

Taxonomic and zoogeographic observations on *Iurus* Thorell (Scorpiones, Iuridae)

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Summary

The genus *Iurus* contains two valid species and is restricted in distribution to the Aegean region. *Iurus dekanum* (Roewer, 1943), described from a single specimen from "Anamalai Hills, Deccan (India)," is conspecific with *Iurus dufourei* (Brullé, 1832) from the Peloponnesus and Crete, and is synonymised. *Iurus asiaticus* Birula, new combination, from Turkey, Rhodes and Karpathos is recognised as a valid species.

Introduction

Recent studies of the genus *Iurus* Thorell and its relatives (Francke & Soleglad, in press) revealed some interesting taxonomic and zoogeographic problems. Roewer (1943) described a new genus and species of scorpion, *Chaerilomma dekanum*, on the basis of a single specimen from "Anamalai Hills, Deccan (India)". Vachon (1966) examined the type specimen, concluded that *Chaerilomma* Roewer is a junior synonym of *Iurus* Thorell, and proposed the combination *Iurus dekanum* (Roewer). This species, however, has remained problematical for several reasons. First, *Iurus dufourei* (Brullé, 1832), the only other recognised species in the genus, has been reported from Greece, Turkey and some islands in the Aegean Sea (Kinzelbach, 1975). Thus, as indicated by Vachon (1966), the disjunct distribution of *Iurus* is rather unusual and difficult to explain. Secondly, Vachon (1966) compared the holotype of *I. dekanum*, 68 mm in total length, with a male from Turkey 83 mm in total length. The size differences coupled with the nature of the distinguishing characteristics given by Vachon (1966) led to suspicions that *I. dekanum* might have been based on a subadult specimen. Thirdly, Tikader (1973) reported 33 scorpion taxa from the Deccan area, but there was no mention of *Iurus* or any other taxon with which it might have been confused. Finally, Helversen &

Martens (1972) reported that Roewer's arachnid collection contains numerous specimens, including type specimens, with erroneous locality data. Consequently I became suspicious about the accuracy of the locality data reported by Roewer for *I. dekanum*, and of the validity of that species.

The study of the holotype of *I. dekanum* and additional specimens from Crete, Rhodes and Turkey reveals a more complex and interesting problem which I aim to clarify in this contribution. Problems of relative growth (allometry) of the pedipalp chela of male *Iurus* are presented, and their implications for scorpion taxonomy are briefly discussed.

Nomenclatural history

Brullé (1832) described *Buthus dufourei* from the Peloponnesus Peninsula (Morea) of Greece. Six years later Koch (1838) described *Buthus granulatus*, also from Greece. Thorell (1876) erected the genus *Iurus* and designated *Buthus granulatus* Koch as its type species, and gave a detailed description based on a specimen from Rhodes. Karsch (1879) indicated that Brullé's *dufourei* was an *Iurus*, and listed Koch's *granulatus* as its junior synonym. Thus *Iurus dufourei* (Brullé) became the type species of the genus and was for many years its only included taxon.

In 1903, however, Birula erected the subspecies *Iurus dufourei asiaticus* for specimens from Turkey, citing pectinal tooth counts as an important difference between this and the nominate subspecies: 12 teeth per comb in *asiaticus* versus 9 teeth per comb for *dufourei* from Crete. Apparently unaware of Birula's work, von Ubitsch (1922) described *Iurus kraepelini* as a new species from Turkey. Vachon (1947a, 1947b) established the synonymy of *I. kraepelini* under *I. dufourei asiaticus*, and cited additional records for this taxon. This subspecies, however, has not been widely recognised (e.g., Gruber, 1963, 1966; Stahnke, 1974; Kinzelbach, 1975).

The identity of *Iurus dekanum*

When Vachon (1966) compared *I. dekanum* (Roewer) with *I. dufourei* (Brullé) no mention was made of the subspecies of the latter, although Vachon referred to and illustrated a male from Turkey. My

examination of the holotype of *I. dekanum* indicates that it differs from Turkish specimens in pectinal tooth counts and in the characters indicated by Vachon (1966). Furthermore, the holotype of *I. dekanum* is an adult male as confirmed by examination of the well developed paraxial organs bearing sclerotised hemispermatophores; therefore, my initial suspicion that it was a subadult specimen was unfounded. Comparison of *I. dekanum* with an adult male *I. dufourei* from Crete, however, failed to reveal any significant differences.

Results and Discussion

The taxonomic conclusions drawn here are that there are indeed two species in the genus *Iurus*. The species *I. dufourei* (Brullé) with its junior synonyms *I. granulatus* (Koch) and *I. dekanum* (Roewer) occurs in the Peloponnesus and Crete. The other species, *Iurus asiaticus* Birula, new combination, occurs in Karpathos, Rhodes and Turkey. One specimen of *I. asiaticus* bearing the label "Kreta-1872" suggests that the two species might be sympatric on that island, but additional records are needed to confirm this.

Thorell (1876) designated *Iurus granulatus* (Koch), based on a female from Greece, as the type species of the genus *Iurus*. In the same contribution, however, he described a male from Rhodes under the name of *I. granulatus*. Based on the description and locality it is obvious that this male was not *I. granulatus* (Koch), but *I. asiaticus* Birula. Since the specific name used in an erroneous specific identification cannot be retained for the species to which the name was wrongly applied (I.C.Z.N., Art. 49), *asiaticus* Birula is the next available name for the taxon from Turkey, Rhodes and Karpathos. Because of Thorell's misidentification of *I. granulatus* a case could be made to designate officially *I. asiaticus* Birula as the type species of the genus (I.C.Z.N., Art. 70 a-i). In my judgement, however, stability and uniformity of nomenclature are best served by retaining the species named by the designator — *I. granulatus* (Koch), regardless of the misidentification as the type species (I.C.Z.N., Art. 70 a-iii). Also, because *I. granulatus* (Koch) is a subjective junior synonym of *I. dufourei* (Brullé), the latter is retained as the type species.

The conspecificity of *I. dekanum* with specimens from Crete indicates that Roewer's reported locality

data of "Anamalai, Deccan" is indeed incorrect. The genus *Iurus* is restricted in distribution to the Aegean region. The reported occurrence of *Iurus* in Samoa, a group of islands in the Pacific Ocean, by Stahnke (1974) is apparently due to a *lapsus* and should be dismissed. Werner (1935) reported *I. dufourei* from Samós, an island in the Aegean Sea, and this record probably refers to *I. asiaticus*.

Iurus dufourei and *I. asiaticus* differ by the characters given below. First, in *I. dufourei* the pectines bear 9-10 teeth per comb, whereas in *I. asiaticus* 12-13 teeth are present. Secondly, the pedipalp chela fingers in adult males of *I. dufourei* are deeply lobed but close completely throughout their length (Figs. 1 and 2), whereas in adult males of *I. asiaticus* a distinct gap is evident (Figs. 3-5). In females and immatures the fingers are only slightly sinuous and close completely in both species (Fig. 6). There is some interesting variability in this sexually dimorphic character in *I. asiaticus*, with rather broad implications for strictly morphometric approaches in scorpion taxonomy.

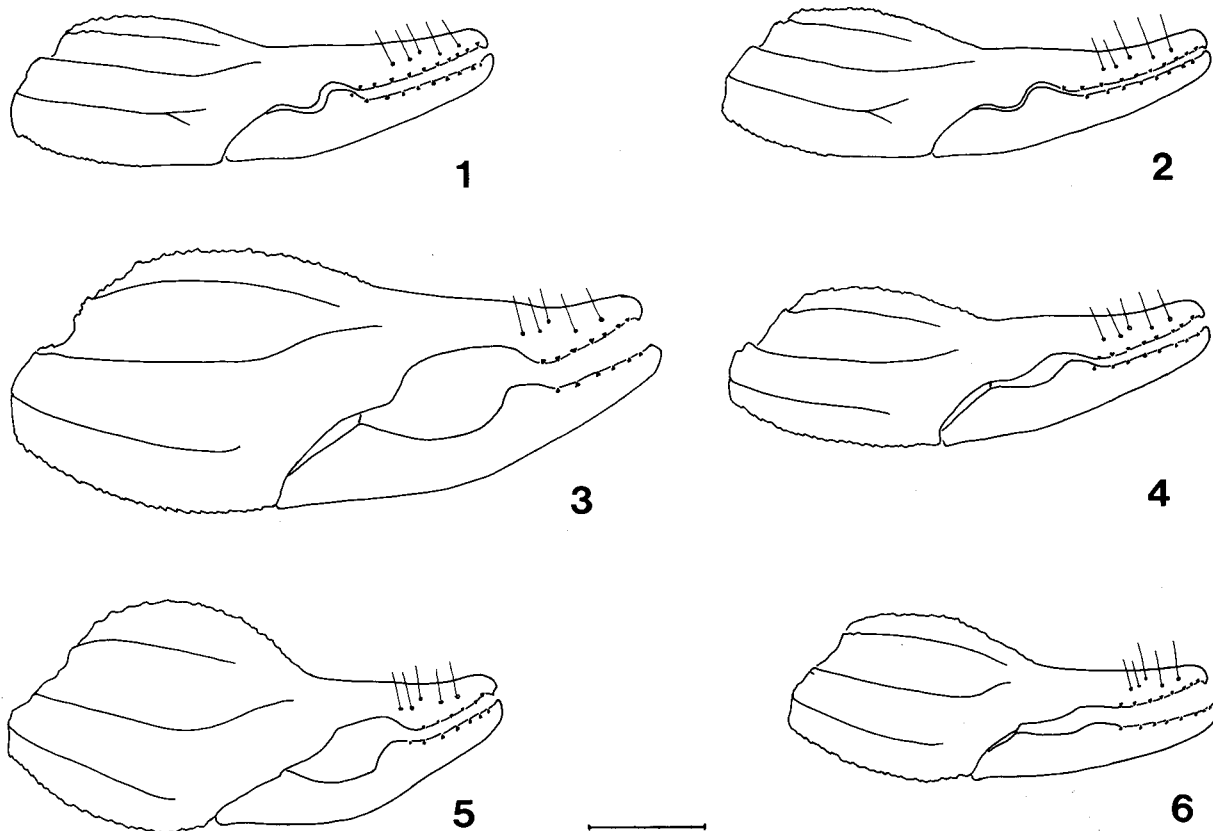
Two confirmed (hemispermatophore present) adult males from the same locality (Namrum, Turkey) and date, show interesting differences (Figs. 3 and 4). The larger male (Fig. 3; carapace length 14.5 mm, chela length 28.0 mm, chela length/width ratio 2.32) has a greater gap between the fingers, and a proportionately wider hand than the smaller male (Fig. 4; carapace length 11.5 mm, chela length 21.5 mm, chela length/width ratio 3.12). The size differences of about 30% between these two specimens strongly suggest that they attained sexual maturity at different instars, i.e., the larger male underwent an additional moult compared with the smaller male before attaining maturity (see Francke, 1977, for pertinent information on scorpion life histories).

Two males from another locality (Antalya, Turkey) provide further information on the ontogenetic variability of this sexually dimorphic character. The differences between an adult male (Fig. 5; carapace length 11.8 mm, chela length 22.3 mm, chela length/width ratio 2.06) and a subadult male with rudimentary paraxial organs (Fig. 6; carapace length 10.5 mm, chela length 19.4 mm, chela length/width ratio 2.50), suggest that a proportionately wider hand with a relatively large gap between the

fingers can be acquired in a single moult (to maturity). Further, the populations from Namrum and Antalya differ in that males of approximately the same size (Figs. 4 and 5), and perhaps representing the same instar, can show varying degrees of sexual dimorphism in these structures.

In adult males of *I. dufourei* ten rows of denticles (in the illustrations only the enlarged outer granule of each row is shown) occur between the finger tip and the bases of the lobe and notch (Figs. 1 and 2). In "wide-hand, broad-gap" adult males of *I. asiaticus* only 6-7 rows of denticles are present in the same region (Figs. 3 and 5); and in "narrow-hand, medium-gap" adult males, and in subadult males of *I. asiaticus* eight rows are present (Figs. 4 and 6). Relative trichobothrial positions with respect to the

lobes suggest that the trichobothria have been displaced distally in *I. dufourei* (compared with *I. asiaticus*), or basally in *I. asiaticus* (compared with *I. dufourei*). However, comparison of the trichobothrial positions with reference to the granules (distal trichobothrium at the level of third granule from apex, basal trichobothrium at the level of 7-8th granule from apex) indicates that no trichobothrial migration occurs; rather, the lobe and notch appear closer to the finger base in *I. dufourei* than in *I. asiaticus*. The topic of "trichobothrial migration" was first raised by Vachon (1974) to explain differences in relative trichobothrial positions among closely related taxa. The problems inherent with such explanations are further discussed by Francke (1981) and Francke & Soleglad (in press).



Figs. 1-6: Right pedipalp chela of male *Iurus* in lateral aspect. 1 *I. dufourei* from Crete; 2 holotype of *I. dekanum* (= *I. dufourei*) from "Anamalai Hills, Deccan (India)"; 3 large adult *I. asiaticus* from Namrum, Turkey; 4 small adult *I. asiaticus* from Namrum; 5 adult *I. asiaticus* from Antalya, Turkey; 6 subadult *I. asiaticus* from Antalya. Scale line = 5 mm.

The chela length/width ratio in *I. dufourei* males is as follows: male from Crete 3.18 (Fig. 1), holotype of *I. dekanum* 3.25 (Fig. 2). The small male *I. asiaticus* from Namrum (Fig. 4; chela length/width ratio 3.12) is morphometrically more similar in this character to *I. dufourei* than it is to other adult *I. asiaticus* males from Turkey with chela length/width ratios of 2.32 (Fig. 3) and 2.06 (Fig. 5). These facts indicate that in some scorpions morphometric differences per se, without detailed studies of ontogenic allometry, can lead to erroneous taxonomic conclusions.

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References

- BIRULA, A. A. 1903: Miscellanea Scorpiologica V. Ein Beitrag zur Kenntnis der Skorpionenfauna der Insel Kreta. *Ezheg.zool.Muz.* **1903**: 295-299.
- BRULLÉ, A. 1832: Expedition scientifique du Moreé 1832-1836. Section des sciences physiques. t. 3, 1er partie: Zoologie, s. 2: Arachnides, pp. 51-61. Paris.
- FRANCKE, O. F. 1977: Observations on the life history of *Uroctonus mordax* Thorell. *Bull.Br.arachnol.Soc.* **3**: 254-260.
- FRANCKE, O. F. 1981: Studies of the scorpion subfamilies Superstitioninae and Typhlochactinae, with description of a new genus. *Bull.Assoc.Mex.Cave Stud.* **7**:
- FRANCKE, O. F. & SOLEGLAD, M. E.: The scorpion family Iuridae Thorell. *J.Arachnol.* **9**: (in press).
- GRUBER, J. 1963: Ergebnisse der von Dr. O. Paget und Dr. E. Kritscher auf Rhodos durchgeführten zoologischen Exkursionen. VII. Scorpiones und Opiliones. *Annl.naturh.Mus.Wien* **66**: 307-316.
- GRUBER, J. 1966: *Ibid.* **69**: 423-426.
- HELVERSEN, O. v. & MARTENS, J. 1972: Unrichtige Fundort-Angaben in der Arachniden-Sammlung Roewer. *Senckenberg.biol.* **53**: 109-123.
- KARSCH, F. 1879: Scorpionologische Beiträge. II. *Mitt.münch.ent.Ver.* **3**: 97-136.
- KINZELBACH, R. 1975: Die Skorpione der Ägäis. Beiträge zur Systematik, Phylogenie und Biogeographie. *Zool.Jb. (Syst.)* **102**: 12-50.
- KOCH, C. L. 1838: *Die Arachniden* **4**: 1-144. Nürnberg.
- ROEWER, C. 1943: Ueber eine neuerworbene Sammlung von Skorpionen des Natur-Museums Senckenberg. *Senckenbergiana* **26**: 205-244.
- STAHNKE, H. L. 1974: Revision and keys to the higher categories of Vejovidae. *J.Arachnol.* **1**: 107-141.
- THORELL, T. 1876: Etudes Scorpiologiques. *Atti Soc.ital.Sci.nat.* **19**: 75-272.
- TIKADER, B. K. 1973: Arachnida of the Deccan area. *Bull.Indian Nat.Sci.Acad.* **45**: 260-276.
- UBITSCH, M. v. 1922: Ueber eine neue *Jurus*-Art aus Kleinasien, nebst einigen Bemerkungen ueber die Funktion der Käme der Skorpione. *Zool.Jb. (Syst.)* **44**: 503-516.
- VACHON, M. 1947a: Remarques préliminaires sur la fauna des scorpions de Turquie. *Bull.Mus.natn.Hist.nat.Paris* (2) **19**: 161-164.
- VACHON, M. 1947b: Repartition et origine des scorpions de Turquie. *C.r.somm.Séanc.Soc.Biogéogr.* **206**: 26-29.
- VACHON, M. 1966: A propos de la synonymie de deux genres de Scorpions: *Chaerilomma* Roewer, 1943 (Chaetidae) et *Iurus* Thorell, 1877 (Vejovidae). *Senckenberg.biol.* **47**: 453-461.
- VACHON, M. 1974: Etude des caractères utilisés pour classer les familles et les genres de Scorpions. 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les scorpions. *Bull.Mus.natn.Hist.nat.Paris* (3) **140** (Zool. 104): 857-958.
- WERNER, F. 1935: Scorpiones, 1-316. In H. G. Bronn (ed.) *Klassen und Ordnungen des Tierreichs* Bd. 5, Abt. 4, Buch 8, 512 pp. Akad. Verlag, Leipzig.