



Confirmation of a new species of *Scorpio* Linnaeus, 1758 in the Tassili N'Ajjer Mountains, South Algeria (Scorpiones: Scorpionidae)

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Abstract. In recent publications about the genus *Scorpio* Linnaeus, 1758, it was suggested that the population previously cited from the Tassili N'Ajjer Mountains in the South of Algeria, could represent a distinct species. Intensive investigation in the collections of the Natural History Museum in Paris, led to the location of the only known specimen collected by F. Bernard in 1949. The present study of this female specimen confirms its position as a new species of *Scorpio* and, curiously, shows that the Tassili N'Ajjer population seems to have more affinities with *S. niger* Lourenço & Cloudsley-Thompson, 2012 known from Niger than to *S. punicus* Fet, 2000, distributed in the high plateaus of Tunisia and North of Algeria. The new species is described here and, as in previous studied cases, the Saharan Massifs prove to be very important endemic centres within the Sahara desert.

Riassunto. Conferma di una nuova specie di *Scorpio* Linnaeus, 1758 nei monti Tassili N'Ajjer, nell'Algeria meridionale (Scorpiones: Scorpionidae). In recenti pubblicazioni relative al genere *Scorpio* Linnaeus, 1758, veniva suggerito che la popolazione precedentemente citata dai monti Tassili N'Ajjer, nell'Algeria meridionale, potesse rappresentare una specie distinta. Una serrata ricerca nelle collezioni del Museo di Storia Naturale di Parigi, ha portato al ritrovamento del solo esemplare conosciuto, raccolto da F. Bernard nel 1949. Il presente studio di questo esemplare femmina conferma la sua posizione come una nuova specie di *Scorpio* e, curiosamente, mostra che la popolazione di Tassili N'Ajjer sembra avere più affinità con *S. niger* Lourenço & Cloudsley-Thompson, 2012 noto del Niger che con *S. punicus* Fet, 2000, distribuito negli alti tavolati di Tunisia ed Algeria settentrionale. La nuova specie viene qui descritta e, come in precedenti casi studiati, i massicci Sahariani dimostrano di essere centri di endemismo molto importanti all'interno del deserto del Sahara.

ملخص. إثبات وجود نوع جديد من *Scorpio* Linnaeus, 1758 في جبال تاسيلي ناجر ، جنوب الجزائر (Scorpiones: Scorpionidae). في مطبوعات حديثة عن جنس *Scorpio* Linnaeus, 1758 تم اقتراح أن جماعة العقارب السابق ذكرها من جبال تاسيلي ناجر في جنوب الجزائر يمكن أن تشكل نوعاً مستقلاً. وقد أدى البحث المكثف في مجموعات متحف التاريخ الطبيعي في باريس إلى موقع العينة الوحيدة المعروفة والتي جمعها ف. برنار سنة 1949. وتؤكد الدراسة الحالية لهذه العينة الأنثى منزلتها كنوع جديد من *Scorpio* وتشير إلى وجود المزيد من صلات القرابة بين جماعة تاسيلي ناجر و *S. niger* Lourenço & Cloudsley-Thompson, 2012 المعروف من النيجر عنها مع *S. punicus* Fet, 2000 المنتشر في السهول المرتفعة في تونس وشمال الجزائر. تم وصف النوع الجديد هنا ، وتثبتت نجود الصحراء - متلماً في الحالات السابق دراستها - أنها مراكز استيطان بالغة الأهمية في الصحراء الكبرى.

Résumé. Confirmation d'une nouvelle espèce de *Scorpio* Linnaeus, 1758 des montagnes du Tassili N'Ajjer, dans le sud de l'Algérie (Scorpiones: Scorpionidae). Dans des publications récentes sur le genre *Scorpio* Linnaeus, 1758, il a été suggéré que la population citée précédemment des montagnes du Tassili N'Ajjer dans le sud de l'Algérie, pourrait représenter une espèce distincte. Des recherches approfondies dans les collections du Muséum d'Histoire Naturelle de Paris ont permis de localiser le seul spécimen connu, récolté par F. Bernard en 1949. L'étude de cette femelle confirme son appartenance à une nouvelle espèce de *Scorpio* et, curieusement, démontre que la population du Tassili N'Ajjer paraît avoir plus d'affinités avec *S. niger* Lourenço & Cloudsley-Thompson, 2012, connu du Niger, qu'avec *S. punicus* Fet, 2000, répandu sur les hauts plateaux de Tunisie et du nord de l'Algérie. La nouvelle espèce est décrite et, comme dans de précédentes études, les massifs montagneux du Sahara se révèlent être de très importants centres d'endémisme au sein du Sahara.

Key words. Scorpion, *Scorpio*, new species, Tassili N'Ajjer Mountains, Algeria.

Introduction

As already stated in previous publications (LOURENÇO, 2009; LOURENÇO & CLOUDSLEY-THOMPSON, 2009, 2012; LOURENÇO *et al.*, 2012), reinvestigation of the taxonomic position of several species of the genus *Scorpio* Linnaeus, 1758, based on a number of characters already defined by VACHON (1952), confirmed that these were valid species. Using this approach, eight forms or subspecies were raised to the rank of species. New species were also described: *Scorpio savanicola* Lourenço, 2009, *Scorpio sudanensis* Lourenço & Cloudsley-Thompson, 2009, *Scorpio niger* Lourenço & Cloudsley-Thompson, 2012 and *Scorpio ennedi* Lourenço, Duhem & Cloudsley-Thompson, 2012. For the first time, *Scorpio* species were reported from beyond the Saharan region.

The initial decision taken by LOURENÇO (2009) of raising several forms or subspecies of *Scorpio* to the rank of species was received with scepticism by a number of authors (several reactions *in litteris*). Nevertheless, in the recent paper by TALAL *et al.* (2015), using more sophisticated molecular methods, followed the same analysis, previously started by LOURENÇO (2009) and concluded about the need of raising some Middle East subspecies of *Scorpio* to the rank of species.

In their analysis about some *Scorpio* species characterized by their pale coloration, e. g. *Scorpio tunetanus* Birula, 1910 (now *Scorpio punicus* Fet, 2000), *Scorpio occidentalis* Werner, 1936, *Scorpio savanicola* Lourenço, 2009 and *Scorpio niger* Lourenço & Cloudsley-Thompson, 2012, LOURENÇO & CLOUDSLEY-THOMPSON (2012) suggested that all these species were possible members of a single group, which originated from a common ancestor, but presently occupy distinct regions of distribution. The range of distribution of *S. punicus* appears to be limited to the high plateaus of Tunisia and North of Algeria (VACHON, 1952, 1958), whereas the other three species are distributed much further to the South, in the Sahel region. In a paper about the scorpions collected in the Mountains of the Tassili N'Ajjer in the south of Algeria, VACHON (1958) referred to one female specimen of '*Scorpio maurus*' but rejected, however, the possibility of any more precise determination. During the study of *Scorpio niger*, LOURENÇO & CLOUDSLEY-THOMPSON (2012) were not able to locate the specimen studied by VACHON (1958), or other specimens collected in the same region, but suggested, however, that the future studies of *Scorpio* specimens from Tassili N'Ajjer, should reveal yet another distinct species of this group. Very recently, the senior author was able to locate the female specimen of *Scorpio* reported by VACHON (1958) in the collections of the Museum in Paris. The present study of this specimen confirms its position as a new species of *Scorpio*, and curiously shows that this population seems to have more affinities with *S. niger*, known from Niger, than to *S. punicus* distributed in the high plateaus of Tunisia and North of Algeria. The new species is described here.

Methods

Illustrations and measurements were made with the aid of a Wild M5 stereo-microscope with a drawing tube (camera lucida) and an ocular micrometer. Measurements follow STAHNKE (1970) and are given in mm. Trichobothrial notations follow VACHON (1974) and morphological terminology mostly follows VACHON (1952) and HJELLE (1990).

Taxonomic treatment

Family Scorpionidae Latreille, 1802

Genus *Scorpio* Linnaeus, 1758

***Scorpio tassili* sp. n.** (Figs 1-6, 8-15).

Type material: 1 female, holotype, Algeria, Tassili N'Ajjer (st. 50), Oasis d'Iherir, 1060 m, 27/IV/1949 - 2/V/1949 (F. Bernard). Deposited in the Museum national d'Histoire naturelle, Paris, RS-3041.

Etymology: The specific name is placed in apposition to the generic name and refers to the region in which the new species was found.

Diagnosis: Scorpion of moderate to large size compared with the genus. Female reaching 48.8 (54.5, including telson) mm in total length. Coloration, basically light yellow to reddish-yellow, with dusty markings on the centre of carapace; chelicerae without any variegated spots. Mesosoma almost smooth and lustrous, with sparse granulations on lateral sides of tergites. Pedipalps, with weak to moderate carinae; chela manus strongly flattened with moderately marked granules on dorso-external aspect. Telson globular and strongly granulated, with spinoid granules ventrally. Pectines moderately narrowed with 10-10 teeth. Trichobothriotaxy of type C, orthobothriotaxic. Genital operculum plate with an almost hexagonal shape and strongly emarginated at the base.

Relationships: *Scorpio tassili* sp. n. seems to be more closely related to *Scorpio niger* Lourenço & Cloudsley-Thompson, 2012, a species described from the nearby Niger, than to other species of *Scorpio* with a pale coloration. Both species can, however, be distinguished by a number of features: (i) the new species is globally yellow, but with some dusty markings in the centre of carapace; chelicerae without any variegated spots (Figs 6, 7), (ii) pedipalps have better marked carinae and granulations, (iii) genital operculum plate with an almost hexagonal shape and strongly emarginated at the base, (iv) tarsi of legs I to IV with 8-5/7-5: 9-5/8-5: 9-7/9-6: 8-7/9-7 internal and external spines, (v) quite distinct morphometric values - see Table 1.

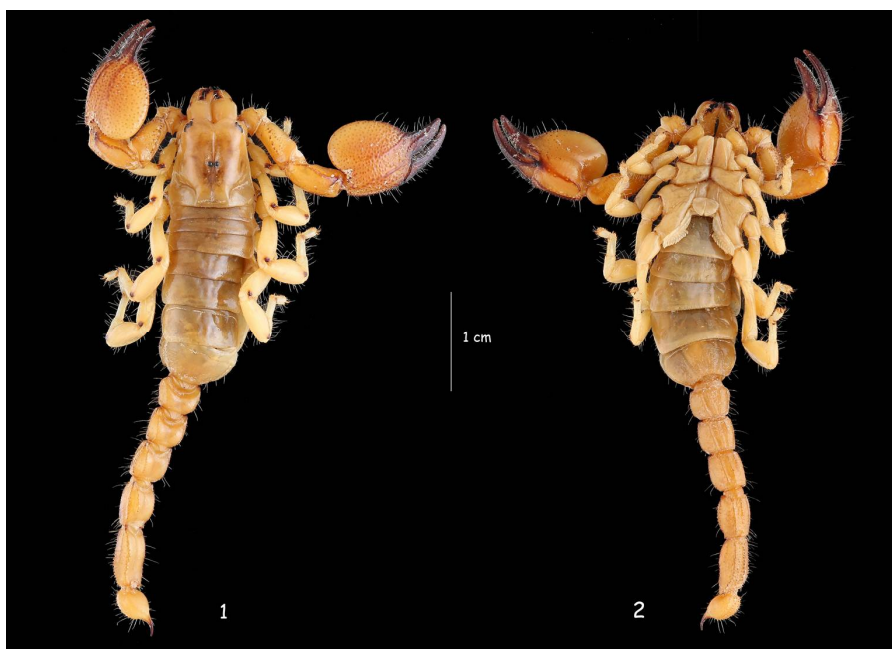
Description: Based on female holotype. Measurements in Table 1.

	<i>Scorpio savanicola</i> ♀ paratype	<i>Scorpio niger</i> ♀ holotype	<i>Scorpio tassili</i> sp. n. ♀ holotype
Total length	51.1 (56.5*)	40.9 (45.6*)	48.7 (54.5*)
Carapace:			
length	8.7	7.9	9.2
anterior width	6.0	5.4	6.0
posterior width	9.2	8.4	9.0
Mesosoma length	21.7	14.6	18.2
Metasomal segment I:			
length	2.9	2.6	3.3
width	4.7	4.2	4.7
Metasomal segment V:			
length	5.8	4.9	6.2
width	3.0	2.9	3.2
depth	2.8	2.6	2.6
Telson:			
length	5.4	4.7	5.8
width	2.7	2.4	2.8
depth	2.3	2.0	2.7
Pedipalp:			
Femur length	4.8	4.5	5.3
Femur width	2.9	2.3	2.8
Patella length	5.9	5.5	6.2
Patella width	3.0	2.7	3.1
Chela length	12.4	11.2	12.5
Chela width	4.6	4.4	4.2
Chela depth	7.6	6.8	7.7
Movable finger: length	7.0	6.0	6.8

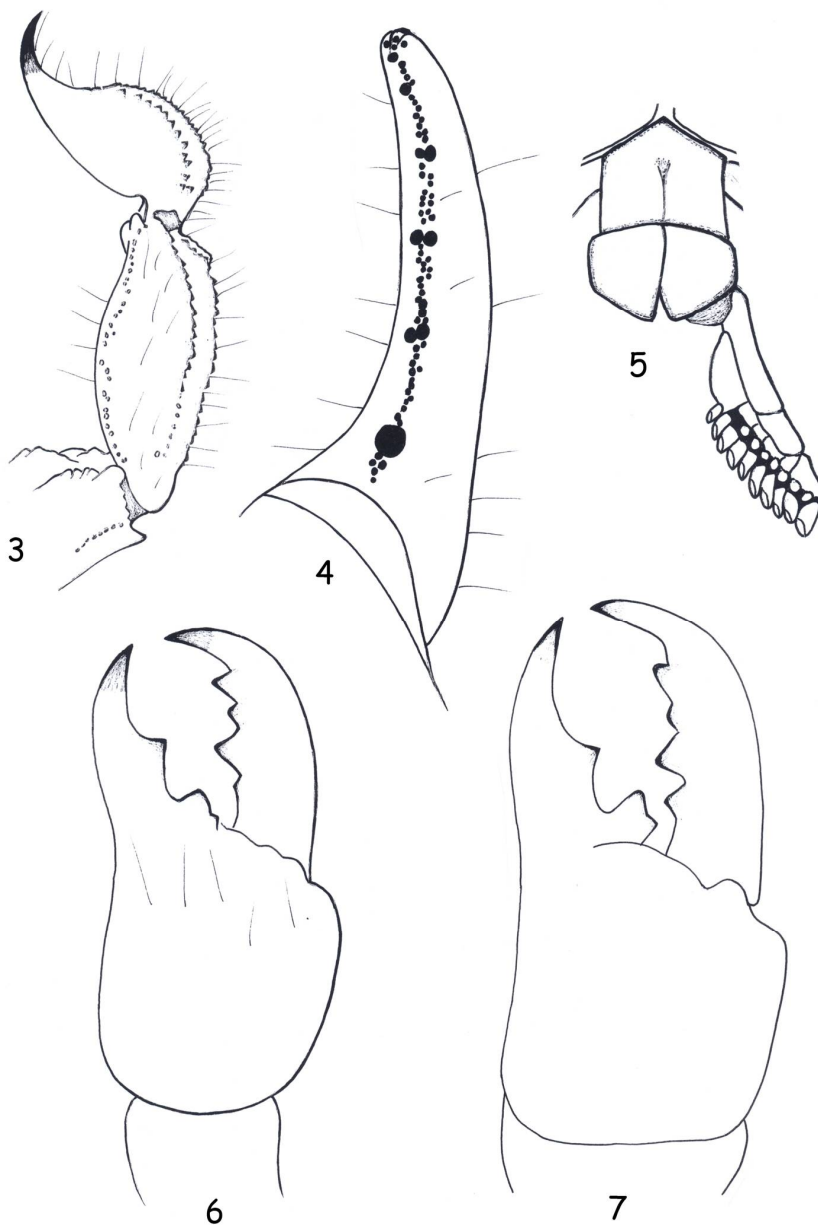
Table 1. Morphometric values (in mm) of the ♀ paratype of *Scorpio savanicola*, the ♀ holotype of *Scorpio niger* and the ♀ holotype of *Scorpio tassili* sp. n.; * including telson length.

Coloration. Body basically light yellow to reddish-yellow. Prosoma: carapace reddish-yellow with dusty markings in its centre; some blackness near the eyes. Mesosoma: tergites yellow, as the carapace with some diffused dustiness; sternites yellow to pale yellow. Coxapophysis and sternum yellow; genital operculum and pectines pale yellow. Metasoma: all segments yellow, with carinae slightly reddish. Telson yellow; aculeus yellow at the base and dark reddish at the extremity. Chelicerae yellow without any variegated spots; fingers yellow with reddish teeth. Pedipalps: femur and patella yellow; chela reddish-yellow with dark red fingers; dentate margins of fingers dark. Legs pale yellow.

Morphology. Carapace acarinate without any granulations and smooth; anterior margin with a moderately to strongly pronounced concavity; posterior furrows moderately pronounced; median ocular tubercle distinct 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 smooth (lustrous) with sparse granulation only on lateral sides. Sternum pentagonal, slightly wider than high. Venter: genital operculum plate with an almost hexagonal shape, strongly emarginated at the base. Pectines moderately narrowed; pectinal tooth count 10-10; fulcra strongly developed. Sternites smooth and shiny; VII with four weakly 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 strongly granular with four ventral carinae formed by strong 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. Pedipalps with weak granulations; femur with four incomplete carinae; patella with dorsal carina almost complete; chela with weakly marked ventral carinae; dorsal carinae moderately marked; dorso-external aspect of the manus moderately granular. Dentate margin on fixed and movable fingers with a series of granules divided by 3 or 4 strong accessory granules. Trichobothriotaxy of type C; orthobothriotaxic (VACHON, 1974); femur with 3 trichobothria, patella with 19, and chela with 26. Legs: tarsi of legs I to IV with 8-5/7-5: 9-5/8-5: 9-7/9-6: 8-7/9-7 internal and external spines arranged in series.



Figs 1-2. *Scorpio tassili* sp. n. female holotype. Habitus. 1. Dorsal aspect. 2. Ventral aspect.



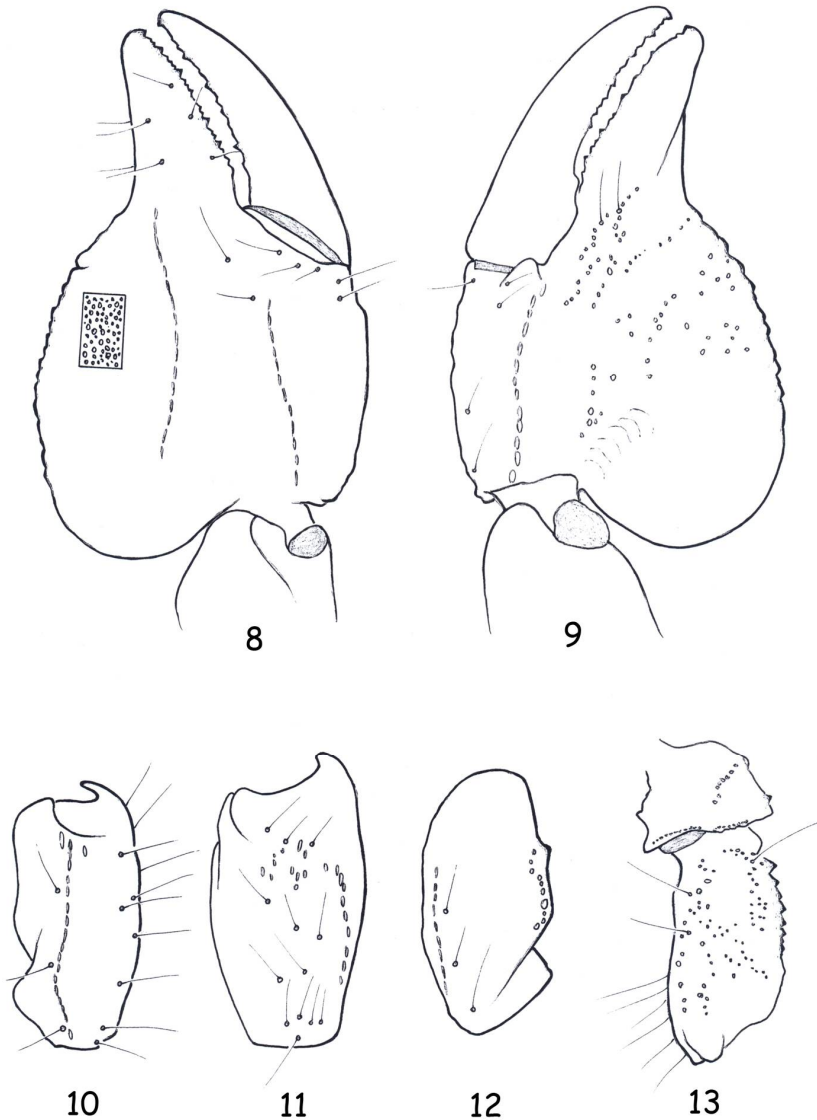
Figs 3-7. 3-6. *Scorpio tassili* sp. n. female holotype. 3. Metasomal segment V and telson, lateral aspect. 4. Dentate margin of movable finger with rows of granules. 5. Ventral aspect, showing sternum, genital operculum and pecten. 6. Chelicera, dorsal aspect. 7. Chelicera, dorsal aspect of *Scorpio niger*, female holotype.

Ecological comments

In his description of the several ecological environments in the Tassili N°Ajjer Mountains, BERNARD (1953) refers to the Iherir oasis as follows: "zone covered by a sandy soil, with numerous cultivated

palm trees. The altitude of the site ranges from 1000 to 1200 m. Nocturnal hunt with lamps allowed the collection of thousands of insects, mainly Coleoptera. The Iherir is therefore a quite unique site in the Sahara for the study of relictual species. The site seems to be more or less diverse in Arachnids.” [translated].

The new species of *Scorpio* is undoubtedly one more endemic element to a Saharan Massif.



Figs 8-13. *Scorpio tassili* sp. n. female holotype. Trichobothrial pattern. 8-9. Chela, dorso-external and ventro-internal aspects (the small rectangular zone illustrates the general granulation). 10-12. Patella, dorsal, external and ventral aspects. 13. Femur, dorsal aspect.

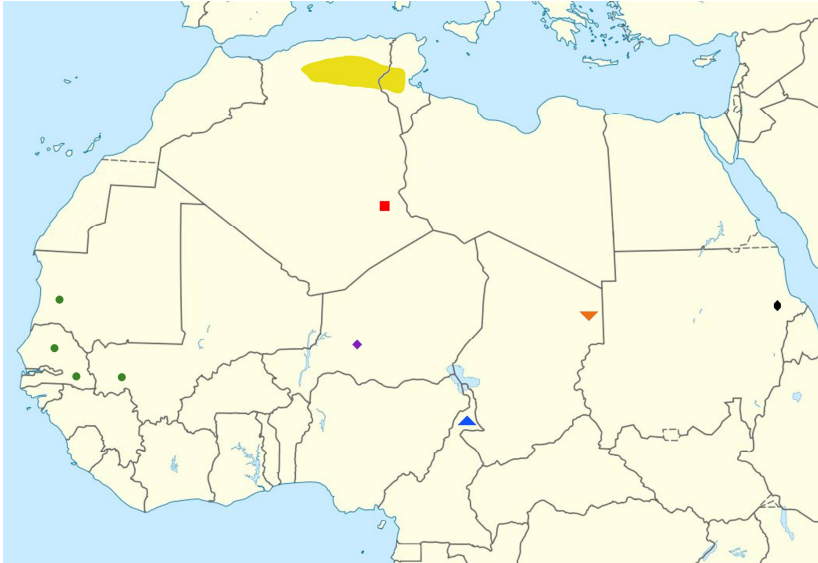


Fig. 14. Map of Africa with the known distribution of *Scorpio punicus* (= *Scorpio tunetanus*) (yellow zone); *Scorpio occidentalis* (green circles); *Scorpio savanicola* (blue triangle); *Scorpio niger* (purple rhombus), *Scorpio ennedi* (inverted orange triangle), *Scorpio sudanensis* (black hexagon) and *Scorpio tassili* sp. n. (red square).

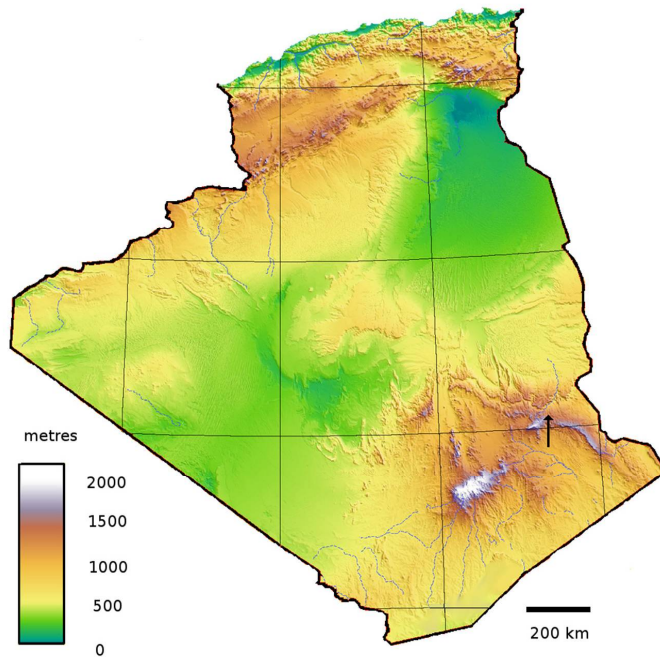


Fig. 15. Altitude map of Algeria with the type locality of *Scorpio tassili* sp. n. indicated by a black arrow.

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