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Artículo científico

A New Species of *Drosophila* (Diptera: Drosophilidae) from the Inflorescences of *Xanthosoma sagittifolium* (Araceae)

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ABSTRACT.- A new species of the genus *Drosophila, Drosophila sagittifolii* sp. nov. is described. Adult specimens of *D. sagittifolii* were aspirated from the inflorescences of *Xanthosoma sagittifolium* (L.) Schott (camacho), from which they also emerged, at the Río Guajalito Research Station, Santo Domingo de los Tsáchilas, Ecuador.

KEYWORDS: biology, breeding site, Ecuador, feeding site, taxonomy

RESUMEN.- Una nueva especie del género *Drosophila, Drosophila sagittifolii* sp. nov. es descrita. Los adultos de *D. sagittifolii* fueron aspirados de las inflorescencias de *Xanthosoma sagittifolium* (L.) Schott (camacho) del cual también emergieron, en la Reserva Ecológica Río Guajalito, Santo Domingo de los Tsáchilas, Ecuador.

PALABRAS CLAVES: biología, Ecuador, sustrato imago, sustrato larval, taxonomía.

INTRODUCTION

In Ecuador, most collections of *Drosophila* use fruit-baited traps to study fruit flies, and for this reason little is known about the ecology of flower-breeding and feeding *Drosophila* species. However, some Ecuadorian species from the followings species groups: *Drosophila flavopilosa* Frey, 1919, *Drosophila bromeliae* Sturtevant, 1921, *Drosophila onychophora* Vilela & Bächli, 1990 and *Drosophila morelia* Vilela, 2004 have been found living in flowers of the botanical families Solanaceae, Bromeliaceae and Asteraceae (Silva and Martins 2004, Vilela and Bachli 2004, Figuero and Rafael 2011, Figuero et al. 2012, Robe et al. 2014).

In particular, interactions like reproductive ecology between species of Araceae and flies have been observed (Gibernau 2003, Miyake and Yafuso 2005). Specifically, species of the genus *Colocasiomyia* (Diptera:Drosophilidae) are found on inflorescences of the Araceae genus, *Alocasia, Colocasia* and *Homalonema* (Miyake and Yafuso 2005). Furthermore, Tsacas and Chassagnard (1992) suggests the existence of a close association between *Xanthosoma robustum* of the Araceae family and *Drosophila aracea.* The aforementioned relationship is likely to occur in Ecuadorian areas where low altitude and high humidity produce a high species richness of Araceae (Leimbeck et al. 2004). *Xanthosoma*, an abundant Araceae terrestrial herb, is a genus whose inflorescences provide shelter to communities of arthropods (García-Robledo et al. 2004). Moreover, the plants of *Xanthosoma sagittifolium* are commonly cultivated in the American tropics because their tubers are used as food (Missouri Botanical Garden 2017). Its inflorescence is made up of a spadix and a sphate: the spadix has pistillate flowers at the base, sterile flowers in the middle, and staminate flowers in the upper part (García-Robledo et al. 2004, Takano et al. 2012). This paper describes a new species of *Drosophila* associated with the inflorescence of *Xanthosoma sagittifolium* (L.) Schott (camacho) (Araceae).

MATERIALS AND METHODS

The collections of drosophilids were carried out in the Río Guajalito Research Station, Santo Domingo de los Tsáchilas, Ecuador, (00°13´48´´S; 78°49´16´´W), from 1 800 to 2 200m above sea level.

Collections were made during six nonconsecutive months (September 2010, March, June, July, August and September 2011). Adult specimens of *Drosophila* were collected directly from the inflorescences of *Anthurium* spp. and *Xanthosoma sagittifolium* (Figure 1) using an entomological aspirator. Several inflorescences were also collected with the possibility that they contained eggs and larvae. These inflorescences were kept in the laboratory in glass jars with moist paper until emergence of the imagines.

The external morphology of each fly was examined under a stereomicroscope (Zeiss; Discovery V8) and measured with the AxioVision program. The terminalia were dissected from the abdomen for description and preserved in 60% glycerol solution in microvials stored with the pinned specimens meaans of morphological characters and indices are presented with ranges in parentheses. Descriptive terms and indices are as described as Bächli et al. (2004). The types and paratypes of the new species have been deposited in the Museo de Zoología-Invertebrados, Pontificia Universidad Católica del Ecuador, Quito (QCAZ).

Drosophila Fallén, 1823
Drosophila sagittifolii sp. nov.

(Figures 2–10)

Type material. Male Holotype (dissected, terminalia in microvial), labelled "*D. sagittifolii* Holotype ♂ Llangarí & Rafael det. 2013 Ex. *X. sagittifolium*/ Ecuador, Santo Domingo de los Tsáchilas, Estación Científica Río Guajalito 1 800m; 00°13´48´´S 78°49´16´´W; VI. 2011; Col. L.M. Llangarí; (QCAZ 2757); ten males paratypes labelled "*D. sagittifolii* Paratype ♂ Llangarí & Rafael det. 2013 Ex. *X. sagittifolium*/ Ecuador, Santo Domingo de los Tsáchilas, Estación Científica Río Guajalito 1 800m; 00°13´48´´S 78°49´16´´W; VI. 2011; Col. L.M. Llangarí; (QCAZ 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2769). Female alotype (dissected, terminalia in microvial), labelled "*D. sagittifolii* alotype ♀ Llangarí & Rafael det. 2013 Ex. *X. sagittifolium*/ Ecuador, Santo Domingo de los Tsáchilas, Estación Científica Río Guajalito to 1 800m; 00°13´48´´S 78°49´16´´W; VI. 2011; Col. L.M. Llangarí; (QCAZ 2767)" ten female paratypes "*D. sagittifolii* Paratype ♀ Llangarí & Rafael det. 2013 Ex. *X. sagittifolium*/ Ecuador, Santo Domingo de los Tsáchilas, Estación Científica Río Guajalito 1800 m; 00°13´48´´S 78°49´16´´W; VI. 2011; Col. L.M. Llangarí; (QCAZ 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2768).

Diagnosis.- Arista generally with 2 dorsal and 2 ventral branches, plus terminal fork. Basal scutellars setae are convergent. Median katepisternal seta is tiny. Wings with the anterior crossvein and the posterior crossvein slightly shadowed. Surstylus with 10 (10–12) prensisetae and ca. 14 inner and 3 outer setae. The triangular distal tip of the aedeagus is membranous. The subapical part presents lateral claw-shaped chitinized extensions. Hypandrium hourglass-shaped.

Description.- Male. Head. Frons yellowish-brown, frontal length 0.33 (0.30-0.34) mm; frontal index = 0.78 (0.70–0.83), top to bottom width ratio = 1.32 (1.24-1.34). Frontal triangle brown. Ocellar triangle blackish-brown about 43% (40–45) % of frontal length. Orbital setae black, distance of or3 to or1, 107% (101–117) % of or3 to vtm, or1/or3 ratio 0.93 (0.90–1.20), or2/or1 ratio 0.62 (0.46–0.71), postocellar setae 53% (47–59) % and ocellar setae 88% (77–91) % of frontal length; vt index = 0.96 (0.87–0.98), vibrissal index = 0.52 (0.4–0.61). Face yellowish-brown. Carina yellow, prominent and slightly sulcate. Cheek index = 6.72 (6.44–6.83). Eye red; eye index = 1.38 (1.12–1.51). Antenna yellow, arista with 2 dorsal and 2 ventral branches, plus terminal fork. Proboscis yellow; palpus yellow.

Thorax.- Brown; length 1.40 (1.30–1.60)mm, 7–8 irregular rows of acrostically setulae. h index = 0.76 (0.70–0.82). Tranverse distance of dorsocentral setae 2.17 (1.78–2.37) of longitudinal distance, dc index = 0.53 (0.51–0.64). Scutellum yellowish-brown. Distance between apical scutellars setae 70 % (67–75) % of that between apical and basal setae; basal scutellar setae convergent; scut index = 0.78 (0.77–0.80). Pleura yellow, sterno index = 0.61 (0.56–0.66), median katepisternal seta tiny. Halteres yellow. Legs yellow. Wing with anterior crossvein and posterior crossveineins slightly shadowed. Costal lappet shadowed, length 2.80 (2.02–2.90)mm, length to width ratio = 2.20 (2.17–2.30). Indexes: C, 2.45 (2.30–2.60); ac, 2.80 (1.62–3.00); hb, 0.50 (0.48-0.56); 4C, 0.98 (0.92–1.04); 4v, 1.65 (1.4–1.70); 5x, 1.14 (1.09–1.20); M, 0.43 (0.40–0.49); prox. x, 0.69 (0.60–0.78).

Abdomen.- (Figure 2) yellow; tergite 1 yellow; tergite 2 with dorsal midline and triangular-shaped, dark pigmented area that reaches the anterior edge, a dark line along the trailing edge; tergite 3 with hourglass-shaped dark pigmentation, a dark line along the trailing edge (in some specimens less pigmented); tergite 4 yellow, with faint and diffuse pigmentation near anterior edge and a dark line along the posterior edge; tergites 5–6 yellow. Length (body + wings) 4.00 (3.90–4.15)mm

Male Terminalia.- (Figures 4–8). Epandrium (Figure 4) dorsodistally microtrichose, with ca. 10 lower and ca. 13 upper setae. Cerci (Figure 4) anteriorly linked to epandrium, microtrichose and with many setae. Surstylus (Figure 4) almost rectangular and microtrichose; left and right surstylus with a row of ca. 10 (10–12) peg-like prensisetae, c.a. 13 inner and 7 outer setae. Hypandrium (Figure 5) hourglass-shaped, longer than epandrium. Dorsal arch absent. Gonopod oval, membranous and with one seta medially, near outer margin. Aedeagus is sclerotized, at the center striated and less sclerotized. Triangular distal tip is membranous. The subapical part presents lateral claw-shaped chitinized extensions. In ventral view, the subapical margins have undulations. Apodeme is wide and sclerotized. Ventral rod is short. Paraphyses elongated and oval (Figures 6–8).

Female.- General morphology similar to males. Measurements: Frontal length 0.41 (0.39–0.45) mm; frontal index = 0.96 (0.85–1.03), top to bottom width ratio = 1.55 (1.49–1.93). Frontal triangle brown. Ocellar triangle about 30% (28–37) % of frontal length. Distance of or3 to or1, 1.2 (0.96–1.25) distance of or3 to vtm, or1/or3 ratio = 0.86 (0.81–0.95), or2/or1 ratio = 0.47 (0.40–0.56), postocellar setae 39% (34–43)% and ocellar setae 57% (49–66)% of frontal length; vt index = 0.88 (0.80–0.93). Vibrissal index = 0.73 (0.68–0.78). Cheek index = 11.61 (9.33–12.4). Eye index =1.05 (0.98–1.19).

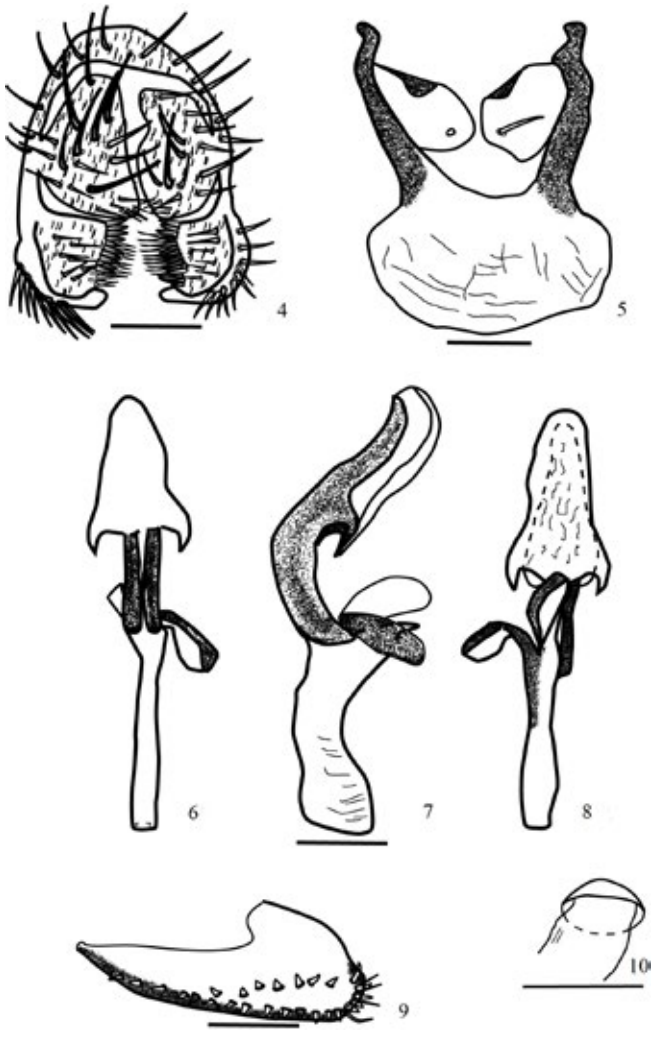
Thorax.- Length 1.1 (0.95–1.42)mm. h index = 0.80 (0.75–0.93). Transverse distance of dorsocentral setae 2.53 (2.00–2.71), longitudinal distance, dc index = 0.79 (0.65–0.83). Distance between apical scutellar setae 64% (64–93) % of that between apical and basal setae; scut index = 0.87 (0.83–0.96). Sterno index = 0.91 (0.88–0.96), tiny median katepisternal setae.

Figures 1-3. 1) *X. sagitifolium* (Araceae). *Drosophila sagittifolii* sp. nov. 2) Male Abdomen; 3) Female Abdomen. Scale bar 0.5 mm.

Wing.- Length 3.20 (3.00–3.68) mm, length to width ratio = 2.58 (2.54–2.63); indexes: C = 2.60 (2.36–2.82); ac = 2.7 (2.68–2.86); hb = 0.47 (0.4–0.54); 4C = 1.04 (0.97–1.06); 4v=1.70 (1.40–1.76); 5x=1.20 (1.17–1.45); M=0.40 (0.38–0.43) y prox. x=0.70 (0.65–0.73).

Abdomen.- (Figure 3) Yellow; tergite 1 yellow, tergite 2 with dorsal midline and triangular dark pigmentation; tergite 3 without dorsal midline, with hourglass-shape pigmentation that extends laterally to the margin; tergite 4 without dorsal midline, with a tenuous stripe near the edge and a dark stripe on the posterior edge; tergite 5 yellow with a dark line along the posterior edge; tergite 6 yellow (in some females, area around the abdomen may be slightly darker). Length (Body + wings) 4.3 (4.1–4.50) mm

Female Terminalia.- (Figures 9–10). Valve of oviscapt (Figure 9) sclerotized, oval, apically rounded with 7–8 discal, and 17–20 marginal, tooth-like outer ovisensillae; trichoid-like inner ovi-



Figures 4-10. Terminalia of *Drosophila sagittifolii* sp. nov. 4-8) Male Terminalia of Holotype: 4) Epandrium, Cerci, Surstylus; 5) Hypandrium; 6) edeagus dorsal view; 7) Aedeagus Lateral View; 8) Aedeagus Ventral View; 9-10) Female Terminalia of Alotype: 9) Oviscapt Valve; 10) Inner Spermathecal Capsule. Scale bar: 3-8) 0.1mm, 9) 0.05 mm

sensillae: 3 thin distally positioned, and 1 long, slightly curved, subterminal. Spermathecae (Figure 10) finger-shaped, small and membranous.

Egg.- Oval-shaped with four long, curved filaments.

Etymology.- This species is named in recognition of its presumed primary larval host plant, *Xanthosoma sagittifolium.*

Biology.- Adults of *D. sagittifolii* sp. nov. were found only on *Xanthosoma sagittifolium* inflorescences at the Río Guajalito Research Station. Eleven individuals (four males and seven females) emerged in the laboratory from three inflorescences of *X. sagittifolium* after 36 days in laboratory.

DISCUSSION

Drosophila sagittifolii sp. nov. belongs to the genus *Drosophila.* Judging by the shape of the aedeagus, *D. sagittifolii* sp. nov. could be related to *Drosophila crassa*, Patterson & Mainland, 1944 an ungrouped species (Vilela and Bächli 1990) It is also similar to the aedeagus of the *Drosophila canalinea* group of species, such as *Drosophila annulosa* Vilela & Bachli, 1990 and *Drosophila parannularis*, Vilela & Bachli, 1990. Although the collections of *Drosophila* adults were from inflorescences of *Anthurium* spp. and *X. sagittifolium, Drosophila sagittifolii* sp. nov. adults were only found from the *X. sagittifolium* inflorescences. The natural breeding and larval feeding sites of the species in relation to flowers have not been studied sufficiently. *Drosophila saggitifolii* sp. nov. is not attracted to traps baited with fermented banana. This fact has been corroborated simultaneously in the same place and at the same time, 3 369 flies from 26 species of *Drosophila* were captured using banana baits fermented with baker's yeast, and no *D. sagittifolii* sp. nov. were found (Cabezas 2012).

During these collections of *D. sagittifolii* sp. nov. on the inflorescences of *X. sagittifolium*, three couples in copulation were captured and individuals of the new species emerged from the inflorescences in the laboratory. This suggests that *X. sagittifolium* is one of the natural breeding and courting sites used by *D. sagittifolii* sp. nov.

The determination of the natural feeding and breeding sites of species in the Drosophilidae family is not an easy task. The abundance and frequency of the hosts/substrates used and the existing faunal associations must be understood. Climatic and geographic factors will also play a role in determining seasonality and range of these species (Brncic 1983). Therefore, it is necessary to continue to conduct phylogenetic, ecological and geographical studies of both the *Drosophila* species and its presumed host plant, *Xanthosoma sagittifolium,* to establish the true interaction between the insect and the inflorescences.

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