

Further taxonomic considerations on the Northwestern African species of *Buthacus* Birula (Scorpiones, Buthidae), and description of two new species

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Abstract

The species of the genus *Buthacus* Birula, in particular those distributed in Northwestern Africa are considered. The existence of a "*leptochelys*-complex" is discussed once again. Three species from Northwestern Africa can be placed in this complex: *Buthacus occidentalis* Vachon, 1953 from Mauritania, *B. zieglerei* Lourenço, 2000, from the central Atlas in Morocco, and *B. huberi* sp. n. from the extreme south of Mauritania. Two other species from Senegal, *B. villiersi* Vachon, 1949 from M'bao, and *B. clevai* sp. n. from Linguéré, which do not belong to the complex, are also considered in this paper.

Introduction

The genus *Buthacus* was erected by Birula, 1908 as a subgenus of *Buthus* Leach, 1815 having as type species *Buthus leptochelys* (Ehrenberg, 1829), originally described from Sinai and Palestine as *Androctonus (Leiurus) leptochelys*. Since its creation, *Buthacus* has been considered to be a subgenus or a genus according to different authors. It was finally defined as a valid genus related to *Buthus* by Vachon (1952).

In his monograph on the North African scorpions, Vachon (1952) discussed the very wide distribution of the genus *Buthacus*, which ranges from the Atlantic coastal region of Africa to Palestine. He also drew attention to the fact that it was impossible at that stage of his work to be sure about the precise composition of this genus. Vachon established, however, that four species could be diagnosed precisely within the genus *Buthacus*: *B. foleyi* Vachon, 1948 and *B. villiersi* Vachon, 1949, respectively, from the south of Algeria and from Senegal, *B. leptochelys* and *B. arenicola* (Simon, 1855) from North Africa and the Middle East. He also suggested that *B. leptochelys* and *B. arenicola* might represent two complexes of forms or subspecies. In his systematic remarks about *B. arenicola* and *B. leptochelys*, Vachon (1952) also indicated his doubts about the real status of the different sub-populations found in North and Northwestern Africa, from Egypt to Mauritania and Morocco. He considered that several forms (or species) could well be present in the distribution of the genus in Africa.

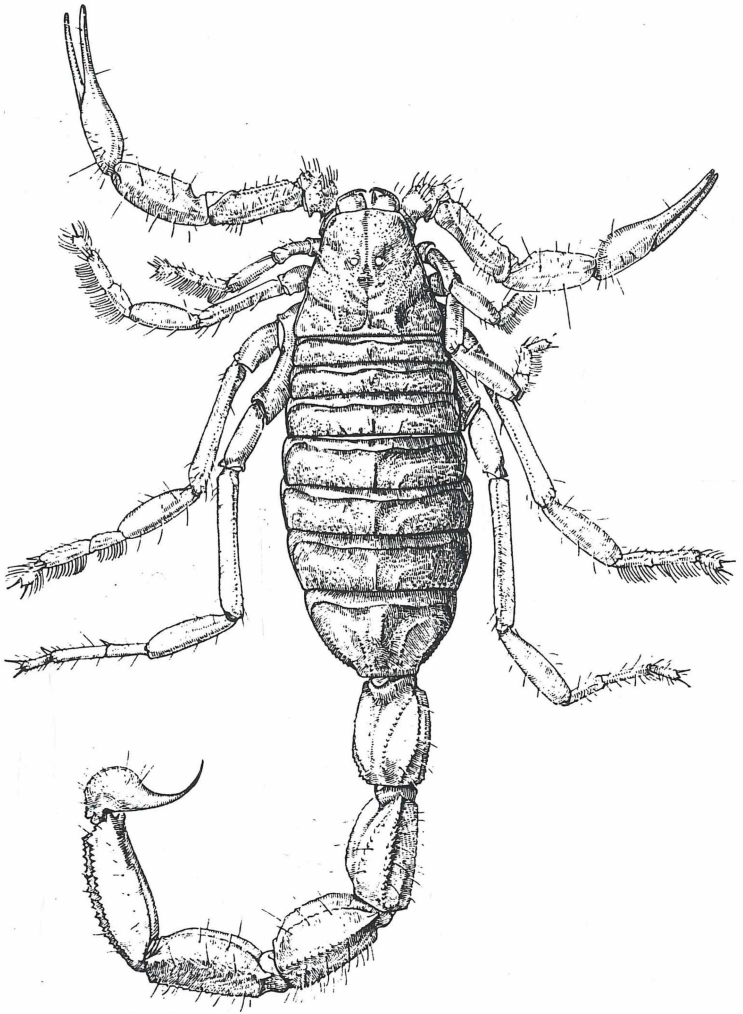


Fig. 1. *Buthacus huberi* sp. n., holotype ♀.

In their "Fauna Palaestina", Levy and Amitai (1980) also attempted to divide the genus *Buthacus* in two groups, mainly on the basis of the structure of dentition of the chela movable finger. These authors also discussed the difficulties in formulating a precise definition of several forms. They stated: "These groups could be further divided according to other characters, however, the definite position of several forms from North Africa is still uncertain".

In a paper on the scorpions of Mauritania, Vachon (1953) described a new subspecies, *B. leptochelys occidentalis*, but he did not indicate type specimens for it precisely. He merely listed the material studied, from several localities in Mauritania: Fort Gouraud, Chinguetti, Akjoujt and Aïoun Lebgar. In his taxonomic remarks he also mentioned some specimens from the south of Morocco (Tiznit and Draa), which he referred to as *B. l. occidentalis*, but with some hesitations because he wrote: "Mais une fois encore, il nous faut insister sur les difficultés de classement des "formes" à l'intérieur d'une même espèce." At least part of this material has been lost, and I have not been able to examine specimens from the south of Morocco.

A recent comparative study of an adult male collected in the central Atlas in Morocco and of some specimens of *B. leptochelys occidentalis* deposited in the collections of the Natural History Museum in Paris, have led to the recognition of a new species, *B. ziegléri* Lourenço, 2000, and to the upgrading of *B. l. occidentalis* to the rank of species (Lourenço 2000). The description of this new species strongly suggests that Vachon's opinion was correct in the sense that *B. leptochelys* represents in fact not one species but a complex of species. Here another new species from the extreme south of Mauritania, also belonging to the "*leptochelys*-complex", is described. Two other species from Senegal, *B. villiersi* Vachon from M'bao, and *B. clevai* sp. n. from Linguéré, which do not belong to the complex, are also considered in this paper.

Buthacus huberi sp. n.

(Figs 1, 4 - 9)

TYPE MATERIAL: Holotype, female. Mauritania, south of Aftout, 2 August 1994, L. Tarzalet leg. Deposited in the Zoologisches Museum Hamburg, Germany (ZMH Acc. No. A23/01).

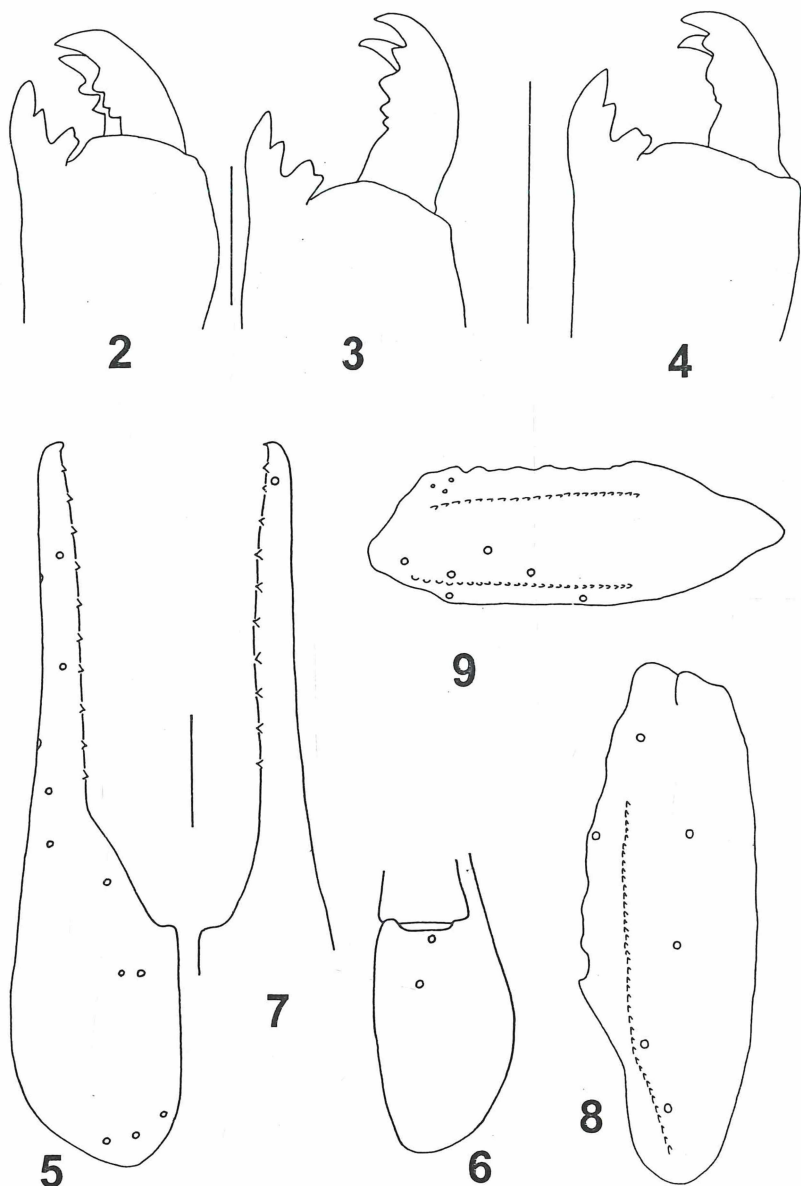
PARATYPE: female; same locality and collection data (ZMH Acc. No. A24/01).

ETYMOLOGY: Patronym in honor of M. Dietmar Huber, Göfis, Austria, for his continued interest in the study of scorpions.

D i a g n o s i s. Median sized, pale-yellow *Buthacus*. Basal denticles of the movable fingers of the chelicerae extremely reduced, almost fused. Pectinal tooth counts 28-28 in females; in males it should range from 30-33.

D e s c r i p t i o n (based on female holotype; morphometric measurements in Table I).

C o l o r a t i o n. Generally pale yellow without any spots or pigmented zones on the body and its appendages. Prosoma: carapace yellowish, only the eyes surrounded by black pigment. Mesosoma: yellowish; tergites I-VII with a central depigmented zone.



Figs 2-9. Chelicerae (2-4): **2, 3-** *Buthacus occidentalis* (σ and f , respectively); **4-** *Buthacus huberi* sp. n. (holotype f); **Figs 5-9,** trichobothrial pattern of *B. huberi* sp. n. (holotype f): **5, 6-** chela, external and ventral aspect; **7-** fixed finger, internal aspect; **8-** tibia, dorsal aspect; **9-** femur, dorsal aspect (scale bars = 1 mm).

Metasoma: all segments yellowish. Vesicle yellowish; aculeus yellowish at the base and reddish at its extremity. Venter pale yellow. Chelicerae yellowish; teeth reddish. Pedipalps: yellowish overall; rows of granules on the dentate margins of the fingers reddish. Legs yellowish.

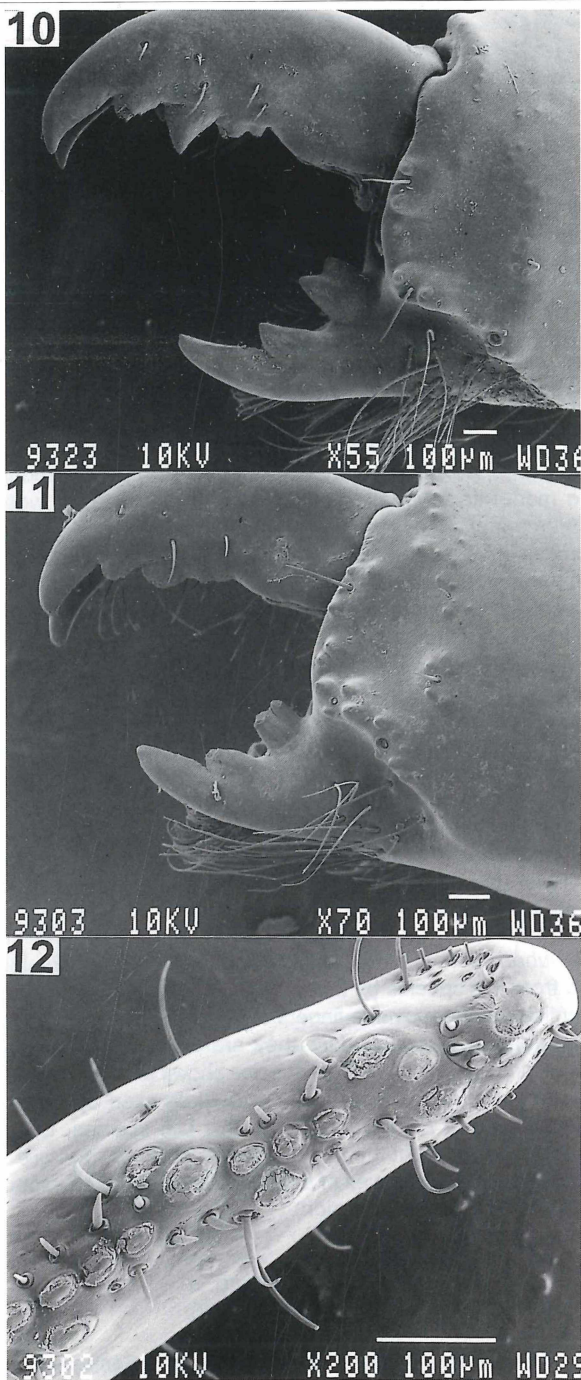
M o r p h o l o g y. Prosoma: Anterior margin of carapace not emarginate, straight. Carapace carinae weakly developed; central median and posterior median carinae weak; anterior median carinae obsolete; central lateral and central median weak. All furrows weak to obsolete. Intercarinal spaces very weakly granular, almost smooth. Median ocular tubercle only slightly anterior to the center of the carapace; median eyes separated by more than one ocular diameter. Five pairs of lateral eyes; the first four disposed in one line, the fifth situated anteriorly, just next to eye three. Mesosoma: Tergites I-VI tricarinate; all carinae very weak. Tergite VII pentacarinate, with lateral pairs of carinae moderate to weak; median carinae moderate to weak, present on proximal half. Intercarinal spaces weakly granular, almost smooth. Sternites: carinae absent from sternites III-VI; moderate to weak on VII. Pectines long; pectinal tooth count 28-28 (28-27 on paratype). Metasoma: Segments I-II with 10 keels; III-IV with 8 keels. Ventral carinae vestigial on segment I; weak on segments II-IV. Segment V with 5 keels; the ventral and latero-ventral armed with spinoid granules. Dorsal furrows of all segments weakly developed, smooth; intercarinal spaces very weakly granular, almost smooth. Telson smooth. Aculeus very long; subaculear tubercle absent. Chelicerae, with two very reduced and almost fused basal denticles on the movable finger (Vachon 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (Vachon 1974); dorsal trichobothria of femur in *beta* configuration (Vachon 1975). Femur pentacarinate; all carinae moderately crenulate. Tibia and chelae with vestigial carinae only. Dentate margins on fixed and movable fingers composed of 8/9 almost linear rows of granules, separated by stronger accessory granules. Legs: ventral aspect of tarsi with numerous thin long setae. Tibial spurs present on legs III-IV but somewhat reduced. Pedal spurs present, moderate to strong on all legs.

R e m a r k s: *B. huberi* sp. n. is most closely allied to *B. occidentalis*. It can, however, be distinguished from this species by the following characters: (A) in the new species the two basal denticles of the movable fingers of the chelicerae are extremely reduced, almost fused, whereas in *B. occidentalis* they are well separated and moderate to strong; (B) pectinal tooth counts in the new species shows a larger number of teeth than their number found in the specimens of *B. occidentalis* cited by Vachon (1953): 28, against 20-25 in females of *B. occidentalis*. In this last species, the most common number is 21. Taking into account the fact that males of *B. occidentalis* show pectinal tooth counts ranging from 26-29, males of *B. huberi* sp. n. would be expected to present values ranging from 30-33 (see discussion).

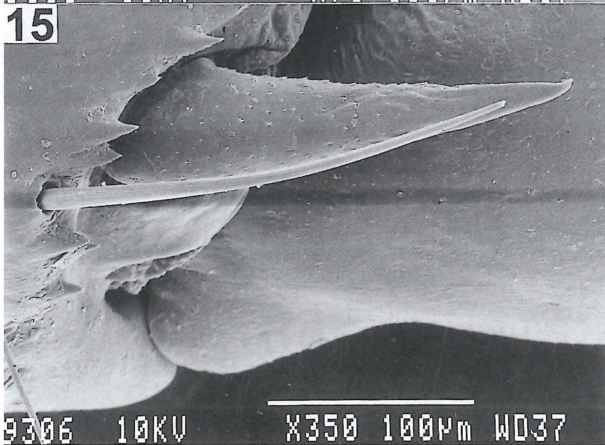
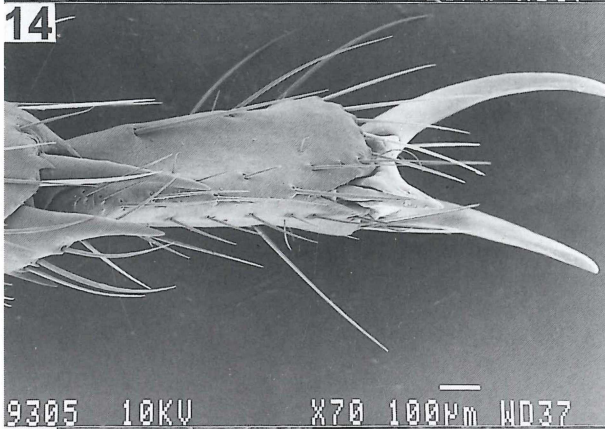
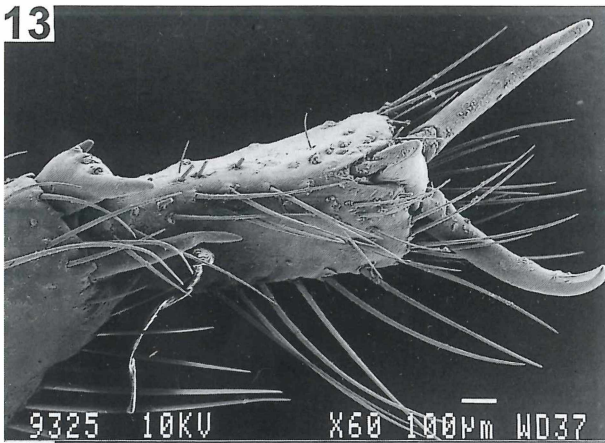
Buthacus clevai sp. n.
(Figs 11 - 12, 14 - 22)

TYPE MATERIAL: Holotype, female. Senegal, Linguéré, 29 September 1994 (L. Tarzalet leg.). Deposited in the Zoologisches Museum Hamburg, Germany (ZMH Acc. No. A25/01).

PARATYPES: adult male, 3 juveniles (male and 2 females); same locality and collection data (ZMH Acc. No. A26/01).

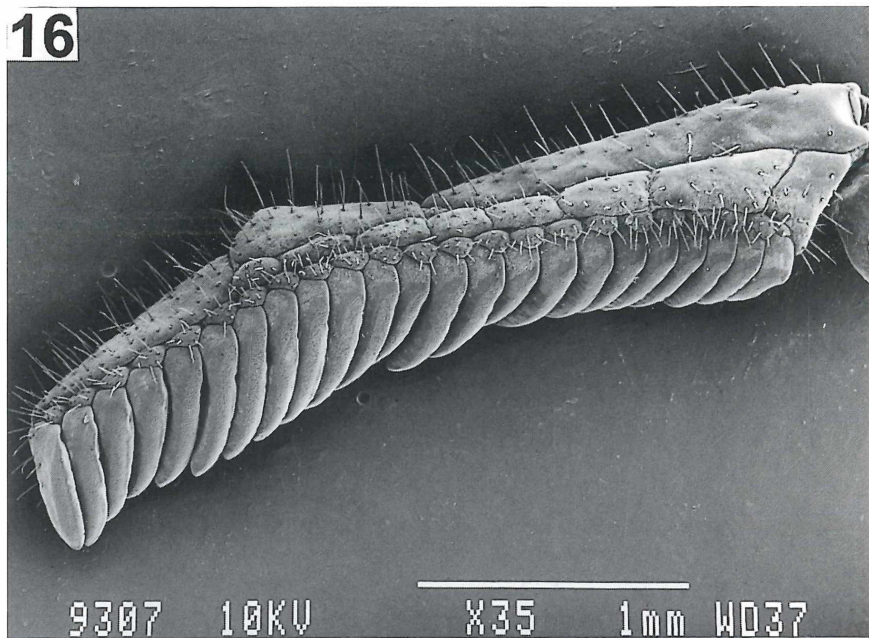


Figs 10-12. Chelicerae: 10- *Buthacus occidentalis* Vachon (σ); 11- *Buthacus clevai* sp. n. (σ); 12- distal portion of movable finger cutting edge of *B. clevai* (paratype σ).

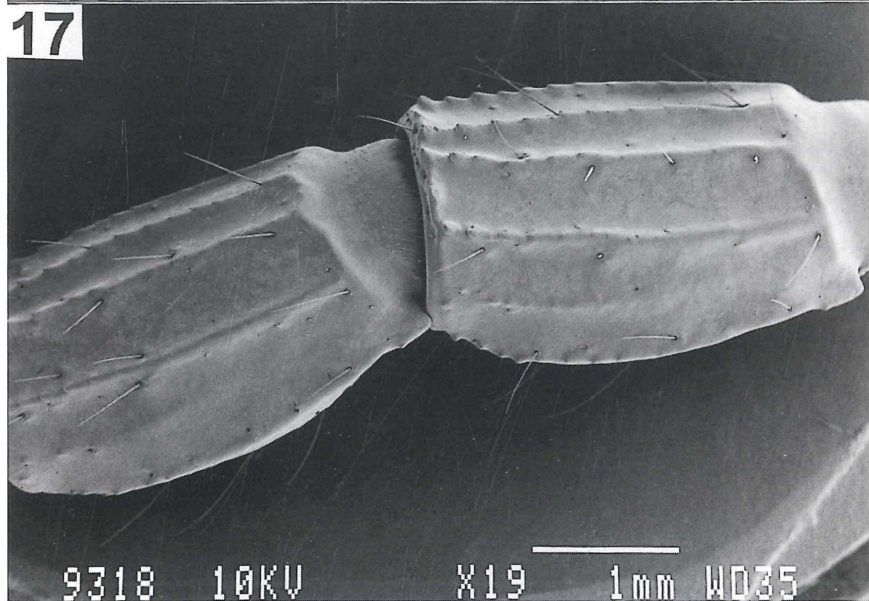


Figs 13-15. Tarsi with setae and pedal spurs: **13-** *Buthacus occidentalis* Vachon (σ); **14-** *Buthacus clevai* sp. n. (paratype σ); **15-** detailed, tibial spur of *B. clevai* sp. n. (paratype σ).

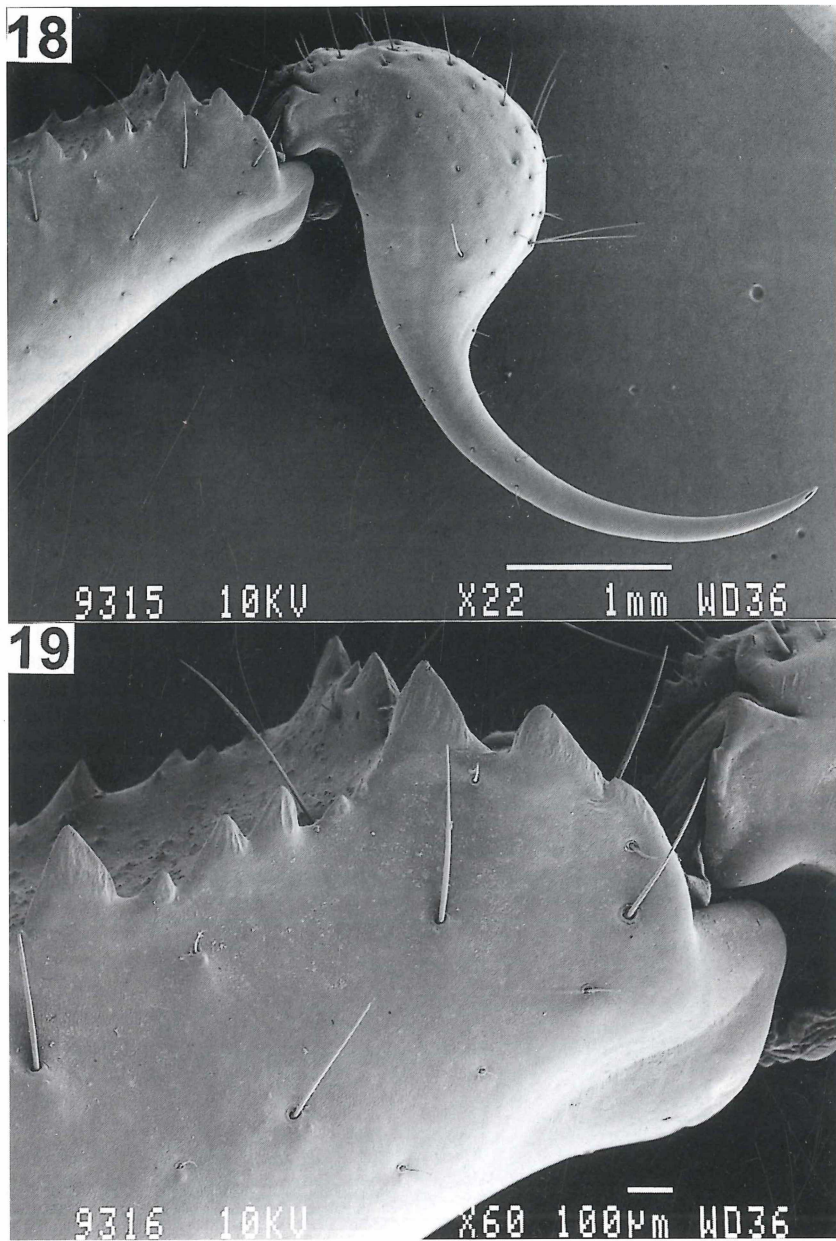
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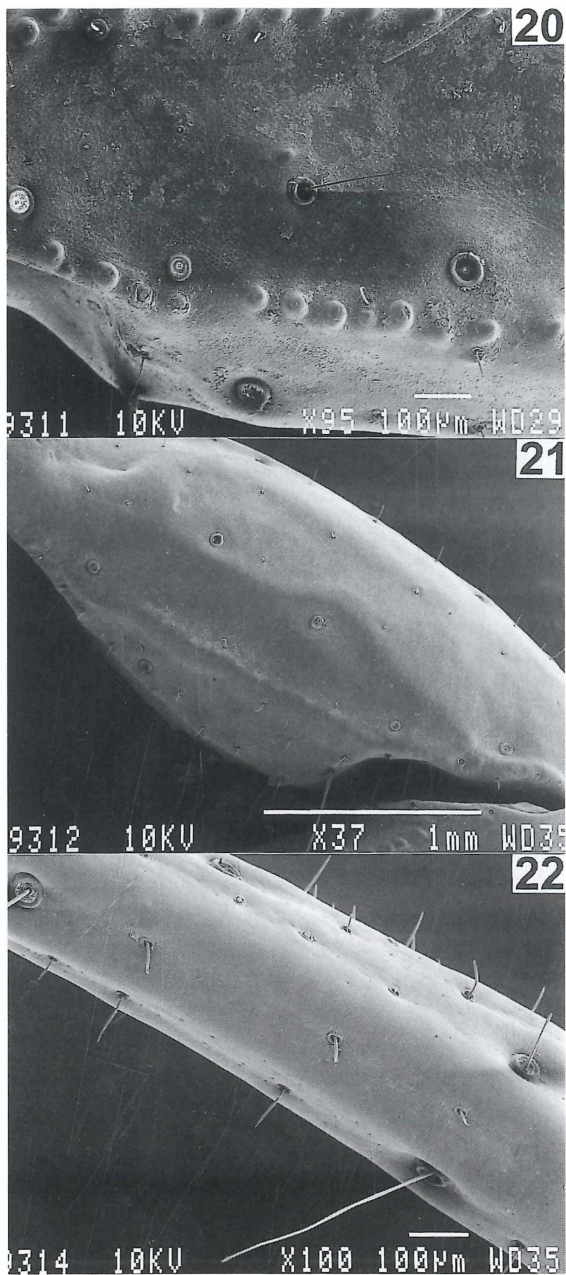
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Figs 16-17. *Buthacus clevai* sp. n. (paratype ♂): **16-** pecten; **17-** metasomal segments II-III with strong ventral carinae.



Figs 18-19. *Buthacus clevai* sp. n. (paratype ♂): **18-** distal portion of metasomal segment V and telson, lateral aspect; **19-** distal portion of metasomal segment V, in detail, showing the very strong lobes.



Figs 20-22. *Buthacus clevai* sp. n. (paratype σ): 20- femur, dorsal aspect (dorsal and one external trichobothria); 21- tibia, dorsal aspect, with dorsal and one internal trichobothria; 22- fixed finger with trichobothria *dt*, *db*, *et* and *est*.

ETYMOLOGY: Patronym in honor of M. Régis Cleva, Laboratoire de Zoologie (Arthropodes), MNHN, Paris, for his constant technical support to the research.

D i a g n o s i s. Median sized yellowish *Buthacus* with pigmented zones on the carapace, tergites and metasomal dorsum. Strong metasomal carinae, in particular the ventral ones on segments II and III; strong latero-ventral carinae on segment V, armed with strong spinoid lobes.

D e s c r i p t i o n (based on female holotype and male paratype; morphometric measurements in Table I).

C o l o r a t i o n. Generally yellowish with some pigmented zones on the carapace, tergites, and on dorsal aspect of metasomal segments. Prosoma: carapace yellowish with some pigmented zones on the anterior margin and on anterior carinae; eyes surrounded by black pigment. Mesosoma: yellowish with dark olivaceous confluent spots on tergites. These are less marked on tergite VII. Metasoma: all segments yellowish with reticular brownish spots on the dorsal aspect. Vesicle yellowish; aculeus yellowish at the base and reddish at its extremity. Venter pale yellow. Chelicerae yellowish; teeth reddish. Pedipalps: yellowish overall, including the rows of granules on the dentate margins of the fingers. Presence of some vestigial pigmented zones on chelae. Legs yellowish.

M o r p h o l o g y. Prosoma: Anterior margin of carapace not emarginate, straight. Carapace carinae weakly developed; central median and posterior median carinae weak; anterior median carinae represented by a few granules; central lateral and central median carina weak to obsolete. All furrows weak to obsolete. Intercarinal spaces very weakly granular, almost smooth. Median ocular tubercle only slightly anterior to the center of the carapace; median eyes separated by more than one ocular diameter. Four pairs of lateral eyes disposed in one line. Mesosoma: Tergites I-VI tricarinate; all carinae weak. Tergite VII pentacarinata, with lateral pairs of carinae moderate; median carinae present on proximal half, moderate to weak. Intercarinal spaces weakly granular, almost smooth. Sternites: all carinae absent from sternites III-VI; moderate to weak on VII. Pectines long; pectinal tooth count 16-16 on female holotype (23-23 on male paratype). Metasoma: Segments I-III with 10 keels; IV with 8 keels. Ventral carinae weak on segment I; moderate to strong on segments II-IV, with spinoid granules on III. Segment V with 5 keels; ventral with spinoid granules; latero-ventral armed with several strong spinoid lobes. Dorsal furrows of all segments weakly developed, smooth; intercarinal spaces very weakly granular, almost smooth. Telson smooth. Aculeus very long; subaculear tubercle absent. Chelicerae, with two very reduced and almost fused basal denticles on the movable finger (Vachon 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (Vachon 1974); dorsal trichobothria of femur in beta configuration (Vachon 1975). Femur pentacarinata; all carinae moderately crenulate. Tibia with internal and dorsal carinae, weak; chelae with vestigial carinae only. Dentate margins on fixed and movable fingers composed of 6/7 almost linear rows of granules separated by stronger accessory granules. Legs: ventral aspect of tarsi with thin long setae. Tibial spurs present on legs III-IV but extremely reduced on III. Pedal spurs present, moderate to weak on all legs.

Table I. Morphometric values (in mm) of the examined species of *Buthacus* (Hol - holotype, Par - paratype)

	<i>B. huberi</i> sp. n. Hol ♀	<i>B. clevai</i> sp. n. Hol ♀	<i>B. clevai</i> sp. n. Par ♂	<i>B. villiersi</i> Hol ♂	<i>B. occidentalis</i> ♂	<i>B. zieglerei</i> Hol ♂
Total length	41.0	36.0	30.0	28.0	45.0	55.0
Carapace:						
- length	4.4	4.3	3.9	3.4	4.9	5.4
- anterior width	2.8	2.9	2.6	2.2	3.1	3.5
- posterior width	5.2	5.1	4.7	3.5	5.5	6.1
Metasomal segment I:						
- length	3.3	3.1	2.3	2.6	3.2	5.2
- width	2.6	2.7	2.3	2.1	3.3	3.5
Metasomal segment V:						
- length	5.2	4.4	4.6	3.8	5.8	6.6
- width	2.0	2.4	1.8	1.6	2.4	2.5
- depth	1.8	2.0	1.7	1.5	2.1	2.3
Vesicle:						
- width	1.4	1.5	1.3	1.2	1.6	1.9
- depth	1.5	1.5	1.2	1.3	1.8	1.8
Pedipalp:						
- Femur length	3.5	2.8	2.6	2.3	3.8	5.2
- Femur width	1.2	1.3	1.0	1.0	1.5	1.5
- Tibia length	4.6	3.9	3.6	3.2	5.0	6.3
- Tibia width	1.5	1.6	1.2	1.3	1.9	2.1
- Chela length	6.6	5.6	5.2	4.8	7.2	9.6
- Chela width	1.1	1.2	1.1	1.3	2.2	2.1
- Chela depth	1.1	1.2	1.1	1.3	2.2	2.0
Movable finger:						
- length	4.2	3.4	3.2	2.8	4.4	5.4

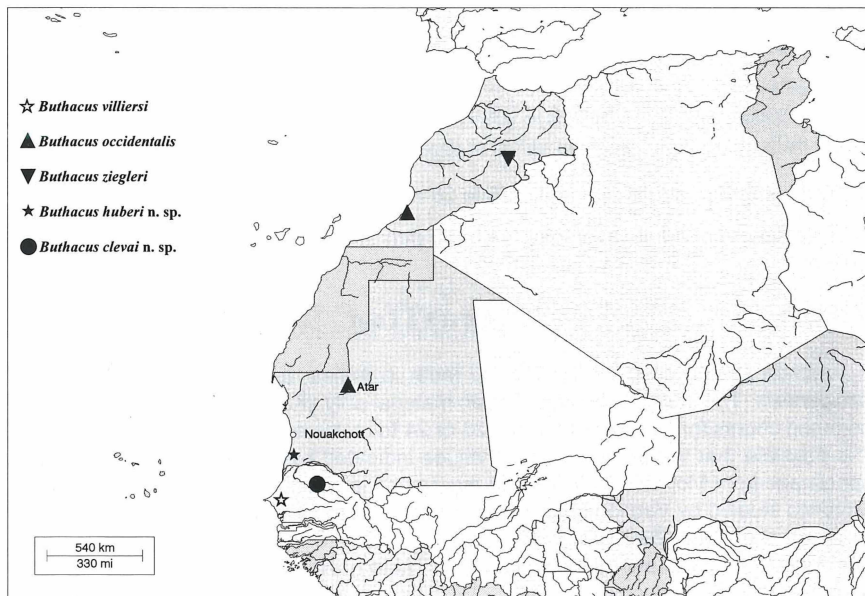


Fig. 23. Type localities of the Northwestern African species of *Buthacus*.

Pectinal tooth count in other paratypes: male, 23-23; females, 16-17, 17-16.

Remark: The new species is allied to *B. villiersi*, also described from Senegal (M'Bao). It can, however, be distinguished from this by the following characters: (A) a different pattern of pigmentation. *B. villiersi* is yellowish, without spots or pigmented zones like those in *B. clevai* sp. n.; (B) stronger metasomal carinae, in particular the ventral ones on segments II and III; stronger latero-ventral carinae on segment V; in *B. clevai* these carinae are armed with strong spinoid lobes, whereas in *B. villiersi* the lobes are reduced.

Key to the Northwestern African species of *Buthacus*

1. Pectines in both males and females with 25 or more teeth (26-33 in males; 25-28 in females) 2
- Pectines in both males and females with less than 25 teeth 3
2. Dentate margins of chelae movable fingers with 10 rows of granules; tibial spurs strong *B. zieglerei* Lourenço
- Dentate margins of chelae movable fingers with 8-9 rows of granules; tibial spurs reduced *B. huberi* sp. n.

3. Segment V with latero-ventral carinae armed with strong spinoid lobes; dentate margins of movable fingers composed of 6/7 rows of granules; tibial spurs moderate on leg IV, extremely reduced on leg III *B. clevai* sp n.
- Segment V with latero-ventral carinae armed with reduced lobes; dentate margins of movable fingers composed of 8/9 rows of granules; tibial spurs moderate to strong on legs III-IV 4
4. Total length of adults averaging 25 to 28 mm *B. villiersi* Vachon
- Total length of adults averaging 44 to 50 mm *B. occidentalis* Vachon

Discussion

Vachon (1953) cited 26-29 pectinal teeth in males, and 20-25 in females of *B. occidentalis*. The study of the Mauritanian material only shows, however, that the most common counts for *B. occidentalis* are 23 or 24 to males and 21 for females. Therefore it is possible that the more important values indicated by Vachon (1953), referred to specimens from Morocco (now lost). In this case it is possible that the specimens from Morocco studied by Vachon (1953) could have been more closely related to *B. ziegléri* in which there are 29-28 teeth in males. Naturally *B. ziegléri* also differs from *B. occidentalis* in its morphometric values (see Table I). However, Vachon (1953) makes no reference to any such variability.

Pectinal tooth counts in the females of *B. huberi* sp. n. show more teeth (27-28) than found in female specimens of *B. occidentalis*. Taking into account that, on average, male scorpions have 3-4 more teeth than females of the same species, males of *B. huberi* sp. n. would be expected to show such values ranging from 30-33.

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