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THE ZALE SETIPES SPECIES COMPLEX (LEPIDOPTERA: NOCTUIDAE)

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ABSTRACT. The *setipes* complex of the noctuid genus *Zale* Hübner is revised. The identity of two species, confused for more than 100 years, is clarified. *Letis incipiens* Walker is removed from the synonymy of *Zale setipes* (Guenée) and elevated to a subspecies of *Z. peruncta* (Guenée). *Z. discisigna discisignata* Draudt is cited as new synonym of *Z. setipes* (Guenée) and *Z. setipes* ♀ f. *postmedialis* Draudt, *Homoptera aemona* Druce (in part), *Zale notipennis* Draudt are new synonyms of *Z. peruncta* (Guenée). The first United States record of typical *Z. peruncta* (Guenée) is listed.

The noctuid genus *Zale* Hübner, as currently recognized, is composed of a large number of moderately large moths, many with a rather similar pattern of cryptic wing maculation. The pattern of maculation is usually composed of numerous irregular transverse or oblique lines, the moths presumably resembling the bark of trees on which the moths may rest. They vary in color from nearly black to pale yellow brown or light gray. A few species, especially some from tropical America, have areas of pale green scaling on the wings, but that color usually fades very rapidly after death to yellow or yellow brown. Identification of species has been difficult in the past and many misidentifications have occurred. Two closely related species, *Zale setipes* (Guenée) and *Z. peruncta* (Guenée) have been confused, misidentified and misnamed since 1869. The purpose of this paper is to indicate the proper application of the names, to describe and illustrate the characters that distinguish the species, to detail the specific geographic distributions and to record *Z. peruncta* (Guenée) from the United States (Texas).

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The two species are very similar in maculation and both species are sexually dimorphic, both males and females of each species more closely resembling the same sex of the other species than the opposite sex of their own species. The dimorphism is expressed in differences in the shape of the forewing and in the pattern of maculation. The males have a narrower forewing, somewhat produced apically, the termen nearly straight or even excavate before tornus, therefore differing from the females and the other species of *Zale* which have broad forewings and a rounded termen. The pattern of maculation of the males approaches that of some species of *Metria* Hübner (= *Safia* Guenée). The females resemble females of other *Zale* species in wing shape and maculation. Examples of *setipes* are consistently larger and have more pale scaling in the postmedial area of the forewing than do examples of *peruncta*. Excellent characters for specific separation exist in the male genitalia and in the shape of the sternal plate of the eighth abdominal segment of the female.

In 1965 the author studied the types and syntypes of *Metria* and *Zale* in the collection of the British Museum (Natural History) in order to correctly identify species from the Antilles and to obtain information necessary for possible future generic revisions. Nearly 80 slides of genitalia, mainly of types, were prepared and the errors in the application of the names, *Zale setipes* (Guenée) and *Zale discisigna* (Walker), were discovered. The types of all the names relating to the *setipes* complex, including the lectotype of *Z. peruncta* (Guenée) which was sent to me at that time from Paris, were studied.

HISTORY

Guenée described *Xylis setipes* (1852, p. 7, Noctuérites Pl. 15, Fig. 6) from a single male from Nova Friburgo, Brazil and *Homoptera peruncta* (1852, p. 9) from 2 specimens without locality. Guenée suggested that one specimen of *peruncta* was a male lacking antennae, but this seems unlikely since he placed the male of *setipes* in a separate genus, *Xylis* Guenée, while placing *peruncta* in *Homoptera* Boisduval with other typical *Zale* species. The lectotype of *peruncta* is a female specimen from the Paris Museum selected by Viette (1951, p. 161). The colored illustration of the type of *setipes* accompanying the original description is excellent.

For a number of years the relationship of *setipes* and *peruncta* and the sexual dimorphism in the complex were not recognized. During that period Walker described males of *peruncta* as *Homoptera ustipennis* ([1858] 1857, p. 1071) and *Letis incipiens* (1858, p. 1266). In 1869 (p.

157) Herrich-Schäffer identified specimens of *peruncta* from Cuba (true *setipes* is not known from the Antilles) as *Xylis setipes* Guenée and the trivial name has since been misapplied by all authors to date. In the collections of the U.S. National Museum and the British Museum (Natural History) the name was likewise misapplied. Möschler (1890, p. 202) listed females in his treatment of "*setipes*," but no discussion of sexual dimorphism was included. He did, however, wonder why the females he studied were only 42–45 mm in expanse whereas the size given for *setipes* in the original description was 55 mm. Butler (1879, p. 41) recognized that Walker's *ustipennis* was related to *setipes* in the statement: "*H. ustipennis*, a *Xylis*." There is no indication as to his specific concept of *setipes*. The sexual dimorphism of the complex had still not been recognized by Druce (1889, p. 341). He utilized *setipes* in the same sense as Herrich-Schäffer and listed *ustipennis* as a separate species from Panamá; both names were placed in *Xylis*. He did not refer to *Homoptera peruncta* Guenée. Females of both species of the complex obviously were present in his series of the new species, *Homoptera aemona*, because he stated: "The specimens from Guatemala are rather larger and are paler in colour than those from the Volcan de Chiriqui. Our figure is taken from one of these latter." In an unexplained action Hampson (1898, p. 250) placed *setipes* in *Polydesma* Boisduval and used *ustipennis* as a form of that combination for examples of *peruncta* from St. Lucia and Grenada. Hampson (1913, pp. 208–210, text figs. 54 and 55) treated both species and provided keys to and illustrations of the males. He placed the generic names *Homoptera* Guenée and *Xylis* Guenée in the synonymy of *Zale* Hübner. The two species of the *setipes* complex (as subgenus *Xylis*) were separated from the other species of *Zale* in the key because the hind tibiae of male are fringed with long hair and the hindwing with termen somewhat excurved at middle, the costa lobed [expanded] at the base. The type of *setipes* now in the British Museum (Natural History) was not available to Hampson as it was not received by that institution until 1928. Unfortunately, Hampson apparently did not check the original description and illustration of *setipes* and continued to use the name incorrectly for *peruncta* which he placed along with all other names of the complex in the synonymy of *setipes* as identified by him. Hampson made another error in treating true *setipes* by calling it *Zale discisigna* (Walker). He thought the worn, damaged female holotype of *Homoptera discisigna* Walker ([1858] 1857, p. 1066) represented the female sex of the large species of the complex. This error was perpetuated in collections and in the literature. *Homoptera discisigna* Walker does

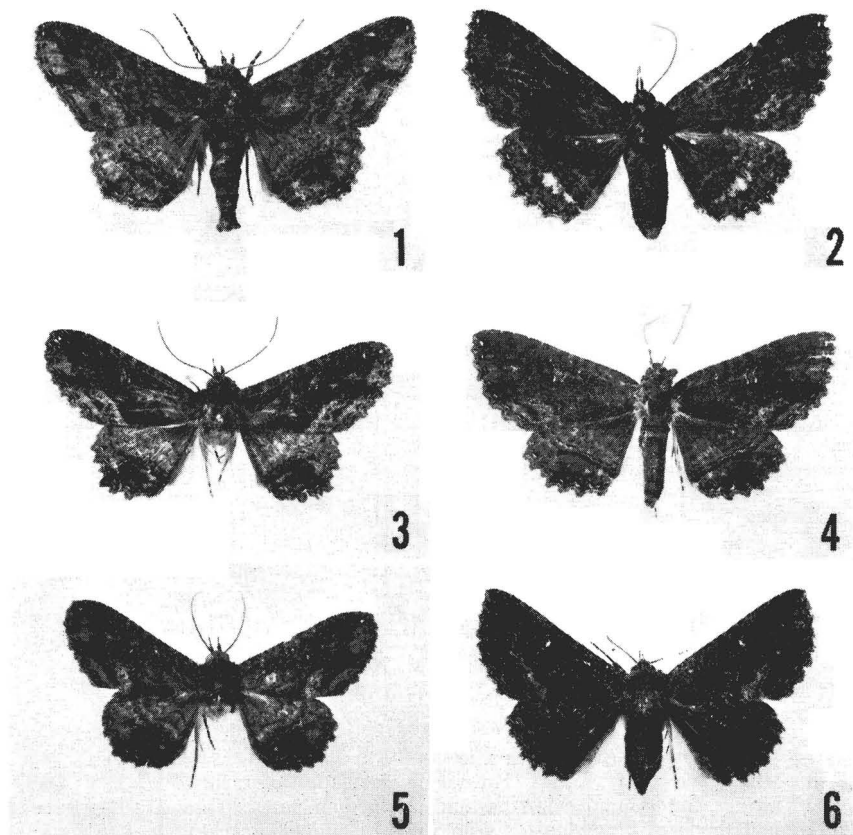
resemble *setipes* somewhat and considering the condition of the type, the error is partially understandable, but *discisigna* is considerably smaller and is not even congeneric. The type of *discisigna* had been studied before by other workers and the species placed in *Peteroma* Schaus or *Barcita* Möschler in collections. Dognin apparently was confused by the use of *Homoptera discisigna* Walker for different species in collections and must have written to William Schaus about the problem. He attached a note from Schaus' reply of June 22, 1922 on a male of *peruncta* from Tucumán, Argentina now in the U.S. National Museum. Schaus informed him that he thought Walker had described two species named *discisigna* and that he believed that the one referable to *Peteroma* was described in "Characters of Lep. Het." Schaus obviously was wrong; no other description by Walker with the trivial name *discisigna* has been located. It seems likely that Schaus's belief in a second description probably developed because *discisigna* was originally described as a *Homoptera* and because Hampson applied the name to a *Zale* species.

SYSTEMATICS

Zale setipes (Guenée) (Figures 1-2, 9 and 12)

- Xylis setipes* Guenée, 1852, p. 7; 1858, Pl. 15 (Noctuérites), Fig. 6.—Walker, 1857, p. 1052.—Druce, 1889, p. 341 (in part).—Möschler, 1890, p. 202 (in part).
Zale setipes (Guenée), Draudt, 1940, Pl. 70, row b (*setipes* ♀).
Xylis ustipennis, Druce not Walker, 1889, p. 342 (in part).—Hampson, 1913, p. 208 (synonym of *discisigna*, Hmps. n.).
Homoptera aemona Druce, 1889, p. 344 (in part).—Hampson, 1913, p. 208 (synonym of *discisigna*, Hmps. n.).
Homoptera discisigna, Druce not Walker, 1890, p. 345 (in part).—Hampson, 1913, p. 208.
Zale discisigna, Hampson not Walker, 1913, p. 208, Fig. 54.—Haimbach, 1928, p. 216.—Draudt, 1940, p. 454 (in part).
Zale discisigna ab. *discisignata* Strand, 1917, p. 43 (= *discisigna* ab. 1 of Hampson. An infrasubspecific name, excluded.).
Zale discisigna discisignata Draudt, 1940, p. 455 (= *discisigna* ab. 1 of Hampson and ab. *discisignata* Strand.) [New synonymy.]

Diagnosis. Length of forewing, male, 24 to 27 mm, average 24.8 mm; female, 23 to 27 mm, average 24.2 mm. Pattern of maculation as illustrated (Figs. 1 and 2). Ground color of male paler than female and males of *Z. peruncta* (Guenée); transverse lines in medial area of forewing distinctly marked; **hindwing of male** with dark subterminal shade between veins M_3 and Cu_2 , reaching termen only at vein M_3 . Maculation of **hindwing of female** variable, with (Fig. 2) or without blue-white postmedial spots, ground color sometimes paler than females of *peruncta*, but usually about the same darkness. **Male genitalia** as illustrated (Fig. 9), apical process of ventral margin of valve rather sigmoid in shape, longer than the thin, rather rectangular apical process of costa of valve. Base of uncus with triangular (apex slightly



Adults of *Zale setipes* complex. Fig. 1, *setipes*, ♂, Chiriqui, Panama; 2, *setipes*, ♀, "Cent. Amer."; 3, *peruncta peruncta*, ♂, Juan Vinas, Costa Rica; 4, *p. peruncta*, ♀, Orizaba, Mexico; 5, *p. incipiens*, ♂, Cuba; 6, *p. incipiens*, ♀, Convento, Dominican Republic.

curved distad) lateral flanges; flanges present also on tegumen, bilobed, the depression between lobes variable in depth and caudal lobe sharp pointed (Fig. 9) or shorter and rounded (Noctuidae genitalia slide No. 5033 of holotype). **Female genitalia** (Fig. 12) with a pair of large rectangular sternal plates present below ostium.

Types. The HOLOTYPE, ♂, of *Xylis setipes* Guenée from Nova Friburgo, Brazil, Noctuidae genitalia slide No. 5033 and the HOLOTYPE of *Zale discisigna discisignata* Draudt, a ♀ from Volcan de Atitlan, [Guatemala], Noctuidae genitalia slide No. 5087, are in the British Museum (Natural History), London, England.

Distribution. The species is known to occur from Mexico to Brazil, but is not known from the West Indies. Specimens from the following localities have been examined. MEXICO: Jalapa; Orizaba. GUATEMALA: Volcan de Atitlan; Chejel; Cayuga; "Guatemala." COSTA RICA: Tuis; Juan Vinas. PANAMA: Chiriqui. COLOMBIA: Pacho, Ost-Cordill. ECUADOR: Jatunyacu, Oriente; Abitagua, Ori-

ente. BRAZIL: Castro, Parana; Rio Janeiro; Petropolis; "Casa Br."; Ponte Nova, Rio Xingu, Amazonas; Nova Friburgo.

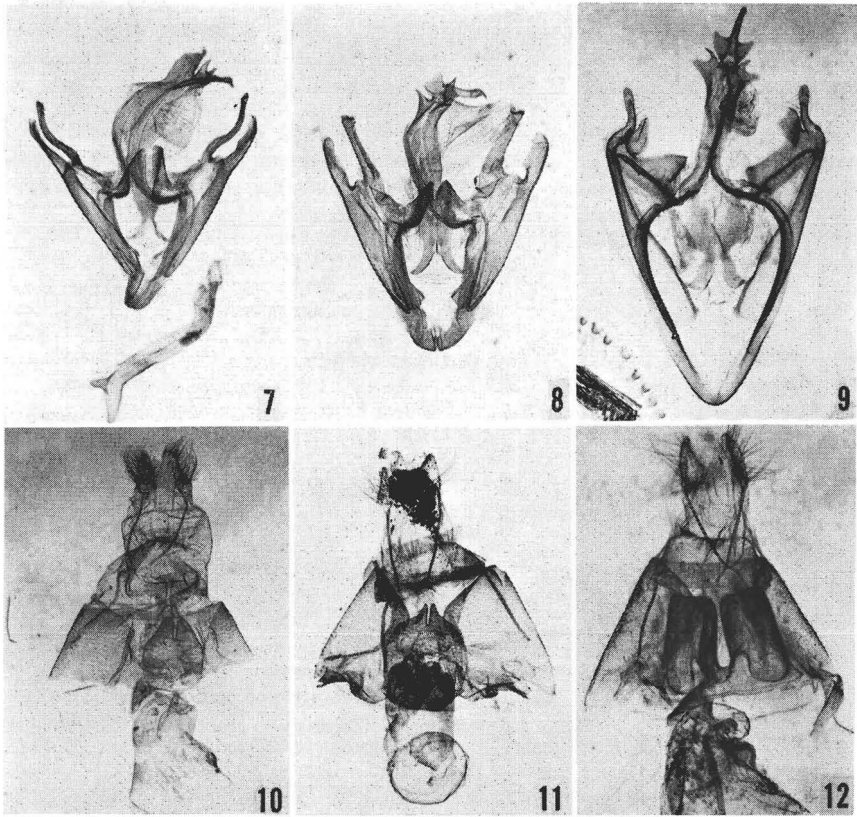
Discussion. The larger size, paler ground color and distinctive male and female genitalia distinguish this species from *Z. peruncta* (Guenée).

Zale peruncta peruncta (Guenée)
(Figures 3-4, 8 and 11)

- Homoptera peruncta* Guenée, 1852, p. 9.—Walker, 1857, p. 1069.—Viette, 1951, p. 161 (Lectotype designation.).
- Xylis setipes*, Gundlach not Guenée, 1881, p. 358 (in part).—Druce not Guenée, 1889, p. 341 (in part).—Möschler not Guenée, 1890, p. 202 (in part).
- Polydesma setipes*, Hampson not Guenée, 1898, p. 250.
- Zale setipes*, Hampson not Guenée, 1913, p. 209, fig. 55 (*peruncta* (Guen.), *ustipennis* (Wlk.), *incipiens* (Wlk.) and *aemona* (Druce) as synonyms).—Wolcott not Guenée, 1923, p. 169; 1936, p. 432; 1951, p. 603.—Haimbach not Guenée, 1928, p. 216.—Draudt not Guenée, 1940, p. 455 (in part).—Schaus not Guenée, 1940, p. 229 (in part).—Biezanko, Ruffinelli and Carbonell not Guenée, 1957, p. 50.
- Zale setipes* ab. *postmedialis* Strand, 1917, p. 43 (= *setipes*, ab. 1 of Hampson. An infrasubspecific name, excluded.).
- Zale setipes* ♀ f. *postmedialis* Draudt, 1940, p. 455, pl. 70, row b (= *setipes*, ab. 1 of Hampson and ab. *postmedialis* Strand). [New synonymy.]
- Homoptera ustipennis* Walker, 1857, p. 1071. [New synonymy.]
- Xylis ustipennis* (Walker), Butler, 1879, p. 41.—Druce, 1889, p. 342 (in part).
- Polydesma setipes* f. *ustipennis* (Walker), Hampson, 1898, p. 250.
- Homoptera aemona* Druce, 1889, p. 344, pl. 31, fig. 3 (in part). [New synonymy.]
- Zale discisigna*, Draudt not Walker, 1940, pl. 70, row 6 (♂, *discisigna*).
- Zale notipennis* (sic) Draudt, 1940, p. 455 (misspelling of *ustipennis* Wlk. ? As synonym of *setipes*, Draudt). [New synonymy.]

Diagnosis. Length of forewing, male, 19 to 23 mm, average 20.4 mm; female, 19 to 23 mm, average 21.7 mm. Pattern of maculation of male (Fig. 3) similar to that of *setipes*, but ground color, particularly median part of forewing darker; dark subterminal shade of hindwing between veins M and Cu reaching termen for most shades width. Female marked and colored as in *setipes*, sometimes slightly darker, hindwing maculation variable as in *setipes*. Male genitalia with process from costa of valve longer than process from ventral margin, the latter slightly clavate or mitten-shaped, both processes (Fig. 8) quite different than in *setipes*. Flanges at base of uncus in typical subspecies nearly rectangular. Flanges of tegumen thornlike, apices slightly recurved. Sternal plate of female genitalia ovoid, caudal margin variable, usually terminating in two short bluntly pointed processes with a prominent narrow medial emargination (Fig. 11), occasionally emargination reduced in length, an extreme example with median caudal lobe that is very weakly emarginate (lectotype of *Homoptera aemona* Druce).

Types. The LECTOTYPE, ♀, of *Homoptera peruncta* Guenée, locality unknown, is in the Muséum National, Paris, France. The HOLOTYPE of *Homoptera ustipennis* Walker, ♂, locality unknown, Noctuidae genitalia slide No. 5091, and the SYNTYPES of *Homoptera aemona* Druce and *Zale setipes* f. *postmedialis* Draudt are in the British Museum (Natural History), London, England. Druce had examples of both this species and true *setipes* in his original series of *aemona* from Mexico, Guatemala, and Panama but did not indicate the number of examples either in total or from the respective countries. He illustrated a specimen, a ♀, from Volcan de Chiriqui, Panama. There are three specimens in the British Museum (Natural History) from that locality. One labeled *Homoptera aemona* Druce, Type ♀, Noctuidae genitalia slide No. 5090 has been selected and is presently designated as LECTOTYPE. The name



Male and female genitalia of *Zale setipes* complex. Fig. 7, *peruncta incipiens*, ♂; 8, *p. peruncta*, ♂ aedeagus not shown; 9, *setipes*, ♂ aedeagus not shown; 10, *p. incipiens*, ♀; 11, *p. peruncta*, ♀; 12, *setipes*, ♀.

postmedialis was proposed for "ab. 1" of Hampson who did not indicate number of specimens or locality. The specimen labeled as type, a female, Noctuidae genitalia slide No. 5088 from Grenada has been selected and is now designated LECTOTYPE.

Distribution. The typical subspecies occurs from southern Texas to Argentina on the continent and in the Antilles from Grenada to Puerto Rico. The specimen from Texas was collected on 27 November 1973 by A. and M. E. Blanchard. It represents a new record for the United States. I have examined specimens from the following localities. TEXAS: Santa Ana Refuge, Hidalgo Co. MEXICO: Jalapa; Misantla; Orizaba; Cordoba; San Cristobal las Casas, Chiapas. COSTA RICA: Tuis; Juan Vinas. PANAMA: Chiriqui. COLOMBIA: Sta. Marta. VENEZUELA: Aroa. ECUADOR: Abitagua, Oriente. BRAZIL: St. Catherines [Santa Catarina]; Alta da Serra, Sao Paulo; Rio Janeiro; Theresopolis. PARAGUAY: Sapucay; "Paraguay." ARGENTINA: Tucuman. GRENADA: Grand Etang; "Grenada." ST. VINCENT: Montreal District. ST. LUCIA: 1.5 mi S. Mt. Gimie; "St. Lucia." DOMINICA: Clarke Hall; Grand Savanne; Pont Casse. VIRGIN ISLANDS: Gallows Point, St. John. PUERTO RICO: 4 mi SE. Ciales; Ciales.

Discussion. This species is smaller than *setipes* and the ground color is slightly darker, especially the median area of the forewing and the subterminal spot between veins M_3 and Cu_{1+2} . The two apical processes of the valve of the male genitalia and the sternal plate of the female genitalia are differently shaped than those structures in *setipes*. This subspecies may be separated from the other subspecies by area of occurrence and by characters of the male and female genitalia discussed in the diagnosis of the atypical subspecies. The species of the *setipes* complex of *Zale* do not appear to be common in most areas judging from the number of examples in collections and from my personal collecting experience. Only at Grand Etang, Grenada, to my knowledge, has a species of the complex been collected in large numbers (personal light trap collecting). Time of year, weather conditions, time of night, collecting locality, and collecting technique may in part explain the reduced captures elsewhere, but I believe some other factor is responsible. A few days later on St. Vincent and then on St. Lucia collecting with traps in apparently similar ecological locations resulted in only a few captured specimens. In a three year survey of Dominica, 1964–1966, eight different collectors collected only four examples of *peruncta*. It is true that traps were not utilized there and the species are also known to be only temporarily attracted to light, settling soon on the plants some distance away. However, I personally collected other species of *Zale* there in large numbers by collecting on such plants, the specimens located by their glowing, light reflecting eyes.

***Zale peruncta incipiens* (Walker), new status**
(Figures 5–6, 7 and 10)

Letis incipiens Walker, 1858, p. 1266.—Hampson, 1913, p. 209 (synonym of *setipes*, Hampson).—Schaus, 1940, p. 229 (synonym of *setipes*, Schaus).
Zale incipiens (Walker), Draudt, 1940, p. 455 (synonym of *setipes*, Draudt).
Xylis setipes, Herrich-Schaeffer not Guenée, 1869, p. 157.—Gundlach not Guenée, 1881, p. 358 (in part); 1891, p. 195.—Druce not Guenée, 1889, p. 341 (in part).—Möschler not Guenée, 1890, p. 351.—Ragués not Guenée, 1914, p. 141.
Xylis setipes (sic), Anonymous not Guenée, 1895, p. 73 (misspelling of *setipes*).
Zale setipes, Hampson not Guenée, 1913, p. 209 (in part).—Schaus not Guenée, 1940, p. 229 (in part).

Diagnosis. Length of forewing, male, 18.5 to 20.5 mm, average 19.5 mm; female, 20.0 to 22.0 mm, average 21.2 mm. It seems likely that the range in size will probably approach that of the typical subspecies when more material is available for study. Only five pairs have been examined. The pattern of maculation appears to be essentially identical to that of *peruncta peruncta* and similarly variable. The male and female genitalia differ consistently from those of the typical subspecies. The apical processes of the valve of the male genitalia (Fig. 7) are more slender than in typical *peruncta*, the process of the costa distinctly sinuous. Flanges at base of uncus thornlike, each with apex bent caudad. Flanges of tegumen much larger, not thornlike in shape as in typical *peruncta*, apex variable in shape, up-curved and blunt (Fig. 7) or sharp-pointed and caudally directed (holotype). Female genitalia with sternal plate of eighth abdominal segment smaller than in typical subspecies, the caudal lobes larger in proportion to plate size (Fig. 10).

Type. The HOLOTYPE, ♂, from St. Domingo, Noctuidae genitalia slide No. 5089 is in the British Museum (Natural History), London, England.

Distribution. Known only from Cuba and Dominican Republic. The specimens studied are labeled as follows. CUBA: Santiago; Cayamas; "Cuba." DOMINICAN REPUBLIC: St. Domingo; San Francisco Mts., St. Domingo; Hotel Montana, 10 km NE Jarabacoa, La Vega Prov.; 1.3 km S Loma de Cabrera, Dajabon Prov.; Convento, 12 km S Constanza.

Discussion. The true status of this entity is not known. It has been placed as a subspecies of *peruncta* because of the geographic isolation and to express the close relationship of the two entities compared to *setipes*. At the present time *incipiens* and typical *peruncta* occur on the neighboring islands of Hispaniola and Puerto Rico respectively. The former population probably representing an old invasion from Central America, the latter a more recent invasion from northern South America through the Lesser Antilles.

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