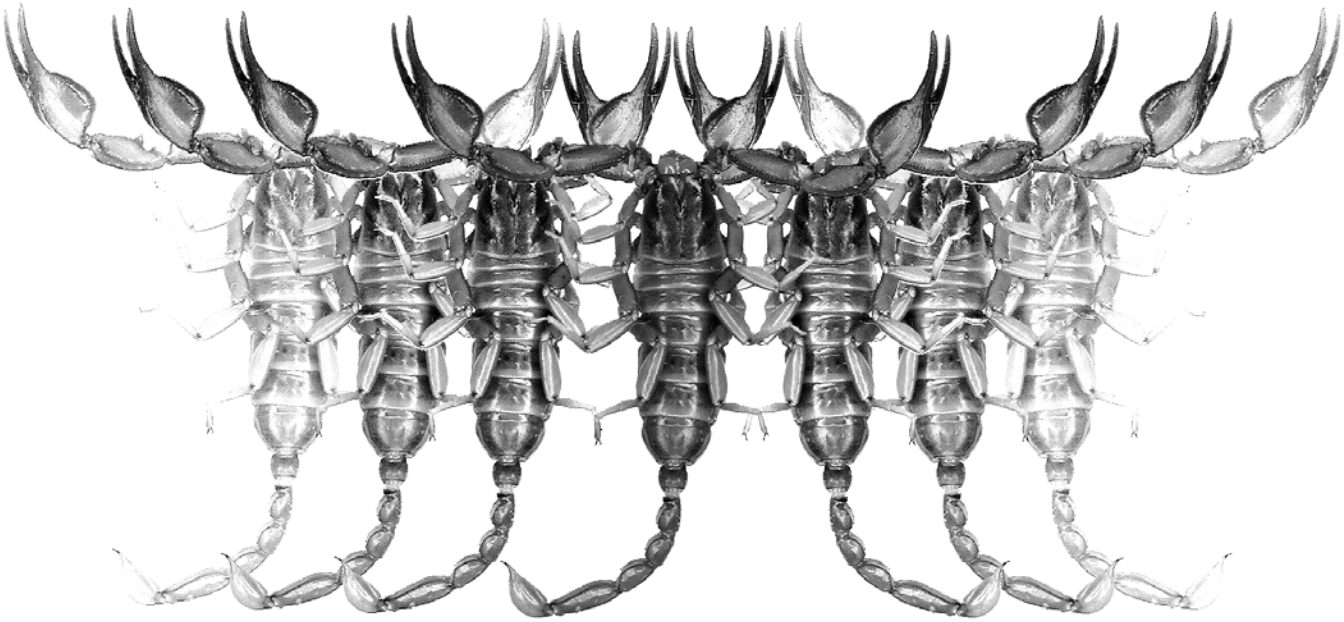
Euscorpius

Occasional Publications in Scorpiology



Description of a New Species of *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) from Southeastern Turkey

Ersen Aydın Yağmur, Halil Koç, and Kadir Boğaç Kunt

October 2009 – No. 85

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'Universita 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

Publication date: 5 October 2009

Euscorpius — Occasional Publications in Scorpiology. 2009, No. 85

Description of a new species of *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) from Southeastern Turkey

Ersen Aydın Yağmur [1], Halil Koç [2] and Kadir Boğaç Kunt [3]

[1] Zoology Section, Biology Department, Science Faculty, Ege University, İzmir, Turkey
E-mail: ersen.yagmur@gmail.com
[2] Biology Department, Science and Art Faculty, Sinop University, Sinop, Turkey
[3] Turkish Arachnological Society, Eserköy Sitesi, 9/A Blok, No 7, Ümitköy, Ankara, Turkey

Summary

Leiurus abdullahbayrami **sp. nov**. is described from Southeastern Turkey and compared with other species of the genus, in particular with *L. quinquestriatus*, which was previously misidentified from Turkey. The new species is readily distinguished from other members of the genus by pedipalp chela and metasomal segments that are distinctly shorter than in *L. quinquestriatus*; metasomal segment V has large and rounded lobes; trichobothrium *db* on the fixed finger of pedipalp is located between trichobothria *est* and *esb* (in *L. quinquestriatus* it is located between *et* and *est*). All known Turkish populations of *Leiurus* were examined and found to represent the new species.

Introduction

The genus *Leiurus* was originally designated by Ehrenberg in 1828 as a subgenus of *Androctonus*, with one species, *Androctonus* (*Leiurus*) *quinquestriatus* Ehrenberg in Hemprich & Ehrenberg, 1828. Vachon (1949) elevated *Leiurus* to generic rank, containing still the only species, *Leiurus quinquestriatus.* Vachon (1949) refrained from revising its intraspecific structure, but accepted two subspecies as valid: *Leiurus quinquestriatus quinquestriatus* (Ehrenberg, 1828) and *L. q. hebraeus* (Birula, 1908). Subsequently, the systematic position of *L. q. hebraeus* was reviewed by Levy et al. (1970) who differentiated this subspecies from *L. q. quinquestriatus*. Two subspecies were discussed again by Levy & Amitai (1980) who accepted these subspecies as valid. Sissom (1994) examined a sizeable collection of *Leiurus quinquestriatus* from Yemen without discussing any subspecific level. Hendrixson (2006) studied a large number of specimens of *L. quinquestriatus* from Saudi Arabia and expressed doubts as to the validity of subspecific taxa of this species.

Recently, the genus *Leiurus*, considered monotypic for many years, has had three species added to it: *Leiurus jordanensis* from Jordan, *L. savanicola* from Cameroon, and *L. nasheri* from Yemen were described by Lourenço et al. (2002, 2006) and Kovařík (2007), respectively.

The genus *Leiurus* is widely distributed in Africa and Middle East. Tulga (1960) was the first to record *Leiurus* from Turkey, as *L. quinquestriatus* from Adıyaman Province. This article addressed the venom composition, and provided poor systematic data. The species was identified by Prof. A. Shulov, but diagnostic characters were not mentioned in the text, which also had no further details or comments on the specimens examined or on the subspecies involved. All subsequent authors accepted *Leiurus* from Turkey as *L. quinquestriatus* (Kinzelbach, 1984; Crucitti & Vignoli, 2002; Yağmur et al., 2007). Levy & Amitai (1980), however, stated that the probable northernmost distributional range limit of *L. quinquestriatus* was Homs-Palmira (Syria). On the other hand, nobody made any detailed examination of Turkish *Leiurus* specimens, or discussed their subspecific status. Diagnostic characters applied to identify the material from Turkey were applied broadly at the genus and species level (Tulga, 1960; Kinzelbach, 1984; Crucitti & Vignoli, 2002).

We have collected *Leiurus* specimens throughout its distribution range in Turkey (see Map in Fig. 1), and carried out a detailed investigation, which revealed the existence of a new *Leiurus* species, described here. Although the new taxon has minor variation between regions, we consider it a single, new species.

Methods

Field studies were performed during the period between 30.05.2003 and 25.04.2009 in Southeastern Anatolia and Eastern Mediterranean Region (see Yağmur et al., 2008); 145 specimens have been collected. The specimens were collected under stones in daytime and at night with the UV lamp, F8T5/BLB, and fixed in 70 % ethanol. The specimens was examined

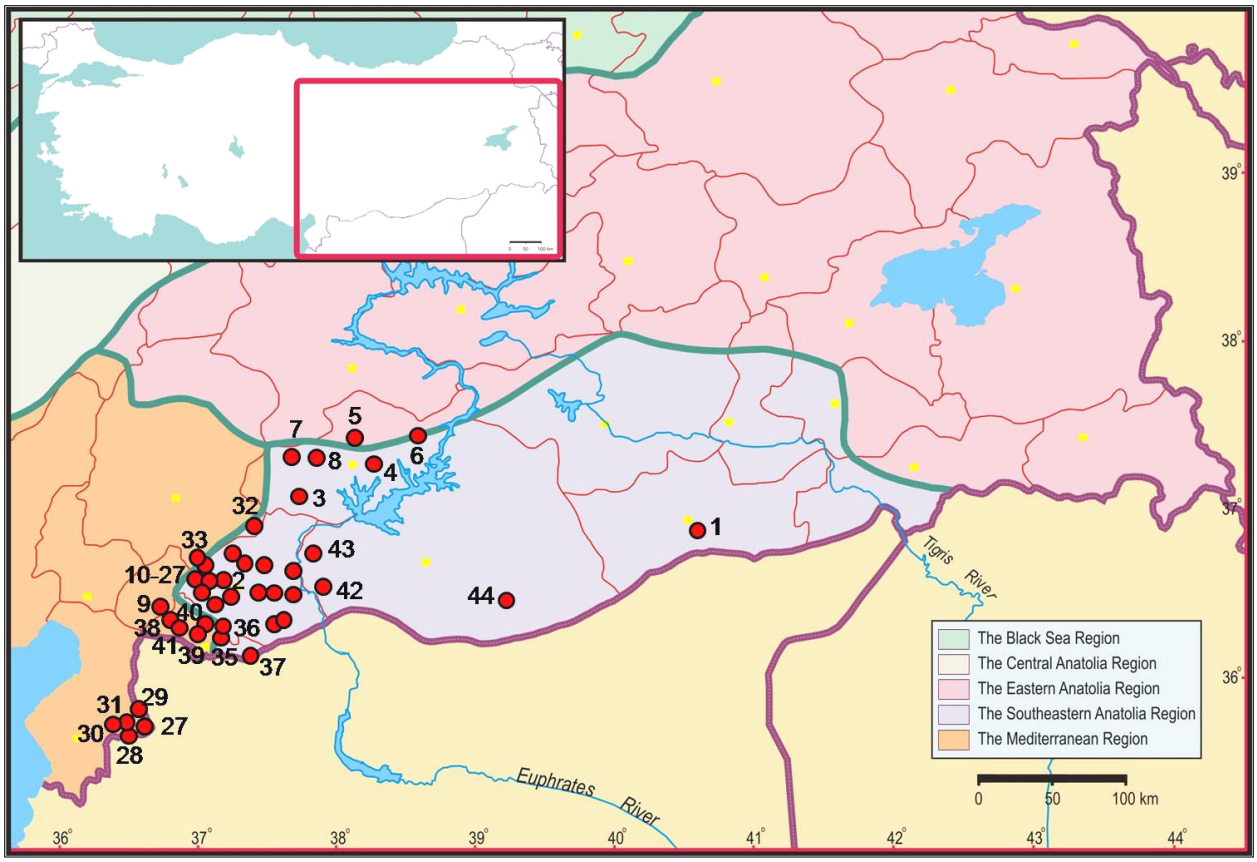


Figure 1: Sampling localities of *Leiurus abdullahbayrami* **sp. nov.** in Eastern Mediterranean Region and Southeastern Anatolia Region, Turkey.

under Stereomicroscope Prior S2026. Photographs were taken using Olympus C7070 photo camera mounted to an Olympus SZX7 binocular microscope. Measurements (in mm) were taken with a 0.01 mm accurate Stainless Electronic Digital caliper using the methods described by Stahnke (1970). Carinal, appendage and tricho-bothrial terminology are according to Francke (1977), Hjelle (1990) and Vachon (1974), respectively.

Abbreviations

FKCP, private collection of František Kovařík, Praha, Czech Republic
MTAS, Museum of Turkish Arachnology Society, Ankara, Turkey
OUMNH, Hope Museum, Oxford, United Kingdom
ZDEU, Zoology Collection of Ege University Museum

Systematics

Leiurus abdullahbayrami Yağmur, Koç et Kunt, sp. nov. Figures 1–22; Tables 1–2

Records cited in the literature as ***Leiurus quinquestriatus*:** TURKEY: *Adıyaman Province* (Tulga, 1960): National Park of Nemrut Mountain (Crucitti & Cicuzza, 2000). *Hatay Province* (Kinzelbach, 1984). *Kilis Province* (Kinzelbach, 1984), Elbeyli District (1,5 km S); Musabeyli District, Aşağı Kalecik Village; Musabeyli District, 1 km W of Hasancalı Village; Musabeyli District, Hasancalı-Yedigöz Villages fork in road; Central District, 1 km E of Küplüce Village; Musabeyli District, 1 km E of Yuvabaşı Village (Yağmur et al., 2007). *Mardin Province*: Deyrzafran Monastery (Crucitti & Vignoli, 2002) (see Map at Fig. 1, No. 1). *Gaziantep Province*: Nizip District, 1 km S of Tanır Village; Nizip District, 2 km NE of Kıratlı Village; Şahinbey District, 1 km south of Kızılhisar Village; Nizip District, 1 km S of Türkyurdu Village; Oğuzeli District, 2 km E of Keçikuyusu Village; Oğuzeli District, 1 km S of Kayacık Village fork in road; Şahinbey District, Sarısalkım Village; Şahinbey District, 2 km N of Sarıkaya Village; Şehitkamil District, 25th km from Gaziantep to Nizip; Şehitkamil District, Sinan Village, fork in road, 22th km from Gaziantep to Nizip; Şehitkamil District, Köksalan Village; İslahiye District, 1 km E of Yesemek Village (Yağmur, 2005).

Comparative Material: *Leiurus quinquestriatus*, 1 ♂, 2 ♀♀, EGYPT (without exact locality data); 1 ♀, 1

juv., ISRAEL, southern part of Negev Desert, Vadi Hazaz near Sede Boqer (Haluqim Ridge), November 2004, J. Král leg.; 1 ♂, SYRIA, Bosra, May 1994, D. Modrý leg.

Type Material: **Holotype:** male, TURKEY, *Gaziantep Province*: Şahinbey District, a hill 1 km E of Sarısalkım Village, 14 August 2004, 37°05′46.5″N, 37°16′51.3″E, 1029 m asl., E. A. Yağmur leg., steppe area, under rock. Deposited in the Museum of Turkish Arachnology Society, Ankara, MTAS/But:0908-01. (see Map at Fig. 1, No. 2)

Paratypes (58 females, 36 males, and 50 juveniles): *Adıyaman Province*: 1 juv., Besni District, 1 km S of Çakırhöyük Village fork in road, 07 July 2006, 37°33′09″N, 37°45′12″ E, 724 asl, E. A. Yağmur & S. Anlaş leg., MTAS/But:0908-02 (3); 2 ♀♀, 2 ♂♂, 3 juv., Central District, 1 km W of Aydınoluk Village fork in road, 11 August 2006, 37°46′08″E, 38°20′54″N, E. A. Yağmur & A. Avcı leg., MTAS/But:0908-07 (4); 3 ♀♀, 1 ♂, 5 juv., Central District, Gökçay Village, Konakdere Hamlet, 29 July 2007, 37°57′24.9″N, 38°17′55.3″E, 1155 asl, E. A. Yağmur & A. Avcı leg., MTAS/But:0908-22 (5); 1 juv., Kahta District, National Park of Nemrut Mountain, 1 km N of the gate, 09 June 2007, 37°56′49″N, 38°44′47″E, 1535 m asl, E. A. Yağmur, G. Çalışır leg., MTAS/But:0908-13 (6); 1 ♀, Tut District, 2 km SW of Meryemuşağı Village fork in road, Hacıvakı Suyu area, 03 June 2007, 37°48′31″N, 37°51′49″E, 1143 asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-23 (7); 4 ♂♂, Tut District, 4 km E of Kaşlıca Village, 08 June 2007, 37°48′34″N, 37°59′21″E, 1183 m asl, E. A. Yağmur & G. Çalışır leg., MTAS/But:0908-12 (8). *Gaziantep Province*: 2 ♂♂, İslahiye District, a hill E of Yesmek Village, 14 May 2005, 36°54′00″N, 36° 44′43″E, 487 m asl, E. A. Yağmur & M. Pehlivanoğlu leg., MTAS/But:0908-68 (9); 1 ♂, Nizip District, 1 km S of Tanır Village, 30 May 2003, 37°06′34″N, 37°49′57″E, 529 m asl, E. A. Yağmur & S. Kesmezoğlu leg., MTAS/But:0908-45 (10); 1 ♀, Nizip District, 10 km W of Türkyurdu Village, 15 September 2007, 37°02′44″N, 37°34′23″E, 804 m asl, E. A. Yağmur, E. Ulupınar leg., FKCP (09F61-2) (11); 1 juv., Nizip District, Türkyurdu Village, 20 January 2008, 37° 00′33″N, 37°37′42″E, 703 asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-36 (12); 1 juv., Oğuzeli District, Çaybeyi Village, 23 May 2008, 36°47′48″N, 37°35′15″E, M. Z. Yıldız leg., MTAS/But:0908-37 (13); 1 ♀, 1 ♂, 1 juv., Oğuzeli District, 1 km NE of Çaybaşı Village, 25 June 2006, 36°47′47″N, 37°35′15″E, 546 m asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-44 (14); 1 ♀, Oğuzeli District, 1 km S of Kayacık Village fork in road, 11 September 2004, 36°50′41″N, 37°34′29″E, 619 m asl, E. A. Yağmur & M. Yalçın leg., MTAS/But:0908-47 (15); 1 ♂, Şahinbey District, 1 km W of Güllüce Village, Lower slop of Ellezi Hill, 29 July 2006, 36°56′38″N, 37°05′12″E, 822 m asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-40 (16); 1 ♂, Şahinbey District, 2 km SW of Gerciğin Village, 21 May 2006, 37°02′11″N, 37°15′00″E, 1034 m asl, E.A. Yağmur leg., MTAS/But:0908-41 (17); 1 ♂, Şahinbey District, 2 km N of Sarıkaya Village, 07 May 2005, 37°07′06″N, 37°03′07″E, 1178 m asl, E. A. Yağmur, M. Yalçın & F. Değirmenci leg., MTAS/But:0908-46 (18); 1 ♀, 2 ♂♂, Şahinbey District, Sarısalkım Village, Şirvan Hill, 06 September 2003, 37°05′27″N, 37°15′52″E, 1076 m asl, E. A. Yağmur leg., MTAS/But:0908-50 (19); 1 ♀, Şahinbey District, a hill E of Sarısalkım Village, 30 July 2003, 37°05′47″N, 37°16′51″E, 1024 m asl, E. A. Yağmur leg., MTAS/But:0908-51 (19); 1 ♀, 1 ♂, Şahinbey District, a hill E of Sarısalkım Village, 12 April 2004, 37°05′47″N, 37°16′51″E, 1024 m asl, E. A. Yağmur leg., MTAS/But:0908-53 (19); 1 ♀, Şahinbey District, a hill E of Sarısalkım Village, 06 September 2004, 37°05′47″N, 37°16′51″E, 1024 m asl, E. A. Yağmur leg., MTAS/But:0908-54 (19); 1 ♀, 4 ♂♂, Şahinbey District, a hill E of Sarısalkım Village, 14 August 2004, 37°05′47″N, 37°16′51″E, 1024 m asl, E. A. Yağmur leg., MTAS/But:0908-59 (19); 1 ♂, Şahinbey District, 2 km S of Sarısalkım Village, brick factory, 10 July 2003, 37°04′57″N, 37°17′11″E, 943 m asl, E. A. Yağmur leg., MTAS/But:0908-60 (19); 1 ♀, 1 ♂, Şahinbey District, Sarısalkım Village, 0,5 km N of school, 12 April 2004, 37°06′16″N, 37°16′48″E, 1034 m asl, E. A. Yağmur leg., MTAS/But:0908-62 (19); 1 ♀, 1 ♂, Şahinbey District, 1 km S of Kızılhisar Village, 14 September 2004, 36°59′52″N, 37°18′17″E, 900 m asl, E. A. Yağmur & C. Toprak leg., MTAS/But:0908-65 (20); 1 ♂, Şehitkamil District, 1 km S of Eski Şarkaya Village, 23 June 2007, 37°12′44.4″N, 37°07′45.5″E, 1000 m asl, E.A. Yağmur & M. Yalçın leg., FKCP (09F96-97); 2 ♂♂, 2 juv., Şehitkamil District, 1 km S of Eski Şarkaya Village, 23 June 2007, 37°12′44.4″N, 37°07′45.5″E, 1000 m asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-27 (21); 1 ♀, 1 ♂, 4 juv., Şehitkamil District, 2 km E of Yamaçoba Village, 01 July 2007, 37°10′27.3″N, 37°05′33.1″E, 1099 m asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-33 (22); 1 ♀, Şehitkamil District, İncesu Village, 04 May 2008, 37°13′16″N, 37°18′05″E, 942 m asl, E. A. Yağmur & E. Tezcan leg., MTAS/But:0908-34 (23); 1 juv., Şehitkamil District, Tuğlu Village, 11 May 2007, 37°10′56″N, 37°31′51″E, 777 m asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-35 (24); 1 ♀, 1 juv., Şehitkamil District, 1,5 km NW of Suboğazı Village, 11 May 2007, 37°09′35″N, 37°28′51″E, 814 m asl, H. Koç leg., MTAS/But:0908-39 (25); 1 ♀, Şehitkamil District, Sinan Village fork in road, 22th km from Gaziantep to Nizip, 14 September 2004, 37°02′31″N, 37°35′48″E, 746 m asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-63 (26); 1 ♀, Şehitkamil District, Köksalan Village, 09 April 2005, 37°15′44″N, 37°

Figures 2–3: *Leiurus abdullahbayrami* **sp. nov. 2 (top).** In a natural habitat (Yukarı Habip Village, Birecik District, Şanlıurfa Province). **3 (bottom).** In captivity (a specimen from Gaziantep Province).

14′32″E, 956 m asl, E. A. Yağmur, M. Yalçın & F. Değirmenci leg., MTAS/But:0908-66 (27). *Hatay Province*: 2 juv., Reyhanlı District, Oğulpınar Village, 28 May 2007, 36°15′13″N, 36°40′12″E, 316 m asl, H. Koç, A. V. Gromov leg., MTAS/But:0908-70 (27); 2 ♀♀, 1 ♂, 3 juv., Reyhanlı District, Kavalcık Village. 26 May 2007, 36°14′45.6″N, 39°37′16.1″E, H. Koç, A. V. Gromov leg., MTAS/But:0908-76 (28); 3 ♀♀, Reyhanlı District, Kavalcık Village. 27 May 2007, 36°14′45.6″N, 39°37′16.1″E, H. Koç, A. V. Gromov leg., MTAS/But:0908-79 (28); 2 ♀♀, 4 juv., Reyhanlı District, Bükülmez Village, 27 May 2007, 36°18′15″N, 36° 38′12″E, 157 m asl, H. Koç leg., MTAS/But:0908-85 (29); 4 ♀♀, 1 ♂, 2 juv., Reyhanlı District, 1 km W of Çakıryiğit Village, 14 April 2007, 36°15′42″N, 36°36′22″E, 225 m asl, E. A. Yağmur, M. Yalçın, G. Çalışır leg., MTAS/But:0908-92 (30); 3 juv., Reyhanlı District, 1 km E of Fevzi Paşa Village, 14 April 2007, 36°15′52″N, 36°38′27″E, 256 m asl, E. A. Yağmur, M. Yalçın, G. Çalışır leg., MTAS/But:0908-95 (31). *Kahramanmaraş Province*: 1 ♀, Pazarcık District, 0.5 km N of Hörük Village fork in road, 24 June 2007, 37°30′10″N, 37°33′46″E, 795 m asl, E. A. Yağmur & M. Yalçın leg., MTAS/But:0908-96 (32); 2 juv., Türkoğlu District, Evri Village, 23 June 2007, 37°16′13″N, 37°08′33″E, 720 m asl, E.A. Yağmur & M. Yalçın leg., MTAS/But:0908-98 (33). *Kilis Province*: 1 ♀, 1 ♂, Central District, 2 km E of Küplüce Village, 23 April 2007, 36°44′92″N, 37°15′19″E, 624 m asl, E. A. Yağmur & M. Z. Yıldız leg., Zoology Collection of Ege University Museum, İzmir, Turkey (ZDEU); 1 ♀, 1 juv., Central District, 2 km E of Küplüce Village, 23 April 2007, 36°44′92″N, 37°15′19″E, 624 m asl, E. A. Yağmur & M. Z. Yıldız leg., OUMNH-2009-022, OUMNH-2009-023; 1 ♀, 2 juv., Central District, 2 km E of Küplüce Village, 23 April 2007, 36°44′92″N, 37°15′19″E, 624 m asl, E. A. Yağmur & M. Z. Yıldız leg., FKCP (09F61a); 4 ♀♀, 1 ♂, 6 juv., Central District, 2 km E of Küplüce Village, 23 April 2007, 36°44′92″N, 37°15′19″E, 624 m asl, E. A. Yağmur & M. Z. Yıldız leg., MTAS/But:0908-110 (35); 4 ♀♀, 1 juv., Central District, 1 km E of Küplüce Village, 29 April 2006, 36°44′92″N, 37°15′19″E, 624 m asl, E. A. Yağmur & M. Yalçın leg., MTAS/But:0908-115 (35); 1 ♀, Central District, Çörten Village, 27 June 2007, 36°46′35″N, 37°18′00″E, M. Z. Yıldız leg., MTAS/But:0908-123 (36); 1 ♀, 1,5 km S of Elbeyli District, Çamurluhöyük mound (tumulus), 30 April 2006, 36°39′36″N, 37°28′31″E, 525 m asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-125 (37); 1 ♀, Musabeyli District, 3 km SW of Hasancalı Village, 27 April 2006, 36°52′47.2″N, 36°47′42.4″E, 755 m asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-116 (38); 1 ♀, 2 ♂♂, 2 juv., Musabeyli District, 3 km SW of Hasancalı Village, 26 May 2007, 36°52′47″N, 36°47′42″E, 755 asl, H. Koç & A. V. Gromov leg., MTAS/But:0908-121 (38); 2 ♀♀, 1 ♂, Musabeyli District, 3 km SW of Hasancalı Village, 30 May 2007, 36°52′47″N, 36°47′42″E, 755 asl, H. Koç & A. V. Gromov leg., MTAS/But:0908-122 (38); 1 ♀, Polateli District, 2 km N of Polateli fork in road, 01 March 2008, 36°46′06,0″N, 37°04′17,1″E, E. A. Yağmur & E. Ulupınar leg., MTAS/But:0908-99 (39); 1 ♀, Polateli District, Aşağı Kalecik Village, 22 April 2006, E. A. Yağmur, M. Yalçın & M. Özkörük leg., MTAS/But:0908-124 (40); 1 ♀, Musabeyli District, Hasancalı Village-Yedigöz Village fork in road, 27 April 2006, 36°51′22″N, 37°49′46″E, 663 m asl, E. A. Yağmur & M. Özkörük leg., MTAS/But:0908-126 (41). *Şanlıurfa Province*: 1 ♀, 1 ♂, Birecik District, 2 km N of Yukarı Habib Village, 24 April 2009, 37°08′49″N, 37°59′56″E, 670 m asl, E. A. Yağmur & V. Ülgezer leg., MTAS/But:0908-128 (42); 1 juv., Halfeti District, 2 km S of Yeşilözen Village, 24 April 2009, 37°11′28.9″N, 37°58′08.8″E, E. A. Yağmur & V. Ülgezer leg., MTAS/But:0908-133 (43); 3 ♀♀, Harran District, 2 km NE of Şuayipşehir Village, 06 May 2006, 36°52′36.9″N, 39°22′18.9″E, 506 m asl, E. A. Yağmur & M. Z. Yıldız leg., MTAS/But:0908-131 (44); 1 ♀, Harran District, 2 km N of Şuayipşehir Village, 25 April 2009, 36°52′36.9″N, 39°22′18.9″E, 506 m asl, E. A. Yağmur & V. Ülgezer leg., MTAS/But:0908-132 (44).

Derivatio nominis: The new species is named after Prof. Dr. Abdullah Bayram (University of Kırıkkale, Turkey), a specialist on Araneae, who has conducted important arachnological research in Turkey.

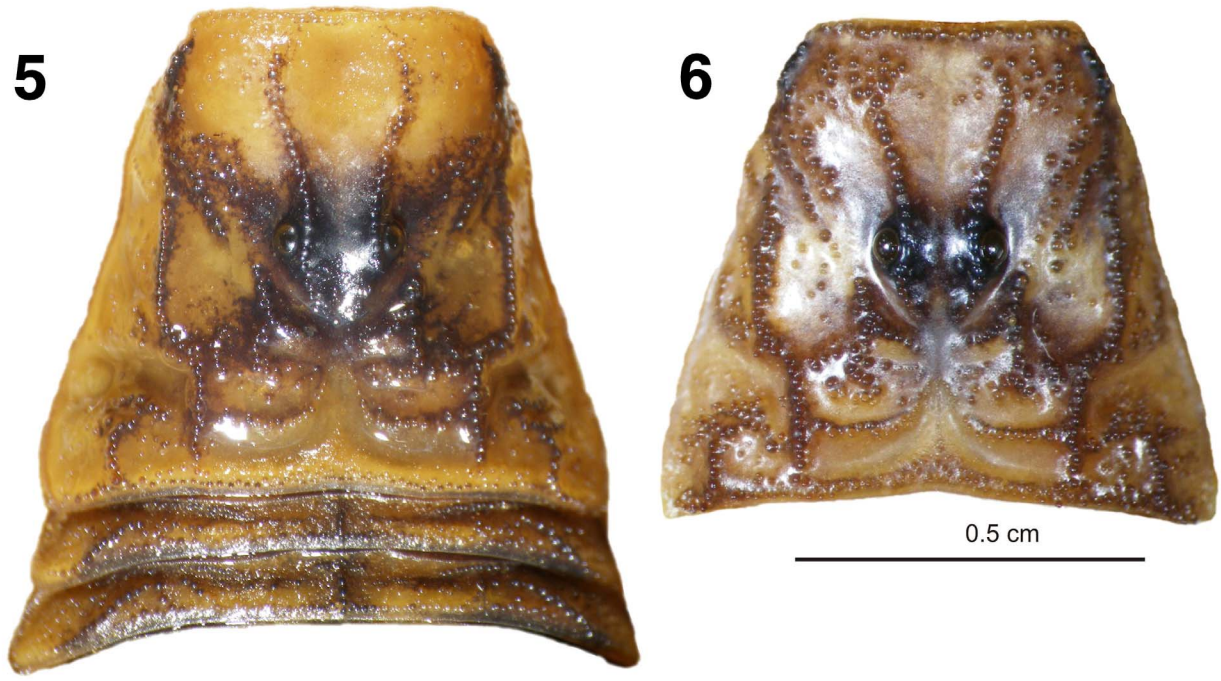
Diagnosis: *Leiurus abdullahbayrami* **sp. nov**. (Figs. 2, 3 and 4) belongs to the genus *Leiurus* Ehrenberg: its tergites I and II bear five carinae and centrolateral and fused posteriomedian carinae form a lyre-shaped figure (Figs. 5–6). Because this species was previously incorrectly identifed as *Leiurus quinquestriatus* (Ehrenberg, 1828), it is compared with other species of *Leiurus* and particularly with *L. quinquestriatus*. It can be distinguished from *L. quinquestriatus* by the following characters:

(a) background color of prosoma, mesosoma and segment V of metasoma of the new species are black, appendages are yellowish; note that *Leiurus jordanensis* also has a generally blackish coloration except for its vesicle;

(b) fixed finger and movable fingers of pedipalps have 11–12 (generally 11, rarely 12) oblique denticle rows (Fig. 16), whereas *L. quinquestriatus* has 12–13 (generally 12, rarely 13) rows. Movable fingers of pedipalps have 13 rows in *L. savanicola*, 12 rows in *L. jordanensis* and 11–12 rows in *L. nasheri*.

(c) ventrolateral carinae of metasomal segment V are armed with large and rounded granules (Figs. 7 and 14), whereas the same carinae in *L. quinquestriatus* bear smaller and rounded lobes. The size of ventrolateral

Figure 4: *Leiurus abdullahbayrami* **sp. nov.** male holotype (left) and a female paratype (Gökçay Village, Adıyaman Province) (right).



Figures 5–6: *Leiurus abdullahbayrami* **sp. nov.** carapace. **5.** Female paratype (Gökçay Village, Adıyaman Province). **6.** Male paratype (2 km E of Yamaçoba Village, Şehitkamil District, Gaziantep Province).

carinal denticles of metasoma V is variable in *L. quinquestriatus.* We have examined a large number of specimens but the new species does not exhibit considerable variation in ventrolateral carinae of the fifth segment. Hendrixson (2006) illustrated variation in lobe size in ventrolateral carinae of metasomal segment V. All our specimens bear large and round lobes in ventrolateral carinae of metasomal segment V compared with all populations illustrated in Hendrixson (2006) (Fig. 7). The ventrolateral carinae of the metasomal segment V in *Leiurus jordanensis* Lourenço et al., 2002 are composed of spinoid lobes.

(d) the anal arch on the metasomal segment V in the new species comprises 2–3 rounded lobes laterally and 5–6 small lobes posteriorly (Figs. 7, 8, 9, and 15), whereas the anal arch of *L. quinquestriatus* is composed of 3 partly spinoid lobes laterally and 9–10 smaller lobes posteriorly. *Leiurus* can dig in hard soils using their legs and metasoma V, and circum-anal dentition and ventrolateral dentition can be worn out or rounded. For this reason, we have examined also juvenile specimens. We still observed large and rounded lobes on ventrolateral carinae of metasoma V and rounded lobes on lateral sides of anal arch. Therefore, these structures were treated as characteristic features for *Leiurus abdullahbayrami* sp. nov.

(e) in the new species, trichobothrium *db* on the fixed finger of the pedipalp is located between trichobothria *est* and *esb* (Fig. 17). This trichobothria pattern resembles *Leiurus nasheri* Kovařík, 2007; however, trichobothrium *db* on the fixed finger of the pedipalp is located between trichobothria *et* and *est* in *L. quinquestiatus*, *L. jordanensis* and *L. savanicola.*

(f) the pedipalp of *L. quinquestriatus* is more slender than in *Leiurus abdullahbayrami* sp. nov. In particular, movable finger of *Leiurus abdullahbayrami* sp. nov. is shorter than in *L. quinquestriatus* (Fig. 11). The pedipalp average length/width ratio is 4.72 in the males and 4.64 in the females of *Leiurus abdullahbayrami* sp. nov. When this ratio is calculated for *L. quinquestriatus* from published tables according to Levy & Amitai (1980), it is 5.42 in males, 5.64 in females; according to Lourenço et al. (2002), it is 6.11 in females; according to Lourenço et al. (2006), it is 7.76 in males. Among the specimens investigated, the ratio in *L. q. quinquestriatus* for male was 7.08, and for a female, 6.26; in *L. q. hebraeus*, 5.00 for a male, 5.74 for a female. Additionally, according to tables in Lourenço et al. (2002), in females of *L. jordanensis* the ratio is 8.47; in males of *L. savanicola* it is 6.95 (Lourenço et al., 2006); in females of *L. nasheri*, it is 4.82 (Kovařík, 2007). According to the literature, the length/width ratio of the pedipalp of *Leiurus abdullahbayrami* sp. nov. is significantly different from *L. quinquestriatus*, *L. jordanensis* and *L. savanicola*; on the other hand, it is close to *L. nasheri*.

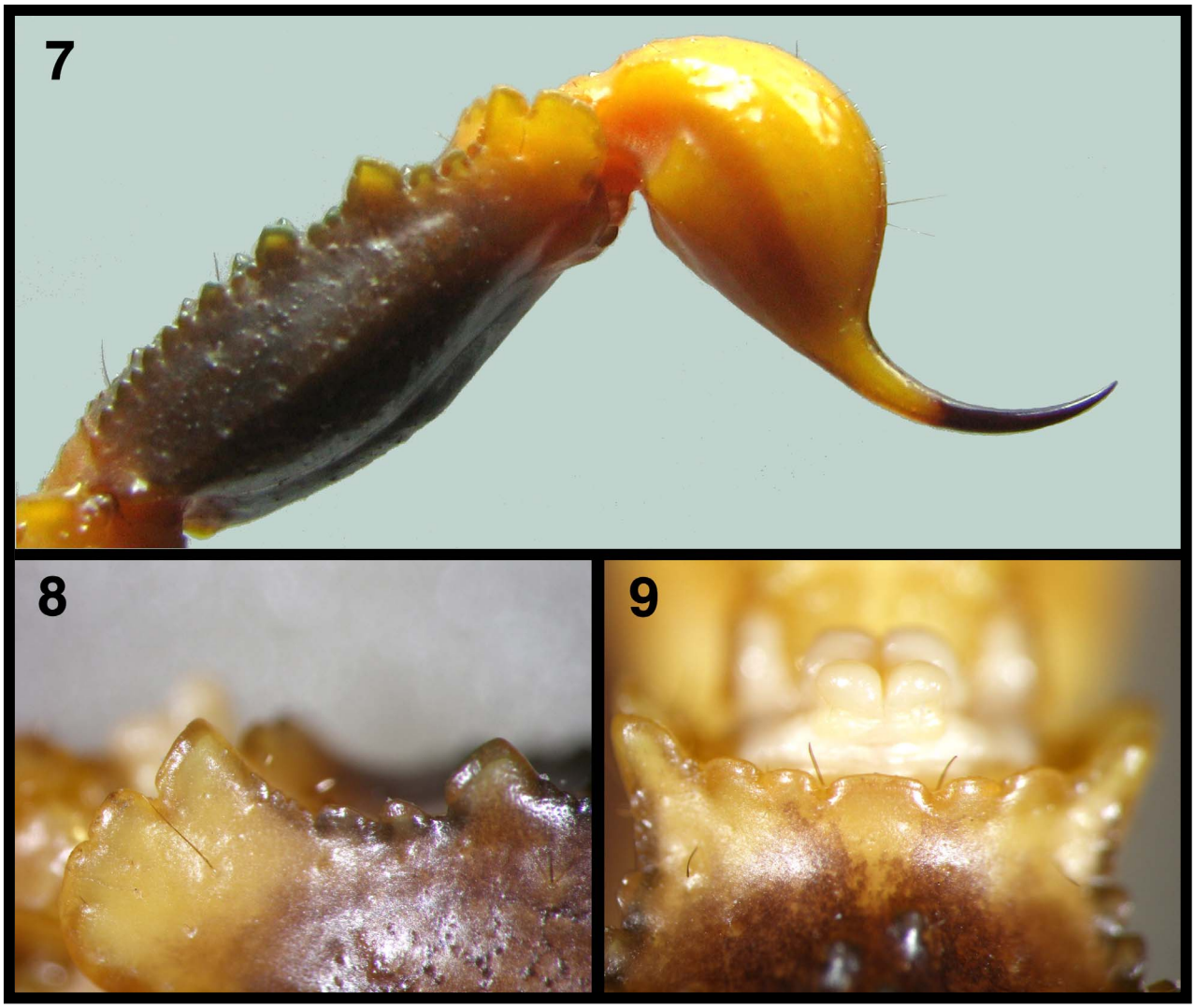


Figure 7–9: *Leiurus abdullahbayrami* **sp. nov. 7.** Ventrolateral carinae of metasomal segment V. **8.** Anal arch, laterally. **9.** Anal arch, ventrally.

(g) sternites IV–VI of *Leiurus abdullahbayrami* sp. nov. are smooth, but they are granulated in *L. quinquestriatus*.

(h) the sting of *L. quinquestiatus* is slightly more curved than sting of *Leiurus abdullahbayrami* sp. nov. (Fig. 10)

The new species has pairs of short spines on the ventral side of tarsus of the legs I–IV (Figs. 20 and 21), similarly to *L. quinquestriatus, L. jordanensis* and *L. savanicola*. However, *L. nasheri* bears long paired ventral setae on the first and second tarsus, quite different from other *Leiurus* species.

Description of male holotype (for morphometric measurements see Table 1.)

Coloration: Body black or blackish brown, appendages light yellow (Figs. 3 and 4). Prosoma: carapace blackish-brown with semicircular yellow zone anteriorly (Figs. 3 and 4), or this area yellowish black (Fig. 6) and a pair of yellowish black spots laterally and posteriorly (Figs. 3, 4, and 5). Lateral eyes surrounded by black pigmentation. Anterior median carinae completely black. Mesosoma: black or blackish-brown. Metasoma: segments I to IV yellowish; ventral submedian carinae distinctly black on segment IV, slightly black on segments II and III; segment V is black, sometimes lighter in adults, always of darker coloration in subadults. Vesicle pale yellow; aculeus yellowish at base and reddish-brown at its extremity. Chelicerae yellowish with little dark reticulated spots; denticles reddish-brown. Pedipalps: dark brown overall; rows of denticles on dentate margins of fingers reddish-brown. Leg femur and patella dark yellow; other segments light yellow.

Leiurus abdullahbayrami **sp. nov.**			
		Male holotype	**Female paratype from Gökçay Village, Adıyaman**
Total	**length**	58.55	67.68
Carapace	**length**	7.04	8.11
	width	6.28	9.39
Mesosoma	**length**	13.82	14.54
Metasoma	**length**	37.87	44.42
Segment I	**length**	4.76	5.51
	width	4.46	4.96
Segment II	**length**	5.86	6.47
	width	4.08	4.51
Segment III	**length**	5.89	6.71
	width	3.91	4.34
Segment IV	**length**	6.73	7.78
	width	3.37	4.05
Segment V	**length**	8.08	9.49
	width	3.16	3.97
Telson	**length**	7.31	9.62
	width	2.82	3.87
	depth	2.66	3.25
Vesicle	**length**	4.65	5.73
Aculeus	**length**	3.24	4.01
Pedipalp			
Femur	**length**	5.43	6.95
	width	1.71	3.87
	depth	1.25	3.25
Patella	**length**	6.62	8.45
	width	2.37	3.14
	depth	1.91	2.41
Chela	**length**	11.02	13.54
	width	2.3	3.08
	depth	1.91	2.79
Movable finger	**length**	7.46	9.21
Fixed finger	**length**	5.95	7.65
Manus	**length**	3.78	4.75

Table 1: Measurements of the types of *Leiurus abdullahbayrami* **sp. nov**.

Figure 10: Stings of female *Leiurus quinquestriatus* (left) (Israel) and female *L. abdullahbayrami* **sp. nov.** (right) (a paratype from Adıyaman Province).

***Morphology**:*

Prosoma: Centrolateral and posteriomedian carinae fused forming a lyre-shaped figure. Anterior margin of carapace slightly concave. All carinae strong, granulose. A transverse row of granules lies between posterior median carinae; posterior median carinae terminates distally in a small spinoid process that extends very slightly beyond posterior margin of carapace. Anterior median carinae do not reach the anterior margin of carapace. Intercarinal spaces smooth, with irregular coarse granules. Median ocular tubercle only slightly anterior to the center of carapace. Five lateral eyes on each side; fourth and fifth eyes vestigial. Carapace margins finely granular.

Mesosoma: Tergites I–II pentacarinate (Fig. 5), III–VI tricarinate. All carinae strong, granular; each carina terminating distally in a spinoid process that extends slightly beyond posterior margin of tergites. Tergite VII pentacarinate, with lateral pairs of carinae strong and fused; median carinae present on proximal half, moderate to strong. Pretergites chagreened on I–VI; posttergites moderately, coarsely granular. Posterior margins of tergites I–VI moderately granular. Sternites: Sternite III with two weak, smooth carinae; sternites IV–VI with moderately smooth carinae; sternite VII with four finely granulate carinae. Pectines long, extending beyond the coxa joint of leg IV; pectinal tooth count 39–40 (Fig. 13).

Metasoma: All segments longer than wide; length increases and width decreases posteriorly on I–V. Segments I–III with ten carinae, crenulate; segment IV with eight carinae. Dorsolateral carinae on I–IV moderate, crenulate. Dorsolateral carinae on segments I–IV moderate, crenulate. Lateral supramedian carinae on segments I–IV moderate, crenulate. Lateral inframedian carinae on segment I complete, moderate, crenulate; on segment II present on posterior half, weak, crenulate, with 8–9 granules; on segment III present on posterior quarter, weak, crenulate, with five granules; on segment IV absent. Ventrolateral carinae on segments I–IV moderate, crenulate Ventral submedian carinae on segments I–IV moderate, crenulate; on segments II–II with larger granules posteriorly. Segment V with five carinae: dorsolateral carinae weak, irregularly granular; ventrolateral carinae strong, granular, with rounded and lobate granules, larger and coarser posteriorly; ventromedian carina strong, crenulate, with coarsely irregular granules. Segment V bears two rows of granules

Figure 11: Pedipalps of female *Leiurus quinquestriatus* (left) (Israel) and female *Leiurus abdullahbayrami* **sp. nov**. (right) (a paratype from Adıyaman Province).

comprising 5–6 coarse granules between ventromedian and ventrolateral carinae. Anal arch composed of 2–3 rounded lobes (anal arch has one large and one small lobe but the large lobe can be partially subdivided into two lobes) laterally (Figs. 7 and 14) and 5–6 small lobes posteriorly (middle lobe can be single or subdivided into two parts) (Figs. 9 and 15). Surfaces of metasomal segments I–IV smooth with moderate, irregular granules; on segment V, slightly shagreened, with small irregular granules. Telson: subaculear tubercle completely absent; aculeus sharply curved and shorter than vesicle. Vesicle shiny, with few setae.

Pedipalps: Trichobothrial pattern is of Type A, orthobothriotaxic. Dorsal trichobothria of femur are arranged in beta-configuration with d_2 situated on dorsal surface (Fig. 18). Trichobothrium *db* on fixed finger of pedipalp is located between trichobothria *est* and *esb*. Trichobothrium *eb* is located on fixed finger of pedipalp (Fig. 17).

Femur: Femur pentacarinate; dorsointernal, dorsoexternal and ventrointernal carinae strong, granulose; ventroexternal carina moderate with a few coarse granules; internal median carinae with weak, irregular coarse granules. Surfaces smooth, inner surface with few coarse granules (Fig. 19).

Patella: Patella with seven carinae; dorsointernal carina strong, with equally spaced coarse granules and dorsointernal carinae with one spinoid granule distally; dorsomedian carina weak, granular; dorsoexternal carina weak, smooth; exteriormedian carina weak, smooth;

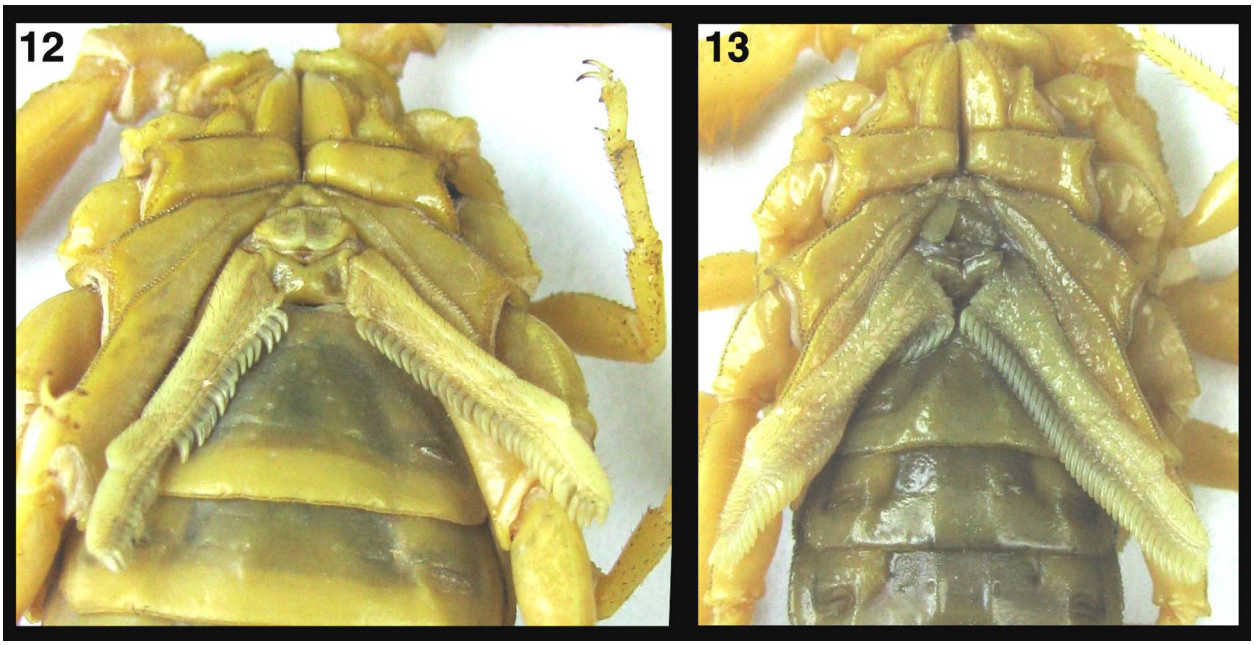


Figure 12–13: *Leiurus abdullahbayrami* **sp. nov.,** coxosternal area. **12.** Female paratype (Adıyaman Province). **13.** Male holotype.

ventroexternal carina weak, smooth; ventromedian carina weak, smooth; ventrointernal carina with equally spaced coarse granules. Surfaces smooth (Fig. 18).

Chela: Slender; carinae weak, smooth. Fingers elongated. Fixed finger with 11 oblique denticle rows. Movable finger with four denticles situated next to terminal denticle and 11 oblique denticle rows (Fig. 16). Inner and accessory denticles present. Pedipalp chela movable finger without scalloping.

Legs: Tibial spurs present on legs III and IV. Tarsus of legs I–IV ventrally with spine-like setae arranged in two rows (Figs. 20–21). Basitarsus of legs I to III with bristlecombs; basitarsus of legs IV without bristlecombs.

Variation

The background color of prosoma, mesosoma and metasomal segment V of the new species is black or blackish-brown (Fig. 3). Coloration is fairly variable: Hatay population has darker coloration on prosoma, mesosoma and metasomal segment V in Gaziantep, Kilis, Adıyaman and Kahramanmaraş populations; carapace in Hatay population has no yellow spots. On the other hand, background color of prosoma, mesosoma and metasomal segment V in Şanlıurfa population is lighter than in Gaziantep, Kilis, Adıyaman and Kahramanmaraş populations (Fig. 22). Juveniles always have darker coloration than adults in all populations. Therefore, a great deal of variability in coloration is observed, probably due to adaptation to local ecological conditions. Color variation in *L. quinquestriatus* in the Middle East was reported previously: Israel populations are light yellow to orange yellow (Levy & Amitai, 1980); specimens collected from Yemen are yellow to yellow brown (Sissom, 1994); specimens from western coast of Saudi Arabia are yellow-brown with distinctly darkened carapace (Hendrixson, 2006); Kovařík (2007) clearly illustrated darker specimens, much like *Leiurus abdullahbayrami* sp. nov. Based on description of Levy & Amitai (1980), *L. q. quinquestriatus* and *L. q. hebraeus* are similar in dark yellow coloration, except for dark segment V.

Total length varies 51.08–67.61 mm (59.45 ± 5.29; n=20) in males; 51.35–76.6 mm (66.73 ± 6.47; n=30) in females (see Table 2).

Variation on pedipalp chela of fixed and movable finger oblique row of denticles: fixed fingers, 123 with 11 rows, 17 with 12 rows (11.12 ± 0.32; n=140); movable fingers: 125 with 11 rows, 15 with 12 rows (11.10 ± 0.31; n=140).

Male pectines always extend beyond the coxa of leg IV; in females, pectines generally extend only slightly beyond the coxa of leg IV (Figs. 12 and 13). Pectinal tooth counts 36–42 in males (39.48 ± 1.26; n=54) (1 comb with 36 teeth; 2 combs with 37 teeth; 9 combs with 38 teeth; 13 combs with 39 teeth; 18 combs with 40 teeth; 9 combs with 41 teeth; two combs with 42 teeth), 30–35 in females (32.88 ± 1.07; n=112) (2 combs with 30 teeth; 7 combs with 31 teeth; 31 combs with 32 teeth; 41 combs with 33 teeth; 24 combs with 34 teeth; 7 combs with 35 teeth).

Scalloping of movable finger of pedipalp is absent in both sexes. Males have slightly longer pedipalp than females; mean length/width ratio, 4.76 ± 0.31 in males (n=20); and 4.66 ± 0.27 in females (n=30).

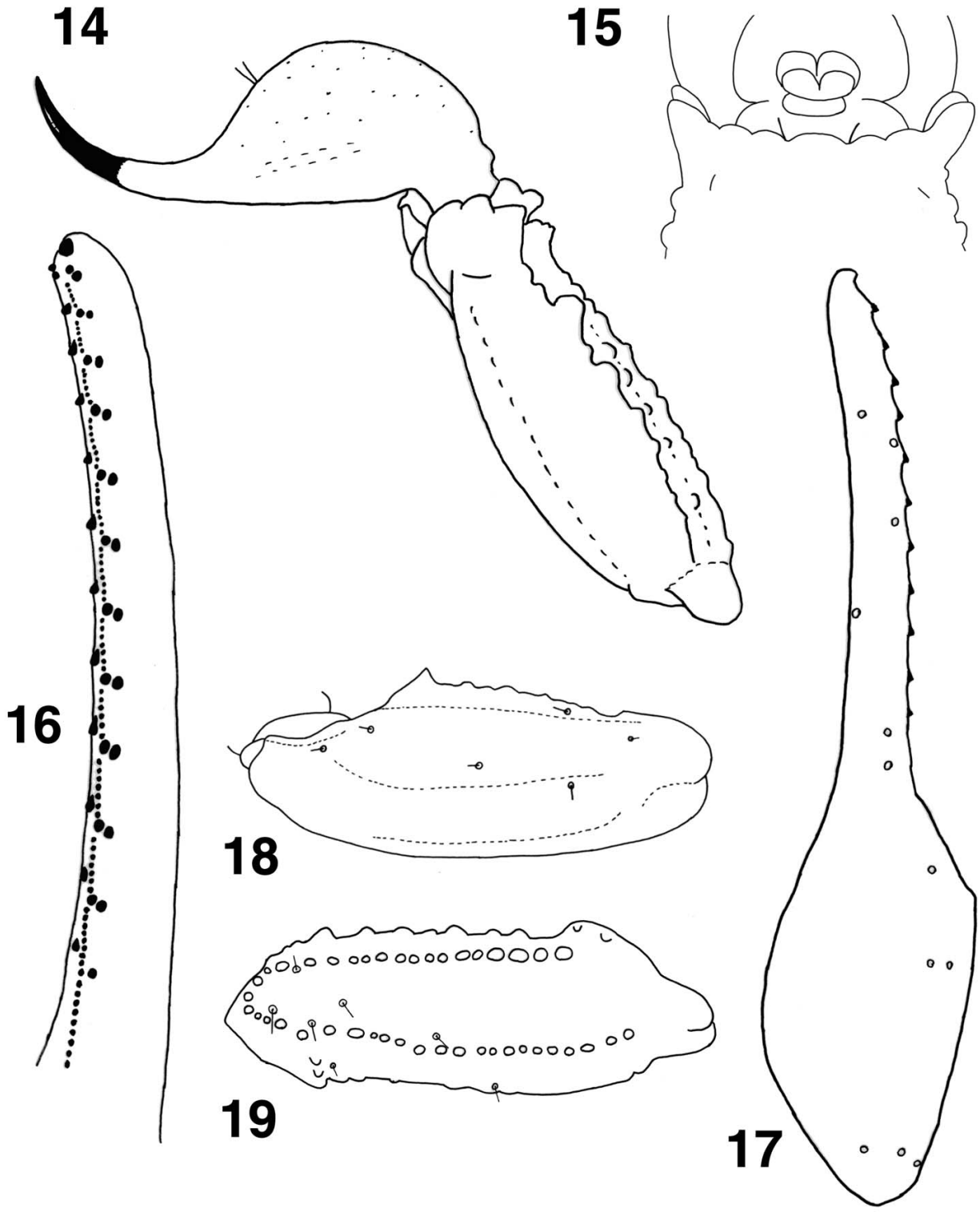


Figure 14–19: *Leiurus abdullahbayrami* **sp. nov. 14.** Lobes of the ventrolateral carinae of metasomal segment V. **15.** Anal arch, ventrally. **16.** Dentition of movable finger. **17.** Trichobothria pattern of chela, external view only. **18.** Trichobothria pattern of patella, dorsal view only. **19.** Trichobothria pattern of femur, dorsal view only.

		Males (n=20)	Females (n=30)
Total	**length**	59.45 ± 5.29	66.73 ± 6.47
Carapace	**length**	7.04 ± 0.91	7.84 ± 0.83
	width	6.81 ± 1.11	8,47 ± 2.32
Mesosoma	**length**	16.00 ±1.72	20.03 ± 4.06
Metasoma	**length**	36.93 ± 4.08	38.50 ± 8.06
Segment I	**length**	4.72 ± 0.62	5.13 ± 0.79
	width	4.22 ± 0.57	4.61 ± 0.51
Segment II	**length**	5.56 ±0.66	5.91 ± 0.60
	width	3.85 ± 0.53	4.18 ± 0.48
Segment III	**length**	5.86 ± 0.68	6.15 ± 0.63
	width	3.68 ± 0.54	4,03 ± 0,47
Segment IV	**length**	6.58 ± 0.75	7,06 ± 0.70
	width	3.50 ± 0.44	3.85 ± 0.42
Segment V	**length**	7.91 ± 0.81	8.51 ± 0.81
	width	3.21 ± 0.37	3.62 ± 0.53
Telson	**length**	7.37 ± 0.93	8.18 ± 0.95
	width	2.93 ±0.39	3.38 ± 0.45
	depth	2.66 ± 0.40	3.03 ± 0.40
Vesicule	**length**	4.64 ± 0.53	5.03 ± 0.54
Aculeus	**length**	3.15 ± 0.39	3.58 ± 0.41
Pedipalp			
Femur	**length**	5.49 ± 0.72	5.85 ± 0.75
	width	1.78 ± 0.72	2.00 ± 0.46
	depth	1.36 ± 0.20	1.63 ± 0.39
Patella	**length**	6.75 ± 0.83	7.25 ± 0.81
	width	2.39 ± 0.33	2.68 ± 0.32
	depth	1.89 ± 0.24	2.16 ± 0.23
Chela	**length**	11.06 ± 1.38	12.03 ± 1.37
	width	2.34 ± 0.39	2.59 ± 0.37
	depth	2.04 ± 0.32	2.25 ± 0.35
Movable finger	**length**	7.31 ± 0.97	8.02 ± 0.97
Fixed finger	**length**	6.17 ± 0.85	6.77 ± 0.76
Manus	**length**	4.01 ± 0.85	4.23 ± 0.57

Table 2: Measurements of the specimens of *Leiurus abdullahbayrami* sp. nov.

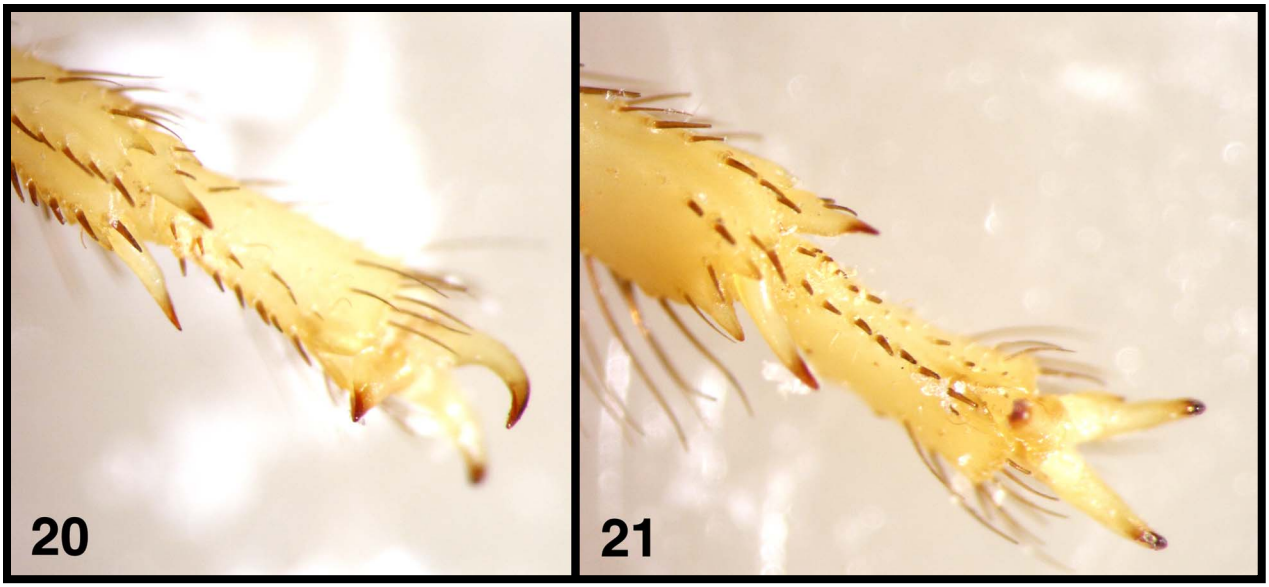


Figure 20–21: *Leiurus abdullahbayrami* **sp. nov. 20.** Tarsus of leg III. **21.** Tarsus of leg IV.

Figure 22: *Leiurus abdullahbayrami* **sp. nov.** color variation among three populations: Hatay Province (left), Şanlıurfa Province (center); Gaziantep, Adıyaman, and Kilis Provinces (right).

In all examined specimens, the trichobothrium *db* on the fixed finger of the pedipalp is always located between trichobothria *est* and *esb* (Fig. 17). However, the trichobothrium *db* was closer to *est* in Hatay population compared to other populations.

Habitat

According to our observations, the new species is quite common in Hatay Province, western Gaziantep Province and western Kilis Province on terra rossa soils, and in the rest of Gaziantep Province, the rest of Kilis Province, Kahramanmaraş Province, Şanlıurfa Province, and Adıyaman Province on mollisol soils. The new species was collected generally in steppe and rocky areas (Figs. 23 and 24), and rarely, in scrub areas (Fig. 25). It also had high densities in rocky basaltic areas (Fig. 26). Most of the specimens were collected under stones at daytime; sometimes, there was a small hole under the stone, in which scorpion was sitting. The soil surface under the stones was generally smooth and clean. In the night trips with UV light, scorpions was usually found in semi-arid steppe vegetation, in the lowlands, in the mountainous areas with scarce vegetation, and also in rock crevices far from human settlements. *Leiurus abdullahbayrami* sp. nov. was observed in the same localities as *Compsobuthus matthiesseni*, *C. schmiedeknechti*, *Mesobuthus eupeus*, *M. nigrocinctus*, *Scorpio maurus*, and *Iurus dufoureius asiaticus*.

Geographic Distribution

The genus *Leiurus* is widespread in the Middle East and Northeast Africa. The southeast of Turkey belongs to the northernmost tectonic plate of the Middle East (it is the warmest region of Turkey that, however, does not have true desert habitats). It is restricted by the southern part of East Taurus Mts. and eastern part of Amanus Mts. Many Saharo-Arabian species penetrate to the Taurus and Amanus Mountains. On the other hand, some species occuring in this area originate from Central Asia, Anatolia, Caucasus, and the Mediterranean. It is not suprising to find interesting new records and species, including Saharo-Arabian species, in this region. There is little endemism associated with this ecoregion because much of its environments and biota grade into neighbouring ecoregions and are associated with the Arabian plate. Among the reptiles of this region, *Rhinotyphlops episcopus* Franzen et Wallach, 2002 (Halfeti District, Şanlıurfa Province), *Acanthodactylus harranensis* Baran et al., 2005 (Harran District, Şanlıurfa Province), and *Rhynchocalamus barani* Olgun et al. (2007) (Dörtyol District, Hatay Province) are endemic. The scorpion *Calchas birulai* (Scorpiones: Iuridae) recently described by Fet et al. (2009) is also endemic to this region.

We have collected specimens of the new species from several regions in Southeastern Turkey (Adıyaman, Hatay, Kilis, Gaziantep, Şanlıurfa, and Kahramanmaraş Provinces). Interestingly, this new species has a very high density to the west of the Fırat (Euphrates) River, while to the east, despite intensive field work, it has been collected only in three localities (Şanlıurfa Province). We have undertaken several day and night field trips in the same locality in Mardin where *Leiurus quinquestriatus* was recorded by Crucitti & Vignoli (2002) but we could not confirm this particular record.

Lourenço & Cloudsley-Thompson (2008) analysed owl pellets collected in Diyarbakır Province and identified scorpion remains as *L. quinquestriatus*. They reported pedipalp chela fixed finger with 14 oblique rows of denticles; however, only 11 or 12 rows are present on the fixed finger in all *Leiurus* specimens examined by us. Many of our field trips were organised in Diyarbakır Province and adjacent territory, but we never collected any *Leiurus* specimens there. An illustration of fixed finger of pedipalp in this paper is given without any trichobothrial pattern. Therefore, we have chosen to disregard this record. Lourenço & Cloudsley-Thompson (2008) also reported a record of *Hottentotta judaicus* in owl pellets from Diyarbakır Province; but this record is probably based on a misidentification and should be disregarded. No other specimens of this species have been reported for Turkey. We employed ultraviolet light detection techniques last five years across the entire southeast of Turkey, and we could not confirm the occurrence of *H. judaicus* in Turkey.

Judging from the locality records of *Leiurus abdullahbayrami* sp. nov. in Turkey, it could be expected to occur also in northern Syria. Records near the Syrian-Turkish border (Kinzelbach, 1984; Yağmur et al., 2007; new localities reported in this paper) support this opinion. However, no authors *Leiurus* specimens have been reported from cenral and northern Syria. It will take further field study to understand the southern limit of this new species. It is possible that species *Leiurus quinquestriatus* and *L. abdullahbayrami* sp. nov. have a disjunct distribution in the Middle East.

Acknowledgments

We wish to thank Alexander V. Gromov (Institute of Zoology, Almaty, Kazakhstan), Aziz Avcı (Department of Biology, Adnan Menderes University), M. Zülfü Yıldız (Department of Biology, Ege University), Selda Kesmezoğlu (Forensic Science Institute of İstanbul University), Mehmet Yalçın, Gökhan Çalışır, Ekber Ulupınar, Volkan Ülgezer, Erman

Figure 23: *Leiurus abdullahbayrami* **sp. nov.** habitat (steppe area) (Türkyurdu Village, Nizip District, Gaziantep Province).

Figure 24: *Leiurus abdullahbayrami* **sp. nov.** habitat (rocky area) (2 km East of Yamaçoba Village, Şehitkamil District, Gaziantep Province).

Figure 25: *Leiurus abdullahbayrami* **sp. nov.** habitat (scrub) (İncesu Village, Şehitkamil District, Gaziantep Province).

Figure 26: *Leiurus abdullahbayrami* **sp. nov.** habitat (basaltic rocks) (Küplüce Village, Central District, Kilis Province).

Tezcan, Mustafa Pehlivan, Fatih Değirmenci (Department of Biology, Gaziantep University), Cemali Toprak, and Mehmet Özkörük for their help in field trips. We also thank František Kovařík (Praha, Czech Republic) for providing comparison material, as well as Victor Fet (Marshall University, West Virginia, USA) and two anonymous reviewers for corrections and suggestions, and Richard Galon (United Kingdom) for English corrections. We would like to thank Ege University, Faculty of Science, Department of Biology and Ege University Foundation Service for technical and financial support.

References

BARAN, İ., Y. KUMLUTAŞ, B. LANZA, R. SİNDOCO, Ç. ILGAZ, A. AVCI & P. CRUCITTI. 2005. *Acanthodactylus harranensis*, a new species of lizard from southeastern Turkey (Reptilia: Sauria: Lacertidae). *Bollettino del Museo Regionale di Scienze naturali, Torino*, 23(1): 323–341.

BIRULA, A. A. 1908. Ergebnisse der mit Subvention aus der Erbschaft Treitl unternommenen zoologischen Forschungsreise Dr. F. Werner's nach dem ägyptischen Sudan und Nord-Uganda *XIV. Scorpiones und Solifugae. Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften in Wien*, 117(1): 121–152.

CRUCITTI, P. & V. VIGNOLI. 2002. Gli scorpioni (Scorpiones) dell'Anatolia sud-orientale (Turchia). *Bollettino del Museo Regionale di Scienze naturali, Torino*, 19(2): 433–480.

FET, V., M. E. SOLEGLAD & F. KOVAŘÍK. 2009. Etudes on iurids, II. Revision of genus *Calchas* Birula, 1899, with the description of two new species (Scorpiones: Iuridae). *Euscorpius*, 82: 1–72.

FRANZEN, M. & V. WALLACH. 2002. A new *Rhinotyphlops* from Southeastern Turkey (Serpentes: Typhlopidae). *Journal of Herpetology*, 36(2): 176−184.

HENDRIXSON, B. E. 2006. Buthid scorpions of Saudi Arabia, with notes on other families (Scorpiones: Buthidae, Liochelidae, Scorpionidae). *Fauna of Arabia*, 21: 33–120.

KINZELBACH, R. 1984. Die Skorpionssammlung des Naturhistorischen Museums der Stadt Mainz. Teil II: Vorderasien. *Mainzer naturwissenschaftlicher Archiv*, 22: 97–106.

KOVAŘÍK, F. 2007. *Leiurus nasheri* sp. nov. from Yemen (Scorpiones, Buthidae). *Acta Societatis Zoologicae Bohemicae*, 71: 137–141.

LEVY, G. & P. AMITAI. 1980. *Fauna Palaestina, Arachnida I: Scorpiones*. Israel Academy of Sciences and Humanities, Jerusalem, 130 pp.

LEVY, G., P. AMITAI & A. SHULOV. 1970. *Leiurus quinquestriatus hebraeus* (Birula, 1908) (Scorpiones; Buthidae) and its systematic position. *Israel Journal of Zoology*, 19(4): 231–242.

LOURENÇO, W. R. & J. L. CLOUDSLEY-THOMPSON. 2008. A new case of predation on scorpions by the little owl *Athene noctua* in the Southeast Anatolia Region. *Turkish Journal of Arachnology*, 1(1): 54–58.

LOURENÇO, W. R., D. MODRY & Z. AMR. 2002. Description of a new species of *Leiurus* Ehrenberg, 1828 (Scorpiones, Buthidae) from the South of Jordan. *Revue suisse de Zoologie*, 109(3): 635–642.

LOURENÇO, W. R., J.-X. QI & J. L. CLOUDSLEY-THOMPSON. 2006. The African species of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) with the description of a new species. *Boletín de la Sociedad Entomológica Aragonesa*, 39: 97–101.

OLGUN, K., A. AVCI, Ç. ILGAZ, N. T. ÜZÜM & C. YILMAZ. 2007. A new species of *Rhynchocalamus* (Reptilia: Serpentes: Colubridae) from Turkey. *Zootaxa*, 1399: 57–68.

SISSOM, W. D. 1994. Descriptions of new and poorly known scorpions of Yemen (Scorpiones: Buthidae, Diplocentridae, Scorpionidae). *Fauna of Saudi Arabia*, 14: 3–39.

TULGA, T. 1960. Türkiyede varlığı ilk defa tespit edilen bir akrep türü (*Buthus quinquestriatus*) ile *Prionurus crassicauda*'ya karşı hazırladığımız akrep serumları arasında çapraz proteksiyon deneyleri (Cross-reactions between anti-scorpion (*Buthus quinquestriatus*) and anti-scorpion (*Prionurus crassicauda*) sera). *Türk İj. Tec. Biol. Derg.* 20(2): 191–203 (in Turkish).

VACHON, M. 1949. Etudes sur les scorpions. III (suite). Déscription des scorpions du Nord de l'Afrique. *Archives de l'Institut Pasteur d'Algérie*, 27 (2): 134–169.

VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle* 140, Zool., 104: 857–958.

VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pédipalpes des Scorpions (Arachnides) dans le classement des genres de la famille des Buthidae Simon. *Comptes Rendus des Séances de l'Académie des Sciences*, 281(D): 1597–1599.

YAĞMUR, E. A. 2005. *Gaziantep akrepleri (Ordo: Scorpiones) ve zoocoğrafik dağılışları*. Yüksek Lisans Tezi, Gaziantep Üniversitesi Fen Bilimleri Enstitüsü, Gaziantep. 136 s.

YAĞMUR, E. A., H. KOÇ, S. KESMEZOGLU & M. YALÇIN. 2007. Scorpions of Kilis Province, Turkey (Arachnida: Scorpiones). *Serket*, 10(3): 91–105.

YAĞMUR, E. A., H. KOÇ & M. YALÇIN. 2008. Distribution of *Hottentotta saulcyi* (Simon, 1880) (Scorpiones: Buthidae) in Turkey. *Euscorpius*, 76: 1–6.