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SUMMARY

33 species of Chrysopini are described and illustrated, of which 30 are recorded from the Amazon Basin. Ten new species are described in *Chrysopodes* (*duckeï*, *spinella*, *nebulosa*, *lineafrons*, *polygonica*, *indentata*, *conisetosa*, *breviata*, *mediocris*, and *tetifera*), and nine in *Ceraeochrysa* (*squalidens*, *acutipuppis*, *rafaeli*, *reddyi*, *nigripes*, *tenuicornis*, *ariasi*, *falcifera*, and *michaelmuris*). *Neosuarus* (type species *collaris* (Schneider)), a new subgenus of *Chrysopodes*, also contains *divisa* (Walker), *escomeli* (Navás) *porterina* (Navás), and *flavescens* (Blanchard). *Orlandsia* Navás and *Ancylochrysa* Navás are synonymized with *Chrysopodes*. New generic placements are assigned to *Chrysopodes diffusa* (Navás), *Chrysopodes limbata* (Navás), *Chrysoperla asoralis* (Banks) and *Suarus nesotala* (Banks). A neotype is designated for *Ceraeochrysa cubana* (Hagen). *Ceraeochrysa caligata* (Banks) and *scapularis* (Navás) are valid species. *C. glorie* Alayo is synonymized with *Ceraeochrysa everes* (Banks).

INTRODUCTION

Chrysopidae are medium-sized insects (6.5 – 35 mm wing length), green to pale brown with prominent gold, green, or brassy eyes, and antennal length from half to more than twice the forewing length. While most species have rather uniformly transparent wings with numerous crossveins, those of a few Amazonian members of the genera *Gonzaga* & *Vieira* have extensive dark markings.

The Chrysopidae are among our most numerous neuropterans, and some of our most beneficial. Aspöck *et al.* (1981) indicate that Chrysopidae is the second largest family of Neuroptera, and Tjeder (1966) records 86 genera and 1350 species. The taxonomy of this family is rapidly changing, as many species are being described for the first time, and previously described species are re-examined, enabling generic assignments and recognition of synonymies. In the Neotropical Region, the great majority of the species names

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have been contributed by Banks and Navás, neither of whom utilized genitalic characters. Furthermore, many of their species were based upon single females, or upon type specimens lacking abdomens. Consequently, it will be many years until the mess is straightened out, and an extended period of nomenclatorial instability is inevitable.

Larvae, often known as aphid-lions, [or trash carriers?], feed on a wide variety of phytophagous insects. Because of their voracious appetites and ability for rapid population increase, they are among our most useful biological control agents. An extensive and ever-growing literature exists concerning the cosmopolitan species most utilized in biological control, *Chrysoperla carnea* (Stephens). This species does not naturally occur in South America, and there is little published information available on bionomics of neotropical chrysopids, relative to utility in biocontrol.

Recent discoveries as to nutrient requirements and attractants for egg-laying have given new scope and potential for their field use, by more rapid adjustment of population levels better to synchronize with levels of field pests. With the Brazilian government's program of national integration of the Amazon Region, rapid development is beginning to take place. Insect pest problems are beginning to occur (Celestino, 1980) and will certainly be amplified with increasing areas under cultivation (Arias & Penny, 1980). Biological control, using chrysopids among other agents, shows great promise because of the diversity of agents potentially available. However, before such agents can be utilized in the field, basic studies of the systematics and ecology of these predators and parasites are needed.

With this objective in mind, the present study, along with others in this series, has been carried out. Because of the large size of this family this part has been divided into four subparts: A) covering the introduction, biology and systematics of Chrysopini, B) covering systematics of Belonopterygini, C) systematics of Apochrysini, and D) systematics of Leucochrysini. Included in this part are the first modern, complete redescrptions of several widespread species which have been observed at significantly high population levels in cultivated areas of other neotropical and subtropical regions; consequently it is expected that the taxonomic information presented here will have significance throughout the Neotropical Region.

BIOLOGY

Eggs are usually laid singly on the end of long stalks, but occasionally a series of eggs are laid together on a fused stalk, or sometimes there is no stalk at all. One female may lay as many as 600 eggs (Neumark, 1952). These are usually laid near a concentration of prey insects, and attraction of egg-laying females in some species is known to occur because of chemicals released from the honey-dew excreted by the prey near their feeding site (Hagen *et al.*, 1976; van Eden & Hagen, 1976).

Larvae pass through three stages, feeding on as many as 2000 aphids (Kuwayama, 1962) 3780 scale insects (Matsuda, 1928) or 6487 scale insect eggs during the 14 days of development (Neumark, 1952). In addition to mealy-bugs (Pseudococcidae), scale insects (Coccoidea),

aphids (Aphididae), white-flies (Aleyrodidae), and flatids (Flatidae), chrysopid larvae are known to feed on saw-fly eggs, moth eggs, mites, corn-borer larvae, syrphid larvae, thrips (Thysanoptera), and small beetle larvae (Coleoptera) (Tjeder, 1966, and personal observations). Some species of chrysopids carry the skins of their victims, or other materials, on their backs. This trash-carrying habit is effective both as camouflage and as a predator defense, and is almost universal in the neotropics. Trash is not carried by **Chrysoperla**; early stages of **Plesiochrysa** have not yet been reported. In one tribe Belonopterygini, larvae associate with and feed upon ants (Principi, 1943, 1946; Weber 1942; Ellis Macleod, pers. comm.).

The mature larva forms an oval silken cocoon, with trash-carrying species incorporating this trash as a cover over the cocoon. A pharate adult emerges from the cocoon through a small round cap and undergoes ecdysis on a nearby support.

Adults of some genera feed on small soft-bodied insects, including active insects such as small Lepidoptera, while in other genera the adults feed on pollen or honeydew.

Taxonomic characters

Colorational characters are helpful, and notes should be made while specimens are fresh, as fading is rapid, especially under tropical conditions of high humidity, or in alcohol. Much individual and geographic variation may be encountered in these characters, so that in most instances identifications will have to be based upon genitalic dissection, or other non-colorational features.

Useful features of the wing include overall shape, width of costal area, numbers of veins, number and proportions of gradate cells, shape of intramedian cell, and position of its apex relative to the main crossvein above it. Venational nomenclature is depicted in Figure 1; for discussion see Adams, 1967a.

In some genera, males have cuticular glands, or **micropoculae**, on the pronotum, detectable as a granular texture under high magnification of a dissecting microscope.

Genitalic terminology corresponds closely to that of Tjeder, 1966, 1970. An idealized male abdominal terminus is depicted in Figure 2, incorporating structural terms used herein. The tignum is an arched sclerite, hinged to the posterior margin of the fused ninth tergite and ectoproct, and bearing a median tooth, the acumen. Ventrally to it lies the gonarcus, which has broad platelike internal apodemes, and a median process, termed the arcessus, and homologous to the mediuncus of other Planipennia. Laterally on the gonarcus, are two usually small projections, the entoprocessus. Detached from the gonarcus and lying on the membrane of the eversible gonosaccus, is the pseudopenis. The genital duct lies ventrally to the gonosaccus, and has attached the small internal trident-shaped sclerite, the hypandrium internum. On the floor of the male genital cavity, near the margin of the ninth sternite, lie the toothlike gonocristae, and the larger gonapsis, which usually bears an apodeme, which is long and rodlike in **Ceraeochrysa**. Cuticular gland openings, or microtholi, may be present on sternites except ninth, and occasionally on tergites. Maturational changes may be conspicuous, especially in **Ceraeochrysa**. The apodemes of the ninth tergite plus ectoproct in **C. cincta**, for example, are produced as

a heavy hook in mature individuals, while in teneral individuals, only the tip of the hook is sclerotized. The gonarcus plates enlarge with age, as does the apodeme of the gonapsis. Usually, little change takes place in the shape of the arcessus. Because of these changes, it is best to rely upon well-sclerotized individuals in making genitalic examinations.

In females (Fig. 3), the most easily observed features are the spermatheca, and subgenitale. For critical work, details of the copulatory bursa, bursal duct and bursal glands, should be worked out. This requires careful removal of internal abdominal contents, and staining. An alternative to extraction is to remove the apical tergites and sternites on the right side by cutting along the midline dorsally and ventrally, then through the ninth tergite + ectoproct, with fine iris scissors; this technique exposes the structures *in situ*. For staining, we inject dilute aqueous chlorazol black e; this is also advantageous for male genitalia. Staining is not necessary for routine examination. In females, maturational changes include progressively heavier sclerotization of the spermatheca, and in some cases, sclerotization of the area between the posterior margin of the seventh abdominal sternite and the subgenitale.

Systematics

Modern Chrysopidae appear to be directly descended from the Mesochrysinæ (Adams, 1967b). Today, Chrysopidae can be found in almost all temperate and tropical regions of the world, except New Zealand. There is no general agreement as to the classification of Chrysopidae, and we have chosen to follow the classification outlined by Adams (1978), where by the family is divided into two recent subfamilies - Chrysopinae and Nothochrysinæ. Nothochrysinæ have not been found in the Amazon Basin Region, American Chrysopinae have been assigned by Adams (*ibid.*) to four tribes - Belonopterygini, Leucochrysinini, Apochrysinini, and Chrysopini, which can be separated using the following key:

KEY TO AMAZONIAN TRIBES OF CHRYSOPINAE

- 1a. Basal antennal segments wider than long; rather stout, wide-bodied species; tignum absent, gonapsis may be present as two separate projections or a two-horned plate, female often with praegenitale ----- BELONOPTERYGINI
- 1b. Basal antennal segments longer than wide; rather thin, slender-bodied species; gonapsis if present not a two-horned plate; female lacks praegenitale ----- 2
- 2a. No dark spot at base of stigma; antennae usually shorter than forewing, tignum and/or gonapsis may be present ----- CHRYSOPINI
- 2b. A dark spot at base of stigma, antennae distinctly longer than forewing; tignum or gonapsis never present ----- 3
- 3a. In forewing, basal subcostal crossvein and intramedian cell absent; distinct thyridial spots in forewing ----- APOCHRYSINI
- 3b. In forewing, basal subcostal crossvein and intramedian cell present; thyridial spots

absent ----- LEUCOCHRYSIINI

CHRYSOPINI Schneider, 1851

Chrysopina Schneider, 1851, *Symbolae ad Monographiam generis Chrysopae*, p. 35.

Crisopinos Navás, 1910, *Broteria*, 9:59.

Chrysopini Navás, 1914, *Ann. Soc. sci. Brux.*, 38:76.

Type genus: *Chrysopa* Leach, 1815.

This tribe can be characterized by generally shorter antennae (shorter than forewing length, although they often are longer in *Ceraeochrysa*); antennal segments longer than wide, and a pterostigma which is pale, without any distinct brown or black spot at the base. The pseudomedius of the forewing is nearly straight, turning posteriad toward the wing margin at the intersection with the last outer gradate crossvein, while in Leucochrysiini and Apochrysiini, it usually turns upward slightly, and the last outer gradates are tilted so that psm appears to run into the outer gradate series. Genitalia are varied, ranging from the simple gonarcus plus arcessus in *Suaris*, to the complex, as in *Meleoma*, not yet found in the Amazon Region, which has in addition a tignum, pseudopenis, and gonapsis.

There are 11 genera and subgenera known from the New World. The five of these presently known from the Amazon Region can be separated using the following key:

KEY TO AMAZONIAN GENERA AND SUBGENERA OF CHRYSOPINI (MALES ONLY)

- 1a. Tignum absent ----- 3
- 1b. Tignum present ----- 2
- 2a. Pseudopenis present; pronotum enlarged, with 4 red spots, or lateral stripes ----- *Chrysopa* (*Plesiochrysa*)
- 2b. Pseudopenis absent; pronotum normal sized, not red-marked ----- *Chrysoperla*
- 3a. Gonapsis elongate; 2 horn-like structures on gonarcus or arcessus ----- *Ceraeochrysa*
- 3b. Gonapsis absent or present but not elongate; horn-like structures absent from gonarcus-arcessus ----- 4
- 4a. Mandibles blunt tipped; wings usually with narrow costal area; gonapsis never present ----- *Neosuaris*
- 4b. Mandibles with fang-like tip; wings usually with wide costal area; gonapsis rarely present ----- *Chrysopodes*

Chrysopa (*Plesiochrysa*) Adams, 1982

Chrysopa (*Plesiochrysa*) Adams, 1982, *Neuroptera International*, 2: 2:28.

Type species: *Chrysopa brasiliensis* Schneider, 1851, by original designation.

This subgenus of *Chrysopa* has both tignum and pseudopenis, lacks the gonapsis, has micropocule and/or microtholi; the female spermatheca is cordate (pill-box shaped), and mandibles are asymmetrical (Fig. 8). Adams (1982a) listed 5 species in this subgenus, of which three occur in South America and two in the Amazon Basin. They can be separated using the following key:

KEY TO AMAZONIAN SPECIES OF CHRYSOPA (PLESIOCHRYSA)

- 1a. Pronotum wider than long; gradate series divergent-----**C. brasiliensis**
1b. Pronotum longer than wide; gradate series parallel-----**C. elongata**

Chrysopa (Plesiochrysa) elongata Navás, 1913

Chrysopa elongata Navás, 1913, *Ent. Z. Frankf. a. M.*, 27:20.

Chrysopa angusta Navás, 1913, *Ann. Soc. scient. Brux.*, 37:89.

Chrysopa submarginata Banks, 1918, *Bull. Mus. comp. Zool. Harv.*, 62:15.

Chrysocerca mariae Lacroix, 1919, *Bull. Soc. ent. France*, 1919:109.

Chrysopa josephina Navás, 1930, *Revta. chil. Hist. nat.*, 34:299.

Holotype male of **C. elongata** in the Munich Museum, of **C. angusta** in the British Museum (Natural History), of **C. josephina** destroyed in the Hamburg Museum during World War II, of **Chrysocerca mariae** not found in Paris Museum, of **C. submarginata** in the Museum of Comparative Zoology, Harvard University.

Present description based on 1 male, 1 female, pinned.

Head: Frons, labrum, labial palpi and vertex yellow, unmarked. Maxillary palpi with basal two segments yellow, apical three segments black dorsally. Red line from base of maxillary palpi across gena to anterior margin of eye. Second red line from posterior margin of eye to posterior margin of head. Antennae yellow, unmarked, basal flagellomeres longer than wide.

Thorax: Pronotum longer than wide (Fig. 10), green, with two lateral red spots each side sometimes confluent. Male pronotum bearing micropocule, which appear as small transparent spots. Pleural areas pale yellow.

Legs: Yellowish, unmarked.

Wings: Venation of both wings pale greenish yellow to straw yellow, with crossveins reddish brown to black; membrane transparent, unmarked. Pterostigma pale green. Venation as in Fig. Pl; gradate series parallel.

Abdomen: As in **C. brasiliensis**.

Forewing length: male, 13 mm; female, 15 mm.

Intraspecific variation: The red pronotal spots are subject to fading; in some populations they are connected to form lateral stripes. Number of gradate crossveins is variable.

Geographic distribution: **C. elongata** was described from Jamaica; other type specimens are from Guatemala, Peru, Guadeloupe and Costa Rica. Banks (1946) recorded this species from Honduras. Within the Amazon Basin, specimens have been examined from Brazil: Amazonas (INPA): BR-174, km 170, 20-IX-1979, J.D. Charlowood, 1 adult; Manaus, 25-IX-1976, N. D. Penny; Manaus, INPA Campus, 27-IV-1976, N. Paratuppi, 1 female; Rio Urubu, 100 km north of Manaus, 11-IV-1983, F. Peralta and P. Bührenheim, 5 males, 12 females.

Species relationships: Banks (1946) indicated that **C. josephina** is the same as **C. angusta**. Adams (1982a) confirmed this synonymy and added the other names in synonymy. All South American species have virtually identical male genitalia. The additional species, from

the western slope of the Andes, *C. paessleri*, has a pronotum still more elongate than in *C. elongata*, but is otherwise similar.

***Chrysopa (Plesiochrysa) brasiliensis* (Schneider, 1851)**

Chrysopa brasiliensis Schneider, 1851, *Symbole ad Monographiam generis Chrysopae*, p.83.

Chrysopa bouvieri Navás, 1924, *Revta. chil. Hist. nat.*, 27:112.

Chrysopa antillana Navás, 1924, *Revta. R. Acad. Cienc. exact. fis. nat. Madr.*, 21:339.

Chrysopa rata Lacroix, 1926, *Annls. Soc. Linn. Lyon.*, 72:68.

Chrysopa uribei Navás, 1927, *Memorie Accad. pont. Nuovi Lincei*, 10(2):5.

Chrysopa scalaris Navás, 1929, *Memorie Accad. pont. Nuovi Lincei*, 12(2):26.

Chrysopa yucatanensis Navás, 1929, *Memorie Accad. pont. Nuovi Lincei*, 12(2):28.

Chrysopa divergens Navás, 1931, *Revta. R. Acad. Cienc. exact. fis. nat. Madr.*, 26:82.

Holotype female of *C. brasiliensis* in the Museum of Humboldt University, Berlin.

Holotype female of *C. bouvieri* in the Paris Museum; holotype male of *C. antillana* in the

Museum of Comparative Zoology, Harvard University; holotype of *C. rata* in the Paris Mu-

seum; holotype of *C. uribei* in the Barcelona Museum, not encountered; holotype male of

C. scalaris in the Hamburg Museum, destroyed during World War II.

Present description based on 2 males, 15 females, pinned.

Head: Frons, labrum, labial palpi and vertex yellow, without markings. Maxillary palpi with basal two segments yellow; apical three segments dorsally black. Red line from base of maxillary palp across gena to anterior margin of eye. Second red line from posterior margin of eye to posterior margin of head. Antennae completely yellow, without markings, of about 105 flagellomeres.

Thorax: Pronotum wider than long; large relative to head size, especially in males; with micropoculae in males; with two pairs of red spots (Fig. 9). Meso- and metanota yellowish, unmarked, or sometimes with two small red spots on mesonotum. Pleural areas pale yellow.

Legs: Pale yellow, unmarked.

Wings: Venation of both wings pale greenish yellow to straw yellow, with crossveins red dish brown to black; membrane transparent, unmarked; pterostigma pale green. Venation as in Figure 1; forewing with two to five inner gradate veins, six to eight outer gradates, the inner strongly divergent from the outer. Hindwing three to four inner and five to eight outer gradate veins.

Abdomen: Dark yellow laterally, pale yellow medially. Male with tignum, gonarcus, T-shaped entoprocessus approximated dorsally, pseudopenis right-angled with small apical bend, gonosaccus a large single pouch with numerous long gonosetae; gonapsis and gonocristae (Fig. 4). Female with cordate spermatheca bearing shallow ventral impression, short veta and a small membranous pouch connecting the veta to the bursa (Fig. 5, 6). Subgenitale (Fig. 7) with sclerotization extending to margin of seventh sternite.

Intraspecific variation: The red spots on the pronotum may be present or absent.

Geographic distribution: Type specimens are from Brazil, Cuba, Costa Rica, Colombia, and

Mexico. Banks (1944) recorded this species from Trinidad, Venezuela, and Guiana, and in 1946 from Honduras and Panama. Within the Amazon Basin, specimens are from Brazil: Amazonas (INPA), 5-VIII-1978, N. D. Penny, 1 female; 25-IX-1976, N. D. Penny, 1 female; 14-II-1976, Miriam F. S. Serrano, 1 female; 27-III-1979, L. P. Albuquerque; Manaus, Parque das Laranjeiras, equipe J. R. Arias, 28-VII-1981, 1 female, 4-VIII-1981, 1 male, 2 females; 29-VII-1981, 1 male, 30-VII-1981, 1 male, 2-VII-1981, 1 female, 6-VII-1981, 1 female; Manaus, Campus Univers. Amazonas, blacklight, 24-25-X-1982, 1 female (INPA); Reserva Duque, AM-010, km 26, 24-XI-1976, N. D. Penny, 1 male; 10-VII-1979, J.R.Arias, 1 female; AM-010, km 30, 9-VII-1982, P. Celestino Filho, 1 male; Rio Urubu, 22-23-I-1982, P. Bührnheim and N. Silva, 1 female; Rio Urubu, 100 km N Manaus, 11-IV-1983, Chico Peralta and P. Bührnheim, 8 males, 9 females (INPA). AM-010, km 232, 2-IX-1977, L. P. Albuquerque and E. Rufino, 1 female.

Pará: Parque Nacional de Tapajós, 63 km SW of Itaituba, 3-X-1977, N. D. Penny, 1 female (INPA). **Maranhão:** Buriticupu, 20-X-1978, 1 female (MPEG). In addition, we have seen Brazilian specimens from Minas Gerais (Parque Florestal de Rio Doce), São Paulo (Araras), and Santa Catarina (Nova Teutônia).

Species relationships: Banks (1946) indicated that *C. bouvieri* is similar or identical to *C. divergens*. Adams (1982a) confirmed the synonymy of Banks, and proposed the other synonymies listed. This is the most common species of *C. (Plesiochrysa)* in South America. The wide, four spotted pronotum is distinctive. The gradate series in the forewing is a useful sorting character; this is shared by various species of *Suaris* and *Chrysopodes*, which usually have wider with longer setae, and a small pronotum.

Chrysoperla Steinmann 1964

Chrysoperla Steinmann, 1964, *Annls., hist.-nat. Mus. natn. hung.*, 56:260.

Type species: *Chrysopa carnea* Stephens, 1836.

This genus is characterized by structures of the genitalia. Male tignum present; gonarcus with a pair of entoprocessus and mediuncus, pseudopenis, gonapsis, microtholli, and micropocule. Female spermatheca cordate, with short bursal duct opening into cylindrical dorsal veta. Male ninth sternite bearing apical lip (Fig. 11). Mandibles are asymmetrical, blunt-tipped (Fig. 19). Larvae do not carry debris.

This genus has only been accepted at subgeneric level by many recent authors, but the trend is toward accepting this group at the generic level. *Chrysoperla* is world wide in distribution, with Tjeder (1966) recording five species from Africa, Adams (1978) recording 10 species from the Nearctic and Neotropical Regions, with only two of them from South America, and Aspöck *et al.* (1980) recording three species from Europe. Only one species is now known to occur in the Amazon Basin.

Chrysoperla externa (Hagen, 1861)

Chrysopa externa Hagen, 1861, *Smithson. mis. Collns.*, 4:221.

Chrysoperla externa Adams, 1983, *Bull. So. Calif. Acad. Sci.*, 82:42.

Chrysoperla externa cocosensis Adams, 1983, *ibid.*

Chrysopa lanata Banks, 1910, Proc. ent. Soc. Wash., 12:154 (= *C. externa*, Adams, 1962, Proc. Hawaiian etn. Soc., 18:221).

Chrysopa lanata var. *platensis* Navás, 1916, Mem. R. Acad. Cienc. Artes Barcelona, 12(7): 132 (new synonymy).

Chrysopa lanata var. *climacia* Navás, 1917, Revta. R. Acad. Cienc. exact. fis. nat. Madr. 16:495 (new synonymy).

Chrysopa lanata var. *gradata* Navás, 1919, Revta. R. Acad. Cienc. exact. fis. nat. Madr. 17:300 (new synonymy).

Chrysopa lanata var. *basalis* Navás, 1920, Ann. Soc. cient. argent., 90:59 (new synonymy).

Chrysopa lanata var. *unita* Navás, 1920, Memorie Accad. pont. Nuovi Lincei, 5:24 (new synonymy).

Chrysopa lanata var. *lineata* Navás, 1927, Memorie Accad. pont. Nuovi Lincei, 10 (2):5. (new synonymy).

Chrysopa graciana Navás, 1919, Revta. R. Acad. Cienc. exact. fis. nat. Madr., 17:301.

Holotypes of *C. graciana*, and *C. lanata* var. *gradata* in the Buenos Aires Museum.

Holotypes of *C. lanata* var. *basalis*, var. *unita*, and neotypes of var. *climacia* and var. *lineata* presumably in the Navás collection, Barcelona. Holotype of *C. lanata* var. *lanata* in the Museum of Comparative Zoology, Harvard University.

Holotype of *C. externa* in the Berlin Museum, but was not available for examination.

Present description based on 10 males, 18 females, pinned.

Head: Vertex yellow, usually a red mark at postero-lateral margin. Frons yellow, occasionally creamy white, unmarked. Genae between compound eyes and mandibles red. Maxillary palpi black-lineate. Antennae yellow, unmarked, with about 81 flagellomeres, basal flagellomeres longer than wide.

Thorax: Pronotum yellow green with an indistinct brown to red elongate mark at anterior-lateral margin, occasionally extending length of pronotum. Meso and metanotum yellow green, unmarked; pleural areas yellow, unmarked.

Legs: Completely yellow, not marked.

Wings: Long, slender (Fig. P2), hindwing very acute. Venation of both wings pale greenish yellow to straw yellow, with pale yellow crossveins, or occasionally, some crossveins dark; membrane transparent, without markings or margining. Pterostigma pale green. Four to seven inner gradate crossveins, five to eight outer gradate veins; the series fairly widely spaced so that the length/width of third cell anterior to psm is about 3.7. Hindwing with four to six inner and six or seven outer gradate veins.

Abdomen: Yellow, without markings. Male tignum elongate (Fig. 15), acumen with rounded apex. Gonarcus bearing tiny entoprocessus and ligulate mediuncus, with lateral margins and tip deflexed, so that ventral surface is slightly concave (Fig. 12-14). Gonosetae numerous, short; ventrally to them a field of spinose tubercles (Fig. 12, 18). Female: subgenitale (Fig. 17) broad, with invagination on anterior surface of ligulate median lobe. Copulatory bursa a simple sac, with two filamentous glands, and a simple, moderately long bursal duct (Fig. 16); spermatheca pillbox-shaped, with short veta.

Forewing length: male, 11 - 13.5 mm; female, 10.5 - 13.5 mm.

Intraspecific variation: In addition to fading from yellow green to yellow with age, there is variation in color of markings from red to brown, and in the intensity of these markings, with the pronotal maculations sometimes almost absent, and maxillary palpi varying from mostly pale to prominently marked. Some individuals may be bright green, with pale middorsal stripe on thorax and abdomen.

Geographic distribution: Hagen's type is from Mexico. We have seen United States material from Florida, South Carolina, and Texas; additionally, Mexico, Guatemala, Honduras, Cuba, Haiti, Colombia (including Cocos Island), Venezuela, Ecuador, Peru, Paraguay, Chile, and Argentina. Navás, (1934), records this species from Uruguay, and Esben-Petersen, 1925, from Easter Island. Relative abundances in collections from Chile and Argentina, as well as numerous published records and described varieties, indicate that *C. externa* is common there. This species appears to be ubiquitous in its grassland habitat, throughout the neotropical region. Within Brazil, we have seen *C. externa* from Rio Grande do Sul (Parecy Novo), Santa Catarina (Novo Teutônia), São Paulo (Araras and Piracicaba), Rio de Janeiro and Minas Gerais (Parque Florestal do Rio Doce) States. From the Amazon Basin, Rondônia: 7.3 km north of Vilhena, 6-IX-1977, equipe J. R. Arias, 1 female (INPA); Vilhena, N. D. Penny (INPA): 28-VII-1983, 3 males, 8 females; 31-VII-1983, 3 females. Amazonas: BR-174, km 123, 12-V-1977, N. D. Penny, 1 female (INPA). Roraima: 20 km north of Caracari, 14-V-1977 N. D. Penny, 1 female (INPA); Boa Vista, 10-VII-1977, N. D. Penny, 2 females (INPA).

Habitat: This species prefers open grassland; we have not taken it in forested areas. Crops of adults usually contain grass pollen, or dust indicating nectar or honeydew feeding.

Species relationships: This is the only *Chrysoperla* known from the Amazon Basin. The only other South American species known to us, *C. asoralis* (Banks) (new combination), has a much longer and thinner mediuncus, which tapers evenly toward the apex, broader wings with dark gradates, etc.

Chrysopodes Navás, 1913

Members of this genus are distinguished by genitalic characters: tignum absent; gonopsis rarely present; mediuncus often somewhat inflated and microsetose dorsally, with two conspicuous internal braces (e.g., Fig. 24, 25). Entoprocessus usually reduced or absent; gonosaccus rarely densely setose; microtholi absent. The spermatheca is elongate, usually connected apically to the bursa by a slender, more or less elongate bursal duct; bursal glands when present are saccate, dorsolateral. Wing venation is highly variable between species, but wings are often broad and intramedian cell occasionally quadrangular.

This genus is divisible into two subgenera. *Chrysopodes* s. str. is characterized by sickle-shaped mandibles; *Neosuaris* by normal broad-tipped mandibles.

Subgenus Chrysopodes Navás, 1913

Chrysopodes Navás, 1913, *Annls. Soc. scient. Brux.*, 37:329.

Orlandsia Navás, 1914, *Annls. Soc. scient. Brux.*, 38:112. (New synonymy)

Ancylochrysa Navás, 1928, *BoIn. Soc. ent. Esp.*, 11:129. (New synonymy)

Type species: of *Chrysopodes* is *C. canudasi* Navás, 1913, holotype female in BMNH. This

species appears synonymous with *Nothochrysa geayi* Navás, 1910, (new synonymy), the type of which, in the Paris Museum, from French Guyana, lacks the abdomen. Type species of *Orlandsia* is *O. jubilosa* Navás, 1913; of *Ancylochrysa* is *A. nevermanni* Navás, 1928, the type of which was destroyed at Hamburg.

Mandibles sickle-shaped (Fig. 31); antennae often shorter than forewing. Many species with red marks on genae and laterally on vertex; scape usually unmarked; vertex in some species with distinctive pitted texture. Pronotum usually red-bordered, without micropocule. Wings often with broad costal area, irregular inner gradate series, gradates usually bordered. Terminal abdominal sternites in both sexes of several species with dark-pigmented tubercles (Fig. 28, 32).

The broad, rather delicate hairy wings, pitted vertex, and red markings of head and pronotum lend a distinctive habitus to the majority of species in this subgenus. The intramedian cell is usually triangular, as in *Orlandsia jubilosa*, but may be quadrangular; as in *Chrysopodes geayi* (Navás), and *Ancylochrysa nevermanni* Navás, as well as in *C. pulchella* (Banks) (Fig. P3).

Additional species belonging to this subgenus are *Chrysopa costalis* Schneider, 1851, (type not found), *Chrysopa albopalpis* Banks, 1910 (type female in MCZ Harvard), *Chrysopa gonzalezi*, 1913 (type female in Bavarian State Museum, Munich), *Allochrysa inornata* Banks 1910, (type male in MCZ, Harvard), *Chrysopa laeva* Navás, 1911, (Type in Paris Museum), *Cin_ tameva limbata* Navás, 1926 (type male in Zool. Museum, Barcelona). (All new combinations).

Little is known of the biology of this group. Adams (unpub.) has reared one species from Honduras; the larva is a trash-carrier. The majority of the adults dissected for this study, from the Amazon Basin, had guts filled with moth scales and setae, but no tiny fragments of cuticle. A probable explanation is that the majority of this material is from various traps, where the insects may spend considerable time grooming before death. Indicative of this scenario, the pinned material is mostly rather "dirty" with moth scales. There needs to be some study made of feeding habits in this group, to account for the unusual mandibular structure on functional terms.

KEY TO AMAZONIAN SPECIES OF CHRYSOPODES

- 1a. Intramedian cell quadrangular ----- 2.
- 1b. Intramedian cell triangular ----- 3.
- 2a. Copulatory bursa with short setae and microtrichia, on bursal duct arranged in diagonal rows, duct only moderately long (Fig. 22) ----- **duckeii**.
- 2b. Copulatory bursa without setae or microtrichia; duct about 16 mm long ---- **pulchella**.
- 3a. Scape with middorsal brown stripe ----- **tetifera**.
- 3b. Scape without such a stripe ----- 4.
- 4a. Gradate crossveins pale, surrounded by areas of brownish membrane ----- **nebulosa**.
- 4b. Gradate crossveins dark; may be brown-margined ----- 5.
- 5a. Gradate series parallel, with cells all about same length ----- **lineafrons**.
- 5b. Gradate series not parallel, some cells much longer than others ----- 6.

- 6a. Inner gradate series straight, converging with outer toward wing tip; genae with fuscous stripes ----- **polygonica**.
- 6b. Inner gradate series curved; genal marks, if present, pink or red ----- 7.
- 7a. Labrum deeply incised medially; clypeus with a median bulge, projecting over labrum medially (Fig. 65) ----- **indentata**.
- 7b. Labrum and clypeus normally shaped ----- 8.
- 8a. Large species (forewing length 14 - 15.5 mm); costal area very wide, narrowing rapidly toward wing apex (Fig. P9) ----- 9.
- 8b. Smaller species (forewing length 10.8 - 12.5 mm); costal area narrows more gradually (Figs. P4, P10) ----- 10.
- 9a. Pronotum with both long and short fuscous setae; radius very strongly curved forward ----- **conisetosa**.
- 9b. Pronotum with longer, pale setae; radius not so strongly curved ----- species "a".
- 10a. Only 3-4 inner gradates; hind wing acute-tipped; head with red marks on frons and clypeus ----- **breviata**.
- 10b. With 5-6 inner gradates; hind wings broader-tipped; crossveins often brown margined; frons and clypeus not red-marked ----- 11.
- 11a. Genitalia as in Figures 32-38; forewing about 3.0 times as long as wide --- **spinella**.
- 11b. Genitalia as in Figures 77-83; forewing about 2.7 times as long as wide --- **mediocris**.

Chrysopodes duckei Adams and Penny, new species

Description based upon the unique holotype female.

Head and thorax: as in *C. pulchella*.

Wings: Venation about as in *C. pulchella*, green, forewing costal and radial crossveins dark at anterior ends; some mid-costals dark posteriorly, 5-6 apical branches of Rs dark basally, gradates dark, marginal forks dark for a short interval anteriorly longer interval posteriorly. Some pseudocubitals with irregular dark intervals; a prominent dark vein from second pseudomedial cell. Dark crossveins surrounded by brown areas. Hindwing veins pale except for outer gradates; a faint brown tint on posterior margin. Forewing inner gradate series irregular.

Abdomen: Female seventh sternite with small fuscous subapical knob (Fig. 20). Subgenitale (Fig. 21) narrow, with margin of ventral pocket undulate. Copulatory bursa small, with interior surface bearing short setae and microtrichia (Fig. 22). Base of bursal duct with diagonal rows of setae; remainder of duct smooth-walled, gradually widening to join spermatheca; bursal gland large, oval. Spermatheca tubular, first two turns forming a U, with a subtubular ventral incision extending their full length, two more turns nearly circular.

Forewing length: 14.0 mm.

Geographic distribution: The holotype female is from Amazonas, Manaus, AM-010, Km 26, Reserva Ducke, 28-ii-1978, Jorge Arias, in the collection of INPA.

Species relationships: This species closely resembles *C. pulchella*, but differs in the female having a setose bursa, shorter bursal duct, not kinked and with smooth walls, much

more elongate spermatheca, narrow subgenitale with distinctively shaped ventral impression. It is not possible to separate these species on non-genitalic characters.

Chrysopodes pulchella (Banks, 1910)

Allochrysa pulchella Banks, 1910, *Proc. ent. Soc. Wash.*, 12:152.

Chrysopodes pulchella (Banks) Banks, 1944, *Bol. ent. venez.*, 3(1):17.

Holotype female in the Museum of Comparative Zoology, Harvard University.

Present description based upon 1 male, 1 female, 1 without abdomen.

Head: Vertex yellow, raised above level of compound eyes medially, surface texture pitted, without markings, except small spot at postero-lateral margin. Frons yellow, without markings. Genae between compound eyes and mandibles red. Mandible tips fanglike (Fig. 31). Maxillary palpi laterally and apically black. Antennae yellow, unmarked, bearing about 98 flagellomeres, basal flagellomeres longer than wide.

Thorax: Pronotum yellow, with lateral dark brown to red line from anterior to posterior margin. Meso- and metanota yellow, unmarked. Pleural area pale, unmarked.

Legs: Yellow, without markings.

Wings: Venation (Fig. P3) of both wings greenish yellow to straw yellow, with most crossveins darkened only at anterior end. Gradate crossveins completely darkened, with diffuse yellowish brown margining. Apical four or five branches of Rs + MA darkened basally. Costal area relatively wide (approximately 40% wider than area between R and Rs). Pterostigma pale green. Anterior median cell quadrangular, its apex including part of the apparent basal psm-psc crossvein. Five to six inner gradate crossveins, the series very irregular; zero to three intermediate gradate crossveins, irregularly arranged (none in wing photographed); eight outer gradates. Hindwing with five inner and six to seven outer gradates.

Abdomen: Male ninth tergite + octoproct apodeme with conspicuous medially-directed triangular projection (Fig. 23), gonarcus (Fig. 24, 25) broadly arched, mediuncus microsetose, with a bird-head appearance in lateral view. Gonosetae absent. In area of gonapsis, cuticle weakly sclerotized as two lobes, bearing minute squamate gonocristae (Fig. 26, 27). Apex of ninth sternite with a few conical-based setae. Tignum absent. Female seventh sternite with subapical fuscous knob. Copulatory bursa extensive, transversely rugose with no internal setae or microtrichia; bursal glands large. Bursal duct narrow, thin-walled, convoluted; when stretched, more than 64 mm long, gradually widening to smooth-walled section leading to elongate conical spermatheca with short conical ventral impression (Fig. 29). Subgenitale broadly confluent with membrane posterior to seventh sternite, ventral pocket with nearly straight margin (Fig. 30).

Forewing length: male, 14.5 mm; female, 14.0 mm.

Geographic Distribution: The type is from Par  (probably Bel m), in the Amazon Basin: Banks (1944) records this species from Surinam. Other specimens from Brazil: Amazonas (INPA) are: Manaus, INPA Campus, 22-X-1979, J. R. Arias, 1 without abdomen; Manaus, C. Univers., 24-VIII-1982, top of tree, J. A. Rafael, 1 male (INPA); Manaus, 11-VI-1979, Malaise trap, J. R. Arias, 1 female (INPA); Manaus, Parque das Laranjeiras, 8-14-VII-1981

J.R. Arias, 1 female (INPA); BK-174, Km 170, 20-IX-1979, J.D. Charlwood, 1 male, 1 female; Reserva Ducke, AM-010, Km 26, 28-11-1978, J.R. Arias, 1 female, 27-IX-1978, Malaise trap, J. Arias, N. Penny 1 male (INPA). **Rondônia:** Porto Velho, CDC 15 m, 2-20-VII-1982, J. R. Arias, 1 adult (INPA).

Species Relationships: This species and *C. duckei* can be recognized by their quadrangular intramedian cell, irregular gradate series, and branches of radial sector dark at base; these two species can be separated only by genitalic characters. A closely related species from Colombia, *C. inornata* Banks, has similar wing markings, but the forewing costal margin is concave and irregular gradate veins are absent; genitalia have not been examined. The extraordinarily elongate and delicate bursal duct of *C. pulchella* is unique.

***Chrysopodes spinella* Adams and Penny, new species**

Description based on three specimens in alcohol, faded.

Head and thorax: Apical maxillary palpmere black, subapical palpmere brown. Other head and body markings, if originally present, completely faded. Flagellum missing.

Wings: Venation as in Figure P4. Forewing costals dark at both ends, basal radials dark anteriorly, apical radials entirely dark. Also dark: branches of RS briefly at origins; gradates, ends of pseudomedials, posterior ends of branches of RS at psm, and basal medial and cubital crossveins. Marginal forks with anterior branch dark near fork, posterior branch wholly dark; pseudocubitals with dark dot at ends. No dark clouds surrounding any pseudocubitals. Longest costal cell 2.2 times as high as wide. Five to six inner, 5 - 6 outer gradates; inner series irregular; extra crossveins may be present. Hind wing with dark veins: costals at ends, apical radials, gradates, marginal forks at the forks.

Abdomen: Male sternite 8+9 with small ventral peg; apex upturned, slightly notched medially, with a few conical setal bases (Fig. 32). Tergite 9+ectoproct with apodeme prolonged apically as protruding tooth; internally apodeme gives rise to ventrally directed process arising under callus cerci. No gonocristae or gonopsis. Mediuncus tip narrow, elongate (Fig. 33, 34); no gonosetae. Female 7th sternite without obvious peglike process (Fig. 35). Subgenitale broadly cordate (Fig. 38). Copulatory bursa broad, longitudinally wrinkled. Bursal glands oval with ducts opening posterolaterally near margin of 7th sternite. Bursal duct arising far posteriorly, from bursal floor near copulatory opening (Fig. 37); long loop extended far anteriorly, twisted about 15 times counter-clockwise; a narrow tract of tiny thorn-like setae extending about 3/4 length of loop. Spermatheca elongate-tubular, rather elongate (Fig. 36).

Forewing length: 10.0-11.5 mm.

Distribution: Male holotype, and male and female paratypes, from Brazil: **Pará**, São Geraldo, 30-XI-8-XII-1982, equipe J. R Arias (INPA).

Relationships: This species resembles *C. pulchella* Banks, but differs in having no clouds on pseudocubitals in forewing, narrower costal area (tallest cell 3.2 times as high as wide in *pulchella*), protruding spine from ectoproct, and shorter, heavier bursal duct, with setal tract inside. It is probable that in life this species will prove to have red genal and vertex marks, as well as red pronotal stripes, as in most other related

species.

Chrysopodes nebulosa Adams and Penny, new species

Present description based upon 3 males, 16 females, 1 without abdomen, pinned; 1 male, alcohol.

Head: Vertex yellow, raised above level of eyes medially, texture pitted, unmarked except for small brown to red spot at postero-lateral margin. Frons yellow, without markings. Genae between compound eyes and mandibles red. Mandibles with fanglike tips (Fig. 47). Maxillary palpi yellow basally and fuscous apically. Antennae yellow, without markings; with about 57 to 71 flagellomeres; basal flagellomeres longer than wide.

Thorax: Pronotum yellow, with dark brown to red lateral line on anterior half. Meso and metanota yellow, without markings. Pleural areas yellow, without markings.

Legs: Yellow, without markings.

Wings: Venation (Fig. P5) of both wings mainly greenish yellow. In forewing, costals black at both ends, radials black anteriorly, a few other crossveins dark at one end, gradates pale; all crossveins and apical twiggings broadly margined with diffuse yellowish brown; in hindwing a few costals dark, outer gradates black. Costal area relatively wide (approximately 10% wider than area between Rs and Rs+MA). Pterostigma pale green. Anterior intramedian cell elongate triangular, reaching Psm after first ma-mp crossvein. Psm at nearly right angle with first outer gradate crossvein. Four to seven inner gradate veins, five to seven outer gradate veins, with last inner and outer gradate veins being more proximal than the others. Basal anal veins swollen. Hindwing with four to six inner and outer gradate veins. Forewing gradate series parallel, except for apicalmost cell.

Abdomen: Pale, unmarked; a brown sternal knob on male eighth + ninth sternite (Fig. 39) on female seventh sternite (Fig. 43). Male ninth tergite + ectoproct without apodemes; sclerotized area on mature individuals extends to include spiracle 8 (Fig. 39). Gonarcus (Fig. 40, 41) delicate, apodemes small; mediuncus short, triangular, dorsal sclerotized braces narrow, widely divergent; gonosetae, gonocristae and gonapsis absent, but some thickening of membrane in gonapsis area (Fig. 42). Female sternal knob conspicuous, subapical (Fig. 43). Subgenitale with rounded anterior margin, no definite ligulate projection (Fig. 46). Copulatory bursa membrane without setae or microtrichia, wrinkled; bursal glands arise from sides of bursa, not base (Fig. 44). Bursal duct easily extends more than 10 mm, basal half flattened, membranous with granular texture, transversely wrinkled; arising from several wider spiralling turns attached ventrally to bursa; apical half smooth-walled (Fig. 45), round in cross section, thrown into tight loops and coils. Spermatheca elongate, veta projecting into bursal duct; ventral invagination enlarged virtually to fill interior of spermatheca, spermathecal duct unusually elongate.

Forewing length: male, 13.8 mm; female, 10.5-14.0 mm.

Intraspecific variation: In the small group of specimens available, the single individual from Porto Velho is distinctly larger, with longer wings and more numerous gradate veins. Whether this is a regional or individual variation is not known.

Geographic distribution: The holotype male, from Amazonas, Reserva Dücke, 26 Km NE Manaus, 6-VI-78, C.D.C. trap, J. Arias and N. Penny, in alcohol, is in the collection of INPA.

Other individuals from **Amazonas**, (INPA): Reserva Ducke, AM-010, Km 26, 11-XI-1976, N. D. Penny, 1 female, 8-VIII-1978, C.D.C. trap 15-2, J. R. Arias, 1 female; AM-010, Km 232, 2-IX-1977, L. P. Albuquerque and E. Rufino, 1 female; AM-010, Km 246, 12-VII-1979, J.R. Arias, 1 female; AM-010, Km 268, 19-I-1977, N.D. Penny, 1 female; Manaus, Campus, Univ. of Amazonas, 4-11-VIII-1979, 1 male, 6 females, Malaise trap, 25-31-VIII-1979, 2 males, 1 female, 8-IX-1979, 5 males, 4 females, 29-VI-1982, 1 male, J. A. Rafael (INPA); Manaus; Parque das Laranjeiras, 4-VIII-1981, J. R. Arias, 1 female (INPA); Reserva Ducke, AM-010 km 26, 20-VIII-1982, N. D. Penny, 3 females; BR-319, km 62, 5-V-1983, J.R. Arias, 1 female. **Rondônia**: Porto Velho, 20-11-1979, J. Campbell, 1 without abdomen (INPA). **Pará**: Rio Trombetas, Cruz Alta, 24-26-XI-1982, N. D. Penny, 3 females (INPA); Serra Norte - Carajás X-1982, M. Miles, 1 female (INPA); São Geraldo, 30-XI-8-XII-1982, equipe J. R. Arias, 1 female; Tucuruí, Rio Parekamen, 16-20-VII-1983, equipe J. R. Arias, 1 male.

Species Relationships: In non-genitalic characters this species closely resembles *C. limbata* Navás, 1926 (Broteria 23:8, **Cintameva**), from Nictheroy, Brasil, the holotype male of which has heavily sclerotized upturned apodemes on the ninth sternite, each terminating in two spines, interdigitating with spines on the posteroventral corners of the ectoproct. The mediuncus is more slender and elongate, entoprocessus are evident, and numerous gonosetae are present. The wings resemble those of *C. parishi* (Banks, 1913) (Proc. ent. Soc. Wash., 15: 139), from British Guiana, also recorded from Surinam and Venezuela (Banks, 1944), but in that species the gonarcus is more strongly sclerotized, with narrower, more deflexed mediuncus, which does not exhibit the divergent narrow dorsal sclerotized braces as in *nebulosa*.

Chrysopodes lineafrons, Adams and Penny, new species

Description based on 2 males, 5 females, pinned.

Head: Vertex yellow to pale green, moderately elevated, four vertex scars elevated posteriorly, thin red line at posterolateral margin (Fig. 48). Frons yellow to pale green with thin transverse red line below antennal fossae, interrupted at mid-line. Genae with two red stripes each side. Maxillary palpi with third segment black-lineate; terminal segments black. Mandibles with fanglike tips (Fig. 55). Antennae pale, somewhat darker apically, unmarked, with about 74 flagellomeres.

Thorax: Pronotum yellow to pale green, with longitudinal red to brown stripe laterally from anterior to posterior margin. Meso- and metanota bright yellow to green. Setation pale. Pleural areas pale. Legs pale.

Wings: Venation (Fig. P6) of both wings pale greenish yellow to straw yellow, with dark crossveins: costals, radials in middle, gradates, basal branches Rs+MA at psm, basal media and cubitus; without margining. Costal area approximately same width as area between R and Rs+MA. Pterostigma pale green. Anterior intramedian cell elongate triangular, reaching psm after ma-mp crossvein. Four to six inner, and six to eight outer, gradate veins. Hindwing with two to four inner and five to seven outer gradate veins; tip quite acute.

Abdomen: Yellow to pale green. In male, tergite width normal; in female, tergites approximately four times as long as wide. Male eighth sternite area with small tubercle

at apex (Fig.49). Ninth tergite plus ectoproct apodeme lightly sclerotized with apically projecting tooth. Gonarcus (Fig. 50,51) with slender straight mediuncus and broad apodemes. Gonosetae absent; gonocristae pointed, gonapsis absent. Female with sclerotized knob on apex of seventh sternite (Fig. 52). No bursal glands found. Bursal duct membranous, slender; spermatheca elongate, bent in tight u-shape, ventral invagination short, spermathecal duct short (Fig. 53). Subgenitale ventral pocket shallow, with undulating margin (Fig. 54).

Forewing length: Male, 11.1 - 11.8 mm; female 11.3 - 12.8 mm.

Intraspecific variation: Of the seven specimens before us, the three from Santa Catarina State have only a single spot on the gena, while the four Amazonas specimens have this spot elongated and a second line below it.

Geographical Distribution: Brazil: **Santa Catarina:** Nova Teutônia, XI-1975, F. Plaumann, 1 female, (INPA); Nova Teutônia (52° 23'W, 27° 11.5'S), VI-1975, F. Plaumann, 1 male (INPA); Nova Teutônia, IX-1977, F. Plaumann, 1 female (INPA); **Amazonas,** Manaus: 11-XI-1976, N. D. Penny, 1 female (INPA); 13-I-1977, N. D. Penny, 1 female (INPA); 29-XI-1976, N. D. Penny, 1 female (INPA).

Type material: The holotype male is from Manaus, 17-11-1977, N. D. Penny, and the allotype female from Manaus, 11-XI-1976, N. D. Penny; both are in the Systematic Entomology collection at INPA. Paratypes have been deposited in the INPA collection and the P. A. Adams collection, Fullerton, California.

Species Relationships: The facial markings of this species set it off immediately from the other *Chrysopodes* species. The slender, acute wings and radial crossveins dark in middle, give it a *Ceraeochrysa* - like facies, but mandibles, genitalia, and terminal knobs in both sexes clearly place it in *Chrysopodes*. The elongate mediuncus resembles that of *C. polygonica*, but that species is readily distinguished by its coloration, specialized male wing venation, and genitalic structure.

Chrysopodes polygonica Adams and Penny, new species

Description based on 4 males, 5 females, pinned; 20 males, 35 females in alcohol.

Head: Yellow; vertex smooth-textured, with small red line at posterolateral margin; genae with two fuscous stripes on each side; maxillary palpi black (Fig. 56). Mandibles with fang-like tips (Fig. 64). Antennae yellow, unmarked, with about 70-72 flagellomeres.

Thorax: Pronotum yellow, with longitudinal red to brown stripe laterally from anterior to posterior margin. Meso- and mesanota bright yellow medially, brownish yellow laterally. Pleural areas yellow.

Legs: Yellow, unmarked.

Wings: Longitudinal veins of both wings (Fig. P7) pale greenish yellow; forewing with all crossveins dark. Forewing gradate crossveins dark, with diffuse brown markings, branches of Rs dark to inner gradates or psm. Costal margin approximately same width as radial area. Pterostigma pale green. Intramedian cell elongate triangular. Six inner, and five to six outer gradate crossveins. Male gradates greatly swollen (Fig. P7), female gradates normal; the series converging apically, forming a series of polygonal cells at wing tip.

Hindwing with costals, gradates, radials at ends, and marginal forks, dark; 3 inner, 4 outer gradates.

Abdomen: Yellow, unmarked. In male, tergite width normal, in female tergites extremely narrow (approximately six times as long as wide) and covering only 1/3 to 1/2 to the dorsal surface of the abdomen. Male eighth sternite area with slight indication of terminal knob (Fig. 51); in female, a weakly developed terminal knob on sternite seven (Fig. 60). In male, ectoproct + ninth tergite without well-developed apodeme; tenth sternite or subanal plate enlarged, densely setose, contiguous with gonarcus (Fig. 59). Mediuncus tip slender, downcurved; gonosetae present and moderately numerous (Fig. 58, 59). Gonapsis absent; gonocristae small, lanceolate. Female subgenitale with anterior margin thickly rounded, slightly bulging (Fig. 61, 62). Copulatory bursa small, membrane wrinkled, without setae or microtrichia; gland ducts arise laterally near base of bursa; bursal duct short, wrinkled, membranous; spermatheca inflated, bean-shaped, spermathecal duct short (Fig. 63).

Forewing length: male, 10.3 - 10.5 mm; female, 10.0 - 11.0 mm.

Intraspecific variation: Sexual dimorphism is quite pronounced in this species, both in reduced tergites of the female, and inflated apical veins in the forewing of the male.

Geographical distribution: Specimens from Brazil in the Systematic Entomology Collection of INPA are from: **Goiás:** Xambioá, 30-XI-8-XII-1982, equipe J. R. Arias, 1 female. **Pará:** Conceição do Araguaia, 19-22-XI-1982, equipe J. R. Arias, 1 male, 1 female; São Geraldo, 30-XI-8-XII-1982, equipe J. R. Arias, 2 males, 2 females; BR-422, km 30, 28-29-X-1981, equipe J. R. Arias, 1 male, 1 female; BR-230, km 30, 26-X-1981, equipe J. R. Arias, 3 males, 6 females; Serra Norte - Carajás, X-1982, M. Miles, 2 males, 9 females. Tucuruí, Rio Parekamen, 16-20-VII-1983, equipe J. R. Arias, 5 males, 3 females. Serra Norte, Paul Reddy; CDC, X-1982, 1 male, 1 female; 700-800 m, CDC 15 m, VIII-IX-1982, 2 males, 1 female; Itacaiunas, CDC, 15 m, VIII-IX-1982, 1 female, X-1982, 1 male, I-II-1983, 1 female; Paranapebas, VIII-IX-1982, 3 males, 2 females, CDC, I-II-1983, 1 male, 2 females. **Amazonas:** Manaus, 27-XI-1976, N. D. Penny, 1 male; INPA campus, 10-XI-1977, J. Gillian, 1 male; INPA campus, XI-1978, J. R. Arias, 1 male, 1 female; INPA campus, 4-VI-1979; J. R. Arias, 1 female; INPA campus, 12-X-1979, 1 female; INPA campus, 15-II-1977, N. D. Penny, 1 female; INPA campus, 24-V-1977, I. S. Goryab, 1 female; Parque das Laranjeiras, 1-IX-1981, 13 males, 14 females, 27-V-1981, 1 male, 3 females, 30-VII-1981, 4 males, 2 females, 22-X-1981, 3 males, 2 females, equipe J. R. Arias; Reserva Ducke, AM-010, km 26, 9-VIII-1977, J. R. Arias, 1 female. **Rondônia:** Vilhena, 6-XI-1979, N. D. Penny and J. R. Arias, 1 male.

Biology: In general, this species is collected during the driest parts of the year, in open, disturbed areas. Guts contain moth scales and setae.

Type material: The holotype male and allotype, from Brazil, Amazonas, Manaus, Parque das Laranjeiras, 22-I-1981, J. R. Arias, are deposited in the Systematic Entomology Collection of INPA. Paratypes have been deposited in Museu Paraense Emílio Goeldi, Belém; Universidade de São Paulo; Dept of Entomology, Universidade Federal de Paraná, Curitiba; United States National Museum, Washington, D. C.; British Museum (Natural History), London, and the P. A. Adams Collection, Fullerton, California.

Species relationships: This small species of *Chrysopodes* is unmistakable. The swollen

at both ends, radials dark anteriorly, gradates black; marginal forks with anterior branch black at base, posterior branch dark for most of its length. Most transverse veins narrowly bordered with light brown. R strongly curved anteriorly; radial crossveins in both wings displaced to join RS+MA near or at the origins of its branches. Six or 7 inner, 8 outer gradates, the inner series divergent from outer in middle. Inflated veins in male: crossvein 1 m-cu, MP near basal side of intramedian cell, base of Rs+MA. Hindwing venation pale, 5 inner gradates, 7 outer (dark) gradates; tip blunt.

Forewing length: 15.5 mm.

Abdomen: Pale. Sternites 8+9 with blunt ventral knob (Fig. 70), posterior lip with lateral bearing obtusely conical teeth, with setal bases on their mesal surfaces (Fig. 73). Ninth tergite + ectoproct with well-sclerotized apodeme, broadened to triangular plate posteriorly. Mediuncus with moderately narrow dorsal braces, lateral margin constricted near deflexed tip; apex microsetose (Fig. 71,72). Gonosetae absent, gonocristae small, sharply pointed; gonapsis absent.

Geographic distribution: Holotype male, from Brazil, Manaus, Parque das Laranjeiras, 8-14-VII-1981, Jorge Arias (INPA Collection).

Relationships: The conical setae are particularly well developed in this species. Shape of the ectoproctal apodeme and narrow mediuncus are similar to those of *C. pulchella*. The radius curves more strongly anteriorly than in other members of the genus, and the costal area narrows more abruptly from its highest point over the origin of Rs.

The anterior wing margin is not concave, as in *C. nebulosa*. It is possible that *Chrysopodes* species "a" may be the female of *C. conisetosa*.

Biology: Gut contents were setae and moth scales.

***Chrysopodes breviata* Adams and Penny, new species**

Description based on 2 females, pinned.

Head: Vertex yellow, pitted, red-marked at eye margin. Frons and clypeus red-marked at eye margin, extending medially through tentorial pits, anteriorly to median clypeal bulge (Fig. 74). Maxillary palpi pale basally, third palpimere brown-lineate, fourth and fifth fuscous, pale apically. Mandibles fang-like. Antennae pale, tip pale fuscous, about as long as forewing.

Thorax: Pronotum yellow-green, broadly red-margined. Meso- and metanotum green, unmarked. Pleurae pale. Setation long, pale. Legs pale, hind tibiae moderately inflated.

Wings: (Fig. P10). Venation pale green; in forewing most transverse veins dark or dark at ends. Gradates dark, apical branches of Rs dark at origin, marginal forks dark for a short interval on anterior branch, posterior branch mostly dark. Three to 5 inner, 5-6 outer gradates, basal four inner gradates diverging from outer series, apical gradate cells much shorter (not present in specimen in photograph).

Abdomen: Basal abdominal tergites marked with red laterally. Female copulatory bursa small, bursal glands small; a short ruffled margin leads into broad moderately short bursal duct (Fig. 75). Spermatheca elongate, ventral impression elongate, conical (compressed in specimen illustrated). Spermathecal duct short. Subgenitale simple, with broad ventral

invagination; area between subgenitale and seventh sternite membranous (Fig. 76).

Forewing length: female, 10.8-11.5 mm.

Holotype: Brazil, Amazonas, BR-174, km 170, 20-IX-1979, J. D. Charlwood, female, in the INPA collection.

Geographical Distribution: Amazonas, Campus INPA, Mn. Am. Km. 4, 16-VI-1976, E. Rufino, female.

Species Relationships: This species has more red facial markings than usual, and the bursal glands, short ruffled bursal conduit are distinctive from the other species described herein.

***Chrysopodes mediocris* Adams and Penny, new species**

Present description based on 3 males, 1 female, 1 without abdomen, pinned.

Head: Vertex yellow, raised medially, unmarked, except for small lateral red spot. Frons yellow, genae with red stripe. Mandibles with fang-like tip. Maxillary palpi black apically and laterally. Antennae yellow, unmarked.

Thorax: Pronotum yellow, with elongate red spot at anterolateral margin. Meso- and metanota bright yellow medially, pale reddish brown laterally. Pleural areas yellow.

Legs: pale.

Wings: (Fig. P11) Venation of both wings pale greenish yellow to straw yellow, with most crossveins dark brown to black at anterior and posterior ends. Costal area slightly wider than area between R and Rs+MA. Pterostigma pale green. Intramedian cell elongate-triangular, reaching psm after first ma-mp crossvein. Five to six inner, five to six outer gradate crossveins; inner series divergent from outer in middle. Hindwing with 4 inner, 4-5 outer gradates.

Abdomen: Yellow, unmarked. Male ectoproct + ninth tergite apodeme with ligulate medially directed process (Fig. 77). No tignum. Gonarcus (Fig. 78, 79) apodemes with posteriorly directed lobe; mediuncus short, triangular in dorsal view, decurved, ventral surface microsetose; gonosetae sparsely present. Gonapsis triangular in side view (Fig. 77), Y-shaped in posterior view (Fig. 78), with margins of posterolateral projections irregularly lobate; gonocristae absent. Female bursa simple (Fig. 81); short duct confluent with relatively short conical spermatheca (Fig. 82). Subgenitale (Fig. 83) narrow, with subtriangular lobate extension.

Forewing length: male, 10.8 - 11.5 mm, female, 12 mm.

Intraspecific variation: The reddish spot at the anterolateral margin of the pronotum to the posterior margin in some specimens of the short series we have from Vilhena. This same reddish line extends to the lateral margins of the meso- and metanota in the same specimens, intensifying the contrast with the bright yellow medial portion of the thorax. However, these specimens show no other differences from others of this series, in wing pattern or wing and body pigmentation.

Geographic distribution: Within the Amazon Basin, Brazil: Rondônia, Vilhena, 6-XI-1979, N. D. Penny and J. R. Arias, holotype male, 4 males, 3 females (INPA); BR-364, Km 100, CDC 1 m, 26-29-VII-1983, J. R. Arias, 1 female (INPA). Amazonas, Manaus, INPA Campus, 4-V-

1979, J. R. Arias, } without abdomen (INPA).

Species relationships: *C. mediocris* can be distinguished from *C. nebulosa* by its darkened gradate veins. *C. conisetosa* has the costal area tapered much more abruptly from the widest point opposite the origin of Rs + MA. *C. breviata* has more acute wings, with the hindwing gradates series closer together, and fewer gradates. In the male, presence of a gonapsis is unique among Amazonian *Chrysopodes*, and the acute mediuncus is distinctive. In the female, the short bursal duct is unusual; in *C. breviata*, the spermatheca is similar, but the membranous portion of the bursal duct is adherent to the bursa. In coloration and wing venation this species closely resembles *C. diffusa* (Navás, 1927) (*Cintameva*, new combination), described from Argentina, but differs in having a more elongate 9T+ectoproct, smaller bursa and spermatheca, and much shorter bursal and spermathecal ducts (Adams, in press).

Biology: Gut contents of two specimens were moth scales and tiny setae.

Chrysopodes species "a"

Description based on one female, pinned, faded.

Head: Vertex pale, slightly pitted; two prominent interconnected elevated vertex scars posteriorly. Frons pale, clypeus bulging. Genae red-marked. Palpi pale, last maxillary palpomere amber. Antennae pale, unmarked, flagellum with about 71 segments; total length 10.0 mm.

Thorax: Pronotum about as long as wide, yellow, faint indications of pink laterally, setation pale. Meso- and metanotum yellow medially, greenish laterally. Pleura pale. Legs pale with pale setation.

Wings: Venation green, transverse veins of forewing slightly fuscous, lightly brown-margined. Gradates black. Marginal forks dark at forkings. Hindwing venation entirely pale. Forewing costal area extremely wide basally. Intramedian cell triangular. Inner gradate series diverges from outer apically; five inner, seven outer gradates. Hindwing with five inner, 6 outer gradates.

Abdomen: Unmarked, sternites pale. Ninth tergite + ectoproct large, extending far anteriorly (Fig. 84). Seventh sternite with prominent apicomarginal knob. Subgenitale confluent laterally with membranous lobe posterior to seventh sternite; basally with ligulate flap distant from apex and lying in shallow depression (Fig. 86). Bursa with longitudinal wrinkles; bursal glands arise from posterolateral lobes. Bursal duct texture granular, basal portion with diagonal wrinkles; apical portion smooth, confluent with elongate contorted spermatheca (Fig. 85). Spermathecal duct moderately short, black-pigmented basally.

Forewing Length: female, 14.5 mm.

Material: One female from Brazil, Amazonas, AM-010, km 246, 12-VII-1979, J.R. Arias, Malaise trap (INPA).

Species Relationships: Wing shape closely resembles that of *C. conisetosa*, but the widening of the costal area is more extreme, the radial vein is not so strongly arched forward, and the gradate series are not so strongly divergent. Marginal forks are not so deep.

Pronotal setation of *conisetosa* includes fairly long pale setae, and many short, curved light-fuscous setae; in species "a" only the longer pale setae are present. With the availability of more material, these species may prove conspecific. Wing markings are much lighter than in *C. pulchella*, the gradate series more regular, and the female genitalia different. No other species has a similar projecting flap on the subgenitale. Relative lengths of the bursal duct and spermatheca are distinctive, as is the shape of the ninth tergite + ectoproct.

Chrysopodes tetifera Adams and Penny, new species

Original description based on holotype male, pinned, faded.

Head: Vertex diagonal line each side above antennal socket, merging with lateral red band near ocular margin; frons below antennal socket broadly red marked laterally. Genal region very short, apparently unmarked; palpi destroyed. Scape with middorsal brown-black stripe, continuing on pedicel, apicolaterally with brown mark; flagellum pale.

Thorax: Pronotum and medial region of mesonotum densely covered with micropoculae; setation short, sparse. Pronotum about as wide as long, pink laterally, pale medially. Meso- and metascuta broadly brown marked. Pleurae and legs pale.

Wings: In forewing (Fig. P12), all transverse veins and branches of RS, dark; longitudinal veins, especially RS, interrupted with dark at intersections of transverse veins. Stigma pale. Setation black. Hindwing similar, but branches of RS mostly pale. In both wings, 4 branches of RS extend to wing margin; 3 inner, 4 outer gradates. Third gradate cell of forewing 1.65 times as long as wide.

Abdomen: Pale. Male eighth sternite area with teatlike midventral peg (Fig. 87); apex of ninth sternite narrow, upcurved, with delicate setae arising from the sides of stout, conical bases (Fig. 90). Ninth tergite + ectoprocts with apodeme downcurved, ending in blunt projection. Gonarcus wings broad, convergent apically; mediuncus slender, downcurved tip covered with tiny setae; entoprocessus absent (Fig. 88, 89).

Forewing length: 9.0 mm.

Geographical distribution: Known only from the holotype male, which has been damaged by psocids: Brazil, Pará: Oriximiná, Rio Trombetas, Alcoa miner., km 22,26-XI-1982, N. Penny (INPA).

Relationships: The mandibles have not been examined, but the well-developed knob on the eighth sternite and form of the genitalia place this species in *Chrysopodes*. The form of the external genitalia resembles that of *Chrysopodes lineafrons*, but that species is larger, with much more complex wing venation. *C. tetifera* more closely approaches *C. polygonica* in size and coloration of the wings, but lacks the inflated veins of RS in the male, and the genae are much shorter, and not conspicuously dark-marked. The mediuncus is also shorter than in *polygonica*.

Subgenus ***Neosuarius*** Adams and Penny, new subgenus

Type species: *Chrysopa collaris* Schneider 1851.

Mandibles blunt-tipped, asymmetrical. Wings usually slender, gradate series parallel, intramedian cell triangular, six apparent pseudomedial crossveins distal to apex of

intramedian cell. Micropoculae sometimes present, microtholi absent. Males lack gonapsis and tignum. Entoprocessus reduced or absent; gonosetae sparse or absent. Mediuncus usually inflated, microsetose dorsally, with two internal braces. Apodemes of ninth tergite and ectoproct often conspicuously produced and very heavily sclerotized. Females with tubular spermatheca; bursal duct short to extraordinarily elongate.

Members of this subgenus superficially resemble **Suaris** Tjeder 1966, in coloration, wing venation, and in the simple structure of the male genitalia. But **Suaris** was originally defined based upon the lack of tignum and gonapsis. This appears to be the primitive condition for the Chrysopidae; all members of the archaic subfamily Nothochrysinæ are so structured. The tignum and gonapsis have no homologues in other Planipennia, and must be regarded as derived structures. Based upon Tjeder's original limits for **Suaris** the species discussed below would have to be included in it (as would all members of **Chrysopodes**, s. str.). But these species share apomorphic characters not, so far as we are aware, to be found in any Old World **Suaris** species: the distinctively shaped mediuncus and the spermatheca, which never is pillbox shaped with the bursa opening in a vertical slit in the erect vela.

Suaris does have some representatives in South America: **S. argentinus** (Navás) and **S. nesotala** (Banks) (**Chrysopa**) (new combination) are example. Both have heavy dark pigmentation, slender, non-setose mediuncus, well-developed entoprocessus, numerous gonosetae, and typical, pillbox-shaped spermathecae opening directly to the bursa via the vela. It is possible that they are derived from stocks originating from Africa, and may be quite distinct from **Neosuaris**, which we consider to be of New World origin.

Neosuaris includes a large number of species in the Andean region. These are often more or less heavily dark-marked, with sparse and short body and wing setation. Examples all previously in **Chrysopa**, are **C. (N.) escomeli** (Navás); **porterina** (Navás), and **flavescens** (Blanchard) (new combinations). The coloration is probably cryptic; one of these darkly marked species, **C. (N.) escomeli**, has been observed by Stange and B. Miller to roost and oviposit in grotto entrances (pers. comm.). The two species we have redescribed below typify those of moister habitats in having predominantly bright green coloration; both are widespread and common in agroecosystems, and while not yet collected in the Amazon Region, almost certainly will eventually be found to occur there. They may be easily differentiated comparing Figures 91, 99, P13, and P14.

Chrysopodes (Neosuaris) collaris Schneider, 1851

Chrysopa collaris Schneider, 1851, *Monogr. Generis Chrysopae*, p. 80.

Chrysopa thoracica Walker, 1853, *List Neur. Brit. Mus.*, p. 245. Smith, 1931, *Ann. Ent. Soc. Amer.* 24:807 (biology, larva).

Chrysopa thoracica cerverina Navás, 1923, *Ann. Soc. sci. Bruxellas*, 42:171.

Chrysopa krugii Kolbe 1888, *Arch. f. Naturg.*, 54:173.

Chrysopa rufolinea Banks 1914, *Canad. Ent.* 1914:24.

Chrysopa signatalis Banks 1911, *Trans. Amer. Ent. Soc.* 37:342.

Chrysopa acolhua Banks 1948, *Psyche, Cambridge*, 55:156.

Type Material: The type of *C. collaris*, without abdomen (probably male), from Puerto Rico, is in the Berlin Museum of Humboldt University. The type of *C. thoracica*, without abdomen, from Santo Domingo, is in the British Museum, Natural History. Types of *C. thoracica cerverai* (male) from Cuba, of *rufo-linea* (male) from Colombia, of *signatalis* (female) from Texas, and of *acolhua* (male) from Mexico are in the Museum of Comparative Zoology, Harvard University.

Head: Conspicuously red or pink marked (Fig. 91): faint oblique marks bordering upper margins of antennal sockets; stripe near eye margin from genae to posterior vertex; lunules under antennae, narrow transverse band at frontoclypeal suture, lateral marks on clypeus and broad genal stripes. Antennae pale, stout, shorter than forewing, the fifth flagellar segment barely longer than wide. Palpi fuscous.

Thorax: Pronotum short, broad, the anterior margin strongly curved and confluent with lateral margin. A pale middorsal band running length of thorax and abdomen, body laterally dark green; tinged with greenish black on lateral pronotal margins. Pterothorax stout, setation short, pale, downcurved.

Wings: Venation mostly green; sometimes dark in forewing: basal costal crossveins, origin of RS+MA, base of CuP, crossvein 1 cu. Gradates either pale or dark. Wings slender, acute (Fig. P13). About 9 branches of RS extending to wing margin. Gradate series parallel, the third cell about 2.4 times as long as wide; 5-6 inner; 8-10 outer gradates. Hindwing with 3-5 inner, 7-8 outer gradates.

Abdomen: Male sternite 8+9 triangular, the tip rounded and densely setose. Tergite 9+ ectoproct apodeme heavy, giving rise to anteroventrally directed process and posteroventral process (Fig. 92). Gonarcus arms broad, the bridge heavy. Two pointed sclerites arise laterally and turn dorsomedially, entering the mediuncus; in well sclerotized individuals, may be interconnected. Mediuncus triangular, with apical hook-like projection; microsetose dorsally (Fig. 93, 94). Minute gonocristae present. Female bursa large, transversely rugose; wide bursal duct arising laterally, widening in course of several loops, then making transition to thin, highly kinked duct about 4 - 6 cm long, returning on right side and gradually expanding as confluent with elongate portion of spermatheca (Fig. 95). Spermathecal apex widely expanded, with unusually broad ventral invagination which continues past the first bend of the spermatheca (Fig. 96). Subgenitale short-cordate, confluent with membrane connecting it with seventh sternite (Fig. 97).

Measurements: Forewing length 12.7 - 13.7 mm (n=5).

Geographical distribution: This species is wide-ranging through the American tropics. We have seen material from Baja California, Mexico, Texas, Florida, through the Antilles Mexico and Central America, to Colombia, Venezuela, and Guyana. It has not been collected from the Amazon Basin as yet, but is included since we consider it probably to occur there and also because of its abundance and potential importance as a biological control agent.

Species Relationships: Genitally, this species resembles *C. (N.) divisa* (Walker) but is easily recognized by its stout-bodied appearance, more pointed wings, and heavier facial markings.

Chrysopodes (Neosuarius) divisa (Walker, 1853), new combination

Chrysopa divisa Walker, 1853, *List Neuropt. Ins. Brit. Museum*: 243.

Chrysopa transversa Walker, 1853, *ibid.*; 255.

Chrysopa nobregana Navás, 1913, *Broteria (Zool.)* 11: 83.

Chrysopa hesperina Banks, 1915, *Proc. Acad. Nat. Sci. Phila.* 1914: 628.

Chrysopa agatha Navás, 1925, *Mitt. Münch. ent. Ges.* 15: 64.

Chrysopa debilis Navás, 1926, *Mem. Pont. Accad. Nuovi Lincei* 9:107. Alayo, 1968, *Poeyana* B(2):43 (illustrations—wing, genitalia; coloration).

Chrysopa uruguayana Navás, 1927, *Broteria (Zool.)* 24:22.

Chrysopa arequipae Navás, 1929, *Mem. Pont. Accad. Sci. Nuovi Lincei* (2)12: 18.

Chrysopa oglobini Navás, 1931, *Rev. Soc. ent. Argentina* 3:317, fig. 27 (wings).

The types of **C. divisa** (female), **transversa** (male), **agatha** (male) and **uruguayana** (female) are in the British Museum, Natural History. The types of **C. hesperina** (female) and **debilis** are in the Museum of Comparative Zoology, Harvard University. The lectotype by present designation of **C. nobregana** Navás, a male from Santos, Brazil, 28 Aug. 1891, is in the Bavarian State Museum, Munich. The female type and male topotype of **C. oglobini** Navás are in the Zoological Museum, Barcelona.

Head: (Fig. 99). Vertex pale, a red line each side near eye; on frons a red mark extending diagonally from lateral corner of antenna, along margin of antennal fossa; clypeus broadly red-marked; genae with broad red stripe. Antennae pale; fifth flagellar segment about 1.7 times as long as wide. Apical 2 maxillary palpimeres dark fuscous.

Thorax: Green with yellow middorsal stripe; pronotum with faint red-brown lateral stripe. Pronotum in male stout, nearly as wide as head; width about 1.5 times midline length. In male, entire pronotum and mesal region of meso- and metanotum with granular texture indicative of micropoculae. Pleurae and legs pale. Thoracic setation pale; that of legs pale to fuscous.

Wings: Forewing longitudinal veins green; transverse veins all dark at least in part, ranging from black (costals, gradates) to light brown. About 6 branches of RS reaching wing margin (Fig. Pl4). Gradates 5/6; the series subparallel, third cell length about 3.4 times width. Hindwing not very acute-tipped; costals and gradates fuscous, 4/5-6.

Abdomen: Tergites green with dorsal yellow stripe; sternites pale. Male ninth sternite acute-tipped. Ninth tergite-ectoproct apodeme with apical incurved hook, and ventrally directed blunt process below callus cerci (Fig. 100). No gonocristae or gonapsis. Mediuncus flat-triangular, tip blunt, microsetose above; prominent internal braces absent or vestigial (Fig. 101-103). Female bursa small; bursal glands postero lateral, round; bursal canal a flat helical ribbon, about 1 cm long (Fig. 104). Spermatheca elongate, only slightly enlarged at posterior end; spermathecal duct only moderately elongated. Subgenitale (Fig. 105) cordate, with well developed free anterior lip.

Measurements: Forewing length 9.7 - 14 mm, antenna 8.2 mm (N=1).

Geographical Distribution: This species has been recorded from Cuba, Jamaica, Venezuela, Colombia, British Guiana, Peru, Paraguay, Uruguay, Argentina and Brazil, (Bahia, San-

tos, Rio de Janeiro, Nictheroy, Novo Teutônia). We have not seen material from the Amazon basin, but are confident that further collecting will demonstrate its presence there.

Species Relationships: *Chrysopodes (N.) divisa* is quite similar to *C. (N.) collaris* in structure of the male genitalia. The facial markings are similar, but the subantennal and frontoclypeal bands are usually not connected medially. The male pronotum is more elongate, the wings less acute, venation darker, and the gradate cells more elongate. The mediuncus is more flattened, and lacks the very conspicuous pair of internal braces of *collaris*. In the female, the spermathecal apex is not swollen, and the spermathecal canal is much shorter.

Ceraeochrysa Adams, 1982

Ceraeochrysa Adams, 1982, *Neuroptera International*, 2(2): 69.

Type species: ***Chrysopa cincta*** Schneider, 1851.

This genus can best be characterized by structures of the male genitalia. There is no tignum, pseudopenis, microtholi, nor micropocule. The gonapsis is elongate. The gonarcus normally has elongate horn-like processes, and the tip of the mediuncus often bears a hook flanked by lateral lobes. The apodemes of the ninth tergite+ectoproct may be produced forming protruding hooks or lobes. Sclerotization of the gonapsis and apodemes with maturation, as may the shape of the mediuncus, to a lesser degree. The female spermatheca is elongate, opening into the bursa by a dorsal longitudinal slit, but elaborately developed bursal ducts are not encountered. Mandibles are blunt-tipped. Typical coloration may include one or more scape stripes; genae are usually unmarked. The pronotum, as with most neotropical chrysopids, most often bears two red stripes. Antennal length varies, but in some species may be nearly 150 percent of wing length.

Adams (1982b) reports 24 species in this genus, most of which are restricted to the Neotropical Region, from Florida, Texas, and Mexico, to Argentina. Within the Amazon Basin 15 species have been collected. The following key may prove helpful in initial sorting of specimens, but dissection of male genitalia is essential for reliable identification.

KEY TO AMAZONIAN SPECIES OF **CERAEOCHRYSA**

- 1a. Scape longitudinally striped ----- 2.
- 1b. Scape pale or banded dorsally ----- 9.
- 2a. At least one scape stripe middorsal or laterodorsal ----- 3.
- 2b. Scape stripe lateral ----- 8.
- 3a. Apical maxillary palpomeres dark; 1 vein from third medial cell to wing margin; male with clasper-like processes on apex of ninth sternite ----- 4.
- 3b. Maxillary palpomeres pale; usually two veins from third medial cell to wing margin; male ninth sternite without such modifications ----- 5.
- 4a. Mesonotum with 2 dark spots; flagellum dark; scape stripe black ----- **scapularis**.
- 4b. Mesonotum unmarked; flagellum pale; scape stripe red ----- **cubana**.
- 5a. Mesonotum with dark marks; stripe not extending to scape base; male unknown ----- **rafaeli**.

- 5b. Mesonotum unmarked. Scape stripes often extending onto antennal fossae; males with hook-like apodeme from ninth tergite + ectoproct ----- 6.
- 6a. Gonarcus horns extend two thirds length of mediuncus; basal mediuncus sclerite divided medially, bearing apical spurs ----- **caligata**.
- 6b. Gonarcus horns short; basal mediuncus sclerite entire, without horns ----- 7.
- 7a. Mediuncus undivided; gonapsis with apical horns ----- **claveri**.
- 7b. Mediuncus with discrete basal sclerite bearing blunt spines dorsally; gonapsis without apical horns ----- **cincta**.
- 8a. Flagellum black; male ectoproct produced ventrally, almost encircling abdomen; mesonotum yellow in life ----- **sanchezi**.
- 8b. Flagellum pale; scape stripe often obscure; male ectoproct not so produced; mesonotum green ----- **everes**.
- 9a. Legs black-marked; scape with basodorsal black band ----- **nigripes**.
- 9b. Legs and scape pale ----- 10.
- 10a. Flagellum dark; gonapsis with scythe-like projection ----- **falcifera**.
- 10b. Flagellum pale; gonapsis otherwise ----- 11.
- 11a. Mesoscutum dark-marked; male gonocristae on conspicuous protuding ear-like lobes ----- **michaelmuris**.
- 11b. Mesoscutum immaculate; male gonocristae otherwise ----- 12.
- 12a. Genae dark-marked; basal mediuncus sclerite two-horned ----- 13.
- 12b. Genae pale ----- 14.
- 13a. Gonarcus horns vestigial, hardly longer than wide ----- **ariasi**.
- 13b. Gonarcus horns nearly as long as mediuncus ----- **tenuicornis**.
- 14a. Flagellar segments rather stout and heavily setose (segment 5 about 1.25 times as long as wide); abdominal apex of female acute; male unknown ----- **acutipuppis**.
- 14b. Flagellar segments slender ----- 15.
- 15a. In forewing, branches of RS pale; male ninth sternite bulging apically, with dentate apicolateral lobes ----- **squalidens**.
- 15b. In forewing, branches of RS dark; male ninth sternite tapering to acute tip, not bulging nor with apicolateral lobes ----- **reddyi**.

Ceraeochrysa cincta (Schneider, 1851)

- Chrysopa cincta** Schneider, 1851, *Symbolae ad Monographiam generis Chrysopae*, p. 86.
- Ceraeochrysa cincta** (Schneider) Adams, 1982, *Neuroptera International*, 2(2): 70.
- Chrysopa bilineata** Navás, 1914, *Anns. Soc. scient. Brux.*, 38:91.
- Chrysopa lafonei** Navás, 1914, *Broteria* 12:222.
- Chrysopa incalis** Banks, 1915, *Proc. Acad. nat. Sci. Philad.*, 66:627.
- Chrysopa bicarnea** Banks, 1920, *Bull. Mus. comp. Zool., Harv.*, 64:338.
- Chrysopa advena** Navás, 1922, *Broteria (Zool.)*, 20:51.
- Chrysopa bessona** Navás, 1922, *Estudios, Revta. Acad. Literaria Plata*, 22:361.
- Chrysopa habana** Navás, 1922, *Broteria (Zool.)*, 20:52.
- Chrysopa mestiza** Navás, 1924, *Revta. R. Acad. Cienc. exact. fis. nat. Madr.*, 21:330.

- Cintameva bina* Navás, 1924, *Revta. Acad. Cienc. exact. fis. nat. Madr.*, 21:331.
Nodita bina (Navás) Alayo, 1968, *Poeyana*, 2:51.
Chrysopa villosula Navás, 1924, *Revta. R. Acad. Cienc. fis. nat. Madr.*, 21:337.
Chrysopa cornuta Navás, 1925, *Mitt. münch. ent. Ges.*, 15:65.
Chrysopa alternans Navás, 1933, *Revta. R. Acad. Cienc. fis. nat. Madr.*, 30:306.
Chrysopa wollebaeki Esben-Petersen, 1934, *Nyt Mag. Naturvid.*, 74:291.
Chrysopa iona Banks, 1944, *BoIn. Ent. venez.* 3:12.
Chrysopodes sallei Banks, 1946, *Psyche, Camb.*, 52:171.

Holotype males of *C. bicarnea*, *C. bina*, *C. incalis*, *C. iona*, and *C. sallei*, holotype female of *C. mestiza*, and holotype without abdomen of *C. villosula*, in the Museum of Comparative Zoology, Harvard University. Holotype males of *C. advena*, *C. cornuta*, and *C. lafonei* in the Paris Museum. Holotype male of *C. alternans* in the Museum of Humboldt University, Berlin. Holotype female of *C. bilineata* in the British Museum (Natural History). Holotype female of *C. bessona* in the La Plata Museum, Argentina. Holotype of *C. wollebaeki* in the Oslo Museum. Type of *C. habana* not located, but Navás-identified Cuban specimens in the Cervera Collection, Harvard.

Present description based upon numerous specimens from throughout the range, with emphasis on Amazonian material.

Head: Vertex pale green medially, moderately elevated. Frons whitish yellow to pale green, genae white; both unmarked. Maxillary palpi pale. Antennae pale yellow becoming somewhat darker apically, in Amazonian material with one red to dark brown longitudinal dorsal line on scape and pedicel; about 102 to 112 flagellomeres.

Thorax: Pronotum pale green with narrow red stripe laterally from anterior to posterior margin. Meso- and metanota green, unmarked; pleural areas pale, unmarked. Legs pale.

Wings: Venation (Fig. P15) pale greenish yellow to stramineous, with some crossveins darkened; radials dark with pale ends. Costal area slightly narrower than area between R and Rs+MA. Pterostigma pale green. Forewing intramedian cell elongate triangular, reaching Psm after first ma-mp crossvein. Three to five inner, eight to nine outer, gradate crossveins, the series parallel, cells short. Two veins from hind margin of third median cell. Hindwing with two to three inner and seven to eight outer gradate crossveins.

Abdomen: Yellow to pale green, unmarked. Male and female tergites cover most of dorsum. Male ninth tergite + ectoproct in mature individuals with heavily sclerotized apodeme bearing posteriorly directed hook (Fig. 106). In teneral individuals, only the tip of the hook is present on the membrane between the tergites and sternites (Fig. 109, right) and the subdivision of mediuncus sclerites (vide infra) is not apparent. Gonarcus with flattened lateral apodemes, two caudally-directed horns, varying from long to very short (Fig. 107). Entoprocessus elongate, extending below mediuncus and curved mesad. Mediuncus with a transverse basal sclerite having ventrally projecting corners, and frequently two small conical caudally directed spines; apical mediuncus sclerite subtriangular, with ventrally directed apical hook. A field of tiny gonocristae laterally to gonarcus, arranged in rows; gonocristae at apex of ninth sternite conspicuous, red-brown. Gonapsis long, slender, without apical horns or projections (Fig. 108). Female subgenitale with

ventral invagination; lip does not project outward; area between subgenitale and seventh sternite enlarged and heavily sclerotized in mature individuals, with transverse lip (Fig. 112-113). Transversely wrinkled bursa is confluent with short, u-shaped spermatheca; spermathecal duct moderately short, with expanded interval at end (Fig. 110). Bursal gland on main cavity of copulatory bursa (Fig. 111).

Forewing length: male, 13.1 - 15.2 mm; female, 13.7 - 14.2 mm.

Intraspecific variation: Coloration of this species is extremely variable over its extensive range. The scape can bear a single longitudinal line, two longitudinal lines, or a single subapical spot (Amazonian specimens have the single line). The flagellum may be either pale or black but is pale in most South American specimens. Pronotal markings can vary from the normal two longitudinal, lateral lines to three dark spots in Peruvian specimens, to two lateral spots in Bolivian and Uruguayan specimens. Geographical distribution: Schneider described this species from Brazil. It has been recorded (under various names) from the following countries: southern United States, Cuba, Mexico, Guatemala, Panama, Galapagos Islands, Guiana, Surinam, Brazil, Peru, Uruguay, and Argentina. We have not seen specimens from the Amazon Basin, but in view of its wide distribution throughout the American tropics and its abundance in agroecosystems, we have considered it appropriate to include its description.

Species relationships: The synonyms listed for this species are those of Adams (1982b). As noted above, this is quite a variable species, although the very complex male mediuncus is much more stable than coloration. Closely related to *C. cincta* is *C. claveri*, which can be separated on the basis of its dark antennae, darker postapical marginal vein of hind wing, and the form of the male genitalia, with horns at apex of gonapsis and undivided triangular mediuncus. Because of variation in coloration in these two species identifications to be reliable must be based upon examination of male genitalia. *C. caligata* cannot be distinguished on non-genitalic characters. This species has longer spines on the medially desclerotized basal mediuncus sclerite, and a wider gonapsis. Until we have seen specimens of *C. cincta* and *C. caligata* collected sympatrically, we must entertain the possibility that *caligata* may be a geographic variant of *cincta*.

Biology: We have collected this species abundantly in citrus and banana plantations in Honduras, and consider it a prime candidate for use in biological control.

***Ceraeochrysa caligata* (Banks, 1946)**

Chrysopa caligata Banks, 1946, *Psyche, Camb.*, 52:154.

Ceraeochrysa cincta Schneider, Adams, 1982, *Neuroptera International*, 2(2):70.

Holotype male, from "P. Cabello, VI-11-08, Ven", in Museum of Comparative Zoology Harvard. Banks (1946) lists the locality as "Puerto Cabello, Panama, 11 June, Englehart."

Description based upon holotype, specimens from Barro Colorado Island, Panama, and numerous specimens from Brazil.

Head: Unmarked; palpi pale. Scape with middorsal red-black to black stripe, extending to pedicel and antennal fossa; flagellum pale.

Thorax: Pronotum short, green with lateral red stripes. Meso- and metanotum green unmarked.

Pleurae pale, legs pale.

Wings: Not distinguishable from those of *C. cincta*.

Abdomen: Apodeme of ninth tergite + ectoproct lightly to very heavily sclerotized, projection quite long, straight, with blunt, upturned end (Fig. 115). Ninth sternite apex deeply cleft; gonocristae very small; gonapsis elongate, moderately broad, without spines or processes at caudal end (Fig. 118). Gonarcus apodemes slender; entoprocessus elongate slender, encircling base of mediuncus. Gonarcus horns straight, extending about 2/3 length of mediuncus (Fig. 116, 117). Basal horn-bearing sclerite of mediuncus divided medially; horns divergent at about 45° , sharply tapered to acute tip. Mediuncus with tip hooklike. Gonosaccus with only a few short setae; membrane of gonosaccus and laterally to gonarcus with numerous tiny gonocristae in transverse rows. Female with subgenitale bearing distinctly protruding median lip (Fig. 120, 121). In teneral specimens subgenitale well set off from membranous area; in mature individuals confluent with membranous area which bulges and is moderately sclerotized. Copulatory bursa large (Fig. 119), marginal area leading to end of spermatheca distinct from remainder of bursa; bursal gland ducts opening dorsolaterally. Spermatheca elongate, U-shaped with ventral invagination reaching to level of bend; becoming thicker-walled with age (Fig. 123, 124).

Forewing Length; male, 13.5 - 16 mm.

Geographical Distribution: Type material is from Panama; Banks (1948) records this species from Mexico, but this has not been verified by genitalic examination. Brazilian material:

Amazonas (all INPA): Manaus, 25-IX-1976, 1 male; 30-IX-1976, 1 male; 6-XI-1976, 1 male; 8-XI-1976, 1 male, 3 females; 11-XI-1976, 2 males, 2 females; 27-XI-1976, 1 male, 3 females; 29-XI-1976, 1 male, 1 female; 13-XII-1976, 1 male, 2 females; 17-XII-1976, 1 female; 20-XII-1976, 1 adult; 13-I-1977, 1 adult; 9-VIII-1978, 1 female, N. D. Penny. Manaus, INPA, 25-V-1976, Paraluppi, 1 male; 18-II-1976, A. P. A. Luna Dias, 1 female; 23-X-1979, 1 adult; 2-VI-1983, 1 male, J. R. Arias. Reserva Ducke, 15-X-1981, J. A. Rafael, 1 female; AM-010 KM 246, 13-14-VII-1979, 2 adults, J. R. Arias. **Pará**, Belém, Utinga, 16-I-1980; M. F. Torres, 1 male (MPEG); Oriximiná, Rio Trombetas, Alcoa miner., M. Branco, 19-19-XI-1982, Binda and Vidal, Malaise trap, 1 male, 1 female. Araguaia, 19-24-I-1983, N.D. Penny, 1 adult.

Species Relationships: This species is not distinguishable from *Ceraeochrysa cincta* on non-genitalic characters. The female genitalia differ only slightly: the spermatheca is more elongate in *caligata*, and the lip of the subgenitale more prominent. These differences are not sufficiently distinctive to be useful in identification. The male genitalia are extremely similar, differing in the shape of the projection of the ninth tergite apodeme, which is curved for its entire length in most *cincta*, and especially in the longer gonarcus horns. The basal mediuncus sclerite is usually split on the midline, with hooks emerging from the apicolateral corners; in *cincta* the horns are borne near the midline of a single transverse sclerite, which has projecting, downcurved corners. Sclerotization of the mediuncus is highly variable in *C. cincta*, and Panamanian material of this species was initially regarded as probably representing a local variation or developmentally deviant population, resulting in synonymy of *caligata* with *cincta* (Adams,

1982). The appearance of this morphotype in Brazil is good evidence that *caligata* constitutes a genetically distinct population; but as yet we have not seen material of this species collected sympatrically with *cincta*.

Ceraeochrysa claveri (Navás, 1911)

Chrysopa claveri Navás, 1911, *Annls. Soc. scient. Brux.*, 35:270.

Chrysopa silvana Navás, 1913, *Broteria*, 11:89.

Chrysopa deficiens Navás, 1930, *Revue russe Ent.*, 24:194.

Cintameva siberica Navás, 1930, *Revue russe Ent.*, 24:195.

Chrysopa haitiensis Smith, 1931, *Ann. ent. Soc. Am.*, 24:806.

Chrysopa adoína Banks, 1946, *Psyche, Camb.*, 52:151.

Chrysopa inexpectata Alayo, 1968, *Poeyana*, 2:42.

Holotype male of *C. adoína* in United States National Museum, Washington. Holotype male of *C. haitiensis* in Museum of Comparative Zoology, Harvard University. Lectotype male *C. claveri* and holotype male of *C. silvana* in Paris Museum. Holotype male of *C. deficiens* and holotype female of *C. siberica* in Barcelona Museum. Holotype female of *C. inexpectata* in Instituto de Biología, Havana, Cuba (not seen).

Present description based on 6 males, 11 females, 1 without abdomen.

Head: (Fig. 125, 126). Vertex yellow to pale green, with short reddish to dark brown or black line extending caudally from antennal base. Frons and genae pale, unmarked; maxillary palpi pale. Antennal scape and pedicel yellow, with one or more rarely two dorsal red to black stripes; flagellum becoming dark fuscous apically. About 121 to 124 flagellomeres.

Thorax: Pronotum yellow to pale green medially, with narrow longitudinal red stripe laterally from anterior to posterior margin; margin darker green. Meso and metanota green, unmarked. Pleural areas pale, unmarked. Legs pale.

Wings: Venation (Fig. Pl6) in both wings pale greenish yellow, with some crossveins darkened; radials dark, pale at ends. Gradate crossveins somewhat darkened, without margining. Costal area slightly narrower than area between R and Rs+MA. Pterostigma pale green. Intramedian cell elongate triangular, reaching Psm after first ma-mp crossvein. Three to six inner, five to eight outer, gradate crossveins, the series parallel, cells short. Two veins from third median cell to wing margin, of which one may arise from near the apex of the cell. Hindwing with one to inner and six to seven outer gradates.

Abdomen: Yellow to pale green, unmarked. Male and female tergites cover almost entire dorsum. Male ninth tergite and ectoproct apodeme with caudally directed horn, in mature specimens (Fig. 127). Gonapsis elongate, slender, with posterolateral acutely pointed (Fig. 130). Gonarcus with elongate apodemes, projecting upward to sharp corners; dorsal horns short, conical; entoprocessus elongate, prominent; mediuncus triangular in dorsal view, not subdivided, no dorsal spines or horns; apical hook flanked by small lobes (Fig. 128, 129). Gonosaccus with a few elongate gonosetae; a field of gonocristae each side of gonarcus; conspicuously developed gonocristae at apex of ninth sternite. Subgenitale with small median incision, confluent with sclerotized area between subgenitale and

seventh sternite; this area with prominent transverse lip (Fig. 132, 133). Spermatheca moderately elongate, U-curved, with elongate ventral invagination, terminus of duct enlarged (Fig. 133). Bursa transversely wrinkled dorsally; ventrally with ruffled margin extending to end of spermatheca. Spermathecal gland ducts open posteriorly on bursa (Fig. 134).

Forewing length: male, 13.0-13.7 mm; female, 12.5 - 14.0 mm.

Intraspecific variation: Either one or two scape stripes may be present; in most non-Amazonian populations there is a single stripe only. The flagellum is usually black in non-Amazonian populations.

Geographical Distribution: The type is from Colombia; this species has been recorded under various names from the following countries: Mexico, Cuba, Haiti, Guatemala, Panama, Honduras, Puerto Rico, Colombia, Guiana, Surinam, Trinidad, and Brazil. Within the Amazon Basin, records are from Brazil, Amazonas (INPA collection): Manaus, 25-IX-1976 to 8-III-1977, N. D. Penny, 5 males, 7 females; Manaus, INPA campus, 16-VI-1976, A. P. A. Luna Dias, 1 female; Manaus, INPA campus, 18-IV-1977, 1 male, 29-VII-1977, 1 female, N. D. Penny; Manaus, 13-VIII-1978, N. D. Penny, 1 male; Manaus, 9-VIII-1978, N. D. Penny, Reserva Ducke, AM-010, km 26, 24-IX-1976, N. D. Penny, 1 female; AM-010, km 246, 12-13-VII-1979, J. R. Arias, 1 female, 1 without abdomen; São Gabriel da Cachoeira, 5-12-VII-1980, N. D. Penny and J. E. B. Brasil, 1 male; BR-174, km 31, 30-IV-1976, I. S. Gorayeb, 1 female. **Pará:** Rio Trombetas, Cruz Alta, 17-19-XI-1982, J. E. B. Brasil and J. Vidal, 1 male (INPA).

Species Relationships: The listed synonyms are those of Adams (1982b). This species is closely related to *C. cincta*, and is reliably separable only on characters of the male genitalia.

Biology: We have taken *C. claveri* abundantly in citrus and banana plantations in Honduras (Adams, unpub.) Smith (1931) illustrates the larva, which was collected on citrus in Haiti. We consider it probable that this species will prove important in biological control of pests in tree crops.

Ceraeochrysa cubana (Hagen, 1861)

Chrysopa cubana Hagen, 1861, *Smithson. misc. Collns.*, 4:215.

Chrysopa tolteca Banks, 1901, *Trans. Am. ent. Soc.*, 27:364.

Chrysopa venularis Navás, 1913, *Ent. Zeitschr.*, Frankfurt, 27:20.

Chrysopa epeba Navás, 1924, *Revta. R. Acad. Cienc. exact. fis. nat. Madr.*, 21:328.

Chrysopa seminole Banks, 1924, *Bull. Mus. comp. Zool., Harv.*, 65:432.

Chrysopa freemani Smith, 1931, *Ann. ent. Soc. Am.*, 24:811.

Chrysopa imbecilla Navás, 1914, *Annls. Soc. scient. Brux.*, 38:307.

Chrysopa damiensis jamaicensis Banks, 1941, *Mems. Soc. cub. Hist. nat. "Felipe Poey"*, 15:394.

Chrysopa albatata Banks, 1913, *Proc. ent. Soc. Wash.*, 15:139.

Holotype females of *C. damiensis jamaicensis*, *C. seminole*, and *C. tolteca*; holotype male of *C. freemani*; and holotype (abdomen missing) of *C. albatata* in the Museum of

Comparative Zoology, Harvard University. Holotype male of *C. imbecilla* in the British Museum, Natural History, London. Holotype female of *C. venularis* in the Munich Museum. Holotypes of *C. cubana* and *C. epheba* not found.

Neotype Designation: Pinned male, from Soledad, near Cienfuegos, Cuba, 6-20-VIII, N. Banks, collector, "cubana" (Banks' determination). Museum of Comparative Zoology Harvard.

Head: Vertex yellow to pale green, unmarked. Frons and genae pale, unmarked. Maxillary palpi black on apical two segments. Flagellum pale yellow to green, becoming somewhat darker apically (black in most non-Amazonian populations); about 77 to 80 flagellomeres; a single narrow red to brown or black line on middle of dorsal surface of scape and pedicel.

Thorax: Pronotum short, pale green, with broad lateral red to brownish stripe, thinner at ends to almost oval in shape. Meso- and metanota green, unmarked. Pleural areas pale. Legs pale.

Wings: Venation (Fig. P17) pale greenish yellow to stramineous, with all crossveins dark. Intramedian cell elongate triangular, reaching Psm after first ma-mp crossvein. Two to five inner, five to six outer gradate crossveins. Forewing gradate series parallel, the cells moderately elongate. A single vein from hind margin of third median cell to hind margin. Hindwing with two to three inner and four to six outer gradates.

Abdomen: Yellow to pale green. Male and female tergites cover almost entire dorsum. Male abdomen with greatly enlarged spiracles and interior spiracular atria. Ninth tergite + ectoproct forming blunt forceps, without projections of apodemes (Fig. 135). Apex of ninth sternite bears ventral, medially curved short spinose-tipped arms; above these a pair of rounded spinose lobes; more dorsally, from the membrane, each side with a pair of spinose processes (Fig. 135, 138). Gonapsis elongate, enlarged at apex of ninth sternite; apex projecting posteriorly, with spatulate tip. Gonarcus very broad, with projection on dorsal margin, sometimes developed into large bulbous appendage; horns unusually elongate, straight, and extending ventrally from the small ligulate entoprocessus (Fig. 136, 137). Mediuncus elongate, apically very narrow, tip acute, ventrally curved; tip usually found tucked into conical sac dorsal to gonosaccus. Gonosaccus with many long gonosetae. Female subgenitale elongate-cordate; bursa small, smooth, with about 6 longitudinal folds; spermatheca slender, somewhat widened dorsoventrally at base of duct; bulb at end of spermathecal duct unusually enlarged. No bursal glands (Fig. 139).

Forewing length: male, 9.7 - 10.5 mm; female, 10.2 - 11.7 mm.

Geographical Distribution: Hagen's type was from Cuba. Other records, under various names, are from: Jamaica, Cayman Islands, southern United States, Barbados, Haiti, Puerto Rico, Mexico, Venezuela, Guiana, Surinam, and Brazil (Santarém). Within the Amazon Basin this species has been collected at Brazil, Rondônia: Porto Velho, 24-III-1979, D. Need, 1 male (INPA); Porto Velho, 3-X-1979, J. Kopp, 1 female (INPA). Amazonas. Manaus: 22-XI-1976, N. D. Penny, 1 male (INPA); 17-XII-1976, N. D. Penny, 1 female; 5-III-1977, N. D. Penny, 1 female (INPA); 20-III-1977, B. C. Ratcliffe, 1 male (INPA); 19-IV-1983, N. D. Penny, 1 male, 1 female (INPA); 10-VIII-1983, N. D. Penny, 2 females (INPA); 7-VI-1983;

N. D. Penny, 1 male (INPA); 13-V-1982, J. A. Rafael, 1 female (INPA); INPA campus, 4-V-1977, A. P. A. Luna Dias, 1 male (INPA). AM-010, km 132, 29-IV-1977, L.P. Albuquerque, 1 male (INPA). Itacoatiara, km 132, 29-IV-1977, Lindalva, female (INPA). **Roraima**: Boa Vista, 10-VII-1977, N. D. Penny, female. **Pará**: Paragominas, 19-V-1978, F.F. Ramos, 1 without abdomen (MPEG); Caibé Vigia, 24-III-1968, J. Barata, 1 male (MPEG); Oriximiná, Rio Trombetas, Alcoa miner., km 22, 26-XI-1982, N. D. Penny, 1 female.

Species Relationships: The listed synonymies are those of Adams (1982b). The combination of short pronotum with broad stripes, dark-tipped palpi, dark crossveins, and single vein from third medial cell to wing margin quickly distinguishes this species group from others known from the Amazon Region. *C. scapularis* (Navás) in South America can be distinguished from *cubana* by its black flagellum, black mesonotal spots, and much darker wing venation. Another relative is *C. valida* (Banks, 1895) which ranges from the southern United States to northern South America; females of these two species cannot reliably be separated on any characteristics applying throughout the range of both. Local populations may be distinguishable based upon color of flagellum and scape stripe, once a determination of the occurrence of these characters has been verified by dissection of a series of males of each. Usually males of *C. cubana* can be separated from those of *valida* without dissection, as the apical arms of the ninth sternite are conspicuous even in dried material of *cubana*, but absent in *valida*. In *C. valida*, a heavily sclerotized spiny dorsally directed lobe arises posterolaterally from the ninth sternite, the ectoprocts project downward, and the spiracles are usually of normal size. The mediuncus of all three species will stubbornly resist being withdrawn from the gonosaccus during dissection, but fortunately this is not necessary for routine determination.

Biology: The type of *C. freemani* was taken at a porch light in an orange grove. We have collected this species abundantly in Honduras, around citrus plantations. It was only occasionally taken on citrus trees, but seemed to prefer hedgerows of native vegetation, and areas of low herbaceous vegetation. On one occasion, it was displaced from such a field by cultivation, and occurred in the remaining vegetation at the edge of the field, in swarms of hundreds. At night, we have observed it, apparently feeding, on grass flowers (Adams, unpub.).

Ceraeochrysa scapularis (Navás, 1914)

Chrysopa scapularis Navás, 1914, *Annls. Soc. scient. Brux.*, 38:44.

Holotype, without abdomen, from "Santarem", in British Museum, Natural History. Present description based on 7 females, pinned; 5 males, 7 females in alcohol.

Head: Vertex yellow green, face light yellow, short. No genal marks. Antennae with black flagellum, pedicel black-ringed; scape broadly black-striped dorsolaterally; a small triangular pink mark above base of stripe, in antennal fossa. Apical maxillary palpimere mostly black, fourth palpimere light brown, palp otherwise pale.

Thorax: Bright green dorsally. Pronotum short and broad, with wide lateral red-brown stripe. Mesoscutum with small black dot at margin of prescutum (Fig. 140). Pleurae and legs pale.

Wings: Most longitudinal veins green, transverse veins of forewing black, frequently black-bordered. Black spot on tegula, base of A1, and on anterior surface of auditory organ. Radial sector and its branches very dark in forewing, mostly dark in hindwing. Venational pattern as in *C. cubana* (Fig. P18). Costal area narrow; 2-4 inner, 4-6 outer gradates in forewing; 1-3 inner, 3-5 outer gradates in hindwing. A single vein from third cubital cell to wing margin.

Abdomen: Bright green above, pale below, setation pale. Male genitalia closely resemble those of *cubana*. The group of spines immediately dorsal to curved arms of ninth sternite are separate at the base, not raised on a common pedestal. The gonarcus horns, seen in lateral view, are shorter, stouter, and strongly curved (Fig. 142). Laterally to gonosaccus, a field of tiny gonocristae formed as clusters of 4-5 small spines. There is no inflated process on dorsal margin of gonarcus (Fig. 141). Female genitalia as in *C. cubana*.

Forewing length: male, 8.9-9.6 mm; female, 9.4-10.4 mm.

Geographical Distribution: Brazil, **Pará:** Santarém (holotype). **Roraima:** Boa Vista, 10-VII-1977, N. D. Penny, 3 females (INPA). Colombia: Puerto Wilches, 1984, oil palm plantation Camilo S. Vargas S., 5 males, 11 females (PAA, USNM).

Species Relationships: This species was erroneously synonymized with *C. cubana* (Hagen) by Adams, 1983, based upon examination of the type, which was without abdomen. Through the kindness of Oliver Flint, examination has been possible of the Colombian specimens, which are sympatric with *cubana*; these demonstrate conclusively the distinctness of these species. *Chrysopa freemani* Smith, from Hispaniola, has similar mesonotal markings, and may prove conspecific with *scapularis*.

This species is easily distinguished from *C. cubana* by the presence of dark spots on the mesonotum and wing base, dark Rs, and black flagellum (in some populations of *cubana* a black flagellum is present). The curvature of the gonarcus horns is also distinctive.

***Ceraeochrysa acutipuppis* Adams & Penny, new species**

Original description based on one female, pinned.

Head: Vertex green medially, laterally ivory. Frons pale green, genae ivory, both unmarked. Maxillary palpi pale. Scape short, green, unmarked; pedicel unmarked; flagellum pale, rather stout, with conspicuous black setation, fifth segment length about 1.25 times width.

Thorax: Pronotum bright green, with lateral brown stripe not reaching posterior margin; broad, width nearly twice midline length. Meso- and metanotum uniformly bright green. Setae of nota short, amber to fuscous. Pleurae whitish green, with longer, pale setae. Legs pale green, setae short, pale to amber.

Wings: Venation (Fig. P19) green; forewing with transverse veins lightly fuscous: costals basal radial crossveins, base of Rs+MA and ma-mp crossvein, gradates, cubital crossveins ends of CuP₂, 1A₁ and 2, 2A. Setation fuscous to black, rather short on base of wing; length equal about 1/2 width of a cell near wing apex. Four inner, seven outer gradates the series parallel, third gradate cell length equals about 2.6 times width. Hindwing

acute; four inner, seven outer gradates.

Abdomen: Bright green dorsally, whitish green below. Setation heavy, dense, amber to fuscous. Intersegmental and pleural membranes densely microtrichiated. Apex acute, slender. Seventh sternite posterior margin with setal bases bearing short spines anteriorly (Fig. 145). Subgenitale short, discrete, posterior lobes domed, with microtextured surface extending onto exterior face; anterior margin obtusely angulate (Fig. 146). Membrane between subgenitale and seventh sternite thin, smooth. Copulatory bursa small, slender, adherent to spermatheca; bursal glands attached midlaterally (Fig. 143). Spermatheca elongate, ends recurved; posterior end expanded rapidly, with shallow ventral invagination on ventral face; bursal duct arising from posterior margin of terminal expansion (Fig. 144).

Forewing Length: 13.4 mm.

Type Material: Holotype female from Brazil, Roraima, Boa Vista, 10-VII-1977, Norman D. Penny (INPA).

Species Relationships: Wing venation and shape are similar to those of *C. cincta* and relatives. The stout antennae, and heavier setation, as well as lack of head or antennal markings, are distinctive. The acute abdomen, peculiar setal bases, and shape of subgenitale are unique.

Biology: The gut contains a few setae, and one fungal structure.

***Ceraeochrysa rafaeli* Adams and Penny, new species**

Original description based on 1 female, pinned.

Head: Vertex green, unmarked. Frons and genae creamy yellow, unmarked. Maxillary palpi yellow. Scape and pedicel yellow, with reddish black dorsal stripe paralleling inner margin, not extending into antennal fossa; flagellum pale yellow, length, 15.0 mm, the fifth segment approximately three times as long as wide.

Thorax: Bright green, with broad longitudinal reddish black stripe laterally from anterior to posterior margin. Meso- and metanotum bright green; mesonotum with two small reddish black spots at anterolateral corner of prescutum and two larger spots more posteromedially on scutum, opposite posterior margin of prescutum (Fig. 147). Pleural areas greenish white, unmarked. Legs green, without markings.

Wings: Venation (Fig. P20) green, with many transverse veins of forewing darkened: basal costals (black), radial crossveins, gradates, most pseudocubitals, and posterior marginal forks. Gradate crossveins without margining. Costal area slightly narrower than radial area. Intramedian cell elongate, triangular, apex reaching Psm after first ma-mp crossvein; two veins from third median cell to wing margin. Four to five inner, seven outer gradate crossveins; the series parallel, cells elongate, third cell about 3.4 times as long as wide. Hindwing with RS dark; three inner and six outer gradates.

Abdomen: Bright green above, greenish white laterally and ventrally, unmarked. Female seventh sternite lightly sclerotized, with flattened apex. A ligulate, smooth sclerite on membrane of eighth segment, between spiracle 8 and sternite VII (Fig. 148). Subgenitale very broad, caudal lobes confluent with margin laterally; a conical ventromedian pocket

opens into a slight depression. Area between subgenitale and seventh sternite heavily sclerotized, smooth, projecting as a ridge with prominent lateral corners (Fig. 148, 149). Bursa large, dorsal surface with about 7-8 transverse pleats; bursal glands open mid-laterally, their ducts moderately short. Spermatheca elongate, arched dorsad, opening to bursa via a wide dorsolongitudinal slit (Fig. 150); spermathecal duct tightly kinked, ending in a swollen terminal bulb.

Forewing Length: 12.2 mm.

Geographical Distribution: the holotype female is from Brazil, Amazonas, campus, Univ. of Amazonas, 22-VI-1982, J. A. Rafael, Malaise trap (INPA).

Species Relationships: These are uncertain, as the male is not known. Several other species of *Ceraeochrysa* have dark spots on the pteronota. *Ceraeochrysa cubana* has dark apical maxillary palpomeres, a single vein from the third median cell to the wing margin, and shorter gradate cells, as well as genitalic differences. Brazilian material with mesonotal spots have black flagella and more extensive, darker scape stripes. *C. michaelmuris* has mesoscutal spots, but lacks the scape stripe; the transverse veins are also darker.

Two other specimens, from Brazil, Acre, Cruzeiro do Sul, Ilha Florianopolis, 12-17-V-1981, Norman & Elias (INPA) and Pará, Tucuruí, Rio Parekamen, 16-20-VII-1983, eq. J.R. Arias (INPA) are similar to *C. rafaeli*, but differ in larger size (forewing length, 14.7 mm), shorter flagellar segments (length of fifth segment about 1.25 times width), shorter gradate cells (length of third cell about 1.85 times width), and paler venation; all the marginal forks, and most pseudocubitals; pale. We consider them probably to belong to a different species, but due to the missing abdomens, we refrain from presenting a formal description.

This species is named for Jose Albertino Rafael, who has kindly contributed much material of Neuroptera for study in preparation of this series of publications.

***Ceraeochrysa reddyi* Adams and Penny, new species**

Description based on 1 male, in alcohol.

Head: Traces of probable red pronotal stripes, otherwise thorax and legs pale.

Wings: (Fig. P21). In forewing all transverse veins dark; branches of RS distal to psm end dark, pale at bases. Three inner, 5-6 outer gradates, the series parallel, third gradate cell about twice as long as wide. Hindwing acute; veins pale except costals and gradates dark; gradates 2/5-6.

Abdomen: Pale. Male without projecting apodemes or modifications of ninth sternite apex short (about 1/3 length of sternite 8+9), flat, widened at base; gonocristae absent (Fig. 154). Gonarcus wide at bridge; horns stout, of medium length, entoprocessus tiny. Mediuncus elongate, inflated, sharply deflexed apically; tip with dorsal ridge confluent with apical tiny tooth, and subapical expansion each side (Fig. 152, 153). Gonosaccus with transverse band of tiny setae above numerous elongate setae with expanded bases.

Distribution: Holotype male from Brazil, Pará, Serra Norte, 600-700 m, CDC trap 1 m, VIII-IX-1982, Paul Reddy (INPA).

Forewing length: 10.0 mm.

Relationships: Usually scape markings persist in alcohol, especially if there is any black pigment present; it is probable that this species has an unmarked scape in life. The flagellar segments are not short, as in *C. rafaeli*, and the dark venation is distinctive, for a *Ceraeochrysa*. It is probable that the bent tip of the mediuncus, as shown in Fig. 153, is an artifact.

Ceraeochrysa sanchezi (Navás, 1924)

Chrysopa sanchezi Navás, 1924, *Boln. Soc. ent. Esp.*, 7:52.

Holotype male in the Museum of Comparative Zoology, Harvard University.

Present description based upon 3 males, 3 females, pinned.

Head: Vertex yellow to pale green, unmarked. Frons yellow to pale green; genae yellow; both unmarked. Maxillary palpi pale. Scape and pedicel yellow, with one reddish brown longitudinal stripe on lateral surface; flagellum black, with about 122 flagellomeres; basal flagellomeres longer than wide.

Thorax: Pronotum pale green, with broad longitudinal red stripe laterally from anterior to posterior margin. Meso- and metanota bright golden yellow to pale green, unmarked. Pleural areas pale green. Legs pale.

Wings: Venation (Fig. P22) in both wings pale greenish yellow, with crossveins darkened. Gradate crossveins dark, without margining. Costal areas slightly narrower than radial area. Pterostigma pale green. Intramedian cell elongate, triangular, reaching Psm after first ma-mp crossvein. Three to six inner, five to eight outer gradate crossveins; series parallel. Hindwing with two to four inner, five to eight outer, gradates. In forewing, often a single vein from third median cell to wing margin.

Abdomen: Yellow to pale green, without markings. Tergites cover almost all dorsum. Male ninth tergite + ectoproct bears very large ventral horn which at times almost encircles ninth sternite (Fig. 155). Eighth plus ninth sternite elongate, dorsocaudally bearing rounded lateral lobes, preceded by a notch fitting ventral horn of ninth tergite. Gonapsis elongate, with broad, upcurved tip (Fig. 155, 159); gonocristae consist of two lateral downturned, spinose projections and squamose median area (Fig. 160). Gonarcus apodemes narrow; attached laterally to bridge are apically pointed, flattened, triangular dorsal horns; also two ventrolaterally projecting entoprocessus; mediuncus triangular, with thin laterally compressed apical hook (Fig. 156-158). Gonosaccus with three hooks or teeth each side, each bearing a gonoseta; in Amazonian specimens arising from basal plates; on gonosetae. Membrane surrounding gonarcus without cristae. Female seventh sternite broad; subgenitale with incised anterior margin (Fig. 161); area between subgenitale and seventh sternite moderately sclerotized. Bursa large, heavily wrinkled; walls with sclerotized areas. Bursal glands represented by a pair of posteroventral flaps opening broadly into bursa (Fig. 163). Spermatheca U-shaped, opening into bursa by dorsal longitudinal slit; in the specimen illustrated imbedded in two transparent heavy lateral sclerites adherent to floor of bursa (Fig. 162).

Forewing length: male, 11.3-14.1 mm; female, 13.2-13.5 mm.

Geographical Distribution: This species was described from Cuba. We have seen additional specimens from Mexico, Honduras, and south-central Brazil. Within the Amazon Basin

records are from Brazil, **Amazonas** (INPA): Manaus, 3-XII-1976, 1 female, 29-XI-1976, 1 female, 21-XII-1976, 1 female, N. D. Penny; Reserva Ducke, AM-010, km 26, 12-V-1977, E. Castellon, 1 female; AM-010, km 132, 29-IV-1977, L. P. Albuquerque, 1 male; AM-010, km 232, 2-IX-1977, L. P. Albuquerque and E. Rufino, 1 male; BR-174, km 115, 16-XI-1977, N. D. Penny, 1 female; Aruanã, 16-IV-1977, Maria Dantas.

Species Relationships: This species, through the Caribbaean Region and Central America, is easily recognized in the field by its golden yellow mesonotum, green pronotum with red stripes, and lateral scape stripe. In pinned specimens, the thorax fades to a uniform yellow green base color, but males are immediately distinguished by the curved ectoproct horns, encircling the abdominal apex in some specimens. Few other species have a single vein from the third cubital cell to the forewing margin; the smaller *C. cubana*, which shares this feature with *sanchezi*, has dark-tipped labial palpi, darker crossveins, and a middorsal scape stripe.

Biology: gut contents of one specimen included dust, one lepidopteran scale, and fungal fragments, indicating a diet of honeydew.

Ceraeochrysa everes (Banks, 1920)

Chrysopa everes Banks, 1920, *Bull. Mus. comp. Zool. Harv.*, 64:338.

Chrysopa furcata Navás, 1922, *Broteria*, 20:53.

Chrysopa furculata Navás, 1923, *Boln. Soc. ent. Esp.*, 6:39. (n.n. for *C. furcata* Navás).

Chrysopa gundlachi Navás, 1924, *Revta. R. Acad. Cienc. exact. fis. nat. Madr.*, 21:329.

Chrysopa instabilis Navás, 1925, *Mitt. munch. ent. Ges.*, 15:65.

Chrysopa jacobaea Navás, 1925, *Boln. Soc. ent. Esp.* 8(5): 87.

Chrysopa peterseni Navás, 1929, *Memorie Accad. pont. Nuovi Lincei*, 12(2):27. (jun. hom).

Chrysopa petersenia Navás, 1931, *Boln. Soc. ent. Esp.*, 14:20. (n.n. for *C. peterseni*).

Chrysopa gloriae Alayo, 1968, *Poeyana* 13(2):24. (new synonymy).

Lectotype female of *C. everes*, holotype female of *C. jacobaea*, and holotype male of *C. gundlachi*, in the Museum of Comparative Zoology, Harvard University. Holotype males of *C. furculata* and *C. instabilis* in the Paris Museum. Type of *C. petersenia* in the Hamburg Museum, destroyed. Holotype of *C. gloriae* in the Instituto de Biología, Havana (not seen, sex not given).

Present description based on type specimens above listed, plus 6 males, 4 females from the Amazon Region.

Head: Vertex yellow to pale green, unmarked texture shiny. Frons pale yellow, genae pale yellow, or with brown spot between mandible and eye. Maxillary palpi pale. Antennal scape and pedicel diffuse light reddish brown dorsally, yellow ventrally, sometimes with poorly defined lateral fuscous stripe; flagellum black basally, bearing about 103 flagellomeres.

Thorax: Pronotum with anterior margin rounded; yellow to pale green, with narrow longitudinal red stripe laterally from anterior to posterior margin. Meso- and metanota yellow green; pleural areas paler, unmarked. Legs pale.

Wings: Venation (Fig. P23) in both wings pale greenish yellow to straw yellow; crossveins in basal costal and radial areas darkened, ends pale. Gradate crossveins somewhat darkened, without margining. Costal area slightly narrower than area between R and Rs+MA. Pterostigma pale green. Intramedian cell elongate, triangular, reaching Psm after first ma-mp crossvein. Three to four inner, seven to eight outer gradate crossveins, the series parallel, length of the third cell about 2.4 times as long as wide. Hindwing with two or three inner and six or seven outer gradate crossveins.

Abdomen: Yellow, unmarked. Tergites cover almost all of dorsum. Male ninth tergite + ectoproct usually bears no projection of ventral apodeme (Fig. 164). Small gonocristae present. Gonapsis flattened; apex with horizontal ligulate lobe and vertical spinose crest (Fig. 168-170). Gonarcus apodemes elongate, curved, projecting caudally beyond their attachment to arch; arch of gonarcus bearing erect transverse sclerotized flap; mediuncus inflated, not heavily sclerotized, dorsally bearing two small apically directed horns; apex with downcurved hook and lateral lobes (Fig. 166, 167). Flanking mediuncus are two large oblique flattened lobes, with apices slightly hooked. Gonosaccus large, with dense field of dorsally directed sharp gonocristae, and ventrally, many small setae. A field of tiny gonocristae laterally to gonarcus complex. Female subgenitale (Fig. 173-174) broadly sclerotized anteriorly, not sharply delimited, the intersegmental membrane infolded to form lateral pockets anterior to margin of seventh sternite. Bursa transversely wrinkled dorsally, bearing rounded bursal glands laterally (Fig. 171). Spermatheca elongate, tortuous, completely inclosed in a pocket of the bursa except for short interval near origin of spermathecal duct (Fig. 172). Spermathecal duct short, terminal expansion moderate. Connected to colleterial gland opening are a slender anterior gland reservoir, and a large double posterior sac, with microtrichiated atrium (Fig. 171, right).

Forewing Length: male, 12.0 mm; female, 12.0 - 13.0 mm.

Geographical Distribution: The type of *C. everes* is from French Guiana. It has been recorded under various names from Cuba, Colombia, Honduras, Panama, Trinidad, and Brazil. Within the Amazon Basin, it has been collected at: **Amazonas** - Manaus: 6-29-XI-1976, N. D. Penny, 3 males, 5 females (INPA); 31-VIII-1977, N. D. Penny, 1 male (INPA); 28-VII-1978, N. D. Penny, 1 male; campus - Univ. of Manaus, 13-I-1979 until 25-XI-1979, J. A. Rafael, Malaise trap, 1 male, 5 females (INPA); INPA, 30-V-1976, A. P. A. Luna Dias, 1 female. BR-319, km 52, E. Castellon, 1 male (INPA). **Rondônia:** Porto Velho, BR-364, km 48, 4-5-X-1979, J. R. Arias, 1 female (INPA). We have seen additional Brazilian material from **Minas Gerais**, Parque Florestal do Rio Doce, M. Vulcano, 12-18-VIII-1978, 1 male, 19-24-X-1979, 1 male, 15-20-IX-1979, 1 female (UFMG).

Species Relationships: *C. everes* is related to the *cincta* group of species, with the field of gonocristae flanking the gonarcus complex. In some mature specimens, the apodeme of the ninth tergite plus ectoproct is acute and projects into a pocket in the membrane dorsally to the margin of the ninth sternite; more frequently, the apodeme is poorly sclerotized. The flattened gonarcus horns vary in shape, sometimes being quite acute. These horns, the field of gonocristae in the gonosaccus, and the erect blade on the gonapsis immediately distinguish this species. Synonymy of *C. gloriae* with *everes* is

based upon Alayo's illustration of the gonarcus complex, description of coloration, etc. Alayo did not have the opportunity to examine determined material of *everes*, and speculated on the possibility of this synonymy (with *gundlachi*). Type locality (presumably Cuba) and sex for *gloriae* have not been designated. Two females of *Chrysopa everes* Banks bearing tags "Type 10864" are in the MCZ, Harvard. One, from "Guyane Français, Nouveau Chantier, Mars, Collector LeMoult", bears a label "*Chrysopa everes* Bks type" in Banks' hand; we designate it as lectotype. This specimen resembles the one illustrated here, except that the irregular double sac dorsal to the colleterial gland opening is not so large, and the spermatheca is slightly shorter. The other specimen is from Guyane Français, Roches de Kourou, Coll. LeMoult, July. Synonymy based upon females is made reluctantly in this group and must be regarded as provisional, pending examination of males from the type locality.

***Ceraeochrysa squalidens* Adams and Penny, new species**

Original description based on 3 males and 2 females.

Head: Vertex, frons, and genae yellow-green, unmarked. Maxillary palpi pale. Scape and pedicel green; flagellum dark amber, with about 102 flagellomeres.

Thorax: Pronotum grass green, with red stripe laterally from anterior to posterior margin setation pale. Meso- and metanota green, pleural areas pale whitish green. Legs green, unmarked.

Wings: Venation (Fig. P24) in both wings pale green, with crossveins darkened in costal, radial, pseudomedial and pseudocubital areas. Gradate crossveins very dark, without margining. Marginal forks dark. Costal area slightly narrower than area between T and Rs+MA. Pterostigma pale green. Intramedian cell elongate, triangular, reaching Psm after first ma-mp crossvein. Four inner, seven outer gradate crossveins, the series parallel, third cell length about 3.0 times width. Hindwing with 3 inner and 6 outer gradate veins, radial sector brownish.

Abdomen: Bright green above, whitish below, without markings. Tergites cover most of dorsum. Male ninth tergite + ectoproct apodeme with ventral point. Ninth sternite rotund apically, with ligulate projection from posterolateral corner bearing conical-based setae (Fig. 175). Gonapsis broad, with dorsal twisted filament in membranous sheath, and erect double crest bearing appressed scales (Fig. 178, 179). Gonarcus apodemes small, bridge straight; bearing dorsal bilobed vertical plate-like expansion, and diagonal, slightly rugose plates fused medially above mediuncus (Fig. 176, 177). Mediuncus quadrate, ventral aspect of apex with median hook and lateral tubercles. Laterally to gonarcus complex an elongate field of closely spaced lanceolate gonocristae. Gonosaccus dorsally bearing obtusely pointed cristae, about as wide as tall; ventrally with sparse gonosetae. Female with very pronounced acute projection on margin of 7th sternite (Fig. 181, 182). Subgenitale with conspicuously projecting ventral lobe; broadly confluent with weakly sclerotized base; membrane at seventh sternite margin deeply infolded. Copulatory bursa broad, transversely rugose dorsally; bursal glands round, their ducts joining bursa posterodorsally. Spermatheca elongate, apex strongly curved, an extension of bursa forms

narrow membranous canal adjoining longitudinal slit; spermathecal duct short (due to heavily tanned condition, ventral impression not visible) (Fig. 180).

Measurements: forewing length—male, 10.8–11.6 mm, female, 13.1 mm; antenna—male, 17.5 mm.

Geographical Distribution: The holotype male is from Brazil: Amazonas, BR-174, km 115, 16-XI-1977, N. D. Penny (INPA). Paratypes—Amazonas: AM-030, km 30, EMBRAPA, 3-VI-1983, P. Celestino Filho, 1 male, 1 female (INPA); Manaus, INPA, 22-VI-1977, Padaluppi, 1 female; Manaus, 8-XI-1976, N. D. Penny, 1 female.

Species Relationships: This species is genitally similar to *C. everes*, in possession of the erect projection on the gonarcus bridge, flattened lateral lobes flanking the mediuncus, and the dentate gonosaccus. It differs in that the lateral gonarcus lobes are fused medially, the cristae of the gonosaccus are shorter, the cristae of the lateral fields more densely packed, and in the extreme development of the projections from the gonopsis apex. The darker venation of the forewing and longer gradate cells will aid in distinguishing specimens from *everes*.

In the teneral male paratype, genitalic sclerotization is limited to the mediuncus, rudiments of the lateral gonarcus lobes, and the filament of the gonopsis. This specimen was laboratory reared and killed shortly after emergence. One female from Manaus has fuscous flagella. A teneral male from Puerto Wilches, Colombia, Camilo Vargas S., collector, may belong to this species, but differs in having the flagellum black at base, a short lateral scape stripe, and shorter gradate cells.

***Ceraeochrysa nigripes* Adams and Penny, new species**

Original description based on 2 males, 2 without abdomens, pinned; 2 males, 1 female in alcohol.

Head: Vertex yellowish brown, with transverse red band across center (Fig. 183); anterior diagonal red lines parallel posterior margins of antennal fossae. Frons and genae yellowish brown, unmarked. Maxillary palpi yellow. Scape and pedicel yellow, scape with dark basal band on dorsal surface (Fig. 184); flagellum black for about one fourth its length, bearing about 114 flagellomeres.

Thorax: Pronotum well sclerotized, anterior margin rounded, red medially, yellow laterally, and pink at lateral margin (Fig. 183). Mesoprescutum with medial red area; mesoscutellum and metanotum blackish red medially and yellow laterally. Pleural areas yellow; some specimens with a few irregular black marks. Setation pale, unusually short, on meso- and metanotum barely longer than microtrichia.

Legs: All segments yellow, except tibiae black for slightly more than half, to entire length. Fore tibia less darkened, with a line on outer surface, or unmarked.

Wings: Venation (Fig. P25) in both wings pale greenish to straw yellow, with veins darkened on apical half of wing. Costals dark, gradates dark, without margining; marginal forks dark. Marginal vein in cubital and anal areas black. Costal area slightly narrower than area between R and Rs + MA. Pterostigma pale green. Intramedian cell elongate, triangular, reaching Psm after first ma–mp crossvein. Four to seven inner, six

to eight outer, gradate crossveins, the series parallel, length of third cell about 3.25 times width. Hindwing with three to five inner and five to six outer gradate crossveins. **Abdomen:** Yellow to pale green laterally and red medially in tergites II to VI; setation pale. Tergites cover almost all dorsum. Male ninth tergite + ectoproct apodeme without ventral projection; a small dentate lateral lobe in membranous area dorsal to ninth sternite (Fig. 185). Ninth sternite without apical lobes. Gonapsis long, slender, without apical horns or projections (Fig. 186). Gonarcus complex consists of broad apodemes, broad domed transverse medial arch or bridge; two acutely-pointed, dorsocaudal projections with small rounded lateral processes; entoprocessus vertical (Fig. 187, 188). Mediuncus elongate, triangular, acute and deflexed apically. Gonosaccus with numerous cristae; gonosetae sparse. Female bursa transversely wrinkled posterodorsally; bursal gland reservoirs oval, ducts joining bursa somewhat posterolaterally (Fig. 189). Spermatheca J-shaped, opening for nearly its entire length into diagonally pleated extension of bursa; spermathecal duct short. Subgenitale with ventral lip bearing notch on its anterodorsal surface; area between subgenitale and posterior margin of seventh sternite heavily sclerotized (Fig. 190). Seventh sternite broad, somewhat bulging anterior to margin.

Forewing Length: male, 11.8 - 13.0 mm; female, 12.3 mm.

Geographical Distribution: Holotype: Brazil. Rondônia, Vilhena, 6-XI-1979, N.D. Penny and J. R. Arias, male (INPA) (1 male paratype, same data). Additional paratypes, from Brazil, **Amazonas:** Reserva Ducke, AM-010, km 26: 1-29-VIII-1978, 2 males, 1 female, 7-11-1978, 1 female, CDC light trap 15-2, 18-VIII-1978, 1 male, J. R. Arias, Malaise trap (INPA); 12-V-1977, E. Castellon, 1 female (INPA). Manaus, INPA Campus, 19-22-X-1979, J. R. Arias, 2 without abdomen (INPA). **Pará:** Igarape Assu, XII-1911, H. L. Parish, 1 female (MCZ). **Acre:** Cruzeiro do Sul, Ilha Florianopolis, CDC light trap 1 m, 15-16-V-1981, Jorge Arias 1 male (INPA).

Species Relationships: This species stands alone in a number of respects. The black tibiae and medial red stripe immediately separate it from all other known New World chrysopids. The small teeth on the gonosaccus are also present in *C. everes* and *C. squallidens*.

***Ceraeochrysa tenuicornis* Adams and Penny, new species**

Original description based on 4 males, 1 female, 1 without abdomen, pinned; 2 males in alcohol.

Head: Vertex pale green, without markings. Frons ivory. Genae ivory, a dark brown spot between eyes and anterior tentorial pit. Maxillary palpi pale. Scape pale green, pedicel and flagellum pale yellow; flagellum with about 107 flagellomeres.

Thorax: Pronotum pale green, with broad longitudinal red-brown stripe laterally from anterior to posterior margin. Meso- and metanota pale green, unmarked. Pleural areas pale ivory, unmarked. Legs pale.

Wings: Venation (Fig. P26) in both wings pale greenish yellow, with all crossveins and transverse veins conspicuously darkened. Gradate crossveins dark, dark-margined. Costal area slightly narrower than area between R and Rs+MA. Pterostigma pale green. Intramedian

cell elongate, triangular, reaching Psm after first ma-mp crossvein. Sometimes a single vein from third median cell to wing margin. Forewing gradates somewhat irregular; three to four inner, four to five outer gradate crossveins; third gradate cell length about 2.9 times width. Hindwing with two to four inner, three to four outer gradates.

Abdomen: Pale green, unmarked. Tergites cover most of dorsum. Male ninth tergite + ectoproct apodeme dark-pigmented, not forming projection. Ninth sternite cleft apically; gonocristae large, thorn-like anteromedially, slender laterally (Fig. 191). Gonopsis long, slender, widened posteriorly, without apical projections (Fig. 192). Gonarcus apodemes almost semicircular; entoprocessus short, vertical; two slender dorsocaudal apically directed horns extending more than 2/3 length of mediuncus (Fig. 194, 195). Mediuncus divided: basal sclerite bearing two short horns; apical sclerite slender, with downcurved acute tip. Gonosaccus ventrolaterally bearing two groups of moderately long setae. Female seventh sternite without obvious knob or button; bursa small, triangular, longitudinally wrinkled; bursal glands absent; spermatheca moderately short, strongly arched, ventral invagination shallow; resembles that of *C. ariasi* (Fig. 201). Subgenitale short, wide, obtuse ventral tip (Fig. 196).

Forewing length: male, 9.1 - 10.2 mm.

Geographical Distribution: Holotype male from Brazil, Amazonas, INPA campus, 23-IV-1976, I. S. Gorayeb, at lights (INPA). Paratypes are from Brazil, **Amazonas:** AM-010, km 246-13-VII-1979, J. R. Arias, 1 without abdomen (INPA); Manaus, Parque das Laranjeiras, 28-I-1981, 11-1981, 29-V-1981, 1-IX-1981, light trap 15m, equipe J. R. Arias, 4 males (INPA); Manaus, 12-VI-1976, A. B. Anderson, 1 male (INPA); São Gabriel de Cachoeira, 29-IV-1982, CDC trap 20 m, eq. J. R. Arias, 1 female (INPA). **Pará:** Serra Norte: 600-700 m, CDC 15m, VIII-IX-1982, Paul Reddy, 2 males, 1 female (INPA); Itaicunas, CDC, X-1982, Paulo Reddy, 1 female, (INPA), XI-XII-1982, J. R. Arias, 2 males; Paranapebas, VIII-IX-1982, Paul Reddy 2 males (INPA); Parapanema, CDC, X-XII-1982, Paul Reddy, 2 males, 2 females; Tucuruí, Rio Parekamen, 16-20-VII-1983, equipe J. R. Arias, 1 male, 2 females (INPA). Oriximiná Rio Trombetas, Alcoa miner., km 22, 23-XI-1982, N. D. Penny, 1 female (INPA); C. Araguaia, 19-24-I-1983, 2 males, 31-I to 4-II-1983, 1 male, N. D. Penny (INPA, USNM).

Variation: The intensity of dark wing coloration is variable, some specimens having most of the longitudinal veins light, and others, all dark. The basal costal crossveins are pale in some specimens.

Species Relationships: Superficially this small species with the margined gradate veins resembles *Chrysopodes polygonica*, but the pale maxillary palpi and lack of swollen apical veins in the male, as well as genitalic characters immediately separate these two species. These two species regularly occur together in trapped material. It much more closely resembles *C. ariasi*, which also has brown genal marks, closely similar size and wing structure and pigmentation. *Ceraeochrysa ariasi* differs in having a slightly narrower costal area, possession of smaller gonocristae, drastically shortened gonarcus horns, wider basal horn-bearing mediuncus sclerite, lateral prongs on mediuncus tip, and more numerous gonosetae, with swollen cuticle surrounding their bases, arranged in a single field.

Biology: Gut contents of some light trap specimens were moth scales and setae.

***Ceraeochrysa ariasí* Adams and Penny, new species**

Original description based on 1 male, 1 female, pinned; 1 male in alcohol.

Head: Vertex green, face ivory, brown mark from eye to anterior tentorial pit; palpi pale. Antennae pale, unmarked.

Thorax: Pronotum green with broad lateral red-brown stripe; meso- and metanota green, unmarked. Pleurae and legs pale.

Wings: Venation (Fig. P27) green, with all crossveins and many transverse veins dark. Gradates black, bordered with brown. Costal area narrow; in widest part, cells no taller than wide. Intramedian cell apex slightly beyond ma-mp crossvein. In forewing, three inner, six outer gradates, third cell shorter than first, length about 2.4 times width. Hindwing with two inner, five outer gradates.

Abdomen: unmarked. Apodeme of tergite 9 + ectoproct not distinct apically, sclerotization extensive; no protruding process. Ninth sternite apex deeply cleft, no dorsocaudal processes; gonocristae small, all short, hardly longer than wide at base (Fig. 197). Gonopsis slender, broadened caudally, shaped as in *C. tenuicornis* (Fig. 192). Gonarcus apodemes fairly narrow; entoprocessus narrow, vertical; gonarcus horns vestigial, represented by short lateral spines; basal horn-bearing sclerite of mediuncus broad at base, horns quite long (Fig. 198, 199). Apical mediuncus sclerite tapering to slender tip, with lateral subapical barbs. Gonosaccus with a single extensive field of gonosetae; cuticle at their bases rounded. Female seventh sternite not modified; subgenitale wide almost stalked; area anterior to subgenitale rugose, partially tanned and sclerotized (Fig. 200). Bursa small, bursal glands oval, ducts appear to open caudolaterally on bursa (Fig. 201). Spermatheca moderately elongate, arched dorsally, opening to bursa via a middorsal slit extending its entire length; widened at caudal end; ventral invagination barely developed.

Forewing Length: male, 10.0 mm; female, 10.0 mm.

Geographic Distribution: Holotype male and allotype female from Brazil, Rondônia, Vilhe na, 7-XI-1979, N. D. Penny and J. R. Arias (INPA). (Abdomen of female lost.). Additional material from Amazonas: Am-010, km 26, Reserva Ducke, 8-VIII-1978, CDC light trap 16-1, J. R. Arias, 1 male (INPA).

Species Relationships: This species is extremely similar to *C. tenuicornis*; differences are discussed under that species. The brown genal mark is infrequently encountered in *Ceraeochrysa*; the only other Amazonian species known to have this feature are *C. everes*, which has a lateral dark scape stripe, and mostly pale venation, and *C. tenuicornis*.

This species is named after Jorge R. Arias, whose indefatigable collecting activities and genal assistance have contributed so much toward making this study possible.

***Ceraeochrysa falcifera* Adams and Penny, new species**

Description based on one faded specimen, hollowed by psocids.

Head: Vertex darker than remainder of head; no head markings. Scape unmarked, pedicel brown-ringed, flagellum black. Maxillary palpi pale, tip of apical palpmere with small

black-brown mark.

Thorax: coloration destroyed, setation pale.

Wings: Venation (Fig. P28) pale, except in forewing some costals slightly dark; radial crossveins dark in middle; gradates, especially outer, dark, without margining. Costal area narrower than radial area; intramedian cell apex beyond ma-mp crossvein. Four inner six outer gradate crossveins, the third cell about 2.7 times as long as wide. Hindwing with 4 inner, 5 outer, gradates.

Abdomen: No apodeme extending from ninth tergite + ectoproct; a small ligulate lobe in membrane dorsally to lateral margin of ninth sternite may represent partially sclerotized apodeme (Fig. 202). Ninth sternite deeply cleft apically, the upper corners bearing setae on pedestals; on medial surface of corner, a lobe bearing small microtrichia-like gonocristae. Gonarcus apodemes moderately developed; mediuncus broad, with apical hook flanked by lateral vertical projections; middorsally on base a pair of short horns; paddle-like entoprocessus applied to lateral surface of mediuncus (Fig. 203, 204). Gonosaccus with small dorsomedial field of short, broad cristae; ventrally with numerous gonosetae. Gonopsis elongate, on right side with two short slightly curved bristles, on left side with scythe-shaped bristle enclosed in membranous sheath (Fig. 205, 206).

Wing Length: 13.5 mm.

Type Material: Holotype male, Brazil, Pará, Belém, Mocambo [Forest], 14-III-1978, Malaise trap (MPEG).

Species Relationships: This species is unremarkable in its eidonomic features. The gonopsis, however, is unique within the genus. *Ceraeochrysa squalidens* also has a curved bristle-like process on the gonopsis, but in *C. falcifera*, the long process is lateral not dorsal, and there is no bristled double crest present.

***Ceraeochrysa michaelmuris* Adams and Penny, new species**

Original description based on one male, one female, in alcohol.

Head: Pale, unmarked; antennae and palpi also pale. Basal flagellomeres about twice as long as wide.

Thorax: Pronotum with rounded anterior margin; setation pale. Meso- and metanotum with fuscous mark on scutum laterally to prescutum (Fig. 213). Legs pale with pale setation.

Wings: (Fig. P29). Transverse veins of forewing all dark; also dark: most longitudinal veins at intersections of transverse veins, base of Rs+MA, and several branches of Rs at base. In hind wing, apex of radius, and middle of Rs+MA, dark; costals, radials, and gradates light brown. No veins dark-margined. Forewing costal area narrow; costal cells only a little narrower than wide. In forewing, three inner, four outer gradates, the third cell about 2.45 times as long as wide; hindwing with two inner, three outer, gradates.

Abdomen: Pale. Apodeme of ninth tergite + ectoproct not projecting (Fig. 207). Gonarcus apodeme large, vertically oriented; bridge moderately wide, dorsally bearing two horns extending half length of mediuncus, and below these, narrow elongate entoprocessus (Fig. 209, 210). Mediuncus with two slender downcurved basal horns appressed to downcurved

elongate mediuncus tip. Gonosaccus laterally with two small groups of gonosetae; midventrally with a field of caudad-directed cristae. Gonapsis elongate, with caudal Y-shaped dark staining arms; extending beyond apex of ninth sternite are two stiff oval lobes, tilted downward medially, and covered with large, short, sharp-tipped gonocristae making a transition laterally to microtrichia with enlarged bases (Fig. 208). Female with no modification of seventh sternite; subgenitale short, with rounded caudal lobes and short basal lobe; well set off from membranous area connecting to seventh sternite (Fig. 211). Copulatory bursa short, subtriangular, longitudinally wrinkled; bursal glands diminutive oval, ducts connecting to bursa mid-laterally (Fig. 212). Spermatheca short, pyriform, opening to bursa along straight dorsal slit; spermathecal duct relatively short, dark-pigmented.

Forewing Length: male, 8.8 mm; female, 9.9 mm.

Type Material: Brazil, Amazonas, Manaus, J. A. Rafael (INPA): holotype male, 06-I-1979; allotype female, 14-X-1978.

Species Relationships: The morphology of the gonarcus complex places this species close to *C. ariasi* and *C. tenuicornis*. *Ceraeochrysa michaelmuris* is unique in having the basal mediuncus horns as long as the entire mediuncus, and in the conspicuously protuberant spinose gonapsis lobes, which resemble mouse ears. These, plus the small size, dark venation, and dark-spotted pteronota, make this species unmistakable. The spermatheca is probably of a generalized type for the genus—only moderately elongate, and opening to the bursa via a dorsal slit.

The species name emphasizes the resemblance of the protruding gonapsis lobes to mouse ears.

CONCLUDING REMARKS

Collecting Intensity

Of the 412 Amazonian specimens examined, 203 were collected within 50 km of Manaus. By state, totals were: Amazonas—271, Pará—96, Rondônia—35, Roraima—7, Acre—1, Goiás—1, Maranhão—1. While the heavy emphasis of collecting activity in the central region of the Amazon Basin gives a most interesting first picture of the fauna in a previously virtually unreported area, it is apparent that additional material from now lightly collected regions can be expected to increase the species list considerably. Of the 20 previously undescribed species treated above, 12 are known from single specimens or a single pair; this may be taken as a further indication of the preliminary state of our knowledge of this group within the Amazon Basin.

Seasonal Distribution

As shown in Table 1, there is a strong seasonal influence in abundance of chrysopids, as reflected by date of collection. *Plesiochrysa* and *Chrysoperla* are represented by a limited number of specimens or collections, and figures shown are not necessarily sig-

nificant. *Chrysopodes* was absent during the wettest months, and shows an abundance maximum in September and October, which are relatively dry. *Ceraeochrysa*, by contrast, was found during every month, with peak abundance in November. It is our impression that population densities of chrysopids are usually quite low in the tropical forest habitat but may be quite high in disturbed situations or agroecosystems, where species represented tend to be wide-ranging, rather than endemic.

ACKNOWLEDGEMENTS

We would like to acknowledge the valuable financial assistance given by CNPq's Trópico Úmido grant nº 3224, and Polo Noroeste grant nº 3421-292, as well as by the California State University, Fullerton.

RESUMO

As 30 espécies de Chrysopini conhecidas da Bacia Amazônica são descritas, ilustradas, e chaves dadas para suas identificações. Dezenove espécies novas e um subgênero novo de *Chrysopodes*, *Neosuarius*, são descritas. Os nomes genéricos *Orlandsia* Navás e *Ancylochrysa* Navás são sinonimizados com *Chrysopodes*.

Table 1. Seasonal distribution of Amazonian chrysopids based on collection data.

GENUS	MONTH											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<i>Plesiochrysa</i>	1	2		35			6	5	5	2	1	
<i>Chrysoperla</i>					2		16		1			
<i>Chrysopodes</i>	5	8			7	5	20	26	43	33	20	10
<i>Ceraeochrysa</i>	8	8	3	10	9	9	16	13	12	11	38	13
TOTAL	14	18	3	45	18	14	58	44	61	46	59	23

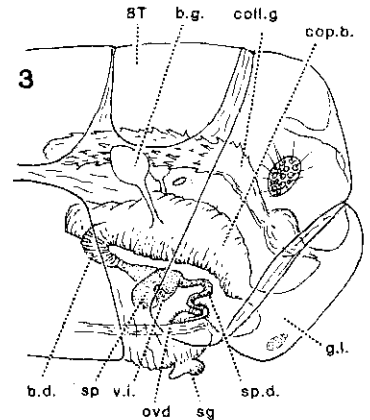
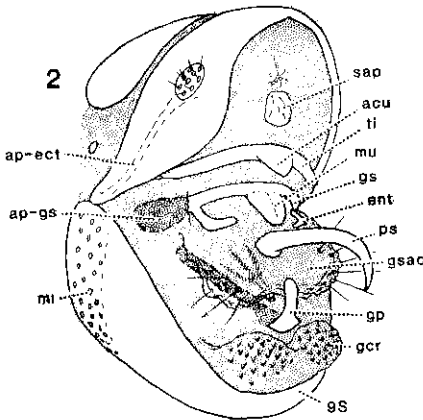
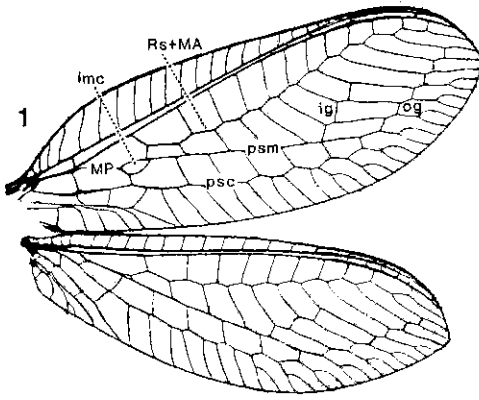


Fig. 1. *Chrysopa (Plesiochrysa) brasiliensis*, wing venation. Abbreviations: ig--inner gradate series; lmc--intramedian cell; MP--Media posterior; og--outer gradate series; psc--pseudocubitus; psm--pseudomedida; RS+MA--combined radial sector and media anterior.

Fig. 2. Generalized chrysopid male genitalia. Abbreviations: acu--acumen; ap-ect--apodeme of the ectoproct; ap-gs--apodeme of the gonarcus; ect--ectoproct; ent--entoproct; gcr--gonocristae; gp--gonapsis; gs--gonarcus; gsac--gonosaccus; mi--microtholi; mu--mediuncus; sap--subanal plate; ti--tignum; 9S--ninth sternite.

Fig. 3. Generalized chrysopid female genitalia. Abbreviations: b.d.--bursal duct; b.g.--bursal gland; coll.g.--colleterial gland; cop.b.--copulatory bursa; g.l.--gonopophysis lateralis; ovd--oviduct; sg--subgenitale; sp--spermatheca; sp.d.--spermathecal duct; v.i.--ventral invagination; 8T--eighth tergite.

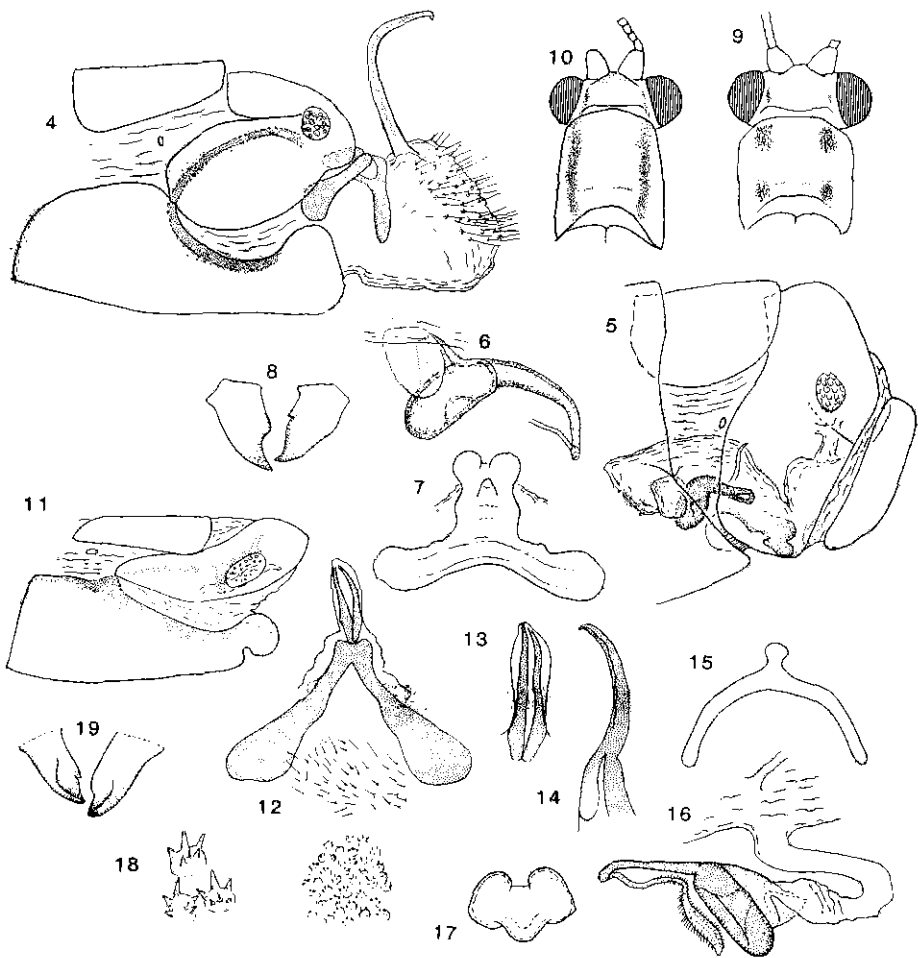


Fig. 4 - 10. *Chrysopa (Plesiochrysa) brasiliensis*. Fig. 4, male abdomen, lateral, with gonosaccus everted. Stipple indicates regions of heavy sclerotization; 5, female abdomen; 6, spermatheca, left lateral; 7, female subgenitale, ventral; 8, mandibles; 9, head and thorax, dorsal. Fig. 10, *C. (P.) elongata*, head and thorax.

Fig. 11 - 19. *Chrysoperla externa*. Fig. 11, male abdomen, showing lip on apex of ninth sternite; 12, gonarcus and gonosaccus, posterior view; 13, 14, mediuncus, dorsal and lateral; 15, tignum; 16, spermatheca, right side, showing bursal duct and base of bursal gland duct; 17, subgenitale; 18, specialized setae and spines from posterior of male gonosaccus; 19, mandibles, posterior view.

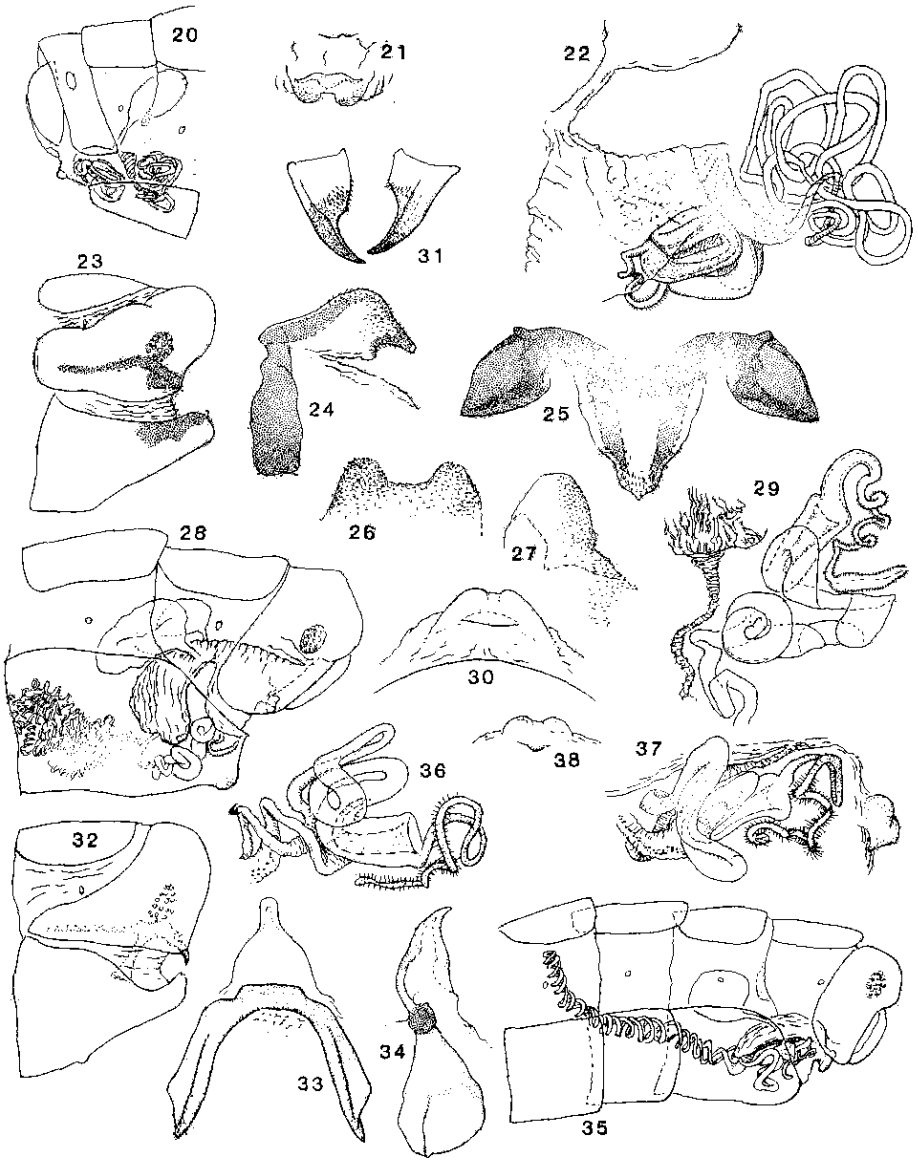


Fig. 20 - 22. *Chrysopodes duckei*. Fig. 20, female abdomen; 21, subgenitale; 22, internal female system, showing base of bursal gland, setose bursal lining, moderately elongate bursal duct, and coiled spermatheca.

Fig. 23 - 31. *Chrysopodes pulchella*. Fig. 23, male abdominal apex; 24, 25, gonarcus complex, lateral and dorsal; 26, 27, gonocristae-bearing lobes from gonapsis region, posterior and lateral views; 28, female abdominal, tip, showing knob on seventh sternite apex and relationship of internal structures; 29, left, attachment of bursal duct to bursa, right, smooth-walled section of duct margin with tubular spermatheca; 30, subgenitale; 31, mandibles.

Fig. 32 - 38. *Chrysopodes spinella*. Fig. 32, male abdomen, lateral; 33, 34, gonarcus complex, ventral and lateral; 35, female abdomen, showing elongate bursal duct; 36, spermatheca, ventral; 37, same, left lateral, showing origin of bursal duct, above, and spermatheca; 38, subgenitale.

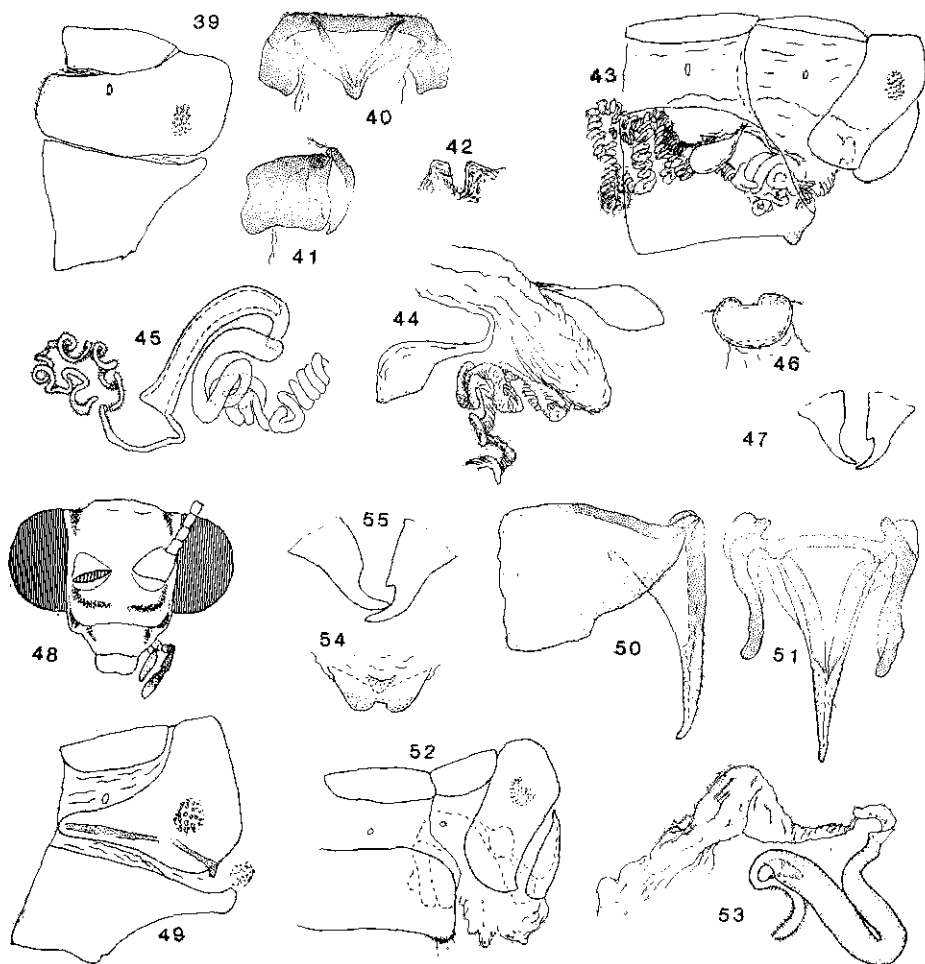


Fig. 39 - 47. *Chrysopodes nebulosa*. Fig. 39, male abdominal apex; 40, 41, gonarcus complex, dorsal and lateral; 42, weakly sclerotized membrane in gonapsis region, posterior; 43, female abdominal apex; 44, bursa, bursal gland, and base of bursal duct; 45, terminus of smooth-walled bursal duct and spermatheca; 46, subgenitale; 47, mandibles.

Fig. 48 - 55. *Chrysopodes lineafrons*. Fig 48, head; 49, male abdominal apex; 50, 51, gonarcus complex, lateral and dorsal; 52, female abdomen, lateral; 53, apex of bursa and spermatheca; 54, subgenitale; 55, mandibles, anterior view.

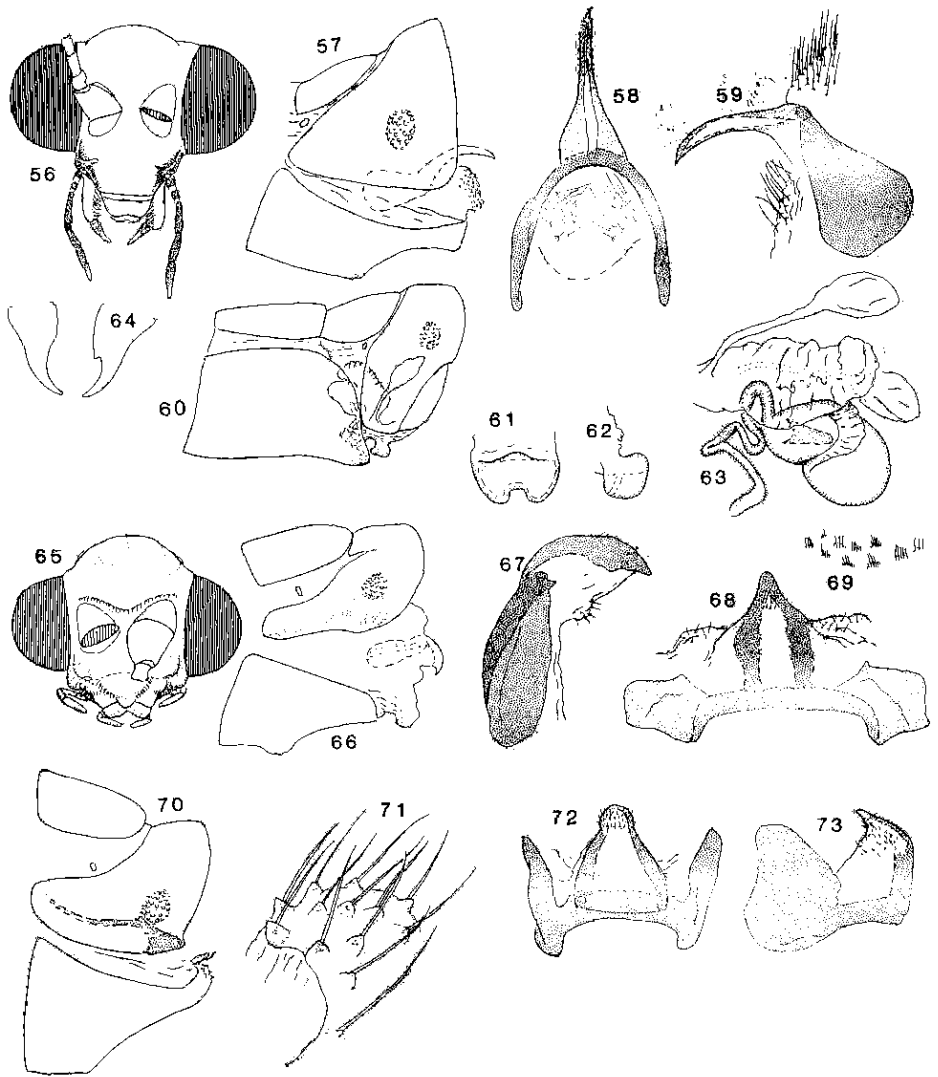


Fig. 56 - 64. *Chrysopodes polygonica*. Fig. 56, head; 57, male abdomen, lateral; 58, 59, gonarcus complex, posterior and lateral; 60, female abdomen, 61, 62, subgenitale, ventral and lateral; 63, bursa and spermatheca, right side; 64, mandibles.

Fig. 65 - 69. *Chrysopodes indentata*. Fig. 65, head; 66, male abdomen, lateral; 67, 68, gonarcus complex, lateral and dorsal; 69, gonocristae, showing filamentous structure (about 150X).

Fig. 70 - 73. *Chrysopodes conisetosa*. Fig. 70, male abdomen; 71, apex of ninth sternite, enlarged, showing conical setal bases; 72, 73, gonarcus complex, dorsal and lateral.

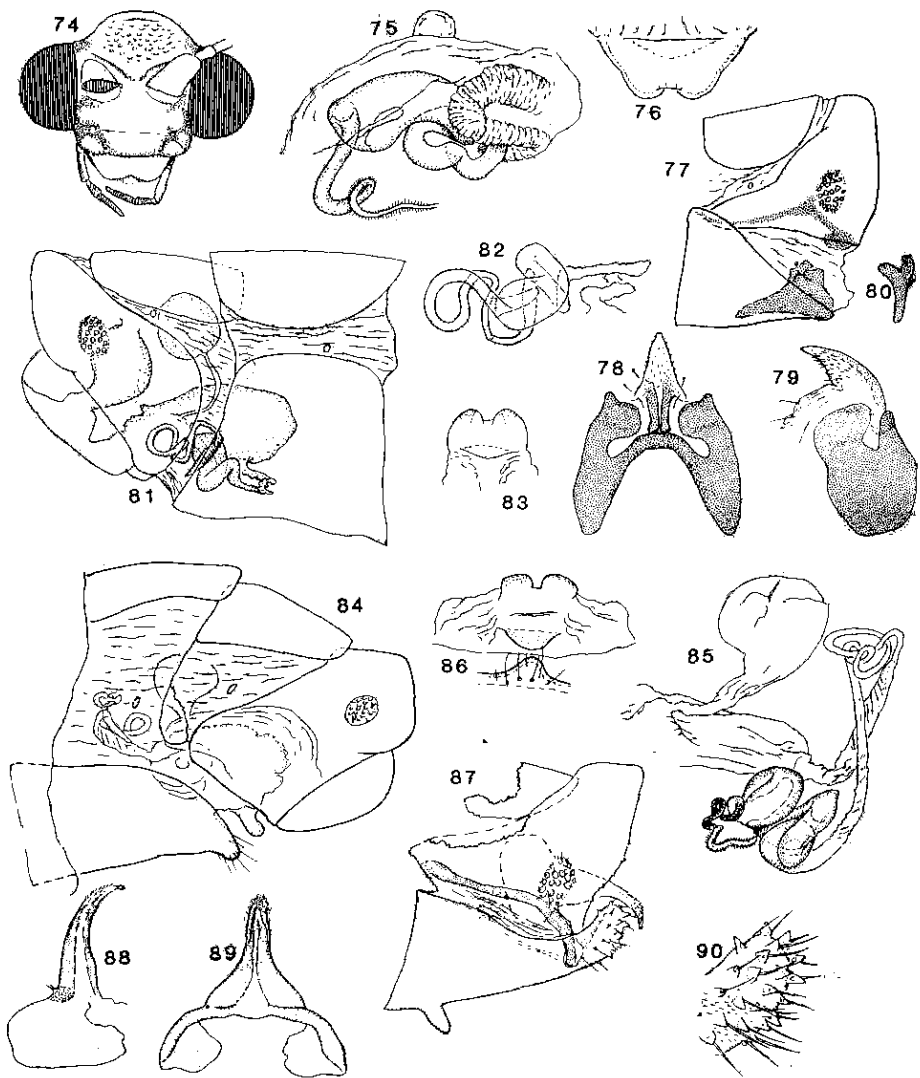


Fig. 74 - 76. *Chrysopodes breviata*. Fig. 74, head; 75, bursa and spermatheca, right side; 76, subgenitale.

Fig. 77 - 83. *Chrysopodes mediocris*. Fig. 77, male abdomen, gonapsis in situ; 78, 79, gonarcus complex, dorsal and lateral; 80, gonapsis, posterior; 81, female abdomen; 82, spermatheca; 83, subgenitale.

Fig. 84 - 86. *Chrysopodes* species "a". Fig. 84, female abdomen, lateral; 85, bursa and spermatheca, right side; 86, subgenitale.

Fig. 87 - 90 *Chrysopodes tetifera*. Fig. 87, male abdomen, with unusual ventral knob (and psocid damage); 88, 89, gonarcus complex, lateral and dorsal; 90, apex of ninth sternite of male.

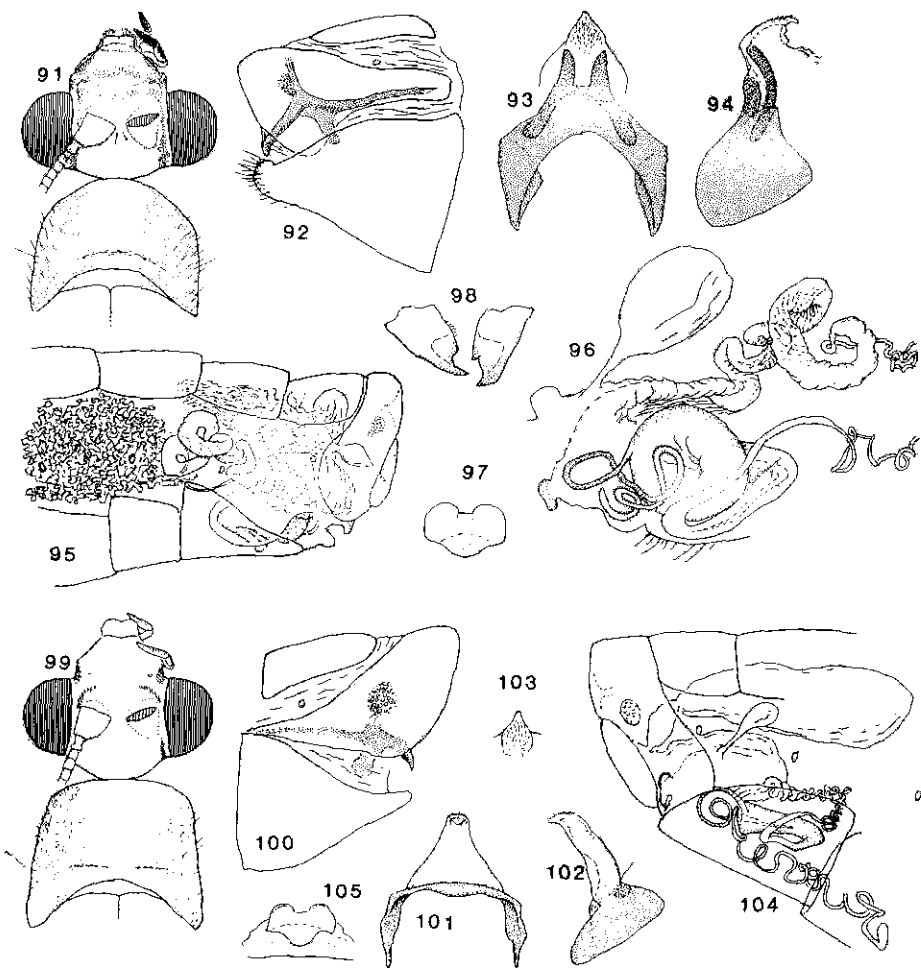


Fig. 91 - 97. *Chrysopodes (Neosuarius) collaris*. Fig. 91, head and pronotum, male; 92, male abdomen; 93, 94, gonarcus complex, dorsal and lateral; 95, female abdomen, left lateral, showing extensive bursal duct in segments 5 and 6; 96, bursa and spermatheca, right lateral view; 97, subgenitale; 98, mandibles, anterior view.

Fig. 99 - 105. *Chrysopodes (Neosuarius) divisa*. Fig. 99, head and pronotum, male; 100, male abdomen; 101-102, gonarcus complex, ventral and lateral; 103, mediuncus tip, apical view; 104, female abdomen; 105, subgenitale.

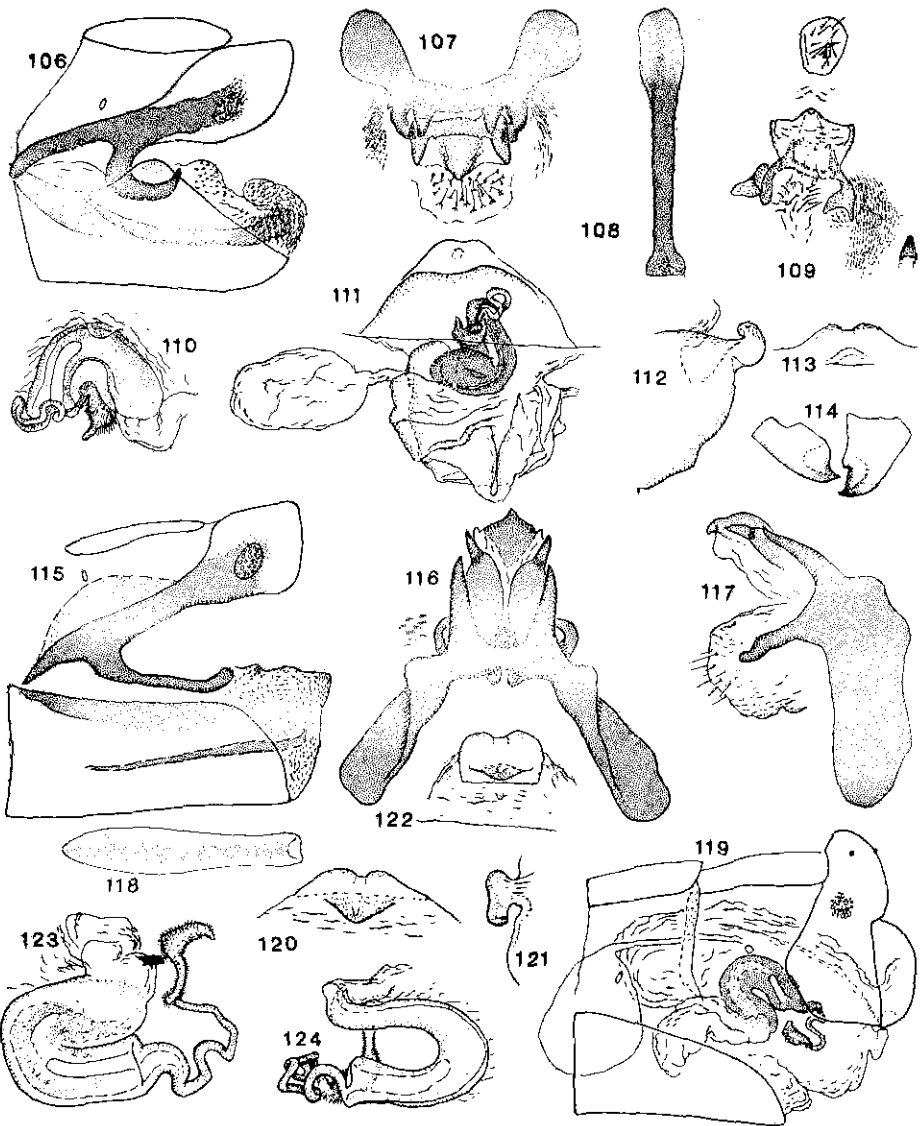


Fig. 106 - 114. *Ceraeochrysa cincta*. Fig. 106, male abdomen; 107, gonarcus complex, dorsal; 108, gonapsis, dorsal; 109, gonarcus complex and subanale, teneral (tip of apodeme, all that is sclerotized at this time, at lower right); 110, spermatheca, right side; 111, subgenitale and bursal complex, ventral; 112, subgenitale, lateral; 113, subgenitale apex; 114, mandibles.

Fig. 115 - 124. *Ceraeochrysa caligata*. Fig. 115, male abdomen; 116, 117, gonarcus complex, dorsal and lateral; 118, gonapsis, dorsal; 119, female abdomen, lateral; 120, 121, subgenitale, ventral and lateral; 122, subgenitale, teneral; 123, spermatheca, mature; 124, spermatheca, teneral.

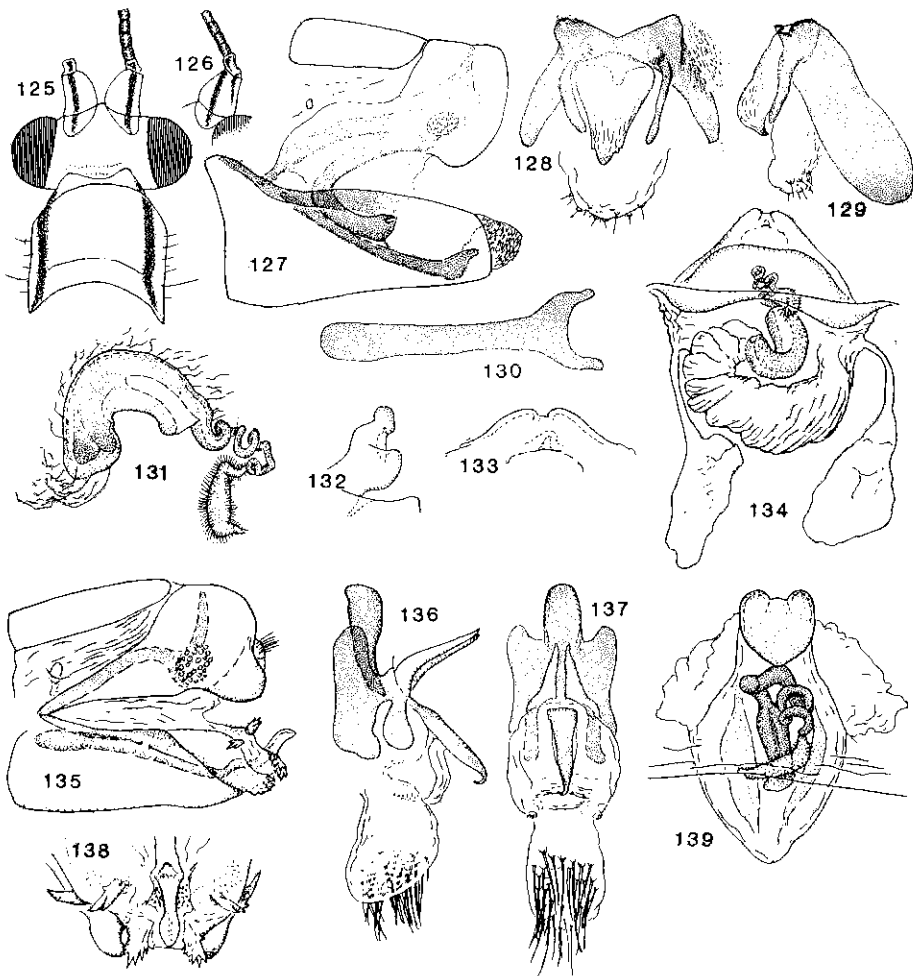


Fig. 125 - 134. *Ceraeochrysa claveri*. Fig. 125, head and pronotum; 126, antennal base, variety with two scape stripes; 127, male abdomen, lateral, gonapsis in situ; 128, 129, gonarcus complex, dorsal and lateral; 130, gonapsis, dorsal; 131, spermatheca, right side; 132, 133, subgenitale, lateral, and ventral; 134, female system, ventral.

Fig. 135 - 139. *Ceraeochrysa cubana*. Fig. 135, male abdomen, lateral; 136, 137, gonarcus complex, lateral and dorsal; 138, apex of ninth sternite, dorsal; 139, female system, ventral.

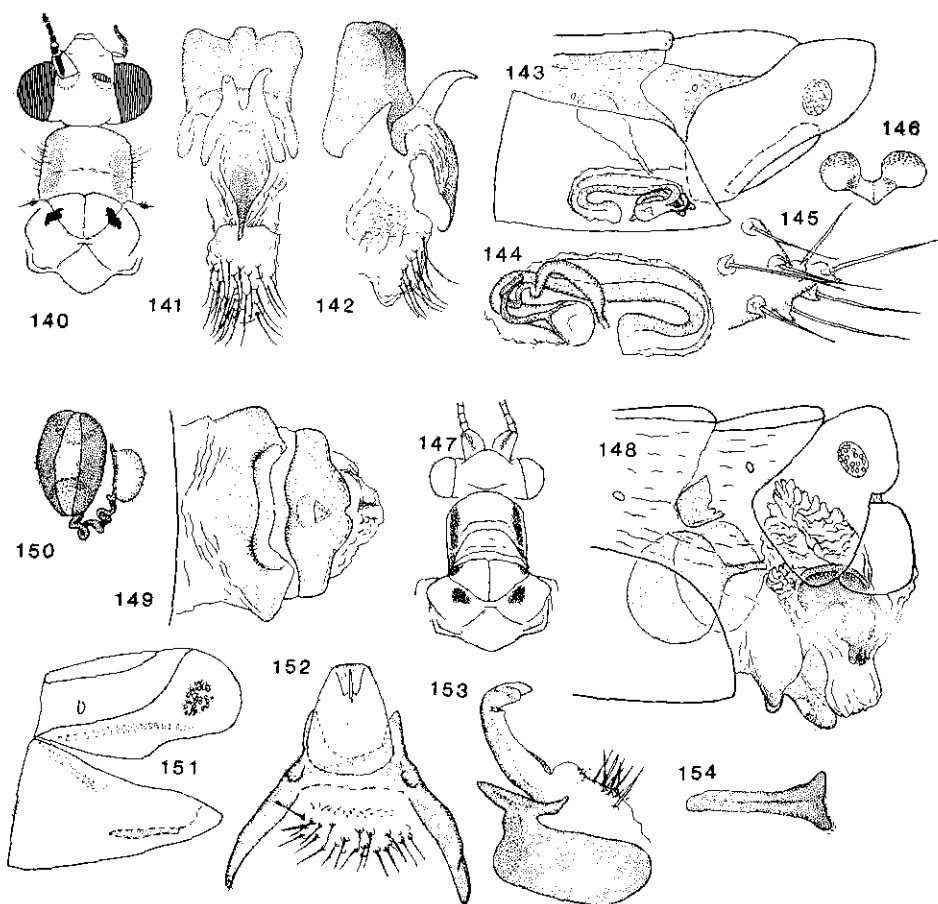


Fig. 140 - 142. *Ceraeochrysa scapularis*. Fig. 140, head and thorax; 141, gonarcus complex, posterior; 142, same, lateral, dashed lines indicate pocket in which mediuncus normally found.

Fig. 143 - 146. *Ceraeochrysa acutipuppis*. Fig. 143, abdomen and female system; 144, spermatheca, right side; 145, apex of female seventh sternite; 146, subgenitale.

Fig. 147 - 150. *Ceraeochrysa rafaelli*. Fig. 147, head and thoracic maculation; 148, female abdomen and reproductive system; 149, subgenitale; 150, spermatheca, dorsal.

Fig. 151 - 154. *Ceraeochrysa reddyi*. Fig. 151, male abdomen; 152, 153, gonarcus complex, posterior and lateral; 154, gonapsis.

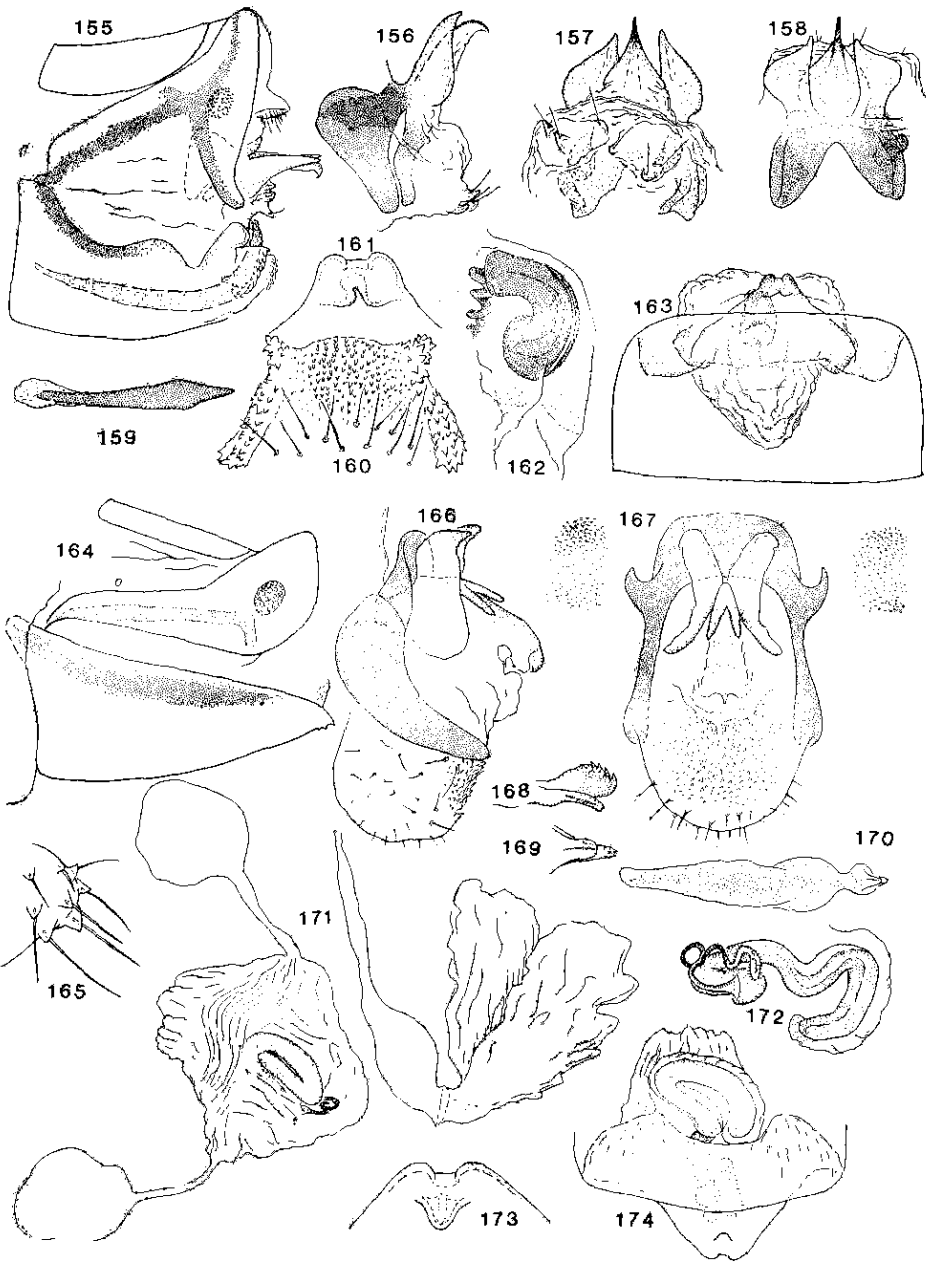


Fig. 155 - 163. *Ceraeochrysa sanchezi*. Fig. 155, male abdomen; 156, 157, 158, gonarcus complex, lateral, ventral, dorsal; 159, gonapsis, 160, gonocristae, posterior, 161, subgenitale; 162, spermatheca, right dorsolateral; 163, female system, ventral.

Fig. 164 - 174. *Ceraeochrysa everes*. Fig. 164, male abdomen; 165, apex of male ninth sternite, lateral; 166, 167, gonarcus complex, lateral and posterior, 168, 169, gonapsis apex, lateral and ventral; 170, gonapsis, ventral; 171, female system, views from above, with enlarged colleterial gland reservoirs; 172, spermatheca, ventral; 173, subgenitale and spermatheca, ventral, showing invaginated intersegmental membrane; 174, apex of subgenitale.

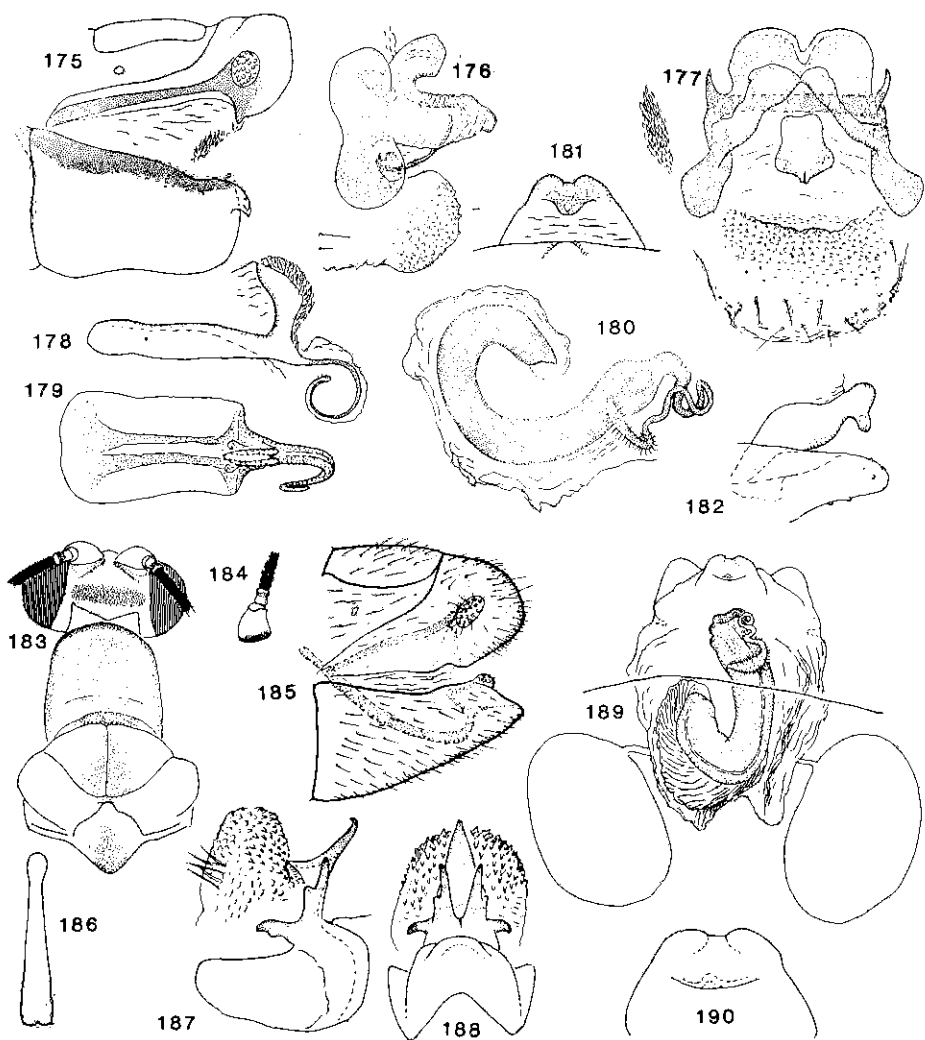


Fig. 175 - 182. *Ceraeochrysa squalidens*. Fig. 175, male abdomen; 176, 177, gonarcus complex, posterior and lateral; 178, 179, gonapsis, lateral and dorsal; 180, spermatheca, ventral; 181, 182 subgenitale, ventral and lateral.

Fig. 183 - 190. *Ceraeochrysa nigripes*. Fig. 183, head and thoracic maculations; 184, right scape, dorsal; 185, male abdomen; 186, gonapsis; 187, 188, gonarcus complex, lateral and dorsal; 189, female system, ventral; 190, subgenitale.

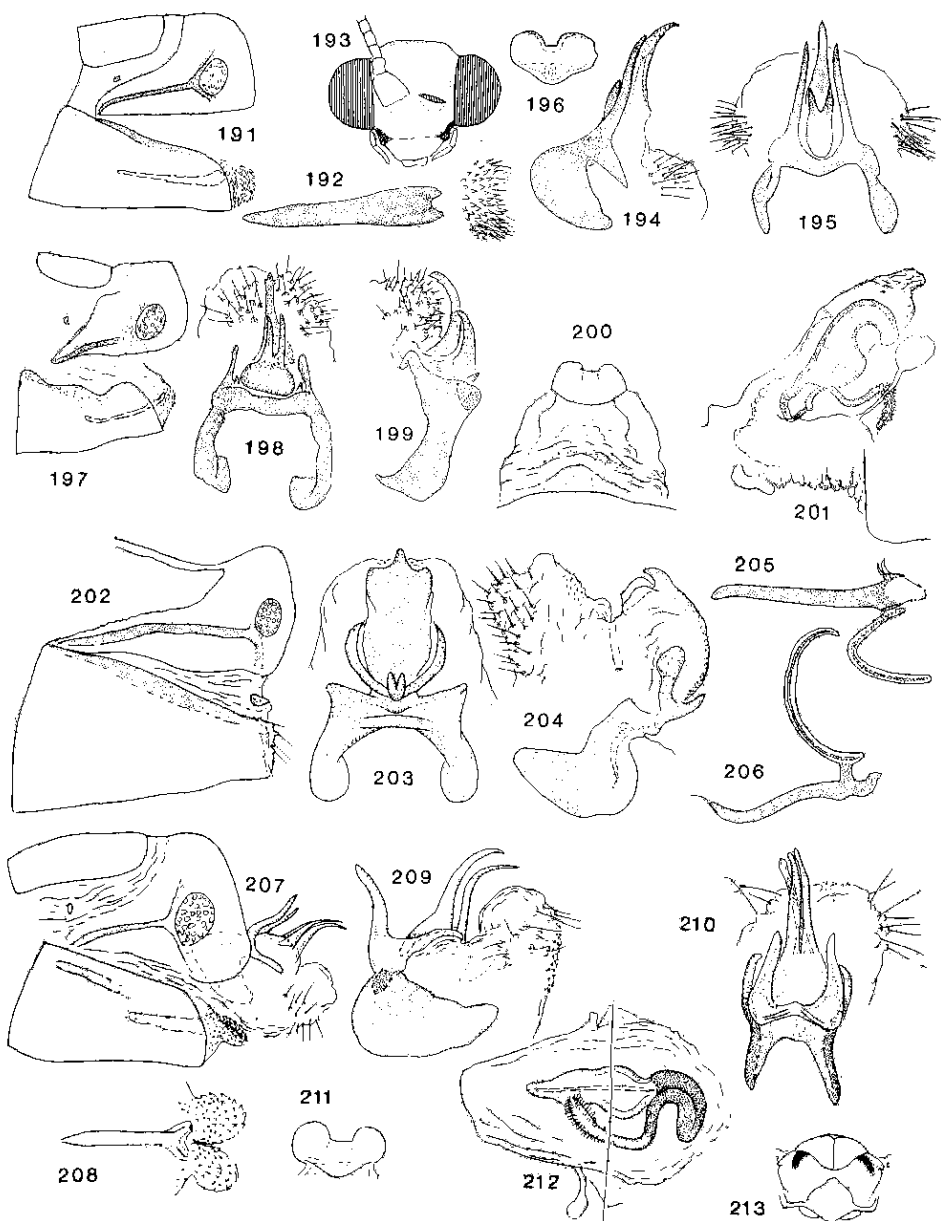


Fig. 191 - 196. *Ceraeochrysa tenuicornis*. Fig. 191, male abdomen; 192, gonapsis and gonocristae; 193, head; 194, 195, gonarcus complex, lateral and dorsal; 196, subgenitale.

Fig. 197 - 201. *Ceraeochrysa ariasi*. Fig. 197, male abdomen; 198, 199, gonarcus complex, dorsal and lateral; 200, subgenitale; 201, bursa and spermatheca, right side.

Fig. 202 - 206. *Ceraeochrysa falcifera*. Fig. 202, male abdomen; 203-204, gonarcus complex, dorsal and lateral; 205, 206, gonapsis, lateral and dorsal.

Fig. 207 - 213. *Ceraeochrysa michaelmuris*. Fig. 207, male abdomen, genitalia everted; 208, gonapsis and gonocristae, dorsal; 209, 210, gonarcus complex, lateral and dorsal; 211, subgenitale; 212, female system, ventral (abdominal apex to right); 213, metanotum.

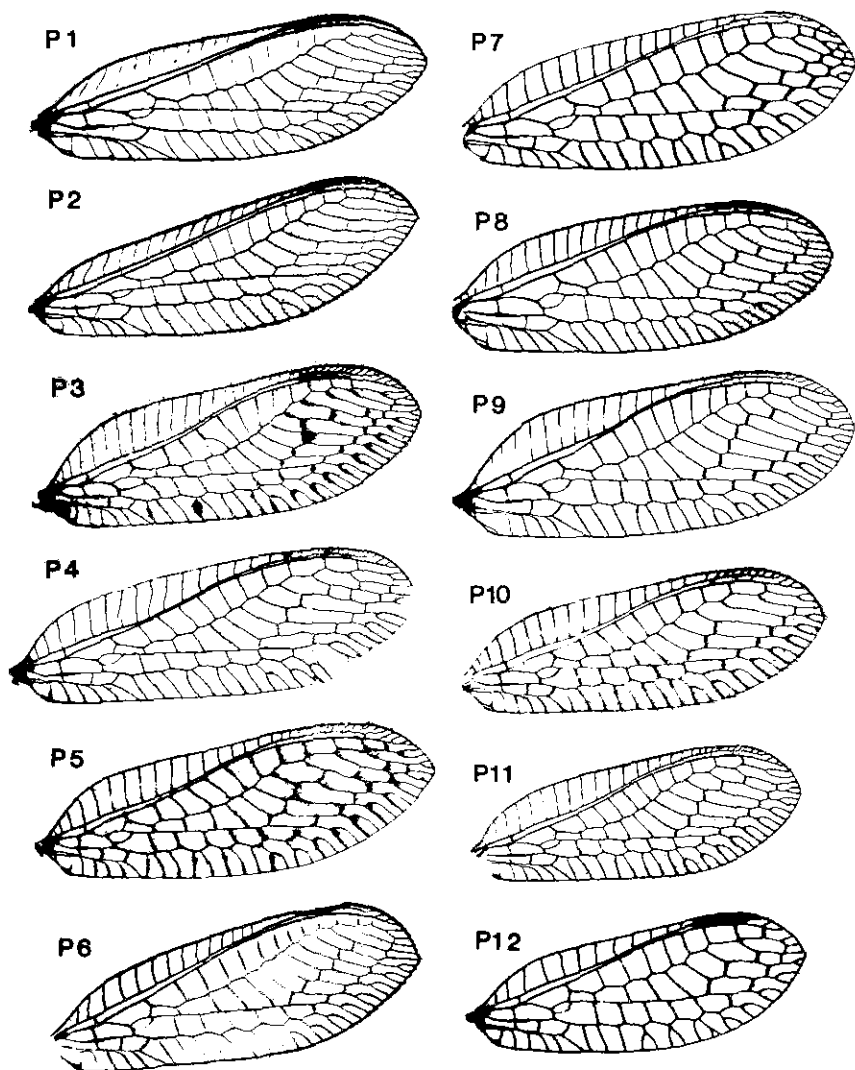


Fig. P1 - P12. P1--*C. (Plesiochrysa) elongata* (12.5), P2--*Chrysoperla externa* (13.0), *Chrysopodes*; P3--*C. pulchella* (14.0); P4--*C. spinella* (11.6); P5--*C. nebulosa* (12.5); P6--*C. lineafrons* (12.8); P7--*C. polygonica* (9.5); P8--*C. indentata* (13.3); P9--*C. conisetosa* (15.5); P10--*C. breviata* (10.8); P11--*C. mediocris* (12.1); P12--*C. tetifera* (9.0). Figures in parentheses are wing lengths in millimeters.

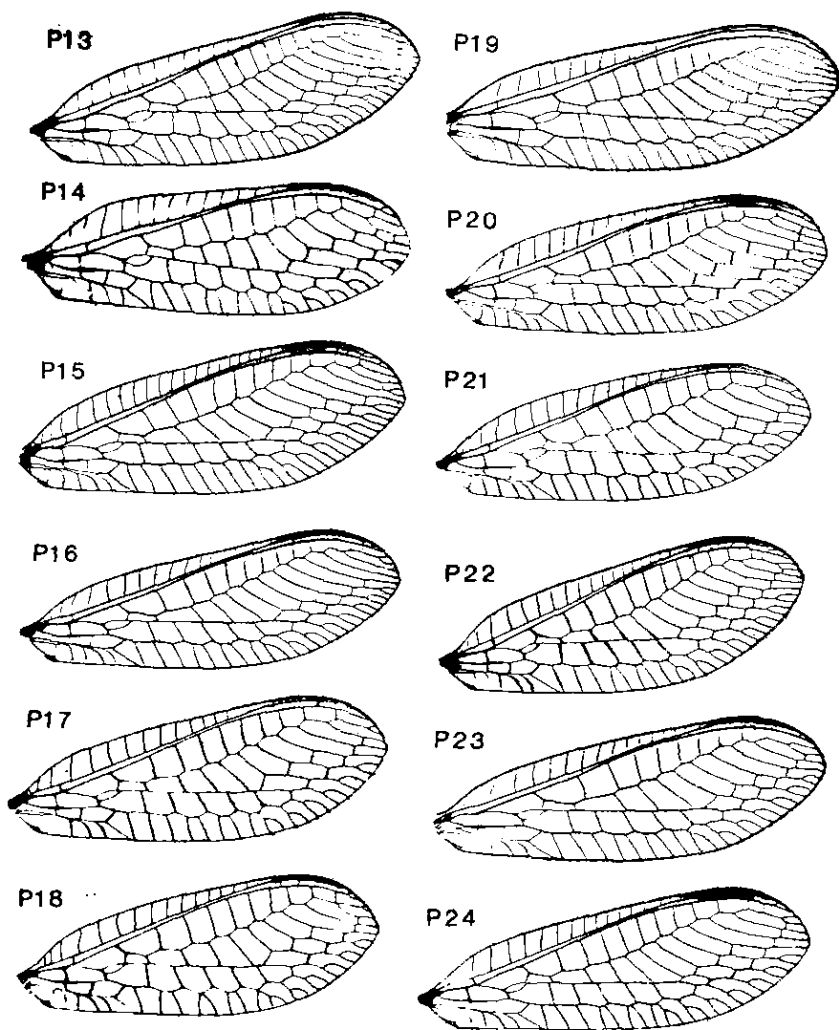


Fig. P13 - P24. P13--*Chrysopodes (Neosuarius) collaris* (13.6); P14--*C. (N.) divisa* (10.2); *Ceraeochrysa*: P15--*C. cincta* (14.8); P16--*C. claveri* (13.7); P17--*C. cubana* (11.0); P18--*C. scapularis*; P19--*C. acutipuppis* (13.4); P20--*C. rafaelli* (12.0); P21--*C. reddy* (9.8); P22--*C. sanchezi* (15.0); P23--*C. everes* (13.0); P24--*C. squalidens* (11.6). Figures in parentheses are wing lengths in millimeters.

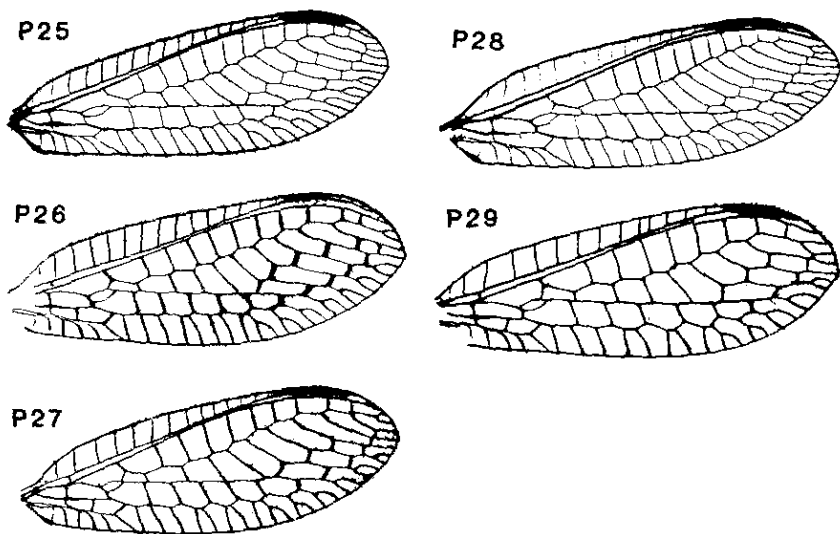


Fig. P25 - P29. *Ceraeochrysa*: P25--*C. nigripes* (13.0); P26--*C. tenuicornis* (9.8); P27--*C. ariasi* (10.0); P28--*C. falcifera* (12.7); P29--*C. michaelmuris* (8.4). Figures in parentheses are wing lengths in millimeters.

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