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## A Revision of the North American Species of the Genus *Pseudoboarmia* (Lepidoptera, Geometridae)

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### ABSTRACT

*Pseudoboarmia* is a small genus of moths that occurs primarily in eastern and southeastern United States; one species from the Palearctic Region is known to me. The number of American species is raised to four, with the elevation of *gnopharia* Guenée to specific rank. All species and their genitalia are redescribed and figured, and keys are provided to separate them.

### INTRODUCTION

The genus *Pseudoboarmia* was erected by McDunnough in 1920 to include *umbrosaria* Hübner from North America and *punctinalis* Scopoli from the Palearctic area. Two Nearctic species have been added since: Lemmer described *buchholzaria* in 1937, and I placed *luridula* Hulst in the genus in 1956. Another name, *gnopharia* Guenée, has also been associated with this group, being placed by most workers as a synonym of *umbrosaria*, but there have been questions raised concerning its exact status. In hopes of solving this problem, I decided to study the members of *Pseudoboarmia*. The present revisionary paper is the result. All the included species from North America are described and illustrated, and keys are provided to separate the four by means of both maculation and genitalia.

*Pseudoboarmia* can be considered as one of the more primitive genera of

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the Cleorini from North America. Some of the characters that have been used to determine this are outlined in the section on Phylogeny. Other characters that can be used to indicate the relatively primitive condition of this genus are 12 veins in the forewings, a lack of a fovea in the forewings of the male, the male antennae with the pectinations arising basally on the segments, and the relatively uncomplicated genitalic structures of both sexes. *Pseudoboarmia* is perhaps most closely related to *Nealcis* McDunnough and *Protoboarmia* McDunnough. The best way to separate these genera is by the genitalia, as all three groups have very distinctive structures. *Pseudoboarmia* is the only one of the three genera to lack a fovea at the base of the forewing in the male.

The biggest single problem within this group was to determine the status of *umbrosaria* and *gnopharia*. Each was poorly illustrated by its author when he described his species. References in the literature are not reliable, as considerable confusion has resulted from the brief original descriptions and poor illustrations of both species; a number of the early workers included several species under the name of *umbrosaria*, and *gnopharia* to a lesser extent. Many authors, beginning with Packard (1876) have considered *gnopharia* to be a synonym of *umbrosaria*; others have considered the Guenée name to represent a subspecies or variety of *umbrosaria*. Lemmer (1937) helped matters by describing *buchholzaria*; this valid species had been confused with the older named species, as the maculation (but not the color) and distribution are very similar to the others. With the exception of *luridula*, the range of these species is on the eastern and southeastern coastal plains, extending into eastern Texas, and north to the Ozark Plateau.

After studying as many specimens as possible, it seems to me that *umbrosaria* and *gnopharia* represent two distinct, but closely related, species. Structural differences are found in the male antennae (number of segments and length of pectinations; see fig. 23), and the relative number of males that possess a hind tibial hair pencil; the male and female genitalia have small but consistently recognizable differences. Correlated with these variations is a slight difference in the color and pattern of the wings; some, but not all, specimens of *gnopharia* are recognizable by the more strongly patterned under surface of the wings. Both species fly at about the same time; specimens of *umbrosaria* tend to be caught slightly earlier than those of *gnopharia* (see fig. 25). At present the information available of life histories and food plants is useless as a guide in separating the two populations, owing to the misidentifications and lack of labels on reared specimens.

During this study, I have examined 338 specimens; of these, 254 were males and 84 females. The approximate ratios of the captured males to

females that were studied were as follows: *luridula*, four males to one female; *buchholzaria*, five to three; *umbrosaria*, five to one; *gnopharia*, three to one. Dissections were also studied of the genitalia of both sexes (48 males and 25 females), and of the antennae and legs (26 males and 12 females).

All the specimens and genitalia illustrated herein are from the collection of the American Museum of Natural History.

### PHYLOGENY

One species of *Pseudoboarmia* from the Old World is known to me; this is *punctinalis* Scopoli, which is found from Japan to western Europe. Structurally, *punctinalis* differs more from the Nearctic species than the latter do among themselves; the Palearctic species has antennae with more segments, and the males have both the groove and well-defined hair pencil on the hind tibia, plus a prominent row of setae on the ventral surface of the third abdominal segment. The males of the American species may have a small tibial hair pencil, but they have neither the tibial groove nor the abdominal row of setae. The Palearctic species is also significantly larger in size than are its congeners from the New World.

Certain basic trends in several characters, usually exemplified within a given genus, have become apparent as the result of my studies on the New World Cleorini (Rindge, 1964, 1966, 1967). The more primitive characters include a smaller size and, in the male, the absence of the hair pencil and groove of the hind tibia, plus the associated absence of the row of setae on the ventral surface of the third abdominal segment. The more advanced condition usually means larger size, plus the hair pencil and groove, and the presence of the abdominal row of setae.

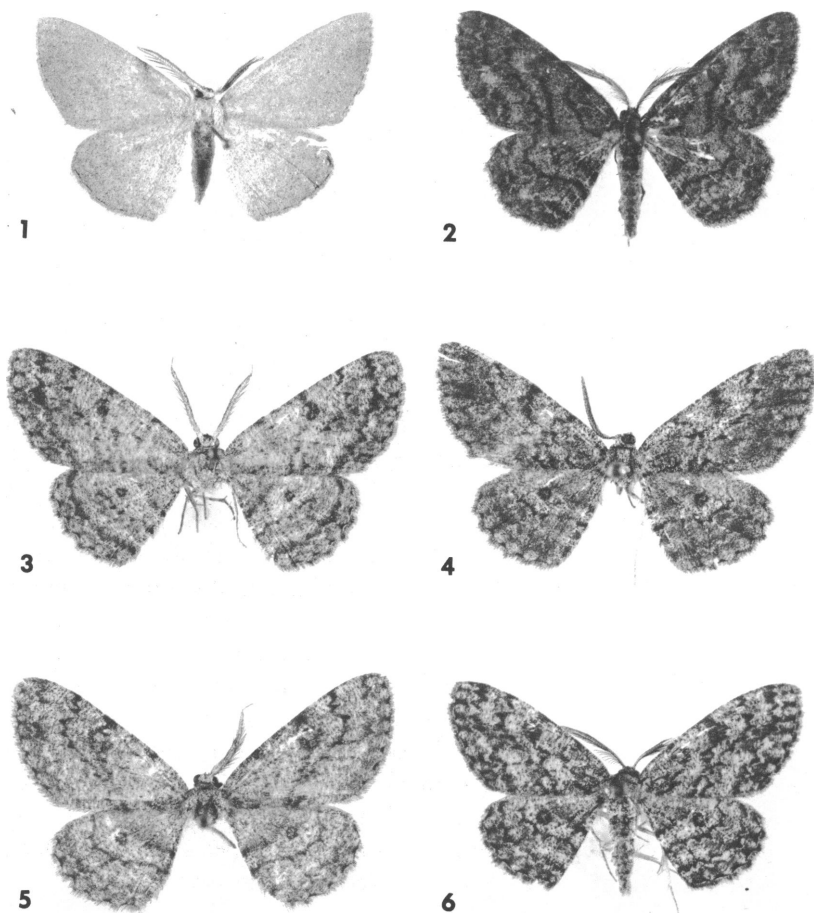
There is no reason to assume that these changes have not occurred within *Pseudoboarmia*. The four New World species are quite closely allied to one another, as they do not differ structurally much among themselves; they possess the more primitive characters listed above. The Old World species, *punctinalis*, fits in with the more advanced conditions. Thus it is speculated that *Pseudoboarmia* is a genus that developed in North America, with the Old World species being derived at a later date.

### ACKNOWLEDGMENTS

I acknowledge with thanks the cooperation and aid of the following colleagues who have allowed me to study the types and specimens in their charge: Dr. D. C. Ferguson of the Systematic Entomology Laboratory, United States Department of Agriculture, for the National Museum of Natural History, Smithsonian Institution; Dr. Richard B. Dominick, of McClellanville, South Carolina; Mr. Bryant Mather, of Vicksburg,

Mississippi; and Dr. J. Bolling Sullivan of Beaufort, North Carolina.

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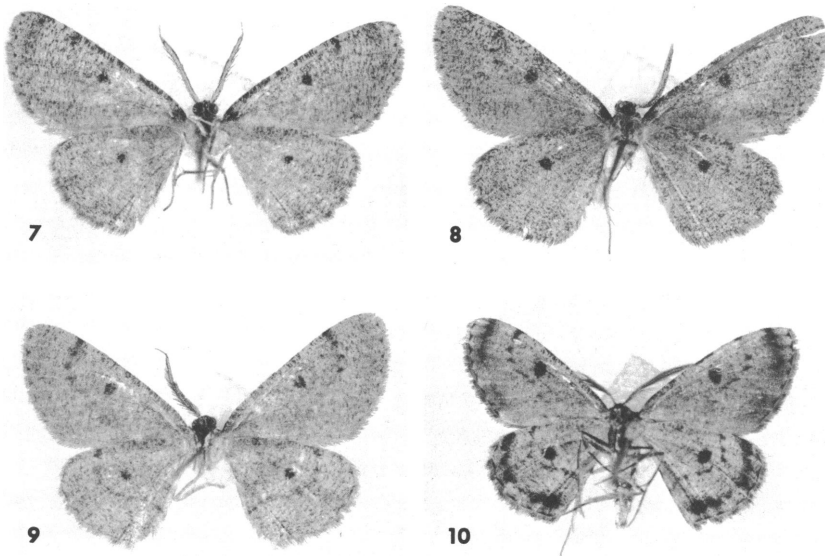
FIGS. 1-6. Males, upper surface. 1. *Pseudoboarmia luridula* (Hulst), Port Sewall, Florida, March 1-4, 1949 (L. J. Sanford). 2. *P. buchholzaria* Lemmer, paratype, Lakehurst, New Jersey, June 1-10 (F. Lemmer). 3, 4. *P. umbrosaria* (Hübner). 3. Smithville, New Jersey, June 22, 1949 (L. J. Sanford). 4. Blue Springs Camp, Arkansas, May 2, 1970 (J. R. Heitzman). 5, 6. *P. gnopharia* (Guenée). 5. Ocean County, New Jersey, May 11, 1953 (O. Buchholz). 6. Biloxi, Mississippi, August 4, 1964 (R. and B. Taylor). All  $\times 1.4$ .

GENUS *PSEUDOBOARMIA* MCDUNNOUGH

*Pseudoboarmia* McDUNNOUGH, 1920, p. 21; 1938, p. 163. FORBES, 1948, p. 53.  
RINDGE, 1956, p. 8.

**DIAGNOSIS:** The male genitalia are unique in having the posterior angle of the tegumen on each side extended in the form of an arm of varying length, with a distal group of ventrally curved, slender setae that extend beyond the uncus. The forewings have 12 veins, with Sc and  $R_{1+2}$  connected; most specimens do not have an areole, and the male does not have a fovea. The pectinations of the male antennae tend to arise near the middle of segments.

**ADULTS:** Head, eyes large, equal to, or broader than, front; front flat; tongue well developed; palpi small, slender, short to moderately scaled below, rising to, or near, middle of eye; antennae with from 37 to 49 segments (Nearctic species) or from 58 to 62 segments (Palearctic species), pectinations of male arising near middle of segment, pectinations elongate, being 5.0 to 9.5 times as long as their basal segments, each pectination with two rows of elongate ventral setae and with or without single terminal seta, and with terminal eight to 17 (Nearctic species), or 17 to 20 (Palearc-



FIGS. 7-10. Males, under surface. 7, 8. *Pseudoboarmia umbrosaria* (Hübner), same specimens as figures 3 and 4. 9, 10. *P. gnopharia* (Guenée), same specimens as figures 5 and 6. All  $\times 1.5$ .

tic species) segments simple, with these segments noticeably shorter than pectinate segments; antennae of female simple, or with very short terminal projections, scaled above, with paired posterior setae. Thorax with broad patagia of mixed spatulate and hairlike scales; without posterior tufts; fore tibia unarmed, with process of male arising medially, of female distad of middle, in both sexes extending to, or just beyond, end of segment; hind tibia with two pairs of spurs, and male either with or without hair pencil and without groove (Nearctic species) or with prominent hair pencil in broad groove (Palearctic species). Abdomen without tufts; male either without row of setae on ventral surface of third segment (Nearctic species) or with prominent row of setae (Palearctic species); terminal segment unmodified. Forewings broad, alike in both sexes; 12 veins present; areole absent;  $R_{1+2}$  connected to Sc,  $R_5$  originating near  $R_1$ ;  $M_1$  from upper angle, with dc weakly curved or slightly angulate;  $Cu_1$  from lower angle; fovea absent. Hind wings broad, outer margin more or less concave between veins; frenulum strong in both sexes; Sc approximate to R for about one-half length of cell; R and  $M_1$  from before upper angle;  $M_3$  from lower angle;  $Cu_1$  from just before lower angle.

Upper surface of wings varying in color from immaculate pale violaceous gray to grayish brown or blackish brown; fore and hind wings concolorous; cross lines and discal spots present in most species. Under surface various shades of gray or grayish black, with discal spots generally prominent. Some melanistic specimens are known; these are almost without maculation (Palearctic species).

**MALE GENITALIA:** Uncus elongate, somewhat swollen basally, tapering to rounded posterior portion, apex curved ventrally and ending in single spine; socius absent; gnathos large, sides of even width, with broad, flat, raised median protuberance; valves symmetrical, extending posteriad of uncus, with smoothly sclerotized costa, posterior region thereof with large area of setae, valvular process in form of elongate, swollen, lightly sclerotized ridge bearing numerous spines, and with sacculus ridge more or less prominent and bearing variable number of spines; transtilla absent; anellus with anterior portion rounded or triangular, rather small, with narrow posterior extension, becoming more or less swollen posteriorly; cristae either absent or few (Nearctic species) or numerous, very long, and gently curved (Palearctic species); tegumen broad, with narrow process of varying length arising on each side posteriorly, apically with group of elongate, ventrally curving setae extending posteriad of uncus; saccus bluntly tapered or rounded; aedeagus shorter than, or equal to, combined lengths of uncus, tegumen, and saccus, straight, posteriorly sclerotized and most species with two lateral elongate spinose rows;

vesica, when exerted, short and angled anteriorly, having various amounts of sclerotized ridges or areas.

FEMALE GENITALIA: Papillae anales simple, membranous, scarcely distinguishable from adjacent membranous area, lengthily exsertile, with apophyses posteriores two and one-half to three times longer than apophyses anteriores, being from 4.2 to 5.8 mm. in length; sterigma with sclerotized, round or elliptical median area, with sclerotized areas extending laterad; ductus bursae short, broad, membranous, often poorly defined; ductus seminalis arising from ventral surface of corpus bursae just anterior of ductus bursae; corpus bursae membranous, of about equal width for entire length, ranging from long and slender to short and broad; signum either absent (Nearctic species) or present and small (Palearctic species).

EARLY STAGES: Apparently undescribed, even though two or three of the species have been reared.

FOOD PLANTS: Deciduous shrubs and trees. Much work needs to be done with the early stages and their food plants in this genus; see the discussion of this topic under *umbrosaria*.

TYPE SPECIES: *Cymatophora proluxa Umbrosaria* Hübner; sole included species.

KEY TO SPECIES

ADULTS

- 1. Upper surface of wings pale violaceous gray . . . . . *luridula*  
Upper surface of wings grayish black or brownish black . . . . . 2
- 2. Upper surface of wings grayish black with maculation usually prominent . 3  
Upper surface of wings brownish black, with maculation usually weakly developed . . . . . *buchholzaria*
- 3. Antennae of males with from 42 to 49 segments, and with longest pectinations 7.0 to 9.5 times as long as their basal segments, averaging 2.0 mm. in length . . . . . *umbrosaria*  
Antennae of males with from 41 to 47 segments, and with longest pectinations 5.0 to 7.0 times as long as their basal segments, averaging 1.6 mm. in length . . . . . *gnopharia*

MALE GENITALIA

- 1. Posterior processes of tegumen with length equal to, or longer than, length of their terminal setae . . . . . 2  
Posterior processes of tegumen noticeably shorter than their terminal setae . . . . . 3
- 2. Posterior processes of tegumen with length approximately equal to length of their terminal setae; vesica with exerted portion membranous . *umbrosaria*  
Posterior processes of tegumen with length averaging one-fourth longer than length of their terminal setae; vesica with exerted portion having longitudinal striations . . . . . *gnopharia*

3. Posterior processes of tegumen with length of terminal setae about one and one-half times longer than process itself . . . . . *buchholzaria*  
 Posterior processes of tegumen with length of terminal setae from six to 15 times longer than process itself . . . . . *luridula*

## FEMALE GENITALIA

1. Corpus bursae very slender (0.3 to 0.4 mm.) and very long, with length from 10 to 15 times greater than width . . . . . 2  
 Corpus bursae wider (0.6 mm.) and shorter, with length about five times greater than width . . . . . 3  
 2. Ductus bursae 0.3 mm. wide . . . . . *buchholzaria*  
 Ductus bursae 0.1 to 0.2 mm. wide . . . . . *luridula*  
 3. Sterigma with median sclerotized area larger, 0.5 to 0.6 mm. wide, with slender lateral sclerotized areas . . . . . *umbrosaria*  
 Sterigma with median sclerotized area smaller, 0.4 to 0.5 mm. wide, with sclerotized and rugose lateral areas wider than median area . . . *gnopharia*

*Pseudoboarmia luridula* (Hulst)

Figures 1, 11, 17, 21

*Alcis luridula* HULST, 1896, p. 346. DYAR, "1902" (1903), p. 321. SMITH, 1903, p. 76. GROSSBECK, 1917, p. 96. RINDGE, 1955, p. 147.

*Cleora luridula*: BARNES AND McDUNNOUGH, 1916, p. 185 (placed as synonym of *Glena cognataria* Hübner).

*Glena luridula*: BARNES AND McDUNNOUGH, 1917, p. 118. McDUNNOUGH, 1920, p. 23; 1938, p. 163. (All as synonym of *G. cognataria*.)

*Pseudoboarmia luridula*: RINDGE, 1956, p. 9, fig. 9 (male). KIMBALL, 1965, p. 181.

DIAGNOSIS: This species is easily distinguished from the other members of the genus by the pale violaceous gray coloration of the wings, and by the obsolete maculation. It is more likely to be mistaken for a large specimen of *Glena cognataria* (Hübner) than to be confused with the other species of *Pseudoboarmia*.

MALE: Head, vertex grayish white; front blackish brown; palpi with mixed gray and brown scales; antennae with about 45 segments, terminal 10 simple, with longest pectinations about 6.25 times as long as their basal segments. Thorax above light violaceous gray; pale gray below; legs pale gray; hind tibia without hair pencil. Abdomen light violaceous gray above, with a few, scattered dark brown scales; pale gray below.

UPPER SURFACE OF WINGS: All wings pale violaceous gray, with a few, scattered brown scales; almost without maculation, some specimens with obsolescent discal spots, traces of t. p. line, and incomplete terminal line; fringe concolorous with wings.

UNDER SURFACE OF WINGS: All wings gray, with slight violaceous tinge; without maculation except for discal spots on all wings, and for incomplete terminal line.



LENGTH OF FOREWING: 15 to 17 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 17 to 18 mm.

MALE GENITALIA: Uncus relatively short and narrow, averaging about 0.35 mm. long and 0.25 mm. wide at base; gnathos quadrate; valve with outer margin tending to be weakly angled, costal swelling with from 13 to 20 (average number, 17) spines, valvular process with from three to five (average number, 4) spines, with length of valvular ridge 0.5 to 0.6 (average length, 0.55) mm.; anellus elliptical, with thickened portion of posterior extension less than one-half length of anellus; tegumen with process much shorter than setae, average length of process 0.06 mm., of terminal setae 0.45 mm., for combined length of 0.51 mm.; aedeagus relatively short, ranging from 1.40 to 1.55 mm. (average, 1.50 mm.); vesica lightly sclerotized.

FEMALE GENITALIA: Apophyses posteriores averaging 4.9 mm. in length; sterigma with central, rounded, sclerotized area, and with broad, subtriangular, sclerotized lateral areas; ductus bursae short and narrow, 0.1 to 0.2 mm. wide; corpus bursae narrow and very long, 0.3 to 0.4 mm. wide and about 10 to 15 times as long.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Hulst apparently described *luridula* from a single specimen. This is a female, and it is in the collection of the American Museum of Natural History (Rindge, 1955, 1956). Its genitalia are mounted on slide FHR 6368.

TYPE LOCALITY: Florida (Mrs. Slosson).

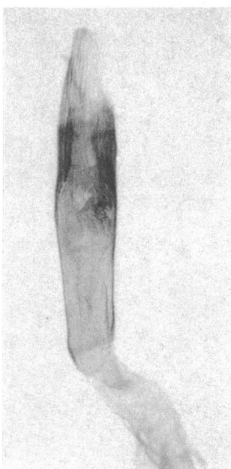
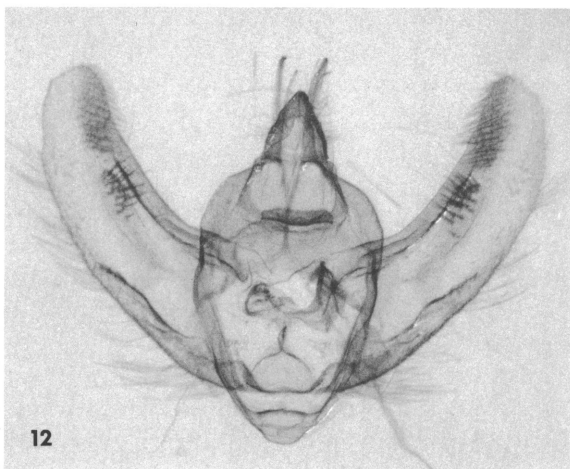
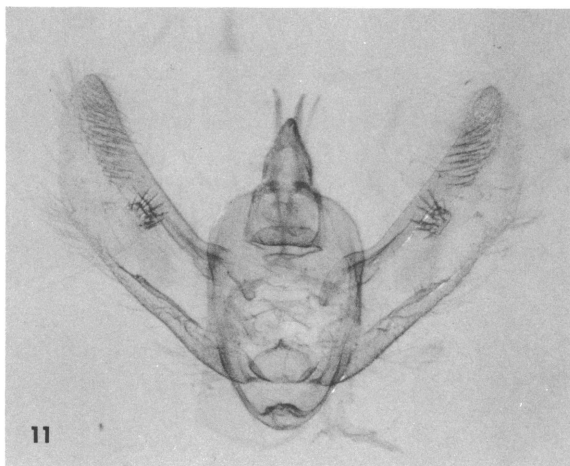
DISTRIBUTION: Central and southern Florida (see fig. 21). All the records, with one exception, are from coastal counties; whether this represents a true distributional picture, or merely reflects where the collectors have been most active, remains to be seen.

Both Dyar ("1902" [1903]) and Grossbeck (1917) reported this species as occurring in Georgia, without additional data. No Georgia specimens have been located.

TIME OF FLIGHT: January through May, and again in August and September.

REMARKS: Fourteen specimens (11 males and three females), two (one male and one female) slide mounts of antennae and legs, and six (three males and three females) genitalic dissections have been studied.

From the small amount of material available, there does not appear to be much individual variation in the color and pattern of the wings.



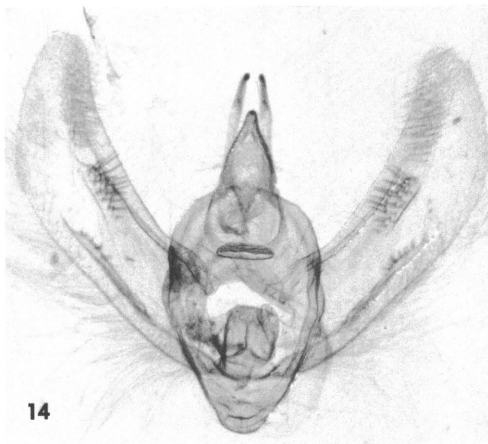
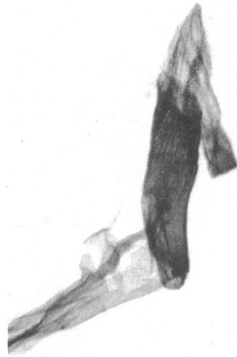
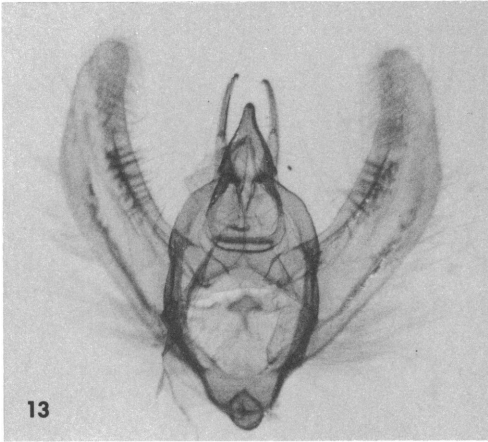
FIGS. 11, 12. Male genitalia. 11. *Pseudoboarmia luridula* (Hulst), Port Sewall, Florida, March 16–21, 1949 (L. J. Sanford). 12. *P. buchholzaria* Lemmer, East Wareham, Massachusetts, July 4, 1968 (C. P. Kimball).

*Pseudoboarmia buchholzaria* Lemmer

Figures 2, 12, 15, 18, 21

*Selidosema gnophosarium* [sic]: BARNES AND McDUNNOUGH, 1912, p. 19, pl. 8, fig. 15 (female).

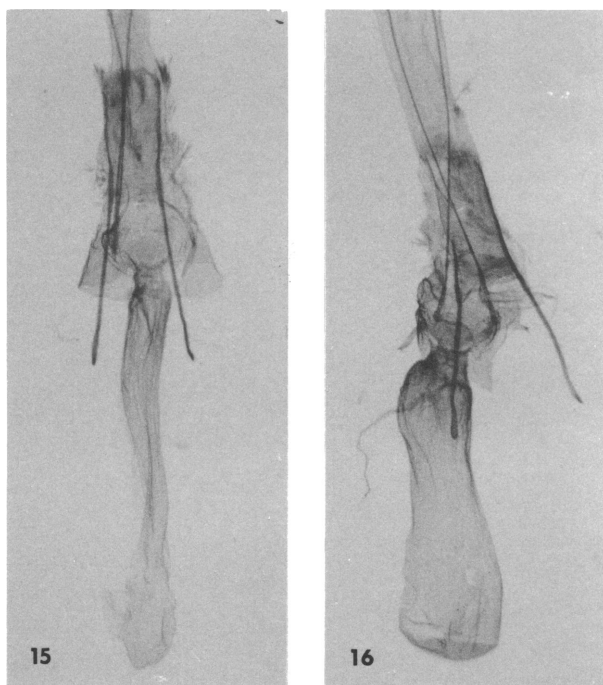
*Pseudoboarmia buchholzaria* LEMMER, 1937, p. 24. McDUNNOUGH, 1938, p. 163. FORBES, 1948, p. 53, figs. 76, 76a (sacculus ridge, and uncus with processes of tegumen). DARLINGTON, 1949, p. 175. KIMBALL, 1965, p. 181, pl. 6, fig. 5 (male). TAYLOR AND TAYLOR, 1965, p. 190.



FIGS. 13, 14. Male genitalia. 13. *Pseudoboarmia umbrosaria* (Hübner), Tennessee Colony, Texas, April 30, 1966 (A. and M. E. Blanchard). 14. *P. gnopharia* (Guenée), Biloxi, Mississippi, June 1, 1964 (R. Taylor).

**DIAGNOSIS:** This species is recognized by the very dark color of the upper surface of the wings, being brownish black, and by the weakly represented maculation. The under surface of the wings is also darker than in any of the other species.

**MALE:** Head, vertex grayish black; front black, some specimens with narrow dorsal band of gray scales; palpi black; antennae with from 37 to 41 segments, terminal six simple, with longest pectinations about six



FIGS. 15, 16. Female genitalia. 15. *Pseudoboarmia buchholzaria* Lemmer, paratype, Lakehurst, New Jersey, May 21–31 (F. Lemmer). 16. *P. gnopharia* (Guenée), Biloxi, Mississippi, July 4, 1964 (R. Taylor).

times as long as their basal segments. Thorax above grayish black to brownish black; gray below; legs gray or grayish brown; hind tibia without hair pencil. Abdomen above grayish black, with scattered brownish black scales; below dark gray.

UPPER SURFACE OF WINGS: All wings more or less evenly covered with dark gray, grayish black, and brownish black scales, some specimens having a faint violaceous tinge; maculation weakly represented; forewings with t. a. line crossing costa one-fourth to one-fifth distance from base, then sharply swinging outward into cell, angled posteriorly and then basally, subparalleling costa to anal vein, then more sharply angled basally; discal spot small, elliptical, most specimens with paler central area; median shade line arising near middle of costa, curving outwardly around discal spot, producing large (1 to 2 mm. in diameter), circular spot, then continuing posteriorly at more or less right angle to inner margin; t. p. line arising three-fourths distance from base on costa, with

sharp basal angle in cell  $R_5$ , then weakly S-shaped to inner margin, outwardly dentate on veins; s. t. line gray, narrow, outwardly curved in cells, enlarged in cell  $M_3$ ; terminal line black, broadly interrupted by veins; fringe concolorous with wing. Hind wings with rather broad intradiscal line fading out anteriorly; discal spot elongate, with paler center; extra-discal line somewhat variable in location and course, ranging from almost straight to subparalleling outer margin, and being outwardly dentate on veins; s. t. line ranging from obsolescent to complete; terminal line and fringe similar to those of forewings.

**UNDER SURFACE OF WINGS:** All wings dark gray, with scattered grayish black scales; discal spots present on all wings, prominent, dull black; outer cross line on all wings varying from absent or obsolescent to complete; some specimens with small costal s. t. spot on forewings; terminal line and fringe similar to those of upper surface.

**LENGTH OF FOREWING:** 14 to 17 mm.

**FEMALE:** Similar to male, with both upper and lower surfaces of wings tending to be slightly blacker, and with maculation on upper surface tending to appear rather obsolescent as result.

**LENGTH OF FOREWING:** 16 to 18 mm.

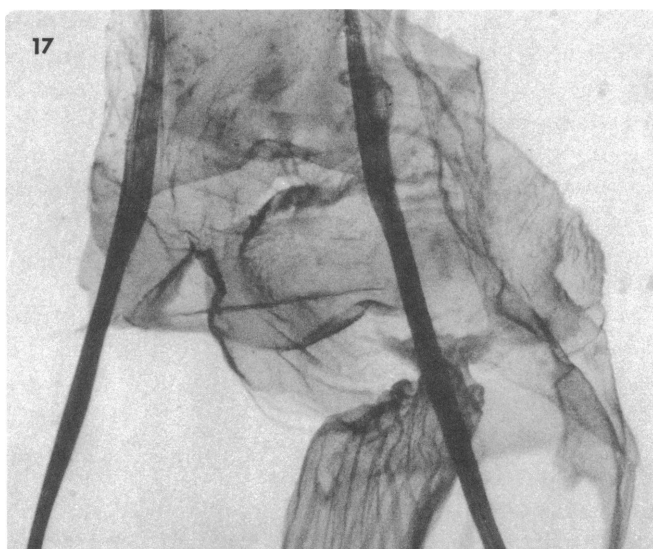
**MALE GENITALIA:** Similar to those of *luridula*, differing mainly as follows: larger; uncus averaging 0.39 mm. long and 0.32 mm. wide at base; gnathos wider than long, increasing in width anteriorly; valve with outer margin rounded, costal swelling with from 13 to 24 (average number, 19) spines, valvular process with from two to eight (average number, five) spines, with length of valvular ridge 0.4 to 0.7 (average length, 0.61) mm.; anellus with thickened portion of posterior extension almost as long as anellus; tegumen with process shorter than setae, average length of process 0.24 mm., of terminal setae, 0.36 mm., for combined length of 0.60 mm.; aedeagus moderately long, ranging from 1.65 to 1.90 mm. (average, 1.75 mm.); vesica lightly sclerotized.

**FEMALE GENITALIA:** Apophyses posteriores averaging 5.0 mm. in length; sterigma with more or less elliptical, sclerotized median area, and with broad, elongate, rugose lateral areas; ductus bursae wider than long, about 0.3 mm. wide; corpus bursae similar to that of *luridula*, but slightly wider.

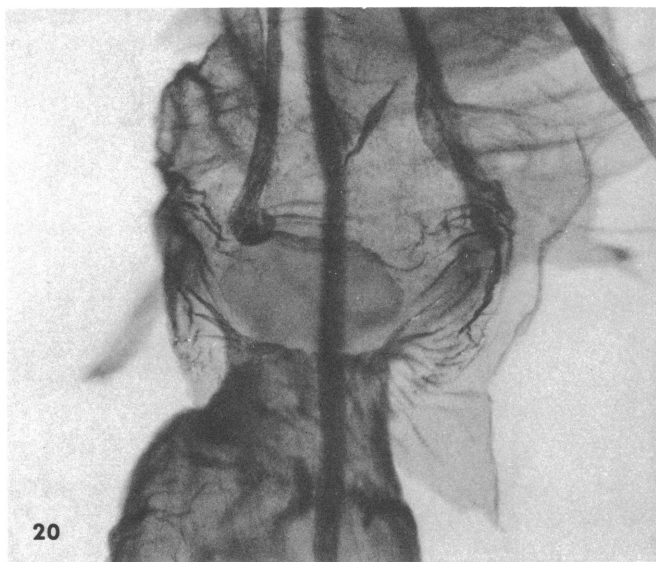
**EARLY STAGES:** Undescribed, although the species was reared by Lemmer prior to his describing it.

**FOOD PLANT:** Sweet fern (*Comptonia peregrina asplenifolia* Linnaeus; Myricaceae).

**TYPES:** The holotype, male, and allotype, female, are in the collection of the National Museum of Natural History.



FIGS. 17, 18. Female genitalia, enlarged view of sterigma and ductus bursae.  
17. *Pseudoboarmia luridula* (Hulst), type, Florida (Mrs. Slosson). 18. *P. buchholzaria*  
Lemmer, paratype, same dissection as figure 15.



FIGS. 19, 20. Female genitalia, enlarged view of sterigma and ductus bursae.  
19. *Pseudoboarmia umbrosaria* (Hübner), Bastrop, Texas, March 30, 1963 (R. O. Kendall). 20. *P. gnopharia* (Guenée), same dissection as figure 16.

**TYPE LOCALITY:** Lakehurst, Ocean County, New Jersey.

**DISTRIBUTION:** The coastal plains from Massachusetts south to central Florida, and west along the Gulf Coast in Mississippi to eastern Texas (see fig. 21). This species is poorly represented in collections, with the exception of specimens from Lakehurst, New Jersey.



FIG. 21. Distribution of *Pseudoboarmia luridula* (Hulst) and *P. buchholzaria* Lemmer.

Kimball (1965) cited two records for this species from the collection of the American Museum of Natural History; these are in error, apparently referring to one or both of the following species.

**TIME OF FLIGHT:** The moths begin flying in February and March in Florida and Texas, April through early August in more northern localities.

**REMARKS:** Eighty-five specimens (52 males and 33 females), four (two males and two females) slide mounts of antennae and legs, and 13 (eight males and five females) genitalic dissections have been studied.

Older specimens tend to have the color of the wings fade, becoming somewhat brownish and slightly paler with age.



*Pseudoboarmia umbrosaria* (Hübner)

Figures 3, 4, 7, 8, 13, 19, 22, 23, 25

*Cymatophora prolixa* *Umbrosaria* HÜBNER, 1813, pl. [204], figs. 1, 2 (male), 3, 4 (female).*Boarmia umbrosaria*: GUENÉE, 1857, p. 251. WALKER, 1860, p. 350. ANON., 1882, p. 24. SMITH, 1891, p. 72.*Cymatophora umbrosaria*: PACKARD, 1876, p. 439 (*partim*), pl. 11, fig. 23 (male). GROTE, 1882, p. 49. BEUTENMÜLLER, 1890, p. 222.*Cleora umbrosaria*: BRUCE, 1887, p. 49. GUMPPENBERG, 1892, p. 319 (*partim*). GROSS-BECK, 1917, p. 98. BARNES AND McDUNNOUGH, 1917, p. 117; 1918, p. 154.*Selidosema umbrosarium*: HULST, 1896, p. 355. DYAR, "1902" (1903), p. 325. SMITH, 1903, p. 77; 1910, p. 503 (*partim*). PEARSALL, 1906, p. 178.*Pseudoboarmia umbrosaria*: McDUNNOUGH, 1920, p. 22, pl. 3, fig. 3 (male genitalia); 1938, p. 163. FORBES, 1948, p. 53, figs. 75, 75a (sacculus ridge, and uncus with processes of tegumen). KIMBALL, 1965, p. 180.*Pseudoboarmia umbrosarium*: FORBES, 1928, p. 602.

DIAGNOSIS: This species has maculation that is very similar to *buchholzaria*, but the color of the upper surface of the wings is paler. Specimens from the northern portion of the range tend to be grayish brown, with southern specimens being grayish black. Approximately one male out of every five has either a rudimentary or relatively well-developed hair pencil on the hind tibia; this condition is not found in the preceding species. The genitalic differences between *umbrosaria* and the proceeding species are given in the keys.

MALE: Head, vertex with mixture of gray and grayish brown scales, with some white scaling anteriorly at base of antennae; front black, with ventrolateral margins tending to be gray; palpi grayish black; antennae with from 42 to 49 segments (average number, 47), terminal eight to 17 (average number, 12) simple, with longest pectinations 7.0 to 9.5 times as long as their basal segments (averaging 8.0 times; see fig. 23), ranging from 1.6 to 2.2 mm. (average length, 2.0 mm.) in length. Thorax above grayish brown to grayish black, some specimens with narrow black band on end of collar and across patagia; below pale gray; legs pale gray, with variable number of brown and grayish black scales, particularly heavy on forelegs; hind tibia of approximately one out of every five specimens with either rudimentary or relatively well-developed hair pencil, these apparently appearing at random throughout the entire range of species. Abdomen above gray with variable number of grayish brown or grayish black scales, and with band of these colors on posterior margin of each segment; below similar to upper surface but with fewer dark scales and without bands.

UPPER SURFACE OF WINGS: All wings varying from pale grayish brown (northern specimens) to grayish black (southern specimens), and more or

less evenly suffused with grayish brown and black scales; maculation variable in strength, from weakly represented to prominent, usually stronger than that of *buchholzaria*; cross lines similar to those of *buchholzaria*, but with s. t. line usually more strongly represented, with larger pale patch in middle of forewing and with broader band of dark scales basally of line on all wings.

UNDER SURFACE OF WINGS: All wings pale to medium gray, evenly suffused with brown or grayish black scales; all discal dots strongly represented, ranging from faint trace of t. p. line at costa of forewing to more or less complete t. p. and extradiscal lines, and rarely with faint subcostal band.

LENGTH OF FOREWING: 14 to 19 mm.

FEMALE: Similar to male; maculation of upper surface tending to be slightly more clearly defined; under surface of wings tending to have slightly heavier markings.

LENGTH OF FOREWING: 17 to 22 mm.

MALE GENITALIA: Similar to those of *buchholzaria*, differing mainly as follows: uncus averaging 0.43 mm. long and 0.55 mm. wide at base; gnathos with length about equal to width; valve with costal swelling with from 14 to 36 (average number, 26) spines, valvular process with from three to 19 (average number, 7) spines, with length of valvular ridge 0.68 to 0.95 (average length, 0.76) mm.; anellus triangular, with short thickened posterior extension; tegumen with process about equal in length to setae, average length of process 0.38 mm., of terminal setae 0.34 mm., for combined total of 0.72 mm.; aedeagus longer, ranging from 1.70 to 2.00 mm. (average, 1.90 mm.); vesica, when exerted, membranous and without longitudinal striations.

FEMALE GENITALIA: Apophyses posteriores averaging 5.5 mm. in length; sterigma with median area sclerotized, broad, elliptical, 0.5 to 0.6 mm. wide with lateral areas relatively short; ductus bursae broad, 0.5 to 0.6 mm. wide; corpus bursae wider and shorter than preceding species, about 0.6 mm. across and with length about five times greater than width.

EARLY STAGES: Undescribed.

FOOD PLANTS: There is considerable confusion in the literature regarding food plants, because of misidentifications of the species by earlier authors and because specimens that were reared were not so labeled, including the host plant data. Some of the earlier literature records cited various conifers as food plants; these were undoubtedly based on misidentifications of the species.

Horse chestnut (*Aesculus* sp.; Hippocastanaceae) and elm (*Ulmus* sp.; Ulmaceae) were recorded as food plants by Bruce (1887, p. 49; and

repeated by Beutenmüller, 1890, p. 222); these need to be verified.

Pearsall (1906, p. 178) reared "*umbrosaria*" from larvae taken in Florida, but neglected to give the host; he treated *gnopharia* as a synonym of *umbrosaria*. One of Pearsall's specimens, labeled as being reared from "Orlando, [Orange County], Florida, larva on oak, March 20, 1899, imago April 16, 1899; compared with Packard's type," is in the collection of the American Museum of Natural History and it does represent *umbrosaria*.

Lemmer (1937, p. 25) stated that he reared "*umbrosaria*" on white birch (*Betula populifolia* March; Corylaceae). Apparently Lemmer did not label his reared material, as there are no specimens with these data on the Lemmer material deposited in the collection of the American Museum of Natural History. The Lemmer specimens came to this museum as part



FIG. 22. Distribution of *Pseudoboarmia umbrosaria* (Hübner).

of the Buchholz collection; the series of "*umbrosaria*" contained both that species and *gnopharia*.

Forbes (1948, p. 53) and Kimball (1965, p. 180) repeated the birch and oak citations as food plants for "*umbrosaria*." These (and any other) records have to be verified, owing to possible confusion with *gnopharia*.

TYPE: It is not known whether or not Hübner's type specimen is in existence.

TYPE LOCALITY: None given.

DISTRIBUTION: The coastal plains of the eastern United States, extending from southeastern Massachusetts to central Florida, west to eastern Texas, and up the Mississippi River Valley to Arkansas and Missouri, occurring on the Ozark Plateau (see fig. 22).

TIME OF FLIGHT: January (Florida records); March through August, and one November record. Texas specimens have been taken from March through April, and again in November; Missouri, April through June; New Jersey, May through July; Massachusetts, June through August. See figure 25.

REMARKS: One hundred thirty-three specimens (111 males and 22 females), 15 (10 males and five females) slide mounts of antennae and legs, and 26 (19 males and seven females) genitalic dissections have been studied.

Specimens from the northern portion of the range tend to have paler wings than do individuals from the south and the Ozark Plateau. In addition, some fading occurs with age, as old specimens tend to become browner; this occurs in both examples that were caught many years ago and also in moths that apparently have been flying for some time.

*Pseudoboarmia gnopharia* (Guenée), revised status

Figures 5, 6, 9, 10, 14, 16, 20, 23-25

*Boarmia gnopharia* GUENÉE, 1857, p. 251. BOISDUVAL AND GUENÉE, 1858, pl. 5, fig. 10 (male). WALKER, 1860, p. 350. PACKARD, 1876, p. 439 (listed as synonym of *umbrosaria*). HULST, 1895, p. 42 (synonym of *umbrosaria*). OBERTHÜR, 1913, p. 274.

*Boarmia umbrosaria gnopharia*: SMITH, 1891, p. 72.

*Cymatophora gnopharia*: GROTE, 1882, p. 49 (synonym of *umbrosaria*).

*Cleora gnopharia*: GUMPPENBERG, 1892, p. 319. BARNES AND McDUNNOUGH, 1918, p. 154. (Both as synonym of *umbrosaria*.)

*Cleora umbrosaria gnopharia*: BARNES AND McDUNNOUGH, 1917, p. 117.

*Selidosema umbrosaria gnophosarium* [sic]: DYAR, "1902" (1903), p. 325. SMITH, 1903, p. 77.

*Pseudoboarmia gnopharia*: McDUNNOUGH, 1920, p. 22; 1938, p. 163 (both as synonym of *umbrosaria*).

*Pseudoboarmia umbrosaria* var. *gnopharia*: FORBES, 1948, p. 53.

DIAGNOSIS: This species can be distinguished from *umbrosaria* only with difficulty. Compared with *umbrosaria*, the antennae of the male of the present species have fewer segments (41 to 47); the longest pectinations are shorter, being between 5.0 and 7.5 times longer than the basal segments (see fig. 23), or 1.3 to 1.8 mm. in length. The males of *gnopharia* are much more likely to have a tibial hair pencil, with three out of four specimens of this sex possessing this character; in *umbrosaria*, only one out of five males have it. The genitalic differences are given in the keys.

MALE: Head, thorax, and abdomen similar to those of *umbrosaria*; antennae with from 41 to 47 segments (average number, 45), terminal eight to 14 (average number, 12) simple, with longest pectinations 5.0 to 7.5 times as long as their basal segments (averaging 6.4 times), ranging

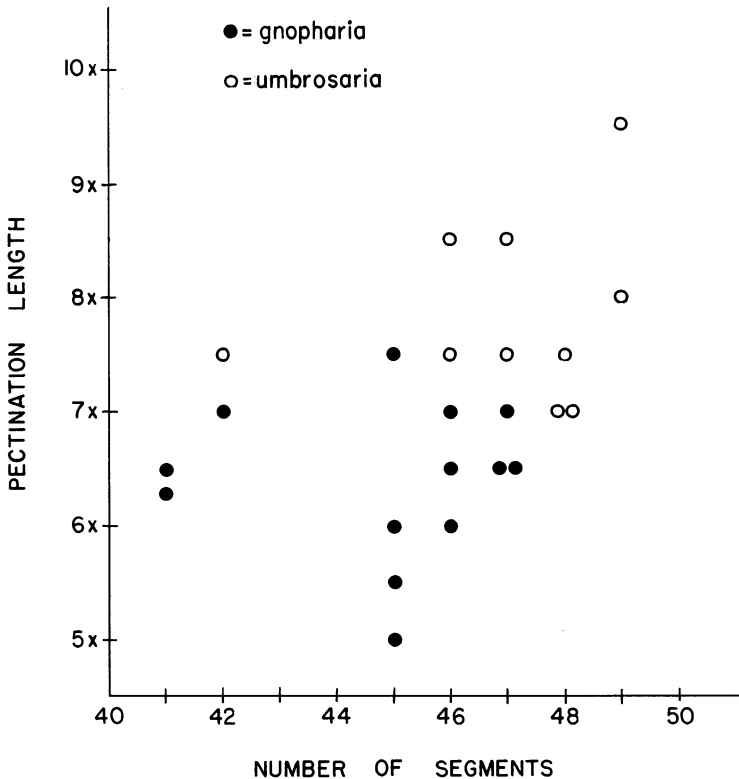


FIG. 23. Male antennae, comparing the number of segments and pectination length. The latter is expressed as a comparison of the length of the longest pectination to the length of its basal segment.

from 1.3 to 1.8 mm. (average length, 1.6 mm.) in length; hind tibia of approximately three out of every four specimens with either rudimentary or well-developed hair pencil, these tending to appear in greater numbers in southern portion of distribution of species.

**UPPER SURFACE OF WINGS:** Very similar to that of *umbrosaria*, differing mainly as follows: slightly darker on the average; median area with median line tending to form larger circle with discal dot; subterminal area of forewings with dark distal shade band of t. p. line tending to curve outwardly to meet s. t. line opposite cell; s. t. line with less basal dark shading on all wings, with line itself tending to be obsolescent except for enlarged grayish white spot in middle of forewing and middle of hind wings.

**UNDER SURFACE OF WINGS:** Similar to those of *umbrosaria*, but tending to have stronger maculation in outer portion of wings, many specimens having partial or complete dark subterminal band in addition to more completely represented t. p. and extradiscal lines.

**LENGTH OF FOREWING:** 13 to 18 mm.

**FEMALE:** Similar to male, tending to have upper surface of wings slightly more unicolorous, with under surface tending to have slightly heavier markings.

**LENGTH OF FOREWING:** 16 to 20 mm.

**MALE GENITALIA:** Similar to those of *umbrosaria*, differing mainly as follows: uncus averaging 0.46 mm. long and 0.37 mm. wide at base; valve with costal swelling with from 17 to 34 (average number, 25) spines, valvular process with from zero to 13 (average number, 6) spines, with length of valvular ridge 0.62 to 0.96 (average length, 0.75) mm.; anellus triangular, with thickened posterior extension almost as long as length of anellus; tegumen with process longer than setae, average length of process 0.39 mm., of terminal setae 0.29 mm., for combined total of 0.68 mm.; aedeagus of same size as *umbrosaria*; vesica, when exerted, covered with sclerotized longitudinal striations.

**FEMALE GENITALIA:** Apophyses posteriores averaging 5.6 mm. in length; sterigma with median area smaller than that of *umbrosaria*, elliptical in outline, 0.4 to 0.5 mm. across, with sclerotized and rugose areas wider than median area; ductus bursae 0.4 to 0.5 mm. wide; corpus bursae similar to that of *umbrosaria*.

**EARLY STAGES:** Briefly described by Guenée (1857, p. 251); this description was "based presumably on an unpublished drawing by Abbot" (McDunnough, 1920, p. 22).

**FOOD PLANT:** Oak (Guenée, *op. cit.*). See the discussion of Food Plants under *umbrosaria* for a discussion of this subject.

**TYPES:** Guenée described *gnopharia* from one male and one female;

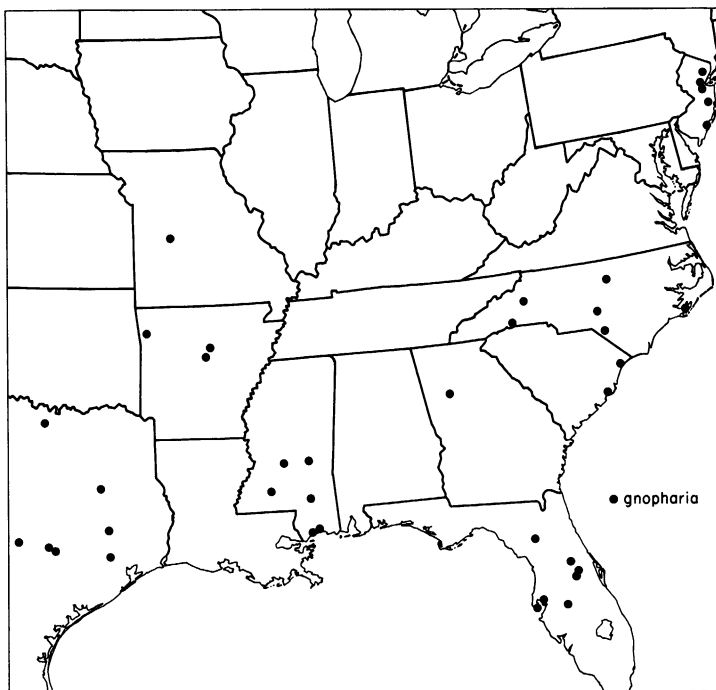


FIG. 24. Distribution of *Pseudoboarmia gnopharia* (Guenée).

these two specimens are presumably the ones in the collection of the National Museum of Natural History. Both are in relatively good condition but lacking most of their antennae, and the female is without an abdomen. The male has a hair pencil on its hind tibia; its genitalia are mounted on slide FHB 350. This male specimen is hereby designated as the lectotype.

TYPE LOCALITY: "Amérique septentrionale."

DISTRIBUTION: Very similar to that of *umbrosaria*, but extending north on the coastal plains of the eastern United States only as far as New Jersey. The species extends south to central Florida, west to eastern Texas, and north to Arkansas and Missouri, occurring on the Ozark Plateau (see fig. 24).

TIME OF FLIGHT: March through September. Texas specimens have been taken from April through September; Missouri, April, May, July, and August; New Jersey, May through August. This species tends to fly, on the average, slightly earlier than does *umbrosaria* (see fig. 25).

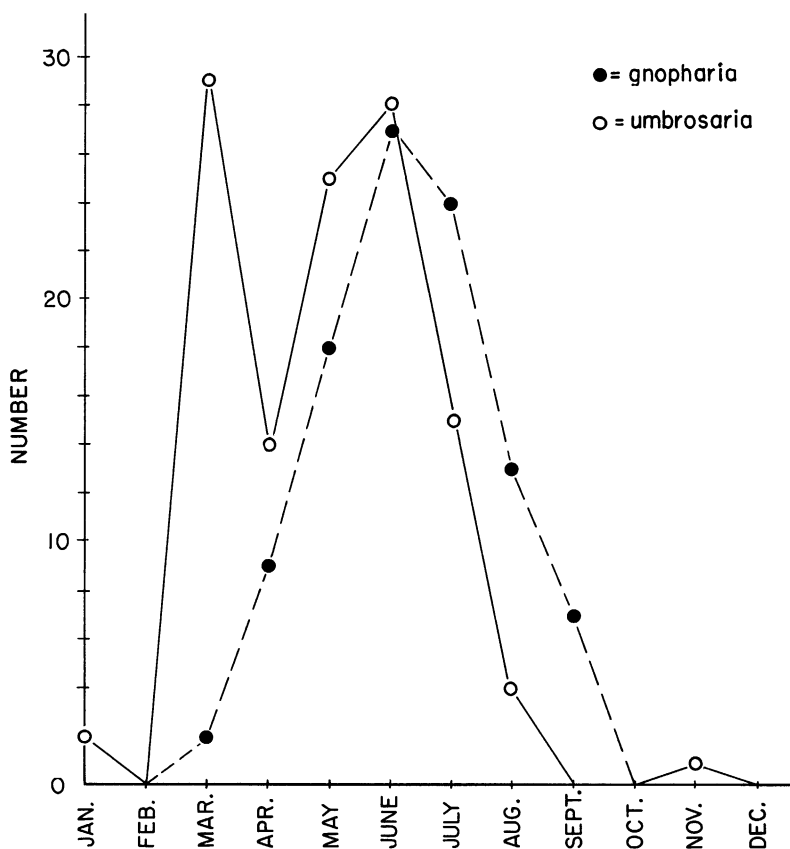


FIG. 25. Time of flight of *Pseudoboarmia umbrosaria* (Hübner) and *P. gnopharia* (Guenée), based on specimens examined.

REMARKS: One hundred six specimens (80 males and 26 females), 17 (13 males and four females) slide mounts of antennae and legs, and 28 (18 males and 10 females) genitalic dissections have been studied. This includes the lectotype and its genitalia.

The coloration of the upper surface of the wings tends to be rather uniform in this species, not showing the clinal variation that is to be found in *umbrosaria*. Specimens from the southern portion of the range tend to have the under surface of the wings clearly patterned, whereas northern examples are usually rather immaculate, and look very similar to *umbrosaria*. Examples of both species from New Jersey have very similar maculation and apparently are on the wing at the same time and place; care-



ful study, particularly of the antennae and genitalia, is necessary to separate the two.

There can be no question about the identity of this species after studying the lectotype of *gnopharia*. The under surface of the wings shows the dark marginal pattern and very prominent discal spots (as in fig. 10), and the male genitalia have the processes of the tegumen longer than the setae. The female that Guenée had is conspecific with the male.

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