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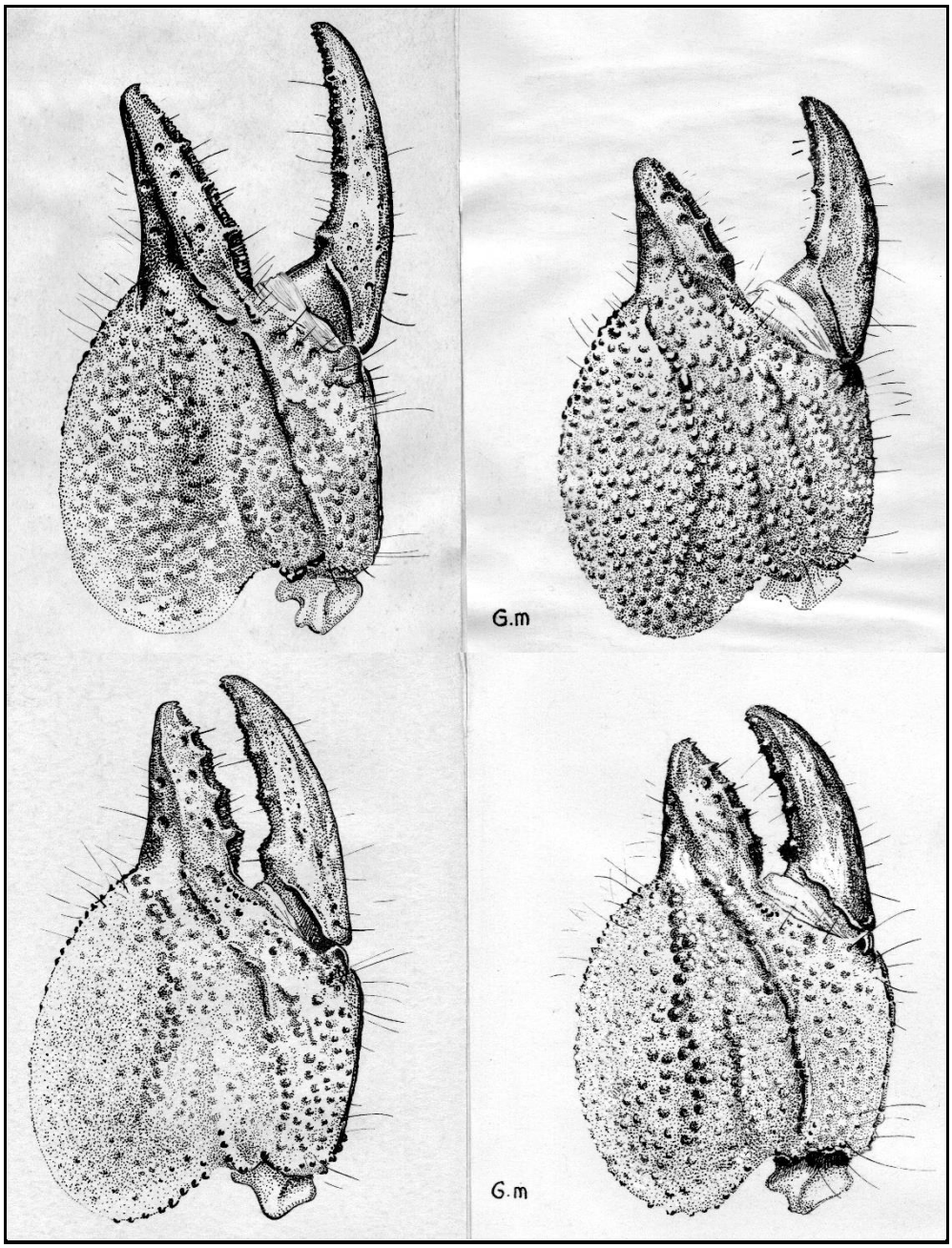

120 **2025**

REDESCRIPTION OF *SCORPIO TRARASENSIS* BOUISSET & LARROUY, 1962 AND UPDATE ON THE DISTRIBUTION OF THE GENUS *SCORPIO* LINNAEUS, 1758 IN NORTHERN ALGERIA (SCORPIONES: SCORPIONIDAE)

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Abstract

Scorpio trarasensis Bouisset & Larrouy (1962), from the Trara Massif, in the western part of the Tellian Atlas of Algeria, is redescribed on the basis of new material collected and a neotype is designated (original type material is considered lost). The geographical distribution of the genus *Scorpio* Linnaeus, 1758 in Northern Algeria is updated based on additional material examined, and a key for their identification is proposed.

Keywords. Scorpion, Biodiversity, Taxonomy, *Scorpio*, Northern Algeria.

Résumé

Scorpio trarasensis Bouisset & Larrouy (1962), du Massif des Trara, dans l'ouest de l'Atlas Tellien en Algérie, est redécrit sur la base de nouveau matériel collecté et un néotype est désigné (le matériel type original est considéré perdu). La distribution géographique du genre *Scorpio* Linnaeus, 1758 dans le nord de l'Algérie est mise à jour sur la base de nouveau matériel examiné, et une clé pour leur identification est proposée.

Mots clés. Scorpion, Biodiversité, Taxonomie, *Scorpio*, Nord de l'Algérie.

Introduction

Scorpio trarasensis was originally described by Bouisset & Larrouy (1962) as a subspecies of *S. maurus* Linnaeus, 1758, on the basis of specimens collected in the Trara Massif, around M'Sirda Fouaga (400-600 m a.s.l.), Tlemcen Wilaya, in the western part of the Tellian Atlas of Algeria, close to the border with Morocco (Fig. 22). In its original description, it was compared notably with two other dark subspecies, *S. m. maurus* distributed on the northern flanks of the Tellian Atlas in Tunisia and eastern Algeria up to Algiers (Vachon, 1952) and *S. m. hesperus* Birula, 1910 described from the surroundings of Tanger in Morocco, but showed morphological differences notably in the shape of

the hemispermatophore, pectinal plate and chelicera setation. Kovařík (2009) placed *S. m. trarasensis* in synonymy with *S. m. maurus* without any explanation and without examining any specimen of *S. m. trarasensis*. This arbitrary decision was not considered in Ouici *et al*. (2020), Sadine *et al*. (2020) and Khammassi *et al*. (2023), while it was questioned in Ythier & François (2023) and considered invalid in Dupré *et al*. (2023). Finally, Ythier *et al*. (2024) restored *S. trarasensis* from its synonymy and raised it to species level, considering the now well accepted evidence that most morphological characters used for the determination of *Scorpio* populations (*e.g.* shape of the hemispermatophore, genital operculum, pectinal plate, etc.) are adequate for the definition of true species (Lourenço, 2009); evidence which is also supported by molecular analyses (*e.g.* Talal *et al*., 2015; Khammassi *et al*., 2023).

Although Fet *et al*. (2000) stated that the type material of *S. trarasensis* was deposited in the University of Toulouse, France (probably since authors were affiliated to the Laboratory of Parasitology of the University of Medicine and Pharmacy of Toulouse), no type deposition was actually stated in the original description. Moreover, the University of Toulouse does not maintain an official research collection meeting criteria as set in Recommendation 72F of ICZN (1999), and after unsuccessful search we have strong reason for believing that the type material is lost. Hence, in accordance with Article 75 of ICZN (1999), and on the basis of new material recently collected 60 km south-east of the type location (around Beni Snous, west of Tlemcen Wilaya, close to the border with Morocco), *S. trarasensis* is redescribed here and a neotype is designated.

Methods

Illustrations and measurements were made with the aid of a Motic DM143 digital stereo-microscope with an ocular micrometer. Habitus photographs were made with a Canon EOS RP and Adobe Photoshop software. Map was made using maps-for-free.com and Adobe Photoshop software. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Vachon (1952) and Hjelle (1990). Material studied herein is deposited in the MNHN (Muséum national d'Histoire naturelle, Paris, France), MHNL (Musée des Confluences (ex Natural History Museum of Lyon), Centre Louis Lortet, Lyon, France), ECWP (Emirates Center for Wildlife Propagation, Missour, Morocco) and EYCP (Eric Ythier Private Collection, Romanèche-Thorins, France).

Taxonomic treatment

Family **Scorpionidae** Latreille, 1802

Genus ***Scorpio*** Linnaeus, 1758

Composition of the genus ***Scorpio*** in Algeria (in order of description):

- *Scorpio maurus* Linnaeus, 1758
- *Scorpio trarasensis* Bouisset & Larrouy, 1962
- *Scorpio punicus* Fet, 2000
- *Scorpio tassili* Lourenço & Rossi, 2016
- *Scorpio atlasensis* Khammassi, Harris & Sadine, 2023
- *Scorpio atakor* Ythier, Sadine, Bengaid & Lourenço, 2024

Fig. 1-2. *Scorpio trarasensis*, male neotype. Habitus, dorsal (1) and ventral (2) aspects. Scale bar = 1 cm.

Scorpio trarasensis Bouisset & Larrouy, 1962 (Figs. 1-9, 12)

Scorpio maurus trarasensis: Pérez, 1974: 40; Kovařík, 2009: 60; Fet *et al*., 2000: 480; Ouici *et al*., 2020: 90-91; Sadine *et al*., 2020: 10; Dupré *et al*., 2023: 9; Khammassi *et al*., 2023: 8-10.
Scorpio trarasensis: Ythier *et al*., 2024: 1-3.

Type material (considered lost). Algeria, north-west of Tlemcen Wilaya, hills around M'Sirda Fouaga, 400-600 m a.s.l. Date unknown (coll. unknown: L. Bouisset or G. Larrouy). 15 ♂♀ (8 adults, 7 juveniles), no type deposition statement, type material considered lost.

Material examined. Algeria, west of Tlemcen Wilaya, around Beni Snous, 900 m a.s.l. (34.632694 -1.577935), 05/VI/2021 (M. El Bouhisi & B. Babali), 1 ♀, EYCP (EY0637). Algeria, west of Tlemcen Wilaya, around Beni Snous, 1220 m a.s.l. (34.560623 -1.642257), 05/VI/2021 (M. El Bouhisi & B. Babali), 1 ♂, EYCP (EY0649). Algeria, west of Tlemcen Wilaya, around Beni Snous, 1220 m a.s.l. (34.560623 -1.642257), 05/VI/2021 (M. El Bouhisi & B. Babali), 1 ♂ neotype (herein designated), MNHN.

Neotype (designated here). Algeria, west of Tlemcen Wilaya, around Beni Snous, 1220 m a.s.l. (34.560623 -1.642257), 05/VI/2021 (M. El Bouhisi & B. Babali), 1 ♂ neotype deposited in the Muséum national d'Histoire naturelle, Paris, France.

Comparative material examined.
Scorpio maurus: Algeria, Souk Ahras, 29/VII/2018 (W. Lourenço leg.), 1 ♂, 1 ♀, EYCP (EY0488). Algeria, Tizi Ouzou Wilaya, Bouzguène, Imsaguène, near Tizouine (36.606079°N 4.507706°E), 10/VIII/2013 (M. Beddek), 1 ♂, EYCP (EY0552). Algeria, Zurich (= Sidi Amar), 1889 (Massard leg.), 2 ♂, 1 ♀, MHNL (44003122).
Scorpio iznassen: Morocco, Guerbous pass, 11/III/1984 (G. Chavanon), 1 ♂ holotype, MHNL (47036249). Morocco, Guerbous pass, 26/II/1984 (G. Chavanon), 1 ♂ paratype, MHNL (47036247). Morocco, Beni Snassen, Tafoughalt (34.84771 -2.33716), 01/VII/2015 (A. François, C. Galkowski & M. Sbai), 1 ♀ paratype (right chela), ECWP (16569).

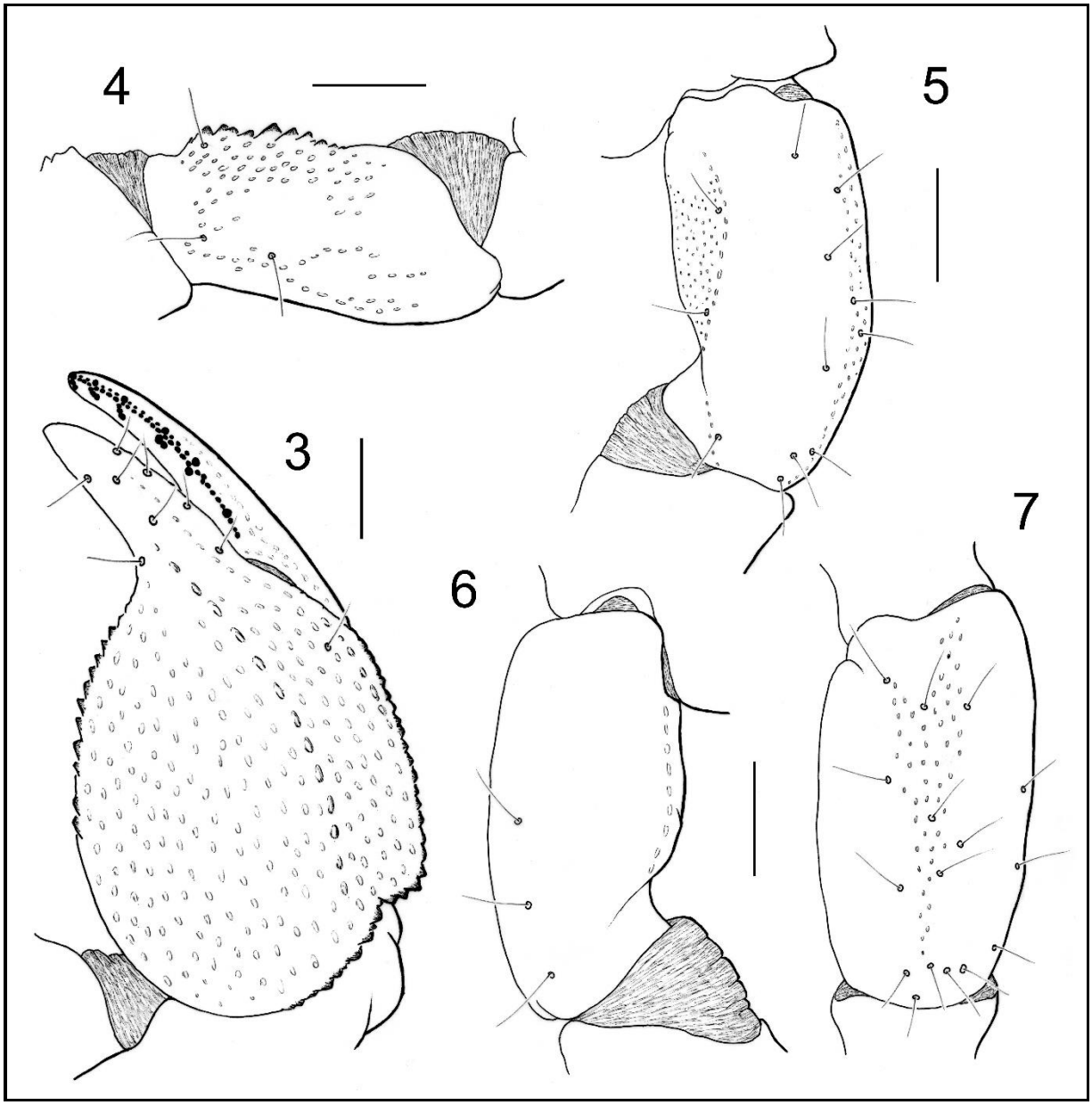

Fig. 3-7. *Scorpio trarasensis*, male neotype, trichobothrial pattern. 3. Chela dorso-external aspect. 4. Femur, dorsal aspect. 5-7. Patella, dorsal (5), ventral (6) and external (7) aspects. Scale bars = 2 mm.

Diagnosis. Scorpion of moderate to large size for the genus, with a total length of 54-68 mm (54 mm for the male neotype). Coloration basically reddish brown to blackish brown. Genital operculum convex anteriorly and posteriorly in male, flattened anteriorly and convex posteriorly in female. Pectinal plate moderately constricted medially, the posterior part slightly narrower than the anterior part; pectines longer than length of third coxa and exceeding distal end of fourth coxa in male, as long as length of third coxa and slightly exceeding distal end of fourth coxa in female; pectinal count 9-12 in males, 9-11 in females. Dorsal surface of chelicera manus at base of fixed finger with the medial macrochaeta much shorter than external ones (half their size). Chela fixed finger internal length shorter than manus ventral length in male, as long as manus ventral length in female. Leg IV tarsus with 8-9 internal and 6-7 external spines. Hemispermatophore somewhat stocky with distal lamina two times longer than the trunk; anterior suture line basal to laminar hook; basal and external hooks starting under the truncal flexure.

Redescription (based on original description and male neotype; measurements of male neotype after the description).

Coloration (in alcohol). Prosoma: carapace reddish brown with diffuse black variegated spots on the entire surface; median and lateral ocular tubercles marked with black pigments. Mesosoma: tergites blackish brown; sternites yellowish brown. Coxapophysis and sternum reddish yellow; genital operculum reddish yellow, pectines yellowish. Metasoma: yellowish brown with blackish pigmentation on surfaces of segments I-IV and on carinae of all segments. Telson yellowish brown with some brownish pigmentation on ventral and lateral surfaces; aculeus reddish at its base and black at its extremity. Chelicerae yellowish brown to reddish brown with blackish variegated spots on the entire surface; fingers yellowish brown with reddish teeth. Pedipalps: femur and patella reddish brown with carinae blackish; chela yellowish brown with carinae and fingers blackish; fingers black. Legs yellowish brown with blackish variegated spots.

Morphology. Carapace acarinate, without any granulations; anterior margin with a strongly pronounced concavity; posterior furrows moderately pronounced; median ocular tubercle in the centre of the carapace; three pairs of lateral eyes; the first two of equal size, the third slightly reduced. Mesosoma: tergites acarinate and minutely granular, coarser on VII. Sternum pentagonal, slightly wider than high. Venter: genital operculum suboval, formed by two plates having a semi-triangular shape; convex anteriorly and posteriorly in male, flattened anteriorly and convex posteriorly in female. Pectinal plate moderately constricted medially, the posterior part slightly narrower than the anterior part. Pectines longer than length of third coxa and exceeding distal end of fourth coxa in male, as long as length of third coxa and slightly exceeding distal end of fourth coxa in female; pectinal tooth count 9-12 in males, 9-11 in females; fulcra strongly developed. Sternites smooth and shiny; VII with four moderately marked carinae; spiracles linear and conspicuous. Metasoma with moderately to strongly marked carinae on segments I to IV; granulation becomes spiniform on segment V; ventral and latero-ventral carinae intensely spinoid on V; all intercarinal surfaces weakly granular. Telson globular and moderately granular on ventral side with four ventral carinae formed by moderate spinoid granules; aculeus shorter than vesicle and moderately curved. Cheliceral dentition characteristic of the Scorpionidae (Vachon, 1963); movable finger with one subdistal tooth and conspicuous basal teeth; dorsal surface of manus at base of fixed finger with the medial macrochaeta much shorter than external ones (half their size). Pedipalps: femur with four incomplete carinae, intercarinal surfaces smooth to moderately granulated; patella with dorsal carina almost complete, intercarinal surfaces smooth to weakly granulated; chela with weakly marked ventral carinae; dorsal carinae moderately marked; dorso-external aspect of the manus coarsely granular. Dentate margin on fixed and movable fingers with a series of granules divided by 5 strong accessory granules; fixed finger internal length shorter than manus ventral length in male, as long as manus ventral length in female. Trichobothriotaxy of type C; orthobothriotaxic (Vachon, 1974); femur with 3 trichobothria, patella with 19 and chela with 26. Legs: tarsus of leg IV with 8-9 internal

and 6-7 external spines arranged in series. Hemispermatophore: somewhat stocky; distal lamina two times longer than the trunk, curved, with terminus not enlarged and ending with a 45° angle; laminar hook apart from lamina, small and almost straight (not curved); anterior suture line basal to laminar hook; basal and external hooks starting under the truncal flexure; median lobe barely distinct from laminar hook.

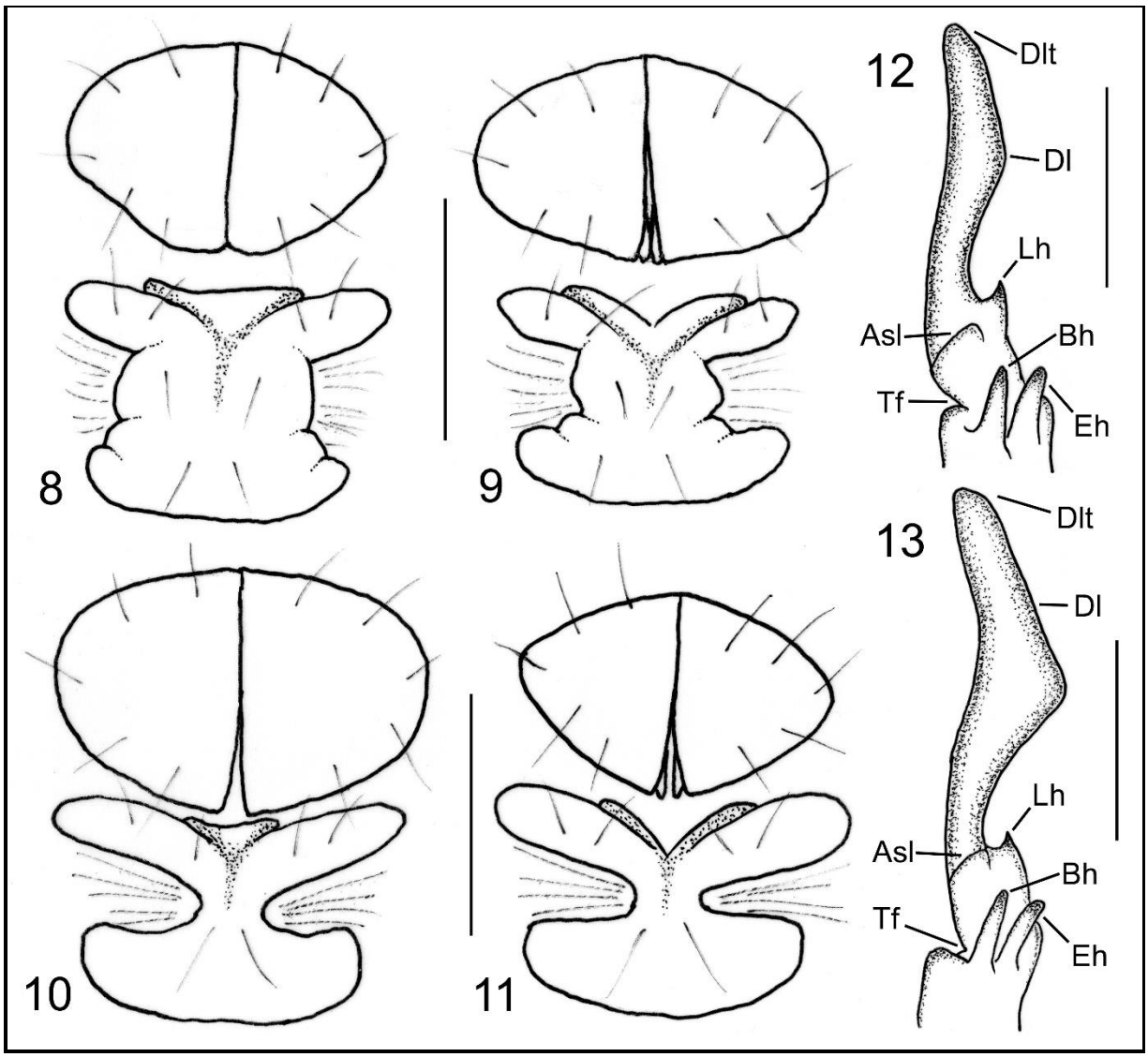

Fig. 8-13. *Scorpio* spp. 8-11. Genital opercula and pectinal plates. 8. *Scorpio trarasensis*, male (8) and female (9). 10-11. *Scorpio maurus*, male (10) and female (11). 12-13. Right hemispermatophore. 12. *Scorpio trarasensis*. 13. *Scorpio maurus*. Scale bars = 2 mm. Dl = distal lamina; Dlt = distal lamina terminus; Lh = laminar hook; Bh = basal hook; Eh = external hook; Asl = anterior suture line; Tf = truncal flexure.

Morphometric values (in mm) of the male neotype. Total length, including telson, 53.7. Carapace: length, 9.06; anterior width, 6.13; posterior width, 8.88. Mesosoma length, 16.0. Metasomal segments. I: length, 3.13; width, 5.13; II: length, 3.75; width, 4.63; III: length, 4.38; width, 4.50; IV: length, 5.00; width, 4.25; V: length, 6.13; width, 3.13; depth, 2.88. Telson length, 6.25; vesicle: width, 3.00; depth, 2.63. Pedipalp: femur length, 6.50, width, 3.00; patella length, 6.88, width, 3.38; chela length, 13.63, width, 5.63, depth, 9.25; movable finger length, 7.50.

Relationships. By its general coloration and its pectinal plate constricted medially, *Scorpio trarasensis* seems to be related to *Scorpio maurus*, distributed on the northern flanks of

Tellian Atlas in Tunisia and eastern Algeria, and *Scorpio iznassen*, distributed in the Beni Snassen mountains in northeastern Morocco (Fig. 22). It can however be distinguished from both species notably by the following main features:

(i) male genital operculum convex anteriorly and posteriorly in male (convex anteriorly and flattened posteriorly in male *S. iznassen*);

(ii) pectinal plate moderately constricted medially (strongly constricted in *S. maurus* and *S. iznassen*);

(iii) male pectines longer than length of third coxa (as long as third coxa in *S. maurus* and only slightly longer than third coxa in *S. iznassen*);

(iv) dorsal surface of chelicera manus at base of fixed finger with the medial macrochaeta much shorter than external ones, *i.e*. about half their size (only slightly shorter in *S. maurus*);

(v) hemispermatophore with distal lamina two times longer than the trunk (three times in *S. maurus*), anterior suture line basal to laminar hook (distal or on same level to laminar hook in *S. maurus*), basal and external hooks starting under the truncal flexure (on same level to truncal flexure in *S. maurus*) (Figs. 12-13).

Fig. 14-17. Some *Scorpio* species from Northern Algeria, alive in their natural habitats. 14. *Scorpio trarasensis* in Beni Snous, Tlemcen Wilaya. 15. *Scorpio punicus* in Youssoufia, Tissemsilt Wilaya. 16. *Scorpio atlasensis* in Frenda, Tiaret Wilaya. 17. *Scorpio touili* in Chellala, Tiaret Wilaya.

Geographic distribution of the genus *Scorpio* in Northern Algeria

Based on its original description and new material examined (Fig. 22), *S. trarasensis* seems to be distributed in the Trara and Tlemcen Massifs, in the western part of the Tellian Atlas of Algeria (Figs. 14, 18). The species is closely related to another dark species, *S. iznassen* which is endemic to

the Beni Snassen Massif, in the Tellian Atlas of north-eastern Morocco, separated from the Trara Massif by the Oued Kiss and from the Tlemcen Massif by the Angad plain. Both species are morphologically more related to *S. maurus*, occurring on the northern flanks of the Tellian Atlas from Tunisia to eastern Algeria, up to Algiers (Vachon, 1952), than to the other dark species occurring in north-western Morocco, namely *S. birulai* Fet, 1997 and *S. hesperus* Birula, 1910. *S. trarasensis* and *S. iznassen* might represent the 'occidental forms' of *S. maurus*. Future field surveys in the Tellian atlas of Algeria might reveal more new species related to *S. maurus*.

S. punicus, a yellowish species described from the central mountains range of Tunisia, seems to be widely distributed in the high plateaus between the Tellian Atlas and the Saharan Atlas, from the Aures Massif to the east up to approximately the region of the Chott Ech Chergui endorheic salt lake to the west (Figs. 15, 19). *S. punicus*, formerly known as *Scorpio maurus tunetanus* Birula, 1910, was generally considered to be widespread on the totality of the high plateaus from Tunisia to Morocco, but recent studies (Khammassi *et al*., 2023; Ythier & François, 2023) showed that it was rather a complex of species, with two 'occidental forms' of *S. punicus* being described, namely *S. atlasensis* described from Ras El Ma in the high plateaus in the south-east of the Tlemcen Massif and more recently collected in the region of the Chott Ech Chergui lake (Figs. 16, 20), and *S. touili* distributed in the high plateaus of the Oriental region of Morocco and recently collected in the eastern high plateaus of Algeria (Figs. 17, 21). The distribution ranges of these three species most certainly present sympatric zones. The high plateaus of Morocco are bordered to the west by the Moulouya river basin where occurs *S. moulouya* Ythier & François, 2023, a brownish species related to both *S. touili* and *S. fuliginosus* (Pallary, 1928) from the High Atlas flanks.

The specific status of the yellowish *Scorpio* population from the Great Eastern Erg, *e.g.* from the Wilayas of Ouargla and El Oued (Sadine, 2012; Sadine *et al*., 2011, 2018; Dupré *et al*., 2023) would need confirmation (Fig. 22).

Fig. 18-21. Natural habitats of some *Scorpio* species in Northern Algeria. 18. Beni Snous, Tlemcen Wilaya, habitat of *Scorpio trarasensis*. 19. Youssoufia, Tissemsilt Wilaya, habitat of *Scorpio punicus*. 20. Frenda, Tiaret Wilaya, habitat of *Scorpio atlasensis*. 21. Chellala, Tiaret Wilaya, habitat of *Scorpio touili*.

Key to the identification of known *Scorpio* species from Northern Algeria

This key must be considered as susceptible to possible exceptions; hence it is to be used with caution and should not be the only tool for identifying a specimen. Species of the genus *Scorpio* are generally morphologically very similar and original descriptions should also be consulted. The structure of the hemispermatophore is a key diagnostic character which should also preferably be studied.

1. Dark coloration (reddish brown to blackish brown) 2
– Pale coloration (yellowish to yellowish brown) 4
2. Pectinal plate strongly constricted medially ..... *Scorpio maurus*
– Pectinal plate moderately constricted medially ..... *Scorpio trarasensis*
4. Dark triangular zone on carapace and median dark line on mesosoma ..... *Scorpio atlasensis*
– Carapace and mesosoma without delimited darker pigmentation 5
5. Female genital operculum plate flattened anteriorly ..... *Scorpio punicus*
– Female genital operculum plate convex anteriorly ..... *Scorpio touili*

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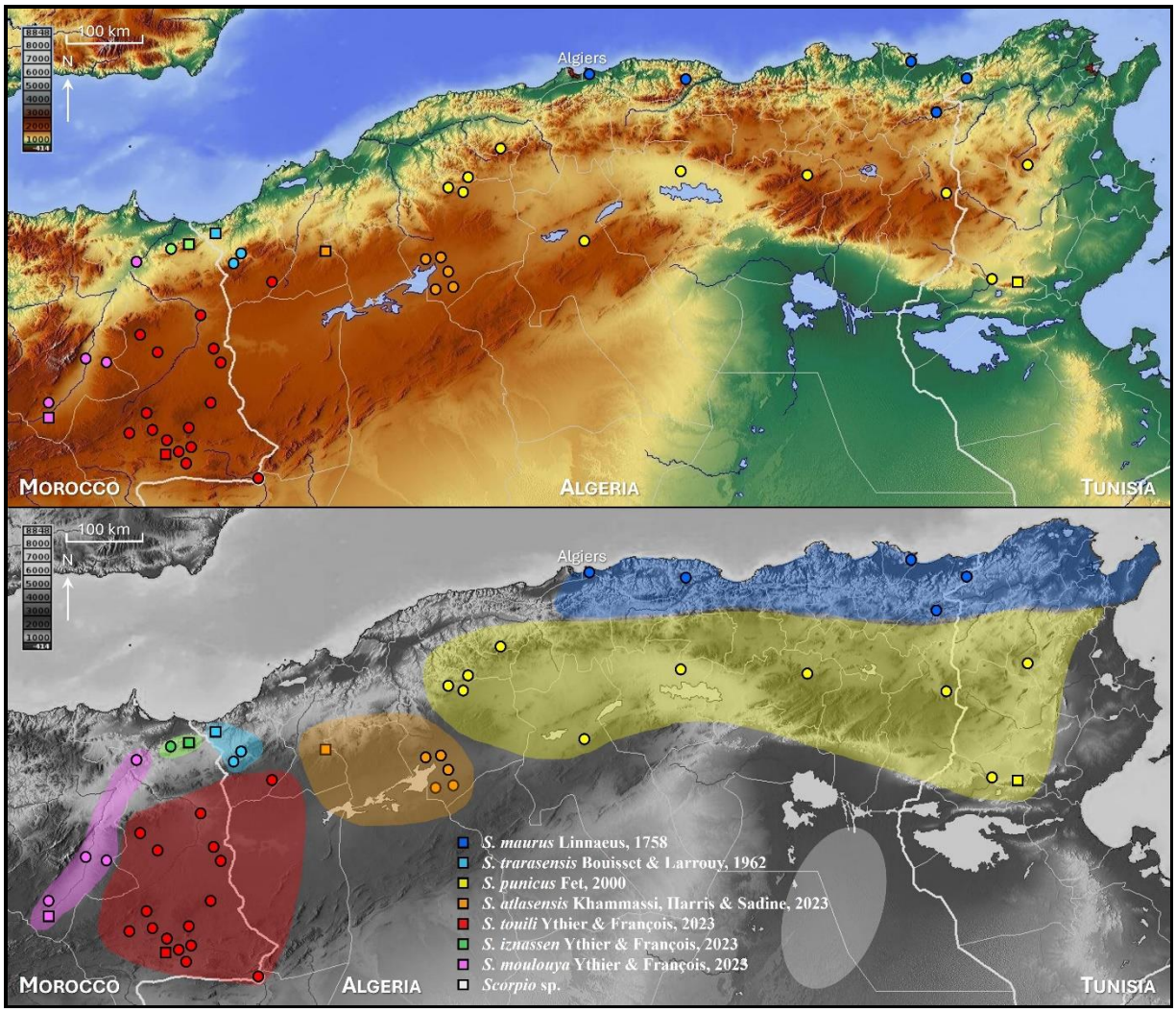

Fig. 22. Topographic maps of Northern Africa, showing the approximate supposed distribution of the *Scorpio* species discussed in this work, based on material examined (dots) and literature. Squares are type localities for each species (approximate for *S. punicus* (central mountains range of Tunisia), no type location for *S. maurus*).

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SOMMAIRE

Photo de couverture : Scan des planches originales de M. Gaillard, publiées dans Vachon, 1952 : pinces de *S. m. maurus* Linnaeus, 1758 et *S. m. tunetanus* Birula, 1910 (= *S. punicus* Fet, 2000).

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