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A review of *Trechus* (Coleoptera: Carabidae: Trechini) from the Doğu Karadeniz Dağları in northeastern Turkey

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Abstract

The species of *Trechus* Clairville, 1806 from the Doğu Karadeniz Dağları (Pontic Alps) in the eastern Black Sea region of Turkey are reviewed. Five new species are described: *Trechus* (s.str.) *catensis* sp.n., *T.* (s.str.) *goelkoeyensis* sp.n., *T.* (s.str.) *hemsinensis* sp.n., *T.* (s.str.) *legorskyi* sp.n., *T.* (s.str.) *ofensis* sp.n. In total 32 species are reported from this area, 28 are endemic. Diagnosis, ecological and distributional data of all endemic species are provided.

Key words: Carabidae, Trechinae, Trechini, *Trechus*, new species, taxonomy, Turkey.

Zusammenfassung

Die Arten der Gattung *Trechus* Clairville, 1806, welche im Doğu Karadeniz Dağları (Pontische Alpen) in der türkischen Schwarzmeerregion vorkommen, werden besprochen. Fünf neue Arten werden beschrieben: *Trechus* (s.str.) *catensis* sp.n., *T.* (s.str.) *goelkoeyensis* sp.n., *T.* (s.str.) *hemsinensis* sp.n., *T.* (s.str.) *legorskyi* sp.n., *T.* (s.str.) *ofensis* sp.n. Insgesamt werden 32 Arten aus dieser Region gemeldet. Diagnosen und Daten zur Faunistik und Ökologie werden zusammengestellt.

Introduction

The Doğu Karadeniz Dağları (Fig. 59) is a mountain range in northeastern Turkey and the eastern part of the Pontic Mountains. For the purpose of this work it is defined as the area limited by the Black Sea in the north, the river Kelkit in the west and south, and the river Çoruh in the southeast and east. In the east it is continued by the Karcal Dag, the western end of the Lesser Caucasus. In the south the Mescit Dağları forms a parallel range. These three ranges are well separated by the deep gorge of the Çoruh river and are inhabited by distinct endemic species of carabid beetles.

The northern parts of the range are characterized by high precipitation and frequent fog. The southern slopes are significantly drier (rain shadow). The northern slopes are covered by a complex mosaic of vegetation zones: the Colchian rainforest, a temperate, mixed rainforest with a rich undergrowth of *Rhododendron ponticum*, followed by a zone of subalpine shrubs (five species of *Rhododendron*) and pastures above (2000 to 2800 m a.s.l.) and finally an alpine zone with long-lasting snow fields above 2800 m a.s.l. The northern slopes are inhabited by an outstanding diverse fauna of Carabidae.

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Many endemic taxa, especially within the well-known carabid genera *Carabus* (Cavazzuti 2006), *Nebria* (Ledeux & Roux 2005), *Leistus* (Farkac & Wrase 2010), *Deltomerus* (Donabauer 2012), *Trechus*, *Calathus* (Battoni 1986), and *Pterostichus* (Hovorka & Skoupy 2007) have been described.

Material and methods

This is my fifth contribution to the knowledge of *Trechus* Clairville, 1806 from northern Turkey (Donabauer 2004, 2006, 2007a, 2007b). This study is based on approximately 1500 specimens of *Trechus* from the Doğu Karadeniz Dağları collected by the author during four field trips. A rich additional material from Dr. Michael Schülke, Prof. Herbert Franz and Franz Schubert could be included. This study is furthermore based on the revision by Pawlowski (1979) and the excellent work of Moravec & Zieris (1998).

The stacked photographs (Figs. 1 - 21) were taken with a Leica DCF490 camera attached to a Leica MZ16 binocular microscope with the help of Leica Application Suite V3 and processed with CombineZM and Adobe Photoshop 7.0 software.

Acronyms: DW – David Wrase (Berlin); MD – Martin Donabauer (Vienna); MS – Michael Schülke (Berlin); NMW – Natural History Museum Vienna.

Results

Organization of taxa in species groups

The genus *Trechus* consists of approximately 1000 taxa. In his worldwide monograph of Trechini Jeannel (1927) arranged the *Trechus* species in species groups instead of subgenera, partly based on morphological similarities, partly on geographic considerations. This concept is kept until today.

Jeannel (1927) was not aware of any of the endemic species treated here. Later he and several authors published significant contributions to the fauna of Turkey (Jeanne 1976, Pawlowski 1976, 1977, 1978, 1979) and of the Caucasus (Jeannel 1960, Belousov 1987, 1989, 1990, Kryzhanovskij 1995) increasing the number of the known species significantly. Unfortunately nobody proposed a convincing system of species groups and the arrangements of taxa strongly deviate from each other, even by the same author.

Modern phylogenetic or genetic studies on a broader sample of taxa are not available yet and out of the scope of this publication. Therefore species are arranged in very small groups in order to facilitate identification, but not necessarily useful for a broader understanding of the phylogeny of *Trechus*.

List of *Trechus* from the Doğu Karadeniz Dağları

***T.* (s.str.) *fritzbeneschi* group (= *T. maculicornis* group, partim)**

1. *T. fritzbeneschi* Donabauer, 2006 endemic
2. *T. ofensis* sp.n. endemic

***T.* (s.str.) *lebenbaueri* group (= *T. osmanilis* group, partim)**

3. *T. akkusianus* Donabauer, 2006 endemic

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4.	*T. barbaritae* Donabauer, 2004	endemic
5.	*T. goelkoeyensis* sp.n.	endemic
6.	*T. lebenbaueri* Donabauer, 2004	endemic
7.	*T. orduensis* Donabauer, 2007	endemic
8.	*T. uenyeensis* Donabauer, 2006	endemic
***T.* (s.str.) *lazicus* group (=*T. osmanilis* group, partim)**		
9.	*T. catensis* sp.n.	endemic
10.	*T. davidwrasei* Donabauer, 2007	endemic
11.	*T. dostali* Donabauer, 2007	endemic
12.	*T. heinzianus* Pawlowski, 1979	endemic
13.	*T. hemsinensis* sp.n.	endemic
14.	*T. kackardagi* Pawlowski, 1978	endemic
15.	*T. karadenizus* Pawlowski, 1976	endemic
16.	*T. lazicus* Pawlowski, 1976	endemic
17.	*T. legorskyi* sp.n.	endemic
18.	*T. michaeli* Pawlowski, 1978	endemic
19.	*T. schillhammeri* Donabauer, 2006	endemic
20.	*T. schuhi* Donabauer, 2007	endemic
21.	*T. weiserti* Donabauer, 2007	endemic
22.	*T. zetteli* Donabauer, 2007	endemic
23.	*T. ziganensis* Jeanne, 1976	endemic
***T.* (s.str.) *aquilus* group**		
24.	*T. ulrichi* Pawlowski, 1976	endemic
***T.* (s.str.) *infuscatus* group**		
25.	*T. cappadocicus* Pawlowski, 1976	endemic
26.	*T. witkowskii* Pawlowski, 1978	endemic
***T.* (s.str.) *quadristriatus* group**		
27.	*T. quadristriatus* (Schrank, 1781)	western Palearctic
***T.* (s.str.) *caucasicus* group**		
28.	*T. franzschuberti* Donabauer, 2006	endemic
29.	*T. viti* Pawlowski, 1977	endemic
***T.* (s.str.) *gravidus* group**		
30.	*T. gravidus* Putzeys, 1870	western and Lesser Caucasus, northeastern Turkey
***T.* (s.str.) *subnotatus* group**		
31.	*T. asiaticus* Jeannel, 1927	Anatolia
32.	*T. quadrimaculatus* Motschulsky, 1850	Lesser Caucasus, Caucasus and northwestern Iran

Trechus is represented by 32 species of which 28 are endemic (88%).

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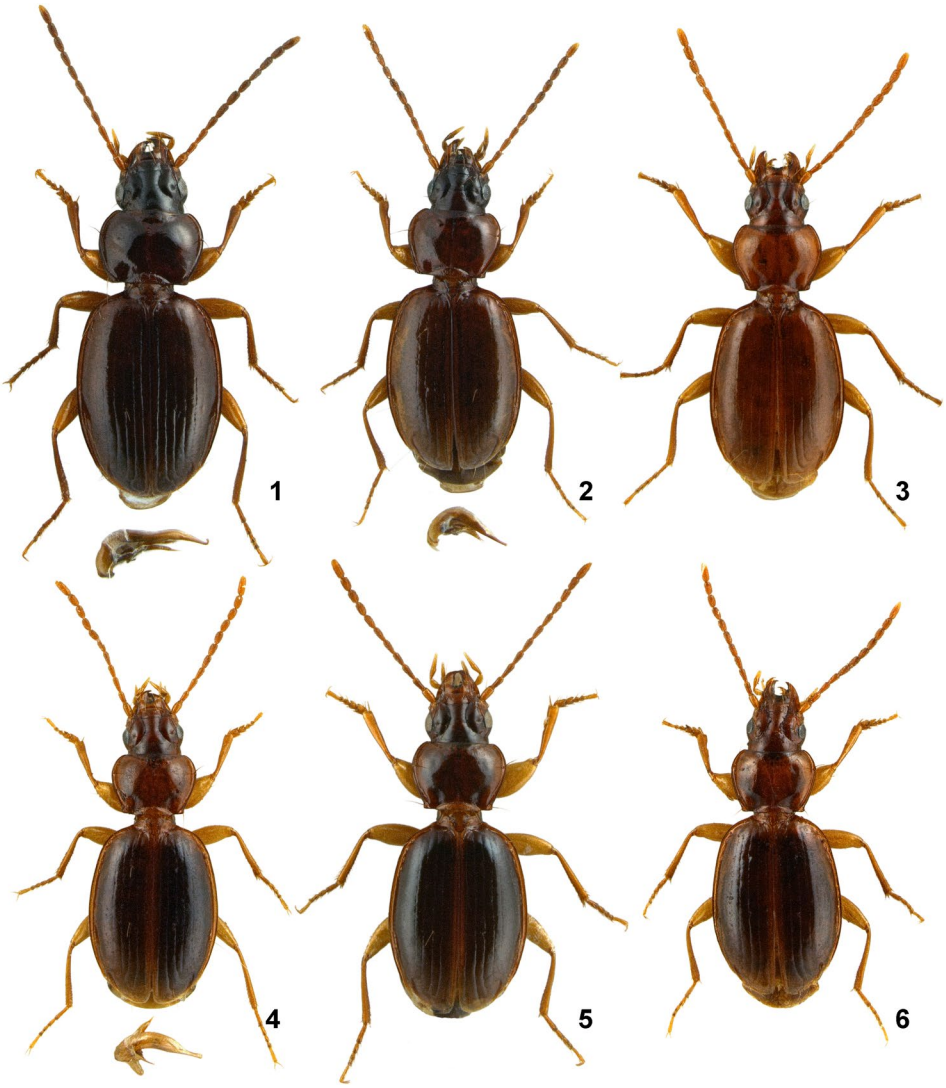

Figs. 1 - 6: Habitus of (1) *Trechus fritzbeneschi*, (2) *T. ofensis* sp.n., (3) *T. akkusianus*, (4) *T. lebenbaueri,* (5) *T. orduensis*, (6) *T. barbaritae.*

***Trechus* (s.str.) *fritzbeneschi* group** (= *T. maculicornis* group)

Body shape typical for forest dwelling species: medium sized, elytra moderately convex with moderately impressed and inpunctuate striae, moderately depigmented, uniformly reddish pale. Therefore similar to the *T. lazicus* group and *T. lebenbaueri* group, but differentiated by less constricted pronotum with basal angles more obtuse, male aedeagus with strongly developed sagittal lamella and simpler, propeller-shaped and smaller

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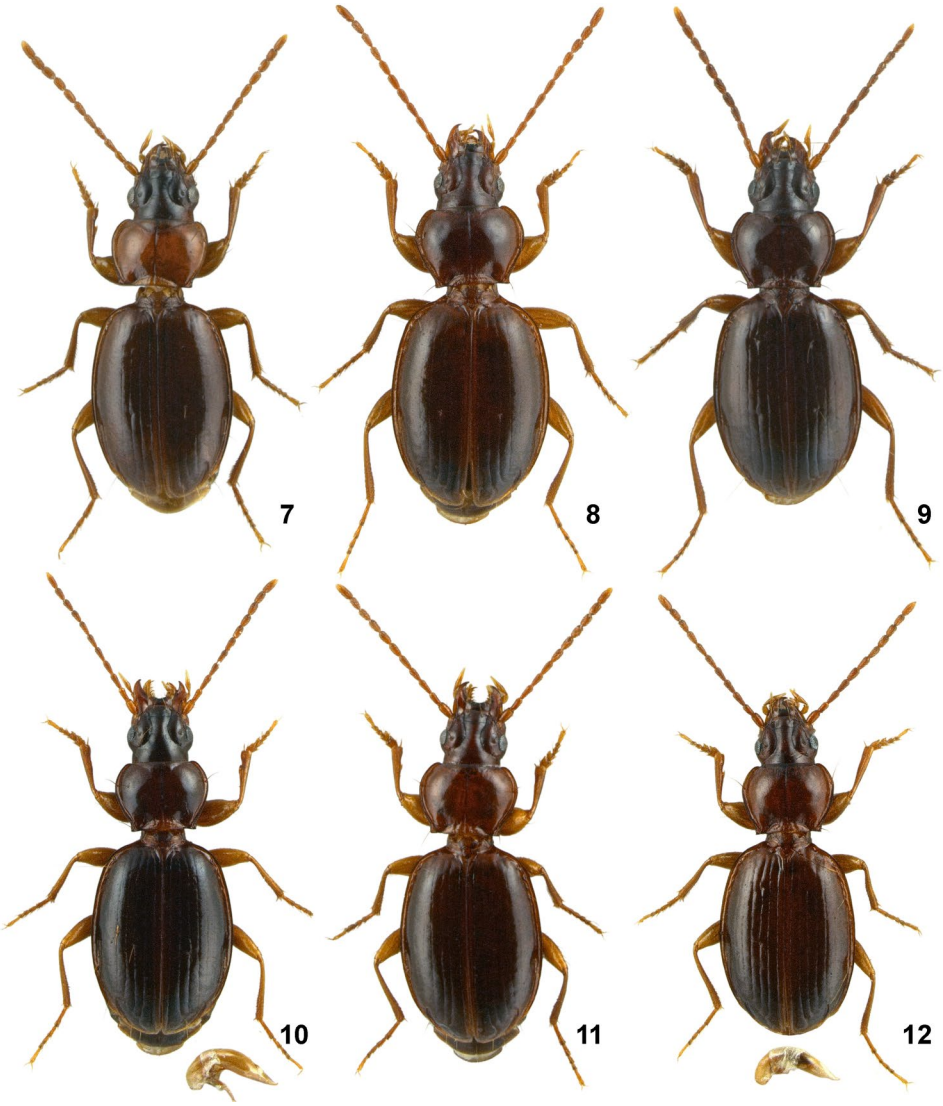

Figs. 7 - 12: Habitus of (7) *Trechus ziganensis*, (8) *T. dostali*, (9) *T. zetteli*, (10) *T. weiserti*, (11) *T. catensis* sp.n., (12) *T. lazicus*.

copulatory pieces. The configuration of aedeagus, habitus and color are most similar to those of *T. nivicola* Chaudoir, 1846 (Lesser Caucasus, central Caucasus) and *T. machardi* Jeanne, 1976 (Yalnizcam Dağları, Turkey), which have been placed in the *T. maculicornis* group by Pawlowski (1979) and Kryzhanovskij (1995). In respect of habitus both taxa are very similar to the winged *T. liopleurus* from the Lesser Caucasus (*T. liopleurus* group).

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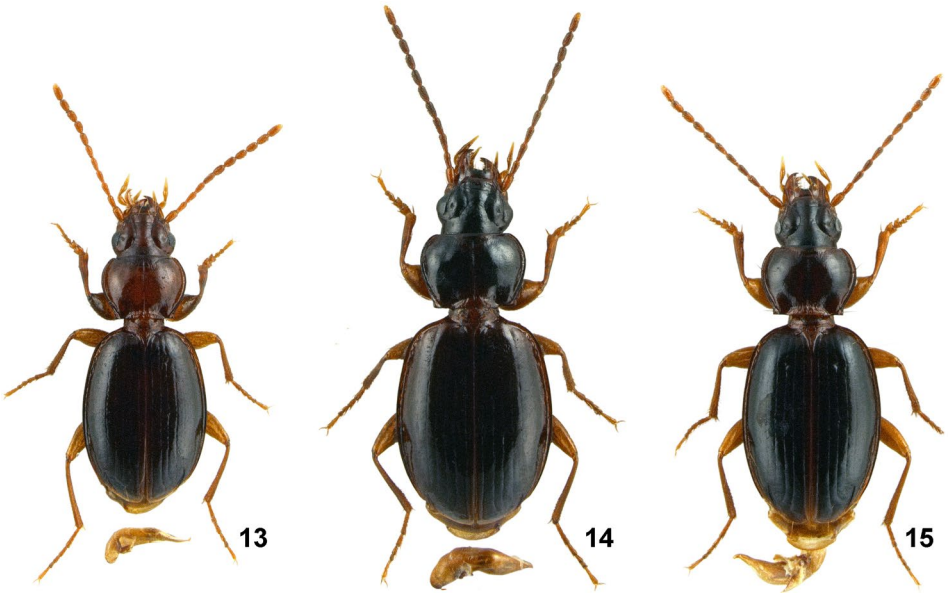

Figs. 13 - 15: Habitus of (13) *Trechus kackardagi,* (14) *T. heinzianus*, (15) *T. karadenizus.*

***Trechus fritzbeneschi* Donabauer, 2006** (Figs. 1, 22, 61)

Type locality: Rize, Ikizdere.

Material examined: Trabzon: 2 ex.: prov., Of env., Balaban S, ca. 40.7200°N, 40.3560°E, 1600 m, 23.X.2010, leg. MD (coll. MD). Rize: 1 ex. (holotype): Ikizdere, 26.VI.1976, leg. F. Schubert (coll. NMW); 14 ex.: Ikizdere env., Camliköy, 1350 m, 40.70974°N, 40.6410°E, 15.VII.2010, leg. MD (coll. MD); 10 ex.: Ikizdere env., Tozköy, 1400 m, 40.6546°N, 40.5807°E, 24.X.2012, leg. MD (coll. MD); 1 ex.: Ikizdere env., Tozköy, 1400 m, 40.6678°N, 40.5823°E, 24.X.2012, leg. MD (coll. MD); 1 ex.: Ikizdere env., Yetimhoca, 1600 m, 40.7497°N, 40.7041°E, 24.X.2012, leg. MD (coll. MD); 2 ex.: ca. 40 km SSE Rize, W Sivrikaya, 2050 m, 40°41'27"N, 40°38'44"E, 1.VIII.2006, leg. M. Schülke (coll. DW); 2 ex.: ca. 35 km SSE Rize, S Camisk, 1380 m, 40°42'33"N, 40°38'36"E, 1.VIII.2006, leg. M. Schülke (coll. MD).

Diagnosis: This species is immediately recognized by larger body size, broad pronotum with more obtuse basal angles, uniform reddish colour (Fig. 1) and extraordinary large and elongated aedeagus with hooked apex (Fig. 22).

Ecology: *Trechus fritzbeneschi* is not common, restricted to the upper forest zone around Ikizdere in the western Kackar Dag (Fig. 61). All specimens were sifted from leaf litter, needle duff or moss in humid and shaded places.

***Trechus ofensis* sp.n.** (Figs. 2, 23, 61)

Type locality: Trabzon, south of Balaban.

Type material: Holotype (♂, coll. MD) and 16 paratypes (11 ♂♂, 5 ♀♀): Turkey NE, Trabzon prov., Of env., Balaban S, ca. 40.7200°N,40.3560°E, 1600 m, 23.X.2010, leg. MD (coll. MD).

Etymology: Named after the small town "Of" at the Black Sea coast in the province of Trabzon, close to the type locality.

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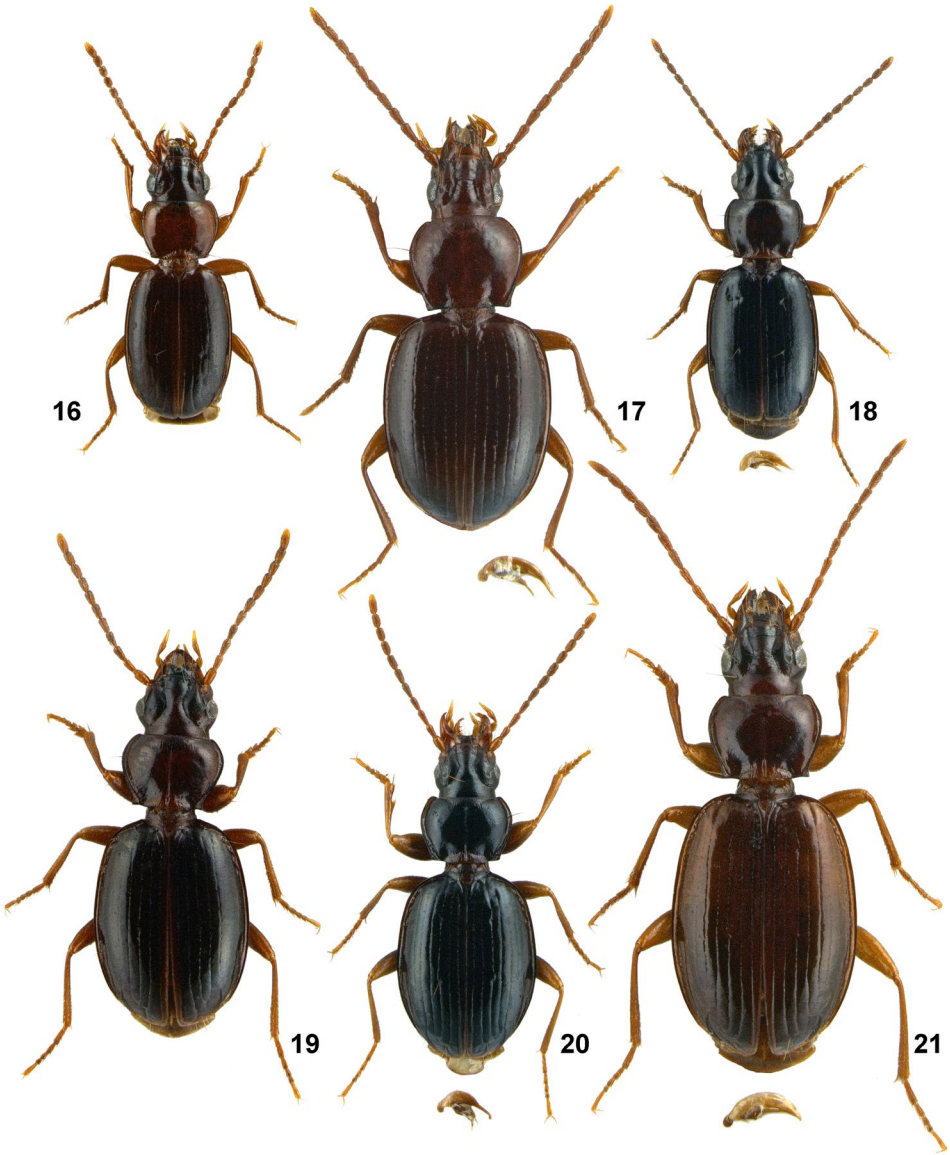

Figs. 16 - 21: Habitus of (16) *Trechus cappadocicus*, (17) *T. gravidus*, (18) *T. ulrichi,* (19) *T. franz-schuberti*, (20) *T. viti*, (21) *T. quadrimaculatus.*

D i a g n o s i s : This new species is closest related to *T. fritzbeneschi* and almost identical in most characteristics, but can be easily recognized by significantly smaller body size (compare Figs. 1 and 2) and a much shorter aedeagus with unmodified apex (compare Figs. 22A and 23A). The shape of the male's aedeagus is more similar to those of the *lebenbaueri* group, but with a strongly developed sagittal lamella and rather different copulatory pieces that resemble those of *T. fritzbeneschi*.

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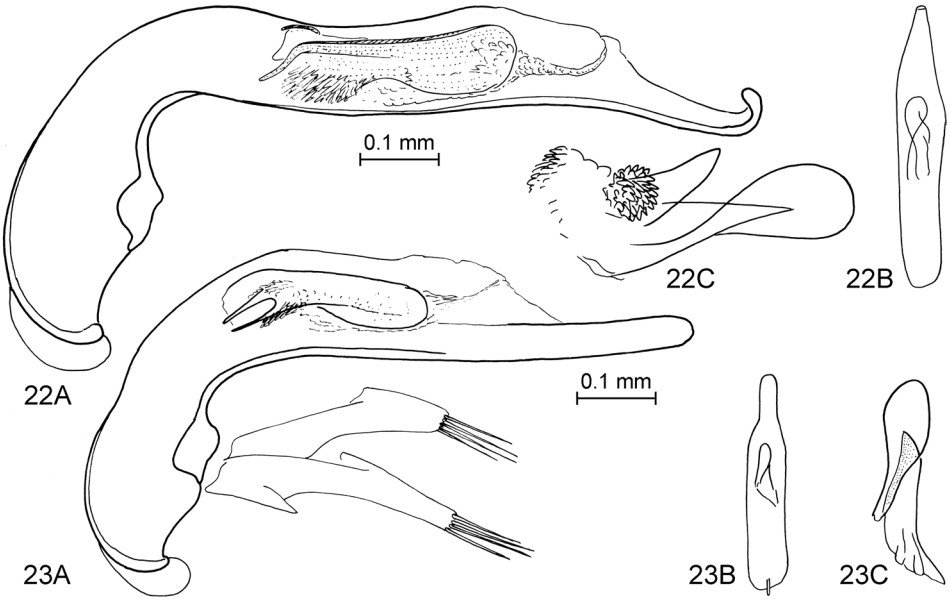

Figs. 22 - 23: Aedeagi of *Trechus* species in lateral (A) and dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (22) *T. fritzbeneschi*, (23) *T. ofensis* sp.n. (B not on scale).

Description: BL 3.15 - 3.75 mm. Measurements and proportions see Table 1. Body rather flat. Body entirely reddish pale, but head often distinctly darker (color patterns distinct to *T. lebenbaueri* group, identical to *T. fritzbeneschi*); legs entirely pale, slightly contrasting to elytra; antenna pale reddish.

Head with strong microsculpture; elytra and pronotum shinier and with less developed, but clearly visible microsculpture (examined at 40 × magnification). Antenna slender, of normal length. Eyes moderately reduced in size, length of temples slightly shorter than eye diameter.

Pronotum large, moderately rounded laterally, convex on disc, maximal width before middle, moderately constricted towards broad base, slightly sinuate before small and slightly obtuse basal angles, lateral furrow narrow, anterior and posterior margins nearly straight; front angles rounded and not prominent; basal foveae almost absent; basal furrow strongly impressed; median line distinct, shallow, almost extended to margins.

Elytra elongated ovate, strongly flattened on disc, shoulders completely rounded and not prominent; inner striae (1 - 4) fine, not punctured, all other striae hardly visible or indistinct; stria 3 with two weakly impressed and small dorsal pores.

Aedeagus in lateral view (Figs. 23A-C) similar to *T. lebenbaueri* group (compare to Figs. 24 - 29) in several aspects: aedeagus large, strongly curved in basal part, straight in middle and apical part, slender, but basal bulbus enlarged (smaller in the *T. lebenbaueri* group) with clearly developed sagittal lamella (almost absent in *T. lebenbaueri* group), apical part straight and rather thick, simple, apex simple without modifications. Aedeagus in dorsal view similar to aedeagi of the *T. lebenbaueri* group by slender shape, sudden constriction before apex, and parallel-sided, thin apex with shortly rounded tip

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(bottle-shaped). Copulatory pieces smaller, less sclerotized, simpler than in the *T. lebenbaueri* group, the apical plate of the larger piece in different position, parallel to lateral border. Configuration of copulatory pieces, large basal bulbus, presence of a sagittal lamella of aedeagus are most similar to those of *T. fritzbeneschi* and *T. nivicola* from the Lesser Caucasus.

Ecology: This species was collected at a single site (Fig. 61) from leaf litter samples beside springs (humid to wet, half shaded) in *Alnus* and *Rhododendron* shrubs just beside the main road. It was the most common *Trechus* at this site and collected together with *T. fritzbeneschi* and *T. gravidus*. I took several other sifting samples in the same river valley at higher elevations (1700 - 2000 m), which consequently resulted in common findings of *T. dostali*, *T. viti* and *T. fritzbeneschi*, but no additional *T. ofensis*. Distribution is unknown, but likely extremely restricted.

***Trechus* (s.str.) *lebenbaueri* group** (= *T. osmanilis* group, partim)

Diagnosis: Six very similar species characterized by: body size rather small, colour reddish pale, elytra paler along suture and lateral border; pronotum with hardly impressed basal foveae, lateral margins narrow and hardly sinuate before small basal angles; aedeagus large, slender, apex narrow and parallel-sided in dorsal view, aedeagus therefore bottle-shaped, tip of apex knobbed or simple, never hooked, larger copulatory piece very large and complex, like a folded leaf with more or less fused basal part, and second piece small or absent (Figs. 1A - 6C). This group is very close to the *T. osmanilis* group (northwestern Turkey) and *T. lazicus* group (northeastern Turkey) as indicated by the ventral position of the large copulatory piece of the aedeagus.

Ecology: All taxa are restricted to the western part of the range (Fig. 60). Distribution areas are extremely limited and likely parapatric. All specimens have been collected in leaf litter in the forest zone at low or medium altitudes.

***Trechus akkusianus* Donabauer, 2006** (Figs. 3, 24, 60)

Type locality: Ordu, Akkus.

Material examined: Ordu: 5 ex. (holotype and paratypes): Akkus, VIII.1977, leg. F. Schubert (coll. NMW, MD); 6 ex. (paratypes): idem, 3.-5.VI.1961, leg. F. Schubert (coll. NMW, MD); 2 ex.: WSW of Ordu, Niksar, VII.1972, leg. F. Schubert (coll. NMW, MD); 2 ex. (paratypes): 18 km NE Akkus, 920 m, 40°56'03N, 37°06'47E, 15.VII.2008, leg. MS (coll. MD).

***Trechus uenyeensis* Donabauer, 2006** (Figs. 25, 60)

Type locality: Ordu, Ünye.

Material examined: Ordu: 18 ex. (holotype and paratypes): Ünye, VII.1972, leg. F. Schubert (coll. NMW, MD).

***Trechus lebenbaueri* Donabauer, 2004** (Figs. 4, 26, 60)

Type locality: Ordu, Gürgentepe gecidi.

Material examined: Ordu: 29 ex. (holotype and paratypes): Gürgentepe gecidi, 1000 - 1200 m, 31.V.2003, leg. MD (coll. MD).

***Trechus goelkoeyensis* sp.n.** (Figs. 27, 60)

Type locality: Ordu, Gölköy.

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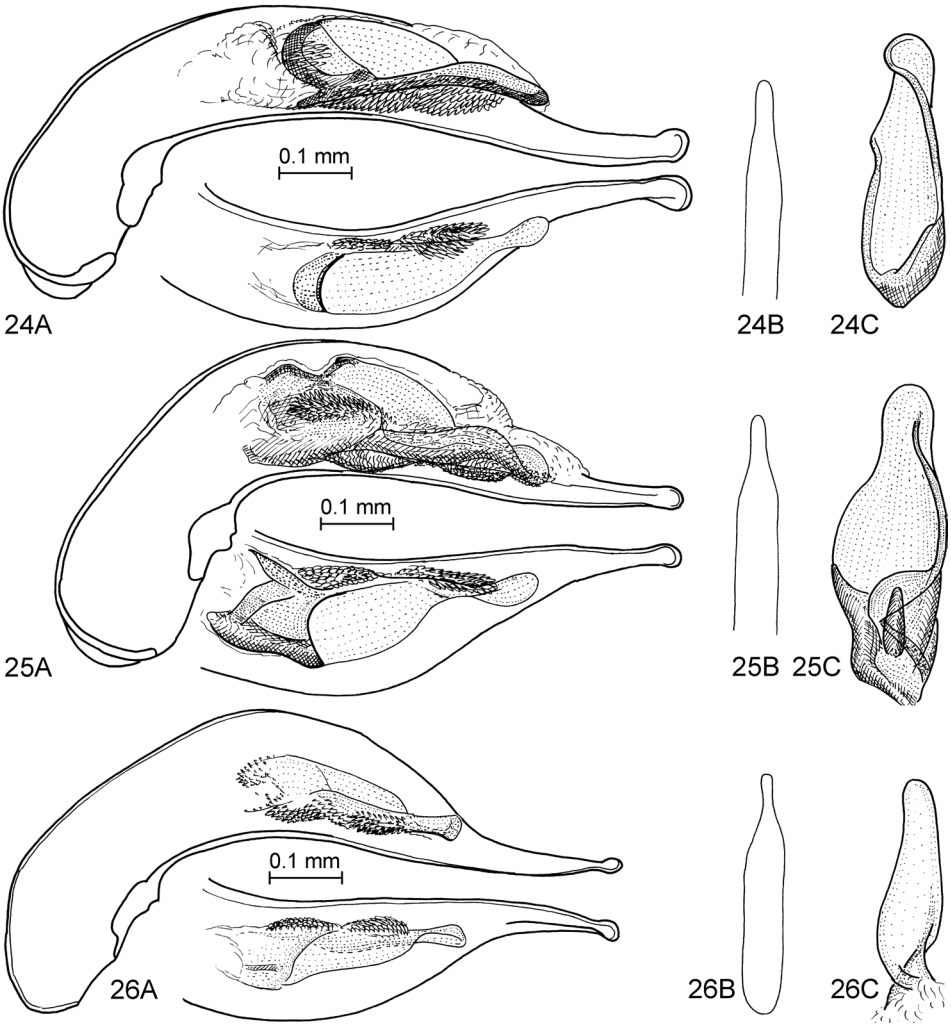

Figs. 24 - 26: Aedeagus of *Trechus* species in both lateral views (A) and in dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (24) *T. akkusianus*, (25) *T. uenyeensis*, (26) T. lebenbaueri (B not on scale).

Type material: Ordu: Holotype (♂) (coll. DW) and 12 paratypes (10 ♂♂, 2 ♀♀) (coll. DW, MD): 11 km W Gölköy, 40°41'28N, 37°29'59E, 1040 m, 22.VII.2008, wet stream valley, leg. MS.

Etymology: This species is named after the village Gölköy, close to the type locality.

Diagnosis: This new species can be recognized by the concave sinuation of the dorso-apical border of the copulatory piece in lateral view (marked with an arrow in Fig. 27).

Description: BL 3.4 - 3.7 mm. Measurements and proportions see Table 1. Body moderately convex. Body pale reddish, but disc of elytra darker, elytra along the suture and along sides paler; legs entirely pale; antenna pale reddish.

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Tab. 1: Measurements (mm) and proportions of new species. Avg – average; Min – minimum; Max – maximum; N – number of specimens; HT – holotype; PT – paratype; BL – body length from labrum to apex of elytra; HW – head width including eyes; PWA – width of pronotum between front angles; PWM – maximal width of pronotum; PWB – width of pronotum between basal angles; PL – length of pronotum; EW – maximal width of elytra; EL – length of elytra; AL – length of antenna; AE – maximal length of aedeagus in lateral view (diagonal).

	BL	HW	PWA	PWM	PWB	PL	EB	EL	AL	AE	EL/ EB	PB/ PL	AL/ BL	AE/ EL
***Trechus ofensis* sp.n.**														
Avg	3.41	0.73	0.70	1.03	0.70	0.72	1.48	2.03	1.83	0.95	1.38	1.45	0.54	0.46
Min	3.15	0.70	0.65	0.95	0.65	0.68	1.40	1.95	1.70	0.93	1.35	1.41	0.51	0.46
Max	3.75	0.75	0.75	1.10	0.75	0.75	1.55	2.13	1.90	0.98	1.40	1.50	0.55	0.47
N	8	8	8	8	8	8	8	8	8	4	8	8	8	4
***Trechus goelkoeyensis* sp.n.**														
Avg	3.54	0.74	0.68	0.99	0.68	0.73	1.53	2.10	1.87	1.14	1.37	1.37	0.53	0.53
Min	3.40	0.70	0.63	0.93	0.63	0.68	1.45	2.00	1.75	1.13	1.35	1.31	0.51	0.53
Max	3.70	0.78	0.75	1.10	0.75	0.78	1.63	2.20	1.98	1.18	1.42	1.42	0.54	0.54
N	8	8	8	8	8	8	8	8	8	4	8	8	8	4
***Trechus legorskyi* sp.n.**														
HT	3.65	0.75	0.73	1.10	0.73	0.75	1.58	2.25	1.88	1.20	1.43	1.47	0.51	0.53
PT	3.50	0.70	0.68	0.95	0.68	0.70	1.45	2.00	1.75	0.00	1.38	1.36	0.50	
***Trechus hemsinensis* sp.n.**														
Avg	3.18	0.69	0.63	0.96	0.63	0.67	1.36	1.92	1.71	1.01	1.41	1.45	0.54	0.51
Min	3.05	0.65	0.58	0.90	0.58	0.63	1.30	1.80	1.55	0.98	1.36	1.37	0.51	0.49
Max	3.40	0.73	0.65	1.05	0.65	0.70	1.43	2.05	1.88	1.03	1.45	1.50	0.56	0.53
N	8	8	8	8	8	8	8	8	8	4	8	8	8	4
***Trechus catensis* sp.n.**														
Avg	3.29	0.69	0.65	0.97	0.65	0.70	1.44	1.96	1.71	0.98	1.36	1.38	0.52	0.50
Min	3.15	0.65	0.60	0.93	0.60	0.68	1.38	1.83	1.63	0.98	1.33	1.34	0.51	0.47
Max	3.55	0.73	0.68	1.03	0.68	0.75	1.58	2.10	1.85	1.00	1.40	1.43	0.54	0.53
N	8	8	8	8	8	8	8	8	8	4	8	8	8	4

Head with strong microsculpture; elytra and pronotum shinier and with less developed, but clearly visible microsculpture (examined at 40 × magnification). Antenna moderately slender, of normal length. Eyes moderately large, slightly reduced in size, length of temples shorter than eye diameter.

Pronotum moderately rounded laterally, convex on disc, maximal width before middle, moderately constricted towards base, slightly sinuate before small and slightly obtuse basal angles, anterior and posterior margins nearly straight; front angles rounded and not prominent; basal angles moderately projecting; basal foveae present but very weakly impressed; basal furrow strongly impressed; median line distinct, very shallow, almost extended to margins.

Elytra ovate, rather convex, slightly flattened on disc, shoulders completely rounded and not prominent; inner striae (1-4) fine but clearly impressed, not punctuate, all other striae hardly visible or indistinct; stria 3 with two weakly impressed and small dorsal pores.

Aedeagus in lateral view (Fig. 27A) typical for the *T. lebenbaueri* group, apex slightly knobbed at tip. Aedeagus in dorsal view (Fig. 27B) almost straight, elongate and slender, apex slightly asymmetric. Copulatory pieces (Fig. 27C) of typical shape for *T. lebenbaueri* group; second smaller piece absent (present in the more eastern *T. barbaritae* and *T. orduensis*); larger part with a large and complicated, heavily sclerotized basal part as in *T. uenyeensis* (significantly smaller or absent in *T. akkusianus* and *T. lebenbaueri*) and

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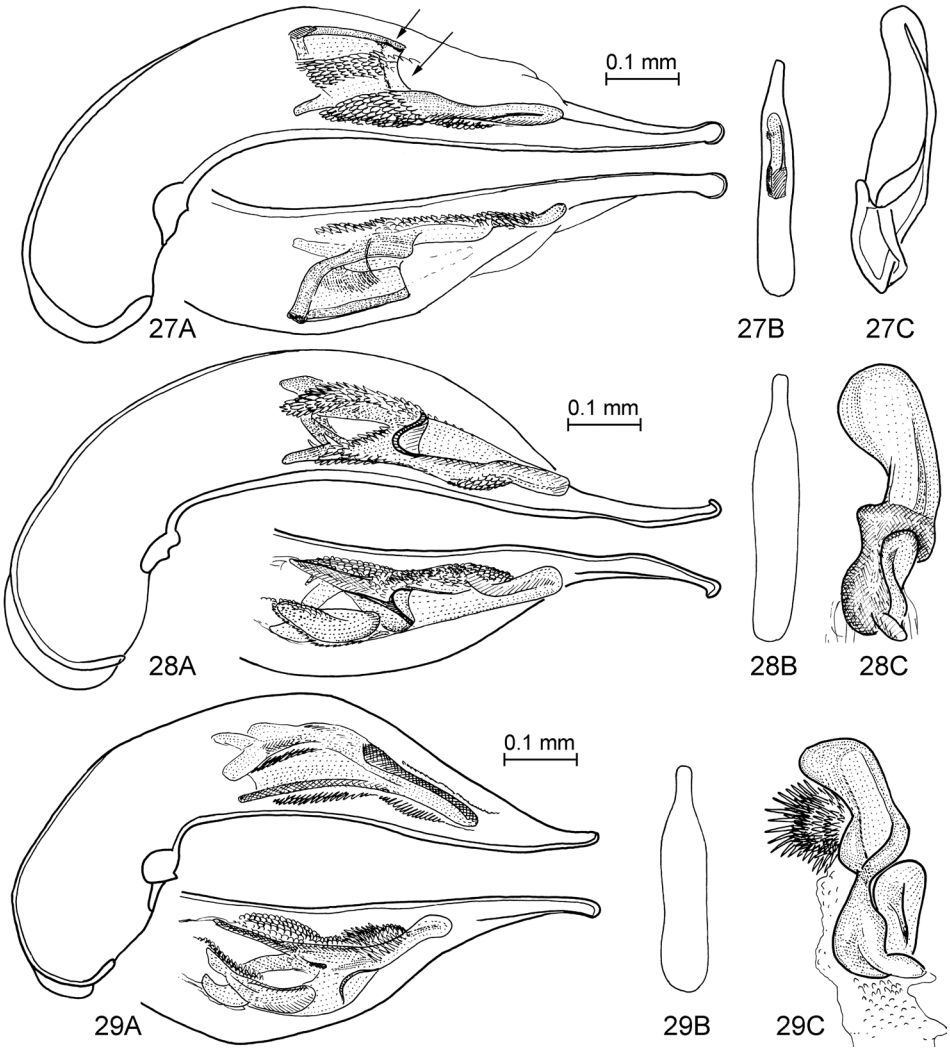

Figs. 27 - 29: Aedeagus of *Trechus* species in both lateral views (A) and in dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (27) *T. goelkoeyensis* sp.n., (28) *T. orduensis*, (29) *T. barbaritae* (B not on scale).

finally immediately distinguished from all other five species by the concave sinuation of the dorsal-apical border of the copulatory piece in lateral view (marked with an arrow in Fig. 27A; convex or straight in all other taxa).

Remarks: This new species is another endemic species of the area west of Giresun, an area of high endemism but incompletely studied so far. It is closest to *T. uenyeensis* in respect to aedeagal morphology and was collected in 15 km distance to *T. lebenbaueri* (Fig. 60).

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Trechus orduensis **Donabauer, 2007** (Figs. 5, 28, 60)

Type locality: Ordu, Ordu.

Material examined: Ordu: 21 ex. (holotype and paratypes): 15 km S Ordu, S Kabaduz, 990 m (grassy roadside), 40°48'49"N, 37°54'28"E, 30.VII.2006, leg. MS (coll. DW, MD).

Trechus barbaritae **Donabauer, 2004** (Figs. 6, 29, 60)

Type locality: Giresun, Giresun.

Material examined: Giresun: 16 ex. (holotype and paratypes): Giresun env., road to Egribel pass, 100-300 m, 3.VI.2003, leg. MD (coll. MD).

Trechus **(s.str.)** ***lazicus*** **group** (= *T. osmanilis* group, partim)

Diagnosis: This group is defined by:

1) Habitus (Figs. 7 - 12) very similar to those of the *T. lebenbaueri* group, but pronotum with more pointed and prominent basal angles, broader lateral furrows, and basal foveae more impressed.

2) Aedeagus (Figs. 30 - 48) thicker, with shorter apex than in the *T. lebenbaueri* group. Apex in dorsal view never narrow and parallel-sided, but equally constricted to the pointed tip, often twisted to the left. Apex in lateral view simple or frequently modified, most often turned up at tip. Sagittal lamella of aedeagus absent.

3) Copulatory pieces (Figs. 30 - 48) of the aedeagus very large, highly asymmetric and complicated. The larger part is formed by a ventral plate or antler-shaped part with two ends, sometimes partly reduced or even split: a shorter right ventral (RV) part and a significantly longer left ventral (LV) part. This plate is connected by a complex, ring-like basal construction with a dorsal spine (D) of very variable length, sometimes entirely reduced (see Fig. 32C). Beside that there sometimes exists a simple and much smaller second copulatory piece.

Remarks: This is by far the most diverse group in northeastern Turkey with 15 species known so far and distributed in the central and eastern part of the range (Figs. 60 - 63). *Trechus skoupyi* Morevec & Zieris, 1998 from south of Kackar Dag and *T. michaeli* Pawlowski, 1978 from Karcal Dag (east of Kackar Dag) belong here as well.

Trechus tshitsherini Belousov, 1987 and *T. arnoldii* Belousov, 1987 and several other taxa from the western Caucasus (compare Belousov 1987: figs. 6 - 7) are closely related without doubt, but assigned to the *T. liopleurus* group by original description. Based on the general morphology of the aedeagus and the similarities in habitus to the *T. lazicus* group, the *T. lebenbaueri* group, the *T. osmanilis* group from northwestern Turkey and finally at least parts of the *T. maculicornis* group, the *T. liopleurus* group and the *T. bradycelloides* group should be combined in one "lineage", group or subgenus, the *T. osmanilis* group sensu Donabauer 2007b. The general shape and position of copulatory pieces indicate a possible relationship to the lineage *T. montanellus-constrictus-pallidulus-latus* from the Alps and Carpathians.

Ecology: Most species are living in the leaf litter in forests and under shrubs (especially *Rhododendron* and *Alnus*) and are moderately hygrophilous. *Trechus heinzianus* is strongly hygrophilous. At least four species penetrate the lower alpine zone, where they live in meadows under stones with sufficient humidity. None of the taxa is strictly alpine.

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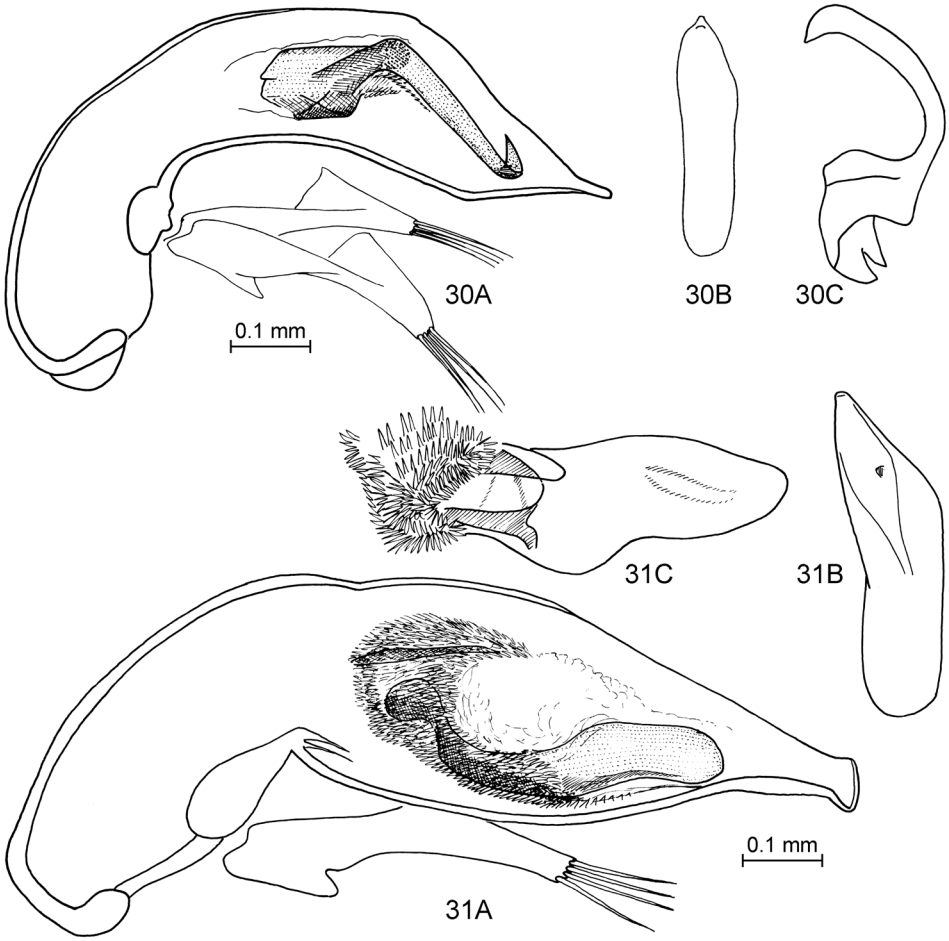

Figs. 30 - 31: Aedeagi of *Trechus* species in lateral (A) and dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (30) *T. ziganensis*, (31) *T. heinzianus* (B not on scale).

***Trechus ziganensis* Jeanne, 1976** (Figs. 7, 30, 60, 62)

Type locality: Trabzon, Zigana Gecidi.

Material examined: Trabzon: 2 ex.: Üzüngöl env., Sogandli Gecidi, 2100 - 2200 m, at snowfield, 10.VII.2010, leg. MD (coll. MD); 14 ex.: ca. 40 km S of Of, Uzungöl, 40°35'57N, 40°16'56E, 2050 m, 4.VIII.2006 (grass, moss sift), leg. MS (coll. MD).

Remarks: Further locations reported by Moravec & Zieris (1998): Giresun: Yavuzkemal at Dereli, 2100 m; Sehitler Gecidi, 2300 m; Ordu: Harcbeli Gecidi, 1590 m.

Diagnosis: This species is characterized by its unique aedeagus shape (Fig. 30) and copulatory pieces. Nevertheless external characteristics (Fig. 7) fit perfectly to those of the *T. lazicus* group. The copulatory pieces are derived by reduction of RV and D and extreme prolongation of LV, which can be observed in different combinations in other species. Therefore I do not follow Pawlowski (1979), who erected a monotypic group for *T. ziganensis*.

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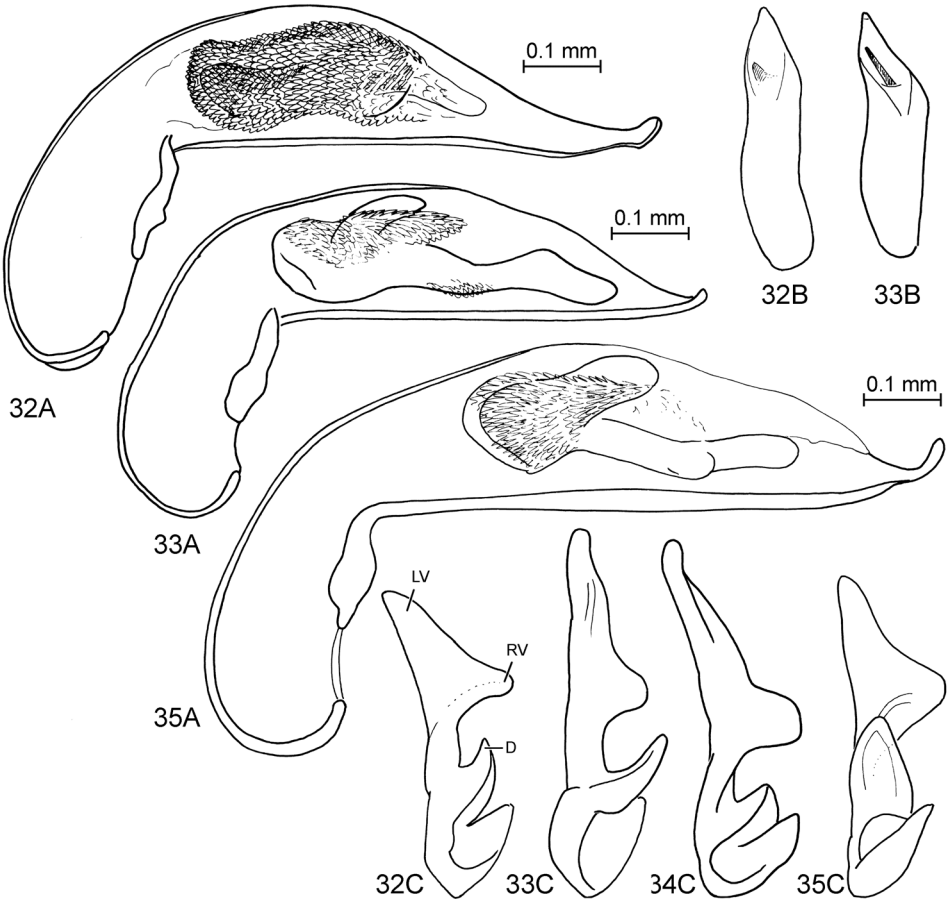

Figs. 32 - 35: Aedeagi of *Trechus* species in lateral (A) and dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (32) *T. dostali*, (33, 34) *T. zetteli,* (35) *T. legorskyi* sp.n. (B not on scale).

Ecology: This species is endemic and rather widespread in the central part of the range. Collection data indicate a preference for shrubs and open meadows at or above timber line (most other species prefer forest habitats). I collected this species close to a large snow field together with *T. ulrichi* and *Deltomerus legorskyi* Donabauer, 2012.

***Trechus heinzianus* Pawlowski, 1979** (Figs. 14, 31, 61)

Type locality: Rize, Ayder.

Material examined: Rize: 1 ex.: Ceymakcur Yayla, 40.9185°N, 41.1639°E, 1950 m, 11.VII. 2010, leg. MD (coll. MD); 5 ex.: idem, 40.9258°N, 41.1587°E, 1850 m, 11.VII.2010, leg. MD (coll. MD); 4 ex.: idem, 40.9264°N, 41.1555°E, 1800 m, 4.VI.2011, leg. MD (coll. MD); 8 ex.: Avuser Yayla, ca. 40.96°N, 41.15°E, 1700 m, 7.VI.2011, leg. MD (coll. MD).

Diagnosis: This species was placed in a different species group by Pawlowsky (1976) together with *T. michaeli* from Karcal Dag (northeast of Artvin). Despite significantly larger body size (commonly observed in hygrophilous species), the habitus (Fig. 16) and

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the aedeagus shape (Fig. 31), and most of all shape and position of the copulatory pieces are typical for the *T. lazicus* group.

Ecology: This is a rare, localized and strongly hygrophilous species, that lives in wet places under *Alnus*-shrubs in the upper forest zone (*Rhododendron smirnovii* zone), together with *T. karadenizus*. Moravec & Zieris (1998) provided another record in some distance from eastern Kackar Dag: Borcka env., Balikli Dagi.

***Trechus dostali* Donabauer, 2007** (Figs. 8, 32, 62)

Type locality: Trabzon, Sogandli Gecidi.

Material examined: Gümushane: 6 ex. (paratypes): ca. 50 km S Trabzon, NE Kürtün, 40.7286°N, 39.2033°E, 1430 m, 27.VII.2006, leg. MS (coll. DW, MD). Trabzon: 6 ex. (holotype and paratypes): Sogandli Pass, 2000 - 2200 m, leg. F. Schubert (coll. NMW, MD); 17 ex.: Uzungöl env., Sogandli Gecidi, 40.59°N, 40.30°E, 1800 m, 19.VII.2010, leg. MD (coll. MD); 9 ex. (paratypes): ca. 40 km S Trabzon, Altindere Milli Park, 40.678°N, 39.678°E, 1650 m, 26.VII.2006, leg. MS (coll. DW, MD); 1 ex. (paratype): ca. 40 km S Trabzon, Altindere Milli Park, 40.678°N, 39.6608°E, 1650 m, 26.VII.2006, leg. MS (coll. DW); 40 ex.: Zigana Gecidi, 40.64°N, 39.41°E, 2000 - 2100 m, 17.VII.2010, leg. MD (coll. MD); 9 ex: Of env., S of Balaban, 40.720°N, 40.356°E, 1600 m, 23.X.2010, leg. MD (coll. MD); 7 ex.: idem, 40.705°N, 40.3587°E, 1700 m, 23.X.2010, leg. MD (coll. MD); 30 ex.: idem, 40.6709°N, 40.3670°E, 23.X.2010, leg. MD (coll. MD).

Diagnosis: This species can be recognized by aedeagal characteristics alone: internal sack of aedeagus densely covered with scales (Fig. 32), covering the copulatory pieces in lateral view; copulatory pieces of characteristic shape with simple and triangular apical plate; aedeagus in dorsal view moderately curved to the left side.

Ecology: This endemic species of the central part of the range is significantly more widespread than related taxa distributed more to the east. It is common in humid leaf litter under shrubs (*Rhododendron luteum*) and in forests, predominately in the upper forest zone.

***Trechus zetteli* Donabauer, 2007** (Figs. 9, 33, 34, 63)

Type locality: Rize, Ikizdere.

Material examined: Rize: 4 ex. (holotype and paratypes): Ikizdere, 26.VI.1973, leg. F. Schubert (coll. NMW, MD); 20 ex. (paratypes): 25 km SSE Rize, 7 km E Ikizdere, 40.7964°N, 40.6439°E, 1030 m, 31.VII.2006, leg. MS (coll. DW, MD); 26 ex. (paratypes): Camova at Dereköy, below Ovitdagi Gecidi, leg. H. Franz (coll. NMW, MD); 40 ex.: Ikizdere env., Camliköy, 40.70974°N, 40.6410°E, 1400 m, 15.VII.2010, leg. MD (coll. MD); 2 ex.: Ikizdere env., Dereköy, 40.6951°N, 40.5958°E, 1200 m, 24.X.2010, leg. MD (coll. MD); 16 ex: E Ikizdere, Ilicaköy, 40.7857°N, 40.5963°E, 800 m, 24.X.2010, leg. MD (coll. MD); 3 ex: Ikizdere env., Ilicaköy, 40.7835°N, 40.6446°E, 1100 m, 24.X.2010, leg. MD (coll. MD).

Diagnosis: This species is closely related to *T. dostali* and can be separated solely by aedeagal characteristics, especially by the very distinct shape of the copulatory pieces which are more elongated than in the similar *T. dostali* and *T. weiserti*, the strongly asymmetric and curved aedeagus in dorsal view and finally by a significantly smaller field of scales than in *T. dostali*. There is a significant variability in the shape of aedeagus and the copulatory pieces between populations (not within a population) as shown in Figs. 33 and 34. In one population three male specimens have mirrored aedeagi. That means that the copulatory pieces are identical in any respect but mirrored along the length axis and therefore turn to the right (instead of left) in dorsal view.

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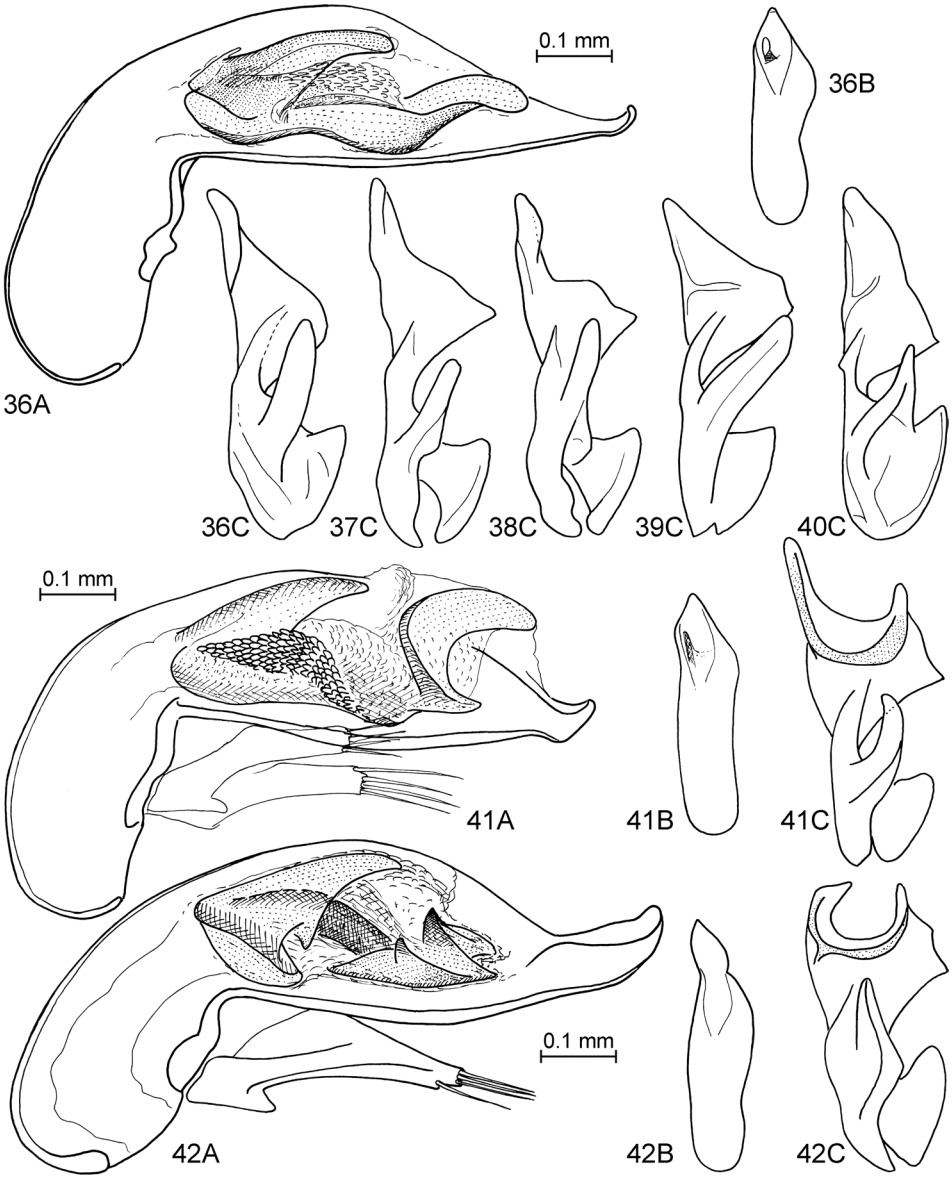

Figs. 36 - 42: Aedeagi of *Trechus* species in lateral (A) and dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (36) *T. weiserti* from Ikizdere env. (37) *T. weiserti* from Andon Ilica, (38) *T. weiserti* from Cagirankaya Yayla, (39) *T. weiserti* from Ballidere, (40) *T. weiserti* from Basköy, (41) *T. schuhi*, (42) *T. schillhammeri* (B not on scale).

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Ecology: This is a micro-endemic in the river valleys around Ikizdere. It was collected syntopic with *T. weiserti*, *T. viti*, *T. gravidus*, and *T. fritzbeneschi* in humid leaf litter.

***Trechus legorskyi* sp.n.** (Figs. 35, 63)

Type locality: Rize, Ikizdere env.

Material examined: Rize: Holotype (♂) and one paratype (♂) (coll. MD): Ikizdere env., Yetimhoca env., ca. 40.7497E, 40.7041N, 1600 m, 24.X.2010, leg. MD.

Diagnosis: This species is very similar to *T. zetteli* from the same area and can be distinguished by aedeagal characteristics only: aedeagus larger and longer, apex stronger turned up and more elongated; copulatory pieces different by shorter LV; LV and RV forming a broader, simple, triangular plate (like in *T. dostali*); D of medium length (shorter in *T. zetteli* and longer in *T. weiserti*), in a more ventral position than in any other species, and significantly broader (Fig. 35C), therefore more a plate than a spike (like in *T. zetteli* and *T.dostali*). Furthermore, the apex of the aedeagus is turned less to the left in dorsal view than in *T. zetteli* (similar to 32B).

Description: BL 3.5 - 3.6 mm. Measurements and proportions see Table 1. Body broad and moderately convex. Body reddish brown, legs and antenna pale, slightly contrasting to body.

Head with strong microsculpture; elytra and pronotum shinier and with less developed, but clearly visible microsculpture (examined at 40 × magnification). Antenna slender, of normal length. Eyes moderately large, slightly reduced in size, length of temples slightly shorter than eye diameter.

Pronotum strongly rounded laterally, convex on disc, maximal width before middle, constricted towards base, shortly sinuate before small and acute basal angles; anterior and posterior margins nearly straight; front angles rounded and not prominent; basal foveae present but weakly impressed; basal furrow strongly impressed; median line distinct, shallow, almost extended to margins.

Elytra ovate, moderately convex, rather flat on disc, shoulders completely rounded and not prominent; inner striae (1 - 4) fine but clearly impressed, weakly and irregularly punctured, all other striae hardly visible or indistinct. Stria 3 with two normally impressed and small dorsal pores.

Aedeagus in lateral view (Fig. 35A) larger and longer, apex more strongly turned up and more elongate; copulatory pieces different by shorter LV; LV and RV forming a simple, triangular plate; D of medium length, in a more ventral position than in any other species, and significantly broader (Fig. 35C), therefore more a plate than a spike; apex slightly turned to the left in dorsal view (similar to Fig. 32B).

Ecology: Sifted from very wet leaf litter around a spring on the east side of the street at rather high elevation. No other locality is known so far, although many sites have been investigated in this river valley.

Etymology: This species is dedicated to Franz Legorsky, coleopterist in Vienna, who led the Austrian Entomologists' Association for several decades.

***Trechus weiserti* Donabauer, 2007** (Figs. 10, 36-40, 63)

Type locality: Rize, Ikizdere.

Material examined: Rize: 42 ex. (holotype and paratypes): 25 km SSE Rize, 4 km E of Ikizdere, 40.7964°N, 40.5931°E, 750 m, 1.VIII.2006, leg. MS (coll. DW, MD); 6 ex.: E of Ikizdere,

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Ilicaköy, 40.7333°N, 40.5730°E, 750 m, 15.VII.2010, leg. MD (coll. MD); 5 ex.: idem, 40.7857°N, 40.5963°E, 800 m, 24.X.2010, leg. MD (coll. MD); idem, 40.7835°N, 40.6446°E, 1100 m, 24.X. 2010, leg. MD (coll. MD); 1 ex.: S of Rize, SW of Güneysu, Ballidere, 40.92°N, 40.58°E, 700 m, 25.X.2010, leg. MD (coll. MD); 5 ex.: S of Güneysu, Camlica, Basköy, 40.92°N, 40.67°E, 700 m, 31.X.2010, leg. MD (coll. MD); 5 ex.: S of Muradye, Cagirankaya Yayla, 40.853°N, 40.632°E, 1000 m, 25.X.2010, leg. MD (coll. MD); 11 ex.: S of Muradye, Andon Ilica, 40.856°N, 40.589°E, 850 m, 25.X.2010, leg. MD (coll. MD).

Diagnosis: This species can be separated solely by aedeagal characteristics, especially by the very distinct shape of the copulatory pieces: D is much more elongated, reaching level of RV, LV and RV form a large, more or less triangulate plate. In dorsal view the aedeagus is strongly asymmetric and curved. There is a significant variability in the shape of the aedeagus and the copulatory pieces between populations (not within a single population) as shown in Figs. 36 - 40.

Ecology: Intensive search yielded findings of this species in several places in the surroundings of Rize, where it is endemic. This area is seriously destroyed by excessive urbanization, street constructions, landslides, tea plantations, destruction of forests, pollution, etc. Therefore this and the next two species should be classified as severely endangered.

***Trechus schuhi* Donabauer, 2007** (Figs. 41, 63)

Type locality: Rize, Rize.

Material examined: Rize: 28 ex. (holotype and paratypes): "Rize, Küstengebirge [AZ32], leg. H. Franz" (coll. NMW, MD).

Remarks: It is known from the type locality only. In Herbert Franz' handwritten collection protocols Rudi Schuh (NMW) could find a hardly legible note, describing the collection site: Rize env., major river valley in direction SSW of Güneysu (villages Yüksekköy, Ballidere; without more precise locality information), sifted below *Rubus*. I collected a few *T. viti* and *T. weiserti* there but could not find *T. schuhi*.

***Trechus schillhammeri* Donabauer, 2006** (Fig. 42)

Type locality: Rize, Rize.

Material examined: Rize: 1 ex. (holotype): Rize, 28.VI.1970, leg. F. Schubert (coll. NMW).

Remarks: The type locality is likely in the surrounding of the town Rize, an area which changed dramatically since 1970. The species is probably highly localized and/or specialized. This taxon shows the most derived configuration of aedeagal characteristics within Turkish *Trechus*.

***Trechus davidwrasei* Donabauer, 2007** (Figs. 43, 63)

Type locality: Rize, Kaptanpasa.

Material examined: Rize: 2 ex. (holotype and paratype): 25 km ESE Rize, S Kaptanpasa, 40°56'56N, 40°46'30E, 690 m, 5.VIII.2006, leg. MS (coll. DW); 2 ex. (paratypes): 25 km SE Rize, 40°54'04N, 40°46'04E, 860 m, 2.VIII.2006, leg. MS (coll. MD); 3 ex.: Kaptanpasa env., Cataldere, 40.919°N, 40.7744°E, 800 m, 26.X.2010, leg. MD (coll. MD), 3 ex.: Kaptanpasa env., Uzundere, 40.92°N, 40.80°E, 800 m, 26.X.2010, leg. MD (coll. MD).

Diagnosis: The configuration of the aedeagal copulatory pieces is somehow variable within a few kilometres distance, especially the apical plate, but characterized by very short dorsal spike (D), strongly developed and prominent RV and more slender aedeagus shape in lateral view.

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Ecology: This species has been collected in four sites in closest vicinity at rather low altitudes (< 1000 m a.s.l.) together with the significantly more common *T. viti*. All specimens have been sifted from forest litter. At higher elevations this species seems to be replaced by *T. weiserti*. It is probably rare and extraordinary localized.

***Trechus hemsinensis* sp.n.** (Fig. 44, 63)

Type locality: Rize, Hemsin.

Type material: Rize: Holotype (♂) and 22 paratypes (12 ♂♂, 10 ♀♀): Kackar Dag, Hemsin env., Gito Yayla, 40.9027°N, 40.9085°E, 2000 m, 5.VI.2011, leg. MD (coll. MD); 6 ♂♂ , 2 ♀♀: road from Hemsin to Gito Yayla, ca. 1600 m, 5.VI.2011, leg. MD (coll. MD); 3 ♂♂: 25 km S Pazar, 40°57'49"N, 40°51'57"E, 670 m, 11.VII.2008, leg. MS (coll. MD); 4 ♂♂: Hemsin env., Kantarli, 800 m, 27.X.2010, 40.97N, 40.87E, leg. MD (coll. MD).

Additional material: 3 ♂♂, 1 ♀: Camlihemsin env., E of Zilkale, Alovit Selalesi, 40.9390°N, 41.0015°E, ca. 1000 m, 3.VI.2011, leg. MD (coll. MD).

Remarks: The material from east of Zilkale needs further investigation and is therefore excluded from the type material. This location is east of the Firtina river valley, which is inhabited by *T. catensis* sp.n., but the type locality of *T. hemsinensis* is located west of the Firtina river valley.

Diagnosis: This species matches perfectly the definition of the *T. lazicus* group in respect to the aedeagus shape both in lateral and dorsal view, and the antler-like and asymmetric shape of the copulatory pieces (Fig. 44). This species is easily differentiated from the five related and adjacent taxa – *T. weiserti* and *T. davidwrasei* in the west (Figs. 36C-40C, 43C), *T. catensis* (Fig. 45) in the south, and *T. karadenizus* (Fig. 46) and *T. kackardagi* (Fig. 47) in the east – by the distinct shape of copulatory pieces. It is most similar to the variable *T. zetteli* and can be distinguished by very slight differences (which may be within the variability of *T. zetteli*): apex of aedeagus slightly more turned up, scales of inner sack denser and apex of aedeagus in dorsal view less strongly turned to the left side. The closest related taxon is *T. catensis* sp.n., which is absolutely identical except the vertical and transverse ridge on the triangular plate between LV and RV, absent in *T. catensis*. Further investigations are necessary to determine, if this is a subspecies of the following *T. catensis* or a valid species.

Description: BL 3.05 - 3.4 mm. Measurements and proportions see Table 1. Identical to *T. catensis* with differences in aedeagus as described above.

Ecology: Sifted from humid leaf litter, fern leaves, mosses etc. On Gito Yayla in comparably high elevation it was significantly more common than in the river valleys at lower elevations. The distribution area is confined to the ridge between Hemsin and Camlihemsin, with populations in the lower river valleys on both sides.

Etymology: This species is dedicated to the small town Hemsin in closest vicinity to the type locality.

Discussion: The taxa *T. dostali*, *T. zetteli*, *T. legorskyi*, *T. davidwrasei*, *T. hemsinensis*, and *T. catensis* sp.n. are certainly very closely related to each other. Although there is a lot of material at hand from many different localities (Fig. 63) it is very hard to decide, if these taxa should be treated as subspecies or species. In the surroundings of Ikizdere in the same valley three taxa live in closest vicinity: *T. legorskyi* at a higher elevation, *T. zetteli* on the left side and *T. weiserti* on the right side of the river, without interbreeding. I have studied almost all recent literature about *Trechus* and Trechini published during

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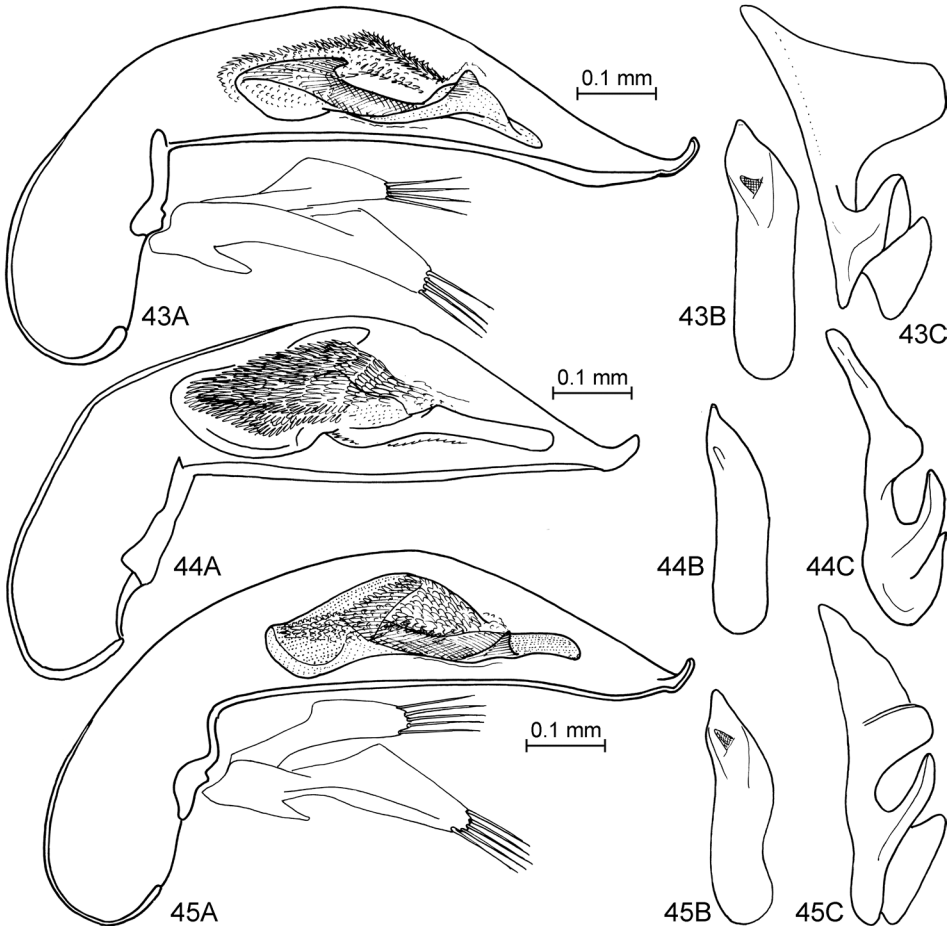

Figs. 43 - 45: Aedeagi of *Trechus* species in lateral (A) and dorsal view (B), extracted copulatory pieces in approximately dorsal view (C: (43) *T. davidwrasei*, (44) *T. hemsinensis* sp.n., (45) *T. catensis* sp.n. (B not on scale).

the last decades, and there is a common consensus to treat allopatric populations with aedeagal differences as distinct species.

***Trechus catensis* sp.n.** (Figs. 11, 45, 63)

= *T. karadenizus* in DONABAUER (2007b), nec *T. karadenizus* PAWLOWSKY, 1976.

Type locality: Rize, Camlihemsin env., Cat.

Type material: Rize: Holotype (♂) and 40 paratypes (18 ♂♂, 22 ♀): Cat, 1300 m, 40.933°N, 40.859°E, 13.VII.2010, leg. MD (coll. MD); 2 ex. (2): 30 km S Ardesen, 750 m, 40°55'31"N, 40°57'46"E, 3.VIII.2006, leg. M. Schülke (coll. MD); 7 ex. (6 ♂♂, 1 ♀): Zilkale env., ca. 1000 m, 40.92°N, 40.95°E, 13.VII.2010, leg. MD (coll. MD); 14 ex. (10 ♂♂, 4 ♀♀): 40 km S Ardesen, Cat, 1240 m, 40°51'44"N, 40°56'25"E, 3.VIII.2006, leg. M. Schülke (coll. MD); 11 ex. (6 ♂♂, 5 ♀♀): Hisarcik, 1700 m, 40.8214°N, 40.9408°E, 8.VI.2011, leg. MD (coll. MD); 38 ex. (28 ♂♂, 10 ♀♀): Orta Yayla, 2600 m, 40.74°N, 40.92°E, 8.VI.2011, leg. MD (coll. MD).

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Diagnosis: This species matches perfectly the definition of the *T. lazicus* group in respect of the shape of the aedeagus both in lateral view and dorsal view and the antler-like and strongly asymmetric shape of the copulatory pieces. The copulatory pieces are very characteristic and deviate from all other taxa by the strongly developed vertical ridge on the otherwise simple triangulate apical plate. The aedeagus is strongly asymmetric in dorsal view.

Description: BL 3.1 - 3.6 mm. Measurements and proportions see Table 1. Body broad and moderately convex. Body entirely reddish to reddish piceous; legs and antennae pale and moderately contrasting to body.

Head with strong microsculpture; elytra and pronotum shinier and with less developed, but clearly visible microsculpture (examined at 40× magnification). Antennae moderately slender, of normal length. Eyes moderately large, slightly reduced in size, length of temples shorter than eye diameter.

Pronotum with strongly rounded sides and convex disc, maximal width before middle, constricted towards base, shortly sinuate before small and acute basal angles, anterior and posterior margins nearly straight; front angles rounded and not prominent; basal angles acute and moderately projecting; basal foveae present but weakly impressed; basal furrow strongly impressed; median line distinct, very shallow, almost extended to margins.

Elytra ovate, moderately convex, slightly flattened on disc, shoulders completely rounded and not prominent; inner striae (1 - 4) fine but clearly impressed, weakly and irregularly punctured, all other striae hardly visible or indistinct. Stria 3 with two normally impressed and small dorsal pores.

Aedeagus in lateral view typical for the *T. lazicus* group, average in every respect, apex turned up at tip. In dorsal view aedeagus almost straight, its apex slightly asymmetric (much less so than in most other species) and evenly constricted to the pointed tip. Copulatory pieces of typical shape for *T. lazicus* group: D normally developed, not elongated above the level of RV, therefore shorter than in *T. weiserti* and *T. karadenizus*, and longer than in *T. davidwrasei*; LV and RV generate a medium-sized flat triangle as in most other taxa, with a clearly visible vertical ridge, which separate it from all other similar taxa. The only other taxa with such a vertical ridge are *T. schuhi* and *T. schillhammeri*, with otherwise different aedeagi. Inner sack moderately covered with scales on the right side, not hiding central part of copulatory pieces in lateral view.

Ecology: This new species is replacing *T. karadenizus* and *T. lazicus* in the main Firtina river valley and its headwaters. The vertical distribution is enormous and covers 2000 m, the overall distribution area is extraordinarily small. Specimens have been sifted from leaf litter (*Alnus*, *Rhododendron*) together with *T. viti* in humid and shaded places and collected under deeply embedded stones between grass roots in humid meadows far above timber line.

Etymology: This species is named after the small village Cat in the Firtina river valley (ca. 1300 m a.s.l.), which seems to be the center of its distribution area.

***Trechus karadenizus* Pawlowski, 1976** (Fig. 15, 46, 63)

Type locality: Rize, Camlihemsin env., Ayder.

Material examined: Rize: 9 ex.: Ayder env., 40.9859°N,41.0630°E, 800 m, 16.VII.2010, leg. MD (coll. MD); 77 ex.: Ayder, 40.9529°N, 41.0948°E, 1300 m, 11.VII.2010, leg. MD (coll. MD);

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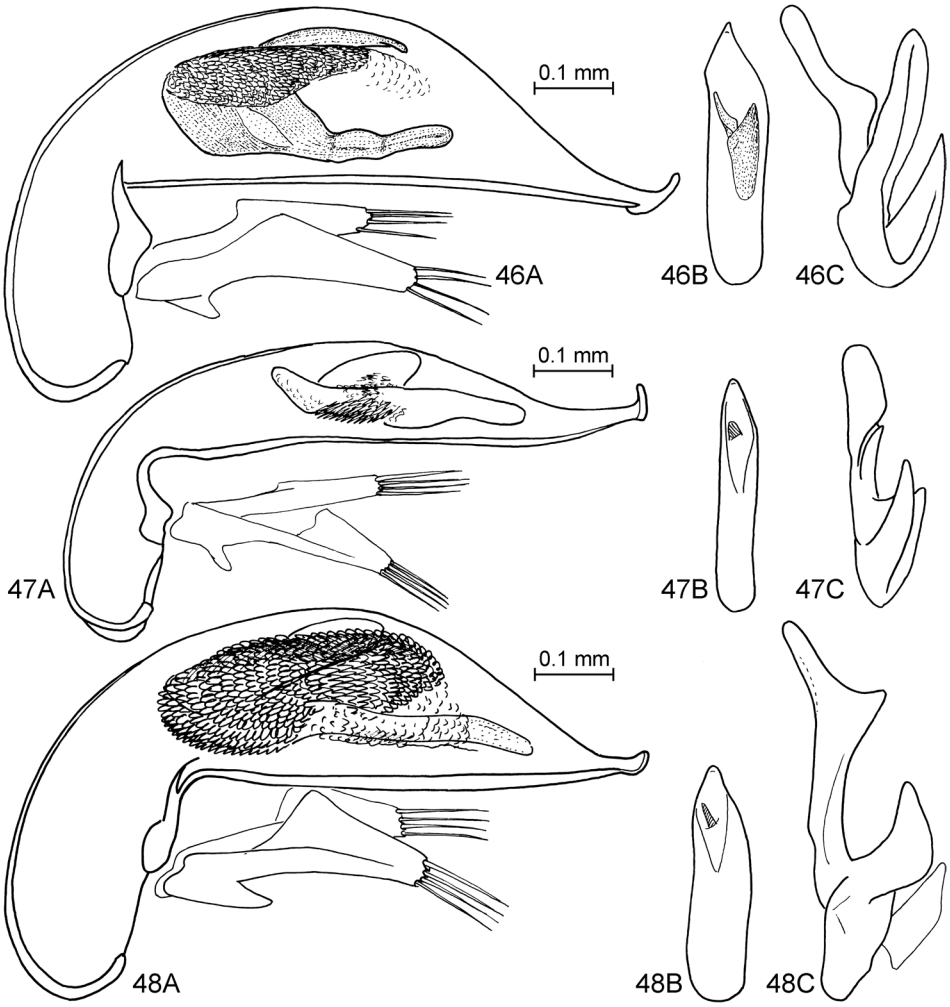

Figs. 46 - 48: Aedeagi of *Trechus* species in lateral (A) and in dorsal view (B), extracted copulatory pieces in approximately dorsal view (C): (46) *T. karadenizus*, (47) *T. kackardagi*, (48) *T. lazicus* (B not on scale).

10 ex.: SE Ayder, 40°55'35"N,41°08'54"E, 1730 m, 10.VII.2008, leg. M. Schülke (coll. DW, MD); 55 ex.: Avuser river., 40°57'18"N, 41°07'49"E, 1600 m, 16.VII.2010, leg. MD (coll. MD); 34 ex.: Avuser Yayla, 40.9531°N, 41.1919°E, 2350 m, 6.VI.2011, leg. MD (coll. MD); 10 ex.: Ceymakcur Yayla, 40.9258°N, 41.1587°E, 1850 m, 11.VII.2010, leg. MD (coll. MD); 53 ex.: Ceymakcur Yayla, 40.9185°N, 41.1639°E, 1950 m, 11.VII.2010, leg. MD (coll. MD); 40 ex.: Ceymakcur Yayla, 40.8947°N, 41.1764°E, 2350 m, 4.VI.2011, leg. MD (coll. MD); 17 ex.: Kavron river, 40.9859°N, 41.0630°E, 1700 m, 13.VII.2010, leg. MD (coll. MD).

D i a g n o s i s : This species can be immediately recognized by the unique configuration of the copulatory pieces (Fig. 46), especially the strongly elongated LV and D, with RV strongly reduced.

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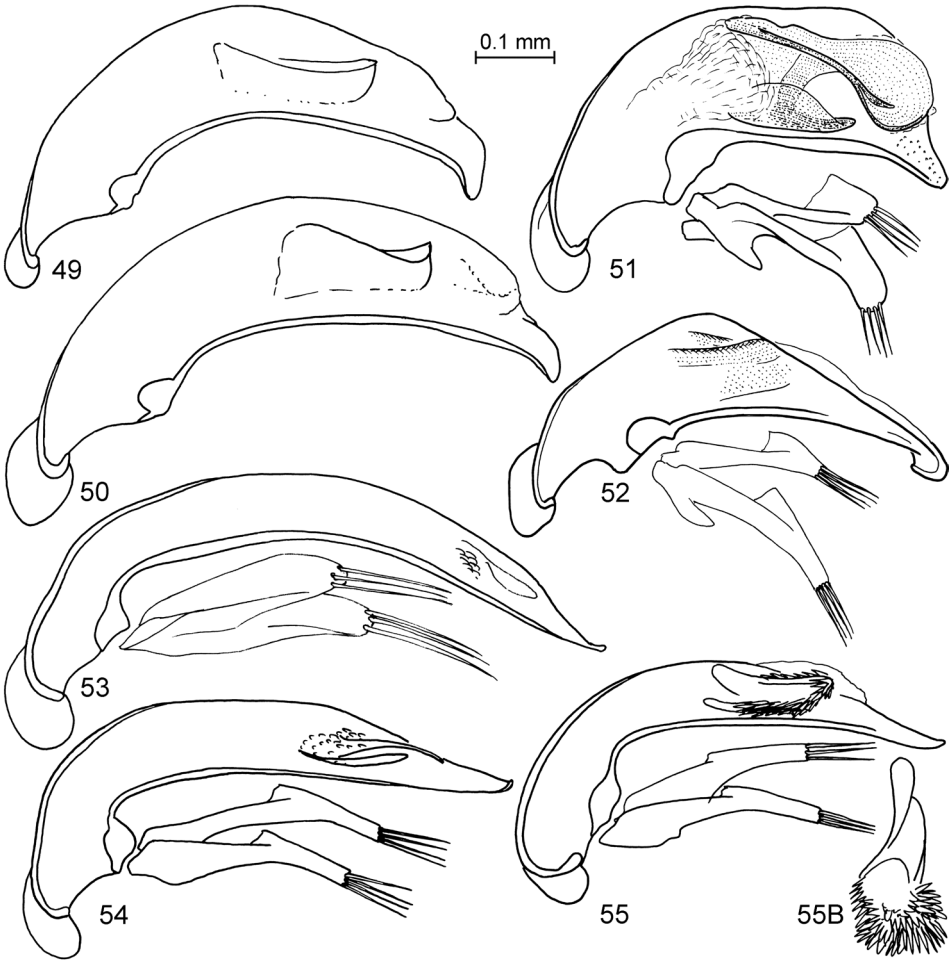

Figs. 49 - 55: Aedeagus of *Trechus* species in lateral view: (49) *T. asiaticus*, (50) *T. quadrimaculatus*, (51) *T. franzschuberti*, (52) *T. viti*, (53) *T. gravidus*, (54) *T. cappadocicus*, (55) *T. ulrichi*. (55B) Extracted copulatory piece of *T. ulrichi* in lateral view.

Ecology: This species is common in humid leaf litter, especially in the higher forest zone (1300 to 2000 m a.s.l.), avoiding excessively wet micro-habitats. Above timber line it is significantly less common and can be found under stones in meadows with sufficient humidity. The vertical distribution covers approximately 2000 m (700 m to 2700 m a.s.l.) and a wide range of different micro-habitats. *Trechus karadenizus* is a micro-endemic species, common and rather eurytopic of the eastern branch of the Firtina river valley – an unusual combination within forest dwelling *Trechus.*

Remarks: All specimens have been collected in closest vicinity of the type locality (Ayder) and are fully identical to the line drawings provided by Pawlowsky (1976). In my previous work (Donabauer, 2007b) I misidentified my material from Cat environment

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as *T. karadenizus* and therefore all figures and material examined have to be assigned to *T. catensis* sp.n.

***Trechus kackardagi* Pawlowski, 1978** (Figs. 13, 47, 63)

Type locality: Rize, Camlihemsin env., Ayder.

Material examined: Rize: 31 ex.: Avuser river, 40°57'18"N, 41°07'49"E, 1600 m, 16.VII. 2010, leg. MD (coll. MD); 4 ex.: hiking path from Kavron Yayla to glacier, 2600-2800 m, 14.VII. 2010, leg. MD (coll. MD); 1 ex.: Ayder env., Ceymakcur Yayla, 40.9264°N, 41.1555°E, 1800 m, 4.VI.2011, leg. MD (coll. MD).

Diagnosis: This species is strongly contrasting to *T. karadenizus* in respect of aedeagal characteristics (Fig. 47) although otherwise almost indistinguishable (compare Figs. 13 and 15) and partly syntopic. It has a significantly more slender aedeagus than any other species of the group and therefore copulatory pieces are smaller and simpler.

Ecology: The vertical distribution of *T. kackardagi* is more restricted to higher elevations. The overall distribution is not yet known, as the high mountain areas in the eastern Kackar Dag are hard to access. The species is uncommon, inhabits moderately humid places, and seems indifferent to shade. It was found in forests in leaf litter as well as high above timber line.

***Trechus lazicus* Pawlowski, 1976** (Fig. 12, 48, 63)

Type locality: Artvin, Murgul.

Material examined: Artvin: 23 ex.: Borcka, 1700 m, leg. F. Schubert (coll. MD); 1 ex.: 20 km E Hopa, 700 m, 41.23°N, 41.33°E, 26-27.VI.1999, leg. Kabalek (coll. MD); Rize: 14 ex.: E of Camlihemsin, Tunca env., ca. 500 m, 41.13°N, 41.16°E, 29.X.2010, leg. MD (coll. MD); 6 ex.: S of Findikli, Yaylacilar, 700 m, 41.17°N,41,18°E, leg. MD (coll. MD).

Diagnosis: Striation of elytra more deeply impressed (Fig. 12) and aedeagus (Fig. 48A) with a dense field of scales, less modified apex and highly characteristic shape of copulatory pieces (Fig. 48C).

Ecology: *Trechus lazicus* is rather widespread in the extreme humid eastern part of the Kackar Dag (Fig. 63).

Trechus (s.str.) *aquilus* group

***Trechus ulrichi* Pawlowski, 1976** (Figs. 18, 55, 63)

Type locality: Trabzon, Soganli Gecidi.

Material examined: Trabzon: 17 ex.: Soganli Gecidi, 2100 - 2200 m, 10.VII.2010, leg. MD (coll. MD); 5 ex.: idem, 2000 - 2200 m, leg. Schubert (coll. MD); 1 ex.: idem, 20.VI.1996, leg. Skoupy (coll. MD); 1 ex.: idem, 1.VI.1994, leg. Skoupy (coll. MD); 2 ex.: idem, 2250 m, 40°32'04"N, 40°13'47", 2.VII.2008, leg. MS (coll. MD); E of Salmankash Gecidi, Erikli Yayla, 2000-2250 m, 12.VI.1996, leg. Belousov (coll. MD).

Diagnosis: This species is very similar to *T. cappadocicus* in body shape (compare Figs. 16 and 18), shape of aedeagus (compare Figs. 54 and 55) and mode of life, but immediately distinguished by the different shape of the larger copulatory piece (55B), lack of a second copulatory piece and presence of a dense field of scales. Therefore these species don't seem to be closely related.

Ecology: *Trechus ulrichi* lives above timber line, at snow fields.

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Trechus (s.str.) *infuscatus* group

***Trechus cappadocicus* Pawlowski, 1976** (Figs. 16, 54, 60)

Type locality: Giresun, col Egri Bel.

Material examined: Giresun: 75 ex.: Egribel – Karagöl, 2200 - 2350 m, 31.V.2003, leg. MD (coll. MD); 2 ex.: E Gönderic Tepesi, 1900 - 2100 m, 14.6.1998, leg. Belousov, Molchanov (coll. MD).

Ecology: Above timber limit, near large snow fields under stones.

***Trechus witkowskii* Pawlowski, 1978** (Figs. 56 - 58, 61)

Type locality: Rize, Ayder env., Kavron glacier.

Remarks: No material examined. Several attempts to collect this species failed. Please refer to Pawlowski (1978, 1979) for a detailed description.

Trechus (s.str.) *quadristriatus* group

***Trechus quadristriatus* (Schrank, 1781)**

Material examined: Giresun: 2 ex.: Egribel – Karagöl, 2200 - 2350 m, 31.V.2003, leg. MD (coll. MD); Rize: 1 ex.: Camlihemsin env., Orta Yayla, VI.2011, 2200 m, leg. MD (coll. MD).

Remarks: This well-known and fully winged species is widespread and common in the entire western Palearctic region including most parts of Turkey. In the Doğu Karadeniz Dağları it seems to be rare on the humid northern slopes. Please refer to Pawlowski (1979) and Jeannel (1927) for detailed descriptions.

Trechus (s.str.) *caucasicus* group

Remarks: This group certainly needs a more profound definition as several lineages within *Trechus* of uncertain relationship have been combined here by previous authors (e.g. *T. aquilus* Jeannel, 1962 and *T. gravidus*). For our purpose it is sufficient to state, that *T. viti* is very closely related to the nominate taxon *T. caucasicus* Chaudoir, 1846 by sharing shape of aedeagus, copulatory pieces and habitus with minor differences only. The systematic position and distribution of *T. franzschuberti* needs further investigation.

***Trechus franzschuberti* Donabauer, 2006** (Figs. 19, 51)

Type locality: Artvin, Borcka.

Material examined: Artvin: 13 ex. (holotype and paratypes): Borcka, VII.1974, leg. F. Schubert (coll. NMW, MD).

Remarks: The distribution of this species is not known. The collector labelled all material collected during a stay in Borcka with the same labels and therefore it cannot be decided whether this species was collected in the Doğu Karadeniz Dağları or in the Karcal Dag further east.

***Trechus viti* Pawlowski, 1976** (Figs. 20, 52, 65)

Type locality: Rize, Ayder.

Material examined: Trabzon: 2 ex.: Of env., Balaban S, ca. 40.705°N, 40.359°E, 1700 m, 23.X.2010, leg. MD (coll. MD); 26 ex.: Of env., Balaban S, ca. 40.671°N,40.367°E, 1800 - 2000 m, 23.X.2010, leg. MD (coll. MD). Rize: 6 ex.: Rize S, Ikizdere env., Tozköy, 40.668°N,

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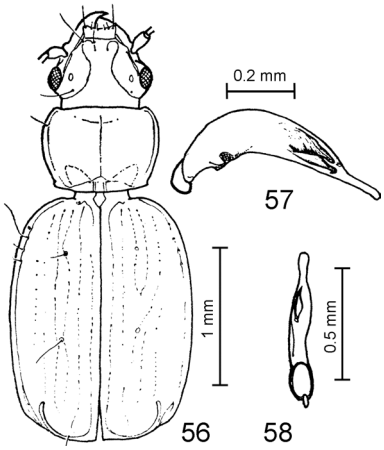

Figs. 56 - 58: *Trechus witkowskii* (from Pawlowski 1979, slightly modified): (56) Habitus, (57) Aedeagus in lateral view, (58) Aedeagus in ventral view.

40.582°E, 1300 m, 24.X.2010, leg. MD (coll. MD); 2 ex.: Rize Prov., Rize S, Ikizdere env., Dereköy, 40.695°N, 40.600°E, 1200 m, 24.X.2010, leg. MD (coll. MD); 9 ex.: Ikizdere env., Ilicaköy env., 40.7835°N, 40.6446°E, 1100 m, 24.X.2010, leg. MD (coll. MD); 23 ex.: 2 ex.: Kalkandere S, Esendere env, 40.874°E, 40.513°N, ca. 500 m, 24.X.2010, leg. MD (coll. MD); Rize S, Muradye S, Cagirankaya Yayla, 40.853°N, 40.632°E, 1000 m, 25.X.2010, leg. MD (coll. MD); 33 ex.: Rize S, Muradye S, Andon Ilica, 40.856°N, 40.589°E, 800-900 m, 25.X.2010, leg. MD (coll. MD); 5 ex.: Rize S, Güneysu SW, Ballidere, 40.92°N, 40.58°E, 700 m, 25.X.2010, leg. MD (coll. MD); 21 ex.: Rize S, Güneysu S, Camlica, Basköy, 40.92°N, 40.67°E, 700 m, 31.X.2010, leg. MD (coll. MD); 59 ex.: Kaptanpasa S, Cataldere env., ca. 1500 m, 26.X.2010, 40.84°N, 40.75°E, leg. MD (coll. MD); 26 ex.: Kaptanpasa S, N of Cataldere, ca. 800 m, 26.X.2010, 40.92°N,40.77°E, leg. MD (coll. MD); 21 ex.: Kaptanpasa S, Uzundere, ca. 800 m, 26.X.2010, 40.92°N, 40.80°E, leg. MD (coll. MD); 71 ex.: Hemsin env., Kantarli, ca. 800 m, 27.X.2010, 40.97°N, 40.87°E, leg. MD (coll. MD); 17 ex.: road from Hemsin to Gito Yayla, ca. 1600 m, 5.VI.2011, leg. MD (coll. MD); 4 ex.: Camlihemsin env., Cat, 40.93°N, 40.86°E, 13.VII.2010, ca. 1300 m, leg. MD (coll. MD); 3 ex.: Camlihemsin env., Zilkale env., 40.92°N, 40.95°E, 13.VII.2010, ca. 1000 m, leg. MD (coll. MD); 13 ex.: 1 km NW Camlihemsin, 16.VII.2010, leg. MD (coll. MD); 2 ex.: Camlihemsin E, Yukaridurak, ca. 500 m, 29.X.2010, 41.09°N, 41.10°E, leg. MD (coll. MD); 14 ex.: E of Zilkale, Alovit Selalesi, 40.9390°N, 41.0015°E, ca. 1000 m, 3.VI.2011, leg. MD (coll. MD); 39 ex.: Tunca E, Eskiarmutluk, ca. 600 m, 29.X.2010, 41.13°N, 41.16°E, leg. MD (coll. MD); 12 ex.: Findikli S, Yaylacilar, ca. 700 m, 28.X.2010, 41.17°N, 41.18°E, leg. MD (coll. MD). Artvin: 2 ex.: 15km W Borcka, Cancurtaran Gecidi, 28.VI.2003, leg. Hajdaj (coll. DW).

Diagnosis: This species can be immediately recognized (among other characteristics) by medium body size (Fig. 20), length 3.2 - 4.1 mm, dark piceous colour, strongly iridescent elytra, pronotum with strongly impressed basal fovea and slightly obtuse, not projecting basal angles, elytra with well impressed and slightly punctuate, almost complete striae, and very small aedeagus (Fig. 52) with weakly developed copulatory pieces and a highly characteristic knobbed and down-turned apex.

Ecology: *Trechus viti* is endemic in the eastern half of the range (Fig. 65), common and widespread in the entire Rize province and at least in the eastern Trabzon province. *Trechus viti* is strongly hygrophilous, lives always close to running water and prefers habitats in shade (forest). It is more common at lower elevations (500 - 1000 m a.s.l.). This species was present in the vast majority of sifting samples in forests between 500 and 1700 m a.s.l. and frequently outnumbered other *Trechus* significantly.

Trechus (s.str.) *gravidus* group

***Trechus gravidus* Putzeys, 1870** (Figs. 17, 53, 64)

Material examined: Artvin: 41 ex.: Borcka, 1700 m, V.1972, leg. Schubert (coll. MD); Rize: 5 ex.: E of Camlihemsin, Tunca env., ca. 500 m, 41.13°N, 41.16°E, 29.X.2010, leg. MD (coll. MD); 1 ex.: 30 km S Ardesen, 40°55'31"N, 40°57'46"E, 750 m, 3.VIII.2008, leg. MS (coll. MD); 2 ex.: Ayder env., 40.9529°N, 41.0948°E, 1300 m, 11.VII.2010, leg. MD (coll. MD); 1 ex.:

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idem, 40.9859°N, 41.0630°E, 1700 m, 13.VII.2010, leg. MD (coll. MD); 1 ex.: Camlihemsin env., E Zilkale, Alovit Selalesi, 40.9390°N, 41.0015°E, 1000 m, 3.VI.2011, leg. MD (coll. MD); 2 ex.: 25 km S Pazar, 40°57'49"N, 40°51'57"E, 670 m, 11.VII.2008, leg. MS (coll. MD); 1 ex.: Kaptanpasa S, 40°56'56"N, 40°46'30"E, 690 m, 2.VIII.2008, leg. MS (coll. MD); 1 ex.: Kaptanpasa S, Uzundere, 40.92°N, 40.80°E, 800 m, 26.X.2010, leg. MD (coll. MD); 2 ex.: 25 km SE Rize, 40°53'32"N, 40°46'03"E, 900 m, 2.VIII.2008, leg. MS (coll. MD); 1 ex.: Rize S, Camlica, Basköy, 40.92°N, 40.67°E, 700 m, 31.X.2010, leg. MD (coll. MD); 2 ex.: Rize SSW, Ikizdere env., Tozköy, 40.6678°N, 40.5823°E, 1300 m, 24.X.2010, leg. MD (coll. MD); 10 ex.: 7 km E Ikizdere, 40°47'01"N, 40°38'18"E, 1030 m, 31.VII.2006, leg. MS (coll. MD); 2 ex.: 4 km E Ikizdere, 40°47'14"N, 40°35'31"E, 750 m, 31.VII.2006, leg. MS (coll. MD); Trabzon: 1 ex.: S Of, S Balaban, 40.72°N, 40.356°E, 1600 m, 23.X.2010, leg. MD (coll. MD).

Diagnosis: This species can be immediately recognized (among other characteristics) by large body size (Fig. 17), length 4.2 - 4.5 mm, strongly convex body, pronotum with strongly impressed basal foveae, elytra with strongly impressed and punctured, almost complete striae, aedeagus slender and equally curved, sagittal lamella strongly developed, apex simple, copulatory pieces small, simple and hyaline, internal sack without dense areas of scales.

Ecology: The single species belonging to this group is a typical western Caucasus element and widespread in Georgia, reaching its south-western distribution limit in the Doğu Karadeniz Dağları. It was collected throughout the northeastern section of the range, frequently together with *T. viti*. This species is not common, strongly hygrophilous, and a very active runner. It lives in forest habitats close to running water.

Trechus (s.str.) *subnotatus* group

This eastern Mediterranean group is a radiation of similar taxa immediately recognized by large and depressed habitus, slightly punctured and well-impressed elytral striae, elytra in many taxa with a humeral and an apical yellowish spot on each elytron. The aedeagus has a highly characteristic shape: the apex bill-shaped and turned down, a single copulatory piece simple and saddle-shaped in dorsal position. This group is well known from several common taxa in Central Europe (e.g., *T. pilisensis* Csiki, 1918), Italy (e.g., *T. fairmairei* Pandelle, 1867), the Balcan Penninsula and Anatolia (*T. asiaticus*), and the Lesser Caucasus (*T. quadrimaculatus*). This group is in need of a profound taxonomic revision.

Figs. 59 - 65 (opposite page): The Doğu Karadeniz Dağları in northeastern Turkey and distribution of *Trechus* species (Map data©2012Basarsoft Google). (59) Overview. The highest summits are connected by the dotted line separating the range in a humid northern part and a much drier southern part. (60) Western Doğu Karadeniz Dağları: 1 – *Trechus uenyeensis*, 2 – *T. akkusianus*, 3 – *T. lebenbaueri,* 4 – *T. goelkoeyensis* sp.n., 5 – *T. orduensis,* 6 – *T. barbaritae,* 7 – *T. ziganensis,* 8 – *T. cappadocicus*. (61): Eastern Doğu Karadeniz Dağları: 1 – *Trechus ofensis* sp.n., 2 – *T. fritzbeneschi*, 3 – *T. heinzianus,* 4 – *T. kackardagi*, 5 – *T. witkowskii*. (62) Central Doğu Karadeniz Dağları: 1 – *Trechus dostali*, 2 – *T. ziganensis*, 3 – *T. ulrichi*. (63) Eastern Doğu Karadeniz Dağları: 1 – *T. lazicus*, 2 – *T. karadenizus*, 3 – *T. catensis* sp.n., 4 – *T. hemsinensis* sp.n., 5 – *T. davidwrasei*; 6 – *T. weiserti*; 7 – *T. schuhi*, 8 – *T. zetteli*, 9 – *T. legorskyi* sp.n. (64) Eastern Doğu Karadeniz Dağları: 1 – *Trechus gravidus*. (65) Eastern Doğu Karadeniz Dağları: 1 – *Trechus viti*.

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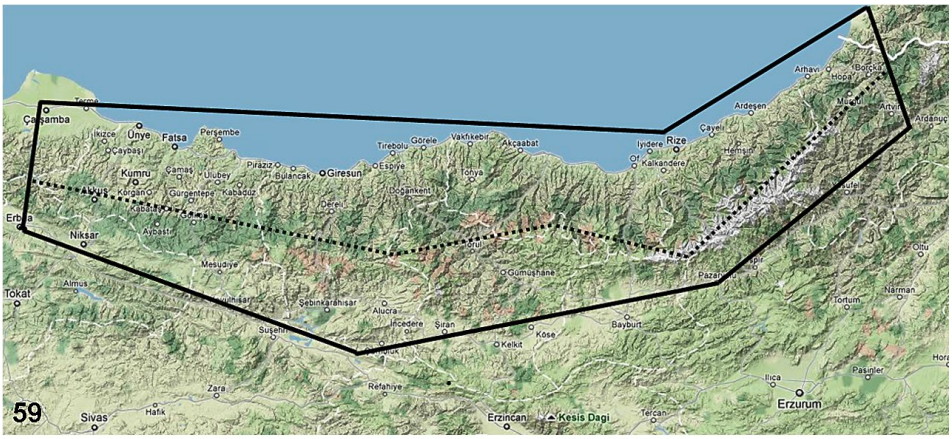

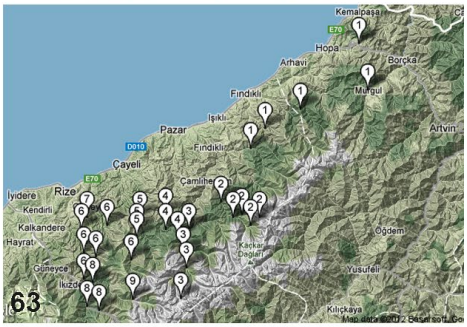

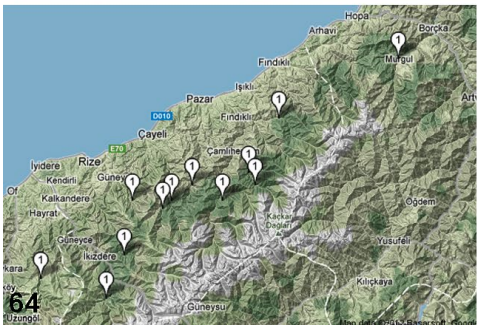

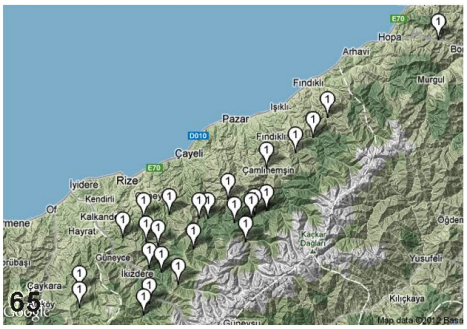

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***Trechus asiaticus* Jeannel, 1927** (Fig. 49)

Material examined: Giresun: 1 ex.: Giresun env., 100 - 300 m, 3.VI.2003, leg. MD (coll. MD).

Ecology: This species is widespread and common in many other parts of Turkey, especially in the west and southwest, but seems to be rare in the study area. It is hygrophilous and can be found from sea level up to the mountains.

***Trechus quadrimaculatus* Motschultsky, 1850** (Figs. 21, 50)

Material examined: Artvin: 4 ex.: Borcka, 1500 m, leg. Schubert (coll. MD, NMW).

Remarks: This species needs further investigation. It was reported by Moravec & Zieris (1998) from Zigana Gecidi. It is widespread, distributed in Iran and the Transcaucasus and reaching its western limit in northeastern Turkey.

Discussion

The knowledge about taxonomy and distribution of *Trechus* in the Pontic Alps increased substantially since the last monographic treatment by Pawlowsky (1979) and support some general remarks:

1. The Doğu Karadeniz Dağları is a hotspot of *Trechus* diversity with at least 28 endemic species, similar to the other two mountain systems at the Black Sea: the western Caucasus and – to a lesser extent – those in northwestern Turkey. The fauna of all other mountain ranges of Turkey further south is comparably poor.

2. All endemic *Trechus* species of the Doğu Karadeniz Dağları are related to Caucasian lineages and not to Anatolian or east Mediterranean lineages.

3. The majority of endemic species evolved from a few stocks. Especially the *T.* "*osmanilis*" group s.l. is characterized by a radiation of taxa. Some species show unusual intraspecific variability of the male aedeagus. Distribution of closely related taxa is frequently parapatric. Therefore all endemic *Trechus* should be considered of comparably recent origin and evolution of new taxa is still in progress (neo-endemics).

4. The majority of endemic *Trechus* live in forests below 2200 m a.s.l. The number of alpine species is very low (*T. ulrichi, T. cappadocicus, T. witkowskii*). This is strongly contrasting to the situation in most other high mountain ranges in the western Palearctic region, where the portion of alpine endemics within *Trechus* is significantly higher than that of the forest zone.

5. Highly specialized species of *Trechus* have not been reported from the Doğu Karadeniz Dağları yet, but are commonly found in other mountain areas. None of the *Trechus* species shows significant morphological adaptations to subterranean, extreme hygrophilous or alpine micro-habitats (like strong eye reduction, depigmentation, flat body, extremely large or small body size, or pubescent elyta).

6. The number of *Trechus* species which can be found syntopic is low. In the vast majority of collection sites one or two species have been collected. The Kackar Dag is exceptional in this respect, because up to five species have been found together around Ayder.

7. The areas of locally endemic forest dwelling *Trechus* species are related to large river valleys or mountain ridges between these river valleys. At least today these areas are obviously not separated by natural distributional barriers. Most rivers flow independently into the Black Sea. This may have caused a sufficient degree of isolation within a single

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valley in the past. Nevertheless most taxa are not very specialized and can be found in wide altitudinal ranges and in a great variety of forest types. As an example *T. karadenizus* was collected in large series from 700 - 2700 m a.s.l. in all types of forest, under shrubs and even in open grassland in the subalpine zone. It was present in all my sifting samples. Nevertheless it is solely known from one of the eastern arms of the Firtina river south of Camlihemsin.

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