Journal of the Lepidopterists' Society
63(4), 2009,185-208

A NEW GENUS OF CARIBBEAN ODONTIINAE WITH PALAEOTROPICAL AFFINITIES (LEPIDOPTERA: CRAMBIDAE)

James E. Hayden
2144 Comstock Hall, Cornell University, Ithaca, NY 14853 USA, email: jeh63@cornell.edu

ABSTRACT. *Suinoorda maccabei* ***gen. et sp. nov***. is described from the Bahama Islands and Cuba. Cladistic analysis of the Eurrhypini (39 terminals, 48 characters) tests the phylogenetic relationships of the species and confirms that it is the earliest-diverging member of an otherwise Palaeotropical clade characterized by a modified plectrum of the eurrhypine genitalic stridulatory apparatus. The new species is not closely related to other Neotropical Eurrhypini with similar but plesiomorphic or convergent maculation. The nomenclatural status of other Eurrhypini is revised. *Clupeosoma orientalale* (Viette) ***comb. nov.*** and *Clupeosoma vohilavale* (Marion & Viette) ***comb. nov.*** are transferred from *Autocharis* Swinhoe, *Noordodes magnificalis* (Rothschild), ***comb. nov.*** is transferred from *Noorda* Walker, and *Hyalinarcha hyalinalis* (Hampson), ***comb. nov.*** is transferred from *Boeotarcha* Meyrick. *Metrea* Grote is synonymized with *Cliniodes* Guenée, ***syn. nov.***, and the synonymy of *Basonga* Möschler with *Cliniodes* is reinstated. Missing data for female genitalia and larval feeding habit are predicted with a simple method.

Additional key words: Stridulation, seed feeding, frontal structure, diagnosis, missing data

INTRODUCTION

The purpose of this paper is to describe and diagnose a new, phylogenetically unique species of snout moth from the West Indies. In the course of my studies on the Neotropical Eurrhypini Leraut & Luquet (Crambidae: Odontiinae), T.L. McCabe brought to my attention a series of specimens that he collected in 1986 on Great Exuma, Bahama Islands. I subsequently found in the Museum für Tierkunde (Dresden) one specimen collected in 2000 by J.-P. Rudloff in eastern Cuba. The male specimens significantly resemble other tropical Eurrhypini in having almost entirely white forewings with the antemedial line nearly absent, a black discocellar spot, and a simple, narrow, reddish terminal band (Fig. 1). This pattern occurs in Neotropical eurrhypines such as *Argyrarcha* Munroe, *Sobanga* Munroe, and *Cliniodes paradisalis* (Möschler) (Fig. 4), as well as in Palaeotropical genera such as *Autocharis* Swinhoe and *Pseudonoorda* Munroe (Fig. 3).

Dissection of males confirmed its placement in the Eurrhypini and more precisely with a group of genera that share an unusual, hitherto unrecognized modification of the genitalic structures that characterize the tribe (Figs. 8, 9) (Leraut & Luquet 1983). Its closest relatives are restricted to the Palaeotropics, ranging from Africa to New Guinea; some of these genera share the wing pattern (*e.g. Pseudonoorda*), and others do not (*Clupeosoma* Snellen). However, the new species also shares symplesiomorphies with members outside the group. Most strikingly, the frontoclypeal suture, just above the base of the haustellum, is exaggerated in a porcine snout of nearly circular shape (Fig. 5). This appears to be homologous to the distinctly upturned frontoclypeus of *Autocharis* and *Dicepolia* Snellen (Fig. 6). The new species also has plesiomorphic forewing venation and genitalic androconia. A new genus seemed necessary, but hesitating to add another name to an already nomenclaturally atomized subfamily, I tested its relationships by cladistic analysis.

The genitalic structures relate to the diagnosis of the Eurrhypini. The tribe includes nearly two hundred species in about four dozen genera, with greatest diversity in Palaeotropical forests. The tribe has been characterized by three apomorphies of the male genitalia: (1) a pair of "lamelliform structures" on the 8th abdominal sternite (Leraut & Luquet 1983), (2) a pair of large, square to oblong "squamiform structures" attached to the vinculum (Minet 1980; Figs. 8, 9: Sq), and (3) a plume of long scales in medial position on the vinculum (Nuss & Kallies 2001). The second and third structures have been confused in previous studies (see Discussion), but in this paper, I identify the squamiform structures with the two square membranes. The lamelliform structures are bundles of a few robust chaetiform setae cemented together and directed posteriad. The chaetae apparently rub against the numerous transverse ridges of the squamiform structures. The structures been observed to have a stridulatory function for male courtship in one species, *Syntonarcha iriastis* Meyrick of Australia and Wallacea (Gwynne & Edwards 1986), but none of the many other species with the apparatus have yet been studied. The squamiform and lamelliform structures in *S. iriastis* are strongly modified, so the species was omitted from this analysis.

In the new species and its Palaeotropical relatives, the lamelliform structures are absent from the eighth sternite (S8) and appear to be functionally replaced by a pair of lozenge- or ribbon-like fields on the intersegmental membrane between S8 and the vinculum, just anterior of the squamiform structures (Fig. 8: Sep). These sclerotized fields bear transverse ridges so that the outline and texture are reminiscent of cuttlebones. Reflecting the terminology of Minet (1980) and Leraut & Luquet (1983), I refer to these as *structurae sepiformes* (Gk. *sepion*, cuttlebone).

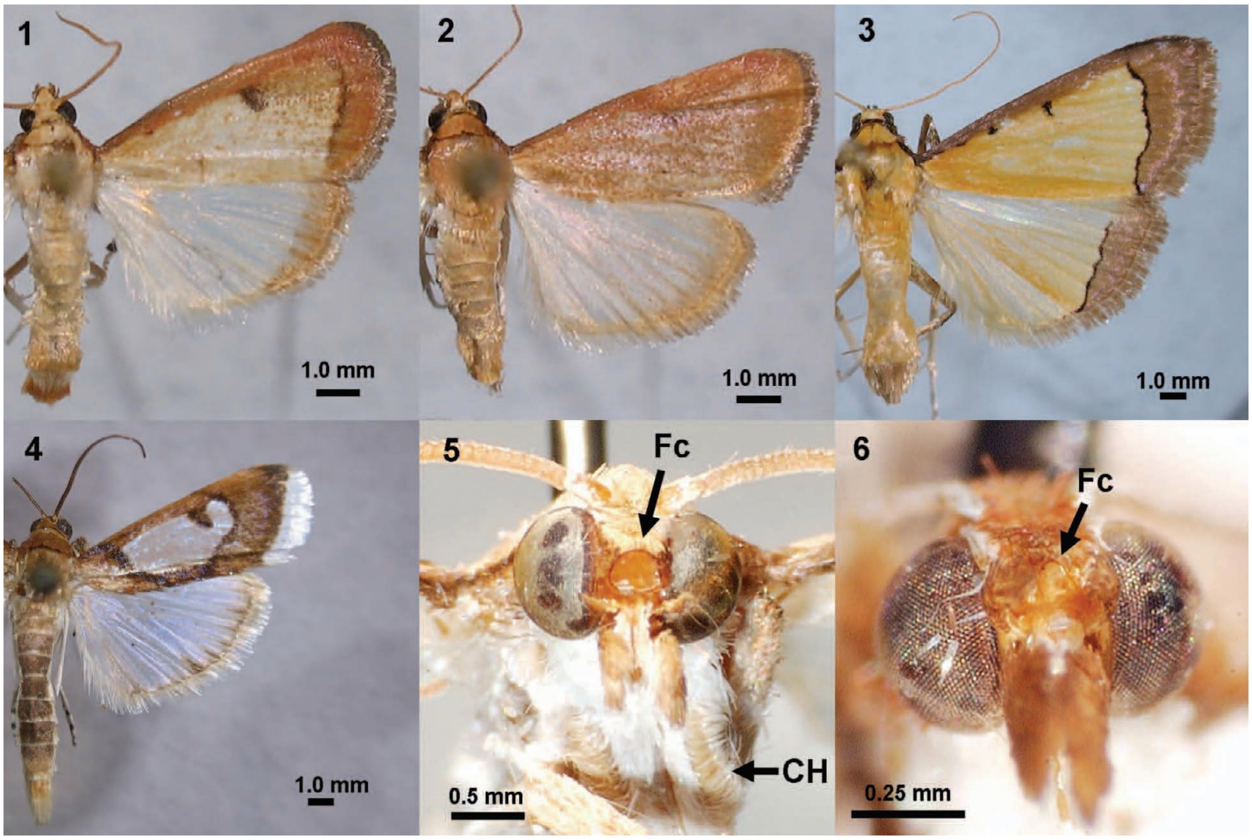
The Odontiinae has not been subject to previous phylogenetic analysis, except as a terminal taxon (Solis & Maes 2002). The results demonstrate that the new species is not closely related to several other Neotropical odontiines, despite shared wing patterns and head structures. In addition, explicit predictions are derived from the phylogeny about unobserved characters, including unknown feeding habits. Generic transfers are made where evidence is sufficient, but broad nomenclatural changes are not made pending a larger sample of species and characters (Hayden in prep.).

MATERIALS AND METHODS

Taxa. The thirty-nine species selected for phylogenetic analysis include Eurrhypini that share similar wing pattern and/or sepiform structures. All known Neotropical Eurrhypini that resemble the new species in maculation are included. The type species of genera were included wherever possible. Two Odontiini serve as outgroups: *Cynaeda dentalis* (Denis & Schiffermüller, 1775), the type species and genus of the Odontiini, and *Tegostoma comparale* (Hübner, 1796). The ingroup taxa are listed in Table 1 with information about slide preparations. For the external characters of many species, additional specimens were examined from the same collections. Species used in this analysis were identified by comparison with original descriptions, digital photographs of type material, and revisions and faunal treatments.

The Neotropical eurrhypine genera were transferred in Munroe (1995). Leraut & Luquet (1983: 528) indicated that *Hyalinarcha* Munroe, *Metrea* Grote,

Figs. 1–6. Dorsal habitus of wings and frontoclypeus. **1,** *Suinoorda maccabei* holotype ♂, right half. **2,** *S. maccabei* paratype ♀, left half (reflected) (McCabe Coll.). **3,** *Pseudonoorda distigmalis* ♀ (Congo, Likouala Region: CMNH). **4,** *Cliniodes paradisalis* (Jamaica, Moneague: AMNH). **5,** *S. maccabei* ♂, frontal aspect of head. **6,** *Dicepolia rufitinctalis*, frontal aspect of head (USNM). **Fc**, frontoclypeus; **CH**, prothoracic coxal hairs.



Pseudonoorda, and *Viettessa* Minet belong in the Eurrhypini based on possession of the apomorphic structures. The following Old-World genera used in this study are hereby placed in the Eurrhypini because their type species possess the structures: *Aeglotis* Amsel, *Autocharis*, *Clupeosoma*, *Deanolis* Snellen, *Ephelis* Lederer, *Hemiscopis* Warren, *Heortia* Lederer, *Hydrorybina* Hampson, *Noordodes* Hampson, and *Pitama* Moore. The following misplaced species are transferred to the Eurrhypini for the same reason: *Epipagis ocellata* (Hampson 1916) and *Mecyna catalalis* Viette 1953.

The terminal "*Pseudonoorda brunneiflava*" is a composite of two species: the female is identified as *Pseudonoorda brunneiflava* Munroe, and the male is a closely related undescribed species. The new species has the forewing postmedial line closer to the distal wing edge and the terminal area yellow like the median area, rather than violet. Consequently, the wing pattern (char. 4) is coded as both states because *P. brunneiflava* and *P. metalloma* have a violet terminal area.

The following sources provided specimens used in this analysis: American Museum of Natural History, New York (AMNH); Academy of Natural Sciences, Philadelphia (ANSP); Carnegie Museum of Natural History, Pittsburgh (CMNH); Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa (CNC); Cornell University Insect Collection, Ithaca (CUIC); Instituto Nacional de Biodiversidad, Costa Rica (INBio); Muséum d'Histoire Naturelle, Genève (MHNG); Museo del Instituto de Zoología Agrícola, Maracay (MIZA); Muséum National d'Histoire Naturelle, Paris (MNHN); The Natural History Museum, London (NHM); New York State Museum, Albany (NYSM); Musée Royal de l'Afrique Centrale, Tervuren (RMCA); Naturalis, Leiden (RMNH); Senckenberg Naturhistorische Sammlungen Dresden (Museum für Tierkunde: MTD); United States National Museum, Washington, D.C. (USNM); Museum für Naturkunde, Humboldt Universität, Berlin (ZMHB); Staatliche Naturwissenschaftliche Sammlung Bayerns, München (ZSM).

Preparation. Specimens were examined under tungsten-filament light with a Wild Heerbrugg stereomicroscope. Measurements were taken with an ocular micrometer at 1000X, and coloration was inspected under incandescent light and compared with the *Methuen Handbook of Colour*, 2nd ed. (Kornerup & Wanscher 1967). Photomicrographs were taken with a digital Nikon DX1 camera and Microptics photomicrographer.

Specimens were dissected according to Robinson (1976). Abdomens were macerated for 20 mins. in 10% aqueous KOH solution in a simmering water bath and dissected in water. After inspection of deciduous hairs and scales, genitalia were cleaned with size 3/0 sable hair brushes and a snipe pinfeather, stained with Chlorazol black E, dehydrated 24hr in 95% ethanol, and mounted in Euparal. Some dissections were stored in glycerin for several months during the process of character coding to observe 3-dimensional structures. Wings were prepared by wetting in 95% ethanol, immersion in acetone for 30s., and denudation of scales in water. Wings were soaked in weak bleach solution (20%) for 60s., brushed again, stained in Eosin-Y (1g / 70% ethanol) for *ca.* 1 hour, and dehydrated and mounted as for the genitalia above.

Additional slides by E.G. Munroe and preparators in the CNC were examined (Table 1). These were often less informative, as the androconia, scales, and even the squamiform structures were often removed.

Characters. Forty-eight characters were coded in the context of a larger survey of Odontiinae (Appendix A). Characters for phylogenetic analysis were drawn from the external morphology of the head (4), wings (11), tympanal organs (1), male genitalia (22), female genitalia (9), and larval feeding habit (1). Terminology follows Klots (1956), Kristensen (2004), and the LepGlossary (Leptree Team 2008), and terms for tympanic organs follow Maes (1995). Sources of hostplant information are listed in Table 2. The states were delimited with consideration of plausible physiological and behavioral constraints while maximizing grouping information for the taxon sample. Characters are numbered from 0; see Appendix B for descriptions of character states. In the Results and Discussion, parenthesized numbers refer to "(character:state)." Some characters were coded as inapplicable if they depend on the presence or absence of another character. Unobserved characters include antennal ciliation for *Dicepolia munroealis* (Viette) (char. 0), the vincular androconia for *Autocharis barbieri* (Legrand), *D. munroealis* and *Sobanga rutilalis* (Walker) (char. 30), female genitalia for *Aeglotis argentalis* (Christoph) and *Clupeosoma atristriatum* Hampson (chars. 37–45), and feeding habit for most terminals (char. 46). Characters were coded for more than one state where a structure either did not clearly belong to one state or where the terminal was polymorphic (exhibiting more than one discrete state among specimens).

Phylogenetic analysis. The data matrix was entered with WinClada v. 1.00.08 (Nixon 2002) (Appendix B). Electronic files are available from the author. The matrix was analyzed with parsimony with TNT v. 1.1 for Windows (Goloboff *et al*. 2003, 2008) on

TABLE 1. Species and specimen preparations included in the analysis. Slide numbers refer to preparations by the author (JEH) unless indicated by preparator's initials.

Taxon	**Sex**	**Locality**	**Slide no.**	**Collection**
Aeglotis argentalis (Christoph 1887)	1m	Pakistan: Kohistan	270	MTD
Argyrarcha margarita (Warren 1892)	2m, 1f	Brasil: Rio Gr. do Sul	126, 127, 427	CUIC
	1f	Br: Sta. Catharina	2760 M. d'A.	CNC
Autocharis albiplaga (Hampson 1913)	1m, 1f	South Africa: Cape Prov.	93, 119	USNM
Autocharis barbieri (Legrand 1965)	1m, 1f	Seychelle Is.	94, 120	USNM
Autocharis fessalis (Swinhoe 1887)	1m, 1f	India: Orissa	49, 50	USNM
Autocharis mimetica (Lower 1903)	1m, 1f	Australia: NT	189, 190	NYSM
Cliniodes costimacula (Hampson 1913)	1m	Venezuela: Aragua: Rancho Grande	48	USNM
	1f	Costa Rica: Prov. Limón	210	INBio
Cliniodes opalalis Guenée 1854	1m	Peru: Pasco Dept.	59	CUIC
	1m	Peru: Huanuco	61	AMNH
	1m	Venezuela: Tachira	64	MIZA
	1m	Peru: Divisoria	66	USNM
	1m	Bolivia: Cochabamba	162	CNC
	1m	Costa Rica: Puntarenas: Monte Verde	195	AMNH
	1f	Costa Rica: Puntarenas: Monte Verde	172	CUIC
	1f	Jamaica	1107 M. d'A.	CNC
Cliniodes ostreonalis (Grote 1882)	1m, 1f	Canada: Que.: Norway Bay	137, 138	CNC
	1m	Canada: Ont.: Merivale	1319 EGM	CNC
	1f	Canada: Ont.: Merivale	2911 M. d'A.	CNC
Cliniodes paradisalis (Möschler 1886)	1m	Jamaica: Port Antonio	17	AMNH
	1m	Jamaica: St. Andrew Parish	269	ANSP
	1m	Jamaica	2553 EGM	CNC
	1f	Jamaica: Trelawny	154	CNC
Clupeosoma atristriatum Hampson 1917	2m	PNG: New Britain: near Keravat	121, 122	CNC
Clupeosoma sericiale (Hampson 1896)	1m, 1f	Philippine Is: Luzon	53, 54	USNM
Clupeosoma orientalale (Viette 1954 [1953])	1m	Madagascar Est	258	MNHN
	1f	Madagascar Est	259	RMCA
Clupeosoma vohilavale (Marion & Viette 1956)	1m, 1f	Madagascar: Maroantsetra	256, 257	MNHN
Cynaeda dentalis (Denis & Schiffer-	1m, 1f	Germany: Rheingau: Loreley	38, 39	USNM
Deanolis sublimbalis Snellen 1899	1m	Malaysia: Sabah: Kinabalu NP	130	USNM
	1f	Philippine Is: Samar	254	ZMHB
Dicepolia munroealis (Viette 1960)	1m	Madagascar: Lakato route	Holotype, prep. unkn.	MNHN
	1f	Madagascar: Anosibe	288	MHNG
Dicepolia roseobrunnea (Warren 1889)	1m	Rio Iça	175	CUIC
	1m	Fr. Guiana: St. Jean de Maroni	BM 22137	NHM
	1m	Brasil: Upper Amazon, Codajas	BM 22138	NHM
	1m	Brasil: Estado Paraíba	111,915 Heinrich	USNM
	1f	Brasil: Estado Paraíba	224	USNM
Dicepolia rufitinctalis (Hampson 1899)	1m	Guyana	79	CUIC
	1m	Venezuela: Amazonas	81	MIZA
	1f	Bolivia: Cochabamba	167	CNC
	1m, 1f	Mexico: Ver.: Jalapa	232, 233	USNM
	1m, 1f	Peru: Avispas	234, 235	CNC
	1m, 1f	Panama: Canal Zone	236, 237	USNM
	1m	Bolivia: Cochabamba	238	USNM
	1f	Brasil: Distr. Fed.	239	USNM
	1m	Brasil: Rondonia	246	LACM
Ephelis cruentalis (Geyer 1832)	1m	Hamfelt Coll.	44	USNM

TABLE 1. (continued)

Taxon	**Sex**	**Locality**	**Slide no.**	**Collection**
Ephelis cruentalis (Geyer 1832)	1m	Hamfelt Coll.	44	USNM
	1m	[unknown]	330	CMNH
	1f	Italy: Basilicata: Monticchio	45	USNM
	1f	Turkey: Dorah Rober	271	RMNH
Epipagis ocellata (Hampson 1916)	1m	Congo: Lulua	307	RMCA
	1f	Congo: Bokuma	308	RMCA
Eurrhypis pollinalis (Denis & Schiffermüller 1775)	1m, 1f	[illeg.] Hamfelt Coll.	132, 133	USNM
Hemiscopis suffusalis (Walker 1866 [1865])	1m, 1f	Philippines: Los Baños	196, 320	USNM
	1m	Philipplines: Mindanao	417	CNC
	1m	Sri Lanka: Kandy	1652 EGM	CNC
	1f	China: Hainan Is.	78	CUIC
	1f	Sri Lanka: Colombo	1653 EGM	CNC
Heortia dominalis (Lederer 1863)	1m, 1f	Philipplines: Mindanao	324, 325	RMNH
Heortia vitessoides (Moore 1885)	1m	Cambodia	75	CUIC
	1m	Sri Lanka: Galle Distr.	326	USNM
	1f	Sri Lanka: E. Distr.	152	USNM
	1m	Indonesia: Borneo	2555 EGM	CNC
Hyalinarcha hyalinalis (Hampson 1896)	1m	PNG: Dagua Rd., Wewak	115	CNC
	1f	PNG: Morobe	116	CNC
	1m	PNG: Wewak	3028 DK	CNC
	2m	India: Assam: Margherita	3024 DK, 3032 DK	CNC
Hydrorybina polusalis (Walker 1859)	1m	Laos	74	CUIC
	1f	Sri Lanka: Kandy	4819 DK	CNC
	1f	Philippines: Luzon	321	ZMHB
Mecyna catalalis Viette 1953	1m	Madagascar: Analamazaotra	279	MNHN
	1f	Madagascar: Anosibe route	280	MNHN
Mecynarcha apicalis (Hampson 1898)	1m, 1f	Guyana: Rupununi	51, 52	USNM
	1f	? Ellsworth Collection	155	CUIC
	1m	Brasil: Amazonas	161	CMNH
Mimoschinia rufofascialis (Stephens 1834)	1m, 1f	USA: Virgin Is.: Kingshill	57, 58	CUIC
	1m	USA: AZ: Pima Co.	87	CUIC
	1f	USA: TX: Uvalde	88	CUIC
	1f	Mexico: B.C. Sur	272	CMNH
Noordodes magnificalis (Rothschild 1916)	1m, 1f	New Guinea: Irian Barat	249, 250	ZSM
Pitama hermesalis (Walker 1859)	1m, 1f	Malaysia: Sabah	197, 204	USNM
Pseudonoorda brunneiflava Munroe 1974	1f	Indonesia: N. Sulawesi	261	RMNH
Pseudonoorda sp. near *brunneiflava* Munroe 1974	1m	Philippine Is: Luzon	260	MTD
Pseudonoorda distigmalis (Hampson 1913)	1m	Cameroon: Efulen	20	CMNH
	1m, 1f	Cameroon: Efulen	117, 118	CNC
Pseudoschinia elautalis (Grote 1881)	1m, 1f	USA: Arizona	139, 140	CUIC
Sobanga rutilalis (Walker 1862)	1m	Venezuela: Amazonas	141	CUIC
	1m, 1f	Brasil: Amazonas	142, 143	CUIC
	1m	Brasil: Téffé	1117 M. d'A.	CNC
Suinoorda maccabei sp. nov.	3m, 1f	Bahamas: Great Exuma	186, 187, 188, 274	CUIC
	1m	Cuba: Holguín	273	MTD
Tegostoma comparale (Hübner)	1m, 1f	S. Russia	27, 28	USNM
Viettessa bethalis (Viette 1958)	1m	Cameroon: Bonenza	264	RMCA
	1f	Congo: Paulis [Isiro]	319	RMCA

a Dell Latitude D610 PC. The commands were "rseed 1; hold 1000; collapse auto; mult= hold 10 replic 20;" The same commands can be implemented by selecting Settings / Memory / Max. trees = 1000, then entering search parameters under Analyze / Traditional Search. "Collapse auto" ensures that branches with no apomorphies are collapsed.

During preliminary character analysis, additivity was explored for some characters, and results that implied homoplasy in complex characters were reanalyzed. In final analysis, characters were treated as non-additive and equally weighted, and polarity was determined from the results of unconstrained analysis with *C. dentalis* as the primary outgroup (Nixon & Carpenter 1993). Inapplicable data are represented by "-" and missing data by "?," but both are analyzed allowing all possible states to be considered. The matrix was analyzed as-is, but to assess tree length correctly, a second matrix was analyzed where the polymorphic terminals were divided into multiple terminals (Nixon & Davis 1991).

The apomorphies of terminals and clades are interpreted to be their diagnoses (Farris 1979). Character evolution was traced with the Character Diagnoser function of Winclada and TNT. Fast and slow optimization herein respectively refer to accelerated and delayed transformation (Swofford & Maddison 1987) and were implemented with WinClada. Bremer support values for clades were calculated by expanding memory for trees, generating many suboptimal trees up to *N* extra steps, and searching among those for the shortest tree that lacks a given node ("hold 80000; subopt *N*; bbreak=fillonly; bsupport").

The values of missing data were predicted to be those that best agree with the optimality criterion in simultaneous analysis. For parsimony, this is all possible permutations for unscored cells that add no extra steps. See Wilkinson (1995: Table 1) for an antecedent. Possible states were restricted to those actually observed in scored taxa. Predictions were made by inspecting mapped characters with WinClada, then running a simple procedure file in TNT to check the ambiguous cases. The file, available from the author, uses the "xread =" command to replace "?'s" with alternative states.

RESULTS

Phylogenetic analysis. Searches found 1 tree of 187 steps (consistency index = 0.35, retention index = 0.67) (Fig. 7). Most of the cells coded for more than one state represent uncertainty of state assignment. There are four real polymorphisms: the wing pattern (char. 4) of the new species and the composite *Pseudonoorda brunneiflava*, and the feeding habit (char. 47) of two other species (Table 2, footnotes). Splitting these four into eight terminals, each pair differing only in the state of the polymorphism, resulted in the same topology with length 191. Branches without support are collapsed as polyotomies. Character state changes are reported in Appendix C.

TABLE 2. Sources of hostplant data.

Species	**References**
Autocharis barbieri	Gerlach and Matyot 2006
Autocharis fessalis	Beeson 1961, Browne 1968
Cliniodes opalalis	Janzen & Hallwachs 2005
*Cliniodes ostreonalis**	McDunnough 1931, Munroe 1961, Hayden 2008
Cynaeda dentalis	Slamka 2006, Huertas Dionisio 2007
Deanolis sublimbalis	Waterhouse 1998
Dicepolia roseobrunnea	de Oliveira 1942 [1941]
Eurrhypis pollinalis	Slamka 2006, Huertas Dionisio 2007 (for *E. guttulalis* (Herrich-Schäffer))
*Hemiscopis suffusalis***	Beeson 1961, Tominaga 1999, Turner 1908
Heortia vitessoides	Munroe 1977, Singh *et al*. 2000
Hydrorybina polusalis	Meyrick, E. 1938 MS, in Robinson *et al.* 2001
Mimoschinia rufofascialis	Heinrich 1921, Leech 1949
Pseudoschinia elautalis	Mann 1969
Tegostoma comparale	Huertas Dionisio 2007

* Folivore on Thymelaeaceae and Rhamnaceae. Coded as polymorphic.

** *H. suffusalis* on Dipterocarpaceae and Phyllanthaceae, but *H. purpureum* (Inoue) and *H. violacea* (Lucas) on Thymelaeaceae. Phyllanthaceae produce alkaloids like those in Thymelaeaceae. Coded as polymorphic.

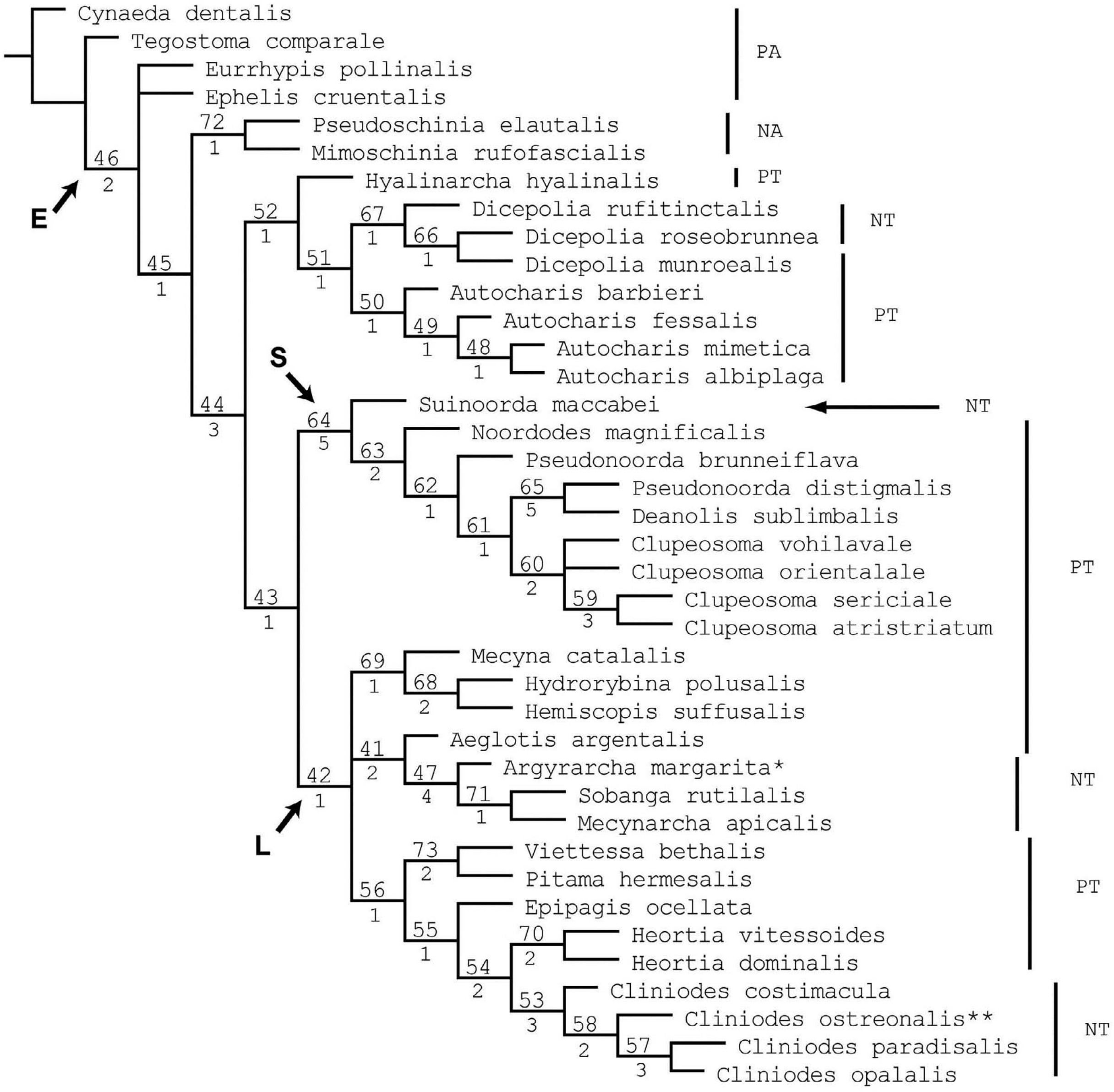


FIG. 7. Cladogram (187 steps, CI = 0.35, RI = 0.67). Numbers above branches refer to nodes (Appendix C), and numbers below are Bremer support values (suboptimality of trees lacking the node). **NA**, Nearctic; **NT**, Neotropical; **PA**, Palaearctic; **PT**, Palaeotropical; **E**, Eurrhypini; **L**, leaf-feeding clade; **S**, sepiform clade. **A. margarita* is also known from Madagascar (Munroe 1974). ***C. ostreonalis* is Eastern Nearctic.

The sepiform clade (node 64, S) is strongly supported as monophyletic, with Bremer support of 5 (*i.e.* the next shortest trees from which the clade is absent are 5 steps longer) (Bremer 1988). The clade has five unambiguous apomorphies: lamelliform structures absent (21:0), sepiform structres present (22:1, uniquely derived), distal edge of squamiform structures rounded (26:1, uniquely derived, reversed to squarish in the *Pseudonoorda brunneiflava*-group), squamiform structures with central enations (27:1), cervix bursae large and sclerotized (40:2).

The new species is the first-diverging terminal in the sepiform clade. The Palaeotropical species that constitute the remainder of the clade (node 63) share three unambiguous synapomorphies: Rs_1 stalked with Rs_{2+3} (11:1), loss of S8 piluli (23:0), and elongate ovipositor (38:1). The results indicate that *Pseudonoorda* is paraphyletic.

The sister group of the sepiform clade (node 42, L) includes medium- to large-bodied species of global distribution. The clade's two apomorphies are an extension of the forewing costal streak through the discal spot that approximates or reaches the postmedial line (6:1) and the shallow depth of the sacci tympanorum extending underneath S2 (15:1). The group includes several members that feed on Thymelaeaceae, a plant family that produces unusual toxic terpenoid compounds (Evans 1986).

Deactivation of char. 47 (feeding habit) results in almost no change. Three trees of 183 steps are recovered that differ in minor aspects that do not affect the sepiform clade, thymelaeacean clade, or any nomenclatural conclusions drawn here. Combining states 2 and 3 into one state (general folivory) returned the same topology with one fewer step.

Systematic section. *Clupeosoma orientalale* (Viette) ***comb. nov.*** and *Clupeosoma vohilavale* (Marion & Viette) ***comb. nov.*** are transferred from *Autocharis*, as they share synapomorphies with *Clupeosoma sensu* Munroe (1974b) (see Discussion). *Hyalinarcha hyalinalis* (Hampson) ***comb. nov.*** is transferred from *Boeotarcha* Meyrick, as it is closely related to the type species *H. hyalina* (Hampson), females of which were not available for study. *Noordodes magnificalis* (Rothschild) ***comb. nov.*** is transferred from *Noorda* Walker.

The synonymy of *Basonga* Möschler, 1886 (type species *B. paradisalis* Möschler) with *Cliniodes* Guenée, 1854, last recognized in Klima (1939), is revived, as is the combination *Cliniodes paradisalis* (Möschler). *Metrea* Grote, 1882 is synonymized with *Cliniodes*, ***syn. nov.***, resulting in the combination *Cliniodes* ostreonalis ***comb. nov.***

Suinoorda Hayden *gen. nov.*

Diagnosis. Unambiguous autapomorphies: female with entire forewing solid orange, concolorous with terminal area (4:1, 2; Fig. 2); lateral arms of gnathos approximated to lower corners of uncus (36:1).

Symplesiomorphies not shared with rest of sepiform clade: forewing Rs$_1$ not stalked with Rs$_{2+3}$ (char. 11:0; Fig. 10); piluli present on S8 (char. 23:1; Fig. 12: Pi); androconium of long, straight setae present near base of valval costa, dorsal side (28:1; Fig. 18: BA); ovipositor short (38:0; Fig. 16). Otherwise sharing the apomorphies of the sepiform clade of Eurrhypini (see above).

Two other diagnostic characters have ambiguous optimization: forewing antemedial line absent (8:0, autapomorphic with slow optimization or synapomorphic with fast optimization); basicostal androconium present as field of deciduous hairs from base of costa (28:1, Fig. 18: BA; autapomorphic with slow optimization or symplesiomorphic with fast optimization).

Etymology: Latin *sus*, swine, referring to the shape of the frontoclypeus, and also the reflexive pronoun, referring to taxonomic rank; plus *Noorda* Walker. Gender, feminine.

Type species: *S. maccabei* Hayden ***sp. nov.***

S. maccabei Hayden *sp. nov.*

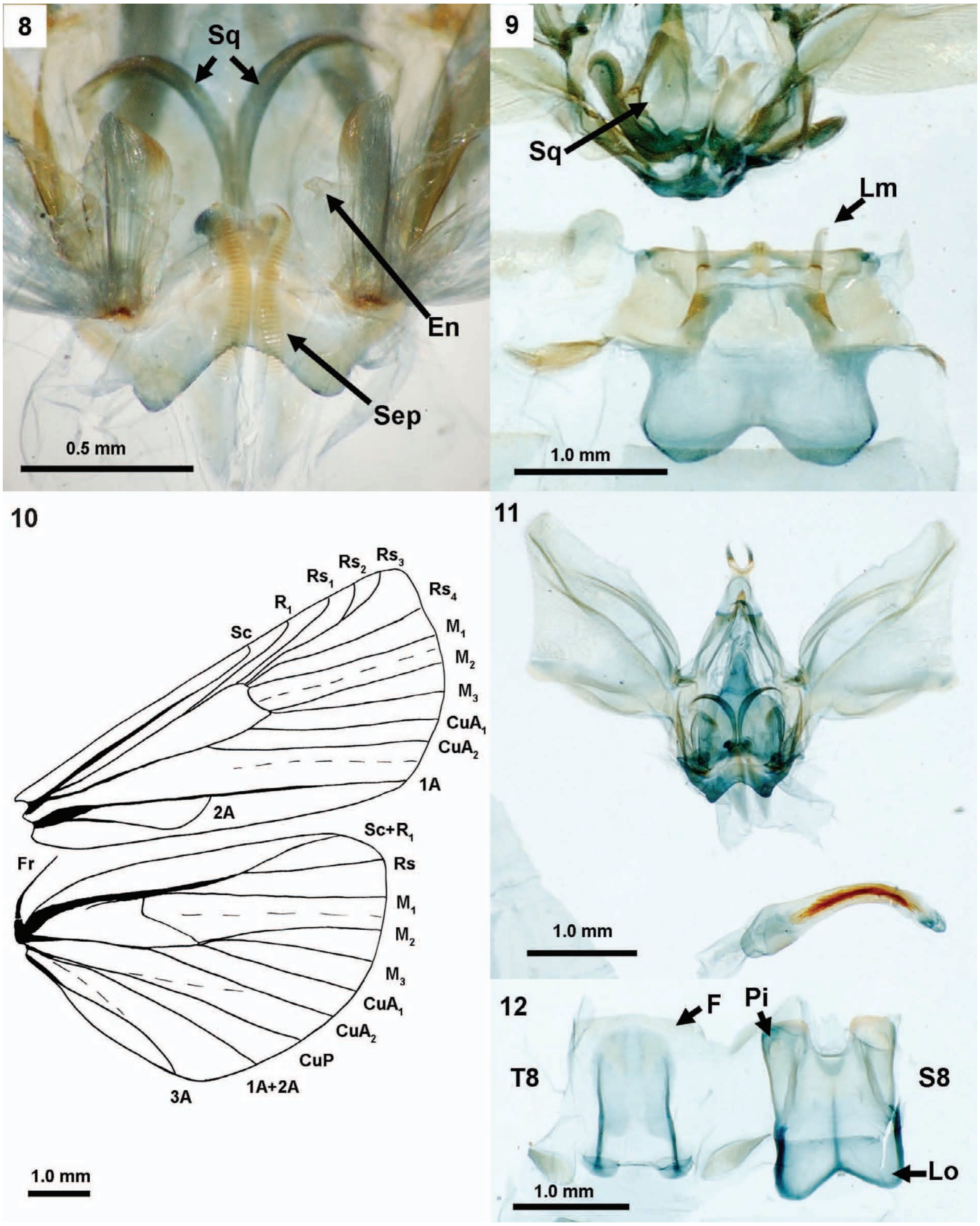
Description. Male habitus (figs 1, 5, 13, 14, 15): *Head.* Frons flat and oblique. Frontoclypeus expanded in a low cylindrical protuberance, lateral edges of ridge curling down and inward almost to secondary contact above pilifers; lower edges of frontoclypeus crenulate (fig. 5: Fc). Frons with smooth, yellow-beige scales, dark brown laterally on protuberance. Vertex rough, yellow-beige. Scales between antennae and eyes white. Ocelli present. Chaetosemata absent. Antennae round and smooth, about 3/5 length of forewings, cilia dense and longer than in female. Labial palpi dark brown above, white below; not greatly exceeding length of head, length 0.90±0.03 mm from base under head to apex; porrect or slightly drooping with third meron downturned ~30° from porrect axis. Maxillary palpi short (0.36±0.03 mm), brown, terminal scales not strongly dilated. Pilifers small and separate from lower corners of frontoclypeus. Haustellum well-developed, basal vestiture white.

Thorax. Collar, distal tegulae and dorsal thorax yellow-beige. Tegulae proximally brownish red. Ventral thorax and coxae white. Forelegs: coxa white mixed with light gray, with patch of long, yellow-gray, backward-sweeping hairs extending the length of anterior margin of coxa (fig. 5: CH); femur and tibia gray, the latter with epiphysis hidden in long scales, without androconium; tarsomeres white, all but the basal one with small dorsal gray patch. Midlegs: femur and inner surface of tibia white; outer tibial surface orange fading to yellow before white, with gray patch at joint with femur; tibia bearing androconium of straight, white hairs as long as tibia (fig. 14: An); inner tibial spur 3 times length of outer; tarsi as for foreleg. Hindlegs: uniformly white, no androconia; spurs as fore midleg; tarsi as for foreleg.

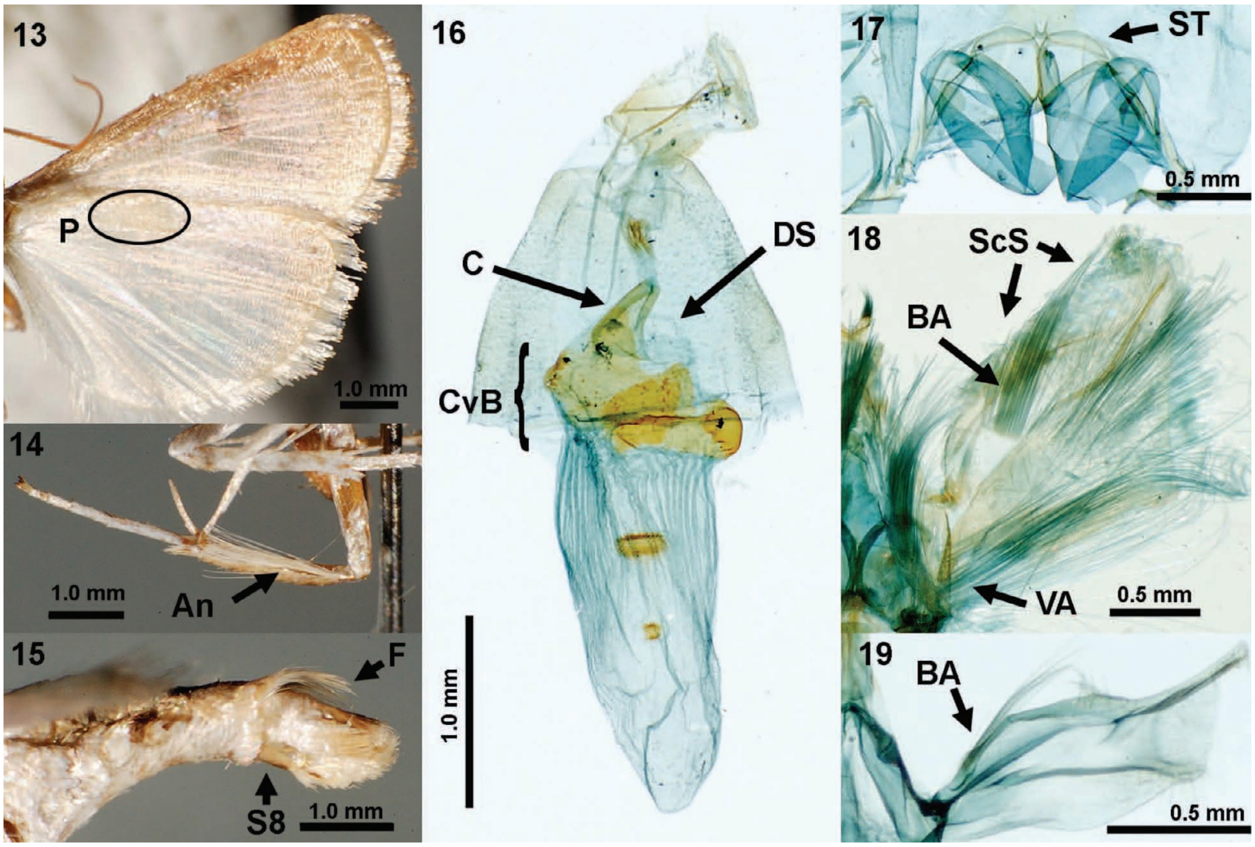
Abdomen. Praecinctorium white-scaled, monolobate, as broad as deep. Abdomen dorsum yellow (hindmost scale row white), venter white. Male abdomen 4.8±0.1 mm in length excluding genitalia. Genitalic androconia pale yellow. Eighth sternite without scales (fig. 15: S8).

Forewing. Length, 7.2 – 7.7 ±0.1mm, width, 3.6 – 4.0 ±0.1mm (n = 6). Upper side pale yellow with scales tipped in yellow, salmon or fuscous, giving irrorate appearance in fresher specimens. Costa thickly scaled and colored, with longer, setiform scales on edge; proximally gray along leading edge; distally and inner proximally dark salmon-orange. Antemedial line represented by minuscule brown spot behind costa at 1/5 length and faint spot or line along dorsal edge at 3/8 length. Discal spot large, oval, dark brown, beyond 1/2 length of wing, 0.42 ±0.06mm wide by 0.66 ±0.06mm long. Postmedial line narrow, dark brown, smoothly curving convexly from costa (at Rs4) to CuA$_1$ and concavely from CuA$_2$ to tornus. Postmedial area 1.0±0.1 mm wide, orange or dark salmon. Terminal fringe dark gray or fuscous. Dorsal edge of forewing without scale tufts. Fovea absent. Forewing underside pale yellow, with costa and terminal area orange. Male-type retinacular hook and female-type retinaculum both present.

Hindwing. Length, 6.2 ±0.1mm by 3.6±0.1 mm; lustrous white, with long, sparse hairs on anal area. Anal edge smoothly curved. Terminal area pale orange with some scales brown-tipped in darker specimens. Postmedial line faint, brown, from M$_2$ to anal fold, where it meets the terminal edge; white behind anal fold (a few brown scales extend proximally along anal fold in fresher specimens). Terminal fringe yellowish brown. Hindwing underneath translucent white, with yellow costa and terminal fringe. Male frenulum a single bristle.



FIGS. 8–12. Genitalia and wings. **8,** *Suinoorda maccabei* ♂ genitalia, stridulatory apparatus (JEH 187). **9,** *Cliniodes ostreonalis* ♂ genitalia, stridulatory apparatus, squamiform structures slightly displaced (JEH 137, CNC). **10,** *S. maccabei* ♂ wing venation (JEH 274). **11,** *S. maccabei* ♂ genitalia, entire (JEH 187). **12,** same, eighth abdominal segment. **En,** enation of squamiform structure; **F,** field of scales in fringe on tergum 8 posterior edge; **Fr**, frenulum; **Lm,** lamelliform structure; **Lo,** lobe of S8; **Pi,** location of piluli; **Sep,** sepiform structures; **Sq,** squamiform structures; **S8,** eighth sternite; **T8,** eighth tergite.



FIGS. 13–19. Habitus and genitalia. **13,** *Suinoorda maccabei* underside of ♂ wings. **14,** *S. maccabei* ♂ mesothoracic tibia, lateral aspect. **15,** *S. maccabei* ♂ abdomen, lateral aspect. **16,** *S. maccabei* ♀ genitalia (JEH 188). **17,** same, tympanal organs. **18,** *S. maccabei* ♂ genitalia, dorsal aspect (JEH 187). **19,** *Autocharis barbieri* ♂ genitalia, ventral aspect (JEH 94, USNM). **An,** androconium of long hairs; **BA,** basicostal androconium; **C,** colliculum; **CvB,** cervix bursae; **DS,** ductus seminalis; **F,** tergum 8 posterior fringe; **P,** patch of scales on hindwing subcostal area; **ScS,** scoop-shaped scales along costa; **ST,** saccus tympani; **S8,** sternite 8 (naturally denuded); **VA,** vincular androconium (pleural A8-9 intersegmental).

Dense patch of small, erect scales between costa and Sc+R, from base of wing to the divergence of Sc+R_1 and Rs; patch extended discretely but more sparsely onto anterior half of discal cell (fig. 13: P).

Female habitus (fig. 2): Structure and coloration as in male, except dorsum of head, thorax and forewings almost uniformly salmon-orange. Tegulae and lateral collar dark brown; midleg tibia upper surface more strongly orange, without androconia. Antennal cilia shorter than in male, but antenna itself of same thickness. Forewing medial and terminal areas concolorous, with the latter slightly more densely scaled. Forewing antemedial line absent; discal spot and postmedial line indistinctly indicated by light-brown scales. Retinaculum a patch of scales as in male. Two frenular bristles. Hindwing underside without subcostal patch of scales. Hindwing terminal area darker yellow than rest of hindwing, but lines absent. Abdomen 4.4±0.2 mm in length excluding ovipositor; exceeding hindwings by about one third length.

Venation (fig. 10): *Forewing*: Sc meeting margin 2/3 from wing apex. R_1 basally straight and moderately broadened. Rs_1 basally straight, not stalked with Rs_{2+3}. Rs_{2+3} with stalk curved to approximate Rs_1 closely. Sc and radial veins except Rs_4 distally curved toward anterior margin, the first three veins suddenly and sharply so. Rs_4 unstalked, basally curved toward Rs_{2+3}, distally meeting margin below wing apex. Cell complete, 7/12 length of wing. M_1 nearly straight, from upper corner of discal cell. M_2 and M_3 straight, from lower corner of cell. CuA_1 and $_2$ straight, arising from cell basad from tip. 1A straight, complete; 2A looped and joining 1A at half its length.

Hindwing: Sc+R_1 stalked to about 1/3 length from point of departure from cell, partly joined to Rs to just beyond discal cell. Base of Sc+R_1+Rs strongly broadened. Discal cell short: anterior portion 1/3 length of wing, distally demarcated by short, straight spur of M_1 parallel to body axis; posterior portion demarcated by straight vein running diagonally to nearly 1/2 length of wing. M_1 straight. M_2 and M_3 basally approximate, not stalked, from lower corner of cell. CuA_1 from corner of cell; CuA_2 from cell at just more than 2/3. CuP and 1A+2A straight; 3A basally straight and broad, distally slightly bowed anteriad before meeting margin.

Tympanal organs (fig. 17): Bullae tympani oval, length twice width. Edges of fornix tympani straight and meeting in blunt, elbow-like right angle. Sacci tympani round, not hypertrophied (fig. 17: ST); rami tympani (transverse edge) on same level as elbow of fornix tympani. Processus tympani a broad, nearly circular lobe. Puteoli tympani shallow. Venulae not evident. S2 a rounded rhombus, wider than long, bluntly protruding over S3; median third of S2 also emergent and slightly more sclerotized than lateral areas.

Male genitalia (figs 8, 11, 12, 18): *Eighth segment*. T8 membranous, longer than wide; lateral sclerotized edges of T8 with anterior ends ending in shallow, posteriad-facing invaginations, posterior ends fading before fringe; transverse bar absent. Transverse fringe of long, broad, keeled scales present along posterior edge of T8 (figs 12, 15: F). Lateral ends of fringe separate as distinct lobes in pleuron 8, slanted dorso-anterior to ventro-posterior and closely adjacent to posterior corners of S8. S8 roughly rectangular, parallel-sided; anterior quarter underneath S7 and bilobate, with broadly triangular emargination and medially sclerotized to halfway point. Edges sclerotized, most strongly along anterior third. Posterior edge with squared corners and central third broadly, roundly emarginate, without projections. Central area of S8 trapezoidal, slightly raised, with corners at sternal margin at anterior third to posterior emargination. Posterolateral corners of S8 with area of fine nondeciduous setae (piluli, char. 22; fig. 12: Pi). Lamelliform structures absent. Androconia of pleuron 8 on large, lance-ovate patches: dorso-anterior end rounded and adjacent to anterior corners of T8, ventro-posterior end tapered and connected directly to the sides of S8 at the point where S8 emerges from underneath S7.

Genitalia. Uncus an isosceles triangle about twice as high as width at base, with expanded, flat-topped, bilobate apex bearing conspicuous tufts of nondeciduous setae at tip of each lobe; rows of fainter hairs on lateral edges of uncus, but elsewhere bare. Arms of gnathos transversely straight, with broad bases fused to tegumen and medial area narrow; bases of gnathos arms close to base of uncus. Gnathos central element parallel-sided, produced 210±15µm, with minute granules at bluntly acute tip; ventrally deeply indented beyond (posterior of) the level of the arms. Tegumen almost as long as vinculum (680±15µm), without ornamentation; with long, straight-sided lateral arms descending to valvae. Membrane between arms with diffuse deciduous hairs, not grouped into discrete patches. Juxta smooth, occupying most of the area inside vinculum and sides parallelling edges of vinculum; base nearly circular, as high as squamiform structures, with concave emargination where base of vinculum bows upward; apex of juxta abruptly cuspidate and acute, unornamented and not projecting. Valvae lyriform, 1,770±15µm along costa. Costa sinuate, proximally convex and distally concave, edge basad of apex membranous and bearing short, smooth, unkeeled scales that curve over edge of costa (fig. 18: ScS). Costa sclerotized to apex, with small tuft of short setiform hairs on a slightly out-turned apex. Distal edge of valva straight. Saccular edge of valva roughly mirroring costa: subapically concave, medially convex, and basally indented to accommodate squamiform structures. Convex area of sacculus with dense, broad scales. Medial area of valva basally sclerotized and distally membranous with striae and sparse, fine setae. Area below costa longitudinally depressed as narrow, shallow pocket. Reverse side of valva with androconium 380±15µm from base of valva, in submarginal position (behind shallow pocket); base of field a transverse row, 150±15µm long (fig. 18: BA). Vinculum 1,050±20µm high, roughly square. Transtilla absent. Saccus not developed, medially concave. Androconia present lateral of vinculum, of straight hairs as long as valvae (fig. 18: VA). Basal area of androconia extended to 500±15µm in length, running up behind (dorsal of) vinculum toward tegumen. Phallus 1,680±15µm long, 170±15µm at narrowest point, gently curved. Vesica with numerous small cornuti along most of length.

Squamiform and associated structures. Posteroventral vinculum (facing juxta) with medial, sclerotized, bicapitate boss. S8–9 intersegmental membrane extended over vinculum, bearing squamiform structures lateral of boss. Medial pluma of unkeeled scales not obvious. Membrane laterally extended as semi-sclerotized arms bearing short tufts of scales parallel to lateral edges of squamiform structures. Membrane anteriad of vinculum with thickened pair of longitudinal, parallel fields bearing transverse ridges at intervals of about 15µm (fig. 8: Sep). Ridged fields narrow, each 45±15µm wide and 450±15µm long, with further sclerotization extending 250±15µm anteriad. Squamiform structures round, 675±15µm long by 400±15µm wide, symmetrical; stiff membranes attached on lower edge to vinculum (fig. 8: Sq). Medial edge of squamiform structures strongly sclerotized and smoothly arcuate in hemiellipse extending over distal end of squamiform structures. Lateral edges clavate and longitudinally striate, with narrow base and broad termination before membranous laterodistal area that does not not meet the arc of the medial edge. Central area of squamiform structures finely striate. Basicentral area of each squamiform structure with digitate process or enation directed medially, adjacent to boss of accessory sclerite (fig. 8: En). Enations curving around ridged areas when the latter are folded against them.

Female genitalia (fig. 16): Ovipositor short, 750±15µm long by 450±15µm deep, with A9 not longer than deep. Ovipositor lobes soft and truncate. Anterior apophyses extending to colliculum; posterior apophyses not extending beyond anterior edge of A9. Colliculum short, about twice as long as wide (fig. 16: C). Ductus bursae between colliculum and corpus bursae proper expanded in an irregularly chamber (cervix bursae: CvB), demarcated from corpus bursae by slight constriction and end of sclerotization. Cervix bursae irregularly but mostly sclerotized. A few granular hooklets irregularly distributed on the signum. Ductus seminalis narrow and arising from unsclerotized area of anterior ductus bursae (DS). Corpus bursae proper (anterior of sclerotized cervix) 1900±30µm long, longitudinally pleated and bearing two convex, granular signa on opposite sides of the bursa, the larger and posterior of the two being transversely ovate, and the anterior one nearly circular.

Type material. Holotype. ♂: BAHAMAS—Great Exuma—Simons Pt, 23.31.50—75.47.30, 12 April 1986, Tim L. McCabe / [red label] HOLOTYPE Suinoorda maccabei Hayden. T.L. McCabe Collection. **Paratypes.** BAHAMAS: 1♂, same data as holotype except: 10 April 1986 / J.E. Hayden Slide No. 187 ♂ (JEH Coll.). 1♂, same data as holotype except: 14 April 1986 / J.E. Hayden Slide Nos. 186 ♂, 274 wings (CUIC). 2♂♂, same data as holotype except: 15 April 1986 (CUIC and T.L. McCabe Collection). 1♀, same data as holotype except: 15 April 1986 / J.E. Hayden Slide No. 188 ♀ (CUIC). CUBA: 1♂: [green label] Cuba, Holguin, Rafael Freyre, Piedra Picar, dry forest, 9.vi.2000, leg. J.-P. Rudloff / J.E. Hayden Slide No. 273 ♂ (MTD). CUIC type no. 7356.

Diagnosis: As for genus.

Biology: Unknown. See Missing Data.

Distribution: Commonwealth of the Bahamas: Great Exuma Island; Republic of Cuba: Holguín Province (fig. 20).

Etymology: I take pleasure in naming this species after Dr. Tim McCabe, Curator of Entomology at the New York State Museum, who collected and finely set the Bahamian series.

Variation: The Cuban specimen differs from the Bahamian ones in having a slightly narrower frontoclypeal arch and the lateral arms of the gnathos at a slightly more obtuse angle to the median element. These features are not of specific distinction.

Similar species: *Suinoorda* differs from similar species in the possession of a highly, almost circularly arched frontoclypeal margin. *Autocharis* and *Dicepolia* have an obtusely to acutely angulate frontoclypeus, and *Noordodes* and *P. brunneiflava* have a low, rounded arch. *S. maccabei* also differs in the sexually dimorphic forewing coloration, and the sharp apical curvature of the forewing radial veins is unique. Similar species outside the sepiform clade lack the sepiform structures.

Among similar Neotropical Eurrhypini, *Dicepolia* species have long labial palpi, are uniformly colored brownish orange or rosy brown, and have a dark, narrow postmedial line farther from the terminal margin. Female *S. maccabei* differ in having no trace of ante- and postmedial lines. *Cliniodes paradisalis* (fig. 4) has short, upturned labial palpi typical of *Cliniodes*. Both have a smooth postmedial line, but it extends much farther basad along the posterior wing margin in *C.*

FIG. 20. Known distribution of *S. maccabei.* Starred localities: Simon's Point, near Georgetown, Great Exuma Island, Bahama Is., and near Rafael Freyre, Holguín Province, Cuba.

paradisalis, approximating the obvious antemedial line. The forewing has a discal spot continuous with the costal streak, and the hindwing is suffused more strongly. *Argyrarcha* and *Sobanga* differ strongly from *S. maccabei* in maculation, including a well-developed antemedial line and the costal streak extending through the discal spot toward the postmedial line. These also have an expanded T8 posterior fringe, which in *Argyrarcha* and *Mecynarcha* Munroe is cape-like and larger than any single tergite.

Among Palaeotropical genera, the red-and-white *Autocharis* species have long labial palpi, some (*A. fessalis* Swinhoe) have hindwing M_{2+3} stalked, and some have a more strongly developed spot of color on the hindwing anal vein. In *Autocharis* species, the shape of the forewing postmedial line tends to be more angulate on the veins. *Pitama hermesalis* and *Viettessa* have a straight frontoclypeus, a much broader postmedial band, and most species are much larger in size. Like some of the Neotropical taxa, *Viettessa* species have a costal streak extending through the discal spot toward the postmedial line. *Pseudonoorda brunneiflava* and *Noordodes* have Rs_1 stalked with Rs_{2+3}. *Noordodes* has a postmedial line that steps sharply basad along the cubital veins. The ground color is yellow and the markings, dark violet.

Character evolution. The four unambiguous symplesiomorphies of *Suinoorda* argue for its early divergence. The frontoclypeal arch (char. 3:2, figs 5, 6) evolved once or twice from a transversely straight margin (3:0), depending on fast or slow optimization: in the last common ancestor of *Hyalinarcha* and *Suinoorda* (fig. 7: node 44) or independently in nodes 52 and 64. The length of antennal sensilla (char. 0) is informative: except for four autapomorphic reversals, it characterizes nodes 43 and 56, and has ci = 0.42, ri = 0.78.

Forewing maculation with a white or light-colored median and distinctly darker terminal area (4:1) evolved one to three times from states 0 or 2 and was lost several times. It appeared above *T. comparale* (node 46) and was retained as the fundamentally plesiomorphic condition along most of the phylogeny. Under slow optimization, it evolved once at node 46, but under fast optimization, it evolves independently in *C. paradisalis* and *Autocharis* (node 50). The concolorous maculation in both female *S. maccabei* and *Pseudonoorda* sp. near *brunneiflava*, regarded as split terminals, is recovered as independent reversals from the white/red condition. The stalking of Rs_1 with Rs_{2+3} (char. 8:1) is mainly a feature of the sepiform clade above *Suinoorda* (node 63), but it evolved independently in *Hydrorybina*.

Some species lack the stridulatory apparatus. Lamelliform structures (21:1; fig. 9: Lm) were gained with the Eurrhypini (node 46) and lost in *S. rutilalis* and the sepiform clade. Likewise, the squamiform structures (square membranes: char. 24; figs 8, 9: Sq) were gained at node 46 and lost in *S. rutilalis*, rendering characters 25, 26, and 27 inapplicable. The outgroup *Cynaeda dentalis* is classified in Odontiini, which is defined by the absence of the lamelliform and squamiform structures (Leraut & Luquet 1983).

The S8 piluli (char. 23) were gained at node 46 (Eurrhypini) and lost at nodes 41 (the *Aeglotis-Argyrarcha* clade), 63 (the sepiform clade above *Suinoorda*), and in *H. hyalinalis*. Some but not all of these clades have the stridulatory apparatus absent or modified (*e.g.* asymmetrical squamiform structures at node 47, evolved from symmetrical structures). The basicostal androconium on the dorsal side of the costa of the male valve (28:1; figs 18, 19: BA) evolved from the absent condition (28:0) at node 44, the last common ancestor of *Hyalinarcha*, *Suinoorda*, and *Aeglotis*. It was secondarily lost at nodes 41, 63, 53 (*Cliniodes* spp.), and in *M. catalalis*. An androconium situated halfway along the costa, at the end of a sclerotized extension (28:2), is a synapomorphy of derived *Cliniodes* species (node 57), and it evolved from the absent condition. A gnathos with arms basally approximate to the lower uncus (36:1) evolved three times from the not-approximated condition (36:0) at nodes 47, 53, and in *Suinoorda*.

The ovipositor length (char. 38) is homoplastic (ci = 0.12), but it contains some grouping information (ri = 0.46). It is long in the Palaeotropical sepiform species, but its short length in *Suinoorda* contributes to grouping that clade with the large-bodied species of node 42.

Stem boring and leaf mining (47:0) is the primitive eurrhypine feeding habit, and it is restricted to the outgroups (Odontiini) and *Eurrhypis* Hübner and is predicted for *Ephelis*. Seed- or fruit-feeding (47:1) evolved from it and is the most general larval feeding habit. It is known for the three distantly related groups *Mimoschinia* Munroe + *Pseudoschinia* Munroe, *Dicepolia roseobrunnea* (Warren), and *Deanolis*, and predicted for the intervening taxa. External folivory on Thymelaeaceae (47:2) is restricted to the clade of node 42 and evolved once or twice from seed-feeding, in *Hemiscopis* and in node 54, or earlier depending on optimization. Folivory on other plant families (47:3) evolved independently from seed-feeding in *Autocharis* and from either seed- or Thymelaeaceae-feeding in *Hemiscopis* + *Hydrorybina*. Predictions for unscored data are reported in Table 3.

TABLE 3. Predicted missing data. The following states add no extra steps to the cladograms when analyzed together.

Species	**Character**	**Predicted states**
A. argentalis	38. Ovipositor length	short
	39. Colliculum	short
	40. Duct. burs. sclerotization	absent
	41. Appendix of duct. burs.	absent
	42. Corp. burs. signum	present (one or two)
	43. Corp. burs. signum, shape	round
	44. Ductus seminalis origin	from ductus bursae
	45. Ductus seminalis width	narrow
	46. Pleats on cervix bursae	absent, or present
	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
A. margarita	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
A. albiplaga	47. Feeding habit	folivore on other family
A. barbieri	31. Vincular androconia	present
A. mimetica	47. Feeding habit	seeds/fruits
C. costimacula	47. Feeding habit	folivore on Thymel.
C. paradisalis	47. Feeding habit	folivore on Thymel.
C. atristriatum	38. Ovipositor length	long
	39. Colliculum	short
	40. Duct. burs. sclerotization	absent
	41. Appendix of ductus bursae	absent
	42. Corpus bursae signum	present (one or two)
	43. Corp. burs. signum, shape	round
	44. Ductus seminalis origin	from ductus bursae
	45. Ductus seminalis width	enlarged
	46. Pleats on cervix bursae	present
	47. Feeding habit	seeds/fruits
C. orientalale	47. Feeding habit	seeds/fruits
C. sericiale	47. Feeding habit	seeds/fruits
C. vohilavale	47. Feeding habit	seeds/fruits
D. munroealis	0. Antennal sensilla	longer in male
	31. Vincular androconia	absent
	47. Feeding habit	seeds/fruits
D. rufitinctalis	47. Feeding habit	seeds/fruits
E. cruentalis	47. Feeding habit	stem borer or leaf miner
E. ocellata	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
H. dominalis	47. Feeding habit	folivore on Thymel.
H. hyalinalis	47. Feeding habit	seeds/fruits
M. catalalis	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
M. apicalis	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
N. magnificalis	47. Feeding habit	seeds/fruits
P. hermesalis	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
P. brunneiflava	47. Feeding habit	seeds/fruits
P. distigmalis	47. Feeding habit	seeds/fruits
S. rutilalis	31. Vincular androconia	present
	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family
S. maccabei	47. Feeding habit	seeds/fruits
V. bethalis	47. Feeding habit	seeds/fruits, or folivore on Thymel., or folivore on other family

DISCUSSION

The recent collection of this new species recalls Hampson's comment on the Bahamian moth fauna: "[…] I should expect a thorough exploration of the other islands [than Nassau and Andros] to add considerably to the list of species" (1901). Hampson studied only specimens from those islands and Abaco (1901, 1904); had he seen it, he probably would have assigned it to *Noctuelia* Guenée or *Noorda* Walker following his classification of Pyraustinae (Hampson 1899a). I find no reference to a species fitting this description in other studies of Bahamian and Cuban Lepidoptera (Smith *et al*. 1994 and citations therein).

The distribution of this species in the Bahamas and Cuba (Fig. 20) can be explained by the subaerial exposure of the Bahama Platform during the last glacial maximum, when the islands were separated by only the narrow Old Bahamas Passage (Miller & Miller 2001). The Cuban locality is about 270km due south of the type locality, but this distribution is congruent with that of other Lepidoptera (Miller & Simon 1998). The species may be expected to be distributed more widely in eastern Cuba and the islands that are part of the Great Bahama Bank. Another species, *Cautethia exuma* McCabe (Sphingidae), was described from the same locality and is apparently endemic to Great Exuma (McCabe 1984).

The flora of the type locality is a mix of native and naturalized species (T. McCabe pers. comm. 2007): *Caesalpinia* L., *Casuarina* L., coconut, *Coccoloba* L., *Erithalis* G. Forst., *Ficus* L., frangipani (*Plumeria rubra* L.), Key Lime, *Malpighia* L., *Mimosa* L., orange, and "old woman's tongue," a legume. The Cuban locality is mixed forest: mostly secondary growth with native dry-forest undergrowth and relictual vegetation in the vicinity characteristic of mogotes; dominant trees include *Acacia* Mill., *Caesalpina*, *Coccoloba*, coconut, *Ficus*, *Gymnanthes lucida* Sw., *Hibiscus elatus* Sw., *Mimosa*, *Plumeria* L., and *Trichilia* L. (J.-P. Rudloff pers. comm. 2008). If the larva is frugivorous on a host common to these areas, *Coccoloba*, *Ficus*, or the legumes are candidates.

The vicariant biogeographic relationship between *Suinoorda* and the rest of the sepiform clade, which is distributed from tropical West Africa to Fiji, parallels other relationships in the cladogram (Fig. 7). *Cliniodes* (node 53) is derived with respect to Asian and African genera. *Dicepolia* (node 67), with both Neotropical and Malagasy species, is related to genera and species distributed around the Indian Ocean. The placement of Malagasy *D. munroealis* is a sampling artifact; additional evidence (Hayden 2009) indicates that the Malagasy and Neotropical members constitute two monophyletic clades. *Argyrarcha margarita*, related to the strictly Neotropical *Mecynarcha* and *Sobanga*, is recorded from Brazil and Madagascar (Munroe 1974a), and *Aeglotis* is Central Asian. Vicariant relationships between Neotropical and Palaeotropical taxa occur in many Lepidoptera (Holloway & Nielsen 1999), although such relationships involving Antillean endemics are better known for other insect orders (Liebherr 1988).

The discovery of congeneric species in the Greater Antilles is probable. Evidence from paleogeography and lepidopteran biogeography suggests that Hispaniola and Puerto Rico are most closely related to the eastern Cuban landmass (Iturralde-Vinent & MacPhee 1999; Liebherr 1988; Fontenla 2003), and the continued discovery of even conspicuous moth taxa in Hispaniola indicates that the fauna remains poorly known (Rawlins & Miller 2008).

The phylogeny includes about half of the genera in the Eurrhypini (Nuss *et al*. 2008), and it will be tested by an analysis with more taxa and characters (Hayden in prep.). It would be premature to confer a formal name and rank on the sepiform clade, as such an act would relegate the rest of the Eurrhypini to a paraphyletic nominotypical taxon.

There is terminological uncertainty about the squamiform structures. Nuss & Kallies (2001) distinguished two different structures: a plume of long scales in medial position on the vinculum (not shown here) and a pair of "riffled membranes" lateral of the plume. They interpreted the scale plume to be the "structures squamiformes" (Minet 1980; Leraut & Luquet 1983), and they considered the membranes to be a third eurrhypine synapomorphy. The "squamiform structures" of Minet (1980: Figs. 5, 9) probably instead refer to the membranes (M. Nuss pers. comm. 2009). The illustrations of Leraut & Luquet could refer to either structure (1983: Figs. 13, 19), and Munroe neither illustrated nor elaborated on his reference to "specialized scalelike sclerotizations associated with the juxta and vinculum midventrally" (1972: 137). Regardless of terminology, the long plume and the large membranes frequently occur together, although the plume was not observed in dissections of *Suinoorda*. The plume is deciduous, whereas the membranes are less easily removed. One hypothesis is that the membranes and plume are developmental homologs: the vinculum fundamentally bears scales in a transverse row, of which two scales are hypertrophic. The riffles or striations are the longitudinal ridges, which bend laterally so that the lamelliform structures rub across the ridges.

Autocharis was reinstated by Amsel (1970) and received numerous species removed from *Noorda* Walker (Viette 1990; Shaffer & Munroe 2007). The results indicate that the small, white-and-violet species and the gray species form one monophyletic group. In addition to the genitalia and apomorphies of node 50, *Autocharis* species can be distinguished from *Pseudonoorda* by having long male antennal sensilla and plesiomorphic forewing venation. *D. munroealis* and related species will have been transferred in another publication (Hayden 2009).

Suinoorda maccabei requires a new genus because it cannot be accommodated by any available genus without substantial recircumscription. The next best alternative would be to transfer the whole sepiform clade to the oldest available name, *Clupeosoma* Snellen, 1880. Such an act would stabilize nomenclature by mitigating the proliferation of genera with one or few species, which is a problem in the Odontiinae (Nuss *et al*. 2008). However, synonymy would disrupt several established combinations, including the pest species in *Deanolis* Snellen (Waterhouse 1998).

An important consideration for generic circumscription is the generic diagnosis or definition, which affects the management of specimens identified only to that rank. Historically, most of the genera included in this study were created to accommodate species that did not fit any pre-existing generic diagnosis. The problem lies not with the general practice of fitting species into generic definitions but rather with two specific issues. First, most of the definitions predate Munroe's circumscription of the Odontiinae (1961), so genera were differentiated from distantly related taxa by means of inappropriate characters. Second, the diagnoses are typological, therefore untestable and arbitrarily exact—that is, new monotypic genera were defined with any number of specious characters (*e.g.* Munroe 1974a). Cladistic parsimony equates diagnoses with synapomorphies, making diagnoses both testable and efficient (Farris 1979). Past nomenclatural debates (*e.g.* Ehrlich & Murphy 1982 *et seqq*.) could have benefited from consideration of diagnoses. In the case of *Clupeosoma*, none of the synapomorphies of node 64 are found in previous definitions (Snellen 1880; Hampson 1897). The characters that figure in Snellen's original diagnosis, revived by Munroe (1974b), are either invariant in the Eurrhypini or dispersed across the cladogram (chars. 2, 7, 10, 11, 12). Of these, the pearly, metallic scales on the body and wings (7:2) are shared among the Malagasy and New Guinean species. With the transfer of the Malagasy species, *Clupeosoma* is delimited at node 60 with the following diagnosis: the forewing medial area is concolorous with postmedial/terminal area (4:2, except *C. orientalale*, which has an irregularly darker medial area), the underside of the body and the wings have pearly, metallic scales (7:2), and the costa of the genitalic valva is apically produced in a straight point (32:1).

One might criticize the proposal of a genus for a single species. As suggested above, congeners probably exist in related areas of endemism. More saliently, *Suinoorda* is the first odontiine genus proposed on explicit phylogenetic grounds, and other monotypic genera (*Basonga*, *Metrea*) are synonymized on the same grounds. *Suinoorda* should accommodate any species that share its derived characters: the sexually dimorphic wing pattern (4:1,2), the absence of the forewing antemedial line (8:0), and the gnathos arms near the base of the uncus (36:1).

Pseudonoorda is recovered as paraphyletic, but nomenclatural changes would require study of more species, including the type species *P. minor* Munroe. Munroe (1974b) recognized these two groups of *Pseudonoorda*: one centering on *P. distigmalis* (Hampson) and *P. nigropunctalis* (Hampson), and another on *P. brunneiflava*. The latter group includes at least *P. brunneiflava*, *P. metalloma* (Lower), *P. photina* (Tams) and an undescribed species mentioned by Munroe (1974b). The male of the coded terminal may be Munroe's undescribed species. *Deanolis sublimbalis* Snellen, the red-banded mango borer of Southeast Asia and New Guinea (confused in Munroe 1974b with the spilomeline *Decelia terrosalis* Snellen), is closely related to *Pseudonoorda* species of the first group.

Cliniodes is restricted to South America and the West Indies, except the eastern Nearctic *C. ostreonalis* (see Hayden 2008). *Cliniodes* is diagnosed here by three apomorphies: loss of the androconium from the base of the valval costa (28:0), proximity of the gnathos arms to the uncus (36:1), and a cervix bursae with pleated sclerotization (46:1). Furthermore, *C. ostreonalis* (= *Metrea*) and *C. paradisalis* (= *Basonga*) share with derived *Cliniodes* species the loss of yellow forewing scales and a juxta with a recurved, apical hook. Male genitalia (not figured) indicate that *C. ostreonalis* is closely related to the Andean *C. glaucescens* (Hampson) and two other species, whereas C. *paradisalis* is related to *C. opalalis* Guenée and *C. euphrosinalis* Möschler.

Epipagis ocellata and *Mecyna catalalis* are misplaced in their respective genera, which both belong in the Spilomelinae. Described in *Sameodes* Snellen, *E. ocellata* is related to the other African species *Epipagis flavispila* (Hampson), *Hapalia iospora* (Meyrick), both of which are here transferred to Eurrhypini, and possibly some of the species placed in *Epascestria* by Maes (2002). Viette (1990: 90) published the combination "*A[utocharis] catalalis* (Viette), 1953," but it is not explicit whether the transfer was for *Mecyna catalalis* Viette, 1953a: 136 or for *Dichocrocis catalalis* Viette, 1953b: 208. Regardless, the species would be misplaced in *Autocharis*, so it will be transferred in a future work.

The specific epithets combined with *Tegostoma* and *Clupeosoma* terminate with *-ale* (ICZN 1999: Artt. 31.2, 34.2) because these generic epithets are unambiguously neuter. The original spellings are with *-alis*, as was Zeller's combination *T. comparalis* (1847: 581). The Greek neuter ending *-ma*, *-mat-* is a common suffix, as in somatic, stomatic. Indeed, the meanings of "*Tegostoma*" and "*Clupeosoma*" evidently refer to character states 3:1 and 7:2, although that fact does not rationalize the present choice of diagnosis. The problems associated with gender agreement (Sommerer 2002) are acknowledged but beyond the scope of this paper.

Predicting missing data is a strong empirical rationale for phylogenetic classification. Given some characters, one can infer the states of other characters to an arbitrary degree of precision. Subsequent observations confirm predictions, thereby expediting field- and labwork. For u unscored cells in characters with n states, there are n^u possible permutations, requiring zero to many extra steps. These predictions follow explicit rules (Fitch 1971) and are replicable.

The results indicate that *Suinoorda* larvae feed on seeds or fruits. One extra step is required if the larvae feed on something else, but without more information about ecology and biology, there is no indication what else that would be. It is possible that the feeding habit is a fifth unobserved state, such as specialization on another tissue or family, though allowing for an unknown state requires process assumptions about character evolution or evolutionary rates.

Most of the predictions herein are precise (Table 3). The least certain area involves the eight species, unscored for feeding habit, above node 42 and below node 54. Those above node 54 are all known or predicted to be external folivores on Thymelaeaceae, which their large body size and aposematism corroborate. Taken individually, the other eight species could assume any of the three habits other than stem-boring/leaf-mining. However, only 17 of the 3^8 possible permutations add no extra steps. For example, *Mecyna catalalis* would feed on Thymelaeaceae only if (1) all the others do the same or if (2) *P. hermesalis*, *V. bethalis* (Viette), and *E. ocellata* do the same and all the others are seed/fruit feeders. The same situation obtains for *E. ocellata* with regard to generalist folivory (state 3). Although there is one tree with substantial support, ambiguous character mapping clearly complicates phylogenetic predictivity.

Fieldwork will be necessary to observe the feeding habits of *Suinoorda* and any broader distribution or undiscovered congeners; the conclusions above are intended to facilitate that research. The phylogenetic results and generic diagnoses will likewise require testing with more evidence. This analysis demonstrates that the new species is more closely related to Palaeotropical genera than to the known Neotropical ones. The Eurrhypini includes many other genera, and the present sample focuses on the sepiform clade and the superficially similar Neotropical species. Elucidating the relationships of the other major groups will depend on description of novel characters and reexamination of traditional ones.

Acknowledgements

I thank James K. Liebherr for his support, discussions about methodology and West Indian biogeography, and critical comments. I give thanks to Bernard Landry, Patrice Leraut, Joel Minet, Michael Shaffer, and especially Alma Solis for advice about pyraloid systematics and Odontiinae in particular. Discussions with M. Nuss about odontiine systematics, methodology, the exigencies of cataloging, and the proliferation of generic names in the subfamily led me to pursue the full cladistic analysis; his comments on an earlier draft greatly improved this paper. I kindly thank Tim McCabe and Jan-Peter Rudloff collecting and lending the specimens and for accounts of the habitats. I am also grateful to many people for making additional material available: J. Barbut, U. Buchsbaum, P. Clavijo, A. Herrera, D. Lafontaine, W. Mey, James Miller, E. van Nieukerken, J. and W. de Prins, J. Rawlins, K. Tuck, and J. Weintraub. I thank K. Nixon, M. Luckow, and the Bailey Hortorium systematics group for comments on the drafts and stimulating discussions. The Willi Hennig Society generously distributed the software gratis. This work was supported in part by NSF Doctoral Dissertation Improvement Grant DEB-0808415 to J. Liebherr and by the Arthur Rawlins Endowment.

Literature Cited

Amsel, H.G. 1949. Die Microlepidopteren der Brandt'schen Iran-Ausbeute. 1. Teil. Bull. Soc. Fouad Ier d'Entom. (Cairo) 33: 227–269.

——. 1970. Afghanische Pyraustinae. Beitr. naturk. Forsch. SüdwDtl. 29(1): 25–66.

Beeson, C.F.C. 1961. The Ecology and Control of the Forest Insects of India and the Neighboring Countries, 2nd ed. Dehra Dun.

Bremer, K. 1988. The limits of amino acid sequence data in Angiosperm phylogenetic reconstruction. Evolution 42(4): 795–803.

Browne, F.G. 1968. Pests and Diseases of Forest Plantation Trees: an annotated list of the principal species occurring in the British Commonwealth. Oxford: Clarendon. p. 475.

Christoph, H.T. 1887. Lepidoptera aus dem Achal-Tekke-Gebiete. Dritter Theil. Pp. 50–125. *In* Romanoff, N. M. (ed.). Mémoires sur les Lépidoptères 3. St. Petersburg.

de Oliveira, M.A. 1942 [1941]. Contribução ao estudo das pragas e moléstias da Oiticica. Bol. Inspect. Fed. de Obras contra as Sêcas. 16(1) (Jul–Setem.): 19–47.

Denis, J.N.C.M. & I. Schiffermüller. 1775. Ankündung eines systematischen Werkes von den Schmetterlingen der Wienergegend herausgegeben von einigen Lehrern am k.k.

Theresianum. Augustin Bernardi, Wien. 1–323.

Ehrlich, P.R. & D.D. Murphy. 1982 [1981]. Butterfly nomenclature: a critique. J. Res. Lepid. 20(1): 1–11.

Evans, F.J. (ed.) 1986. Naturally Occurring Phorbol Esters. Boca Raton: CRC Press.

Farris, J.S. 1979. The Information Content of the Phylogenetic System. Syst. Zool. 28(4): 483-519.

Fitch, W.M. 1971. Toward defining the course of evolution: minimum change for a specific tree topology. Syst. Zool. 20(4): 406–416.

Fontenla, J.L. 2003. Biogeography of Antillean butterflies (Lepidoptera: Rhopalocera): patterns of association among areas of endemism. Trans. Amer. Entom. Soc. 129(3+4): 399–410.

Gerlach, J. and P. Matyot. 2006. Lepidoptera of the Seychelles Islands. Leiden: Backhuys.

Geyer, C. *In* Hübner, J. 1826–1832 [1832]. Zuträge zur Sammlung exotischer Schmettlinge, bestehend in Bekundigung einzelner Fliegmuster neuer oder rarer nichteuropäischer Gattungen. Augsburg. [1]–[3]–4–6–[7]–8–48, pl. [104]–[137].

Goloboff, P., J. Farris, & K. Nixon. 2003. T.N.T.: Tree Analysis Using New Technology, v. 1.1 for Windows. Program and documentation available from the authors and at www.zmuc.dk/public/phylogeny/TNT/. Accessed 14 June 2009.

——, ——, and ——. 2008. TNT, a free program for phylogenetic analysis. Cladistics 24(5): 774–786.

Grote, A.R. 1881. New moths from Arizona, with remarks on Catocala and Heliothis. Papilio 1: 153–168.

——. 1882. On Certain Pyralidae. Papilio 2: 72–74.

Guenée, M.A. 1854. Deltoides et Pyralites. Pp. 1–448. *In* Boisduval, J. & M.A. Guenée (eds.) Histoire Naturelle des Insectes. Species Général des Lépidoptères 8. Paris: Roret.

Gwynne, D.L. & Edwards, E.D. 1986. Ultrasound production by genital stridulation in Syntonarcha iriastis (Lepidoptera: Pyralidae): long-distance signalling by male moths? Zool. J. Linn. Soc. 88: 363–376.

Hampson, G.F. 1896. The Fauna of British India, including Ceylon and Burma, London 4 (Moths). pp. i–xxviii, 1–594.

——. 1897. On the classification of two subfamilies of moths of the family Pyralidae: The Hydrocampinae and Scopariinae. Trans. Entom. Soc. London: 127–240.

——. 1899a. A revision of the moths of the subfamily Pyraustinae and family Pyralidae. Part I. Proc. Zool. Soc. London (1898) (4): 590–761.

——. 1899b. A revision of the moths of the subfamily Pyraustinae and family Pyralidae. Part II. Proc. Zool. Soc. London 1899 (1): 172–291.

——. 1901. The Lepidoptera-Phalaenae of the Bahamas. Ann. Mag. Nat. Hist. (ser. 7) 7(39): 246–261.

——. 1904. The Lepidoptera-Phalaenae of the Bahamas [continued]. Ann. Mag. Nat. Hist. (ser. 7) 14(81): 165–188.

——. 1913a. Descriptions of new species of Pyralidae of the subfamily Pyraustinae. Ann. Mag. Nat. Hist. (ser. 8) 11: 322–342, 509–530.

——. 1913b. Descriptions of new species of Pyralidae of the subfamily Pyraustinae. Ann. Mag. Nat. Hist. (ser. 8) 12: 1–38, 299–319.

——. 1916. Descriptions of new Pyralidae of the subfamilies Epipaschiinae, Chrysauginae, Endotrichinae, and Pyralinae. Ann. Mag. Nat. Hist. (ser. 8) 18: 126–160, 349–373.

——. *In* Poulton, E.B. 1916. On a collection of moths made in Somaliland by Mr. W. Feather. Proc. Zool. Soc. London: 91–182.

——. 1917. Descriptions of new Pyralidae of the subfamilies Hydrocampinae, Scoparianae, &c. Ann. Mag. Nat. Hist. (ser. 8) 20: 201–216, 265–282.

Hayden, J.E. 2008. Notes on *Metrea ostreonalis* Grote. News Lepid. Soc. 50(1): 20–21, 25.

——. 2009. Taxonomic revision of Neotropical *Dicepolia* Snellen (Lepidoptera: Crambidae). Zootaxa 2237:1–33, pl. 1–6.

Heinrich, C. 1921. Some Lepidoptera likely to be confused with the pink bollworm. J. Agric. Research 20: 807–836.

Holloway, J.D. & E.S. Nielsen. 1999. Biogeography of the Lepidoptera. Ch. 21 in Handbook of Zoology, Vol. IV Arthropoda: Insecta. Part 36 (Lepidoptera, Moths and Butterflies), Vol. 1 (Evolution, Systematics, and Biogeography). N.P. Kristensen, ed. New York: Walter de Gruyter.

Hübner, J. 1796–1833 [1796]. Sammlung europäischer Schmetterlinge. 6. Horde. Die Zünsler; nach der Natur geordnet, beschrieben und vorgestellt. Augsburg: by the author. [i]–[iv], [i–ii], [i–ii], 1–30, [i–ii], [i–ii], pls. 1–32.

——. 1825 [1816]. Verzeichniß bekannter Schmettlinge. Augsburg: by the author. [1]–[3]–4–6–[7]–8–431.

Huertas Dionisio, M. 2007. Estados inmaturos de Lepidoptera (XXVIII). Cuatro especies de la subfamilia Odontiinae Guenée, 1854 en Huelva, España (Lepidoptera: Crambidae). SHILAP Revta. Lepid. 35 (137): 49–65.

International Commission on Zoological Nomenclature. 1999. International Code of Zoological Nomenclature, fourth ed. London: The International Trust for Zoological Nomenclature.

Iturralde-Vinent, M.A. & R.D.E. MacPhee. 1999. Paleogeography of the Caribbean Region: implications for Cenozoic biogeography. Bull. Amer. Mus. Nat. Hist. 238: 1–95.

Janzen, D.H. & Hallwachs, W. 2005. Dynamic database for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), northwestern Costa Rica. http://janzen.sas.upenn.edu, accessed 1 Nov. 2006.

Klima, A. 1939. Pyralididae: Subfam.: Pyraustinae II. Pp. 225–383 in: Bryk, F., Lepidopterorum Catalogus 94. 's Gravenhage: W. Junk.

Klots, A.B. 1956. Lepidoptera. Ch. 20 in Taxonomist's glossary of genitalia in insects. S. L. Tuxen, ed. Copenhagen: Ejnar Munksgaard. pp. 97–111.

Kornerup, A. and Wanscher, J.H. Methuen. Handbook of Colour. 2nd ed. London: Methuen & Co. Ltd., 1967.

Kristensen, N.P. 2004. Skeleton and muscles: adults. Ch. 4 in Handbook of Zoology, Vol. IV Arthropoda: Insecta. Part 36 (Lepidoptera, Moths and Butterflies), Vol. 2 (Morphology, Physiology, and Development). N.P. Kristensen, ed. New York: Walter de Gruyter.

Landry, B. 1995. A phylogenetic analysis of the major lineages of the Crambinae and of the genera of Crambini of North America (Lepidoptera: Pyralidae). Memoirs on Entom. Internat.: 1.

Lederer, J. 1863. Beitrag zur Kenntniss der Pyralidinen. Wiener Entom. Monatschrift 7 (8, 10–12): 243–280, 331–504.

Leech, H.B. 1949. The occurrence of a hollyhock-seed eater, Noctuelia rufofascialis, at Vernon, British Columbia (Lepidoptera: Pyralidae). Entom. Soc. Brit. Columbia Proc. 45 (1948): 25.

Legrand, H. 1966. Lépidoptères des îles Seychelles et d'Aldabra. – Mém. Mus. Hist. naturelle (sér. A Zool.) 37: 1–210.

LepTree Team. 2008. LepGlossary: Leptree.net. Accessed Oct 03, 2008 at http://www.leptree.net/g2.

Leraut, P. J. A. & Luquet, G.C. 1983. Statut de quelques genres et espèces d'Odontiinae paléarctiques et description de quatre nouveaux taxa (Le. Crambidae). Linneana Belgica 8 (1982) (12): 527–555.

Liebherr, J.K. 1988. General patterns in West Indian insects, and graphical biogeographic analysis of some circum-Caribbean *Platynus* beetles (Carabidae). Syst. Zool. 37(4): 385–409.

Lower, O.B. 1903. Descriptions of new Australian Noctuina,

&c. Trans. R. Soc. S. Austr. 27: 27–74.

MAES, K.V.N. 1995. A comparative morphological study of the adult Crambidae (Lepidoptera: Pyraloidea). Bull. Ann. Soc. R. Belge Ent. 131:383–434.

——. 2002. Crambidae. Pp. 96–105. *In* Vári, L., D.M. Kroon & M. Krüger. Classification and Checklist of the species of Lepidoptera recorded from Southern Africa. Chatswood, Australia: Simple Solutions.

MAISTRELLO, L., M.A. LÓPEZ, F.J. SORIA AND R. OCETE. 2005. Growth inhibitory activity of *Daphne gnidium* L. (Thymelaeaceae) extracts on the elm leaf beetle (Col., Chrysomelidae). J. Appl. Entom. 129(8):418–424.

MANN, J. 1969. Cactus-feeding insects and mites. Bull. U.S.N.M. 256.

MARION, H. & P. VIETTE. 1956. Pyrales de Madagascar nouvelles ou peu connues (Lepidoptera). Mém. Inst. Sci. Madagascar, Sér. Entom. (E) 7: 77–115, pl. 1.

MCCABE, T.L. 1984. A new Cautethia from the Bahamas (Lepidoptera: Sphingidae). Proc. Entom. Soc. Washington 86(3): 614–618.

MCDUNNOUGH, J. 1931. Note on the larvae of *Metrea ostreonalis* (Pyraustinae, Lepid.) Canad. Entom. 63: 50.

MILLER, J.Y. AND L.D. MILLER. 2001. The biogeography of the West Indian butterflies (Lepidoptera): an application of a vicariance/dispersalist model. pp. 127–155 in Biogeography of the West Indies: Patterns and Perspectives. 2nd ed. C.A. Woods and F.E. Sergile, eds. CRC Press.

MILLER, L.D. AND M.J. SIMON. 1998. Rediscovery of the rare, “endemic” Cuban butterfly, *Achylodes munroei* Bell, with notes on its behavior and possible origin. Caribbean J. Sci. 34: 327–329.

MINET, J. 1980. Création d’une sous-famille particulière pour Noorda Walker, 1859, et définition d’un nouveau genre parmi les Odontiinae. Bull. Soc. ent. France 85: 79–87.

MOORE, F. 1884–1887 [1885]. The Lepidoptera of Ceylon. London: L. Reeve. i–xvi, 1–578.

MOORE, F. 1888. Heterocera (continued) (Pyralidae, Crambidae, etc.). Pp. 199–299. *In* Hewitson, W.C. & Moore, F. Descriptions of new Indian lepidopterous Insects from the collection of the late Mr. W.S. Atkinson 3. London: Taylor & Francis.

MÖSCHLER, H.B. 1886. Beiträge zur Schmetterlings-Fauna von Jamaica. Abhandl. Senck. Naturforsch. Ges. (Frankfurt a. M.) 14: 25–84.

MUNROE, E.G. 1961. Synopsis of the North American Odontiinae, with Descriptions of New Genera and Species (Lepidoptera: Pyralidae). Memoirs of the Entomological Society of Canada, Ottawa 24: 1–93.

—— *In* Dominick, R.B., *et al.* 1972. The Moths of America North of Mexico, fasc. 13.1B, Pyraloidea (in part). London: E.W. Classey, ltd.

——. 1974a. New genera, species and generic transfers of Neotropical Odontiinae (Lepidoptera: Pyralidae). Canad. Entom. 106: 127–137.

——. 1974b. Pyralidae of the third Archbold Expedition. 1. Subfamily Odontiinae (Lepidoptera). Tijds. voor Entom. 117(2): 27–37.

——. 1977. Synopsis of Heortia Lederer, with descriptions of a new species and a new subspecies (Lepidoptera: Pyralidae: Odontiinae). Canad. Entom. 109: 429–441.

——. 1995. Odontiinae. Pp. 51–52 in Heppner, J.B. (ed.) Checklist: Atlas of Neotropical Lepidoptera. Gainesville: Assoc. for Neotropical Lepidoptera.

NIXON, K.C. 1999–2002. WinClada ver. 1.00.08. Published by the author, Ithaca, NY, USA. http://www.cladistics.com/wincDownload.htm [accessed 2004]

—— & J.M. CARPENTER. 1993. On outgroups. Cladistics 9: 413–426.

—— & J.I. DAVIS. 1991. Polymorphic taxa, missing values and cladistic analysis. Cladistics 7: 233–241.

NUSS, M. & KALLIES, A. 2001. *Titanio caradjae* (Rebel, 1902) comb. n., transferred from Brachodidae (Sesioidea) to Crambidae (Pyraloidea). Nota Lepid. 24 (3): 33–39.

—— and collaborators. 2008. GlobIZ: Globales Informationssystem Zünslerfalter. www.pyraloidea.org, accessed June 2009.

RAWLINS, J.E. & J.S. MILLER. 2008. Dioptine moths of the Caribbean Region: description of two new genera with notes on biology and biogeography (Lepidoptera: Notodontidae: Dioptinae). Ann. Carnegie Mus. 76(4): 203–225.

ROBINSON, G.S. 1976. The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. Entom. Gazette 27: 127–132.

——, P.R. ACKERY, I.J. KITCHING, G.W. BECCALONI AND L.M. HERNÁNDEZ. 2001. Hostplants of the moth and butterfly caterpillars of the Oriental Region. London: The Natural History Museum.

——, ——, ——, —— AND ——. 2008. HOSTS: a Database of the World's Lepidopteran Hostplants. The Natural History Museum (London). www.nhm.ac.uk/research-curation/projects/hostplants/ [accessed 23 Jan. 2008].

ROTHSCHILD, L.W. 1916. Lepidoptera of the British Ornithologists' Union and Wollaston Expeditions in the Snow Mountains, Southern Dutch New Guinea. Zoological Museum, Tring. 1–148.

SHAFFER, J.C. AND MUNROE, E. 2007 [2003]. Crambidae of Aldabra Atoll (Lepidoptera: Pyraloidea). Trop. Lepid. 14(1–2): 1–110.

SINGH, S., N.D. BARTHAKUR, AND D. GURUNG. 2000. Bioecology of *Heortia vitessoides* Moore (Lepidoptera: Pyralidae: Odentiinae [sic]), a major defoliator of *Aquilaria malaccensis* Lam. (Indian Eagle-wood). Ann. For. 8(1): 109–115.

SLAMKA, F. 2006. Pyraloidea (Lepidoptera) of Europe, Volume 1: Pyralinae, Galleriinae, Epipaschiinae, Cathariinae & Odontiinae. Bratislava: by the author.

SMITH, D.S., L.D. MILLER, & J.Y. MILLER. 1994. The Butterflies of the West Indies and South Florida. Oxford U. Press.

SNELLEN, P.C.T. 1880. *In* Piepers, M.C. & Snellen, P.C.T.: Nieuwe Pyraliden op het Eiland Celebes gevonden. Tijds. Entom. 23 (1879): 198–250.

——. 1892. Bijdrage tot de Kennis der Pyralidina. Tijds. Entom. 35: 152–178.

——. 1899. Nieuwe Aanteekeningen over Pyraliden. Tijds. Entom. 42: 58–95.

SOLIS, M.A. & K.V.N. MAES. 2002. Preliminary phylogenetic analysis of the subfamilies of Crambidae (Pyraloidea Lepidoptera). Belgian J. Entom. 4: 53–95.

SOMMERER, M. 2002. To agree or not to agree—the question of gender agreement in the International Code of Zoological Nomenclature. Nota Lepid. 25(2/3): 191–204.

STEPHENS, J.F. 1834. Illustrations of British Entomology; or, a synopsis of indigenous insects. London: Baldwin and Cradock. 1–433.

SUTRISNO, H. 2002. Cladistic analysis of the Australian *Glyphodes* Guenée and allied genera (Lepidoptera: Crambidae; Spilomelinae). Entom. Science 5(4): 457–467.

SWINHOE, C. 1887. On the Lepidoptera of Mhow, in Central India. Proc. Zool. Soc. London 1886: 421–465.

——. 1894. New species of Geometers and Pyrales from the Khasia Hills. Ann. Mag. Nat. Hist. (6) 14: 135–149.

SWOFFORD, D.L. & W.P. MADDISON. 1987. Reconstructing ancestral character states under Wagner Parsimony. Math. Biosci. 87: 199–229.

TOMINAGA, S. 1999. Hostplants of five species of Pyralidae in Okinawa. Yugato 156 (20 Apr.): 61–62.

TURNER, A.J. 1908. New Australian Lepidoptera of the families Noctuidae and Pyralidae. Trans. & Proc. of the Roy. Soc. of South Austr. 32 (Dec.): 102.

VIETTE, P. 1953 a. Nouvelles Pyrales de Madagascar. Rev.

franç. Entom. 20(1): 130–137.

——. 1953 b. Descriptions de nouvelles espèces de pyrales de la faune Malgache (Ins. Lépid.) Bull. Mens. Soc. Linn. de Lyon 22(8): 203–209.

——. 1954 [1953]. Nouvelles descriptions de Pyrales malgaches (Lepid. Pyraustidae). Bull. Mus. Nat. Hist. Naturelle (2) 25 (Octobre): 483–488.

——. 1958. Pyrales de la region Malgache nouvelles ou peu connues (Lepidoptera). Mém. Inst. Sci. Madagascar (Sér. Entom.) 9: 119–156.

——. 1960. Pyrales nouvelles ou peu connues de Madagascar et des Comores (Lep.). Ann. Soc. Entom. France 129: 151–177.

——. 1990. Crambidae (pp. 84–103) in Faune de Madagascar, supplément 1: A provisional check-list of the Lepidoptera Heterocera of Madagascar. Published by the author.

WALKER, F. 1859. Pyralides. List of the Specimens of Lepidopterous Insects in the Collection of the British Museum 18: 509–798.

——. 1862. Characters of undescribed Lepidoptera in the Collection of W. W. Saunders, Esq. Trans. Entom. Soc. London (3) 1: 70–128.

——. 1866 [1865]. Suppl. 4. List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, London 34: 1121–1533.

WARREN, W. 1889. On the Pyralidina collected in 1874 and 1875 by Dr. J.W.H. Trail in the basin of the Amazons. Trans. Entom. Soc. London 1889: 227–295.

——. 1890. Descriptions of some new genera of Pyralidae. Ann. Mag. Nat. Hist. (6) 6: 474–479.

——. 1892. Descriptions of new genera and species of Pyralidae contained in the British Museum collection. Ann. Mag. Nat. Hist. (6) 9: 172–179, 294–302, 389–397, 429–442.

WATERHOUSE, D.F. 1998. Ch. 4.6 in ACIAR Monograph No. 51: Biological Control of Insect Pests: Southeast Asian Prospects. Canberra: ACIAR, pp. 105–112.

WILKINSON, M. 1995. Coping with abundant missing entries in phylogenetic inference using parsimony. Syst. Biol. 44(4): 501–514.

ZELLER, P.C. 1847. Bemerkungen über die auf einer Reise nach Italien und Sicilien beobachteten Schmetterlingsarten. Isis von Oken (Leipzig) 8: 561–594.

Received for publication 2 January 2009; revised and accepted 27 May 2009.

Please see Appendices on next 4 pages

Appendix A: Characters.

Head

0. Antennal sensilla: sensilla short in both sexes = 0; male antenna thicker = 1; male sensilla longer = 2; sensilla long in both sexes = 3.

1. Labial palpi, aspect: porrect = 0; upturned = 1. Difficult to discern for species with very short palpi, such as *C. ostreonalis.*

2. Labial palpi, length: shorter than or equal to head = 0; longer than length of head = 1.

3. Frontoclypeal margin: straight = 0; prong = 1; ^-shaped arch = 2 (figs 5, 6: Fc). Despite its exaggeration, the nearly circular structure in *Suinoorda* is homologized with the sharply angled shape in other taxa. At the other extreme, some species have an slightly bowed arch. The double prong, two horizontal projections above the haustellum shared by *Eurrhypis* and *Tegostoma*, is common in many Odontiini.

Wings

4. Forewing medial area, color: terminal and medial areas translucent or paler than postmedial line = 0; terminal area dark, medial area pearly white or yellow = 1 (figs 1, 3, 4); terminal and medial areas dark = 2 (fig. 2); terminal area lighter than medial area = 3. In practice, states 0 and 2 may be hard to discern, e.g. comparing *Dicepolia* to *Hemiscopis* and *Hydrorybina*. In state 0, the red or violet terminal forewing band is fundamentally absent, and any coloration affects the whole forewing de novo. In state 2, the terminal band is fundamentally present, and the medial area is suffused with the same coloration. State 1 broadly characterizes the sharply different coloration between medial and postmedial areas, seen in the white/red pattern of *Suinoorda*, *Autocharis*, etc., the *Schinia*-like pattern of *Mimoschinia*, and the modified aposematic pattern of *Heortia*.

5. Forewing medial area suffusion: absent = 0; with yellow or orange scales = 1. The yellow scales may be diffusely dispersed among whiter scales (*E. ocellata*), or may occupy the entire wing. In some cases (*Heortia*), the pattern is implicated in aposematic mimicry.

6. Extension of forewing costa: absent = 0; costa approximating or fused to postmedial line through discal spot = 1. Applicable only for char. 4 state 1.

7. Sheen of wings and body scales: matte = 0; opalescent, silky, or hyaline = 1; metallic = 2. The difference between states 0 and 1 can best be distinguished on the hindwings. State 2 is restricted to the legs, lower thorax and underside of the wings in *C. orientalale* and *C. vohilavale*, whereas in other species *C. atristriatum* and *C. sericiale*, it also occurs on the dorsal side of the wings.

8. Antemedial line: absent or reduced = 0; present = 1.

9. Proximity of forewing postmedial line to distal wing margin: narrow (PM line near distal margin) = 0; broad (PM line ca. 3/5 from base of wing) = 1.

10. Forewing fovea: absent = 0; present = 1.

11. Forewing Rs_1: not stalked with Rs_{2+3} = 0 (fig. 10); stalked with Rs_{2+3} = 1.

12. Hindwing M_2, M_3: arising separately from cell = 0; stalked = 1.

13. Color in terminal hindwing anal area: not suffused = 0 (figs 1–4); suffused = 1. Inapplicable where the hindwing lacks any trace of color. The absence or strong reduction of coloration on the anal area, at least indicated by the postmedial line's abrupt cessation or convergence with the margin at A1, is also common in Glaphyriinae, Evergestinae, Pyraustinae *s. str*. and a few Spilomelinae.

14. Hindwing anal margin, emargination: absent = 0; present = 1. The round notch in the basal half of the hindwing anal area appears to articulate with the metathoracic legs.

Tympanal organs

15. Saccus tympani, medial rounding: rounded and deep: = 0 (fig. 17: ST); medially oblong: = 1. The pair of sacci extend anteriad under S2. The outline of state 0 is like a D, and state 1 is more like a "|)" shape.

Male genitalia

16. A8 tergite posterior fringe: not expanded = 0; expanded, square, like whole tergite = 1. All Odontiinae have a distinct fringe of hairs on the posterior edge of T8. The fringe is normally a narrow strip (state 0; fig. 12: F); state 1 describes cases where the scale-bearing field is expanded, up to a length:width ratio of 1:1. *Syntonarcha* also has an expanded fringe (Gwynne & Edwards 1986, fig. 2: "cuticular flap").

17. S8 bilobate: straight or monolobate = 0; weakly bilobate (lobe depth less than width) = 1 (fig. 12); strongly bilobate (lobe depth exceeds width) = 2. The anterior, internally extended lobes of sternite 8 evidently serve as muscle insertion sites for the retraction of the genitalia. In state 2, the medial concavity is deeper than the width of either lobe.

18. S8 posterior median projection: absent = 0 (fig. 12); present = 1. This is in the same plane as the rest of the sclerite (cf. characters 19, 20).

19. S8 posterior median projection, shape: simple, triangular = 0; bilobate or trapezoidal = 1. Inapplicable if char. 18 absent.

20. S8 posterior edge: straight = 0; excavate or concave = 1 (fig. 12); boss or saddle-horn = 2 (fig. 9). In state 2, the medial posterior margin emerges out of the plane of the rest of S8.

APPENDIX A (continued)

21. Lamelliform structures: absent = 0 (fig. 12); present = 1 (fig. 9: Lm).

22. Sepiform structures: absent = 0 (fig. 9); present = 1 (fig. 8: Sep).

23. Piluli of S8 (posterolateral of lamelliform structures): absent = 0; present = 1 (fig. 12: Pi). These sensillae occur posterolaterally of lamelliform structures, closer to the posterior corners of S8. See also Nuss & Kallies 2001: fig. 2.

24. Squamiform structures: absent = 0; present = 1 (figs 8–10). These are the paired "riffled membranes" of Nuss & Kallies (2001: fig. 1).

25. Squamal symmetry: symmetrical = 0 (figs 8–10); asymmetrical = 1. See Gwynne & Edwards 1986 for an asymmetrical example not included in this study.

26. Squamiform structures, distal edge: squarish = 0 (fig. 9); rounded = 1 (figs 8, 10).

27. Squamal enations: absent = 0; present = 1 (fig. 8: En). These fold around the sepiform structures where the latter are present, but the presence of a similar mid-squamal protuberance in *Hemiscopis* warrants coding them as a separate character.

28. Basicostal androconia: absent = 0; medium-length to long scales from field at base of costa = 1 (figs 18 & 19: BA); long scales from discrete field at end of sclerotized costa = 2.

29. Main patch of nondeciduous setae: not differentiated = 0; massive, robust setae = 1. Restricted to *Heortia* and *Cliniodes*. In *C. paradisalis*, this is represented by a single, hook-like, basally directed spine near the apex of the valve. Like other sensilla chaetica, it does not absorb Chlorazol stain.

30. Scoop-shaped scales: absent = 0; present = 1 (fig. 18: ScS). These broad scales have fine, closely spaced ridges, pearly lustre, and are shaped like potato chips. They commonly arise from the dorsal side of the valve and curve over the edge. They are often apparent by their lustre and dense packing on the valval edges of partly exposed genitalia.

31. Vincular androconia: absent = 0; present = 1 (fig. 18: VA). Common to most Pyraloidea, this is the pair of androconia on the pleural portion of the A8-A9 intersegmental membrane. Often called "coremata" (e.g. Sutrisno 2002, char. 30; Landry 1995, "coremata on intersegmental membrane VIII-IX").

32. Apex of costa: not projecting = 0; straight hook = 1; blunt sigmoid (apex out-turned) = 2 (fig. 19); downcurved hook fused to pleated flap = 3.

33. Juxta apex: not differentiated = 0; recurved hook = 1.

34. Gnathos apex: blunt and linguiform = 0; sharp, acute = 1; hatchet-shaped = 2.

35. Gnathos sides: inverse V = 0; inverse Y, with medial process = 1 (fig. 11); compact base with ventral notch = 2; transverse bar = 3. Some gnathoi coded as state 0, including *S. maccabei*, have bent lateral arms and approximate state 1, but the bends lie well below the medial junction, more like a capital upsilon.

36. Gnathos base-uncus base: gnathos base not articulating with uncus lower corners = 0; gnathos base near or articulating with uncus lower corners = 1 (fig. 11).

37. Phallus: not spiral = 0; spiral = 1.

Female genitalia

38. Ovipositor length: short = 0 (fig. 16); long = 1.

39. Colliculum: short = 1 (fig. 16: C); long (most of length of ductus) = 2.

40. Ductus bursae sclerotization: absent = 0; smooth, extending along the long, narrow ductus bursae = 1; rough, on limited area of cervix bursae = 2. In many Eurrhypini, including *Suinoorda*, the ductus bursae is expanded as a cervix bursae (fig. 16: CvB). In this sample of taxa, no clear distinction could be made between the typically long, narrow ductus and a short, inflated cervix bursae. Species with state 1 have the ductus bursae mostly but weakly sclerotized, whereas state 2 represents a limited area that is often granular. *Suinoorda* and *Noordodes* share a large cervix bursae occupied by massive, irregular sclerotization.

41. Appendix of ductus bursae: absent = 0; present = 1.

42. Corpus bursae signum: absent = 0; present (1 or 2) = 1 (fig. 16).

43. Corpus bursae signum shape: round = 0 (fig. 16); linear = 1. Inapplicable if char. 42 absent.

44. Ductus seminalis origin: from ductus bursae = 0 (fig. 16: DS); from corpus bursae, with signum extension = 1.

45. Ductus seminalis basal width: narrow = 0; enlarged = 1.

46. Pleats or wrinkles on cervix bursae: absent = 0; present = 1; present over both cervix and corpus bursae = 2. State 2 represents cases where there is no clear distinction between the plications of the cervix and corpus bursae. In *Suinoorda*, pleats occur on the corpus, but they are clearly not continuous from the irregularly shaped sclerotization of the cervix.

Larva

47. Feeding habit: tube-dwelling stem borer or leaf miner = 0; seed and fruit pulp feeder = 1; folivore, Thymelaeaceae = 2; folivore, other = 3. The states reflect plausible physiological and metabolic constraints. The external silken tube of Eurrhypis and Tegostoma is probably a modification of an ancestrally internal gallery, retained for feeding on thin-branched hostplants. Thymelaeaceae produce many unique feeding deterrents (Maistrello *et al*. 2005), and folivory on this family is rare in Lepidoptera (Robinson *et al*. 2008). How correctly the states are defined will emerge as new records are obtained (see the predicted values).

APPENDIX B: Data matrix. ?: unobserved, -: inapplicable. More than one state: A: [01], B: [02], C: [12], D: [23]

```
Terminal                           Character Number

                                     0   5    10   15    20   25   30    35   40   45
                                     |   |    |    |     |    |    |     |    |    |
  Cynaeda dentalis-----------------  200000-0-0100000000-00000---00010010000100110000
  Tegostoma comparale--------------  200120-010000100000-00000---000100100011000-0000
  Aeglotis argentalis--------------  D01010111000000001010-11001000000100013 00?????????
  Argyrarcha margarita-------------  00001011100000001100-2100110000100012100100100 01?
  Autocharis albiplaga-------------  20121001100000000020-0101100010112020000120 11000?
  Autocharis barbieri--------------  2012A0011000000000211110110001 01?201100120 0110003
  Autocharis fessalis--------------  20121001000010000 20-1101100010113010001220110003
  Autocharis mimetica--------------  20121001000000000020-01011000101120200012200-000?
  Cliniodes costimacula------------  000021-110000101010-21011000001100001001201010 1?
  Cliniodes opalalis---------------  310020-110000100010-21011000211101121002201010 12
  Cliniodes ostreonalis------------  1A0000-110000-01010-2101100000110103100120101 01D
  Cliniodes paradisalis------------  11001011100001000 10-C1011000211001101001200-101?
  Clupeosoma atristriatum----------  001020-200111000111010101011001110100 0?????????
  Clupeosoma orientalale-----------  000030-200010000011010101011001110100011001001A?
  Clupeosoma sericiale-------------  000020-200111000111010101011001110100011001001 1?
  Clupeosoma vohilavale------------  10A020-210010000011010101011001110000011001001A?
  Deanolis sublimbalis-------------  001010010001001001111010101100110020001100100101
  Dicepolia munroealis-------------  ?01200-1100000010110110110001 01?30110101010-00A?
  Dicepolia roseobrunne------------  201200-110000000021001011000101130110101011 00001
  Dicepolia rufitinctalis----------  001200-1100010000210110110001011301101010010000?
  Ephelis cruentalis---------------  200010001000000000 10-01011000000100100001000-000?
  Epipagis ocellata----------------  10001111100000001010-210110001011001000110110100?
  Eurrhypis pollinalis-------------  20011110100001000 10-01011000000100100001000-0010
  Hemiscopis suffusalis------------  001020-11100010101102101100110110000000010010000D
  Heortia dominalis----------------  10101111100001011 00-110110001111000000012010000?
  Heortia vitessoides--------------  11001111110001011 10-1101100011110000000120100022
  Hyalinarcha hyalinalis-----------  200200-110000000010-2100100010103011000100110 01?
  Hydrorybina polusalis------------  001020-1110100010210110110001011000000 11000-0013
  Mecyna catalalis-----------------  000021-11000000101101101100000110 01A0001000-000?
  Mecynarcha apicalis--------------  000020-110000101100-110011000000001210010010001?
  Mimoschinia rufofascialis--------  20001000100000000 10-11011000000100100011100-0021
  Noordodes magnificalis-----------  00021001100100000 10-101010110011001000112010001?
  Pitama hermesalis----------------  10001001010000010 20-010110001011001100010010000?
  Pseudonoorda brunneiflava--------  0002A00100010000010-00101001001100100 0A12000011?
  Pseudonoorda distigmalis---------  00101001000100100111101010110011002000110 0010010?
  Pseudoschinia elautalis----------  20001000100000000 10-11011000000100100001100-0001
  Sobanga rutilalis----------------  00001011100000001100-00000---000?0012100100100 01?
  Suinoorda maccabei---------------  0002C0010000000000 10-1011101110110010100120100 0A?
  Viettessa bethalis-------------    10001011010000010 20-B10110001011001000 11000-000?
```

APPENDIX C: Unambiguous character state changes of nodes for cladogram (fig. 7). Format: "character: primitive state --> derived state." Obtained with TNT commands "Optimize / Synapomorphies / List synapomorphies."

Cynaeda dentalis :
No autapomorphies
Tegostoma comparale :
3: 0 --> 1
13: 0 --> 1
38: 0 --> 1
Aeglotis argentalis :
0: 0 --> 23
2: 0 --> 1
Argyrarcha margarita :
20: 1 --> 2
Autocharis albiplaga :
38: 1 --> 0
39: 2 --> 1
Autocharis barbieri :
No autapomorphies
Autocharis fessalis :
12: 0 --> 1
Autocharis mimetica :
42: 1 --> 0
Cliniodes costimacula :
0: 1 --> 0
Cliniodes opalalis :
0: 1 --> 3
35: 0 --> 2
39: 1 --> 2
Cliniodes ostreonalis :
4: 12 --> 0
35: 0 --> 3
Cliniodes paradisalis :
31: 1 --> 0
42: 1 --> 0
Clupeosoma atristriatum :
2: 0 --> 1
Clupeosoma orientalale :
4: 2 --> 3
Clupeosoma sericiale :
No autapomorphies
Clupeosoma vohilavale :
0: 0 --> 1
8: 0 --> 1
34: 1 --> 0
Deanolis sublimbalis :
No autapomorphies
Dicepolia munroealis :
15: 0 --> 1
17: 2 --> 1
42: 1 --> 0
Dicepolia roseobrunnea :
20: 1 --> 0
Dicepolia rufitinctalis :
0: 2 --> 0
12: 0 --> 1
Ephelis cruentalis :
No autapomorphies
Epipagis ocellata :
38: 0 --> 1
41: 0 --> 1
Eurrhypis pollinalis :
3: 0 --> 1
5: 0 --> 1
6: 0 --> 1
13: 0 --> 1
46: 0 --> 1
Hemiscopis suffusalis :
13: 0 --> 1
20: 1 --> 2
27: 0 --> 1
Heortia dominalis :
2: 0 --> 1
17: 1 --> 0
Heortia vitessoides :
1: 0 --> 1
9: 0 --> 1
46: 0 --> 2
Hyalinarcha hyalinalis :
20: 1 --> 2
23: 1 --> 0
31: 1 --> 0
46: 0 --> 1
Hydrorybina polusalis :
11: 0 --> 1
17: 1 --> 2
38: 0 --> 1
46: 0 --> 1
Mecyna catalalis :
5: 0 --> 1
Mecynarcha apicalis :
4: 1 --> 2
13: 0 --> 1
Mimoschinia rufofascialis :
38: 0 --> 1
46: 0 --> 2
Noordodes magnificalis :
No autapomorphies
Pitama hermesalis :
6: 1 --> 0
35: 0 --> 1
Pseudonoorda brunneiflava :
20: 1 --> 0
26: 1 --> 0
42: 1 --> 0
Pseudonoorda distigmalis :
No autapomorphies
Pseudoschinia elautalis :
No autapomorphies
Sobanga rutilalis :
20: 1 --> 0
21: 1 --> 0
24: 1 --> 0
Suinoorda maccabei :
36: 0 --> 1
Viettessa bethalis :
38: 0 --> 1
42: 1 --> 0
Node 41 :
23: 1 --> 0
31: 1 --> 0
Node 42 :
6: 0 --> 1
15: 0 --> 1
Node 43 :
0: 2 --> 0
43: 1 --> 0
Node 44 :
7: 0 --> 1
30: 0 --> 1
42: 0 --> 1
Node 45 :
20: 0 --> 1
47: 0 --> 1
Node 46 :
17: 0 --> 1
21: 0 --> 1
23: 0 --> 1
24: 0 --> 1
Node 47 :
16: 0 --> 1
17: 1 --> 0
25: 0 --> 1
36: 0 --> 1
Node 48 :
20: 1 --> 0
34: 1 --> 2
Node 49 :
35: 1 --> 0
40: 0 --> 2
Node 50 :
38: 0 --> 1
39: 1 --> 2
47: 1 --> 3
Node 51 :
2: 0 --> 1
17: 1 --> 2
Node 52 :
32: 0 --> 3
35: 0 --> 1
Node 53 :
28: 1 --> 0
36: 0 --> 1
46: 0 --> 1
Node 54 :
13: 0 --> 1
34: 1 --> 0
40: 0 --> 2
Node 55 :
5: 0 --> 1
Node 56 :
0: 0 --> 1
Node 57 :
15: 1 --> 0
28: 0 --> 2
29: 0 --> 1
34: 0 --> 1
Node 58 :
5: 1 --> 0
33: 0 --> 1
Node 59 :
10: 0 --> 1
12: 0 --> 1
16: 0 --> 1
Node 60 :
4: 1 --> 2
7: 1 --> 2
32: 0 --> 1
Node 61 :
3: 2 --> 0
18: 0 --> 1
40: 2 --> 0
Node 62 :
45: 0 --> 1
Node 63 :
11: 0 --> 1
23: 1 --> 0
38: 0 --> 1
Node 64 :
21: 1 --> 0
22: 0 --> 1
26: 0 --> 1
27: 0 --> 1
40: 0 --> 2
Node 65 :
2: 0 --> 1
14: 0 --> 1
19: 0 --> 1
34: 1 --> 2
46: 1 --> 0
Node 66 :
41: 0 --> 1
Node 67 :
37: 0 --> 1
43: 1 --> 0
Node 68 :
2: 0 --> 1
9: 0 --> 1
34: 1 --> 0
Node 69 :
4: 1 --> 2
18: 0 --> 1
Node 70 :
16: 0 --> 1
29: 0 --> 1
Node 71 :
30: 1 --> 0
Node 72 :
40: 0 --> 1
Node 73 :
8: 1 --> 0
9: 0 --> 1
17: 1 --> 2