# REVISION OF THE NOMINATE SUBGENUS CHALYBION DAHLBOM (HYMENOPTERA, SPHECIDAE) 

by<br>R. V. HENSEN<br>I. B. Bakkerlaan 69-III, 3582 VV Utrecht


#### Abstract

The subgenera and species-groups of the genus Chalybion Dahlbom are reviewed. Seven species-groups are recognized within the nominate subgenus, and two in the subgenus Hemichalybion Kohl. Their phylogeny is discussed, and a cladogram is added. The species of the nominate subgenus are revised. Fourty species are recognized, and three additional subspecies. Keys to the species and subspecies are provided. Thirteen new species are described: C. gracile, C. incisum, C. kenyae, C. lividum, C. magnum, C. mochii, C. parvulum, C. petroleum, C. polyphemus, C. ruficorne, C. tomentosum, C. triangulum and C. vechti, and one new subspecies: C. bocandei aeronitens. A new name, C. ammophiloides, is proposed for Ammophila cyanea Cameron. Lectotypes are selected for nine names. A neotype is designated for Pelopoeus flebilis Lepeletier.


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## Introduction

In this paper the species of the nominate subgenus Chalybion are treated, as formed by the exclusion of the subgenus Hemichalybion Kohl. Since the revision of Sceliphron s.l. by Kohl (1918), no major studies on a world scale have been published on Chalybion, though the group kept receiving attention of scientific workers, as testified by the many publications on regional faunas. Arnold (1928) and Leclercq (1955) worked on the Afrotropical fauna; the Western Palaearctic fauna was studied by De Beaumont in several publications; and the Nearctic species were revised by Bohart \& Menke (1963). In contrast to its sister-group,
the genus Sceliphron Klug, which yielded only one new species since Kohl's (1918) work. Chalybion was enriched several times. Moreover, examination of the collections of some of the more important museums revealed the existence of many undescribed species.

The present study was initiated by Dr J. van der Vecht many years ago, and is partly based on his personal notes on the literature, taxonomy, morphology and type-material in some museums visited by him.

Chalybion is a morphologically diverse genus, and this makes it a very rewarding task to establish species-groups on a phylogenetic basis. Kohl (1918) paid relatively little attention to characters reflecting infra-generic relationships. Bohart \& Menke (1963, 1976) gave valuable discussions, mentioning many important characters, and placing some species in groups. In the present study the species of Chalybion s.s. are placed in seven groups, and several previously unnoticed characters are used for this purpose.

A number of characters appeared to require a quantitative approach. These are expressed as the following indices:

FR (flagellar ratio). - Length of the first flagellomere, divided by the length of the second flagellomere.

OR (orbital ratio). - Shortest interocular width across the vertex, divided by the shortest interocular width across the clypeus.
CR (clypeal ratio). - Length of the clypeus, divided by the shortest interocular width across the clypeus.
HCR (hypostomal cavity ratio). - Length (A) of the hypostomal cavity, divided by its width (B). The width is defined as the distance between the ventral parts of the hypostomal carina, just above their endings; the length as the distance between a line connecting these endings, and the most dorsal part of the hypostomal carina.
MR (mesosomal ratio). - Length of the mesosoma, divided by its height. The length is measured from the anteroventral margin of the pronotal collar to the propodeal orifice; the height at the level of the scutellum.
PBR (petiolus-basitarsal ratio). - Length of the petiolus, divided by the length of the hind basitarsus. The petiolus is measured from the site of attachment of the propodeal muscle to the anterior margin of the first metasomal tergite.

The measurements were made on a selection of about five specimens per sex per species, as far as possible including the extremes. The values are either given for each species, or for a species-group as a whole, if little variation is present within that group. Only of the PBR the range is always presented; for the other indices the mean of the measured values is given, because the ranges of the infraspecific variation is often very small in these characters, and would be contaminated by the influence of measuring errors and artifacts.

The terminology used is the same as in my revision of Prosceliphron Van der Vecht (Hensen, 1987), and is based mostly on Bohart \& Menke (1976) for general morphological terms, and on Eady (1968) for surface sculpturing.

## Acknowledgements

I am much indebted to the curators of the various museums and owners of private collections which I visited, or from which I received material on loan; they are listed below, with the abbreviations used in the text.

BMNH British Museum (Natural History), London, England (Mr C. R. Vardy).
CG Collection J. Gusenleitner, Linz, Austria.
CH Collection R. Hensen, Utrecht, The Netherlands.


CJH Collection J. Hamon, Gaillard, France.
CM Collection A. Mochi, Rome, Italy.
CO Collection P. van Ooijen, Utrecht, The Netherlands.
CP Collection G. Pagliano, Torino, Italy.
CR Collection C. G. Roche, Maidstone, England.
DEI former Deutsche Entomologische Institut, Eberswalde, GDR (Dr J. Oehlke).
FSAG Faculté de Sciences Agronomiques, Gembloux, Belgium (Prof. Dr J. Leclercq).
IRSNB Institut Royal de Sciences Naturelles, Brussels, Belgium (Dr P. Dessart).
KMMA Koninklijk Museum voor Midden Afrika, Tervuren, Belgium (Dr E. de Coninck).
MCG Museo Civico di Storia Naturale, Genova, Italy (Dr R. Poggi).
MCZ Museum of Comparative Zoology, Cambridge, Mass., USA (Dr J. M. Carpenter).
MNHN Muséum National d'Histoire Naturelle, Paris, France (Dr J. Casevitz-Weulersse).
NCI National Collection of Insects, Pretoria, South Africa (Dr C. D. Eardley).
NMW Naturhistorisches Museum, Vienna, Austria (Dr M. Fischer).
NRS Naturhistoriska Riksmuseet, Stockholm, Sweden (Dr. K.-J. Hedqvist).
OUM Oxford University Museum, Oxford, England (Dr C. O'Toole).
RMNH Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands (Dr C. van Achterberg).
SAM South African Museum, Capetown, South Africa (Dr V. B. Whitehead).
TMB Termeszettudomanyi Muzeum, Budapest, Hungary (Dr J. Papp).
ZMA Zoologisch Museum, Amsterdam, The Netherlands (Mr W. Hogenes).
ZMB Zoologisches Museum der HumboldtUniversität, Berlin, GDR (Dr F. Koch).

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## The subgenus Chalybion Dahlbom

Chalybion Dahlbom, 1843: 21. Type-species: Sphex cyanea Fabricius, 1775 (nec Sphex cyanea Linnaeus, 1758) (= Chalybion californicum (Saussure, 1867)). Designated by Patton, 1880: 380.
Chalybium Schulz, 1906 (emendation).
An excellent diagnosis of the group was provided by Bohart \& Menke (1976: 100). It seems sufficient to mention here just a few diagnostic features of Chalybion s.s.

Rather large ( $12-25 \mathrm{~mm}$ ), slender wasps. Integument bright metallic blue to violaceous, the mesosoma black in one species. Head with clypeus more or less convex, apically generally with three to five teeth or lobes. Flagellum of ô rarely without placoids. Pronotal collar usually medially indented. Propodeum without dorsal enclosure. Forewing with three submarginal cells, recurent veins both received by second submarginal cell. Metasoma with petiolus curved, generally about as long as hind basitarsus. Several sternites of $\widehat{\delta}$ covered with micro-pubescence.

## Phylogeny and classification

The division of the genera Chalybion and Sceliphron has been rather confused in the past decades, particularly with respect to the species placed in Hemichalybion by Kohl (1918), and the enigmatic species C.femoratum (Fabricius). Hemichalybion has been treated as a subgenus of Sceliphron (Leclercq, 1955), as a genus (Bohart \& Menke, 1963), and as a subgenus of Chalybion (Bohart \& Menke, 1976). The species femoratum was placed in Chalybion by Kohl (1918), but Van der Vecht (1961b) and Bohart \& Menke (1976) transferred the species to Hemichalybion.

In the course of my investigations I have come to the conclusion that Chalybion s.s., and Hemichalybion including femoratum are natural groups, and that they are sister-groups. The evidence for this is presented in the following paragraphs. It is clear that the phylogenetic relationships are well represented by the classification of Bohart \& Menke (1976), recognizing Hemichalybion as a subgenus of Chalybion. C. femoratum (F.) is now placed in a monotypic species-group, and Chalybion s.s. is divided in a number of species-groups.

In order to establish the sister-group relationship of Chalybion s.s. and Hemichalybion, the most favourable outgroup is Sceliphron, the sister-group of Chalybion (Hensen, 1987). On some points however, like the shape of the clypeus, Sceliphron shows a structurally different condition, which clearly is a derived one if other genera of the Sceliphronini are taken into consideration. In such cases, the genus Cblorion has been used as the outgroup. Chlorion is, generally speaking, the most "primitive" genus of the Sceliphronina, morphologically as well as biologically (Bohart \& Menke, 1976).

For the construction of species-groups within the subgenus Chalybion s.s., its sister-group Hemichalybion Kohl has been used as the outgroup.

The following apomorphies are used to define the subgenera and species-groups of Chalybion on a phylogenetic basis. The corresponding plesiomorphies, as found in Sceliphron c.q. Cblorion (characters 1-5) or Hemichalybion (characters 6-19) are given in parentheses.

1) Spiracular groove absent. (Spiracular groove present).
2) Dorsal propodeal enclosure absent. (Dorsal enclosure present).
3) The apical margin of the clypeus. Apomorphous character-states are: (i) clypeus toothless, with broad, flat margin, which is medially incised; (ii) clypeus with median projecting lobe, which may still be faintly bior trilobate, or bordered by a pair of sharp lateral teeth. (Apical clypeal margin toothed or lobed, generally five teeth or lobes present).
4) Apicolateral propodeal carina [this term is presently reserved for the short carina, which runs from the top of the propodeal orifice to the outer side of the hind coxa, in most Sphecinae] present. (Apicolateral propodeal carina reduced [not stronger than surrounding sculpture] or lost).
5) Yellow pigment present. (Yellow pigment absent).
6) Digitus slender, with a well differentiated globose or triangular head. (Digitus broad, apically truncate).
7) Mesosoma elongate. (Mesosoma comparatively stocky).
8) Mandible of female with inner subapical tooth. (Mandible of female without inner subapical tooth).
9) Plantulae (small apicoventral pads on the tar-


Fig. 1. Cladogram of the subgenera and species-groups of Chalybion Dahlbom. Plesiomorphies are represented by open circles, apomorphies by dots.
someres) absent. (Plantulae present).
10) Metapleuron without angular carina. (Metapleuron with angular carina, running along the outer side of the mid coxa, and the anterior side of the hind coxa).
11) Anterior margin of propodeum raised into
a rim. (Propodeal rim absent).
12) Third segment of the maxillary palpi hardly widened, terminal three segments hardly longer than third. (Third segment of maxillary palpi strongly expanded on inner side, much shorter than subsequent segments).

Table 1. Synopsis of character-states among the species-groups of Chalybion Dahlbom, and its sister-group Sceliphron. Open circles indicate plesiomorphies, dots represent apomorphies. Explanation, see text.

13) Hypostomal cavity about as broad as high. (Hypostomal cavity much broader than high).
14) Sixth sternite of female broad and apically truncate. (Sixth sternite of female small, triangular, apically rounded).
15) Eighth tergite of male without cerci. (Eighth tergite of male with cerci).
16) Supra-antennal plate ventrally carinate. (Su-pra-antennal plate ventrally not carinate).
17) Punctation of mesoscutum and -pleuron very coarse. (Punctation fine).
18) Mesosoma streamlined: mesopleuron, metapleuron and side of propodeum form a continuous smooth surface. (Mesosoma not streamlined: metapleuron sunken below level of mesopleuron and side of propodeum).
19) Outer ventral margin of aedeagus with row of denticles. (Outer ventral margin of aedeagus without row of denticles).

The occurence of plesio- and apomorphous char-acter-states is presented in a synoptic table (table 1). The most parsimonious (shortest in terms of character transformations) cladogram has been constructed, and is given in fig. 1. I have not been able to trace proper synapomorphies linking the species of the group of $C$. bengalense, and this assemblage may well be paraphyletic. It seems undesirable however to lump it with the tibialegroup, and there is no suitable way to split it up into smaller, monophyletic groups. Consequently, the group is retained for the sake of convenience.

The groups of C. femoratum, californicum, and incisum are monotypic. Their autapomorphies need no further discussion for the purpose of overall classification.

## Key to the species-Groups of Chalybion Dahlbom

1. Ventral margin of clypeus with broadly projecting median lobe, which may be weakly emarginate medially in the $q$ or bi- or trilobate in the $\widehat{\delta}$ (fig. 2); petiolus and legs partly yellow, or hind femora ferruginous; Old World. (Hemichalybion Kohl) $\qquad$

- Ventral margin of clypeus with three or five teeth or lobes (toothless in $\widehat{\delta}$ C. parvulum and \& C. triangulum), or simple, with median notch (fig. 60); no yellow pigment present (Chalybion s.s.)

2. Tarsi with plantulae (fig. 3); hind femora fer-
ruginous; petiolus and legs not partly yellow
group of C. femoratum (F.) (p. 16)

- Tarsi without plantulae; hind femora not ferruginous; petiolus and legs partly yellow
group of C. spinolae (Lepeletier) (p. 17)

3. Tarsi with plantulae (fig. 3); metapleuron with a carina, which runs along the outer side of the mid coxa and bends sharply outwards posteriorly, to end above the base of the hind coxa (fig. 25); mandible of $q$ without inner subapical tooth

- Tarsi without plantulae; metapleuron without angular carina; mandible of $Q$ with inner subbasal tooth


4. Pubescence of head and mesosoma black; metanotal flange broad and produced over the propodeum (fig. 5); stout species, mesosoma $2-2.2$ times as long as high; New World.... group of C. californicum (Saussure) (p. 20)

- Pubescence of head and mesosoma white; metanotal flange rarely somewhat broadened; usually slender species, mesosoma $2.3-3.3$ times as long as high

5. Supra-antennal plate ventrally delimited by a transverse carina, which runs along and between the antennal sockets; $\hat{\delta}$ without cerci; Oriental and Australian Regions, Madagascar group of C. madecassum (Gribodo) (p. 23)

- Supra-antennal plate ventrally without carina; $\widehat{\text { with cerci; Afrotropical Region excluding }}$ Madagascar
group of C. gredleri (Kohl) (p. 21)

6. Clypeus with median notch (fig. 60), without teeth or lobes; propodeum without anterior rim; Malawi
group of C. incisum sp. n. (p. 30)

- Clypeus with three or five teeth or lobes (without teeth in $\hat{\delta}$ of $C$. parvulum); anterior margin of propodeum raised, forming a rim behind the metanotum .


7. Metapleuron not depressed below level of mesopleuron and side of propodeum, the sides of the mesosoma forming a continuous, streamlined surface; Afrotropical region group of C. tibiale (Fabricius) (p. 36)

- Metapleuron more or less distinctly depressed, the sides of the mesosoma do not form a continuous, smooth surface


8. Clypeus with five teeth, the median three are close together, more or less fused, the lateral teeth are sharp and rather distant from the others (fig. 64, 71, 79); sixth sternite of the $\%$ flat and wide, apically broadly trunctate (fig. 76); Oriental and Australian region
group of C. fabricator (Smith) (p. 30)


Figs. 2-12. 2, Chalybion (Hemichalybion) spinolae (Lepeletier), $\widehat{0}$, Malawi, clypeus. 3-12, Chalybion californicum (Saussure), USA. 3,, , detail of tarsus, ventral view. 4, $\widehat{0}$, clypeus. $5-7, \not .9$, metanotum; 6 , first metasomal segment; 7 , clypeus. $8-11, \delta .8$, first metasomal segment; 9, genitalia, ventral view; 10 , inner side of left half of aedeagus; 11, eighth sternite. 12 , ㅇ, pronotum, lateral aspect. (scale-line $=1 \times$ ); $2,6,8: 0.5 \times ; 3-5,7: 0.75 \times ; 12: 1.5 \times$; $9 — 11$ : $2 \times$.

- Clypeus with three or five teeth, in the latter case the lateral teeth are usually not sharply pointed and not distant from the median three (eg. figs. 145, 147); terminal sternite of 9 not unusually wide, apically rounded; all regions group of C. bengalense (Dahlbom) (p. 47)


## Group of Chalybion Californicum (SAUSSURE)

Formation of a monotypic species-group for C. californicum proved to be necessary, because no synapomorphies could be traced to link this species to any of the other groups. It has a number of plesiomorphous character-states in common with the madecassumgroup, but it lacks the elongate mesosoma characteristic for that group. The stockier mesosoma of C. californicum is a primitive trait, shared with Hemichalybion. The digitus in C. californicum is of a shape which is also highly reminiscent of Hemichalybion. Therefore it seems likely that $C$. californicum is the sistergroup of the rest of Chalybion s.s. Its only outstanding autapomorphy is the broadened propodeal flange, which is not found elsewhere in Chalybion.

## Diagnosis.

Head. - Mandible without inner subapical tooth; hypostomal cavity much broader than high; clypeus with three teeth in the $\widehat{\delta}$, with five teeth in the $\mathcal{O}$; segments of maxillary palpi strongly differentiated; third segment short and dilated, fourth to sixth slender and much longer than third.

Mesosoma. - Metapleuron with angular carina along outer side of mid coxa and anterior side of hind coxa; metapleuron distinctly sunk below level of mesopleuron and side of propodeum; propodeum without anterior rim; tarsi with plantulae; claws of hind tarsi without inner tooth.

Metasoma. - Sixth sternite of $q$ rounded, not truncate; eighth tergite of $\widehat{\delta}$ with cerci.

## Chalybion californicum (Saussure) (figs. 3-12)

Sphex caerulea Linnaeus, 1763:412 (nec Linnaeus, 1758) - Philadelphia (location of type unknown).

Sphex cyanea Fabricius, 1775: 346 (nec Linnaeus, 1758). Pelopoeus (Chalybion) californicus Saussure, 1867: 26, 9 , ठิ - California (Musée d'Histoire Naturelle, Geneva) [lectotype designated by Bohart \& Menke, 1863: 110]. Chalybion caeruleum; Rau, 1915: 62-63; Rau \& Rau, 1916a: 228 (sleeping habits); Rau \& Rau, 1916b: 27 (prey records); Rau, 1928a: 25 (biology); Rau, 1938: 540.

Sceliphron (Chalybion) coeruleum; Kohl, 1918: 57.
Chalybion cyaneum; Irving \& Hinman, 1935: 395.
Sceliphron cyaneum; Hutson, 1919: 217, 219.

Chalybion coeruleum; Muma \& Jeffers, 1945: 245 (prey records).
Chalybion californicum; Snodgrass, 1941: 50, pl. 23, figs. H, J, L (ô genitalia); Pate, 1943: 217 (synonymy); Evans \& Lin, 1956: 149, figs. 67, 68 (larva); Bohart \& Menke, 1963: 110, figs. 6, 48, 63, 94, 105; Bohart \& Menke, 1976: 100, 101, 102, fig. 17 D; Krombein e.a., 1979: 1577.

## Description.

Body length: ㅇ $16.9-22.5 \mathrm{~mm}$, ô $13.0-16.5$ mm ; length of forewing: ㅇ $12.2-15.9 \mathrm{~mm}, \hat{\sigma}$ $10.8-15.2 \mathrm{~mm}$. Integument dark blue; wings dark brown. Erect pubescence of head and mesosoma black.

Head. - Clypeus of $\&$ (fig. 7) with small, rather sharp lateral lobes, with broad submedian and somewhat narrower median lobe; clypeus of $\hat{\delta}$ with three sharp teeth (fig. 4); clypeus and frons rather densely coarsely punctate; antenna of $\hat{\delta}$ with placoids on seventh and eighth flagellomere.

Mesosoma. - Pronotal collar in dorsal view about twice as broad as long, medially strongly indented, laterally with broad, deep furrow, which is sharply delimited anteriorly (fig. 12); mesopleural flange sharply carinate; metanotal flange strongly dilated and produced into a flat lamella (fig. 5); mesoscutum, propodeum, meso- and metapleuron strongly and densely punctate, pronotum and scutellum more sparsely so.

Metasoma. - Petiolus shorter than hind basitarsus (figs. 6, 8); fourth sternite of 9 with large median depression bearing dense micro-pubescence, third sternite often with smaller patch of micro-pubescence; eighth sternite of $\hat{\sigma}$ with broadly rounded apical process, with dense pubescence (fig. 1); genitalia (figs. 9, 10): volsellar plate broad, apically sharply pointed, digitus stout, its apex broadly truncate, aedeagus ventrally with teeth along inner and outer margin.

Indices. - Y: FR 0.99; OR 0.92; CR 0.78; HCR 0.61; MR 2.1; PBR 0.7-0.8. ठ̂: FR 0.94; OR 1.0; CR 0.72; HCR 0.59; MR 2.1; PBR 0.7-0.8

Note on distribution. - North America: Southern Canada, USA, Northern Mexico; introduced in the Hawaiian Islands and Bermuda; Puerto Rico (introduced?). New record: Peru; the species was apparently introduced there recently, and after the common invader Sceliphron caementarium (Drury) established a population in this area. In North America C. californicum prefers old nests of this species as nesting sites (Rau, 1928a).
Material examined.
Canada. - 1 \&, Bear River (N.S.), 30 July 1981, O. Brinkkemper (ZMA).

USA. - Series in BMNH, CH, CP, RMNH, OUM; USNM; ZMA. Localities: see Bohart \& Menke (1963).

Mexico. - 1 ¢, Veracruz, Fortin, 900 m, 2 June 1963, C. Epping (ML).

Puerto Rico. - 1 \&, Cialitos Cruces, 7 km S . Ciales, 3200 ft., at white light, 2 Feb.-12 March 1973, W. Plathsr. (USNM).
Peru. - 1 \&, Lima, 24 Feb. 1974, 70 m, R. Garcia; 2 ठ, Lima, 26/27 April 1983, C. \& M. Vardy; 3 ठ̂, Ventanilla, 20 km N. Lima, 27 April 1983, C. \& M. Vardy (all BMNH; Mr. C. Vardy reported the presence of more specimens in the Museo de Historia Natural "Javier Prado" in Lima, Peru, all collected in 1976 and 1977).

## Group of Chalybion gredleri (Kohl)

## Diagnosis.

Small, very slender species ( $10-14 \mathrm{~mm}$ ); erect pubescence of head and mesosoma white; wings hyaline, apical margins infuscated.

Head. - Mandible of $Q$ without inner subbasal tooth; hypostomal cavity much broader than high; clypeus nearly flat; supra-antennal plate ventrally without transverse carina.

Mesosoma. - Elongate (MR 2.6-3.0); metapleuron with angular carina, which runs along the outer side of the mid coxa, and bends sharply outwards posteriorly, to end near the outer side of the hind coxa (fig. 25); metapleuron sunken below level of mesopleuron and side of propodeum; propodeum dorsally with anterior rim, immediately behind metanotum; punctation of mesoscutum and pleuron sparse, but unusually coarse. Tarsi with plantulae; forewing: second submarginal cell strongly narrowed anteriorly, or even petiolate.

Metasoma. - Petiolus longer than hind basitarsus; sixth sternite of $q$ rounded, not trunctate; eigth tergite of $\hat{\delta}$ with cerci.

## Key to the species of the group of Chalybion gredleri

1. Second submarginal cell petiolate (fig. 22); third and fourth segment of maxillary palpi produced beyond base of the next segment (fig. 24); Gambia to Central Africa
triangulum sp. n .

- Second submarginal cell not petiolate (fig. 14); third and fourth segment of maxillary palpi not produced apically; South Africa to Zaire and Somalia gredleri (Kohl)

Chalybion gredleri; Leclercq, 1955: 46; Bohart \& Menke, 1976: 102.

## Description.

Small, slender species, body length: \& 14.0 mm , ठ $11.5-12.5 \mathrm{~mm}$; length of forewing: $\& 8.6 \mathrm{~mm}$, o $7.0-7.2 \mathrm{~mm}$. Integument blue, mandibles red.

Head. - In frontal view (fig. 13) the head is comparatively broad, and the vertex is raised above the eyes; clypeus nearly flat, with three short lobes of equal size in $\&$ (fig. 15), with three triangular teeth in $\hat{\delta}$ (fig. 13); flagellum of $\hat{\delta}$ with placoid on seventh segment.

Mesosoma. - About three times as long as high; pronotal collar (fig. 20) 1.5 times as broad as long in dorsal view, medially indented, lateral furrow shallow, not sharply delimited anteriorly; mesopleural flange only posteriorly sharply keeled; metanotal flange broadened, though not as strongly as in C. californicum (fig. 5); posterior part of propodeum excavate; mesoscutum and mesopleuron strongly, but usually not very densely punctate; propodeum transversely striate, partly with additional shallow punctation; posterior part of metapleuron striate. Forewing: second submarginal cell strongly narrowed anteriorly (fig. 14).

Metasoma. - Petiolus very long, about as long as hind femur; sternites in $\varphi$ without micro-pubescence; eighth sternite of $\widehat{\delta}$ broadly triangular (fig. 21); genitalia see figs. 18,19 .

Indices. - \& : FR unknown; OR 0.89; CR 0.74;
 CR 0.58; HCR 0.61; MR 2.6; PBR 1.2-1.4.

Material examined.
Somalia. - 1 §̂, Horadieh, N. of Hargeisa, 24 April 1949, K. M. Guichard (BMNH).
Tanzania. - 1 ठ̂, Mahenge, Mpanga, April 1961, P. E. Moussault (RMNH).

Congo. - 6 ㅇ (MNHN).
Zaire. - 1 \& , Luluabourg, April 1939, J. J. Deheyn (KMMA).
Zimbabwe. - 2 § , Spongweni, Bubi Dist., 7 Dec. 1931, R. H. R. Stevenson (SAM); 1 §ో, Kaputa, 8 Feb. 1944 (SAM).

South Africa. - 1 § , Transvaal, 5 mls W . Warmbad, 24-25 Feb. 1968, P. Spangler (USNM).

## Chalybion triangulum sp. n . <br> (figs. 22-29)

## Description.

Small species, body length $\widehat{\hat{c}} 10.3-12.6 \mathrm{~mm}$, 우 13.0 mm ; length of forewing $\widehat{\lambda} 6.8-7.4 \mathrm{~mm}, \$ 7.7$ mm (type $\widehat{\delta}$ resp. $10.3,6.8 \mathrm{~mm}$ ). Integument metallic blue, legs and antennae dark violaceous


Figs. 13-21, Chalybion gredleri (Kohl). 13-14, ${ }^{\text {® }}$, South Africa. 13, head, frontal aspect; 14, detail of forewing.
 genitalia, ventral view; 19 , inner side of left half of aedeagus; 20 , pronotum, lateral view. 21 , $\hat{\delta}$, South Africa, eighth sternite. 16, 17: scale-line $(=1 \times$ ); 14: $1.3 \times$; $13,15,20: 2 \times ; 21: 4 \times ; 18,19: 5.3 \times$.
brown, mandibles and first metasomal segment ferruginous; wings subhyaline, infuscated in distal third.

Head. - In anterior view wider than high; vertex broad and swollen, raised above the eyes (fig. 23 ); clypeus only slightly convex in the middle, much broader than high, with three strong teeth in $\widehat{\delta}$ (fig. 23), toothless in $\ell$ (fig. 29); frons with long median carina; clypeus very finely, frons coarsely and densely punctate; maxillary palpus unusually slender, third and fourth segments produced beyond base of next segment (fig. 24); antenna of $\widehat{\delta}$ with placoid on seventh flagellomere.

Mesosoma. - Long and slender, nearly three times as long as high; pronotal collar nearly as long as wide in dorsal view, without median impression and without lateral furrow, regularly curved in lateral view (fig. 25); mesopleural flange strongly swollen, not carinate; propodeum hardly convex in lateral view, apical part dorsally with shallow median furrow; pronotum and mesonotum rather densely very coarsely punctate, mesopleuron sparsely coarsely punctate, propodeum and metapleuron striate, the interspaces between the striae on anterior part of the propodeum with shallow punctation. Forewing with second submarginal cell petiolate (fig. 22).

Metasoma. - Petiolus (fig. 26) long, nearly as long as hind femur; fourth to sixth sternites with decumbent pubescence; eighth sternite triangular (fig. 28); genitalia (fig. 27): head of digitus subspherical, cuspis covered with short setae, rather slender.

Indices. - $\widehat{0}$ : FR 1.1; OR 1.0; CR 0.65 ; HCR 0.66; MR 2.7-2.9; PBR 1.4-1.6. ㅇ: FR 1.0; OR 1.0; CR 0.70; HCR 0.7; MR 3.3; PBR 1.4.

Material examined.
Holotype. - ${ }^{\text {® }}$, "Gambia, Keneba, Malaise, Sep.-Oct. 1975, M. C. D. Speight" (BMNH).
Paratypes. - Gambia. - $1 \delta$, same data as holotype (RMNH).
Togo. - 1 §̊, km 15, 31 VII 1984, 1 §̂, Kaode, 26 VI 1984, 1 \&, Mo Aual, 19 VI 1984, all malaise trap, J. W. Everts (ZMA, $1 \hat{0} \mathrm{CH}$ ).
Central African Republic. - 1 § , Uamgebiet, Bosum, 1-10 June 1914, Tessmann, no. 1682-85 (ZMB) [Bozoum, at River Ouham, $6^{\circ} 16 \mathrm{~N}, 16^{\circ} 22 \mathrm{E}$ ].

## Group of Chalybion madecassum

 (Gribodo)
## Diagnosis.

Small to large, slender species ( $12-25 \mathrm{~mm}$ ); erect pubescence of head and mesosoma white; wings hyaline, apical margins infuscated.

Head. - Mandible of $Q$ without inner subapical tooth; hypostomal cavity much broader than long; clypeus comparatively flat; supra-antennal plate ventrally delimited by a transverse carina, running along and between the antennal insertions.

Mesosoma. - More or less elongate, except in C. bonneti; metapleuron with angular carina, which runs along outer side of mid coxa, and bends sharply outwards posteriorly, to end near the outer side of the hind coxa (fig. 25); metapleuron sunken below level of mesopleuron and side of propodeum; propodeum dorsally without anterior rim; tarsi with plantulae (sometimes only those of fourth tarsomere well discernable); forewing: 2 m - cu ends distally on second submarginal cell (fig. 54), or is even interstitial with $2 \mathrm{r}-\mathrm{m}$.

Metasoma. - Petiolus longer than hind basitarsus, except in C. dolichothorax and C. bonneti; sixth tergite of $q$ rounded, not truncate; eighth tergite of $\hat{\delta}$ without cerci.

Key to the species of the group of Chalybion madecassum

1. Mesosoma strongly elongate, more than three times as long as high; petiolus shorter than hind basitarsus; propodeal dorsum with a pair of longitudinal furrows laterally, behind the spiracles; occipital carina ventrally evanescent; large species: forewing 16 mm ; China, Vietnam dolichothorax (Kohl)

- Mesosoma less than three times as long as high and/or petiolus longer than hind basitarsus; propodeum without longitudinal furrows; occipital carina ventrally complete, distinctly separated from hypostomal carina; smaller species

2. Mesoscutum punctate to reticulate-punctate; supra-antennal plate not strongly protruding; flagellum of $\hat{\delta}$ with placoids, at least on seventh and eighth flagellomere; Malagasy Subregion


- Mesoscutum transversely strigose, with shallow punctation between the striae; supra-antennal plate strongly protruding flagellum of $\widehat{\delta}$ without placoids

4
3. Petiolus shorter than hind basitarsus; pronotum with distinct median impression; clypeus of $q$ with median nasiform projection; fourth sternite of $q$ with depression, bearing dense yellowish micro-pubescence; Madagascar ....
bonneti Leclercq

- Petiolus longer than hind basitarsus; pronotum without distinct median impression; clypeus of $Q$ without median nasiform projection; fourth sternite of $q$ without depression, with


Figs. 22-29, Chalybion triangulum sp. n. 22-26, ${ }^{\text {® }}$, holotype, Gambia. 22, detail of forewing; 23, head, frontal view; 24, maxillary palpus; 25, mesosoma; 26, first metasomal segment. 27-28, ${ }^{\text {®' }}$, paratype, Central African Republic. 27, genitalia, ventral view; 28, eighth sternite. 29, ㅇ, paratype, Gambia, clypeus. 22, 25, 26, 29: scale-line ( $=1 \times$ ); 23, 24: $1.5 \times$; 18: $3 \times$; 27: $4 \times$.
some silvery tomentum; Madagascar and Mascarenes . . . . . . . . . . . madecassum (Gribodo)
4. Dorsal margin of propodeal orifice raised into a broad lamella (fig. 51); Celebes frontale (Kohl)

- Dorsal margin of propodeal orifice narrow (fig. 57)

5
5. Ocelli reduced to about the size of the punctures of the mesopleuron, and nearly flat, not raised above the surrounding sculpture; clypeus of $q$ with lateral teeth (fig. 44); Philippines
polyphemus sp. n.

- Ocelli normal, larger than the punctures of the mesoscutum, distinctly convex; clypeus of $¢$ without lateral teeth (fig. 55); Sri Lanka to Java and Borneo
gracile sp. n.


## Chalybion bonneti Leclercq

(figs. 30-33)
Chalybion bonneti Leclercq, 1966: 55-59, figs. 2, 3, 6, 7, ㅇ, $\widehat{\delta}$ - Madagascar, Tamatave (FSAG; examined); Bohart \& Menke, 1976: 102.

## Description.

Rather large species, body length: $\uparrow 19 \mathrm{~mm}, \hat{\delta}$ 16.5 mm ; length of forewing: \& $14.6 \mathrm{~mm}, \hat{\delta} 12.7$ mm . Integument blue, mandibles reddish; wings subhyaline.

Head. - Occipital carina a complete circle, separated from the hypostomal carina; clypeus of $q$ (fig. 30) apically with three lobes, the median lobe very broad; clypeus of $\hat{\delta}$ (fig. 31) with rather broad median lobe, the lateral lobes very small; clypeus of $\ddagger$ with strong nasiform process medially; antennae of $\delta$ with placoids on seventh and eighth flagellomere; frons reticulate-punctate in $q$, coarsely punctate in $\widehat{\delta}$.

Mesosoma. - Pronotal collar medially impressed, slightly shorter than in C. madecassum, laterally in $\ell$ with well developed furrow, which is sharply delimited anteriorly (like in C.californicum, fig. 12), in the $\hat{\delta}$ this furrow is weakly developed; mesopleural flange only posteriorly sharply keeled; mesoscutum and propodeum in 9 reticulate-rugose, in $\widehat{\delta}$ strongly punctate, mesopleuron strongly and densely punctate, metapleuron posteriorly transversely striate in $\mathcal{Q}$, strongly punctate in $\widehat{\delta}$; tarsal claws without inner tooth.

Metasoma. - Petiolus shorter than hind basitarsus; third and fourth sternites of $q$ with semicircular depression, bearing yellowish tomentumlike pubescence, which is particularly dense on the fourth sternite; eighth sternite of $\hat{\delta}$ (fig. 33) truncate; genitalia (fig. 32): aedeagus without teeth along ventral margin; head of digitus triangular,
but much broader than in C. madecassum; cuspis of peculiar shape, admedian side with semicircular emargination, apicolateral corner with curved process bearing dense pubescence; volsellar plate swollen, cylindrical, and projecting ventrally of gonobasis; gonostyles without lamellae.

Indices. - Holotype $\uparrow$ : FR 0.89 ; OR 0.73 ; CR 0.86 ; HCR 0.56; MR 2.3; PBR 0.9. Paratype ठ': FR 0.85 ; OR 0.88; CR 0.88; HCR 0.75; MR 2.6; PBR 0.9 .

Material examined. - Madagascar: 1 \&, Tamatave (FSAG; holotype); 1 §§, Tamatave, March 1961 (FSAG; paratype); 1 §̂, Tamatave, Fampanambo, Jan. 1959 (KMMA; allotype).

## Chalybion dolichothorax (Kohl) <br> (figs. 34-36)

Sceliphron (Chalybion) dolichothorax Kohl, 1918: 31, 78, \& - China (ZMB; examined).
Chalybion (C.) dolichothorax; Bohart \& Menke, 1976: 101, 102, figs. $22 \mathrm{~N}, \mathrm{M}$.

## Description.

Large, very slender wasp, body length 25.0 mm , length of forewing 16.2 mm . Only the $q$ is known.

Head. - As long as wide; occipital carina ventrally evanescent, more or less contiguous with the hypostomal carina; clypeus with three teeth, the median narrower than the submedian (fig. 36); clypeus somewhat more convex than in other species of the madecassum-group, with faint median keel; supra-antennal plate ventrally and along the antennal insertions delimited by a carina; vertex behind the posterior ocelli slightly raised above the eyes.

Mesosoma. - Strongly elongate, more than three times as long as high; pronotal collar (fig. 35) 1.5 times as wide as long, without median impression, in lateral view not regularly curved, but with anterior steeper part; mesopleural flange completely carinate; propodeum with a pair of tapered furrows, which begin just behind the spiracles, and end beyond the apex of the dorsal part (these furrows seem not to be homologous with the dorsal enclosure in Scelophron etc.: in that case they would end before the apex of the propodeal dorsum); mesoscutum and propodeum transversely striate, with shallow punctation; mesopleuron and anterior part of metapleuron with dense, rather fine punctation; posterior part of metapleuron sparsely punctate, and with faint striae; all tarsal claws with inner subbasal tooth.

Metasoma. - Petiolus shorter than hind basitarsus (fig. 34); fourth sternite largely covered with micro-pubescence.


Figs. 30-43. 30-33, Chalybion bonneti Leclercq, Madagascar. 30, ㅇ, holotype, clypeus. 31-32, $\delta$, paratype. 31, clypeus; 32, genitalia, ventral view. 33, $\widehat{0}$, allotype, eighth sternite. 34-36, Chalybion dolichothorax (Kohl), ㅇ, Vietnam, Tonkin. 34, first metasomal segment; 35, pronotum, lateral view; 36, head, frontal view. 37-43, Chalybion

Indices. - FR 0.95; OR 0.65; CR 0.86; HCR 0.61; MR 3.3; PBR 0.71.

Material examined. - 1 ¢, "China, Mell S. V." (ZMB; holotype); 1 \&, Vietnam, Tonkin Central, Environs de Tuyen-Quan, A. Weiss, 1901 (MNHN).

## Chalybion madecassum (Gribodo)

(figs. 37-43)
Pelopoeus madecassus Gribodo, 1883: 263,, , $\widehat{\text { o }}$ - Madagascar (MCG; examined).
Sceliphron purpurascens Pérez, 1895: 211, \&\&, $\widehat{\text { o }}$ - Madagascar (MNHN; examined).
Sceliphron violaceum; Friederichs, 1918: 33, 42, pl. 2, 3 (biology); Vesey-Fitzgerald, 1950: 75; Vesey-Fitzgerald, 1956: 362.
Sceliphron (Chalybion) madecassum; Kohl, 1918: 65; Arnold, 1945: 85 (prey: Therididae).
Chalybion madecassum; Leclercq, 1953: 211; Leclercq, 1966: 56-59, figs. 4, 5 (compared with C. bonneti); Bohart \& Menke, 1976: 100, 103.
Description.
Rather small, slender species; body length: 우 $11.9-16.2 \mathrm{~mm}$, क $10.1-13.8 \mathrm{~mm}$; length of forewing: $\& 8.2-10.7 \mathrm{~mm}$, $\widehat{0} 7.3-10.3 \mathrm{~mm}$. Integument blue to violaceous.

Head. - Distinctly broader than high; clypeus moderately convex, in $q$ (fig. 43) with five teeth, median tooth larger than submedian, lateral teeth obsolete; clypeus in $\hat{\delta}$ (fig. 41) with three teeth, median broader than submedian; occipital carina a complete circle, distinctly separated from the hypostomal carina; frons reticulate-rugose; antenna of $\delta$ with placoids on fourth or fifth to ninth flagellomeres.

Mesosoma. - About 2.3 times as long as high; pronotal collar with very shallow dorsal impression, 1.8 times as wide as long in dorsal view, in lateral view not regularly curved, with anterior much steeper part (cf. fig. 50); mesopleural flange only posteriorly sharply keeled; posterior part of propodeum with shallow median furrow; mesoscutum and propodeum reticulate-rugose, mesopleuron strongly and densely punctate; posterior part of metapleuron coarsely transversely striate; tarsal claws without inner tooth.

Metasoma. - Petiolus longer than hind basitarsus; fourth sternite of $Q$ with large semicircular patch of silvery pubescence; eighth sternite of $\hat{\delta}$ with slender apical process (fig. 37), which is densely covered with short pubescence; genitalia (fig. 39,40 ): aedeagus with teeth along inner and outer
margins; head of digitus triangular, cuspis with setosity restricted to apical half; volsellar plate broadly triangular, apically sharply pointed.

Indices. - Q: FR 0.82; OR 0.95; CR 0.87; HCR 0.74; MR 2.3; PBR 1.2-1.3. ठ̂: FR 0.78 ; OR 1.1; CR 0.81; HCR 0.84; MR 2.3; PBR 1.2-1.4.

## Material examined.

Types. - The lectotype of P. madiecassus Gribodo, by present designation, is a $q$ in the MCG, labelled "Madag", "Pelopoens madecassus Grib., Tipo of $\widehat{\text { B }}$, Madagascar". I have seen no other type specimens, but the species was described from both $\circ$ and $\delta$. The lectotype of S. purpurascens Pérez, by present designation, is a $¢$ in the MNHN, labelled "Madag" and "Museum Paris, coll. J. Pérez 1915"; a ô paralectotype is labelled identically, a $q$ paralectotype lacks the former label.
Madagascar. - Numerous specimens, from many localities (BMNH, CP, DEI, FSAG, IRSNB, KMMA, RMNH, MNHN, NMW, OUM, SAM, USNM, ZMA, CH).
Seychelles. - Numerous specimens (BMNH, KMMA, RMNH, ZMA, ZMB).
Comores. - Series of specimens (MNHN).
Gloriosa Islands. - 2 \& 1 d̂, leg. W. L. Abbott (USNM).

## Chalybion polyphemus sp. n. (figs. 44-49)

## Description.

Smaller species, body length $\uparrow 14.3-15.5 \mathrm{~mm}$, ठ 12.3 mm ; length of forewing ㅇ $10.2-10.4 \mathrm{~mm}$, © 8.4 mm (type $q$ resp. $15.5,10.0 \mathrm{~mm}$ ). Integument blue.

Head. - Clypeus nearly flat, apically in $q$ with five teeth, including a distinct remnant of lateral teeth (fig. 44), in $\widehat{\delta}$ with three teeth (fig. 46); supra-antennal plate strongly protruding, its ventral and lateral margins sharply carinate, medially concave, its ventral margin forming a half-circle in anterior view; frons strongly reticulate-rugose; ocelli reduced, more or less sunken in surrounding sculpture; occipital carina a complete circle, distinctly separated from hypostomal carina; antenna of $\hat{\delta}$ without placoids.

Mesosoma. - Pronotal collar in lateral view evenly curved (cf. fig. 56), in dorsal view about twice as wide as long; lateral furrow sharply delimited anteriorly (cf. fig. 56); mesopleural flange only posteriorly sharply keeled; apical part of propodeum with well developed median furrow, in lateral view straight, not convex; dorsal margin of propodeal orifice narrow (cf. fig. 57); mesoscutum

[^0]coarsely transversely strigose, laterally and posteriorly with additional punctation; mesopleuron densely coarsely punctate; posterior part of metapleuron strigose-punctate; propodeum transversely strigose, with dense shallow punctation between the striae; tarsal claws without inner tooth.

Metasoma. - Petiolus longer than hind basitarsus; first tergite very slender, practically a continuation of the petiolus (fig. 45, 49); fourth sternite of $q$ with small transverse spot of micropubescence; eighth tergite of $\hat{\delta}$ without cerci; eighth sternite of $\widehat{\delta}$ (fig. 48) triangular; genitalia (fig. 48) very slender; aedeagus without teeth on ventral margins; head of digitus triangular, like in C. madecassum volsellar plate short, triangular; gonostyles without distinct lamellae.

Indices. - \&: FR 0.75; OR 0.96; CR 1.0; HCR 0.69; MR 2.5-2.7; PBR 1.2-1.3. ©ं: FR 0.68; OR 0.95 ; CR 0.82; HCR 0.62; MR 2.6; PBR 1.3.

Material examined.
Holotype. - \&, "Philippine Islands, Luzon, Atimonan, July 1963, A. Concepcion" (RMNH).

Paratypes. - Philippines, 1 ¢, Butuan, Mindanao, Baker (USNM), 1 \&, Luzon, Mt. Maquiling, Baker (CH), 1 ठ', Mindanao, Iligan, Baker (USNM).

## Chalybion frontale (Kohl) (figs. 50-53)

Sceliphron (Chalybion) frontale Kohl, 1906: 192, ¢ ¢ - N Celebes, Toli-Toli (NMW: examined). Chalybion frontale; Bohart \& Menke, 176: 101, 102.

## Description.

Rather large species, body length: ㅇ $19.5-21.0$ $\mathrm{mm}, \hat{\sigma} 17.0 \mathrm{~mm}$; length of forewing: \& $12.0-12.7$ mm , $\widehat{\hat{c}} 11.5 \mathrm{~mm}$. Like C. polyphemus, except for the following.

Head. - Clypeus with three equally wide teeth, rounded in $\ell$ (fig. 52), sharp in $\widehat{\delta}^{\circ}$; supra-antennal plate not as strongly concave as in polyphemus its ventral margin shallowly v-shaped in frontal view (fig. 52); ocelli not reduced, but somewhat sunken in surrounding sculpture; frons reticulate-punctate to coarsely rugose.

Mesosoma. - Anterior slope of pronotal collar differentiated in small vertical impunctate ara and less steep, punctate area (fig. 50); mesoscutum coarsely shallowly strigose, with some indistinct punctures; propodeum dorsally likewise; posterior part of metapleuron coarsely punctate; posterior part of propodeum with median furrow ill developed, in lateral view this part is distinctly convex; propodeal orifice with the dorsal margin distinctly raised (fig. 51).

Metasoma. - First tergite (fig. 53) less slender than in C. polyphemus and C. gracile; male geni-
talia: head of digitus apically sharply pointed.
Indices. - O: FR 0.83 ; OR 0.79 ; CR 1.0; HCR 0.74; MR 2.3; PBR 1.2-1.3; ô: FR 0.82; OR 0.94; CR 1.0; HCR 0.72; MR 2.4; PBR 1.2.

## Material examined.

Type. - The species was described from one $\rho$, labelled "Nord Celebes, Toli-Toli, Nov.-Dec. 1895, H. Fruhstorfer" and "frontalis Kohl, type", which is the holotype. Two more specimens marked "frontalis, type, det. Kohl" in the NMW are not mentioned in the description, and have no type status.

Celebes. - 2 of, S. Celebes, Patunuang, Jan. 1896, H. Fruhstorfer (frontalis type, det. Kohl) (NMW); 1 \&, S. Celebes, 10 km N. of Udjung Lemuru, 30 May 1948, J. v. d. Vecht (RMNH); $1 \widehat{\delta}, \mathrm{~N}$. Celebes, Tangkoko-Dua Saudara N. R., $1^{\circ} 30 \mathrm{~N}, 125^{\circ} 10 \mathrm{E}, 28$ Nov. 1985, 1 ㅇ, Dumoga-Bone N. P., $220 \mathrm{~m}, 1-9$ Nov. 1985, $0^{\circ} 34 \mathrm{~N}$, $123^{\circ} 54 \mathrm{E}$, both C. v. Achterberg (RMNH).

## Chalybion gracile sp. n.

(figs. 54-58)

## Description.

Small species, body length $11.1-13.9 \mathrm{~mm}$, length of forewing $8.4-10.7 \mathrm{~mm}$ (type resp. 12.4, 8.4 mm ). The $\widehat{\delta}$ is not known. Like C. polyphemus, except for the following.

Head. - Clypeus (fig. 55) with three teeth, median tooth broader than submedian; supra-antennal plate concave, though not as strongly as in polyphemus, its ventral margin forms about a quarter of a circle (fig. 55); ocelli not reduced; frons reticulate-punctate.

Mesosoma. - Pronotal collar in lateral view evenly curved (fig. 56); mesoscutum and propodeum dorsally strongly transversely strigose, posterior part of propodeum with well differentiated median furrow, in lateral view the dorsal outline is straight; dorsal margin of propodeal orifice narrow (fig. 57).

Metasoma. - First metasomal tergite very slender, almost forming a part of the petiolus (fig. 58).

Indices. - FR 0.78, OR 0.96; CR 0.98; HCR 0.63; MR 2.5-2.7; PBR 1.2-1.3.

Material examined.
Holotype. - \&, "Sri Lanka: Rat. Dist., Sinharaja Forest, Weddagala, 18-21 June 1976", "collected by K. V. Krombein, P. S. Karunaratne, S. Karunaratne" (USNM).

Paratypes. - Sri Lanka. - 1 \&, Gal. Dist., Kanneliya Jungle, 13-16 Aug. 1972, K. V. Krombein \& P. B. Karunaratne (USNM); 2 \&, Kan. Dist. Thawalamtenne, 2200 ft., 7-8 Sep. 1980, K. V. Krombein e.a.; (USNM, RMNH).

Malaya. -1 \&, Kedah, near Jitra, catchment area, 4


Figs. 44-53. 44-49, Chalybion polyphemus sp. n. 44-45, 9 , holotype, Philippines, Luzon. 44, head, frontal view; 45 , first metasomal segment. 46-49, $\widehat{\text { ® }}$, paratype, Philippines, Mindanao. 46, clypeus; 47, genitalia, ventral view; 48, eighth sternite; 49, first metasomal segment. 50-53, Chalybion frontale (Kohl), ㅇ, Indonesia, Celebes. 50, pronotum, lateral view; 51 , propodeal orifice; 52 , head, frontal view, 53 , first metasomal segment. $45,49,50,52,53$ : scale-line $(=1 \times$ ); 44: 1.3 $\times$; 51: $2.7 \times$; 48: $4 \times$; 47: $5.3 \times$.

April 1928 (BMNH).
Vietnam. - 1 \&, Cochinchine, P. Condora, 9 Aug. 1924, R. Vitalis de Salvaza (IRSNB).

Java. - 1 \& , Radjamandala, 1200 ft . Djempang Wetan, Nov. 1937. K. M. Walsh (BMNH).

Borneo. - 1 \&, Sarawak, fourth div. Gn. Mulu, RGS Exp., March 1978, M. N. Collins, malaise trap (BMNH); 1 ¢, Sabah, Poring Springs, 1600 ft., 6-10 May 1973, K. M. Guichard (CR).

## Group of Chalybion incisum sp. n.

The group of C. incisum is monotypic, and the following diagnosis contains only the characters which are necessary for the establishment of the group and some peculiarities of the species.

## Diagnosis.

Head. - Mandible with inner subapical tooth; clypeus untoothed, with median notch (fig. 60); segments of maxillary palpi strongly differentiated: third segment short and dilated, fourth to sixth slender and much longer than third; hypostomal cavity much broader than high.

Mesosoma. - Mesoscutum with a pair of deep and wide furrows, opposite the tegulae, which converge slightly towards the scutellum and on the scutellum are continued as deep cavities on each side of the disc; extreme outer side of the axilla produced into a large triangular lamella which overhangs the outer half of the cavity (fig. 61); metanotal flange elevated next to the metanotum; metapleuron without distinct angular carina posteroventrally; metapleuron sunk below level of mesopleuron and side of propodeum; propodeum without anterior rim; tarsi without plantulae.

Metasoma. - Sixth sternite of $\mathcal{Y}$ rounded, not truncate.

> Chalybion incisum sp. n. (figs. $59-62$ )

## Description.

Body length 18.0 mm ; length of forewing 12.7 mm . Integument bluish violaceous, propodeum and metapleuron more strictly blue, mandibles and ventral margin of clypeus reddish, tip of mandible dark, antennae black; wings brown. Pubescence white, some setae ventrally on the clypeus brown; face with sparse silvery tomentum; metasomal sternites with numerous long setae.

Head. - Wider than high (fig. 60); clypeus without median carina, slightly convex (less than in e.g. C. laevigatum); frons with median carina; clypeus finely sparsely punctate, frons medially strongly punctate, superiorly transversely rugose.

Mesosoma. - Pronotum in dorsal view 0.6 times as long as wide; pronotum laterally with
shallow furrow, which is not bordered anteriorly; mesoscutum with impressed median line on anterior half; pronotum and mesonotum very finely and sparsely punctate, mesopleuron more densely, rather coarsely punctate, metapleuron with a few scattered punctures; propodeum rather sharply transversely striate, laterally the interspaces bear some shallow punctures; claws of fore and middle tarsi with, of hind tarsi without inner submedian tooth.

Metasoma. - Petiolus nearly as long as hind femur, slightly but distinctly curved (fig. 62); fourth sternite with large oval patch of micropubescence, which covers most part of the sternite.

Indices. - FR 0.82; OR 0.73; CR 1.5; HCR 0.56; MR 2.5; PBR 1.3.

Material examined.
Holotype. - ㅇ, Malawi: "Nyasaland, Mlanje, $4-4-13$, S. A. Neave, $1913-140$ " (BMNH).

## Group of Chalybion fabricator (Smith)

Diagnosis.
Large species, length of forewing $12.3-18.0$ mm ; erect pubescence of head and mesosoma white.

Head. - Mandibles of $q$ with inner subapical tooth; clypeus with the lateral teeth sharp and narrow, distant from the submedian teeth, which are more or less fused with the median lobe to form a single protruding lobe (e.g. fig. 75); hypostomal cavity broader than high.

Mesosoma. - Pronotum laterally with deep furrow, which is sharply delimited anteriorly; metapleuron sunk below level of mesopleuron, posteroventrally without angular carina; propodeum without anterior rim; propodeal dorsum making a distinct angle of about $130^{\circ}$ with the declivity; propodeum transversely striate and more or less punctate, but along the sides of the dorsum a zone without punctation is present; tarsi without plantulae; claws of fore and middle tarsi with, those of hind tarsi without inner subbasal tooth; forewing with third submarginal cell usually very broad (fig. 69).

Metasoma. - Sixth sternite of Q broadly truncate (fig. 76); eighth tergite of $\hat{\delta}$ with cerci.

Key to the species of the group of Chalybion fabricator (Smith)

1. Distal two third of forewing, and distal half of hindwing brown, contrasting strongly with the hyaline proximal area; Sri Lanka to Java . malignum (Kohl)

- Wings homogeneously coloured, or only


Figs. 54-62. 54-58, Chalybion gracile sp. n., ㅇ, holotype, Sri Lanka. 54, detail of forewing; 55, head, frontal view; 56 , pronotum, lateral view; 57 , propodeal orifice; 58 , first metasomal segment. $59-62$, Chalybion incisum sp. n.,, , holotype, Malawi. 59, detail of forewing; 60, head, frontal view; 61, median part of mesosoma, dorsal view; 62, first metasomal tergite. 58 , 59: scale-line $(=1 \times$ ); 62: $0.7 \times$; $60: 1.2 \times ; 54,55,56,61: 1.3 \times ; 57: 2.7 \times$.
slightly lighter proximally, light or dark brown......................................... . 2
2. Fourth sternite with large apical patch of micropubescence; mesoscutum and mesopleuron finely, rather sparsely punctate; New Guinea accline (Kohl)

- Fourth sternite without micropubescence; sculpture more coarse
. 3

3. Median and submedian lobes of clypeus fused into a single protruding lobe (fig. 71); mesoscutum coarsely, rather densely punctate; Philippines
magnum sp. n.

- Median and submedian lobes of clypeus well recognizable (figs. 65, 70); mesoscutum transversely strigose, with fine punctation between the striae

4. Petiolus strongly curved (fig. 68); wings light brown; China . . . . . . . . . . . . . lividum sp. n.

- Petiolus weakly curved (fig. 66); wings dark brown; Batjan ...........fabricator (Smith)


## Chalybion accline (Kohl) <br> (figs. 63-64)

Sceliphron (Chaiybion) accline Kohl, 1918: 33, 76, \& New Guinea, Finschhafen (ZMB; examined).
Chalybion (C.) accline; Bohart \& Menke, 1976: 102.

## Description.

Body length $17.2-21.5 \mathrm{~mm}$, length of forewing $13.2-16.8 \mathrm{~mm}$ (the type is the largest specimen). Integument dark blue, head, metasoma and legs with violaceous reflections; wings brownish hyaline, forewing proximally slightly less dark. The $\widehat{\delta}$ is not known.

Head. - Clypeus with distinct median and submedian lobes, the median lobe slightly narrower than the submedian lobe (fig. 64); interocular distance across vertex short, about as long as second flagellomere; clypeus sparsely punctate, frons more densely punctate, laterally still with distinct shiny interspaces; ocelli well developed.

Mesosoma. - Sculpture compared with other members of the fabricator-group fine; pronotum, scutellum and metapleuron sparsely finely punctate, mesoscutum and mesopleuron rather densely, finely punctate, with distinct shiny interspaces; propodeum anteriorly finely, posteriorly rather coarsely transversely striate, laterally with additional punctation; scutellum medially with weak longitudinal impression.

Metasoma. - Petiolus distinctly shorter than hind basitarsus, weakly curved (fig. 63); fourth sternite largely covered with micropubescence.

Indices. - FR 0.95; OR 0.58; CR 0.77; HCR 0.72; MR 2.3; PBR 0.73-0.82.

Material examined.
Type. - The holotype is a $\rho$ in the ZMB, labelled "D. NGuinea, Finshafn, 1910, Hertle", "Sc. acclinis n. sp., Type, ¢, det. Kohl".

New Guinea. - 1 ¢, Milne-Bay, 1 ¢, Sinhang, Huon Golf, 1898, Biro (both RMNH); 2 \&, Hollandia, July 1938, L. J. Toxopeus (RMNH).

## Chalybion fabricator (Smith) <br> (figs. 65-67)

Pelopoeus fabricator Smith, 1861: 123, \& - Batjan, leg. Wallace (OUM; examined).
Sceliphron (Chalybion) gnavum Kohl, 1918: 33, 77, fig. 22a, ㅇ - Batjan (NMW; examined).
Chalybion (C.) fabricator; Bohart \& Menke, 1976: 102.
Description.
Body length 19.6 mm , length of forewing 14.7 mm . Dark blue, metasoma with violaceous reflections; wings dark brown, their bases hardly paler (not subhyaline, as Smith (1861) states. The $\hat{\delta}$ is not known.
Head. - Clypeal lobes well differentiated, the median narrower than the submedian (fig. 65); clypeus rather sparsely finely punctate, frons densely strongly punctate; ocelli well developed.

Mesosoma. - Pronotum and scutellum distinctly, rather sparsely punctate; mesoscutum transversely strigose, the interspaces shallowly punctate; mesopleuron densely coarsely punctate; metapleuron anteriorly finely punctate, posteriorly transversely strigose; propodeum dorsally strigose, posteriorly and laterally punctate to reticulatepunctate.

Metasoma. - Petiolus moderately curved, shorter than hind basitarsus (fig. 66); fourth sternite without micropubescence.

Indices. - FR 0.94; OR 0.65; CR 0.82; HCR 0.80; MR 2.4; PBR 0.76.

## Material examined.

Types. - The holotype of $P$. fabricator Smith is a $q$ in the Saunders-collection (OUM), labelled "Bac", "Pelopoeus fabricator Smith". The holotype of S. gnavum Kohl probably is a $\varphi$ in the NMW, labelled " 18 " (Mocsary's handwriting, sec. Dr J. Papp, TMB), "fabricator Sm. det. Kohl" and "Scel. gnavum Kohl, \&, det. Maidl". The type was originally in the TMB, according to the original publication. Apparently Kohl removed the type-label, concluding that his $C$. gnavum was a junior synonym, and left the specimen in Vienna. The two types are still the only specimens known.

> Chalybion lividum sp. n.
> (figs. $68-70$ )

## Description.

Body length $16.5-20.0 \mathrm{~mm}$, length of forewing


Figs. 63-72. 63-64, Chalybion accline (Kohl), \&, New Guinea. 63, first metasomal segment; 64, clypeus. 65-67, Chalybion fabricator (Smith), \&, holotype of Chalybion gnavum (Kohl), Batchian. 65, clypeus; 66, first metasomal segment; 67, detail of forewing. 68-70, Chalybion lividum sp. n., q, holotype, China. 68, first metasomal segment; 69, detail of forewing; 70, clypeus. 71-72, Chalybion magnum sp. n., \&, holotype, Philippines, Luzon. 71, clypeus; 72 , first metasomal tergite. 64, 65, 70, 71: scale-line ( $=1 \times$ ); 63, 66, 68, 72: $0.5 \times ; 67,69: 0.75 \times$.
$12.3-14.4 \mathrm{~mm}$ (type resp. $16.5,12.3 \mathrm{~mm}$ ). Head and mesosoma deep blue, metasoma and legs violaceous, antennae brown; wings rather uniformly brown, proximally somewhat more hyaline. The $\widehat{\delta}$ is not known.

Head. - Clypeus with well defined median and submedian lobes (fig. 70), which are sharper and narrower than in the related species; clypeus rather densely strongly punctate, frons with punctures coalescing into transverse striae; ocelli well developed.

Mesosoma. - Pronotum weakly punctate-strigose; mesoscutum strongly transversely strigose, the striae curving posterad in the middle, interspaces shallowly punctate; mesopleuron punctate, ventrally rather sparsely and coarsely, dorsally finely, very densely; scutellum sparsely punctate; anterior part of metapleuron densely finely punctate, posterior part strongly transversely strigose; propodeum strongly transversely strigose, interspaces medially and on sides punctate.

Metasoma. - Petiolus strongly curved, distinctly shorter than hind basitarsus (fig. 68); fourth sternite without micro-pubescence.

Indices: FR 0.86 ; OR 0.75 ; CR 0.75 ; HCR 0.78 ; MR 2.3; PBR 0.68-0.83.

## Material examined.

Holotype. - , China, "Yachow to Mupin, June 23-27 1929; 2000-5000 ft" (USNM).
Paratypes. - 1 \&, China, Foochow, June 1936, M. S. Yang (RMNH); 1 \&, Yungshien, Kwangsi, China, 1933, G. Liu (MCZ).

## Chalybion magnum sp. n. <br> (figs. 71—72)

Description.
Body length $20.5-24.5 \mathrm{~mm}$, length of forewing $15.5-18.0 \mathrm{~mm}$ (type resp. $20.5,15.5 \mathrm{~mm}$ ). Body dark greenish blue, mesoscutum and metasoma dark blue; legs and antennae dark violaceous to brown; wings dark brown. The $\hat{\delta}$ is not known.

Head. - Clypeus with median and submedian lobes fused into a single broad lobe, with nearly straight apical margin (fig. 71); clypeus rather densely, coarsely punctate; frons punctate-reticulate; ocelli reduced, small and flat, sunk below level of surrounding integument.

Mesosoma. - Pronotum sparsely punctate, with traces of transverse striae; mesoscutum and mesopleuron densely, coarsely punctate, mesoscutum posteriorly faintly transversely striate; scutellum and anterior part of metapleuron finely punctate; posterior part of metapleuron anteriorly nearly smooth, posteriorly with some coarse punctures and transverse striae; propodeum with strong
striae, which are laterally replaced by dense strong punctation.

Metasoma. - Petiolus rather weakly curved, shorter than hind basitarsus (fig. 72); fourth sternite without micropubescence.

Indices: FR 0.97 ; OR 0.74 ; CR 0.72 ; HCR 0.87 ; MR 2.2; PBR $0.67-0.88$.

Material examined.
Holotype. - \&, Philippines, "Mt. Makiling, Luzon, Baker" (USNM).

Paratypes. - Philippines, 1 \& , Island Samar, Baker (CH); 1 ¢, Island Sibuyan, Baker (USNM); 1 \&, Leyte, Mt. Pangasugan, $200 \mathrm{~m}, 7$ May 1952, F. Baseng (RMNH).

In the paratypes from Sibuyan and Leyte the median and submedian lobes of the clypeus are indicated by two small incisions. In all paratypes the metapleuron is more strongly sculptured, punctate-strigose over most of the posterior part.

## Chalybion malignum (Kohl) (figs. 73-79)

Sceliphron (Chalybion) malignum Kohl, 1906: 192, q Ceylon (NMW; examined); Kohl, 1918: 74, figs. 42-44 ( $\mathrm{O}, \mathrm{m}$ ).
Sceliphron (Chalybion) horni Strand, 1915: 91, \& Ceylon (DEI; examined).
Chalybion (C.) malignum; Bohart \& Menke, 1976: 102.

## Description.

Body length ㅇ $16.8-22.0 \mathrm{~mm}$, $\hat{0} 14.5 \mathrm{~mm}$; length of forewing ㅇ $12.5-14.3 \mathrm{~mm}, \widehat{\delta} 10.4 \mathrm{~mm}$. Dark blue, metasoma and legs dark violaceous; wings proximally hyaline, distally dark brown, with violaceous reflections, the two areas sharply delimited.

Head. - Clypeus with well defined lobes, submedian slightly broader than median (fig. 75, 79); clypeus sparsely, rather strongly punctate; frons punctate-reticulate; ocelli not reduced; presence and position of placoids on antenna of $\widehat{0}$ unknown.

Mesosoma. - Pronotum and mesoscutum strongly transversely strigose, interspaces shallowly punctate; mesopleuron densely rather coarsely punctate, the punctures with tendency to coalesce into transverse striae; posterior part of metapleuron strongly transversely strigose; propodeum reticulate-rugose to punctate-reticulate, along the sides of the dorsum smooth with coarse transverse striae. Claws of hind tarsi with inner subbasal tooth.

Metasoma. - Petiolus moderately curved, shorter than hind basitarsus (fig. 73); fourth sternite of ㅇ without micropubescence; eighth sternite of $\hat{\delta}$ approximately triangular (fig. 77); genitalia: see fig. 78.

Indices. - Q: FR 0.94; OR 0.69; CR 0.72; HCR


Figs. 73-83. 73-79, Chalybion malignum (Kohl). 73, ¢, Indonesia, Sumatra, first metasomal segment. 74-76, ¢, Indonesia, Bawean. 74, pronotum, lateral aspect; 75, clypeus; 76, sixth sternite. 77-79, $\widehat{0}$, India, Sikkim. 77, eighth sternite; 78, genitalia, ventral view; 79, clypeus. 80-83, Chalybion ammophiloides nom. nov., \&, holotype, Kenya. 80, pronotum, lateral view; 81, first metasomal segment; 82 , detail of forewing; 83 , clypeus. 74-76, 79, 80, 82: scaleline $(=1 \times)$; 73: $0.5 \times$; 81: $0.75 \times$; 83: $1.5 \times ; 77,78: 2 \times$.
0.82; MR 2.1; PBR 0.62-0.71. ठ̂: FR 0.92; OR unknown; CR unknown; HCR 0.65; MR 2.2; PBR 0.73 .

Variation. - Stemmaticum in larger specimens with, in smaller specimens without a longitudinal carina. Colour pattern of wings weak in specimens from Sikkim and Tenasserim: dark distal area not sharply defined, and paler than usual.

Material examined.
Types. - The holotype of S. malignum Kohl is a $\varphi$ in the NMW, labelled "Ceylon", "malignum, type det. Kohl". The holotype of S. borni Strand is a $q$ in the DEI, labelled "Pankulam, Ceylon, W. Horn 99", "Chalybion malignum Kohl, det. Kohl 1906" and "Sceliphron horni m., \&, Strand det.'

Sri Lanka. - 1 \&, Kandy, 16-31 Aug. 1976, S. Karunaratne (USNM).

India. - $1 \hat{\text { on }}$, Sikkim, coll. Bingham (ZMA).
Burma. - 1 \&, Tenasserim, Haundraw Valley, Aug. 1891, Bingham (BMNH).

Malaysia. - 1 \&, Johore, Kota Tinggi, 16 May 1949 (BMNH).

Indonesia. - Sumatra, 1 \&, Lampong Bergen Est., June 1953. A. Sollaert (RMNH), 1 \&, Pakam-Batu, May-June 1963, O. Milton (RMNH); Java, 1 \&, Palaboean Ratoe, Dec. 1935, F. Dupont (RMNH), 1 ㅇ, South Bantam, Bajah, 300 ft., Jan. 1938 (BMNH); 1 \&, Nias, Labewa, Kleiweg de Zwaan (RMNH); 1 \&, Bawean, Regenzeit, H. Frühstorfer (RMNH).

## Group of Chalybion tibiale (F.)

## Diagnosis.

Head. - Mandible of $q$ with inner subapical tooth; hypostomal cavity about as long as wide (HCR 1.0-1.1) except in C. ammophiloides; segments of maxillary palpi weakly differentiated, third hardly dilated, fourth to sixth little longer than third, except in C. ruficorne; clypeus of $\mathcal{Y}$ usually with five lobes, median lobe narrower than submedian.

Mesosoma. - Pronotal collar with median impression, except in C. ruficorne; lateral furrow of pronotum anteriorly not sharply delimited; metapleuron not or hardly sunk below level of mesopleuron and propodeum, but forming a continuous, smooth surface with these parts: the mesosoma is streamlined; metapleuron ventrally without angular carina; propodeum anteriorly with a rim, immediately behind the metanotum; tarsi without plantulae; claws of hind tarsi with or without inner subbasal tooth.
Metasoma. - Fourth sternite of $Q$ without micropubescence, except in C. tibiale, C. heinii, C. kenyae and C.tomentosum; sixth sternite of 9 rounded, not trunctate; eighth tergite of $\widehat{\delta}$ with cerci.

## Key to the species of the group of Chalybion tibiale (F.)

1. Legs, antennae, and first and second metasomal segment, including the petiolus reddish; mesosoma and remaining part of metasoma bright greenish blue; propodeum transversely striate, with very weak punctation; Kenya ammophiloides nom. nov.

- Coloration different; if the metasoma is partly reddish (C. ruficorne), than propodeum punc-tate-strigose

2. Propodeal dorsum closely and finely transversely striate, punctation indistinct; small and slender species: forewing of $\uparrow 8.9-12.0 \mathrm{~mm}$, of $\widehat{\delta} 7.3-8.9 \mathrm{~mm}, \mathrm{MR} 2.7-3.2$

- Propodeal dorsum nearly smooth to punctatestrigose; larger and more stoutly built species: forewing of $911.0-15.8 \mathrm{~mm}$, of $\widehat{\delta} 9.2-12.2$ $\mathrm{mm}, \mathrm{MR} 2.0-2.4$


3. Metapleuron somewhat sunk below level of mesopleuron and propodeum: mesosoma not perfectly streamlined


- Mesosoma completely streamlined: the metapleuron forms part of a continuous, regularly curved surface

4. Mesoscutum finely to rather coarsely punctate, the punctures without tendency to coalesce into transverse striae; forewing proximally hyaline, or at least much less dark than apical part; claws of hind tarsi without inner subbasal tooth; flagellum of $\hat{\delta}$ with placoids on fourth to eighth segment; clypeus of $\hat{\sigma}$ with three small teeth (fig. 87); Chad to South Arabia . . . . . . . . . . . . . . . . . . . . . beinii (Kohl)

- Mesoscutum coarsely punctate, punctures with tendency to coalesce into transverse striae; forewing usually entirely dark; claws of hind tarsi with inner subbasal tooth; flagellum of $\hat{\delta}$ with placoids on sixth to eighth segment; clypeus of $\widehat{\delta}$ without recognizable teeth (fig. 92); Kenya parvulum sp. n.

5. Punctation of mesoscutum obsolete; forewing brown, with violaceous reflections; mesosoma violaceous; Kenya . . . . . . . . . . . kenyae sp. n.

- Punctation of mesoscutum distinct, though rather sparse; forewing clear, darkened along apical margin only; mesosoma blue or greenish blue


6. Meso- and metasoma with conspicuous white tomentum; clypeus of $\widehat{\delta}$ with five teeth (fig. 125); flagellum of $\widehat{\delta}$ with placoids on fourth to eighth segment; Somalia
tomentosum sp. n .

- Meso- and metasoma without conspicuous to-
mentum; clypeus of $\hat{\delta}$ with three teeth; flagellum of $\widehat{\delta}$ with placoids on fifth to eighth segment; $\uparrow$ unknown; Ethiopia
planatum (Arnold)

7. Pronotal collar without median impression, in lateral aspect low and rounded (fig. 104); mesoscutum coarsely punctate; petiolus much longer than hind basitarsus; Central African Republic ruficorne sp. n .

- Pronotal collar with median impression, high and narrow in lateral aspect (fig. 115); mesoscutum often finely punctate; petiolus about as long as hind basitarsus

8
8. Mesosoma olive-green to black; clypeus, legs and antennae often largely ferruginous; Senegal to Zaire bocandei (Spinola)

- Mesosoma bright metallic blue to dark violaceous; clypeus always, legs and antennae usually dark 9

9. Claws of hind tarsi without inner subbasal tooth; punctation of mesoscutum very weak; mesosoma blue; erect pubescence of head and mesosoma usually white

- Claws of hind tarsi with inner subbasal tooth; punctation of mesoscutum rather strong; mesosoma dark violaceous; erect pubescence of head and mesosoma black12

10. Legs except the coxae entirely reddish; Kenya, Tanzania sommereni (Turner)

- Legs with at least the femora and trochanters violaceous11

11. Wings dark brown, with violaceous reflections; flagellum of $\widehat{\delta}$ with placoids on eighth and ninth segment; South Africa to Zaire and Kenya . . . . . . . . . . . . . . . laevigatum (Kohl)

- Wings light brownish hyaline; flagellum of $\widehat{\delta}$ with placoids on seventh to ninth segment; Kenya (q unknown) mochii $\mathrm{sp} . \mathrm{n}$.

12. Metapleuron strongly sculptured: with transverse striae or strong coalescing punctures; fourth sternite of $Q$ without micropubescence; legs entirely dark metallic; Liberia to Uganda schulthessirechbergi (Kohl)

- Metapleuron rather finely punctate; fourth sternite of $q$ largely covered with micropubescence; hind tibiae usually ferruginous; South Africa
tibiale (Fabricius)


## Chalybion ammophiloides nom. nov. (figs. 80-83)

Ammophila cyanea Cameron, 1908: 268, ㅇ - Meru (NRS; examined) (nec Sphex cyanea Fabricius [=Chalybion californicum (Saussure)]).
Chalybion laevigatum; Leclercq, 1955: 47; Bohart \& Menke, 1976: 102.

## Description.

Body length 14.5 mm , length of forewing 10.5 mm . Body greenish blue, reddish to fuscous are: legs except the coxae, mandibles, antennae, tegulae, petiolus, second and third sternite, first and second tergite and third laterally. Wings yellowish hyaline. Erect pubescence of head and mesosoma white, mesosoma entirely covered with sparse silvery tomentum, face with very dense silvery tomentum (much denser than in C. sommereni).

Head. - Clypeus (fig. 83) with median lobe narrower than submedian; clypeus sparsely rather finely punctate, frons coarsely, rather densely punctate.

Mesosoma. - Pronotal collar in dorsal view 0.6 times as long as wide (longer than in C. laevigatum and allied species), in lateral view (fig. 80) the anterior slope is differentiated in anterior vertical and posterior sloping part; median line of mesoscutum hardly impressed; scutellum with distinct median impression; metapleuron slightly sunk below level of mesopleuron and propodeum, thus mesosoma not perfectly streamlined (though better than in C. heinii); propodeum 0.78 times as long as high; thorax sparsely rather finely punctate; propodeum transversely striate, with faint traces of punctation between the striae. Third submarginal cell of forewing very wide (fig. 82). The type lacks hind claws.

Metasoma. - Petiolus as long as hind basitarsus, weakly curved (fig. 81); sternites without micropubescence.

Indices. - FR 0.93; OR 1.0; CR 0.94; HCR 0.86; MR 2.1; PBR 0.98.

## Material examined.

Holotype. - $\uparrow$ (not a $\hat{\delta}$, as stated in the original description), "Meru Nieder", "Ngare na nyuki", "Sjöstedt", "Ammophila cyanea Cam. type" (NRS).

## Chalybion heinii (Kohl) <br> (figs. 84-89)

Sceliphron (Chalybion) beinii Kohl, 1906: 189, 194, 197, ot 9 - "Gischin, S. Arabien" (Qishn, S. Yemen) (NMW; not examined); Kohl, 1918: 23, 28, 56; Arnold, 1928: 235, 236, 239; Guiglia, 1938: 199 (Erythrea, E. Sudan).
Chalybion beinii; Leclercq, 1955: 46; Bohart \& Menke, 1976: 103.

## Description

Body length $13.1-15.1 \mathrm{~mm}$, ô $9.9-14.9 \mathrm{~mm}$, length of forewing $\uparrow 8.8-10.1 \mathrm{~mm}$, ô $7.0-9.5$ mm . Body deep bleu, legs violaceous. Wings hyaline, distal third, occasionally distal two thirds in


Figs. $84-97.84-89$, Chalybion beinii (Kohl). $84-86, \widehat{\text { on }}$, Tchad. 84 , genitalia, ventral view; 85 , inner side of left half of aedeagus; 86, eighth sternite. 87, đ̂, Saudi Arabia, clypeus. 88-89, ¢, Somalia. 88, clypeus; 89, pronotum, lateral view. $90-91$, Chalybion kenyae sp. n., ㅇ, holotype, Kenya. 90, clypeus; 91, first metasomal segment. 92-95, Chalybion
fuscated. Erect pubescence of head and mesosoma white.

Head. - Interocular distance below shorter than across vertex; clypeus of $q$ (fig. 88) with median lobe much narrower than submedian, lateral lobes distinct; clypeus of $\widehat{\delta}$ with three small teeth (fig. 87); clypeus sparsely finely punctate; frons densily coarsely punctate; flagellum of $\hat{\delta}$ with placoids on fourth to eighth segment.

Mesosoma. - Pronotal collar long, in dorsal view about 0.55 times as long as wide, in lateral view (fig. 89) anterior slope nearly straight; metapleuron not forming a continuous streamlined surface with mesopleuron and propodeum, but slightly sunk below these parts, particularly in the middle; propodeum long, in dorsal view longer than thoracal part of mesosoma, 1.6 times as long as median height of mesosoma; pronotum, scutellum, and mesopleuron sparsely rather finely punctate; mesoscutum sparsely finely to rather coarsely punctate, punctures not or hardly with tendency to coalesce; metapleuron posteriorly smooth, with some punctures, or with weak transverse striae; propodeum finely transversely striate, medially with fine, laterally with stronger punctures between the striae. Claws of hind tarsi without inner subbasal tooth.

Metasoma. - Petiolus shorter than hind basitarsus; fourth sternite of $q$ typically without, but in African specimens with transverse patch of micropubescence; eighth sternite of $\hat{\delta}$ (fig. 86) pointed; genitalia of $\hat{\delta}$ (figs. 84, 85): outer ventral margin of aedeagus with a few teeth.

## Material examined.

Yemen. - 1 \&, Aden, 2 April 1895 (BMNH); 1 \&, W. Aden Prot., Dhala, 4800 ft., Sep. 1936, B. F. Haythornthwaite (BMNH); 1 ô 1 \&, Hais, Tihama, 25 April 1976, A. Mochi (CM).

Saudi Arabia. - $1 \delta^{\hat{3}}$, Abu-Arish, 23-29 March 1980, K. M. Guichard (CH); 2 §, Wadi Jowra, $17^{\circ} 15 \mathrm{~N}, 43^{\circ} 00$ E, 30 Dec. 1946, G. V. Popov (BMNH); 1 \& , Ktubu, G. W. Bury (BMNH).

Djibouti. - 4 아 2 ô, (MNHN).
Somalia. - 3 ô 2 \&, Bio Dia, 17 April 1949, K. M. Guichard (BMNH).

Ethiopia. - 2 \&, Dire-Daoua, 3 June 1836, Ulenhuth (RMNH); 2 ठ̂, Africa Or., Katona, Assab, 1 Feb.-10 March 1907 (RMNH).

Tchad. - 1 ठ̂, Doba, 380 m, 1970, F. A. Bink (ZMA).

Chalybion kenyae sp. n.
(figs. 90-91)
This species is very similar to C. planatum, differing only in a few details of sculpture and colour from that species. The species are known from only one $q$ resp. two $\widehat{\text { or }}$ specimens; more specific characters will probably be discovered when the opposite sexes are found.

## Description.

Body length 15.4 mm , length of forewing 11.9 mm . Body violaceous, legs and antennae largely black. Forewing brown, proximally slightly less dark, hindwing only darkened along apical margin. Erect pubescence of head and mesosoma white.

Morphology. - Like C. heinii, except for the following.

Head. - Clypeus (fig. 90) with median lobe nearly as wide as submedian; frons medially longitudinally rugose-punctate, lateral quarters only finely sparsely punctate.

Mesosoma. - Pronotal collar in dorsal view 0.7 times as long as wide; in lateral view the anterior slope is nearly straight (cf. fig. 115); metapleuron not sunk below level of mesopleuron and propodeum: mesosoma completely streamlined; propodeum in dorsal view slightly longer than thoracal part of mesosoma, 1.4 times as long as median height of mesosoma; pronotum and mesonotum obsoletely punctate; meso- and metapleuron sparsely finely punctate, metapleuron posteriorly largely smooth; propodeum medially finely transversely striate, laterally punctate.

Metasoma. - Petiolus much shorter than hind basitarus (fig. 91); fourth sternite with large semicircular patch of micropubescence.

Indices. - FR 1.0; OR 0.98 ; CR 0.86; HCR 1.0; MR 2.8; PBR 0.70.

Material examined.
Holotype. - , Kenya, "Brit. E. Africa, Marsabit, R. J. Stordy, 1912-329" (BMNH).

> Chalybion parvulum sp. n. (figs. $92-95$ )

Description.
Body length \& $13.0-13.5 \mathrm{~mm}$, $\widehat{0} 12.2 \mathrm{~mm}$; length of forewing $99.4-9.6 \mathrm{~mm}, \widehat{ } 9.2 \mathrm{~mm}$ (type $\delta$ ). Body dark blue, legs violaceous. Wings proxi-

[^1]

Figs. 98-110. 98-99, Chalybion mochii sp. n., đ̂, holotype, Kenya. 98, genitalia, ventral view; 99, eighth sternite. 100-105, Chalybion ruficorne sp. n., ©̂, holotype, Central African Republic. 100, maxillary palpus; 101, first metasomal segment; 102, genitalia, ventral view; 103, eighth sternite; 104, pronotum, lateral view; 105, clypeus.
mally slightly darkened, apical third brownish. Erect pubescence of head and mesosoma white.

Morphology. - Like C. heinii (Kohl), except for the following.

Head. - Clypeus of $Q$ with five short, rounded lobes of nearly equal size (fig. 93), of $\widehat{\delta}$ toothless (fig. 92); flagellum of $\hat{\delta}$ with placoids on sixth to eighth segment, frons very densely, coarsely punctate.

Mesosoma. - Propodeum 1.7 times as long as median height of mesosoma; pronotal collar anteriorly with transverse striae, dorsally sparsely punctate; mesoscutum transversely strigose and with sparse punctures; laterally the striae are indistinct, replaced by the punctures; mesopleuron with sparse fine punctures, coalescing into faint transverse striae; scutellum and anterior part of metapleuron sparsely finely punctate; posterior part of metapleuron hardly punctate, with some fine transverse striae. Claws of hind tarsi with inner subbasal tooth.

Metasoma. - Petiolus nearly as long as hind basitarsus, fourth sternite of $Q$ without micro-pubescence; eighth sternite (fig. 94) pointed; genitalia (fig. 95); outer ventral margin of aedeagus without teeth, cuspis more slender.

Indices. - $\widehat{0}$ : FR 0.88; OR 1.05; CR 0.66; HCR 0.88; MR 3.1; PBR 0.95. ©: FR 0.91; OR 1.0; CR 0.83 ; HCR 1.0; MR 3.0; PBR 0.8-0.9.

## Material examined.

Holotype. - $\widehat{0}$, "Africa", "25 IX 51; 1" (BMNH). Unfortunately the locality of the type could not be traced. It is probably from Kenya, as are the paratypes. The paratypes are all severely damaged, and thus unfit to serve as holotype.

Paratypes. - 1 §ิ, "Uganda, Turkana Prov., D. R. Buxton, L. Rudolf Rift Valley exp., 1934, BM 1935-267" (BMNH); 2 ㅇ, "Brit, E. Africa, Marsabit, R. J. Stordy, 1912-329" (BMNH). At present, both localities are in Kenya.
Variation. - In the ô and one of the $q$ paratypes the body is violaceous, the forewing entirely brown, and the striae of the mesoscutum rather weak.

## Chalybion planatum (Arnold) (figs. 96-97)

Sceliphron planatum Arnold, 1951: 139, fig. 31, © Ethiopia, Danakil (BMNH; examined).
Chalybion (C.) beinii; Leclercq, 1955: 53; Bohart \& Menke, 1976: 102.

Description.
Body length 14.2 mm , length of forewing 9.8 mm . Body dark blue, legs violaceous. Wings hyaline, only darkened along apical margins. Erect pubescence of head and mesosoma white.

Morphology. - Like C. beinii, except for the following.

Head. - First and second flagellomere equally long; placoids on fifth to eighth flagellomere.

Mesosoma. - Punctation of mesoscutum fine; metapleuron not sunk below level of mesopleuron and propodeum: mesosoma completely streamlined.

Metasoma. - Genitalia (fig. 97): digitus wider and without teeth along outer ventral margin, cuspis of slightly different shape, volsellar plate with distinct, blunt apical process.

Indices. - FR 1.0; OR 1.1; CR 0.79; HCR 1.2; MR 3.0; PBR 0.73.

Material examined.
Lectotype. - $\widehat{\text { § }}$, "Ethiopia, Mille-River, $1500 \mathrm{ft}, 27$ July 1946, K. M. Guichard, BM 1945-89", by present designation. Paralectotype, labelled similarly, in the SAM. The types are still the only specimens known of this species.

Note. - C. planatum is very similar to $C$. heinii, and was synonymized with that species by Van der Vecht in Bohart \& Menke (1976: 102). Examination of the types, and in particular the genital apparatus has convinced me that the differences are sufficient to retain C. planatum as a separate species.

## Chalybion mochii sp. n. <br> (figs. 98-99)

Description.
Body length 14.3 mm , length of forewing 9.5 mm . Body blue, legs largely violaceous. Wings light brownish hyaline, apical margins infuscated. Head and mesosoma with conspicuous white tomentum, like in C. sommereni.

Head. - Clypeus with three small teeth; flagellum with placoids on seventh to ninth segment; clypeus sparsely finely punctate, frons sparsely more coarsely punctate.

Mesosoma. - Pronotal collar in dorsal view 0.55 times as long as wide, in lateral view the anterior slope is nearly straight (cf. fig. 115); metapleuron not sunk below level of mesopleuron and propo-

[^2]deum, but forming a continuous smooth surface with these parts; propodeum in dorsal view longer than thoracal part of mesosoma, 1.3 times as long as median height of mesosoma; punctation of pronotum and mesonotum obsolete; meso- and metapleuron sparsely finely punctate; propodeum finely sparsely punctate, transverse striae on dorsum very weak. Claws of hind tarsi without inner tooth.

Metasoma. - Petiolus as long as hind basitarsus; eighth sternite (fig. 99) broadly triangular; genitalia (fig. 98): aedeagus dilated, without teeth along outer ventral margin.

Indices. - FR 0.78; OR 1.1; CR 0.81; HCR 1.0; MR 2.2; PBR 1.0.

## Material examined.

Holotype. - $\widehat{\delta}$, Kenya, Travo, Kuaguni, 27 Nov. 1972, coll. A. Mochi (CM).

## Chalybion ruficorne sp. n. <br> (figs. 100-105)

Description.
Body length 15.3 mm , length of forewing 10.0 mm . Head and mesosoma blue, metasoma violaceous; antennae (only the four proximal segments present), legs except the coxae and hind femora, tegulae, petiolus and first tergite anteriorly bright ferruginous; hind femora violaceous. Wings yellow apically greyish yellow. Erect pubescence of head and mesosoma white; face and mesosoma with sparse silvery tomentum; fourth to sixth sternite covered with long adpressed brown pubescence, apical margins of fourth and sixth sternites with fringes of flattened brown setae. The $Q$ is not known.

Head. - Fourth to sixth segments of maxillary palpi slender (fig. 100); clypeus (fig. 105) with broad, flattened apical margin, largely composed of the submedian lobes; clypeus nearly impunctate, frons with sparse strong punctures.

Mesosoma. - Pronotal collar (fig. 104) long, without median impression, in dorsal view 0.7 times as long as wide; mesoscutum long and narrow, longer than shortest distance between the tegulae (unlike any other Chalybion); mesopleural flange anteriorly not keeled; metapleural flange slightly expanded into a narrow lamella (like in C. californicum (fig. 5), but less strong); metapleuron very slightly sunk below level of mesopleuron and propodeum, thus mesosoma not completely streamlined; pronotum, scutellum and mesopleuron sparsely rather strongly punctate; mesoscutum rather densely strongly punctate; metapleuron me-
dially with weak striae, posteriorly sparsely punctate; propodeum transversely strigose, interspaces dorsally and laterally distinctly punctate. Claws of hind tarsi with inner subbasal tooth.

Metasoma. - Petiolus as long as hind femur, anterior half straight, posteriorly curved (fig. 101); eighth sternite triangular (fig. 103); genitalia (fig. 102); outer ventral margin of aedeagus with row of teeth; cuspis proximally with dense, long pubescence, volsellar plate long, sharply pointed.

Indices. - FR 1.0; OR 0.91; CR 0.88; HCR 1.0; MR 2.3; PBR 1.5.

## Material examined.

Holotype. - $\delta^{\star}$, Central African Republic, "Uamgebiet, Bosum, 11-20.6.14, Tessmann S." (Bozoum, at river Ouham, $6^{\circ} 16 \mathrm{~N}, 16^{\circ} 22 \mathrm{E}$ ) (ZMB).

## Chalybion tibiale (Fabricius)

(figs. 106-108)

Sphex tibialis Fabricius, 1781: 444, \& - Cape of Good Hope, Coll. Banks (BMNH; examined).
Sceliphron (Chalybion) tibiale; Kohl, 1918: 70; Arnold, 1928: 241.
Chalybion tibiale; Leclercq, 1955: 47; Bohart \& Menke, 1976: 103; Gess \& Gess, 1980: 11 (nesting); Callan, 1985: 25 (roosting).

## Description.

Body length ¢ $16.5-20.0 \mathrm{~mm}$, ô $15.7-16.2$ ठ̂; length of forewing ㅇ $11.5-14.4 \mathrm{~mm}$, $\widehat{\text { ® }} 11.1-11.6$ mm . Body dark violaceous blue, mandibles slightly ferruginous; proximal three or four flagellomeres usually light ferruginous, legs usually with at least hind tibiae an tarsi light ferruginous, often also mid tibiae and mid and fore tarsi; antennae and legs rarely entirely dark; wings brown. Erect pubescence of head and mesosoma black; face with sparse silvery tomentum.

Head. - Clypeus of $\&$ (cf. fig. 111) with median lobe small, much narrower than submedian lobes; clypeus of $\hat{\delta}$ (cf. fig. 116) with three small blunt teeth; clypeus sparsely punctate; frons sparsely rather coarsely punctate, punctures coalescing into longitudinal striae above antennal insertions. Antenna of $\hat{\delta}$ with placoids on eighth an ninth flagellomere.

Mesosoma. - Pronotal collar in dorsal view 0.4 times as long as wide, in lateral view (cf. fig. 115) the anterior slope is nearly straight; mesoscutum without median longitudinal impression; sides of mesosoma completely streamlined, metapleuron not sunk below level of mesopleuron and propodeum; pronotum, mesonotum and meso- and metapleuron rather densely, coarsely punctate; propodeum rather densely coarsely punctate, and
with weak transverse striae. Claws of hind tarsi with inner subbasal tooth.

Metasoma. - Petiolus shorter than hind basitarsus (cf. fig. 114); fourth sternite with large semicircular patch of micropubescence; eighth sternite of $\widehat{\delta}$ (fig. 107) approximately triangular; genitalia (figs. 106, 108); aedeagus dilated and without teeth along outer ventral margin.

Indices. - Y: FR 0.91; OR 0.91; CR 0.85; HCR 1.1; MR 2.3; PBR 0.81-0.93. © ${ }^{\text {o }}$ : FR 0.88; OR 1.1; CR 0.90; HCR 1.1; MR 2.2; PBR 0.88-0.93.

Material examined.
Type. - The Banks collection (BMNH) contains one specimen standing under Sphex tibialis F., labelled "Africa", apparently the holotype, since no specimens are in the Fabrician collections at Copenhagen (Van der Vecht, 1961a: 42), and there are no indications in the original description that Fabricius had more than one specimen.

South Africa. - 16 ¢ 23 万人, all from Cape Province and Southern Transvaal, several localities (BMNH, IRSNB, OUM, USNM, ZMA, RMNH, SAM, KMMA, NCI, CH).

## Chalybion bocandei (Spinola)

(figs. 109-112)
This species is thought to consist of two well characterized subspecies, which can be separated by means of the following key.

1. Mesosoma black, clypeus usually with apical third or more ferruginous; mesoscutum finely punctate; Senegambia to Gabon
bocandei (Spinola)

- Mesosoma olive-green; clypeus entirely dark; mesoscutum rather coarsely punctate; Central African Republic, Zaire ....aeronitens ssp. n.


## Chalybion b. bocandei (Spinola)

Ammophila bocandei Spinola, 1851: 36, ô - Guinea (type lost); Spinola, 1853: 52, 53.
Pelopoeus fuscipennis Smith, 1856: 229, \& - Sierra Leone (BMNH: examined).
Sceliphron (Chalybion) fuscipennis; Kohl, 1906: 190, 195; Kohl, 1918: 21, 27, 72 (우, © ); Arnold, 1928: 235, 241.

Sphex laevigatum nigrithorax Benoit, 1951: 127, \&, © Ghanga, Liberia (holotype $\widehat{\widehat{\gamma}}, \mathrm{KMMA}$, examined).
Chalybion fuscipenne; Leclercq, 1955: 46; Bohart \& Menke, 1976: 102.
Chalybion bocandei; Bohart \& Menke, 1976: 102.
Description.
Body length of $16.2-20.0 \mathrm{~mm}$, ô $11.3-16.0$ mm ; length of forewing $\uparrow 11.0-14.8 \mathrm{~mm}$, $\widehat{\delta}$ $9.0-11.5 \mathrm{~mm}$. Head and mesosoma black, without metallic reflections, metasoma violaceous blue; cly-
peus ferruginous on apical margin to apical half, proximal six to seven segments of antennae ferruginous, legs largely ferruginous; wings brown. Erect pubescence of head and mesosoma grey to black, at least vertex and mesosomal dorsum with dark grey pubescence; face with sparse silvery tomentum.

Morphology. - Like C. tibiale, except for the following. Mesoscutum with weak median depression, mesonotum sparsely finely punctate, mesoand metapleuron more densely finely punctate; propodeum finely punctate with weak transverse striae; claws of hind tarsi without inner subbasal tooth; petiolus usually slightly longer than hind basitarsus; fourth sternite of $q$ without micropubescence.

Indices. - Q: FR 0.93; OR 0.95; CR 0.89; HCR 0.97; MR 2.4; PBR 1.0-1.1. © : FR 0.95; OR 1.0; CR 0.83; HCR 0.98; MR 2.5; PBR 1.0-1.1.

## Material examined.

Approximately 50 ¢ $40 \widehat{o}$ were examined. Only the localities are given here.

Types. - The type of Ammophila bocande $i$ is not in the Spinola collection (MZU), neither in the MNHN; thus we can reasonably assume that the specimen is lost. The description agrees in all respects with the species usually called C. fuscipenne, except for the wing venation. The forewing is said to have "cellulis quattor cubitalibus, prima tertia et quarta formae consuetae, secunda minore triangulare oblique petiolata, nervos duos recurrentes excipiente." It seems most likely that the situation described is only an anomaly, such as the ones described in the related species C. laevigatum by Leclercq (1955: $47-50$, figs. $2-7$ ).

The lectotype of $P$. fuscipennis, by present designation, is a , labelled "Sierra Leone, Morgan 42-31" and "fuscipennis Sm." (Smith's handwriting). A second Q , paralectotype, is labelled "Presented by the Revd. D. F. Morgan". Both specimens are in the BMNH.

Senegal and Gambia. - Dakar; Thies Region; Fatick; Keneba (BMNH; USNM; RMNH; CJH).

Mali. - Bamako (ZMA).
Ivory Coast. - Danangoro (Maraoue) (KMMA).
Guinea. - N'zerekore (RMNH).
Sierra Leone. - Kebgama, Njala, Rokupr; Chutes de Samlia R., N. Camie (SAM, IRSNB, BMNH).

Liberia. - Mt. Coffee; Citrus Lys; Zwedru Dist. 2; Ghanga (KMMA; USNM).

Upper Volta. - Pala, near Bobo-Dioulasso; Tangreela, near Banfora (CJH).

Ghana. - Labadi, Kumasi; Neija; Accra (BMNH).
Nigeria. - Olokemeji, Ibadan; Ekpene; Warri Dist.; Ile-Ife, W. State; Fashola, W. State; Zugurma, W. State, Ibadan; Porto Novo, Lagos; Jebba Bacita env. (USNM; SAM; ZMA; RNMH; DEI).

Congo. - Fernand-Vaz (CP).
Soudan. - W. Darfur, N. Djebel Murra, Killing (BMNH).


Figs. 111-122. 111-112, Chalybion bocandei aeronitens ssp. n., Zaire. 111, $\uparrow$, holotype, clypeus; 112, $\delta^{2}$, paratype, clypeus. 113-119, Chalybion laevigatum (Kohl). 113-115, 9 , Rhodesia. 113, clypeus; 114, first metasomal segment; 115, pronotum, lateral view. 116-119, $\widehat{\delta}$, Kenya. 116, clypeus; 117, genitalia, ventral view; 118, eighth sternite; 119,

Cameroun. - Kribi; Ebolowa (RMNH).
Equatorial Guinee. - Nkolontangan (RMNH).
Gabon. - Without locality (RMNH).

## Chalybion bocandei aeronitens ssp. n.

Chalybion laevigatum; Leclercq, 1955: 47 (Zaire, several localities, partly as var. sommereni).

## Description.

Body length of $14.7-18.7 \mathrm{~mm}$, ô $11.6-14.9$ mm , length of forewing ㅇ $11.2-12.9 \mathrm{~mm}$, $\widehat{\delta}$ $8.6-11.1 \mathrm{~mm}$. (type $\uparrow$ resp. 18.3, 12.3 mm ). Head and mesosoma dark bronze green, metasoma violaceous, antennae black, proximal half to variable extent ferruginous (only first flagellomere ferruginous in type) legs dark violaceous (type) to largely ferruginous; wings brown. Erect pubescence of head and mesosoma white to greyish; face with sparse silvery tomentum.

Morphology. - Like the nominate subspecies, but mesonotum rather coarsely punctate; propodeum very densely rather coarsely punctate, posteriorly with additional transverse striae. Indices. ㅇ: FR 0.92; OR 0.89 CR 0.91; HCR 1.0; MR 2.2; PBR 1.1. ठ̀: FR 0.84; OR 1.1; CR 0.80; HCR 1.0; MR 2.3; PBR 1.0.

Material examined.
Holotype. - \& Zaire, "Eale, XI 1931, H. J. Bredo" (IRSNB).
Paratypes. - Zaire: 1 \&, Coquihatville, 15 Oct. 1922 (USNM); 1 ¢, Kongolo, $5^{\circ} 25$ S, $27^{\circ}$ E; 6 Nov. 1974, R. Baker (BMNH); 1 \&, Haut Uele, Paulis, Feb. 1947, P. L. Benoit; 1 \&, Bambesa, 16 Nov. 1938, J. Vrijdagh; 2 \& Lulua, Kapanga, April 1933, G. F. Overlaet; 1 \&, Abumombazi, 18/26 Feb., 1932, H. J. Bredo; 1 ठ̊, Eala, June 1932, A. Corbisier (KMMA, CH); 1 \&, Stanleyville, 11 May 1926, Dr. H. Schouteden; Eala, 1 ¢, Nov. 1931, 1 \&, March 1932, 1 ठ̂, May 1934, 1 § , Nov. 1934, H. J. Bredo; 1 \& $\uparrow$, July 1935, J. Ghesquiere, 2 \& $\uparrow$, June 19032, A. Corbisier; 1 个, Coquihatville, 14 Oct. 1922, J. Bequaert; 1 \&, Bambesa, 12 Sep. 1938, J. Vrijdagh; 1 ¢, Lulua, Kapanga, April 1933, F. G. Overlaet; 1 \&, Haut-Uele, Paulis, June 1947, P. L. G. Benoit; 1 ठ, Kivu, Walikale, 16 Jan. 1915, J. Bequaert; 1 §, Bambesa, 24 March 1938, J. Vrijdagh, 1 §, Kasai, Tshikapa, April 1939, Mevr. Bequaert (IRSNB, RMNH: CH); $1 \delta^{\hat{\prime}}$, Walikale, $1^{\circ} 25$ S, $28^{\circ}$ E, 16 Jan. 1915 (SAM); 1 \&, prov. Maniema, Kinou, 1917, L. Burgeon (MNHN).
Central African Republic. - 22 \& 22 ठ̂, Kembe, $4^{\circ} 29$ N, $21^{\circ} 53$ E, July-Aug. 1985, Dolfuss (NMW, duplicates in RMNH, BMNH, USNM, CH).

The specimens from Central Africa are less distinctly green that the type and other specimens
from Zaire. C. brocandei aeronitens occurs sympatrically with C. laevigatum in part of Southern Zaire.

Chalybion laevigatum (Kohl)<br>(figs. 113-119)

Pelopoeus chalybeus Smith, 1856: 229, \& - Port Natal, The Gambia (BMNH; examined) (nec Pelopoeus chalybeus Van der Linden, 1827).
Pelopoeus (Chalybion) laevigatum Kohl, 1888: 155, ㅇ, , $\widehat{\delta}$ - Zanzibar (ZMB; not examined).

Sceliphron levigatum Dalla Torre, 1897: 387 (unjustified emendation).
Sceliphron cubitaloide Strand, 1910: 47, © - Port Natal (type depository not known).
Sceliphron (Chalybion) laevigatum; Kohl, 1918: 69; Arnold, 1928: 237.
Chalybion laevigatum; Leclercq, 1955; 47,figs. 2-7; Bohart \& Menke, 1976: 103.
Chalybion benoiti Leclercq, 1955: 52, figs. 8, ㅇ, $\widehat{\delta}$ South Mozambique (KMMA; examined) [new synonymy].

## Description.

Body length ㅇ $16.5-19.1 \mathrm{~mm}$, ô $13.5-15.5$ mm ; length of forewing $\uparrow 12.0-14.4 \mathrm{~mm}$, $\widehat{\delta}$ $10.2-12.3 \mathrm{~mm}$. Body dark blue, legs violaceous to black, antennae black, occasionally the proximal four segments ferruginous; mandibles slightly reddish; wings brown. Erect pubescence of head and mesosoma white, rarely dark grey; face with sparse white tomentum.

Morphology. - Like C. tibiale, except of the following. Mesoscutum with median longitudinal depression, laterally somewhat swollen; pronotum and mesonotum obsoletely punctate, meso- and metapleuron more densely finely punctate; propodeum densely finely punctate, and with weak transverse striae; claws of hind tarsi without inner subbasal tooth; fourth sternite of $\$$ without micropubescence.

Indices. — Y: FR 0.93; OR 0.84; CR 0.92; HCR 1.0; MR 2.3; PBR 0.72-0.96. ${ }^{\text {o }}$ : FR 0.83; OR 1.0; CR 0.90; HCR 1.0; MR 2.3; PBR 0.90-1.0.

Material examined.
Only the localities of the many specimens examined (approximately $100 \% 50 \delta$ ) are given.
Types. - Lectotype of Pelopoeus chalybeus, by present designation, is a $\varphi$ labelled "Natal", "chalybaeus Smith, type" (Smith's handwriting). Paralectotype is a $\delta$, labelled "Gambia", " 42 ". The latter specimen belongs to C. bocandei (Spinola), and does not agree with the de-

[^3]scription, but it is the only specimen old enough and from the Gambia in the BMNH.

Kenya. - Tana River; Shimba Hills; Kilifi; Diani Beach; Rabai; Taveta Fox; Mombasa; Masongaleni; 30 km S. Mombasa (USNM; BMNH; CP; CG).

Tanzania. - Mpanga; Old Shinyanga (RMNH; BMNH)

Zaire. - Lubumbashi; Sandoa; Kapanga; Elisabethville; Usambara; Tupele; Mwandingusha; La Panda; Kahwasa; Jadotville (USNM; IRSNB; KMMA; FSAG).

Angola. - Luanda; R. Giraul, 10 mls . NE. Mocamedes (USNM; BMNH).
Zimbabwe. - Rhodesdale; Victoria Falls; Amtili; Sawmills; Hope Fountains; Helen Vale; Bulawayo; Salisbury (BMNH; USNM; SAM).

Malawi. - Phalombe, Mt. Mulanje; Limbe, Nantipwili; Monkey Bay; Monkey Bay 15 km SE; Lingadzi, nr. Domira Bay; Ntchisi Forestry; Salima; Zoma; Chilwa; Chikaluma; Nkudzi Bay; Nkhata Bay; Mlunguzi est.; Zomba; Upufa; Kasuman (RMNH; ZMA; CH).

Mozambique. - Chimonzo; Massangena Dist., Saye River; Valley of Kola River, nr. E. Mt. Chiporone; Goba; Maputo; Inhaca Isl., Nampula Baragem; Rikatla; Beira (ZMA; USNM; SAM; BMNH; NCI).
Swaziland. - Moanane (ZMA).
Namibia. - Kombat (BMNH).
South Africa. - Udumu; Pieter Maritzburg; Scottburgh; Warmbad; Port St. Johns; Mtubatuba; Potsietersrus; Durban; St. Lucia; Mooketsi; Punda Milia (USNM; ZMA: RMNH; IRSNB; NCI; CH).

## Chalybion schulthessirechbergi (Kohl) (figs. 120-122)

Sceliphron (Chalybion) schulthessirechbergi Kohl, 1918: 73, ㅇ - Zaire, near Kisantu (NMW; examined); Arnold, 1928: 235, 238.
Chalybion schulthessirechbergi; Leclercq, 1955: 46; Bohart \& Menke, 1976: 103.

## Description.

Body length \& $18.0-20.8 \mathrm{~mm}$, ô $14.7-16.0$ mm , length of forewing $\$ 14.4-15.7 \mathrm{~mm}$, $\hat{\delta}$ $10.9-12.1 \mathrm{~mm}$. Body dark blue to violaceous, mandibles ferruginous; wings dark brown. Erect pubescence of head and mesosoma black.

Morphology. - Like C. tibiale, except for the following. Clypeus of $\hat{\delta}$ (fg. 122) with submedian teeth wider than median; mesosoma slightly stockier; scutellum not or hardly with median impression; sculpture of mesosoma stronger, particularly in the $\mathcal{P}$ : metapleuron with strong punctures, partly or largely coalescing into striae; propodeum transversely rugose-punctate; petiolus about as long as hind basitarsus; eighth sternite of $\hat{\delta}$ (Fig. 121) with rather narrow apical process.

Indices. - Q: FR 0.90; OR 0.86; CR 0.87; HCR 1.0; MR 2.1; PBR 0.97-1.0. © ${ }^{\text {: }}$ FR 0.87; OR 1.1; CR 0.83; HCR 1.1; MR 2.1; PBR 1.1.

Material examined.
Type. - The only type specimens, and consequently the holotype appears to be a specimen in the NMW, labelled "Congo Belg., Kisantu"; the TMB possesses no type material although the original publication states that the type is property of that museum.

Liberia. - 1 O, Mt. Coffee, April 1897, R. P. Currie (USNM); 1 \&, Mangopley, 11 Jan. 1950, coll. Himmelheber (Mus. Basel).

Ivory Coast. - 1 \&, Danangoro (Maraoue), June 1975, P. M. Elsen (KMMA).

Nigeria. - 1 \&, S. Nigeria, Ekpene, 1929 (SAM); 1 §, Nov. 1973, J. T. Medler (BMNH); 1 \&, S. Nigeria, Gambari Forest, Dec. 1969, D. C. D. Happold (BMNH).

Cameroun. - 1 \&, Ebolowa, Nkoemvon, 30 Nov.-20 Dec. 1979, D. Jackson (BMNH).

Uganda. - 1 \&, Betw. Jinja \& Busia or Mbwago's, E. Busoga, 3800-4000 ft., 1 Aug. 1911, 1 \&, S. of Lake George, 3200-3400 ft., 17-19 Oct. 1911, both S. A. Neave (BMNH).

Gabon. - 1 \& , Ogoue, Lambarene; 1 , , betw. Lambarene and the sea (both CP).

Congo. - 1 \&, Djiri, 9.VI.1978, Dr. Onore (CP).
Zaire. - 1 §̂, Kivu, Uvira, 24-28 Dec. 1952, P. Basilewski; 1 \&, Kivu, Mboko, 1 Sep. 1927, C. Seydel; 1 \&, Kasai, Tshikapa-Tshisaka, 1938, J. Ghesquière; 1 ¢, Kunungu, Nkele, 1938, coll. Schouteden; 1 \&, Sankuru, Komi, 26 Jan. 1930, J. Ghesquière; 1 \&, Equateur, Bokote, 1922, R. P. Hulstaert; 1 Q, Mayidi, 1945, P. van Eeyen; 1 \&, Coquihatville, J. Bequaert (all KMMA).

## Chalybion sommereni (Turner)

Sceliphron (Chalybion) sommereni Turner, 1920: 267, of - Kabete, near Nairobi (BMNH; examined). Sceliphron (Chalybion) perpulchrum Arnold, 1934: 27, 아 - British East Africa (type depository unknown).

Chalybion laevigatum sommereni; Bohart \& Menke, 1976: 103.

## Description.

Body length ㅇ $15.5-18.4 \mathrm{~mm}$; length of forewing $q 11.0-11.9 \mathrm{~mm}$. Body bright blue; proximal seven antennal segments, tegulae, and legs except the coxae bright ferruginous; wings brownish hyaline, apically brown. Erect pubescence of head and mesosoma white; face densely, mesosoma sparsely covered with silvery-white tomentum. The $\hat{\delta}$ is not known.

Morphology. - Like C. tibiale, except for the following. Mesoscutum with weak median impression; pronotum and mesonotum sparsely finely punctate; meso- and metapleuron more densely finely punctate; propodeum finely punctate and with weak transverse striae; claws of hind tarsi without inner subbasal tooth; fourth sternite of $\mathcal{q}$ without micropubescence.

Indices. - FR 0.92; OR 0.95; CR 0.86; HCR 1.1; MR 2.3; PBR 0.94-1.0.

Synonymy and status. - The description of C. perpulchrum is in all respects applicable to C. sommereni, and to no other Chalybion. The species cannot be considered a subspecies of C. laevigatum, as Bohart \& Menke (1976: 103) did, since it occurs sympatrically with that species in large parts of Tanzania and Kenya, and no intergradation has been observed in specimens from those parts. Material recorded as C. laevigatum var. sommereni by Leclercq (1955: 47) belongs to C. bocandei aeronitens.

## Material examined.

Types. - Of the three syntypes mentioned in the original description of S. sommereni, two are in the BMNH. Both are labelled "Kabete, near Nairobi, Dr. van Someren". The specimen labelled by Turner as the "type" is the lectotype by present designation. The type of S. perpulchrum could not be found in the OUM, the original depository, neither in the SAM, where Arnold's collection is preserved.

Kenya. - 1 \&, Mt. Kenya to Ft. Hall (USNM); 1 ¢, Nairobi, 1 May 1920 (SAM); 1 \&, Nairobi, Nov. 1928, Dr. van Someren (BMNH); 4 ¢, Nairobi, 4 May and 14 June 1920 (BMNH).

Tanzania. - 5 ㅇ, Lake Tanganyika, Prov. Old Shinyanga, 2 April 1958, O. W. Richards (BMNH, RMNH); 1 \&, Tanganyika, Old Shinyanga, 26 Feb. 1952, E. Burtt (BMNH); 3 \& , Lushoto, May 1934, J. P. M. Ingham (BMNH).

## Chalybion tomentosum sp. n. <br> (figs. 123-125)

Description.
Body length \& 18.0 mm , of $13.0-15.0 \mathrm{~mm}$; length of forewing $\$ 12.8 \mathrm{~mm}, \widehat{\widehat{c}} 9.0-10.5$ (type $\hat{\sigma}^{\hat{c}}$ resp. $13.5,9.5 \mathrm{~mm}$ ). Integument greenish blue. Wings clear, infuscated along apical margins. Erect pubescence of head and mesosoma white. Clypeus, frons, mesosoma with conspicuous, dense white tomentum; metasoma with less dense, but still very conspicuous white tomentum.

Head. - Clypeus apically with five teeth (fig. 125); clypeus sparsely punctate, frons sparsely rather finely punctate. Antenna of $\hat{\delta}$ with placoids on fourth to eighth flagellomere.

Mesosoma. - Pronotal collar in dorsal view 0.55 times as long as wide, in lateral view with anterior vertical part and posterior gradual slope (cf. fig. 89); mesosoma completely streamlined: metapleuron not sunk below level of mesopleuron and side of propodeum; pronotum, mesonotum and mesoand metapleuron sparsely finely punctate; propodeal dorsum transversely striate, the striae very fine, medially interrupted and laterally evanescent in the type (stronger and uninterrupted in the paratypes), interspaces obsoletely punctate. Claws
of hind tarsi without inner tooth in $\hat{\delta}$ (the single $\bigcirc$ lacks hind legs).

Metasoma. - Petiolus shorter than hind basitarsus; eighth sternite of $\hat{\delta}$ approximately triangular (fig. 124); genitalia (fig. 123): aedeagus not dilated, without teeth along outer ventral margin.

Indices. - Y: FR 1.0; OR 0.9; CR 0.9; HCR 1.0; MR 2.2; PBR ?. $\widehat{0}$ : FR 1.0; OR 1.0; CR 0.86; HCR 1.0; MR 2.3; PBR 0.67.

## Material examined.

Holotype. - ठ̂, "Coll. A. Mochi, III.35, Baidoa [Iscia Baidoa], Somalia" (CP).

Paratypes. - $1 \hat{\delta}$, same data, $1 \widehat{\delta}, 1$ \&, same, but v. 1935 (CP, 1 ठ ${ }^{\circ}, \mathrm{CH}$ ).

## Group of Chalybion bengalense

(Dahlbom)

## Diagnosis.

Medium-sized species. Erect pubescence of head and mesosoma white, except in C. zimmermanni.

Head. - Mandible of $¢$ with inner subapical tooth; segments of maxillary palpi weakly differentiated, third segment hardly dilated, fourth to sixth not much longer than third; hypostomal cavity about as long as wide (HCR 0.9-1.1), except in C. omissum; clypeus of $\hat{\delta}$ with three small teeth.

Mesosoma. - Pronotal collar with median impression; metapleuron without angular carina posteriorly, distinctly sunk below level of mesopleuron and propodeum; propodeum with anterior rim, immediately behind the metanotum. Tarsi without plantulae; claws of hind tarsi without inner subbasal tooth, except in C. omissum and sometimes in C. bengalense and C. petroleum.

Metasoma. - Sixth sternite of $q$ rounded, not truncate; eighth sternite of $\widehat{\delta}$ with cerci.

Key to the species of the group of Chalybion bengalense (Dahlbom)

## (The $\widehat{\delta}$ of $C$. klapperich $i$ is unknown)

1. Ot (twelve antennal segments) . . . . . . . . . . . 2

- $\widehat{\delta}$ (thirteen antennal segments) .......... 12

2. Fourth sternite with large patch of micro-pubescence, covering at least most of its posterior half

- Fourth sternite without micro-pubescence, or with small patch on anterior half ......... 9

3. Dorsum of propodeum longitudinally striate on posterior half; Afghanistan
klapperichi (Balthasar)

- Dorsum of propodeum transversely striate, anteriorly as well as posteriorly

4. Clypeus with three broad apical lobes of nearly


Figs. 123-135.123-125, Chalybion tomentosum sp. n., $\widehat{\text { ® }}$, holotype, Somalia. 123, genitalia, ventral view; 124 , eighth sternite; 125, clypeus. 126-131, Chalybion bengalense (Dahlbom). 126-127, đ̂, Sri Lanka. 126, clypeus; 127, eighth sternite. 128, $\widehat{\delta}$, Thailand, genitalia, ventral view. 129-131, ¢, Sri Lanka. 129, clypeus; 130, first metasomal segment;
equal width, the lateral lobes are absent (fig. 162); mesoscutum and mesopleuron very coarsely and densely punctate, interspaces hardly recognizable, anterior part of metapleuron shiny, only with a few weak punctures, contrasting sharply with the coarse sculpture of the metapleuron; posterior half of metapleuron transversely striate; Yugoslavia to Kazakhstan walteri (Kohl)

- Outer lobes of clypeus present, though sometimes small (figs. 145, 156); median lobe often much narrower than submedian lobes; punctation of anterior part of metapleuron nearly as strong as that of propodeum and mesopleuron

5. Petiolus strongly curved (fig. 137); median lobe of clypeus very narrow, acute (fig. 136); propodeum apically without lateral spots of tomentum; Thailand, Indochina, China, Japan japonicum (Gribodo)

- Petiolus not strongly curved (fig. 130); median lobe of clypeus usually wider; propodeum with apicolateral spots of tomentum

6
6. Petiolus nearly as long as hind basitarsus (PBR 0.85-0.98)

7

- Petiolus much shorter than hind basitarus (PBR 0.58-0.77)

8
7. Metapleuron strongly transversely striate; mesopleuron very densely punctate, the punctures more or less coalescing into striae; lateral lobes of clypeus as strong as submedian (fig. 145); Greece, Turkey ...... minos (De Beaumont)

- Metapleuron not striate; mesopleuron with comparatively weak, not coalescing punctation; lateral lobes of clypeus much smaller than submedian (fig. 158); Philippines: Luzon
vechti sp. n.

8. Median lobe of clypeus much narrower than submedian lobes (fig. 147); clypeus rather weakly convex; propodeum dorsally reticulaterugose; claws of hind tarsi with inner subbasal tooth; Yugoslavia to Israel
omissum (Kohl)

- Median lobe of clypeus about as wide as submedian lobes (fig. 156); clypeus strongly convex; propodeum dorsally transversely strigose, with weak punctures between the striae; hind claws without inner tooth; Central Asia: Tadzhikistan, Kazakhstan
turanicum (Gussakovskij)

9. Metapleuron transversely striate; clypeus slightly longer than shortest interocular distance across clypeus; Mediterranean region to Pakistan and Arabia ..... flebile (Lepeletier)

- Metapleuron without striae; clypeus shorter than shortest interocular width across clypeus

10
10. Clypeus without lateral lobes (fig. 167); erect pubescence of head and often of mesosoma black; petiolus much shorter than hind basitarsus (PBR 0.65-0.75); North and Central America ...........zimmermanni Dahlbom

- Clypeus with lateral lobes (fig. 152); erect pubescence of head and mesosoma white; petiolus nearly as long as hind basitarsus (PBR $0.87-0.98$ )

11
11. Pronotal collar with strongly differentiated vertical part anteriorly, which is concave, and impunctate (fig. 151); frons sparsely punctate, interspaces medially as large as the punctures; Iran, Bahrein ............ petroleum sp. n

- Pronotal collar with less strongly differentiated vertical part anteriorly (fig. 131), here punctate and not concave; frons densely punctate to punctate-reticulate, interspaces medially not recognizable; East Africa, Oriental region to New Guinea, Australia: Darwin Peninsula ............. bengalense (Dahlbom)

12. Eighth metasomal sternite with narrow apical process (figs. 127, 138, 143, 149); flagellum without placoids on fourth and fifth segment, except in C. petroleum

- Eighth sternite without narrow process, more or less triangular (figs. 133, 154, 160, 165, 169); fourth and fifth flagellomere with placoids except in C. zimmermanni and C. vechti.... 17

13. Petiolus strongly curved (fig. 137); only eighth and ninth flagellomere with placoids; mesoand metapleuron densely coarsely punctate . . . . . . . . . . . .... japonicum (Gribodo)

- Petiolus weakly curved (fig. 130); sixth and seventh flagellomere often with placoids; sculpture variable

14. Petiolus much shorter than hind basitarsus (PBR 0.68-0.70); flagellum with placoids on eighth and ninth segment only
omissum (Kohl)

- Petiolus nearly as long as hind basitarsus (PBR $0.87-1.0$ ); flagellum with placoids on sixth and seventh segment
 sternite. 134, ठ, Greece, Rhodes, genitalia, ventral view. 135, \&, Italy, clypeus. 125, 126, 129, 131-133, 135: scaleline $(=1 \times)$; 130: $0.5 \times$; 123, 124, 134: $2 \times$; 127, 128: $3 \times$.




142
$-1$ -

15. Metapleuron strongly transversely striate; mesopleuron very densely punctate, punctures more or less coalescing into transverse striae minos (De Beaumont)

- Metapleuron not striate; mesopleuron comparatively sparsely punctate, with well recognizable smooth interspaces 16

16. Second to fourth flagellomere with placoids (fig. 150); pronotal collar with short vertical part anteriorly, which is sharply differentiated from the nearly horizontal posterior part, slightly concave, impunctate (fig. 151)
petroleum sp. n .

- Second to fourth flagellomere without placoids; pronotal collar with less strongly differentiated anterior vertical part, and behind this more steeply sloping (fig. 131)
bengalense (Dahlbom)

17. Median tooth of clypeus distinctly longer than submedian teeth (fig. 168); head and often mesosoma partly with black pubescence; metapleuron punctate
zimmermanni Dahlbom

- Median and submedian tooth of clypeus equally long (figs. 132, 157, 163); pubescence of head and mesosoma white; sculpture of metapleuron variable

18. Fourth flagellomere without a placoid; ocelli reduced, about as large as surrounding punctures; metapleuron not striate; petiolus as long as hind basitarsus (PBR 0.98-1.0)
vechti $\mathrm{sp} . \mathrm{n}$.

- Fourth flagellomere with placoid; ocelli normal metapleuron posteriorly with transverse striae; petiolus usually shorter

19
19. Clypeus as long as shortest interocular width across the clypeus; petiolus longer (PBR $0.82-0.98$ ) ............. flebile (Lepeletier)

- Clypeus shorter than interocular width across clypeus; petiolus shorter (PBR $0.74-0.86$ ) . . . . . . . . . . . . . . . . . . . . . . . 20

20. Anterior part of metapleuron nearly as strongly and densely punctate as mesopleuron; posterior part of metapleuron weakly and irregularly striate . ..turanicum (Gussakovskij)

- Anterior part of metapleuron much less strongly and densely punctate than the mesopleuron; posterior part of the metapleuron strongly and regularly transversely striate .. walteri (Kohl)

> Chalybion bengalense (Dahlbom)
> (figs. $126-131$ )

Sphex violacea Fabricius, 1775:346, 오 \$ - Cape of Good Hope (coll. Fabricius, Mus. Kiel) (lectotype designated by Van der Vecht, 1961:41) [nec Sphex violacea Scopoli, 1763].
Pelopoeus (Chalybion) bengalensis Dahlbom, 1845: 433, ㅇ $\widehat{\delta}$ - Bengal (Museum Lund; not examined).
Pelopoeus convexus Smith, 1876: 449, © - Mascarenes, Rodriquez (BMNH; examined). [New synonymy].
Scelipbron (Chalybion) bengalense; Kohl, 1906: 194, 197; Bordage, 1912 (not seen); Kohl, 1918: 34, 41, 54; Williams, 1919: 80; Arnold, 1945: 85; Tsuneki, 1967: 8; Tsuneki, 1974: 591.
Chalybion violaceum; Williams, 1919: 119.
Sceliphron violaceum; Dutt, 1912: 233; Rohwer, 1921: 674.

Chalybion (C.) bengalense; Krombein, 1949:386 (Gilbert Isl.); Krombein, 1950: 138 (Guam); Jayakar \& Spurway, 1963: 747; Jayakar \& Mangipudi, 1965: 708; Jayakar \& Spurway, 1965: 169, Van der Vecht \& Van Breugel, 1968: figs. 2, 3, 4; Bohart \& Menke, 1976: 102, fig. 22 I; Tsuneki, 1982b: 8; Tsuneki, 1982c: 57, 72; Joseph, 1982: 403.

## Description.

Body length \& $13.5-17.8 \mathrm{~mm}$, ô $10.6-16.0$ mm ; length of forewing $\& 8.5-11.8 \mathrm{~mm}$, $\hat{\delta}$ $7.0-10.6 \mathrm{~mm}$. Integument blue to greenish blue, legs largely violaceous, antennae black. Wings light brownish hyaline, with apical margins or apical third infuscated to entirely light brown. Propodeum with apicolateral spots of white tomentum.

Head. - Clypeus of $q$ (fig. 129) apically with five lobes, median lobe usually distinctly narrower than submedian (as wide as submedian in specimens from Malaya and Indochina), lateral lobes short, rounded; clypeus of $\hat{\delta}$ with three small teeth (fig. 126); clypeus sparsely rather finely punctate, frons densely coarsely punctate to rugose-punctate; antenna of $\hat{\delta}$ with placoids on fifth or sixth to ninth flagellomere.

Mesosoma. - Pronotal collar with anterior vertical part (cf. fig. 131), laterally with smooth furrow, which is not sharply delimited anteriorly, but fades gradually; scutellum without median impressed line; pronotum and mesoscutum sparsely finely to coarsely punctate; scutellum sparsely finely punctate; mesopleuron densely coarsely punctate to rugose-punctate; anterior part of metapleuron finely punctate, posterior part with a few
large punctures, usually largely smooth; propodeum medially transversely strigose, with shallow punctures, laterally punctate to rugose-punctate. Claws of hindlegs usually without, rarely with small inner subbasal tooth ( $¢$ from Sumatra, Malaya, Indochina). Third submarginal cell anteriorly 1.3-2.9 times as wide as second.

Metasoma. - Petiolus (fig. 130) weakly curved, nearly as long as hind basitarsus; fourth sternite of \& at most anteriorly with small patch of micropubescence; eighth sternite of $\hat{\delta}$ (fig. 127) with slender apical process; genitalia (fig. 128): aedeagus with teeth along outer ventral margin.

Indices. - O: FR 0.84; OR 1.0; CR 0.92; HCR 1.1; MR 2.3; PBR 0.87-0.96. © : FR 0.79; OR 1.1-1.3; CR 0.88; HCR 1.1; MR 2.3; PBR 0.87-1.0.

Variation. - The strong differences in sculpture are largely geographically defined. Fine sculpture is found in East Africa, parts of India and the Philippines; strong sculpture occurs particularly on New Guinea. In the remaining area, sculpture is usually intermediate.

## Material examined

Approximately 1500 specimens. The species occurs commonly throughout the Oriental region to New Guinea and Australia, and occurs also along the Eastern coasts of Africa and on many islands in the Indian and Pacific Oceans. A complete enumeration of localities seems unnecessary, and the following list is consequently restricted to some border-line localities, and to the islands on which the species has been observed.

Africa. - Kenya, Kelife; Tanzania, Dar es Salaam (BMNH); "Congo" (MNHN).

Indian Ocean. - Socotra (BMNH); Mauritius (BMNH; FSAG); Rodriguez (BMNH); Chagos Isl. (BMNH); Maldives (BMNH).
India. - Dehra Dun (USNM); New Delhi (USNM): Bombay (RMNH) [Westernmost localities].

Nepal. - Kathmandu, Pokhara, Sangu, Sundarijal (BMNH, USNM, CG).

China, Shanghai (USNM); Taiwan, Hungt'ou (USNM) [Northernmost localities]

Philippines. - Luzon (USNM, BMNH, RMNH); Leyte (RMNH).

Indonesia. - Sumatra, Java, Borneo, Kangean Isl., Sulawesi, Sumba, Flores, Ternate, Ambon, New Guinea (RMNH, BMNH, USNM, CH).

Australia. - Darwin (USNM); Cairns, Townsville, Daly River Mission, Berimah, Wyndham (in several Australian museums, according to E. McC. Callan, in correspondence).

Pacific Ocean. - Guadalcanal, Horiaka, Line Islands (all BMNH); Marianas Isl., Phoenix Isl., Oahu (all

USNM); Gilberts: Tarawa Isl., Carolines: Palau (Bishop Museum).

Chalybion flebile (Lepeletier)<br>(figs. 132-135)

Pelopoeus flebilis Lepeletier, 1845: 321, \&, $\bar{\delta}$ - Turkey, Izmir (type lost).
Pelopoeus targionii Carruccio, 1872: 273 - Ozieri, Sardegna (type lost).
Sceliphron (Chalybion) targionii; Kohl, 1918: 14, 18, 51; Giner Mari, 1944: 359 (E. Morocco); Balthasar, 1952: 281 (Palestina): De Beaumont, 1961: 2 (Iraq); De Beaumont, 1965: 15 (Greece).
Sceliphron (Chalybion) targioni; De Beaumont, 1947: 384 (Cyprus); De Beaumont, 1962: 19 (South Spain). Chalybion (C.) targionii; Ferton 1921: 346 (bionomics); Bohart \& Menke, 1976: 103.

## Description.

Body length \& $14.7-19.0 \mathrm{~mm}$, ô $13.3-15.5$ mm ; length of forewing $\uparrow 9.0-11.3 \mathrm{~mm}, \hat{\sigma}$ $9.9-10.5 \mathrm{~mm}$. Integument blue to violaceous, antennae black. Wings usually brownish hyaline, with apical third infuscated, sometimes entirely brownish. Propodeum with apicolateral spots of white tomentum.

Head. - Clypeus of $\&$ (fig. 135) apically with five lobes, median lobe as wide or nearly as wide as submedian, lateral lobes short, rounded; clypeus of $\widehat{\delta}$ with three small teeth (fig. 132); clypeus moderately convex, longer than broad, sparsely finely punctate, frons rugose-punctate; antenna of $\hat{\delta}$ with placoids on third or fourth to ninth flagellomere.

Mesosoma. - Pronotal collar with anterior vertical part (cf. fig. 153) (often weakly developed in \&), lateral furrow variable, anteriorly more or less sharply delimited, deep or shallow, with or without transverse rugae; scutellum usually without median impressed line; pronotum sparsely punctate, anterior slope with some transverse striae; mesoscutum sparsely rather coarsely punctate; scutellum and anterior part of metapleuron sparsely finely punctate; mesopleuron densely coarsely punctate; posterior part of metapleuron transversely striate; propodeum medially transverely strigose, laterally densely punctate to punctate-strigose. Claws of hind legs without inner subbasal tooth. Third submarginal cell anteriorly 1.6-1.9 times as wide as second.

Metasoma. - Petiolus weakly curved, nearly as long as hind basitarsus; fourth sternite of $Q$ without micro-pubescence; eighth sternite of $\hat{\delta}$ (fig. 133) triangular; genitalia (fig. 134); aedeagus without teeth along outer ventral margin.

Indices. - Q : FR 0.94; OR 1.0; CR 1.1; HCR 1.0; MR 2.4; PBR $0.75-0.87$. $\widehat{0}$ : FR 0.90; OR 1.2; CR 1.0; HCR 1.0; MR 2.3; PBR 0.82-0.98.

Variation. - The few available specimens from the Eastern part of the range (Eastern Turkey, Arabian peninsula, Pakistan) are characterized by coarse culpture (mesoscutum striate); the specimens from Turkey, Pakistan and the Emirates have an impressed median line on the scutellum, and the males have a placoid on the third flagellomere. As long as these populations are imperfectly known, I prefer not to give them a formal name.

## Material examined.

Types. - The types of both P. flebilis (not in MNHN, nor Torino Museum) and $P$. targionii (not in: MCG, museums of Florence, Sassari, Bologna, Modena; sec. G. Grandi in correspondence with J. de Beaumont) appear to be lost. The interpretation of P. targionii is not problematic, since from Sardegna, the type locality, only one species is known. In the case of P. flebilis, there is no certainty which species was involved. In Turkey four species of Chalybion s. s. have been observed: C. minos, C. omissum, C. walteri and the species generally referred to as $C$. targionii. The first three are ruled out by slight differences with Lepeletier's description: C. minos has the wings only infuscated along the apical margins; C. omissum has no spots of white tomentum on the propodeum; C. walteri is always more or less violaceous, not blue. In order to end all confusion I herewith designate as the neotype of Pelopoens flebilis Lepeletier a $\uparrow$ of the species generally named C. targionii, labelled "Museum Leiden, Greece, Ild. Rhodos, Trianta, 30.vi.1971. L. D. Brongersma" (RMNH). I have seen a specimen from the original type-locality Izmir too, but is was too heavily damaged to serve as the type. Rhodes is in fact only 200 km removed from Izmir.

Other specimens. - Approximately 70 ᄋ,+ 50 § . The following list is restricted to the localities.

Morocco. - Tiznit, Oued Massa; Middle Atlas, Ifrane; High Atlas, Asni-Imlil; Marrakech (RMNH; USNM; CG).

Algeria. - Ain Fezza; Sidi-bel Abbes; El Kantara; (RMNH; MNHN; IRSNB).

Tunisia. - Nefta; Tozeur; (CG).
Spain. - Lanjaron; Benidorm; Imsoren, Pardo Alcaide; Tetuan, Marruecos; 10 km N. Jodar, nr. Guadalquivir; Mijas (RMNH; FSAG).

Italy. - Sardegna; Sicily, Syracuse; Reggio; Sardegna, L. di Coghinas; Sardegna, Musei; Baunei (USNM; RMNH; ZMA; CP; IRSNB; CR).

Greece. - Crete, Messara; Crete, Chora; Crete, Khania; Asterusi Mts.; Ancyia; Parnassos; Pelopenesios, Arkadia, Leonidion; Rhodes, Trianta; Rhodes, Ixia; (RMNH; CO; CH).

Turkey. - Izmir; Antalya; Finike; Urfa; Ovacik; Merkaris (RMNH; CP, BMNH; CG; CH).

Cyprus. - Limassol; Cherkis (RMNH).
Lebanon. - Beyruth; Becharse (RMNH).
Jordan. - Barahta; 13 km N. Irbid; Wadi es Sir (RMNH; CH).

Israel. - "G. B. 4. a."; Tel Jeruchazu (BMNH; RMNH).

Egypt. - Wadi el Ghedeirat, N. Sinai; Abon Zaabal; Saqqara; Cairo; Zagazia; El Faiyum Birket Qarun el Olberge (USNM; SAM; CO; CH).
United Arab Emirates. - Wadi Fay, near Dibba (CR). Saudi Arabia. - Taif (BMNH).
Pakistan. - Near Quetta (BMNH).

> Chalybion japonicum (Gribodo)
> (figs. $136-139$ )

Chalybion curvatum Ritsema, 1880: 226, 9 , $\widehat{\delta}$ - Japan (RMNH; examined) [secondary homonym of Pelopoeus curvatus Smith, 1870].
Pelopoeus japonicus Gribodo, 1883: 264, ㅇ, $\boldsymbol{o}^{i}$ - Japan (MCG; examined).
Pelopoeus (Chalybion) punctatum Kohl, 1888: 155, \& Zanzibar (ZMB: not examined) [presumably incorrectly labelled].
Sceliphron (Chalybion) inflexum Sickman, 1894: 220, \&, ठ - China, Tientsin (type depository unknown); Kohl, 1918: 62; Iwata, 1939: 92 bionomics).
Sceliphron ritsemae Dalla Torre, 1897: 389 (new name for $C$. curvatum Ritsema).
Chalybion japonicum Pérez, 1905: 152 - Central Japan (MNHN; examined) [homonym and synonym of Pelopoeus japonicus Gribodo, 1882].
Chalybion (C.) j.japonicum; Bohart \& Menke, 1976: 102; Tsuneki, 1982a: 6; Tsuneki, 1982b: 57, 72.
Chalybion (C.) japonicum punctatum; Bohart \& Menke, 1976: 102.
Description.
Body length \& $17.5-20.5 \mathrm{~mm}$, ô $14.5-17.0$ mm ; length of forewing ㅇ $10.7-14.1 \mathrm{~mm}$, $\widehat{\delta}$ $9.9-11.8 \mathrm{~mm}$. Integument dark blue, legs more or less violaceous, antennae black. Wings brown. Propodeum apically without spots of tomentum.

Head. - Clypeus of $q$ (fig. 136) with broad submedian lobes, median and lateral lobes narrow, tooth-like; clypeus of $\widehat{\delta}$ with three small teeth (fig. 139); clypeus densely coarsely punctate, frons reti-culate-punctate; antenna of $\hat{\delta}$ with placoids on eighth and ninth flagellomere.

Mesosoma. - Pronotal collar with anterior vertical part (cf. fig. 131), laterally with deep furrow, which is sharply delimited anteriorly; scutellum without median impressed line; pronotum, mesonotum, mesopleuron and metapleuron densely strongly punctate, metapleuron with the punctures sometimes coalescing into weak transverse striae; propodeum transversely punctate-strigose. Claws of hind legs without inner subbasal tooth. Third submarginal cell anteriorly $1.6-2.4$ times as wide as second.

Metasoma. - Petiolus (fig. 137) strongly curved, shorter than hind basitarsus; fourth sternite of $q$ largely covered with micro pubescence; eighth sternite of $\widehat{\delta}$ (fig. 138) with slender apical process; genitalia (cf. fig. 128): aedeagus with teeth
along outer ventral margin.
Indices. - \&: FR 0.83; OR 0.94; CR 0.85; HCR 0.88; MR 2.4; PBR 0.77-0.82. ${ }^{\text {o }}: 0.81$; OR 1.1; CR 0.82 ; HCR 0.95; MR 2.3; PBR 0.82-0.93.

## Material examined.

Types. - The lectotype of C. curvatum Ritsema, by present designation, is a $q$ in the type collection of the RMNH, labelled "Japan, Von Siebold", and with a label in Japanese. There are three paralectotypes, 1 ㅇ, 2 ठ , similarly labelled "Japan, Von Siebold"

The lectotype of P. japonicus Gribodo, by present designation, is a $\circ$ in the MCG, labelled "Giappone", "Pelopoeus japonicus Grib., ©̊ of, Tipo, Giappone"'. I have not seen the $\widehat{\delta}$ specimen mentioned in the description, which should be a paralectotype.

Apparently the holotype of $C$. japonicum Pérez is a $q$ in the MNHN, labelled "Museum Paris, Nippon Moyen, Env. de Tokio et Alpes de Nokko, J. Harmand, 1901" and "Chalybion japonicum Per."
Other material. - Approximately 100 specimens. The following list is restricted to the localities.

Japan. - Chizuka, Okinawa Island; Mitsukuri; Saitoma; Hodagaya; Tokyo; Nahone (BMNH; MNHN; RMNH; USNM).

Korea. - Without localicy (BMNH; RMNH)
China. - Howlik; Hongkong; Thianshan Occid.; Chekiang; Hangtcheou; Macoa; Kwangtung; Sahmgong; Gaofung; Lungtaoshan; Canton; Shanchow, Honan; Suifu; Yachow; Mt. Omei; Kuanshien; Shinkaishi; Chiacopin; Weichow, 65 mls. NE Pekin Chileli; Huanghsiho, Mt. Taishan; Ningyuenfu; Chungking; Chengtu; Yaogi (BMNH; MNHN; RMNH; USNM; CH).

Taiwan. - Fuhosho, Kosempo; Taihanroku (RMNH; USNM).

Vietnam. - Tonkin, Ha Giang; Hanoi (BMNH; USNM).

Thailand. - Without locality (MNHN).
Chalybion klapperichi (Balthasar)
(figs. 140-141)
Sceliphron (Chalybion) klapperichi Balthasar, 1957: 196, ¢ - N. E. Afghanistan, Koksha Vallay, Djurm (holotype, NRS: not examined), Nuristan, Bashgal Valley, near Achmede Dewane (paratype; examined).
Chalybion (C.) klapperichi; Bohart \& Menke, 1976: 102.

## Description.

Body length \& $20.7-21.4 \mathrm{~mm}$, length of forewing \& 14 mm ; $\widehat{\delta}$ unknown. Integument dark bluish violaceous, antennae black. Wings proximally brownish hyaline, distal third brown. Propodeum with apicolateral spots of white tomentum.

Head. - Clypeus strongly convex, wider than long, apical margin with median lobe as wide as submedian, lateral lobes absent (fig. 140); clypeus densely coarsely punctate, except along median line, frons punctate-reticulate.

Mesosoma. - Pronotal collar with anterior ver-
tical part behind slightly concave in lateral view (cf. fig. 153), laterally with deep crenulate furrow, which is sharply delimited anteriorly; scutellum without median impressed line; pronotal collar and mesoscutum punctate-strigose; mesopleuron punctate-reticulate; scutellum and anterior part of metapleuron rather sparsely punctate, interspaces larger than the punctures; posterior part of metapleuron with coarse punctures and short transverse striae; propodeum with characteristic sculpture: striae laterally oblique, medially longitudinal, interspaces shallowly punctate (in specimen from Hindu Kush anterior third transversely striate, in types all striae curved posterad), propodeum posteriorly transversely rugose. The last tarsomeres of the hindlegs were absent in the examined specimens. Third submarginal cell anteriorly 1.3 times as wide as second.

Metasoma. - Petiolus short, weakly curved, posteriorly distinctly wider than anteriorly (fig. 141); fourth sternite largely covered with micropubescence.

Indices. - FR 1.0; OR 0.97; CR 0.95; HCR 0.96; MR 2.1; PBR 0.67—0.71.

## Material examined.

Afghanistan: 1 \&, "J. Klapperich, Achmede Dewane, 2700 đ̂, Bashgul-Tal, Nuristan, 25.7.52, O-Afghanistan" (paratype, NRS); 1 \& , Hindu Kush, near Kamdesh, confluence of R. Suingal \& R. Shkurigal, 1100 ft ., $35^{\circ} 45 \mathrm{~N}$, $15^{\circ}$ E, viii. 1977, P. H. Ryley (BMNH).

## Chalybion minos (De Beaumont) <br> (figs. $142-145$ )

Sceliphron (Chalybion) minos De Beaumont, 1965: 15, ㅇ, ठ - Crete, Sitia (holotype $\uparrow$, coll. Schwarz, Linz; not examined); De Beaumont, 1967: 277 (Turkey).
Chalybion (C.) minos; Bohart \& Menke, 1976: 102.

## Description.

Body length of $17.4-19.2 \mathrm{~mm}$, ô $13.5-17.8$ mm ; length of forewing \& $10.5-11.2 \mathrm{~mm}$, $\hat{\delta}$ $8.7-11.2 \mathrm{~mm}$. Integument dark blue, in $\&$ with greenish shine, in $\hat{\delta}$ with violaceous shine; legs bluish violaceous, antennae black. Wings nearly hyaline, apical margins infuscated. Propodeum apically with small spots of white tomentum.

Head. - Clypeus of $q$ (fig. 145) with five lobes, median lobe much narrower than other four; clypeus of $\hat{\delta}$ with a trace of lateral teeth (fig. 142); clypeus rather densely strongly punctate, frons medially reticulate-rugose; antenna of $\hat{\delta}$ with placoids on sixth to ninth flagellomere.

Mesosoma. - Pronotal collar with anterior vertical part (cf. fig. 131) (ill developed in $\uparrow$ ), laterally with deep crenulate furrow, which is sharply de-
limited anteriorly; scutellum without median impressed line; pronotum, mesoscutum and mesopleuron rather coarsely transversely punctate-strigose; scutellum and anterior part of metapleuron punctate, interspaces resp. smaller and larger than punctures; posterior part of metapleuron coarsely striate; propodeum transversely strigose, medially with weak, laterally with strong punctation. Claws of hind legs without inner subbasal tooth. Third submarginal cell anteriorly 2.0 times as wide as second.

Metasoma. - Petiolus weakly curved, as long as hind basitarsus; fourth sternite of $q$ largely covered with micropubescence; eighth sternite of $\hat{\delta}$ (fig. 143) with rather broad apical process; genitalia (fig. 144); aedeagus with teeth along outer ventral margin.

Indices. - Q: FR 0.86; OR 0.95; CR 0.86; HCR 0.89; MR 2.4; PBR 0.85-0.96. ${ }^{\text {® }}$ : FR 0.84; OR 1.1; CR 0.81; HCR 0.84; MR 2.3; PBR 0.94-0.98.

## Material examined.

Greece. - 1 ô 1 ㅇ, Crete, Katonakros, 19.v.1974, O. W. Richards (BMNH); 1 ô 1 \&, Crete, Sitia, resp. 17-20.vi.1963, J. Gusenleitner, and 19.v.1963, M. Schwarz (RMNH, paratypes); 1 § , Crete, Sitia, 18.v.1963, J. Schmidt (RMNH); 2 \&, Crete, Khora Sfakion, 14/16.vii.1982, 2 ㅇ, Crete, Khania, Mathes Apokoronou, 25.vi.1985, 1 Q Crete, Sitia, 3/5.vi.1984, all Hurkmans ( CH ; CO).

Turkey. - 1 §̂, Alata, nr. Mersin, 29 May 1960, Guichard \& Harvey (BMNH); 1 \& , Balıkesir, Ayvalık, June 1969, J. Schmidt (CG).

## Chalybion omissum (Kohl) <br> (figs. 146-149)

Pelopoeus omissum Kohl, 1906: 22, ㅇ, $\widehat{\delta}$ - Balkan (NMW).
Sceliphron (Chalybion) omissum Kohl, 1906: 193, 196 (emendation); Kohl, 1918: 14, 18, 64.
Sceliphron (Chalybion) omissum; De Beaumont, 1967: 277 (Turkey).
Chalybion (C.) omissum; Bohart \& Menke, 1976: 102.

## Description

Body length \& $16.5-20.8 \mathrm{~mm}$, ô $13.0-17.0$ mm ; length of forewing ㅇ $10.8-13.0 \mathrm{~mm}$, $\hat{\delta}$ $8.3-11.3 \mathrm{~mm}$. Integument violaceous, scutellum, metanotum and propodeum usually blue. Wings brownish hyaline, apical third infuscated. Propodeum apically without spots of tomentum.

Head. - Clypeus only weakly convex; apical margin in $q$ with five lobes, median lobe slightly narrower than submedian lobes (fig. 147); clypeus of $\widehat{\delta}$ with three small blunt teeth (fig. 146); clypeus rather densely punctate, frons punctate-reticulate;
antenna of $\hat{\delta}$ with placoids on ninth and usually eighth flagellomere.

Mesosoma. - Pronotal collar without anterior vertical part, nearly regularly curved in lateral view (cf. fig. 166), laterally with rather shallow smooth furrow, which is weakly delimited anteriorly; scutellum with median impressed line; pronotum weakly punctate, occasionally with a few transverse striae, mesoscutum and mesopleuron densely coarsely punctate, scutellum and anterior part of metapleuron finely rather densely punctate, posterior part of metapleuron sparsely rather coarsely punctate (typically) to transversely striate (specimens from Israel); propodeum dorsally finely transversely strigose, with punctures, laterally punctatereticulate. Claws of hind legs with inner subbasal tooth. Third submarginal cell anteriorly 1.7-2.4 times as wide as second.

Metasoma. - Petiolus distinctly curved, rather short; fourth sternite of $\&$ largely covered with micro-pubescence; eighth sternite of $\widehat{\delta}$ (fig. 149) with broad apical process; genitalia (fig. 148): aedeagus with teeth along outer ventral margin.

Indices. - \& : FR 0.93; OR 0.92; CR 0.84; HCR 0.83; MR 2.1; PBR 0.58-0.70. §ै: 0.91; OR 0.98; CR 0.76; HCR 0.91; MR 2.1; PBR 0.68-0.70.

Material examined.
Type. - The lectotype, by present designation, is a $Q$ in the NMW, labelled "Rhodus, 1884, F. Kohl". A ठ̂, "Rhodus, 80 " is paralectotype. Several more specimens were labelled as types by Kohl, but it remains doubtfull if these were indeed apart of the original type-series. The material was examined in 1960 by Van der Vecht.

Other specimens. - About 32 ¢ 18 ठ; only the localities are given.

Yugoslavia. - Omis; Babuna Valley, nr. Titov. Veles.; Limski Fjord; Rovin; Gravosa; Paklenica; SkarskoJezero; Bale; Novi; Montenegro (ZMA; RMNH; MNHN).

Greece. - "Attica"; Rhodes; Olympia; Mistras; Kerkyra; Corfu (Mus. Copenhagen; IRSNB; RMNH; BMNH; CH; CO).

Turkey. - "Asia Minor" (RMNH).
Israel. - Jeruzalem (RMNH).

> Chalybion petroleum sp. n.
> (figs. $150-152$ )

Description.
Body length \& $14.6-15.9 \mathrm{~mm}$, ô $12.6-14.0$ mm ; length of forewing \& $10.2-10.6 \mathrm{~mm}$, $\hat{\delta}$ $9.0-10.0 \mathrm{~mm}$ (type $\&$ resp. $15.9,10.4$ ). Body blue, mandibles fuscous, antennae black, legs partly violaceous; wings nearly hyaline, infuscated along apical margins; head and mesosoma with white tomentum, which is more abundant than in C. bengalense and other species of this group,
propodeum apicolaterally with large patches of white tomentum．
Head．－Clypeus convex，apically in $甲$（fig．152） with five lobes，median lobe narrower than subme－ dian，in $\hat{\delta}$ with three teeth（cf．fig．126）；clypeus nearly impunctate，frons rather densely punctate， but with distinct flat interspaces；flagellum of $\widehat{\delta}$ （fig．150）with placoids on second to ninth seg－ ment．

Mesosoma．－Pronotal collar with anterior ver－ tical part strongly differentiated（fig．151），concave and shiny；laterally with shallow smooth furrow， which is not delimited anteriorly；scutellum with－ out median impressed line；pronotum，scutellum and anterior part of metapleuron sparsely finely punctate，mesoscutum sparsely rather finely punc－ tate，interspaces larger than the punctures；meso－ pleuron more densely punctate，interspaces as large as the punctures；posterior part of metapleu－ ron largely smooth，with a few coarse punctures； propodeum medially shallowly strigose，laterally coarsely punctate．Claws of hind tarsi with or with－ out inner subbasal tooth（with tooth in type）．Third submarginal cell anteriorly $1.1-1.5$ times as wide as second（1．5 in type）．

Metasoma．－Petiolus weakly curved，nearly as long as hind basitarsus；fourth sternite anteriorly with small patch of micropubescence；eighth me－ tasomal sternite of $\hat{\delta}$ with slender process（cf．fig． 127）；genitalia of male like in C．bengalense（fig． 128）．

Indices．－Q：FR 0．88；OR 0.98 ；CR 1．0；HCR 1．1；MR 2．3；PBR 0．93－0．98．© ：FR 0．82；OR 1．2； CR 0．98；HCR 1．2；MR 2．3；PBR 0．94－1．0．

Material examined．
Holotype．－\＆，＂Bahrain：1970＂（BMNH）．
Paratypes．－ 1 \＆ 3 万人，same data as holotype（BMNH， CH）； 1 ¢ 3 of，Iran，Bushir（Mus．Zurich，RMNH）．

> Chalybion turanicum (Gussakovskij) (figs. $153-156$ )

Sceliphron turanicum Gussakovskij，1935：414，fig．1，\＆， $\hat{\delta}$－＂per totam Asiam mediam et in Persiam boreali＂ （Zoological Inst．，Leningrad；USNM；examined）． Chalybion turanicum；Bohart \＆Menke，1976： 103.

Description．
Body length of $16.9-18.1 \mathrm{~mm}$ ，$\widehat{0} 13.5-15.1$ mm ；length of forewing \＆ $11.5-13.2 \mathrm{~mm}, \hat{\delta}$ $9.2-10.2 \mathrm{~mm}$ ．Integument violaceous，antennae black．Wings hyaline，apical half light brown． Propodeum with apicolateral spots of white to－ mentum．

Head．－Clypeus of $\&$（fig．156）apically with five lobes short，rounded；clypeus of $\widehat{\delta}$ with three
small teeth（cf．fig．163）；clypeus strongly convex， wider than long，sparsely strongly punctate，frons reticulate－rugose；antennae of $\hat{\delta}$ with placoids on fourth to ninth flagellomere．

Mesosoma．－Pronotal collar with anterior ver－ tical part（cf．fig．153）（often weakly developed in O），behind，the slope is slightly concave；laterally with deep crenulate furrow，which is sharply de－ limited anteriorly，scutellum usually with median impressed line；pronotum transversely striate and punctate；mesoscutum and mesopleuron densely coarsely punctate，scutellum more sparsely punc－ tate；metapleuron anteriorly rather coarsely punc－ tate，occasionally with weak striae，posteriorly with coarse punctures and usually transverse striae； propodeum medially transversely striate，laterally densely coarsely punctate．Claws of hind legs with－ out inner subbasal tooth．Third submarginal cell anteriorly 1．8－2．6 times as wide as second．

Metosoma．－Petiolus nearly straight，nearly as long as hind basitarsus；fourth sternite of $q$ with large patch of micro－pubescence；eighth sternite of $\widehat{\sigma}$（fig．154）triangular；genitalia（fig．155）：aedea－ gus without teeth along outer ventral margin．

## Material examined．

Types．－The USNM possesses three syntypes of S．turanicum，29，＂Chiva，Ravat，22／25 June 1927＂， 1 ठิ， Chiva， 5 June 1927＂．A lectotype should be chosen from the material in Leningrad，which I have not seen．

Tazhikistan．－19，Kondara， 35 km N Dushanbe，29－ 30 June 1979，W．J．Pulawski（USNM）； 1 ठ̂，Zeravshan， 13 July 1971，N．Kurzenko（RMNH）；1§， 40 km W． Azhirzatalja， 17 July 1971，Kurzenko（RMNH）．

Kazakhstan．－Alma Ata（Medeo），1q4ठ̂， 26 June 1977，3̂̉， 11 July 1976， 1 ઠ̂， 7 July 1976，all W．J．Pulawski （USNM，BMNH；CH）；19，Yuzkno－Kazach Reg．，Tyul－ bakas Dist．，Aksu－r Dzhabagly Res．， 1 July 1958，G．M．
 and 19 Aug．1967，V．Kazenas（RMNH）；19，Okr，Oz．， Bilikul，Khr．Karatau， 27 July 1971，Kurzenko（RMNH）； 19，Thian Chan Occ．，Monts Susamyr，Ketmen Tjube， 1914，M．Pic．（MNHN）．

Location uncertain．－19，＂Buchara＂，19，＂A．A．Obl．， Karzalinka＂，1\＆，＂Siber．＂（RMNH）．

Chalybion vechti sp．n． （figs．157－161）

## Description．

Body length of $15.5-18.0 \mathrm{~mm}$ ，ô $11.7-13.6$ mm ；length of forewing $\uparrow 10.9-12.3 \mathrm{~mm}$ ，$\hat{\sigma}$ $8.2-10.4 \mathrm{~mm}$（type $q$ resp， $17.6-11.9 \mathrm{~mm}$ ）．Body blue，mandibles dark fuscous，antennae black，legs violaceous；wings entirely brownish hyaline． Propodeum apicolaterally with spots of white to－ mentum．


Figs. 148-158.148-149, Chalybion omissum (Kohl), ô, Yugoslavia. 148, genitalia, ventral view; 149, eighth sternite. 150-152, Chalybion petroleum sp. n., paratypes, Iran. 150, $\widehat{\delta}$, antenna; 151, \&, pronotum, lateral view; 152, clypeus. 153-156, Chalybion turanicum (Gussakovskij), Kazachstan. 153, \&, pronotum, lateral view; 154, $\mathbf{\delta}^{\circ}$, eighth sternite; 155, $\widehat{\delta}$, genitalia, ventral view; 156, \&, clypeus. 157-158, Chalybion vechti sp. n., Luzon. 157, $\widehat{6}$, paratype, clypeus; 158 , ㅇ, holotype, clypeus. $150-153,156-158$ : scale-line $(=1 \times) ; 148,149,154: 2 \times ; 155: \times$.

Head. - Clypeus of $q$ (fig. 158) apically with five small lobes, median lobe slightly narrower than submedian, of $\hat{\delta}$ with three small teeth (fig. 157); ocelli strongly reduced, small an nearly flat; clypeus sparsely, frons densely coarsely punctate; flagellum of $\hat{\delta}$ with placoids on fifth to ninth segment.

Mesosoma. - Pronotal collar with anterior vertical part (cf. fig. 131), laterally with rather shallow smooth furrow, which is sharply delimited anteriorly; scutellum without median impressed line; pronotum with shallow punctures and striae, mesoscutum densely coarsely punctate; mesopleuron and posterior part of metapleuron with less dense strong punctation, scutellum and anterior part of metapleuron more finely punctate; propodeum medially transversely strigose, laterally rugosepunctate. Claws of hind tarsi without inner subbasal tooth. Third submarginal cell anteriorly 1.5 times as wide as second.

Metasoma. - Petiolus weakly curved, as long as hind basitarsus; fourth sternite of $q$ largely covered with micropubescence; eighth sternite of $\hat{\delta}$ triangular (fig. 160); genitalia of $\widehat{\delta}$ (figs. 159, 161): aedeagus with a few teeth along other ventral margin.

Indices. - Q: FR 0.90; OR 0.90; CR 0.90; HCR 0.93; MR 2.6; PBR 0.93-0.97. ${ }^{\text {B }}$ : FR 0.77; OR 1.1; CR 0.82; HCR 1.0; MR 2.6; PBR 0.98-1.0.

## Material examined

Holotype. - \&, Philippines, "Los Banos, P. I., V 30 1915, F. Otanes" (RMNH).

Paratypes. - Philippines, Luzon: 1 \&, Mt. Maquiling, Laguna, 16 July 1938, F. C. Hadler (RMNH); 1 \& , Mt. Maquiling, 23 March 1934, S. R. Capco (RMNH); 1 ㅇ, "Insul. Filip.." (RMS); 1 ㅇ, Los Banos, March 1953, V. Baclig (RMNH); 1 \& 1 ô, Los Banos, 7 March 1953 , Townes Fam. (RMNH); 4 \& 8 ठ', Los Banos, Baker (USNM, CH); 1 ¢ 1 ठ̂, Mt. Maquiling, Baker (USNM); 1 Ô, Los Banos, 8 March 1952, E. Baltazar (RMNH); 1 §̂, Los Banos, 1917, F. X. Williams (RMNH); 1 §̂, Los Banos, 8 March M. Mancera (RMNH); $1 \hat{\delta}$, Mt. Maquiling, 4 March 1954, C. R. Baltazar (RMNH).

This species is very similar to $C$. bengalense, with which it occurs sympatric; C. vechti is recognized by the reduced ocelli, the large patch of mi-cro-pubescence on the fourth sternite of the $q$, and the triangular eighth sternite of the $\widehat{\delta}$. Within the Philippines, C. vechti is also distinguished by its coarser sculpture, and the presence of a placoid on the fifth flagellomere of the $\delta: C$. bengalense exhibits these traits only in other parts of its range.

The species is named after Dr J. van der Vecht, who was the first to recognize it.

## Chalybion walteri (Kohl) <br> (figs. 162-165)

Pelopoeus (Chalybion) walteri Kohl, 1889: 22, 276, qCaucasus and Turcmenia (NMW; not examined). Sceliphron (Chalybion) walteri; Kohl, 1918: 53 (오, ठ̂); Gussakovskij, 1932: 274 (Iran); De Beaumont, 1967: 103.

Chalybion (C.) walteri; Bohart \& Menke, 1976: 103.

## Description.

Body length of $18.0-20.0 \mathrm{~mm}$, $\hat{0} 16.1-19.0$ mm ; length of forewing $\uparrow ~ 11.0-14.3 \mathrm{~mm}$, $\hat{\delta}$ $10.8-12.3 \mathrm{~mm}$. Integument dark violaceous, antennae black. Wings brownish hyaline, apical half more or less strongly infuscated. Propodeum with well-developed apicolateral spots of white tomentum.

Head. - Clypeus strongly convex, apical margin in $\&$ (fig. 162) with three lobes of nearly equal width, lateral lobes absent; clypeus of $\hat{\delta}$ with three broad teeth (fig. 163); clypeus sparsely finely punctate, frons coarsely rugose-punctate; antenna of $\hat{\delta}$ with placoids on fourth to ninth flagellomere.

Mesosoma. - Pronotal collar with anterior vertical part, behind which the slope is slightly concave in lateral view (cf. fig. 153), laterally with deep broad furrow, which is sharply delimited anteriorly and bears some transverse rugae; scutellum with median impressed line; pronotal collar anteriorly striate, posteriorly punctate; mesoscutum and mesopleuron very densely coarsely punctate, comparatively dull; scutellum sparsely finely punctate; anterior part of metapleuron largely smooth and shiny, contrasting sharply with the coarse sculpture of the mesopleuron; posterior part of metapleuron more or less strongly transversely striate; propodeum medially coarsely transversely strigose; laterally rugose-punctate. Claws of hind legs without inner subbasal tooth. Third submarginal cell anteriorly $1.6-2.4$ times as wide as second.

Metasoma. - Petiolus weakly curved, about as long as mid basitarsus, posteriorly distinctly broader than anteriorly; fourth sternite of $\ell$ largely covered with micropubescence; eighth sternite of $\widehat{\jmath}$ (fig. 165) triangular; genitalia (fig. 164): aedeagus without teeth along outer ventral margin.

Indices. - \&: FR 0.95; OR 0.99; CR 1.0; HCR 1.0; MR 2.3; PBR 0.67-0.82. ©̂: FR 0.95; OR 1.1; CR 0.93; HCR 1.0; MR 2.2; PBR 0.79—0.83.

Material examined.
Greece. - 1 \&, Rhodes, Lindos, 22 May 1971, J. P. van Lith (RMNH).

Turkey. - 1 §̂, Pammukkale, 8-9 June 1964, J. Gusenleitner (USNM); 1 ㅇ, Mut, 21 May 1970, 1 § , Urfa, 28 May 1970, both J. Gusenleitner (CG); 1 \&, Konya, July


Figs. 159-170.159-161, Chalybion vechtisp. n., §̂, paratype, Luzon. 159, genitalia, ventral view; 160, eighth sternite; 161, inner side of left half of aedeagus. 162-165, Chalybion walteri (Kohl). 162, \&, clypeus; 163-165, §, Turkey. 163, clypeus; 164, genitalia, ventral view; 165, eighth sternite. 166-170, Chalybion zimmermanni Dahlbom. $166-167$, \&, Mexico. 166, pronotum, lateral view; 167 , clypeus. $168-170$, $\widehat{0}$, Mexico. 168 , clypeus; 169 , eighth sternite; 170, genitalia, ventral view. 162, 163, 166-168: scale-line $(=1 \times$ ); 159-161, 164, 165, 169, 170: $2 \times$.

1906, Dr. Lendl (RMNH); 1 \& Asia minor, Seidenstücker (RMNH); 1 §, Maraş (RMNH); 1 §̂, Van, Mengene Dag̃, N. Başkale, 2700-3000 m, Hurkmans (CO); 2 \&, Ispir, 1300 m, 15.vii. 1986, J. Lucas (CP.).

USSR. - 1 §', ASSR, "...", Bocharnikov (USNM); 1 ᄋ, Caucasus, Leder (RMNH); 1 \&, Ordubad (TMB).
Iran. -2 \&, Salmas (RMNH); 1 § , Schahrad, Stauding (RMNH); 1 \&, Gajereh., 3 July 1975, 2250 m, P. Brignoli (CP).
Lebanon. - 1 \& , Beyruth, Stauding (RMNH).

> Chalybion zimmermanni Dahlbom
> (figs. $166-170$ )

This species is thought to consist of three subspecies, which can be separated by means of the following key, based on males.

1. Erect pubescence of head and mesosoma black; wings uniformly brown; Baja California
peninsularum Bohart \& Menke

- Erect pubescence of head and mesosoma mostly white

2. Wings uniformly brow; Southeastern USA zimmermanni Dahlbom

- Wings proximally hyaline; Utah to W. Texas aztecum (Saussure)


## Chalybion z. zimmermanni Dahlbom

Chalybion zimmermanni Dahlbom, 1843: 22, ¢, © § South Carolina (Museum Lund; not examined); Dahlbom, 1845: 433.
Pelopoeus texanus Cresson, 1873: 210, $\widehat{\text { O }}$ - Dallas, Texas (Philadelphia Academy of Sciences; not examined).
Sceliphron (Chalybion) zimmermanni; Kohl, 1918: 44, 47, 59; Hutson, 1919: 217, 223; Rau, 1940: 591; Rau, 1942; 196; Ward, 1970: 231; Ward, 1971: 264.
Chalybion (C.) z. zimmermanni; Bohart \& Menke, 1963: 112; Bohart \& Menke, 1976: 103; Krombein et al., 1979: 1577.
Description.
Body length of $15.5-18.5 \mathrm{~mm}$, ô $14.1-17.0$ mm ; length of forewing ㅇ $11.0-13.0 \mathrm{~mm}$; $\hat{\delta}$ $9.6-13.4 \mathrm{~mm}$. Integument dark greenish blue, legs largely violaceous, antennae black. Wings uniformly dark brown. f : Erect pubescence of head and mesosoma black; $\delta^{\circ}$ : pubescence of head mostly black, of mesosoma white. Propodeum without apicolateral spots of tomentum.

Head. - Clypeus rather strongly convex, apical margin in $\&$ (fig. 167) with three teeth of equal width, clypeus of $\hat{\delta}$ (fig. 168) with single median tooth, at most with traces of submedian teeth; clypeus rather densely and coarsely punctate, frons punctate-reticulate; antenna of $\hat{\delta}$ with placoids on seventh to ninth flagellomere.

Mesosoma. - Pronotal collar anteriorly straight, not differentiated in vertical and sloping part (fig. 166), laterally with well-developed
smooth furrow, which is not sharply delimited anteriorly; scutellum without median impressed line; mesoscutum, mesopleuron and metapleuron densely coarsely punctate, punctures on anterior part of metapleuron finer; scutellum sparsely finely punctate; propodeum medially punctate-strigose, laterally densely punctate to rugose-punctate. Claws of hind legs without inner subbasal tooth. Third submarginal cell anteriorly $1.5-3.1$ times as wide as second.

Metasoma. - Petiolus distinctly curved, as long as mid basitarsus; fourth sternite of $O$ without micropubescence; eighth sternite of $\hat{\delta}$ (fig. 169) triangular; genitalia (fig. 170): aedeagus without teeth along outer ventral margin.

Indices. - Q: FR 0.92; OR 0.97; CR 0.82; HCR 1.1; MR 2.2; PBR 0.65-0.75. ف́: FR 0.88; OR $1.1-1.2 ;$ CR $0.80 ;$ HCR 1.1; MR 2.2; PBR $0.70-0.78$.

## Material examined.

USA. - Numerous specimens from the southeastern states ranging from Central Texas to Arizona and Florida (USNM, BMNH, RMNH, MNHN). Localities see Bohart \& Menke, 1963: 113.

## Chalybion zimmermanni aztecum (Saussure)

Pelopoeus aztecus Saussure, 1867: 26, © - Tampico, Mexico (Museum d'Histoire Naturelle, Geneva; not examined) [lectotype designated by Bohart \& Menke, 1963: 112].
Sceliphron (Chalybion) monstrosum Kohl, 1918: 61, fig. 37, $\hat{\delta}$ - Mexico, between Tampico and San Luis (ZMB; not examined).
Chalybion zimmermanni aztecum; Bohart \& Menke, 1963: 112; Bohart \& Menke, 1976: 103; Krombein et al., 1979: 1579.
Diagnosis. - Like the nominate subspecies, but wings of $\widehat{\delta}$ proximally clear, infuscated only along apical margins.

Material examined.
USA. - Numerous specimens fron Utah, Arizona, New Mexico, W. Texas (USNM, RMNH, BMNH, CH). Localities: see Bohart \& Menke, 1963: 113.

Caribbean. - Guadeloupe, Mc Kittrick Canyon; Haiti, Port au Prince (USNM).
Mexico. - Yucatan, Merida; Tacala, Hidalgo; Compostela, Navarit; Cuernavaca; Manzanilla; Colima; San Jeronimo; Ventanas; Acagnizotla; Guadalajara (BMNH; MNHN; NMH; RMNH; USNM; CH).

Honduras. - Tegucigalpa (USNM).
Nicaragua. - San Antonio; La Calera (USNM).

## Chalybion zimmermanni peninsularum <br> Bohart \& Menke

Chalybion zimmermanni peninsularum Bohart \& Menke,

1963: 113 , holotype $\widehat{\delta}$, paratypes $\uparrow, \widehat{\phi}$ - Todos Santos, Baja California (California Academy of Sciences, Los Angeles; not examined); Bohart \& Menke, 1976: 103.

Diagnosis. - Like the nominate subspecies, but $\hat{\delta}$ with erect pubescence of mesosoma uniformly black.

Distribution. - Mexico: Baja California. Known only from the type series.

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[^0]:    madecassum (Gribodo). 37-41, $\widehat{\text { ® }}$, Madagascar. 37, eighth tergite; 38, first metasomal segment; 39, genitalia, ventral view; 40 , inner side of left half of aedeagus; 41 , clypeus. $42-43,9$, Seychelles. 42 , first metasomal segment; 43 , clypeus. $30,31,33,41,43:$ scale-line $(=1 \times) ; 34,35: 0.5 \times ; 36,38,42: 0.75 \times ; 32: 1.5 \times ; 37,39,40: 3 \times$.

[^1]:     te; 95, genitalia, ventral view. 96-97, Chalybion planatum (Arnold), $\widehat{\text { ® }}$, lectotype, Ethiopia. 96, eighth sternite; 97, genitalia, ventral view. 88, 89, 90: scale-line $(=1 \times)$; $91: 0.75 \times ; 87,92,93: 1.5 \times ; 94,96,97: 2 \times ; 84-86,95: 3 \times$.

[^2]:    106-108, Chalybion tibiale (Fabricius), $\begin{gathered} \\ \text {, South Africa. 106, genitalia, ventral view; 107, eighth sternite; 108, inner }\end{gathered}$ side of left half of aedeagus. 109-110, Chalybion bocandei aeronitens ssp. n., $\widehat{\delta}$, paratype, Zaire. 109, eighth sternite; 110, genitalia, ventral view. 104, 105: scale-line $(=1 \times$ ); 101: $0.5 \times$; 99, 100, 102, 103, 106-109: $2 \times$; 98, 110:3×.

[^3]:    first metasomal segment. 120-122, Chalybion schulthessirechbergi (Kohl), ${ }^{\wedge}$, Nigeria. 120, genitalia, ventral view; 121, eighth sternite; 122, clypeus. $111-113,116,122$ : scale-line $(=1 \times$ ); 114; $0.5 \times ; 115,119: 0.75 \times$; 117, 118, 120, 121: $2 \times$.

