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A Study of Some Scopariinae (Lepidoptera) of Nova Scotia, with Particular Reference to the Female Genitalia

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For the past several years the author has been working sporadically on certain species of the Scopariinae belonging to the genera *Scoparia* Haworth and *Eudoria* Chapman from the Maritime Provinces, and the present paper summarizes some of the results.

The separation of *Eudoria* from *Scoparia* on genitalic characters was well established by Pierce and Metcalfe (1938, The genitalia of the British Pyrales, pp. 34–37; Liverpool, published by F. N. Pierce). They restricted *Scoparia* to species in which the male uncus tapers and ends in a blunt point, the claspers show a short, projecting spine on the ventral margin, and the vesica contains a cluster of strong cornuti. *Eudoria*, on the other hand, possesses a hood-like uncus, claspers without a ventral spine, and the vesica without cornuti.

In the female genitalia the most striking point of difference is seen in the ovipositor, which in *Eudoria* is retractile, with long posterior apophyses, whereas in *Scoparia* this section is non-retractile, and, in consequence, the posterior apophyses are very short.

This study is concerned with the few Maritime species belonging to the two above-mentioned genera with particular reference to the female genitalia. The identities of the common Maritime species *centuriella* Denis and Schiffermüller and *penumbralis* Dyar are well established,

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so they are omitted from this paper. Incidentally, it may be necessary to employ separate generic terms for these two species.

Dyar made the first complete revision of our North American *Scopariinae* (1906, Jour. New York Ent. Soc., vol. 14, pp. 97–107). He included all the species under the one generic heading, *Scoparia*, and gave a synopsis of the species (p. 100). He described a number of new species and attempted to clear up the synonymy of some of the older names proposed by Walker, Hulst, and Grote. In a second rather superficial paper (1929, Proc. U. S. Natl. Mus., vol. 74, art. 24, pp. 1–9), largely devoted to species from Mexico and other southern localities, Dyar changed the synonymy of certain North American species without any very adequate reasons.

Forbes (1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, pp. 581–584, figs. 352–360) discussed the seven species occurring in eastern North America and placed them in the single genus *Scoparia* but separated them into three sections. The first section includes the single species *centuriella* for which he notes the generic name *Scoparona*, proposed by Chapman. The second section also includes a single species, *penumbrales* Dyar, representing Forbes's idea of the genus *Scoparia*. The third section, under the name *Eudoria* Chapman, includes the remaining five species which, to judge from their genitalia, are certainly not congeneric.

SYSTEMATIC SECTION

Scoparia basalis Walker

Scoparia basalis WALKER, 1865, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 34, p. 1497. DYAR, 1906, Jour. New York Ent. Soc., vol. 14, p. 105; 1929, Proc. U. S. Natl. Mus., vol. 74, art. 24, p. 3 (*partim*). FORBES, 1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, p. 583 (*partim*).

A long series of specimens in the Nova Scotia Museum of Science from various sections of Nova Scotia had been tentatively placed under the name *basalis*. After examination of a number of slides of the female genitalia it became obvious that several species were involved. In order to establish correct identifications, an examination of the genitalia of Walker's and Grote's types was essential. Fortunately, Dr. Eugene Munroe of Ottawa at the time was visiting the British Museum (Natural History), and he kindly undertook the preparation of genitalia of the type material and a comparison with drawings of female genitalia submitted to him. He established the fact that *biplagiialis* Walker, with its synonym *libella* Grote, was a species quite distinct from *basalis* and

should therefore be removed from its synonymy.

As thus determined, *basalis* is at present represented in the collection of the Nova Scotia Museum of Science by only one male and three females and would appear to be rather rare in Nova Scotia, unless it has been overlooked, as it is on the wing approximately at the same time as *biplagialis*. The two species are very similar in maculation and can be separated with certainty only on genitalic characters.

The male genitalia show all the characteristics of typical *Scoparia*: the uncus narrow and pointed; the clasper with a small, distinct spine on the ventral margin somewhat basad of the middle; and the vesica with a cluster of three or four long, thin, pointed cornuti.

The female genitalia are also typical as far as the non-retractile ovipositor is concerned. This is illustrated in figure 1, based on a specimen from the Halifax watershed area. The genital plate is rectangular, broader than high. No definite ostium could be discerned. The initial portion of the ductus bursae is fairly broad, lightly sclerotized, and somewhat twisted. It narrows distally, giving rise to the ductus seminalis. Beyond this section it is membranous, variably broad, making a single convolution shortly before entering the bursa. Preceding this convolution it contains a longitudinal row of small spines, the most characteristic feature of the organ. The bursa is oval, rather heavily scobinate, with the usual small, terminal, oval, membranous appendage. No signum is present.

So far the species has been taken in the Halifax area and Queens County (White Point Beach; Lake Kejimukujik) in late July or early August.

Scoparia biplagialis Walker

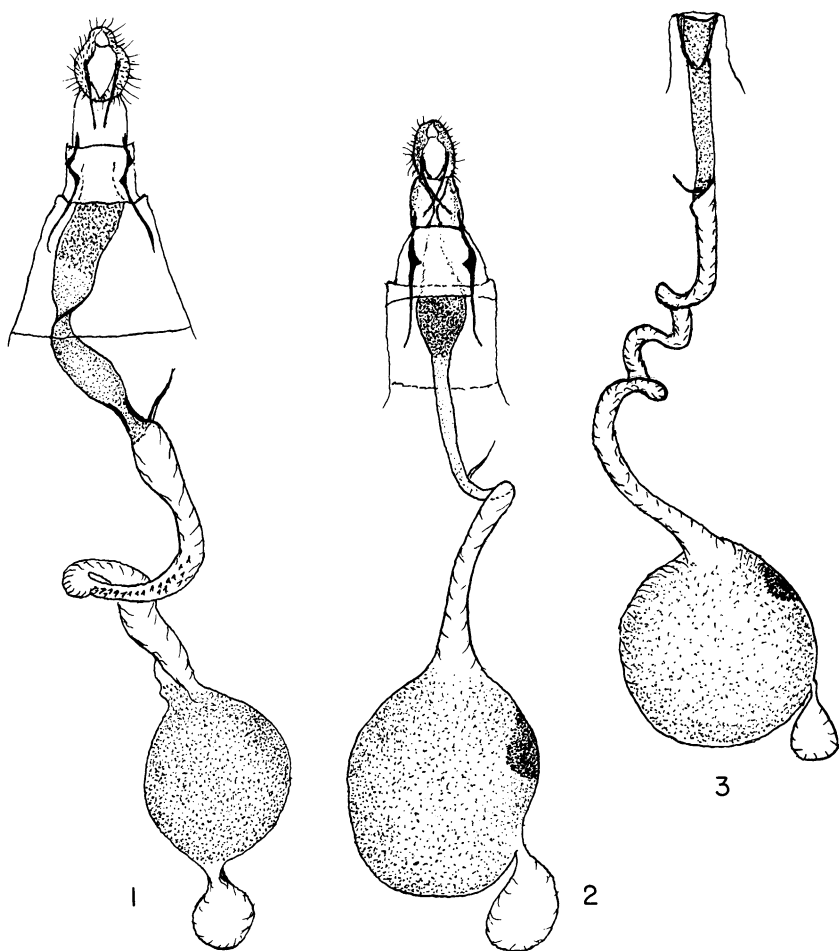
Scoparia biplagialis WALKER, 1865, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 34, p. 1499. HAMPSON, 1897, Trans. Ent. Soc. London, p. 234 (sp. distinct).

Scoparia basalis, DYAR (*nec* Walker), 1906, Jour. New York Ent. Soc., vol. 14, p. 105; 1929, Proc. U. S. Natl. Mus., vol. 74, art. 24, p. 3 (*partim*). FORBES, 1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, p. 582, fig. 358.

Scoparia libella GROTE, 1878, Bull. U. S. Geol. Surv., vol. 4, p. 675.

The type of *biplagialis* is unfortunately without abdomen, but a careful comparison with Grote's types of *libella* by Munroe has established the synonymy. Genitalic slides of the *libella* types were made, and the slide of the female was found to agree with one of the drawings submitted.

Biplagialis is one of the commonest species of *Scoparia* in Nova Scotia. It is subject to considerable variation in both the color and the macula-



FIGS. 1-3. Female genitalia. 1. *Scopia basalis* Walker. 2. *Scopia biplagiata* Walker. 3. *Eudoria lugubralis* Walker.

tion of the primaries. In a series taken at Aylesford, Kings County, some males show a distinct, pale ochreous ground color, with a tendency for the maculation to become obscure. The females appear to be less subject to such variation. In the genitalia nothing was noticed that could point to a separate species.

The male genitalia are typical of the genus *Scopia* as far as the shape of the uncus is concerned; the spine on the ventral margin of the clasper is considerably nearer the apex than is that of *basalis*. The

vesica lacks the cluster of long spines found in *basalis*, the armature being reduced to a thin strip of very fine spicules, which at once distinguishes the species from other members of the genus.

In the female genitalia (fig. 2) the non-retractile ovipositor is present. The initial portion of the ductus bursae is a thin, straight, weakly sclerotized tube arising from a funnel-shaped enlargement and giving rise to the ductus seminalis at its distal end. It then makes a small convolution and continues, entirely membranous and slightly wider, to enter the apex of the bursa. The bursa is globular, feebly scobinate, with the usual small, membranous appendage arising slightly laterad of the distal end. The signum is a semicircular patch thickly covered with spicules and situated laterad. The drawing is based on a specimen from White Point Beach, Queens County, Nova Scotia.

Scoparia cinereomedia Dyar

Scoparia cinereomedia DYAR, 1904, Ent. News, vol. 15, p. 72; 1906, Jour. New York Ent. Soc., vol. 14, pp. 100, 103. FORBES, 1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, p. 583, fig. 359.

Scoparia truncatalis MCDUNNOUGH, 1922, Canadian Ent., vol. 54, p. 36.

Forbes (1924, *ibid.*, p. 584) suggested that *truncatalis* might be a form of *cinereomedia*. This fact has been confirmed by Munroe (*in litt.*) who has had the opportunity of studying the types. Dyar's placement (*ibid.*, p. 4) as a synonym of *lugubralis* is quite erroneous.

A male specimen taken at Lake Kejimikujik, Queens County, is the sole representative of this species in the collection of the Nova Scotia Museum. The male genitalia are very similar to those of *basalis*.

Eudoria lugubralis Walker

Scoparia lugubralis WALKER, 1865, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 34, p. 1498. HAMPSON, 1897, Trans. Ent. Soc. London, p. 233. DYAR, 1906, Jour. New York Ent. Soc., vol. 14, p. 104; 1929, Proc. U. S. Natl. Mus., vol. 74, art. 24, p. 4 (*partim*). FORBES, 1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, p. 583, fig. 360.

Through the courtesy of Mr. Paul Whalley of the British Museum, the correct identity of this species was established. Two specimens which had been identified as *lugubralis* were sent to him for comparison with the male type, and he writes that "they are identical with the type specimen both externally and on a detailed comparison of the male genitalia." *Nominatalis* Hulst, which has generally been listed as a synonym, proves to be a different species. Through the kind offices of the Department of Entomology of the American Museum of Natural History, the female type of Hulst's species was submitted for study, and

the genitalia (fig. 4) were shown to be decidedly different from those of a female *lugubralis*, although definitely belonging to the genus *Eudoria*. Dyar (1929, *ibid.*, p. 2) had already removed Hulst's species from the association with *lugubralis*, but the fact that he considered *spaldingalis* Barnes and McDunnough to be a synonym leaves much doubt as to whether his identification was correct.

Hulst's type from Vancouver Island is in very poor condition but is evidently considerably suffused on the primaries with dark shades, whereas in *spaldingalis* (Barnes and McDunnough, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 5, p. 34, pl. 3, figs. 1, 4) from Eureka, Utah, it is shown that the primaries are pale, with sharply defined maculation. Further discussion of the identity is beyond the scope of the present paper.

The species is a fairly large one, with an average expanse of 17–18 mm. in the males and 15 mm. in the females. The ground color of the primaries is whitish, with more or less smoky suffusion, especially in the basal section. A black basal streak is usually evident. The t. a. line is evenly outwardly bowed, bordered outwardly by a black band that extends across the entire wing and more or less conceals the two short black streaks that represent the orbicular and claviform. The reniform is the usual cusp. The best character for separation is found in the t. p. line which is evenly concave between the costa and cell, then bends sharply inward and runs obliquely to the inner margin; it is bordered narrowly with black on both sides and may at times appear faintly dentate. There is a terminal series of black dots which are faintly repeated in the pale fringes of the wing. The secondaries are dull whitish, with a slight smoky tinge.

The species flies in mid-July and is widespread in Nova Scotia; specimens are also in the collection of the Nova Scotia Museum from the Avalon Peninsula, Newfoundland, and Jefferson Notch, New Hampshire.

In the male genitalia of *lugubralis*, the chief characteristic is found in the very broad, hood-like uncus, the terminal edge of which is distinctly indented, the sides being clothed with long hairs. The clasper and aedeagus show no particular characters.

The female genitalia (fig. 3) show the retractile ovipositor characteristic for the genus. The genital plate is rectangular and lightly sclerotized; no obvious ostium could be found. The initial portion of the ductus bursae is thin, straight, and lightly sclerotized, with the ductus seminalis arising from its distal end; beyond this it is membranous, fairly long, with three small convolutions occurring about halfway be-

tween its origin and its entrance into the bursa. The faintly scobinate bursa is globular, with the usual small distal appendage. The signum is laterally placed and is a semicircular patch heavily clothed with small spicules. The drawing (fig. 3) is based on a specimen from White Point Beach, Queens County, Nova Scotia.

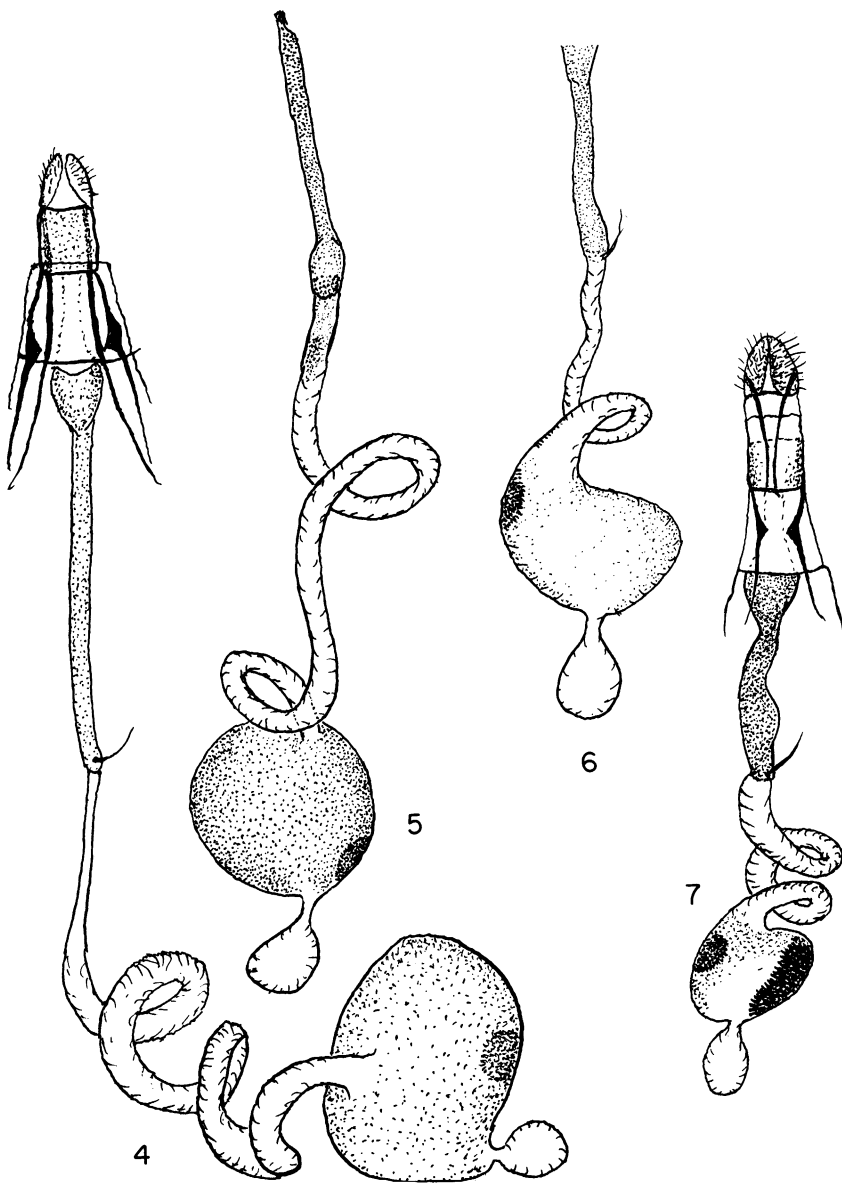
***Eudoria persimilalis*, new species**

The head and thorax are deep smoky. The primaries with a white ground color are somewhat suffused with fine, smoky atoms. The basal area to the t. a. line smoky, with traces of a short, black, basal streak in the cell and another on vein 1. The white t. a. line is less evenly rounded than in *lugubralis* and is slightly irregular in outline; it is bordered outwardly by a blackish band that partially conceals the streak-like orbicular and claviform. The median area is somewhat paler than the remainder of the wing and contains an X-like reniform, rather obscured by a dark shade attached to the costa. The white t. p. line is the most characteristic feature of the maculation. It shows a distinct inward angle in the cell, lacking in *lugubralis*, and then runs obliquely inward to the inner margin. It is bordered inwardly by a narrow black line arising from a small costal spot. Outwardly large costal and inner-marginal dark patches, narrowly connected in the median area, form its outer border. The terminal area is whitish, forming an irregular, subterminal line, margined inwardly by the aforesaid dark patches and outwardly by a series of black spots, more or less conjoined, and a small, dark, median patch. Fringes pale smoky, with traces of a median row of darker spots. Expanse, male, 17–20 mm.; female, 15–18 mm.

MALE GENITALIA: The main difference from the genitalia of *lugubralis* is in the uncus, which is much narrower and has no indentation on the terminal margin. The aedeagus appears to be slightly longer than in the allied species.

FEMALE GENITALIA: (Based on the allotype; fig. 5). The ovipositor is retractile. The genital plate is rectangular, lightly sclerotized; there is no sign of an ostium. The initial section of the ductus bursae is much as in *lugubralis* but somewhat longer; it is lightly sclerotized, with its distal end showing a small patch of spicules. The remainder of the ductus is membranous, with a single convolution in its median section and a second one immediately before its entrance into the bursa. The bursa and its signum are much as in *lugubralis*.

TYPE MATERIAL: Holotype, male, Doyles, Codroy Valley, Newfoundland, June 29, 1959 (D. Ferguson). Allotype, female, Parrsboro, Nova Scotia, June 24, 1954 (D. Ferguson). Paratypes: Four males, same data



FIGS. 4-7. Female genitalia of *Eudoria*. 4. *E. nominatalis* Hulst, holotype. 5. *E. per-similalis*, new species, allotype. 6. *E. strigalis* Dyar. 7. *E. heterosalis*, new species, holotype.

as holotype; one male, Table Mountain Trail, Long Range, Newfoundland, July 5, 1959; one female, same data as holotype, July 5; one female, Table Mountain Plateau, 1700 feet, Newfoundland, July 8, 1959 (D. Ferguson).

REMARKS: The species has possibly been confused with *lugubralis*, but the differences in both male and female genitalia warrant the supposition that it is a distinct species. It has been impossible to determine whether one of the numerous names based on western material is available for the species. The types remain in the author's collection for the present but will be distributed later to various museums.

Eudoria strigalis Dyar

Scoparia strigalis DYAR, 1906, Jour. New York Ent. Soc., vol. 14, p. 104. FORBES, 1924, Mem. Cornell Univ. Agr. Exp. Sta., no. 68, p. 583.

The representation of this species in the Nova Scotia Museum of Science consists of two males collected at Boulderwood, Halifax County, and North Mountain, Cape Breton highlands, respectively, and a single female from Lake Kejimukujik, Queens County. None of the specimens is in very good condition.

MALE GENITALIA: The hood-like uncus is moderately broad, with a slight indentation in its apical margin. The aedeagus is much shorter and somewhat thicker than that of the preceding species.

FEMALE GENITALIA (FIG. 6): Ovipositor lobes retractile. Genital plate rectangular, broader than high, feebly sclerotized; an ostium could not be observed. The proximal half of the ductus bursae forms a thin, straight, weakly sclerotized tube, with the ductus seminalis arising at its terminal end. The distal half of the ductus bursae is membranous, slightly irregular in its course, and forms a single convolution just before entering the bursa neck. Bursa with a long neck, broadening distad, the remainder forming a flat oval, weakly scobinate, with the usual small, distal appendage. Signum a spiculate, semicircular patch.

Eudoria heterosalis, new species

The palpi are rather short, porrect, and black, and the head is dull white. The thorax is smoky. The primaries are very similar in maculation to those of *Scoparia basalis*. The ground color is whitish, rather heavily suffused with smoky. The basal area to the t. a. line is smoky, with a short black dash in the cell and another on vein 1. The t. a. line is white, strongly bowed outwardly, and bordered on its outer side by a narrow black band. The orbicular and claviform are short, black dashes, the latter rather obscured by the dark suffusion on the inner half of the me-

dian area. The reniform is obscurely X-shaped, black, and connected with a black spot on the costa. The t. p. line is evenly rounded below the costa and parallel to the outer margin of the wing, finely dentate, bordered inwardly by a fine black line and outwardly by broad black patches on the costal and inner margins, considerably narrowed opposite the cell and more or less connected with a small, dark, median spot on the margin of the wing. The row of black spots on the wing margin is not prominent and forms a more or less connected dark line. The fringes are pale whitish, with a median row of distinct, black spots. The secondaries are deep smoky, paling towards the base. The fringes are paler. Expanse, 14 mm.

FEMALE GENITALIA (FIG. 7): The ovipositor lobes are retractile. The genital plate is rectangular, weakly sclerotized, and much as in other species, with no obvious ostium. The initial, weakly sclerotized section of the ductus bursae arises from a short, funnel-shaped section, is somewhat shorter than usual, fairly broad, with a slight distal bulge and with the ductus seminalis arising from its distal end. The following membranous section is broader and almost immediately forms two convolutions before it enters the short neck of the bursa. The bursa is flatly oval, very similar in shape to that of *strigalis*. The signum is the usual spiculate, semicircular patch, but, in addition, there is a much longer strip on the opposite side composed of much larger spines, a very characteristic feature.

TYPE MATERIAL: Holotype, female, Kearney Lake Road, Halifax County, Nova Scotia, June 30, 1957 (D. Ferguson). Paratypes: One female, White Point Beach, Queens County, Nova Scotia, July 13, 1955 (J. McDunnough); one female, Crailhope, Kentucky, May 20, 1946 (Carl Cook). The types are in the author's collection.

REMARKS: The Nova Scotian specimens were found mixed with a series of *Scoparia biplagialis*, the paratype being rather worn but agreeing genitally with the very perfect holotype. The Kentucky specimen was found among a collection of geometrid moths sent to D. Ferguson. As yet, no males have been discovered.