

Appendix 1. Character list

List of 65 characters scored for cladistic analysis of 30 bothriurid scorpion species, including all species of *Orobothriurus* Maury, 1976, *Pachakutej* Ochoa, 2004 and *Rumikiru* Ojanguren Affilastro *et al.*, in press. Data matrix in Table 1. Character states are scored 0–3, unknown (?) and inapplicable (-). Morphological terminology follows Vachon (1974) for trichobothrial nomenclature; Vachon (1952) and Prendini (2000) for pedipalp carinae, abbreviated as follows: internommedian (IM), dorsointernal (DI), dorsomedian (DM), dorsoexternal (DE), externommedian (EM), ventroexternal (VE), ventromedian (VM), ventrointernal (VI), dorsal patellar process (DPP), ventral patellar process (VPP), digital (D), dorsal secondary (DS), dorsomarginal (DMA), external (E); a modified version of Prendini (2000, 2003b) used by Ochoa *et al.* (2010) for tergite, sternite and metasomal carinae, abbreviated as follows: dorsolateral (DL), lateral supramedian (LSM), lateral median (LM), lateral inframedian (LIM), ventrolateral (VL), ventrosubmedian (VSM), ventromedian (VM); Mattoni and Acosta (2005) for metasomal macrosetae; Stahnke (1970) for other characters. Characters from previous analyses that correspond partially or entirely to those in the present matrix are as follows: O2004 = Ochoa (2004); OA&R2009 = Ojanguren Affilastro & Ramírez (2009); P2003 = Prendini (2003a).

Pigmentation pattern

0. Tergites I–IV, pigmentation: entirely pigmented (0); paired spots sublaterally, unpigmented area medially (1) [O2004: 0; OA&R2009: 1].
1. Tergite VII, pigmentation: entirely pigmented (0); paired spots sublaterally, unpigmented area medially (1); inapplicable (-).
2. Metasomal segments II and III, dorsal surfaces, pigmentation: absent, unpigmented (0); subtriangular spot medially, it may be divided by unpigmented line medially (1).
3. Metasomal segments I–III, dorsal surfaces, pigmentation along DL carinae: absent, unpigmented (0); reticulate lines (1).
4. Metasomal segments IV and V, ventral surfaces, VM stripe: contiguous with VL stripe posteriorly (0); not contiguous with VL stripe posteriorly (1); absent (2). [OA&R2009: 5].
5. Telson vesicle, ventral and lateral surface, coloration (♂): similar to ♀, pigmented (0); different from ♀, unpigmented, with glandular, light-yellow coloration (1).

Carapace

6. Anterior margin, shape: sublinear or with shallow median notch (0); with weak median projection (epistome) (1). [OA&R2009: 7].
7. Anteromedian longitudinal sulcus, length (♂): complete (0); vestigial (1). [P2003: 4; O2004: 1;

OA&R2009: 8].

Chelicera

8. Movable finger, subdistal teeth, number: one (0); two (1). [P2003: 9; O2004: 2; OA&R2009: 6].

Pedipalps

9. Femur, length (♂): greater than three times width (0); less than three times width (1). [O2004: 3; OA&R2009: 75].

10. Femur, dorsal surface, shape: slightly convex, DE and DI carinae situated in different axes (0); flat, DE and DI carinae situated in same axis (1). [O2004: 4].

11. Chela, shape: similar in both sexes or narrower (length/width ratio of pedipalp chela smaller) in ♂ than ♀ (0); more robust (length/width ratio of pedipalp chela greater) in ♂ than ♀ (1). [O2004: 5; OA&R2009: 60].

12. Chela manus, external surfaces, shape (♂): prismatic (0) flat (1). [O2004: 6].

13. Chela manus, surfaces adjacent to DMA carinae, shape (♂): D-DMA-DI carinae forming angle greater than 90° (0); D-DMA-DI carinae forming angle less than 90°. [O2004: 7].

14. Chela manus, DMA, DI and VM carinae, granulation (♂): absent, smooth (0); present, finely and densely granular (1).

15. Chela movable finger, shape (♂): straight (0); curved (1). [O2004: 8].

16. Chela manus, secondary sexual apophysis (♂): present (0); absent (1). [O2004: 9].

17. Chela manus, secondary sexual apophysis, shape (♂): conical (0); spiniform (1); lobate (2); conical-truncate (3); horn-like (4); inapplicable (-). [P2003: 25; O2004: 10; OA&R2009: 61].

18. Chela manus, secondary sexual apophysis, position (♂): close to base of fixed finger, distal to trichobothrium *ib* (0); in distal third of manus, proximal to trichobothrium *ib* (1).

19. Chela fixed finger, group of granules at base (♂): absent (0); present (1). [P2003: 26; O2004: 11; OA&R2009: 62].

20. Chela fingers, median denticle rows, number: single row (0); multiple rows (1). [P2003: 27; O2004: 12; OA&R2009: 64].

21. Chela movable finger, median denticle row, relative denticle size: all denticles equal in size (0); basal denticle greatly enlarged, approximately five times larger than other denticles (1).

Trichobothria

22. Chela manus, trichobothrium *ib*, position (♂): situated at base of ventral side of secondary sexual apophysis, visible in ventral view (0); situated at base of internal side of apophysis, not visible in ventral view (1); situated more distal to apophysis, visible in ventral view (2). [O2004: 13].

23. Chela manus, trichobothrium *Esb*, position: intermediate between *Eb*₁ and *Eb*₂ (0); dorsal to *Eb*₂ (1); intermediate between *Eb*₂ and *Eb*₃ (2). [O2004: 14; OA&R2009: 53].
24. Chela manus, trichobothrium *Et*₃, position: distal to *Est* (0); in same axis as *Est* (1); proximal to *Est* (2). [O2004: 15; OA&R2009: 54].
25. Chela manus, trichobothrium *V*₂, position: forming obtuse angle (< 180°) with *V*₁ and *V*₃ (0); in same axis as *V*₁ and *V*₃ (1). [O2004: 16].
26. Chela fixed finger, trichobothrium *dst*, position: in same axis as *est* (0); proximal to *est* (1). [O2004: 17].
27. Chela manus, trichobothrium *Db*, position: close to *Dt* (0); equidistant between *Dt* and *Eb*₃ (1). [O2004: 18].
28. Chela manus, trichobothrium *Et*₅, position: forming acute angle (< 90°) with *eb* and *Et*₄ (0); forming obtuse angle (< 180°) with *eb* and *Et*₄ (1). [O2004: 19].

Legs

29. Legs III and IV, telotarsi, ventrosubmedian spiniform macrosetae, number of pairs: three (0); more than five (1). [O2004: 20; OA&R2009: 39].

Genital operculum

30. Genital sclerites, shape (♀): rhomboid (0); posteriorly elongated, anterior edge slightly rounded (1).

Sternites and Metasoma

31. Sternite VII, carinae: absent (0); VL and/or VSM carinae present (1). [O2004: 21; OA&R2009: 81].
32. Metasomal segment I, VSM carinae (♀): absent (0); present (1). [O2004: 22; OA&R2009: 91].
33. Metasomal segment II, VSM carinae (♀): present (0); absent (1). [O2004: 23; OA&R2009: 92].
34. Metasomal segment II, VSM carinae (♂): present (0); absent (1). [O2004: 24].
35. Metasomal segment III, VSM carinae (♀): present (0); absent (1). [O2004: 25].
36. Metasomal segment IV, VSM carinae (♀): present (0); absent (1). [O2004: 26; OA&R2009: 97].
37. Metasomal segment IV, VSM carinae (♂): present (0); absent (1). [O2004: 27].
38. Metasomal segment V, VL carinae (♂): present in more than half of segment (0); restricted the posterior third (1); absent or reduced to few granules posteriorly (2). [O2004: 28; OA&R2009: 104].
39. Metasomal segment V, VL and VSM carinae, relative orientation: well separated, diverging (0);

adjacent, subparallel (1); inapplicable (-). [O2004: 29].

40. Metasomal segment V, VSM carinae, orientation in posterior third: subparallel, not diverging (0); diverging slightly (1), diverging strongly, forming arc (2). [P2003: 82; O2004: 30; OA&R2009: 101; additive].

41. Metasomal segment V, VM carina: present, well developed (0), vestigial or absent (1). [O2004: 31].

42. Metasomal segment III, length (σ): less than or equal to width (0); greater than width (1). [O2004: 32; OA&R2009: 105].

43. Metasomal segment V, length (σ): less than or equal to twice width (0); greater than twice width (1). [O2004: 33; OA&R2009: 106].

Macrosetae

44. Pedipalp femur, dorsal macroseta (M_1) situated near *d* trichobothrium: present (0), absent (1). [O2004: 34].

45. Metasomal segment I, VSM macrosetae, number of pairs: two (0); three (1). [O2004: 35; OA&R2009: 83].

46. Metasomal segment III, VSM setae, number of pairs: two (0); three (1). [O2004: 36].

47. Metasomal segment IV, VSM setae, number of pairs: two (0); three (1); four (2). [O2004: 37; OA&R2009: 87; additive].

Hemispermaphore

48. Apex of lamina, shape of distal margin: subtriangular (0); rounded or subquadrangular (1). [O2004: 38].

49. Apex of lamina, length: greater than length of frontal crest (0); less than length of frontal crest (1); inapplicable (-).

50. Distal crest, shape: curved with respect to ventral border (0); parallel to ventral border (1); straight and diagonal to ventral border (2). [O2004: 40].

51. Semicircular depression at base of lamina, development: well developed, extended to basal portion (0); slightly developed (1); obsolete (2). [O2004: 41; additive].

52. Posterodistal fold: absent (0); present (1). [O2004: 42].

53. Frontal crest: absent (0); present (1). [O2004: 43; OA&R2009: 35].

54. Frontal crest, incision in distal border: absent (0); present (1); inapplicable (-). [O2004: 44].

55. Frontal crest, shape: undivided, with continuous, smooth borders, without undulations (0); divided in two parts, proximal oblique part with two lateral folds, distal part straight usually parallel to ventral margin of lamina, with lateral projections on each side (1); divided in two parts, distal

part sinuous with strong undulation in dorsal border (2).; inapplicable (-). [O2004: 45].

56. Frontal crest, lateral projections of distal part, shape: reduced, length of projections less than length of proximal oblique part (0); elongated, length of distal part greater than proximal oblique part (1); inapplicable (-). [O2004: 47].

57. Capsule, internal lobe, development: similarly developed to external lobe (0); considerably more developed than external lobe (1). [O2004: 49].

58. Capsule, internal lobe, spiniform apophysis on external surface: absent (0); present (1). [O2004: 50].

59. Capsule, internal lobe, sclerotized apophysis on internal fold: absent (0); present (1). [O2004: 51].

60. Capsule, basal lobe, tortuous stem, subdistal spoon-like dilation ending in terminal process: absent (0); present (1). [O2004: 52].

61. Capsule, basal lobe, subdistal dilation, shape: widened (0); oval (1); elongated (2); inapplicable (-). [O2004: 53].

62. Capsule, basal lobe, terminal process, shape: short (0); elongated (1); inapplicable (-). [O2004: 54].

63. Capsule, basal lobe, spatulate terminal process: absent (0); present (1). [O2004: 55].

64. Capsule, basal lobe, papillose fold: absent (0); present (1). [O2004: 56].