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Source: Arachnologische Mitteilungen: Arachnology Letters, 63(1) : 7-10

Published By: Arachnologische Gesellschaft e.V.

URL: https://doi.org/10.30963/aramit6303

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First record of the medically significant scorpion *Leiurus abdullahbayrami* (Scorpiones: Buthidae) for Lebanon

Adolfo Borges & Ersen Aydın Yağmur

doi: 10.30963/aramit6303

Abstract. The first record of *Leiurus abdullahbayrami* Yağmur, Koç & Kunt, 2009 for Lebanon is presented, collected in the East Bekaa province. This is the second *Leiurus* species reported for this country. The medical importance of *L. abdullahbayrami*, associated with severe and fatal cases among children in Turkey and Syria, makes it highly relevant to determine its current distribution range in the Levant region.

Keywords: Distribution, East Bekaa, Levant region, new locality

Zusammenfassung. Erstnachweis des medizinisch bedeutenden Skorpions *Leiurus abdullahbayrami* (Scorpiones: Buthidae) für Libanon. Der Erstnachweis von *Leiurus abdullahbayrami* Yağmur, Koç & Kunt, 2009 für den Libanon wird aus der Ost Bekaa Provinz präsentiert. Es ist die zweite *Leiurus*-Art in diesem Land. Die medizinische Bedeutung von *L. abdullahbayrami* ist durch schwere und tödliche Fälle bei Kindern in der Türkei und Syrien begründet. Daher ist es von großer Wichtigkeit, die genaue Verbreitung der Art in der Levante zu dokumentieren.

الملخص. للبنان (Scorpiones: Buthidae) *Leiurus abdullahbayrami* طبية أهمية ذو لعقرب الأول السجل
لـ الطبية الأهمية البلد لهذا عنه الإبلاغ تم *Leiurus* نوع ثاني هو هذا .لبنان في 2009 ، وكونت كوتش ، يغمور بيرامي الله عبد ليوروس تسجيل أول الدراسة هذه تقدم تم .الشام منطقة في الفعلي توزيعه نطاق تحديدِ المناسب من تجعل ، وسوريا تركيا في الأطفال بين والقاتلة الشديدة بالحالات المرتبطة ، *L. abdullahbayrami* .بلبنان الشرقي البقاع محافظة من بيرامي الله عبد ليوروس تسجيل

Lebanon is a country located in the Levant region. Up to now, 13 scorpion species have been recorded from Lebanon (Fet 2000, Fet & Lowe 2000, Sissom & Fet 2000): *Aegaeobuthus nigrocinctus* (Ehrenberg, 1828), *Androctonus amoreuxi* (Audouin, 1826), *Androctonus bicolor* Ehrenberg, 1828, *Androctonus crassicauda* (Olivier, 1807), *Buthacus leptochelys* (Ehrenberg, 1829), *Buthus occitanus* (Amoreux, 1789) complex, *Compsobuthus schmiedeknechti* Vachon, 1949, *Hottentotta judaicus* (Simon, 1872), *Leiurus hebraeus* (Birula, 1908), *Orthochirus negebensis* Shulov & Amitai, 1960, *Nebo hierichonticu*s (Simon, 1872), *Scorpio fuscus* (Ehrenberg, 1829) and *Scorpio kruglovi* Birula, 1910. Among these reports, the records for *Buthacus leptochelys* and the *Buthus occitanus* complex need to be revised. Cain et al. (2021) stated that *B. leptochelys* is restricted to Egypt (including south Sinai), and according to Teruel & Turiel (2020) *B. occitanus* occurs only in NE Spain and SW France. More recently, Ythier (2021) doubted the presence of this species in Spain and suggested that it is present only in France.

Leiurus abdullahbayrami (Fig. 1) was described by Yağmur et al. (2009) from south-eastern Turkey, and shortly after it was recorded from Syria (Khalil & Yağmur 2010) too. In addition, the species was redescribed by Lowe et al. (2014). Its venom toxicity (median lethal dose, LD_{50}) in mouse bioassays makes *L. abdullahbayrami* among the most lethal scorpions inhabiting the Middle East (LD_{50} = 0.19 mg/kg) (Ozkan et al. 2011). Its reported medical importance in southern Turkey (Dokur et al. 2017, Aslan et al. 2018, Yöntem et al. 2020) strongly justifies an investigation of its current distribution range in the Levant region, which now includes Lebanon (Fig. 2).

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Academic Editor: Petr Dolejš

submitted 17.12.2021, accepted 21.2.2022, online 31.5.2022

Material and methods

An adult male and adult female were collected from Bekaa Province, Lebanon (Fig. 2). Photographs of *Leiurus abdullahbayrami* were taken with a Canon EOS 7D. Image stacking was carried out using Helicon Focus software. The specimens were preserved in 96% ethanol, and are kept at the Alaşehir Zoological Museum, Celal Bayar University, Alaşehir, Manisa, Turkey (AZMM). Identification of the specimens is based on Yağmur et al. (2009) and Lowe et al. (2014). The pedipalp length/width ratio of *Leiurus hebraeus* was calculated according to measurement tables published by Levy & Amitai (1980). The map was created using the software SimpleMappr (Shorthouse 2010).

Results

Material examined. LEBANON, East Bekaa, Maqneh (34.08722°N, 36.22889°E, 1052 m a.s.l.), 17. Jul. 2021, 1 ♂, leg. M. Tarif, Z. Al Hallak, A. Ayoub, A. Al Hallak, M. Al Hallak, Y. Al Hallak, T. Al Hallak, S. Al Okdi, A. Fares, M. Abu Hamia, coll. AZMM/Sco-2021:16. East Bekaa, Brital (33.94194°N, 36.17000°E, 1216 m a.s.l.), 21. Jul. 2021, 1 ♀, same collectors, coll. AZMM/Sco-2021:17.

Description of the Lebanese specimens. Background colour of prosoma, mesosoma and segment V of metasoma black, appendages yellowish. Centrolateral and posteriomedian carinae fused into a lyre-shaped form. Tergites I and II bear five carinae. Trichobothrium db on fixed finger of pedipalp is located between trichobothria est and esb, whereas it is located between trichobothria et and est in *Leiurus hebraeus*. Fixed finger with eleven oblique granule rows. Movable fingers of pedipalps with four distal and eleven oblique granule rows, whereas twelve oblique granule rows are found in *Leiurus hebraeus*. The ventrolateral carinae of metasomal segment V are armed with large and rounded granules, whereas smaller and rounded lobes are found in *Leiurus hebraeus*. The anal arch comprises three rounded lobes laterally and six small lobes posteriorly. Sternites IV–VI are smooth. The pedipalp length/

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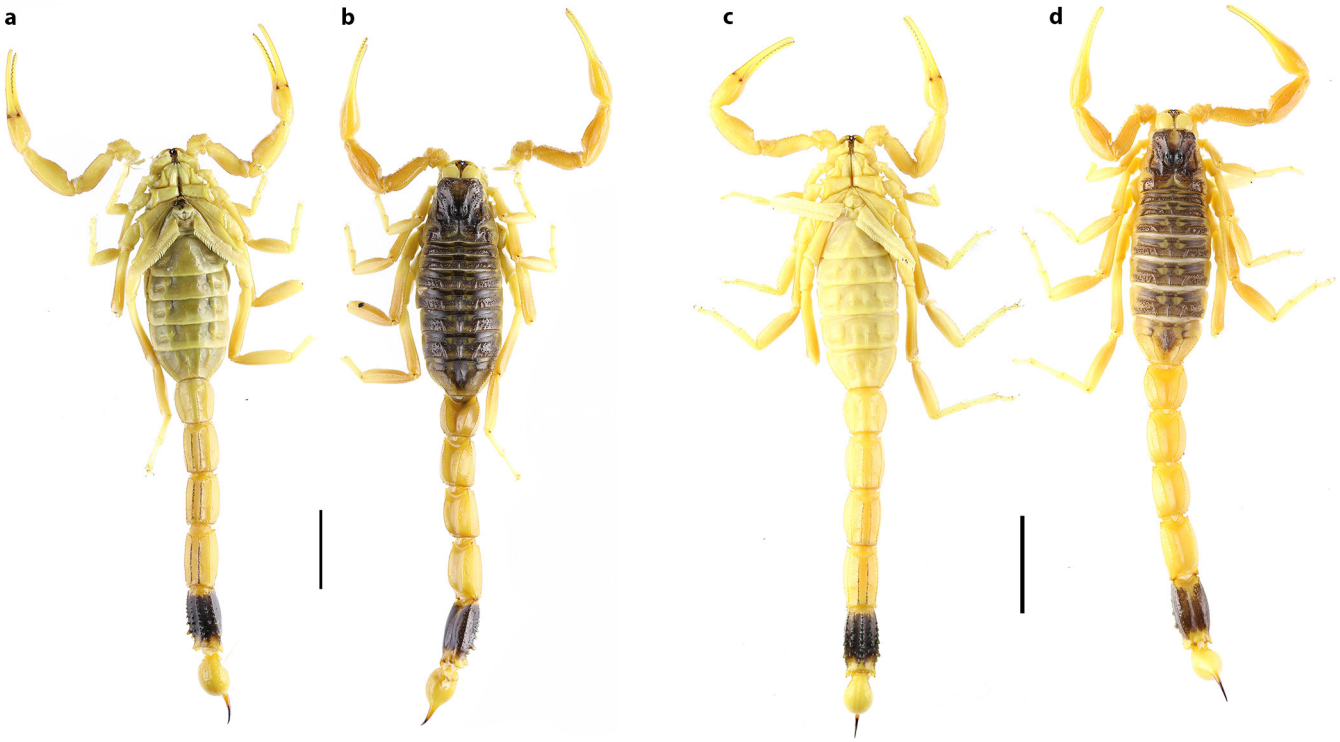


Fig. 1: Specimens of *Leiurus abdullahbayrami* from Lebanon. **a, b.** female; **c, d.** male. a, c – ventral view; b, d – dorsal view (scale: 10 mm)

width ratio is 4.43 in the female specimen and 4.31 in the male specimen, whereas this ratio is 5.42 in males and 5.64 in females of *Leiurus hebraeus*. These ratios are slightly lower than those reported by Yağmur et al. (2009). Leg I–IV with short spines on the ventral side of the tarsus. Basitarsus of legs I–III with bristlecombs, basitarsus of legs IV without bristlecombs. Pectinal tooth number is 30–30 in the female specimen and 36–37 in the male specimen (Fig. 3).

Distribution. Syria (Khalil & Yağmur 2010), Turkey (Yağmur et al. 2009) and Lebanon (present study).

Discussion

Yağmur et al. (2009) reported three colour variations of *Leiurus abdullahbayrami* in Turkey. In addition, Khalil & Yağmur (2010) reported a population of *L. abdullahbayrami* from Homs (Syria), about 70 km from the Lebanese border, in which the specimens have the same colour pattern as in Gaziantep (Turkey), i.e. brown. However, the specimens from Bekaa in Lebanon are black, similar to those from the Hatay (Turkey) (linear distance of about 240 km). Interestingly, the population from Homs comprising brown *L. abdullahbayrami* is located much closer (about 80 km north of collection sites in Bekaa). The third colour variation comprises grey specimens, which are found in the region east of the Euphrates River.

The trichobothrium db on the fixed finger of the pedipalp is located between trichobothria est and esb in the Lebanese specimens, as in the specimens from Turkey. On the other

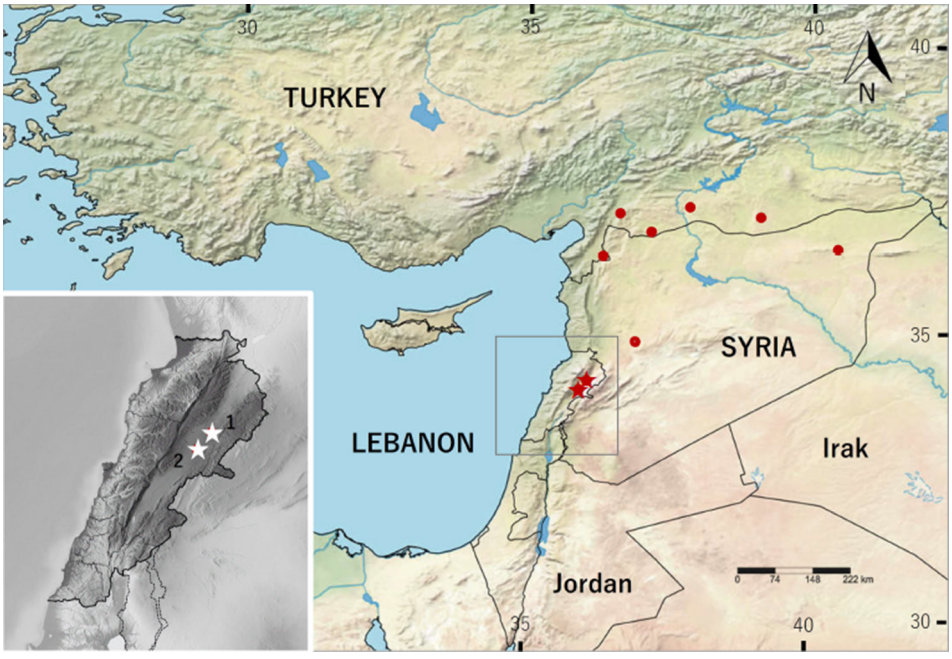


Fig. 2: Map showing collecting localities of *Leiurus abdullahbayrami* in Lebanon (stars in the main map and inset) and the current species´ distribution (red dots), 1 – Maqneh, 2 – Brital

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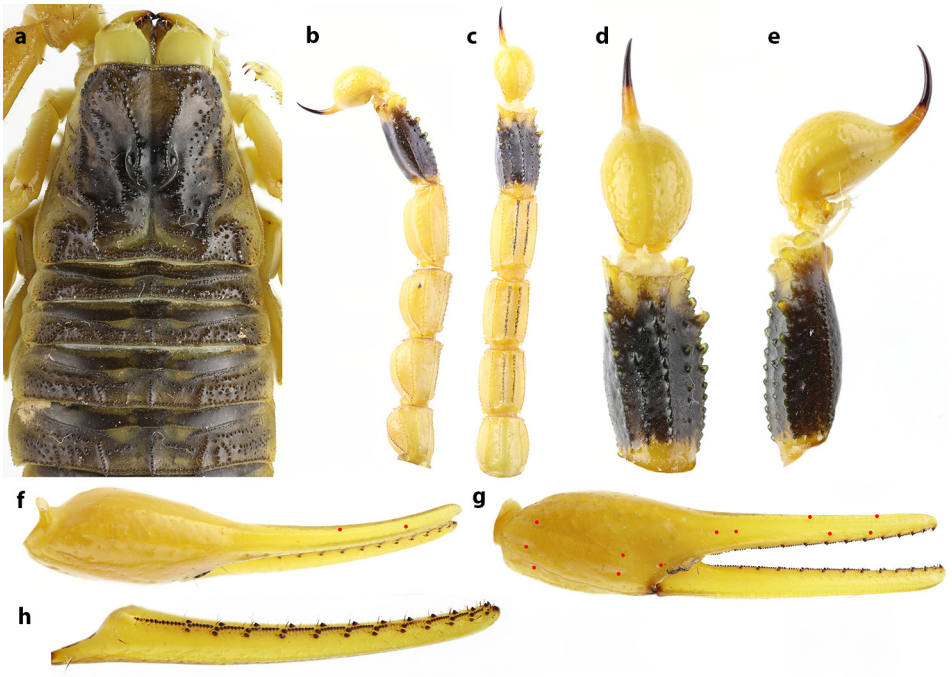


Fig. 3: *Leiurus abdullahbayrami*, female specimen. **a.** carapace and first four tergites; **b.** metasoma, lateral view; **c.** metasoma, ventral view; **d.** fifth segment and telson, ventral view; **e.** fifth segment and telson, lateral view; **f.** chela, dorsal view; **g.** chela, lateral view; **h.** movable finger (trichobothrial pattern is indicated by red circles)

hand, the trichobothrium db is closer to trichobothrium est compared to specimens from the Turkish population.

The species *Aegaeobuthus nigrocinctus* (Ehrenberg, 1828) (Karataş 2007), *Compsobuthus schmiedeknechti* Vachon, 1949 (Varol et al. 2006) and *Scorpio kruglovi* Birula, 1910 (Roewer 1943) are also distributed in the Hatay province (Turkey) and in Lebanon as well. The presence of these species in both Hatay and Lebanon indicates that faunal similarities exist between these regions, which are both in the Levant and share ecologically similar characteristics. The true relationship between the *L. abdullahbayrami* populations should be determined through future phylogenetic studies, a task facilitated by the availability of mitochondrial DNA sequences from the specimens from Turkey (Ayhan et al. 2018).

Vachon (1966), Fet & Lowe (2000) and El-Hennawy (2013) listed *Leiurus hebraeus* as the only species belonging to the genus *Leiurus* that inhabits Lebanon. The present study provides evidence of a second *Leiurus* species in Lebanon, showing that the genus is probably undersampled in the region.

Severe cardiac alterations and acute pulmonary edema in children envenomed by *L. abdullahbayrami* attest to its very high venom toxicity towards humans (Dokur et al. 2017, Aslan et al. 2018, Yöntem et al. 2020), which correlate with the species' venom LD_{50} in mouse bioassays, the lowest among all species of the genus *Leiurus* thus far determined. Therefore, *L. abdullahbayrami* is potentially one of the medically most relevant scorpion species in the Middle East.

Considering that significant venom divergence between *Leiurus quinquestriatus* and *Leiurus hebraeus* has been reported (Nascimento et al. 2006, Smertenko et al. 2001), a fact that may limit the neutralization spectrum of therapeutic antivenoms available in the Middle East (Amr et al. 2021), knowledge of the current distribution of medically important scorpion species is of public health interest in this region. Given that fatal scorpion stings in children – by as yet unidentified specimens – have occurred in areas of Lebanon (Brital, Bekaa), where *L. abdullahbayrami* is present (e.g. https://www.albawaba.com/news/lebanese-kid-dies-after-scorpion-sting-amid-medicine-shortages-1440607), it seems possible that this species has been involved in such cases. Local health administration should therefore take the presence of this highly venomous species in Lebanon into account. As a consequence, further investigations to reveal the current distribution of *L. abdullahbayrami* in Lebanon should be carried out. The appropriate medical infrastructure for the local human communities should be set up, which might prevent further fatalities, especially among children.

Acknowledgements

We acknowledge the Lebanese Ministry of Health for issuing permit Nº 10564 for scorpion collection. This study was supported by the Research and Development Department, Lebanese Venom Company, Qaraoun, Lebanon.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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