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RESEARCH PAPER

# Platyplastinx ibanezbernali sp. nov., a new species of moth fly (Diptera: Psychodidae) from Ecuador

Santiago JAUME-SCHINKEL<sup>1)</sup> & Gunnar M. KVIFTE<sup>2)</sup>

- <sup>1)</sup> Zoologisches Forschungsmuseum Alexander Koenig, Leibniz-Institut für Biodiversität der Tiere, Adenauerallee 160, DE-53113 Bonn, Germany; e-mails: santijaumes@hotmail.com, s.jaume@leibniz-lib.de
- 2) Department of Biosciences and Aquaculture, Nord University, P.O. Box 2501, NO-7729 Steinkjer, Norway; e-mail: gunnar.mikalsen-kvifte@nord.no

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**Abstract.** A new species of *Platyplastinx* Enderlein, 1937, *Platyplastinx ibanezbernali* sp. nov., is described from Ecuador based on morphological characters as well as DNA barcodes from male and female specimens. We provide the first brief description of an egg for the genus. Furthermore, this species is included in the key to world species of the genus, and we provide a key to adult males of *Platyplastinx* from Ecuador.

Key words. Lower Diptera, Psychodinae, new species, taxonomy, Ecuador, Neotropical Region

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### Introduction

Platyplastinx Enderlein, 1937 was described based on a single broken female specimen of P. solox Enderlein, 1937. It remained as such until QUATE (1963) redescribed this species, but the genus was first reliably defined when QUATE (1999) transferred the male of P. moragai (Quate, 1996) (previously described as *Tonnoira moragai*) to this group and provided a diagnosis of the genus based on male characters. According to LOPES & BRAVO (2015), there are 13 described species in this genus (not including the one described here). A single species, P. sycophantos Quate, 1955, represents the northernmost record of the genus collected in a subtropical part of the Nearctic Region. The majority of other Platyplastinx species occur in the Neotropical Region: P. amazonensis Lopes & Bravo, 2015, P. apodastos Quate & Brown, 2004, P. crossomiscos Quate & Brown, 2004, P. culmosus Quate & Brown, 2004, P. duckhousei Lopes & Bravo, 2015, P. exiguus Lopes & Bravo, 2015, P. hirsutus Lopes & Bravo, 2015, P. moragai (Quate, 1996), P. obscurus (Bravo, Lago & Castro, 2004), P. plumaris (Quate, 1996), P. solox Enderlein, 1937, P. sycophantos (Quate, 1955), P. tango Quate & Brown, 2004, with São Paulo state in Brazil being the southernmost record for the genus. Distribution of known species is shown in Table 1. In the present paper, we describe a new species of Platyplastinx based on male and female specimens from Ecuador, increasing the total number of species of this genus recorded from the country to 3 and the total species worldwide to 14. Additionally, we provide DNA barcodes (5'-end of the cytochrome c oxidase subunit 1 or COI) for the new species. Finally, we include this species in the Key to World Species of *Platyplastinx* (Lopes & Bravo 2015) and we provide a key to the adult males recorded in Ecuador.

### Material and methods

Study area. Pichincha province is located in the northern part of Ecuador. Canton Pedro Vicente Maldonado (0°10′00″N 79°00′00″W) includes an area of 620 km<sup>2</sup> with average altitude of 600 m a.s.l. The climate in this area is warm-humid, with annual precipitation of 4,341 mm and average annual temperature of 24.5 °C. The main biotope is a very humid pre-mountain rainforest (HPPC 2015). Collection and preparation of specimens. Specimens were collected using a Malaise trap set for three days (25-28 January, 2020), with 96% ethanol used as preservative. Psychodidae were sorted from the trap sample and stored at -20 °C. The preparation of permanent slides follows the procedure outlined by IBÁÑEZ-BERNAL (2005) with the following modifications: before the clearing process, the head, left-wing and abdomen were dissected. The thorax, right-wing, and legs (if present) were used for DNA extraction and barcoding. The pieces of the specimens (head, wing, and abdomen) were not placed in water with dish soap; instead, they were rinsed in bi-distilled water for 5 minutes, and then cleared in a solution of 10% NaOH for



24 hours at room temperature. Then, they were rinsed in bi-distilled water and dehydrated in 70%, 96%, and 100% ethanol for 10 minutes each, and finally placed in clove oil for 10 more minutes. Euparal was used as a mounting medium. Specimen dissections were performed with the aid of a Leica M205C stereomicroscope; once permanently mounted, specimens were examined using a Nikon E600 microscope equipped with a Nikon Y-IDT drawing arm. Measurements were taken using an ocular micrometer. Drawings were completed with a mixed technique of charcoal and ink, and then digitally processed in Adobe Photoshop CS6.

Terminology. We follow the general terminology proposed by Cumming & Wood (2017) and for the male genital terminology we follow the term of hypopods instead of cerci or surstyli as these caudal appendages seem to have origins in both the proctiger and epandrium (see discussion of Kvifte & Wagner 2017). Egg poles follow the definition of Dutra et al. (2011), the anterior pole is the end of the egg that bears the pedicel or a slight projection, while the posterior pole is usually smooth and rounded with no external structures or openings.

Measurements. Head width was taken in the widest part, approximately above the insertion of antennal scape, whereas the length was taken from the vertex to the lower margin of clypeus; wing length was measured from the base of the wing at the start of the costal node to the apex of the wing tip, while the width was taken approximately at an imaginary vertical line crossing the radial and medial forks; palp segment proportions are given considering the length of the first palp segment as a unit (1.0).

In the material examined section, at the end of each record and between square brackets ([]), the holding institution and the unique identifier or number are given. The abbreviations used for collections and their equivalents are given below:

INABIO Instituto Nacional de Biodiversidad, Quito, Ecuador;

IEXA Coleccion Enomologica IEXA, Instituto de Ecologia (INE-COL) A.C., Xalapa, Veracruz;

ZFMK Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany.

In the description of the type labels, the contents of each label are enclosed in double quotation marks (""), and the individual lines of data are separated by a double forward-slash (//).

### Taxonomic account

## Platyplastinx Enderlein, 1937

Platyplastinx Enderlein, 1937: 107, type species: Platyplastinx solox Enderlein. 1937.

Platyplastinx: Quate (1963) (diagnosis); Quate (1999) (revised description); Quate & Brown (2004) (revised description); Lopes & Bravo (2015) (diagnosis, world species list).

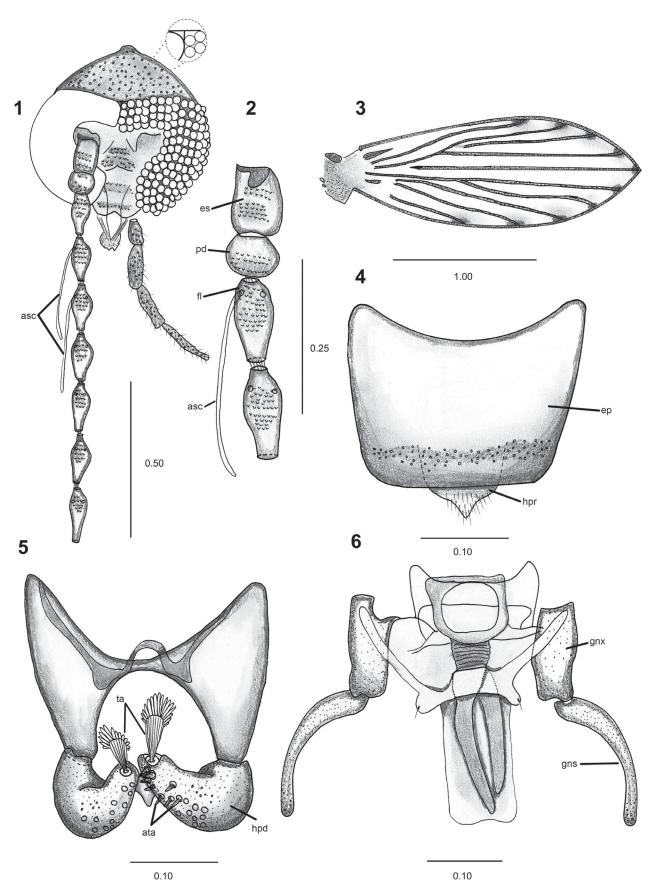
**Diagnosis.** Modified from Lopes & Bravo (2015) and Quate & Brown (2004).

*Male.* Interocular suture present; frontal patch of alveoli undivided; antennae with 14 flagellomeres, flagellomere 14 with cylindrical apiculus; ascoids simple, digitate and paired, approximately length of two antennal flagellomeres. Thorax without allurement organs; wings with infuscate patterns, usually with dark spots on apices of longitudinal veins; wing forks  $R_{2+3}$  and  $M_{1+2}$  basal to wing center,  $R_5$  ending at wing apex. Genitalia with asymmetrical aedeagal complex (except in *P. exiguous* where it is symmetrical); epandrium with single foramen; hypopods with two types of tenacula; often with single principal elongated apical tenaculum (some species with 3, 12 or 15) with fimbriate, feathered or clavate apices; another group of 2–20 small, spine-like accessory tenacula; principal elongate apical tenaculum 2–8 times longer than accessory tenacula.

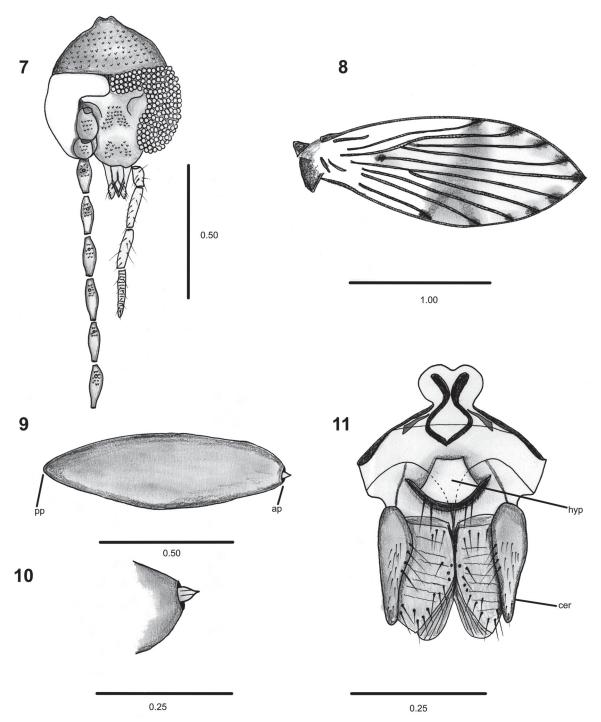
*Female.* Subgenital plate bilobed and ending with rounded apices; genital ducts comma-shaped and small, not hemispherical; lateral strut present; cerci short, broad and longer than wide.

Table 1. Known distribution of Platyplastinx species.

Species	Author	Distribution	Reference
P. amazonensis	Lopes & Bravo, 2015	Brazil	Lopes & Bravo (2015)
P. apodastos	Quate & Brown, 2004	Brazil	Lopes & Bravo (2015); Quate & Brown (2004)
P. crossomiscos	Quate & Brown, 2004	Brazil	Lopes & Bravo (2015); Quate & Brown (2004)
P. culmosus	Quate & Brown, 2004	Ecuador	Lopes & Bravo (2015); Quate & Brown (2004)
P. duckhousei	Lopes & Bravo, 2015	Brazil	Lopes & Bravo (2015)
P. exiguus	Lopes & Bravo, 2015	Brazil	Lopes & Bravo (2015)
P. hirsutus	Lopes & Bravo, 2015	Brazil	Lopes & Bravo (2015)
P. ibanezbernali	Jaume-Schinkel & Kvifte, 2022	Ecuador	Present manuscript
P. moragai	(Quate, 1996)	Brazil, Costa Rica, Panama	Lopes & Bravo (2015); Quate (1996, 1999)
P. obscurus	(Bravo, Lago & Castro, 2004)	Brazil	Bravo et al (2004); Lopes & Bravo (2015)
P. plumaris	(Quate, 1996)	Costa Rica	Lopes & Bravo (2015); Quate (1996)
P. solox	Enderlein, 1937	Costa Rica	Lopes & Bravo (2015); Quate (1996)
P. sycophantos	(Quate, 1955)	United States of America	Lopes & Bravo (2015)
P. tango	Quate & Brown, 2004	Costa Rica	Lopes & Bravo (2015); Quate & Brown (2004)



 $Figs\ 1-6.\ Platyplastinx\ ibanezbernali\ sp.\ nov., male\ holotype.\ 1-head;\ 2-antennal\ scape,\ pedicel\ and\ first\ two\ flagellomeres;\ 3-wing;\ 4-epandrium\ and\ hypandrium;\ 5-6-male\ genitalia.\ Abbreviations:\ asc-ascoids,\ ata-accessory\ tenacula,\ ep-epandrium,\ es-scape,\ fl-flagellomere,\ gns-gonostyli,\ gnx-gonocoxites,\ hpd-hypopods,\ hpr-hypandrium,\ pd-pedicel,\ ta-tenaculum.\ Scale\ in\ millimeters.$ 



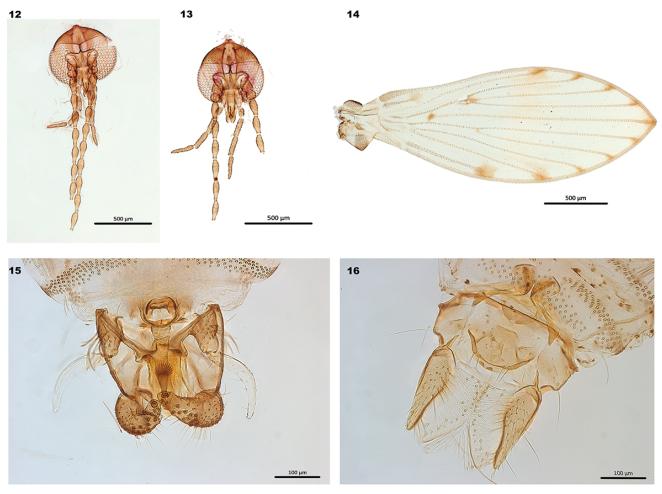
Figs 7–11. *Platyplastinx ibanezbernali* sp. nov., female paratype. 7 – head; 8 – wing; 9–10 – egg; 11 – terminalia. Abbreviations: ap – anterior pole, cer – cercus, hyp – hypogynium, pp – posterior pole. Scales in millimeters.

# Platyplastinx ibanezbernali sp. nov. (Figs 1–8)

Type material. HOLOTYPE:  $\circlearrowleft$ , slide mounted (on the slide: head, left wing, terminal segments of abdomen and genitalia; thorax, right wing and legs removed for DNA barcoding). Deposited at INABIO with the following labels: "Ecuador, Pichincha Prov., // Parroquia Pedro Vicente // Maldonado 0.118626, - // 78.958022400000004 // 779 m. 25-January-28-// January-2020. // Kilian, Isabel" "PSYCHODIDAE  $\circlearrowleft$  // Platyplastinx // ibanezbernali // Jaume-Schinkel, S. & Kvifte, G. M // det. Jaume-Schinkel, S. 2021" "HOLOTYPE" [red] "ZFMK-DIP-00082164" [barcode]. PARATYPES: 2  $\circlearrowleft$   $\circlearrowleft$  , slide mounted as holotype, same label information [deposited at INABIO] [ZFMK-DIP-00081679, ZFMK-DIP-00081672]; 1  $\circlearrowleft$ , 1  $\circlearrowleft$ , slide mounted as holotype, same label information [deposited

at ZFMK] [ZFMK-DIP-00082161, ZFMK-DIP-00082180]; 1  $\circlearrowleft$ , slide mounted as holotype, same label information [deposited at IEXA] [ZFMK-DIP-00082168]; 1  $\circlearrowleft$  complete specimen stored in 96% ethanol, same label information [deposited at ZFMK] [ZFMK, ZFMK-DIP-000-81982].

**Diagnosis.** *Adult male.* Males of this species can be differentiated from other species of *Platyplastinx* by the following characters: hypopods with only 1 apical elongated tenaculum; hypopods pyriform, tapering towards apex; eye bridge with 4 facet rows; 16–18 short spiniform accessory tenacula; eyes contiguous with interocular suture T-shaped; wing membrane not darkened except for dark spots on apices of longitudinal veins.



Figs 12–16. *Platyplastinx ibanezbernali* sp. nov., photographies. 12 – head, male holotype; 13 – head, female paratype; 14 – wing, male paratype; 15 – genitalia, male holotype; 16 – genitalia, female paratype. Scale in µm.

It can be separated from *P. sycophantos*, *P. cromosso*miscos and P. culmosus by the presence of only one apical elongated tenaculum in the hypopods. It differs from P. hirsutus, P. tango, P. exiguus, P. moragai, and P. plumaris by the shape of the hypopods (pyriform and tapering towards the apex in *Platyplastinx ibanezbernali* sp. nov.). Finally, it can be differentiated from the most similar species, Platyplastinx duckhousei Lopes & Bravo 2015, by the following characters: in *Platyplastinx ibanezbernali* sp. nov. the interocular suture is T-shaped and eyes contiguous with 4 facet rows, wings are not darkened in the apical half and bear dark spots at apices of wing veins, gonostyli are incurved; in P. duckhousei the interocular suture is inverted U-shaped and eyes separated by less than 1 facet diameter, wings are darkened in the apical half except for clear spots between wing veins, gonostyli are straight.

**Description.** *Adult male* (Figs 1–6, 12, 14–15). Measurements (averages, n = 6): Head width 0.58 mm, length 0.53 mm; wing width 0.93 mm, length 2.34 mm.

Head round in frontal view; surface regularly covered with setae alveoli. Eyes contiguous; Interocular suture T-shaped; eye bridge with 4 facet rows. Frontal alveoli patch bell-shaped, with lower margin bilobed. Clypeus with alveoli patch square, very sparse at median. Antenna with scape cylindrical, about twice length of pedicel; pedicel spherical; flagellomeres broadly fusiform, about same

length as scape, terminal flagellomeres absent in material examined, maximum number of flagellomeres present in one specimen: 11, ascoids paired and long, digitiform, about length of 2.1 flagellomeres. Palpus short, not extending beyond flagellomere 6, all palp segments cylindrical; palp segment 4 striated; proportions of palp segments 1:2:2:2:2.4. Labellum fleshy, longer than broad, with 3–5 setae and no spiniform or tooth-like sensilla.

Wing length 2.5 times its maximum width, oblanceolate with acute apex, general coloration of membrane yellowish with brown spots on apex of all longitudinal veins and at origin of  $R_5$  and fork  $R_{2+3}$ ; costa with one basal node; Sc ending freely at about start of  $M_3$ ; Rs pectinate, radial fork slightly basal to medial fork, junction of  $R_3 + R_2$  very faint (Figs 3, 14),  $R_5$  ending at wing apex.

Terminalia. Hypandrium bilobed and joining gono-coxites at basal margin, lobes with single bristle near apex (Fig. 6), it appears membranous, giving appearance of "cleft" near median line; gonostyli longer than gono-coxites, curved inward, with apices at same level as that of aedeagus; ejaculatory apodeme almost square with anterior margin little wider than posterior margin; aedeagal-paramere complex with two finger-like appendages; epandrium approximately as wide as long, with anterior margin concave, with bristles distributed at apical margin; hypopods curved pyriform, with one apical feathered

tenaculum and additional 16–18 short spiniform accessory tenacula distributed in distal half of ventral surface.

**Female** (Figs 7–10, 13, 16). Measurements (n = 1) head width 0.48 mm, length 0.53 mm; wing width 0.76 mm, length 1.92 mm. Same as male except for proportion of palp segments 1:2:2:2.3 (Fig. 7). Terminal flagellomeres missing in material examined; maximum number of flagellomeres present in one specimen: six. Ascoids missing in material examined. Wing length 2.5 times its maximum width, general coloration as in male wing, with faint darkening in middle section but not extending towards apex (Fig. 8).

Terminalia. Hypogynium apical margin rounded (hypogynium rounded and not bilobed is a characteristic of the genus, see diagnosis in Quate 1999; Quate & Brown 2004 [as subgenital plate]) trapezoid-shaped with broadly sclerotized U-shaped margin carrying small setulae and 4 strong bristles as in Figs 11, 16. Hypogynium short, about 0.45 length of cerci. Cerci length is about 1.5 its maximum width. Genital chamber simple, shaped like inverted S on each side, as in Figs 11, 16.

*Egg.* The single female specimen contained eggs inside the abdomen, the overall shape is ovoid (Fig. 9). All eggs present micropyle as conical-shaped structure on anterior pole as in Figs 9–10. Microsculpture is not preserved well enough to allow diagnosis.

**Etymology.** The specific epithet is in honor of a great mentor, entomologist and Psychodidae specialist, Dr. Sergio Ibáñez-Bernal.

Genetics. The GenBank accession numbers for the DNA barcodes (5'-COI) for this species are: ON002471 [ZFM-K-DIP-00082164], ON002470 [ZFMK-DIP-00082168], ON002472 [ZFMK-DIP-00082180].

**Distribution.** Currently known only from the type locality. **Differential diagnosis.** This species can be included in the key to males of world *Platyplastinx* presented by LOPES & BRAVO (2015), modified as follows:

- Hypopods (cercus in Lopes & Bravo 2015) with accessory tenacula numbering 6 to 9.
- 7 Eyes separated by less than 1 facet diameter; interocular suture inverted U-shaped; Wing membrane darkened in apical half with exception of small apical areas between wing veins; genitalia as in LOPES & BRAVO (2015: fig. 4).
- ..... *Platyplastinx duckhousei* Lopes & Bravo, 2015

  Eyes contiguous; interocular suture T-shaped (Fig. 1); wing membrane not darkened in apical half, with darkened apices of wing veins; genitalia as in Figs 5–6. ... *Platyplastinx ibanezbernali* sp. nov.

### Key to adult males of *Platyplastinx* in Ecuador

- 2 Eyes separated by 1.5 facet diameters, interocular suture as inverted Y; accessory tenacula 20, genitalia as in QUATE & BROWN (2004: figs 171–172). ......
  - ...... P. crossomiscos Quate & Brown, 2004
- Eyes separated by less than 1 facet diameter; inter-ocular suture curved, not Y-shaped; accessory tenacula 10, genitalia as in QUATE & BROWN (2004: figs 164–166).
   P. culmosus Quate & Brown, 2004

#### Discussion

In the most recent paper focused on *Platyplastinx* (LOPES & BRAVO 2015) as well as in the revised descriptions of QUATE (1999) and QUATE & BROWN (2004), females of only two species were known: *P. solox*, for which only the female is known, and *P. moragai*. With the inclusion of the description of a female *Platyplastinx ibanezbernali* sp. nov. three females are now known for the genus, which leads us to emphasize the importance of biological inventories and that there is still a lot of diversity waiting to be discovered in the Neotropical Region.

Eggshell structures of Psychodidae species are considered to be species-specific and have been used as a character for species identification (Rocha et al. 2011), although it is recommended to base such descriptions on electron microscopy; however, biological material for new species is sometimes hard to obtain. Unfortunately, the eggs of the single female specimen are still inside the abdomen, and no microsculpture can be differentiated through the microscope. Nonetheless, the description and drawings of the conical structure of the eggs of *Platyplastinx ibanezbernali* sp. nov. represent the first known description of the egg in the genus *Platyplastinx* which establishes a base for additional studies in the near future.

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