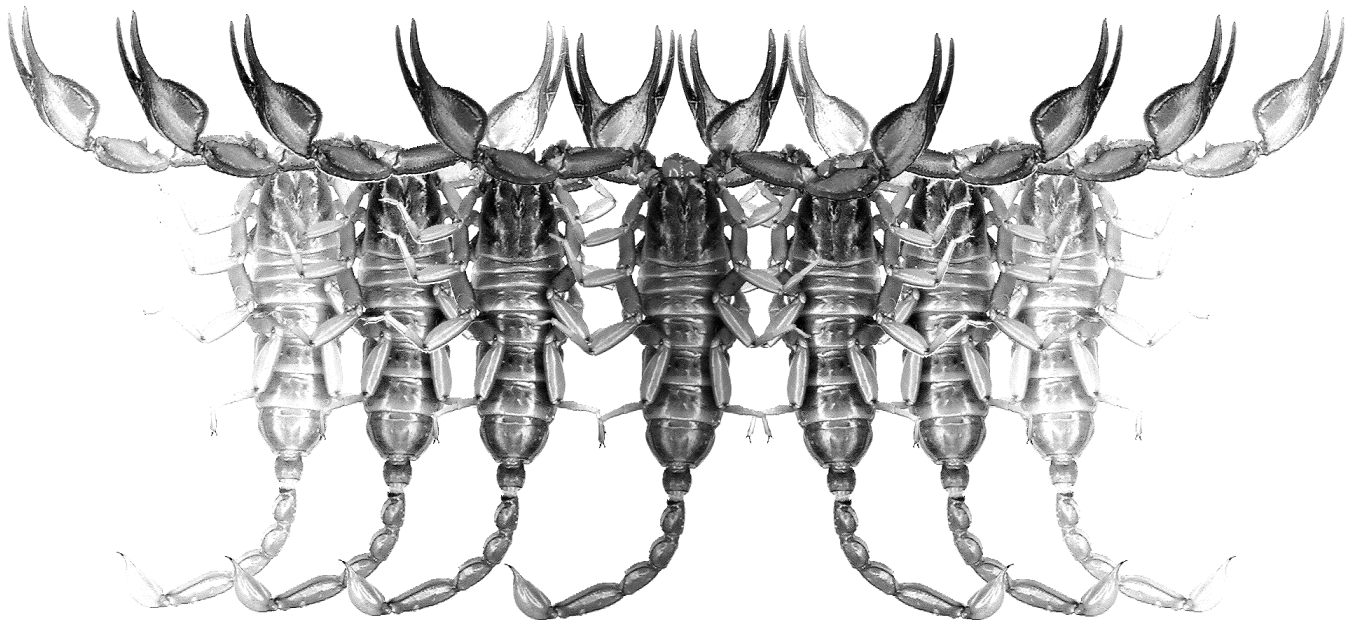


Euscorpius

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Scorpions 2011

John L. Cloudsley-Thompson 90th Birthday Commemorative Volume

**Further Considerations on the Species of the Genus *Orthochirus*
Karsch, 1891 from Africa, with Description of Three
New Species (Scorpiones: Buthidae)**

Wilson R. Lourenço & Elise-Anne Leguin

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Further considerations on the species of the genus *Orthochirus* Karsch, 1891 from Africa, with description of three new species (Scorpiones: Buthidae)

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Summary

New considerations are proposed regarding the African species of the genus *Orthochirus* Karsch, 1891. Two species, *Orthochirus aristidis* (Simon, 1882) and *Orthochirus innesi* Simon, 1910 have been the subject of several publications in the past decades; however, doubts remain about their exact identity and range of geographical distribution. In this note, their taxonomic status is reinvestigated. The type material is revised and the lectotype and paralectotypes are designated for *O. aristidis*. Revised diagnoses and illustrations are proposed for both species, and these are confirmed as valid. Three new species are described from Algeria, Morocco, and Mauritania. The total number of African species is raised to five.

Introduction

The genus *Orthochirus* was created by Karsch (1891) as a replacement name for *Orthodactylus* Karsch, 1881 a preoccupied name. Since its creation, however, it has been the subject of some polemics. It was first considered by Kraepelin (1899) to be merely a synonym of the genus *Butheolus*, but was later reestablished by Simon (1910) as a valid genus. Two species have clearly been reported from Africa, *Orthochirus aristidis* (Simon, 1882), previously described in the genus *Butheolus* and *Orthochirus innesi* Simon, 1910. The first was described from Nubia in the frontier of what are today Egypt and Sudan, and the second from Djebel Mokattam, today inside Cairo, in the Lower Egypt. Before the description of *O. innesi* by Simon (1910), this population was reported by Birula (1908) from Djebel Mokattam, who associated it to *O. aristidis*. Simon (1910) considered, however, this population is distinct from that of *O. aristidis* and proposed a new species, *O. innesi*.

In his monograph about the scorpions of North Africa, Vachon (1952) clearly defined morphological differences between *O. aristidis* and *O. innesi* and justified the validity of both species. Subsequently, however, only *O. innesi* was the subject of many reports for North African and even Middle East localities (Levy & Amitai, 1980; El-Hennawy, 1992). The reason why *O. aristidis* was neglected in most publications is probably associated to the uncertain situation of the type material used by Simon (1882) for the description of the new species. The material was originally collected by J.

Doria and O. Beccari in January 1880 during their expedition to Assab on the coast of the Red Sea, and published by Simon (1882) in the “Annali del Museo Civico di Storia Naturale Giacomo Doria, Genova”, together with other specimens deposited in this Museum. This naturally leads most authors to believe that the type material of *O. aristidis* was also deposited in Genova Museum (Fet & Lowe, 2000).

Some recent research carried on the collections of the Muséum national d'Histoire naturelle in Paris allow us to locate the original type material used by Simon (1882) for the description of *O. aristidis*. Since the holotype of *O. innesi* is also deposited in the Muséum in Paris, the type material of both species is revised and a lectotype and paralectotypes are designated for *O. aristidis*. Revised diagnoses and illustrations are also proposed for the two species which are confirmed as valid. Three new species are described from Algeria, Morocco and Mauritania. The total number of African species is raised to five.

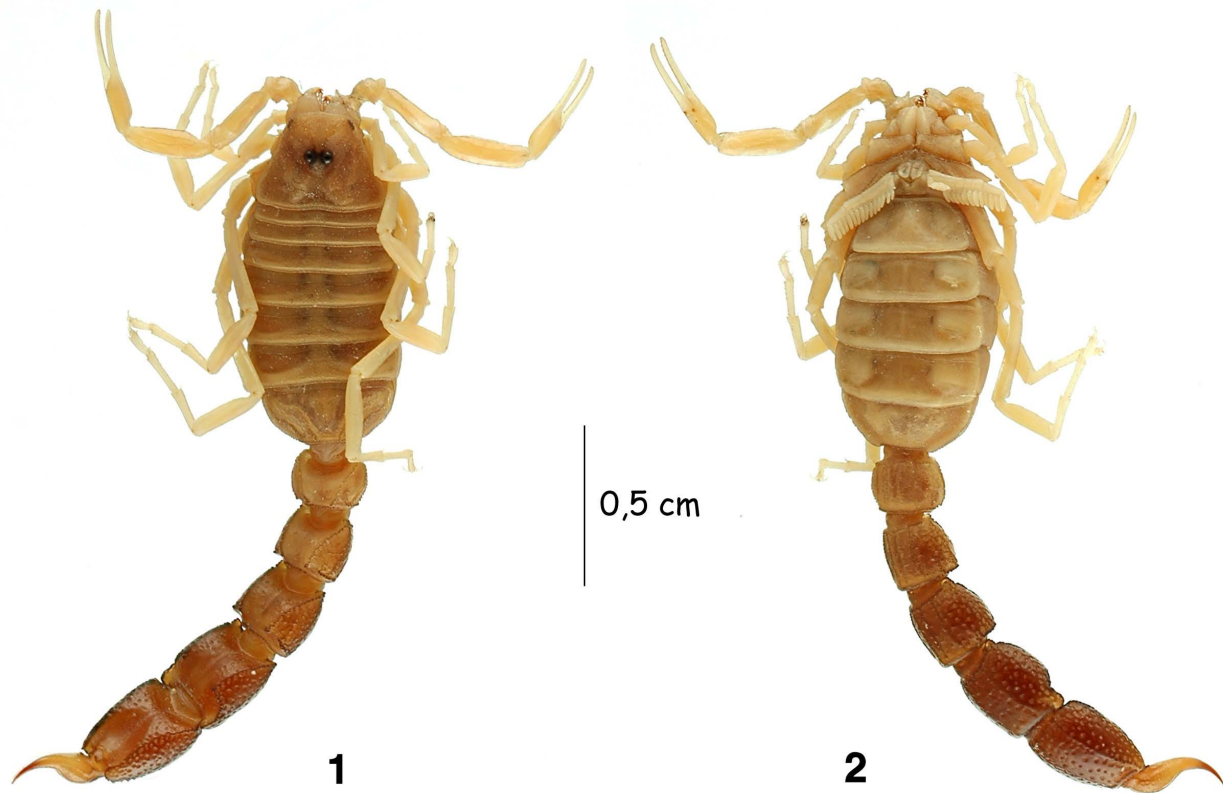
Taxonomy

Family Buthidae C.L. Koch, 1837

Genus *Orthochirus* Karsch, 1891

Orthochirus aristidis (Simon, 1882)
(Figs. 1–5, 22, 27, 33; Tab. 1)

Type material: Nubia (Egypt/Sudan), near to the Nile (Aristide Letourneux leg.). One pre-adult female



Figures 1–2: *Orthochirus aristidis*, female lectotype, dorsal and ventral aspects.

here designated as lectotype (RS-1771 - Simon's number 4272). One adult female, 3 males and 2 female juveniles designated paralectotypes (RS-8832). Deposited in the Muséum national d'Histoire naturelle, Paris.

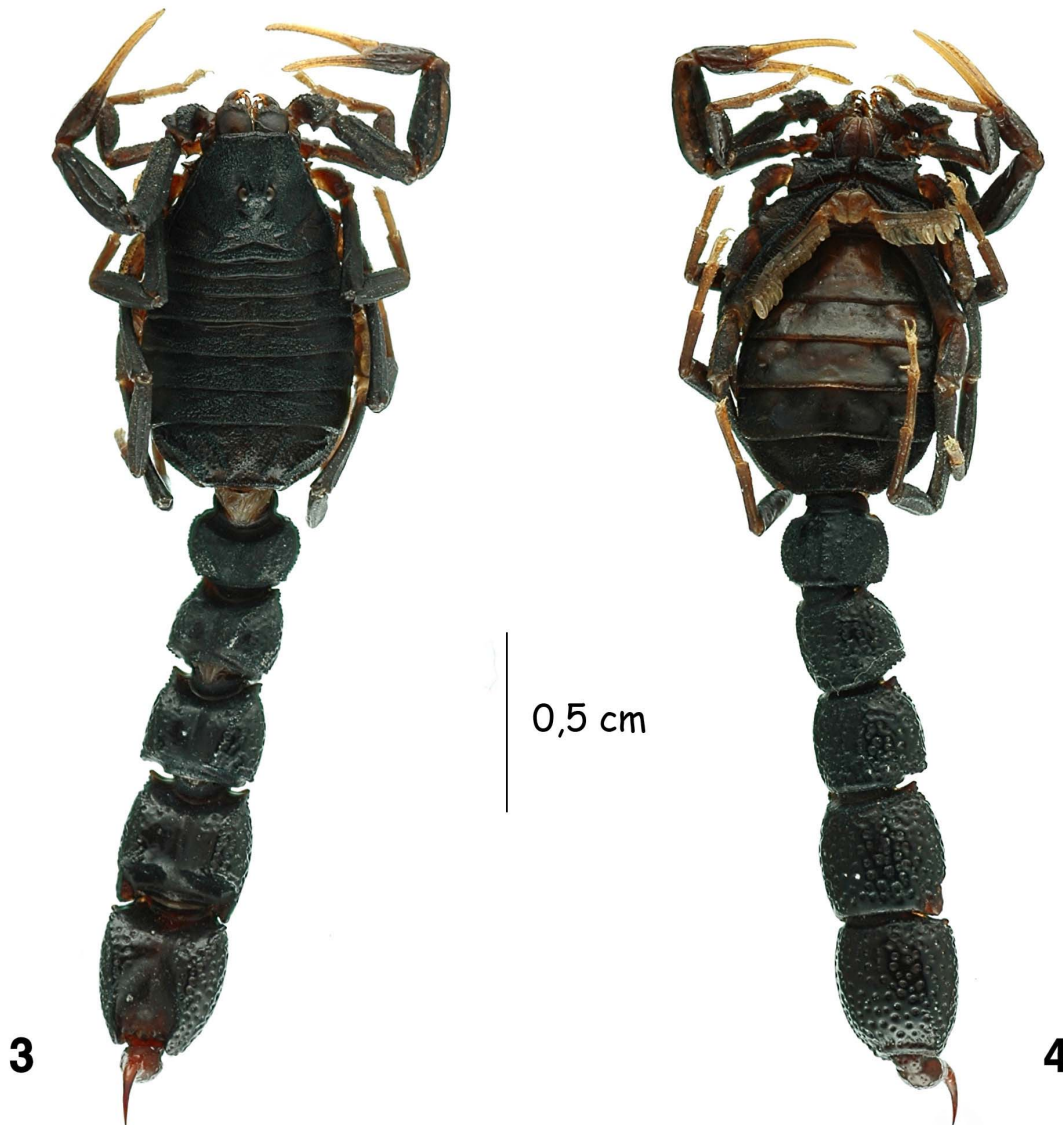
Note: The pre-adult female designated as lectotype is the only specimen in the series which corresponds in size and number of pectinal teeth to the values given by Simon (1882) in the original description.

Revised diagnosis based on type material and on one female topotype collected in Sudan (Nubia), Wadi Halfa, X/1975 (P. Brignoli).

Medium sized scorpions, reaching a total length of 30 mm for males and for females. (Measurements in Table 1.)

Coloration (based on topotype). Dark reddish-brown to blackish. Prosoma: carapace blackish; furrows reddish-yellow; median and lateral eyes surrounded by black pigment. Mesosoma: blackish; carinae and granulations very dark. Metasomal segments dark reddish to blackish; telson reddish; aculeus paler than vesicle. Metasomal carinae blackish. Venter reddish-brown; pectines yellowish. Chelicerae reddish-brown with blackish granules; teeth reddish-yellow. Pedipalps: femur and patella blackish; chela hand dark brown; fingers yellowish. Legs blackish with three distal segments reddish-yellow.

Morphology. Carapace moderately to strongly granular; anterior margin with a slight convexity. Carinae and furrows moderate. Median ocular tubercle almost at the centre of the carapace; median eyes separated by more than one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal, wider than long. Mesosoma: tergites with strong granulation; median carina moderate to weak in all tergites. Tergite VII pentacarinata with strong carinae. Venter: genital operculum elongated, divided longitudinally into two suboval plates. Pectinal tooth count 16 to 18 in males, 13 to 16 in females; basal middle lamellae of each pecten not dilated. Sternites almost smooth with slit-like spiracles; VII with four moderate carinae with some minute granulations. Metasomal segments rounded, with carinae moderately to strongly marked; granulations moderately marked, except on I; segment I with ten carinae; other segments with some carinae and strongly marked punctuations; ventral aspect of segments II to V without granulations. Intercarinal spaces smooth. Telson smooth with a few punctuations; aculeus slightly longer than the vesicle and moderately curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); movable finger with basal teeth strongly marked; ventral aspect of both finger and manus with thin setae. Pedipalps: femur with five carinae, moderately granular; patella with seven carinae;



Figures 3–4: *Orthochirus aristidis*, female from Nubia, dorsal and ventral aspects, showing coloration pattern.

chela without carinae, smooth. Fixed and movable fingers with 8/9 rows of denticles; accessory denticles present. Trichobothriotaxy: A-β; neobothriotaxy 'minorante' (Vachon, 1974, 1975). Legs: tarsus with two row of setae ventrally. Tibial and pedal spurs moderately marked on all legs.

Distribution: Egypt, Sudan, ?Ethiopia, Djibouti.

***Orthochirus innesi* Simon, 1910**
(Figs. 6–9, 23, 28, 34, 38; Tab. 1)

Type material: Egypt, Djebel Mokattam (today inside Cairo), under stones and under low vegetation. One pre-adult female (RS-1774 – Simon's number 8086). Specimen poorly preserved. Deposited in the Muséum national d'Histoire naturelle, Paris.

Revised diagnosis based on type material and on two females collected in Egypt: one topotype collected at Wadi Degla, near Cairo, 12/XII/1996 (M. S. Abdel-Dayem). One female collected at El-Omayed Protectorate, 80 km west of Alexandria, 30°44'N, 29°08'E, 10/X/2000 (El-Hennawy).

Medium sized scorpions, reaching a total length of 30 mm for males and for females. (Measurements in Table 1.)

Coloration reddish-yellow to reddish-brown. Prosoma: carapace reddish-brown; anterior margin darker; median and lateral eyes surrounded by black pigment. Mesosoma: reddish-yellow; carinae and granulations reddish-brown. Metasomal segments dark reddish-brown; almost blackish ventrally; telson reddish-brown with a reddish aculeus. Metasomal carinae marked with



Figure 5: *Orthochirus aristidis*, female (alive) from Djibouti.

blackish. Venter yellowish, except for sternite VII, reddish-brown; pectines pale yellow. Chelicerae yellowish to reddish-yellow; base of fingers blackish; fingers slightly reddish. Pedipalps reddish-yellow; femur reddish-brown. Legs reddish-yellow with three distal segments yellowish.

Morphology. Carapace moderately granular; anterior margin with a slight convexity. Carinae and furrows moderate. Median ocular tubercle slightly anterior to the centre of the carapace; median eyes separated by almost two ocular diameters. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal, wider than long. Mesosoma: tergites with thin, moderately marked granulations; median carina weak to moderate in all tergites. Tergite VII pentacarinat with strong carinae. Venter: genital operculum elongated, divided longitudinally into two suboval plates. Pectines: pectinal tooth count 17 to 19 in males, 15 to 16 in females; basal middle lamellae of each pecten not dilated. Sternites III to VI with a thin granulation laterally; VII very strongly granulated and with four carinae fused with granulations; spiracles small and slit-like. Metasomal segments rounded, with carinae strongly marked; granulations moderately marked; segments IV and V with granulations ventrally and

strongly punctated. Intercarinal spaces almost smooth dorsally; weakly granular laterally. Telson smooth with a few punctuations; aculeus as long as the vesicle and moderately curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); movable finger with basal teeth well distinct; ventral aspect of both finger and manus with thin setae. Pedipalps: femur with five carinae, moderately granular; patella with weakly marked internal and dorsal carinae; chela without carinae, smooth. Fixed and movable fingers with 8/8 rows of denticles; accessory denticles present on distal 2/3 of the finger. Trichobothriotaxy: A-β; neobothriotaxy 'minorante' (Vachon, 1974, 1975). Legs: tarsus with two row of slightly spinoid setae ventrally. Tibial and pedal spurs moderately to strongly marked on all legs.

Distribution: North of Egypt and possibly also in the north ranges of Libya, Algeria and Tunisia. Part of the old material listed by Vachon (1952) is still present in the collections of the Museum in Paris. This material is, however, faded and poorly preserved. Moreover, precise data about their localities of collection is often not available. Only new field collections will allow the definition of the exact range of distribution of this species.

	<i>O. aristidis</i> ♀ paralectotype	<i>O. innesi</i> ♀ topotype	<i>O. tassili</i> sp. n. ♂ ♀ holotype/paratype	<i>O. cloudsleythompsoni</i> sp. n. ♂ holotype	<i>O. atarensis</i> sp. n. ♂ ♀ holotype/paratype
Total length*	29.6	28.0	25.1/23.7	24.1	21.3/23.2
Carapace:					
- length	3.8	3.4	3.0/2.8	3.2	2.7/3.1
- anterior width	2.6	2.5	2.0/2.2	2.3	2.0/2.2
- posterior width	4.9	4.8	3.8/4.0	3.8	3.6/3.8
Metasoma, segment I:					
- length	2.2	2.1	1.9/1.8	1.8	1.6/1.8
- width	3.3	3.2	2.5/2.4	2.8	2.2/2.4
Metasoma, segment V:					
- length	4.2	4.0	3.7/3.6	3.8	3.2/3.6
- width	3.7	3.5	2.6/2.5	3.2	2.3/2.7
- depth	2.6	2.5	1.9/1.7	2.2	1.6/2.0
Telson length	3.8	3.6	3.4/3.3	3.6	3.3/3.5
- width	1.3	1.4	1.0/1.2	1.2	1.2/1.3
- depth	1.3	1.2	1.2/1.0	1.0	1.0/1.2
Femur:					
- length	2.8	2.7	2.3/2.3	2.4	2.2/2.4
- width	0.9	0.8	0.9/0.8	0.8	0.8/0.8
Patella:					
- length	3.4	3.3	3.0/2.9	3.2	2.6/3.0
- width	1.0	1.3	1.0/0.9	1.0	1.0/1.0
Chela:					
- length	4.5	4.7	4.1/4.2	4.2	3.8/4.2
- width	0.8	0.9	0.9/0.8	0.8	0.8/0.8
- depth	0.9	1.0	0.8/0.8	0.8	0.9/0.9
Movable finger:					
- length	3.1	3.3	2.9/2.8	3.0	2.7/3.1
* excluding telson					

Table 1: Morphometric values (in mm) of the *Orthochirus* species treated in this study.



Figures 6–7: *Orthochirus innesi*, female holotype, dorsal and ventral aspects.

***Orthochirus tassili* Lourenço et Leguin, sp. n.**
(Figs. 10–14, 24, 29, 35; Tab. 1)

Type material: Algeria, 3 km E-NE Tin Taghirt, 115 km W. NW Djanet (25.1570°N, 8.5338°E), 1420 m, 22/IV/2009 (P. Geniez), male holotype. Tassili-N-Ajjer, 1.2 km E. NE Telou-Tedjert, 36 km NW Djanet (24.7411°N, 9.1867°E), 1185 m, 19/IV/2009 (P. Geniez), female paratype. Deposited in the Muséum national d'Histoire naturelle, Paris.

Etymology: The specific name is placed in apposition to the generic name and refers to 'Tassili-N-Ajjer', the location in which the new species was collected.

Diagnosis

Small to medium sized scorpions, reaching a total length of 25.1 mm for male and 23.7 mm for female. General coloration dark reddish-brown to blackish. Anterior margin of carapace moderately convex. Ventral aspect of metasomal segment V without granulations posteriorly. Fixed and movable fingers of pedipalps with 9/9 rows of granules; accessory granules present. Pectines with 18-18 teeth in male and 15-16 teeth in female. Trichobothriotaxy: A-β; neobothriotaxy 'minorante'.

Relationships: *Orthochirus tassili* sp. n. can be distinguished from the other species of *Orthochirus*, and

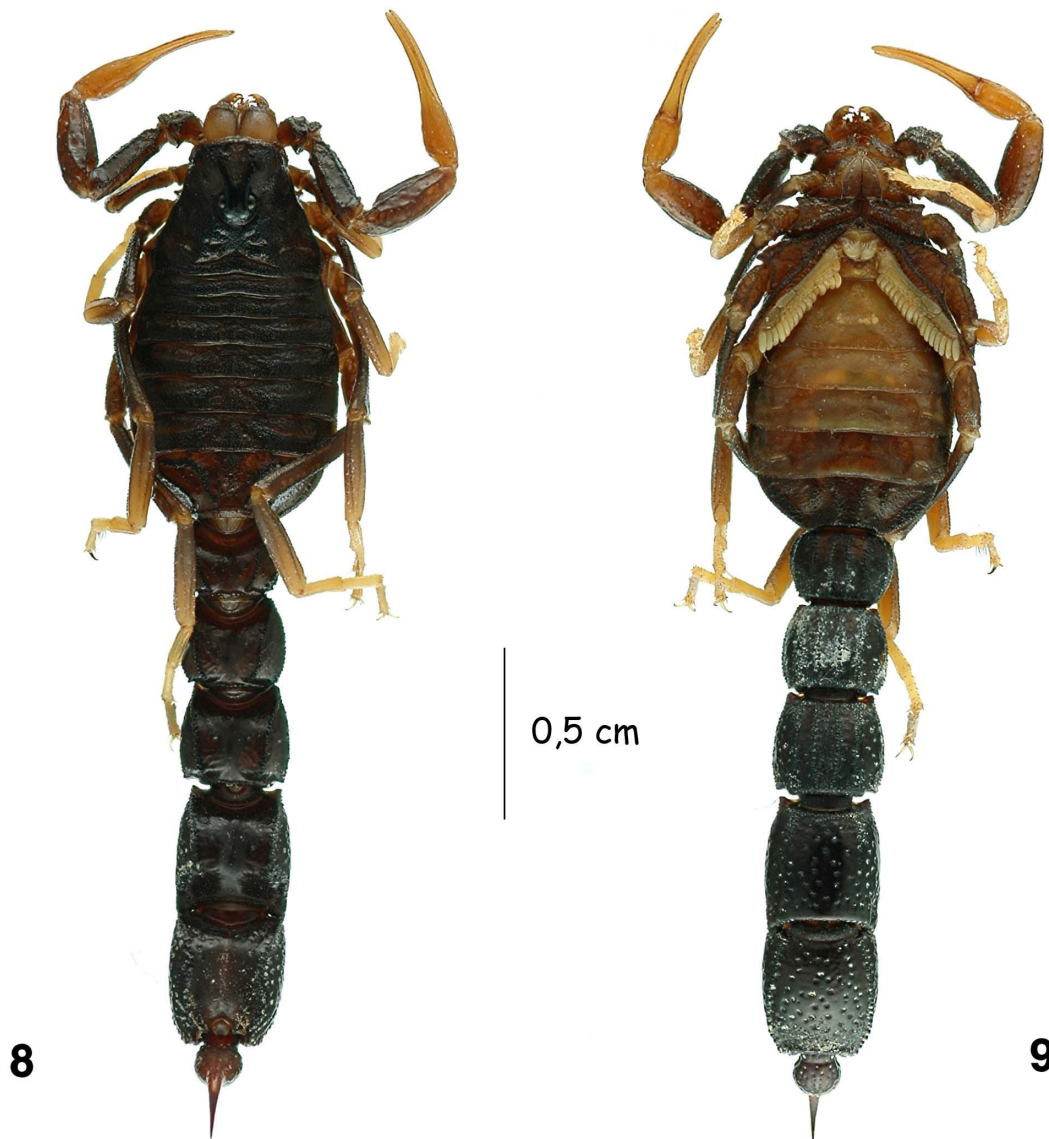
in particular from *Orthochirus innesi* by the following characters:

(i) smaller size (see Table 1), (ii) a distinct pigmentation pattern; much darker, (iii) a small, weakly elongated, oval to rounded genital operculum, (iv) ventral aspect of metasomal segment V without granulations.

Description based on male holotype and female paratype. Measurements in Table 1.

Coloration. Basically dark reddish-brown to blackish. Prosoma: carapace dark brown to blackish; median and lateral eyes surrounded by black pigment. Mesosoma: reddish-brown with some dark yellow spots; carinae and granulations blackish. Metasomal segments dark brown to blackish; telson reddish-brown aculeus reddish. Metasomal carinae marked with blackish. Venter reddish-brown; two triangular pale zones on sternites V–VI of male; pectines pale yellow. Chelicerae yellowish, with dark variegated spots; fingers blackish. Pedipalps, femur and patella dark brown to blackish; chela yellowish. Legs dark brown with three distal segments yellowish.

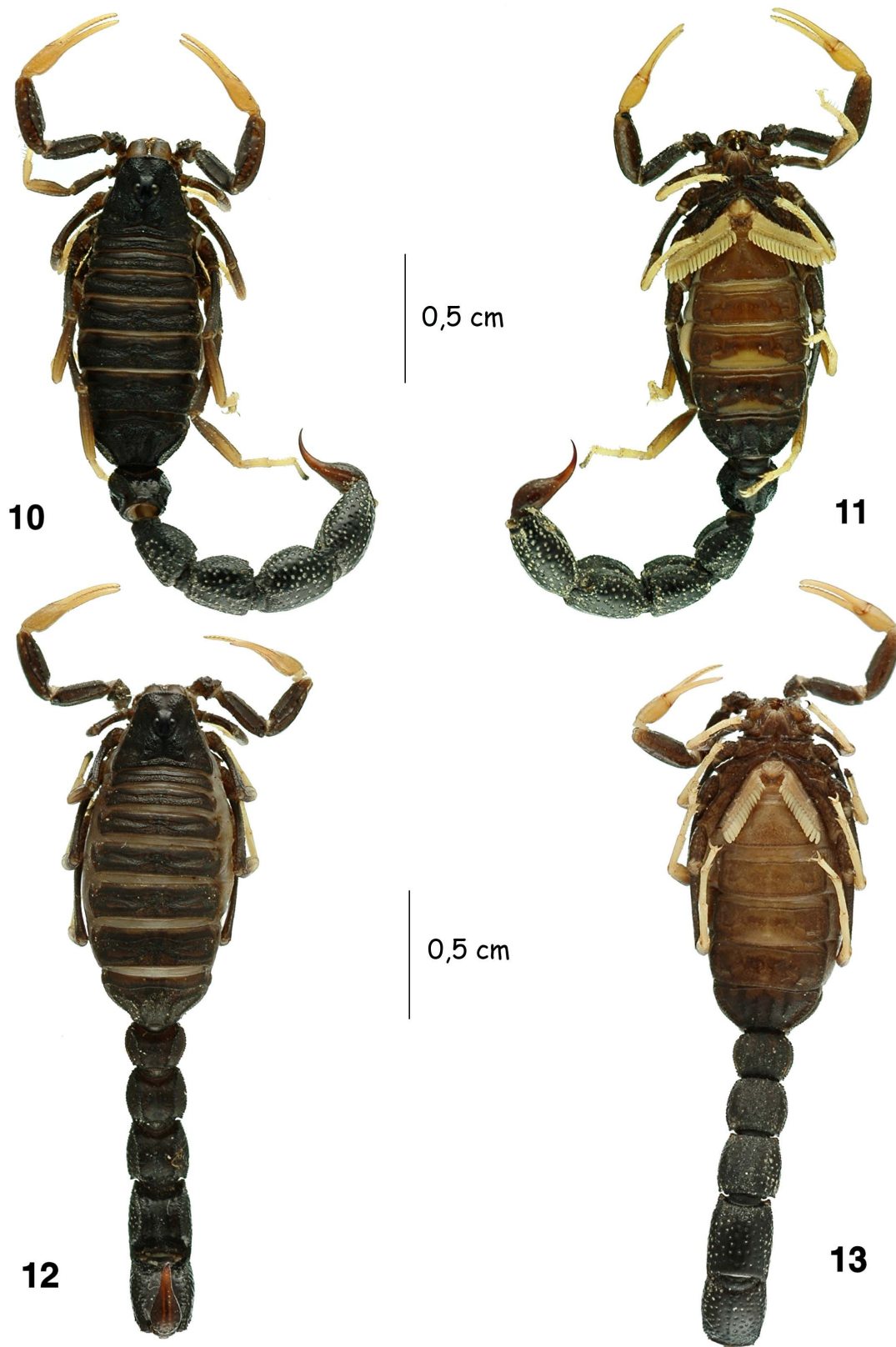
Morphology. Carapace weakly granular; anterior margin with a moderate convexity. Carinae and furrows weakly marked. Median ocular tubercle slightly anterior



Figures 8–9: *Orthochirus innesi*, female from El-Omayed Protectorate, 80 km west of Alexandria, dorsal and ventral aspects, showing coloration pattern.

to the centre of the carapace; median eyes separated by more than one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal, wider than long. Mesosoma: tergites with a weakly marked granulation, almost smooth; median carina moderate in all tergites. Tergite VII pentacarinat with strong carinae. Venter: genital operculum small, weakly elongated, divided longitudinally into two suboval to round plates. Pectines: pectinal tooth count 18-18 in male, 15-16 in female; basal middle lamellae of each pecten not dilated. Sternites almost smooth with small slit-like spiracles; VII with four carinae moderate and some minute granulations. Metasoma: segments rounded, with carinae moderately marked; granulations weakly mark-

ed; segments I to III with ten carinae; segment IV–V with punctuations; ventral aspect of segment without granulations on the distal region. Intercarinal spaces smooth dorsally; weakly granular laterally and ventrally. Telson smooth; aculeus longer than the vesicle and moderately curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); movable finger with well distinct basal teeth; ventral aspect of both finger and manus with thin setae. Pedipalps: femur with five moderate carinae, granular; patella with weakly marked carinae; chela without carinae, smooth. Fixed and movable fingers with 9/9 rows of denticles granules. Trichobothriotaxy: A-β; neobothriotaxy 'minorante' (Vachon, 1974, 1975). Legs:



Figures 10–13: *Orthochirus tassili* sp. n., male holotype and female paratype, dorsal and ventral aspects.



Figure 14: *Orthochirus tassili* sp. n., female paratype (alive) in the field (photo by P. Geniez).

tarsus with two rows of setae ventrally. Tibial spur reduced; pedal spurs moderately marked.

Distribution: Only known from the type locality.

***Orthochirus cloudsleythompsoni* Lourenço et Leguin, sp. n.**
(Figs. 15–16, 25, 30, 36; Tab. 1)

Type material: Morocco, Tata, 26/I/1962 (P. Girat leg.), male holotype.

Deposited in the Muséum national d'Histoire naturelle, Paris (RS-5050).

Etymology: Patronym in honor of Professor John L. Cloudsley-Thompson, on his 90th anniversary, for his enormous contribution to biology and arachnology during more than 60 years.

Diagnosis

Small to medium sized scorpions, reaching a total length of 24 mm for male. General coloration yellowish to reddish-yellow. Anterior margin of carapace slightly convex. Ventral aspect of segment V without granulations posteriorly. Fixed and movable fingers with 8/8 rows of granules; accessory granules present. Pectines

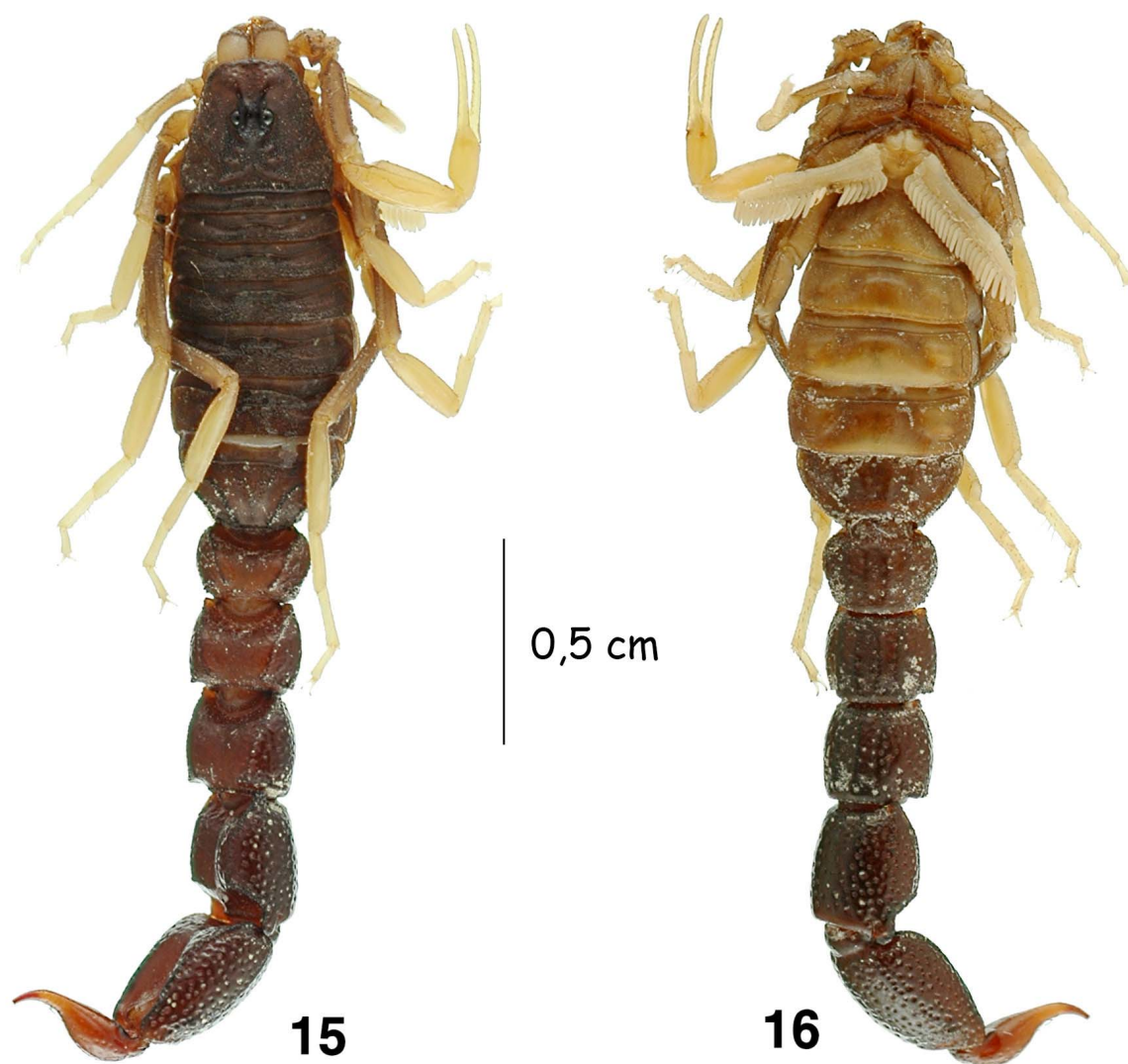
with 24–25 teeth in male. Trichobothriotaxy: A-β; neo-bothriotaxy 'minorante'.

Relationships: *Orthochirus cloudsleythompsoni* sp. n. can be distinguished from the other species of *Orthochirus*, and in particular from *Orthochirus innesi* by the following characters:

(i) smaller overall size (see Table 1), (ii) paler coloration pattern, (iii) ventral aspect of metasomal segment V without granulations, (iv) high number of teeth on pectines.

Description based on male holotype. Measurements in Table 1.

Coloration. Basically yellowish to reddish-yellow. Prosoma: carapace reddish-yellow; median and lateral eyes surrounded by black pigment. Mesosoma: reddish-yellow; carinae and granulations reddish. Metasomal segments reddish-yellow to dark reddish; telson reddish-yellow; aculeus yellowish with a reddish tip. Metasomal carinae marked with blackish. Venter yellowish to reddish-yellow; pectines pale yellow. Chelicerae yellowish, with variegated spots; fingers dark brown. Pedipalps and legs pale yellow with diffused brownish spots.

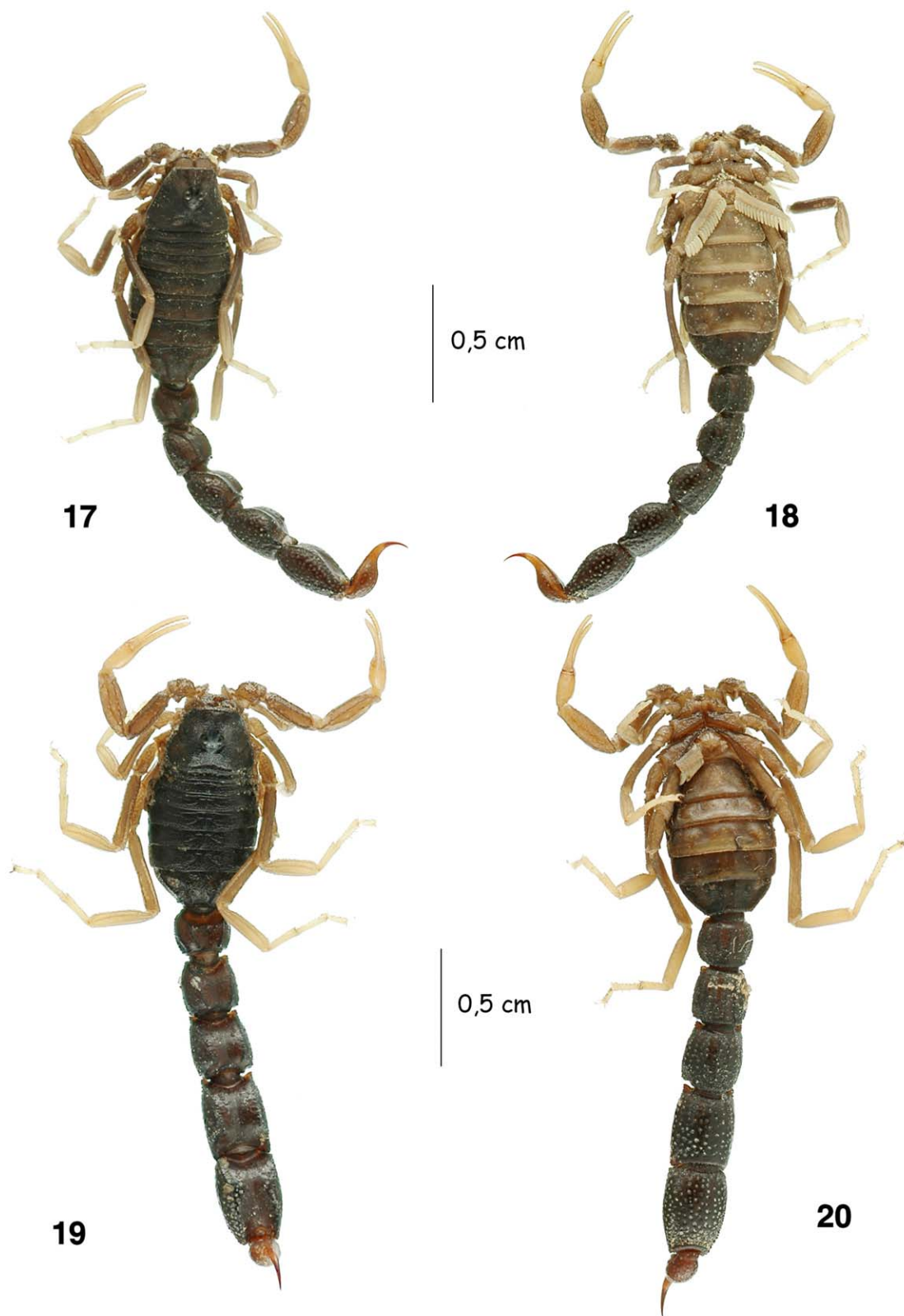


Figures 15–16: *Orthochirus cloudsleythompsoni* sp. n., male holotype, dorsal and ventral aspects.

Morphology. Carapace moderately granular; anterior margin with a slight convexity. Carinae and furrows moderate to weak. Median ocular tubercle slightly anterior to the centre of the carapace; median eyes separated by almost two ocular diameters. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal wider than long. Mesosoma: tergites with granulations better marked than those of carapace; median carina weak in all tergites. Tergite VII pentacarinat with strong carinae. Venter: genital operculum weakly elongated, divided longitudinally into two suboval plates. Pectines: pectinal tooth count 24–25; basal middle lamellae of each pecten not dilated. Sternites almost smooth with minute granulations laterally; small slit-like spiracles; VII with four carinae moderate to weak. Metasomal segments rounded, with carinae moderately marked; granulations weakly marked; segments I to III with ten carinae moderate to weak; segments IV and V

with punctuations; ventral aspect of segment V without granulations in the distal region. Intercarinal spaces almost smooth dorsally; weakly granular laterally and ventrally. Telson smooth with minute punctuations; aculeus shorter than the vesicle and moderately curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); movable finger with basal teeth distinct; ventral aspect of both finger and manus with thin setae. Pedipalps: femur with five strong carinae, granular; patella with vestigial carinae; chela without carinae, smooth. Fixed and movable fingers with 8/8 rows of denticles; accessory denticles present. Trichobothriotaxy: A-β; neobothriotaxy 'minorante' (Vachon, 1974, 1975). Legs: tarsus with two rows of setae ventrally. Tibial and pedal spurs moderately to strongly marked.

Distribution: Only known from the type locality.



Figures 17–20: *Orthochirus atarensis* sp. n., male holotype and female paratype, dorsal and ventral aspects.



Figure 21: *Orthochirus atarensis* sp. n., male holotype (alive) in the field (photo by P. Geniez).

***Orthochirus atarensis* Lourenço et Leguin, sp. n.**
(Figs. 17–21, 26, 31–32, 37; Tab. 1)

Type material: Mauritania, Atar, 44 km past Chingetti towards Atar (20.54587°N, 12.68945°W), 703 m, 7/1/2005 (P. Geniez), male holotype. N Azougui (20.5739°N, 13.0961°W), 270 m, 12/XI/2006 (P. Geniez), 1 female, 1 male juvenile paratypes. Deposited in the Muséum national d'Histoire naturelle, Paris.

Etymology: specific name refers to the locality in which the holotype was collected.

Ecological note: the two sites where *Orthochirus atarensis* sp. n. was collected correspond to an endemic area in Mauritania. A new endemic species of lizard, *Pristurus adrarensis* Geniez & Arnold, 2006 was also recently collected and described from this same area of Adrar Atar (Geniez & Arnold, 2006).

Diagnosis

Small sized scorpions, reaching a total length of 21 mm for male and 23 mm for female. General coloration brownish-yellow to dark brown. Anterior margin of carapace straight in male, slightly convex in female.

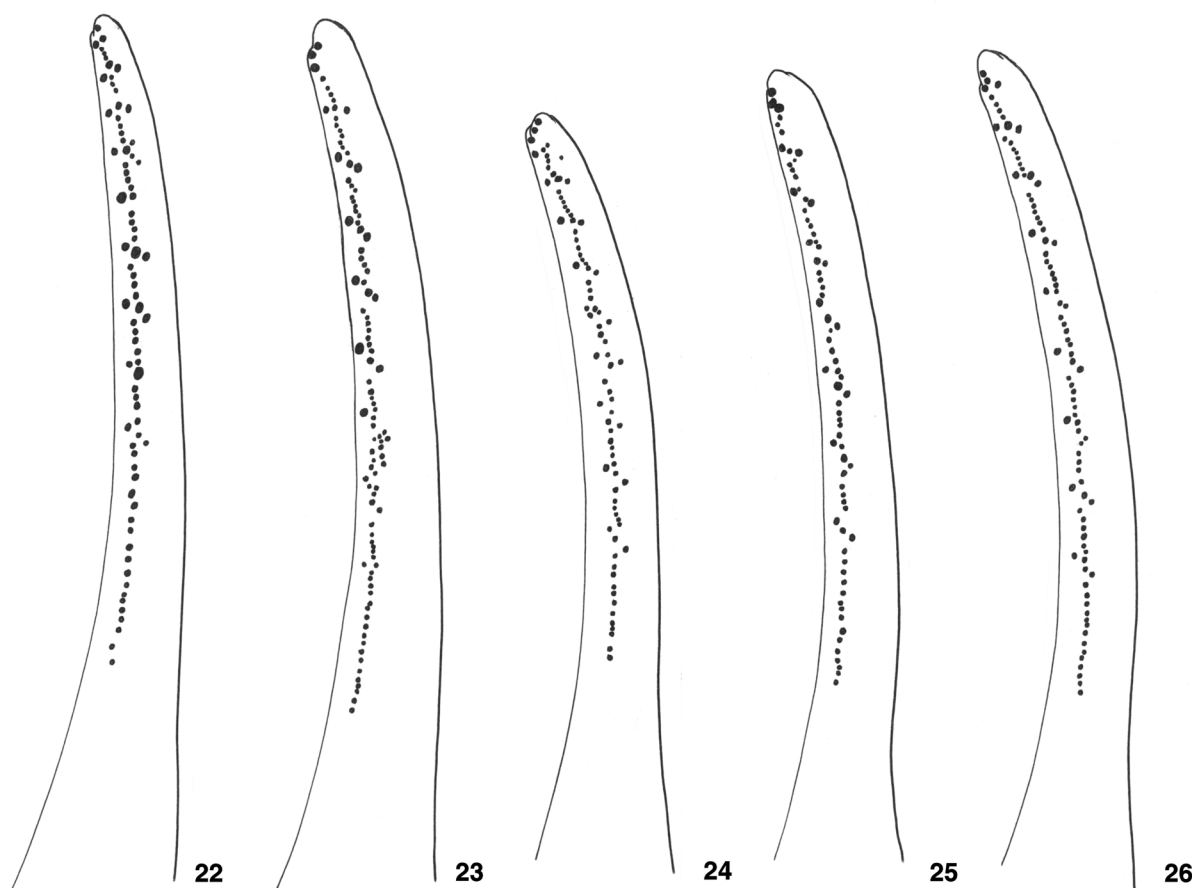
Ventral aspect of metasomal segment V without granulations posteriorly. Fixed and movable fingers with 9/9 rows of denticles; accessory denticles present. Pectines with 17–18 teeth in male and 15–16 teeth in female. Trichobothriotaxy: A-β; neobothriotaxy 'minor-ante' in male, orthobothriotaxy in female.

Relationships: *Orthochirus atarensis* sp. n. can be distinguished from the other species of *Orthochirus*, and in particular from *Orthochirus innesi* by the following characters:

(i) smaller overall size (see Table 1), (ii) anterior margin of carapace straight in male, (iii) presence of trichobothrium d_2 of femur in female, (iv) coloration pattern very dark, (v) carapace and tergites weakly granular.

Description based on male holotype and paratypes. Measurements in Table 1.

Coloration. Basically brownish-yellow. Prosoma: carapace dark brown; anterior margin yellowish-brown; median and lateral eyes surrounded by black pigment. Mesosoma: brownish to brownish-yellow; carinae and granulations dark brown. Metasomal segments dark brown; telson reddish-brown; aculeus yellowish with a reddish tip. Metasomal carinae marked with blackish.



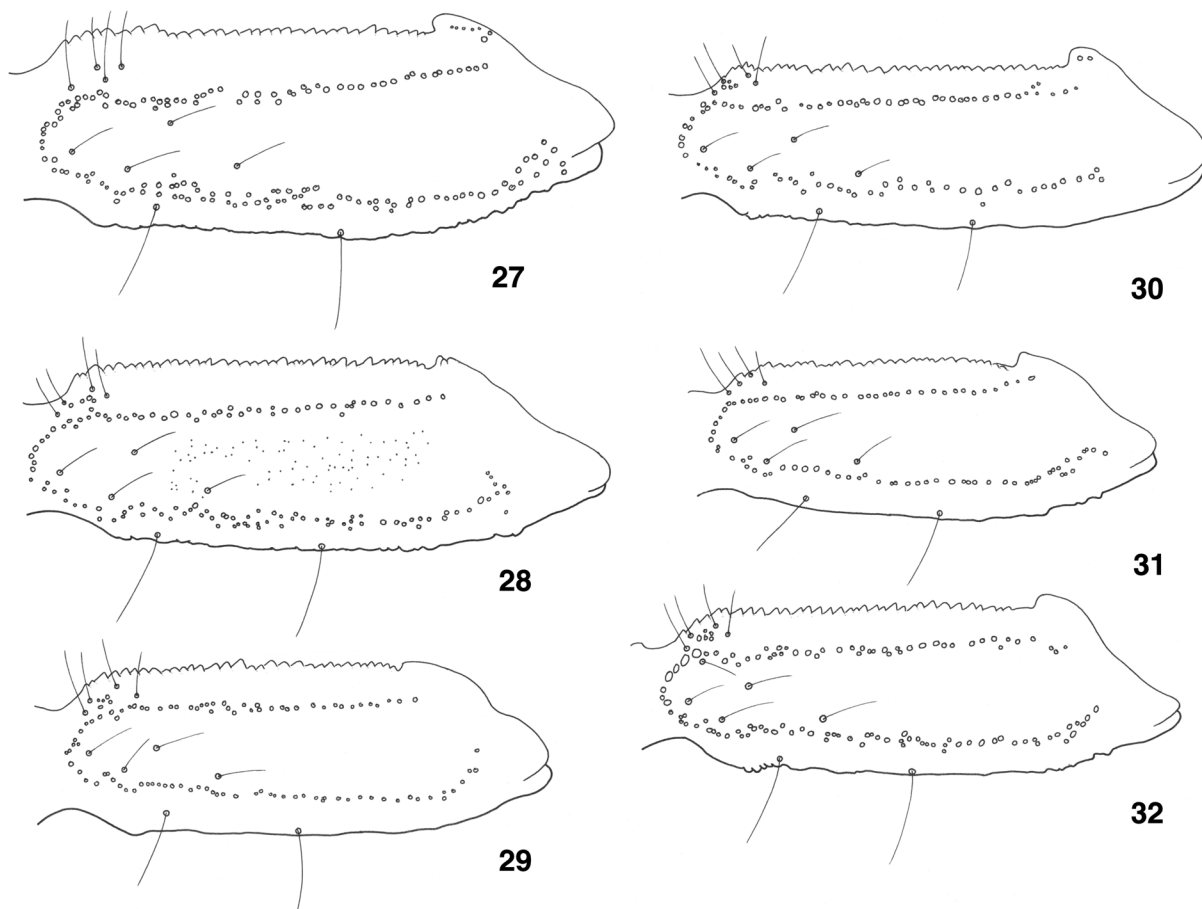
Figures 22–26: Disposition of the granulation over the dentate margin of the movable finger. **22.** *Orthochirus aristidis*, female from Nubia. **23.** *Orthochirus innesi*, female from Wadi Degla near Cairo. **24.** *Orthochirus tassili* **sp. n.**, female paratype. **25.** *Orthochirus cloudsleythompsoni* **sp. n.**, male holotype. **26.** *Orthochirus atarensis* **sp. n.**, female paratype.

Venter yellowish-brown; pectines pale yellow. Chelicerae yellowish, with dark variegated spots; fingers dark brown. Pedipalps, femur and patella dark brown; chela yellowish. Legs yellowish with diffused dark brown spots.

Morphology. Carapace weakly granular; anterior margin straight in male, with a slight convexity in female. Carinae and furrows moderate to weak. Median ocular tubercle slightly anterior to the centre of the carapace; median eyes separated by about one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal, wider than long. Mesosoma: tergites with moderate to weak granulations; median carina weak in all tergites. Tergite VII pentacarinat with moderate carinae. Venter: genital operculum weakly elongated, divided longitudinally into two suboval plates. Pectines: pectinal tooth count 17–18 in male, 15–16 in female; basal middle lamellae of each pecten not dilated. Sternites almost smooth with small slit-like spiracles; VII with four carinae moderate. Meta-

soma: segments rounded, with carinae moderately marked; granulations weakly marked; segments I to III with ten carinae; segments IV and V with punctuations; ventral aspect of segment V without granulations in the distal region. Intercarinal spaces smooth dorsally; weakly granular laterally and ventrally. Telson smooth with a few punctuations; aculeus as long as the vesicle and moderately curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); movable finger with basal teeth distinct; ventral aspect of both finger and manus with thin setae. Pedipalps: femur with five strong carinae, granular; patella with 6–7 weakly marked carinae; chela without carinae, smooth. Fixed and movable fingers with 9/9 rows of denticles. Trichobothriotaxy: A-β; neo-bothriotaxy 'minorante' in male, orthobothriotaxy in female (Vachon, 1974, 1975). Legs: tarsus with two rows of setae ventrally. Tibial and pedal spurs moderately to strongly marked.

Distribution: Only known from the type locality.



Figures 27–32: Femur, dorsal aspect, showing trichobothrial pattern. **27.** *Orthochirus aristidis*, female from Nubia. **28.** *Orthochirus innesi*, female from Wadi Degla near Cairo. **29.** *Orthochirus tassili* sp. n., female paratype. **30.** *Orthochirus cloudsleythompsoni* sp. n., male holotype. **31–32.** *Orthochirus atarensis* sp. n., male holotype and female paratype.

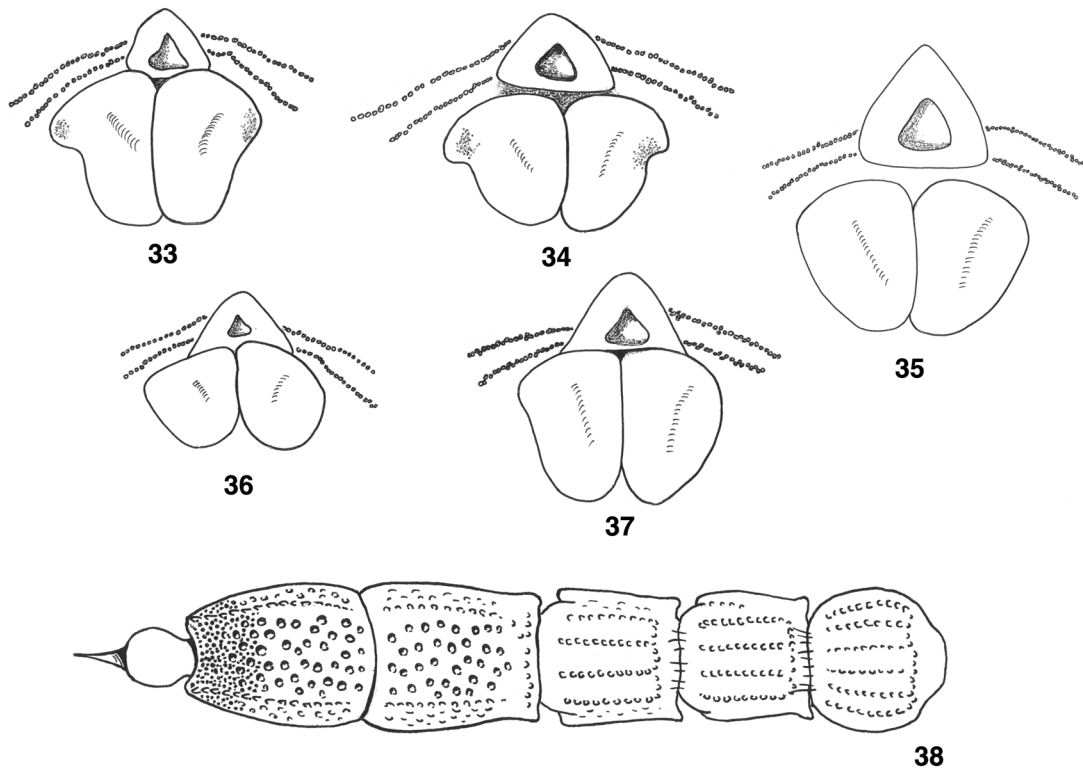
Key to the African species of *Orthochirus*

1. Ventral aspect of metasomal segment V with granulations posteriorly *O. innesi*
- (1). Ventral aspect of metasomal segment V without granulations posteriorly 2
2. Pectines with more than 20 teeth *O. cloudsleythompsoni* sp. n.
- (2). Pectines with less than 20 teeth 3
3. Chela dark brown; genital operculum elongated, divided longitudinally into two suboval plates *O. aristidis*
- (3). Chela yellowish; genital operculum not elongated .. 4
4. Genital operculum small with suboval to rounded plates; anterior margin of male carapace with a moderate convexity; trichobothrium d_2 of femur absent in female *O. hoggarensis* sp. n.
- (4). Genital operculum moderate with suboval plates; anterior margin of male carapace straight; trichobothrium d_2 present in female *O. atarensis* sp. n.

Remarks About the Geographical Distribution of the African Species

Orthochirus aristidis has been the subject of few citations in the recent literature about scorpions (El-Hennawy, 1992; Fet & Lowe, 2000). This was probable associated to the incertitude about its taxonomic position, since the type material was misleading for more than a century. The distribution of this species can now be confirmed for the South of Egypt, Sudan, Djibouti and possibly Ethiopia.

In contrast with *O. aristidis*, *Orthochirus innesi* was cited very often in the literature, and recorded for most regions of North Africa. This was largely due to the taxonomic decisions synthesized by Vachon (1952) in his studies of the North African fauna of scorpions. Studies of more southern populations of the Sahara desert (this publication) show, however, that several of these populations have been misidentified by Vachon (1952). Therefore, it is quite possible that *O. innesi* has a distribution limited to the north of Egypt, Libya, Algeria



Figures 33–38: Sternum and genital operculum. **33.** *Orthochirus aristidis*, female from Nubia. **34.** *Orthochirus innesi*, female from Wadi Degla near Cairo. **35.** *Orthochirus tassili* **sp. n.**, female paratype. **36.** *Orthochirus cloudsleythompsoni* **sp. n.**, male holotype. **37.** *Orthochirus atarensis* **sp. n.**, female paratype. **38.** *Orthochirus innesi*, female from Wadi Degla near Cairo. Ventral aspect of metasomal segments I–V and telson, showing granulations on segment V.

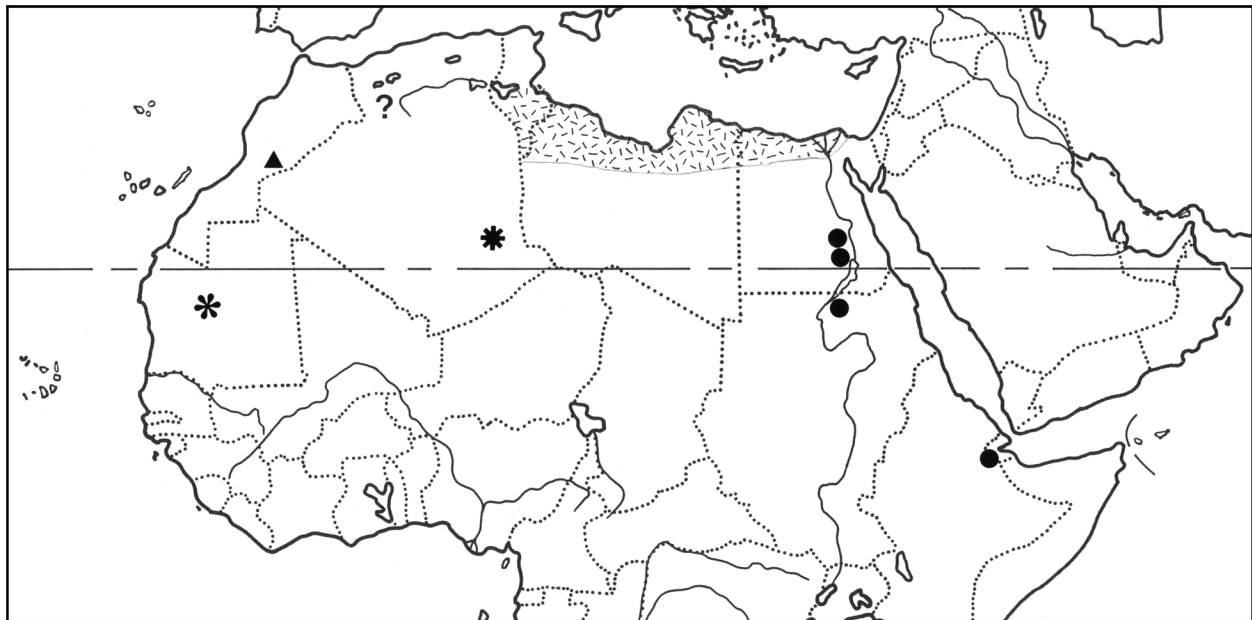


Figure 39: Map of North Africa, showing the distribution and type localities of the studied species. *Orthochirus aristidis* (black circle). *Orthochirus innesi* (hatched area), *Orthochirus tassili* **sp. n.** (black asterisk), *Orthochirus cloudsleythompsoni* (black triangle) and *Orthochirus atarensis* (black flower).



Figure 40: Habitat of *O. innesi*. Typical 'palmeraie' in South of Tunisia (photo by W. R. Lourenço).



Figure 41: Habitat of *O. tassili* sp. n. Dry formation in the region of Tassili-N-Ajjer, South of Algeria (photo by P. Geniez).

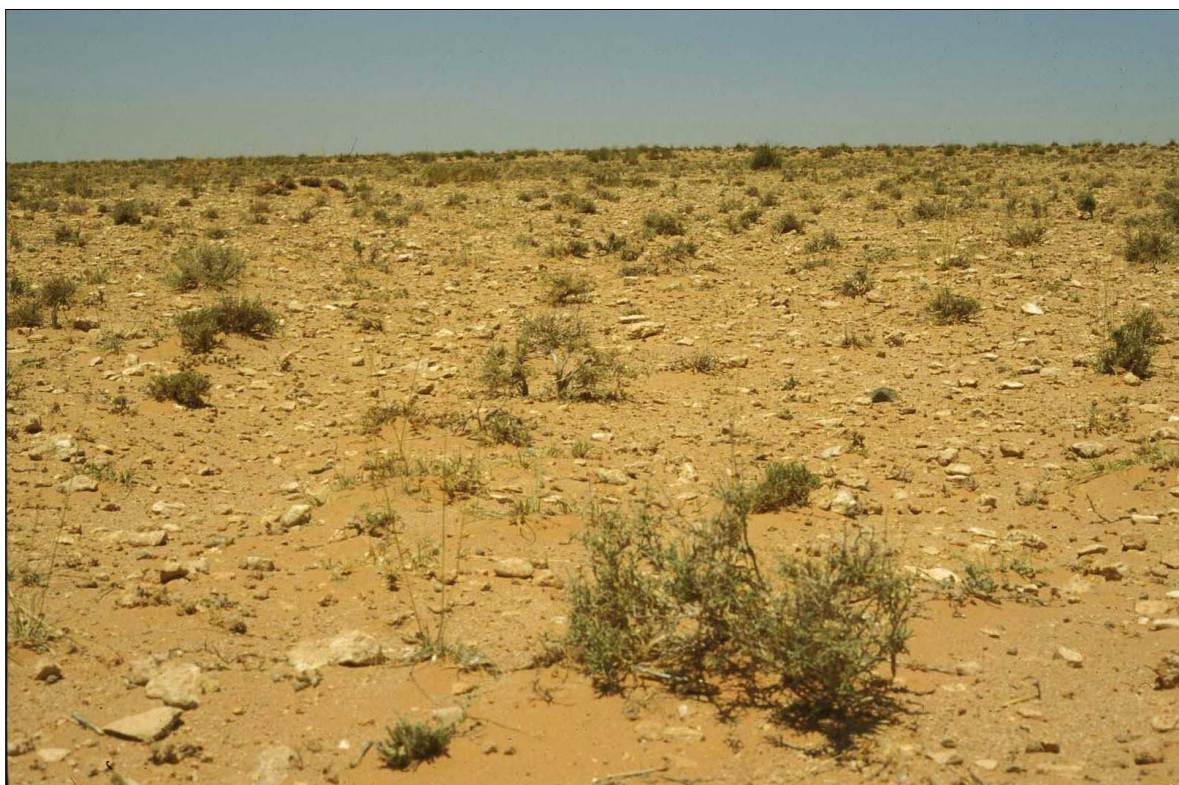


Figure 42: Habitat of *O. cloudsleythompsoni* sp. n. Region of Tata, Morocco.



Figure 43: Habitat of *O. atarensis* sp. n. Dry formation in the region of Chingetti towards Atar, Mauritania (photo by P. Geniez).

and Tunisia. Part of the old material listed by Vachon (1952) is still present in the collections of the Museum in Paris. This material, however, is poorly preserved and the data available for their original localities is often imprecise. New collections will be required to define the exact range of distribution of the species. The presence of this species in the Middle East most certainly can be rejected. Examination of one female from southern Sinai ((Egypt, S of Sinai, Wadi Feiran, 3/IX/2001 (H. El-Hennawy)) confirms that the species present there is *Orthochirus scrubiculosus*. This confirms the identification done by Levy & Amitai (1980).

The population of Hoggar and Tassili Mountains in the south of Algeria, was tentatively referred to *O. innesi* by Vachon (1952). Subsequently, in a more precise study on the scorpions of this region, Vachon (1958) confirmed this population as *O. innesi*. At present, this population is described as a new species, *Orthochirus tassili* **sp. n.**, probably endemic to this mountain region.

The first record of an *Orthochirus* species from Morocco, is the one proposed by Vachon (1954) for specimens from Aouinet Torkoz in the southern region of this country. The female specimen reported was in fact collected and determined by J. B. Panouse. The subsequent 'first record' proposed by Kovařík (1995), was evidently erroneous. More recent field trips to the region of Aouinet Torkoz carried out by the senior author, allowed the collection of more specimens of *Orthochirus* from this area. These specimens are yet under biological study, but we can already suggest that this population is distinct both from *O. innesi*, and *O. cloudsleythompsoni* **sp. n.** described from Tata.

Orthochirus innesi was also recorded by Vachon (1950) from Mauritania in a single line of his key to the scorpions of North Africa. This citation, was again repeated by Vachon (1952), but in his much more completed study of the scorpions from Mauritania none species of *Orthochirus* are listed. The new species described here, *O. atarensis* **sp. n.**, is markedly different from *O. innesi*, in particular by the orthobothriotaxic trichobothrial pattern of females.

Subsequent studies on the southern Saharan populations of *Orthochirus* should reveal yet new species to be described.

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