

A REVISION OF THE NEOTROPICAL GENUS *CORA* SELYS, 1853 (ZYGOPTERA: POLYTHORIDAE)

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The revision is based on a study of adult males. *C. chirripa donnellyi* ssp. n. (holotype ♂, allotype ♀ deposited in FSCA, Gainesville) is described from: Costa Rica, Puntarenas Province, Monteverde, VII-1985, VI-1986. *C. alcyone* Sel. is a synonym of *marina* Sel., *brasiliensis* Montg. of *inca* Sel., and *bogotensis* Foer., of *modesta* Sel. *C. jocosa* McL. and *klenei* Karsch are returned to *Cora* from *Josocora*; *terminalis* McL. to *Cora* from *Euthore*. *C. subfumata* Foer. is a *nomen dubium*. The first male of *munda* McL. is described, and supplementary descriptions of *lugubris* Navas and *klenei* are given. Each of the 18 spp. is assigned to one of 3 groups based primarily on the apex of the terminal segment of the penis. Groups are characterized, a key to males is presented, and penes and pterothoracic color patterns are figured.

INTRODUCTION

SELYS (1853) established the genus *Cora* with *cyane* the type species. The only study of the genus as a whole is by MONTGOMERY (1967) who examined many types, discussed their depositions, and presented a key to 19 species based only on types. No new species has been described subsequent to his description of *brasiliensis*. DE MARMELS (1982) described the larva of *cyane* and treated (1988a) *alcyone* as a subspecies of *marina*. PAULSON tabulated the species by country in Central America (1982) and in South America (1983). GONZALEZ & VERDUGO (1984a, b) reported the reproductive behavior of *marina*.

In this paper, we describe *C. c. donnellyi* ssp. nov., place *alcyone* Selys in synonymy with *marina*, *brasiliensis* Montgomery with *inca*, and *bogotensis* Foerster with *modesta*. *Josocora jocosa*, *J. klenei* and *Euthore terminalis* are

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returned to *Cora*, and *subfumata* Foerster is regarded as a *nomen dubium*. The 19 taxa considered herein (spelling of McLachlan as suggested by LIEFTINCK et al., 1984) are:

<i>chirripa chirripa</i> Calvert, 1907	<i>marina</i> Selys, 1868
<i>chirripa donnellyi</i> , ssp. nov.	<i>modesta</i> Selys, 1869
<i>confusa</i> Kennedy, 1940	<i>munda</i> McLachlan, 1878
<i>cyane</i> Selys, 1853	<i>notoxantha</i> Ris, 1918
<i>dualis</i> McLachlan, 1878	<i>obscura</i> Ris, 1918
<i>inca</i> Selys, 1873	<i>semiopaca</i> Selys, 1878
<i>irene</i> Ris, 1918	<i>skinneri</i> Calvert, 1907
<i>jocosa</i> McLachlan, 1881	<i>terminalis</i> McLachlan, 1878
<i>klenei</i> Karsch, 1891	<i>xanthostoma</i> Ris, 1918
<i>lugubris</i> Navas, 1934	

B.E. Montgomery's unpublished notes and figures of types were available in the archives of IORI, and we examined directly types of 12 species. Additionally, specimens from many institutions and individuals were studied. These, frequent collectors, and deposition of types are abbreviated as follows:

ANSP	Academy of Natural Sciences, Philadelphia
BMNH	British Museum (Natural History), London
CC	C. Cook
CE	C. Esquivel
DP	D. Paulson
EW	E.B. Williamson, et al.
FSCA	Florida State Collection of Arthropods, Gainesville
IORI	International Odonata Research Institute, Gainesville
IRSN	Institut Royal des Sciences Naturelles, Brussels
MCZ	Museum Comparative Zoology, Harvard University, Cambridge
MW	M.J. Westfall Jr
OF	O.S. Flint, et al.
RG	R.W. Garrison
SD	S.W. Dunkle
SMF	Senckenberg Museum, Frankfurt
TD	T.W. Donnelly
UMAA	University of Michigan, Ann Arbor
USNM	National Museum, Smithsonian Institution, Washington, D.C.
WM	W.C. MacIntyre

This paper deals almost entirely with males and is not designed for identification of females. Records of only those females collected with males are given. There seem to be no previous descriptions of females of 8 species and, among these, 3 were not present in our material. Fortunately, females of the remaining 5 (*semiopaca*, *skinneri*, *klenei*, *jocosa*, *cyane*) were collected with males. Brief descriptive notes only for these are included. Previously described females are not discussed.

Under material examined, basic data are given in this sequence: country (caps), department, province or state (*italics*), collector, date, number and sex, deposition of specimens. Information in: RIS (1918), KENNEDY (1940), RACENIS (1953), FRASER (1957), MONTGOMERY (1967)

permits generic placement of most specimens. However, difficulty in assignment of *terminalis*, *confusa*, *klenei*, and *jocosa* will be discussed for these species.

SPECIES GROUPS

Based primarily on obvious differences in the apex of the terminal segment of the penis, we recognize 3 species groups. Of secondary importance are position of nodus, length of pterostigma, and color of abdominal segment 2. The pterothoracic color pattern, important in species determination, is of little use in defining groups, and the superior appendages are of no use in group separation.

I. MODESTA GROUP (Tabs I, II, III; Figs 1-12, 20-31).

- (A) Penis with 2 distinct apical horns varying in length from 0.05 to 0.35 mm. This appears to be the generalized condition, occurring in most Polythoridae: *Euthore* (KENNEDY, 1919, 1920); *Chalcopteryx* (KENNEDY, 1920); *Stenocora*, *Miocora*, KENNEDY (1940); *Polythore* (BICK & BICK, 1985, 1986); *Chalcothore* (DE MARMELS, 1988b).
- (B) Fore wing base to nodus equal to or less than nodus to pterostigma in most species.
- (C) Fore wing pterostigma small, 1.7-3.0 mm along posterior border.
- (D) Abdominal segment 2 dorsally entirely dark.
- (E) This group may be divided into 2 subgroups based on distribution, the 1st, Central American, the 2nd, South American. Within each subgroup, the sequence of species is, in general, according to increasing length of penis horns:
 - (1) *semiopaca*, *notoxantha*, *obscura*, *chirripa*, *skinneri*.
 - (2) *dualis*, *modesta*, *lugubris*, *munda*, *terminalis*, *confusa*, *klenei*.

II. INCA GROUP (Tabs I, IV, Figs 13, 32).

- (A) Penis apically concave but without distinct horns. This apical indentation suggests that the *inca* group is intermediate between *modesta* and *cyane* groups.
- (B) Fore wing base to nodus greater than nodus to pterostigma.
- (C) Fore wing pterostigma long, 3.0-3.4 mm along posterior border.
- (D) Basal half of abdominal segment 2 blue.
- (E) Includes only *inca* from Colombia and Ecuador.

III. CYANE GROUP (Tabs I, IV, V, Figs 14-19, 33-37).

- (A) Penis apically convex to truncate, without concavity or horns. This type, which differs from that of all other Polythoridae, suggests the possibility of assigning the included species to a new genus.
- (B) Fore wing base to nodus greater than nodus to pterostigma.
- (C) Fore wing pterostigma long, 2.5-4.0 mm along posterior border.
- (D) Abdominal segment 2 dorsally completely or almost completely blue.
- (E) Includes: *cyane*, *jocosa*, *xanthostoma*, and *irene* from South America, and *marina* from Mexico, Central and South America.

SPECIES KEY TO ADULT MALES OF *CORA*

The following key will permit initial determinations of most male specimens, which should then be verified from figures of the penes and the color patterns of the pterothorax, considering variation discussed for some species. Terminology of wing venation is that of BORROR (1945).

- 1 Penis apically convex to truncate (Figs 14-19); abdominal segment 2 dorsally almost all pale;

pterothorax blue and black	<i>CYANE</i> group	3
1' Penis apically concave or with distinct horns; abdominal segment 2 dorsally at least half dark; pterothorax variously colored		2
2 Penis apically concave but without distinct horns (Fig. 13); basal half of abdominal segment 2 dorsally blue	<i>INCA</i> group (<i>inca</i> only)	
2' Penis with 2 distinct apical horns (Figs 1-12); abdominal segment 2 dorsally entirely dark	<i>MODESTA</i> group	7
3 Dorsum of abdominal segments 4-6 pale		4
3' Dorsum of abdominal segments 4-6 dark		6
4 With a complete black stripe along humeral suture (Fig. 35)	<i>marina</i>	
4' Without any black stripe or only an incomplete one along humeral suture		5
5 First and second lateral sutures each with a full length black stripe (Fig 33)	<i>jocosa</i>	
5' Each of these sutures without or with only an incomplete black stripe (Fig. 34)	<i>cyane</i>	
6 Abdominal segments 8 and 9 dorsally black; hind wing without a sector between CuP and A.	<i>irene</i>	
6' Abdominal segments 8 and 9 dorsally blue; hind wing with at least 1 sector between CuP and A.	<i>xanthostoma</i>	
7 Each mesepisternum with 2 elongate parallel black stripes between dorsal carina and humeral suture (Figs 28, 29)		8
7' Without these stripes		9
8 Each wing with a small apical dark mark; fore wing length 35 mm; penis horns elongate, 0.30 mm (Fig. 10)	<i>terminalis</i>	
8' Each wing without an apical dark mark; fore wing length only 27 mm; penis horns shorter, 0.20 mm (Fig. 9)	<i>munda</i>	
9 Mesepisternum with a large black area surrounded or almost surrounded by a pale stripe along the dorsal carina and the humeral suture (Figs (25-27)		10
9' Mesepisternum not as above		12
10 Each wing with a very small white spot along the costa just distad of nodus; fore wing length 41 mm	<i>dualis</i>	
10' Without the above wing marking; fore wing length only 25-28 mm		11
11 Each wing with an apical dark spot	<i>modesta</i>	
11' Each wing without such a spot	<i>lugubris</i>	
12 With a dark band on each wing extending from just beyond the nodus to or almost to the apex	<i>semiopaca</i>	
12' Wings entirely hyaline or with a small brown or black apical mark		13
13 Mesepimeron mostly pale (yellow or blue), sometimes with a black streak		14
13' Mesepimeron mostly dark (brown or black)		17
14 Mesepisternum almost entirely black; mesepimeron mostly blue-gray (Fig. 31); penis horns very elongate, 0.35 mm (Fig. 12)	<i>klenei</i>	
14' Without this combination of characters		15
15 Dorsal carina with a narrow black stripe; pale areas of mesepisternum and mesepimeron either yellow-orange or blue-gray (Fig. 21)	<i>notoxantha</i>	
15' Dorsal carina with a broad black stripe which may or may not bulge; pale areas of mesepisternum and mesepimeron blue-gray		16
16 Wings entirely hyaline; f. w. 26-31 mm	<i>chirripa chirripa</i>	
16' Each wing with a dark brown or black mark from proximal end of pterostigma to wing apex; f. w. 31-35 mm	<i>chirripa donnellyi</i>	
17 Fore wing long, 30-34 mm; metepisternum without 2 elongate pale stripes but with posterior half pale (Fig. 24); pterothoracic sternum with paired black spots	<i>skinneri</i>	
17' Fore wing much shorter, 22-26 mm; metepisternum with 2 elongate pale stripes separated by		

- black or brown 18
 18 Mesepisternum almost entirely black (Fig. 22); penis horns short, 0.07 mm (Fig. 3) *obscura*
 18' Mesepisternum only half black (Fig. 30); penis horns elongate, 0.20 mm (Fig. 11) .. *confusa*

DISTRIBUTION

The strictly Neotropical genus, *Cora*, is represented from Veracruz State in southern Mexico (about 18° N) south to LaPaz Department in western Bolivia (about 16° S). Although *Cora* almost certainly occurs throughout Central America, it has not been reported (WESTFALL, 1986) previously from El Salvador, and there are still no records for Nicaragua. East-west limits are unclear, but some species occur east at least to Puerto Cabello in north-western

Table I
 The occurrence of 18 species of *Cora* by country

Species	Mexico	Belize	Guatemala	El Salvador	Honduras	Costa Rica	Panama	Colombia	Venezuela	Ecuador	Peru	Bolivia	Brazil
<i>marina</i>	x	x	x	x	x	x	x	x	x				
<i>chirripá</i>						x							
<i>skinneri</i>						x							
<i>semiopaca</i>						x	x						
<i>notoxantha</i>						x	x						
<i>obscura</i>						x	x						
<i>lugubris</i>								x					
<i>xanthostoma</i>								x	x				
<i>klenei</i>								x		x			
<i>modesta</i>								x		?	?		
<i>inca</i>								x		x			x
<i>cyane</i>									x	?			
<i>confusa</i>										x			
<i>dualis</i>										x			
<i>munda</i>										x			
<i>jocosa</i>										x	x		
<i>terminalis</i>										x	x	x	
<i>irène</i>											x	x	

Venezuela (about 68° W) and reach the Pacific in Central America and probably Colombia. Most South American localities are Andean. Occurrence of each of the 18 species by country is summarized in Table I. The greatest diversity of species is in Ecuador, Colombia, and Costa Rica. The only widespread species is *marina* which occurs in southern Mexico, south to Colombia and Venezuela.

CORA SEMIOPACA SELYS

Figures 1, 20; Table II

Cora semiopaca SELYS, 1878: 12 (Panama; 1 ♂, ♀ unknown); 1879: 62 (Panama; addit. ♂ descr., compared with *modesta*, ♀ unknown); — KIRBY, 1890: 118 (Panama); — CALVERT, 1901-08: 45 (Panama: Chiriqui, 762-1219 m; addit. ♂ descr.); — RIS, 1918: 22 (Panama: Chiriqui, Lino 800 m; fig. 8, wings); — KENNEDY, 1919 (Chiriqui; figs 33, 34, penis); — MONTGOMERY, 1967: 134, 146 (key, type); — PAULSON, 1982: 250 (Costa Rica, Panama).

Type data — The lectotype ♂ in IRSN was not seen.

Material examined — COSTA RICA, *Heredia*, Rivas Valley, 1280 m, C. Lankester, V-1936, 1 ♂, ANSP; — *Puntarenas*, Gofito, OF, VII-1967, 1 ♂, 1 ♀, USNM; Rincon de Osa, DP, III-1969, 1 ♂, DP; — *San Jose*, Ciudad Colon, CE, I-1988, 7 ♂, IV-1988, 3 ♂, 1 ♀, VI-1988, 5 ♂, VII-1988, 6 ♂, IX-1988, 2 ♂, XII-1988, 1 ♂, II-1989, 3 ♂, 6 ♀, CE; Santiago, W. Benson, I-1968, 1 ♂, DP. — PANAMA, *Chiriqui*, Chiriqui, from R. Martin, 2 ♂, ANSP: Potrerillos, 1097 m, D. Brown, II-1934, 2 ♂, IV-1934, 2 ♂, V-1934, 1 ♂, FSCA; G. Small, III-1966, 2 ♂, RG.

This is the only species in the genus with distal broad dark wing bands. In males, the bands began 3-5 mm beyond the nodus, ended 10-15 beyond, some almost reaching the wing apex. The wing color of females was much smaller, most beginning only at the proximal end of the pterostigma.

Table II

Comparison of males of 11 species of *Cora* in the *modesta* group — [See Tab. III for *chirripa*; — all numbers except those in the last 2 horizontal rows are averages]

	<i>semiopaca</i>	<i>notosaniha</i>	<i>obscura</i>	<i>skinneri</i>	<i>dualis</i>	<i>modesta</i>	<i>lugubris</i>	<i>munda</i>	<i>terminalis</i>	<i>confusa</i>	<i>klenei</i>
Number studied	10	8	9	9	1	2	1	1	6	2	2
Labrum, % specimens more than half dark	30	0	0	0	0	0	0	0	0	0	0
Postclypeus, % specimens more than half dark	90	0	78	100	100	100	0	0	17	100	0
Abdominal segment 2, % specimens more than half dark	100	100	100	100	100	100	100	100	100	100	100
Abdominal segment 8, % specimens more than half dark	100	100	100	100	100	100	100	100	100	100	100
F.W. length	28.1	23.5	23.4	33.0	41.0	28.5	25.0	27.0	35.5	25.0	26.5
F.W. base-nodus	13.1	11.1	11.1	14.1	16.0	12.0	11.0	11.0	16.2	10.5	12.0
F.W. nodus-pterostigma	12.7	10.1	10.4	15.2	21.0	13.5	11.0	13.0	15.8	12.0	12.0
F.W. pterostigma along posterior border	2.4	2.0	2.0	2.4	2.1	2.2	2.1	2.2	2.7	2.0	1.8
F.W. antenodals	33.7	27.7	27.5	36.1	34.0	27.5	27.0	24.0	32.2	27.0	28.5
F.W. postnodals	25.9	23.1	23.0	34.2	43.0	27.5	23.0	30.0	31.9	21.0	27.0
H.W. petiole length	2.6	2.3	2.0	2.8	3.3	3.2	3.2	2.5	4.4	1.4	2.3
H.W. sectors between CuP & A — mode	1	0	0	1	3	2	0	2	2	0	0
Penis horns	0.05	0.07	0.07	0.17	0.07	0.15	0.15	0.20	0.30	0.20	0.35

The mesepisternum and mesepimeron of all males were black, of females, dark brown. The labrum of males varied from all pale to all dark, the postclypeus from 0.2 dark to all dark; while in females these parts were 0.2-0.6 dark and 0.5 to all dark respectively.

CORA SUBFUMATA FOERSTER, *nomen dubium*

"*Cora semiopaca* Selys Rasse *subfumata* n. sbsp." FOERSTER, 1914: 60 (Peru: Vilcanota; 1 ♂ semiad.); — MONTGOMERY, 1967: 147 (type).

Cora semiopaca subfumata: SCHMIDT, 1952: 222; — SOUKUP, 1954: 14; — RACENIS, 1959: 486 (all Vilcanota).

Cora subfumata: MONTGOMERY, 1967: 135 (key); — PAULSON, 1983 (Peru); — DAVIES & TOBIN, 1984: 26 (Peru).

Type data — FOERSTER (1914) stated that the type is in his own collection, MONTGOMERY (1967), that it was probably destroyed or lost before reaching Ann Arbor. We could find no type of *subfumata* in UMAA where most of Foerster's types were deposited, nor in any other collection.

Material examined — none.

The "semiad." type, almost certainly lost, is apparently the only specimen ever recorded as *subfumata*. FOERSTER'S (1914) very brief description, separating it from *semiopaca*, included only: larger; dark wing band proximally curved, begins about midway between nodus and pterostigma (straight and at $\frac{1}{4}$ in *semiopaca*). MONTGOMERY (1967) used these criteria to differentiate the 2 specifically but reversed the proximal level of the band from that of FOERSTER (1914).

The possibility that *subfumata* may be only a variant of *semiopaca* is unlikely because of great geographic separation. Also, the *subfumata* type could have been mislabelled *semiopaca* in UMAA — another unlikely possibility because there were no specimens of either "species" there. Without a type, without specimens, and with an original description based only on variable characters, the status of *subfumata* is very doubtful.

CORA NOTOXANTHA RIS

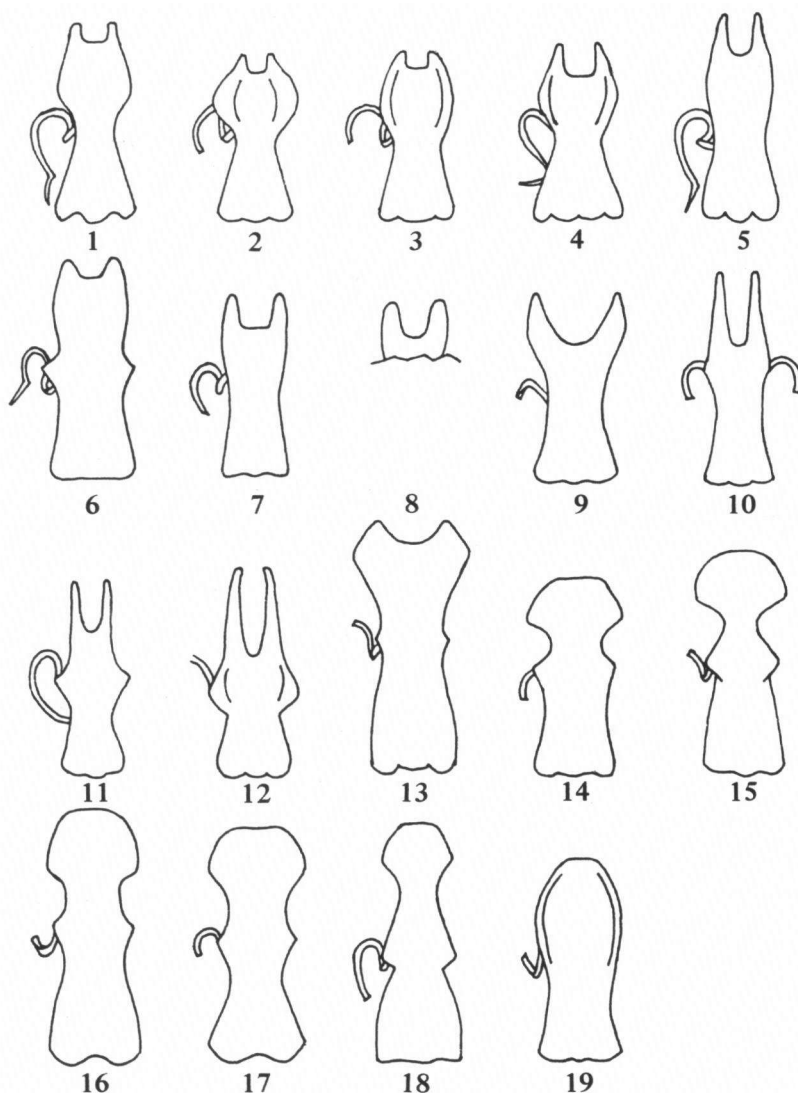
Figures 2, 21; Table II

Cora notoxantha RIS, 1918: 20 (Panama: Lino, 800 m; 1 ♂, 1 ♀, fig. 7, wings); — MONTGOMERY, 1967: 134, 146 (key, type); — PAULSON, 1982: 250 (Costa Rica, Panama).

Type data — We were unable to study types 124, 125 in SMF.

Material examined — COSTA RICA, *Puntarenas*, Rincon de Osa, DP, XI-1966, 1 ♂, FSCA, 1 ♂, DP, 1 ♂, RG, III-1967, 1 ♂, DP; Golfito, OF, VII-1967, 1 ♂, CC, 3 ♂, USNM; — *San Jose*, Ciudad Colon, CE, IV-1988, 1 ♂, VII-1988, 1 ♂, 1 ♀, II-1989, 3 ♂, 4 ♀, CE.

To determine specimens as *notoxantha* in either RIS (1918) or MONTGOMERY (1967) one must consider the pterothorax as orange. However, in our



Figs 1-19. Terminal segment of penis, ventral view. **MODESTA GROUP:** (1) *Cora semiopaca*; — (2) *C. notoxantha*; — (3) *C. obscura*; — (4) *C. c. chirripa*; — (5) *C. skinneri*; — (6) *C. dualis*, lectotype; — (7) *C. modesta* (*C. bogotensis*, syn.); — (8) *C. lugubris*, holotype, damaged; — (9) *C. munda*; — (10) *C. terminalis*; — (11) *C. confusa*; — (12) *C. klenei*. — **INCA GROUP:** (13) *C. inca*. — **CYANE GROUP:** (14) *C. jocosa*; — (15) *C. cyane*; — (16-17) *C. marina*, Mexico, same locality, same date; — (18) *C. xanthostoma*; — (19) *C. irene*.

specimens, the mesepisternum was yellow-orange (10) or blue or blue-gray (3), and the mesepimeron was blue or blue-gray (8) or yellow-orange (5). The anterior head spots also varied: very large orange ones, greatly expanded anteriorly to almost cover the frons and almost surround a black area (8); large blue (1); large farinose white (2); small yellow (1).

CORA OBSCURA RIS

Figures 3, 22; Table II

Cora obscura RIS, 1918: 21 (Panama: 3 ♂); — MONTGOMERY, 1967: 134, 146 (key, type); — PAULSON, 1982: 250 (Costa Rica, Panama).

Type data — We were unable to study the lectotype ♂ No. 126 in SMF.

Material examined — COSTA RICA, *Puntarenas*, Rincon de Osa, DP, XI-1966, 2 ♂, FSCA, 2 ♂, DP, 1 ♂, RG, III-1967, 1 ♂, DP, III-1969, 1 ♂, DP; Golfito, OF, VII-1967, 2 ♂, USNM; *San Jose*, Ciudad Colon, CE, IX-1988, 2 ♂, XII-1988, 2 ♂, CE.

RIS (1918) considered *obscura* similar to *semiopaca*, a similarity which holds for color of mesepisternum and mesepimeron. However, most specimens of *obscura* were quite different from *semiopaca* in the absence of distinct dark wing bands. Only one male *obscura* had an indistinct brown area distad of the nodus.

CORA CHIRRIPA CHIRRIPA CALVERT

Figures 4, 23; Table III

Cora chirripa CALVERT, 1901-08: 348 (Costa Rica: Carrillo; 2 ♂); 1911: 52 (Costa Rica: Juan Vinas; descr. larva); — RIS, 1918: 19 (Costa Rica: Infernillo, 1000-1500 m; descr. ♂, ♀); — MONTGOMERY, 1967: 134, 143 (key, type); — KIMMINS, 1970: 199 (type); — PAULSON, 1982: 250 (Costa Rica).

Cora cirripa [sic]: KENNEDY, 1919 (Carillo [sic]; figs 35, 36, penis); 1920 (Carillo [sic]; figs 20, 21, penis).

Type data — The lectotype ♂ in BMNH was studied.

Additional material examined — COSTA RICA, *Alajuela*, La Marina, 549 m, DP, X-1966, 1 ♂, FSCA, 1 ♂, 1 ♀, DP; Varablanca, 853 m, MW, VI-1967, 5 ♂, 1 ♀, FSCA; OF, VI-1967, 1 ♂, CC, 8 ♂, 1 ♀, USNM; RG, VIII-1979, 7 ♂, 2 ♀, RG, 1 ♂, SD: — *Cartago*, Honda, P. Calvert, VIII-1909, 1 ♂, FSCA, 1 ♂, ANSP; Juan Vinas, 762-1051 m, P. Calvert, VI-1909, 2 ♂, 1 ♀, FSCA, 4 ♂, ANSP, VII-1909, 1 pr., FSCA, — 2 ♂, ANSP, VIII-1909, 1 ♂, 1 ♀, FSCA, 1 ♂, ANSP, III-1910, 1 ♂, ANSP, IV-1910, 2 ♂, ANSP, V-1910, 1 ♂, FSCA.

Although all specimens were from the small country of Costa Rica, considerable variation was recorded. The anal vein (Cu_2 of KENNEDY, 1940; MONTGOMERY, 1967) of each wing of the lectotype was trifurcate but, among 40 hind wings of other specimens, 10 were bifurcate, a matter discussed further under "Status of the genus *Josocora*". Among 19 specimens, the black along the dorsal carina showed: a mid-length bulge (9) as in the lectotype (Fig. 23), an anterior notch (5), and a wide straight stripe (5). The mesepimera of 2 males were darker than all others: posterior half black, anterior half pale (1), entire mesepi-

meron brown (1). These males could be distinguished from *skinneri* by the absence of paired black spots on the pterothoracic sternum.

CORA CHIRRIPA DONNELLYI SSP. NOV.

Table III

Material examined — **Holotype** ♂ and **allotype** ♀: COSTA RICA, *Puntarenas* Province, Monteverde Biological Reserve, Rio Guacimal, 1600 m, T. Donnelly leg., 7-VI-1986, both deposited in FSCA. — **Paratypes**: 5 ♂, same data as holotype, Donnelly Collection; 11 ♂, same location as holotype, V. Hellebuyck leg., 30/31-VII-1985, Hellebuyck Collection.

This subspecies is named for the collector of the holotype, allotype, and many paratypes, Dr T.W. Donnelly.

Like *C. c. chirripa* in color pattern of pterothorax (Fig. 23) and in terminal penis segment (Fig. 4) but readily set apart by the dark wing tips and the slightly larger wing size. All specimens with h.w. anal veins trifurcate.

HOLOTYPE ♂ — Total length 48 mm (including appendages), abdominal length 38, h.w. 32. Other measurements in Table III.

Head — Dorsally black with a small yellow spot just mesad of each antenna; postclypeus black; labrum medially black with 2 large lateral yellow spots.

Pterothorax — Similar to Figure 23 but the wide black band along the dorsal carina does not bulge, and there is a full-length narrow black stripe on metepisternum; pale areas of mesepisternum, mesepimeron, metepisternum blue, of metepimeron mostly yellow.

Wings — Table III gives major venational features. Each wing with a dark brown spot beginning at proximal end of pterostigma and extending to wing apex.

Abdomen — All segments dorsally black; low dorsal keel on 10; superior appendages 1.4 mm.

ALLOTYPE ♀ — Total length 43 mm, abdomen 33.

Head — Labrum and postclypeus entirely black; yellow spot mesad of each antenna slightly larger than in the male.

Pterothorax — Color pattern as in the male but pale colors are red-brown, slightly paler on metepisternum and metepimeron.

Wings — F.w. length 35 mm, base to nodus 15, nodus to stigma 15, pterostigma 2.6, antenodals 38, postnodals, 35; h.w. length 32, 1 (left wing), 2 (right) sectors between CuP and A; apical dark of all wings scarcely discernible.

Abdomen — Dorsally entirely dark.

PARATYPE MALES (16) — Average measurements are given in Table III. Ranges are: f.w. length 31-35 mm, base to nodus 14-16, nodus to pterostigma 14-16, pterostigma 2.2-2.5, antenodals 32-40, postnodals 25-39; h.w. sectors between CuP and A, 0-3. Labrum 0.2 to all black, postclypeus 0.8 to all black. Penis horns of 2 specimens each 0.15 mm as in *C. chirripa* (Fig. 4). The mesepisternum and mesepimeron of one male was much darker than all others of the type series.

C. c. donnellyi is known only from high elevations (1600 m) in the cloud forest at the crest and on the Pacific slope of the mountains of northwestern Costa Rica. This habitat differs greatly from that of the lowland Caribbean drainage where *C. c. chirripa* was collected.

Table III
Comparison of males of *C. c. chirripa* and *C. c. donnellyi* of the *modesta* group

	<i>c. chirripa</i>	<i>c. donnellyi</i> holotype	<i>c. donnellyi</i> paratypes
Number studied	20		16
Labrum, % specimens more than half dark	0	0.6 dark	37
Postclypeus, % specimens more than half dark	55	all dark	100
Abdominal segment 2, % specimens more than half dark	100	all dark	100
Abdominal segment 8, % specimens more than half dark	100	all dark	100
F.W. length	28.1	34.0	32.0
F.W. base-nodus	12.7	16.0	14.5
F.W. nodus-pterostigma	13.1	16.0	14.8
F.W. pterostigma along posterior border	2.1	2.5	2.4
F.W. antenodals	29.1	40	35.6
F.W. postnodals	25.4	35	32.8
H.W. petiole length	2.6	2.8	2.8
H.W. sectors between CuP and A — mode	0	2	1
Penis horns	0.15	—	0.15

CORA SKINNERI CALVERT

Figures 5, 24; Table II

Cora skinneri CALVERT, 1901-08: 349 (Costa Rica: Tablazo, 1300-1600 m; ♂ descr., ♀ unknown); — MONTGOMERY, 1967: 135, 147 (key, type); — KIMMINS, 1970: 200 (type); — PAULSON, 1982: 250 (Costa Rica).

Type data — The holotype ♂ in BMNH, with the removed penis attached to the labelling of the pinned specimen, was studied.

Additional material examined — COSTA RICA, *Cartago*, Tapanti, V. Hellebuyck, VII-1985, 1 ♂, VH; OF, VI-1988, 5 ♂, 1 ♀, USNM; — *San Jose*, San Jose, RG, VIII-1979, 2 ♂, 1 ♀, RG.

The width of the pale mesepisternal-mesepimeral stripe varied from 0.6 to 1.1 mm and in half the specimens was gray, in half orange. Paired black spots on the pterothoracic sternum distinguish *skinneri* from the occasional specimen

of *chirripa* with a dark mesepimeron. Seven males had 2 small pale anterior head spots which were absent in one other. In the female, the mesepisternal-mesepimeral stripe was wide and dark orange-brown; 2 anterior pale head spots were present.

CORA DUALIS McLACHLAN

Figures 6, 25; Table II

Cora dualis McLACHLAN, 1878: 90 (Ecuador: Intag; 3 ♂ 2 ♀); — SELYS, 1879: 59 (Intag; addit. descr. ♂, ♀); — KIRBY, 1890: 118 (Ecuador); — CAMPOS, 1922: 15 (Ecuador); — MONTGOMERY, 1967: 134, 144 (key, type); — KIMMINS, 1970: 199 (type); — PAULSON, 1983 (Ecuador).

Type data — The lectotype ♂ in BMNH, with the removed penis glued to labelling of the pinned specimen, was studied.

No additional material.

This species, apparently known only from the type series, has the longest wings (f.w. 41 mm) of the genus and the highest postnodal count (43). The small (3.2x1.6 mm), milky white spot, near the anterior margin of each wing just beyond the nodus, unique for the genus, suggests the more frequent and extensive white wing markings of *Euthore* and *Polythore*.

CORA MODESTA SELYS

Figures 7, 26; Table II

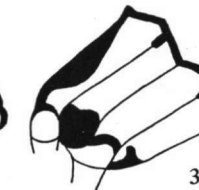
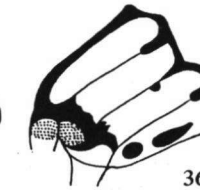
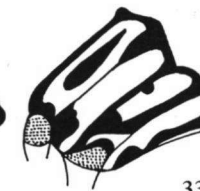
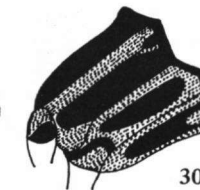
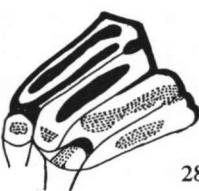
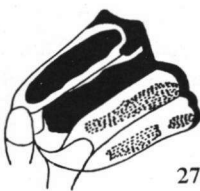
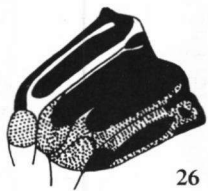
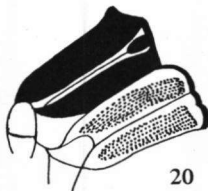
Cora modesta SELYS, 1869: 36 (Colombia: Bogota; ♀ descr., ♂ unknown); 1873: 40 (Bogota; ♂ descr.); 1879: 63 (♂ wing tip a little "sali"); — HAGEN, 1875: 32 (Bogota); — KIRBY, 1890: 118 (Bogota); — RIS, 1918: 22 (Colombia: Rio Aguacatal, Villa Elvira, V. Carolina, 1600-2000 m; ♂, ♀ descr., fig. 9, wings); — CAMPOS, 1922: 16 (Ecuador only); — MONTGOMERY, 1967: 134, 145 (key, type); — PAULSON, 1983 (Colombia, Peru).

Cora terminalis: FRASER, 1946: 24, nec McLACHLAN, 1878 (see our discussion of *terminalis*).

"*Cora terminalis* Mac Lachlan Rasse *bogotensis* [sic] n. subsp." FOERSTER, 1914: 60 (Kolombia, Sta. Margarita, 2300 m; 1 ♂); — RIS, 1918: 22 (Foerster's *bogotensis* is from the same region and is likely the same species as Ris' *modesta* series); — MONTGOMERY, 1967: 142 (type).

Cora bogotensis: MONTGOMERY, 1967: 135 (key); — PAULSON, 1983 (Colombia); — DAVIES & TOBIN, 1984: 26 (Colombia).

Figs 20-37. Left lateral view of male pterothorax. *MODESTA* GROUP: (20) *Cora semiopaca*; — (21) *C. notoxantha*; — (22) *C. obscura*; — (23) *C. c. chirripa*, lectotype; — (24) *C. skinneri*, holotype; (25) *C. dualis*, lectotype; — (26) *C. modesta* (holotype of *C. bogotensis*, syn.); — (27) *C. lugubris*, holotype; — (28) *C. munda*; — (29) *C. terminalis*, lectotype; — (30) *C. confusa*, holotype; — (31) *C. klenei*. — *INCA* GROUP: (32) *C. inca* (holotype of *C. brasiliensis*, syn.). — *CYANE* GROUP: (33) *C. jocosa*; — (34) *C. cyane*; — (35) *C. marina*; — (36) *C. xanthostoma*; — (37) *C. irene*.



Type data — Type ♀ of *modesta* is probably lost; of 4 ♂ labelled *modesta* in IRSN, 3 are *cyane*, 1 is probably *inca* (MONTGOMERY, 1967). We examined the holotype ♂ of *bogotensis* in UMAA.

Additional material — COLOMBIA, *Valle*, Buena Ventura, Mattowell, VIII-1979, 1 ♂, FSCA.

MONTGOMERY (1967) concluded that the type of *modesta* is lost, that specimens so labelled in IRSN are mis-identified, and that the RIS (1918) description and specimens in SMF most likely apply to the true *modesta* of Selys. Because these specimens were unavailable, we had to depend on Montgomery's unpublished drawings, photographs, and notes which were available in the archives of IORI. All of these agree with SELYS' (1869, 1873, 1879) descriptions of *modesta*.

In his brief description, FOERSTER, (1914) associated *bogotensis* with *terminalis* probably only because of the small dark apical wing spot on both. The new subspecies was set apart as smaller and daintier. But RIS (1918) considered the Foerster male *bogotensis* probably the same species as his (Ris') *modesta*. We agree with Ris. *C. terminalis* differed markedly from *modesta* and its synonym *bogotensis* Table II: in overall size (f.w. 35.5 mm vs 28.5), length of penis horns (0.30 mm vs 0.15), and in pterothoracic color pattern, Figures 26, 29: 2 slender black stripes on the mesepisternum (*terminalis*), a large solid black area (*modesta*-*bogotensis*).

We found that the ♂ *bogotensis* holotype and one other ♂ closely resembled Montgomery's drawings of the Ris *modesta* series in SMF. The most striking similarities were the narrow pale stripe bordering both the dorsal carina and the humeral suture and the small dark apical spot on each wing.

CORA LUGUBRIS NAVAS

Figures 8, 27; Table II

Cora lugubris NAVAS, 1934: 135 (Colombia: Pensilvania; 1 ♂); — MONTGOMERY, 1967: 135, 145 (key, type); — PAULSON, 1983 (Colombia).

The original description, in Latin, is very brief and inconclusive. Montgomery did not see the type and considered it unstudied subsequent to description. Navas stated, "Patria, Colombia: Pensilvania, 1913." Pensilvania is in Caldas Dept., Colombia, 5°33'N, 75°0'W. There is a specimen in FSCA with the following 4 labels:

- (1) *Cora lugubris* ♂ Nav./ det. Navas S.J.
- (2) Pensilvania/ Colombia/ 1913
- (3) *Cora lugubris* Navo
- (4) TYPE (red)

This badly damaged and only known specimen, almost certainly the **holotype**, merits supplementary descriptive notes.

Head — dorsally black with 4 large pale spots; labrum and postclypeus pale.

Pterothorax (Fig. 27) — mesepisternum with a large black area completely

surrounded by narrow pale bands parallel to dorsal carina and humeral suture; mesepimeron almost entirely black; metepisternum and metepimeron pale, each with an ill-defined brown patch.

Wings — entirely hyaline, f.w. length 25 mm, antenodals 27, postnodals 23, pterostigma 2.1 along posterior margin; no sector between CuP and A in h.w.

Abdomen — dorsally entirely black; spine on 10 very low; superior appendage 1.2 mm; penis damaged (Fig. 8), the horns 0.15 mm.

CORA MUNDA McLACHLAN

Figures 9, 28; Table II

Cora munda McLACHLAN, 1878: 91 (Ecuador: Intag; 3 ♀); — SELYS, 1879: 60 (Intag; addit. descr. ♀, ♂ unknown); — KIRBY, 1890: 118 (Ecuador); — CAMPOS, 1922: 15 (Ecuador); — MONTGOMERY, 1967: 134, 146 (key, type); — KIMMINS, 1970: 199 (type); — PAULSON, 1983 (Ecuador).

Type data — Montgomery recorded: "Type: ♀, Intag, Ecuador.... In Br. Mus." Kimmins mistakenly quoted him as recording "Type: ♂". We studied the lectotype ♀ in BMNH.

Additional material examined — ECUADOR, *El Oro*, Pinas, 1000-1500 m, D.B. Laddey, VII-1941, 1 ♂, FSCA.

There seems to be no description of the male of this species. The male which we studied resembled closely the lectotype female and the McLachlan and Selys description in non-sexual features. The following are descriptive notes of the first male.

Head — dorsally black with 4 large pale head spots; labrum, postclypeus, genae pale.

Pterothorax (Fig. 28) — Mesepisternum with dorsal carina narrowly and uniformly black, 2 black (brown in ♀ type) stripes between it and the humeral suture, the one nearer the humeral joins the black of the carina anteriorly, the other wider one is completely surrounded by pale; humeral suture with only a small dark spot at the sulcus; large black oval mesepimeral patch; metepisternum with a brown, slightly sinuate stripe from spiracle to alar ridge; a shorter brown metepimeral patch.

Wings (Tab. II) — F.w. 27 mm, antenodals 24 (the fewest in the genus), postnodals 30, pterostigma dark brown, short, 2.2 mm.

Abdomen — All segments dorsally entirely black; low dorsal spine on 10; superior appendage 1.5 mm, without distinctive features; penis horns 0.20 mm long (Tab. II), separated basally by a broad U (Fig. 9).

C. munda, similar to *terminalis* in color pattern of pterothorax, is much smaller, including much shorter penis horns, and lacks wing markings.

CORA TERMINALIS McLACHLAN

Figures 10, 29; Table II

Cora terminalis McLACHLAN, 1878: 92 (Bolivia: Unduvai; 1 ♂, 1 ♀); — SELYS, 1879: 61 (Unduvai; addit. descr.); — KIRBY, 1890: 118 (Bolivia); — KENNEDY, 1919 (Peru: Porziwizo [sic] = Pozuzo; figs 31, 32, penis); — CAMPOS, 1922: 16 (Ecuador); — SCHMIDT, 1952: 223 (Peru: Oxapampa; Col.?, Ecuador?; figs thorax, wings); — RACENIS, 1959: 486 (Peru); — KIMMINS, 1970: 200 (type).

Euthore modesta: FRASER, 1946: 24, nec Selys (Pozuzo; 4 ♂, 1 ♀, discussion of proximal primary antenodal).

Euthore terminalis: MONTGOMERY, 1967: 126, 136, 146, 148 (key, type); — PAULSON, 1983 (Bolivia, Colombia, Peru); — DAVIES & TOBIN, 1984: 25 (Bolivia).

Type data — The lectotype ♂ in BMNH, with the removed penis glued to the labelling of the pinned specimen, was studied.

Additional material — BOLIVIA, *LaPaz*, Coroico, 1200 m, collector? XII-1955, 1 ♂, CC. — PERU, *Huanuco*, Pozuzo, 1800 m, K. Morton, date?, 1 ♂, FSCA, 3 ♂, ANSP, 1 ♂, BMNH. — Without data, 2 ♂, FSCA.

FRASER (1946), judging by the presence of a proximal primary antenodal without considering other of the SELYS (1853, 1869) generic characters, placed *terminalis* in *Euthore*. MONTGOMERY (1967) also assigned *terminalis* to *Euthore* but stated that the basal thickened antenodal is not always present and offered other criteria for separating *Cora* and *Euthore*. In the holotype of *terminalis* we detected with difficulty a very slightly thickened basal antenodal in 3 of the wings. In other *terminalis* specimens, a well-defined, thickened, basal antenodal was absent in 7 of 19 wings. It does not seem logical to assign *terminalis* to *Euthore* solely on the presence of a basal primary antenodal which often is very difficult to detect. This contrasts with other species of *Euthore* (e.g. *fasciata* Hagen, *fastigiata* Selys) where the basal primary antenodal is evident.

As a generalisation, *Euthore* has hind wings: (1) broader, relative to length, than *Cora*, — (2) with a shorter petiole, — (3) with more numerous sectors and marginal cells between CuP and A, — (4) with anterior branch of A more strongly uparched. On all of these criteria we assign *terminalis* to *Cora*.

MONTGOMERY (1967) considered FRASER's (1946) synonymy (*Cora terminalis* McL. syn. of *Euthore modesta* Selys) very doubtful. Fraser's opinion was based on examination of 4 ♂, 1 ♀ from Pozuzo, Peru, sent to him by K. Morton. Very likely, males from Pozuzo which we studied are part of the Fraser series: the one in FSCA is labelled K.J. Morton, the one in BMNH is in a box labelled *modesta* and bears a pinned label "F.C. Fraser bequest." Both of these are *Cora* by the above characteristics and both match the pterothoracic markings of the lectotype of *terminalis* which is not at all like that described by Selys for *modesta*. We agree with Montgomery in rejecting the FRASER (1946) synonymy.

A combination of large size (f.w. 35 mm), very long penis horns (0.30 mm), and 2 black mesepisternal stripes distinguish *terminalis* from other *Cora* species. In

the lectotype ♂ and 1 other ♂, these stripes were completely separate, but in 3 other males were posteriorly connected.

CORA CONFUSA KENNEDY

Figures 11, 30; Table II

Cora confusa KENNEDY, 1940: 430 (Ecuador: Abitagua, 1100 m; 3 ♂, 1 ♀, figs head, penis, thorax, wings); — MONTGOMERY, 1967: 134, 143 (key, type); — PAULSON, 1983 (Ecuador).

Type data — Holotype ♂ and allotype ♀ in UMAA were studied.

Additional material — ECUADOR, *Pastaza*, Abitagua, WM, XII-1948, 1 ♂, FSCA.

The hind wing petioles of the holotype (1.3 mm) and the other male (1.5 mm) short compared with other species of *Cora*, corresponded with measurements for *Euthore fasciata* Calvert (1.6), *inlactea* Calvert (1.3), *meridana* Selys (1.5). However, the absence of basal thickened antenodals in all *confusa* wings and the length/width wing ratio showed that this species is not a *Euthore*.

CALVERT (1917) established the genus *Miocora* to separate his *peraltica* with an unbranched anal vein from other Polythorids having bifurcate or trifurcate anals. KENNEDY (1940) redefined *Miocora* and was concerned about the generic placement of his *Cora confusa* because in the type ♂ the fore wings were trifurcate as in other species of *Cora*, but the left hind wing was bifurcate, the right hind unbranched. He also recorded variation in anal vein branching of the paratype males and the allotype female. We observed such variation in one additional male (3, 3/2, 2) and in 6 females, not collected with males (1, 1/1, 1; 2, 2/2, 2; ?, 1/?, 1; 1, 1/1, 1; 3, 3/2, 2; ?, 1/1, 1). Regardless of the unbranched anals, *confusa* is not a *Miocora* because the *confusa* penis horns are at least twice as long as those of *Miocora*. Also, in *confusa*, the anterior and ventral margins of the ventral branch of the superior appendage meet at almost a right angle (KENNEDY, 1940), a feature shared with *klenei* but not with any *Miocora*. Furthermore, because *confusa* characters were within the variability range for species in the *modesta* group (Tabs II, III), we judge that *confusa* should remain in *Cora*.

CORA KLENEI KARSCH

Figures 12, 31; Table II

Cora klenei KARSCH, 1891: 113 (Ecuador; ♂).

Josocora klenei: KENNEDY, 1940: 410 (Ecuador; transl. of Karsch); — MONTGOMERY, 1967: 136, 148 (key, type); — PAULSON, 1983 (Ecuador); — DAVIES & TOBIN, 1984: 25 (Ecuador).

For generic placement, see below under "Status of the genus *Josocora*".

Type data — Along with Montgomery, we could not find the type which is presumably lost.

Material examined — COLOMBIA, *Valle*, Carretera al Mar, G. Wolffhugel, V-VI-1969, 1 ♂, FSCA, 1 ♂, 1 ♀, DP.

The following supplements the brief original description of the male.

Head — Labrum, postclypeus, genae, frons mostly orange; postclypeus with black at anterior border and a black medial basal spot. Orange anterior head spots are greatly expanded anteriorly to almost cover the frons and to almost surround a medial bilobed black area.

Pterothorax (Fig. 31) — Black areas include: most of mesepisternum and full-length stripes on metepisternum and metepimeron. Blue-gray areas are: anterior ventral part of mesepisternum, posterior 3/4 of mesepimeron, dorsal portions of metepisternum and metepimeron.

Wings (Tab. II) — F.w. 26.5 mm, pterostigma short (1.8 mm), nodus midway between base and pterostigma; anal vein bifurcate in both hind wings.

Abdomen — Mostly black; inferior branch of superior appendage distinctive, suggesting a hatchet, the cutting edge being the ventral margin. Penis horns longest (0.35 mm) of the genus (Tab. II, Fig. 12).

Our poorly preserved female is much more drab than the associated male. The head is black except for two small blue-gray median spots on the frons and a narrow brown line between antennal bases. The pterothorax is black except for a brown stripe adjacent to the carina and a shorter one immediately laterad. Wings: f.w. 28 mm, pterostigma 2.0 mm, antenodals 29, postnodals 26; h.w. anal vein bifurcate in both.

CORA INCA SELYS

Figures 13, 32; Table IV

Cora inca SELYS, 1873: 39 (Ecuador: Quito; 1 ♂, 1 ♀); — HAGEN, 1875: 31 (Quito; "probably *C. brasiliensis*"); — McLACHLAN, 1878: 93 (♀ disagrees with ♂ descr.); — KIRBY, 1890: 118 (Quito); — RIS, 1918: 17 (Colombia: Canon del Tolima, 1700 m; 2 ♂, addit descr., fig. 4, wings); — CAMPOS, 1922: 16 (Quito); — MONTGOMERY, 1967: 134, 144 (key, type); — PAULSON, 1983 (Colombia?, Ecuador).

Cora brasiliensis MONTGOMERY, 1967: 153 (Brazil only; 1 ♂, 1 ♀, earlier references = *nomen nudum*); — Hagen in SELYS, 1869: 34 (Brazil; similar to *marina*); — SELYS, 1873: 38, 53 (Brazil; position of nodus); — HAGEN, 1875: 31 (Brazil); — McLACHLAN, 1881: 31 (no previous descr.); — PAULSON, 1983 (Brazil); — DAVIES & TOBIN, 1984: 26 (Brazil).

Cora braciensis [sic] KENNEDY, 1919: figs 37, 38 (penis).

Type data — MONTGOMERY (1967) stated that the ♂ type of *inca* is in IRSN, the ♀ in BMNH, but KIMMINS (1970) recorded no *inca* type in BMNH. Neither ♂ nor ♀ *inca* types were examined, however we did study the ♂ (headless) and ♀ types of *brasiliensis* in MCZ.

Additional material examined — COLOMBIA, *Loreto*, Leticia, C. Farrell, date?, 1 ♂, RG. — ECUADOR, *Pastaza*, WM, X-1937, 1 ♂, FSCA; — *Pichincha*, Tandapi collector?, VI-1970, 1 ♂, CC.

An undescribed *Cora* from an unspecified locality in Brazil often has been recorded as *brasiliensis*. KENNEDY (1919) drew the penis, without further description, of a specimen in MCZ labelled "Thorey, 1865" and labelled his drawing *Cora brasiliensis* [sic]. MONTGOMERY (1967) considered *brasiliensis* a *nomen nudum*, gave a description, and designated as types a ♂ and a ♀ in MCZ with the number 12119. Each of these bears labels "Thorey, 1865, #12119," and the male has the label "penis drawn". Our examination of the distinctive penis of the *brasiliensis* type showed that it was identical with the KENNEDY (1919) drawing.

Montgomery (unpublished) drew the pterothorax of the *inca* type ♂ in IRSN and recorded a close similarity with the *brasiliensis* type in MCZ. We could not distinguish the pterothorax of the *brasiliensis* type ♂ from Montgomery's drawing of the *inca* type. Although a feature of both types is the large oval dark area between dorsal carina and humeral suture, Montgomery did not show it in his unpublished drawing of *brasiliensis*. We surmise that he omitted the mark while drawing the type, intending to add it later. When preparing his 1967 description, he must have relied on his drawing, which unfortunately lacked the mark. Nowhere in MONTGOMERY (1967) is it mentioned or illustrated for *brasiliensis*, and one must judge it to be absent to reach that species in his key.

We compared 3 *inca* males with the *brasiliensis* type. The apically concave penes were indistinguishable (Fig. 13). The 2 forms were alike in 10 characteristics and overlapped within the range of variability in 2 others. They did differ in size of the mesepisternal mark between dorsal carina and humeral suture (mean of 3 *inca* ♂ = 3.1x0.5 mm; type *brasiliensis* = 2.2x0.4). But because the size of this mark varied greatly among specimens of a certainly single species, *jocosa*, size difference in this mark does not justify species separation. We consider *brasiliensis* a synonym of *inca*.

The apically concave penis lacking distinct horns (Fig. 13) separates *inca* from all other *Cora* species.

STATUS OF THE GENUS *JOSOCORA* KENNEDY

KENNEDY (1940) removed *jocosa* and *klenei* from *Cora* assigning both to the new genus, *Josocora*. His primary criterion for the new genus was anal vein (Cu2) bifurcate, not trifurcate, as in *Cora*. This branching is actually quite variable. The anal vein was bifurcate in 10 of 40 hind wings of *c. chirripa* and in 8 of 26 of *cyane*, both series having been compared with the types. Also, 2 specimens of *chirripa* and 3 of *cyane* showed bi-trifurcate asymmetry in left-right hind wings. Although the anal vein was bifurcate in both hind wings of the *klenei* males available and in the holotype of *jocosa*, it was bifurcate in only 2 of 36 hind wings of our series of *jocosa*, strong evidence that the principal criterion for establishment of the genus *Josocora* does not hold for a large sample. Because *Josocora* was based on an anomalous and variable character and because both *jocosa* and *klenei* are within the range of variability of *Cora* for other characters (Tabs II-V), we return these species to *Cora*.

Table IV
Comparison of *Cora* males in the *inca* and *cyane* groups — [See Tab. V for *marina* in the *cyane* group; — all numbers except those in the last horizontal row are averages]

	<i>inca</i> group		<i>cyane</i> group		
	<i>inca</i>	<i>jocosa</i>	<i>cyane</i>	<i>xantho-</i> <i>stoma</i>	<i>irene</i>
Number studied	4	20	14	3	6
Labrum, % specimens more than half dark	0	0	0	0	0
Postclypeus, % specimens more than half dark	0	0	0	0	17
Abdominal segment 2, % specimens more than half dark	0	0	0	0	0
Abdominal segment 8, % specimens more than half dark	100	35	0	0	100
F.W. length	31.2	28.6	26.0	33.0	30.5
F.W. base-nodus	14.6	14.5	12.6	15.3	14.2
F.W. nodus-pterostigma	13.0	10.7	10.6	13.3	12.8
F.W. pterostigma along posterior border	3.2	3.1	2.8	3.2	3.0
F.W. antenodals	36.0	29.4	27.9	37.7	35.0
F.W. postnodals	30.2	19.5	21.6	28.7	26.5
Hind wing petiole length	3.9	4.0	3.8	4.3	4.1
H.W. sectors between CuP and A — mode	1	0	1	1	0

CORA JOCOSA McLACHLAN

Figures 14, 33; Table IV

Cora jocosa McLACHLAN, 1881: 30 (Ecuador: Intag; 1 ♂, ♀ unknown); — KIRBY, 1890: 118 (Ecuador); — CAMPOS, 1922: 15 (Ecuador).

Josocora jocosa: KENNEDY, 1940: 408 (new genus, *jocosa* genotype); — MONTGOMERY, 1967: 136, 148 (key, type); — KIMMINS, 1970: 199 (type); — PAULSON, 1983 (Ecuador); — DAVIES & TOBIN, 1984: 25 (Ecuador).

Type data — The holotype ♂ in BMNH, with penis removed and glued to the labelling of the pinned specimen, was studied.

Additional material examined — ECUADOR, *Chimborazo*, Huigra, WM, IV-1941, 1 ♂, FSCA; — *Napo*, Lago Agrio, SD, VIII-1980, 1 ♂, 1 ♀, SD, 1 ♂, RG, 1 ♂, DP; K. Knopf, 4 ♂, K. Knopf; — *Pastaza*, Puyo, 1000 m, WM, III-1950, 1 ♂, 1 ♀, UMAA; — Province?, Panbay, WM, III-1950, 1 ♂, UMAA; — *Tungurahua*, Rio Negro, 1200 m, R. Lafebre, VI-1977, 1 ♂, CC. — PERU, *Huanuco*, Shapajilla, 630 m, F. Woytkowski, V-1939, 13 ♂, UMAA; — *Junin*, Satipo, P. Paprzycki, VI-1940, 1 ♂, VI-1941, 1 ♂, III-1945, 1 ♂, IV-1945, 5 ♂, 3 ♀, UMAA.

The black mesepisternal patch between dorsal carina and humeral suture (Fig. 33) varied from 2.9x0.4 mm to 1.3x0.2, average 2.2x0.3 (N = 18) and in 2 specimens was indicated by only a dark smudge. The 1st and 2nd lateral dark thoracic stripes were most often (14 of 20) confluent above the legs as McLachlan

stated. The apically blunt penis (Fig. 14) and the long pterostigma (Tab. IV) substantiate placement in the *cyane* group.

Five females were collected with males. Instead of the bright blue background color of male thorax and abdomen, the female thorax was dull gray, its abdomen mid dorsally black. The black stripes on 1st and 2nd lateral sutures converged above the legs in only 2 of 5 females.

CORA CYANE SELYS

Figures 15, 34; Table IV

Cora cyane SELYS, 1853: 71 (Venezuela; 2 ♂, ♀ unknown); 1854: 263 (Venezuela: Puerto Cabello; addit. descr., pl. 7, wing); 1869: 35 (Venezuela, ♀ unknown, anal incompletely trifurcate); — HAGEN, 1861: 307, 1875: 31 (Venezuela: Puerto Cabello); — KIRBY, 1890: 118 (Venezuela); — CAMPOS, 1922: 16 (Ecuador?); — RACENIS, 1953: 28 (Venezuela: Avila, Guarico, Guatopo, Maracay, as *marina*, see DE MARMELS, 1988a: 92; Puerto Cabello); — MONTGOMERY, 1967: 134, 144 (key, type); — KIMMINS, 1970: 199 (type); — DE MARMELS, 1982: 107 (Venezuela: H. Pittier Nac. Parque, 200-1600 m; descr. larva); — PAULSON, 1983 (Venezuela).

Cora incana SELYS, 1869: 35 (Venezuela; ♂ descr., ♀ unknown; perhaps a race of *cyane*); — KENNEDY, 1919 (Venezuela; figs 41, 42, penis); — MONTGOMERY, 1967: 144 (syn., type); — DAVIES & TOBIN, 1984: 26 (syn.).

Type data — The lectotype ♂ in BMNH was examined.

Additional material examined — VENEZUELA, *Aragua*, Cumbre de Choroni, 900-1000 m, DP, VIII-1978, 1 ♂, DP; TD, VIII-1986, 2 ♂, TD; Guatopa Nac. Parque, J. Salcedo & L. Jaspe, IX-1976, 2 ♂, FSCA; — *Carabobo*, San Esteban, EW, II-1920, 1 ♂, 1 ♀, FSCA; — *Miranda*, Caracas, RG, IX-1980, 2 ♂, RG; Petare, collector?, VI-1945, 1 ♂, 1 ♀, CC; — *Tachira*, LaFria, EW, IV-1920, 1 ♂, FSCA; — *Trujillo*, Cuicas, 1025 m, J. Teran & M. Gelvez, X-1974, 1 ♂, FSCA; — *Yaracuy*, Aroa, EW, III-1920, 2 ♂, FSCA; — State?, Troa Yora, EW, III-1920, 1 ♂, FSCA; — Venezuela, no other data, 3 ♂, MCZ.

Even though the species is known only from Venezuela, considerable variation was noted. The branching of the anal vein in the hind wing (only 70% trifurcate) has been discussed above under "Status of the genus *Josocora*". The black of the dorsal carina may be: narrow and straight; narrow, with a detached adjacent spot; broad, with an anterior bulge; broad and notched anteriorly. The pale dorsal head spots showed almost every possible variation. SELYS (1869) stated that they were absent. This was so for 8 of 14 specimens, but 3 had only the anterior pair, 1 only the posterior, 2 both pairs.

The color pattern of females differed from associated males in that the blue of the male pterothorax and abdomen was dull yellow-brown, and females lacked an expansion of the dark color along the carina.

CORA MARINA SELYS

Figures 16, 17, 35; Table V

Cora marina SELYS, 1868: 69 (Mexico: Orizaba; ♂ descr., ♀ unknown); 1869: 34 (ibid., addit. ♂ descr., ♀ unknown); — KIRBY, 1890: 118 (Orizaba); — CALVERT, 1901-08: 43 (Mexico: Atoyac, Orizaba; Guatemala: Panima, San Geronimo; descr. ♂, ♀, figs 31, 32 appendages); — MUNZ, 1919: 72 (fig. 5, wing); — KENNEDY, 1919 (Guatemala: Panama [sic]; figs 39-40 penis); 1920: 29 (Guatemala: Panima; figs 22, 23 penis); — MONTGOMERY, 1967: 134, 145 (key, type); — PAULSON, 1982: 250 (Mexico, Guatemala, Costa Rica, Panama); 1983 (Colombia, Venezuela?); — GONZALEZ & VERDUGO, 1984a: 95, 1984b: 4 (rep. behavior).

Cora alcyone SELYS, 1873: 39 (Colombia: Bogota; ♂ descr., ♀ unknown, resembles *marina* from Mexico); — HAGEN, 1875: 31 (Bogota); — KIRBY, 1890: 118 (Bogota); — RIS, 1918: 19 (Panama: Bugabita; fig. 6, wings; see DE MARMELS, 1988a); — MONTGOMERY, 1967: 134, 142 (key, type); — KIMMINS, 1970: 199 (type); — PAULSON, 1983 (Colombia, det?, locality?).

Cora marina "or intermediate between it and *C. alcyone*": CALVERT & CALVERT, 1917: 368 (Costa Rica).

Cora marina Selys (race *alcyone* Selys?): CALVERT, 1919: 162 (Panama: Cayuga; 1 ♀).

Cora marina alcyone: DE MARMELS, 1988a: 92 (Venezuela: Tachira; figs 1-3 penes, incl. holotype; Panama and South American populations are subspecies of *marina*).

Type data — We did not examine the type of *marina* Selys in IRSN but did study the lectotype ♂ of *alcyone* Selys in BMNH. Its removed penis is glued to labelling of the pinned specimen.

Additional material examined — BELIZE, *Cayo*, Mt. Pine Ridge, 600 m, TD, VII-1983, 3 ♂, TD. — COLOMBIA, *Antioquia*, Cristalina, EW, II-1917, 4 ♂, 1 ♀, FSCA. — COSTA RICA, *Guanacaste*, Est. Maritza, S. Brooks, VII-1988, 1 ♂, BMNH; CE, V-1989, 5 ♂, CE. — EL SALVADOR, *Ahuachapan*, Hda. San Benito, V. Hellebuyck, VIII-1985, 7 ♂, VH; Bosque Imposible, VH, VI, VII-1986, 3 ♂, VH. — GUATEMALA, *Baja Vera Paz*, Panima, 560 m, Champion, 1879-80, 1 ♂, MCZ, 2 ♂, ANSP; — *Chiquimula*, Padre Miguel, 800 m, TD, VII-1962, 2 ♂, TD, 1 ♂, 1 ♀, FSCA, 1 ♂, USNM; OF, VIII-1965, 11 ♂, USNM; — *El Progreso*, Finca la Cajeta, OF, VIII-1965, 6 ♂, USNM; TD, VIII-1968, 2 ♂, TD; — *Izabal*, Las Escobas, OF, VIII-1965, 6 ♂, VI-1966, 5 ♂, USNM; TD, VIII-1968, 3 ♂, TD; Puerto Matias, F. Thompson, D. Dean, VI-1964, 1 ♂, FSCA, 2 ♂, DP; — *Zacapa*, Juan de Paz, 100 m, TD, VIII-1976, 1 ♂, TD; Locality?, Jones, VIII-1969, 2 ♂, TD. — HONDURAS, *Cortes*, San Pedro Sula, TD, VII-1971, 1 ♂, VIII-1976, 1 ♂, TD; Province?, Comayagua, 762 m, J. Edwards, date?, 2 ♂, 1 ♀, MCZ. — MEXICO, *Chiapas*, Ixhuatan, 518 m, DP, VII-1965, 1 ♂, DP; Ocozocoautla, 610 m, DP, VII-1965, 7 ♂, DP, 4 ♂, FSCA; — *Oaxaca*, Tapanatepec, 853 m, DP, VIII-1965, 4 ♂, VI-1966, 4 ♂, FSCA; — *Veracruz*, Arroya Claro, SD, VIII-1988, 4 ♂, SD; Atoyac, H. Smith, V-1888, 1 ♂, ANSP; Bastonal, SD, VIII-1988, 3 ♂, 2 ♀, SD; MW, VIII-1988, 3 ♂, FSCA; Catemaco, RG, VII-1982, 2 ♂, SD; Jicacal Beach, SD, VIII-1988, 2 ♂, SD; Tuxtla, G. Beatty, VII-1959, 2 ♂, FSCA; TD, IX-1965, 3 ♂, TD; MW, VIII-1988, 1 ♂, FSCA. — PANAMA, *Canal Zone*, Gamboa, E. Morton, VII-1970, 1 ♂, VIII-1970, 1 ♂, TD; Juan Grande, M. May, IV-1974, 1 ♂, M. May; Cabima, A. Busck, V-1911, 1 ♂, FSCA. — VENEZUELA, *Tachira*, LaFria, EW, IV-1920, 40 ♂, 9 ♀, FSCA; Tachira, EW, IV-1920, 64 ♂, 15 ♀, FSCA.

SELYS (1873) used size to differentiate *alcyone* and *marina* specifically, DE MARMELS (1988a), subspecifically. Even in specimens from range limits,

Table V

Comparison of *C. marina* males from Mexico to Venezuela — [All numbers except those in the last horizontal row are averages]

[illegible]

specimens from range limits, Mexico and Venezuela.

A number of other characters were studied. The shape of the spine on abdominal segment 10 and that of the anterior portion of the penis vesicle were not identical in all specimens. First examination of a few from Mexico and from Venezuela suggested differences, but when larger series were studied we could no longer accurately quantify these characters. Also, even though the labrum and postclypeus of all specimens from Venezuela were pale, not all Mexican ones were dark. As a generalization, wings of Venezuelan specimens were paler than Mexican ones. Yet, those from Veracruz state, Mexico, collected on the same date, included both the darkest and palest wings of all specimens, and a few from Tachira, Venezuela, had very dark wings.

Nevertheless, comparison of a large series from Mexico and Venezuela did show differences (Tab. V): apical wing spots present (Mex.), absent (Venez.); abdominal segment 8 pale (Mex.), dark (Venez.); 2 sectors between CuP and A (Mex.), only 1 (Venez.). However, in the extensive intermediate area, including all of Central America (where unfortunately the sample was more limited), the above 3 characters were seldom conclusive. For example, half of the Honduran specimens resembled Mexican ones, half Venezuelan ones in color of abdominal segment 8 and in the presence of an apical wing spot. Similarly, Costa Rican specimens resembled Mexican ones in number of sectors, Venezuelan ones in the dark color of abdominal segment 8 and in the absence of an apical wing spot. Also, half of the specimens from Guatemala had abdominal segment 8 dark as in Venezuelan ones, half pale as in Mexican ones. Although there were differences in peripheral populations (Mexico and Venezuela), these characters could not be used to distinguish populations from intermediate areas in Central America. We conclude that *marina* is a widespread and very variable species and that *alcyone* is a synonym.

CORA XANTHOSTOMA RIS

Figures 18, 36; Table IV

Cora xanthostoma RIS, 1918: 16 (Colombia: Rio Negro, Soso Muco, San Miguel, 800-1200 m; 4 ♂, fig. 3, wings); — MONTGOMERY, 1967: 134, 147 (key, type); — PAULSON, 1983 (Colombia, Venezuela).

Type data — We were unable to study the lectotype ♂ No. 135 in SMF.

Material examined — VENEZUELA, *Aragua*, Cumbre de Chononi, J. Racenis, VIII-1957, 1 ♂, TD; — *Miranda*, Rio Chacieto, P. Anduze, VII-1939, 2 ♂, FSCA.

C. xanthostoma had the longest wings (33.0 mm) and the greatest number of ante- (38) and postnodals (29) in the *cyane* group.

CORA IRENE RIS

Figures 19, 37; Table IV

Cora irene RIS, 1918: 18 (Bolivia: Rio Songo, 800 m; 2 ♂, 2 ♀, fig. 5, wings); — SCHMIDT, 1952: 223 (Bolivia: Aina, 1400 m; addit. descr. ♂, ♀, fig. 8a, b, thorax); — RACENIS, 1959: 486 (Peru); — MONTGOMERY, 1967: 134, 145 (key, type); — PAULSON, 1983 (Bolivia, Peru).

Type data — We were unable to study the lectotype ♂ No. 102 in SMF.

Material examined — BOLIVIA, *La Paz*, Chulumani, 1585 m, T. Emmel, V-1989, 9 ♂, FSCA; Coroico, 1200 m, L. Pena, XII-1955, 1 ♂, 1 ♀, CC. 4 ♂, 2 ♀, UMAA; Estancia Anacu, 1372 m, T. Emmel, V-1989, 1 ♂, FSCA; Puente Villa, 1372 m, T. Emmel, V-1989, 1 ♂, FSCA. — PERU, *Junin*, Satipo, P. Paprzycki, IV-1948, 1 ♂, FSCA.

The distinctive penis differed from others in the *cyane* group by the almost straight lateral margins (Fig. 19). The black stripe of the dorsal carina varied even in specimens taken at the same locality on the same date. As in the lectotype (Montgomery, unpublished), it may bulge in the middle (11 specimens) or it may be a narrow straight stripe (5).

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