

Revision of the Genus *Lopezus* Navás, 1913 (Neuroptera, Myrmeleonidae)*

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Up till now, *Lopezus* Nav. was represented by a single species, *L. fedtschenkoi* (McL.) with unusual variation within local populations and throughout its entire range. Its range includes deserts of the USSR, Mongolia, the Middle East, and N Africa. Hölzel (1970, 1972) described 3 subspecies of *L. fedtschenkoi* from Arabia (*L. f. arabicus*), Iran (*L. f. persicus*), and Gobi (*L. f. gobiensis*), which differ from the nominate subspecies in the color of wings and body size. At the same time, in type series of most subspecies, additional color variations were distinguished without precise determination of their systematic rank and names.

Results of the revision of collections of the Zoological Institute of the USSR Academy of Sciences and other collections from the USSR (Kazakhstan, Uzbekistan, Turkmenia), Iran, Mongolia, and Tunisia, including paratypes of *L. f. gobiensis* kindly sent by G. Hölzel (Germany) caused us to consider *Lopezus* as a polyphyletic genus of the tribe Lopezini sensu Esben-Petersen, 1918 (*Myrmecaelurini* sensu Mark, 1954, sensu Hölzel, 1968).

I express my gratitude to M. G. Volkovich, S. I. Golovach, L. A. Zhil'tsova, A. V. Zakharenko, and M. I. Falkovich for their materials, including special collections, and for several valuable suggestions in the preparation of the manuscript.

All holotypes and most paratypes and the material studied are deposited in the collection of the Zoological Institute of the USSR Academy of Sciences, USSR, Leningrad.

Genus *Lopezus* Navás 1913

Navás, 1913: 449; Hölzel, 1969: 203.

Type species *Myrmecaelurus fedtschenkoi* McLachlan, 1879.

Diagnosis. The original description (Navás, 1913) and redescription (Hölzel, 1969) of the genus are constituted of differences from other genera of *Myrmecaelurini* sensu Hölzel, which basically include the presence of the dark pattern of the wings, absence of axillary plates and paired tufts on segment VI of the abdomen in the ♂. Other characters listed in diagnoses of the genus in keys (Hölzel, 1972; Luppova, 1987, and others), in the investigation of large series, including new species, have appeared unacceptable. I therefore think it necessary to redescribe the genus as follows.

Small and middle-sized insects. Length of forewing 19-33 mm. Body yellow with brown or black pattern, may be strongly melanized.

Wings oval, membrane with brown shading along and on forks of longitudinal veins. Stigma

*Originally published in Entomologicheskoye Obozreniye, No. 4, 1990, pp. 893-904.

of both wings developed, Banks' lines absent. Branching of *Rs* of forewing above, before, and after cubital fork. Radial field of forewing with 3-6 transverse veins, of hindwing with 2.5 transverse veins. *A*₂ and *A*₃ usually fused for short distance. Longitudinal veins in forewing usually dotted with dark color, in hindwing unicolorous. Hindwing without or with small number of shades.

Head yellow. Dark stripe along epicranial suture crossed by 2 bands which may be fused or separated into individual spots. Pattern of head melanized to various degrees. Antennae yellow-brown, longer or as long as head and thorax together. Apical segment of mandibular palpi fusiformly swollen, with slightly split and obtuse apex, yellow with brown spot on distal side around sensory pit. Pronotum with 3 longitudinal solid black stripes and 2 narrow longitudinal lateral stripes not reaching apex. Pattern continuing on mesothorax and metathorax. Entire thorax with erect white hairs, on mesoscutum mixed with black hairs.

Legs yellow with black pattern; femora with white, tibia and tarsi with white and black hairs. At base of forefemora and midfemora with one long black hair each. Segments of tarsi of all legs yellow, with black apices. Spurs little longer, shorter, or as long as baritarsus.

Abdomen dark brown with 2 longitudinal, evanescent yellow stripes little shorter than wings, in ♂ on segment VII with paired tufts of white hairs. Terminalia of ♀ of one type, as in all Myrmecaelurini, sternite VIII without notch; ♂ genitalia of myrmecaelurine type.

Lopezus fedtschenkoi (McLachlan, 1875), morpho typica.

Myrmecaelurus fedtschenkoi McLachlan, 1875: 4 (partim)*¹; 1898: Kozhanchikov, 1948: 232. *Lopezus fedtschenkoi* (McL.), Navás, 1913: 449, Esben-Petersen, 1918: 148; Luppova, 1961: 200 (partim)*, 1987: 83; Hölzel, 1968: 6, 1969: 294.

Lopezus fedtschenkoi gobiensis Hölzel, 1970: 117 (partim)*, **syn. n.**

Lopezus fedtschenkoi fedtschenkoi (McL.) Hölzel, 1972: 24.

Lopezus fedtschenkoi persicus Hölzel, 1972: 24 (partim)*, **syn. n.**

Lopezus fedtschenkoi arabicus Hölzel, 1972: 24, **syn. n.**

Material examined. USSR: Turkmenia - 25 ♂s, 21 ♀s, Uzbekistan - 6 ♂s, 9 ♀s, Kazakhstan - 1 ♂, 5 ♀s; Mongolia - 3 ♂s, 5 ♀s; Iran - 1 ♂, 2 ♀s; Iraq - 1 ♂; Tunisia - ♂s.

Variations. Size of individuals varies strongly even within local populations. Thus, length of the forewing in specimens from Repetek (E Karakum, Turkmenia) is 20-29 mm, within entire Turkmenia the length of the forewing is also 20-29 mm, in Uzbekistan 23-28, in Kazakhstan 24-28, in Iran 26-31, in Iraq 28, in Arabia 24-27 in Tunisia 23, and in Mongolia 27-33 mm.

Details of the wing pattern and venation selected from the description of geographic subspecies are within a general homologous series and have analogues outside the given geographic regions.

Specimens from Iran [1 ♂, 1 ♀, SW of Dakipaturgun Lake, SE of Khorasan, 24.IV.1898 (Zarudnyy); 1 ♀, Zakhedan, 15.IV.1955 (Shteinberg)] and Iraq [1 ♂, Ajemi, Kashan, 28.IV.1904

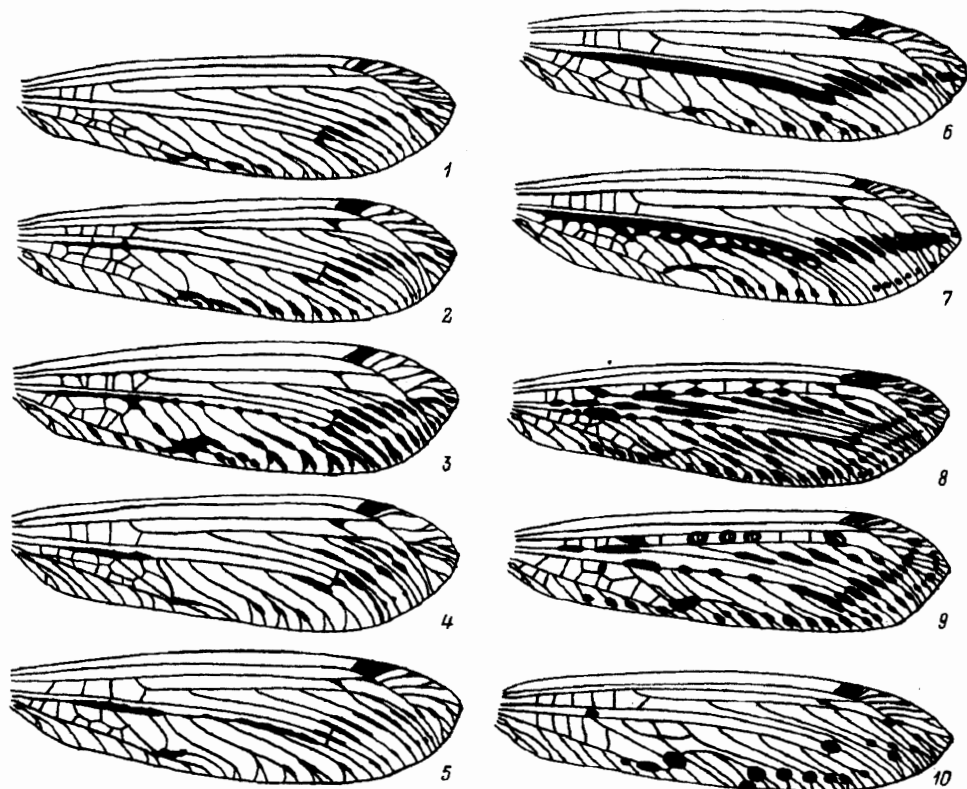
¹Asterisk marks series which contain non-typical forms.

(Zarudnyy)], in characters typical of *L. f. persicus*, are similar to some individuals from Turkmenia [(1 ♂, Maryysk Prov., Murgab, IV. 1974 (Vedmederya); 1 ♀, Krasnovodsk, 19.VI.1905 (Sumakov)] Kazakhstan [1 ♀, Urda, 29.VII.1952 (Erpert); 1 ♀, Perovsk (Kzyl-Orda), Julek, 16.V.1905 (Baekmann)], and Tunisia [1 ♂, Nefta, 1927, Dumont (Navás)].

Specimens from Turkmenia [1 ♂, 1 ♀, 20 km WSW of Jebel, sands, 9-10.V.1987 (Volkovich)] appear to be similar to *L. f. arabicus* in body size and pattern.

Specimens from Mongolia [1 ♂, 1 ♀, E Gobi Aimak, Dulan-Khara, 29.VI.1971; 2 ♀s, 15 km S of Khuvsgela, 28.VI.1971 (Kerzhner)], including a paratype of *L. f. gobiensis* (♀, Mongolia, Bajanchongor Aimak 8 km OSO von Somon Bajanleg, 1350 m, Exp. Dr. Z. Kaszab, 1967), are variable in the pattern and differ from specimens from other localities of the range only in larger size and in less spotty wing membrane.

Different degrees of the melanization of wings (Figs. 1-5) is usually associated with the degree of melanization of the pattern of the head (Figs. 11-13) and abdomen, on which in darker specimens yellow spots may disappear partly or completely. The only color variation without transitional forms will be described below as a different morph.



Figs. 1-5. *Lopezus* Navás. Pattern of forewing (orig.): 1-5) *L. fedtschenkoii* (McL.) morpha *typica* (1, 2 - Turkmenia, Repetek, 3 - Turkmenia, Jebel, 4 - Iraq, 5 - Tunisia).

Figs. 6-10. *Lopezus* Navás. Pattern of forewing (orig.): 6, 7) *L. fedtschenkoii* morpha *maclachlani* Kriv. (Repetek); 8) *L. karakumicus* morpha *typica* Kriv. (Repetek); 9) *L. karakumicus* morpha *ocellatus* Kriv. (Repetek); 10) *L. nanus* (Repetek).

Variable characters, even within local populations, are length of setae of the distal row on all segments of mid- and hindtarsi (Figs. 17, 18), length and width of bristles in apical part of the ectoproct, and on sternite VIII in ♂ (Figs. 22-25).

The number of transverse veins in the proximal radial field of the forewing (3-6) and hindwing (2-5) is variable. This character often differs on left and right wings of the same specimen. In the forewing, branching of *Rs* from *R* is above, before, or immediately after *Cu*-fork. Cells of the cubital field are partly or completely in 2 rows, *A*₂ and *A*₃ are more or less fused, in some specimens connected with the short transverse vein. *A*₂ is single (in 1 ♀ from Topyatan Lake, Turkmenia, *A*₂ is branching in both wings), *A*₃ is branched into 2 or 3 veins.

Terminalia of the ♀ actually are not variable, and in the structure of genitalia of the ♂, the shape and size of parameres are most constant characters (Figs. 28-33).

Ecology. Time of flight throughout the range is from 15 April 29 June. They fly well to the light trap. In the Repetek Reserve (Turkmenia) they are common in all communities and most numerous among ant lions.

Distribution. N Africa, Arabian Peninsula, Middle East, Central Asia, Kazakhstan, and Transcaucasia (?).

Lopezus fedtschenkoi morpha *maclachlani* Krivokhatasky, nov.

Myrmecaelurus fedtschenkoi McLachlan, 1875: 4 (var.).

Lopezus fedtschenkoi (McL.), Luppova, 1961: 200 (forma).

Lopezus fedtschenkoi gobiensis Hölzel, 1970: 117 (partim, paratype), **syn. n.**

Lopezus fedtschenkoi fedtschenkoi (McL.), Hölzel, 1972: 24 (var.), **syn. n.**

Lopezus fedtschenkoi persicus Hölzel, 1972: 24 (partim, paratype), **syn. n.**

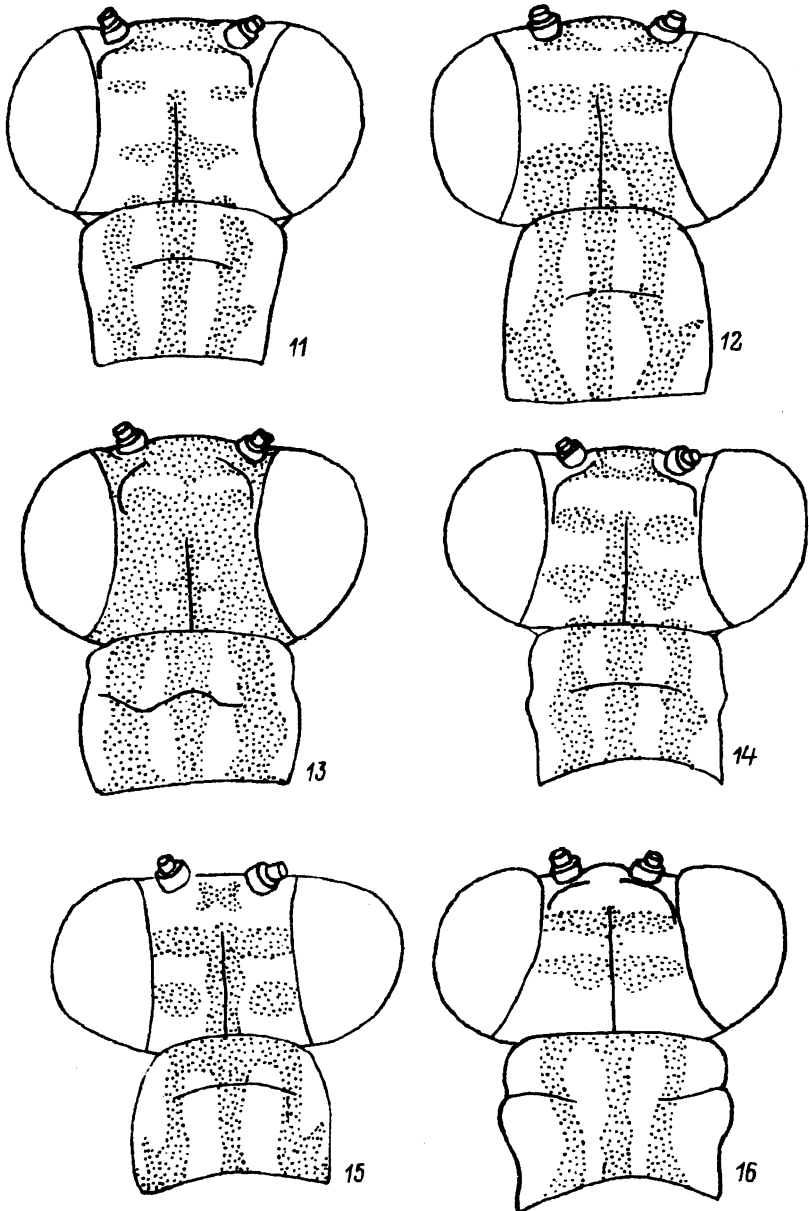
Holotype: ♂ Turkmenia, E Karakum, Repetek, in light trap, 12.V.1979 (Krivokhataskiy). Paratypes: Turkmenia: 7 ♂s, 4 ♀s, same, 6.V.1981, 24.IV.1983, 2.V.1982, 18.V.1982, 13.VI.1982, 23.V.1983, 29.IV.1975 (Falkovich), 1 ♀, 55 km E of Shafirkan, Kyzylkum, without date (Falkovich); Iran: 1 ♀, SW of Dakipaturgun Lake, SE of Khorasan, 24.IV.1898 (Zarudnyy); Mongolia: 1 ♀, S Gobi Aimak, 20 km NE of Aguit-Ula Mountain, 24.VI.1971 (Emel'yanov).

The rest of the material examined labelled *Lopezus fedtschenkoi* by E. P. Luppova and A. V. Zakharenko: Turkmenia, 1 ♀, Repetek, 12.V.1889 (Semenov); 2 ♀, near Ashkabad, 1977, No. 7803 (Zakharenko); 1 ♀, Uzboy River, sands near Topyatan Lake, in light trap, 23.IV.1951 (Shteinberg); 1 ♀, Transcaspian Prov., 1895 (Anger); 1 ♂, sands, 25 km W of Yaskhan, 6.V.1952 (Slepyan); 1 ♂, Uch-Aji, 4.V.1923 (Smirnov); 1 ♂, same, 5.V.1923 (Rohdendorf); Kazakhstan: 1 ♀, Perovsk (Kzyl-Orda), Dzhulek, 23.V.1905 (Boekmann); Mongolia paratype *L. f. gobiensis* (♂, Mongolia, Südgobi, Bajan Zag, 20 km NO von Somon Bulgan, 1200 m., exp. Dr. Z. Kaszab. 1967).

Length of forewing 22 (in paratypes 20-28), length of hindwing 19 (17-26), length of abdomen 19 (14-20) mm. Body yellow with brown pattern, same pattern as in pale *L. fedtschenkoi* (Fig. 14). Forewing with solid brown stripe along *Cu* up to regma and further to apical margin of wing;

width of stripe varying, from 1/2 of field adjacent to *Cu* cells to whole row (Figs. 6, 7); in latter case, brown color of membrane uneven, most intensive near longitudinal and transverse veins and causing stripe to appear reticulate.

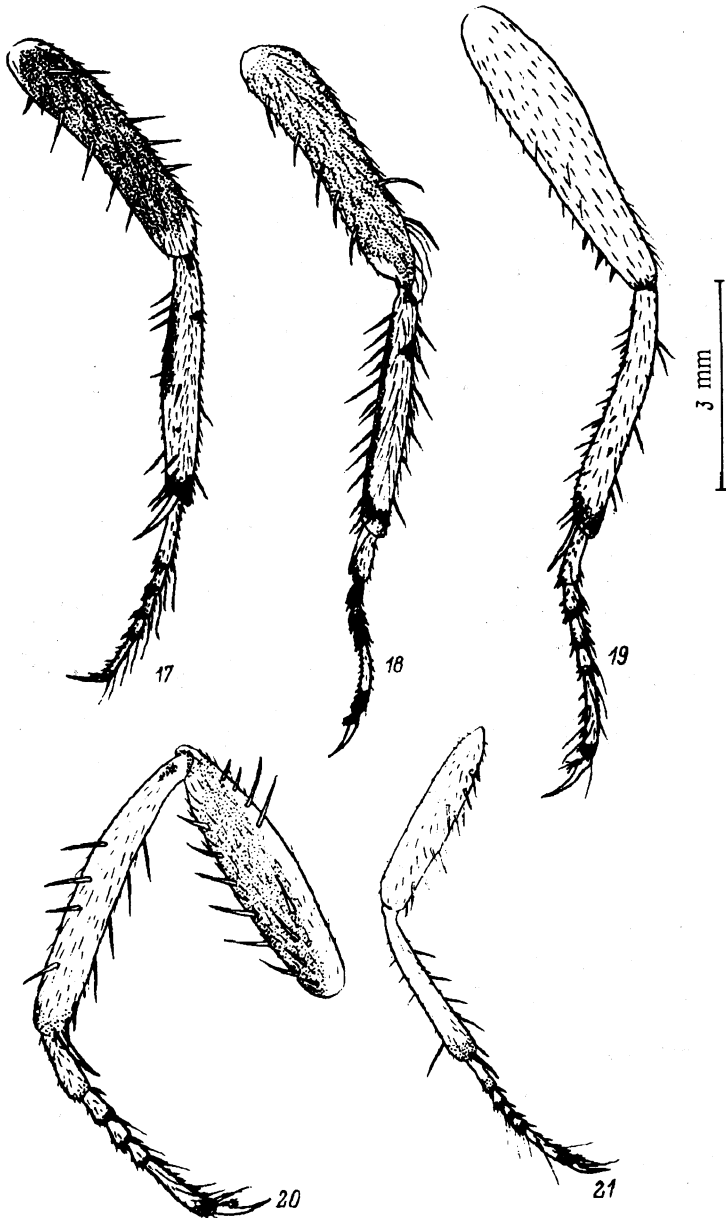
Apical and subapical dark parts of wing at expense of dark spots on terminal forks of longitudinal veins less distinct than in *L. fedtschenkoi* morpha *typica*, or wholly absent (in some specimens from Ashkhabad, Repetek, and Mongolia). Hindwing repeating pattern of forewing, but



Figs. 11-16. *Lopezus* Navás. Head and pronotum (orig.): 11-13) *L. fedtschenkoi* (McL.) morpha *typica*, Turkmenia (11 - Repetek, 12 - Topyatan Lake, 13 - Dzhebel); 14) *L. fedtschenkoi* morpha *maclachlini* Kriv. (Repetek); 15) *L. nanus* sp. n. (Repetek); 16) *L. karakumicus* sp. n. (Repetek).

weaker, causing medial stripe to appear very slender. Stigma bicolored, on forewing stronger than on hindwing. Variation in pattern of wing, melanization of body and venation insignificant. Genitalia of both sexes not differing from those of *L. fedtschenkoi*.

Distribution. This morph probably occurs throughout the range of *L. fedtschenkoi*, but is considerably rarer than the typical morph. It is known from Turkmenia, Uzbekistan, Kazakhstan, and Mongolia.

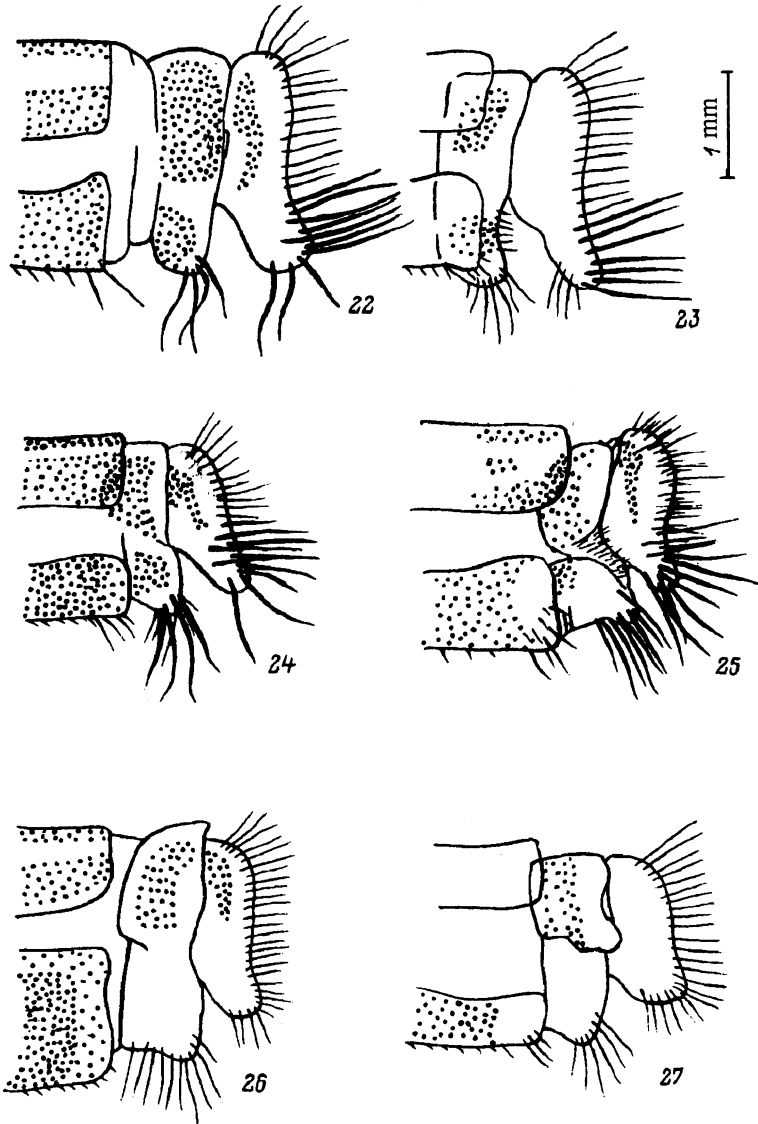


Figs. 17-21. *Lopezus* Navás. Hindleg (orig.): 17, 18) *L. fedtschenkoi* (McL.) morpha *typica*, Turkmenia (17 - Repetek, 18 - Topyatan Lake); 19) *L. karakumicus* sp. n. (Uzbekistan, Khiva); 20) *L. autumnalis* sp. n. (Repetek); 21) *L. nanus* sp. n. (Repetek).

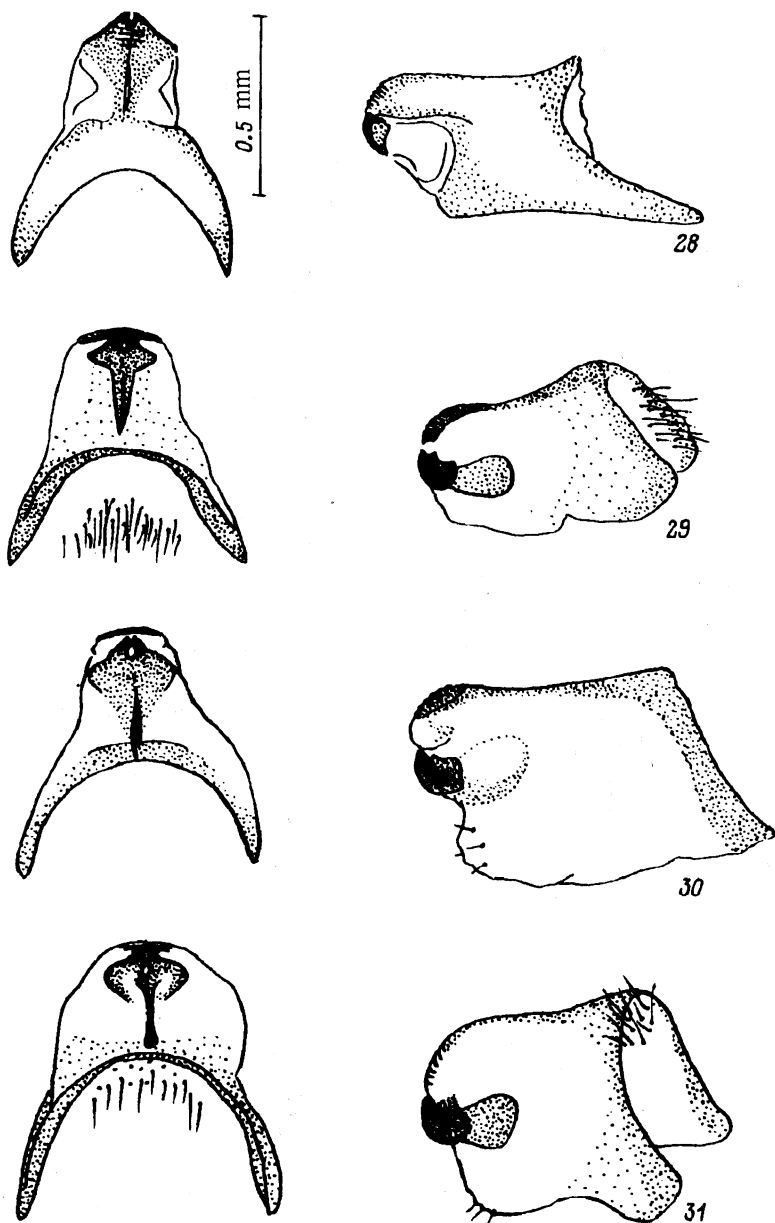
Lopezus autumnalis Krivokhatsky, sp. n.

Holotype: ♀, Turkmenia, E Karakum, Repetek, in light trap, 21.03.1981 (Krivokhatskiy). Paratypes 1 ♂, same, 6.IX.1981 (Krivokhatskiy); 1 ♀, Uzbekistan, Zhamansai Valley, Kyzylkum, 20.VIII.1970 (Falkovich).

Length of forewing 27 (24-27), hindwing 24 (20-24), abdomen 20 (15-20) mm. Body straw yellow, with weak brown pattern. Face yellow with sparse brown hairs. Frons and vertex 2 brown bands, anterior band split into 3 spots; bands crossed with longitudinal brown stripe, darkest along epicranial suture. Antennae pale brown, palpi yellow, last segment of mandibular palpi fusiform with furcate apex and with darker spot around sensory pit. Prothorax yellow, with 3 complete and



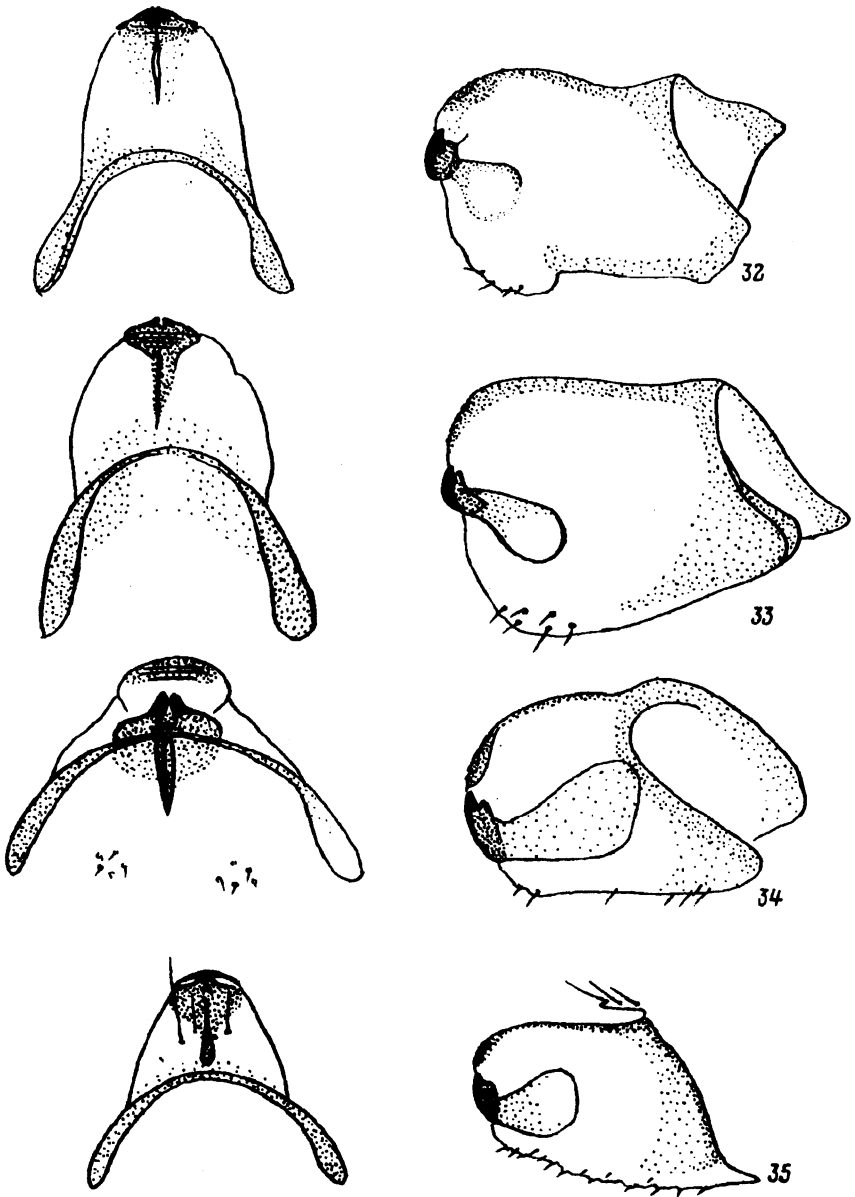
Figs. 22-27. *Lopezus* Navás. Apex of abdomen of ♂ (orig.): 22-25) *L. fedtschenkoi* (McL.) morpha *typica* (22 - Iran; 23 - Iraq; 24 - Turkmenia, Repetek; 25 - Mongolia); 26) *L. karakumicus* sp. n. (Uzbekistan, Khiva); 27) *L. nanus* sp. n. (Repetek).



Figs. 28-31. *Lopezus fedtschenkoi* (McL.) morpha *typica*, genitalia of ♂: 28, 29) Turkmenia: 28) Repetek, 29) Topyatan Lake; 30) Mongolia; 31) Tunisia.

2 lateral incomplete brown stripes continuing onto mesothorax and metathorax. Thorax with erect white, mesoscutum with erect white and black hairs. Legs as in *L. fedtschenkoi*, hind- and midtarsi with very long hairs (Fig. 20).

Radial field of forewing with 2-3, hindwings with 2 transverse veins. Pattern of wings completely coinciding with that of typical morph of *L. fedtschenkoi*. Difference in venation consisting in presence of only one row of cells in cubital field of forewing. In hindwings with veins *R* and *MP*₂ pale with short brown lines (in *L. fedtschenkoi* both veins always dark). Abdomen yellow



Figs. 32-35. *Lopezus* Navás, ♂ genitalia: 32,33) *L. fedtschenkoi* morpha *typica*: 32) Iran, 33) Iraq; 34) *L. karakumensis* sp. n. (Khiva); 35) *L. nanus* sp. n. (Repetek).

with dorsal, ventral, and 2 lateral brown stripes developed to variable degrees. Sternite VIII of ♀ yellow apically, with very conspicuous round black spot; ♂ unknown.

The differences listed above at first glance seem insufficient to distinguishing a species, but are confirmed strongly by the separation of the flight activity time. *L. fedtschenkoi* flies from April to June, and the new species flies in August-September.

Distribution. Karakum, Kyzylkum.

Lopezus karakumicus Krivokhatsky, sp. n., morpho *typica*

Holotype: ♀, Repetek, E Karakum, in light trap, 10.VIII.1982 (Krivokhatskiy). Paratypes: 1 ♀ with same label; 1 ♀, Repetek, Transcaspiian Prov., 3.VI.1899 (Anger); 1 ♀, Dzhebel, Turkmen., 9.VII.1934 (Popov); 1 ♂, Khiva, Ravat, 29.VII.1927 (Gussakovskiy), 1 ♀, same, 31.VII.1927 (Zimin). Last 3 spms. with determination labels by E. P. Luppova (1961) as *L. fedtschenkoi*.

Length of forewing 30 (24-32), hindwing 28 (23-28), abdomen of ♀ 22 (19-24), of ♂ 17 mm. Body robust, straw yellow with brown pattern.

Head large, almost twice as wide as thorax, yellow. Face without pattern, bare, clypeus with short decumbent hairs, with 2 transverse interrupted spots and wide brown stripes. Epicranial suture narrow, brown. Antennae long, pale brown, basal segment yellow. Palpi yellow; last segment of mandibular palpi fusiform, yellow, with brown spot around sensory pit.

Prothorax as long as wide, yellow, with 3 solid longitudinal brown stripes and 2 short lateral stripes not reaching apex, with erect white hairs especially long on margins. Pattern continuing onto mesothorax and metathorax, these also covered with tufts of erect white hairs; mesoscutum covered with white and black hairs.

Legs strong. Femora yellow with brown longitudinal stripes evanescent on hindfemora, covered with decumbent white hairs and erect white setae; hindfemora with one row of black spines (Fig. 19). Base of fore- and midfemora with one black hair each. Tibia shorter or as long as femora, yellow, incompletely ringed with brown (on foretibia with 3 rings, on midtibia 2 rings, on hindtibia 1 ring), with white hairs and black spines. Spurs brick red, slightly curved as long as basitarsus or a little shorter. Basitarsus of all legs little longer than 2nd, 3rd, or 4th segments and twice as long as 5th segment. Tarsi covered with white and black hairs, black hairs on mid- and hindtarsus very long. Claws brick red, curved, with lobe at base covered with black spines.

Wings (Fig. 8) wide, with rounded apex. Branching of *R*s above, before or immediately after cubital fork. Radial field of forewing with 3-5, in hindwing with 2-4 transverse veins. All longitudinal veins of forewings yellow with brown or black punctation. Around dark places (especially distinctly on *R*s, *MP*, and *CuA*) membrane darkened with brown. Dark stripe from regma to apical field conspicuous. Hindwing with veins basically unicolorous yellow or pale brown, membrane sometimes dark in area of cubital fork and between *R* and *R*s. Below stigma of hindwing with conspicuous Z-shaped pattern. Stigma brown, apically yellow, equally conspicuous on both pairs of wings.

Abdomen brown, paler near apex, covered with white hairs. Apex of sternite VIII in ♂ and ♀ with black hairs. Ectoproct of ♂ shorter than in *L. fedtschenkoi* (Fig. 26), shape of parameres also differing (Fig. 34).

Variation. ♂ from Khiva and ♀ from Dzhebel have paler color of wings: ♂ (length of forewing 24 mm), considerably smaller than in ♀ (28-32 mm).

Diagnosis. *L. karakumicus* differs from other species of the genus in more robust body and large head; width of head with eyes in ♀ 3.7-5.0 mm, whereas in *L. fedtschenkoi*, including largest Mongolian specimens, 2.5-3.2 mm. Other differences from *L. fedtschenkoi* are the absence of pattern between antennae, presence of brown pattern around vein *MP* of forewings and equally pronounced stigma on both pairs of wings.

Distribution. Turkmenia, Karakum.

Lopezus karakumicus morpho *ocellatus* Krivokhatsky, sp. n.

Holotype: ♀, Repetek, E Karakum, in light trap, 18.VI.1981 (Krivokhatskiy), Paratype: ♀, same, light trap, 3.VIII.1972 (Bogush).

Length of forewing 29 (28), hindwing 26 (25), abdomen 22 (19) mm. Size and color of body, venation, pattern of wings, and structure of terminalia close to typical morph of *L. karakumicus*; differing in presence of brown annuli colored membrane around 2-3 transverse veins between *R* and *Rs* on forewing (Fig. 9) and one vein in same field of hindwing. Hindwing below stigma with round brown spot, not Z-shaped pattern as in typical morph.

Distribution. Turkmenia, Repetek.

Lopezus nanus Krivokhatsky, sp. n.

Holotype: ♂, Turkmenia, E Karakum, Repetek, in light trap, 18.VIII.1982 (Krivokhatskiy).

Small, length of forewing 19, hindwing 17, abdomen 15 mm. Face yellow, bare, with brown dot in middle, between antennae diffused brown spot with yellow middle part. Frons and vertex (Fig. 15) yellow with decumbent white hairs, with 2 bright red-brown bands, first of which solid; both bands crossed with wide longitudinal stripe. Antennae pale brown, longer than head and thorax together. Palpi yellow, last segment of mandibular palpi fusiform, with furcate and obtuse apex and dark spot around sensory pit.

Pronotum with 3 brown longitudinal stripes, widely fused near head. Pattern continuing onto mesothorax and metathorax. Thorax with white hairs, mesoscutum with white and black hairs (Fig. 21).

Wings long with round apex, longitudinal veins yellow with brown streaks. Branching of *R*_s in forewing considerably farther from cubital vein. Radial field of forewings with 5, hindwings with 2 transverse veins. Stigma large, bicolourous, proximally brown, apically yellow, in hindwings less pronounced. Membrane of wing with large brown dots not merging into stripes (Fig. 10). Hindwing with only one distinct spot, on regma.

Ectoproct of ♂ (Fig. 27) considerably shorter than in other species of the genus, genitalia with shape close that of *L. fedtschenkoi*, but considerably smaller (Fig. 35). ♀ unknown.

Diagnosis. The species differs from other species of the genus in the color of wings and head and in smaller body size.

Distribution. Turkmenia. Repetek.

KEY TO SPECIES AND MORPHS OF *Lopezus*

1. Larger length of forewing more than 20 mm. Dark band from regma to apical margin of wing present (Figs. 5-9).....2.
- Length of forewing less than 20 mm. Dark band from regma to apical margin of wing lacking (Fig. 10).....*L. nanus* sp. n.

2. Shading on *MP* for forewings absent, *MP* dark for short distance only in region of regma (Figs. 1-7). Stigma of forewing larger than in hindwing.....3.
- Membrane along *MP* of forewing partly dark (Figs. 8, 9). Stigma of fore- and hindwings of equal size..... 5.
3. *R* and *MP*₂ of hindwing unicolorous dark.....4.
- *R* and *MP*₂ of hindwing pale with brown dots *L. autumnalis* sp. n.
4. Forewings with solid brown stripe from base of *Cu* to regma (Figs. 6, 7).....
..... *L. fedtschenkoi* morpha *maclachlani* Kriv.
- Solid brown stripe along *Cu* of forewing absent (Figs. 1-5).....*L. fedtschenkoi* (McL.)
5. Between *R* and *Rs* of forewing with 2-3 annular darkenings of membrane (Fig. 9); below stigma of hindwing with round brown spot.....*L. karakumicus* morpha *ocellatus* Kriv.
- Annular darkenings of forewing absent (Fig. 8); below stigma of hindwing with Z-shaped pattern..... *L. karakumicus* sp. n.

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7502

Reference Citation:

Krivokhatsky, V. A. 1990 [1990.??.??]. Revision of the genus *Lopezus* Navás, 1913 (Neuroptera, Myrmeleonidae). *Entomologicheskoe Obozrenie* 69:893-904.

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