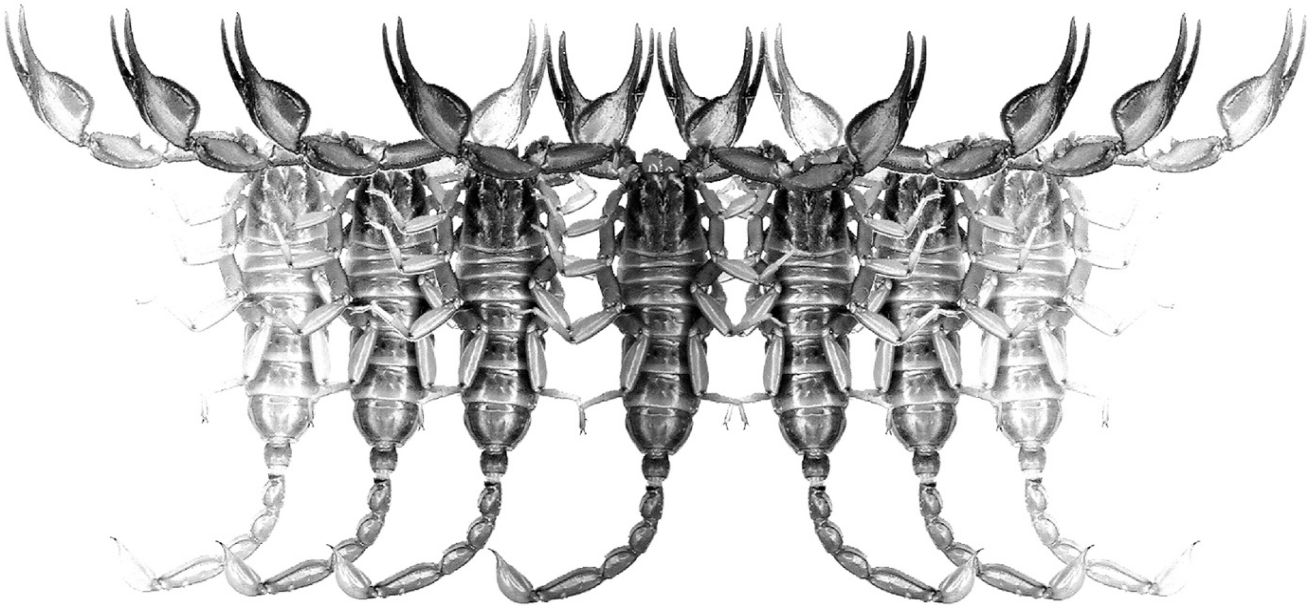
Euscorpius

Occasional Publications in Scorpiology



An anomaly of chelicera in *Scorpio kruglovi* Birula, 1910 (Scorpiones: Scorpionidae)

Ersen Aydın Yağmur, Mehmet Sait Kılıç & Ömer Yılmaz

June 2021 — No. 335

Euscorpius

Occasional Publications in Scorpiology

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: 24 June 2021

http://zoobank.org/urn:lsid:zoobank.org:pub:0D023343-31B5-485A-9435-42357F36EC83

Euscorpius — Occasional Publications in Scorpiology. 2021, No. 335

An anomaly of chelicera in *Scorpio kruglovi* Birula, 1910 (Scorpiones: Scorpionidae)

Ersen Aydın Yağmur [1], Mehmet Sait Kılıç [2] & Ömer Yılmaz [3]

[1] Manisa Celal Bayar University, Alaşehir Vocational School, Alaşehir, Manisa, 45600 Turkey.
email: ersen.yagmur@gmail.com
[2] Sarsalkım Secondary School, No. 285, Sarısalkım Neighborhood, Street No. 121001, Şahinbey, Gaziantep, Turkey
[3] Mimar Sinan Anatolian High School, Bostancı Neighborhood, Koçmustafa Street, No. 3, Şahinbey, Gaziantep, Turkey

http://zoobank.org/urn:lsid:zoobank.org:pub:0D023343-31B5-485A-9435-42357F36EC83

Summary

An anomaly in cheliceral dentition of the fixed finger is recorded in the scorpion *Scorpio kruglovi* Birula, 1910. This rare teratological anomaly herein is described and illustrated.

Introduction

Anomalies that occur during embryonic development cause teratologic disorders in scorpions. These anomalies include deformations (malformations), duplications, division or fusion, or absence of scorpion body parts. Very common are duplications that were reported for prosoma (Berland, 1913); pedipalp (Karataş & Kürtüllü, 2006); pectinal organs (Teruel & Baldazo-Monsivaiz, 2015); and especially for metasoma (Berland, 1913; Campos, 1918; Sergent, 1946; Vachon, 1952, 1953; Briseño, 1963; Williams, 1971; Sissom & Shelley, 1995; Lourenço & Hypolite, 2010; Seiter & Teruel, 2014) as well as vesicle and aculeus (Shulov & Amitai, 1955; Vachon, 1972; Galvis & Flórez-D., 2016; Salabi et al., 2021). Various reported malformations include fusion on carapace and tergites (Armas, 1976); division or fusion in tergites (Teruel, 2003; Mattoni, 2005); pedipalp fusion (Cao & Solórzano, 1991); leg malformation (Armas, 1977); pectinal malformation (Ayrey, 2011; Šarić & Tomić, 2020), and pedipalp malformation (Mattoni, 2005; Graham, 2006; Jahanifard et al., 2008). Also, Jahanifard et al. (2008) reported vesicle malformation; David (2012), leg absence; and Teruel (2003), pedipalp, tergite, and cheliceral anomalies.

Scorpio maurus kruglovi was described by Birula (1910) from Deir ez-Zor, Syria (upper Euphrates). This taxon was first reported from Turkey (as *S. fuscus kruglovi* Birula, 1910) by Roewer (1943) from the Amanos Mountains (now Hatay Province). Its existence in the Hatay Province was confirmed by Talal et al. (2015) who also elevated this subspecies to species level as *Scorpio kruglovi* Birula, 1910.

Material and Methods

The adult female of *Scorpio kruglovi* (Figs. 1–2) was collected from Kale Village, İskenderun, Hatay Province, Turkey (36°17'37"N 35°47'34"E, 94 m a. s. l., 01 May 2007, leg. H. Koç, AZMM/Sco-2007:1). It is preserved in 75% ethanol and deposited in AZMM (Alaşehir Zoological Museum, Manisa Celal Bayar University, Alaşehir, Manisa, Turkey). Identification of specimen was done after Birula (1910) and Talal et al. (2015).

Results and Discussion

The examined specimen has abnormal dentition of the fixed finger of its left chelicera whereas that on the right chelicera is normal (Figs. 3–6). Both chelicerae have normal dentition of the movable finger, and normally developed tibiae.

Vachon (1963) formally established a nomenclature for identifying various denticles (also called "teeth"; Hjelle, 1990; Sissom, 1990) of scorpion chelicera. The dentition differs in the movable vs fixed finger; denticles can be present on the cutting egde and on the surface. Soleglad & Fet (2003) explained that "The cheliceral fixed finger has only one denticulate cutting edge, which we refer to in this paper as the dorsal edge". The fixed finger of chelicera (tarsus) has four denticles, from base to tip: basal (*b*), median (*m*), subdistal (*sd*), and distal (*d*) (Vachon, 1963; Hjelle, 1990; Sissom, 1990). The basal (*b*) and median (*m*) denticles usually form a bicusp, in which the denticles can be more or less divided (Hjelle, 1990, fig. 2.7; Sissom, 1990, fig. 3.1; Solegad & Fet, 2003, figs. 56–63, dorsal edge depicted from ventral aspect).

Only one case of a cheliceral anomaly so far has been recorded (but not illustrated) in scorpions by Teruel (2003) in *Lychas obsti* Kraepelin, 1913 (family Buthidae). The abnormal specimen had only one denticle on the ventral (or internal; Sissom, 1990) surface of the fixed finger of left chelicera (typical for the genus *Lychas*) but two denticles on the right chelicera. These denticles are absent in the family Scorpionidae (and the entire parvorder Iurida; Soleglad & Fet, 2003) where the ventral surface of the fixed finger is smooth. Our observations in *Scorpio kruglovi* refer to the four denticles of the cutting egde.

Figures 1–**6**: *Scorpio kruglovi*, female. **Figures 1**–**2**. Dorsal (1) and ventral (2) views. **Figures 3**–**6**. Carapace (3), coxosternal area (4), and chelicerae in dorsal (5) and ventral (6) views. Scale bar: 10 mm (1–2).

In the studied abnormal specimen of *S. kruglovi*, the left chelicera has a normal movable finger with fully developed dentition. However, in its fixed finger all four denticles are abnormal (Figs. 3–6). Of the four fundamental dorsal edge denticles, the basal (*b*) and median (*m*) denticles are completely fused (compare to the right chelicera with a normal bicusp found in in *Scorpio*). The subdistal denticle (*sd*) is very weakly developed and represented by a small granule. The distal denticle (*d*) is short, slightly curved, and slightly flattened. It is also slightly bifurcated at the tip, which resembles the structure of the movable cheliceral finger where the tip is normally bifurcated.

Cheliceral dentition provides an important taxonomic set of characters for scorpions (Vachon, 1963; Solegad & Fet, 2003), and any malformations are of a special interest as they might reflect changes in specific developmental genes. For instance, the degree of fusion of basal (*b*) and median (*m*) denticles in a bicusp varies in different taxonomic groups. This variation ranges to a considerable fusion, e.g., in some Vaejovidae (see Solegad & Fet, 2003, fig. 62; Solegad & Fet, 2008, figs. 115-116) where the depth of the separate denticles is 30% or less of the bicusp. The observed malformation in *Scorpio*, therefore, continues the trend of fusion found in some scorpion taxa (assuming it is a developmental abnormality and not a result of a damage).

According to Galvis & Flórez-D. (2016), malformations of important structures such as chelicera, chela, or telson, may affect the prey capture efficiency and they are relatively less common. The *Scorpio kruglovi* specimen that we examined is an adult female in good condition, and well developed. This indicates that the cheliceral anomaly has not prevented feeding (Fig. 1 and 2), and that it has could feed well using one chelicera.

Acknowledgements

We would like to thank Halil Koç (Sinop University, Sinop, Turkey) for collecting the discussed specimen, Victor Fet, František Kovařík and two anonymous reviewers for their comments.

References

ARMAS, L.F. 1976. Escorpiones del archipiélago Cubana. Familia Diplocentridae (Arachnida: Scorpionida). *Poeyana*, 147: 1–35.

ARMAS, L. F., de. 1977. Anomalías en algunos Buthidae (Scorpionida) de Cuba y Brasil. *Poeyana*, 176: 1–6.

AYREY, R. F. 2011. An anomaly of pectinal organs in *Vaejovis lapidicola* (Scorpiones: Vaejovidae). *Euscorpius*, 130: 1–6.

BERLAND, L. 1913. Note sur un Scorpion muni de deux queues. *Bulletin de la Société entomologique de France*, 18: 251–252.

BIRULA, A. 1910. Über *Scorpio maurus* Linné und seine Unterarten. *Horae Societatis Entomologicae Rossicae*, 39: 115–192.

BRISEÑO, C. 1963. Presencia de un ejemplar de alacran de la especie *Centruroides noxius*, con dos colas. *Revista del Instituto de Salubridad y Enfermedades Tropicales (México)*, 23(3/4): 185–186.

CAMPOS, F. 1918. Algunos casos teratologicos observados en los Arthropodos. *Annals of the Entomological Society of America*, 11: 97–98.

CAO, J. & L. SOLÓRZANO. 1991. Escorpión con pedipalpo anómalo. *Resúmenes II Simposio de Zoología, La Habana:* p. 48.

GALVIS, W. & E. D. FLÓREZ. 2016. A new telson teratology in the scorpion *Opisthacanthus* Peters, 1861 (Scorpiones: Hormuridae). *Arachnology*, 17(3): 157–158.

DAVID, D. 2012. A seven-legged scorpion: the first teratological leg absence found in *Scorpio maurus fuscus* (Scorpiones: Scorpionidae). *Euscorpius*, 151: 1–4.

GRAHAM, M. R. 2006. Malformed pedipalp finger dentition of the scorpion *Superstitionia donensis* (Scorpiones: Superstitioniidae). *Euscorpius*, 42: 1–4.

HJELLE, J. T. 1990. Anatomy and morphology. Pp. 9–63 in: Polis, G.A. (ed.), *Biology of Scorpions*. Stanford, CA: Stanford University Press.

JAHANIFARD, E., S. NAVIDPOUR & B. MASIHIPOUR. 2008. Pedipalps and venom vesicle anomalies in two families of scorpions (Scorpiones: Hemiscorpiidae, Buthidae) from Iran. *Pakistan Journal of Biological Sciences*, 11(2): 309–311.

KARATAŞ, A. & M. KÜRTÜLLÜ. 2006. Duplication of pedipalp segments in the scorpion *Androctonus crassicauda* (Olivier, 1807) (Scorpiones: Buthidae). *Euscorpius*, 43: 1–4.

LOURENÇO, W. R. & F. HYPOLITE. 2010. A new case of duplication of the metasoma and telson in the scorpion *Euscorpius flavicaudis* (DeGeer, 1778) (Euscorpiidae). *Euscorpius*, 102: 1–2.

MATTONI, C. I. 2005. Tergal and sexual anomalies in bothriurid scorpions (Scorpiones, Bothriuridae). *The Journal of Arachnology*, 33(2): 622–628.

SALABI, F., H. JAFARI, & A. FOROUZAN. 2021. Report of a Rare Anomaly in the Metasoma of *Hottentotta zagrosensis* (Scorpiones: Buthidae). *Iranian Journal of Science and Technology, Transactions A: Science*, 45(2): 405–408.

ŠARIĆ, M., & J. TOMIĆ. 2016. The first record of malformed pectines in genus *Euscorpius* (Scorpiones: Euscorpiidae). *Euscorpius*, 221: 1–10.

SEITER, M. & R. TERUEL. 2014. Two new cases of metasomal duplication in scorpions, with notes on their reproductive biology (Scorpiones: Buthidae). *Revista Ibérica de Aracnología*, 24: 127–129.

SERGENT, E. 1946. Anomalies chez les scorpions. *Archives de l'Institut Pasteur d'Algérie*, 24(1): 80–82.

SHULOV, A. & P. AMITAI. 1955. A scorpion *Leiurus quinquestriatus* H. et E. with two stings. *Bulletin of the Research Council, Israel*, 5B(2): 193–194.

SISSOM, W. D. 1990. Systematics, biogeography, and paleontology. Pp. 64–160 in: Polis, G.A. (ed.), *Biology of Scorpions*. Stanford, CA: Stanford University Press.

SISSOM, W. D. & R. M. SHELLEY. 1995. Report on a rare developmental anomaly in the scorpion, *Centruroides vittatus* (Buthidae). *The Journal of Arachnology*, 23: 199–201.

SOLEGLAD, M. E. & V. FET. 2003. High-level systematics and phylogeny of the extant scorpions (Scorpiones: Orthosterni). *Euscorpius*, 11: 1–175.

SOLEGLAD, M. E. & V. FET. 2008. Contributions to scorpion systematics. III. Subfamilies Smeringurinae and Syntropinae (Scorpiones: Vaejovidae). *Euscorpius*, 71: 1–115.

ROEWER, C. F. 1943. Über eine neuerworbene Sammlung von Skorpionen des Natur-Museums Senckenberg. *Senckenbergiana*, 26(4): 205–244.

TALAL, S., I. TESLER, J. SIVAN, R. BEN-SHLOMO, H. TAHIR, L. PRENDINI, S. SNIR & E. GEFEN. 2015. Scorpion speciation in the Holy Land: Multilocus phylogeography corroborates diagnostic differences in morphology and burrowing behavior among *Scorpio* subspecies and justifies recognition as phylogenetic, ecological and biological species. *Molecular Phylogenetics and Evolution*, 91: 226–237.

TERUEL, R. 2003. Nuevos casos de anomalías morfológicas en escorpiones (Scorpiones: Bothriuridae, Euscorpiidae, Hemiscorpiidae, Ischnuridae, Iuridae, Buthidae, Chactidae, Chaerilidae, Diplocentridae, Scorpionidae). *Revista Ibérica de Aracnología*, 7: 235–238.

TERUEL, R. & J. G. BALDAZO-MONSIVAIZ. 2015. Hermaphroditism, gynandromorphism, and four pectines: an extreme case of developmental anomaly in scorpions (Scorpiones: Vaejovidae). *Euscorpius*, 197: 1–7.

VACHON, M. 1952. *Etudes sur les Scorpions*. Institut Pasteur d'Algérie, Algér, 482 pp.

VACHON, M. 1953. The biology of scorpions. *Endeavour*, 12: 80–87.

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. 1972. Remarques sur les scorpions appartenant au genre *Isometrus* H. et E. (Buthidae). A propos de l'espèce *Isometrus maculatus* (Geer) habitant l'Ile de Pâques. *Cahiers du Pacifique*, 16: 169–180.

WILLIAMS, S. F. 1971. Developmental anomalies in the scorpion *Centruroides sculpturatus*. *Pan-Pacific Entomologist*, 47 (1): 76–77.