

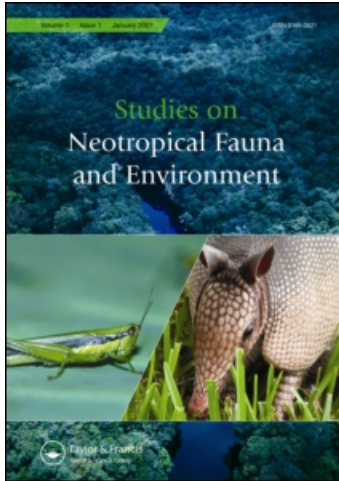
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Studies on Neotropical Fauna and Environment

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713817190>

A new species of the genus *Fannia* Robineau-Desvoidy (Diptera: Fanniidae) belonging to the *canicularis* species group, collected on pig carrion in the Yungas of the province of Jujuy, Argentina

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Online publication date: 30 July 2010

To cite this Article Quiroga, Nancy I. and Domínguez, M. Cecilia(2010) 'A new species of the genus *Fannia* Robineau-Desvoidy (Diptera: Fanniidae) belonging to the *canicularis* species group, collected on pig carrion in the Yungas of the province of Jujuy, Argentina', *Studies on Neotropical Fauna and Environment*, 45: 2, 95 – 100

To link to this Article: DOI: 10.1080/01650521.2010.497994

URL: <http://dx.doi.org/10.1080/01650521.2010.497994>

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ORIGINAL ARTICLE

A new species of the genus *Fannia* Robineau-Desvoidy (Diptera: Fanniidae) belonging to the *canicularis* species group, collected on pig carrion in the Yungas of the province of Jujuy, Argentina

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(Received 22 May 2009; accepted 31 May 2010)

This study describes the male, female and third instar larva of *Fannia yunguensis* sp. nov., a new species of Fanniidae that was reared from larvae captured on pig carcasses in the Yungas of the province of Jujuy, Argentina. Modifications to the keys for males and females are also provided. The presence of an epiphallus suggests including the new species into the *pusio* subgroup of the *canicularis* species group.

Keywords: Argentina; *Fannia*; Fanniidae; forensic entomology; key; new species; pig carcass; Yungas

Introduction

The genus *Fannia* Robineau-Desvoidy (Diptera: Fanniidae) contains approximately 260 species, of which 66 occur in the Neotropical Region (Carvalho et al. 2003). Partial revisions of *Fannia* have been made for the Nearctic (Chillcott 1961), Neotropical (Albuquerque et al. 1981), Australia (Pont 1977) and the southern part of South America (Domínguez 2007). Twenty-five species are found in Argentina and Chile (Domínguez 2007). Six of these 25 species are endemic to Patagonia, while the remaining 16 species can also be found in the Neotropical realm, and three are widely distributed throughout the world. Recently seven other Neotropical species have been described (Couri 2004, 2005; Couri & Winagraski 2005; Domínguez 2007; Domínguez & Aballay 2008).

The major contribution to the higher classification of Fanniidae was that by Chillcott (1961), who recognized five genera within Fanniidae and 18 species-groups and subgroups within the genus *Fannia*, based on external morphology and genitalic characters. According to Chillcott (1961), Fanniidae included five genera: *Fannia* Robineau-Desvoidy, *Coelomyia* Haliday, *Piezura* Rondani, *Euryomma* Stein and *Platycoenosia* Strobl. Currently, *Platycoenosia* is considered a junior synonym of *Piezura*, and *Coelomyia* was included in the genus *Fannia* (Pont 1964). Furthermore, a genus was described after Chillcott's revision: *Australofannia* (Pont 1977), endemic to Australia. The classification proposed by Chillcott (1961) has been adopted in most posterior contributions. One of the first keys to the Neotropical Fanniidae

was published by Shannon & Del Ponte (1926, 1928). Albuquerque et al. (1981) divided the Neotropical species of *Fannia* in eight species-groups, also discussing the relationship of the Neotropical species-groups with the Nearctic groups proposed by Chillcott (1961). Seventeen of the 25 species cited for Argentina and Chile were included by Albuquerque et al. (1981) in the eight species groups proposed. The first hypothesis dealing with the phylogenetic relationships of the genera of Fanniidae and the species groups within *Fannia* was proposed by Domínguez & Roig-Juñent (2008).

The medical and hygienic importance of most Southern South American species of *Fannia* is unknown. *Fannia albitarsis* Stein is an important nuisance in poultry farms in southern Buenos Aires province (Perotti 1998). *Fannia fusconotata* Rondani, as well as *F. canicularis* (Linnaeus) and *F. scalaris* (Fabricius), are believed to cause myiasis in man and in cattle (Mazza & Oribe 1939; Oliva 1997). The larvae of *F. scalaris* are frequent in cesspools, latrines and dunghills, having also been reared, accompanied by *F. canicularis* from human feces (Rozkošný et al. 1997). Some of the most abundant species occur regularly in agricultural pens used for breeding pigs, cattle, horses or fowls, and in fur farms (Rozkošný et al. 1997). The larvae apparently develop in animal droppings and dung (Rozkošný et al. 1997).

The importance of the family Fanniidae in forensic investigations is well known (Smith 1986). In the Neotropical region there are several studies that show the presence of *Fannia* in corpses (Marchiori et al.

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2000; Souza & Linhares 1997; Carvalho et al. 2000; Centeno et al. 2002). The most commonly found species of *Fannia* in forensic entomology experiments using pig carcasses in Brazil are *F. pusio* (Wiedemann) and *F. canicularis* (Souza & Linhares 1997; Carvalho et al. 2000; Marchiori et al. 2000). In Argentina, *F. fusconotata* has been found in an experiment in the province of Buenos Aires (Centeno et al. 2002) and Domínguez & Aballay (2008) described a new species collected on pig carrion in the province of Mendoza. Nevertheless, only the adults of most species of *Fannia* of the Neotropical region have been described and the immature stages are unknown.

The purpose of this study is to describe the adults and immature stages of a new species of the genus *Fannia* that was captured on a pig carcass in the province of Jujuy, Argentina.

Material and methods

The study area, the Municipal reserve Carlos Maria Shuel (24°09'54.13"S, 65°18'37.73"W) is located in the city and municipality of San Salvador de Jujuy. The reserve is included in the Perales band, which corresponds to the biogeographical province of the Yungas, and specifically to the Mountainous Forest district.

The Yungas are located in the eastern mountain-side of the Andes, between 300 and 3500 m a.s.l., and extend from the North of Peru up to the northwestern region of Argentina (Morrone 2001). The Yungas are conformed by dry and cloudy forests, especially rich in Lauraceae and Myrtaceae, alternated with forests of *Alnus acuminata* and *Podocarpus* spp., and grasslands (Cabrera 1971; Cabrera & Willink 1973). According to Müller (1973), the Yungas province is related to the Amazonian Guyana and the Caribbean Cauca Biogeographical provinces (Morrone 2001).

Adults and larvae were collected from two carcasses of *Sus scrofa* L, which were laid in two separate cages during the autumn, winter and part of spring of 2007. Adults were collected using entomological nets; and larvae were collected using ethanol pitfall traps located next to the carcasses, from soil samples taken under the corpses, and by direct collection from the carcasses; some adults were also found in the pitfall traps and the soil samples. Most larvae were transferred to boiling water and then to ethanol (70%), and a sample of the larvae was kept alive and transferred to a substrate consisting of beef to allow their development at room temperature in the laboratory. The adults were conserved as dry pinned specimens.

Measurements are expressed as follows: body length: anterior margin of head (frons), excluding antennae, to apex of abdomen; frons width: narrowest

distance between eye margins; vitta width: measured at uppermost pair of frontal setae; frontal setae length: relative to length of flagellum, parafacial width: relative to width of flagellum at its base, shape of flagellum: length/width; palp shape: basal width relative to apical width; shape of fore-femur: length/width; length of ventral pubescence of mid tibia: relative to tibial width; shape of hind femur: length/width.

The following abbreviations are used in the descriptions: Head: *fr*, frontal seta; *pocl*, postocular seta; *orb*, orbital seta. Thorax: *acr*, rows of acrostichal setulae; *acr s*, acrostichal seta; *dc*, dorsocentral seta; *ial*, intra-alar seta; *npl*, notopleura; *prepm*, proepimeral seta; *pra*, prealar seta; *pprn*, postpronotal seta; *spal*, supraalar seta. Legs: *C*, coxa; *F*, femur; *T*, tibia; *a*, anterior seta; *ad*, anterodorsal seta; *av*, anteroventral seta; *d*, dorsal seta; *p*, posterior seta; *pv*, posteroventral seta; *pd*, posterodorsal seta; *v*, ventral seta; *ad*, anterodorsal seta.

Morphological terminology mainly follows McAlpine (1981) with the exception of the following terms for genitalia: pregonite and postgonite (paramere and gonopod of McAlpine). The terminology for the description of the larva follows Holloway (1984).

For examination of genitalia, the abdomen was removed from a dry specimen and heated in 10% KOH for 10–15 minutes. The abdomen was then transferred to acetic acid, and then to glycerine. The postabdominal structures were separated from the rest of the abdomen. Examination and illustration of genitalia were done using a compound microscope equipped with a drawing tube. After examination, the genitalia and the rest of the abdomen were placed in glycerine in a plastic microvial and pinned directly under the specimen.

Results

Taxonomy

Fannia yunguensis sp. nov. (Figure 1)

Etymology

The species' name refers to the biogeographical province where the type specimens were collected.

Type material

Holotype: ♂, Argentina: Jujuy: Reserva Municipal Carlos Maria Shuel (24°09'54.13"S, 65°18'37.73"W) (INBIAL). Paratypes: 2♂, 30♀, same data as holotype. Immature stages: four third instar larvae, 62 puparia. The material is kept at the Instituto de Biología de la Altura, Universidad Nacional de Jujuy

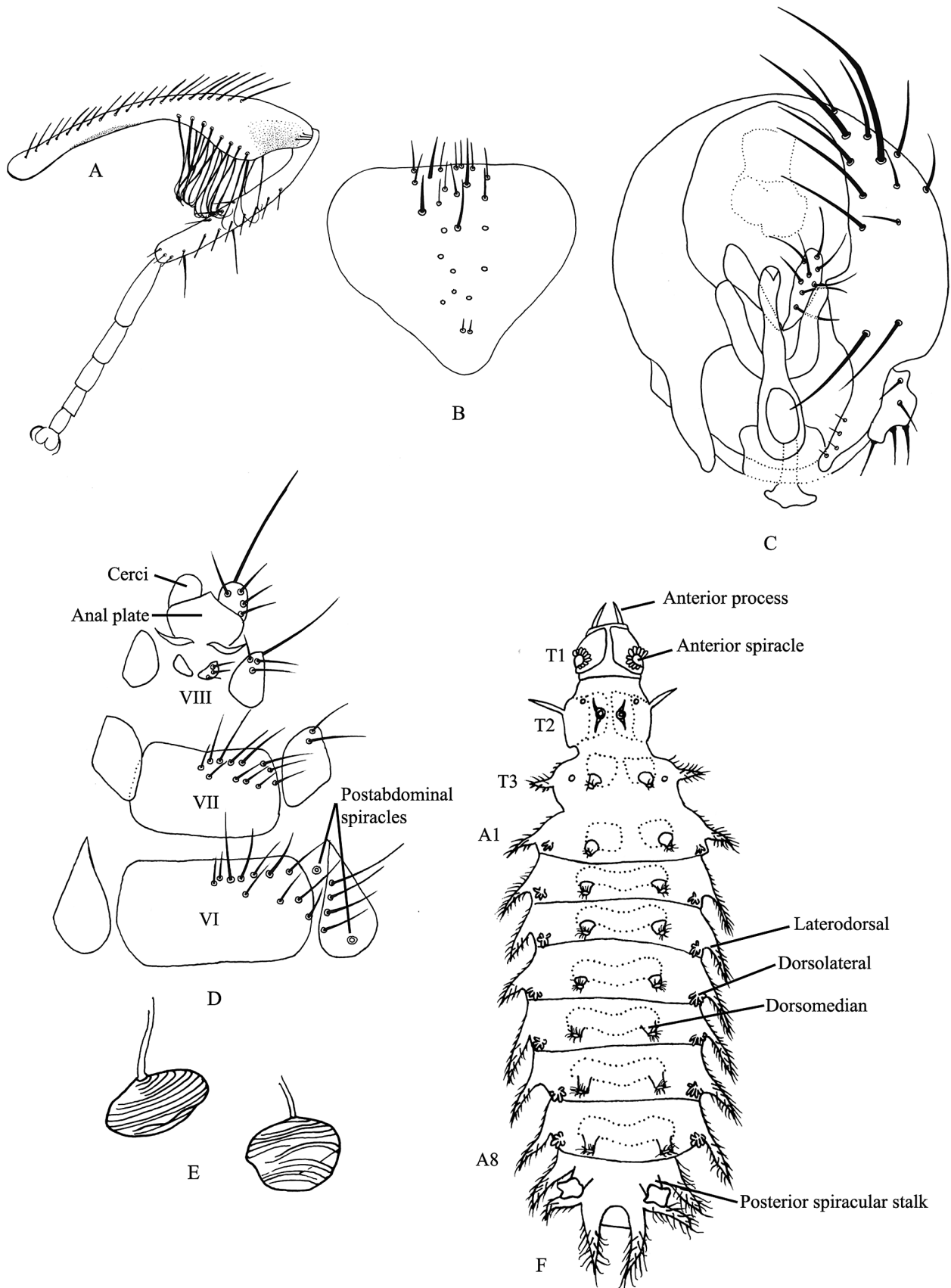


Figure 1. *Fannia yunguensis* sp. nov. (A) Male, hind leg, anterior; (B) male, sternite 5, ventral; (C) male, genitalia, external structures, ventral; (D) female, genitalia, external structures, ventral; (E) spermathecae; (F) third instar larva, dorsal.

(INBIAL) and Instituto Argentino de Investigaciones de Zonas Áridas (IADIZA), Centro Científico Tecnológico Mendoza (CCT-Mendoza).

Distribution

The species is only known from the type locality.

Diagnosis

This species can be easily separated from the remaining species of *Fannia* known in Argentina by the dark color of the body and the shape of the male hind femur, which is thin, strongly curved, dorsoventrally flattened, and presents on its posteroventral surface a very strong preapical tubercle that bears a tuft of long anteroventral and posteroventral setae (Figure 1A). The male genitalia resemble that of the other species of the *pusio* subgroup of the *canicularis* species group of the genus *Fannia*.

Description

Adult male

Body length. 4.6–5.3 mm.

Head. Frontal vitta very narrow and black, at narrowest point 1.2× width of anterior ocellus. Fronto-orbital plate black, at uppermost pair of *fr* slightly narrower than anterior ocellus. Eleven to twelve long *fr* as long as flagellum. Eyes bare, antero-internal facets larger than remaining; one row of *poel* of regular length in first quarter. Face and parafacial area black; parafacial area at base of flagellum 0.5× width of same and bearing four or five short setae. Facial carina black. Scape and pedicel black, flagellum 2.1 times as long as broad and covered with silver grey pruinosity. Arista black and arista pubescence shorter than arista width at base. Palpi black, slightly clavate, the apex 1.5× the width of the base. Lower oral margin slightly concave and grooved.

Thorax. Completely black; 3+3 *acr*, with one pair of strong prescutellar *acrs*; 2+3 *dc*; *pprn* with few setulae; two strong *pral*, prealar area lacking setulae; two *prepm* surrounded by five or six hair-like setulae.

Legs. Black. F1: thin (length/width = 8.2), with one row of *pd* as long as femoral width, two rows of hair-like *p*; one row of *pv* slightly longer than femoral width, only present in apical 3/4. T1 with one subapical *pd*; one apical *v* and one apical *pv*; one apical and one submedial *ad*, lacking medial row of *ad*. Foretarsi

cylindrical. F2 with one complete row of *ad* and one row of *a*; one row of short *av* and three longer subapical *av*; one row of *pv*; one row of *p*, hair-like at base, stouter and ventrally directed at apex. T2 constricted at base, with a weak subbasal protuberance; ventral pubescence long, as long as tibial width; with one submedian and three apical *a*; one subapical *ad*; one strong, apical *av*; one submedian and one weaker apical *pd*; one short and stout apical *p*. C3 with two setae at apex of posterior surface. F3 thin (length/width = 9.2); strongly curved and dorsoventrally flattened; posteroventral surface with a very strong preapical tubercle (Figure 1A); one row of *ad*, longer and dorsally directed towards apex; one row of long *av* that are 2.5× width of hind femur at the preapical tubercle; one row of hair-like *pv* that form a long preapical tuft as long as femoral width at the preapical tubercle. T3 with one submedian and one apical *d*, eight to nine *ad*; three medial and one apical *av*; ventral and posteroventral surfaces with a weak apical ctenidium at apex (Figure 1A).

Wings. Smoky. Lower calypter slightly oval, the uppermost is rounded, both smoky; halteres yellowish-brown.

Abdomen. Elongate, tergite 2 slightly broader than tergite 4. Shiny black. Hypopygium not protruding.

Postabdomen. Posterior margin of sternite 5 straight, setae occupying central longitudinal line, weak on posterior margin (Figure 1B). Hypandrial arms directed inwards, and directly connected to hypandrium; postgonites reduced to small stubs at both sides of aedeagus; epiphallus present, projecting dorsally beyond cercal plate (Figure 1C). Epandrium wider than long, narrower in anterior region; cercal plate weakly fused; bacilliform process absent; surstyli marginal with respect to epandrium and formed by a central and a very short ventro-lateral process bearing few short setulae; surstyli broadly connected to epandrium (Figure 1C).

Female

Body length. 4.5–5.2 mm. Differs from male as follows:

Head. Ocellar triangle extending up to second fronto-orbital seta. Frons and vitta broad, distance between eye margins wider than 0.33× of head width. Frons shining black. Four to five strong *fr*, slightly shorter than flagellum. With upper and lower *orb*, and two rows of fronto-orbital setulae.

Legs. F2 with row of *av* not forming a ctenidium at apex and posterior surface covered with setulae that

do not form rows. Mid tarsomere lacking the short and stout baso-ventral setae. T3 with one submedian and one apical *d* of almost equal length.

Abdomen. Elongate, tergite 2 slightly broader than tergite 4. Shiny black with yellow triangular markings on lateral margins of tergite 2, and grey markings on tergites 3 and 4.

Postabdomen. Cerci short; anal plate longer than broad and uniformly covered with setulae; sternite 8 reduced to an anterior pair of elongated plates bearing three to four setae; postabdominal spiracles 7 and 8 on tergite 6 (Figure 1D). Two round spermathecae, slightly grooved, ducts not sclerotized (Figure 1E).

Third instar larva

Dorsal aspect (Figure 1F). First thoracic segment (T1) with long anterior processes with very coarse projections throughout; anterior spiracle with 10–12 short lobes. Second thoracic segment (T2) with short laterodorsals bearing very short unbranched projections; dorsolaterals near anterior margin, each a ring of minute projections enclosing a sensillus; dorsomedians each a rosette of small projections on a small distinct stalk. Third thoracic segment (T3) with laterodorsals slightly longer than those of T2, their projections unbranched; dorsolaterals similar to those of T2 but further from anterior margin; dorsomedians short and on a more conspicuous stalk than that of T2. First to seventh abdominal segments (A1–A7) with laterodorsals similar to those of T3, increasing in length towards caudal end of body, always with simple projections; dorsolaterals very small, each small stalk bearing three to five simple projections of varying length, not forming star shape; dorsomedians on a very conspicuous stalk, the stalk is longer towards caudal end of the body. Eighth abdominal segment (A8) with marginals similar to laterodorsals of remaining abdominal segments, subapical longest; posterior spiracular stalks short, broad slightly divergent, arising slightly closer to lateral margin than to midline; spiracular plate subtriangular with small, oval spiracular apertures near points of triangle. Cuticle with pattern of irregularly shaped polygonal plates, with low rounded domes, that are more conspicuous near anterior margin of segments and in the proximities of dorsolaterals.

The male of *Fannia yunguensis* sp. nov. keys to couplet 13 (in the key to males) and the female to couplet 12 (in the key to females) in the most recent keys for southern South American *Fannia* (Domínguez

2007). These keys can be modified as follows to include *F. yunguensis* sp. nov.

Modification of the key to males of *Fannia* by Domínguez (2007)

- 12. Parafacial with setae 13
 - Parafacial bare 14
- 13. F3 lacking preapical posteroventral tubercle.
 - femorialis* (Stein)
 - F3 with preapical posteroventral tubercle. 13a
 - 13a. F3 not dorsoventrally flattened and with a weak preapical posteroventral protuberance, T3 with numerous long and hair-like rows of *v.*
 - *pusio* (Wiedemann)
 - F3 dorsoventrally flattened and with a very strong preapical posteroventral protuberance, T3 lacking numerous long and hair like rows of *v.* *yunguensis* sp. nov.

Key to females

- 12. Abdomen entirely black 1
 - Abdomen trimaculated 13
- 12a. Frons grey pruinose, abdomen light bluish-grey at posterior margin of 1–3 abdominal tergites.
 - *losgateados* Domínguez
 - Frons shining black, abdomen lacking light bluish-grey markings at posterior margin of 1–3 abdominal tergites. *yunguensis* sp. nov

Discussion

Fannia yunguensis could belong to the *pusio* subgroup of the *cunicularis* species group. It shares an important character with the remaining species of the subgroup: the presence of the epiphallus. It is an important character state because the absence of this structure was considered an autapomorphy of the family (McAlpine 1989). Furthermore, in a phylogenetic analysis of the Fanniidae (Domínguez & Roig-Juñent 2008) the *cunicularis* species group was not recovered as a monophyletic unit and only one previously defined subgroup of the *cunicularis* species group was recovered, the *pusio* subgroup and this subgroup was strongly supported by the presence of the epiphallus.

This is the second species of the genus *Fannia* that is described in association with pig carcasses. The first, *F. sanihue* Domínguez & Aballay, was described from the province of Mendoza, Argentina. *Fannia sanihue* and *F. yunguensis* sp. nov. belong to very different subgroups within the genus with *F. sanihue* perhaps belonging to a new species group containing *F. roigi* Domínguez, *F. carvalhoi* Couri, and *F. hermani* Domínguez (Domínguez & Aballay 2008; Domínguez & Roig-Juñent 2008).

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Acknowledgement

We thank Dr. Sergio Roig-Juñent for reading this manuscript.

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