An unusual new genus of spider beetle (Coleoptera: Ptinidae) from a guano island of Peru

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Un inusual nuevo género de escarabajo araña (Coleoptera: Ptinidae) de la isla de guano peruana

RESUMEN. Se describe un nuevo género y especie de escarabajo araña de Perú. Se sabe que un espécimen proviene de la isla sur de Chincha, mientras que otros fueron interceptados en un envío de guano en Texas, EE. UU. Los caracteres inusuales de este género incluyen una pequeña cavidad lateralmente a cada lado del metepísternum y un espacio muy amplio entre las antenas. Se discuten brevemente la biología potencial y las relaciones evolutivas de este género.

PALABRAS CLAVE. Bostrichoidea. Evolución. Islas Chincha. Mirmecofilia. Tricoma.

ABSTRACT. A new genus and species of spider beetle from Peru is described. One specimen is known to have come from South Chincha Island, while others were intercepted in a guano shipment in Texas, USA. Unusual characters of this genus include a small cavity laterally on each side of the metepisternum and very broad spacing between the antennae. The potential biology and evolutionary relationships of this genus are briefly discussed.

KEYWORDS. Bostrichoidea. Chincha Islands. Evolution. Myrmecophily. Trichome.

INTRODUCTION

The coast and offshore islands of Peru are lined with numerous guano deposits, a resource that has been exploited for use as a fertilizer for centuries by the Inca and in more recent history (Hunt, 1973; Cushman, 2005). The guano boom from 1840-1870 has long disappeared, but a small global demand by organic farmers continues today (Romero, 2008). One international guano shipment was intercepted at Corpus Christi, Texas in 1972 containing the species here described, but the original locality of these specimens is unknown. However, an additional specimen collected from one of the Chincha Islands in 1935 was later discovered in unsorted museum material.

Several island-dwelling spider beetle (Coleoptera: Ptinidae) genera exist, with some taxa sharing similarities in morphology. For example, Pitinus Gorham is globally widespread, with described island species in the Antilles and the Galapagos, as well as coastal Central America, western Mexico, southern Australia, and one inland species reported from Arizona, United States (Bellés, 1992). Neoptinus Gahan is found on both Christmas Island and mainland Australia. Three genera, Casapus Wollaston, Piarus Wollaston, and Stereocaulophilus Bellés, are endemic to the Canary Islands. We take this opportunity to describe another possible island endemic that was discovered on South Chincha Island, located about 20 km offshore from Pisco, Peru.

*Xenocotylus Whorrall & Philips, gen. n.*

Type species: *Xenocotylus latifrons* Whorrall & Philips, sp. n.

Diagnosis. This genus is distinguished from all other known spider beetle taxa by the combination of the head visible from above (Fig. 1A), relatively short, nine-segmented antennae (Fig. 2A) and an extremely wide,
flat interantennal space (Figs 1D, 2A). Most notable is the presence of a shallow ovoid cavity located on the antero-lateral part of each side of the metepisternum (Figs 1C, 3D, 6B). This depression is partially covered by the elytron and there is a darker ring around the perimeter formed by thicker cuticle internally. This taxon is perhaps most similar to Pitnus, but members of this latter genus have a body with a length of ~1 mm and are black in color in contrast to this genus with a body ~2.5 mm in length that is reddish brown in color.

**Description:**

**Body** small, stout, subovate, length approximately 2.2-2.8 mm, vestiture of short, fine, appressed setae sparse, ventral surface broad.

**Head** visible in dorsal view (Fig. 1A), somewhat square-shaped, distinctly narrower than pronotum, slightly flattened dorsally and more rounded ventrally; labrum slightly broadly emarginate anteriorly (Fig. 2B); clypeus short, trapezoidal, fused with frons, anterior margin slightly broadly emarginate opposite labrum (Fig. 2A); mandible with medial tooth, medial tooth and apex somewhat rounded (Fig. 2C); maxillary and labial palp 4- and 3-segmented respectively (Figs 2D, E); mentum triangular, concave, with a median carina (Fig. 2F); interantennal space very broad, flat, approximately twice length of scape, about half the width of the head at the
base (Figs. 1D, 2A); antennal fossae distinct posteriorly where adjacent to interantennal space, but edges rounded and indistinct elsewhere; antennae quite short; about the length of pronotum; 9 antennomeres, scape and apical segment largest, ovoid, segments 2-8 decreasing in length to apex (Fig. 2A), insertion of pedicel into scape offset posteriorly; eyes small, ovoid, hidden from above beneath broad, rounded sides of the head (Fig. 1C).

**Pronotum** about as long as wide, subovate when viewed from above, rounded, slightly compressed dorso-ventrally, lateral carinae absent, indistinct shallow depression on either side laterally and slightly anteriorly of middle (Fig. 1A).

Fig. 2. *Xenocotylus latifrons* gen. n. and sp. n. A. Head, dorsal view. B. Labrum, dorsal view. C. Mandible, lateral view. D. Maxilla, dorsal view. E. Labium, dorsal view. F. Mentum, ventral view. Scale bars = 0.5 mm (A), 0.1 mm (B-F).
**Fig. 3.** *Xenocotylus latifrons* gen. n. and sp. n. A. Prothorax, frontal view. B. Fore leg, frontal view. C. Meso-, meta-, and abdominal ventrites (note female genitalia partially visible through the cuticle surface). D. Close-up of cavity on the metepisternum. E. Aedeagus, ventral view. Scale bars = 0.2 mm (A, B, E), 0.5 mm (C), 0.1 mm (D).

**Elytra** convex, oblong, smoothly rounded shape throughout, humeral angles and posterior margins broadly smooth, rounded, fine puncture rows present (Figs. 1A, 6A).

**Legs** short in length; procoxae conical and strongly projecting, mesocoxae ovoid and projecting; metacoxae completely fused with metathorax with no trace of suture, slightly excavate at trochanter insertion; trochanters small, ovoid, increasing in size from pro- to metatrochanter; femora gradually expanding to apical \( \frac{1}{3} \), slightly tapering to apex; tibiae slender, increasing in girth slightly from base to apex; all tarsi 5 segmented, fifth distinctly longer than the others, tarsomeres 2-4 on pro- and mesolegs as wide as long (Figs. 1B, C, 3B, C).

**Thorax:** Pro- and metathoracic ventrites each completely fused, mesothorax with episternum distinct (Figs. 1B, 3C); hind wings completely absent; prosternal process extending narrowly between procoxae, apex globular and extending past coxal posterior margin (Fig. 3A); scutellum short, broad, triangular (Fig. 1A); mesoventrite somewhat pentagonal, rectangular posterior process wide, slightly protruding between widely separated
mesocoxae (Fig. 3C); metepisternum with small cavity near costal margin of elytron, cavity obscured by dense clump of minute setae.

**Abdominal ventrites** (Figs. 1B, 3C) tapered from second ventrite to apex, more abruptly narrowing after segment 2, segments 4 and 5 much narrower than segments 1-3; segments 1-3 connate, similar in length, separated by shallow sulci laterally, absent medially, segment 4 arcuate, greatly shortened, about 1/5 length of segment 5 at middle.

**Genitalia**: males with relatively simple median lobe and symmetrical parameres (Fig. 3E); females with broad coxites and fine stylets.

**Etymology**: The generic name comes from the Latinized Greek roots "xeno-", meaning strange, and "cotylus", meaning cup, referring to the unusual cavity on each side of the metathorax. The gender is masculine.

*Xenocotylus latifrons* Whorrall & Philips, sp. n.

(Figs. 1-3, 6)

**Holotype**: PERU: Ex. Corpus Christi, TX #538, 25.V.1972, with bird guano fertilizer. Deposited in the Smithsonian National Museum of Natural History, Washington, D.C. **Paratypes** (5): 1. Museo Nacional de Historia Natural, Lima, Peru (MUSM), 1. Smithsonian National Museum of Natural History (USNM), and the collections of the authors: 2. TKPC (including one disarticulated for study and illustrated), 1. KAWC. (1) So. Chincha Isld. Peru, 23. IV. 1935 Crocker Exped. Acc. 33813 deposited in the American Museum of Natural History (AMNH). Note this specimen was originally mounted as three separate pieces and is now mounted with all parts on a single card.

**Diagnosis**: This species can be distinguished from any congener by its reddish brown coloration with light yellow setae, the rugose texture of the elytra, and arrangement of punctuation. The presence (and perhaps the form) of the cavities on the metepisternum may be distinctive to this species if additional taxa belonging to this genus are discovered. Currently the only known precise locality is South Chincha Island, Peru.

**Description**:

**Body** (Fig. 1) reddish brown, glossy, generally darker along elytral suture margins, setae light yellow; length 2.27-2.85 mm (µ = 2.67 ± 0.27) mm (n = 4).

**Head** antenomere 9 densely covered with short setae, roughly ½ total length of scape, antenomeres 2 and 3 pedunculate, roughly ½ length of antenomere 9, antenomeres 4-8 roughly half length of antenomere 2 and 3, increasing in width toward apex, antenomeres 7 and 8 distinctly transverse (Fig. 2A); labrum covered with erect, relatively thick pale yellow setae, clypeus appearing distinct from frons, punctures slightly more dense on the latter, vertex punctures indistinct and surface finely rugulose (Fig. 1D).

**Pronotum** finely reticulate laterally, irregularly punctured, less densely medio-transversely, small punctures present around median line, no more than half the width of punctures elsewhere; setae medially and mediolaterally pointed toward median line, more anteriorly near apex and more posteriorly near base.

**Elytra** surface rugose, fine suberect setose punctures in somewhat irregular rows along and between remnant puncture rows, punctures sometimes appearing slightly darker than surrounding surface, setae angled towards posterior, in some locations punctures arranged in close pairs spaced roughly the width of one puncture apart (Fig. 6A).

**Ventral Surface** finely reticulate, except for meso- and metasternum; covered with apically pointing setae, more dense generally than those on elytra.

**Etymology**: The specific name is from the Latin root "lat/is", meaning wide, and frons. This refers to the particularly wide interantennal space.

**Distribution**: Currently the only record for this species is South Chincha Island of the coast of Peru south of Lima (Fig. 4). A guano shipment from Peru to Corpus Christi, Texas, where several beetles were intercepted, gives no precise information on origin. Hence it remains to be discovered if this genus is present on other islands along the Peruvian coast (Fig. 5) and possibly on the mainland.
Fig. 5. Map from Cushman (2005) showing distribution of guano islands in Peru that potentially have additional populations. The Chinchas Islands are located northwest of Pisco. Reproduced with permission

DISCUSSION

An unusual ovoid cavity is present laterally on each metepisternum (Figs. 1C, 3D, 6B). The small opening to this chamber is visible below the lateral margin of the elytron and is obscured by a dense brush of minute setae. This visible opening is connected to a large cavity hidden under the elytra and extending to the dorso-lateral edge of the metepisternum. The role of these cavities is unknown but may function in a similar manner as trichomes. Trichomes, hair-like structures which collect glandular excretions to appease predatory ants, are known in three New World spider beetle genera, *Gnostus* Westwood, *Fabrasia* Martinez & Viana (Lawrence & Reichardt, 1966), and *Coleoaethes* Philips (Philips, 1998). However, ants are reported as being very scarce on Peruvian guano islands (Murphy, 1925). It is possible that the species or lineage evolved on the mainland in the presence of ants before a founder event to the single island from where this species is known.

Nothing is known of the feeding habits of this genus. The only known locality, South Chinchas Island, provides one obvious potential food source: seabird guano. Although guano is acidic and possibly an unfavorable food source, *Bellesus* Özdiğmen has been observed feeding on lizard droppings in Venezuela (Philips, unpublished), feces which are similar to those produced by birds. This taxon might also feed on accumulated plant detritus. The morphologically similar *Pitnus* is notable for its habit of feeding on coastal vegetation as either a leaf miner (Philips et al., 1998) or a seed head feeder (Philips & Keller, unpublished). But as plants are mostly absent on Peruvian guano islands, this association seems less likely. Resolving the ecology of this genus may require observation of beetles in situ.

This genus bears close similarities to members of the *sphaericinae* group of spider beetles (see Philips & Mynhardt, 2020). With *Pitnus* and *Neoptinus*, it shares the trait of 9-segmented antennae, an uncommon number in spider beetles which typically have 11 antennomeres. These genera also show a relatively broad interantennal space, though not as developed as in *Xenocotylus*. The structure of the abdominal ventrites in *Xenocotylus* and *Neoptinus* is very similar, displaying a high degree of fusion between segments 1-3 and an abrupt narrowing point between these and segments 4 and 5. Due to the wide geographic separation between the two, it is possible that any characteristics shared by *Xenocotylus* and *Neoptinus* but perhaps not *Pitnus* developed independently. The wide distribution of *Pitnus*, including species nearby in both the Galapagos Islands and coastal Peru (Whorrall & Philips, unpublished), supports *Pitnus* as the most likely sister group to *Xenocotylus*.

Of further note is the association of some of these characters with the traditional anobiid beetles. Wide interantennal spacing is a key character differentiating
the anobiids from the spider beetles (i.e., Ptinidae sensu stricto). The female genitalia in this genus also bear a resemblance to the typical form in anobiids. Other characters, however, validate placement among the spider beetles, especially the connate first three abdominal ventrites, reduced length of the fourth (Figs. 1B, 3C), and rounded pronotal lateral margins (Figs. 1C, 3A). Nevertheless, this new genus challenges a distinct division of the two groups. Acquisition of DNA quality specimens should be a major goal for use in future family level phylogenetics of Ptinidae.

This article has been registered in the Official Register of Zoological Nomenclature (ZooBank) as [urn:lsid:zoobank.org:pub:207F6D0E-8579-40D0-A104-F407FEEDE198

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LITERATURE CITED

Bellés, X. (1992) Sistemática, historia natural y biogeografía del género Pitnus Gorham, 1880 (Coleoptera, Ptinidae). Eos, 68, 167-192.

Cushman, G.T. (2005) "The Most Valuable Birds in the World": International Conservation Science and the Revival of Peru’s Guano Industry, 1909-1965. Environmental History, 10, 477-509.

Hunt, S.J. (1973) Growth and guano in nineteenth century Peru. Princeton University, New Jersey, USA.

Lawrence, J.F., & Reichardt, H. (1966) Revision of the genera Gnostus and Fabrasia (Coleoptera: Ptinidae). Psyche, 73, 30-45.

Murphy, R.C. (1925) Los invertebrados terrestres de las islas guaneras del Perú. Boletín de la Compañía Administradora del Guano, 1, 475-490.

Philips, T.K. (1998) A new genus and species of putatively myrmecophilous ptinine, Coleoaethes tetralobus (Coleoptera: Anobiidae: Ptininae). Pan-Pacific Entomologist, 74, 113-117.

Philips, T.K., & Mynhardt, G. (2020) Description of Kelypitnus steineri, a minute-sized spider beetle (Ptinidae) from Madagascar. Journal of Insect Biodiversity, 17, 48-57.

Philips, T.K., Ivie, M.A., & Ivie, L.L. (1998) Leaf mining and grazing in spider beetles (Coleoptera: Anobiidae: Ptininae): An unreported mode of larval and adult feeding in the Bostrichoidea. Proceedings of the Entomological Society of Washington, 100, 147-153.

Romero, S. (2008) Peru Guards Its Guano as Demand Soars Again. The New York Times, May 30th. New York, USA.