



A review of the species of *Lithostege* Hübner, [1825] 1816 (Lepidoptera: Geometridae, Larentiinae), occurring in Iran and adjacent countries, with description of two new species from Iran and Pakistan

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Abstract

The Iranian species of *Lithostege* are reviewed and additional species from neighbouring countries (which are also likely to occur in Iran), as a whole twenty-eight taxa, are studied. Adults of all species and male and/or female genitalia for most species are figured. Two new species are described: *L. samandooki* Rajaei **sp. nov.** from Iran and *L. hreblayi* Rajaei & Viidalepp **sp. nov.** from Pakistan. *L. repeteki* Tsvetajev and *L. griseata gigantea* Bytinski-Salz & Brandt are synonymized with *L. obliquata* Urbahn and *L. griseata griseata* (Denis & Schiffermüller), respectively. *L. amseli* Wiltshire is discussed as a possible synonym of *L. amoenata* Christoph. *L. flavicornata* (Zeller) is upgraded to species-rank again. Distribution areas of all species discussed are shown by maps. Literature data concerning faunistics, ecology, and biological data are reviewed. Female genitalia of *L. obliquata* Urbahn, *L. turkmenica* Tsvetajev, and *L. luminosata* Christoph, are figured and their morphological characters compared with other taxa for the first time. A check list is presented and a preliminary grouping of species treated is proposed, based largely on morphological characters of the genitalia. It does not necessarily reflect a natural relationship of the species included, but may provide a first structure to the genus, as a basis for future studies.

Key words: Iran, Larentiinae, *Lithostege*, new species, *L. hreblayi*, *L. samandooki*, taxonomy, morphology, new synonyms, check list, preliminary species groups.

Introduction

As generally accepted, *Lithostege* Hübner [1825] 1816 is a genus well defined by morphological characters of legs, wing venation, build of head, abdomen and genitalia structures. However, distinguishing its various species based on wing shape and pattern only appeared to be difficult for early taxonomists. For example, Staudinger recognized only six species for Europe, with many putative synonyms in his first catalogue, a result of many confusing descriptions of the species known that time (Staudinger & Wocke, 1871). Thirty years later, he enumerated eighteen Palearctic species and varieties in *Lithostege* (Staudinger & Rebel, 1901). Prout (1914:171) reported on 22 species (one placed here erroneously, according to Prout, 1915: 397) and in the years 1937/38, 27 Palearctic species were known, but one of them (*L. flavicornata* Z.) still not recognized as a distinct species (Prout, 1937: 83; 1938: 237). Parsons et al., 1999 included 37 Palearctic species of *Lithostege* (49 species and 8 subspecies worldwide). The most recent list (Scoble & Hausmann (2007)) recorded 50 species worldwide for this genus.

Lithostege Hübner [1825] 1816 belongs to the tribe Chesiadini Stephens, 1850 (subfamily Larentiinae). Other genera belonging to this tribe are *Chesias* Treitschke, 1825, *Chesistege* Viidalepp, 1990, *Carsia* Hübner [1825] 1816, *Aplocera* Stephens, 1827. All of them are also represented in the Iranian fauna by a number of species. They share some distinctive morphological characters, e.g. the fore-tibia with distal, tooth-like projections, male genitalia with a rib-like sclerite, from below the uncus to the hemitransstilla (Viidalepp, 1990b). *Chesias* and even more *Chesistege* are close to *Lithostege* sharing strongly bulbed femora of forelegs, short fore-tibiae ending in two distal teeth, large and strongly sclerotized 8th abdominal tergite, forewing with two areoles, anal vein of hindwings in male short and hidden in a longitudinal pocket.

Lithostege seems to be the most derived genus, as shown by more strongly modified wing shape (forewings narrower, hindwings more strongly reduced), the more enlarged femora and the extremely short tibiae of fore legs, with tooth-like projections of the same length. This highly developed digging-apparatus is distinctly less developed in *Chesistege*, *Chesias* and the other included genera.

The main aim of this paper is to review the species of the genus *Lithostege* occurring in Iran. Some related species of adjacent countries are also discussed, as they may occur and may be found in Iran in future. Twenty-eight species belonging to the genus *Lithostege* (i.e. more than half of the total species-number) are studied and reviewed.

Material and Methods

Specimens studied came from the following collections (as far as included, acronyms after Evenhuis & Samuelson, 2007): HMIM-Hayk Mirzayans Insect Museum at the Iranian Research Institute of Plant Protection (former Plant Pests and Diseases Research Institute, PPDRI), Tehran, Iran; IZBE-Institute of Agronomy and Environmental Studies, Estonian University of Life Sciences (Institute of Zoology and Botany) Tartu, Estonia; NHMW-Naturhistorisches Museum Wien, Austria; NHRS-Naturhistoriska Riksmuseet, Stockholm, Sweden; PCJM-private collection of Dr. Jörg-Uwe Meineke, Kippenheim, Germany; SMNK-Staatliches Museum für Naturkunde, Karlsruhe, Germany; TUZ-Zoological Museum of Tartu University, Tartu, Estonia; ZFMK-Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany; ZIAT-Zoological Institute, Academy of Sciences of Turkmenistan, Ashkhabat; ZISP-Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; ZMHB-Museum für Naturkunde der Humboldt-Universität, Berlin, Germany; ZSM-Zoologische Staatssammlung München (Munich), Germany. Other abbreviations: H. R.-Hossein Rajaei; J. V.-Jaani Viidalepp; prov.-Province; alt.-Altitude.

Species were identified by original descriptions and by type material, wherever possible and available, and also by comparison of identified specimens in different collections. Prior to dissection the specimens were photographed using an Olympus E3 digital camera. Genitalia were mounted in Euparal and photographed by a digital stereo-microscope (ZEISS-SteREO: Discovery.V20). Images were edited using Adobe Photoshop CS2. Geographical coordinates of old records were investigated using 'Google Earth' and the 'Road Map of Iran' (2005) (www.gitashenasi.com). Maps were prepared manually using Adobe Photoshop CS2. Collecting data are given as written on the labels, Russian words were translated, with optional additions in squared brackets (“[.]”). Uncertain reports or label data (especially in the additional distributional data from literature) are denoted with “[?]”. In the “Species account” the taxa with an asterisk (*) occur in Iran.

History of faunistical studies of the genus *Lithostege* in Iran

Édouard Ménétries (a student of Georges Cuvier and a leading scientist in Russia at that time) authored the first paper on Iranian Lepidoptera, in which he described just one geometrid moth: *Ourapteryx persica* Ménétries, 1832. Soon after this work, other entomologists of the nineteenth century published many geometrid species new for Iran in other papers (Kollar & Redtenbacher, 1849; Lederer, 1869, 1871; Christoph, 1873, 1876–1877, 1885, 1887a, b; Butler & Hampson, 1899). Just two of these studies reported *Lithostege* species from Iran: *L. usgentaria* Christoph, 1885 by Butler and Hampson (1899) and *L. coassata* (Hübner, [1825]) by Lederer (1871). Since 1900 at least ten other papers with one or more reports on *Lithostege* species of Iran were published (Prout, 1912–1916, 1937–1939; Wiltshire, 1944, 1945; Barou, 1967; Mirzayans & Kalali, 1970; Bytinski-Salz & Brandt, 1937; Brandt, 1939, 1941; Viidalepp, 1988). In 2009 Lehmann et al. reported two *Lithostege* species from Iran, of which *L. dissocyma* Prout, 1938 was new for Iran. Very recently, the new species *L. stadiiei* Lehmann, 2011 was described from Iran.

Taxonomic account

Lithostege Hübner [1825] 1816

Type species: *Geometra griseata* Denis & Schiffermüller, 1775.

Type locality: Austria, Vienna district.

Generic description. Small to medium-sized moths, wingspan ranging from 16 to 35 mm. Forewings elongate, apex acutely angled or slightly falcate, termen oblique, tornus shallowly and evenly rounded. Hindwings oval, short and narrow, moderately or strongly reduced in size. Venation: Forewing with two areoles. The anal vein of hindwings in male short and hidden in an elongate, basal pocket in males, pocket absent and vein longer in females. Frons moderately protruding, surrounded by a sharp ridge; vertex with distinct lateral chaetosemata, both connected by a transverse band of setae; palps slightly or moderately exceeding frons, covered with enlarged, sometimes elongated, lamellate scales. Antennae: very shortly and homogeneously ciliated in males, filiform in females. Haustellum well developed. Femora of forelegs in both sexes strongly thickened, fore-tibia extremely short, with a massive distal, forked projection, consisting of a long internal and a much shorter external tooth. The longer tooth is often as long or longer as the tibia. Epiphysis present, but very small. Middle tibia with one, hind tibia with two pairs of rather delicate spurs. Last abdominal tergite very large and strongly sclerotized, its posterior margin evenly rounded, with a small central incision or shaped like a buckle or snout in some species. In the male genitalia, a process arising from the basal centre of valva (termed “harpe” in the following species account) is distinctive, in most species basally extended into an arched or curved, distally spined dorsal arm, running along the valve costa towards the apex (absent in *L. amoenata* group, see species account). In some species, additional ornamentation like costal or saccular processes is present. In most species the bursa copulatrix is internally spined and extended anteriorly to a small, membranous diverticulum (not present in *L. excelsata* and *L. distinctata*).

Species Accounts

Preliminary grouping of species and checklist:

We recognized four species-groups in the genus *Lithostege*, as far as treated in the present paper, based on wing pattern and genitalia characters. This grouping is still preliminary and does not necessarily represent a phylogenetic relationship of all included species. We offer this grouping as a tool for an easier handling of the rather large number of species included here. Further studies certainly will define these groups more exactly or show the necessity to separate some or create new groups. Species marked by an asterisk (*) are recorded for the Iranian fauna.

I. The *amoenata* group

Characterized by plain, sclerotised valves without any basal ornamentation (Viidalepp, 1990a). Valves tapering in width towards apex, with acute, curved distal processes (*amoenata*) or not tapering and broadly rounded (*excelsata*) or with a short, rounded process dorsally at apex (*distinctata*). Saccus rounded or extended triangularly. Females with or without a diverticulum. A rather heterogeneous group:

L. amoenata Christoph, 1885 * (= *L. amseli* Wiltshire, 1967, syn. nov. ?)

L. excelsata (Erschov, 1874)

L. distinctata Christoph, 1887

II. The *buxtoni* group

Valves with a simple harpe and a sclerotized central area, connected by a ridge to the base of the costa; saccus elongated triangularly:

L. buxtoni Prout, 1920 *

L. stadiiei Lehmann, 2011 *

L. obliquata Urbahn, 1971 (= *L. repeteki* Tsvetajev, 1971 **syn. nov.**)

III. The *bosporaria* group

Valves sclerotised, plate-like, harpe present, at base extended into a simple, free, slender, smooth dorsal projection. Saccus triangular; aedeagus short, straight, with scobinate or shortly dentate vesica. Female genitalia with a deep incision of the posterior margin of antrum:

- L. bosporaria* (Herrich-Schäffer, 1848)
- L. usgentaria* Christoph, 1885
- L. witzenmanni* Standfuss, 1892 *
- L. dissocyma* Prout, 1938 *
- L. hreblayi* Rajaei & Viidalepp, **sp. nov.**
- L. samandooki* Rajaei **sp. nov.** *
- L. senata* Christoph, 1887

IV. The *farinata* group

Valves with a harpe of variable shape, extended into a basally curved or arched, apically spined dorsal arm, often directed towards valve apex; saccus short and broad. Most species of this group have white or off-white wings without or with only faint pattern.

- L. notata* Bang-Haas, 1906 *
- L. fissurata fissurata* Mabilie, 1888
- *L. fissurata inanis* Prout, 1941 *
- L. parva* Shchetkin, 1965
- L. turkmenica* Tsvetajev, 1971
- L. farinata* (Hufnagel, 1767)
- L. coassata* (Hübner, [1825]) *
- L. ancyrana* Prout, 1938
- L. narynensis* Prout, 1938
- L. griseata griseata* (Denis & Schiffermüller, 1775) * (= *L. griseata gigantea* Bytinski-Salz & Brandt, 1937 **syn. nov.**)
- L. palaestinensis* Amsel, 1935 *
- L. luminosata* Christoph, 1885
- L. luigi* Viidalepp, 1992
- L. infuscata* (Eversmann, 1837) *
- L. flavicornata* (Zeller, 1847) **stat. rev.**

I. The *amoenata* group

L. amoenata Christoph

(Figs 1, 2, 32, 33, 58; Map 1)

Lithostege amoenata Christoph, 1885: 128. Syntypes 1 ♂, 2 ♀, ZISP (examined). Type locality: Turkmenistan, Ashkhabad (Kopet-Dagh Mts., near Ashkhabad, Turkmenistan, sq. Parsons et al., 1999).

Lithostege amoenata: Prout, 1914: 173, pl. 12b; Viidalepp, 1996: 46; Parsons et al., 1999: 545.

Lithostege amseli Wiltshire, 1967: 150, pl. 1, fig. 3. **syn. nov.** (?). Holotype ♂ in ZSM (not traced). Type locality: Herat (Afghanistan), 970 m.

Lithostege amseli: Parsons et al., 1999: 545.

Material examined. Type material: Syntypes 2 ♀, 1 ♂: ‘[Turkmenistan] Ashkhabat’, ‘Coll. Great Knjaz Nikolaj Mikhajlovich’, ‘5.6.82, 244 amoena[ta?] Chr.’, ZISP. Additional material: 9 ♂, 5 ♀: 1 ♂: [Iran] Khorasan, Kopet-dagh-Allahakbar, 1950 m, 16.6.1974, leg. Radj [abi], Paz [ouki], prep. 1065/2010 H. R.; 1 ♀: [Iran, Khorasan e Shomali] Sarekhs [Sarakh], 21.5.[19]73, [leg.] Abai; both in HMIM. 1 ♀: Nord Iran, Elbursgebirge östl. Shemshak, 50 km nördl. Tehran, 2100–2500 m, 8.-24.6.1973, leg. G. Junge, prep. 1024/2010 H. R.; in SMNK. 2 ♂; N-Iran, 2400 m, Demavend, 25.-26.IX.1965, [leg.] E. & A. Vartian, ZSM Genital prep. No. 4530 and 4531; both in ZSM. 1 ♂, [Turkmenistan], Kopet-Dagh, Suljukli, 25.05.1923, Shestoperov leg.; in ZIAT. 1 ♂: Tadz [ikistan], 04.07.1989, Peter I Mts., K [ishlak] Odilovot, 2000 m, U. Jürivete leg.; 1 ♀: [Tajikistan], Peter I [Mts.], Surhob [river], Odilovot, 2500 m, 04-07.07.1989, U. Jürivete leg.; in IZBE. 3 ♂, 2 ♀: 31.V. [19]58. Tajikistan, 6 km from

Nikolajevsky pass, eastern slopes of Khozratisho Range, above Chertovyj bridge, h = 2200 [m], meadows slope, Yu. Stshetkin [Shchetkin], preps ♂ 1022/2010, 1611/2011, 1612/2011 and ♀ 1023/2010, 1613/2011 H. R.; all in ZFMK. 1 ♂: Dasht-i-Nawar, NW v Ghazni, 3000 m, Afghan [istan], [leg.] Kasy & Vartian, prep. 1025/2010 H. R.; in SMNK; Preparations of genitalia: 7 ♂, 3 ♀.

Description & Diagnosis. Wingspan 29–30 mm. Wings dark grey or brownish grey, forewings with light grey or white transverse lines; postmedial line strongly curved anterior to M1 and posterior to M3, antemedial line straight, but acutely angled near discal dot. There are several additional transverse lines, including a weaker basal line, a broad grey and a narrow, double, waved line at median area and a white submarginal line. Fringes are chequered white and dark grey. Hindwings elongate-oval, grey, with one or a few indistinct, curved whitish lines, without discal dot. Underside of forewings with less distinct pattern, dark lines absent, but white postmedial and submarginal lines present, the latter anteriorly dentate (smooth on upperside). Hindwings similar to upperside, but a discal dot present (Figs. 1, 2). Male genitalia (Figs 32, 33): valve broad at base, width tapering towards apex, the latter acutely pointed and curved dorsad; costa slightly curved, terminating with a tooth-like process, both processes variable in size and shape at different localities; juxta elongate, tube-like; uncus broad, triangular at base, narrow distally; lateral arms of gnathus present; aedeagus arched subapically; vesica covered with very short, round teeth. Female genitalia (Fig. 58): corpus bursae simple, pyriform, distal half spiculose, with broad, strongly sclerotised ductus bursae; diverticulum present. Externally, *L. amoenata* is similar to *L. dissozyma* Prout and the two subsequent species, *hreblayi* sp. n. and *samandooki* sp. n., described herein (Figs 11–14). However, there are clear differences in coloration and pattern. Even more distinct differences are present in the male and female genitalia.

Bionomics. Specimens collected in May, June, July and August, at an altitude of 1700–3400 m, from lower forest zone (Kuznetsov 1960) to montane areas (Brandt 1941).

Additional data on distribution based on literature sources. Kuznetsov (1960): Kopet-Dagh; Shchetkin (1965a): Khozratisho Mts., SW Tajikistan; Brandt (1941): Binaloud Mt. (Khorasan-e Razavi prov.); Wiltshire (1945): Alvand Mt. (Hamadan prov.); Prout (1912–1916); Viidalepp (1988): Kopet-Dagh (Khorasan-e Shomali) and Viidalepp (1996): N Pakistan.

Distribution. SW and E Tajikistan, SE and S Turkmenistan, N and W Iran (western part of Elburz); East Afghanistan; N Pakistan (Map 1).

Taxonomic note. Wiltshire described *amseli* based on a single ‘male’ (his fig. 3 rather shows a female, regarding proportions and length of the abdomen) and without dissection of genitalia. He described rather slight differences in wing pattern and shape between the holotype of the new species and *L. amoenata* which to our experience (material from Iran, Tajikistan and Afghanistan compared) fall within the range of variation of *amoenata*. A male from Afghanistan also rather belongs to *amoenata* than fitting with *amseli*. The low wingspan of the holotype of *amseli* (23 mm, *amoenata* 29–30 mm), however, is exceptional. We believe that there is a high probability that *amseli* is just a junior synonym of *amoenata*, but we were unable to prove this in the absence of the type specimen. Besides the latter, fresh material from the type locality of *amseli* and subsequent molecular studies would help to solve this open question.

L. excelsata (Erschov)

(Figs. 3, 34, 60; Map 1)

Anaitis excelsata Erschov, 1874: 70, pl. 4, fig. 71. Holotype ♀ not traced. Type locality: Turkestan: Kisil-Kum desert near Baïbek, 30 April.

Lithostege excelsata: Prout, 1914: 174, pl. 8a; Viidalepp, 1996: 46; Parsons et al., 1999: 546.

Material examined. 37 ♂, 29 ♀: 1 ♀, 1 ♂, [Turkmenistan] Askhabat, coll. Great Knjaz Nikolaj Mikhajlovich, 25.4.[?] *excelsata* Chr. [a piece of green paper]; coll. ZISP. 4 ♂, 1 ♀: USSR, Turkmenia, Dzahar, Kurgan, 15.4.1966, leg. Ganson V.A., Coll. K.Krušek; 1 ♂, 1 ♀: Tekke [Akhali-Tekke, Turkmenistan]; 7 ♂ ♀: Merw [Merv, E Turkmenistan]; 1 ♂: Turkmenistan, Karakum des. SW, 40 km NE Gizilarbat, 1996.05.03.-06, leg. Miatleuski J., leg. Povilaitis A.; 1 ♀: Kasachstan, Balchasch-See, Umgeb. Wüste Sary-Tankum, bei Fl. Jli, 1.-2.V. [19]67, gen. prep. 1617/2011 H. R.; all in ZFMK. 2 ♂: USSR, Turkmenia, Kara-Kum desert, 100 m, 50 km N of Ashkhabad, 58°33'E, 38°21'N, 29.IV.1991, No. L12, leg. G. Csorba, Gy. Fabian, B. Herczig, M. Hreblay & G. Ronkay, preps 1018/2010 and 1019/2010 H. R.; both in ZSM. 1 ♂: Central Kara-Kum desert, water-bed Kirpili [100 km] north-

west to Kyzyl-Arvat; ♂/♀: Kopet-Dagh Mts.: Kyzyl-Arvat, Geok-Tepe; in ZIAT. 8 ♂ ♀: „Turkmeenia” [Turkmenistan] 1977, Uzboi [river-bed], Yashan, 27.04–02.05, J.V. leg.; 2 ♂, the same locality but 20.05. [19]92, T. Kesküla leg.; 12 ♂ ♀: „Turkmeenia” [Turkmenistan] 1977, Repetek, 16–17.04, leg. (gen. prep. 3417, 7646, J.V.); 20 ♂ ♀: „Turkmeenia” [Turkmenistan] 1977, Lambe at Amu-Darja, 20.04, J.V. leg; 1 ♀: Zhamansai, Kyzylkum, Uzbek [istan], 27.04. [19]72, Falkovitsh leg.; all in IZBE. Preparations of genitalia: 3 ♂, 2 ♀.

Description & Diagnosis. Wingspan 22–26 mm. Easily recognized by the light grey forewings with numerous transverse grey and black lines (Fig. 3), the postmedial and also the posterior two thirds of the antemedial lines being separated medially by a faint black line and slightly angled outwards at veins M_3-CuA_1 by the small, rounded, greyish-white hindwings, powdered with black scales, with a thin, black marginal line. Underside of forewings almost without any pattern elements, there is only a short, black line near costa at postmedial position. In the male genitalia (Fig. 34), the plain, apically rounded valve without a basal process, the long and narrow uncus and the triangularly elongated saccus are distinctive. Similar male genitalia are only present in *L. distinctata*, but in the latter species, the valves are shorter, their costa terminating in a rounded, lobe-like process; the uncus is broad at base and rather short and stout; the female genitalia (Fig. 60) are also distinctive by a triangular antrum and a weakly developed colliculum, the ductus bursae being narrow, elongated, membranous like the globular corpus bursae, the latter with very tiny spines internally and without a diverticulum. Antevaginal sclerotization narrow, strap-like. Female genitalia in *L. distinctata* are also membranous, corpus bursae without internal spines, but the latter is elongate-oval in shape and a colliculum is absent.

Bionomics. Larvae feed on *Astragalus* (sect. *Ammodendron*) (Falkovitsh, 1986). Specimens studied are collected in April and May only.

Additional data on distribution based on literature sources. Shchetkin (1965a): South Tajikistan; Falkovitsh (1986): Uzbekistan.

Distribution. Turkmenistan, Uzbekistan, S Tajikistan and Kasachstan (Map 1). The species is not yet reported from Iran, but it is likely to occur in the Iranian parts of the Kopet-Dagh area.

L. distinctata Christoph

(Figs. 4, 35, 59; Map 1)

Lithostege distinctata Christoph, 1887 (a): 104. Syntypes 2 ♀, ZISP (examined). Type locality: Turkmenistan: Ashkhabad.

Lithostege distinctata: Prout, 1914: 174, pl. 13c; Viidalepp, 1996: 46; Parsons et al., 1999: 546.

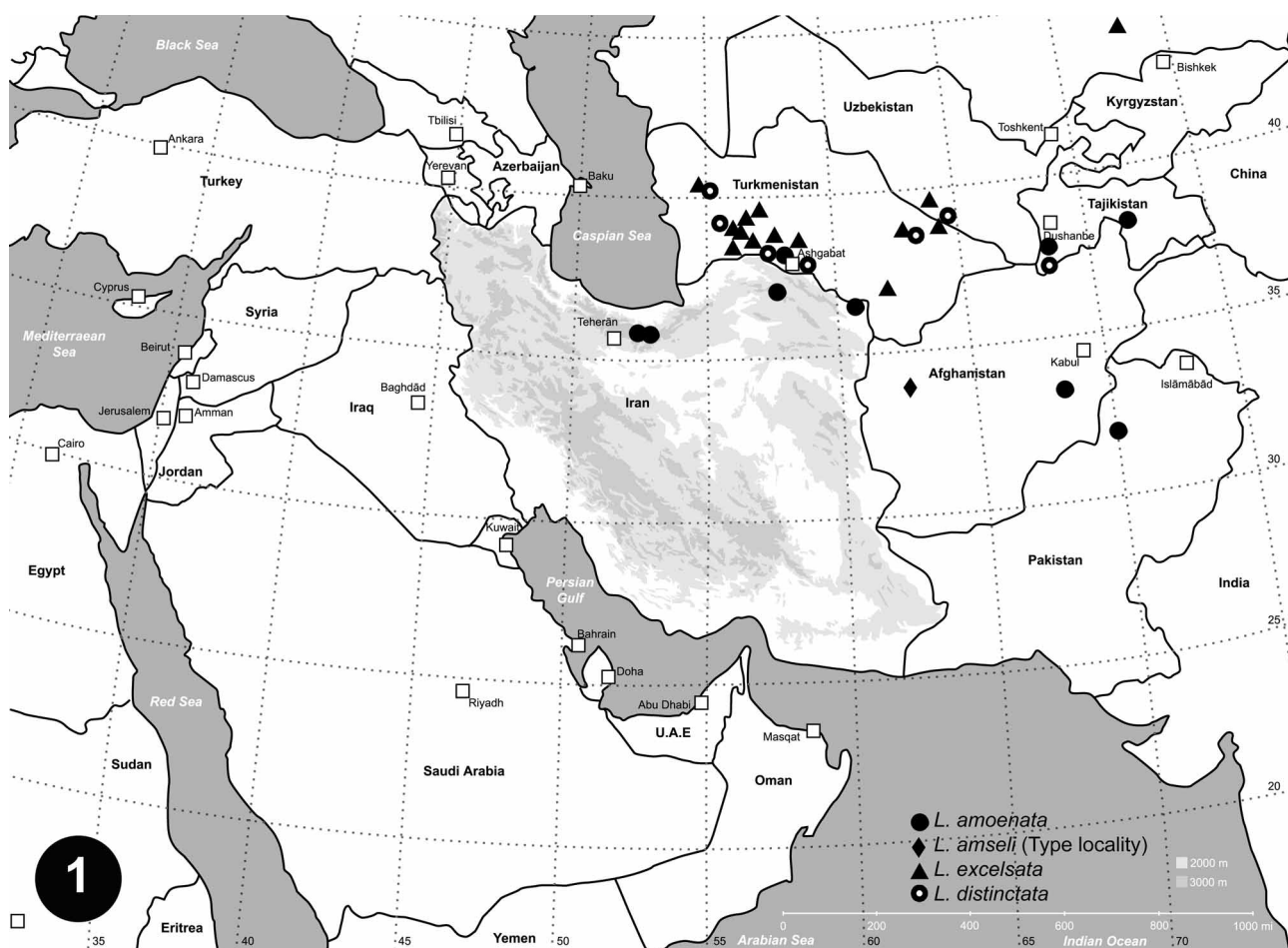
Material examined. Type material: Syntypes 2 ♀: ‘[Turkmenistan] Ashkhabat’, ‘101.’, ‘Coll. Great Knjaz Nikolaj Mikhajlovich’, [a piece of green paper] ‘5.6.82’, ‘*distinctata* Chr.’; coll. ZISP. Additional material: 3 ♂, 6 ♀: 3 ♀: USSR, Turkmenia, Dzahar, Kurgan, 15.4.1966, leg. Ganson V.A., Coll. K.Krušek, gen. prep. 1618/2011 H. R.; in ZFMK. 2 ♀: Transcaspia, Repetek, [♂] 14.IV.1966, [♀] 13.V.1966, A. Tsvetajev leg., gen. prep. 1086/2010 H. R.; 1 ♂: Turkmenistan, Kopet-Dagh Mts. Dushak Mt., 57°56'E, 37°54'N, 1500 m, 7.-8.VII.1992, No. L69, leg. M. Hreblay, Gy. Laszlo, G. Ronkay, gen. prep. 1089/2010 H. R.; all in ZSM. ♂, ♀: Central Karakum desert, 27.09.1967, F. Luppov [leg.]; 1 ♂, Turkmeenia 1977, Uzboi [river-bed], Yashan, 27.04–02.05, leg. (gen. prep. 3429, J.V.); in ZIAT. Preparations of genitalia: 2 ♂, 2 ♀.

Description & Diagnosis. Wingspan 16–20 mm. Easily recognized by the small size and the conspicuous pattern elements (Fig. 4): the blackish antemedial line nearly straight in forewing, the postmedial line with three projections outwards at veins M_1 , M_3-CuA_1 and near hind margin of wing. Both lines highlighted distally by broad, whitish bands, the postmedial proximally by a brown band. Apex of forewings with a triangular whitish patch, giving rise to a faint, white submarginal line. Fringes chequered black and white. Hingwings small, longitudinally oval in shape, greyish-brown, with a medial, slightly curved line, the latter accompanied distally by a broad, whitish band. Underside of both wings lighter than above, with distinct postmedial of forewing and medial line of hindwing. Male genitalia: valve plain, short, sclerotized costa with a rounded lobe apically; juxta trapezoid, triangularly furrowed dorsally (Fig. 35). Uncus rather stout and broad at base. Saccus not elongated. Aedeagus straight, with a curved line of cornuti. Female genitalia with a short, membranous ductus bursae; corpus bursae elongate-oval, similarly membranous, without internal spines; anterior diverticulum absent. Antevaginal sclerotization broad, band-like (Fig. 59). Similar genitalia are found in *L. excelsata* (diagnosis see previous species).

Bionomics. Specimens studied are collected in April, May and July, September. Possibly bivoltine.

Additional data on distribution based on literature sources. Shchetkin (1965a): South Tajikistan; Falkovitsh (1986): Uzbekistan.

Distribution. S Tajikistan, Uzbekistan and S and SE Turkmenistan. The species is not yet reported from Iran, but it may occur in the Iranian parts of the Kopet-Dagh area (Map 1).



MAP 1. *amoenata* species group: *L. amoenata*; *L. amseli* (type locality); *L. excelsata*; *L. distinctata*.

II. The *buxtoni* group

L. buxtoni Prout

(Figs. 5, 36; Map 2)

Lithostege buxtoni Prout, 1920: 312. Holotype ♂, BMNH (examined). Type locality: Kangavar (Hamadan prov., NW Iran).

Lithostege buxtoni: Prout, 1937: 84, pl. 8g; Parsons et al., 1999: 545.

Material examined. Type material: Holotype ♂: 'Kangavar, Hamadan N. W. Persia 5000 ft. 6.12.18 P. A. Buxton', '*Lithostege buxtoni* male Prout type', 'L. B. Prout coll. 1939–643'; coll BMNH.

Additional material: 5 ♂: 1 ♂: Iran, Fars, Bakhtegan-Tashk NP Geb. Dschokaran, 1400 m, 18.2.1997, 29°41' [N], 53°45' [E], leg. Dr. Wieser Ch., BC ZSM Lep 08632, gen. prep. 1015/2010 H. R.; in ZSM. 4 ♂: Fars, Kazerun, Gavkoshak, 22.12.1975, L.T. (Abai), preps 1066/2010 and 1067/2010 H. R.; all in HMIM. Preparations of genitalia: 3 ♂.

Description & Diagnosis. The largest Iranian *Lithostege* (wingspan: 33–35 mm). Forewing with a dark, deeply waved line from apex to the middle of hind margin, with the two strongest outward projections at veins CuA_1 and CuA_2 (Fig. 5); proximally, this line is highlighted by a broad white band; there are two indistinct, sub-

marginal lines; hindwing without pattern elements. In the only other species similar in size and pattern, *L. stadii*, the medial line is not waved and terminates at the base of the forewings. Male genitalia: saccus narrowly elongated; valve triangular; basal process (“harpe”) short, broad, with rounded apex; juxta with rounded base, converging laterally and notched apically; uncus broad at base, terminal half broad, apex truncate; aedeagus long, apically curved (Fig 36). Female unknown.

Bionomics. Specimens studied are collected in December, January (Lehmann et al., 2009) and February, at altitudes from 680 m (Lehmann et al., 2009) to 1524 m (Prout, 1937: 84).

Additional data on distribution based on literature sources. Barou (1967): Caspienne [Mazandaran]; Prout (1937–1939): Kangavar (Hamadan prov.); Wiltshire (1942): Arabs (Shergat), Iran (between Hamadan and Kermanshah; Takht-i Suleiman in Kurdistan; Kermanshah; Shiraz); Wiltshire (1964): Turkey (Vilayet Elaziz), Iran, Iraq[without exact locality]; Lehmann et al. (2009): Tang-e-Faryab (Bushehr prov.).

Remarks. Barou (1967) reported this species from Mazandaran, but it is very unlikely that an arid species like *L. buxtoni* occurs under the ecological conditions (Hyrceanian forest) of Mazandaran.

Distribution. Saudi Arabia, Iraq, Turkey and widely distributed in Iran (middle and western Zagros Mts.) (Map 2).

L. stadii Lehmann

(Figs. 6, 37; Map 2)

Lithostege stadii Lehmann, 2011: 249–251. Holotype ♂, coll. L. Lehmann, will later be deposited in coll. ZMHB (examined). Type locality: NE Zanjan (Iran).

Material examined. Holotype ♂: ‘Iran, Prov. Zanjan, 20 km NE of Zangan [Zanjan], 2220m, 36° 42' N; 48° 45' E, 25.X.2000, leg. B. Benedek & Gy. Fábíán, col. György Fábíán / Hungary’, ‘Holotype ♂ *Lithostege stadii* Lehmann, L. Lehmann’, ‘Gen. Prep. Nr. 10/2008’; in coll. L. Lehmann.

Description & Diagnosis. Wingspan 29 mm, a little smaller than *L. buxtoni*. Forewing palebrown, with a smooth, black line from apex to basal area of forewings, highlighted proximally by a broad white band (Fig. 6). In the somewhat similar *L. buxtoni*, this line is strongly waved distally and terminates at the middle of the hind margin. Hindwings white, without any pattern. Male genitalia highly similar to those of *L. buxtoni* (Fig.37), but basal process of valve narrower, with almost pointed tip, terminal half of uncus gradually tapering towards apex, the latter not truncate. Aedeagus shorter, almost straight. Female unknown.

Distribution. Known only from type locality (NW Iran) (Map2).

L. obliquata Urbahn

(Figs. 7, 38, 61; Map 2)

Lithostege obliquata Urbahn, 1971: 193. Syntypes (not traced). Type locality: Repetek.

Lithostege obliquata: Viidalepp, 1996: 47; Parsons et al., 1999: 547.

Lithostege repeteki Tsvetajev, 1971: 663, text-fig. 4; pl. 1, fig. 2. (**syn. nov.**). Holotype ♂, Paratype ♂, ZISP (examined) Type locality: Repetek (Turkmenistan).

Lithostege repeteki: Parsons et al., 1999: 547.

Material examined. Type material: Holotype ♂ of *L. repeteki*: ‘Repetek, Turkmenia, A. Tsvetajev, 24.III.[1]965’, ‘Gen. Prep. No. 2625’, ‘Holotypus *Lithostege repeteki* Tsvet.’; Paratype ♂, same data, 2.IV.[1]965; in ZISP. Additional material: 7 ♂, 5 ♀; 1 ♀: Turkmenistan, Kerki, 37.50 N; 65.12 E, 10.-20.04.1993, ex. Coll. A. Schintlmeister; 2 ♂, 1 ♀: Turkmeni [stan], Karakumi, Repetek, 13.IV.[19]69, leg. Stschetkin; 2 ♂, 1 ♀: Turkmenien Genalik, leg. Zwetaew, gen. prep. ♀, 1616/2011 H. R.; all in ZFMK. 1 ♂: Turkmenistan, 50 km N of Ashkhabad, 100 m, 17.IV.1993; Ashkhabad, 100 m, 27.III.1993, No. L78, 58°33'E, 38°22'N, leg. M. Hreblay, Gy. Laszlo, A. Podius-sany, gen. prep. 1087/2010 H. R.; in ZSM. 2 ♂, 2 ♀: „Turkmeenia” [Turkmenistan], Repetek, 04.04.[19]80, M. Falkovitsh leg. (gen. prep. 3431, 7645, J.V.) (IZBE). Preparations of genitalia: 2 ♂, 2 ♀.

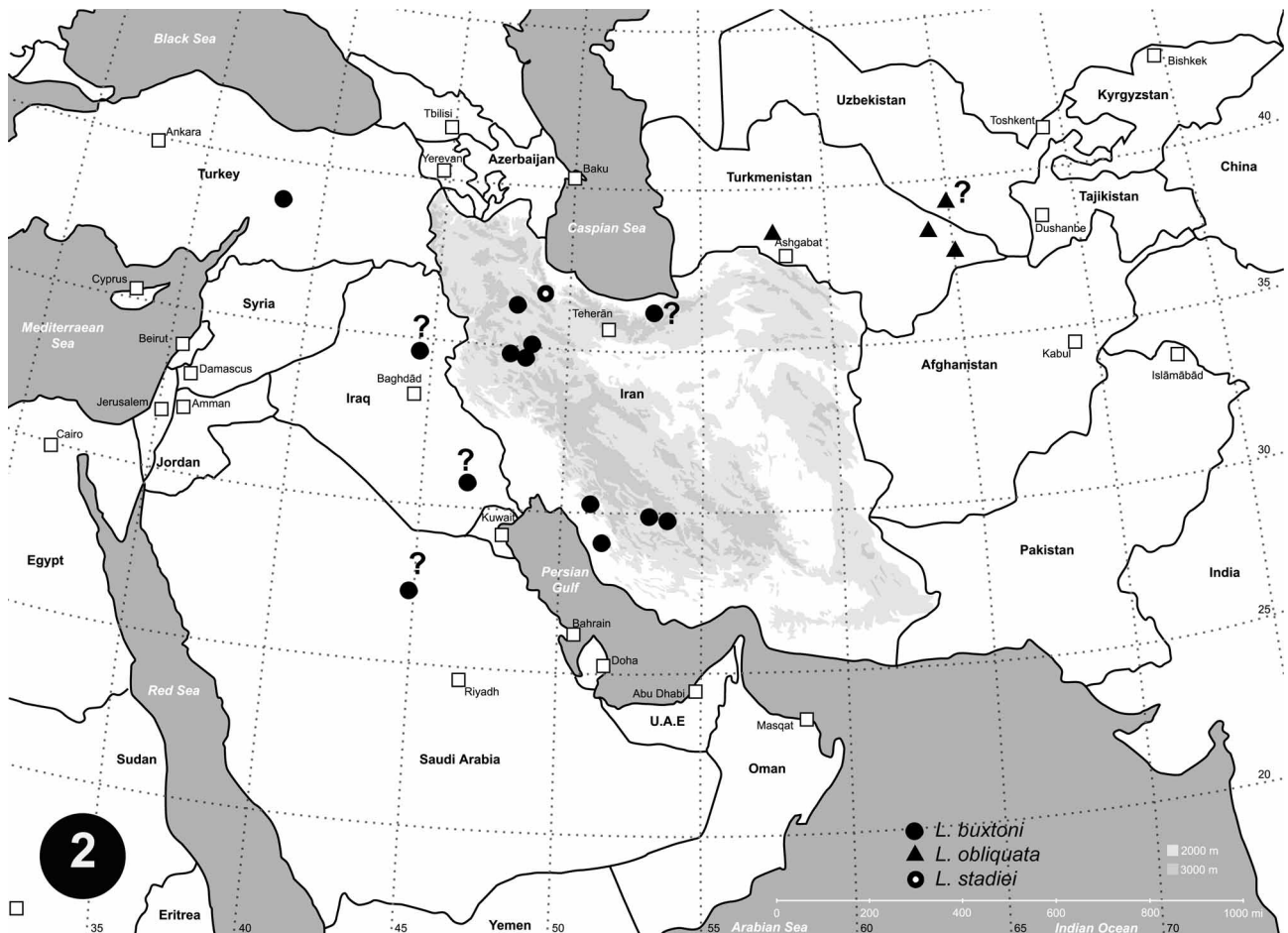
Description & Diagnosis. Wingspan 18–19 mm. Forewings with an oblique, ochreous medianband which is bordered by dark brown lines ante- and postmedially, the first rather weak, the second strong and shallowly

incurved at anterior half. There is a whitish band outside the postmedial, continued on the hindwings which are otherwise without pattern (Fig. 7). Male genitalia with elongate, distally rounded valves, with a strong, apically hooked and pointed harpe arising from their base; juxta deeply divided longitudinally; aedeagus with a peculiar distal prong (Fig. 38), the latter being unique for the whole genus. Female genitalia (here figured for the first time) with broad tubular ductus bursae, longitudinally folded corpus bursae, rugose but without internal spines, with a membranous apex connected to a membranous diverticulum (Fig. 61). The characteristic small species cannot be confused with any other of the Iranian *Lithostege*.

Taxonomic note. Type material of *L. obliquata* Urbahn could not be traced so far, but, the descriptions of this species and of *L. repeteki* Tsvetajev and the attached illustrations fit perfectly well and without doubt are dealing with the same species. Moreover, the type localities are also the same, and so we treat the two names as synonyms. As page 193 of the Entomologische Zeitschrift was published September 1, 1971, and the third part of vol. 50 of the Entomologitsheskoje Obozrenie later than September 16, 1971 (loc. cit., impressum p. 728) *L. obliquata* Urbahn must be considered as the valid name and *L. repeteki* Tsvetajev as its junior subjective synonym.

Bionomics. Specimens studied are collected in March and April only, at an altitude of 100 m (one record on elevation only).

Additional data on distribution based on literature sources. Falkovitsh (1986): Uzbekistan (as *L. repeteki*)
Distribution. Turkmenistan and Uzbekistan (Map 2).



MAP 2. *buxtoni* species group: *L. buxtoni*; *L. stadii*, *L. obliquata*.

III. The *bosporaria* group

L. bosporaria (Herrich-Schäffer)

(Figs. 8, 39; Map 3)

Chesias bosporaria Herrich-Schäffer, 1848: 182; pl. 53, fig. 327. Syntypes 2 ♀, ZISP (examined). Type locality: Constantinople [Istanbul] (Turkey).

Lithostege bosporaria: Prout, 1914: 173, 12c; Prout, 1938: 241; Viidalepp, 1996: 47; Parsons et al., 1999: 545.

Larentia porcataria Boisduval, 1848: 30. Syntypes in BMNH (not examined). Type locality: Odessa region (Ukraine).

Lithostege latestrigata Rebel, 1933: 24. Syntype ♀ in NHMW (not examined). Type locality: Ankara (Turkey).

Material examined. Type material: Syntypes: 2 ♀: '[Azerbaijan] Helen[en]dorf', 'Coll. Great Knjaz Nikolaj Mikhajlovich', 'ex coll. Zool. Inst. Acad. Sci. St. Petersburg, Russia', '*Lithostege bosporaria* H.-S. ♀, Mironov DET. 2000'; in ZISP; Additional material: 3 ♂, 5 ♀: 1 ♂, 3 ♀: Asia Minor, Ankara, 11.5.[19]66, leg. Dr. Sielmann, gen. prep. 1088 (♂)/2010 H. R.; in ZFMK. 1 ♂: Asia min, Kirikkale, 65 km östl Ankara, 29.5.1964, [leg.] J. Klimesch, coll. Klimesch; in ZSM. 1 ♂, 1 ♀: Azerb [aijan] SSR, Kucheti, 16.05.[19]63 [H. Remm leg.] (gen. prep. K-776, ♀, J.V.); 1 ♀: Arm [enia], Khosrov, 10.06.1969, J.V.; coll IZBE. Preparations of genitalia: 1 ♂, 1 ♀.

Description & Diagnosis. Wingspan 27–29 mm. Forewing crossed by straight, greyish-white bands, the distal two (postmedial and submarginal) lined blackish, basal and antemedial lines acutely angled near costa. Wing surface otherwise dark brown. Hindwings with a white, curved postmedial line without dark borders, veins black. *L. witzenmanni* has very similar pattern elements, but the wing surface between the lines is rather light grey instead of brown (Fig. 8). Male genitalia (Fig. 39) with broad, distally truncate valves, provided with elongate, distally curved harpes and straight, rather short, finger-shaped dorsal arms; strong, tooth-shaped projections are arising internally from the bases of the harpes; juxta broad, elongate, distally notched. Female genitalia with corpus bursae broad and spiculate; diverticulum of bursa present.

Bionomics. Confined to steppe and mountain steppe (Didmanidze, 1978). Specimens studied are collected in May and June only.

Additional data on distribution based on literature sources. Didmanidze (1978): Georgia; Wardikjan (1985): Armenia.

Distribution. Southern Ukraine and southern European Russia to Transcaucasus (Georgia, Armenia, Azerbaijan), Turkey (Map 3).

L. usgentaria Christoph

(Figs. 9, 40, 62; Map 3)

Lithostege usgentaria Christoph. 1885: 131, pl. 6, fig. 11. Syntypes (not traced). Type locality: "Mergelhügel" near Krasnowodsk [now Turkmenbashi] (Turkmenistan).

Lithostege usgentaria: Prout, 1914: 173, 11b; Prout, 1938: 241, pl. 18k; Viidalepp, 1996: 47; Parsons et al., 1999: 547.

Material examined. 6 ♂, 11 ♀: 1 ♀, 1 ♂: '[Turkmenistan], Tura', 'Coll. Great Knjaz Nikolaj Mikhajlovich', '455'; in ZISP. 1 ♂, 1 ♀: Turkmenistan, 50 km N of Ashkhabad, 100 m, 17.IV.1993, No. L88, 58°33'E, 38°22'N, leg. M. Hreblyay, Gy. Laszlo, A. Podiussany, preps ♂ 1017/2010, ♀ 1016/2010 H. R.; both in ZSM. 2 ♂, 2 ♀: „Turkmeenia” [Turkmenistan] 1977, Repetek 16–17.04, gen. prep. ♂ 7548, J.V.; 1 ♀: „Turkmeenia” [Turkmenistan], Kyzyl-Arvat, 27.04.1984, Martin & Talve leg.; 1 ♂: Turkestan mer., Iolotanj, 14.04.[19]77, lum., terr. psamm., Kozakevitsh leg., gen. prep. 7548, J.V.; in IZBE. ♂♀: Turkmenistan: Central Karakum desert; Murgab; Badkhyz; Kopet-Dagh: Germob, in IZAT. 1 ♀, USSR, Uzbekistan, Buchara, 25.4.[19]82, gen. prep. 1078/2010 H. R.; 3 ♀, Afghanistan, Herat, 970 m, 15.4.1956, H. G. Amsel leg., gen. prep. 1079/2010 H. R.; in ZFMK. 1 ♀: same data, gen. prep. 1061/2010 H. R., in SMNK. Preparations of genitalia: 3 ♂, 3 ♀.

Description & Diagnosis. Wingspan 21–25 mm. Wings light grey or brownish-grey, dark grey distal half of medial band edged by smoothly curved white lines (gently incurved below CuA2). Antemedial line oblique, a double until lower vein of cell, simple, whitish and sharply angled in cell. Hindwings grey or brown, almost without pattern (Fig. 9). Fore-tibia with epiphysis (inner distal projection) shorter than in *L. bosporaria*. Male genital armature (Fig. 40) smaller than in *L. bosporaria*, valves distally evenly rounded, harpe similar, a little longer, dorsal process of harpe parallel to valve costa, distinctly longer and a little narrower than in *bosporaria*; saccus triangular, in *bosporaria* rather elongate and distally rounded; uncus longer and narrower than that in *L. bosporaria*. Female antrum broad and cup-shaped, its posterior margin with a U-shaped notch (Fig. 62); apophyses posteriores 2 times longer than apophyses anteriores; ductus bursae long, broad, strongly sclerotized; corpus bursae globular, interiorly spiculate; anterior diverticulum present.

Bionomics. Specimens studied are collected in April.

Additional data on distribution based on literature sources. Shchetkin (1965a): South Tajikistan; Falkovitsh (1986): Uzbekistan and South Kazakhstan.

Distribution. S and SE of Turkmenistan to southern and eastern parts of Uzbekistan, W Tajikistan, S Kazakhstan and W Afghanistan. May also occur in NE Iran (Map 3).

L. witzenmanni Standfuss

(Figs. 10, 41, 63; Map 3).

Lithostege witzenmanni Standfuss, 1892: 668, pl. 15, fig. 8. Syntypes, ♂, not traced. Type locality: Mardin (Turkey).

Lithostege witzenmanni: Prout, 1914: 173; Parsons et al., 1999: 547.

Material examined. 9 ♂: 1 ♂: Armenien, Ordubad, Belas, 24.V.[19]57; 3 ♂, 2 ♀: Süd-O Türkei, Hakkari, 1700 m, Bagisli, 16.6.1985, leg. P. Kuhna; all in ZFMK. 2 ♂: W-Iran, 50 km N. v. Hamadan, 1600 m, E. & A. Vartian, 20.v.[19]66, preps ♂ 1026/2010 and 1037/2010 H. R.; 1 ♂, 1 ♀: [Azerbaijan, near Khoy] Ghotor, 20.6.[19]70, [leg.] Paz [ouki], gen. prep. ♂ 1027/2010 H. R.; all in SMNK. 1 ♂, 1 ♀: [Iran] W. Azerbaijan, Rezaieh, 1350 m, 1.–3.6.1975 and 7.6.1975, [leg.] Abai; L.T., preps ♂ 1080/2010, ♀ 1081/2010 H. R.; 1 ♂: [Azerbaijan, near Khoy] Ghotor, 20.6.[19]70, [leg.] Paz [ouki]; all in HMIM. Preparations of genitalia: 4 ♂, 1 ♀.

Description & Diagnosis. Wingspan 26–29 mm, clearly larger than *L. usgentaria*. Colour and pattern roughly similar to *L. bosporaria*; a white, triangular patch at the apex of the forewing of *L. witzenmanni* is distinctive. Ground colour much lighter in *witzenmanni*; medial area of forewings with an additional, double line; discal dot present, in *bosporaria* not visible (Fig. 10). Male genitalia (Fig. 41) with distally quadriform valves, similar to those of *bosporaria*, but more strongly angled; harpes and dorsal processes also similar to *bosporaria*, but there are no tooth-shaped projections from their basal parts; saccus triangular, distally rounded; aedeagus straight. Females (Fig. 63) with very short apophyses anteriores (apophyses posteriores 5 times longer) and short ductus bursae (especially compared to *L. usgentaria*); antrum cylindrical, its posterior margin with a V-shaped notch (U-shaped in *L. usgentaria*); ductus bursae quadrate (shorter than in *L. usgentaria*); corpus bursae more or less globular, internally spiculate; anterior diverticulum present.

Bionomics. Specimens studied are collected in May and June and these records are from altitudes of 1350–1700 m.

Additional data on distribution based on literature sources. Prout (1912–1916): NW Iran; Butler and Hampson (1899): Urmia (Azerbaijan-e Gharbi).

Remarks. Lederer (1871) reported *L. usgentaria* from Urmia, NW. Iran. This specimen probably should be identified as *L. witzenmanni*. *L. usgentaria* is distributed in the Transcaspien countries only (Turkmenistan, Uzbekistan, Kazakhstan, and Tajikistan) and reaches Afghanistan, for the fauna of Iran it is an Eastern species, while *L. witzenmanni* is a western species.

Distribution. From Mardin (Turkey) to NW Iran (Map 3).

L. dissocyma Prout

(Figs. 11, 64; Map 3)

Lithostege dissocyma Prout, 1938: 241, pl. 17 b. Holotype ♀, BMNH (examined). Type locality: Table Mt. (Dyala, NE of Baghdad, Iraq).

Lithostege dissocyma: Parsons et al., 1999: 546.

Material examined. Type material: Holotype ♀, ‘Iraq, Dyala, Table Mt. 14.iii.1936 E. P. Wiltshire’, ‘Figured in Seitz 4 supplement’, ‘Wiltshire coll. B.M. 1979–433’; in BMNH. Additional material: 3 ♀: 1 ♀: S-Iran, Bandar-Abbas, km 107 d. Strasse nach Sirdjan, 850 m, 7.3.1973, G. Ebert leg., gen. prep. 1028/2010 H. R.; in SMNK. 1 ♀: [Iran] Fars, Kazerun, Gavkoshak, 4.4.1976, L.T. [leg.] Abai, gen. prep. 1074/2010 H. R.; 1 ♀: [Iran] Hormozgan, Bandar-Abas, 20 km N Ghotbabad, 950 m, 28.2.1978, [leg.] Pazuki, gen. prep. 1075/2010 H. R.; both in HMIM. Preparations of genitalia: 3 ♀.

Description & Diagnosis. Wingspan 29–31 mm. Wing pattern: a pale grey reminiscent of that in *L. amoenata*, also quite similar to the next two species; postmedial line most conspicuous, curved outwards two times, rather close to termen; ground colour of both wings darker grey; hindwings without pattern, dark grey (Fig. 11). Male genitalia with short, broadly rounded valves and a strong, thorn-shaped harpe arising from its centre; dorsal arm slender, without apical spines, diverging from valve costa; saccus short, triangular; aedeagus short and stout (Lehmann et al., 2009). Male genitalia are most similar to *L. senata* (see also Lehmann et al., 2009). Female genitalia (Fig. 64): Antrum almost quadrate, posterior margin V-shaped; ductus bursae narrow, elongate; corpus bursa transversely oval, finely spiculate, provided with an anterior diverticulum.

Bionomics. Specimens are collected in January (Lehmann et al., 2009), February, March and April (Lehmann et al., 2009) and records are from altitudes 450–950 m.

Additional data on distribution based on literature sources. Wiltshire (1942): Iraq (Table Mts.); Lehmann et al. (2009): Kuh-e Geno (Hormozgan prov.) and Shib Kuh (Bushehr prov.).

Distribution. East Iraq and southwestern to southern Iran (Map 3).

***L. hreblayi* Rajaei & Viidalepp, sp. nov.**

(Figs. 12, 13, 42, 65; Map 3)

Type material. Holotype ♂: 'N-Pakistan, 5 km E of Chorit, 2400 m, 35°14'N, 74°46'E, Nr. 8, 2.VI.1992, leg. M. Hreblay & G. Csorba', 'Museum A. Koenig Eing. Nr. 94/402, ex. Coll. J. Plante', 'gen. prep. 1056/2010 H. R.'; Paratypes: 6 ♂, 1 ♀: same locality, ♀ gen. prep. 1085/2010 H. R.; all in ZFMK; 1 ♂: same data, in SMNK; 1 ♂, 1 ♀: same data, gen. prep. YV 4070, 4071, in IZBE.

Description (Figs. 12, 13). Wingspan 24 mm. Frons protruding about one-half of the eye diameter, spotted white and grey. Palpi rather long and narrow, reaching well beyond frons. Antennae filiform, finely and homogeneously pubescent in both sexes. Fore-tibia short and stout, 0.7 mm long, bidentate distally, with inner tooth-like projection as long as tibia. The last abdominal tergite of male terminally rounded, without a distinct buckle. Forewing ash-grey with postmedian line white, shaded dark grey proximally, projecting distad at veins M_1 , M_3 and anterior to An, concave in between. Antemedian line rather indistinct, moderately angled in cell. Basal line posteriorly obsolete, but sharply angled in cell. Termen with a narrow, black line, interrupted at veins. Hindwing uniformly grey. Underside of forewings of a darker grey ground colour, with only the postmedian line faintly visible. Underside of hindwings lighter than upperside, with a darker marginal band. Male genitalia (Fig. 42). Uncus short, rather broad and triangular, distally hooked and finely pointed. Valve parallel-sided, distally rounded and finely dentate. Harpe long, running close to costa, its distal projection long as well, recurved and approaching the tip of the costal arm, the latter long and flattened at distal half. Sacculus broad at base, distally narrow, with a flat, elongate-triangular, distally rounded projection apically on right valva. This projection on left valva not flat, spine-like. Saccus long, distally rounded. Aedeagus long, curved in lateral view, with vesica covered with small, stout teeth. Female genitalia (Fig. 65). Antrum large, elongate, V-shaped, with internally oblique posterior margins and a deep central incision. Ductus bursae tubular, sclerotised, with a membranous stripe along its right side, extended into a broad, sclerotized field covering partly the membranous, proximal area of the corpus bursae. The latter slightly oval, densely spiculate at distal three fourths, with a small membranous anterior diverticulum.

Diagnosis. Resembling *L. amoenata*, but ground colour more uniformly grey, the medial area seems to be much broader due to the weakly marked antemedial line; hindwing grey, without a pale transverse band which is present in *L. amoenata*. Differs also considerably in the build of male and female genitalia, especially in the shape of aedeagus and valves. Also similar to the next species, but *L. samandooki* has the postmedian lines more strongly angled and distinctly double. The female genitalia (males are unknown) are similar, but the sclerotized antrum has a different shape. This is also true for *L. dissocyma*. In addition, this species has the postmedian lines situated much closer to the termen.

Distribution. Pakistanian part of Kashmir. Known from type locality only (Map 3).

Etymology. The name of the species is dedicated to the late Hungarian lepidopterologist and noctuid specialist, Martón Hreblay, one of the collectors of the type material.

***L. samandooki* Rajaei, sp. nov.**

(Figs. 14, 66; Map 3)

Type material. Holotype ♀: 'Iran, Kerman, Jiroft NW, Gardaneh Sarbishan, Shingara vic., 2700–2900 m, 3./4.6.2002, leg. J.-U. Meineke, A. Hofmann, A. Kallies et al.', 'gen. prep. 1073/2010 H. R.'; Paratypes: 1 ♀: same locality; both in SMNK. 1 ♀: same locality, gen. prep. 1076/2010 H. R.; in ZFMK.

Description. Wingspan 25–26 mm. Antennae of female filiform, finely pubescent (male unknown). Frons protruding about one-half of the eye diameter. Palpi rather long and narrow, reaching well beyond frons. Head (palpi, frons, vertex) and abdomen spotted white and brown. Fore-tibia stout and flat (0.8 mm), bidentate distally, with inner tooth-like projection as long as tibia. The last abdominal tergite heavily sclerotised, with a straight posterior edge. Forewing greyish-brown, with a white postmedial line, longitudinally bisected by a brown line, projecting distad and sharply angled at veins M_1 , M_3 , less sharply angled in between; there is a broad, brownish band basally of the postmedial line. Antemedial line similar, angled in cell, not reaching costa. Hindwing grey, with two broad, very obscure bands on medial area. All wings with fringes alternatingly dark and light. Underside of forewings with the postmedial line visible only. Hindwing underside lighter, with a faint line in the middle. Female genitalia (Fig. 66). Antrum cylindrical, its posterior margin with a small, V-shaped incision; ductus bursae tubular, width about half the width of the antrum, extended into a sclerotized patch on membranous part of corpus bursae. The latter oval, distal half densely spiculate; membranous anterior diverticulum present.

Diagnosis. The waved postmedial lines on forewing resemble *L. amoenata* (Fig. 1), *L. dissocyma* (Fig. 11) and *L. hreblayi* (Figs 12, 13), however, in *L. samandooki* they are more distinctly angled than in the other three. In *L. dissocyma* the postmedials are also closer to the termen. The three lines on the hindwing of *L. amoenata* are absent here; in the female genitalia, the apophyses anteriores are shorter, and the cylindrical antrum in *samandooki* (Fig. 66) contrasts with the wide one found in *L. amoenata* (Fig. 58); ductus bursae narrower and membranous close to the antrum in the new species. In *L. dissocyma* and the other related species, more than half of corpus bursae is spiculate (Fig. 64); antrum cylindrical. posterior margin with a small, V-shaped incision in *samandooki*, but with a larger incision in *hreblayi*.

Distribution. SE Iran, vicinity of Shingara. Known from type locality only (Map 3).

Etymology. The name of this species is dedicated to **Ebrahim Samandook**, teacher of biology (at high school) of the first author (1993–1997). He is still active in teaching biology in Taybad, Khorasan-Iran.

***L. senata* Christoph**

(Figs. 15, 43, 67; Map 3)

Lithostege senata Christoph, 1887 (b): 166. Holotype ♀, ZISP (examined). Type locality: Ashkhabat (Turkmenistan).
Lithostege senata: Prout, 1914: 174, pl. 13b; Viidalepp, 1996: 47; Parsons et al., 1999: 547.

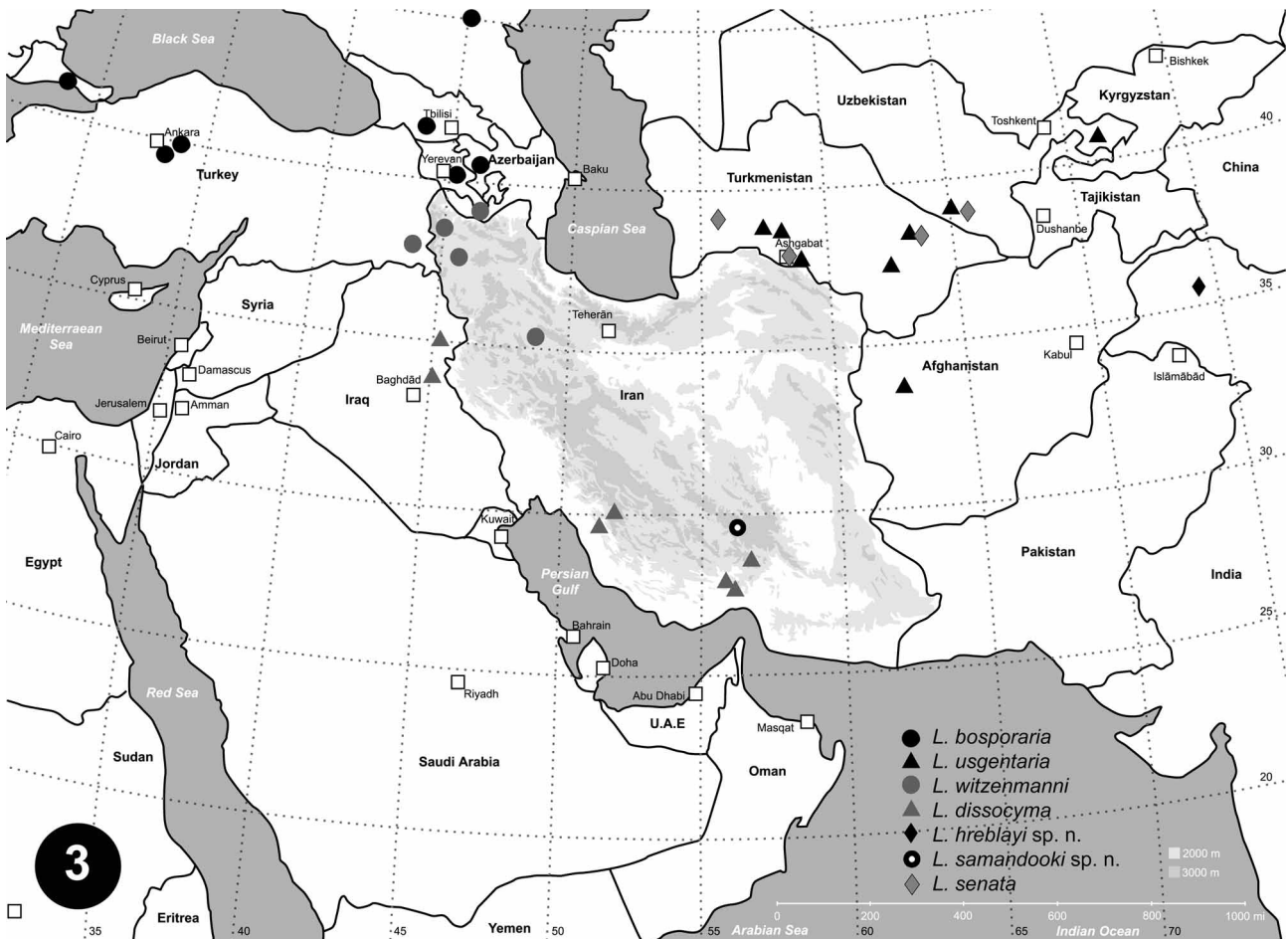
Material examined. Type material: Holotype ♀: '[Turkmenistan] Ashkhabat', '100.', 'Coll. Great Knjaz Nikolaj Mikhajlovich', '*Lithostege senata* Chr.'; in ZISP. Additional material: 5 ♂, 4 ♀: 1 ♂: „Turkmeenia” [Turkmenistan] 1977, Repetek, 16–17.04, J.V. leg., gen. prep. 1771, J.V.; 8 ♂ ♀, „Turkmeenia” [Turkmenistan] 1977, Uzboi [river-bed], Yashan, 27.04–02.05, J.V. leg., gen. prep. 3416, J.V.; 8611; in coll. IZBE. Preparations of genitalia: 2 ♂, 1 ♀.

Description & Diagnosis. Wingspan 16–18 mm. Wings light brown with white antemedian and postmedian transverse lines, postmedian projecting outwards at veins R_5 and M_3 ; medial area composed of a distal, broad, brown band, accompanying the postmedial line and an even larger proximal part, accentuated with greyish scales (Fig. 15). Male genitalia (Fig. 43) with short, broadly rounded valves and a strong, thorn-shaped harpe arising from its centre; dorsal arm slender and diverging from valve costa; saccus rather narrow, acutely elongated. Aedeagus long, curved at middle. Male genitalia most similar to those of *L. dissocyma*, but harpe of *senata* stronger and curved ventrad (dorsad in *dissocyma*), saccus longer and narrower, aedeagus longer. Female genitalia (Fig. 67) with a cylindrical antrum, with very deeply incised posterior margin; ductus bursae short, extended into a much longer, sclerotized band running across the posterior, hyalinous part of the bursa. Anterior three fourths of the latter densely spined, diverticulum present. Small size, colour, pattern and distinct characters of male and female genitalia render this species unmistakable among the species treated here.

Bionomics. Occurring in sand deserts; specimens studied are collected in April only.

Additional data on distribution based on literature sources. Tsvetajev (1972), Remm & Viidalepp (1981): Turkmenistan; Falkovitsh (1986): Uzbekistan.

Distribution. Turkmenistan and Uzbekistan (Map 3). May also be found in the north-eastern parts of Iran.



MAP 3. *bosporaria* species group: *L. bosporaria*; *L. usgentaria*; *L. wizenmanni*; *L. dissocyma*; *L. hreblayi* sp. nov.; *L. samandooki* sp. nov.; *L. senata*.

IV. The *farinata* group

L. notata Bang-Haas

(Figs. 16, 44; Map 4)

Lithostege notata Bang-Haas, 1906: 138, pl. 5, fig. 16. Syntype (s) (not traced). Type locality: Tunisia: Gafsa; Dehibat; Fom-Tatahouine.

Lithostege notata: Prout, 1914: 175; Prout, 1937: 84, pl. 8g; Prout, 1938: 241; Parsons et al., 1999: 546.

Material examined. 7 ♂, 3 ♀: 1 ♂: Algerie, Biskra, Décembre 1913, Chlerotti; 1 ♂: [Algeria] Biskra, Faroult, Janvier-Février 1910; in ZFMK. 1 ♂: 2.1.[19]51, [Bushire prov.], Bushire, Fars [according to old maps], Persia, [leg.] E. P. Wiltshire; 1 ♂, Gohreh [or Ghotb-Abad, Hormozgan prov.] (B.A.) 9.3.1971, [leg.] Paz [ouki], Ayat, gen. prep. 1059/2010 H. R.; 2 ♂: [Iran, Chaharmahal-o Bakhtiari prov.] Sarkhoun, 8.3.1972, [leg.] Mirz [ayans], Broum [and], gen. prep. 1058/2010 H. R.; all in SMNK. 1 ♀: [Iran] Khuzestan, 32 km Behbahan, Guenaveh, 6.3.1975, [leg.] Pazouki, Broumand; 1 ♂, 2 ♀: [Iran] Hormozgan, Kamir [Bandar-e Khamir], 60 m, 10.3.1991, [leg.] Mirz [ayans], Paz [ouki]; all in HMIM. Preparations of genitalia: 2 ♂.

Description & Diagnosis. Wingspan 26–28 mm. Forewing grey, loosely speckled with black scales, the latter

often forming indistinct streaks, with a white terminal band (from R_5 to CuA_2) which is shaded darker grey internally; a second, similar white line starts from apex and continues, more or less parallel to costa, along anterior margin of cell towards base, but not reaching the latter. Hindwing dirty white, notmarked, fringe concolorous. Underside similar to upperside (Fig. 16). Male genitalia (Fig. 44) Valve flat, its proximal part heavily sclerotized. Harpe reduced to a setose band, dorsal projection rather short, curved, distally spined; juxta laterally oblique, apically notched. Female genitalia: see Hausmann & Seguna (2005).

Bionomics. Specimens studied are collected in December, January and March.

Additional data on distribution based on literature sources. Prout (1937–1939): N Africa, Iraq and Arabia; Wiltshire (1942): Iraq (Table Mts.); Wiltshire (1951): Iran (Bushire, SW Iran); Wiltshire (1990): E Arabia.

Distribution. N Africa, eastern Saudi Arabia, Iraq, South and Southwest Iran (Map 4).

L. fissurata fissurata Mabilie

(Figs. 17, 45; Map 4)

Lithostege fissurata Mabilie, 1888: 58. Holotype ♀, ZSM (examined). Type locality: Tunisia.

Lithostege fissurata: Prout, 1914: 172, pl. 11b; Prout, 1937: 84; Prout: 1938: 241; Parsons et al., 1999: 546.

Material examined. 3 ♂, 5 ♀: 1 ♂, 1 ♀: [locality not mentioned] 1957, coll. L. Lhomme, gen. prep. ♂ 1045/2010 H. R.; in ZSM. 1 ♂: Algeria, Centre Hassi Bahbah Plantation, 24.IV.1930, Schwingenschuss; 1 ♂, 2 ♀: Algier, El Mesrane Predota, 26.–27.4.1931, preps. ♂ 1608/2011 H. R.; 2 ♀: Algier, Roche de Sel, Predota, 18.4.1931; Biskra, Mars, 1910, V. Faroult; all in ZFMK. Preparations of genitalia: 2 ♂.

Description & Diagnosis. Wingspan 19–28 mm. Forewing creamy white, with a short, curved, narrow apical dark grey line. Hindwing dirty white, without pattern (Fig. 17). Tergite A–8 (Fig. 45 c) strongly sclerotised, distally prominent and irregularly crinkled. Male genitalia (Fig. 45): Valve with its larger, proximal part densely sclerotised, with a small, rounded l projection more ventrally on its outer margin; harpe a small, rounded, somewhat elongate lobe at base of valva, dorsal projection short, semicircular, with a pointed tip; aedeagus straight. Female genitalia (see Hausmann & Seguna, 2005: 12, fig. 3) very similar to those of *L. fissurata inanis*.

Bionomics. Specimens studied are collected in April only.

Distribution. Western Algeria to Libya, Malta, Southeast of Egypt, Israel (Hausmann & Seguna (2005) (Map 4).

L. fissurata inanis Prout

(Figs. 18, 68; Map 4)

Lithostege inanis Prout, 1941: 331, pl. 34: i. Holotype ♂, allotype ♀, BMNH (examined by photo). Type locality: Saudi-Arabia: Khafs.

Lithostege fitzgeraldi Wiltshire, 1947: 10, pl. Fig. 15; text-fig. 10. Holotype ♂, BMNH (not examined). Type locality: Saudi-Arabia: Artawiya.

Lithostege fissurata inanis: Wiltshire, 1990: 125, fig 81.

Lithostege inanis: Parsons et al., 1999.

Lithostege fissurata inanis: Hausmann & Seguna, 2005: 11–15.

Material examined. Type material: Holotype ♂: ‘Arabia: Khafs. 26.ii.1935. H. St. J. B. Philby, B. M. 1935–222’, ‘Type’, ‘*Lithostege inanis* Prout Holotype ♂’; allotype ♀: same data; coll. BMNH.

Additional material: 1 ♀: Iran, Belutschistan, Iranshahr, 800 m, 1.-10.III.1954, [leg.] Richter u. Schäuuffele, gen. prep. 1012/2010 H. R. Preparations of genitalia: 1 ♂, 2 ♀.

Description & Diagnosis. Wingspan of the single specimen from Iran: 22 mm. Wings similar to *L. fissurata*, but without apical dark grey line on forewing (Fig. 18). Female genitalia (Fig. 68) with very short apophyses anteriores (0.1 of apophyses posteriores) and a short funnel-shaped antrum; the pear-shaped corpus bursae fully spinulate, with a small anterior diverticulum. Female genitalia of *fissurata* without distinct differences. Also the male genitalia of the holotype (studied) almost identical.

Taxonomic note. Wiltshire (1990) synonymised *L. fitzgeraldi* Wiltshire, 1947 with *L. inanis* Prout, 1941 and simultaneously downgraded this taxon to a subspecies of *L. fissurata* Mabille, 1888. The single examined specimen from Iran was recorded by Hausmann & Seguna (2005) as *L. fissurata inanis* Prout, 1941. The female genitalia of this specimen are highly similar to those of *L. fissurata* (figured in Hausmann & Seguna (2005)). Also the male genitalia of the holotype of *L. inanis* Prout fit well with those of *L. fissurata* Mabille. On the other hand, a separation on species-level of *inanis* and *fissurata* is supported by genetic differentiation between these two taxa. DNA-barcoding of 5 specimens of *fissurata* from a wide area of distribution (Mauretania: 2; Tunisia:2; Israel: 1) does not show any intraspecific variation, but comparing these with three barcodes of *inanis* (from United Arab Emirates) reveals a distance of 2.35%, suggesting *inanis* to be a distinct species. Conventionally, a barcode difference exceeding 2% is understood as an argument of a species-level difference. It seems not unlikely that long-term isolation between Iranian and Arab populations led to a cryptic species (“in statu nascendi”) in Iran, but without further studies of more material we are not able to decide this question. So here we follow Hausmann & Seguna (2005), regarding *inanis* as a subspecies of *L. fissurata*.

Bionomics. Specimens studied are collected in January and February.

Distribution. Saudi Arabia, Iraq and SE of Iran (Hausmann & Seguna, 2005) (Map 4).

L. parva Shchetkin

(Figs. 19, 46, 69; Map 4)

Lithostege parva Shchetkin, 1965b: 39, fig. 1. Holotype ♂, ZISP (examined); paratypes 2 ♂, 1 ♀ ZFMK (examined). Type locality: Tajikistan: Pjandzh Distr., Vaksh valley, Ak-Bash-Adyry hills. Paratypes from Vaksh valley; Parhar District, Kyzyl-Su valley; Dushanbe; Uzbekistan: Samarkand; Turkmenistan: Ashkhabad, Germob, Bairam-Ali.

Lithostege parva: Viidalepp, 1996: 47; Parsons et al., 1999: 547.

Material examined. Type material: Holotype ♂: ‘Tadjikistan, Vakhsh valley, bei Djilikul, 350 m, 7.IV.1953’, ‘Holotypus *Lithostege parva* Stshetkin’, ‘ex. Coll. Zool. Inst. Acad. Sci. St. Petersburg, Russia’ in ZISP; paratypes 2 ♂, 1 ♀: Tadj [ikistan], Wachs-Tal, bei Djilikul, 350 m, (paratype ♂) 24.III.[19]49, (♀) 14.IV.[19]49, (♂) 26.III.[19]49, [*Lithostege pumilata*] Paratypus, Zucker-Präp. [♂] Umgebettet, Stün. 107, preps (♂) 1614, (♀) 1615/2011 H. R.; in ZFMK. Additional material: 7 ♂, 3 ♀: 1 ♂: Tadj [ikistan], bei Duschanbe, 750 m, 18.VII.[19]63; 1 ♂: same data, 18.03.[19]62; 1 ♀: Tadj [ikistan], Tabaktschi-Geb. Bei Kalininabad, 450 m, 6.03.[19]78; 1 ♀: Samarkand, Pumila, *Lithostege parva* Shchetk. det. J. Viidalepp, 1994; all in ZFMK. 2 ♂: Turkmenistan, Kopet-Dagh Mt. 17 km SW from Ashkhabad, Nissa, 300 m, 26.III.1993, No. L77, 58°07'E, 37°59'N, leg. M. Hreblay, Gy. Laszlo, A. Podlussany, gen. prep. 1020/2010 and 1021/2010 H. R.; both in ZSM. 1 ♂: [Uzbekistan] Ayakguzhumdy 40 km O Djin [gildy], Kyzylkum, 10.07.[1]965, Pastukhov leg.; in IZBE. ♂/♀: Turkmenistan: Ashkhabat, Repetek, Badkhyz; in IZAT. Preparations of genitalia: 4 ♂, 1 ♀.

Description & Diagnosis. Wingspan 19.5–24 mm. Forewing brownish grey with indistinct brownish bands and lines from costa to hind margin, parallel to the distal margin of wing. Only the postmedial line is relatively distinct, brownish, accentuated darker at veins (Fig. 19). Male genitalia (Fig. 46) characterized by the extremely broad and stout uncus and the valve costa ending in a short, pointed projection. Harpe reduced to a dentate, sclerotised band in the middle of the valve, the long dorsal projection spinose in distal half, reaching more than one-half the length of valve; juxta deeply V-shaped grooved. Saccus short, rounded. Aedeagus slightly curved, coecum inflated. Female genitalia (Fig. 69) with apophyses posteriores about three times longer than ap. anteriores; sclerotised antrum absent, ductus bursae and corpus bursae membranous, with membranous anterior diverticulum (Fig. 69). A species similar in shape and coloration is *L. luminosata*, which is a little larger, and lighter, especially in the hindwings, and lacks the darker transverse lines on the forewing upperside. It differs also in the finger-shaped uncus, the larger, triangular saccus, and the much stronger ornamentation of the valve.

Bionomics. Moths possibly bivoltine, occurring in March-April and July. Probably associated with *Malcolmia turkestanica* (Cruciferae), growing on sands in the desert (Shchetkin, 1965b).

Additional data on distribution based on literature sources. Shchetkin (1965b): Tajikistan, Uzbekistan, Turkmenistan. Falkovitsh (1986): Uzbekistan.

Distribution. SE Turkmenistan, S Uzbekistan and SW Tajikistan (Map 4).

***L. turkmenica* Tsvetajev**

(Figs. 20, 70; Map 4)

Lithostege turkmenica Tsvetajev, 1971: 662, text-fig. 3; pl. 1, fig. 1. Holotype ♂ and paratypes 4 ♂, ZISP (examined). Type locality: Repetek (Turkmenistan).

Lithostege turkmenica: Viidalepp, 1996: 47; Parsons et al., 1999: 547.

Material examined. Type material: Holotype ♂: ‘Repetek, Turkmenia, A. Tsvetajev, 3.IV.1965’, ‘Gen. Prep. No. 2624’, ‘Holotypus *Lithostege turkmenica* Tsvet.’; Paratypes 4 ♂, same data, 14.IV.[1]966; in ZISP. Additional material: 1 ♀: [Uzbekistan] 60 km NW Djingildy, Karakum desert, Haloxylon forest, 21.04.1966, Pastukhov leg., gen. prep. 7649, J.V.; in IZBE.

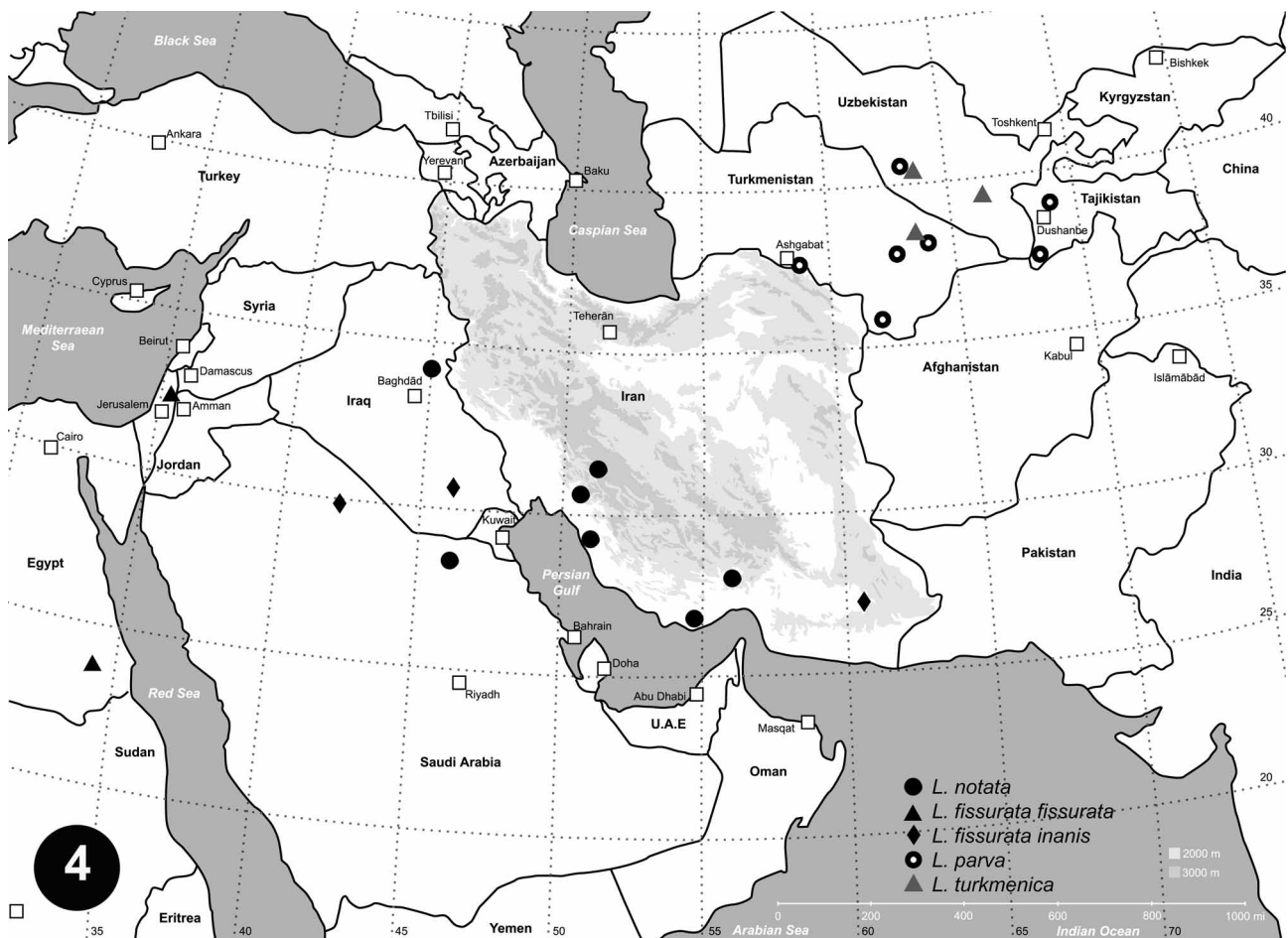
Description & Diagnosis. Wingspan 20–24 mm. A yellowish-white moth with narrow, elongate wings, rounded termen and acute apex of forewings. The brown, oblique postmedian line consists of separate vein-dots, most clearly so in the posterior half of the wing (Fig. 20). Male genitalia (figured in Tsvetajev 1971) die Arbeit brauche ich heavily sclerotised, harpe a low crest with short curved projection from base reaching behind base of costa. Female genitalia (Fig 70, figured for the first time) with large papillae anales of ovipositor and a membranous bursa without internal spining, with a small anterior diverticulum.

Bionomics. Specimens studied are collected in April only. A desert species. Preimaginal stages unknown, but moths were collected in *Haloxylon* forests in both localities.

Additional data on distribution based on literature sources. Tsvetajev (1971, 1972): Turkmenistan; Falkovitsh (1986): Uzbekistan.

Distribution. SE Turkmenistan and S Uzbekistan (Map 4).

Note. This species is not mentioned in Parsons et al. (1999) and Scoble & Hausmann (2007).



MAP 4. *farinata* species group-a: *L. notata*; *L. fissurata fissurata*; *L. fissurata inanis*; *L. parva*; *L. turkmenica*.

L. farinata (Hufnagel)

(Figs. 21, 47)

Phalaena farinata Hufnagel, 1767: 610. Types not traced. Type locality: Berlin.

Geometra illibata [Denis & Schiffermüller], 1775: 116. Types not traced. Type locality: Vienna.

Geometra nivearia Hübner, [1799]: pl. 41, fig. 217. Types not traced. Type locality: Europe.

Phalaena albaria Turton, 1802: 241. Types not traced. Type locality: Austria.

Lithostege farinata bachmutensis Prout, 1938: 239, pl. 18, g. Syntypes in BMNH (not examined). Type locality: Bakhmut (Ukraine).

Lithostege farinata: Prout, 1914: 172, pl. 6d; Prout, 1937: 83; 1938: 238; Viidalepp, 1996: 47; Parsons et al., 1999: 546.

Material examined. More than 500 specimens from different European countries in SMNK, ZSM, ZFMK. Here we mention just data of specimens with genitalia preparation: 1 ♂: Falknerstein, Austria inf. 2.V.1951, coll. H. Reisser, Wien, prep: 776/2009 H. R.; in SMNK. 1 ♂: Hainburg, N. Österr[eich], 24.5.1963, leg. Dr. Sielmann, prep: 1054/2010 H. R.; 1 ♂: Süd-Frankreich, Provence Le Castellet, 19.5.1974, 600m, leg. P. Kuhna, prep: 1609/2011 H. R.; 1 ♂: Austria, Burgenland, Neusiedl, 12.7.65, P. Kuhna, prep: 1610/2011 H. R.; all in ZFMK. Preparations of genitalia: 4 ♂. Determination verified, based on comparison with identified specimen, and the identification key of Amsel (1935).

Description & Diagnosis. Wingspan 27–30 mm. Forewing milk-white to creamy-white, hindwing of a lighter white, fringes white. Pattern elements absent, except some weak dusting with grey scales on forewings. Underside darker, forewing of a brownish-grey, hindwings of a milky white, with a dark discal spot (Fig. 21). Male genitalia (Fig. 47) characterized by an elongated valve, the strongly sclerotized costa reach only half the length of the valve, terminating with a short, pointed, apical projection; harpe a broad, lobe-like process near the centre of the valve, pointed distally, with a narrow basal arm; dorsal arm narrow, elongated, terminally with a few spines, running parallel to valve costa, hardly reaching its tip; uncus shorter than in *L. coassata*, *L. ancyrana*, *L. griseata* and *L. palaestinensis*; juxta vase-shaped and elongated (longer than other species of the *farinata* group); saccus broad, elongated, truncate distally, aedeagus extremely long and narrow (both much longer than all other members of the group, Figs 47–53).

Bionomics. Hostplants: *Sisymbrium officinale*, *Sinapis arvensis*, *Alliaria petiolata*, *Raphanus raphanistrum*. The species flies from the beginning of May to July (Heinicke & Müller, 1976).

Distribution. Reported from many European countries including European Russia; also from Caucasus, Transcaucasus and Turkey (FAUNA EUROPAEA, 2011; Viidalepp 1996). Not recorded from Iran.

L. coassata (Hübner)

(Figs. 22, 48, 71; Map 5)

Ortholitha coassata Hübner, [1825]: 338 [Replacement name for *Geometra duplicata* Hübner, [1817]]. Type locality: Europe.

Geometra duplicata Hübner, [1817]: pl. 95, fig. 491. Types not traced. Type locality: Europe.

Minoa assinata Freyer, 1830: 123, pl. 132, fig. 2. Type locality: Odessa region, Ukraine.

Eubolia coassaria Boisduval, 1840: 202. [Emendation]

Lithostege coassata: Prout, 1914: 173, pl. 6e (as *duplicata*); Prout, 1938: 240; Viidalepp, 1996: 47; Parsons et al., 1999: 545.

Material examined. 29 ♂, 103 ♀: 19 ♂, 95 ♀: N-Iran, Masandaran, Gonbad Qabus, O-m Zone, 28.4.1969, Einh. Sammler leg., preps ♂ 1041/2010 and 1042, ♀ 1043/2010 H. R.; 1 ♂: Turkestan Oriental, Fort-Naryne, Prov. Semirechgensee, S. Akulin, 1920–1911 [m], gen. prep. 1040/2010 H. R.; 2 ♂: NW-Iran, 15 km SÖ. Maku, 1050 m, 3.6.1975, H.G. Amsel leg., preps 1068/2010 and 1069/2010 H. R.; all in SMNK. 1 ♀: same data, 6.6.1975, [leg.] Abai; 1 ♂: [Iran, Golestan prov.] Gorgan, 14.4.1970, gen. prep. 1070/2010 H. R.; 1 ♂: NW-Iran, 40 km westl. Marand, 1100 m, 6.6.1975, H. G. Amsel leg., gen. prep. 1071/2010 H. R.; 1 ♀: [Iran, Golestan prov.] Gorgan, Naharkhoran, 500 m, 5.6.1982, [leg.] Hashemi; 1 ♀: [Iran, Golestan prov.] Gorgan, 26.4.1970; 1 ♂: [Iran, Golestan prov.] Gonbad Ghabous, 11.5.[19]69, gen. prep. 1084/2010 H. R.; 1 ♂, 1 ♀: [Iran] Azarbaidjan, Moghan, 2.5.1968, [leg.] Arghand; all in HMIM. ♂/♀: Turkmenistan: Kopet-Dagh Mts.: Kara-Kala, Ai-Dere, Tshuli, Yablonovka, Askhabat, Keledjar, Keshi, Kyzyl-Arvat; Kara-Bogaz; Repetek; Morgunovskii, Badkhyz, in ZIAT. 1 ♂, 2 ♀: „Turkmeenia” [Turkmenistan] 1977, Sumbar riv., Ai-Dere, 24–25.04, J.V.; 1 ♂: the same locality but 10.05.1974,

P. Ivinskis leg.; 1 ♀: “Turkmeenia” [Turkmenistan], Morgunovka, 03.05.1974, P. Ivinskis leg.; 1 ♀: the same locality but 26.03.1987, E. Veromann leg.; all in IZBE. Preparations of genitalia: 6 ♂, 2 ♀.

Description & Diagnosis. Wingspan 26–32 mm. Wings brownish-grey, with darker brown pattern elements. Similar to *L. griseata griseata* in size and wing-shape, but distinguishable by the presence of transverse bands or lines demarcating the median area of forewing and an oblique line reaching the apex of forewing. Also an indistinct antemedian line present. Underside concolorous, almost without pattern. Also similar to *L. luigi*, but the latter is smaller, the transverse lines are indistinct, less oblique and the submarginal line does not reach the apex (Fig. 22). Male genitalia (Fig. 48) similar to *farinata*, but the apical projection from costa shorter and pointed, curved ventrad; harpe rather elongate, dorsal arm shorter, stouter, with longer spines apically: Uncus longer, distally truncate, saccus shorter; aedeagus shorter, less narrow. Female genitalia (Fig. 71) with a narrow, tubular ductus bursae; corpus bursae globular, completely spined internally; a membranous anterior diverticulum is present.

Bionomics. Univoltine, common on irrigated and cultivated areas in arid zones. Specimens studied are collected end of March-beginning of June, at altitudes of 500–1100 m.

Additional data on distribution based on literature sources. Tsvetajev (1972): Repetek; Falkovitsh (1986): Uzbekistan; Mirzayans and Kalali (1970): Gonbad-e Qabus (Golestan prov.); Gorgan (Golestan prov.) (Lederer, 1871); Kopet-Dagh (Khorasan-e Shomali) (Viidalepp, 1988).

Distribution. Widely distributed from southern Ukraine and southern European Russia to SW Siberia, Turkmenistan and N Iran (Map 5).

L. ancyrana Prout (Figs. 23, 49; Map 5)

Lithostege ancyrana Prout, 1938: 239, pl. 6: i. Holotype ♂, paratype ♂, BMNH (examined). Type locality: Ankara (Turkey).
Lithostege ancyrana: Viidalepp, 1996: 47; Parsons et al., 1999: 545.

Material examined. Type material: Holotype and paratype (both ♂); ‘Turkey, Angora [Ankara] 1930 Sureya Bay’, ‘*Lithostege ancyrana* male Prout type; Geom 1937–316’, ‘Pres. Imp. Inst. Ent. Brit. Mus. 1933–172’; in BMNH. Additional material: 7 ♂, 11 ♀: 1 ♂, 4 ♀: Türkei, Konya, Taurus, Aladag, 25.5.1986, 1000m, leg. P. Kuhna; 5 ♂, 3 ♀, preps ♀ 1627, ♂ 1629/2011 H. R.: same data, 30.5.1975, preps ♂ 1625, 1626, /2011 H. R.; 2 ♀: Türkei, Taurus, Aladag, Göksu-tal, 30.5.1976, leg. P. Kuhna, gen. prep. ♂ 1628/2011 H. R.; 2 ♀: Ost-Türkei, Gürün, 1400m, 11.6.1985, leg. P. Kuhna, gen. prep. 1607/2010 H. R.; all in ZFMK. 1 ♂: Asia Min., Gürün, 19.-30. Juni 1976, leg. Friedel, gen. prep. 1013/2010 H. R.; in ZSM. Preparations of genitalia: 5 ♂, 2 ♀.

Description & Diagnosis. Wingspan 24–26 mm, in general smaller than the externally similar *L. farinata* which also occurs in Turkey. Forewings a little narrower than those of *farinata*, greyish white, without discal dot, grey underneath, with the basal and central area brown. Hindwings on upper- and underside like forewings (Fig. 23). Male genitalia (Fig. 49) similar to those in *L. griseata griseata*, with short sclerotized costa with weakly marked distal tip (not a free process like in *farinata* and *coassata*), differing in the much larger harpe with a pointed, tooth-like apex and the longer dorsal arm. Juxta in *L. ancyrana* vase-shaped, nearly two times longer than in *L. griseata griseata*. Saccus much shorter than in *farinata*, but longer compared to *griseata*; aedeagus longer and more distinctly curved compared to *griseata* (Figs 47–53).

Bionomics. Collected in May and June at 1400m.

Distribution. Turkey (Map 5). May also occur in W. Iran.

L. narynensis Prout (Figs. 24, 50; Map 5)

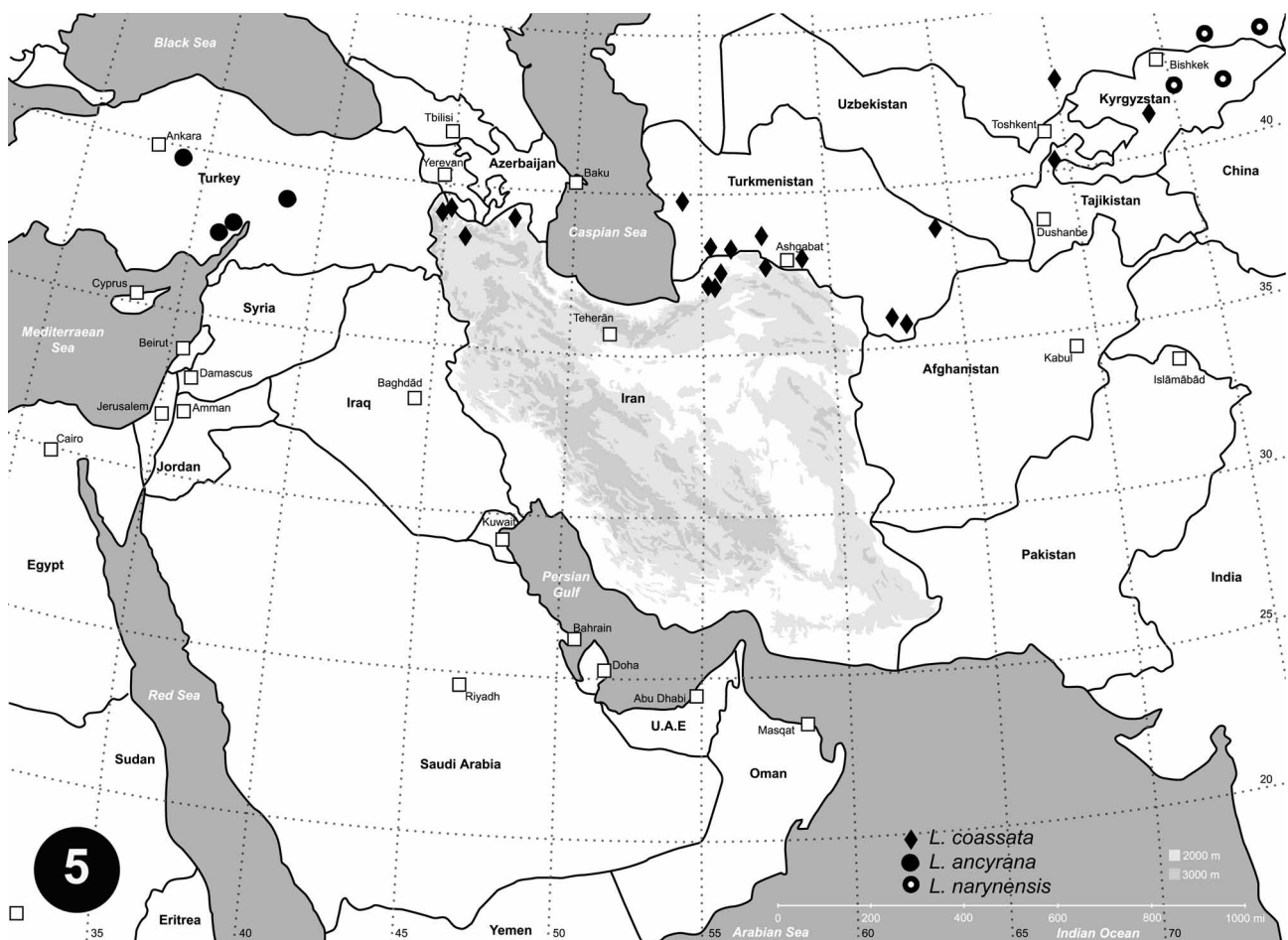
Lithostege narynensis Prout, 1938: 239, pl. 18: h. Syntypes 9 ♂ ♀, BMNH (examined). Type locality: Narine, Semirechgensee (Kyrgyzstan); Almatinka, Valley Malaya River (Turkmenistan).
Lithostege narynensis: Viidalepp, 1996: 47; Parsons et al., 1999: 547.

Material examined. Type material: Syntypes 9 (♂/♀): ‘Turkestan Orientale, Province Semirechgensee Fort Narine G. S. Akulini 1907’, ‘ex Oberthur Coll. Brit. Mus. 1927–3’, ‘*Lithostege narynensis* Prout’; in BMNH. Additional material: 8 ♂, 3 ♀: 4 ♂: 3 ♀: same data as type material, gen prep. ♂ 1055/2011 H. R.; in ZFMK; 1 ♂: Kazakhstan, Terskei Alatau Mts., Samarkand, 12.-13.07.1983, U. Jürivete leg.; 1 ♂: Kazakhstan, Alma-Ata, 5–10.07.1983, U. Jürivete leg.; 1 ♂: Kyrgyzstan, Terskei Alatau Mts., Turgen, 24–25.07.1987, U. Jürivete leg., gen. prep. 7675, J.V.; 1 ♂: Kyrgyzstan, Tsholpon-Ata, 18.-20.07.1983, U. Jürivete leg.; all in IZBE. Preparations of genitalia: 2 ♂.

Description & Diagnosis. Wingspan 25–28 mm. White moths, forewing with a delicate, silvery grey shine while fresh, hindwings lighter; larger than *L. ancyrana*, forewing broader, much lighter and more whitish below, but also with a slight brownish tinge on forewing underside (Fig. 24). Male genitalia (Fig. 50) with the valve rather narrow, dorsal margin concave, sclerotized costa reaching one-half valve length, its apical projection thorn-like, diverging from valve margin, acutely pointed; harpe short, distally rounded, its dorsal arm strong, terminally straight and spined over a long distance, shorter than in *L. farinata*, *griseata*, *ancyrana*, *luigi* and *palaestinensis*, a little longer than that of *L. coassata*. *Farinata* and *coassata* are similar in having a free apical process to the costa.

Bionomics. Specimens studied are collected in July only.

Distribution. Northern and central Tian-Shan in S Kazakhstan and NE Kyrgyzstan (Map 5).



MAP 5. *farinata* species group-b: *L. coassata*; *L. ancyrana*; *L. narynensis*.

***L. griseata griseata* (Denis & Schiffermüller)**

(Figs. 25, 26, 51, 52; Map 6)

Geometra griseata Denis & Schiffermüller, 1775: 116. Syntypes 3 ♀, ZISP (examined). Type locality: Vienna district, Austria.

Phalaena asinata Fabricius, 1794: 184. Types not traced.

Geometra duplicaria Hübner, [1799] 1817: pl. 40, fig. 208. Types not traced. Type locality: Europe.

Geometra grisearia Hübner, [1799] 1817: pl. 41, fig. 216. Types not traced. Type locality: Europe.

Phalaena incanata Hufnagel, 1767: 604. Types not traced. Berlin region, Germany.

L. griseata gigantea Bytinski-Salz & Brandt, 1937: (13). **syn. nov.** Syntypes 3 ♂, ZFMK; Type locality: Karaj, Iran.

Lithostege griseata: Prout, 1914: 172, pl.6d; Viidalepp, 1996: 47; Parsons et al., 1999: 546.

Material examined. Type material: 3 ♂ (*L. griseata gigantea*): 'Iran, Keredj [Karaj], 1400 m, leg. F. Brandt, 1938, Dr. H. Bytinski-Salz'; 'Cotypus *L. griseata gigantea* Brandt & Bytinski, = *L. griseata griseata* (Denis & Schiffermüller, 1775) det. H. Rajaei', 'gen. prep. 1035 and 1057/2010 H. R.'; coll. ZFMK. Additional material: more than 300 specimens in SMN, ZSM and ZFMK; genitalia preparation from: 1 ♂: Armenian, Agri-Dagh, Juli 2500–3000, leg. Kotsch, gen. prep. 1048/2010 H. R.; 5 ♂: [Germany] Naumburg-S. 19.5.43, gen. prep. 1047/2010 H. R.; 1 ♂: Keredj [Karaj], Iran, 1800 m, Brandt.-B.-Salz. coll. Dr. Wehrli; in ZFMK; 3 ♀ (*L. griseata griseata*): '[Turkmenistan] Askhabat', 'Coll. Great Knjaz Nikolaj Mikhajlovich', '3.5.82, 244 *griseata* Chr.'; coll. ZISP; 5 ♂: Austr [ia] inf., Leitersdorf bei Stockerau, 1.v.1931, A. Ortner [leg.], gen. prep. 1050/2010 H. R.; in SMNK. Preparations of genitalia: 5 ♂.

Description & Diagnosis. Wingspan 26–29 mm. Moths grey to grey-brown, similar to *L. coassata* but only the oblique darker submarginal line present, anteriorly reaching the apex. Other transverse bands in medial area of forewing absent (Figs 25, 26). Male genitalia (Figs 51, 52) with sclerotised costa of valve short, without a free distal process; harpe rounded at tip, shorter than half of valve length Dorsal arm long and narrow, apically spined, reaching the tip of the valve. The juxta is relatively broad, more or less equal in length and width (in *L. farinata* distinctly longer and vase-shaped, rather similar to *griseata*, but distal part longer and narrower in *ancyrana*, just a little longer, but more distinctly bilobed in *palaestinensis*).

Taxonomic note. Bytinski-Salz & Brandt described *L. griseata gigantea* as a new subspecies especially according to its bigger size (♂ 32 mm) in comparison to the nominate subspecies (♂ 26–29 mm). Measuring the wingspan of three paratypes (collected from same locality as holotype) of *L. griseata gigantea* yielded 27 mm for the male. The transverse band, as the second distinguishing character in the original description, occurs in some specimens of nominate subspecies as well. So we think that the ssp. *gigantea* cannot be reliably separated from the nominate subspecies. Therefore, both are synonymized here.

Bionomics. Confined to steppe and mountain steppe belt in Georgia (Didmanidze, 1978), to irrigated land and steppe in Central Asia (Viidalepp, 1988). Food-plants: *Erysimum cheiranthoides* (Cruciferae [Brassicaceae]) (Parsons et al., 1999), *Descurainia sophia* (Heinicke & Müller, 1976). Flight-period from end of April to mid of June (Heinicke & Müller, 1976). Specimens collected at altitudes between 300 and 1400 m.

Additional data on distribution based on literature sources. Parsons et al. (1999) and Prout (1937–1939): *L. griseata gigantea* Bytinski-Salz & Brandt from Karaj (Tehran prov.); Viidalepp (1988): from Kopet-Dagh.

Distribution. From N Spain and Central Europe to Kazakhstan and E Kyrgyzstan and also in N Iran (Karaj) (Map 6).

L. palaestinensis Amsel

(Figs. 27, 53, 72; Map 6)

Lithostege palaestinensis Amsel, 1935: 276, pl. 14, fig. 9. Syntypes not traced, not in SMNK as stated in Parsons et al. (1999).

Type locality: Kiriath Anavin (Palestine); Tabgha; Kasr el Jehud near Jericho; Jericho.

Lithostege palaestinensis: Prout, 1937: 84, 239, pl. 8f; Parsons et al., 1999: 547; Hausmann & Seguna, 2005: 11.

Material examined. 23 ♂, 20 ♀: 2 ♀: SW Iran, Bushire [Bushehr prov.], 5.2.1950, E. P. Wiltshire, Samml. Reisser, Ka. 2, preps 777/2009 and 778/2009 H. R.; 1 ♂, 1 ♀: [Tehran prov.] Varamin, [♀] 29.IV.1949, [♂] 30.IV.1949, Eyff. preps ♀ 781/2009, ♂ 782/2009 H. R.; 1 ♂, 1 ♀: Gohreh [or Ghotb-Abad, Hormozgan prov.], [♂] 12.3.1972, [♀] 13.3.1972 [leg.] Mirz [ayans], Broom [mand], gen. prep. ♂ 780/2009 H. R.; 1 ♀: [Khuzestan prov.] Ahvaz, 70 km, 8.3.1972, Iran.-Term., gen. prep. 779/2009 H. R.; 1 ♂, 3 ♀: N-Iran, Elburs-Mts. Masandaran, Polur, Damavand, 2500 m, Ebert & Falkner leg., 7.-10.7.1972; 2 ♂, 1 ♀: S-Iran, Tange-Tchogan, 930 m, 30 km n. Kazerun, 23.3. [19]73, leg. H. G. Amsel; 1 ♀: S-Iran, Bandar-Abbas, Kuhe Genou, S-exp. 550 m, 1. u. 5.3.1973, G. Ebert leg.; 4 ♂: Iran, Zanjan, E Talish, NE Abhar, 500 m, 8.V.2007, leg. W. ten. Hagen, gen. prep. 1082/2010 H. R.; all in SMNK. 3 ♂, 3 ♀: Iran [Iran], mer. Occ. Kasrun, Kunar Takteh, 240 m, Ende III. [19]38, preps ♂ 1034/2010 and 1051/2010 H. R.; 1 ♂, Alep [Aleppo], Syrie, 1909, gen. prep. 1619/2011 H. R.; 1 ♀, Syrie, Akbes, 1896, prep: 1620/2011 H. R.; 1 ♂, Türkei/Prov. Urfa, Img. Urfa, 9.4.1991, gen. prep. 1621/2011 H. R.; all in ZFMK. 1 ♀: Iran, Fars, Straße Kazeroun-Bouchir, Tchouroum, ca. 1000 m, 25.März.1937, coll. Brandt, gen. prep. 1014/2010 H. R.; 1

♀: Türkei, Prov. Kars, 40°10' N, 42°40' E, Arag-Tal, 1500 m, 7 km SÖ Karakurt, 4.VI.1986, TF, leg. H. Falkenhahn, ex coll. EMEM, ZSM Genital prp. No. 8111; 1 ♀: SO-Türkei, 2 km N-Halfeti, 600 m, 12.IV.1993, leg. Geck; all in ZSM. 2 ♂: S-Iran, 42 km WnW Djahrom, 1300 m, Astragalus-Steppe, 26.3.1973, [leg.] M. Abai; 1 ♂: [Iran, Frasn prov.] Borazdjan, 3.3.[19]70, [Leg.] Paz [uoki]; 1 ♂: [Iran, Frasn prov.] Kazerun, Konar-Takhteh, 4.3.1970, [leg.] Paz [ouki]; 1 ♀: [Iran], Fars, Kazeroun, Konar-Takhteh, 9.3.1975, 450 m., [leg.] Pazouki, Broumand; 2 ♂: [Iran, Ilam prov.] Mehran, 19.3.1970, [leg.] Abai, Hasch [emi]; 1 ♂, 1 ♀: [Iran, Tehran prov.] Varamin, 29.-30.4.1949, [leg.] Egh.; 1 ♂: [Iran] Khouzestan, 32 km Behbahan, Guenaveh, 6.3.1975, [leg.] Pazouki, Broumand; 1 ♂, 1 ♀: [Iran, Bushehr prov.], Bouschehr, Schabankareh, 7.3.1975, 10 m, [leg.] Pazouki, Broumand; all in HMIM. Preparations of genitalia: 6 ♂, 7 ♀.

Description & Diagnosis. Wingspan 28–32 mm, greyish-white, without any wing pattern, except fine dusting with dark grey scales. Very similar to *L. farinata*, but in *palaestinensis* also the hindwings are dusted with darker scales (Fig. 27). Male genitalia (Fig. 53) with valve very broad at base, sclerotized costa short, without a free distal process. Harpe rather long, reaching the middle of valve, with rounded apex and almost straight dorsal margin; the dorsal arm rather strong near spined apex, not reaching the tip of the valve; Juxta similar to that of *griseata*, but distal part a little longer and more strongly bilobed; aedeagus slightly curved, length 2 mm, longer than aedeagus of *griseata*. Uncus and saccus also longer. Female genitalia (Fig. 72) with apophyses anteriores long (more than half the length of a. posteriores) Sterigma developed as large, lateral plates; ductus bursae membranous; corpus bursae globular to slightly oval, completely spined internally; a membranous anterior diverticulum present.

Bionomics. Host plant: Cruciferae (Brassicaceae) (Wiltshire, 1944). Additional host plant records: *Berberis incana*, *Sisymbrium officinale*, *Sinapis arvensis*, *Isatis tinctoria* (Leraut, 2009). Specimens studied are collected from March to July and at 240–2500 m elevation in different localities.

Additional data on distribution based on literature sources. Brandt (1939) and Prout (1937–1939): Tchouroum (Fars prov., Kazerun-Bushehr road); Wiltshire (1944): Coasts of S Iran; Wiltshire (1942): Palestina, Iraq (Kerbela Desert, Nejef); Wiltshire (1990): N Saudi Arabia; Hausmann (1991): Jordan; Hausmann (1997): Israel.

Distribution. Southern and eastern Turkey, Syria, Jordan, Israel, Palestina, N Saudi Arabia and Iraq. Also North and West Iran to the southern foothills of Zagros (SW Iran) (Map 6).

L. luminosata Christoph

(Figs. 28, 54, 73; Map 6)

Lithostege luminosata Christoph, 1885: 127, pl. 6, fig. 9. Holotype ♂, ZISP (examined). Type locality: Askhabat (Turkmenistan) Parsons et al. (1999) erroneously cited the type locality as 'Achal-Tekke region'.

Lithostege luminosata: Prout, 1914: 174, pl.12c; Viidalepp, 1996: 47; Parsons et al., 1999: 546.

Material examined. Type material: Holotype ♂: '[Turkmenistan] Askhabat', 'Coll. Great Knjaz Nikolaj Mikhajlovich', [28 April]; coll. ZISP. Additional material: 4 ♂, 3 ♀: 1 ♂: [locality is not mentioned] 632 Samml. Daup, Ka. 30, gen. prep. 1039/2010 H. R.; in SMNK. 1 ♂, 1 ♀: „Turkmeenia” [Turkmenistan] 1881, Parhai, 28.04–02.05, Kesküla & Luig leg., gen. prep. ♀ 7644, J.V.; 1 ♂, 2 ♀: „Turkmeenia” [Turkmenistan], Kyzyl-Arvat, 25.04.1984, Martin & Talve leg.; 1 ♂: Tadjikistan, Isfan, Arabkishlak, 05.04.1984, semidesert, T. Pani leg., gen. prep. 3480, J.V.; all in IZBE. Preparations of genitalia: 1 ♂, 1 ♀.

Description & Diagnosis. Wingspan 17–23 mm. Light sandy brown, with indistinct paler and darker transverse bands across forewing, more or less in parallel to distal margin. Similar to *L. parva*, which is of the same size, but distinguished by the more clearly defined wing markings and the darker hindwings in *parva*; also similar to *L. luigi*, but differing from it by the absence of darker scaling on veins crossing the postmedial band and by smaller size (Fig. 28). Male genitalia (Fig. 54) are characterized by a horn-shaped, curved projection from the middle of costa and a relatively short but strong dorsal arm of harpe, which is spined in its distal half. The harpe is formed like a triangular process, arising from the middle of the valve, the latter strongly sclerotized except the distal part. Female genitalia (Fig. 73) with a large, strongly sclerotized, funnel-shaped antrum, ductus bursae very short, corpus bursae membranous, without internal spines, a small diverticulum present.

Bionomics. All specimens studied are collected in April and May (in semidesert areas).

Additional data on distribution based on literature sources. Shchetkin (1965a): SW Tajikistan, Vahkhs valley; Viidalepp (1988): Kopet-Dagh (Khorasan-e Shomali).

Distribution. From northern foothills of Kopet-Dagh (Turkmenistan) to western Tajikistan (Map 6). May also be present at the Iranian side of Kopet-Dagh.

L. luigi Viidalepp

(Figs. 29, 55, 74; Map 6)

Lithostege luigi Viidalepp, 1992: 121. Holotype ♂, IZBE (examined). Type locality: Badkhyz, Kepele (Turkmenistan).

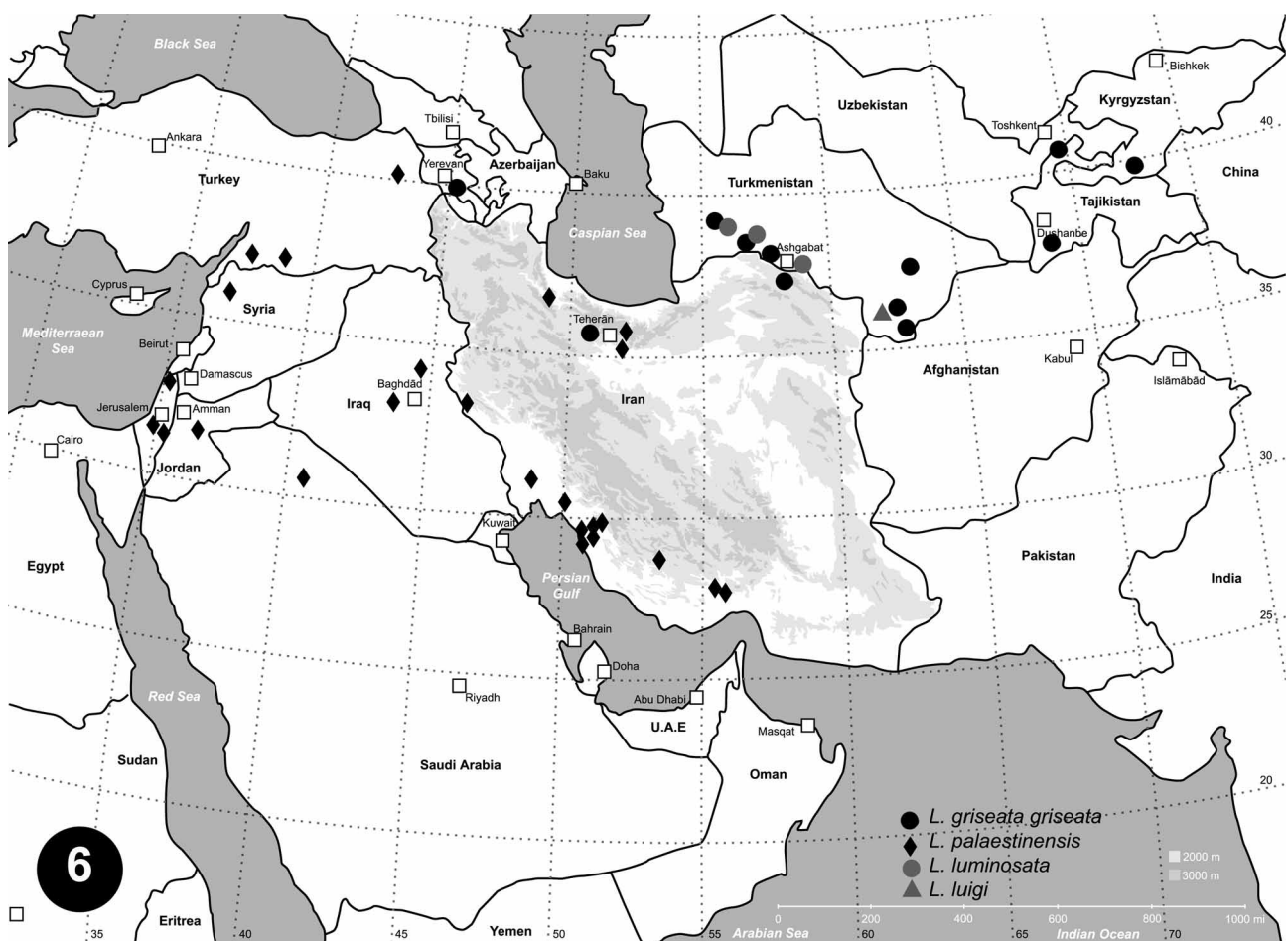
Lithostege luigi: Viidalepp, 1996: 47; Parsons et al., 1999: 546.

Material examined. Type material. Holotype ♂: Turkmenistan, Badkhyz, Kepele, 14.04.[19]88, R. Kuresoo leg., gen. prep. 3687 & 7679, J.V.; Paratypes, 1 ♀: Turkm [enistan], Badkhyz, Kordon Kepele, 17.04.[19]88, M. Talve leg., gen. prep. J.V. 3688; 1 ♀: Turkm [enistan], Badkhyz, Yerolanduz, 18.04.[19]88, M. Talve leg., gen. prep. 3658, J.V.; 1 ♂: „Turkmeenia” [Turkmenistan], Badkhyz, 26.02.1987, E. Veromann leg., gen. prep. 7647, J.V.; in IZBE. Preparations of genitalia: 2 ♂, 2 ♀.

Description & Diagnosis. Wingspan 24.5–28 mm. Similar to the smaller *L. parva* in colour, but distinguished by the darker scaling on veins crossing the very indistinct and sometimes not discernible postmedial band; also the other transverse lines weak, apical streak, as present in *L. griseata* and *L. coassata*, absent (Fig. 29). Frons flat, edged by a thicker wall. In male genitalia (Fig. 55) valve sclerotized only at basal half; costa short, without apical projection; harpe long, distally truncate, almost reaching dorsal margin of valve; dorsal arm widely curved, as long as valve, apically shortly spinose. Uncus narrow, pointed at apex, saccus short, rounded. Aedeagus long and narrow. Female genitalia (Fig. 74). Corpus bursae globular, almost completely spined internally, antrum narrow, elongated, sterigma not developed.

Bionomics. Specimens studied are collected in February and April.

Distribution. S Turkmenistan (Badkhyz) (Map 6).



MAP 6. *farinata* species group-c: *L. griseata griseata*; *L. palaestinensis*; *L. luminosata*; *L. luigi*.

L. infuscata (Eversmann)

(Figs. 30, 56, 75; Map 7)

Minoa infuscata Eversmann, 1837: 63. Holotype ♀, ZISP (examined). Type locality: Sarepta [= Volgograd], Russia.

Lithostege griseata: Prout, 1914: 172 (jun. syn.).

Lithostege griseata ab. *infuscata*: Prout, 1937: 84.

Lithostege infuscata: Prout, 1938: 238; Viidalepp, 1988: 20; 1996: 47; Parson et al., 1999: 546.

Material examined. Type material: Holotype ♀: '[Russia, Volgograd] Sarepta', 'III. a', 'coll. Acad. Petrop.', 'Holotype: ♀ *Lithostege infuscata* Eversmann, det.: V. Mironov, 1998'; in ZISP. Additional material: 18 ♂, 20 ♀: 15 ♂, 11 ♀: NW-Iran, 15 km sö Maku, 1050 m, 3.6.1975, H.G. Amsel leg., preps ♂ 1032 and ♀ 1033/2010 H. R.; 1 ♀: NW-Iran, 25 km nö. Khoy, 1000 m, 7.6.1975, H. G. Amsel leg.; 2 ♀: NW-Iran, 17 km nw. Maku, 1400 m, 4.6.1975, H.G. Amsel leg.; 1 ♀: Moghan [Ardabil prov.], [leg.] Damn [Damanabi]; all in SMNK. 1 ♂, 1 ♀: Keredj [Karaj], Iran, 1800 m, Brandt.-B.-Salz, coll. Dr. Wehrli, preps ♀ 1029/2010 and ♂ 1030/2010 H. R.; both in ZFMK. 1 ♂: Persia [Iran], Keredj [Karaj], leg. Brandt 1936, *subfuscata* det. A. Hausmann, Sammlung Osthelder, ZSM ♂ genital prp. No. 4471; 1 ♂, 1 ♀: [Iran] Azarbayjan, Marand, 1050 m, 4.6.1975, [leg.] Abai; in HMIM. 2 ♀: Russ [ia], Armen, Erivan, 13.V.[1]925, [leg.] Rjabov; 16 15, gen. prep. 1036/2010 H. R.; 1 ♀: Tadzjikistan, Parhar vic., Karatau Mts., 22.05.1987, V. G. Mironov leg.; in IZBE. Preparations of genitalia: 3 ♂, 3 ♀.

Description & Diagnosis. Wingspan 22–25 mm. Forewings brownish grey, darker distally, hindwings a little lighter, both without pattern. Underside like upperside (Fig. 30). The similar, but larger and darker grey *L. flavicornata* is also clearly distinguishable by the genitalia. Male genitalia (Fig. 56) with valves narrow, sclerotized costa very short, with a very large, triangular projection. Harpe with a long, upright, distally curved process, dorsal arm strong, stout, with long spines terminally. Aedeagus long, narrow, straight. Female genitalia (Fig. 75, holotype) characterized by trapezoid, posteriorly concavely rounded sterigma, with inserted triangular ostium orifice; ductus bursae tubular, corpus bursae globular, completely spined internally, large diverticulum present.

Bionomics. Specimens studied are collected in May and June at altitudes of 1000–1800 m.

Additional data on distribution based on literature sources. Falkovitsh (1986): Uzbekistan; Prout (1937–1939): Karaj (Tehran prov.).

Distribution. S Russia to Armenia and N Iran; distribution areas in southern Uzbekistan and western Tajikistan probably disjunctive (Map 7).

L. flavicornata (Zeller) stat. rev.

(Figs. 31, 57, 76; Map 7)

Minoa flavicornata Zeller, 1847: 20. Holotype 1 ♂, BMNH (not examined). Type locality: Macri (Turkey).

Lithostege flavicornata: Prout, 1914: 172, pl.6e (as *flavicornata*).

Lithostege infuscata ab. (subsp.?) *flavicornata*: Prout, 1938: 238.

Lithostege infuscata flavicornata: Viidalepp, 1996: 47; Parsons et al., 1999: 546.

Material examined. 11 ♂, 7 ♀: 1 ♂: Türkei, Beynam-Orman, 24.5.1976, leg. P. Kuhna; 3 ♂: Ost Türkei, 23 km West Oltu, 24.6.1985, 1800m, leg. P. Kuhna; 1 ♀, 2 ♂: Türkei, Anatolien, Karapinar-Göl-viran, 4.6.1976, leg. P. Kuhna; 1 ♂: Turkey, Sereflikoçhisar, 31.5.1973, leg. P. Kuhan; 1 ♂: Türkei, Taurus, Aladag Göksu-tal, 30.5.1976, leg. P. Kuhna; 1 ♀, 1 ♂: Türkei, Karapinar, 27.5.1973, leg. P. Kuhna; 2 ♀: Türkei, Prov. Sivas, Camlibel Gecidi, 3.4.[19]86, 1700m, W. Pavlas; 1 ♀: Türkei, Ürgüpalkum, West, 6.6.[19]84, leg. Meteno; 1 ♀, 1 ♂: Asia min. o. Ak-Chehir, 16.31.Mai, coll. Wagner-Wien, preps ♀ 1031/2010, ♂ 1062/2010 H. R.; in ZFMK. 1 ♂: [locality data are not mentioned, but identified as *L. flavicornata*] 641; Samml. Daup, Ka. 30, gen. prep. 1044/2010 H. R.; in SMNK. 1 ♂/♀: Amasia, *flavicornata*, gen. prep. 6269 & 6261, J.V.; coll. TUZ (ZMTU) ex Staudinger. Preparations of genitalia: 3 ♂, 2 ♀.

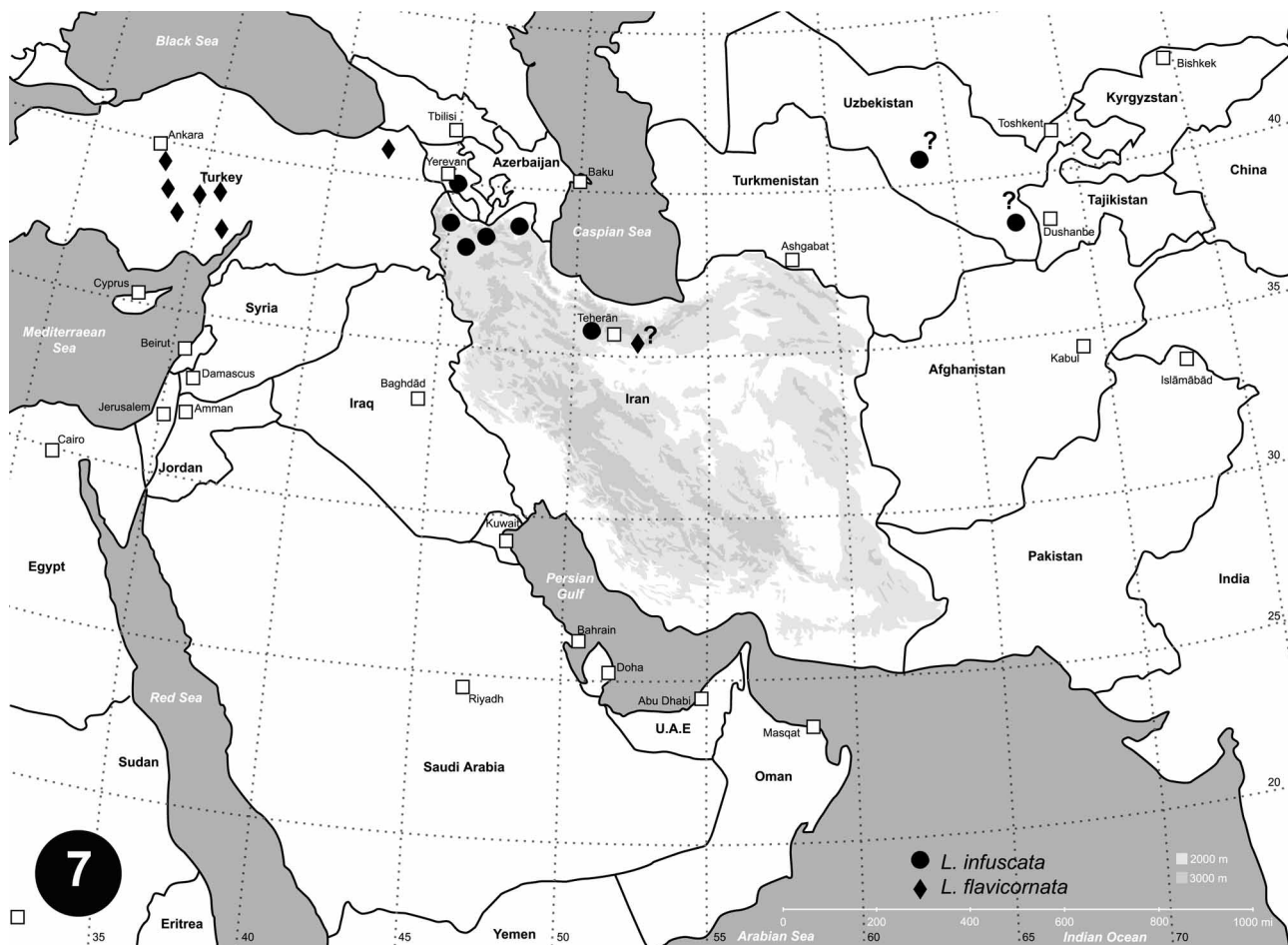
Description & Diagnosis. Wingspan 28–33 mm. Forewings grey-brown, slightly darker distally. Much larger and darker than *L. infuscata*, also without pattern. Hindwings lighter than forewings, underside a little lighter than upperside (Fig. 31) Male genitalia (Fig. 57) with valves broad, costa a short, broad plate with a massive, hook-like, sharply pointed projection; harpe with a long, upright, distally curved process, very similar to that in *infuscata*; dorsal arm longer and narrower; aedeagus long, slightly curved in lateral view. Female sterigma wide, with a pair of

lateral thickenings, posterior margin straight, ductus bursae tubular, longer than in *infuscata*, corpus bursae globular, completely spined internally, diverticulum present (Fig. 76).

Bionomics. Specimens studied are collected in April, Mai and June.

Additional data on distribution based on literature sources. Barou (1967): Varamin [?] (Tehran prov.); Viidalepp (1996): Transcaucasus and Turkey.

Distribution. Turkey to Georgia, Armenia, Azerbaijan (Transcaucasus), central part of Arborz in N Iran (Map 7).



MAP 7. *farinata* species group-d: *L. infuscata*; *L. flavicornata*.

Summary

Twelve species of *Lithostege* have been recorded from Iran. Two of them are known from the type locality only: *L. stadii* (NW. Iran) and *L. samandooki* (SE. Iran). Only *L. palaestinensis* has a wide distribution, occurring in N., W. and S. Iran. *L. witzemanni* and *L. infuscata* are found in the northern and northwestern parts, while *L. buxtoni* occupies the whole western part of Iran, from North to South (and also occurs in Iraq, Saudi Arabia and Turkey). A distinctly north-eastern distribution is observed in *L. amoenata*, whereas *L. coassata* occurs in the Northwest and Northeast, with a huge gap in between. A southern distribution in Iran (but occurring also in the more western countries like Iraq and Saudi Arabia at about the same latitude) are found for *L. dissocyma*, *L. notata* and *L. fissurata inanis*. *L. griseata*, only recorded from N. and NE. Iran, is a widespread species, occurring from W. Europe to Central Asia. It may be expected also in the northwestern parts of Iran.

A number of further species may perhaps be discovered in Iran in the future: *L. excelsata*, *distinctata*, *obliquata*, *usgentaria*, *senata*, *parva*, *luminosata* and *luigi* occur close to the northeastern border of Iran, some of them on the northern slopes of the Kopet Dagh mountain chain stretching along the northeastern border. Here the biogeographical question arises, if the Kopet-Dagh really delimits the distribution of species and the exchange of arid components between the Iranian and Turanian deserts. Although our current study seems to confirm this role for

the Kopet-Dagh, large parts of southern Kopet-Dagh are not well explored and a number of species may occur on both sides of this mountain range. More undiscovered species may be found flying during the winter-season. A striking example is the recent discovery of *L. stadii*, a spectacular large species only on the wing during the cold season.

Acknowledgements

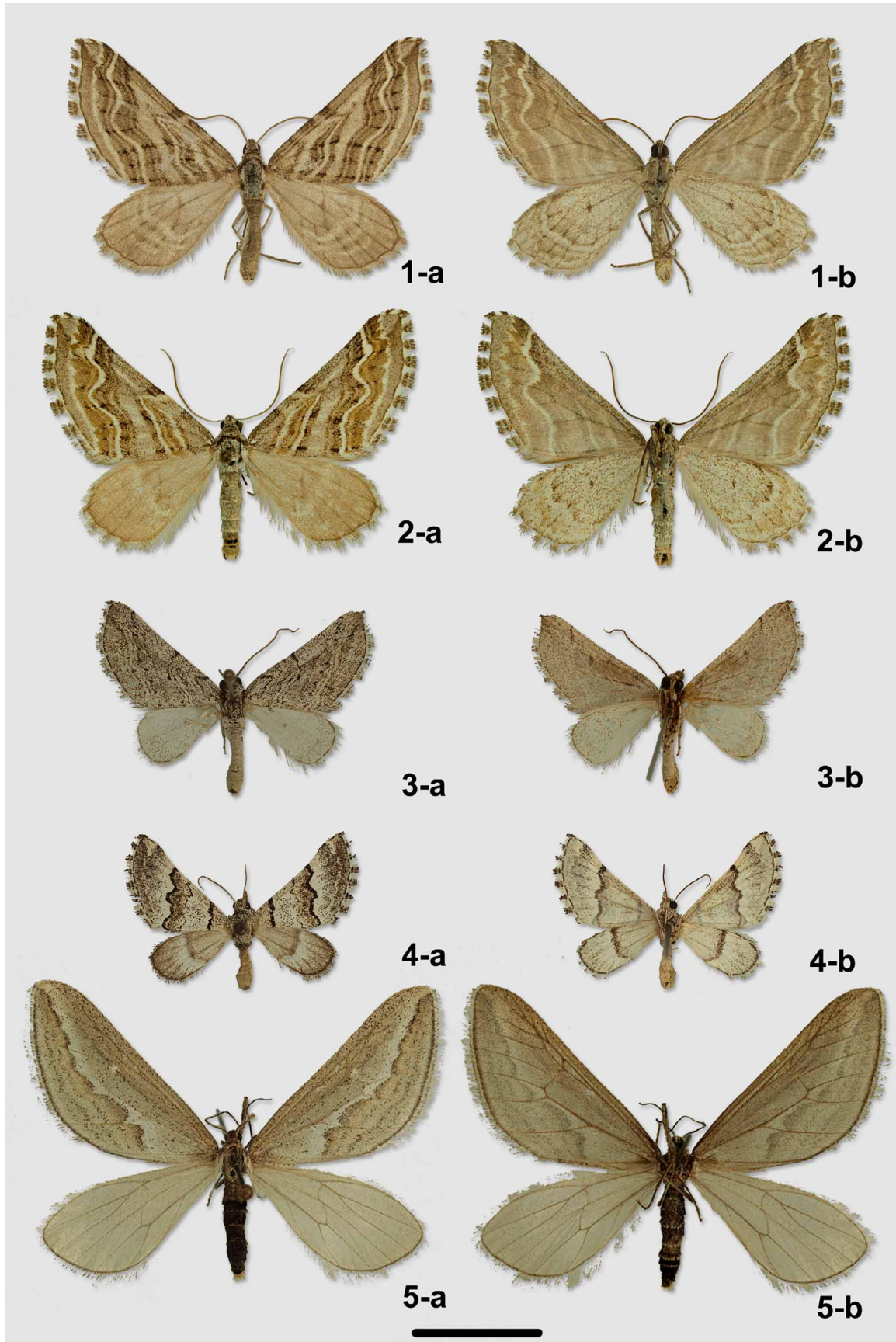
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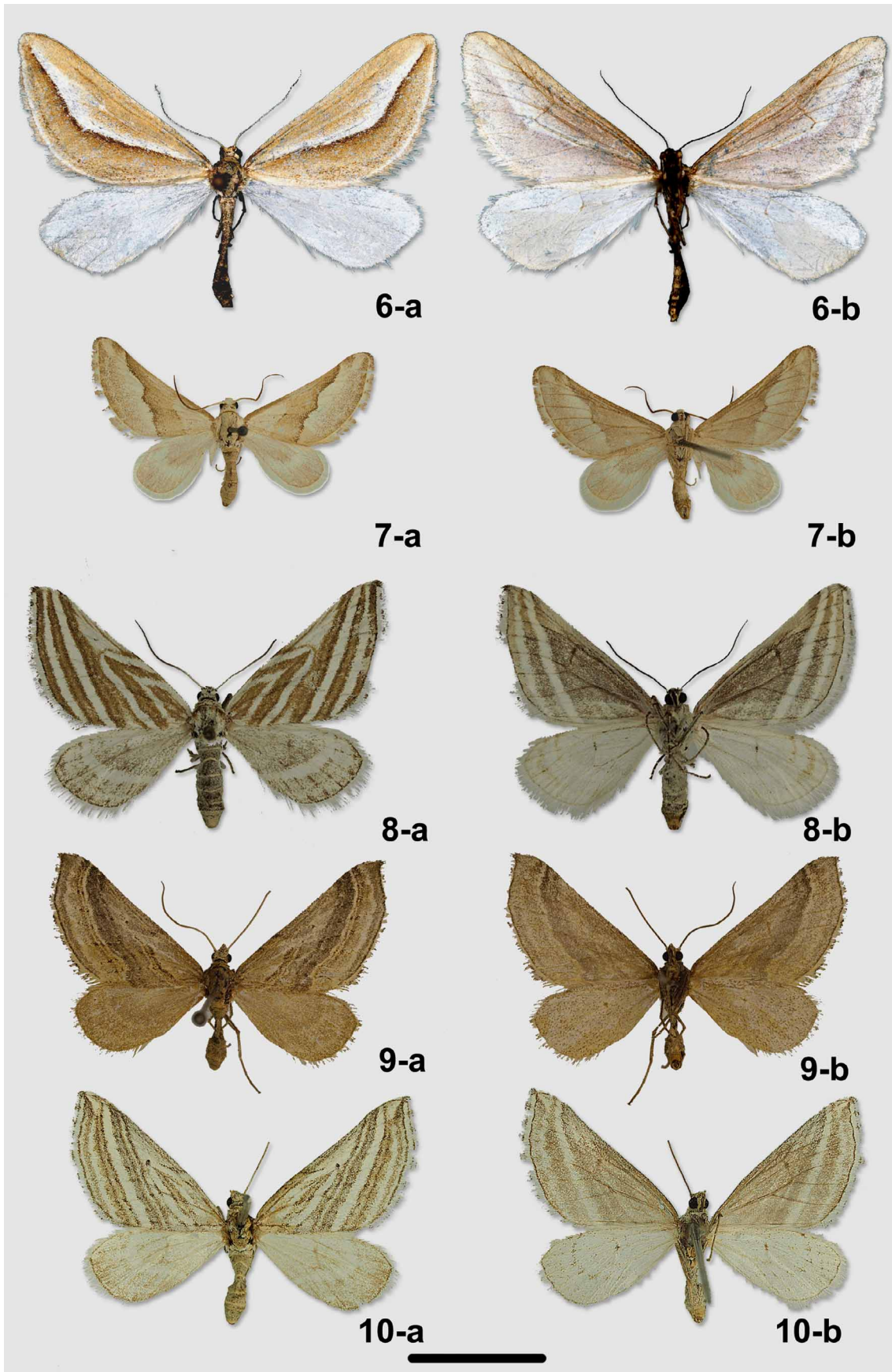
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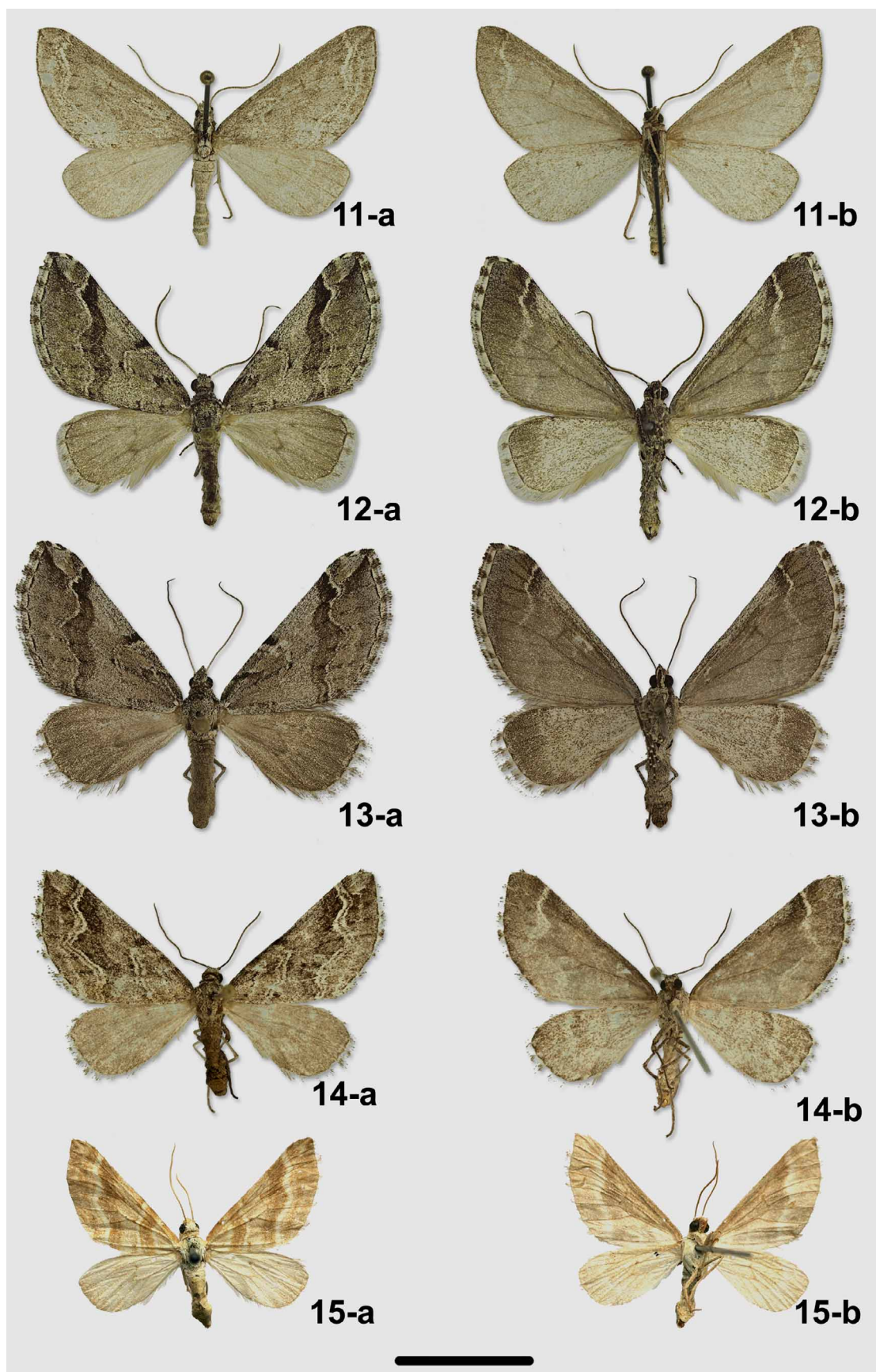
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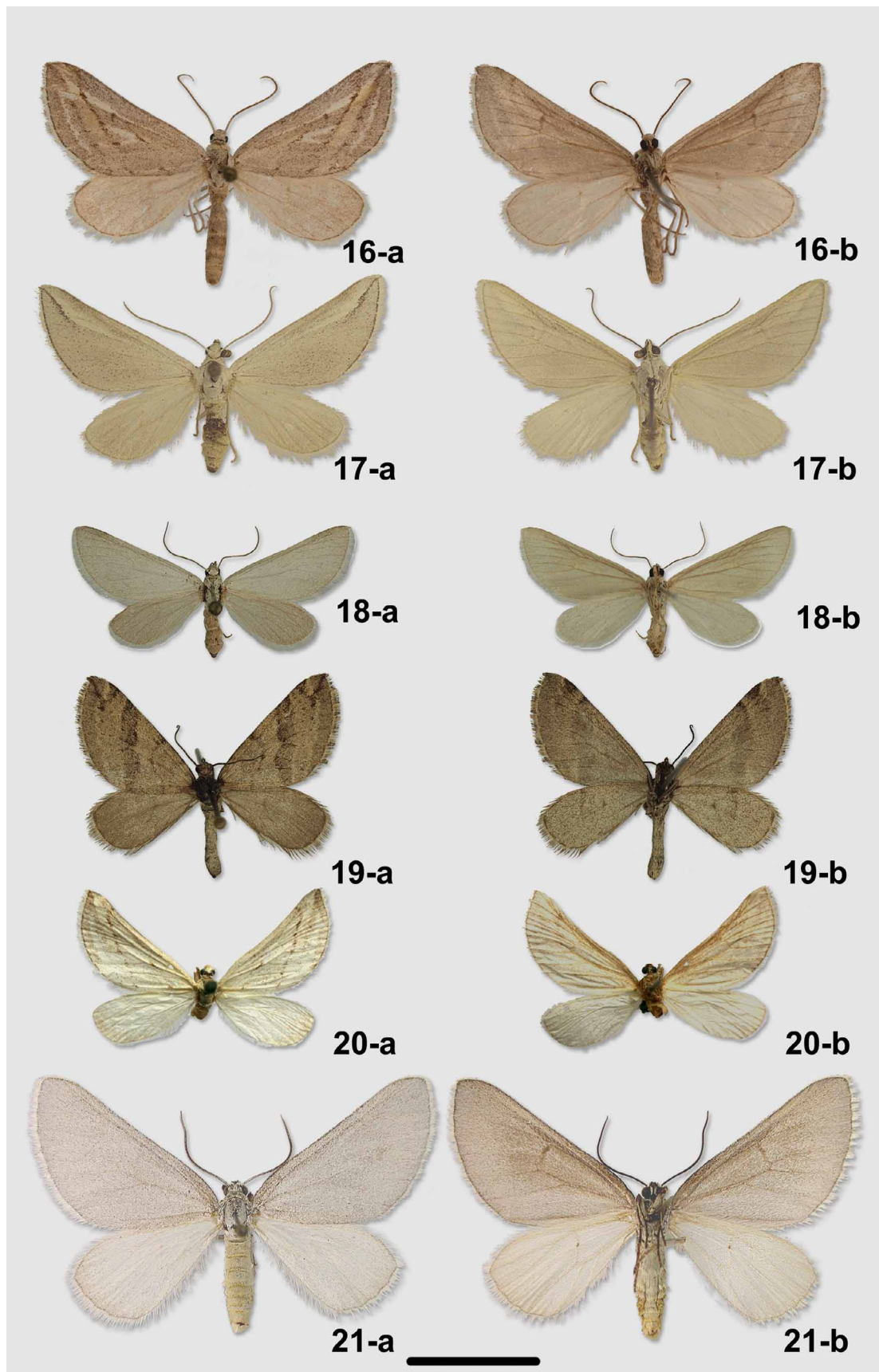
FIGURES 1–5. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 1. *L. amoenata* (♂, from Kopet-Dagh, NE Iran); 2. *L. anseli* ? (♂, Dasht-i-Nawar, E Afghanistan); 3. *L. excelsata* (♂, Dzahar, Turkmenistan); 4. *L. distinctata* (♂, Repetek, E Turkmenistan); 5. *L. buxtoni* (♂, Bakhtegan-Tashk National Park, S Iran). Scale bar: 10 mm.



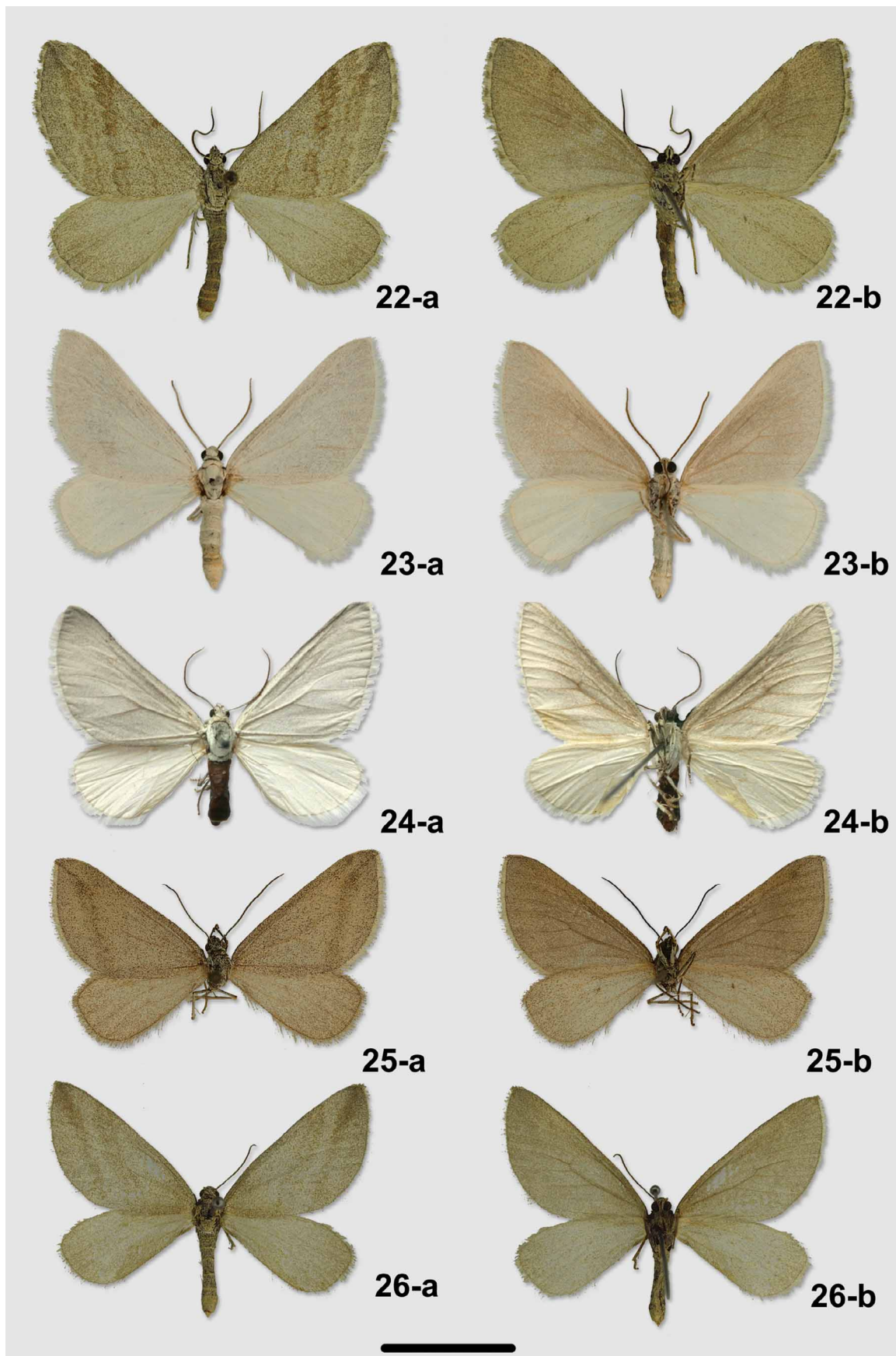
FIGURES 6–10. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 6. *L. stadii* (♂, type locality, NW Iran); 7. *L. obliquata* (♂, Karakumi, Turkmenistan); 8. *L. bosporaria* (♂, Kirikkale, Central Turkey); 9. *L. usgentaria* (♀, Herat, W Afghanistan); 10. *L. witzenmanni* (♀, Ghotor, NW Iran). Scale bar: 10 mm.



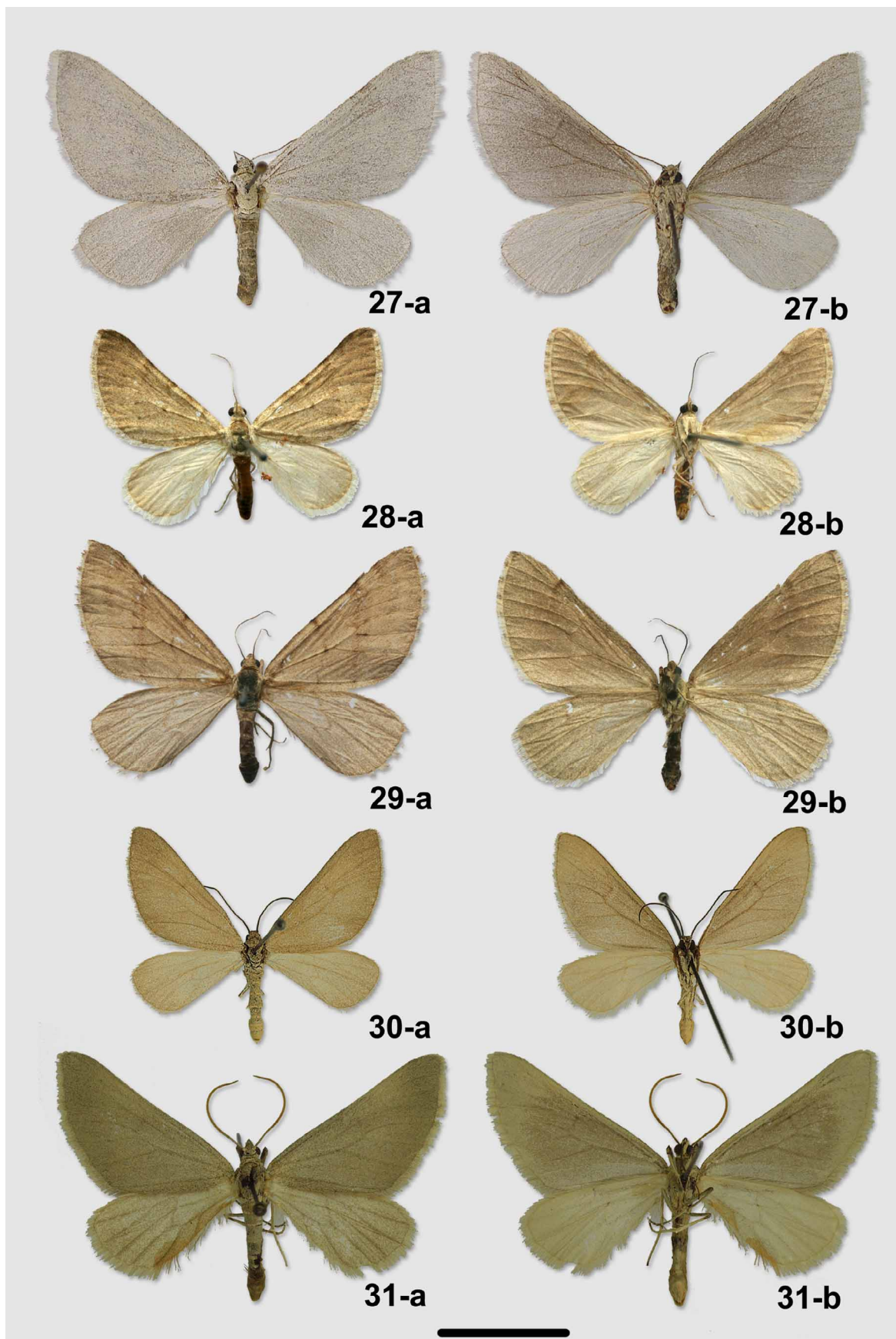
FIGURES 11–15. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 11. *L. dissocyma* (♀, Bandar Abbas, S Iran); 12. *L. hreblayi* **sp. nov.** (♂, type locality, N Pakistan); 13. *L. hreblayi* **sp. nov.** (♀, Type locality, N Pakistan); 14. *L. samandooki* **sp. nov.** (♀, Type locality, S Iran); 15. *L. senata* (Repetek, E Turkmenistan). Scale bar: 10 mm.



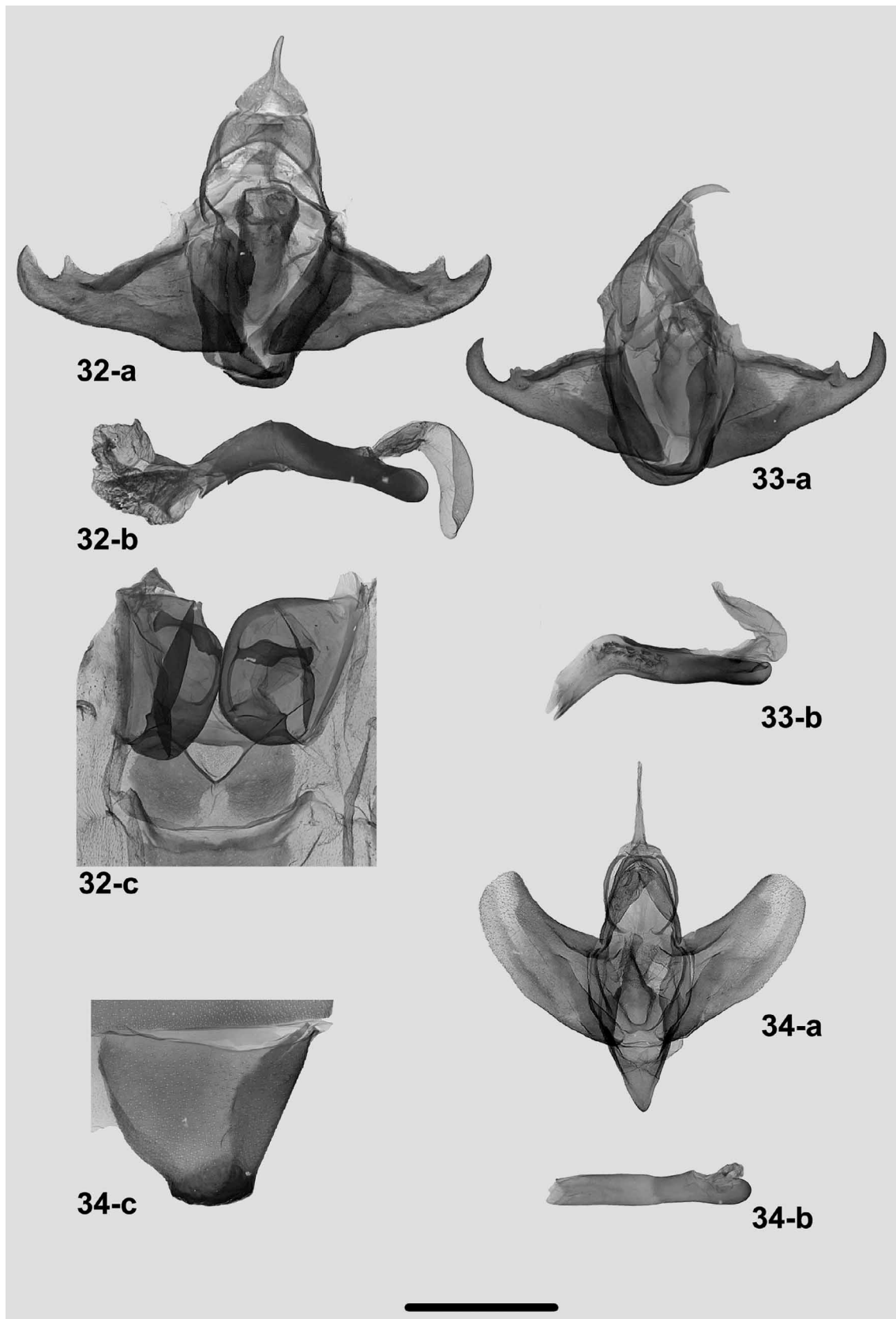
FIGURES 16–21. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 16. *L. notata* (♂, Sarkhoun, SW Iran); 17. *L. fissurata fissurata* (♀, Roche de Sel, Algier); 18. *L. fissurata inanis* (♀, Baluchistan, E Iran); 19. *L. parva* (♂, Kopet-Dagh, Turkmenistan); 20. *L. turkmenica* (♂, Karakum desert, Uzbekistan); 21. *L. farinata* (♀, Sarepta, Russia). Scale bar: 10 mm.



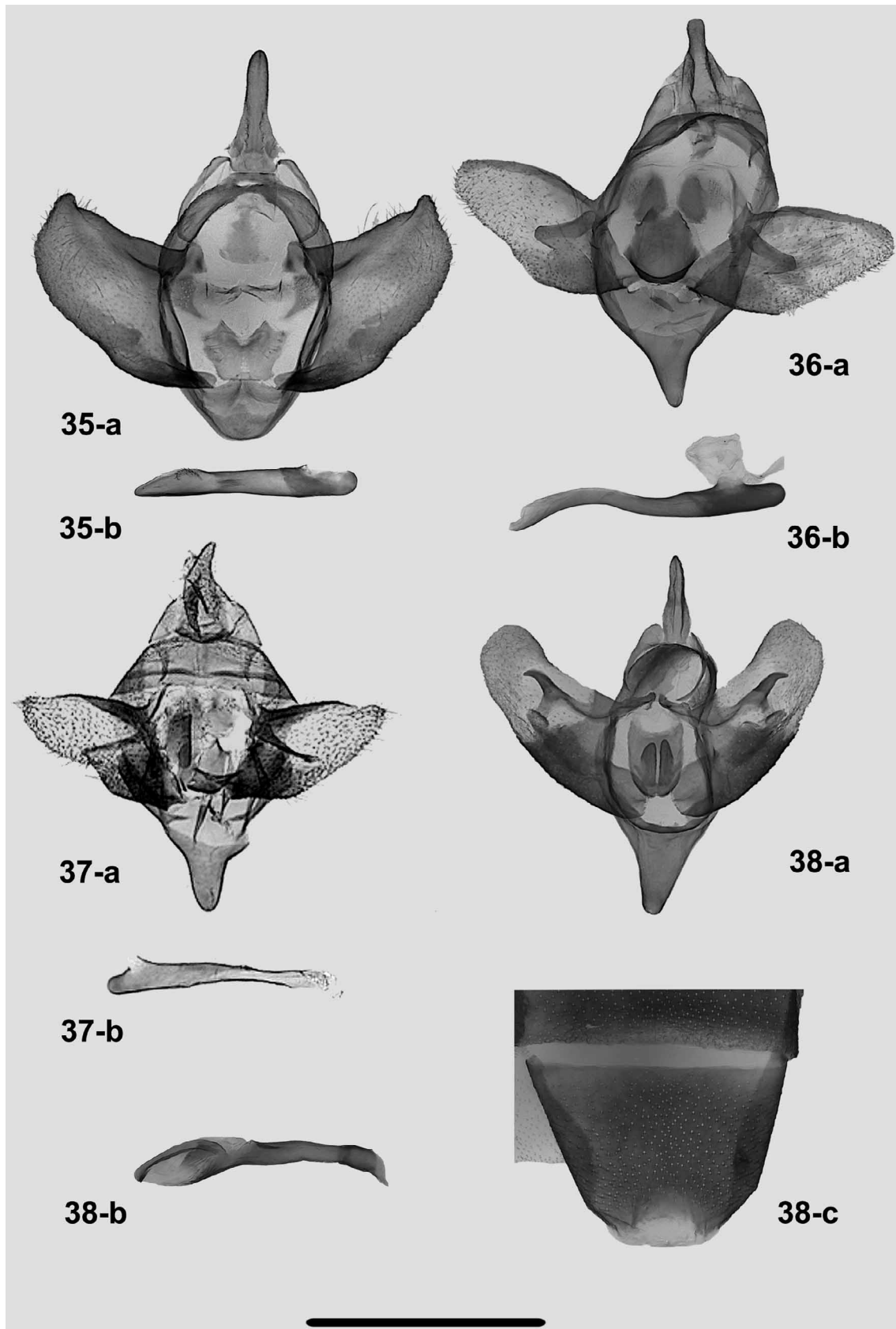
FIGURES 22–26. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 22. *L. coassata* (♂, Gonbad, N Iran); 23. *L. ancyrana* (♂, Aladag, Turkey); 24. *L. narynensis* (♂, Samarkand, Kazakhstan); 25. *L. griseata griseata* (♂, Agri-Dagh, Armenia); 26. *L. griseata gigantea* (♂, Karaj, N Iran). Scale bar: 10 mm.



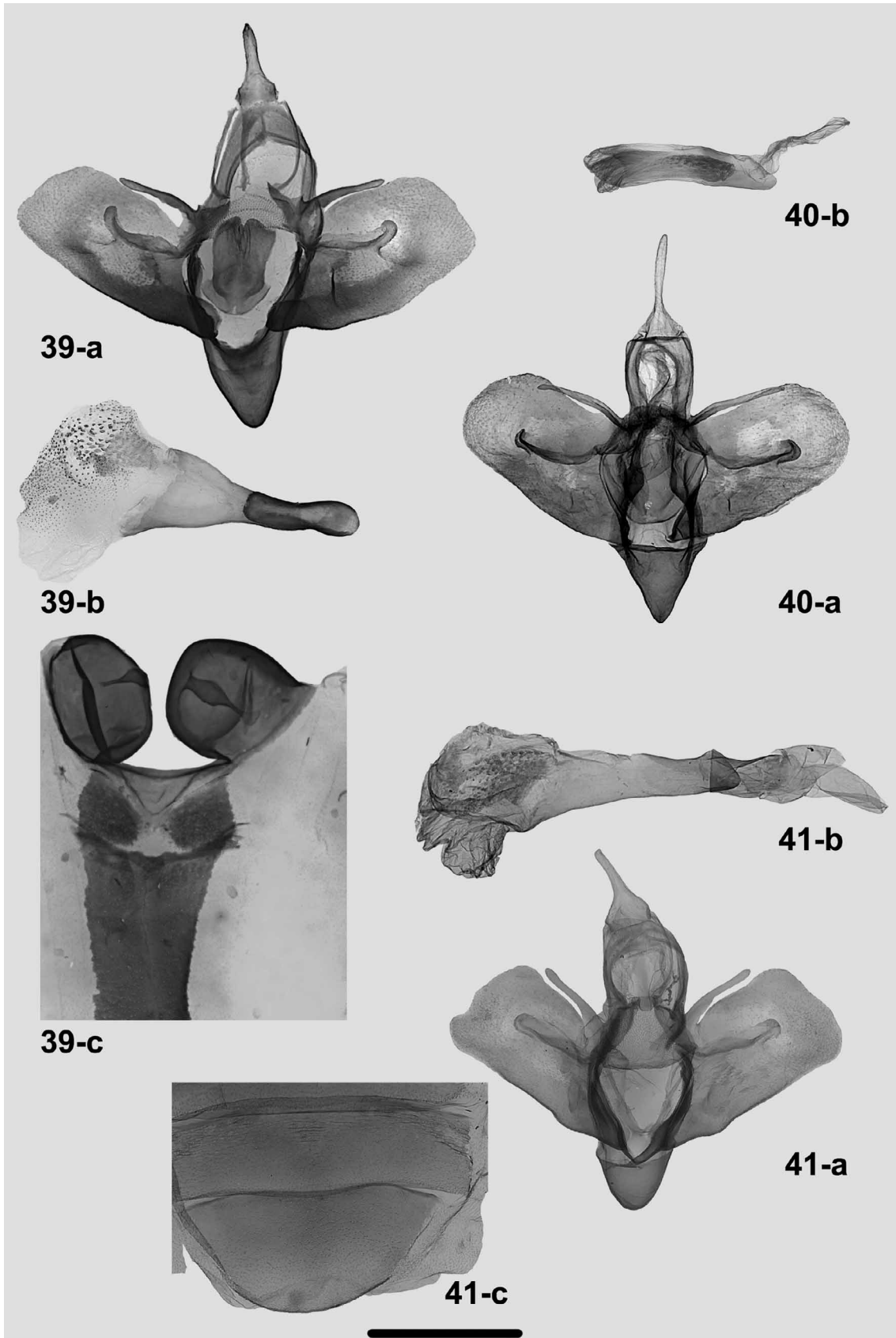
FIGURES 27–31. Adult moths of *Lithostege* Hübner (left column, a: upperside, right column, b: underside). 27. *L. palaestinis* (♀, Ahvaz, SW Iran); 28. *L. luminosata* (♂, Kyzyl-Arvat, Turkmenia); 29. *L. luigi* (♀, Badkhyz, Turkmenistan); 30. *L. infuscata* (♀, Karaj, Iran); 31. *L. flavicornata* (♂, Ak-Chehir, Turkey). Scale bar: 10 mm.



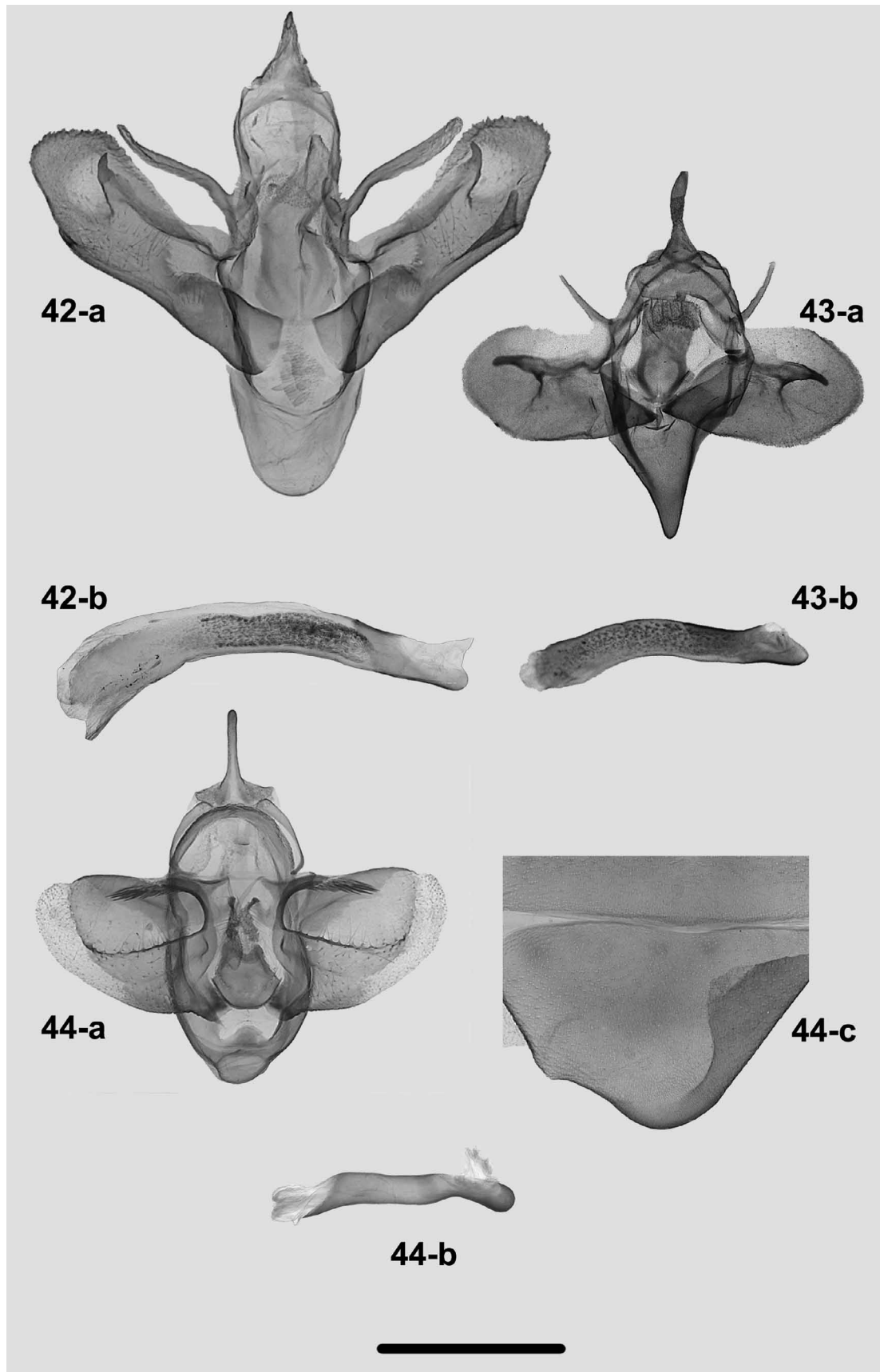
FIGURES 32–34. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 32. *L. amoenata* (gen. prep. 1022 H.R.; Nikolajevsky pass, Tajikistan), a: genital capsule, b: aedeagus, lateral view, vesica partly everted, c: tympanal organ, tergite 1+2; 33. *L. amseli* ? (gen. prep. 1025 H.R.; Dasht-i-Nawar, E Afghanistan); a: genital capsule, b: aedeagus, lateral view; 34. *L. excelsata* (gen. prep. 1018 H.R., Kara-Kum desert, Turkmenistan), a: genital capsule, b: aedeagus, lateral view, c: 8th tergite (right margin turned up). Scale bar: 1 mm.



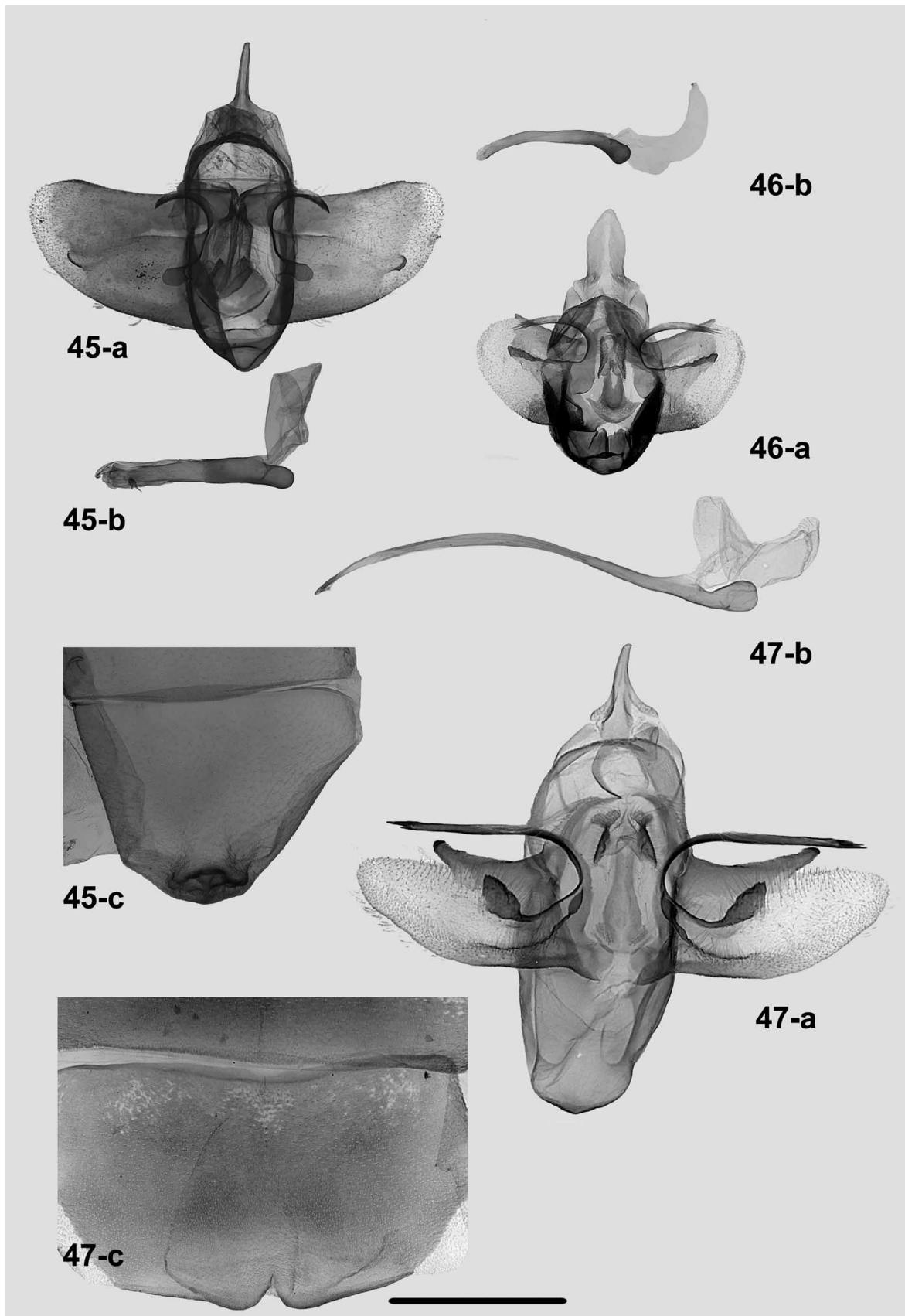
FIGURES 35–38. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 35. *L. distinctata* (gen. prep. 1089 H.R.; Dushak Mt., Turkmenistan), a: genital capsule, b: aedeagus, lateral view; 36. *L. buxtoni* (gen. prep. 1066 H.R.; Kazerun, S Iran), a: genital capsule, b: aedeagus, lateral view; 37. *L. stadiiei* (photo of L. Lehmann; type locality, NW Iran), a: genital capsule, b: aedeagus, lateral view; 38. *L. obliquata* (gen. prep. 1087 H.R.; Ashkhabad), a: genital capsule, b: aedeagus, lateral view, c: 8th tergite (lateral margins slightly curved up). Scale bar: 1 mm.



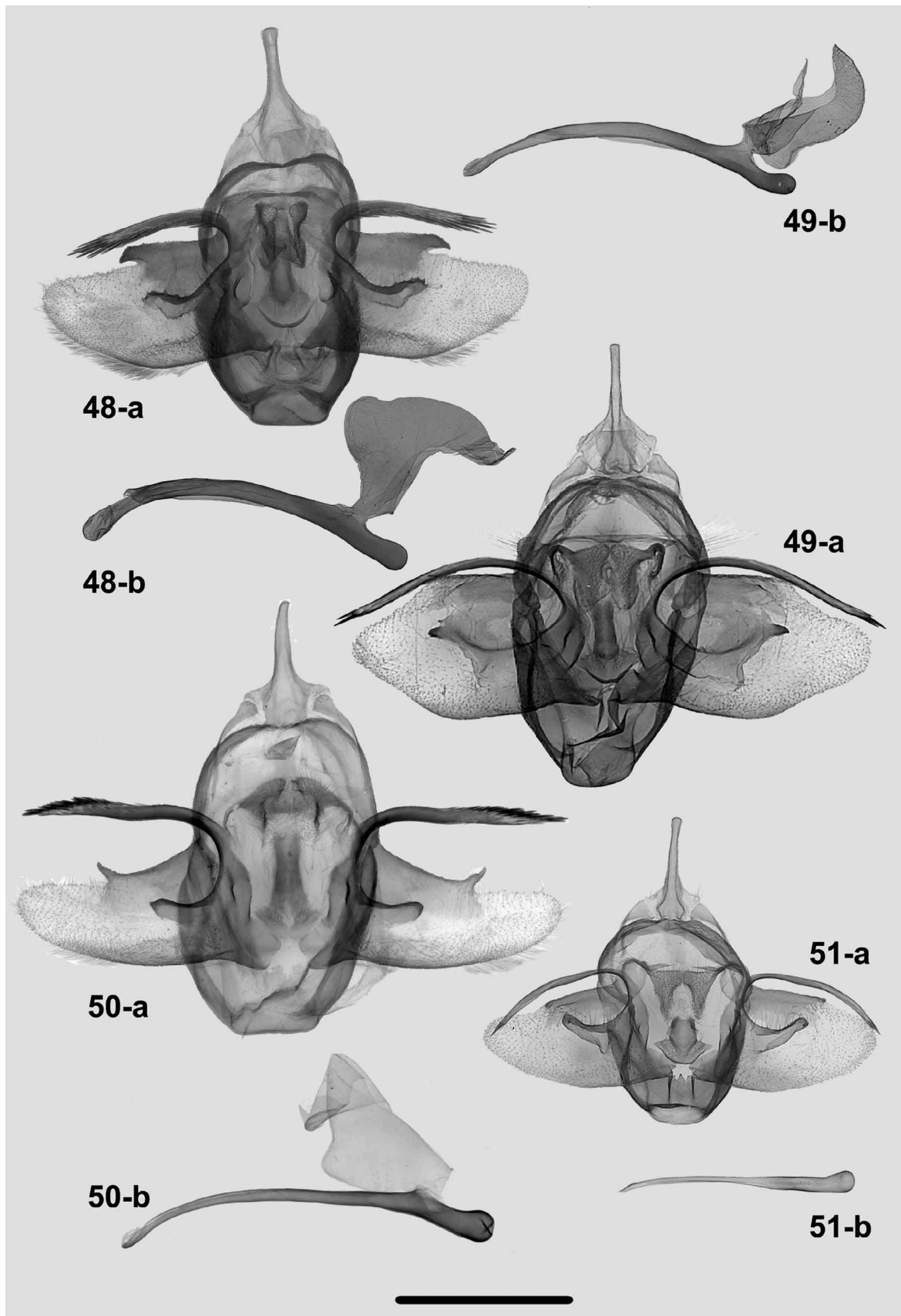
FIGURES 39–41. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 39. *L. bosporaria* (gen. prep. 1088 H.R.; Ankara), a: genital capsule, b: aedeagus, lateral view, vesica everted, c: tympanal organs & anterior sternites; 40. *L. usgentaria* (gen. prep. 1017 H.R.; N Ashkhabad), a: genital capsule, b: aedeagus, lateral view; 41. *L. witzemanni* (gen. prep. 1037 H.R.; Hamadan, W Iran), a: genital capsule, b: aedeagus, lateral view, vesica everted, c: 8th tergite. Scale bar: 1 mm.



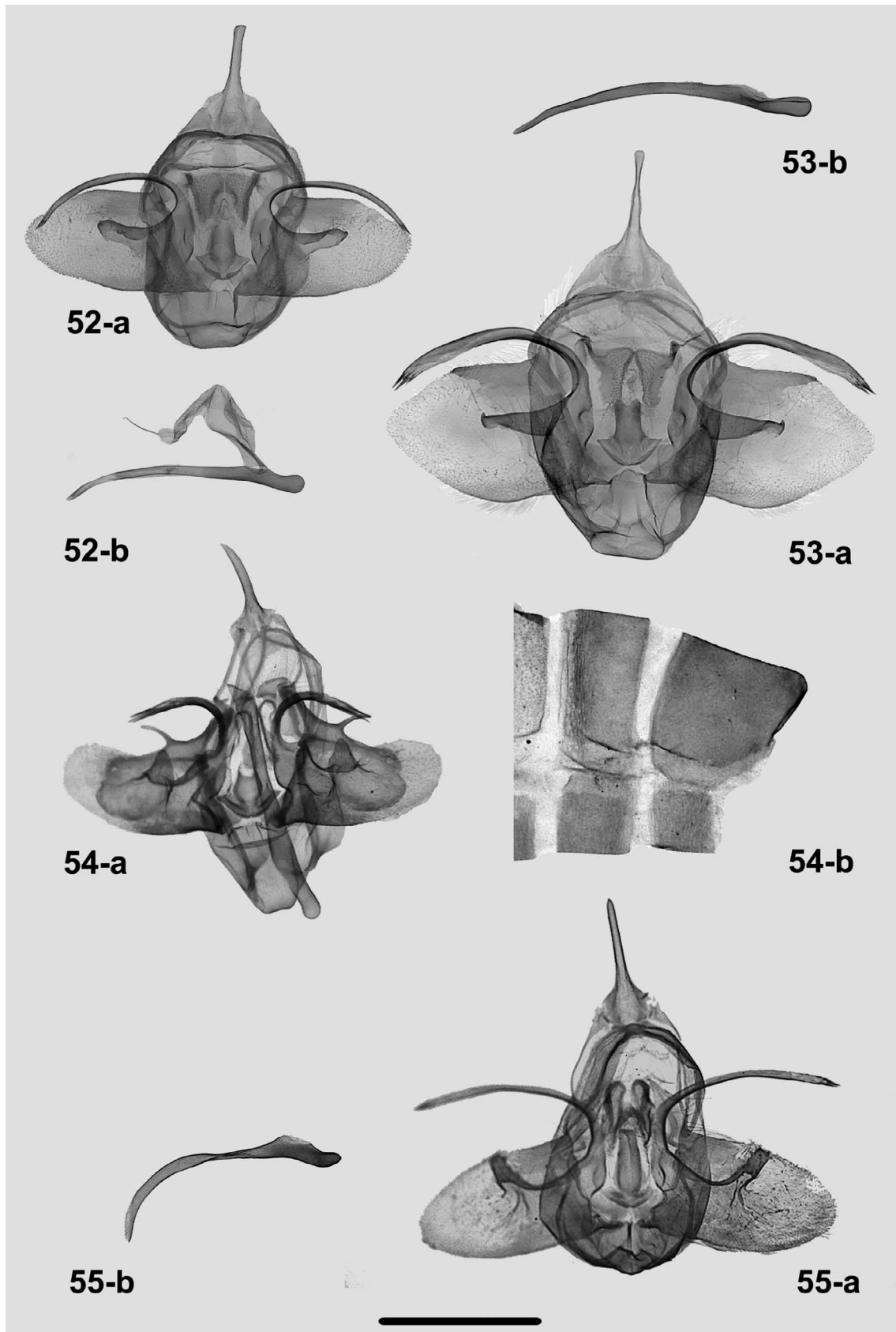
FIGURES 42–44. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 42. *L. hreblayi* **sp. nov.** (gen. prep. 1056 H.R.; type locality, N-Pakistan), a: genital capsule, b: aedeagus, lateral view; 43. *L. senata* (gen. prep. 1771 J.V., Repetek, E Turkmenistan), a: genital capsule, b: aedeagus, lateral view; 44. *L. notata*. (gen. prep. 1058 H.R.; Sarkhoun, SW Iran), a: genital capsule, b: aedeagus, lateral view, c: 8th tergite (right margin curved up). Scale bar: 1 mm.



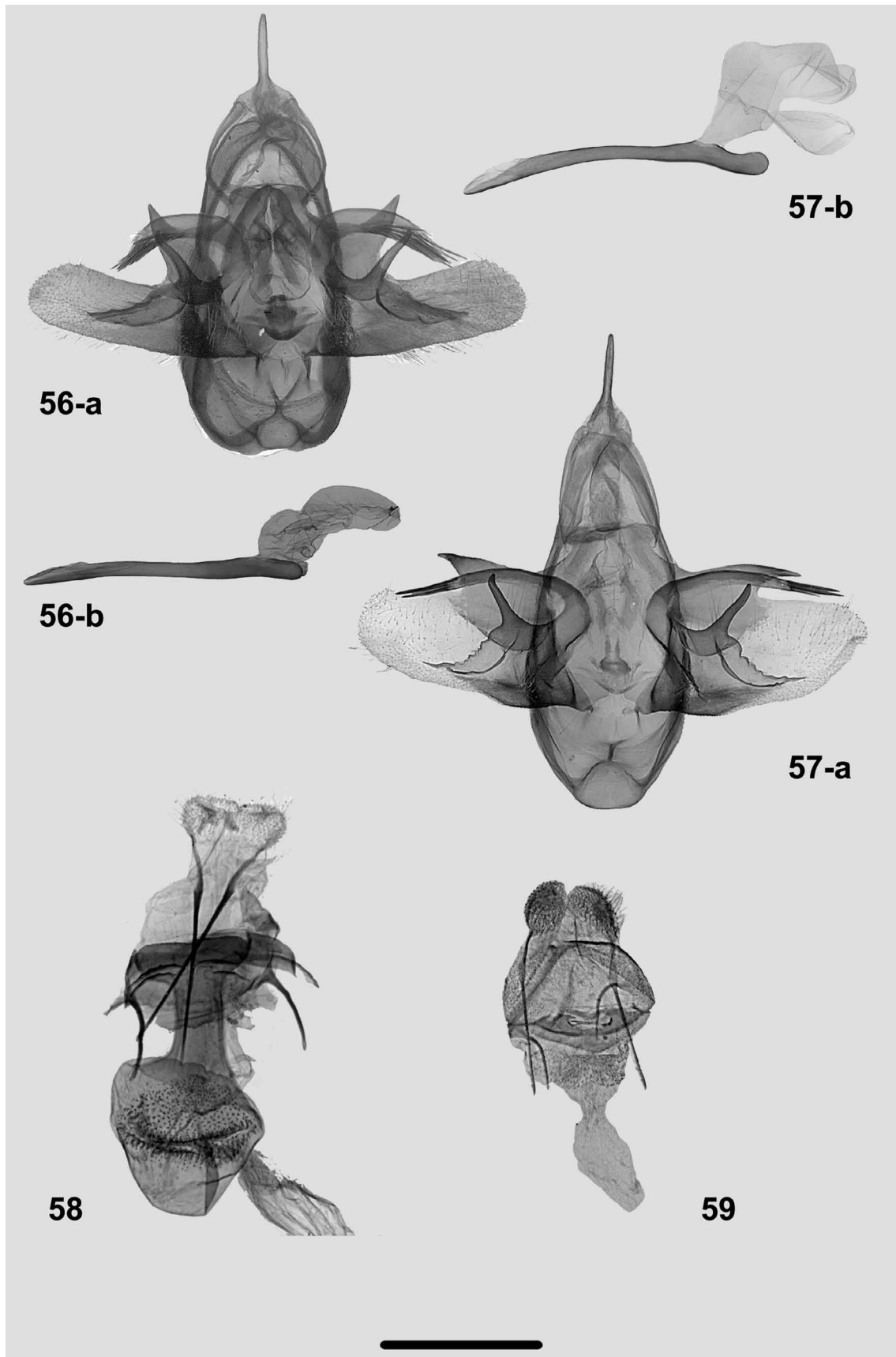
FIGURES 45–47. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 45. *L. fissurata fissurata* (gen. prep. 1608 H.R.; El Mesrane, Algeria), a: genital capsule, b: aedeagus, lateral view, c: 8th tergite (left margin curved); 46. *L. parva* (gen. prep. 1021 H.R.; Kopet-Dagh, Turkmenistan), a: genital capsule, b: aedeagus, lateral view; 47. *L. farinata* (gen. prep. 1054 H.R.; Hamburg, Germany), a: genital capsule, b: aedeagus, lateral view, c: 8th tergite. Scale bar: 1 mm.



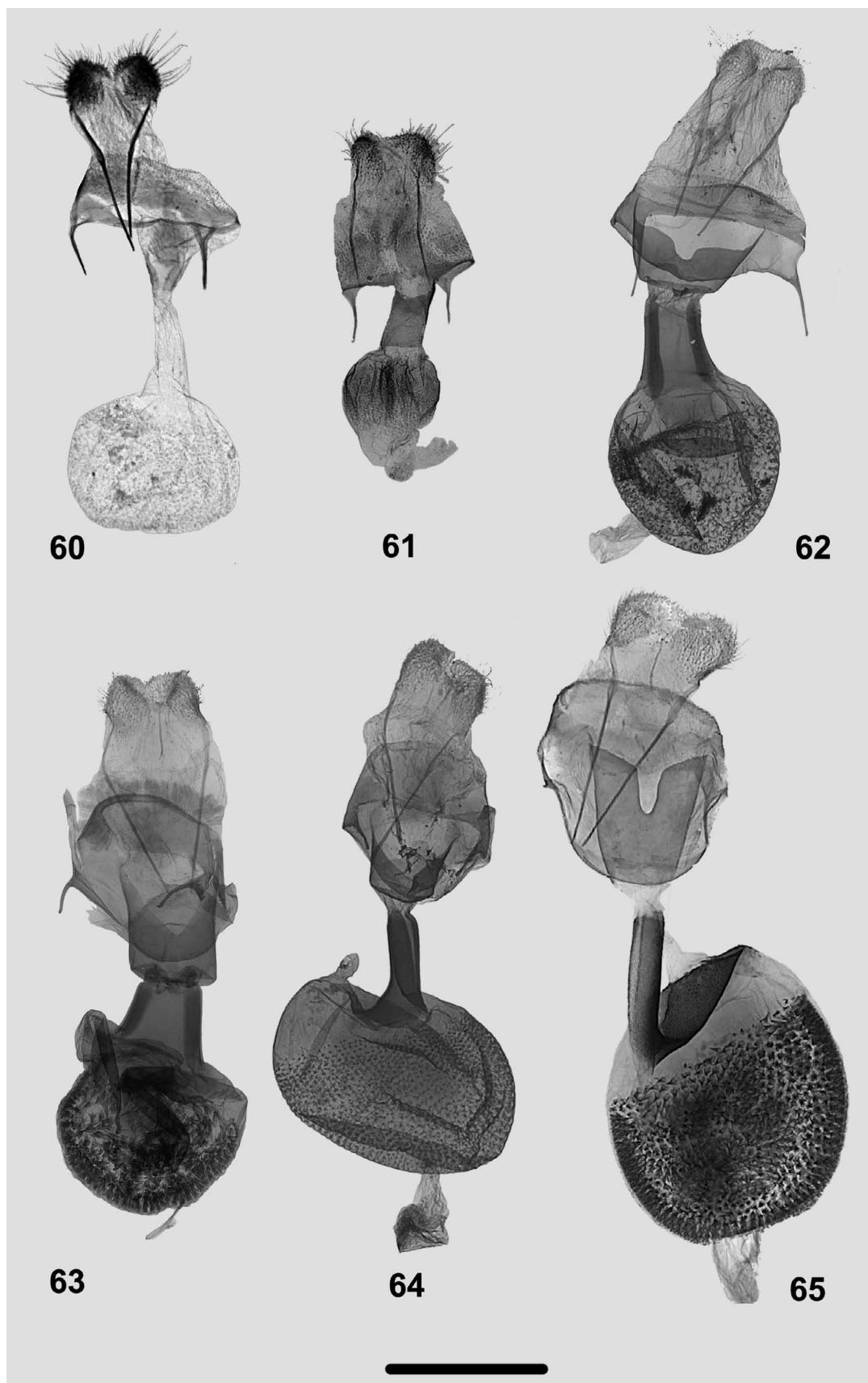
FIGURES 48–51. *Lithostege* Hübner: Male genitalia. 48. *L. coassata* (gen. prep. 1041 H.R.; Gonbad, N Iran), a: genital capsule, b: aedeagus, lateral view; 49. *L. ancyrana* (gen. prep. 1013 H.R.; Gürün, Turkey), a: genital capsule, b: aedeagus, lateral view; 50. *L. narynensis* (gen. prep. 1055 H.R.; Narine, Turkestan, type locality), a: genital capsule, b: aedeagus, lateral view; 51. *L. griseata griseata* (gen. prep. 1048 H.R.; Agri-Dagh, Armenian), a: genital capsule, b: aedeagus, lateral view. Scale bar: 1 mm.



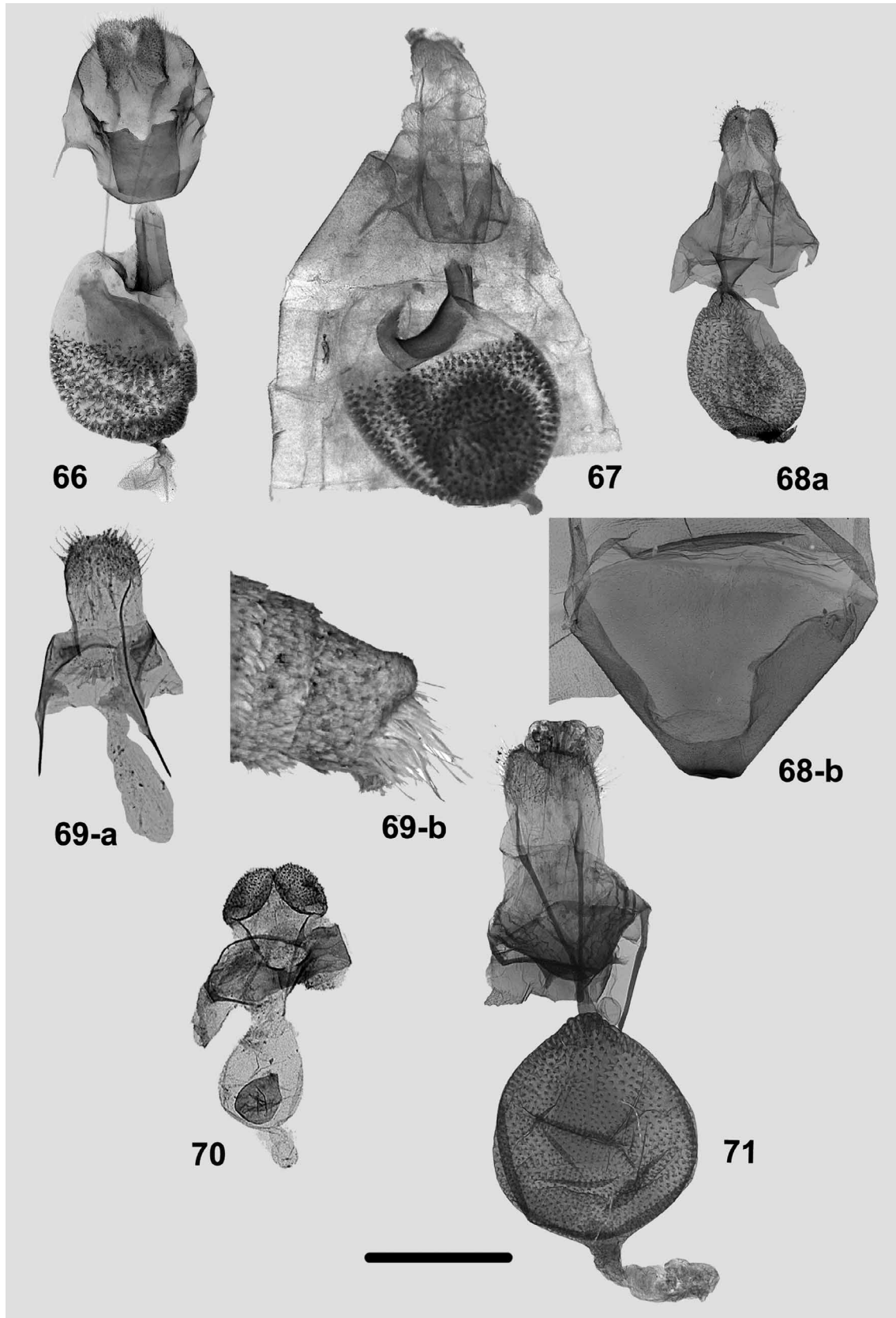
FIGURES 52–55. *Lithostege* Hübner: Male genitalia & details of abdominal integument. 52. *L. griseata gigantea* (gen. prep. 1035 H.R.; Karaj, N Iran), a: genital capsule, b: aedeagus, lateral view; 53. *L. palaestinensis* (gen. prep. 782 H.R.; Varamin, N Iran), a: genital capsule, b: aedeagus, lateral view; 54. *L. luminosata* (gen. prep. 3480 J.V.; Isfan, Tadjikistan), a: genital capsule and aedeagus, b: 6th-8th abdominal segments, lateral view; 55. *L. luigi* (gen. prep. 7679 J.V.; Badkhyz, Turkmenistan), a: genital capsule, b: aedeagus, lateral view. Scale bar: 1 mm.



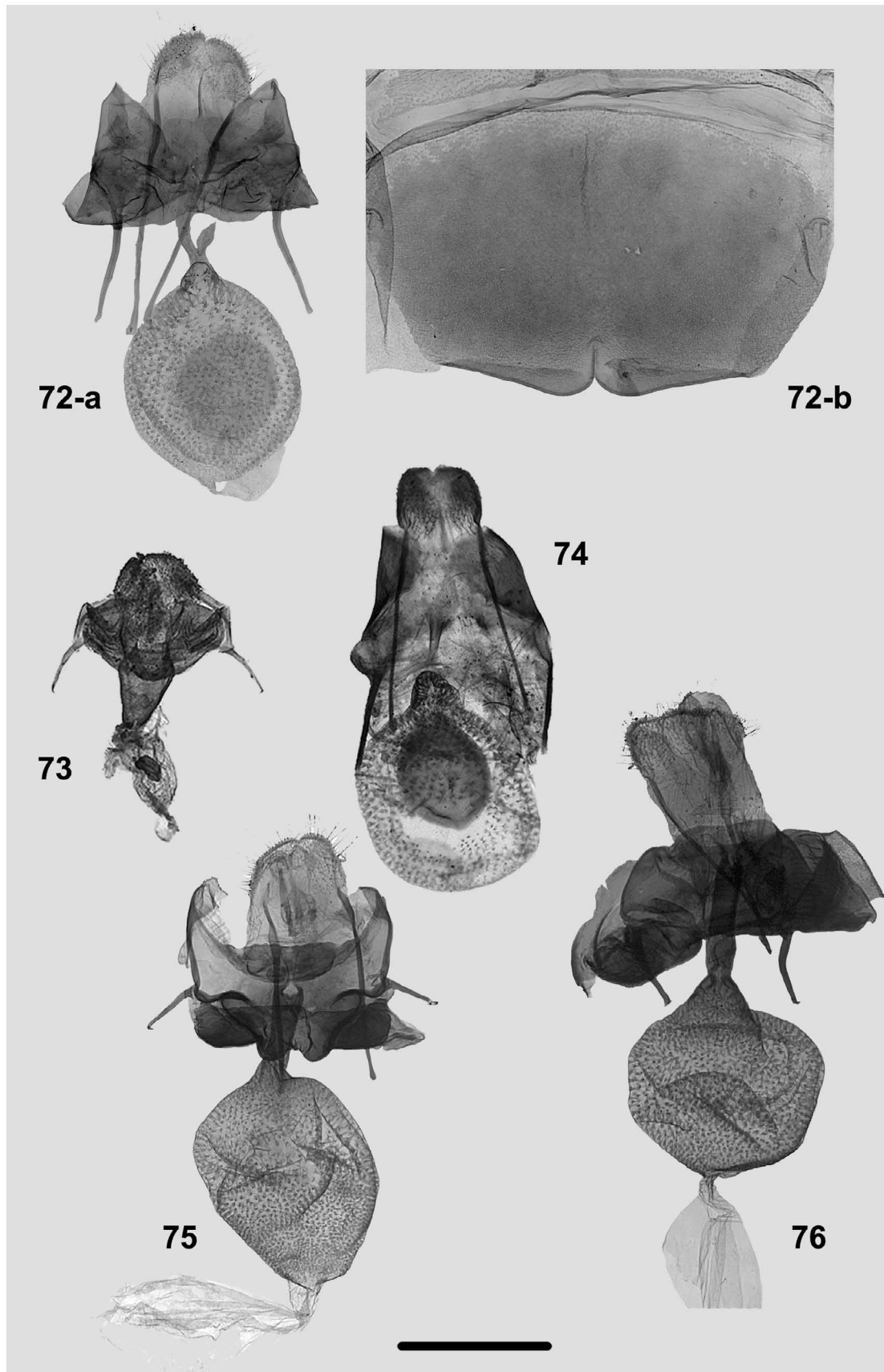
FIGURES 56–59. *Lithostege* Hübner: Male & female genitalia. 56-57: Male genitalia. 56. *L. infuscata* (gen. prep. 1032 H.R.; Maku, NW Iran), a: genital capsule, b: aedeagus, lateral view; 57. *L. flavicornata* (gen. prep. 1062 H.R.; Ak-Chehir, Turkey), a: genital capsule, b: aedeagus, lateral view; Figs 58-59: Female genitalia. 58. *L. amoenata* (gen. prep. 1023 H.R.; Nikolajevsky pass, Tajikistan); 59. *L. distinctata* (gen. prep.1618 H.R.; Kurgan, Turkmenistan). Scale bar: 1 mm.



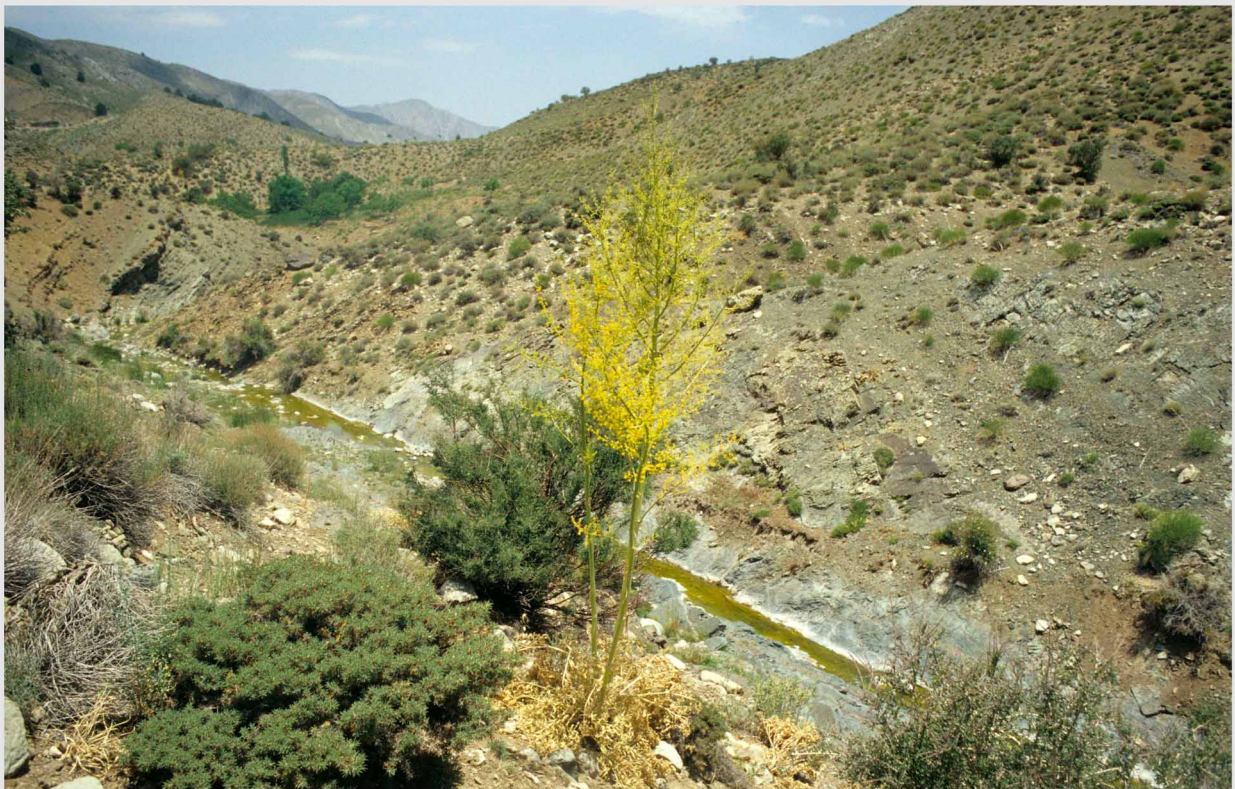
FIGURES 60–65. *Lithostege* Hübner: Female genitalia. 60. *L. excelsata* (gen. prep. 7646 J.V.; Repetek, E Turkmenistan); 61. *L. obliquata* (gen. prep. 7645 J.V.; Repetek, E Turkmenistan); 62. *L. usgentaria* (gen. prep. 1016 H.R.; Ashkhabad); 63. *L. witzmanni* (gen. prep. 1027 H.R.; Hamadan, W Iran); 64. *L. dissocyma* (gen. prep. 1074 H.R.; Kazerun, S Iran); 65. *L. hreblayi* **sp. nov.** (gen. prep. 1085 H.R.; type locality, N Pakistan). Scale bar: 1 mm.



FIGURES 66–71. *Lithostege* Hübner: Female genitalia & details of abdominal integument. 66. *L. samandooki* **sp. nov.** (gen. prep. 1076 H.R.; type locality, S Iran); 67. *L. senata* (gen. prep. 8611 H.R.; Uzboi, Turkmenistan); 68. *L. fissurata inanis* (gen. prep. 1012 H.R.; Baluchistan, E Iran), a: genital organ, b: 7th tergite, dorsal view; 69. *L. parva* (gen. prep. 1615 H.R.; Wachschtal, Tajikistan), a: genital organ, b: terminal segments of abdomen, lateral view; 70. *L. turkmenica* (gen. prep. 7649 J.V.; Uzbekistan, Karakum desert); 71. *L. coassata* (gen. prep. 1043 H.R., Gonbad, N Iran). Scale bar: 1 mm.



FIGURES 72–76. *Lithostege* Hübner: Female genitalia & details of abdominal integument. 72. *L. palaestinensis* (gen. prep. 781 H.R.; Varamin, N Iran), a: genital organ, b: 7th tergite; 73. *L. luminosata* (gen. prep. J.V.; Parhai, Turkmenistan); 74. *L. luigi* (gen. prep. 3688 J.V.; Badkhyz, Turkmenistan); 75. *L. infuscata* (gen. prep. 1036 H.R.; Erivan, Armenia); 76. *L. flavicornata* (gen. prep. 1031 H.R.; Ak-Chehir, Turkey). Scale bar: 1 mm.



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FIGURES 77. Type locality of *L. samandooki* **sp. nov.** Eastern part of Zagros Mountains, Altitude 2800 m (NW of Jiroft, Gardaneh Sarbishan). Dominant plants: *Artemisia* ssp. (Asteraceae); *Astragalus* ssp. (Fabaceae); *Eryngium* ssp. (Apiaceae); *Prunus* (*Amygdalus*) ssp. (Rosaceae). Photos: Dr. J.-U. Meineke.