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OROBOTHRIURUS ATIQUIPA, A NEW BOTHRIURID SPECIES (SCORPIONES) FROM LOMAS IN SOUTHERN PERU

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ABSTRACT. *Orobothriurus atiquipa* new species (Scorpiones, Bothriuridae) from Lomas formations in the coastal desert of southern Perú is described and illustrated. This species belongs to the *alticola* species-group, and within the group, it is closely related to *O. alticola* (Pocock), *O. paessleri* (Kraepelin) and *O. curvidigitus* (Kraepelin). The spine formula (4 + 3) on tarsi III–IV is probably an autapomorphy for the new species. Some features of the habitat (the Lomas formation are green isolates in the coastal desert), as well as a distribution map are provided.

RESUMEN. Se describe *Orobothriurus atiquipa* nueva especie de escorpión Bothriuridae, colectado en una formación de Lomas en el desierto costanero del Sur del Perú. Esta especie pertenece al grupo *alticola*; dentro de éste, las especies más próximas son *O. alticola* (Pocock), *O. paessleri* (Kraepelin) y *O. curvidigitus* (Kraepelin). La fórmula de espinulación tarsal en patas III–IV (4 + 3) es probablemente una autapomorfia de la nueva especie. Se presentan también algunos datos del habitat de *O. atiquipa* (las formaciones de Lomas son verdaderos parches de vegetación dentro del desierto costero), así como un mapa de distribución.

Keywords: Scorpiones, Bothriuridae, *Orobothriurus*, Perú, Neotropics

The genus *Orobothriurus* Maury 1976 (Scorpiones, Bothriuridae) comprises small to medium sized bothriurids, with most species inhabiting high Andean environments above 2,000 m, from Perú to Argentina. The taxon follows very closely the Andean distributional pattern (Maury 1976), also referred to as the ''trans-Andean'' or ''A'' corridor (Lourenço 1994). One *Orobothriurus* species was reported to hold the elevation record for the whole order (Polis 1990; Lourenço 1997), and in some cases the genus has been thought to include only high elevation species (Lowe & Fet 2000). The latter statement, however, overlooks the fact that at least one species, *Orobothriurus paessleri* (Kraepelin 1911) was already known to occur near the Pacific coast, in southern Perú (Maury 1976; Dávila Flores 1982). With more materials at hand (Ochoa & Acosta, pers. obs.), it is now clear that this species exists in a very peculiar biotope, the ''Lomas'', a plant formation which develops on seawards slopes inside the highly xeric coastal desert. In this paper we describe the second *Orobothriurus* species inhabiting the Lomas, *O. atiquipa* new species, captured more northerly than *O. paessleri*. The presence of these species at low elevations does not contradict the general Andean pattern, for it should comprise not only the Andean chains proper, but also several associated orographic systems east of the Andes (e.g. sub-Andean and Pampean systems in W and NW Argentina, from where some captures of *Orobothriurus* have been reported; Acosta & Ochoa 2001, as well as the low Coastal Range of Perú and N Chile, where most of the Lomas develop.

Lomas formations extend along the Pacific coast from about Trujillo, Perú (8°S) to the Chilean locality of Coquimbo (30°S) (Ferreyra 1986). They are green isolated patches, surrounded by one of the most extreme hot deserts on earth (Péfaur 1981). In the Lomas of Yuta, temperature ranges between 26–28 °C (highest temperatures in summer) and 10–12 °C (lowest temperatures in winter) (Dávila Flores 1982); the annual precipitation (rain plus fog) fluctuates between 125 and 250 mm, while the surrounding areas receive only 20 mm a year (Péfaur 1981). Precipitation is most concentrated in winter, and the vegeta-

tion shows an accordingly remarkable seasonal phenology, caused by the drastic meteorological changes. The winds bring humidity from the sea to the continent. In winter and the beginning of spring (June–October), the fog condenses on the west-facing slopes of the Coastal Range (most abundant at 700–1000 m), enabling the appearance of Lomas vegetation; this phenomenon develops much more strikingly in years when ''El Niño'' occurs, because of the increase of humidity. In summer, these areas remain relatively free of clouds or fog and the moisture in the air does not condense on the Lomas, but continues its east-ward displacement up to the higher slopes of the Andean Cordillera Occidental (Bowman 1938). In contrast to the plant phenology, many animal communities are more abundant in the dry season, following a sudden increase in September (Péfaur 1981). The insular condition of the Lomas and their seasonality attracted the attention of several researchers, who have carried out many vegetation and faunistic surveys (Aguilar 1964; Dávila 1979; López 1977; López et al. 1978; Péfaur 1981). The scorpion species previously known from Lomas biotopes include the iurid *Hadruroides lunatus* (L. Koch 1867), and the bothriurids *O. paessleri* and *Brachistosternus ehrenbergii* (Gervais 1841) (Aguilar 1968; Dávila Flores 1982). The senior author has also collected there some as yet undetermined *Brachistosternus* (*Leptosternus*) species.

With the description of *O. atiquipa* new species, the number of species contained in *Orobothriurus* is now 11 (Maury 1976; Acosta & Ochoa 2000, 2001). Carinae on metasomal segments are described according to the following nomenclature and abbreviations: DL = dorsal lateral; LSM = lateral supramedian; LM = lateral median; LIM = lateral inframedian; VL = ventral lateral; VSM = ventral submedian; VM = ventral median. Materials examined are deposited at Museo Argentino de Ciencias Naturales ''Bernardino Rivadavia'', Buenos Aires (MACN), and Museo de Historia Natural, Facultad de Ciencias Biológicas, Universidad Nacional de San Antonio Abad del Cusco, Perú (MHNC).

Orobothriurus atiquipa new species
Figs. 1–8

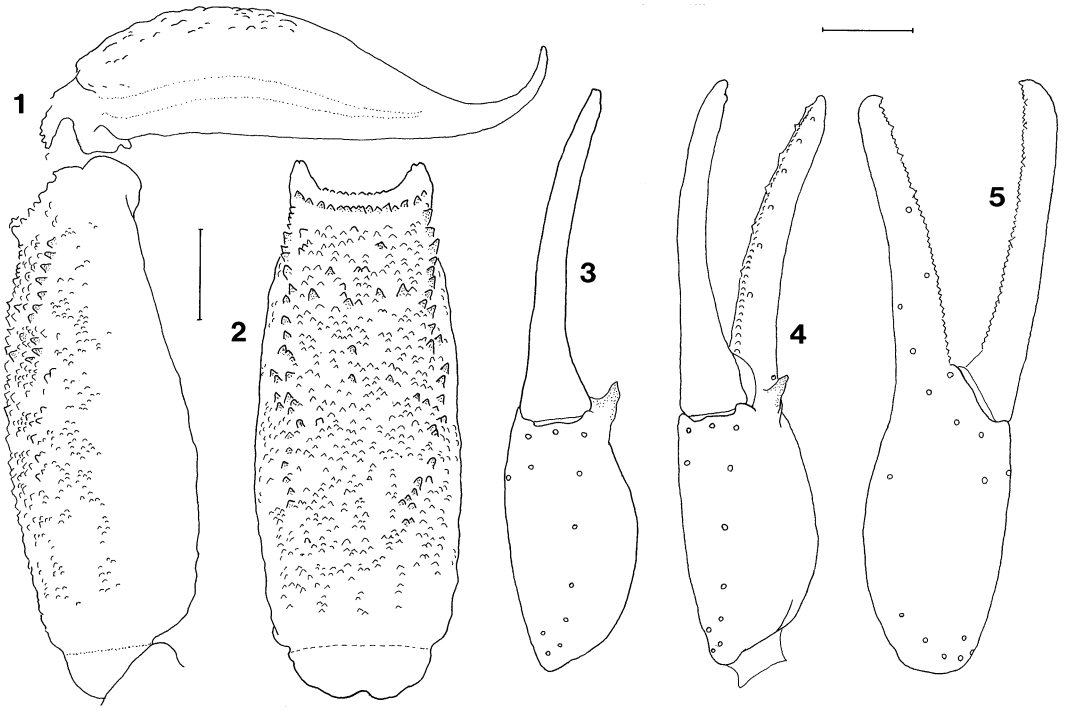
Etymology.—The species name is a noun in apposition, based on the type locality.

Type series.—Holotype ♂ (MACN 10010), 1 ♂ paratype (MHNC): Lomas de Atiquipa (Cerro Lloque, 950 m, 15°45′S 74°22′W), Departamento Arequipa, Perú (Fig. 9), 13 September 1999, H. Zeballos & R. Gutierrez coll.

Diagnosis.—Species belonging to the *alticola* species-group as defined by Acosta & Ochoa (2001). Within the group, *O. atiquipa* new species shows the closest affinities with *O. alticola* (Pocock 1899), *O. curvidigitus* (Kraepelin 1911) and *O. paessleri* (Kraepelin 1911), which have been already determined to form a subgroup in the *alticola* group. This subgroup is characterized, among other features, by the shape of the hemispermatophore lamina: basal portion substraight, and a reduced, S-curved tip (Acosta & Ochoa 2001). The frontal crest of the lamina of *O. atiquipa* new species is proportionally longer than its closest relatives, and the whole lamina has a more slender appearance. The pigmentation pattern of the new species is similar to most members of the *alticola* group (axial clear stripe on mesosoma, ventral dark line on metasoma); however, unlike the typical pattern in the group, on metasomal segments I–III the ventral line has irregular expansions and joins distally to the ventrolateral pigment (in most species the line remains separate all along the metasoma). The dense and irregular ventral granulation of metasomal segment V, and the tarsal spine formula on legs III–IV (most tarsi with 4 + 3 spines) are unique of *O. atiquipa* new species in the whole genus; as a (hitherto) constant generic feature, all remaining *Orobothriurus* bear 3 + 3 ventral spines on telotarsi III–IV, so that this peculiar character state for the new species is probably an autapomorphy. The trichobothrial pattern agrees with the group definition, but is closer to *O. alticola* in subtle details: Et_3 slightly more proximal than Est, Esb above Eb_2.

Description.—Medium sized scorpions; females unknown. Ground color straw-yellowish, with brown dense reticle on carapace, mesosomal tergites, metasoma and legs; venter depigmented, pectines whitish.

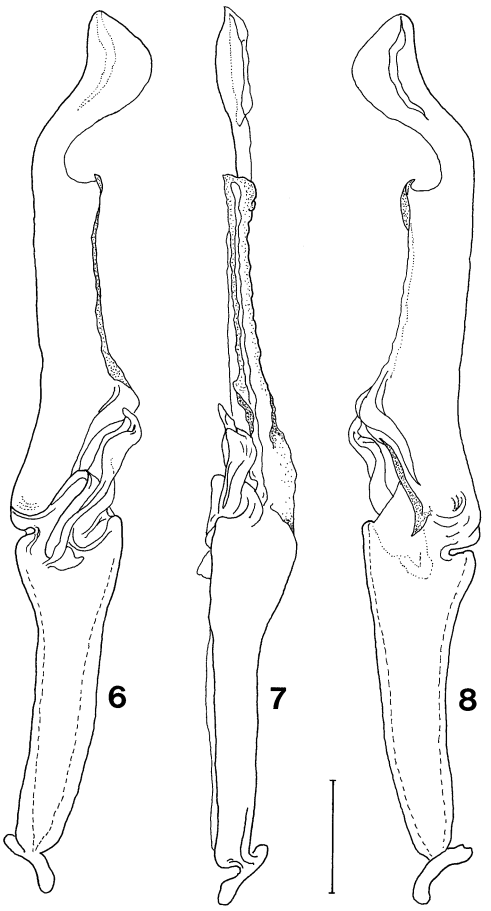
Pigment pattern: Carapace densely pigmented, especially the anterior third, with pigment filling up to the frontal border; ocular mound even darker. Tergites I–VI with two large paramedian pigment areas, extending to the pretergite but not reaching the lateral edg-



Figures. 1–5.—*Orobothriurus atiquipa* new species, holotype male (MACN); 1. Metasomal segment V and telson, lateral view; 2. Metasomal segment V, ventral view; 3—5. Right pedipalp chela; 3. Ventral view; 4. Ventromedial view; 5. Lateral view. Scale bars = 1 mm.

es; they leave small, irregular clear areas inside of the pigmented sector, forming a ''crescent-shaped'' figure on each side. A median unpigmented stripe between these pigmented areas constitutes a longitudinal clear stripe along the mesosoma (in the holotype it is 14.3 % of the tergite width, 11.9 % in the paratype). On tergite VII the lateral pigment is fainter and the median clear stripe is much less defined. Metasomal segments I–III: one dorsal irregular spot, roughly shield-like (on segment I it is divided by a clear median line); segment IV with an elongated spot, less defined. Laterally with a dense reticle, reaching the telescopic part of each segment; it is darker towards the distal portion. Ventrally with a median stripe, wide and irregular on segments I–III (reticular expansions join to thin paramedian lines), quite sharp on segment IV; the median stripe joins distally the lateral pigment through reticular pigment, very faint on segment IV. Metasomal segment V: on lateral view, three longitudinal, reticulate major stripes (dorsolateral, lateral, ventrolateral) join at the caudal end; ventral face with a thin median line, thickened posteriorly but not joining the ventrolateral pigment. Chelicerae with very faint reticle. Pedipalps: dorsal face of femur pigmented on its borders and on the distal quarter, leaving a large elongated clear area on the median portion; patella densely reticulated; chela with irregular faint lines along the hand, joining at the base of fingers. Prolaterally, legs with reticular spots.

Morphology: Tegument finely granular, granulation more pronounced near the front median edge of carapace and the laterals of tergites. Front edge of carapace with a slight median prominence. Tergite VII granulous, with four carinae of granules increasing in size posteriorly. Sternites I–II smooth, III–IV with slight granulation on the posterior border, V with dense granulation on the median third. Metasomal segments I–IV. DL carinae complete, the posterior granule slightly larger than the rest. LSM carinae complete, conspicuously granulous on segment I, smaller granules on segments II–IV. LIM carinae limited to the posterior third, represented by sparse granulation on segments III–IV. VL carinae less de-



Figures. 6–8.—*Orobothriurus atiquipa* new species, left hemispermatophore of the holotype; 6. Internal view; 7. Frontal view; 8. External view. Scale bar = 1 mm.

fined and sparsely granular, granulation decreases towards segment IV. VSM carinae lacking, they are replaced by scattered granulation (dense on segment I, much less evident on segments II–IV). Metasomal segment V. DL carinae complete, 4–5 proximal granules slightly larger. LM carinae represented as fine sparse granulation, especially on the distal half. Ventral surface scabrous, with large granules densely covering the segment: VL carinae are discernible on the distal half, but VSM and VM carinae disappear among the abundant ventral granulation (on the male paratype a faint VM can be distinguished). Number of VSM setae on metasomal segments I–IV: 3–3–3–4 pairs. Telson slightly granular, low (length / height ratio: 4.0 in the holotype, 4.3 in the paratype). Pedipalps slender, fingers proportionally long (chela length / width ratio: 4.6 in the holotype, 4.7 in the paratype); acute spine-shaped apophysis on the prolateral side of hand. Trichobothrium Et_3 slightly more proximal than Est; Esb above Eb_2, it is slightly displaced to Eb_1 in the paratype. Legs: telotarsi III–IV with 4 + 3 ventral spines (only the left tarsus IV of holotype with 3 + 3). Number of pectinal teeth: holotype with 24–23, paratype 24–24. Hemispermatophore slender, lamina straight, except of the apex, S-curved; distal crest curved, parallel to the abfrontal border; frontal crest longer than the half of the lamina, internal border almost smooth, external slightly undulated. Lobe region all like the *alticola* group.

Table 1.—Measurements (mm) of the holotype male of *Orobothriurus atiquipa* new species.

Total length	31.3
Carapace: length	3.7
anterior/posterior width	3.9/2.7
Mesosoma, length	7.3
Metasoma, length	20.3
Metasomal segment I, length/width	1.9/2.4
Metasomal segment II, length/width	2.4/2.2
Metasomal segment III, length/width	2.5/2.2
Metasomal segment IV, length/width	3.2/2.1
Metasomal segment V, length/width/height	5.1/2.1/1.9
Telson, length	5.2
Vesicle, length/width/height	4.1/1.7/1.3
Sting, length	1.1
Pedipalp, total length	13.2
Femur, length/width	3.5/0.9
Patella, length/width	3.7/1.1
Chela, length/width/height	6.0/1.3/1.5
Movable finger, length	3.5

Habitat.—The species is only known from the type locality, a Lomas formation on the coastal desert of northern Departamento Arequipa, Perú (Fig. 9). Specimens were captured in pitfall traps. The main plant physiognomy in the capture site is that of a shrubland (*Duranta armata* Moldenke, *Citharexylum flexuosum* (Ruiz Lopez & Pavon) D. Don, and *Heliotropium arborescens* L. are the most characteristic species), but also gramineae and small forests of ''tara'' (*Caesalpinia spinosa* (Molina) Kuntze), ''arrayán'' (*Myrcianthes ferreyrae* (Mc Vaugh) Mc Vaugh) and *Acacia macracantha* Humboldt & Bonpland ex Willdenow occur there (H. Zeballos pers. comm.).

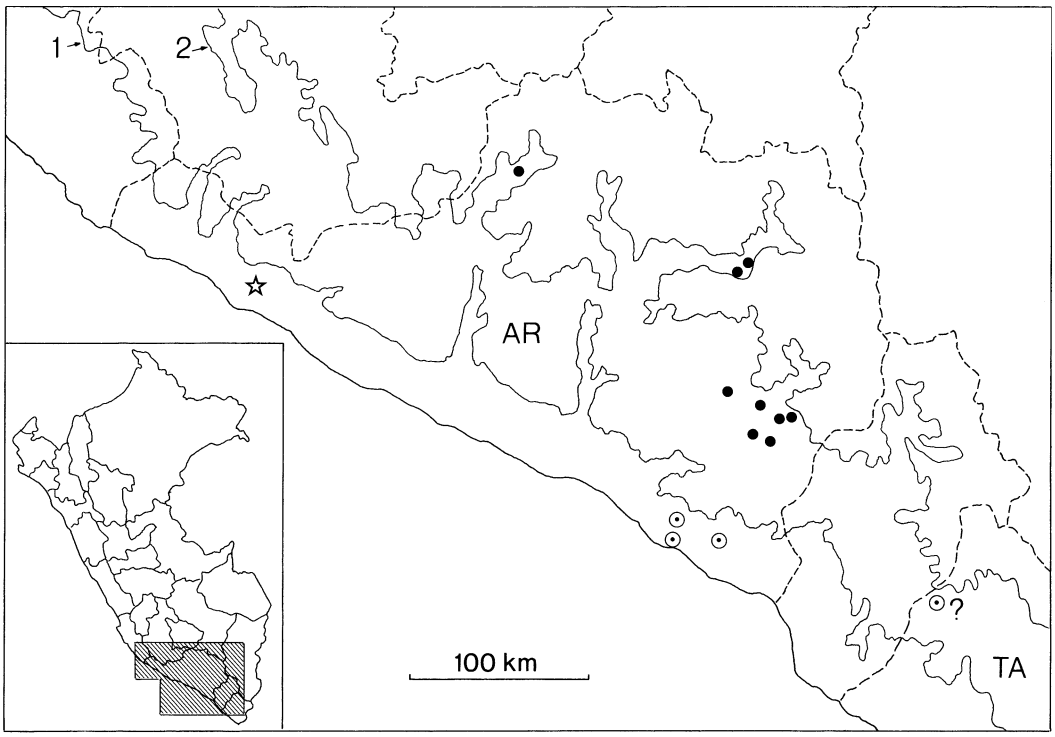


Figure. 9.—Records of three *Orobothriurus* species in southern Perú: *O. atiquipa* new species (star), *O. curvidigitus* (black dots), *O. paessleri* (open circles). Solid lines: upper limits of the coastal desert (1 = *circa* 1000 m a.s.l.) and the ''serrania esteparia'' (2 = *ca.* 3800 m). Dashed lines: administrative boundaries of Departamentos (AR = Arequipa, TA = Tacna). Inset: location of the represented area in Perú.

The geographically nearest *Orobothriurus* species is *O. curvidigitus*, with captures between 2300 and 3600 m at Cotahuasi, in the Colca canyon, and in several localities around Arequipa (Fig. 9); however, this species does not occur in the coastal desert but in a quite different ecoregion, the ''Serrania Esteparia'' (Brack 1986). The nearest desert species is *O. paessleri*, also captured in Lomas biotope (Lomas de Mejía and Yuta, southern Departamento Arequipa), 280 km away from Atiquipa. The desert in between might act as a barrier separating these two related species. The isolation of each Loma patch and the high degree of endemism in these formations may suggest *O. atiquipa* new species to be endemic of its capture site, but this should be supported by further samplings.

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