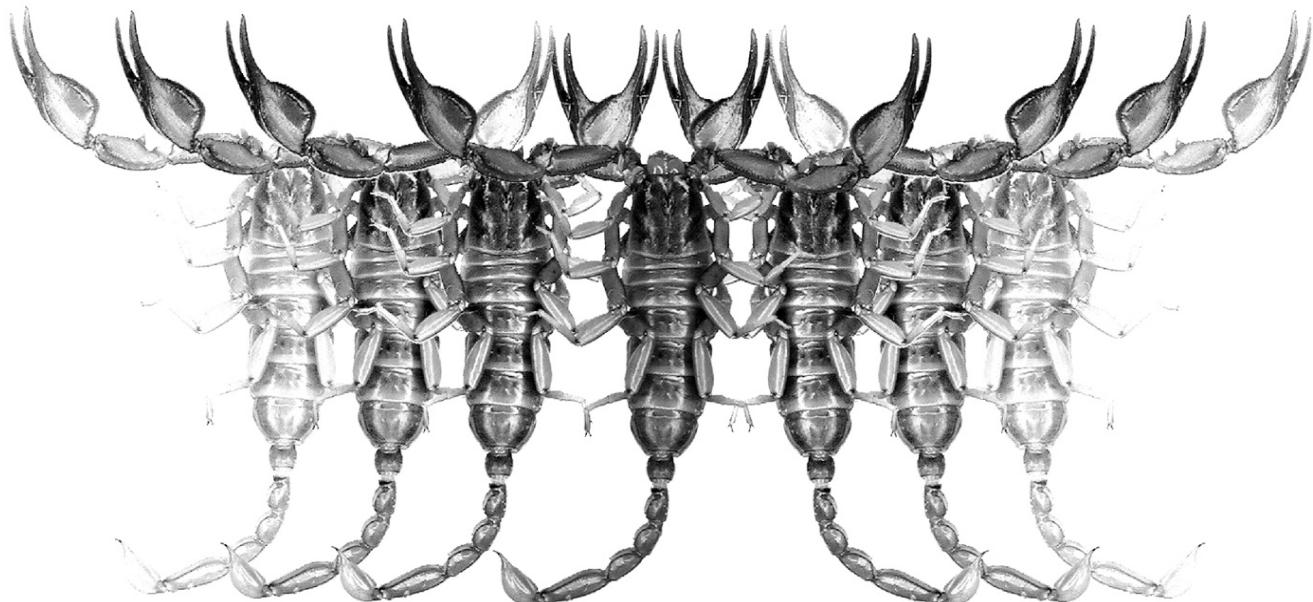


Euscorpius

Occasional Publications in Scorpiology



A review of *Orthochirus* from Turkey, Iraq,
and Iran (Khoozestan, Ilam, and Lorestan
Provinces), with descriptions of three new species
(Scorpiones: Buthidae)

František Kovařík, Ersen Aydin Yağmur, Victor Fet & Fenik Sherzad Hussen

February 2019 — No. 278

Euscorpius

Occasional Publications in Scorpiology

EDITOR: Victor Fet, Marshall University, ‘fet@marshall.edu’
ASSOCIATE EDITOR: Michael E. Soleglad, ‘msoleglad@gmail.com’

Euscorpius is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). ***Euscorpius*** takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). ***Euscorpius*** is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

Derivatio Nominis

The name ***Euscorpius*** Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

Euscorpius is located at: <https://mds.marshall.edu/euscorpius/>
Archive of issues 1-270 see also at: <http://www.science.marshall.edu/fet/Euscorpius>

(Marshall University, Huntington, West Virginia 25755-2510, USA)

ICZN COMPLIANCE OF ELECTRONIC PUBLICATIONS:

Electronic (“e-only”) publications are fully compliant with ICZN ([International Code of Zoological Nomenclature](#)) (i.e. for the purposes of new names and new nomenclatural acts) when properly archived and registered. All ***Euscorpius*** issues starting from No. 156 (2013) are archived in two electronic archives:

- **Biotaxa**, <http://biotaxa.org/Euscorpius> (ICZN-approved and ZooBank-enabled)
- **Marshall Digital Scholar**, <http://mds.marshall.edu/euscorpius/>. (This website also archives all *Euscorpius* issues previously published on CD-ROMs.)

Between 2000 and 2013, ICZN **did not accept online texts** as “published work” (Article 9.8). At this time, *Euscorpius* was produced in two **identical** versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293) (laser disk) in archive-quality, read-only format. Both versions had the identical date of publication, as well as identical page and figure numbers. **Only copies distributed on a CD-ROM** from *Euscorpius* in 2001-2012 represent published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts.

In September 2012, ICZN Article 8. What constitutes published work, has been amended and allowed for electronic publications, disallowing publication on optical discs. From January 2013, ***Euscorpius*** discontinued CD-ROM production; only online electronic version (ISSN 1536-9307) is published. For further details on the new ICZN amendment, see <http://www.pensoft.net/journals/zookeys/article/3944/>.

Publication date: 21 February 2019

<http://zoobank.org/urn:lsid:zoobank.org:pub:A5D48DB3-5F10-40B5-A170-63A6449CE40D>

A review of *Orthochirus* from Turkey, Iraq, and Iran (Khoozestan, Ilam, and Lorestan Provinces), with descriptions of three new species (Scorpiones: Buthidae)

František Kovařík¹, Ersen Aydin Yağmur², Victor Fet³ & Fenik Sherzad Hussen⁴

¹P. O. Box 27, CZ-145 01 Praha 45, Czech Republic; <http://www.scorpio.cz>

²Celal Bayar University, Alaşehir Vocational School, TR-45600, Alaşehir, Manisa, Turkey

³Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755-2510, USA; email: fet@marshall.edu

⁴College of Science, Salahaddin University, Erbil, Iraq

<http://zoobank.org/urn:lsid:zoobank.org:pub:A5D48DB3-5F10-40B5-A170-63A6449CE40D>

Summary

Three new species, *Orthochirus fomichevi* sp. n. from Turkey and Iraq, *O. gantenbeini* sp. n. from Iran (Khoozestan Province), and *O. navidpouri* sp. n. from Iran (Khoozestan and Lorestan Provinces) are described, compared with other *Orthochirus* species from the region, and fully illustrated with color photos. Lectotype of *O. mesopotamicus* Birula, 1918 stat. n. from Iran (Khoozestan Province) is designated. Emended diagnoses are given for *O. iranus* Kovařík, 2004, *O. iraqus* Kovařík, 2004, *O. mesopotamicus* Birula, 1918 stat. n., and *O. zagrosensis* Kovařík, 2004. A key and a distribution map are included.

Introduction

Until recently, the genus *Orthochirus* included a number of apparently morphologically uniform species found in the large area from North Africa through the Middle East to India. Fet & Lowe (2000) listed nine valid species and compiled references until 2000. Kovařík (2004) revised *Orthochirus*, described 11 new species from Asia, and defined eight major diagnostic characters for the genus. Among other publications focused on the Asian species of *Orthochirus*, we can mention primarily Kovařík & Fet (2006), and a series of papers on the scorpion fauna of separate Iranian provinces (Navidpour et al., 2008a, 2008b, 2008c, 2008d, 2010, 2011, 2012, 2019; Pirali-Kheirabadi et al., 2009) where the specimens were identified mainly according to eight previously defined characters. Recently, we have had an opportunity to study many other *Orthochirus* populations in detail; this new research indicates that there are other cryptic species present in this genus, and that the genus is rather paraphyletic. Here, we describe three new species, which previously were considered as only isolated populations of *O. zagrosensis* Kovařík, 2004 (*O. fomichevi* sp. n.), *O. stockwelli* (Lourenço et Vachon, 1995) (*O. gantenbeini* sp. n.), and *O. iranus* Kovařík, 2004 (*O. navidpouri* sp. n.). We also confirm as valid, and elevate to species status, *O. mesopotamicus* Birula, 1918 stat. n.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974).

Specimens studied herein are preserved in 80% ethanol. Specimen depositories: AZMM, Zoology Museum of Alaşehir Vocational School, Celal Bayar University, Manisa, Turkey; FKCP, František Kovařík, private collection, Prague, Czech Republic; NMPC, National Museum of Natural History, Prague, Czech Republic; ZISP, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

Systematics

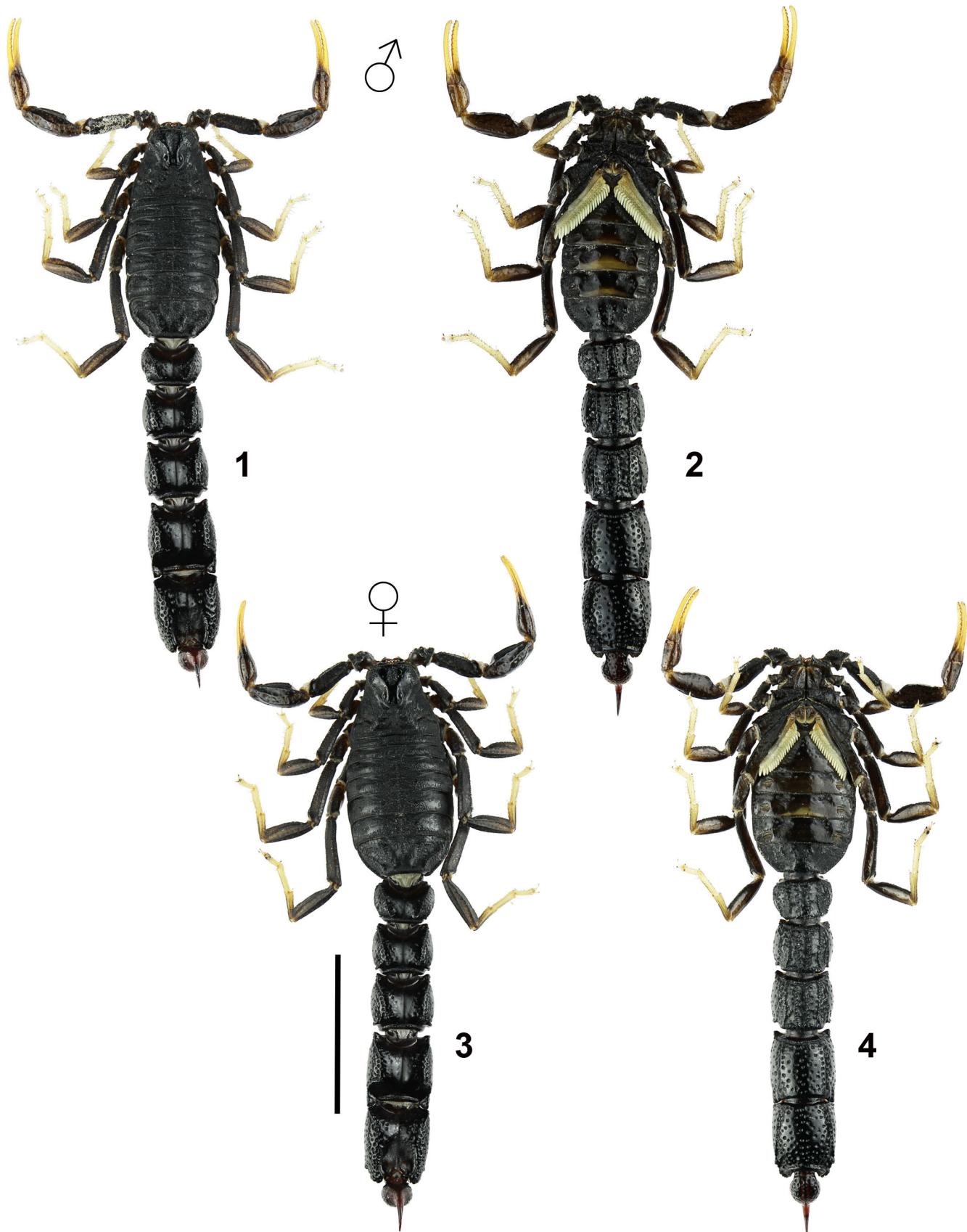
Family Buthidae C. L. Koch, 1837

Orthochirus Karsch, 1892 (Figs. 1–176, Tables 1–2)

Orthochirus Karsch, 1892: 306; Fet & Lowe, 2000: 193–200 (complete references list); Kovařík, 2004: 4–23, figs. 1–8, table 1; Fet et al., 2003: 69–72, figs. 1–5; Kovařík & Fet, 2006: 1–10, figs. 1–9; Navidpour et al., 2008a: 14–22, figs. 19, 23–30, 93–102; Kovařík, 2009: 31.

= *Orthodactylus* Karsch, 1881: 90, a junior homonym of *Orthodactylus* Hitchcock, 1858 (Reptilia), type species: *Orthodactylus olivaceus* Karsch, 1881 = *Orthochirus scrobiculosus* (Grube, 1873) (syn. by Kraepelin, 1895: 84).

= *Simonoides* Vachon et Farzanpay in Farzanpay, 1987: 162, type species: *Simonoides farzanpayi* Vachon et Farzanpay, 1987; Farzanpay, 1988: 40; Fet & Lowe, 2000: 223 (syn. by Kovařík & Fet, 2006: 2).



Figures 1–4: *Orthochirus fomichevi* sp. n. **Figures 1–2.** Holotype male, dorsal (1) and ventral (2) views. **Figures 3–4.** Paratype female from type locality, dorsal (3) and ventral (4) views. Scale bar: 10 mm.

- = *Afghanorthochirus* Lourenço & Vachon, 1997: 330, type species: *Afghanoorthochirus erardi* Lourenço & Vachon, 1997; Kovařík, 1998: 120 (syn. by Kovařík, 2004: 5).
 - = *Paraorthochirus* Lourenço & Vachon, 1995: 299, type species: *Paraorthochirus stockwelli* Lourenço et Vachon, 1995; Lourenço & Vachon, 1997: 329, Fet & Lowe, 2000: 211 (syn. by Navidpour et al., 2008a: 17).
- Pseudorthochirus* [sic]: Lourenço & Vachon, 1995: 304.

TYPE SPECIES: *Orthodactylus olivaceus* Karsch, 1881 = *Orthochirus scrobiculosus* (Grube, 1873).

DIAGNOSIS: Total length of adults 22–50 mm. Patella of pedipalp without ventral trichobothria. Dorsal trichobothria of femur arranged in beta-configuration. Trichobothrium d_2 of pedipalp femur absent or present on dorsal surface. Chelicerae with typical buthid dentition (Vachon, 1963), ventral aspect of fixed finger with two denticles. Tibial spurs present on legs III and IV. Pectines with fulcra and densely hirsute. Movable fingers of pedipalps with 7–10 rows of denticles and 2–5 subterminal denticles. Carapace in lateral view distinctly inclined downward from median eyes to anterior margin. Metasomal segments I and II with carinae. Metasomal segments IV and V ventrally punctated. Telson elongate, aculeus as long or longer than vesicle. Total length under 60 mm.

Orthochirus fomichevi sp. n.

(Figs. 1–31, 155, 163, 170–171, 176, Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:EC46AC45-647F-4BAA-A4F6-5B6FD03C09C8>

Orthochirus zagrosensis: Yağmur, 2010: 15–19, figs. 1–3.

TYPE LOCALITY AND TYPE DEPOSITORY. **Iraq, Sulaymaniyah Province**, Chaqzhi Khwaroo, 35.626307°N 45.199277°E; FKCP.

TYPE MATERIAL. **Iraq, Sulaymaniyah Province**, Chaqzhi Khwaroo, 35.626307°N 45.199277°E, leg. Fenik Sherzad Hussen, 1♂(holotype) 1♂2♀(paratypes), FKCP; **Dohuk Province**, S foothill of Chiaje-Spizakho-Dag Mountain Range, Rogarm River valley (left bank), 17 km SE of Zakho City, 37°02'59"N 42°52'05"E, stony maquis shrubland, 560–600 m a.s.l., 28.IV.2017, leg. A. A. Fomichev, 1♀(paratype), FKCP. **Turkey, Hakkari Province**, Çukurca District, 2 km E of Çukurca Town, 37°15'21"N 43°36'46"E, 1269 m a.s.l., 19.V.2010, leg. E. A. Yağmur, 1♀ (paratype), FKCP, 1♀ (paratype), AZMM.

ETYMOLOGY. The species epithet is a patronym honoring Alexander A. Fomichev (Russia), the collector of a paratype of the new species. His recent adventurous field trip yielded many new records of arachnids from Iraq (Fomichev et al., 2018).

DIAGNOSIS. Total length of adults 29–40 mm. Trichobothrium d_2 of pedipalp femur dorsal surface is absent or reduced. Median tibial spurs present on legs III and IV. Pectinal teeth number 21–23 in males and 17–20 in females. Movable and fixed fingers of pedipalps with 8–9 rows of denticles, with internal and external denticles and 5 subterminal denticles. Dorsal carinae on pedipalp patella smooth. Metasoma I with 10 carinae, metasoma II with 8 carinae. Metasoma IV–V ventrally punctate with ventrolateral carinae present; spaces among punctae smooth, without granules. Metasoma II–III ventrally and laterally smooth without granules, punctate and bumpy. Dorsal surface of metasoma I with several granules, metasoma II–IV smooth, and metasoma V mesially finely granulate. Sternite VII granulate, with granulate carinae present. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs with bristlecombs composed of 4–8 bristles. Ratio length/width of metasoma V in males 1.14–1.16.

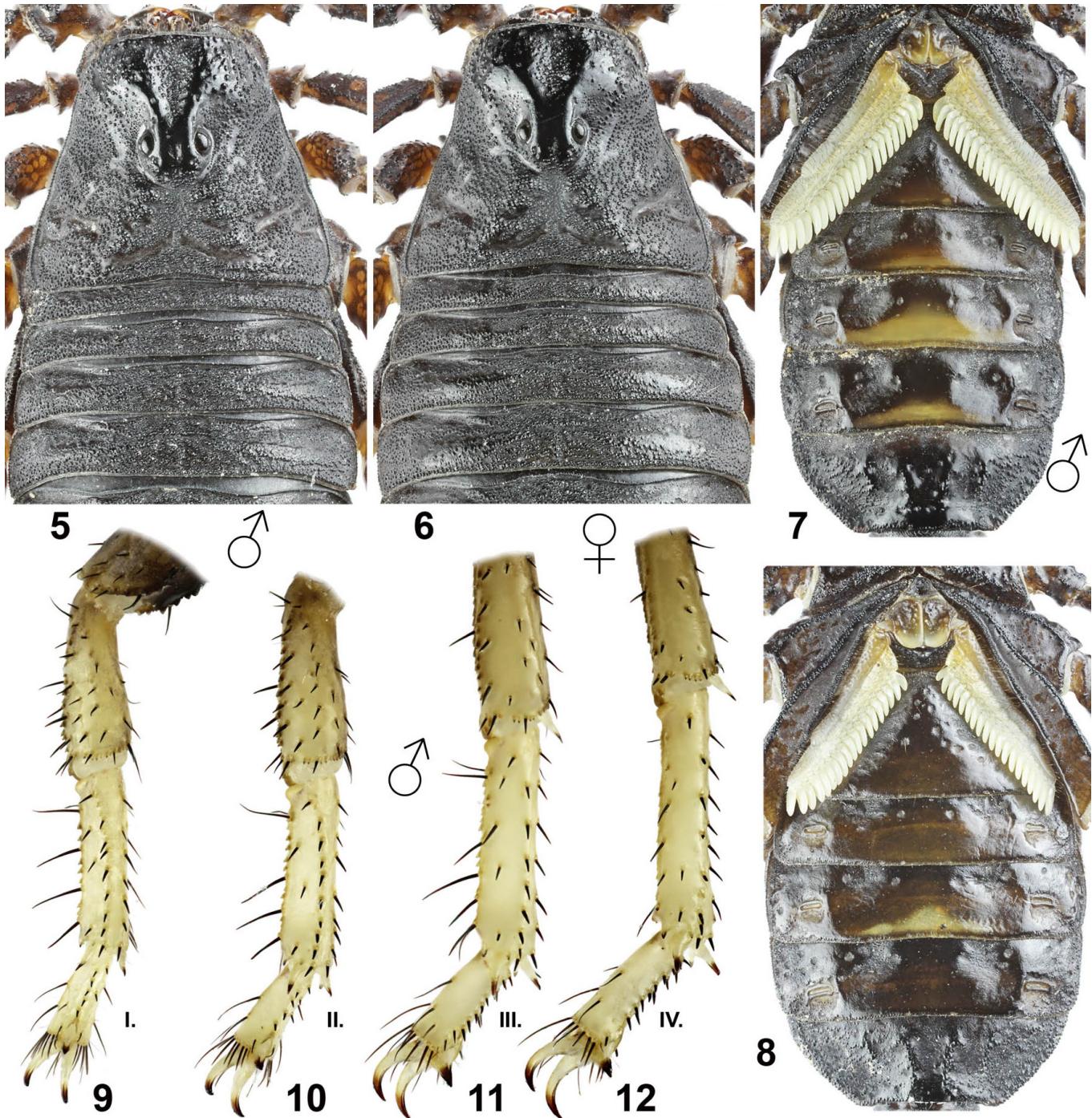
DESCRIPTION. Total length of adults is 29–40 mm in both sexes. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps are given in Table 1. For habitus see Figs. 1–4.

Coloration (Figs. 1–4). Carapace, tergites, metasoma and femur of pedipalps and legs are black, tibia and tarsomeres of legs and fingers of pedipalps are yellow. Patella of legs and pedipalps and pedipalp chela can be brown to black. Sternite VII is usually black, other sternites are reddish brown to black obviously with yellow median zone present in posterior margin of sternites III–VI. Telson is black with reddish brown aculeus.

Mesosoma and carapace (Figs. 5–8). The mesosoma bears a median carina and is densely granulated. The carapace is densely granulated, including the middle of interocular triangle. Only anterior median carinae are developed, which are smooth. The sternite VII is granulated and bears four granulated carinae, other sternites are smooth medially, finely granulated laterally, with a pair of smooth carinae. Pectinal teeth number 21–23 in males and 17–20 in females.

Metasoma and telson (Figs. 13–18). The metasoma segment I bears 10 granulated carinae. The segments II–V lack lateral carinae, ventromedian carinae are present on metasoma I–III, ventrolateral carinae are present on all metasomal segments, dorsolateral carina is present on metasoma I–III and reduced to absent on metasoma IV–V. Only metasoma I is granulated laterally; granulation absent on ventral surfaces of all metasomal segments and dorsal surfaces of segments II–IV. Dorsal surface of metasoma I has several granules. Metasoma V is mesially finely granulated. All segments are punctate ventrally and laterally, less so metasoma I. Spaces among punctae are smooth. The entire metasoma and telson are only very sparsely hirsute. The telson is punctate and lacks granules.

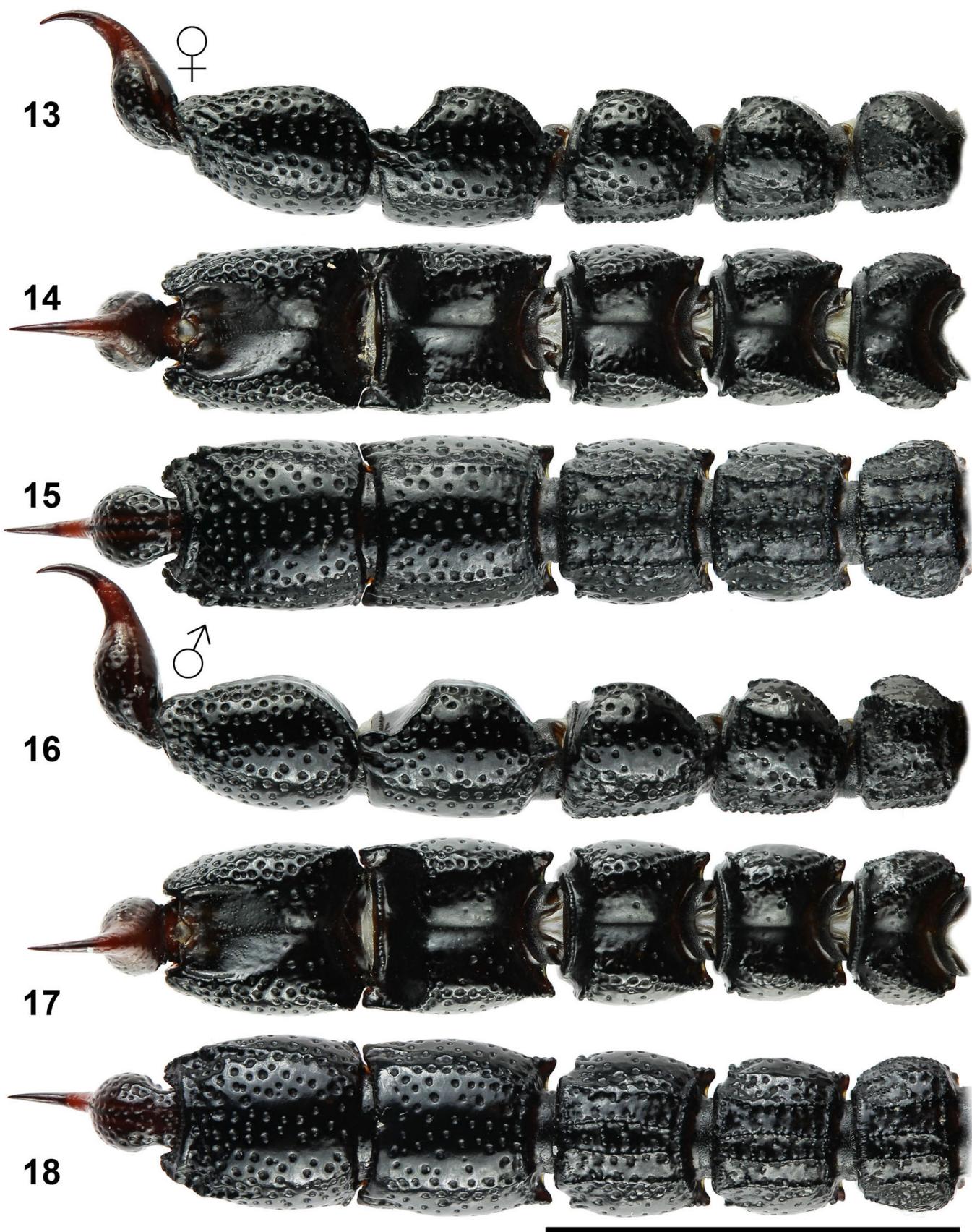
Pedipalps (Figs. 19–30). The distance between trichobothria d_1 and d_3 on the femur of pedipalp approximately equals that between d_3 and d_4 ; trichobothrium e_1 is situated between



Figures 5–12: *Orthochirus fomichevi* sp. n. **Figures 5, 7, 9–12.** Holotype male, carapace and tergites I–IV (5), sternopectinal region and sternites (7), and distal segments of right legs I–IV, retrolateral views (9–12). **Figures 6, 8.** Paratype female from type locality, carapace and tergites I–IV (6), sternopectinal region and sternites (8).

d_3 and d_4 or in level with d_4 . Trichobothrium d_2 of pedipalp femur dorsal surface is absent or reduced. The femur of pedipalp bears five granulate carinae. The patella has seven smooth carinae, and the chela has smooth carinae which may be discernible throughout the length of the fixed finger. The entire pedipalps are only very sparsely hirsute. The movable fingers bear 8–9 rows of denticles, with external and internal denticles and 5 subterminal denticles.

Legs (Figs. 9–12) The femur bears four partly granulated carinae, the patella bears five rather smooth carinae, and the tibia is smooth. The patella bears only a few spiniform setae. The tibia bears spiniform setae on the outer side of legs I–II. Tarsomere I of legs I to III bears bristlecombs composed of 4–8 bristles; legs IV lack bristlecombs. Tarsomeres I–II of all legs with two rather irregular rows of spiniform setae.



Figures 13–18: *Orthochirus fomichevi* sp. n. **Figures 13–15.** Paratype female from type locality, metasoma and telson, lateral (13), dorsal (14), and ventral (15) views. **Figures 16–18.** Holotype male, metasoma and telson, lateral (16), dorsal (17), and ventral (18) views. Scale bar: 10 mm.



Figures 19–34: Figures 19–32: *Orthochirus fomichevi* sp. n. Figures 19–20, 31–32. Paratype female from type locality. Pedipalp chela, movable finger dentate margin (19), pedipalp chela, dorsal view (20). Right chelicera, ventral (31) and dorsal (32) views. Figures 21–30. Holotype male. Pedipalp chela, dorsal (21), external (22), and ventrointernal (23) views. Pedipalp patella, dorsal (24), external (25), and ventral (26) views. Pedipalp femur and trochanter, internodorsal (27), ventral (28) and dorsoexternal (29) views. Pedipalp chela, movable finger dentate margin (30). The trichobothrial pattern is indicated in Figures 22–25, 27, and 29 (white circles). Figures 33–34. *Orthochirus navidpouri* sp. n., paratype female from type locality. Right chelicera, ventral (33) and dorsal (34) views.

Dimensions (MM)		<i>O. fomichevi</i> sp. n. ♂ holotype	<i>O. fomichevi</i> sp. n. ♀ paratype	<i>O. gantenbeini</i> sp. n. ♂ holotype
Carapace	L / W	4.466 / 5.194	4.795 / 5.864	3.415 / 4.252
Mesosoma	L	9.527	9.886	6.726
Tergite VII	L / W	2.621 / 5.411	2.623 / 6.177	1.935 / 4.421
Metasoma + telson	L	24.526	24.212	ca 18.75
Segment I	L / W / D	2.858 / 3.924 / 3.040	2.857 / 3.866 / 3.441	2.100 / 3.022 / 2.538
Segment II	L / W / D	3.215 / 3.878 / 3.100	3.320 / 3.915 / 3.509	2.511 / 3.087 / 2.723
Segment III	L / W / D	3.721 / 4.069 / 3.199	3.738 / 4.113 / 3.674	2.775 / 3.267 / 2.798
Segment IV	L / W / D	4.782 / 4.312 / 3.392	4.759 / 4.248 / 3.779	3.570 / 3.500 / 2.793
Segment V	L / W / D	4.895 / 4.250 / 3.293	4.972 / 4.204 / 3.429	3.791 / 3.439 / 2.582
Telson	L / W / D	5.055 / 1.957 / 1.583	4.566 / 2.066 / 1.746	- / 1.538 / 1.171
Pedipalp	L	13.695	13.295	10.757
Femur	L / W	3.331 / 1.181	3.408 / 1.308	2.836 / 0.862
Patella	L / W	4.207 / 1.550	4.045 / 1.567	3.349 / 1.133
Chela	L	6.157	5.842	4.572
Manus	W / D	1.193 / 1.141	1.159 / 1.261	0.812 / 0.811
Movable finger	L	3.990	3.809	3.061
Total	L	38.52	38.90	ca 28.90

Table 1. Comparative measurements of *Orthochirus fomichevi* sp. n. and *O. gantenbeini* sp. n. types. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

AFFINITIES. The described features distinguish *Orthochirus fomichevi* sp. n. from all other species of the genus. Yağmur (2010) misidentified the species as *O. zagrosensis*, from which *O. fomichevi* sp. n. differs by granulation present on the dorsal surface of metasoma V. For differentiating *O. fomichevi* sp. n. from all other *Orthochirus* species of the region, see the key below.

Orthochirus gantenbeini sp. n.

(Figs. 35–36, 39–44, 49–51, 55–63, 164, 176, Table 1)
<http://zoobank.org/urn:lsid:zoobank.org:act:3524FB39-3BFE-4751-8E4F-6926179367A0>

Orthochirus stockwelli: Navidpour et al., 2008a: 20, figs. 2, 101–102, (in part, figs. 2, 101–102).

TYPE LOCALITY AND TYPE DEPOSITORY. Iran, **Khoozestan Province**, Dezful District, Shahyoon village, 32°36'41"N 48°33'36"E, 527 m a.s.l.; FKCP.

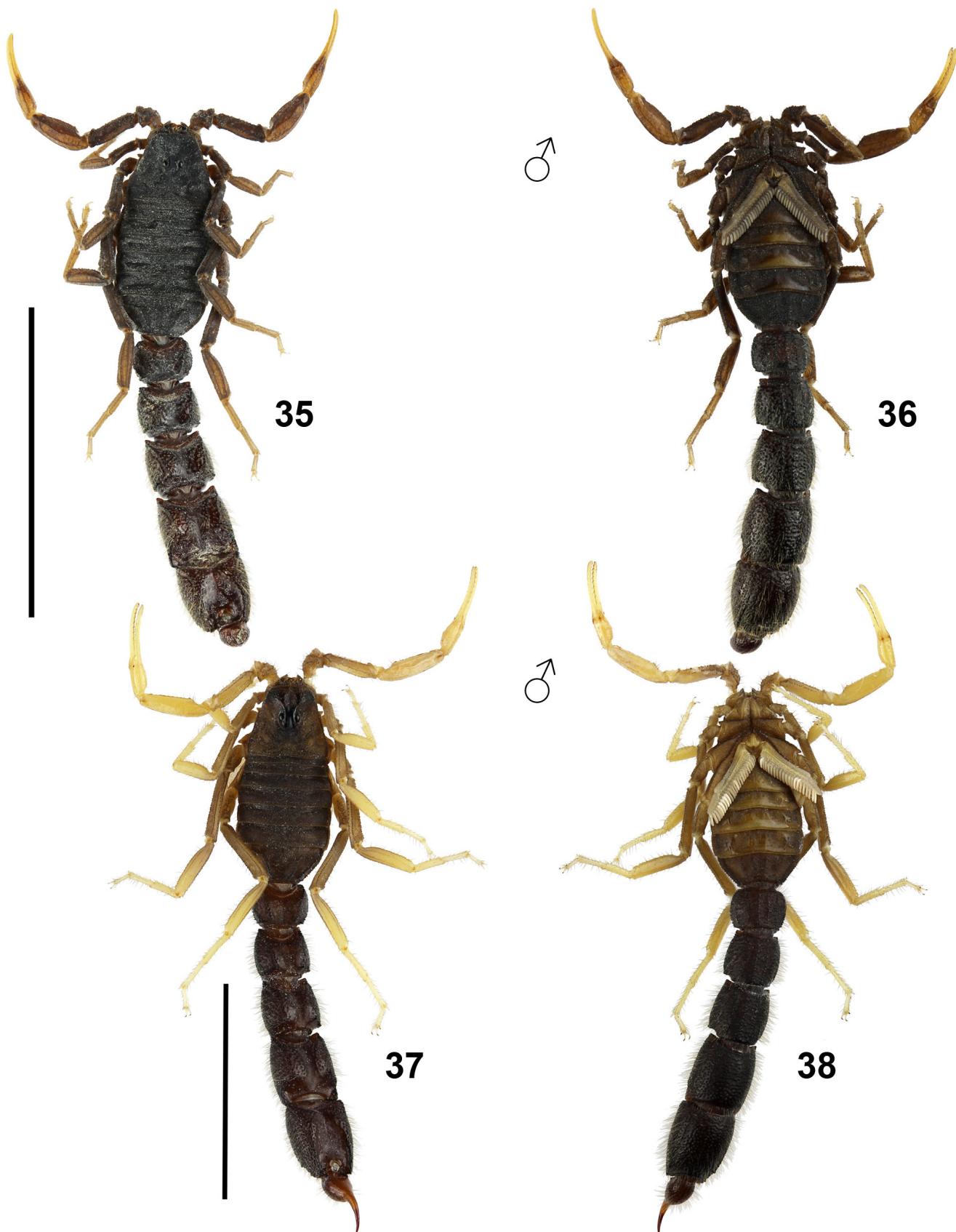
TYPE MATERIAL. Iran, **Khoozestan Province**, Dezful District, Shahyoon village, 32°36'41"N 48°33'36"E, 527 m a.s.l. (Locality No. D-103), VI.2007, leg. Navidpour, Masihipour & Hayader, 1♂ (holotype), FKCP.

ETYMOLOGY. The species epithet is a patronym honoring our colleague and friend, Benjamin Gantenbein (Bern, Switzerland), for his great contributions to the study of scorpions of the Old World.

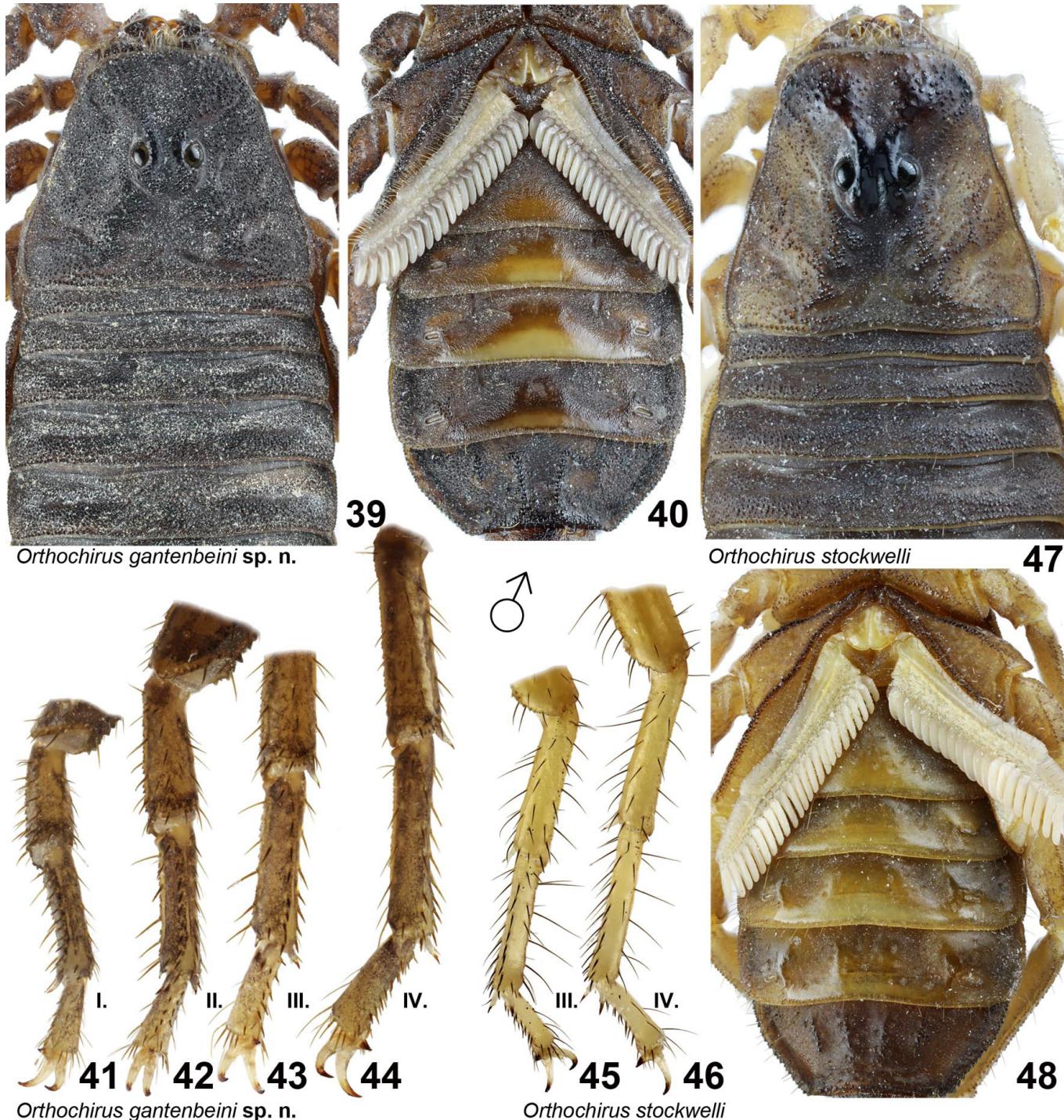
DIAGNOSIS. Total length of male ca 29 mm, female unknown. Trichobothrium d_2 of pedipalp femur present on dorsal surface. Median tibial spurs present on legs III and IV. Pectinal teeth number 23–24 in male. Movable and fixed fingers of pedipalps with 9 rows of denticles, with internal and external denticles and 5 subterminal denticles. Dorsal carinae of pedipalp patella granulate. Metasoma and telson densely hirsute, pedipalp hirsute. Metasoma I with 10 carinae, metasoma II with 8 carinae. Metasoma IV–V ventrally punctate with ventrolateral carinae indicated; spaces among punctae smooth, without granules. Metasoma II–III ventrally and laterally smooth without granules, punctate and bumpy. Dorsal surface of metasoma I granulate, metasoma II–V smooth. Sternite VII granulate with granulate carinae present. Tarsomere I of legs with bristlecombs composed of 5–7 bristles. Ratio length/width of metasoma V in male 1.10. Ratio length/width of pedipalp patella in male 2.96.

DESCRIPTION. Total length of adult male is ca. 29 mm, female unknown. Measurements of the carapace, telson, segments of the metasoma, and segments of the pedipalps are given in Table 1. For habitus see Figs. 35–36.

Coloration (Figs. 35–36). Carapace, tergites, and metasoma are black; femur and patella of pedipalps and legs are brown to black, tibia and tarsomeres of legs and pedipalp chela are yellowish brown. The sternites are black with glabrows yellow to brown zones present in posterior margin of sternites III–VI. Telson is reddish brown.



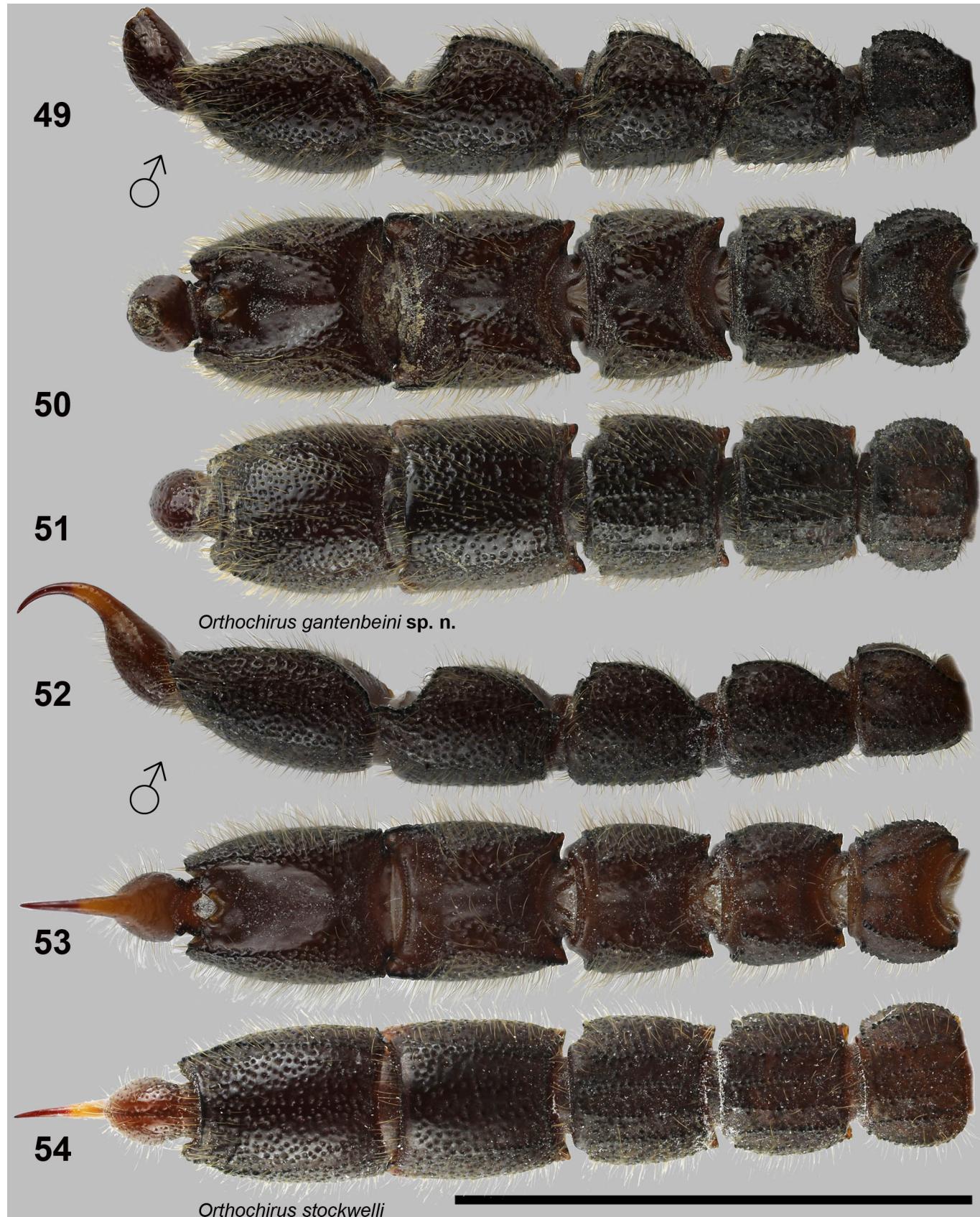
Figures 35–38: Figures 35–36. *Orthochirus gantenbeini* sp. n., male holotype, dorsal (35) and ventral (36) views. Figures 37–38. *Orthochirus stockwelli*, male from Iran, Hormozgan Province, Bandar Abbas to Lengeh Port road, 26°40'40.2"N 55°04'07.4"E, 17 m a.s.l. (Locality No. HO-150), dorsal (37) and ventral (38) views. Scale bars: 10 mm.



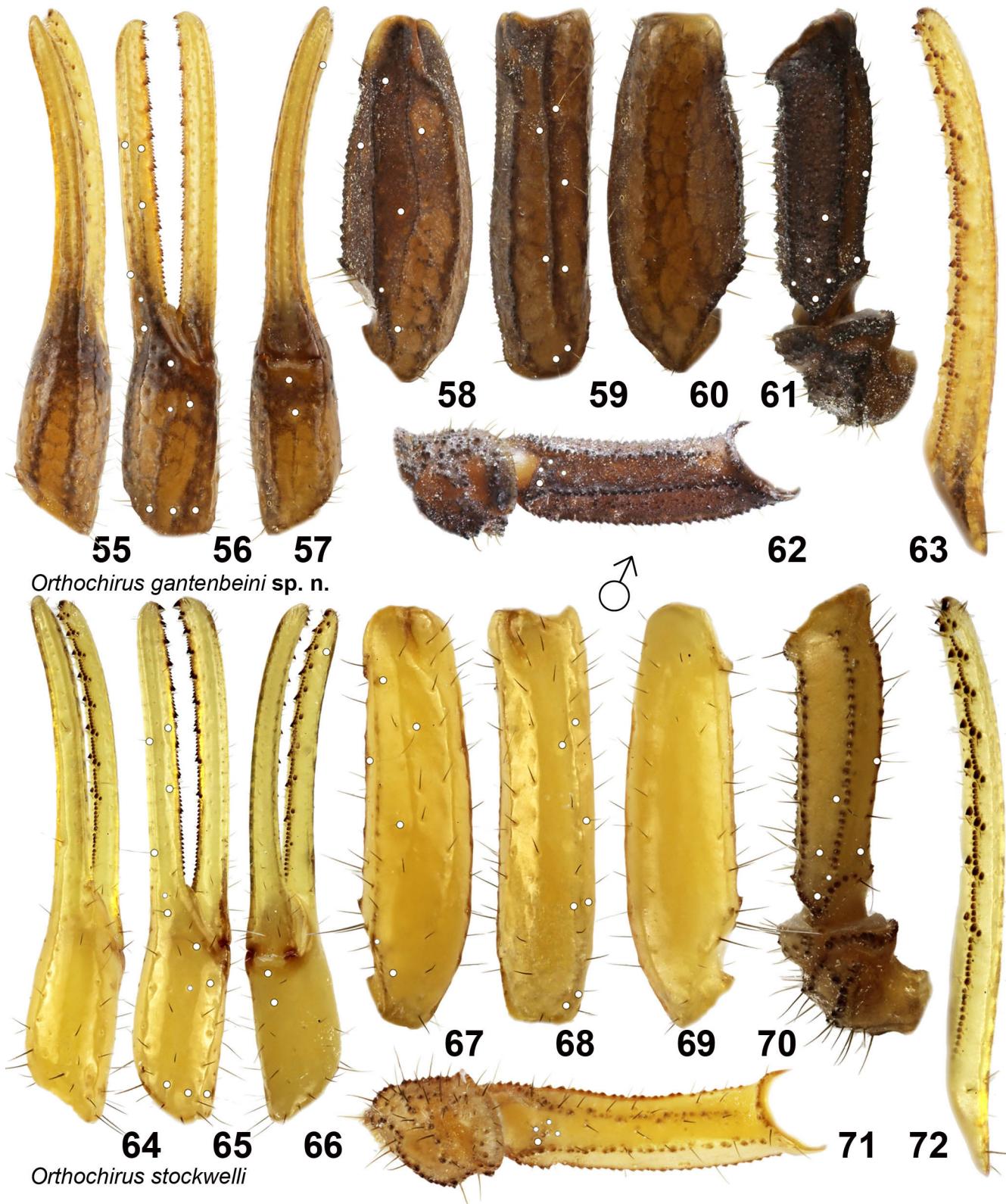
Figures 39–48: Figures 39–44. *Orthochirus gantenebeini* sp. n., male holotype, carapace and tergites I–V (39), steropectinal region and sternites (40), and distal segments of right legs I–IV, retrolateral views (41–44). Figures 45–48. *Orthochirus stockwelli*, male from Iran, Hormozgan Province, Bandar Abbas to Lengeh Port road, 26°40'40.2"N 55°04'07.4"E, 17 m a.s.l. (Locality No. HO-150), distal segments of left legs III–IV, retrolateral views (45–46), carapace and tergites I–IV (47), and steropectinal region and sternites (48).

Mesosoma and carapace (Figs. 39–40). The mesosoma bears a median carina and is densely granulated. The carapace is densely granulated, including the middle of interocular triangle. Only anterior median carinae are indicated, which are granulated. The sternite VII is granulated and bears four granulated carinae, the other sternites are granulated except the smooth median glabrous zones. Pectinal teeth number 23–24 in male holotype.

Metasoma and telson (Figs. 49–51). Whole metasoma and telson are densely hirsute. The segment I bear 10 granulated carinae. The segments II–V lacks lateral carinae, ventromedian carinae are present on metasoma I–III, ventrolateral carinae are present on metasoma I–II and absent or incomplete on metasoma III–V, dorsolateral carinae are present on all metasomal segments but can be reduced. Only metasoma I



Figures 49–54: Figures 49–51. *Orthochirus gantenbeini* sp. n., male holotype, metasoma and telson, lateral (49), dorsal (50), and ventral (51) views. Figures 52–54. *Orthochirus stockwelli*, male from Iran, Hormozgan Province, Bandar Abbas to Lengeh Port road, 26°40'40.2"N 55°04'07.4"E, 17 m a.s.l. (Locality No. HO-150), metasoma and telson, lateral (52), dorsal (53), and ventral (54) views. Scale bar: 10 mm.



Figures 55–72: Figures 55–63. *Orthochirus gantenbeini* sp. n., male holotype. Pedipalp chela, dorsal (55), external (56), and ventrointernal (57) views. Pedipalp patella, dorsal (58), external (59), and ventral (60) views. Pedipalp femur and trochanter, dorsoexternal (61) and internodorsal (62) views. Pedipalp chela, movable finger dentate margin (63). Figures 64–72. *Orthochirus stockwelli*, male from Iran, Hormozgan Province, Bandar Abbas to Lengeh Port road, $26^{\circ}40'40.2''\text{N}$ $55^{\circ}04'07.4''\text{E}$, 17 m a.s.l. (Locality No. HO-150). Pedipalp chela, dorsal (64), external (65), and ventrointernal (66) views. Pedipalp patella, dorsal (67), external (68), and ventral (69) views. Pedipalp femur and trochanter, dorsoexternal (70) and internodorsal (71) views. Pedipalp chela, movable finger dentate margin (72). The trichobothrial pattern is indicated in Figures 56–59, 61–62, 65–68, 70–71 (white circles).

is granulated laterally and dorsally. All segments are punctate ventrally, laterally, and partly dorsally, metasoma I is less punctate. Spaces among punctae are smooth. The telson is punctate and lacks granules.

Pedipalps (Figs. 55–63). The distance between trichobothria d_1 and d_3 on the femur of pedipalp shorter than between d_3 and d_4 ; trichobothrium e_1 is situated between d_3 and d_4 . Trichobothrium d_2 of pedipalp femur present on dorsal surface. The femur of pedipalp bears five granulate carinae. The patella has seven granulate carinae, and the chela has smooth carinae, which may be discernible throughout the length of the fixed finger. The entire pedipalps are hirsute. The movable fingers bear 9 rows of denticles, with external and internal denticles and 5 subterminal denticles.

Legs (Figs. 41–44). The femur bears four granulated carinae, the patella bears five carinae, and the tibia is smooth. The patella bears only a few setae. The tibia bears setae on the outer side of legs I–II. Tarsomere I of first to legs III to IV bears bristlecombs composed of 5–7 bristles, legs IV lack bristlecombs. Tersomeres I–II of all legs with two rather irregular rows of spiniform setae.

AFFINITIES. The described features distinguish *Orthochirus gantenbeini* sp. n. from all other species of the genus. Navidpour et al. (2008) formerly cited the male holotype as *O. stockwelli* known from Hormozgan (type locality) and Bushehr Provinces according to densely hirsute metasoma. This character differentiates the species from all other species from the region. Comparison with the true male topotype of *O. stockwelli* (Figs. 37–38, 45–48, 52–54, 64–72) shows strong differences between these two species (lighter color, smooth sternites, reduced granulation and smooth anterior carinae on carapace, and a narrower metasoma in *O. stockwelli*). Among the main characters, we can mention: (1) the shape of pedipalp patella and femur, which are considerably shorter and wider in *O. gantenbeini* sp. n. than in *O. stockwelli*. Ratio length/width of pedipalp patella is 2.96 in male holotype *O. gantenbeini* sp. n. (Fig. 58, Table 1) vs. 3.2 (holotype, see Lourenço & Vachon, 1995: 304, table 1) to 3.9 (Fig. 67, male from FKCP collection) in *O. stockwelli*; (2) pedipalp patella carinae, which are developed and granulated in *O. gantenbeini* sp. n. (Fig. 58) vs. smooth and incomplete in *O. stockwelli* (Fig. 67).

Orthochirus iranus Kovařík, 2004 (Figs. 73–82, 159, 166, 172–173, 176)

Orthochirus iranus Kovařík, 2004: 13–14; Kovařík & Fet, 2006: 8; Navidpour et al., 2008a: 15–20 (in part); Navidpour et al., 2008b: 17; Navidpour et al., 2008c: 11 (in part); Navidpour et al., 2008d: 7, figs. 39–42; Navidpour et al., 2010: 15 (in part); Mirshamsi et al., 2011: 20.

TYPE LOCALITY AND TYPE DEPOSITORY. Iran, Bushehr Province, ca 17 km NW. Bandar-e-Gonaveh, 29°38'32"N 50°26'56"E, 10 m. a. s. l.; FKCP.

TYPE MATERIAL EXAMINED. **Iran, Bushehr Province**, ca 17 km NW Bandar-e-Gonaveh, 10 m a.s.l., 29°38'32"N 50°26'56"E, 13–14.X.1998, leg. P. Kabátek, 3♂2♀A (holotype and paratypes), FKCP; Chahak, 15 km NW Bandar-e-Gonaveh by road, 29°40'N 50°25'E, 20 m a.s.l., 3–5.V.1996 (loc No. 19 in Frynta et al., 1997: 4), leg. D. Král, 1♀ (allotype), leg. M. Kaftan, 1♂1♀ (paratypes), FKCP.

OTHER MATERIAL FROM THE REGION (FIG. 176) EXAMINED. **Iran, Khozestan Province**, Baghmalek District, Karbalai Ghasem village, 31°27'24"N 49°57'37"E (Locality No. H-201), XII.2006, leg. Kazemi & Habibzadeh, 1♂, FKCP.

EMENDED DIAGNOSIS. Total length of adults 24–38 mm. Trichobothrium d_2 of pedipalp femur dorsal present, reduced or absent. Median to large tibial spurs present on third and fourth legs. Pectinal teeth number 17–22 in both sexes. Movable and fixed fingers of pedipalps with 8–9 rows of denticles, with internal and external denticles and 4–5 subterminal denticles. Dorsal cainae on pedipalp patella developed and smooth. Metasoma I–II with 10 carinae, metasoma III with 8 carinae. Metasoma IV–V ventrally punctate with ventrolateral carinae present. Metasoma ventrally and laterally granulate. Dorsal surface of metasoma I with several granules, metasoma II–IV smooth, and metasoma V mesially densely granulate. Sternite VII granulate with granulate carinae present. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs with bristlecombs composed of 4–7 bristles. Ratio length/width of metasoma V in males 1.06–1.11.

DISTRIBUTION. Iran (Bushehr, Khoozestan, and Kohkiloyeh & Boyer Ahmad Provinces).

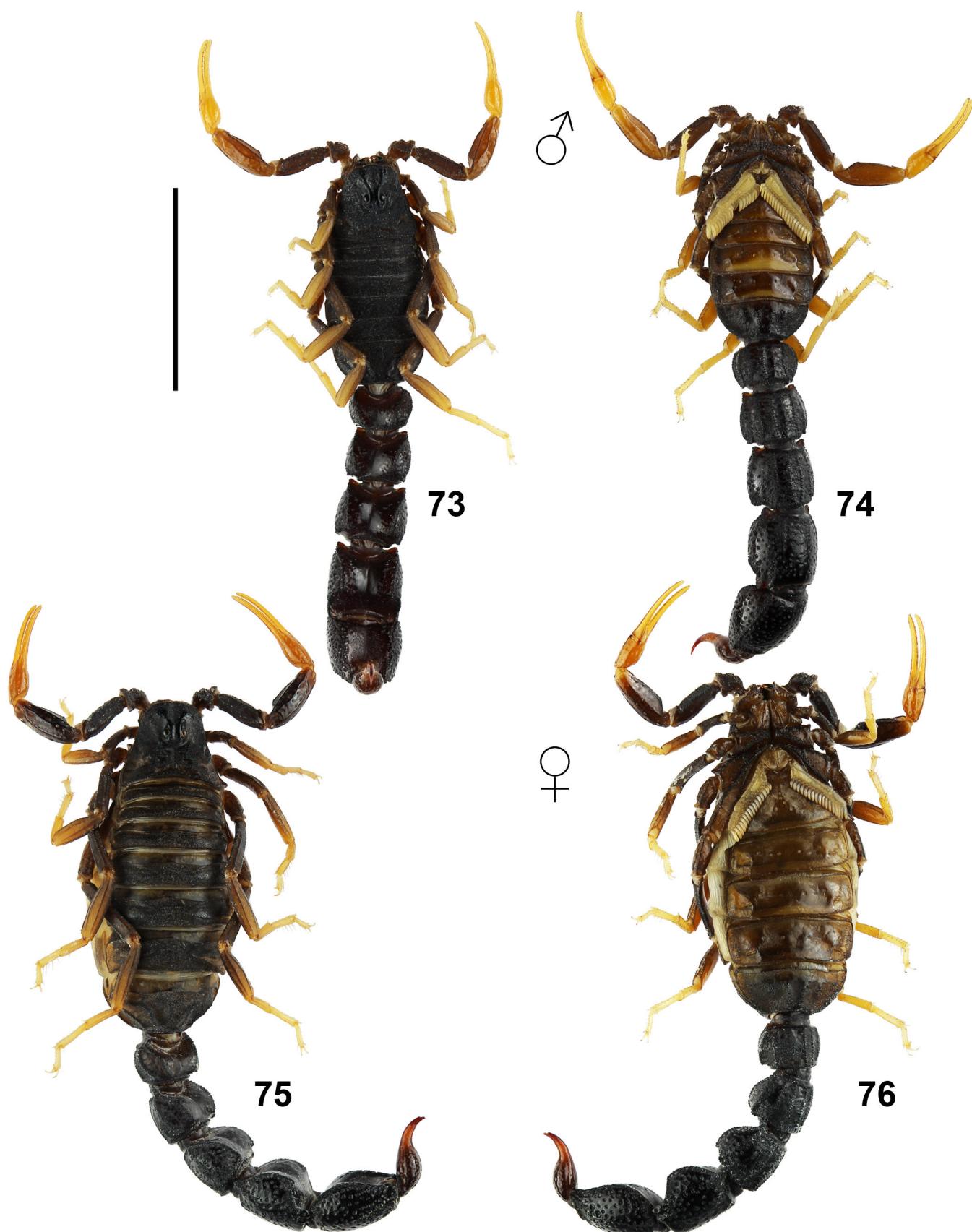
Orthochirus iragus Kovařík, 2004 (Figs. 83–87, 156, 158, 165, 176)

Orthochirus iragus Kovařík, 2004: 14–15, table 1; Kovařík & Fet, 2006: 8.

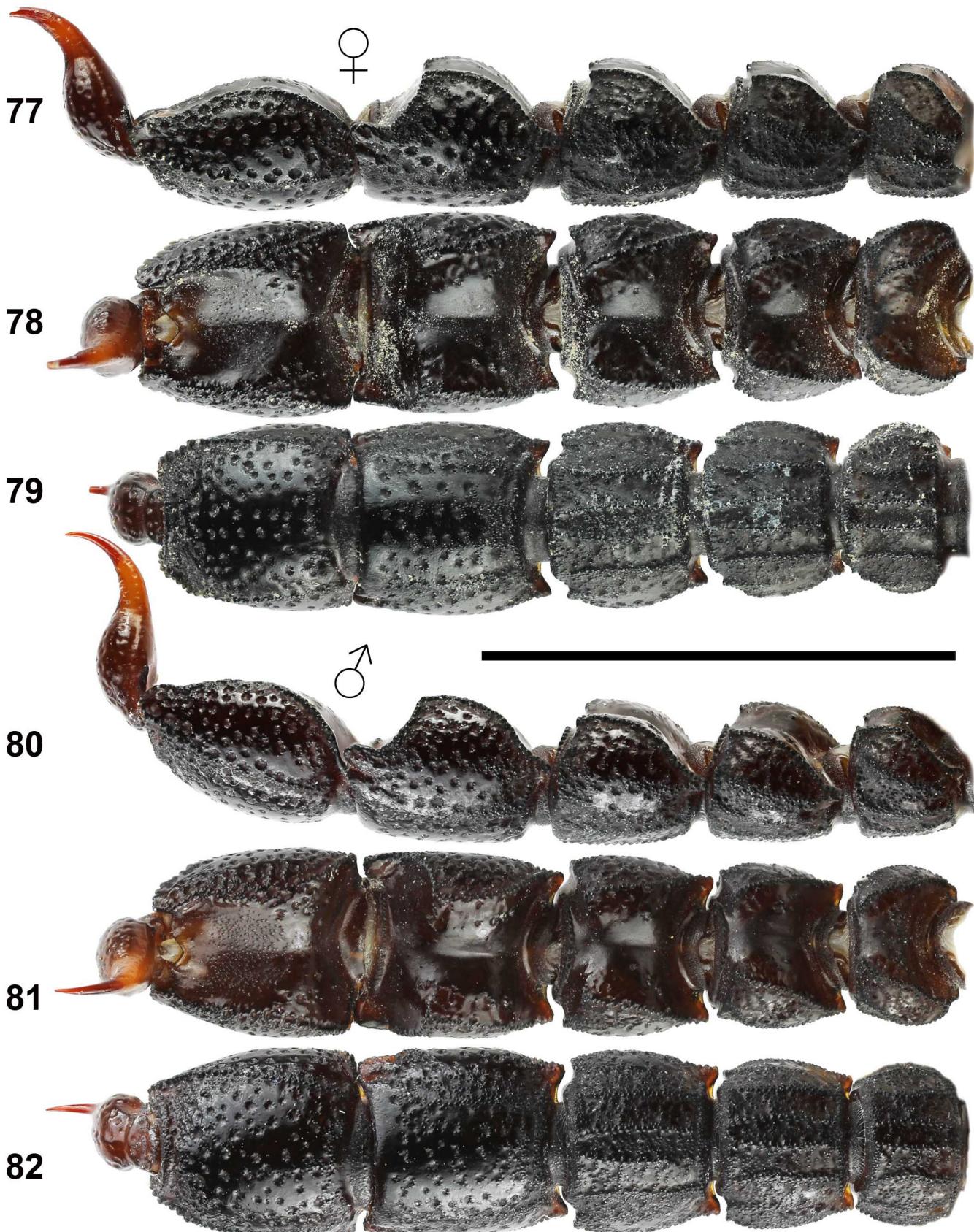
TYPE LOCALITY AND TYPE DEPOSITORY. **Iraq, Najaf Province**, Ash-Shabakah (Shabachah, Shabicha), Geophysics Brno base camp, 150 km SW of An-Najaf (Najaf), 262 m asl, 31°06'N 43°95'E; FKCP.

TYPE MATERIAL EXAMINED. **Iraq, Najaf Province**, Ash-Shabakah (Shabachah, Shabicha), Geophysics Brno base camp, 150 km SW of An-Najaf (Najaf), 262 m asl, 31°06'N 43°95'E, X.–XII.1978, leg. O. Jakeš, 1♂ (holotype, originally cited incorrectly as a female) 1♂ (paratype), FKCP; Baghdad, 1929–1932, leg. V. Kálalová, 1♂ (paratype), NMPC.

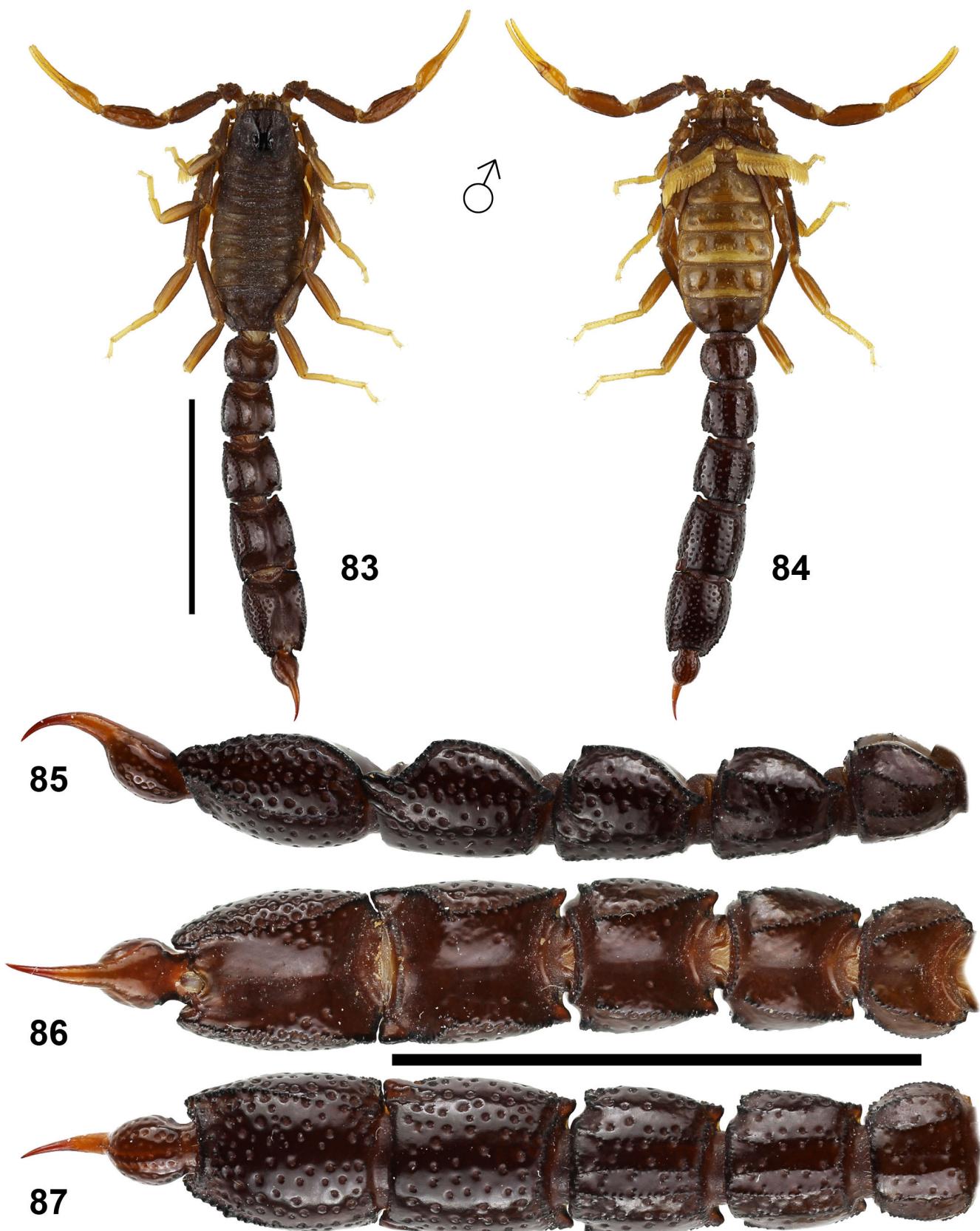
EMENDED DIAGNOSIS. Total length of adults 23–36 mm. Trichobothrium d_2 of pedipalp femur dorsal surface absent or reduced. Median tibial spurs present on legs III and IV. Pectinal teeth number 18–22 in both sexes. Movable and



Figures 73–76: *Orthochirus iranus* Kovařík, 2004. **Figures 73–74.** Holotype male, dorsal (73) and ventral (74) views. **Figures 75–76.** Paratype female from type locality, dorsal (75) and ventral (76) views. Scale bar: 10 mm.



Figures 77–82: *Orthochirus iranus* Kovářík, 2004. **Figures 77–79.** Paratype female from type locality, metasoma and telson, lateral (77), dorsal (78), and ventral (79) views. **Figures 80–82.** Holotype male, metasoma and telson, lateral (80), dorsal (81), and ventral (82) views. Scale bar: 10 mm.



Figures 83–87. *Orthochirus iraqus* Kovářík, 2004, male holotype, dorsal (83) and ventral (84) views. Metasoma and telson, lateral (85), dorsal (86), and ventral (87) views. Scale bars: 10 mm (83–84, 85–87).

fixed fingers of pedipalps with 7–8 rows of denticles, with internal and external denticles and 4–5 subterminal denticles. Dorsal carinae on pedipalp patella smooth. Metasoma I with 10 carinae, metasoma II with 8 carinae. Metasoma ventrally punctate with ventrolateral carinae present on metasoma I–II and partly on metasoma V; spaces among punctae smooth, without granules. Whole metasoma smooth without granules, punctate and bumpy, only metasoma V dorsal mesially with several granules. Sternite VII rather smooth without granulate carinae developed. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs with bristlecombs composed of 5–6 bristles.

DISTRIBUTION. Iraq.

Orthochirus mesopotamicus Birula, 1918, stat. n.
(Figs. 88–116, 157, 160, 167, 176)

Orthochirus scrobiculosus mesopotamicus Birula, 1918: 35–42; Birula, 1928: 83; Vachon, 1966: 214; Levy & Amitai, 1980: 94; Fet, 1989: 116; Fet, 1994: 530; Kovařík, 1998: 116; Fet & Lowe, 2000: 199; Kovařík, 2004: 19, 20.
Orthochirus iranus (in part): Navidpour et al., 2008a: 15–20, figs. 4, 19, 24–26, 27–30, 31, 97–100, table 2; Navidpour et al., 2008c: 11, 8, 10, 50–53.

TYPE LOCALITY AND TYPE DEPOSITORY. Iran, **Khoozestan Province**, Karun River, Kut-e-Gazaie, camp of Sheikh Gazal near Ahvaz; ZISP.

TYPE MATERIAL EXAMINED. Iran, **Khoozestan Province**, Karun River, Kut-e-Gazaie, camp of Sheikh Gazal near Ahvaz, 14.II.1904, leg. N. Zarudny, 1♂ (lectotype, designated here, Figs. 88–90; see Notes), ZISP No. 684. Paralectotypes: Iran, **Khoozestan Province**, Shuster [now Shushtar], 22.III.1904, leg. N. Zarudny, 2♀, ZISP No. 683; Karun River, near Nasrie [now Naseri] and Ahvaz, Jebel-Tebe [now Jabal-Tube] hills, 25.II.1904, leg. N. Zarudny, 1♀, ZISP No. 685.

OTHER TYPE MATERIAL (NOT SEEN). Paralectotypes: “Mesopotamia inferior”, now **Iraq**, **Wasit Province**, Baksai, 5–14 (18–27). III.1914, leg. P. Nesterov, 1sbad♂1sbad♀, ZISP; Gengir [now Gangir] River, 31.III (13.IV).1914, leg. P. Nesterov, 1sbad♂, ZISP; upper Abi-Neft River, 7–8(20–21).IV.1914, leg. P. Nesterov, 1sbad♀, ZISP; Kanibis, 9(22).IV.1914, leg. P. Nesterov, 1♀, ZISP.

OTHER MATERIAL FROM THE REGION (FIG. 176) EXAMINED. Iraq, **Basra Province**, Basra (ca. 30°48'N 47°34'E), 2017, leg. Mohammed Morad, 5♂1♀, FKCP. Iran, **Ilam Province**, Dashte Abbas, Ein Saleh village, 32°25.24'N 47°43.86'E, 182 m a.s.l. (Locality No. IL-828), X.2007, leg. Navidpour, Masihipour & Bahrani, 2♂2♀, FKCP. Khoozestan Province, Chogha Zanbil (Locality No. CH-95), 2007, leg. Masihipour, Hayader & Bahrani, 1♂, FKCP; Shadegan

District, Toopjeh village, 30°39'33"N 48°36'44"E (Locality No. SH-75), 2006, leg. Hayader & Jahanifard, 1♀, FKCP; Shadegan District, Toopjeh village, 30°39'33"N 48°36'44"E, 33 m a.s.l. (Locality No. SH-1 to 4), IV.2007, leg. Navidpour & Jahanifard, 15♂7♀6ims.1juv., FKCP; Omidiyeh, 30°57'49"N 49°31'47"E, 21 m a.s.l. (Locality No. A-OM-1), V.2007, leg. Navidpour & Jahanifard, 1♂, FKCP; near Masdjedsoleyman, 31°38'40"N 48°56'41"E, 54 m a.s.l. (Locality No. A-ma 809), VIII.2007, leg. Navidpour & Masihipour, 4♂2♀, FKCP; Shushtar (Locality No. SHO-014), VIII.2007, leg. Hayder, 2♂1im., FKCP; Hamidiyeh, 31°27'57"N 48° 29'18"E, 13 m a.s.l. (Locality No. A-Ham-812), IX.2007, leg. Masihipour & Navidpour, 4♂1♀, FKCP.

DIAGNOSIS. Total length of adults 26–38 mm. Trichobothrium d_2 of pedipalp femur dorsal surface present, reduced or absent. Median tibial spurs present on legs III and IV. Pectinal teeth number 18–24 in both sexes. Movable and fixed fingers of pedipalps with 7–8 rows of denticles, with internal and external denticles and 4–5 subterminal denticles. Dorsal carinae on pedipalp patella developed and smooth. Metasoma I–II with 10 carinae, metasoma III with 8 carinae. Metasoma IV–V ventrally punctate with ventrolateral carinae present; spaces among punctae sparsely granulate. Metasoma I–III ventrally and laterally granulate. Dorsal surface of metasoma I with several granules, metasoma II–IV smooth, and metasoma V mesially granulate. Sternite VII granulate with granulate carinae present. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs with bristlecombs composed of 4–7 bristles. Ratio length/width of metasoma V in males 1.18–1.24.

NOTES. Birula (1918) analyzed scorpion collections of the Russian zoologist Pëtr V. Nesterov (1883–1941) from Mesopotamia. An account of Nesterov's life, work, and tragic end in the Communist Estonia was recently published by Shergalin (2011). From February to August of 1914, just before and then during the outbreak of the Great War, Nesterov worked for the Persian-Turkish international delineation commission; he traveled along the modern border between Iraq and Iran, where he collected many valuable zoological specimens.

Earlier, in 1896–1904, another Russian explorer, a great ornithologist Nikolay A. Zarudny (1859–1919), has collected many important scorpion specimens in Iran (then Persia), also published by A. A. Birula, and deposited in ZISP. In his description of *Orthochirus scrobiculosus mesopotamicus* Birula (1918: 32, 39) explicitly stated that this new subspecies included both Nesterov's 1914 specimens from “Mesopotamia inferior” (modern Iraq) and Zarudny's 1904 specimens from the modern Khoozestan Province of Iran, in the valley of the Karun River near Ahvaz (“Mesopotamia karunensis”).

We designate here a male collected by Zarudny on 14

№ входящаго журн.	Число экз.	Сингр. Сурхаг. Марк. провер.	Полъ.	МѢСТО СБОРА.	Время сбора.	КОЛЛЕКТОРЪ.	Кто опредѣлилъ.	Наземн. жив. Персія Листъ 1.	
								ОТМѢТКА.	
683. ✓ 2				Гаджох. Персія, Арадиенгатъ окр. с. Мусієвъ	22 II 1904	Н. Заруднікъ	A. Birula.		
684. ✓ 1				Гаджох., р. Каракъе, Кумъ -и-Гаджохъ, пасирт месъ за Гаджохъ	14 II 1904	"	"		
685. ✓ 1				Гаджох., р. Каракъе, окр. Деп. Насрін и Аскабадъ примыкающи к южно-казахскому Дунайскому - Манасу.	25 II 1904	"	"		



Зоол. инст. АН
№

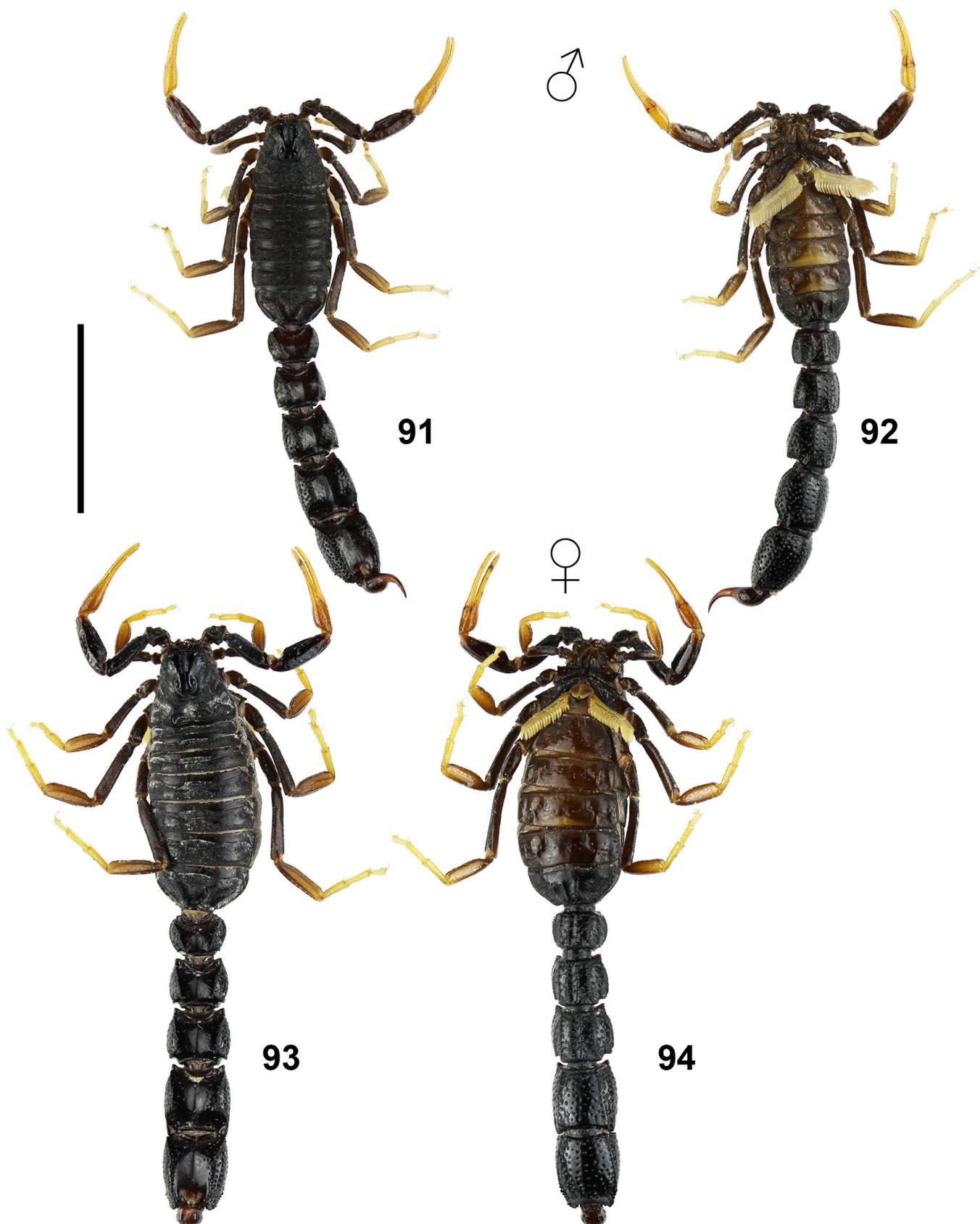
684. *Orthochirus* ♂ sad
sericeiculus mesopot.
Оп. А. Бирулъ Birula
Сбор 14. II. 1904.
Н. Заруднікъ Н. Заруднікъ

N=684.

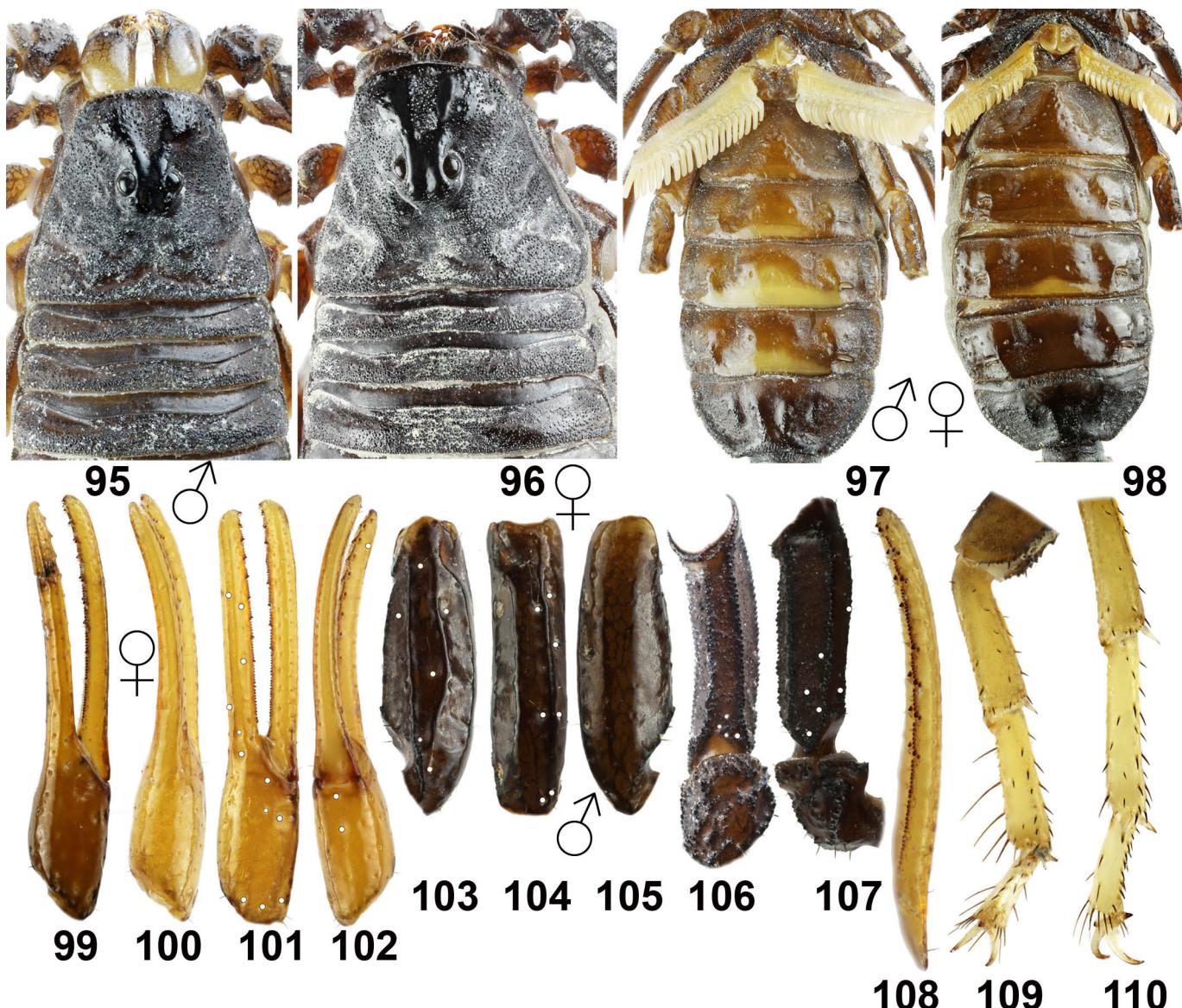
14 II 1904
Персія
Заруднікъ

Orthochirus sericeiculus mesopotamicus, f. ♂

Figures 88–90. *Orthochirus mesopotamicus* Birula, 1918 comb. n., male lectotype, dorsal (88) and ventral (89) views. Original labels and registered card (90).



Figures 91–94: *Orthochirus mesopotamicus* comb. n., from Iraq, Basra (ca. 30°48'N 47°34'E). **Figures 91–92.** Male, dorsal (91) and ventral (92) views. **Figures 93–94.** Female dorsal (93) and ventral (94) views. Scale bar: 10 mm.



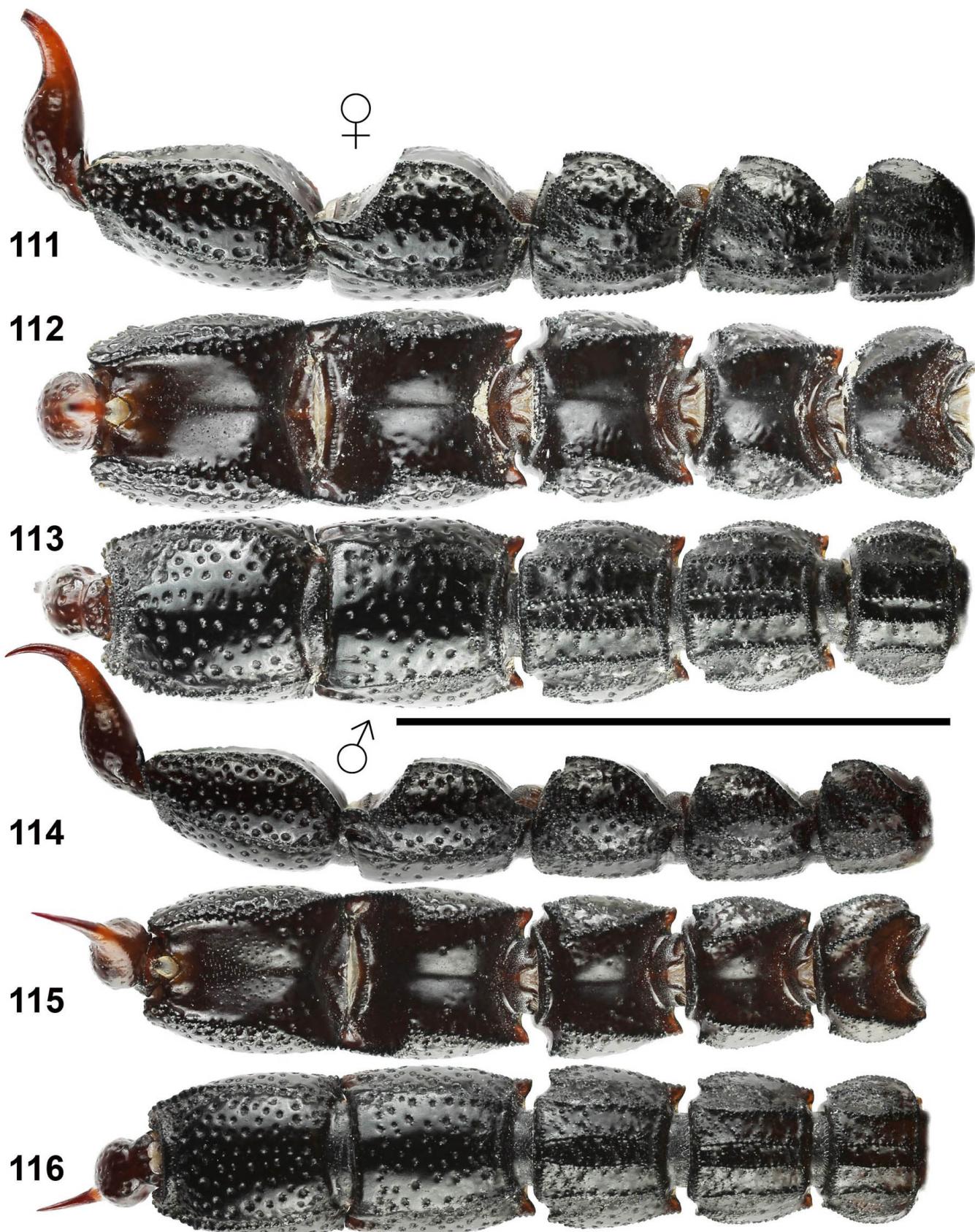
Figures 95–110: *Orthochirus mesopotamicus* comb. n., from Iraq, Basra (ca. $30^{\circ}48'N$ $47^{\circ}34'E$). **Figures 95, 97, 100–110.** Male, carapace and tergites I–III (95), sternopectinal region and sternites (97). Pedipalp chela, dorsal (100), external (101), and ventrointernal (102) views. Pedipalp patella, dorsal (103), external (104), and ventral (105) views. Pedipalp femur and trochanter, internodorsal (106) and dorsoexternal (107) views. Pedipalp chela, movable finger dentate margin (108). The trichobothrial pattern is indicated in Figures 101–104, 106–107 (white circles). Distal segments of right legs III–IV, retrolateral views (109–110). **Figures 96, 98–99.** Female, carapace and tergites I–III (96), sternopectinal region and sternites (98), and pedipalp chela dorsoexternal (99).

February 1904 (ZISP 684; the only adult male among the syntypes), as a lectotype of this taxon, which we elevate to species status in accordance with the current understanding of the genus taxonomy. A travelogue of Zarudny's four Persian expeditions has been recently published in English (Aliabadian et al., 2012). They list (p. 38) Zarudny "reaching the Karun River mouth on 2 Feb[ruary] 1904. On the way back, a longer period was spent in Ahvaz, Naseri, Jabal Tübe and surroundings (15–29 Feb)." Naseri, where one of the paralectotypes was collected on 25 February, is a wetland located north from Khorramshahr (formerly Muhammarah), next to Karun River; in our map (Fig. 176), we used the coordinates for Naseri ($30^{\circ}45'31''N$ $48^{\circ}15'54''E$).

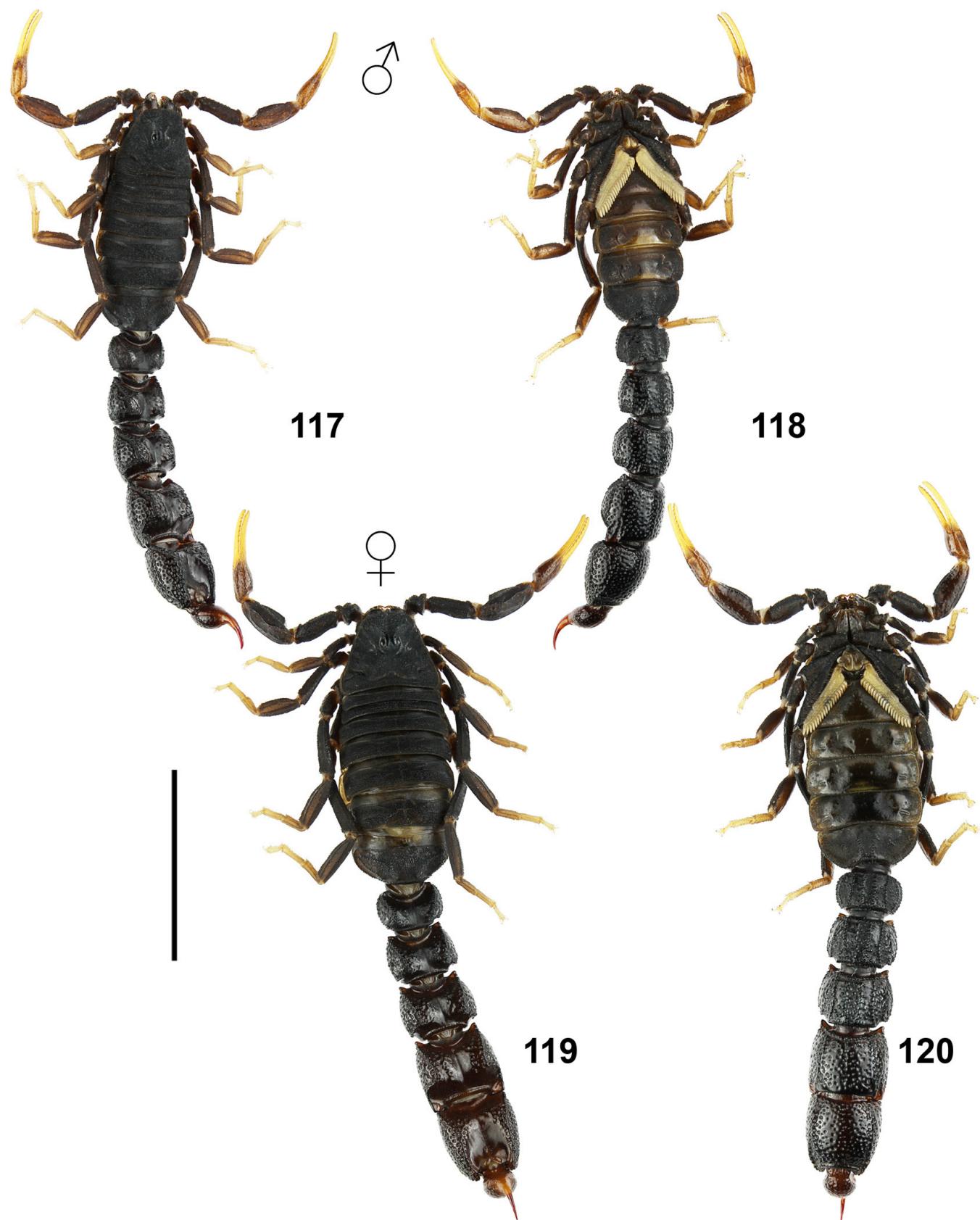
A travelogue of Nesterov's 1914 travel is given by Birula (1918: 2–3) showing that Nesterov's syntypes were collected in March–April 1914 as his expedition traveled between Basra and Baghdad. We identified the first of his localities as modern Baksai in Iraq ($32^{\circ}53'00''N$ $46^{\circ}25'30''E$), included in our map (Fig. 176).

The dates of Zarudny's 1904 travels are given according to the Old Style (Julian) calendar used in Russia before 1918; the dates of Nesterov's 1914 travels are given in both Old and New (Gregorian) Style after Birula (1918).

DISTRIBUTION. Iraq, Iran (Ilam and Khoozestan Provinces).



Figures 111–116: *Orthochirus mesopotamicus* comb. n., from Iraq, Basra (ca. 30°48'N 47°34'E). **Figures 111–113.** Female, metasoma and telson, lateral (111), dorsal (112), and ventral (113) views. **Figures 114–116.** Male, metasoma and telson, lateral (114), dorsal (115), and ventral (116) views. Scale bar: 10 mm.



Figures 117–120: *Orthochirus navidpouri* sp. n. **Figures 117–118.** Holotype male, dorsal (117) and ventral (118) views. **Figures 119–120.** Paratype female from type locality, dorsal (119) and ventral (120) views. Scale bar: 10 mm.

Dimensions (mm)		<i>O. navidpouri</i> sp. n.	<i>O. navidpouri</i> sp. n.
		♂ holotype	♀ paratype
Carapace	L / W	3.639 / 4.245	4.254 / 5.320
Mesosoma	L	8.506	10.305
Tergite VII	L / W	2.167 / 4.138	2.601 / 5.386
Metasoma + telson	L	19.065	20.341
Segment I	L / W / D	2.190 / 3.252 / 2.489	2.284 / 3.522 / 3.013
Segment II	L / W / D	2.651 / 3.353 / 2.596	2.736 / 3.707 / 3.048
Segment III	L / W / D	3.008 / 3.532 / 2.673	3.076 / 4.008 / 3.128
Segment IV	L / W / D	3.494 / 3.706 / 2.850	3.906 / 4.229 / 3.196
Segment V	L / W / D	3.929 / 3.629 / 2.751	4.155 / 4.029 / 2.898
Telson	L / W / D	3.793 / 1.637 / 1.291	4.184 / 1.803 / 1.412
Pedipalp	L	11.179	11.319
Femur	L / W	2.799 / 0.911	2.940 / 1.062
Patella	L / W	3.453 / 1.243	3.499 / 1.349
Chela	L	4.927	4.880
Manus	W / D	0.905 / 0.917	0.967 / 1.106
Movable finger	L	3.354	3.197
Total	L	31.21	34.90

Table 2. Comparative measurements of *Orthochirus navidpouri* sp. n. types. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Orthochirus navidpouri sp. n.

(Figs. 33–34, 117–154, 161, 168, 176, Table 2)
<http://zoobank.org/urn:lsid:zoobank.org:act:3399E2CC-272B-4EEA-913F-11F6ED7B009F>

Orthochirus iranus: Navidpour et al., 2010: 15 (in part).

TYPE LOCALITY AND TYPE DEPOSITORY. **Iran, Lorestan Province**, Koramabad, Haftcheshmeh Village, 33°48'39"N 47°46'03"E, 1398 m a.s.l.; FKCP.

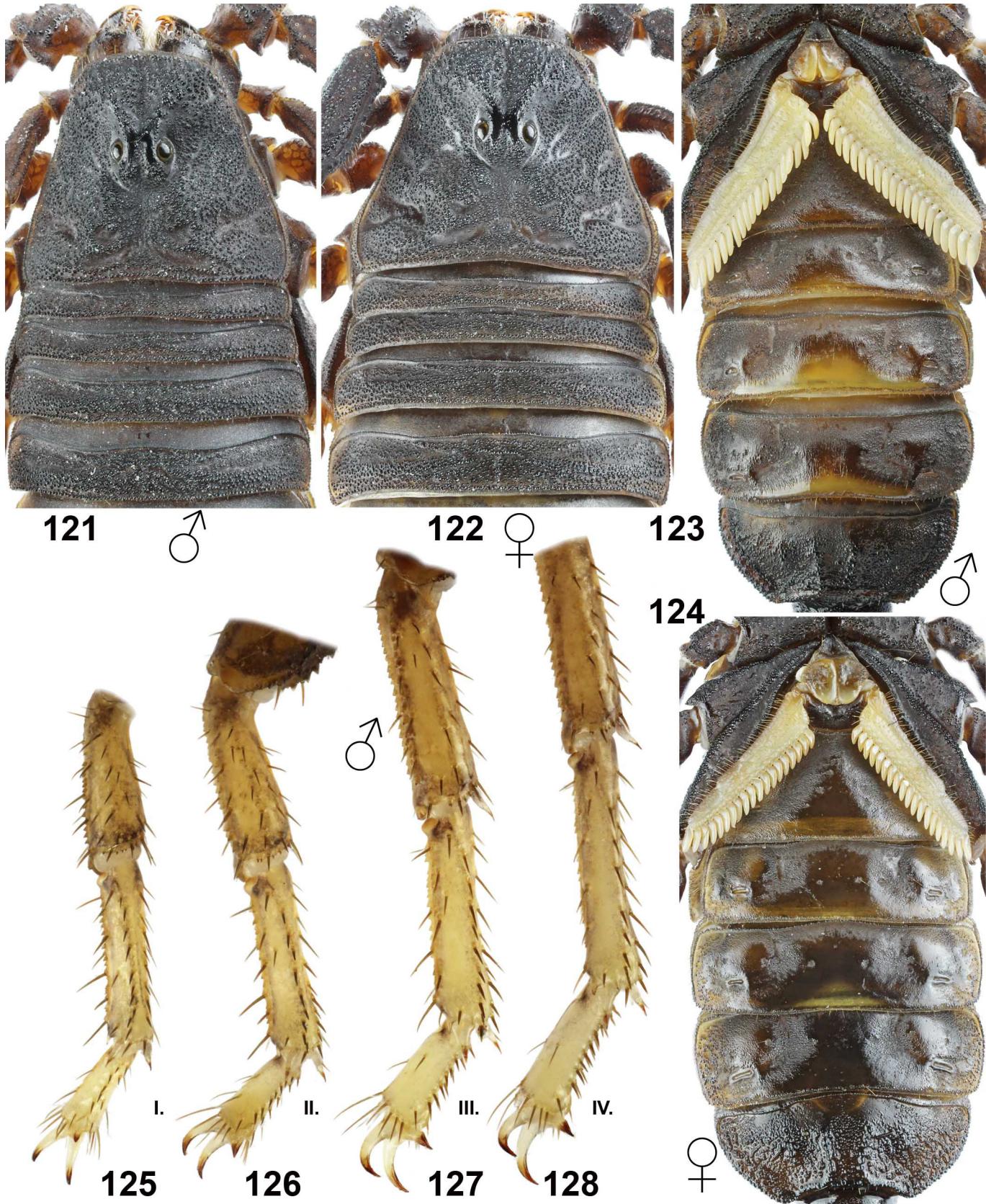
TYPE MATERIAL. **Iran, Khozestan Province**, Jeiugir env., 500 m a.s.l., 32°19'37"N 48°30'40"E, 1♂1♀ (paratypes), 10.-11.X.1998, leg. P. Kabátek, FKCP. **Lorestan Province**, Dorud, 33°26'57"N 49°01'14"E, 1700 m a.s.l., 2♂2♀ (paratypes), 8.-10.X.1998, leg. P. Kabátek, FKCP; Koramabad, Haftcheshmeh Village, 33°48'39"N 47°46'03"E, 1398 m a.s.l. (Locality No. LO-1362), X.2009, 1♂1♀ (holotype and paratype), leg. A. Pahlavani, A. Bahreei, M. Bahreei & R. Amraee, FKCP; Sepiddasht, Dareashkaft Village, 33°13'46"N 48°49'18"E, 1144 m a.s.l. (Locality No. LO-1364), X.2009, 1♀ (paratype), leg. A. Bahreei, M. Bahreei & R. Amraee, FKCP; Poldokhtar, Maemulan, 33°23'50"N 48°58'17"E, 1193 m a.s.l. (Locality No. LO-1387), X.2009, 1♂ (paratype), leg. Bahreei & A. Pahlavani, FKCP.

ETYMOLOGY. The species epithet is a patronym honoring Shahrokh Navidpour (Iran) for his friendship and lifelong dedication to arachnids.

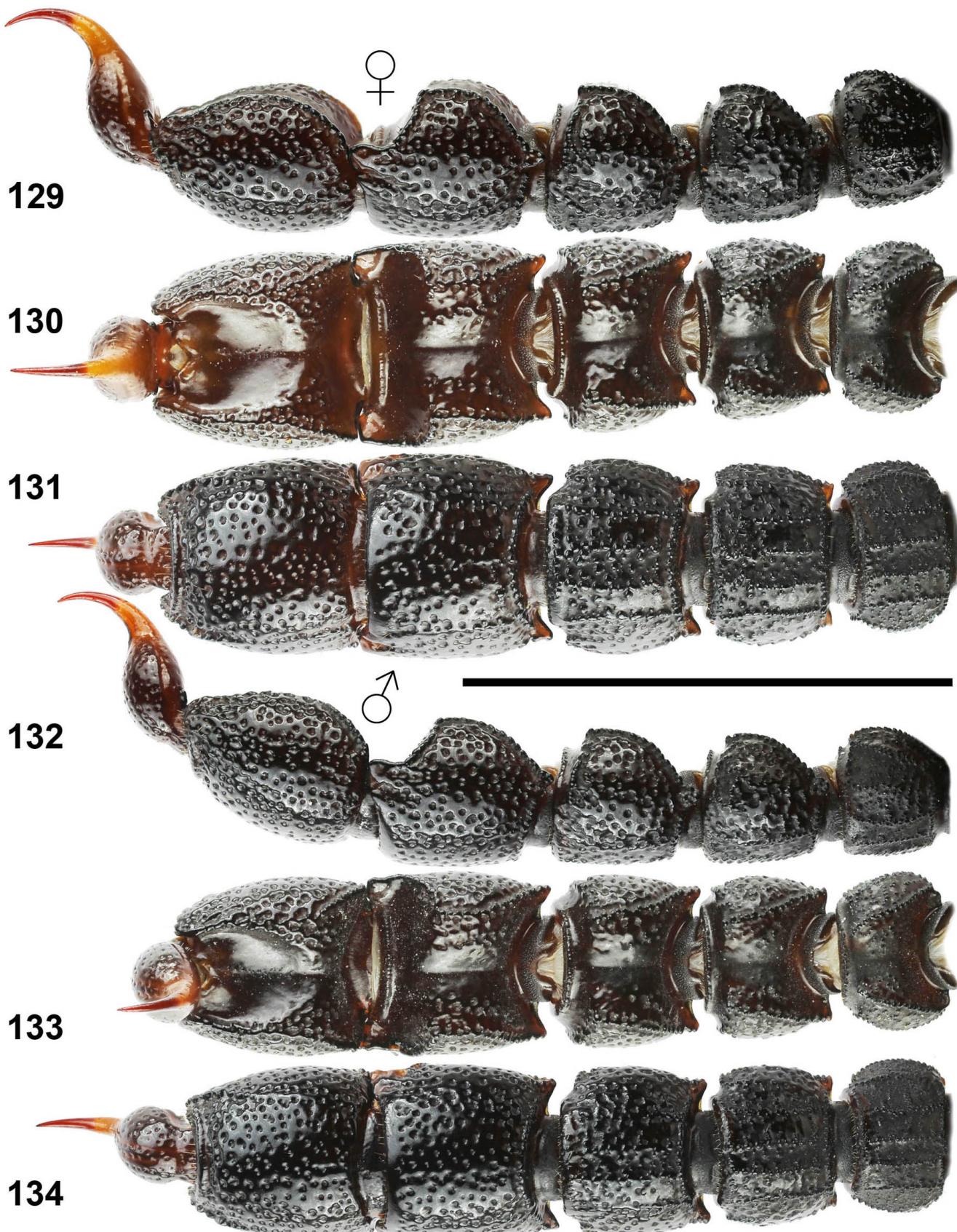
DIAGNOSIS. Total length of adult 28–43 mm. Trichobothrium d_2 of pedipalp femur dorsal surface present. Median to long tibial spurs present on legs III and IV. Pectinal teeth number 20–23 in males and 18–20 in females. Movable and fixed fingers of pedipalps with 9 rows of denticles, with internal and external denticles and 5 subterminal denticles. Pedipalp patella carinae dorsal granulate. Metasoma I with 10 carinae, metasoma II with 8 carinae. Metasoma IV–V ventrally punctate with ventrolateral carinae absent or incomplete; spaces among punctae smooth, without granules. Metasoma II–III ventrally and laterally coarsely granulate, partly punctate and bumpy. Dorsal surface of metasoma I with several granules, metasoma II–IV smooth, and metasoma V mesially with several granules. Sternite VII densely granulate, with granulate carinae present. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs without bristlecombs. Ratio length/width of metasoma V in males 1.05–1.15.

DESCRIPTION. Total length of adults is 28–43 mm in both sexes. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps are given in Table 2. For habitus see Figs. 117–120.

Coloration (Figs. 117–120). Carapace, tergites, metasoma and femur of pedipalps and legs are black, tibia and tarsomeres of legs and fingers of pedipalps are yellow. Patella of legs and pedipalps and pedipalp chela can be brown to black. Sternite VII is black, other sternites are reddish brown to black obviously with yellow median zone present in posterior margin of sternites III–VI. Telson is reddish black.



Figures 121–128: *Orthochirus navidpouri* sp. n. **Figures 121, 123, 125–128.** Holotype male, carapace and tergites I–IV (121), sternopectinal region and sternites (123), and distal segments of right legs I–IV, retrolateral views (125–128). **Figures 122, 124.** Paratype female from type locality, carapace and tergites I–IV (122), sternopectinal region and sternites (124).



Figures 129–134: *Orthochirus navidpouri* sp. n. **Figures 129–134.** Paratype female from type locality, metasoma and telson, lateral (129), dorsal (130), and ventral (131) views. **Figures 132–134.** Holotype male, metasoma and telson, lateral (132), dorsal (133), and ventral (134) views. Scale bar: 10 mm.



Figures 135–154: *Orthochirus navidpouri* sp. n. **Figures 135–144.** Holotype male. Pedipalp chela, dorsal (135), external (136), and ventrointernal (137) views. Pedipalp patella, dorsal (138), external (139), and ventral (140) views. Pedipalp femur and trochanter, internodorsal (141), dorsaloexternal (142) and ventral (143) views. Pedipalp chela, movable finger dentate margin (144). The trichobothrial pattern is indicated in Figures 136–139, 141–142 (white circles). **Figures 145–154.** Paratype female from type locality. Pedipalp chela, dorsal (145), external (146), and ventrointernal (147) views. Pedipalp patella, dorsal (148), external (149), and ventral (150) views. Pedipalp femur and trochanter, internodorsal (151), dorsaloexternal (152) and ventral (153) views. Pedipalp chela, movable finger dentate margin (154).

Mesosoma and carapace (Figs. 121–124). The mesosoma bears a median carina and is densely granulated. The carapace is densely granulated, including the middle of interocular triangle. Only anterior median carinae are indicated, which are granulated. The seventh sternite is granulated and bears four granulated carinae, the other sternites are finely granulated except the smooth median glabrous zones, with a pair of smooth carinae. Pectinal teeth number 20–23 in males and 18–20 in females.

Metasoma and telson (Figs. 129–134). The segment I bears 10 granulated carinae. The segments II–V lack lateral carinae, ventromedian carinae are present on metasoma I–III, ventrolateral carinae are present on metasoma I–III, absent or incomplete on metasoma IV–V, dorsolateral carina is present on metasoma I–IV and present or reduced on metasoma V. Metasoma I is densely granulated laterally, metasoma II–III laterally with several granules, granulation absent on ventral surfaces of metasoma IV–V. Dorsal surface of metasoma I with several granules, metasoma II–IV smooth, and metasoma V mesially with several granules. Metasomal segments IV–V are densely punctate, less so metasoma II–IV ventrally. Spaces among punctae on metasoma IV–V are smooth. The entire metasoma and telson are only very sparsely hirsute, rather glabrous. The telson is punctate and lacks granules.

Pedipalps (Figs. 135–154). The distance between trichobothria d_1 and d_3 on the femur of pedipalp approximately equals that between d_3 and d_4 ; trichobothrium e_1 is situated between d_3 and d_4 . Trichobothrium d_2 of pedipalp femur dorsal surface is present. The femur of pedipalp bears five granulate carinae. The patella has seven carinae from the dorsal are granulated, and the chela has smooth carinae, which may be discernible throughout the length of the fixed finger. The entire pedipalps are only sparsely hirsute. The movable fingers bear 9 rows of denticles, with external and internal denticles and 5 subterminal denticles.

Legs (Figs. 125–128). The femur bears four partly granulated carinae, the patella bears five rather smooth carinae, and the tibia is smooth. The patella bears only a few spiniform setae. The tibia bears spiniform setae. Tarsomere I without bristlecombs, there are usually only 3 longer spiniform setae. Tarsomeres I–II of all legs with two rather irregular rows of spiniform setae.

AFFINITIES. The described features distinguish *Orthochirus navidpouri* sp. n. from all other species of the genus. Navidpour et al. (2010) formerly cited populations of the new species as *O. iranus* according to the previously used complex of characters. A detailed comparison done in this study shows morphological differences between these two species, which are evident from our comparative photoplates. These two species can be morphologically unequivocally separated by the following features: (1) Metasoma V dorsal mesially densely granulated in *O. iranus* (Fig. 159) vs. mesially with only several granules in *O. navidpouri* sp. n. (Fig. 161); (2) Ventral and lateral

surfaces of metasoma IV–V are granulated in *O. iranus* (Fig. 173) vs. smooth in *O. navidpouri* sp. n. (Fig. 134); (3) Pedipalp patella dorsal carinae, mainly the dorsomedian carina, granulated in *O. navidpouri* sp. n. (Fig. 168) vs. smooth in *O. iranus* (Fig. 166). For differentiating of *O. navidpouri* sp. n. from all other *Orthochirus* species of the region, see the key below.

***Orthochirus zagrosensis* Kovařík, 2004**
(Figs. 162, 169, 174–176)

Orthochirus zagrosensis Kovařík, 2004: 22; Kovařík & Fet, 2006: 8, figs. 7–8; Navidpour et al., 2008a: 20; Navidpour et al., 2008d: 7; Pirali-Kheirabadi et al., 2009: 10, figs. 2–3, 5, 8, 10, 36–39; Navidpour et al., 2011: 17, figs. 14, 49–52; Navidpour et al., 2012: 17.

Orthochirus farzanpayi: Navidpour et al., 2008a: 14–15, figs. 31, 93–94 (in part, specimens from Khoozestan Province).

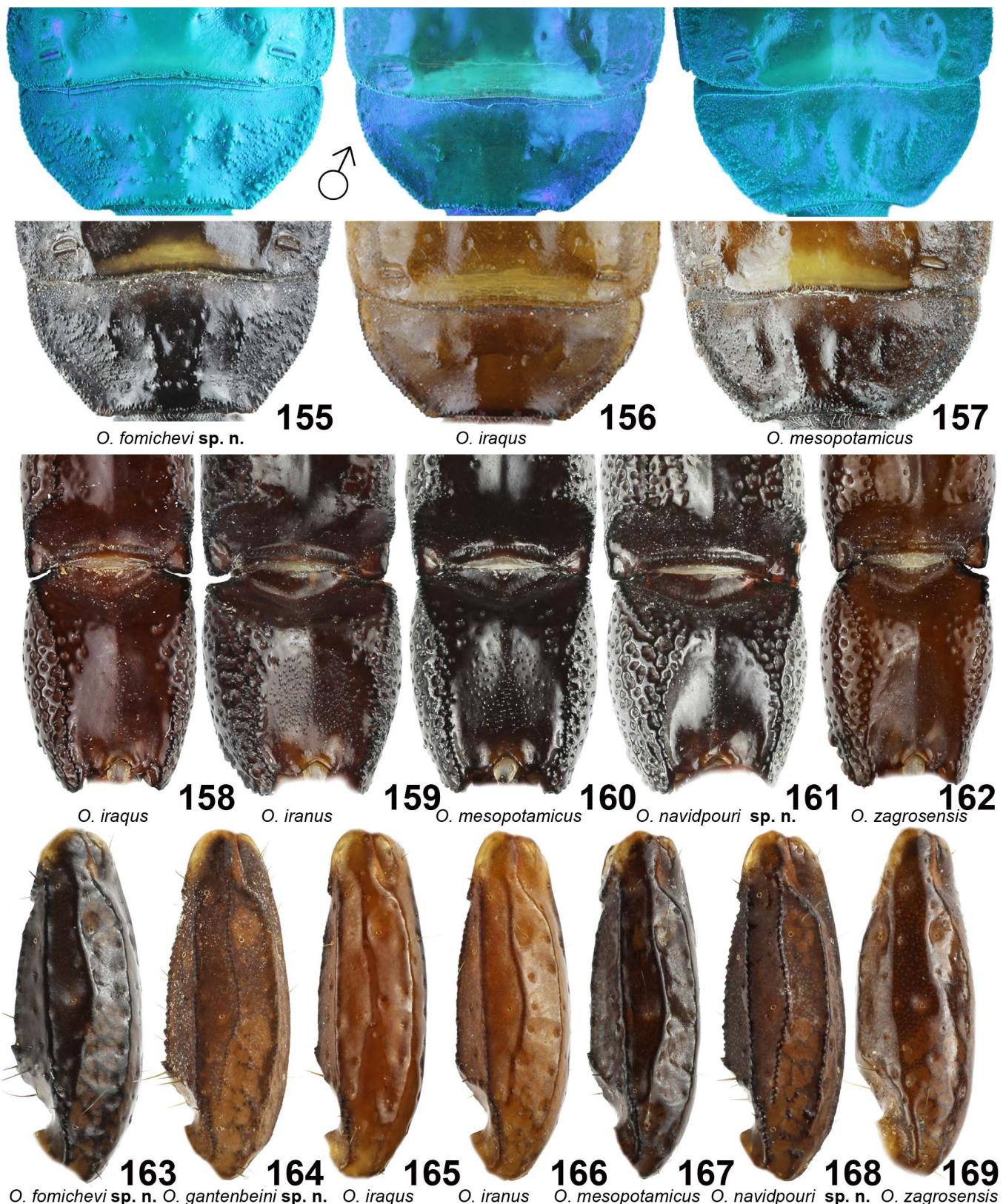
TYPE LOCALITY AND TYPE REPOSITORY. Iran, Fars Province, Dasht-e-Arghan, 29°34'N 51°56'E, 2000 m. a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. Iran, Fars Province, Dasht-e-Arghan, 29°34'N 51°56'E, 2000 m. a.s.l., 21–22.IV.2000, leg. J. Šobotník, 1♂ (holotype), FKCP.

OTHER MATERIAL FROM THE REGION (FIG. 176) EXAMINED. Iran, Khoozestan Province, Shushtar District, Arab Hasan village (Locality No. SH-100), VII.2007, leg. Masihipour & Hayader, 1♂, FKCP.

EMENDED DIAGNOSIS. Total length of adults 26–46 mm. Trichobothrium d_2 at pedipalp femur dorsal surface absent or reduced. Strong median tibial spurs present on third and fourth legs. Pectinal teeth number 18–22 in both sexes. Movable and fixed fingers of pedipalps with 7–9 rows of denticles, with internal and external denticles and 2–4 subterminal denticles. Dorsal carinae on pedipalp patella smooth and reduced. Metasoma I with 10 carinae, metasoma II with 8 carinae. Metasoma ventrally punctate with ventrolateral carinae present on metasoma I–II and partly on metasoma III and V; spaces among punctae smooth, without granules. Whole metasoma smooth without granules, punctate and bumpy, including metasoma V dorsal. Sternite VII granulate, with granulate carinae developed. Pedipalp, metasoma and telson very sparsely hirsute, rather glabrous. Tarsomere I of legs with bristlecombs composed of 4–6 bristles. Ratio length/width of metasoma V in males 1.27–1.30.

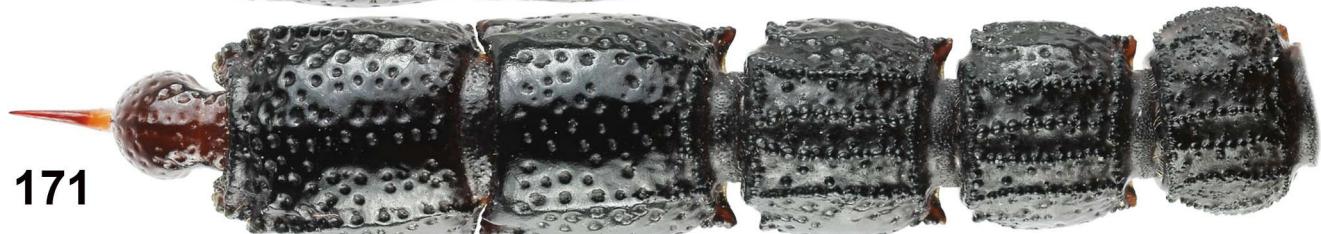
DISTRIBUTION. Iran (Chahar Mahal & Bakhtiari, Esfahan, Fars, Kerman, Kohkiloyeh & Boyer Ahmad, and Yazd Provinces).



Figures 155–169: *Orthochirus*, males, main characters used in the key of species. **Figures 155–157.** Sternites IV–V in UV fluorescence (top) and normal light. Holotype of *O. fomichevi* sp. n. (155), holotype of *O. iraqus* (156), *O. mesopotamicus* comb. n. from Iraq, Basra (157). **Figures 158–162.** Metasoma V dorsal. Holotype of *O. iraqus* (158), holotype of *O. iranus* (159), *O. mesopotamicus* comb. n. from Iraq, Basra (160), holotype of *O. navidpouri* sp. n. (161), holotype of *O. zagrosensis* (162). **Figures 163–169.** Pedipalp patella, dorsal view. Holotype of *O. fomichevi* sp. n. (163), holotype of *O. gantenbeini* sp. n. (164), holotype of *O. iraqus* (165), holotype of *O. iranus* (166), *O. mesopotamicus* comb. n. from Iraq, Basra (167), holotype of *O. navidpouri* sp. n. (168), holotype of *O. zagrosensis* (169).



170

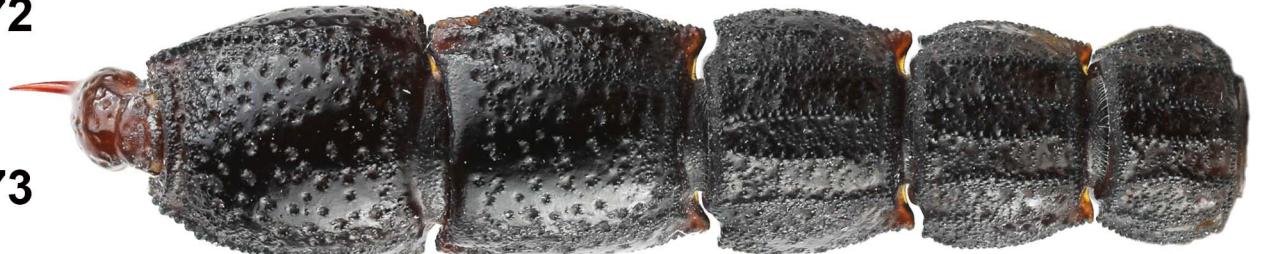


171

Orthochirus fomichevi sp. n. ♀ paratype from Turkey



172



173

Orthochirus iranus, ♂ holotype



174



175

Orthochirus zagrosensis, ♂ holotype

Figures 170–175: *Orthochirus*, comparation of metasoma and telson, dorsal and ventral views. **Figures 170–171.** *O. fomichevi* sp. n., female from Turkey. **Figures 172–173.** *O. iranus*, male holotype. **Figures 174–175.** *O. zagrosensis*, male holotype.

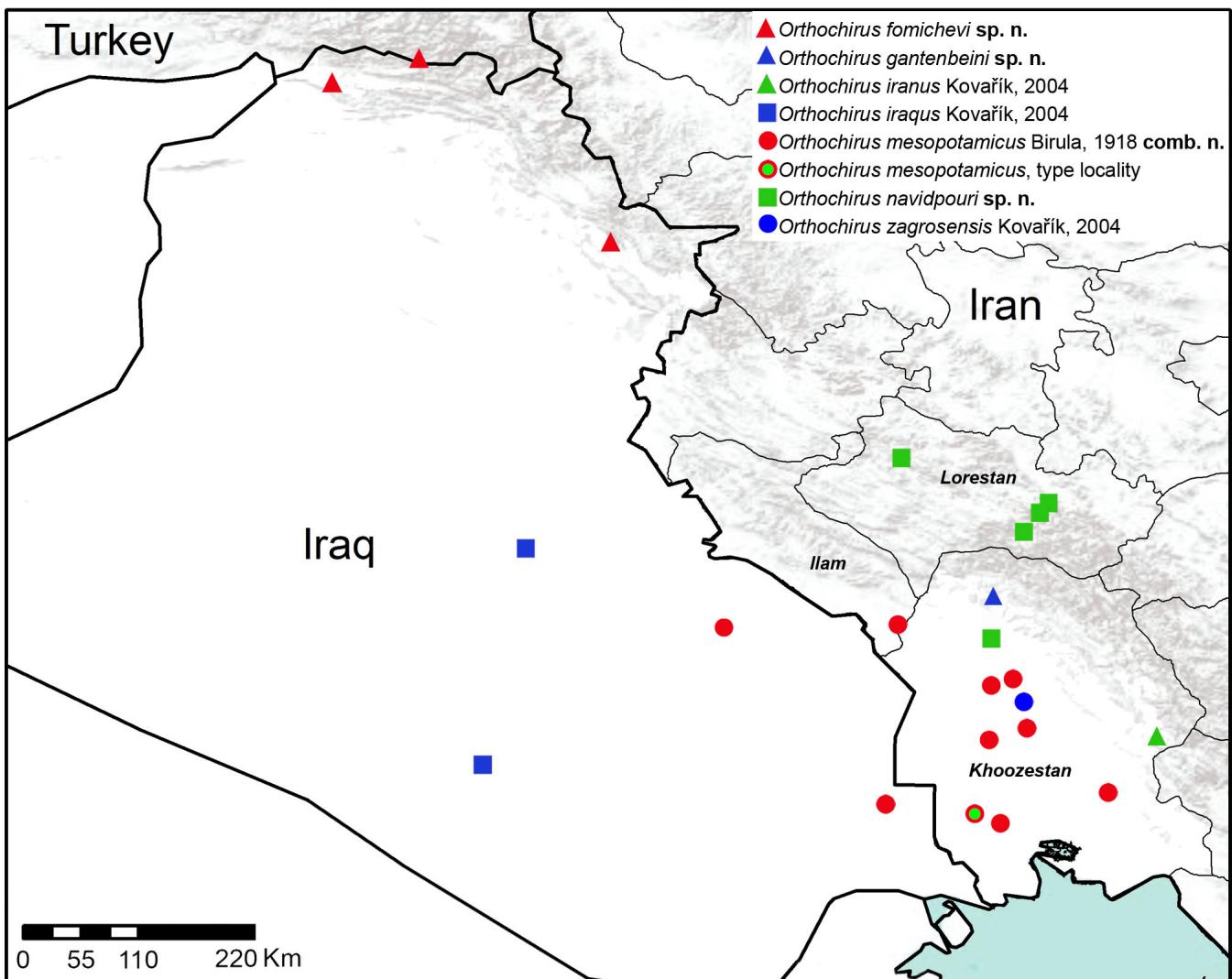


Figure 176. Map showing confirmed distribution of *Orthochirus* in Turkey, Iraq, and Iran (Khoozestan, Ilam and Lorestan Provinces).

Key of *Orthochirus* of Turkey, Iraq, and southwestern Iran (Khoozestan, Ilam, and Lorestan Provinces)

1. Metasoma densely hirsute (Fig. 49)... *O. gantenbeini* sp. n.
– Entire metasoma glabrous (short, thin setae may emanate from some punctae) (Fig. 85). 2
2. Sternite VII rather smooth, without developed granulate carinae (Fig. 156). *O. iraqus* Kovařík, 2004
– Sternite VII granulate, with developed granulate carinae (Figs. 155 and 157). 3
3. Metasoma V dorsal surface mesially densely granulated (Figs. 159–160). 4
– Metasoma V dorsal surface mesi+ally smooth (Fig. 162) or only with several granules (Fig. 161). 6
4. Metasoma II–III ventrally and laterally smooth, without granules, punctate and bumpy (Fig. 171). *O. fomichevi* sp. n.

- Metasoma II–III ventrally and laterally granulate (Fig. 173) 5
- 5. Metasomal segments wide (Fig. 159), ratio length/width of metasoma V in males 1.06–1.11. Ventral and lateral surfaces of metasoma IV–V densely granulate (Fig. 173).. *O. iranicus* Kovařík, 2004
- Ratio length/width of metasoma V in males 1.18–1.24. Ventral and lateral surfaces of metasoma IV–V sparsely granulate (Fig. 116). *O. mesopotamicus* Birula, 1918 stat. n.
- 6. Metasoma V dorsal surface mesially smooth (Fig. 162). Ratio length/width of metasoma V in males 1.27–1.30. Dorsal carinae on pedipalp patella smooth or absent (Fig. 169). *O. zagrosensis* Kovařík, 2004
- Metasoma V dorsal surface mesially with several granules (Fig. 161). Ratio length/width of metasoma V in males 1.05–1.15. Pedipalp patella developed and granulate (Fig. 168). *O. navidpouri* sp. n.

Acknowledgments

We thank Alexander A. Fomichev for his kind donation of scorpion specimens from Iraq. E.Y. is grateful to Boris Korotyaev and Viktor Krivokhatsky for their help in working with the great and well-preserved Birula collection in ZISP, St. Petersburg, Russia. F. S. H. is grateful to Asociated Prof D. Sherwan T. Ahmed and Salahaddin University, Iraq for help and supportation. We thank two anonymous reviewers for their comments.

References

- ALIABADIAN, M., H. BARANI-BEIRANVAND, S. M. GHASEMPOURI. 2012. Expeditions of N. A. Zarudny in Iran (Persia). Pp. 35–38 in *Nazemnye pozvonochnye aridnykh ekosistem* [Terrestrial Vertebrates of the Arid Ecosystems]. Tashkent: Chinor EK, 2012, 352 pp.
- BIRULA, A. A. 1918. Miscellanea scorpionologica. XI. Materiały k scorpiofaune nizhnei Mesopotamii, Kurdistana i severnoi Persii (Matériaux pour servir à la scorpiofaune de la Mésopotamie inférieure, du Kurdistan et de la Perse septentrionale). *Annuaire du Musée Zoologique de l'Académie Impériale des Sciences de St.-Pétersbourg*, 22(1917): 1–44 (in Russian).
- BIRULA, A. A. 1928. Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitl von F. Werner uternommenen Zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. XXV. Skorpione. *Denkschriften der Akademie der Wissenschaften in Wien*, 101: 79–88.
- FARZANPAY, R. 1987 (1366). *[Knowing Scorpions]*. Teheran: Central University Publications, No. 312, Biology 4, 231 pp. (in Farsi, with Latin index).
- FARZANPAY, R. 1988. A catalogue of the scorpions occurring in Iran, up to january 1986. *Revue Arachnologique*, 8(2): 33–44.
- FET, E. V., D. NEFF, M. R. GRAHAM & V. FET. 2003. Metasoma of *Orthochirus* (Scorpiones: Buthidae): are scorpions evolving a new sensory organ? *Revista Ibérica de Aracnología*, 8: 69–72.
- FET, V. 1989. A catalogue of scorpions (Chelicerata: Scorpiones) of the USSR. *Rivista del Museo Civico di Scienze Naturali "Enrico Caffi"* (Bergamo), 13(1988): 73–171.
- FET, V. 1994. Fauna and zoogeography of scorpions (Arachnida: Scorpions) in Turkmenistan. Pp. 525–534 in Fet V. & K. I. Atamuradov (eds.), *Biogeography and Ecology of Turkmenistan*. Boston–Dordrecht: Kluwer Academic Publishers.
- FET, V. & G. LOWE. 2000. Family Buthidae C. L. Koch, 1837. Pp. 54–286 in Fet, V., Sissom, W. D., G. Lowe & M. E. Braunwalder. 2000. *Catalog of the Scorpions of the World (1758–1998)*. The New York Entomological Society, New York, 689 pp.
- FOMICHEV, A. A., Y. M. MARUSIK & S. KOPONEN. 2018. New data on spiders (Arachnida: Araneae) of Iraq. *Zoology in the Middle East*, 64: 1–11. <http://dx.doi.org/10.1080/09397140.2018.1484018>
- KARSCH, F. 1881. Uebersicht der europäischen Skorpione. *Berliner Entomologische Zeitschrift*, 25: 89–91.
- KARSCH, F. 1892. Arachniden von Ceylon und von Minikoy, gesammelt von den Herren Doctoren P. und F. Sarasin. *Berliner Entomologische Zeitschrift*, 36(1891): 267–310.
- KOVARÍK, F. 1998. *Štíři [Scorpiones]*. Publishing House “Madagaskar”, Jihlava (Czech Republic). 175 pp. (in Czech).
- KOVARÍK, F. 2004. Revision and taxonomic position of genera *Afghanorthochirus* Lourenço & Vachon, *Baloorthochirus* Kovařík, *Butheolus* Simon, *Nanobuthus* Pocock, *Orthochirodes* Kovařík, *Pakistanorthochirus* Lourenço, and Asian *Orthochirus* Karsch, with descriptions of twelve new species (Scorpiones, Buthidae). *Euscorpius*, 16: 1–33.
- KOVARÍK, F. 2009. Illustrated catalog of scorpions. Part I. Introductory remarks; keys to families and genera; subfamily Scorpioninae with keys to *Heterometrus* and *Pandinus* species. *Clairon Production, Prague*, 170 pp.
- KOVARÍK, F. & V. FET. 2006. Taxonomic position of the genus *Simonoides* Vachon et Farzanpay, 1987, and description of a new species of *Orthochirus* Karsch from Iran (Scorpiones, Buthidae). *Euscorpius*, 38: 1–10.
- KOVARÍK, F. & A. A. OJANGUREN AFFILASTRO. 2013. Illustrated catalog of scorpions Part II. Bothriuridae; Chaerilidae; Buthidae I., genera *Compsobuthus*, *Hottentotta*, *Isometrus*, *Lychas*, and *Sassanidotus*. *Clairon Production, Prague*, 400 pp.
- KRAEPELIN, K. 1895. Nachtrag zu Theil I der Revision der Skorpione. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 12(1894): 73–96.
- LEVY, G. & P. AMITAI. 1980. *Fauna Palaestina, Arachnida I—Scorpiones*. The Israel Academy of Sciences and Humanities, 132 pp.

- LOURENÇO, W. R. & M. VACHON. 1995. Un nouveau genre et deux nouvelles espèces de scorpions Buthidae d'Iran. *Bulletin du Muséum National d'Histoire Naturelle Paris*, 17: 297–305.
- LOURENÇO, W. R. & M. VACHON. 1997. Un nouveau genre et quatre nouvelles espèces de scorpions (Buthidae) du Moyen-Orient. *Zoosystema*, 19(2–3): 327–336.
- MIRSHAMSI, O., A. SARI & S. HOSSEINIE. 2011. History of study and checklist of the scorpion fauna (Arachnida: Scorpiones) of Iran. *Progress in Biological Sciences*, 1(2): 16–28.
- NAVIDPOUR, S., F. KOVAŘÍK, M. E. SOLEGLAD & V. FET. 2008a. Scorpions of Iran (Arachnida, Scorpiones). Part I. Khoozestan Province. *Euscorpius*, 65: 1–41.
- NAVIDPOUR, S., M. E. SOLEGLAD, V. FET & F. KOVAŘÍK. 2008b. Scorpions of Iran (Arachnida, Scorpiones). Part II. Bushehr Province. *Euscorpius*, 67: 1–33.
- NAVIDPOUR, S., V. FET, F. KOVAŘÍK & M. E. SOLEGLAD. 2008c. Scorpions of Iran (Arachnida, Scorpiones). Part III. Ilam Province. *Euscorpius*, 69: 1–29.
- NAVIDPOUR, S., F. KOVAŘÍK, M. E. SOLEGLAD & V. FET. 2008d. Scorpions of Iran (Arachnida, Scorpiones). Part IV. Kohgilouyeh & Boyer Ahmad Province. *Euscorpius*, 74: 1–24.
- NAVIDPOUR, S., M. EZATKHAH, F. KOVAŘÍK, M. E. SOLEGLAD & V. FET. 2011. Scorpions of Iran (Arachnida, Scorpiones). Part VII. Kerman Province. *Euscorpius*, 131: 1–32.
- NAVIDPOUR, S., V. FET, F. KOVAŘÍK & M. E. SOLEGLAD. 2012. Scorpions of Iran (Arachnida, Scorpiones). Part VIII. Fars Province. *Euscorpius*, 139: 1–29.
- NAVIDPOUR, S., F. KOVAŘÍK & M. E. SOLEGLAD & V. FET. 2019. Scorpions of Iran (Arachnida, Scorpiones). Part X. Alborz, Markazi and Tehran Provinces with a description of *Orthochirus carinatus* sp. n. (Buthidae). *Euscorpius*, 276: 1–20. *Euscorpius*, 276: 1–20.
- NAVIDPOUR, S., H. H. NAYEBZADEH, M. E. SOLEGLAD, V. FET, F. KOVAŘÍK & M. H. KAYEDI. 2010. Scorpions of Iran (Arachnida, Scorpiones). Part VI. Lorestan Province. *Euscorpius*, 99: 1–23.
- PIRALI-KHEIRABADI, K., S. NAVIDPOUR, V. FET, F. KOVAŘÍK & M. E. SOLEGLAD. 2009. Scorpions of Iran (Arachnida, Scorpiones). Part V. Chahar Mahal & Bakhtiyari Province. *Euscorpius*, 78: 1–23.
- SHERGALIN, E. É. 2011. [Pëtr Vladimirovich Nesterov (1883–1941) – an ornithologist, a geographer, and a teacher.] *Russkiy ornitologicheskii zhurnal*, 20(662):1099–1111 (in Russian).
- STAHNKE, H.L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.
- VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents de chelicères chez les Scorpions. *Bulletin du Muséum National d'Histoire Naturelle, Paris*, (2), 35(2):161–166.
- VACHON, M. 1966. Liste des scorpions connus en Égypte, Arabie, Israël, Liban, Syrie, Jordanie, Turquie, Irak, Iran. *Toxicon*, 4: 209–218.
- VACHON, M. 1974. Étude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en Arachnologie, Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum National d'Histoire Naturelle Paris*, 140: 857–958.
- YAĞMUR, E. A. 2010. First record of *Orthochirus* Karsch, 1891 (Scorpiones: Buthidae) from Turkey. *Anadolu Doğa Bilimleri Dergisi*, 1(1): 15–19.