

Faunitaxys

*Revue de Faunistique, Taxonomie et Systématique
morphologique et moléculaire*



Volume 9
Numéro 38

Novembre 2021

ISSN : 2269 - 6016
Dépôt légal : Novembre 2021

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*Revue de Faunistique, Taxonomie et Systématique
morphologique et moléculaire*

ZooBank : <http://zoobank.org/79A36B2E-F645-4F9A-AE2B-ED32CE6771CC>

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Lionel Delaunay

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Faunitaxys est indexé dans / *Faunitaxys* is indexed in:

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Imprimée sur les presses de SPEED COPIE

6, rue Tréfilerie, F- 42100 Saint-Etienne

Imprimé le 27 novembre 2021

The genus *Buthus* Leach, 1815 (Scorpiones: Buthidae) in France with description of a new species from the Eastern Pyrenees

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- ZooBank: <http://zoobank.org/06FD0852-A88E-49E5-B8E6-E1494B86C4E1>

Keywords:

Scorpion;
Buthus;
pyrenaicus;
taxonomy;
new species;
description;
morphology;
France;
Pyrenees.

Abstract. – A new species of *Buthus* is described on the basis of six specimens collected in the Eastern Pyrenees, in the South of France. *Buthus pyrenaicus* sp. n. is mainly characterized by a general yellowish coloration with a dark univittate pattern on tergites, chela fingers with lobe/notch combination obsolete, male slightly larger than same size-class female with chela manus wider than patella and telson laterally compressed, and female with metasomal segment I as wide as long to wider than long. The new species shows affinities with *B. alacanti* Teruel & Turiel, 2020 (most similar species) and *B. occitanus* (Amoreux, 1789) but can be easily distinguished from these two species by a combination of several key characters. This new scorpion taxon represents the 2nd known species of the genus *Buthus* reported from France and the 15th reported from Western Europe.

Ythier E., 2021. – The genus *Buthus* Leach, 1815 (Scorpiones: Buthidae) in France with description of a new species from the Eastern Pyrenees. *Faunitaxys*, 9(38): 1 – 10.

ZooBank: <http://zoobank.org/FC146A0D-C77A-4242-85A3-AFA3D5003FEA>

Introduction

As already outlined in several papers (Lourenço & Vachon, 2004; Rossi, 2012; Lourenço & Rossi, 2013; Lourenço, 2021; Teruel & Turiel, 2020, 2021; Ythier, 2021), until the unexpected description of two new species of *Buthus* from Spain (*B. ibericus* Lourenço & Vachon 2004 and *B. montanus* Lourenço & Vachon 2004) only one nominal species of the genus *Buthus* Leach, 1815 was generally considered to occur in Western Europe, *B. occitanus* (Amoreux, 1789), since the synonymization by Simon (1879) with *B. occitanus* of three species previously described by C. L. Koch (*Androctonus ajax* C. L. Koch 1839 from Spain, *Androctonus eurialus* C. L. Koch 1839 from France and *Androctonus halius* C. L. Koch 1839 from Portugal). Many years later, several other species were described or revalidated from Spain (*B. ajax* C. L. Koch 1839, *B. elongatus* Rossi 2012, *B. alacanti* Teruel & Turiel, 2020, *B. baeticus* Teruel & Turiel, 2020, *B. delafuentei* Teruel & Turiel, 2020, *B. garcialorcai* Teruel & Turiel, 2020, *B. manchego* Teruel & Turiel, 2020 and *B. serrano* Teruel & Turiel, 2020) and Portugal (*B. halius* C. L. Koch 1839, *B. lusitanus* Lourenço 2021 and *B. gabani* Ythier 2021), showing a high degree of microendemism in the Iberian Peninsula, as already demonstrated in the genus *Buthus* in other regions of complex topography (e.g. northern Africa) with mountain ranges providing the prerequisites for extensive speciation in geographically limited areas (e.g. Lourenço, 2002; Husemann et al., 2012; Klessner et al., 2018; Ythier et al., 2021).

This high degree of microendemism of the genus *Buthus* in the Iberian Peninsula led me to analyse and compare populations occurring in France, where only *B. occitanus* was reported until now. 50 *Buthus* specimens of both sexes from 16 localities covering the original known distribution of *B. occitanus* in

France (see Fig. 19) were examined and led to the description of a new species, *Buthus pyrenaicus* sp. n. from the Pyrenees Mountains. The new species shows affinities with *B. alacanti* Teruel & Turiel, 2020 (most similar species) and *B. occitanus* (Amoreux, 1789) but can be easily distinguished from these two species by a combination of several key characters. This new scorpion taxon represents the 2nd known species of the genus *Buthus* reported from France and the 15th reported from Western Europe.

Methods

Illustrations and measurements were made with the aid of a Motic SMZ-1713 stereo-microscope with an ocular micrometer, together with a digital camera Tucsen HD Lite, a Canon EOS 7D camera and a Wacom Intuos drawing tablet. Map was made using Géoportail and Adobe Photoshop software. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Vachon (1952a) and Hjelle (1990). Specimens studied herein are deposited in the MHNL (Musée d'Histoire Naturelle de Lyon (Musée des Confluences), CCEC, Lyon, France) and EYCP (Eric Ythier Private Collection, Romanèche-Thorins, France).

Composition of the genus *Buthus* in France (in order of description)

- *Buthus occitanus* (Amoreux, 1789) (Alpes-de-Haute-Provence, Ardèche, Aude, Bouches-du-Rhône, Drôme, Gard, Hérault, Pyrénées-Orientales, Var, Vaucluse)
- *Buthus pyrenaicus* sp. n. (Pyrénées-Orientales)

Taxonomic treatment

Family **Buthidae** C. L. Koch, 1837

Genus *Buthus* Leach, 1815

Buthus occitanus (Amoreux, 1789)

(Fig. 3, 7-8, 10, 13, 15, 17, Tab. II-III)

Material examined (France, 44 ex.)

- Alpes-de-Haute-Provence, Gréoux-les-Bains, VII/2002 (E. Ythier, C. Benros-Ythier, G. Roy, J.-M. Chambon, M. Boutin), 1 ♀, 4 juvenile ♂, 8 juvenile ♀, EYCP (EY011).

- Alpes-de-Haute-Provence, Manosque, VII/2002 (E. Ythier, C. Benros-Ythier, G. Roy, J.-M. Chambon, M. Boutin), 1 ♀, EYCP (EY109).

- Ardèche, Saint-Remèze, Les Costes, 26/IV/2004 (S. Rojkoff), 1 ♀, MHNL (47036304).

- Aude, Lapalme, Cap, 01/IV/1974 (N. Jean-Pierre), 1 ♀, MHNL (47023111).

- Bouches-du-Rhône, Marseille, ca. 1840-1860 (J. M. Perret / C. Jourdan), 2 ♀, 3 juvenile ♂, 5 juvenile ♀, MHNL (44000886).

- Bouches-du-Rhône, Fontvieille, 03/X/1949 (D. Jean), 1 ♀, MHNL (47023174).

- Bouches-du-Rhône, Aix-en-Provence, Col des Portes, ca. 1970-1980 (J.-B. Lacroix), 1 juvenile ♂, J.-B. Lacroix leg. (No. 283), 1993, EYCP (EY0306).

- Drôme, Saint-Restitut, 26/VI/1974 (P. Grivot), 1 ♂, 2 ♀, 2 juvenile ♀, MHNL (47023129, 47023130, 47023133, 47023134, 47023135).

- Gard, Souvignargues, VII/2007 (E. Ythier), 1 ♂, 1 ♀, 2 juvenile ♂, 1 juvenile ♀, EYCP (EY005).

- Hérault, location unknown, ca. 1930-1950 (G. Favarel), 1 ♀, C. Escudé leg., 06/VI/2017, MHNL (47023162).

- Hérault, location unknown, ca. 1970-1980 (G. Chavanon), 1 juvenile ♀, G. Chavanon leg., 26/02/2004, MHNL (47036256).

- Var, Vidauban, Plaine des Maures, along D48, 25/VII/2011 (P. Escoubas), with collecting permit, 3 ♀, EYCP (EY362, EY374).

- Vaucluse, Gordes, Garrigue, 31/III/2002 (S. Rojkoff), 1 juvenile ♀, MHNL (47036320).

Diagnosis (emended). – Scorpion of medium to moderately large size for the genus, with a total length of 50-70 mm. General coloration pale yellow to yellowish orange; carapace with ocular tubercle marked with dark pigments; tergites with dark spots on median carina forming a dark univittate pattern; metasoma and pedipalps yellowish with some carinae slightly infusate; legs yellowish. Carinae and granulations moderately to strongly marked on carapace and tergites. Metasoma with carinae moderately marked; dorsal and dorsolateral weakly subcrenulate to crenulate on segments II-IV; ventral feebly raised distally on II-III, stronger in female; anal arc composed of two lateral lobes and 8-11 ventral teeth; intercarinal spaces minutely granular, especially dorsally and more densely on V. Pedipalps with carinae moderately marked and all faces weakly granular on femur and patella; chela with carinae vestigial, smooth; femur with some macrosetae which are mostly concentrated along ventrodorsal edge, patella with a few macrosetae scattered all over. Leg tibial spurs strongly developed. Pectines with 31-34 teeth in male, 25-30 in female. Sexual secondary dimorphism moderate in habitus with male more slender and smaller than same size-class female (54-64 mm in male, 50-70 mm in female). Sexual secondary dimorphism conspicuous in pedipalps with chela manus slender in male (length/width ratio 1.73-1.87, length/depth ratio

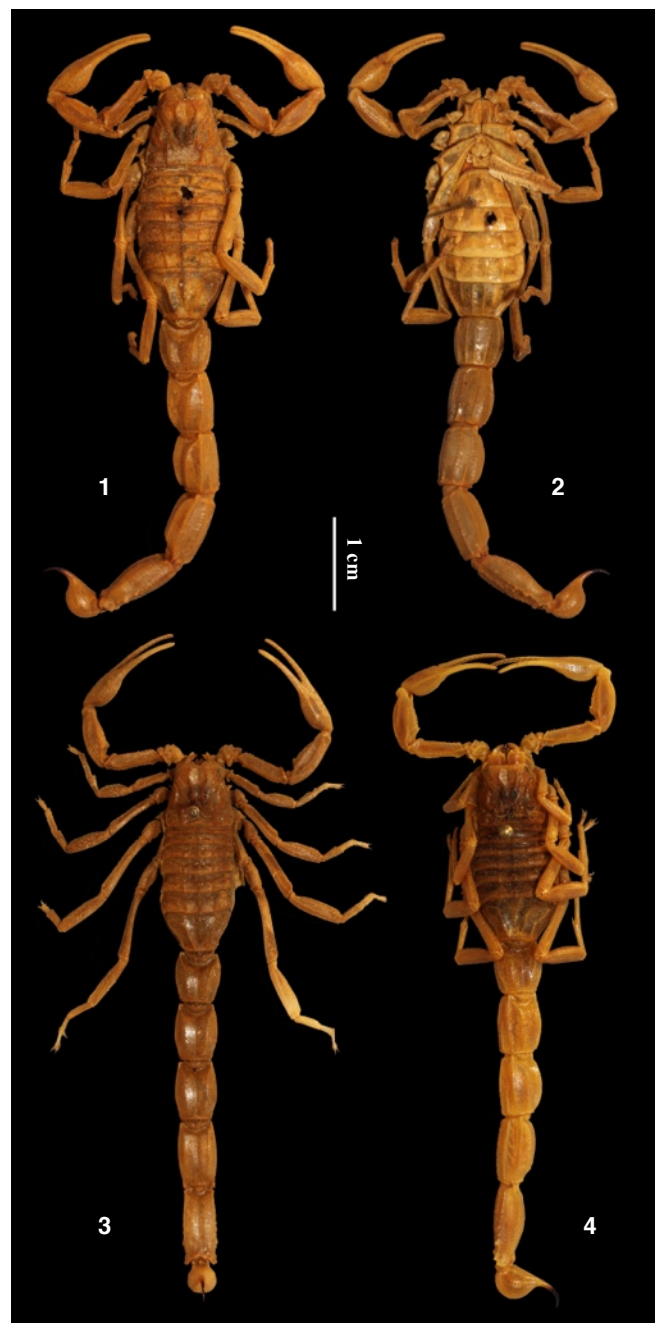


Fig. 1-4. Adult ♂ of three *Buthus* species. Habitus (dried specimens).

1-2. *Buthus pyrenaicus* sp. n., holotype, Cerbère, France.

1. Dorsal aspect. 2. Ventral aspect.

3. *Buthus occitanus*, Saint-Restitut, France, dorsal aspect.

4. *Buthus alacanti*, Alicante, Spain, dorsal aspect.

1.50-1.61) than in female (length/width ratio 1.48-1.66, length/depth ratio 1.22-1.43) and narrower than patella in male (manus/patella width ratio 0.87-0.99) while wider than patella in female (manus/patella width ratio 1.04-1.22). Chela fingers with lobe/notch combination obsolete; fingers long (movable fingers/manus length ratio 1.76-1.84 in male, 1.55-1.87 in female); fixed finger with 11-13 rows of granules, movable finger with 12-14 rows of granules. Sexual secondary dimorphism inconspicuous in metasoma (very similar in both sexes and with size and shape standard for the genus), conspicuous in telson with vesicle small and sub-globose in male, wider than deep (length/width ratio 1.27-1.30, length/depth ratio 1.37-1.42, width/depth ratio 1.06-1.10), moderately globose in female, wider than deep (length/width ratio 1.15-1.19, length/depth ratio 1.29-1.33, width/depth ratio 1.10-1.14). Metasomal segment I longer than wide in both sexes (length/width ratio 1.03-1.11 in male, 1.02-1.07 in female).

Buthus alacanti Teruel & Turiel, 2020

(Fig. 4, 11, 18, Tab. II-III)

Material examined (Spain, 2 ex.)

- Alicante, Puerto de la Carrasqueta, 1 ♂, 04/V/2004 (S. Rojkoff), MHNL (47036303).

- Murcia, Cabo de Palos (written Cap Pepolos on label), 1 juvenile ♀, 09/VII/1973 (P. Grivot), MHNL (464733).

Diagnosis (emended). – Scorpion of medium to moderately large size for the genus, with a total length of 61–66 mm. General coloration vivid yellow; carapace with ocular tubercle marked with dark pigments; tergites with dark spots on median carina forming a dark univittate pattern; metasoma and pedipalps yellowish with some carinae slightly infuscate; legs yellowish. Carinae and granulations moderately to strongly marked on carapace and tergites. Metasoma with carinae moderately marked; dorsal and dorsolateral vestigially to weakly subcrenulate on segments II–IV; ventral feebly raised distally on II–III, stronger in female; anal arc composed of two lateral lobes and 9 ventral teeth; intercarinal spaces minutely granular, especially dorsally and more densely on V. Pedipalps with carinae moderately marked and all faces weakly granular on femur and patella; chela with carinae vestigial, smooth; femur almost bare with only 4–6 very short setae mostly concentrated along ventrodistal edge, patella almost bare. Leg tibial spurs strongly developed. Pectines with 32–34 teeth in male, 28–30 in female. Sexual secondary dimorphism moderate in habitus with male more slender and of similar size or slightly larger than same size-class female (61–66 mm in male, 65 mm in female). Sexual secondary dimorphism conspicuous in pedipalps with chela manus slender in male (length/width ratio 1.54–1.65, length/depth ratio 1.48–1.65) than in female (length/width ratio 1.45, length/depth ratio 1.45) and slightly wider than patella in male (manus/patella width ratio 1.02–1.07) while much wider than patella in female (manus/patella width ratio 1.27). Chela fingers with lobe/notch combination obsolete; fingers long, slightly longer in male (movable fingers/manus length ratio 1.60–1.88) than in female (1.53); fixed finger with 12 rows of granules, movable finger with 13 rows of granules. Sexual secondary dimorphism moderate in metasoma (size and shape standard for the genus but longer and heavier in male) and in telson with vesicle slightly less globose in male (wider than deep; length/width ratio 1.18–1.24, length/depth ratio 1.26–1.38, width/depth ratio 1.07–1.12) than in female (wider than deep; length/width ratio 1.06, length/depth ratio 1.24, width/depth ratio 1.16). Metasomal segment I longer than wide in both sexes (length/width ratio 1.08–1.10 in male, 1.02 in female).

***Buthus pyrenaicus* sp. n.**

(Fig. 1-2, 5-6, 9, 12, 14, 16, Tab. I-III)

ZooBank: <http://zoobank.org/42801260-6B12-4D19-A764-A30BCB003E4B>

Buthus occitanus: Simon, 1879: 97; Paulian, 1936; Gourc & Fiasson, 1947: 209; Berland, 1948: 101–102; Denis, 1948; Vachon, 1952b; Dumont, 1986; Lacroix, 1997: 9, 15; Gantenbein, 2004: 521; Dupré et al., 2008: 23–25.

Holotype, ♂, France, Pyrénées-Orientales, Cerbère, 25/IX/1938 (A. Primot), deposited in the MHNL (47036301).

Paratypes (5 ex.)

- 2 ♀, France, Pyrénées-Orientales, Cerbère, V/1950 (P. Cauchois), deposited in the MHNL (47023075, 47023076).

- 1 ♀, France, Pyrénées-Orientales, Montauriol, Mas Julia (St Michel), 23/VIII/1980 (P. Cauchois), deposited in the MHNL (47023076).

- 2 juvenile ♀, France, Pyrénées-Orientales, Massif des Albères, ca. 1970–1980 (J.-B. Lacroix), J.-B. Lacroix leg. (No. 111), 1993, EYCP (EY0244).

Etymology. – The specific epithet refers to Pyrenees, where the new species occurs.

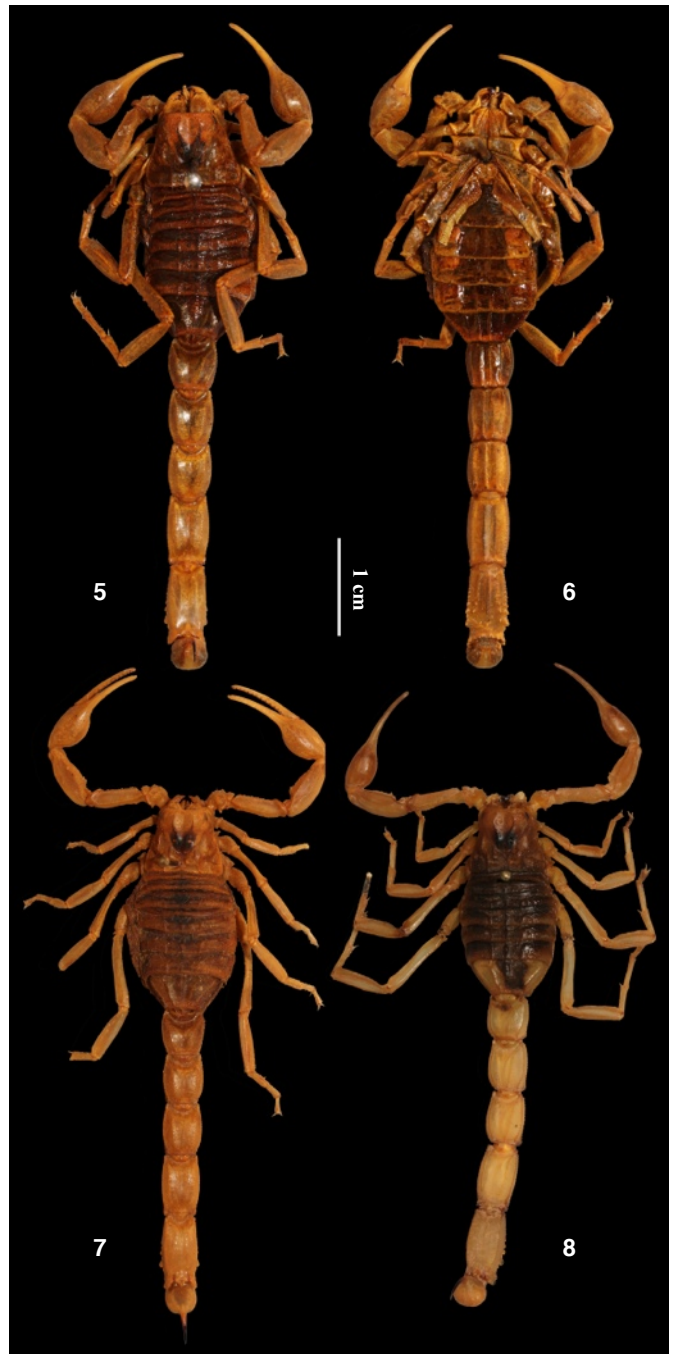


Fig. 5-8. Adult ♀ of two *Buthus* species. Habitus (dried specimens).

5-6. *Buthus pyrenaicus* sp. n., paratype, Cerbère, France.

5. Dorsal aspect. **6.** Ventral aspect.

7. *Buthus occitanus*, Saint-Restitut, France, dorsal aspect.

8. *Buthus occitanus*, the Plaine des Maures, France, dorsal aspect.

Diagnosis. – Scorpion of medium to moderately large size for the genus, with a total length of 60–67 mm. General coloration pale yellow to yellowish orange; carapace with ocular tubercle marked with dark pigments; tergites with dark spots on median carina forming a dark univittate pattern; metasoma and pedipalps yellowish with some carinae slightly infuscate; legs yellowish. Carinae and granulations moderately to strongly marked on carapace and tergites. Metasoma with carinae moderately marked; dorsal and dorsolateral vestigially to weakly subcrenulate on segments II–IV; ventral feebly raised distally on II–III, stronger in female; anal arc composed of two lateral lobes and 10–12 ventral teeth; intercarinal spaces minutely granular, especially dorsally and more densely on V. Pedipalps with carinae moderately marked and all faces weakly granular on femur and patella; chela with carinae

vestigial, smooth; femur with some macrosetae which are mostly concentrated along ventrodistal edge, patella with a few macrosetae scattered all over. Leg tibial spurs strongly developed. Pectines with 31 teeth in male, 26-28 in female. Sexual secondary dimorphism moderate in habitus with male more slender and slightly larger than same size-class female (67 mm in male, 60-66 mm in female). Sexual secondary dimorphism conspicuous in pedipalps with chela manus slender in male (length/width ratio 1.42, length/depth ratio 1.42) than in female (length/width ratio 1.29-1.42, length/depth ratio 1.21-1.30) and slightly wider than patella in male (manus/patella width ratio 1.04) while wider than patella in female (manus/patella width ratio 1.08-1.14). Chela fingers with lobe/notch combination obsolete; fingers long, slightly longer in male (movable fingers/manus length ratio 1.91) than in female (1.64-1.75); fixed finger with 12-13 rows of granules, movable finger with 13-14 rows of granules. Sexual secondary dimorphism moderate in metasoma (size and shape standard for the genus but longer and heavier in male) and in telson with vesicle slightly less globose in male (deeper than wide; length/width ratio 1.42, length/depth ratio 1.35, width/depth ratio 0.95) than in female (wider than deep; length/width ratio 1.11-1.17, length/depth ratio 1.18-1.35, width/depth ratio 1.06-1.18). Metasomal segment I longer than wide in male (length/width ratio 1.12), as wide as long to wider than long in female (length/width ratio 0.97-1.00).

Description (based on adult male holotype and three adult female paratypes. Measurements in Table I).

Coloration. – Basically pale yellow to yellowish orange. Prosoma: carapace yellowish with median and lateral ocular tubercles marked with dark pigments; carinae slightly infuscate. Mesosoma yellowish with conspicuous dark spots on median carina forming a dark univittate pattern. Metasomal segments yellowish with some carinae slightly infuscate; telson vesicle yellowish, aculeus yellowish orange at its base and blackish at its extremity. Venter yellowish; genital operculum and pectines paler than the other zones. Chelicerae yellowish; fingers yellowish with dark red teeth. Pedipalps yellowish without spots; fingers with the oblique rows of granules dark red. Legs yellowish.

Morphology. – Carapace moderately to strongly granular; anterior margin with a weak concavity. Carinae moderately to strongly marked; anterior median, central median and posterior median carinae strongly granular, with 'lyre' configuration. Furrows deep. Median ocular tubercle located in the centre of the carapace; eyes separated by about two ocular diameters; three pairs of lateral eyes of moderate size in relation to median eyes. Sternum triangular, weakly narrowed, slightly wider than long. Mesosoma: tergites moderately granular. Three longitudinal carinae moderately to strongly crenulate in all tergites; lateral carinae reduced in tergites I and II; tergite VII pentacarinat. Venter: genital operculum divided longitudinally, each plate with a semi-oval shape. Pectines: pectinal tooth count 31-31 in male holotype and 26 to 28 in females paratypes; middle basal lamella of the pectines not dilated. Sternites without granules, smooth with elongated spiracles; four moderate carinae on sternite VII; four weak on posterior half of VI; other sternites acarinated and with two vestigial furrows. Metasomal segments with a weak setation; segment I with ten complete carinae, II-IV with eight, V with five; intermediate carinae complete on segment I, present on distal half of II-III, absent on IV-V; dorsal and dorsolateral carinae vestigially to weakly subcrenulate on segments II-IV; ventral carinae moderately marked and feebly raised distally on II-III, stronger in female; segment V with ventrolateral carinae crenulate with 2-3 lobate denticles posteriorly; ventral median carina divided posteriorly, over 1/3 of the total length; anal arc composed of 10-12 ventral teeth and two lateral lobes. Intercarinal spaces minutely granular, especially dorsally and more densely on V. Metasoma size and shape standard for the genus but longer and heavier in male than in female. Metasomal segment I longer than wide in male (length/width ratio 1.12), as wide as long to wider than long in female (length/width ratio 0.97-1.00). Telson with some vestigial granulations ventrally; aculeus curved and shorter than the vesicle (aculeus/vesicle ratio 0.75 in male, 0.72-0.73 in female), without a subaculear tubercle; telson with vesicle slightly less globose in male (deeper than wide; length/width ratio 1.42, length/depth ratio 1.35, width/depth ratio 0.95) than in female (wider than deep; length/width ratio 1.11-1.17, length/depth ratio 1.18-1.35, width/depth ratio 1.06-1.18). Cheliceral dentition as defined by

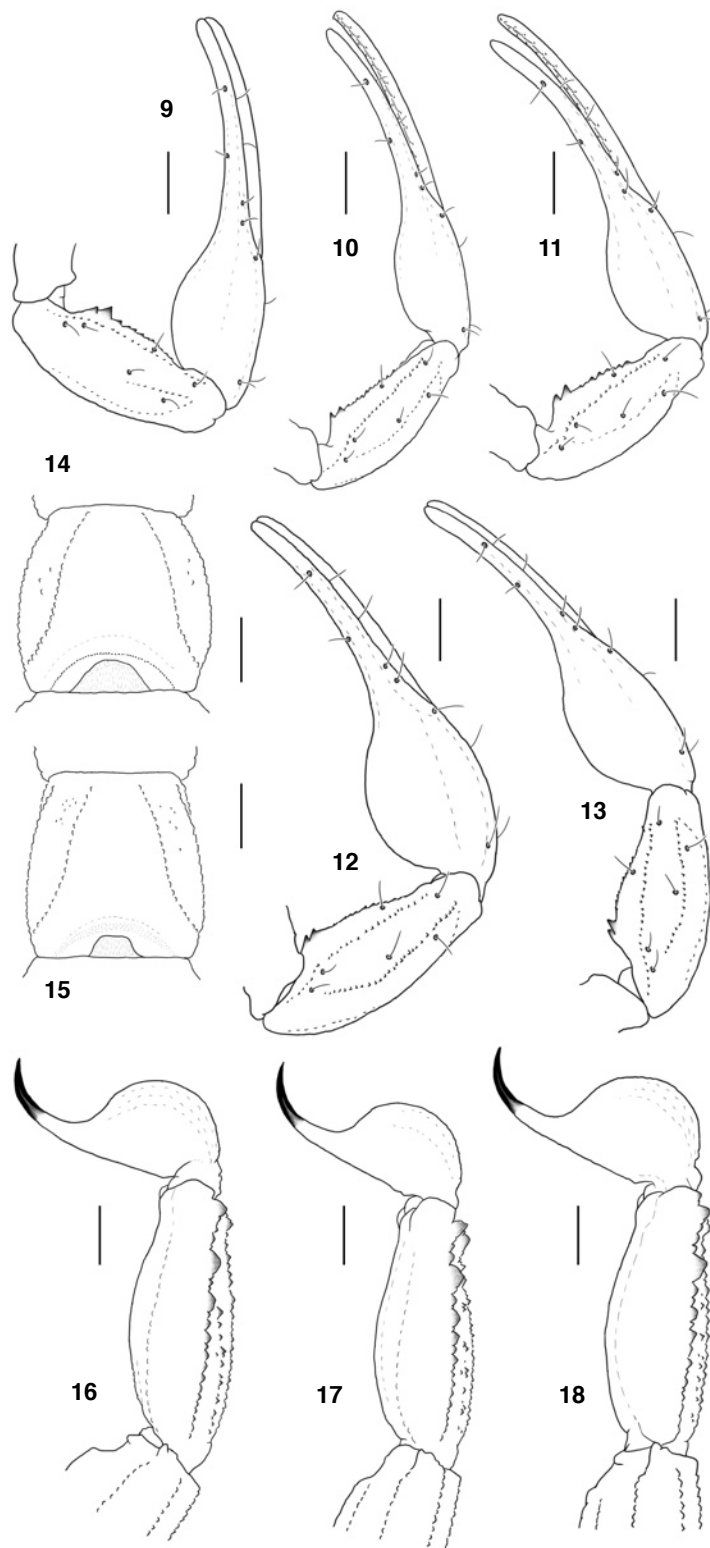


Fig. 9-18. Pedipalps, metasomal segments and telson of *Buthus* species.

9-13. Right pedipalp patella and chela, dorsal aspect, showing the trichobothrial pattern.

9. *Buthus pyrenaicus* sp. n., ♂ holotype, Cerbère, France.

10. *Buthus occitanus*, ♂, Saint-Restitut, France.

11. *Buthus alacanti*, ♂, Alicante, Spain.

12. *Buthus pyrenaicus* sp. n., ♀ paratype, Cerbère, France.

13. *Buthus occitanus*, ♀, Saint-Restitut, France.

14-15. Metasomal segment I, dorsal aspect.

14. *Buthus pyrenaicus* sp. n., ♀ paratype, Montauriol, France.

15. *Buthus occitanus*, ♀, Souvignargues, France.

16-18. Metasomal segment V and telson, lateral aspect.

16. *Buthus pyrenaicus* sp. n., ♂ holotype, Cerbère, France.

17. *Buthus occitanus*, ♂, Saint-Restitut, France.

18. *Buthus alacanti*, ♂, Alicante, Spain. Scale bars = 2 mm.

Vachon (1963) for the family Buthidae; external distal and internal distal teeth approximately the same length; basal teeth on movable finger small and not fused; ventral aspect of both fingers and manus covered with long dense setae. Pedipalps with a weak setation, femur with some macrosetae which are mostly concentrated along ventrodiscal edge, patella with a few macrosetae scattered all over; femur pentacarinata; patella with 8 carinae moderately to strongly marked, internal with 9-10 spinoid granules, all faces weakly granular; chela with vestigial carinae, almost smooth; chela manus slender in male (length/width ratio 1.42, length/depth ratio 1.42) than in female (length/width ratio 1.29-1.42, length/depth ratio 1.21-1.30) and slightly wider than patella in male (manus/patella width ratio 1.04) while wider than patella in female (manus/patella width ratio 1.08-1.14); fingers with lobe/notch combination obsolete; fingers long, slightly longer in male (movable fingers/manus length ratio 1.91) than in female (1.64-1.75); fixed finger with 12-13 rows of granules, movable finger with 13-14 rows of granules; internal and external accessory granules present, stronger than principal granules; three accessory granules on the distal end of the movable finger next to the terminal denticle. Legs: tibial spurs strong on legs III and IV; pedal spurs strong on legs I to IV. Trichobothriology: trichobothrial pattern of Type A, orthobothriotaxic as defined by Vachon (1974). Dorsal trichobothria of femur arranged in β (beta) configuration (Vachon, 1975).

Comparisons. – *Buthus pyrenaicus* sp. n. shows affinities with *B. alacanti* (most similar species) and *B. occitanus* in respect to four key characters (general coloration yellowish with a dark univittate pattern along tergites, pedipalp chela narrower in males than females, pedipalp fingers with lob/notch combination obsolete and metasomal segments with ventral carinae feebly raised distally on II-III). Adults of these two species can however be easily distinguished from *B. pyrenaicus* sp. n. notably by the following main features:

- *B. alacanti*:

- (i) general coloration vivid yellow (less vivid in *B. pyrenaicus* sp. n., from pale yellow to yellowish orange),
- (ii) pedipalp chela manus slender in both sexes (length/width ratio 1.54-1.65 and length/depth ratio 1.48-1.65 in male *B. alacanti*, both ratios 1.42 in male *B. pyrenaicus* sp. n.; length/width ratio and length/depth ratios 1.45 in female *B. alacanti*, length/width ratio 1.29-1.42 and length/depth ratio 1.21-1.30 in female *B. pyrenaicus* sp. n.),
- (iii) fingers shorter in both sexes (male movable fingers/manus length ratio 1.60-1.88 in *B. alacanti*, 1.91 in *B. pyrenaicus* sp. n.; female movable fingers/manus length ratio 1.53 in *B. alacanti*, 1.64-1.75 in *B. pyrenaicus* sp. n.),
- (iv) femur almost bare with only 4-6 very short setae mostly concentrated along ventrodiscal edge and patella almost bare (femur with some macrosetae mostly concentrated along ventrodiscal edge and patella with a few macrosetae scattered all over in *B. pyrenaicus* sp. n.),
- (v) female metasomal segment I longer than wide, with length/width ratio 1.02 (as wide as long to wider than long in *B. pyrenaicus* sp. n. with length/width ratio 0.97-1.00),
- (vi) male telson vesicle wider than deep (width/depth ratio 1.07-1.12) while vesicle is laterally compressed, deeper than wide in *B. pyrenaicus* sp. n. (0.95),
- (vii) anal arc with less ventral teeth (9) than in *B. pyrenaicus* sp. n. (10-12).

	♂ holotype (Cerbère)	♀ paratype (Cerbère)	♀ paratype (Cerbère)	♀ paratype (Montauriol)
Total length	66.60	63.96	60.07	66.42
Carapace (L - W)	7.13 - 8.25	8.13 - 9.88	7.50 - 10.00	8.13 - 11.13
Metasomal segment I (L - W - D)	5.88 - 5.24 - 4.76	5.19 - 5.25 - 4.38	4.81 - 4.81 - 4.38	5.52 - 5.71 - 4.88
Metasomal segment II (L - W - D)	6.50 - 4.95 - 4.48	5.63 - 4.75 - 4.38	5.75 - 4.50 - 4.38	6.25 - 5.50 - 5.00
Metasomal segment III (L - W - D)	6.63 - 4.76 - 4.48	5.88 - 4.63 - 4.38	6.00 - 4.38 - 4.13	6.38 - 5.38 - 5.00
Metasomal segment IV (L - W - D)	8.13 - 4.38 - 3.90	7.25 - 4.50 - 4.00	7.00 - 4.13 - 3.75	7.88 - 5.00 - 4.63
Metasomal segment V (L - W - D)	8.75 - 3.90 - 3.33	8.63 - 4.29 - 3.63	8.50 - 4.10 - 3.38	9.50 - 4.95 - 4.00
Telson (L)	7.33	7.75	7.63	8.38
Vesicle (L - W - D)	4.19 - 2.95 - 3.10	4.48 - 4.00 - 3.38	4.38 - 3.75 - 3.25	4.86 - 4.38 - 4.13
Telson (L)	3.13	3.27	3.25	3.52
Pedipalp (L)	26.00	29.13	26.38	29.38
Pedipalp femur (L - W)	5.00 - 1.88	5.50 - 2.00	5.63 - 1.88	6.50 - 2.25
Pedipalp patella (L - W)	7.38 - 2.76	8.25 - 3.50	7.63 - 3.13	8.38 - 3.50
Pedipalp chela (L)	12.38	13.75	13.26	14.88
Pedipalp chela manus (L - W - D)	4.25 - 2.86 - 3.00	5.00 - 3.88 - 4.13	4.88 - 3.44 - 3.75	5.63 - 4.00 - 4.50
Movable finger (L)	8.13	8.75	8.38	9.25

Table I. Morphometric values (mm) of the adult types of *Buthus pyrenaicus* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

- *B. occitanus*:

(i) male smaller than same size-class female (slightly larger than same size-class female in *B. pyrenaicus* sp. n.),

(ii) pedipalp chela manus slenderer in both sexes (length/width ratio 1.73-1.87 and length/depth ratio 1.50-1.61 in male *B. occitanus*, both ratios 1.42 in *B. pyrenaicus* sp. n.; length/width ratio 1.48-1.66 in female *B. occitanus*, 1.29-1.42 in female *B. pyrenaicus* sp. n.),

(iii) male with chela manus narrower than patella, with manus/patella width ratio 0.87-0.99 (slightly wider than patella in *B. pyrenaicus* sp. n. with manus/patella width ratio 1.04),

(iv) male fingers shorter (movable fingers/manus length ratio 1.76-1.84) than in *B. pyrenaicus* sp. n. (1.91),

(v) metasoma very similar in both sexes (male metasoma longer and heavier than female in *B. pyrenaicus* sp. n.) with dorsal and dorsolateral carinae weakly subcrenulate to crenulate on segments II-IV in male (vestigially to weakly subcrenulate in *B. pyrenaicus* sp. n.),

(vi) female metasomal segment I longer than wide, with length/width ratio 1.02-1.07 (as wide as long to wider than long in *B. pyrenaicus* sp. n. with length/width ratio 0.97-1.00),

(vii) male telson vesicle wider than deep (width/depth ratio 1.06-1.10) while vesicle is laterally compressed, deeper than wide in *B. pyrenaicus* sp. n. (0.95).

All specimens of *B. occitanus* from the 13 French localities studied herein (including type locality) showed a remarkable homogeneity in morphology in both sexes (this was also noticed in Teruel & Turiel, 2020). The only *Buthus* specimens differing in morphology were the ones from the 3 localities in Pyrénées-Orientales, corresponding to the new species described here.

Distribution and ecological characteristics of the type localities

As already outlined in the introduction, a high degree of microendemism has been demonstrated in the genus *Buthus* in

	♂ <i>B. pyrenaicus</i> sp. n.	♂ <i>B. occitanus</i>	♂ <i>B. alacanti</i>
Total L	67	<u>54-64</u>	61-66
Pedipalp L / Carapace L	3.65	3.59-3.70	3.39-3.51
Pedipalp chela L/W	4.13	<u>4.88-5.26</u>	4.28-4.34
Pedipalp chela manus L/W	1.42	<u>1.73-1.87</u>	<u>1.54-1.65</u>
Pedipalp chela manus L/D	1.42	<u>1.50-1.61</u>	<u>1.48-1.65</u>
Pedipalp chela L / Movable finger L	1.52	1.52-1.57	1.53-1.63
Pedipalp Movable finger L / Chela manus L	1.91	<u>1.76-1.84</u>	<u>1.60-1.88</u>
Pedipalp chela manus W / Patella W	1.04	<u>0.87-0.99</u>	1.02-1.07
Metasoma (without telson) L / Carapace L	5.03	4.66-5.07	4.92-5.29
Metsaomal segment I L/W	1.12	<u>1.03-1.11</u>	<u>1.08-1.10</u>
Metsaomal segment I L/D	1.24	1.15-1.29	1.20-1.26
Metsaomal segment IV L/W	1.86	<u>1.63-1.83</u>	<u>1.71-1.81</u>
Metsaomal segment IV L/D	2.08	<u>1.86-2.04</u>	<u>1.93-1.96</u>
Metsaomal segment V L/W	2.24	2.21-2.30	2.05-2.16
Metsaomal segment V L/D	2.63	2.44-2.65	2.48-2.56
Telson L/W	2.48	<u>2.32-2.41</u>	<u>2.07-2.19</u>
Telson L/D	2.36	<u>2.47-2.62</u>	<u>2.31-2.35</u>
Vesicle L/W	1.42	<u>1.27-1.30</u>	<u>1.18-1.24</u>
Vesicle L/D	1.35	<u>1.37-1.42</u>	1.26-1.38
Vesicle W/D	0.95	<u>1.06-1.10</u>	<u>1.07-1.12</u>

Table II. Comparative table of total length and selected morphometric ratios of adult males of *Buthus pyrenaicus* sp. n. (France, n=1; MHNL), *Buthus occitanus* (France and Spain, n=6; MHNL, EYCP, Teruel & Turiel, 2020) and *Buthus alacanti* (Spain, n=2; MHNL, Teruel & Turiel, 2020).

Abbreviations: length (L), width (W), depth (D). Ratios different from *Buthus pyrenaicus* sp. n. are indicated in italic, those underlined being reported in the comparisons of main features in the text.

	♀ <i>B. pyrenaicus</i> sp. n.	♀ <i>B. occitanus</i>	♀ <i>B. alacanti</i>
Total L	60-66	50-70	65
Pedipalp L / Carapace L	3.51-3.58	3.49-3.84	3.78
Pedipalp chela L/W	3.54-3.85	<i>4.00-4.52</i>	3.66
Pedipalp chela manus L/W	1.29-1.42	<i>1.48-1.66</i>	<i>1.45</i>
Pedipalp chela manus L/D	1.21-1.30	1.22-1.43	<i>1.45</i>
Pedipalp chela L / Movable finger L	1.57-1.61	1.54-1.64	<i>1.65</i>
Pedipalp Movable finger L / Chela manus L	1.64-1.75	1.55-1.87	<i>1.53</i>
Pedipalp chela manus W / Patella W	1.08-1.14	1.04-1.22	<i>1.27</i>
Metasoma (without telson) L / Carapace L	4.01-4.37	4.08-4.48	<i>4.45</i>
Metsaomal segment I L/W	0.97-1.00	<i>1.02-1.07</i>	<i>1.02</i>
Metsaomal segment I L/D	1.10-1.17	1.06-1.19	1.16
Metsaomal segment IV L/W	1.58-1.69	1.59-1.72	1.61
Metsaomal segment IV L/D	1.70-1.87	1.83-1.94	1.82
Metsaomal segment V L/W	1.92-2.07	1.97-2.25	2.02
Metsaomal segment V L/D	2.38-2.51	2.26-2.58	<i>2.56</i>
Telson L/W	1.91-2.03	1.97-2.32	<i>2.05</i>
Telson L/D	2.03-2.35	2.25-2.56	2.38
Vesicle L/W	1.11-1.17	1.15-1.19	<i>1.06</i>
Vesicle L/D	1.18-1.35	1.29-1.33	1.24
Vesicle W/D	1.06-1.18	1.10-1.14	<i>1.16</i>

Table III. Comparative table of total length and selected morphometric ratios of adult females of *Buthus pyrenaicus* sp. n. (France, n=3; MHNL), *Buthus occitanus* (France and Spain, n=18; MHNL, EYCP, Teruel & Turiel, 2020) and *Buthus alacanti* (Spain, n=1; Teruel & Turiel, 2020).

Abbreviations: length (L), width (W), depth (D). Ratios different from *Buthus pyrenaicus* sp. n. are indicated in italic, those underlined being reported in the comparisons of main features in the text.

regions of complex topography, with mountain ranges allowing speciation in geographically limited areas. This is the case in the Iberian Peninsula where 14 *Buthus* species occur, most of them being reported from mountain areas. In France, *B. occitanus* is generally reported to occur in low altitude areas, *i.e.* most of the time under 300 m a.s.l. (82% of reported observations from 1731-2008) and almost always under 500 m a.s.l. (95% of reported observations from 1731-2008) (Vachon, 1952b; Camusso, 1985; Dumont, 1986; Lacroix, 1997; Dupré & Lambert, 2008; iNaturalist, 2021; ONEM, 2021). The remaining 5% of reported observations (above 500 m a.s.l. and up to 1100 m a.s.l.) mostly concern localities in the Pyrenees Mountains (see Fig. 20) and all these records may actually correspond to *B. pyrenaicus* sp. n. The specific identity of these records, as well as those from the Spanish side of the Eastern Pyrenees (*e.g.* Cadaqués, Cap Norfeu, Berga, Alinyà, Rivert, etc.) should be regarded as confirmation pending until specimens become available for taxonomic comparison with the new species.

The Pyrenees are an interzonal mountain system (orobiome) making a "transition area" between Central and Mediterranean Europe, containing high levels of biodiversity and many endemic species (*e.g.* about 200 endemic vascular plant species). This mountain range is divided into three major bioclimatic sectors: the western portion is affected by the mild and humid Atlantic air streams, the central continental sector by colder and drier weather, and the eastern section by a Mediterranean influence bringing warm summer drought. In the eastern section, where *B. pyrenaicus* sp. n. occurs, the climate is Mediterranean with annual temperature ranges going from 7-24° C in lower elevations to 0-16 °C in medium elevations and average annual precipitation going from 600 mm (lower elevations) to 1200 mm (medium elevations). Lower elevations and limestone/dolomite canyons have a Mediterranean vegetation type, where mixed evergreen (mainly *Quercus ilex* L.) and deciduous species (*Q. faginea* Lam., *Q. pubescens* Willd., *Acer opalus* Mill.) predominate. Cork oak (*Q. suber* L.) and stone pine (*Pinus pinea* L.) form important

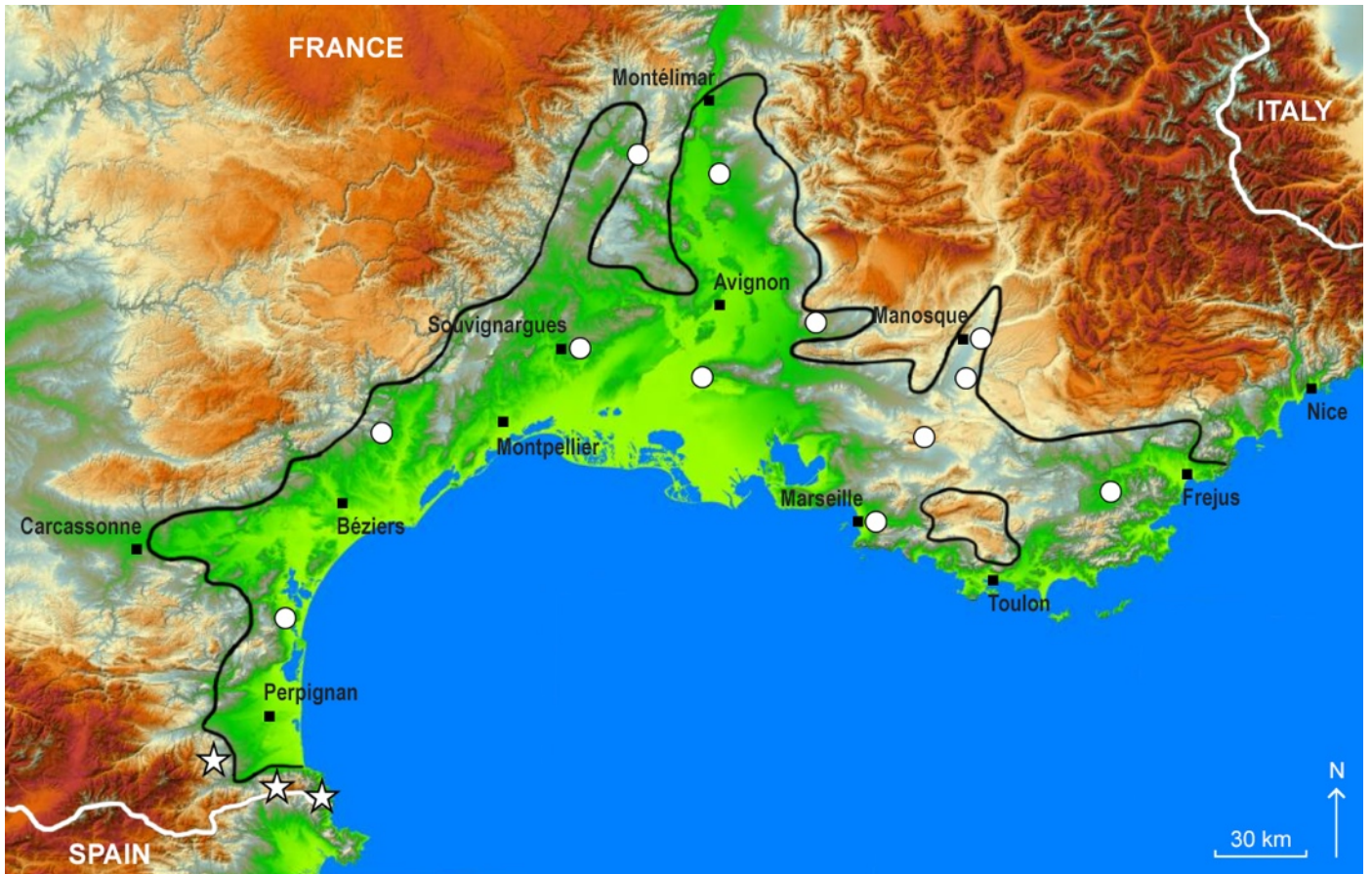


Fig. 19. Topographic map of Southern France showing the approximate known distribution of *Buthus occitanus* (low altitude area), the localities of examined material of *Buthus occitanus* in the present study (white circles) and the type localities of *Buthus pyrenaicus* sp. n. (white stars). Localities in Spain are not indicated here.

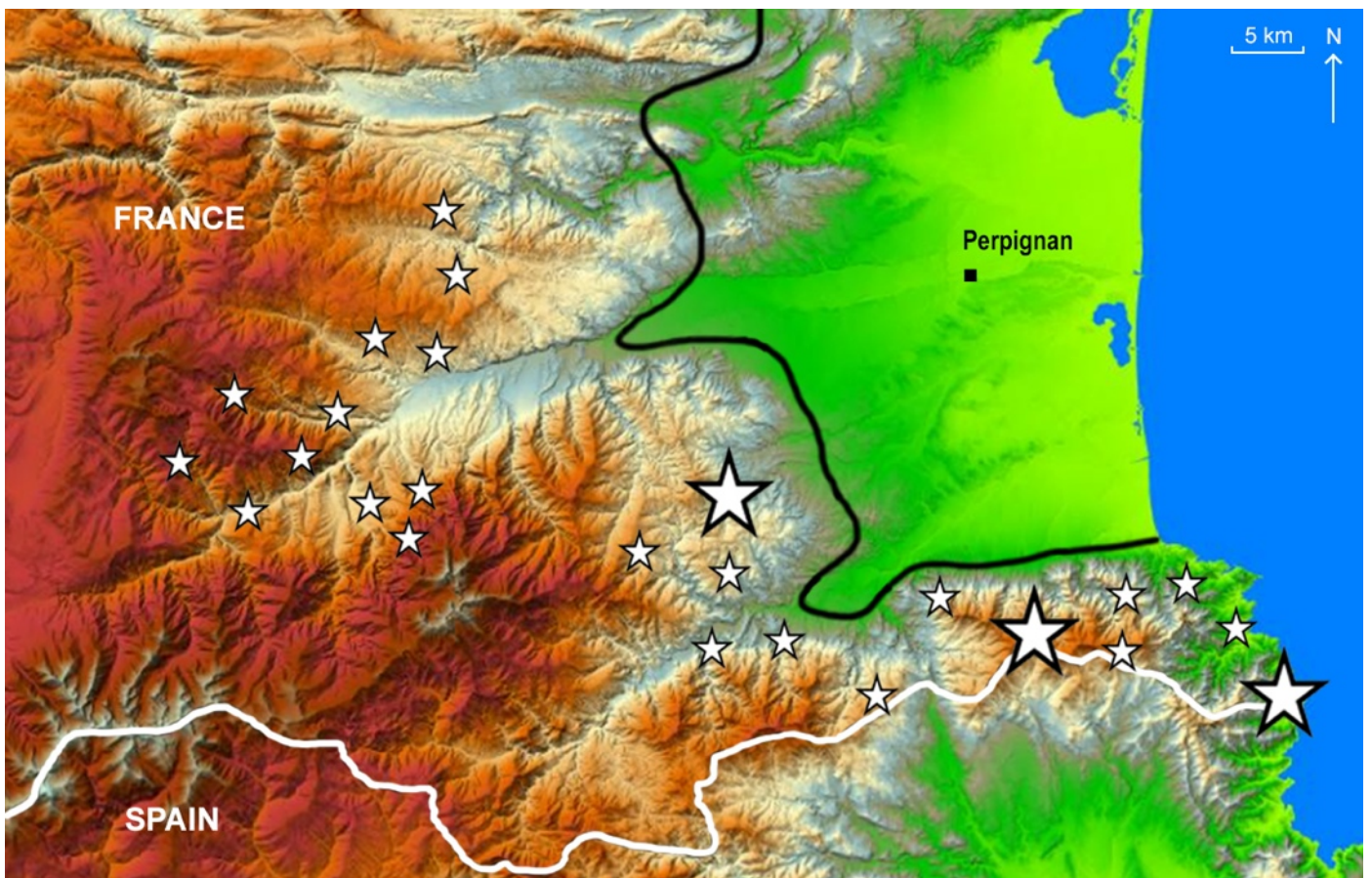


Fig. 20. Topographic map of Eastern Pyrenees (Pyrénées-Orientales) showing the approximate known distribution of *Buthus occitanus* (low altitude area), the type localities of *Buthus pyrenaicus* sp. n. (large white stars) and the known records of "*Buthus occitanus*" (small white stars) which may correspond to the new species described in this study. Localities in Spain are not indicated here.



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Fig. 21-22. Natural habitat of *Buthus pyrenaicus* sp. n. in the Pyrenees, near Banyuls, Pyrénées-Orientales, France.

forest stands in the siliceous substrates of the easternmost extreme, near the Mediterranean Sea. Medium elevations are characterized by deciduous mixed forest (*Q. petraea* Matt., *Q. pubescens* Willd.) and pine forests of Scotch pine (*P. sylvestris* L.) and Mediterranean black pine (*P. n. salzmannii* Dun.). As most Western European *Buthus* species, *B. pyrenaicus* sp. n. is a lapidicolous scorpion digging short burrows in the soil, usually under limestone rocks.

Acknowledgements

I am deeply grateful to Cédric Audibert (MHNL, Lyon, France) for his invaluable help in locating the *Buthus* specimens in the MHNL collections. I am also very grateful to Pierre Escoubas (Valbonne, France) for the donation of specimens from the Plaine des Maures.

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Résumé

Ythier E., 2021. – Le genre *Buthus* Leach, 1815 (Scorpiones: Buthidae) en France avec la description d'une nouvelle espèce des Pyrénées-Orientales. *Faunitaxys*, 9(38): 1 – 10.

Une nouvelle espèce appartenant au genre *Buthus* est décrite sur la base de six spécimens collectés dans les Pyrénées-Orientales, dans le sud de la France. L'espèce *Buthus pyrenaicus* sp. n. est principalement caractérisée par sa coloration générale jaunâtre avec une tache centrale longitudinale foncée sur les tergites, les doigts des mains des pédipalpes avec un lobe basal obsolète, le mâle légèrement plus grand que la femelle et avec les mains des pédipalpes plus larges que les patellas ainsi qu'un telson comprimé latéralement, et la femelle avec le premier segment metasomal aussi large que long à plus large que long. La nouvelle espèce montre des affinités avec *B. alacanti* Teruel & Turiel, 2020 (l'espèce la plus proche) et *B. occitanus* (Amoreux, 1789) mais peut être aisément distinguée de ces deux espèces par une combinaison de plusieurs caractères. Ce nouveau taxon représente la seconde espèce de *Buthus* décrite pour la France et la 15^{ème} décrite pour l'Europe de l'Ouest.

Mots clés. – Scorpion, *Buthus*, *pyrenaicus*, taxonomie, nouvelle espèce, description, morphologie, France, Pyrénées.

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Illustration de la couverture : Mating (*Promenade à deux*) of *Buthus occitanus* sp. n.

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