

## On the genus *Tetracnemus* Westwood, 1837 (Hymenoptera: Encyrtidae), with description of a new species from Ethiopia

### О роде *Tetracnemus* Westwood, 1837 (Hymenoptera: Encyrtidae) с описанием нового вида из Эфиопии

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KEY WORDS: Hymenoptera, Encyrtidae, *Tetracnemus*, *Tetracnemus gumilevi* **sp.n.**, taxonomy, key, Ethiopia.

КЛЮЧЕВЫЕ СЛОВА: Hymenoptera, Encyrtidae, *Tetracnemus*, *Tetracnemus gumilevi* **sp.n.**, таксономия, определитель, Эфиопия.

ABSTRACT: Diagnosis of the genus *Tetracnemus* Westwood, 1837, key to females of 22 species of the world fauna and description of *T. gumilevi* Pilipjuk et Trjapitzin **sp.n.** from Ethiopia are provided.

illustrations, was prepared by Pilipiuk; we planned to publish the description jointly.

An abbreviation used in the text is: F — an antennal funicular segment.

РЕЗЮМЕ: В статье даны диагноз рода *Tetracnemus* Westwood, 1837, определительная таблица 22 видов мировой фауны по самкам и описание *T. gumilevi* Pilipjuk et Trjapitzin **sp.n.** из Эфиопии.

#### Genus *Tetracnemus* Westwood, 1837

Westwood, 1837: 258.

DIAGNOSIS. Female. Body elongate (Figs 1, 4–5), usually somewhat flattened, dark with metallic luster. Frontoververtex broad; ocelli form equilateral to obtuse triangle. Facial area with short scrobes confluent above (or sometimes absent). Toruli situated near oral aperture. Antennal scape sublinear (Figs 1, 8–9) or strongly broadened and flattened (Figs 2–5); funicle 6-segmented, its segments usually transverse (Figs 3, 7–8) and sometimes strongly broadened (Fig. 2), but in some species several segments (or even all) a little longer than wide; clava solid, with rounded apex. Mandible with two acute teeth. Mesoscutum without parapsidal lines. Wings usually not shortened (Fig. 5), but there are brachypterous individuals or forms (Figs 1, 4); forewing with dark pattern; marginal vein long, at least about 2x as long as stigmal vein, the latter is very short, strongly dilated apically and with uncus, postmarginal vein shorter than stigmal (Fig. 11). Abdominal paratergites present; last (VII) sternite (hypopygium) reaching apex of gaster and sometimes very long (Fig. 1). Ovipositor sheaths long, sometimes even as long as gaster, very short only in *T. subapterus* (Ashmead, 1900) (Fig. 1). Body length (without exerted part of ovipositor sheaths) 0.98–2.50 mm.

Male. Body compact. Toruli situated higher on the face. Antennal scape shorter, not broadened. F1–F4 very short, F5–F6 long; F2–F5 (F2–F4 in a particular specimen) with long branches (Fig. 12). Forewing not infuscate.

DISTRIBUTION. Cosmopolitan, with 33 species described in the world fauna. 13, 12, 5, 2, 2 and 1 species are known in the Palearctic, Nearctic, Indo-Malayan (Oriental), Neotropical, and Afrotropical regions, as well as in Australia, respectively. *Tetracnemus* is found in Finland, as well as in Argentina, Republic of South Africa and Australia as the northernmost and southernmost points respectively.

#### Introduction

The encyrtid genus *Tetracnemus* Westwood, 1837 (type species: *Tetracnemus diversicornis* Westwood, 1837, by monotypy) belongs to the subfamily Tetracneminae, tribe Tetracnemini, subtribe Tetracnemina. Its synonyms are: *Tetracladia* Howard, 1892; *Calocerinus* Howard, 1892; *Tetralophidea* Ashmead, 1900; *Henicopygus* Ashmead, 1900; *Tetralophiellus* Ashmead, 1900; *Paracalocerinus* Girault, 1915; *Nebaucharis* Girault, 1916; *Masia* Mercet, 1919; *Anusiella* Mercet, 1923; *Placoceras* Erdős, 1946; and *Comperencyrtus* De Santis, 1964.

Characteristic features of *Tetracnemus* were listed by Noyes [2000], but as his book on Encyrtidae of Costa Rica is very difficult to access, I provide here an updated diagnosis of the genus. Key to species of *Tetracnemus* existed earlier only for 11 species of the Palearctic fauna [Trjapitzin, 1989]. I include in the present publication a key to 22 described species of the world fauna. The new species *T. gumilevi* Pilipjuk et Trjapitzin, **sp.n.** was collected in Ethiopia by my late friend Dr. Vladimir Ivanovich Pilipjuk. He was the Director of Lazarevskoye Scientific Station of the All-Union Institute of Plant Protection (VIZR) near Sochi at the Black Sea coast of the Krasnodar Territory, Russia. I identified this species as a new to science, and the description of it, as well as

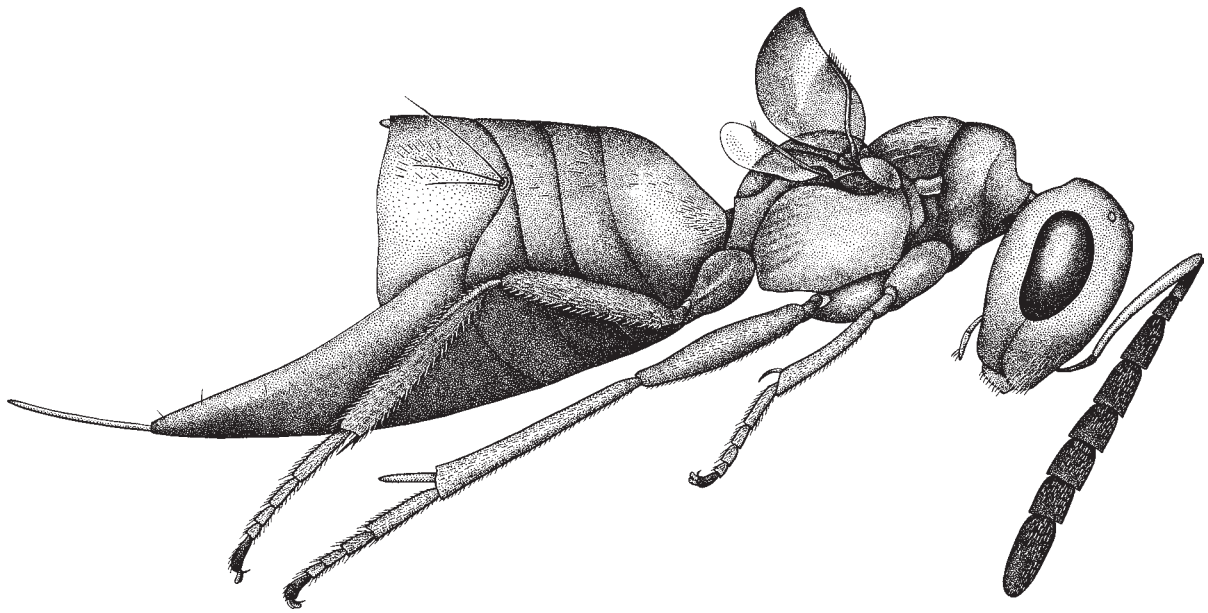


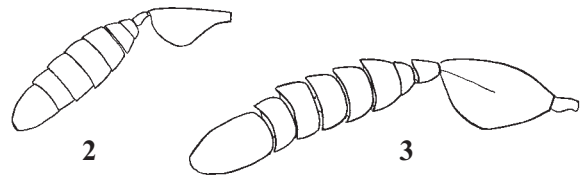
Fig. 1. *Tetracnemus subapterus*, female, lateral view (drawing by N.A. Florenskaya).

Рис. 1. *Tetracnemus subapterus*, самка, вид сбоку (рисунок Н.А. Флоренской).

**BIOLOGY.** All species of the genus *Tetracnemus* are considered primary endoparasitoids of mealybugs (Homoptera: Pseudococcidae), but this is confirmed only by rearing of *F. peliococci* Myartseva from *Peliococcus mesasiaticus* Borchsenius et Kosarzhevskaya [Myartseva, 1979, 1984] in Georgia and Turkmenistan.

**KEY TO SPECIES OF TETRACNEMUS (FEMALES)\***

- 1(8) Wings strongly shortened: rudiments of forewings reaching at most base of gaster (Figs 1, 4).  
 2(3) Antennal scape not broadened or flattened, about 10x as long as wide; F1–F6 longer than wide. Ovipositor sheaths very short; apical abdominal sternite (hypopygium) long, projecting well beyond apex of gaster (Fig. 1). 2.5 mm. — USA (Colorado, New Mexico, Texas) ..... *T. subapterus* (Ashmead, 1900)  
 3(2) Antennal scape broadened and flattened, about 2x as long as wide (Figs 2, 3); F1–F6 transverse.  
 4(5) Base of antennal scape strongly narrowed (Fig. 2). Ovipositor sheaths about 2/3 length of gaster. Head with deep microcellular sculpture. 1.3–2.0 mm. — Mongolia ..... *T. hofferi* Szelényi, 1971  
 5(4) Base of antennal scape not strongly narrowed (Figs 3–5, 7).  
 6(7) Antennal scape distinctly expanded ventrally (Fig. 3). Distance between posterior ocelli 1.5x more than distance from posterior to anterior ocellus. Outer edges of scrobes rounded. 1.35–1.60 mm. — Russia (Primorye Territory, Sakhalin) ..... *T. kozlovi* Sharkov, 1984

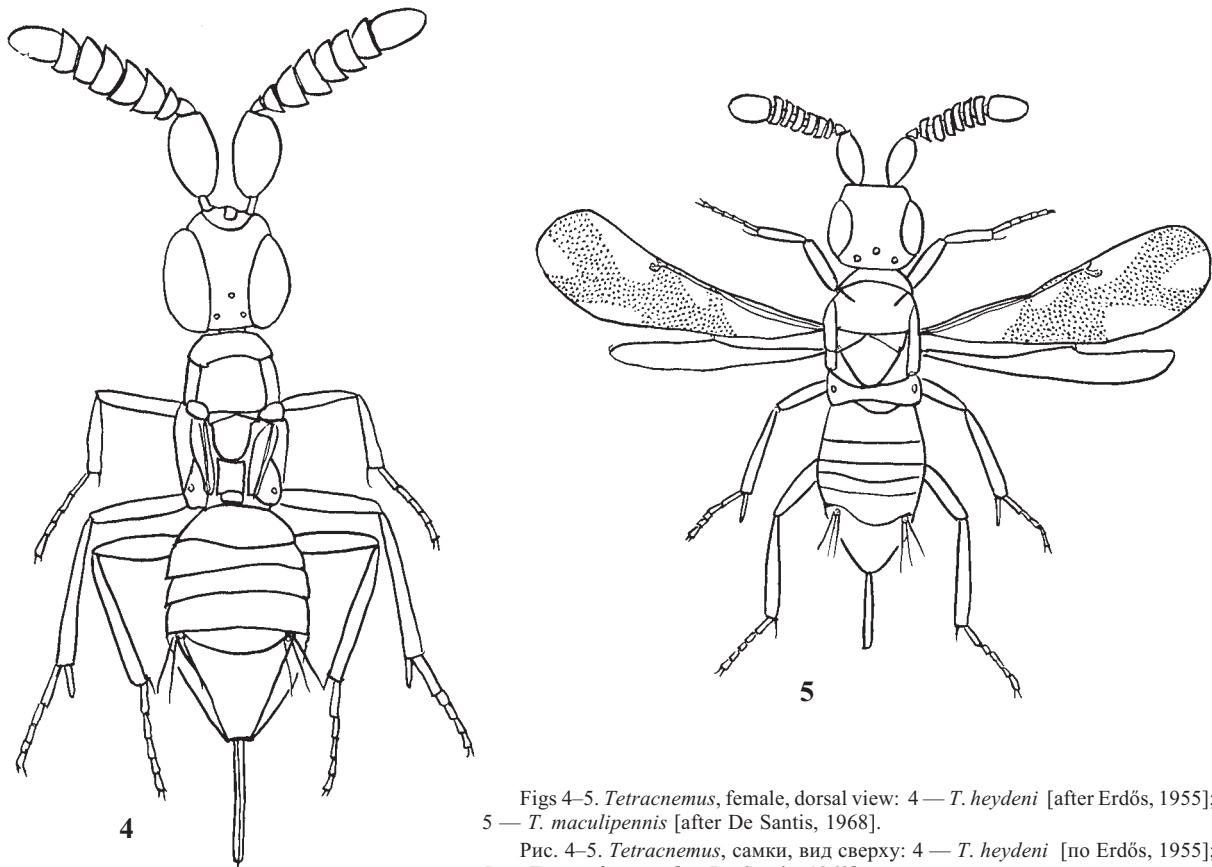


Figs 2–3. *Tetracnemus* spp., antennae of females: 2 — *T. hofferi* [after Szelényi, 1971], 3 — *T. kozlovi* [after Sharkov & Trjapitzin, 1995].

Рис. 2–3. *Tetracnemus* spp., усики самок: 2 — *T. hofferi* [по Szelényi, 1971]; 3 — *T. kozlovi* [по Шаркову и Тряпицыну, 1995].

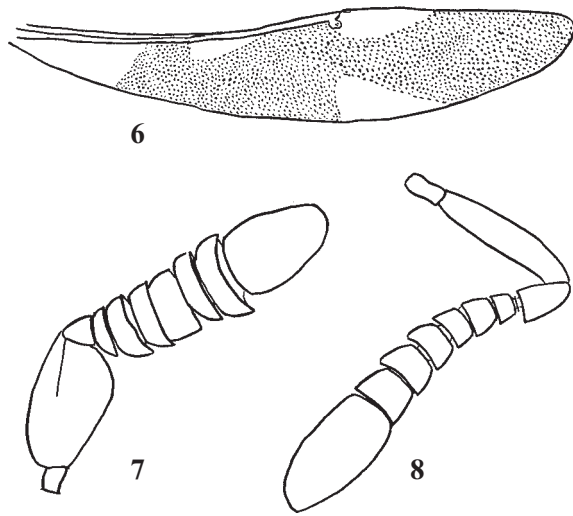
- 7(6) Antennal scape smoothly rounded ventrally (Fig. 4). Ocelli form an equilateral triangle. Outer edges of scrobes acute. 1.4–1.5 mm. — Germany; Austria; Czech Republic; Slovakia; Hungary, ex Coccoidea (Homoptera) on stem of gramineous grass *Elytrigia intermedia*; Serbia; Moldavia; Greece; Turkey; Georgia; Azerbaijan; Kazakhstan; Mongolia ..... *T. heydeni* (Mayr, 1876)  
 8(1) Wings not shortened (Fig. 5).  
 9(14) Forewing with an entire broad transverse hyaline band distad of venation, in addition to hyaline base of wing.  
 10(11) Dark apical part of forewing with triangular process directed basad. Antennal scape 4.5x as long as wide; clava wider than F6. 1.14 mm. — India (Tamil Nadu) ..... *T. narendrani* Hayat et Kazmi, 1999  
 11(10) Dark apical part of forewing without triangular process directed basad. Antennal scape 2–3x as long as wide; clava not wider than F6.  
 12(13) Antennal scape about 2x as long as wide (see couplet 7) ..... *T. heydeni*  
 13(12) Antennal scape 3x as long as wide. 1.5–1.7 mm. — Czech Republic; Slovakia; Romania; Ukraine; Georgia ..... *T. simillimus* (Hoffer, 1953)  
 14(9) Forewing with two (Fig. 10), three (Fig. 6) or four (Fig. 5) hyaline spots in addition to hyaline base of wing.

\* Females of the following species of *Tetracnemus* are unknown: 1) *T. floridanus* (Ashmead, 1885), *T. texanus* (Howard, 1892), *T. gracilis* (Howard, 1892), *T. brevicollis* (Ashmead, 1900) (USA); 2) *T. hispanicus* (Mercet, 1921) (Spain); 3) *T. heterocornis* Mani et Saraswat, 1974 (India). Females of some species that are insufficiently described, could not be included into the key, viz.: 1) *T. americanus* (Girault, 1916), *T. hemipterus* (Girault, 1916), *T. marilandia* (Girault, 1917) (USA); 2) *T. australiensis* (Girault, 1915) (Australia). Length of body is given without exerted part of ovipositor sheaths.



Figs 4–5. *Tetracnemus*, female, dorsal view: 4 — *T. heydeni* [after Erdős, 1955]; 5 — *T. maculipennis* [after De Santis, 1968].  
Рис. 4–5. *Tetracnemus*, самки, вид сверху: 4 — *T. heydeni* [по Erdős, 1955]; 5 — *T. maculipennis* [по De Santis, 1968].

- 15(24) Antennal scape about 2x as long as wide.  
 16(19) Forewing narrow, 4.5 or 5.5x (sometimes 6x) as long as wide, with three hyaline spots, in addition to hyaline base of wing.  
 17(18) Forewing 4.5x as long as wide, its apex rounded. Hind tibiae almost entirely brown. 1.37–1.41 mm. — USA (Texas); Costa Rica..... *T. patro* Noyes, 2000  
 18(17) Forewing 5.5x (sometimes 6x) as long as wide, its apex not rounded (Fig. 6). Hind tibiae more or less entirely yellow. 1.75 mm. — USA (Florida); Mexico (Sinaloa) ..... *T. ashmeadi* Noyes et Woolley, 1994  
 19(16) Forewing not narrow, 3–3.4x as long as wide, with two or four hyaline spots, in addition to hyaline base of wing.  
 20(21) Forewing with four hyaline spots (Fig. 5), 3.4x as long as wide. 1.55 mm. — Brazil; Argentina (Prov. Buenos Aires) ..... *T. maculipennis* (De Santis, 1964)  
 21(20) Forewing with two hyaline spots (Fig. 10), 3x as long as wide.  
 22(23) Ovipositor sheaths about 1/3 length of gaster. Ventral margin of antennal scape moderately convex (Fig. 7). Frontoververtex with transverse sculpture. 1.76 mm. — Czech Republic; Hungary; Russia (Voronezh Province, Primorye Territory); Ukraine (Crimea) ..... *T. colocensis* (Erdős, 1946)  
 23(22) Ovipositor sheaths about 1/2 gaster length. Ventral margin of antennal scape strongly convex. Frontoververtex with polygonal sculpture. 1.44 mm. — England; Finland; Czech Republic; Slovakia; Hungary; Croatia; Romania; Russia (Kaluga Province); Ukraine ..... *T. diversicornis* Westwood, 1837  
 24(15) Antennal scape 3–9x as long as wide. Forewing with two opposite hyaline spots distad of venation, in addition to hyaline base of wing (Fig 10).  
 25(26) Ovipositor sheaths not longer than 1/3 length of gaster. Antennal scape 5–6x as long as wide. Mesoscutum dark violet; scutellum with bright bronzegreen luster. 1.5–1.7 mm. — Georgia, ex *Peliococcus mesasiaticus* Borchsenius et Kosarzhhevskaya (Homoptera: Pseudococcidae) on *Sal-sola dendroides*; Turkmenistan, from same host on *Zygo-phyllum atriplicoides* ..... *T. peliococci* Myartseva, 1979  
 26(25) Ovipositor sheaths not shorter than 1/2 length of gaster.  
 27(40) Ovipositor sheaths about 1/2 length of gaster.  
 28(29) Scutellum with distinct reticulate sculpture. Antennal scape 4.5–4.7x as long as wide; clava as long as four preceding funicular segments combined (Fig. 8). 1.10–1.35 mm. — Russia (Primorye Territory); Armenia ..... *T. avetianae* Herthetvzian, 1978  
 29(28) Scutellum with hardly visible sculpture or smooth.  
 30(31) 4th and 5th segments of hind tarsi dark. Scutellum with bronze luster. 1.6 mm. — Turkmenistan ..... *T. phragmitis* Myartseva, 1982  
 31(30) All segments of hind tarsi not darkened (except claws of 5th segment), or only 5th segment dark.  
 32(33) All segments of hind tarsi not darkened. Antennal clava as long as three preceding funicular segments combined. 0.98–1.58 mm. — USA (California), Mexico (Tamaulipas) ..... *T. tertius* (Girault, 1917)  
 33(32) Only 5th segment of hind tarsi dark.  
 34(35) F6 about 3x as wide as long; antennal scape 3.6x as long as wide. Facial cavity absent. 1.5 mm. — Russia



Figs 6–8. *Tetracnemus* spp. (females): 6 — *T. ashmeadi*, forewing [after Gordh and Trjapitzin, 1981]; 7–8, antennae: 7 — *T. colocensis* [after Sharkov & Trjapitzin, 1995], 8 — *T. avetianae* [after Sharkov and Trjapitzin, 1995].

Рис. 6–8. *Tetracnemus* spp. (самки): 6 — *T. ashmeadi*, переднее крыло [по Gordh and Trjapitzin, 1981], 7–8 — усики: 7 — *T. colocensis* [по Шаркову и Тряпицыну, 1995], 8 — *T. avetianae* [по Шаркову и Тряпицыну, 1995].

- (Primorye Territory, Sakhalin) .....  
 ..... *T. cnaeus* Sharkov, 1986  
 35(34) F6 about 2x as wide as long; antennal scape 5x as long as wide. Facial cavity present.  
 36(37) F1–F2 quadrate. Antennal clava as long as five preceding funicular segments combined. 1.0–1.4 mm. — India (Radzhasthan, Uttaranchal, Uttar Pradesh) .....  
 ..... *T. perspicuus* Hayat et Kazmi, 1999  
 37(36) F1–F2 transverse.  
 38(39) F1 very small and strongly transverse; antennal clava distinctly longer than funicle. 1.2 mm. — India (Assam, Kerala, Maharashtra) .....  
 ..... *T. deccanensis* (Mani et Kaul, 1974)  
 39(38) F1 not very small and not strongly transverse; antennal clava as long as 5 funicular segments combined (see couplet 36) ..... *T. perspicuus*  
 40(27) Ovipositor sheaths not shorter than 2/3 length of gaster.  
 41(46) Not all funicular segments of antennae transverse, some of them longer than broad, or at least F1 and F2 quadrate.  
 42(43) Antennal scape 9x as long as wide. F1 very short, subquadrate, F2–F3 longer than wide, F4 quadrate, F5–F6 somewhat wider than long (Fig. 9). Forewing 3x as long as wide (Fig. 10). 2.3 mm. — Ethiopia .....  
 ..... *T. gumilevi* Pilipjuk et Trjapitzin **sp.n.**  
 43(42) Antennal scape 5x as long as wide.  
 44(45) F1–F2 quadrate, other funicular segments of antennae wider than long; clava as long as five preceding funicular segments combined (see couplets 36 and 39) .....  
 ..... *T. perspicuus*  
 45(44) F1–F6 longer than wide; clava as long as four preceding funicular segments combined. 1.25–1.75. — India (Jharkhand, Kerala, Maharashtra, Orissa, Uttar Pradesh) .....  
 ..... *T. peninsularis* (Mani et Saraswat, 1974)

- 46(41) All funicular segments of antennae transverse.  
 47(48) Antennal scape 3x as long as wide. Clava as long as four preceding funicular segments combined. Forewing 3.4–3.5x as long as wide. Scutellum with distinct but superficial cellular sculpture. Mid tibiae entirely yellow. 1.3 mm. — Spain ..... *T. bifasciatellus* (Mercet, 1919)  
 48(47) Antennal scape 3.8x or 5x as long as wide.  
 49(50) Antennal scape 3.8x as long as wide. Clava 1.7x as long as wide. Frontoververtex about 0.3 head width. 1.2–1.9 mm. — France (Corsica); Greece; Turkey; Armenia; Azerbaijan ..... *T. terminassianae* Herthetvzian, 1978  
 50(49) Antennal scape 5x as long as wide.  
 51(52) Antennal clava distinctly longer than funicle; F1 very small and strongly transverse (see couplet 38) .....  
 ..... *T. deccanensis*  
 52(51) Antennal clava as long as five preceding funicular segments combined; F1 not very small and not strongly transverse.  
 53(54) Antennal clava 2x as long as wide. Propodeum with 8–12 setae on each side before spiracle. Upper edge of facial cavity broadly rounded (see couplet 45) .....  
 ..... *T. peninsularis*  
 54(53) Antennal clava 2.5x as long as wide. Propodeum with 3–5 setae on each side before spiracle. Upper edge of facial cavity acutely rounded (see couplets 36, 39 and 44) .....  
 ..... *T. perspicuus*

COMMENTS ON THE KEY. I interpret here *Tetracnemus bifasciatellus* (Mercet, 1919) basing on my study of the lectotype of *Masia bifasciatella* in Madrid in 1993. With this information, the following records of this species from 7 countries (except Spain) have to be eventually confirmed: Sweden [Hedquist, 2003]; Russia: Leningrad Province [Trjapitzin, 1966, 1968, 1971, 1978, 1994; Herthetvzian, 1986], Stavropolye Territory [Trjapitzin, 1966, 1968, 1971, 1978; Rzajeva, 1973; Herthetvzian, 1986], Primorye Territory [Monrreal Hernández et al., 2005]; Moldavia [Trjapitzin, 1966; Talitzky, Kuslitzky, 1990]; Armenia [Trjapitzin, 1966, 1968, 1978; Herthetvzian, 1971, 1986; Rzajeva, 1973, 2002; Avetian et al., 1976; Japoshvili, Noyes, 2005a; Monrreal Hernández et al., 2005]; Azerbaijan [Rzajeva, 1973, 2002; Japoshvili, Noyes, 2005a]; Kazakhstan [Trjapitzin, 1966, 1968]; and Republic of South Africa [Japoshvili, Noyes, 2005b]. I could not place the macropterous female of *T. hofferi* Szelényi, 1971 into the key due to absence of necessary materials at my disposal. Anyway, antenna of *T. hofferi* is very characteristic (Fig. 2). As far as geographic distribution of *T. simillimus* is concerned [Hoffer, 1953], I did not place data on its discovery in Hungary [Erdős, 1955, 1957, 1964] into the key. Hoffer [1953: 87] wrote in the original description of this species from Czech Republic: “Fascia apicali alae anterioris processu interno deficiente” (“Apical band of forewing without internal process”), but such basad-directed process is present that is typical for *T. narendrani* Hayat et Kazmi, 1999 from India is shown on the drawings of Erdős [1955: 224; 1964: 289]. However, the Hungarian species is not identical to the Indian one and might be still undescribed as a new species, although a possibility of intraspecific variation cannot be excluded.

Hosts of the two species of *Tetracnemus* also remain doubtful. Data by Myartseva [1984: 84] as well as citation by Monrreal Hernández et al. [1995] on rearing *T. phragmitis* Myartseva, 1982 from the mealybug *Adelosoma phragmitidis* Borchsenius (Homoptera: Pseudococcidae) in Turkmenistan are incorrect, because Myartseva [l.c.: 207] wrote that this parasitoid had been collected by sweeping the reed

*Phragmites australis*. The record of *Rhizopulvinaria armenica* Borchsenius (Homoptera: Coccidae) as a host of *T. simillimus* by Japoshvili and Noyes [2005b] in Georgia is most probably erroneous, because representatives of the encyrtid subfamily Tetracneminae do not infest coccoids of the family Coccidae.

*Tetracnemus gumilevi* Pilipjuk et Trjapitzin sp.n.  
Figs 9–12.

TYPE MATERIAL. Holotype ♀. Ethiopia, Gambala, 35 km W Abobo, 16.08.1985, V. Pilipjuk; paratypes: ♀, ♂ with the same label (Zoological Institute, Russian Academy of Sciences, St. Petersburg).

DESCRIPTION. **Female** (holotype and paratype). Frontoververtex 1.4x as wide as long. Apical angle of ocellar triangle about 90°. Antennae inserted at level of lower margins of eyes. Distance between toruli 1.5x less than distance from a torulus to eye margin. Antennal scape sublinear, 9x as long as wide; pedicel 2x as long as wide at apex and 2x longer than F1, which is small, subquadrate and 2x shorter than F2; F2–F4 somewhat longer than wide, F5 subquadrate, F6 a little wider than long; clava somewhat longer than three preceding funicular segments combined (Fig. 9). Mesoscutum 2x as wide as long. Scutellum as long as mesoscutum. Wings not shortened; forewing 3x as long as wide (Fig. 10), its marginal vein about 5x longer than stigmal one, postmarginal vein very short (Fig. 11). Mesotibial spur shorter than 1st segment of mid tarsus (4:5). Exerted part of ovipositor sheaths a little shorter than gaster (5:6).

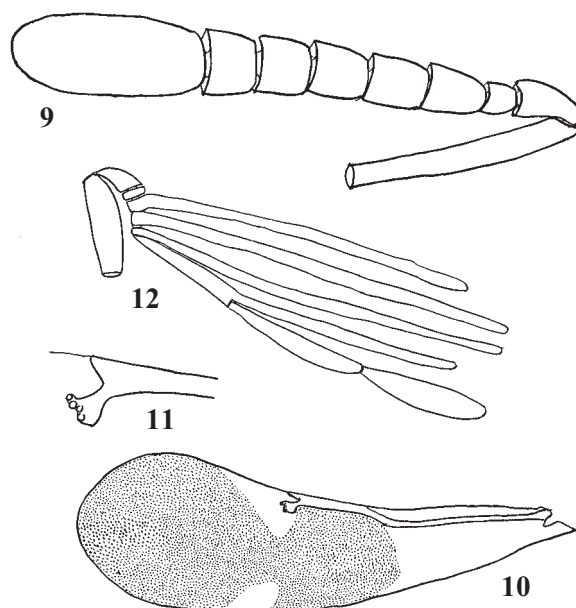
Body black, including antennae and ovipositor sheaths. Frontoververtex with slight greenish luster. Facial cavity with reddish hue. Scutellum smooth, with distinct emerald luster. Mesopleura with violet luster. Forewing infuscate, with hyaline basal 1/3 and two opposite hyaline spots distad of venation (Fig. 10). All coxae, femora and fore tibiae dark, with greenish luster; basal 1/2 of mid tibiae and basal 1/5 of hind tibiae white; mesotibial spur and tarsi of all legs dirty yellow, except 5th segment, which is dark brown. Body length (without ovipositor sheaths) 2.3 mm.

**Male**. Frontoververtex 2x as wide as long. Ocelli form a slightly obtuse triangle. Toruli situated at level of lower margins of eyes; distance between toruli 2x less than distance from a torulus to eye margin. Antennae 4-ramose (Fig. 12); scape about 3.5x as long as wide; F1 annelliform; F2–F4 very short, with long rami; F5 long, with somewhat shorter ramus; F6 longer than F5; clava a little shorter than F6. Wings not shortened; forewing hyaline, about 2.8x as long as wide; marginal vein 3x longer than stigmal one, the latter 1.5 longer than postmarginal one. Colour of legs similar to that of female, but tarsi being dark brown; 1st segment of fore and hind tarsi and 1st–3rd segments of mid tarsi yellowish white. Body length 1.6 mm.

COMMENTS. Relationships of *Tetracnemus gumilevi* sp.n. to other described species of *Tetracnemus* are now difficult to ascertain. It is compared in the present key with *T. peninsularis* (Mani et Saraswat, 1974) and *T. perspicuus* Hayat et Kazmi, 1999 from India, clearly differing from them in proportions of antennal segments and especially very long scape (9x as long as wide).

ETYMOLOGY. The new species is named after the famous Russian poet Nikolai Stepanovich Gumilev (1886–1921) who travelled to Tropical Africa.

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Figs 9–12. *Tetracnemus gumilevi* sp.n. [drawings by V.J. Pilipjuk]: 9 — antenna of female, 10 — forewing of female, 11 — venation of forewing of female, 12 — antenna of male.

Рис. 9–12. *Tetracnemus gumilevi* sp.n. [рисунки В.И. Пилипюка]: 9 — усик самки, 10 — переднее крыло самки, 11 — жилкование переднего крыла самки, 12 — усик самца.

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