Arthropoda Selecta 7 (3): 163–174 © ARTHROPODA SELECTA, 1998

Revision of the Central Asian millipede genus *Turanodesmus* Lohmander, 1932 (Diplopoda: Polydesmidae)

Ревизия диплопод центральноазиатского рода *Turanodesmus* Lohmander, 1932 (Diplopoda: Polydesmidae)

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KEY WORDS: Diplopoda, *Turanodesmus*, taxonomy, new species, Central Asia.
КЛЮЧЕВЫЕ СЛОВА: Diplopoda, *Turanodesmus*, таксономия, новые виды, Центральная Азия.

ABSTRACT: The Central Asian genus *Turanodesmus* appears to be quite prolific and currently encompassing 8–9 valid species, including *T. glaber* sp.n., *T. cornutus* sp.n. and *T. cynodon* sp.n. as well as the redescribed *T. almassyi* (Attems, 1904) (the type-species), *T. elevatus* Lohmander, 1932, *T. expressus* Golovatch, 1979, *T. inermis* Lohmander, 1932, and *T. stummeri* (Attems, 1904). A key is provided to all species of *Turanodesmus*.

РЕЗЮМЕ: Оказалось, что центральноазиатский род *Turanodesmus* весьма большой и в настоящее время включает 8–9 валидных видов, в т.ч. *T. cornutus* sp.n., *T. glaber* sp.n. и *T. cynodon* sp.n., а также переописываемые *T. almassyi* (Attems, 1904) (типовой вид), *T. elevatus* Lohmander, 1932, *T. expressus* Golovatch, 1979, *T. inermis* Lohmander, 1932 и *T. stummeri* (Attems, 1904). Дан ключ для всех видов рода.

Introduction

The millipede genus *Turanodesmus* Lohmander, 1932, has hitherto been known to comprise only six species, all confined to Central Asia: *T. almassyi* (Attems, 1904) (the type-species), *T. elevatus* Lohmander, 1932, *T. expressus* Golovatch, 1979, *T. inermis* Lohmander, 1932, *T. stummeri* (Attems, 1904), and *T. tenuis* Golovatch, 1979. All other erstwhile *Turanodesmus* species have long been shown to actually belong in *Schizoturanius* Verhoeff, 1931, a genus closely related to and partly (in Central Asia) sympatric with *Turanodesmus* [cf. Golovatch, 1979].

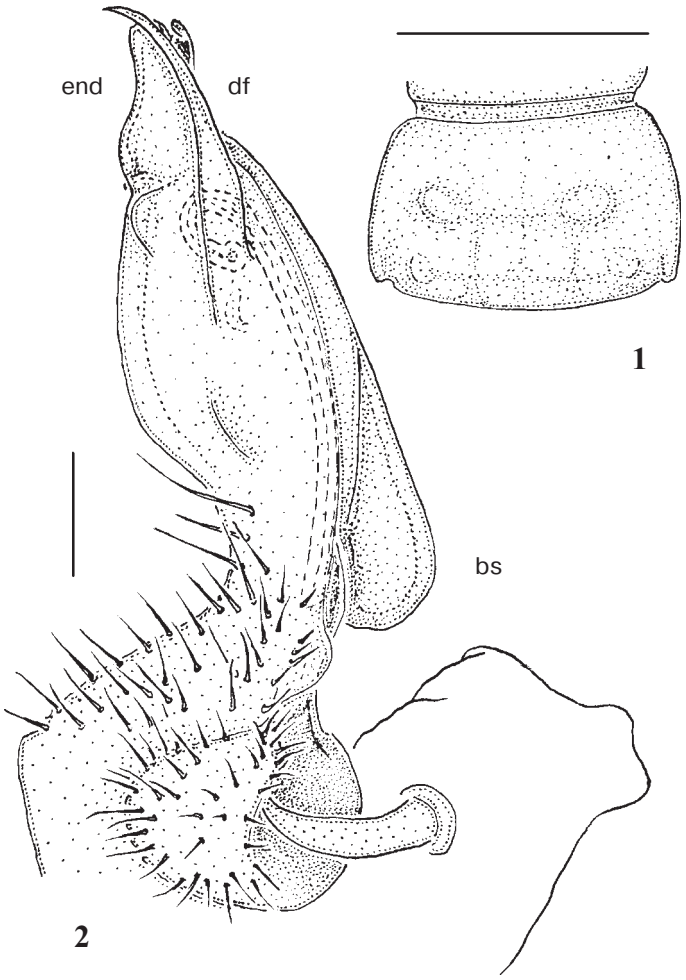
Since the latest reviews of the Central Asian millipede fauna [Golovatch, 1979; Read & Golovatch, 1994], new collections have become available for study, with a considerable proportion of these samples representing *Turanodesmus*. This paper is a revision of this genus as based on virtually all available material, both old and new. A major impetus has been received after a recent international expedition to Kirghizia and Kazakhstan [cf. Read & Golovatch, 1994].

Material and methods

Material revised has been borrowed from the Naturhistorisches Museum Wien (NHMW) and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN). Newly treated samples have been deposited mainly in the collection of the Zoological Museum of the State University of Moscow (ZMUM), with only a few duplicates donated to the NHMW, the Zoologisk Museum, University of Bergen (ZMUB) or retained in the personal collection of one of us (JS), as indicated herein.

Among the new methods used, taking careful measurements deserves special mention. We considered the following measurements, all summarized in individual tables/graphs presented per species: breadths of head, collum, tergites 5, 7, and 10 (both prozonite and metazonite); breadth of metazonite 2; breadth of tergite 4 (both prozonite and metazonite, except for the type series of *almassyi* and *stummeri*); length of collum; and the estimated length of the whole animal (Table). However, among these measurements, only two ratios proved useful as biplots showing character distributions (Figs 55, 56).

In the catalogue references, (D) stands for a (re)description or a fuller diagnosis, and (N) only



Figs 1, 2. *Turanodesmus almassyi* (Attems, 1904), ♂ lectotype: 1 — metatergum 10, dorsal; 2 — gonopod, mesal. Scale 1.0 (1) and 0.1 mm (2).

Рис. 1, 2. *Turanodesmus almassyi* (Attems, 1904), ♂ лектотип: 1 — 10-й метатергит, сверху; 2 — гонопод, изнутри. Масштаб 1,0 (1) и 0,1 мм (2).

for some note(s) in the context of a key or a mere mention for nomenclatorial / faunistic purposes, valid or not.

Turanodesmus Lohmander, 1932

Turanodesmus Verhoeff, 1931: 417 (having been proposed invalidly as based on two species, this name had no status in nomenclature, cf. Jeekel [1970]).

Turanodesmus Lohmander, 1932: 28 (validated through selection of *Polydesmus almassyi* Attems, 1904, as type-species).

Kirgisdesmus Lohmander, 1932: 29 (as a subgenus of *Turanodesmus*, the type-species: *Turanodesmus inermis* Lohmander, 1932, by original designation; synonymized by Golovatch [1979: 994]).

Kirgisdesmus — Hoffman, 1980: 172 (as an independent genus of Polydesmidae, with two species included).

Turanodesmus — Hoffman, 1980: 174 (as an independent genus of Polydesmidae, with one species included).

Turanodesmus has been defined as a polydesmid genus with the following characters [cf. Golovatch, 1979]:

Body small, poorly pigmented, with 20 segments. Dorsum more or less strongly convex, because paraterga, if present at all, small and low. Tergal sculpture from rough to almost indistinct. Tergal setae from pointed to claviform or club-shaped.

Gonopods relatively stout, not strongly falcate caudally, relatively poorly differentiated. Seminal groove in the distalmost extent making a loop to immediately debauche into a small accessory seminal chamber (= Samenblase) placed distally inside telopodite; latter branching into a relatively long and slender caudal endomerite, simple or armed, and a more or less digitiform frontal tibiotarsus. Latter with a more or less well-expressed lateral projection.

Legpair 2 in ♀ with outer coxal projections. Vulvae usually elongate, relatively straight. Main gutter (= Naht) anterolaterally with a small, caudolaterally with a very considerable, notch. Neither sacci- nor spiraliform structures at bottom of main gutter.

Little can be added to this diagnosis, except that in polydesmid gonopod morphology, a different terminology has since been developed [Golovatch, 1991], one claiming to better reflect the evolution of the entire family. In particular, what was termed as endomerite [cf. Lohmander, 1932; Golovatch, 1979] has been shown to be a distofemoral process, or acropodite, while the structure lying frontally of the recurvature point of the seminal groove, formerly named tibiotarsus, is actually what we recognize now as the true endomerite. With this innovation borne in mind, the respective designations in our figures have been changed accordingly here, with **end** standing for endomerite, and **df** for distofemoral process.

Also the structure of the vulva appears not so uniform as believed earlier. An especially important case concerns *T. glaber* in which the vulvae in situ are positioned transversely, not longitudinally, to the main axis. This seems a rather rare case in the entire Polydesmidae known with respect to ♀ genitalia [cf. Tadler & Thaler, 1993].

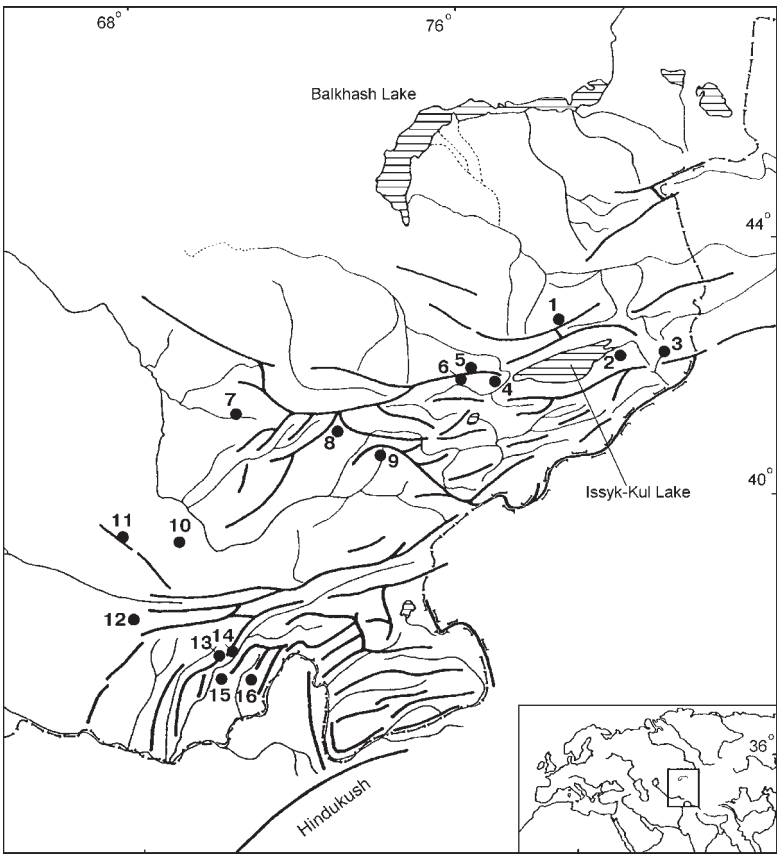
The antennae seem somewhat particular in having at best very poorly developed distodorsal fields of sensilla on joints 5 and 6, as well as a virtually wanting middorsal knob on joint 7. Sphaerotrichs often present.

Descriptions and remarks

Turanodesmus almassyi (Attems, 1904)
Figs 1, 2.

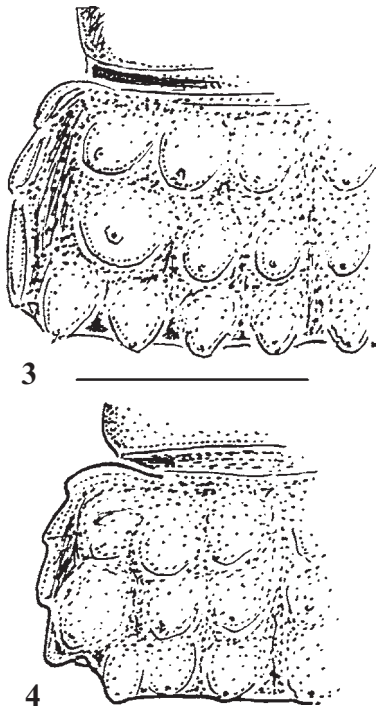
Polydesmus almassyi Attems, 1904: 125, tab. 9, figs 13–15 (D).
Polydesmus Almassyi (sic!) — Attems, 1926: 65 (N).
Polydesmus almassyi — Lignau, 1929: 161 (D).
Turanodesmus almassyi — Verhoeff, 1931: 417 (N).
Turanodesmus almassyi — Lohmander, 1932: 28 (N).
Turanodesmus almassyi — Attems, 1940: 82, fig. 118 (D).
Turanodesmus almassyi — Golovatch, 1979: 994 (N).
Turanodesmus almassyi — Read & Golovatch, 1994: 65 (N).
Turanodesmus almassyi — Shukurov, 1996: 155 (N).

REMARKS: This species remains only known from the original description [Attems, 1904] and a single subsequent record [Lignau, 1929]. We have revised the ♂ lectotype (NHMW, designated herewith), in which somite 7 is missing, and both gonopods are mounted on a slide



Map. Distribution of *Turanodesmus* species: 1 — Bolshaya Almatinka (*T. expressus*); 2 — Chon-Kyzyl-Su + Kara-Batkak + Przhevalsk (Przewalsk, Aksu) (*T. almassyi, T. stummeri*); 3 — Kensu River (*T. expressus, T. inermis*), Kokzhar (*T. expressus*); 4 — Shamsi River (*T. elevatus*); 5 — Frunze (=Bishkek) (*T. glaber*); 6 — Chon-Kurchak (*T. stummeri*); 7 — Vannovka (*T. cynodon*); 8 — Sary-Chelek (*T. inermis*); 9 — Arslanbob (*T. cornutus*); 10 — Nuratinsky Reserve (*T. cynodon*); 11 — Golodnaya Step Station (*T. inermis*); 12 — Kitab (*T. cynodon*); 13 — Faizabad (*T. tenuis*); 14 — Garm (*T. tenuis*); 15 — Dangara, Kangurt (*T. tenuis*); 16 — Muminabad (*T. tenuis*).

Карта. Распространение видов рода *Turanodesmus*: 1 — Большая Алматинка (*T. expressus*); 2 — Чон-Кызыл-Су + Кара-Баткак + Пржевальск (Аксу) (*T. almassyi, T. stummeri*); 3 — река Кенсу (*T. expressus, T. inermis*), Кокжар (*T. expressus*); 4 — река Шамси (*T. elevatus*); 5 — Фрунзе (Бишкек) (*T. glaber*); 6 — Чон-Курчак (*T. stummeri*); 7 — Ванновка (*T. cynodon*); 8 — Сары-Челек (*T. inermis*); 9 — Арсланбоб (*T. cornutus*); 10 — Нуратинский заповедник (*T. cynodon*); 11 — станция Голодная степь (*T. inermis*); 12 — Китаб (*T. cynodon*); 13 — Файзабад (*T. tenuis*); 14 — Гарм (*T. tenuis*); 15 — Дангара, Кангурт (*T. tenuis*); 16 — Муминабад (*T. tenuis*).



Figs 3, 4. Dorsal view of metatergum 10 of *Turanodesmus elevatus* Lohmander, 1932, ♂ lectotype (3), and *Turanodesmus inermis* Lohmander, 1932, ♂ lectotype (4). Scale 0.5 mm.

Рис. 3, 4. Метатергит 10 сверху у *Turanodesmus elevatus* Lohmander, 1932, ♂ лектотип (3), и *Turanodesmus inermis* Lohmander, 1932, лектотип ♂ (4). Масштаб 0,5 мм.

preparation. One of the gonopods was originally treated with KOH, so the other, more intact gonopod was used for a new illustration (Fig. 2). Metatergal sculpture almost wanting, paraterga very poorly developed, mostly unincised laterally (Fig. 1). Body coloration rather dark brown. The gonopod tip is known to somewhat vary [Lignau, 1929] but not strikingly so. The swelling**bs** on the gonopod femur is characteristically prominent (Fig. 2).

This species is known from Pass Almaty in Aksu Valley, environs of Przewalsk (locus typicus) and from Kaindy Valley, SE of Przewalsk (Map).

Turanodesmus elevatus Lohmander, 1932
Figs 3, 5, 6, 20.

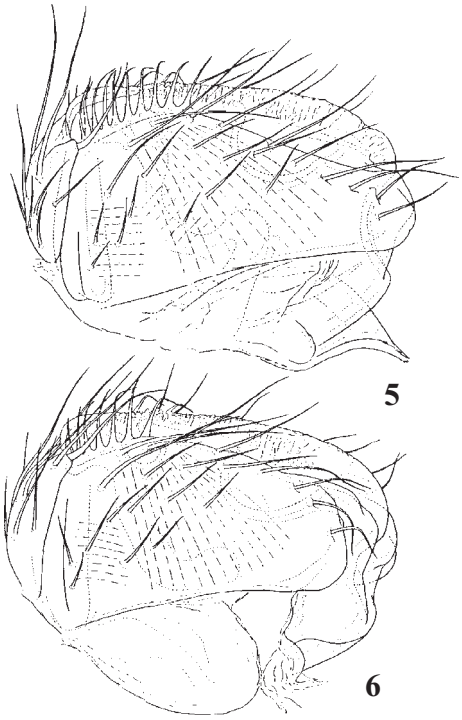
Turanodesmus (Kirgisdesmus) elevatus Lohmander, 1932: 9, figs 6, 8–9 (D).

Turanodesmus elevatus — Attems, 1940: 85 (D).

Turanodesmus elevatus — Golovatch, 1979: 994 (N).

Turanodesmus elevatus — Read & Golovatch, 1994: 65 (N).

REMARKS: Described originally from 2♀♀ deriving from southern Kazakhstan [Lohmander, 1932], this species has since never been rediscovered. We have revised both syntypes (ZIN), the correct label for them reading "Semirechye, 5 Werst upstream the division of Shamsi Canyon into left Tuyuk and right Shamsi rivers, Shamsi branch, coniferous forest, on stumps and stones, 2340 m, 27.VI.1904, leg. A. Begak & V. Abramov" (ZIN 611, No. 147-04). We have selected and illustrated the lectotype for comparative purposes, showing a very distinct macrosculpture even on the 10th metatergite (Fig. 3), thus somewhat contradicting the statement by Lohmander [1932] that this species is a little less distinctly sculptured than *T. inermis.* On the contrary, we have found this to be actually reverse, as our drawings taken from the lectotypes clearly show (cf. Figs 3 & 4). The paraterga are distinctly incised laterally. The structure of both vulva and ♀ coxa 2 as reproduced here after Lohmander [1932] (Figs 5, 6, 20).



Figs 5, 6. Vulvae of *Turanodesmus elevatus* Lohmander, 1932, ♀ paralectotype. Scale absent. (After Lohmander [1932]).

Рис. 5, 6. Вульвы *Turanodesmus elevatus* Lohmander, 1932, ♀ паралектотип. Масштаб отсутствует. (По [Lohmander, 1932]).

This species is currently known from the type locality only (Map).

Turanodesmus expressus Golovatch, 1979
Figs 7–19.

Turanodesmus expressus Golovatch, 1979: 991, fig. 2 (1–6) (D).

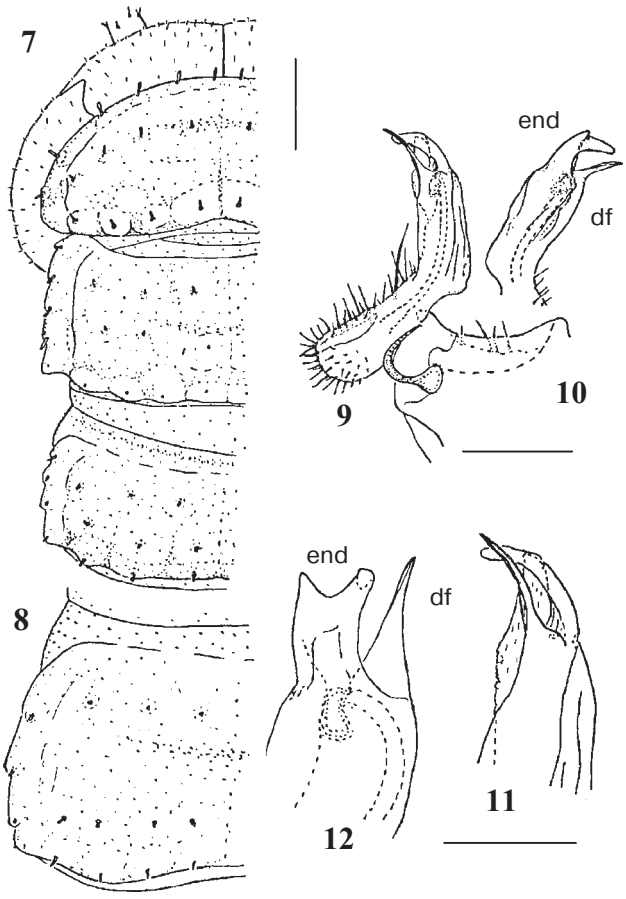
Turanodesmus expressus — Read & Golovatch, 1994: 65 (N).

Turanodesmus expressus — Shukurov, 1996: 155 (N).

MATERIAL: 6♂♂, 5♀♀ (ZMUM), 1♂ (NHMW), 1♂ (JS), 1♂ (ZMUB), Kazakhstan, S of Alma-Ata (= Almaty), Zailiisky Alatau Mt. Range, Bolshaya Almatinka River valley, 2400–2600 m, *Picea* forest, 30.08–03.09.1992, leg. K. Eskov. — 1♀ (ZMUM), same locality, 2300–2500 m, *Picea schrenkiana* forest, 06.06.1993, leg. S. Golovatch (referred to in Read & Golovatch [1994]). — 2♂♂ (ZMUM), Kirghizia, Sary-Djaz, Kensu River valley, 16.07.1986, leg. S. Ovtchinnikov. — 1♂, 2♀♀ (ZMUM), Kirghizia, Kungei-Alatoo Mt. Range, Kokzhar River, 11.07.1993, leg. O. Gorbunov.

REMARKS: This species has hitherto been known only from a holotype ♂ deriving from the southern environs of Alma-Ata, Kazakhstan [Golovatch, 1979]. The new samples at hand, largely topotypic, allow to somewhat broaden our knowledge of both variation range and distribution of *T. expressus* (Map). Old and new illustrations are presented here for comparative purposes (Figs 7–19).

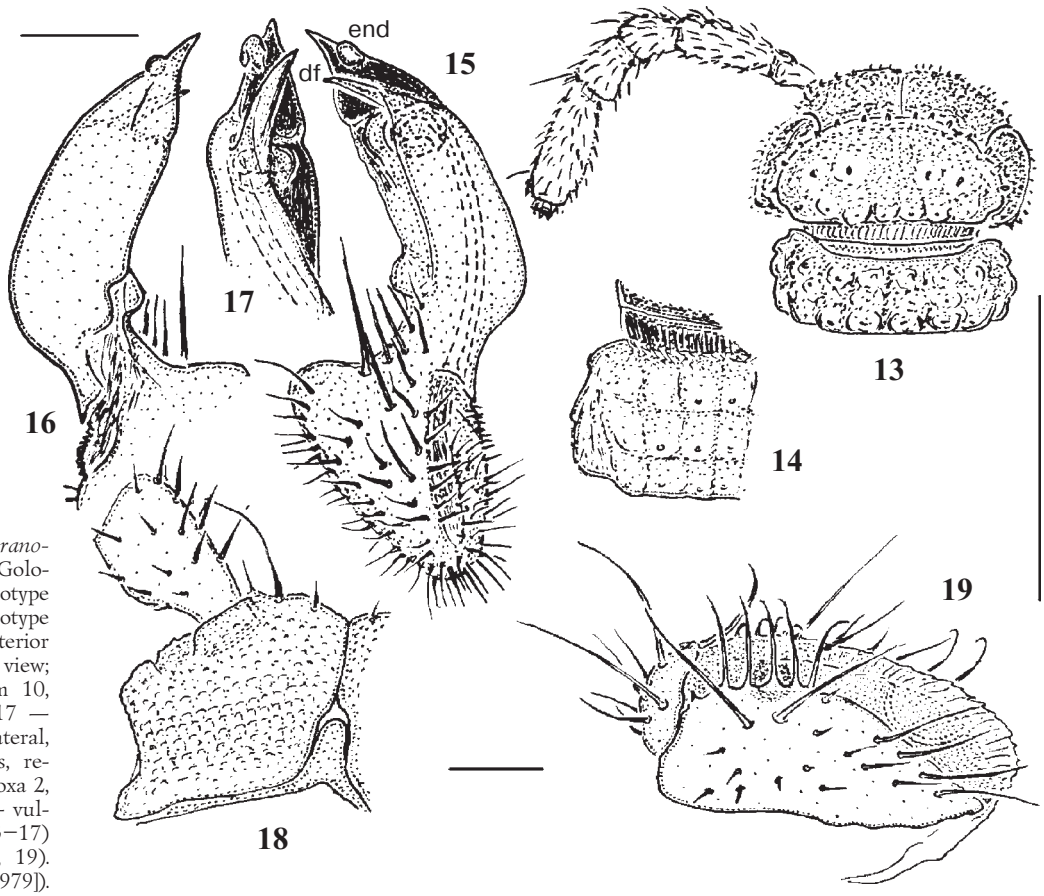
VARIATION: This appears to be one the largest congeners reported to date (length up to 19 mm, though the smallest specimens only 8–9 mm long), with the sizes given in Table. Body usually pinkish-yellow, more pinkish anteriorly and caudally, then antennomeres 6 and 7



Figs 7–12. *Turanodesmus expressus* Golovatch, 1979, ♂ holotype: 7 — anterior body part, dorsal view; 8 — metatergum 11, dorsal view; 9–12 — gonopods, mesal, lateral, ventral, and submesal views, respectively. Scales 0.2 (7–10) and 0.1 mm (11, 12). (After Golovatch [1979]).

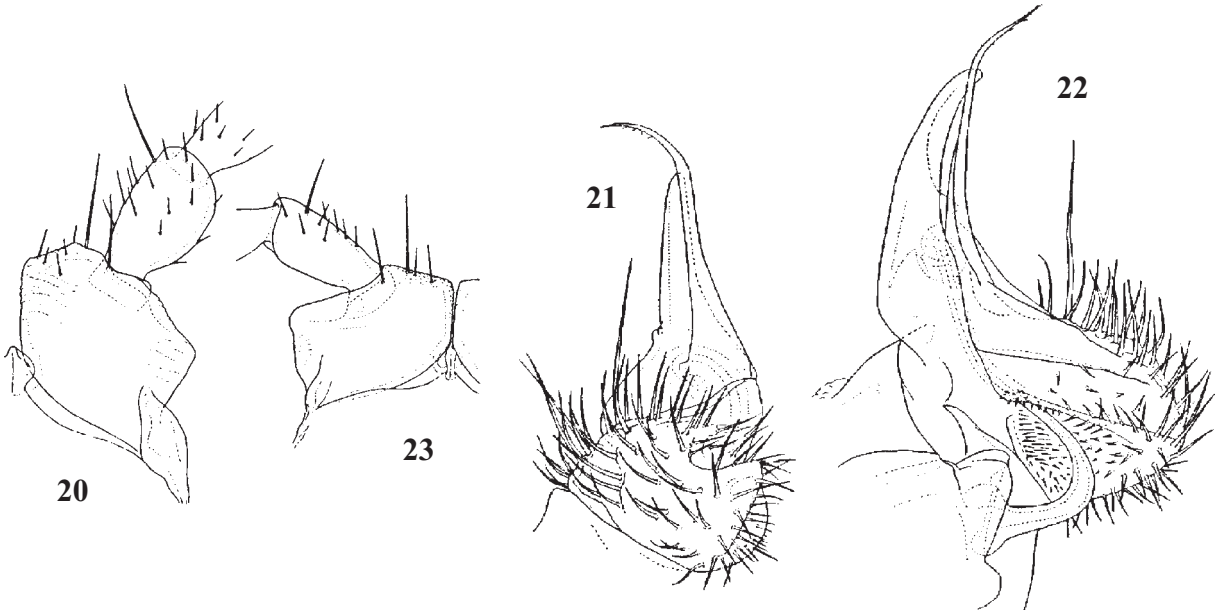
Рис. 7–12. *Turanodesmus expressus* Golovatch, 1979, ♂ голотип: 7 — передняя часть тела, вид сверху; 8 — метатергит 11, вид сверху; 9–12 — гоноподий, вид соответственно изнутри, сбоку, снизу и почти изнутри. Масштаб 0,2 (7–10) и 0,1 мм (11, 12). (По [Головач, 1979]).

characteristically pallid; more rarely, body entirely pinkish (1 ♂ from Sary-Djaz and both ♀♀ from Kungei-Alatoo), then antennae (except for the normal whitish tip) entirely pinkish as well but legs yellowish. The width ratios of the head and individual body segments varying, usually the head being somewhat broader than collum, but rarely both are of subequal width (Kungei-Alatoo ♀♀). Tergal sculpture from relatively poorly to moderately developed (cf. Figs 7–8 and 13–14). Tergal setae invariably minute (except for being a little longer in fore row on collum and in rear row on somite 19), largely clavate. The Kungei-Alatoo sample is particular also in that the ♂ displays a somewhat larger dorso-parabasal gonofemoral hump **bs** (between the conditions observed in Figs 1 and 9–10), yet far from as strongly developed as in *T. almassyi*; most of the ♀ paraterga are strongly bordered but very poorly incised laterally, almost smooth. The tip of the gonopod in many of the topotypical samples is variable (cf. Figs 9–12 and 15–17). The vulva is elongate (Fig. 19), ♀ coxa 2 prominent (Fig. 18), the epigynal ridge low, quite regularly rounded.



Figs 13–19. *Turanodesmus expressus* Golovatch, 1979, ♂ topotype (13–17) and ♀ topotype (18, 19): 13 — anterior body part, dorsal view; 14 — metatergum 10, dorsal view; 15–17 — gonopod, mesal, lateral, and ventral views, respectively; 18 — coxa 2, frontal view; 19 — vulva. Scales 0.2 (13–17) and 0.1 mm (18, 19). (After Golovatch [1979]).

Рис. 13–19. *Turanodesmus expressus* Golovatch, 1979, ♂ топотип (13–17) и ♀ топотип (18, 19): 13 — передняя часть тела, вид сверху; 14 — метасомит 10, вид сверху; 15–17 — гоноподий, вид соответственно изнутри, сбоку и снизу; 18 — тазик 2, вид спереди; 19 — вульва. Масштаб 0,2 (13–17) и 0,1 mm (18, 19). (По [Головач, 1979]).



Figs 20–23. *Turanodesmus elevatus* Lohmander, 1932, ♀ paralectotype (20), and *Turanodesmus inermis* Lohmander, 1932, ♂ lectotype (21, 22) and ♀ paralectotype (23): 20, 23 — coxa 2, caudal view; 21, 22 — gonopod, sublateral and mesal views, respectively. Scales absent. (After Lohmander [1932]).

Рис. 20–23. *Turanodesmus elevatus* Lohmander, 1932, ♀ паралектотип (20), и *Turanodesmus inermis* Lohmander, 1932, ♂ лектотип (21, 22) и ♀ паралектотип (23): 20, 23 — тазик 2, вид сзади; 21, 22 — гоноподий, соответственно почти сбоку и изнутри. Масштаб отсутствует. (По [Lohmander, 1932]).

Table.
Some measurements of study material.
Таблица.
Некоторые промеры изученного материала.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Lectotype	almassyi	m	Aksu Valley	14.0	1.24	1.09	0.63	1.13	0.94	1.15					1.01	1.25
Paratype	cornutus	m	Arslanbob	13.0	0.99	0.81	0.41	0.90	0.68	0.96	0.66	1.06	0.88	1.16	0.85	1.15
Holotype	cornutus	m	Arslanbob	15.0	0.96	0.82	0.37	0.94	0.62	1.00	0.66	1.10	0.87	1.19	0.79	1.19
	expressus	f	B.Almatinka	13.0	1.01	0.94	0.41	1.01	0.78	1.09	0.78	1.10	0.87	1.13	0.84	1.15
	expressus	f	B.Almatinka	14.0	1.06	0.94	0.44	1.03	0.78	1.07	0.78	1.12	0.87	1.12	0.85	1.13
	expressus	m	B.Almatinka	12.0	0.85	0.74	0.35	0.76	0.56	0.76	0.57	0.85			0.62	0.85
	expressus	m	B.Almatinka	12.0	0.90	0.74	0.40	0.79	0.60	0.82	0.65	0.88	0.72	0.91	0.65	0.90
	expressus	m	B.Almatinka	12.0	0.88	0.75	0.41	0.81	0.59	0.79	0.59	0.90	0.68	0.93	0.60	0.88
	expressus	m	B.Almatinka	13.0	0.88	0.71	0.40	0.75	0.59	0.79	0.59	0.87	0.71	0.91	0.62	0.90
	expressus	m	B.Almatinka	13.0	0.90	0.79	0.37	0.79	0.65	0.82	0.65	0.90	0.69	0.93	0.65	0.93
	expressus	m	B.Almatinka	13.0	0.90	0.76	0.41	0.79	0.59	0.82	0.62	0.91	0.72	0.91	0.65	0.93
	expressus	m	B.Almatinka	13.0	0.91	0.74	0.37	0.79	0.57	0.84	0.60	0.93	0.72	0.93	0.63	0.94
	expressus	m	B.Almatinka	13.0	0.85	0.75	0.37	0.83	0.54	0.78	0.57	0.87	0.66	0.90	0.60	0.87
	cynodon	m	Nuratinsky	9.0	0.62	0.47	0.29	0.56	0.41	0.62	0.46	0.69	0.59	0.72	0.44	0.71
	cynodon	m	Nuratinsky	7.0	0.60	0.49	0.32	0.56	0.40	0.60	0.40	0.69		0.74	0.44	0.71
	expressus	m	B.Almatinka	15.0	1.06	0.93	0.57	0.97	0.72	0.99	0.71	0.99	0.93	1.13	0.84	1.13
	expressus	m	Sary-Djaz	15.0	1.03	0.90	0.51	0.91	0.71	0.96	0.72	1.06	0.88	1.07	0.79	1.09
	expressus	m	B.Almatinka	15.0	1.03	0.88	0.51	0.91	0.69	0.94	0.72	1.04	0.85	1.07	0.78	1.06
	expressus	f	Kungei	13.0	1.13	1.03	0.51	1.13	0.85	1.18	0.90	1.21	0.91	1.26	0.94	1.00
	expressus	f	Kungei	19.0												
	expressus	f	Kungei													
	expressus	f	B.Almatinka	15.0	1.07	0.99	0.54	1.06	0.90	0.93	0.88	1.15	0.90	1.19	0.91	1.19
Paratype	glaber	f	Arslanbob	14.0	0.93	0.84	0.47	0.87	0.75	0.87	0.71	0.93	0.74	0.96	0.74	0.97
Holotype	glaber	m	Arslanbob	13.0	0.93	0.76	0.41	0.81	0.63	0.85	0.68	0.93	0.78	0.96	0.71	0.94
	inermis	f	Sary-Chelek	12.0	0.82	0.71	0.37	0.85	0.60	0.90	0.59	0.93	0.62	0.96	0.62	0.96
	inermis	m	Sary-Chelek	15.0	0.99	0.79	0.47	0.91	0.63	1.03	0.69	1.10	0.94	1.19	0.85	1.21
	inermis	m	Sary-Chelek	15.0	0.99	0.76	0.43	0.88	0.66	0.99	0.69	1.07	0.93	1.18	0.87	1.18
	inermis	m	Sary-Chelek	12.0	0.81	0.76	0.41	0.84	0.59	0.91	0.65	1.00			0.74	1.06
	inermis	m	Sary-Chelek	15.0	0.93	0.76	0.46	0.87	0.60	1.00	0.68	1.06	0.87	1.18	0.79	1.19
	inermis	m	Sary-Chelek	15.0	1.13	0.82	0.44	0.93	0.66	1.03	0.71	1.15	0.94	1.22	0.82	1.25
	inermis	m	Sary-Chelek	13.5	1.01	0.78	0.41	0.72	0.66	0.99	0.72	1.06	0.93	1.15	0.82	1.15
	inermis	f	Sary-Chelek	13.0	1.03	0.81	0.49	0.96	0.69	1.03	0.72	1.07	0.74	1.13	0.75	1.13
	inermis	f	Sary-Chelek	12.0	0.88	0.75	0.44	0.90	0.69	0.91	0.68	0.99	0.72	1.03	0.75	1.04
	inermis	f	Sary-Djaz	12.0	0.97	0.81	0.49	0.94	0.69	0.96	0.68	0.99	0.76	1.03	0.75	1.01
	inermis	f	Sary-Chelek	12.0	0.96	0.81	0.51	0.96	0.72	1.00	0.72	1.09	0.82	1.15	0.84	1.16
	inermis	f	Sary-Chelek	12.0	0.94	0.81	0.49	0.96	0.71	1.00	0.74	1.07	0.76	1.13	0.82	1.15
Paratype	cynodon	m	Vannovka	7.0	0.63	0.51	0.31	0.59	0.41	0.62	0.43	0.69			0.43	0.71
Holotype	cynodon	m	Nuratinsky	9.0	0.68	0.51	0.32	0.60	0.43	0.63	0.44	0.71	0.59	0.74	0.49	0.72
Paratype	cynodon	m	Nuratinsky	9.0	0.63	0.50	0.32	0.59	0.43	0.62	0.44	0.69	0.59	0.72	0.49	0.72
Lectotype	stummeri	m	Aksu Valley	8.0	0.65	0.51	0.29	0.53	0.49	0.57			0.53	0.68	0.50	0.65
Paratype	stummeri	m	Aksu Valley	9.0	0.69	0.59	0.28	0.62	0.51	0.68			0.59	0.78	0.51	0.75
	stummeri	m	Chon-Kurchak	7.5	0.68	0.53	0.29	0.59	0.41	0.60	0.44	0.69	0.54	0.69	0.50	0.71
	stummeri	m	Terskei	7.0	0.65	0.49	0.25	0.56	0.43	0.56	0.41	0.62	0.54	0.65	0.49	0.65
	stummeri	m	Terskei	6.0	0.63	0.50	0.26	0.56	0.43	0.59					0.51	0.68
Paratype	stummeri	f	Aksu Valley	9.0	0.74	0.57	0.35	0.66	0.50	0.69			0.54	0.75	0.57	0.76
Paratype	stummeri	f	Aksu Valley	8.0	0.72	0.59	0.29	0.65	0.56	0.68			0.57	0.76	0.57	0.76
	stummeri	f	Terskei	9.0	0.72	0.57	0.22	0.65	0.53	0.68	0.51	0.71	0.56	0.72	0.57	0.74
	stummeri	f	Terskei	7.0	0.71	0.56	0.37	0.65	0.53	0.66	0.51	0.71	0.53	0.71	0.57	0.72

Column numbers: 1 — status, 2 — species, 3 — sex (m — male, f — female), 4 — locality, 5 — body length, 6 — head width, 7 — collum width, 8 — collum length, 9 — metatergum 2 width, 10 — protergum 4 width, 11 — metatergum 4 width, 12 — protergum 5 width, 13 — metatergum 5 width, 14 — protergum 7 width, 15 — metatergum 7 width, 16 — protergum 10 width, 17 — metatergum 10 width. All measurements are given in mm.

Turanodesmus inermis Lohmander, 1932
Figs 4, 21–31.

Turanodesmus (Kirgisdesmus) inermis Lohmander, 1932: 5, figs 1–4, 7 (D).

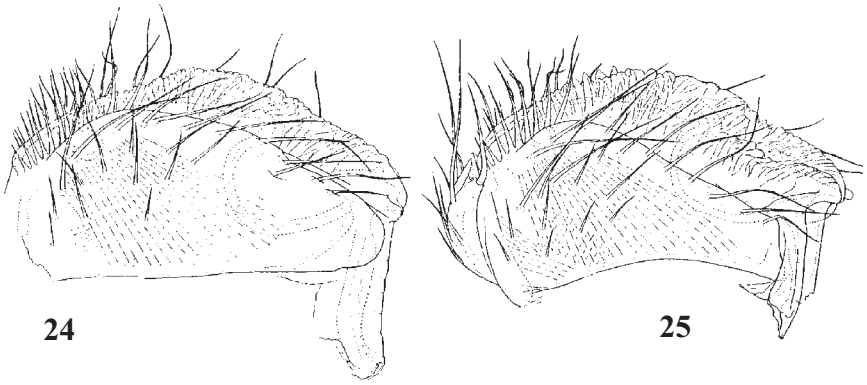
Turanodesmus inermis — Attems, 1940: 83, fig. 120 (D).

Turanodesmus inermis — Golovatch, 1979: 999, fig. 3 (3–4) (D).

Turanodesmus inermis — Read & Golovatch, 1994: 65 (N).

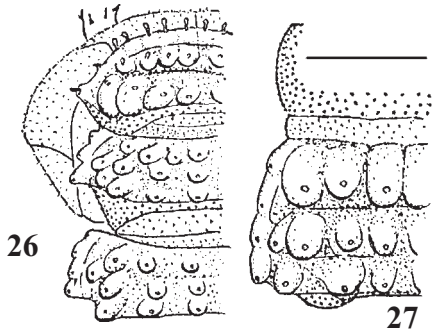
Turanodesmus inermis — Shukurov, 1996: 155 (N).

MATERIAL: 2 ♂♂, 2 ♀♀ (ZMUM), 1 ♂, 1 ♀ (NHMW), 1 ♀ (JS), Kirghizia, Chatkalsky Mt. Range, Sary-Chelek Reserve, 1550–2200 m, forests, 29.05.1993, leg. S. Golovatch. — 1 ♂, 1



Figs 24, 25. Vulvae of *Turanodesmus inermis* Lohmander, 1932, ♀ paralectotype. Scale absent. (After Lohmander [1932]).

Рис. 24, 25. Вульвы *Turanodesmus inermis* Lohmander, 1932, ♀ паралектотип. Масштаб отсутствует. (По [Lohmander, 1932]).



Figs 26, 27. *Turanodesmus inermis* Lohmander, 1932, ♂ from Sary-Chelek Reserve: 26 — anterior body part, dorsal view; 27 — metatergum 11, dorsal view. Scale 0.4 mm. (After Golovatch [1979]).

Рис. 26, 27. *Turanodesmus inermis* Lohmander, 1932, ♂ из Сары-Челекского заповедника: 26 — передняя часть тела, вид сверху; 27 — метатергит 11, вид сверху. Масштаб 0,4 мм. (по [Головач, 1979]).

juv. ♀ (19 segm.) (ZMUM), same locality, 1800–1950 m, surroundings of Lake Sary-Chelek, *Malus* litter, 30.05.1993, leg. S. Golovatch. — 1 ♂ , 1 juv. ♀ (19 segm.) (ZMUM), 1 ♂ (JS), same locality, head of Lake Sary-Chelek, *Abies* forest on slope, litter, 22.09.1983, leg. A. Ryvkin. — 1 ♀ (ZMUM), Kir-ghizia, Sary-Djaz, Kensu River valley, 16.07.1986, leg. S. Ovtchinnikov.

REMARKS: Type material (ZIN) has been re-examined, with the original labels reading "Turkestan, Station Golodnaya Step, Sardaba, 25.III.1909, leg. N. Zarudny" (ZIN 609, No. 347-909, 2 ♂♂ (including a selected and depicted lectotype), 2 ♀♀), and "Turkestan, Station Golodnaya Step, Sardaba, 19.II.1908, leg. N. Zarudny" (ZIN 610, No. 267-08, 2♂♂, 2♀♀, all badly fragmented).

VARIATION: This species appears relatively strongly variable both in peripheral (size, tergal sculpture, ♀ coxae 2) and genitalic characters (gonopods, vulvae). Individual variation is illustrated in part here in Table, in a number of drawings as well as in some verbal comments. Body usually pale yellowish-brown to pallid, sometimes pinkish, especially so anteriorly and posteriorly. Tergal sculpture from strongly to very strongly developed (cf. Figs 4 and 26–27), all paraterga evidently incised laterally; tergal setae usually very short, clavate, only rarely simple, slenderer and almost pointed (sometimes in fore row on collum and in rear row on somite 19 in Sary-Chelek examples, almost entirely in Sary-Djaz ♀). Head usually wider than both collum and somite 2 in ♂♂ (Fig. 26) but up to subequal in ♀♀ (Table). ♀ coxa 2 strongly variable (Figs 23, 28–30) but always with a considerable median swelling, vulva elongate (Figs 24, 25, 31), epigynal ridge very low, rounded, laterally a little angulate.

The DISTRIBUTION of this species is as in Map.

Turanodesmus glaber **sp.n.**
Figs 32–36.

Holotype: ♂ (ZMUM), Kirghizia, Frunze (= Bishkek), *Populus* grove, summer 1979, leg. S. Zonstein. — Paratype: ♀ (ZMUM), same locality, *Populus* grove, 15.05.1979, leg. S. Zonstein.

NAME: Emphasizing the almost missing metatergal sculpture.

DESCRIPTION: Size medium (Table). Body uniform yellowish-brown, head, legs and venter a little paler. Head densely pilose, considerably broader than collum (Fig. 35 and Table). Antennae a bit longer in ♂ as compared to ♀. Metatergal sculpture very poorly developed though traceable, especially so in ♂ on collum and a few anteriormost somites, as usual three transverse rows of low bosses. Tergal setae very short, subclavate. Paraterga set low (at about 1/3 midbody height), poorly developed, in ♂ incised laterally only in somewhat better developed paraterga 2–4, onward unincised, caudal corner always rounded, especially tooth-like (narrowly rounded and subrectangular) only in somites 17 and 18 but never protruding beyond caudal contour even in ♂; paraterga unincised in ♀. Ozopores lateral. Epiproct rather long, digitiform.

Legs in ♂ distinctly incrassate and longer compared to ♀. Sterna usual. Epigynal ridge behind ♀ legpair 2 rather high, bisinuate with a small central denticle. ♀ coxa 2 relatively small (Fig. 33), vulva ovoid, relatively short (Fig. 34).

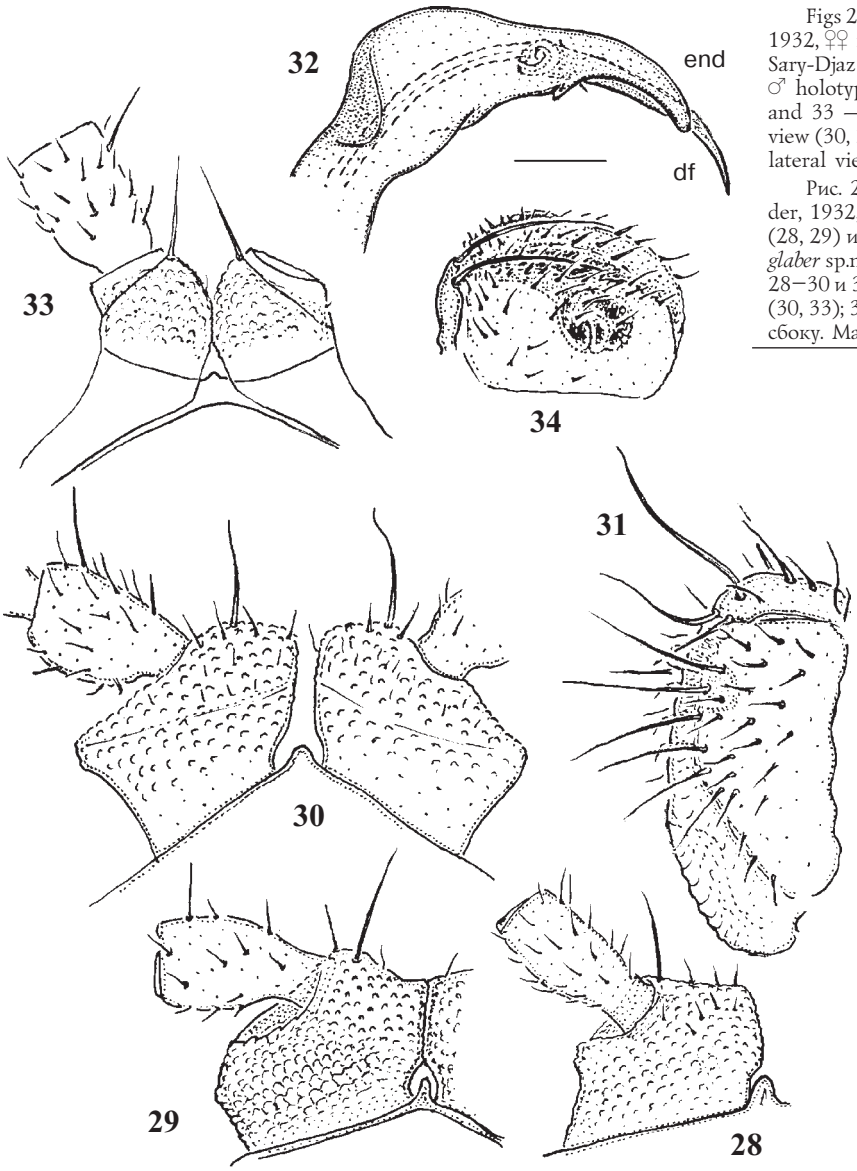
Gonopods (Fig. 32) much like in *T. inermis* but distofemoral process (**df**) bare.

Turanodesmus stummeri (Attems, 1904)
Figs 37–40.

Polydesmus stummeri Attems, 1904: 128, tab. 9, fig. 18 (D).
Polydesmus Stummeri (sic!) — Attems, 1926: 64 (N).
Turanodesmus stummeri — Verhoeff, 1931: 417 (N).
Turanodesmus stummeri — Lohmander, 1932: 28 (N).
Turanodesmus stummeri — Attems, 1940: 82, fig. 118 (D).
Turanodesmus stummeri — Golovatch, 1979: 994 (N).
Turanodesmus stummeri — Read & Golovatch, 1994: 65 (N).

MATERIAL: 1 ♂, 1 ♀ (ZMUM), Kirghizia, Terskei-Alatoo Mt. Range, Chon-Kyzyl-Su River canyon, near research station, *Picea* forest, 01–02.09.1983, leg. A. Ryvkin. — 1 ♂ (JS), Kirghizia, Terskei-Alatoo Mt. Range, delta of Kara-Batkak River, *Picea* forest, 12.06.1986, leg. S. Zonstein. — 1 ♂ (ZMUM), Kirghizia, Kirghizsky Mt. Range, Chon-Kurchak, 08.07.1986, leg. S. Ovtchinnikov.

REMARKS: This species is known only from the original description (Aksu Valley near Przewalsk, Kirghizia) [Attems, 1904] and has since never been rediscovered. The above new samples coupled with the revised



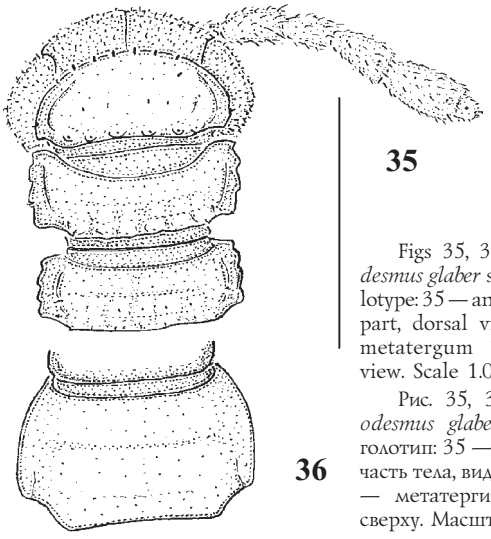
Figs 28–34. *Turanodesmus inermis* Lohmander, 1932, ♀♀ from Sary-Chelek Reserve (28, 29) and Sary-Djaz (30, 31), and *Turanodesmus glaber* sp.n., ♂ holotype (32) and ♀ paratype (33, 34): 28–30 and 33 — coxae 2, caudal (28, 29) and frontal view (30, 33); 31 and 34 — vulva; 32 — gonopod, lateral view. Scale 0.1 mm.

Рис. 28–34. *Turanodesmus inermis* Lohmander, 1932, ♀♀ из Сары-Челекского заповедника (28, 29) и Сары-Джаза (30, 31), и *Turanodesmus glaber* sp.n., ♂ голотип (32) и ♀ паратип (33, 34): 28–30 и 33 — тазики 2, сзади (28, 29) и спереди (30, 33); 31 и 34 — вульва; 32 — гоноподий, вид сбоку. Масштаб 0,1 мм.

syntypes (NHMW, 4 torsos of 2 ♂♂ and 2 ♀♀, one micropreparation without corresponding torso; an intact ♂ was thus selected as the lectotype, while the older paralectotype micropreparation was remounted and served for the new illustrations) allow for both variation and geographical ranges to be elucidated.

VARIATION: Body generally small (Table), pallid, sometimes a little pinkish, especially so anteriorly and posteriorly. Tergal sculpture very poorly developed, paraterga almost wanting, set particularly low though a little incised laterally even on midbody segments (Fig. 37). Head always broader than collum and somite 2 (Table); tergal setae minute, largely almost pointed. ♀ coxa 2 as in Fig. 39, vulva elongate (Fig. 40), epigynal ridge low, regularly rounded. Gonopod as in Fig. 38.

DISTRIBUTION as in Map.



Figs 35, 36. *Turanodesmus glaber* sp.n., ♂ holotype: 35 — anterior body part, dorsal view; 36 — metatergum 10, dorsal view. Scale 1.0 mm.

Рис. 35, 36. *Turanodesmus glaber* sp.n., ♂ голотип: 35 — передняя часть тела, вид сверху; 36 — метатергит 10, вид сверху. Масштаб 1.0 мм.

Turanodesmus tenuis Golovatch, 1979
Figs 41–44.

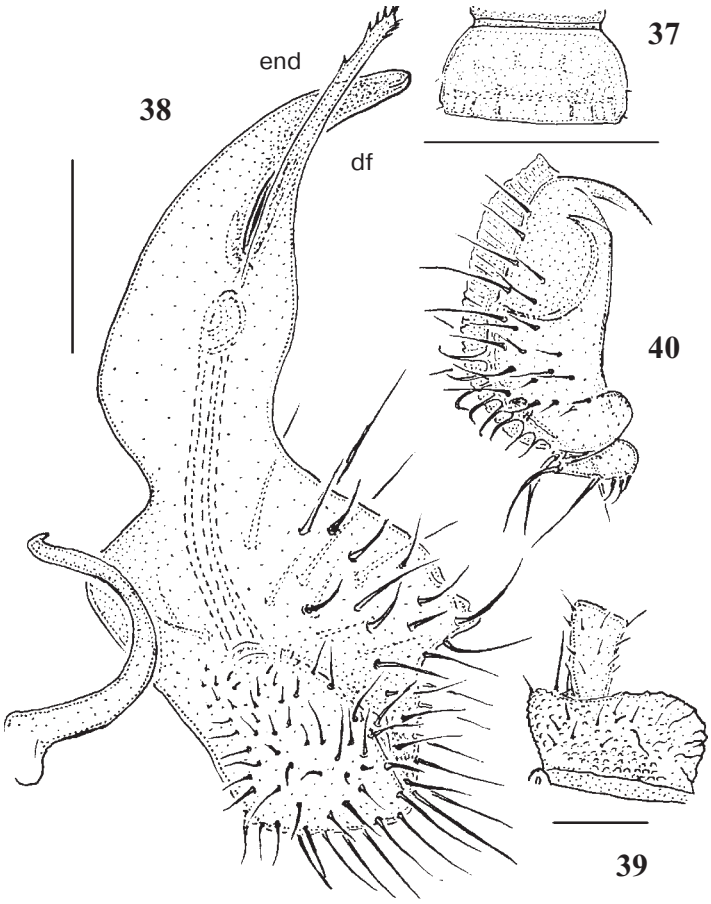
Turanodesmus tenuis Golovatch, 1979: 994, fig. 3 (1–2, 5–6) (D).

Turanodesmus tenuis — Read & Golovatch, 1994: 65 (N).

REMARKS: This species is only known from a few specimens deriving from Muminabad, Faizabad, Khodzha-Obi-Garm, Dangara (locus typicus), and Galaba near Kangurt, all in Tajikistan. The original description [Golovatch, 1979] seems fairly good, with the old illustrations provided here only for comparative purposes (Figs 42–45). The species is characterized by the rough metatergal sculpture, the narrow head (even in the ♂), and some particulars of gonopod structure. Vulva elongate, epigynal ridge like a low, slightly rounded, laterally a little angulate ridge.

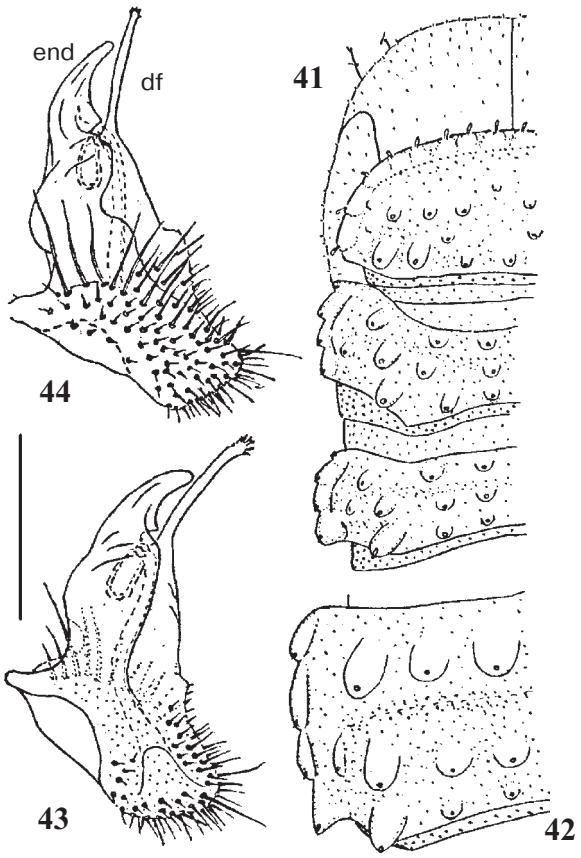
Turanodesmus cornutus **sp.n.**
Figs 45–48.

Holotype: ♂ (ZMUM), Kirghizia, Tien-Shang Mts, Fergan-



Figs 37–40.*Turanodesmus stummeri*(Attems, 1904), ♂ lectotype (37–38) and ♀ from Chon-Kyzyl-Su (39, 40): 37 — metatergum 10, dorsal view; 38 — gonopod, submesal view; 39 — coxa 2, caudal view; 40 — vulva. Scales 1.0 (37) and 0.1 mm (38–40).

Рис. 37–40.*Turanodesmus stummeri*(Attems, 1904), ♂ лектотип (37–38) и ♀ из Чон-Кызыл-Су (39, 40): 37 — метатергит 10, вид сверху; 38 — гоноподий, почти изнутри; 39 — тазик 2, вид сзади; 40 — вульва. Масштаб 1,0 (37) и 0,1 мм (38–40).



sky Mt. Range, Baubash-Ata Mts, near Arslanbob, 1800–1900 m, scrub, litter and under stones, 19.05.1993, leg. S. Golovatch. — Paratype: ♂ (ZMUM), same locality, 08–10.06.1982, leg. S. Zonstein.

NAME: Emphasizing the peculiar distoventrolateral horn on the gonopod coxite.

DESCRIPTION: Size medium (Table). Body pinkish-yellowish, more pinkish anteriorly, antennae (except for normal pallid tip) pinkish throughout; head, legs and venter a little paler. Head densely pilose, considerably broader than collum (Fig. 45 and Table). Metatergal sculpture very rough, especially so on collum and a few anteriormost somites, as usual three transverse rows of tubercles (Fig. 46). Tergal setae very short, subbacilliform, almost entirely abraded. Paraterga set relatively high (at about 1/4 midbody height), relatively well-developed, incised, caudal corner always rounded, especially tooth-like and reaching the caudal tergal contour only in somites 17 and 18. Ozopores lateral. Epiproct rather long, digitiform.

Legs long, distinctly incrassate. Sterna usual.

Gonopods (Fig. 47, 48) much like in *T. tenuis* or *T. inermis* but coxite with a conspicuous distodorsal process (**h**).

REMARKS: These samples have been misidentified by Read & Golovatch [1994] as belonging to *T. inermis*.

Turanodesmus cynodon **sp.n.**
Figs 49–54.

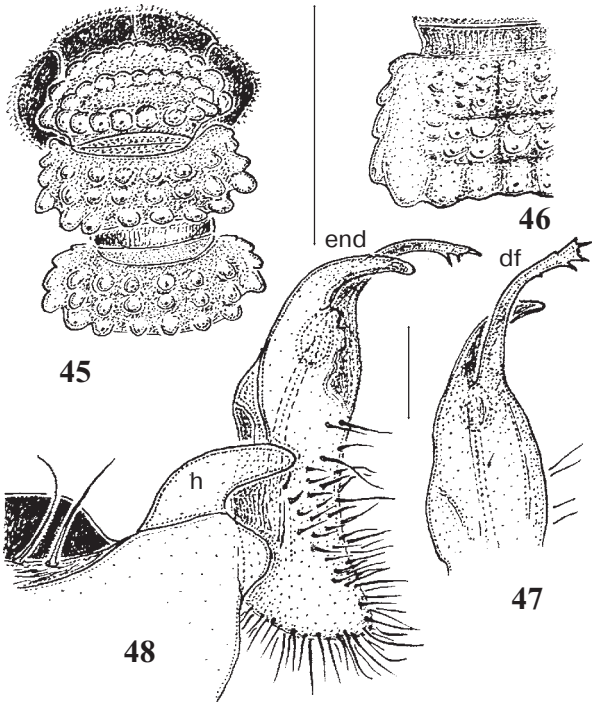
Holotype: ♂ (ZMUM), Uzbekistan, Djizak Area, Nuratinsky Reserve, Khayatsay River valley, 1200 m, 09.04.1990, leg. S. Dashdamirov. — Paratypes: 1 ♂ (ZMUM), 1 ♂ (NHMW), 1 ♂ (JS), same locality, together with holotype. — 2 ♂♂ (ZMUM), Kazakhstan, Zailiisky Mt. Range, 30 km E of Chimkent, Vannovka, 850 m, under stones, 06.04.1990, leg. S. Dashdamirov.

Non-type: 1 ♀ (ZMUM), Uzbekistan, Kitab Reserve, Djaus, Djindy-Darya and Khodja-Kurgan river basin, sparse *Juglans regia* forest, under bark and stones, 13.04.1990, leg. S. Dashdamirov.

NAME: Emphasizing the particularly strong metatergal tuberculation.

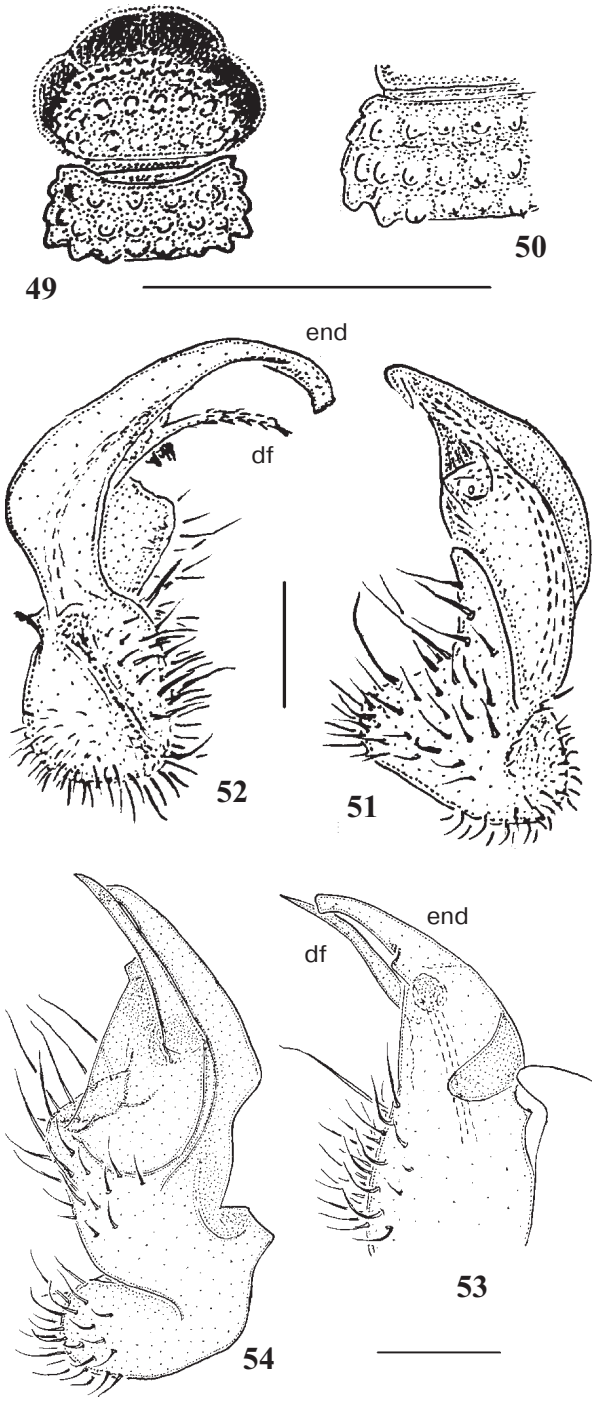
Figs 41–44.*Turanodesmus tenuis*Golovatch, 1979,♂ paratype: 41 — anterior body part, dorsal view; 42 — metatergum 11, dorsal view; 43 and 44 — gonopod, mesal and lateral views, respectively. Scales 0.3 (41, 42) and 0.2 mm (43, 44). (After Golovatch [1979]).

Рис. 41–44. *Turanodesmus tenuis* Golovatch, 1979, ♂ паратип: 41 — передний конец тела, вид сверху; 42 — метатергит 11, вид сверху; 43 и 44 — гоноподий, соответственно изнутри и сбоку. Масштаб 0,3 (41, 42) и 0,2 мм (43, 44). (По [Головач, 1979]).



Figs 45–48. *Turanodesmus cornutus* sp.n., ♂ paratype: 45 — anterior body part, dorsal view; 46 — metatergum 11, dorsal view; 47 and 48 — gonopod, mesal and lateral views, respectively. Scales 1.0 (45, 46) and 0.1 mm (47, 48).

Рис. 45–48. *Turanodesmus cornutus* sp.n., ♂ паратип: 45 — передний конец тела, вид сверху; 46 — метатергит 11, вид сверху; 47 и 48 — гоноподий, соответственно изнутри и сбоку. Масштаб 1,0 (45, 46) и 0,1 мм (47, 48).



Figs 49–54. *Turanodesmus cynodon* sp.n., ♂ paratype from Nuratinsky Reserve (49–52) and ♂ paratype from Vannovka (53, 54): 49 — anterior body part, dorsal view; 50 — metatergum 10, dorsal view; 51–54 — gonopod, submesal, lateral, submesal, and lateral views, respectively. Scales 1.0 (49, 50) and 0.1 mm (51–54).

Рис. 49–54. *Turanodesmus cynodon* sp.n, ♂ паратип из Нуратинского заповедника (49–52) и ♂ паратип из Ванновки (53, 54): 49 — передний конец тела, вид сверху; 50 — метатергит 10, вид сверху; 51–54 — гоноподии, соответственно почти изнутри, сбоку, почти изнутри и сбоку. Масштаб 1,0 (49, 50) и 0,1 мм (51–54).

DESCRIPTION: Size small (Table). Body entirely pallid to yellowish. Head densely pilose, considerably broader than collum (Fig. 49 and Table). Metatergal sculpture particularly rough, especially so on collum and a few anteriormost somites, as usual three transverse rows of high tubercles (Fig. 50). Tergal setae very short, subbacilliform to clavate. Paraterga set relatively high (at about 1/4–1/5 midbody height), relatively well-developed, incised, caudal corner always rounded, especially tooth-like and surpassing caudal tergal contour only in somite 18. Ozopores lateral. Epiproct rather short, digitiform.

Legs long, distinctly incrassate. Sterna usual.

Gonopods (Figs 51–54) much like in *T. inermis* but femorite swollen parabasally, sometimes endomerite serrate and longer than distofemoral process (Nuratinsky Reserve ♂♂, Figs 51, 52), sometimes vice versa with endomerite bare (Vannovka ♂♂, Figs 53, 54). Coxite with an inconspicuous distodorsal horn.

KEY TO *TURANODESMUS* SPECIES:

1(2) Metatergal sculpture on midbody somites almost wanting, without distinct tuberculation (Figs 1, 36), lateral edge of paraterga unincised 3

2(1) Metatergal sculpture/tuberculation evident, rarely poorly developed but lateral edge of paraterga remaining (sometimes poorly) incised 7

3(4) Gonopod endomerite stout, bifid distally; femorite with a conspicuous dorso-parabasal bulge (**bs**, Fig. 2) ..... *T. almassyi*

4(3) Gonopod endomerite digitiform, unipartite; femorite without such a conspicuous swelling dorso-parabasally.

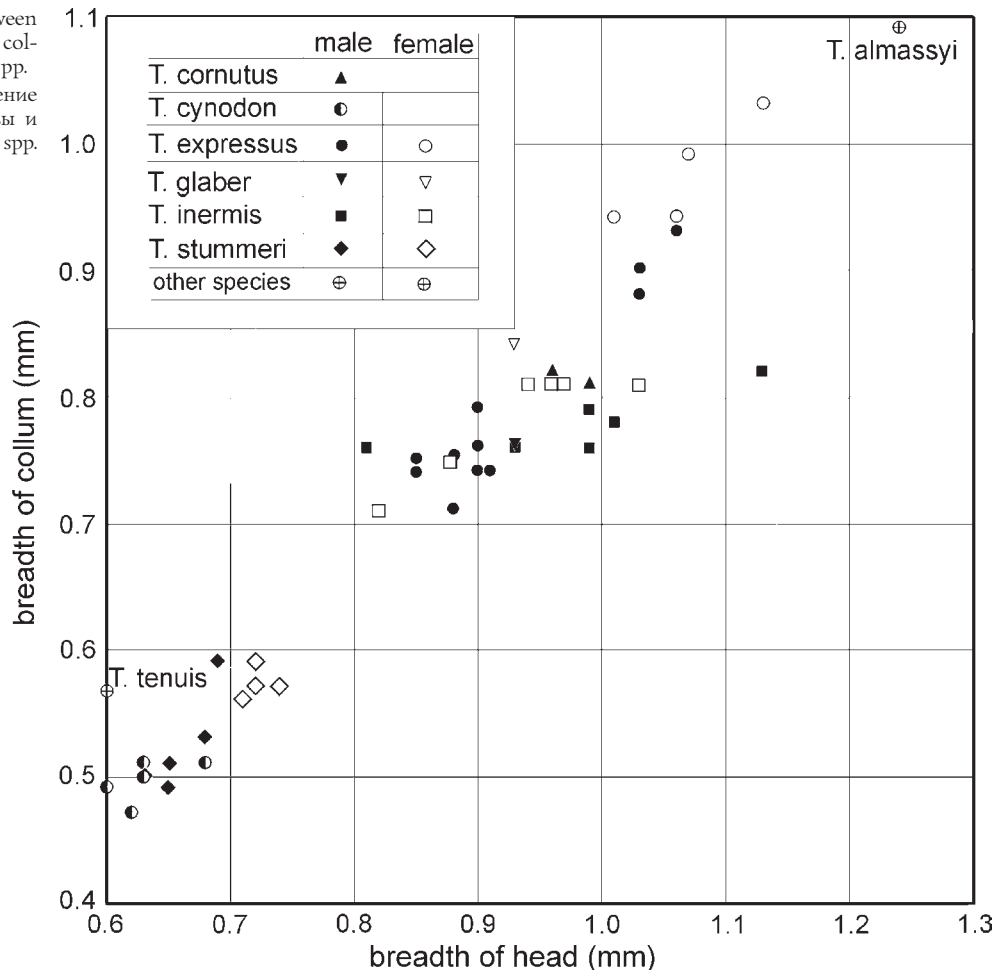


Fig. 55. Relation between breadth of head and of collum in *Turanodesmus* spp.

Рис. 55. Соотношение между шириной головы и коллума у *Turanodesmus* spp.

5(6) Body medium-sized, 13–14 mm long. Metazonite 10 larger, more than 0.85 mm. Base of gonopod endomerite with a tooth (Fig. 32). ♀ coxa 2 small, without lateral lobe (Fig. 33); epigynal ridge higher, bisinuate with a central lappet. Vulvae in situ positioned transversely, relatively short (Fig. 34) .... *T. glaber*

6(5) Body smaller, 7–9 mm long. Metazonite 10 narrower, less than 0.85 mm. Base of gonopod endomerite without tooth (Fig. 38). ♀ coxa 2 with a strongly developed lateral lobe (Fig. 39); epigynal ridge low, regularly rounded. Vulvae normal, positioned along main axis of body, elongate (Fig. 40) . *T. stummeri*

7(8) Metatergal tuberculation not too conspicuous, relatively poorly to moderately developed (Figs 7, 8, 13, 14), midbody paraterga laterally up to quite poorly incised. Body size highly variable, 8.5–19 mm long. Antennomeres 6 and 7 largely pallid, more or less contrastingly so compared to proximal pinkish antennomeres. Gonopod endomerite stout, bifid distally (Figs 9–12, 15–17) ..... *T. expressus*

8(7) Metatergal tuberculation much more distinct (Figs 3, 4, 26, 27, 41, 42, 45, 46, 49, 50), midbody paraterga invariably evidently incised laterally. Antennae largely monochromous (except for the usual whitish tip), entirely pallid to pinkish. Gonopod endomerite (unknown in *T. elevatus*!) digitiform, unipartite.

9(10) Metazonite 10 narrower, less than 0.85 mm .. 11

10(9) Metazonite 10 larger, more than 0.85 mm 13

11(12) Head subequal in width to collum. Caudal corner of paraterga pointed from somite 6 on. Gonofemorite relatively slender, always with a distinct tooth near base (Figs 43, 44) ..... *T. tenuis*

12(11) Head much broader than collum. Caudal corner of paraterga always rounded. Gonofemorite relatively stout, sometimes with a small tooth at base of endomerite (Figs 51–54) ..... *T. cynodon*

13(14) Gonopod coxite without distodorsal horn, endomorite with an evident tooth near base (Figs 21, 22) ..... *T. inermis*

14(13) Gonopod coxite with a prominent horn (**h**, Fig. 48), endomerite without distinct tooth near base .. .. *T. cornutus*

NB: *T. elevatus* keys out either as *T. inermis* or *T. cornutus*. Both males and females of these three species do not differ externally (Figs 3, 4, 26, 27, 45, 46). As the male of *T. elevatus* is not known, strictly topotypic material is the only solution.

Acknowledgments

We are most grateful to all collectors who entrusted us their material for treatment: Mr. S.A. Ovtchinnikov, Dr. S.L. Zonstein (both Bishkek), Dr. K.Y. Eskov, Dr. O.G. Gorbunov, Dr. A.V. Tanasevitch (all from Moscow), and Dr. S. Dashdamirov (Baku). Special thanks are due to all

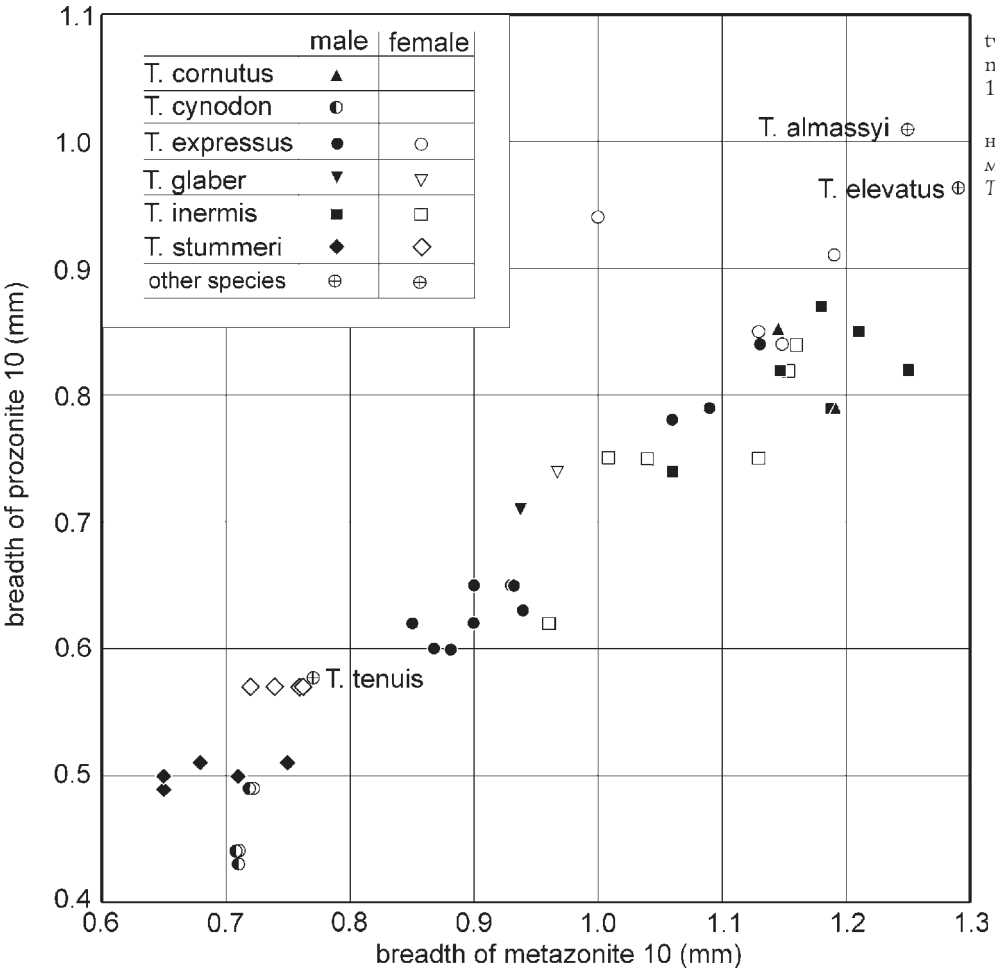


Fig. 56. Relation between breadth of metazonite 10 and of prozonite 10 in *Turanodesmus* spp.

Рис. 56. Соотношение между шириной мета- и прозонита 10 у *Turanodesmus* spp.

participants of the 1993 international expedition to the Tien-Shang Mountains: Prof. Dr. J. Martens (Mainz), Dr. W. Schawaller (Stuttgart), Dr. H. Read (Burnham Beeches), Mr. P. Read (Slough), Mr. D. Milko (Bishkek), Mrs. L. Gorbunova, Dr. L. Grigorieva as well as again Dr. O. Gorbunov, Dr. S. Zonstein, Mr. S. Ovtchinnikov, and Dr. S. Dashdamirov. We are greatly indebted to the following keepers involved: Dr. J. Gruber (NHMW), Dr. K. Mikhailov (ZMUM), and Dr. V. Ovtsharenko (ZIN). This study has been supported in part through a grant from the Russian Academy of Sciences, Biodiversity Project H11, rendered to one of us (SG).

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