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THE GENUS FUNDELLA ZELLER: A CONTRIBUTION
TOWARD A REVISION OF THE AMERICAN PYRALI-
DROID MOTHS OF THE FAMILY PHYCITIDAE

By CARL HEINRICH

This paper is offered now because two of the species treated have been discovered in the United States, and one of these (*pellucens*) is rated as a bean pest of some importance in the Tropics and may easily become one in our Gulf States. Also, there has been considerable misidentification of at least three of the species due to the wide variability of the markings and the misapplication of the name *pellucens* in economic and taxonomic literature. The species are markedly different in their genitalia, but heretofore these organs have not been figured, nor have the structural peculiarities of the several species been indicated.

The genus is confined to the New World. Five species are recognized of which one is here described for the first time. Two older names are referred to synonymy. The study is based upon material in the United States National Museum, a considerable collection of specimens from Puerto Rico in the Cornell University collection, and a few specimens from the Janse and British Museum collections.

Genus FUNDELLA Zeller

Fundella ZELLER, Isis von Oken, vol. 41, p. 863, 1848.—RAGONOT, Mémoires sur les Lépidoptères, vol. 7, p. 219, 1893.—JANSE, Journ. Ent. Soc. South Africa, vol. 4, p. 163, 1911. (Genotype: *Fundella pellucens* Zeller.)

Ballovia DYAR, Proc. U. S. Nat. Mus., vol. 41, p. 323, 1913; Insector Inscitiae Menstruus, vol. 7, p. 40, 1919. (Genotype: *Ballovia cistipennis* Dyar.)

Antenna of male slightly pubescent, base somewhat enlarged, shaft laterally flattened and very slightly excavate at base (pl. 4, fig. 2)

(except in *ignobilis* and *ahemora*) and with a very small blackish scale tuft in the excavation (except in *ignobilis*); of female slender, simple. Front of male head deeply grooved to hold labial palpi; of female rounded. Labial palpus upcurved, reaching to vertex, clothed with broad appressed scales; in male closely appressed to face, with second segment over three times as long as first and with third segment very short (about one-sixth the length of second); in female with second segment shorter and third about one-third the length of second. Maxillary palpus minute. Forewing smooth; 11 veins, 10 from cell, parallel for some distance but not approximate to stalk of 8-9, 9 short, 6 from below upper angle of cell, straight, 4-5 connate or approximate at base, 3 approximately equidistant from 4 and 2, 2 from before lower angle of cell. Hind wing with 8 veins, 7 and 8 closely approximate beyond cell for less than half their lengths, 4 and 5 long stalked, 3 from stalk of 4-5 or closely approximate for some distance, 2 from near lower angle of cell, cell short, discocellular slanting and slightly curved; in male anal area, involving veins 1a and 1b, thickened and folded under to form a pocket enclosing enlarged scales and hair tufts. Eighth abdominal segment of male bearing a thin, short pair of ventrolateral hair tufts.

Male genitalia with uncus long, curved, strongly sclerotized, constricted at middle and broadly divided at apex (hammer-clawed); gnathos terminating in a short, stout hook or a short, broad plate (*ahemora*); harpe rather short, with clasper; vinculum narrow, short; aedeagus stout with long, stout, projecting, curved spine or spines at apex (except in *argentina*); cornutus a single, strong spine.

Female genitalia without signum (*pellucens*) or with signum well developed and consisting of a large oval or pear-shaped cluster of thornlike spines (*argentina*, *agapella*), or curved sclerotized bands armed with stout, thornlike spines (*ahemora*, *ignobilis*); bursa large; ductus bursae short, broad (narrowest in *agapella*); area surrounding genital opening strongly sclerotized, the dorsal sclerotization in the form of a band connected with the supporting rods of eighth segment collar, and armed with two or four spinelike projections (except in *ignobilis* and some examples of *argentina*); ductus seminalis from caudal area of bursa.

This genus is easily distinguished by its striking male characters: the strongly sclerotized, long-stemmed, bifurcate (hammer-clawed) uncus; the large pocket on anal area of hind wing; the long, embedded labial palpus with very short third segment; and minute maxillary palpus. A similar bifurcate uncus is not found in any other American genus except *Defundella* Dyar. In the type species of the latter (*corynophora* Dyar) the uncus is somewhat produced and exhibits a slight bifurcation at apex; but other species, which must also be

referred to *Defundella*, lack this character. *Defundella* separates readily on other male structures: Its greatly reduced gnathos, strongly hooked, partially free sacculus of harpe, its rounded frons, and the narrow, strongly sclerotized, deeply invaginated pocket of the sternite of the eighth abdominal segment.

In *Fundella* the wing pattern varies so much within any given species that it affords no reliable character for specific identification, and the several species can be separated with certainty only by their genitalia.

KEY TO THE SPECIES OF FUNDELLA

MALES

1. Clasper a straight spine; aedeagus simple *argentina* Dyar
Clasper a curved digitus; aedeagus armed with curved, strongly sclerotized spine or spines at or near apex 2
2. With large, strongly sclerotized subanal plate; a cluster of several spines from apex of aedeagus; clasper short *pellucens* Zeller
Without sclerotized subanal plate; no more than two spines from aedeagus at or near apex; clasper long 3
3. Gnathos terminating in a broad plate; aedeagus with a pair of spines from apex *ahemora* Dyar
Gnathos terminating in a short, stout hook; aedeagus with a single spine from below apex *ignobilis*, new species

FEMALES

1. Bursa copulatrix without signum; ductus bursae sclerotized throughout length, sclerotization involving part of bursa adjacent to ductus bursae and ductus seminalis *pellucens* Zeller
Bursa copulatrix with strong signa; ductus bursae at most only partially sclerotized 2
2. Signa in form of large oval or pear-shaped clusters of spines *argentina* Dyar
agapella Schaus
Signa in form of bands bearing stout spines 3
3. Signa consisting of 2 rather short bands, each armed with a row of long spines; ductus bursae with a strongly sclerotized median collar; a widely spaced pair of long, curved spines from sclerotized area immediately behind genital opening *ahemora* Dyar
Signa consisting of 2 long, partially fused bands each armed with a row of short, stout, thornlike spines; ductus bursae with median area unsclerotized; no spines adjacent to genital opening *ignobilis*, new species

FUNDELLA PELLUCENS Zeller

PLATE 4, FIGURES 1-4, 6-6a, 7-7c; PLATE 6, FIGURES 15-15a

Fundella pellucens ZELLER, Isis von Oken, vol. 41, p. 866, 1848; Horae Soc. Ent. Rossicæ, vol. 16, p. 236, 1881. — RAGONOT, Mémoires sur les Lépidoptères, vol. 7, p. 210, 1893.

Balloria cistipennis DYAR, Proc. U. S. Nat. Mus., vol. 44, p. 323, 1913.

Fundella cistipennis (Dyar) DYAR, Insector Inscitiae Menstruus, vol. 7, p. 40, 1919.—WOLCOTT, Journ. Dept. Agr. Puerto Rico, vol. 17, pp. 241-255, 1933; Journ. Agr. Univ. Puerto Rico, vol. 18, p. 432, 1934; vol. 20, p. 477, 1936.—SCOTT, Journ. Agr. Univ. Puerto Rico, vol. 24, pp. 35-47, 1940. (New synonymy.)

Male.—Antennal shaft with very small black basal tuft (pl. 4, fig. 3). Palpi, thorax, and forewing grayish fuscous more or less dusted with whitish and with interspersed reddish-brown scales (in many specimens the ground color is reddish brown), giving the moth a distinctly gray or gray-brown appearance to the naked eye. Forewing with a conspicuous, round, darker brown or fuscous spot in the center of the area usually occupied by the antemedian line, this dark spot more or less obscured in some specimens but in typical examples outlined by whitish areas inwardly and outwardly and not reaching to inner margin or costa of the wing; discal mark at end of cell obscure, often absent; subterminal line (when distinguishable) faint, white, indented at vein 6 and at submedian fold; a row of dark spots along termen (present only in specimens having an appreciable dusting of white scales). Hind wing white, translucent, a faint fuscous border along costa and (in some specimens) a fuscous line on termen for a short distance from apex; cilia white; anal pocket yellowish white. Midtibia with a fringe of pale hairlike scales along dorsum. Hind tibia with a rather long and slender tuft of pale (whitish ochreous), hairlike scales from the knee joint (pl. 4, fig. 4).

Alar expanse 19-23 mm.

Genitalia (pl. 4, figs. 7-7e) with a large, strongly sclerotized subanal plate, constricted before and beyond its middle. Harpe with apex notched below costa; clasper short, curved, situated near middle of harpe and armed with several setae at its knobbed apex. Aedeagus with a cluster of several long, curved spines from apex; cornutus long, straight, stout.

Female.—Essentially like the male in color and markings except that the dark spot near the base of the forewing is more diffused, sometimes reaching to the costa. Hind wing usually with a dark shade along termen.

Alar expanse 19-24 mm.

Genitalia (pl. 6, figs. 15-15a) with bursa copulatrix finely scobinate but without signum; ductus bursae flattened, broad, twisted and constricted near genital opening, sclerotized throughout, the sclerotization involving bursa adjacent to ductus bursae and ductus seminalis; sclerotized band behind genital opening armed with four long, stout, projecting spines; collar of eighth segment invaginated at dorsal margin to form a sclerotized pocket (pl. 6, fig. 15a).

Types.—In British Museum (*pellucens*); United States National Museum (*cistipennis*).

Type localities.—St. Thomas, British West Indies (*pellucens*); Barbados (*cistipennis*).

Food plants.—*Vigna unguiculata* (cowpeas, black-eyed peas, and garden peas), *Canavalia ensiformis* (sword beans), *Canavalia maritima* (black bean), *Cajun cajan* (pigeon pea), *Phaseolus lunatus* (cultivated and wild lima beans), *Phaseolus* sp. (Brazilian specimens), *Cassia occidentalis* (one reared specimen from McCubbins Mills, Puerto Rico, before me; most records from this last plant are doubtful and probably the result of a misidentification of *Fundella argentina* as *cistipennis*).

Distribution.—UNITED STATES: *Florida*, Hobe Sound, Miami, Jupiter, Coconut Grove, Marco Island, Walton, Jensen (U.S.D.A. rearings from lima beans, February 1944), Vero Beach (J. R. Malloch, December 1941). *BARBADOS*, *Haiti*: Damien (December, February), Port-au-Prince. *MONTSEREAT* (January). *CUBA*: Santiago, Matanzas. *VIRGIN ISLANDS*: St. Croix (March). *PUERTO RICO*: San Juan, Río Piedras (March-May), Isabella, Cataño (July), Vieques Island (April). *BRAZIL*: Bahia (May), Ceará.

Ninety-six specimens examined.

Zeller had two species before him when he described *pellucens*, and the one he figured (fig. 41*b*) in *Horae Soc. Ent. Rossicae* is his "var. b," which is Dyar's *argentina*. Through the courtesy of Messrs. Riley and Tams, of the British Museum, I have been able to examine the genitalia of the male paratype designated "var. b" by Zeller and a typical male *pellucens* of the Zeller material from Maraquita. The latter proved to be what Dyar described as *cistipennis* and the species that has appeared in economic literature under that name. What Möschler and others have identified as *pellucens* could not be determined without a genitalic examination of their specimens. Probably in many instances they had mistaken *argentina* for *pellucens*, since both species occur in the West Indies and Brazil.

According to Scott the favored host of *pellucens* (= *cistipennis*) in Puerto Rico is the cowpea (*Vigna unguiculata*), and the species while frequent in lima beans seldom does serious damage. Potentially it is an insect of economic importance. The larvae are primarily pod borers but also bore into the stems and feed on the flowers of their hosts. They attack, as far as known, only Leguminosae.

FUNDELLA ARGENTINA Dyar

PLATE 5, FIGURES 8-8C; PLATE 6, FIGURES 12, 13

- Fundella pellucens* ZELLER (in part, "var. b"), *Isis von Oken*, vol. 41, p. 867, 1848;
Horae Soc. Ent. Rossicae, vol. 16, p. 237, fig. 41*b*, 1881 (new synonymy).
Fundella argentina DYAR, *Insector Insectinæ Mensuris*, vol. 7, p. 40, 1919.
Fundella lucasis DYAR, *Insector Insectinæ Mensuris*, vol. 7, p. 40, 1919 (new synonymy).

Male.—Antennal shaft with even smaller black basal scale tuft than that of *pellucens*. Forewing gray without the reddish brown, interspersed scaling characteristic of typical examples of *pellucens*; entire basal area to antemedian line dark fuscous gray (with but very slight dusting of whitish scales toward base in some specimens); this dark basal patch contrasted against the paler gray color of the remainder of the wing, extending from costa to inner margin and bordered outwardly by a narrow whitish line. Otherwise not distinguishable, superficially, from *pellucens*.

Alar expanse 15–20 mm.

Genitalia (pl. 5, figs. 8–8c) without sclerotized subanal plate. Terminal projection of gnathos varying from round to pointed (pl. 5, fig. 8a) at apex. Harpe tapering to bluntly pointed apex; clasper a single, straight, slightly roughened, appressed spine, situated beyond middle of harpe. Aedeagus simple; cornutus a single, straight spine.

Female.—Essentially like the male in color and markings except that the basal area of forewing is concolorous with or contrastingly paler than the remainder of the wing. A narrow dark line or a diffused dark shading outwardly bordering the obscure antemedian line.

Alar expanse 15–23 mm.

Genitalia (pl. 6, figs. 12, 13) with signum well developed and consisting of a large pear-shaped cluster of thornlike spines; sclerotized band behind genital opening, divided in the middle, simple (pl. 6, fig. 12) in Argentinian and Brazilian specimens, or armed with a pair of median, spinelike projections (pl. 6, fig. 13), rather long in West Indian specimens or short and disappearing in Mexican and Venezuelan specimens.

Types.—In United States National Museum (*argentina* and *cucasis*).

Type localities.—Tucumán, Argentina (*argentina*); Caracas, Venezuela (*cucasis*).

Food plant.—*Cassia* spp. (reared examples in National Collection from *Cassia bicapsularis* and *C. corymbosa*).

Distribution.—UNITED STATES: *Florida*, Biscayne Bay (May), Coconut Grove (April); *Texas*, Brownsville (November). MEXICO: Several examples reared from pods and blossoms of *Cassia bicapsularis* at Brownsville, Tex., quarantine station. CUBA: Baraguá (March), Habana, Matanzas, Santiago Province. PUERTO RICO: Bayamón (March, September), Vieques Island (April, July), Coamo Springs (April), Aguirre Central (August), San Germán (August), San Juan (November). HAITI: Pétienville (June). JAMAICA. VENEZUELA: El Valle (June). BRAZIL: Bahia (May). ARGENTINA: Tucumán (March).

Seventy-three specimens examined.

In collections this species has appeared most frequently under the name *pellucens*. Both *argentina* and *pellucens* have about the same distribution and are abundant in the West Indies, though, from material at hand, *pellucens* seems to be rarer on the mainland. Throughout its range *argentina* shows considerable variation in female genitalia. West Indian specimens have rather conspicuous spinelike extensions of the sclerotized band behind the genital opening. These are entirely lacking in Brazilian specimens, and if one had only these extremes he would be justified in assuming that they were at least racially distinct. However, Venezuelan and Mexican examples show an intermediate form with very short projections, and Central American specimens, when recovered in sufficient numbers, will probably show all intergradations. The male genitalia are remarkably uniform throughout the range of the species, exhibiting only minor individual variations in the shape of the terminal projection of the gnathos. The type of Dyar's *vacasis* is only a small, somewhat faded male of *argentina*.

FUNDELLA AGAPELLA Schaus

PLATE 6, FIGURE 11

Fundella agapella SCHAU'S, Zoologica, vol. 5, No. 2, p. 47, 1923.

Female.—Palpi, head, thorax, and forewing whitish gray; dark markings drab gray; transverse antemedian line of forewing white, defined chiefly by its narrow, dark outer border, sharply sinuate, indented a trifle just below costa, more deeply at top of cell and still more deeply at fold below cell; discal dot at end of cell obscure; white subterminal line indented at vein 6 and at submedian fold, bordered inwardly by a distinct dark shade as broad as the white line itself and outwardly by a similar, fainter, dark shading, the latter conspicuous only at apex. Hind wing as in the other species of *Fundella*.

Alar expanse 12 mm.

Genitalia (pl. 6, fig. 11) like those of intermediate examples of *argentina* except that the signum is considerably smaller in proportion to the size of the bursa.

Type.—In United States National Museum.

Type locality.—Tagns Cove, Albemarle, Galápagos Islands.

Food plant.—Unknown.

Known only from the female type. Superficially a distinct species. The female genitalia, however, would indicate that *agapella* is only a race of *argentina*. A male will be needed for exact placement, and until it is available we shall have to treat *agapella* as a species.

FUNDELLA IGNOBILIS, new species

PLATE 5, FIGURES 9-9d; PLATE 6, FIGURE 14

Male.—Antennal shaft without any trace of black basal scale tuft. Otherwise partaking of the pattern markings of both *pellucens* and *argentina*; in some specimens dark basal patch of forewing round and reaching neither costa nor inner margin (as in typical *pellucens*), in majority of specimens, however, basal patch occupying whole basal area (as in typical *argentina*); median and outer areas of wing averaging a trifle paler than in *argentina* and without the reddish-brown scaling of *pellucens*.

Alar expanse 13-20 mm.

Genitalia (pl. 5, figs. 9-9d) with gnathos terminating in a short, stout hook. Harpe with apex truncate; clasper moderately long, curved, and weakly haired at apex. Aedeagus with a single, long, strong, curved spine from below apex; cornutus a short, stout, curved thorn.

Female.—Superficially similar to *argentina* except a trifle paler on the average.

Alar expanse 15-22 mm.

Genitalia (pl. 6, fig. 14) without spines adjacent to genital opening. Bursa copulatrix with signa, consisting of a pair of partially fused bands, each armed with a row of short, stout, thornlike spines; ductus bursae short and broad, with median area unsclerotized; eighth segment collar completely sclerotized except for a small, round, transparent spot on midventer, sclerotization extending to and over area behind genital opening.

Type and paratypes.—U. S. N. M. No. 57185. Paratypes also in British Museum and in Cornell University and Janse collections.

Type locality.—Oaxaca, Mexico.

Food plant.—Unknown.

Described from the male type and 2 male and 4 female paratypes from the type locality; 4 male and 8 female paratypes from Tehuacán, Mexico (May, June, July); 3 male and 7 female paratypes from Orizaba, Mexico; 1 male and 6 female paratypes from Córdoba, Mexico (May); 1 female paratype from Guadalajara, Mexico; 1 female paratype from Jalapa, Mexico; 1 male paratype from Cayuga, Guatemala; 1 female from Costa Rica; 1 male and 1 female paratype from Santiago, Cuba (June); 1 male and 1 female paratype from Sierra Miestra, Cuba (May); 1 male paratype from Cuba without other locality label; 1 male paratype from Aguirre Central, Puerto Rico; and 1 female paratype from Pétienville, Haiti. Most of the foregoing were in the National Collection under either *pellucens* or *argentina*. The species is quite distinct and easily recognized in either sex by its genitalia.

FUNDELLA AHEMORA Dyar

PLATE 4, FIGURE 5; PLATE 5, FIGURES 10-10c; PLATE 6, FIGURE 16

Fundella ahemora DYAR, Proc. U. S. Nat. Mus., vol. 47, p. 403, 1914.

Male.—Antenna with small black scale tuft at base of shaft. Forewing with no or a very faint dark basal patch (when present covering basal area to antemedian line); antemedian line whitish, very faint; subterminal line white, faint but less obscure than antemedian, without dark borders except for an inner and an outer dark spot at inner margin of wing; veins from cell rather strongly outlined by dark scaling (the most conspicuous superficial character of the species). A thick, dark (brownish) hair tuft covering outer surface of fore tibia (pl. 4, fig. 5), a male character not found in other species of the genus.

Alar expanse 18-23 mm.

Genitalia (pl. 5, figs. 10-10c) with gnathos terminating in a broad tongue-like plate. Harpe somewhat tapering but with apex truncate; a strong tuft of long scales from costa; clasper long, curved, slender, with a few hairs at apex. Aedeagus with a pair of long, curved, flattened spines from apex; cornutus a long, straight, slender spine.

Female.—Essentially like the male in color and markings.

Alar expanse 15-23 mm.

Genitalia (pl. 6, fig. 16) with a pair of long, widely spaced, basally curved spines from sclerotized area immediately behind genital opening. Bursa copulatrix with signa consisting of two rather short bands, each armed with a row of long spines. Ductus bursae bulged in the middle and with a strongly sclerotized median collar. Collar of eighth segment partially sclerotized and fused ventrally.

Type.—In United States National Museum.

Type locality.—Orizaba, Mexico.

Food plant.—Unknown.

Distribution.—MEXICO: Orizaba, Jalapa, Teapa (December), Córdoba (April, December), Cuernavaca (July). GUATEMALA: Quirigua (March), Cayuga (January, May), Parullia (July). COSTA RICA: Juan Vinas (November).

Nineteen specimens examined.

Superficially the most easily distinguished species in the genus. The large foretibial tuft at once identifies the male, and both sexes can be separated by the rather conspicuous dark outlining of the veins. The veins are similarly dark scaled in the other species, but the contrast of the dark veins against the pale intervenular areas is more marked in *ahemora*.

EXPLANATION OF PLATES

The drawings of figures 7-7*c*, 8-8*c*, 9-9*d*, 10-10*c*, 11, 12, and 13 for the plates accompanying this paper were made by Mrs. Eleanor A. Carlin, formerly with the Bureau of Entomology and Plant Quarantine. Figures 1, 2, 3, 4, 5, 6-6*a*, 14, 15-15*a*, and 16 were drawn by Mrs. Sara H. DeBord, of the Bureau of Entomology and Plant Quarantine.

PLATE 4

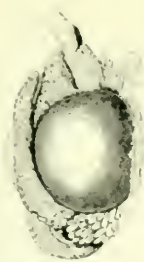
- 1-4, 6-7*c*, *Fundella pellucens* Zeller: 1, Side view of male head; 2, basal segments of male antenna, denuded to show depression in shaft; 3, same, showing scale tuft on shaft; 4, hind tibia of male; 6, wings of male showing venation; 6*a*, ventral view of anal pocket of male hind wing, opened to show scale tufts; 7, ventral view of male genitalia with aedeagus omitted; 7*a*, lateral view of tegumen, gnathos, subanal plate, and uncus; 7*b*, aedeagus; 7*c*, sternite and tergite of eighth abdominal segment of male.
- 5, *Fundella ahemora* Dyar: Tufted foretibia of male.

PLATE 5

- 8-8*c*, *Fundella argentina* Dyar: 8, Ventral view of male genitalia with aedeagus omitted; 8*a*, terminal projection of gnathos showing extreme of variation; 8*b*, sternite and tergite of eighth abdominal segment of male; 8*c*, aedeagus.
- 9-9*d*, *Fundella ignobilis*, new species: 9, Ventral view of male genitalia with aedeagus omitted; 9*a*, lateral view of tegumen, gnathos, and uncus; 9*b*, aedeagus; 9*c*, sternite and tergite of eighth abdominal segment of male; 9*d*, anellus.
- 10-10*c*, *Fundella ahemora* Dyar: 10, Ventral view of male genitalia with aedeagus omitted; 10*a*, lateral view of tegumen, gnathos, and uncus; 10*b*, aedeagus; 10*c*, sternite and tergite of eighth abdominal segment of male.

PLATE 6

- 11, *Fundella agapella* Schaus: Ventral view of female genitalia.
- 12, 13, *Fundella argentina* Dyar: 12, Ventral view of female genitalia of type with bursa copulatrix omitted; 13, ventral view of female genitalia of West Indian specimen.
- 14, *Fundella ignobilis*, new species: Ventral view of female genitalia.
- 15-15*a*, *Fundella pellucens* Zeller: 15, Ventral view of female genitalia; 15*a*, collar of eighth abdominal segment of female, dorsal view.
- 16, *Fundella ahemora* Dyar: Ventral view of female genitalia.



1



2



3



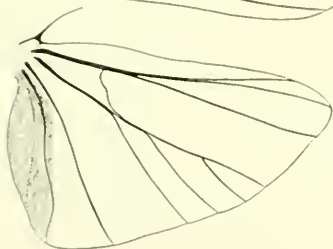
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5



6a



6



ahemora



7

pellucens



7a

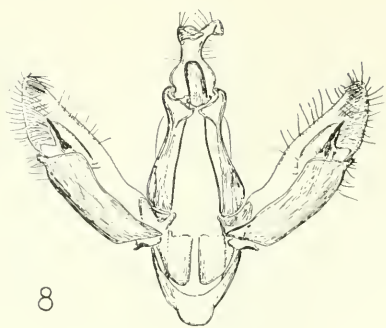


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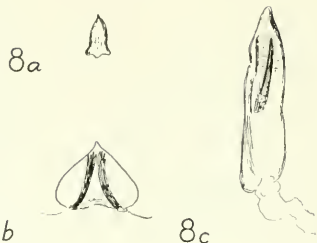
7c

THE GENUS FUNDELLA.
For explanation see page 114.



8

argentina



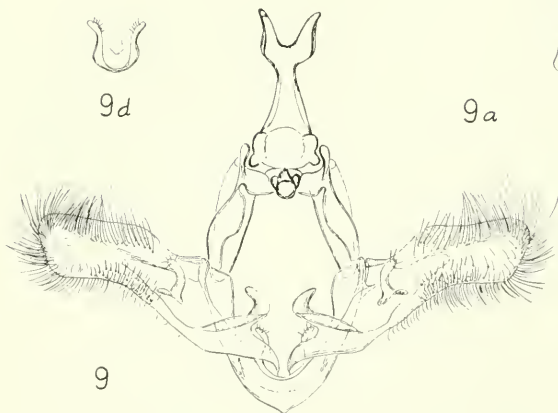
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8b

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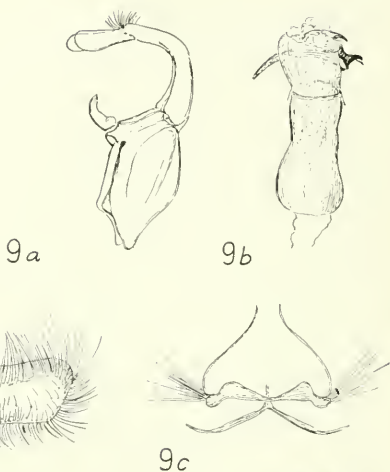


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9

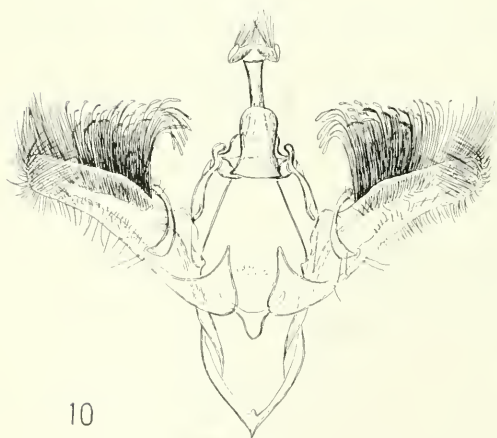
ignobilis



9a

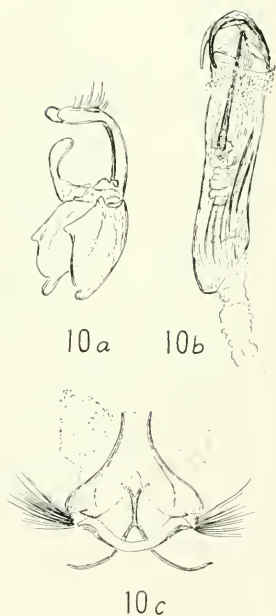
9b

9c



10

ahemora



10a

10b

10c



11 *agapella*



12 *argentina*



15a



13 *argentina*



14 *ignobilis*



15 *pellucens*



16 *ahemora*

THE GENUS FUNDELLA
For explanation see page 114.

