

JIŘÍ KRÁTKÝ¹, JERZY SZYPULA²

**On the validity of *Mogulones albolineatus*
(J. FRIVALDSZKY, 1878) (Coleoptera: Curculionidae)**

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¹ Třebechovická 821, 500 03, Hradec Králové, Czech Republic, e-mail: macshort@tiscali.cz

² Museum of Natural History, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland,
e-mail: jszypula@biol.uni.wroc.pl

Abstract: *Mogulones albolineatus* (J. FRIVALDSZKY, 1878), formerly synonymised with the closely related species *M. lineatus* (GYLLENHAL, 1837) and later also confused with another closely related species, *M. sublineellus* (C.N.F. BRISOUT de BARNEVILLE, 1869), is shown to be a valid species and redescribed here. The informal species-subgroup of *Mogulones lineatus* is here defined and a key to its species is included. *Mogulones albolineatus* lives on several plant species of the genus *Onosma* in Southeastern and Central Europe, the Caucasus and Turkey.

Key words: Coleoptera, Curculionidae, Conoderinae, Ceutorhynchitae, *Mogulones*, taxonomy, bionomics.

INTRODUCTION

Mogulones albolineatus (J. FRIVALDSZKY, 1878) is morphologically very close to both *M. lineatus* (GYLLENHAL, 1837) and *M. sublineellus* (C.N.F. BRISOUT de BARNEVILLE, 1869), having alternating dark and light coloration of scales on elytral intervals, forming distinct zebra-stripping on elytra. These three species could be included in an informal *M. lineatus* species-subgroup, situated inside the *Mogulones geographicus* (GOEZE, 1777) species-group (formerly specified and described as a subgenus *Mogulones* REITTER, 1916 inside the genus *Ceutorhynchus* GERMAR, 1823) (WAGNER 1927).

Mogulones albolineatus was described from Budapest, and in 1899 it was synonymised by SCHULTZE (1899) with the morphologically very similar *M. lineatus*. ALONSO-ZARAZAGA *et al.* (2017) also follow this taxonomic status. This species was also connected with a second morphologically very similar species, *M. sublineellus*, mainly based on the shape of the rostrum. Under this name, specimens were published as a new record for the then Czechoslovak Socialist Republic and for Central Europe (STREJČEK 1991).

The type material of all related species, including the synonymised taxa, was studied and compared. *Mogulones albolineatus* was found to be a distinct, valid taxon, morphologically similar to *M. sublineellus*, but with the shape of the aedeagus closer to *M. lineatus*. All species can be distinguished and identified using the diagnosis and key below. Identification is usually straightforward for fresh specimens with well preserved dorsal vestiture; specimens where the rostrum is not visible, or with missing scales on the elytra or pronotum, may be problematic to separate.

MATERIAL AND METHODS

Measurements of the specimens were taken as follows: body length (from the base of rostrum to the apex of the elytra); rostral length (a straight line going from the base of the curved rostrum to the rostral apex); pronotal length (from the anterior margin of pronotum to the tip of its base in front of scutellum); elytral length (from the middle of a line tangent to shoulders to the elytral apex). Measurements were taken using a Novex RZ trinocular microscope with original scale under 30x magnification.

Aedeagus or spermatheca, if dissected, was glued to the same card as the respective specimen; that of the holotype of *M. albolineatus* is glued on an additional card.

The locality data given use the original spelling as written on labels; in the type material, separate lines on labels are indicated by a comma and separate labels by a semicolon; additional comments and explanations are given in square brackets. Taxonomy follows ALONSO-ZARAZAGA *et al.* (2017).

Abbreviations of the type depositories:

BMNH	The Natural History Museum, London, United Kingdom
DEI	Deutsches Entomologisches Institut, Müncheberg, Germany
HNHM	Hungarian Natural History Museum, Budapest, Hungary
JJPC	Jiří Januš private collection, Kladno, Czech Republic
JKPC	Jiří Krátký private collection, Hradec Králové, Czech Republic
JSPC	Jerzy Szypuła private collection, Wrocław, Poland
MNHN	Muséum National d'Histoire Naturelle, Paris, France
NHRS	Naturhistoriska riksmuseet, Stockholm, Sweden
NMPC	National Museum, Prague, Czech Republic
NMW	Naturhistorisches Museum Wien, Austria
SBPC	Stanislav Benedikt private collection, Plzeň, Czech Republic
SJPC	Jaromír Strejček private collection, Prague, Czech Republic

RESULTS

Mogulones albolineatus (J. FRIVALDSZKY, 1878) stat. rev.

Ceutorhynchus albolineatus J. FRIVALDSZKY, 1878: 112

Type material. Holotype: ♂: Hungar.; 503, 23; Holotypus 1878, *Ceutorrhynchus, albolineatus*, J. FRIVALDSZKY [red printed and black hand written on white card with red frame]; Hungaria, Budapest., leg. J. Langerth; 503, 23 [black hand written on white card];

C. lineatus, GYLL. [blue hand written on white card]; (HNHM) [aedeagus dissected] (Fig. 1); Paratype: 1 ♀: Hungaria, Budapest., leg. J. Langerth; 503, 23 [all black hand written on white card]; Paratypus 1878, *Ceutorrhynchus, albolineatus*, J. FRIVALDSZKY [red printed and black hand written on white card with red frame]; *Mogulones, lineatus* (GYLL.), det. A. Podlussány 2007; (HNHM).

Other material examined: Bulgaria: Melnik env., 26.V.-5.VI.1985, 1 ♀, Macek lgt., J. Krátký det., (NMPC); Hungary: Kecskemét - Umg., Agasegyháza, 28.IX.1973, 1 ♀, *Onosma* sp., J. Strejček lgt., *C. sublineellus* BRIS. L. Dieckmann det. 1975, J. Szypuła rev. (SJCP); Pilisszentkerest, Pilis Mt., 1 ♀, 4.IX.1999, *Onosma pseudoarenaria*; Örkény env., military area, sandy dunes, 20.VI.2006, 9 ♀♀, *Onosma arenaria*, all J. Krátký lgt. et det. (JKPC); Iran: West Azerbaijan prov., near Piranshahr, 17.V.2015, D. Kasatkin lgt. et coll., E. Colonnelli det. [as *M. sublineellus*], J. Krátký & J. Szypuła rev. [from the image online available: <https://www.zin.ru/animalia/coleoptera/rus/mogsubza.htm>]; Slovakia: Turňa nad Bodvou, Turnianský hradný vrch, 1 ♂, 1 ♀, 19.IX.1984, *Onosma tornensis*, J. Strejček lgt., J. Szypuła det. (JKPC, SJPC); 1 ♀, 4.IV.1999, *Onosma tornensis*; Host'ovce, Dlhý vrch hill, 1 ♂ [torso], 21.VIII.1998, 1 ♀, 9.IX.2001, *Onosma tornensis*, all lgt. et det. J. Krátký (JKPC); Russia: Stavropol kray, Pyatigorsk, 11.VI.1986, 1 ♀, J. Strejček lgt., J. Krátký det. (SBPC); 1 ♂, J. Strejček lgt., J. Szypuła det. (SJPC); Turkey: Adiyaman prov., Karadut env., 37°54'N, 38°48'E, 17.-19.V.2001, 1 ♂, J. Szypuła lgt. et det. (JSPC); Mardin prov., Hop Geçidi, 8 km NE of Mardin, 37°21'N/ 40°51'E, 1115m, 4.-5.VI.2002, 2 ♂♂, 3 ♀♀, J. Szypuła lgt., 1 ♂, 1 ♀, R. Królik lgt., all J. Szypuła det. (JSPC).

Diagnosis.

Morphologically very similar to both the closely related species *M. lineatus* and *M. sublineellus*. From *M. lineatus* it is easily distinguishable by its considerably larger size (4.0-4.7 mm instead of 3.3-3.6 mm as in *M. lineatus*), distinctly shorter and evenly curved rostrum in both sexes (instead of much longer and nearly straight rostrum as in *M. lineatus*), the presence of subhumeral oblique transverse white stripes of oval scales at elytral intervals 6-9 (absent in *M. lineatus* and only very faintly present sometimes in *M. sublineellus*), as well as the shape of the apex of the aedeagus. From *M. sublineellus* it can be distinguished by regular rows of white scales in even elytral intervals (instead of irregular and interrupted rows as in *M. sublineellus*), usually yellowish postscutellar sutural spot of scales on elytra (instead of always white as in *M. sublineellus*), oblique-lateral longitudinal stripes on the disc of pronotum strongly contrasting with neighbouring space (instead of only hinted stripes as in *M. sublineellus*) and strongly different shape of median lobe of aedeagus.

Redescription.

Body length: 4.0-4.7 mm.

Integument and vestiture. Body completely black, only tarsi and antennae dark reddish. Dorsal vestiture consisting of hairlike brown scales distributed on head, pronotum and odd elytral intervals and oval whitish scales distributed in the middle of the frons, at the sides of head, and at the base of pronotum. Same kind of scales make 3 longitudinal stripes on the disc of pronotum, and they are distributed in 2 or 3 regular dense rows on elytral intervals 2, 4 and 6, and partly also on interval 8. These scales also make a subhumeral oblique transverse stripe on elytral intervals 6-9. Scattered scales are also distributed between brownish hairlike scales on the disc of pronotum and in apical half of odd elytral intervals, where these scales darken to a brownish colour anteriorly. Yellowish oval scales make postscutellar sutural spot on basal fifth of first elytral interval. Under side covered densely with whitish oval scales

similar to those on elytra, brownish scales more sparsely distributed forming darker spots in the middle of each pro- and mesosternal segment, and lateral spots on each of ventrites. Rostrum rather sparsely covered in the basal half with light hairlike scales, darkening to brown color apically; apical half of rostrum covered with fine brown hairs, distributed on sides. Legs covered with hairlike light-brown scales mixed with oval whitish ones, the latter more dense on apical part of tibiae and on outer side of teeth and in apical third of femora.

Head. Rostrum in male as long as pronotum, in female 1.13-1.15 times longer than pronotum, regularly curved toward apex, in male only indistinctly angled on upper side at the point of antennal insertion, laterally slightly narrowing toward apex. Rostrum dorsally parallel-sided, distinctly narrowed at the base and indistinctly narrowed behind antennal insertion, and then moderately dilated at apex, more evidently in females; from base to antennal insertion moderately punctured and wrinkled, with indistinct lateral carinae, onwards to the apex, coarsely punctured, with shiny interspaces. Antennae inserted approximately in the middle of the length of rostrum in both sexes; scape nearly straight, clubbed in apical 1/3; funicle 7-segmented, its segment 1 clubbed, about twice as long as wide, segment 2 subconical, slightly longer than segment 1, segments 3-5 about twice as long as wide, segment 6 moderately and 7 broadly rounded; club fusiform, twice as long as wide in the middle, about one third as long as the funicle. Frons shallowly depressed in the middle, moderately punctured as well as the basal half of rostrum; eyes in dorsal view slightly rounded, not protruding from the head outline, in lateral view suboval, protruding anteriorly downwards.

Pronotum 0.71-0.79 times as long as wide, bell-shaped, widest before the middle, sides in the middle rounded, apical margin half as wide as base, base protruding toward the scutellum in the middle; in lateral view slightly and regularly vaulted, apical margin raised; disc regularly punctured, lacking antero-lateral impressions and lateral tubercles, dorsal sulcus shallow, completely covered with light oval scales.

Elytra 1.08-1.15 times as long as wide, widest in basal third, slightly convex in both directions, sides regularly narrowed and moderately rounded from humeral calli to the apex; fine preapical tubercles on intervals 5-7 not protruding from elytral outline. Striae deep, strongly and regularly punctured, with sharp edges, with regular rows of brownish long oval scales. Odd intervals 2 times as wide as striae, flat, with 3 subregular rows of hairlike scales irregularly mixed with oval brownish scales, even intervals 1.5 times as wide as striae, flat, intervals 2 and 6 usually with 3, apically sometimes narrowed in 2, interval 4 with 2 subregular rows of light scales, sometimes mixed with brownish ones in basal half.

Legs normally long, not robust or elongate. Femora strongly dentate about $\frac{3}{4}$ of the length of under margin, teeth of anterior femora with indication of second tip on outer margin. Anterior and middle tibiae slightly S-curved, posterior tibiae straight, all apically regularly widened, with moderate apical lobe on outer margin, rather small on hind tibiae, highlighted by a group of strong hairs. Middle and posterior tibia in male with a small mucro at apex of inner margin, in female without mucro. Tarsi 0.8 times as long as tibiae, claws dentate.

Abdomen. Ventrites flat, ventrite 5 in males with nearly indistinct preapical impression, in females such an impression is absent. Aedeagus strongly asymmetrical, with apical projection protruding on right from the middle in ventral view, apex obliquely rounded (Fig. 9).

Variability. The species is only slightly variable in the number of brownish oval scales mingled with the light ones on all body; sometimes the underside is completely covered only with white scales. Also, the postscutellar sutural spot is sometimes formed of scales of the same colour as those on even intervals.

Bionomics. Time of adults occurrence: April-July, and September-October. Adults feed on several *Onosma* species, in Slovakia they were collected from *O. viridis* (= *O. tornensis*), in Hungary from *O. arenaria* and *O. pseudoarenaria*. Active adults were observed during warm days, when they climbed up the host plant on early morning. For the rest of the day they are hidden and well camouflaged among the remnants of dried leaves or in the soil below the leaves on the ground. The larva probably develops in the root collar of the host plant.

Mogulones lineatus (GYLLENHAL, 1837)

Ceutorhynchus lineatus GYLLENHAL, 1837: 509

Type material. Holotype: 1 ♀, Tauria [= Crimea], Steven.; Typus; NHRS-JLKB 000021071 (NHRS) (Fig. 2).

Other material examined: Crimea: Bakhchysaray E, Chufut-Kale vic. (300-400) [m.a.s.l.], xerothermic grasslands, 19.-21.VI.2005, 1 ♂, 1 ♀, R. Ruta lgt. (JSPC); Greece: Peloponnesos S, Taygethos Mts., 1300-1500 m, Krioneri pr. Paleopanagia, *Onosma* sp., 29.IV.2008, 7 ♂♂, 6 ♀♀, S. Benedikt lgt., J. Krátký det. (SBPC); Argolida, Mykenai, 6.V.1993, 1 ♂, J. Jelínek lgt., J. Krátký det. (NMPC); Austria: „Styria, coll. Letzner“, 1 ♂, L. Dieckmann det., J. Krátký rev. (DEI); Serbia: „Serbien“, coll. Letzner, 1 ♂ (NMW), 1 ♀ (DEI), both J. Krátký det.; Turkey: Stambul [= Istanbul], 1 ♂, (DEI); Turkey CW, Kutahya, Porsuk Brj., 20.V.,2001, 1 ♀, M. Snížek lgt., J. Szypuła det. (JSPC); Kastamonu prov., 10 km N of Tosya, a = 1260 m, 21.VI.2002, 2 ♀♀, J. Szypuła lgt. et det. (JKPC, JSPC).

Diagnosis. Easy distinguishable from the two above-mentioned related species by smaller size (body length 3.3-3.6 mm instead of 3.7-4.7 mm as in both *M. albolineatus* and *M. sublineellus*), longer rostrum in male about 1.2 as long as pronotum, and in female about 1.5 times longer than pronotum (instead of ratio 1.0-1.15 in male and 1.15-1.25 in female of both *M. albolineatus* and *M. sublineellus*), rostrum in lateral view only slightly curved particularly in female, apicad of antennal insertion to the apex strongly tapered and at extreme apex bulbously widened in lateral as well in dorsal view. Pronotum with subparallel sides in basal half (instead of bell-shaped as in both *M. albolineatus* and *M. sublineellus*). White stripes on elytra cover full length of even intervals and they are formed by two (on intervals 2 and 6 sometimes partly by three) regular rows of nearly rounded scales (instead of oval scales as in *M. albolineatus* and interrupted and irregular rows of oval scales in *M. sublineellus*). Aedeagus of similar shape of that of *M. albolineatus*, but the apical projection is not so long and extreme apex in lateral view less curved (Fig. 8).

Bionomics. Lives on several plant species of the genus *Onosma*, like *M. albolineatus*.

Mogulones sublineellus (C.N.F. BRISOUT de BARNEVILLE, 1869)

Ceutorhynchus sublineellus C.N.F. BRISOUT DE BARNEVILLE, 1869: 457

Ceutorhynchus vittatipennis PIC, 1940: 2

Type material. Holotype: ♂: Greece: Athéne, Grecia; Type; *Ceut. sublineellus*, CH. BRIS.-; Museum Paris, 1968, Col. A. Hoffmann (MNHN) [aedeagus dissected] (Fig. 3); Lectotype: Cyprus: ♂: Livadia, Chypre; *vittatopennis*, nov.; ex coll. de Vauloquer [all hand written on white card]; Museum Paris, coll. M. Pic [printed on white card]; Lectotypus ♂, *Mogulones, vittatipennis* PIC, E. Colonnelli det. 1985 [printed and hand written on red card]; = *Mogulones, sublineellus* (BRIS.), E. Colonnelli det. 1985 [handwritten on white card] (MNHN) (Fig. 4).

Other material examined: Bulgaria: Kresna (N41°43'42" E23°09'29"), 30.IV.2009, 1 ♂, F. Pavel lgt., J. Szypuła det. (JSCP); Sandanski env., Lebnica valley (N41°31'32" E23°14'15"),

3 ♂♂, 2 ♀♀, J. Pelikán & F. Pavel lgt., J. Krátký det. (JKPC); 10.V.2008, 2 ♂♂, 2 ♀♀, F. Pavel lgt., J. Szypuła det. (JSPC); Sandanski, 29.V.2005, 1 ♂, J. Januš lgt., J. Krátký det. (JJPC); Cyprus: Mt. Troodos, 5,500-6000 ft., 5-6.V.1947, B. M. 1947-397, 1 ♂, 1 ♀, G. A. Mavromoustakis lgt., J. Krátký det. (BNHM); Greece: Samos isl., Oros Kerkis Mt., S Kalithea, N37°42'33, E26°36'00, 276 m, 10.V.2013, 6 ex., Ch. Germann lgt., det. et coll. (GERMANN *et al.* 2015); Turcia: Anatolia occ., Prov. Izmir, Çeşme, 11.IV.1973, 1 ♀, N. Lodos lgt., L. Dieckmann det., J. Krátký rev. (DEI);

Diagnosis. Very similar to *M. albolineatus* in the size and shape of body and rostrum, but white stripes on even elytral intervals are composed of discontinuous, interrupted rows of scales, not of one longitudinal white stripe continuous over the entire length of the interval. A larger number of white scales is also present on the first interval. Postscutellar spot on elytra is always of the same colour as the scales on even intervals (instead of usually yellowish as in *M. albolineatus*). Lateral longitudinal stripes of white oval scales on disc of pronotum are only hinted, not sharply terminated and strongly contrasting with neighbouring space (instead of strongly contrasting stripes made of broadly oval scales as in both *M. albolineatus* and *M. lineatus*). Aedeagus of a completely different shape from that of the related species, its apex in the form of a thin, long and strongly curved hook positioned near the centre, less asymmetrical, subparallel (Fig. 10) (instead of strongly asymmetrical with broader and shorter, less curved apical projection as in both *M. albolineatus* and *M. lineatus*). This species is sometimes also confused with *M. beckeri* (SCHULTZE, 1900), also sometimes with an indication of a nearly complete white stripe on elytral interval 2. From *M. sublineellus*, *M. beckeri* is very easily distinguishable by the lack of subcomplete rows of white scales on elytral intervals 4 and 6, the presence of oblique stripes beside the postscutellar spot, forming an arrow-shaped light pattern at the basal part of elytra, as well as by the shape of the aedeagus continuously prolonged into a very long asymmetrical apex.

Bionomics. *Mogulones sublineellus* lives oligophagously on several plant species of the family Boraginaceae. In Bulgaria it was observed in large quantities on *Alkanna tinctoria* and occasionally also on *Onosma* sp. (J. Pelikán, pers. comm.). Adults are active mainly in the afternoon and evening on the lower parts of flowering plants. Larval development is unknown. GERMANN *et al.* (2015) also observed this species feeding on *Alkanna tinctoria* on the Greek island of Samos.

A key to species close to *Mogulones lineatus*:

1. Rostrum longer, in male 1.2, in female 1.5 times as long as pronotum, only very slightly curved in lateral view; in dorsal view, the rostrum is slightly broadened at antennal insertion and distinctly narrowed between this point and the apex; pronotum in basal half almost parallel-sided or slightly divergent, sides almost straight; light stripes on elytral intervals 2, 4 and 6 composed by 2-3 complete rows of nearly round scales; smaller species, body length 3.3-3.6 mm (Fig. 5); aedeagus asymmetrical (Fig. 8) *M. lineatus* (GYLL.)
- Rostrum shorter, in male 1.0-1.15, in female 1.15-1.25 as long as pronotum, regularly curved in both sexes, in dorsal view parallel sided; pronotum bell-shaped, its sides in basal ½ strongly rounded; light stripes on elytral intervals 2, 4 and 6 composed of 2-3 complete or interrupted rows of oval scales; larger species, body length 3.7-4.7 mm. 2.

2. Light stripes on elytral intervals 2, 4 and 6 composed of 2-3 complete rows of oval scales; postscutellar spot on elytra usually of a different colour from the scales on interval 2, yellowish or brownish; subhumeral oblique transverse white stripes of oval scales present on elytral intervals 6-9; 3 longitudinal stripes of white scales on the disc of pronotum very distinct and composed of 2 rows of oval scales strongly contrasting with neighbouring space (Fig. 6); aedeagus strongly asymmetrical, the apex protruding to the right of middle in ventral view, apical projection broader and shorter, in lateral view only slightly curved (Fig. 9) *M. albolineatus* (FRIV.)
- Light stripes on elytral intervals 2, 4 and 6 composed of 2-3 incomplete and interrupted rows of oval scales mixed with brownish hairlike scales; postscutellar spot on elytra coloured as the scales on interval 2; subhumeral oblique transverse white stripes of oval scales on elytral intervals 6-9 lacking; only middle longitudinal stripe of white scales on disc of pronotum distinct, lateral stripes only hinted (Fig. 7); aedeagus almost symmetrical, subparallel, its apex in the form of a long, thin and strongly curved hook (Fig. 10)
..... *M. sublineellus* (C. BRIS.)

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Fig. 1. *Mogulones albolineatus* (FRIVALDSZKY, 1878), holotype (photo L. Sekerka).



Fig. 2. *Mogulones lineatus* (GYLLENHAL, 1837), holotype (Photographed by J. Bergsten (© 2017 Naturhistoriska riksmuseet). Compiled of two separate photos of the habitus and the labels; original photos were cropped, light levels and contrast as in originals. Made available by the Swedish Museum of Natural History under Creative Commons Attribution 4.0 International Public License, CC-BY 4.0 (on-line: <https://creativecommons.org/licenses/by/4.0/legalcode>).

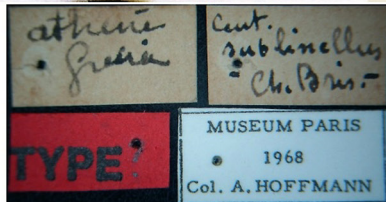


Fig. 3. *Mogulones sublineellus* (C.N.F. BRISOUT de BARNEVILLE, 1869), holotype (photo J. Skuhrovec).



Fig. 4. *Mogulones vittatipennis* (Pic, 1940), lectotype (photo J. Skuhrovec).



Figs 5–7. *Mogulones* spp., dorsal view: *M. lineatus* (GYLLENHAL, 1837), female from Crimea: Chufut-Kale (photo L. Sekerka) (5); *M. albolineatus* (FRIVALDSZKY, 1878), female from Hungary: Örkény (photo J. Skuhrovec) (6); *M. sublineellus* (C.N.F. BRISOUT de BARNEVILLE, 1869), female from Bulgaria: Sandanski (photo J. Skuhrovec) (7).



Figs 8–10. *Mogulones* spp., aedeagus, dorsal view: *M. lineatus* (GYLLENHAL, 1837), from Crimea: Chufut-Kale (photo L. Sekerka) (8); *M. albolineatus* (FRIVALDSZKY, 1878), holotype (photo J. Skuhrovec) (9); *M. sublineellus* (C.N.F. BRISOUT de BARNEVILLE, 1869), holotype (photo J. Skuhrovec) (10).

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