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Erythraeus (Zaracarus) tuzicus n. sp. from Montenegro and redescription of *Erythraeus (Zaracarus) eleonora* Haitlinger, 1987 (Acari: Prostigmata, Erythraeidae)

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ABSTRACT — *Erythraeus (Zaracarus) tuzicus* n. sp. is described and illustrated from larvae collected from herbaceous plants in Montenegro. This paper presents new morphological and meristic data and new illustrations of *E. (Z.) eleonora* Haitlinger from Poland.

KEYWORDS — Trombidiformes; Parasitengona; new species; re-description; Montenegro

INTRODUCTION

In the world 28 species of larval *Erythraeus* (*Zaracarus*) are known (Małol and Wohltmann 2012, Mahmoudi *et al.*, 2014). From Europe, including Turkey and Cyprus, the following species are reported: *E. (Z.) eleonora* Haitlinger, 1987 from Poland, *E. (Z.) lancifer* Southcott, 1995 from Spain, *E. (Z.) budapestensis* Fain and Ripka, 1998 from Bosnia and Hercegovina, Croatia, Greece, Hungary, Montenegro, Serbia and Turkey, *E. (Z.) preciosus* Goldarazena and Zhang, 1998 from Greece, Spain and Ukraine, *E. (Z.) didonae* Haitlinger, 2000 from Turkey, *E. (Z.) sibuljinicus* Haitlinger, 2004 from Croatia, *E. (Z.) ueckermanni* Saboori, Nowzari and Bagheri-Zenouz, 2004 from Iran and Montenegro, *E. (Z.) ankaraicus* Saboori, Çobanoğlu and Bayram, 2004 from Montenegro and Turkey, *E. (Z.) kastaniensis* Haitlinger, 2006 from Greece (Samos),

E. (Z.) passidonicus Haitlinger, 2006 from Greece (Samos) and Turkey, *E. (Z.) ruizporterae* Mayoral and Barranco, 2008 from Spain, *E. (Z.) arminouensis* Haitlinger and Łupicki, 2011 from Cyprus, *E. (Z.) adriaticus* Haitlinger, 2012 and *E. (Z.) monrealicus* Haitlinger, 2012 both from Sicily (Haitlinger 1987, 2000, 2006, 2012, Southcott 1995, Fain and Ripka 1998, Goldarazena and Zhang 1998, Saboori *et al.* 2004, Saboori and Pešić 2006, Mayoral and Barranco 2008, Beron 2008, Haitlinger and Łupicki 2011). From Montenegro only three *Erythraeus* species were known; *E. (Z.) budapestensis*, *E. (Erythraeus) ankaraicus* and *E. (Z.) ueckermanni* (Saboori and Pešić 2006, Haitlinger 2007). In this paper a new species of *Erythraeus* from Montenegro is described and a redescription (including new morphological and meristic data) of *E. (Z.) eleonora* is also given.

MATERIALS AND METHODS

12 larvae of *Erythraeus* (Z.) *tuzicus* n. sp. were collected in Tuzi, Nikšić and Rijeka Crnojevića in Montenegro, all from herbaceous plants. Larvae were preserved in 70% ethanol and mounted on microscopic slides using Hoyer's medium. Measurements (given in micrometers) were made using microscope NIKON Eclipse 50i. Figures were drawn using Carl Zeiss Axioscope A1 microscope. The terminology and abbreviations follow Haitlinger (1999, 2013) and Wohltmann *et al.* (2006). The holotype is deposited in the Museum of Natural History of Podgorica, Montenegro.

Family Erythraeidae Robineau-Desvoidy, 1828

Genus *Erythraeus* Latreille, 1806

Erythraeus (*Zaracarus*) *tuzicus* n. sp.

Figures 1-3

Diagnosis — The new species belongs to the species group of the subgenus *Zaracarus* with fnBf 2-2-2, Ta I 110 – 160 and Ti III 220 – 320. Larva with following features: AL with thin bases 188 (176 – 226), Ti III 245 (223 – 311), IP 2286 (2173 – 2802), fD 54 (44 – 58), fV 20 (16 – 22), fnTa I-III 22-20-25 (22 – 24, 19 – 22, 19 – 24) and fn Ti I-III 14-15-13 (14, 15, 13 – 15).

Description based on holotype — Idiosoma with 54 barbed setae (in paratypes 44 – 58). Two pairs of anterolateral eyes on platelets (Figure 1A). Scutum smooth, wider than long, its posterior border slightly concave; bearing two slightly barbed setae AL and PL. Setae AL sharply pointed without expanded bases; setae PL distinctly shorter than setae AL. Anterior ASE very short, setulose, placed among pouch-like structures. Posterior PSE about twice longer than ASE, setulose on their distal half; two lines between bases of ASE and PSE (Figure 1C).

Ventral surface of idiosoma bearing two setae 1a, two setae 3a and 20 setae behind coxae III (in paratypes 16 – 22); all these setae are slightly barbed. Setae 1b distinctly longer than setae 2b and 3b, all slightly setulose (Figure 1B). NDV = 74 (in paratypes 62 – 78). Supracoxal seta *elcp* present (4 µm).

Gnathosoma with smooth galealae (*cs*), short posterior hypostomalae (*as2*) and three or four times longer anterior hypostomalae (*as1*) (Figure 1D). Palpfemur and palpgenu, each with one weakly barbed seta. Palptibia with three slightly barbed setae and bifurcate tibial claw (Figure 3D). Palptarsus with 7 nude setae (including eupathidium and solenidion) (Figure 3E).

Leg setal formula: Leg I: Ta – 1ω, 1ε, 2ζ, 22; Ti – 2φ, 1κ, 1z, 14; Ge – 1σ, 1κ, 8; Tf – 5; Bf – 2; Tr – 1; Cx 1 (Figs. 2A, 3A) (in paratypes normal setae on Ta 22 – 24). Leg II: Ta – 1ω, 2ζ, 20; Ti – 2φ, 15; Ge – 1κ, 8; Tf – 6; Bf – 2; Tr – 1; Cx – 1 (Figures 2B, 3B) (in paratypes Ta 19 – 22, Ti one specimen with 3 φ, Tf in all paratypes with 5 setae). Leg III: Ta – 1ζ, 25; Ti – 1φ, 13; Ge – 8; Tf – 5; Bf – 2; Tr – 1; Cx – 1 (Figures 2C-3C) (in paratypes Ta 19 – 23, Ti 14 – 15). Legs length: I 710 holotype, 675 – 874 paratypes, II 702, holotype, 696 – 865 paratypes, III 874 holotype, 802 – 1063 paratypes. IP = 2286 holotype, 2173 – 2802 paratypes. Measurements are given in Table 1.

Etymology — The species was named after the place where the holotype was collected.

Type material — The holotype larva was collected by M. Šundić from herbaceous plants in Tuzi n. Podgorica, Montenegro (42°21'N, 19°19'E), 12 June 2011. Paratypes: 4 larvae from Tuzi, 3 larvae from Nikšić (42°45'N, 18°35'E) and 4 larvae from Rijeka Crnojevića (42°21'N, 19°01'E). The holotype is deposited in the Museum of Natural History of Podgorica, Montenegro, one paratype in Biologiezentrum der Oberösterreichischen Landesmuseen, Linz, Austria and 10 paratypes in the Museum of Natural History, Wrocław University of Environmental and Life Sciences, Poland.

Remarks — *Erythraeus* (*Zaracarus*) *tuzicus* n. sp. belongs to the species group with fnBf 2-2-2, Ta I 110-160 and Ti III 220-320. This group includes: *E. (Z.) eleonora* Haitlinger, 1987, *E. (Z.) didonae* Haitlinger, 2000, *E. (Z.) kurdistanensis* Khanjani and Ueckermann, 2005, *E. (Z.) arminouensis* Haitlinger and Łupicki, 2011, *E. (Z.) monrealicus* Haitlinger, 2012 and additionally *E. (Z.) kharrazii* Saboori, 2000 (Ta I (105, Ti III 215) (Haitlinger 1987, 2000, 2012, Saboori 2000, Khanjani and Ueckermann 2005, Haitlinger and Łupicki 2011).

FIGURE 1: *Erythraeus (Zaracarus) tuzicus* n. sp. (larva): A – Idiosoma, dorsal view, B – Idiosoma; ventral view, C — Scutum, D — Gnathosoma, ventral view — right side; dorsal view — left side.

FIGURE 3: *Erythraeus (Zaracarus) tuzicus* n. sp., (larva): A – Leg I, tarsus, B – Leg II, tarsus, C – Leg III, tarsus; D – Palp, dorsal view - left, ventral view - right, E – Palptarsus.

TABLE 1: Metric data (in μm), fD and fV, for *Erythraeus (Zaracarus) tuzicus* n. sp.; H – holotype, P – paratypes.

	H	P (n=11)		H	P (n=11)
IL	413	350-586	PaGe (L)	32	27-36
IW	320	255-447	PaGe (W)	30	27-33
L	103	88-112	Ta I	124	112-154
W	159	146-165	Ti I	156	147-201
AW	54	47-59	Ge I	115	111-156
PW	120	104-127	Tf I	80	79-110
AA	18	15-30	Bf I	95	91-125
SB	19	15-21	Tr I	57	55-64
ISD	47	46-62	Cx I	83	68-81
AP	55	47-62	Ta II	125	114-145
Al.	188	176-226	Ti II	159	141-209
PL	94	66-88	Ge II	103	112-138
ASE	35	32-38	Tf II	81	78-110
PSE	72	64-80	Bf II	81	96-113
GL	145	134-164	Tr II	59	58-68
DS	78-102	54-106	Cx II	93	78-102
PsFd	71	45-62	Ta III	137	127-170
PsGd	65	62-75	Ti III	245	223-311
1a	78	49-82	Ge III	121	124-161
3a	49	39-46	Tf III	107	79-129
1b	96	87-101	Bf III	110	101-135
2b	58	30-48	Tr III	60	59-75
3b	66	41-62	Cx III	94	81-103
cs	34	28-35	Leg I	710	675-874
as1	37	34-49	Leg II	702	696-865
as2	11	oct-14	Leg III	874	802-1063
OD	34	27-37	IP	2286	2173-2802
PaFe (L)	71	51-79	FD	56	44-58
PaFe (W)	51	34-60	FV	20	16-22

FIGURE 4: *Erythraeus (Zaracarus) eleonora* Haitlinger, 1987 (neotype larva): A – Idiosoma, dorsal view, B – Idiosoma, ventral view, C — Scutum, D Gnathosoma, dorsal view - left side, ventral view - right side.

FIGURE 5: *Erythraeus (Zaracarus) eleonorae* Haitlinger, 1987 (neotype larva): A – Palptarsus, B – Palp.

It differs from *E. (Z.) eleonorae* in the shorter L (88 – 112 vs. 132 – 154), W (146 – 165 vs. 192 – 216), AW (47 – 59 vs. 66 – 75), PW (104 – 127 vs. 140 – 167), ISD (46 – 62 vs. 64 – 80), PSE (64 – 80 vs. 84 – 101), GL (134 – 164 vs. 175 – 202), PsGd (62 – 75 vs. 80 – 91), cs (29 – 35 vs. 39 – 48), OD (27 – 37 vs. 39 – 47), PaFe (L) (51 – 79 vs. 95 – 104) and fD (44 – 58 vs. 32 – 38); from *E. (Z.) didonae* in the shorter AA (15 – 30 vs. 36), longer AL (176 – 226 vs. 150), ASE (32 – 38 vs. 26), fD (44 – 58 vs. 26), fV (16 – 22 vs. 12) and scutum without concave anterior margin vs. scutum with concave anterior margin; from *E. (Z.) kurdistanensis* in the shorter PW (104 – 128 vs. 140 – 150), 1b (87 – 101 vs. 118 – 124), 3a (39 – 49 vs. 60 – 63), longer AL (176 – 226 vs. 138 – 150), fD (44 – 58 vs. 38) and fV (16 – 23 vs. 10); from *E. (Z.) arminouensis* in the shorter 1a (52 – 82 vs. 113 – 115), as1 (35 – 49 vs. 57 – 60), longer the longest dorsal setae (92 – 102 vs. 83 – 85, fD (44 – 58 vs. 36), fV (16 – 23 vs. 10), setae AL without expanded bases vs. setae AL with expanded bases, Ta II (19 – 22 vs. 18) and Ta III (19 – 24 vs. 16); from *E. (Z.) monrealicus* in the shorter AA (15 – 30 vs. 39), longer the longest dorsal setae (92 – 102 vs. 68 – 74), fnTa I (22 – 24 vs. 19), fbTa II (19 – 22 vs. 17), fD (44 – 58 vs. 36), fV (16 – 23 vs. 12) and from *E. (Z.) kharrazii* in the longer AL (176 – 220 vs. 110 – 124), leg III (802 – 1063 vs.

777 – 799), IP (2173 – 2802 vs. 2000 – 2086), longer the longest dorsal setae (102 – 105 vs. 66 – 69), fD (44 – 58 vs. 39) and fV (15 – 23 vs. 12).

Erythraeus (Zaracarus) eleonorae Haitlinger, 1987
Figures 4-6

Holotype of *E. (Z.) eleonorae* is lost, therefore, paratype larva collected 31 July 1986 in Dąbki, Poland, is designated as neotype.

Diagnosis — fnBf 2-2-2, AL 210 (200 – 242), Ta I 137 (122 – 154), Ti III 256 (254 – 309), IP 2572 (2470 – 2871), fD 36 (32 – 38), fV 17 (16 – 18).

Re-description based on neotype — Dorsal surface of idiosoma with 36 barbed setae (32 – 38 in paratypes). Two pairs of anterolateral eyes without platelets (Figure 4A). Scutum wider than long with two barbed scutalae (AL and PL). Setae AL with expanded bases and sharply pointed, setae PL distinctly shorter than setae AL. Anterior (ASE) short, setulose, posterior setulose in distal half (PSE), over twice longer than ASE. Two lines placed laterally to bases of PSE (Figure 4C).

Ventral surface of idiosoma with two sternalae (1a) and two setae 3a; setae 1a longer than setae 3a. 17 setae placed behind coxae III (16 – 18 in paratypes). All setae slightly barbed. Coxae I-III

FIGURE 6: *Erythraeus (Zaracarus) eleonora* Haitlinger, 1987 (neotype larva): A – Leg I, B – Leg II, C – Leg III.

TABLE 2: Metric data (in μm), fD and fV, for *Erythraeus (Zaracarus) eleonora* Haitlinger, 1987; N – neotype, P – paratypes.

	N	P (n=10)		N	P (n=10)
IL	516	680-1528	PaGe (L)	41	36-46
IW	374	352-976	PaGe (W)	40	33-45
L	123	132-154	Ta I	137	122-154
W	186	192-216	Ti I	178	166-198
AW	62	66-75	Ge I	139	140-162
PW	146	140-167	Tf I	91	90-115
AA	32	24-33	Bf I	106	97-120
SB	19	15-24	Tr I	70	62-75
ISD	64	64-80	Cx I	87	62-92
AP	63	48-75	Ta II	124	112-137
AL	210	200-242	Ti II	168	164-200I
PL	100	92-102	Ge II	122	124-146
ASE	41	34-44	Tf II	90	82-106
PSE	61	84-101	Bf II	98	94-110
GL	183	172-202	Tr II	70	66-88
DS	65-97	80-100	Cx II	119	97-120
PsFd	69	63-88	Ta III	147	120-154
PsGd	85	80-91	Ti III	256	254-309
1a	68	60-88	Ge III	142	143-167
3a	50	31-64	Tf III	111	110-141
1b	81	90-112	Bf III	126	120-141
2b	55	39-55	Tr III	76	64-88
3b	45	37-53	Cx III	115	101-120
cs	40	39-52	Leg I	808	778-891
as1	58	43-67	Leg II	791	758-872
as2	13	oct-18	Leg III	973	934-1111
OD	40	39-47	IP	2572	2470-2871
PaFe (L)	85	74-104	fD	36	32-38
PaFe (W)	68	57-79	fV	12	déc-18

each with one barbed seta (Figure 4B). Supracoxal seta *elcp* present. NDV = 53 (in paratypes 50–54).

Gnathosoma with smooth galealae (*cs*), short posterior hypostomalae (*as2*) and anterior hypostomalae *as1* three-four times longer than hypostomalae *as2*, both nude (Figure 4D). Palpfemur and palpgenu, each with one barbed seta. Palptibia with three serrate setae and bifurcate tibial claw (Figure 5B). Palptarsus with 7 nude setae (including solenidion and eupathidium) (Figure 5A).

Leg setal formula: Leg I: Ta – 1 ω , 2 ζ , 24; Ti – 2 φ , 1 κ , 14; Ge – 1 σ , 1 κ , 8; Tf — 5; Bf — 2; Tr — 1; Cx — 1 (in paratypes Ta with normal setae 23–24, Ti with 14–15) (Figure 6A). Leg II: Ta 1 ω , 2 ζ , 20; Ti 2 φ , 15; Ge 1 κ , 8, Tf 5; Bf 2; Tr 1; Cx 1 (in paratypes normal setae on Ta II 20–22; Ti II 14–15) (Figure 6B). Leg III: Ta 1 ζ , 22; Ti 1 φ , 16; Ge 8; Tf 5; Bf 2; Tr 1; Cx 1 (in paratypes normal setae on Ta 20–24; Ti 15–16) (Figure 6C). Measurements are given in Table 2.

Material examined — Neotype larva, 31 July 1986, Dąbki n. Darłowo, Poland. Paratypes: 7 larvae, 5 August 1983, Dęblin, two larvae, 31 July 1986, Dąbki n. Darłowo, one larva, 24 August 1986, Szewca n. Wałcz; all larvae collected by R. Haitlinger. Neotype is deposited in the Museum of Natural History, Wrocław University (MN-HWU); paratypes in the Museum of Natural History, Wrocław University of Environmental and Life Sciences, Poland.

Remarks — *Erythraeus* (*Zaracarus*) *eleonorae* belongs to the species group with fnBf 2-2-2, Ta I 110–160 and Ti III 220–320. This group includes: *E. (Z.) didonae*, *E. (Z.) kurdistanensis*, *E. (Z.) arminouensis*, *E. (Z.) monrealicus*, *E. (Z.) tuzicus* **n. sp.** and additionally *E. (Z.) kharrazii*. It differs from *E. (Z.) didonae* in scutum with anterior and posterior margin not concave vs. scutum with anterior and posterior margin concave, fV 16–18 vs. 12, the longer L (132–154 vs. 112), W (192–216 vs. 160), PW (140–167 vs. 126), AL (200–241 vs. 150), PL (92–102 vs. 76), GL (172–202 vs. 156), PsFd (68–88 vs. 46) and PsGd (80–91 vs. 68), from *E. (Z.) kurdistanensis* in fV (16–18 vs. 10), the longer L (132–154 vs. 106–115), W (192–216 vs. 166), ISD (64–80 vs. 57–68), AL (200–242 vs. 138–140), PL (92–102 vs. 81–84), PsFd (68–88 vs. 42–43) and PsGd (80–92 vs.

50–64); from *E. (Z.) arminouensis* in the longer AW (62–75 vs. 53), PW (140–167 vs. 115–125), L (132–154 vs. 113–120), W (192–216 vs. 155–168), AL (200–242 vs. 173–176), PL (92–102 vs. 80), PSE (84–101 vs. 73–75), GL (175–202 vs. 155–167), PsFd (68–88 vs. 45–48), PsGd (80–91 vs. 70–73) and shorter 1a (60–88 vs. 113–115), from *E. (Z.) monrealicus* in fV (16–18 vs. 12), the longer AW (62–75 vs. 52–58), PW (140–167 vs. 120–122), L (132–154 vs. 74–90), AL (200–242 vs. 168–182), PL (92–102 vs. 70), GL (175–202 vs. 140–156), DS (80–100 vs. 60–74), PsFd (68–88 vs. 46–50), PsGd (80–91 vs. 62–66), ISD (64–80 vs. 44–52), Ti I (166–198 vs. 148–162), IP (2470–2871 vs. 2210–2326), AL with expanded bases vs. AL without expanded bases), Ta I (23–24 vs. 19) and Ta II (20–22 vs. 17) and from *E. (Z.) kharrazii* in the longer L (123–154 vs. 99–100), W (186–216 vs. 154), PW (149–167 vs. 115–122), ISD (64–80 vs. 47), AL (200–242 vs. 110–124), PL (92–102 vs. 58–66), GL (172–202 vs. 132–140), the longest dorsal setae (97–100 vs. 66–71), PsFd (63–88 vs. 36–44) and Ti III (254–309 vs. 215). Comparison with *E. (Z.) tuzicus* **n. sp.** is given in remarks for *E. (Z.) tuzicus*.

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