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The green lacewings of the world: a generic review (Neuroptera: Chrysopidae)

S. J. BROOKS & P. C. BARNARD

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

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SYNOPSIS. The systematic relationships of the world genera of green lacewings, family Chrysopidae, are discussed. Each of the 75 genera and 11 subgenera currently recognised is redescribed, and a cladistic analysis of the main groups of genera is made. The resultant higher classification recognises the three subfamilies Apochrysinae, Chrysopinae and Nothochrysinae, with the Chrysopinae subdivided into four tribes, the Ankylopterygini, Belonopterygini, Chrysopini and Leucochrysini. Keys are provided to the subfamilies and to the genera within each subfamily and a check list of the 1200 currently recognised species and subspecies is given. Three new genera are described and two are given replacement names because of homonymy; there are 18 new generic synonyms and ten genera have new status. In addition, 233 new generic combinations of species are given.

INTRODUCTION

The Chrysopidae is one of the largest and economically most important families of the Neuroptera. The family includes over 1200 currently recognized species and subspecies that are divided between 86 genera and subgenera. The larvae of all species and the adults of a few genera are predaceous and most feed on aphids, coccids and other soft-bodied insects which they encounter on foliage. For this reason some species have been reared and successfully used for the biological control of agricultural pests (New, 1975).

The classification of the family is confused and many of the species and genera, especially those described by L. Navás during the first 30 years of this century, are difficult to interpret from the original descriptions. Many of these genera were based on single species (frequently on single

specimens) and have not been examined or redescribed by modern systematists.

The present study is the first to attempt a generic revision of the entire Chrysopidae on a world-wide basis. However, the two smallest subfamilies, the Apochrysinae and Nothochrysinae which include no more than 3% of the described species between them, were revised by Kimmins (1952*a*) and Adams (1967) respectively. There have also been several faunistic accounts (Zimmerman, 1957: Hawaii; Adams, 1959: Micronesia; Kuwayama, 1962: Japan; Tjeder, 1966: South Africa; Hölzel, 1967: Asia; Aspöck, Aspöck & Hölzel, 1980; Europe; Hölzel, 1980: Arabia; New, 1980: Australia), although the majority of these were concerned with the identification of species and did not critically review or examine the natural relationships of the genera.

The need for a world revision of the family was recognized over 50 years ago by Killington (1937). This need is just as apparent now and has been discussed by New (1984). During the present study representatives of nearly all the described chrysopid genera with examples of almost 50% of the described species (in addition to many undescribed species) have been critically examined. As a result of this work 75 genera and 11 subgenera are now recognized as valid and these have been redescribed and figured. Three new genera are described and two have been given replacement names as a result of homonymy. There are 18 new generic synonyms and ten genera have new status. In addition, 233 new generic combinations of species are listed.

Although this review will not be the last word on the classification of this large and important group, it should provide a framework for future taxonomic work on the family. The main problems yet to be resolved would seem to be the exact relationships of all the genera within each tribe and subfamily.

HISTORICAL REVIEW

Suprageneric classification

The Chrysopidae were first recognized as a suprageneric taxon by Schneider (1851) who proposed Chrysopina as a subgroup of the Hemerobiidae. Two genera were included, *Chrysopa* Leach which comprised 53 species, and *Apochrysa* Schneider of which only one species was known. Handlirsch (1908) regarded *Apochrysa* and related genera as sufficiently distinct from the rest of the Chrysopidae to merit a family of their own. This view was supported by Esben-Petersen (1918) who based his reasons on venational characters, but Tillyard (1926) regarded the group as a subfamily of the Chrysopidae. The Apochrysinae were subsequently revised by Kimmins (1952*b*), who also based his study on the wing venation. He concluded that the group were highly derived chrysopids and should be treated as a subfamily of the Chrysopidae. Most later workers have followed Kimmins but some (e.g. Adams, 1978*a*) have argued that the group should have no more than tribal status, being related to the Neotropical chrysopine genus *Leucochrysa* McLachlan.

Navás (1910*a*; 1913*a*; 1914*a*) divided the Chrysopidae into several tribes many of which were distinguished by relatively trivial venational characters and have been ignored by subsequent authors. However, one of these tribes, the Nothochrysini, has been shown to be valid and was revised by Adams (1967). He established the Nothochrysinae as a subfamily of the Chrysopidae and demonstrated that it was probably the most primitive group of extant chrysopids.

Another tribe proposed by Navás (1910*a*) was the Ankylopterygini and this was one of three tribes into which Hölzel (1970) divided the Old World Chrysopinae. The Chrysopinae is the largest of the three subfamilies of Chrysopidae, comprising more than 97% of the described species, and yet Hölzel's was the first critical attempt to assess the tribal classification of the subfamily. Hölzel included the majority of genera in the Chrysopini but also recognized the Ankylopterygini, which was further characterized by Brooks (1983), and the Italochrysini, which was also redescribed by Brooks (1984). Adams (1978*a*) listed two additional New World chrysopine tribes, the Belonopterygini which was originally erected by Navás (1913*a*) and a new tribe, the Leucochrysini. The tribes were not described but the constituent genera were given. Later, Adams & Penny (1986) synonymized the Italochrysini with the Belonopterygini. The Chrysopini and Leucochrysini have, until now, never been fully described.

Generic classification

Until about twenty years ago most of the generic classification of the Chrysopidae had relied on characters of the wing venation. This resulted in the erection of many genera containing few species with unusual venational characteristics but

left nearly 1000 species with more conservative venation in the unwieldy and phylogenetically meaningless genus *Chrysopa* Leach. However, additional characters were available, particularly those of the genitalia. The morphology of neuropteran genitalia was elucidated by Stitz (1909*a*; 1909*b*) and their possible significance in chrysopid taxonomy was recognized by Smith (1932) and Killington (1937), but it was not until Tjeder's (1966) important work on the South African lacewings that their true value in chrysopid systematics was realized.

Tjeder noted that there is a great variety in the male genitalic components of *Chrysopa* s.l. Furthermore, he was able to demonstrate that the presence or absence of certain structures in the male genitalia united groups of allied species which he considered as subgenera of *Chrysopa*. However, he was unable to discern many significant external characters or differences in the female genitalia which would also distinguish most of these subgenera. This implied that the male genitalic characters had limited application, since there would be difficulty in assigning females which were not associated with males to the correct subgenus. Some subsequent authors (New, 1980; Barnard, 1984) have argued that the separation of taxa based almost entirely on the composition of the male genitalia can be simplistic and that these characters do not necessarily delimit natural groups. However, Principi (1977) demonstrated that useful external and female genitalic characters do exist which help to define these genera and Séméria (1977) has observed biological differences. Hölzel (1970) and Aspöck *et al.* (1980) have followed Tjeder's lead and raised many of his subgenera to generic rank.

Most of the recent work on the genera of the New World fauna has been carried out by Adams (1975; 1977; 1982*a*; 1982*b*). He has also shown the usefulness of the male genitalia for delimiting genera and has linked many external and female genitalic characters with them. More than any other contemporary chrysopid worker, Adams has tried to demonstrate phylogenetic relationships between the genera. This has necessitated a close scrutiny of the characters used to define genera in order to assess whether or not they are derived.

In addition to using adult morphological characters to investigate chrysopid taxonomy, some authors (Tauber, 1974; 1975; Tsukaguchi, 1978; Gepp, 1983) have examined the larvae while others (Séméria, 1983) have looked at the karyotypes. Although these methods can help to elucidate particular problems when used in conjunction with morphological evidence, only a few Palaearctic and North American chrysopid species have so far been examined using these techniques. It is therefore difficult to draw any general conclusions from these data until biological information from species occupying a wider zoogeographical range is available.

DISCUSSION OF TAXONOMIC CHARACTERS

Almost all the chrysopid genera that were described before Tjeder's (1966) work were based on wing venational characters. Since 1966 authors have adopted a more integrated approach, using as many characters as possible and placing an emphasis on male genitalic characters. However, almost invariably authors have not taken a phylogenetic view when describing genera and usually have not attempted to assess whether the characters used to define a taxon are apomorphic or plesiomorphic. This has led to the erection of many polyphyletic genera based on convergent characters and also to the unnecessary splitting of taxa when undue weight is placed on a particular derived character, leaving sister groups poorly defined without unique apomorphies.

In this study we have thoroughly examined as many specimens as possible in order to assess the maximum number of characters from all parts of the insect. Like previous authors, we have found that the male genitalia provide the most useful and phylogenetically meaningful characters. However, there are many external and female genitalic characters of great significance and we have succeeded in finding external (non-genitalic) autapomorphies for most genera. This has enabled the construction of a key to the genera with which most chrysopid specimens can be correctly assigned without recourse to dissecting the genitalia.

Wings (Fig. 1)

Barnard (1984) has discussed the taxonomically useful imaginal chrysopid characters and advised caution when interpreting the venation. During this study it has become apparent that many genera which have been distinguished on venational characters are invalid when other characters are taken into consideration. The most frequent errors have arisen when undue emphasis has been placed on the number of rows of gradate crossveins. It seems likely that multiple series of gradates have arisen, or been lost, independently

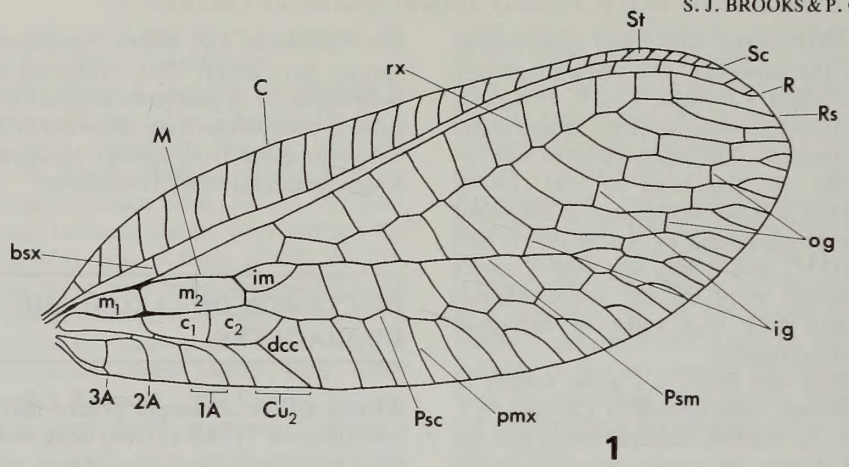


Fig. 1 *Chrysopa perla*, right fore wing. bsx = basal subcostal crossvein, C = costa, c_1 and c_2 = 1st and 2nd cubital cells, Cu_2 = 2nd cubital vein, dcc = distal cubital cell, i.g. = inner gradate crossveins, im = intramedian cell, M = media, m_1 and m_2 = 1st and 2nd median cells, o.g. = outer gradate crossveins, pmx = posterior median crossveins, Psc = pseudocubitus, Psm = pseudomedia, R = radius, Rs = radial sector, rx = radial crossveins, Sc = subcosta, St = pterostigma, 1A – 3A = 1st–3rd anal veins.

on many occasions in the Chrysopidae and that the number of gradate series has little significance at the generic level. Indeed, the number of gradate rows sometimes varies even between individuals of the same species (Tsukaguchi, 1985). The shape of the intramedian cell in the fore wing has also been used on several occasions to distinguish certain genera. Again, this has proved to have little significance when other characters are taken into account and it is apparent that the shape of cell *im*, and sometimes even its presence or absence, can vary within genera or species. However, a long median fork is probably the plesiomorphic condition and a short fork is apomorphic within the family. Therefore, a broad, quadrangular intramedian cell is plesiomorphic and a narrow, short, ovate *im* is apomorphic. The absence of *im* is the most derived condition.

However, there are many wing venational characters which are helpful in determining phylogenies. In the Nothochrysinae the absence of a tympanal organ is plesiomorphic. The tympanal organ is small, spherical and bulging in the Chrysopinae and is in its most derived condition in the Apochrysinae where it is elongate but not bulging. The basal subcostal crossvein is positioned relatively distally in the Nothochrysinae. This is probably the primitive condition in the family Chrysopidae; in the more advanced subfamilies it occupies a more basal position. In the Chrysopinae the subcostal crossvein is situated closer to the base of the fore wing than in the Nothochrysinae, but within the subfamily Chrysopinae it is most distal in the Belonopterygini and most basal in the Ankylopterygini. The most derived condition occurs in the Apochrysinae in which the crossvein is completely lacking. The relative lengths of cells c_1 and c_2 are also significant. In most Chrysopidae c_1 is shorter than c_2 and this is seen at its most extreme in the Nothochrysinae where c_1 may be less than half the length of c_2. In the Apochrysinae and most of the Chrysopinae cells c_1 and c_2 are about equal in length but in most of the belonopterygine genera cell c_1 is considerably longer than c_2 and this probably represents the most derived condition. The plesiomorphic condition for wing setation which occurs widely throughout the Chrysopidae is for short, inclined setae. However, the apomorphic condition occurs in the Apochrysinae, Ankylopterygini and a few Chrysopini and Leucochrysini in which the setae are long and erect.

Description of plesiomorphic chrysopid wing

Fore wing unmarked; length : breadth 2.5–3.0 : 1; costal setae short, inclined; costal area narrow; Sc long; Sc and R widely separated; basal Sc crossvein > 0.75 mm; *im* broad, quadrangular; radial crossveins straight; Rs sinuate; gradates in two parallel series; inner and outer gradates equal in number; basal inner gradate meeting Psm; inner gradates not extending basally; veins not crassate in ♂; c_1 shorter than c_2; c_2 narrow; *dcc* open at margin.

Head

The head also provides many useful characters and the shape of the mandibles and apical segment

of the palps are of considerable significance when considering generic relationships. Plesiomorphically the mandibles are broad, asymmetrical with a basal tooth on the left mandible, and this condition occurs in all three subfamilies. However, in some Chrysopini genera there is a basal tooth on both mandibles and this would appear to be an apomorphic condition. The most derived condition occurs in some species of *Chrysopodes* Navás and the Ankylopterygini in which the mandibles are narrow, scythe-like and lack basal teeth. The morphology of the apical segment of the palps varies considerably in the Chrysopidae but is consistent within certain groups. The plesiomorphic condition probably occurs in the Nothochrysinae and the Belonopterygini in which the palps are broad and rounded apically. In the Apochrysinae and Chrysopini the apical segment is compressed dorsoventrally and the apex is asymmetrical since it tapers more strongly on the inner margin than outer. The palps of the Apochrysinae are more truncate than those of the Chrysopinae. The most derived condition occurs in the Ankylopterygini in which the apical segment is rounded but narrows abruptly subapically and is considerably elongated. This condition is approached in some Chrysopini genera such as *Eremochrysa* Banks.

The relative size of the eyes and width of the head can also suggest possible relationships. The Nothochrysinae have the smallest eyes amongst the Chrysopidae and this apparently represents the apomorphic condition since it rarely occurs in the rest of the family. Small eyes also occur in the Chrysopinae but they are restricted to a few genera such as *Chrysopa* Leach and *Chrysopiella* Banks. The largest eyes occur in the Apochrysinae.

Similarly, the relative width of the flagellar segments and the number of rings of setae can provide useful clues. The plesiomorphic condition for the width of the flagellar segments in the Chrysopidae is probably 2–3 times as long as broad. In the Belonopterygini the trend has been for the segments to become broader and the most derived condition occurs in *Belonopteryx* Gerstaecker in which the segments are twice as broad as long. In other taxa the segments are elongated and in *Ankylopteryx* Brauer they are over 4 times as long as broad. It seems likely that there has been a reduction in the number of setal rings on the flagellar segments during the evolution of the Chrysopidae. In the Nothochrysinae there are six rings, with five in the Apochrysinae, but this has reduced to four in the Chrysopinae. In some Belonopterygini the apical ring is present but sparse, suggesting the most derived condition.

Description of plesiomorphic chrysopid head

Head with black markings; palps broad, short, rounded apically; galea broad with large apical papilla; mandibles broad, asymmetrical with basal tooth on left mandible; labrum emarginate; vertex flattened; toruli small; eyes large; scape about as long as broad; pedicel hardly constricted medially; flagellar segments 2–3 times as long as broad; flagellar setae in six rings; antenna shorter than fore wing.

Thorax

There are few useful characters on the thorax and legs although the degree of dilation at the base of the claw is sometimes important. A simple claw probably represents the plesiomorphic condition, but the basal dilation appears to have arisen in the Chrysopidae on many separate occasions. A broad pronotum is probably plesiomorphic in the family, and occurs in the Nothochrysinae and Belonopterygini. The most derived condition occurs in the Apochrysinae and certain Chrysopini such as *Plesiochrysa* Adams and *Ceratochrysa* Tjeder in which the pronotum is elongate.

Abdomen

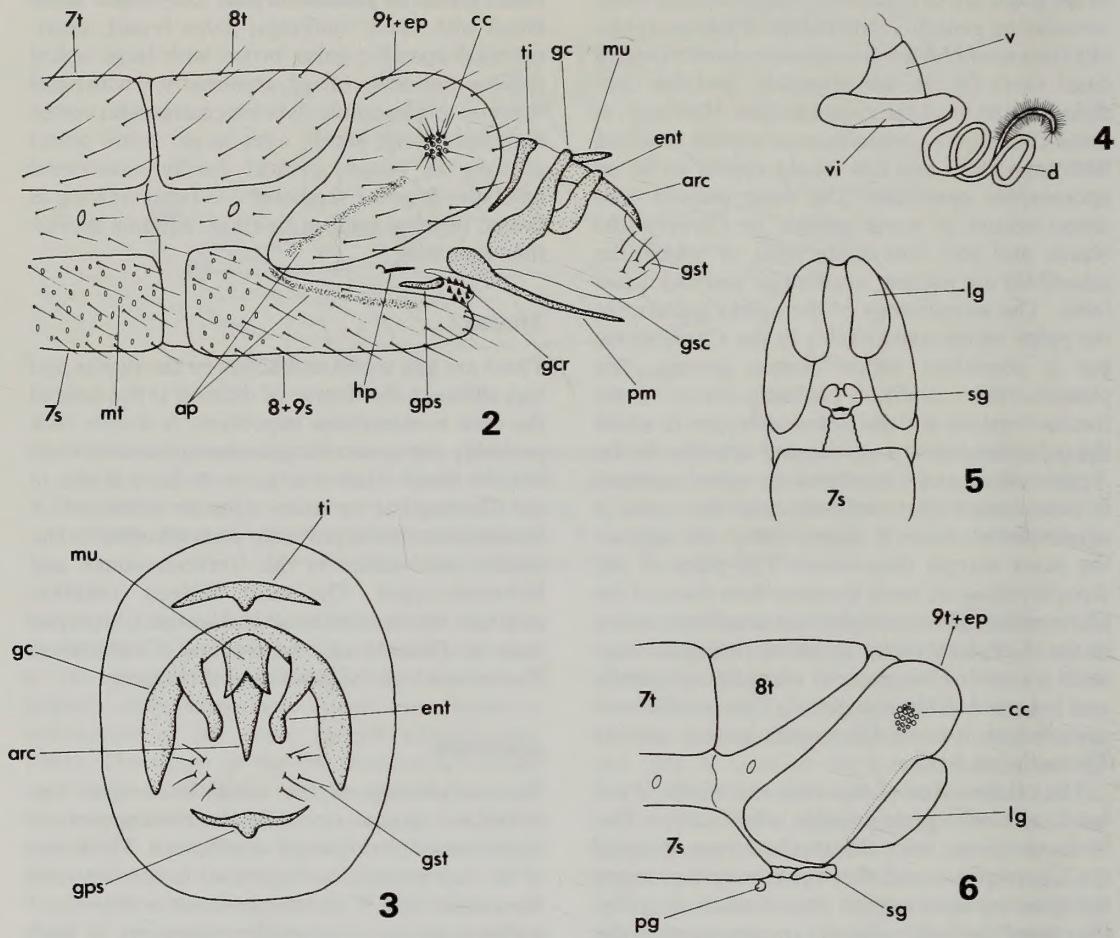
The morphology of the apical abdominal segments and genitalia provide the most numerous characters of phylogenetic significance. The shape of the ectoprocts, the degree of fusion between them and tergite 9, and the presence or absence of a dorsal suture between the ectoprocts in both males and females have proved to be very useful in establishing generic relationships. Of similar importance is whether or not sternites 8 and 9 are fused in males, fusion between the sternites probably being the derived condition.

Description of plesiomorphic chrysopid abdomen

Abdominal setae short, sparse; microtholi absent; trichobothria few; ectoprocts with slight dorsoapical invagination; ectoprocts short and rounded apically; ectoprocts fused dorsally; ectoprocts entirely separate from tergite 9; sternites 8 and 9 separate; sternite 9 short, broad.

Male genitalia (Figs 2, 3)

The morphology and complement of the male genitalia are of fundamental significance in assessing the higher classification of the Chrysopidae. The plesiomorphic male genitalia simply consist of a broadly arcuate gonarcus with entoprocessus and a short, hooked arcessus surrounded by a small gonosaccus with a few short gonosetae; this



Figs 2–6 2, 3, diagrammatic representation of apex of abdomen and genitalia of male chrysopid; (2) lateral view, (3) caudal view. ap = apodemes, arc = arcessus, cc = callus cerci, ent = entoprocessus, gc = gonarcus, gcr = gonocristae, gps = gonapsis, gsc = gonosaccus, gst = gonosetae, hp = hypandrium internum, mt = microtholi, mu = median plate, pm = parameres, ti = tignum, 7s = 7th sternite, 7t – 8t = 7th – 8th abdominal tergites, 8+9s = 8th + 9th fused sternites, 9t+ep = 9th tergite plus ectoproct. 4, typical female chrysopid spermatheca, lateral view; 5, 6, apical abdominal segments of typical female chrysopid; (5) ventral view, (6) lateral view. cc = callus cerci, d = duct, lg = lateral gonapophyses, pg = praegenitale, sg = subgenitale, v = vela, vi = ventral impression, 7s = 7th sternite, 7t and 8t = 7th and 8th abdominal tergites, 9t+ep = 9th abdominal tergite plus ectoproct. (After Barnard, 1984.)

occurs largely in the Nothochrysinae and the Apochrysinae.

In the Chrysopinae the genitalia are more complex. In the most primitive tribe, the Belonopterygini, the gonarcus is transverse and hardly arcuate, often with a pair of lateral horns (gonocornua), and the entoprocessus have been lost. The arcessus is short and is flanked apically by membranous lateral lobes. In some of the more derived genera a pair of parameres is present and the gonocornua are absent. The male genitalia of the Leucochrysini are similar to those of the Belonopterygini, although parameres are never present, and the shared apomorphies suggest that the two tribes may be closely related. In the Chrysopini, the gonarcus is acutely arched and in many genera entoprocessus are present. These structures can be distinguished from gonocornua because they articulate freely with the gonarcus whereas gonocornua are fused with the gonarcus. Where the entoprocessus are absent in the Chrysopini they have probably been secondarily lost.

Many Chrysopinae possess a tignum and/or a gonapsis and this may be plesiomorphic within the tribe Chrysopini. This seems to be the most plausible explanation; otherwise one would have to postulate the repeated independent

development of these structures in genera which are otherwise clearly related to genera lacking a tignum or gonapsis. This seems to be highly unlikely especially considering the close similarity in the shape of the tignum throughout the tribe. Parameres do not occur in the Chrysopini, but the gonapsis, which may have evolved more than once in the family (Adams, 1982*a*), can resemble parameres in some genera such as *Chrysocerca* Weele and *Himalochrysa* Hölzel; however, parameres consist of a paired structure articulated basally whereas the gonapsis is a single entity. In some Chrysopini the arcessus is detached from the gonarcus and is termed the pseudopenis; this is the apomorphic condition. Similarly, a large and strongly setose gonosaccus is the derived condition for the family. Gonocristae have arisen in several genera of Chrysopini. They are situated on a membranous flap at the apex of sternite 8+9 and probably represent modified microsetae.

Female genitalia (Figs 4–6)

The female genitalia offer fewer characters than the male genitalia. The basic pattern repeated throughout the family is a bilobed subgenitale and a pillbox-shaped spermatheca with long, coiled duct, conical ventral impression and curved vela. However, many of the Belonopterygini have a lobate praegenitale situated basad of the subgenitale. This may be derived from a basal elongation of the subgenitale which has become detached; an intermediate condition is probably present in *Nacarina* Navás and is perhaps suggested in *Leucochrysa* McLachlan in which many species have a ventrally curving basal extension of the subgenitale. The ventral impression is very broad and hardly tapers apically in the Nothochrysinae. In the Chrysopinae it gradually tapers but is exceptionally deep in the Belonopterygini. In the Apochrysinae the ventral impression is deep and abruptly tapers apically. These character states probably represent a progression from the plesiomorphic nothochrysine condition to the most derived in the Apochrysinae.

Description of plesiomorphic female genitalia in the Chrysopidae

Apex of sternite 7 straight; gonopophyses narrow; praegenitale absent; subgenitale bilobed apically, not extended basally; spermatheca broad, pillbox-shaped; ventral impression broad, not tapering apically; vela and duct moderately long.

Biological characters

By examining the gut contents of dissected specimens we have been able to ascertain that most adult chrysopids do not feed on insects, unlike the Hemerobiidae. The gut contents of most species are amorphous and these are probably nectar feeders, representing the plesiomorphic condition within the family. Several of the Nothochrysinae feed on pollen and the grains are easily recognizable in the guts. In some genera, especially *Chrysopa* and *Atlantochrysa*, the guts are crammed with insect remains. This probably represents the most derived condition and the species have secondarily returned to a carnivorous diet.

Stridulation has arisen on at least three separate occasions in the Chrysopinae (Brooks, 1987) and courtship displays, which have led to morphological modifications, have appeared in *Meleoma* (Tauber, 1969) and *Mallada* (Duelli & Johnson, 1981).

The larval morphology offers several useful characters. Larvae in all three chrysopid subfamilies carry debris and, although this is undoubtedly a derived character for the Chrysopidae, probably represents the plesiomorphic condition within the family. The most plesiomorphic condition occurs in the Nothochrysinae in which a few large particles of debris are carried, the abdomen is hardly humped, and the thoracic tubercles are only slightly enlarged and bear a few short setae. The most apomorphic of the debris-carriers occur in genera such as *Chrysotropia* Navás and *Ceraeochrysa* Adams in which the larva is almost entirely covered by the debris packet, the abdomen is strongly humped, and the thoracic tubercles are greatly elongated and bear numerous, long, hooked setae. In some Chrysopini the larvae do not carry debris and are very active. This is probably apomorphic and the larvae have secondarily lost the debris-carrying habit. In these genera the abdomen is not humped and the thoracic tubercles are reduced in size, the most extreme state being present in *Nineta* in which the tubercles are virtually absent. In the Belonopterygini it is likely that the larvae of some genera, like *Italochrysa*, live parasitically in ant colonies and this also represents an apomorphic modification.

MATERIALS AND METHODS

This work has been based primarily on the extensive chrysopid collections held at the British Museum (Natural History) (abbreviated to BMNH hereafter) although additional specimens have been kindly loaned from many institutions around

the world, and visits were made by one of us (SJB) to the Muséum National d'Histoire Naturelle, Paris; the Musée Royal de l'Afrique Centrale, Tervuren; and the Institut Royal des Sciences Naturelles de Belgique, Brussels. The initial stages of the project involved a complete examination of all the specimens held in the BMNH. First, the material was identified and sorted into appropriate genera and species which involved dissecting the male genitalia of large numbers of specimens. After initial sorting, the material was re-examined genus by genus. At least one specimen from each zoogeographical region in which the genus occurred was thoroughly studied and notes were made of morphological characters from all over the body. In this way a complete picture of the generic characters was built up. In addition, reliably identified examples of the type species of almost all the available generic names were examined. In many cases it was possible to examine the type species of each genus. We have examined nearly 50% of the described species of Chrysopidae together with many undescribed species.

Some of the characters used in this study were assessed by making comparative measurements and are explained below. All measurements were taken with a calibrated graticule.

Head width : eye width
The head width was taken as the distance between the eyes across the front of the vertex. The eye width was taken as a mean of the distance between the inner and outer edge of both eyes from the dorsal side (Fig. 16).

Flagellar segment width : length
A flagellar segment from the middle of the antenna was measured because it was found that the segments were broadest at the base of the antenna and narrower towards the apex.

Wing length : breadth
The wing length was measured from the base to the extreme apex. The breadth was measured across the broadest part of the wing, perpendicular to the costa.

Basal subcostal crossvein (Fig. 1)
This was taken as the distance in millimetres along the radius from the crossvein between m_1 and m_2 to the first subcostal crossvein.

$c_1 : c_2$ (Fig. 1)
The lengths of c_1 and c_2 were measured along the posterior margin of the cells.

Genitalia
The terminology for the genitalia largely follows Tjeder (1966) although it has been necessary to modify this slightly. To avoid confusion we have redefined the terms used in the present work below.

Males (Figs 2, 3).

ARCESSUS. Attached medially to the gonarcus, usually long, narrow and tapering to a hook.
ENTOPROCESSUS (plural). Short, paired structures attached laterally to the gonarcus but articulating with the gonarcus and not fused like the gonocornua.
GONAPSIS. Single plate-like structure closely associated with sternite 8+9.
GONARCUS. A large arcuate structure situated medially.
GONOCORNUA. A pair of medio-lateral horns fused to the gonarcus.
GONOCRISTAE. Patch of coarse, enlarged microsetae on membrane at apex of sternite 8+9.
GONOSACCUS. Membranous sac surrounding the gonarcus complex, often bearing long gonosetae.
MEDIAN PLATE [= mediuncus of Tjeder]. Like the arcessus this structure is also attached medially to the gonarcus but lies above the arcessus. It is usually transverse and bears horns.
PARAMERES. Like the gonapsis these are also associated with sternite 8+9 but are formed from paired cylindrical structures weakly fused and articulating basally.
PSEUDOPENIS. A long, narrow, arcuate structure, lying ventrad of the gonarcus, loosely associated with the gonosaccus.
TIGNUM. A transverse, often arcuate, structure situated dorsad of the gonarcus. The acumen is the small median projection.

Females (Figs 4–6).

CRUMENA. Small pocket situated medially and near base of subgenitale.
PRAEGENITALE. Ventral lobed structure situated subapically of sternite 7. Not fused with subgenitale.
SPERMATHECA. Large, heavily sclerotized, doughnut-shaped structure situated within 7th abdominal segment.
SPERMATHECAL DUCT. Long, narrow, often highly coiled tube emanating posteriorly from spermatheca. Towards apex duct is fringed with minute glandular ducts.
SUBGENITALE. Bilobed structure, sometimes with short median projection, positioned at apex of long membranous tube posteriorly to sternite 7.
VELA. Tubular structure extending dorsally from the centre of the spermatheca.

VENTRAL IMPRESSION. Ventral median invagination in spermatheca.

A SUMMARY OF THE GENERIC CLASSIFICATION OF THE CHRYSOPIDAE

A full synonymic check list of the world Chrysopidae is given at the end of this paper, but in order to facilitate an understanding of the classification of the family there follows a simple list of the valid subfamilies, tribes, genera and subgenera. Names within in each group are in alphabetical order.

Subfamily **APOCHRYSINAE** Handlirsch

Anapochrysa Kimmins
Apochrysa Schneider
Claverina Navás
Domenechus Navás
Joguina Navás
Lainius Navás
Loyola Navás
Nacaura Navás
Nobilinus Navás
Nothancyla Navás
Oligochrysa Esben-Petersen
Synthochrysa Needham

Subfamily **CHRYSOPINAE** Schneider

Tribe **ANKYLOPTERYGINI** Navás

Ankylopteryx Brauer
  Subgenus *Ankylopteryx*
  Subgenus *Sencera Navás*
Parankylopteryx Tjeder
Retipenna Brooks
Semachrysa Brooks
Signochrysa gen. n.

Tribe **BELONOPTERYGINI** Navás

Abachrysa Banks
Belonopteryx Gerstaecker
Calochrysa Banks
Chrysacanthia Lacroix
Chrysaloysia Navás
Dysochrysa Tjeder
Evanochrysa gen. n.
Italochrysa Principi
Nacarina Navás
Nesochrysa Navás
Nodochrysa Banks
Oyochrysa Brooks
Stigmachrysa Navás
Turnerochrysa Kimmins

Tribe **CHRYSOPINI** Schneider

Anomalochrysa McLachlan
Apertochrysa Tjeder
Atlantochrysa Hölzel
Austrochrysa Esben-Petersen
Borniochrysa nom. n.
Brinckochrysa Tjeder
Ceraeochrysa Adams
Ceratochrysa Tjeder
Chrysemosa nom. n.
Chrysocerca Weele
Chrysopa Leach
Chrysoperla Steinmann
Chrysopidia Navás
  Subgenus *Anachrysa* Hölzel
  Subgenus *Chrysopidia*
  Subgenus *Chrysotropia* Navás
Chrysopodes Navás
  Subgenus *Chrysopodes*
  Subgenus *Neosuarius* Adams & Penny
Cunctochrysa Hölzel
Eremochrysa Banks
  Subgenus *Chrysopiella* Banks
  Subgenus *Eremochrysa*
Glenochrysa Esben-Petersen
Himalochrysa Hölzel
Kostka Navás
Mallada Navás
Meleoma Fitch
Nineta Navás
Parachrysopiella gen. n.
Peyerimhoffina Lacroix
Plesiochrysa Adams
Rexa Navás
Suarius Navás
Tumeochrysa Needham
Ungla Navás
Yumachrysa Banks

Tribe **LEUCOCHRYSINI** Adams

Berchmansus Navás
Cacarulla Navás
Gonzaga Navás
Leucochrysa McLachlan
  Subgenus *Leucochrysa*
  Subgenus *Nodita* Navás
Neula Navás
Nuvol Navás
Vieira Navás

Subfamily **NOTHOCHRYSINAE** Navás

Dictyochrysa Esben-Petersen
Hypochrysa Hagen
Kimochrysa Tjeder
Nothochrysa McLachlan
Pamochrysa Tjeder
Pimachrysa Adams
Triplochrysa Kimmins

THE TRIBAL CLASSIFICATION OF THE FAMILY

As described in the Historical Review (p. 118) most recent authors have divided the family Chrysopidae into three subfamilies, the Apochrysinae, Chrysopinae and Nothochrysinae, with a varying number of ill-defined tribes within the Chrysopinae. In order to attempt a clarification of the relationships between these various groups we studied the distribution of 120 characters among as many genera and subgenera as possible: only *Neula* Navás and *Nuvol* Navás were omitted from the analysis owing to lack of suitable material. The list of characters is given below, with the presumed apomorphic (+) and plesiomorphic (−) states indicated. The character polarity is based on outgroup comparisons with other Neuropteran families, principally the closely related Hemerobiidae.

1 Palps truncate (+); tapered (−)
2 Palps elongate (+); rounded (−)
3 Labrum straight (+); indented (−)
4 Mandibles narrow (+); broad (−)
5 Both mandibles toothed (+); only left mandible toothed (−)
6 Galea narrow (+); broad, swollen apically (−)
7 Vertex raised (+); flat or domed (−)
8 Toruli small (+); large (−)
9 Head width : eye width large, >2.8:1 (+); small (−)
10 Scape elongate (+); squared (−)
11 Flagellar segments narrow (+); broad, length : breadth < 2 : 1 (−)
12 Flagellar segments with more than 4 rings of setae (+); 4 rings (−)
13 Antenna longer than fore wing (+); shorter or same length (−)
14 Head with red markings (+); black markings or unmarked (−)
15 Prothorax broad (+); narrow or elongate (−)
16 Thorax marked with red or black (+); unmarked (−)
17 Prothoracic setae long (+); short (−)
18 Tarsal claws dilated (+); simple (−)
19 Setae on legs long (+); short (−)
20 Legs marked (+); unmarked (−)
21 Fore wing narrow, length : breadth >3.0 (+); broad (−)
22 Costal setae long (+); short (−)
23 Subcosta short (+); long (−)
24 Pterostigma marked (+); unmarked (−)
25 Subcosta and radius close (+); widely separated (−)
26 Basal subcostal crossvein proximal (+); distal, >1.4 (−)
27 Fore wing gradate crossveins in 3 series (+); 2 series (−)
28 Hind wings gradates in 3 series (+); 2 series (−)
29 Gradates divergent (+); parallel (−)
30 Gradates unequal in number (+); equal (−)
31 Basal inner gradate not meeting Psm (+); meeting Psm (−)
32 Cell im ovate (+); rectangular (−)
33 Rs straight (+); sinuate (−)
34 Veins crassate in male (+); not crassate (−)
35 Basal inner gradate series extended basally (+); not basally extended (−)
36 Basal costal area narrow (+); broad (−)
37 Costal cells broad, >0.4 (+); narrow (−)
38 Cell c_1 longer than c_2 (+); shorter or same length (−)
39 Cu_2 forked (+); unforked (−)
40 1A forked (+); unforked (−)
41 Cell c_2 broad (+); narrow (−)
42 Fore wing extensively marked (+); unmarked (−)
43 Basal costal spot present (+); absent (−)
44 Radial crossveins sinuate (+); straight (−)
45 Cell *dcc* closed (+); open (−)
46 Basal post-marginal crossvein forked (+); unforked (−)
47 Hind wing narrow (+); broad (−)
48 Male abdominal setae long (+); short (−)
49 Abdominal setae dense (+); sparse (−)
50 Microtholi present (+); absent (−)
51 Callus cerci rounded (+); ovate (−)
52 Trichobothria numerous (+); few (−)
53 Ectoproct dorsal invagination deep (+); shallow (−)
54 Ectoprocts extended apically (+); rounded (−)
55 Ectoprocts fused dorsally (+); not fused or with suture (−)
56 Sternites 8 and 9 fused (+); not fused (−)
57 Sternites 8 and 9 long (+); short (−)
58 Male ectoproct and tergite fused (+); not fused (−)
[59 & 60: characters not used in final analysis]
61 Tignum present (+); absent (−)
62 Gonapsis present (+); absent (−)

63 Median plate present (+); absent (−)
64 Entoprocessus present (+); absent (−)
65 Parameres present (+); absent (−)
66 Gonarcus transverse (+); arcuate (−)
67 Gonarcus with gonocornua (+); gonocornua absent (−)
68 Pseudopenis present (+); absent (−)
69 Additional ventral process present (+); absent (−)
70 Arcessus long and narrow (+); broad and short (−)
71 Apical hook of arcessus strong (+); weak (−)
72 Gonosaccus long (+); short (−)
73 Gonosetae present (+); absent (−)
74 Gonosetae in lateral clumps (+); evenly dispersed (−)
75 Gonosetae numerous (+); sparse (−)
76 Gonocristae present (+); absent (−)
77 Apex of sternite 7 in female indented (+); straight (−)
78 Praegenitale present (+); absent (−)
79 Crumena present (+); absent (−)
80 Subgenitale trilobed (+); bilobed (−)
81 Spermatheca narrow (+); broad (−)
82 Ventral impression of spermatheca deep (+); shallow (−)
83 Vela long (+); short (−)
84 Spermathecal duct long (+); short (−)
85 Adult insectivorous (+); not insectivorous (−)
86 Stridulatory structure present (+); absent (−)
87 Cell m_2 short (+); long (−)
88 Sternites enlarged (+); small (−)
89 Subgenitale extended basally (+); short (−)
90 Papilla on galea large (+); small (−)
91 Basal Sc crossvein present (+); absent (−)
92 Cell *im* present (+); absent (−)
93 Thorax with median yellow stripe (+); stripe absent (−)
94 Cell *im* narrow (+); broad (−)
95 Arcessus with dorsal striations (+); striations absent (−)
96 Tympanal organ present (+); absent (−)
97 Tympanal organ swollen (+); narrow (−)
98 Psc and Psm close (+); widely separated (−)
99 Psm meeting outer gradates (+); meeting inner gradates (−)
100 Rs arises close to wing base (+); arises distally (−)
101 Ectoproct and tergite fused in female (+); not fused (−)
102 Arcessus trifurcate apically (+); simple (−)
103 Ectproct not hinged, no basal extension (+); hinged (−)
104 Gonosetae long (+); short (−)
105 Arcessus with dorsal microsetae (+); no microsetae (−)
106 Male with additional short setae on sclerites (+); setae absent (−)
107 Larvae naked (+); larvae debri-carriers (−)
108 Ventral apodeme projecting dorsally (+); not projecting (−)
109 Tergite 9 broad (+); narrow (−)
110 Male ectoprocts lobed (+); simple (−)
111 Flagellar segments with 3 (or reduced 4) rings of setae (+); more than 3 rings (−)
112 Costal crossveins sinuous at base (+); straight (−)
113 Prothoracic setae absent (+); present (−)
114 Cell *im* short (+); long (−)
115 Spermatheca with lateral striations (+); no striations (−)
116 Eighth abdominal spiracle on membrane (+); spiracle on tergite (−)
117 Ventral impression of spermatheca narrow (+); broad (−)
118 Psm upturned at outer gradates (+); downturned (−)
119 Jugal lobe reduced (+); well developed (−)
120 Larva associated with ants (+); not ant-associated (−)

The distribution of these character states throughout the 80 genera and subgenera examined is given in Table 1. It should be noted that where a name represents both a genus and its nominate subgenus (e.g. *Ankylopteryx*) then it is the subgenus which is referred to: this was to see whether the presumed relationships of subgenera were confirmed by the analysis.

The data were analysed using G. S. Farris's phylogenetic program 'Hennig-86'. The full results are discussed in detail in a separate paper by I. J. Kitching & S. J. Brooks (in prep.), but the resultant relationships of the subfamilies and tribes are shown as a cladogram in Fig. 7. The cladogram confirms that the three subfamilies Apochrysinae, Chrysopinae and Nothochrysinae are monophyletic; the Nothochrysinae is apparently the most plesiomorphic group, which corresponds to many authors' description of them as the most primitive subfamily. Within the Chrysopinae the tribe Belonopterygini is the most primitive, but the relationships of the other three tribes are impossible to determine with any certainty, largely because it appears that the tribe Chrysopini is not monophyletic. However, our aim is to provide a practical framework for the classification of the family: the final classification simply recognises the three subfamilies, with four tribes within the Chrysopinae, and we are confident that this basic classification will serve the needs of taxonomists working on this group for some time to come.

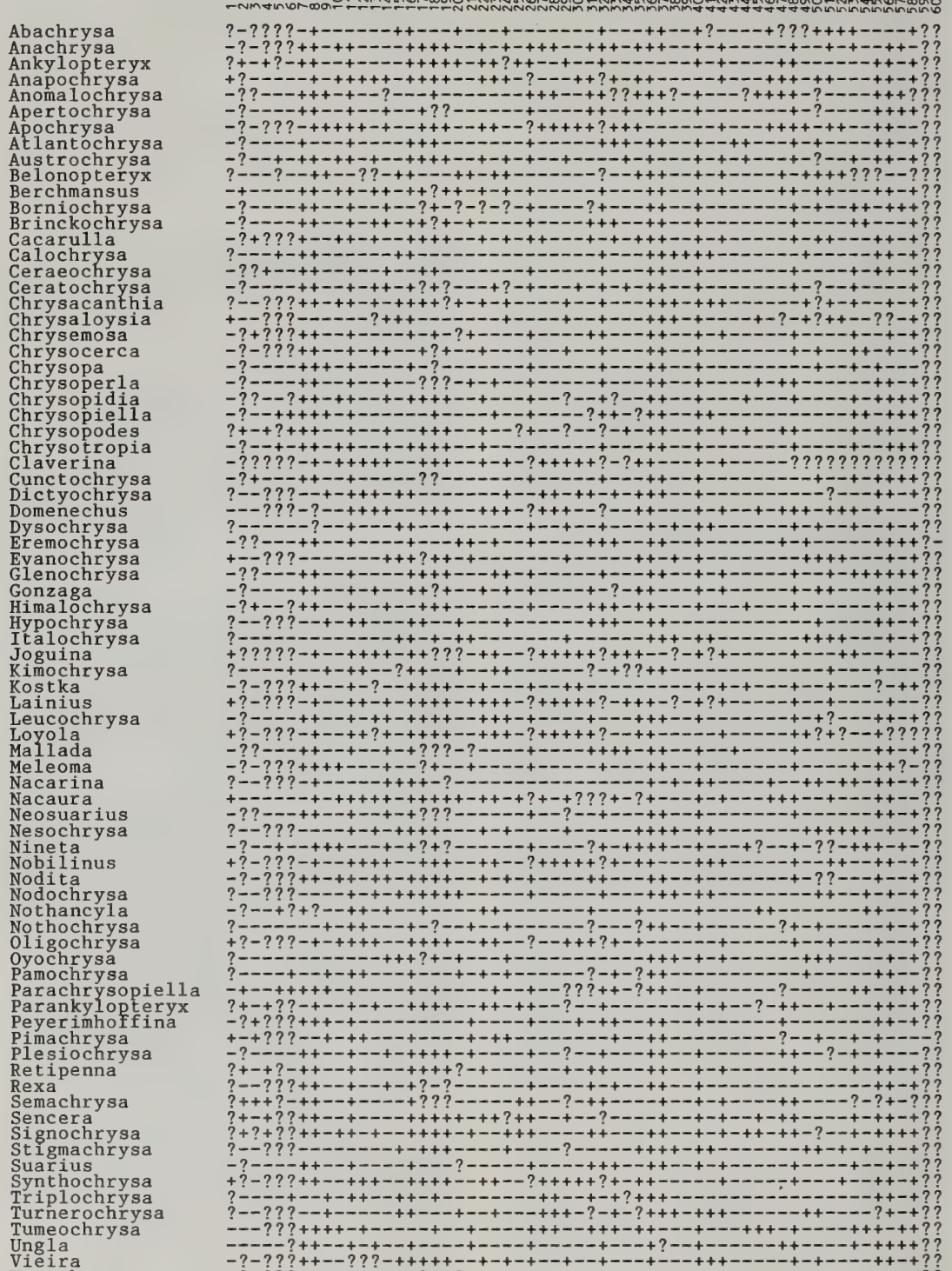
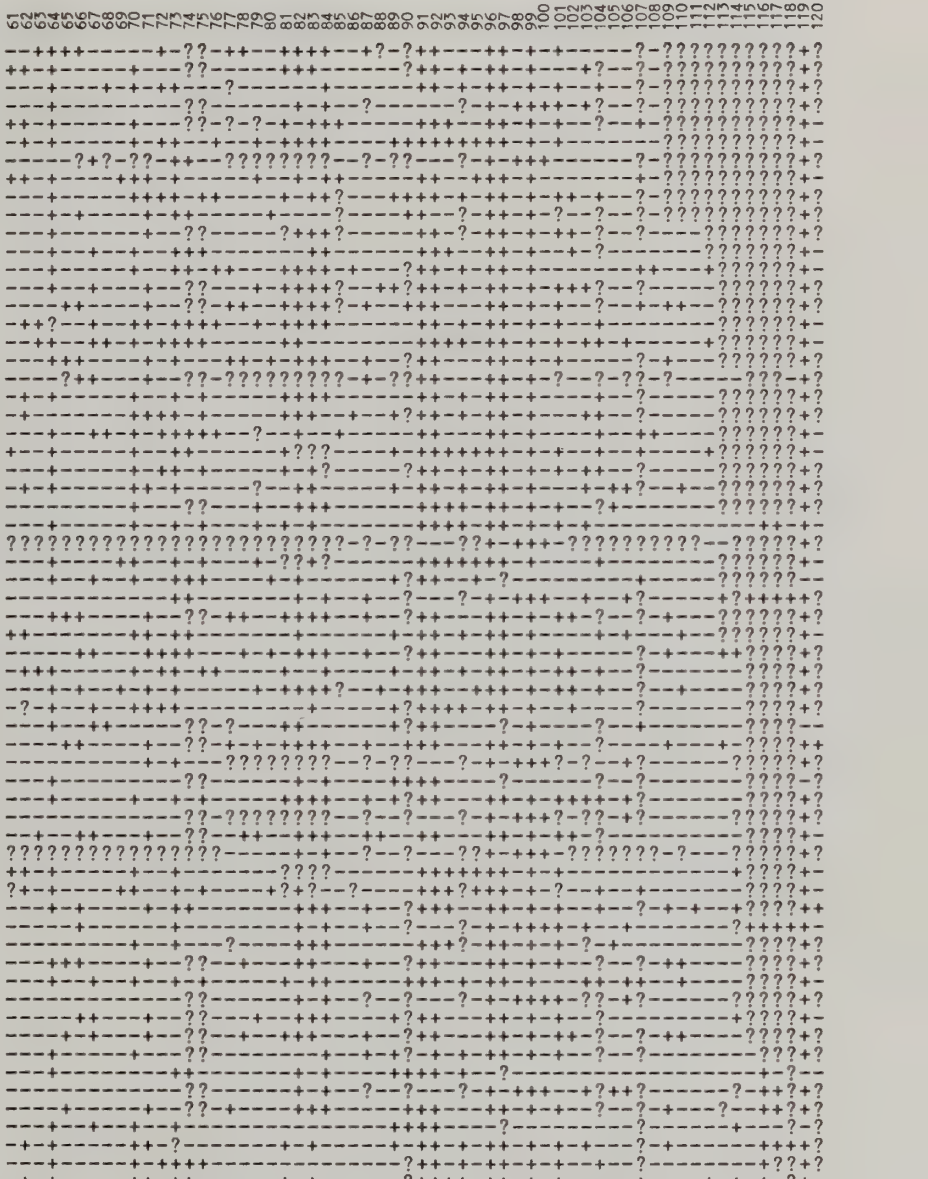


Table 1 The distribution of characters among the 80 genera and subgenera examined in the cladistic analysis, showing presence (+) or absence (−) of a character, or state unknown (?) due to lack of information. See text for list of characters 1–120.



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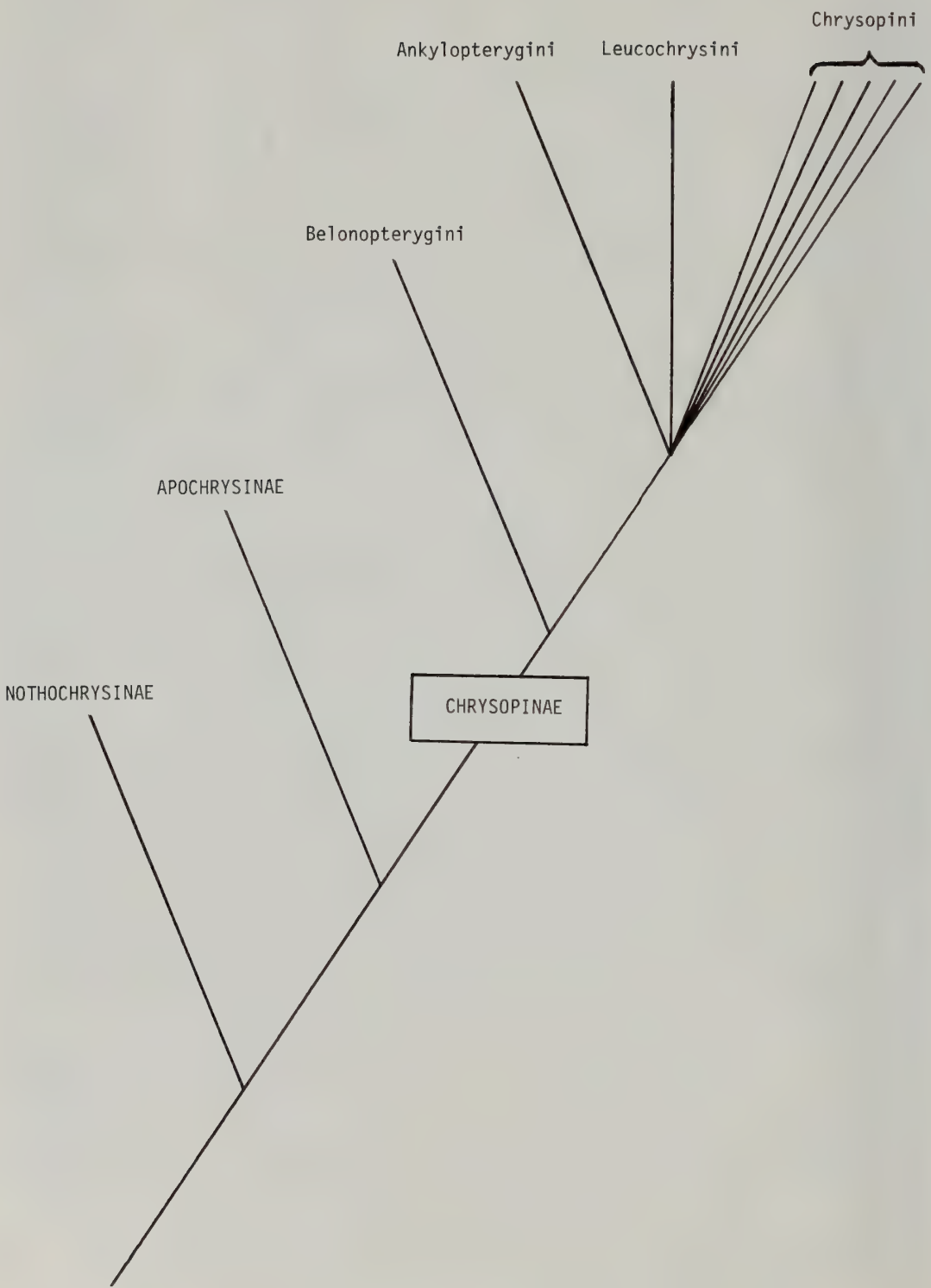
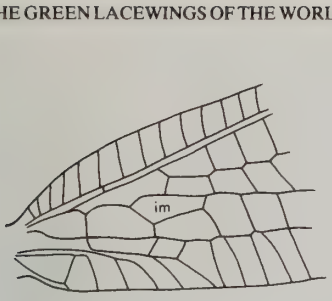


Fig. 7 Cladogram of subfamilies and tribes of Chrysopidae. See text for explanation.



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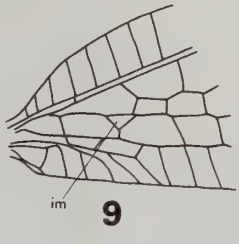

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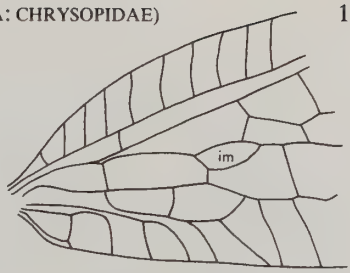

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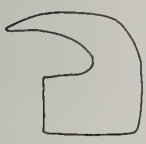
Figs 8–10 Base of fore wing of three chrysopid genera showing variation in shape of intramedian cell (im).



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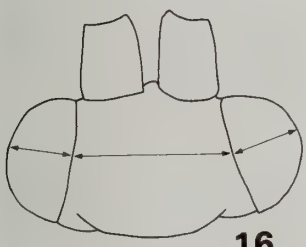
Figs 11–15 11, chrysopid claw with basal dilation; 12, claw without basal dilation; 13–15, apical segment of maxillary palps showing variation between the tribes of Chrysopinae.



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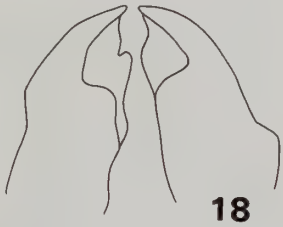

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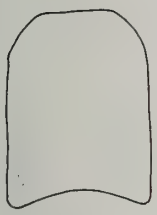

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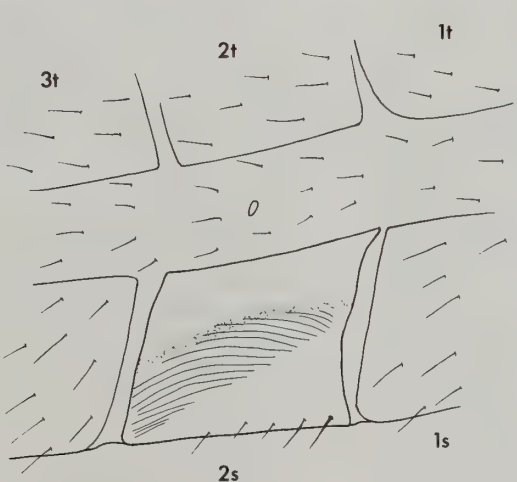

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Figs 16–21 16, chrysopid head showing head width : eye width measurements; 17, 18, variation in morphology of chrysopid mandibles; 19, prothoracic markings in *Austrochrysa*; 20, position of stridulatory structure in certain genera; 21, apex of ♀ 7th sternite in *Brinckochrysa*, ventral view.

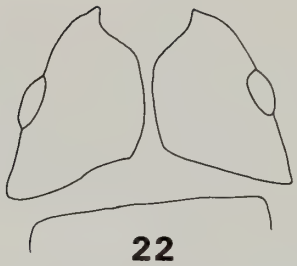


Fig. 22 Apex of ♂ abdomen of *Chrysemosa*, dorsal view, showing suture between ectoprocts.

Key to the Subfamilies of Chrysopidae

1 In fore wing Psm continuous with inner row of gradates (Fig. 545); tympanal organ absent; jugal lobe well developed (Fig. 527) ... **NOTHOCHRYSINAE**

– In fore wing Psm meets outer gradates (Fig. 1); tympanal organ present (but sometimes small); jugal lobe reduced or absent (Fig. 1) 2

2 In fore wing basal subcostal crossvein present; cell *im* present (Fig. 1); flagellar setae in four (or less) rings ..... **CHRYSOPINAE**

– In fore wing basal subcostal crossvein absent; cell *im* absent (Fig. 27); flagellar setae in five rings ..... **APOCHRYSINAE**

Subfamily **APOCHRYSINAE** Handlirsch

Apochrysidae Handlirsch, 1908: 1251. Type genus: *Apochrysa* Schneider.
Apochrysinae Tillyard, 1926: 318.
Apochrysini Adams, 1978*a*: 211.

DISTRIBUTION. Afrotropical, eastern Palaearctic, Oriental, Australian, Neotropical.

DIAGNOSIS. *Adult*. Large lacewings, fore wing 18–34 mm. Head width : eye width = 1.6–2.3 : 1, head relatively narrow; palps broad, short, truncate (Fig. 83); toruli small; vertex flattened; scape with long, coarse frontal setae; pedicel deeply constricted medially; antenna longer than fore wing; flagellar segments narrow, 3 times as long as broad; setae arranged in five rings. Pronotum narrow. Legs long; claws with basal dilation. Fore wing broad (length : breadth = 2.1–2.6 : 1), often densely reticulated; marked with black pustulate spots in discal area; costal area broad; costal setae long, erect; Sc short; basal Sc crossvein absent; *im* absent; tympanal organ narrow, elongate; Rs straight, arising near to wing base; c_1 shorter than c_2; Psm and Psc very close, upturned apically; posterior margin broad; jugal lobe small, 1A forked or unforked. Hind wing longer and much narrower than fore wing (length : breadth = 2.9–3.3 : 1). Abdomen long, elongate, swollen apically; trichobothria 32–63; ♂: sternite 8+9 usually fused, short, broad; ectoprocts rounded basally, not hinged; microtholi usually absent; apodemes short, weakly sclerotized; ♀: sternite 7 straight apically; gonapophyses narrow, bearing coarse setae.

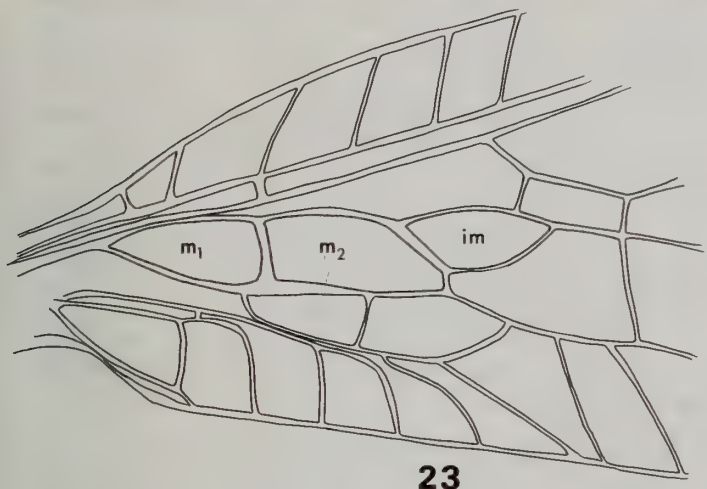
GENITALIA ♂. Weakly sclerotized; tignum and gonapsis, median plate absent; entoprocessus absent; gonarcus narrow, arcuate; arcessus short, triangular with apical hook; pseudopenis, gonocristae and spinellae absent; gonosetae usually absent or very short.

GENITALIA ♀. Praegenitale absent; subgenitale bilobed; spermatheca long, very broad with lateral striations; ventral impression deep, often abruptly tapered apically; duct long narrow; vela short, straight.

REMARKS. At present the Apochrysinae includes 12 genera. From the Afrotropics are *Anapochrysa* Kimmins and *Apochrysa* Schneider, from the eastern Palaearctic is *Nacaura* Navás, from the Oriental region and Australia are *Oligochrysa* Esben-Petersen, *Nobilinus* Navás, *Nothancyla* Navás, *Synthochrysa* Needham and *Joguina* Navás, and from the Neotropics are *Loyola* Navás, *Claverina* Navás, *Domenechus* Navás and *Lainius* Navás.

Adams (1967) suggested that the Apochrysinae may be specialized derivatives of the Leucochrysini and should have no more than tribal status (Adams, 1978*a*). He suggested that the zig-zag of MP_2, which forms the intramedian cell in *Gonzaga*, could easily have become straightened in the apochrysines. However, this does not seem to be a particularly convincing argument since MP_2 is zig-zagged in all chrysopids and so does not necessarily indicate a close relationship between the Apochrysinae and Leucochrysini. Indeed the Apochrysinae lack several apomorphic characters that are present in the Chrysopinae which suggests that the Apochrysinae may have arisen before the advent of the Chrysopinae. In the Apochrysinae the setae on the flagellar segments are arranged in five concentric rings, 1A is often unforked and the male genitalia are simple. There are several synapomorphies exhibited in the Apochrysinae which suggest that the group is monophyletic and distinct from the rest of the Chrysopinae, fully justifying its retention as a subfamily. These include the deeply constricted pedicel; the elongate tympanal organ; lack of basal subcostal crossvein; the close proximity of Psm and Psc; the long, narrow hind wing; the lateral striations on the spermatheca.

Within the subfamily the male genitalia are very



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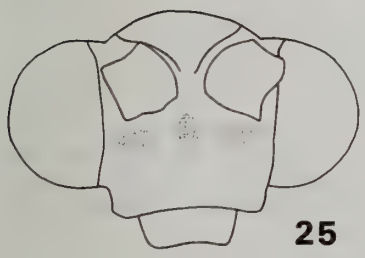

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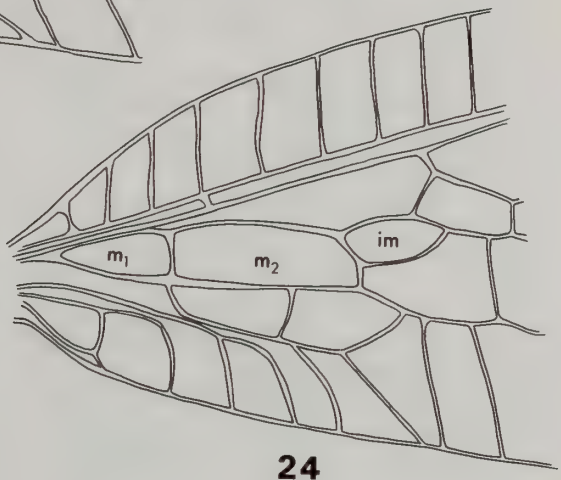

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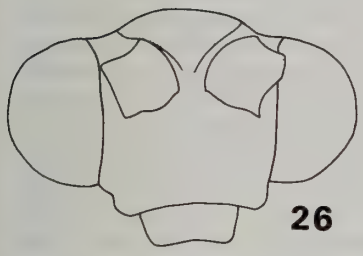

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Figs 23–26 23, 24, base of fore wing in (23) *Plesiochrysa*, (24) *Chrysopa*; 25, 26, front of head of (25) *Semachrysa*, (26) *Plesiochrysa*.

conservative and offer few generic characters. However, the wing venation is diverse and it is on these characters that the genera are based. The most primitive genera are distributed in the Old World. In the Australian and African genera the wing venation is open but becomes more reticulated in the Oriental genera. The Neotropical genera appear to be the most derived and have densely reticulated venation.

The genera of the Apochrysinae are apparently closely related to each other since they all share a large number of characters, both externally and in the genitalia. They seem to form a much more cohesive group than any other suprageneric taxon in the family. Although the genitalia differ in detail between most of the genera, it is really only in *Apochrysa* that the male genitalia differ significantly from the usual Apochrysinae pattern. It is therefore in details of the wing venation that the genera can best be distinguished. To an extent this is unsatisfactory since it has been shown that genera in the rest of the family can only convincingly be distinguished by the male genitalia and that venational characters alone are not sufficient to delimit the genera. One could therefore argue that many of these monophyletic genera of Apochrysinae should be synonymized, but we have retained them in this work in the

absence of strong evidence either way: when more is known of the biology and larvae of this group such decisions may become easier to make.

Key to the Genera of Apochrysinae

This key is based on that of Kimmins (1952b) with the addition of *Nothancyla* Navás.

1 Fore wing with quadrangular cell *im* (Fig. 70) ***NOTHANCYLA*** Navás

– Fore wing lacking cell *im* 2

2 Only two series of gradates in both wings 3

– More than two series of gradates, at least in fore wing, or basal half of wing with dense reticulation of crossveins 5

3 Basal half of fore wing with dense irregular reticulation (Fig. 59) ..... ***NACAURA*** Navás

– Basal half of both wings with no more than three rows of cells between R and Psm 4

4 Costal area of fore wing almost equally broad from near base to apex; inner gradate series sinuous, abruptly bent twice at about middle of wing (Fig. 76) ..... ***OLIGOCHRYSA*** Esben-Petersen

– Costal area of fore wing tapering towards apex; inner gradate series bent forwards at about two-thirds from base of wing (Fig. 27) ***ANAPOCHRYSA*** Kimmins

5 Radial area of fore wing consisting of single row of cells (sometimes with an occasional divided cell) (Fig. 65) 6

– Radial area of fore wing with at least the basal half consisting of two or more rows of cells (Fig. 35) ... 8

6 Radial area of fore wing with crossveins almost to apex; venation dense (Fig. 65) ***NOBILINUS*** Navás

– Radial area of fore wing with distinct space free of crossveins behind pterostigma 7

7 Outer gradates in both wings more or less parallel to wing margin (Fig. 82) ***SYNTHOCHRYSA*** Needham

– Outer gradates in both wings bent inwards towards costal margin near apex of wing (Fig. 32) ***APOCHRYSA*** Schneider

8 Costal area of fore wing with virtually all cells undivided (Fig. 55) 9

– Costal area of fore wing consisting of two or more rows of cells, or densely reticulated (Fig. 44) 11

9 Fore wing with three to seven elevated pustules, often arranged in an arc from midway along Psm to apex of wing (Fig. 55) ..... ***LOYOLA*** Navás

– Fore wing with not more than two elevated pustules 10

10 Fore wing with 1A forked, 2A and 3A simple (Fig. 35); hind wing with small elevated pustule ***CLAVERINA*** Navás

– Forewing with 1A and 2A forked, 3A simple; no elevated pustule in hind wing (Fig. 39) ***DOMENECHUS*** Navás

11 Fore wing with Rs straight, distinct; an accessory row of crossveins present in marginal area in apical half of both wings (Fig. 44) ..... ***JOGUINA*** Navás

– Fore wing with Rs irregular, not distinct from general reticulation of veins; no accessory row of crossveins in marginal area in apical half of either wing (Fig. 49) ..... ***LAINIUS*** Navás

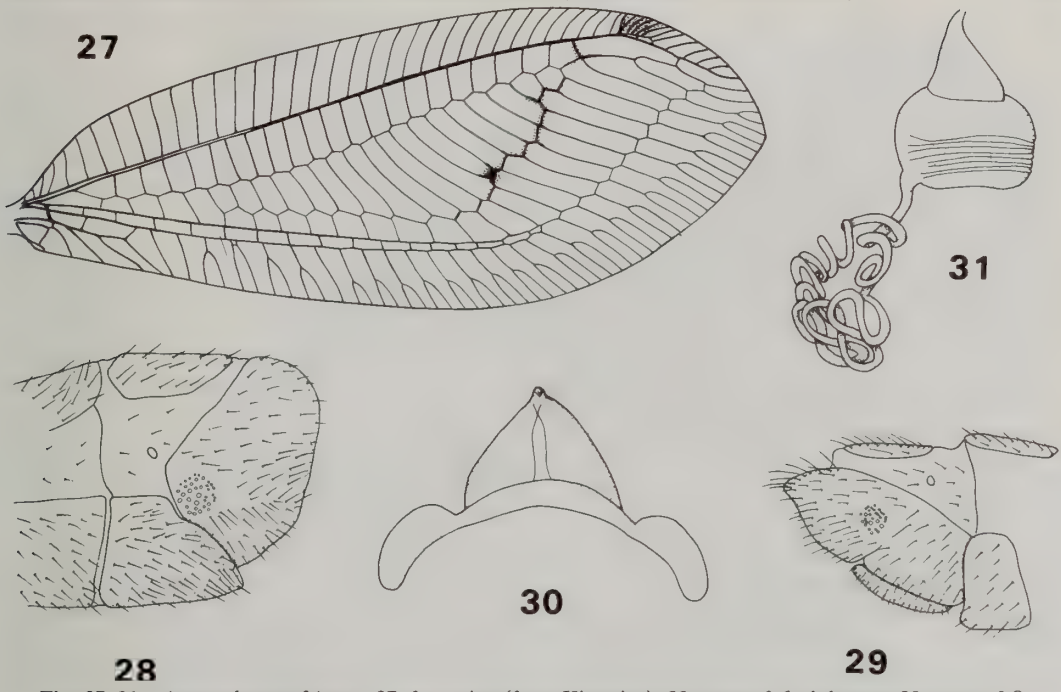
Genus *ANAPOCHRYSA* Kimmins

Anapochrysa Kimmins, 1952*b*: 932. Type species: Anapochrysa africana Kimmins, by monotypy.

DISTRIBUTION. East Africa, Madagascar.

Two species have been described in the genus.

DIAGNOSIS. *Adults*. Large lacewings, fore wing (Fig. 27) 18–20 mm. Head marked with red spot between base of scape and eye; palps truncate, brown stripe on scape; labrum indented; mandibles broad, asymmetrical with basal tooth on left mandible; galea narrow with median constriction but widely expanded apically; apical papilla very small; vertex flattened; head width : eye width = 1.8–1.9 : 1; scape elongate; pedicel very narrow medially; antenna longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum marked with red lateral stripe; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.6 : 1), pointed apically; membrane with several pustules which are marked with dark shading; costal setae long, erect; stigma short; Sc short; Sc and R quite close; basal Sc crossvein absent; *im* absent; tympanal organ narrow, elongate; Rs straight, arising near base of wing; gradates in two parallel series; inner gradates greatly extended basally, not meeting Psm; veins not crassate in ♂; costal area broad; c_1 shorter than c_2; Psm and Pcu very close, converging apically, upturned apically; posterior margin broad, marginal crossveins forked towards base of wing; 1A not forked. Abdomen elongate (Figs 28, 29), swollen apically; unmarked; setae long, sparse; callus cerci rounded; trichbothria 32–34; ectoprocts slightly invaginate apico-dorsally, fused dorsally, fused with tergite 9; atria small; ♂: microtholi present; sternite 8+9 fused, short; apodemes weakly sclerotized; ♀: sternite 7 straight apically; gonapophyses long, narrow.



Figs 27–31 *Anapochrysa africana*. 27, fore wing (from Kimmins); 28, apex of ♂ abdomen; 29, apex of ♀ abdomen; 30, ♂ genitalia, dorsal; 31, ♀ spermatheca, lateral.

GENITALIA ♂ (Fig. 30). Tignum, gonapsis and median plate absent; entoprocessus absent; gonarcus narrow, arcuate; arcessus short, triangular with short apical hook; pseudopenis, gonosaccus, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Fig. 31). Praegenitale absent; subgenitale bilobed; spermatheca broad, long with annulations; ventral impression deep, broad, abruptly tapered apically; vela short, straight, tapered; duct very long, narrow, highly coiled.

REMARKS. *Anapochrysa* possesses few apomorphic apochrysine characters and the lack of multiplicity in the gradates is notable. However, the posterior marginal crossveins are forked at the base of the fore wing and the costa narrows towards the wing apex, and these are probably apomorphic characters.

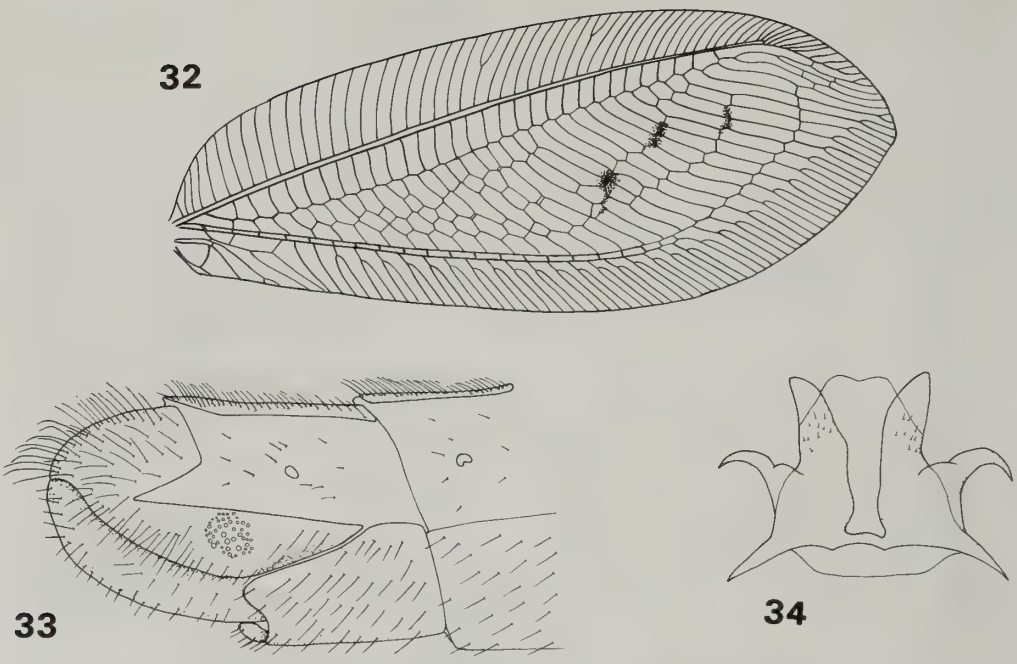
BIOLOGY. Unknown.

Genus ***APOCHRYSA*** Schneider

Apochrysa Schneider, 1851: 38. Type species: *Hemerobius leptalea* Rambur, by monotypy.

DISTRIBUTION. Southern Africa.
The genus is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 32) 21–22 mm. Head marked with red stripe between eyes and vertex, scape with red lateral stripe; palps tapered; labrum indented; clypeus with long setae; vertex flattened; head width : eye width = 2.2–2.3 : 1; scape elongate with long setae; pedicel constricted medially; antenna as long as fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum elongate; marked with black basolateral spot; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae very long, pale; claws with slight basal dilation. Fore wing broad (length : breadth = 2.5–2.6 : 1), pointed apically; with pustules shaded black; costal setae long, erect; Sc short; Sc and R widely separated; basal Sc crossvein absent; *im* absent; tympanal organ narrow, elongate; Rs straight, arises near wing base; gradates in four irregular series; inner gradates greatly extended basally; veins slightly crassate in ♂; costal area broad; c_1 shorter than c_2; Psm and Pcu very close, parallel, upturned apically; posterior margin broad; 1A not forked. Hind wing much narrower than fore wing (length : breadth = 3.2 : 1). Abdomen (Fig. 33) elongate, swollen apically; marked with dorsal red/brown spot on tergite 1; setae short and dense on tergites, long and dense on sternites; callus cerci rounded; trichobothria 62; ectoprocts with slight dorso-apical invagination, fused dorsally, with deep broad suture between ectoproct and tergite 9; ectoprocts positioned ventrally; atria



Figs 32–34 *Apochrysa leptalea*. 32, fore wing (from Kimmins); 33, apex of ♂ abdomen, lateral; 34, ♂ genitalia, ventral.

small; ♂: microtholi absent; sternite 8+9 fused, short broad, indented apically; apodemes weakly sclerotized, very short.

GENITALIA ♂ (Fig. 34). Tignum, gonapsis, median plate absent; gonosaccus short; gonosetae few, very short in lateral clump; gonocristae and spinellae absent.

GENITALIA ♀. Unknown.

REMARKS. The wing venation of *Apochrysa* has two apomorphies which help to distinguish the genus. The gradates are arranged in three series and the posterior marginal crossveins are forked towards the base of the wing. The male genitalia are particularly significant, however. In the rest of the subfamily the male genitalia have the same basic pattern with an arcuate gonarcus and triangular arcessus. In *Apochrysa* the gonarcus or arcessus are totally different. Indeed, the genitalia are so distinct that homologous structures are difficult to interpret. Therefore it would appear that although externally *Apochrysa* resembles the rest of the subfamily, it is in fact quite distantly related to the other genera.

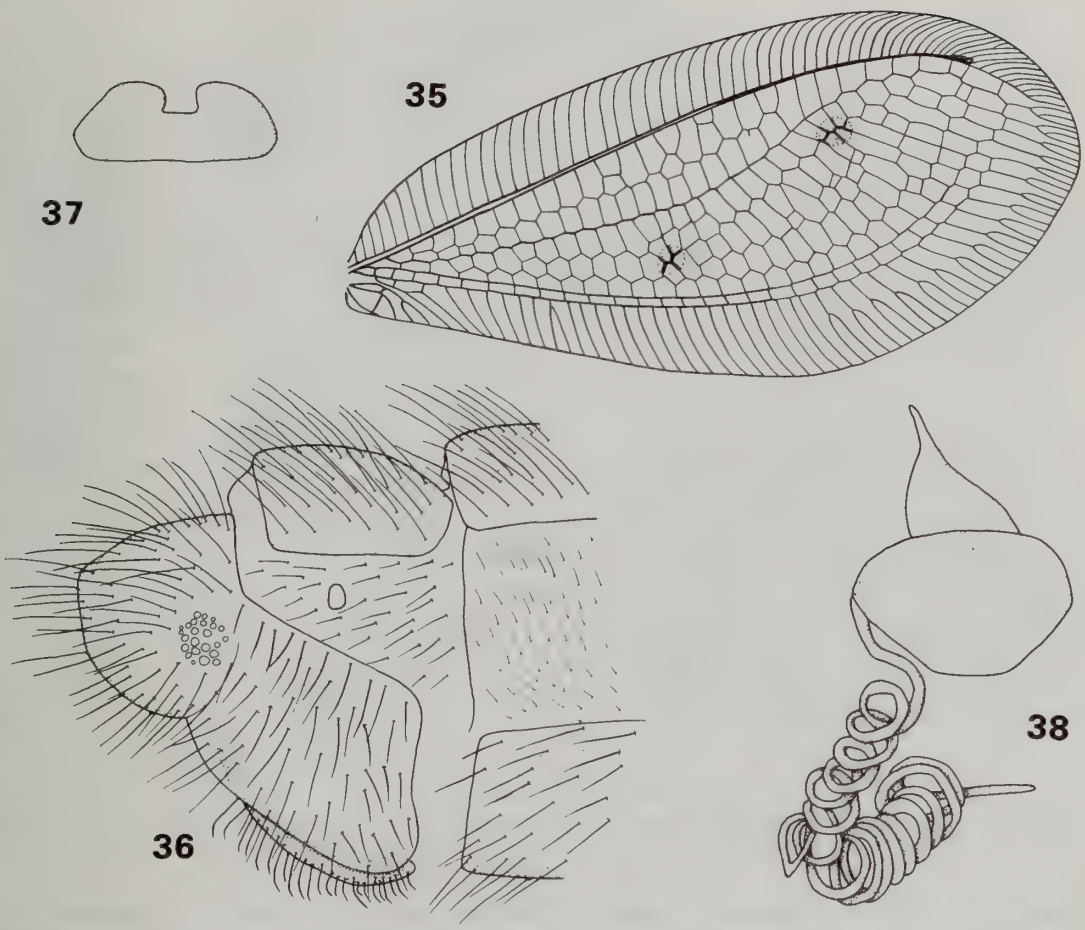
BIOLOGY. Unknown. There were no insect remains in the guts of any of the adults examined during this study.

Genus ***CLAVERINA*** Navás

Claverina Navás, 1913*a*: 164. Type species: *Apochrysa beata* Walker, by monotypy.

DISTRIBUTION. Brazil (Amazonia).
The genus is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 35) 24.5 mm; ground colour green. Head marked with broad red stripe in front of vertex; palps tapered apically; vertex flat, steeply raised anteriorly; head width : eye width = 1.6 : 1; toruli small; scape slightly elongate; antenna about 1.5 times length of fore wing; flagellar segments about 3 times as long as broad; setae arranged in five rings. Pronotum unmarked; dorsal setae long, pale; meso– and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing marked with pustules, veins in pustules shaded dark brown; wing broad (length : breadth = 2.2 : 1); rounded apically; costal setae long, erect; stigma very short, marked with dark brown spot; Sc short; Sc and R widely separated; basal Sc crossvein absent; *im* absent; Rs sinuate; radial cells doubled; gradates in 5–6 poorly defined rows; inner gradates greatly extended basally, not meeting Psm; costal area broad; c_1



Figs 35–38 *Claverina beata*. 35, fore wing (from Kimmins); 36, apex of ♀ abdomen, lateral; 37, ♀ subgenitale, ventral; 38, spermatheca, lateral.

shorter than c_2; c_2 narrow, squared apically; posterior margin very broad; 1A forked. Hind wing 24.5 mm, much narrower than fore wing (length : breadth = 3.1 : 1). Abdomen (Fig. 36) long, unmarked; setae long, dense but sparser on sternites than tergites; ectoprocts with slight dorso-apical invagination, fused dorsally with fine suture between ectoprocts and tergite 9; trichobothria 24; sternite 7 straight apically.

GENITALIA ♂. Unknown.

GENITALIA ♀ (Figs 37, 38). Praegenitale absent; spermatheca large rounded, lateral striations absent; vela prominent; duct very long, coiled; ventral impression deep, tapering abruptly apically.

REMARKS. Claverina can be distinguished from other apochrysine genera by the following apomorphies: the gradates are arranged in 5–6 poorly defined rows, the radial area is subdivided and 1A is forked.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

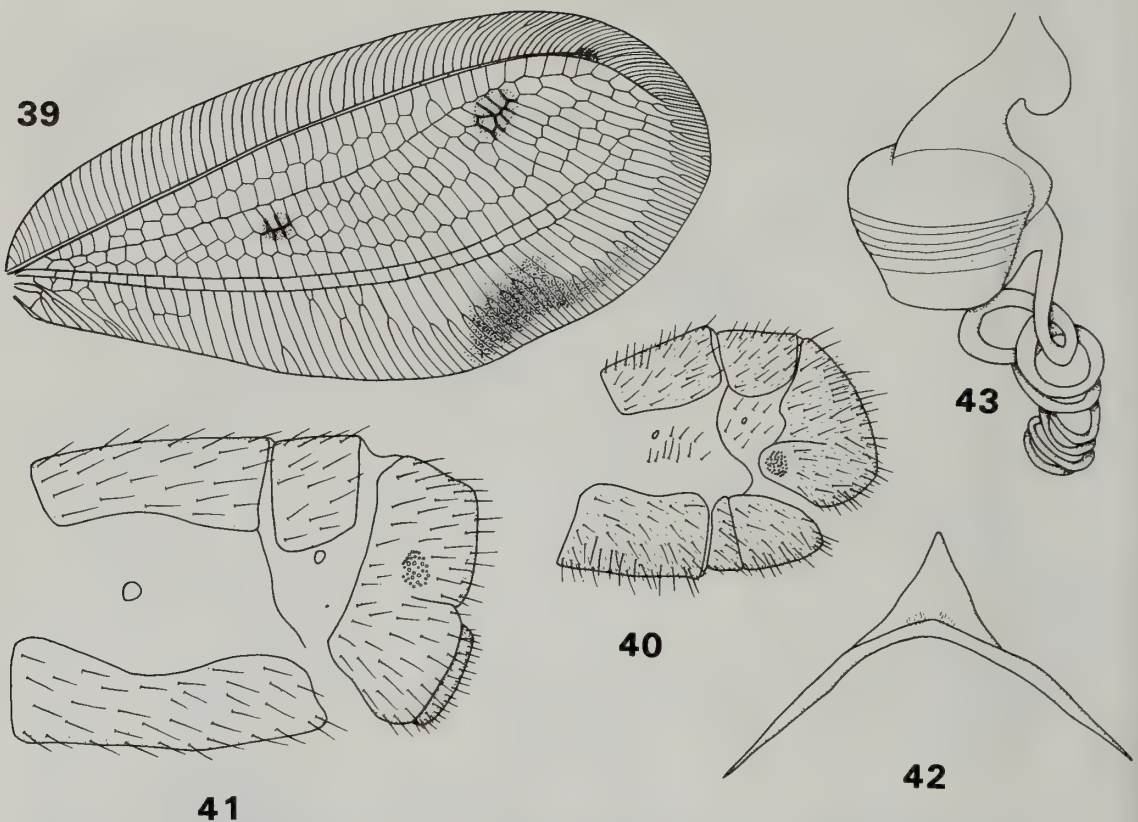
Genus ***DOMENECHUS*** Navás

Domenechus Navás, 1913*b*: 298. Type species: *Domenechus sigillatus* Navás, by monotypy.

DISTRIBUTION. Brazil, central America.

Only two species of this genus have been described.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 39) 28–29 mm; ground colour green. Head with red stripe on frons and front of vertex; palps tapered apically; labrum invaginate; vertex flat; head width : eye width = 1.4–1.5 : 1; antenna considerably longer than fore wing; flagellar segments about 3 times as long as broad; setae



Figs 39–43 *Domenechus mirifica*. 39, fore wing (from Kimmins); 40, apex of ♂ abdomen, lateral; 41, apex of ♀ abdomen, lateral; 42, ♂ genitalia, dorsal; 43, ♀ spermatheca, lateral.

arranged in five rings. Pronotum unmarked; slightly elongate; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with short basal dilation. Fore wing marked with two black pustules in discal area; costal area narrow at base; costal setae long, slightly inclined; stigma marked with brown spot; Sc short; Sc and R widely separated; radial area subdivided; gradates arranged in six rows; gradates greatly extended basally; c_1 and c_2 subequal in length; cubital cells very short; 1A and 2A forked; posterior marginal area subdivided by crossveins. Abdomen (Figs 40, 41) unmarked; setae long, quite dense; callus cerci rounded; trichobothria 36–58; ectoprocts with deep, broad dorso-apical invagination, fused dorsally; ♂: additional short setae present on all sclerites; microtholi absent; suture present between sternites 8 and 9; deep suture present between ectoproct and tergite 9; ♀: short suture between ectoprocts and tergite 9; sternite 7 straight apically. GENITALIA ♂ (Fig. 42). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus narrow, broadly arcuate; arcessus short, triangular, tapering to short apical hook; pseudopenis absent; gonosaccus short; gonosetae few, very short, positioned in small lateral clump at base of arcessus; gonocristae absent.

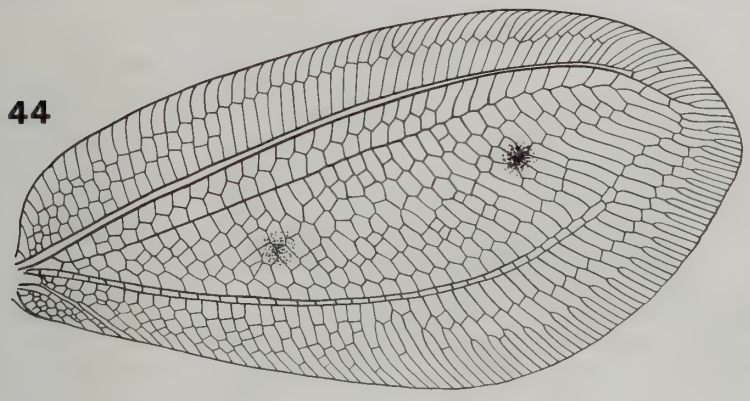
GENITALIA ♀ (Fig. 43). Praegenitale absent; subgenitale bilobed apically; spermatheca broad with lateral striations; ventral impression narrow, deep; vela short; duct long, narrow, highly coiled.

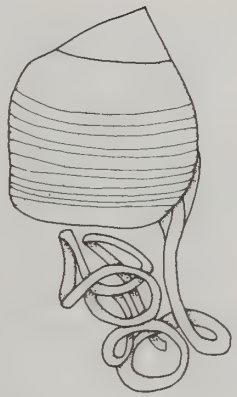
REMARKS. Species of *Domenechus* can be recognized by the numerous rows of gradates, the subdivided radial area, 1A and 2A forked and the partially divided posterior marginal area in the fore wing.

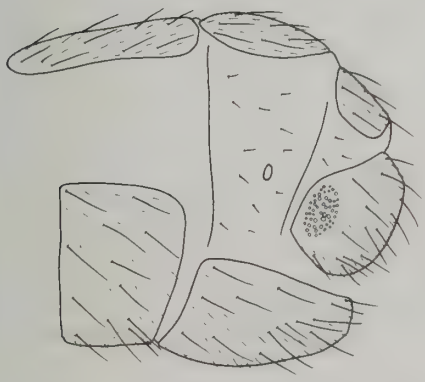
BIOLOGY. Unknown. Insect remains were not present in the guts of any of the adults examined during this study.

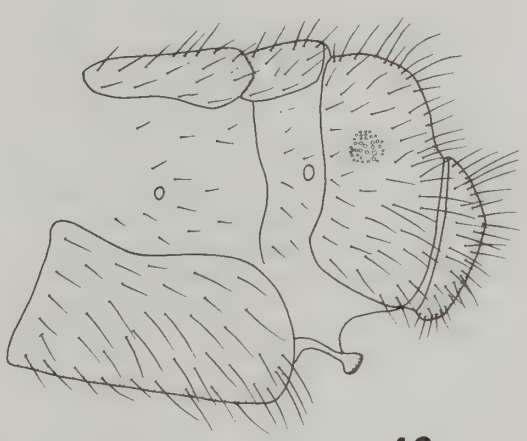
Genus ***JOGUINA*** Navás

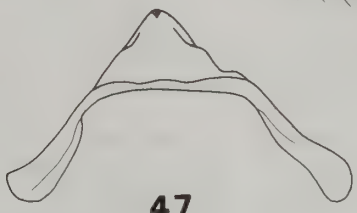
Joguina Navás, 1912: 98. Type species: *Apochrysa nicobarica* Brauer, by original designation.









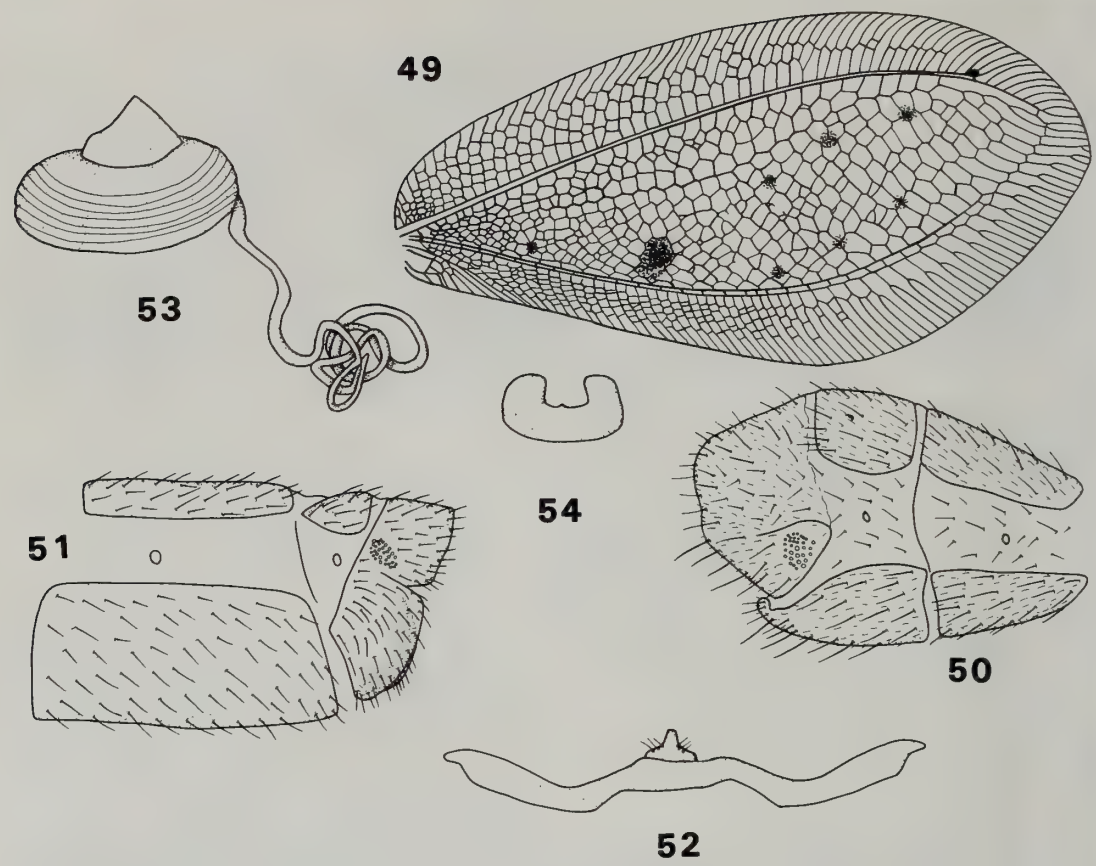


Figs 44–48 *Joguina nicobarica*. 44, fore wing (from Kimmins); 45, apex of ♂ abdomen, lateral; 46, apex of ♀ abdomen, lateral; 47, ♂ genitalia, dorsal; 48, ♀ spermatheca, lateral.

DISTRIBUTION. Assam, Burma, Malaysia, Borneo.

The genus includes three described species and there is a further undescribed species present in the BMNH collections.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 44) 26–27 mm. Head marked with brown stripe on frons, vertex scape red; palps broad, truncate; toruli small; vertex flat with anterior fringe of long setae; head width : eye width = 1.7 : 1; scape broad with long setae; pedicel constricted medially; antenna 1.5 times length of fore wing; flagellar segments about 3 times as long as broad; setae arranged in five rings. Pronotum unmarked; elongate; dorsal setae long, pale; mesonotum marked with broad red anterior stripe; metanotum unmarked. Fore wing broad (length : breadth = 2.1–2.3 : 1), rounded apically; marked with dark shading on pustules; costal setae long, erect; stigma unmarked; Sc short; Sc and R widely separated; basal Sc crossvein absent; numerous Sc crossveins in apical half of wing; *im* absent; tympanal organ very narrow, elongate; Rs straight, arising close to wing base; wings highly reticulated, gradates indistinct; veins slightly crassate in ♂; costal area broad; c_1 and c_2 indistinct; Psm and Pcu very close, parallel, curving apically; posterior margin broad; 1A deeply forked; 2A forked. Hind wing much narrower than fore wing (length : breadth = 3.1 : 1). Abdomen (Figs 45, 46) elongate, swollen apically; marked with red/brown dorsal band at



Figs 49–54 *Lainius constellatus*. 49, fore wing (from Kimmins); 50, apex of ♂ abdomen, lateral; 51, apex of ♀ abdomen, lateral; 52, ♂ genitalia, dorsal; 53, ♀ spermatheca, lateral; 54, ♀ subgenitale, ventral.

apex of each segment; setae long, sparse; ectoprocts quite deeply invaginated dorso-apically, not fused dorsally; ♂: additional short, dense setae present on sternites; callus cerci ovate; trichobothria 52; ectoprocts not fused with tergite 9; atria small; microtholi absent; sternite 8+9 fused but with very short dorsal suture, short, broad; apodemes absent; ♀: sternite 7 straight apically; callus cerci rounded; trichobothria 38.

GENITALIA ♂ (Fig. 47). Genitalia weakly sclerotized; tignum, gonapsis, median plate and entoprocessus absent; gonarcus barely arcuate, very narrow; arcessus short, broadly triangular with apical hook; pseudopenis, gonosaccus absent; gonosetae very short, situated ventro-laterally of arcessus; gonocristae and spinellae absent; hypandrium small.

GENITALIA ♀ (Fig. 48). Praegenitale absent; subgenitale bilobed; spermatheca broad with lateral striations; ventral impression deep, narrow; vela short; duct long, narrow, highly coiled.

REMARKS. *Joguina* is apparently the most highly evolved of the Old World apochrysine genera. There are multiple gradates series, the radial area is subdivided, the costal area is subdivided, 1A and 2A are forked, and the posterior and apical marginal areas are subdivided.

BIOLOGY. Unknown. Insect remains were not included in any of the adult guts examined during this study.

Genus *LAINIUS* Navás

Lainius Navás, 1913*b*: 300. Type species: *Lainius constellatus* Navás, by original designation.

DISTRIBUTION. Central and South America. The genus includes two described species.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 49) 21–22 mm. Head marked with red stripe on vertex, scape, brown stripe on pedicel and basal flagellomeres; palps truncate; labrum slightly indented; vertex flat, steeply rising anteriorly; head width : eye width = 2.0–2.1 : 1; toruli small;

pedicel constricted medially; antenna slightly longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum marked with red baso-lateral spot; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.0–2.2 : 1), rounded apically; pustules marked with dark shading; costal setae long, erect; stigma marked with brown spot; Sc short; Sc and R quite close; basal Sc crossvein absent, five Sc crossveins present in apical half of wing; *im* absent; tympanal organ narrow, elongate; Rs sinuate, arising basally; wing highly reticulated particularly in basal half, gradates indistinct; veins slightly crassate in ♂; costal area broad; c_1, c_2 indistinct; Psm and Pcu very close together, upturned apically; posterior margin broad; 1A forked. Hind wing narrower than fore wing (length : breadth = 3.3 : 1). Abdomen (Figs 50, 51) swollen apically; marked with red dorsal spot at apex of tergite; ♂ setae short, dense with long, sparse setae interspersed; callus cerci rounded; trichobothria 37; ectoprocts slightly invaginated dorso-apically, not fused dorsally, suture between ectoprocts and tergite 9; ♂: microtholi absent; sternite 8+9 fused, short, broad; apodemes weakly sclerotized; atria small; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 52). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus slender, barely arcuate; arcessus very small, triangular; pseudopenis, gonosaccus, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 53, 54). Praegenitale absent; subgenitale bilobed apically with small median projection; spermatheca narrow with lateral striations; ventral impression deep; vela short; duct long, narrow, highly coiled.

REMARKS. *Lainius* appears to be the most highly derived of the apochrysine genera. The discal area of the wing is densely reticulated, the radial, costal and posterior marginal areas are subdivided and the radial sector is irregular.

BIOLOGY. Unknown. None of the adults examined during this study included insect remains in its gut contents.

Genus ***LOYOLA*** Navás

Loyola Navás, 1913*b*: 297. Type species: *Apochrysa croesus* Gerstaecker, by original designation.

DISTRIBUTION. Neotropics.

The genus is known from only two species.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 55) 33–34 mm; ground colour pale green. Head marked with red stripe on gena, frons, vertex, scape and postocular region; palps truncate; labrum indented; frons with long setae; vertex flattened; head width : eye width = 1.7–1.8 : 1; pedicel constricted medially; antennae broken; flagellar segments about 3 times as long as broad; setae arranged in five rings. Pronotum marked with red dorsal suffusion; dorsal setae long, pale; meso- and metanotum with red lateral suffusion. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.1 : 1), rounded apically; with dark markings on pustules; costal setae long, slightly inclined; stigma with dark spot; Sc short; Sc and R widely separated; basal Sc crossvein absent; 16 Sc crossveins in apical half; *im* absent; tympanal organ narrow, elongate; Rs sinuate, arising close to wing base; R cells in two rows; gradates irregular; veins not crassate in ♂; costal area broad; c_1 shorter than c_2; Psm and Pcu very close, parallel, upturned apically; posterior and anterior margin broad; 1A not forked. Hind wing narrower than fore wing (length : breadth = 3.1 : 1); stigma marked with dark spot. Abdomen (Fig. 56) elongate, swollen apically; marked with dorsal red suffusion; setae long, dense; callus cerci rounded; trichobothria 42; ectoprocts with dorso-apical invagination, fused dorsally, apical suture between ectoprocts and tergite 9; ♀: sternite 7 straight apically.

GENITALIA ♂. Unknown.

GENITALIA ♀ (Figs 57, 58). Praegenitale absent; subgenitale bilobed; spermatheca long, very broad; ventral impression deep; vela short; duct long, narrow, highly coiled.

REMARKS. Like the other South American apochrysine genera *Loyola* appears to be more derived than its Old World counterparts. The gradates are numerous and arranged irregularly throughout the discal area, the radial area is subdivided basally and the fore wing is marked with several black pustules.

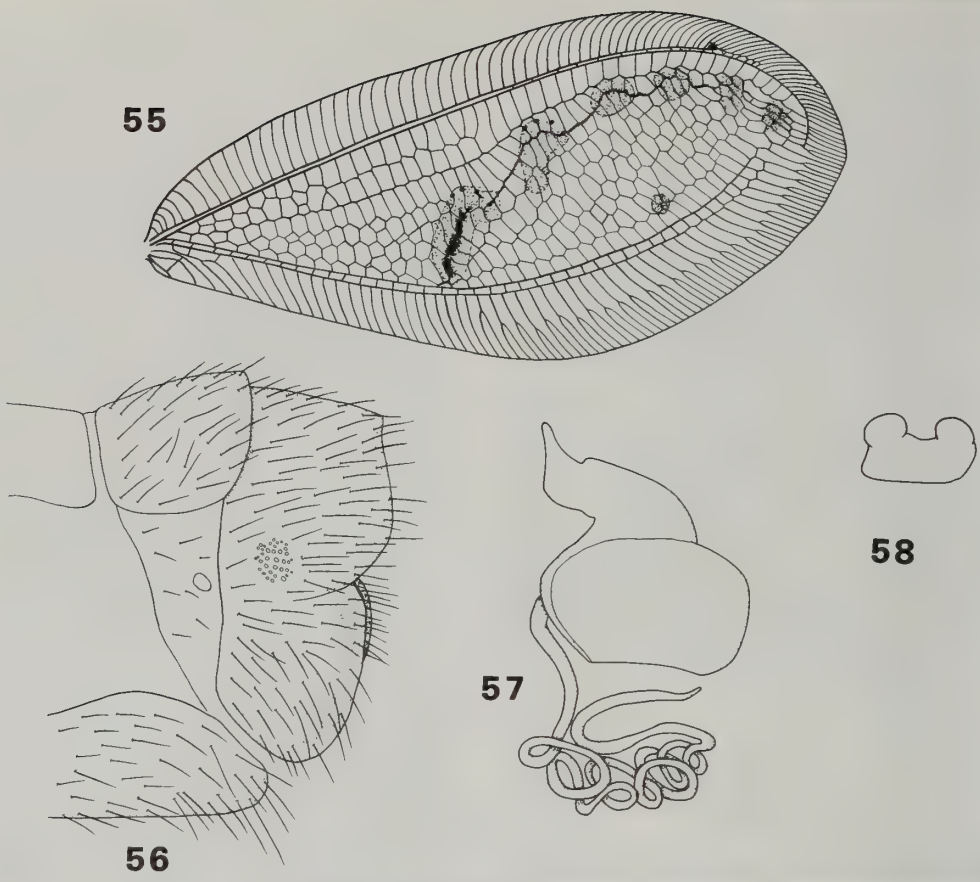
BIOGOGY. Unknown. The guts of adults examined during this study did not contain insect remains.

Genus ***NACAURA*** Navás

Nacaura Navás, 1913*d*: 280. Type species: *Apochrysa matsumurae* Okamoto, by original designation and monotypy.

DISTRIBUTION. Japan, Taiwan.

The single species described in the genus occurs



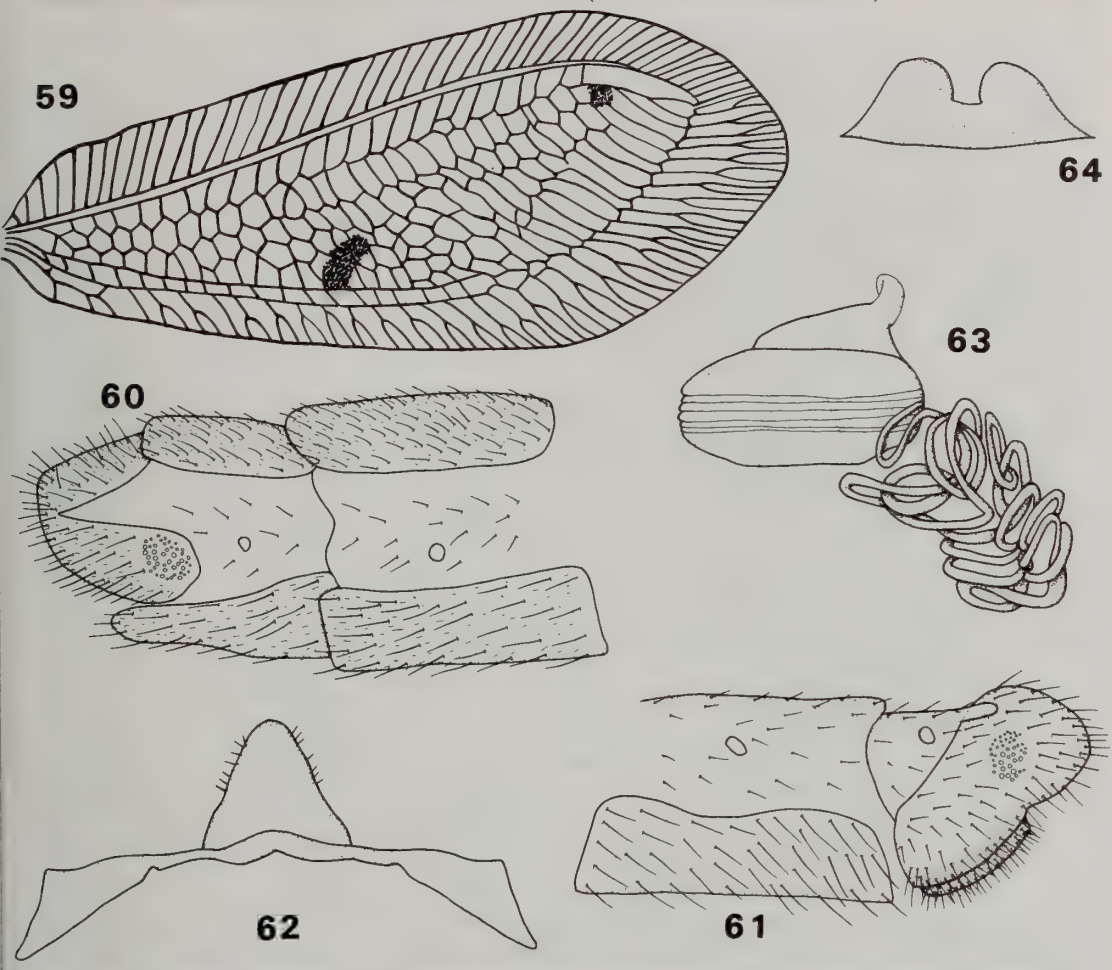
Figs 55–58 *Loyola croesus*. 55, fore wing (from Kimmins); 56, apex of ♀ abdomen; 57, ♀ spermatheca, lateral; 58, ♀ subgenitale, ventral.

uncommonly in Hoshû , Shikoku and Kyûshû in Japan (Tsukaguchi, *in litt.*) (but see 'Remarks' below).

DIAGNOSIS. *Adult*. Large green lacewings, fore wing (Fig. 59) 22–27 mm; ground colour pale green. Head marked with red lateral stripe on scape; mandibles broad and asymmetrical with basal tooth on left mandible; palps truncate apically; galea broad; labrum emarginate; vertex flat; toruli small; head width : eye width = 1.8–2.0 : 1; scape elongate with coarse setae; antenna considerably longer than fore wing; flagellar segments about 3 times as long as broad; setae arranged in five rings. Pronotum elongate; marked with red lateral stripe; dorsal setae long, pale; meso- and metanotum unmarked. Legs marked with black annulation at apex of hind femur; setae long, pale; claws with basal dilation. Fore wing marked with large black spot in median discal area; costal area broad; costal setae long, erect; stigma unmarked; Sc short; Sc and R quite close together; Rs straight; radial area partially subdivided with crossveins; radial space below stigma open, with no crossveins; discal area with numerous crossveins; inner gradates indistinct; c_1 only half as long as c_2, narrow; 1A forked; 2A unforked. Hind wing narrow (length : breadth = 3.1 : 1); with two distinct gradate series; radial area undivided; posterior apical margin marked with faint black suffusion. Abdomen (Figs 60, 61) unmarked; elongate; setae long sparse; callus rounded; trichobothria 42–45; ectoprocts with slight dorso-apical invagination, fused dorsally; ♂: additional short, dense setae present on all sclerites; microtholi absent; ectoproct separated from tergite 9 by deep suture; sternite 8+9 fused, short, broad; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 62). Tignum, gonapsis and median plate absent; gonarcus narrow almost straight, hardly arcuate; arcessus weakly sclerotized, triangular, bearing a few short lateral gonosetae; entoprocessus absent; gonosaccus very short.

GENITALIA ♀ (Figs 63, 64). Praegenitale absent; subgenitale bilobed; spermatheca large, slightly



Figs 59–64 *Nacaura matsumurai*. 59, fore wing (from Kimmins); 60, apex of ♂ abdomen, lateral; 61, apex of ♀ abdomen, lateral; 62, ♂ genitalia, dorsal; 63, ♀ spermatheca, lateral; 64, ♀ subgenitale, ventral.

flattened, bearing several lateral grooves; duct very long, highly coiled; vela short; ventral impression deep with irregular outline.

Larva. Abdomen fusiform, weakly humped; debris-carrier (Tsukaguchi, *in litt.*).

REMARKS. *Nacaura* can be distinguished from other apochrysine genera by the elongate scape, the dense reticulation of the basal half of the fore wing (although the hind wing has no additional crossveins), and the forking of the first anal vein. A single undescribed species represented in the BMNH collection by three males reared as a predator of the mealybug *Rastrococcus invadens* from Bangalore, India may belong to this genus. It has the dense reticulation in the basal half of the fore wing, but has three distinct rows of gradates in the apical half, and hence would not key out to *Nacaura*.

BIOLOGY. Insect remains were not included in the gut contents of any adults examined during this study. According to Tsukaguchi (*in litt.*), *Nacaura matsumurae* Okamoto usually occurs in laurel forests and passes the winter in the adult stage.

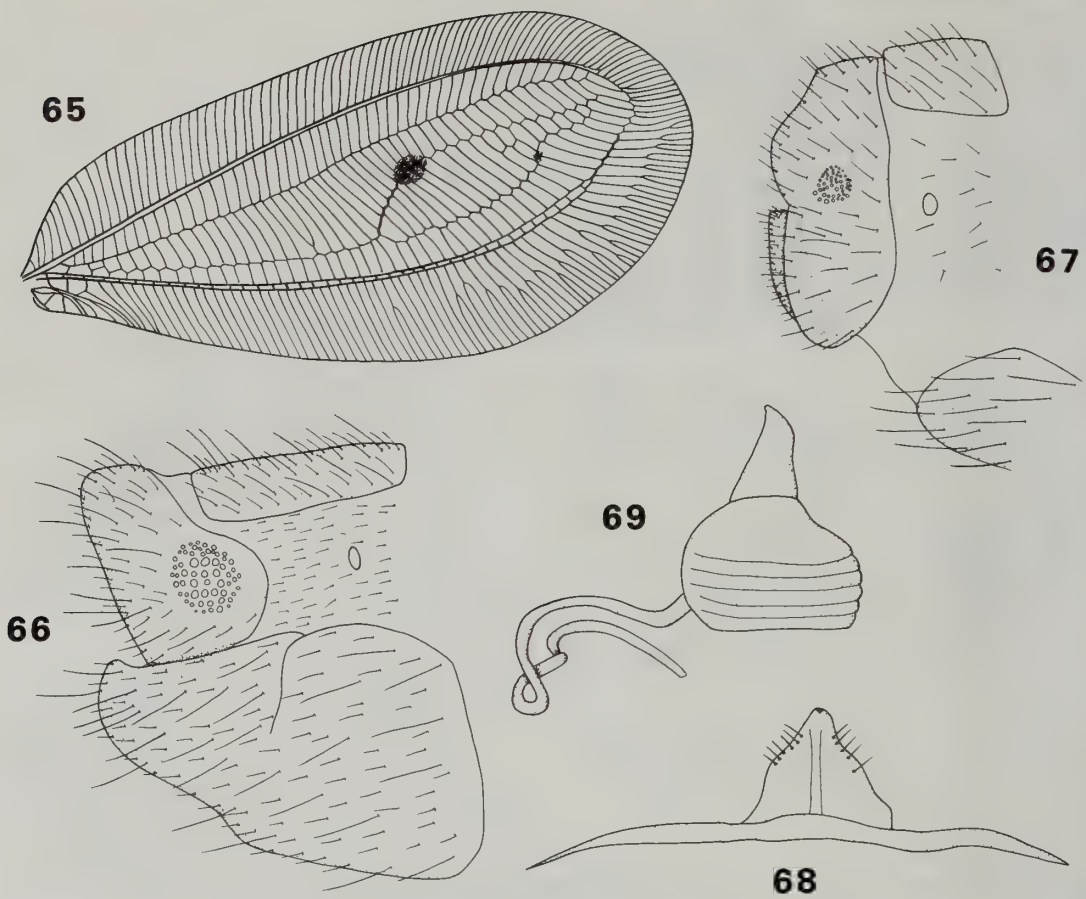
Genus ***NOBILINUS*** Navás

Nobilinus Navás, 1913*b*: 295. Type species: *Nobilinus insignitus* Navás, by original designation.

DISTRIBUTION. Oriental.

The genus includes six described species and subspecies with a further two undescribed species represented in the BMNH collections. Most of the species are Indonesian.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 65) 23–31 mm; ground colour pale green.



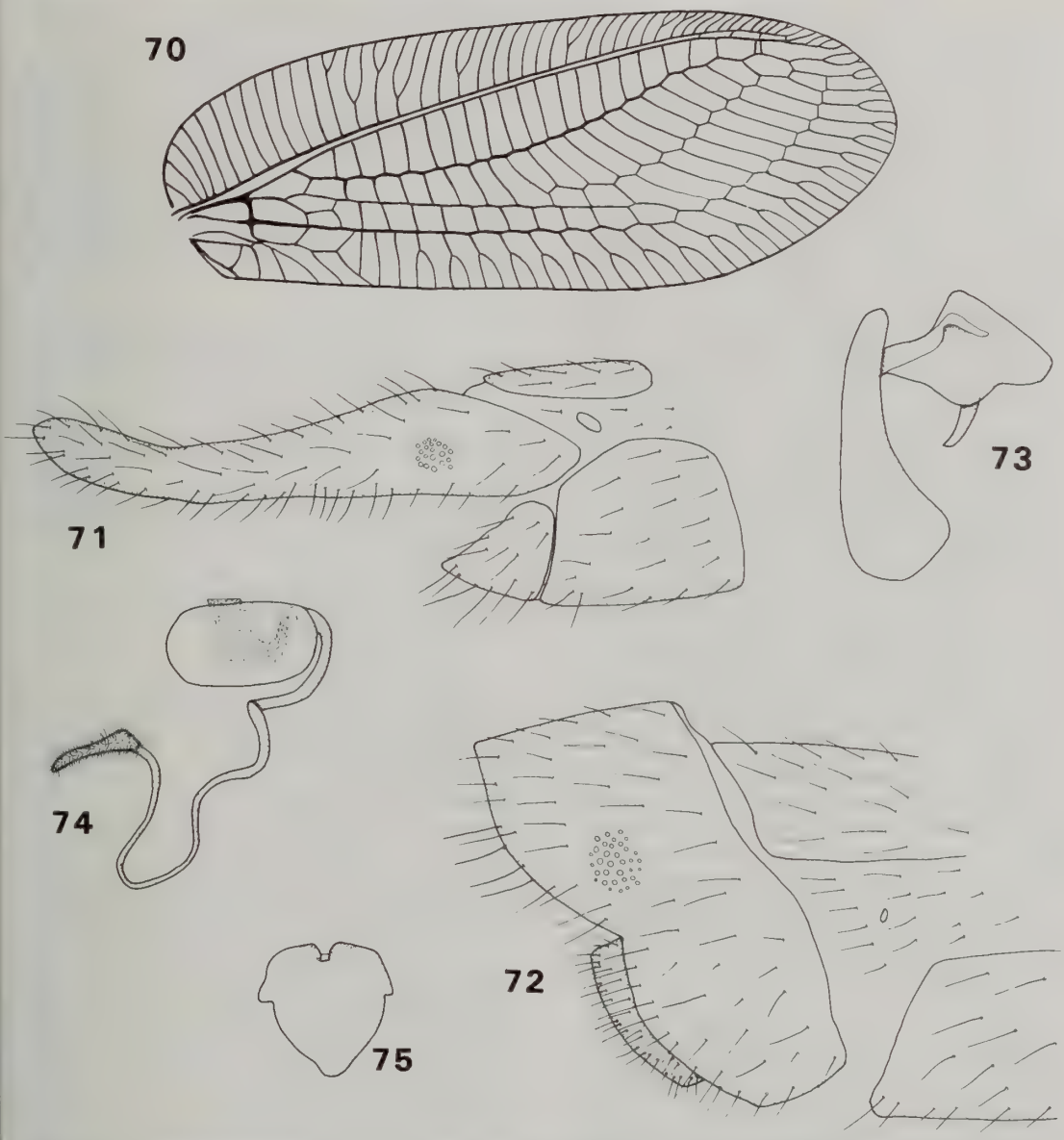
Figs 65–69 *Nobilinus*. 65, *N. albardae insignitus*, fore wing (from Kimmins); 66–69, *N. phantoma*; (66) apex of ♂ abdomen, lateral; (67) apex of ♀ abdomen, lateral; (68) ♂ genitalia, ventral; (69) ♀ spermatheca, lateral.

Head marked with red transverse stripes on frons and vertex; palps truncate apically; labrum invaginate; vertex flattened; head width : eye width = 1.8–2.0 : 1; antenna considerably longer than fore wing; flagellar segments 3 times as long as broad; setae in five rings. Pronotum elongate; unmarked; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.1–2.3 : 1); marked with dark brown spots in discal area; costal area narrow at base; costal setae long, erect; stigma unmarked; Sc short; numerous Sc crossveins present in apical half of wing; Sc and R widely separated; gradates in three divergent series; inner gradates greatly extended basally; basal inner gradate not meeting Psm; crossveins not crassate in ♂; c_1 slightly shorter than c_2, cubital cells broad; 1A and 2A forked. Abdomen (Figs 66, 67) unmarked; setae long, sparse; callus cerci rounded; trichobothria 50; ectoprocts with slight dorso-apical invagination, fused dorsally, fused with tergite 9; ♂: all sclerites with dense covering of additional short setae; microtholi absent; sternites 8+9 separated by short suture, broad; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 68). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus hardly arcuate; arcessus triangular with weak apical hook bearing a few short setae laterally; pseudopenis absent; gonosaccus short; gonocristae absent.

GENITALIA ♀ (Fig. 69). Praegenitale absent; subgenitale bilobed apically; spermatheca broad with lateral striations; ventral impression deep; vela short; duct long, narrow, sinuous.

REMARKS. *Nobilinus* has four apomorphies which help distinguish it from other apochrysine genera: the gradates are arranged in three series, the radial area below the pterostigma is completely filled with crossveins, and both 1A and 2A are forked.



Figs 70–75 *Nothancyla verreauxi*. 70, fore wing (from Kimmins); 71, apex of ♂ abdomen, lateral; 72, apex of ♀ abdomen, lateral; 73, ♂ genitalia, lateral; 74, ♀ spermatheca, lateral; 75, ♀ subgenitale, ventral.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Genus ***NOTHANCYLA*** Navás

Nothancyla Navás, 1910*a*: 51. Type species: *Nothancyla verreauxi* Navás, by monotypy

DISTRIBUTION. Southern and western Australia, Tasmania.

The single known species has a well-defined Bassian distribution.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 70) ♂ 13–15 mm, ♀ 17–20 mm; ground colour pale yellowish green. Head unmarked or with red stripe on front of vertex; palps tapered apically; labrum slightly indented; mandibles broad, symmetrical with large basal tooth on each mandible; vertex slightly raised; head width : eye width = 2.3–2.8 : 1; antenna shorter than fore wing; flagellar segments 3 times as long as broad;

setae arranged in five rings; scape and pedicel bearing coarse setae. Pronotum unmarked; dorsal setae long, pale, very coarse; mesonotum with red spot above wing base or unmarked; metanotum unmarked. Legs unmarked; setae short, dark; claws without basal dilation. Fore wing broad (length : breadth = 2.5–3.0 : 1); unmarked or red at base; costal area broad at base; costal setae long, erect; stigma unmarked; Sc quite short; some costal crossveins forked; Sc and R widely separated; basal Sc crossvein absent; *im* short, quadrangular; Rs slightly sinuate; gradates in two parallel series; basal inner gradate not meeting Psm, extending basally; veins not crassate in ♂; c_1 about same length as c_2 or slightly longer; *dcc* closed at margin, short. Hind wing broad (length : breadth = 2.9–3.0 : 1). Abdomen (Figs 71, 72) unmarked; setae short, sparse; ectoproct fused with tergite 9, fused dorsally; ♂: callus cerci ovate; trichobothria 27; ectoprocts greatly elongated apically, grooved ventrally; tergites small, sternites broad; sternites 8 and 9 not fused; sternite 9 short, squared apically; microtholi absent; microtrichia very small; ♀: callus cerci rounded; trichobothria 30; ectoprocts with slight apical invagination; microtrichia present; sternite 7 straight apically; gonapophyses laterales small.

GENITALIA ♂ (Fig. 73). Tignum, gonapsis and median plate absent; entoprocessus broad, quite long; arcessus narrow, dorsally grooved; pseudopenis absent; gonarcus narrow, long; gonosaccus, gonosetae, spinellae and gonocristae absent.

GENITALIA ♀ (Figs 74, 75). Praegenitale absent; subgenitale bilobed apically, very broad with basal extension; spermatheca very broad; ventral impression very small; duct very long, sinuous; vela very short.

REMARKS. *Nothancyla* can be readily distinguished from other chrysopid genera by the quadrangular intramedian cell and broad basal costal margin in the fore wing, and the coarse setae on the scape, pedicel, pronotum and mesonotum. The greatly extended male ectoprocts and the large basal lobe on the female subgenitale are also distinctive. When New (1980) redescribed the genus he mentioned the presence of a tignum, but we have been unable to find this structure in any of the males we examined.

The phylogenetic position of *Nothancyla* is difficult to ascertain. The possession of five rows of flagellar setae and the absence of a basal subcostal crossvein are apomorphic for the Apochrysinae. However, *Nothancyla* does not fit comfortably in this subfamily since it lacks the other apochrysine venational apomorphies, such as Psm and Psc in close proximity or a short Sc. *Nothancyla* also lacks apochrysine apomorphies in the male and female genitalia, such as the absence of entoprocessus or the presence of lateral striations on the spermatheca, although the large spermatheca is reminiscent of the Apochrysinae. Although the genus sits rather uneasily in this subfamily, it cannot be placed in any other group on existing evidence and is therefore tentatively placed in the Apochrysinae until further information is available to clarify its relationships.

BIOLOGY. Unknown. There were no insect remains in the guts of any of the adults examined during this study.

Genus ***OLIGOCHRYSA*** Esben-Petersen

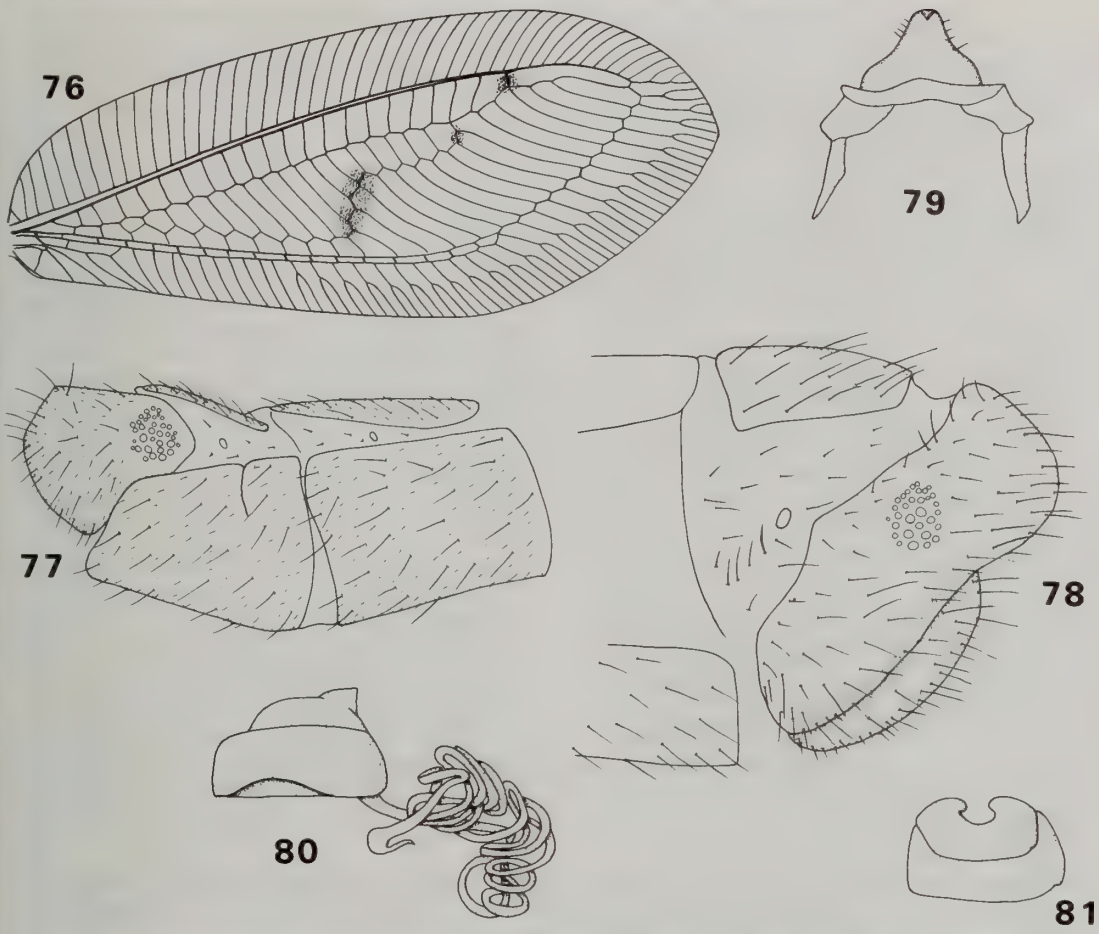
Oligochrysa Esben-Petersen, 1914: 639. Type species: *Oligochrysa gracilis* Esben-Petersen, by original designation.

DISTRIBUTION. Australia (Queensland, New South Wales), Norfolk Island.

The genus is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 76) 17–23 mm; ground colour pale greyish green. Head unmarked; palps short, broad, tapering apically; labrum indented; vertex flattened; head width : eye width = 2.1–2.3 : 1; scape elongate, marked with red apical annulation; antenna considerably longer than fore wing; flagellar segments about 3 times as long as broad; setae arranged in five rings. Pronotum marked with red lateral stripe; dorsal setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.3–2.5 : 1); marked with black spot in middle of inner gradates and on radial crossvein below stigma, outer gradates black; costal setae long, erect; stigma unmarked; Sc short; Sc and R quite close; gradates in two divergent series; inner gradates greatly extended basally; basal inner gradate not meeting Psm; veins not crassate in ♂; costal area broad at base; c_1 about half the length of c_2; 1A not forked. Hind wing narrow (length : breadth = 3.1–3.4 : 1). Abdomen (Figs 77, 78) unmarked; setae long, sparse; callus cerci rounded; trichobothria 32–37; ectoprocts slightly invaginated dorso-apically, fused dorsally, fused with tergite 9; ♂: additional short setae present on sternites 5–9 and ectoprocts; microtholi absent; sternites 8+9 partially separated by narrow suture; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 79). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus



Figs 76–81 *Oligochrysa lutea*. 76, fore wing (from Kimmins); 77, apex of ♂ abdomen, lateral; 78, apex of ♀ abdomen, lateral; 79, ♂ genitalia, dorsal; 80, ♀ spermatheca, lateral; 81, ♀ subgenitale, ventral.

arcuate; arcessus short, triangular, tapering to short apical hook; pseudopenis absent; gonosaccus short; few short setae present laterally on arcessus; gonocristae absent.

GENITALIA ♀ (Figs 80, 81). Praegenitale absent; subgenitale bilobed apically; spermatheca long, broad; ventral impression deep, broad; vela short; duct long, narrow, highly coiled.

REMARKS. We have been unable to find any autapomorphic characters for *Oligochrysa* and it may be the most primitive genus of the subfamily. It may be most closely related to *Synthochrysa*, which is distributed in the western Pacific and Indonesia, and from which it can be distinguished by the lack of a third series of gradate crossveins in the fore wing.

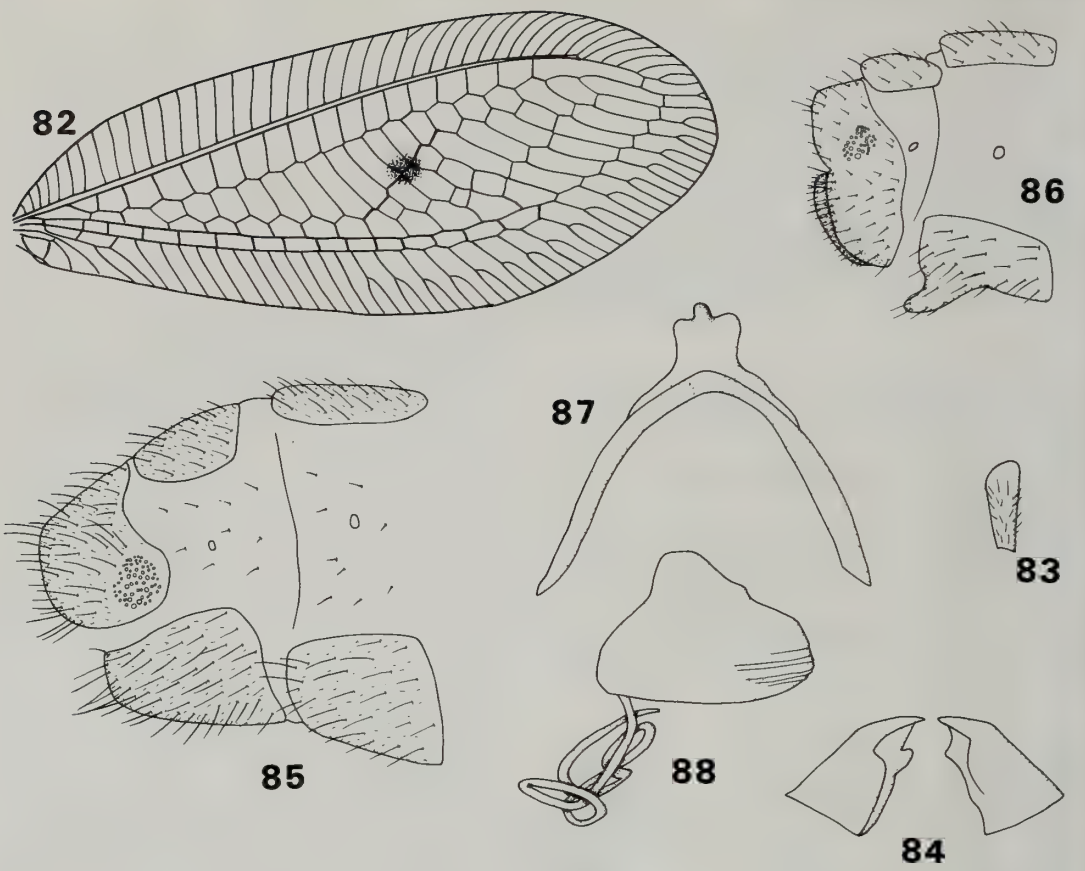
BIOLOGY. Unknown.

Genus ***SYNTHOCHRYSA*** Needham

Synthochrysa Needham, 1909: 202. Type species: *Hemerobius stigma* Girard, by original designation.

DISTRIBUTION. Western Pacific and Indonesia. Four species have been described in the genus.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 82) 20–24 mm; ground colour pale green. Head unmarked; palps truncate (Fig. 83); mandibles broad, asymmetrical with basal tooth on left mandible (Fig. 84); labrum indented; vertex slightly raised; head width : eye width = 1.6–2.2 : 1; antenna longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum marked with red lateral stripe; dorsal setae long, pale; meso- and



Figs 82–88 *Synthochrysa*. 82, 85–88, *S. montrouzieri*; 83, 84, *S. salomonis*. 82, fore wing (from Kimmins); 83, apical segment of maxillary palp, dorsal; 84, mandibles, dorsal; 85, apex of ♂ abdomen, lateral; 86, apex of ♀ abdomen, lateral; 87, ♂ genitalia, dorsal; 88, ♀ spermatheca, lateral.

metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.2–2.5 : 1); marked with black spot on central inner gradates; costal area narrow at base; costal setae long, erect; stigma unmarked; Sc short; Sc and R widely separated; gradates in three divergent series; inner gradates greatly extended basally; basal inner gradate not meeting Psm; veins not crassate in ♂; c_1 shorter than c_2; 1A not forked. Abdomen (Figs 85, 86) unmarked; setae long, sparse; callus cerci rounded; trichobothria 35–63; ectoprocts with slight dorso-apical invagination, fused dorsally; ♂: additional short setae on sternites 5–9, tergites 7–9 and ectoprocts; microtholi absent; ectoprocts fused with tergite 9; sternite 8+9 fused, short; ♀: sternite 7 straight apically with long subapical median horn.

GENITALIA ♂ (Fig. 87). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus arcuate; arcessus triangular with apical hook and lateral lobes; pseudopenis absent; gonosaccus short; gonosetae and gonocristae absent.

GENITALIA ♀ (Fig. 88). Praegenitale absent; subgenitale bilobed with median projection; spermatheca long, broad with lateral annulations; ventral impression deep, broad, abruptly narrowing apically; vela short; duct long, narrow, sinuous.

REMARKS. *Synthochrysa* is one of the least derived genera in the Apochrysinae and the wing venation closely resembles *Oligochrysa* Esben-Petersen. *Synthochrysa* may be distinguished from other genera by the presence of three series of gradate crossveins, the median projection at the apex of sternite 7 in females and the lateral lobes at the apex of the arcessus in males.

BIOLOGY. Unknown.

Subfamily ***CHRYSOPINAE*** Schneider

Chrysopina Schneider, 1851: 35. Type genus: *Chrysopa* Leach.
Chrysopinae Esben-Petersen, 1918: 27.

DISTRIBUTION. World-wide.

DIAGNOSIS. *Adult.* Small to large lacewings, fore wing 9–31 mm; head width : eye width = 1.6–4.9 : 1; pedicel slightly constricted medially; setae on flagellar segments arranged in four or less rings; basal Sc crossvein in fore wing positioned relatively basad (−0.08 to +0.96 mm); *im* quadrangular or ovate; basal Rs crossvein meets *im* in apical half; tympanal organ swollen, spherical; c_1 longer or shorter than c_2; Psm and Psc widely separated; Psm long, fusing with outer gradates; gradates arranged in 0–4 rows; jugal lobe small. Genitalia variable.

REMARKS. This is by far the largest of the three subfamilies of Chrysopidae, containing 56 of the 75 genera currently recognised in the family. It is also a very diverse group, which has led several authors (e.g. Adams, 1967) to suggest that it may be a convenient but paraphyletic assemblage. However, our studies show that it seems to be a monophyletic group, recognised by the autapomorphy of possessing only four rings of setae on the flagellar segments.

Key to the genera and subgenera of the Chrysopinae

Three genera, *Chrysaloysia* Navás (p. 170), *Nuvol* Navás (p. 251) and *Neula* Navás (p. 251), have been omitted from this key because we have not been able to examine suitable specimens.

The key ignores the tribal classification of the Chrysopinae and goes straight to generic and subgeneric level: this is because we believe that keys should be practical and easy to use, rather than conforming to the phylogeny of the group concerned. A key to tribes would necessitate an examination of male genitalia and mouthparts of every specimen, whereas the key presented here uses non-genitalic 'external' characters as far as possible. Some of the more complex genera key out in more than one place.

The captions of Figs 1–6 explain the terminology of many of the characters used in the key.

1 Sc very short; 1–2 crossveins below pterostigma (Fig. 89) 2

– Sc long; at least 3–4 crossveins below pterostigma (Fig. 125) 4

2 Cell *im* absent in fore wing (Fig. 95)
ANKYLOPTERYX (subgenus ***SENCERA*** Navás)

– Cell *im* present in fore wing (Fig. 89) 3

3 Costa at base of fore wing unmarked; apex of tarsus marked black; ♂: entoprocessus long, usually fused apically; gonosaccus simple; pseudopenis present; arcessus absent (Fig. 92)
ANKYLOPTERYX Brauer

– Costa at base of fore wing marked black; apex of tarsus unmarked; ♂: entoprocessus short, not fused apically; gonosaccus paired; pseudopenis absent; arcessus present (Fig. 104)
PARANKYLOPTERYX Tjeder

4 Gradates absent from fore and hind wing (or only one gradate crossvein present) (Fig. 215)
TURNEROCHRYSA Kimmins

– At least one complete series of gradate crossveins present in either fore or hind wing 5

5 Only one series of gradate crossveins present in hind wing, inner gradates absent from all wings ... 6

– Two or more series of gradate crossveins in hind wing 9

6 Old World species; cell *im* absent from fore wing
CHRYSOPA Leach [part: *minuta* McLachlan only]

– New World species; cell *im* present in fore wing ... 7

7 One series of gradate crossveins in fore wing 8

– Two series of gradate crossveins in fore wing (Fig. 363)
EREMOCHRYSA Banks (subgenus ***EREMOCHRYSA***)

8 Claws dilated (Fig. 11); pedicel elongate; ♂: ectoprocts extended apically, bearing strong, apical teeth (Fig. 426); gonapsis short, broad, bifurcate (Fig. 428); ♀: subgenitale extended basally (Fig. 431) ..... ***PARACHRYSOPIELLA*** gen. n.

– Claws undilated (Fig. 12); pedicel about as long as broad; ♂: ectoprocts rounded, not extended apically with long, fine setae (Fig. 356); gonapsis long, narrow (Fig. 359); ♀: subgenitale not extended basally but projects ventrally (Fig. 360)
EREMOCHRYSA Banks (subgenus ***CHRYSOPIELLA*** Banks)

9 Three or more regular series of gradate crossveins in fore wing (Fig. 220) 10

– Two series of gradate crossveins in fore wing, although occasional crossveins may be doubled (Fig. 322) 21

10 Two series of gradate crossveins in hind wing 11

– More than two regular series of gradate crossveins in hind wing 13

11 Neotropical species; antenna equal to or longer than fore wing; fore wing with dark spots or shading 12

– Oriental species; antenna shorter than fore wing; fore wing unmarked (Fig. 253)
BORNIOCHRYSA nom. n. [part]

12 Antenna 1.5 times length of fore wing; cell *im* quadrangular; fore wing with numerous dark spots (Fig. 486) ..... ***CACARULLA*** Navás

– Antenna about as long as fore wing; cell *im* ovate; fore wing with pale brown shading around crossveins ..... ***CHRYSOPODES*** Navás [part]

13 Cell *im* quadrangular (Fig. 8) 14

– Cell *im* ovate (Fig. 10) 15

14 Claws with basal dilation (Fig. 11); scape elongate (Fig. 16).
AUSTROCHRYSA Esben-Petersen [part]

– Claws without basal dilation (Fig. 12); scape about as broad as long ..... ***REXA*** Navás [part]

15 Scape grossly enlarged; costa convex in hind wing
TUMEOCHRYSA Needham

– Scape as broad as long or slightly elongate; costa straight in hind wing 16

16 Eyes small (head width : eye width ≥ 2.5 : 1) (Fig. 16); ♂: ectoprocts flattened caudally; apex of sternite 8+9 hooked dorsally (Fig. 223); species confined to Hawaiian Islands
ANOMALOCHRYSA McLachlan

– Eyes larger (head width : eye width ≤ 2.5 : 1); ♂: ectoprocts not flattened; sternite 8+9 straight; Oriental species 17

17 Costal setae long, erect or slightly inclined towards fore wing apex; ♂: sternite 8+9 elongate, extending beyond apex of ectoprocts (Fig. 317) 20

– Costal setae short, strongly inclined towards wing apex; ♂: sternite 8+9 short 18

18 Gradates arranged in four series; radial crossveins sinuate in apical half of fore wing; ♂: gonosaccus bearing teeth; arcessus with paired ventro-apical hooks (Fig. 384)
HIMALOCHRYSA Hölzel [part]

– Gradates arranged in three series; radial crossveins straight; ♂: gonosaccus untoothed; arcessus without paired apical hooks 19

19 Small species, fore wing < 15 mm; ♂: sternites 8+9 fused; gonapsis, tignum and arcessus present; pseudopenis absent ..... ***MALLADA*** Navás [part]

– Large species, fore wing > 16 mm; ♂: sternites 8+9 not fused; gonapsis, tignum and arcessus absent; pseudopenis present
PLESIOCHRYSA Adams [part]

20 Radial crossveins in fore wing straight (Fig. 308); ♂ with tignum (Fig. 312) ..... ***ANACHRYSA*** Hölzel

– Radial crossveins in fore wing sinuous (Fig. 316); ♂ without tignum ..... ***CHRYSOPIDIA*** Navás

21 Cell *im* absent in fore wing (Fig. 133)
NESOCHRYSA Navás [Madagascar species] and ***BELONOPTERYX*** Gerstaecker [New World species]

– Cell *im* present in fore wing 22

22 Cell *im* quadrangular (Fig. 8) 23

– Cell *im* ovate (Fig. 10) or triangular (Fig. 9) 34

23 Pterostigma of fore wing marked with dark spot 24

– Pterostigma of fore wing unmarked 28

24 Pronotum narrow; flagellar segments at least 3 times as long as broad in mid-antenna; palps narrow, asymmetrical apically, flattened apically in lateral view (Fig. 14); vertex raised; New World species 25

– Pronotum broad; flagellar segments at most 2 times as long as broad in mid-antenna; palps broad, symmetrical apically, cylindrical not flattened apically in lateral view (Fig. 13); vertex flat; Old World species 26

25 Fore wing marked, often extensively, with black or dark brown spots (Fig. 492) ..... ***GONZAGA*** Navás

– Fore wing usually unmarked but if markings are present these are restricted to dark shading adjacent to crossveins (Fig. 498)
LEUCOCHRYSA McLachlan (subgenus ***LEUCOCHRYSA***)

26 Inner gradate crossveins not extended basally; c_2 narrow (Fig. 201); ♂: gonarcus arcuate (Fig. 205); ♀: praegenitale absent; subgenitale supported on elongate sclerotized plate (Fig. 203)
OYOCHRYSA Brooks

– Inner gradate crossveins extended basally; c_2 broad (Fig. 208); ♂: gonarcus transverse (Fig. 211); ♀: praegenitale present (Fig. 210); subgenitale not supported on sclerotized plate 27

27 Antenna shorter than or same length as fore wing; flagellar segments in mid-antenna less than twice as long as broad; c_1 2.0–2.5 times longer than c_2; ♂: parameres short, paired (Fig. 211); ♀: small median projection at apex of subgenitale (Fig. 213) ..... ***STIGMACHRYSA*** Navás

– Antenna longer than fore wing; flagellar segments in mid-antenna twice as long as broad; c_1 at most 1.5 times longer than c_2; ♂: parameres long, 2–3 pairs (Fig. 190); ♀: without median projection at apex of subgenitale (Fig. 194) ..... ***NESOCHRYSA*** Navás

28 Flagellar segments twice as broad as long; c_1 shorter than c_2; pronotum narrow 29

– Flagellar segments about as broad as long; c_1 at least 1.5 times longer than c_2; pronotum broad .. 32

29 Claws without basal tooth (Fig. 12); radial crossveins straight ..... ***REXA*** Navas

– Claws with basal tooth (Fig. 11); radial crossveins sinuous 30

30 Old World species; pronotum elongate, marked with black medio-lateral spot (Fig. 19); antennae longer than fore wing; mandibles (Fig. 18) and palps (Fig. 14) broad 31

– New World species; pronotum almost square, marked with yellow median stripe; antennae at most as long as fore wing; mandibles (Fig. 17) and palps (Fig. 15) narrow
CHRYSOPODES Navás (subgenus ***CHRYSOPODES***)

31 Fore wing marked with a few large spots in discal area; inner gradate series irregular and widely divergent from outer gradates; outer gradates green (Fig. 388) ..... ***KOSTKA*** Navás

– Fore wing without large spots; outer gradates black; inner and outer gradates parallel (Fig. 246)
AUSTROCHRYSA Navás

32 New World species; claws without basal tooth (Fig. 12) ..... ***NACARINA*** Navás

– Old World species; claws with basal dilation (Fig. 11) 33

33 Cell *im* short (Fig. 162); ♂ parameres absent; ♀ praegenitale present (Fig. 166)
EVANOCHRYSA gen. n.

– Cell *im* long (Fig. 169); ♂ parameres present; ♀ praegenitale absent ..... ***ITALOCHRYSA*** Principi

34 Basal radial crossvein, which meets apex of cell *im*, leaves radius before origin of Rs (Fig. 480)
BERCHMANSUS Navás

– No radial crossvein basal to origin of Rs 35

35 Cell c_1 much longer than c_2 36

– Cell c_1 shorter (rarely slightly longer) than c_2 39

36 Claws without distinct basal dilation (Fig. 12) 37

– Claws with strongly toothed basal dilation (Fig. 11) 38

37 Vein Cu_2 in fore wing forked (Fig. 135)
CALOCHRYSA Banks

– Vein Cu_2 in fore wing unforked (Fig. 154)
DYSOCHRYSA Tjeder

38 Both wings and pterostigma extensively marked with black spots (Fig. 147); scape slightly elongate; ♂: parameres long, tapering apically (Fig. 151); ♀: sternite 7 without subapical spines (Fig. 149)
CHRYSACANTHIA Lacroix

– Crossveins shaded in basal half of fore wing, pterostigma unmarked (Fig. 195); scape broad; ♂: parameres short, swollen apically (Fig. 198); ♀: sternite 7 with short subapical spines (Fig. 197) ..... ***NODOCHRYSA*** Banks

39 Male 40

– Female (N.B. this part of the key should be used with caution as it is not always possible to identify unassociated females) 74

40 Gonapsis present (Figs 2, 3) but sometimes very small and indistinct in *Glenochrysa* (Fig. 377), most specimens of which have extensively marked wings (Fig. 373) 41

– Gonapsis absent 50

41 Pseudopenis present as additional hooked structure below arcessus (Fig. 408) 42

– Pseudopenis absent, only arcessus present 43

42 Fore wing narrow (length : breadth ⩾ 3.0 : 1) and unmarked; scapes elongate and widely separated at base; New World species, often with head ornamentation or stridulatory structure on second sternite (Fig. 20) ..... ***MELEOMA*** Fitch

– Fore wing broad (length : breadth < 3.0 : 1) and marked with small black spot at base of costa; scapes as long as broad and close together at base; species endemic to Canary Is and Madeira; head without ornamentation; stridulatory structure absent ..... ***ATLANTOCHRYSA*** Hölzel

43 Tignum present ..... ***MALLADA*** Navás

– Tignum absent 44

44 Gonapsis large, elongate (Fig. 270); median plate present 45

– Gonapsis small, short; median plate absent 46

45 Fore wing narrow (length : breadth > 2.9 : 1); anal veins not crassate; radial crossveins straight; median plate with dorsal horns (Fig. 268)
CERAEOCHRYSA Adams

– Fore wing broad (length : breadth < 2.8 : 1); anal veins crassate; radial crossveins sinuate; median plate without dorsal horns
CHRYSOPODES Navás

46 Fore wing marked, often extensively, with black and pale brown shading; Sc short; basal branch of Cu_2 recurrent (Fig. 373)
GLENOCHRYSA Esben-Petersen

– Fore wing unmarked or markings restricted to small black spots on cell *dcc* and pterostigma; Sc long; basal branch of Cu_2 only slightly curved 47

47 Fore wing usually (but not invariably) marked; gonapsis narrow, broadly arcuate; ectoprocts separated by dorsal suture (Fig. 22) 48

– Fore wing unmarked; gonapsis V- or T-shaped; ectoprocts fused dorsally 49

48 Fore wing usually marked with red basal suffusion; ectoprocts very long and narrow (Fig. 289); gonapsis broad, arcuate with apical teeth (Fig. 291); antenna considerably longer than fore wing
CHRYSOCERCA Weele

– Fore wing usually marked with black spot on *dcc* and pterostigma; ectoprocts short and broad (Fig. 281); gonapsis narrow, simple (Fig. 284); antenna short, at most only slightly longer than fore wing
CHRYSEMOSA nom. n.

49 Ectoprocts narrow, pointed dorso-apically (Fig. 433); gonapsis V-shaped (Fig. 435); inner gradates more numerous than outer; wings very narrow (length : breadth > 3.5 : 1) (Fig. 432)
PEYERIMHOFFINA Lacroix

– Ectoprocts broad (Fig. 231); gonapsis small, T-shaped (Fig. 234); outer gradates more numerous than inner; wings broad (length : breadth < 3.5 : 1) (Fig. 230) ..... ***APERTOCHRYSA*** Tjeder

50 Tignum present (Fig. 3) 51

– Tignum absent 53

51 First Rs crossvein usually meets Psm distal to cell *im* (Fig. 301); arcessus present; pseudopenis absent (Fig. 304); sternites 8+9 fused; apex of sternite 8+9 with distinct lip (Fig. 302)
CHRYSOPERLA Steinmann

– First Rs crossvein meets cell im subapically; arcessus absent; pseudopenis present; sternites 8 and 9 not fused; apex of sternite 9 without lip 52

52 Head marked with black spot on gena and between antennae; radial crossveins straight; tignum small, ovate ..... ***CHRYSOPA*** Leach [part]

– Head and pronotum marked with orange or red spots (Fig. 26); radial crossveins sinuous or oblique; tignum large, transverse (Fig. 446)
PLESIOCHRYSA Adams [part]

53 Stridulatory structure situated laterally on abdominal segment 2 (Fig. 20)
BRINCKOCHRYSA Tjeder

– Stridulatory structure absent 54

54 Gonarcus short, broad, transverse (Fig. 523); arcessus broad (pseudopenis absent) 55

– Gonarcus long, narrow, arcuate; arcessus or pseudopenis narrow, tapering apically 57

55 Palps broad, rounded apically (Fig. 13); pronotum very broad; parameres present (Fig. 129)
ABACHRYSA Banks

– Palps narrow, tapered apically (Fig. 14); pronotum narrow; parameres absent 56

56 Fore wing (except pterostigma) unmarked or with a few small black spots; gradates parallel; basal costal crossveins straight; radial crossveins parallel (Fig. 512)
LEUCOCHRYSA (subgenus ***NODITA*** Navás)

– Fore wing marked extensively with large black spots; inner gradates widely divergent from outer; basal costal crossveins sinuate; radial crossveins below pterostigma divergent (Fig. 520)
VIEIRA Navás

57 Sternites 8 and 9 not fused (Fig. 274) 58

– Sternites 8+9 fused (Fig. 2) 61

58 Entoprocessus very long and narrow, protruding beyond apex of abdomen (Fig. 276); at least twice as many outer gradates as inner gradates in all wings (Fig. 273) ..... ***CERATOCHRYSA*** Tjeder

– Entoprocessus short; less than twice as many outer gradates as inner gradates 59

59 Pseudopenis present, arcessus absent; ectoprocts short (Fig. 2); inner gradates not extended basally, basal inner gradate meeting Psm (Fig. 1) 60

– Pseudopenis absent, arcessus present; ectoprocts elongated apically (Fig. 417); inner gradates greatly extended basally, basal inner gradate not meeting Psm (Fig. 414) ..... ***NINETA*** Navás

60 Head marked (often extensively) with black spots; entoprocessus with dorsal horn (Fig. 297); horns absent from gonarcus; eyes small (head width : eye width ≥ 2.6 : 1) ..... ***CHRYSOPA*** Leach

– Head usually marked with large red or yellow spots (Fig. 26); entoprocessus without horn; gonarcus with paired median horns (Fig. 444); eyes large (head width : eye width ≤ 2.6 : 1)
PLESIOCHRYSA Adams [part]

61 Ectoprocts narrow and projecting apically, bearing tuft of long, coarse setae at apex (Fig. 254)
BORNIOCHRYSA nom. n.

– Ectoprocts rounded apically, not extended, tuft of setae absent 62

62 Radial crossveins oblique or sinuate (Fig. 380); scape usually elongate (Fig. 16) 63

– Radial crossveins straight (Fig. 107); scape about as long as broad 67

63 Median radial crossveins sinuate or oblique, radial crossveins below pterostigma straight (Fig. 380); sternite 8+9 short (Fig. 381) 64

– Median radial crossveins straight, radial crossveins below pterostigma sinuate or oblique (Fig. 322); sternite 8+9 elongate (Fig. 325) 66

64 Old World species; dorsal apodeme short, not extending beyond apex of abdomen; sternite 8+9 without ventral swelling 65

– New World species; dorsal apodeme long, extending beyond apex of abdomen; small mid-ventral swelling on sternite 8+9 (Fig. 333)
CHRYSOPODES Navás [part]

65 Gonocristae present (Fig. 247); gonosaccus without apical teeth ..... ***AUSTROCHRYSA*** Navás

– Gonocristae absent; gonosaccus with apical teeth (Fig. 384) ..... ***HIMALOCHRYSA*** Hölzel

66 Costal setae in fore wing long, erect; arcessus narrow, tapering apically (Fig. 327); head unmarked or with red spots; wings unmarked (Fig. 322) ..... ***CHRYSOTROPIA*** Navás

– Costal setae short, inclined towards wing apex; arcessus with apico-ventral forked process (Fig. 122); head with black markings; wings with extensive black shading (Fig. 119)
SIGNOCHRYSA gen. n.

67 Mandibles narrow, scythe-like (Fig. 17); palps narrow, cylindrical, elongate apically (Fig. 15) .. 68

– Mandibles broad (Fig. 18); palps broad, flattened laterally, abruptly tapering apically (Fig. 14) 70

68 New World species; arcessus weakly sclerotized, triangular with apical hook, lateral rods and dorsal microsetae (Fig. 335)
CHRYSOPODES Navás [part]

– Old World species; arcessus strongly sclerotized, linear, tapering apically without strong apical hook; dorsal microsetae and lateral rods absent 69

69 Antenna shorter than fore wing; frons unmarked; apodeme of sternite 8+9 with prominent apical tooth (Fig. 108); genitalia with median plate and membranous sac dorsal of arcessus present (Fig. 110); gonosetae numerous .. ***RETIPENNA*** Brooks

– Antenna longer than fore wing; frons marked with row of 2–3 black spots below antennae (Fig. 25); apodeme of sternite 8+9 short, not projecting (Fig. 114); genitalia with median plate and dorsal membranous sac absent; gonosaccus with 4 (rarely 2) long, lateral gonosetae (Fig. 116)
SEMACHRYSA Brooks

70 Basal inner gradate not meeting Psm (Fig. 230) ..71

– Basal inner gradate meeting Psm (Fig. 1) 72

71 Old world species; ectoprocts separated dorsally by deep groove or narrow suture (Fig. 22); fore wing often marked, particularly cell *dcc* (Fig. 456) (fore wing marked in all species with fore wing > 9 mm); arcessus trifurcate apically (Fig. 459); ♂ ectoprocts extended and hinged basally .... ***SUARIUS*** Navás

– New World species; ectoprocts fused dorsally, dorsal groove absent; fore wing unmarked (Fig. 468); arcessus tapering to single point (Fig. 471); ♂ ectoprocts rounded, not hinged, basally (Fig. 469) ..... ***UNGLA*** Navás

72 Arcessus axe-head shaped when viewed laterally (Fig. 352) ..... ***CUNCTOCHRYSA*** Hölzel

– Arcessus narrow, tapering apically to short hook 73

73 Gonocristae present (Fig. 475); entoprocessus present with dorsal hooks; arcessus entirely sclerotized, large (Fig. 477) ..... ***YUMACHRYSA*** Banks

– Gonocristae absent; entoprocessus absent; arcessus small, membranous with lateral sclerotized rods (Fig. 346) ..... ***NEOSUARIUS*** Adams & Penny

74 Praegenitale present (Fig. 6); pronotum very broad 75

– Praegenitale absent; pronotum narrow 76

75 New World species; pronotum marked with two transverse rows of black spots; fore wing < 20 mm; claws without basal dilation (Fig. 12)
ABACHRYSA Banks

– Old World species; pronotum marked with broad red/brown longitudinal stripe; fore wing > 20 mm; claws basally dilated (Fig. 11)
NESOCHRYSA Navás

76 Basal inner gradate not meeting Psm in fore wing (Fig. 259) 77

– Basal inner gradate meeting Psm in at least one wing (Fig. 1) 85

77 Sternite 7 with deep apical invagination (Fig. 21); stridulatory structure present, situated laterally on abdominal segment 2 (Fig. 20)
BRINCKOCHRYSA Tjeder

– Sternite 7 straight or convex apically; stridulatory structure absent 78

78 Radial crossveins sinuous or oblique (Fig. 119) ..79

– Radial crossveins straight (Fig. 1) 81

79 Large species (fore wing ≥ 16 mm); fore wing unmarked; mandibles broad, symmetrical with basal tooth on both mandibles (Fig. 416); palps broad, tapering abruptly apically (Fig. 14) 80

– Smaller species (fore wing ≤ 13 mm); fore wing marked with black spots; mandibles narrow, scythe-like, symmetrical without basal tooth (Fig. 17); palps narrow, elongate apically (Fig. 15)
SIGNOCHRYSA gen. n.

80 Scape elongate; inner gradates extended basally; head broad (head width : eye width ≥ 2.7 : 1) ..... ***NINETA*** Navás

– Scape about as broad as long; inner gradates not extended basally; head narrow (head width : eye width ≤ 2.6 : 1)... ***PLESIOCHRYSA*** Adams [part]

81 Sc short; basal branch of Cu_2 recurrent; wing veins usually with extensive black and pale brown shading; wing membrane with pustules (Fig. 373)
GLENOCHRYSA Esben-Petersen

– Sc long; basal branch of Cu_2 not recurrent; wing unmarked or marked with small spots only; wing membrane not pustulated 82

82 Ectoprocts not fused dorsally or with deep dorsal groove (Fig. 22); basal lobe of subgenitale elongate or with V-shaped indentation; fore wing usually marked with black spots, particularly on cell *dcc*; longitudinal veins often unforked apically 83

– Ectoprocts fused dorsally; subgenitale straight or tapered basally; fore wing usually unmarked; longitudinal veins forked apically; 84

83 Fore wing marked with black spots on *dcc* and pterostigma (Fig. 280); claws with basal dilation (Fig. 11); basal lobe of subgenitale with V-shaped indentation (Fig. 286); ectoprocts separated by dorsal suture ..... ***CHRYSEMOSA*** nom. n.

– Fore wing unmarked or marked with numerous small black spots throughout wing (Fig. 456); claws undilated (Fig. 12); basal lobe of subgenitale elongate (Fig. 460); ectoprocts separated by deep dorsal groove ..... ***SUARIUS*** Navás

84 Subgenitale tapering basally (Figs 236, 472)
APERTOCHRYSA Tjeder [Old World species] and ***UNGLA*** Navás [New World species]

– Subgenitale straight basally (Fig. 400)
MALLADA Navás

85 Radial crossveins oblique or sinuate (Fig. 245) ..86

– Radial crossveins straight (Fig. 1) 93

86 Costal crossveins sinuate; fore wing extensively marked, with spot on stigma; inner gradates widely divergent from outer gradates (Fig. 520)
VIEIRA Navás

– Costal crossveins straight; stigma unmarked; fore wing unmarked or with small spots; inner and outer gradates subparallel 87

87 Median radial crossveins sinuate, radial crossveins below pterostigma straight (Fig. 245) 88

– Median radial crossveins straight, radial crossveins below pterostigma oblique (Fig. 322) 92

88 Fore wing marked with black spot at base of costa; head marked with broad black X-shaped marking between antennae; species endemic to Canary Is and Madeira..... ***ATLANTOCHRYSA*** Hölzel

– Fore wing with costa unmarked basally; head not marked between antennae; species not occurring in Canary Is or Madeira 89

89 Pronotum marked with black medio-lateral spot (Fig. 19); callus cerci large, trichobothria widely dispersed (Fig. 247)
AUSTROCHRYSA Esben-Petersen

– Pronotum marked with yellow median stripe; callus cerci small, trichobothria compact (Fig. 335)....90

90 Fore wing with more than 4 outer gradates and less than 4 inner gradates and with at least twice as many outer gradates as inner gradates (Fig. 273); subgenitale mounted on long sclerotized plate (Fig. 278)..... ***CERATOCHRYSA*** Tjeder

– Wings with less than twice as many outer gradates as inner gradates (Fig. 1); subgenitale without sclerotized ventral plate 91

91 New World species; radial crossveins oblique (Fig. 330); subgenitale straight basally (Fig. 338)
CHRYSOPODES Navás [part]

– Old World species; radial crossveins sinuate (Fig. 380); subgenitale elongate basally (Fig. 386)
HIMALOCHRYSA Hölzel

92 Scape elongate (Fig. 16); costal setae of fore wing long, erect .....***CHRYSOTROPIA*** Navás

– Scape as broad as long; costal setae short, inclined towards wing apex.....***MALLADA*** Navás

93 Sc in stigmatic region marked black; im usually triangular or broadly ovate (Fig. 512); antenna about 1.5 times as long as fore wing
LEUCOCHRYSA McLachlan
(subgenus ***NODITA*** Navás)

– Pterostigma unmarked; im ovate; antenna shorter or only a little longer than fore wing 94

94 Wings usually marked, often extensively, with brown spots or shading around crossveins; palps narrow, elongate apically (Fig. 15), rounded in cross-section; mandibles narrow, scythe-like (Fig. 17).....95

– Wings unmarked; palps broad, tapering abruptly apically (Fig. 14), flattened in cross-section; mandibles broad (Fig. 18) 97

95 New World species
CHRYSOPODES Navás [part]

– Old World species 96

96 Frons marked with row of 2–3 black spots below antennae (Fig. 25); spermatheca duct narrow (Fig. 117).....***SEMACHRYSA*** Brooks

– Frons unmarked; spermatheca duct with broad ventral expansion (Fig. 111)
RETIPENNA Brooks

97 First Rs crossvein meets Psm distal to apical cell (Fig. 301) .....***CHRYSOPERLA*** Steinmann

– First Rs crossvein meets cell *im* at apex or subapically 98

98 Fore wing very narrow (length : breadth $\geq 3.5 : 1$); inner gradates more numerous than outer gradates (Fig. 432) ..... ***PEYERIMHOFFINA*** Lacroix

– Fore wing broader (length : breadth $< 3.2 : 1$); inner gradates fewer than outer 99

99 Scape and/or pronotum marked with red lateral stripes; median radial crossveins black
CERAEOCHRYSA Adams

– Not with this combination of markings 100

100 Base of fore wing and mesoscutum marked red/brown or black ..... ***CHRYSOCERCA*** Weele

– Base of fore wing unmarked.....101

101 Basal fork of M (at base of *im*) and crossvein between m_1 and m_2 thickened; M with acute fork (Fig. 23); vertex and frons usually marked with large yellow, orange or red suffusion (Fig. 26)
PLESIOCHRYSA Adams [part]

– Crossveins at base of wing not swollen; M with less acute fork (Fig. 24); head with black or brown markings, any red markings restricted to small spot or narrow stripe 102

102 Scapes elongate and widely separated from each other at base *or* stridulatory structure present laterally on abdominal segment 2 and inner surface of hind femur (Fig. 20)
MELEOMA Fitch

– Scapes as long as broad and close together at base; stridulatory structure absent 103

103 Cell m_2 broad (width : length $\leq 2.5 : 1$); most crossveins in fore wing entirely green
BORNIOCHRYSA nom. n.

– Cell m_2 narrow (width : length $\geq 2.7 : 1$); most crossveins in fore wing entirely black or black at each end 104

104 Spermatheca large; vela very long and coiled (Fig. 348) ..... ***NEOSUARIUS*** Adams & Penny

– Spermatheca small; vela shorter, not coiled ... 105

105 Subgenitale extended basally (Fig. 478); head with extensive brown markings; pronotum with broad brown lateral stripe; antenna brown; longitudinal wing veins brown ..... ***YUMACHRYSA*** Banks

– Subgenitale straight basally; head and pronotal markings (if extensive) black; antenna and longitudinal wing veins green/yellow 106

106 Head markings restricted to black or red stripe on gena; fore wing narrow (length : breadth $\geq 3.0 : 1$), slightly pointed at apex; Rs sinuous (Fig. 349); subgenitale with basal crumena (Fig. 353) ..... ***CUNCTOCHRYSA*** Hölzel

– Head usually marked with extensive black spots and/or stripes; fore wing broad (length : breadth $< 3.0 : 1$), rounded at apex; Rs straight or slightly sinuous, especially in larger species (Fig. 294); subgenitale without crumena

CHRYSOPA Leach

Tribe **ANKYLOPTERYGINI** Navás

Ancilopteryginos Navás, 1910*a*: 59. Type genus: *Ankylopteryx* Brauer.
Ancylopterygini Navás, 1913*b*: 293.
Ankylopterygini Hölzel, 1970: 51.

DISTRIBUTION. Palaeotropics.

DIAGNOSIS. *Adult*. Small to medium lacewings, forewing 7–21 mm. Head short; head narrow, head width : eye width = 1.6–2.6 : 1; palps narrow, elongate apically (Fig. 15); galea narrow; mandibles scythe-like, symmetrical without basal teeth (Fig. 17); toruli small; vertex raised; flagellar segments narrow, at least 3 times as long as broad; setae arranged in four rings. Pronotum narrow, short. Legs short. Fore wing more or less marked with black spots; usually highly setose; costal area narrow or broad at base; Sc and R generally close together; basal Sc crossvein −0.08 to +0.4 mm; *im* usually ovate, narrow or subrhomboidal; gradates in two parallel series; c_1 shorter than c_2. Hind wing usually narrow (length : breadth > 3.3 : 1). Abdomen with setae long, sparse; trichobothria less than 35; ectoprocts narrow; ♂: microtholi usually absent; sternite 8+9 fused.

GENITALIA ♂. Tignum and gonapsis absent; median plate usually absent; entoprocessus present; long, narrow arcessus or pseudopenis present; gonarcus narrowly arcuate; gonosetae usually present; parameres absent.

GENITALIA ♀. Praegenitale absent; spermatheca narrow.

REMARKS. Ankylopterygini includes six genera and subgenera. *Ankylopteryx* Brauer is distributed throughout the Old World, *Parankylopteryx* Tjeder is restricted to the Afrotropics, and from the eastern Palaearctic and Oriental region are *Signochrysa* gen. n., *Retipenna* Brooks, *Semachrysa* Brooks and *Sencera* Navás.

Ankylopterygini genera are characterised by narrow hind wings, highly setose wings, scythe-like mandibles and elongate apical segments of the palps. The most derived genera are *Ankylopteryx*, *Sencera*, *Parankylopteryx* and *Semachrysa* all of which have the basal costal area of the fore wing enlarged and the basal subcostal crossvein positioned more basad than any other chrysopid genus (it is often basad of the m_1/m_2 crossvein). The presence of a pseudopenis and lack of an arcessus in *Sencera* and *Ankylopteryx*, which is the apomorphic condition in the Chrysopidae, suggests that these two genera are the most advanced of the tribe. *Sencera* has a further specialisation in that the intramedian cell is absent. *Semachrysa* is the least specialised of this subgroup because the basal costal area is only slightly expanded. In *Retipenna* and *Signochrysa* the costal area is narrow basally and the basal subcostal crossvein is positioned more distally, although it is still more basal than in most other chrysopid genera.

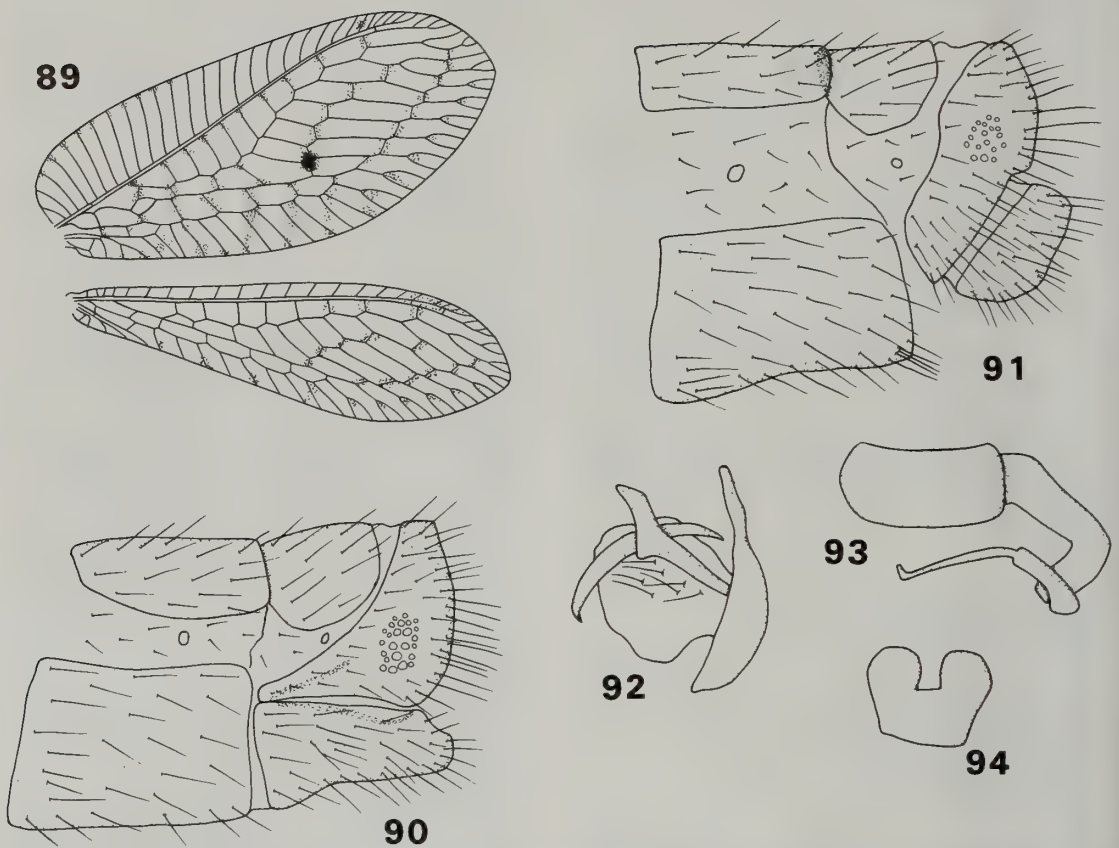
The apomorphic ankylopterygine characters also occur in the *Chrysopodes canudasi* Navás group of species and initially we had considered this group to be related to the Ankylopterygini. However, after fully surveying the male genitalia of *Chrysopodes* it has become evident that it is a very diverse genus and also includes species such as *C. divisa* (Walker) and *C. collaris* which exhibit typically chrysopine features. It makes no sense to include two species groups which have very similar male genitalic characters in different tribes so we have decided to exclude *Chrysopodes* from the Ankylopterygini, thus implying that the *canudasi* group characters have evolved independently of the Ankylopterygini.

Genus ***ANKYLOPTERYX*** Brauer

Ankylopteryx Brauer, 1864: 899. Type species: *Chrysopa venusta* Hagen, by subsequent designation by Tjeder, 1966: 493.
Ethiochrysa Fraser, 1952: 57. Type species: *Ethiochrysa polychlora* Fraser, by monotypy. **Syn. n.**

DISTRIBUTION. Palaeotropics.

There are 50 species and subspecies included in this large Palaeotropical genus. From Madagascar



Figs 89–94 *Ankylopteryx*. 89, *A. basalis*, 90, 92, *A. buttikaferi*, 93, 94, *A. venusta*. 89, fore and hind wing (from Kimmins); 90, apex of ♂ abdomen, lateral; 91, apex of ♀ abdomen, lateral; 92, ♂ genitalia, lateral; 93, ♀ spermatheca, lateral; 94, ♀ subgenitale, caudal.

and the Afrotropics 18 species have been described, eight species are known from India and southern China, 20 from the Oriental region, with a further four Australian species.

DIAGNOSIS. *Adult*. Small to medium lacewings; fore wing (Fig. 89) 9–17 mm; ground colour pale green. Head marked with black or red stripes on clypeus, gena or frons; palps elongate; labrum indented; mandibles scythe-like, symmetrical, without basal teeth; vertex slightly raised; head narrow (head width : eye width 1.9–2.6 : 1); antenna about as long as fore wing; flagellar segments 3–4 times as long as wide with four rings of setae. Pronotum narrow, sometimes marked with black lateral spot; setae long, pale, fine; mesonotum sometimes with broad black marking; metanotum unmarked. Legs often marked with black annulation on fore and mid tibia, apex of 5th tarsal segment usually black; setae long, pale; claws with basal dilation. Fore wing very broad (length : breadth = 2.1–2.5 : 1); marked with large black spots or veins with dark brown suffusion; costa usually unmarked at base; costal area at base of fore wing broad; costal setae long, erect; Sc very short; stigma often marked with black spot; Sc and R very close; basal Sc crossvein 0.08–0.12 mm; *im* present or absent; m_2 with strongly arched costal margin; Rs strongly sinuate; gradates in two slightly divergent rows, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter than c_2; c_2 narrow, rounded apically. Hind wing narrow (length : breadth = 3.0–4.0 : 1). Abdomen (Figs 90, 91) unmarked; setae long, sparse; callus cerci ovate, 17–24 trichobothria; ectoprocts fused dorsally with slight dorsal invagination; ♂: sternite 8+9 fused; microtholi absent; ♀: sternite 7 straight apically with small setose apical tubercle.

GENITALIA ♂ (Fig. 92). Tignum, gonapsis and median plate absent; gonarcus long, arcuate; entoprocessus long, usually fused apically; arcessus absent; pseudopenis narrow, tapering apically; gonosaccus long with few gonosetae; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 93, 94). Praegenitale absent; subgenitale bilobed apically; spermatheca broad; ventral impression absent or very small; duct long, coiled; vela absent or very small.

Larva. The presumed larva of the subgenus *Sencera* is described below.

REMARKS. *Ankylopteryx* can be distinguished from other ankylopterygine genera by the presence of a pseudopenis in the male genitalia; in all other genera in the tribe an arcessus is present rather than a pseudopenis. It is probably closely related to *Parankylopteryx* with which it shares several apomorphies. Both genera have a broad, setose fore wing marked with numerous black spots and females of both genera have a very small ventral impression and vela. However, *Ankylopteryx* can be distinguished from *Parankylopteryx* by the black tip to the tarsi, the unmarked base of the costa, and the long, apically fused entoprocessus.

From Fraser's (1952) figure of the fore wing it is apparent that *Ethiochrysa* is a synonym of *Ankylopteryx*. The type species of *Ethiochrysa*, *E. polychlora* Fraser, appears to be closely related to *Ankylopteryx decorsei*. Unfortunately, we were unable to locate the type of *E. polychlora* in the MNHN, Paris collections.

BIOLOGY. There were no insect remains in the guts of any of the adults examined during this study.

Subgenus ***ANKYLOPTERYX*** Brauer

There are two major species groups in *Ankylopteryx* s.str.: those, including *A. venusta* (Hagen), which have the wings marked with large black spots; and a smaller group, including *A. polygramma* Gerstaecker, in which the wing veins are suffused with dark markings but without definite spots.

Ankylopteryx s.str. is apparently very closely related to subgenus *Sencera*, from which the generalized pattern of the male and female genitalia are indistinguishable. Species of *Sencera* may be separated from *Ankylopteryx* s.str. only by the absence of the intramedian cell in the fore wing. However, this condition is approached in some *Ankylopteryx* species, such as *A. doleschali* Brauer and *A. obliqua* Banks, where cell *im* is much reduced in size.

Subgenus ***SENCERA*** Navás **stat. n.**

Sencera Navás, 1925a: 26. Type species: *Sencera scioneura* Navás, by original designation and monotypy.

DISTRIBUTION. Indo-Australian.

The subgenus includes 4 described species and a further two undescribed species are present in the BMNH collections.

The description of *Sencera* is the same as for the genus *Ankylopteryx* except in the following characters. Fore wing (Fig. 95) 10–11 mm. Head width : eye width = 1.8–1.9 : 1. Fore wing broad, length : breadth = 2.2–2.6 : 1; *im* absent. Abdomen (Figs 96, 97) unmarked or with black dorsal stripes. The male genitalia (Fig. 98) and female genitalia (Figs 99, 100) are as described for the genus.

Larva. Description based on an unreared larva from Papua New Guinea collected by Dr N. D. Penny on croton bushes. Similar larvae taken at the same time were reared and found to be *Sencera scioneura* Navás. Abdomen narrow, fusiform, humped; thoracic tubercles long and cylindrical, bearing very long, plumose setae; transverse row of four long setae on meso- and metanotum; abdominal tubercles short and broad, with long plumose setae; dorsal setae plumose, hooked apically; dorso-lateral chalazae present; large debris packet carried.

REMARKS. *Sencera* is very similar to *Ankylopteryx* s.str. and can be distinguished only by the absence of the intramedian cell in the fore wing; for this reason it can be considered as no more than a subgenus of *Ankylopteryx*.

BIOLOGY. Adults examined lacked insect remains in the gut contents. The presumed larva of *S. scioneura* is described above. The pupa of an undescribed species reared from Sulawesi was covered in a large amount of debris which confirms that the larva is a debris carrier.

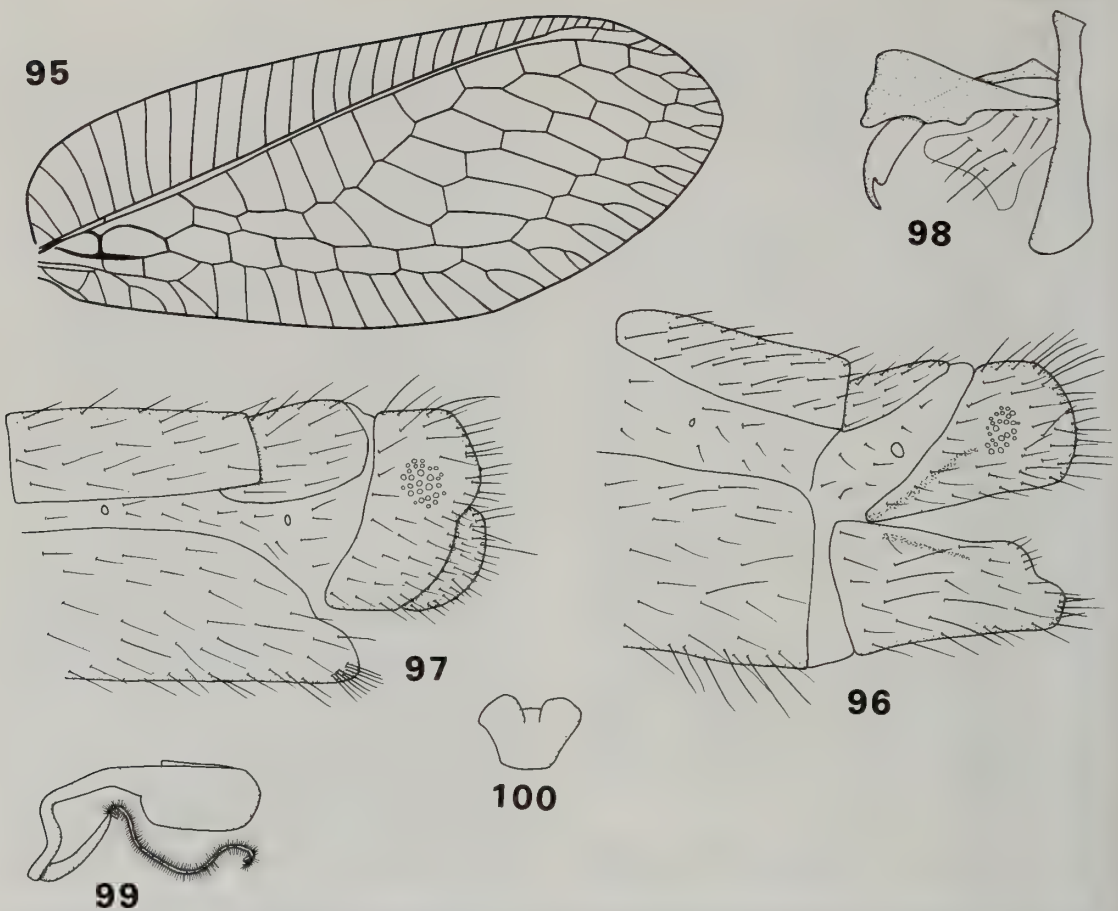
Genus ***PARANKYLOPTERYX*** Tjeder **stat. n.**

Parankylopteryx Tjeder, 1966: 508 [as subgenus of *Ankylopteryx* Brauer]. Type species: *Ankylopteryx neavei* Navás, by original designation and monotypy.

DISTRIBUTION. Afrotropics and Madagascar.

The genus includes 10 described species.

DIAGNOSIS. *Adults*. Small to medium lacewings, fore wing (Fig. 101) 9–14 mm. Head marked with black stripes on gena, clypeus, labrum, frons, scape, vertex, post-ocular region; palps elongate; labrum indented; mandibles narrow, symmetrical without basal teeth; vertex flattened; head width : eye width = 1.9–2.1 : 1, head narrow; antenna 1.5



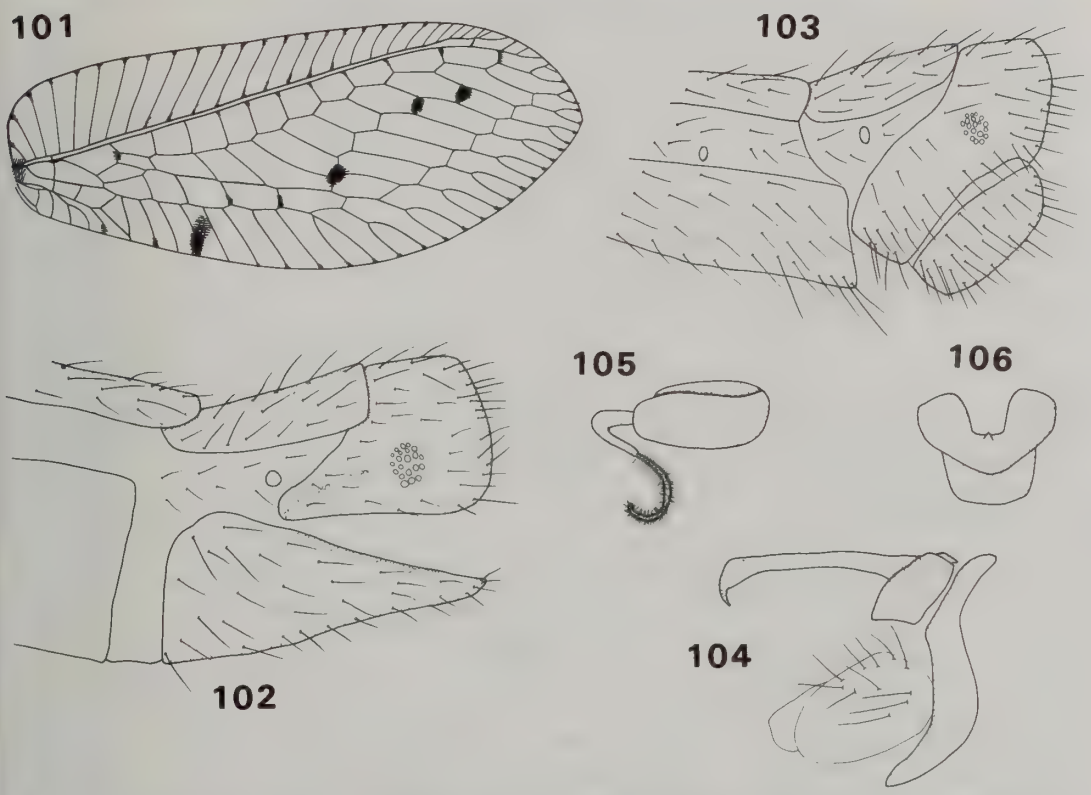
Figs 95–100 *Ankylopteryx (Sencera) scioneura*. 95, fore wing (from Kimmins); 96, apex of ♂ abdomen, lateral; 97, apex of ♀ abdomen, lateral; 98, ♂ genitalia, lateral; 99, ♀ spermatheca, lateral; 100, ♀ subgenitale, ventral.

times length of fore wing; flagellar segments about 6 times as long as broad; setae arranged in four rings. Pronotum unmarked; dorsal setae very long, pale; mesonotum marked with broad black stripe; metanotum unmarked. Legs unmarked; setae very long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.3–2.4 : 1); marked with black spots, particularly at base of inner gradate series, base of costa black; costal area broad at base; costal setae long, erect; Sc short; stigma unmarked; Sc and R close; basal Sc crossvein positioned slightly basally of m_1–m_2 crossvein (−0.04 mm); m_1 very short; *im* short, four or five-sided, occasionally ovate, costal margin angled; Rs sinuate; gradates in two parallel or divergent series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter than c_2; fork of 1A short; *dcc* open or closed at posterior margin. Hind wing narrow (length : breadth = 3.3–3.8 : 1); marked with black spots on gradates and marginal veins. Abdomen (Figs 102, 103) unmarked; setae long, sparse; callus cerci rounded; trichobothria 16–21; ectoprocts with slight apical invagination, fused dorsally, fused to tergite 9; atria large; ♂: sternite 8+9 fused; microtholi absent; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 104). Tignum, gonapsis and median plate absent; entoprocessus short, broad; parameres absent; gonarcus narrow, long; arcessus 'bone'-shaped; pseudopenis absent; gonosaccus long, paired; gonosetae long, numerous; gonocristae, spinellae absent.

GENITALIA ♀ (Figs 105, 106). Praegenitale absent; subgenitale bilobed apically with deep invagination, extended basally; spermatheca broad; ventral impression absent; vela absent; duct short, curved.

REMARKS. Species of *Parankylopteryx* can be distinguished from those of *Ankylopteryx*, which they closely resemble, by the unmarked tarsi, black base of the costa, the black spot on the basal inner gradates and the black post-ocular spot. In the male genitalia an arcessus is present and



Figs 101–106 *Parankylopteryx neavei*. 101, fore wing (from Kimmins); 102, apex of ♂ abdomen; 103, apex of ♀ abdomen, lateral; 104, ♂ genitalia, lateral; 105, ♀ spermatheca, lateral; 106, ♀ subgenitale.

pseudopenis absent, and the entoprocessus are short and not fused apically with each other. In *Ankylopteryx* a pseudopenis is present and arcessus absent, and the entoprocessus are long and fused apically. Although *Parankylopteryx* is apparently closely related to *Ankylopteryx*, these differences indicate that the genera are sufficiently distantly related to regard them as separate taxa.

BIOLOGY. Unknown. Adults examined in this study did not have insect remains in their gut contents.

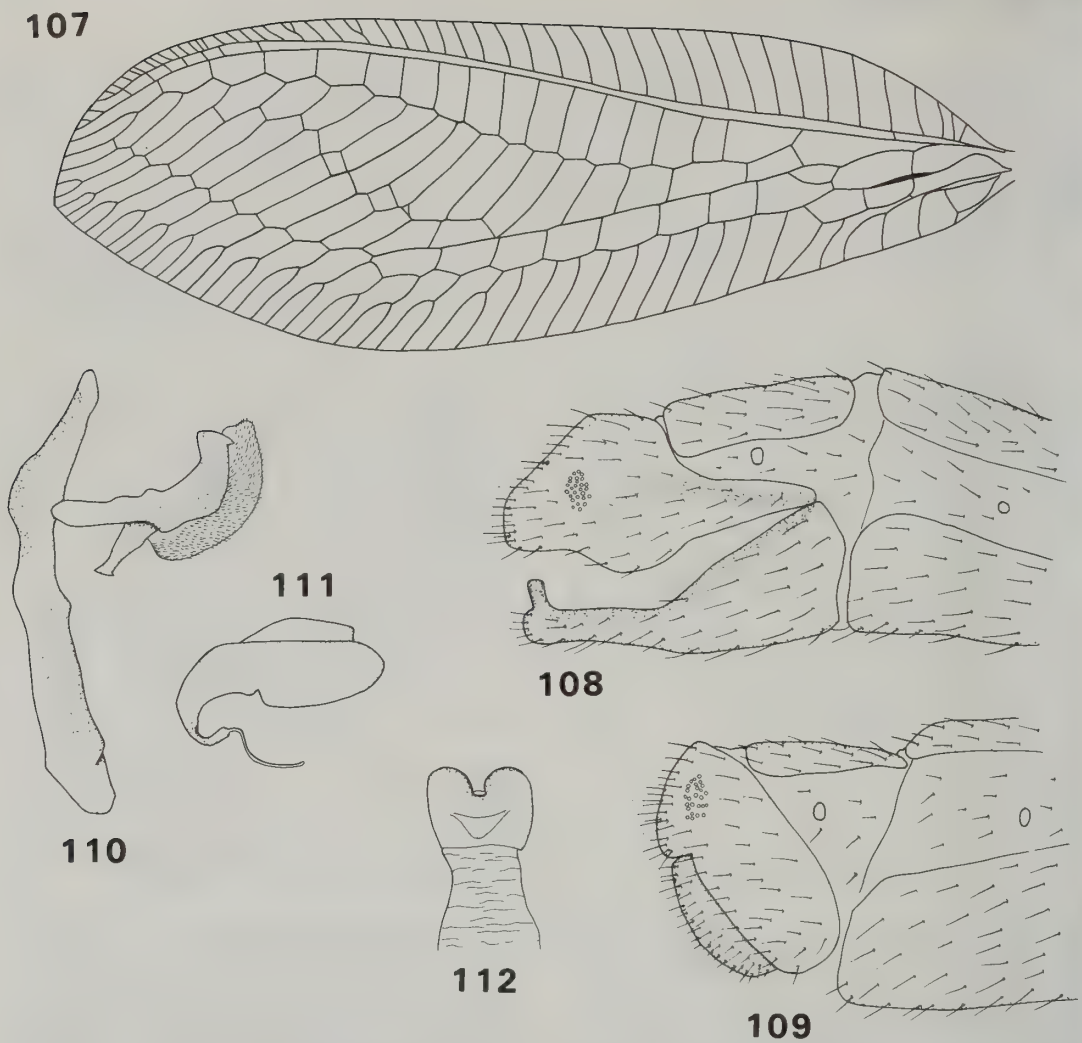
Genus ***RETIPENNA*** Brooks

Retipenna Brooks, 1986: 36. Type species: *Chrysopa notata* Navás, by original designation.

DISTRIBUTION. India, South East Asia.

Eight species of *Retipenna* have been described. *R. notata* (Navás) is the most widespread, occupying most of the generic range, the other species being apparently more localized.

DIAGNOSIS. Adult. Large lacewings, fore wing (Fig. 107) 15–21 mm; ground colour pale green. Head unmarked or with brown markings on gena, scape, vertex; palps elongate; galea long; mandibles narrow, symmetrical without basal teeth; labrum emarginate; head width : eye width = 2.0–2.1 : 1; vertex slightly raised; antenna shorter than fore wing; flagellar segments about 3 times as long as broad; setae arranged in four rings. Pronotum unmarked or with brown lateral spots; dorsal setae long, pale; meso- and metanotum unmarked or with brown spots. Legs with long, pale setae; claws with basal dilation. Fore wing usually broad (length : breadth = 2.7–3.0 : 1); unmarked or with dark suffusion on gradates, spot on *dcc*; costal area narrow at base; costal setae long, inclined; Sc and R widely separated; Sc long; stigma unmarked; basal Sc crossvein 0.2–0.4 mm; radial crossveins straight; *im* small, ovate; gradates in two divergent series; inner basal gradate meeting Psm or basally extended and not meeting Psm; Rs sinuate; c_1 shorter than c_2. Hind wing length : breadth = 3.0–3.4 : 1, narrow. Abdomen (Figs 108, 109) long, unmarked; setae long, sparse; callus cerci ovate; trichobothria 26–31; ectoprocts with deep apical invagination; ♂:



Figs 107–112 *Retipenna*. 107, *R. dasyphlebia*; 108–112, *R. notata*. 107, fore wing; 108, apex of ♂ abdomen, lateral; 109, apex of ♀ abdomen, lateral; 110, ♂ genitalia, lateral; 111, ♀ spermatheca, lateral; 112, ♀ subgenitale, ventral.

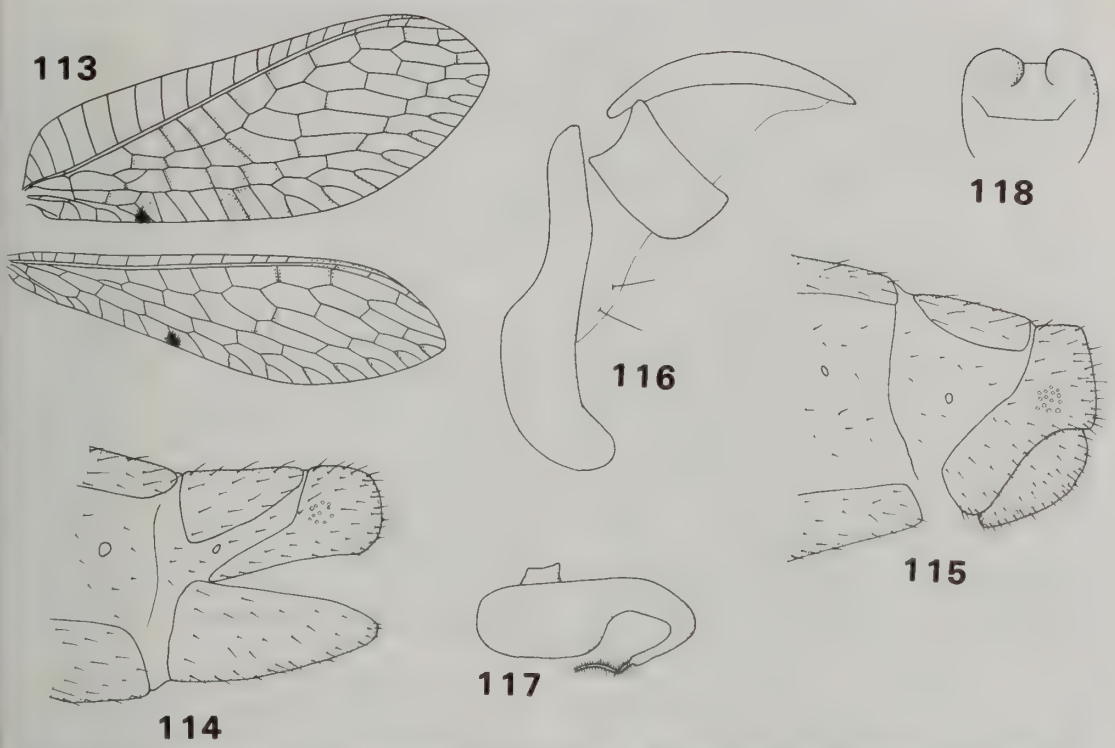
sternite 8+9 fused, narrow ventrally; microtholi absent; ventral apodeme with prominent apical tooth; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 110). Tignum and gonapsis absent; median plate broad, bilobed; gonarcus narrow, elongate; entoprocessus long, slender; arcessus tapering apically with small apical tooth; membranous sac, with many basally inclined microtrichia, situated on dorsum of arcessus; narrow, elongate membrane situated ventrally between arcessus and gonarcus; pseudopenis absent; gonosaccus short with numerous gonosetae; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 111–112). Praegenitale absent; subgenitale bilobed apically; spermatheca rounded, broad; duct short, expanded ventrally; vela small; ventral impression deep.

Remarks. *Retipenna* can be distinguished from other ankylopterygine genera by the relatively broad hind wings, the wide separation of Sc and R, and the short gonosaccus. In males, the presence of a median plate and the membranous sac above the arcessus, which are absent in other members of the tribe, also serve to distinguish the genus. Females of *Retipenna* are characterized by the broad ventral expansion of the spermatheca duct, which is narrow in the rest of the Ankylopterygini.

BIOLOGY. Unknown. The gut contents of adults



Figs 113–118 *Semachrysa*. 113, *S. picilabris*; 114–118, *S. minuta*. 114, fore wing (from Kimmins); 115, apex of ♂ abdomen, lateral; 116, apex of ♀ abdomen, lateral; 117, ♀ spermatheca, lateral; 118, ♀ subgenitale, ventral.

examined during this study did not include insect remains.

Genus ***SEMACHRYSA*** Brooks

Indochrysa Banks, 1938*a*: 225. [Unavailable name: no type species designated.]

Semachrysa Brooks, 1983: 6. Type species: *Semachrysa minuta* Brooks, by original designation.

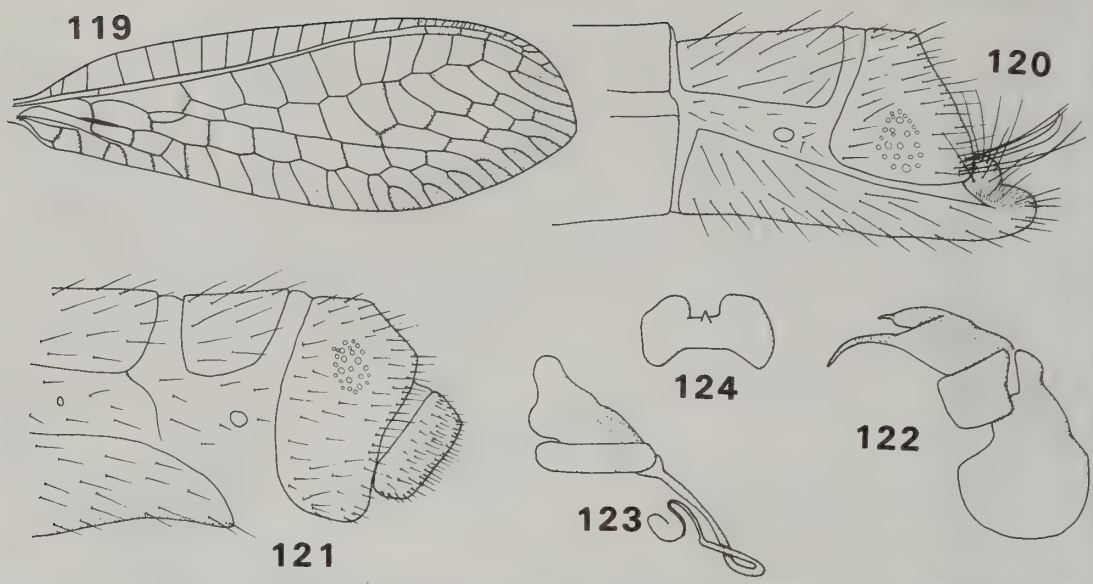
DISTRIBUTION. Japan, Indo-Australian region.

Semachrysa includes 14 described species and there are a few additional undescribed species in the BMNH collections. One undescribed species was especially common in canopy fogging samples taken in Sulawesi in 1987.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 113) 7–13 mm; ground colour pale green. Head marked with black spots on gena, clypeus, labrum, scape, post-ocular region, row of three spots across frons; palps elongate; galea broad, short; labrum straight; mandibles narrow, symmetrical without basal teeth; head width : eye width = 1.6–2.0 : 1, head narrow; vertex raised; antenna slightly longer than fore wing; flagellar segments about 5 times as long as broad; setae arranged in four rings. Pronotum unmarked; dorsal setae long, pale; mesonotum with black markings; metanotum unmarked. Legs unmarked; setae pale, long; claws with or without basal dilation. Fore wing more or less marked with black spots, base of costa black; basal costal area slightly enlarged; costal setae short, inclined; Sc and R close; basal Sc crossvein at or slightly basad of m_1–m_2 crossvein (−0.08 mm); radial crossveins straight; Sc long, unmarked; *im* ovate; Rs sinuate; gradates in two parallel or divergent series; basal inner gradate meeting Psm; c_1 shorter than c_2; c_2 rounded apically, narrow. Hind wing narrow (length : breadth = 3.0–4.0 : 1). Abdomen (Figs 114, 115) usually unmarked; setae long, sparse; callus cerci ovate; trichobothria 11–23; ectoprocts hardly invaginated apico-dorsally, fused dorsally, fused with tergite 9; ♂: sternite 8+9 fused; microtholi absent; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 116). Tignum, gonapsis and median plate absent; gonarcus long, narrow; entoprocessus short, broad; arcessus narrow, bifurcate basally, tapering apically; pseudopenis absent; gonosaccus long; gonosetae long, two (rarely one) pairs; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 117, 118). Praegenitale absent; subgenitale bilobed apically; spermatheca



Figs 119–124 *Signochrysa*. 119, *S. bakeri*; 120, 122, *S. caliptera*; 121, 123, 124, S. signata. 119, fore wing; 120, apex of ♂ abdomen, lateral; 121, apex of ♀ abdomen, lateral; 122, ♂ genitalia, lateral; 123, ♀ spermatheca, lateral; 124, ♀ subgenitale, ventral.

small, narrow; duct short, twisted; vela distinct, often long; ventral impression shallow.

REMARKS. Species of *Semachrysa* can be distinguished from other Ankylopterygini by the row of three black spots on the frons, the long stigma and weakly expanded basal costal area. Males are characterized by the two pairs of gonosetae; in other related genera the gonosetae are more numerous.

BIOLOGY. Unknown. Adults examined during this study did not have insect remains in the gut contents.

Genus ***SIGNOCHRYSA*** gen. n.

Type species: *Leucochrysa mira* Navás.

DISTRIBUTION. Sri Lanka, Oriental, Australia.

The genus includes 9 described species, evenly distributed throughout the range.

DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Fig. 119) 10–13 mm; ground colour pale green. Head short, marked with black spots on gena, labrum, between antennae, scape; palps elongate; labrum straight or indented; mandibles narrow, symmetrical without basal teeth; vertex raised; head width : eye width = 1.8–1.9 : 1, head narrow; scape elongate; antenna 1.5 times longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in four rings. Pronotum marked with yellow median stripe or brown lateral stripe; dorsal setae long, pale; mesonotum unmarked or with dark spot on mesoscutum; metanotum unmarked. Legs unmarked or with tibial stripe; setae long, pale; claws with basal dilation. Fore wing narrow (length : breadth = 2.9–3.3 : 1); extensively marked with dark shading, particularly on Rs crossveins above inner gradates; costal area narrow at base; costal setae short, inclined; stigma yellow with brown apical and basal spot; R crossveins divergent below stigma; Sc and R close together; Sc long; basal Sc crossvein 0.12–0.20 mm; *im* narrow, ovate; Rs sinuate; gradates in two parallel series; basal inner gradate not meeting Psm; veins usually not crassate in ♂, extreme apex of costa sometimes thickened; c_1 about same length as c_2; base of c_1 squared; *dcc* often closed at wing margin. Hind wing average to narrow (length : breadth = 3.0–3.5 : 1); marked with brown shading; stigma yellow with brown basal spot. Abdomen (Figs 120, 121) unmarked; setae long, sparse; callus cerci ovate; trichobothria 19–24; ectoprocts with deep dorsal invagination, fused dorsally, fused with tergite 9; atria moderate to large; ♂: setae very long at apex of ectoproct; microtholi present on sternites or absent; sternite 8+9 fused, extending beyond apex of ectoprocts, tapering apically; ectoprocts roughly triangular; dorsal apodeme absent; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 122). Tignum, gonapsis and median plate absent; entoprocessus short, fused

apically below arcessus; parameres absent; gonarcus narrow, long; arcessus tapering apically with forked processus below apex; pseudopenis absent; gonosaccus short; gonosetae few, long, in lateral clump, positioned apico-laterally of sternite 8+9; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 123, 124). Praegenitale absent; subgenitale bilobed apically with small median crumena; spermatheca narrow; ventral impression deep; vela long; duct long, sinuous.

REMARKS. Species of this genus can be distinguished from other Ankylopterygini by the elongate scape, the divergent radial crossveins below the stigma and the dark marking on the radial crossveins below the stigma. Males of the genus are characterized by the elongate sternite 8+9, the apico-ventral forked process on the arcessus, the short entoprocessus which are fused ventral of the arcessus, the triangular ectoprocts, the absence of a dorsal apodeme and the gonosetae positioned apico-laterally on sternite 8+9. This is the only genus of Ankylopterygini with microtholi.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Tribe **BELONOPTERYGINI** Navás

Belonopterygini Navás, 1913a: 163. Type genus: *Belonopteryx* Gerstaecker.

Nadivini Banks, 1943: 100. Type genus: *Nadiva* Navás. **Syn. n.**

Italochrysini Hölzel, 1970: 51. Type genus: *Italochrysa* Principi. [Synonymized by Adams & Penny, 1986: 120.]

DISTRIBUTION. World-wide

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing 14–24 mm (exceptionally 9 mm). Head broad, head width : eye width 1.8–2.8 : 1 (exceptionally 3.1 : 1); palps broad, rounded apically (Fig. 172); galea broad (Fig. 171); mandibles broad (Fig. 170); vertex flattened; toruli often large; flagellar segments broad, at most twice as long as broad; setae arranged in four rings. Pronotum broad. Fore wing with costal area narrow at base; costal setae short, inclined; Sc and R widely separated; *im* rectangular or broad, ovate; basal Sc crossvein 0.44–0.96 mm; gradates in two series; c_1 longer than c_2; c_2 broad, squared apically. Abdomen with setae short, dense; trichobothria numerous (at least 35); ectoprocts broad, not fused dorsally; ♂: microtholi usually present; sternite 8+9 fused, short.

GENITALIA ♂. Tignum, gonapsis and median plate absent; entoprocessus usually absent; arcessus short, broad with median hook; pseudopenis absent; gonarcus usually short, broad; parameres usually present; gonosetae usually absent.

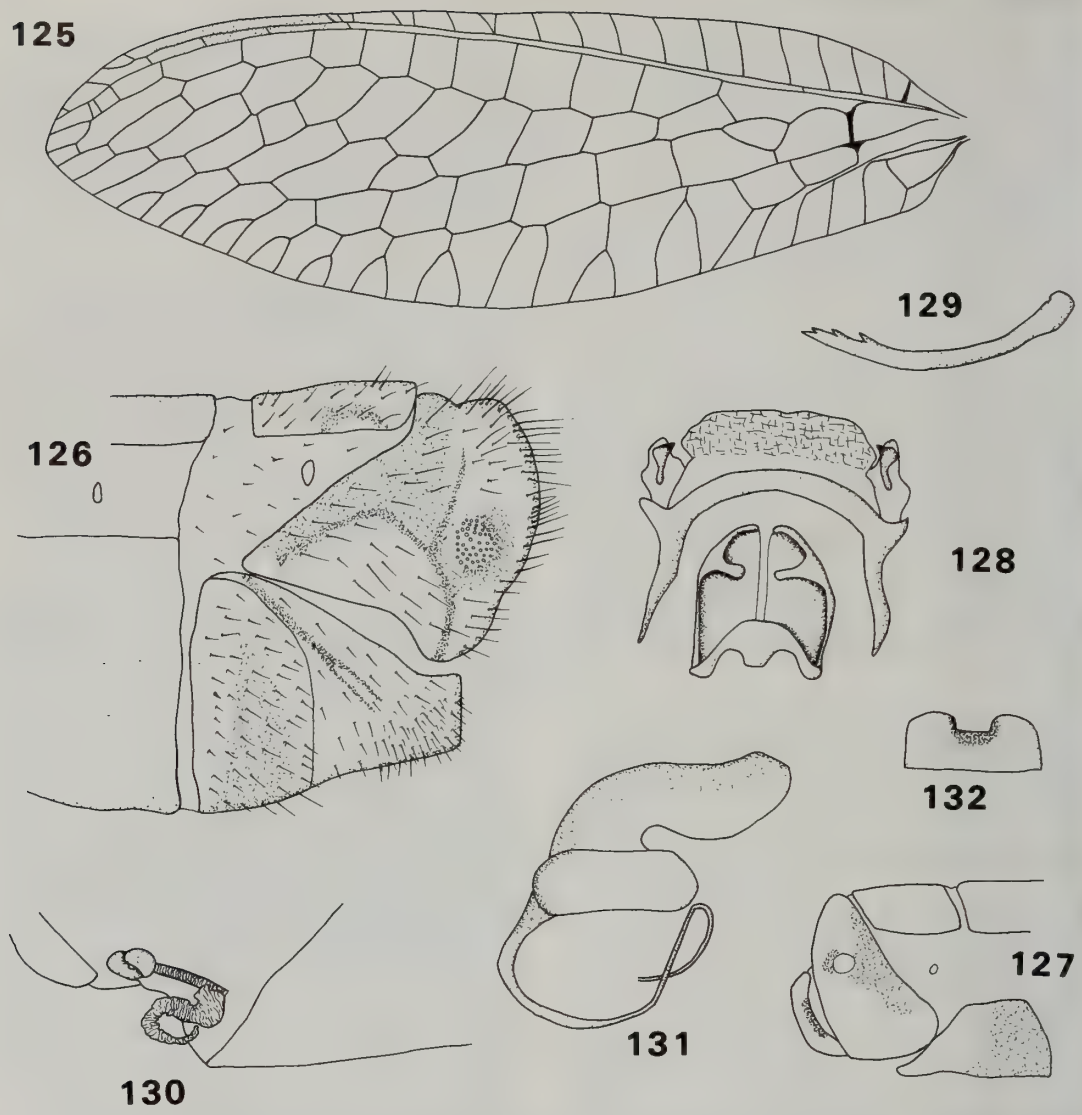
GENITALIA ♀. Ventral impression very deep; vela long; duct long; praegenitale usually present.

REMARKS. Fourteen genera can now be assigned to the Belonopterygini. The Old World genera include *Italochrysa* Principi, which is distributed throughout the Old World, *Oyochrysa* Brooks, *Dysochrysa* Tjeder, *Turnerochrysa* Kimmins, *Chrysaloysia* Navás and *Nesochrysa* Navás from the Afrotropics and Madagascar. The eastern Palaearctic and Oriental genera are *Evanochrysa* gen. n., *Stigmachrysa* Navás and *Nodochrysa* Banks, with *Calochrysa* Banks from Australia. In addition, *Chrysacanthia* Navás occurs in the Oriental region and the Afrotropics. The three New World belonopterygine genera are *Abachrysa* Banks, which is restricted to the south-east U.S.A., *Belonopteryx* Gerstaecker and *Nacarina* Navás, which both have a Neotropical distribution.

The Belonopterygini are apparently the most primitive of the Chrysopinae tribes and retain many plesiomorphic characters not found in the more derived groups of the subfamily. The basal subcostal crossvein is positioned more distad than in the other chrysopine tribes, the intramedian cell is long (usually quadrangular) and broad, the pronotum and the apical segment of the palps are broad and the vertex is hardly raised. However, there are several synapomorphies which indicate that the tribe is monophyletic. The flagellar segments are broad, c_1 is longer than c_2, c_2 is broad, tergite 9 is broad and not fused dorsally, parameres are usually present in the male genitalia and females usually have a praegenitale with an associated medio-apical invagination of sternite 7.

The Belonopterygini and Leucochrysini share certain apomorphic characters in the male genitalia which do not occur in the rest of the Chrysopidae, suggesting a relationship between these two tribes. In both tribes the gonarcus is broad and hardly arcuate with gonocornua, and the arcessus is short and broad with a strong hook and lateral membranous lobes at the apex. In females of some *Leucochrysa* species (Figs 506–510) the base of the subgenitale is greatly extended and folds back on itself, forming a structure which may be homologous with a praegenitale.

Both *Belonopteryx* and *Abachrysa* primitively retain entoprocessus and a suture between sternites 8 and 9. In the rest of the tribe the



Figs 125–132 *Abachrysa eureka*. 125, fore wing; 126, apex of ♂ abdomen, lateral; 127, apex of ♀ abdomen, lateral; 128, ♂ gonarcus complex, dorsal; 129, ♂ parameres, lateral; 130, ♀ subgenitale and praegenitale at apex of sternite 7, latero–ventral; 131, ♀ spermatheca, lateral; 132, ♀ subgenitale, caudal.

entoprocessus have fused with the gonarcus to form the gonocornua and sternites 8+9 are fused. In the more advanced genera (*Italochrysa, Oyochrysa, Calochrysa* and *Turnerochrysa*) the gonocornua have been lost. Parameres have apparently arisen only once in the Chrysopidae and occur in most of the belonopterygine genera. However, they do not occur in *Nacarina, Belonopteryx* or *Evanochrysa* which suggests that these are amongst the more primitive genera in the tribe. Gonosetae, which have been lost in most of the Belonopterygini, also primitively occur in these three genera and in a modified form in *Chrysacanthia*.

Stigmachrysa, *Nesochrysa* and *Nodochrysa* are probably closely related since males of all three genera have lobes at the apex of the ectoprocts and sternite 8+9. These lobes do not occur in the rest of the tribe and rarely occur in the rest of the Chrysopidae so are probably apomorphic for this group. The praegenitale, a lobate structure situated near the apex of sternite 7 in females, occurs only in belonopterygine genera and is apomorphic for a group of genera within the tribe. (A similar structure occurs in some *Meleoma* species but is probably not homologous.) It is absent in *Abachrysa*, some species of *Nacarina* and *Belonopteryx*, which is probably the plesiomorphic

condition, and also in *Italochrysa* and *Oyochrysa* where its loss is probably secondary. The three New World genera *Abachrysa, Belonopteryx* and *Nacarina* all share an apomorphic reduction in the number of flagellar setae from four to three or two rings.

BIOLOGY. The larvae in this tribe may all be ant associates (Principi, 1946; Weber, 1942): see *Calochrysa, Nacarina* and *Italochrysa* below.

Genus ***ABACHRYSA*** Banks

Abachrysa Banks, 1938*b*: 75. Type-species: *Chrysopa eureka* Banks, by original designation and monotypy.

DISTRIBUTION. South-eastern U.S.A.

There is only one species in this genus, *A. eureka* (Banks), which was described from Arkansas, although Banks (1938*b*) also listed specimens from Mississippi and there are specimens in the collections of the BMNH from Florida.

DIAGNOSIS. *Adult.* Large lacewings, fore wing (Fig. 125) 16–17 mm; ground colour pale brown with orange head. Head unmarked; palps entirely black, rounded apically, bulbous; labrum deeply invaginated; vertex slightly raised; toruli small; head broad (head width : eye width = 2.7 : 1); flagellar segments slightly longer than wide; setae arranged in four rings, apical ring sparse; antenna shorter than fore wing. Pronotum very broad (more than twice as broad as long), marked with two transverse rows of black spots; setae short, coarse, black; meso- and metanotum marked with large black spots. Legs marked with black annulation on femur and tibia, apical tarsomere black; setae short, black; claws without basal dilation. Fore wing unmarked; narrow (length : breadth = 3.1 : 1); costal area narrow at base; costal setae short, inclined; Sc long; radial crossveins straight: Sc and R widely separated; basal Sc crossvein 0.84 mm; m_2 short; *im* broad, ovate; Rs slightly sinuate; gradates arranged in two or three parallel series, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 slightly shorter than c_2. Abdomen (Figs 126, 127) marked extensively with black spots; callus cerci rounded, 45–50 trichobothria; ectoprocts with deep dorsal invagination, separated by dorsal suture, fused with tergite 9; ♂: setae short, sparse; microtholi present on sternites; sternites 8 and 9 separated by suture; ♀: setae short, dense; sternite 7 slightly indented apically.

GENITALIA ♂ (Figs 128, 129). Tignum and gonapsis absent; median plate very broad, sculptured; entoprocessus very short, hooked; parameres narrow, toothed apically; gonarcus broad, short, transverse; arcessus very broad with weak apical tooth; pseudopenis absent; gonosaccus long; gonosetae absent; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 130–132). Praegenitale present; subgenitale bilobed apically with long, membranous, ventrally projecting tube at base; spermatheca narrow; ventral impression deep; vela very long; duct very long, sinuous.

REMARKS. Males of *Abachrysa* can be distinguished from other belonopterygine genera by the suture between sternites 8 and 9 (these sternites are fused in all other genera in the tribe except *Belonopteryx*), the presence of a large median plate (which is lacking in all other Belonopterygini) and the presence of both entoprocessus and parameres (most of the other genera of the tribe have either parameres or entoprocessus but not both). Females of the genus are characterized by the long membranous tube at the base of the subgenitale, which may be a form of praegenitale. A similar structure is present in *Nacarina titan* (Banks). The apomorphic reduction in the number of flagellar setae in the apical ring also occurs in *Belonopteryx* and *Nacarina*, and further suggests a close relationship between these genera. Banks (1938*b*) stated that another characteristic of the genus is that the posterior marginal crossveins arise in pairs from the pseudocubital cells, but this character is now known to be variable.

BIOLOGY. None of the specimens dissected had insect remains in the gut contents. The larvae have not been described.

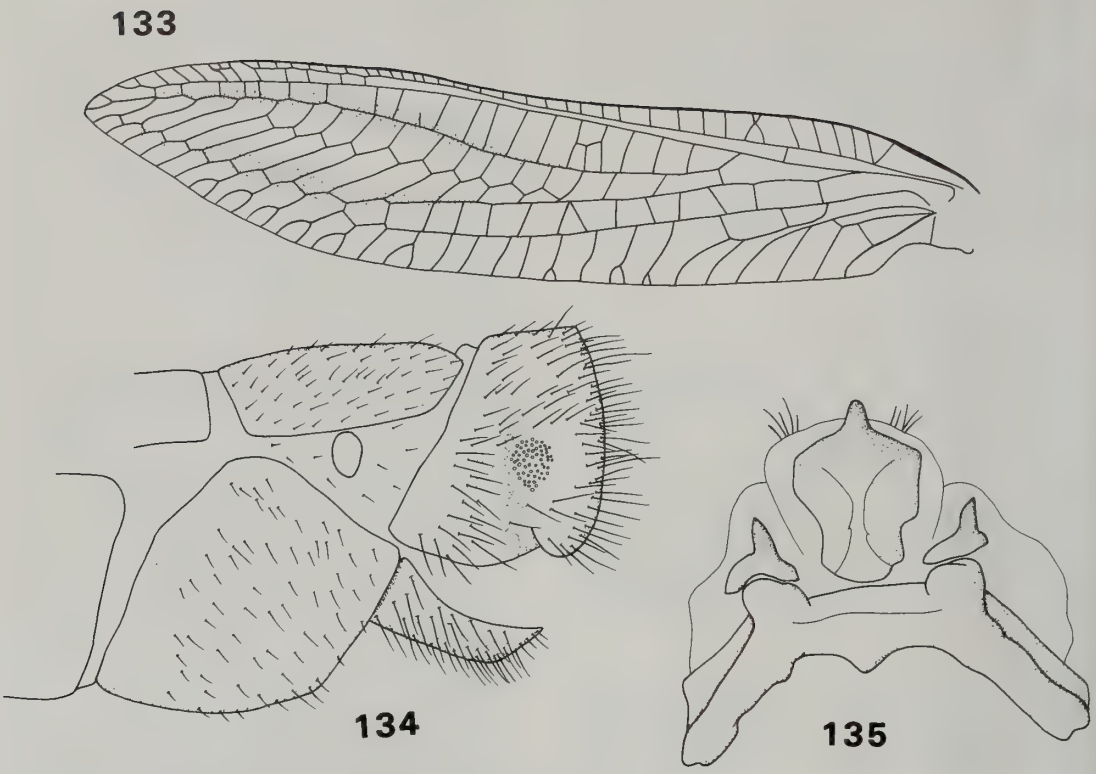
Genus ***BELONOPTERYX*** Gerstaecker

Belonopteryx Gerstaecker, 1863: 169. Type species: *Belonopteryx arteriosa* Gerstaecker, by monotypy.

DISTRIBUTION. Southern Brazil, Argentina.

The genus is monotypic and apparently rare since we have been able to trace only three specimens in existing collections.

DIAGNOSIS. *Adult.* Large lacewings, fore wing (Fig. 133) 20–22 mm. Head marked with black spots between antennae, at front of vertex, between vertex and eye, black lateral stripe on scape, pedicel black; palps rounded apically, very short and broad, marked black; labrum deeply indented; mandibles broad, blunt apically, left mandible without basal tooth (right mandible not examined); vertex almost flat; toruli small; head

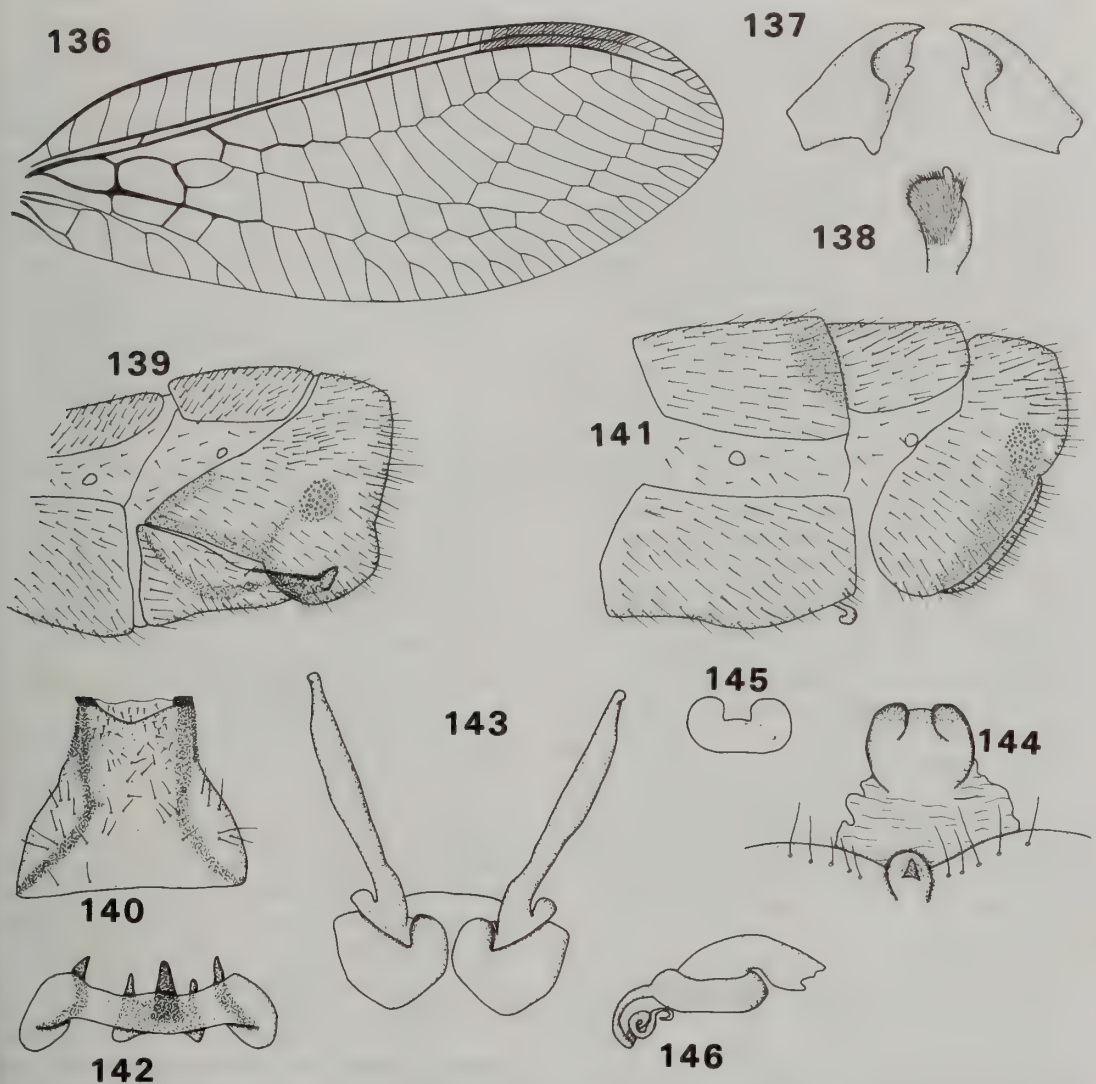


Figs 133–135 *Belonopteryx arteriosa*. 133, fore wing; 134, apex of ♂ abdomen, lateral; 135, ♂ genitalia, dorsal.

width : eye width = 4.7 : 1; head broad, eyes narrow; scape slightly elongate; antennae broken, marked entirely black; flagellar segments twice as broad as long; setae short, coarse, black, arranged in 2–3 irregular rings. Pronotum very broad; marked with black lateral sinuous stripe; dorsal setae very short, pale; meso- and metanotum marked with narrow black lateral stripe and black basal spot. Legs marked with a few black spots on tibia and femur; setae short, pale; claws large, without basal dilation; tarsi long. Fore wing very narrow (length : breadth = 5 : 1), pointed apically; marked with dark brown longitudinal stripe on Rs and Psm/outer gradates; C, Sc, base of R, base of Psc, posterior wing margin marked black, all other veins yellow; C concave, almost fusing with Sc proximal to pterostigma; costal area narrow at base; costal setae very short, inclined apically; stigma marked yellow; Sc short; Sc and R widely separated; basal Sc crossvein 0.8–0.92 mm; tympanal organ very small; m_2 short; M unforked, *im* absent; Rs sinuate; gradates in two parallel series, inner gradates extended basally, basal inner gradates sometimes meeting Psm, outer gradates extended apically; crossveins not crassate in ♂; c_1 shorter than c_2; c_2 narrow, squared apically; *dcc* open at margin; some posterior marginal crossveins forked; venation generally unstable with many crossveins forked and irregularly placed. Hind wing narrow (length : breadth = 4.5 : 1), pointed apically; marked as in fore wing. Abdomen (Fig. 134) marked with broad black ventral median stripe and laterally; setae short, dense; ; callus cerci rounded; trichobothria 45; ectoprocts deeply invaginated apico-dorsally, fused dorsally, with short apical suture between ectoproct and tergite 9; ectoproct projecting slightly apico-ventrally; sternites large; ♂: sternites 8 and 9 not fused, short; sternites (except S9) with dense microtholi; apodemes short; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 135). Tignum, gonapsis and median plate absent; entoprocessus short, toothed apically; arcessus broad with strong median hook; parameres absent; gonarcus short, broad, transverse; pseudopenis absent; gonosaccus short; gonosetae short, few, in lateral clump; spinellae and gonocristae absent; hypandrium large; atria large.

GENITALIA ♀. [From information supplied by Prof. P. A. Adams.] Praegenitale absent; subgenitale bilobed apically with median projection; spermatheca large; duct short curved; ventral impression shallow; vela short.



Figs 136–146 *Calochrysa extranea*. 136, fore wing (from Kimmins); 137, mandibles, dorsal; 138, galea, dorsal; 139, apex of ♂ abdomen, lateral; 140, sternite 8+9, ventral; 141, apex of ♀ abdomen, lateral; 142, ♂ gonarcus complex, dorsal; 143, ♂ parameres, dorsal; 144, ♀ subgenitale and praegenitale, ventral; 145, ♀ subgenitale, caudal; 146, ♀ spermatheca, lateral.

REMARKS. *Belonopteryx* can easily be distinguished from other Chrysopidae by the lanceolate wings, marked with two black longitudinal stripes, the concave costal margin and absence of an intramedian cell. It differs from most Belonopterygini in primitively lacking parameres but retaining entoprocessus and in having extraordinarily dense microtholi. The genus is probably most closely related to *Nacarina*, species of which also lack parameres, but which, like *Belonopteryx*, have only three rows of setae on the flagellar segments, an unstable venation with many forked and irregularly placed crossveins, and a short second medial cell. *Belonopteryx* is apparently unique among the Chrysopidae in having a broad but untoothed left mandible. Due to the rarity of specimens of *B. arteriosa* we have not made any head preparations so have been unable to examine the right mandible but it is unlikely that this possesses a tooth either.

BIOLOGY. Unknown.

Genus *CALOCHRYSA* Banks

Calochrysa Banks, 1943: 100. Type-species: *Chrysopa extranea* Esben-Petersen, by original designation and monotypy

DISTRIBUTION. Australia.

C. extranea Esben-Petersen is the only species included in *Calochrysa* and it occurs in most regions of Australia.

DIAGNOSIS. *Adult.* Large lacewings, fore wing (Fig. 136) 14–23 mm; ground colour pale yellowish green. Head marked with dark stripe between antennae; palps rounded apically; labrum indented; mandibles broad (Fig. 137), symmetrical with basal tooth on both mandibles; galea broad (Fig. 138); vertex slightly raised; head width : eye width = 2.0–2.3 : 1; antenna slightly longer than fore wing; flagellar segments almost as long as wide, with setae arranged in four rings. Pronotum broad, marked with narrow black lateral stripes; setae short, dark; mesonotum marked with black stripes; metanotum unmarked. Legs unmarked; setae short, dark; claws without basal dilation. Forewing unmarked; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc moderately long; Sc and R widely separated; basal Sc crossvein 0.52–0.72 mm; m_2 short; *im* broad, ovate; Rs sinuate; gradates in two parallel series, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 1.5 times longer than c_2; c_2 slightly broadened apically; Cu_2 forked. Abdomen (Figs 139–141) unmarked; setae short, dense; ectoprocts with slight dorso-apical invagination; ectoprocts fused with tergite 9; ♂: callus cerci ovate, trichobothria 39; sternite 8+9 fused, short, indented apically; microtholi absent; ♀: callus cerci rounded, trichobothria 48; sternite 7 indented apically.

GENITALIA ♂ (Figs 142, 143). Tignum, gonapsis, median plate and entoprocessus absent; parameres paired, narrow, tapering apically; gonarcus short, broad, transverse; arcessus broad with apical hook; pseudopenis absent; gonosaccus, gonosetae, spinellae and gonocristae absent.

GENITALIA ♀ (Figs 144–146). Praegenitale present; subgenitale broad, bilobed apically; spermatheca narrow; ventral impression deep; vela long; duct long, tightly coiled.

Larva (first instar only). Mandibles short, curved; abdomen fusiform, not humped; thoracic tubercles cylindrical; abdominal tubercles undeveloped; setae rounded apically, not hooked; oviruptor with anterior process considerably enlarged.

REMARKS. *Calochrysa* is the only genus in the Chrysopidae in which vein Cu2 is forked and this is sufficient reason to continue to regard the genus as distinct. Banks (1943) included *Calochrysa* in the Nadivini (= Belonopterygini) and it is clearly related to *Italochrysa* Principi. New (1986*a*) suggested that the oviruptor, with its enlarged anterior process, was characteristic of the Italochrysini (= Belonopterygini). Other apomorphies include symmetrical toothed mandibles and a bulbous lobe at the apex of the male ectoprocts.

BIOLOGY. The first instar larva was described and figured by New (1986*a*). The larva shares many characters with the larvae of *Italochrysa* Principi and for this reason it is possible that those of *Calochrysa* are similarly specialized to have a close association with ants (Principi, 1946); indeed this may be a characteristic of the tribe. This may be the reason why New could not keep the larvae alive beyond the first instar.

Genus ***CHRYSACANTHIA*** Lacroix

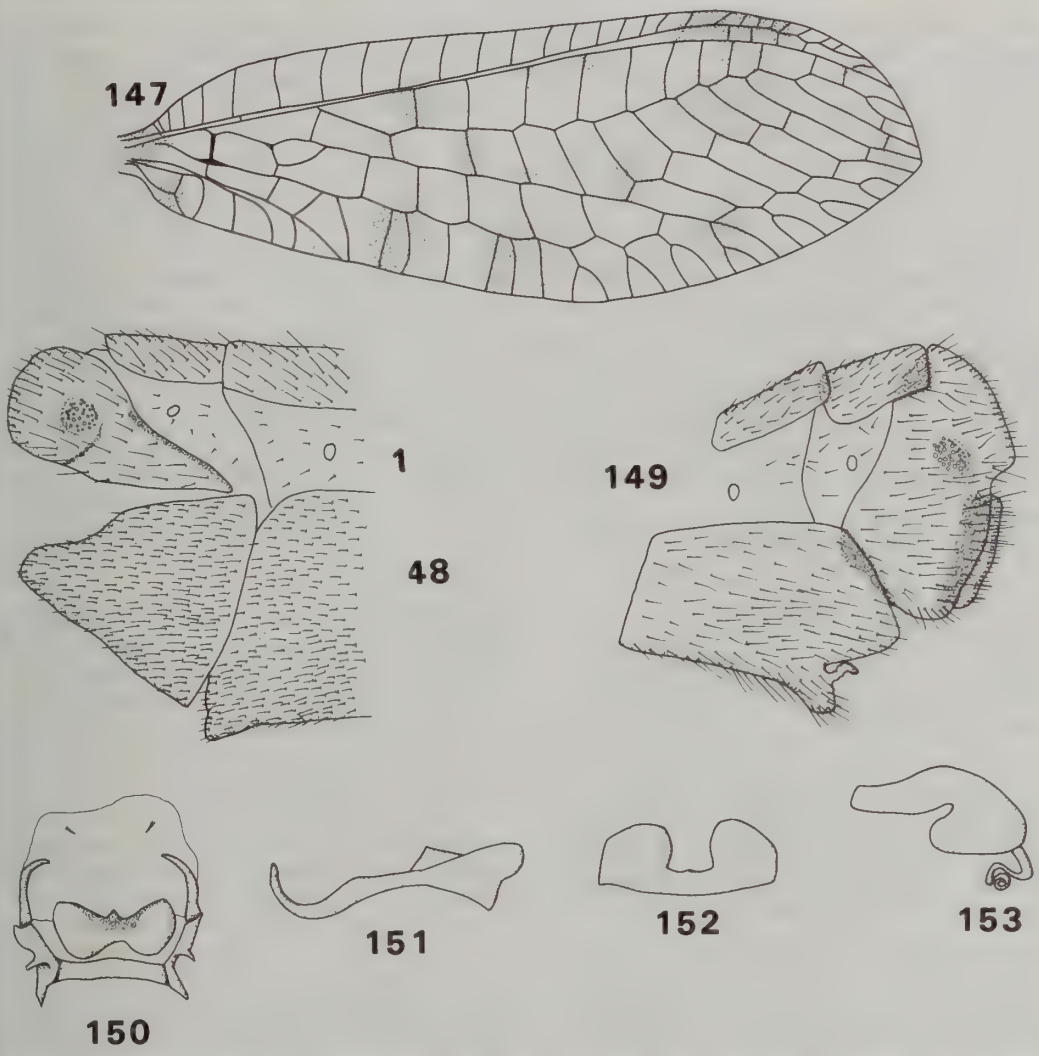
Chrysacanthia Lacroix, 1923: 120. Type species: Chrysacanthia esbeniana Lacroix, by monotypy.

Nesochrysa Fraser, 1951: 29. Type species: *Nesochrysa varicella* Fraser, by monotypy. [Homonym of *Nesochrysa* Navás, 1910*a*: 53; synonymized with *Glenochrysa* Esben-Petersen by Fraser, 1955: 134.] **Syn. n.**

DISTRIBUTION. Madagascar, west and central Africa, southern India.

The genus includes two described species and there are a further two undescribed species in the BMNH collections.

DIAGNOSIS. *Adult.* Medium to large lacewings, fore wing (Fig. 147) 14–18 mm; ground colour brown. Head, scape almost entirely marked dark brown, with lateral pale brown stripe on vertex; palps rounded apically; labrum emarginate; vertex raised; head width : eye width = 2.0–2.3 : 1; scape slightly elongate; antenna pale or dark brown, longer than fore wing; flagellar segments twice as long as broad; setae arranged in four rings. Pronotum broad; marked with narrow, submedian pale brown longitudinal stripe; dorsal setae long, dark; meso- and metanotum almost entirely dark brown, with pale brown suture lines. Legs marked with dark brown spots and stripes on tibiae and femora; setae long or short, pale or dark; claws with basal dilation. Fore wing marked extensively with large pale brown spots; costal area narrow at base; costal setae quite long, inclined; stigma marked dark brown; Sc and R widely separated; basal Sc crossvein 0.56–0.64 mm; *im* short, broad, ovate; m_2 short; Rs slightly sinuate; gradates in two divergent series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 1.5–2.0 times longer than c_2; c_2 broad, squared apically. Hind wing marked with large pale brown spots on stigma, 2nd posterior marginal crossvein and minute spot at wing apex. Abdomen (Figs 148, 149) marked dark brown on



Figs 147–153 *Chrysacanthia*. 147, *C. esbeniana*; 148, 150, *C.* sp. indet.; 149, 152, 153, *C. varicella*. 147, fore wing; 148, apex of ♂ abdomen, lateral; 149, apex of ♀ abdomen, lateral; 150, ♂ gonarcus complex, dorsal; 151, ♂ parameres, lateral; 152, ♀ subgenitale, caudal; 153, ♀ spermatheca, lateral.

ectoprocts, tergites 4–8 and sternites 7–9; setae short, dense; membranal microsetae on segments 6–8 very coarse and dense but absent from tergite 8; callus cerci rounded, prominent; trichobothria 30–36; ectoprocts with deep apical invagination, not fused dorsally, fused with tergite 9; ♂: microtholi absent or present on sternites; sternite 8+9 fused, short, broad; sternite 7 with large median apical swelling; ♀: apex of sternite 7 straight or with very deep, narrow median indentation.

GENITALIA ♂ (Figs 150, 151). Tignum, gonapsis, median plate and entoprocessus absent; parameres long, narrow, upturned apically or protruding beyond apex of abdomen; gonarcus short and broad with long, tapering gonocornua; arcessus short, broad with median apical hook; gonosaccus short with few, short, widely dispersed gonosetae or one short, very broad, lateral gonoseta; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 152, 153). Praegenitale present at base of large subapical swelling on sternite 7; papilla absent; subgenitale broad, bilobed apically with small median projection; spermatheca short, broad; ventral impression deep; vela long, curved; duct long, sinuous.

REMARKS. Species of *Chrysacanthia* may be readily recognized by the extensive pale brown spots on the fore and hind wing, reminiscent of *Glenochrysa*

Esben-Petersen. However, *Gleno-chrysa* may be distinguished by the relatively short subcosta, which ends before the wing apex, and long second cubital cell, which is about the same length as the first cubital cell. In *Chrysacanthia* Sc is long and c_2 less than half the length of c_1. Males and females of *Chrysacanthia* are notable for the large subapical swelling on sternite 7. This feature also appears in *Chrysopodes* in which Adams & Penny (1986) suggested it might have a sound-producing function.

The arcessus and gonarcus in males of *Chrysacanthia* have a similar morphology to those of *Dysochrysa* Tjeder which suggests that the two genera may be closely related. In both genera the gonarcus has long, tapering gonocornua and the arcessus is small and membranous. These characters are unusual within the Belonopterygini.

BIOLOGY. Unknown. The gut contents of specimens examined did not contain insect remains.

Genus ***CHRYSALOYSIA*** Navás

Chrysaloysia Navás, 1928: 87. Type species: *Chrysaloysia somalica* Navás, by original designation and monotypy.

DISTRIBUTION. Somalia (East Africa).

We know of only two specimens of this genus. The holotype was deposited in Genova Museum but has subsequently been lost (Poggi, *in litt.*). We have been able to examine a second specimen collected in 1988 by P. Ohm.

DIAGNOSIS. *Adult*. Female unknown. Large lacewing, fore wing (Fig. 573) 21 mm. Head marked with narrow, black, median longitudinal stripe on frons and vertex, epistomal suture outlined with black stripe, scape red with red stripe between antenna and on edge of vertex, back of head red; palps narrow, rounded apically, tapering slightly in lateral view; labrum deeply indented; vertex flat; toruli large; head width : eye width = 2.1 : 1; scape as long as broad; antennae broken; flagellar segments about as long as broad; flagellar setae short, black, arranged in four rows. Pronotum broad, marked with narrow, black median longitudinal stripe and broad black lateral stripe; dorsal setae short, black; meso- and metanotum with various black markings. Legs unmarked; setae short, black; claws without basal dilation. Fore wing broad (length : breadth = 2.3 : 1); unmarked but basal crossveins and gradates black; costal area narrow at base; costal setae short, inclined apically; stigma with small black basal spot in subcostal area; Sc and R widely separated; Sc long; basal Sc crossvein 0.8 mm; *im* broad, ovate; Rs sinuous; gradates in two slightly diverging series; inner basal gradate meeting Psm; inner gradate series not extended basally; veins not crassate in ♂; c_1 twice as long as c_2; c_2 narrow. Abdomen of only known specimen destroyed except for ectoprocts and sternite 9; setae short, dense; callus cerci small, rounded; trichobothria 52; ectoprocts with slight dorso-apical invagination; apodemes extensive, branched, heavily sclerotized; apex of sternite 9 with heavily sclerotized, transverse, W-shaped rod bearing 25 stout spicules; spicules grouped in pairs centrally and at each end of rod but singly medially.

GENITALIA ♂ (Figs 576–578). Tignum, gonapsis, median plate and entoprocessus absent; arcessus small, narrow, strongly hooked apically; pseudopenis absent; parameres absent in specimen examined but probably destroyed; gonarcus narrow, transverse with very long, narrow gonocornua; gonosaccus very short, gonosetae absent.

Larva. Unknown.

REMARKS. *Chrysaloysia* can be distinguished from other belonopterygine genera by the short W-shaped spiculate rod at the apex of sternite 9 in males which is not present in any other genus in the tribe. Although the specimen did not have parameres we consider that it is probable that they were destroyed by pests together with most of the rest of the abdomen. Other significant characters, but which are shared by certain other related genera, are the presence of short setae on the dorsum of the pronotum, the undilated base of the claws, the relatively broad fore wings, the presence of a small stigmatic spot, the ovate intramedian cell and the long gonocornua in the male genitalia. If the presence of gonocornua is apomorphic then this suggests a close relationship with *Nesochrysa* even though the ectoprocts are not lobed like those of *Nesochrysa*. *Dysochrysa* and *Chrysacanthia* also have long narrow gonocornua, but lack the apical abdominal lobes present in the *Nesochrysa*-like group of genera.

BIOLOGY. Unknown.

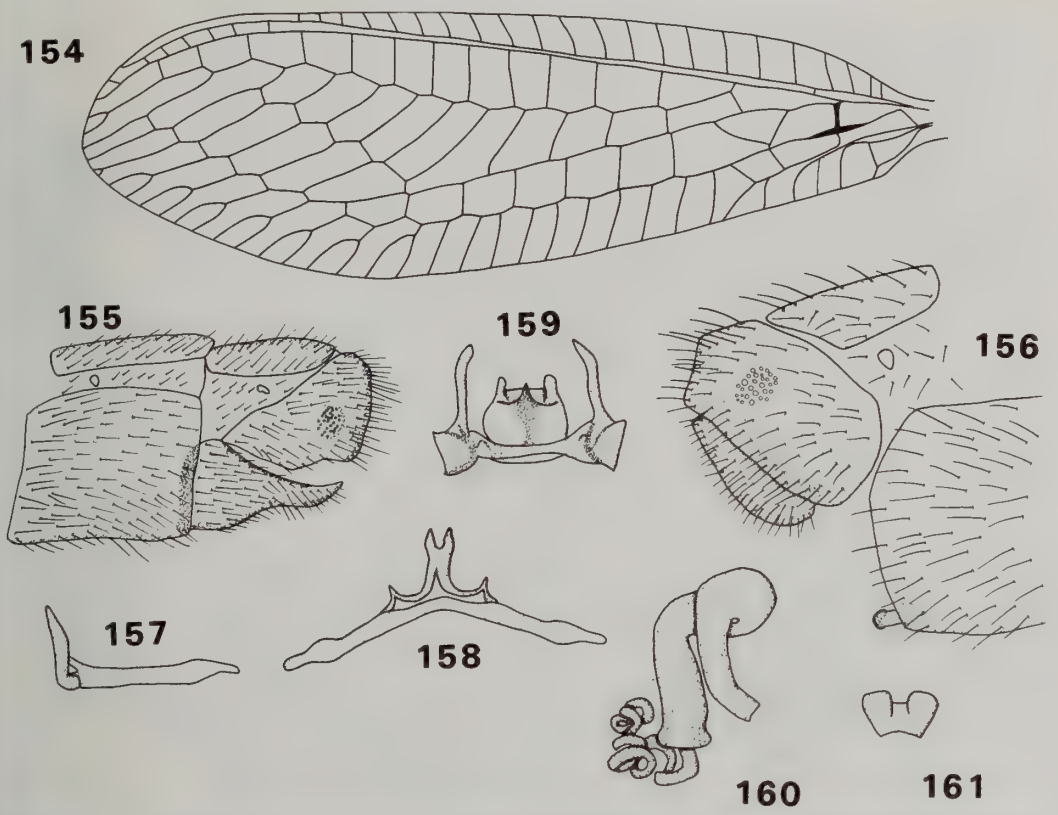
Genus ***DYSOCHRYSA*** Tjeder

Dysochrysa Tjeder, 1966: 335. Type species: *Dysochrysa furcata* Tjeder, by original designation.

DISTRIBUTION. Afrotropics.

The two (? one) species included in *Dysochrysa* are distributed in southern and central Africa.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 154) 15–17 mm; ground colour pale brown. Head marked with red-brown stripes on frons and

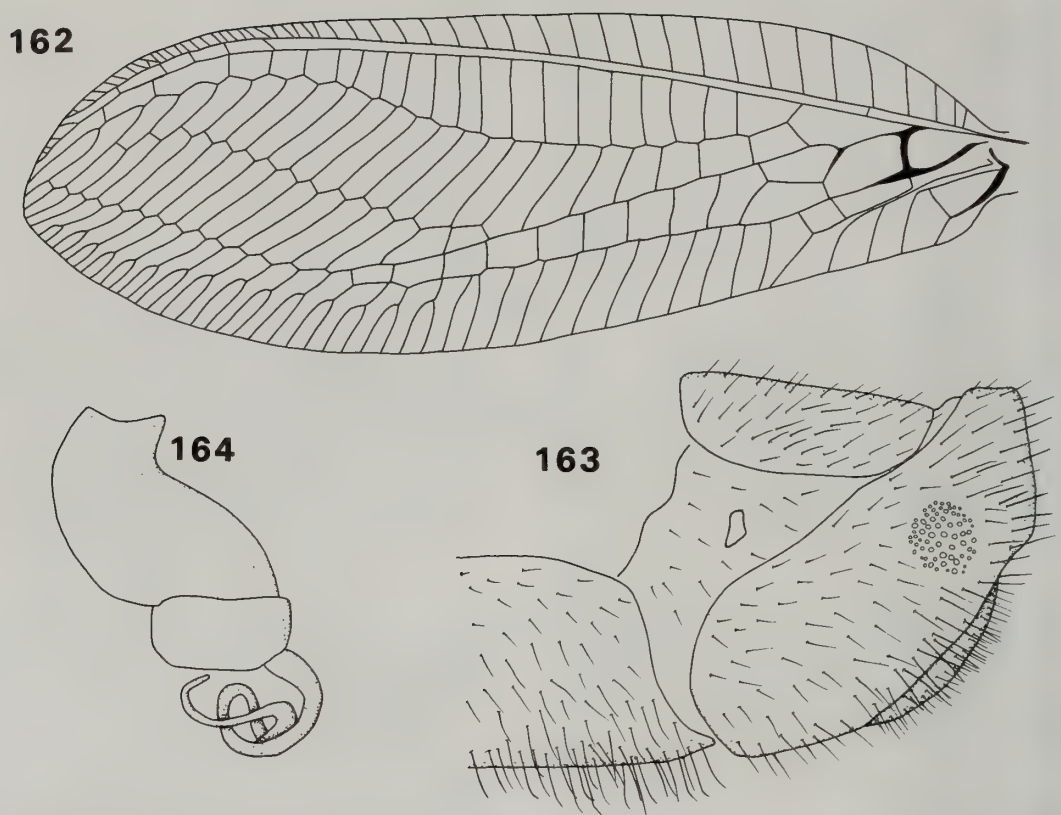


Figs 154–161 *Dysochrysa*. 154, 155, 157–159, *D. furcata*; 156, 160, 161, *D. reflexa*. 154, fore wing; 155, apex of ♂ abdomen, lateral; 156, apex of ♀ abdomen with praegenitale, lateral; 157, ♂ parameres, lateral; 158, ♂ parameres, caudal; 159, ♂ gonarcus complex, dorsal; 160, ♀ spermatheca, lateral; 161, ♀ subgenitale, ventral.

vertex; palps narrow, rounded, flattened apically in lateral view; galea broad; mandibles broad, asymmetrical with broad basal tooth on left mandible; labrum with broad, deep invagination; vertex very slightly raised; head width : eye width = 2.0–2.2 : 1; antenna slightly longer than fore wing; flagellar segments about twice as long as broad; setae in four rings. Pronotum broad with broad, whitish longitudinal median stripe; dorsal setae short, pale; meso- and metanotum marked with pale longitudinal stripe. Legs unmarked; setae long, pale; claws without basal dilation. Fore wing narrow, unmarked; crossveins black; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc moderately long; Sc and R widely separated; basal Sc crossvein 0.36–0.44 mm; *im* very broad, triangular; m_2 short; Rs sinuate; gradates in two divergent series, sometimes with additional irregular median series, inner gradate sometimes meeting Psm; veins not crassate in ♂; c_1 at least 1.5 times longer than c_2; c_2 slightly broadened. Abdomen (Figs 155, 156) with extensive dark markings; setae long (shorter in ♂ than ♀), sparse; callus cerci ovate; trichobothria 31–35; ectoprocts with deep dorso-apical invagination, not fused dorsally, fused with tergite 9; ♂: microtholi present on sternites 3–8; sternite 8+9 fused (with ventral indentation) short, broad, rounded apically; apodemes indistinct; ♀: sternite 7 deeply invaginated apically.

GENITALIA ♂ (Figs 157–159). Tignum, gonapsis and median plate absent; gonarcus short, broad, transverse; gonocornua long, tapering apically; pseudopenis absent; arcessus broad with median apical hook and blunt lateral lobes; parameres narrow, arcuate with short apico-lateral tooth and forked median process projecting dorsally; hypandrium large; gonosaccus, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 160, 161). Praegenitale present; subgenitale bilobed apically, broad; spermatheca narrow, very elongate; ventral impression very deep; vela extremely long; duct very long, highly coiled.



Figs 162–164 *Evanochrysa*. 162, *E. infecta*, fore wing; 163, 164, *E. evanescens*; 163, apex of ♀ abdomen, lateral; 164, ♀ spermatheca, lateral.

REMARKS. *Dysochrysa* can be distinguished from other Belonopterygini by the short cell m_2 and the broad, triangular intramedian cell. In males, the arcuate parameres, each with a forked, vertically projecting, median process are distinctive and females have a narrow spermatheca with a very elongate vela and ventral impression.

Tjeder (1966) thought that there was a close affinity between *Dysochrysa* and *Oviedus* (= *Nesochrysa*) because of morphological similarities in the gonarcus, arcessus and gonocornua of the males. There are also close parallels with the male genitalia of *Chrysacanthia*. However, the parameres of *Dysochrysa* are quite different from these genera and fully justify its recognition as a distinct genus.

Tjeder (1966) included the species *furnata* and *reflexa* in *Dysochrysa*. *D. furcata* was described from three males and a female but *reflexa* was known only from the female holotype. It now seems likely that the species are synonymous since the characters Tjeder used to distinguish *reflexa*, particularly the presence of a third gradate series, broad pronotum, broad apical incision at the apex of sternite 7 and facial markings, also occur in various combinations in specimens otherwise identifiable as *furcata*.

Tjeder (1966) figured the male abdominal sternites with dense setae. In fact this is a misinterpretation and what he thought were setal follicles are microtholi.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

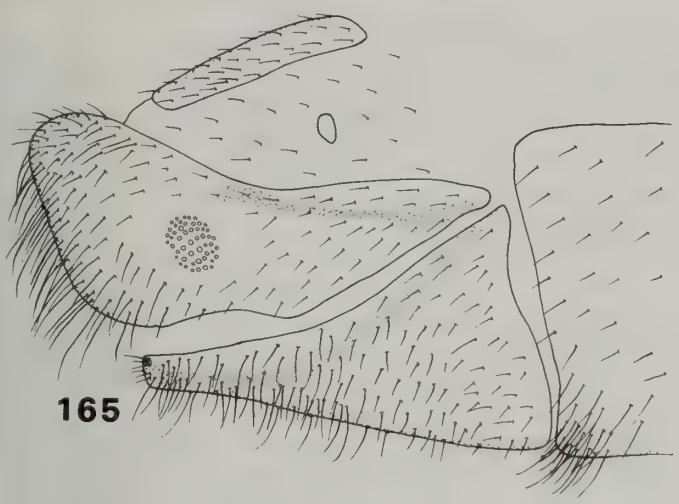
Genus *EVANOCHRYSA* gen. n.

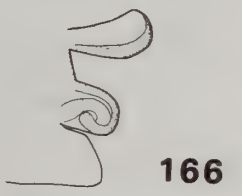
Type species: *Italochrysa evanescens* McLachlan.

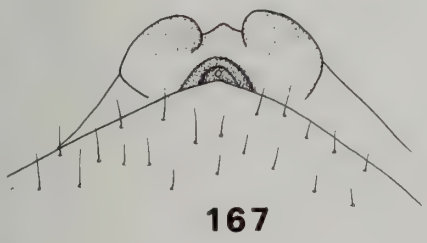
DISTRIBUTION. Indo-Malaysia.

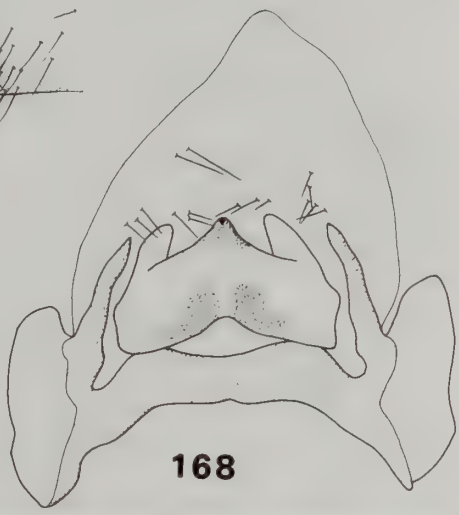
The genus includes three described species.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 162) 22–27 mm; ground colour yellowish green. Head marked with red stripe on vertex and frons; palps rounded; labrum deeply indented; vertex hardly raised; toruli large; head width : eye width = 2.2–2.3 : 1; antenna brown, as long as fore









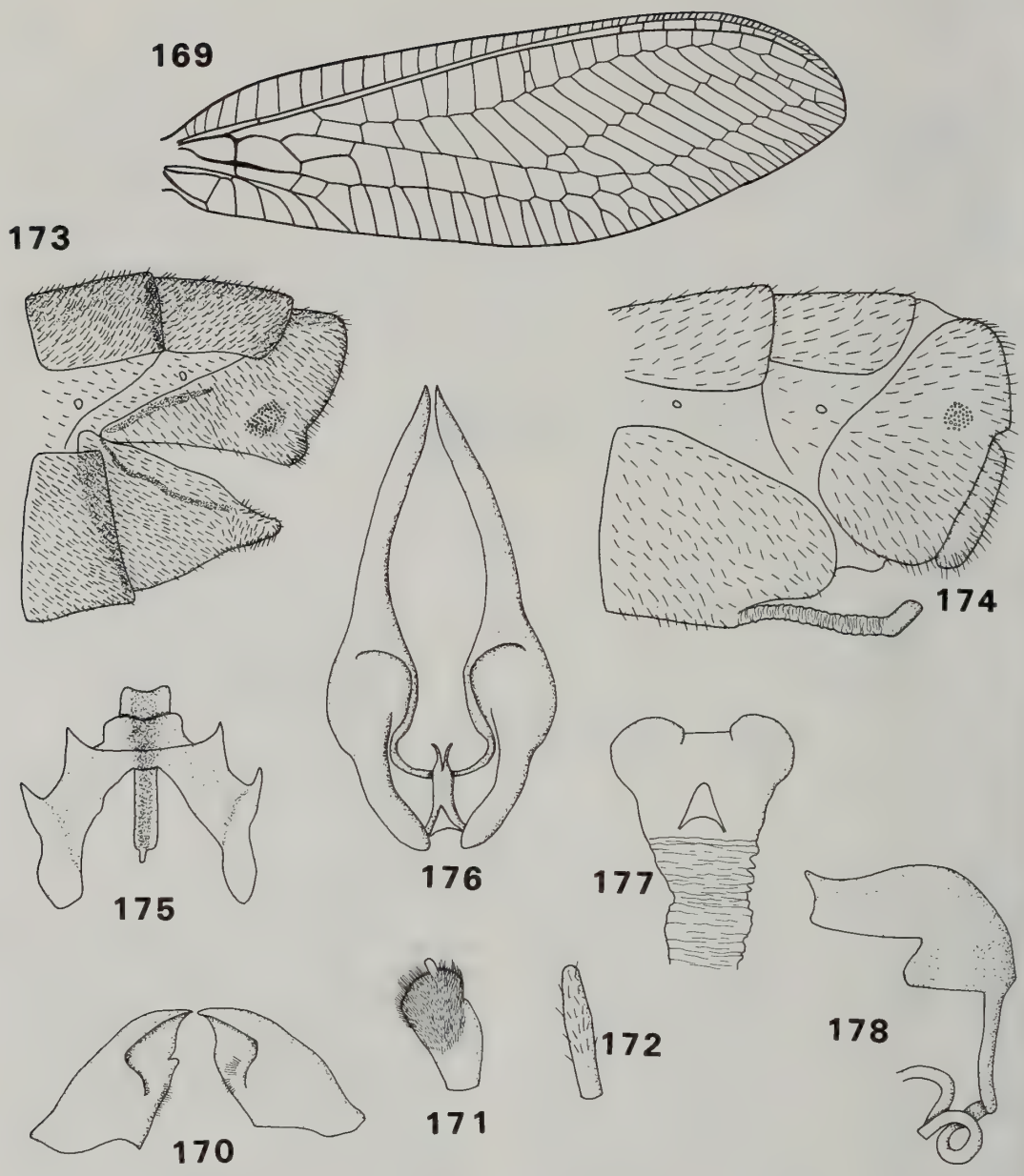
Figs 165–168 *Evanochrysa evanescens*. 165, apex of ♂ abdomen, lateral; 166, ♀ subgenitale and praegenitale, lateral; 167, ♀ subgenitale and praegenitale, ventral; 168, ♂ genitalia, ventral.

wing; flagellar segments almost as broad as long; setae arranged in four rings. Pronotum broad; marked with dark lateral stripes or red longitudinal median stripe; dorsal setae absent; meso- and metanotum unmarked. Legs unmarked; setae pale; claws with basal dilation. Fore wing narrow (length : breadth = 2.8–3.1 : 1); unmarked or red at base, gradates and forking posterior marginal crossveins black; costal area narrow at base; costal setae very short, inclined; stigma unmarked or tinted pale brown; Sc long; Sc and R widely separated; basal Sc crossvein 0.76–0.88 mm; *im* short, broad, quadrangular; m_2 short; Rs sinuate; gradates in two slightly divergent series; inner gradates extended basally, meeting Psm; veins not crassate in ♂; c_1 2.5 times longer than c_2. Abdomen (Figs 163, 165) unmarked; setae short, dense; callus cerci rounded; trichobothria 55–70; ectoprocts with shallow apical invagination, not fused dorsally, fused with tergite 9; ♂: dense microtholi present on sternites; sternite 8+9 fused, short; dense setae at apex of sternite 7; ♀: sternite 7 tapering to median apical point, not swollen ventrally.

GENITALIA ♂ (Fig. 168). Tignum, gonapsis and median plate absent; entoprocessus absent; arcessus short, broad with strong apical hook and membranous lateral lobes; pseudopenis absent; gonarcus short, broad, transverse with long tapering lateral horns; gonosaccus short; gonosetae present in three lateral groups of 2–4 setae; parameres absent; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 164, 166, 167). Praegenitale present; subgenitale bilobed apically with small median projection; spermatheca short; ventral impression very deep; vela very long; duct very long, coiled.

REMARKS. *Evanochrysa* superficially resembles *Italochrysa* Principi but can be distinguished by the short intramedian cell, short 2nd median cell and basally extended inner gradates. *Evanochrysa* has retained several plesiomorphic characters; in



Figs 169–178 *Italochrysa*. 169, 173–178, *I. italica*; 170–172, *I. chloromelas*. 169, fore wing (from Kimmins); 170, mandibles, dorsal; 171, galea, dorsal; 172, maxillary palp, dorsal; 173, apex of ♂ abdomen, lateral; 174, apex of ♀ abdomen, lateral; 175, ♂ gonarcus complex, ventral; 176, ♂ parameres, dorsal; 177, ♀ subgenitale, ventral; 178, ♀ spermatheca, lateral.

particular the males lack parameres and possess gonosetae. The genus may be related to *Nacarina* since in both genera *im* is short and broad, and the forking marginal crossveins and gradates are black. There may also be links with *Stigmachrysa*, which has a short *im* and a median projection on the female subgenitale like *Evanochrysa*.

BIOLOGY. Unknown. No insect remains were discovered in the guts of adults examined during this study.

Genus *ITALOCHRYSA* Principi

Italochrysa Principi, 1946: 86. Type species: *Hemerobius italica* Rossi, by monotypy.

DISTRIBUTION. Afrotropics, Madagascar, east and west Palaearctic, Oriental, Australia.

This large Old World genus contains 73 species. The centre of distribution is the Afrotropical region in which there are at least 26 species, and there are four in Madagascar, 10 in the Palaearctic, eight in India, 16 Oriental species and 9 in Australia.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 169) 14–27 mm; ground colour brown. Head unmarked or with red or brown markings on gena, frons and vertex; palps rounded apically (Fig. 172); labrum deeply indented; galea broad (Fig. 171); mandibles broad, asymmetrical with basal tooth on left mandible (Fig. 170); toruli large; vertex flat or slightly raised; head width : eye width = 1.8–2.5 : 1; antenna as long as fore wing; flagellar segments about as long as broad; setae arranged in four rings. Pronotum usually with dark markings; generally broad; setae generally absent from dorsum; meso- and metanotum with dark markings or unmarked. Legs unmarked or with brown annulation on tibia; setae short, dark; claws with basal dilation. Fore wing narrow (length : breadth = 3.0–3.2 : 1); unmarked or with brown shading on anal veins and *dcc*; costal area narrow at base; costal setae very short, inclined; stigma unmarked; Sc and R widely separated; Sc moderately long; basal Sc crossvein 0.76–0.96 mm; *im* broad, long, quadrangular; Rs sinuate; gradates in two slightly divergent series, inner gradate meeting Psm, occasionally extended basally; veins not crassate in ♂; c_1 1.5–2.0 times longer than c_2; c_2 narrow or broad. Abdomen (Figs 173, 174) unmarked or marked with brown dorsal stripes; setae short, dense; callus cerci rounded; trichobothria 36–80+; ectoprocts with slight apical invagination, not fused dorsally; ectoprocts fused with tergite 9; ♂: sternites with or without microtholi; sternite 8+9 fused, short; ♀: sternite 7 deeply invaginated apically, with small ventral swelling.

GENITALIA ♂ (Figs 175, 176). Tignum, gonapsis, median plate and entoprocessus absent; arcessus broad with strong apical hook; pseudopenis absent; gonarcus broad, short; gonosaccus and, gonosetae absent; parameres paired, long, narrow, sometimes toothed; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 177, 178). Praegenitale absent; subgenitale bilobed apically; spermatheca narrow, short; ventral impression very deep; vela very long; duct very long, coiled.

Larva. Abdomen broad, grossly humped; thoracic tubercles very broad, projecting laterally on short, narrow stalk; lateral abdominal tubercles spherical; latero-dorsal abdominal tubercles absent; dorsal abdominal setae hooked apically; transverse row of long, plumose setae on abdominal tergite 7; debris carried.

REMARKS. *Italochrysa* may be distinguished from other Belonopterygini by the quadrangular intramedian cell, unmarked stigma, one pair of parameres, the absence of gonocornua on the gonarcus in the male and the absence of a praegenitale in the female. The lack of gonocornua is apomorphic and suggests a relationship with *Oyochrysa*, *Calochrysa* and *Turnerochrysa*.

BIOLOGY. Principi (1946) has described the larvae of *I. italica* Rossi and shown that they are associated with ants. The female deposits eggs on tree-trunks near nests of the ant *Crematogaster scutellaris* Olivier. Hatched larvae enter the ants' nest and feed on larvae and pupae of the ant. They will not feed on other insects. The eggs and first instar larva of *I. insignis* (Walker) have been described by New (1983).

Adult gut contents examined during this study did not contain insect remains.

Genus *NACARINA* Navás

Nacarina Navás, 1915: 17. Type species: *Nacarina furcata* Navás, by original designation and monotypy.

Nadiva Navás, 1919: 303. Type species: *Nadiva pletorica* Navás, by original designation and monotypy. [Synonymized by Stange, 1967: 303.]

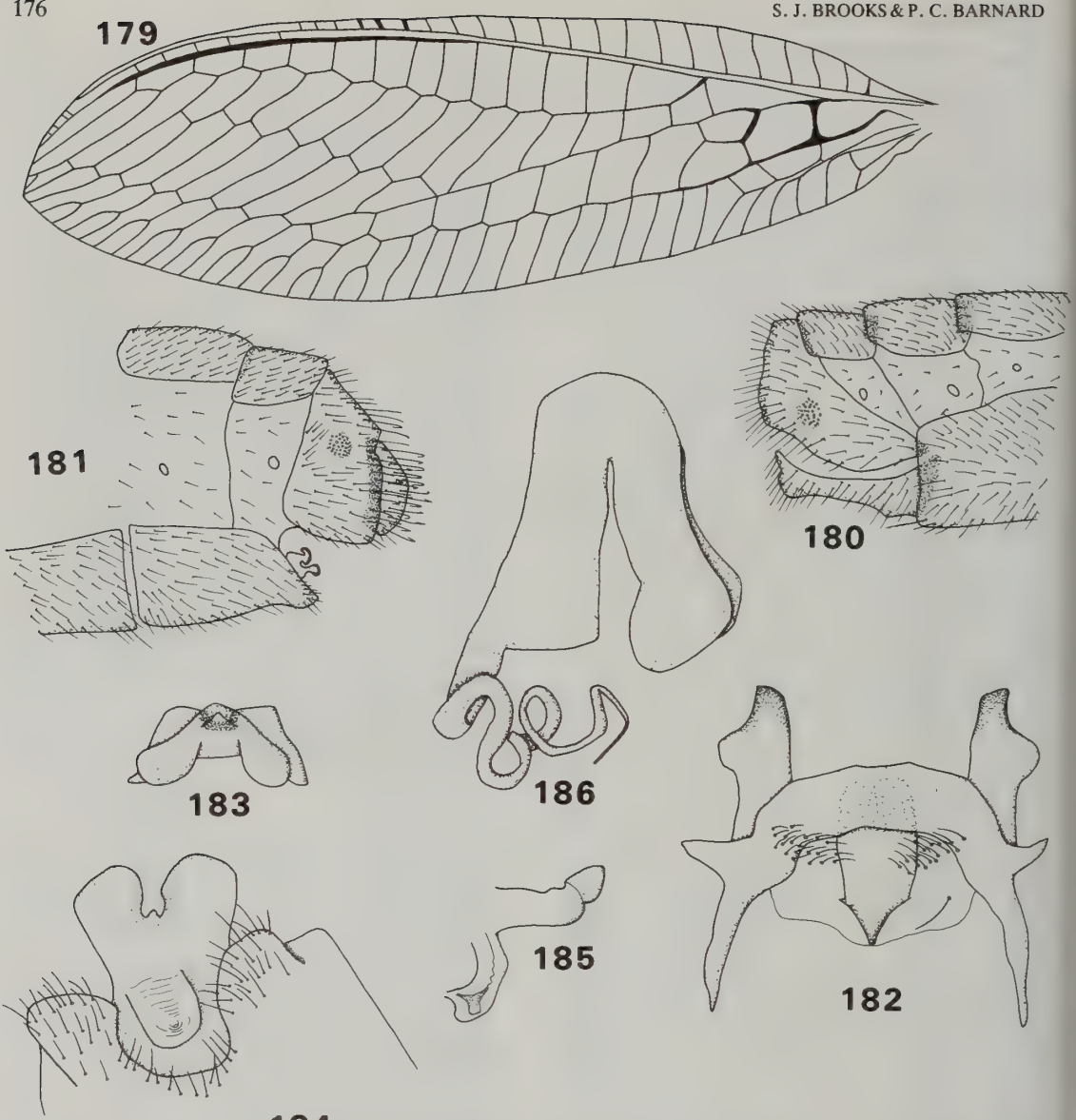
Goliva Navás, 1920*a*: 49. Type species: *Goliva deletangi* Navás, by original designation and monotypy. [Synonymized with *Nadiva* Navás by Banks, 1924: 49.]

Rameta Navás, 1920*a*: 50. Type species: *Rameta sanguinea* Navás, by original designation and monotypy. [Synonymized with *Nadiva* Navás by Banks, 1924: 60.]

Mesochrysa Navás, 1927*a*: 55. Type species: *Mesochrysa megaptera* Navás, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. Neotropics and south-eastern U.S.A.

Nacarina includes 14 described species, 11 of which occur in South America. Two species are known from Central America and another has been described from Cuba. In addition, there are several undescribed species present in the BMNH collections.



Figs 179–186 *Nacarina*. 179, 180, 182, *N. balboana*; 181, 183, 186, *N.* sp. indet.; 184, 185, *N. titan*. 179, fore wing (from Kimmins); 180, apex of ♂ abdomen, lateral; 181, apex of ♀ abdomen, lateral; 182, ♂ genitalia, caudal; 183, ♀ subgenitale and praegenitale, ventral; 184, ♀ subgenitale and praegenitale at apex of sternite 7, ventral; 185, ♀ subgenitale and praegenitale, lateral; 186, ♀ spermatheca, lateral.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 179) 19–31 mm; ground colour green. Head unmarked or with red spots and stripes on gena, clypeus, frons, vertex, post-ocular region and scape; palps broad, rounded apically; labrum indented; vertex flat; toruli small; head broad, head width : eye width = 2.1–2.8 : 1; antenna often black in basal half, shorter than fore wing; flagellar segments about as long as broad; setae arranged in four rings, apical ring sparse. Pronotum very broad; marked with yellow median stripe or red lateral stripe; dorsal setae long or short, pale or dark; meso- and metanotum unmarked or with yellow median stripe. Legs unmarked; setae long or short, dark or pale; tarsi long; claws very large, undilated or with slight basal dilation. Fore wing unmarked, radial and forking marginal crossveins often black; narrow (length : breadth = 2.9–3.4 : 1), pointed apically; distinctly longer in ♂ than ♀; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc long; Sc and R well separated but

close at stigma; basal Sc crossvein 0.60–0.88 mm; *im* long or short, quadrangular, broad (rarely ovate); m_2 usually short; Rs sinuate; gradates in two (sometimes three) parallel, occasionally divergent, series; inner gradates extended basally; basal inner gradate usually meeting Psm; veins not crassate in ♂; c_1 1.2–1.7 times longer than c_2; venation unstable, number of crossveins and forks varies between individuals; posterior marginal veins forked. Hind wing broad (length : breadth = 2.9 : 1); anal veins sometimes forked; anal area broad. Abdomen (Figs 180, 181) sometimes marked with red dorsal stripe; setae short, dense; trichobothria 48–60; ectoprocts with moderate or deep apical invagination, fused dorsally; sternites enlarged; ectoprocts fused with tergite 9; ♂: sternites with microtholi; callus cerci ovate; sternite 8+9 fused, squared apically with median indentation; ♀: callus cerci rounded; sternite 7 straight apically or, in *N. titan* (Banks), deeply excised with pair of submedian lobes.

GENITALIA ♂ (Fig. 182). Tignum, gonapsis, median plate and entoprocessus absent; arcessus short with apical hook; parameres absent; gonarcus short, broad with lateral gonocornua; pseudopenis absent; gonosaccus short; gonosetae long or short, in small lateral clump; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 183–186). Praegenitale present (in *N. titan* a long membranous tongue is present); subgenitale bilobed apically, sometimes with median projection, base broadly expanded, sometimes downcurved; spermatheca broad; ventral impression deep; vela long; duct long, sinuous.

REMARKS. *Nacarina* can easily be distinguished from other genera by the broad, rounded apical segment of the palps, the broad flagellar segments, the antennae which are positioned very close together, the very broad pronotum, the short rectangular intramedian cell and the forked posterior marginal veins. *Nacarina* is unusual amongst the Chrysopidae in showing marked sexual dimorphism in which males are considerably smaller than females.

The lack of parameres in males and the unstable venation of *Nacarina* indicate a close relationship with *Belonopteryx* Gerstaecker. However, *Nacarina* also shares several characters with *Evanochrysa* which, intriguingly, suggests a link between these genera. In both genera the intramedian cell is short and broad, and the forking marginal crossveins and gradates are black. In males microtholi are present, the arcessus is short and broad with an apical hook, the gonarcus has long lateral gonocornua, gonosetae are present and parameres are absent. In females a praegenitale close to the base of the subgenitale is present; the long membranous tube in *N. titan* is similar to that of *Abachrysa*.

New (1984) treated *Nacarina* and *Nadiva* as separate taxa but there does not seem to be any justification for this. Banks (1943) erected the tribe Nadivini in which he also included *Calochrysa* Banks.

The holotype of *Mesochrysa megaptera*, the type species of *Mesochrysa*, was deposited in Navás's collection but we were unable to locate it; it is not listed by Monserrat (1985) and so is probably lost. However, Navás (1927*a*) figured the head, thorax and base of the fore wing of *M. megaptera*. A red stripe is shown on the scape, vertex and laterally on the pronotum, the claws are not dilated basally, cell *im* is broadly ovate, c_2 shorter than c_1 and the basal Sc crossvein is relatively distal. Navás compared *Mesochrysa* with *Nothochrysa* (= *Italochrysa* Principi) but cell *im* is quadrangular in *Italochrysa*. He also compared *Mesochrysa* with *Nodita* Banks but, unlike the latter genus, *M. megaptera* has robust antennae which are shorter than the fore wing and the pterostigma is unmarked. These characters suggest that *Mesochrysa* is a belonopterygine and so is probably synonymous with *Nacarina* since the other New World belonopterygine genera are not marked in this way.

BIOLOGY. The gut contents of adults examined during this study did not include insect remains. Weber (1942) reported that the larvae of *Nacarina valida* (Erichson) are myrmecophiles.

Genus ***NESOCHRYSA*** Navás

Nesochrysa Navás, 1910*a*: 53. Type species: *Nesochrysa grandidieri* Navás, by original designation and monotypy.

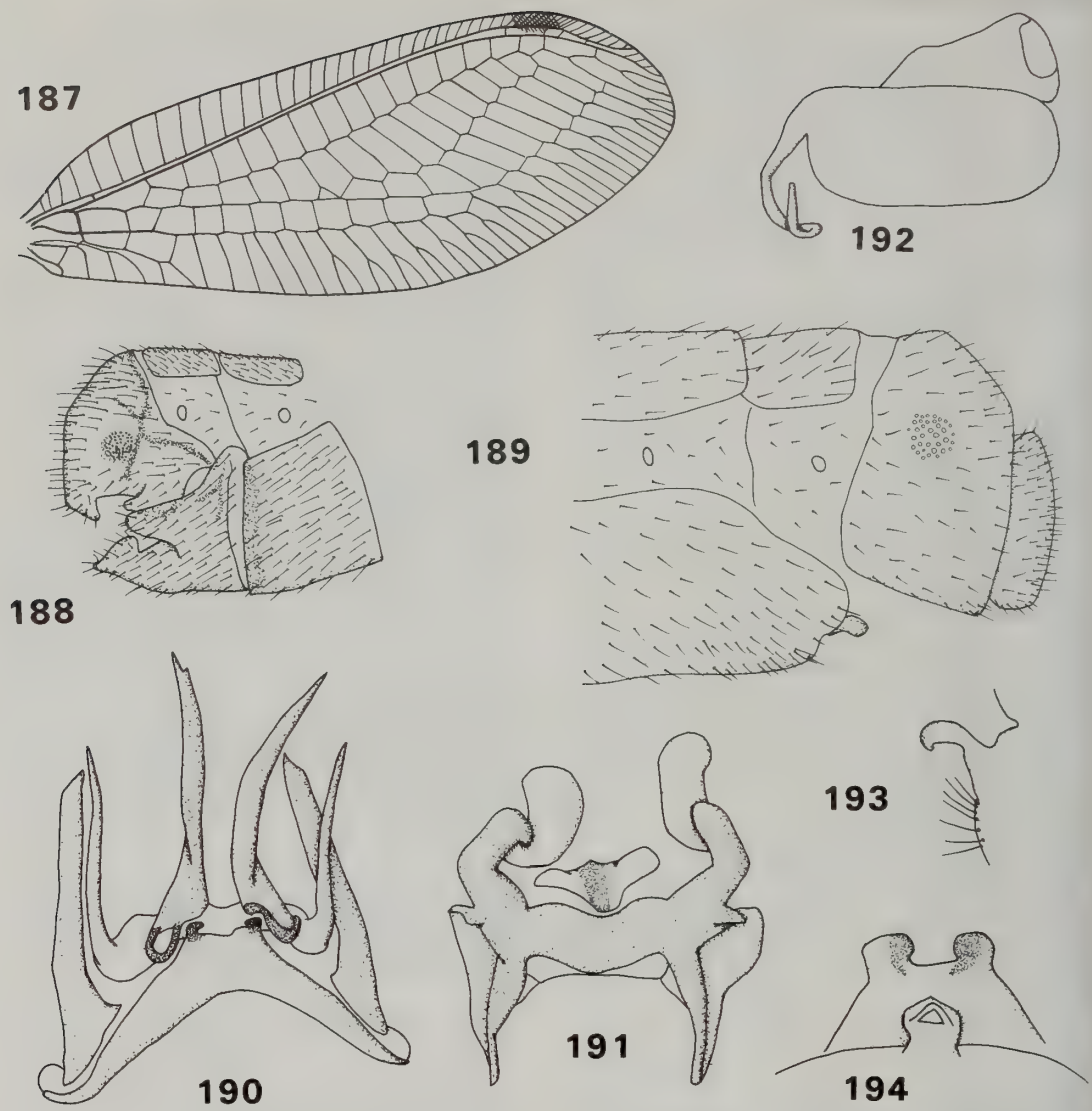
Oviedus Navás, 1913*b*: 326. Type species: *Oviedus auricollis* Navás, by monotypy. **Syn. n.**

Madachrysa Navás, 1934: 62. Type species: *Madachrysa seyrigi* Navás, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. Madagascar, Afrotropics.

The genus includes 10 described species, three of which occur in Madagascar. *N. macrostigma* Gerstaecker is widely distributed over central and west Africa.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 187) 16–23 mm; ground colour brown. Head with red or black stripe on labrum, scape, vertex; palps broad, pointed apically; mandibles broad, asymmetrical with basal tooth on left mandible; galea broad with small apical papilla; labrum



Figs 187–194 *Nesochrysa*. 187, 188, 190–194, *N. seyrigi*; 189, *N. macrostigma*. 187, fore wing (from Kimmins); 188, apex of ♂ abdomen, lateral; 189, apex of ♀ abdomen, lateral; 190, ♂ parameres, ventral; 191, ♂ gonarcus complex, dorsal; 192, ♀ spermatheca, lateral; 193, ♀ praegenitale, lateral; 194, ♀ subgenitale and praegenitale, ventral.

deeply indented; vertex slightly raised; toruli large; head width : eye width = 2.0–2.8 : 1; antenna considerably longer than fore wing; flagellar segments about twice as long as broad; setae arranged in four rings. Pronotum broad; marked with broad red or black lateral band; dorsal setae long, pale; meso- and metanotum entirely red or brown. Legs unmarked or with black stripe on tibia and femur; setae long or short, dark; claws with basal dilation. Fore wing broad or narrow (length : breadth = 2.2–3.1 : 1); unmarked; costal area narrow at base; costal setae long, inclined; stigma marked red/brown; Sc and R widely separated; basal Sc crossvein 0.52–0.88 mm; m_1 very short; *im* absent or long, quadrangular, rarely ovate; Rs slightly sinuate; gradates in two parallel or slightly divergent series; inner gradates greatly extended basally, meeting Psm; veins not crassate in ♂; c_1 up to 1.5 times longer than c_2; c_2 broad, squared apically. Abdomen (Figs 188, 189) with red/brown or black dorsal markings; setae short, dense on tergites but long, sparse on sternites; callus cerci ovate or rounded, prominent; trichobothria 29–65; ectoprocts with deep apical invagination, not fused dorsally, fused with tergite 9; atria large; ♂: sternites with microtholi; sternite 8+9 fused, short, broad, often with long lateral lobes; tergite

9 often with lateral lobe; ectoprocts often with ventral trunk-like process; ♀: setae short, dense; sternite 7 straight or slightly indented apically.

GENITALIA ♂ (Figs 190, 191). Tignum, gonapsis, median plate and entoprocessus absent; gonarcus short, broad, transverse with long lateral gonocornua sometimes terminating in broad swelling; arcessus very short, broad with median hook; pseudopenis, gonosaccus, gonosetae, spinellae and gonocristae absent; three pairs of long, narrow parameres fused to arcuate basal plate.

GENITALIA ♀ (Figs 192–194). Praegenitale present; subgenitale bilobed apically, broad; spermatheca long, broad; ventral impression deep; vela moderate; duct short, sinuous.

REMARKS. Species of *Nesochrysa* can be distinguished from most other belonopterygine genera by their very long antennae, pointed apex of the palps, the short cell m_1 and the dark brown spot on the pterostigma. Males of the genus are characterized by the long lateral gonocornua and the three pairs of parameres.

Nesochrysa closely resembles *Stigmachrysa* Navás which has similar external characteristics, with a marked stigma and lobes on the ectoprocts. However, *Stigmachrysa* differs from *Nesochrysa* in that males have only one pair of parameres.

There are two species groups within *Nesochrysa*. *M. seyrigi* and *macrostigma* have broad fore wings (length : breadth $< 2.5 : 1$); the costal area in the stigmatic region is broad; the stigma is marked with a large black spot; c_2 is very broad; males have trunk-like apical lobes on the ectoprocts and sternite 8+9; the gonocornua have a broad apical swelling; the spermatheca is broad and sternite 7 is straight apically in the female. In contrast, the other species have relatively narrow fore wings (length : breadth $> 2.5 : 1$); the costal area is narrow; the stigma is marked with only a small spot; c_2 is only slightly broader than c_1; males have no lobes on the ectoprocts or sternite 8+9; the gonocornua taper apically; the spermatheca is narrow; sternite 7 is concave apically in females.

When Tjeder (1973) redescribed *Madachrysa* he noted that it was very similar to *Nesochrysa* and *Oviedus* but hesitated to synonymize them. However, the characters which separate them are trivial and the shared apomorphies of the male genitalia indicate that they are so closely related that synonymy seems to be the only reasonable option.

BIOLOGY. Unknown. No gut contents were present in any of the adult specimens examined during this study.

Genus *NODOCHRYSA* Banks

Nodochrysa Banks, 1938*a*: 226 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa necrota* Banks, by monotypy. [Raised to genus by Brooks, 1984: 80.]

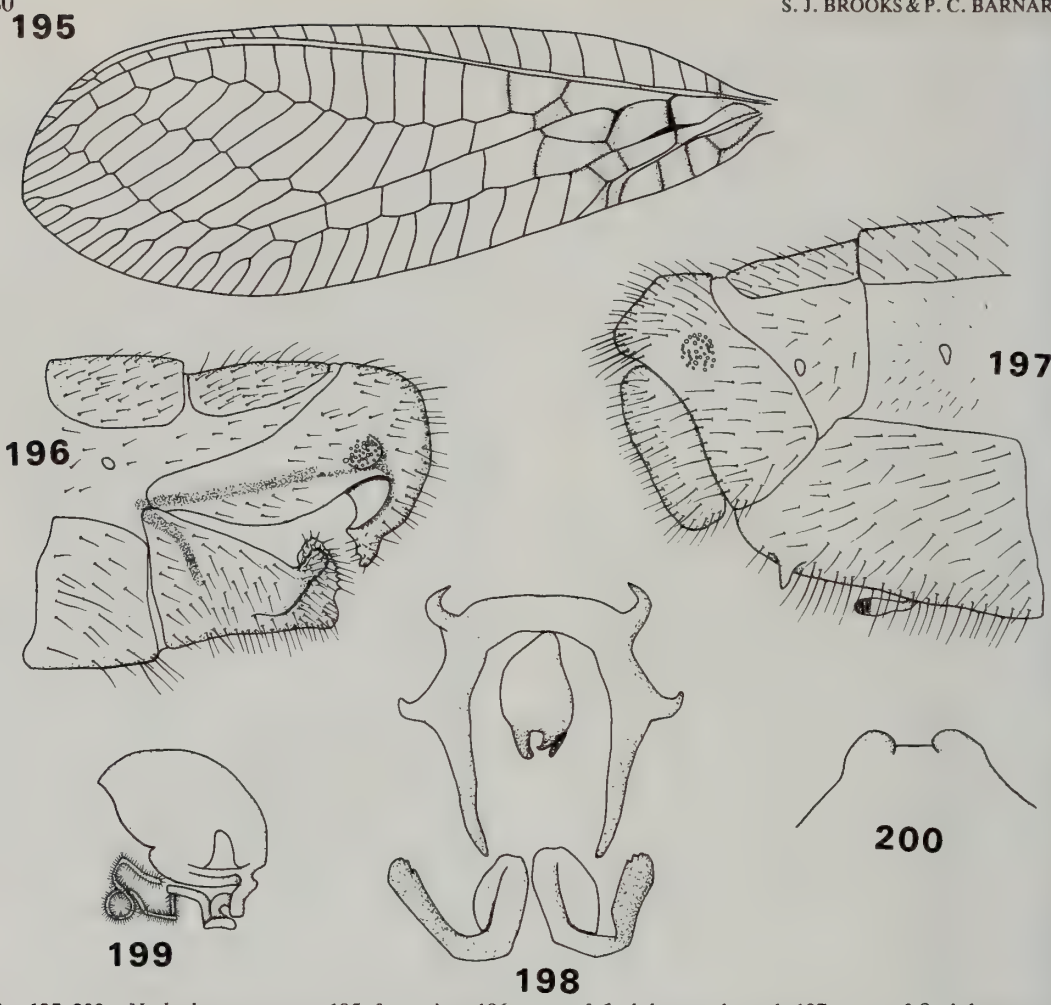
DISTRIBUTION. Singapore, Malaysia, Brunei. *Nodochrysa* is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 195) 12–15 mm. Ground colour in life orange/brown (G. S. Robinson, pers. comm.). Head marked with black stripe on vertex and between antennae; palps narrow, rounded; labrum slightly indented; vertex flat; toruli large; head width : eye width = 2.0–2.2 : 1; scape broad; antenna 1.5 times longer than fore wing; flagellar segments twice as long as broad; setae arranged in four rings. Pronotum broad, periphery marked black with black median stripe; lateral setae long, pale; dorsal setae few, black, short; mesonotum with black stripe on suture; metanotum marked with black spot above wing base. Legs with brown stripe on tibia; setae long, pale; claws with basal dilation. Fore wing length : breadth = 2.6–3.0 : 1; marked with brown shading on basal crossveins; costal area very narrow at base; costal setae short, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.44–0.52 mm; *im* broad, ovate; Rs sinuate; gradates in two parallel series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 1.5–2.0 times as long as c_2; c_2 slightly broadened, squared apically. Abdomen (Figs 196, 197) marked with large dark brown spots on tergites 1, 2, 5, 6 and sternites 6–9; setae short, sparse; callus cerci rounded; trichobothria 30–33; ectoprocts with slight apico-dorsal invagination, fused with tergite 9; ♂: microtholi present on sternites 3–8; ectoprocts not fused dorsally, elongated apico-ventrally; sternite 8+9 fused, short with lateral tubercle and apical membrane bearing enlarged setal bases; ♀: sternite 7 straight apically with pair of short, subapical spines.

GENITALIA ♂ (Fig. 198). Tignum, gonapsis, median plate and entoprocessus absent; parameres short, U-shaped, slightly swollen apically with three small apical teeth; gonarcus long, narrow with lateral gonocornua; arcessus small, membranous with strong apical hook and blunt lateral projection; gonosaccus, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 199, 200). Praegenitale present; subgenitale broad, bilobed at apex; spermatheca narrow; ventral impression deep; vela very broad, long; duct short, coiled.

Larva. Unknown.



Figs 195–200 *Nodochrysa necrota*. 195, fore wing; 196, apex of ♂ abdomen, lateral; 197, apex of ♀ abdomen and praegenitale, lateral; 198, ♂ genitalia, caudal; 199, ♀ spermatheca, lateral; 200, ♀ subgenitale, ventral.

REMARKS. Species of *Nodochrysa* have a broad, ovate intramedian cell and very long antennae. Males of the genus are characterized by the lateral lobes on sternite 8+9 and the trunk-like extension of the ectoprocts. Females of *Nodochrysa* are readily distinguished from other genera by the short, subapical spines on sternite 7.

The long antennae, narrow palps and lobes on the ectoproct and sternite 8+9 of males suggest that *Nodochrysa* may be related to *Nesochrysa* Navás.

Nodochrysa was only briefly described in a key couplet (Banks, 1938*a*) and since then appears to have been overlooked by subsequent workers. However, the unusual male and female abdominal characters indicate the validity of the genus. The short second cubital cell, broad flagellar segments and relatively distal position of the basal subcostal crossvein place the genus in the Belonopterygini and suggest only a distant relationship with *Chrysopa* Leach, therefore justifying the elevation of *Nodochrysa* to full generic status.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

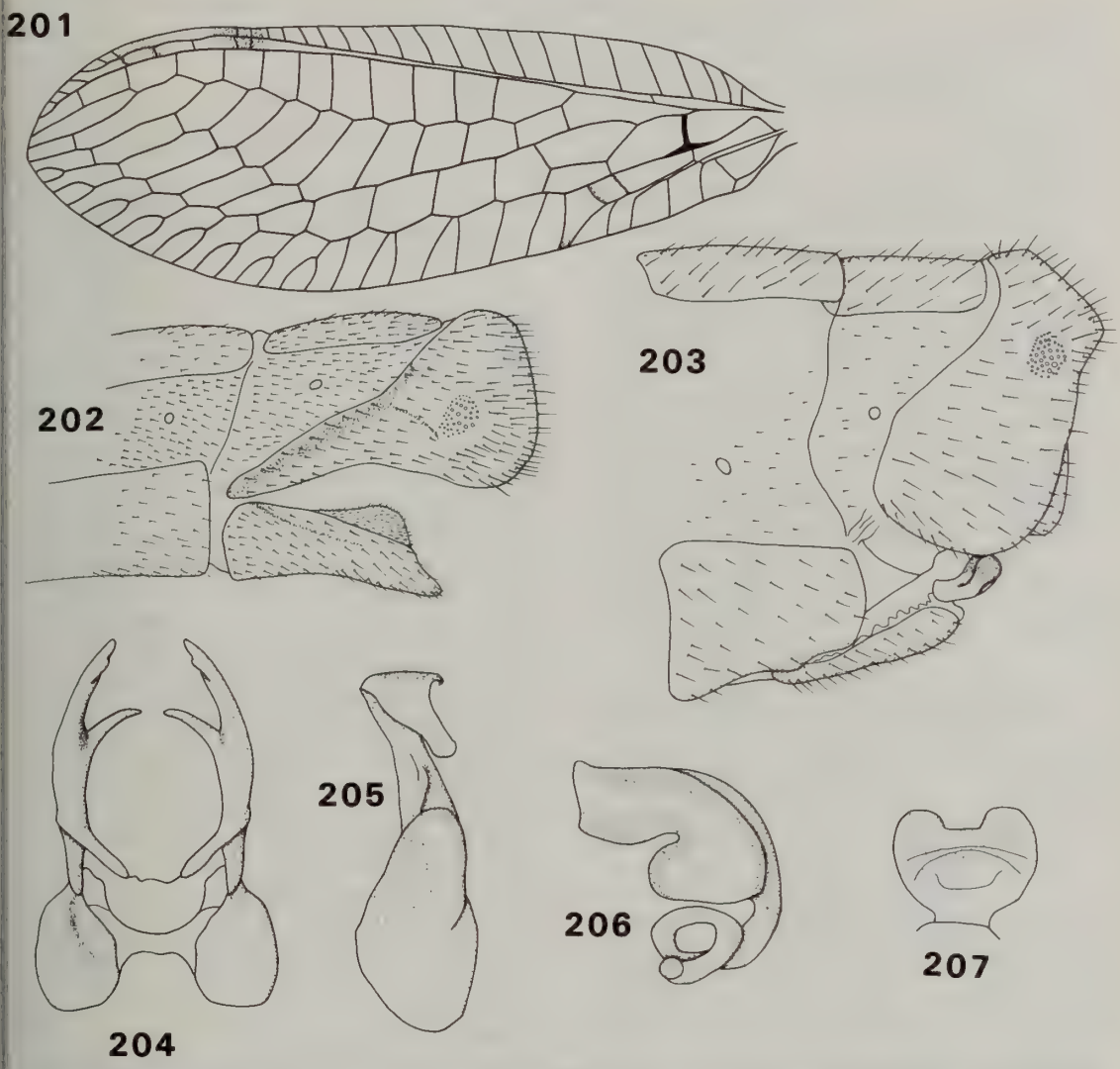
Genus ***OYOCHRYSA*** Brooks

Oyochrysa Brooks, 1984: 80. Type species: *Oyochrysa ancora* Brooks, by original designation.

DISTRIBUTION. West Africa.

The genus is known from three species.

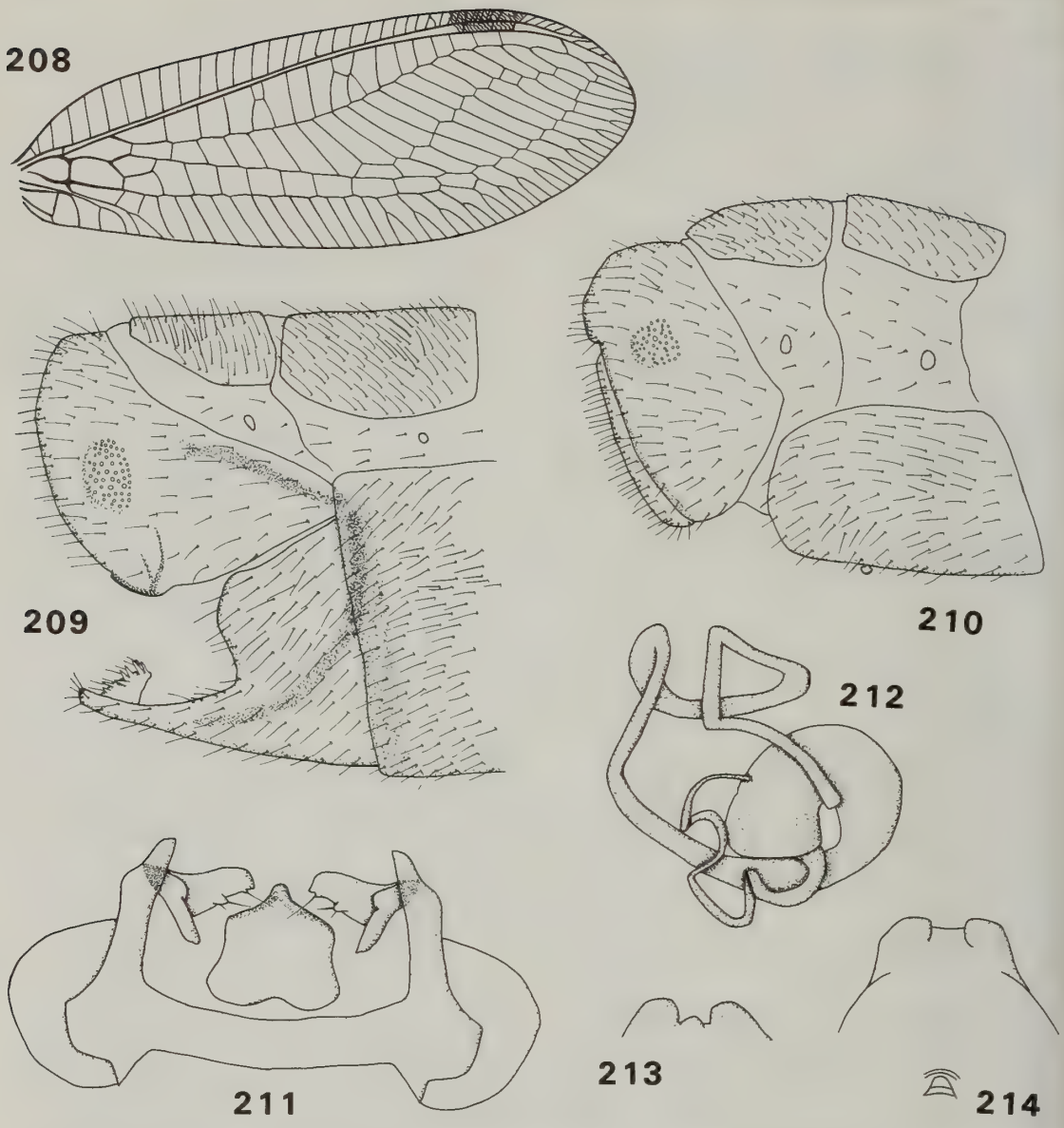
DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 201) 14–19 mm; ground colour brown. Head with extensive red or brown markings; palps rounded apically; galea broad; labrum



Figs 201–207 *Oyochrysa*. 201, *O. sanguinea*, fore wing; 202–207, *O. ancora*; (202) apex of ♂ abdomen, lateral; (203) apex of ♀ abdomen, lateral; (204) ♂ parameres, dorsal; (205) ♂ gonarcus complex, lateral; (206) ♀ spermatheca, lateral; (207) ♀ subgenitale, ventral.

emarginate; mandibles broad, asymmetrical with basal tooth on left mandible; head width : eye width = 1.8–2.1 : 1; eyes large; vertex flat; toruli large; antenna slightly longer than fore wing; flagellar segments less than twice as long as broad; setae arranged in four rings. Pronotum broad, with extensive dark brown markings; meso- and metanotum marked dark brown. Legs marked with red/brown stripes on tibiae and femora; setae short, dark; claws with basal dilation. Fore wing marked in basal half with brown or red spots; costal area narrow at base; costal setae short, inclined; Sc and R widely separated; basal Sc crossvein 0.72–0.76 mm; *im* quadrangular, broad; Rs sinuate; veins not crassate in ♂; c_1 1.5–3.0 times longer than c_2; gradates in two parallel series; basal inner gradate meeting Psm; stigma marked with brown spot. Abdomen (Figs 202, 203) with prominent dark dorsal markings; setae short, dense; callus cerci rounded; trichobothria 32–49; ectoprocts with slight dorso-apical invagination, not fused dorsally, fused with tergite 9; ♂: sternite 8+9 fused; sternites and tergites with microtholi; ♀ sternite 7 with broad apico-dorsal invagination.

GENITALIA ♂ (Figs 204, 205). Tignum, gonapsis and median plate absent; gonarcus long, narrow; parameres broad, deeply bifid apically; ento-



Figs 208–214 *Stigmachrysa*. 208–211, 213, 214, *S. cladostigma*; 212, *S. kervillei*. 208, fore wing (from Kimmins); 209, apex of ♂ abdomen, lateral; 210, apex of ♀ abdomen, lateral; 211, ♂ genitalia, dorsal; 212, ♀ spermatheca, lateral; 213, ♀ subgenitale and praegenitale, caudal; 214, ♀ subgenitale and praegenitale, ventral.

processus absent; arcessus short, with apical tooth, situated above membranous sac; pseudopenis absent; gonosaccus short; gonosetae absent. GENITALIA ♀ (Figs 206, 207). Praegenitale absent; subgenitale broad, bilobed apically, connected to abdomen by long membranous tube supported by sclerotized apical extension of sternite 7; spermatheca large, strongly sclerotized; vela large; ventral impression deep; duct long, coiled.

Larva. Unknown.

REMARKS. *Oyochrysa* shares many characters with *Italochrysa* Principi, to which it is probably closely related, but can be readily distinguished by the long, arcuate gonarcus in the male and the long apical extension of sternite 7 in the female. In *Italochrysa*, and the rest of the Belonopterygini, the gonarcus is short and transverse and sternite 7 is not extended in the female.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Genus *STIGMACHRYSA* Navás

Stigmachrysa Navás, 1925*b*: 570. Type species: *Stigmachrysa kervillei* Navás, by original designation and monotypy.

DISTRIBUTION. India, Burma, Singapore, Java.
Three species have been described but a fourth undescribed species is present in the Institut Royal des Sciences Naturelles de Belgique, Brussels.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 208) 20–23 mm; ground colour brown. Head unmarked or with dark spot below antennae; palps rounded; labrum invaginated; vertex slightly raised; toruli large; head width : eye width = 2.0–2.4 : 1; antenna as long as fore wing; flagellar segments about 1.5 times as long as broad; setae arranged in four rings. Pronotum broad; unmarked; dorsal setae long, pale; meso- and metanotum unmarked or entirely black. Legs unmarked; setae long or short, pale; claws with basal dilation. Fore wing broad; unmarked or with shading in anal region; costal area narrow at base; costal setae short, inclined; Sc long; stigma marked brown; Sc and R widely separated, particularly at stigma; basal Sc crossvein 0.60–0.72 mm; *im* quadrangular, broad, short; Rs slightly sinuate; gradates in two parallel or divergent rows; inner gradate series irregular with additional crossveins; inner gradates extended basally, meeting Psm; veins not crassate in ♂; c_1 2.0–2.5 times longer than c_2; c_2 broad, squared apically. Hind wing with stigma marked brown. Abdomen (Figs 209, 210) unmarked or with brown spot on sternite 7; trichobothria 41–65; ectoprocts with narrow apical invagination, not fused dorsally, fused with tergite 9; ♂: setae short, dense; sternites with microtholi; callus cerci ovate, prominent; ectoproct with ventro-apical projection; sternite 8+9 fused; ♀: setae long, sparse but short on tergites 4–5; callus cerci rounded; sternite 7 broadly concave apically.
GENITALIA ♂ (Fig. 211). Tignum, gonapsis and median plate absent; entoprocessus absent; parameres short, arcuate bearing short setae; gonarcus short, broad with long, tapering lateral gonocornua; arcessus short, broad with hooked apex; pseudopenis absent; gonosaccus short; gonosetae absent; gonocristae present in small group at apex of sternite 8+9; spinellae absent.
GENITALIA ♀ (Figs 212–214). Praegenitale present; subgenitale broad, bilobed apically with small median projection and basal crumena; spermatheca short, broad; ventral impression very deep; vela enormously elongated, highly coiled; duct long, sinuate.

Larva. Unknown.

REMARKS. Species of *Stigmachrysa* are superficially similar to those of *Nesochrysa* Navás since both genera have a large dark brown spot on the pterostigma and a basally extended inner gradate series. However, they can be distinguished because males of *Stigmachrysa* have a single short pair of parameres, unlike the three pairs in *Nesochrysa*, and there is a small median projection at the apex of the subgenitale in females of *Stigmachrysa* which is absent in *Nesochrysa*. Nevertheless, *Stigmachrysa* is probably closely related to *Nesochrysa* since both genera have an apical lobe on the male ectoprocts.

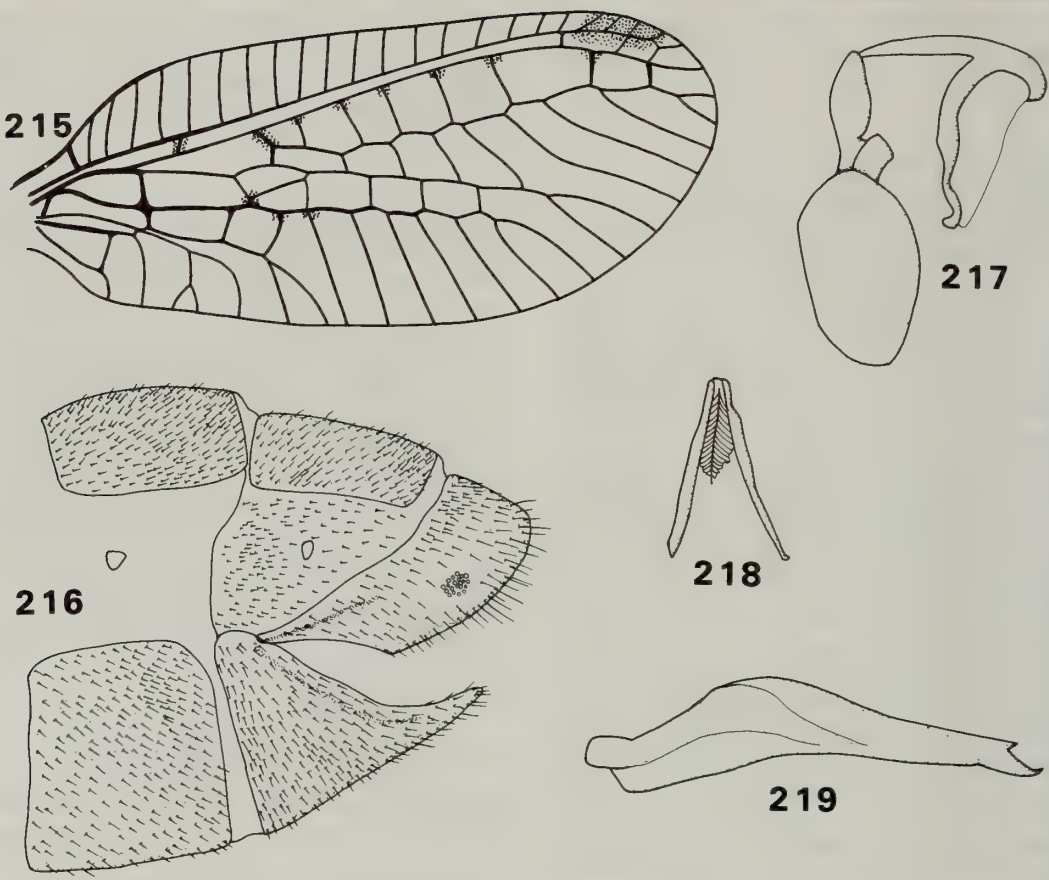
BIOLOGY. Unknown. There were no insect remains in the guts of any adults examined during this study.

Genus *TURNEROCHRYSA* Kimmins

Turnerochrysa Kimmins, 1935: 576. Type species: *Turnerochrysa mirifica* Kimmins, by monotypy.

DISTRIBUTION. Namibia.
Known only from a single species.

DIAGNOSIS. *Adult*. ♀ unknown. Small lacewings, fore wing (Fig. 215) 9–10 mm. Ground colour brown. Head marked with brown stripes on vertex; palps rounded apically; labrum indented; vertex flat; toruli large; head width : eye width = 3.1 : 1, eyes small; antenna about half length of fore wing; flagellar segments about 1.5 times as long as broad; setae arranged in four rows. Pronotum very broad; marked with dark spots; dorsal setae short, dark; meso- and metanotum marked with dark spots. Legs marked with brown annulations on tibia, femora and tarsi; setae short and dark; claws without basal dilation. Fore wing broad (length : breadth = 2.4 : 1); marked with dark shading around some crossveins; costal area narrow at base; costal setae short, inclined; Sc short, stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.56 mm.; *im* broad, quadrangular; Rs straight; gradates absent; veins not crassate in ♂; c_1 1.5 times longer than c_2; c_2 broad, squared apically; posterior marginal crossveins very long. Hind wing very broad (length : breadth = 2.4 : 1); gradates absent. Abdomen (Fig. 216) marked with sparse black spots; setae



Figs 215–219 *Turnerochrysa mirifica*. 215, fore wing (from Kimmins); 216, apex of ♂ abdomen, lateral; 217, ♂ gonarcus complex, lateral; 218, ♂ hypandrium internum, dorsal; 219, ♂ paramere, lateral.

very short, dense (longer on ectoprocts); microtholi present on sternites 3–8; callus cerci ovate; trichobothria 22; ectoprocts with slight dorsal invagination, fused with tergite 9; sternite 8+9 fused, short; apodemes short, narrow, straight; atria large.

GENITALIA ♂ (Figs 217–219). Tignum, gonapsis, median plate and entoprocessus absent; arcessus short, broad with strong median tooth and long, broad lateral projections; pseudopenis absent; gonarcus short, broad, transverse with short median projection; 1 pair of short parameres tapering to apical point with dorsal subapical tooth; gonosaccus very short; gonosetae absent; gonocristae and spinellae absent; hypandrium very large.

Larva. Unknown.

REMARKS. *Turnerochrysa* seems to be a highly derived genus, and may be distinguished from other Belonopterygini by the lack of gradate crossveins and the short, broad wings with a broad posterior margin.

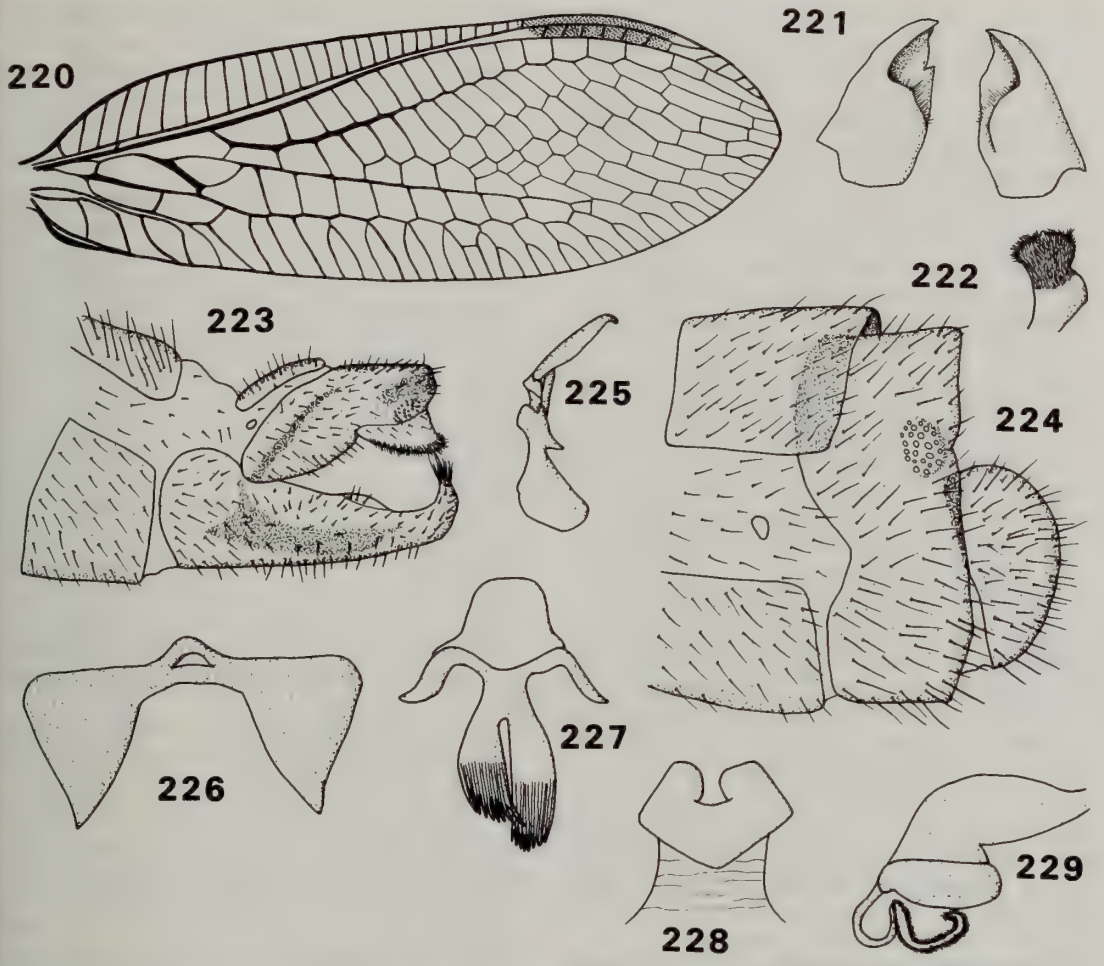
BIOLOGY. Unknown. Insect remains were not present in the adult gut contents examined.

Tribe **CHRYSOPINI** Schneider

Chrysopina Schneider, 1851: 35. Type genus: *Chrysopa* Leach.
Crisopinos Navás, 1910*a*: 59.
Chrysopiscini Navás, 1910*a*: 59. Type genus: *Chrysopisca* Mc Lachlan.
Suarini Navás, 1914*a*: 73. Type genus: *Suarius* Navás.
Chrysopini Navás, 1914*a*: 76.

DISTRIBUTION. World-wide.

DIAGNOSIS. Small to large lacewings, fore wing 9–25 mm; palps tapered apically (Fig. 14); galea broad or narrow; mandibles broad with basal tooth on left mandible (Fig. 18), sometimes tooth also present on right mandible, exceptionally mandibles scythe-like with or without basal tooth on left mandible; toruli small; head width : eye



Figs 220–229 *Anomalochrysa*. 220, 223–229, *A. hepatica*; 221, 222, *A. maclachlani*. 220, fore wing (from Kimmins); 221, mandibles, dorsal; 222, galea, dorsal; 223, apex of ♂ abdomen, lateral; 224, apex of ♀ abdomen, lateral; 225, ♂ gonarcus complex, lateral; 226, ♂ tignum, dorsal; 227, ♂ gonapsis, ventral; 228, ♀ subgenitale, caudal; 229, ♀ spermatheca, lateral.

width = 1.9–4.9 : 1; flagellar segments 2–3 times as long as broad; basal Sc crossvein in fore wing 0.16–0.52 mm; *im* ovate, rarely quadrangular; Psm curved posteriorly at junction with outer gradate series; c_1 shorter than c_2; abdominal setae long, sparse; ♂: gonarcus arcuate; arcessus narrow, tapering apically; pseudopenis, tignum and gonapsis sometimes present; gonosetae present; ♀: praegenitale absent; spermatheca narrow.

REMARKS. This is not only the largest tribe in the subfamily Chrysopinae but is also the largest in the family, comprising 31 genera. The cladistic analysis suggested that the tribe is not monophyletic, and it seems that further study may be needed to determine the generic relationships within this group, which is here retained as a tribe for convenience. Broadly speaking the Chrysopini corresponds to early authors' concepts of the genus *Chrysopa*.

Nearly all the species of any economic importance are to be found in the Chrysopini, and for this reason the biologies of the genera in this tribe are the best known in the family.

Genus ***ANOMALOCHRYSA*** McLachlan

Anomalochrysa McLachlan, 1883: 298. Type species: *A. hepatica* McLachlan, by subsequent designation by Zimmerman, 1957: 95.

DISTRIBUTION. Hawaiian Islands.

The genus includes 22 species and subspecies all of which are endemic to the Hawaiian Islands. Nine species are confined to the island of Hawaii,

the other major islands each have two endemic species and the remaining five are distributed more widely throughout the archipelago.

DIAGNOSIS. Adult. Medium to large lacewings, fore wing (Fig. 220) 13–20 mm. In life usually coloured green but some species are bright purple or red/brown; head usually marked with black or red stripes on frons, gena, between antennae or on vertex; palps tapered; galea broad (Fig. 222); labrum straight or indented; mandibles broad, asymmetrical with tooth on left mandible (Fig. 221); vertex raised; head broad (head width : eye width = 2.5–3.1 : 1); antenna shorter than fore wing; antennae widely separated at base; flagellar segments about three times as long as wide, with four rings of setae. Pronotum unmarked or with bright yellow median stripe, with long or short dark setae; meso- and metanotum unmarked. Legs usually unmarked, with short dark setae; claws with basal dilation. Fore wing unmarked or with brown suffusion; costal area narrow at base; costal setae short, inclined; Sc and R widely separated; basal Sc crossvein 0.28–0.36 mm.; m_2 very long; *im* broad, ovate; basal fork of M (at base of *im*) acutely angled, thickened; Rs straight or slightly sinuous; gradates in three or more parallel rows, basal inner gradate not meeting Psm; veins sometimes crassate in ♂; c_1 usually longer than or same length as c_2; *dcc* often closed at wing margin; posterior marginal crossveins forked in basal half of fore wing. Hind wing narrow (length : breadth = 3.4–4.0 : 1), with three or more series of gradates. Abdomen (Figs 223, 224) with setae long, sparse; 16–35 trichobothria; ectoproct and tergite 9 fused; ♂: setae on tergites sometimes very long, dense, projecting basally; callus cerci very small, ovate; ectoprocts narrow, flattened caudally, fused dorsally, with apical lobe bearing short, dense setae; sternite 8+9 fused, upturned apically or projecting beyond apex of ectoprocts, often with rounded mid-dorsal swelling; apex of abdomen 'gaping' (ectoprocts and sternite 8+9 widely separated), tergite 7 very small; microtholi absent; ♀: callus cerci rounded, small; sternite 7 straight apically.

GENITALIA ♂ (Figs 225–227). Tignum straight with median projection; gonapsis broad, cross-shaped; median plate absent; gonarcus long, narrow with short lateral lobes; entoprocessus absent; arcessus long, narrow, tapering apically; pseudopenis absent; gonosaccus small, flat; gonosetae absent but numerous microsetae present.

GENITALIA ♀ (Figs 228–229). Subgenitale bilobed apically, sometimes on sclerotized plate; praegenitale absent; spermatheca narrow; ventral impression absent or minute; vela large; duct long.

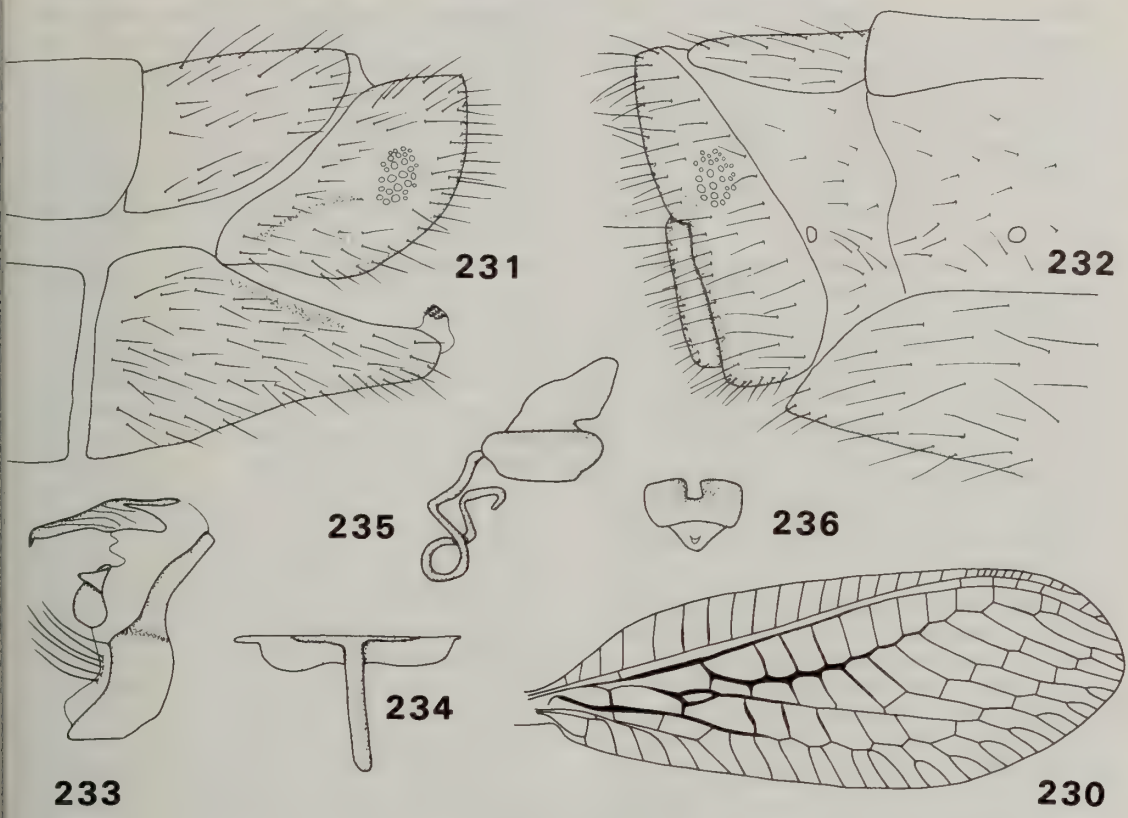
Larva. Abdomen slender, fusiform, not humped. Thoracic tubercles small, spherical, bearing a few short, unhooked setae; abdominal segments 2–8 with small lateral tubercles; setae few, short, unhooked apically; debris absent. (Description based on New, 1986*b*.)

REMARKS. Kuwayama (1962) synonymized *Bornia* Navás and *Chrysopidia* Navás with *Anomalochrysa* because they all possessed more than two series of gradate crossveins. However, it is now apparent that this character has arisen many times in the Chrysopidae and does not necessarily indicate a close relationship between the genera in which it occurs.

Anomalochrysa can be distinguished from most genera of Chrysopidae by the presence of at least three series of gradates in the fore and hind wing. The genus is endemic to the Hawaiian Islands and is the only one to have multiple gradate series there. The apex of the male abdomen is also distinctive since it is considerably flattened caudally, with tergite 7 greatly reduced; in addition there is a membranous lobe at the apex of the ectoprocts and sternite 8+9 is hooked apically.

Although species of *Anomalochrysa* possess many derived characters and so are very distinctive, the genus seems to be most closely related to *Mallada* Navás, and in particular to the *boninensis*-group of species. Like *Mallada* but unlike most other chrysopine genera, males of *Anomalochrysa* possess both a tignum and gonapsis. The gonapsis is broad with a narrow, but deep, apical invagination and a short, narrow, median transverse bar. Morphologically, this is very similar to the gonapsis of *M. boninensis* (Okamoto) but dissimilar to the gonapsis of any other chrysopid and it is unlikely that this form of gonapsis would have evolved independently more than once in the family. Another character linking *Anomalochrysa* with the *boninensis*-group is the mid-lateral lobe on sternite 8+9 (Fig. 396). *M. boninensis* (Okamoto) and *M. basalis* (Walker) are both widely distributed throughout the Oriental and Pacific regions; indeed *M. basalis* currently occurs on the Hawaiian Islands, and it is possible that the species of *Anomalochrysa* originally arose from a population of *M. basalis* which became isolated on the Hawaiian Islands.

BIOLOGY. Zimmermann (1957) stated that all the species are confined to the forests. Eggs are not stalked and are laid singly or in small groups. Larvae do not carry debris (Terry, 1905; Perkins, 1913) and are marked bright pink, red, yellow and green. The cocoons are egg-shaped and quite hard. Larvae feed on sugarcane aphids, the



Figs 230–236 *Apertochrysa*. 230, *A. madegassa*; 231–236, *A. umbrosa*. 230, fore wing; 231, apex of ♂ abdomen, lateral; 232, apex of ♀ abdomen, lateral; 233, ♂ gonarcus complex, lateral; 234, ♂ gonapsis, ventral; 235, ♀ spermatheca, lateral; 236, ♀ subgenitale, caudal.

sugarcane leafhopper *Perkinsiella saccharicida* Kirkaldy and caterpillars of the geometrid moth genus *Scotorythra*.

Adult gut contents include insect remains.

Genus ***APERTOCHRYSA*** Tjeder

Apertochrysa Tjeder, 1966: 480 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa umbrosa* Navás, by original designation.

Apertochrysa Tjeder; Hölzel, 1973*b*: 341 [as subgenus of *Anisochrysa* Nakahara]. [Raised to genus by Tsukaguchi, 1985: 505.]

DISTRIBUTION. Palaearctic, Palaeotropics.

The genus includes 16 species which are scattered throughout the range with a somewhat discontinuous distribution.

DIAGNOSIS. Adult. Small to medium lacewings, fore wing (Fig. 230) 10–13 mm; ground colour green. Head often marked with red stripe on frons, gena, scape or vertex; palps long, narrow, tapered apically; labrum indented; mandibles broad, asymmetrical with basal tooth on left mandible; galea quite narrow; vertex raised; head width : eye width = 2.1–2.5 : 1); antenna longer or shorter than fore wing; flagellar segments 3 times as long as broad, setae arranged in four rings. Pronotum unmarked or with red lateral stripe; dorsal setae long, pale; meso- and metanotum unmarked or with pale median stripe. Legs unmarked, with setae long and pale or short and dark; claws with or without basal dilation. Fore wing unmarked; costal area narrow at base; costal setae short or long, inclined; pterostigma unmarked; Sc and R widely separated; basal Sc crossvein 0.12–0.24 mm.; *im* narrow, ovate; Rs sinuate; gradates in two parallel series, basal inner gradate not meeting Psm; veins sometimes crassate in ♂; c_1 shorter or equal to c_2. Abdomen (Figs 231, 232) with setae long, sparse; callus cerci ovate, 27–36 trichobothria; ectoprocts fused dorsally; ♂: sternite 8+9 fused, more or less elongate; microtholi absent (but present in large numbers in *A. edwardsi*); ♀: sternite 7 straight apically.

GENITALIA ♂ (Figs 233, 234). Tignum absent; gonapsis small, basically T-shaped; gonarcus long, narrow; median plate absent; entoprocessus with median projection; arcessus narrow, tapering apically, with dorsal striations; pseudopenis absent; gonosaccus long; gonosetae few, short; spinellae absent; gonocristae, when present, positioned in central clump at apex of sternite 8+9.

GENITALIA ♀ (Figs 235, 236). Praegenitale absent; subgenitale bilobed apically, tapering basally; spermatheca narrow; ventral impression deep; vela large; duct long, sinuous.

Larva. Abdomen broadly fusiform, humped; thoracic tubercles long, cylindrical; metanotum with row of dorsal bristles; lateral abdominal tubercles cylindrical; pair of latero-dorsal setae, arising from short projections, on tergites 6 and 7; dorsal abdominal setae hooked apically; debris packet small.

REMARKS. *Apertochrysa* is apparently closely related to *Mallada* from which it is indistinguishable on external characters. However, males of *Apertochrysa* can be distinguished from *Mallada* by the absence of a tignum, and the presence of the T-shaped gonapsis, and digitiform entoprocessus, which are not found in *Mallada*. In females of *Apertochrysa* the subgenitale characteristically tapers basally. The costal setae are longer in *Apertochrysa* than in most species of *Mallada* and in several species the wing veins of males are crassate.

BIOLOGY. In some specimens examined the adult gut contents included traces of insect remains (e.g. setae, lepidopterous scales). New (1981*b*) recorded that adults of *A. edwardsi* (Banks) fed on *Psylla* (Psyllidae) and *Brevicoryne* (Aphididae) in the laboratory.

A. edwardsi is the only species assigned to *Apertochrysa* in which the larva has been described (Boros, 1984). It does not differ in any significant characters from the larvae of *Mallada* species.

Genus *ATLANTOCHRYSA* Hölzel

Atlantochrysa Hölzel, 1970: 48 [as subgenus of *Anisochrysa* Nakahara]. Type species: *Chrysopa atlantica* McLachlan, by original designation. [Raised to genus by Aspöck *et al.*, 1980: 379.]

DISTRIBUTION. Madeira, Canary Islands.

The genus includes three species which are restricted to the eastern Atlantic islands of Madeira and the Canaries.

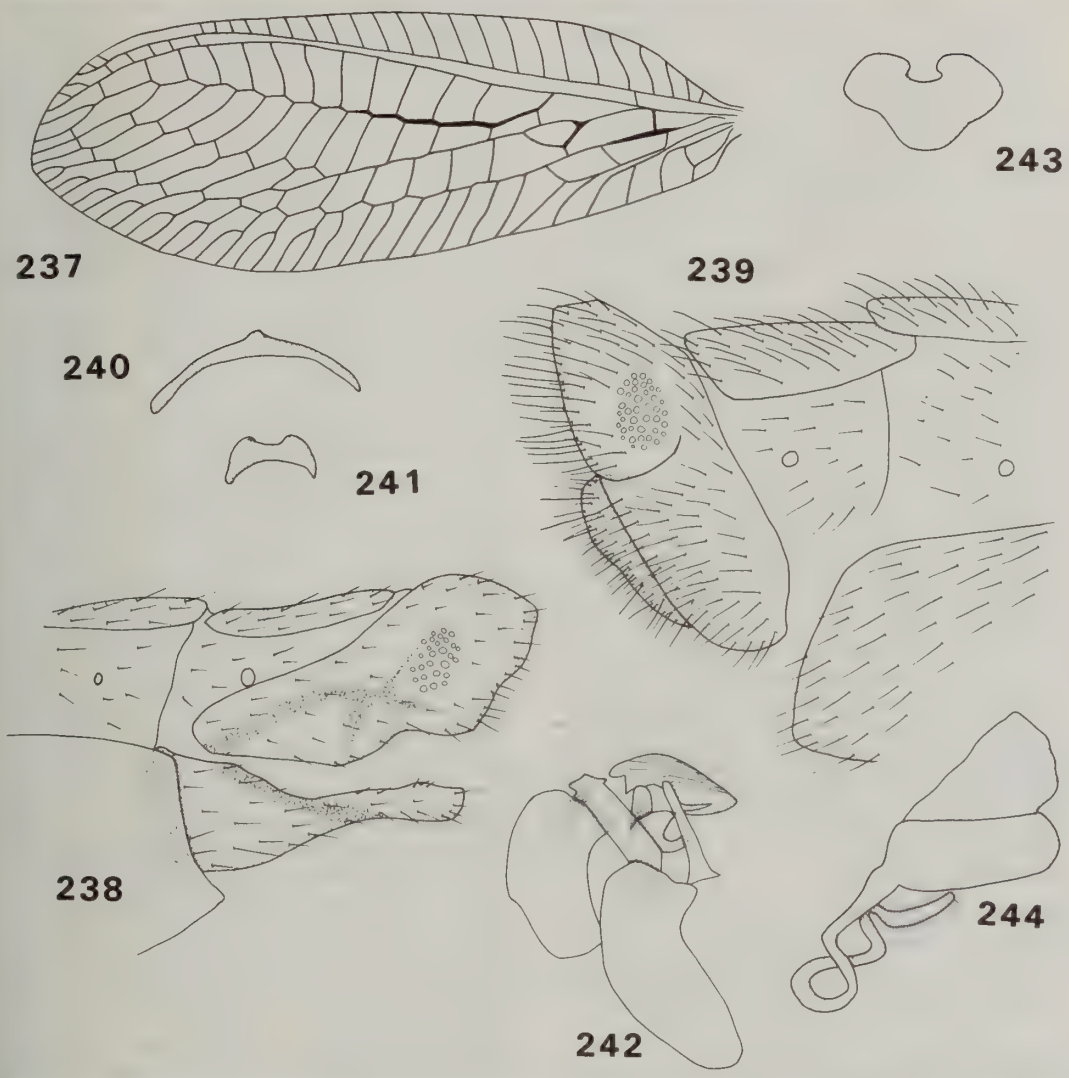
DIAGNOSIS. *Adult*. Medium sized lacewings, fore wing (Fig. 237) 13–16 mm; ground colour olive green. Head marked with stripe on gena and X-shaped mark between the antennae which extends along the front of the vertex and across the frons below the antennae; palps tapered; labrum indented; mandibles broad, asymmetrical, with tooth on left mandible; galea short; vertex raised; head width : eye width = 2.1–2.3 : 1; antenna about same length as fore wing; flagellar segments about twice as long as wide, with setae arranged in four rings. Pronotum marked with narrow, black, transverse stripe; setae long, black; mesonotum marked with black stripes; metanotum unmarked. Legs unmarked; setae short, black; claws with basal dilation. Fore wing membrane unmarked, but with small black spot at base of costa; length : breadth = 2.7–2.9 : 1; costal area narrow at base; costal setae very short, inclined; stigma unmarked; Sc long; Sc and R widely separated; basal Sc crossvein 0.20–0.28 mm; *im* broad, ovate; basal fork of M acute, vein slightly thickened; m_2 long, narrow; Rs slightly sinuate; median radial crossveins sinuate; gradates in two parallel series, basal inner gradate usually meeting Psm; c_1 about same length as c_2. Abdomen (Figs 238, 239) marked with black spot on each tergite; setae long, sparse; callus cerci ovate, trichobothria 32–40; ectoprocts fused dorsally, with slight apical invagination; ♂: microtholi present on sternites; sternite 8+9 fused; ♀: sternite 7 straight apically; short apical suture between tergite 9 and ectoproct.

GENITALIA ♂ (Figs 240–242). Tignum arcuate with short, median process; gonapsis short, broad arcuate; gonarcus long, arcuate; median plate absent; entoprocessus narrow, elongate; arcessus broad, with apical tooth and dorsal striations; additional hooked structure positioned below arcessus, deeply bifurcate basally; gonosaccus with few short gonosetae; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 243, 244). Praegenitale absent; subgenitale bilobed apically, tapering and slightly extended basally; spermatheca narrow; ventral impression moderate; vela moderate; duct long, coiled.

Larva. Abdomen broadly fusiform; thoracic tubercles small, spherical with short setae; abdominal latero-dorsal tubercles absent; dorsal setae short, sparse; no debris carried.

REMARKS. When Hölzel (1970) described *Atlantochrysa* he stated that it could be distinguished from *Mallada* Navás because it lacked a gonapsis. However, it is now apparent that a small gonapsis is, in fact, present. Nevertheless, males of *Atlantochrysa* may be distinguished from *Mallada*



Figs 237–244 *Atlantochrysa atlantica*. 237, fore wing; 238, apex of ♂ abdomen, lateral; 239, apex of ♀ abdomen, lateral; 240, ♂ tignum, dorsal; 241, ♂ gonapsis, ventral; 242, ♂ gonarcus complex, dorso–lateral (right entoprocessus not figured); 243, ♀ subgenitale, ventral; 244, ♀ spermatheca, lateral.

by the presence of a hooked structure positioned below the arcessus which is never found in *Mallada* and which rarely occurs in other chrysopid genera. In addition, the basal inner gradate meets Psm, the radial crossveins are sinuate and the adult gut contents were found to include insect remains; no species of *Mallada* has yet been found to be carnivorous. The larval morphology of *Atlantochrysa* also differs considerably from that of *Mallada* since the larvae of *Mallada* are debris carriers and so have long, hooked setae and cylindrical thoracic tubercles whereas the larvae of *Atlantochrysa*, which do not carry debris, have short setae and short, spherical tubercles.

Mallada, *Atlantochrysa* and *Anomalochrysa* McLachlan are the only genera in the Chrysopidae in which males have both a tignum and a gonapsis. However, this does not necessarily indicate a close relationship between the genera since this is probably the plesiomorphic character state for the Chrysopini. There are at least 16 genera in the Chrysopini in which males have either a gonapsis or tignum and it is highly unlikely that these structures have arisen independently on several occasions. The tignum, in particular, has a very similar morphology in all the genera in which it occurs, lending weight to the hypothesis that it only arose once in the Chrysopidae. The probable

explanation is that one or other of these structures has been lost on different occasions and that their absence is a derived state.

Atlantochrysa may be closely related to *Cunctochrysa* Hölzel since they share several apomorphic characters. In males of both genera there is a hooked structure positioned below the arcessus, there are dorsal striations on the arcessus, and microtholi are present on the sternites. However, the tignum and gonapsis are absent in *Cunctochrysa*, which is probably the derived state, thus establishing that it is a distinct genus. *Meleoma* species and *Plesiochrysa ramburi* also possess an additional hooked structure below the arcessus or pseudopenis, which suggests that these taxa may also be related to *Atlantochrysa* and *Cunctochrysa*.

It is possible that '*Anisochrysa*' *oblonga* Hölzel, described from Nepal, should be included in *Atlantochrysa* on the basis of the male genitalia which, in addition to possessing a tignum, gonapsis and dorsal striations on the arcessus, also have narrow, elongate entoprocessus and a hooked structure below the arcessus. However, the species does differ in several ways from the description given for *Atlantochrysa* above. In *A. oblonga* the claws are undilated basally; the basal fork of M is oblique and the vein is not thickened; the radial crossveins are straight; the fore wing is narrow (length : breadth = 3.2 : 1); and insect remains were not present in the gut of the one adult male examined.

BIOLOGY. The larva of *A. atlantica* (McLachlan) has been described by Monserrat (1978). The gut contents of adults examined during this study included large quantities of insect remains.

Genus *AUSTROCHRYSA* Esben-Petersen

Austrochrysa Esben-Petersen, 1928: 98. Type species: *Austrochrysa samoana*, by original designation

Scoliochrysa Navás, 1929: 365. Type species: *Scoliochrysa loriana* Navás, by original designation and monotypy. [Synonymized with *Chrysopa* Leach by Banks, 1937: 149.] **Syn. n.**

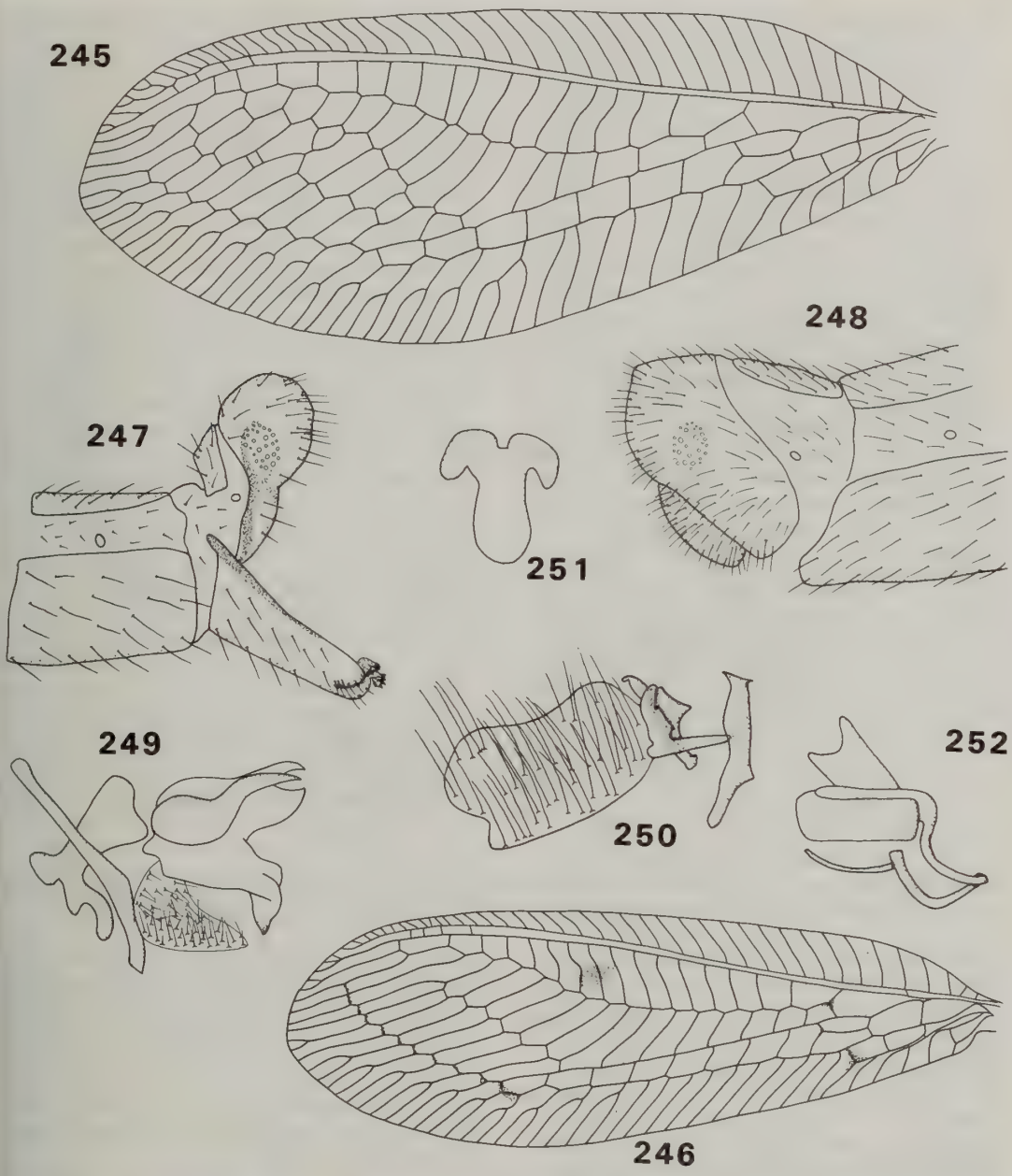
DISTRIBUTION. Oriental, Samoa, Fiji.

Austrochrysa includes seven described species, most of which occur in Indonesia. There is an undescribed species from Assam in the BMNH collections.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Figs 245, 246) 15–18 mm. Head unmarked or with labrum marked brown, scape marked with lateral brown stripe; palps tapered apically; galea broad; labrum invaginated; mandibles broad, symmetrical with basal tooth on both mandibles; vertex slightly raised; head width : eye width = 2.1–2.4 : 1; scape swollen, elongate; antenna considerably longer than fore wing; flagellar segments about 3 times as long as broad; setae arranged in four rings. Pronotum somewhat elongate, marked with pair of reddish brown or black medio-lateral oval spots; dorsal setae very long, pale; mesoprescutum marked with small brown spot; yellow median stripe along entire length of pteronota. Legs unmarked; setae long, pale; claws with strong basal tooth. Fore wing broad (length : breadth = 2.4–2.8 : 1), with pale brown suffusion around most crossveins or black spots on *dcc*, median radial crossveins, base of outer gradates; outer gradates usually black; costal area narrow at base; costal setae long, erect or slightly inclined; pterostigma marked basally with grey spot; Sc long; Sc and R widely separated; basal Sc crossvein 0.2–0.4 mm; median radial crossveins sinuate; *im* long, narrow, quadrangular or ovate; Rs very sinuate; gradates in two or three irregular rows, inner gradates arched; inner basal gradate meeting Psm; anal veins slightly crassate in ♂; c_1 shorter or slightly longer than c_2. Hind wing with gradates or posterior apical margin lightly suffused grey; gradates in two or three series. Abdomen (Figs 247, 248) unmarked; setae long, sparse; ectoprocts with deep apico-dorsal invagination, fused dorsally, fused with tergite 9; atria sometimes enlarged; ♂: callus cerci ovate, large; trichobothria 20–25, large, widely dispersed; abdomen 'gaping' apically (sternite 8+9 and ectoprocts widely separated); ectoprocts pointed apico-dorsally, extended basally to narrow antero-ventral projection; sternite 8+9 fused, deeply excised anteriorly, invaginated apically; microtholi absent; ♀: callus cerci small, rounded; trichobothria 26–32, not widely dispersed; sternite 7 straight apically.

GENITALIA ♂ (Figs 249, 250). Tignum, gonapsis and median plate absent; gonarcus long, narrow, arcuate with small median projection and no lateral expansion; arcessus trilobed apically, sometimes with long, membranous, ventral projection; pseudopenis absent; entoprocessus short, broad, L-shaped; gonosaccus large, circular; gonosetae long, numerous, evenly dispersed; T-shaped sclerite at apex of sternite 8+9 bearing row of prominent black gonocristae, or gonocristae present on subapical tubercle on sternite 8+9; spinellae absent.

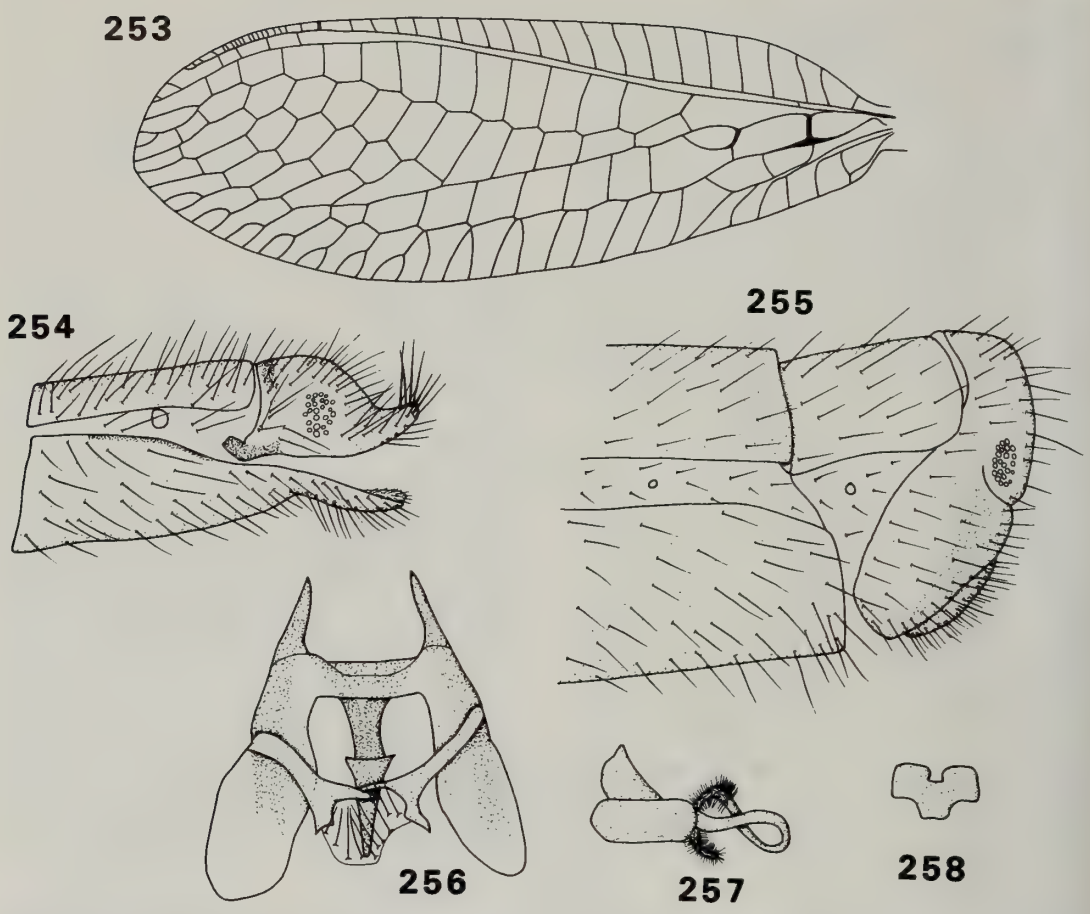
GENITALIA ♀ (Figs 251, 252). Praegenitale absent; subgenitale narrow, bilobed apically, with long basal extension; spermatheca small, narrow; ventral impression shallow or moderate; vela long; duct long, sinuous.



Figs 245–252 *Austrochrysa*. 245, 249, *A. samoana*; 246, 247, 250–252, *A. abnormis*; 248, *A. javanensis*. 245, 246, fore wing; 247, 248, apex of ♂ abdomen, lateral; 249, 250, ♂ genitalia, lateral; 251, ♀ subgenitale, ventral; 252, ♀ spermatheca, lateral.

REMARKS. *Austrochrysa*, which has recently been redescribed by New (1987), may be distinguished by a combination of characters which is rarely found in the Chrysopidae. There is a large mediolateral spot on the pronotum, a basal tooth on both mandibles, elongate scape and long, often quadrangular, intramedian cell. In females there is a basal extension of the subgenitale and in males the apex of the abdomen is 'gaping', there are relatively few, widely dispersed trichobothria, gonocristae are present, the gonarcus is very narrow with no lateral expansion and sternite 8+9 is apically invaginated.

Although there are three series of gradates in *Austrochrysa* and only two in *Scoliochrysa*, the male and female genitalia are so similar that they



Figs 253–258 *Borniochrysa*. 253, 254, 256, *B. winkleri*; 255, 257, 258, *B. squamosa*. 253, fore wing; 254, 255, apex of ♂ abdomen, lateral; 256, ♂ genitalia, dorsal; 257, ♀ spermatheca, lateral; 258, ♀ subgenitale, caudal.

must be regarded as synonymous. Many of the species now included in *Austrochrysa* have, in the past, been regarded as *Leucochrysa* McLachlan (Albarda, 1881; Weele, 1909; Esben-Petersen, 1926; Banks, 1931) because of the quadrangular intramedian cell that occurs in both genera. However, the wing venation and genitalia of *Austrochrysa* and *Leucochrysa* have little in common which suggests that the two genera are only distantly related.

The type of *Austrochrysa samoana* Esben-Petersen has lost its abdomen; however, the specimen is probably male since the anal veins are slightly crassate.

Esben-Petersen (1928) suggested *Austrochrysa* had affinities with *Anomalochysa* McLachlan, because of the three rows of gradates which occur in both genera, and *Nothancyla* Navás which has a quadrangular intramedian cell. However, it is now apparent that any similarities between these genera and *Austrochrysa* are superficial. Multiple series of gradate crossveins and a quadrangular intramedian cell have arisen on several occasions in unrelated genera in the Chrysopidae and the male genitalic compliments are totally different in the three genera.

BIOLOGY. Unknown. No insect remains were included in the gut contents of any adults examined during this study.

Genus *BORNIOCHRYSA* nom. n.

Bornia Navás, 1928: 123. Type species: *Bornia winkleri* Navás, by original designation and monotypy. [Banks, 1931: 381 as synonym of *Chrysopa* Leach; Kuwayama, 1962: 372 as synonym of *Anomalochrysa* McLachlan.] [Homonym of *Bornia* Philippi, 1836: 13.]

DISTRIBUTION. Afrotropics, Oriental, Solomon Is. Five species are included in *Borniochrysa*; one

species is widespread throughout the Afrotropics, the other four occurring in the Oriental region.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 253) 10–15 mm; ground colour pale green. Head with red or black stripe on gena, red lateral stripe on clypeus, or with entire reddish suffusion; palps tapered; labrum invaginated; mandibles broad, asymmetrical with basal tooth on left mandible; vertex slightly raised; head : eye width = 1.6–2.3 : 1; antenna slightly shorter than fore wing; flagellar segments about 3 times as long as broad, with four rings of setae. Pronotum unmarked or with median yellow longitudinal stripe; dorsal setae long or short, pale or dark; meso- and metanotum unmarked or with brown stripe above wing base. Legs unmarked or with black stripe on tibia; setae short, black; claws with basal dilation. Fore wing unmarked or with brown suffusion on crossveins; costal area narrow at base; costal setae long or short, inclined; pterostigma unmarked or with brown basal spot; Sc and R widely separated; basal Sc crossvein 0.12–0.20 mm; *im* quite broad, long, ovate; m_2 broad; Rs sinuate; gradates in two or three parallel or slightly divergent rows; basal inner gradate sometimes meeting Psm; veins not crassate in ♂; c_1 same length as or slightly shorter than c_2. Hind wing with gradates in two parallel rows. Abdomen (Figs 254, 255) unmarked or sternites with brown apical stripe; setae long, sparse; ♂: callus cerci rounded or ovate, trichobothria 22–31; sternite 8+9 fused, elongate, with protruding apical membrane bearing microsetae; ectoprocts with narrow, upturned apical projection, bearing a few stout setae at tip with deep apical invagination, fused only at base dorsally; microtholi present on tergites and sternites or absent; short apodeme situated dorsally on ectoproct; ♀: callus cerci ovate, trichobothria 28–29; ectoprocts with slight dorso-apical invagination, extended ventrally and curving below abdomen; short apical suture usually present between ectoproct and tergite 9; sternite 7 straight apically.

GENITALIA ♂ (Fig. 256). Tignum, gonapsis and median plate absent; gonarcus narrow, long, with dorso-lateral horns; entoprocessus long, T-shaped; arcessus tapering, arrowhead-shaped or trifurcate apically; pseudopenis absent; gonosaccus short; gonosetae long or short, numerous, in lateral clump or at apex of arcessus; hypandrium large, broad; comes absent.

GENITALIA ♀ (Figs 257, 258). Praegenitale absent; subgenitale broad, bilobed apically; spermatheca broad; ventral impression shallow or absent; vela large; duct long, sinuous.

Larva. *B. squamosa* (Tjeder) was reared from larvae collected in Zambia (Brooks, unpublished). The larvae were grey with a fusiform, humped abdomen; cylindrical thoracic tubercles bearing long setae; abdominal setae hooked apically, carrying large packet of debris.

REMARKS. *Borniochrysa* was originally described (Navás, 1928) to include those species that possessed three rows of gradate crossveins in the fore wing but only two rows in the hind wing; a character which also occurs in some species of *Chrysopodes* within the Chrysopini. However, the male genitalia, with elongate ectoprocts bearing stout setae at the apex, dorsal horns on the gonarcus and long entoprocessus which bifurcate apically, are also distinctive. These genitalic characters also occur in *Chrysopa appendiculata* Esben-Petersen and *Chrysopa squamosa* Tjeder which are, therefore, transferred to *Borniochrysa*, although they do not have three rows of gradates in the fore wing.

Kuwayama (1962) synonymized *Borniochrysa* with *Anomalochrysa* because both genera possess more than two rows of gradates; however, multiple rows of gradates appear to have arisen independently in the Chrysopidae several times and since the male genitalia of *Borniochrysa* and *Anomalochrysa* show few similarities the synonymy is unjustified.

BIOLOGY. Unknown.

Genus ***BRINCKOCHRYSA*** Tjeder

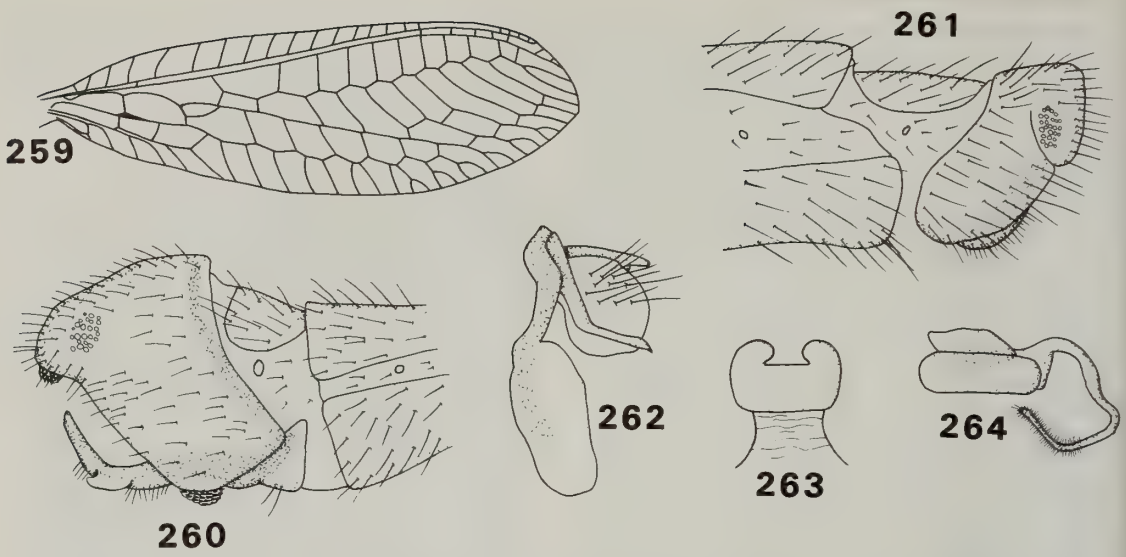
Neda Navás, 1933: 106. Type species: *Neda decaryella* Navás, by original designation. [Homonym of *Neda* Mulsant, 1850: 274.] **Syn. n.**

Brinckochrysa Tjeder, 1966: 360 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa peri* Tjeder, by original designation. [Raised to genus by Hölzel, 1970: 51.]

DISTRIBUTION. Old World.

This wide-ranging Old World genus includes 16 described species with several more undescribed in the BMNH collections. Most of the species are concentrated in the Afrotropics.

DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Fig. 259) 7–15 mm; ground colour bright green. Head marked with red stripes on post-ocular region, vertex and frons; palps tapered apically; labrum indented; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 1.8–2.4 : 1; antenna longer than fore wing; flagellar segments 3 times as long as broad, with



Figs 259–264 *Brinckochrysa*. 259, 261, 263, 264, *B. amseli*; 260, 262, *B. alfieri*. 259, fore wing; 260, apex of ♂ abdomen, lateral; 261, apex of ♀ abdomen, lateral; 262, ♂ genitalia, lateral; 263, ♀ subgenitale, caudal; 264, ♀ spermatheca, lateral.

four rings of setae. Pronotum unmarked or with red lateral stripe; dorsal setae long, pale; meso- and metanotum unmarked or with red spots on scutum. Legs unmarked; setae long, dark or pale; stridulatory structure present on inner surface of hind femur; claws with or without basal dilation. Fore wing very narrow (length : breadth = 3.0–3.8 : 1), pointed apically; unmarked; costal area narrow at base; costal setae short, inclined apically; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.16–0.24 mm; *im* long, narrow, ovate; Rs straight or slightly sinuate; gradates in two parallel series; basal inner gradate not meeting Psm; veins not crassate in ♂; c_1 slightly shorter or longer than c_2. Abdomen (Figs 260, 261) with red dorsal markings; setae long and sparse; callus cerci ovate, trichobothria 23–27; stridulatory structure present laterally on sternite 2; ♂: ectoprocts not fused dorsally, with short, broad apical projection and ventral extension overlapping sternites 8 and 9; sternites 8 and 9 very narrow, not fused, with distinct narrow suture; ventral apodeme (= solimere of Tjeder, 1966) with long apical, toothed hook; ♀: ectoprocts with apical invagination, greatly extended ventrally and curving below abdomen with small gap between apices; apical suture present between tergite 9 and ectoproct; sternite 7 with deep apical indentation.

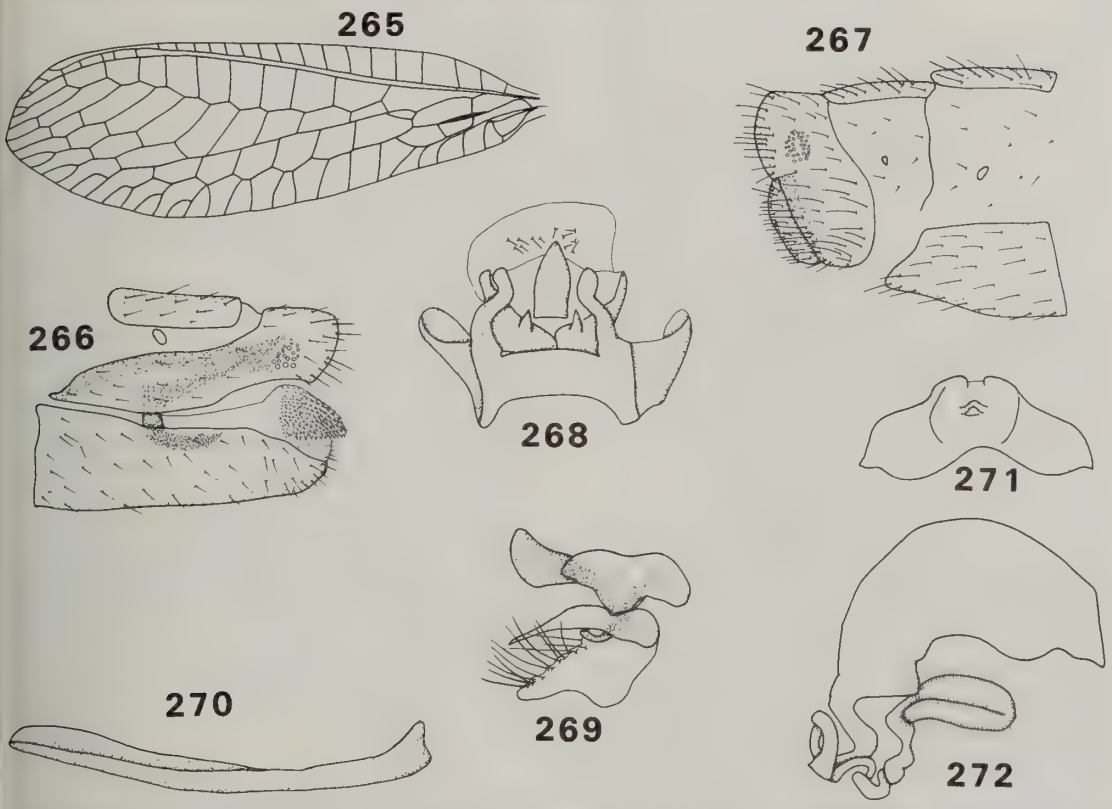
GENITALIA ♂ (Fig. 262). Tignum, gonapsis and median plate absent; gonarcus long, narrow; entoprocessus narrow, sometimes with lateral extension, long or short; arcessus narrow, tapering apically; pseudopenis absent; gonosaccus short; gonosetae few, short in lateral clump; gonocristae present at apical and ventral extremities of ectoprocts and on membrane at apex of sternite 9.

GENITALIA ♀ (Figs 263, 264). Praegenitale absent; subgenitale narrow, bilobed at apex; spermatheca narrow; ventral impression deep; vela long; duct long.

Larva. Abdomen fusiform, flattened; tubercles rudimentary or undeveloped; setae not hooked; row of setae absent from metanotum; debris not carried.

REMARKS. *Brinckochrysa* is the only genus in the Chrysopidae in which a stridulatory structure is present in all species. A stridulatory structure also occurs in a few species of *Meleoma* and in one species of *Chrysocerca* (Brooks, 1987). Males of *Brinckochrysa* can be distinguished by the very narrow sternites 8 and 9 and the overlapping ventral extension of the ectoprocts; females by the marked indentation at the apex of sternite 7. The genus may be related to *Chrysoperla* Steinmann and *Peyerimhoffina* Lacroix which also have narrow wings, a short intramedian cell and widely spaced, sinuous, costal crossveins at the base of the fore wing.

In most *Brinckochrysa* species the fore wing is less than 11 mm but we have seen an undescribed Madagascan species (in the Muséum National d'Histoire Naturelle, Paris) in which the forewing is 15 mm. In females of this species the indentation at the apex of sternite 7 is unusually broad and the apical margins of the sternite are folded outwards



Figs 265–272 *Ceraeochrysa*. 265, *C. albatala*; 266, 268, 270, *C. discolor*; 267, 271, *C. cincta*; 269, *C. cubana*. 265, fore wing; 266, apex of ♂ abdomen, lateral; 267, apex of ♀ abdomen, lateral; 268, 269, ♂ gonarcus complex, dorsal; 270, ♂ gonapsis, lateral; 271, ♀ subgenitale, ventral; 272, ♀ spermatheca, lateral.

so that they project ventrally to form a lobe on either side of the indentation.

BIOLOGY. The eggs and larva of *B. kintoki* (Okamoto) have been described by Tsukaguchi (1979). The eggs are laid singly or in widely spaced groups of 7–14. From their flattened form, it is likely that the larvae conceal themselves in crevices. Adults are attracted to light and can be found resting on the underside of the leaves of *Catalpa bignonioides* Walter. Adams (1959) described the putative larva of *B. scelestes* (Banks) from Palau, Micronesia. His description agrees closely with that given by Tsukaguchi for *kintoki*, and differs from most other known chrysopid larvae, so it seems likely that the larva was correctly assigned to *B. scelestes*.

Genus *CERAEOCHRYSA* Adams

Ceraeochrysa Adams, 1982*b*: 70. Type species: *Chrysopa cincta* Schneider, by original designation.

DISTRIBUTION. Nearctic, Neotropics.

This genus includes 40 described species and, in addition, several undescribed species are present in the BMNH collections. They are widely distributed throughout North and South America and the West Indies. *C. cincta* is widely distributed from Florida to Argentina and the Galapagos Islands. *Ceraeochrysa* is the dominant Neotropical chrysopine genus in numbers of individuals and numbers of species.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 265) 9–15 mm; ground colour pale green. Head unmarked or with red suffusion and red stripe on scape; palps tapered; galea narrow; labrum indented or straight; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 2.3–2.7 : 1; antenna slightly longer than fore wing, sometimes black; flagellar segments about 3 times as long as broad; setae arranged in four rings. Pronotum unmarked or with red lateral stripe; dorsal setae long, pale; micropoculae absent; meso- and metanotum unmarked. Legs unmarked; setae short or long, dark or pale; claws with basal

dilation. Fore wing unmarked but radial crossveins dark; costal area narrow at base; costal setae short, inclined; stigma unmarked, long; Sc and R widely separated; basal Sc crossvein 0.20–0.32 mm; *im* narrow, ovate; Rs slightly sinuate; gradates in two, closely apposed parallel series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter than c_2. Abdomen (Figs 266, 267) unmarked; setae long, sparse; callus cerci ovate, trichobothria 24–33; ectoprocts usually with deep dorso-apical invagination and fused dorsally; ectoprocts fused with tergite 9; ♂: microtholi absent; apodeme of tergite 9 often with strong ventral hook; sternite 8+9 fused, sometimes elongate, dorsally curved; some species with apical elongation of ectoprocts; ♀: sternite 7 straight apically.

GENITALIA ♂ (Figs 268–270). Tignum absent; gonapsis elongate, narrow, bifurcate apically; median plate large with median horns; entoprocessus absent but lateral gonarcus horns often well developed; parameres absent; gonarcus long, narrow often with gonocornua, in *cubana*-species group gonarcus with massive dorsal expansion; arcessus long or short, narrow tapering apically often with median hook and lateral lobes; pseudopenis absent; gonosaccus short; gonosetae absent, few or numerous and long arranged in lateral clump; gonocristae usually present at apex of sternite 8+9; spinellae absent; atria sometimes expanded.

GENITALIA ♀ (Figs 271, 272). Praegenitale absent; subgenitale bilobed, sometimes with small median crumena and mounted on large plate, or pointed basally; spermatheca very small, narrow; ventral impression deep; vela very long; duct long, highly coiled.

Larva. Abdomen broadly fusiform, humped; thoracic tubercles long, slender; metanotum with row of dorsal setae and chalazae; abdominal tubercles broad, short; latero-dorsal abdominal tubercles absent; latero-dorsal chalazae present on segments 6 and 7; setae hooked apically, usually smooth but plumose in *cubana*-group; debris packet very large, obscuring most of body.

REMARKS. Species of *Ceraeochrysa* have no outstandingly distinctive external characters, although members of the genus can often be recognized by the presence of a red lateral stripe on the pronotum or scape and the dark radial crossveins. Males of *Ceraeochrysa* can be distinguished from other chrysopid genera by the straight, elongate gonapsis and horned median plate, and females by the relatively small spermatheca. In addition, species of the *cubana*-group possess a grossly enlarged gonarcus and enlarged atria.

Tjeder (1966) suggested that the genus was related to *Glenochrysa* due to the presence of a gonapsis and enlarged atria in males. However, the presence of a gonapsis in the Chrysopini is plesiomorphic, and enlarged atria have evolved several times in the Chrysopidae; the two genera do not share any other significant characters which might suggest a close relationship. Adams (1982*b*) proposed that there was a relationship between *Ceraeochrysa* and *Leucochrysa* because in both genera the gonarcus has gonocornua, the apex of the arcessus is hooked and has lateral lobes, and the spermathecae are of similar shape. However, it seems unlikely that these genera are closely related since *Ceraeochrysa* is clearly a member of the Chrysopini, and exhibits none of the critical leucochrysine characteristics.

BIOLOGY. Larvae of several species of *Ceraeochrysa* have been described including *C. lineaticornis* Fitch (Smith, 1921; 1926*b*; Muma, 1957), *C. bicarnea* Banks (Smith, 1926*b*), *C. bimaculata* McCloud (Smith, 1922; 1926*b*), *C. cubana* Hagen (Muma, 1959), *C. damiensis* Smith (Smith, 1932) and *C. lateralis* Guérin (Smith, 1921; 1926*b*; Muma, 1957). Adult gut contents do not include insect remains.

Genus ***CERATOCHRYSA*** Tjeder

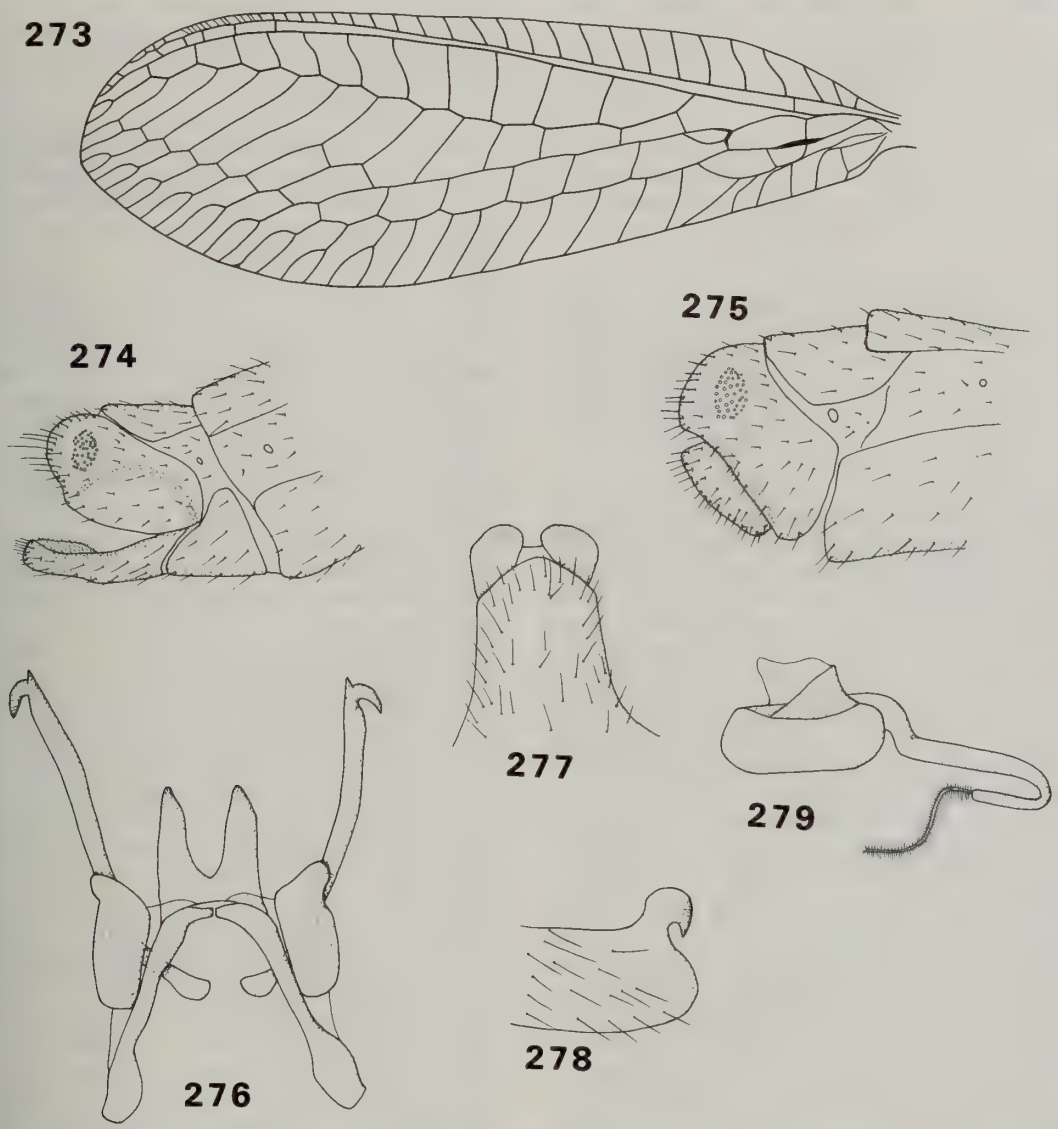
Musola Navás, 1929: 367. Type species: *Musola impar* Navás, by original designation and monotypy. [Homonym of *Musola* Roewer, 1927: 398 (Arachnida).]

Ceratochrysa Tjeder, 1966: 352 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa ceratina* Navás, by original designation. [Raised to genus by Barnard & Brooks, 1984: 361.]

DISTRIBUTION. Afrotropics, Mauritius and Madagascar.

The genus includes three species. *C. antica* (Walker) is widely distributed throughout tropical Africa, *C. ceratina* is restricted to southern Africa and *C. disparilis* (Navás) is known only from Madagascar.

DIAGNOSIS. *Adult*. Large green lacewings, fore wing (Fig. 273) 14–22 mm; ground colour pale green. Head unmarked or marked with red stripe on frons, vertex and scape; palps tapered; labrum deeply emarginated; mandibles broad, asymmetrical with basal tooth on left mandible; galea broad; head width : eye width = 2.1–2.5 : 1; vertex slightly raised; antenna 1.5 times length of fore wing; flagellar segments almost 3 times as long as broad; setae arranged in four rings. Pronotum longer than broad, sometimes with red lateral



Figs 273–279 *Ceratochrysa*. 273–275, 277–279, *C. antica*; 276, *C. ceratina*. 273, fore wing; 274, apex of ♂ abdomen, lateral; 275, apex of ♀ abdomen, lateral; 276, ♂ genitalia, dorsal; 277; ♀ subgenitale, ventral; 278, ♀ subgenitale, lateral; 279, ♀ spermatheca, lateral.

stripe or yellow median stripe; meso- and metanotum unmarked or entirely black. Legs unmarked; setae short, pale; claws with basal dilation. Fore wing narrow (length : breadth = 3.1–3.4 : 1); unmarked but stigma sometimes marked black; costal area narrow at base; costal setae short, inclined; Sc and R well separated; basal Sc crossvein 0.24–0.32 mm; radial crossveins sinuous; *im* ovate, long, narrow; veins sometimes crassate in ♂; gradates in two parallel series, at least twice as many outer gradates than inner, outer gradates black; basal inner gradate meeting Psm; c_1 shorter than c_2. Abdomen (Figs 274, 275) sometimes marked with red lateral spots or yellow median stripe; setae long, sparse; callus cerci ovate, trichobothria 35–45; ectoprocts with deep apical invagination, not fused dorsally, fused with tergite 9; ♂: tergite 9 broad, rounded basally, sternites 8 and 9 not fused; microsetae present throughout all sclerites in some species; microtholi absent; ♀: sternite 7 straight apically, sometimes thickened.

GENITALIA ♂ (Fig. 276). Tignum and gonapsis absent; gonarcus long, narrow with dorsal sail-like

structure; median plate large, bifurcate; entoprocessus extremely elongate with pair of apical teeth; arcessus absent; pseudopenis narrow; gonosaccus with numerous long gonosetae; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 277–279). Praegenitale absent; subgenitale bilobed apically, mounted on large sclerotized plate bearing setae; spermatheca narrow; ventral impression deep; vela small; duct short.

Larva. Abdomen broadly fusiform, moderately humped; thoracic tubercles spherical; row of setae present on meso- and metanotum but chalazae absent; small dorso-lateral tubercles present on abdominal segments 1, 6 and 7; abdominal setae smooth, hooked apically; small packet of debris present.

REMARKS. *Ceratochrysa* can be distinguished from other chrysopid genera by the small number of inner gradates compared with outer ones and, in the male, by the extraordinary length of the entoprocessus, which are usually visible protruding beyond the apex of the abdomen, and the presence of the sail-like structures on the gonarcus. Females are characterized by the sclerotized plate which supports the subgenitale. *Ceratochrysa* is apparently closely related to *Chrysopa* Leach, since males of both genera have a pseudopenis, a broad, basally rounded ectoproct and a persistent suture between sternites 8 and 9. There are also close similarities to *Plesiochrysa* in which, like *Ceratochrysa*, there is a pair of mid-dorsal horns on the gonarcus, microsetae on the abdominal sclerites of males and a dorsal suture between the ectoprocts. These characters are rarely encountered in other chrysopine genera. Other shared characters include a long, narrow prothorax and antennae which are longer than the fore wing. The larva of *Ceratochrysa* is similar in appearance to the putative larva of *C. ramburi* Schneider, which has been described by Adams (1959), further suggesting a relationship between the two genera.

BIOLOGY. The larva of *C. antica* has been described by Barnard & Brooks (1984). It has been found to prey on the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero which was recently introduced into west Africa.

Genus ***CHRYSEMOSA*** **nom. n.**

Mesochrysa Navás, 1936*a*: 169. Type species: *Mesochrysa stigmata* Navás, by original designation and monotypy. [Homonym of *Mesochrysa* Navás, 1927*a*: 55.]

DISTRIBUTION. Afrotropics, Middle East.

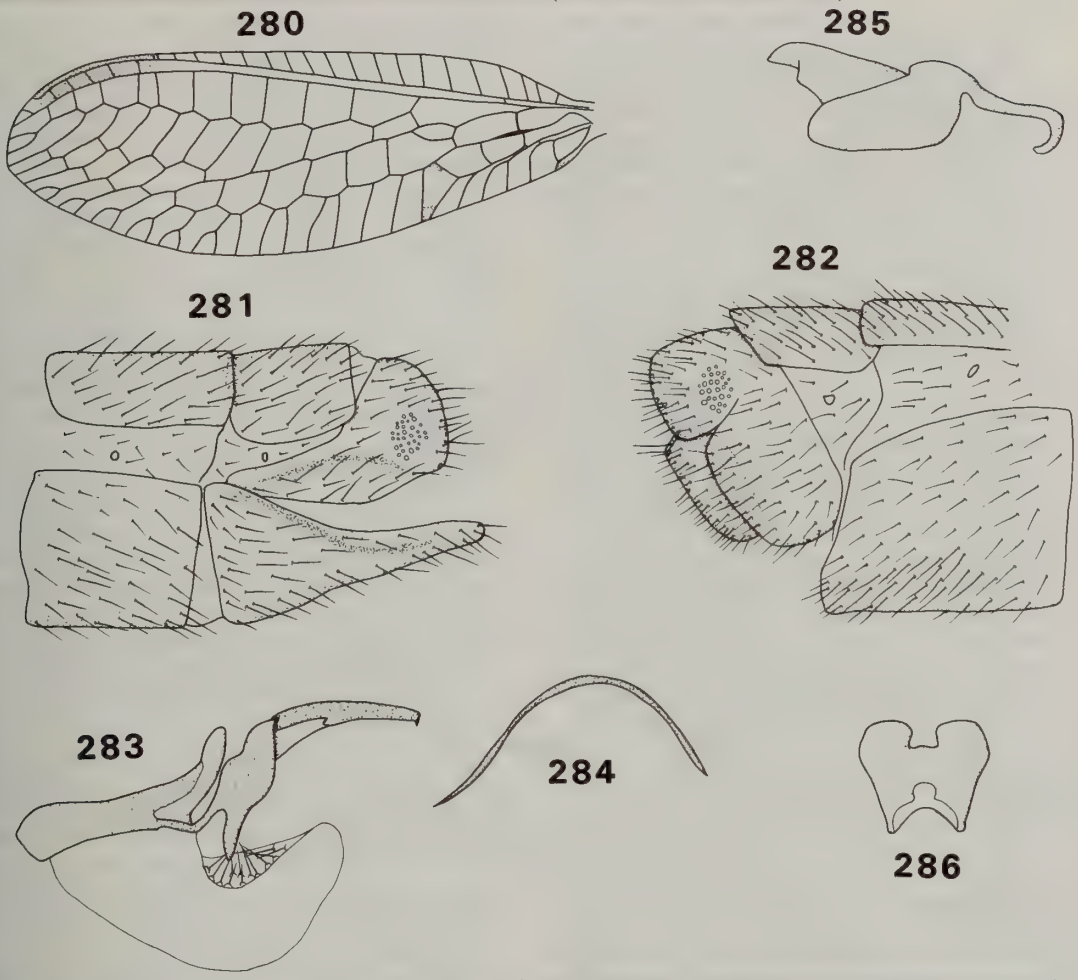
Chrysemosa includes 10 described species: three from the Middle East, the remaining seven from the Afrotropics.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 280) 9–10 mm; ground colour brown or green. Head usually extensively marked with red or dark brown stripes; palps tapered apically; labrum straight apically; vertex raised; head width : eye width = 1.8–1.9 : 1; antenna pale; as long as or slightly longer than fore wing; flagellar segments about 3 times as long as broad; setae short, dark, arranged in four rings. Pronotum marked with broad, brown lateral stripe; dorsal setae short, dark; meso- and metanotum marked with brown lateral stripe. Legs marked with brown annulations on tibia and femora; setae short, dark; 1st tarsal segment elongate in hind leg; claws with basal dilation. Fore wing narrow (length : breadth = 2.9–3.0 : 1); marked with two dark brown spots on *dcc*, sometimes unmarked; costal area narrow at base; costal setae short, inclined; costal cells almost as broad as long; stigma marked with brown spot; Sc long; Sc and R widely separated; basal Sc crossvein 0.16–0.20 mm; *im* narrow, ovate; Rs sinuate; gradates in two parallel series; basal inner gradate not meeting Psm; c_1 about same length as c_2. Hind wing with stigma marked dark brown. Abdomen (Figs 281, 282) with extensive black markings; setae long, sparse; trichobothria 27–29; ectoprocts with broad dorso-apical invagination, separated by wide suture dorsally, fused with tergite 9; ♂: callus cerci ovate; sternite 8+9 fused; ♀: sternite 7 straight apically.

GENITALIA ♂ (Figs 283, 284). Tignum and median plate absent; gonapsis narrow, arcuate; entoprocessus short, fused apically to each other dorso-basally of arcessus; parameres absent; gonarcus long, arcuate, dorsal horns absent; arcessus narrow, tapering apically, bifurcate basally without dorsal striations; pseudopenis absent; gonosaccus small; gonosetae long, numerous; gonocristae, spinellae absent.

GENITALIA ♀ (Figs 285, 286). Praegenitale absent; subgenitale bilobed apically, with V-shaped basal indentation; spermatheca narrow; ventral impression broad, moderately deep; vela moderate; duct long, sinuous.

REMARKS. Most species of *Chrysemosa* can be recognized by the prominent black spot on *dcc* in the fore wing and the broad dorsal suture between the ectoprocts. Males of the genus are characterized by the presence of a gonapsis and the short, apically fused entoprocessus. In females there



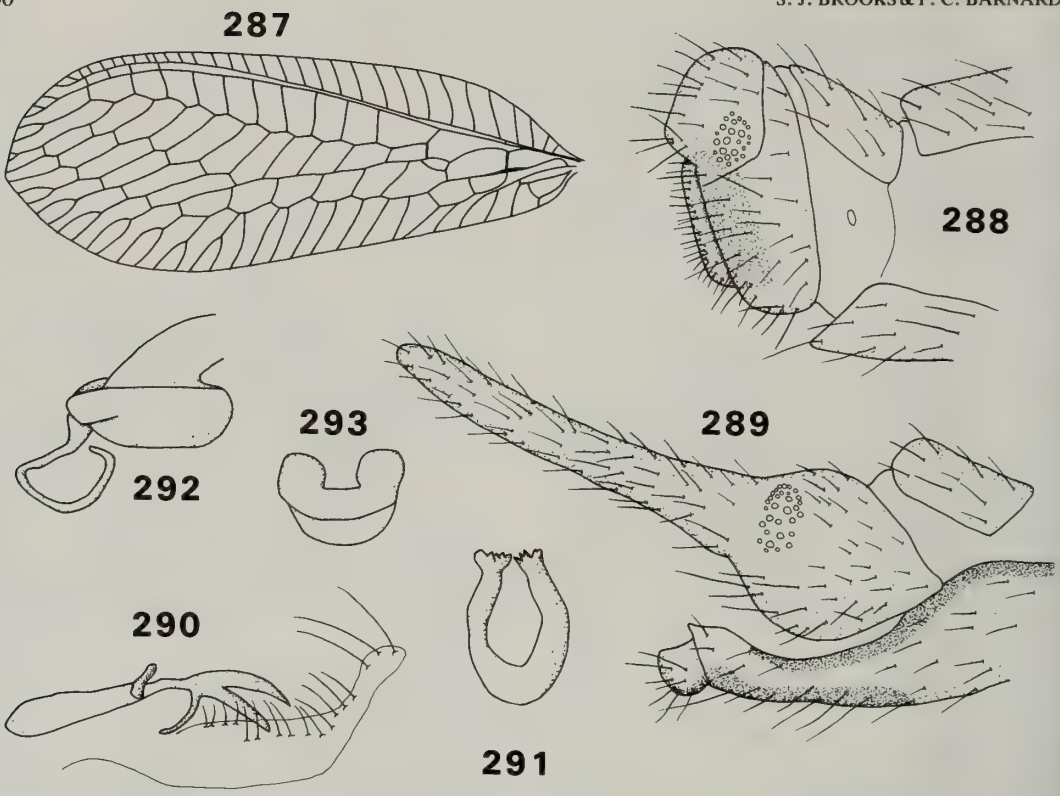
Figs 280–286 *Chrysemosa*. 280, 281, 283, 284, *C. jeanneli*; 282, 285, 286, *C. andresi*. 280, fore wing; 281, apex of ♂ abdomen, lateral; 282, apex of ♀ abdomen, lateral; 283, ♂ gonarcus complex, lateral; 284, ♂ gonapsis, ventral; 285, ♀ spermatheca, lateral; 286, ♀ subgenitale, ventral.

is a V-shaped indentation at the base of the subgenitale.

The species now included in *Chrysemosa* were all previously placed in *Suarius* Navás following Tjeder (1966). Tjeder grouped all the Afrotropical chrysopine species which lacked a tignum and gonapsis in *Suarius*. Although this probably is the apomorphic condition for the Chrysopini, nevertheless, the tignum and gonapsis appear to have been lost independently several times in the tribe and the resulting group appears to be paraphyletic. However, Tjeder recognized that the *jeanneli* group of species (his group c) differed from the rest of *Suarius* because, unlike the other species then included in the genus, the entoprocessus were narrow and fused apically to each other dorsal of the arcessus. He also noted that they each possessed what he referred to as an apical apodeme of sternite 8+9. However, it is more likely that this structure is homologous with a gonapsis since an apodeme does not occur in this position in any other genus of Chrysopidae.

The holotype of *C. stigmata*, the type species of *Chrysemosa*, was deposited in Hamburg Museum but was destroyed during the Second World War (Strümpel, *in litt.*). Nevertheless, from Navás's (1936*a*) description it is possible to deduce that *Chrysemosa stigmata* Navás is referable to the *jeanneli* group of species. *C. stigmata* is a small species, the fore wing is only 9 mm, with only one inner and two outer gradate crossveins. A dark brown mark is described as being situated between the oblique apical branches of the cubitus and the proximal posterior vein (i.e. in *dcc*) in the fore and hind wing and there is also a brown spot at the base of the stigma.

However, Navás included *stigmata* in a new genus because of the unusual form of the



Figs 287–293 *Chrysocerca*. 287, 289, 290, 292, 293, *C. perturbata*; 288, 291, *C.* sp. indet.; 287, fore wing; 288, apex of ♂ abdomen, lateral; 289, apex of ♀ abdomen, lateral; 290, ♂ gonarcus complex, lateral; 291, ♂ gonapsis, ventral; 292, ♀ spermatheca, lateral; 293, ♀ subgenitale, caudal.

intra-median cell, which he compared with *Nesochrysa* Navás. The third median cell was simple without a looping posterior branch, neither ovate nor quadrangular. In all the *jeanneli*-group species that we have examined cell *im* is ovate. Indeed, the form of *im* in *Nesochrysa grandidieri* is unique in the Chrysopidae. Therefore, the condition that Navás described for *Chrysemosa* may be aberrant or restricted to one species (as in *Nesochrysa*) but in any case it is not of generic significance. It therefore seems to be a reasonable supposition to include the *jeanneli* group species in *Chrysemosa*.

BIOLOGY. Unknown. No insect remains were found in the guts of any of the adults examined during this study.

Genus *CHRYSOCERCA* Weele

Chrysocerca Weele, 1909: 75. Type species: *Chrysocerca jacobsoni* Weele, by original designation and monotypy. [Synonymized with *Nineta* Navás by Lacroix, 1924: 571; reinstated by Tjeder, 1966: 345]

Pseudochrysa Okamoto, 1914: 55. Type species: *Pseudochrysa formosana* Okamoto, by monotypy. [Synonymized by Kuwayama, 1966: 137.]

DISTRIBUTION. Uganda, Oriental region.

Five species have been described in *Chrysocerca* and there is a further undescribed species in the BMNH collections. Only one species is known from the Afrotropical region.

DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Fig. 287) 9–13 mm; ground colour pale green. Head unmarked or with red or black markings on gena, clypeus, frons and scape; mandibles broad, symmetrical, with basal tooth on both mandibles; galea broad; palps tapered; labrum indented; vertex raised; head width : eye width = 2.0–2.6 : 1; antenna considerably longer than fore wing; flagellar segments at least 3 times as long as broad. Pronotum unmarked; setae long, pale; mesonotum unmarked or with large red/black spot above wing base; metanotum unmarked. Legs unmarked; setae long, pale; stridulatory structure sometimes present at apex of hind femur; claws with or without basal dilation. Fore wing narrow or broad (length : breadth = 2.5–3.0 : 1); unmarked or with red suffusion at base and

inner gradates with black suffusion; costal area narrow at base; costal setae long erect; stigma unmarked or slightly darkened; Sc and R widely separated; basal Sc crossvein 0.16–0.24 mm; *im* narrow, ovate, short; 1st Psm crossvein apical of *im* oblique; Rs sinuate; gradates in two divergent or parallel rows, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter than c_2. Abdomen (Figs 288, 289) unmarked; setae long, sparse; callus cerci very large, ovate; trichobothria 22–32; ♂: stridulatory structure sometimes present on lateral membrane of 2nd segment; ectoprocts not fused dorsally, produced apically into long cerci; sternite 8+9 fused, usually with median apical projection; tergites and sternites sometimes with microtholi; ♀: ectoprocts with deep apical invagination, not fused dorsally, narrow suture present between ectoprocts and tergite 9; sternite 7 straight apically.

GENITALIA ♂ (Figs 290, 291). Tignum and median plate absent; gonapsis broad, arcuate with apical teeth; gonarcus long, narrow; entoprocessus absent; arcessus with deep pincer-like apical bifurcation; pseudopenis and parameres absent; gonosaccus very long, protruding from apex of abdomen; gonosetae numerous, long, evenly distributed; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 292, 293). Praegenitale absent; subgenitale bilobed apically, tapering basally; spermatheca narrow; ventral impression moderate; vela large; duct short, curved.

REMARKS. Males of *Chrysocerca* can be readily distinguished by the long cerci at the apex of the abdomen, the deeply bifid arcessus and the presence of a broad, arcuate gonapsis with apical teeth. The long antennae, red/black spot on the mesonotum and large callus cerci are also distinctive and are useful for assigning unassociated females to this genus.

Dr S. Tsukaguchi and Dr S. Takagi have kindly provided us with information on the type of *Pseudochrysa formosana* Okamoto which has enabled us to confirm the synonymy of *Pseudochrysa* with *Chrysocerca*.

BIOLOGY. Adults examined in this study did not have insect remains in the gut contents.

Genus *CHRYSOPA* Leach

Chrysopa Leach, 1815: 138. Type species: *Hemerobius perla* L., by subsequent designation by ICZN, 1954: 3.

Aeolops Billberg, 1820: 95. Type species: *Hemerobius chrysops* L., by subsequent designation by Tjeder, 1966: 351. [Synonymized by Tjeder, 1966: 351.]

Emerobius Costa, 1834: 72. Type species: *Hemerobius chrysops* L., by monotypy. **Syn. n.**

Melanops Doumerc, 1861: 192. Type species: *Chrysopa parvula* Doumerc, by monotypy. [Synonymized by Leraut, 1980: 242.]

Chrysopisca McLachlan, 1875: 23. Type species: *Chrysopisca minuta* McLachlan, by monotypy. **Syn. n.**

Cintameva Navás, 1914*c*: 214. Type species: *Cintameva venulosa* Navás, by original designation. [Synonymized by Smith, 1932: 581.]

Minva Navás, 1920*b*: 288. Type species: *Minva punctata* Navás, by original designation and monotypy. **Syn. n.**

Polyphlebia Navás, 1936*b*: 88. Type species: *Polyphlebia punctata* Navás, by original designation and monotypy. **Syn. n.**

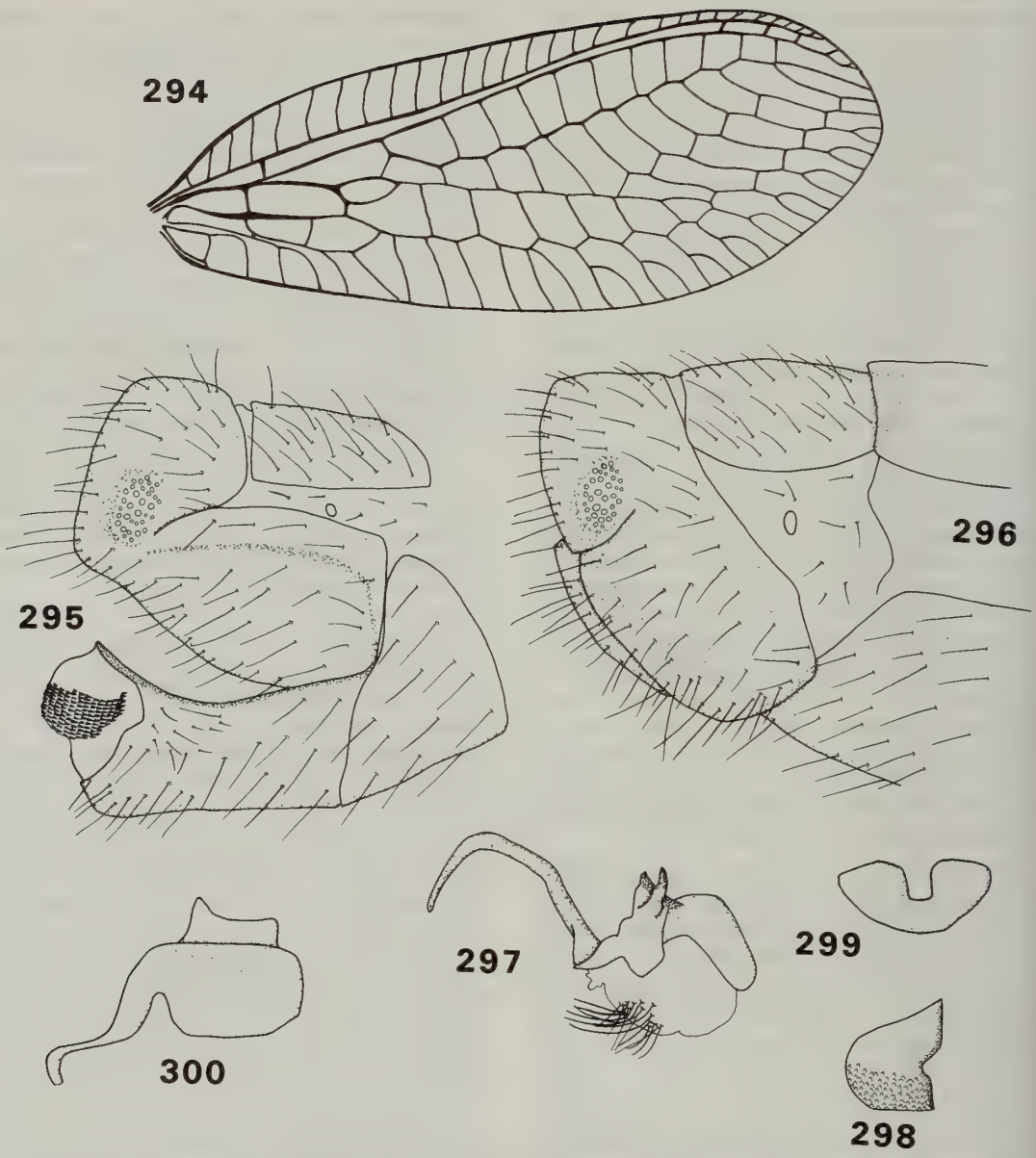
Metachrysopa Steinmann, 1964: 264 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa septempunctata* Wesmael [= *Chrysopa pallens* Rambur], by original designation. [Synonymized by Tjeder, 1966: 351.]

Nigrochrysopa Steinmann, 1964: 264 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa formosa* Brauer, by original designation. [Synonymized by Tjeder, 1966: 351.]

Parachrysopa Séméria, 1983: 310. Type species: *Hemerobius pallens* Rambur, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. Holarctic, including 27 species in the western Palaearctic, 15 species in the eastern Palaearctic and 11 Nearctic species. *C. pallens* is particularly widespread throughout the Palaearctic region.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 294) 9–19 mm. Head usually extensively marked with black spots or stripes; ground colour olive or pale green; palps tapered apically; labrum with deep or slight emargination; mandibles broad, deeply excised, asymmetrical with basal tooth on left mandible; galea short; vertex slightly raised; head width : eye width = 2.6–4.9 : 1, head broad; antenna shorter than fore wing; flagellar segments about twice as long as broad, setae arranged in four rings. Pronotum unmarked or with extensive black markings; dorsal setae usually short, black; meso- and metanotum marked with black spots or unmarked. Legs unmarked; setae usually short, black; claws with or without basal dilation. Fore wing often quite broad (length : breadth = 2.4–3.0 : 1), oval, unmarked; basal costal area narrow; costal setae short, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.20–0.52 mm.; *im* ovate, broad or narrow, occasionally absent; Rs straight or slightly sinuate; gradates in two parallel



Figs 294–300 *Chrysopa*. 294–297, 299, 300, *C. perla*; 298, *C. pallens*. 294, fore wing; 295, apex of ♂ abdomen, lateral; 296, apex of ♀ abdomen, lateral; 297, ♂ genitalia, lateral; 298, ♂ tignum, lateral; 299, ♀ subgenitale, caudal; 300, ♀ spermatheca, lateral.

rows, basal inner gradate usually meeting Psm; veins not crassate in ♂; c_1 slightly longer or shorter than c_2. Abdomen (Figs 295, 296) marked black or unmarked; setae short, coarse, sparse; callus cerci rounded or ovate, trichobothria 23–47; ectoprocts fused dorsally, not completely fused with tergite 9; ♂: ectoprocts with deep dorso-apical invagination; tergite 9 broad, rounded basally; sternites 8 and 9 not fused, widely separated; sternites 2–8 with microtholi; apodeme on tergite 9 arcuate, apodeme on sternites 8 and 9 usually with long, dorsally projecting apical tooth; ♀: sternite 7 straight apically; ectoprocts with slight dorso-apical invagination.

GENITALIA ♂ (Figs 297, 298). Tignum usually absent or small, cylindrical or disc-shaped in some species; gonapsis and median plate absent; entoprocessus broad basally with dorsal horn; arcessus absent; pseudopenis arcuate, tapering apically; gonarcus long, narrow, arcuate, sometimes with pair of short median horns; gonosaccus short, globular, paired; gonosetae very long, numerous,

in lateral clump; gonocristae usually present in large lateral group at apex of sternite 9.

GENITALIA ♀ (Figs 299, 300). Praegenitale absent; subgenitale bilobed apically, sometimes with small median projection; spermatheca broad; ventral impression shallow to moderate, narrow; vela short, duct long or short, sinuous.

Larva. Abdomen fusiform, not humped; thoracic tubercles large, spherical, bearing long setae; row of setae absent from metanotum; setae smooth, not hooked apically; abdominal tubercles spherical; dorso-lateral tubercles present on each abdominal segment; debris absent.

REMARKS. *Chrysopa* is a distinctive genus and can be recognized by several characters. The adults of all species are carnivorous, they generally have broad, oval forewings, the head and thorax are more or less marked black and the eyes are small. In both sexes the ectoproct and tergite 9 are only partially fused and in males sternites 8 and 9 are not fused and the apodeme on tergite 9 is arcuate. In the male genitalia a pseudopenis is present, the gonosetae are very long and arranged in lateral clumps, and the entoprocessus have dorsal horns. *Chrysopa* shares several synapomorphies with *Plesiochrysa* and *Ceratochrysa*, suggesting a close relationship between these genera. The most striking of these are the basally rounded ectoproct and arcuate apodeme in the male, with the presence of a pseudopenis and dorsal horns on the gonarcus. A close relationship with *Nineta* and *Tumeochrysa* is also suggested by the relatively small eyes, and sutures between sternites 8 and 9 and between the ectoprocts and tergite 9.

Electrophoretic studies by Bullini *et al.* (1983) suggested that *C. viridana* Schneider was not closely related to *walkeri* McLachlan, *formosa* Brauer and *dorsalis* Burmeister which were also examined during the study. *C. viridana* also differs morphologically from the latter species. The head is marked only with a black spot on the gena in *viridana* but is extensively marked in the *walkeri*-group. In males of *viridana* the gonocristae are absent but a large clump is present in the *walkeri*-group.

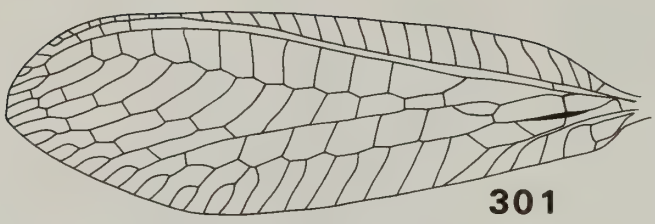
Chrysopisca was described by McLachlan (1875) to include *C. minuta* McLachlan which differed from other species of *Chrysopa* s.l. in that it did not have an intramedian cell. However, this study has revealed that in all other important characters *C. minuta* resembles *Chrysopa* s.str. It could be argued that, on the basis of the absence of *im*, *Chrysopisca* should be retained at least as a subgenus of *Chrysopa*, but examination of the male genitalia of *C. minuta* has shown that this species is merely a small form of *C. sogdianica*. There seems, therefore, to be no justification in recognizing *Chrysopisca* as a valid genus.

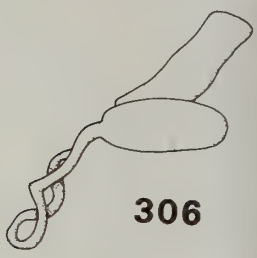
It was not possible to trace the type species of *Minva* Navás but from the original description it is apparent that *M. punctata* Navás is almost certainly a synonym of *C. minuta* and so must also be regarded as a synonym of *Chrysopa*.

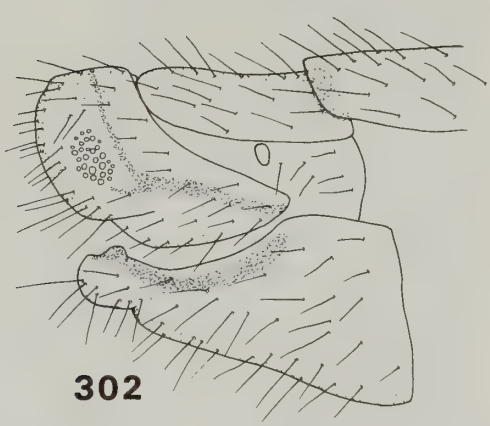
The holotype of the type species of *Polyphlebia*, *P. punctata* Navás, was deposited in Rabat, Morocco but unfortunately we have been unable to examine it. Nevertheless, from Navás's (1936*b*) description it is possible to synonymise the genus with *Chrysopa*. The fore wing of *P. punctata* is broad and rounded apically, *im* ovate and the basal inner gradate meeting Psm. The head is marked with seven black spots, similar to *C. formosa* Brauer, and there is a black lateral stripe on the pronotum, all of which support the synonymy with *Chrysopa*. However, the reason Navás originally described *Polyphlebia* as a new genus was that it possessed an irregular median series of gradate crossveins. We have not seen any *Chrysopa* species with a median row of gradates, but this condition has arisen independently several times in the Chrysopidae and does not appear to have much taxonomic significance. However, this aspect of the wing venation in *Polyphlebia* does resemble *Rexa* and it is possible that the genus should be included with that taxon although the other characters mentioned above do not occur in *Rexa*.

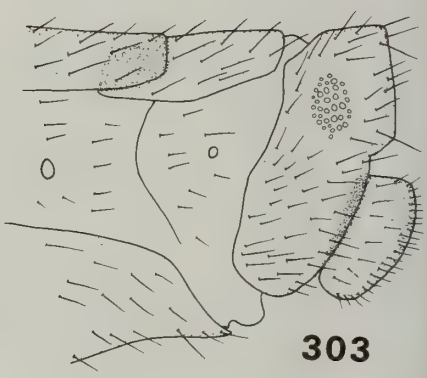
In some species, including *C. pallens* (Rambur) and *C. nigricornis* Burmeister, the wings are long nd relatively narrow and males possess a small tignum. However, this is not sufficient reason to erect a new genus to accommodate these species since such characters are probably plesiomorphic and the species share many apomorphies with *Chrysopa*. Therefore, *Metachrysopa* Steinmann is maintained as a synonym of *Chrysopa*. *Parachrysopa* Séméria is an objective synonym of *Metachrysopa*, because it shares the same type species. Séméria (1983) argued that because the chromosomal complement of *C. pallens* Rambur [= *angustipennis* Stephens] ($2n = 10$) differed from that of the rest of the genus ($2n = 12$), '*pallens*' should have distinct generic status. He used the term 'twin-genus' to indicate the close relationship between the taxa. However, until the chromosomes of more than just a few European genera have been examined it seems premature to erect new taxa based solely on this kind of evidence.

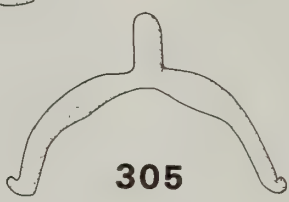
BIOLOGY. The larvae of many species have been described including *C. abbreviata* Curtis (Killington, 1937; Gepp, 1983), *C. chi* Fitch

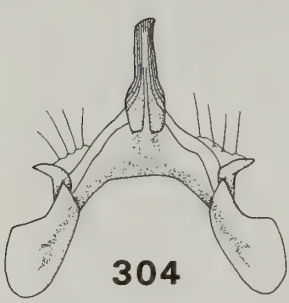


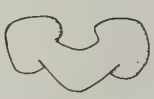












Figs 301–307 *Chrysoperla*. 301, fore wing; 302, apex of ♂ abdomen, lateral; 303, apex of ♀ abdomen, lateral; 304, ♂ gonarcus complex, dorsal; 305, ♂ tignum, dorsal; 306, ♀ spermatheca, lateral; 307, ♀ subgenitale, caudal.

(Smith, 1922), *C. commata* Kis & Ujhelyi (Gepp, 1983), *C. dorsalis* Burmeister (Alderson, 1911*b*; Killington, 1937; Fraser, 1945; Gepp, 1983), *C. flaviceps* Brullé (Monserrat, 1982); *C. formosa* Brauer (Principi, 1947; Gepp, 1983), *C. hungarica* Klapálek (Gepp, 1983); *C. intima* McLachlan (Tsukaguchi, 1978), *C. majuscula* Banks (Clancy, 1946), *C. nigra* Okamoto (Tsukaguchi, 1978), *C. nigricornis* Burmeister (Clancy, 1946; Toschi, 1965; Tauber & Tauber, 1972), *C. nigricostata* Brauer (Brauer, 1850; Gepp, 1983), *C. oculata* Say (Smith, 1921), *C. perla* L. (Killington, 1937; Canard, 1971; 1973; 1976; Gepp, 1983), *C. phyllochroma* Wesmael (Killington, 1937; Gepp, 1983), *C. quadripunctata* Burmeister (Smith, 1921; 1922; Toschi, 1965), *C. pallens* (Rambur) (Killington, 1937; Principi, 1940; Gepp, 1983), *C. viridana* Schneider (Principi, 1954; Gepp, 1983) and *C. walkeri* McLachlan (Gepp, 1983).

The gut contents of adults examined during this study included large quantities of insect remains.

Genus ***CHRYSOPERLA*** Steinmann

Chrysoperla Steinmann, 1964: 260 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa carnea* Stephens by original designation. [As subgenus of *Anisochrysa* Nakahara by Hölzel, 1970: 51; raised to genus by Séméria, 1977: 238.]

DISTRIBUTION. World-wide.

This large genus is distributed throughout the world with 12 species in the Afrotropics, 3 species in Madagascar, 7 species in the western Palaearctic, 5 species in the eastern Palaearctic, 5 Oriental and Indian species, 5 Australian species, 5 species in the Nearctic and 8 in the Neotropics. The genus includes several particularly common species, especially *C. carnea* (Stephens) in the Palaearctic, *C. plorabunda* (Fitch) in the Nearctic, *C. congrua* (Walker) in the Afrotropics, and *C. externa* (Hagen) in the Neotropics.

DIAGNOSIS. *Adult*. Medium lacewings, fore wing (Fig. 301) 9–14 mm; ground colour pale green. Head unmarked or with red and sometimes brown stripes on gena, clypeus, frons and vertex; palps tapered; labrum indented; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 1.9–2.8 : 1; antenna longer or shorter than fore wing; flagellar segments 2–3 times as long as broad; setae in four rings. Pronotum with yellow median stripe or red lateral spots; dorsal setae long, pale or short, dark; meso- and metanotum with yellow median stripe or unmarked. Legs unmarked; setae long or short, pale or dark; claws with or without basal dilation. Fore wing narrow (length : breadth = 2.9–3.8 : 1); unmarked; costal area narrow at base; costal setae short, inclined or infrequently long, erect; basal costal crossveins sinuous; stigma unmarked; Sc and R well separated; basal Sc crossvein 0.12–0.20 mm; *im* narrow, ovate; 1st Rs crossvein usually meeting Psm well distad of apex of *im*; Rs sinuous; gradates in two parallel series, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 usually shorter than c_2; c_2 broad, rounded apically; posterior marginal crossveins parallel. Hind wing narrow (length : breadth = 2.9–3.7 : 1). Abdomen (Figs 302, 303) unmarked or with median yellow stripe; setae long, sparse; callus cerci narrowly ovate, trichobothria 23–34; ectoprocts with slight apical invagination; ♂: sternite 8+9 fused, with apical lip; microtholi absent; ♀: apex of sternite 7 straight.

GENITALIA ♂ (Figs 304, 305). Tignum arcuate; gonapsis and median plate absent; entoprocessus absent or very short; arcessus narrow, tapering and often recurved apically; pseudopenis absent; gonarcus long, narrow and arcuate; gonosaccus short; gonosetae long, few, in lateral clump; spinellae present or absent.

GENITALIA ♀ (Figs 306, 307). Praegenitale absent; subgenitale bilobed apically, slightly extended basally; spermatheca narrow; ventral impression shallow or deep; vela long or short; duct long or short, sinuous.

Larva. Abdomen narrow, fusiform, not humped; thoracic and abdominal tubercles small, spherical; setae short, smooth, not hooked apically; transverse row of metanotal setae absent; latero-dorsal chalazae, bearing single seta, present but indistinct; debris not carried.

REMARKS. *Chrysoperla* may be distinguished from other Chrysopini genera by the narrow fore and hind wings with short, inclined costal setae and short *im*. However, in *C. nyerina* (Navás) the wings are broad, costal setae long and erect, and *im* long. In the male genitalia of all species a tignum is present but gonapsis absent and there is usually a distinct lip at the apex of sternite 8+9. However, a few species, including *C. satilota* (Banks) and *C. krakatauensis* Tsukaguchi from Australia and the Oriental region, appear to form a discrete species group in which the apex of the abdomen is 'gaping', the ectoproct and tergite 9 are caudally compressed, the callus cerci very narrow, there is no apical lip on sternite 8+9 but a lateral lobe is present, the gonarcus is short, and there is a broad wing-shaped plate, fused to the apodemes, at the apex of sternite 8+9. The morphology of the apical abdominal segments in these species is therefore similar to that of the *Mallada boninensis*-group and may indicate a close relationship, since such structures do not occur elsewhere in the Chrysopidae. The apical plate in sternite 8+9 of the *satilota*-group may be homologous with the gonapsis.

Chrysoperla is the only genus in the Chrysopidae in which spinellae occur. These structures appear to be modified microsetae which are distributed ventrally on the gonosaccus of some species. In *C. insulata* (Fraser), from Réunion, the tignum is absent in males. However, the apex of sternite 8+9 is lipped and there are spinellae on the gonosaccus, which are autapomorphic characters for *Chrysoperla*, so inclusion of this species in the genus is justified.

Chrysoperla and *Peyerimhoffina* are probably closely related since in both genera the wings are unusually narrow, the basal costal crossveins are sinuous and the posterior marginal crossveins are parallel. In most chrysopid genera the basal costal crossveins are straight and the posterior marginals are divergent.

BIOLOGY. The larvae of many species of *Chrysoperla* have been described including *C. carnea* (Stephens) (Smith, 1922; Killington, 1937; Neumark, 1952; Putman, 1956; Fleshner & Scriven, 1957; Muma, 1959; Toschi, 1965; Tsukaguchi, 1977; Gepp, 1983), *C. commanche* (Banks) (Tauber, 1974), *C. congrua* (Walker) (Brettell, 1982); *C. downesi* (Smith) (Putman,

1937), *C. externa* (Hagen) (Tauber, 1974), *C. harrisii* (Fitch) (Tauber, 1974; Tauber & Tauber, 1974), *C. interrupta* (Schneider) (Smith, 1921; Muma, 1959), *C. lanata* (Banks) (Ru *et al.*, 1975), *C. pudica* (Navás) (Tjeder, 1966; Brettell, 1982), *C. rufilabris* (Burmeister) (Putman, 1937; 1956; Hydorn & Witcomb, 1972; Tauber, 1974) and *C. zastrowi* (Esben-Petersen) (Barnes, 1975).

The guts of adults examined during this study did not contain insect remains although Smith (1922) recorded adult *C. rufilabris* (Burmeister) feeding on aphids in captivity and there are records of *C. carnea* (V. F. Eastop, pers. comm.) and *C. externa* and *C. asoralis* (E. Nuñez, pers. comm.) feeding on aphids. Adults of several species of *Chrysoperla* are known to hibernate during the winter in temperate regions when they undergo a change from green to brown. *Chrysoperla* is the only chrysopid genus known to diapause in the adult stage of the life-cycle.

Henry (1983) has shown that, by vibrating their abdomens, some morphologically identical populations of *Chrysoperla* produce different substrate-borne calls. These populations will not mate with each other and Henry terms them 'acoustical species.'

Genus ***CHRYSOPIDIA*** Navás

Chrysopidia Navás, 1910*a*: 54. Type species: *Chrysopidia nigrata* Navás, by monotypy. [Synonymized with *Anomalochrysa* McLachlan by Kuwayama, 1962: 372; reinstated by Hölzel, 1971: 57.]

DISTRIBUTION. Eastern Palaearctic.

Fourteen species have been described in this genus.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing 12–17 mm; ground colour pale green. Head unmarked or with red or brown stripes on the scape, gena or vertex; palps tapered apically, marked with black dorsal stripe; labrum straight or indented; mandibles broad, symmetrical or asymmetrical; vertex raised; toruli small; head width : eye width = 1.8–2.8 : 1; scape more or less elongate; antenna often marked red/brown basally; flagellar segments 3 times as long as broad; setae long, pale, arranged in four rings. Pronotum slightly elongate; dorsal setae long, pale. Legs unmarked; setae long, pale; claws basally dilated. Fore wing: costal area narrow at base; costal setae long, slightly inclined or erect; Sc long; Sc and R widely separated; *im* narrow, ovate, often short; Rs straight or sinuous; gradates in two or three parallel or divergent rows; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter than c_2. Hind wing often with black suffusion on apical posterior margin. Abdomen usually unmarked; setae long (especially at apex of ectoprocts), sparse; sternites long, narrow; callus cerci ovate or rounded; ♂: setae at apex of ectoprocts long, coarse; atria grossly enlarged in some species; sternite 8+9 fused, elongate apically; ♀: ectoprocts slightly invaginated dorso-apically.

REMARKS. Species of *Chrysopidia* can be recognized by the presence of an elongate scape and long, slightly inclined costal setae. Males of the genus are characterized by the elongation of sternite 8+9 and the long, coarse apical setae on the ectoprocts.

Subgenus ***ANACHRYSA*** Hölzel

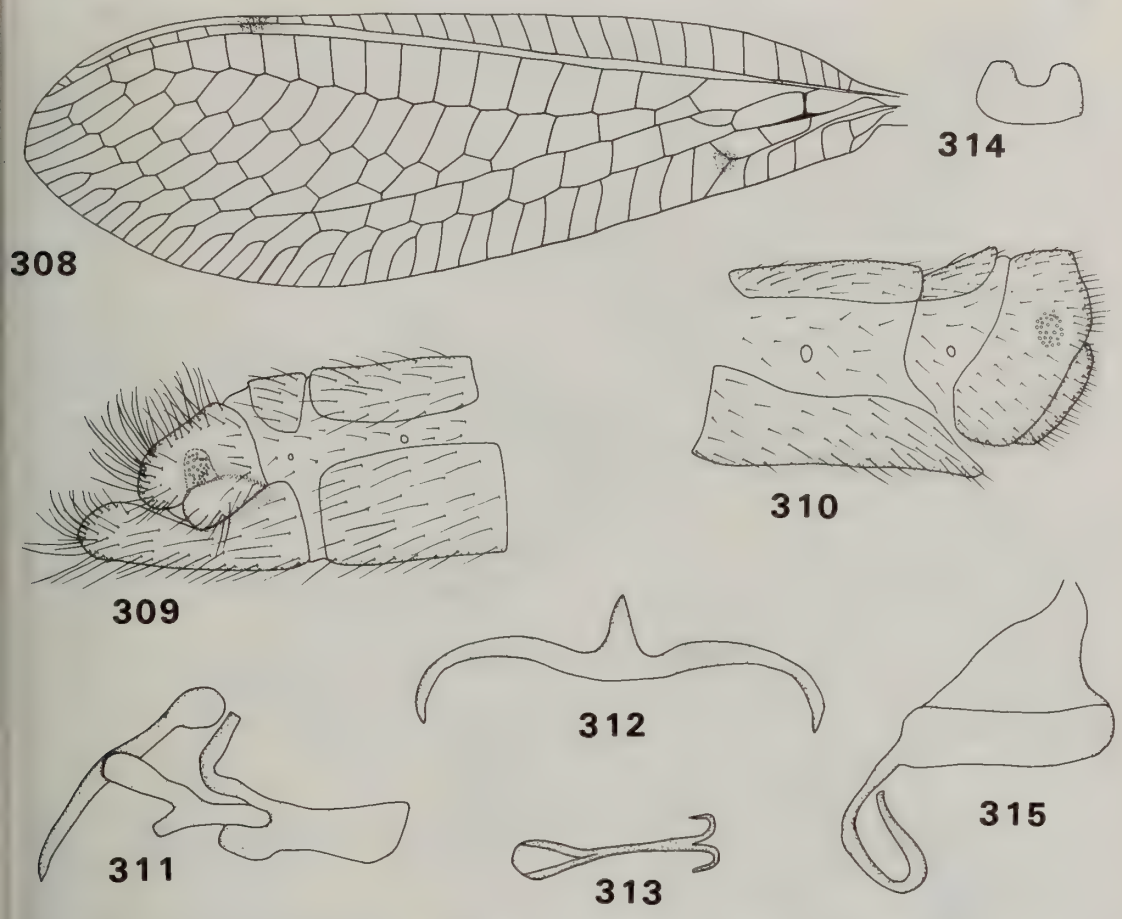
Anachrysa Hölzel, 1973*b*: 356 [as subgenus of *Chrysopidia* Navás]. Type species: *Chrysopidia (Anachrysa) elegans* Hölzel, by original designation.

DISTRIBUTION. Nepal, India (Assam).

There are two described species included in the subgenus.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 308) 15–17 mm. Head marked with dark brown stripe on gena and scape; labrum deeply indented; head width : eye width = 1.8–2.0 : 1; mandibles asymmetrical with small tooth on left mandible; antenna shorter than fore wing. Pronotum with brown medio-lateral spot; meso- and metanotum unmarked. Fore wing rounded apically; marked with brown spot on *dcc*, gradates marked black; costal setae long, inclined apically; pterostigma marked with small basal red-brown spot; basal Sc crossvein 0.32–0.36 mm; radial crossveins not sinuate; Rs straight; gradates in three parallel series; *dcc* open at margin. Hind wing with gradates arranged in three parallel series. Abdomen (Figs 309, 310) with callus cerci rounded; trichobothria 30–32; ♂: ectoprocts deeply invaginated apico-dorsally, not fused dorsally, short apical suture between ectoproct and tergite 9; apodemes long, straight; ♀: sternite 7 pointed apically.

GENITALIA ♂ (Figs 311–313). Weakly sclerotized; tignum narrow, long, slightly curved with short median projection; gonapsis straight, very narrow, hardly sclerotized; median plate absent; entoprocessus short, thorn-shaped, deeply bifurcate apically; parameres absent; gonarcus long, arcuate; arcessus narrow, elongate, tapering apically;



Figs 308–315 *Chrysopidia (Anachrysa)*. 308, 309, 311–313, 315, *C. (A.) elegans*; 310, 314, *C. (A.)* sp. indet. 308, fore wing; 309, apex of ♂ abdomen, lateral; 310, apex of ♀ abdomen, lateral; 311, ♂ gonarcus complex, lateral; 312, ♂ tignum, dorsal; 313, ♂ gonapsis, ventral; 314, ♀ subgenitale, caudal; 315, ♀ spermatheca, lateral.

gonosaccus short, covered in numerous microsetae; gonosetae, gonocristae and spinellae absent. GENITALIA ♀ (Figs 314, 315). Praegenitale absent; subgenitale bilobed; spermatheca narrow; ventral impression very deep; vela large, straight; duct long, sinuous.

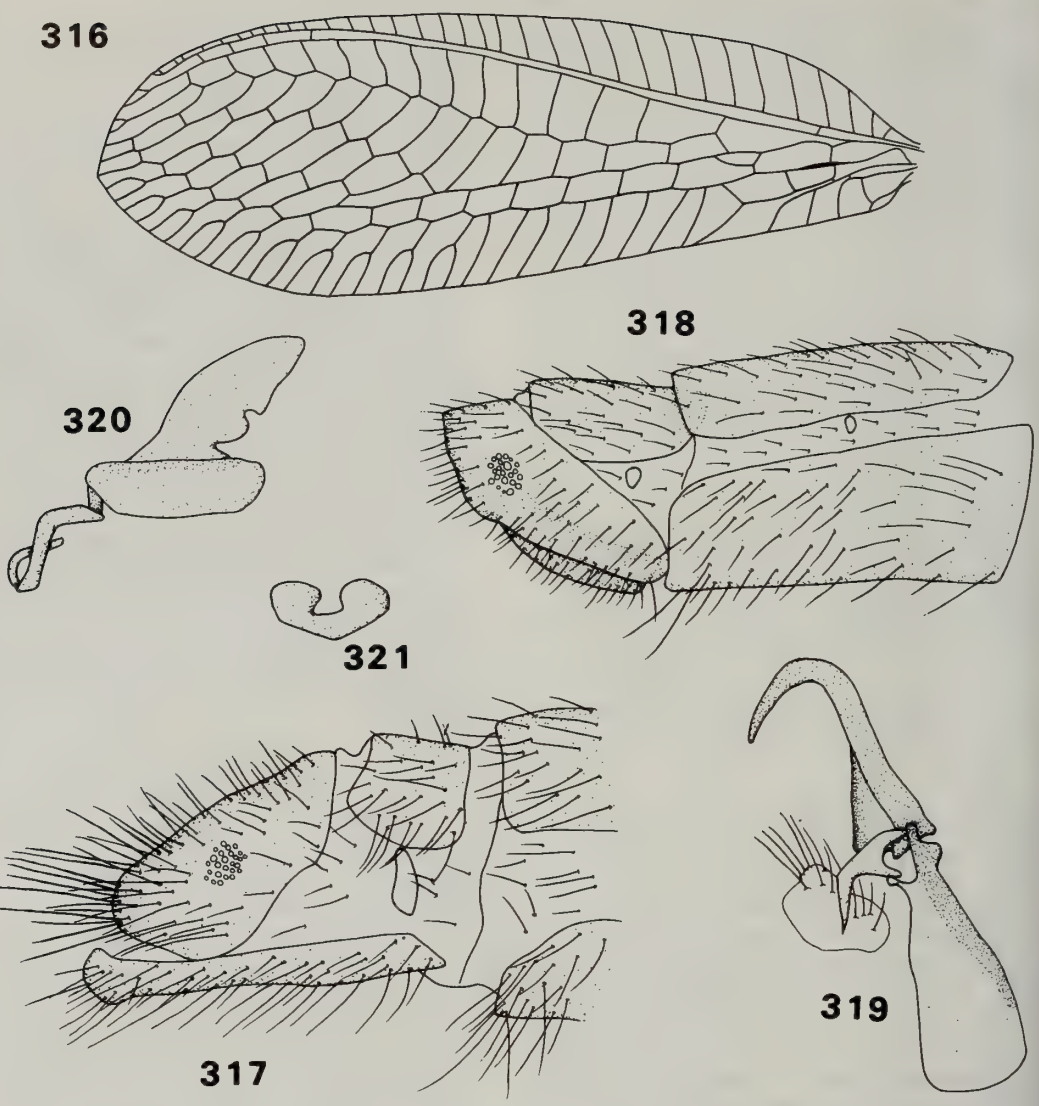
REMARKS. *Anachrysa* can be distinguished from subgenus *Chrysopidia* by the larger eyes, small brown stigmatic spot and straight radial crossveins, which are sinuate in *Chrysopidia* s.str. In males of *Anachrysa*, gonosetae are absent but a tignum and gonapsis are present. In *Chrysopidia* s.str. gonosetae are present but a tignum and gonapsis are lacking.

Despite these differences *Anachrysa* is clearly closely related to *Chrysopidia* because both groups share several synapomorphies such as the setose abdominal apex, rounded ectoprocts, elongate sternite 8+9 and long costal setae.

BIOLOGY. Unknown. No insect remains were discovered in the gut contents of adults examined during this study.

Subgenus ***CHRYSOPIDIA*** Navás

DIAGNOSIS. *Adult*. Medium-sized lacwings, fore wing (Fig. 316) 13–16 mm. Head unmarked or with red stripe on scape, gena, between scape and vertex. Head width : eye width = 2.3–2.5 : 1; mandibles asymmetrical with small tooth on left mandible; antenna as long as or longer than fore wing; often marked red/brown basally. Pronotum slightly elongate; unmarked or with brown lateral spot or red median spot; mesonotum unmarked or with red lateral spot on prescutum; metanotum unmarked. Fore wing oval (length : breadth = 2.7–3.1 : 1); unmarked with gradates black, costal and radial crossveins black at each end; costal



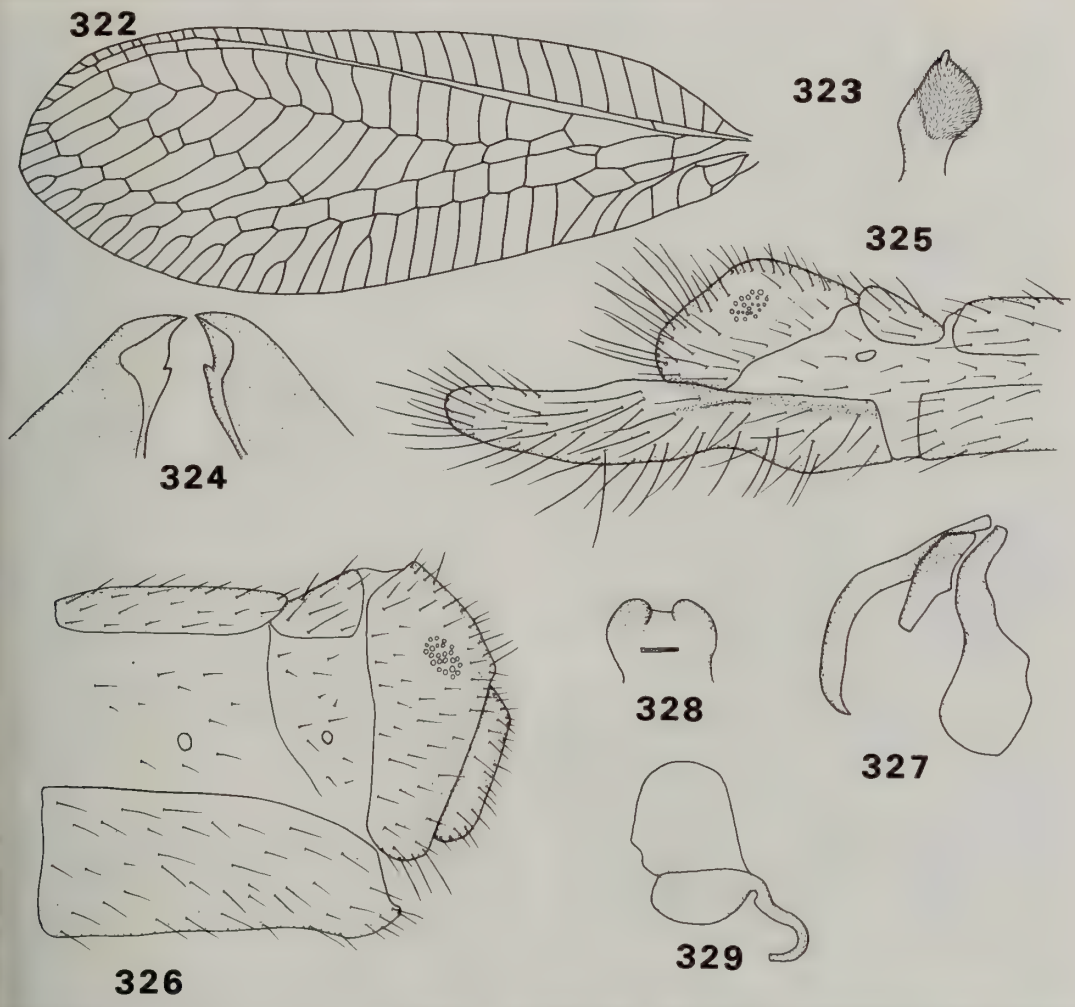
Figs 316–321 *Chrysopidia (Chrysopidia) nigrata*. 316, fore wing; 317, apex of ♂ abdomen, lateral; 318, apex of ♀ abdomen, lateral; 319, ♂ genitalia, lateral; 320, ♀ spermatheca, lateral; 321, ♀ subgenitale, caudal.

setae long, slightly inclined or erect; stigma unmarked; basal Sc crossvein 0.16–0.28 mm; radial crossveins in apical half sinuate; Rs straight or sinuous; gradates in three parallel or divergent rows. Hind wing often with black suffusion on apical posterior margin; gradates in three parallel rows. Abdomen (Figs 317, 318) with callus cerci ovate; trichobothria 21–25; ectoprocts fused dorsally, fused with tergite 9; ♂: atria grossly enlarged in some species; apodemes absent; ectoprocts with deep dorso-apical invagination, rounded basally (without hinge), lobate apically; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 319). Tignum, gonapsis and median plate absent; entoprocessus short, narrow, triangular, bifurcate basally; parameres absent; gonarcus long, narrow, arcuate without horns; arcessus long, narrow, tapering apically, strongly curved ventrally; gonosaccus large; gonosetae long, numerous, in central clump; pseudopenis, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 320, 321). Praegenitale absent; subgenitale bilobed; spermatheca narrow; ventral impression shallow; duct long or short, sinuous; vela long.

REMARKS. The subgenus *Chrysopidia* is distinguished from *Chrysotropia* by the presence of



Figs 322–329 *Chrysopidia (Chrysotropia) ciliata*. 322, fore wing; 323, galea, dorsal; 324, mandibles, dorsal; 325, apex of ♂ abdomen, lateral; 326, apex of ♀ abdomen, lateral; 327, ♂ genitalia, lateral; 328, ♀ subgenitale, ventral; 329, ♀ spermatheca, lateral.

three gradate series, and from *Anachrysa* by the lack of a tignum and gonapsis.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Subgenus *CHRYSOTROPIA* Navás **stat. n.**

Chrysotropia Navás, 1911: 12. Type species: *Chrysopa lacroixi* Navás [= *ciliata* Wesmael], by monotypy. [As subgenus of *Chrysopa* Leach by Hölzel, 1967: 36; raised to genus by Hölzel, 1973*b*: 354.]

DISTRIBUTION. East and west Palaearctic, Oriental.

One species, *C. ciliata* (Wesmael), is widespread in Europe with a further species from Nepal and a third from the Philippines.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 322) 12–15 mm. Head unmarked or with red stripe on vertex and scape; galea (Fig. 323); mandibles symmetrical with tooth on both (Fig. 324); head width : eye width = 2.6–2.8 : 1; antenna slightly shorter than fore wing. Pronotum unmarked or with yellow median stripe and red lateral spot; meso- and metanotum unmarked or with yellow median stripe. Fore wing broad (length : breadth = 2.6–2.8 : 1), unmarked; costal setae long, erect or slightly inclined; stigma unmarked, sometimes thickened in ♂, pale brown; basal Sc crossvein 0.16–0.24 mm; radial crossveins sinuate, oblique; Rs sinuate; gradates in two parallel or divergent rows. Hind wing with

posterior apical margin often with grey suffusion. Abdomen (Figs 325, 326) unmarked or with median yellow stripe and red lateral spots; callus cerci ovate; trichobothria 16–24; ♂: ectoprocts with deep apical invagination, dorso-ventrally flattened; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 327). Tignum, gonapsis and median plate absent; entoprocessus short, bifurcate basally; arcessus narrow, tapering apically, swollen basally; pseudopenis absent; gonarcus long, narrow; gonosaccus short; gonosetae short, numerous; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 328, 329). Praegenitale absent; subgenitale bilobed apically; spermatheca narrow or broad; ventral impression shallow; vela long; duct short, sinuous.

Larva. Abdomen broadly fusiform, humped; thoracic tubercles very long, narrow; setae very long, smooth; metanotum with row of long setae; mid-abdominal tubercles short, very broad; abdominal dorso-lateral tubercles absent; abdominal setae hooked dorsally; large debris packet carried covering entire dorsum.

REMARKS. It is evident from the close similarities in male and female genitalia and even in the head and wing markings that *Chrysotropia* and *Chrysopidia* are closely related. They could almost be considered as synonymous, but because there are only two series of gradates in *Chrysotropia*, rather than three as in *Chrysopidia*, and the mandibles are symmetrical in *Chrysotropia* but asymmetrical in *Chrysopidia* we have decided to treat them as distinct subgenera.

BIOLOGY. The larva of *C. ciliata* Wesmael has been described (Killington, 1937; Gepp, 1983). Insect remains were not present in any of the adult guts that were examined during this study.

Genus ***CHRYSOPODES*** Navás

Chrysopodes Navás, 1913*b*: 329. Type species: *Chrysopodes canudasi* Navás, by monotypy

Orlandisa Navás, 1914*a*: 112. Type species: *Orlandisa jubilosa* Navás, by original designation and monotypy. [Synonymized with *Chrysopodes* Navás by Adams & Penny, 1986: 422.]

Ancylochrysa Navás, 1928: 129. Type species: *Ancylochrysa nevermanni* Navás, by monotypy. [Synonymized with *Chrysopodes* Navás by Adams & Penny, 1986: 422.]

DISTRIBUTION. Neotropics.

Thirty-two described species are included in the genus, distributed throughout the Neotropical region.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing 10–17 mm; ground colour green or brown. Head often marked with red stripe on gena, clypeus, scape and with postocular spot; labrum indented or straight; vertex raised; head width : eye width = 1.9–2.8 : 1; flagellar setae arranged in four rings; scape sometimes elongate. Fore wing: costal area narrow at base, stigma unmarked; Rs sinuate; basal inner gradate usually meeting Psm. Abdominal setae long, sparse; ectoproct fused dorsally and fused with tergite 9; ♂ (Figs 334, 344): callus cerci ovate; apodeme projecting apically from tergite 9; sternite 8+9 fused; microtholi absent; ♀ (Figs 335, 345): sternite 7 straight apically.

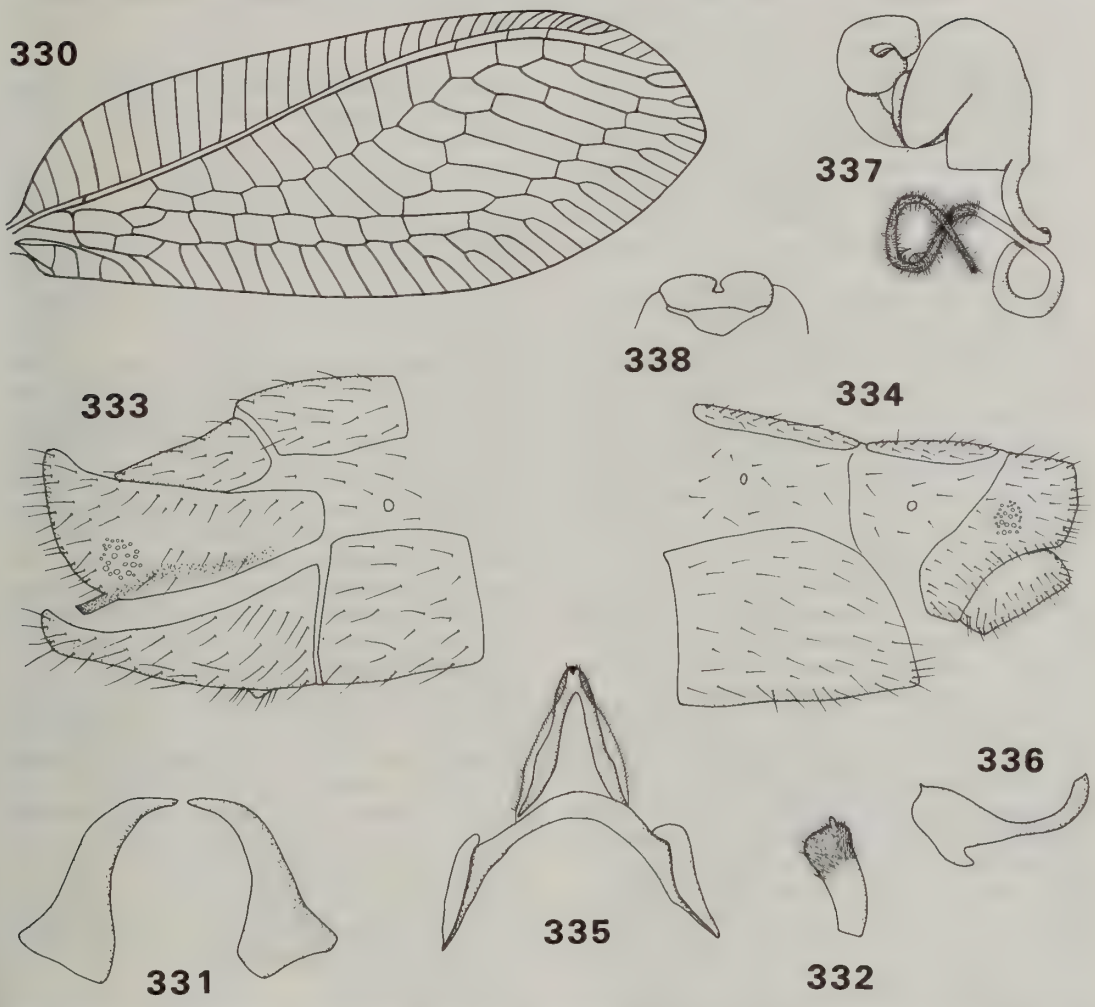
GENITALIA ♂ (Figs 336, 346). Tignum, gonapsis, median plate and entoprocessus absent; arcessus weakly sclerotized, triangular, often domed, with apical hook, pair of medio-lateral sclerotized rods, and dorsal microsetae; parameres absent; gonarcus usually short, broadly expanded laterally sometimes with narrow lateral horn; pseudopenis absent; gonosaccus short; gonosetae absent or few, short; spinellae absent.

GENITALIA ♀ (Figs 337, 338, 347, 348). Praegenitale absent; subgenitale bilobed apically; spermatheca tall, cylindrical; ventral impression very deep; vela very long, coiled; duct long, sinuous.

REMARKS. *Chrysopodes* is a complex genus but can be recognized by examination of the male and female genitalia. In males the apodeme in tergite 9 is extended apico-ventrally and protrudes beyond the apex of the abdomen. The shape of the arcessus is also distinctive since it is weakly sclerotized with a prominent apical hook, sclerotized lateral rods and often bears dorsal microsetae. The large spermatheca is distinctive in females of *Chrysopodes* since it is hardly constricted at the junction with the vela which itself is very long and coiled and there is a very deep ventral impression. *Chrysopodes* may be related to *Chrysopiella*, males of which also have dorsal microsetae on the arcessus.

Subgenus ***CHRYSOPODES*** Navás

DIAGNOSIS. *Adult*. Medium sized lacewings, fore wing (Fig. 330) 12–16 mm. Head often marked with red stripe on gena, clypeus, scape and with postocular spot; galea narrow (Fig. 332); palps elongate (Fig. 15); labrum indented; mandibles scythe-like, symmetrical with no basal tooth (Fig. 331); head width : eye width = 1.9–2.3 : 1; vertex with numerous small indentations; antenna as long as fore wing; flagellar segments 3 times as



Figs 330–338 *Chrysopodes (Chrysopodes)*. 330, *C. (C.) jubilosa*; 331, 332, *C. (C.) circumfusa*; 333–335, 337, 338, *C. (C.) canudasi*; 336, *C. (C.)* sp. indet. 330, fore wing (from Kimmins); 331, mandibles, dorsal; 332, galea, dorsal; 333, apex of ♂ abdomen, lateral; 334, apex of ♀ abdomen, lateral; 335, ♂ genitalia, ventral; 336, ♂ gonapsis, lateral; 337, ♀ spermatheca, lateral; 338, ♀ subgenitale, caudal.

long as broad. Pronotum marked with yellow median stripe; dorsal setae long, pale; meso- and metanotum marked with median yellow stripe. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.7–2.8 : 1); sometimes marked with faint greyish suffusion on posterior margin and around crossveins; costal setae long, erect; Sc and R close or widely separated; Sc long; basal Sc crossvein 0.16–0.32 mm; *im* ovate, sometimes quadrangular; medial radial crossveins oblique, sinuate; gradates in two series (sometimes with additional irregular median series), either parallel or divergent; anal veins often slightly crassate in ♂; c_1 shorter than c_2. Hind wing narrow (length : breadth = 3.1–3.6 : 1). Abdomen (Figs 333, 334) unmarked or with median yellow stripe. ♂: trichobothria 28–30; ectoprocts deeply invaginated apically, extended basally; sternite 8+9 with small ventral tubercle; ♀: callus cerci rounded; trichobothria 23–28; sternite 7 with small ventral tubercle.

REMARKS. The genitalia of *Chrysopodes* s.str. and the subgenus *Neosuarius* Adams & Penny are very similar which suggests that they are closely related. However, species of *Chrysopodes* s.str. have several characters which do not occur in *Neosuarius*. In *Chrysopodes* the mandibles are scythe-like and symmetrical with no basal teeth,

which is presumably a convergence with the Ankylopterygini (see 'Remarks' on p. 155), and the palps are elongate apically, similar to *Ankylopteryx* Brauer (p. 156). In addition, the vertex is pitted, the anal veins are slightly crassate in males, the radial crossveins are sinuate, the fore wings are broad and highly setose and there is a small subapical papilla on sternite 8+9 in males and on sternite 7 in females which Adams & Penny (1986) postulated may function as a sound producing organ.

Some species, such as *C. divisa* (Walker), are apparently intermediate between the two subgenera. In these species the mandibles are narrow but with a basal tooth on the left mandible (Fig. 342) (unknown in other chrysopid genera with narrow mandibles), the palps are narrow apically and the galea (Fig. 343) is narrow with an elongate apical papilla. Species of this group may also be recognized by the slight broadening of the costal area at the base of the fore wing.

The type of *Ancylochrysa nevermanni* Navás (type species of *Ancylochrysa*) was destroyed when Hamburg Museum was bombed during the Second World War (Strümpel, *in litt.*). Although the descriptions of the genus and species were far from adequate, Navás (1928) mentioned some characters which suggest that it is correct to regard *Ancylochrysa* as a synonym of *Chrysopodes*. The fore wing is shown to be broad with the costal area broadening subbasally, there are some doubled gradate crossveins, the inner and outer gradates are divergent, Rs is sinuate and the posterior margin of the hind wing has a yellowish brown suffusion. The genus is also said to be similar to *Ankylopteryx* Brauer and Navás placed it in the Ankylopterygini. However, the intramedian cell is figured as a very long, narrow rectangle more reminiscent of *Cacarulla* than *Chrysopodes*.

An undescribed species from Brazil and Peru is present in the BMNH collections which, on external characteristics, resembles *Chrysopodes*. However, the male genitalia differ considerably from any other species in the genus which suggests that it may belong to an undescribed genus. There is a narrow, hooked gonapsis, an X-shaped median plate, the arcessus is short, broad and trifurcate apically with dorsal striations, there is a large gonosaccus bearing numerous long gonosetae and the apodeme of tergite 9 does not protrude from the abdominal apex.

BIOLOGY. Unknown. No larvae of *Chrysopodes* species have been described, although Adams & Penny (1986) state that the larva of at least one species is a debris carrier.

Subgenus *NEOSUARIUS* Adams & Penny **stat. n.**

Neosuarius Adams & Penny, 1986: 435. Type species: *Chrysopa collaris* Schneider, by original designation.

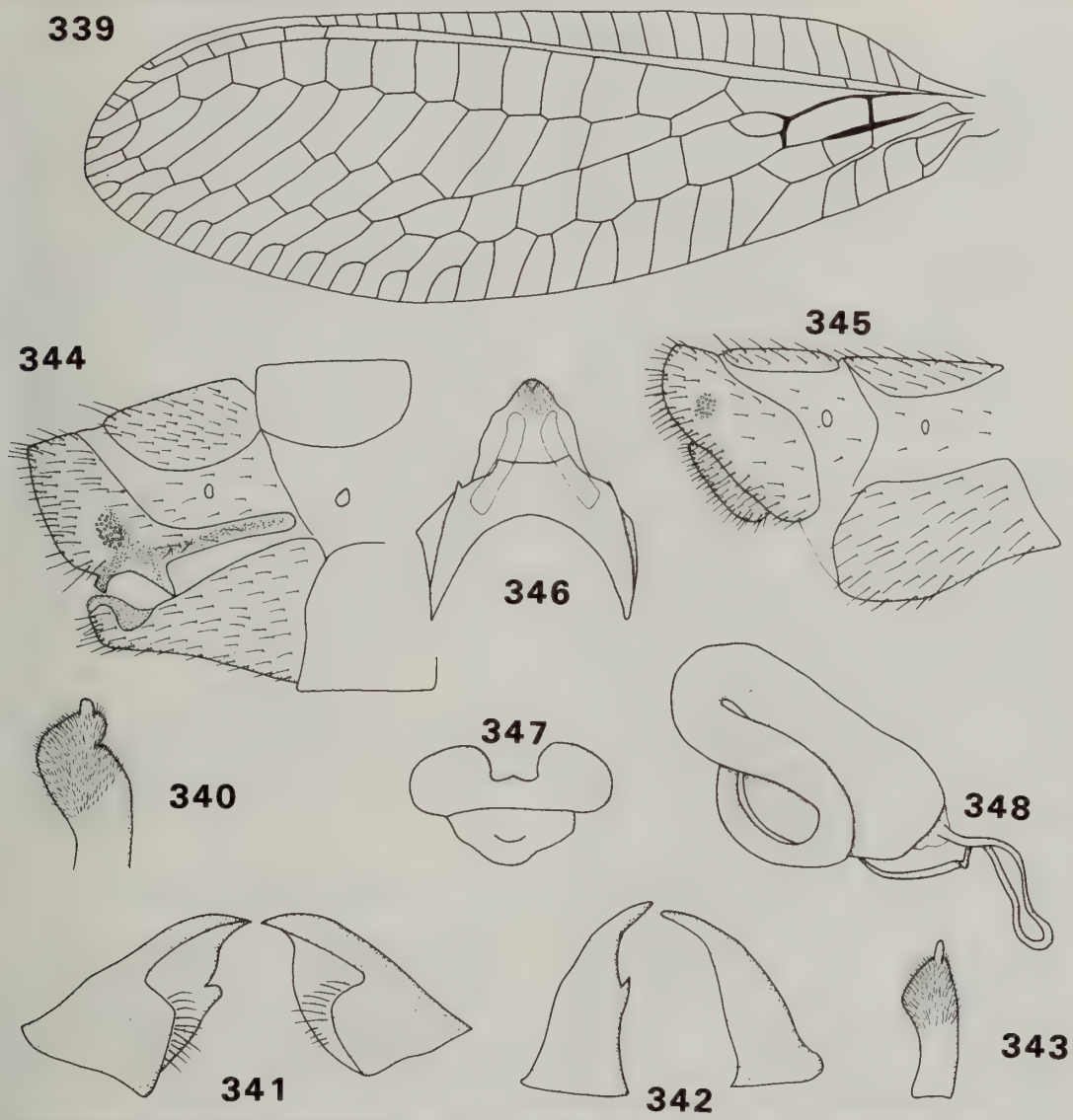
DISTRIBUTION. Nearctic, Neotropics.

The subgenus includes 11 described species distributed throughout the Neotropics. *C. collaris* is particularly widespread and occurs in northern South America, Central America, the Antilles, Florida and Texas.

DIAGNOSIS. *Adult.* Medium-sized lacewings, fore wing (Fig. 339) 10–17 mm. Head marked with brown or red stripes on gena, vertex, scape; palps tapered apically; labrum indented or straight; galea broad (Fig. 340); mandibles broad, asymmetrical with basal tooth on left mandible (Fig. 341); head width : eye width = 1.9–2.8 : 1; antenna shorter than fore wing; flagellar segments about twice as long as broad. Pronotum marked with yellow median stripe or brown lateral stripe; setae long or short, pale or dark; meso- and metanotum marked with yellow median stripe or brown lateral stripe. Legs unmarked; setae long or short, pale or dark; claws with or without basal dilation. Fore wing narrow, unmarked; costal setae short, inclined; Sc and R widely separated; basal Sc crossvein 0.24–0.36 mm; radial crossveins straight; *im* ovate, narrow or broad; Rs sinuate; gradates in two parallel or divergent series; veins not crassate in ♂; c_1 slightly longer or shorter than c_2. Abdomen (Figs 344, 345) brown or unmarked; trichobothria 23–39; ectoprocts with slight dorsoapical invagination.

REMARKS. Although species of *Chrysopodes* s.str. and *Neosuarius* are easily distinguished from each other externally, their genitalia are almost identical. This suggests that the two taxa are very closely related and therefore justifies their treatment as subgenera rather than distinct genera. *Neosuarius* seems to be less specialized than *Chrysopodes* and still retains many plesiomorphic characters which serve to distinguish it from *Chrysopodes*. These include: broad, asymmetrical mandibles with a basal tooth on the left mandible; broad, tapering palps; narrow wings with short setae; straight radial crossveins and unmodified apical abdominal sternite. However, unlike *Chrysopodes* the subgenitale is slightly extended in females of *Neosuarius*.

BIOLOGY. Unknown. No insect remains were present in the guts of any adults examined during this study but the guts of several specimens of *C.*



Figs 339–348 *Chrysopodes (Neosuarius)*. 339, *C. (N.) porterina*; 340, 341, 344–348, *C. (N.) collaris*; 342, 343, *C. (N.) divisa*. 339, fore wing; 340, galea, dorsal; 341, 342, mandibles, dorsal; 343, galea, dorsal; 344. apex of ♂ abdomen, lateral; 345, apex of ♀ abdomen, lateral; 346, ♂ genitalia, dorsal; 347, ♀ subgenitale, caudal; 348, ♀ spermatheca, lateral.

(N.) nigripilosa (Banks) were found to be full of pollen grains.

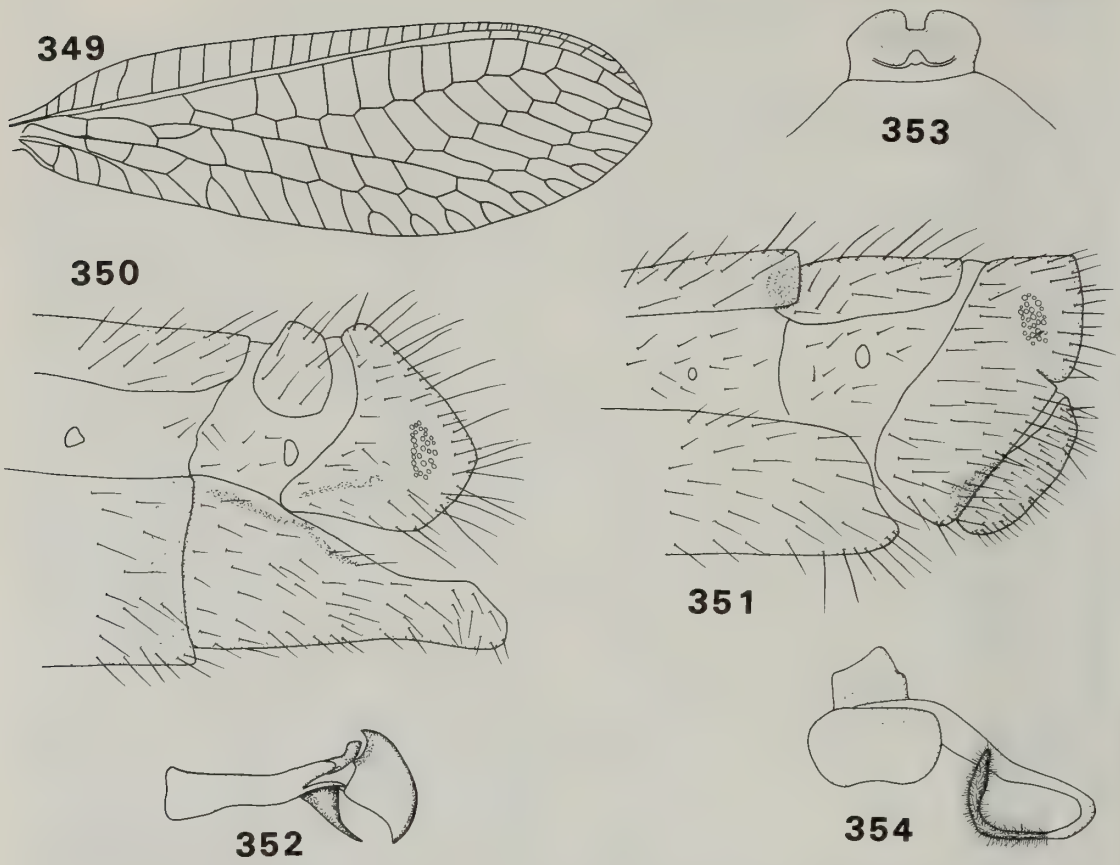
Genus ***CUNCTOCHRYSA*** Hölzel

Cunctochrysa Hölzel, 1970: 47 [as subgenus of *Anisochrysa* Nakahara]. Type species: *Chrysopa albolineata* Killington, by monotypy. [Synonymized with *Suarius* Navás by Zeleny, 1971: 176; as subgenus of *Chrysopa* Leach by Tjeder, 1972: 23; raised to genus by Aspöck *et al.*, 1980: 271.]

DISTRIBUTION. Afrotropics, east and west Palaearctic.

Cunctochrysa includes four described species: one from southern Africa, two from western Europe and one from Nepal.

DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Fig. 349) 9–14 mm; ground colour pale green. Head with black or red stripe on gena, clypeus; palps tapered; galea broad; labrum straight; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head



Figs 349–354 *Cunctochrysa albolineata*. 349, fore wing; 350, apex of ♂ abdomen, lateral; 351, apex of ♀ abdomen, lateral; 352, ♂ genitalia, lateral; 353, ♀ subgenitale, ventral; 354, ♀ spermatheca, lateral.

width : eye width = 2.0–2.7 : 1; antenna as long as fore wing; flagellar segments 2–3 times as long as broad; setae in four rings. Pronotum with median yellow stripe; dorsal setae long or short, black or pale; meso- and metanotum with yellow median stripe. Legs unmarked; setae short, black; claws with or without basal dilation. Fore wing narrow (length : breadth = 3.0 : 1); unmarked, gradate veins dark; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.12–0.24 mm; *im* narrow, ovate, occasionally rectangular; Rs sinuate; gradates in two parallel series, basal inner gradate meeting Psm; veins not crassate in ♂; c_1 about same length as c_2. Abdomen (Figs 350, 351) unmarked; setae short, sparse; callus cerci ovate; trichobothria 21–33; ♂: ectoprocts slightly flattened caudally, with dorso-apical invagination sometimes pronounced; sternite 8+9 fused, sometimes elongate; sternites sometimes with microtholi; ♀: ectoprocts with slight apical invagination and apical suture between ectoprocts and tergite 9; sternite 7 straight apically.

GENITALIA ♂ (Fig. 352). Tignum, gonapsis and median plate absent; entoprocessus long, tapering, ventrally curved; arcessus large, broad, 'axe head'-shaped in lateral view with large ventral hook and dorsal striations; pseudopenis absent; gonarcus long, narrow; gonosaccus short; gonosetae long, numerous, evenly dispersed; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 353, 354). Praegenitale absent; subgenitale bilobed apically with basal crumena; spermatheca narrow or broad; ventral impression variable; vela moderate; duct long or short, sinuous.

Larva. Abdomen fusiform, humped; thoracic and abdominal tubercies spherical; transverse row of setae on meso- and metanotum; setae long, smooth, hooked apically; small latero-dorsal tubercle present on abdominal segment 6 but absent from rest of abdomen; small packet of debris carried.

REMARKS. Species of *Cunctochrysa* can only be recognized with certainty from the male genitalia

in which the arcessus is characteristically 'axe head'-shaped when viewed laterally and bears a ventral hook. However, a ventral hook also occurs in males of *Atlantochrysa* McLachlan and *Mallada oblonga* Hölzel, suggesting a close relationship between *Cunctochrysa* and these taxa, which differ mainly in the possession of a tignum and gonapsis (which is the plesiomorphic condition, see 'Discussion of taxonomic characters', p. 122). Males of *Meleoma* and *Plesiochrysa ramburi* (Schneider) also have a ventral hook to the arcessus but these latter taxa are undoubtedly more distantly related since they do not share any other significant characters with *Cunctochrysa*.

Hölzel's (1973*b*) figures of *C. opipara* clearly show it to be a *Cunctochrysa* from the shape of the arcessus and the presence of a ventral hook in the male genitalia. However, he also figures a small cruciform gonapsis and, for this reason includes the species in *Apertochrysa* Tjeder. *C. opipara* is present in the BMNH collections but we have been unable to find a gonapsis in the male which suggests that Hölzel's specimen may have been aberrant.

BIOLOGY. The larva of *C. albolineata* (Killington) has been described (Killington, 1937; Gepp, 1983). The gut contents of adults examined in this study did not include insect remains.

Genus ***EREMOCHRYSA*** Banks

Eremochrysa Banks, 1903: 158. Type species: *Chrysopa punctinervis* McLachlan, by original designation.

Lolochrysa Banks, 1950: 59 [as subgenus of *Eremochrysa*]. Type species: *Eremochrysa hageni* Banks, by original designation. **Syn. n.**

DISTRIBUTION. Nearctic, West Indies.

Of 19 species included in *Eremochrysa*, 17 occur in the western U.S.A., one species occurs in Canada and another in Cuba.

DIAGNOSIS. *Adult*. Small lacewings, fore wing 6–11 mm. Labrum straight or indented; mandibles narrow; vertex raised; flagellar segments 2–3 times as long as broad; setae arranged in four rings. Pronotum unmarked or with dark brown lateral stripe; meso- and metanotum unmarked or with broad, black lateral stripe. Legs with setae short, dark claws without basal dilation. Fore wing unmarked, narrow (length : breadth = 2.9–3.6 : 1); costal area narrow at base; costal setae short inclined; stigma unmarked; Sc short; Sc and R widely separated; basal Sc crossvein 0.16–0.32 mm; *im* ovate; Rs straight; veins not crassate in ♂; c_1 shorter than c_2. Hind wing without inner gradate series. Callus cerci ovate; trichobothria 20–30; ectoprocts with slight or deep dorso-apical invagination, fused dorsally; ♂: sternite 8+9 fused, or separated by narrow suture; sternites without microtholi; small, ovate sclerotized area, bearing setae present on membrane below tergite 9; ♀: setae short, sparse; apex of sternite 7 straight; short apical suture between ectoproct and tergite 9.

GENITALIA ♂. Tignum absent; gonapsis narrow, hooked apically; median plate absent; entoprocessus broad, short, positioned dorsally; parameres absent; gonarcus long, narrow; pseudopenis absent; gonosaccus short; gonocristae and spinellae absent.

GENITALIA ♀. Praegenitale absent; subgenitale at apex of long membrane, bilobed apically, slightly extended ventrally.

REMARKS. This genus of small lacewings can be recognized by the absence of an inner gradate series in the hind wing, Rs is straight with broad radial cells and the mandibles are narrow. Males are characterized by the narrow, hooked gonapsis and arcessus; the short, dorsally positioned entoprocessus; the small sclerotized plate below the ectoprocts; and the blunt lobe at the apex of the ectoprocts. In females the subgenitale is situated at the apex of a long membrane and the basal lobe of the subgenitale projects ventrally.

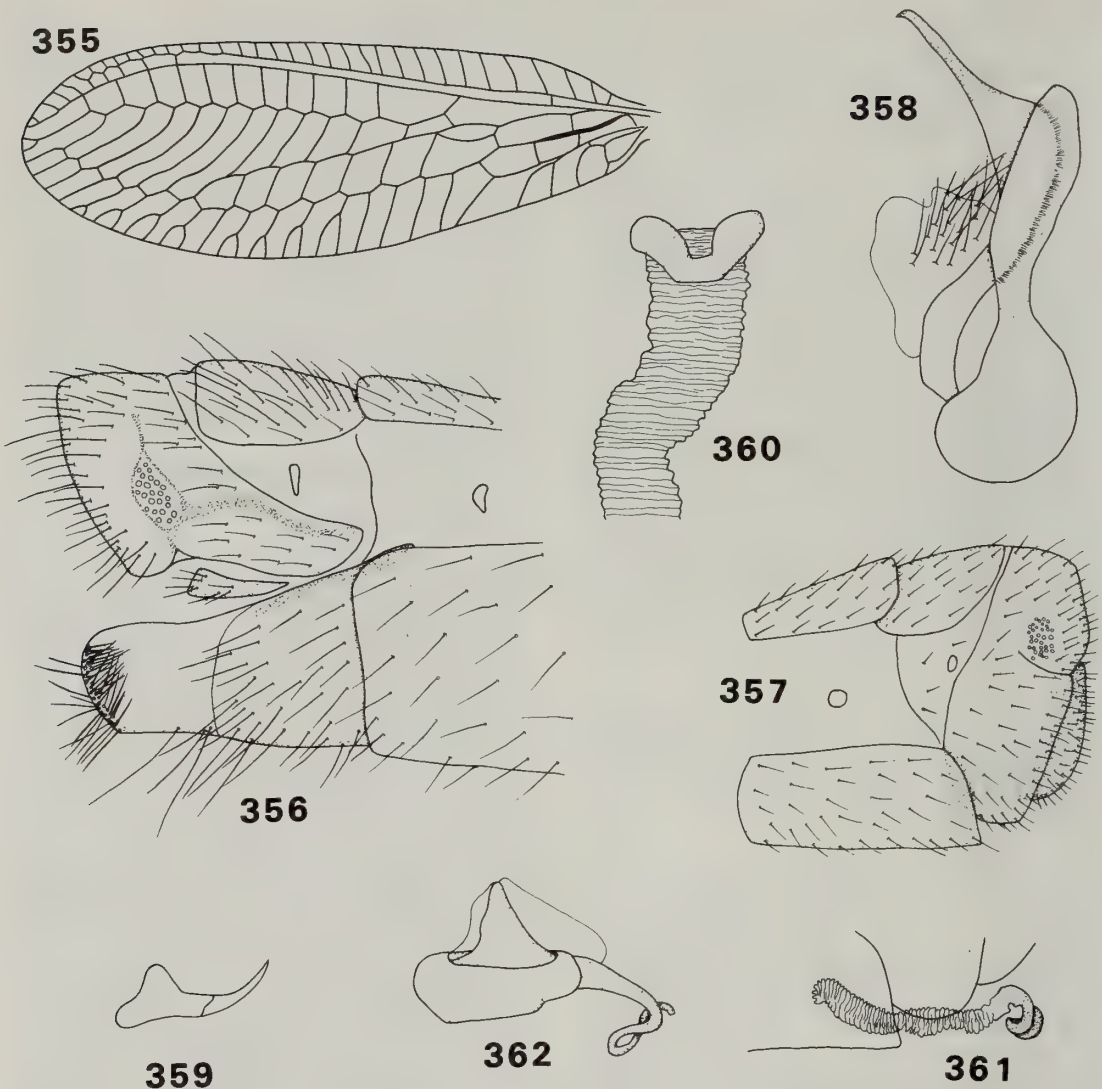
Banks (1950) erected the subgenus *Lolochrysa* to accommodate those species which had a broad vertex, long pale setae on the pronotum, uniformly brown veins, and an elongate, upturned apex of sternite 8+9 in males. On examination of the species assigned to *Lolochrysa* the vertex was not found to be any broader than *Eremochrysa* species and sternite 8+9 did not differ significantly in shape between species of the two subgenera. In addition to the above characters, *Lolochrysa* species have a row of teeth at the apex of the gonapsis, there is a short suture between sternites 8+9 and the gonosetae are numerous. However, none of these characters is sufficient to regard these species as anything more than a species group and accordingly *Lolochrysa* is synonymized with *Eremochrysa*.

Subgenus ***CHRYSOPIELLA*** Banks **stat. n.**

Chrysopiella Banks, 1911: 344. Type species: *Chrysopa sabulosa* Banks, by original designation

DISTRIBUTION. Nearctic.

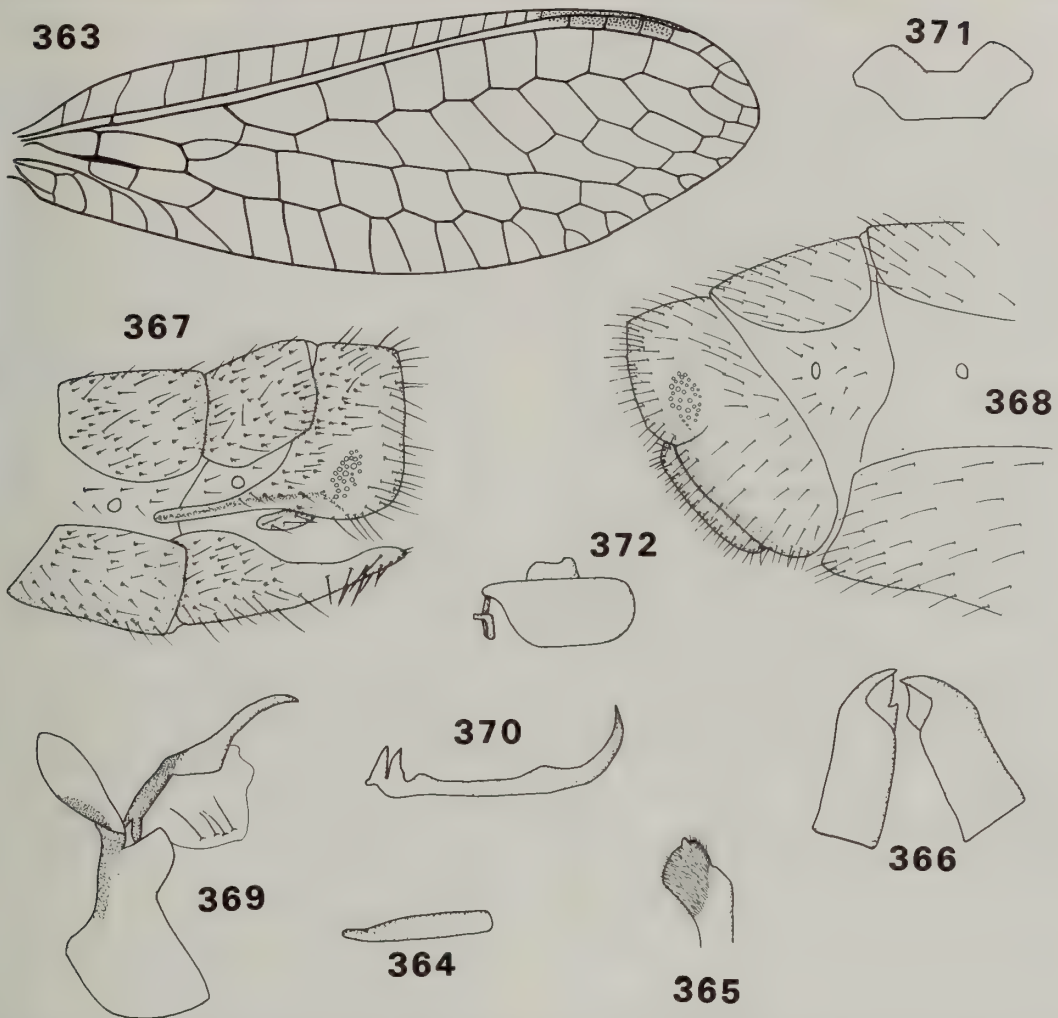
Four species are included in *Chrysopiella*, all from the western U.S.A.



Figs 355–362 *Eremochrysa (Chrysopiella)*. 355, *E. (C.) pallida*; 356, 359, *E. (C.) sabulosa*; 357, 358, 360–362, *E. (C.) brevisetosa*. 355, fore wing; 356, apex of ♂ abdomen, lateral; 357, apex of ♀ abdomen, lateral; 358, ♂ gonarcus complex, lateral; 359, ♂ gonapsis, lateral; 360, 361, ♀ subgenitale, ventral; 362, ♀ spermatheca, lateral.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 355) 10–11 mm; ground colour green. Head long, narrow; marked with black spots on gena, clypeus, scape and vertex; mandibles narrow, symmetrical either with small basal tooth on both mandibles or with tooth lacking in both mandibles; galea narrow, elongate; head width : eye width = 2.9–3.3 : 1, eyes very small; antenna as long as fore wing. Pronotum unmarked or with dark brown median stripe; dorsal setae short, black; meso- and metanotum unmarked or with black longitudinal stripe. Legs unmarked. Fore wing unmarked, narrow (length : breadth = 2.9 : 1); basal Sc crossvein 0.24–0.28 mm; Rs straight, widely separated below R, particularly below stigma; gradates in one series, inner gradate series absent. Abdomen (Figs 356, 357) unmarked; ectoprocts deeply invaginate apically, not fused dorsally; trichobothria 20–24; ♂: abdominal setae short, sparse, often with longer setae interspersed; ectoproct with short, broad ventral lobe; ectoprocts fused with tergite 9; setae at apex of sternite 8+9 stout, reclinate.

GENITALIA ♂ (Figs 358, 359). Arcessus long, narrow with dorsal microsetae at base; gonosetae numerous, long.



Figs 363–372 *Eremochrysa (Eremochrysa) punctinervis*. 363, fore wing (from Kimmins); 364, apical segment of maxillary palp, lateral; 365, galea, dorsal; 366, mandibles, dorsal; 367, apex of ♂ abdomen, lateral; 368, apex of ♀ abdomen, lateral; 369, ♂ gonarcus complex, lateral; 370, ♂ gonapsis, lateral; 371, ♀ subgenitale, caudal; 372, ♀ spermatheca, lateral.

GENITALIA ♀ (Figs 360–362). Spermatheca large; ventral impression shallow; vela moderately long; duct short, sinuous.

REMARKS. The male and female genitalia of *Chrysopiella* and *Eremochrysa* have many characters in common that are not found elsewhere in the Chrysopidae and this suggests that they are closely related. However, rather than synonymize them, we have decided to treat them as distinct subgenera because there are several characters which are not shared. In *Chrysopiella* the mandibles are symmetrical, the galea is narrow, the eyes are small (head width : eye width 3.0 : 1), the inner gradates are absent from the fore wing and microsetae are present on the dorsum of the arcessus. However, in *Eremochrysa* the mandibles are asymmetrical, the galea broad, the eyes larger (head width : eye width = 2.4–2.9 : 1), an inner gradate series is present in the fore wing and microsetae are absent from the arcessus.

BIOLOGY. Unknown. Adams & Garland (1981) noted that adult *Chrysopiella* species were pollen-feeders and that the guts of *C. brevisetosa* Adams & Garland contained pollen resembling *Atriplex* (Chenopodiaceae). Pollen was also found in the guts of *C. brevisetosa* and *C. sabulosa* (Banks) during this study.

Subgenus *EREMOCHRYSA* Banks

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 363) 6–9 mm; ground colour brown. Head extensively marked with black or red/brown spots and stripes; palps narrow (Fig. 364); galea broad (Fig. 365); mandibles narrow, asymmetrical with basal tooth on left mandible (Fig. 366); head width : eye width = 2.3–2.9 : 1; antenna shorter than fore wing. Pronotum with dark brown lateral stripe; dorsal setae short, black or long, pale, coarse, erect; meso- and metanotum marked with broad, black lateral stripe. Legs marked with black spot at apex of hind femur; 1st tarsal segment elongate. Fore wing very narrow (length: breadth = 3.2–3.6: 1); basal Sc crossvein 0.16–0.32 mm; gradates in two parallel series, basal inner gradate not meeting Psm. Abdomen (Figs 367, 368) with black dorsal markings; trichobothria 21–30; ectoprocts with slight or deep dorso-apical invagination, fused dorsally; ♂: most setae very short and dense with a few longer setae interspersed; pair of microsetae at base of each seta except on ectoproct and tergite 9; sternite 8+9 fused or sometimes with short suture, elongate, tapering apically, deeply bifid apically; setae at apex of sternite 8+9 long, coarse, reclinate in most species.

GENITALIA ♂ (Figs 369, 370). Arcessus long, narrow, tapering apically to strong hook, bifurcate basally; gonosetae long, few or numerous, in lateral clump.

GENITALIA ♀ (Figs 371, 372). Spermatheca minute, broad; ventral impression deep; vela short; duct very short.

Larva. Abdomen broadly fusiform, humped; thoracic tubercles short, cylindrical, bearing very long setae; abdominal tubercles spherical; abdominal latero-dorsal tubercles present on tergites 6 and 7; abdominal setae hooked apically; debris carried.

BIOLOGY. The larva of *E. punctinervis* (McLachlan) has been described by Smith (1926*a*). No insect remains were found in the guts of any adults examined during this study.

Genus *GLENOCHRYSA* Esben-Petersen

Glenochrysa Esben-Petersen, 1920: 518. Type species: *Glenochrysa typica* Esben-Petersen, by original designation. [As subgenus of *Chrysopa* Leach by Tjeder, 1966: 410; reinstated as genus by New, 1980: 32.]

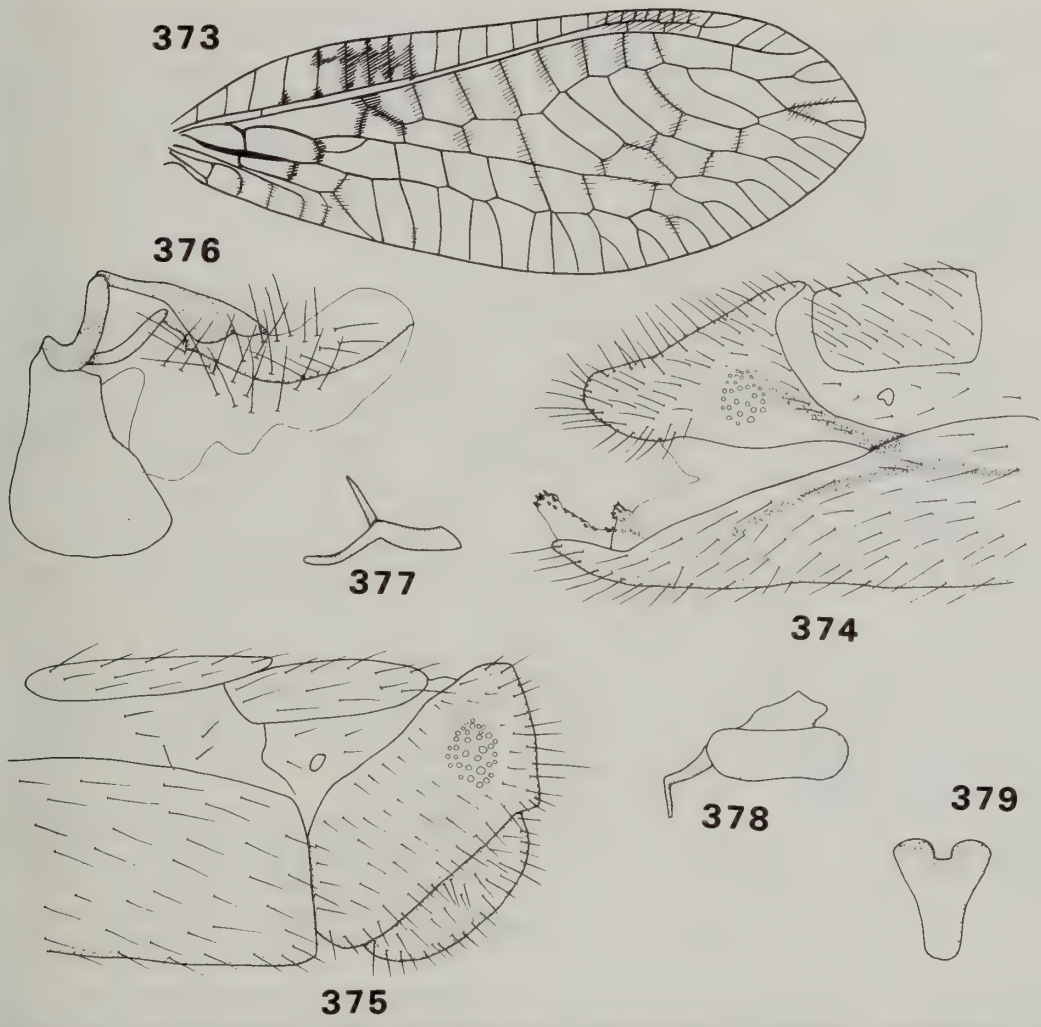
DISTRIBUTION. Afrotropics, Oriental, N. Australia, Samoa.

There are 16 described species and subspecies included in this widely dispersed genus. Four species occur in southern and west Africa, three in the Indian subcontinent, three in the Oriental region, five in Australia (all in Queensland), and one in Samoa.

DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Fig. 373) 9–13 mm; ground colour pale green. Head with extensive black markings; palps tapered; labrum slightly indented or straight; mandibles broad, asymmetrical with basal tooth on left mandible; vertex steeply raised; head width : eye width = 2.0–2.5 : 1; antenna shorter or as long as fore wing; flagellar segments about 3 times as long as broad; setae arranged in four rings. Pronotum usually marked with dark brown spot in each corner; dorsal setae long, pale, sometimes with clump of long coarse setae; mesonotum with dark brown spots; metanotum with broad dark brown marking or unmarked. Legs unmarked or with black median annulation; setae long, pale; claws with basal dilation. Fore wing narrow (length : breadth = 2.8–3.2 : 1); extensively marked with dark brown and brownish yellow shading around crossveins and usually with iridescent pustules; costal area narrow at base; costa slightly convex in basal half; costal setae short, inclined; stigma marked dark brown; Sc very short; Sc and R widely separated; basal Sc crossvein 0.16–0.36 mm; *im* narrow, ovate; Rs sinuate; gradates in two parallel rows, basal inner gradate usually not meeting Psm; veins not crassate in ♂; c_1 about same length as c_2; basal branch of Cu_2 recurrent. Hind wing with dark brown markings, especially in basal half; stigma marked dark brown. Abdomen (Figs 374, 375) often with dorsal dark brown markings; setae long, sparse; callus cerci rounded; trichobothria 23–35; ectoprocts fused with tergite 9; ♂: ectoprocts broadly elongate apically, with deep apical invagination; atria large or small; sternite 8+9 fused, elongate; ♀: ectoprocts with slight apical invagination; sternite 7 straight apically.

GENITALIA ♂ (Figs 376, 377). Tignum and median plate absent; gonapsis small, indistinct, rod-shaped; entoprocessus long, narrow; arcessus broad, elongate, pointed or trifurcate apically; pseudopenis absent; gonarcus long, narrow with upturned median projection; gonosaccus very long, sometimes protruding from apex of abdomen; gonosetae long, numerous, evenly dispersed; gonocristae present in lateral and median rows; spinellae absent.

GENITALIA ♀ (Figs 378, 379). Praegenitale absent; subgenitale bilobed apically with long basal lobe; spermatheca narrow; ventral



Figs 373–379 *Glenochrysa* 373, *G. typica*; 374–376, 378, 379, *G. splendida*; 377, *G. principissa*. 373, fore wing (from Kimmins); 374, apex of ♂ abdomen, lateral; 375, apex of ♀ abdomen, lateral; 376, ♂ gonarcus complex, lateral; 377, ♂ gonapsis, ventro-lateral; 378, ♀ spermatheca, lateral; 379, ♀ subgenitale, ventral.

impression shallow or absent; vela short; duct long, coiled.

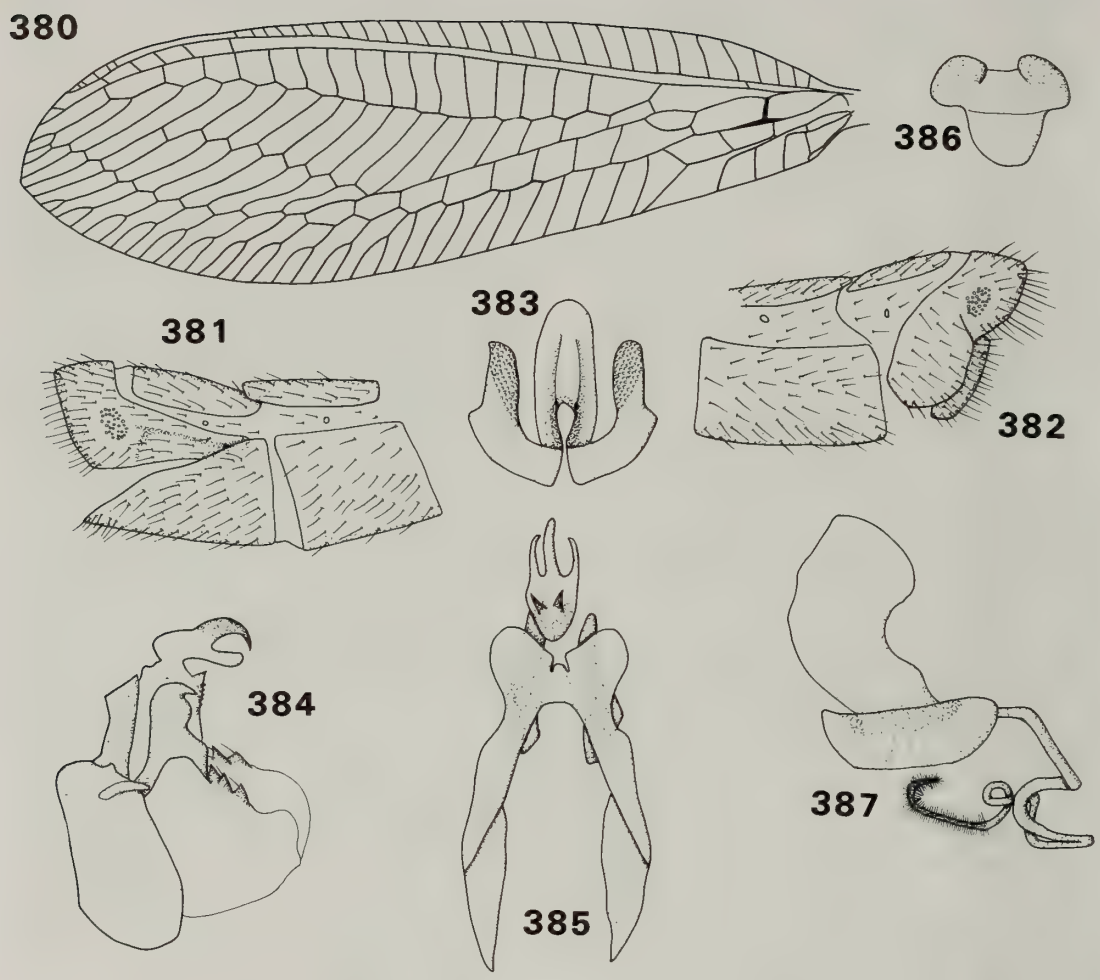
REMARKS. *Glenochrysa* is one of the most distinctive genera of the Chrysopini. It is easily recognized by the extensive dark and pale brown wing markings and iridescent pustules, caused by embossed parts of the wing membrane. In addition, Sc is short, the basal branch of Cu_2 is recurrent, the basal half of the fore wing costal margin is slightly convex and the anterior part of the vertex markedly raised. In the male genitalia the gonocristae and deeply invaginated ectoprocts are distinctive, as is the upturned median projection of the gonarcus. In females the long basal lobe of the subgenitale is characteristic of the genus.

Tjeder (1966) included two American species, *C. bimaculata* McClendon and *C. cubana* Hagen, in *Glenochrysa* because the male genitalic complement was similar, although they lacked wing markings. These species have now been shown to belong to *Ceraeochrysa* Adams (q.v.).

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Genus ***HIMALOCHRYSA*** Hölzel

Himalochrysa Hölzel, 1973*b*: 367. Type species: *Himalochrysa modesta* Hölzel, by original designation and monotypy.



Figs 380–387 *Himalochrysa*. 380, 384, *H. bhandarensis*; 381–383, 385–387, *H. modesta*. 380, fore wing; 381, apex of ♂ abdomen, lateral; 382, apex of ♀ abdomen, lateral; 383, ♂ gonapsis, ventral; 384, ♂ gonarcus complex, lateral; 385, ♂ gonarcus complex, dorsal; 386, ♀ subgenitale, ventral; 387, ♀ spermatheca, lateral.

Nepalochrysa Hölzel, 1973*b*: 347 [as subgenus of *Anisochrysa* Nakahara]. Type species: *Anisochrysa (Nepalochrysa) bhandarensis* Hölzel, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. Nepal.

The genus includes two species.

DIAGNOSIS. *Adult*. Medium lacewings, fore wing (Fig. 380) 15–16 mm; ground colour pale green. Head marked with small red or black spot on gena; palps tapered apically; labrum with deep, narrow indentation; mandibles broad, asymmetrical, with basal tooth on left mandible; vertex raised; toruli small; head width : eye width = 1.9–2.2 : 1; scape squared; antenna unmarked, shorter than fore wing; flagellar segments about twice as long as broad; setae short, dark, arranged in four rings. Pronotum with red latero-median stripe in apical half, unmarked or with yellow, median longitudinal stripe; dorsal setae long, pale; mesonotum marked with red spot on prescutum or yellow median stripe; metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing length : breadth = 2.8–3.1 : 1; unmarked, gradates black; costal area narrow at base; costal setae quite short, inclined; stigma unmarked; Sc long; Sc and R widely separated; basal Sc crossvein 0.28–0.32 mm; radial crossveins sinuate in apical half of wing; *im* ovate (sometimes quadrangular), narrow, long or short; Rs straight; gradates in two or four parallel series; basal inner gradate meeting Psm; inner gradate series extended basally in species with multiple series; veins not crassate in ♂; c_1 slightly shorter than c_2. Hind wing with

gradates black; gradates arranged in two or four parallel series. Abdomen (Figs 381, 382) unmarked; setae long, sparse; callus cerci ovate; trichobothria 25–34; ectoprocts slightly invaginate apico-dorsally, fused dorsally; ♂: ectoprocts fused with tergite 9; microtholi present on tergites and sternites or absent; sternites 8+9 fused, short; apodemes straight; ♀: sternite 7 straight apically; short apical suture present between tergite 9 and ectoprocts.

GENITALIA ♂ (Figs 383–385). Tignum and median plate absent; gonapsis absent or large with broad median lobe and shorter, rounded lateral lobes bearing small tubercles on inner face; entoprocessus short, broad, toothed or tapering apically with ventral lobe; parameres absent; gonarcus long, arcuate with rounded, apico-lateral lobes and broad lateral expansion; arcessus short, narrow, hooked apically, with pair of long, curved subapical ventral horns; gonosaccus large with broad median tooth below arcessus; gonosetae few, short, medially placed; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 386, 387). Praegenitale absent; subgenitale bilobed apically, basally slightly elongate, tapering; spermatheca narrow; ventral impression shallow; vela long; duct short, sinuous.

REMARKS. Species of *Himalochrysa* may be distinguished by the complex male genitalia. The arcessus with paired ventro-apical horns, the gonarcus with the broad, rounded latero-apical lobes and the median tooth on the gonosaccus situated below the arcessus are unique in the Chrysopini. Other significant characters shared by species of *Himalochrysa* include the black gradate crossveins, sinuate radial crossveins, the short arcessus and the entoprocessus which taper apically and have a ventral lobe.

Hölzel (1973b) regarded *Nepalochrysa* as distinct from *Himalochrysa* and, indeed, there are some characters which are not shared by the two taxa. For example, a gonapsis is present in *Himalochrysa* but absent in *Nepalochrysa*, microtholi are absent in *Himalochrysa* but present in *Nepalochrysa*, the arcessus has a pair of dorsal horns in *Himalochrysa* which are absent in *Nepalochrysa*, there are four series of gradates in *Himalochrysa* but only two in *Nepalochrysa*, and the intramedian cell is long (and sometimes quadrangular) in *Himalochrysa* but short in *Nepalochrysa*. However, apart from the presence or absence of the gonapsis, none of the above characters appears to have much value in separating chrysopid genera since they have frequently been lost or gained within other genera in the family. Therefore, the striking synapomorphic characters which occur in the male genitalia seem to fully justify the synonymy of *Himalochrysa* and *Nepalochrysa*.

Hölzel (1973*b*) noted that males of *Himalochrysa* are unusual amongst the Chrysopini in the apparent possession of parameres, a character usually confined to the Italochrysini. However, re-examination of the male genitalia has revealed that what Hölzel took to be parameres is an enlarged gonapsis.

BIOLOGY. Unknown. There were no insect remains in the gut contents of any of the adults examined during this study.

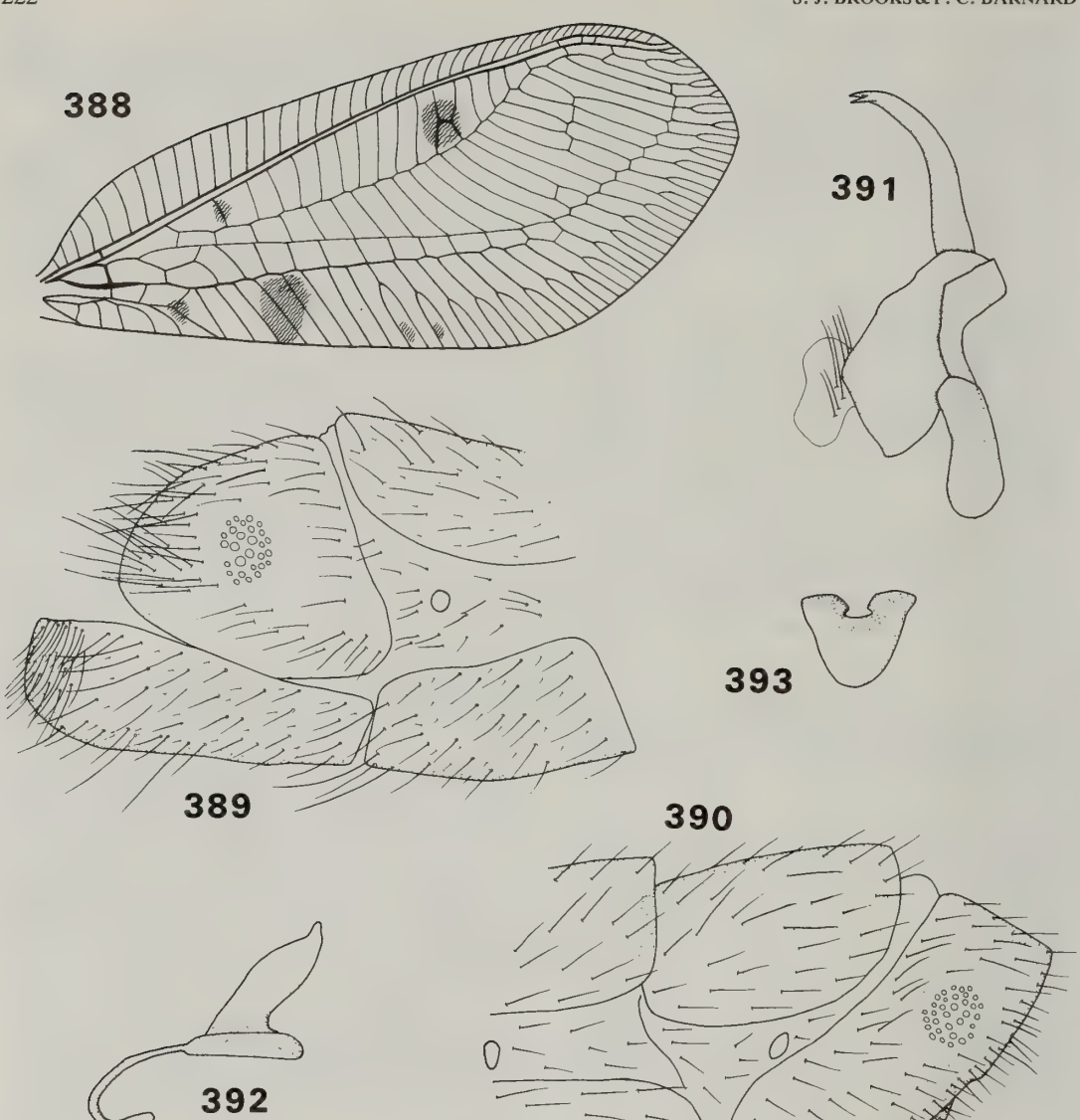
Genus ***KOSTKA*** Navás

Kostka Navás, 1913*b*: 319. Type species: *Kostka nacaratus* Navás, by original designation and monotypy.

DISTRIBUTION. Sumatra.

Only one species has been described, and is known from only two specimens.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 388) 22–23 mm. Head unmarked; palps tapered apically; labrum slightly indented; vertex raised; eyes large, head width : eye width = 1.9–2.0 : 1; antennae broken in all specimens examined; flagellar segments about twice as long as broad; setae arranged in four rings. Pronotum elongate, marked with dark lateral spot; setae long, pale; meso- and metanotum unmarked. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing broad (length : breadth = 2.4–2.6 : 1); marked with several large dark spots; costal area narrow at base; costal setae long, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein at level of or slightly basal of m_1–m_2 crossvein; *im* broad, quadrangular; radial crossveins sinuate; Rs abruptly curved towards R in apical half of wing; gradates in two divergent series; inner gradate series irregular; veins not crassate in ♂; c_1 shorter than c_2; posterior margin very broad. Hind wing broad (length : breadth = 2.8–2.9 : 1); unmarked. Abdomen (Figs 389, 390) unmarked, very long; setae long, sparse; callus cerci rounded or slightly ovate; trichobothria 29–33; ectoprocts with shallow apical invagination, not fused dorsally; ectoprocts fused with tergite 9; ♂: sternites 8 and 9 not fused, sternite 9 broad, extending beyond apex of ectoprocts; short setae scattered on all sclerites except tergite 9 and ectoproct; setae very dense at apex of sternite 9; sternites 7 and 8 very short;



Figs 388–393 *Kostka nacaratus*. 388, fore wing (from Kimmins); 389, apex of ♀ abdomen, lateral; 390, apex of ♀ abdomen, lateral; 391, ♂ genitalia, lateral; 392, ♀ spermatheca, lateral; 393, ♀ subgenitale, ventral.

apodemes absent; atria large; ectoprocts rounded basally, not hinged; ♀: apex of sternite 7 slightly convex.

GENITALIA ♂ (Fig. 391). Tignum, gonapsis and median plate absent; entoprocessus very long, broad; arcessus long, narrow, tapering, trifurcate apically; pseudopenis absent; gonarcus long, narrow; gonosaccus very short; gonosetae long, numerous in median clump; parameres absent; spinellae and gonocristae absent.

GENITALIA ♀ (Figs 392, 393). Praegenitale absent; subgenitale bilobed, slightly extended basally; spermatheca very narrow; ventral impression very deep, broad, occupying most of spermatheca; vela long; duct long, sinuous.

REMARKS. *Kostka* can be recognized by the broad wings with a few large spots, irregular inner gradate series and quadrangular intramedian cell. Males of *Kostka* are unusual in having sternites 8 and 9 not fused and an elongate sternite 9 and in females the very narrow spermatheca and heart-shaped subgenitale are distinctive.

It is difficult to suggest a possible sister-group of *Kostka*, although the basal position of the Sc crossvein possibly indicates ankylopterygine affinities. Similarly, the lateral spot on the elongate pronotum and the sinuous radial crossveins suggest a relationship with *Austrochrysa* Esben-Petersen.

BIOLOGY. Unknown. Adult gut contents do not include insect remains.

Genus *MALLADA* Navás

Mallada Navás, 1925*a*: 24. Type species: *Mallada stigmatus* Navás, by monotypy.

Anisochrysa Nakahara, 1955: 145. Type species: *Anisochrysa paradoxa* Nakahara, by monotypy and original designation. [Synonymized with *Chrysopa* Leach by Adams, 1959: 25; as subgenus of *Chrysopa* by Tjeder, 1966: 416; reinstated as full genus by Hölzel, 1970: 46; synonymized with *Mallada* by Adams, 1975: 172.]

Triadochrysa Adams, 1978*b*: 294 [as subgenus of *Mallada*]. Type species: *Mallada (Triadochrysa) triangularis* Adams, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. World-wide, but absent from much of the Neotropics.

This is the largest genus of the Chrysopidae with at least 122 described species and, doubtless, many more remain to be described. At present 29 species are known from the Afrotropics, 8 from Madagascar and neighbouring islands, 31 species from the western Palaearctic, 8 from the eastern Palaearctic, 19 species from the Indian subcontinent, 10 Oriental species, 12 species from Australia and the nearby Pacific islands and a further 5 from south-western Canada, western U.S.A. and Mexico. Two species are particularly widespread: *M. boninensis* (Okamoto) occurs throughout the Afrotropics and Indo-Malaysia, and *M. basalis* (Walker) is distributed from Australia to Japan and the Pacific Islands.

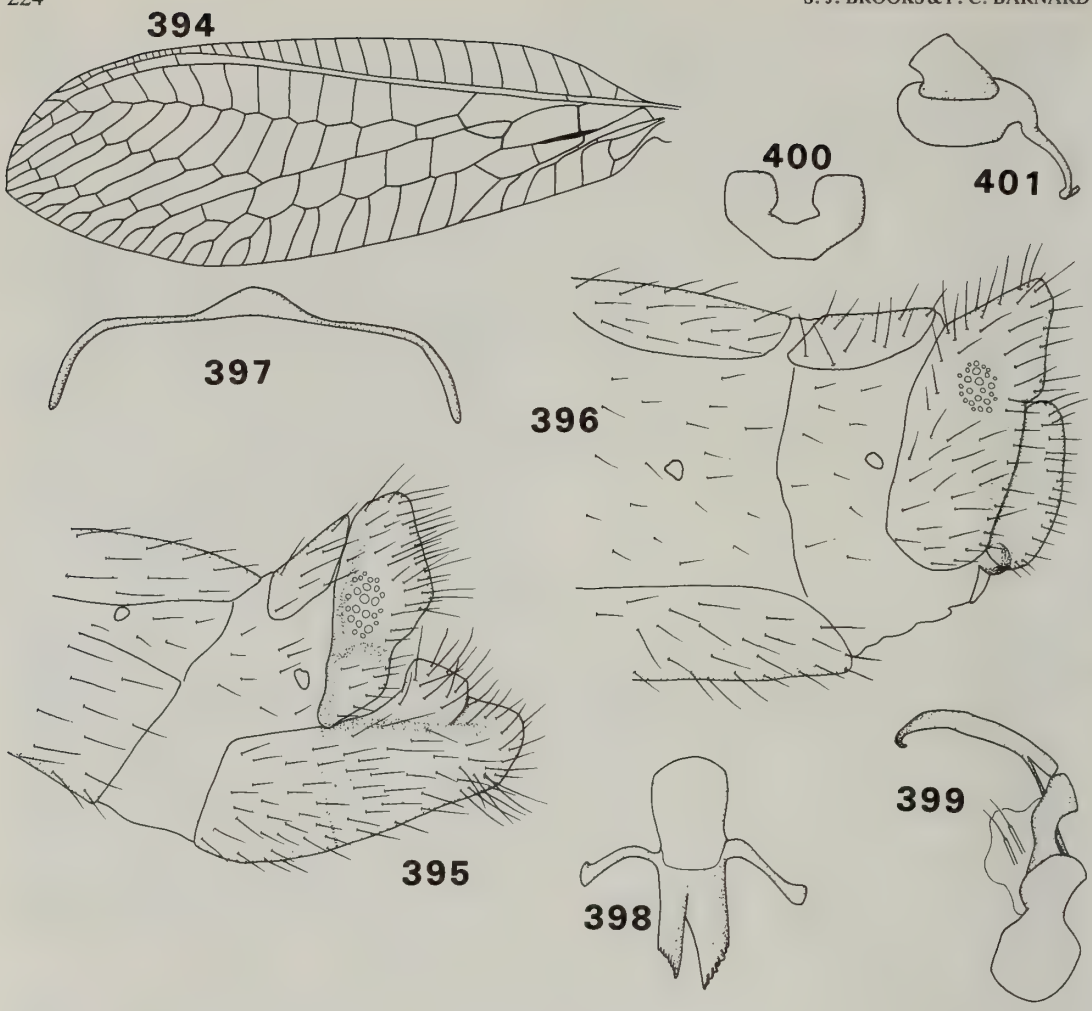
DIAGNOSIS. *Adult*. Small to medium lacewings, fore wing (Figs 394, 402) 7–16 mm; ground colour pale green, sometimes brown. Head sometimes unmarked or with red, brown or black markings on gena, clypeus, scape, vertex; labrum straight or invaginated; galea broad; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 1.9–2.9 : 1; antenna slightly longer or shorter than fore wing; flagellar segments 2–3 times as long as broad; setae arranged in four rings. Pronotum unmarked or with yellow median stripe or red or brown stripes or spots; dorsal setae long or short, pale or black; meso- and metanotum marked or unmarked; calciform organs (cuticular glands) present on pronotum and central region of mesonotum in ♂. Legs unmarked; setae long or short, pale or dark; claws with or without basal dilation. Fore wing narrow or broad (length : breadth = 2.5–3.2 : 1); unmarked or sometimes with dark suffusion around crossveins or spots; costal area narrow at base; costal setae short, inclined, occasionally long, erect; stigma unmarked or sometimes pale brown; Sc and R widely separated; basal Sc crossvein 0.16–0.32 mm; *im* short, ovate; Rs straight or slightly sinuate; gradates in two, occasionally three, parallel series, basal inner gradate not usually meeting Psm; veins often crassate in ♂; c_1 shorter than c_2. Hind wing with Sc and R fused and stigma thickened, pale brown in ♂ of some species. Abdomen (Figs 395, 396, 404) unmarked or with red or black markings; setae long, sparse; callus cerci ovate; trichobothria 25–42; ectoprocts with slight apical invagination, fused dorsally, fused with tergite 9; ♂: microtholi usually absent; sternite 8+9 fused; ♀: sternite 7 straight or convex apically.

GENITALIA ♂ (Figs 397–399, 403). Tignum arcuate or T-shaped, absent in some individuals; gonapsis variable, often three-pronged, absent in some individuals; median plate absent; entoprocessus short, straight, occasionally absent; gonarcus long, narrow; arcessus narrow, tapering apically, often with dorsal striations and basal invagination; pseudopenis absent; gonosaccus short; gonosetae few, short; spinellae and gonocristae usually absent or weakly developed.

GENITALIA ♀ (Figs 400, 401). Praegenitale absent; subgenitale bilobed apically; spermatheca broad or narrow; ventral impression deep or shallow; vela long or short; duct long or short, sinuous.

Larva. Abdomen broad, fusiform, humped; thoracic tubercles elongate, cylindrical; row of setae on metanotum; setae long, smooth or plumose; latero-dorsal abdominal tubercles absent; paired dorsal setae on abdominal segments 5–7; small packet of debris carried.

REMARKS. *Mallada* is a very diverse genus but the

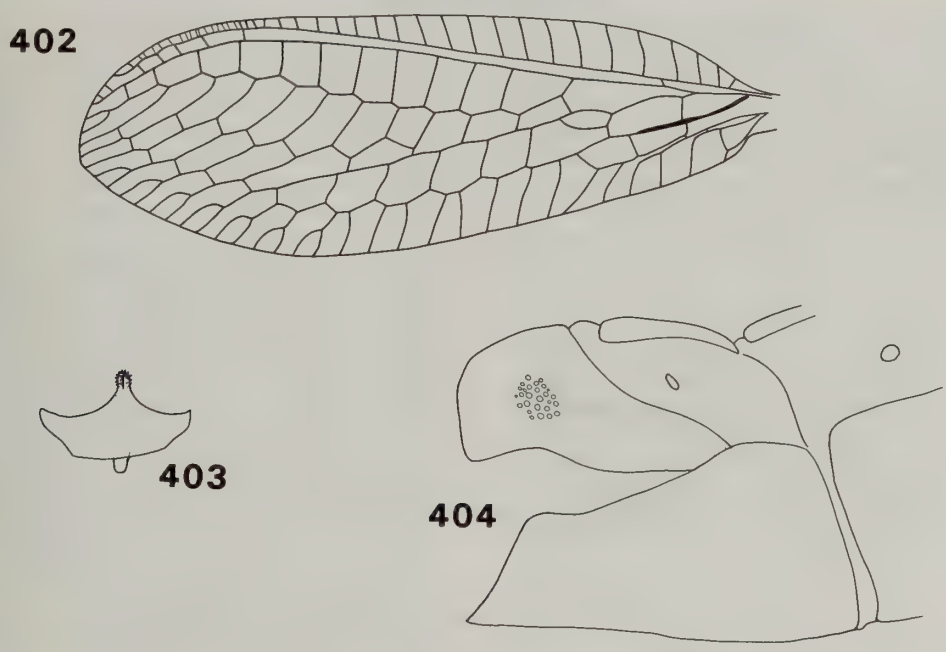


Figs 394–401 *Mallada*. 394, 398, *M. boninensis*; 395–397, 399–401, *M. basalis*; 394, fore wing; 395, apex of ♂ abdomen, lateral; 396, apex of ♀ abdomen, lateral; 397, ♂ tignum, ventral; 398, ♂ gonapsis, ventral; 399, ♂ gonarcus complex, lateral; 400, ♀ subgenitale, caudal; 401, ♀ spermatheca, lateral.

following characters are shared by most species. The basal inner gradate crossvein does not meet Psm, Rs is straight or only slightly sinuate, a tignum and gonapsis are present in the male genitalia, there are very few gonosetae and the arcessus has dorsal striations and a deep basal invagination. However, in some species, such as *M. inotata* (Walker) and a second undescribed Australian species, the gonapsis and/or tignum may be absent in certain individuals. Adams & Penny (1987) have suggested that some male genitalic components may become more heavily sclerotized as the insect matures. However, this seems unlikely to be the case in this instance since the gonapsis or tignum may be absent in individuals which are apparently otherwise mature and have the gonarcus and other genitalic structures heavily sclerotized. It seems that some *Mallada* species are prone to have a variable male genitalic complement; of course, this can lead to errors in generic placement of some species.

Triadochrysa Adams differs from *Mallada* only in the possession of three gradate series. However, from this study it is now clear that a third series of gradate crossveins has arisen independently within several chrysopid genera and that this character does not have much taxonomic significance. Moreover, Tsukaguchi (1985) has shown that *M. babai* Kuwayama, which has three series of gradates, is conspecific with *M. formosana* Matsumurae which has only two rows of gradates. Therefore, there seems to be no justification for regarding *Triadochrysa* as a distinct subgenus of *Mallada*.

Within *Mallada* there seems to be a distinct species group which has an Austro-Indonesian



Figs 402–404 *Mallada prasina*. 402, fore wing; 403, ♂ gonapsis, ventral; 404, apex of ♂ abdomen, lateral.

origin, and comprises *adamsi, basalis, boninensis, desjardinsi, dierli, dispar, flaveola, flavostigma, khandalensis, morota, nea, noumeana, scolius, serrandi, signata* and *tripunctata*. In these species the basal inner gradate crossvein meets Psm, c_2 is relatively long and broad and the radial crossveins in the apical half of the fore wing are usually sinuous or oblique. In males, the apex of the abdomen is gaping; the ectoprocts are compressed caudally and sternite 8+9 is elongate; there is a lateral lobe on sternite 8+9; the gonapsis is scale-like; there are few gonosetae which often have an elongate, swollen base; in most species veins Sc and R in the hind wing are closely apposed or fused and the stigma is thickened.

BIOLOGY. The biologies and larvae have been described in several species including *M. boninensis* (Okamoto) (Tsukaguchi, 1977; Brettell, 1979; New, 1984), *M. burgeonina* (Navás) (Tjeder, 1966); *M. clathrata* (Schneider) (Principi, 1956), *M. flavifrons* (Brauer) (Lacroix, 1925; Killington, 1937; Principi, 1956; Gepp, 1983), *M. innotata* (Walker) ((Boros, 1984); *M. inornata* (Navás) (Lacroix, 1925; Gepp, 1983), *M. prasina* (Burmeister) (Withycombe, 1923; Principi, 1956; Gepp, 1983), *M. ventralis* (Curtis) (Withycombe, 1923; Gepp, 1983), *M. basalis* (Walker) (Adams, 1959), *M. cockerelli* (McCloud) (Smith, 1926b), *M. madestes* (Banks) (Mehra, 1966; Dessart, 1973), *M. microphya* (= *basalis*) (McLachlan) (Terry, 1908; Zimmerman, 1957), *M. signata* (Schneider) (Boros, 1984); *M. traviata* (Banks) (Boros, 1984); *M. tripunctata* (McLachlan) (Boros, 1984).

In most chrysopid species occurring in temperate regions it is the pupal stage which overwinters; however, in *Mallada* it is the third instar larva which goes through the winter (Séméria, 1977; Barnard, Brooks & Stork, 1986).

Duelli & Johnson (1981) observed males of *M. basalis* during courtship vibrate their wings so vigorously that they hit the substrate and produced an easily perceptible sound. Thickening of the hind wing pterostigma probably enhances sound production and protects the wing from damage.

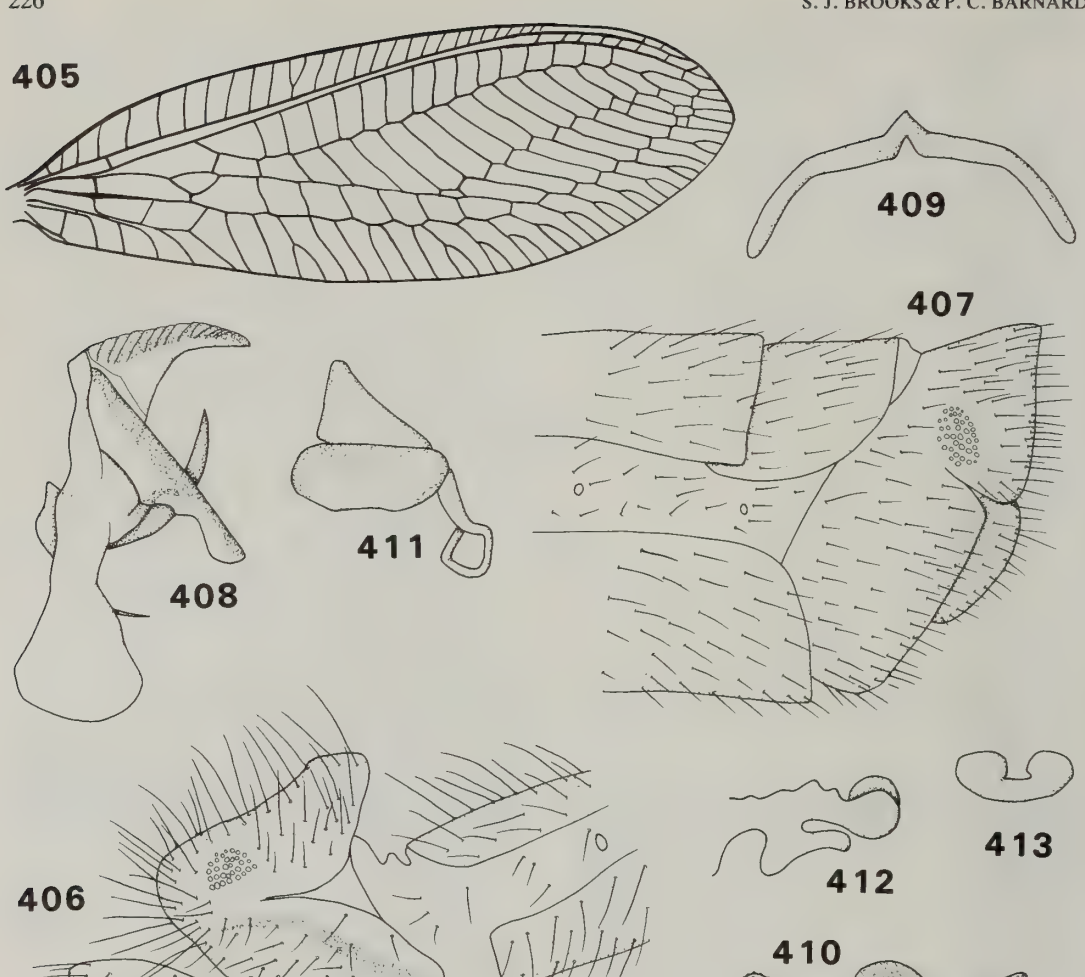
The adult gut contents do not contain insect remains.

Genus *MELEOMA* Fitch

Meleoma Fitch, 1855: 786. Type species: *Meleoma signoretii* Fitch, by monotypy.

DISTRIBUTION. Nearctic, Neotropics.

There are 26 described species of *Meleoma* with seven in the south-western U.S.A. and two species from the south-eastern U.S.A. An additional 14 species occur in Central America (mainly Mexico) and there are three more species from northern South America.



Figs 405–413 *Meleoma*. 405, 410, *M. signoretii*; 406–409, 411–413, *M. emuncta*. 405, fore wing (from Kimmins); 406, apex of ♂ abdomen, lateral; 407, apex of ♀ abdomen, lateral; 408, ♂ gonarcus complex, lateral; 409, ♂ tignum, dorsal; 410, ♂ gonapsis, ventral; 411, ♀ spermatheca, lateral; 412, ♀ subgenitale, ventral; 413, ♀ subgenitale, caudal.

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 405) 11–21 mm. Head unmarked or with red or black stripes on frons, clypeus, gena and vertex; palps tapered apically; labrum indented; vertex raised; head broad, head width : eye width = 2.7–3.9 : 1; frons of ♂ often ornamented with horns and cavity; scape sometimes elongate; antenna shorter than fore wing, widely separated at base; flagellar segments 1.5–2.0 times as long as broad; setae arranged in four rings. Pronotum unmarked or with yellow median stripe and red lateral stripe; dorsal setae long or short, pale or dark; meso- and metanotum unmarked or with yellow median stripe and red lateral stripe. Legs unmarked; setae usually short, dark; hind femur sometimes with stridulatory file; claws usually with basal dilation. Forewing narrow (length : breadth = 3.0–3.3 : 1); unmarked; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.24–0.32 mm; *im* narrow or broad, ovate; Rs sinuate; gradates in two parallel series, basal inner gradate usually meeting Psm; veins usually not crassate in ♂; c_1 shorter than c_2. Abdomen (Figs 406, 407) unmarked; setae long, sparse; callus cerci ovate;

trichobothria 28–39; ectoprocts sometimes deeply invaginated apically, fused dorsally, sometimes fused to tergite 9; lateral stridulatory structure sometimes present on 2nd sternite; ♂: ectoproct usually somewhat flattened; microtholi absent; sternite 8+9 fused; ♀: sternite 7 straight apically. GENITALIA ♂ (Figs 408–410). Tignum present or absent; gonapsis W-shaped, lateral wings expanded, bearing gonocristae; arcessus broad, often with dorsal striations; entoprocessus short, projecting ventrally; pseudopenis short, pointed apically, upturned; parameres absent; gonarcus long, narrow; gonosaccus short; gonosetae usually numerous, long; gonocristae usually absent; spinellae absent.
GENITALIA ♀ (Figs 411–413). Praegenitale absent; subgenitale bilobed apically, often with short median projection, basal lobe similar to praegenitale, and broad basal expansion; spermatheca variable; ventral impression deep; vela long or short; duct short, sinuous.

Larva. Abdomen narrow, fusiform; thoracic tubercles short, spherical; abdominal latero-dorsal tubercles absent; setae not hooked apically; debris absent or present only in small amounts.

REMARKS. *Meleoma* is very heterogenous but some external characters are shared by most species. The head is usually broad and the antennae are shorter than the fore wing and widely separated at the base. Males often have an intricate head ornamentation or a stridulatory structure and in the male genitalia there is a broad arcessus with upturned pseudopenis. A similar structure occurs in *Atlantochrysa*, *Cunctochrysa* and *Plesiochrysa ramburi*, which suggests that *Meleoma* may be distantly related to these taxa. Tauber (1969) stated that a tignum (= transverse arch) is present in all species; however, we have been unable to find one in *dolicharthra* Navás and *signoretii* Fitch. In the female the basal lobe resembling a praegenitale is an outgrowth of the membranous tube rather than an extension of the base of the subgenitale itself, and is therefore not a true praegenitale. A crumena is not present.

The head is narrow in both sexes of those species which do not have frontal ornamentation in males. However, the head is broad even in females of those species in which the males have frontal ornamentation. The frons and clypeus are marked with a broad transverse stripe in species without frontal ornamentation but unmarked in those with ornamentation.

BIOLOGY. Tauber (1969) described a complex courtship display in which the male abdomen is vibrated and the wings held out while the female advances and inserts her mandibles into the frontal cavity of the male prior to mating. Some species, which do not have this frontal ornamentation in the male, have been found to possess a stridulatory structure in both sexes (Adams, 1962; Tauber, 1969; Brooks, 1987) which is presumably used to produce songs during courtship.

The larvae have been described in several species including *M. arizonensis* Banks (Tauber, 1969), *M. cavifrons* Banks (Toschi, 1965), *M. colhuaca* Banks (Tauber, 1969), *M. comata* Banks (Toschi, 1965), *M. dolicharthra* Navás (Tauber, 1969), *M. emuncta* Fitch (Putman, 1932; 1937; Tauber, 1969), *M. hageni* Banks (Tauber, 1969), *M. pipai* Tauber (Tauber, 1969), *M. kennethi* Tauber (Tauber, 1969); *M. schwarzi* Banks (Tauber, 1969) and *M. signoretii* Fitch (Putman, 1932; 1937; Tauber, 1969).

The gut contents of adults examined during this study did not include insect remains.

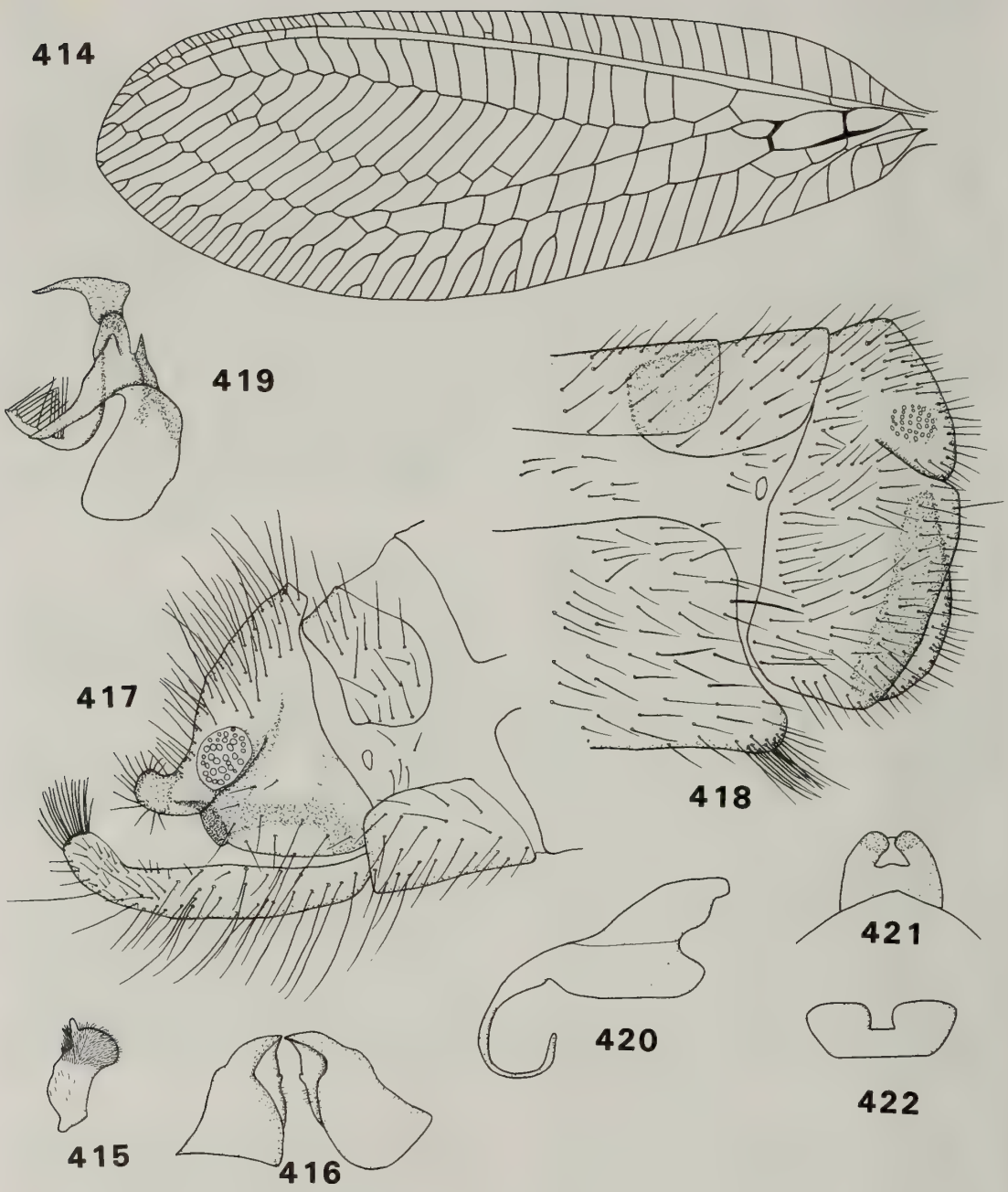
Genus ***NINETA*** Navás

Nineta Navás, 1912: 98. Type species: *Hemerobius flavus* Scopoli, by original designation. [As subgenus of *Chrysopa* Leach by Banks, 1940: 187; Hölzel, 1965: 92; reinstated as genus by Tjeder, 1966: 345.]

Parachrysa Nakahara, 1915: 121. Type-species: *Nothochrysa olivacea* Gerstaecker, by original designation and monotypy. [Synonymized by Kuwayama, 1962.]

DISTRIBUTION. West and east Palaearctic, Nearctic.
Nineta is restricted to the Holarctic with seven species occurring in the western Palaearctic, four species in the eastern Palaearctic, one undescribed species from the Nilgiri Hills, southern India and two species known from western U.S.A. *N. vittata* Scopoli is the most widely distributed species and occurs throughout the Palaearctic region.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 414) 16–22 mm. Head usually unmarked or with red lateral stripe on vertex and scape or broad dark brown band across frons, front of vertex and between antennae; palps tapered apically; galea long (Fig. 415), broad with large apical papilla; mandibles broad, symmetrical with small basal tooth on each mandible (Fig. 416); labrum almost straight or with deep indentation; vertex flat; head width : eye width = 2.7–3.0 : 1 (2.4: 1 in Nilgiri species), head broad; scape sometimes elongate; antenna shorter than fore wing; flagellar segments 1.5–2.0 times as long as broad; setae arranged in four rings. Pronotum



Figs 414–422 *Nineta*. 414–416, 418, 420–422, *N. vittata*; 417, 419, *N. flava*. 414, fore wing; 415, galea, dorsal; 416, mandibles, dorsal; 417, apex of ♂ abdomen, lateral; 418, apex of ♀ abdomen, lateral; 419, ♂ genitalia, lateral; 420, ♀ spermatheca, lateral; 421, ♀ subgenitale, ventral; 422, ♀ subgenitale, caudal.

marked with red or dark brown lateral spot or stripe; dorsal setae short, dark (long, pale in Nilgiri species); meso- and metanotum unmarked or with red or dark brown spot. Legs unmarked; setae short, dark (long, pale in Nilgiri species); claws with basal dilation. Fore wing unmarked; narrow or ovate (length : breadth = 2.7–3.0 : 1); costal area narrow at base; costal setae usually very short, inclined (long, erect in Nilgiri species); stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.4–1.3 mm; radial crossveins sinuate; *im* narrow, ovate; Rs sinuate; gradates in

two parallel or slightly divergent series; basal inner gradates extended basally, sometimes meeting Psm; veins sometimes crassate in ♂; costa sometimes concave medially; c_1 shorter than c_2. Abdomen (Figs 417, 418) elongate, unmarked; setae long, sparse; ectoprocts deeply invaginated apically, fused dorsally, not fused with tergite 9; ♂: additional very short, coarse setae present at least on sclerites 3–5; setae long, coarse at apex of ectoprocts and sternite 9; microtholi present or absent; callus cerci rounded or ovate; trichobothria 25–32; ectoprocts elongate apically; sternite 8 and 9 not fused; sternite 9 elongate, curved dorsally with apical swelling; ♀: setae long, coarse at apex of sternite 7; callus cerci rounded; trichobothria 34–37; sternite 7 convex and slightly projecting apically.

GENITALIA ♂ (Fig. 419). Tignum, gonapsis and median plate absent; entoprocessus straight; gonarcus long, narrow with median horns; arcessus short, L-shaped; pseudopenis absent; gonosaccus short; gonosetae numerous, long or short, in circular median clump; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 420–422). Praegenitale absent; subgenitale bilobed apically; ventral impression absent or very shallow; vela long; duct long, sinuous; spermatheca narrow.

Larva. Abdomen fusiform, not humped; prothoracic tubercles hardly developed; other thoracic and abdominal tubercles very short, spherical; setae short, smooth, not hooked; latero-dorsal abdominal tubercles absent; debris not carried.

REMARKS. Species of *Nineta* may be distinguished from most other Chrysopini by their large size, and usually by their lack of head markings and elongate scape. The apex of the male abdomen is also very distinctive with the elongate ectoprocts and upturned tip of sternite 9.

The genus appears to be very closely related to *Tumeochrysa* Needham, since both genera share many apomorphies. Similarities in the male genitalia and abdominal apex are particularly striking. However, *Tumeochrysa* differs from *Nineta* in that there are three gradate series, *dcc* is short and closed before the posterior margin of the fore wing, the costal margin of the hind wing is convex and the scape is grossly enlarged in all species, not just narrowly elongate as in some *Nineta* species. There is a geographical overlap in the ranges of the two genera in India and China but no species in this region show intermediate characters. Therefore, it seems justifiable to continue to regard them as distinct genera.

The possession of short abdominal setae and median horns on the gonarcus in males of *Nineta* is reminiscent of *Ceratochrysa* Tjeder and there are also similarities with *Chrysopa* Leach, species of which also have broad heads, a suture between sternites 8 and 9 and the ectoprocts and tergite 9 incompletely fused.

Navás (1912) suggested that *Nineta* was similar to *Chrysocerca* Weele because males of both genera have apical extensions of the ectoprocts. However, these two genera do not appear to be closely related since they share no significant characters and even the cerci are morphologically quite different.

BIOLOGY. The larvae of several species of *Nineta* have been described including *N. carinthiaca* (Hölzel) (Gepp, 1983), *N. flava* (Scopoli) (Alderson, 1911*a*; Killington, 1937; Canard, 1983; Gepp, 1983), *N. guadarramensis* (Pictet) (Gepp, 1983), *N. inpunctata* (Reuter) (Gepp, 1983), *N. pallida* (Schneider) (Brauer, 1867; Gepp, 1983) and *N. vittata* (Wesmael) (Killington, 1937; Gepp, 1983).

Adult gut contents do not include insect remains.

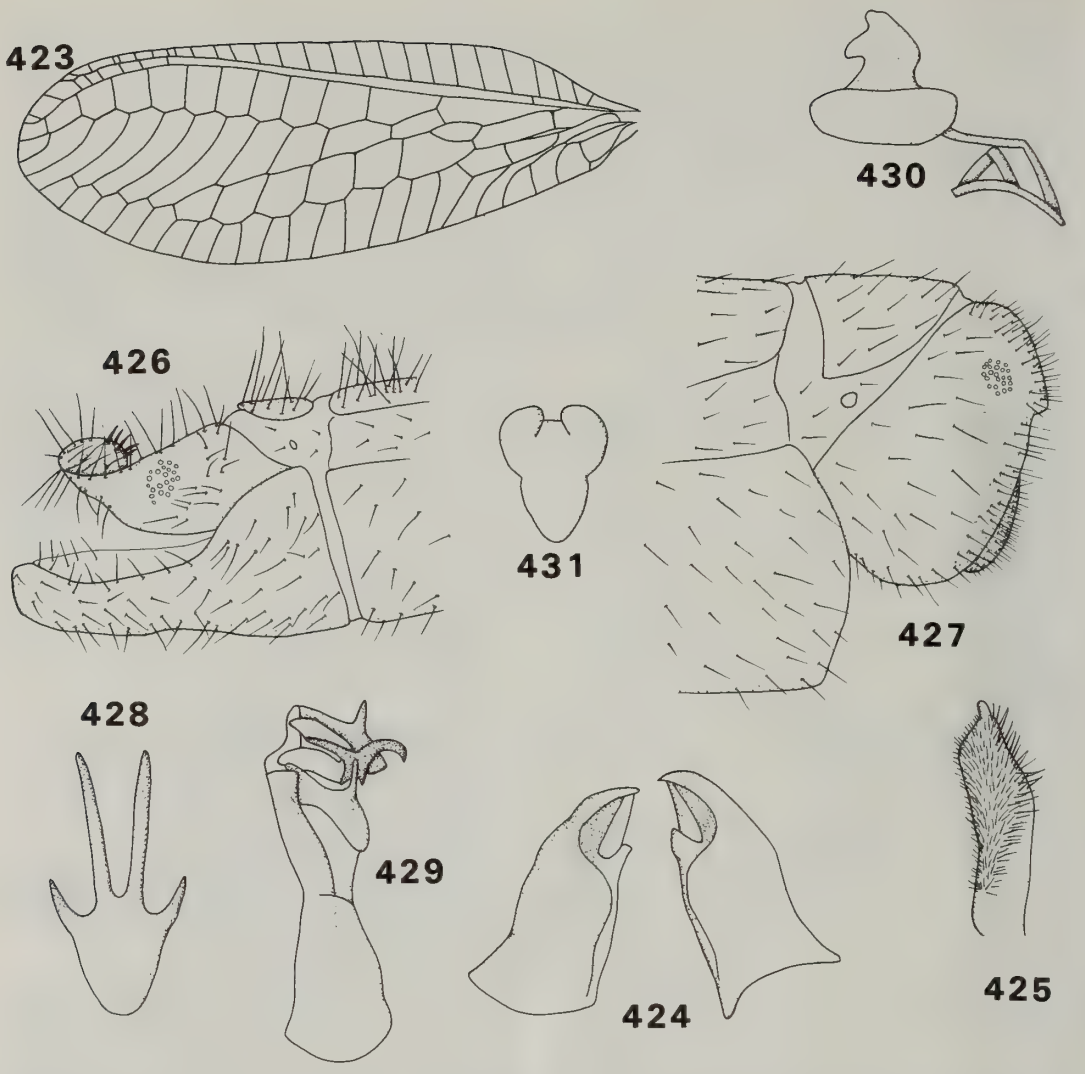
Genus ***PARACHRYSOPIELLA*** **gen. n.**

Type species: *Eremochrysa argentina* Banks.

DISTRIBUTION. Neotropics.

The genus includes two species, one from Argentina and an undescribed species, present in the BMNH collections, from Chile.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 423) 6–11 mm; ground colour green. Head long, narrow; marked with dark brown stripe on gena, clypeus, vertex, scape; labrum slightly invaginated; mandibles narrow, symmetrical with basal tooth on each mandible (Fig. 424); galea long, narrow (Fig. 425); palps long, narrow; vertex slightly raised; head width : eye width = 3.0–4.9 : 1, eyes very small; pedicel elongate; antenna as long as fore wing; flagellar segments 3 times as long as broad; setae short, dark, arranged in four rings. Pronotum marked with dark brown longitudinal stripe; dorsal setae short, coarse, black; meso- and metanotum marked with longitudinal median brown stripe. Legs unmarked; setae short, dark; claws with basal dilation. Fore wing oval (length : breadth = 2.6–2.8 : 1); unmarked; costal area narrow at base; costal setae short, inclined; costal cells broad; Sc short; Sc and R widely separated; basal Sc crossvein 0.24 mm; *im* ovate; Rs straight; inner gradates absent; veins not crassate in ♂; c_1 slightly longer than c_2. Hind wing with inner gradates absent. Abdomen (Figs



Figs 423–431 *Parachrysopiella* sp. indet. 423, fore wing; 424, mandibles, dorsal; 425, galea, dorsal; 426, apex of ♂ abdomen, lateral; 427, apex of ♀ abdomen, lateral; 428, ♂ gonapsis, ventral; 429, ♂ gonarcus complex, lateral; 430, ♀ spermatheca, lateral; 431, ♀ subgenitale, ventral.

426, 427) unmarked; setae coarse, short, sparse; microtholi absent; trichobothria 20–34; ectoprocts deeply invaginated apico-dorsally, not fused dorsally, fused with tergite 9; ♂: ectoprocts extended apically with short, very coarse setae at apex; sternite 8+9 fused, elongate; apodeme on sternite 8+9 curving ventrally; callus cerci ovate; ♀: callus cerci rounded; sternite 7 straight apically.

GENITALIA ♂ (Figs 428, 429). Tignum absent; gonapsis short, broad, bifurcate; median plate absent; entoprocessus elongate with dorsal median tooth; parameres absent; gonarcus long, arcuate; arcessus short with strong apical hook; pseudopenis absent; gonosaccus very short; gonosetae absent or very few, short; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 430, 431). Praegenitale absent; subgenitale bilobed apically with long basal extension; spermatheca large, narrow; ventral impression moderate; vela long; duct short, sinuous.

REMARKS. Species of *Parachrysopiella* superficially resemble *Eremochrysa* (subgenus *Chrysopiella*) which also lacks inner gradates in the fore wing. However, the male and female genitalia differ considerably which suggests that they are not congeneric. In males of *Eremochrysa*, unlike *Parachrysopiella*, the ectoprocts are not

extended apically, dorsal microsetae are present on the arcessus, long gonosetae are present, there is a small ovate sclerite situated below the ectoprocts, the gonapsis is long and narrow and the entoprocessus are broad and not toothed. In females of *Eremochrysa* the subgenitale is not extended basally. In addition, the claws are undilated and the pedicel is not elongate in *Eremochrysa*. Nevertheless, the two genera do share several synapomorphies, such as the narrow galea, narrow symmetrical mandibles, narrow palps and absence of inner gradates, which suggest a close relationship.

BIOLOGY. Unknown. Pollen grains were present in the guts of adults examined during this study, but no insect remains.

Genus ***PEYERIMHOFFINA*** Lacroix

Peyerimhoffina Lacroix, 1920: 83. Type species: *Peyerimhoffina pudica* Lacroix, by monotypy.

Tjederina Hölzel, 1970: 48. Type species: *Chrysopa gracilis* Schneider, by original designation and monotypy. [Synonymized with *Apertochrysa* Tjeder by Zeleny, 1971: 175; as subgenus of *Chrysopa* Leach by Principi, 1977: 326; reinstated as genus by Aspöck *et al.*, 1980: 261.] **Syn. n.**

DISTRIBUTION. Eastern and western Europe, Morocco.

At present, two described species are included in *Peyerimhoffina* but further investigation will probably reveal that they are synonymous.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 432) 9–10 mm; ground colour green. Head marked with dark brown stripe on gena, scape and lateral red stripe below antennae; palps squared apically; labrum straight; vertex raised; head width : eye width = 3.0–3.3 : 1; antenna shorter than fore wing; flagellar segments about twice as long as broad; setae arranged in four rings. Pronotum marked with yellow median stripe; dorsal setae short, dark; meso- and metanotum marked with yellow median stripe. Legs unmarked; setae short, dark; claws without basal dilation. Fore wing very narrow (length : breadth = 3.5–4.0 : 1); unmarked; costal area narrow at base; costal setae short, inclined; basal costal crossveins sinuous; stigma long, thickened, marked pale brown; Sc and R widely separated; basal Sc crossvein 0.16–0.24 mm; *im* narrow, ovate; 1st Rs crossvein meets *im* at or just basal or proximal of apex; m_2 elongate; Rs straight; gradates in two parallel series; basal inner gradate meeting Psm; inner gradates more numerous than outer gradates; veins not crassate in ♂; c_1 same length as c_2; posterior marginal crossveins parallel. Hind wing narrow (length : breadth = 3.2–3.6 : 1); unmarked; inner gradates more numerous than outer gradates; costal margin convex. Abdomen (Figs 433, 434) unmarked or with yellow dorsal median stripe; setae quite short and sparse; callus cerci large, ovate; trichobothria 26–28; ectoprocts very narrow, pointed apico-dorsally; ectoprocts without dorsal invagination, fused dorsally, fused with tergite 9; ♂: microtholi absent; sternite 8+9 fused, short; apodemes linear; ♀: sternite 7 straight apically.

GENITALIA ♂ (Figs 435, 436). Tignum absent; gonapsis V-shaped; median plate absent; entoprocessus short, T-shaped; parameres absent; gonarcus long, narrow, arcuate, lateral lobes large; arcessus short, narrow, tapering to apical hook; gonosaccus small; gonosetae short, few arranged in lateral clump; gonocristae and spinellae absent.

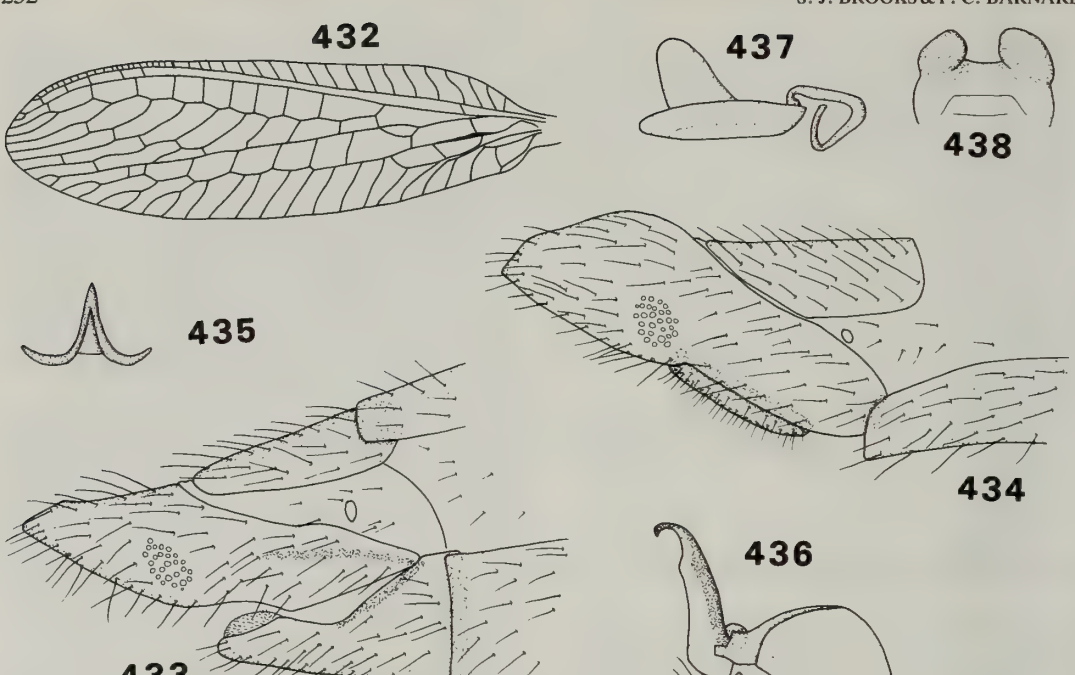
GENITALIA ♀ (Figs 437, 438). Praegenitale absent; subgenitale bilobed apically; spermatheca very narrow, flattened; ventral impression shallow; vela quite long; duct short, sinuous.

Larva. Abdomen narrow, fusiform; thoracic and abdominal tubercles hardly developed; setae short; no debris carried.

REMARKS. *Peyerimhoffina* is a very distinctive genus and has several synapomorphic characters suggesting that it is highly derived. Species may be distinguished by the narrow wings, inner gradates out-numbering the outer ones and the narrow, pointed ectoprocts in both sexes. However, the narrow fore wing, short intramedian cell and sinuous basal costal crossveins are reminiscent of *Chrysoperla* and these characters do not occur widely in the rest of the Chrysopidae so may indicate a close relationship.

Principi (1977) and Aspöck *et al.* (1980) figured a tignum in males of *P. gracilis* but this was not shown by Kis *et al.* (1970). We have been unable to find a tignum in any of the males examined in this study.

Although we have synonymized *Tjederina* Hölzel with *Peyerimhoffina*, we have been unable to examine the type specimen of *P. pudica* Lacroix (the type species of *Peyerimhoffina*) because it could not be located in the Muséum National d'Histoire Naturelle, Paris. From Lacroix's (1920) description it is evident that *P. pudica* shares many characters with *Tjederina* which are not found elsewhere in the Chrysopidae. The pterostigma is long, thickened and pale brown, there are more inner than outer gradates, the wings are



Figs 432–438 *Peyerimhoffina gracilis*. 432, fore wing; 433, apex of ♂ abdomen, lateral; 434, apex of ♀ abdomen, lateral; 435, ♂ gonapsis, ventral; 436, ♂ gonarcus complex, lateral; 437, ♀ spermatheca, lateral; 438, ♀ subgenitale, ventral.

very narrow, the basal costal crossveins are sinuous, the first Rs crossvein meets Psm just proximal of the apex of *im*, the ectoprocts are pointed dorso-apically, the callus cercus is relatively large and the species is associated with the conifer *Abies numidica*. Lacroix commented on the lack of Sc crossveins in the pterostigmal region: these are present in *Tjederina* but are often difficult to see.

BIOLOGY. The larva of *P. gracilis* has been described by Gepp (1983) and is said to be associated with conifers. No insect remains were found in the guts of adults examined during this study.

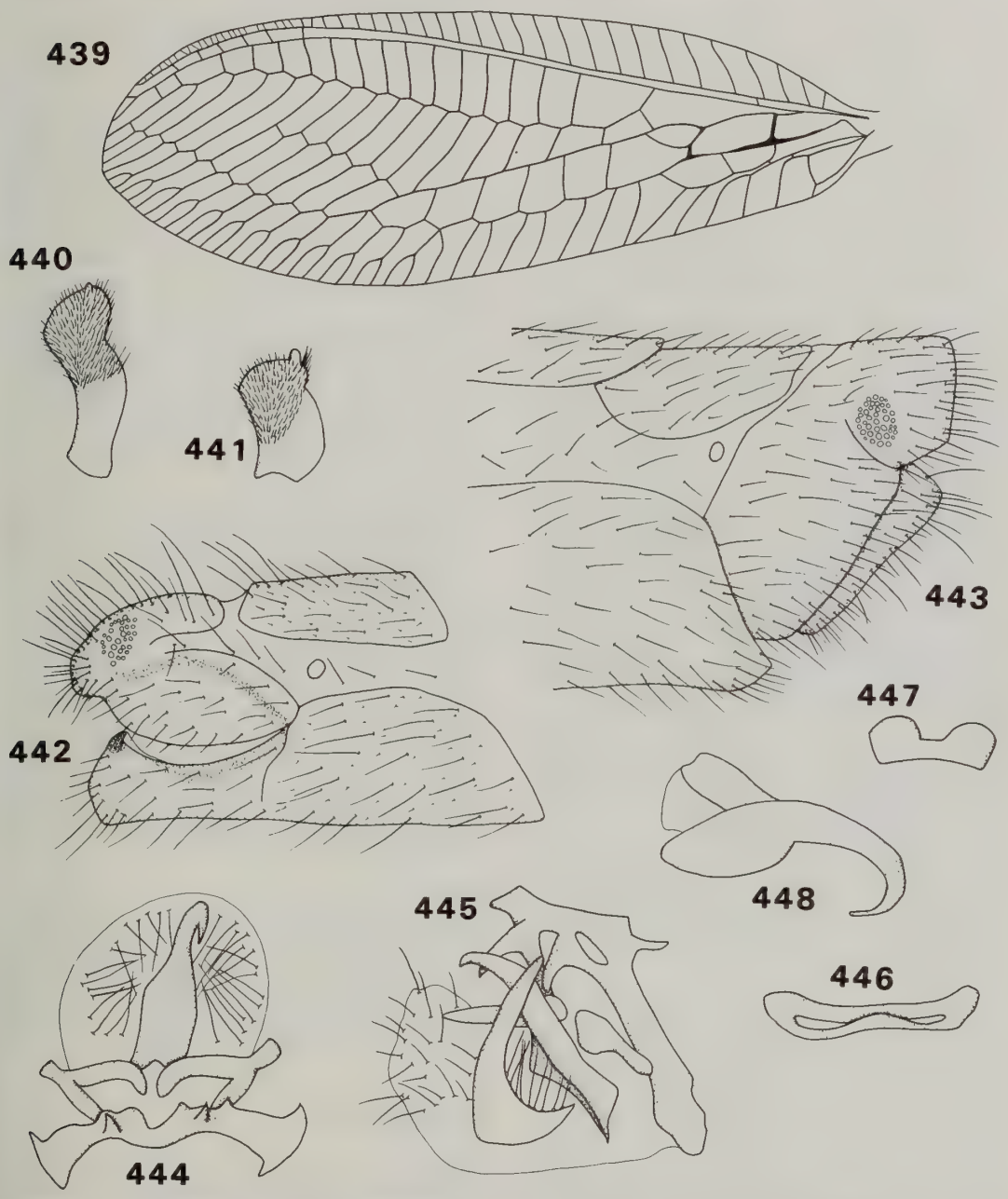
Genus ***PLESIOCHRYSA*** Adams **stat. n.**

Plesiochrysa Adams, 1982a: 28 [as subgenus of *Chrysopa* Leach]. Type species: *Chrysopa brasiliensis* Schneider, by original designation.

DISTRIBUTION. Neotropics, Oriental, Australasia.

The genus includes 23 described species and several undescribed ones are in the BMNH collections. Five species occur in the Neotropics and the rest are widely distributed from Australia and the Pacific Islands, through Malaysia to southern India and the Seychelles. *Plesiochrysa ramburi* (Schneider) is common and occurs through-out Austro-Malaysia and most of Micronesia.

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 439) 13–18 mm; ground colour pale green. Head unmarked or with red or yellow markings on gena, clypeus, frons, vertex, markings sometimes black; palps tapered apically; mandibles broad, asymmetrical with basal tooth on left mandible; galea variable (Figs 440, 441); labrum indented; vertex slightly raised; head width : eye width = 1.9–2.6 : 1; antenna slightly longer or shorter than fore wing; scape as long as broad; flagellar segments 2–3 times as long as broad; setae arranged in four rings. Pronotum sometimes elongate with numerous micropoculae; dorsal setae coarse, pale; marked with yellow median stripe, red lateral spot or stripe, sometimes with black markings; meso- and metanotum unmarked or marked with yellow median stripe or red lateral spots, sometimes with black markings. Legs unmarked; setae long or short, pale or dark; claws with basal dilation, occasionally undilated. Fore wing often narrow (length : breadth = 2.7–3.3 : 1); unmarked, occasionally with brown



Figs 439–448 *Plesiochrysa*. 439, 440, *P. oceanica*; 441, 445, *P. ramburi*; 442, 444, 446, *P. brasiliensis*; 443, 447, 448, *P. elongata*. 439, fore wing; 440, 441, galea, dorsal; 442, apex of ♂ abdomen, lateral; 443, apex of ♀ abdomen, lateral; 444, ♂ gonarcus complex, dorsal; 445, ♂ gonarcus complex, caudal; 446, ♂ tignum, dorsal; 447, ♀ subgenitale, caudal; 448, ♀ spermatheca, lateral.

shading on basal crossveins; costal area narrow at base; costal setae short, inclined; stigma unmarked; Sc long; Sc and R widely separated; basal Sc crossvein 0.20–0.36 mm; radial crossveins straight in Old World species, sinuous in New World species; *im* ovate, narrow or broad; Rs sinuate; gradates in two, occasionally three, parallel or divergent series; basal inner gradate usually meeting Psm; veins rarely crassate in ♂; c_1 shorter than c_2; c_2 rounded apically, broad. Hind

wing narrow (length : breadth = 2.8–3.6 : 1); unmarked; gradates in two (occasionally three) series. Abdomen (Figs 442, 443) unmarked or with yellow mid-dorsal stripe or brown markings; setae long, sparse, occasionally dense; callus cerci rounded or ovate; trichobothria 28–40; ectoprocts fused dorsally, with or without suture between ectoproct and tergite 9; ♂: additional short setae often present on sclerites; microtholi present or absent; ectoprocts broad, basally rounded, deeply invaginated apically; sternites 8 and 9 not fused or incompletely fused with short suture present; apodeme on tergite 9 arcuate; ♀: ectoprocts slightly invaginated dorso-apically; sternite 7 straight apically.

GENITALIA ♂ (Figs 444–446). Tignum narrow, linear in Neotropical species, absent in Old World species; gonapsis and median plate absent; entoprocessus elongate, usually Y-shaped (bifurcating basally); arcessus absent; parameres absent; gonarcus long, arcuate with paired median horns; pseudopenis elongate, arcuate, tapering apically (in *P. ramburi* additional up-turned ventral hook bearing setae and bilobed apex is present); gonosaccus large, globular; gonosetae numerous, long, usually projecting inwards, in lateral clump; spinellae absent; gonocristae usually absent but small subapical patch present in *ramburi*.

GENITALIA ♀ (Figs 447, 448). Praegenitale absent; subgenitale bilobed apically sometimes with basal crumena; spermatheca narrow; ventral impression shallow; vela short; duct long or short, curved, sometimes broad basally.

Larva. Abdomen broadly fusiform; thoracic tubercles spherical; setae smooth; row of setae absent from metanotum; laterodorsal abdominal tubercles absent except from tergites 6 and 7; small packet of debris carried.

REMARKS. *Plesiochrysa* may be recognized by its large size, elongate prothorax and long, narrow wings. The genus is obviously closely related to *Chrysopa* Leach since in males the apodeme on tergite 9 is arcuate, a pseudopenis is present, dorsal horns are present on the gonarcus and the gonosetae are long, numerous and in lateral clumps. However, it differs from *Chrysopa* Leach in that the head width : eye width is greater, males sometimes possess a tignum, the head markings are generally red not black, the entoprocessus are elongate and not horned, there are short microsetae on all sclerites, the gut contents show no signs of insect remains and the larvae lack laterodorsal tubercles. All these characters justify the elevation of *Plesiochrysa* to a genus. *Plesiochrysa* is also probably closely related to *Ceratochrysa* Tjeder which share a similar wing shape and venation, elongate prothorax and males of which also have additional short abdominal setae.

There are four distinct species groups within *Plesiochrysa*: the Neotropical species; the Old World species including *oceanica*; *ramburi*; and an undescribed species from the Solomon Islands. In the Neotropical species the head is marked with narrow red stripes; the wings are narrow; the radial crossveins are sinuous; sternites 8 and 9 are incompletely fused; the ectoproct and tergite 9 are not completely fused; a tignum is present; the short, additional setae on the male abdomen are sparse.

The Old World species differ from the others in having slightly broader wings; the head is marked with large red or yellow spots; the intramedian cell is broad; the short setae on the male abdomen are dense; sternites 8 and 9 are entirely separate; the ectoprocts and tergite 9 are completely fused in males and females.

In *P. ramburi* the head and thorax have black markings; the claws are undilated; sternites 8 and 9 are entirely separate; the ectoprocts and tergite 9 are completely fused; an additional ventral hook is present in the male genitalia (Fig. 445); a small patch of gonocristae is present subapically on sternite 9; the gonosetae do not project inwards.

In the undescribed species from the Solomon Islands the head is unmarked; the eyes large (head width : eye width = 1.9 : 1); thorax is marked with black; the gradates are arranged in three series in the fore and hind wing; the basal crossveins are shaded brown; abdominal setae are dense; microtholi are present in males.

BIOLOGY. The larvae of two species of *Plesiochrysa* have been described: *P. lacciperda* (Kimmins) (Mehra, 1966) and *P. ramburi* (Schneider) (Adams, 1959). No insect remains were present in the guts of any of the adults examined during this study, although *P. paessleri* is reported to be an insect feeder (E. Nuñez, pers. comm.).

Genus ***REXA*** Navás

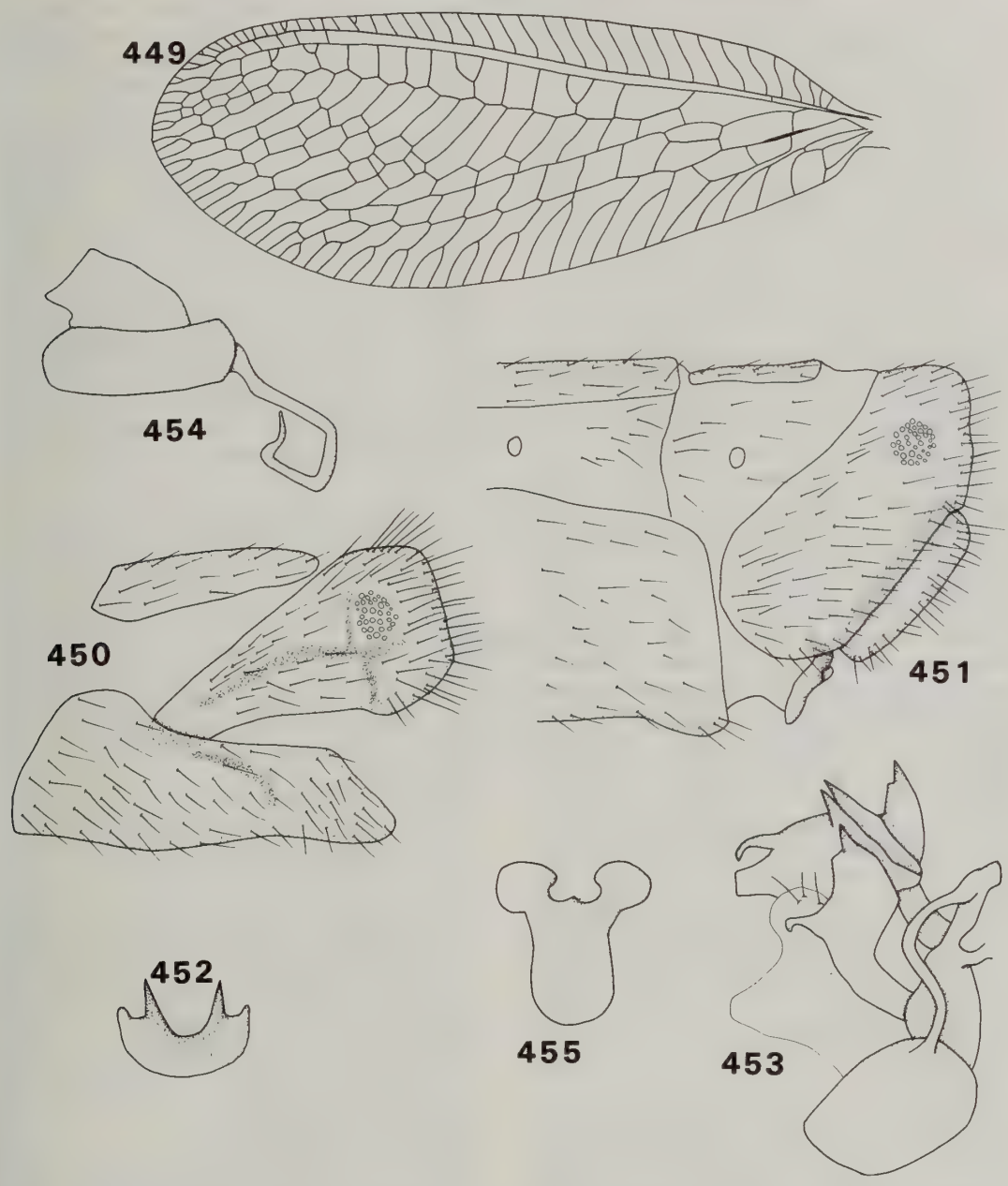
Rexa Navás, 1920b: 289. Type species: *Rexa lordina* Navás, by original designation and monotypy.

Eurochrysa Esben-Petersen, 1925: 67. Type species: *Chrysopa corsica* Hagen, by original designation. [Synonymized by Hölzel, 1973c: 78.]

DISTRIBUTION. Mediterranean.

The genus includes three described species.

DIAGNOSIS. *Adult*. Medium sized lacewings, fore wing (Fig. 449) 13–14 mm; ground colour olive



Figs 449–455 *Rexa*. 449, 451, 454, 455, *R. lordina*; 450, 452, 453, *R. raddai*. 449, fore wing; 450, apex of ♂ abdomen, lateral; 451, apex of ♀ abdomen, lateral; 452, ♂ gonapsis, dorsal; 453, ♂ gonarcus complex, lateral; 454, ♀ spermatheca, lateral; 455, ♀ subgenitale, caudal.

green. Head with black stripe on gena or red suffusion, red stripe on vertex; palps truncate, flattened apically; labrum deeply invaginated; vertex raised; toruli small; head width : eye width = 2.3–2.7 : 1; antenna shorter than fore wing; flagellar segments twice as long as broad, first segment elongate; setae arranged in four rings. Pronotum with broad yellow median longitudinal stripe or red lateral stripe; dorsal setae long or short, pale or dark, coarse; meso- and metanotum with yellow longitudinal median stripe. Legs unmarked; setae long or short, pale or dark; claws without basal dilation. Fore wing broad (length : breadth = 2.5 : 1), oval; unmarked; costal area

narrow at base; costal setae quite short, inclined; stigma unmarked; Sc long; Sc and R widely separated; basal Sc crossvein 0.32 mm; *im* long, quadrangular; Rs straight; veins not crassate in ♂; gradates in three irregular series or two parallel series; basal inner gradate not meeting Psm; c_1 shorter than c_2; c_2 broad, squared apically; posterior margin broad; posterior marginal crossveins parallel, forked from just proximal of mid-wing. Hind wing very broad (length : breadth = 2.5 : 1); gradates in three irregular series or two parallel series. Abdomen (Figs 450, 451) unmarked; setae quite short, sparse; trichobothria 32–34; ectoprocts with slight dorso-apical invagination, fused dorsally, fused with tergite 9; atria small; ♂: microtholi absent; callus cerci ovate; sternite 8+9 fused, broad, short; ♀: callus cerci rounded; sternite 7 straight apically.

GENITALIA ♂ (Figs 452, 453). Tignum absent; gonapsis broad with pair of strong submedian teeth; median plate absent; entoprocessus broad, triangular, strongly toothed at apical angle; arcessus trifurcate at apex with pair of dorsal teeth basally; pseudopenis absent; gonarcus long, narrow, arcuate; gonosaccus short; gonosetae few, short, positioned in central clump below arcessus; spinellae and gonocristae absent; hypandrium small.

GENITALIA ♀ (Figs 454, 455). Praegenitale absent; subgenitale bilobed apically with median projection, lobes widely separated, with very long basal extension; spermatheca very narrow; ventral impression very deep, broad; vela long; duct long, sinuous.

Larva. Abdomen humped; jaws shorter than head; thoracic tubercles broad and long, bearing many long, smooth setae with apical hooks; meso- and metanotum with transverse row of setae; abdominal tubercles situated laterally on segments 2–7; abdominal setae hooked apically; debris carried.

REMARKS. *Rexa* may easily be distinguished from other Chrysopini genera by the quadrangular intramedian cell, straight radial sector, broad posterior margin with posterior marginal crossveins forked from mid-wing and irregular gradate series. The female genitalia are distinctive with the long basal extension of the subgenitale. *Rexa* may be related to *Himalochrysa* because of the following shared characters: in the male the arcessus is trilobed apically with dorsal horns, the entoprocessus is toothed apically with a ventral lobe and a gonapsis present; in the female the subgenitale has a ventral extension.

The description of *Eurochrysa* given by Esben-Petersen (1925) agrees closely with that of *Rexa* Navás and there can be little doubt that they are synonymous. However, Esben-Petersen (1925) noted that there were two syntypes of *Chrysopa corsica* Hagen, the type-species, in the de Selys collection, Institut Royal des Sciences Naturelles de Belgique, Brussels. At present, there are two specimens in the de Selys collection over a label reading 'Chrysopa corsica Hagen'. However, these specimens are *Mallada flavifrons* (Brauer), and were determined as such by Tjeder in 1967. Hagen's (1864) description was very detailed and clearly does not refer to the above specimens but does correspond with Esben-Petersen's diagnosis, so it must be assumed that these are not the types and that they were placed over the 'corsica' label after Esben-Petersen examined them. However, there are apparently no other specimens in the de Selys collection which could be the syntypes of *C. corsica*.

BIOLOGY. The biology of *Rexa lordina* Navás has been investigated in south-west France by Canard & Labrique (1989). In that region the species was associated with the oleaceous bush *Phillyrea angustifolia* (L.) which supported nymphs of the jumping plantlouse *Euphyllura olivina* (Costa). Adults were on the wing from May to early July and they had a glycophagous diet. Eggs were laid singly, and the life cycle was univoltine. The gut contents of adults examined in this study did not contain insect remains.

Genus ***SUARIUS*** Navás

Suarius Navás, 1914a: 73. Type species: *Suarius walsinghami* Navás, by original designation and monotypy. [As subgenus of *Chrysopa* Leach by Tjeder, 1966: 372; reinstated as genus by Hölzel, 1970: 51.]

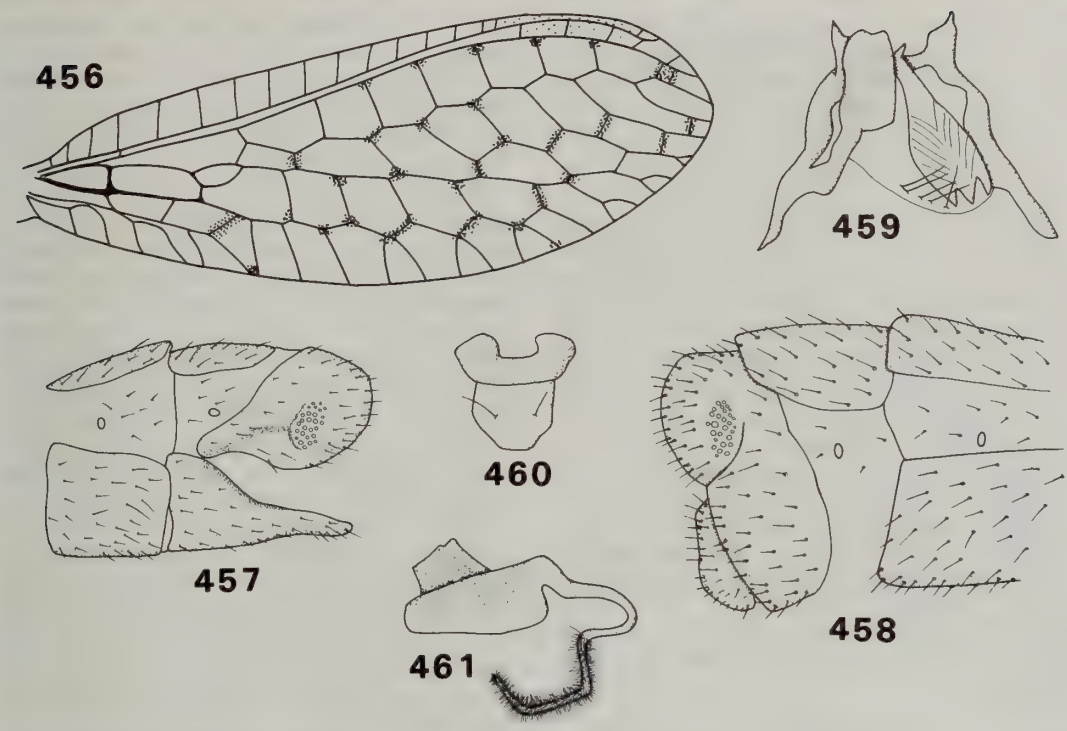
Vasquezius Navás, 1914a: 75. Type species: *Vasquezius alisteri* Navás, by original designation and monotypy. [Synonymized with *Suarius* by Hölzel, 1980: 169.]

Prochrysopa Tjeder, 1936: 18. Type species: *Prochrysopa mongolica* Tjeder, by monotypy. [Synonymized with *Suarius* by Tjeder, 1966: 372; as subgenus of *Suarius* by Hölzel, 1970: 51.] **Syn. rev.**

DISTRIBUTION. Eastern and western Palaearctic.

Suarius includes 17 species and subspecies described from the western Palaearctic region and five species from the eastern Palaearctic.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 456) 6–12 mm; ground colour brown or green. Head usually extensively marked with red



Figs 456–461 *Suarius*. 456, *S. nana*; 457, 459, *S. walsinghami*; 458, 460, 461, *S. caviceps*. 456, fore wing (from Kimmins); 457, apex of ♂ abdomen, lateral; 458, apex of ♀ abdomen, lateral; 459, ♂ genitalia, caudal (right entoprocessus not shown); 460, ♀ subgenitale, ventral; 461, ♀ spermatheca, lateral.

or black stripes; palps tapered; galea short, broad; labrum slightly indented; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 1.9–2.6 : 1; antenna as long as fore wing; flagellar segments about 3 times as long as broad; setae arranged in four rings. Pronotum marked with broad, brown lateral stripe; dorsal setae short, dark; meso- and metanotum unmarked or with brown lateral stripe. Legs unmarked or with tibial or femoral annulations; setae short, dark; 1st tarsal segment elongate, especially in hind leg; claws without basal dilation. Fore wing quite narrow (length : breadth = 2.6–3.0 : 1); unmarked or marked with numerous small black spots; costal area narrow at base; costal setae very short, inclined; underside of R bearing dense, thickened setae ('scales') in males of some species; costal crossveins widely spaced, costal cells almost as long as broad; stigma usually unmarked; Sc and R widely separated; basal Sc crossvein 0.16–0.28 mm; *im* ovate, broad; Rs straight; few, if any, radial crossveins forking at apex; gradates in two parallel series; inner basal gradate not meeting Psm; R sometimes crassate in ♂; c_1 about same length as c_2. Hind wing with stigma unmarked; dorsal side of R crassate with thickened setae ('scales') in ♂ of some species.

Abdomen (Figs 457, 458) with extensive black markings or unmarked; setae long, sparse but often coarse, short; callus cerci rounded or ovate; trichobothria 25–33; ectoprocts with broad dorsoapical invagination, fused dorsally or separated by deep groove; ♂: ectoprocts and tergite 9 fused; sternite 8+9 fused; ♀: sternite 7 straight apically; short apical suture present between ectoproct and tergite 9.

GENITALIA ♂ (Fig. 459). Tignum, gonapsis and median plate absent; entoprocessus long, often broadening apically, not fused apically; parameres absent; gonarcus long, arcuate with pair of dorsal horns; arcessus narrow, arcuate, trifurcate apically; pseudopenis absent; gonosaccus very small; gonosetae short, few; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 460, 461). Praegenitale absent; subgenitale bilobed apically, elongate basally; spermatheca narrow; ventral impression broad, quite deep; vela moderate length; duct long, sinuous.

REMARKS. Species of *Suarius* may be distinguished from other chrysopids by their distinctive genitalia. In males, a tignum and gonapsis are absent, the arcessus is trifurcate apically and has

dorsal striations, the entoprocessus are long, broad and not fused apically, the gonarcus has a pair of dorsal horns and there are a few short gonosetae. In addition, the wings are unmarked or marked with numerous small spots, the claws are undilated and the female subgenitale is extended basally.

Hölzel (1970) re-established *Prochrysopa* Tjeder as a subgenus of *Suarius* to include those species in which males do not possess dense thickened setae (or 'scales') on the underside of the radius in the fore wing and the upper surface in the hind wing and in which the radius is not thickened. However, since the subgenus is based solely on the absence of a single character it must fall as a synonym of *Suarius*.

The type of *S. walsinghami* Navás has aberrant venation so, as Tjeder (1966) points out, the description and figure of the wings given by Navás (1914a) are misleading and do not provide suitable characters on which to base the genus.

BIOLOGY. Unknown. No insect remains were found in the guts of any adults examined during this study.

Genus *TUMEOCHRYSA* Needham

Tumeochrysa Needham, 1909: 204. Type species: *Tumeochrysa indica* Needham, by original designation and monotypy

Chrysoplecta Navás, 1910a: 55. Type species: *Chrysoplecta immaculata* Navás, by monotypy. [Synonymized by Banks, 1940: 187.]

DISTRIBUTION. Eastern Palaearctic.

The seven described species of *Tumeochrysa* are restricted to the highlands of India, Nepal and eastern China, with one species known from Taiwan.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 462) 19–25 mm; ground colour green. Head unmarked; palps tapered apically; labrum indented; vertex slightly raised; head width : eye width = 2.4–2.9 : 1, head broad; scape grossly enlarged, elongate; antenna shorter than fore wing; flagellar segments about 1.5 times as long as broad; 1st and 2nd antennal segments fused; setae very short, arranged in four rings. Pronotum unmarked; setae very short, dark; meso- and metanotum unmarked. Legs unmarked; setae short, dark; hind coxa swollen; claws basally dilated. Fore wing narrow; unmarked; costal area narrow at base; costal setae very short, inclined; stigma unmarked; Sc and R widely separated; basal Sc crossvein 0.28–0.41 mm; *im* ovate, narrow; Rs straight or sinuate; radial crossveins sinuate; gradates in three or four parallel series; inner gradates extended basally, not meeting Psm; veins not crassate in ♂; c_1 shorter than c_2; *dcc* short, closed before posterior margin. Hind wing with three gradate series; costa convex. Abdomen (Figs 463, 464) unmarked; elongate; trichobothria 35, densely packed; ectoprocts fused dorsally; ♂: setae long, sparse with short, dense setae on tergites 4–5 and very long, erect setae on tergites 7–8; microtholi absent; callus cerci ovate; ectoprocts with deep, broad apical invagination and blunt apical projection, fused with tergite 9; sternites 8 and 9 not fused; sternite 9 elongate, curved dorsally, with large apical tubercle; ♀: setae long, dense; callus cerci rounded; ectoprocts with slight apical invagination and incompletely fused with tergite 9 ; sternite 7 straight apically.

GENITALIA ♂ (Fig. 465). Tignum and gonapsis absent; median plate absent; entoprocessus short, broad; parameres absent; gonarcus long, narrow, arcuate with median horns; arcessus L-shaped, tapering apically; pseudopenis absent; gonosaccus small; gonosetae long, several; gonocristae and spinellae absent.

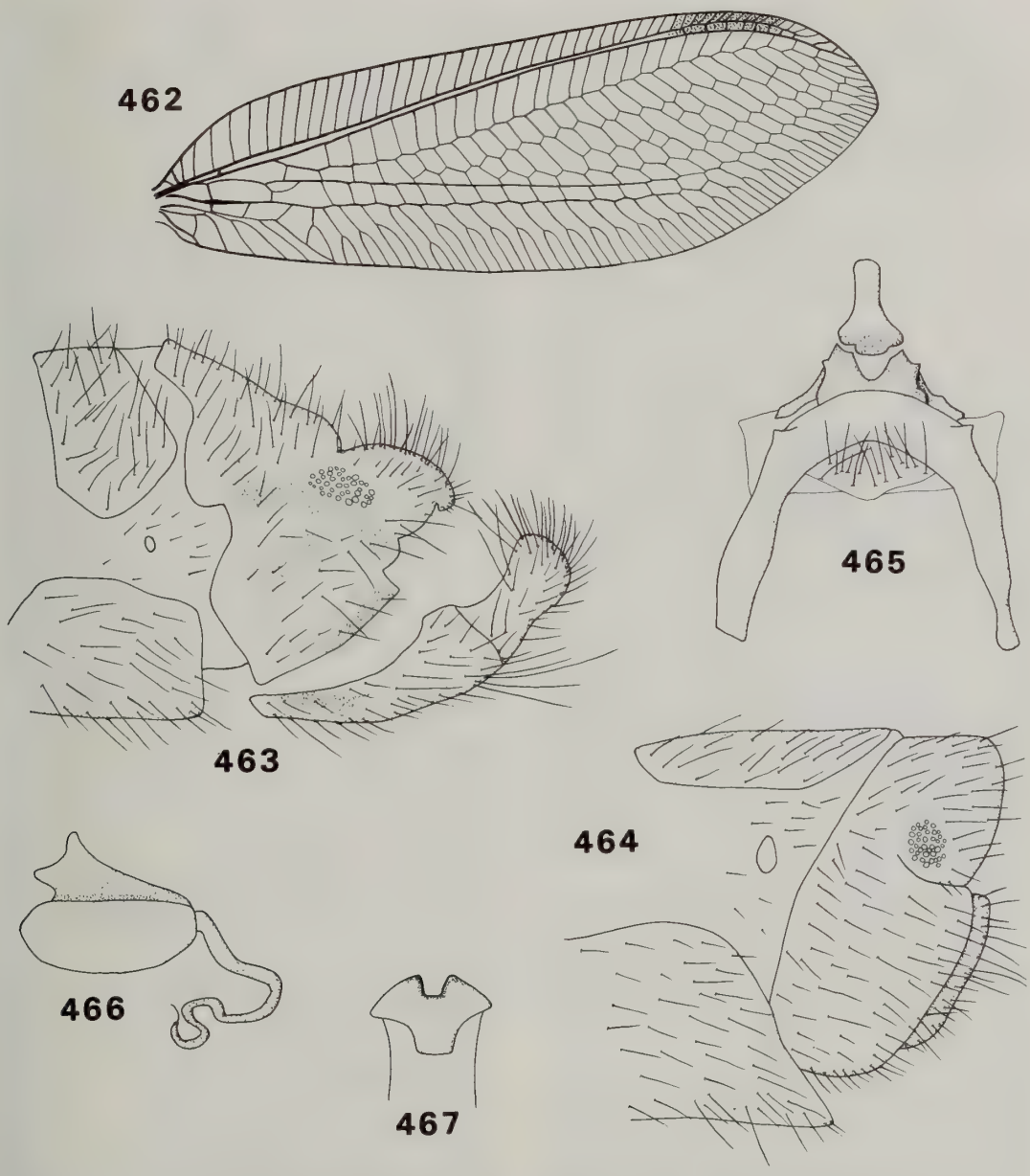
GENITALIA ♀ (Figs 466, 467). Praegenitale absent; subgenitale bilobed; spermatheca narrow; ventral impression absent; vela long; duct long, sinuous.

REMARKS. Species of *Tumeochrysa* can be distinguished by the swollen scape, distal cubital cell closed at wing margin, gradates arranged in three or four rows and convex costa in the hind wing. The male genitalia and abdominal apex are very similar to *Nineta* which suggests a close affinity between these genera since these characters do not occur in the rest of the Chrysopidae. On the basis of the irregular and additional gradate series Needham (1909) suggested that *Tumeochrysa* was allied to *Anomalochrya* McLachlan. However, it has now been shown that this character has arisen independently on several occasions in the Chrysopidae and is of little value in assessing possible generic affinities.

BIOLOGY. Unknown. There were no insect remains in any of the guts of adults examined during this study.

Genus *UNGLA* Navás **gen. rev.**

Ungla Navás, 1914b: 224. Type species: *Ungla annulata* Navás, by original designation and monotypy. [Synonymized with *Suarius* Navás by Adams, 1975: 169.]

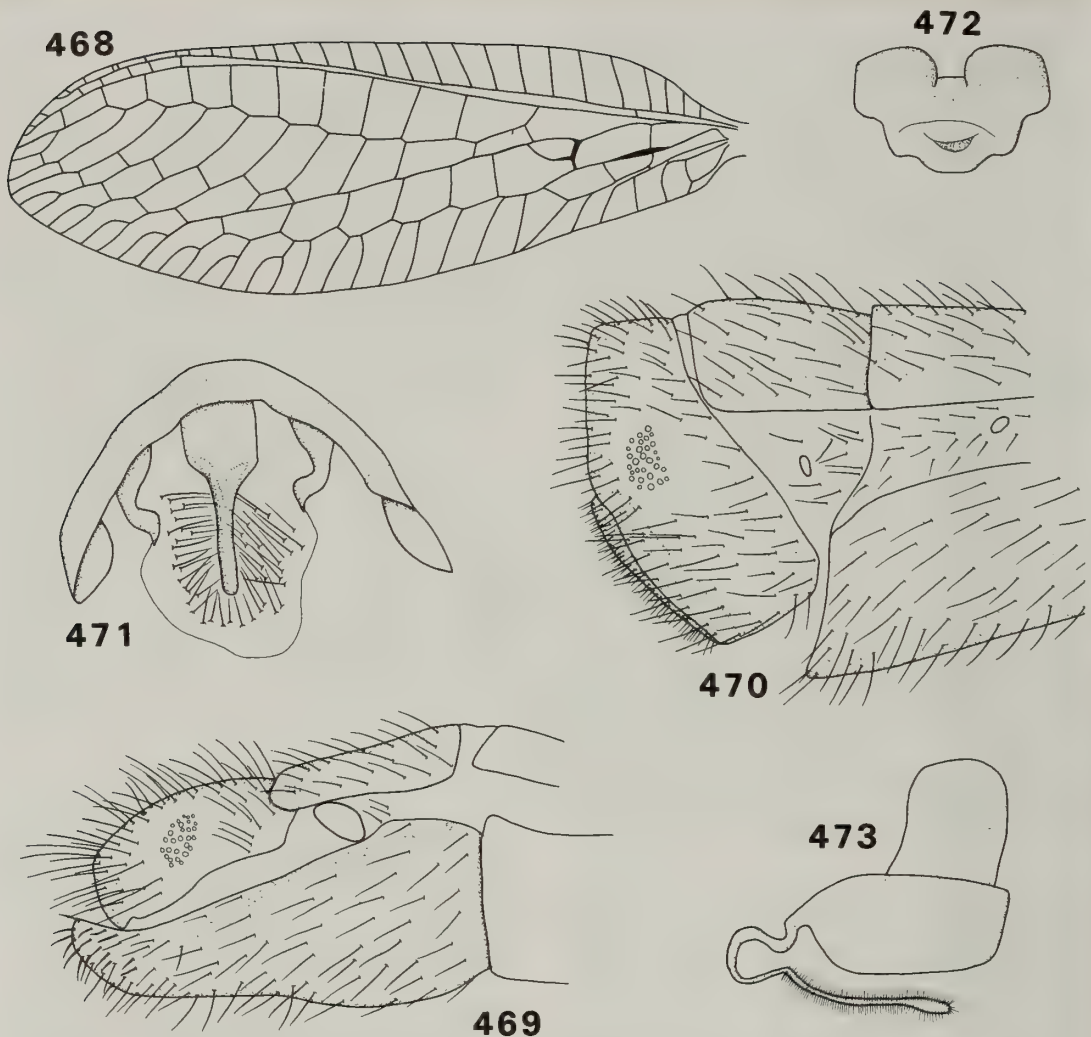


Figs 462–467 *Tumeochrysa*. 462, *T.* sp. indet.; 463–467, *T. indica*. 462, fore wing (from Kimmins); 463, apex of ♂ abdomen, lateral; 464, apex of ♀ abdomen, lateral; 465, ♂ genitalia, lateral; 466, ♀ spermatheca, lateral; 467, ♀ subgenitale, ventral.

DISTRIBUTION. Southern Neotropics.

The genus includes four described species that occur in Argentina and Peru.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 468) 11–13 mm; ground colour pale green. Head marked with brown stripe on gena, vertex and between antennae; palps tapered apically; labrum emarginate; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width =1.8–2.4 : 1; scape about as broad as long; antenna about as long as fore wing; flagellar segments about twice as long as broad; flagellar setae arranged in four rings. Pronotum marked with brown spots; dorsal setae short, black; meso- and metanotum



Figs 468–473 *Ungla binaria*. 468, fore wing; 469, apex of ♂ abdomen, lateral; 470, apex of ♀ abdomen, lateral; 471, ♂ genitalia, dorsal; 472, ♀ subgenitale, ventral; 473, ♀ spermatheca, lateral.

unmarked. Legs unmarked; setae short, black; claws undilated basally. Fore wing unmarked; narrow (length : breadth = 2.9–3.1 : 1); costal area narrow, undilated basally; costal setae short, inclined; stigma unmarked; Sc long; Sc and R widely separated; *im* short, broad, ovate; m_2 long, narrow; Rs sinuate; gradates in two, closely apposed, parallel series; basal inner gradate not meeting Psm; veins not crassate in ♂; c_1 slightly shorter than c_2. Hind wing narrow (length : breadth = 3.3–3.4 : 1). Abdomen (Figs 469, 470) unmarked; setae long, sparse; callus cerci ovate; trichobothria 29–30; ectoprocts deeply invaginated dorso-apically, fused dorsally, fused with tergite 9; ♂: ectoprocts rounded basally, not hinged; sternite 8+9 fused, elongate; setae at apex of sternite 8+9 short, coarse; atria enlarged; apodeme in tergite 9 absent; ♀: sternite 7 pointed apically.

GENITALIA ♂ (Fig. 471). Tignum, gonapsis, median plate, entoprocessus and parameres absent; gonarcus arcuate with long sinuous lateral horn; arcesuss narrow, tapering apically; pseudopenis absent; gonosaccus large, globular; gonosetae long, numerous, arranged in lateral clump; gonocristae absent.

GENITALIA ♀ (Figs 472, 473). Praegenitale absent; subgenitale bilobed apically, slightly extended basally; spermatheca short, narrow; ventral impression moderate; vela long; duct long, sinuous.

REMARKS. Externally species of *Ungla* are similar to *Neosuarius* Adams & Penny, but they may be

distinguished by examination of the male and female genitalia. In males of *Ungla* the apodeme in tergite 9 is absent, the ectoproct is rounded basally, sternite 8+9 is elongate, the gonosaccus is large and bears numerous gonosetae, and the arcessus is well sclerotized. In *Neosuarius* the apodeme in tergite 9 protrudes from the apex of the abdomen, the ectoprocts are extended basally, sternite 8+9 is short, the gonosaccus is short and gonosetae are usually absent, and the arcessus is weakly sclerotized and has dorsal microsetae and lateral rods. In females of *Ungla* the spermatheca is short and pill-box-shaped but in *Neosuarius* it is large and hardly constricted at the junction with the vela.

In his redescription of *C. argentina* Navás, Adams (1975) described entoprocessus in the male genitalia. However, it is apparent from his figures and examination of *U. binaria* that true entoprocessus, which freely articulate with the gonarcus, are absent in the genus. What Adams interpreted as entoprocessus are lateral horns on the gonarcus which are present in many chrysopine genera (some of which also have entoprocessus) and may act as an attachment for the gonosaccus.

Adams (1975) incorrectly stated (citing Article 1 of the *International Code of Zoological Nomenclature*) that the name *Ungla* Navás is unavailable because the holotype of the type-species is a composite specimen. However, this is a misinterpretation of Article 1 and, according to Article 17, the name is available. In the same paper Adams synonymized the genus with *Suarius* Navás, species of which also lack a tignum and gonapsis in the male genitalia, and because, like *C. squamosa* Tjeder, the ectoprocts are not hinged basally. However, it is probable that the tignum and gonapsis have been lost independently in the Chrysopidae on several occasions and the absence of these structures does not necessarily indicate a close relationship between taxa. In addition, *C. squamosa* has now been shown to belong to *Borniochrysa* so it would seem that the synonymy with *Suarius* is unjustified. Moreover, *Ungla* does not show any of the apomorphies of *Suarius* such as the dorsal suture between the ectoprocts, a trifurcate arcessus and dorsal horns on the gonarcus. In several chrysopid genera the ectoprocts are rounded basally, such as *Borniochrysa*, *Chrysopidia*, *Chrysocerca*, and it is possible that *Ungla* is related to these genera, although this seems to be a tenuous link since they share no other apomorphies.

BIOLOGY. Unknown. The gut contents of adults examined during this study did not include insect remains.

Genus *YUMACHRYSA* Banks

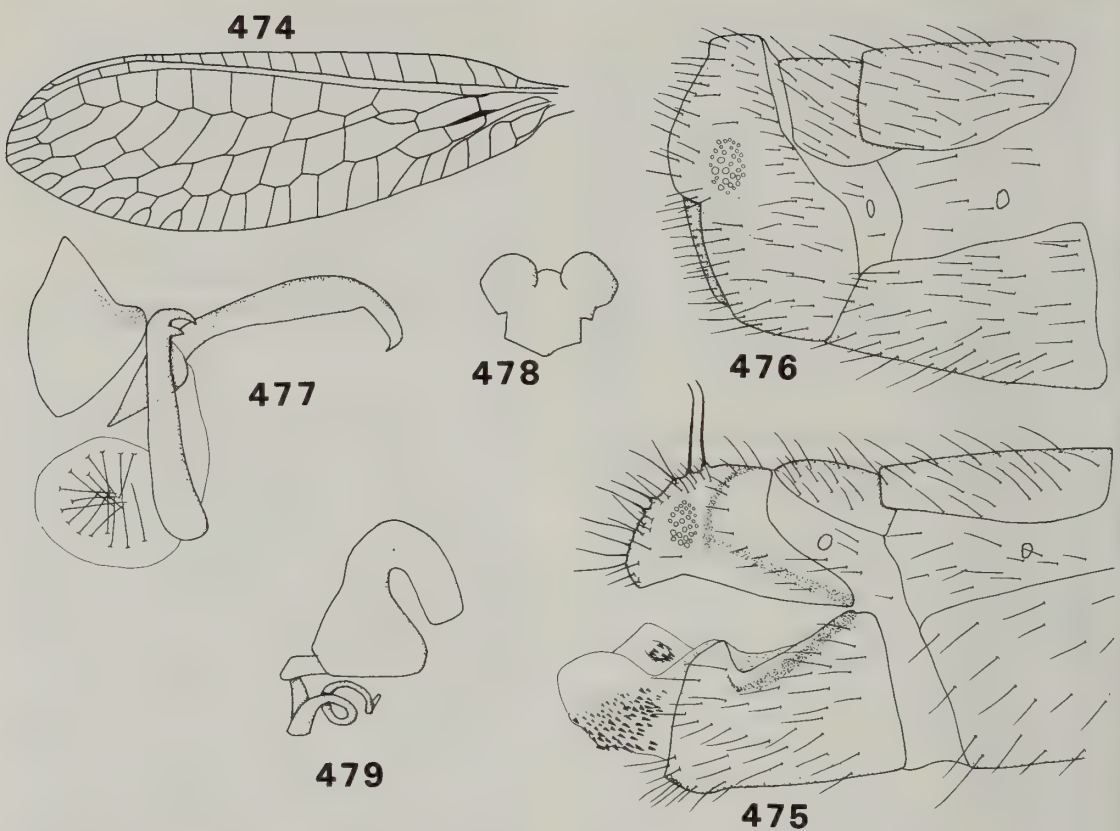
Yumachrysa Banks, 1950: 51 [as subgenus of Chrysopa Leach]. Type species: *Chrysopa apache* Banks, by original designation. [Synonymized with *Suarius* Navás by Tjeder, 1966: 372; raised to genus by Adams & Penny, 1986: 121.]

DISTRIBUTION. Western U.S.A., Mexico

At present the genus includes three described species and there is one undescribed species in the BMNH collections.

DIAGNOSIS. *Adult.* Small lacewings, fore wing (Fig. 474) 8–12 mm; ground colour green or brown. Head unmarked or marked with brown stripes on frons, vertex, scape; palps tapered apically; labrum indented; vertex raised; toruli small; head width : eye width = 2.1–2.5 : 1; antenna as long as fore wing; flagellar segments about twice as long as broad; setae arranged in four rings. Pronotum quite broad; dorsal setae long or short, fine or coarse; unmarked or marked with broad brown lateral stripe; meso- and metanotum marked brown laterally. Legs unmarked or with brown spots and stripes on femur and tibia; setae short, dark; claws with basal dilation. Fore wing narrow (length : breadth = 3.0–3.3 : 1); unmarked, crossveins dark; costal setae short; costal area narrow basally; costal cells as broad as long; stigma unmarked; Sc long; Sc and R widely separated; basal Sc crossvein 0.28–0.32 mm; *im* narrow, ovate; Rs straight; gradates in two parallel series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 shorter or same length as c_2. Hind wing narrow (length : breadth = 3.0–3.8 : 1). Abdomen (Figs 475, 476) marked extensively with brown; setae long, sparse; callus cerci ovate; trichobothria 21–31; ♂: sometimes with additional short setae sparsely scattered on sclerites; very long, coarse dorsal setae present at apex of ectoprocts; microtholi sometimes present on tergites and sternites; ectoprocts deeply invaginated apico-dorsally, fused dorsally, fused with tergite 9, slightly elongate apically; sternite 8+9 fused, projecting dorsally at apex; ♀: ectoprocts slightly invaginate apico-dorsally, incompletely fused with tergite 9; sternite 7 straight apically.

GENITALIA ♂ (Fig. 477). Tignum, gonapsis and median plate absent; entoprocessus narrow, greatly extended ventrally, bearing dorsal hooks; arcessus long, swollen medially, tapering apically; parameres absent; gonarcus short, broad, broadly expanded laterally; gonosaccus large; gonosetae numerous, long, in lateral clump; gonocristae in large apical group, with small lateral clump; spinellae absent.



Figs 474–479 *Yumachrysa*. 474, 475, 477, *Y. apache*; 476, 478, *Y.* sp. indet. 474, fore wing; 475, apex of ♂ abdomen, lateral; 476, apex of ♀ abdomen, lateral; 477, ♂ genitalia, lateral; 478, ♀ subgenitale, ventral; 479, ♀ spermatheca, lateral.

GENITALIA ♀ (Figs 478, 479). Praegenitale absent; subgenitale broad, bilobed with squared basal extension; spermatheca small; vela long, curved; ventral impression deep; duct long, highly coiled.

Larva. Abdomen broadly fusiform, distinctly humped; thoracic tubercles cylindrical, long; row of plumose setae present on metanotum; abdominal dorso-lateral tubercles absent except from tergites 6 and 7; setae hooked, long; debris carried.

REMARKS. Species of *Yumachrysa* can be distiguished by examination of the male or female genitalia. In males, the arcessus is long and swollen medially and the entoprocessus are narrow, greatly extended ventrally and bear strong dorsal hooks. In females the small spermatheca has a relatively long duct and vela with a deep ventral impression and a square basal extension to the subgenitale.

Tjeder (1966) linked *Yumachrysa* with *Suarius* because the male genitalia of both genera lack a tignum and gonapsis. However, although this is probably the advanced condition, it appears to have arisen independently several times in the Chrysopidae and so does not necessarily indicate a close relationship between the two genera.

The characters of the male genitalia of *Yumachrysa* suggest an affinity with *Chrysopa* Leach. In both genera gonocristae are present, sternite 9 has a subapical dorsal projection, the entoprocessus bear dorsal hooks, the gonosetae are long, numerous and arranged in a lateral clump, and the ectoprocts are deeply invaginated apico-dorsally. Although, unlike *Chrysopa*, a pseudopenis is not present in *Yumachrysa*, the arcessus is arcuate and not closely attached to the gonarcus and may be intermediate between a true arcessus and fully detached pseudopenis.

BIOLOGY. The larvae and aspects of the biolog of *Y. apache* (Banks) and *Y. yuma* (Banks) have been described by Tauber (1975). No insect remains were present in any of the adult guts examined during this study.

Tribe **LEUCOCHRYSINI** Adams

Leucochrysini Adams, 1978*a*: 211. Type genus: *Leucochrysa* McLachlan.

DISTRIBUTION. Nearctic, Neotropics.

DIAGNOSIS. *Adult*. Large lacewings, fore wing > 15 mm. Palps tapered apically (Fig. 501); galea broad (Fig. 500); mandibles broad, asymmetrical with tooth on left mandible (Fig. 499); vertex raised; toruli small; eyes large (head width : eye width = 1.6–2.4 : 1); antenna at least 1.5 times longer than fore wing; flagellar segments at least 3 times as long as broad; setae arranged in four rings. Pronotum narrow. Claws with narrow basal dilation. Fore wing marked with black spot on stigma; basal Sc crossvein 0.16–0.60 mm; *im* rectangular or broadly ovate; Psm curves towards costa at wing apex before fusing with outer gradates; a few additional gradates distal to outer gradate series; c_1 shorter than c_2; c_2 squared apically, narrow. Abdominal setae long, sparse; trichobothria < 35; ♂: microtholi usually present.
GENITALIA ♂. Tignum, gonapsis and entoprocessus absent; gonarcus broad, short, transverse with gonocornua; arcessus broad, short with median hook and usually with blunt lateral lobes; parameres absent; gonosetae absent or few.
GENITALIA ♀. Praegenitale absent; subgenitale often extended, downcurved basally, and mounted on a broad membranous plate; crumena present; spermatheca narrow; ventral impression deep; vela very long, sinuous.

REMARKS. Leucochrysini includes *Berchmansus* Navás, *Cacarulla* Navás, *Gonzaga* Navás, *Leucochrysa* McLachlan (including the subgenus *Nodita* Navás), *Neula* Navás, *Nuvol* Navás and *Vieira* Navás. Adams (1978a) stated that the Apochrysinae are closely related to the Leucochrysini. However, there seems to be little substantiating evidence for this as the genitalia and wing venation of the two taxa do not share any significant apomorphic characters. Conversely, there are several characters which suggest a close relationship between the Leucochrysini and Belonopterygini. The male genitalia of these tribes are quite similar. The gonarcus is broad, transverse and hardly arcuate, and bears lateral gonocornua but entoprocessus are absent. This condition is probably apomorphic within the Chrysopidae since the plesiomorphic condition, which occurs in the rest of the family and also in the Hemerobiidae, is for a narrow, strongly arcuate gonarcus with entoprocessus and no gonocornua. Another link between the tribes is suggested in the female genitalia. The extended and downcurved basal part of the subgenitale in the *Leucochrysini* might be the precursor of the praegenitale which occurs as a synapomorphy in most of the belonopterygine genera. If this basal section became detached from the rest of the subgenitale and migrated basally it would be termed a praegenitale, and this condition is closely approached in several species of *Leucochrysa*. A crumena is present in the basal part of the subgenitale in the Leucochrysini and is also present in the praegenitale of the Belonopterygini but is absent from the belonopterygine subgenitale, which further supports this theory.

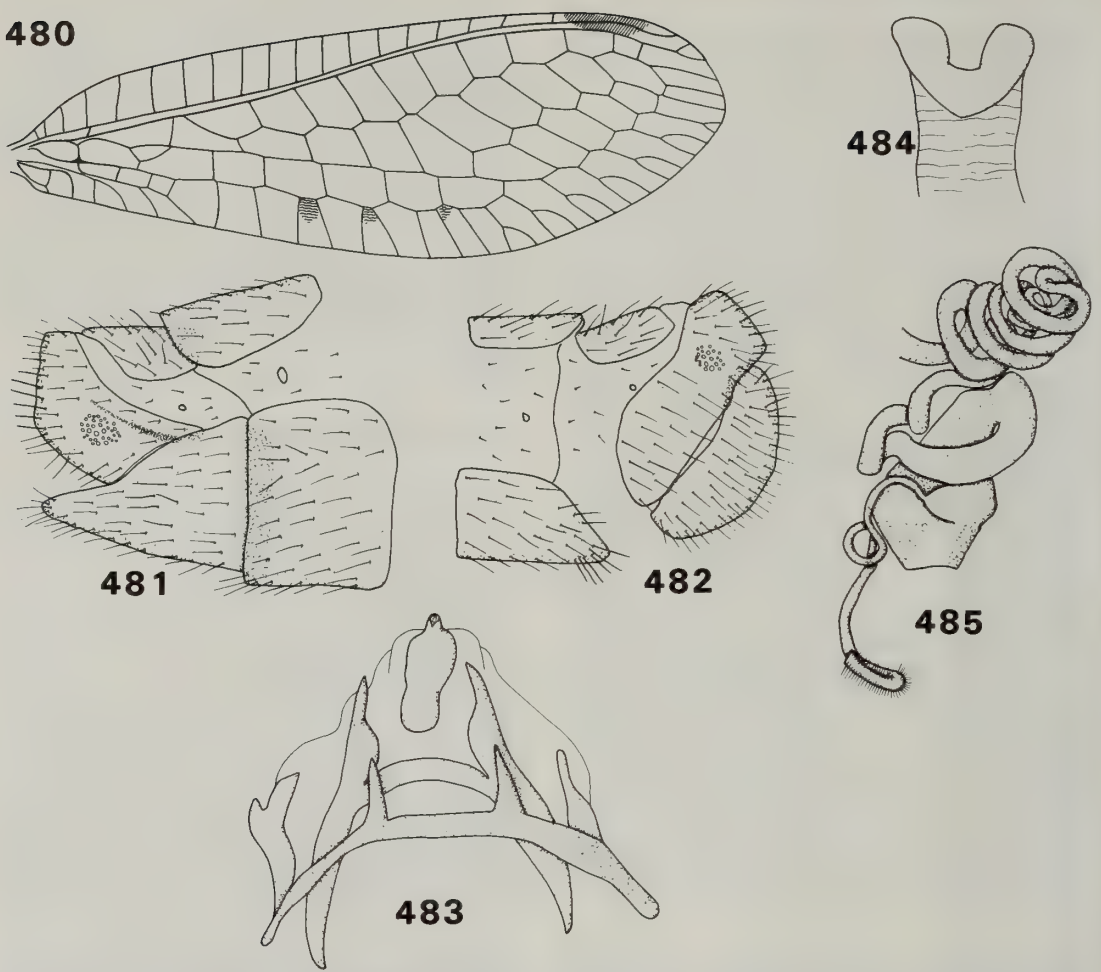
Genus ***BERCHMANSUS*** Navás

Berchmansus Navás, 1913b: 327. Type species: *Berchmansus adumbratus* Navás, by original designation and monotypy.

DISTRIBUTION. Central and South America, Trinidad.

Three species are included in *Berchmansus* from Panama and Brazil.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 480) 13–15 mm. Head marked with red or black stripes on gena, frons, clypeus and vertex; palps elongate or tapered (in *elegans*); labrum indented; galea short, broad; mandibles broad, asymmetrical with basal tooth on left mandible; vertex raised; head width : eye width = 1.9–2.4 : 1; scape elongate or as broad as long; antenna twice length of fore wing or same length; flagellar segments about 3 times as long as broad, with setae in four rings. Pronotum with red lateral stripe or unmarked; setae long, pale; meso- and metanotum unmarked or entirely black. Legs unmarked or with black annulation on tibiae; setae long, pale; tarsi very short in *adumbratus*; claws with or without basal dilation. Fore wing narrow or broad (length : breadth = 2.4–3.3 : 1); lightly suffused on base of Rs and on posterior marginal crossveins or with numerous large black spots; costal area narrow at base; costal setae long, inclined; Sc long; stigma marked with small brown spot; Sc and R widely separated; basal Sc crossvein 0.2–0.4 mm; basal R crossvein proximal of Rs; *im* ovate; Rs sinuous; gradates in two parallel series; basal inner gradate meeting Psm; veins not crassate in ♂; c_1 slightly longer or shorter than c_2; c_2 squared apically; c_3 present in *adumbratus*; *dcc* very broad in *adumbratus*. Hind wing narrow (length : breadth = 3.3–3.4 : 1); marked with numerous brown spots or faint suffusion. Abdomen (Figs 481, 482) unmarked or



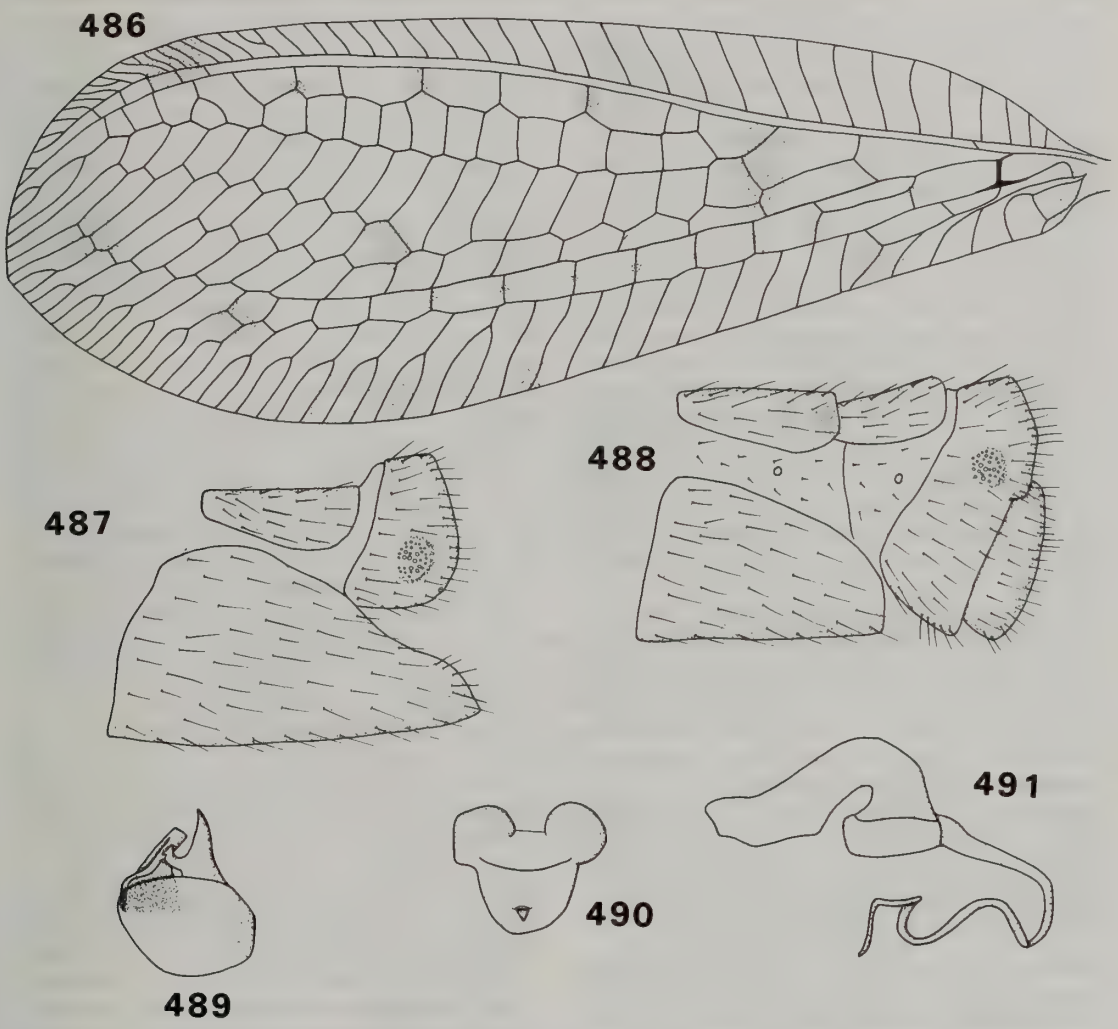
Figs 480–485 *Berchmansus*. 480, 482, 484, 485, *B. adumbratus*; 481, 483, *B. elegans*. 480, fore wing (from Kimmins); 481, apex of ♂ abdomen, lateral; 482, apex of ♀ abdomen, lateral; 483, ♂ genitalia, ventral; 484, ♀ subgenitale, ventral; 485, ♀ spermatheca, lateral.

with extensive black markings; setae long, sparse; sternites with microtholi in ♂; callus cerci rounded, trichobothria 23–33; sternites large; ectoprocts fused dorsally with slight apical invagination; sternite 8+9 fused in ♂; sternite 7 straight apically in ♀; ectoproct and tergite 9 fused.

GENITALIA ♂ (Fig. 483) (*B. elegans* only). Tignum, gonapsis, median plate and entoprocessus absent; parameres absent; gonarcus long, narrow with short gonocornua; arcessus broad, short with apical tooth; additional arcuate structure, sometimes with pair of median horns, situated below gonarcus, attached laterally to ectoproct; pseudopenis absent; gonosaccus, gonocristae, spinellae absent.

GENITALIA ♀ (Figs 484, 485). Praegenitale absent; subgenitale bilobed apically; spermatheca very broad or narrow; ventral impression very deep; vela moderate or very long, highly coiled or simply curved; duct long, coiled.

REMARKS. *Berchmansus* can be distinguished from all other chrysopid genera by the position of the basal radial crossvein which leaves the radius before the origin of Rs, and by the arcuate structure, situated ventrad of the gonarcus complex, in the male genitalia. The two species examined in this study (*B. adumbratus* Navás and *B. elegans* Guérin) differ considerably in many respects as noted in the generic description. Unfortunately, it has not been possible to examine a male of *B. adumbratus* so it is unclear at present which characters in the male genitalia are of generic significance. Until the male of *adumbratus* is described it seems reasonable to group the species in the same genus on the basis of the



Figs 486–491 *Cacarulla maculipennis*. 486, fore wing; 487, apex of ♂ abdomen, lateral; 488, apex of ♀ abdomen, lateral; 489, ♂ genitalia, lateral; 490, ♀ subgenitale, ventral; 491, ♀ spermatheca, lateral.

synapomorphy of the basally positioned radial crossvein. However, it is unsatisfactory to base the genus solely on this venational character, particularly in view of the many characters not shared by the two species, and it is possible that the male genitalia of *adumbratus* will show that the species are not congeneric.

BIOLOGY. Unknown. The guts of adults examined during this study did not contain insect remains.

Genus *CACARULLA* Navás

Cacarulla Navás, 1910b: 479. Type species: *Allochrysa maculipennis* Banks, by original designation and monotypy.

DISTRIBUTION. Colombia, Peru.

Only one species is known.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 486) 20–21 mm. Head marked with brown stripe on labrum, clypeus, gena, scape, base of antenna; palps tapered; labrum straight; vertex slightly raised, small; head broad, head width : eye width = 1.8–1.9 : 1; scape elongate; antenna about 1.5 times length of fore wing; flagellar segments about 3 times as long as broad with setae arranged in four rings. Pronotum elongate; marked with median lateral spot; setae long, pale; meso- and metanotum marked with black spots. Legs unmarked; setae long, pale; claws with narrow basal dilation. Forewing length : breadth = 2.7–3.0 : 1; marked with numerous black spots;

costal area narrow at base; costal setae long, slightly inclined; stigma long, marked with black spot; Sc very long, curving round wing apex; Sc and R well-separated; basal Sc crossvein 0.36–0.48 mm; *im* very narrow, long, quadrangular; Rs straight, with two origins; Rs cells in two rows; gradates in three series, inner gradates greatly extended basally, not meeting Psm; a few extra gradates distal to outer gradates; veins not crassate in ♂; c_1 much shorter than c_2; c_2 squared apically. Hind wing marked with faint shading on posterior marginal crossveins; Rs with one origin; Rs cells not doubled; gradates in two parallel series, greatly extended basally. Abdomen (Figs 487, 488) marked with black dorsal spots; setae long, sparse; callus cerci rounded; trichobothria 26–33; sternites large; ectoprocts with apical invagination, dorsal suture absent; ectoproct and tergite 9 fused; ♂: sternite 8+9 fused; microtholi present on sternites; ♀: sternite 7 straight apically.

GENITALIA ♂ (Fig. 489). Tignum, gonapsis, median plate, entoprocessus and parameres absent; gonarcus long, narrow, with lateral horns and very large ventro-lateral expansion; arcessus tapering to apical hook with latero-apical lobes; pseudopenis absent; gonosaccus, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 490, 491). Praegenitale absent; subgenitale bilobed apically, extended basally, with small basal crumena; spermatheca very small, narrow; ventral impression very deep; vela long, curved; duct long, sinuous.

REMARKS. This striking genus may be distinguished from other chrysopid genera by the very long antennae; the fore wings which are marked with numerous black spots; cell *im* which is narrowly quadrangular; the double origin of Rs; Rs cells in two rows; and three rows of gradates in the fore wing with two in the hind wing.

BIOLOGY. Unknown.

Genus *GONZAGA* Navás

Gonzaga Navás, 1913b: 317. Type species: *Gonzaga torquatus* Navás, by original designation and monotypy. [Synonymized with *Allochrysa* Banks by Banks, 1915: 624; reinstated as valid genus by Banks, 1944: 32.]

DISTRIBUTION. Neotropics.

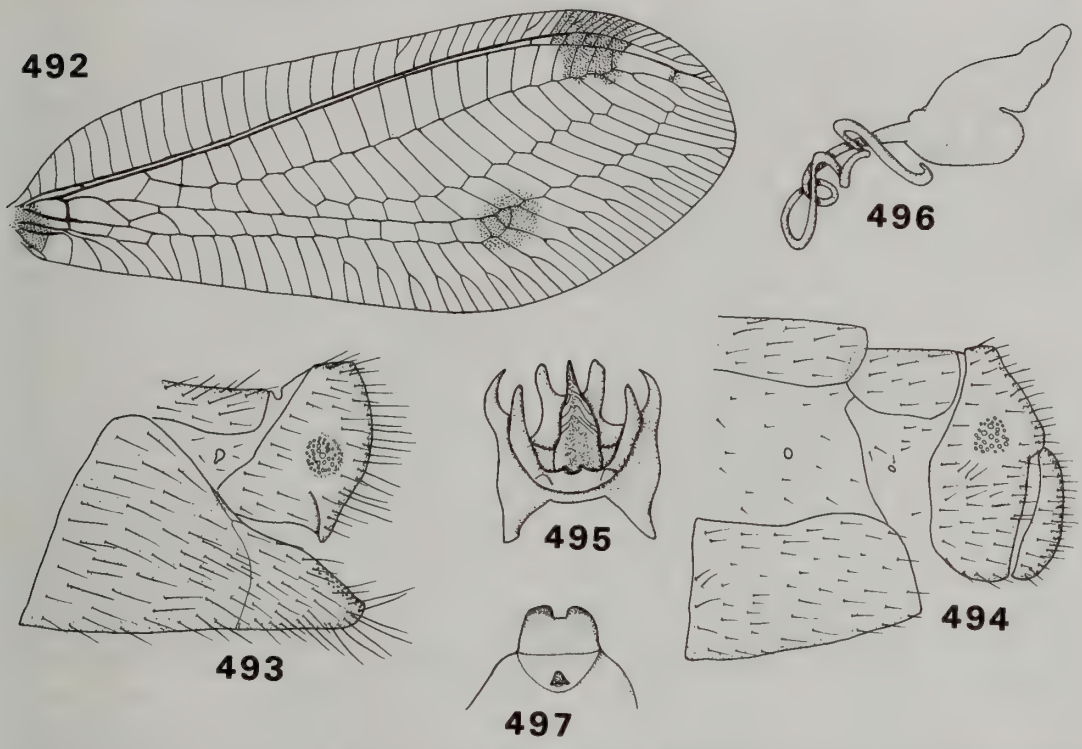
The seven species are distributed throughout South and Central America and the West Indies (Cuba).

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 492) 14–21 mm; ground colour green. Head entirely dark brown or marked with black stripes on frons, clypeus, vertex, scape; palps tapering; labrum deeply indented; vertex raised; mandibles broad, right mandible untoothed; galea broad, apical papilla prominent; head width : eye width = 1.6–1.7 : 1, eyes very large; antenna longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in four rings. Pronotum entirely dark or unmarked; dorsal setae long, pale; meso- and metanotum usually with extensive black markings. Legs unmarked; setae long, pale; claws with or without basal dilation. Fore wing broad (length : breadth = 2.3–2.6 : 1); extensively marked with large black spots; costal area narrow at base; costal setae long erect; stigma marked with large black spot; stigmal area between C and Sc often broad; Sc and R widely separated; basal Sc crossvein 0.36–0.44 mm; *im* long, quadrangular; Rs straight or sinuate; gradates in two parallel rows, inner basal gradates usually extended basally, not meeting Psm; Psm crossveins often extending beyond outer gradate series; veins not crassate in ♂; c_1 shorter than c_2; c_2 narrow, squared apically. Hind wing marked with black spots. Abdomen (Figs 493, 494) marked entirely black on dorsum; setae long, sparse; callus cerci prominent, rounded; trichobothria 23–39; sternites enlarged; ectoprocts fused dorsally; ♂: dense microtholi present on sternites 2–8; ectoprocts with slight apical invagination, incompletely fused with tergite 9 and with short ventral lobe; sternite 8+9 fused; short teeth on dorsal margin of sternite 9; ♀: ectoprocts with deep apical invagination, fused with tergite 9; sternite 7 straight apically.

GENITALIA ♂ (Fig. 495). Tignum, gonapsis and median plate absent; arcessus narrow with dorsal striations and membranous lateral lobes, tapering to apical tooth; parameres absent; gonarcus short, broad, transverse with broad lateral lobes and lateral horns bearing a small submedian tubercle; pseudopenis absent; gonosaccus very small; gonosetae absent or few, long; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 496, 497). Praegenitale absent; subgenitale bilobed apically, mounted on large plate, basal half curved ventrally at right angles, bearing median crumena; spermatheca narrow; ventral impression deep; vela long; duct long, coiled.

REMARKS. *Gonzaga* was placed in the Leucochrysini by Adams (1978a). The genus appears to be closely related to *Leucochrysa* McLachlan with which it shares many characters. Indeed, some



Figs 492–497 *Gonzaga*. 492, 493, 495, *G. torquata*; 494, 496, 497, *G. nigriceps*. 492, fore wing (from Kimmins); 493, apex of ♂ abdomen, lateral; 494, apex of ♀ abdomen, lateral; 495, ♂ genitalia, dorsal; 496, ♀ spermatheca, lateral; 497, ♀ subgenitale, ventral.

species placed in *Leucochrysa*, such as *L. risi* which has extensive dark brown wing markings, appear to be very closely related to *Gonzaga*. However, males of *Gonzaga* share several synapomorphies, which do not occur in *Leucochrysa*, and which suggest that the genus is distinct. In *Gonzaga* there is a short lobe at the apex of the ectoprocts, there is no suture between sternites 8+9 and the arcessus is narrow with dorsal striations. *Gonzaga* may be distinguished from other chrysopid genera by the very long antennae, conspicuous black wing and head markings and the rectangular intramedian cell.

Banks (1944) noted that the costal stigmal area is usually twice as broad as the subcostal stigmal area in *Gonzaga* but in *Leucochrysa* the costal stigmal area is rarely twice as broad as the subcostal stigmal area. However, there are so many exceptions to this in each genus that the character is practically worthless.

BIOLOGY. Unknown.

Genus *LEUCOCHRYSA* McLachlan

Leucochrysa McLachlan, 1868: 208. Type species: *Chrysopa varia* Schneider, by original designation.

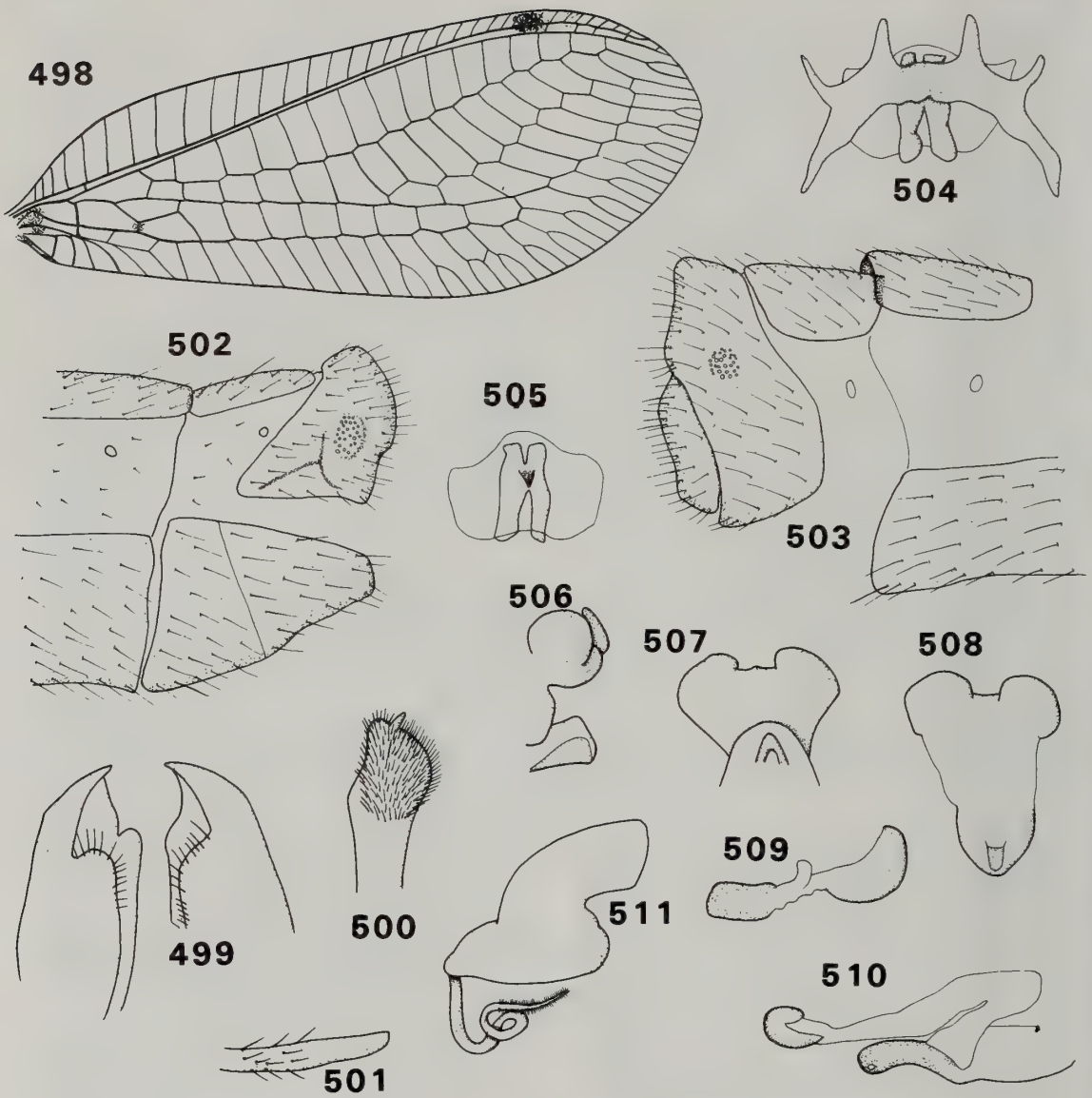
Protochrysopa Kolbe, 1888: 174. Type species: *Chrysopa insularis* Walker, by monotypy. [Synonymized by McLachlan, 1894.]

Allochrysa Banks, 1903: 143. Type species: *Chrysopa virginica* Fitch, by original designation. [Synonymized by Navás, 1917.]

DISTRIBUTION. Nearctic, Neotropics.

There are 160 described species in *Leucochrysa*.

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing 10–25 mm; ground colour green. Head with palps tapered apically (Fig. 501); labrum indented; galea broad (Fig. 500); mandibles broad, asymmetrical with small tooth on left mandible (Fig. 499); vertex raised; head width : eye width = 1.8–2.3 : 1, eyes large; antenna longer than fore wing; flagellar segments 3 times as long as broad; setae arranged in four rings. Pronotum with dorsal setae long, pale. Legs unmarked; setae long, pale; claws with basal dilation. Fore wing with costal area narrow at base, costal setae long, slightly inclined; Sc and R widely separated; veins not crassate in ♂; c_1 shorter than c_2; c_2 narrow, squared apically. Abdomen (Figs 502, 503, 513, 514) unmarked or with dorsal black spots; setae long, sparse; callus cerci rounded or



Figs 498–511 *Leucochrysa (Leucochrysa)*. 498–507, *L. (L.) varia*; 508, 509, *L. (L.) dolichocera*; 510, 511, *L. (L.) longicornis*. 498, fore wing (from Kimmins); 499, mandibles, dorsal; 500, galea, dorsal; 501, maxillary palp, dorsal; 502, apex of ♂ abdomen, lateral; 503, apex of ♀ abdomen, lateral; 504, ♂ genitalia, dorsal; 505, ♂ arcessus, ventral; 506, 509, 510, ♀ subgenitale, lateral; 507, 508, ♀ subgenitale, ventral; 511, ♀ spermatheca, lateral.

ovate; ectoprocts invaginated apically, fused dorsally; ectoproct fused with tergite 9; ♂: sternites 8 and 9 separated by narrow suture; ♀: sternite 7 straight apically.

GENITALIA ♂. Tignum, gonapsis, median plate, entoprocessus and parameres absent; pseudopenis absent.

GENITALIA ♀. Praegenitale absent; subgenitale bilobed apically.

BIOLOGY. Larvae of both subgenera of *Leucochrysa* are debris-carriers. Adults examined during this study did not have insect remains included in the gut contents.

Subgenus *LEUCOCHRYSA* McLachlan

DISTRIBUTION. Nearctic, Neotropics.

There are 41 described species in *Leucochrysa* s.str. which has its centre of distribution in the Neotropics. The majority occur in central and

south America, with a few in the West Indies and in southern U.S.A.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 498) 15–25 mm; ground colour green. Head unmarked or with red or black markings on gena, clypeus, labrum, vertex, post-ocular region; labrum deeply indented; galea broad; head width : eye width = 1.8–2.1 : 1; antenna longer than fore wing. Pronotum unmarked or with red lateral spot; slightly elongate; meso- and metanotum unmarked or with red/brown spots. Fore wing usually unmarked or with shading on some veins; stigma marked with black basal spot; basal Sc crossvein 0.36–0.60 mm; *im* quadrangular, broad; Rs almost straight; gradates in two parallel series, inner gradates extended basally, not meeting Psm in most species, outer gradates black; Psm crossveins often extending beyond outer gradates. Hindwing stigma marked black. Trichobothria 23–38; ♂: sternites enlarged; microtholi present.
GENITALIA ♂ (Figs 504, 505). Arcessus broad, short, with apical hook and membranous lateral lobes; gonarcus usually broad, short, transverse, usually with submedian projections; gonosaccus absent or very small; gonosetae absent or few, short; gonocristae and spinellae absent.
GENITALIA ♀ (Figs 506–511). Subgenitale often greatly extended and recurved basally; spermatheca broad or narrow, sometimes tubular; ventral impression usually deep; vela usually long, sometimes highly coiled; duct long or short, sinuous or coiled.

REMARKS. The male and female genitalia and wing venation of *Leucochrysa* s.str. are very similar to those of *Nodita* and *Gonzaga*, suggesting a close relationship between these taxa. However, species of *Gonzaga* may be readily distinguished by the prominent black wing spots which are absent in most *Leucochrysa* and *Nodita* species. Also, unlike *Leucochrysa* and *Nodita*, males of *Gonzaga* possess a short lobe at the apex of the ectoprocts, sternites 8+9 are completely fused and the arcessus has dorsal striations. In females of *Gonzaga* the base of the subgenitale is not as extended or elaborated as in the other two taxa. The wing venation of *Gonzaga* and *Leucochrysa* is very similar, in particular both have a quadrangular intramedian cell. However, this does not necessarily indicate a close relationship since this is probably the plesiomorphic condition in the Chrysopidae.

Species of *Leucochrysa* s.str. can usually be distinguished from those of *Nodita* by the quadrangular intramedian cell and straight radial sector. In *Nodita* cell *im* is ovate or triangular and Rs is sinuous, although these characters are not always reliable (Adams, 1977). Nevertheless, the two taxa are apparently very closely related since the genitalia are virtually indistinguishable and for this reason we have decided to treat them as subgenera. However, in the females we have been able to detect a slight difference in the extent of the modification of the subgenitale between the two subgenera. In *Nodita* the subgenitale is often extended basally and the basal half curved ventrally, sometimes at right angles. In some *Leucochrysa* species this elaboration is taken a stage further and the basal half is greatly extended and only membranously attached to the rest of the subgenitale. Sometimes the base is completely recurved on itself so that it resembles a praegenitale.

Adams (1978a) suggested that the Apochrysinae were an off-shoot of *Leucochrysa*, but there seems to be little evidence to support this view since the Apochrysinae lack many of the leucochrysine apomorphies.

BIOLOGY. Larvae of *Leucochrysa* are debris-carriers (Canard & Principi, 1984). Adults examined during this study did not have insect remains included in the gut contents.

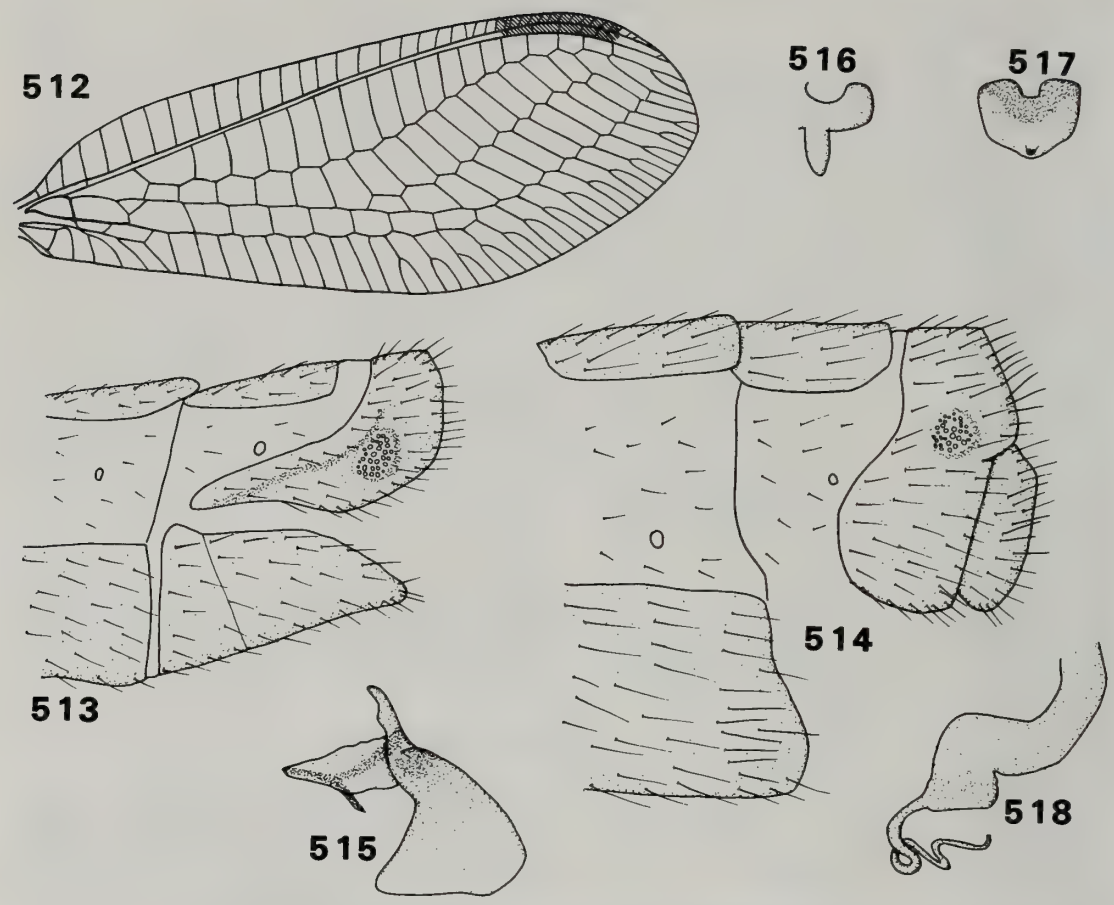
Subgenus ***NODITA*** Navás **stat. n.**

Nodita Navás, 1916: 21. Type species: *Nodita ramosi* Navás, by PRESENT DESIGNATION.
Lachlanita Navás, 1929: 369. Type species: *Lachlanita mainerina* Navás, by original designation and monotypy. **Syn. n.**

DISTRIBUTION. Nearctic, Neotropics.

Only five species of *Nodita* are known from the U.S.A. compared with 114 species distributed throughout South America.

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 512) 10–23 mm. Head marked with red or brown spots and stripes on gena, frons, vertex and scape; vertex slightly raised; head width : eye width = 1.9–2.3 : 1; scape usually slightly elongate; antenna at least 1.5 times length of fore wing. Pronotum marked with red lateral stripe or spot; mesonotum marked with red/brown spots or entirely suffused; metanotum unmarked. Fore wing rounded apically; unmarked or with a few small black spots, Rs often black medially; stigma usually marked with small basal black spot; basal Sc crossvein 0.8–1.4 mm; *im* broad, triangular (occasionally narrow, ovate); Rs sinuate; gradates in two parallel series; basal inner gradate usually meeting Psm. Hind wing of larger species with posterior margin usually suffused dark grey; Rs often marked black



Figs 512–518 *Leucochrysa (Nodita) intermedia*. 512, fore wing (from Kimmins); 513, apex of ♂ abdomen, lateral; 514, apex of ♀ abdomen, lateral; 515, ♂ genitalia, lateral; 516, ♀ subgenitale, lateral; 517, ♀ subgenitale, caudal; 518, ♀ spermatheca, lateral.

medially. ♂: sternites small, with or without microtholi; trichobothria 22–31; ♀: trichobothria 25–34.

GENITALIA ♂ (Fig. 515). Arcessus short with median apical tooth, usually with lateral projections; gonarcus short, broad with lateral projections; gonosaccus short; gonosetae, spinellae and gonocristae absent.

GENITALIA ♀ (Figs 516–518). Subgenitale often extended and downcurved basally, with basal papilla, mounted on broad, membranous structure; spermatheca short, broad; ventral impression deep; vela very long; duct long, coiled.

REMARKS. Species of *Nodita* can be distinguished by their long antennae, the black spot on the stigma, the broadly triangular intramedian cell and the sinuate radial sector. *Nodita* is very similar externally to *Leucochrysa* s.str. but in *Leucochrysa* the intramedian cell is quadrangular, Rs is straight, and Rs and the posterior margin of the wing are unmarked. However, these characters are not always reliable and Adams (1977) noted that some species, such as *Leucochrysa risi* Navás, could be assigned equally well to either group.

The male and female genitalia of *Nodita* and *Leucochrysa* are almost indistinguishable (see above), but because of the venational differences we have decided to recognize *Nodita* as a subgenus of *Leucochrysa*, rather than as a synonym.

Navás (1916) made *Nodita* available when he described two species in the genus, although he did not include a description of *Nodita* itself. Instead he merely noted that it was the same as *Leucochrysa* sensu Banks nec McLachlan. No type species was designated. He later (Navás, 1917) made a formal description of *Nodita* and designated *Chrysopa intermedia* Schneider as type species. However, since this species was not

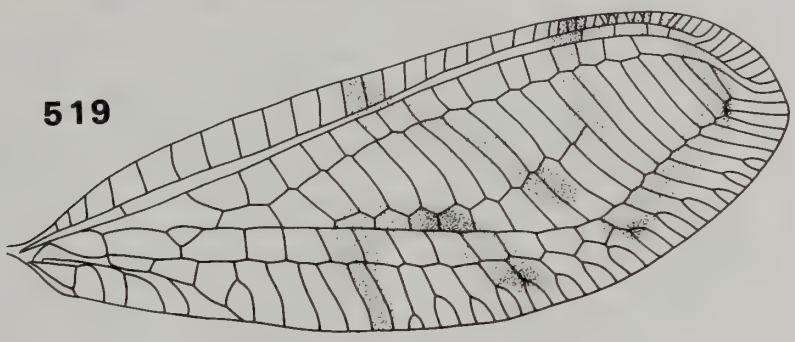


Fig 519 *Nuvol umbrosus*, fore wing.

included in the original description this designation is invalid.

BIOLOGY. The larva of *N. floridana* Banks was described by Smith (1926b), but the only information given was that it was a debris-carrier. *N. oenops* has recently been partially figured and described by Adams (1987). This species is also a debris-carrier and is shown to have extremely elongate prothoracic tubercles.

Genus *NEULA* Navás

Neula Navás, 1917: 280. Type species: *Neula mesana* Navás, by original designation and monotypy.

DISTRIBUTION. Colombia. This genus is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing 25 mm; ground colour yellowish green. Head marked with red stripe on vertex; antenna longer than fore wing, marked black at base. Thorax marked with red lateral stripe. Legs unmarked; claws with basal dilation. Fore wing unmarked; broad; costal area narrow at base; Sc long; stigma marked with black basal spot; *im* quadrangular; Rs sinuate; gradates in three parallel series; inner gradates greatly extended basally; basal inner gradate not meeting Psm; Psm extending slightly beyond base of outer gradate series. Hind wing with gradates in three series; posterior margin with brownish suffusion.
GENITALIA. Unknown.

REMARKS. It has not been possible to trace any specimens of this genus. From the long antennae, long, broad fore wing, black spot on the stigma and upturned Psm extended beyond the base of the outer gradates it is evidently a leucochrysine genus, probably related to *Leucochrysa*. However, the presence of three gradate series is distinctive and should make it easy to recognise if any specimens are subsequently discovered.

BIOLOGY. Unknown.

Genus *NUVOL* Navás

Nuvol Navás, 1916: 24. Type species: *Nuvol umbrosus* Navás, by original designation and monotypy.

DISTRIBUTION. Neotropics (Brazil). This genus is monotypic.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 519) 17 mm. Head marked with black lateral stripe on vertex and black postocular spot. Pronotum marked with three longitudinal black stripes; setae long. Legs unmarked; claws basally dilated. Fore wing marked with five, faint yellowish brown transverse stripes radiating from centre of wing; costal area narrow at base; costal setae short, inclined; stigma marked with small black spot; Sc and R widely separated; R greatly extended apically, curving posteriorly around wing apex; branching veinlets at apex of Sc and R unforked, marked black; *im* short, broadly ovate; Rs almost straight; gradates arranged in two parallel series; outer gradates closely aligned; inner gradates extended basally, not meeting Psm; c_1 about as long as c_2; c_2 broadening apically; *dcc* closed before posterior margin of wing. Hind wing marked similarly to fore wing.

REMARKS. The type specimen of *N. umbrosus* is apparently lost. However, we are grateful to Prof. P. A. Adams for providing a photograph of a specimen of *umbrosus* which is in the collection of the University of São Paulo Museum of Zoology. Unfortunately, we have been unable to examine the actual specimen which seems to be the only extant example of this species. The specimen is in poor condition, lacking the left fore and hind

wings, antennae and abdomen, although the right fore and hind wings are in good condition leaving no doubt about the identity of the specimen.

Nuvol can be readily distinguished from other chrysopid genera by the long apical extension of the radius, which curves posteriorly at the wing apex, running parallel to the costa. In addition, there are seven unbranched veinlets at the apex of the radius. In other Chrysopidae (except the Apochrysinae) the radius is shorter, with fewer apical veinlets, most of which are branched. The close alignment of the outer gradate series is also an unusual feature of *Nuvol*, since in most Chrysopidae the outer gradates are arranged stepwise, although this character is paralleled in the Apochrysinae and in *Vieira*. The short, almost triangular intramedian cell and the unusual black longitudinal stripes on the head and pronotum of *Nuvol* are also similar to *Vieira* and suggest that these two genera may be closely related.

Nuvol is clearly a member of the Leucochrysini, with which it shares several venational characters, and the characters described above indicate its generic validity, but further speculation on the generic affinities of *Nuvol* must await the discovery of additional specimens with their abdomens intact so that the genitalia can be examined.

BIOLOGY. Unknown

Genus ***VIEIRA*** Navás

Vieira Navás, 1913a: 152. Type species: *Leucochrysa leschenaulti* Navás, by original designation and monotypy.

DISTRIBUTION. French Guiana, Surinam, Amazonia. This genus is known from only two species.

DIAGNOSIS. *Adult*. Large lacewings, fore wing (Fig. 520) 21–24 mm. Head marked with black stripes on gena, frons, laterally on vertex; mandibles broad, asymmetrical with basal tooth on left mandible; palps entirely black, tapered apically; labrum emarginate; vertex flattened; toruli small; head width : eye width = 1.6–1.8 : 1, eyes very large; antenna shorter than fore wing; flagellar segments 2 times as long as broad; setae short, in four rings. Pronotum broad; marked with black lateral stripe; setae very long, black, coarse; mesonotum with black stripes along sutures; metanotum marked with black lateral stripe. Legs long; unmarked; setae very long, pale; claws with small basal dilation. Fore wing broad (length : breadth = 2.4–2.6 : 1); extensively marked with large pale brown spots and stripes; costal setae long, erect; costal area narrow at base, widening abruptly at level of Sc crossvein; costal crossveins highly sinuate at level of Rs base; Sc long; stigma marked with brown spot; Sc and R widely separated; basal Sc crossvein 0.32–0.36 mm; radial crossveins sinuate; *im* short, broad, triangular; m_2 long, narrow; first Psm crossvein oblique; Rs very sinuate; gradates in two divergent rows; basal inner gradate meeting Psm, not extending basally; veins not crassate in ♂; c_1 and c_2 about same length; c_2 broad, squared apically; *dcc* open at wing margin, anterior corner adjacent to c_2 not Psm. Hind wing broad (length : breadth = 2.7–3.1 : 1), falcate apically; marked with large pale brown spot on mid Rs and on pterostigma. Abdomen (Figs 521, 522) marked with pair of longitudinal submedian and lateral black stripes; setae long, sparse (shorter on tergites than sternites); callus cerci ovate; trichobothria 40–46; ectoprocts with slight dorso-apical invagination, fused dorsally, fused with tergite 9; tergite 9 short basally, not hinged; sternites enlarged; spiracles large; ♂: microtholi present on sternites; sternite 8+9 fused; ♀: sternite 7 straight and setose at apex.

GENITALIA ♂ (Fig. 523). Tignum, gonapsis and median plate absent; parameres absent; gonarcus short, broad, transverse, with long lateral horn tapering to apical tooth; arcessus short, broad with strong apico-median hook and blunt lateral lobes bearing 2 short gonosetae situated laterally below arcessus; gonosaccus short; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 524–526). Praegenitale absent; subgenitale bilobed apically with median projection, extended and ventrally curved basally; spermatheca long, narrow; vela large; ventral impression deep, narrow; duct long, coiled.

REMARKS. *Vieira* may be distinguished by its large broad fore wings which are extensively marked with pale brown spots and streaks and have very sinuate radial and basal costal crossveins. It is the only leucochrysine genus in which the antennae are shorter than the fore wing.

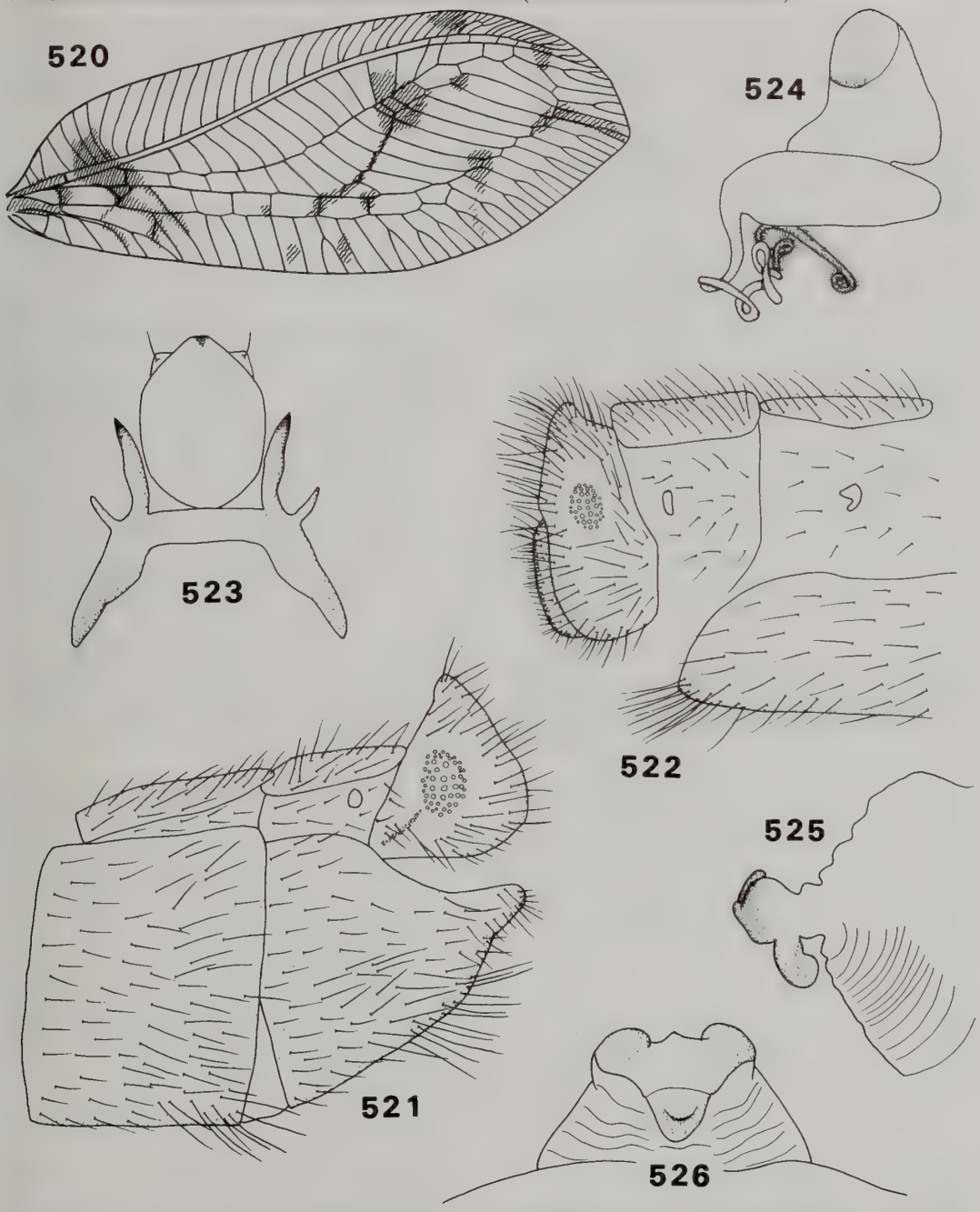
BIOLOGY. Unknown. Insect remains were not included in the gut contents of adults examined during this study.

Subfamily **NOTHOCHRYSINAE** Navás

Notochrysinos Navás, 1910a: 59. Type-genus: *Nothochrysa* McLachlan.

Nothochrysini Navás, 1913b: 303.

Dictyochrysinae Esben-Petersen, 1918: 26. Type-genus: *Dictyochrysa* Esben-Petersen. [Synonymized by Adams, 1967: 219.]



Figs 520–526 *Vieira leschenaulti*. 520, fore wing (from Kimmins); 521, apex of ♀ abdomen, lateral; 522, apex of ♀ abdomen, lateral; 523, ♂ genitalia, dorsal; 524, ♀ spermatheca, lateral; 525, ♀ subgenitale, lateral; 526, ♀ subgenitale, ventral.

Nothochrysinae Navás; Adams, 1967: 219.

DISTRIBUTION. Afrotropical, western Palaearctic, Australia, western Canada and U.S.A.

DIAGNOSIS. *Adult*. Small to large lacewings, fore wing 6–23 mm. Head narrow, elongate; head width : eye width = 2.5–4.7 : 1; eyes small; palps rounded apically (Fig. 547); toruli large; vertex domed; pedicel hardly constricted medially; antennae shorter than fore wing; flagellar segments narrow, at least twice as long as broad, often short; setae arranged in 5–6 rings. Claws

usually without basal dilation. Fore wing quite narrow (length : breadth = 2.6–3.2 : 1); costal area narrow; costal setae short, inclined; basal Sc crossvein relatively distal (0.76–1.68 mm); *im* broad, variable in shape; 1st Rs crossvein meets *im* in basal half; R and Cu hardly swollen basally; M sometimes forked after m_3; tympanal organ absent; Rs arises distally; c_1 often considerably shorter than c_2; Psm and Pcu widely separated; Psm short, fusing with inner gradates; gradates arranged in two or three rows; jugal lobe large; veins not crassate in ♂. Abdomen short; setae short, sparse, often absent from intersegmental membrane; trichobothria 20–39; ♂: ectoprocts with slight dorso-apical invagination; sternites 8+9 fused; ♀: ectoproct and tergite 9 not completely fused.

GENITALIA ♂. Tignum, gonapsis, median plate, gonocristae and spinellae absent; gonarcus arcuate; entoprocessus present, often long and well developed.

GENITALIA ♀. Praegenitale absent; subgenitale bilobed apically, extended basally; spermatheca large.

REMARKS. The Nothochrysinae may be readily distinguished from the rest of the Chrysopidae by the short pseudomedian vein which is continuous with the inner gradates. In the rest of the Chrysopidae Psm meets the outer gradates.

Adams (1967) established that the Nothochrysinae are the most primitive group of the Chrysopidae on the grounds that they retain many archaic features; our analysis confirms that they are the least derived subfamily. The most advanced group of genera within the Nothochrysinae appears to include *Nothochrysa* and the two Australian genera *Dictyochrysa* and *Triplochrysa*. Unlike other nothochrysine genera Psm is distinct, c_1 long, the claws are basally dilated, 1A is forked and no pollen was found in the gut contents of adults. *Hypochrysa* lacks these apomorphies but shares two other apomorphies with the group: in males the tergites and ectoprocts are fused, and microtholi are present. The remaining three genera are probably the most primitive in the subfamily, although we have been unable to find an apomorphic character to link them. The South African genera *Kimochrysa* and *Pamochrysa* both have Sc and C fused basal to the stigma in the hind wing which suggests a close relationship. In *Pamochrysa* and *Pimachrysa* tergite 8 is extended laterally and the spiracle is located on the tergite rather than on the lateral membrane. These are the only two genera in the entire Chrysopidae which exhibit this character. However, it would appear to be plesiomorphic since it occurs widely in the Neuroptera (e.g. Hemerobiidae, Myrmeleonidae, Rapismatidae) and in the Raphidioptera and so does not necessarily suggest a close relationship between these two genera.

Key to the genera of the Nothochrysinae

1 Gradate crossveins arranged in three or more series (Fig. 567) 2

– Gradate crossveins arranged in two series (Fig. 533) 3

2 Gradates arranged in 5–7 irregular series (Fig. 527); 1A forked ..... ***DICTYOCHRYSA*** Esben-Petersen

– Gradates arranged in three parallel series (Fig. 567); 1A unforked ..... ***TRIPLOCHRYSA*** Kimmins

3 Sc and C fused basad of pterostigma in hind wing ..4

– Sc and C not fused in hind wing 5

4 Cell *im* rhomboidal, about as long as broad (Fig. 554) ..... ***PAMOCHRYSA*** Tjeder

– Cell *im* triangular or pentagonal, about twice as long as broad (Fig. 539) ..... ***KIMOCHRYSA*** Tjeder

5 Cell *im* narrow, quadrangular (Fig. 545); large species, fore wing > 14 mm; 1A forked in fore wing ..... ***NOTHOCHRYSA*** McLachlan

– Cell *im* broad, subtriangular (Fig. 533); small species, fore wing < 10 mm; 1A not forked in fore wing 6

6 2A and 3A not fused in fore wing (Fig. 561) ***PIMACHRYSA*** Adams

– 2A and 3A fused apically in fore wing (Fig. 533) ***HYPOCHRYSA*** Hagen

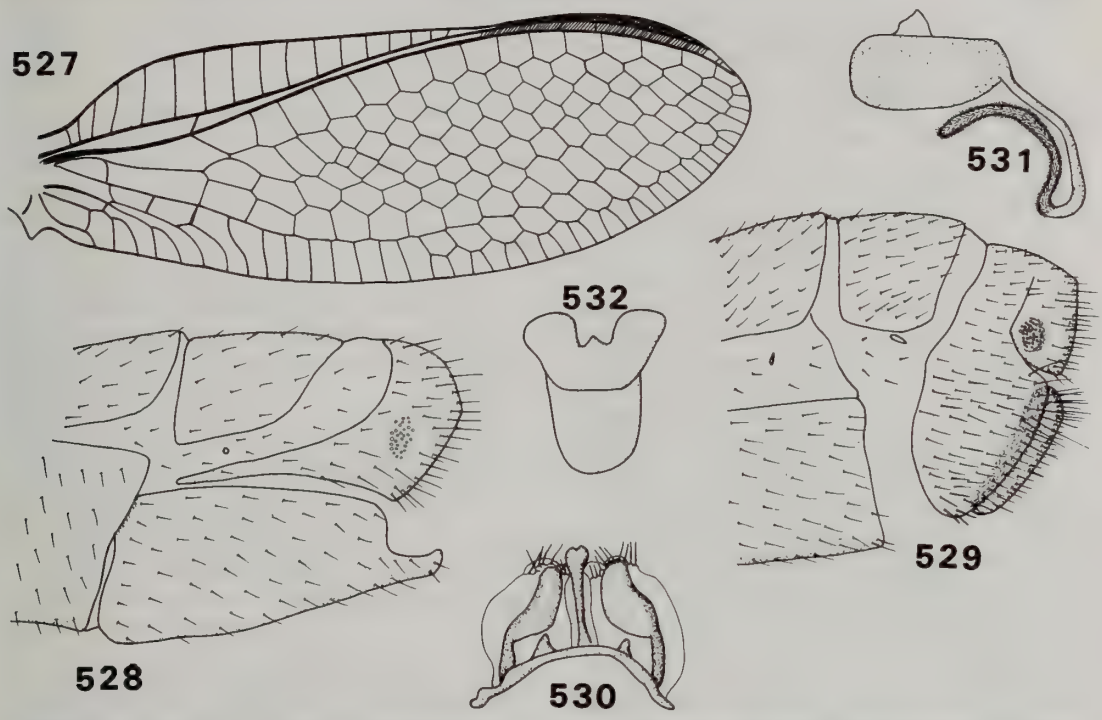
Genus ***DICTYOCHRYSA*** Esben-Petersen

Dictyochrysa Esben-Petersen, 1917: 214. Type species: *Dictyochrysa fulva* Esben-Petersen, by original designation and monotypy.

DISTRIBUTION. Australia and Tasmania.

Three species have been described from this region.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 527) 14–17 mm; ground colour brown. Head unmarked or marked with brown arcuate stripe on front of vertex; palps truncate, rounded apically; labrum indented; vertex flattened; toruli large; head broad (head width : eye width = 2.6–3.9 : 1); scape as long as broad; pedicel as long as broad, hardly constricted medially; antenna longer than fore wing; flagellar segments about 2.5 times as long as broad; setae arranged in six rings. Pronotum broad; marked with numerous dark spots and stripes; dorsal setae short, dark,



Figs 527–532 *Dictyochrysa*. 527, *D. fulva*; 528–532, *D. peterseni*. 527, fore wing (from Kimmins); 528, apex of ♂ abdomen, lateral; 529, apex of ♀ abdomen, lateral; 530, ♂ genitalia, dorsal; 531, ♀ spermatheca, lateral; 532, ♀ subgenitale, ventral.

coarse; mesonotum with black markings; metanotum entirely black or unmarked. Legs unmarked or with black annulations; setae short, dark; pair of tibial spurs present; claws without basal dilation. Fore wing unmarked; basal half with numerous rounded shallow depressions in some species; slightly pointed apically; costal area narrow at base but abruptly expanding subbasally; costal setae very short, coarse, inclined; costa indented immediately proximal to stigma; Sc quite long but not extending beyond pterostigma; Sc and R widely separated; basal Sc crossvein 1.48–2.12 mm; M not fusing basally with R; tympanal organ absent; *im* not apparent but M forked; Rs straight; gradates arranged into 5–7 irregular series, wing highly reticulated; veins not crassate in ♂; c_1 shorter than c_2; 1A forked. Hindwing with C and Sc fused (or very closely apposed) just basad of pterostigma. Abdomen (Figs 528, 529) unmarked or sclerites marked dark brown; setae short, sparse; callus cerci rounded or ovate; trichobothria 32–54; ectoprocts slightly invaginated dorso-apically, fused dorsally; atria small; ♂: ectoproct fused with tergite 9, narrowly extended basally; microtholi absent or present on tergites; sternites 8+9 fused; ♀: ectoproct not fused with tergite 9; sternite 7 straight apically.

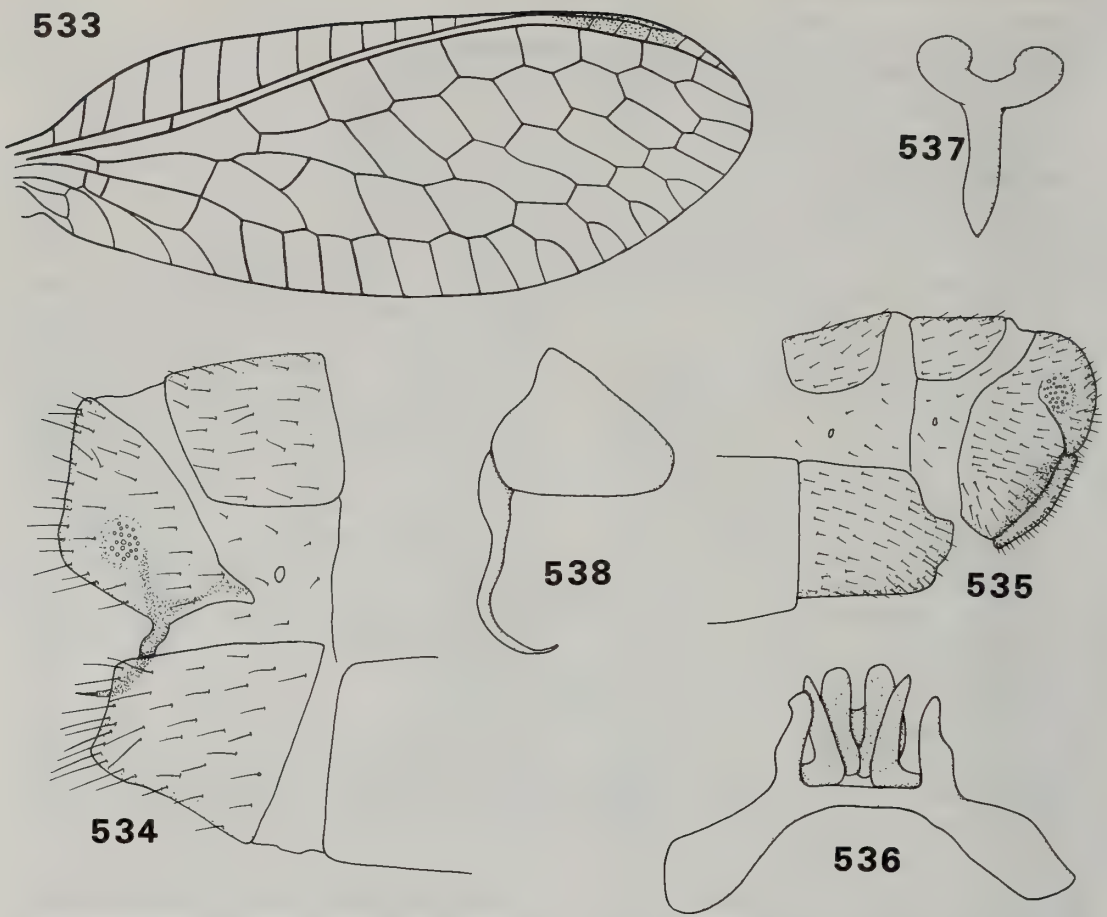
GENITALIA ♂ (Fig. 530). Tignum, gonapsis and median plate absent; entoprocessus long, spoon-shaped; gonarcus arcuate with short medio-lateral projections; arcessus long, narrow, broadening apically with narrow dorsal groove; pseudopenis, gonocristae and spinellae absent; gonosaccus short, gonosetae short, numerous in lateral clump.

GENITALIA ♀ (Figs 531, 532). Praegenitale absent; subgenitale extended basally, bilobed apically with small median projection; ventral impression broad, deep; vela very short; duct short, curved, highly setose in apical half; spermatheca broad.

Larva (1st instar only). Abdomen fusiform, not humped; abdominal tubercles hardly developed; chalazae absent; dorsal thoracic setae and abdominal setae not hooked apically; debris not carried.

REMARKS. *Dictyochrysa* is readily distinguishable from other nothochrysine genera by the highly reticulated venation in the discal area of the wings.

BIOLOGY. The first instar larva of *Dictyochrysa fulva* Esben-Petersen has been described by New



Figs 533–538 *Hypochrysa elegans*. 533, fore wing (from Kimmins); 534, apex of ♀ abdomen, lateral; 535, apex of ♀ abdomen, lateral; 536, ♂ genitalia, dorsal; 537, ♀ subgenitale, ventral; 538, ♀ spermatheca, lateral.

(1981a). The eggs are stalked and laid singly. None of the adults examined had insect remains included in the gut contents.

Genus ***HYPOCHRYSA*** Hagen

Hypochrysa Hagen, 1866: 377. Type species: *Chrysopa nobilis* Schneider, by monotypy.
Hypochrysodes Leraut, 1980: 243 [replacement name for *Hypochrysa* Hagen; unnecessary replacement name; Oswald, 1987: 225.]

DISTRIBUTION. Southern Europe, Argentina.

There are only two species known in *Hypochrysa* and only females are known of *H. viridula* Adams, the Argentinian species.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 533) 9–10 mm; ground colour brown. Head marked with black median stripe and stripe on gena; palps rounded apically, slightly elongate; labrum indented; vertex domed; toruli large; eyes small (head width : eye width = 4.4–4.7 : 1); scape as broad as long; antennae dark brown, shorter than fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum unmarked or marked with median and lateral black stripe; dorsal setae few, long, pale; mesonotum unmarked or marked with black stripes along sutures; metanotum unmarked. Legs with black stripes on tibiae and femora; setae short, dark; claws without basal dilation. Fore wing unmarked; rounded apically; costal area narrow at base; costal setae very short, inclined; stigma suffused with pale brown; Sc long; Sc and R widely separated; basal Sc crossvein 1.16–1.40 mm; *im* broad, triangular; M forking after m_3; Rs straight; gradates in two parallel series; inner gradates not fused with Psm; c_1 at most half as long as c_2; 2A and 3A fused apically; 1A not forked; *dcc* broad, open at margin. Abdomen (Figs 534, 535) unmarked or with dark brown

markings; setae short, sparse; callus cerci ovate; trichobothria 20–27; ectoproct with slight dorso-apical invagination, fused dorsally, fused with tergite 9, not articulated with sternite 8+9; ♂: microtholi present on all sclerites; sternites 8+9 fused; apodeme greatly elongated beyond apex of ectoproct, bearing stout seta; ♀: ectoproct not completely fused with tergite 9; apex of sternite 7 emarginate.

GENITALIA ♂ (Fig. 536). Tignum, gonapsis and median plate absent; gonarcus heavily sclerotized, arcuate, flattened, with lateral horns; entoprocessus large, L-shaped; arcessus rounded, bilobed; pseudopenis, gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 537, 538). Praegenitale absent; subgenitale bilobed apically, with or without basal extension; spermatheca long, narrow, heavily sclerotized; ventral impression broad, deep; duct short, narrow, sinuous; vela short.

Larva. Abdomen very slender, fusiform, not humped; tubercles not at all developed; setae short; no debris carried.

REMARKS. Species of *Hypochrysa* may be distinguished from other nothochrysine genera by 2A and 3A fused apically in the fore wing; in males there is a long ventral extension of the apodeme.

Adams (1967) stated that in males of *H. elegans* sternites 8 and 9 are not fused but moveable. However, in all the male specimens examined during this study sternites 8+9 were fused.

BIOLOGY. The larva of *Hypochrysa elegans* (Burmeister) has been described (Brauer, 1867; Principi, 1956; Gepp, 1983). The guts of adults examined during this study contained pollen grains.

Genus ***KIMOCHRYSA*** Tjeder

Kimochrysa Tjeder, 1966: 254. Type species: *Kimochrysa impar* Tjeder, by original designation.

DISTRIBUTION. Three species are known from southern Africa.

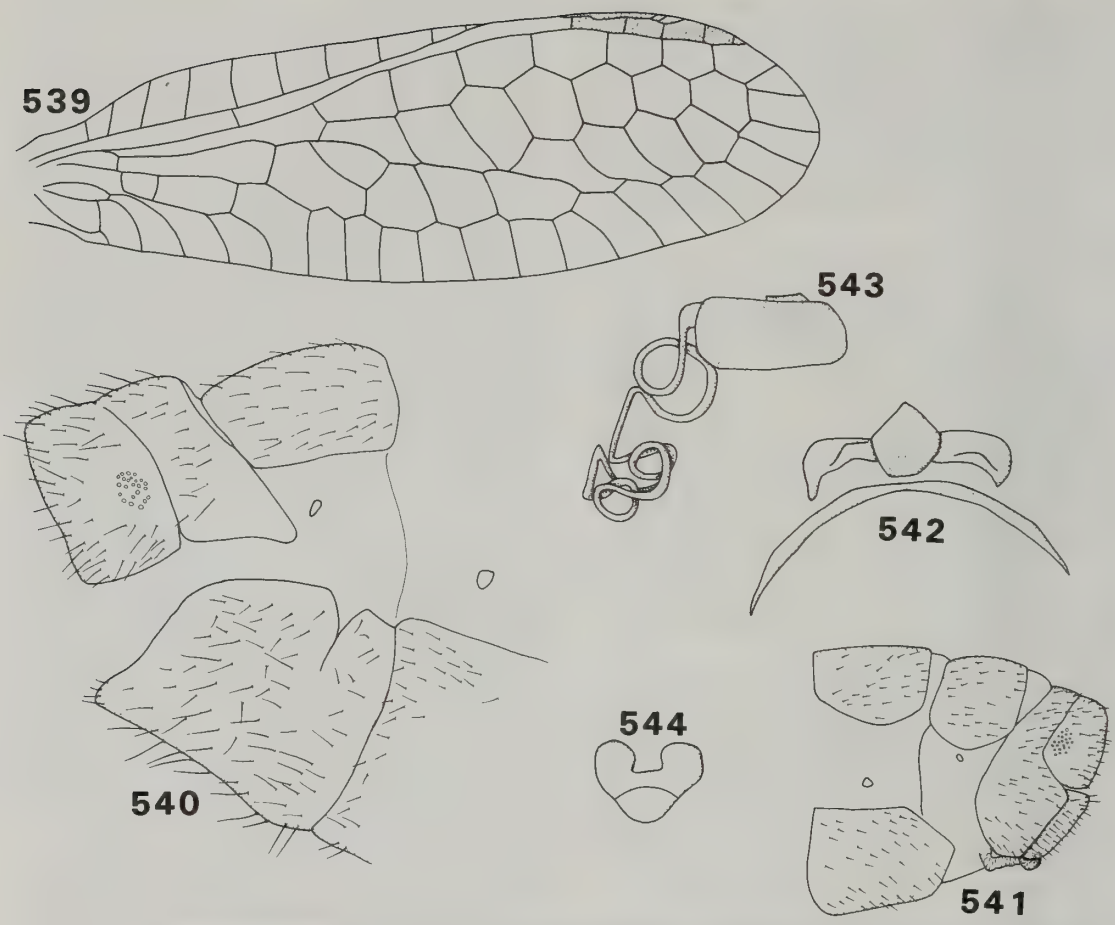
DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 539) 6–9 mm. Head unmarked or marked with dark brown on gena, labrum, vertex, antennae, scape, pedicel; palps rounded apically; galea narrow with large apical papilla; mandibles broad, asymmetrical, with basal tooth on left mandible; labrum indented; vertex domed, sometimes pitted; toruli very large; eyes small (head width : eye width = 4.1–4.3 : 1); scape squared, bearing numerous short, dorsal setae; pedicel hardly constricted medially; antenna shorter than fore wing; flagellar segments short, 2–3 times as long as broad; setae arranged in six rings. Pteronotum entirely dark brown; dorsal setae on pronotum long, pale. Legs unmarked or marked with dark brown dorsal stripe on femora and tibiae; setae short, black; claws without basal dilation. Fore wing unmarked; rounded apically; costal area narrow at base; costal setae quite short, inclined; stigma suffused pale brown, broad; Sc very short, fused for short distance with C basad of stigma; Sc and R widely separated; basal Sc crossvein 0.44–1.08 mm, sometimes multiple Sc crossveins present; m_1 very short; m_2 very long; *im* broad, triangular or quadrangular; M forks at or just distal to m_3; tympanal organ absent; Rs straight; gradates in two parallel series; c_1 2–3 times shorter than c_2; c_2 narrow, squared apically; 2A unforked; *dcc* broad, open at margin. Hind wing with C and Sc fused basad of pterostigma. Abdomen (Figs 540, 541) marked brown dorsally; setae short, sparse; trichobothria 23–35; ectoproct with slight dorso-apical invagination, fused dorsally, not fused with tergite 9; ♂: callus cerci rounded; microtholi absent; sternites 8+9 short, broad, incompletely fused, dorsal suture present; apodemes absent; ♀: callus cerci ovate; sternite 7 straight apically.

GENITALIA ♂ (Fig. 542). Tignum, gonapsis and median plate absent; entoprocessus short, broad with median lobe; parameres absent; gonarcus narrow, long, arcuate; arcessus short, broadly triangular with few, very short dorsal setae; gonosaccus short; gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 543, 544). Praegenitale absent; subgenitale bilobed apically, slightly extended and tapering basally; spermatheca long, quite broad; ventral impression deep, tapered abruptly apically; vela very short; duct long, coiled.

REMARKS. *Kimochrysa impar* Tjeder is the only species amongst the Nothochrysinae to have multiple subcostal crossveins in the fore wing. *Kimochrysa* and *Pamochrysa* are probably closely related since in both genera the subcosta and costa are fused before the stigma in the hind wing. The two genera can be separated by the lack of the spiracle on the 8th tergite in *Kimochrysa* and by the shape of cell *im*.

BIOLOGY. Unknown. The gut contents of specimens examined in this study contained only pollen grains.



Figs 539–544 *Kimochrysa*. 539, 541, 543, 544, *K. africana*; 540, 542, *K. impar*. 539, fore wing; 540, apex of ♂ abdomen, lateral; 541, apex of ♀ abdomen, lateral; 542, ♂ genitalia, dorsal; 543, ♀ spermatheca, lateral; 544, ♀ subgenitale, caudal.

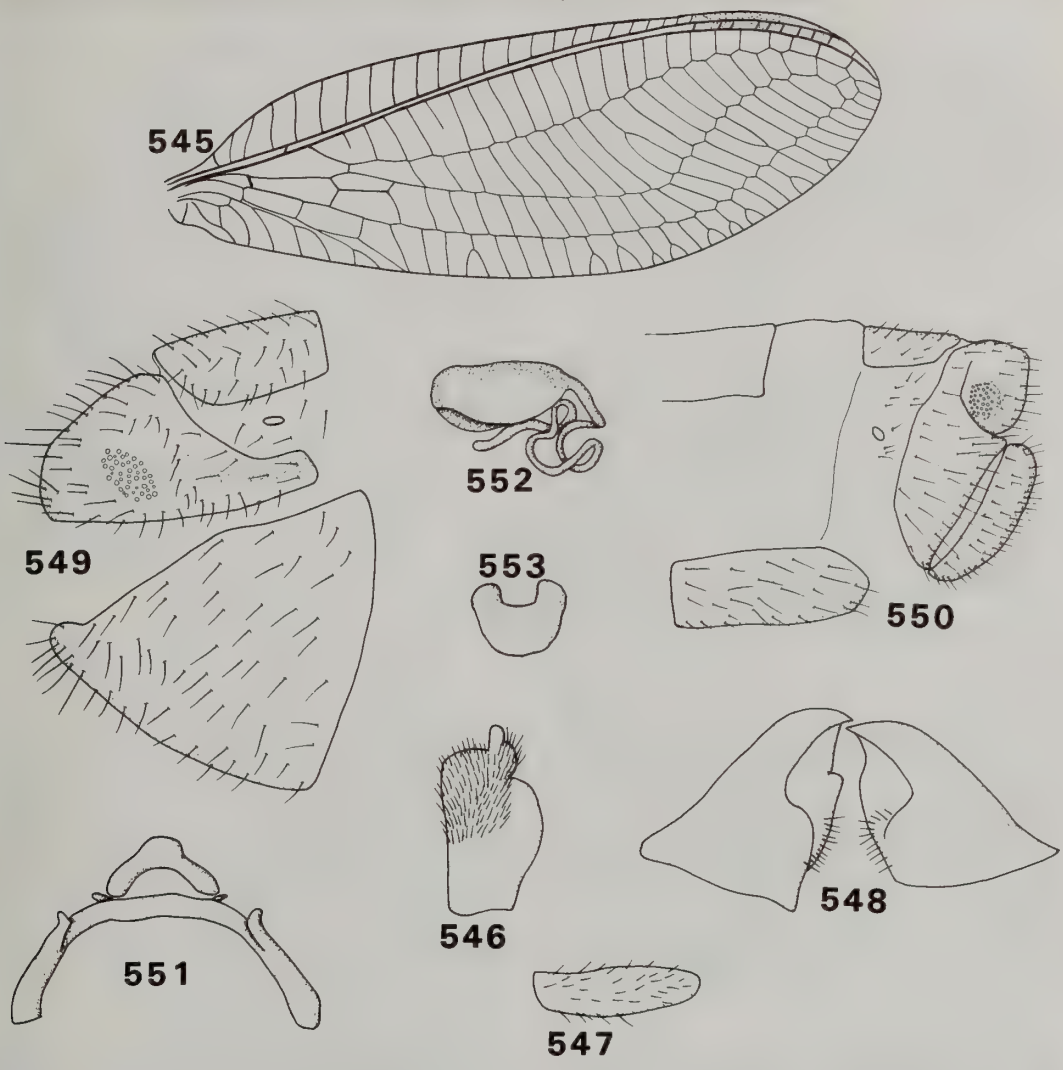
Genus *NOTHOCHRYSA* McLachlan

Nothochrysa McLachlan, 1868: 195. Type species: *Chrysopa fulviceps* Stephens, by subsequent designation by Banks, 1903.

Nathanica Navás, 1913c: 180. Type species: *Hemerobius capitatus* Fabricius, by original designation. [Synonymized by Tjeder, 1941: 30.]

DISTRIBUTION. Two species are known from the western Palaearctic and one from western U.S.A.

DIAGNOSIS. *Adult*. Medium to large lacewings, fore wing (Fig. 545) 12–23 mm; ground colour brown. Head unmarked or with broad black stripes on vertex and frons; palps rounded, truncate apically (Fig. 547); labrum indented; mandibles broad, asymmetrical with basal tooth on left mandible (Fig. 548); galea broad with large apical papilla (Fig. 546); vertex domed; toruli large; head width : eye width = 2.5–3.2 : 1, head broad; pedicel barely constricted medially; antenna shorter than fore wing; flagellar segments 3 times as long as broad; setae arranged in 5–6 rings. Pronotum marked laterally or entirely dark brown; dorsal setae short, dark or pale; meso- and metanotum marked dark brown. Legs unmarked; setae short, dark; claws with or without basal dilation. Fore wing unmarked; narrow (length : breadth = 2.9–3.2 : 1); costal area narrow at base; costal setae short, inclined; stigma suffused red/brown; Sc long; Sc and R widely separated; basal Sc crossvein 0.76–1.80 mm; *im* rectangular, narrow; Rs sinuate; gradates in two parallel series; crossveins not crassate in ♂; c_1 shorter than c_2; 1A forked. Abdomen (Figs 549, 550) marked entirely brown; setae long, sparse on sternites, shorter on tergites; trichobothria 36–39; ectoprocts slightly invaginated dorso-apically, narrow dorsal suture present; ♂: microtholi



Figs 545–553 *Nothochrysa*. 545, *N. fulviceps*; 546–553, *N. capitata*. 545, fore wing (from Kimmins); 546, galea, dorsal; 547, apical segment of maxillary palp, dorsal; 548, mandibles, dorsal; 549, apex of ♂ abdomen, lateral; 550, apex of ♀ abdomen, lateral; 551, ♂ genitalia, ventral; 552, ♀ spermatheca, lateral; 553, ♀ subgenitale, ventral.

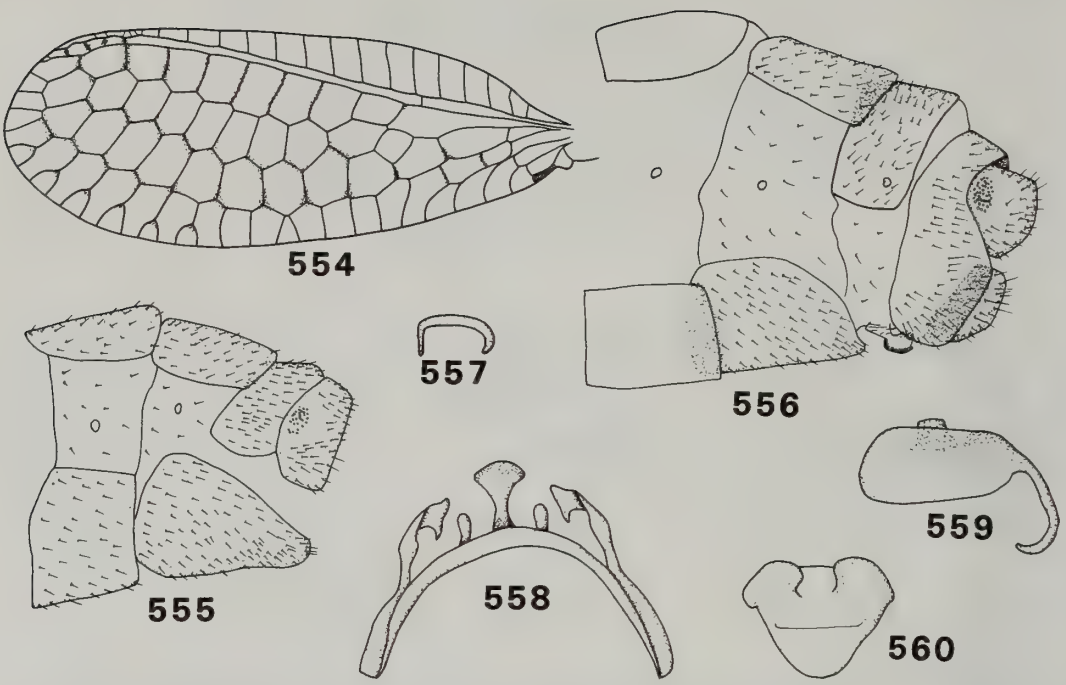
present on all sclerites except sternite 9 and ectoproct; callus cerci ovate; ectoprocts fused with tergite 9; sternites 8+9 fused; sternites broad; atria small; apodemes strongly developed on sternites 1–4; ♀: callus cerci rounded; ectoprocts not completely fused with tergite 9; sternite 7 convex apically.

GENITALIA ♂ (Fig. 551). Tignum, gonapsis and median plate absent; entoprocessus minute, triangular; gonarcus arcuate; arcessus short, triangular; pseudopenis absent; gonosaccus very short; gonosetae short, in small lateral group; gonocristae, spinellae absent; hypandrium large.

GENITALIA ♀ (Figs 552, 553). Praegenitale absent; subgenitale bilobed apically with broad basal extension; spermatheca long, broad; ventral impression broad, deep; vela absent; duct long, coiled.

Larva. Abdomen broadly fusiform, humped; thoracic tubercles weakly developed, bearing two short setae; metanotum with row of setae on chalazae; abdominal tubercles short, spherical with a few short setae; abdominal setae hooked; abdominal latero-dorsal tubercles absent; single latero-dorsal setae with chalazae on abdominal tergites 6 and 7; debris often carried, usually composed of large particles.

REMARKS. *Nothochrysa* and *Dictyochrysa* are the only nothochrysine genera in which 1A is forked



Figs 554–560 *Pamochrysa stellata*. 554, fore wing; 555, apex of ♂ abdomen, lateral; 556, apex of ♀ abdomen, lateral; 557, ♂ arcessus, lateral; 558, ♂ genitalia, dorsal; 559, ♀ spermatheca, lateral; 560, ♀ subgenitale, ventral.

in the fore wing. *Dictyochrysa* can be distinguished from *Nothochrysa* by the dense reticulation of the wing venation. *Nothochrysa* is unusual amongst the Nothochrysinae in having reduced entoprocessus. Adams (1967) showed a suture between sternites 8+9 in *N. californica* and Psm not meeting the inner gradates but extending slightly beyond them, although the vein stops short of the outer gradates.

BIOLOGY. The larvae of all three species of *Nothochrysa* have been described: *N. californica* Banks (Toschi, 1965), *N. capitata* Fabricius (Killington, 1937; Kimmins, 1939; Gepp, 1983) and *N. fulviceps* Stephens (Killington, 1937; Gepp, 1983).

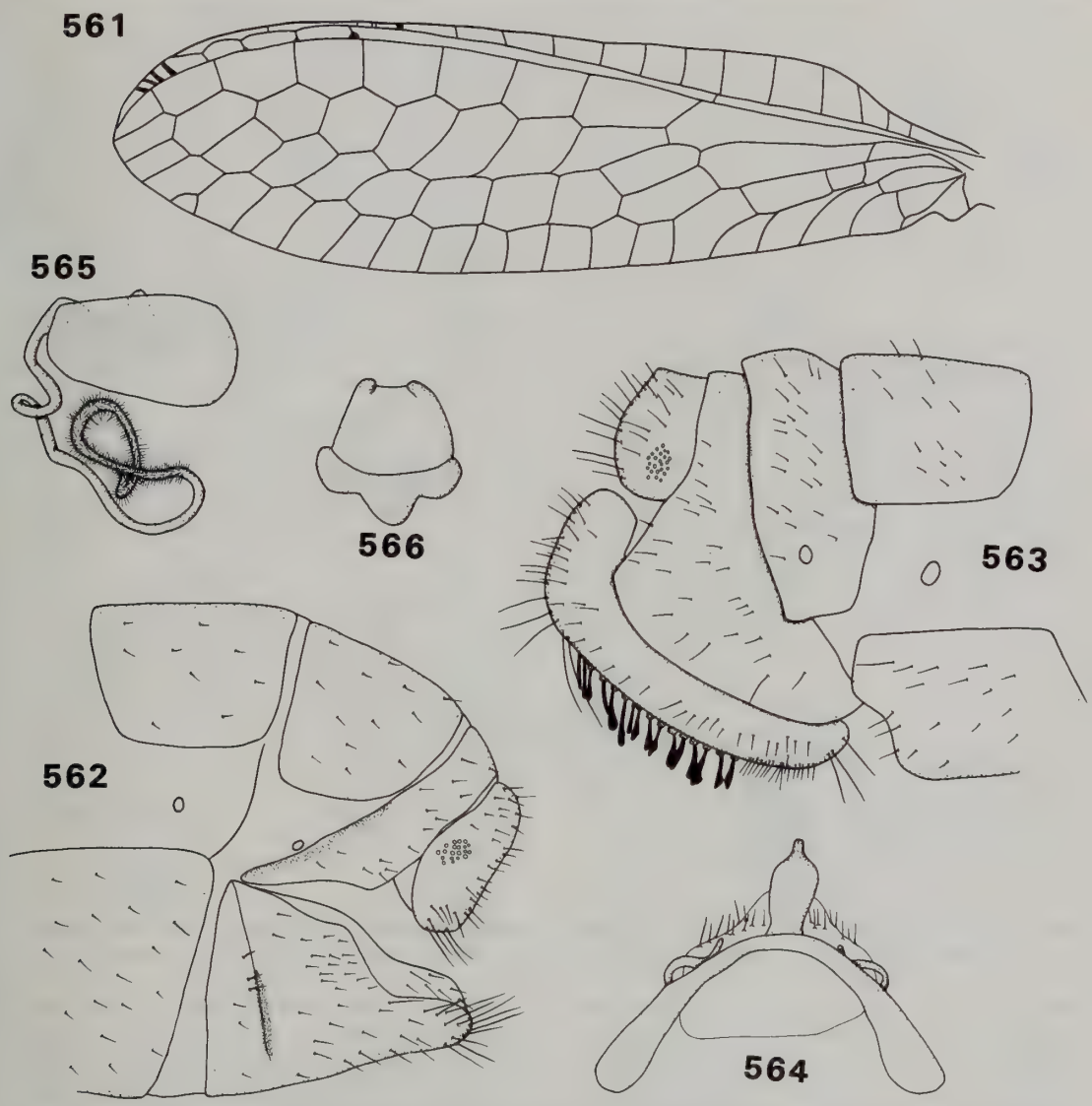
Adults examined during this study did not have insect remains in their gut contents.

Genus *PAMOCHRYSA* Tjeder

Pamochrysa Tjeder, 1966: 248. Type species: *Pamochrysa stellata* Tjeder, by monotypy.

DISTRIBUTION. The single included species is known from southern Africa.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 554) 9–11 mm; ground colour pale green. Head, scape, pedicel marked extensively with black spots and stripes; palps narrow, rounded apically; mandibles broad, asymmetrical with basal tooth on left mandible; galea long, narrow with prominent apical papilla; labrum indented; vertex domed; toruli large; eyes small (head width : eye width = 3.7–4.4 : 1); scape squared; pedicel slightly constricted medially; antenna shorter than fore wing; flagellar segments 3 times as long as broad; setae arranged in five rings. Pronotum marked with black lateral stripes; dorsal setae short, black; meso- and metanotum with black markings. Legs marked with black stripes on femora and tibiae; setae short, dark; claws without basal dilation. Fore wing rounded apically; marked with pale brown shading on gradates; costal area narrow at base; costal setae quite long, inclined; stigma marked with black spots; Sc long; R sinuate below stigma; Sc and R widely separated; basal Sc crossvein 1.4–1.6 mm; *im* broad, diamond-shaped; M forking after base of m_3; Rs straight; gradates in two parallel series; veins not crassate in ♂; c_1 shorter than c_2; 1A not forked; *dcc* broad, open at margin. Hind wing with C and Sc fused just basad of pterostigma. Abdomen (Figs 555, 556) marked along entire length with black dorsolateral stripe; setae short, coarse on apical segments, quite dense; callus cerci ovate; trichobothria 41–44; ectoprocts with slight dorso-apical invagination, fused dorsally,



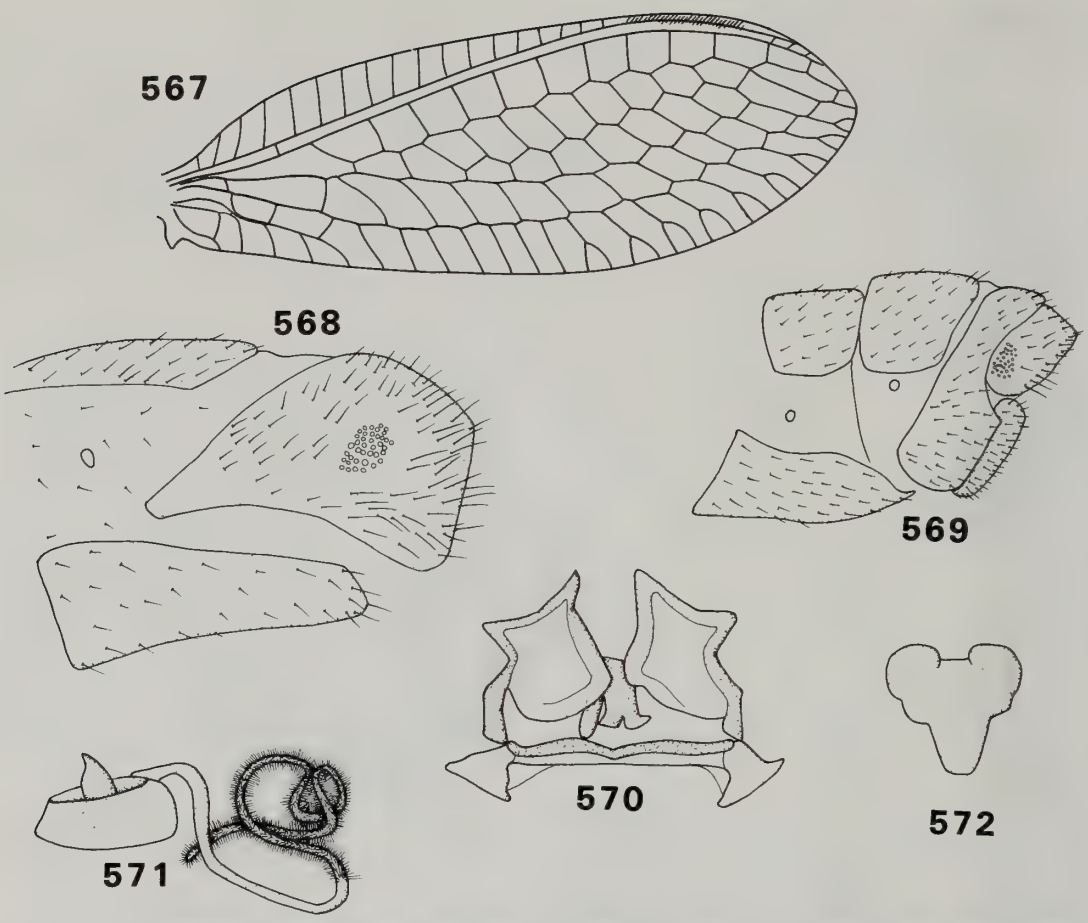
Figs 561–566 *Pimachrysa*. 561, *P. nigra*; 562–566, *P. fusca*. 561, fore wing; 562, apex of ♂ abdomen, lateral; 563, apex of ♀ abdomen, lateral; 564, ♂ genitalia, dorsal; 565, ♀ spermatheca, lateral; 566, ♀ subgenitale, ventral.

not fused with sternite 9; ♂: microtholi absent; sternite 8+9 fused; apodemes absent; ♀: spiracle on segment 8 opens on sternite; sternite 7 straight apically.

GENTALIA ♂ (Figs 557, 558). Tignum, gonapsis and median plate absent; entoprocessus large, linear; parameres absent; gonarcus arcuate, narrow with short, medio-lateral horns; arcessus short, narrow, tapering apically, curved medially at 90°; gonosaccus short; gonosetae few, short, evenly distributed; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 559, 560). Praegenitale absent; subgenitale bilobed apically, tapered slightly basally; spermatheca large, broad; ventral impression very broad, deep; vela very short; duct short, curved.

REMARKS. *Pamochrysa* may be distinguished from other nothochrysine genera by the rhomboidal intramedian cell since *im* is quadrangular in other Nothochrysinae. The genus is probably closely related to *Kimochrysa* with which it shares the apomorphy of having Sc and C fused in the hind wing. *Pamochrysa* and *Pimachrysa* are the only genera in the Chrysopidae in which a spiracle (on tergite 8 in females) opens on a tergite, in all other genera the spiracles open on the lateral



Figs 567–572 *Triplochrysa pallida*. 567, fore wing (from Kimmins); 568, apex of ♀ abdomen, lateral; 569, apex of ♀ abdomen, lateral; 570, ♂ genitalia, dorsal; 571, ♀ spermatheca, lateral; 572, ♀ subgenitale, ventral.

membrane. This is a plesiomorphic condition which occurs widely throughout the Neuroptera (e.g. Hemerobiidae and Myrmeleonidae). *Pamochrysa, Kimochrysa* and *Pimachrysa* plesiomorphically retain a suture completely separating tergite 9 and the ectoprocts in males.

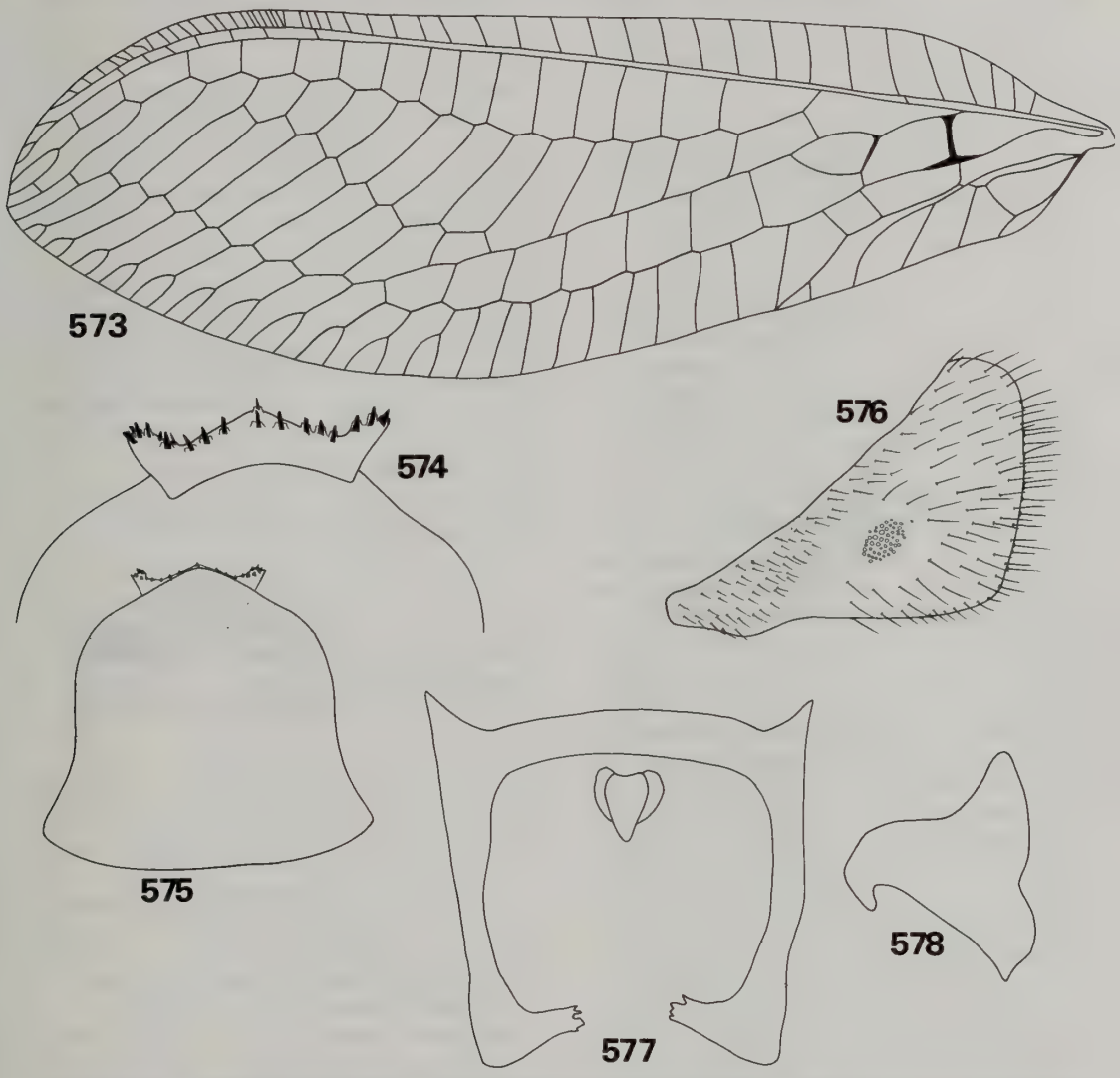
BIOLOGY. Unknown. Pollen grains were present in the guts of adults examined during this study and Tjeder (1966) identified Dipsacacae and Compositae pollen grains in the gut contents of specimens that he examined.

Genus ***PIMACHRYSA*** Adams

Pimachrysa Adams, 1956: 67. Type species: *Pimachrysa grata* Adams, by original designation.

DISTRIBUTION. Five species are known from western U.S.A. and northern Mexico.

DIAGNOSIS. *Adult*. Small lacewings, fore wing (Fig. 561) 7–10 mm; ground colour brown. Head marked with brown stripes on labrum, clypeus, frons, vertex, scape; palps broad, rounded apically; labrum with straight apical margin; vertex domed; toruli large; head width : eye width = 2.6–4.1 : 1, eyes very small; antenna, pale brown, shorter or same length as fore wing; flagellar segments 3 times as long as broad; setae arranged in 6 rings. Pronotum marked with brown lateral stripe; dorsal setae very short, few; meso- and metanotum with brown lateral stripe. Legs with short, black setae; claws without basal dilation. Fore wing narrow (length : breadth = 3.0–3.3 : 1); unmarked; costal area narrow at base; costal setae short, inclined; stigma marked with brown spot on each crossvein; Sc long or short; Sc and R widely separated; basal Sc crossvein 1.16–1.52 mm; *im* long, quadrangular; Rs straight; m_2 very long; radial crossveins straight; gradates in two parallel series; crossveins not crassate in ♂; c_2 up to 1.5



Figs 573–578 *Chrysaloysia somalica* ♂. 573, fore wing; 574, apex of abdomen, dorsal view; 575, sternite 8 + 9, ventral view (stippling indicates apodemes); 576, ectoproct + tergite 9, lateral view; 577, gonarcus and arcessus, caudal view; 578, arcessus, lateral view.

times longer than c_1; 1A unforked; *dcc* open at wing margin, very broad. Abdomen (Figs 562, 563) extensively marked brown; setae very short and sparse; trichobothria 20–25; ectoprocts not fused with tergite 9, fused dorsally, deeply invaginated apico-dorsally; ♂: callus cerci ovate; sternites 8 and 9 not completely fused; microtholi present on all sclerites except sternite 8+9 and ectoproct; ♀: sternite 7 straight apically; gonapophyses grossly enlarged, bearing large spoon-shaped setae; spiracle opens on 8th tergite.

GENITALIA ♂ (Fig. 564). Tignum, gonapsis and median plate absent; entoprocessus narrow, elongate; parameres absent; gonarcus arcuate with shallow curve; arcessus short, narrowing abruptly to apical hook, curved ventrally at base; gonosaccus short; gonosetae absent or few, short, evenly dispersed; gonocristae and spinellae absent.

GENITALIA ♀ (Figs 565, 566). Praegenitale absent; subgenitale with narrow basal extension, bilobed apically; spermatheca broad; ventral impression deep, broad basally, tapering abruptly apically; duct long, coiled; vela absent.

REMARKS. *Pimachrysa* has retained the primitive character of the spiracle opening on the 8th tergite (like *Pamochrysa*), but it can be distinguished by

the narrow wings with the pterostigmatic subcostal crossveins marked with black. The female is readily distinguished by the spoon-shaped setae on the gonapophyses.

BIOLOGY. Larva unknown. The guts of adult specimens of *P. nigra* Adams contained pollen grains, but insect remains were not present. Dr N. D. Penny (*in litt.*) states that the adults are on the wing during the winter.

Genus ***TRIPLOCHRYSA*** Kimmins

Triplochrysa Kimmins, 1952a: 69. Type species: *Triplochrysa pallida* Kimmins, by monotypy and original designation.

DISTRIBUTION. Queensland (Australia). Two species are known in the genus.

DIAGNOSIS. *Adult*. Medium-sized lacewings, fore wing (Fig. 567) 12–14 mm; ground colour pale yellowish green. Head unmarked or marked with broad black stripe between antennae; palps narrow, rounded apically; labrum deeply invaginated; mandibles broad, left mandible with basal tooth; galea long, narrow with long apical papilla; vertex small, hardly raised; toruli large; eyes small, (head width : eye width = 2.3–2.9 : 1); scape as broad as long; antenna shorter than fore wing; flagellar segments short, twice as long as broad; setae arranged in 5 rings. Pronotum short, broad; unmarked or marked with small black spot in each corner; dorsal setae long, pale; meso- and metanotum unmarked or with lateral black spot. Legs unmarked; setae short, dark; claws with small median tooth, hardly dilated. Fore wing unmarked; rounded apically; costal area very narrow at base; costal setae short, inclined; stigma unmarked; narrow strip of dense microsetae present on pterostigma between Sc and R; Sc long; Sc and R widely separated; basal Sc crossvein 1.08–1.12 mm; m_2 very long; M forked distal to m_3; *im* broadly quadrangular or open apically (apical crossvein absent); Rs straight; gradates in three parallel series; inner gradates extended basally, not fusing with Psm; c_1 about half as long as c_2; 1A not forked; 2A and 3A not fused apically; *dcc* broad, open at margin. Abdomen (Figs 568, 569) unmarked; setae short, sparse; callus cerci ovate; trichobothria 31–35; ectoprocts with slight dorso-apical invagination, fused dorsally; ♂: microtholi absent; tergite 9 and ectoproct fused; sternite 8+9 fused, broad, short; ♀: suture present between ectoprocts and tergite 9; sternite 7 convex apically.

GENITALIA ♂ (Fig. 570). Tignum, gonapsis and median plate absent; entoprocessus short, broad; parameres absent; gonarcus short, broad, transverse; arcessus long, narrow, rounded apically, strongly curved ventrally basad; gonosaccus short; gonosetae, gonocristae and spinellae absent.

GENITALIA ♀ (Figs 571, 572). Praegenitale absent; subgenitale bilobed apically with tapering basal extension; spermatheca long, narrow or broad; ventral impression deep; vela short; duct very long, narrow, sinuous.

REMARKS. *Triplochrysa* may be readily distinguished from other nothochrysine genera by the three parallel series of gradate crossveins. The two Australian genera *Triplochrysa* and *Dictyochrysa* are the only nothochrysines with more than two gradate series, *Dictyochrysa* being distinguished by its reticulate venation.

BIOLOGY. Unknown. Adult gut contents do not include insect remains.

CHECKLIST OF EXTANT SPECIES OF CHRYSOPIDAE

(* indicates material examined)

Family **CHRYSOPIDAE** Schneider

Subfamily **APOCHRYSINAE** Handlirsch, 1908

Genus ***ANAPOCHRYSA*** Kimmins, 1952
africana* Kimmins, 1952
voeltzkowi (Weele, 1909)

Genus ***APOCHRYSA*** Schneider, 1851
leptalea* (Rambur, 1842)
picteti (Navás, 1911)

Genus ***CLAVERINA*** Navás, 1913
beata* (Walker, 1858)

Genus ***DOMENECHUS*** Navás, 1913
marianella* (Guérin, 1853)
mirifica* (Gerstaecker, 1888)
**isigillatus* Navás, 1913

Genus ***JOGUINA*** Navás, 1912
borneensis* Kimmins, 1952
malayana* Banks, 1931
nicobarica* (Brauer, 1864)

Genus ***LAINIUS*** Navás, 1913
constellatus* Navás, 1913
decoratus Navás, 1930

Genus ***LOYOLA*** Navás, 1913
croesus* (Gerstaecker, 1893)
tripunctata Banks, 1924

Genus ***NACAURA*** Navás, 1913
matsumurae* (Okamoto, 1912)
minomoana (Nakahara, 1915)

Genus ***NOBILINUS*** Navás, 1913
albardae albardae* (McLachlan, 1875)
albardae insignitus* Navás, 1913
albardae phantoma* (Gerstaecker, 1893)
aurifera* (Walker, 1853)
bellula (Banks, 1914)
coccinea (Brauer, 1864)

Genus ***NOTHANCYLA*** Navás, 1910
verreauxi* Navás, 1910

Genus ***OLIGOCHRYSA*** Esben-Petersen, 1914
lutea* (Walker, 1853)
gracilis Esben-Petersen, 1914

Genus ***SYNTHOCHRYSA*** Needham, 1909
cognata* Kimmins, 1953
evanida (Gerstaecker, 1893)
montrouzieri* (Girard, 1862)
stigma (Girard, 1862)
salomonis* (Kimmins, 1951)

Subfamily **CHRYSOPINAE** Schneider, 1851

Tribe **ANKYLOPTERYGINI** Navás, 1910

Genus ***ANKYLOPTERYX*** Brauer, 1864
Ethiochrysa Fraser, 1952 **syn. n.**
Subgenus ***ANKYLOPTERYX*** Brauer, 1864
alluaudi* Navás, 1910
basalis* Kimmins, 1952
braueri Banks, 1937
buttikaferi* Weele, 1905
collarti* Navás, 1925
decorsei* Navás, 1910
decormei misspelling
delicata* Navás, 1935
delicatula Banks, 1937
doleschali* Brauer, 1864
fastuosa* Navás, 1929
fraterna* Banks, 1939
gracilis Nakahara, 1955
grata* Tjeder, 1966
immaculata Brauer, 1864
lambillioni* Navás, 1929
laticosta* Banks, 1939
nepalensis* Hölzel, 1973
nepheloptera* Navás, 1912
nesiotica* Navás, 1913
nonelli* Navás, 1913
obliqua* Banks, 1924
octopunctata octopunctata (Fabricius, 1793)
octopunctata borneensis Weele, 1909
octopunctata candida* (Fabricius, 1798)
octopunctata kisserensis Weele, 1909
octopunctata punctata* (Hagen, 1858)
octopunctata sigillaris* Gerstaecker, 1893
octopunctata trimaculata* (Girard, 1859)
octopunctata* (Fraser, 1951) **comb. n.**
[Homonym]
overlaeti* Navás, 1936
pallida* Banks, 1910
pallidula* Tjeder, 1966
pellucida* Tjeder, 1966
perpallida Banks, 1924
polychlora (Fraser, 1952) **comb. n.**
polygramma* Gerstaecker, 1893
**nervosa* Navás, 1913
pusilla Tjeder, 1966
quadrimaculatus (Guérin, 1844)
rhodocephala Navás, 1914
rieki New, 1980
scioptera Navás, 1924
splendidissima Gerstaecker, 1884
tanana Fraser, 1952
tesselatus Needham, 1909
tristicta* Navás, 1910
venusta* (Hagen, 1853)

Subgenus ***SENCERA*** Navás, 1925. **stat. n.**
anomala* (Brauer, 1864)
exquisita* Nakahara, 1955
feae* Navás, 1929
scioneura* Navás, 1924

Genus ***PARANKYLOPTERX*** Tjeder, 1966 **stat. n.**
burgeoni* (Navás, 1929) **comb. n.**
elgonica* (Navás, 1936) **comb. n.**
feana* (Navás, 1929) **comb. n.**
maculata* (Kimmins, 1939) **comb. n.**
multipunctata* (Fraser, 1951) **comb. n.**
neavei* (Navás, 1913)
**verdcourti* (Kimmins, 1951)
polysticta* (Navás, 1910) **comb. n.**
speciosa (Navás, 1924) **comb. n.**
tetrasticta* (Navás, 1932) **comb. n.**
walterloti* (Navás, 1911) **comb. n.**
waterloti misspelling

Genus ***RETIPENNA*** Brooks, 1986
burmana* Brooks, 1986
chione (Banks, 1940) **comb. n.**
dasyphlebia* (McLachlan, 1894) **comb. n.**
irregularis* (Navás, 1914) **syn. n.
grahami (Banks, 1940) **comb. n.**
hasegawai* (Nakahara, 1955)
jubingensis (Hölzel, 1973) **comb. n.**
notata* (Navás, 1910)
**guttata* (Navás, 1930)
**longipilis* (Banks, 1938)

*__variegata__ Brooks, 1986

Genus __SEMACHRYSA__ Brooks, 1983
Indochrysa Banks, 1938
*__claggi__ (Banks, 1937)
*__contorta__ Brooks, 1983
*__cruciata__ (Esben-Petersen, 1928)
*__dammermanni__ (Esben-Petersen, 1929)
*__decorata__ (Esben-Petersen, 1913)
rectoides (Banks, 1939)
*__hyndi__ Brooks, 1983
*__matsumurae__ (Okamoto, 1914)
*__minuta__ Brooks, 1983
*__nigribasis__ (Banks, 1920)
*__papuensis__ Brooks, 1983
*__picilabris__ (Kimmins, 1952)
*__polysticta__ Brooks, 1983
*__sagitta__ Brooks, 1983
*__wallacei__ Brooks, 1983

Genus __SIGNOCHRYSA__ gen. n.
*__bakeri__ (Banks, 1924) **comb. n.**
boettcheri (Esben-Petersen, 1933)
__buruensis__ (Esben-Petersen, 1929) **stat. n. & comb. n.**
*__caliptera__ (Banks, 1920) **comb. n.**
*__catenulata__ (Gerstaecker, 1893) **comb. n.**
*__jocaste__ (Banks, 1940) **comb. n.**
*__mira__ (Navás, 1913) **comb. n.**
__ornatissima__ (Nakahara, 1955) **comb. n.**
__rizali__ (Banks, 1924) **comb. n.**
*__signatipennis__ (Banks, 1910) **comb. n.**

Tribe **BELONOPTERYGINI** Navás, 1913

Genus __ABACHRYSA__ Banks, 1938
*__eureka__ (Banks, 1931)

Genus __BELONOPTERYX__ Gerstaecker, 1863
*__arteriosa__ Gerstaecker, 1863

Genus __CALOCHRYSA__ Banks, 1943
*__extranea__ (Essben-Petersen, 1917)

Genus __CHRYSACANTHIA__ Lacroix, 1923
Nesochrysa Fraser, 1951 **syn. n.**
*__esbeniana__ Lacroix, 1923
*__varicella__ (Fraser, 1951) **comb. n.**

Genus __CHRYSALOYSIA__ Navás, 1927
*__somalica__ Navás, 1927

Genus __DYSOCHRYSA__ Tjeder, 1966
*__furcata__ Tjeder, 1966
*__reflexa__ Tjeder, 1966

Genus __EVANOCHRYSA__ **gen. n.**
*__evanescens evanescens__ (McLachlan, 1869) **comb. n.**
__evanescens javanica__ (Weele, 1909) **comb. n.**
*__infecta__ (Newman, 1838) **comb. n.**
subcostalis (Navás, 1917)
*__levasseuri__ (Navás, 1921) **comb. n.**

Genus __ITALOCHRYSA__ Principi, 1946
*__aequalis aequalis__ (Walker, 1853)
*__aequalis polychroa__ (Gerstaecker, 1893)
*__aequalis sumatrana__ (Albarda, 1881)
*__aethiopiae__ (Lacroix, 1925)
__albescens__ (Navás, 1932) **comb. n.**
__amplipennis__ Tjeder, 1966
__asirensis__ Hölzel, 1980
__banksi__ New, 1980
*__bimaculata__ Hölzel, 1980
*__boueti__ (Navás, 1927)
*__burgeoni__ (Navás, 1924)
__carletoni__ (Banks, 1939)
*__chloromelas__ (Girard, 1862)
*__cornuta__ (Navás, 1935)
__cruciata__ (Navás, 1935)
*__cuneata__ (Navás, 1911)
*__everetti__ (Weele, 1909) **stat. n.**
*__exilis__ Tjeder, 1966
*__fascialis__ (Banks,1910)
__falcata__ Tjeder, 1966
*__ferruginea__ (McLachlan, 1869)
__flavobrunneus__ Ghosh, 1981
__froggatti__ (Esben-Petersen, 1914)
*__fulvicornis__ Kimmins, 1955
__gagginoi__ (Navás, 1929)
*__gigantea__ (McLachlan, 1867)
finoti (Navás, 1908)
*__gillavryi__ (Navás, 1924)
*__guerini__ (Navás, 1911)
*__henryi__ (Kimmins, 1938)
*__impar__ (Navás, 1912)
__indigena__ (Needham, 1909)
*__insignis__ (Walker, 1853)
stictoneura (Gerstaecker, 1885)
insignita (Navás, 1913)
xanthocephala (Navás, 1932)
*__italica__ (Rossi, 1790)
lateralis Olivier, 1792)
grandis (Thunberg, 1838)
*__japonica__ (McLachlan, 1875)
modesta (Nakahara, 1955)
*__jubilaris__ (Navás, 1924)
*__lata__ (Banks, 1910)
__lefroyi__ (Needham, 1909)
*__limbata__ (Navás, 1924)
__lobini__ Hölzel & Ohm, 1982
__luddemanni__ (Navás, 1935)
*__ludekingi__ (Weele, 1909) **stat. n.**
ignobilis (Navás, 1913)
__lyrata__ Tjeder, 1966
__maclachlani__ (Wallengren, 1875)
__modesta__ (Navás, 1935) **comb. n.**
*__mozambica__ (Walker, 1860)

*__neobritanica__ (Navás, 1913)
*__neurodes__ (Rambur, 1842)
__nigrinervis__ (Esben-Petersen, 1917)
__nigrovenosus__ Kuwayama, 1970
__nossibensis__ (Navás, 1928)
*__oberthuri__ (Navás, 1908)
__okavangoensis__ Tjeder, 1966
__pallicornis__ (Banks, 1920)
*__peringueyi__ (Esben-Petersen, 1920)
__polemia__ (Navás, 1916)
__punctistigma__ (Esben-Petersen, 1918)
__robusta__ (Needham, 1909)
*__rufostigma__ (McLachlan, 1867)
maculata (Esben-Petersen, 1912)
__rugosa__ Tsukagachi, 1988
*__sectoria__ (Navás, 1925)
__serrata__ Tjeder, 1966
__similis__ Tjeder, 1966
__simplex__ (Banks, 1920)
__stigmalis__ (Navás, 1928)
*__stigmatica__ (Rambur, 1842)
*__stitzi__ (Navás, 1924)
__talaverae__ (Navás, 1928)
*__temerata__ (Navás, 1914)
*__tibialis__ (Navás, 1913)
*__turneri__ (Kimmins, 1948)
__soror__ Tjeder, 1966
__uchidae__ (Kuwayama, 1927)
__vansoni__ Tjeder, 1966
*__variegata__ (Burmeister, 1839)
sordidata (Navás, 1908)
**zonata* (Navás, 1913)
__vartianorum__ Hölzel, 1967
__zulu__ Tjeder, 1966

Genus __NACARINA__ Navás, 1915
Nadiva Navás, 1919
Goliva Navás, 1920
Rameta Navás, 1920
Mesochrysa Navás, 1927 **syn. n.**
__balboana__ (Banks, 1941)
__deletangi__ (Navás, 1920)
__egena__ (Navás, 1930)
__furcata__ Navás, 1916
__megaptera__ (Navás, 1927) **comb. n.**
*__neotropica__ (Navás, 1913) **comb. n.**
*__panchlora__ (Gerstaecker, 1888)
__pletorica__ (Navás, 1919)
*__sanctiignatii__ (Navás, 1927) **comb. n.**
__sanguinea__ (Navás, 1920)
*__titan__ (Banks, 1915) **comb. n.**
*__valida__ (Erichson, 1848)
__viridipennis__ (Alayo, 1968)
*__wagneri__ (Navás, 1924)

Genus __NESOCHRYSA__ Navás, 1910
Oviedus Navás, 1913 **syn. n.**
Madachrysa Navás, 1934 **syn. n.**
__elizabethae__ (Navás, 1928) **comb. n.**
*__grandidieri__ Navás, 1910
*__illotus__ (Tjeder, 1966) **comb. n.**
*__macrostigma__ (Gerstaecker, 1894) **comb. n.**
**auricollis* Navás, 1913
*__marginata__ (Navás, 1912) **comb. n.**
*__marginicollis__ (Kimmins, 1957) **comb. n.**
__rubeolus__ (Tjeder, 1966) **comb. n.**
*__ruficeps__ (Tjeder, 1966) **comb. n.**
*__seyrigi__ (Navás, 1934) **comb. n.**
__virgatus__ (Tjeder, 1966) **comb. n.**

Genus __NODOCHRYSA__ Banks, 1938
*__necrota__ (Banks, 1920)

Genus __OYOCHRYSA__ Brooks, 1985
*__ancora__ Brooks, 1985
*__sanguinea__ Brooks, 1985
*__spadix__ Brooks, 1985

Genus __STIGMACHRYSA__ Navás, 1925
*__cladostigma__ (Navás, 1913)
__elegans__ Esben-Petersen, 1933
*__kervillei__ Navás, 1925

Genus __TURNEROCHRYSA__ Kimmins, 1935
*__mirifica__ Kimmins, 1935

Tribe **CHRYSOPINI** Schneider, 1851

Genus __ANOMALOCHRYSA__ McLachlan, 1883
*__angulicosta__ Perkins, 1899
*__cognata__ Perkins, 1899
*__debilis__ Perkins, 1899
nana Perkins, 1899
*__frater__ Perkins, 1899
*__fulvescens fulvescens__ Perkins, 1899
*__fulvescens rhododora__ Perkins, 1899
*__haematura__ Perkins, 1899
*__hepatica__ McLachlan, 1883
proteus Perkins, 1899
*__longipennis__ Perkins, 1899
*__maclachlani maclachlani__ Blackburn, 1884
paurosticta Perkins, 1899
deceptor Perkins, 1899
gayi Perkins, 1899
zoe Perkins, 1899
*__maclachlani simillima__ Perkins, 1899
*__molokaiensis__ Perkins, 1899
*__montana__ Blackburn, 1884
__ornatipennis__ Blackburn, 1884
*__peles__ Perkins, 1899
*__princeps__ Perkins, 1899
*__raphidioides raphidioides__ Perkins, 1899
*__raphidioides reticulata__ Perkins, 1899
*__rufescens__ McLachlan, 1883
biseriata Perkins, 1899
*__soror__ Perkins, 1899

**sylvicola* Perkins, 1899
**viridis* Perkins, 1899

Genus ***APERTOCHRYSA*** Tjeder, 1966
afghanica (Hölzel, 1973)
anomala (Tillyard, 1917) **comb. n.**
araucariae (Tillyard, 1917) **comb. n.**
crassinervis (Esben-Petersen, 1927) **comb. n.**
*****edwardsi*** (Banks, 1940) **comb. n.**
*****eremita*** (Kimmins, 1955)
*****ictericus*** (Esben-Petersen, 1927) **comb. n.**
kichijoi (Kuwayama, 1936)
leai (Tillyard, 1917) **comb. n.**
*****madegassa*** (Navás, 1921) **comb. n.**
*****metastigma*** (Tillyard, 1917) **comb. n.**
nautarum (Tillyard, 1917) **comb. n.**
*****norfolkensis*** (Tillyard, 1917) **comb. n.**
*****physophlebia*** (Navás, 1914) **comb. n.**
*****umbrosa*** (Navás, 1914)
waitei (Tillyard, 1917) **comb. n.**

Genus ***ATLANTOCHRYSA*** Hölzel, 1970
*****atlantica*** (McLachlan, 1882)
*****pseudoatlantica*** (Tjeder, 1939)
sororcula (Tjeder, 1939)

Genus ***AUSTROCHRYSA*** Esben-Petersen, 1928
Scoliochrysa Navás, 1929 **syn. n.**
*****abnormis abnormis*** (Albarda, 1881) **comb. n.**
lunigera (Gerstaecker, 1893)
*****abnormis javanensis*** (Weele, 1909) **comb. n.**
apoana (Banks, 1937) **comb. n.**
*****hexasticha*** (Gerstaecker, 1893) **comb. n.**
leucoptera (Esben-Petersen, 1926) **comb. n.**
*****loriana*** (Navás, 1929) **comb. n.**
samoana Esben-Petersen, 1928

Genus ***BORNIOCHRYSA*** **nom. n.** for *Bornia* Navás, 1928 **stat. n.**
*****appendiculata*** (Esben-Petersen, 1926) **comb. n.**
luzonica (Banks, 1939) **comb. n.**
*****solomonis*** Banks, 1941
*****squamosa*** (Tjeder, 1966) **comb. n.**
*****winkleri*** Navás, 1928

Genus ***BRINCKOCHRYSA*** Tjeder, 1966
Neda Navás, 1933 (Homonym) **syn. n.**
*****alfierii*** (Navás, 1926) **comb. n.**
*****amseli*** (Hölzel, 1967) **comb. n.**
*****cardaleae*** (New, 1980) **comb. n.**
*****chlorosoma*** (Navás, 1915) **comb. n.**
*****decaryella*** (Navás, 1933) **comb. n.**
*****goniophora*** (Navás, 1935) **comb. n.**
kintoki (Okamoto, 1919) **comb. n.**
*****lauta*** (Esben-Petersen, 1927) **comb. n.**
*****michaelseni*** (Esben-Petersen, 1928)
nachoi (Monserrat, 1977)
naumanni (Hölzel, 1982)
plagata (Navás, 1929) **comb. n.**
pulchella Hölzel, 1987
scelestes (Banks, 1911) **comb. n.**
*****stenoptera*** (Navás, 1910)
mozambica* (Navás, 1931) **syn. n.
sigwalti (Séméria, 1984) **syn. n.**
*****turkanensis*** (Navás, 1936)
peri (Tjeder, 1966) **syn. n.**

Genus ***CERAEOCHRYSA*** Adams,1982
acutipuppis Adams & Penny, 1987
*****adornata*** (Lacroix, 1926)
*****anceps*** (Navás, 1925)
ariasi Adams & Penny, 1987
*****arioles*** (Banks, 1944)
binaria (Navás, 1928)
*****azoguesina*** (Navás, 1928) **comb. n.**
*****berlandi*** (Navás, 1924)
caligata (Banks, 1945)
castilloi (Navás, 1913)
caucana (Banks, 1910) **comb. n.**
*****cincta*** (Schneider, 1851)
**bilineata* (Navás, 1913)
lafonei (Navás, 1914)
incalis (Banks, 1915)
bicarnea (Banks, 1920)
**advena* (Navás, 1922)
habana (Navás, 1922)
mestiza (Navás, 1924)
villosula (Navás, 1924)
bessona (Navás, 1924)
bina (Navás, 1924)
cornuta (Navás, 1925)
alternans (Navás, 1933)
wollebaeki (Esben-Petersen, 1934)
sallei (Banks, 1940)
iona (Banks, 1944)
*****claveri*** (Navás, 1911)
**silvana* (Navás, 1913)
deficiens (Navás, 1930)
sibirica (Navás, 1930)
haitiensis (Smith, 1931)
adoina (Banks, 1945)
inexpectata (Alayo, 1968)
*****cubana*** (Hagen, 1861)
tolteca (Banks, 1901)
albatala (Banks, 1913)
venularis (Navás, 1913)
**imbecilla* (Navás, 1914)
epheba (Navás, 1924)
seminole (Banks, 1924)
freemani (Smith, 1931)
jamaicensis (Banks, 1941)
*****discolor*** (Navás, 1914)
*****effusa*** (Navás, 1911)
everes (Banks, 1920)
**furcata* (Navás, 1922)
**furculata* (Navás, 1923)

gundlachi (Navás, 1924)
**instabilis* (Navás, 1925)
jacobaea (Navás, 1925)
peterseni (Navás, 1929)
petersenia (Navás, 1931)
gloriae (Alayo, 1968)
fairchildi (Banks, 1945)
falcifera Adams & Penny, 1987
****fiebrigi*** (Navás, 1913)
****gradata*** (Navás, 1913)
**guatemalteca* (Navás, 1914)
****indicata*** (Navás, 1913) **comb. n.**
infausta (Banks, 1945)
josephina (Navás, 1926)
**angulata* (Navás, 1929)
****laufferi*** (Navás, 1922) **comb. n.**
****lineaticornis*** (Fitch, 1855)
puncticornis (Fitch, 1855)
parvula (Banks, 1903)
columbiana (Banks, 1903)
stichoptera (Navás, 1914)
michaelmuris Adams & Penny, 1987
montoyana (Navás, 1913)
nigripes Adams & Penny, 1987
****placita*** (Banks, 1908)
intacta (Navás, 1912)
**forreri* (Navás, 1913)
rafaeli Adams & Penny, 1987
reddyi Adams & Penny, 1987
****reducta*** (Banks, 1944)
****rochina*** (Navás, 1915)
sanchezi (Navás, 1924)
scapularis (Navás, 1914)
****silvanoi*** (Navás, 1916) **comb. n.**
****smithi*** (Navás, 1914)
poeyi (Navás, 1924)
neotropica (Navás, 1929)
squalidens Adams & Penny, 1987
tenuicornis Adams & Penny, 1987
****valida*** (Banks, 1895)
bimaculata (McClendon, 1901)
**limitata* (Navás, 1913)
**longicella* (Navás, 1913)
**breviata* (Banks, 1915)
**lioni* (Navás, 1927)
damiensis (Smith, 1931)
wolcotti (Smith, 1931)

Genus ***CERATOCHRYSA*** Tjeder, 1966
Musola Navás, 1929 **syn. n.**
****antica*** (Walker, 1853)
**nesaea* (Navás, 1911)
inaequalis (Navás, 1912)
**ducissa* (Navás, 1914)
**regina* (Navás, 1914)
**vuilleti* (Navás, 1914)
pooana (Navás, 1922)
dimidiata (Navás, 1928)
iniqua (Navás, 1929)
impar (Navás, 1929) **syn. n.**
**undulata* (Fraser, 1952)
**atrostrata* (Tjeder, 1966)
****ceratina*** (Navás, 1910)
****disparilis*** (Navás, 1934)

Genus ***CHRYSEMOSA*** **nom. n.** for *Mesochrysa* Navás, 1936
****andresi*** (Navás, 1915) **comb. n.**
****commixta*** (Tjeder, 1966) **comb. n.**
****jeanneli*** (Navás, 1915) **comb. n.**
**ellenbergeri* (Navás, 1921)
laristanus (Hölzel, 1982) **comb. n.**
parva (Tjeder, 1966) **comb. n.**
piresi (Hölzel & Ohm, 1982) **comb. n.**
****simillima*** (Tjeder, 1966) **comb. n.**
sodomensis (Hölzel, 1982) **comb. n.**
stigmata Navás, 1936
****umbralis*** (Navás, 1933) **comb. n.**

Genus ***CHRYSOCERCA*** Weele, 1909
Pseudochrysa Okamoto, 1914
formosana (Okamoto, 1914)
jacobsoni Weele, 1909
****nigrivultuosa*** (Kimmins, 1955)
****perturbata*** (Banks, 1931) **comb. n.**
timorina Handschin, 1935

Genus ***CHRYSOPA*** Leach, 1815
Aeolops Billberg, 1820
Melanops Doumerc, 1861
Chrysopisca McLachlan, 1875 **syn. n.**
Cintameva Navás, 1914
Minva Navás, 1920 **syn. n.**
Polyphlebia Navás, 1936 **syn. n.**
Metachrysopa Steinmann, 1964
Nigrochrysopa Steinmann, 1964
Parachrysopa Séméria, 1983 **syn. n.**
****abbreviata abbreviata*** Curtis, 1834
immaculata Stephens, 1836
chlorophanus Ratzeburg, 1844
decora Evans, 1847
germanica (Esben-Petersen, 1913)
abbreviata caerulescens Bianchi, 1931
abbreviata maclachlaniola Bianchi, 1931
****albicornis*** Fitch, 1855
****altaica*** Hölzel, 1967
altaiensis Hölzel, 1980
replacement name for *quadripunctata* Steinmann, 1968
****astarte*** Hölzel, 1967
****chazaudi*** Navás, 1922
****chi*** Fitch, 1855
upsilon Fitch, 1855
****chlorophana*** Burmeister, 1839
latipennis Schnieder, 1851

chlorophana Walker, 1853
xanthocephala Fitch, 1855
bipunctata Fitch,1855
transmarina Hagen, 1861
***coloradensis** Banks, 1895
***commata** Kis & Ujhelyi, 1965
curdica Hölzel, 1967
***dasyptera** McLachlan, 1872
minima Keljander, 1881
lubischewi (Navás, 1933)
depressa Steinmann, 1968
schamona Hölzel, 1971
***dorsalis** Burmeister, 1839
pini Brauer, 1850
bifidilinea Costa, 1884
ypsilon Costa, 1884
***dubitans** McLachlan, 1887
venulosa (Navás, 1914)
excepta Banks, 1911
fezzanina (Navás, 1932) **comb. n.**
***flaviceps** (Brullé, 1840)
***formosa** Brauer, 1850
burmeisteri Schneider, 1851
japana Okamoto, 1919
pyreaea (Navás, 1930)
bicristata Tjeder, 1936
fuscostigma Esben-Petersen, 1933
hummeli Tjeder, 1936
***hungarica** Klapalek, 1899
***intima** McLachlan, 1893
fracta Navás, 1910
silens Steinmann, 1971
kansuensis Tjeder, 1936
***lezeyi** Navás, 1910
minuta (McLachlan, 1975) **syn. n.**
***nierembergi** Navás, 1908
nigra Okamoto, 1919
nigrescens Hölzel & Ohm, 1986
***nigricornis** Burmeister, 1839
colon Fitch, 1855
erythrocephala Banks, 1898
majuscula Banks, 1906
crotchi Banks, 1938
***nigricostata** Brauer, 1850
heydenii Schneider, 1851
nigrovenosa Pongrácz, 1912
**fastigiata* Navás, 1914
cosmia Navás, 1918
laburdensis Lacroix, 1924
**mediata* (Navás, 1924)
**neuralis* (Navás, 1926)
ingens Steinmann, 1964
***oculata** Say, 1849
euryptera Burmeister, 1839
illepida Fitch, 1855
omikron Fitch, 1855
mississipiensis Fitch, 1855
assimilis Banks, 1898
rubicunda Navás, 1913
***pallens** (Rambur, 1838)
septempunctata Wesmael, 1841
mauriciana (Rambur, 1842)
nobilis Brauer, 1850
**cognata* McLachlan, 1867
**centralis* McLachlan, 1875
robusta (Gerstaecker, 1893)
ricciana Navás, 1910
puncticollis Navás, 1915
parvula (Doumerc, 1861)
***perla** L., 1758
chrysops (L., 1758)
viridis (Retzius, 1783)
cancellatus (Schrank, 1802)
reticulata Leach, 1815
maculata Stephens, 1836
fallax Navás, 1913
nigriceps Okamoto, 1914
nothochrysodes (Navás, 1935)
***perplexa** McLachlan, 1887
kreyembergi (Navás, 1933)
persica Hölzel, 1966
***phyllochroma** Wesmael, 1841
tenella Brauer, 1850
pusilla Brauer, 1850
labbei Navás, 1910
magnicauda Tjeder, 1936
electra Hölzel, 1965
***pleuralis** Banks, 1911
punctata (Navás, 1920) **comb. n.**
punctata (Navás, 1936) **comb. n.**
***quadripunctata** Burmeister, 1839
sulphurea Fitch, 1855
sichelii Fitch, 1855
***quettana** (Navás, 1930)
***regalis** Navás, 1915
dorsalis Navás, 1904 nec Burmeister
sapporensis Okamoto, 1914
***separata** Banks, 1911
***slossonae** Banks, 1924
***sogdianica** McLachlan, 1875
minuta* (McLachlan, 1875) **syn. n.
nadali Navás, 1913
euprepia Navás, 1916
indiga Navás, 1916
**harterti* Navás, 1929
asiatica Steinmann, 1971
thibetana McLachlan, 1887
***viridana** Schneider, 1845
geniculata Pictet, 1865
peterseni Navás, 1910
galaica Navás, 1927
**clypealis* Navás, 1931
**collina* Navás, 1934
zelenyi Steinmann, 1964

*__walkeri__ McLachlan, 1893
novempunctata Navás, 1912
__xanthocephala__ Navás, 1916

Genus __CHRYSOPERLA__ Steinmann, 1964
*__acutella__ (Navás, 1933) **comb. n.**
__anpingensis__ (Esben-Petersen, 1913) **comb. n.**
*__arequipae__ (Navás, 1929) **comb. n.**
*__asoralis__ (Banks, 1915) **comb. n.**
*__australis__ (New, 1980) **comb. n.**
*__carnea carnea__ (Stephens, 1836)
affinis (Stephens, 1836)
microcephala (Brauer, 1850)
vulgaris (Schneider, 1851)
lampropter (Stein, 1863)
lucasina (Lacroix, 1912)
pillichi (Pongracz, 1913)
nipponensis (Okamoto, 1914)
kurisakiana (Okamoto, 1914)
**kolthoffi* (Navás, 1927)
angelina (Navás, 1931)
**quettana* (Navás, 1931)
downesi (Smith, 1932)
ferganica (Navás, 1933)
renoni (Lacroix, 1933)
pictavica (Lacroix, 1933)
sinica (Tjeder, 1936)
mohave (Banks, 1938)
lundbladi (Tjeder, 1939)
maderensis (Tjeder, 1939)
canariensis (Tjeder, 1939)
__carnea nanceiensis__ Séméria, 1980
*__clypealis__ (Navás, 1929) **comb. n.**
__comans__ (Tjeder, 1966)
*__comanche__ (Banks, 1938) **comb. n.**
sperryae (Banks, 1943)
*__concinna__ (Hölzel, 1974)
*__congrua__ (Walker, 1853)
**concolor* (Walker, 1853)
**bequaerti* (Navás, 1912)
*__decaryana__ (Navás, 1934) **comb. n.**
__dozieri__ (Smith, 1931) **comb. n.**
*__exotera__ (Navás, 1913) **comb. n.**
*__externa externa__ (Hagen, 1861)
**lanata* (Banks, 1910)
gracina (Navás, 1919)
__externa cocosensis__ Adams, 1983
*__exul__ (McLachlan, 1869) **comb. n.**
**wollastoni* (Navás, 1913)
*__furcifera__ (Okamoto, 1914)
*__galapagoensis__ (Banks, 1924) **comb. n.**
__gujaratensis__ (Ghosh, 1976)
*__harrisii__ (Fitch, 1855)
stenostigma (Navás, 1914)
__incongrua__ (Navás, 1914) **comb. n.**
*__insulata__ (Fraser, 1957) **comb. n.**
__iranica__ (Hölzel, 1967)
__italotis__ (Banks, 1910)
__krakatauensis__ Tsukagachi, 1988
*__lindana__ (Navás, 1924) **comb. n.**
*__maquilingi__ (Banks, 1937) **comb. n.**
replacement name for *inconspicua* (Navás, 1926)
*__mediterranea__ (Hölzel, 1972)
*__meloui__ (Navás, 1924) **comb. n.**
*__mutata__ (McLachlan, 1898)
expurgata (Tjeder, 1949)
*__nepia__ (Navás, 1911) **comb. n.**
*__nigriciana__ (Navás, 1931) **comb. n.**
*__nyerina__ (Navás, 1933) **comb. n.**
__oblita__ (Hölzel, 1973)
*__oscillans__ (Navás, 1922) **comb. n.**
*__otalatis__ (Banks, 1910) **comb. n.**
**lemoulti* (Lacroix, 1923)
*__phaeocephala__ (Navás, 1931) **comb. n.**
__plicata__ (Tjeder, 1966)
__plorabunda__ (Fitch,1855)
pseudographa (Fitch, 1855)
robertsonii (Fitch, 1855)
illinoiensis (Shimer, 1865)
*__pudica__ (Navás,1913)
__punensis__ (Ghosh, 1976)
*__rufilabris__ (Burmeister, 1839)
interrupta (Schneider, 1851)
**attenuata* (Walker, 1853)
**repleta* (Walker, 1853)
novaeboracensis (Fitch, 1855)
tabida (Fitch,1855)
medialis (Banks, 1903)
__sanandensis__ (Ghosh, 1976)
*__satilota__ (Banks, 1910)
__savioi__ (Navás, 1933) **comb. n.**
__shansiensis__ (Kuwayama, 1962) **comb. n.**
*__socia__ (Navás, 1936) **comb. n.**
__suzukii__ (Okamoto, 1919)
__triactinata__ (New, 1980) **comb. n.**
*__zastrowi__ (Esben-Petersen, 1928)

Genus __CHRYSOPIDIA__ Navás, 1910
Subgenus __ANACHRYSA__ Hölzel, 1973
*__elegans__ Hölzel, 1973
__erato__ Hölzel, 1973
Subgenus __CHRYSOPIDIA__ Navás, 1910
__fuscata__ Navás, 1914
*__ignobilis__ (Walker, 1860) **comb. n.**
__jiriana__ Hölzel, 1973
__jocasta__ Hölzel, 1973
__junbesiana__ Hölzel, 1973
*__nigrata__ Navás, 1910
__numerosa__ Navás, 1914
__regulata__ Navás, 1914
__remanei__ Hölzel, 1973
Subgenus __CHRYSOTROPIA__ Navás, 1911 **stat. n.**
*__ciliata__ (Wesmael, 1841) **comb. n.**

alba auctorum nec L., 1767
kusnezovi (Navás, 1911)
lacroixi (Navás, 1911)
japonica (Nakahara, 1915)
linensis (Navás, 1916)
absona (Navás, 1916)
melaneura (Navás, 1916)
****obliquata*** (Banks, 1931) **comb. n.**
****orientalis*** (Hölzel, 1973) **comb. n.**

Genus ***CHRYSOPODES*** Navás, 1913
Orlandisa Navás, 1914
Ancylochrysa Navás, 1928
Subgenus ***CHRYSOPODES*** Navás, 1913
albopalpis (Banks, 1910)
breviata Adams & Penny, 1987
****circumfusa*** (Burmeister, 1839) **comb. n.**
burmeisteri (Navás, 1929)
conisetosa Adams & Penny, 1987
costalis (Schneider, 1851)
diffusa (Navás, 1927)
duckei Adams & Penny, 1987
gonzalezi (Navás, 1913)
indentata Adams & Penny, 1987
inornata (Banks, 1910)
****jubilosa*** (Navás, 1914)
laeva (Navás, 1910)
****limbata*** (Navás, 1926)
lineafrons Adams & Penny, 1987
mediocris Adams & Penny, 1987
nebulosa Adams & Penny, 1987
nevermanni (Navás, 1928)
polygonica Adams & Penny, 1987
****pulchella*** (Banks, 1910)
**geayi* (Navás, 1910)
**canudasi* Navás, 1913
spinella Adams & Penny, 1987
tetifera Adams & Penny, 1987
Subgenus ***NEOSUARIUS*** Adams & Penny, 1987
****collaris*** (Schneider, 1851)
**thoracica* (Walker, 1853)
krugii (Kolbe, 1888)
signatalis (Banks, 1911)
rufolinea (Banks, 1914)
acolhua (Banks, 1949)
****divisa*** (Walker, 1853)
**transversa* (Walker, 1853)
**nobregana* (Navás, 1913)
hesperina (Banks, 1915)
**agatha* (Navás, 1925)
debilis (Navás, 1926)
**uruguaya* (Navás, 1927)
oglobini (Navás, 1931)
****escomeli*** (Navás, 1922)
****figuralis*** (Banks, 1915) **comb. n.**
**verticalis* (Navás, 1929)
****flavescens*** (Blanchard, 1851)
****jaffuelina*** (Navás, 1918) **comb. n.**
****nigripilosa*** (Banks, 1924) **comb. n.**
****nosina*** (Navás, 1913) **comb. n.**
****porterina*** (Navás, 1910)
****poujadei*** (Navás, 1910) **comb. n.**
****tristella*** (Navás, 1920) **comb. n.**

Genus ***CUNCTOCHRYSA*** Hölzel, 1970
****albolineata*** (Killington, 1935)
replacement name for *tenella* (Schneider, 1851)
****baetica*** (Hölzel, 1972)
kannemeyeri (Esben-Petersen, 1920) **comb. n.**
ignobilis (Navás, 1921)
tarsalis (Navás, 1927)
**instabilis* (Navás, 1934)
****opipara*** (Hölzel, 1973) **comb. n.**

Genus ***EREMOCHRYSA*** Banks, 1903
Lolochrysa Banks, 1950 **syn. n.**
Subgenus ***CHRYSOPIELLA*** Banks, 1911 **stat. n.**
****brevisetosa*** Adams & Garland, 1981
****minora*** Banks, 1935
****pallida*** Banks, 1911
****sabulosa*** (Banks, 1897)
Subgenus ***EREMOCHRYSA*** Banks, 1903
****altilis*** Banks, 1950
california Banks, 1906
canadensis (Banks, 1911)
****digueti*** Navás, 1911
fraterna (Banks, 1897)
****hageni*** Banks, 1903
israeli Alayo, 1968
****pima*** Banks, 1950
****pumilis*** Banks, 1950
****punctinervis*** (McLachlan, 1869)
****rufifrons*** Banks, 1950
rufina Banks, 1956
****spilota*** Banks, 1950
****tibialis*** Banks, 1950
****yosemite*** Banks, 1950

Genus ***GLENOCHRYSA*** Esben-Petersen, 1920
****conradina*** (Navás, 1910)
****franzeni*** Kimmins, 1952
gloriosa (Navás, 1931) **comb. n.**
****hopkinsi*** (Esben-Petersen, 1928) **comb. n.**
irregularis (Banks, 1910)
marmorata (Needham, 1909)
nimbosa (Banks, 1918)
****opposita*** (McLachlan, 1863)
****principissa*** (Navás, 1915)
regularis (Banks, 1910)
****splendida splendida*** (Weele, 1909) **comb. n.**
**faceta* (Navás, 1912)
splendida lucasseni (Weele, 1909) **comb. n.**
splendida timorensis (Weele, 1909) **comb. n.**
tillyardi New, 1980

typica Esben-Petersen, 1920
zeylanica (Banks, 1913)

Genus ***HIMALOCHRYSA*** Hölzel, 1973
Nepalochrysa Hölzel, 1973 **syn. n.**
bhandarensis (Hölzel, 1973)
modesta Hölzel, 1973

Genus ***KOSTKA*** Navás, 1913
nacaratus Navás, 1913

Genus ***MALLADA*** Navás, 1925
Anisochrysa Nakahara, 1955
Triadochrysa Adams, 1978 **syn. n.**
adamsi (New, 1980) **comb. n.**
alarconi (Navás, 1915)
alcestes (Banks, 1911)
esakii (Esben-Petersen, 1926)
alcines (Banks, 1940) **comb. n.**
alluaudi (Navás, 1930) **comb. n.**
alticola (Banks, 1931) **comb. n.**
amseli (Hölzel, 1980)
ariadne (Hölzel, 1978)
astur (Banks, 1937)
atomalis (Navás, 1933) **comb. n.**
atrosparsa (Tjeder, 1966)
baronissa (Navás, 1921)
basalis (Walker, 1853)
microphya (McLachlan, 1883)
jolyana (Navás, 1910)
latotalis (Banks, 1910)
olatatis (Banks, 1910)
formosana (Esben-Petersen, 1913)
tagalica (Banks, 1914)
skottsbergi (Esben-Petersen, 1924)
stigmatus Navás, 1924
delmasi (Navás, 1927)
delmasinus Navás, 1935
paradoxa (Nakahara, 1955)
bertrani (Navás, 1931) **comb. n.**
boninensis (Okamoto, 1914)
rutila (Esben-Petersen, 1927)
obliqua (Navás, 1929)
burgeonina (Navás, 1936)
caesa (Navás, 1929) **comb. n.**
chailensis (Ghosh, 1977)
chlorella (Navás, 1915) **comb. n.**
chloris (Schneider, 1851)
clathrata (Schneider, 1845)
neglectus (Costa, 1855)
nympha (Navás, 1910)
riveti (Navás, 1923)
cypria (Navás, 1932)
cognatella (Okamoto, 1914)
nakaharai (Navás, 1915)
hoffmanni (Esben-Petersen, 1916)
collartina (Navás, 1932) **comb. n.**
crassoneura (Weele, 1909) **comb. n.**
darwini (Banks, 1940) **comb. n.**
decolor (Navás, 1913) **comb. n.**
derbendica (Hölzel, 1967)
desjardinsi (Navás, 1911) **comb. n.**
dierli (Hölzel, 1973)
dispar (Kimmins, 1952)
dubia (Hölzel, 1973)
duplicata (Navás, 1934) **comb. n.**
eurycista (Navás, 1914) **comb. n.**
eurydera (Navás, 1910) **comb. n.**
flaveola (Schneider, 1851) **comb. n.**
flavifrons (Brauer, 1851)
clathrata (Pictet, 1865)
lineolata (McLachlan, 1880)
luteola (Navás, 1901)
narcissina (Navás, 1910)
gallica (Lacroix, 1914)
irenaea (Navás, 1915)
fiorina (Navás, 1926)
cyprina (Navás, 1932)
flavostigma (Esben-Petersen, 1927) **comb. n.**
formosana (Matsumura, 1911)
sauteri (Esben-Petersen, 1913)
yamamurae (Nakahara, 1915)
babai (Kuwayama, 1962)
fortunata (McLachlan, 1882)
genei (Rambur, 1842)
granadensis (Pictet, 1865)
clathrata (Pictet, 1865)
escudera (Navás, 1908)
gunvorae (Tjeder, 1966)
hamata (Tjeder, 1966)
handschini (Navás, 1929)
collarti (Navás, 1931)
herasina (Navás, 1929) **comb. n.**
iberica (Navás, 1903)
incerta (Navás, 1936) **comb. n.**
inclinata (Navás, 1934) **comb. n.**
incrassata (Tjeder, 1966)
ingae (Tjeder, 1966)
ignita (Navás, 1910) **comb. n.**
illota (Navás, 1908) **comb. n.**
incongrua (Fraser, 1951) **comb. n.**
innotata (Walker, 1853) **comb. n.**
assimilata (Navás, 1934)
inornata (Navás, 1901)
craspedia (Navás, 1915)
infecta (Lacroix, 1915)
caverina (Navás, 1933)
joannisi (Navás, 1910) **comb. n.**
liberata (Navás, 1935)
khandalensis (Navás, 1931) **comb. n.**
khandalina (Navás, 1931) **comb. n.**
kibonotoensis (Weele, 1910)
kinnaurensis (Ghosh, 1977)
lavata (Navás, 1914) **comb. n.**
luaboensis (Tjeder, 1966)

*__luctuosa__ (Banks, 1911)
__macleodi__ Adams & Garland, 1982
*__maculithorax__ (Kimmins, 1936) **comb. n.**
*__madestes__ (Banks, 1911) **comb. n.**
__maghrebinus__ Hölzel & Ohm, 1984
*__makrana__ (Hölzel, 1966)
*__melanopis__ (Navás, 1913) **comb. n.**
__mira__ (Hölzel, 1973)
__morota__ (Banks, 1915) **comb. n.**
unicolor (Navás, 1918)
herasi (Navás, 1923)
*__murreensis__ (Tjeder, 1963)
*__nea__ (Navás, 1912) **comb. n.**
*__neglecta__ (Banks, 1931) **comb. n.**
__nepalica__ (Hölzel, 1973)
*__nesophila__ (Navás, 1920) **comb. n.**
oceanica (Navás, 1914)
buxtoni (Esben-Petersen, 1928)
*__nigra__ (McLachlan, 1869) **comb. n.**
*__notalis__ (Navás, 1914) **comb. n.**
*__noumeana__ (Navás, 1910) **comb. n.**
__nuristana__ (Hölzel, 1982)
*__nyassalandica__ (Navás, 1914)
*__oblonga__ (Hölzel, 1973)
*__obvia__ (Hölzel, 1973)
__opima__ (Hölzel, 1973)
__parabola__ (Okamoto, 1919)
*__perfecta__ (Banks, 1895)
cockerelli (Banks, 1903)
injusta (Banks, 1906)
marginalis (Banks, 1906)
__perpallida__ (Tjeder, 1966)
__personata__ (Navás, 1934) **comb. n.**
__pervenosa__ (Tjeder, 1966)
__phlebia__ (Navás, 1927)
*__pictella__ (Navás, 1933) **comb. n.**
*__picteti__ (McLachlan, 1880)
thoracica (Pictet, 1865)
*__polyneura__ (Navás, 1940) **comb. n.**
*__prasina__ (Burmeister, 1839)
aspersa (Wesmael, 1841)
abdominepunctata (Brauer, 1850)
coerulea (Brauer, 1850)
ramburii (Costa, 1855)
abdominalis (Brauer, 1856)
mariana (Navás, 1905)
sachalinensis (Matsumura, 1911)
**burri* (Navás, 1914)
caucasica (Navás, 1914)
nikkoensis (Okamoto, 1914)
**vernalis* (Navás, 1926)
*__pulchrina__ (Tjeder, 1966)
*__punctilabris__ (McLachlan, 1894) **comb. n.**
*__rocasolanoi__ (Navás, 1929) **comb. n.**
*__sanvitoresi__ (Navás, 1913) **comb. n.**
__scolius__ Navás, 1928
__sensitiva__ (Tjeder, 1939)
*__serrandi__ (Navás, 1921) **comb. n.**
*__sierra__ (Banks, 1924)
*__signata__ (Schneider, 1851) **comb. n.**
alcatoa (Banks, 1943)
*__sjoestedti__ (Weele, 1910)
nubilata (Navás, 1910)
inopina (Navás, 1914)
burgeoni (Navás, 1929)
__spissinervis__ (Tjeder, 1966)
*__subcostalis__ (McLachlan, 1882)
*__subcubitalis__ (Navás, 1901)
__subflavifrons__ (Tjeder, 1949)
*__sumatrensis__ (Esben-Petersen, 1926) **comb. n.**
*__sybaritica__ (McLachlan, 1875)
*__tacta__ (Navás, 1921)
horcheri (Esben-Petersen, 1928)
__teiresias__ (Hölzel & Ohm, 1982)
*__tosta__ (Navás, 1932) **comb. n.**
__traviata__ (Banks, 1940) **comb. n.**
__triangularis__ Adams, 1978
*__tripunctata__ (McLachlan, 1867)
*__tropica__ (Hagen, 1858) **comb. n.**
*__varians__ (Kimmins, 1959) **comb. n.**
__vartianorum__ (Hölzel, 1973)
*__venosa__ (Rambur, 1842)
reticulata (Steinmann, 1965)
__venosella__ (Esben-Petersen, 1920)
distracta (Navás, 1934)
*__ventralis__ (Curtis, 1834)
aspersa (Schneider, 1851)
*__venusta__ (Hölzel, 1974)
*__zelleri__ (Schneider, 1851)
soumainae (Lacroix, 1915)
benedictae (Séméria, 1976)

Genus __MELEOMA__ Fitch, 1855
*__adamsi__ Tauber, 1969
__antennensis__ Tauber, 1969
__arizonensis__ (Banks, 1903)
__beardi__ Tauber, 1969
__carapana__ Adams, 1969
__colhuaca__ Banks, 1949
*__dolicharthra__ (Navás, 1913)
cavifrons Banks, 1950
*__emuncta__ (Fitch, 1855)
slossonae Banks, 1896
verticalis Banks, 1908
comata Banks, 1950
__festivata__ Adams, 1969
__furcata__ (Banks, 1911)
delicata Banks, 1950
__hageni__ Banks, 1949
__innovata__ (Hagen, 1861)
__kennethi__ Tauber, 1969
*__macleodi__ Tauber, 1969
__mexicana__ Banks, 1899
__nahoa__ (Banks, 1949)

pallida Banks, 1908
****pinalena*** (Banks, 1958)
pipai Tauber, 1969
****poolei*** Adams, 1969
powelli Tauber, 1969
****rubricosa*** (Navás, 1913) **comb. n.**
****schwarzi*** (Banks, 1903)
****signoretii*** (Fitch, 1855)
tezcucana (Banks, 1949)
****titschacki*** Navás, 1928

Genus ***NINETA*** Navás, 1912
Parachrysa Nakahara, 1915
afghanica Hölzel, 1982
alpicola (Kuwayama, 1956)
carinthiaca (Hölzel, 1965)
****dolichoptera*** (Navás, 1910)
****flava*** (Scopoli, 1763)
subfalcata (Stephens, 1836)
****grandis*** Navás, 1915
gravida (Banks, 1911)
****guadarramensis guadarramensis*** (Pictet, 1865)
alvesi (Navás, 1917)
guadarramensis principiae (Monserrat, 1980)
inpunctata (Reuter, 1894)
impunctata (Klingstedt, 1935)
reuteri (Tjeder, 1967)
nanina (Banks, 1911)
****pallida*** (Schneider, 1845)
pomacea (Zakharneko, 1983)
****vittata*** (Wesmael, 1841)
proximus (Rambur, 1842)
integra (Hagen, 1852)
olivacea (Gerstaecker, 1894)
inornata (Matsumura, 1911)
inornatella (Nakahara, 1914)
matsumurana (Navás, 1915)

Genus ***PARACHRYSOPIELLA*** **gen. n.**
argentina (Banks, 1910) **comb. n.**

Genus ***PEYERIMHOFFINA*** Lacroix, 1920
Tjederina Hölzel, 1970 **syn. n.**
****gracilis*** (Schneider, 1851) **comb. n.**
stenoptila (Schneider, 1851)
tricolor (Brauer, 1856)
pudica Lacroix, 1920

Genus ***PLESIOCHRYSA*** Adams, 1982 **stat. n.**
****armstrongi*** (Esben-Petersen, 1928) **comb. n.**
****atalotis*** (Banks, 1910) **comb. n.**
****brasiliensis*** (Schneider, 1851)
**cubana* (Navás, 1921)
antillana (Navás, 1924)
bouvieri (Navás, 1924)
**rata* (Lacroix, 1926)
uribei (Navás, 1927)
scalaris (Navás, 1929)
yucatanensis (Navás, 1929)
cajencis (Navás, 1930)
divergens (Navás, 1931)
****dussumieri*** (Navás, 1912) **comb. n.**
****elongata*** (Navás, 1913)
**augusta* (Navás, 1913)
mariae (Lacroix, 1919)
submarginata (Banks, 1918)
josephina (Navás, 1930)
****gilola*** (Navás, 1914) **comb. n.**
****impunctata*** (Navás, 1914) **comb. n.**
****invaria*** (Walker, 1853) **comb. n.**
****lacciperda*** (Kimmins, 1956) **comb. n.**
****litorosa*** (Navás, 1911) **comb. n.**
****oceanica*** (Walker, 1853)
v-rubrum (Brauer, 1865)
marcheana (Navás, 1910)
ogasawarensis (Okamoto, 1914)
paessleri (Navás, 1928)
****paraguaria*** (Navás, 1920) **comb. n.**
****peterseni*** (Banks, 1924) **comb. n.**
****ramburi*** (Schneider, 1851)
affinis (Rambur, 1842)
vicina (Kempny, 1904)
jaluitana (Kempny, 1904)
neutra (Navás, 1910)
**notosticta* (Navás, 1913)
**deutera* (Navás, 1913)
**reaumuri* (Navás, 1914)
**controversa* (Lacroix, 1920)
****remota*** (Walker, 1853) **comb. n.**
rubida (Navás, 1929) **comb. n.**
ruficeps ruficeps (McLachlan, 1875) **comb. n.**
procubitalis (Navás, 1912)
****ruficeps fervida*** (Gerstaecker, 1893) **comb. n.**
****scotti*** (Esben-Petersen, 1927) **comb. n.**
****seurati*** (Navás, 1922) **comb. n.**
****tahitensis*** (Navás, 1913) **comb. n.**
****tetrasticta*** (Navás, 1913) **comb. n.**
hieronyma (Navás, 1917)

Genus ***REXA*** Navás, 1920
Eurochrysa Esben-Petersen, 1925
corsica (Hagen, 1864)
****lordina*** Navás, 1920
almerai (Navás, 1920)
**jordani* (Navás, 1929)
corsicana (Hölzel, 1965)
****raddai*** (Hölzel, 1966)

Genus ***SUARIUS*** Navás, 1914
Vasquezius Navás, 1914
Prochrysopa Tjeder, 1936 **syn. n.**
afghana (Hölzel, 1967)
****alisteri*** (Navás, 1914)
**puparia* (Navás, 1914)
****caviceps*** (McLachlan, 1898)
fedtschenkoi (McLachlan, 1875)

*__gobiensis__ (Tjeder, 1937)
kaszabi (Steinmann, 1968)
__iberiensis__ Hölzel, 1974
__iranensis__ Hölzel, 1974
*__lucasi__ (Navás, 1910)
**luchi* (Navás, 1913)
pilosella (Navás, 1916)
__maroccanus__ Hölzel, 1965
__mongolica__ (Tjeder, 1937)
gobica (Steinmann, 1965)
*__nanus__ (McLachlan, 1893)
pretiosa (Gerstaecker, 1894)
nymphula (Navás, 1910)
nymphulina (Navás, 1915)
**egena* (Navás, 1940)
*__nanchanica__ (Navás, 1927) **comb. n.**
__paghmana__ (Hölzel, 1967)
mongolica (Steinmann, 1968)
__pallidus__ Hölzel, 1978
__ressli__ Hölzel, 1974
__storeyi__ (Navás, 1926) **comb. n.**
*__tigridis__ (Morton, 1921)
__vanensis__ (Hölzel, 1967)
__vartianae__ (Hölzel, 1967)
*__walsinghami walsinghami__ Navás, 1914
*__walsinghami orientalis__ Hölzel, 1978
__yasumatsui__ (Kuwayama, 1962) **comb. n.**

Genus __TUMEOCHRYSA__ Needham, 1909
Chrysoplecta Navás, 1910
*__caesarea__ Hölzel, 1973
__cirerai__ (Navás, 1930)
__immaculata__ (Navás, 1910)
*__indica__ Needham, 1909
__issikii__ (Kuwayama, 1961) **comb. n.**
*__magnifica__ Hölzel, 1973
*__praeclara__ Hölzel, 1973

Genus __UNGLA__ Navás, 1914 **stat. n.**
*__argentina__ (Navás, 1911) **comb. n.**
annulata Navás, 1914
*__binaria__ (Navás, 1923) **comb. n.**
__confraterna__ (Banks, 1913) **comb. n.**
__nesotala__ (Banks, 1944) **comb. n.**

Genus __YUMACHRYSA__ Banks, 1950 **stat. n.**
*__apache__ (Banks, 1938)
__clarivena__ (Banks, 1950)
__yuma__ (Banks, 1950)

Tribe **LEUCOCHRYSINI** Adams, 1978

Genus __BERCHMANSUS__ Navás, 1913
*__adumbratus__ Navás, 1913
__cinctipes__ (Banks, 1915)
*__elegans__ (Guerin, 1844)

Genus __CACARULLA__ Navás, 1910
*__maculipennis__ (Banks, 1910)

Genus __GONZAGA__ Navás, 1913
__amabilis__ Navás, 1932
*__calliptera__ Banks, 1944
*__nigriceps__ (McLachlan, 1867) **comb. n.**
__notatus__ Navás, 1929
__palliatus__ Navás, 1929
__soroana__ Alayo, 1968
*__torquatus__ Navás, 1913

Genus __LEUCOCHRYSA__ McLachlan, 1868
Protochrysopa Kolbe, 1888
Allochrysa Banks, 1903
Subgenus __LEUCOCHRYSA__ McLachlan, 1868
*__ampla__ (Walker, 1853) **comb. n.**
__annulata__ (MacGillivray, 1894)
__arizonica__ (Banks, 1906)
__bedoci__ Navás, 1923
*__benoisti__ Navás, 1933
*__benoistina__ Navás, 1934
__bolivari__ Banks, 1944
__boliviana__ (Banks, 1915)
__boxi__ Navás, 1930
__brasilica__ (Navás, 1913)
__callota__ Banks, 1915
__christophei__ Banks, 1938
*__clara__ (McLachlan, 1867)
**scioptera* (Navás, 1913)
*__colombia__ (Banks, 1910)
claverina Navás, 1927
californica Navás, 1928
__cordillera__ (Banks, 1910)
*__dolichocera__ (Navás, 1913)
__duarte__ Banks, 1945
__ehrhardti__ Navás, 1929
*__erminea__ Banks, 1945
__geminata__ Navás, 1913
__haitiensis__ Smith, 1931
*__ignatii__ Navás, 1923
__insularis__ (Walker, 1853)
virginica (Fitch, 1855)
phantasma (MacGillivray, 1894)
cerverai Navás, 1924
__lestagei__ Navás, 1922
*__longicornis__ (Gray, 1832)
__loretana__ Navás, 1935
*__magnifica__ (Banks, 1920)
__navasi__ Banks, 1941
antennata Navás, 1921
*__negata__ (Navás, 1913)
**singularis* Navás, 1913
__nigrilabris__ (Banks, 1915)
*__notha__ Navás, 1913
*__pretiosa__ (Banks, 1910)
**angrandi* (Navás, 1911)
**variata* (Navás, 1913)
delicata Navás, 1925

reedi Navás, 1919
****risi*** Esben-Petersen, 1933
****riveti*** (Navás, 1913)
serrula Adams, 1979
tavaresi Navás, 1916
****varia*** (Schneider, 1851)
vegana Navás, 1917
**phaeocephala* Navás, 1929
****vigoi*** (Navás, 1913)
****vulnerata*** (Navás, 1913)
walkerina Navás, 1913
**internata* (Walker, 1853)
Subgenus ***NODITA*** Navás, 1916 **stat. n.**
Lachlanita Navás, 1929 **syn. n.**
aleura Banks, 1944
alloneura Banks, 1945
****alternata*** (Navás, 1913)
****amazonica*** (Navás, 1913)
americana (Banks, 1897)
anchietai Navás, 1922
antennalis Navás, 1932
antennata (Banks, 1906)
****antica*** (Navás, 1913)
****apicalis*** (Banks, 1915) **comb. n.**
apicata Navás, 1926
****askanes*** Banks, 1946
australis Navás, 1917 [nomen nudum]
azevedoi (Navás, 1913)
****camposi*** Navás, 1933
****caucella*** (Banks, 1910)
****centralis*** (Navás, 1913)
ceratica (Navás, 1911)
****cerverai*** Navás, 1914
****championi*** (Navás, 1914)
citri (Ashmead, 1880)
clepsydra (Banks, 1918)
clystera (Banks, 1918)
compar (Navás, 1921)
loyolana Navás, 1925
cornesta Banks, 1944
****cortesi*** (Navás, 1913)
calverti (Banks, 1914)
cruentata (Schneider, 1851)
****deminuta*** (Lacroix, 1926) **comb. n.**
diasi Navás, 1922
dimidia Navás, 1925
****diversa*** (Walker, 1853) **comb. n.**
****egregia*** (Navás, 1913)
eubule Banks, 1944
****euterpe*** Banks, 1944
explorata (Hagen, 1861)
firmini Navás, 1924
firmini (Navás, 1927) [Homonym]
****floridana*** (Banks, 1897)
****fuscinervis*** (Navás, 1914)
garridoi Alayo, 1968
gemina Navás, 1929
gloriosa (Banks, 1910)
****gossei*** (Kimmins, 1940) **comb. n.**
replacement name for *conformis* (Walker, 1853)
****grisoli*** (Navás, 1912) **comb. n.**
heriocles Banks, 1944
horni Navás, 1932
****hybrida*** (Rambur, 1842) **comb. n.**
indiga Navás, 1928
inquinata (Gerstaecker, 1888)
****intermedia*** (Schneider, 1851)
****intermedia*** (Walker, 1853) **comb. n.** [Homonym]
israeli Alayo, 1968
kotzbaueri Navás, 1926
laertes Banks, 1945
****lafoni*** (Navás, 1911) **comb. n.**
****lancala*** Banks, 1944
****lateralis*** (Navás, 1913)
lenora Banks, 1944
longistigma Navás, 1930
****luctuosa*** (Banks, 1914)
maculata Navás, 1928
mainerina (Navás, 1929) **comb. n.**
marginalis (Banks, 1915)
****maronica*** (Navás, 1915)
marquezi (Navás, 1913)
melanocera Navás, 1916
meridana Navás, 1927
meteorica (Gerstaecker, 1893)
mexicana (Banks, 1900)
minima (Banks, 1918)
montanola (Banks, 1910)
****morenoi*** Navás, 1934
****morrisoni*** (Navás, 1914) **comb. n.**
****mortoni*** (Lacroix, 1926) **comb. n.**
****nativa*** (Navás, 1911) **comb. n.**
****navasi*** Kimmins, 1940
replacement name for *alternata* (Navás, 1914)
****nesites*** (Navás, 1913)
neuralis (Banks, 1910)
nevermanni Navás, 1928
nictheroyana Navás, 1926
nigrinervis Banks, 1939
****nigrovaria*** (Walker, 1853)
notulata Navás, 1924
oenops Adams, 1987
orthones Banks, 1945
pacifica Navás, 1928
****pallescens*** Banks, 1946
****palliceps*** (McLachlan, 1867)
panama Banks, 1945
paraquaria Navás, 1929
****pavida*** (Hagen, 1861)
platyptera (Gerstaecker, 1888)
****postica*** (Navás, 1913)
punctata (Banks, 1903)

radiosa (Gerstaecker, 1888)
ramosa Navás, 1917
ramosi Navás, 1916
rochana Navás, 1922
rodriguezi (Navás, 1913)
rufescens Navás, 1931
salleana (Navás, 1911)
senior Navás, 1935
****scurra*** (Lacroix, 1926) **comb. n.**
****serrei*** Navás, 1924
stichocera (Navás, 1908)
submacula (Banks, 1915)
****sulcata*** (Navás, 1921)
****superior*** (Navás, 1913)
surinamensis Banks, 1944
tarini Navás, 1924
texana Banks, 1939
theodori Navás, 1932
theodorina Navás, 1935
vegana Navás, 1925
vieirana (Navás, 1913)
vinesi Navás, 1924
ypirangana Navás, 1932
****zapotina*** (Navás, 1913)
zayasi Alayo, 1968

Genus ***NEULA*** Navás, 1917
mesana Navás, 1917

Genus ***NUVOL*** Navás, 1916
****umbrosus*** Navás, 1916

Genus ***VIEIRA*** Navás, 1913
iridea (Olivier, 1792) **comb. n.**
****leschenaulti*** (Navás, 1911)

Subfamily **NOTHOCHRYSINAE** Navás, 1910

Dictyochrysinae Esben-Petersen, 1918

Genus ***DICTYOCHRYSA*** Esben-Petersen, 1917
****fulva*** Esben-Petersen, 1917
****latifascia*** Kimmins, 1952
****peterseni*** Kimmins, 1953

Genus ***HYPOCHRYSA*** Hagen, 1866
Hypochrysodes Leraut, 1980
****elegans*** (Burmeister, 1839)
nobilis (Schneider, 1851)
pernobilis Tjeder, 1967
viridula Adams, 1978

Genus ***KIMOCHRYSA*** Tjeder, 1966
****africana*** (Kimmins, 1937)
****impar*** Tjeder, 1966
raphidioides Tjeder, 1966

Genus ***NOTHOCHRYSA*** McLachlan, 1868
Nathanica Navás, 1913
californica Banks, 1892
****capitata*** (Fabricius, 1793)
****fulviceps*** (Stephens, 1836)
erythrocephalus (Rambur, 1842)

Genus ***PAMOCHRYSA*** Tjeder, 1966
****stellata*** Tjeder, 1966

Genus ***PIMACHRYSA*** Adams, 1956
****albicostales*** Adams, 1967
****fusca*** Adams, 1967
grata Adams, 1956
****intermedia*** Adams, 1967
****nigra*** Adams, 1967

Genus ***TRIPLOCHRYSA*** Kimmins, 1952
kimminsi New, 1980
****pallida*** Kimmins, 1952

Genus '*CHRYSOPA*' *incertae sedis*

Many species of Chrysopidae were originally described in *Chrysopa* when that genus was ill-defined and much broader in scope than it is now. Although some of those species have now been placed correctly in other genera, a large number still remain *incertae sedis*. These 239 species are listed below; where possible we have indicated the genus in which the species may eventually prove to belong.

aculeata Tjeder, 1966
acuta Hoffmansegg, 1805
adnexa Navás, 1929
adnixa Esben-Petersen, 1913 (? *Mallada*)
adonis Banks, 1937
aegyptiaca Navás, 1915 (? *Mallada*)
alethes Banks, 1940
alobana Banks, 1944
****amabilis*** Banks, 1938 (? *Apertochrysa*)
annotaria Banks, 1945
annularis Navás, 1921
anomala (Navás, 1929)
****antennalis*** Navás, 1915 (? *Mallada*)
apurina Navás, 1935
argyrea Navás, 1915
atala Brauer, 1865
atrioris Banks, 1920
****aurea*** Kimmins, 1951
aztecana Banks, 1903
azygota Banks, 1915
bandrensis (Navás, 1929)
bandrina Navás, 1935
barberina Navás, 1932
barbouri Navás, 1924
basuto Tjeder, 1966 (? *Mallada*)
batesi Banks, 1946
beccarii Navás, 1929

behni Benthin, 1875 (? *Nothochrysa*)
benaventi (Navás, 1930)
bermudezi Navás, 1927
[***bimaculata*** Hagen, 1864 nomen nudum]
bineura Navás, 1936
bipunctata Burmeister, 1839
birungana Navás, 1924 (? *Mallada*)
bolivarensis Navás, 1929
bolivari Banks, 1913
bonnini Lacroix, 1919
brevicollis (Rambur, 1842)
brevihirta Banks, 1946
bruchi Navás, 1914
buhleri Handschin, 1936
bulbosa (Navás, 1926)
bullocki Navás, 1933
caffer Tjeder, 1966 (? *Mallada*)
camposana Navás, 1935
canaria Navás, 1915 (? *Mallada*)
cantonensis Navás, 1931
caprae (Navás, 1929)
castalia Banks, 1949
cephalica Navás, 1936
chacranella Banks, 1915 (? *Ungla*)
chemoensis (Navás, 1936) (? *Chrysopa* s.str.)
chusanina Navás, 1933
climacia Navás, 1935
comitissa (Navás, 1914)
concinna Banks, 1944
conformis (Rambur, 1842)
congolana Navás, 1911
conspersa (Navás, 1929)
cornuta Navás, 1926
ricana Navás, 1929
ceratodes Navás, 1932
coronata Navás, 1930
cufrina Navás, 1932 (? *Suarius*)
cymantis Banks, 1944
cymbele Banks, 1933
dahli Navás, 1925 (? *Plesiochrysa*)
****dampfina*** Navás, 1928 (? *Ungla*)
dancalia Navás, 1931 (? *Chrysoperla*)
darlingtoni Banks, 1938
decarlina Navás, 1924
decaryna Navás, 1924
decolor (Navás, 1936)
derota Banks, 1937
deserta Navás, 1912 (? *Mallada*)
devia McLachlan, 1887
dichroa Navás, 1923
diploa Navás, 1935 (? *Mallada*)
distracta Navás, 1930
durandi Lacroix, 1925 (? *Chrysoperla*)
emiliae Lacroix, 1919
estradai Navás, 1924
eudora Banks, 1937
everina Banks, 1946
excelsior Banks, 1937
exterior Navás, 1925
externa Navás, 1924
cubensis Navás, 1927
extranea Navás, 1923
facialis Navás, 1927
fascialis Banks, 1906
favrei Navás, 1935
feana (Navás, 1929)
festana Navás, 1932
filosa (Fabricius, 1787)
fischerina Navás, 1933
fratercula Banks, 1940
frequens Esben-Petersen, 1913 (? *Mallada*)
gasteria Navás, 1917
gestroi Navás, 1929
geyri Esben-Petersen, 1915 (? *Brinckochrysa*)
gialina Navás, 1932 (? *Suarius*)
grandis Navás, 1933 (? *Austrochrysa*)
gratiosa Navás, 1933 (? *Chrysopa* s.str.)
gravesi Navás, 1926 (? *Mallada*)
grazianii Navás, 1932 (? *Chrysoperla*)
guineensis Navás, 1929
hansensis Navás, 1929
healdi Navás, 1926 (? *Mallada*)
hestia Banks, 1918
heudei Navás, 1934
huasanensis Navás, 1915
ifranina Navás, 1936 (? *Mallada*)
ilota Banks, 1915 (? *Chrysoperla*)
inaequata Navás, 1935
incerta Banks, 1895 (? *Ceraeochrysa*)
incisa Banks, 1949
incompleta Banks, 1911
inconspicua Navás, 1914 (? *Mallada*)
****iniqua*** Navás, 1931 (? *Mallada*)
intemerata Navás, 1934
irrorella Navás, 1935 (? *Mallada*)
isolata Banks, 1913
jacobsoni Weele, 1909 (? *Apertochrysa*)
javanica Esben-Petersen, 1913 (? *Mallada*)
julia Navás, 1927
karakurti Rossikova, 1904
kiangsuensis Navás, 1934
kulingensis (Navás, 1936)
lagunensis Navás, 1920 (? *Mallada*)
lambda Navás, 1933
laminaris Navás, 1917
lateralis (Guérin, 1844) (? *Ceraeochrysa*)
latithorax Banks, 1913
leptana Banks, 1914
libera Navás, 1928 (? *Chrysoperla*)
lojensis Navás, 1929
lorenzana Navás, 1913
loretensis (Navás, 1931)
loriae Navás, 1929
luederwaldti Navás, 1923

lurida (Navás, 1930)
lybica Navás, 1914 (? *Mallada*)
mainerii Navás, 1929
malayana Esben-Petersen, 1926
marchionissa Navás, 1915
marcida Banks, 1937
margaritina (de Beauvois, 1809)
mendocensis Navás, 1918
menetriesi Hagen, 1861
meriani Navás, 1925 (? *Plesiochrysa*)
mesonotalis Esben-Petersen, 1926 (? *Chrysocerca*)
metanotalis Navás, 1924
mexicana Banks, 1901
meyeri Handschin, 1936
mimeuri Navás, 1936
mindanensis Banks, 1937
mosconica Navás, 1931 (? *Mesochrysa*)
nadali Navás, 1913
naesonympha Brauer, 1865
navasi Lacroix, 1914
nicolaina Navás, 1929 (? *Brinckochrysa*)
nigripalpis Banks, 1910
notulata Banks, 1937
nymphodes Navás, 1914 (? *Suarius*)
obesa Navás, 1929
ochracea Albarda, 1881
ophthalmica Navás, 1913
oralis Navás, 1914
orestes Banks, 1911
orientalis Hagen, 1859 (? *Mallada*)
paolii Navás, 1928
parallela Navás, 1931
parishi Banks, 1913 (? *Ceraeochrysa*)
peruviana Navás, 1924
pieli (Navás, 1931)
pigmentata Handschin, 1935
plesia Navás, 1918
polonica Lurié, 1897
polyphlebia Navás, 1914
postica Navás, 1936
pucayensis Navás, 1929
puerula Navás, 1921
pullata Banks, 1944 (? *Ceraeochrysa*)
punctithorax New, 1980 (? *Apertochrysa*)
pusilla Schneider, 1851
pygmaea Navás, 1930 (? *Suarius*)
quadornia Banks, 1949
reboredina Navás, 1933
reedina Navás, 1919
reichardti Bianchi, 1931
robusta Banks, 1906 (? *Nineta*)
rossa Navás, 1924
rothschildi Navás, 1915
rotundata Navás, 1929 (? *Brinckochrysa*)
ruizi Navás, 1934
sajanina (Navás, 1928)
sanguinea (Navás, 1928)
sansibarica Kolbe, 1897 (? *Mallada*)
sarta Banks, 1914
satoruna Navás, 1922
scalai Navás, 1917
selenia Navás, 1912 (? *Mallada*)
senior (Navás, 1928)
sequens Banks, 1943 (? *Mallada*)
serrana Navás, 1927
siderocephala Navás, 1933
sillemi Esben-Petersen, 1935 (? *Chrysoperla*)
silvestrina Navás, 1929
simplex Navás, 1908
smitzi Navás, 1913 (? *Mallada*)
****sobria*** Navás, 1933 (? *Mallada*)
solaria Navás, 1930 (? *Chrysoperla*)
steinbachi Navás, 1925
sumatrensis (Navás, 1929) (? *Austrochrysa*)
tacorensis Navás, 1934
taikuensis Kuwayama, 1962 (? *Cunctochrysa*)
tenera Navás, 1924
[*ternata* Hagen, 1861 nomen nudum]
tetuanensis (Navás, 1934) (? *Chrysopa* s.str.)
thallina Navás, 1919
thieli Navás, 1929 (? *Plesiochrysa*)
thomasensis Navás, 1929
tibialis Banks, 1914 (? *Leucochrysa*)
torrei Navás, 1924
tortolana Banks, 1949
trifurcata Banks, 1949
tucumana Navás, 1919
valdezi Banks, 1924 (? *Signochrysa*)
****varicosa*** Navás, 1913
vegeta Navás, 1917
venulosa Navás, 1918 (? *Ungla*)
venulosa Navás, 1923
vilallongai Navás, 1940
replacement name for *villalongae* Navás, 1935
villica Navás, 1929
virgata Handschin, 1935
virgestes Banks, 1911
viridinervis Jakowleff, 1869
wagneri Esben-Petersen, 1932 (? *Chrysopa* s.str.)
yuanensis Navás, 1932
yuanica Navás, 1932
zina Navás, 1933
zulu Tjeder, 1966 (? *Mallada*)

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