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## Six new species of *Athaumasta* Hampson, 1906 (Lepidoptera, Noctuidae, Bryophilinae) from the mountains of Kazakhstan, Russian Altai and Mongolia

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### Abstract

Six new species of the bryophiline genus *Athaumasta* Hampson, 1906 are described from the mountains of north-eastern and eastern Kazakhstan, Russian Altai and Western Mongolia: *A. dzhungarica* Volynkin & Saldaitis, **sp. nov.** (W Mongolia), *A. kurchuma* Volynkin & Titov, **sp. nov.** (E Kazakhstan), *A. arida* Volynkin & Saldaitis, **sp. nov.** (SE Russian Altai and W Mongolia), *A. etugen* Volynkin & Saldaitis, **sp. nov.** (W Mongolia), *A. tarbagata* Volynkin, Titov & Saldaitis, **sp. nov.** (E Kazakhstan) and *A. kuchinichi* Volynkin, Titov & Saldaitis, **sp. nov.** (NE Kazakhstan). The species status of new taxa is proved based on morphological and molecular data as well. The checklist of valid taxa of the genus is provided. Adults and genitalia of new and related species are illustrated. The habitats of the new and some related species are illustrated.

**Key words:** *Athaumasta*, new species, COI 5' sequences, Central Asia, Siberia, Kazakhstan, Altai, Mongolia..

### Introduction

The genus *Athaumasta* Hampson, 1906 is a noctuid genus of the subfamily Bryophilinae, distributed from Central Asia through mountains of South Siberia to the Korean Peninsula. The genus was long time considered to be a member of the subfamily Cucullinae (Poole 1989) and was transferred to Acronictinae by Kononenko *et al.* (1998). Later, it was transferred to Bryophilinae by Kononenko (2005). However, in the checklist of Palearctic genera of the subfamily Bryophilinae (Fibiger *et al.* 2009) the genus was missing. The primary data on Siberian taxa of the genus was provided by Kononenko (2005; 2016). The

taxonomy and morphology of the genus was discussed by Volynkin & Pekarsky (2016). Up to date, the genus included 13 valid species, some of which were described recently (Volynkin 2012; Volynkin & Pekarsky 2016; Pekarsky 2017; 2018; Volynkin & Gyulai 2018). Several additional taxa from Siberia and Mongolia await description (Kononenko 2016). Species of the genus are variable externally in their forewing coloration, and the male genitalia of species are noticeably variable in the width of a valva apex and length and the shape of harpe. It makes the genitalia structure little helpful, and molecular research is the best method to differentiate and determine species.

During our studies of the taxonomy of the genus *Athaumasta*, we compared COI 5' sequences of various morphologically different populations from Kazakhstan, Russian Altai and Mongolia. As a result, six unidentified species were recognized. Comparison of their COI 5' sequences and genitalia with those of known taxa of the genus proved their belonging to new, yet undescribed species. The species are described below as new.

## Material and methods

Abbreviations used: AFM = coll. Alessandro Floriani (Milan, Italy); ASV = coll. Aidas Saldaitis (Vilnius, Lithuania); CAV = coll. A.V. Volynkin (Barnaul, Russia); HT = holotype; NHMUK (formerly BMNH) = Natural History Museum, London (United Kingdom); MCK = coll. M. Černila (Kamnik, Slovenia); MDS = coll. M. Dvořák (Smrčná, Czech Republic); PGM = coll. Péter Gyulai (Miskolc, Hungary); PT = paratype; ST = syntype; STP = coll. S.V. Titov (Pavlodar, Kazakhstan); ZISP = Zoological Institute of Russian Academy of Sciences (St. Petersburg, Russia); ZMB = Museum für Naturkunde (Berlin, Germany).

Most COI 5' barcode sequences were obtained through sequencing at the Department of Zoology, Institute of Ecology and Earth Sciences (University of Tartu, Estonia) using standard methods (described by Ōunap et al. 2016; Saldaitis et al. 2018). Some other COI 5' barcodes were obtained through sequencing at the Canadian Centre for DNA Barcoding (CCDB, Guelph) (Table 1). The barcode sequences were compared using neighbor-joining trees constructed using the Kimura-2-Parameter distance model (Fig. 76).

*Athaumasta* Hampson, 1906

*Athaumasta* Hampson, 1906, *Catalogue of the Lepidoptera Phalaenae in the British Museum* 6: 380. A replacement name for *Thaumasta* Staudinger, 1871.

= *Thaumasta* Staudinger, 1871, *Catalog der Lepidopteren des europaischen Faunengebiets (Edn. 2)* 1871: 79, a junior homonym of *Thaumasta* Gistel, 1848 (Crustacea).

Type species: *Polia expressa* Lederer, 1855, by original designation.

**Diagnosis.** *Athaumasta* is closely related to the genera *Victrix* Staudinger, 1879 and *Bryophila* Treitschke, 1825, but its members are easily recognizable by their broader forewings with the characteristic pattern described below, which is rather uniform within the genus. Male antenna of typical *Athaumasta* is bipectinate, whereas in *Victrix* and *Bryophila* male antennae are ciliate. Only the *miltina* species-group has filiform antennae. The male genitalia of *Athaumasta* is also very similar to those of the genus *Bryophila* (subgenera *Bryophila* and *Moureia* Orfila & Rossi, 1956) and *Victrix* (subgenera *Rasihia* Koçak, 1989 and *Micromima* Matov, Fibiger & L. Ronkay, 2009), but the distal part of its uncus is dorso-ventrally flattened (uncus is evenly cylindrical in *Bryophila* and *Victrix*), and the valva strongly narrowed distally and pointed apically (that is broader and rounded distally in *Bryophila*, *Moureia* and *Micromima*). In the *miltina* species-group, the distal section of valva is slightly broadened with a rounded tip (similar to *Bryophila*, *Moureia* and *Micromima*), and the uncus is strongly broadened and swollen basally and medially, and the valva shape of all *Athaumasta* species is similar to that of *Victrix* (*Rasihia*), but the dorso-ventrally flattened tip of uncus is characteristic for the genus and can be considered as an autapomorphic feature. In addition, in *Athaumasta* the tip of uncus is blunted (like in *Moureia* and unlike *Bryophila*, *Rasihia* and *Micromima*, which have a pointed claw-like tip of uncus); the tip of harpe is pointed (that is rounded in *Bryophila* and *Micromima*; in *Moureia* that is pointed, but the harpe is longer and reaches the tip of valva); the aedeagus has no heavily sclerotized carinal plate (present in *Moureia*); the vesica is broadly saccate (that is narrowly tubular in *Bryophila* and much narrower in *Rasihia* and *Micromima*). In female genitalia of *Athaumasta*, the heavily sclerotized anterior section of ductus bursae is characteristic.

TABLE 1. *Athaumasta* COI 5' sequence vouchers.

Species	Locality	BOLD voucher	GenBank voucher
<i>A. dzhungarica</i> sp. n., HT	W Mongolia, Ovkhood-Ula Mt.		MN023167
<i>A. dzhungarica</i> sp. n., PT	W Mongolia, Ovkhood-Ula Mt.		MN023168
<i>A. dzhungarica</i> sp. n., PT	W Mongolia, Arshantyn-Nuruu Mts.	AVLEP068-11	
<i>A. golomto</i> , PT	W Mongolia, Mogojjn-Gol valley	AVLEP064-11	MH916810
<i>A. golomto</i> , PT	W Mongolia, Mogojjn-Gol valley	AVLEP067-11	MH916808
<i>A. golomto</i> , PT	W Mongolia, Adzh-Bogd-Uul Mts.	AVLEP069-11	MH916814
<i>A. golomto</i> , PT	W Mongolia, vic. of Mankhan		MN023166
<i>A. kurchuma</i> sp. n., HT	E Kazakhstan, vic. of Karatogai vill.		MN023154
<i>A. kurchuma</i> sp. n., PT	E Kazakhstan, vic. of Karatogai vill.		MN023155
<i>A. kurchuma</i> sp. n., PT	E Kazakhstan, Bukombai Mt. massif		MN023156
<i>A. pekarskyi</i> , PT	Russia, Altai Republic, vic. of Aktash vill.	AVLEP061-11	MH916809
<i>A. pekarskyi</i> , PT	Russia, Altai Republic, Kurai Steppe	AVLEP062-11	MH916812
<i>A. arida</i> sp. n., HT	Russia, Altai Republic, Chuya Steppe		MN023144
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe		MN023145
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe		MN023146
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe		MN023147
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe		MN023173
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe		MN023174
<i>A. arida</i> sp. n., PT	Russia, Altai Republic, Chuya Steppe	AVLEP074-11	
<i>A. arida</i> sp. n., PT	W Mongolia, Arshantyn-Nuruu Mts.		MN023150
<i>A. arida</i> sp. n., PT	W Mongolia, Hundijn-Gol river valley		MN023151
<i>A. etugen</i> sp. n., HT	W Mongolia, Hundijn-Gol river valley		MN023153
<i>A. etugen</i> sp. n., PT	W Mongolia, Hundijn-Gol river valley		MN023152
<i>A. argillacea</i> , PT	E Kazakhstan, Zaisan Valley, Kiin-Kirish	BC ZSM Lep 94108	
<i>A. argillacea</i> , PT	E Kazakhstan, Zaisan Valley, Kiin-Kirish	BC ZSM Lep 94109	
<i>A. tarbagata</i> sp. n., HT	E Kazakhstan, Tarbagatai Mts, Tasaryk		MN023163
<i>A. tarbagata</i> sp. n., PT	E Kazakhstan, Tarbagatai Mts, Tasaryk		MN023160
<i>A. tarbagata</i> sp. n., PT	E Kazakhstan, Tarbagatai Mts, Tasaryk		MN023161
<i>A. tarbagata</i> sp. n., PT	E Kazakhstan, Tarbagatai Mts, Tasaryk		MN023162
<i>A. tarbagata</i> sp. n., PT	E Kazakhstan, Tarbagatai Mts, Altynshoky		MN023164
<i>A. tarbagata</i> sp. n., PT	E Kazakhstan, Tarbagatai Mts, Altynshoky		MN023165
<i>A. kuchinichi</i> sp. n., HT	NE Kazakhstan, Bayanaul Mts., Toraygyr		MN023159
<i>A. kuchinichi</i> sp. n., PT	NE Kazakhstan, Bayanaul Mts., Toraygyr		MN023157
<i>A. kuchinichi</i> sp. n., PT	NE Kazakhstan, Bayanaul Mts., Toraygyr		MN023158
<i>A. expressa</i> , topotype	E Kazakhstan, vic. of Ust-Kamenogorsk	AVLEP070-11	
<i>A. expressa</i>	Russian Altai, vic. of Bely Bom vill.	AVLEP078-11	
<i>A. expressa</i>	Russian Altai, vic. of Aktash vill.	AVLEP071-11	
<i>A. expressa</i>	Russian Altai, vic. of Aktash vill.	AVLEP075-11	
<i>A. expressa</i>	Russian Altai, vic. of Aktash vill.	AVLEP076-11	
<i>A. expressa</i>	Russian Altai, vic. of Aktash vill.	AVLEP077-11	
<i>A. expressa</i>	Russian Altai, vic. of Aktash vill.		MN023169
<i>A. expressa</i>	Russian Altai, Kurai Steppe		MN023148
<i>A. expressa</i>	Russian Altai, Kurai Steppe		MN023149
<i>A. expressa</i>	Russian Altai, vic. of Cherga vill.	AVLEP073-11	
<i>A. expressa</i>	Russian Altai, Tigiretsky Ridge		MN023170

**Description. External morphology of adults.** Male antenna bipectinate (filiform in the *miltina* species-group), female antenna filiform. Head, thorax, patagia and tegulae orange from orange and ochreous to greyish green or brownish olive. Abdomen dark brown with ochreous scales. Forewing ground colour from orange and ochreous to greyish green or brownish olive, often irrorated with blackish or grey scales; wing pattern well developed (in the *pekarskyi* species-group may be diffuse); basal area as ground colour. Transverse lines double: subbasal, postmedial and subterminal lines blackish inwardly and whitish outwardly, antemedial line whitish inwardly and blackish outwardly; subbasal line dentate, antemedial line irregularly wavy, postmedial line S-shaped curved, dentate on veins, subterminal line sinuous, discontinuous; terminal line as row of black dots on veins. Reniform and orbicular stigmata as ground colour, with whitish margins edged by blackish scales along outer margin; claviform stigma as dark stroke, indistinct, sometimes absent. Cilia as ground colour with blackish spots on veins. Hindwing dark, greyish brown; discal spot as large dark grey; transverse line pale grayish brown; cilia grayish brown.

**Male genitalia.** Uncus moderately long, cylindrical basally and dorso-ventrally flattened distally, slightly

curved at base with blunted apex; tegumen relatively short, penicular lobes narrow and rounded; transtilla broad, obtuse apically; juxta ovate, broad, shield-like, with two short trigonal apical processes; valva elongated, moderately broad, strongly narrowed distally, with pointed apex, its width vary within species; costal margin of valva slightly convex, dorsal margin slightly constricted at middle; clasper moderately long, distally broadened, S-shaped; harpe long, finger- or claw-shaped, evenly curved or almost straight, narrowed distally, with pointed apex; width of its basal and medial sections vary within species. Aedeagus short, cylindrical, distally curved, with weakly scobinated carinal plate; vesica saccular, membranous, finely granulated, its basal part broad, globular, curved dorsally, with small plate-like cornutus in distal section (the *expressa*, *nana* and *miltina* species-groups) or without it (the *pekarskyi* and *splendida* species-groups); distal tube long and narrow. **Female genitalia.** Ovipositor short, broadly conical; papillae anales trapezoidal, with rounded edges; apophyses anteriores and posteriores of equal length, elongated and thin, as long as 8<sup>th</sup> abdominal segment; antrum broadly funnel-like, heavily sclerotized; ductus bursae as long as antrum or longer, its posterior section membranous, anterior section sclerotized; corpus bursae sack-like, membranous; appendix bursae situated postero-laterally, broadly conical.

### Check list of valid species of the genus *Athaumasta*

#### The *miltina* species-group

- *miltina* (Püngeler, 1902)
- *kyrkyza* Pekarsky, 2017
- *melyakhi* Pekarsky, 2017
- *lithoplasta* (Hampson, 1908)
- *kegena* Pekarsky, 2018

#### The *pekarskyi* species-group

- *dzhungarica* Volynkin & Saldaitis, **sp. nov.**
- *golomto* Volynkin & Gyulai, 2018
- *kurchuma* Volynkin & Titov, **sp. nov.**
- *pekarskyi* Volynkin, 2012

#### The *splendida* species-group

- *splendida* O. Bang-Haas 1927

#### The *expressa* species-group

- *arida* Volynkin & Saldaitis, **sp. nov.**
- *etugen* Volynkin & Saldaitis, **sp. nov.**
- *tarbagata* Volynkin, Titov & Saldaitis, **sp. nov.**
- *argillacea* Volynkin & Pekarsky, 2016
- *kuchinichi* Volynkin, Titov & Saldaitis, **sp. nov.**
- *expressa* (Lederer, 1855)
- *siderigera* (Christoph, 1893)

#### The *nana* species-group

- *nana* (Staudinger, 1896)
- *koreana* L. Ronkay & Kononenko, 1998

### Descriptions of new species

#### *Athaumasta dzhungarica* Volynkin & Saldaitis, **sp. nov.**

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(Figs 1–3, 46, 47, 70)

**Type material. Holotype** (Figs 1, 46): male, “26–27.V.2015, SW Mongolia, Khovd aimak, Dzhungarian Gobi, Uvkhod-ula (Ovkhood-Uul) Mt., 1250 m, 45°48’ N, 91°06’ E, Yakovlev R.V & Yakovlev A.R. leg.”, GenBank voucher MN023167, slide AV4919♂ (Coll. NHMUK).

**Paratypes.** 5 males, 1 female, same data as in the holotype, GenBank voucher MN023168, slide AV4921♂ (Coll. CAV); 6 males, 19.VII.2009, W. Mongolia, Hovd aimak, Bulgan-gol basin, Arshantyn-

Nuruu Mts., 1700 m, Yakovlev R.V. & Guskova E.V. leg., DNA voucher BOLD AVLEP068-11, slide AV0282♂ (Coll. CAV); 1 male, Mongolia, Hovd Ajmag, Arshantin Nuruu Mtns., 1730–2000 a.s.l., 14–16.V.2012, 46°22'08"N 91°13'52"E, Černila M., Yakovlev R.V., Nakonechny A.N. (Coll. MCK).

**Remark.** The specimens of *A. dzhungarica* were previously included into the type series of *A. golomto* (Volynkin & Gyulai 2018). However, comparison of their genitalia and COI 5' sequences with those of true *A. golomto* proved their belonging to another species.

**Diagnosis.** Forewing length 15–16 mm in males (15.5 mm in the holotype) and 15.5 mm in female. *Athaumasta dzhungarica* (Figs 1–3) is very similar externally to *A. golomto* (Figs 4–9), but its orbicular and reniform stigmata are opened to the costa (those are more or less distinctly encircled in *A. golomto*), and its reniform stigma is usually slightly broader in general than that of *A. golomto*. The correct identification is often possible by the genitalia structures only. In the male genitalia, *A. dzhungarica* (Figs 46, 47) can be easily distinguished by the absence of a subapical diverticulum of vesica, which is present in *A. golomto* (Figs 48, 49). In addition, the juxta of *A. dzhungarica* is slightly narrower than that of *A. golomto*. The female genitalia of *A. dzhungarica* (Fig. 70) differ from those of *A. golomto* (Fig. 71) by the broader antrum and the anteriorly broadened anterior sclerotized section of ductus bursae.

**Molecular data.** COI 5' sequences of three specimens of *A. dzhungarica* from two localities were compared with COI 5' sequences of four specimens of *A. golomto* from three localities, three specimens of *A. kurchuma* from two localities and two paratype specimens of *A. pekarskyi* from two localities. The infraspecific variation of COI 5' sequences of both, *A. dzhungarica* and *A. golomto* is 0.15%. The distance between the specimens of *A. dzhungarica* and the specimens of *A. golomto* is 1.54–1.86%; that between *A. dzhungarica* and *A. pekarskyi* is 1.86–2.02%; that between *A. dzhungarica* and *A. kurchuma* is 2.33–2.49%. The COI 5' sequences of *A. dzhungarica* are characterized by the combination of one character state unique for the genus, 619(C), and two character states unique for the species-group, 427(C) and 451(T). The COI 5' sequences of its closest relative *A. golomto* are characterized by the combination of two character states unique for the genus, 208(G) and 268(C), and four character states unique for the species-group, 22(G), 86(A), 385(T) and 542(C) (Table 2).

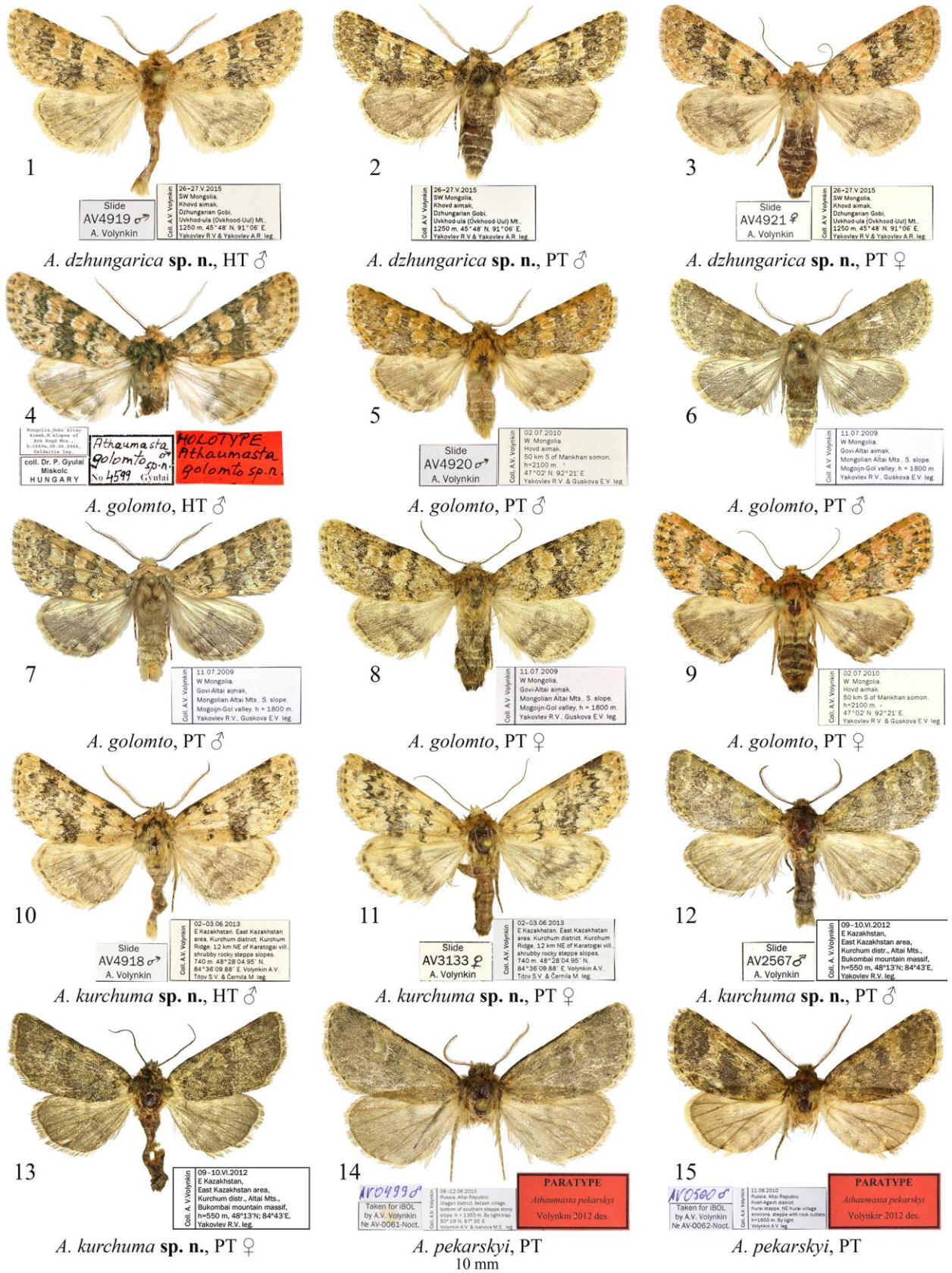
**TABLE 2.** Variable COI 5' characters among *Athaumasta pekarskyi* species-group: bold font character states highlighted in gray are unique to species within the genus; character states highlighted in gray are unique to species within the species-group; italicized character states are infraspecific polymorphisms.

	22	86	106	130	208	220	238	268	317	364	385	389	400	403	427	451	536	542	548	574	586	589	616	619
<i>A. golomto</i> PT (Adzh-Bogd-Uul) AVLEP069-11	G	A	T	A	<b>G</b>	C	T	<b>C</b>	G	C	T	G	C	C	T	C	T	C	T	T	T	T	T	T
<i>A. golomto</i> PT (Mogojin-Gol) AVLEP064-11	G	A	T	A	<b>G</b>	C	T	<b>C</b>	G	C	T	G	C	T	T	C	T	C	T	T	T	T	T	T
<i>A. golomto</i> PT (Mogojin-Gol) AVLEP067-11	G	A	T	A	<b>G</b>	C	T	<b>C</b>	G	C	T	G	C	T	T	C	T	C	T	T	T	T	T	T
<i>A. golomto</i> (Mankhan) (MN023166)	G	A	T	A	<b>G</b>	C	T	<b>C</b>	G	C	T	G	C	C	T	C	T	C	T	T	T	T	T	T
<i>A. dzhungarica</i> sp. n. HT (Ovkhood-Ula Mt) (MN023167)	A	G	T	A	A	C	T	T	G	T	C	G	C	T	<b>C</b>	<b>T</b>	<b>C</b>	T	T	T	T	T	T	<b>C</b>
<i>A. dzhungarica</i> sp. n. PT (Ovkhood-Ula Mt) (MN023168)	A	G	T	A	A	C	T	T	G	T	C	G	C	T	<b>C</b>	<b>T</b>	<b>C</b>	T	T	T	T	T	T	<b>C</b>
<i>A. dzhungarica</i> sp. n. PT (Arshantyn-Nuruu) AVLEP068-11	A	G	T	A	A	C	T	T	G	T	C	G	C	T	<b>C</b>	<b>T</b>	<b>C</b>	T	T	T	T	T	T	<b>C</b>
<i>A. pekarskyi</i> PT (Aktash) AVLEP061-11	A	G	T	G	A	T	<b>C</b>	T	<b>A</b>	T	C	G	T	C	T	C	T	T	C	T	C	C	T	T
<i>A. pekarskyi</i> PT (Kuraj) AVLEP062-11	A	G	T	G	A	T	<b>C</b>	T	<b>A</b>	T	C	G	T	C	T	C	T	T	C	T	C	C	T	T
<i>A. kurchuma</i> sp. n. HT (Kurchum Ridge) (MN023154)	A	G	<b>C</b>	G	A	T	T	T	G	C	C	<b>A</b>	T	C	T	C	T	T	C	<b>C</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>T</b>
<i>A. kurchuma</i> sp. n. PT (Kurchum Ridge) (MN023155)	A	G	<b>C</b>	G	A	T	T	T	G	C	C	<b>A</b>	T	C	T	C	T	T	C	<b>C</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>T</b>
<i>A. kurchuma</i> sp. n. PT (Bukombai) (MN023156)	A	G	<b>C</b>	G	A	T	T	T	G	C	C	<b>A</b>	T	C	T	C	T	T	C	<b>C</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>T</b>

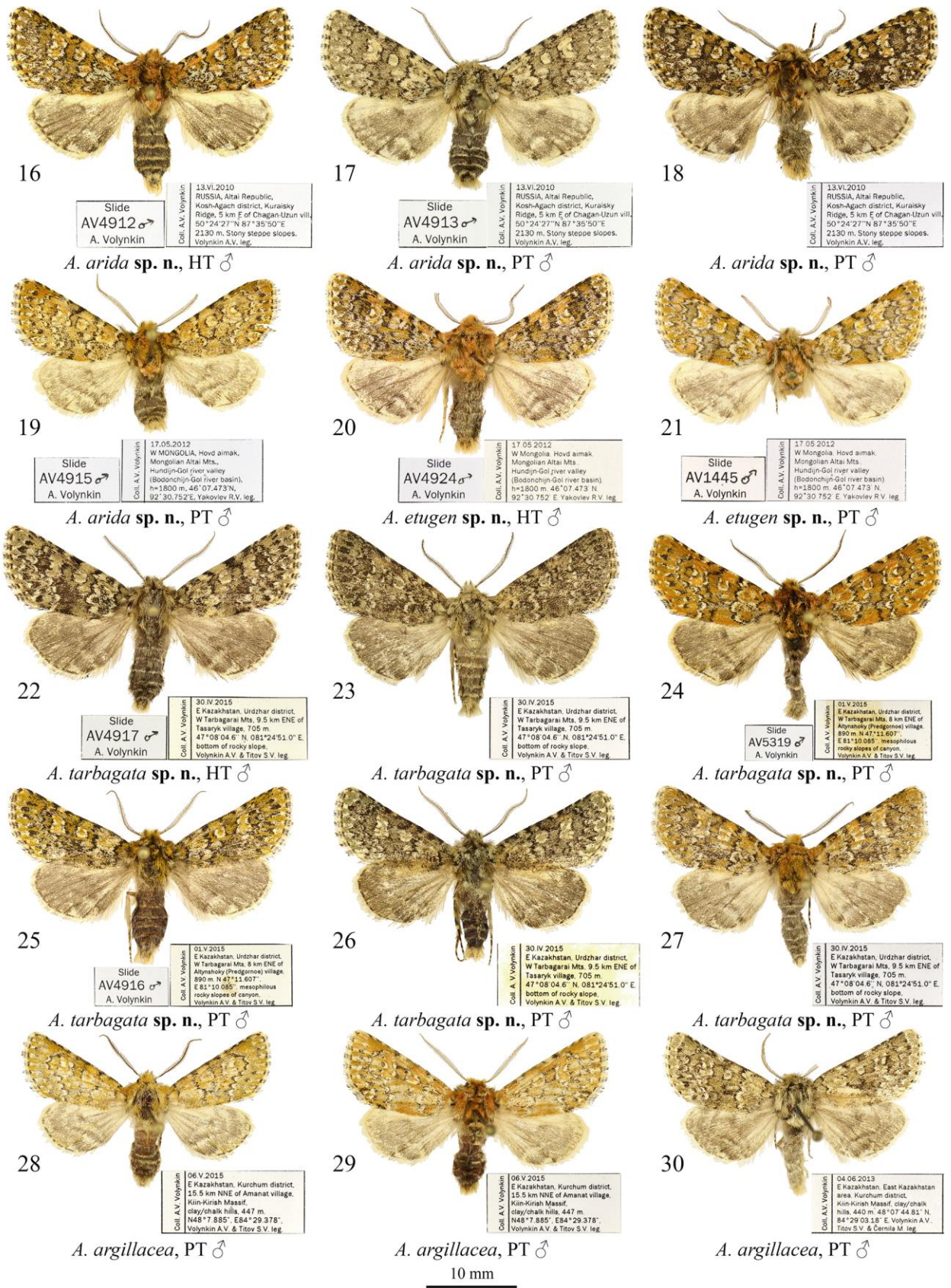
**Distribution.** *Athaumasta dzhungarica* is found in two small mountains massifs in the Dzhungarian Gobi in West Mongolia, whereas *A. golomto* is known from Mongolian and Chinese Altai and the Aj Bogd (or Adzh-Bogd-uul) mountain massif (Volynkin & Gyulai 2018).

**Etymology.** The species' name refers to the area of its distribution, Dzhungarian Gobi in West Mongolia.

SIX NEW SPECIES OF *ATHAUMASTA* KAZAKHSTAN, RUSSIAN ALTAI AND MONGOLIA

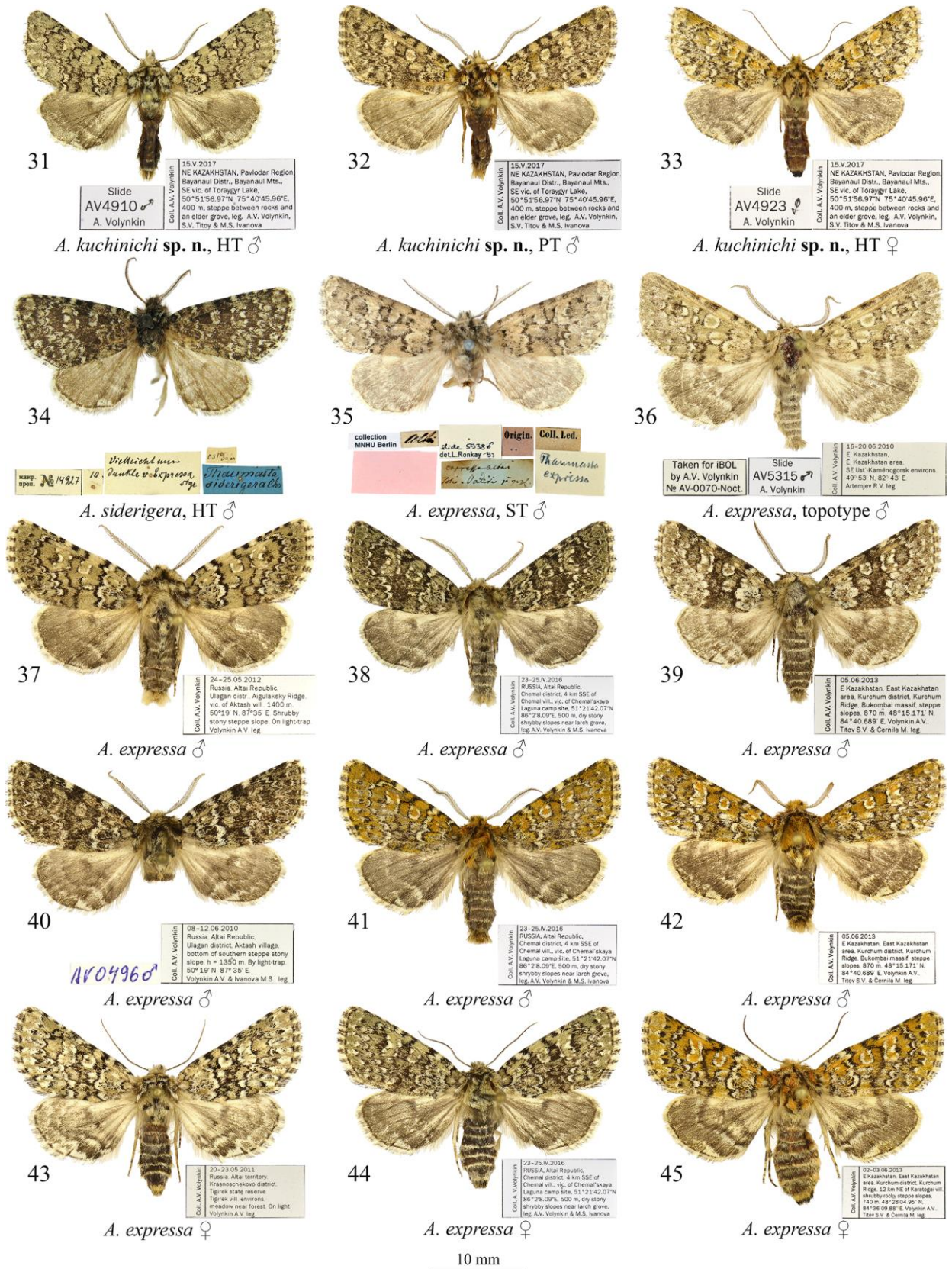


Figures 1–15. *Athaumasta pekarskyi* species-group: adults. 1, *A. dzhungarica*, HT male, W Mongolia (NHMUK); 2, *ditto*, PT male, W Mongolia (CAV); 3, *ditto*, PT female, W Mongolia (CAV); 4, *A. golomto*, HT male, W Mongolia (PGM); 5, *ditto*, PT male, W Mongolia (CAV); 6, *ditto*, PT male, W Mongolia (CAV); 7, *ditto*, PT male, W Mongolia (CAV); 8, *ditto*, PT female, W Mongolia (CAV); 9, *ditto*, PT female, W Mongolia (CAV); 10, *A. kurchuma*, HT male, E Kazakhstan (NHMUK); 11, *ditto*, PT female, E Kazakhstan (CAV); 12, *ditto*, PT male, E Kazakhstan (CAV); 13, *ditto*, PT female, E Kazakhstan (CAV); 14, *A. pekarskyi*, PT male, Russian Altai (CAV); 15, *ditto*, PT male, Russian Altai (CAV).



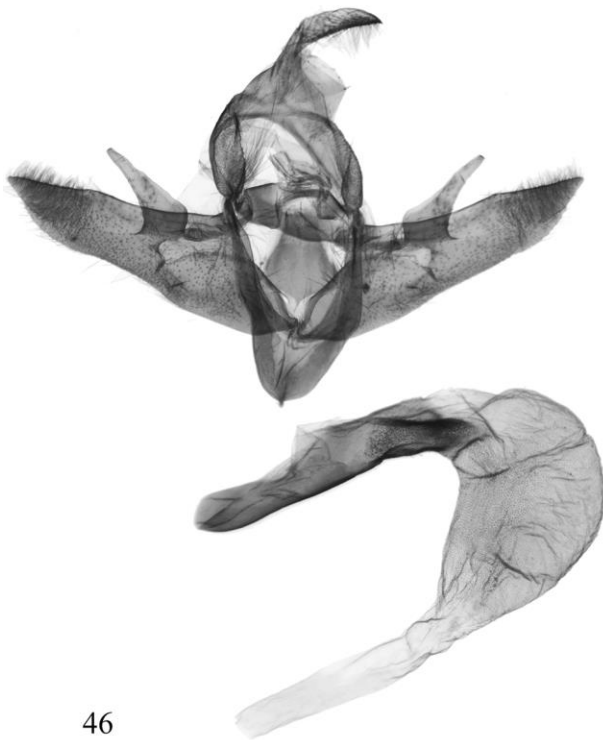
**Figures 16–30.** *Athaumasta expressa* species-group: adults. 16, *A. arida*, HT male, Russian Altai (NHMUK); 17, *ditto*, PT male, Russian Altai (CAV); 18, *ditto*, PT male, Russian Altai (CAV); 19, *ditto*, PT male, W Mongolia (CAV); 20, *A. etugen*, HT male, W Mongolia (NHMUK); 21, *ditto*, PT male, W Mongolia (CAV); 22, *A. tarbagata*, HT male, E Kazakhstan (NHMUK); 23, *ditto*, PT male, E Kazakhstan (CAV); 24, *ditto*, PT male, E Kazakhstan (CAV); 25, *ditto*, PT male, E Kazakhstan (CAV); 26, *ditto*, PT male, E Kazakhstan (CAV); 27, *ditto*, PT male, E Kazakhstan (CAV); 28, *A. argillacea*, PT male, E Kazakhstan (ZISP); 29, *ditto*, PT male, E Kazakhstan (CAV); 30, *ditto*, PT male, E Kazakhstan (CAV).

SIX NEW SPECIES OF *ATHAUMASTA* KAZAKHSTAN, RUSSIAN ALTAI AND MONGOLIA



**Figures 31–45.** *Athaumasta expressa* species-group: adults. 31, *A. kuchinichi*, HT male, NE Kazakhstan (NHMUK); 32, *ditto*, PT male, NE Kazakhstan (CAV); 33, *ditto*, PT female, NE Kazakhstan (CAV); 34, *A. siderigera*, HT male, East Sayan (ZISP) (photo by A. Matov); 35, *A. expressa*, ST male, E Kazakhstan (ZMB) (photo by G. & L. Ronkay); 36, *ditto*, topotype male, E Kazakhstan (CAV); 37, *ditto*, male, Russian Altai (CAV); 38, *ditto*, male, Russian Altai (CAV); 39, *ditto*, male, E Kazakhstan (CAV); 40, *ditto*, male, Russian Altai (CAV); 41, *ditto*, male, Russian Altai (CAV); 42, *ditto*, male, Russian Altai (CAV); 43, *ditto*, female, Russian Altai (CAV); 44, *ditto*, female, Russian Altai (CAV); 45, *ditto*, female, E Kazakhstan (CAV).

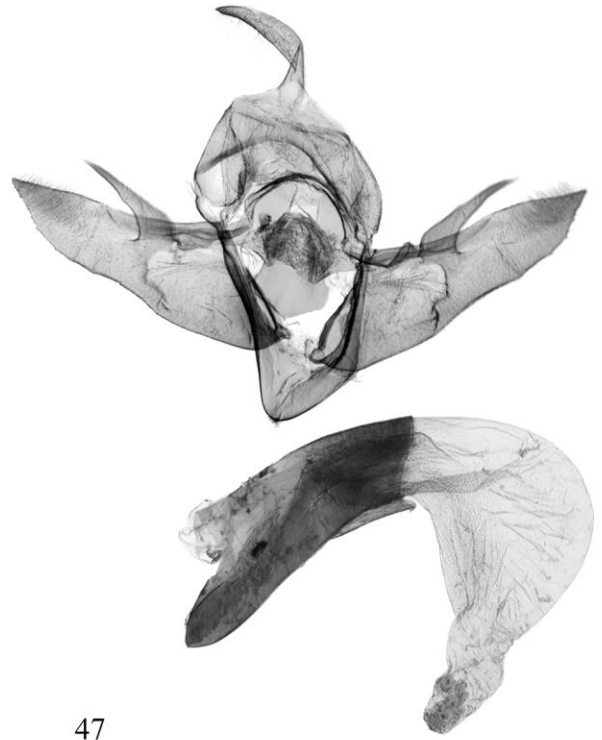




46

*A. dzhungarica* sp. n., HT

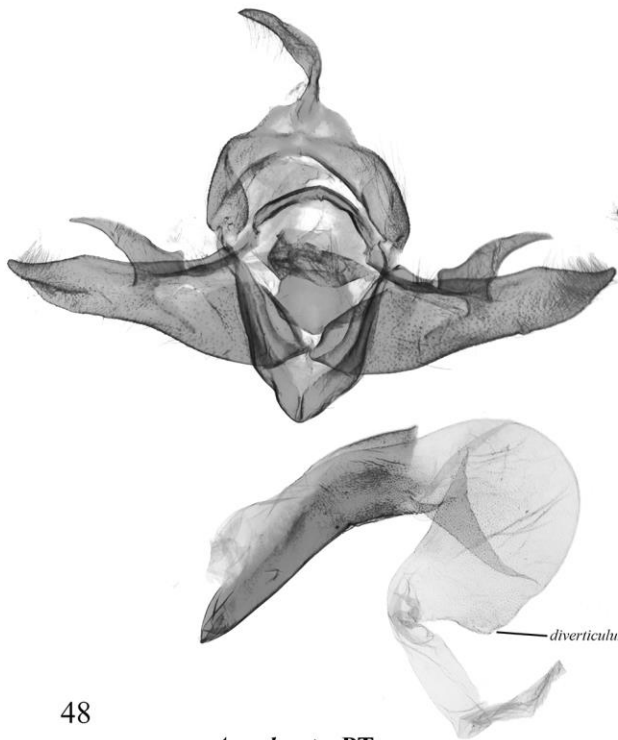
SW Mongolia, Dzhungarian Gobi, Uvkhod-Ula Mt., slide AV4919  
GenBank accession number MN023167



47

*A. dzhungarica* sp. n., PT

SW Mongolia, Dzhungarian Gobi, Arshantyn-Nuruu Mts., slide AV0282  
BOLD voucher AVLEP068-11



48

*A. golomto*, PT

SW Mongolia, Mongolian Altai Mts., slide AV0501  
BOLD voucher AVLEP064-11



49

*A. golomto*, PT

SW Mongolia, Hovd aimak, vic. of Mankhan, slide AV4920  
GenBank accession number MN023166

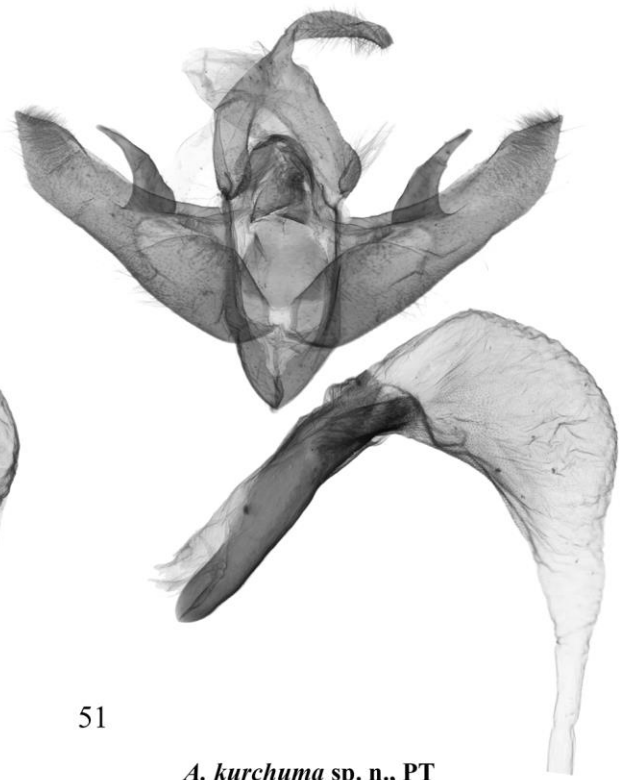
**Figures 46–49.** *Athaumasta* spp., male genitalia. 46, *A. dzhungarica*, HT, W Mongolia, slide AV4919 Volynkin; 47, *A. dzhungarica*, PT, W Mongolia, slide AV0282 Volynkin; 48, *A. golomto*, PT, W Mongolia, slide AV0501 Volynkin; 49, *A. golomto*, PT, W Mongolia, slide AV4920 Volynkin.



50

*A. kurchuma* sp. n., HT

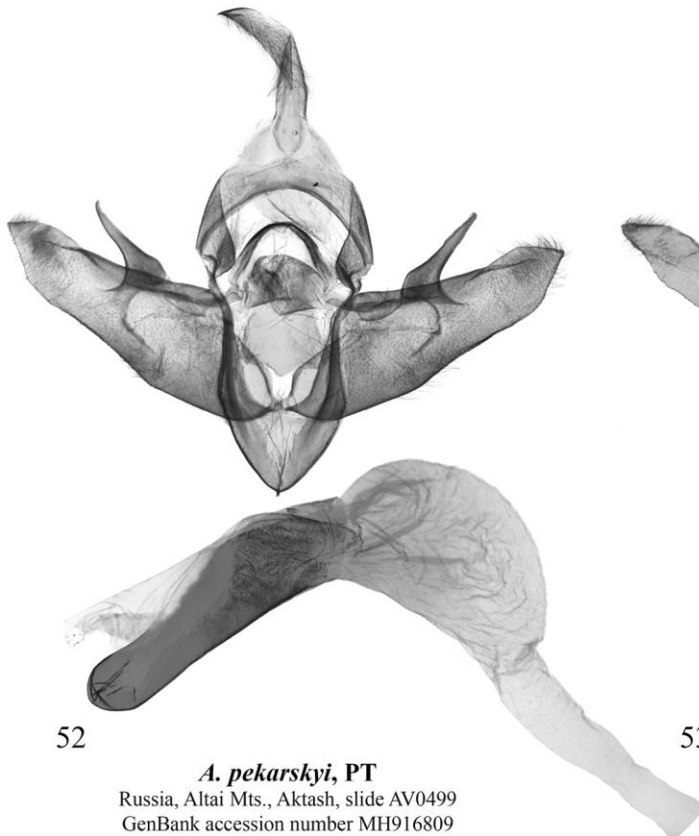
E Kazakhstan, Kurchum Range, Karatogai, slide AV4918  
GenBank accession number MN023154



51

*A. kurchuma* sp. n., PT

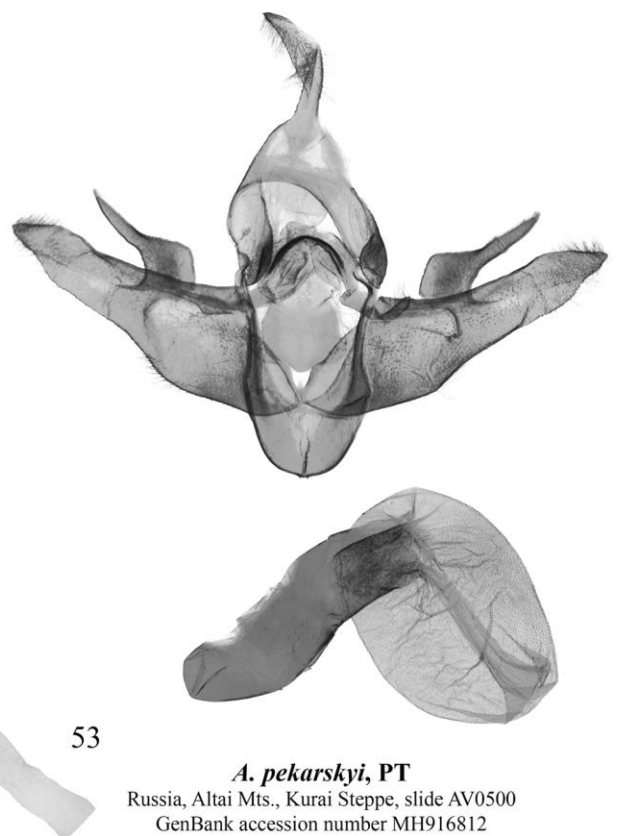
E Kazakhstan, Kurchum Range, Bukombai, slide AV5320  
GenBank accession number MN023156



52

*A. pekarskyi*, PT

Russia, Altai Mts., Aktash, slide AV0499  
GenBank accession number MH916809



53

*A. pekarskyi*, PT

Russia, Altai Mts., Kurai Steppe, slide AV0500  
GenBank accession number MH916812

**Figures 50–53.** *Athaumasta* spp., male genitalia. 50, *A. kurchuma*, HT, E Kazakhstan, slide AV4918 Volynkin; 51, *A. kurchuma*, PT, E Kazakhstan, slide AV5320 Volynkin; 52, *A. pekarskyi*, PT, Russian Altai, slide AV0499 Volynkin; 53, *A. pekarskyi*, PT, Russian Altai, slide AV0500 Volynkin.

***Athaumasta kurchuma*** Volynkin & Titov, **sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:4F79D9C7-0B84-4699-A8BB-B3D9405E910D>

(Figs 10–13, 50, 51, 72)

**Type material. Holotype** (Figs 10, 50): “02–03.VI.2013, E Kazakhstan, East Kazakhstan area, Kurchum district, Kurchum Ridge, 12 km NE of Karatogai vill., shrubby rocky steppe slopes, 740 m. 48°28′04.95” N, 84°36′09.88” E, Volynkin A.V., Titov S.V. & Černila M. leg.”, GenBank voucher MN023154, slide AV4918♂ Volynkin (Coll. NHMUK).

**Paratypes.** 6 males, 2 females, same data as in the holotype, GenBank voucher MN023155, slides AV0948♂ and AV3133♀ Volynkin (Colls CAV, MDS & MCK); 3 males, 1 females, 09–10.VI.2012, E Kazakhstan, Kurchum distr., Altai Mts., Bukombai mountain massif, h=550 m, 48°13′N; 84°43′E, Yakovlev R.V. leg., GenBank voucher MN023156, slides AV2568♀ and AV5320♂ Volynkin (Coll. CAV); 2 females, [E Kazakhstan], S. Altai, Bukhtarma [river] S W, Bil’schenarymskoje, 22.VI.1999., Leg. Churkin (Colls AFM & ASV); 2 males, 6.VI.2016, North-East Kazakhstan, Chernyi Irtysh valley, 10 km SW of Boran settl., 410 m. 47°57′ N, 85°04′ E, Gorbunov P. leg. (Coll. MDS); 1 male, 7.VI.2016, North-East Kazakhstan, SW Altai, Karazhalskie Mts., 14 km of Kokpety settl., 680 m. 48°50′ N, 82°13′ E, Gorbunov P. leg. (Coll. MDS).

**Remark.** The female of *A. kurchuma* was erroneously illustrated as *A. pekarskyi* by Volynkin & Gyulai (2018).

**Diagnosis.** Forewing length 14.5–15.5 mm in males (15.5 mm in the holotype) and 15–16.5 mm in females. *Athaumasta kurchuma* is a closest relative of *A. pekarskyi* distributed in southeastern Russian Altai and Tyva Republic (Volynkin 2012; Kononenko 2016). The new species (Figs 10–13) differs externally from *A. pekarskyi* (Figs 14, 15) by its less convex anal margin of forewing with less oblique tornus. The male genitalia of both species are similar (Figs 50–53), but in *A. kurchuma* the basal part of uncus is less massive, the vinculum is slightly shorter, the distal section of valva is longer, and the harpe is broader medially. The female genitalia of *A. kurchuma* (Fig. 72) differ from those of *A. pekarskyi* (Fig. 73) by their longer antrum, broader anterior sclerotized anterior section of ductus bursae, and broader corpus bursae.

**Molecular data.** COI 5’ sequences of three specimens of *A. kurchuma* from two localities were compared with COI 5’ sequences of two paratype specimens of *A. pekarskyi* from two localities, four specimens of *A. golomto* from three localities and three specimens of *A. dzhungarica* from two localities. The infraspecific variation of COI 5’ sequences of both, *A. kurchuma* and *A. pekarskyi* is 0%. The distance between the specimens of *A. kurchuma* and the specimens of *A. pekarskyi* is 1.08%; that between *A. kurchuma* and *A. golomto* is 2.49–2.65%; that between *A. kurchuma* and *A. dzhungarica* is 2.33–2.49%. Despite the relatively small distance between the COI 5’ sequences of *A. kurchuma* and *A. pekarskyi*, both species are characterized by unique combinations of character states. The COI 5’ sequences of *A. kurchuma* are characterized by the combination of two character states unique for the genus, 106(C) and 389(A), and two character states unique for the species-group: 574(C) and 616(C). The COI 5’ sequences of its closest relative *A. pekarskyi* are characterized by the combination of one character state unique for the genus, 317(A), and one character state unique for the species-group, 238(C). In addition, the COI 5’ sequences of *A. kurchuma* differ from those of *A. pekarskyi* by the character state 364: (C) in *A. kurchuma* and (T) in *A. pekarskyi* (Table 2).

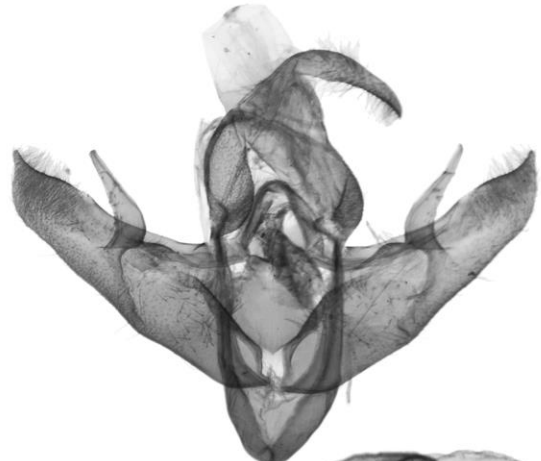
**Distribution and bionomics.** The species is found in the foothills of Kurchum Ridge (East Kazakhstan). *Athaumasta kurchuma* inhabits stony steppe slopes at low elevations (550–740 m) (Fig. 77).

**Etymology.** The species’ name refers to its type locality, Kurchum Ridge in East Kazakhstan.



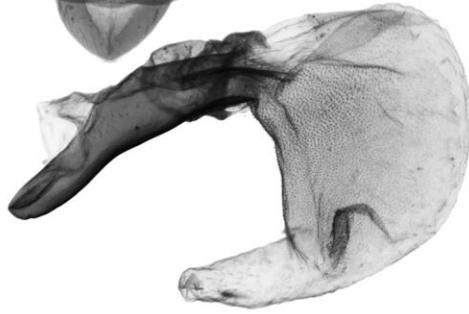
54

*A. arida* sp. n., HT  
Russia, Altai Mts., Chuya Steppe, slide AV4912  
GenBank accession number MN023144



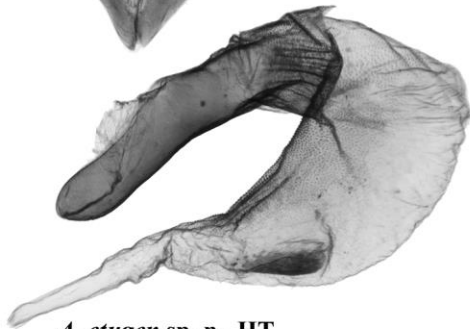
55

*A. arida* sp. n., PT  
W Mongolia, Hovd Aimak, Hundijn-Gol river, slide AV4915  
GenBank accession number MN023151



56

*A. etugen* sp. n., HT  
W Mongolia, Hovd Aimak, Hundijn-Gol river, slide AV4924  
GenBank accession number MN023153



57

*A. etugen* sp. n., PT  
W Mongolia, Hovd Aimak, Hundijn-Gol river, slide AV1445  
GenBank accession number MN023152



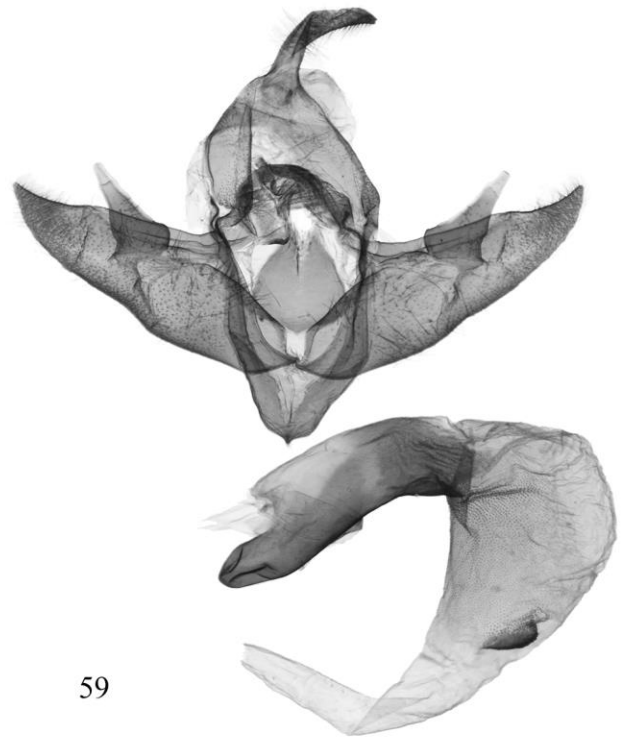
**Figures 54–57.** *Athaumasta* spp., male genitalia. 54, *A. arida*, HT, Russian Altai, slide AV4912 Volynkin; 55, *A. arida*, PT, W Mongolia, slide AV4915 Volynkin; 56, *A. etugen*, HT, W Mongolia, slide AV4924 Volynkin; 57, *A. etugen*, PT, W Mongolia, slide AV1445 Volynkin.



58

*A. tarbagata* sp. n., HT

E Kazakhstan, Tarbagatai Mts., near Tasaryk, slide AV4917  
GenBank accession number MN023163



59

*A. tarbagata* sp. n., PT

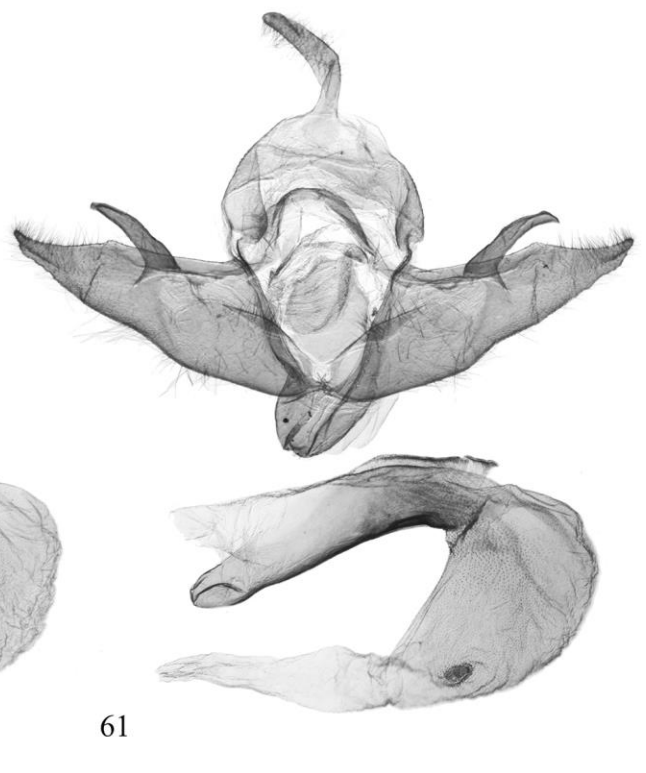
E Kazakhstan, Tarbagatai Mts., near Altynshoky, slide AV5319  
GenBank accession number MN023164



60

*A. argillacea*, HT

E Kazakhstan, Zaisan Valley, slide AV1467

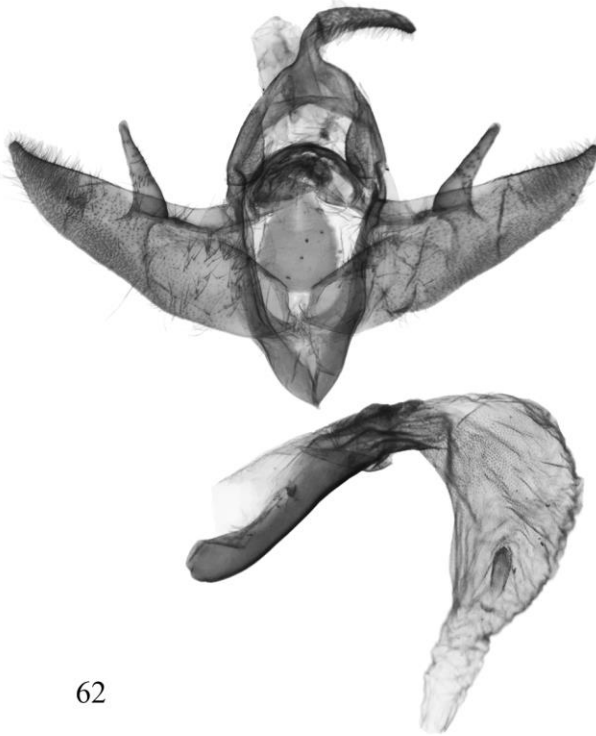


61

*A. argillacea*, PT

E Kazakhstan, Zaisan Valley, slide AV1466

**Figures 58–61.** *Athaumasta* spp., male genitalia. 58, *A. tarbagata*, HT, E Kazakhstan, slide AV4917 Volynkin; 59, *A. tarbagata*, PT, E Kazakhstan, slide AV5319 Volynkin; 60, *A. argillacea*, HT, E Kazakhstan, slide AV1467 Volynkin; 61, *A. argillacea*, PT, E Kazakhstan, slide AV1466 Volynkin.



62

*A. kuchinichi* sp. n., HT

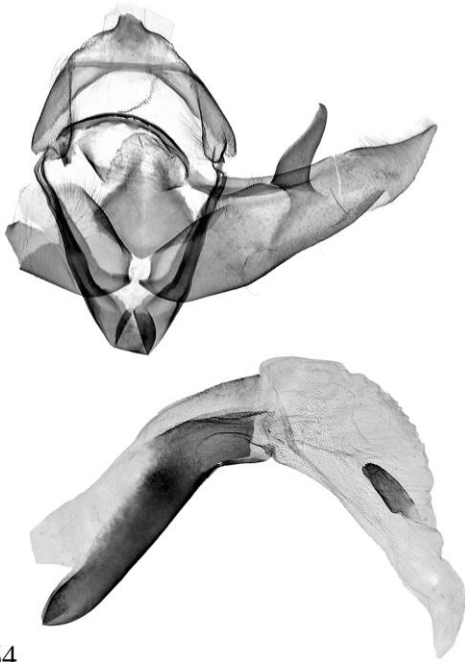
NE Kazakhstan, Bayanaul Mts, Toraygyr Lake, slide AV4910  
GenBank accession number MN023159



63

*A. kuchinichi* sp. n., PT

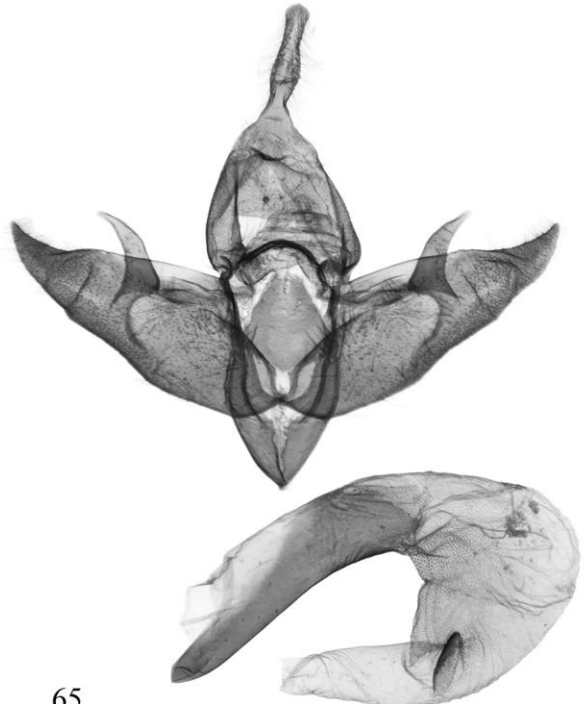
NE Kazakhstan, Bayanaul Mts, Toraygyr Lake, slide AV4911  
GenBank accession number MN023157



64

*A. expressa*, ST

E Kazakhstan, Altai Mts., slide RL5938

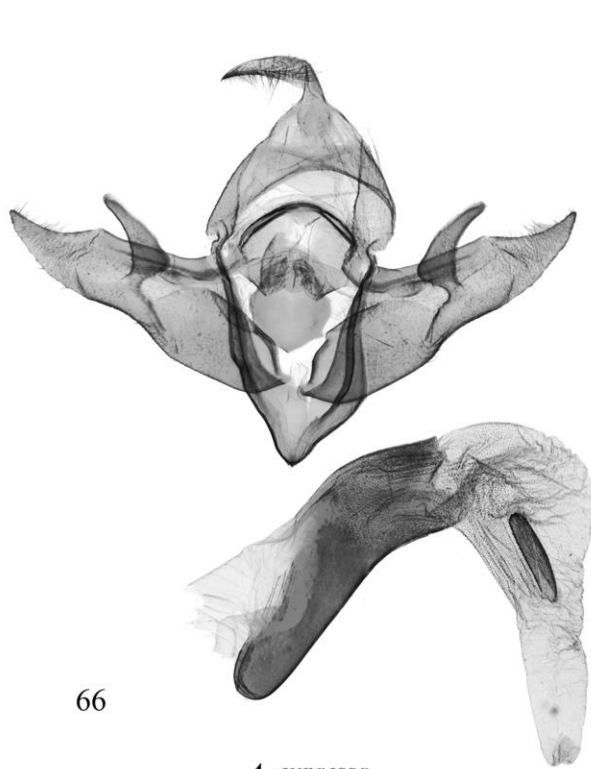


65

*A. expressa*, topotype

E Kazakhstan, vic. of Ust-Kamenogorsk, slide AV5315  
BOLD voucher AVLEP70-11

**Figures 62–65.** *Athaumasta* spp., male genitalia. 62, *A. kuchinichi*, HT, NE Kazakhstan, slide AV4910 Volynkin; 63, *A. kuchinichi*, PT, NE Kazakhstan, slide AV4911 Volynkin; 64, *A. expressa*, ST, E Kazakhstan, slide RL5938 Ronkay (photo by G. & L. Ronkay); 65, *A. expressa*, topotype, E Kazakhstan, slide AV5315 Volynkin.



66

*A. expressa*

C Russian Altai, Belyi Bom vill., slide AV0497  
BOLD voucher AVLEP078-11



67

*A. expressa*

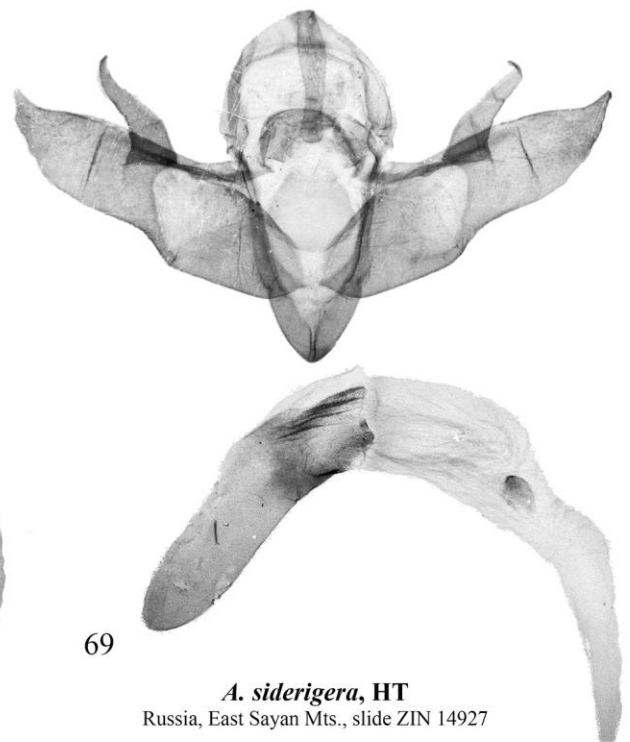
SE Russian Altai, Aktash vill., slide AV5316



68

*A. expressa*

SE Russian Altai, Aktash vill., slide AV0642  
BOLD voucher AVLEP076-11

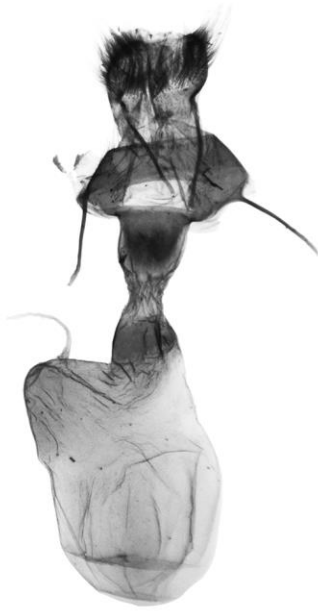


69

*A. siderigera*, HT

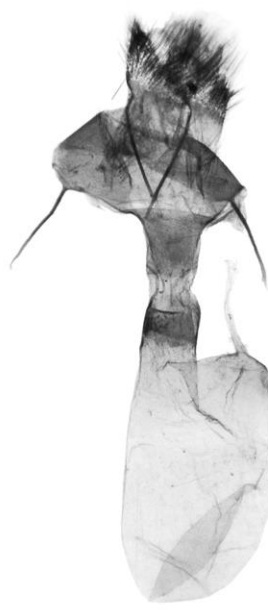
Russia, East Sayan Mts., slide ZIN 14927

**Figures 66–69.** *Athaumasta* spp., male genitalia. 66, *A. expressa*, Russian Altai, slide AV0497 Volynkin; 67, *A. expressa*, Russian Altai, slide AV5316 Volynkin; 68, *A. expressa*, Russian Altai, slide AV0642 Volynkin; 69, *A. siderigera*, HT, Russia, East Sayan, slide ZIN 14927 (photo by A. Matov).



70

*A. dzhungarica* sp. n., PT  
SW Mongolia, Khovd aimak,  
slide AV4921



71

*A. golomto*, PT  
SW Mongolia, Govi-Altai aimak,  
slide AV2569



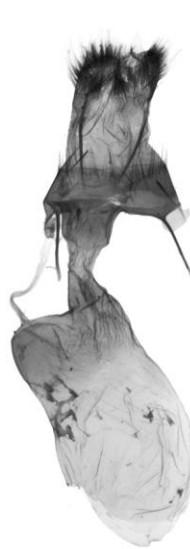
72

*A. kurchuma* sp. n., PT  
E Kazakhstan, Kurchum Ridge,  
slide AV3133



73

*A. pekarskyi*  
Russia, Tyva Republic,  
slide 050698/3 VK



74

*A. kuchinichi* sp. n., PT  
NE Kazakhstan, Bayanaul Mts.,  
slide AV4923



75

*A. expressa*  
W Russian Altai Mts., Tigireksky Ridge,  
slide AV4922

**Figures 70–75.** *Athaumasta* spp., female genitalia. 70, *A. dzhungarica*, PT, W Mongolia, slide AV4921 Volynkin; 71, *A. golomto*, PT, W Mongolia, slide AV2569 Volynkin; 72, *A. kurchuma*, PT, E Kazakhstan, slide AV3133 Volynkin; 73, *A. pekarskyi*, Russia, Tyva Rep., slide 050698/3 VK Kononenko (photo by V.S. Kononenko); 74, *A. kuchinichi*, PT, NE Kazakhstan, slide AV4923 Volynkin; 75, *A. expressa*, Russian Altai, slide AV4922 Volynkin.



***Athaumasta arida* Volynkin & Saldaitis, sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:CDE0C4E5-F009-4F8F-B201-7347185C72CE>

(Figs 16–19, 54, 55)

**Type material. Holotype** (Figs 16, 54): male, “13.VI.2010, Russia, Altai Republic, Kosh-Agach district, Kuraisky Ridge, 5 km E of Chagan-Uzun village, 50°24'27" N, 87°35'50" E. 2130 m. Volynkin A.V. leg.”, GenBank voucher MN023144, slide AV4912♂ Volynkin (Coll. NHMUK).

**Paratypes.** 11 males, same data as in the holotype, GenBank vouchers MN023145, MN023146, MN023147, MN023173, MN023174 & BOLD voucher AVLEP074-11, slide AV4913♂ Volynkin; 4 males, same locality, but 1.VI.2009, A.V. Volynkin & M.S. Ivanova leg. (Coll. CAV); 2 males, same locality, but 3–5.VI.2008, R.V. Yakovlev leg. (Coll. CAV); 1 male, 13.VII.2009, Russia, Altai Republic, Kosh-Agach distr., 15 km NE of Tashanta village, Chuya steppe, Zhalpakkoby hole, valley of Yustyt riv., left bank of Yustyt riv., steppe. h = 2300 m. By light. Volynkin A.V., Černila M., Nakonechnyi A.N. leg. (Coll. CAV); 2 males, 17.V.2012, W Mongolia, Hovd aimak, Mongolian Altai Mts., Hundijn-Gol river valley (Bodonchijn-Gol river basin), h=1800 m, 46°07.473' N, 92°30.752' E, Yakovlev R.V. leg., GenBank voucher MN023151, slides AV4915♂, AV5318♂ Volynkin (Coll. CAV); 1 male, 15–16.05.2012, W Mongolia, Hovd aimak, Dzhungarian Gobi, Arshantyn-Nuruu Ridge, h=1700–2100 m, 46°22' N, 91°15' E, Yakovlev R.V. leg., GenBank voucher MN023150, slide AV4914♂ Volynkin (Coll. CAV); 2 males, 07.VI.2009, Altai Republic, Kosh-Agach district, Chagan Uzun, Krasnaja Gorka, 1 800 m. 50°05' N, 88°24' E, Nakonechny A. leg. (Coll. MDS); 2 males, Mongolia, Hovd Ajmag, Arshantin Nuruu Mtns., 1730–2000 a.s.l., 14–16.V.2012, 46°22'08" N 91°13'52" E, Černila M., Yakovlev R.V., Nakonechny A.N. (Coll. MCK); 3 males, Mongolia, Hovd Ajmag, Mongol Altai, r. Bodonchiin Gol, 1720m a.s.l., 18.V.2012, 46°07'28" N 92°30'45" E, Černila M., Yakovlev R.V., Nakonechny A.N. (Coll. MCK).

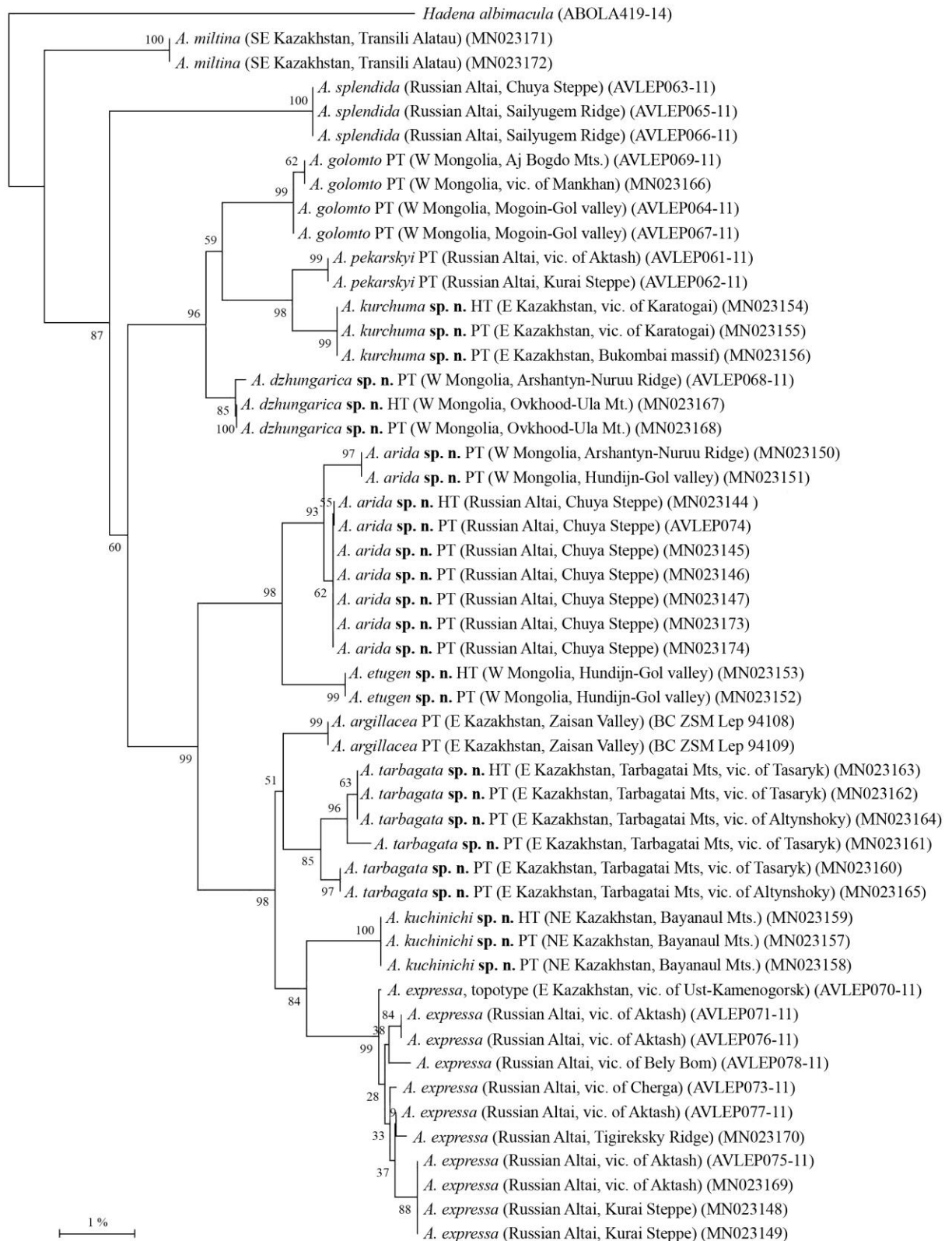
**Diagnosis.** Forewing length 13.5–15 mm in males (14.5 mm in the holotype). Specimens from Mongolia (Fig. 19) are slightly smaller in size than those from the Russian Altai (Figs 16–18). *Athaumasta arida* (Figs 16–19) is very similar externally to *A. expressa* (Figs 35–45) and can be distinguished by the genitalia structures only. In the male genitalia, *A. arida* (Figs 54, 55) differs from *A. expressa* (Figs 64–68) by its longer harpe, slightly longer valva with more massive distal section, and smaller cornutus in vesica. Compared to those of *A. kuchinichi* (Figs 62, 62), the male genitalia of *A. arida* have longer harpe and slightly broader vesica. The male genitalia of *A. arida* are also similar to those of *A. siderigera* (Fig. 69), but the vinculum is more robust, the ventral margin of valva is less convex, the harpe is slightly shorter, and the vesica is much broader. The moths of *A. arida* (Figs 16–19) differ clearly from *A. siderigera* (Fig. 34) by their more robust body and orange or olive green forewing ground color (that is blackish in *A. siderigera*).

Female unknown.

**Molecular data.** COI 5' sequences of nine specimens of *A. arida* from three localities were compared with COI 5' sequences of eleven specimens of *A. expressa* from six localities, three specimens of *A. kuchinichi* from one locality, six specimens of *A. tarbagata* from two localities and two paratype specimens of *A. argillacea* from one locality. The infraspecific variation of COI 5' sequences of *A. arida* is 0.00–0.62%; that of *A. expressa* is 0.00–0.77%. The distance between specimens of *A. arida* and *A. expressa* is 4.11–4.99%; that between *A. arida* and *A. kuchinichi* is 3.78–4.15%; that between *A. arida* and *A. argillacea* 3.62–3.98%; that between *A. arida* and *A. tarbagata* is 3.86–4.65%. The COI 5' sequences of *A. arida* are characterized by the combination of two character states unique for the genus, 19(C) and 87(A), and a character state unique for the species-group, 274(T) (Table 3).

**Distribution.** The species is widespread from the Chuya Steppe in the southeastern Russian Altai to the southern part of Mongolian Altai. It inhabits dry stony steppe slopes and semi-deserts at medium altitudes (1700–2300m) (Figs 78, 79).

**Etymology.** The species' name refers to its habitat in dry biotopes.



**Figure 76.** Neighbour-joining tree of COI (658bp) partial gene sequences of *Athaumasta* spp., with *Hadena albimacula* as an outgroup.

***Athaumasta etugen* Volynkin & Saldaitis, sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:8E5B6C53-5FA1-4B1A-8348-2743F3AF757C>  
(Figs 20, 21, 56, 57)

**Type material. Holotype** (Figs 20, 56): male, “17.V.2012, W Mongolia, Hovd aimak, Mongolian Altai Mts., Hundijn-Gol river valley (Bodonchijn-Gol river basin), h=1800 m, 46°07.473' N, 92°30.752' E, Yakovlev R.V. leg.”, GenBank voucher MN023153, slide AV4924♂ (Coll. NHMUK).

**Paratype.** 1 male, same data as in the holotype, GenBank voucher MN023152, slide AV1445♂ Volynkin (Coll. CAV).

**Diagnosis.** Forewing length 14–15 mm in males (15 mm in the holotype). *Athaumasta etugen* is a closest relative of *A. arida*. Externally, *A. etugen* (Figs 20, 21) differs from Mongolian specimens of *A. arida* (Fig. 19) by the broader forewing with less oblique tornus. The male genitalia of *A. etugen* (Figs 56, 57) differ clearly from those of *A. arida* (Figs 54, 55) by the much broader harpe with convex outer margin, the more convex ventral margin of valva, the longer broad section of vesica and the larger cornutus. Female unknown.

**Molecular data.** COI 5' sequences of both specimens of *A. etugen* were compared with nine specimens of *A. arida* from three localities (including one sympatric specimen) and specimens of *A. expressa*, *A. kuchinichi*, *A. argillacea* and *A. tarbagata* as well. The infraspecific variation of COI 5' sequences of *A. etugen* is 0.00%. The distance between specimens of *A. etugen* and *A. arida* is 1.39–2.03%. It is worth to note that the distance between specimens of *A. etugen* and the Mongolian specimens of *A. arida* (including the sympatric one) is higher (2.01–2.03%) than that between *A. etugen* and the specimens of *A. arida* from the Russian Altai (1.39–1.42%). The distance between specimens of *A. etugen* and *A. expressa* is 4.27–4.77%; that between *A. etugen* and *A. kuchinichi* is 4.27%; that between *A. etugen* and *A. argillacea* is 3.46%; that between *A. etugen* and *A. tarbagata* is 4.10–4.44%. The COI 5' sequences of *A. arida* are characterized by the combination of three character states unique for the genus, 100(C), 205(C) and 472(G), and one character state unique for the species-group, 292(T) (Table 3).

**Distribution.** *Athaumasta etugen* is known so far only from its type locality in West Mongolia. In its type locality, *A. etugen* is sympatric with *A. arida*. The species inhabits stony semi-deserts at medium altitudes (1800 m) (Fig. 79).

**Etymology.** “Etugen” is the goddess of the earth in Mongolian mythology.

***Athaumasta tarbagata* Volynkin, Titov & Saldaitis, sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:035EB489-FBD6-43F8-B8C3-BE5E10AB364D>  
(Figs 22–27, 58, 59)

**Type material. Holotype** (Figs 22, 58): male, “30.IV.2015, E Kazakhstan, Urdzhar district, W Tarbagarai Mts, 9.5 km ENE of Tasaryk village, 705 m. 47°08'04.6''N, 081°24'51.0''E, bottom of rocky slope, Volynkin A.V. & Titov S.V. leg.”, GenBank voucher MN023163, slide AV4917♂ Volynkin (Coll. NHMUK);

**Paratypes.** 5 males, same data as in the holotype, GenBank vouchers MN023160, MN023161 and MN023162 (Coll. CAV); 3 males, 01.V.2015, E Kazakhstan, Urdzhar district, W Tarbagarai Mts, 8 km ENE of Altynshoky (Predgornoe) village, 890 m. 47°11.607''N, 81°10.085''E, mesophilous rocky slopes of canyon, Volynkin A.V. & Titov S.V. leg., GenBank vouchers MN023164 and MN023165, slides AV4916♂ and AV5319♂ Volynkin (Coll. CAV); 1 male, Kazakhstan E, Saur Mts., Zhanaturmis, 8.VI.2000., leg. Klimenko (Coll. AFM); 4 males, 10.V.2017, E Kazakhstan, Urdzhar district, 4 km SW of Nekrasovka vill., Kyzylbeltai Mts., h~920 m. 47,21° N, 81,35° E, Nakonechny A. leg. (Coll. MDS); 5 males, 16.V.2017, E Kazakhstan, Ayagoz district, 34 km SE of Tarbagatai vill., Okpekty Mts., h~1505 m. 47,60° N, 81,64° E, Nakonechny A. leg. (Coll. MDS).



**Figure 77.** East Kazakhstan, Kurchum district, Kurchum Ridge, 12 km NE of Karatogai vill., 740m. 48°28'04.95"N 84°36'09.88E, 02.VI.2013, the type locality of *A. kurchuma* (photo by A.V. Volynkin).



**Figure 78.** Russia, Altai Republic, Kosh-Agach district, Chuya Steppe at foothills of Kuraisky Ridge, 5 km E of Chagan-Uzun village, 2100m, 50°24'27"N 87°35'50"E, 10.VI.2010, the type locality of *A. arida* (photo by A.V. Volynkin).



**Figure 79.** West Mongolia, Khovd aimak, Mongolian Altai Mts., Hundijn-Gol river valley (Bodonchijn-Gol river basin), 1800 m, 18.V.2012, the type locality of *A. etugen* and the habitat of *A. arida* (photo by M. Černila).



**Figure 80.** East Kazakhstan, Urdzhar district, W Tarbagarai Mts, 9.5 km ENE of Tasaryk village, 705m. 47°08'04.6''N 081°24'51.0''E, 30.IV.2015, the type locality of *A. tarbagata* (photo by A.V. Volynkin).



**Figure 81.** East Kazakhstan, Zaisan Valley, 15.5 km NNE of Amanat village, Kiin-Kirish Massif, clay/chalk hills, 447 m. 48°7.885'N 84°29.378'E, 06.V.2015, the type locality of *A. argillacea* (photo by A.V. Volynkin).



**Figure 82.** North East Kazakhstan, Bayanaul District, Bayanaul Mts., rock area Kempirtas, 50°51'24.65"N 75°34'37.21"E, 13.VI.2013, the habitat of *A. kuchinichi* (photo by S.V. Titov).

**Diagnosis.** Forewing length 14–16 mm in males (16 mm in the holotype). *Athaumasta tarbagata* (Figs 22–27) is a sister species of *A. argillacea* (Figs 28–30), from which it differs externally by its slightly larger size and more elongated forewing. The male genitalia of *A. tarbagata* (Figs 58, 59) differ from those of *A. argillacea* (Figs 60, 61) by the more massive basal part of uncus, the slightly broader juxta, the pointed tip of vinculum (that is rounded in *A. argillacea*), the much broader harpe, and the slightly broader vesica with much larger cornutus.

Female unknown.

**Molecular data.** COI 5' sequences of six specimens of *A. tarbagata* were compared with two paratype specimens of *A. argillacea* from one locality and specimens of *A. expressa*, *A. kuchinichi*, *A. etugen* and *A. arida* as well. The infraspecific variation of COI 5' sequences of *A. tarbagata* is 0.00–0.76%; that of *A. argillacea* is 0.00%. The distance between specimens of *A. tarbagata* and *A. argillacea* is 1.38–1.54%; that between *A. tarbagata* and *A. expressa* is 2.17–3.13%; that between *A. tarbagata* and *A. etugen* is 4.10–4.44%; that between *A. tarbagata* and *A. arida* is 3.86–4.65%. The COI 5' sequences of *A. tarbagata* are characterized by the combination of one character state unique for the genus, 124(C), and one character state unique for the species-group, 646(C), while the COI 5' sequences of *A. argillacea* are characterized by one character state unique for the species-group, 403(C). In addition, the COI 5' sequences of *A. tarbagata* differ from those of *A. argillacea* by the character states 160 ('A' in *A. tarbagata* and 'G' in *A. argillacea*), 169 ('C' in *A. tarbagata* and 'T' in *A. argillacea*), 367 ('C' in *A. tarbagata* and 'T' in *A. argillacea*) and 400 ('C' in *A. tarbagata* and 'T' in *A. argillacea*) (Table 3).

**Distribution.** *Athaumasta tarbagata* is known from several localities in the Saur-Tarbagatai mountain massif in East Kazakhstan. In the Tarbagatai Ridge, the species inhabits stony steppe and mesophilous slopes at medium altitudes (705–890 m) (Fig. 80). *Athaumasta argillacea* inhabits other biotope, clay and chalk hills covered by ground-dwelling lichens (Fig. 81).

**Etymology.** The species' name refers to its type locality, the Tarbagatai Ridge.

*Athaumasta kuchinichi* Volynkin, Titov & Saldaitis, **sp. nov.**

<https://zoobank.org/urn:lsid:zoobank.org:act:D9486171-B548-4869-9690-A44BFA961DFC>  
(Figs 31–33, 62, 63, 74)

**Type material. Holotype** (Figs 31, 62): male, "15.V.2017, NE Kazakhstan, Pavlodar Region, Bayanaul Distr., Bayanaul Mts., SE vic. of Toraygyr Lake, 50°51'56.97''N 75°40'45.96''E, 400m, steppe between rocks and an elder grove, leg. A.V. Volynkin, S.V. Titov & M.S. Ivanova", GenBank voucher MN023159, slide AV4910♂ Volynkin (Coll. NHMUK).

**Paratypes.** 2 males, 1 female, same data as in the holotype, GenBank vouchers MN023157 and MN023158, slides AV4911♂, AV4923♀ Volynkin (Coll. CAV); 2 males, 4 females, same data (Coll. STP); 1 male, 1 female, same locality and collectors, but 17.V.2017 (Coll. STP); 1 male, 12–14.VI.2014, NE Kazakhstan, Pavlodar Area, Bayanaul district, Bayanaul Mts., eastern coast of Torajgyr lake, steppe near rocks, 380 m. 50°52'06" N, 75°40'17" E, Volynkin A.V. & Titov S.V. leg. (Coll. CAV); 1 male, 11.V.2014, NE Kazakhstan, Pavlodar Region, Bayanaul area, lake Toraigy, at light, 50°51'57.23''N 75°40'22.89''E, Titov S.V. leg. (Coll. STP); 1 male, NE Kazakhstan, Bayanaul area, Bayanaul State National Nature Park, Bayanaul mts., Kurkeli natural landmark, 50°44'34.00"N 75°38'16.80"E, 02.V.2012, S.V. Titov leg. (Coll. STP); 3 males, 1 female, same locality and collector, 12.V.2012 (Coll. STP); 2 males, same locality, 14.VI.2013, M. Černila, S.V. Titov & A.V. Volynkin leg. (Coll. STP); 2 males, NE Kazakhstan, Bayanaul area, Bayanaul State National Nature Park, Bayanaul mts., vic. of Shonai vill., 50°48'53.88"N 75°44'22.45"E, 29.VI.2013, S.M. Reznichenko leg. (Coll. STP); 2 males, 1 female, same locality, 05.V.2014, S.V. Titov leg. (Coll. STP); 17 males, 8 females, NE Kazakhstan, Bayanaul area, Bayanaul State National Nature Park, Bayanaul mts., rock area Kempirtas, 50°51'24.65"N 75°34'37.21"E, 13.VI.2013, M. Černila, S.V. Titov & A.V. Volynkin leg. (Coll. STP); 3 females, same locality, 17.V.2014, S.V. Titov leg., slide AV1813♀ (Colls. STP & CAV); 3 males, 1 female, same locality, 13.VI.2014, S.V. Titov & A.V. Volynkin leg. (Coll. STP); 4 males, 2 females, same locality, 27.V.2015, M. Černila, S.V. Titov & M. Kučinić leg. (Coll. STP); 1 male, 1 female, 25.V.2015,

SIX NEW SPECIES OF *ATHAUMASTA* KAZAKHSTAN, RUSSIAN ALTAI AND MONGOLIA

**TABLE 3.** Variable COI 5' characters among *Athaumasta expressa* species-group: bold font character states highlighted in gray are unique to species within the genus; character states highlighted in gray are unique to species within the species-group; italicized character states are infraspecific polymorphisms

	19	22	46	67	76	87	100	103	124	160	169	181	193	202	205	214	220	235	238	250	274	282	283	287	292	298	313	316	367	386	397	400	403	412	433	472	520	553	562	571	631	646
<i>A. arida</i> sp. n. HT (Chagan-Uzun) (MN023144)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (MN023145)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (MN023146)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (MN023173)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (MN023174)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (MN023147)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Chagan-Uzun) (AVLEP074-11)	C	A	T	G	A	A	T	T	T	A	T	A	C	C	T	A	T	C	T	C	T	C	C	T	C	T	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Arshantyn-Nuruu Mts) (MN023150)	C	A	C	G	A	A	T	T	T	A	T	A	C	C	T	A	T	T	T	C	T	C	C	C	C	A	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. arida</i> sp. n. PT (Hundijn-Gol river) (MN023151)	C	A	C	G	A	A	T	T	T	A	T	A	C	C	T	A	T	T	T	C	T	C	C	C	C	A	T	A	T	C	C	C	T	T	A	A	A	T	G	T	A	T
<i>A. etugen</i> sp. n. HT (Hundijn-Gol river) (MN023153)	T	A	T	G	A	G	C	T	T	A	T	A	C	C	C	A	T	C	T	C	C	C	C	T	T	T	T	A	T	C	C	T	T	T	A	G	A	T	G	T	A	T
<i>A. etugen</i> sp. n. PT (Hundijn-Gol river) (MN023152)	T	A	T	G	A	G	C	T	T	A	T	A	C	C	C	A	T	C	T	C	C	C	C	T	T	T	T	A	T	C	C	T	T	T	A	G	A	T	G	T	A	T
<i>A. argillacea</i> PT (Zaisan Valley) (BC ZSM Lep 94108)	T	A	T	G	A	G	T	T	T	G	T	A	T	T	T	A	T	T	T	C	C	C	C	C	T	C	T	T	A	T	T	T	C	G	A	A	A	T	A	T	A	T
<i>A. argillacea</i> PT (Zaisan Valley) (BC ZSM Lep 94109)	T	A	T	G	A	G	T	T	T	G	T	A	T	T	T	A	T	T	T	C	C	C	C	C	T	C	T	T	A	T	T	T	C	G	A	A	A	T	A	T	A	T
<i>A. tarbagata</i> sp. n. HT (Tasaryk vill.) (MN023163)	T	A	T	G	A	G	T	T	C	A	C	A	T	T	T	A	T	T	C	C	C	C	C	T	C	T	T	A	C	T	T	C	T	G	A	A	A	T	C	T	A	C
<i>A. tarbagata</i> sp. n. PT (Tasaryk vill.) (MN023161)	T	A	T	G	A	G	T	T	C	A	C	A	T	T	T	A	T	T	T	C	C	C	C	T	C	T	C	G	C	T	T	C	T	G	A	A	A	T	C	T	A	C
<i>A. tarbagata</i> sp. n. PT (Tasaryk vill.) (MN023162)	T	A	T	G	A	G	T	T	C	A	C	A	T	T	T	A	T	T	C	C	C	C	C	T	C	T	T	A	C	T	T	C	T	G	A	A	A	T	C	T	A	C
<i>A. tarbagata</i> sp. n. PT (Altynshoky vill.) (MN023164)	T	A	T	A	A	G	T	T	C	A	C	A	T	T	T	A	T	T	C	C	C	C	C	T	C	T	T	A	C	T	T	C	T	G	A	A	A	T	C	T	A	C
<i>A. tarbagata</i> sp. n. PT (Altynshoky vill.) (MN023165)	T	A	T	A	A	G	T	T	C	A	C	A	T	T	T	A	C	T	T	T	C	C	C	T	C	T	T	A	C	T	T	C	T	G	A	A	A	T	A	T	A	C
<i>A. tarbagata</i> sp. n. PT (Tasaryk vill.) (MN023160)	T	A	T	A	A	G	T	T	C	A	C	A	T	T	T	A	C	T	T	T	C	C	C	T	C	T	T	A	C	T	T	C	T	G	A	A	A	T	A	T	A	C
<i>A. kuchinichi</i> sp. n. HT (Bayanaul Mts) (MN023159)	T	A	T	G	A	G	T	C	T	G	C	A	C	T	T	G	T	T	T	C	C	C	T	C	T	T	A	T	T	C	C	T	A	G	A	A	T	G	T	G	T	
<i>A. kuchinichi</i> sp. n. PT (Bayanaul Mts) (MN023158)	T	A	T	G	A	G	T	C	T	G	C	A	C	T	T	G	T	T	T	C	C	C	T	C	T	T	A	T	T	C	C	T	A	G	A	A	T	G	T	G	T	
<i>A. kuchinichi</i> sp. n. PT (Bayanaul Mts) (MN023157)	T	A	T	G	A	G	T	C	T	G	C	A	C	T	T	G	T	T	T	C	C	C	T	C	T	T	A	T	T	C	C	T	A	G	A	A	T	G	T	G	T	
<i>A. expressa</i> (Ust-Kamenogorsk) (AVLEP070-11)	T	G	T	A	G	G	T	T	T	G	C	A	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	T	T	C	T	T	G	A	A	G	T	G	T	A	T	
<i>A. expressa</i> (Bely Bom) (AVLEP078-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	C	C	C	C	T	T	C	T	A	T	T	C	T	T	G	A	A	G	T	A	T	A	T	
<i>A. expressa</i> (Aktash) (AVLEP071-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	T	T	C	T	T	G	A	A	G	T	G	T	A	T	
<i>A. expressa</i> (Aktash) (AVLEP075-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	A	A	A	G	C	G	T	A	T	
<i>A. expressa</i> (Aktash) (AVLEP076-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	T	T	C	T	T	G	A	A	G	T	G	T	A	T	
<i>A. expressa</i> (Aktash) (AVLEP077-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	G	A	A	G	T	G	T	A	T	
<i>A. expressa</i> (Aktash) (MN023169)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	A	A	A	G	C	G	T	A	T	
<i>A. expressa</i> (Kurai Steppe) (MN023148-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	A	A	A	G	C	G	T	A	T	
<i>A. expressa</i> (Kurai Steppe) (MN023149-11)	T	G	T	A	G	G	T	T	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	A	A	A	G	C	G	T	A	T	
<i>A. expressa</i> (Cherga) (AVLEP073-11)	T	G	T	A	G	G	T	T	T	G	C	A	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	G	A	A	G	T	G	T	A	T	
<i>A. expressa</i> (Tigireksky Ridge) (MN023170)	T	G	T	A	G	G	T	C	T	G	C	G	C	T	T	A	C	T	T	C	C	C	T	T	C	T	A	C	T	C	T	T	G	A	A	G	T	G	T	A	T	



Kazakhstan, Pavlodar Region, Ekibastuz District, rocky steppe & low hills, Shiderty river valley, 230m, 51°39'N 74°38'E. At light. S.V. Titov, M. Černila & M. Kučinić leg. (Coll. STP).

**Remark.** The species erroneously reported for Bayanaul Mts. as *A. expressa* by Titov *et al.* (2017).

**Diagnosis.** Forewing length 14.5–15 mm in males (14.5 mm in the holotype) and 14–15.5 mm in females. *Athaumasta kuchinichi* (Figs 31–33) has no external differences from the allopatric sister species *A. expressa* (35–45). The male genitalia of *A. kuchinichi* (Figs 62, 63) differ from those of *A. expressa* (Figs 64–68) by the more massive uncus, the slightly longer valva with a less convex ventral margin, the slightly longer harpe, and the maller cornutus in vesica. The female genitalia of *A. kuchinichi* (Fig. 74) differ from those of *A. expressa* (Fig. 75) by the shorter apophyses anteriores, the shorter and narrower antrum and the smaller corpus bursae.

**Molecular data.** COI 5' sequences of three specimens of *A. kuchinichi* from one locality were compared with eleven specimens of *A. expressa* from six localities and *A. tarbagata*, *A. argillacea*, *A. etugen* and *A. arida* as well. The infraspecific variation of COI 5' sequences of *A. kuchinichi* is 0.00%. The distance between specimens of *A. kuchinichi* and *A. expressa* is 2.02–2.49%; that between *A. kuchinichi* and *A. tarbagata* is 2.49–2.65%; that between *A. kuchinichi* and *A. argillacea* is 2.17%; that between *A. kuchinichi* and *A. etugen* is 4.27%; that between *A. kuchinichi* and *A. arida* is 3.78–4.15%. The COI 5' sequences of *A. kuchinichi* are characterized by the combination of three character states unique for the genus, 214(G), 433(G) and 631(G), while the COI 5' sequences of *A. expressa* are characterized by the combination of one character state unique for the genus, 76(G) and two character states unique for the species-group, 22(G) and 283(T). In addition, the COI 5' sequences of *A. kuchinichi* differ from those of *A. expressa* by the character states 67 ('G' in *A. kuchinichi* and 'A' in *A. expressa*), 220 ('T' in *A. kuchinichi* and 'C' in *A. expressa*), 250 ('T' in *A. kuchinichi* and 'C' in *A. expressa*) and 400 ('C' in *A. kuchinichi* and 'T' in *A. expressa*) (Table 3).

**Distribution.** *Athaumasta kuchinichi* is known from the eastern Kazakh Upland (the Bayanaul mountain massif, North East Kazakhstan). The species inhabits rocky outcrops, stony steppe and shrubby slopes and rocks at low altitudes (230–420 m) (Fig. 82).

**Etymology.** The species is dedicated to Prof. Mladen Kučinić (University of Zagreb, Croatia), a former PhD supervisor of the third author and a collector of two paratypes.

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