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STUDIES IN THE CASTNIIDAE

II. Descriptions of Three New Species of Castnia, *s. l.*

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Since my last paper, I have been working on a revision of the higher classification of the family Castniidae. There are, however, three new species which have been brought to my attention which I now will describe in order to make the names available to my colleagues. A number of prospective genera are involved in these new species and in one case, the species' closest relatives still remain in doubt. Again, I will follow Rothschild (1919) and Talbot (1919) and refer to the entire genus as *Castnia* rather than use the generic assignments of Houlbert (1918) and Oiticica (1955).

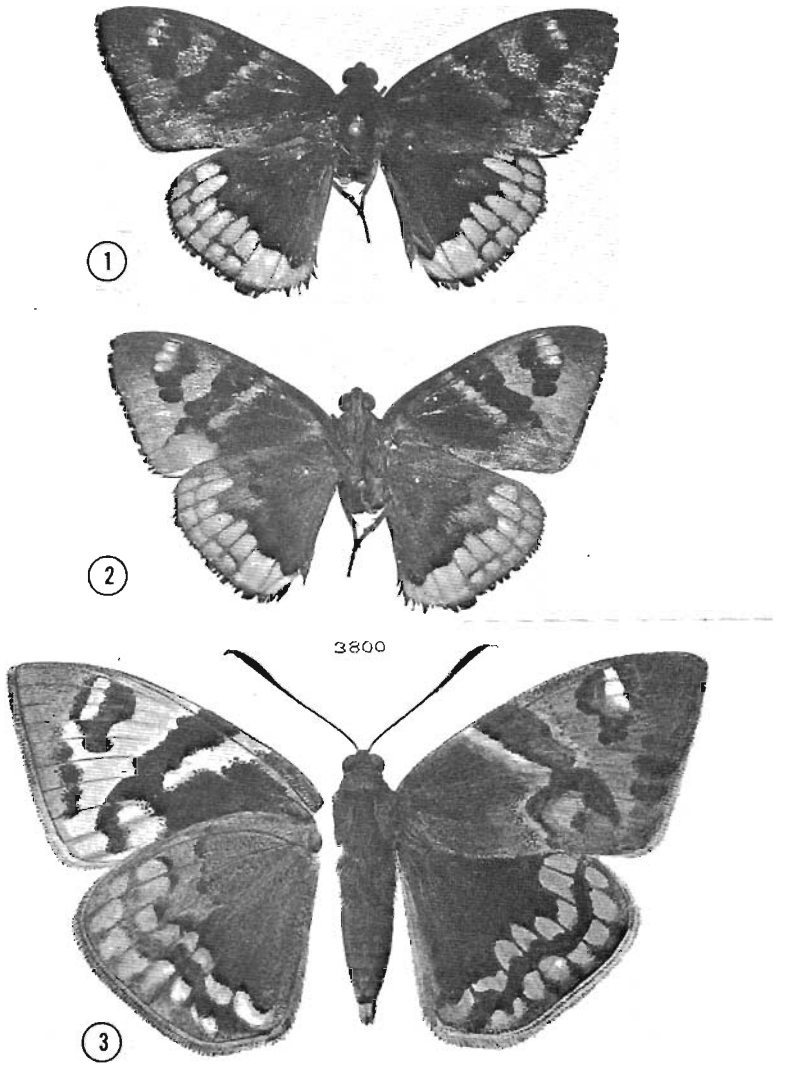
Castnia allyni, new species

Plate I (♂), Text Figures 4 (venation), 5 (♂genitalia)
15 (foreleg)

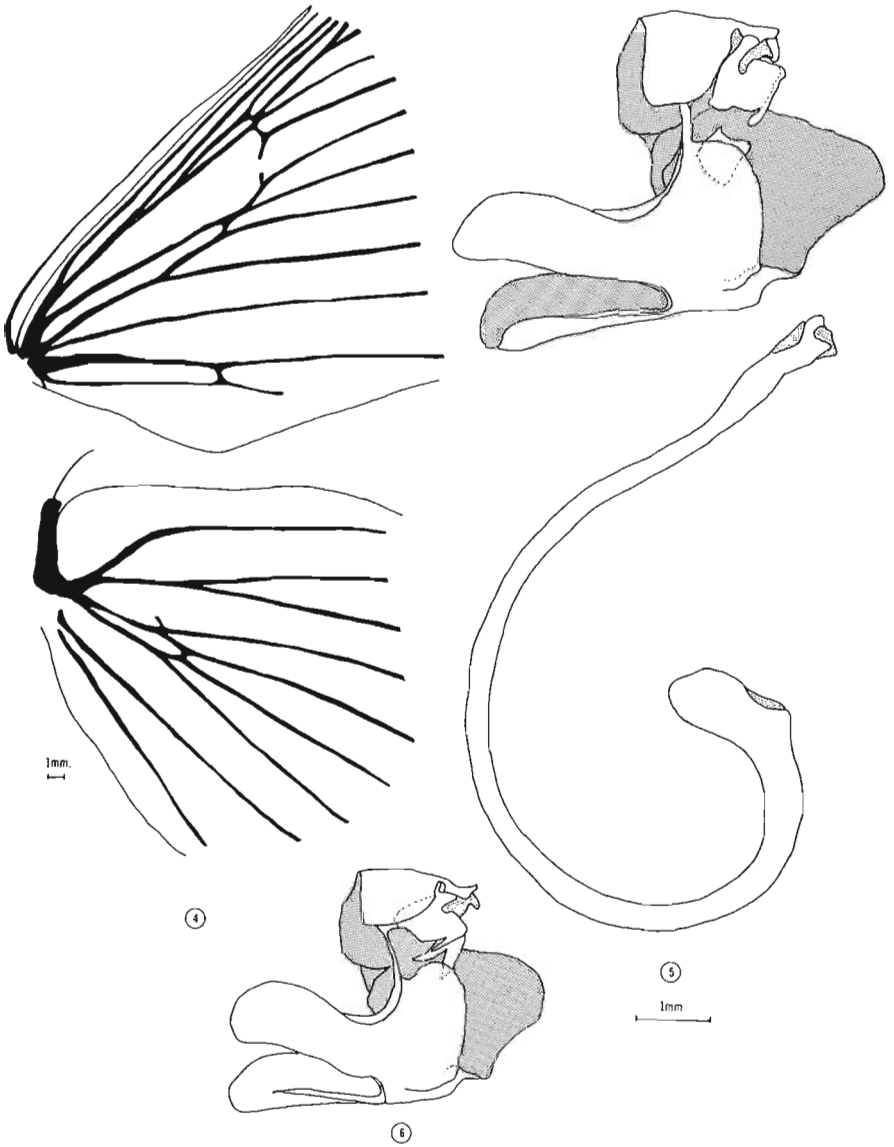
Male: Head, thorax above dark brown with sparse dark rust scales. Abdomen fuscous with larger scales delineating abdominal segments; first two segments of abdomen above with spatulate possibly pheromone releasing scales. Head, thorax, legs and abdomen below fuscous with interspersed ashen-gray scales. Hair tuft end abdomen red-fulvous. Palpi, basal and median segments tawny; terminal segment with distal edge tawny and basal surface fuscous. Antennae above and below reddish-brown.

Forewing above, fuscous basad from costal to anal margin. Inverted bifurcate marking (Pl. I) extends across end cell from costal margin to Cu_2-1A; fuscous globular marking near apex extends from costa to M_2-M_3; area inside lighter in R_2-R_3, R_3-R_4 and R_4-R_5. Fuscous with rust overscaling at apex and along lateral margin to Cu_{1b}-Cu_2.

Hindwing above, ground color fuscous with spatulate, possibly pheromone releasing scales below cell between cubital and anal stems; bright reddish-orange extradiscal marking along lateral margin with veins darkened inside reddish-orange marking; separate bright reddish-orange extradiscal spots in



Figures 1-3, *Castnia*. 1-2, *Castnia subvaria* Walker, upper (1) and under (2) sides; "Palur". 3, *Castnia rubrophalaris* Houlbert (after Houlbert, 1918), ♂, upper (right) and under (left) sides; BRASIL: BAHIA: S. Antonio do Barra.



Figures 4-6, *Castnia*. 4, *C. allyni*, new species, ♂ venation. 5, *C. allyni*, ♂ genitalia (Slide M-1792, Jacqueline Y. Miller). *C. subvaria* Walker, genitalic capsule without aedeagus (Slide M-1793, Jacqueline Y. Miller).

M_3-Cu_{1a}, Cu_{1a}-Cu_{1b} and Cu_{1b}-Cu_2. Two specimens in series had additional markings in M_1-M_3 and M_3-Cu_{1a}.

Forewing below with markings as above (Pl. I). Reddish-orange overscaling basad in Cu_{1b}-Cu_2, Cu_2-1A and at anal angle; areas between fuscous markings tawny; rust brown at apex and along lateral margin to Cu_1-Cu_2; blackish-brown spotband along outer margin from M_2-M_3 to Cu_{1a}-Cu_{1b}. Fringes above and below fuscous, tawny at anal angle.

Hindwing below light fuscous basad and along inner margin; two blackish-brown discal spotbands: (1) basal spotband extends from Sc+R_1-Rs to Cu_{1b}-Cu_2; (2) distal spotband extends from M_1-M_3 to Cu_2-1A. Reddish overscaling gives an indication of reddish-orange extradiscal marking above. Prominent bright reddish-orange extradiscal markings in Cu_2-1A and 1A-2A; faint reddish-orange extradiscal markings in M_1-M_3, M_3-Cu_{1a} and Cu_{1b}-Cu_2. Veins accentuated in ashen-gray distal half wing to outer margin. Fringes above and below ashen-gray with interspersed tawny scales along costa to outer margin; rust brown at anal angle and fuscous along inner margin. Length of forewing of Holotype ♂ 41 mm.; length of the forewing of the three male Paratypes range from 38 mm. to 43 mm. (mean 40.25 mm.)

Male genitalia (Fig. 5) as illustrated. The robust genitalia capsule and long curved aedeagus are quite characteristic of the *"Synpalamides"* group.

Female unknown.

Described from four males.

HOLOTYPE ♂: BRASIL: PARANA: Iguassu; 5.xii.1921. ♂ genitalia slide no. M-1792 (Jacqueline Y. Miller).

PARATYPES: 3 ♂, all same locality as the Holotype with the following dates: 28.xi.1921; 30.xi.1921; 2.xii.1921.

Holotype and two Paratypes are returned to the collection of the British Museum of Natural History. Through the kindness of the British Museum and Mr. Allan Watson, one Paratype will be deposited in the collection of the Allyn Museum.

The forewing pattern and genitalia place this new species in the basically Brasilian complex "Synpalamides" Huebner (1823). Houlbert misspelled the genus *"Sympalamides"* and other workers (Rothschild, 1919, Talbot, 1919 and Oiticica, 1955) followed. Hemming (1937, 1967) and Scudder (1875) cited the name correctly.

C. allyni is closely related to *subvaria* Walker (Figs. **1, 2**) and *rubrophalaris* Houlbert (Fig. **3**), but it differs from both species in that the upper surface hindwing markings are not identical to those of the under surface: in *subvaria* and *rubrophalaris* the orange markings of the upper surface hindwing are repeated on the under surface. In both species the discal blackish-brown spotbands of the under surface hindwing intersect in M_3-Cu_{1a} whereas in *C. allyni,* the point of intersection is Cu_2-1A.

The genitalia of most of the *"Synpalamides"* complex are basically of the same configuration with the rather robust saccus and valvae. The aedeagus is not only recurved as is characteristic of the family Castniidae, but it is also gently curved laterally. Genitalically *C. allyni* (Fig. **5**) differs from *C. subvaria* (Fig. **6**) in that the valvae protrude posteriad and the uncus is elongated. In *C. subvaria* the valvae are more square-cut and the uncus is shortened.

At the suggestion of Mr. Allan Watson, it is indeed a great pleasure to name this species in honor of our Director and colleague, Mr. Arthur C. Allyn.

Castnia estherae, new species

Plate I; Text Figures 7 (venation), 8, 9 (♀ genitalia)

Female: Head ashen-gray with interspersed fuscous scales; tegulae and prothorax covered with ashen-gray basal and fuscous distal scales; remainder of thorax dark brown with few gray-fuscous scales as described above. Abdomen

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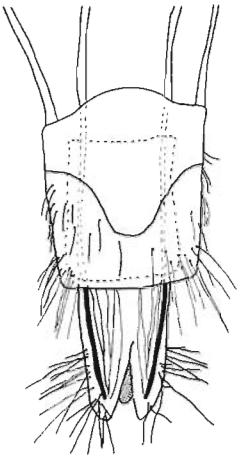

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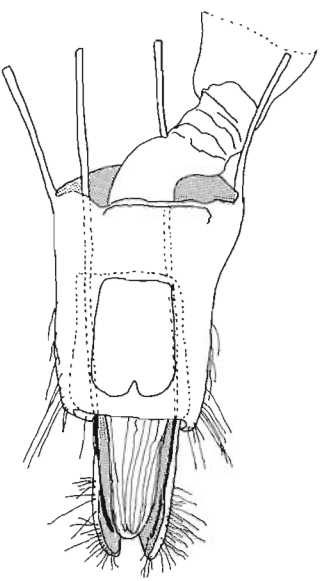

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Figures 7-9, *Castnia estherae,* new species. 7, ♀ venation. 8, ♀ genitalia (genitalia preparation M-3040-V, J. Y. Miller), dorsal view. 9, ♀ genitalia (same preparation), ventral view.

grayish, darkened at terminal segments; antennal shaft reddish-brown above and below; club and apiculus white above, dark brown below. Palpi missing. Proboscis appears shortened and fused with labium. Thorax below and legs tawny; abdomen below tawny, darkened at end segments.

Forewing above (Pl. I) marked by two semi-hyaline bands with interspersed white and dark gray-fuscous scales; one band extends from costa across end cell to inner margin; second band two-thirds up wing, extends from costal margin to Cu_{1a}; area in cell between two semi-hyaline bands and at apex brown to dark brown; two dentate submarginal bands, basal band brown and distal band gray-brown; both bands lighter in Cu_{1b}-Cu_2; lower third of wing below cell basad and along inner margin appears gray but actually dark brown with interspersed tawny scales.

Hindwing above, ground color reddish-brown with spatulate basal ashen-gray scales from Cu_{1a}-Cu_{1b} to 1A-2A; two distinguishable extradiscal spotbands: white semi-hyaline band from Sc+R_1-Rs to Cu_2-1A with a single marking in each space, lateral edge of each marking outlined in dark brown except comma-shaped marking in Cu_2-1A, which is totally surrounded by dark brown; second extradiscal spotband extends from Sc+R_1-Rs to 1A-2A with markings in Sc+R_1-Rs, Rs-M_1 and M_1-M_3 reddish-brown; doubled spot in Cu_2-1A with spot toward costal margin tawny with interspersed reddish-brown scales and the second marking tawny, encased in dark brown; inverted comma-shaped marking in 1A-2A with marking encircled in dark brown toward 1A, shading to reddish brown at 2A; outer margin dark brown; inner margin gray basad shading to reddish-brown and dark brown at anal angle.

Forewing below, tawny basad and toward inner margin; markings same as above; reddish-brown along costal and basal edge of basal semi-hyaline band; area between semi-hyaline bands and toward apex dark brown with interspersed reddish-brown scales; submarginal markings same as above with distal band dark brown edged in fuscous, shading to reddish-brown at anal angle. Fringes above, fuscous, shading to ashen-gray at anal angle; fringes below, light fuscous, shading to tawny at anal angle.

Hindwing below, tawny at base and along costal margin; ground color, dull reddish-brown with tawny and fuscous overscaling; markings as above; basal white semi-hyaline extradiscal spotband outlined in bright reddish-brown with interspersed dark brown scales; distal extradiscal spotband poorly indicated, but as above with additional reddish-brown overscaling; outer margin darkened with interspersed tawny, dark brown and ashen-gray scales. Fringes above and below tawny.

Length of forewing of Holotype ♀, 47 mm.

Male unknown.

HOLOTYPE ♀: MEXICO: MICHOACAN: Purua; 13.iv.1965: T. Escalante, Jr.

The Holotype will be deposited in the collection of the Allyn Museum of Entomology.

This new species of *Castnia* is unique in many ways. Usually a common forewing marking or pattern or an extradiscal hindwing pattern gives a clue to the species' close relatives. The forewing markings of *C. estherae* resemble closely those of the true *Castnia* (=*Elina* Houlbert), but the combination of the forewing and hindwing markings does not give any indication of any particular known group or complex at this time. Genitalically this female is similar to that of *C. penelope* Schaufuss (=*C. icarus* Cramer) and to a lesser extent that of *C. escalantei,* new species (described below). Again, there is no conclusive evidence as to the species' closest relatives.

It is my pleasure to name this species for Sra. Esther Arias de Escalante. To the delight of collectors who have never captured a *Castnia,* Tarsicio Escalante, Jr. collected this specimen by hand while it was perched on a rock and brought it back to his father, Dr. Escalante, as a present.

Castnia escalantei, new species

Plate II; Text Figures 10 (venation), 11 (♂ genitalia), 13, 14 (♀ genitalia) 16, 17 (legs)

Male: Head, gray-brown; eye fringe buff. Thorax above, gray-brown, darker anteriad; abdomen above and below gray-brown ringed with dark brown scales at end segments. Antennae dark gray above, dark brown at tip of club; antennae below with longitudinal brown striping on distal half. Palpi buff. Thorax below ashen-brown; legs buff with dark brown tibial and tarsal spines.

Forewing above, gray-brown, darker basad; lighter bifurcate marking (Pl. II) extends across end cell and terminates in Cu_2-1A; fuscous line at outer margin.

Hindwing above, ground color gray-brown. Prominent iridescent blue-black markings extend from near costa across distal half wing; basal branch of marking terminates in 1A-2A while outer branch extends as extradiscal spotband and terminates in Cu_1b-Cu_2; extradiscal branch and distal margin of basal branch outlined in buff scales.

Forewing below: ground color warm ashen-brown; blue-black basad in cell along transverse anterior line to Cu_1-1A; globular blue-black marking outlined in buff scales at end cell extends from R_1-R_2 to M_2-M_3; submarginal dentate blue-black spotband outlined in buff scales extends from R_3-R_4 to Cu_1a-Cu_1b with faint markings in Cu_1b-Cu_2 and Cu_2-1A. Forewing fringes above warm brown, darker at tips; below grayer than above.

Hindwing below (Pl. II), ground color warm gray-brown with interspersed buff scales along costal margin; markings same as above with additional blue-black marking in cell basad and interspersed buff overscaling on blue-black markings; iridesence not present in blue-black markings of under surface. Hindwing fringes above, warm gray-brown, darker at tips; below, grayer than above.

Length of forewing Holotype ♂, 45 mm. Forewing lengths of male Paratypes range from 40-45 mm. (mean 42.6 mm.). Male venation as illustrated (Fig. **10**).

Male genitalia as illustrated (Fig. **11**). Genitalic capsule and aedeagus greatly reduced.

Female: ground color above and below much browner and duller than in male; markings similar with additional iridescent blue-black marking in cell of hindwing above and an additional iridescent blue extradiscal spot in Cu_2-1A of upper surface hindwing.

Forewing lengths of three females examined range from 55-58 mm. (mean, 56.1 mm.).

Female genitalia as illustrated (Figs. **13, 14**).

Described from eleven specimens, seven males and four females from Mexico.

HOLOTYPE ♂: MEXICO: GUERRERO: Acahuizotla; viii.1973; A. Diaz Frances.

PARATYPES: MEXICO: CHIHUAHUA: Primavera; 30.vi.1947; 5500-6000 ft.; Frank Johnson Coll., 2♂; MEXICO: GUERRERO: Mexcala; 22.vii.1966; 550 m.; Kent H. Wilson, 1♂; MEXICO: GUERRERO: Rio Balzas to Iguala; 22-26.viii.1904; Dr. Gadow, 1♂; MEXICO: GUERRERO: Acahuizotla; T. Escalante, various dates: v.1958, 2♀; ix.1963, 1♀; same locality, 3.vi.1972; A. Diaz Frances, 1♂; MEXICO: MORELOS: Tepoztlan; 9.vi.1965; A. Diaz Frances, 1♀; MEXICO: MORELOS: Rancho Viejo; viii.1973; A. Diaz Frances, 1♂.

The Holotype, one male and three female Paratypes will be deposited in the collection of the Allyn Museum. The deposition of the remainder of the Paratypes are as follows: 1♂, 1♀, private collection of A. Diaz Frances; 2♂, American Museum of Natural History; 1♂ Inst. de Biologia, Univ. Nal. Auton. Mexico; and 1♂, British Museum of Natural History.

A discussion of the relationship of *escalantei* in the Castniidae will follow the description of *Castnia chelone.*

I am deeply indebted to Kent Wilson for bringing this species to my attention in the summer of 1972 and at his urging, we visited Dr. Escalante in 1973, when we first saw this new species in his collection. At this time we also visited with Sr. Diaz Frances and observed two specimens of this new species in his collection.

Through his tireless efforts for nearly a half century Dr. Escalante has en-

Plate I, new species of *Castnia*. Top, *Castnia allyni*, new species, Holotype ♂, upper (left) and under (right) sides; BRASIL: PARANA: Iguassu; 5.xii.1921. Bottom, *Castnia estherae*, new species, Holotype ♀, upper (left) and under (right) sides; MEXICO: MICHOACAN: Purua; 13.iv.1965, T. Escalante.

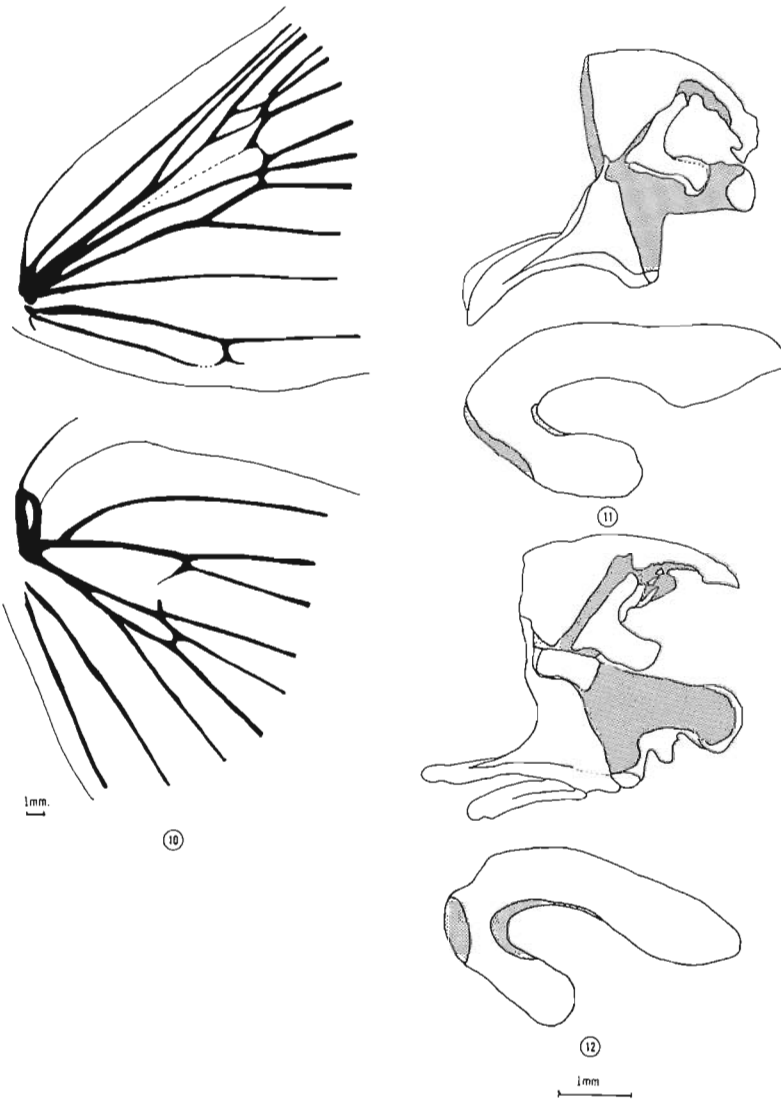
couraged many lepidopterists in the field and has supplied various researchers with specimens necessary for their studies. It is a great honor to name this unusual *Castnia* for a truly remarkable man and fellow lepidopterist, Dr. Tarsicio Escalante.

Castnia chelone Hopffer, 1857

Plate II; Text Figures 12 (♂ genitalia), 18, (leg)

Head, thorax, abdomen and antennae above and below as in *escalantei.* Forewing above (Pl. **II**), ground color ashen-gray; lighter gray basad and along inner margin, with markings similar but more prominent than in *escalantei;*

Plate II, *Castnia.* Top, *Castnia escalantei,* new species, Holotype ♂, upper (left) and under (right) sides; MEXICO: GUERRERO: Acahuizotla; viii.1973, A. Diaz Frances. Bottom, *Castnia chelone* Hopffer, Lectotype ♂, upper (left) and under (right) sides; MEXICO.



Figures 10-12, *Castnia*. *Castnia escalantei*, new species, 10, ♂ venation. 11, ♂ genitalia (genitalia preparation M-2543-V, Jacqueline Y. Miller). Figure 12, *Castnia chelone* Hopffer, ♂ genitalia (Slide M-1794, J. Y. Miller).

basal branch of bifurcate marking tapered. Hindwing above, ground color blackish-brown with ashen-gray at base; two tawny sine-curved lines extend diagonally from Sc+R_1-Rs to 1A-2A with interspace between lines blackish-brown. No evidence of blue-black iridescence as in *escalantei.*

Forewing markings below same as in *escalantei,* accented in blackish-brown and outlined heavily in buff; submarginal spotband not as dentate as in *escalantei* (Pl. II) and markings reduced in R_3-R_4 and R_4R_5. Hindwing markings below similar to *escalantei* with extradiscal spotband reduced; distinct black marking outlined in buff scales at end cell; no buff overscaling on black markings as in *escalantei.*

Fringes of forewing and hindwing, above and below gray-brown, darker and anal angle.

Male genitalia as illustrated (Fig. 12). Aedeagus reduced as in *escalantei* but valvae have pronounced distal lobe.

Two specimens of *Castnia chelone* Hopffer were examined from the Zoologische Museum der Humboldt-Universität (ZMHU). One specimen bore a green label with *"Castnia chelone* Hopffer, type" with the only data as Mexico. The second specimen had more complete data with "MEXICO: Min del Monte, Coll. Sommer." Dr. Carlos Beutelspacher informs me that the locality Min. del Monte is in the state of Hidalgo in northern Mexico. A third specimen of *Castnia chelone* from the collection of the British Museum was also examined which had no locality label but had a "Felder Colln." label and another label which read, "Museum Berlin Type". All of the specimens examined were males.

The original type series of Hopffer included two males and one female, all from Mexico. The specimen figured on Plate II is the ZMHU specimen which bore the green label and was indicated as the type. I hereby designate this specimen, figured here, as the Lectotype of *Castnia chelone* Hopffer and have sent the following red label to be placed on the specimen: "LECTOTYPE / Castnia chelone / Hopffer / designated by Jacqueline Y. Miller, 1975."

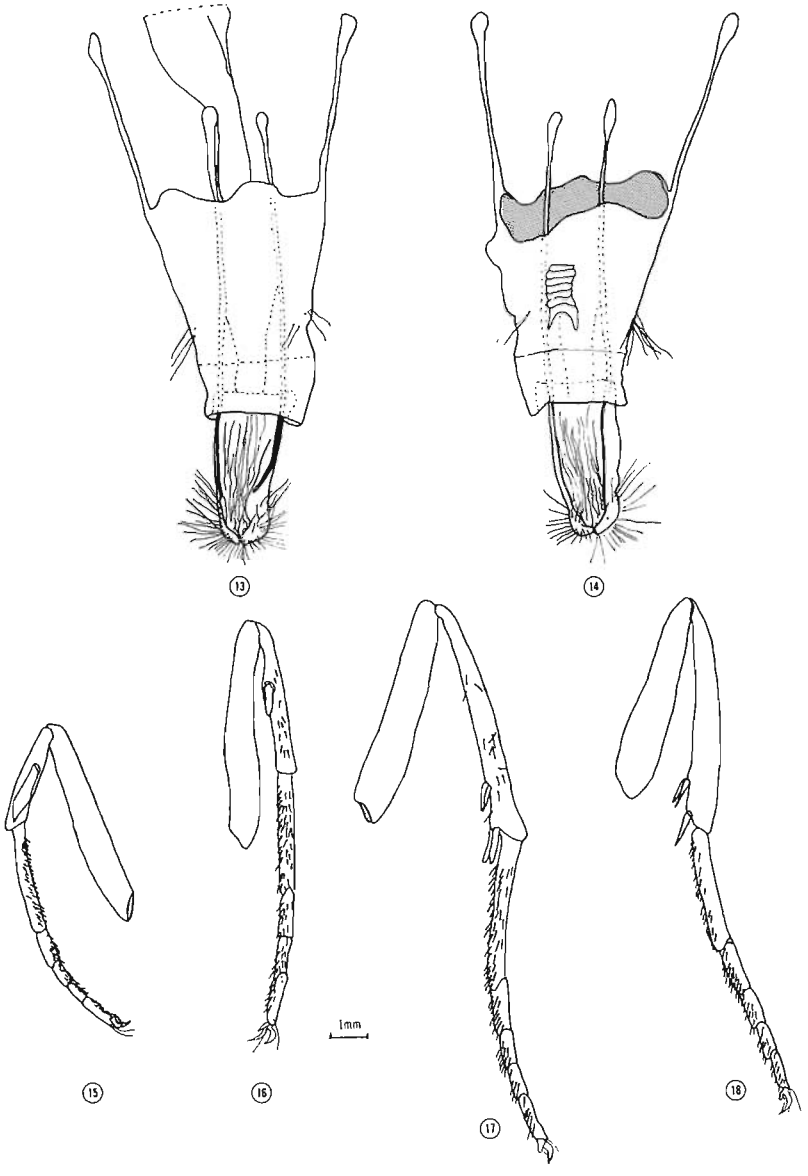
The specimen in the collection of the British Museum which bears the label "Museum Berlin Type" is possibly a paralectotype, but this conclusion is difficult to determine at this late date.

DISCUSSION

This has proven to be one of the most interesting projects thus far in my work on the Castniidae. At first inspection it is obvious that the two species, *escalantei* and *chelone,* are close relatives, and in the course of this investigation, it was evident that a number of workers believed that they were in fact the same species. Rothschild (1919) had listed two specimens of *C. chelone,* a male and a female, in the collections at Tring. Upon examination and genitalic dissection this "female" was found to be a male of *Castnia escalantei* and the male was indeed a male of *Castnia chelone.* This particular specimen of *C. escalantei* also was the only specimen in the type series with supernumerary veins at M_1 and M_2 of the forewing.

There are several characteristics which differentiate the two species, but the most striking character is the blue iridescence on the hindwings in *escalantei.* Various researchers have commented upon this fact and have inferred that the absence of the blue iridescence in *chelone* was due to the presence of body fat on the wings, which in turn would result in the greasy appearance found in some older specimens of Castniidae and would also diminish and iridescence present in *chelone.* Specimens of *C. escalantei* were observed to have higher concentrations of fatty deposits during microscopic dissections and the older specimens of *escalantei* still had some of these iridescent scales present.

Several other characteristics separate *escalantei* from *chelone.* The interspace between the tawny sine-markings of the hindwing in *chelone* is blackish-brown whereas in *escalantei* this area is ashen-brown. The venation of the holotype



Figures 13-18, *Castnia. Castnia escalantei,* new species, ♀ genitalia (Slide M-3028), dorsal (13) and ventral (14) views. 15, *Castnia allyni,* new species, ♂ foreleg. *Castnia escalantei,* new species, ♂ foreleg (16) and metathoracic leg (17). 18, *Castnia chelone* Hopffer, metathoracic leg.

of *escalantei* (Fig. **10**) has a closed forewing cell, but other specimens approach the weak tubular vein development at the end of cell seen in the examples of *C. chelone* examined. There are tibial spines present on the metathoracic leg in *escalantei* (Fig. **17**) but absent in *chelone* (Fig. **18**). The epiphysis of the foreleg is not fully developed (Fig. **15**) in either *chelone* or *escalantei* (Fig. **16**). Genitalically these species are distinct with a developed distal lobe on the valva in *C. chelone*.

As with the *inca* complex, I have omitted using the generic classification of Houlbert (1918), which placed *chelone* in *"Synpalamides"* Hübner, a predominately Brasilian group. Houlbert in his discussion was rather unsure of the exact relationship of this Mexican species. It is obvious that *C. chelone* and *C. escalantei* are one another's close relatives, but their genitalic configurations are quite different from members of *"Synpalamides"* (Figs. **5, 11, 12**). In the final analysis *chelone* and *escalantei* probably will need a new generic or subgeneric assignment, but the literature of the group is already so complicated that I am reticent to do so here. Further work is in progress to clarify this situation.

ACKNOWLEDGEMENTS

No research work would be possible without the cooperation of many collectors and numerous museum personnel. I would like to thank Dr. J. F. Gates Clarke, National Museum of Natural History, Smithsonian Institution, Dr. H. J. Hannemann, Zoologische Museum der Humboldt-Universität (ZMHU), East Berlin; Dr. Frederick H. Rindge, American Museum of Natural History (AMNH) and Messrs. Richard Vane-Wright and Allan Watson, British Museum of Natural History (BMNH) for providing comparative material in this study. Special thanks are due Dr. Tarsicio Escalante, Sr. Alberto Diaz Frances, Mr. Allan Watson and Mr. Kent Wilson for collecting and/or providing specimens for description. Photographs were done by Mr. A. C. Allyn and Amanda Goethe. Special thanks are due Mr. Allyn and my husband, Lee, for their comments during this study, many of which have been incorporated into this manuscript.

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