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

August 2011 – No. 123
Euscorpius
Occasional Publications in Scorpiology

EDITOR: Victor Fet, Marshall University, ‘fet@marshall.edu’
ASSOCIATE EDITOR: Michael E. Soleglad, ‘soleglad@la.znet.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 on Website ‘http://www.science.marshall.edu/fet/euscorpius/’ at Marshall University, Huntington, WV 25755-2510, USA.

The International Code of Zoological Nomenclature (ICZN, 4th Edition, 1999) does not accept online texts as published work (Article 9.8); however, it accepts CD-ROM publications (Article 8). Euscorpius is produced in two identical versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293). Only copies distributed on a CD-ROM from Euscorpius are considered published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts. All Euscorpius publications are distributed on a CD-ROM medium to the following museums/libraries:

- ZR, Zoological Record, York, UK
- LC, Library of Congress, Washington, DC, USA
- USNM, United States National Museum of Natural History (Smithsonian Institution), Washington, DC, USA
- AMNH, American Museum of Natural History, New York, USA
- CAS, California Academy of Sciences, San Francisco, USA
- FMNH, Field Museum of Natural History, Chicago, USA
- MCZ, Museum of Comparative Zoology, Cambridge, Massachusetts, USA
- MNHN, Museum National d’Histoire Naturelle, Paris, France
- NMW, Naturhistorisches Museum Wien, Vienna, Austria
- BMNH, British Museum of Natural History, London, England, UK
- MZUC, Museo Zoologico “La Specola” dell’Università de Firenze, Florence, Italy
- ZISP, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
- WAM, Western Australian Museum, Perth, Australia
- NTNU, Norwegian University of Science and Technology, Trondheim, Norway
- OUMNH, Oxford University Museum of Natural History, Oxford, UK
- NEV, Library Netherlands Entomological Society, Amsterdam, Netherlands

Publication date: 7 August 2011
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

1 Muséum national d’Histoire naturelle, Département Systématique et Evolution, UMR7205, CP 053, 57 rue Cuvier 75005 Paris, France: e-mail: arachne@mnhn.fr

2 Muséum national d’Histoire naturelle, Direction des Collections, CP 053, 57 rue Cuvier 75005 Paris, France: e-mail: leguin@mnhn.fr

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 restablished 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 Museum 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 toptype 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 toptype). 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 carinae moderate to weak in all tergites. Tergite VII pentacarinate 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 punctations; 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.

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

---


*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.
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 pentacarinate 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. Stermites 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.

**Figure 5:** *Orthochirus aristidis*, female (alive) from Djibouti.
<table>
<thead>
<tr>
<th></th>
<th>O. aristidis</th>
<th>O. innesi</th>
<th>O. tassili sp. n.</th>
<th>O. cloudsleythompsoni sp. n.</th>
<th>O. atarensis sp. n.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♀ paralectotype</td>
<td>♀ topotype</td>
<td>♂ ♀ holotype/paratype</td>
<td>♂ holotype</td>
<td>♂ ♀ holotype/paratype</td>
</tr>
<tr>
<td>Total length*</td>
<td>29.6</td>
<td>28.0</td>
<td>25.1/23.7</td>
<td>24.1</td>
<td>21.3/23.2</td>
</tr>
<tr>
<td>Carapace:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>3.8</td>
<td>3.4</td>
<td>3.0/2.8</td>
<td>3.2</td>
<td>2.7/3.1</td>
</tr>
<tr>
<td>- anterior width</td>
<td>2.6</td>
<td>2.5</td>
<td>2.0/2.2</td>
<td>2.3</td>
<td>2.0/2.2</td>
</tr>
<tr>
<td>- posterior width</td>
<td>4.9</td>
<td>4.8</td>
<td>3.8/4.0</td>
<td>3.8</td>
<td>3.6/3.8</td>
</tr>
<tr>
<td>Metasoma, segment I:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>2.2</td>
<td>2.1</td>
<td>1.9/1.8</td>
<td>1.8</td>
<td>1.6/1.8</td>
</tr>
<tr>
<td>- width</td>
<td>3.3</td>
<td>3.2</td>
<td>2.5/2.4</td>
<td>2.8</td>
<td>2.2/2.4</td>
</tr>
<tr>
<td>Metasoma, segment V:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>4.2</td>
<td>4.0</td>
<td>3.7/3.6</td>
<td>3.8</td>
<td>3.2/3.6</td>
</tr>
<tr>
<td>- width</td>
<td>3.7</td>
<td>3.5</td>
<td>2.6/2.5</td>
<td>3.2</td>
<td>2.3/2.7</td>
</tr>
<tr>
<td>- depth</td>
<td>2.6</td>
<td>2.5</td>
<td>1.9/1.7</td>
<td>2.2</td>
<td>1.6/2.0</td>
</tr>
<tr>
<td>Telson length</td>
<td>3.8</td>
<td>3.6</td>
<td>3.4/3.3</td>
<td>3.6</td>
<td>3.3/3.5</td>
</tr>
<tr>
<td>- width</td>
<td>1.3</td>
<td>1.4</td>
<td>1.0/1.2</td>
<td>1.2</td>
<td>1.2/1.3</td>
</tr>
<tr>
<td>- depth</td>
<td>1.3</td>
<td>1.2</td>
<td>1.2/1.0</td>
<td>1.0</td>
<td>1.0/1.2</td>
</tr>
<tr>
<td>Femur:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>2.8</td>
<td>2.7</td>
<td>2.3/2.3</td>
<td>2.4</td>
<td>2.2/2.4</td>
</tr>
<tr>
<td>- width</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9/0.8</td>
<td>0.8</td>
<td>0.8/0.8</td>
</tr>
<tr>
<td>Patella:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>3.4</td>
<td>3.3</td>
<td>3.0/2.9</td>
<td>3.2</td>
<td>2.6/3.0</td>
</tr>
<tr>
<td>- width</td>
<td>1.0</td>
<td>1.3</td>
<td>1.0/0.9</td>
<td>1.0</td>
<td>1.0/1.0</td>
</tr>
<tr>
<td>Chela:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>4.5</td>
<td>4.7</td>
<td>4.1/4.2</td>
<td>4.2</td>
<td>3.8/4.2</td>
</tr>
<tr>
<td>- width</td>
<td>0.8</td>
<td>0.9</td>
<td>0.9/0.8</td>
<td>0.8</td>
<td>0.8/0.8</td>
</tr>
<tr>
<td>- depth</td>
<td>0.9</td>
<td>1.0</td>
<td>0.8/0.8</td>
<td>0.8</td>
<td>0.9/0.9</td>
</tr>
<tr>
<td>Movable finger:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- length</td>
<td>3.1</td>
<td>3.3</td>
<td>2.9/2.8</td>
<td>3.0</td>
<td>2.7/3.1</td>
</tr>
</tbody>
</table>

* 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)


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. Meso-soma: 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. Ven-ter 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 pentacarinate 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. Stermites 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 marked; 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.
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)


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

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.
**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 pentacarinate 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; subacicular 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)


*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).

*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 *d₂* 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.

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 sub-triangular to subpentagonal, wider than long. Mesosoma: tergites with moderate to weak granulations; median carina weak in all tergites. Tergite VII pentacarinate 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. Metasoma: 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; neobothriotaxy ‘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.

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; tricho-
       bothrium $d_2$ 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 probably 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 cloudsleythomsoni 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 cloudsleythomsoni (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 originals 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 Kovár (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. cloudslethompsonii 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 revel yet new species to be described.

Acknowledgments

We are most grateful to Philippe Geniez, University of Montpellier-EPHE, for sending us the specimens of Orthochirus collected by him during his field trips to Algeria and Mauritania and also for the use of some of his field photographs. We thank Dr. H. El-Hennawy, Cairo, for sending specimens of O. innesi from Egypt. We thank Victor Fet and Michael Soleglad for their useful comments to the manuscript

References


