Journal of the Lepidopterists' Society
40(4), 1986, 327–346

RESURRECTION OF *CATASTEGA* CLEMENS AND REVISION OF THE *EPINOTIA VERTUMNANA* (ZELLER) SPECIES-GROUP (TORTRICIDAE: OLETHREUTINAE)

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ABSTRACT. *Catastega* is recognized as a valid genus; *C. timidella,* the type species, and *C. aceriella* are resurrected from synonymy with *Epinotia*; and *E. marmoreana* is transferred to *Catastega.* In the *Epinotia vertumnana* species-group revision, *E. atristriga* is synonymized with *E. zandana,* and *Paedisca celtisana* is synonymized with *E. laracana.* The previously misidentified *E. laracana* is described as a new species. Lectotypes are designated for *Grapholitha subnisana,* a junior synonym of *C. aceriella,* and *Paedisca vertumnana,* which has been previously misidentified as *E. zandana.* Imagos and female genitalia of *Catastega* species are illustrated; imagos and male and female genitalia of six species in the *E. vertumnana* species group are described and illustrated.

The treatment of North American *Epinotia* Hübner by Heinrich (1923) included two species groups with similarly developed male genitalia, both having plesiomorphic forms of an uncus and valva. *Epinotia vertumnana* (Zeller) and five related species comprise the most generalized species-group of the genus, whereas the *E. aceriella* species-group does not appear congeneric with the former. Although a systematic study of world *Epinotia* is near completion, these two species-groups are treated here to clarify nomenclature and make names available to other workers.

For species descriptions, specimens and genitalia were examined with a phase-contrast microscope and stereomicroscope with ocular micrometer, which was used for all measurements. Measurements of forewings are accurate to 0.1; other measurements are accurate to 0.01. The forewing length (FWL) was measured from base to apex, including fringe. The length of sacculus was measured as a straight line from ventral base of valva to beginning of the cucullus, as restricted to the apical portion of the valva with subparallel dorsal and ventral margins (Fig. 8). The number of deciduous cornuti in the aedeagus was obtained by counting their sockets, which were usually distinct. For scanning electron microscopy, specimens were coated with gold-palladium for six min and examined with a Hitachi HH-S-2R scanning electron microscope.

Partial synonymies are given for *Catastega* species to include previous binomial combinations and major references with illustrations of life stages. Complete synonymies are given for species in the *E. vertumnana* group. Specimens in collections of the following individuals and institutions were examined: André Blanchard (AB), American Mu-

seum of Natural History (AMNH), Academy of Natural Sciences, Philadelphia (ANSP), Bryant Mather (BM), British Museum of Natural History (BMNH), Canadian National Collection (CNC), Cornell University (CU), Edward C. Knudson (ECK), Illinois Natural History Survey (INHS), John G. Franclemont (JGF), J. Richard Heitzman (JRH), Kansas State University (KSU), Natural History Museum of Los Angeles (LACM), Museum of Comparative Zoology (MCZ), Mississippi Entomological Museum (MEM), Michigan State University (MSU), Richard L. Brown (RLB), University of California, Berkeley (UCB), United States National Museum of Natural History (USNM). Label data from these specimens have been recorded and deposited in the Mississippi Entomological Museum.

RESURRECTION OF *CATASTEGA*

In 1862 Brackenridge Clemens erected the genus *Catastega* for *aceriella* and *timidella,* based solely on larval habits. Larvae incorporate frass with silk to form serpentine tubes on the underside of leaves (Fig. 1), similar to some Gelechiidae and Pyralidae. The tubes and feeding area are covered by a loose web of silk, which causes the leaf to crumple as larvae mature. The family placement was uncertain until H. G. Dyar reared an adult of *C. timidella,* which was determined to be a tortricid (Busck 1903). Heinrich (1923) treated *Catastega* as a synonym of *Epinotia* and described *E. marmoreana,* which is transferred to *Catastega* here.

Catastega is characterized as follows: forewing usually with well developed pretornal triangular spot, often with reticulations between fascia, costal strigulae present or absent, male costal fold present or absent; male genitalia with uncus bifid, socii broad, setose, ventrally fused with bases of gnathos, anellus not closely surrounding base of aedeagus, often cuplike, valva with saccular spine cluster, cucullus poorly defined or delimited by deep ventral invagination; female with lamella postvaginalis reduced, lamella antevaginalis developed and forming conelike sterigma around ostium, ductus bursae with sclerotized band posterior to inception of ductus seminalis, two signa present.

The previous inclusion of *Catastega* with *Epinotia* was based on plesiomorphic characters that also are present in some Olethreutini, such as *Omiostola* Meyrick: uncus well developed and bifid, socius broadly joining tegumen, valva with a saccular spine cluster. The male anellus and female sterigma are apomorphic for *Catastega.*

Although *Catastega* is known to occur only in North America, the genus appears to be closely related to *Pseudacroclita* Oku, which is endemic to Japan. Larvae of the latter genus also spin a tubular nest

FIG. 1. Larval feeding tube (arrow) of *Catastega aceriella* on *Acer* sp., Ithaca, New York.

covered by a sparse web on the lower surface of leaves. Female genitalia of the type species, *P. hapalaspis* (Meyrick), are very similar to *Catastega* species, but the male differs in having a short, broad uncus, and a different form of aedeagus and valva (Oku 1979).

Catastega Clemens, revised status

Catastega Clemens (1861 [1862]:86). Type species: *Catastega timidella* Clemens, by subsequent designation (Busck 1903:852).

Catastega aceriella Clemens, revised status
(Figs. 2, 5)

Catastega aceriella Clemens (1861 [1862]:86).
Hedya signatana Clemens (1864 [1865]:514); Miller (1973:222, fig. 41, imago).
Steganoptycha variana Clemens (1864 [1865]:520); Miller (1973:224, fig. 49, imago).
Grapholitha submisana Zeller (1875:294).
Semasia signatana; Fernald (1902 [1903]:462); Felt (1905:168, fig. 24, larval work); Mosher (1916:54).
Gelechia aceriella; Busck (1902 [1903]:515).
Enarmonia aceriella; Fernald (1908:39, 56).
Eucosma sigmatana Barnes & McDunnough (1917:172, misspelling).
Epinotia aceriella; Heinrich (1923:244, fig. 372, ♂ genitalia); MacKay (1959:118, fig. 111, larva), (1962:638); Miller (1973:211); Côté & Allen (1973:463–470, figs. 3–9, egg, larval work, pupa, imago); Johnson & Lyon (1976:178, Pl. 81, figs. a–c, larval work).

Types. *aceriella* description based on larval work; type locality: unknown locality in North America. *signatana*—Holotype, ♂, in ANSP; type locality: Virginia. *variana*—Lectotype, ♀, designated by Miller (1973); in ANSP; type locality: Maine or Easton, Pennsylvania. *submisana*—Lectotype here designated, ♂, "Mass.-Maine? Packard" [green label], genitalia slide BM No. 11597; a lectotype label was previously affixed to the specimen by N. S. Obraztsov, but no formal designation was published; a lectotype label dated 1986 with designation by R. L. Brown has been added to the specimen; in BMNH; type locality: "Maine-Mass.?".

FIGS. 2–4. Imagos of *Catastega* species. **2,** *C. aceriella*, male, Tompkins Co., New York; **3,** *C. marmoreana*, female, Coconino Co., Arizona; **4,** *C. timidella*, male, Tompkins Co., New York.

Distribution. Eastern North America from S Ontario and Nova Scotia to North Carolina and Tennessee, W to Illinois and Minnesota.
Hosts. *Acer* spp.
Material examined. Types of *signatana, variana, subnisana*; 91 ♂, 36 ♀ (AMNH, ANSP, BMNH, CNC, CU, INHS, JGF, RLB, UCB, USNM).

Catastega marmoreana Heinrich, new combination
(Figs. 3, 6)

Epinotia marmoreana Heinrich (1923:222, fig. 349, ♂ genitalia).

Type. Holotype, ♂, USNM Type No. 24852, genitalia slide "CH 2 Nov. 1920"; in USNM. Type locality: Stockton, Utah.
Distribution. Western United States from N Arizona and New Mexico to S Wyoming.
Host. Unknown.
Material examined. ♂ Type, 15 ♂, 29 ♀ (AMNH, INHS, JGF, LACM, USNM).

Catastega timidella Clemens, revised status
(Figs. 4, 7)

Catastega timidella Clemens (1861 [1862]:96).
Gelechia timidella; Busck (1902 [1903]:518).
Enarmonia timidella; Fernald (1908:39).
Epinotia timidella; Heinrich (1923:223, fig. 373, ♂ genitalia); MacKay (1962:638, fig. 7, larva); Miller (1973:224).

Type. *timidella* description based on larval work; type locality: St. Paul, Minnesota?
Distribution. Eastern North America from S Canada to Virginia, W to Illinois and Minnesota; British Columbia (probable introduction).
Hosts. *Quercus* spp.
Material examined. 71 ♂, 50 ♀ (AMNH, ANSP, CNC, CU, INHS, JGF, LACM, RLB, UCB, USNM).

Discussion

The three described species are differentiated easily by wing pattern. *Catastega timidella* and *C. aceriella* cannot be separated easily by characters of male genitalia. The female *C. aceriella* has sternum VII without rugae, tergum VIII and papillae anales narrower, and sterigma

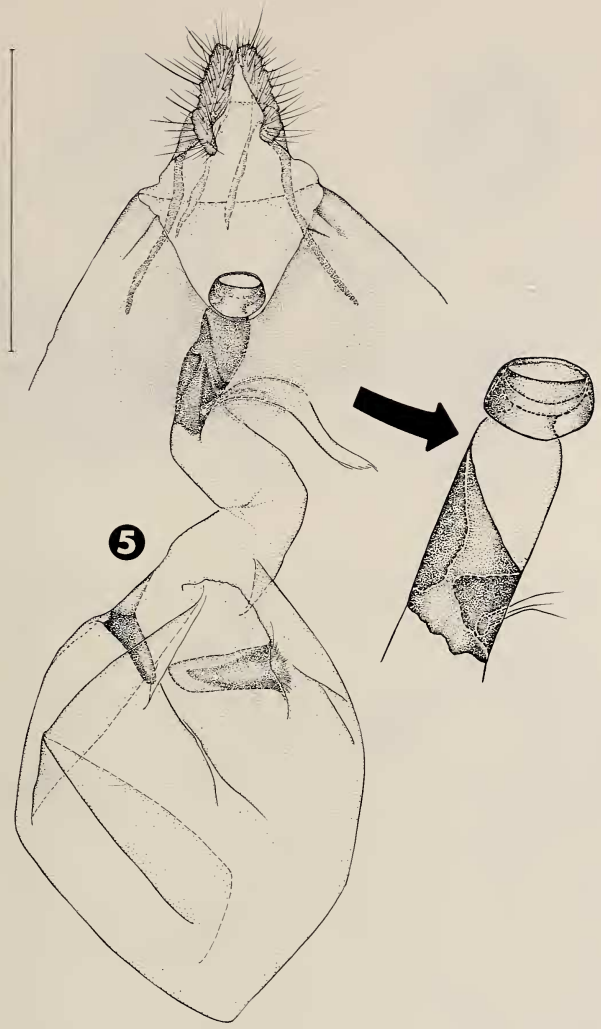
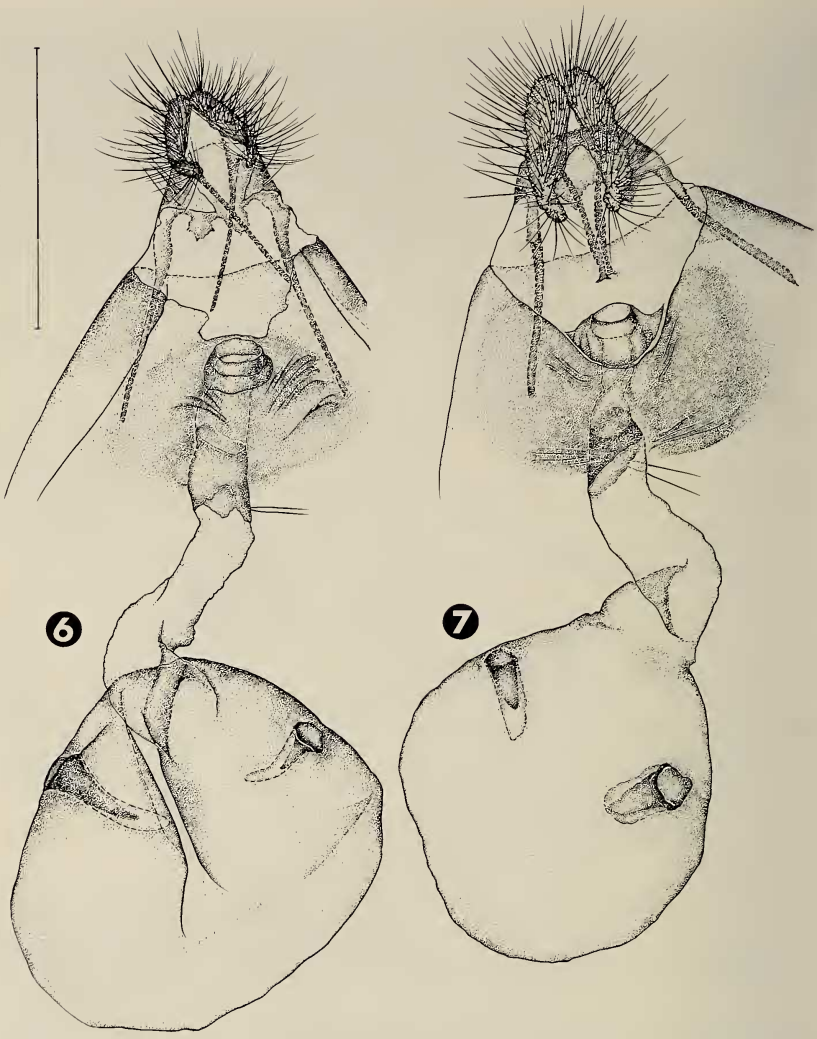


FIG. 5. Female genitalia of *Catastega aceriella*, Pittsburgh, Pennsylvania, USNM slide 17600, with sterigma and ductus bursae enlarged. Scale line = 1 mm.

more rounded than *C. timidella*. Both sexes of the western *C. marmoreana* differ greatly from eastern species, especially in shape of male valva and female sterigma. More than 10 undescribed species occurring in SW United States and Mexico and at least one new species in E United States have been collected recently. These will be described when additional material becomes available; some are represented by only one sex.



FIGS. 6, 7. Female genitalia of *Catastega* species. **6,** *C. marmoreana,* Colorado Springs, Colorado, RLB slide 471 (INHS); **7,** *C. timidella,* Aweme, Manitoba, RLB slide 523 (CNC). Scale line = 1 mm.

REVISION OF THE *EPINOTIA VERTUMNANA* SPECIES-GROUP

The *E. vertumnana* species-group of Eucosmini includes six species of grayish brown moths, all of which occur E of the Rocky Mountains in North America. Species in this group are the most difficult to identify among all *Epinotia* because of obscure and variable forewing fasciae in most, and similarity of color pattern and male genitalia among

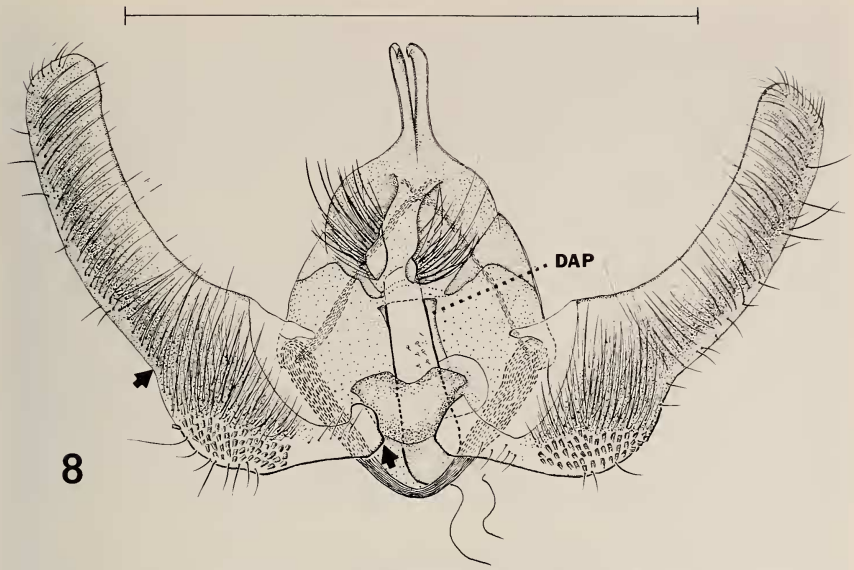


FIG. 8. Male genitalia of *Epinotia vertumnana*, Dallas, Texas, RLB slide 1155 (MCZ). DAP, dorsal anellar plate; length of sacculus measured as straight line between arrows. Scale line = 1 mm.

some. Of the six treated here, five were misidentified in the last revision of North American Eucosmini (Heinrich 1923).

Imagos of this group are among the first tortricids to fly during early spring, and are often collected with *Pseudexentera* and *Chimoptesis*. *Epinotia* can be separated from the latter two genera and other Eucosmini by the following genital characters: in the male, uncus developed, socius arising laterally rather than dorsally from tegumen, gnathos usually not fused medially, anellus usually closely surrounding aedeagus and extended dorsally as an anellar plate; and in the female, sternum VII not fused with sterigma and not posteriorly invaginated around ostium, lamella antevaginalis reduced, and ductus bursae with sclerotized, denticulate band or plate near inception of ductus seminalis.

Species in the *vertumnana* group share the following characters: length of third segment of labial palpus less than half the length of second; scales of head, tegulae, and mesonotum concolorous with forewing ground color; forewing outer margin straight, forming an acute angle with costal margin; male costal fold present or absent, enclosing hair pencils; hindwing light grayish brown, without contrasting colors; in the male, uncus bifid from near base; socius arising from bulbous expansion of tegumen, elongate, apically rounded, setose on dorsal

margin from apex to base of uncus; gnathos arising from tegumen and base of socius, heavily sclerotized basally; aedeagus moderately long and stout; anellus closely surrounding aedeagus basally, divergent apically; caulis of juxta V-shaped in cross-section; valva with well defined saccular spine cluster; cucullus not well defined nor delimited by neck; in the female, sternum VII with medial area more lightly sclerotized than lateral areas, without depressions and microtrichia; tergum VIII setose, without scales; lamella postvaginalis with microtrichia present medially, setose laterally; ductus bursae spiraled, medial sclerotized band encircling ductus bursae much wider on one side than other; two signa present. Species of the *vertumnana* group can be separated easily from other *Epinotia* by the grayish brown forewings with acute apex and poorly defined fasciae, the form of bifid uncus, the valva with a well defined saccular spine cluster and poorly defined cucullus (Fig. 8), and in the female, by the lightly sclerotized medial line of sternum VII and form of the sterigma.

Epinotia zandana (Kearfott)
(Figs. 9, 10, 18, 19, 26)

Eucosma zandana Kearfott (1907:25).
Eucosma peristicta Meyrick (1912:34, invalid replacement name).
Epinotia atristriga Clarke (1953:228). **NEW SYNONYMY.**

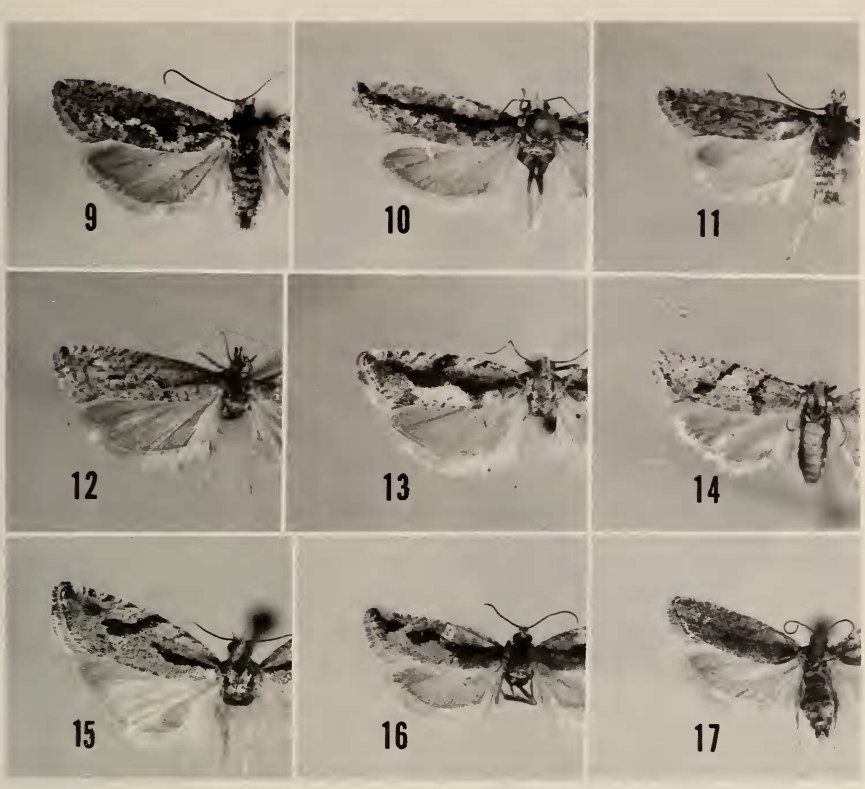
Adult. ♂ Types, *zandana*, *atristriga*; 58 ♂, 48 ♀ examined (AMNH, ANSP, CNC, CU, ECK, JRH, INHS, KSU, MSU, RLB, UCB, USNM).

Forewing (Figs. 9, 10). FWL: 6.0–8.5 mm; length of costal fold 0.42–0.46 FWL (12n); most specimens dark grayish brown peppered with variable number of white or white-tipped scales, white scales usually forming a longitudinal sinuate line on inner marginal half; some specimens with narrow, brown, subbasal and median fasciae, median fascia interrupted near CuA1 to form pretornal triangular spot; some specimens with brown, continuous or interrupted, longitudinal streak from base to apex.

Male genitalia (Figs. 18, 19). Width of uncus at bifurcation 0.44–0.48 greatest width of juxta; dorsal anellar plate with straight lateral margins, apically curved outward; aedeagus with 9–11 cornuti (5n); valva abruptly narrowed beyond sacculus, cucullus much longer than sacculus; saccular spine cluster rounded. Twenty-three preparations examined (AMNH, CNC, ECK, MSU, UCB, USNM).

Female genitalia (Fig. 26). Tergum VIII with row of setae on posterior margin, bare medially, anterior margin with rounded medial notch; papillae anales large, with dense setae and microtrichia, facing laterally, subequal in width anteriorly and posteriorly; length of anterior apophyses 1.0–1.1 length of posterior apophyses (7n); posterior margin of sterigma straight to slightly concave; bursa seminalis without spinules; width of posterior signum 1.7–2.7 width of anterior signum (8n). Twenty-one preparations examined (ANSP, CNC, INHS, MSU).

Types. *Eucosma zandana*—Lectotype, ♂, genitalia slide by Klots, 26 Oct. 1941; designated by Klots (1942); in AMNH. Type locality: Cincinnati, Ohio. *Epinotia atristriga*—Holotype, ♂, genitalia slide CH#1, 13 Aug. 1940; in USNM. Type locality: Putnam Co., Illinois. The *zandana* lectotype is similar to the specimen in Fig. 9; the *atristriga* holotype is similar to the specimen in Fig. 10. The *atristriga* holotype is labeled as collected on 24 March 1938, rather than 17 March 1938, as given in error by Clarke (1953). The female genitalia illustrated by Clarke for *atristriga* are those of *E. laracana*.



FIGS. 9–17. Imagos of *Epinotia* species. **9,** *E. zandana*, female, no data; **10,** *E. zandana*, male, Ottawa, Ontario; **11,** *E. bicordana*, male, Aweme, Manitoba; **12,** *E. laracana*, male, Dallas, Texas; **13,** *E. laracana*, female, Ottawa, Ontario; **14,** *E. xandana*, female, Cincinnati, Ohio; **15,** *E. sotipena*, female paratype, Ithaca, New York; **16,** *E. vertumnana*, female, Merivale, Ontario; **17,** *E. vertumnana*, female, Clifton Springs, New York.

Geographical distribution and flight times. S Ontario and Quebec (24 Mar.–29 Apr.) to Massachusetts (16 Mar.–1 May), W to Michigan (21 Mar.–13 Apr.), and S to Arkansas (4–13 Mar.) and E Texas (17 Feb.–10 Mar.).

Host. *Crataegus* sp. (one specimen reared by T. N. Freeman in Ontario).

Discussion. Specimens that Heinrich (1923) treated as *E. zandana* are conspecific with the lectotype of *E. vertumnana*. Most specimens of *E. zandana* can be differentiated from other members of the species group by the darker color of the forewings. This species is easily identified by the broad base of uncus, rounded saccular spine cluster of valva, and cucullus that is much longer than the sacculus. The female is distinctive in having broad papillae anales with dense setae and microtrichia, and can be identified without dissection. The short ovipositor (with posterior and anterior apophyses subequal in length) and

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the densely setose papillae anales suggest that eggs are not inserted into crevices or buds, in contrast to the inserting form of ovipositor with reduced papillae anales (Figs. 30, 31). The papillae anales of many females have debris packed between setae.

Epinotia bicordana Heinrich
(Figs. 11, 20, 27)

Epinotia bicordana Heinrich (1923:220, fig. 368).

Adult. ♂ Type, 12 ♂, 7 ♀ examined (AMNH, CNC, USNM).

Forewing (Fig. 11). FWL: 6–7 mm; costal fold absent; basal third of costa rolled dorsally and slightly posteriorly; uniformly grayish brown, some specimens with narrow, dark grayish brown subbasal and median fasciae.

Male genitalia (Fig. 20). Width of uncus at bifurcation 0.24 greatest width of juxta (1n); dorsal anellar plate with sinuate lateral margins; aedeagus with six cornuti (1n); valva abruptly narrowed beyond sacculus, cucullus much longer than sacculus; saccular spine cluster elongate. Two preparations examined (AMNH, USNM).

Female genitalia (Fig. 27). Tergum VIII with 1–2 rows of setae on posterior margin, anterior margin W-shaped, median notch acute; papillae anales large, facing ventrally, posterior cleft shallow, subequal in width anteriorly and posteriorly; posterior and anterior apophyses subequal in length; posterior margin of lamella postvaginalis slightly sinuate; bursa seminalis without spinules; width of posterior signum 1.6 width of anterior signum. One preparation examined (CNC).

Type. Holotype, ♂, genitalia slide "#5, Jan. 30, 1920"; in AMNH. Type locality: Aweme, Manitoba.

Geographical distribution and flight times. Known only from Aweme, Manitoba (26 Mar.–27 Apr.).

Host. Unknown.

Discussion. This species is superficially similar to uniformly colored individuals of *E. zandana* and *E. vertumnana*. Males of *E. bicordana* differ from males of all related species in lacking a forewing costal fold. The female can be easily identified by the combination of the W-shaped anterior margin of tergum VIII, and the broad, ventrally facing papillae anales. Debris was absent on the papillae anales of the single female examined.

Epinotia xandana (Kearfott)
(Figs. 14, 21, 28)

Paedisca vertumnana; Zeller (1875:310, part, var. c).
Eucosma xandana Kearfott (1907:24).
Eucosma atacta Meyrick (1912:34, invalid replacement name).

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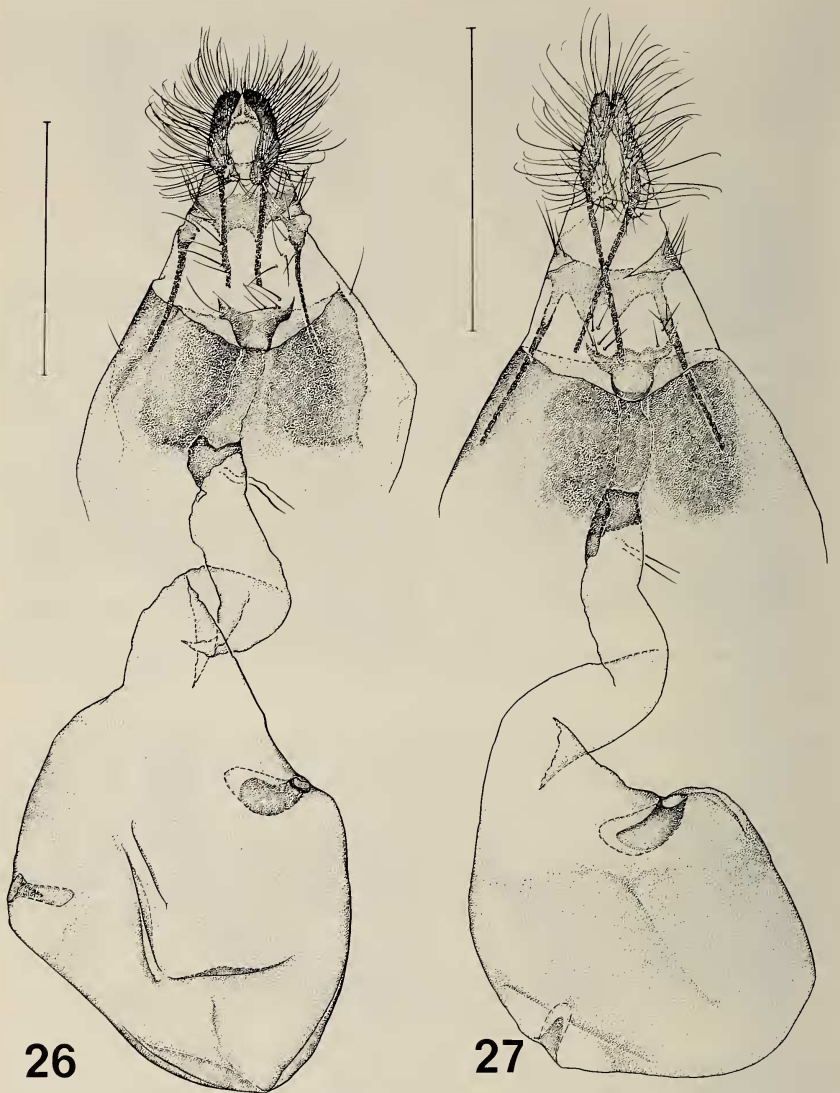
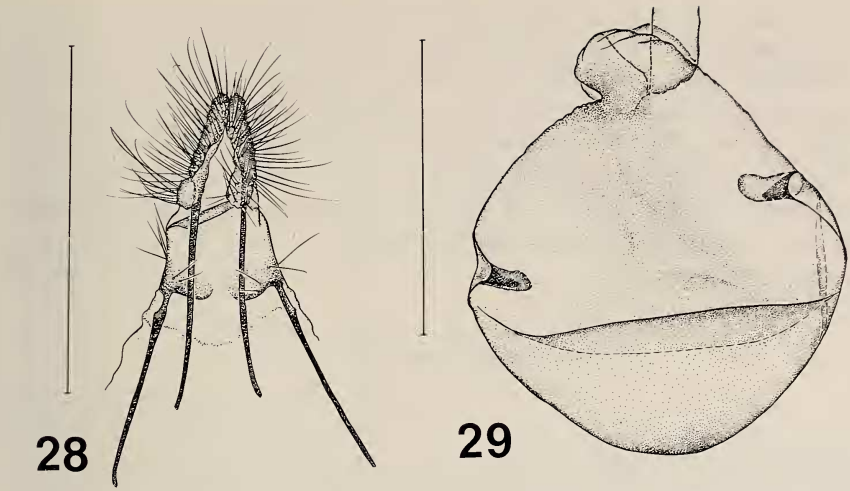
FIGS. 18–25. Male genitalia of *Epinotia* species. **18,** *E. zandana*, Putnam Co., Illinois, JFGC 10564 (USNM); **19,** *E. zandana*, Cincinnati, Ohio, Klots 26 Oct. 1941, lectotype (AMNH); **20,** *E. bicordana*, Aweme, Manitoba, USNM 17668; **21,** *E. xandana*, New Brighton, Pennsylvania, CH 8 Oct. 1924 (USNM); **22,** *E. vertumnana*, Merivale, Ontario, RLB slide 569 (CNC); **23,** *E. sotipena*, Cincinnati, Ohio, RLB slide 575 (ANSP); **24,** *E. laracana*, Dallas, Texas, RLB slide 573 (MCZ); **25,** *E. laracana*, Cincinnati, Ohio, USNM slide 17719.



FIGS. 26, 27. Female genitalia of *Epinotia* species. **26,** *E. zandana*, Cincinnati, Ohio, RLB slide 453 (ANSP); **27,** *E. bicordana*, Aweme, Manitoba, RLB slide 552 (CNC). Scale lines = 1 mm.

Epinotia xandana; Heinrich (1923:204, as synonym of *vertumnana*), (1929:15).
Eucosma yandana Kearfott (1907:25).
Eucosma nothrodes Meyrick (1912:34, invalid replacement name).
Epinotia yandana; Heinrich (1923:206, fig. 369), (1929:15, as synonym of *xandana*).

Adult. ♂ Types, *xandana*, *yandana*; 15 ♂, 18 ♀ examined (AB, ANSP, JRH, RLB, CNC, LACM, MEM, USNM).



FIGS. 28, 29. Female genitalia of *Epinotia* species. **28,** *E. xandana,* eighth segment and papillae anales, Cincinnati, Ohio, RLB slide 462 (CNC); **29,** *E. laracana,* corpus bursae, Dallas, Texas, RLB slide 458 (MCZ).

Forewing (Fig. 14). FWL: 6.0–8.0 mm; length of costal fold 0.33–0.38 FWL (5n); grayish white or dark grayish brown with brown subbasal and median fasciae, some specimens with scattered brown scales forming reticulations between fascia.

Male genitalia (Fig. 21). Width of uncus at bifurcation 0.25–0.27 greatest width of juxta (2n); dorsal anellar plate with straight to slightly sinuate lateral margins, not expanded apically; aedeagus with eight cornuti (1n); valva abruptly narrowed beyond sacculus; saccular spine cluster elongate. Five preparations examined (ANSP, RLB, USNM).

Female genitalia (Fig. 28). Tergum VIII sclerotized laterally, forming two narrow tergites, with irregular row of setae on posterior margins of tergites, anterior margin of each tergite straight, forming acute angle with anterior apophyses; papillae anales as in *bicordana,* except slightly less setose; length of anterior apophyses 0.88–0.97 length of posterior apophyses (4n); posterior margin of sterigma concave; seminalis bursae without spinules; width of posterior signum 2.0–2.2 width of anterior signum (3n). Six preparations examined (ANSP, CNC, RLB, USNM).

Types. *Eucosma xandana*—Lectotype, ♂, genitalia CH 15 Dec. 1919. Type locality: Cincinnati, Ohio. *Eucosma yandana*—Lectotype, ♂, genitalia slide "CH June 17, 1924". Type locality: New Brighton, Pennsylvania. Both lectotypes designated by Klots (1942); in AMNH.

Geographical distribution and flight times. Western Pennsylvania and Ohio (3 Mar.–12 Apr.) to N Mississippi (21–24 Feb.), and E Texas (27 Feb.).

Host. Unknown.

Discussion. The grayish white forewing was thought to distinguish this species from all others. Dark specimens recently collected with grayish white specimens in Mississippi are similar in fasciae, reticulated lines between fasciae, length of forewing costal fold, and in male and female genitalia. A uniformly dark female in poor condition is among the co-types of Zeller's *Paedisca vertumnana,* and the partially damaged genitalia suggest it should be assigned to this species. These dark specimens indicate a degree of variation similar to that in related species;

this species differs from others in having a light form with transverse fasciae rather than a longitudinal dark streak. The female is similar to *E. zandana* and *E. bicordana* in having papillae anales that are not reduced, and posterior and anterior apophyses that are subequal in length; it resembles *E. vertumnana*, *E. laracana*, and *E. sotipena* in having the tergum reduced to lateral tergites. The papillae anales of some females are covered with debris, similar to *E. zandana*. The male genitalia are similar to those of *E. vertumnana*, but differ in having a narrower uncus, a dorsal anellar plate not expanded apically, and a wider saccular spine cluster.

Epinotia laracana (Kearfott)
(Figs. 12, 13, 24, 25, 29)

Proteopteryx laracana Kearfott (1907:45).
Proteopteryx navalis Meyrick (1912:34, invalid replacement name).
Paedisca vertumnana Zeller (1875:310, part, var. e, f).
Epinotia vertumnana; Heinrich (1923:204, part, inc. fig. 371).
Epinotia atristriga; Clarke (1953:228, part, fig. 3b).
Paedisca celtisana Riley (1881 [1882]:319); Fernald (1902 [1903]:459, as *Eucosma*); Heinrich (1923:204, as synonym of *vertumnana*). **REVISED SYNONYMY.**

Adult. ♀ Type *laracana*, ♂ type, *celtisana*; 22 ♂, 48 ♀ examined (AMNH, ANSP, CNC, ECK, INHS, MCZ, MEM, MSU, RLB, USNM).

Forewing (Figs. 12, 13). FWL: 6.1–7.2 mm; length of costal fold 0.39–0.45 FWL (20n); light grayish brown to grayish brown intermixed with variable amounts of white or white-tipped scales; narrow to broad brown subbasal fascia extending from middle of discal cell to inner margin; narrow to broad brown median fascia usually extending from costa to CuA1, usually widened in discal cell; brown preapical and apical spots present or absent; most specimens with longitudinal streak between wing base and basal fascia, some specimens with sinuate, longitudinal streak between wing base and basal fascia, some specimens with sinuate, longitudinal streak extending from base through subbasal and median fasciae to preapical spot, some longitudinally streaked specimens with large, white spot at middle of inner margin (Fig. 13); some specimens suffused with grayish orange between median fascia and apex.

Male genitalia (Figs. 24, 25). Width of uncus at bifurcation 0.26–0.35 width of juxta; dorsal anellar plate with sinuate lateral margins; aedeagus with 14–17 cornuti (13n); valva tapered or narrowed near middle, length of cucullus less than or subequal length of sacculus; saccular spine cluster elongate. Thirty-seven preparations examined (AMNH, CNC, ECK, MCZ, MSU, MEM, RLB, USNM).

Female genitalia (Fig. 29). Tergum VIII as in *xandana*; papillae anales reduced, posterior half facing ventrally, anteriorly narrowed and facing laterally; length of anterior apophyses 0.70–0.79 length of posterior apophyses (28n); posterior margin of lamella postvaginalis V-shaped, acutely angled; bursa seminalis with sparse, small spinules; width of posterior signum 1.0–1.4 width of anterior signum (25n). Thirty-two preparations examined (AMNH, BM, CNC, ECK, MCZ, MSU, USNM).

Types. *Proteopteryx laracana*—Lectotype, ♀, designated by Klots (1942); in AMNH. Type locality: Cincinnati, Ohio. *Paedisca celtisana*—Holotype, ♂, in USNM. Type locality: Dallas, Texas. *E. laracana* was described from 13 specimens, 8 of which are *E. vertumnana*.

Geographical distribution and flight times. Southern Ontario (26 Apr.) to E Pennsylvania (19 Apr.), W to Wisconsin (20 May), and S to central Mississippi (8 Mar.) and E Texas (10 Feb.).

Host. *Celtis* (holotype of *celtisana*).

Discussion. Identities of *E. laracana*, *E. vertumnana*, and a new species, *E. sotipena*, have been confused frequently. Males of *E. laracana* can be identified by characters including forewing maculation (Figs. 12, 13), more tapered valva, aedeagus with 14–17 cornuti (more than any related species), and dorsal anellar plate with sinuate lateral margins. Females are distinctive among related species in having signa subequal in width. *E. laracana* appears to have a flight period concurrent with *E. sotipena*, and slightly later in the spring than *E. vertumnana*.

Epinotia sotipena Brown, new species
(Figs. 15, 23, 31)

Proteopteryx laracana Kearfott (1907:45, part).
Epinotia laracana; Heinrich (1923:204).

Adult. 21 ♂, 45 ♀ examined (AMNH, ANSP, CNC, CU, INHS, JGF, JRH, RLB, USNM).

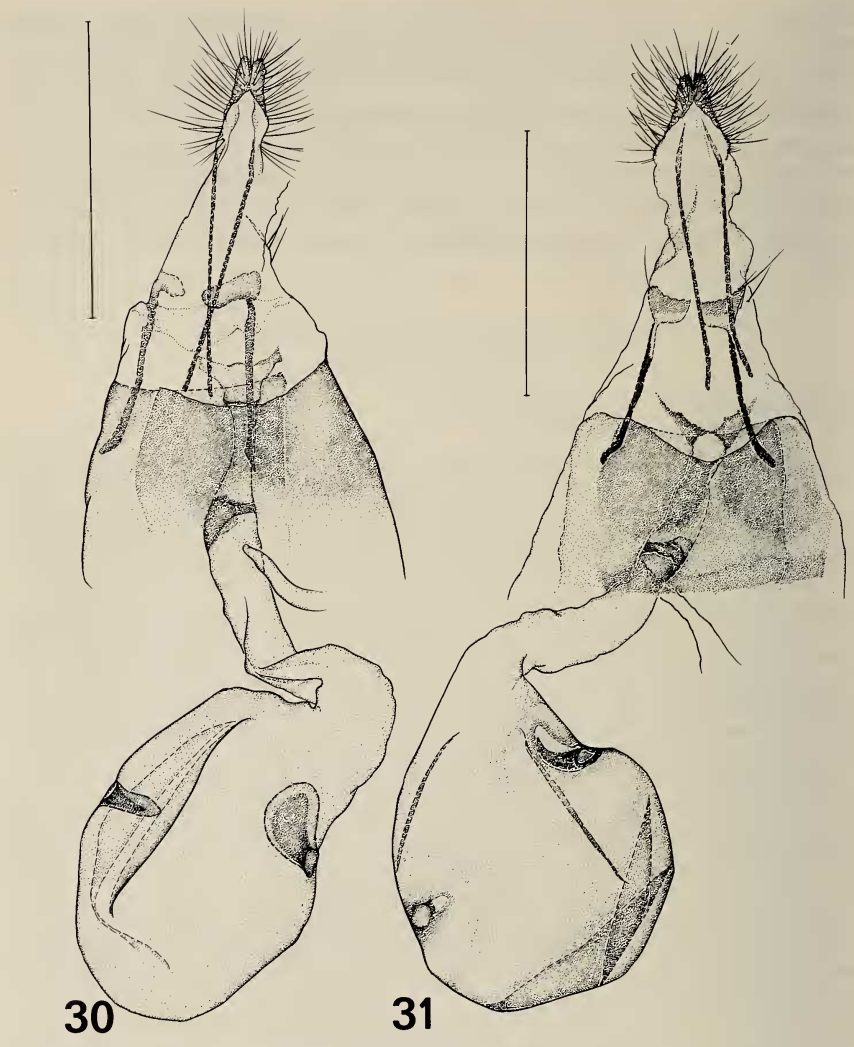
Forewing (Fig. 15). FWL: 5.8–8.2 mm; length of male costal fold 0.31–0.35 FWL (15n); light grayish brown intermixed with variable amounts of white or white-tipped scales; brown basal streak extending from base to 0.39–0.45 FWL; curved, brown, median fascia extending from costa to CuA1; brown preapical spot present or absent, confluent with median fascia in some specimens; small, brown apical spot present or absent, confluent with preapical spot in some specimens, strigulae on basal third and apical third of costa, basal row of outer marginal scales, and scattered scales in tornus dark grayish brown, most specimens suffused with grayish orange between median fascia and apex, some specimens also suffused with grayish orange between base and median fascia.

Male genitalia (Fig. 23). Width of uncus at bifurcation 0.24–0.30 greatest width of juxta; dorsal anellar plate and valva as in *laracana*; aedeagus with 12–14 cornuti; saccular spine cluster elongate. Nine preparations examined (ANSP, CNC, INHS, JGF, USNM).

Female genitalia (Fig. 31). Tergum VIII as in *E. xandana*, except lateral tergites narrowed medially, anterior margin of each tergite forming obtuse angle with anterior apophyses; papillae anales as in *E. laracana*; length of anterior apophyses 0.60–0.69 length of posterior apophyses; lamella postvaginalis as in *E. laracana*; bursa seminalis with dense, large spinules; width of posterior signum 2.0–3.3 width of anterior signum (5n). Nine preparations examined (CNC, INHS, USNM).

Holotype. ♀, Plummers Id. [Island], Md. [Montgomery Co., Maryland], 7-IV-62, R. W. Hodges. U.S.N.M. Type No. 76280; in USNM. Data given as on the label except for bracketed information. Specimen is not dissected, is in excellent condition, and has a forewing length of 7 mm.

Paratypes. *Arkansas:* Johnson Co., 9 mi [14.5 km] N Clarksville, 11 Mar. 1985, R. L. Brown (1 ♂, genit. slide RLB 1425). *Illinois:* Putnam Co., 1 May 1937 (1 ♀, genit. slide USNM 17718), 2 Apr. 1939 (1 ♂, genit. slide RLB 446), 5 Apr. 1939 (1 ♂, genit. slide CH 13 Aug. 1940, #3), 9 Apr. 1939 (1 ♀), 14 Apr. 1940 (1 ♂), 21 Apr. 1940 (1 ♀, genit. slide RLB 456), 28 Mar. 1943 (1 ♀, genit. slide RLB 166). *Maryland:* same data as Holotype (2 ♂, 2 ♀, ♀ genit. slide USNM 17674). *Missouri:* Jackson Co., Independence, 12 Apr. 1969, J. R. Heitzman (1 ♂), Kansas City, 13 Apr. 1969 (1 ♂); Jasper Co., Sarcoxie, city limits, open field, 15 Apr. 1975, R. Letsinger (1 ♀). *New York:* Tompkins Co., Ithaca, Six Mile Creek, 20 Apr. 1957, J. G. Franclemont (1 ♂, 1 ♀, ♂ genit. slide JGF 4478), 22 Apr. 1957 (1 ♂), 24 Apr. 1957 (1 ♂, 1 ♀), 26 Apr. 1957 (1 ♀), 25 Apr. 1959 (2 ♂, 3 ♀, ♂ genit. slide RLB 576), 16 Apr. 1960 (1 ♀), 7 May 1961 (1 ♀), same data except R. W. Hodges, 18 Apr. 1959 (1 ♀), 27 Apr. 1961 (1 ♀, genit. slide USNM 17617), 7 May 1961 (1 ♂, 3 ♀), 12 May 1961 (1 ♀), Buttermilk Falls, Apr. 1920 (1 ♂). *Ohio:* Hamilton Co, Cincinnati, 19 Mar. 1903, Annette F. Braun (2 ♀, genit. slide CNC Epi. 12), 26 Mar. 1903 (1 ♀), 15 Apr. 1904 (1 ♀), 17 Mar. 1905 (1 ♂, genit. slide CNC 12), 3 Apr. 1906 (2 ♂, 9 ♀), 20 Mar. 1904



FIGS. 30, 31. Female genitalia of *Epinotia* species. **30,** *E. vertumnana,* St. Davids, Ontario, RLB slide 460 (CNC); **31,** *E. sotipena,* paratype, Putnam Co., Illinois, USNM slide 17718.

(1 ♂, genit. slide RLB 575); Warren Co., 15 Mar. 1935, Annette F. Braun (1 ♀). *Pennsylvania:* Beaver Co., New Brighton, 12 Apr. 1902, H. D. Merrick (1 ♀), 15 Apr. 1902 (2 ♀), 3 Apr. 1903 (1 ♂, genit. slide USNM 17675), 10 May 1907 (1 ♀); Dauphin Co., Rockville (1 ♂, 1 ♀, ♂ genit. slide CH 29 Oct. 1921, #2). *Ontario:* Ottawa East, 29 Apr. 1944, J. McDunnough (1 ♀, genit. slide RLB 447). *Quebec:* Chelsea, 24 Apr. 1933, G. S. Walley (1 ♀), 21 Apr. 1933, J. McDunnough (1 ♀, genit. slide RLB 450), Old Chelsea, 3 May 1939, T. N. Freeman (1 ♀). Paratypes are deposited in collections listed in the material examined for the adult, and in BMNH.

Host. Unknown.

Discussion. Male genitalia of this superficially distinctive species are similar to those of *E. laracana*. Both species have valvae that intergrade in form from gradually narrowed to somewhat abruptly narrowed, although the abruptness of narrowing is less in both than in *E. vertumnana*. Width of uncus relative to juxta is usually greater in *E. laracana* than in *E. sotipena*. The aedeagus has 14–17 cornuti in *E. laracana* and 12–14 in *E. sotipena*. Males of the two species are easily separated by length of the costal fold relative to forewing length, the fold being shorter in *E. sotipena*. Female *E. sotipena* differ from *E. laracana* in having anterior apophyses shorter relative to posterior apophyses, bursa seminalis with large spinules, and posterior signum much wider than anterior signum. Some females have debris on the papillae anales, as in *E. zandana*.

Epinotia vertumnana (Zeller)
(Figs. 8, 16, 17, 22, 30)

Paedisca vertumnana Zeller (1875:310, var. d).
Epinotia zandana; Heinrich (1923:205, fig. 370); Comeau & Roelofs (1973:197); Roelofs & Cardé (1974:98) (not Kearfott).
Epinotia prob. *zandana*; Comeau & Roelofs (1973:194).
Epinotia atristriga Clarke (1953:228, part).
Epinotia atistriga; Comeau & Roelofs (1973:194); Roelofs & Cardé (1974:98) (misspelling and misidentification).
Epinotia atristriga; Roelofs & Brown, 1982:411 (not Clarke, 1953).
Epinotia sp.; MacKay (1959:64).

Adult. ♀ Type; 143 ♂, 117 ♀ examined (AMNH, ANSP, CNC, CU, INHS, MEM, MSU, RLB, UCB, USNM).

Forewing (Figs. 16, 17). FWL (nonreared): 5.5–7.0 mm; length of costal fold 0.36–0.42 FWL (22n); uniformly grayish brown or grayish brown peppered with varying numbers of white-tipped scales, some specimens with discontinuous, dark grayish brown, basal, median, and apical longitudinal streaks or with continuous longitudinal streak; rarely with dark grayish brown, subbasal and median fasciae, and preapical spot.

Male genitalia (Figs. 8, 22). Width of uncus at bifurcation 0.21–0.24 width of juxta (15n); dorsal anellar plate with straight lateral margins, apically curved outwardly; aedeagus with 6–10 cornuti (22n); valva abruptly narrowed beyond sacculus, cucullus distinctly longer than sacculus; saccular spine cluster elongate. Forty-seven preparations examined (CNC, MSU, RLB, USNM).

Female genitalia (Fig. 30). Tergum VIII as in *E. xandana*; papillae anales as in *E. laracana*; length of anterior apophyses 0.67–0.77 length of posterior apophyses (15n); posterior margin of sterigma irregularly concave; bursa seminalis without spinules; width of posterior signum 1.7–2.5 width of anterior signum (14n). Twenty-two preparations examined (AMNH, CNC, CU, RLB, USNM).

Larva. The description of *Epinotia* sp. by MacKay (1959) was based on nine larvae reared from *Crataegus* at St. David's and Merivale, Ontario. Associated adults from both localities are identified here as *E. vertumnana*.

Type. Lectotype here designated: ♀, Dallas, Tex., Boll; *vertumnana* var. d [green, handwritten label]; genitalia slide R. L. Brown 1158 [green label], Type 14336 [red label], Lectotype *Paedisca vertumnana* by R. L. Brown [red bordered label]; in MCZ. The original corroded pin holding the specimen has been clipped and the specimen has been double-mounted on a polyporus block. The specimen is in good condition, except that the right wings are rubbed. The lectotype is similar to the specimen in Fig. 16, except the median and apical streaks are continuous, and the basal streak is narrower.

Geographical distribution and flight times. Southern Ontario and Quebec (19 Mar.–20 Apr.) to E Pennsylvania (14 Mar.–15 Apr.), W to Michigan (23–31 Mar.), and S to N Mississippi (21–24 Feb.) and E Texas. Two males (UCB) tentatively identified as this species were collected during early March in Jefferson Co., Colorado.

Host. *Crataegus* (72n), reared by P. J. Chapman and S. E. Lienk in New York, and in Ontario by W. L. Putnam, T. N. Freeman, and J. McDunnough.

Discussion. Zeller described six varieties (a–f) of this species from an unknown number of specimens collected in Texas by Jacob Boll and one specimen collected by Speyer in New York. The type series in MCZ includes two specimens of "var. a", one specimen of "var. c", one specimen of "var. d", five specimens of "var. e", and two specimens of "var. f", all from Dallas, Texas. Specimens of "var. e" and "var. f" are conspecific with *E. laracana*, and "var. c" is identified tentatively as *E. xandana*. The longitudinally streaked "var. d" specimen, designated as lectotype, appears clearly conspecific with specimens reared from *Crataegus*. Specimens of "var. a" tentatively are considered synonymous with the lectotype, but these males differ in having a contrastingly paler inner margin of the forewing.

The unicolorous and fasciate forewing forms of *E. vertumnana* were misidentified by Heinrich (1923) and others as *E. zandana*. Specimens with longitudinally streaked forewings were named by Clarke (1953) as *E. atristriga*, a junior synonym of *E. zandana*. Two male specimens from Colorado have a superficially darker appearance, similar to *E. zandana*, but their genitalia cannot be differentiated from other *E. vertumnana*; collection of females from this area should clarify their identity.

In addition to smaller size and lighter color, *E. vertumnana* differs from *E. zandana* in the male genitalia by having a narrow uncus and an elongate saccular spine cluster, and, in the female, by having reduced papillae anales and long anterior and posterior apophyses. *E. vertumnana* differs from *E. laracana* and *E. sotipena* in having less than 11 cornuti and a dorsal anellar plate with straight lateral margins in the male. Females of *E. vertumnana* differ from those of *E. laracana* in having one signum much wider than the other, and from those of *E. laracana* and *E. sotipena* in having the posterior margin of the lamella postvaginalis irregularly concave rather than acutely angled.

Although the pheromone of *E. vertumnana* has not been identified, males are attracted to cis-7-dodecenyl acetate. Because this species was misidentified as "*Epinotia* sp. prob. *zandana*" and "*E. atistriga*", the attractancy of males to another form of females was considered to be an example of cross-attractancy between species (Comeau & Roelofs 1973). Fortunately, voucher specimens of both forms were retained (CU) and the correct identity now can be established.

ACKNOWLEDGMENTS

I thank Frederick H. Rindge (AMNH), Donald Azuma (ANSP), Bryant Mather, L. L. Pechuman (CU), John G. Franclemont, J. Richard Heitzman, George L. Godfrey (INHS), Edward C. Knudson, Julian P. Donahue (LACM), Margaret K. Thayer (MCZ), Frederick W. Stehr (MSU), Jerry A. Powell (UCB), and Donald R. Davis (USNM) for the loan of specimens. The assistance of Gaden Robinson and Kevin Tuck at the British Museum (Natural History) is appreciated. Photographs of imagos were made by Howard Lyons; drawings by David Adamski (Fig. 8) and Amy Trabka. This research was supported in part by National Science Foundation Grant DEB 77-15808 and a Grant-in-Aid of Research from Sigma Xi, the Scientific Research Society of North America.

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Received for publication 4 August 1986; accepted 10 October 1986.