THE RUBIDELLA GROUP OF ARISTOTELIA (LEPIDOPTERA, GELECHIIDAE)

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There has been a suspicion for many years[1] that the material standing in American collections as *Aristotelia rubidella* and *A. pudibundella* represented a considerable number of similar but definitely characterized species. The need for a correct determination of the Porto Rican species reported by Walsingham under these names necessitated some more definite action and led to a review of the material standing in several collections under those names.

There is no attempt here to make the study complete, but merely to identify these two species definitely and clear up some material that was actually confused with them. For a real revision of the group the material standing as *fungivorella* and as *roseosuffusella* would also have to be gone over, as they also include several species, some of which have been recently described by Braun and Meyrick. Two of these I had actually confused with *rubidella* and *pudibundella,* namely an undescribed close relative of *fungivorella,* which had been mistaken for *pudibundella,* and a southern form of *roseosuffusella* (the eastern clover species which commonly goes by that name) which had lost the white markings almost wholly, and so fitted rather closely to Zeller's original description of *pudibundella.*

I have examined the types of Zeller's *pudibundella,* Clemens's *rubidella,* and Chambers' *intermediella* and *rubensella.* Zeller's *molestella* is not at Cambridge, and no doubt is in the Zeller collection at London. It cannot be identified from the description alone, and may turn out the same as intermediella. I found in this type material there were three well characterized species, none of which were the Porto Rico species from which I started, and which Walsingham had used to recharacterize rubidella

[1] See Busck, Proc. U. S. Nat. Mus. 25: 797; Forbes Lep. N. Y. 296.

and perhaps *pudibundella.* Zeller's types of *pudibundella* from Texas were a species that we had not previously recognized, but his Massachusetts types agreed with Clemens's unique type of *rubidella.* Clemens's species was very distinct and generally correctly named, but was a species that did not have the secondary sexual characters given it by Walsingham, who seems to have had only the West Indian species (*diolcella* Forbes). The types of *intermediella* agree so far as can be told (lacking an abdomen) with the species which Miss Murtfeldt bred from apple and called *intermediella,* but were very different from either the species which Busck or I had identified as *pudibundella,* to which Busck sank the species. On the other hand there is an oak species which Miss Murtfeldt had standing as *rubensella,* which I cannot distinguish structurally from the apple species. Chambers' single surviving type of *rubensella* is the same as the apple species, so far as one can see; but other material Chambers had determined as *rubensella,* and standing beside it in the M. C. Z. collection was *rubidella,* thus explaining Busck's misidentification of 1903. The type also lacks an abdomen and the name cannot be finally fixed, as there is no food record to help us, so the name should certainly be allowed to lapse. In strict interpretation it should perhaps have priority over *intermediella,* which itself may eventually turn out to be *molestella* Zeller.

There are two rather distinct subgroups represented in this material, the first with *rubidella* and *diolcella* well defined, the other, with *pudibundella, intermediella,* the Porto Rican new species *vagabundella,* etc., less sharply defined, and grading off into *fungivorella* on one side and *roseosuffusella* on the other. The two groups may be characterized as follows:

A. Outer part of antenna with five white rings or dots on alternate segments; fore tarsus with a white ring on third as well as first two segments; markings of fore wing normally obscure and confused, of gray and blackish with some scattered rose scaling. Male with conspicuous sex-scaling on fore wing below; uncus scoop-shaped; valve spatulate but undivided; saccus more slender, not extended in a double juxta-like process to support the penis ..... Subgroup *Rubidella.*

B. Outer part of antenna plain, or with a white scale on each segment; fore tarsus with two rings on first segment and one on

second, but none on third; fore wing normally with contrasting oblique brown fasciae and broad areas of yellow or rose or both. Male without sex-scaling or with some obscure and diffuse scaling on hind wing; uncus simple, a curved cone or acute at apex; valve simple and slender (bifurcate in the outlying *roseosuffusella* group); saccus more massive, and penis supported by an angular chitinization except in *intermediella,* in which the penis itself is very large and angular ..... Subgroup *Pudibundella.*

KEY TO THE SPECIES CONSIDERED—MALE CHARACTERS

1. Fore wing with sex-scaling below; uncus scoop-shaped, open at the end; valve spatulate ..... 2.
   Fore wing without sex-scaling below; uncus tapering, if hollow beneath closed at the end by the strong down curve of the pointed tip; valve slender or notched at apex ..... 3.
2. Valve more slender, the angulation on its lower edge half way out; fore wing below with costal edge plaited and heavily covered with pale sex-scales so that it appears double; hind wing at costa with a large hair-pencil, received in a groove in fore wing below cell (Porto Rico, etc.) ..... *diolcella.*
   Valve with end much broadened, the angulation on its lower edge located near apex; fore wing below with a triangular area of blackish sex-scaling near base, normally followed and rarely replaced by pale sex-scaling; no hair-pencil or grooves ..... *rubidella.*[2]
3. Valve broad and notched at apex (Figs. 2, 3). Subgroup *Roseosuffusella.*
   Valve slender, linear 4
4. Penis very broad and stout, scoop-shaped at the end, the left side of the scoop raised in a broad blade; no juxta ..... 5.
   Penis nearly cylindrical or conical, slender, at least toward tip; supported by a double triangular chitinization functioning as a juxta, though perhaps a derivative of the saccus 6
5. Structures more slender, valves straighter, subscaphium acute (Fig. 4). *intermediella.*
   Structures stouter, valve upcurved, subscaphium blunt at end (Fig. 5) (Mexico) ..... *squamigera.*
6. Subscaphium very slender and sharp, less than $\frac{1}{3}$ as long as valve; penis with an extra somewhat sheath-like chitinization on dorsal side, suggesting the modification of *A. roseosuffusella* (Fig. 6) ..... *pudibundella.*
   Subscaphium longer and stouter, nearly half as long as valve; penis simple 7
7. Subscaphium pointed, simply curved, lower side of tegumen with a curving concave patch of fine bristles; membrane between 8th segment and

[2] In *A. corallina* of Mexico, which is an outlier of this group, the point on the valve has moved out to form its actual apex, and the rounded apex has become wholly dorsal (Fig. 1); there is no sex-scaling.

genitalia with a complicated mass of expansile scales, which show as a pale mass at the end of the abdomen in the intact insect. *vagabundella.*

Subscaphium blunt, S-shaped; tegumen without patch of bristles; expansile tufts at base of genitalia reduced to a few deciduous hairs, inconspicuous ..... 8.

8. Valve short and abruptly narrowing; penis also very short and stout (Fig. 7) ..... *ivae.*

Valve with outer part linear or nearly so; penis slender, spine-like (Figs. 8, 9) ..... Subgroup *Fungivorella.*

PARTIAL KEY TO SPECIES—SUPERFICIAL CHARACTERS

1. Fore wing suffused, particularly on outer half, where it is practically immaculate; Indian red ..... *salicifungiella.*

Fore wing with complex markings on outer part, or a confused mixture of scales of two or more contrasting colors ..... 2.

2. Outer ten segments of antenna with five white bars on alternate segments, obscurer species ..... 3.

Outer ten segments not specially marked; wings as a rule with more contrasting markings ..... 4.

3. A sixth bar on antenna, three segments before the fifth one from apex; almost all the light markings rose, even the bars on palpi being rose ..... *diolcella.*

No sixth white bar on antenna; bars on palpi white; fore wing frequently marked with some white, at least the bars in the apical fringe being white ..... *rubidella.*

4. Third segment of palpus very long, mostly with fine black and white longitudinal stripes; a transverse black and white ring at base; fore wing *normally* extensively marked with white, and with a white apical spot ..... Subgroup *Roseosuffusella.*

Third segment of palpus stouter, as a rule but little longer than second segment, with three transverse bands each of black and white; fore wing with little white, and never with a white apical spot ..... 5.

5. Apical fringe subcaudate, crossed by a curved longitudinal black streak and white bar (very variable in intensity) ..... Group *Fungivorella.*

Apical fringe with transverse striping only ..... 6.[3]

6. Antenna with a contrasting white scale or two on each segment, blackish otherwise; antemedial band not extended out in middle of wing, but followed by a separate blackish spot in the fold, which may be obscured by the general dark ground color; fore wing with a tendency to iridescence ..... 7.

[3] The following species are only partly determinable on superficial characters and the male genitalia must always be considered. *A. ivae* also belongs to this group, but I haven't sufficient data to place it in the key.

Antenna dull fuscous, with alternate whorls somewhat paler but no contrasting white spots; second fascia extended far out in fold, incorporating the following black dot; ground nearly evenly fuscous, with a little ochre opposite the two middle fasciae (Texas).....*pudibundella.*

7. Ground with a decided violet or rose iridescence, in light specimens with buff head and thorax, with a strong rose iridescence; discal spot at end of cell partly cut off from the third fascia as a rule (Mississippi Valley and Southwest) .....*intermediella.*

Ground blackish, normally so dark as to conceal the black spot in the fold; the dorsal region more or less ochre, with golden iridescence in a favorable light (Porto Rico).....*vagabundella.*

A. diolcella Forbes

Eucatoptus rubidella Walsingham, Proc. Zool. Soc. 1897, 70; *Aristotelia r.* Forbes, Sci. Surv. Porto Rico xii, 116, 1930.

Aristotelia diolcella Forbes, Jour. Dept. Agr. P. R. xv, 366, 1931, Pl. 42, fig. 13; 47, Fig. 42 (male genitalia).

(Not *Aristotelia rubidella* Clemens)

Very close at first glance to the North American *A. rubidella* with which Walsingham confused it, but easily separated in the male by the sex-scaling and pencil. Walsingham transferred *A. rubidella* to *Eucatoptus* on the basis of this species; in fact the true *rubidella* has no hair-pencil. Besides Porto Rico the species is found in the Virgin Islands and Lesser Antilles.

A. rubidella Clemens

Gelechia rubidella Clemens, Proc. Nat. Sci. Phil. xii, 163, 434, 1860. *Aristotelia r.* auct. in part.

(Not *Eucatoptus rubidella* Walsingham, Proc. Zool. Soc. 1897, 70, which is *A. diolcella*).

The type of this species in Philadelphia is a female, but it shows the characteristic barred antenna and fore tarsus, and is completely congruent in appearance, so I believe there is no question of identification. The corresponding male does not have the hair-pencil which both Walsingham and Busck used as the special character of the species, but which exists only in the related Antillian one; in fact I know of no mainland species which does have the pencil.

The species differs from others on the mainland in the general scattering of pink flecks on a generally dark wing with confused markings, a character more emphasized in *A. diolcella.* The group characters will also separate it from the other mainland species, *corallina* alone having a similar fore tarsus and genitalia, but being easily separated by the continuous pink and white dorsal stripe. The secondary sex-scaling on the fore wing varies a great deal without any corresponding variation in genitalia; typically there is a triangular patch of blackish scales followed by a less definite, similar straw area, but the straw area may be lost, and a Florida specimen shows the two colors almost reversed, the dark area being enclosed in a large cream area which extends across the base of the wing and out along both margins to the middle. Some of these variations may mark good local forms.

A. rubidella is the only one of the three species common in the east, and practically all eastern records should be credited to it; including Zeller's Massachusetts types of *pudibundella.* There is a single *intermediella* in the Dietz collection labelled "East River, Conn.," but the record should be verified.

I have the following records: Labelle, Florida, May 8–10, 1916 (Bradley); Silver Lake, Chesham, N. H., July 1930 (Klots); Ithaca and McLean, N. Y., July–Aug., not rare; Rock City, N. Y., July 4; Monteagle, Tenn., Aug., 1930 (Richards); Biloxi, Miss., June 13, 1917 (Bradley).

A. pudibundellla Zeller

Gelechia pudibundella Zeller, Verh. zool.-bot. Ges. Wien, xxiii, 273, 1873 (in part, Texas material only); Walsingham, Trans. Am. Ent. Soc., x, 181, 1882; *Aristotelia p.* Busck, Proc. U. S. Nat. Mus. xxv, 796, 1903 (in part, not synonyms or life history).

(Not *Aristotelia pudibundella* Walsingham, Proc. Zool. Soc., 1897, 66, nor Forbes, Lep. N. Y., 295, 1924, nor Sci. Surv. P. R., xii, 116, 1930.)

This species must be limited to the Texas types, the Massachusetts ones surviving in the U. S. National Museum being *A. rubidella* Clemens. Zeller's description was obviously composite, being based primarily on the Texas material, but referring to the

extensive pink markings which are found only in *rubidella.* All the material in several collections I have seen with this name belongs to other species, and I have characterized it entirely from the Texas types in Cambridge and Washington, of which there are 11, several in good condition. The one at the head of the series in Cambridge has some right to be considered the holotype, and as it has preserved its abdomen and is a male, I have mounted the genitalia (Fig. 6) and marked it "lectotype." Superficially it is practically indistinguishable from a small Texas member of the *fungivorella* group (which however shows traces of the black and white apical bar of that group), from *A. ivae* Busck, and from *A. intermediella* Chambers, which is the species most frequently passing for it. The genitalia, however, are perfectly distinct in each case. The nearest thing to a superficial character to separate it from the others is the nearly plain antenna, also shared by the Texas *fungivorella,* but the character seems to have some exceptions. In the genitalia it comes nearer to *roseosuffusella* than any other member of its group, showing the characteristic very small, curved and sharply pointed subscaphium, and the irregular chitinization on the dorsal side of the penis, but the slender valve is as in other members of this subgroup, the valve also has a rough swelling and mass of short bristles about $\frac{1}{3}$ way out, which seems limited to the species.

A. vagabundella Forbes

Aristotelia pudibundella Walsingham, Proc. Zool. Soc. 1897, 66; Forbes, Sci. Surv. P. R. xii, 116, 1930.

Aristotelia vagabundella Forbes, Jour. Dept. Agr. P. R. xv, 365, 1931, Pl. 42, Fig. 12; 47, Figs. 40, 41 (male genitalia).

(Not *Aristotelia pudibundella* Zeller)

I have described this species in the paper cited in the Journal Dept. Agr. P. R. It is decidedly close to pudibundella on the one hand and to ivæ on the other, but abundantly distinct in genitalia. The yellow gloss when distinct seems characteristic, but sometimes is obsolete, especially in rubbed specimens. The yellow anal tuft is absolutely diagnostic of the male, and apparently can always be seen. It is only known from Porto Rico and the Virgin Islands.

A. intermediella Chambers

?? *Gelechia modestella* Zeller, Verh. z.-b. Ges. Wien, xxiii, 274, 1873; *Aristotelia m.* Busck, Proc. U. S. Nat. Mus. xxv, 797, 1903.

Gelechia intermediella Chambers, Bull. U. S. Geol. Geog. Surv. Terr. iv, 89, 144, 1878; Murtfeldt, Bull. U. S. Dept. Agr. Div. Ent. xxiii, 53, 1871.

Gelechia rubensella Chambers, Can. Ent. iv, 193, 1872 (in part); Murtfeldt, Can. Ent. vi, 222, 1874 (variety).

There are two forms of this species, with identical pattern and genitalia but differing in coloring and food-plant,—an apple phase with purple iridescence, and a paler oak phase with rose iridescence. Chambers' marked types of intermediella and rubensella are both of the purple phase, and apparently not bred; they have both lost their abdomens. The genitalic characters were investigated on one of Miss Murtfeldt's original apple breeding, which is obviously identical with the Chambers types, and a specimen from the Murtfeldt collection of the rose colored phase without data, but most probably of the original oak breeding (Fig. 4); since the only specimen with her oak breeding number had lost the abdomen. The Cornell collection has also a still paler form with identical genitalia from Gillett, Texas, June 25, 1917 (Bradley). It is caught, but may turn out to be a third food-variety when bred. The surviving type of *intermediella* is from Texas, and of *rubensella* from Kentucky, by their labels, which are presumably correct, but not original, as the material was, I understand, received at the M. C. Z. in pill-boxes and mounted there.

The characters of this species are difficult to put in words, but not so difficult to recognize; in fact, it looks more distinct than *fungivorella* or *ivæ* from *pudibundella,* at first glance. It is the one that Busck has had mainly in mind in determining *pudibundella.*

A. squamigera Walsingham, of which Mr. Busck has allowed me to examine a paratype (Fig. 5), has a similar deformed penis but a different valve. It must be very close to *intermediella.*

A. roseosuffusella Clemens

This species is usually considered easily determinable by the contrasting white apical spot, and clear white areas of ground generally (a character shared by a couple of the recently described close relatives). We have a strain from the Gulf Strip which has largely lost these white areas, and looks remarkably like the light forms of *intermediella*. The simplest discriminating character is the long longitudinally striped third segment of the palpus, as in other members of the *roseosuffusella* group. The fore wing is brown-banded on a light powdery gray base, much mixed with pink and yellow; and the thorax is light brown, with contrasting blackish tegulæ, a little more prominent than in the light forms of *intermediella*. Males usually have the genitalia (Fig. 2) sufficiently extruded to show the broadly expanded and notched tips of the valves, which are identically as in *roseosuffusella*. The University collection has specimens from La Place, Ala., June 9, 1917, Leroy, Ala., June 11, 1917, and Victoria, Texas, June 24, 1917, all collected by Bradley.

A. fungivorella Clemens

This species is typical of a little group characterized superficially by the strikingly marked apical fringe, and in the genitalia by the blunt S-curved subscaphium, combined with most of the other characters of *pudibundella*. There are at least three species, and I am not sure which is the true *fungivorella*. I figure the genitalia of two of them (Figs. 8, 9).

A. salicifungiella Clemens

A very striking thing, which seems to have been confused with *fungivorella* merely on account of the similar food. It appears almost solidly brick red, and has almost the identical markings of the South American *Empedaula*; but the palpi are slender and pointed as in other Aristotelias. I have not seen the genitalia; in fact, know of only two specimens—the type, supposed to be from Pennsylvania, and a specimen in the M. C. Z. from Iowa City, Ia., July 18, 1898 (Wickham).

PLATE XX

Male genitalia of species of *Aristotelia*. The penes are in most cases drawn separately and placed at the right or below the main figures.

Figure 1. *A. corallina.*

Figure 2. *A. roseosuffusella.*

Figure 3. *A. psoraleae* (slide by Busck from specimen in the U. S. National Museum).

Figure 4. *A. intermediella.*

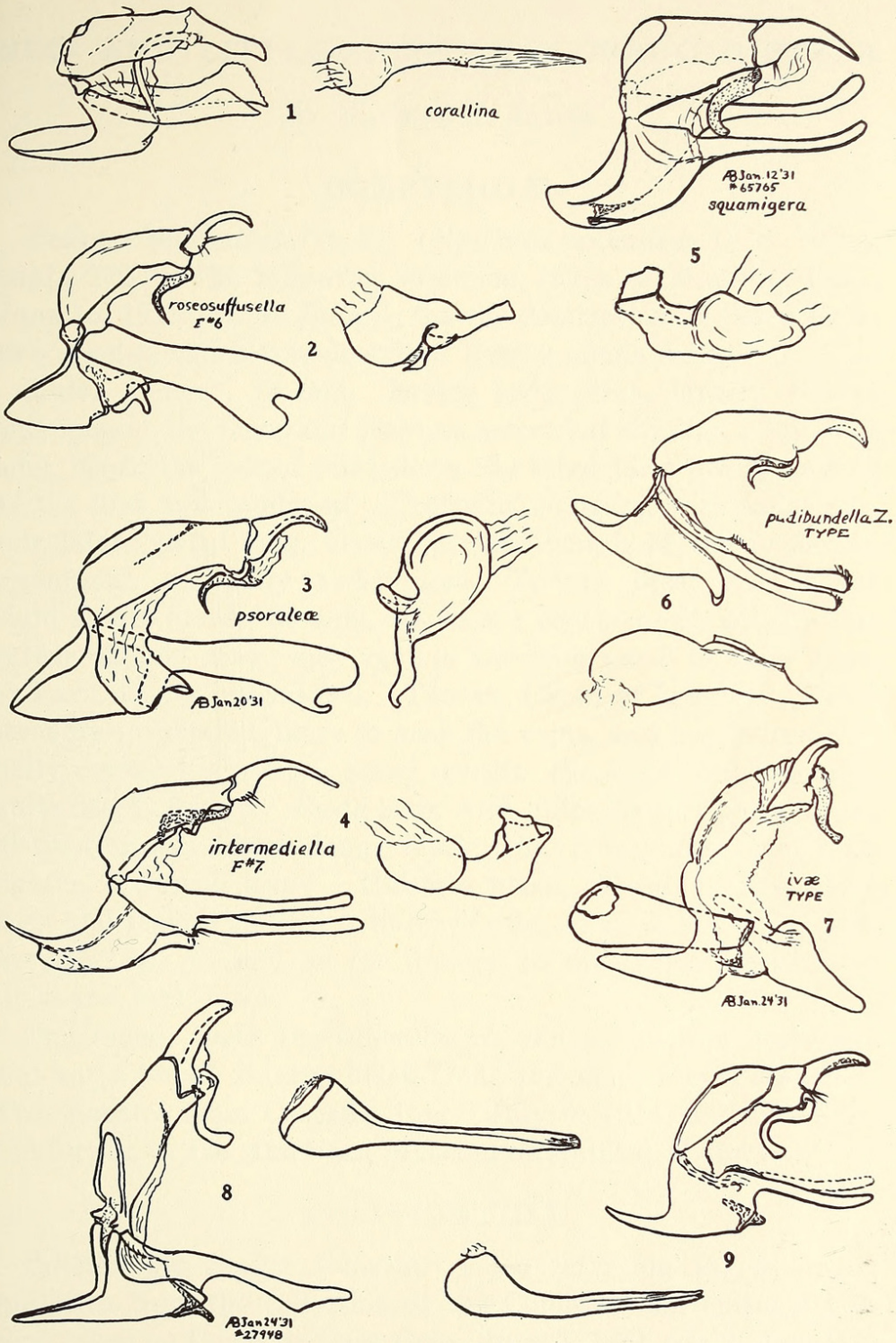
Figure 5. *A. squamigera* (slide by Busck from specimen in the U. S. National Museum).

Figure 6. *A. pudibundella* (lectotype in the Museum of Comparative Zoology, Cambridge).

Figure 7. *A. ivae* (slide by Busck of type in the U. S. National Museum).

Figure 8. *Aristotelia,* group *fungivorella* (slide by Busck of specimen in the U. S. National Museum).

Figure 9. *Aristotelia,* group *fungivorella* (Texas specimen, superficially very close to *A. pudibundella*).



ARISTOTELIA