

***DICTYA BEHRMANI*, A NEW SPECIES OF SNAIL-KILLING FLY
(DIPTERA: SCIOMYZIDAE) FROM INDIANA**

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Abstract.—*Dictya behrmani* Murphy, new species (Diptera: Sciomyzidae), from Indiana, U.S.A., is described and illustrated. A male collected near Belmont, Brown County, Indiana, U.S.A., represents the only known specimen of the new species. The most recent key to the genus *Dictya* is updated to include the two species described since publication of the key.

Key Words: taxonomy, description, distribution, new record, Tetanocerini, Nearctic

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The snail-killing flies (Insecta: Diptera: Sciomyzidae) are a moderately speciose family of true flies of worldwide distribution, with 543 extant species in 63 genera (Vala et al. 2012). Approximately 270 species in 37 genera are found in the Western Hemisphere, of which almost 200 species are known from the Nearctic. Larvae of most species attack aquatic, shoreline, or terrestrial species of snails and slugs. Exceptions include larvae of *Renocera* Hendel species, most of which (Chapman et al. 2012) attack fingernail clams, and early instars of *Anticheta* Haliday species, which feed within egg masses of pulmonate snails.

From September 2009 until February 2013, the author collected and determined to species 9,527 sciomyzid flies from marshes, swamps, fens, bogs, roadside ditches, and wet meadows throughout Indiana. In entomological collections in the U.S.A. and Canada he found 524 additional specimens from Indiana. The resulting data set of 10,051 records included sciomyzid specimens from all

92 Indiana counties. A new species in the genus *Dictya* was discovered among the material the author collected.

Generic diagnosis.—*Dictya* Meigen 1803:277. Type species: *Musca umbrarum* Linnaeus 1758:599, by subsequent designation (Cresson 1920:70) [Traditional usage pending submission of proposal to I.C.Z.N. for fixation of type species]. Major studies: Curran 1932:1–7 [taxonomy]; Steyskal 1954:511–539, Steyskal 1960:34–41 [taxonomy], Steyskal 1965:689 [Nearctic catalog]; Fisher and Orth 1969:222–228 [biology and taxonomy]; Valley and Berg 1977:1–44 [biology and taxonomy]; Knutson et al. 1986:18–21 [Nearctic catalog]; Orth 1991:660–689 [taxonomy].

Dictya is the third largest genus in the family (Murphy et al. 2012) and the second largest genus in the family in the Americas. Excluding the species described here, *Dictya* comprises 43 described, valid species worldwide, including 29 occurring primarily or exclusively north of Mexico and 12 occurring primarily or exclusively

south of the U.S.A. Two species (*D. insularis* Steyskal and *D. jamaica* Orth) are known only from the northern Caribbean (Vala et al. 2012). In the Americas, the northernmost species reaches Alaska, and the southernmost species has been collected in Colombia (Valley and Berg 1977). A single species is known from and is restricted to the Palearctic.

In North America, 12 species of *Dictya* occur almost exclusively in states and provinces east of the Mississippi River. Eight species are confined to states and provinces west of the Mississippi River, and 11 species range both east and west of it. Three of the eastern species occur only in salt marshes; two are known only from the coastal marshes of the Atlantic and Gulf States.

Including the new species described here, 10 species of *Dictya* are known from Indiana (W. L. Murphy, unpublished); those species comprised 26% (2,621) of the 10,051 sciomyzid specimens from Indiana. The most recently described *Dictya* species was *D. orthi* Mathis, Knutson, and Murphy, known only from Virginia (Mathis et al. 2009). Larvae of all reared species are overt predators of molluscs, including terrestrial snails, freshwater pulmonate snails, and slugs (Valley 1974; Valley and Berg 1977). The most recent biological study was of *D. disjuncta* Orth, known only from a male collected in Mississippi in 1921 until the author rediscovered the species in 2010 in Indiana and reared it through all life stages (Murphy in press).

Adult *Dictya* lack a proepisternal seta and are placed therefore in the tribe Tetanocerini, subfamily Sciomyzinae. Adult *Dictya* are distinguished from those of other genera of Tetanocerini by the following characteristics: face white with a central black spot, ocellar setae present, frons not strongly convex, arista black, subalar sclerite without setae,

hind tibia with a single dorsal pre-apical seta, pedicel at least half the length of the first flagellomere, anepisternum and anepimeron with setae, and one fronto-orbital seta and two dorsocentral setae (Orth 1991). The wings are black along the costal margin, becoming grayish on the posterior half; small, white spots scattered over the surface give the wings a mottled appearance. Except for one species from the southeastern U.S.A., adults of all species are so similar in external morphology and appearance that positive determination to species requires dissection of the terminalia. Immature stages have been described for about half (22) of the 43 species of *Dictya*. Immatures of nearly all species of *Dictya* are so similar in gross morphology that positive identification can be made only by rearing them to the adult stage.

Here I describe and illustrate *Dictya behrmani* n. sp. and update the most recent key to *Dictya* (Orth 1991) to include the two species described since its publication.

MATERIALS AND METHODS

The descriptive terminology used here for external structures and for many internal structures follows the Manual of Central American Diptera (Cumming and Wood 2009). For structures of the male postabdomen, the terminology suggested by Cumming et al. (1995) has been adopted.

The terminalia were prepared by use of the method of Clausen and Cook (1971) and Grimaldi (1987). Microscissors were used to remove the terminalia, with about half of the abdomen remaining attached to the body. Boiled water and a pellet of potassium hydroxide were placed in a depression in a ceramic spot plate. The terminalia were then submerged in the potassium hydroxide solution and allowed to macerate at ambient room

temperature (20–24 °C) for at least eight hours. The terminalia, now cleared of soft tissue, were then rinsed in place with acetic acid diluted with boiled water, rinsed again in place with boiled water, and then transferred to 70% ethyl alcohol in a glass spot plate for examination. To maintain proper orientation during examination, photography, and drawing, the terminalia were transferred to a glass spot plate and suspended in a drop of methyl and carboxymethyl cellulose (K-Y Jelly[®]) covered with 70% ethyl alcohol. For permanent storage, the prepared terminalia were placed in a plastic microvial partially filled with glycerin.

RESULTS AND DISCUSSION

Dictya behrmani Murphy, new species (Figs. 1–4)

Diagnosis.—This species can be distinguished readily from its congeners by the unique shape of the ventral process of the hypandrium, the apex of which in lateral view appears folded over from the lateral side toward the median side, and by the shape of the ventral process of the epandrium, which has a relatively large, rounded, posteroventrally directed posterior lobe and a smaller, raised anterior lobe.

Description.—Holotype male (Fig. 1). Length 7.0 mm. Body and legs grayish-brown. Most setae and many setulae with dark somatic base, some of the bases confluent, presenting a mottled appearance; some large brownish spots microtomentose, dull. The combination of pedicel dull on the dorsal side, parafacial spots smaller than the diameter of the anterior ocellus, and lack of black spots centered in the depressions mesad of the humeral callosities identifies *Dictya behrmani* as a member of the “Typical Group” as characterized by Steyskal (1954).

Head: Frons nearly flat, tomentose except subshining near base of fronto-orbital and orbital setae, essentially parallel sided in dorsal view; frontal vitta very narrow, subshining, reaching front margin; 1 fronto-orbital seta; ocellar, postocellar, and vertical setae well developed; postocellar setae slightly divergent; anterior half of frons with numerous setulae with dark somatic bases; small, round, dark brown spot (parafacial) near orbital margin approximately 1/3 distance from base of fronto-orbital seta to front margin; triangular, orange-brown orbito-antennal spot at anterior lateral corner of frons; lunule almost entirely concealed. Pedicel subquadrate, nearly equal to length of first flagellomere, with numerous setulae and 2 slightly stouter apicodorsal setae; first flagellomere concave apicodorsally, truncate apically; arista with segments 1–2 whitish, remainder black, hairs sparse, moderately long on basal third. Face tomentose white with small, central, dark brown, oval spot; setulae along antennal groove reaching base of antenna.

Thorax: Thoracic setae well developed: 2 postsutural dorsocentral setae; 1 prescutellar acrostichal seta; 1 postpronotal seta; 1 presutural supra-alar seta; 2 post-alar setae; 2 notopleural setae; scutellum setulose, with 2 anterior and 2 posterior



Fig. 1. *Dictya behrmani*, holotype ♂, Belmont, Brown County, Indiana, U.S.A. Terminalia removed.

marginal setae with dark somatic bases; prosternum bare; anepisternum setulose, bearing 1 well developed seta postero-dorsally; anepimeron with several setulae and 1 well developed seta anteroventrally and with 1 well developed and 2 moderately well developed setae surrounded by 7–9 setulae below subalar ridge; subalar ridge without setae; katepisternum setulose but lacking setae. Wing (Fig. 2). Length 4.8 mm. Strong brown infuscation and numerous pale spots; crossvein dm-cu nearly straight, with irregular undulations. Legs. All femora pale to testaceous, paler on ventral surface, with brown, strap-like band on ventral surface 2/3 distance from coxa; base of forefemur dark; midfemur with seta at midlength of anterodorsal surface. All tibiae pale, darker at distal apex, with 1 dorsal preapical seta; midtibia with 3 well developed apicoventral, spur-like setae; hind tibia with 2 short apicoventral, spur-like setae. Foretarsus and tarsomeres pale, distal 2/3 of tarsomere 3 and all of tarsomeres 4–5 blackish; mid-tarsus and tarsomeres pale, distal 3/4 of tarsomere 5 blackish; hind tarsus and tarsomeres pale, tarsomeres 4–5 blackish. Inner posterodorsal margin of hind coxa with sparse setulae.

Abdomen: Terga setulose, setulae larger along posterior margins; middorsal vitta not apparent. Male terminalia (Figs. 3–4;

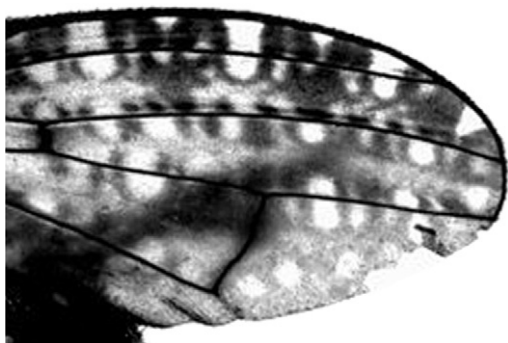


Fig. 2. Wing, dextral side, dorsal view.

terminology for structures of the male terminalia is provided in Fig. 3): surstylus with dorsal apex rounded, projecting well beyond dorsal margin of surstylus; ventral process of hypandrium long, in lateral view straight on anterior and posterior surfaces, triangular in cross section, with small preterminal lobe, apex in lateral view appearing folded over from lateral side toward median side, in ventral view appearing roughly semicircular; ventral process of epandrium with posterior lobe large, rounded, directed posteroventrally; anterior lobe small, rounded.

FEMALE.—Unknown.

Type material.—The holotype male is labeled “USA, IN, Brown Co., Belmont, 39°09.682’N 86°19.217’W, 1 June 2011, W. L. Murphy, Coll.” The holotype is directly pinned and is in good condition (abdomen removed, dissected, and stored in a microvial containing glycerin on the same pin). The holotype will be deposited in the entomological collection at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Type locality.—Nearctic: United States, Indiana, Brown County, Belmont (39°09.682’N 86°19.217’W). The collection site is in a hilly area with isolated soybean and corn fields surrounded by

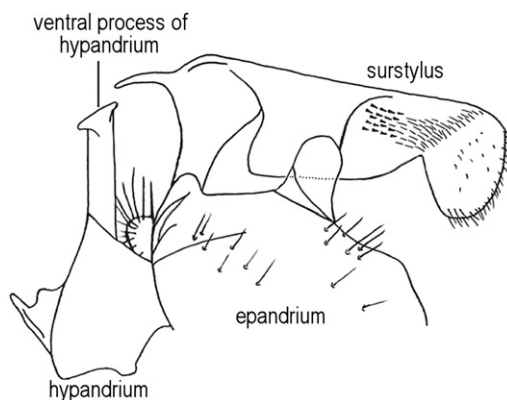


Fig. 3. Male terminalia, lateral view, specimen inverted.

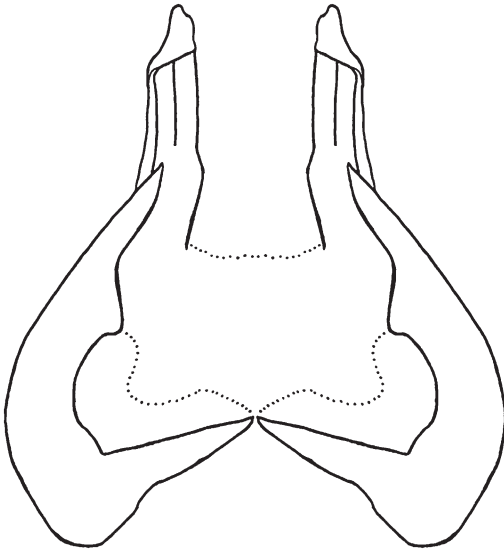


Fig. 4. Hypandrium, anterior view, specimen inverted.

extensive deciduous forests. The species described here was collected in a vernal wet, fallow, weedy field with small, disjunct patches of sedges and cattails on the south side of Indiana State Road 46. Except for seasonal seeps, no permanent source of water occurs near the collection site.

Distribution.—Nearctic: United States (Indiana).

Etymology.—The specific epithet, *behrmani*, is a genitive patronym to honor Jill Behrman, a student at Indiana University, Bloomington, whose tragic death in 2000 inspired her parents to co-found Jill’s House, a residential facility in Bloomington in which the author stayed in 2013 while preparing this paper.

Identification.—Orth (1991) provided a key to all 42 species of *Dictya* known at that time. Regional keys to *Dictya* include those of Fisher and Orth (1983), which covers six species of *Dictya* in California and adjacent states, Foote and Keiper (2004), which covers six species of *Dictya* in Ohio and adjacent states, and Mathis et al. (2009), which covers 18 species of *Dictya* in the Delmarva and adjacent states.

Update to Orth’s (1991) key.— Orth’s key can be modified as shown below to include the two species of *Dictya* (*behrmani* new species and *orthi* Mathis, Knutson and Murphy) described since its publication:

- 22. Ventral process of epandrium with large posterior lobe. Preterminal lobe of ventral process of hypandrium directed anterolaterally (figs. 68, 69)..... *D. floridensis* Steyskal
- Ventral process of epandrium with relatively small posterior lobe. Preterminal lobe of ventral process of hypandrium directed anteriorly or anterobasally, not anterolaterally..... 22a
- 22a. Ventral process of hypandrium with prominent, well sclerotized, triangular process on anterior margin (Fig. 5, this paper) *D. orthi* Mathis, Knutson and Murphy
- Ventral process of hypandrium without prominent, well sclerotized, triangular process on anterior margin (figs. 70, 71) *D. sabroskyi* Steyskal [no change to couplets 23 through 26]
- 27. Ventral process of epandrium with large, somewhat sickle-shaped posterior lobe. Ventral process of hypandrium as in figs. 8, 9 *D. fisheri* Orth

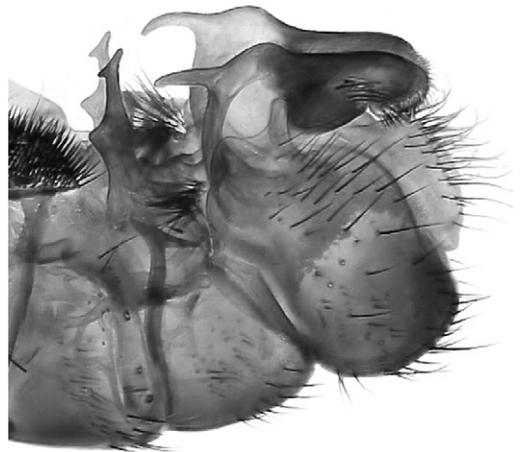


Fig. 5. *Dictya orthi*, terminalia of male, lateral view, specimen inverted.

- Ventral process of epandrium with moderately large, rounded posterior lobe . . . 27a
27a. Ventral process of hypandrium in lateral view with tip smoothly tapering to sharp, anteriorly directed point, in anterior view well inclined mesally.
. *D. laurentiana* Steyskal
- Ventral process of hypandrium in lateral view truncated, with apex appearing folded over from lateral side toward median side, in anterior view not inclined mesally (Fig. 3, this paper).
. *D. behrmani* new species

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