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A new species of flea beetle, genus *Pedilia* Clark (Coleoptera: Chrysomelidae: Galerucinae), from Osa Pennisula, Costa Rica

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Abstract

A **new species** of *Pedilia* Clark, *P. sirena*, from Costa Rica is described and illustrated. This species is monophagous on *Passiflora pittieri* HBK, and known only from the Sirena area of Parque National Corcovado, Costa Rica, for which it is named. Previous scientific reports mentioning this species are discussed, specifically those treating its ecological interaction with *Heliconius hewistoni* Staudinger, (Lepidoptera: Nymphalidae). This species is also notable for the two distinctly textured areas of its mandibular mola.

Key words: *Pedilia sirena*, new species, Chrysomelidae, Costa Rica

Resumen

Se describe e ilustra una nueva especie de *Pedilia* Clark, de Costa Rica. Esta especie se alimenta únicamente de *Passiflora pittieri* HBK, y se ha encontrado solamente en la zona conocida como Sirena en el Parque Nacional Corcovado en Costa Rica; de este hecho se ha derivado su nombre, *Pedilia sirena*. Se discuten estudios científicos previos en los que se menciona esta especie, específicamente aquellos en los que se analiza su interacción ecológica con *Heliconius hewitsoni* Staudinger, (Lepidoptera: Nymphalidae). Esta especie tambien es notable por dos áreas con una textura característica y distintiva en la muela mandibular.

Introduction

Pedilia is a rarely collected genus of flea beetle (Chrysomelidae: Galerucinae: Alticini: Disonychina), remarkable for its strongly emarginate eyes (see Fig. 1 and Fig. 3a) and sub-

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circular habitus. Most described species are fulvous in color and practically impossible to distinguish without genitalic examination. In the course of preparing phylogenetic work on the genus, it became clear that a species mentioned ecologically in the context of associations with *Passiflora pitteri* H. B. K. (Duckett 1989, and see Figure 2) was undescribed. This species is described here. Terminology used to describe genitalia follows Duckett (1999).

Pedilia sirena, new species
(Figs. 1, 2, 3a-f, 4a-f, 5)

Diagnosis. *Pedilia sirena* can be distinguished from other described species of *Pedilia* by the slightly concave shape of the ventral lip of the median lobe (Figure 3) and by a unique combination of female genital characters, including presence of a gonophysis and the shape of sternite VIII.

Description. Body robust, very broadly ovate, convex, 4.2 - 5.5 mm long, 3.1 - 4.2 mm wide at elytral midpoint. Color orange (see Figure 2) or fulvous after death, antennomeres III - XI andmandibles piceous.

Head ovate, widest dorsally with mouth small, (Figs.1, 3a) eye deeply emarginate, upper ocular lobe smaller than lower; occiput narrow, less than one-third head width; vertex glabrous and lightly punctate, one postocular seta, postantennal calli pronounced, medially delimited by suture (Fig. 3a); occiput with pronounced bilobed depression abutting ocular setae; frontal carina pronounced, forming a broad based inverted Y over clypeus, (Fig. 1 and Fig. 3a). Labrum: broader than long, slightly emarginate apically, bearing four pairs of setae (Fig. 3b) with many stout setae on apical margin. Mandible: palmate bearing four teeth (Fig. 3e), mandibular mola with two grinding surfaces, apical surface bearing transverse ridges when unworn and basal surface bearing honeycomb-like reticulations (Figure 3f); prostheca bearing long,dense microtrichia (Fig. 3e), exterior face glabrous. Maxillary palpus: last segment,incrassate (Fig. 3c), bearing many setae (see Figure 3d). Antenna long, very thin, extending to between elytral midpoint and apex; antennomere III (0.35 mm) less than 2/3 length IV; V slightly shorter than IV; XI slightly longer than III. Pronotum transverse, convex, width 2.5 - 3x length; anterior angles level with eyes, beveled, with seta on posterior edge of anterior angle and setal pit prominent; pronotal lateral margins distinct, wide, convergent towards head, accompanied by single row of fine punctures two antennal widths from margin, lateral margins convergent towards head; posterior angles anteriorly directed; disc punctation confused and lightly impressed; prebasal pronotal impression bearing sharp lateral prebasal folds, oblique impression arising at anterior corner of lateral impression, fading posteriorly near midline. Elytral punctation indistinct; elytral margin, wide, translucent; epipleuron horizontal, ventrally concave. Scutellum triangular, glabrous.

FIGURE 1. Ventral habitus of *Pedilia sirena*, new species, total length, 5 mm. Copyright Frances L. Fawcett, used by permission.

Prosternum excavated anteriorly to receive head; prosternal process setose (Fig. 1), narrow, extending just beyond procoxae; procoxal cavity open; procoxa oblique. Mesosternum short, transverse, finely pilose, concave anteriorly, posterior edge sinuate.

Male sternum VII with small trapezoidal internal flange at midline articulating with pygidium (Fig. 4a). Pygidium unmodified (Fig. 4a).

Male genitalia (Fig. 4c, d) with ventral lip of median lobe truncate and concave. Median dorsal process of median lobe thin with very small rounded apex, lateral median process wide, shorter than median dorsal process; apically pointed; basal half of median lobe unmodified. Tegmen narrow.

FIGURE 2. New shoot of *Passiflora pittieri* bearing eggs of *Heliconius hewitsoni* (Lepidoptera: Nymphalidae) and several *Pedilia sirena* adults. Note flea beetle feeding damage at base of the shoot and partially eaten *Heliconius* eggs.

Female sternum VII and pygidium evenly convex.

Female genitalia with prominent triangular gonocoxae (vaginal palpi of Konstantinov 1998) (Fig. 4e), each with 17 - 19 short setae distributed along gonocoxal perimeter. Gonapophysis or genital sclerite (Fig. 5) convex, roundly triangular, glabrous. Sternite VIII (the"tignum" of Konstantinov 1998) apically spatulate though narrow, basally broad with highly emarginate proximal edge (Fig.4b). Spermatheca curved (Fig. 4f), receptacle smoothly ovate, pump and proximal spermathecal duct long relative to receptacle. Bursa copulatrix covered with microtrichia, specialized epithelium present at apex, where distal spermathecal duct enters bursa (Fig. 5).

Karyotype. Male with 25 chromosomes, sex determination system unknown (Segarra and Duckett, unpublished data).

Holotype. COSTA RICA: Puntarenas, Osa Peninsula, Parque Nacional Corcovado, Sirena station, 8º 28'N, 83º 35'W, July1985, ex *Passiflora pittieri*, C.N Duckett, (MCZ).

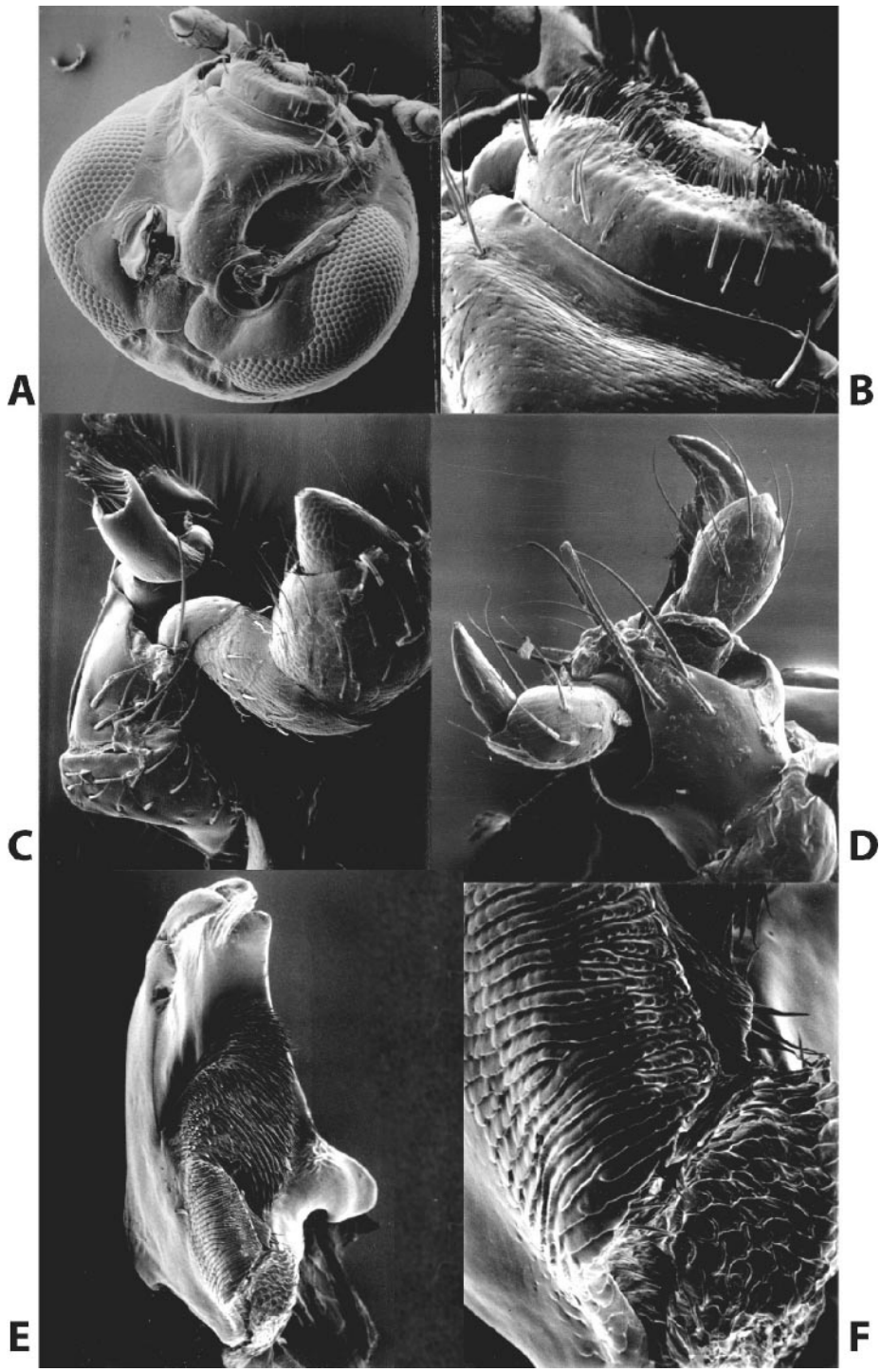

FIGURE 3. *Pedilia sirena*, head and mouth parts, A, frontal view of head, antennae removed, total length 0.6mm; B, labrum, magnification 250X; C, ventral view of maxillary palpus, X 295 ; D, ventral view of labium, 325X; D, interior view of right mandible, 325X; F, detail of mandibular mola,1350X.

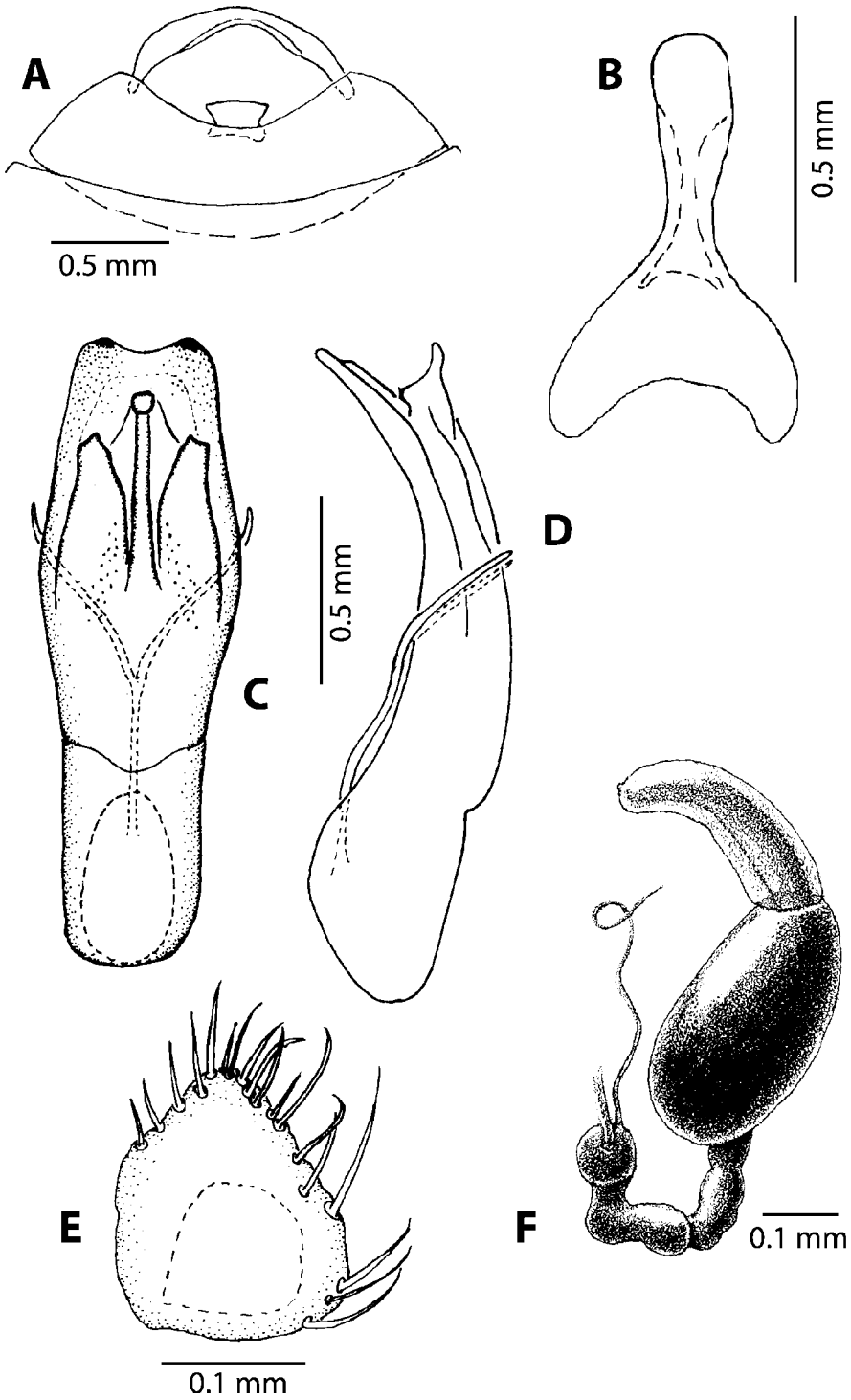

FIGURE 4. *Pedilia sirena* genitalic and reproductive structures. A, apex of male abdomen, showing internally directed flange of sternum VII; B, Female sterrnite VIII; C, median lobe of aedeagus, dorsal view; D, lateral view of median lobe; E, left gonocoxa (vaginal palpus); F, spermatheca.

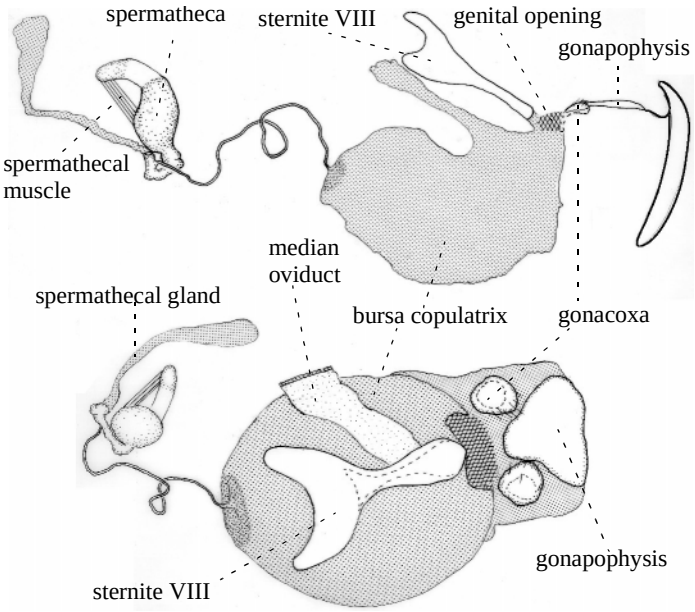

FIGURE 5. *Pedilia sirena* female genital system, Lateral view, top; Ventral view, bottom. Size of individual structures can be inferred from figure 4, all structures drawn to the same scale.

Paratypes (39). COSTA RICA: 15, Puntarenas, Osa Peninsula, Parque Nacional Corcovado, Sirena station, 8º 28'N, 83º 35'W, July 1985 , ex *Passiflora pittieri*, C.N Duckett leg. (2 each deposited in MCZ, CASC, MNCR, MIZA, BMNH, USNM) 3 (CNDC); 5, same location and collector, July 1986, 3, (EGRC), 1 (CNDC), 1 (CUIC); 7, same location and collector, Jan 1988, 5 (CNDC) 2 (MZSP); 8, same location, vi.1986, C.D. Thomas, 4 (FAMU), 2 (TAMU), 2 (AMSA); 1, same location, 23.vii.1980, J. Longino, (FAMU); 1, same location and collector, 6.viii.1980, & 7.v.1981, (FAMU); 2, same location, vi 1993 "L S 2705000_5083000 #2098" and vii 1994 "L S 2705000_5083000 #2853", both G. Fonseca leg. (INBIO).

Etymology. Named for the type locality, *sirena*, which is also Spanish for mermaid; to be treated as noun in apposition. Gender is feminine.

Remarks. The life history and basic oviposition and feeding behaviors of *Pedilia sirena* were reported by Duckett (1989). *Pedilia sirena* is strictly monophagous on *Passiflora pittieri* (Passifloraceae: subgenus *Astrophea*) (Duckett 1989), a woody liana (See Fig 2), which also occurs in Panama and parts of northern Venezuela (Longino 1984). Further collections in these areas might expand the known range of *P. sirena*.

This species has been mentioned in at least three publications as "*Pedilia* sp. A" in a phylogenetic analysis of the sub-tribe Disonychina (Duckett 1999), in a comparison of female reproductive structures (Duckett 1995) and in an ecological study (Duckett 1989). *Pedilia sirena* is brilliant orange in life (Fig. 2) but may fade to a pale creamy white if preserved in alcohol. The living orange color is the same as the eggs of *Heliconius hewitsoni* Stgr. (Lepidoptera: Nymphalidae), a species which is also monophagous on *Passiflora pittieri* and which will avoid shoots that have received conspecific eggs in previous days

(Longino 1984, Duckett *pers. Obs.*). Therefore the similarity in color of *Pedilia sirena* to an egg mass of *H. hewitsoni* may have ecological significance (Duckett, *in prep*).

It is also notable that *Pedilia sirena* has a prominent mandibular mola (Figure 3e,f) and that this mola has two separate grinding surfaces and textures (See Figure 3f). Mandibular molae have been reported for few galerucines. Lingafelter and Konstantinov (1999) code the mandibular mola as missing for all but two of 21 galerucine genera analyzed. Crowson and Crowson 1996 report mandibular molae from *Arisopoda*, *Diabrotica*, *Diacantha*, *Ergana Nonarthra* and *Prosmidia*, noting it as a Galerucine feature probably associated with pollen feeding. *Pedilia sirena* is not known to feed on pollen despite extensive observations by the author (see also Duckett 1989). However, a single, but similarly ridged mola, was reported from a disonychine flea beetle on *Ptocadica tica* Duckett and Moyá (1999) that has never been reported to feed on pollen, and from a still undescribed species of *Alagoasa* (Duckett and Daza 2003) whose eating habits are unknown.

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