Atomorpha punctistrigaria (Christoph, 1893) (Geometridae: Ennominae) – a new geometrid species for the fauna of Europe

Tatyana A. Trofimova

Samara State University, Laboratory of Animal Systematics and Faunistics, ul. Ac. Pavlova 1, 443011, Samara, Russia; e-mail: apame@mail.ru

Abstract. A little-known geometrid moth, *Atomorpha punctistrigaria* (Christoph, 1893), was found in the Volgo-Ural sands (Ryn-sands, Western Kazakhstan) and is new to Europe. The type material of *A. punctistrigaria* (Christoph, 1893), *A. falsaria* (Alpheraky, 1892) (type species of the genus), and *A. hedemanni hedemanni* (Christoph, 1885) was examined in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia. Lectotypes for *A. punctistrigaria* (Christoph, 1893) and *A. falsaria* (Alpheraky, 1892) are designated. Images of the adults and genitalia structures are also given.

Introduction

Atomophora Alphéraky, 1892 was established as a monotypic genus for *Atomophora falsaria* Alphéraky, 1892 described from Gansu [China]. Later, Staudinger (1901: 282) proposed the name *Atomorpha* for genus *Atomophora* Alphéraky, 1892 because the latter is a junior homonym of *Atomophora* Reuter, 1884 (Hemiptera). The genus inhabits desert and semidesert zones of Central Asia, the Middle East, and northern Africa (Tunisia) (Remm & Viidalepp 1981; Scoble 1999; Viidalepp 1975, 1988, 1996; Viidalepp et al. 1992). At present, the genus includes four species: *A. falsaria* (Alphéraky 1892), *A. hedemanni* (Christoph, 1885), with subspecies *A. h. khalia* Wiltshire, 1986, *A. mabillearia* Lucas, 1907, and *A. punctistrigaria* (Christoph, 1893). An examination of moths collected in the eastern part of the Volgo-Ural sands (Kazakhstan, Ryn-sands) has revealed one specimen of a little known geometrid moth, *Atomorpha punctistrigaria*. The species is very rare in collections and insufficiently known in bionomics. It was described from Turkmenistan in the environs of Ashkhabad from seven specimens that are deposited now in the collection of the Zoological Institute of the Russian Academy of Sciences (St. Petersburg – ZISP). A comparative study of the genitalia structure of specimens from the Volgo-Ural sands with that of the type specimens of *A. punctistrigaria* confirmed my determination. The occurrence of *A. punctistrigaria* in the Volgo-Ural sands adds to its distribution. It was recently known only from very few localities in Turkmenistan and from the Malye Barsuki sands in Southern Kazakhstan. The new finding of *A. punctistrigaria* is especially interesting because this point is the most northwestern and is in the territory of European Russia; thus the species is for the first time recorded for the fauna of Europe (Fig. 1).

The Volgo-Ural sands (Fig. 6) are represented by hilly-ridge fixed sands and in some areas weakly fixed sands on interfluve of the Volga and Ural rivers. The hilly sands are covered with psammophytic shrubs and grass-sagebrush vegetation: *Poa bulbosa* L. (Poaceae), *Leymus racemosus* (Lam.) Tzvel. (Poaceae), *Agriophyllum squarrosum* (L.) Moq. (Poaceae), *Artemisia lercheana* Web. ex Stechm. (Asteraceae), *Elaeagnus angustifolia* L. (Elaeagnaceae), *Tamarix ramosissima* Ledeb. (Tamaricaceae), *Calligonum aphyllum* (Pall.) Guerke (Polygonaceae), and others plants. In

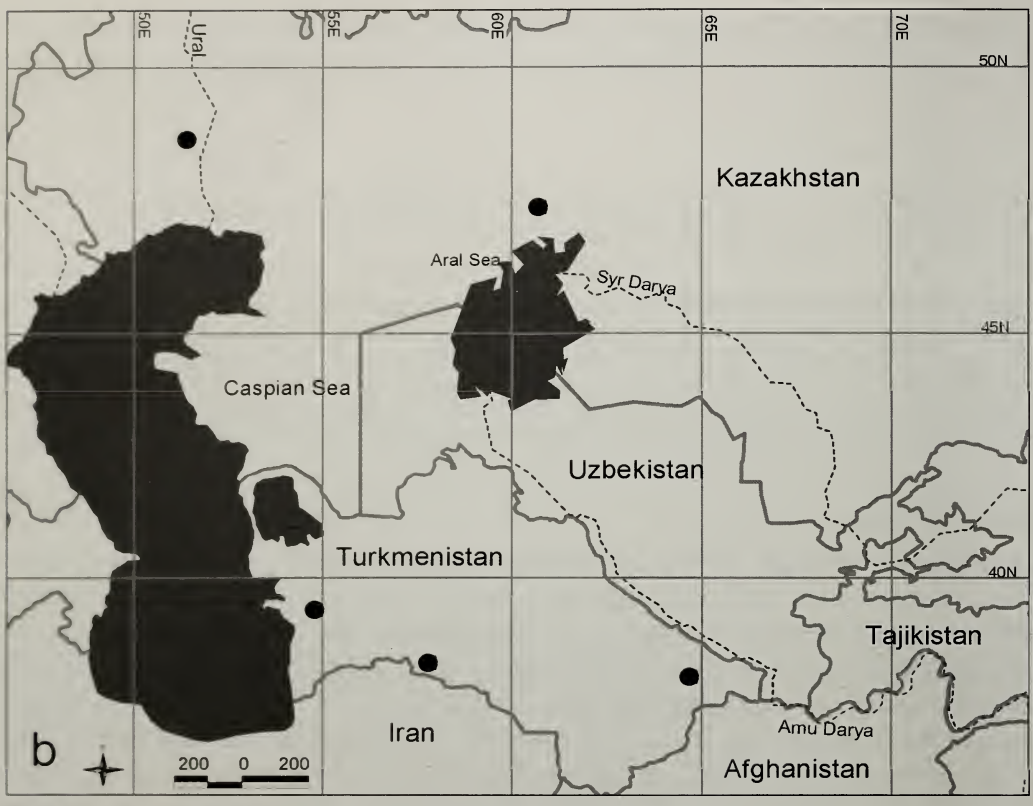


Fig. 1. Distribution of *Atomorpha punctistrigaria* (scale bar in km).

depressions, where groundwater surfaces, there are communities of reed grass (*Phragmites australis* (Cav.) Trin. ex Steud. (Poaceae)) and saltworts such as *Salicornia*, *Suaeda*, *Climacoptera*, and *Halocnemum* (all Chenopodiaceae). Based on the previous finding of *Atomorpha punctistrigaria* (Christoph 1893) and my data, it has become more obvious that the occurence of this species is restricted to desert hilly sands.

I investigated the type specimens of *Atomorpha punctistrigaria, A. hedemanni*, and *A. falsaria* deposited in St. Petersburg (ZISP). The latter taxon is the type species of *Atomorpha* Staudinger, 1901. Here I am giving images of adults and genitalia structures of these three species. The genitalia of *Atomorpha punctistrigaria* have not been figured previously and those of *A. falsaria* have been figured schematically only once (Viidalepp 1975). Lectotypes are designated here for nomenclatorial stabilization.

Abbreviations

Coll. P. Skou	The collection of P. Skou (Denmark)
LSSU	Laboratory of Animal Systematics and Faunistics, Samara State University (Samara, Russia
ZISP	Zoological Institute of Russian Academy of Sciences (St. Petersburg, Russia)

Atomorpha Staudinger, 1901

Type species: *Atomophora falsaria* Alphéraky, 1892

References: Alphéraky, 1892: 66 (*Atomophora*); Staudinger 1901: Viidalepp 1975: 486; Scoble 1999: 76 (*Atomorpha*).

Redescription (Figs 2–7, 9–14). Medium to small sized geometrid moths. Wingspan 18–20 mm. Forewings triangular, hindwings rounded. Venation as in ennominae ground plan. Forewing with 4 branches of R-veins, R-Cu cell wide and long, Sc and R1 joined, R1 anastomosed with R2, R2+R3 on stalk, R4 originating from top of R-cell. Hindwing with R and M1 without anastomosis. Antennae rather ciliate in male and with very short rami in female. Eyes rounded, large. Frons protruding. Head, thorax, abdomen, and legs covered with pale scales. Hind tibia with two pairs of spurs. Male and female genitalia characters discussed in species accounts and illustrated below (Figs 9–14).

Atomorpha falsaria (Alphéraky, 1892) (Figs 2–3, 9–11)

Atomophora falsaria Alphéraky, 1892: 66. Type locality: [China], Gan-Sou.

References. Viidalepp 1975: 486; Scoble 1999: 76 (*Atomorpha*).

Material. Lectotype (here designated) with the following labels: ♂ *Atomophora falsaria* Alphéraky, 1892, with labels: '24.VI. 1886 Edsin prov.| Gan-Sou | leg. Potanin' <green rectangle hand-written in black ink>, 'Кол. Вел. Кн. | Николая | Михайловича' [collection of Grand Duke Nikolay Mikhailovich] <white rectangle, printed>, LECTOTYPUS. | *Atomophora | falsaria* Alpheraky, 1892 | T. Trofimova design 2009' <red rectangle, printed>, ZISP. – Paralectotypes: 3 ♀ with the same data (ZISP). – Additional material. 11♂, 1♀ **Mongolia**, Southern-Gobi aimak, 60 km Eastern of brooks Talyn-Bilgah-Bulak, leg. M. Kozlov, 17.–19.viii.1969 (ZISP).

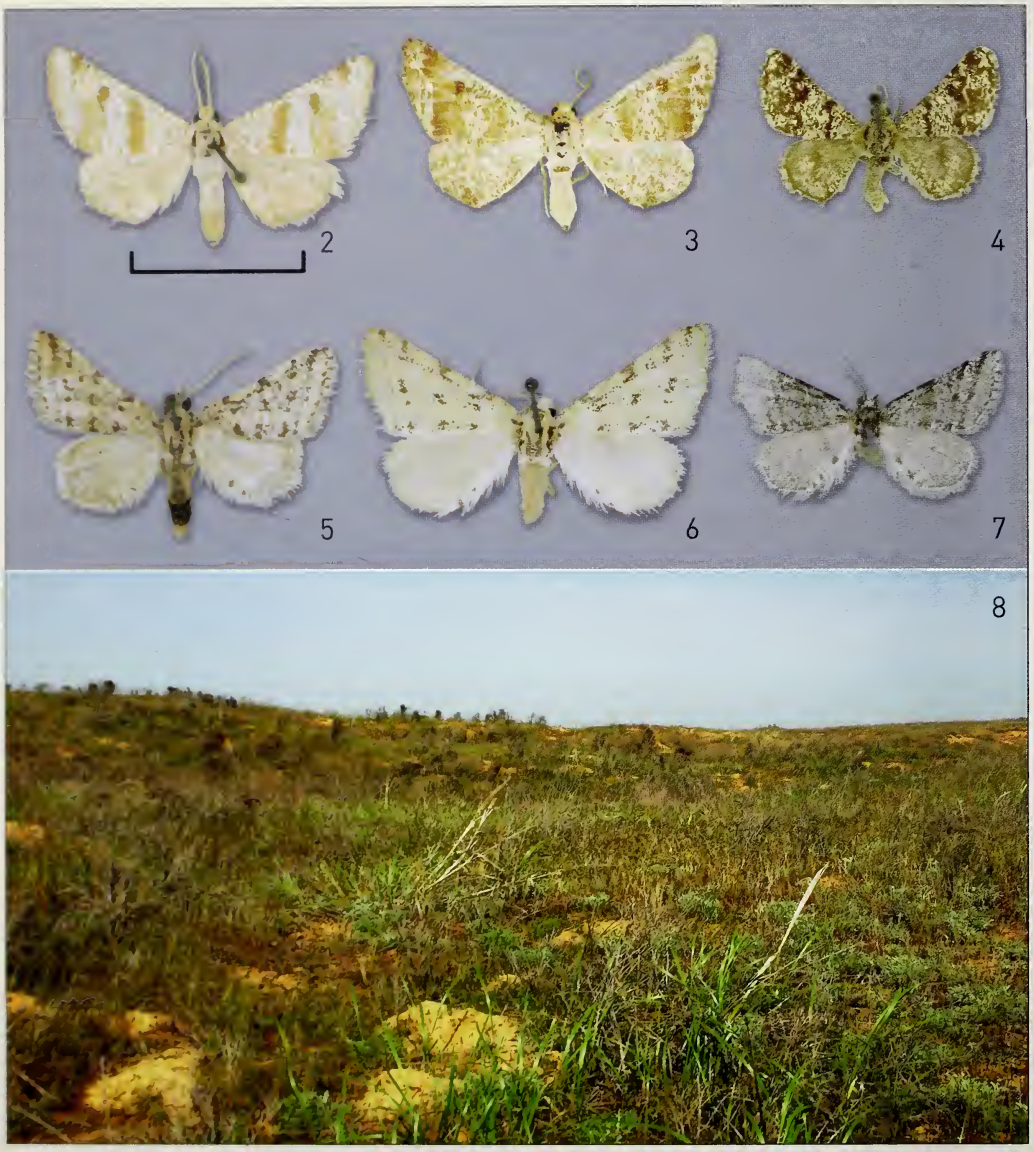
Redescription (Figs 2–3). Wingspan 20 mm in both sexes. Forewings triangular, with yellowish white ground color, irrorate by brown scales, fringe pale yellowish. Two straight transversal bands typical, submarginal one diffused in costal area and with large diffuse brown discal spot. Hindwing of same ground color, with scattered brown scales and fringe. Female somewhat darker and with same characters of wings colour and pattern. Head, thorax, abdomen, and legs covered with yellowish white scales.

Male genitalia (Figs 9–10). Tergum VIII strongly sclerotized, dome-shaped, covering genitalia structures (Figs 9c, d). Valva very characteristically shaped: with expanded sacculus curved by right angle to long cucullus, which is two times narrower than sacculus, dorsal edge ribbon, sclerotized, with slightly extended basal process. Uncus triangular, wide, gnathos triangular, taeniate, narrow apically, tegumen and vinculum wide, juxta ovate slightly sclerotized, phallus slender weakly curved, almost in 1.2 time shorter of valvae, vesica without cornuti.

Female genitalia (Fig. 11). Segment VIII cone-shaped, strongly sclerotized, anterior apophyses very short, rather rudimental. Papillae anales oval-shaped, posterior apophyses developed, antrum funnel-shaped with sclerotization, ductus bursae membraneous, corpus bursae ovate without signa.

Distribution and life history. The species occurs in China and Mongolia. The biology and immature stages are unknown.

Remarks. *Atomophora falsaria* Alphéraky, 1892, was described based on 1 male and 3 females: "Un ♂ et 3♀ de l'Atomophora Falsaria furent trouvés par l'expédition



Figs 2–8 *Atomorpha* Staudinger, 1901 (scale bar 10 mm). **2**. *A. falsaria* male, lectotype (ZISP). **3**. *A. falsaria* female, paralectotype (ZISP). **4**. *A. hedemanni hedemanni*, male, holotype (ZISP). **5**. *A. punctistrigaria* male, lectotype (ZISP). **6**. *A. punctistrigaria* (Christoph, 1893), female, paralectotype (ZISP). **7**. *A. punctistrigaria* from the Volgo-Ural sands (LSSU). **8**. Habitat of *A. punctistrigaria* in the Volgo-Ural sands.

Potanine, entre le 24 Juin et le 1 Juillet, 1886, dans la province de Gan-Sou."; they are preserved in ZISP. One male is designated here as lectotype in order to clarify the taxonomy of the species. The figures of the male genitalia structures (Figs 9–10) given here are from a preparation made by Viidalepp of a specimen from the Southern Gobi aimak of Mongolia (preparation K-213, Viidalepp det. in ZISP). They have been published already (Viidalepp 1975) and appended with a detailed description of the relative

sizes of some sclerites of the genitalia. The female genitalia of the paralectotype are in Euparal (Fig. 11).

Atomorpha hedemanni hedemanni (Christoph, 1885)

Fidonia hedemanni Christoph, 1885: 121. Type locality: [Turkmenistan], Askhabad.

References. Staudinger 1901: 282; Wiltshire 1986: 285; Viidalepp 1988: 217; 1996: 84; Scoble 1999: 76 (*Atomorpha*).

Material. Holotype ♂ *Fidonia hedemanni*, Christoph 1885, with the following labels: <green circle>, '♂ | Askha | bad' <white rectangle, hand-written in black ink> '92 | 10 v. 82 | Chr' <white rectangle, hand-written in black ink>, '104 / 6.' <white rectangle, hand-written in black ink>, 'Кол. б. Вел. Кн. | Николая Михайловича' [collection of Grand Duke Nikolay Mikhailovich] <white rectangle, printed> (ZISP). – Additional material. 3♂, 1♀ **Turkmenistan** Askhabad.

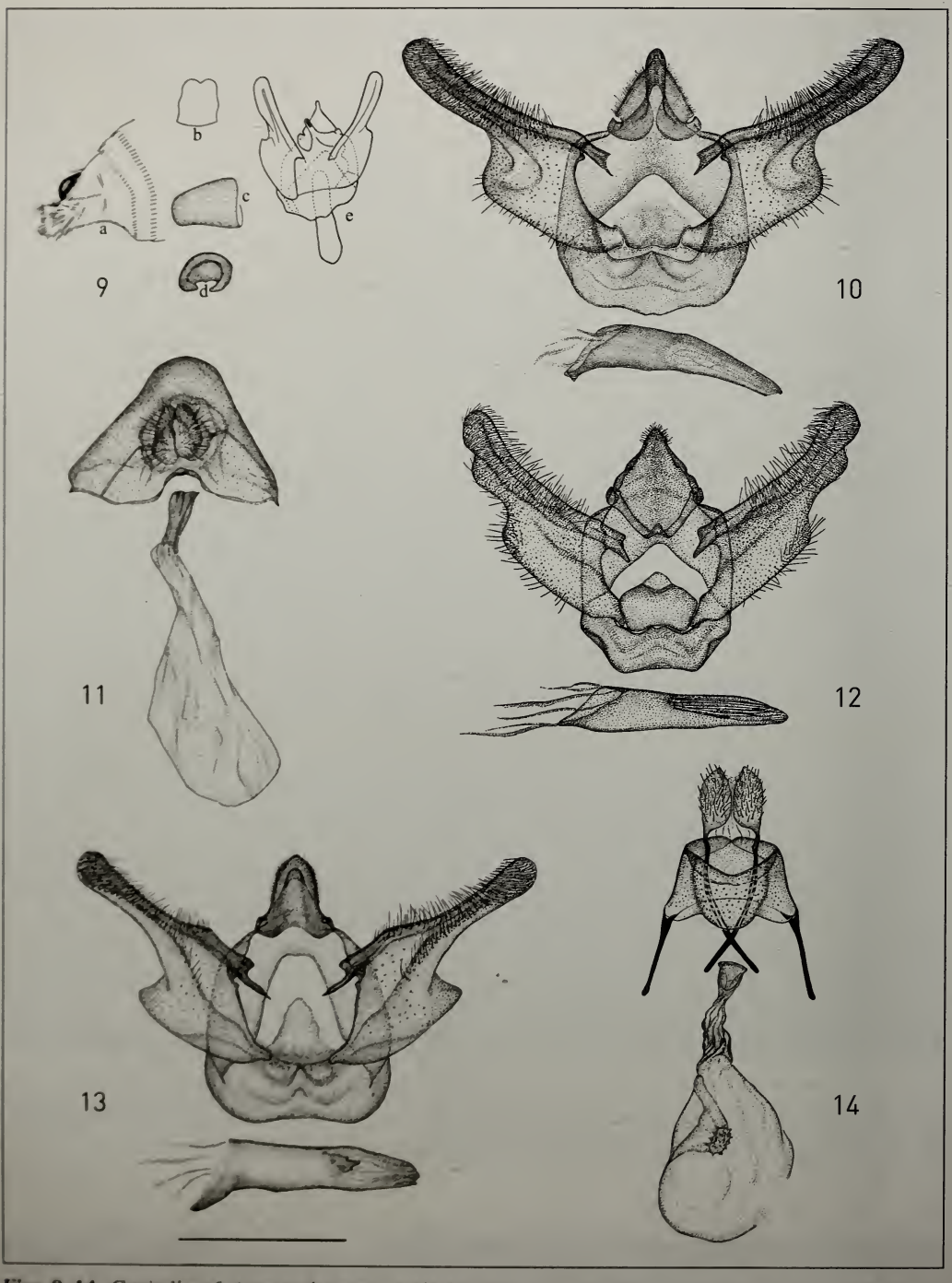
Redescription (Fig. 4). Wingspan 20 mm in both sexes. Head, body, and legs with brown scales, abdomen pale brown. Forewings with yellowish white ground color irrorated with streaks of brown scales, fringe variegated and consisting of white and brown scales. Forewings with 2 clear dark brown bands, marginal band zigzag, submarginal band almost straight but slightly curved towards costa, discal spot brown and merged with marginal band, marginal area consisting of separate brown spots. Hindwings with yellowish grey ground color densely irrorated with pale brown scales, with distinct marginal curved band and with slightly marked submarginal band.
Male genitalia (Fig. 12). Tergum VIII sclerotized, triangular. Sternum VIII strongly sclerotized as in *falsaria*, triangular, posteriorly concave. Valvula with two ventral lobes, cucullus exceeding valvula. Uncus triangular, wide. Gnathos arms conspicuously narrow. Tegumen and vinculum wide. Juxta trapezoid, weakly sclerotized. Phallus slender, straight almost long as long valva, vesica with 7 needle-shaped cornuti.
Female genitalia. Not examined.
Distribution and life history. This eremic species occurs in Turkmenistan, Uzbekistan, Iran, and Balutschistan. The life history and immature stages are unknown.
Remarks. Variable species in coloration of the fore- and hindwing. In Balutschistan and Iran it is known as form *hedemanni baloutschistana* Werhli, 1953. Subspecies *hedemanni khalia* was described by Wiltshire (1986) from Saudi Arabia and Southern Iran and differs from *baloutschistana* by the whiter ground colour of the wings and the less irrorated dark scales of the wings than in form *baloutschistana*. In the original description Wiltshire (1986) described that this subspecies has no significant genitalic differences from those of the nominotypical *hedemanni*.

Atomorpha punctistrigaria (Christoph, 1893) (Figs 5–7, 13–14)

Atomophora punctistrigaria Christoph, 1893: 95. Type locality: [Turkmenistan]. Askhabad.

References. Staudinger 1901: 282; Viidalepp 1988: 217; 1996: 84; Scoble 1999: 76 (*Atomorpha*).

Material. Lectotype (here designated) with the following labels: ♂ *Atomophora punctistrigaria* Christoph, 1893, with labels: <green circle>, '♂ | Askha | bad' <white rectangle with black frame, hand-written in black ink>, '104' <white rectangle with blue line, hand-written in black ink>, 'Кол. Вел. Кн. | Николая | Михайловича' [collection of Grand Duke Nikolay Mikhailovich]' <white rectangle, print-



Figs 9–14. Genitalia of *Atomorpha* spp. (scale bar 0,5 mm). **9.** Male terminalia of *A. falsaria* from Vitidalepp (1975), Mongolia. Southern-Gobi aimak (ZISP), **a.** abdomen male; **b.** sternum VIII; **c.** tergum VIII in lateral view; **d.** tergum VIII from behind; **e.** genitalia structure. **10.** Male genitalia of *A. falsaria*, phallus below; Mongolia, Southern-Gobi aimak (ZISP). **11.** Female genitalia of paralectotype *A. falsaria*, Gan-Sou (ZISP). **12.** Male genitalia of *A. hedemanni*, phallus below, Turkmenistan, Ashkhabad (ZISP). **13.** Male genitalia of paralectotype *A. punctistrigaria* phallus below; 'Askhabad' (ZISP). **14.** Female genitalia of paralectotype *A. punctistrigaria* 'Askhabad'(ZISP).

ed> 'Atomophora | punctistrigaria | Chr' <blue rectangle, hand-written in black ink>, 'LECTOTYPUS. | Atomophora | punctistrigaria | Christoph, 1893 | T. Trofimova design. 2009' <red rectangle, printed>, ZISP – Paralectotypes: 3♂, 3♀ with same data (ZISP). – Additional material. 1♂, 1♀ [**Kazakhstan**] Stepper, sands Malye Barsuki near Kara-Chokata, Turgai district, 1908.vii.22, leg. N.V. Andreev, (ZISP); 1♂, 30.v.2007, Kazakhstan, Atyrau district, N 48°28'35" E 51°18'46", leg. T. Trofimova & D. Shovkoon (LSSU); 1♂ [Turkmenistan], Repetek, 1988.v.12, leg. H. Ostrauskas (et coll. P.Skou).

Redescription (Figs 5–7). Wingspan 18 mm (male), 20 mm (female). Forewings triangular, from pale yellowish to pale grayish, irrorated with brown scales, fringe chequered as in *A. hedemanni*. Forewings with 4 almost straight bands consisting of separate greyish brown spots. Hindwings of same ground color, with separate spot on edge and indistinct grey submarginal band more visible on upper side. Head, thorax, abdomen, and legs covered with pale brown scales. Antennae ciliate in male and with very short pectination, rather filiform in female. Frons tapering, labial palpus protruding. Females with rather lighter tone of both wings with less clear bands on forewings.

Male genitalia (Fig. 13). Similar to those of *Atomorpha falsaria*. Valva with wider sacculus with pointed ventro-caudal angle, cucullus long and two times narrower than sacculus, caudally expanded, dorsal edge without basal bifurcation. Uncus and gnathos triangular. Vinculum and tegumen wide and rounded. Juxta triangular, lightly sclerotized, almost membranous. Phallus slender, with one dentate plate-like? cornutus.

Female genitalia (Fig. 14). Papillae anales disk-shaped, anterior and posterior apophyses developed, anterior apophysis 1.5 times shorter than posterior ones, antrum funnel-shaped with sclerotization, ductus bursae folded, anteriorly sclerotized, corpus bursae ovate with one disc-shaped, spinous signum.

Distribution and life history (Fig. 8). This psammophilous species is very rare in the hilly sands of Turkmenistan and Kazakhstan. The immature stages are unknown. Little is known on the bionomics. Viidalepp et al. (1992) mentioned that *A. punctistrigaria* occurs in 2 generations: the first in April–May and the second in October. Therefore in my opinion, this species can expand further northwest towards to the Volga delta where where the well-known (hilly-ridge fixed) Naryn sands are found.

Remarks. *Atomophora punctistrigaria* Christoph, 1893, was described based on 4 males and 3 females preserved in ZISP. One male is designated as lectotype. This species was mentioned in some publications (Viidalepp 1988; Viidalepp et al. 1992), but without detailed discussion and illustrations. It is mostly known from the very short and insufficient original description. Therefore, I am providing a redescription and figures here, including the type specimen and genitalia structures of male and female for the first time.

Acknowledgements

The author is very grateful to Dr Vladimir G. Mironov (St. Petersburg, Russia) for the help in identifying our material and for providing access to the collection of ZISP, to Dr Vadim V. Zolotuhin (Ulyanovsk, Russia) for his valuable comments on the manusript, to Mr Igor Yu. Kostjuk (Kiev, Ukraine) for information on specimens in collections of the Zoological Museum of Kiev State University and for providing rare literature sources, to Dr Axel Hausmann for information on the species in the collections of the Zoologische Staatssammlung (Munich, Germany), to Mr P. Skou who courteously provided materials from his collection, to Svetlana V. Nedoshivina (St. Petersburg, Russia) for providing rare literature sources, to Dmitriy

F. Shovkoon (Samara, Russia) for preparing the photos, and to Alexey S. Pazhenkov (Samara, Russia) for heading the expedition.

References

Alphéraky, S. 1892. Lépidoptères rapportés de la Chine et de la Mongolie par G.N. Potanine. II. Heterocera. – *In*: Romanoff, Mémoires. Lépidoptères **6**: 66–68.

Christoph, H. 1893. Lepidoptera Nova Faunae Palearcticae. – Deutsche entomologische Zeitschrift Iris **6** (1): 95.

Remm, H. & J. Viidalepp 1981. On the fauna of Heterocera of Yashan and Uzboi valley. – Gidrobiological investigations. Tallin **10**: 28–32. (in Russian)

Scoble, M. J. (ed.). 1999. Geometrid Moths of the World: A Catalogue (Lepidoptera, Geometridae). – CSIRO Publishing, Apollo Books, Stenstrup Vol. 1: xxv + 482 pp.

Staudinger, O. 1901. Catalog der Lepidopteren des palaearctischen Faunengebietes **1**. – Berlin, 282 pp.

Viidalepp, J. R. 1975. On the fauna of Geometrid moths (Lepidoptera, Geometridae) (Lepidoptera, Geometridae) of the Mongolian People's Republic. Pp. 438–490. – *In*: Insects of Mongolia, Leningrad. (in Russian).

Viidalepp, J. R. 1988. Fauna of Geometrid moths of the mountains of Middle Asia. – Moskow. 240 pp. (in Russian).

Viidalepp, J. R. 1996. Checklist of the Geometridae (Lepidoptera) of the former U.S.S.R. – Apollo Books, Stenstrup. 111 pp.

Viidalepp, J. R., G. A. Krassilnikova & M. A. Daritsheva 1992. Ecologo-faunistitsheskii obzor pyadenits (Lepidoptera, Geometridae) Turkmenii. – Ecologia i raspredelenie nasekomyh Turkmenistana [Ecology and distribution of Insects of Turkmenia], Ashkhabad: 89–152. (in Russian)

Wiltshire, E. P. 1986. Lepidoptera of Saudi Arabia: Fam. Cossidae, Sesiidae, Metarbelidae, Lasiocampidae, Sphingidae, Geometridae, Lymantriidae, Arctiidae, Nolidae, Noctuidae (Heterocera); Fam. Satyridae (Rhopalocera) (Part 5). – *In*: Büttiker & Krupp (eds.), Fauna of Saudi Arabia **8**: 262–323.