations/174426388
iNatiralist	*Brahmaea certhia*	South Korea, Chungcheongbuk-do, Chilgok	20.07.2021	https://www.inaturalist.org/observations/89158050
iNatiralist	*Brahmaea certhia*	South Korea, North Jeolla, Jeongeup-si	29.06.2022	https://www.inaturalist.org/observations/124458401
iNatiralist	*Brahmaea certhia*	South Korea, Jeollabuk-do, Jinan	15.06.2024	https://www.inaturalist.org/observations/223055182
iNatiralist	*Brahmaea certhia*	South Korea, Jeollabuk-do, Muju	10.07.2021	https://www.inaturalist.org/observations/86348414
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Geochang-gun	27.05.2022	https://www.inaturalist.org/observations/118872979
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Geochang-gun	29.06.2024	https://www.inaturalist.org/observations/225865110
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Geochang-gun	14.06.2023	https://www.inaturalist.org/observations/167312984
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Sancheong-gun	2.07.2021	https://www.inaturalist.org/observations/85335610
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Jinju	–.06.2020	https://www.inaturalist.org/observations/65996223
iNatiralist	*Brahmaea certhia*	South Korea, Gyeongsangnam-do, Sancheong-gun	13.06.2024	https://www.inaturalist.org/observations/223115894
iNatiralist	*Brahmaea certhia*	South Korea, Busan, Geumjeong	20.07.2024	https://www.inaturalist.org/observations/230452212
GBIF	*Brahmaea certhia*	Sout Korea, , Gwangju	-.06.1982	https://www.gbif.org/ru/occurrence/4131067309
jpmoth.org	*Brahmaea magnificentia*	Sout Korea, , Gwangju	24.06.2006	http://www.jpmoth.org/~dmoth/Digital_Moths_of_ Asia/80_BRAHMAEIDAE/framepage_Brahmaeidae.html
iNatiralist	*Brahmaea certhia*	South Korea, South Jeolla, Wando	16.07.2024	https://www.inaturalist.org/observations/234673941

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TABLE 8. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia*	South Korea, South Jeolla, Wando	28.07.2024	https://www.inaturalist.org/observations/232234330
iNatiralist	*Brahmaea certhia*	South Korea, South Jeolla, Wando	28.07.2024	https://www.inaturalist.org/observations/232617216
iNatiralist	*Brahmaea certhia*	South Korea, South Jeolla, Goheung	29.07.2009	https://www.inaturalist.org/observations/168050625
iNatiralist	*Brahmaea lunulata*	China, Hebei, Chengde, 450 m	7.07.2021	https://www.inaturalist.org/observations/86112523
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Beijing, Haidian, 250 m	15.07.2023	https://www.inaturalist.org/observations/173007724
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Beijing, Mentougou	19.07.2020	https://www.inaturalist.org/observations/53692018
iNatiralist	*Brahmaea certhia*	China, Beijing, Haidian	12.07.2019	https://www.inaturalist.org/observations/155894286
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Shandong, Weihai	12.08.2023	https://www.inaturalist.org/observations/178102748
iNatiralist	*Brahmaea certhia*	China, Shandong, Yantai	22.07.2006	https://www.inaturalist.org/observations/194047079
iNatiralist	*Brahmaea certhia*	China, Shandong, Yantai	25.06.2023	https://www.inaturalist.org/observations/169475854
iNatiralist	*Brahmaea certhia*	China, Shandong, Yantai	18.07.2024	https://www.inaturalist.org/observations/230471127
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Shandong, Qingdao	24.07.2021	https://www.inaturalist.org/observations/215869674
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Hubei, Jingmen	27.05.2023	https://www.inaturalist.org/observations/195258659
iNatiralist	*Brahmaea certhia*	China, Anhui, Lu'an	18.07.2024	https://www.inaturalist.org/observations/230463212
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Anhui, Hefei	10.06.2021	https://www.inaturalist.org/observations/103184802
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Anhui, Hefei	1.08.2024	https://www.inaturalist.org/observations/260229888
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	2.09.2023	https://www.inaturalist.org/observations/181345108
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	7 .07.2022	https://www.inaturalist.org/observations/125402841

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TABLE 8. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Changzhou	24.05.2015	https://www.inaturalist.org/observations/139430850
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Nanjing	22.07.2024	https://www.inaturalist.org/observations/230920746
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	21.06.2022	https://www.inaturalist.org/observations/122957002
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	12.03.2023	https://www.inaturalist.org/observations/150868917
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	6.06.2023	https://www.inaturalist.org/observations/166004996
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	9.07.2023	https://www.inaturalist.org/observations/172307536
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	23.05.2023	https://www.inaturalist.org/observations/163260860
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	26.08.2023	https://www.inaturalist.org/observations/180428440
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	26.06.2022	https://www.inaturalist.org/observations/123508514
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	6.08.2021	https://www.inaturalist.org/observations/181866354
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	10.08.2021	https://www.inaturalist.org/observations/90608938
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Zhenjiang	20.08.2021	https://www.inaturalist.org/observations/92042000
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Nanjing	2.09.2023	https://www.inaturalist.org/observations/181345108
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Wuxi	9.06.2023	https://www.inaturalist.org/observations/166347114
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Jiangsu, Suzhou	21.07.2022	https://www.inaturalist.org/observations/127190302
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Suzhou	11.07.2019	https://www.inaturalist.org/observations/205117933
iNatiralist	*Brahmaea certhia*	China, Jiangsu, Suzhou	11.07.2019	https://www.inaturalist.org/observations/205117933

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TABLE 8. (Continued)

Website	Species name on the website	Location	Observation date	Link
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Shanghai	–.05. 2021	https://www.inaturalist.org/observations/129381619
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Shanghai	7.09.2023	https://www.inaturalist.org/observations/195448158
iNatiralist	*Brahmaea certhia*	China, Shanghai	12.08.2020	https://www.inaturalist.org/observations/179800888
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Shanghai	18.07.2022	https://www.inaturalist.org/observations/126821461
iNatiralist	*Brahmaea certhia*	China, Shanghai	17.06.2018	https://www.inaturalist.org/observations/13795350
iNatiralist	*Brahmaea certhia*	China, Zhejiang, Huzhou	8.09.2024	https://www.inaturalist.org/observations/240527822
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Zhejiang, Hangzhou	16.07.2021	https://www.inaturalist.org/observations/88095858
iNatiralist	Brahmaea certhia	China, Zhejiang, Hangzhou	2.08.2023	https://www.inaturalist.org/observations/176267470
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Zhejiang, Hangzhou	17.07.2021	https://www.inaturalist.org/observations/87961237
iNatiralist	*Brahmaea certhia*	China, Zhejiang, Ningbo	25.04.2022	https://www.inaturalist.org/observations/112798018
iNatiralist	*Brahmaea certhia*	China, Zhejiang, Ningbo	9.08.2006	https://www.inaturalist.org/observations/18707388
Flickr (Pittaway 2007)	*Brahmaea certhia*	China, Zhejiang, Ningbo	4.01.2007 [?]	https://www.flickr.com/photos/16504650@N00/345875321/
iNatiralist	*Brahmaea certhia* ssp. *porphyria*	China, Zhejiang, Zhoushan Island	26.07.2010	https://www.inaturalist.org/observations/27000824
GBIF	*Brahmaea tancrei*	China, Sichuan	–.08.2001	https://www.gbif.org/ru/occurrence/1457656999

TABLE 9. Molecular samples of *Brahmaea certhia*.

No	Sequence ID	Species name of the specimen in the database	Region of specimen origin	Collection date	BOLD BIN
20	BOLD:SARBB939-09*	*Brahmaea certhia*	China, Shaanxi, Dabashan 1500	01.07.2000	AAC0020
21	BOLD:GBMIN22885-13	*Brahmaea certhia*	South Korea (no locality) (Lee, 2012)	no data	AAC0020
22	BOLD:GBMIN79232-17	*Brahmaea certhia*	? China (Kang, 2019; the moth was obtained in South Korea from container of foreign shipping vessel by quarantine inspection)	no data	AAC0020
23	BOLD:SARBB1306-09*	*Brahmaea certhia*	China, Yunnan (no locality)	01.09.1999	AAC0020
24	BOLD:SARBB1307-09*	*Brahmaea certhia*	China, Jiangxi, Zhangjiangang	06.06.2009	AAC0020
25	BOLD:SARBB1308-09*	*Brahmaea certhia*	China, Jiangxi, Zhangjiangang	07.06.2009	AAC0020
26	BOLD:SARBB937-09*	*Brahmaea certhia*	China, Yunnan, Lanchang, Heishan	«08.01.1999» [? 01.08.1999]	AAC0020
27	BOLD:SARBB940-09*	*Brahmaea certhia*	China, Shaanxi, Dabashan	01.07.2000	AAC0020
28	BOLD:SARBB951-09*	*Brahmaea certhia*	China, Jiangxi, Zhangjiangang	27.08.2008	AAC0020
29	BOLD:SASNB613-09*	*Brahmaea porphyria*	China, Liaoning, Dachangshan Island	01.07.2007	AAC0020
30	NIBR:WBN0013426	*Brahmaea certhia*	South Korea, Jeollanam-do	21.07.2006	–
31	BOLD:INSSD5998-21*	*Brahmaea porphyria*	China, Shandong, Yantai	15.07.2019	AAC0020
–	BOLD:SASNA223-08*	*Brahmaea porphyria*	China, Yunnan, Lanchang, Heishan	01.10.1999	AAC0020

Note. Number of a sample in the first column corresponds to the number on the Figure 18. Dash indicates a sample not included in the tree. Asterisk at the Sequence ID marked the presence of a photograph of the specimen on the database.

TABLE 10. Additional molecular samples of *Brahmaea* species.

No	Sequence ID	Species name of the specimen in the database	Region of specimen origin	BOLD BIN
32	BOLD:LTOL149-06	*Acanthobrahmaea europaea*	Italy, Tuscany	AAF3816
33	BOLD:SASNB684-09	*Acanthobrahmaea europaea*	Italy, Calabria	AAF3816
34	BOLD:SASNC137-11	*Acanthobrahmaea europaea*	Italy, Potenza	AAF3816
35	BOLD:SASNC818-11	*Brahmaea christophi*	Turkey, Mersin	AAJ8779
36	BOLD:SASNC816-11	*Brahmaea christophi*	Turkey, Uezumcue env.	AAJ8779
37	BOLD:SASNC817-11	*Brahmaea christophi*	Turkey, Mersin	AAJ8779
38	BOLD:SASNC138-11	*Brahmaea ledereri*	Turkey, Erzincan	AAJ8779
39	BOLD:SAVSE527-12	*Brahmaea ledereri*	Turkey, Erzincan	AAJ8779
40	BOLD:SASNB604-09	*Brahmaea christophi*	Iran, Albourz Mts	AAE8002
41	BOLD:SASNB605-09	*Brahmaea christophi*	Iran, Albourz Mts.	AAE8002
42	BOLD:SAWNA080-09	*Brahmaea christophi*	Iran, Elburs	AAE8002
43	BOLD:SAVSE496-12	*Brahmaea christophi*	Azerbaijan	AAE8002
44	BOLD:SASNB855-10	*Brahmaea christophi*	Azerbaijan	AAE8002
45	BOLD:SAVSE497-12	*Brahmaea christophi*	Azerbaijan	AAE8002
46	BOLD:LBEOW990-11	*Brahmaea wallichii*	Vietnam, Lai Chau	AAB1471

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TABLE 10. (Continued)

No	Sequence ID	Species name of the specimen in the database	Region of specimen origin	BOLD BIN
47	BOLD:SARBB934-09	*Brahmaea wallichii*	Thailand	AAB1471
48	BOLD:SASNB614-09	*Brahmaea wallichii*	India, Nagaland	AAB1471
49	BOLD:SARBB921-09	*Brahmaea wallichii*	China, Shaanxi	AAB1471
50	BOLD:SASNB618-09	*Brahmaea wallichii*	Myanmar	AAB1471
51	BOLD:SARBB926-09	*Brahmaea wallichii*	China, Jiangxi	AAB1471
52	BOLD:LTOL562-07	*Brahmaea wallichii insulata*	Taiwan Island	AAW7054
53	BOLD:SARBB919-09	*Brahmaea wallichii*	Bhutan	ABZ3471
54	BOLD:SAVSE521-12	*Brahmaea wallichii*	Nepal	ABZ3471
55	BOLD:SASNB617-09	*Brahmaea wallichii*	Nepal	ABZ3471
56	BOLD:SASNB606-09	*Brahmaea wallichii*	Pakistan, Khyber, Pakhtunkhwa	ABZ3471
57	BOLD:SASNB616-09	*Brahmaea wallichii*	India, Uttarakhand	ABZ3471
58	BOLD:SAVSE498-12	*Brahmaea japonica*	Japan, Nagano	AAW7059
59	BOLD:SAVSE813-15	*Brahmaea japonica*	Japan, Tottori	AAW7059
60	BOLD:SAVSE513-12	*Brahmaea celebica*	Indonesia, Sulawesi	AAF6166
61	BOLD:SAVSE514-12	*Brahmaea celebica*	Indonesia, Sulawesi	AAF6166
62	BOLD:SPRBA880-09	*Brahmaea celebica*	Indonesia, Sulawesi	AAF6166
63	BOLD:SPRBA878-09	*Brahmaea ardjoeno*	Indonesia, Jawa, Timur	AAD7814
64	BOLD:LEPPK129-17	*Brahmaea hearseyi*	Malaysia, Perak	AAB8752
65	BOLD:SAVSE451-12	*Brahmaea ardjoneo*	Indonesia, Jawa, Barat	AAB8752
66	BOLD:SAVSE518-12	*Brahmaea loeffleri*	Indonesia, Sumatra	AAB8752
67	BOLD:SPRBA873-09	*Brahmaea loeffleri*	Indonesia, Sumatera	AAB8752
68	BOLD:SAVSE467-12	*Brahmaea loeffleri*	Indonesia, Kalimantan	AAB8752
69	BOLD:SASNA221-08	*Brahmaea* sp. 2	Philippines, Central, Luzon	AAB8752
70	BOLD:SAVSE988-15	*Brahmaea*	Philippines, Eastern, Samar	AAB8752
71	BOLD:SASNC1933-12	*Brahmaea hearseyi*	Philippines, Panay	AAB8752
72	BOLD:SAVSE509-12	*Brahmaea hearsyi*	Thailand	AAB8752
73	BOLD:SAVSE503-12	*Brahmaea hearsyi*	China, Yunnan	AAB8752
74	BOLD:SAVSE1224-16	*Brahmaea wallichii*	China, Shaanxi	AAB8752
75	BOLD:LBEOW985-11	*Brahmaea hearsey*	Vietnam, Hue	AAB8752
76	BOLD:SASNC1942-12	*Brahmaea*	China, Hubei	AAB8752
77	BOLD:SAVSE500-12	*Brahmaea hearsyi*	China, Fujian	AAB8752

Note. Numbers of samples in the first column corresponds to the numbers on the Figure 18. All samples are supplied with a photograph of the moth.