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HAIRSTREAK BUTTERFLIES OF THE GENUS *SERRATOFALCA* (LEPIDOPTERA: LYCAENIDAE)

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ABSTRACT.– *Serratofalca* includes six species distributed from Belize southward to Argentina. Although very similar in generalized wing pattern, interspecific structural differences are great. As revised, often synonymized historical taxa *Thecla cerata* Hewitson and *Thecla palumbes* Druce are titular taxa of two divergent species groups, former with sclerotized female genital structures occurring in lineal configuration, latter in a spiral. The "*cerata* Group" includes *S. cerata* (Amazon Basin) and new species: *S. sasha* **n. sp.** (Central America and western South America), *S. gorgoniensis* **n. sp.** (Gorgona Island, Pacific continental shelf) and *S. callilegua* **n. sp.** (NW Argentina). The "*palumbes* Group" includes *S. palumbes* (Amazon Basin, Guyana Shield) and new species: *S. iguapensis* **n. sp.** (SE Brazil). *S. cerata* and *S. palumbes* are sympatric in the eastern Amazon Basin; *S. palumbes* and *S. sasha* are sympatric in the western Amazon Basin; *S. iguapensis* is divergent and may be the most primitive member of the group with some characters suggestive of a sister genus *Klaufera* Johnson 1991.

KEY WORDS: Amazon, Argentina, Belize, Bolivia, Brazil, *Calycopis*, *Calystyrma*, Central America, Colombia, Costa Rica, Ecuador, Eumaeini, French Guiana, Guatemala, Guyana, *Klaufera*, Neotropical, Nicaragua, Panama, Peru, ***Serratofalca callilegua*** n. sp., ***Serratofalca gorgoniensis*** n. sp., ***Serratofalca iguapensis*** n. sp., ***Serratofalca sasha*** n. sp., South America, *Strymon*, Surinam, *Thecla*, Theclinae, Venezuela.

In 1991, the senior author described a number of new genera from the poorly known "*Calycopis*/*Calystryma*" grade of the Eumaeini (*sensu* Eliot, 1973). Members of this grade exhibit a variety of "W"-like elements in their undersurface wingbands and show great structural diversity. This has complicated identification and hindered development of a basic taxonomy for the many Neotropical members. Johnson's monograph elucidated twenty structural groups (genera) from this grade, including treatment of the available names, extant type specimens and report of the number of undescribed entities encountered during the initial study. The large number of these latter entities made it impossible to include all of them in the original study.

This paper elaborates taxa of the genus *Serratofalca*, a group showing few differences in the superficial wing characters of species, but great differences in their genital and tergal structures. Historically, because of confusion about wing patterns, available names have often been haphazardly applied or synonymized (see Bridges, 1988). *Serratofalca*, as defined by Johnson (1991) generally included species of Draudt's (1919) *Thecla* "cerata Group". Congeners share an inwardly serrate falces on the genitalia of males along with other distinctive characters of the genitalia and tergal morphology in males and females. Two available names within the group, *S. cerata* Hewitson and *S. palumbes* Druce (transferred by Johnson, 1991, from *Thecla*), have historically been considered synonyms (Draudt, 1919) or subspecies based on generalized wing characters (Bridges, 1988, and others *in lit.* therein). However, when studied from the types and other specimens, *S. cerata* shows (among other characters) sclerotized female genital structures occurring in a lineal configuration (Figs. 13-15) while those of *S. palumbes* occur in a spiral (Figs. 16-17).

Four widely distributed and variously sympatric populations of *Serratofalca* exhibit distinctive structural characters including a lineal female genital configuration like *S. cerata*; *S. palumbes* and an allopatric population show a distinctive habitus including spiral female genital elements. Based on the reliability of these differences in "blind" diagnostic tests, and sympatry apparent in three of the entities, we define a taxonomy for *Serratofalca* below including six species—four in the "*cerata*" Species Group and two in the "*palumbes*" Species Group. The paper illustrates the difficulties posed by reliance on superficial characters in some Neotropical Theclinae and in defining an alpha taxonomy from divergent structural characters when both sympatry and allopatry occur. The paper also indicates the need for biological studies in similar butterflies where coherent structural characters and sympatry suggest far more species than reflected by superficial wing resemblance.

MATERIALS AND METHODS

Collections

Samples were studied from the Allyn Museum of Entomology, Florida Museum of Natural History (AME), American Museum of Natural History (AMNH), Carnegie Museum of Natural History (CMNH), Hope Entomological Collections (Oxford) (HEC), Milwaukee Public Museum (MPM), Muséum National d'Histoire Naturelle (Paris) (MNHN) and the Natural History Museum (London) (BMNH).

Fig. 1-6 (a, male, b, female, uppersurface left, undersurface right). 1[a]. *S. cerata*, Pará (BMNH); 2ab. *S. sasha*, holotype, allotype; 3a. *S. gorgoniensis*, holotype; 4ab. *S. callilegua*, holotype, allotype; 5ab. *S. palumbes*, St. Jean de Maroni (MNHN); 6ab. *S. iguapensis*, holotype, allotype.

Methods

In 1991, preliminary study was made by the junior author of all assembled material at the AMNH based on characters delineated for *S. cerata*, *S. palumbes* and three entities noted as undescribed by Johnson (1991). In 1992, based on delineation of additional characters supporting the presence of five taxonomic units, blind test dissections were performed by the senior author on remaining specimens at the BMNH. Subsequently, all remaining material was dissected and identified. Six taxonomic units were ultimately recognized as species, reflecting an alpha taxonomic procedure involving consistent differences in characters of the wings, genitalia and tergal morphology recognizable in the

blind tests. The present paper emphasizes problems facing alpha taxonomy (Foote, 1977) (e.g. "dead bug-" or "museum-" taxonomy, Crowson, 1970) in superficially similar, wide-ranging, Neotropical butterflies and a subsequent Discussion section recognizes other options for delineating taxonomic statuses within the genus.

Presentation

Standard revisionary format is employed with reference to superficially similar wing patterns limited to the generic treatment and notes in an initial entry "Identification" under "Species". Thereafter, species diagnoses emphasize structural characters, employing for brevity certain telegraphic phrases to denote morphological structures referred to thereafter in the character tables and figure captions. Terminology follows Johnson (1991), particularly regarding the "sipc", "bilobed" and "caudal extension" elements of the valvae in male genitalia and various elements of the female genital apparatus (Fig. 7). Morphological illustrations were prepared by the junior author using the camera lucida attachment to the Zeiss Stemi SV-8 binocular microscope (AMNH). Locality listings and diacritical usages follow Rand McNally & Company (Anon., 1992) with unlocatable names placed in quotation marks.

SERRATOFALCA Johnson

Serratofalca Johnson 1991:14.

DIAGNOSIS.– *Structural characters* (as elaborated in more detail by Johnson 1991:14) include, most outstandingly, male genitalia with falces serrate along the inner margin (Fig. 7f) and female genitalia dominated by extremely large, generally ovate, genital plates (Fig. 13s,vs) terminating a short, robust, ductus bursae (13db). In addition, in males the vincular dorsum is cleft but lacks brush organs (7v) and the terminal tergites are modified to an elaborate subchordate incised posterior cavity ("*sipc*", 7c); in females the *sipc* is limited to slight bilobate sclerotization of the terminal tergite (13t).

Wing pattern (Figs. 1-6) can generally be characterized as dull azure blue iridescence on the upper wing surfaces of both sexes contrasting gray to yellow-gray undersurface grounds crossed on the hindwing by a thin orange to reddish band forming a "W"-shape near the anal margin. Experienced workers will find this pattern distinguishes nearly all *Serratofalca* specimens except for a few which resemble certain taxa of the sister genus *Klaufera* (see Table 1 and Remarks below).

DESCRIPTION.– Johnson 1991, p. 14.

TYPE SPECIES.– *Thecla cerata* Hewitson (1863-1878 [1877]) by original designation.

DISTRIBUTION.– *Spatial* (Fig. 18): six species, together extending from Belize southward to western Argentina and southeastern Brazil. *Temporal*: data on well known species from Central America and South America north of SE Brazil and Argentina indicate year-round occurrence; data on poorly known species from latter regions is currently limited to summer months (December-March).

REMARKS.– *Characters*. Earlier workers noted the utility of certain wing characters in generally distinguishing the *cerata* Group of *Thecla*. Godman and Salvin (1879-1901 [1887]: 83) called the distinctive hue of the blue wing upper surfaces "slaty", Draudt (1919: 800) "easily distinguished...dull-lustrous indigo". Table 1 indicates general success in identification of the genus from superficial characters. Although sexual dimorphism is negligible (Johnson 1991), we noted some females show a more prominent white marginal line around the hindwing upper surface. As indicated in species entries below, only a few congeners show distinctive superficial characters, these being limited to wing hue and size.

Species Diversity. The genus is divided into two species groups based on the distinctive sclerotized structures of the female genitalia and a corresponding habitus in the aedeagii of males. The "*cerata* Group" reflects a lineal configuration in female sclerotized parts and a straight male aedeagus; the *palumbes* Group shows a spiral configuration in females and an undulate male aedeagus. Johnson (1991) mentioned three undescribed species. These are described herein along with one additional species discovered during the course of revisionary work.

Material Examined. Entries are divided as follows: single asterisk (*) marks specimens examined in the 1991 AMNH study which constructed a hypothesis of species numbers and their characters; double asterisk (**) marks specimens examined in 1992 blind tests at BMNH using the character matrix from 1991 (Tb. 1); triple asterisk (***) marks specimens subsequently identified.

SPECIES

Identification

All species, except one, fall within the "*Wing pattern*" diagnosis of the generic entry. Diagnoses below emphasize the structural characters summarized in Table 1 with descriptions listing the morphological characters by the character and species subset numbers from the table. Species' males can be identified by any of three distinctive tergal or genital characters, females by a combination of two (species group members share a common lineal or spiral habitus).

Nomenclature

cerata Group

Female genitalia with sclerotized elements in a lineal configuration; male genitalia with straight aedeagal shaft.

Serratofalca cerata (Hewitson)

Figs. 1, 7, 13

Thecla cerata Hewitson 1863-1878 [1877]: vol. 1, 191, vol. 2, pl. 76, Figs. 607, 608. Godman and Salvin 1879-1901 [1887]: (2) 84; Draudt 1919:800, pl. 158g; Huntington 1932: 195, 1933: 5; Comstock and Huntington 1958-1964 [1959]:182; Smart 1975: 221; Robbins and Small 1981: 315.

Thecla palumbes [not *palumbes* H. H. Druce 1907]: Draudt 1919:800 (synonymy in error, followed as *cerata palumbes*: Comstock and Huntington *Ibid.*, *op. cit*; Bridges 1988: I.264, II.20, III.30).

Calycopis (?) *cerata*: Bridges *Ibid.*, *op. cit.*: I.76, II.20, III.68.

Serratofalca cerata: Johnson 1991:14.

DIAGNOSIS.– Males identified by concave terminal margin of *sipc* (Tb. 1, Character ["Ch."] 1, Fig. 7) and short ovate valvae terminating in short, slightly upturned, caudal extensions (Tb. 1, Ch. 2, Fig. 7); females showing each lobe of bilobate superior

genital plate showing only a single, usually short, distoterminal spine (Tb. 1, Ch. 6, Fig. 13).

DESCRIPTION.– Wings (Fig. 1AB) typical of genus, generally indistiguishable from congeners. Forewing: males, 12.0 - 13.5 mm. (n= 5, MNHN,BMNH); females 12.5 - 13.5 mm. (n= 3, MNHN, BMNH). Male Tergal Morphology and Genitalia: Fig. 7, Tb. 1, Chs. 1(1), 2(1), 3(1), 4(1). Female Genitalia: Fig. 13, Tb. 1, Chs. 5(1), 6(1).

TYPES.– Lectotype male* (BMNH) (Johnson 1991, Fig. 6) designated by Johnson 1991 from Hewitson syntype 4, labelled "Para" [Brazil]; two BMNH paralectotype males, syntypes 1 and 2 designated by Johnson 1991, same data (but 1 noted as without abdomen and thus identification now tenuous). Syntype male 3 represented a sympatric specimen of *S. palumbes* (see below).

DISTRIBUTION.– *Spatial* (Fig. 18): restricted to northeastern Brazil from mouth of Amazon River (Pará State) southeastward to Pernambuco and Bahia states. To date indicated as sympatric with *S. palumbes* at four localities in Pará State (see Remarks). *Temporal*: all known specimens are old and lack collection dates; however, one can infer from the well-known sympatric congeners that occurrence is year-round.

REMARKS.– *General*. This familiar name is restricted by the facies of its lectotype; various parts of pan-Neotropical range traditionally attributed to "*Thecla cerata*" hereafter assume new species names as appropriate to this revision.

Characters. In addition to the characters summarized in the Diagnosis and Table 1, pertinent comment on structural features also includes the following.

Most *cerata* Group members show a contoured juncture of the male valval bilobed configuration and caudal extension (Figs. 7-10) contrasting the more even contour in the elongate valvae of the *palumbes* Group (Figs. 11-12). However, the character is not included in Tb. 1 because *cerata* Group member *S. gorgoniensis* lacks a caudal extension of the valvae (Fig. 9). We have said above that *cerata* Group males show a "straight" shaft on the aedeagus. By this we refer to the aedeagal habitus posterior of the caecum and anterior of the terminal recurvature apparent in most species surrounding the vesica and cornuti (this same area posterior of the caecum is undulate in the *palumbes* Group).

Distribution. Restricted herein to Brazilian localities near the mouth of the Amazon River and southward along the coast to Bahia and Pernambuco states. Sympatric with *S. palumbes* along the Amazon River through Pará State, sympatric specimens currently known from four localities in Material Examined ["ME"], listed hereafter from first ME entry word and as shown from east to west in Fig. 18, (1) Bragança, (2) Pará, (3) Santarém, (4) Óbidos. Most of these specimens are old and with generalized locality data.

MATERIAL EXAMINED (in addition to types).– BRAZIL.– *Bahia*: *1 male (BMNH). *Pernambuco*: *1 male (BMNH). *Amazonas*: Santarém, 1880, leg. de Methan, **1 male, **1 female (BMNH); Tonantins, 1880, leg. de Mathan, *1 male, ***1 female (BMNH). *Pará* [=Belém], leg. Miles Moss, ***1 female (BMNH); Bragança, leg. Miles Moss, **1 male (BMNH); Óbidos, ***1 male, ***1 female (MNHN).

Serratofalca sasha Johnson & Sourakov, **new sp.**

Figs. 2, 8, 14

Thecla cerata Hewitson [not *cerata* Hewitson 1863-1878 [1877]]: Huntington 1932: 195 (misidentification, series becomes type series of *S. sasha*); Robbins and Small 1981:315.

DIAGNOSIS.– Males distinguished by terminally notched and laterally undulate shape of *sipc* (Tb. 1, Fig. 8) and pentagonal ventral habitus of valvae (Tb. 1, Fig. 8 & Remarks); females differ from other group members by each lobe of the superior genital plate exhibiting an elongate distoterminal spine and shorter proximal spine (Tb. 1, Fig. 14).

DESCRIPTION.– Wings (Fig. 2AB) typical of genus and generally indistiguishable from congeners. Forewing: males 11.0 - 13.5 mm. (n= 15, AMNH,BMNH); females 11.5 - 14.0 mm. (n= 15, AMNH,BMNH). Male Tergal Morphology and Genitalia: Fig. 8, Tb. 1, Chs. 1(2), 2(2), 3(2), 4(2). Female Genitalia: Fig. 14, Tb. 1, Chs. 5(2), 6(2).

TYPES.– Holotype male*, allotype female*, Barro Colorado Island, Panama, leg. W. J. Gertsch, 11-19 March 1936, deposited (AMNH).

Paratypes. Same data as primary types, 10 (2*,8***) males, 5 (1*,4***) females (AMNH), 2*** males, 1*** females (AME), 2*** males, 1*** females (CMNH).

DISTRIBUTION.– *Spatial* (Fig. 18): widespread, occurring from Belize southward through the Isthmus of Panama, eastward to coastal Venezuela and (sympatric with *S. palumbes*) into the upper Amazon River basin east to at least Tefé, west and southward along the Andean/upper Amazon margin to the "yungas" region of northcentral Bolivia. *Temporal*: dates on specimens indicate year-round occurrence.

REMARKS.– *General*. The new species name applies to the most widespread population historically referred to as "*Thecla cerata*", identity of latter being restricted herein by its types (see Remarks, *S. cerata*).

Characters. "Pentagonal", used herein to describe the ventral shape of the valvae, refers to the stout, angulate, shape formed by the lateral edges of the paired valval elements (two caudal extensions, two bilobes), with the valval base forming the fifth side (Fig. 8). The only group member with stout paired valval elements forming an angulate ventral shape is *S. callilegua* but its elongate caudal extension (rivaled only by *S. palumbes* of the sister species group) distends terminal shape to triangulate (Fig. 10). Typical of the *cerata* Group, the aedeagus of *S. sasha* is straight posterior of the caecum but terminates with a gradual dorsal inclination in the posterior one-fourth (Tb. 1, Ch. 4, Fig. 8).

Surprisingly little variation in structural facies of males and females across the trans-Neotropical range of *S. sasha* and no evidence of traits converging towards those of other adjacent or sympatric species (Tb. 1 Remarks) strongly supports the view of species limits in this revision and underscores the very different traits of males offshore Colombia on Gorgona Island characterized in the subsequent entry.

Distribution. *S. sasha* is quite common in collections from Belize southward through the Andes of South America. Its range follows the Amazon River eastward where, thus far, it is indicated as sympatric with *S. palumbes* at three localities (listed hereafter from first ME entry word and as shown from east to west in Fig. 18, (1) Tefé, (2) São Paulo de Olivenca, (3) Iquitos). Most of these specimens are old and with generalized locality data.

ETYMOLOGY.– Patronym for Sasha Shapiro, wife of the junior author.

MATERIAL EXAMINED.– BELIZE.– "Manattee", **1 male (BMNH). BOLIVIA.– *Cochabamba*: Yungas del Espirito Santo, leg. Germain, **

male (BMNH). BRAZIL.– *Amazonas*: Juhuty, Apr 1905, leg. de Mathan, *1 male, *1 female (BMNH); San Juan, Solimões, *1 male, ***l male (BMNH); Tefé, **1 male (BMNH); São Paulo de Olivenca, Jan 1933, leg. S. Waenner, **2 males, **1 female (BMNH); Ega, leg. Bates, **,***2 males, **,***2 females (BMNH); Ega, **1 male (BMNH); Juhuty, Apr 1905, leg. de Mathan, ***1 male, ***l female (BMNH); Tefé ["Teffe", sic], Jan 1905, leg. de Mathan, ***1 male (BMNH); Tonantins, 1880 de Mathan, **1 male, **1 female (BMNH); São Paulo de Olivenca, leg. de Mathan, 1878, ***l male (BMNH); São Paulo de Olivenca, Jan, leg. S. Waenner, Jan 1933, **1 male, ***2 males (BMNH). COLOMBIA.– "Colombia", *1 male (MNHN), Bogotá, *l male, *1 female (BMNH); Interior of Colombia, leg. Wheeler, *1 male (BMNH); Novella Grenada [=Colombia], *2 males, *1 female (BMNH), Cundinimarca, 1900, leg. de Methan, *1 male, **1 female (BMNH); Rio Putumayo, *1 male (AMNH), Rio Tacana, Amazonas, *1 male (AMNH), Rio Cotuhé, Amazonas, *1 female (AMNH); Bogotá, Novella Grenada, Cundiminarca, 1900, leg. de Mathan, ***2 males; Interior of Colombia, leg. Wheeler, **1 male (BMNH); "El Lumto", Cundinimarca, Jul 1903, leg. de Mathan, ***1 male. COSTA RICA.– Irazú *2 males (BMNH), Volcán Irazú, leg. Fassl, *l male, *2 females (MNHN); Guápiles, *1 male (AMNH); Guápiles, May-Nov, **l male, **l female (BMNH); "Esperanza", May, ***l male (BMNH); Costa Rica, leg. G. M. Gillott, ***l male (BMNH). ECUADOR.– La Chima, Sep 1893, leg. de Mathan, **1 male (BMNH); Cachabe, Jan 1897, leg. Rosenberg, **l female, ***l male (BMNH); La Chima, Sep 1893, leg. de Mathan, ***1 male, ***1 female (BMNH); Cachabe, Febr 1897, leg. Rosenberg, ***1 male. GUATEMALA.– Verapaz, leg. Champion, *1 male, *1 female (BMNH), Rabinal, *1 male, *1 female (AMNH). NICARAGUA.– Chontales, leg. T. Belt, *1 male (BMNH); Chontales, leg. T. Belt, ***1 male (BMNH); PANAMA.– Chiriquí, ex. coll. Godman & Salvin, *l male (BMNH); Calobre, *1 male (BMNH), Summit, *1 male, *1 female (AMNH); Chiriquí, ***1 male (BMNH); Isthmus of Panama, leg. Walker, ***l male (BMNH); Isthmus of Panana, Dec 1907, leg. Pemberton, ***l male (BMNH); Chiriquí, Arce, ex. coll. Godman & Salvin, ***male, **1 female (BMNH). PERU.– Rio Tono, *1 male, *1 female (BMNH); Tingo María, *1 male (AMNH); Iquitos, *1 male (AMNH); San Ramón, *1 male (AMNH); Putumayo River, *1 female (AMNH); Iquitos, leg. Fruhstorfer, *1 male (BMNH); Rio Ucayali, *1 male (BMNH); Rio Marañón, ***1 female (BMNH); Iquitos, February 1932, leg. G. King, ***l male (BMNH); Iquitos, Peru, leg. Fruhstorfer, ***l male; **1 female (BMNH); Tarapoto, ***l male (BMNH); Iquitos, Feb 1932, leg. G. Klug, **l male, ***2 males (BMNH); Rio Cachiyacu, 1893, leg. Stuart, ***1 male (BMNH); Champireyacu, Yurimaguas, 1885, leg. de Methan, ***l male (BMNH); Rio Tono, 1200ft., leg. Watkins, ***1 male, **l female (BMNH); Pebas, Amazonas, leg. de Mathan 1880, **1male (BMNH). VENEZUELA.– Caripito, 9-20 Mar 1942, *l male, ***3 males, *l female, *** 2 females (AMNH).

Serratofalca gorgoniensis Johnson & Sourakov, **new sp.**

Figs. 3, 9

DIAGNOSIS.– Three known males are all larger than mainland congener specimens (see below) and show extremely elongate hindwing tails. Male genital habitus is distinctive with a terminally notched but laterally entire *sipc* (Tb. 1, Fig. 9) and flattened valval terminus showing *no appreciable caudal extension* (ventral & lateral view, Fig. 9, Remarks below and under Tb.1).

DESCRIPTION.– Wings (Fig. 3) typical of genus except for large expanse and more elongate hindwing tails. Forewing: males 15.0 - 15.5 mm. (BMNH types). Male Tergal Morphology and Genitalia: Fig. 9, Tb. 1, Chs. 1(3), 2(3), 3(3), 4(3). Female Genitalia: Unknown.

TYPE.– Holotype male: COLOMBIA, Gorgona Island, 7 Sep 1924 ("9/7/24"), St. George Expedition, C. L. Collenette.

Paratypes. Same data as primary type, two males (BMNH) (see Remarks).

DISTRIBUTION.– *Spatial* (Fig. 18): limited to Gorgona Island, some 60 km. offshore equidistant the coasts of Nariño and Cauca departments, western Colombia. *Temporal*: known only from the September or July ("9/7") type data.

REMARKS.– *General*. This taxon illustrates the dilemma of alpha taxonomy when dealing with distinctive characters in an offshore isolate. Although unique characters of the eventual holotype were initially observed, they were omitted from the blind test data matrix because the specimen was a singleton. However, without our knowledge, two specimens from Gorgona Island were also included in the blind test series and these stood out as noted immediately below.

Characters. Blind test specimens nos. 11 and 19 were not scoreable as any known species for any character in the blind test matrix (Table 1 minus *gorgoniensis* and character 4, see Remarks thereunder). However, in all characters both specimens were only like each other. Subsequent examination of specimen data confirmed concurrence of all characters with the initially known Gorgona Island specimen. The population is perhaps either an early dispersal isolate or offshore vicariate of the larger *S. sasha* population but shows distinctive character in every structure shown to be informative at the species level in congeners. Because of its geographic position, some lepidopterists would consider *S. gorgoniensis* a "subspecies" of *S. sasha* either *a priori* or because the female is currently unknown. However, such practice would break the coherence of species level characters demonstrated in this study (including those disclosing apparent sympatry in three of the species level entities). Since there are no objective character criteria to group *S. gorgoniensis* with another species of this study, we consider it distinct. However, in Discussion we note it as a fine "test case" when considering systematic problems elicited by alpha taxonomic studies.

Distribution. Gorgona Island appears to be an emerged offshore element of the Sanguianga and Munchique montane coastal system with no independent tectonic significance. The population may have been introduced by dispersal or perhaps by former land contiguity reflecting eustatic changes of the Cenozoic (see Discussion).

ETYMOLOGY.– Named for Gorgona Island.

Serratofalca callilegua Johnson & Sourakov, **new sp.**

Figs. 4, 10, 15

DIAGNOSIS.– Males recognized by prominently lobate pseudovalvae (*sensu* Scott 1990) on *sipc* (Tb. 1, Ch. 1, Fig. 10) and stout, triangulate ventral valvae shape (Tb. 1, Ch. 2, Fig. 10); females differ congeners by each lobe of the bilobate superior genital plate exhibiting an elongate distoterminal spine and two shorter proximal spines (Tb. 1, Ch. 6, Fig. 15). The species is also smaller than any other group member (see below).

DESCRIPTION.– Wings (Fig. 2AB) typical of genus, generally indistiguishable from congeners. Forewing: males 10.0 - 10.5 mm. (AMNH types); females 11.0 mm. (allotype). Male Tergal Morphology and Genitalia: Fig. 8, Tb. 1, Chs. 1(4), 2(4), 3(4), 4(4). Female Genitalia: Fig. 14, Tb. 1, Chs. 5(4), 6(4).

TYPES.– Holotype male*, allotype female*: ARGENTINA,

Jujuy Province, Dept. Ledesma, Parque Nacional Calilegua, park track 11-13 km. W. of Rt. 34, 1600 m., upland mesic forest, 14 Feb 1991, leg. K. Johnson and D. Kroenlein, deposited AMNH. *Paratypes*. ARGENTINA. Data as on primary types, 1 male (AMNH); "Jujuy Prov.", no other data, 2 males, 1 female (IML).

DISTRIBUTION.– *Spatial* (Fig. 18): currently known from limited upland tropical forest in northern Argentina. *Temporal*: dated specimens include only February.

REMARKS.– Old material was located in unprepared specimens at the IML. The species has been collected recently in Jujuy Province at Parque Nacional Calilegua [spelling conformed here to Anon., 1992]and may, therefore, also occur in upland tropical forest biome at "Cucho" [see Site Description 5A in Johnson, Eisele and MacPherson 1988], south slopes of the Cerro Labrado and, considering southern extent of tropical forest in Argentina, perhaps as far south as "La Corniza" [see Site Description 112A in Johnson, Eisele and MacPherson 1990] in the Alto da las Sauces of Salta Province.

ETYMOLOGY.– Noun in apposition, referring to the type locality spelled in the local colloquial.

palumbes Group

Female genitalia with sclerotized elements in spiral configuration; male genitalia with aedeagal shaft undulate posterior of the caecum.

Serratofalca palumbes (H. H. Druce)

Figs. 5, 11, 16

Thecla palumbes H. H. Druce 1907:617. Comstock and Huntington 1958-1964 [1962]:101.

Thecla cerata [not *cerata* Hewitson 1863-1878 [1877]: vol. 1, 191, vol. 2, pl. 76, Figs. 607, 608 (synonymy in error, *palumbes* considered described as an aberration).

Thecla cerata palumbes: Comstock and Huntington, *Ibid.*, *op. cit.*

Calycopis (?) *cerata palumbes*: Bridges 1988: I.264, II.20, III.30.

Serratofalca palumbes: Johnson 1991:14.

DIAGNOSIS.– Males recognized by produced convex terminal margin of *sipc* (Tb. 1, Ch. 1, Fig. 11) and elongate elliptic valval ventrum (Tb. 1, Ch. 2, Fig. 11); female differing from known specimens of group congener by slightly more angulate terminal and lateral margins on the bilobate lamellae (Fig. 16) and less robust and more elongate ductus bursae (Fig. 16) (see Remarks).

DESCRIPTION.– Wings (Fig. 5AB) typical of genus and generally indistiguishable from congeners (see Remarks). Forewing: males 11.5 - 13.0 mm. (n= 15, AMNH,BMNH); females 12.0 - 13.5 mm. (n= 15, AMNH,BMNH). Male Tergal Morphology and Genitalia: Fig. 8, Tb. 1 characters 1(5), 2(5), 3(5), 4(4). Female Genitalia: Fig. 14, Tb. 1 characters 5(5), 6(5).

TYPES.– Holotype male (BMNH type No. 960): "Cayenne, French Guiana".

DISTRIBUTION.– *Spatial* (Fig. 18): known throughout the Guyana Shield region of South America; sympatric with *S. cerata* along the mouth of the Amazon River in Brazil and with *S. sasha* along the upper Amazon of Brazil and Peru (see Remarks). *Temporal*: many specimens are old and lack collection dates; however, dated specimens from March, April, June and November, along with data on more well-known sympatric congeners, suggest year-round occurrence.

REMARKS.– *General*. This taxon appears to have few literatur citations due to its synonymic association with *T. cerata* afte Draudt (1919).

Characters. The spiral ductus bursae in genitalia of som females of *Serratofalca* stood out immediately in the initial stud of the group (Johnson 1991). Subsequent analysis of male/femal pairs with duplicate collection data (see ME below) showed th spiral ductus to co-occur with males exhibiting the distinctiv characters of the *S. palumbes* type. Such males are distinctive i numerous genital features, including the most distinctive aedeagu of the genus (Tb. 1). A spiral ductus bursae was also discovere subsequently in the southeast Brazilian population describe below as *S. iguapensis*. Female genitalia in *S. palumbes* and *iguapensis* differ the least among congeners. We note some sma differences in these species' Diagnoses but, considering sma sample size in *S. iguapensis*, did not include these in the da matrix for blind tests (Tb. 1).

Hitherto in the Eumaeini, a spiral ductus bursae has bee observed only in the widely distributed and well known genu *Strymon* Hübner, for which it is considered a generic characte The occurrence in one subgroup of *Serratofalca* is apparent homoplesious and coincides with the presence of an undula aedeagus in males. An undulate aedeagus also characteriz *Strymon* (Johnhon *et al.*, 1990). Considering the sympatry of *palumbes* with two congeners showing linear female genitalia, th genus may be a good study group regarding "lock and ke hypotheses in butterfly genitalia (Porter and Shapiro 1990) sin no intermediate genitalic configurations have been noted fro numerous dissections in the present study (Tb. 1 and ME).

The above is particularly interesting since wing charact distinctions in one species of this species group, *S. iguapens* described below, are the most outstanding of the genus.

Distribution. Currently known localities of sympatry for *palumbes* are as follows: with *S. cerata* at Bragança, Pa Santarém, and Óbidos, Brazil and with *S. sasha* at Tefé and S Paulo de Olivenca, Brazil and Iquitos, Peru. While it is desirab to confirm such sympatry by modern specimens with detail distributional data, the long series from early resident collecto like Miles Moss at Bragança and Pará (=Belém) and MNH expeditions across the Guyana Shield may well never be equall by modern workers. Little current material has been available f study of this genus.

MATERIAL EXAMINED.– BRAZIL.– *Pará*: **1 female (BMN Bragança, **1 male (BMNH); Tonantins, **1 male (BMNH); Pará, l Stuart, **1 male (BMNH); "Amazon Valley", leg. Bates. *1 m (HEC); Pará, leg. Stuart, *1 male (BMNH); Maranhão, N. Brazil, leg Bett, **1 male (BMNH); Pará, leg. Miles Moss, **1 male (BMN Tapajós, leg. Bates, **1 male (BMNH); Pará, leg. Stuart, *1 m (BMNH); Pará, leg. Miles Moss, *1 female (BMNH); Pará, leg. Walla **1 male, ***4 males (BMNN); Maués, Amazon, leg. Bates, * female; Amazons, leg. Fassl, ***1 male; Pará, 1893, leg. Stuart, ** males; Pará, leg. de Methan, ***1 male; Bragança, ***1 male (BMN Rio Tapajós, Itaituba Fassl, **1 male. FRENCH GUIANA.– "Fre Guiana", **1 male, **1 female (BMNH); Maroni, **1 male (BMN "Valley of the Amazon" 1 male (MNHN); Bas Maroni, F. G., Feb-M 1921, **2 male, ***3 males (BMNH); Guyane Francaise, June, Brabant, ***1 male (BMNH); Maroni, 2 Mar 1919, ***1 male (BMN Guyane Francaise, leg. Le Moult, ***1 male (BMNH); Guy Francaise, leg. C. Bar, **2 males, ***5 males (BMNH); Maroni, Fre

Guiana, leg. Meaux, **1 male (BMNH); French Guiana, ***3 males (BMNH); French Guiana, "36.26 1", ***1 male (BMNH); French Guiana, Apr 1908, ***1 male (BMNH); French Guiana, leg. Juillet, **1 male, *** 2 males (BMNH); Cayenne, ***2 males (BMMH); St. Jean de Maroni, 1909, leg. Le Moult, ***5 males, 2 females (MNHN); St. Laurent de Maroni, 1909, leg. Le Moult, ***4 males, 2 females (MNHN); Rives de Maroni, 1909, leg. Le Moult, ***4 males, 1 female (MNHN); Guyane Francaise, 1909, leg. Le Moult, ***2 males (MNHN); Gourdonville [sic], Kourou River, Sep 1905, leg. Le Moult ***2 males (MNHN); Gordonville, **1 male (BMNH). GUYANA.– Essequibo River, *1 male (BMNH); Christianburg, **1 male (BMNH); British Guiana, leg. Whitely, ***1 male (BMNH); Bartica, Mar-Apr 1901, **1 male (BMNH); Christianburg, Rio Demerara, **1 male (BMNH); "British Guiana", *2 males (MNHN); Bartica, leg. H. S. Parrish, ***2 males (BMNH). PERU. Iquitos, *2 males (AMNH); Iquitos, **1 male, ***3 males, ** 1 female, ***1 females (MNHN). SURINAM.– Pará District, Surinam, Nov 1922, *2 males (BMNH); Albina, Surinam, *1 male (BMNH); Surninam, leg. Small, *1male (BMNH); Surinam, *1 female (MNHN); Surinam, leg. Fruhstorfer, **1 male (BMNH); Surinam, May-Sep, leg. Ellacombe, **1 male (BMNH); Paramaribo, Oct-Nov 1923, leg. T. T. Dyer, ***2 males, **1 female (BMNH); Surinam, leg. Fruhstorfer, **1 male, ***2 males (BMNH); Anai [undecipherable] River, ***1 male (BMNH); Bergen-Daal, Apr 1892, E. Ellacombe, ***2 males (BMNH); Ornoribe, Feb 1893, ***2 males (BMNH).

Serratofalca iguapensis Johnson & Sourakov, **new sp.**

Figs. 6, 12, 17

DIAGNOSIS.– Structurally, males recognized by deeply cleft terminal margin of *sipc* (Tb. 1, Ch. 1, Fig. 12) and elongate but ventrally multiplanar valvae (Tb. 1, Ch. 1, Fig. 12); known female differing from specimens of group congener by slightly less angulate terminal and lateral margins of bilobate lamellae (Fig. 17) and more robust and elongate ductus bursae (Fig. 17) (see Remarks). In the wings, males of *S. iguapensis* are blackish blue (Fig. 6A) confusing them with some members of sister genus *Klaufera* (Tb. 1 Remarks).

DESCRIPTION.– On wings (Fig. 6AB) under surfaces generally indistiguishable from congeners but male with upper surface of wings markedly darker, black-hued blue. Forewing: males, 11.5 (holotype); females, 10.5, 12.0 mm. (AMNH types). Male Tergal Morphology and Genitalia: Fig. 8, Tb. 1. Chs. 1(6), 2(6), 3(6), 4(6). Female Genitalia: Fig. 14, Tb. 1, Chs. 5(6), 6(6).

TYPES.– Holotype male*, allotype female*: BRAZIL, Paraná State, Iguape, Dec 1914 (AMNH).

Paratypes: Same data as primary types, *1 female (AMNH); BRAZIL, São Paulo State, Goyaz, Campinas, Mar 1933, leg. R. Spitz, Niedhoffer Collection (MPM), ***1 male, 2 females.

DISTRIBUTION.– *Spatial* (Fig. 18): currently known only from older material suggesting coastal forest habitat in southeastern Brazil (see Remarks). *Temporal*: label data indicates at least December through March.

REMARKS.– *General*. Initial dissection of the specimens representing this species led us to examine much larger series of SE Brazil Theclinae with somewhat similar superficial facies. Most of these (n=16), however, proved to be species of *Klaufera*. Similarly, among BMNH specimens historically identified as "*Thecla cerata*" and used in the 1992 blind tests, other *Klaufera* specimens (bluer than some of their congeners) also appeared (Tb. l Remarks). We discuss this further immediately below and suggest that likely locations of further *S. iguapensis* material are in the AMNH series from highlands near Blumenau (undated but acquired by E. I. Huntington in the 1940's), various additional early SE Brazilian material from the Gargarin Collection at MPM, widely deposited specimens of C. M. Biezanko which often predate the 1940's, and historical material at the Museo Zoologia Universidade Federal do Paraná, Curitiba. The problem with assembling study material is the superficial similarity between the respective dark blue-black and brighter blue species of *Serratofalca* and *Klaufera*.

Characters. In the 1991 study by Johnson, *Serratofalca* was figured (Fig. 87) as a rather isolated lineage within the larger grade. However, upon delineation of the *Serratofalca* species herein, it is evident that the *sipc* in males of *S. iguapensis* (like that, to some extent, of *S. callilegua*) shows supralimital development of the lateral lobes (pseudovalvae *sensu* Scott, 1986) much resembling the deeply cleft *sipc* typifying *Klaufera* and a few other members of the *Calycopis/Calystryma* grade. Considering this, the widely bilobate superior genital plates of female *Serratofalca* and *Klaufera* also become evident as a possible shared character. Thus, *S. iguapensis* may represent the primitive character habitus of *Serratofalca* resembling certain species on the basal stem of *Klaufera*. Johnson (1993) and Johnson and Kroenlein (1993a, b) describe a number of peculiar eumaeine species known only from old SE Brazilian material. These also emphasize the odd characters typifying many of the unique species of original SE Brazilian coastal forests.

ETYMOLOGY.– Noun in apposition referring to type locality.

DISCUSSION

Serratofalca well illustrates the perplexing problem faced by alpha taxonomy when diversity in structural habitus belies superficial similarity in wing pattern. Studied with reference to both external and internal features, *Serratofalca* taxa show a consilience of structural characters and geographic sympatry indicating a much larger diversity of distinctive populations than would be apparent by simple reference to the overall wing habitus. Systematic problems illustrated by the genus accentuate that, as well known for many groups of moths, Neotropical Eumaeini will not always be readily identified by simple comparison to field guide photographs, series of specimens "identified" at museums or photographs of type specimens. The problems are more complex and, quite beyond applying consistent methods of alpha taxomony, suggest the need for biological fieldwork to determine which distinctive populations may be considered "biological" species (see Cracraft, 1983; Wiley, 1981).

Tropical Lepidoptera, with its wide circulation among lepidopterists specializing in Neotropical faunas, is apt for reporting these results. Problems of nomenclatural usage concerning the many poorly known Neotropical Eumaeini require candid comment. Each year, the senior author receives many letters asking for a simple photobook or "keys" for identifying the diverse Neotropical Theclinae. Some workers (including professionals) state they disregard Theclinae classifications which refer to structural characters and, for convenience, prefer older classifications based on generalized wing habitus. Such classifications cluster voluminous historical names in omnibus genera like "*Thecla*" and

"*Calycopis*". Their purpose, to quote one worker, is to have "names handy" for faunal lists and local biological commentary. Such views suggest the need for serious reflection concerning the purposes of systematic study. We aggressively question the scientific veracity of methods which simply list taxa based on external similarity and ignore reference to structural characters because the latter are considered too cumbersome or impractical. Certainly, nearly all lepidopterits would agree that such methods would never be considered satisfactory for well-known groups like the Papilionidae where members of the Papilionini and Troidini often appear confusingly alike.

Alpha taxonomic studies, like the one herein presented for *Serratofalca*, should probably be considered the "first step" in larger processes to determine whether taxa have significance as "morphological", "cladistic" or "biological" species (see e.g. Cracraft 1983, Wiley 1981). Certainly, the apparent sympatry of the populations described in *Serratofalca* as *S. cerata*, *S. palumbes* and *S. sasha* suggest a fruitful area of study for field workers in the Amazon River basin. Equally compelling are the peculiar characters of the outlying allopatric taxa *S. iguapensis*, *S. callilegua* and *S. gorgoniensis*. The biological status of these entities also needs to be investigated before determining the appropriateness of infraspecific taxonomic categories. For instance, the subspecies category might be used for taxa comprising the respective morphoclusters (herein, the "species groups") of *Serratofalca*— limiting the genus to two species, *palumbes* and *cerata*. However, this currently contradicts the distribution of morphological characters and patterns of sympatry. The subspecies category might also be applied to immediate sister vicariates like *S. sasha* and offshore oddity *S. gorgoniensis*, which appear to represent elements of the same ancestral area of endemism (Colombian Andes and an offshore mountaintop). However, current restriction of this category exclusively to *S. sasha* and *S. gorgoniensis* is inconsistent with the morphological data. *S. gorgoniensis*, though currently known only from males, shows no exclusive morphological affinity to *S. sasha* and, instead, unique characters of its own. One either follows a consistent set of criteria or is left to guess and/or erect arbitrary categories.

As is well-known, much literature concerning centers of endemism in the Neotropical Realm (e.g. tropical forest "refugia") attributes current taxonomic interrelations to comparatively recent climatic events of the Pleistocene (see, for instance, summary of Brown, 1982). Workers seeing the "*Thecla cerata* complex" from this viewpoint would not expect the structural diversity reported here for *Serratofalca*. At most, recognizing sympatry of populations showing "linear" and "spiral" female genitalic configurations might lead to recognition of two species—*S. cerata* and *S. palumbes*. However, the geographic ranges of the elements comprising these complexes must be accounted for and here the earlier Quaternary period invites interest. Events from mid-Miocene forward (Gansser, 1973; Brooks and McLennan, 1993) original westward drainage of the Amazon basin, mid-Miocene inland sea dividing the basin north from south, and subsequent uplift of the Andes prompting eastward flow of the Amazon may better account for (1) north/south disjunction of *S. cerata* and *S. palumbes* species groups, (b) isolation of a species around the mouth of today's Amazon [*S. cerata*], (c) widespread occurrence of a species westward along the Andes mountains and across th Pliocene bridge into Central America [*S. sasha*], and (d) morphologically unique entity confined to an emergent peak of the western Colombian coast [*S. gorgoniensis*]. The origin o *Serratofalca* purely from simultaneously occurring Pleistocen forest refugia would appear to predict a more homogenou morphology (certainly a less dichotomous one), little morpholog cal distinction (if any) of sympatric subunits, less distinctiv allopatric units, and clearer association of the offshore elemen with one of the contemporaneous mainland populations. Withou doubt Pleistocene events further affected pan-Neotropica *Serratofalca*. However, the dichotomy of the morphologica ground plan in modern entities, and their South and Centra American occurrence, suggest the ancestral population (as well a its two major subunits) were most likely in place by the Pleisto cene.

In considering complex Neotropical groups, it appears th function of basic alpha taxonomy is to provide initial benchmarks These latter then serve to guide further systematic study aimed a answering various, or even different, kinds of questions abou these natural populations. Certainly, in the case of a group lik *Serratofalca*, none of the interesting and perplexing problem presented by the group would ever be exposed by the "quick fixing" of arbitrary names based on superficial characters. Thes would recognize only one "easily distinguished . . . dull-lustrou indigo" species (Draudt, 1919; Bridges, 1988). Morphologica assessment of the complex across its entire Neotropical rang exposes two major morphoclusters comprised of six distinctiv populations, three of which are sympatric. These results shoul be kept in mind by those prone to consider every delineation o new taxa in the Neotropical Eumaeini as a matter of simpl "taxonomic splitting".

TABLE 1

CHARACTERS

The six taxa of *Serratofalca* recognized in this revision wer identified in the "blind tests" (N=73 [including 3 misplace BMNH *Klaufera* specimens]) by scoring five unequivoc characters of the male tergal morphology and genitalia and th female genitalia as summarized below.

Descriptions are repeated briefly from text employed in th diagnoses; species are denoted by numbers following the taxo nomic order of the revision: 1 (*cerata*), 2 (*sasha*), 3 (*gorgo iensis*), 4 (*callilegua*), 5 (*palumbes*), 6 (*iguapensis*). Figu references assume the structure indicators ("a", "b", etc.) use initially in Figs. 7 and 13; remarks concerning blind test scorin consistency of results, etc. are footnoted below.

MALE

Character 1. Tergal Morphology, shape of *sipc* dorsum: terminal margin concave (Fig. 7c); 2, terminal margin centrall notched, lateral margin undulate (Fig. 8c); 3, terminal margin centrally notched, lateral margin entire (Fig. 9c); 4, showin prominently lobate pseudovalvae (Fig. 10c); 5, terminal marg greatly convex (Fig. 11c); 6, terminal margin deeply cleft bifurcate fashion (Fig. 12c).

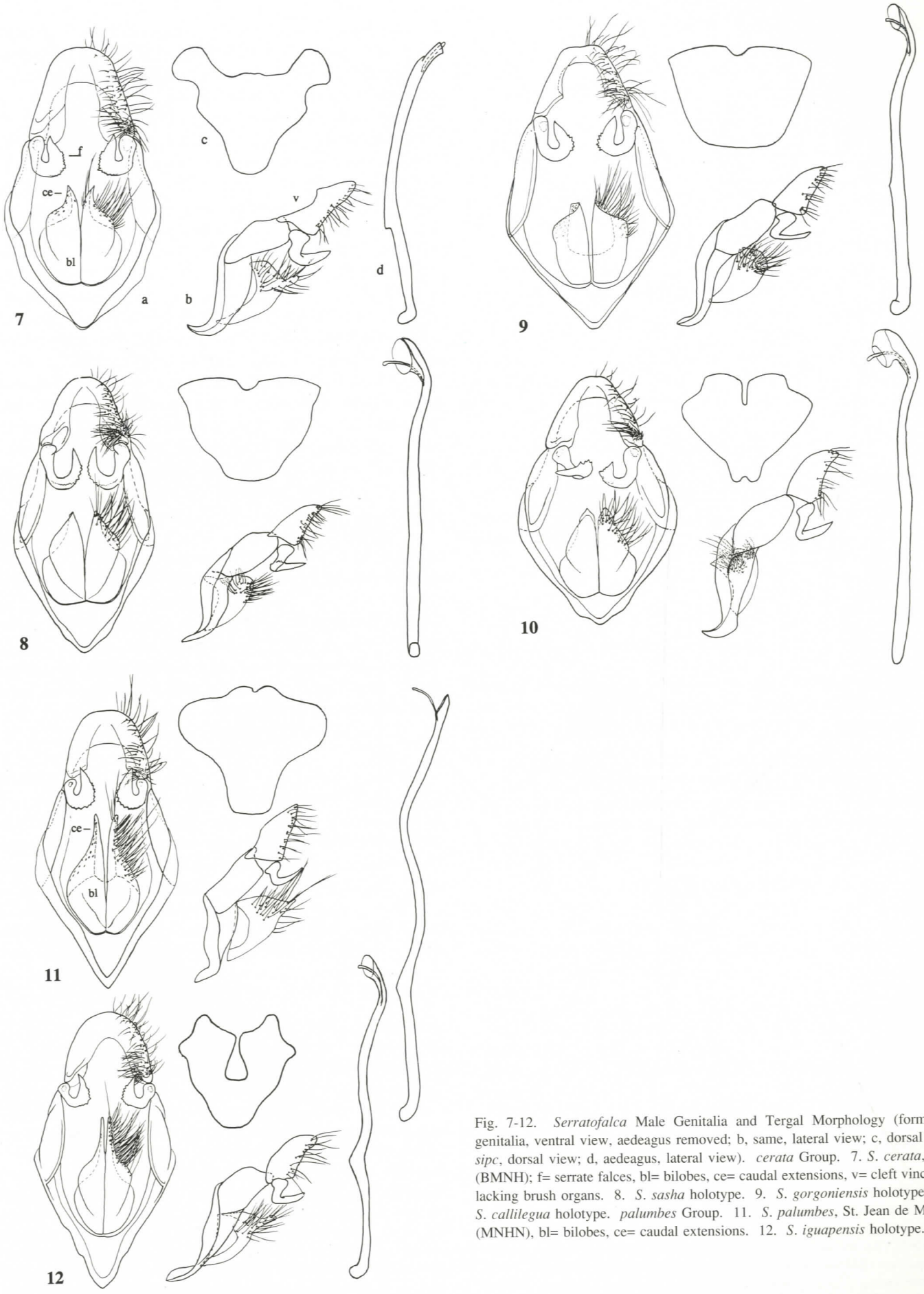

Fig. 7-12. *Serratofalca* Male Genitalia and Tergal Morphology (format a, genitalia, ventral view, aedeagus removed; b, same, lateral view; c, dorsal plate *sipc*, dorsal view; d, aedeagus, lateral view). *cerata* Group. 7. *S. cerata*, Pará (BMNH); f= serrate falces, bl= bilobes, ce= caudal extensions, v= cleft vinculum lacking brush organs. 8. *S. sasha* holotype. 9. *S. gorgoniensis* holotype. 10. *S. callilegua* holotype. *palumbes* Group. 11. *S. palumbes*, St. Jean de Maroni (MNHN), bl= bilobes, ce= caudal extensions. 12. *S. iguapensis* holotype.

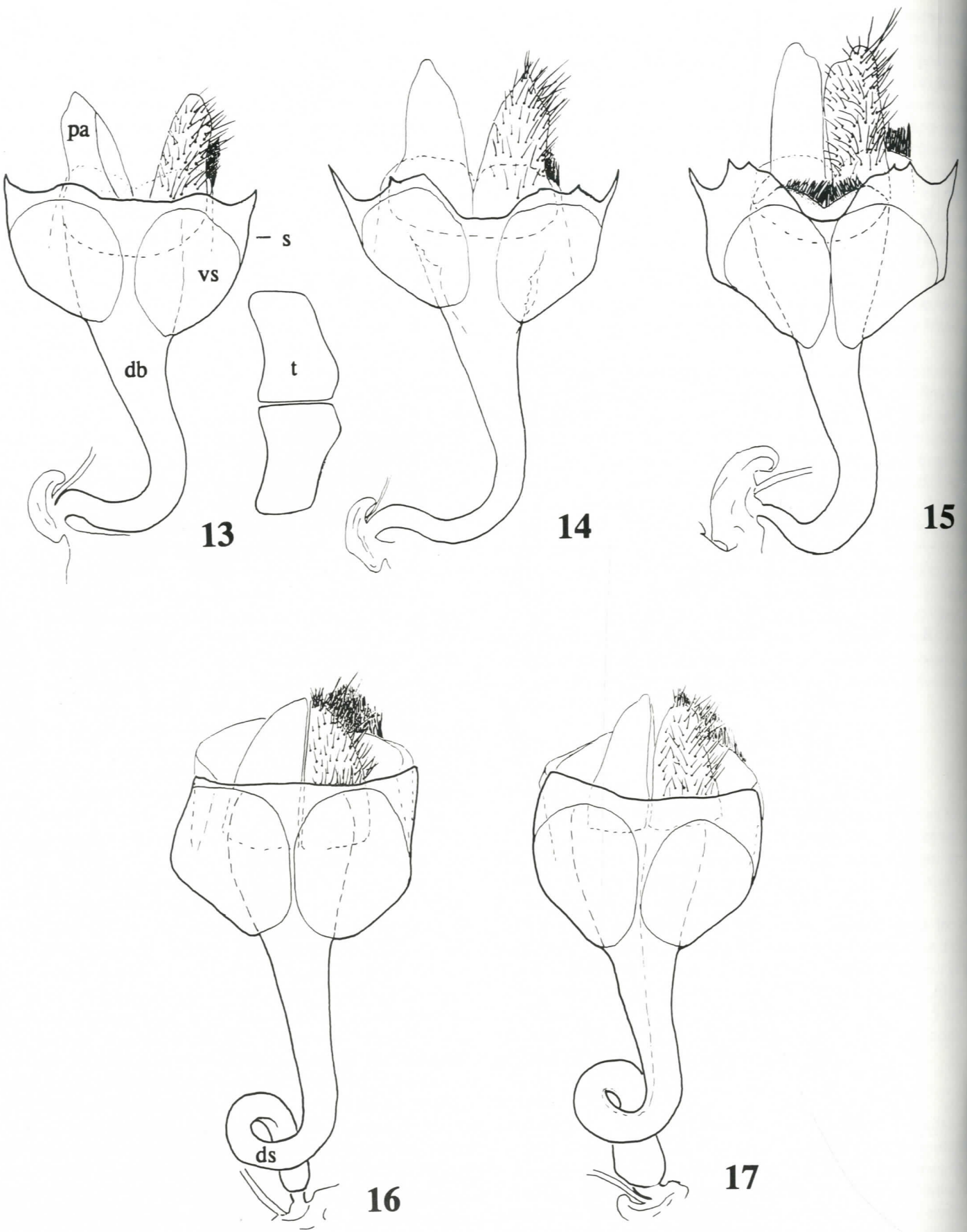

Fig. 13-17. *Serratofalca* female genitalia (genitalia, ventral view from terminal plates, above, to juncture of ductus and cervix bursae, below). *cerata* Group. 13. *cerata*, Pará (BMNH); s= superior genital plate, vs, ventral scutes, db, ductus bursae, pa, papillae anales; immediate right, t, terminal tergite (dorsal bilobate vie terminus right). 14. *S. sasha* allotype. 15. *S. callilegua* allotype. *palumbes* Group. 16. *S. palumbes*, St. Jean de Maroni (MNHN); ds, ductal spiral. 17. *iguapensis* allotype.

Character 2. Genitalia, shape of valvae: 1, ventrum basally ovate terminating in short, slightly upturned, caudal extensions (Fig. 7bl,ce); 2, ventrum shape (comprised of caudal extension, bilobe, and basal margins), pentagonal (Fig. 8bl,ce); 3, terminus flat, showing no appreciable caudal extension (Fig. 9bl); 4, ventrum shape (comprised as above in 2) triangulate (Fig. 10bl,ce); 5, ventrum elongate and elliptical in shape with ventrum generally of even contour (Fig. 11bl,ce); 6, ventrum elongate and elliptical in shape with ventrum undulate, separating caudal extensions and bilobes (Fig. 12bl,ce).

Character 3. Genitalia, shape of aedeagus shaft adjacent juncture with caecum: 1, 2, 3, 4 straight (Figs. 7d-10d); 5, 6 undulate (Figs. 11d-12d).

Character 4. Genitalia, shape of aedeagus posterior of caecum: 1, shaft element contiguously straight after a strong angle at caecum (Fig. 7d); 2, straight shaft with gradual dorsal inclination in terminal one-fourth (Fig. 8d); 3, shaft straight until posterior one-fifth, then with emphatic dorsal arch (Fig. 9d); 4, shaft straight until terminal one-sixth, then with slight dorsal inclination (Fig. 10d); 5, shaft elongate and undulate throughout (Fig. 11d); 6, shaft shorter, posterior with one undulation followed by slight dorsal inclination in terminal one-fifth (Fig. 12d).

FEMALE

Character 5. Genitalia, shape of ductus bursae: 1,2,4, straight, then arched in anterior two-fifths (Figs. 13db-15db); 5,6, spiral in anterior one-half (Figs. 16ds-17ds).

Character 6. Genitalia, terminal shape of bilobate superior genital plate: 1, each lobe with a single, usually short, distoterminal spine (Fig. 13s); 2, each lobe with elongate distoterminal spine and shorter proximal spine (Fig. 14s); 3, unknown; 4, each lobe with a distoterminal spine and two shorter proximal spines (Fig. 15s) ; 5,6, terminal shape entire (Figs. 16s, 17s).

REMARKS

The 1992 blind tests dissected every third specimen in the BMNH collection historically identified as *"Thecla cerata/ palumbes"* (beginning from the upper left hand side and proceeding down rows) without regard to label data or sex identification (specimens lacking abdomens were skipped) (N=73). The following comments are pertinent:

1. None of the characters of Table 1 "blurred" where taxonomic units defined herein were sympatric (see Remarks under *S. cerata*, *sasha* and *palumbes*).
2. Taxa 2 and 6 in male Character 2 are similar but identification unequivocal by other characters.
3. Taxa 5 and 6 in female Characters 4 and 5 are similar but identification not only unequivocal by males, finer analysis indicates more angulate genital plate in *S. palumbes* and robust ductal spiral in *S. iguapensis* consequently located less remote from the terminal genital plates (see *palumbes* Group Diagnoses).
4. Confusion in scoring occurred in 3 instances involving degree of serration of a female genital plate margin determining the number of distoterminal spines. The occurrence was in three specimens finally distighished as *S. sasha* from *S. cerata* and appeared irrespective of geographic location (e.g. BRAZIL, Ega and São Paulo de Olivenca; COLOMBIA, Cundinimarca [see *S. sasha* ME for complete data]).
5. Original scoring did not include a character category for *S. gorgoniensis* because only a single Gorgona Island specimen was known at the time; however, unbeknownst, the blind test included two additional specimens from the island and these (i) could not be scored as any of the other taxa but (ii) were noted as showing characters matching only each other.
6. Though unknown at the beginning of the test, specimens did not include representatives of *S. iguapensis* or *S. callilegua*.
7. Scoring disclosed 3 specimens of *Klaufera* sp. (see structral characters, Johnson 1991, pp. 14-15) misplaced by BMNH curators with the *"Thecla cerata"* assemblage.

Fig. 18. Geographic distributions of *Serratofalca* taxa.

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NOTE ADDED IN PROOF

A recent publication (1992. *A Guide to the National Pa System of Colombia*. Inst. Nac. Rec. Natr., Bogota. 198p reports that Gorgona Island is part of an old mountain cha extending southward to the Darién of Ecuador, separated fro mainland Colombia by a 270m deep ocean trench, and physi graphically akin to the Serranía de Baudó mountains of Ecuado This supports the view that *S. gorgoniensis* is probably an o relict.