

Monograph of the bees of the subfamily Nomiodinae (Hymenoptera: Halictidae) of Africa (excluding Madagascar)

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Abstract. The paper presents the results of a study of 11863 specimens of Nomiodinae caught in Africa (excepting Madagascar) from 43 institutions and private collections. In total, 33 species belonging to three genera of Nomiodinae are found in the African fauna. All of the species are redescribed, figured and keyed. Their variability is analysed. Distributional maps in Africa are provided for all species. The types of nearly all the nominal taxa described earlier are examined. Seven new species and one new subspecies are described: *Cellariella inexpectata* n. sp., *C. schwarzi* n. sp., *Ceylalictus congoensis* n. sp., *Nomioides deceptor capverdensis* n. ssp., *N. griswoldi* n. sp., *N. kenyensis* n. sp., *N. micheneri* n. sp., and *N. paulyi* Pesenko, n. sp. New status is established for the following nominal taxa: *Nomioides maculiventris* var. *fulviventris* Blüthgen 1925 and *N. somalicus* ssp. *kalaharicus* Cockerell 1936 are considered separate species in the genus *Cellariella*; *Nomioides karachensis* var. *desertorum* Blüthgen 1925, a separate species in the genus *Ceylalictus*; *Nomioides canariensis* Blüthgen 1937, an insular subspecies of *N. deceptor* Saunders 1908; *Nomioides maurus* Blüthgen 1925, an African subspecies of *N. minutissimus* (Rossi 1790). The names *Nomioides elbanus* Blüthgen 1934 and *N. squamiger* Saunders 1908 are resurrected. The following new synonymies are established: *Nomioides somalica* ssp. *kalaharica* Cockerell 1936 = *Cellariella brooksi* Pesenko 1993; *Nomioides somalicus* Magretti 1899 = *N. somalicus* var. *completus* Blüthgen 1934 = *N. atomellus* Cockerell 1936; *Nomioides deceptor* Saunders 1908 = *N. minutissimus* var. *deserticola* Blüthgen 1925; *Ceratina maculiventris* Cameron 1905 = *Nomioides maculiventris* var. *convergens* Blüthgen 1934 = *N. callonotus* Cockerell 1936 = *N. maculiventris* var. *cyaneonotus* Cockerell 1937; *Nomioides minutissimus* ssp. *maurus* Blüthgen 1925 = *N. senecionis* Cockerell 1931 = *N. maurus* var. *tingitanus* Blüthgen 1933. Lectotypes are designated for the following nominal taxa: *Ceratina maculiventris* Cameron 1905; *Nomioides callonotus* Cockerell 1936; *N. maculiventris* var. *cyaneonotus* Cockerell 1937, *N. somalicus* ssp. *kalaharicus* Cockerell 1936. The morphological evolution, phylogeny and geographical history of the subfamily Nomiodinae are presented and discussed. The paper includes 228 line drawings on 39 figures in the text, 124 colour, 8 black and white, 48 SEM photos and 33 maps on 20 plates, 7 tables, and provided with a list of 140 papers cited.

Résumé. Monographie des abeilles de la sous-famille des Nomiodinae (Hymenoptera : Halictidae) de l'Afrique à l'exclusion de Madagascar. Cette publication présente les résultats d'une étude de 11863 spécimens de Nomiodinae récoltés en Afrique (excepté Madagascar) provenant de 43 institutions et collections privées. Au total, 33 espèces appartenant à 3 genres de Nomiodinae existent en Afrique. Toutes les espèces sont redécrites avec des clés et figures. Leur variabilité est analysée. Des cartes illustrent leur distribution en Afrique. Les types de presque tous les taxons nominaux décrits précédemment ont été examinés. Sept nouvelles espèces et une nouvelle sous-espèce sont décrites: *Cellariella inexpectata* n.sp., *C. schwarzi* n.sp., *Ceylalictus congoensis* n.sp., *Nomioides deceptor capverdensis* n.ssp., *N. griswoldi* n.sp., *N. kenyensis* n.sp., *N. micheneri* n.sp., et *N. paulyi* Pesenko n.sp. Un nouveau statut est établi pour les taxons nominaux suivants: *Nomioides maculiventris* var. *fulviventris* Blüthgen 1925 et *N. somalicus* ssp. *kalaharicus* Cockerell 1936 sont considérés comme des espèces séparées dans le genre *Cellariella*; *Nomioides karachensis* var. *desertorum* Blüthgen 1925, une espèce séparée dans le genre *Ceylalictus*; *Nomioides canariensis* Blüthgen 1937, une sous-espèce insulaire de *N. deceptor* Saunders 1908; *Nomioides maurus* Blüthgen 1925, une sous-espèce africaine de *N. minutissimus* (Rossi 1790). Les noms *Nomioides elbanus* Blüthgen 1934 et *N. squamiger* Saunders 1908 sont ressuscités. Les nouvelles synonymies suivantes sont établies: *Nomioides somalica* ssp. *kalaharica* Cockerell 1936 = *Cellariella brooksi* Pesenko 1993; *Nomioides somalicus* Magretti 1899 = *N. somalicus* var. *completus* Blüthgen 1934 = *N. atomellus* Cockerell 1936; *Nomioides deceptor* Saunders 1908 = *N. minutissimus* var. *deserticola* Blüthgen 1925; *Ceratina maculiventris* Cameron 1905 = *Nomioides maculiventris* var. *convergens* Blüthgen 1934 = *N. callonotus*

Cockerell 1936 = *Nomioides maculiventris* var. *cyaneonotus* Cockerell 1937; *Nomioides minutissimus* ssp. *maurus* Blüthgen 1925 = *N. senecionis* Cockerell 1931 = *N. maurus* var. *tingitianus* Blüthgen 1933. Des lectotypes sont désignés pour les taxons nominaux suivants: *Ceratina maculiventris* Cameron 1905; *Nomioides callonotus* Cockerell 1936; *N. maculiventris* var. *cyaneonotus* Cockerell 1937, *N. somalicus* ssp. *kalaharicus* Cockerell 1936. L'évolution morphologique, la phylogénie et l'histoire géographique de la sous-famille Nomioidinae est présentée et discutée. La publication comprend 228 dessins au trait sur 39 figures dans le texte, 124 photos couleurs, 8 en noir et blanc, 48 photos au microscope électronique à balayage et 33 cartes sur 20 planches, 7 tables et 140 références.

Keywords: Halictid bees, Nomioidinae, taxonomy, fauna, Africa.

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The subfamily Nomioiinae, including nearly 90 species, is represented by small and usually brightly colored forms (with metallic green or blue tint and extensive pale integument markings), whose body size only rarely exceeds 5 mm. The distribution of the subfamily is restricted to the Old World, with a single Australian representative, *Ceylalicus* (*Ceylalicus*) *perditellus* (Cockerell). Most of species inhabit arid and semiarid areas of Africa and Central and Southern Asia. All species whose biology is known are solitary (or subsocial) polylectic forms, nesting in soil.

The species presently united in the tribe Nomioiini were distinguished as a separate taxon by Schenck (1867), who described the genus *Nomioides* with a single species, referred to as "*Andrena pulchella* Jurine" (for comments on the type species of the genus *Nomioides*, see Pesenko & Kerzhner 1981). The tribe Nomioiini was substantiated as a separate taxon by Michener (1978), even though this name was proposed already in the beginning of the century by Börner (1919). In his work on the classification of Halictinae with "strong" venation, Michener considered this tribe as comprising the lone genus *Nomioides* Schenck consisting of 2 subgenera: *Ceylalicus* Strand and *Nomioides* s. str. In the monograph on the Palearctic Nomioiini by Pesenko (1983), these subgenera were raised to separate genera, subdivided into 7 subgenera, including 4 newly established ones. One of these, namely, the Afrotropical subgenus *Cellariella* Strand, whose name had been specified by Michener as a junior synonym of *Ceylalicus*, was tentatively included in the genus *Nomioides*. Later, *Cellariella* was promoted to a separate genus (Pesenko 1993). Nomioiines were established at the rank of subfamily by Alexander & Michener (1995).

Thus the current classification of the subfamily (Pesenko 1996, 2000a, 2000b; Michener 2000) recognises three genera: *Cellariella* Strand, endemic of the Afrotropical Region and Madagascar, and two genera widely distributed in warm territories of Africa, Europe and Asia: *Ceylalicus* Strand (with three subgenera, *Atronomioides* Pesenko, *Ceylalicus* s. str., and *Meganomioides* Pesenko,) and *Nomioides* Schenck (with three subgenera, *Erythronomioides* Pesenko, *Nomioides* s. str., and *Paranomioides* Pesenko).

On the basis of collection data, it can be concluded that all the Nomioiinae are polylectic species. Data on the nesting were published only for *Nomioides minutissimus* (see Batra 1966, 1977; Radchenko 1979), *N. pulverosus* (see Marikovskaya 1972 [*"N. rotundiceps"*]; Marikovskaya 1997), and *Ceylalicus variegatus* (see Batra 1966, 1977); review see Pesenko *et al.* 2000. Nomioiines nest in the ground, usually

preferring sandy and stony soils, frequently forming small or large nest aggregations. On the basis of their flight activity (both sexes fly simultaneously), it can be concluded that nomioiines are solitary or subsocial species (not eusocial). In Europe they are usually univoltine, flying in mid-summer; in North Africa and Central Asia they are bi- or polyvoltine.

History of the study of the African Nomioiinae

The first information on the African Nomioiinae was published by Walker (1871) in "*A List of Hymenoptera Collected by J. K. Lord in Egypt ...*". *Allodape syrphoides* described by him from Tadjura (Somalia) is rather a junior synonym of *Ceylalicus variegatus* (Olivier 1789) that is widespread in the southern Palearctic region. Several species were described from Africa by Handlirsch (1888; *Nomioides rotundiceps*), Friese (1898; *Nomioides fasciatus* = *Ceylalicus variegatus*), Magretti (1899; *Nomioides somalica*), Friese (1913; *Nomioides arnoldi* = *Cellariella somalica*), Cameron (1905; *Nomioides maculiventris*), Saunders (1908; *Nomioides exellens* = *Ceylalicus punjabensis*), Cockerell (1909; *Ceylalicus muiri*), Dębski (1917; *Nomioides heluanensis* = *Nomioides turanicus*, *Nomioides storeyi* = *Nomioides turanicus*), and Alfken (1924; *Nomioides fasciatus* var. *intermedius* = *Ceylalicus variegatus*).

The most fruitful period of studies of the African nomioiines was associated with an activity by Blüthgen (1925, 1933a, 1933b, 1933c, 1934a, 1934b, 1937) and Cockerell (1931, 1932, 1935, 1936, 1937, 1939; most indications of African localities for *Ceylalicus variegatus* by Cockerell are ignored here because this author mixed this species with *C. muiri*). They described and keyed a number of dozen new species, subspecies and varieties. In the time period, Ireland (1935) for first time figured and described the male genitalia of nomioiines (4 species: *Nomioides maculiventris*, *Ceylalicus variegatus*, *C. muiri*, and *C. halictoides*) on the basis of a material collected by the Vernay-Lang Kalahari Expedition in 1930.

A half of century later, Pesenko (1983) published the monograph on the Palearctic Nomioiinae that includes also some new taxonomic and distributional data on species from North Africa. The authors of the present paper published an annotated list of and a key to species of the Madagascan Nomioiinae, including description of five new species (Pesenko 1996; Pesenko & Pauly 2001). Also the paper by Pauly *et al.* (2002) on the Halictidae of the Cape Verde Islands, containing description of two new species of *Ceylalicus*, should be mentioned.

The authors listed above also published many localities in Africa where nomioiines were collected

(see also: Friese 1909; Alfken 1927; Pesenko 1989a). In addition, some information on localities in North Africa can be found in faunal lists by a number of other authors: Schulthess (1924), Guiglia (1929, 1933, 1936, 1939), Benoist (1943, 1962), Dekeyser & Villers (1956), Warncke (1983), Simon Thomas & Wiering (1993), Pauly (1984, 1998).

Material and methods

Material examined

In the present paper, the results of examination of the Nomioidinae from the continental Africa and such allied islands, as the Canary Islands, Cape Verde Islands, and Island of Socotra, are represented. A revision of the Nomioidinae from Madagascar (and the Island of Aldabra) was published by us earlier (Pesenko 1996; Pesenko & Pauly 2001).

In the section "African material examined" for each species, the countries are arranged from the north to the south and from west to the east, in the geaiographical order. Localities within each country are listed in alphabet order, when they are numerous.

The data are managed by the Data Fauna Flora (Barbier *et al.* 2000) software.

Most locus typicus conventional coordinates are found in Data Fauna Flora. They are given between brackets. For status measurements, conversion in international units are given between brackets.

A total of 11863 specimens have been studied from 43 institutions and private collections listed below with indication of their curators (or other persons, who have sent the bees for study) and acronyms (bold) used in the further text.

- AMNH**, American Museum of Natural History, New York, USA; J.G. Rozen & E. Quinter.
BAK, Private collection of the late D.B. Baker; Oxford, UK (at present, it is deposited at UKL).
BMNH, British Museum of Natural History, London, UK; G.R. Else.
CAS, California Academy of Sciences, San Francisco, USA; W.J. Pulawski.
CUI, Cornell University, Ithaca, USA; the late G.C. Eickwort.
EBM, Private collection of A.W. Ebmer, Puchenau near Linz, Austria.
EIE, Entomologisches Institut, Eberswalde (since August 2004, Müncheberg), Germany; J. Oehlke & H.H. Dathe.
FSF, Forschungsinstitut Senckenberg, Frankfurt an Main, Germany; D.S. Peters.
FUSAG, Faculté des Sciences Agronomiques del'Etat, Zoologie Générale, Gembloux, Belgium; A. Pauly.
GUS, Private collection of J. Gusenleitner; Linz, Austria.
HNHMB, Hungarian Natural History Museum, Budapest, Hungary; J. Papp.
IBU, Institutionen för Systematisk Botanik, Uppsala Universitet, Uppsala, Sweden; L.A. Nilsson.
IZK, Institute of Zoology, Krakow, Poland; M. Dylewska & W. Celary.
KUH, Private collection of M. Kuhlmann; Muenster, Germany.
LACM, Los Angeles County Museum of Natural History, Los Angeles, Californis, USA; R. Snelling
LAR, Private collection of F. LaRoche; Canary Islands: Tenerife, Spain.
LNK, Landessammmlungen für Naturkunde, Karlsruhe, Germany; G. Ebert.
MRAC, Musée Royal de l'Afrique Centrale, Tervuren,

- Belgium; E. De Coninck.
MCG, Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy; R. Poggi.
MCZC, Museum of Compare Zoology, Harvard University, Cambridge, Massachusetts, USA; J. Carpenter & S.R. Shaw.
MNHUB, Museum für Naturkunde an der Humboldt Universität zu Berlin, Germany; F. Koch.
MNHNP, Muséum National d'Histoire Naturelle, Paris, France; J. Casevitz-Weulersse & C. Villemant.
MSNP, Museo di Storia Naturale e del Territorio, Università di Pisa, Calci, Italia; P.L. Scaramozzino
NCP, National Collection of Insects, Pretoria, Republic of South Africa; C.D. Eardley.
NMB, Naturhistorisches Museum, Basel, Switzerland; M. Brancucci.
NMW, Naturhistorisches Museum, Wien, Austria; M. Fischer.
NRS, Naturhistoriska Riksmuseet, Stockholm, Sweden; E. Erlandsson.
OLML, Oberösterreiches Landesmuseum, Linz; F. Gusenleitner.
RNHL, Rijksmuseum van Natuurlijke Histoire, Leiden, Netherlands; R. Hensen & C. van Achterberg.
SCH, Private collection of M. Schwarz; Ansfelden near Linz, Austria.
UCR, University of California, Riverside, California, USA; S. Frommer.
UKL, University of Kansas, Lawrence, Kansas, USA; C.D. Michener & R.W. Brooks.
UMH, Université de Mons-Hainaut, Zoologie; P. Rasmont.
NMNH, National Museum of Natural History, Smithsonian Institution, Washington, D. C. USA; R.J. McGinley.
UUL, Utah State University, Logan, Utah, USA; T. L. Griswold.
WAR, Private collection of the late K. Warncke; München, Germany (at present, it is deposited at OLML).
ZISP, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; Yu.A. Pesenko.
ZMA, Zoölogisk Museum, Amsterdam, Netherlands; G. Kruseman & W. Hogenes.
ZMH, Zoological Museum, Helsinki University, Helsinki, Finland; W. Hackman.
ZMK, Universitetets Zoologiske Museum, Copenhagen, Denmark; B. Petersen.
ZML, Zoologiska Museet, Lunds Universitet, Lund, Sweden; R. Danielsson.
ZMM, Zoological Museum, Moscow University, Moscow, Russia; A.V. Antropov.
ZSM, Zoologische Staatssammlung, München, Germany; E. Diller.

Morphological terms

On the whole, the morphological terms used in this paper are those proposed by Michener (1944, 1965, 2000). In accordance with the terminology of classic anatomy, we use the terms *apex* and *base*, *apical* and *basal* (end, part, *etc.*) only for description of such structures as protuberances, processes, projections, teeth, tubercles, lobes *etc.* The terms *distal* and *proximal* (end, part, *etc.*) are used for descriptions of articulated structures and appendages, such as antenna, leg, gonostylus, *etc.* and also their parts: the scapus, pedicel, flagellum, flagellomere, labial palpus, tibia, femur, tarsus, tarsomere, *etc.* The terms *anterior* and *posterior* (also *median* and *lateral*) are used for characterisation of main sclerites of the body: pronotum, mesoscutum, scutellum, metanotum, mesepisterna, propodeum, metasomal terga and sterna, *etc.*, e.g., posterior margin of the mesoscutum, anterior hair bands on the terga, posterior areas of the sterna. The word

“mesad” is used here in the sense “toward the middle”.

Bees are hypognathous insects. So for characterisation of the general form of the head in frontal view and its subdivisions like the clypeus and supraclypeal area, we use the terms *height*, *high* (not *length*, *long*) and also *upper* and *lower* (margin, part, etc.).

In accordance with the current tradition, surfaces and margins of femora, tibiae and tarsomeres are described in their orientation when legs are directed downward; antennae considered as oriented forward. Natural borders do not mark all margins of some traditionally distinguished parts of the body surface. For description of these parts, with the exception of the frons and vertex, the term *area* is used, e.g., paraocular areas, supraclypeal area, genal areas, posterior areas of terga, etc. For description of the main, central part of a sclerite, the term *disc* is used, e.g., punctuation on the mesoscutal disc, pubescence on the disc of the tergum II, etc. For taxonomic purposes, terga and sterna of the metasoma are usually named just as metasomal ones. We use the term *metapostnotum* for the “middle area of the propodeum” (“propodeal triangle”) after Brothers (1975, 1976).

Abbreviations and scale lines

In the keys and descriptions below, the following abbreviations are used after Michener (2000): “S” for metasomal sternum and “T” for metasomal tergum, when they are numbered; e.g., T1 means tergum I; S4, sternum IV, in metasomal (not abdominal or gastral) numeration).

For description of the punctuation, the following “formula” is sometimes used after Ebmer (1969): interval of (typical) puncture diameters in μm and intervals of (typical) interspaces width estimated in the number of average puncture diameters (in parentheses), e.g. 28-35 μm / (2 - 3).

The scale lines on plates with line draw figures represent 1 mm for the mesosoma and metasoma; 0.5 mm for the head, antenna, and wings; 0.25 mm for the metasomal sterna VII and VIII of the male, male genitalia, and inner metatibial spur of the female.

RESULTS

The generic and subgeneric classification of the African Nomioiinae is given according to Pesenko (2000a, 2000b). In total, 33 species belonging to 3 genera (and 5 subgenera) are recorded from Africa (see tab. 6). The types of nearly all the nominal taxa described earlier are examined. Seven new species and one new subspecies are described: *Cellariella inexpectata* n. sp., *C. schwarzi* n. sp., *Ceylallictus congoensis* n. sp., *Nomioiodes deceptor capverdensis* n. ssp., *N. griswoldi* n. sp., *N. kenyensis* n. sp., *N. micheneri* n. sp., and *N. paulyi* Pesenko, n. sp. New status is established for the following nominal taxa: *Nomioiodes maculiventris* var. *fulviventris* Blüthgen 1925 and *N. somalicus* ssp. *kalaharicus* Cockerell 1936 are considered separate species in the genus *Cellariella*; *Nomioiodes karachensis* var. *desertorum* Blüthgen 1925, a separate species in the genus *Ceylallictus*; *Nomioiodes canariensis* Blüthgen 1937, an insular subspecies of *N. deceptor* Saunders 1908; *Nomioiodes maurus* Blüthgen 1925, an African subspecies of *N. minutissimus* (Rossi 1790). The names *Nomioiodes elbanus* Blüthgen 1934 and *N. squamiger* Saunders 1908 are resurrected. The following new synonymies are established: *Nomioiodes somalica* ssp. *kalaharica* Cockerell 1936 = *Cellariella brooksi* Pesenko 1993; *Nomioiodes somalicus* Magretti 1899 = *N. somalicus* var. *completus* Blüthgen 1934 = *N. atomellus* Cockerell 1936; *Nomioiodes deceptor* Saunders 1908 = *N. minutissimus* var. *deserticola* Blüthgen 1925; *Ceratina maculiventris* Cameron 1905 = *Nomioiodes maculiventris* var. *convergens* Blüthgen 1934 = *N. callonotus* Cockerell 1936 =

N. maculiventris var. *cyaneonotus* Cockerell 1937; *Nomioiodes minutissimus* ssp. *maurus* Blüthgen 1925 = *N. senecionis* Cockerell 1931 = *N. maurus* var. *tingitanus* Blüthgen 1933. Lectotypes are designated for the following nominal taxa: *Ceratina maculiventris* Cameron 1905; *Nomioiodes callonotus* Cockerell 1936; *N. maculiventris* var. *cyaneonotus* Cockerell 1937, *N. somalicus* ssp. *kalaharicus* Cockerell 1936.

All records of Nomioiinae from Africa are taken into consideration excepting *Nomioiodes aegyptiaca* Blüthgen 1933. We undertook all possible measures for receiving the types of the species, deposited in the insect collection of the Ministry of Agriculture in Cairo, for study, but could not examine them. The synonymy of this name with *Nomioiodes parviceps* Morawitz 1876 by Pesenko (1983: 168) is wrong, because the last species does not occur in Africa. For this reason, we consider *N. aegyptiaca* as a *nomen dubium* until examination of the types is possible.

Subfamily Nomioiinae Börner 1919

Nomioiini Börner 1919: 167, 181.

Type (stem) genus. *Nomioiodes* Schenck 1867.

Taxonomy. Blüthgen 1934a: 114. Blüthgen 1933b: 23. Michener 1978: 503. Michener 2000: 306 (key), 330-332. Pesenko 1983: 1-199. Pesenko 2000a: 120. Pesenko 2000b: 210-226; Pesenko & Pauly 2001: 50.

Diagnosis. *Both sexes.* Body length usually 3-5 mm, rarely 6 mm. Body tegument thin (in comparison with, e.g., species of *Erylaeus* of similar size), with yellow pattern (often extensive). The following parts usually pale: clypeus, labrum, mandible, scape, pronotal collar and spiracular lobes, scutellum, scutellar ridges, metanotum, and transverse bands on terga. Head and mesosoma (usually) and metasoma (often) metallic-green or blue. Sculpture of body fine, usually shallow and finely granular. Upper end of subantennal sutures directed toward outer margin of antennal sockets. Anterior tentorial pits lying close to lower margin of face, so that mesally adjoined epistomal suture forming a loop; inside this loop, paraocular areas of face forming acute protrusions, deeply protruding into clypeus and dividing it into 3 lobes. Inner orbits with rounded or triangular incision. Annulate hairs of glossa simple, not bifid apically. Pronotum without lateral carinae or anterolateral angles. Scutellar carina long, high, and narrow along its entire length to the base of hind wing. Axillae without carina along posterior margin. Both inner and outer margins of malus of strigilis in distal half pectinate, bearing very long, densely positioned, radiating denticles. Fore wings with “strong” venation: distal transverse veins *r-m* and *r-cu* not weakened. Marginal cell relatively short; its costal margin shorter than the distance from distal end of cell to wing apex. Distal end of marginal cell usually transversely truncate, less frequently narrowly rounded or pointed. First submarginal cell of fore wing as large as, or larger than 2nd and 3rd cells combined. Anterior margin of hind wing with 1-2 proximal (basal) frenal hamuli and 6-7 distal (apical) ones. Anal incision of hind wing as long as, or shorter than jugal one. Lateral gradular angles of T3 and T4 lost.

Female. Labrum with wide trapeziform apical process, flattened dorsoventrally, without longitudinal carina. Inner hind tibial spur with 1-4 long processes. Prepygidial fringe of T5 complete, not divided in middle by longitudinal gap or incision.

Male. T7 concealed by T6, flat, hairless; its posterior margin not bent forward. Graduli of S2-S6 reduced to short median parts. S7 shortened, weakly sclerotized, resembling S6 in general shape. S8 Y-shaped, with membrane present between its

posterolateral "arms". Posterior margin of membrane sometimes thickened medially, forming protrusion or short process. In the advanced genus *Nomioides*, this membranous thickening modified into long sclerotized posterior lobe (fig. 32-34), turning freely in dorsoventral plane relative to the main part of S8 about the axis connecting the ends of the posterolateral "arms" of S8. Ventral parapenial lobe of gonocoxites or lower lobe of gonostyli absent. Gonostylus indistinguishably fused to gonocoxite (whole sclerite formed by this fusion named as *gonoforceps*). In species of *Ceylalictus* s. str. and in some other species, gonoforceps secondarily subdivided into proximal part and immobile distal one.

Key to genera and subgenera of the subfamily Nomioidinae

1. *Both sexes*: body almost uniformly granulate, dull; main coloration of head and mesosoma black, without metallic tints; 2nd submarginal cell of forewing petiolate (fig. 4c, 5i); T1 with transverse rectangular pale integument spot. *Male*: antenna short; length of middle flagellomeres about 0.7 times their diameters (fig. 1b, 2b, 3c, 5b); S8 with short apical lobe (fig. 1f, 2f, 3j, 5f); penis valves large, triangularly broadened distally (fig. 2f, 3j, 5f; except for *C. fulviventris*, fig. 1f). *Female*: inner metatibial spur unidentate (fig. 1i, 3p, 4b, 5i). **Genus *Cellariella* Strand**
 - *Both sexes*: body, at least partly, shiny or slight shiny; usually at least, mesoscutum with green or blue metallic tint; 2nd submarginal cell of forewing trapezoidal or triangular (fig. 8c, 9d, 15b, 16d, 19c, 24c, 25c, 26c, 26e, 28e, 30e, 30f, 34c; except for *Ceylalictus petiolatus* Pesenko, endemic to Madagascar); T1 dark or with other pale pattern. *Male*: antenna relatively long, middle flagellomeres as long as their diameters or longer; S8 with very long apical lobe or without lobe; penis valves narrower, of other form. *Female*: inner metatibial spur with 2-4 ong processes (except for *Ceylalictus karachensis*) **2**
2. *Both sexes*: transverse vein *r-m* of hind wings 0.3-0.5 times as long as vein *RS* (fig. 19d); metasoma yellow almost throughout or with pale integument bands formed on pregradular areas of terga and appearing through hyaline posterior areas of succeeding terga (except for *N. socotranus* Blüthgen). *Male*: S8 with long apical sclerotized lobe; genital foramen transverse; ventral gonobasal bridge spaced immediately under ventral gonocoxal bridge, represented by narrow arms with a point conjunction medially. *Female*: inner orbits slightly emarginate; metasoma heart-shaped. (Genus *Nomioides* Schenck) **3**
 - *Both sexes*: transverse vein *r-m* of hind wings 0.6-1.0 times as long as vein *RS* (fig. 15c, 16e); metasoma with pale integument bands on discs (postgradular areas) of terga. *Male*: S8 without an apical sclerotized lobe, sometimes with apical membranous protuberance; genital foramen rounded or longitudinal; ventral gonobasal bridge spaced distinctly behind ventral gonocoxal bridge, broad, usually with median lobe directed backward. *Female*: inner orbits with deep roundly triangular emargination; metasoma elongate elliptical or broadened in posterior art. (Genus *Ceylalictus* Strand) **5**
3. *Both sexes*: body larger, length of male 5 mm, of female 5.5 mm; mandible long, distinctly curved, sabre-shaped; metasoma red, with yellow bands. *Male*: apical lobe of S8 regularly narrowed to distal end, without a neck near base (fig. 17b).... ***Nomioides* subg. *Erythronomioides* Pesenko**
 - *Both sexes*: body smaller, length under 4.5 mm; mandible short, slightly curved; metasoma black, with yellow bands or entirely yellow. *Male*: apical lobe of S8 of other form **4**
4. *Both sexes*: propodeum short, its dorsal surface 0.7 times as long as scutellum. *Male*: apical lobe of S8 very broad, leaf-shaped, wider than main body of this sternum; gonobase 5 times as wide as long; gonoforceps very broad, leaf-shaped, 1.7 times as long as wide ***Nomioides* subg. *Paranomioides* Pesenko** (not occurring in Africa)
 - *Both sexes*: propodeum longer. *Male*: apical lobe of S8 much narrower, with a neck near base; gonobase 1.5-2.0 times as wide as long; gonoforceps narrow, leaf-shaped, 3-6 times as long as wide ***Nomioides* subg. *Nomioides* Schenck**
5. *Both sexes*: metanotum with median tubercle bearing a bunch of dense and long plumose hairs. *Female*: metasoma yellow throughout, except for base of T1 (fig. 15j, 16n) ***Ceylalictus* subg. *Meganomioides* Pesenko**
 - *Both sexes*: metanotum without median tubercle. *Female*: metasoma dark, with yellow bands (dark coloration replaced with rusty reddish in *C. warnckei* Pesenko from southwestern Iran) **6**
6. *Male*: mandible without subapical tooth; T6 strongly narrowed in posterior part (pseudopygidium narrow); S8 without lobe-like structure at posterior margin (fig. 9i, 9j, 11g, 12f-12h, 13i, 13j); genital foramen rounded; gonoforceps curved mesad, narrowed, with ventral projection; penis valve narrow (fig. 9k, 11h, 11i, 12i, 12k, 13k, 13l). *Female*: mesoscutum usually with yellow integumental median transverse spot before hind margin (fig. 10e, 10f, 14c-14e); inner metatibial spur with two teeth (fig. 10g, 11m, 12n, 14f) ***Ceylalictus* subg. *Ceylalictus* Strand**
 - *Male*: mandible with subapical tooth; T6 weakly narrowed in posterior part (pseudopygidium wide); S8I with apical membranous protuberance (fig. 6f, 7f, 8f); genital foramen longitudinal; gonoforceps not narrowed or not curved mesad; penis valve usually broadened (fig. 6g, 7g, 8g). *Female*: mesoscutum without pale markings; inner metatibial spur with three (fig. 6k, 7j, 8m) or four teeth ***Ceylalictus* subg. *Atronomioides* Pesenko**

Genus *Cellariella* Strand 1926

Nomioides subg. *Cellaria* Friese 1913: 584, nec Ellis & Selander 1786 (Bryozoa).

Nomioides subg. *Cellariella* Strand 1926: 53, replacement name for *Cellaria* Friese.

Type species. *Nomioides arnoldi* Friese 1913 (= *N. somalica* Magretti 1899), by monotypy.

Taxonomy. Pesenko 1983: 122 (*Nomioides* subg. *Cellariella*). Pesenko

1993: 1. Pesenko 2000a: 120 (key). Pesenko 2000b: 214 (key). Michener 2000: 330 (key), 331. Pesenko & Pauly 2001: 50 (key), 62.

Distribution. This is a small Afrotropical-Madagascan genus, hitherto known from three species: *C. somalica* (Magretti), a rare but widely spread species in the Afrotropical Region from Somalia to the Republic of South Africa, *C. fulviventr* (Blüthgen) known from Namibia and the Republic of South Africa, and *C. kalaharica* (Cockerell), recorded from sub-Saharan Africa and Madagascar (under the name *C. brooksi* Pesenko). Two new species of the genus are described below: *C. inexpectata* from Kenya and *C. schwarzi* from the Republic of South Africa.

Key to species of the genus *Cellariella*

1. Male..... 2
 - Female 5
2. Body length 2.8–3.0 mm. Head shorter: its height / width ratio 0.9–0.95 (fig. 1a). Antenna much paler: scapus entirely yellow, except for narrow fuscous longitudinal stripe on upper side; flagellum light ochre-yellow on lower side, ochre-yellow to light fuscous on upper side. Scutellum with distinct longitudinal median groove. Metapostnotum distinctly striate in anterior third or fourth. Dorsal surface of propodeum 0.6–0.7 times as long as scutellum. Gonoforceps very wide, flattened, curved ventrally at apex; penis valve slender, about of equal width along its length (fig. 1f, 1g) *C. fulviventr* (Blüthgen)
 - Body length usually 3.3–4.0 mm. Head higher. Antenna much darker: scapus black on upper side or black entirely, except for narrow yellow longitudinal stripe on lower side; flagellum dark ochre-yellow to ochre-fuscous on lower side, fuscous to black on upper side. Scutellum without or with weak longitudinal median groove. Metapostnotum without or with very short striae along anterior margin. Dorsal surface of propodeum 0.9–1.1 times as long as scutellum. Gonoforceps thin in distal two thirds, sharply curved mesad at apex; penis valves massive, triangularly broadened distally 3
3. Dorsal surface of propodeum with smooth and shiny stripe along posterior margin. Lateral spots on T1 elongate, sometimes merging into central one (fig. 2c) *C. inexpectata* Pesenko & Pauly, n. sp.
 - Dorsal surface of propodeum uniformly granulate, mat. T1 without (fig. 3f, 5c) or with square rounded lateral spots (fig. 3d–e) 4
4. Head triangularly rounded in frontal view; its height / width ratio 1.05–1.15. Height / width ratio of median clypeal lobe 1.1–1.2. Clypeus projecting about half of its height below lower margins of eyes (fig. 3a, 3b). T1 with median and usually lateral yellow spots (fig. 3d, 3e); T4 and T5 on discs usually with transverse yellow bands frequently interrupted medially (fig. 3e, 3f). Genital foramen rounded; gonoforceps triangularly broadened at apex; penis valve strongly triangularly broadened to apex, its distal outer end directed laterally (fig. 3a–3m) *C. kalaharica* (Cockerell)
 - Head rounded in frontal view; its height / width ratio 0.95–1.0. Height / width ratio of median clypeal lobe 0.9–0.95. Clypeus projecting about a third of

its height below lower margins of eyes (fig. 5a). T1 without lateral spots; T4 and T5 without bands (fig. 5c). Genital foramen longitudinally elliptic; gonoforceps in distal third thin, sharply curved mesad; penis valve not so strongly broadened to apex, its distal outer end directed forward (fig. 5f, 5g)

- *C. somalica* (Magretti)
- 5. Head distinctly elongate, egg-shaped in frontal view; its height/width ratio 1.15. Inner orbit with shallow rounded emargination. Clypeus fuscous on most part of surface, with fuscous yellow bands along its upper and lower margins (fig. 4a) *C. schwarzi* Pesenko & Pauly, n. sp.
 - Head about as high as wide or wider than high, at most 1.05 times as high as wide (in some females of *C. kalaharica*); triangularly rounded or transversely elliptical in frontal view. Inner orbit with deep, triangular (fig. 2b, 3n, 5b) or rounded (fig. 1b) notch. Clypeus yellow entirely or on most part of surface, usually with two fuscous or black lateral spots 6
- 6. Dorsal surface of propodeum with smooth and shiny stripe along posterior margin *C. inexpectata* Pesenko & Pauly, n. sp.
 - Dorsal surface of propodeum uniformly granulate, mat 7
- 7. Body length 3.7–4.0 mm. Antenna much paler: scapus yellow entirely, except for narrow fuscous longitudinal stripe on upper side; flagellum light ochre-yellow on lower side, narrowly fuscous on upper side. Metapostnotum distinctly striate in anterior third or fourth. Dorsal surface of propodeum 0.6–0.7 times as long as scutellum. Metasoma rusty reddish, with yellow pattern (fig. 1j) *C. fulviventr* (Blüthgen)
 - Body length 4.1–5.2 mm. Antenna much darker: scapus black on upper side or black entirely, except for narrow yellow longitudinal stripe on lower side; flagellum ochre-fuscous on lower side, dark fuscous on upper side. Metapostnotum flat, without or with very short striae along anterior margin. Dorsal surface of propodeum 0.9–1.1 times as long as scutellum. Metasoma black or dark fuscous, with yellow pattern 8
- 8. Head triangularly rounded in frontal view; its height / width ratio about 0.82–0.93 (fig. 3n). T2–T5 on discs with wide yellow bands (fig. 3r, 3s) *C. kalaharica* (Cockerell)
 - Head rounded or transversely elliptical in frontal view; its height / width ratio usually 0.78–0.88 (fig. 5b). T2 on disc with two lateral triangular spots; T3–T5 with narrow bands, often interrupted medially (fig. 5k, 5l) *C. somalica* (Magretti)

Cellariella fulviventr (Blüthgen 1925), n. comb., n. stat.

[fig. 1a–1j; Pl. I: 42–43 (total view), V: 108–109 (head), XII: 196 (male genitalia), XV: 220 (map)]

Nomioides somalica var. *fulviventr* Blüthgen 1925: 83, ♀. Holotype: ♀, “Oudtshoorn, Cape Province [Republic of South Africa] [33°34’S 22°12’E], 1000 ft. [ca. 304 m], 9.XII.1921”, “S. Africa, [leg.] R.E. Turner. Brit. Mus. 1922–15”, “B. M. Type Hym. 17.a.1045”; BMNH (examined).

Nomioides (*Cellariella*) aff. *somalica*: Pesenko 1983: 122, fig. 335, 336.

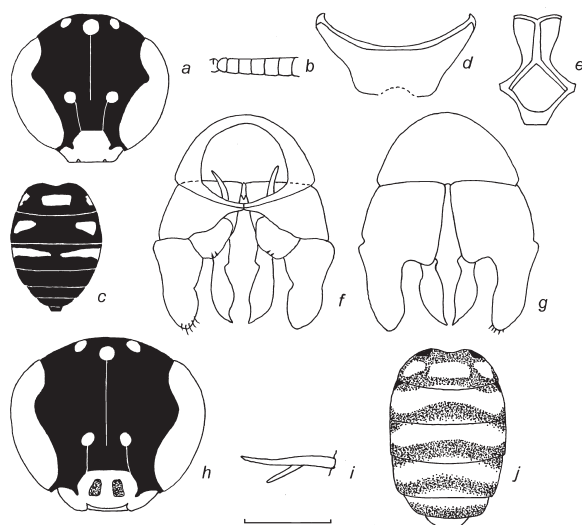


Figure 1
Cellariella fulviventris (Blüthgen 1925): male (a-g) and female (h-j)
a and h, head in frontal view; b, flagellomeres 1-5 in lateral view; c and j, metasoma in dorsal view; d, S7; e, S8; f, genital capsule in ventral view; g, genital capsule in dorsal view; i, inner metatibial spur.
a-j, male and female from Mariental (Namibia).
Scale line: 1 mm for c, j; 0.5 mm for a, h, b; 0.25 mm for d, e, f, g.

Diagnosis. From all other species of the genus, this differs in the smaller body, shorter head, paler antenna, presence of striation on the anterior third or fourth of the metapostnotum, and shorter propodeum, in both sexes; especially strongly in the structure of the male genitalia and also yellow reddish metasoma of the female.

The current status of the species was recognised owing to the availability of three specimens, which are very similar (in the body size, antenna coloration and propodeum structure): two males and one female collected in the same locality (Namibia: 75 km S Mariental) and the date (12.II.1990) by Mr. Maximilian Schwarz (Ansfelden, Austria).

Male. Structure. Body length 2.8-3.0 mm. Head transversely elliptical in frontal view; its height / width ratio usually 0.9-0.95 (fig. 1a). Face weakly depressed around antennal sockets. Ocellar elevation indistinct. Median lobe of clypeus flat (in lateral view), its height / width ratio 0.8. Clypeus projecting two thirds of its height below lower margins of eyes. Malar space nearly linear. Inner orbits with relatively deep triangular notch; its depth about 0.3 of maximal (extrapolated) ocular width in frontal view (fig. 1a). Frontal line absent. Dorsal surface of propodeum roundly passing to its posterior vertical surface, 0.6-0.7 times as long as scutellum. Hind wings with 6 distal hamuli. Metasoma strongly convex, elliptical, with pointed posterior end (fig. 1c). S8 1.4 times as long as wide, with short apical lobe-like thickening, maximal width of apical lobe about 2.0 times its length, proximal width/distal width ratio 2.0 (fig. 1e). Genital foramen nearly round; median gonobasal suture absent. ventral gonobasal bridge entirely narrow. Ventral gonocoxal bridge narrow, situated behind gonobasal one. Volsella rounded triangular. Gonoforceps very wide, flattened, glabrous (except for few hairs on distal end); penis valve relatively slender, of about equal width along its length. (fig. 1f; 1g)

Sculpture. Median lobe of clypeus moderately shiny, sparsely punctate and uniformly punctate, with traces of strigation. Frons and vertex more coarsely granulate, mat. Genal area sparsely punctate, smooth in interspaces. Mesoscutum and scutellum uniformly densely granulate (each granule equal to eye facet), mat. Metapostnotum granulate, more densely so than mesoscutum, with distinct striae in anterior third or fourth; its borders marked by change in sculpture. T1 densely granulate, subsequent terga with more obscure sculpture, slightly roughened and strigate, slight shiny.

Coloration. Body black, without metallic tint. Labrum, mandible entirely (except for reddish apex), clypeus entirely (fig. 1a) or except for two small fuscous lateral spots, scapus (except for narrow fuscous longitudinal stripe on upper side), collar, spiracular lobes and stripe along anterior margin of pronotum, anterior part of hyaline tegula, bases of wings, scutellar crest, metanotum, distal ends of femora, tibiae and tarsi entirely, median and lateral spots on T1, large lateral spots on T2, interrupted band on disc of T3 (fig. 1c), all yellowish white. Antennal flagellum light ochre-yellow on lower side, ochre-yellow to light fuscous on upper side. Wing membrane hyaline; pterostigma and veins yellow to yellowish fuscous.

Vestiture. White, relatively short, not dense, erect, slightly plumose on most surfaces; hairs longer and denser on pronotum, metanotum, and last sterna. Supraclypeal area, paraocular areas, upper half of clypeus, genal areas, and vertex covered with very short, not dense appressed plumes.

Female. Structure. Body length 3.7-4.0 mm. Head transversely elliptical in frontal view, its height / width ratio 0.8-0.9 (fig. 1h). Ocellar elevation indistinct. Median lobe of clypeus weakly convex, its height / width ratio 0.6. Clypeus projecting 0.5 of its height below lower margins of eyes. Malar space linear. Inner orbits with a shallow rounded triangular notch; its depth somewhat more than half maximal (extrapolated) ocular width in frontal view (fig. 1h). Frontal line distinct. Structure of propodeum same as that in male.

Sculpture. It similar to that of male, with the following differences: clypeus finely obscurely granulate, nearly smooth on lower fourth.

Coloration. Coloration of head, antenna, mesosoma, legs, and wings similar to that of male, with the following differences: clypeus with two longitudinal fuscous stripes (fig. 1h), hind femur with large fuscous spot. Metasoma rusty reddish with rich pale (light yellow) pattern: three large spots on T1; T2-T5 with wide yellow bands occupying most of their discs (postgradular areas); dark coloration presented only by two small black lateral spots on T1 (fig. 1j).

Vestiture. Whitish, ordinary. Sparse short appressed plumes present on face, genal area, pronotum, and mesoscutum.

Records from Africa. Blüthgen 1925: 83 (*Nomioides somalica* var. *fulviventris*; Republic of South Africa: Oudtshoorn). Pesenko 1983: 122, fig. 335, 336 (*Nomioides* aff. *somalicus*; South Africa: Willowmore).

Distribution. Namibia, Cape Province.

African material examined. 16 specimens. *Namibia*: 65 km S Mariental, 13.II.1990, leg. W.J. Pulawski, 5 ♂♂; CAS. 75 km S Mariental, 10.II.1990, 4 ♂♂; 12.II.1990, 2 ♂♂, 1 ♀, leg. M. Schwarz; SCH, ZISP.

Republic of South Africa: Cape Province: Oudtshoorn, 1000 ft. [ca. 304 m], 9.XII.1921, leg. R.E. Turner, 1 ♀ (holotype);

BMNH. Willowmore, v. leg. Brauns, 1 ♂; NMB. Knersvlakte, 30 km N Vanrhynsdorp, 31°22' S, 18°43' E, 146 m, 5-6.IX.2003, leg. K. Timmermann, 2 ♀♀; KUH.

***Cellariella inexpectata* Pesenko & Pauly, n. sp.**

[fig. 2a-2i; Pl. I: 44-45 (total view), V: 110-111 (head), IX: 173 (propodeum), X: 183 (T1), XII: 199, 2002 (male genitalia), XV: 221 (map); tab. 1]

Diagnosis. In addition to the characters given in the key above, the new species is compared with the close *C. kalaharica* and *C. somalica* in detail in tab. 1.

Male. Structure. Length 3.75 mm. Head triangularly rounded in front view, height / width ratio 0.9-0.95. Median lobe of clypeus flattened, height / width ratio about 1.0. Clypeus projecting approximately 0.3 of its height below lower margins of eyes. Malar space linear. Inner orbits with deep, V-shaped notch; its depth about 0.6 of maximal (extrapolated) ocular width in front view (fig. 2a). Frontal line distinct. Antenna relatively short (fig. 2b), reaching posterior third of mesoscutum. Dorsal surface of propodeum moderately convex, about 0.8 times as long as scutellum, its posterior margin rounded. Hind wing with 6 distal hamuli. S8 about 1.4-1.5 as long as maximum width, with relatively long, trapezoidal, mobile apical lobe-like thickening, length / maximum width of the latter about 1.0 times, proximal width/distal width ratio 3.0 (fig. 2e). Gonostylus moderately narrow in proximal half, thickened in middle of its length, bent mesally; distal part of gonostylus, directed mesad, about 0.5 gonostylar length, elongate triangular (fig. 2f-2g). Volsella small, rather triangular, with pointed thin mesal process directed backward. Penis valve broadly triangular distally, posterior margin nearly perpendicular to body axis; length of valve from level of bridge to distal end 1.5 times maximal width (fig. 2f-2g).

Sculpture. Clypeus silk-mat, with few shallow pits. Frons densely granulate, mat. Vertex more obscurely granulate silk-mat. Genal area finely and sparsely punctate on upper part near eyes, shiny; finely striate on lower part, slight shiny. Mesoscutum and scutellum dull, densely contiguously granulate; each granule about as large as eye facet. Dorsal surface of propodeum slight shiny, obscurely granulate, in some individuals with very short, fine striae along anterior margin. Metapostnotum bordered smooth shiny stripe along its lateral and posterior margins. T1 more obscurely and sparsely granulate than mesoscutum, silk-mat or slight shiny. Sculpture on succeeding terga progressively more obscure, terga becoming shiny. Posterior areas of terga shiny, slightly transversely striate.

Coloration. Black, without metallic tint. Labrum, clypeus (fig. 2a), mandible, lower surface of scapus; collar and posterior lobes of pronotum, spot on anterior part of slightly infusate tegula, basal sclerites of wings, scutellar crest, median metanotal area, distal ends of femora and tibiae, and entirely tarsi of all legs, large transverse median and elongate lateral spots on T1, triangular lateral spots on anterior part of T2 and wide band on anterior part of T3 (fig. 2c); all light yellow or whitish yellow. Upper surface of flagellum ochre-fuscous, lower surface ochre-yellow. Wings hyaline or slightly infusate, veins and stigma ochre-yellowish.

Vestiture. Whitish, short, not dense, erect, slightly plumose; only hairs on genal areas, metanotum, and last sterna relatively long and dense. Face nearly throughout, genal areas, mesoscutum, sides of mesosoma, and posterior vertical surface of propodeum

covered with very short, sparse, appressed, scale-like, white plumes, in some individuals partly lost.

Female. Structure. Length 4.5 mm. Head transversely elliptical in front view; its height / width ratio 0.85. Median lobe clypeus flat, its height / width ratio 0.68-0.7. Clypeus projecting approximately 0.5 of its height below lower margins of eyes. Malar space linear. Inner orbits with deep, V-shaped notch; its depth about 0.5 of maximal (extrapolated) ocular width in front view (fig. 2a). Frontal line distinct. Crest between antennal sockets absent. Propodeum and wings as in male.

Sculpture. Similar to that of male except as follows. Clypeus superficially finely granulate, mat except shiny stripe along lower margin. Genal area on lower part mat.

Coloration. Similar to that of male except as follows. Labrum light fuscous; clypeus with two dark spots (fig. 2b); mandible yellow only on proximal half; scutellum with yellow, interrupted in middle, transverse stripe along its posterior margin; hind femur entirely dark; hind tibia with large dark fuscous spot; T1 and T2 with wide transverse yellow bands (fig. 2i). Posterior areas of terga dark translucent fuscous.

Vestiture. Similar to that of male.

Distribution. Kenya.

Holotype: ♂, Kenya: Voi, Tsavo [3°23'S 38°34'E], 23.III-4.IV.1997, leg. M. Halada; OLML.

Paratypes (128 specimens): Kenya: Voi, Tsavo, 23.III-4.IV.1997, 70 ♂♂, 15 ♀♀, 11-14.IV.1997, 34 ♂♂, 7 ♀♀, leg. M. Halada; OLML, FUSAG, ZISP. Archer's Post, Uaso Nyiro river, 2300 ft. [ca. 700 m], 12.XII.1969, leg. M.E. Irwin & E.S. Ross, 1 ♀; CAS. Rift Valley Province, 33 km N Lodwar, 3°21' N, 35°28' E, 23.XI.2002, leg. M.A. Prentice, 1 ♂; CAS.

Etymology. The name of the new species originates from Latin "inex(s)pectatus" (unexpected).

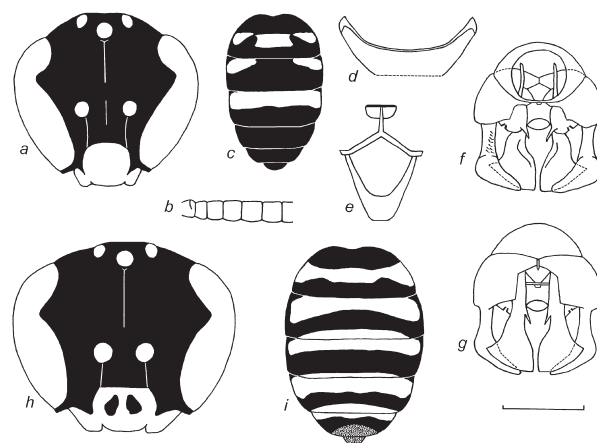


Figure 2
***Cellariella inexpectata* sp. n.: male (a-g) and female (h, i)**

a and h, head in frontal view; b, flagellomeres 1-5 in lateral view; c and i, metasoma in dorsal view; d, S7; e, S8; f, genital capsule in ventral view; g, genital capsule in dorsal view.

Male and female paratypes from Voi (Tsavo, SE Kenya).

Scale line: 1 mm for c, i; 0.5 mm for a, h, b; 0.25 mm for d, e, f, g.

Table 1. Differences between *Cellariella inexpectata* sp. n., *C. kalabarica* (Cockerell) and *C. somalica* (Magretti)

Character	<i>Cellariella inexpectata</i>	<i>Cellariella kalabarica</i>	<i>Cellariella somalica</i>
Both sexes			
Dorsal surface of propodeum at posterior margin	Smooth, shiny	Densely granulate, mat	Densely granulate, mat
T1: sculpture	Obscure and sparser granulate than mesoscutum, silk-mat or slight shiny	Densely granulate, similar to mesoscutum, mat	Densely granulate, similar to mesoscutum, mat
Sparse appressed short scale-like white hairs	On head and mesosoma nearly throughout, except for scutellum and metapostnotum	On supraclypeal and paraocular areas, upper half of frons	Only on face below antennal sockets
Male			
Height / width ratio of head	0.9-0.95 (fig. 2a)	1.01-1.1 (fig. 3a)	0.9-0.95 (fig. 5a)
Height / width ratio of median clypeal lobe	1.0 (fig. 2a)	1.1-1.2 (fig. 3a)	0.95-1.0 (fig. 5a)
Portion of clypeal length situated below eyes	0.3 (fig. 2a)	0.5 (fig. 3a)	0.3 (fig. 5a)
Clypeus: sculpture	Obscurely granulate, with few shallow pits, silk-mat	Very slightly strigate, with few shallow pits, moderately shiny	Very slightly strigate, with few shallow pits, moderately shiny
Lateral pale spots on T1	Elongate, often merging into central one (fig. 2c)	Square rounded, not merging into central one; sometimes absent (fig. 3d-3f)	Absent (fig. 5c)
Length / maximum width ratio of S8	1.4-1.5 (fig. 2e)	1.0-1.3 (fig. 3b, 3i)	1.6-1.8 (fig. 5e)
Length / maximum width ratio of apical lobe-like thickening of S8	1.0 (fig. 2e)	0.7 (fig. 3b, 3i)	0.75 (fig. 5e)
Length / maximum width ratio of genital capsule	1.2 (fig. 2f)	1.3 (fig. 3j)	1.5 (fig. 5f)
Genital foramen	Rounded (fig. 2f)	Rounded (fig. 3j)	Longitudinally elliptical (fig. 5f)
Distal part of gonoforceps directed mesad	Long, massive, narrowed toward apex, distinctly bordered from proximal part by ventral carina (fig. 2f)	Short, triangular (fig. 3j)	Long, thin, parallel-sided (fig. 5f)
Long hairs along outer apical margin of gonoforceps	Absent (fig. 2f)	Dense (fig. 3j)	Sparse (fig. 5f)
Volsella	Rather triangular, with pointed thin mesal process directed backward (fig. 2f)	Rhomboid, without process (fig. 3j)	Rhomboid, without process (fig. 5g)
Length of penis valve from level of bridge to distal end times / maximal width of penis valve ratio	1.5 (fig. 2g)	1.3 (fig. 3k)	1.9 (fig. 5g)
Distal outer end of penis valve	Pointed, directed anterolaterally (fig. 2g)	Pointed, directed anterolaterally (fig. 3k)	Pointed, directed forward (fig. 5g)
Bridge of penis valvae	Wide, elliptic (fig. 2g)	Narrow, with small median broadening (fig. 3k)	Narrow, with small median broadening (fig. 5g)
Female			
Height / width ratio of head	0.85 (fig. 2b)	0.95-1.05 (fig. 3n)	0.9-0.95 (fig. 5b)
Pale pattern on T1	Wide transverse band (fig. 2i)	Median transverse and two large lateral spots, sometimes merging into median one (fig. 3r, 3s)	Median transverse and two small lateral spots (fig. 5k, 5k)
Pale pattern on T2	Wide transverse band (fig. 2i)	Wide transverse band (fig. 3r, 3s)	Two transverse triangular lateral spots (fig. 5k, 5k)

***Cellariella kalaharica* (Cockerell 1936), n. comb., n. stat.**

[fig. 3a-3s; Pl. I: 40-41, 46 (total view), V: 104-105, 113 (head), IX: 172 (propodeum), X: 182 (T1), XII: 198, 200-201 (male genitalia), XV: 222 (map); tab. 1]

Nomioides somalica ssp. *kalaharica* Cockerell 1936: 3, ♀. Lectotype (**designated here**): ♀, Botswana: "V[ernay]-L[ang] Kal[ahari] Exp[edition], Nata River, Makarikari [20°40'S 25°40'E], 24-27.VIII.1930" [leg. Van Son], "B.M. Type Hym. 17.a.2809"; BMNH.

Cellariella brooksi Pesenko 1993: 3, fig. 1-5, 7, 8, 10, 12, 14, 15, 17, 19, 21. ♂♂, ♀. Holotype: ♂, Madagascar: Tulear Province, Beza Mahafaly Reserve [23°42'S 44°42'E], Malaise trap, no. 142, 18.XI.1984, leg. R.W. Brooks; UKL. **Syn. n.**

Taxonomy. Pesenko 1996: 495 (key), fig. 1-7 (*Cellariella brooksi*). Pesenko & Pauly 2001: 50 (key), 62, fig. 17b, Pl. 1g, h. (*Cellariella brooksi*)

Male. Structure. Length 3.5-4.0 mm. Head triangularly rounded in front view, height / width ratio 1.01-1.1 (in holotype 1.08, fig. 3a). Median lobe of clypeus moderately convex, height / width ratio 1.1-1.2 (in holotype 1.15, fig. 3a). Clypeus projecting approximately 0.5 of its height below lower margins of eyes (fig. 3a, 3b). Malar space linear. Inner orbits with deep, V-shaped notch; its depth about 0.7 of maximal (extrapolated) ocular width in front view. Frontal line absent. Antenna relatively short (fig. 3c), reaching middle of mesoscutum or sometimes its posterior third. Dorsal surface of propodeum moderately convex, as long as scutellum or slightly shorter, its posterior margin rounded. Hind wing with 6 distal hamuli. S8 about as long as wide, with relatively long, trapezoidal, mobile apical lobe-like thickening, maximal width of apical lobe about 1.5 times its length, proximal width/distal width ratio 2.2 (fig. 3b, 3i). Gonostylus narrow and straight in proximal two thirds, subapically thickened, bent mesally, distal part of gonostylus about 0.25 gonostylar length (fig. 3j-3m). Volsella small, rhomboid. Penis valve broadly triangular distally, posterior margin perpendicular to body axis; length of valve from level of bridge to distal end 1.3 times maximal width (fig. 3k).

Sculpture. Clypeus moderately shiny, very slightly strigate, with few shallow pits, those on lower fourth denser where pits separated by 0.2-0.3 of their diameters. Frons and vertex densely granulate. Genal area finely punctate on upper part near eyes, polished or inconspicuously sparsely punctate on lower part. Mesoscutum and scutellum dull, densely contiguously granulate; each granule 0.7 times eye facet. Dorsal surface of propodeum mat, contiguously granulate, more densely and finely than mesoscutum, sometimes with very short, fine striae along anterior margin. T1 granulate, mat: its microsculpture similar to that of mesoscutum. Sculpture on succeeding terga progressively more obscure, terga becoming shiny. Posterior areas of terga shiny, slightly transversely striate.

Coloration. Black, without metallic tints. Labrum; clypeus (fig. 3a; sometimes except two longitudinal dark spots, fig. 3b); mandible (except red distal third); lower surface of scapus; collar and posterior lobe of pronotum; spot on anterior part of dark brownish, translucent tegula; basal sclerites of wings; scutellar crest; median metanotal area; distal ends of femora; tibiae (sometimes except black spot on middle tibia); tarsi; large transverse spot (fig. 3f) and usually two small lateral spots on T1 (fig. 3d, 3e); triangular lateral spots on anterior part of T2; transverse bands on anterior parts of T3-T5 (variable in width, usually interrupted in middle); all yellow or whitish yellow. Lower surface of flagellum dark ochre-yellow to ochre-fuscous,

upper surface fuscous to black. Wings hyaline or slightly infuscate, veins and stigma usually fuscous.

Vestiture. Whitish, short, not dense, erect, slightly plumose; only hairs on genal areas, metanotum, and last sterna relatively long and dense. Supraclypeal area, paraocular area, and upper half of frons with very short, appressed, white plumes, denser between antennal sockets.

Female. Structure. Length 4.5-5.2 mm. Head triangularly rounded in front view; its height equal to width or slightly less (fig. 3n). Median lobe of clypeus flat, its height / width ratio 0.66-0.72. Clypeus projecting as in male. Depth of notch on inner orbits 0.5-0.6 of maximal ocular width in front view; its form nearly same as that in male (fig. 3n). Crest between antennal sockets absent. Propodeum and wings as in male.

Sculpture. Similar to that of male except as follows. Clypeus slightly shagreened, foveolate, slight shiny except usually

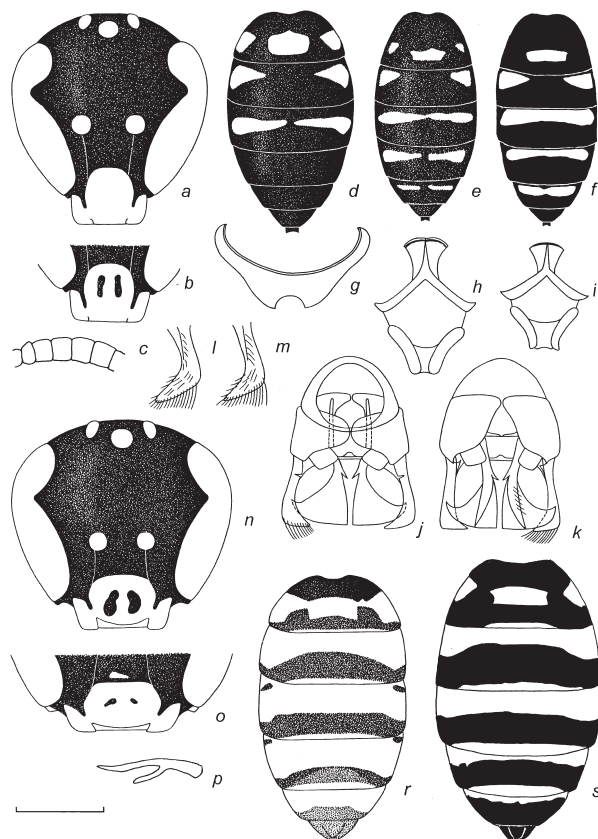


Figure 3

***Cellariella kalaharica* (Cockerell 1936): male (a-m) and female (n-s)**

a and n, head in frontal view; b and o, lower part of head; c, flagellomeres 1-5 in lateral view; d-f, r, and s, metasoma in dorsal view; g, S7; b and i, S8; j, genital capsule in ventral view; k, genital capsule in dorsal view; l and m, distal part of gonoforceps; p, inner metatibial spur.

a, c, and e, holotype; b, f, g, i, j, k, n, p, and s, paratypes from Beza Mahafaly Research Station (Madagascar); b, o, and r, specimens from Omaruru (Namibia); l, male from Komatipoort (Republic of South Africa); m, male from Kruger National Park (Republic of South Africa).

Scale line: 1 mm for d, e, f, r, s; 0.5 mm for a, b, c, n, o; 0.25 mm for g, h, i, j, k, l, m, p.

polished lower marginal strip. Genal area dull, very densely punctate on lower part. Sculpture of terga more obscure than in male. Sculpture of posterior areas of terga almost like that of postgradular areas.

Coloration. Head and mesosoma black, metasoma fuscous black, body without metallic tints. Yellow markings similar to those of male except as follows: labrum fuscous; clypeus always with two dark spots (fig. 3*n*, 3*o*); mandible yellow only on proximal third; also scutellum with yellow, interrupted in middle, transverse stripe along its posterior margin; hind femur usually entirely dark; hind tibia with large dark spot or entirely dark; usually pale coloration on hind and sometimes on middle legs not yellow but light orange brown; two lateral spots on T1 always present, larger than those of male (fig. 3*s*), sometimes merging into median spot (fig. 3*r*); T2-T5 with complete, usually wide yellow bands occupying pregradular areas and anterior halves of postgradular areas. Posterior areas of terga dark translucent brownish. Flagellum same as or darker than in male. Wing membrane hyaline, veins brownish yellow or dark yellow, stigma yellow.

Vestiture. Whitish, short, not dense, erect, slightly plumose; only hairs on lower surface of mesosoma and sterna long and dense. Frons, genal area, mesoscutum, and lateral surface of propodeum with rather sparse and often obliterated, very short, appressed, white plumes.

Variation. This is not a highly variable species. Data on variation in the size and pale pattern of the body are given in description of both sexes. In addition, six females from: Luderitz Küste (Namibia) are characterised by somewhat higher head (height / width ratio about 1.05), denser pubescence of the face, and wide continuous pale bands on the T1-T5.

Distribution. Kenya, Tanzania, Zambia, Mozambique, Botswana, Angola, Namibia, Republic of South Africa, Madagascar.

African material examined (120 specimens). *Kenya*: Eastern Province, near Ewaso Ng'iro, opposite Archer's Post, 0°38' N, 37°40' E, 19-20.XII.2002, leg. M.A. Prentice, 1 ♀; CAS. Voi, Tsavo, 23.III-3.IV.1997, 6 ♂♂, 5 ♀♀; 11-14.IV.1997, 2 ♂♂, 12 ♀♀; 10.XII.1999, leg. M. Snizek, 9 ♀♀; OLML.

Tanzania: Tanga Region, 2 km NE Mkomazi, 4°38' S, 38°05' E, 29-31.XII.2002, leg. M.A. Prentice, 1 ♀; CAS. Mombo or., 9-11.I.1996, leg. M. Snizek, 4 ♂♂, 2 ♀♀; OLML.

Zambia: 30 km NW Kazangula, 23.XII.2002, leg. J. Halada, 1 ♀; OLML.

Mozambique: Sofala Province, 110 km NW Save, 7.XII.2003, leg. J. Halada, 2 ♀♀; OLML.

Botswana: Maun, Island Sateri, i.1997, leg. M. Snizek, 1 ♀; OLML. Gaborone, 6.II.1997, leg. M. Snizek, 3 ♂♂; OLML.

Angola: Huila District, Pediva, E Porto Alexandre, vi.1972, 1 ♂, 1 ♀; BMNH. NE Mocamedes, 27-28.II.1972, 1 ♀; BMNH. Roçadas, 30.III.1972, 1 ♀; BMNH.

Namibia: 10 km SSE Omaruru, 24.II.1977, leg. J.G. & B.L. Rozen, 1 ♂; AMNH. 68 km W Omaruru, 18.II.1977, leg. J.G. Rozen & B.L. Rozen, 5 ♂♂, 1 ♀; AMNH, ZISP. 10 km E Swakopmund, 23.II.1990, leg. W.J. Pulawski, 1 ♂; CAS. 15 km E Swakopmund, 4-8.II.1993, leg. M. Schwarz & J. Gusenleitner, 3 ♂♂, 3 ♀♀; SCH. 30 km E Swakopmund, 5.II.1993, leg. M. Schwarz & J. Gusenleitner, 1 ♂, 2 ♀♀; SCH. Swakopmund, Swakop River, 28.XI.1994, leg. M. Kuhlmann, 1 ♂; KUH. 25 km N Windhoek, 12.I.1993, leg. M. Schwarz, 1

♂; SCH. Rundu, 20-22.I.1993, leg. M. Schwarz, 7 ♀♀; SCH. Karibib, 60 km SW Usakos, 1.III.1990, leg. M. Schwarz, 1 ♂; SCH. 55 km W Outjo, 4.III.1990, leg. M. Schwarz, 1 ♂; SCH; leg. W.J. Pulawski, 1 ♀; CAS. Damaraland, 38 km W Khorixas, 4.III.1990, leg. M. Schwarz, 4 ♂♂; SCH. Usakos, 16.I.1934, leg. J. Ogilvie, 1 ♂; BMNH. Kuiseb Canyon, 23°19' S, 15°45' E, 22-23.I.1972, 1 ♂; BMNH. Luderitz Küste, 7.XII.1994, leg. M. Kuhlmann, 6 ♀♀; KUH, FUSAG, ZISP.

Republic of South Africa: Transvaal: Komatipoort, 29.V.1969, leg. L.C. Starke, 5 ♂♂, 2 ♀♀; NCP; 3.VI.1969, leg. M.W. Strydom, 1 ♂; NCP. Kruger National Park, Crocodile Bridge, 20.V.1969, leg. L.C. Starke, 1 ♂; NCP. Kruger National Park, Skukuza, 24°59' S, 31°35' E, 290 m, 26.V.1969, leg. L.C. Starke, 1 ♂; NCP; 14-17.I.1985, leg. G.L. Prinsloo, 3 ♂♂, 5 ♀♀; NCP. Kruger National Park, Onder Sabie, 22.V.1969, leg. M.W. Strydom, 1 ♂, 3 ♀♀; NCP. Kruger National Park, Mashipange, 22°35' S, 31°01' E, 26.I.1984, leg. C.D. Eardley, 1 ♀; NCP. Soutpan, Pretoria Dist., 25°24' S, 28°06' E, 31.XII.1985, leg. C.D. Eardley, 2 ♂♂; NCP.

Cellariella schwarzi Pesenko & Pauly, n. sp.

[fig. 4*a-d*; Pl. I: 47 (total view), V: 112 (head), XV: 223 (map)]

Diagnosis. This species differs from all congeners in the distinctly elongate head, shallow emarginate inner orbit, and fuscous clypeus.

Female. *Structure.* Length 3.5 mm. Head elongate, egg-shaped in front view, length / width ratio 1.15. Median lobe of clypeus flattened, height / width ratio 0.9. Clypeus projecting approximately 0.7 of its height below lower margins of eyes. Malar space about 0.7 mandibular width at base. Inner orbits with shallow rounded emargination; its depth about 0.3 of maximal (extrapolated) ocular width in front view (fig. 4*a*). Frontal line distinct. Crest between antennal sockets absent. Dorsal surface of propodeum moderately convex, as long as scutellum, its posterior margin rounded. Hind wing with 6 distal hamuli.

Sculpture. Clypeus on lower half moderately shiny, with few shallow pits; on upper half slight shiny, finely obscurely granulate. Supraclypeal and parapocular areas, frons and vertex uniformly densely granulate, mat. Genal area finely obscurely punctate, shiny. Mesoscutum, scutellum, dorsal surface of propodeum and episterna uniformly densely granulate, mat;

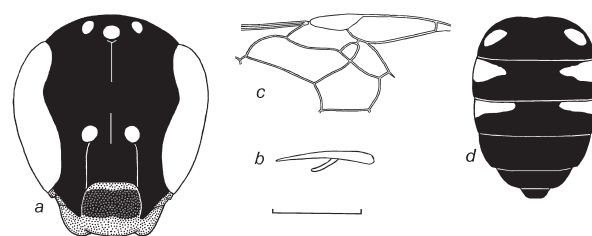


Figure 4
Cellariella schwarzi sp. n.: female (holotype)

a, head in frontal view; *b*, inner metatibial spur; *c*, part of forewing; *d*, metasoma in dorsal view.

Scale line: 1 mm for *d*; 0.5 mm for *a*, *c*; 0.25 mm for *b*.

each granule about as large as eye facet. T1 and T2 silk-mat, more coarsely granulate than mesoscutum. Sculpture on succeeding terga progressively more obscure, terga becoming more shiny. Posterior areas of terga more obscurely and finely granulate than their discs.

Coloration. Black, without metallic tints. Labrum, mandible (except black apex), malar space; lateral lobes of clypeus, band along lower margin and small spot at upper margin of its median lobe (fig. 4a); all dark yellow (fuscous yellow). Most part of clypeus fuscous. Lower surface of scapus; collar and posterior lobe of pronotum; spot on anterior part of dark brownish, translucent tegula; basal sclerites of wings; scutellar crest; median metanotal area, and lateral spots on T1-T3 (fig. 4a); all yellow. Upper surface of scapus dark fuscous on distal two thirds, flagellum ochre-yellow. Distal ends of femora; tibiae and tarsi entirely of fore and middle legs and hind tarsi ochre-yellow; rest parts of legs dark fuscous. Wings slightly infuscate, veins and stigma fuscous. Posterior areas of terga dark, not translucent.

Vestiture. Whitish, short, not dense, erect, slightly plumose. Only genal areas with sparse or obliterated, short, appressed, white plumes.

Male. Unknown.

Distribution. Republic of South Africa (north-west of Cape Province).

Holotype. ♀, *Republic of South Africa: Cape Province*: 25 km E Hondeklipbay [30°19'S 17°16'E], wadi, 17.X.1999, leg. M. Halada; OLML.

Paratypes (2 specimens). *Republic of South Africa: Cape Province*: 25 km E Hondeklipbay, wadi, 17.X.1999, leg. M. Halada, 1 ♀; OLML. 40 km NE Vanrhynsdorp, Farm Kalkgat, Sukkulent Karoo, 31°07' S, 18°55' E, 140 m, 4.X.2003, leg. K. Timmermann, 1 ♀; KUH.

Etymology. The species is named after Maximilian Schwarz (Anselden, Austria), in our gratitude to the material supplied and other help.

Cellariella somalica (Magretti 1899), n. comb.

[fig. 5a-5l; Pl. I: 48-49 (total view), V: 106-107 (head), XII: 197, 203 (male genitalia), XV: 224 (map); tab. 1]

Nomioides somalica Magretti 1899: 592, ♀, ♂. Lectotype (**designated here**): ♀, "[Ethiopia], Lago Bass Narok [= Lake Turkana] [4°30'N 36°E], IX.[18]96, [leg.] Botego"; MCG.

Nomioides (Cellaria) arnoldi Friese 1913: 584, ♀. Lectotype (**designated here**): ♀, "Bulawayo, [Zimbabwe] [20°09'S 28°35'E], [leg.] G. Arnold, 1909"; AMNH. Synonymised by Blüthgen (1925: 81).

Nomioides somalica var. *completa* Blüthgen 1934a: 262, ♀. Holotype: ♀, "Saw-Mills, S. Rhodesia [Zimbabwe] [19°35'S 28°02'E], 31.X.1919"; MNHUB (examined). **Syn. n.**

Nomioides (Cellariella) atomella Cockerell 1936: 1, ♂. Lectotype (**designated here**): ♂, "60 kilos. S. of Bukavu [R.D. Congo] [2°30'S 28°52'E], 28.VIII.[1928], A[llice] [M]ackie", "ac. 34242"; AMNH. **Syn. n.**

Taxonomy. Friese 1909: 150. Friese 1913: 584 (*Nomioides arnoldi*). Blüthgen 1925: 81. Blüthgen 1934a: 262 (*Nomioides somalica*). Cockerell 1936: 1 (*Nomioides atomella*). Cockerell 1936: 3 (*Nomioides somalica* and *N. somalica* var. *completa*; key). Cockerell 1939: 180 (*Nomioides somalica* var. *completa*). Pesenko 1983: 122, fig. 337, 338 (*Nomioides somalicus*).

Male. **Structure.** Body length 3.1-4.1 (usually 3.3-3.6) mm. Head rounded in frontal view; its height / width ratio 0.9-0.95

(fig. 5a), sometimes more (but not over 1.05). Face relatively flat. Ocellar elevation distinct. Median lobe of clypeus flat (in lateral view), its height / width ratio varying from 0.95 up to 1.0. Clypeus projecting about a third of its height below lower margins of eyes. Malar space nearly linear. Inner orbits with deep triangular notch; its depth about 0.6 of maximal (extrapolated) ocular width in frontal view (fig. 5a). Frontal line weak, nearly inconspicuous. Dorsal surface of propodeum flat, roundly passing to its posterior vertical surface, as long as scutellum or slightly shorter. Hind wings with 6 distal hamuli. S8 1.5 times as long as wide, with relatively long, V-shaped, mobile apical lobe-like thickening, maximal width of apical lobe about equal to its length, proximal width/distal width ratio 3.0 (fig. 5e). Genital foramen longitudinally elliptic; median gonobasal suture absent. ventral gonobasal bridge entirely narrow. Ventral gonocoxal bridge very wide, sharply narrowed medially; situated directly above gonobasal one. Volsella rhomboidal. Gonoforceps thin, its distal third sharply curved mesad, densely pubescent, slender; penis valve strongly broadened in distal half, pole-axis-shaped. (fig. 5f, 5g)

Sculpture. Median lobe of clypeus moderately shiny, finely strigate, with rounded shallow pits more distinct and dense on lower third where pits are separated by 0.2-0.3 of their diameters. Frons and vertex more coarsely granulate, mat. Genal area sparsely punctate, smooth in interspaces. Mesoscutum and scutellum uniformly densely granulate (each granule equal to eye facet), mat. Dorsal surface of propodeum granulate, more densely than mesoscutum, mat, often with very short, fine

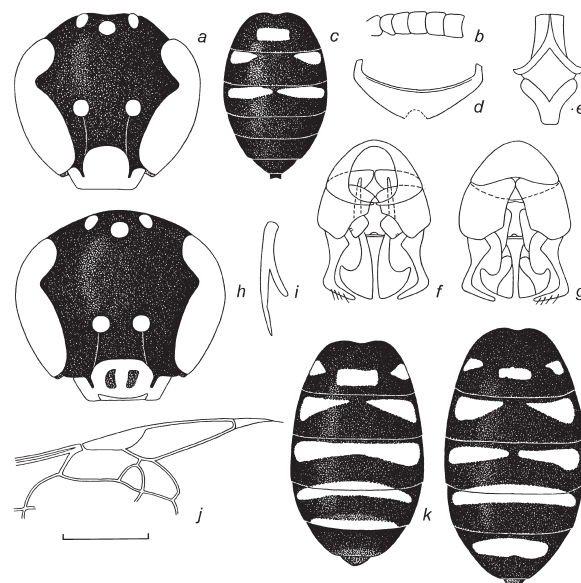


Figure 5

Cellariella somalica (Magretti 1899): male (a-g) and female (h-l)

a and b, head in frontal view; b, flagellomeres 1-5 in lateral view; c, k, and l, metasoma in dorsal view; d, S7; e, S8; f, genital capsule in ventral view; g, genital capsule in dorsal view; h, inner metatibial spur; j, part of forewing. a, b, c, d, f, and g, male from Samburu Game Research Station (Kenya); e, lectotype of *Nomioides atomella* Cockerell; h, i, j, and k, lectotype of *C. somalica*; l, lectotype of *Nomioides arnoldi* Friese.

Scale line: 1 mm for c, k, l; 0.5 mm for a, b, c, h, j; 0.5 mm for d, e, f, g, i.

striae along anterior margin. Borders of metapostnotum usually not marked by change of sculpture. T1 densely granulate, subsequent terga with more obscure sculpturing, slightly roughened and strigate, slight shiny.

Coloration. Body black, without metallic tint. Labrum, mandible entirely (except for reddish apex), clypeus (fig. 5a), scapus on lower side, collar and posterior lobes of pronotum, tegula on anterior half, bases of wings, scutellar crest, metanotum medially, distal parts of femora, most of tibiae, all tarsi, transverse spot on middle of T1, narrow lateral spots on T2, narrow band interrupted medially on T3 (fig. 5c), all yellowish white. Flagellum dark ochre-yellow (sometimes ochre-fuscous) on lower side, dark fuscous on upper side. Wing membrane usually infusate, sometimes nearly hyaline; pterostigma and veins blackish fuscous, sometimes yellowish fuscous.

Vestiture. White, relatively short, not dense, erect, slightly plumose on most surfaces; hairs longer and denser on genal areas, metanotum, and sterna. Supraclypeal area, paraclypeal areas, and upper half of clypeus covered with very short, appressed plumes, denser between antennal sockets.

Female: Structure. Body length 4.1–5.0 (usually 4.5–4.7) mm. Head with slightly convex anterior outline (in lateral view), transversely elliptical in frontal view; its height / width ratio 0.9–0.95 (fig. 5b). Ocellar elevation less distinct than that in male. Median lobe of clypeus flat, its height / width ratio 0.6–0.7. Clypeus projecting 0.6 of its height below lower margins of eyes. Malar space linear. Inner orbits with deep triangular notch; its depth somewhat more than half maximal (extrapolated) ocular width in frontal view (fig. 5b). Frontal line weak. Dorsal surface of propodeum flat, roundly passing to its posterior vertical surface, as long as scutellum or somewhat shorter.

Sculpture. Similar to that of male, with the following differences: clypeus usually smooth on lower fourth; genal area mat near occipital suture; T1 more obscurely granulate.

Coloration. Similar to that of male, with the following differences: clypeus with two fuscous spots (fig. 5b), tibia and tarsus of hind leg fuscous.

Vestiture. Whitish, ordinary. Sparse short appressed plumes present on face, genal area, pronotum, sometimes on mesoscutum.

Variation. A very variable species. Some individuals having various deviations from the typical form in the body size and coloration were described as separate species, subspecies or varieties (see the synonymy above). However, this variation demonstrates no distinct geographical trend. The body length varies in males from 3.1 mm (“*N. atomella*”, some males from Burkina Faso) up to 4.0 mm (some males from Namibia and Republic of South Africa), in females from 4 mm up to 5 mm. The individuals are smaller, the pale pattern on their bodies is usually poorer and the sculpture is more obscure. However, the correlation above is not absolute, e.g., the type of “*N. arnoldi*” being one of the darkest variants of females is of middle body size (4.5 mm), the type of “*N. somalica* var. *completa*” being of the same body size (4.5 mm) is one of the palest variants of females. The ground coloration of the body is black in the majority of individuals, but in some, the body has a reddish fuscous tint (e.g., the type of “*N. arnoldi*”).

Distribution. Sub-Saharan Africa.

Records from Africa. Magretti 1899: 592 (Somalia: Lago Bass Narok). Friese 1909: 150 (Somalia: Lago Bass). Friese 1913a:

575 (*Nomioidea arnoldi*; Zimbabwe: Bulawayo). Friese 1913b: 584 (*Nomioidea arnoldi*; Zimbabwe: Bulawayo). Blüthgen 1925: 83, 84 (Somali: See Bass Narok; Malawi: “Langenburg”, Rukwa; Zaire: Bukana, Bulongo; Zimbabwe: Bulawayo). Blüthgen 1934a: 263 (*Nomioidea somalica* var. *completa*; Zimbabwe: Saw-Mills). Cockerell 1935: 90 (Botswana: N’Kate, Nata River, Makarikari). Cockerell 1936: 3 (*Nomioidea somalica* ssp. *kalaharica*; Botswana: Nata River). Cockerell 1939: 180 (*Nomioidea somalica* var. *completa*; Namibia: Usakos).

African material examined (149 specimens). *Burkina Faso*: Kougny, 20–22.II.1980, leg. A. Pauly, 43 ♂♂, 20 ♀♀; FUSAG, ZISP. River Volta Blanche, 50 km E Ouagadougou, 29.II.1979, leg. A. Pauly, 7 ♂♂; FUSAG, ZISP. Bobo-Dioulasso, 20.II.1980, leg. A. Pauly, 2 ♀♀; FUSAG.

Ethiopia: Sidamo, 35 km N Moyale, 3°43’ N, 38°50’ E, 14.VIII.1997, leg. W.J. Pulawski, 2 ♂♂; CAS. Sidamo, 100 km N Moyale, 4°01’ N, 38°22’ E, 16.VIII.1997, leg. W.J. Pulawski, 1 ♀; CAS.

Somalia: Lago Bass Narok, IX.1896, leg. Botego, 1 ♀ (lectotype); MCG.

Kenya: Samburu Game Reserve, 4.VI.1975, leg. M.K. Tourtellot, 1 ♂; ZISP. Lamu district, 2°18’ S, 40°30’ E, 20.VII.1974, leg. R. Taden, 1 ♀; ZISP. Archer’s Post Ewaso Nyiro River, 2300 ft. [ca. 701m], 6–16.XII.1969, leg. M.E. Irwin & E.S. Ross, 2 ♀♀; CAS, ZISP. Eastern Province, near Ewaso Ng’iro, River opposite Archer’s Post, 0°38’ N, 37°40’ E, 19–20.XII.2002, leg. M.A. Prentice, 3 ♂♂; CAS. Rift Valley Province, Marich Pass Field Studies Centre, 1°32’ N, 35°27’ E, 9–13.VII.1999, leg. W.J. Pulawski & J.S. Schweikert, 1 ♂; 1 ♀, CAS; *ibid.*, 25–29.VII.1999, leg. W.J. Pulawski & J.S. Schweikert, 2 ♂♂, 2 ♀♀; CAS; *ibid.*, 14–17.V.2000, leg. V.F. Lee & W.J. Pulawski, 1 ♀; CAS; *ibid.*, 26–27.XI.2002, leg. M.A. Prentice, 1 ♀; CAS. Rift Valley Province, western shore of Lake Turkana, 3°20’ N, 35°57’ E, 24.XI.2002, leg. M.A. Prentice, 1 ♂; CAS. Masai Mara Game Reserve, 18.VIII.1980, leg. S. Meredith, 1 ♂; CAS.

Tanzania: Morogoro Region, 48 road km W Morogoro, 6°57’ S, 37°20’ E, 10.I.2003, leg. M.A. Prentice, 1 ♂, 1 ♀; CAS.

Mozambique: Nova Chupanga, 1928, leg. J. Surcouf, 2 ♂♂; MNHN.

Zimbabwe: Bulawayo, leg. G. Arnold, 2 ♀♀ (lectotype and paralectotype of *Nomioidea arnoldi*); AMNH, UKL. Saw-Mills, 31.X.1919, 1 ♀ (holotype of *Nomioidea somalica* var. *completa*); MNHUB.

Botswana: Maun, Crocodile Camp, 13.XI.1995, leg. M. Kuhlmann, 4 ♂♂, 1 ♀; KUH. Maun, Island Sateri, i.1997, leg. M. Snizek, 16 ♂♂, 17 ♀♀; OLML. Gaborone, 6.II.1997, leg. M. Snizek, 1 ♀; OLML.

Angola: R. Giraul, 10 mi [ca 16 km] NE Mocamedes, 27–28.II.1972, 3 ♀♀; BMNH.

Namibia: Tsumeb, 30 km E Namutoni, 4.III.1990, leg. W.J. Pulawski, 1 ♂; CAS; 7.III.1990, leg. M. Schwarz, 1 ♂, 1 ♀; SCH. 80 km NE Grootfontein, 9.III.1990, leg. M. Schwarz, 1 ♀; SCH.

Republic of South Africa: Transvaal: Kruger National Park, Crocodile Bridge, 21.V.1969, leg. L.C. Starke, 1 ♂; NCP. Kruger National Park, Skukuza, 24°59’ S, 31°35’ E, 292 m, 14–17.I.1985, leg. G.L. Prinsloo, 1 ♀; NCP. Kruger National Park, Pafuri, 22°26’ S, 31°12’ E, 23–30.I.1984, leg. C.D. Eardley, 1 ♀; NCP. Komatipoort, 29.V.1969, leg. L.C. Starke,

1 ♂; NCP. Cape Province: Vanrhynsdorp, 16.X.1972, leg. J.G. Rozen, 3 ♀♀; AMNH, ZISP.

Visited plants. Balanitaceae: *Balanites aegyptiaca* (49 ♂♂, 19 ♀♀). Combretaceae: *Guiera senegalensis* (2 ♀♀). Mimosaceae: *Acacia tortilis* var. *radiana* (1 ♂, 1 ♀).

Genus *Ceylalictus* Strand 1913

Halictus subg. *Ceylalictus* Strand 1913: 137.

Type species *Halictus horni* Strand 1913, by monotypy.

Comment. The indication by Ebmer (1987: 85) of *Eunomioides* as a junior synonym of *Nomioides* is wrong. The name *Eunomioides* was proposed by Blüthgen (1937a: 3) as a subgeneric one for the “*Nomioides variegata* group” without a diagnosis. Neither a description, nor a bibliographic reference was given. Therefore, the name *Eunomioides* is a *nomen nudum* because invalidly proposed (see also: Michener 1978: 505).

Taxonomy. Handlirsch 1888: 395-405 (*Nomioides*, part). Dębski 1917: 25-50 (*Nomioides*, part). Blüthgen 1925a: 1-100 (*Nomioides*, part). Blüthgen 1933b: 114-127 (*Nomioides*, part). Blüthgen 1933c: 63 (*Nomioides*, part). Blüthgen 1934a: 238-283 (*Nomioides*, part). Blüthgen 1934c: 493-501 (*Nomioides*, part). Blüthgen 1935b: 231-237 (*Nomioides*, part). Ireland 1935: 95-107 (*Nomioides*, part). Cockerell 1936: 1-3 (*Nomioides*, part). Michener 1978b: 503-505 (*Nomioides* subg.). Pesenko 1983: 120 (key), 177-187. Ebmer 1987: 85-87 (*Nomioides*, part). Ebmer 1988: 677-678 (*Nomioides*, part). Pesenko 1996: 493-516. Pesenko 2000a: 121 (key). Pesenko 2000b: 174 (key), 176. Pesenko & Wu 1991: 454-458; Pagliano & Nobile 1995: 547-561 (*Nomioides*, part). Michener 2000: 330 (key), 331. Pesenko *et al.* 2000: 108 (key), 144-145. Pesenko & Pauly 2001: 50 (key), 52.

Distribution. The genus includes 28 currently recognised species, mostly Palaetropical in occurrence. It consists of three subgenera readily distinguished by the wing venation, coloration of the body, structure of the metanotum and propodeum, form of the inner metatibial spur of the female, structure of the male genitalia and pregenital sterna (see: Pesenko 1983: 178-180): *Atronomioides* Pesenko, *Ceylalictus* s. str., and *Meganomioides* Pesenko. The subgenus *Atronomioides* is the less specialized or less advanced group in the subfamily Nomioidinae (Pesenko 2000b); six of the 13 currently recognised species of *Atronomioides* occur only in Madagascar (Pesenko 1996; Pesenko & Pauly 2001).

Key to African species of the genus *Ceylalictus*

1. Male..... 2
 - Female..... 10
2. Metanotum with median tubercle bearing a bunch of dense and long plumose hairs (*Ceylalictus* subg. *Meganomioides*) 3
 - Metanotum without median tubercle 4
3. Dorsal surface of propodeum finely and sparsely punctate, shiny. Marginal cell of forewing shortened, slightly narrowed to distal end, sharply and broadly truncated (transverse vein *3r* about 0.3 times as long as vein *R*₁; fig. 15b). Gonoforceps in distal half relatively wide, with sole-like structure covered with dense short hairs along outer margin of ventral surface (fig. 15e) *C. desertorum* (Blüthgen)
 - Dorsal surface of propodeum densely granulate, mat. Marginal cell of forewing longer, distinctly narrowed to distal end, narrowly truncated (transverse vein *3r* about 0.1-0.2 times as long as vein *R*₁; fig. 16d), or rounded, or pointed. Gonoforceps slender, without sole-like

- structure (fig. 16i) *C. karachensis* (Cockerell)
- 4. Mandible without subapical tooth. T6 strongly narrowed in posterior part (pseudopygidium narrow). S8 without lobe-like structure in posterior margin (fig. 9j, 11g, 12f-12h, 13i, 13j). Genital foramen rounded; gonoforceps curved mesad, narrowed, with ventral projection; penis valve narrow (fig. 9k, 11h, 11i, 12i, 12k, 13k, 13l). (*Ceylalictus* subg. *Ceylalictus*) 5
 - Mandible with subapical tooth. T6 weakly narrowed in posterior part (pseudopygidium wide); S8 with an apical membranous protuberance (fig. 6f, 7f, 8f). Genital foramen longitudinal; gonoforceps not narrowed or not curved mesad; penis valve more massive (fig. 6g, 7g, 8g). (*Ceylalictus* subg. *Atronomioides*) 8
- 5. Body length 5.0-5.5 mm. Mesoscutum and sides of mesosoma covered with not dense tomentum. Scutellum usually with pale pattern similar to that of female. Metasoma elliptical in dorsal view, nearly pointed at anterior and posterior ends (fig. 12c). Genital capsule not proportionally large in relation to body: length 1.0 mm. Volsella with long thin posterolateral process directed mesad; penis valve thin, S-shaped curved (fig. 12i-12l) *C. punjabensis* (Cameron)
 - Body length 3.5-5.0 mm. Mesoscutum and sides of mesosoma without tomentum. Scutellum without pale pattern. Metasoma broadened in posterior third. Genital capsule small, length about 0.5 mm. Volsella without a process. Penis valve of other form 6
- 6. Head wider, height / width ratio 0.85-0.9 (fig. 9a). Face distinctly depressed around antennal sockets. Middle flagellomeres as long as wide (fig. 9c). Head and mesosoma darker (blackish green) and covered with dark hairs, at least partly. Pale pattern of body poorer: clypeus usually with dark markings (fig. 7b; rarely yellow throughout, fig. 9a), metasoma without bands (fig. 9f) or with interrupted narrow bands on T2 and T3 (fig. 9e). Wing membrane infusate, veins and pterostigma fuscous. Metasoma usually without metallic tint (sometimes weak tint present on T1), weakly narrowed to anterior end, nearly elliptical (fig. 9e, 9f). T1 wider; its length / maximum width ratio 0.5 (fig. 9e, 9f). Gonoforceps broadened distally and pointed at apex (fig. 9k-9r). Penis valve massive, widened distally, pointed at apex (fig. 9k, 9l) *C. congoensis* n. sp.
 - Head narrower: its height / width ratio 0.95-1.0 (fig. 9a, 11a). Face flat. Middle flagellomeres 1.2-1.3 times as long as wide (fig. 11b, 13b). Head and mesosoma paler (dull green or blue) and covered with only whitish hairs. Pale pattern of body richer: clypeus entirely yellow (fig. 11a, 13a), metasoma with continuous bands on T2 and T3 and bands or lateral spots on T4 and T5 (fig. 11c-11e, 13c-13f). Wing membrane hyaline, veins and pterostigma usually light yellow. Metasoma always with distinct metallic tint, at least on T1, strongly narrowed (fig. 11c-11e, 13c-13f). T1 narrower; its length / maximum width ratio 0.6-0.7 (fig. 11c-11e, 13c-13f). Gonoforceps of other form at apex. Penis valve relatively small and narrow (fig. 11b-11k, 13l-13n) 7

7. Body length usually 4.5-5.5 mm. Main coloration of head and mesosoma metallic dull olive-green, face with distinct bronze tint. Metasoma blackish or dark fuscous, with metallic tint only on T1. T1 nearly mat. Usually T2-T5 or T2-T6 with transverse yellow spots in middle of discs (fig. 11c, 11d). Gonoforceps widened at apex (fig. 11b-11k) ***C. muiri* (Cockerell)**
- Body length usually 3.5-4.5 mm. Main coloration of head and mesosoma usually metallic dull blue-green or deep blue, face usually without bronze tint. Metasoma usually blackish blue with distinct metallic tint, but sometimes in southern populations metallic tint present only on T1. T1 shiny. Usually only T2 and T3 with transverse spots in middles of discs (fig. 13c, 13d). Gonoforceps not widened, but sharply curved forward (retrorse) at apex (fig. 13k-13n) ***C. variegatus* (Olivier)**
8. Body length 4.0-4.5 mm. Head transversely elliptical, its height / width ratio 0.85-0.9 (fig. 8a). Hind wing with 6 distal hamuli. Terga without pale pattern (fig. 8d). Gonoforceps knee-shaped, bearing large rounded, lateral prominence at level of proximal third of its length, with pointed apex directed laterad (fig. 8g, 8h) ***C. halictoides* (Blüthgen)**
- Body length 5.0-5.5 mm. Head rounded triangular, its height / width ratio 1.0-1.05 (fig. 6a, 7a). Hind wing with 7 distal hamuli. Terga with pale pattern (fig. 6d, 7c, 7d). Gonoforceps without lateral knee-like prominence, with rounded or truncate apex directed backward (fig. 6g, 7g) **9**
9. Pale pattern on body much richer: metanotum, lateral spots on T1, transverse bands, (usually interrupted) on discs of T2-T5 (fig. 7c, 7d), all yellow. Mesoscutum, scutellum and metasoma slight shiny. Gonoforceps nearly parallel-sided, broadly rounded at apex, and provided there with short hairs (fig. 7g) ***C. grandior* Pesenko et al.**
- Pale pattern on body much poorer: metanotum and T1 entirely dark, only T2 and T3 (fig. 7d) or T2-T4 with small lateral yellow spots connected by narrow transverse yellow along tergal graduli appearing through translucent posterior areas of preceding terga. Mesoscutum, scutellum and metasoma mat or silk-mat. Gonoforceps narrowed in middle of its length, obliquely truncate at apex and provided there with very long hairs (fig. 7g) ***C. capverdensis* Pesenko et al.**
10. Metanotum with median tubercle bearing a bunch of dense and long plumose hairs. Metasoma yellow throughout, except for base of T1. (*Ceylalictus* subg. *Meganomioides*) **11**
- Metanotum without median tubercle. Metasoma dark, with yellow bands **12**
11. Head shorter: its height / width ratio 0.95 (fig. 15g). Mandible flattened and rounded at apex, with subapical tooth. Dorsal surface of propodeum finely and sparsely punctate, shiny. Inner metatibial spur as long as outer metatibial spur, provided with two long processes (fig. 15b, 15i). Marginal cell of forewing shortened, slightly narrowed to distal end, sharply and widely truncated (transverse vein 3r about 0.3 times as long as vein R_1 ; fig. 15b) ***C. desertorum* (Blüthgen)**
- Head shorter: its height / width ratio 1.1 (fig. 16a). Mandible pointed at apex, without subapical tooth. Dorsal surface of propodeum densely granulate, mat. Inner metatibial spur nearly half as long as outer metatibial spur, provided with one long process (fig. 16m). Marginal cell of forewing longer, distinctly narrowed to distal end, narrowly truncated (transverse vein 3r about 0.1-0.2 times as long as vein R_1 ; fig. 16d), or rounded, or pointed ***C. karachensis* (Cockerell)**
12. Mesoscutum with yellow integumental median transverse spot before hind margin; inner metatibial spur with two teeth (fig. 10g, 12n). (*Ceylalictus* subg. *Ceylalictus*) **13**
- Mesoscutum without pale markings; inner metatibial spur with three teeth (fig. 6k, 7j, 8m). (*Ceylalictus* subg. *Atronomioides*) **16**
13. Body length 5.5-6.0 mm. Mesoscutum and sides of mesosoma covered with rather sparse tomentum. Metasoma entirely mat ***C. punjabensis* (Cameron)**
- Body length 4.0-5.5 mm. Mesoscutum and sides of mesosoma without tomentum. Metasoma shiny (except for T1 in *C. muiri*) **14**
14. Face distinctly depressed around antennal sockets. Head and mesosoma darker (blackish green) and covered with dark hairs, at least partly. Pale pattern of body poorer, clypeus usually (fig. 10b-10d) and scutellum (fig. 10e, 10f) dark on most surface, on metasoma usually only T2 and T3 (fig. 10k) or II-IV (fig. 10j) with transverse lateral spots. Wing membrane infusate, veins and pterostigma fuscous. Metasoma without metallic tint (sometimes with weak oil tint on T1 or T1-T3) ***C. congoensis* n. sp.**
- Face flat. Head and mesosoma paler (light green) and covered with only whitish hairs. Pale pattern of body richer: clypeus entirely yellow (fig. 14b) or only with two dark longitudinal spots (fig. 11l, 14a), scutellum entirely yellow (fig. 14c; except for some individuals of *C. variegatus* from Canary Islands, in which it has dark markings, fig. 14d, 14e), T1 with pale lateral spots, T2-T6 with wide continuous bands (fig. 11n, 11o, 14g, 14h). Wing membrane hyaline, veins and pterostigma usually light yellow. T1 with metallic green tint on dark parts **15**
15. Body length 5.0-5.5 mm. Pale pattern of body richer: clypeus usually entirely yellow (fig. 11a), lateral spots on T1 very large, united or nearly so (fig. 11n, 11o) ***C. muiri* (Cockerell)**
- Body length 4-5 mm. Pale pattern of body poorer: clypeus usually with two brown spots (fig. 14a), lateral spots on T1 small (fig. 14g, 14h) ***C. variegatus* (Olivier)**
16. Body length 4.1-4.6 mm. Head transversely elliptical (fig. 8j). Clypeus entirely yellow, except for two small brown spots (fig. 8i, 8k). Hind wing with 6 distal hamuli ***C. halictoides* (Blüthgen)**
- Body length 5.5-6.5 mm. Head short triangularly rounded (fig. 6i, 7i). Clypeus entirely or largely dark (fig. 6i, 6j, 7i). Hind wing with 7 distal hamuli **17**
17. Pale pattern on body much richer: metanotum, lateral spots on T1, wide transverse bands on

discs of T2-T5 (fig. 7k), all yellow. Mesoscutum, scutellum and metasoma shiny or slight shiny

- *C. grandior* Pesenko *et al.*
- Pale pattern on body much poorer: metanotum and T1 entirely dark, only T2-T4 with small lateral yellow spots (fig. 6d). Mesoscutum, scutellum and metasoma mat or silk-mat

..... *C. capverdensis* Pesenko *et al.*

Ceylalictus subgenus *Atronomioides* Pesenko 1983

Ceylalictus subg. *Atronomioides* Pesenko 1983: 179 (key to females), 180 (key to males), 186.

Type species. *Ceylalictus warnckeii* Pesenko 1983, by original designation.

This subgenus is the less specialized [in the sense “more generalized” of Pesenko 2000b: 172] taxon in the subfamily Nomioiinae. It is a strictly Palaetropical subgenus and comprises 13 species. Six species are endemic to Madagascar (Pesenko 1996; Pesenko & Pauly 2001); two species, *C. capverdensis* Pesenko *et al.* and *C. grandior* Pesenko *et al.*, are endemic to the Cape Verde Islands; one species, *C. halictoides* (Blüthgen), is Afrotropical; *C. warnckeii* Pesenko is known only by the type series from southwestern Iran; and three other species inhabit southeastern Asia.

Ceylalictus (Atronomioides) capverdensis Pesenko, Pauly & La Roche 2002

[fig. 6a-6l; Pl. I: 50-51 (total view), V: 114-115 (head), XV: 225 (map)]

Ceylalictus (Atronomioides) capverdensis Pesenko, Pauly & La Roche in Pauly *et al.* 2002: 206, fig. 3, 4, 20, 21, 28, ♂, ♀. Holotype: ♀, Cape Verde Islands, Fogo, Caldeira, Monte Cruz [14°56'N 24°22'W], 10.III.1999, [leg.] La Roche; LAR.

Diagnosis. This species occupies an isolated position in the subgenus because of its larger and relatively broader body (especially in the female) and a combination of other characters. It shares the metallic green coloration of the head and mesosoma only with the South African *C. halictoides* (Blüthgen), two Oriental species, and *C. grandior* Pesenko *et al.* (see below).

Male. Structure. Length 5.0-5.5 mm. Body length / maximal width (in head) ratio 3.0. Head triangularly round in frontal view, with projecting vertex; about as high as wide (fig. 6a). Face flat, with slight shallow depression between antennal sockets. Ocellar elevation distinct. Median clypeal lobe flat (in lateral view), about as high as wide. Clypeus projecting about 0.7 of its height below lower margins of eyes. Supraclypeal area flat, provided with small sharp tubercle below upper border. Malar space linear. Inner orbits with deep triangular notch; its depth about 0.5 of maximal (extrapolated) ocular width in frontal view (fig. 6a); paraocular area in the notch flat. Longitudinal carina between antennal sockets and frontal line absent. Mandible bidentate. Antenna relatively long, reaching middle of dorsal surface of propodeum; middle flagellomeres 1.4 times as long as wide (fig. 6c). Metapostnotum not defined. Dorsal surface of propodeum flat, widely rounded on lateral and posterior margins, equal to scutellum in length. Marginal cell of forewing relatively narrow, narrowly truncate at distal end; second submarginal cell trapezoidal. Hind wings with 7 distal hamuli. Metasoma moderately convex, elongate elliptical, 1.8-2.0 times as long as wide (fig. 6d). Terga flattened, their posterior areas relatively narrow, slightly separated from tergal discs (postgradular areas), only posterior area of T1 distinctly depressed. Sclerotised part of S8 in form of triangle star with

very narrow and long axes, lateral axes twice longer than posterior median one, sternum provided with small triangular membranose lobe (fig. 6f). Genital foramen roundly triangular, somewhat longer than wide (fig. 6g). Median gonobasal suture absent. Unlike other species of the subgenus, both ventral bridges not broadened medially: ventral gonobasal bridge entirely narrow, ventral gonocoxal bridge sharply narrowed medially; the latter situated before gonobasal one. Volsella provided with pointed lobe directed backward. Gonoforceps flattened, narrowed in middle of length, strigate on ventral surface before apex, provided longitudinal row of bristles and apical fringe of very long hairs, obliquely truncate at apex (fig. 6g, 6h).

Sculpture. Face, vertex and genal areas on lower half uniformly,

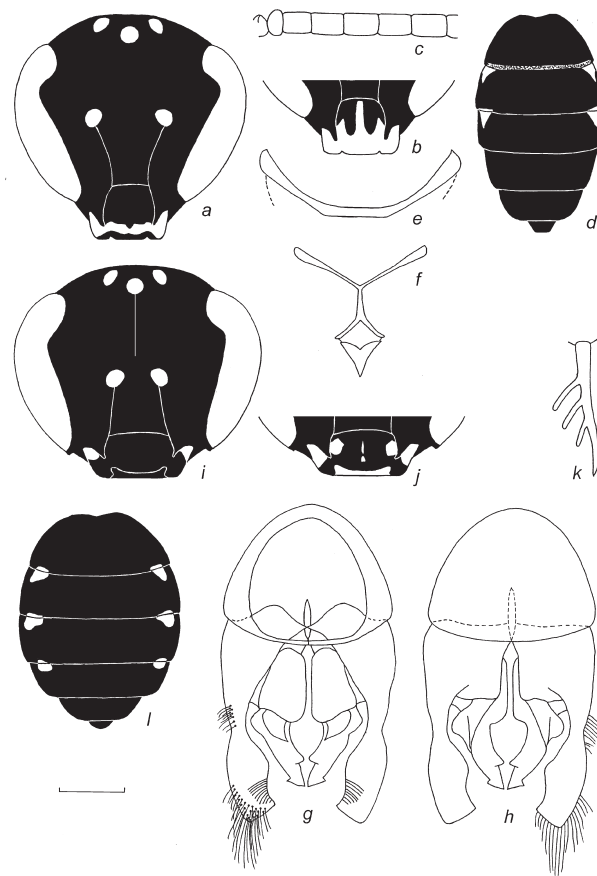


Figure 6
Ceylalictus (Atronomioides) capverdensis Pesenko *et al.* 2002: male (a-h) and female (i-l)

a and i, head in frontal view; b and j, lower part of head; c, flagellomeres 1-5 in lateral view; d and l, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view; k, inner metatibial spur.

a, c, d, i, and l, male and female paratypes from Cova (Cape Verde Islands: São Antão); b, male paratype from Mindelo São (Cape Verde Islands: Vincente); e-h, male paratype from Caldeira (Cape Verde Islands: São Nicolau); j and k, female paratype from Caldeira (Cape Verde Islands: Fogo).

Scale line: 1 mm for d; 0.5 mm for a, b, c, i, l, j; 0.25 mm for e, f, k, g, h.

very densely and finely granulate, impunctate, mat or silk-mat; genal area on upper part obscurely indistinctly and very finely punctate, shiny. Mesoscutum, lateral sides of mesosoma and propodeum uniformly densely granulate (each granule subequal to eye facet), mat. Scutellum on disc obscurely granulate, slight shiny. Dorsal surface of propodeum provided with short fine longitudinal carinae at anterior margin. Terga more obscurely granulate, slight shiny; their posterior areas very finely striate.

Coloration. Head and mesosoma dull metallic dark green; labrum, mandible, lateral lobes of clypeus, stripe along lower margin of median lobe of clypeus (fig. 6a) or pattern similar to that of *C. grandior* n. sp. (fig. 6b), and scutellar crests, all yellow. Antennal scapus black, with narrow yellow longitudinal stripe on lower side; flagellum brown on upper side and ochre-yellow on lower one. Legs brownish black, except for dark yellow tarsi and partly yellow tibiae. Tegula fuscous, translucent in posterior half. Wing membrane infusate; pterostigma and veins brown. Metasoma blackish brown; T1 on disc with green metallic tint; posterior areas of terga horny translucent. T2 and T3 (fig. 6d) or T2-T4 with small lateral yellow spots connected by narrow transverse yellow along tergal graduli appearing through translucent posterior areas of preceding terga.

Vestiture. Whitish, relatively short, not dense, erect, slightly

plumose on most surfaces. Mesoscutum, scutellum, and metanotum covered with denser, brownish hairs. Appressed plumose and tomentose pubescence absent.

Female. Structure. Length 6.0-6.5 mm. Body relatively wide: length / maximal width (at posterior margin of T2) ratio 2.5-2.7. Head triangularly rounded in frontal view; its height / width ratio 0.85-0.9 (fig. 6i). Face flat, with weak transverse depression at level of upper margins of antennal sockets. Ocellar elevation distinct. Median lobe of clypeus flat, 0.7-0.8 times as high as wide. Clypeus projecting half of its height below lower margins of eyes. Supraclypeal area flat. Malar space linear. Inner orbits with deep triangular notch; its depth about 0.4 of maximal (extrapolated) ocular width in frontal view (fig. 6i, 6j); paraocular area in notch flat. Longitudinal carina between antennal sockets absent or present in form of indistinct shiny elevation. Frontal line absent. Mandible with subapical tooth. Structure of propodeum and wing venation similar to those of male. Inner metatibial spur with three teeth (fig. 6k). Metasoma moderately convex, widely elliptical, about 1.5 times as long as wide (fig. 6l); terga flattened, their posterior marginal areas relatively narrow, separated from tergal discs by shallow depressions.

Sculpture. Face and vertex uniformly, very densely and finely granulate, impunctate, mat or silk-mat; clypeus and lower part of paraocular area provided with sparse shallow punctures (diameters 25-30 µm) on granulate background; clypeus with shiny smooth stripe along lower margin. Sculpture of genal area, and mesosoma similar to that of male. T1 granulate similar to mesoscutum, sometimes T1 a little shiner; on subsequent terga and posterior area of T1, granulation performing to dense fine transverse striation.

Coloration. Head and mesosoma dull metallic dark green. Pale (dark yellow) usually limited to spot on lateral lobe of clypeus (fig. 6i); sometimes also labrum, mandible, two or three spots on median lobe of clypeus (fig. 6j), scutellar crests, and lateral spots on metanotum. Antennal scapus black, flagellum brown on upper side and ochre-yellow on lower one. Legs black, except for the following dark yellow parts: most of anterior surface of fore tibia, distal ends of fore and middle femora. Coloration of tegula and wings similar to that of male. T1 dull metallic dark green; subsequent terga blackish brown, sometimes with slight metallic green tint; posterior areas of terga horny translucent. T2-T4 with small lateral yellow spots (fig. 6l).

Vestiture. Dark brownish, erect, mostly plumose. Only propodeum covered with paler hairs. Appressed plumose and tomentose pubescence absent.

Distribution. Cape Verde Islands.

Records from Africa. Pauly *et al.* 2002: 208 (Cape Verde Islands).

African material examined (type series, 63 specimens). *Cape Verde Islands: Fogo:* Altos de Portela, 9.III.1999, leg. F. LaRoche, 2 ♂♂; LAR. Bangaieira, 14.III.1999, leg. F. LaRoche, 1 ♀; LAR. Bordeira Sur, 24.III.1999, leg. F. LaRoche, 1 ♂; LAR. Caldeira, Monte Cruz, 10.III.1999, leg. F. LaRoche, 5 ♀♀ (including the holotype); LAR, ZISP. Cha das Caldeiras, 18.III.1999, leg. F. LaRoche, 4 ♂♂; LAR, ZISP. Mte Velha Piorno, 22.III.1999, leg. F. LaRoche, 1 ♀; LAR.

Santo Antão: Alto Mira, 19.IX.1980, leg. Hölzel and others, 1 ♂, 1 ♀; FSF. Cova, 17.VII. 1988, 3 ♀♀, 6.IX.1988, 1 ♀, 6.XI.1988, 9 ♂♂, 9 ♀♀, leg. van Harten & Simon Thomas; ZMA, ZISP. Paul, 9.VIII.1989, leg. van Harten, 1 ♂; ZMA.

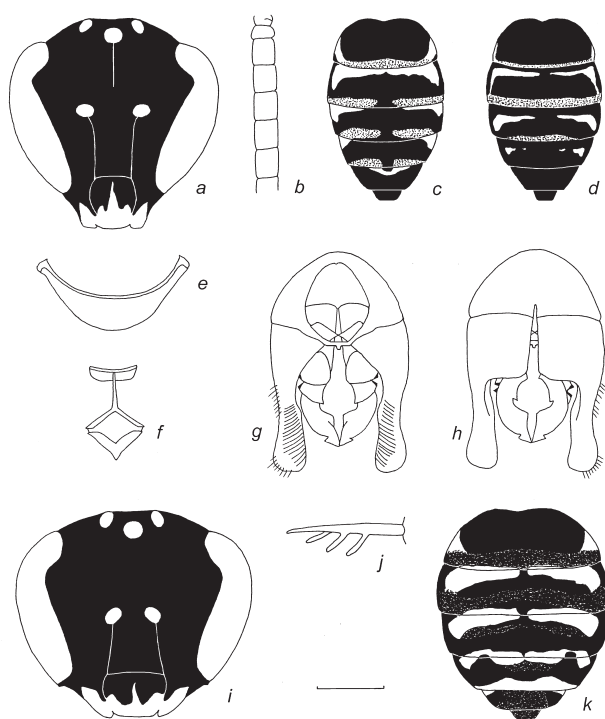


Figure 7
Ceylalicthus (Atronomioides) grandior Pesenko *et al* 2002: male (a-h) and female (i-k)

a and i, head in frontal view; b, flagellomeres 1-5 in lateral view; c, d, and k, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view; j, inner metatibial spur.

a, b, e, f, g, and h, male paratype from Viana (Cape Verde Islands: Boavista); c and i-k, male and female paratypes from Santa Maria (Cape Verde Islands: Sal); d, male paratype from Santa Monica (Cape Verde Islands: Boavista). Scale line: 1 mm for c, d, k; 0.5 mm for a, b, i; 0, 25 mm for e, f, g, h, j.

Rib Da Torre, 11.IX.1980, leg. Hölzel and others, 4 ♂♂; FSF. Supra Cova, 12.IX.1980, leg. Hölzel and others, 1 ♀; FSF. Supra Porto Nova, 24.IX.1980, leg. Hölzel and others, 5 ♂♂, 3 ♀♀; FSF, ZISP.

Santa Luzia: Ile Heu Branco, 11.X.1998, leg. F. LaRoche, 3 ♂♂; LAR.

São Nicolau: Caldeira, 13.X.1998, leg. F. LaRoche, 1 ♂, 1 ♀; LAR. Estanzia Bras, 29.XI.1980, leg. Hölzel and others, 1 ♀; FSF. Preguica, 9.VI.1986, leg. Hölzel and others, 1 ♂; FSF.

São Vicente: Mindelo, 4.XI.1988, leg. Simon Thomas, 4 ♂♂; ZMA. Parque Eólico, 12.X.1998, leg. F. LaRoche, 1 ♀; LAR.

Visited plants. Boraginaceae: *Echium stenosphon* (1 ♂, 1 ♀), *Heliotropium ramosissimum* (2 ♂♂, 1 ♀). Caryophyllaceae: *Polycarpaea gayi* (1 ♂). Fabaceae: *Cajanus cajan* (2 ♂♂). Lamiaceae: *Lavandula rotundifolia* (2 ♂♂, 6 ♀♀). *Micromeria forbesii* (= *Satureja*) (1 ♀). Zygophyllaceae: *Zygophyllum simplex* (3 ♂♂).

Ceylalictus (Atronomioides) grandior Pesenko, Pauly & La Roche 2002

[fig. 7a-7k; Pl. I: 52-53 (total view), V: 116-117 (head), XVI: 226 (map)]

Ceylalictus (Atronomioides) grandior Pesenko, Pauly & La Roche in Pauly *et al.* 2002: 208, fig. 5, 6, 22, 23, 29, ♂, ♀. Holotype: ♀, Cape Verde Islands, Sal, Santa Maria [16°36'N 22°54'W], [leg.] La Roche; LAR.

Diagnosis. It is similar to *C. halictoides* (Blüthgen) in the body coloration of the female, but differs from the latter in the body size and sculpture of both sexes and the coloration of the male body and structure of the male genitalia.

Male. Structure. Length 5.0-5.5 mm. Head nearly triangular in frontal view, about as high as wide (fig. 7a). Face weakly convex, not depressed at level of antennal sockets. Ocular elevation distinct. Median lobe of clypeus somewhat higher than wide. Clypeus projecting about 0.75 of its height below lower margins of eyes. Supraclypeal area flat, usually with weak, but distinct rounded median tubercle. Malar space linear. Inner orbits with deep rounded notch; its depth about 0.6 of maximal (extrapolated) ocular width in frontal view (fig. 7a); paraocular area in the notch flat. Longitudinal carina between antennal sockets absent. Frontal line indistinct. Mandible with subapical tooth. Antenna moderately long, reaching propodeum; middle flagellomeres approximately as long as wide (fig. 7b). Metapostnotum poorly defined. Dorsal surface of propodeum slightly transversely concave, lateral and posterior margins narrowly rounded, forming with posterior vertical surface of propodeum an angle of about 130°; 0.75-0.8 times as long as scutellum. Marginal cell of forewing relatively long, narrowly truncated at distal end; second submarginal cell triangular or nearly so. Hind wings with 6 distal hamuli. Metasoma convex, elongate elliptical in dorsal view, 1.5-1.7 times as long as wide (fig. 7c, 7d). Discs (postgradular areas) of T2-T4 weakly, but distinctly convex. Posterior areas of terga relatively narrow, flattened, distinctly separated from tergal discs. Structure of S8 (fig. 7f) similar to that of *C. aldabranus* (Cockerell) (cf. Pesenko 1996: fig. 23). Genital capsule similar to that of *C. capverdensis* Pesenko *et al.* (see above), with some differences: genital foramen longitudinally elliptic; gonoforceps nearly parallel-sided, strigate on ventral surface of distal half; broadly rounded at apex, and provided there with short hairs (fig. 7g, 7h).

Sculpture. Yellow parts of clypeus nearly polished, shiny; its dark part, supraclypeal area and lower half of paraocular areas

obscurely finely granulate, slight shiny. Frons, upper half of paraocular areas and vertex densely finely granulate, mat to silk-mat. Genal area with an obscure, fine, sparse punctation, shiny. Mesoscutum and dorsal surface of propodeum densely granulate (each granule subequal to eye facet), silk-mat: the latter with narrow polished stripe along its posterior margin. Scutellum shiny except for margins. Sculpture of lateral sides of mesosoma similar to that of frons. Metasoma shiny; T1 very obscurely granulate on disc; posterior areas and discs of T2-T5 very finely striate.

Coloration. Head and mesosoma dull metallic greenish black or black with distinct dark green tint, excluding the following yellow parts: labrum, mandible, wavelike pattern on lower third of clypeus and median stripe on it (fig. 7a), pronotal

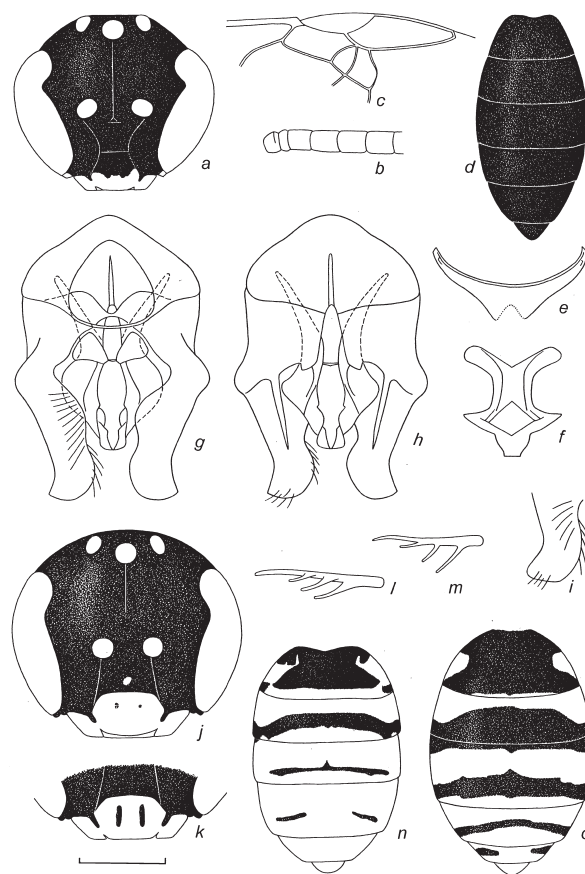


Figure 8
Ceylalictus (Atronomioides) halictoides (Blüthgen 1925): male (a-i) and female (j-o)

a and j, head in frontal view; b, flagellomeres 1-5 in lateral view; c, part of forewing; d, n, and o, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view; i, distal part of gonoforceps; k, lower part of head in frontal view; l and m, inner metatibial spur.

a-d, male from Grahamstown (Republic of South Africa); e-i and k-m, males and females from Doringbos (Republic of South Africa); j and o, holotype of *Nomioides capensis* Blüthgen; n, female from Langjan Nature Reserve (Republic of South Africa).

Scale line: 1 mm for d, n, o; 0.5 mm for a, b, c, j, k; 0.25 mm for e, f, g, h, i, l, m.

collar entirely or partly, humeral tubercles (pronotal spiracular lobes), scutellar crests, transverse (sometimes interrupted) band on posterior half of median metanotal sclerite, spots on light brown translucent tegula. Antennal scapus black, with narrow longitudinal yellow stripe on lower side; flagellum brown to light brown on upper side and ochre on lower one. Coxae, trochanters and femora black with distinct metallic green tint; tibiae yellow, with brown to fuscous spot on inner surfaces; tarsi yellow throughout. Wing membrane hyaline; pterostigma and veins fuscous. T1 black, with metallic green tint; background of T2-T4 black, without tint; posterior areas of terga light horny translucent; T5 and T6 or only T6 orange brown. Yellow pattern of metasoma varying: T1 with lateral spots of various sizes; T2-T4 (fig. 7*d*) or II-V (fig. 7*c*) with transverse bands on pregradular areas, appearing through translucent posterior areas of preceding terga, and with transverse (usually interrupted medially) bands of various widths on anterior half of discs (postgradular areas); laterally these bands widening backward, to posterior areas of terga; some times both bands on T2 joined together, forming a single wide band (fig. 7*g*, 7*h*).

Vestiture. Whitish, short, not dense, erect, slightly plumose on most surfaces; denser and longer on lower half of face, genal areas, lateral surfaces of mesosoma and anterior surface of T1. Appressed plumose and tomentose pubescence absent.

Female. Structure. Length 5.6–6.4 mm (5.0 in one of paratypes from Santa Maria in the Sal Islands). Body relatively wide, length / maximal width (at posterior margin of T2) ratio 2.6–2.7. Head flattened, triangularly rounded in frontal view; its height / width ratio 0.85–0.9 (fig. 7*i*). Face weakly convex. Ocellar elevation distinct. Median lobe of clypeus flat, about 0.6 times as high as wide. Clypeus projecting 0.7 of its height below lower margins of eyes. Supraclypeal area very weakly convex, without tubercle. Malar space linear. Notch in inner orbits similar to that of male (fig. 7*i*); paraocular area in the notch flat. Longitudinal carina between antennal sockets absent. Frontal line indistinct. Mandible with subapical tooth. Scutellum convex. Structure of propodeum and wing venation similar to those of male, except for trapezoid second submarginal cell in the majority of paratypes. Inner metatibial spur with three teeth (fig. 7*j*). Metasoma weakly convex, elliptical, heart-shaped in dorsal view (fig. 7*k*); posterior areas of terga wide, flat, not separated from tergal discs, except for T1.

Sculpture and coloration similar to those of male, with some differences: yellow pattern of clypeus poorer (fig. 5*i*); antennal scapus black throughout; all tibiae, middle and hind tarsi mostly fuscous.

Vestiture. White, short, not dense, erect, slightly plumose on most surfaces; in some paratypes brown on clypeus and brown, with silver tint on hind tibia. Appressed plumose and tomentose pubescence absent.

Distribution. Cape Verde Islands.

Records from Africa. Pauly *et al.* 2002: 210 (Cape Verde Islands).

African material examined (type series, 25 specimens). *Cape Verde Islands: Boavista:* Sal Rei, 20.X.1988, leg. Simon Thomas, 1 ♀; ZMA. Santa Monica, 7.X.1998, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR. Viana, 7.X.1998, leg. F. LaRoche, 1 ♂; LAR.

Maio: Morrinho, 6.X.1998, leg. F. LaRoche, 1 ♀; LAR.

Sal: Santa Maria, , 8.X.1998, leg. F. LaRoche, 3 ♂♂, 1 ♀; 3.XI.1988, leg. Simon Thomas, 4 ♂♂, 10 ♀♀ (including the

holotype); LAR, ZISP, ZMA. Pedra Lume, 21.VII.1984, leg. van Harten, 1 ♀; ZMA. Salinas de Pedra da Lume, 15.XI.1988, leg. Simon Thomas, 1 ♂; ZMA.

Visited plants. Aizoaceae: *Sesubium portulacastrum* (1 ♂, 1 ♀). Boraginaceae: *Heliotropium ramosissimum* (1 ♀). Tamaricaceae: *Tamarix senegalensis* (1 ♂).

Ceylalictus (Atronomioides) halictoides (Blüthgen 1925) comb. n.

[fig. 8*a*–8*o*; Pl. I: 54–55 (total view), V: 118–119 (head), XI: 192 (male genitalia), XVI: 227 (map); tab. 2]

Nomioides halictoides Blüthgen 1925: 27, ♂. Holotype: ♂, "Zwartkops Salt Pan [Republic of South Africa] [33°51'S 25°36'E], 16.II.[18]97", "Dr. Penther. Süd-Afrika"; NMW (examined).

Nomioides capensis Blüthgen 1925: 44, ♀. Holotype: ♀, "Mossel Bay, Cape Province [Republic of South Africa] [34°11'S 22°08'E], Febr. 1922", "S. Africa, [leg.] R. E. Turner. Brit. Mus. 1922-97", "B. M. Type Hym. 17.a.1054"; BMNH (examined). Synonymised by Blüthgen (1934: 246).

Nomioides (Nomioides) halictoides ssp. *vernayi* Cockerell & Ireland in Cockerell 1935: 90, ♀, ♂. Syntypes: "Kalahari, Kuke Pan [Botswana] [23°19'S 24°27'E]"; "in Transvaal Mus." **Syn. n.**

Taxonomy. Cockerell 1932: 2 (key). Blüthgen 1934a: 246, 251. Ireland 1935: fig. 1, 6–8, 21–23, 30, 31, 32, 33a, 33b, 34a, 34b, 35a, 35b.

Diagnosis. This is the smallest species of the subgenus *Atronomioides*. It differs from two other African species of the subgenus, *C. capverdensis* Pesenko *et al.* and *C. grandior* Pesenko *et al.* occurring only in the Cape Verde Islands (see above), in the transversely elliptical head, presence only 6 hamuli on the anterior margin of the hind wings in both the sexes; in the absence of pale pattern on the metasoma of males and in the structure of the male genitalia (see the key above).

Male. Structure. Length 4.0–4.5 mm. Head transversely elliptical in frontal view, 0.85–0.9 times as high as wide (fig. 8*a*). Face weakly concave in middle. Ocellar elevation distinct. Median lobe of clypeus flat, 0.75 times as high as wide. Clypeus projecting about 0.3 of its height below lower margins of eyes. Supraclypeal area flat, below upper margin with small, but distinct triangular transverse median tubercle. Malar space linear. Inner orbits with moderately deep triangular notch; its depth about 0.3 of maximal (extrapolated) ocular width in frontal view (fig. 8*a*). Longitudinal carina between antennal sockets absent. Frontal line distinct. Mandible with subapical tooth. Antenna relatively short, reaching middle of scutellum; middle flagellomeres of approximately equal form, 1.2 times as long as their diameters (fig. 8*b*). Metapostnotum semicircular, shallowly transversely depressed in anterior third or in middle, bordered with weak transverse rounded elevation along posterior margin. Dorsal surface of propodeum about as long as scutellum, forming with posterior vertical surface of propodeum a distinct angle of about 110°. Marginal cell of forewing relatively long, narrowly truncated at distal end; second submarginal cell triangular or nearly so (fig. 8*c*). Hind wings with 6 distal hamuli. Metasoma strongly convex in dorsal side, elongate elliptical in dorsal view, with pointed posterior end, twice as long as wide (fig. 8*d*), usually curved downward at apex. Posterior areas of terga flat, distinctly separated from tergal discs. Sclerotised part of S8 elongate, nearly X-shaped; S8 provided with short trapezoidal apical membranous lobe, that 0.15 as long as main body of the sternum (fig. 8*f*). Genital foramen roundly triangular, about as long as wide (fig. 8*g*). Median gonobasal suture absent. Outline

of gonobase with shallow lateral emargination. Both ventral bridges not broadened medially: ventral gonobasal bridge very narrow, ventral gonocoxal bridge sharply narrowed medially; the latter situated behind gonobasal one. Volsellae small, triangular. Gonoforceps wide, flattened, with knee-shape bend in middle of its length, with pointed apex directed laterally; distal half nearly transversely aciculate on ventral surface, provided with strong longitudinal carina on ventral surface. Penis valves thickened in middle (fig. 8g, 8h).

Sculpture. Clypeus, lower half of supraclypeal area and paraocular areas finely and relatively densely punctate, shiny in interspaces. Frons, upper half of supraclypeal area and paraocular areas and vertex densely finely granulate, mat. Genal area in upper half densely punctate, roughened on narrow interspaces, slightly shiny, on lower half roughened shagreened. Mesoscutum slight shiny, with uniform microsculpture being intermediate between obscure granulation and fine, not dense punctation; each granule as large as eye facet (similar to microsculpture of *C. variegatus*). Scutellum with a similar, but more obscure microsculpture, often nearly smooth on disc, shiny. Mes- and metepisterna uniformly granulate, more densely than mesoscutum, mat. Metapostnotum with a varying microsculpture: from obscurely rugose or indistinctly fan-shaped striate and mat to nearly smooth and shiny. Lateral and posterior vertical surfaces of propodeum, granulose roughened, mat. T1 densely granulate on disc, slightly shiny; on discs of subsequent terga, granulation becoming more obscure step by step, thus shinier. Posterior areas of T1 and T2 finely and densely punctate, those of subsequent terga obscurely and more sparsely punctate.

Coloration. Head and mesosoma dull metallic olive-green; sometimes metanotum, metepisterna and propodeum black or blackish fuscous, without metallic tint. Metasoma black or dark fuscous, without metallic tint and pale markings (fig. 8d). Pale pattern of body very poor, only the following yellow: mandible (except for reddish apex), wavelike pattern on lower third of clypeus (fig. 8a), malar space, scapus on lower side, often pronotal collar entirely or partly and spiracular lobes, small spot on translucent tegula, basal sclerites of wings, distal ends of femora, entirely tibiae and tarsi. Flagellum light ochre-yellow

on lower side, fuscous yellow on upper one. Wing membrane hyaline; pterostigma and veins light yellow. Posterior areas of terga nearly hyaline.

Vestiture. Rich, white. Head entirely, pronotum, and mesepisterna covered with long dense erect plumose hairs. Mesoscutum and scutellum with shorter and sparser hairs. Metepisterna and propodeum glabrous, except for sparse hairs on border of dorsal and lateral surfaces of propodeum with posterior vertical surface. On lower half of face, hairs inclined downward; in addition it covered with short appressed plumes, especially dense between antennal sockets. Terga covered with short, relatively dense hairs; in addition, with a row of long hairs inclined backward along posterior margins of discs. Sterna covered with sparse long erect hairs.

Female. Structure. Length 4.1-4.6 mm. Head transversely elliptical in frontal view, 0.85-0.9 times as high as wide. Face weakly concave in middle. Ocellar elevation distinct. Median lobe of clypeus flat, 0.4-0.5 times as high as wide. Clypeus projecting about half of its height below lower margins of eyes (fig. 8j, 8k). Supraclypeal area flat, below upper margin with small, but distinct, triangular transverse median tubercle. Malar space linear. Inner orbits with rounded shallow notch; its depth about 0.25 of maximal (extrapolated) ocular width in frontal view (fig. 8j). Longitudinal carina between antennal sockets and frontal line absent. Metapostnotum semicircular, shallowly transversely depressed in middle or weakly concave, bordered with weak transverse rounded carina along posterior margin, not bordered on lateral margins. Dorsal surface of propodeum 0.8 times as long as scutellum, forming with posterior vertical surface of propodeum a distinct angle of about 110°. Inner metatibial spur with three long processes (fig. 8l, 8m). Venation of forewing and armature of hind wing same as those of male. Metasoma flattened, elliptical in dorsal view, with nearly pointed anterior and posterior ends, 1.5 times as long as wide (fig. 8n, 8o), its maximal width in middle of its length. Posterior areas of terga flat, not separated from tergal discs medially.

Sculpture. Clypeus shiny, with dense shallow pits; interspaces between pits smooth, 0.5-1.0 times as large as their diameters. Supraclypeal area mat or submat, obscurely finely sparsely punctate; interspaces between punctures granulose roughened, 3-5 times as large as their diameters. Frons and vertex densely finely granulate, mat. Genal area shiny, punctate. Mesoscutum slightly shiny, densely granulate. Scutellum with a similar, but more obscure microsculpture, shinier. Mes- and metepisterna densely granulate, mat. Metapostnotum densely and roughly alveolate; often such a microsculpture transformed into striation before anterior margin and into strigation laterally. Lateral and posterior vertical surfaces of propodeum, granulose roughened, mat. T1 entirely densely uniformly granulose punctate, mat; T2 finely shagreened, slightly shiny; subsequent terga with an obscure microsculpture, shinier.

Coloration. Head and mesosoma black or dark fuscous. Face (except for supraclypeal area), mesoscutum, scutellum, mes- and metepisterna with distinct green or bronze-green metallic tints. Pale pattern of body much richer than that of male, the following yellow: mandible (except for reddish apex), clypeus (except for small dark lateral spots, fig. 8j, or two longitudinal stripes, fig. 8k), malar space, usually small median spot on supraclypeal area (fig. 8j), scapus on lower side, pronotal collar and spiracular lobes, spot on translucent tegula, scutellar crests, most of surface of metanotum, basal sclerites of wings, fore and middle femora on distal ends, tibiae (except for a large fuscous

Table 2

Frequencies of differently coloured males of *Ceylalicus halictoides* in some localities

Origin of material	Dark form	Intermediate forms	Light form
Namibia: Gobabed	-	-	5
R.S.A. Cape Town	7	-	-
R.S.A. Sanflatos	5	-	-
R.S.A. Graafwater	2	3	-
R.S.A. Doringbos	22	15	7
R.S.A. St. Luis Estuary	-	-	4
Total	36	18	16

R.S.A.: Republic of South Africa

Data on 70 specimens examined in 1985-1988.

spot on hind one), tarsi and varying pattern on metasoma (cf. fig. 8n and 8o; see also Section "Variation"). Flagellum ochre-yellow on lower side, fuscous yellow on upper one. Coxae, trochanters and most surfaces of femora black, without metallic tint. Wing membrane hyaline, with slight milk haze; pterostigma and veins light yellow. On metasoma, only dark surfaces of T1 with weak green tint. Posterior areas of terga nearly hyaline.

Vestiture. White, much weaker than that of male, as usual for females of the genus; appressed and tomentose pubescence absent.

Variation. This is a relatively constant species, showing a little variability in the body size and sculpture. This variation and as well the variability of the body coloration (see below) has no geographical trend.

The variability of the body coloration is more distinct. In the original diagnosis of «*Nomioides halictoides* ssp. *vernayi*», Cockerell & Ireland (1935: 90) wrote: «Male (type). Distinguished [from the typical form] by the pale tubercles [pronotal spiracular lobes], the yellow also extending more or less along upper margin of prothorax». In fact, the holotype of the species also possesses such a pale pattern. For this reason for characteristics of the variability in the body coloration of the species, we shall use the terms as follows.

«Dark form»: in males, pronotum and spiracular lobes dark; in females, clypeus with two dark longitudinal stripes and lateral spots, supraclypeal area (fig. 8k), metanotum, hind tibia and basitarsus mostly or entirely dark, metasoma much darker: T1 with only two small pale lateral spots, T2 and T3 mostly dark (fig. 8o), pale part of body dark-yellow

«Light form»: in males, pronotal collar and spiracular lobes yellow; in females, clypeus with only two small dark lateral spots, supraclypeal area with small pale median spot (fig. 8j), metanotum yellow entirely, hind tibia mostly yellow, hind basitarsus entirely yellow, metasoma much lighter (fig. 8n), pale part of body light yellow.

We counted the proportion of dark and light males in some localities from which a number of individuals were examined. From tab. 2, one may derive the following conclusions: (1) dark males occur more often than light ones; (2) variability of the body coloration is rather of interpopulation character but not intrapopulation one.

Distribution. Widespread in southern Africa, also known from an isolated locality in SW Nigeria (Ibadan).

Records from Africa. Blüthgen 1925: 27, 44 (Republic of South Africa: Zwartkops Salt Pan, Capetown, Ceres, Mossel Bay). Blüthgen 1934a: 246 (Namibia: Okahandja; Republic of South Africa: Montagu, Algoa Bay, Stellenbosch). Cockerell 1932: 2 (Republic of South Africa: Port Elizabeth, Doorn River). Cockerell 1935: 90 (*Nomioides halictoides* ssp. *vernayi*; Botswana: Kuke Pan). Cockerell 1936: 2 (Republic of South Africa: George, Ceres, [Blaukrans, this male is really *Nomioides maculiventris* var. *cyaneonotus*; see Cockerell 1937: 9]).

African material examined (438 specimens). *Nigeria*: Olokemeji, Ibadan, 1914, leg. J. C. Bridwell, 1 ♀, NMNH.

Mozambique: 70 km N. Maputo, 3.XII.2003, leg. J. Halada, 15 ♂♂, 6 ♀♀; OLML. Inhambane Prov., 25 km N. Massinga, 29.XII.2003, leg. J. Halada, 1 ♀; OLML.

Botswana: Kalahari, Kuke-Pan, 21-30.III.1930, leg. T.D.A. Cockerell, 9 ♂♂; CUI, LACM, MCZC, UKL, ZISP. Maun,

Island Sateri, i.1997, leg. M. Snizek, 1 ♂; OLML.

Namibia: Tsumeb, 30 km E Namutoni, 7.III.1990, leg. M. Schwarz, 2 ♂♂, 6 ♀♀; SCH. Gobabis, 40 km W Witsvlei, 12.II.1990, leg. M. Schwarz, 5 ♂♂; SCH; ibid, 21.XII.1974, leg. Empey, 1 ♀; NCP. Mariental, 24.X.1968, leg. J.G. Rozen & E. Martinez, 1 ♂; AMNH. 4 km ESE Sees, 16.II.1977, leg. J.G. & B.L. Rozen, 3 ♀♀; AMNH. 22 km ESE Sees, 15.III.1976, leg. J.G. Rozen & B.L. Rozen, 1 ♀; AMNH. 25 km W Sees, 12.III.1976, leg. J.G. Rozen & B.L. Rozen, 1 ♀; AMNH. 18 km S Omaruru, 24.II.1977, leg. J.G. & B.L. Rozen, 1 ♂; AMNH. Gobabed, Namib Desert Research Station, 400 m, 5.X.1967, leg. E.S. Ross & A.R. Stephen, 5 ♂♂, 5 ♀♀; CAS, ZISP. 20 km E Kochena, 27°06' S, 19°02' E, 13.IX.1984, leg. C.L. Bellamy, 1 ♀; NCP. Okahandja, 2-4.II.1972, 1 ♂; BMNH. An inlet to Omaruru river, W of Omaruru, road C36, 11-13.IV.2000, leg. P. Zabransky, 2 ♀♀; OLML. Windhoek Dist., 110 km E Windhoek, Arnhem Farm, 22°41' S, 18°08' E, 27.X.1972, leg. C.L. Hogue, 1 ♀; LACM. Keetmans Dist., 1 km W Mata Mata, Welverdiend Farm, 25°47' S 19°59' E, 15.X.1972, leg. C.L. Hogue, 4 ♀♀; LACM. Otjiwarongo Dist., 50 km ESE Otjiwarongo, Okosongomongo Farm, 20°39' S, 17°05' E, 17.XI.1972, leg. C.L. Hogue, 1 ♂; LACM.

Republic of South Africa: Transvaal: Albertinia, 18.X.1982, leg. T.L. Griswold & R.T. Griswold, 1 ♀; UUL. Langjan Nature Reserve, 22°52' S, 29°14' E, 2.II.1984, leg. C.D. Eardley, 1 ♀; NCP. Kruger National Park, Pretoriosky, 21.II.1968, leg. K.V. Krombein, 1 ♂, 1 ♀; NMNH. Florida Lake, 17.II.1962, leg. H.N. Empey, 1 ♀; NCP. Discovery, 16.IX.1961, leg. N.H. Empey, 1 ♀; NCP. Bronkhorstbaai, 30.X.1965, leg. N.H. Empey, 1 ♀; NCP. *Orange Free state*: 80 km N Bloemfontein, 26.XI.2002, leg. M. Halada, 2 ♂♂, 2 ♀♀; OLML. *Natal*: Salt Rock, 6.I.1967, leg. C.D. Michener & D.J. Brothers, 1 ♂, 2 ♀♀; UKL. St. Luis Estuary, 4-6.XII.1966, leg. J.G. Rozen & D.J. Brothers, 4 ♂♂, 19 ♀♀; AMNH, ZISP. Kosi Bay, 26°58' S, 32°48' E, 10-11.II.1990, leg. C.D. Eardley, 5 ♂♂, 4 ♀♀; NCP. *Mapoutoland*: SW Emanguzi, 29.I.2003, leg. Snizek, 1 ♀; OLML. *Cape Province*: 10 km SE Alexandria Nature Reserve, 28-31.I.2000, leg. J. Halada, 4 ♀♀; OLML. Aliwal North, 30°42' S, 26°43' E, I-III.1979, leg. C.D. Eardley, 2 ♂♂, 7 ♀♀; NCP. Barrydale, 16.XII.2002, leg. M. Snizek, 1 ♀; OLML. 25 km S Bredasdorp, 23.X.1999, leg. M. Snizek, 1 ♀; OLML; leg. M. Halada, 3 ♀♀; OLML. Cape Town, I-IV.1915, leg. J.C. Bridwell, 7 ♂♂, 8 ♀♀; NMNH. ZISP. 60 km N Cape Town, 9.XI.1999, leg. M. Halada, 8 ♂♂, 6 ♀♀; OLML. Cedarberg, 32°30' S 19°15' E, 15.XI.1984, leg. C.D. Eardley, 1 ♀; NCP. Citrusdal, 32°36' S, 19°03' E, 19.XI.1984, leg. C.D. Eardley, 1 ♂; NCP. 20 km N Citrusdal, 27.X.1999, leg. M. Halada, 6 ♂♂, 14 ♀♀; OLML. Clanwilliam, 24.X.1982, 32°16' S, 18°56' E, leg. T.L. & R.T. Griswold, 1 ♂; UUL; ibid, 16.XI.1984, leg. C.D. Eardley, 3 ♂♂; NCP. 7 km S Cradock, 25.I.2000, leg. J. Halada, 42 ♂♂, 4 ♀♀; OLML. Doorn River, 3.XI.1931, leg. J. Ogilvie, 2 ♀♀; MRAC, MCZC. Doringbos, 3.XI.1966, leg. C.D. Michener, 18 ♂♂, 10 ♀♀; UKL, ZISP; ibid, 3.XI.1966, leg. J.G. Rozen, 26 ♂♂, 7 ♀♀; AMNH, ZISP. Elands Bay, XI.1984, leg. G.L. Prinsloo, 1 ♂; NCP. 40 km SW Garies, Wadi Groen, 16.X.1999, leg. M. Halada, 1 ♂; OLML. Graafwater, 4.XI.1966, leg. C.D. Michener, 5 ♂♂; UKL, ZISP; ibid, 4.XI.1966, leg. J.G. Rozen, 2 ♂♂; AMNH. Grahamstown, 5.III.1972, leg. D.J. Brothers & C.F. Jacot-Guillarmad, 1 ♂, 2 ♀♀; UKL; ibid, 17.III.1969, leg. L.C. Starke, 1 ♂; NCP. 17 mi [ca 27 km] NW Grahamstown, 21.XI.1966, leg. C.D. Michener, 1 ♂; UKL; ibid, 21-23.XI.1966, leg. J.G. Rozen &

D.J. Brothers, 1 ♂; AMNH. Greyton, Riviersonderend river, 21.X.1999, leg. M. Halada, 11 ♀♀; OLML; *ibid.*, 22.XI.2002, leg. M. Snizek, 7 ♀♀; OLML. NE of Gydo Pass, 33°12' S, 19°30' E, 9.XII.1988, leg. C.D. Eardley, 1 ♂; NCP. Kalahari Gemsbok Park, Nossob camp, 25°26' S, 20°36' E, 2.X.1991, leg. M.W. Mansell, 2 ♂♂; NCP. Katbakkies Pass, near Cérés, 32°49' S, 19°31' E, 19.XII.1988, leg. C.D. Eardley, 1 ♂, 1 ♀; NCP. Klein-Karoo, 24.XI.2002, leg. M. Halada, 1 ♂; OLML. Kommetjie, 29.X.1966, leg. C.D. Michener, 1 ♂; UKL; 12-14.X.1972, leg. J.G. Rozen and others, 3 ♀♀; AMNH. Kuruman, 14.I.2001, leg. M. Snizek, 4 ♂♂; OLML. 5 km S Lambert's Bay, 20-28.XI.2002, leg. M. Halada & M. Snizek, 15 ♂♂, 5 ♀♀; OLML. 13 mi [ca. 21 km] E Lambert's Bay, 4.XI.1966, leg. C.D. Michener, 1 ♂; UKL. 40 km S Lambert's Bay, 30.X.1999, leg. M. Halada, 15 ♂♂, 3 ♀♀; OLML. 40 km S Lambert's Bay, 29.X.1999, leg. M. Halada, 1 ♂; OLML. Mossel Bay, II.1922, leg. R.E. Turner. 1 ♀ (holotype of *Nomioides capensis*); BMNH; *ibid.*, III-IV.1930, leg. R. E. Turner, 2 ♂♂; CUI. 15 km NW Nieuwoudtville, near Engelsepunt, Fynbos, 31°15' S, 18°59' E, 830 m, 7.X.2003, leg. K. Timmermann, 1 ♀; KUH. Nuwerus, 31.X.1999, leg. M. Halada, 2 ♂♂; OLML. Pakhuis Pass, 32°08' S, 19°01' E, 24.X.1982, leg. T.L. Griswold & R.T. Griswold, 4 ♂♂, 3 ♀♀; UUL, ZISP; *ibid.*, 16.XI.1984, C.D. Eardley, 1 ♀; NCP. Plettenberg Bay, 34°03' S, 23°23' E, 13.II.1990, leg. V.M. Uys, 1 ♀; NCP. Sanflatos, 280 m, 18.IV.1958, leg. E.S. Ross & R.E. Leech, 5 ♂♂, 7 ♀♀; CAS, ZISP. Sederberg, 15-30 km SE Clanwilliam, 24.X.1982, leg. T.L. & R.T. Griswold, 11 ♂♂, 6 ♀♀; UUL, ZISP. 35 km W Springbok, 29°37' S, 17°31' E, 28.IX.1997, leg. M. Kuhlmann, 1 ♀; KUH. 62 km SW Vanzylsrus, 27°04' S, 21°33' E, 23.III.1983, leg. C.D. Eardley, 3 ♀♀; NCP. Van Zylsrus, Southern Kalahari, 15.I.2001, leg. M. Snizek, 26 ♂♂, 7 ♀♀; OLML. Velddrif, 6.XI.1972, leg. J.G. Rozen, 1 ♂; AMNH. 28 km E Velddrif, 15-24.X.1972, leg. J.G. Rozen and others, 2 ♀♀; AMNH. North West Prov., Wryburg, 14.I.2001, leg. M. Snizek, 4 ♂♂, 1 ♀; OLML. Zwartkops Salt Pan, 16.II.1897, leg. Penther, 1 ♂ (holotype); NMW.

Ceylalictus subgenus *Ceylalictus* s. str.

The geographical range of the subgenus coincides with that of the subfamily. The subgenus comprises 13 currently recognised species, most of which inhabit southeastern Asia. Only four species are known from Africa: *C. variegatus* (Olivier) widespread in the Southern Palaearctic region, *C. punjabensis* (Cameron) occurring in deserts of North Africa and southwestern Asia (to India in the east), the Afrotropical *C. muiri* (Cockerell), and *C. congoensis* n. sp. inhabiting the Niger and Congo basins.

Ceylalictus (Ceylalictus) congoensis n. sp.

[fig. 9a-9r, 10a-10k; Pl. II: 56-57 (total view), VI: 124-125 (head), XIII: 204-205 (male genitalia), XVI: 228 (map)]

Diagnosis. This species differs from the close *C. variegatus* (Olivier) and *C. muiri* (Cockerell) in the darker coloration of the head and mesosoma, poorer pale pattern of the body, infusate membrane of the wings, fuscous tegula, uniformly and more densely granulate and mat scutellum, presence of dark pubescence on the head and mesosoma, absence of the metallic tint on the metasoma, presence of distinct depression on the face around the antennal sockets, and in the structure of the male genitalia (for detail see the description below).

Male. *Structure.* Body length 4.0-4.8 mm. Head transversely

elliptical in frontal view; its height / width ratio 0.85-0.9 (fig. 9a). Median lobe of clypeus flat, its height / width ratio 0.7-0.8; clypeus extending half of its length below eyes. Malar space linear. Emargination in inner orbits deep, nearly right angular; its depth half of extrapolated width of eye in frontal view (fig. 9a, 9b). Face distinctly depressed around antennal sockets; supraclypeal area and space between antennal sockets distinctly elevated, the last bearing strong longitudinal carina. Antenna relatively short, reaching middle or posterior margin of scutellum; middle flagellomeres as long as their diameters (fig. 9c). Metapostnotum showing no lateral borders. Dorsal surface of propodeum flat, 1.2-1.5 as long as scutellum, passing onto posterior vertical surface at rounded right angle. Hind wing usually with 7 distal hamuli (sometimes only six ones in one of wings). Metasoma flattened; in dorsal view, elongate, weakly broadened in posterior third; T1 relatively wide, its length / maximum width ratio 0.5 (fig. 9e, 9f). Posterior areas of terga narrow, flattened, distinctly separated from tergal discs by steps. S8 relatively long, with distinct membranous lobe at posterior end (fig. 9i, 9j). Length of genital capsule about 0.5 mm. Gonobase broadly emarginated in dorsolateral margins; ventral gonobasal bridge situated behind gonocoxal one, provided with small rounded median lobe (fig. 9k). Gonoforceps with large triangle parapennial lobe, slender in distal half, not strongly

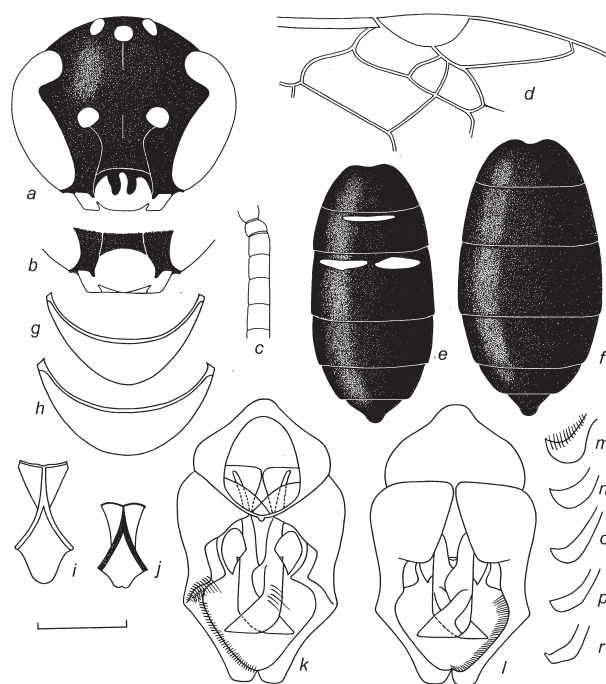


Figure 9

Ceylalictus (Ceylalictus) congoensis sp. n.: male

a, head in frontal view; b, lower part of head; c, flagellomeres 1-5 in lateral view; d, part of forewing; e and f, metasoma in dorsal view; g and h, S7; i and j, S8; k, genital capsule in ventral view; l, genital capsule in dorsal view; m-r, distal part of gonoforceps.

a, c, d, f, g, j, and n-r, paratypes from Lusambo (R. D. Congo); b and e, paratype from Nova Chavez (Angola); h, i, k, and l, paratype from Kenge (R.D. Congo); m, paratype from Garamba National Park (R.D. Congo).

Scale line: 1 mm for e, f; 0.5 mm for a, b, c, d; 0.25 mm for g, h, i, j, k, l, m, n, o, p, r.

broadened at distal end, pointed at apex (fig. 9*k-9r*). Penis valve massive, widened at distal end, pointed at apex (fig. 9*k, 9l*).

Sculpture. Clypeus finely granulose roughened, submat, sometimes mat, rarely shiny (*e.g.*, in one of males from Angola: Lunda), usually with shallow, not dense pits, sometimes without pits, rarely with dense pits (*e.g.*, in other male from Angola: Lunda). Supraclypeal and paraocular areas shiny, very finely and obscurely roughened, usually also with indistinct sparse punctation. Frons densely and finely granulate, mat. Vertex granulose roughened, slightly shiny. Genal area in upper part obscurely punctate, finely roughened or smooth in interspaces, shiny; in lower part, shagreened, sometimes with traces of striation, silk-mat. Mesoscutum slight shiny, with uniform microsculpture being intermediate between obscure granulation and fine, not dense punctation; each granule as large as eye facet. Scutellum with denser and finer granulation in comparison with that on mesoscutum, silk-mat. Metapostnotum with microsculpture similar to that on mesoscutum, but more regular (reticulate), silk-mat, laterally without distinct borders indicated by change in microsculpture. Posterior vertical surface of propodeum granulose, mat. All terga shiny or slight shiny; T1 and T2 or T1-T3 with fine obscure, not dense granulation having transverse arrangement; subsequent ones obscurely roughened, with few shallow pits.

Coloration (typical dark form). Main coloration of head and mesosoma metallic dull dark green or blue-green, even black with dark green metallic tint, usually replaced with bronze tint on face, lower fourth of genal areas, and mesepisterna. Metasoma black or dark fuscous throughout (fig. 9*f*); sometimes with narrow bands on T1 and T2, fig. 9*e*), without metallic green or blue tint, only T1 usually with slight oil tint. Pale pattern on body very weak; labrum, usually only trident pattern on clypeus (fig. 9*a*), mandible (except for reddish apex), spiracular pronotal lobes,

distal end of fore femur, middle femur, proximal and distal ends of hind femur, fore tibia, proximal third or fourth of hind tibia, all tarsi; all yellow. Scapus and pedicel black; flagellum fuscous or dark fuscous on lower side, black or dark fuscous on upper side. Tegula dark fuscous, slightly infusate. Wing membrane light fuscous infusate; veins and pterostigma fuscous. Posterior areas of terga almost not translucent, fuscous.

Vestiture (typical dark form). Face, vertex, genal areas in upper half, mesoscutum, and scutellum covered with short erect, not dense dark fuscous hairs. Lower half of genal areas, mes- and metepisterna covered with erect light fuscous-grey hairs of middle length. Appressed and tomentose pubescence absent. Pubescence of legs yellowish; that of hind trochanter, femur and tibia brownish yellow. Pubescence of metasomal segments I-III pale, of subsequent segments fuscous; short erect hairs on terga, sterna with long hairs inclined backward.

Female. Structure. Body length 5.0-5.8 mm. Head transversely elliptical in frontal view; its height / width ratio 0.9 (fig. 10*a, 10b*). Median lobe of clypeus very slightly convex, its height / width ratio 0.5-0.65; clypeus extending 0.5-0.7 of its length below eyes. Malar space linear. Upper minimum distance between eyes in upper part 1.1-1.2 times as large as lower minimum distance between eyes. Emargination in inner orbits relatively not deep, rounded triangular; its depth a third of extrapolated width of eye in frontal view (fig. 10*a, 10b*). Relief of face same as that of male. Structure of propodeum similar to that of male, its dorsal surface 1.15-1.25 as long as scutellum. Number of hamuli same as in male. Metasoma slightly convex; in dorsal view, elongate elliptical, blunted at anterior end (fig. 10*b-10k*). Posterior areas of terga relatively narrow, flattened, these areas of T1-T3 distinctly separated from tergal discs by steps.

Sculpture. Clypeus smooth or very finely roughened, shiny, with few rounded shallow pits. Supraclypeal area, frons, paraocular areas above clypeus, and vertex very finely, densely, and obscurely granulate, silk-mat; lower part of paraocular area finely roughened, with sparse pits. Genal area with upper part obscurely punctate, finely roughened or smooth in interspaces, shiny; lower part sparsely punctate, finely roughened in interspaces, silk-mat. Microsculpture of mesosoma and metasoma similar to that of male, only T4 and T5 with discs more or less coarsely and not densely roughened punctate.

Coloration (typical dark form). Main coloration of head and mesosoma metallic dull dark green. Labrum and mandible fuscous. Dark parts of legs dark fuscous. Dark areas of metasoma black, without metallic green or blue tint, only T1 or T1-T3I usually with slight oil tint. Pale pattern of body very weak: three longitudinal spots of variable size on median lobe of clypeus (fig. 10*a-10d*) and sometimes spot on its lateral lobes; pronotal spiracular lobes; spots of variable size on mesoscutum, scutellum, and metanotum (fig. 10*e, 10f*); distal ends of fore and middle femora, anterior surfaces of fore and middle tibiae, proximal third or fourth of hind tibia, all tarsi, usually narrow transverse lateral spots on anterior parts of T2 and T3 (fig. 10*k*) or T2-T4 (fig. 10*j*); all yellow. Coloration of tegula, antenna, wing membrane, veins, pterostigma, posterior areas of terga as in male.

Vestiture. Similar to that of male.

Variation. A very variable species in comparison with the relative constant *C. variegatus* and *C. muiri*. In addition to variability in the characters of structure and sculpture indicated in the

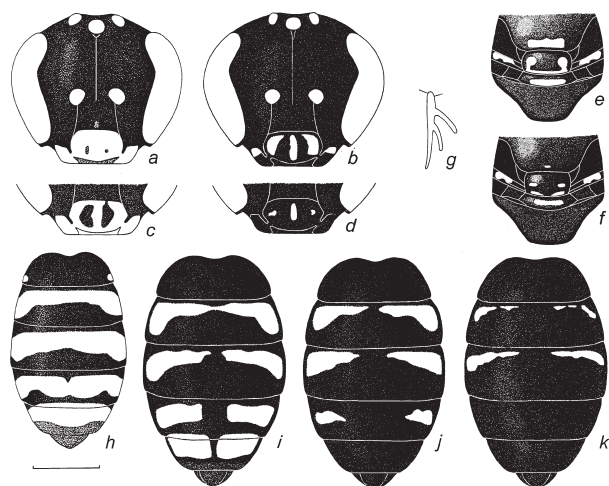


Figure 10

Ceylalictus (Ceylalictus) congoensis sp. n.: female

a and *b*, head in frontal view; *c* and *d*, lower part of head; *e* and *f*, posterior two thirds of mesosoma in dorsal view; *g*, inner metatibial spur; *h-k*, metasoma in dorsal view.

a-i, and *k*, paratypes from Lusambo (R.D. Congo); *j*, paratype from Kibomba (R.D. Congo).

Scale line: 1 mm for *e, f, h, i, j, k*; 0.5 mm for *a, b, c, d*; 0.25 mm for *g*

description above, there is a high variability in the coloration and pubescence of the integument. The palest individuals nearly reaching the coloration of *C. variegatus* and *C. muiri* more frequently occur near the borders of the geographical range of the species.

In the palest individuals (in relation to coloration of integument), the following parts of the body are also yellow (usually in different combinations): the labrum, entirely clypeus (fig. 9b, 10a), mandible (except for reddish apex), scapus on lower surface, the corolla of pronotum, a spot on tegula, and the basal sclerites of the wings. Such individuals usually have a somewhat paler background coloration, slightly infuscate tegula and wing membrane, pterostigma the fuscous only along margins, ochre yellow flagellum on lower side; and also richer pale pattern on metasoma: narrow transverse bands on T2 and T3 (fig. 9e) in males, small lateral spots on T1 and wide bands on the discs of T2-T5 in females (fig. 10b, 10i). In the palest females, also sometimes the T1 has a metallic green tint; yellow pattern on the mesoscutum, scutellum, and metanotum is similar to that of *C. variegatus* and *C. muiri*.

In the palest individuals (in relation to pubescence), the hairs on the body are yellowish greyish white (in females, at least light fuscous hairs are present, always on the mesoscutum and posterior legs), also not dense white appressed plumes are present on the lower parts of the paracocular areas (only in males) and on the upper half of the genital area.

Distribution. Niger and Congo basins: Senegal, Gambia, Mali, Burkina Faso, Niger, Côte d'Ivoire, Togo, Nigeria, Cameroon, Central African Republic, Gabon, Zaire, R.D. Congo, Angola, and Namibia. Over entire its geographical range, this species is sympatric in relation to *C. muiri*; in Niger, Mali, Burkina Faso, Cameroon, and Senegal, also in relation to *C. variegatus*.

Holotype: ♂, "B. Congo [R.D. Congo], 39 mi [ca 63 km] NE Lusambo [4°58'S 23°27'E], 12.VIII.1957, [leg.] E.S. Ross & R.E. Leech"; CAS.

Paratypes (477 specimens):

Senegal: Bignona, 15.VIII.1979, leg. A. Pauly, 5 ♂♂, 1 ♀; FUSAG, ZISP. Ziguinchor, 13.VIII.1979, leg. A. Pauly, 2 ♂♂, 1 ♀; FUSAG, ZISP. Dakar, VII.1937, 1 ♂, leg. L. Berland; MNHN.

Gambia: Fajara, 19.XI.1983, leg. K.M. Guichard, 1 ♂; BMNH.

Mali: 30 km NE Hombori, 18.VIII.1991, leg. M. Schwarz, 1 ♂; SCH. 100 km NE San, 21.VIII.1991, leg. M. Schwarz, 1 ♂; SCH.

Burkina Faso: Volta Blanche River, 50 km E Ouagadougou, 28.II.1979, forest gallery, leg. A. Pauly, 1 ♂; FUSAG. Bobo-Dioulasso, 20.II.1980, leg. A. Pauly, 6 ♂♂, 1 ♀; FUSAG, ZISP. Kougny, 22.II.1980, leg. A. Pauly, 1 ♀; FUSAG.

Namibia: Rundu, 20-22.I.1993, leg. M. Schwarz, 31 ♂♂, 14 ♀♀; SCH, ZISP.

Niger: Niamey, 1.XI.1979, leg. A. Pauly, 4 ♂♂, 2 ♀♀; FUSAG, ZISP. Aguié, 13°31' N, 7°46' E, 11.VIII.1979, leg. A. Pauly, 1 ♀; FUSAG.

Côte d'Ivoire: Tabou, 20.XII.1979, leg. A. Pauly, 3 ♂♂, 13 ♀♀; FUSAG, ZISP. Niakaramandougou, 10.I.1991, leg. W.J. Pulawski, 1 ♂; CAS. 30 km N Korhogo, 28.II.1980, leg. J.W. Everts, 1 ♂, 4 ♀♀; ZMA.

Togo: Sokodé, XII.1982, leg. A. Pauly, 26 ♂♂, 39 ♀♀; FUSAG,

ZISP.

Benin: 15 km SE Save, 6-25.IV.2000, leg. J. Halada, 40 ♂♂, 7 ♀♀; OLML. Cove, Zou River, 16.IV.2000, leg. J. Halada, 3 ♂♂; OLML. Zangnanado, Ouene River, 15.IV.2000, leg. J. Halada, 1 ♂; OLML.

Nigeria: Lagos, 18.VIII.1966, leg. C.D. Michener, 1 ♀; UKL. Oloke Meji, Ibadan, 1914, leg. J.C. Bridwell, 2 ♂♂, 2 ♀♀; NMNH.

Cameroon: Yagoua, 11°21' N, 15°14' E, 6.VIII.1987, leg. A. Pauly, 37 ♂♂, 37 ♀♀; FUSAG, ZISP. Mindif, Mayo Boula River, 10°27' N, 14°25' E, 30.VII.1987, leg. A. Pauly, 1 ♂; FUSAG. Djafga, Logone River, 10°37' N, 15°09' E, 6.VIII.1987, leg. A. Pauly, 2 ♂♂; FUSAG, ZISP.

Central African Republic: Kembe, 4°29' N, 21°53' E, 7-8.VIII.1985, leg. Dollfuss, 2 ♂♂; SCH. Haut Oubangui, Bessou (mission), Fort de Possel, IX.1904, leg. J. Decorse, 1 ♂; MNHN. Bambari, 6.III.1994, leg. G.G.M. Schulten, 1 ♂, 1 ♀; ZMA.

Gabon: Estuaire: Owendo, 8.XII.1985, leg. A. Pauly, 16 ♂♂, 3 ♀♀; FUSAG, ZISP. Libreville, 30.IV.1985, leg. A. Pauly, 1 ♀; FUSAG. *Woleu Ntem:* Eboro, 20.III.1987, leg. A. Pauly, 2 ♂♂; FUSAG, ZISP. Allém II, 19.III.1987, leg. A. Pauly, 1 ♂; FUSAG. *Moyen Ogooué:* Alembé, 17.III.1986, leg. A. Pauly, 1 ♂; FUSAG. Akou, 29.I.1987, leg. A. Pauly, 7 ♂♂, 2 ♀♀; FUSAG, ZISP. *Haut Ogooué:* Léconi, I.1985, leg. A. Pauly, 1 ♂, 8 ♀♀; FUSAG, ZISP.

R.D. Congo: Bandundu: 61 mi [ca. 98 km] E Kenge, 4°52' S, 16°59' E, 5.VIII.1957, leg. E.S. Ross & R.E. Leech, 1 ♂; CAS. *Kasai Oriental:* 39 mi [ca. 63 km] NE Lusambo, 4°58' S, 23°27' E, 12.VIII.1957, leg. E.S. Ross & R.E. Leech, 20 ♂♂, 21 ♀♀; CAS, ZISP. *Kivu:* 78 mi [ca. 125 km] W Kibombo, 3°58' S, 25°54' E, 13.VIII.1957, leg. E.S. Ross & R.E. Leech, 1 ♀; CAS. *Haut Zaire:* Parc National de la Garamba, 29.III.1950, 18 ♂♂, 1 ♀; 14.IV.1950, 2 ♀♀; 25.IX.1950, 3 ♂♂, 2 ♀♀; 20.X.1950, 3 ♀♀; 9-27.III.1951, 6 ♂♂, 9 ♀♀; 16-28.IV.1951, 16 ♂♂, 1 ♀; 9.VII.1951, 1 ♀; 16.VIII.1951, 1 ♀; 8-9.X.1951, 2 ♂♂, 1 ♀; 8.XI.1951, 2 ♀♀; 27.XII.1951, 1 ♂; 3.I.1952, 6 ♀♀; 4.II.1952, 14 ♂♂, 1 ♀; 8.III.1952, 1 ♀; 22-30.VIII.1952, 1 ♂, 18 ♀♀; 18.IX.1952, 1 ♀, leg. H. De Saeger; MRAC. ZISP. Stanleyville, 0°30' N, 25°10' E, 7.IV.1915, leg. Lang & Chapin, 2 ♂♂; AMNH. Yangambi, 14.VI.1958, leg. P.L.G. Benoit, 2 ♂♂; MRAC.

Angola: Lunda, Nova Chavez, 15.IX.1949, leg. Malkin, 4 ♂♂; CAS.

Visited plants: Anacardiaceae: *Mangifera indica* (26 ♂♂, 39 ♀♀). Asteraceae: *Acanthospermum hispidum* (5 ♂♂, 1 ♀). Balanitaceae: *Balanites aegyptiaca* (1 ♀). Caesalpiniaceae: *Cassia* sp. (3 ♂♂, 6 ♀♀), *Dialium* cfr. *soyauxii* (7 ♂♂, 2 ♀♀). Capparidaceae: *Crateva religiosa* (1 ♂). Combretaceae: *Guiera senegalensis* (6 ♂♂, 1 ♀). Euphorbiaceae: *Antidesma venasum*. Irvingiaceae: *Irvingia smithii*. Rubiaceae: *Borreria verticillata* (6 ♂♂, 17 ♀♀), *Canthium* sp., *Diodia vaginalis* (15 ♂♂, 1 ♀), *Mitracarpus villosus* (= *M. scaber*) (31 ♂♂, 32 ♀♀). Verbenaceae: *Vitex doniana*.

Etymology. This species is named after this type locality (Congo River basin).

***Ceylalictus (Ceylalictus) muiri* (Cockerell 1909)**

[fig. 11a-11o; Pl. II: 58-59 (total view), VI: 126-127 (head), XIII: 206-207 (male genitalia), XVI: 229 (map)]

Nomioides muiri Cockerell 1909: 400, ♀. Holotype: ♀, "Hab. Mozambique (F. Muir)"; BMNH (personal communication by G.E. Else, in his email message of 18 August 2005).

Nomioides variegata var. *albopicta* Blüthgen 1925: 53. ♂. Lectotype (designated by Pesenko 1996: 498): ♂, "Nyassa-See, Langenburg [Tanzania] [10°28'S 34°35'E], 1-9.VI.[18]98, [leg.] Füllerborn S." (the nearest specimen to the pin of two ones glued on the same paper piece); MNHUB. Synonymised by Pesenko (1996: 498).

Nomioides variegata var. *luederitzi* Blüthgen 1925: 54. ♂. Lectotype (designated by Pesenko 1996: 498): ♂, "S. W. Afrika, Rooibank [Namibia] [23°11'S 14°39'E], v.1905, no. 1136"; MNHUB. Synonymised by Pesenko (1996: 498).

Nomioides variegata var. *quinquefasciata* Blüthgen 1934a: 257. ♂. Holotype: ♂, "Okahandja [Namibia] [21°59'S 16°53'E], 19-29.XII.1927", "S. W. Africa, [leg.] R. E. Turner. Brit. Mus. 1928-52", "B. M. Type Hym. 17.a.1058"; BMNH (examined). Synonymised by Pesenko (1996: 498).

Taxonomy. Blüthgen 1925: 51 (*Nomioides variegata* var. *muiri*). Cockerell 1932: 1 (♂ nov.; *Nomioides muiri*). Blüthgen 1934a: 257 (*Nomioides variegata* var. *muiri*). Ireland 1935: 98 (*Nomioides luederitzi*), 107 (*Nomioides muiri*), fig. 36 (*Nomioides luederitzi*), 37 (*Nomioides muiri*). Cockerell 1939: 179. Alfken 1939: 112 (*Nomioides variegatus* var. *muiri*); Pesenko, 1996: 495 (key), 498, fig. 8-16 (comb. n.). Pesenko & Pauly 2001: 50 (key), 52, fig. 17 a, Pl. I k, l.

Male. Structure. Body length usually 4.5-5.0 mm. Head nearly rounded in frontal view; its height / width ratio 0.95-1.0 (fig. 11a). Median lobe of clypeus convex, its height equal to width or a little less; clypeus extending half of its length below eyes. Malar space linear. Minimum upper distance between eyes equal to minimum lower distance between eyes. Emargination in inner orbits deep, rounded; its depth nearly half of extrapolated width of eye in frontal view (fig. 11a). Face flattened; supraclypeal area and space between antennal sockets flat, not or very slightly elevated, the last with or without slight longitudinal carina. Supraclypeal area before upper margin with distinct small tubercle of variable form: from rounded elevation to pointed process. Antenna relatively long, nearly reaching posterior margin of propodeum; middle flagellomeres 1.2-1.3 times as long as their diameters (fig. 11b). Metapostnotum semicircular. Dorsal surface of propodeum flat, 1.15-1.2 times as long as scutellum, passing onto posterior vertical surface at widely rounded angle of 110°. Hind wing usually with 6 distal hamuli. Metasoma strongly flattened, in dorsal view elongate lancet-like, strongly broadened in posterior third; T1 relatively narrow, its length / maximum width ratio 0.6-0.7 (fig. 11a-11e). Posterior areas of terga narrow, flattened, usually separated from tergal discs by weak steps. S8 short, without posterior membranous lobe, as long as wide (fig. 11g). Length of genital capsule about 0.5 mm. Gonobase roundly triangular in dorsal view, without emargination in dorsolateral margin; ventral gonobasal bridge narrow, provided with small rounded median lobe, situated behind gonocoxal one (fig. 11h, 11j). Gonoforceps with small triangular parapennial lobe, relatively short and thick in distal half, club-like at distal end, rounded at apex. Penis valve slender and relatively short (fig. 11h-11k).

Sculpture. Clypeus usually finely obscurely roughened, shiny, with few large shallow pits. Supraclypeal area more densely roughened, less shiny. Frons densely and finely granulate, mat. Vertex granulate roughened, slightly shiny. Genal area with upper part densely punctate, finely roughened or smooth

in interspaces, shiny; lower part shagreened and striate, silk-mat. Mesoscutum slight shiny, with uniform microsculpture intermediate between obscure granulation and fine, not dense punctation; each granule as large as eye facet. Scutellum with microsculpture similar to that of mesoscutum, but more obscure, in middle usually almost smooth. Metapostnotum with microsculpture similar to that on mesoscutum, but more regular (reticulate), silk-mat, bordered along lateral and posterior margins with shiny stripe. Posterior vertical surface of propodeum granulate roughened, mat. T1 uniformly finely granulate, mat; subsequent terga shiny, their granulation step by step becoming more obscurely and transformed to fine strigation.

Coloration (typical form). Main coloration of head and mesosoma dull metallic olive green; frons, supraclypeal area and upper half of paraocular area greenish bronze; lower paraocular

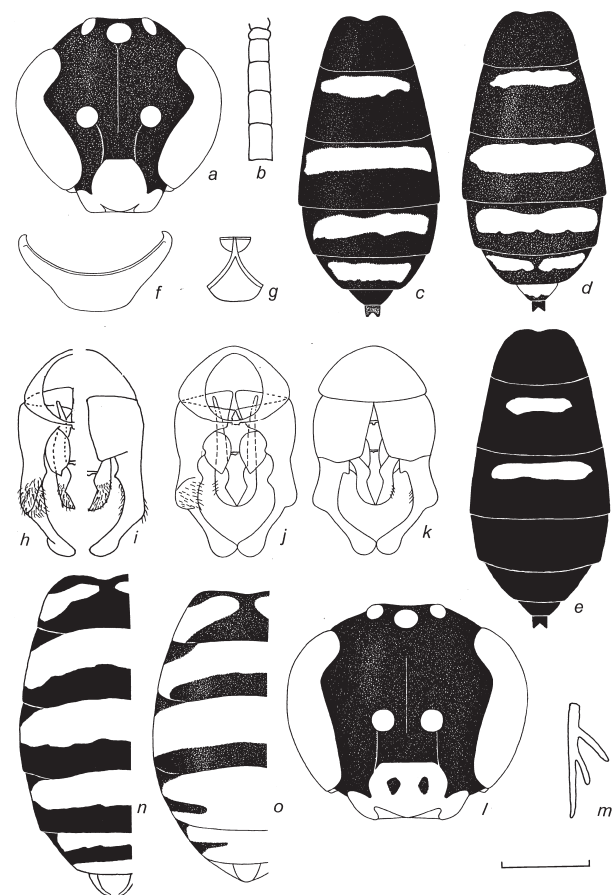


Figure 11
***Ceylalictus (Ceylalictus) muiri* (Cockerell 1909): male (a-k) and female (l-o)**

a and l, head in frontal view; b, flagellomeres 1-5 in lateral view; c-e, n, and o, metasoma in dorsal view; f, S7; g, S8; h and j, genital capsule in ventral view; i and k, genital capsule in dorsal view; m, inner metatibial spur.

a, b, e-i, and l-o, specimens from Louis Trichard (Republic of South Africa); c, lectotype of *Nomioides variegata* var. *luederitzi* Blüthgen; d, j, and k, holotype of *Nomioides variegata* var. *quinquefasciata* Blüthgen.

Scale line: 1 mm for c, d, e, n, o; 0.5 mm for a, b, l; 0.25 mm for f, g, h, i, j, k, m.

areas dark fuscous with violet tint; dark parts of legs black or fuscous; of metasoma black or dark fuscous; only T1 with slight greenish metallic tint. Pale pattern on body relatively rich: labrum, clypeus (fig. 11*a*), mandible (except for reddish apex), scapus on lower side, collar and stripe along anterior margin of pronotum, pronotal spiracular lobe, spot on anterior part of tegula, basal sclerites of wings, distal halves of fore and middle femora, all tibiae (except for large brown spot on hind one), all tarsi, transverse spots in middle of discs of T2-T5 (fig. 11*c*) or T2-T6 (fig. 11*d*); all yellow. Scapus on upper side and pedicel black; flagellum ochre yellow on lower side, fuscous on upper side. Tegula hyaline. Wing membrane hyaline; veins and pterostigma light yellow; except for fuscous vein R_1 and stripes along margins of pterostigma. Posterior areas of terga fuscous translucent.

Vestiture. Relatively weak, whitish, short, not dense, erect; denser and longer on genal areas, sides of mesosoma and metanotum. Paraocular area on lower part and genal area on upper half also usually covered with not dense, white appressed plumes.

Female. Structure. Body length usually 5.0-5.5 mm. Head transversely elliptical in frontal view; its height / width ratio 0.85-0.9 (fig. 11*l*). Median lobe of clypeus weakly convex, its height / width ratio 0.6-0.7; clypeus extending half of its length below eyes. Malar space linear. Emargination in inner orbits deep, rounded; its depth half of extrapolated width of eye in frontal view (fig. 11*l*). Face flattened; with weak, but distinct longitudinal carina between antennal sockets; this carina with upper end transforming into frontal line. Scutellum moderately convex. Structure of propodeum as in male. Hind wing usually with 7 distal hamuli. Metasoma weakly convex; in dorsal view, elongate elliptical, blunted at anterior end (fig. 11*n*, 11*o*). Posterior areas of terga relatively narrow, flattened, areas of T1-T3 distinctly separated from tergal discs by weak steps.

Sculpture. Clypeus usually smooth or finely transversely aciculate, shiny, with few shallow pits on sides of wide polished median longitudinal stripe. Supraclypeal area and frons densely and finely granulate, mat. Paraocular area and vertex usually more obscurely granulate, slight shiny. Genal area on upper part densely punctate, smooth in interspaces, shiny; lower part, shagreened, slight shiny. Microsculpture of mesosoma and metasoma similar to that of male.

Coloration. Main coloration of body similar to that of male of typical form. Pale pattern on mesosoma and metasoma much richer; also yellow: transverse spot along posterior margin of mesoscutum, most of surface of scutellum, scutellar crests, median area of metanotum, fore and middle femora nearly entirely (except for their proximal ends), two large transverse lateral spots on T1 (fig. 11*n*, 11*o*), sometimes jointed medially. T2-T5 with wide pale bands occupying their discs almost completely (fig. 11*n*, 11*o*), sometimes interrupted medially on T4 and T5; T6 entirely yellow; sometimes metasoma yellow nearly throughout, except for narrow lateral spots before posterior areas of T1-T3 (fig. 11*o*). Clypeus usually with two brown spots (fig. 11*l*). In one of females from Doringbos (Republic of South Africa), a small yellow spot present also on supraclypeal area. Hind tibia sometimes dark entirely.

Vestiture. Relatively weak, white, short, not dense, erect; denser and longer on genal areas, sides of mesosoma, on metanotum and intermediate area between dorsal and lateral surfaces of propodeum. Only on vertex pubescence sometimes light fuscous. Genal area with upper half also usually covered with not dense, white appressed plumes.

Variation. This is a relatively constant species (especially in females) showing, nevertheless, a certain variation in the body coloration of males: The main coloration of the head and mesosoma varies from olive green to blue green, violet or dark fuscous with slight green tint (*e.g.*, in the type of “*Nomioiodes variegata* var. *luederitzi*”); sometimes the bronze coloration or tints are absent on the face (*e.g.*, in some males from Namibia: Maltahöhe, Omaruru, Keetmanshoop, Nolloth). Variation of the pale pattern is as follows: labrum sometimes partly or entirely dark; pale surface on the fore and middle femora occupying from 0.25 to 0.7 of their lengths, sometimes the tibiae are yellow throughout (*e.g.*, in males from Republic of South Africa: Doringbos); spots on the terga can be white (*e.g.*, in the type of “*Nomioiodes variegata* var. *albopicta*”) and interrupted medially; sometimes only T2 and T3 are provided with pale transverse spots (*e.g.*, in males from Somalia: Hargeisa; Republic of South Africa: Louis Trichardt, Ubombo; fig. 11*e*). The flagellum of both the sexes is sometimes darker than that in the typical form: light fuscous on the lower side and dark fuscous on the upper one. This variation has no distinct geographical trend.

Distribution. Sub-Saharan Africa and Madagascar.

Records from Africa. Friese 1909: 149 (*Halictus fasciatus*, nec Friese 1898, see Cockerell 1932: 2; “Mozambique”). Blüthgen 1925: 52 (*Nomioiodes variegata* var. *muiri*; Tanzania: Darussalam; Zaire: Kalengwe, Katanga; Malawi: “Langenburg”). Cockerell 1932: 1 (*Nomioiodes muiri*; Zaire: Boma; Zimbabwe: Saw Hills; “Zuzuland: Mfongosi”; Republic of South Africa: Whitehill, Colesburg, Blaukrans, Graaf-Reinet). Blüthgen 1934a: 257 (*Nomioiodes variegata* var. *muiri*; *Nomioiodes variegata* var. *intermedia*, nec Alfken 1924; *Nomioiodes variegata* var. *quinquefasciata*; Zimbabwe: Buluwayo, Saw Hills; Namibia: Okahandja; Republic of South Africa: Weenen, Mossel Bay). Alfken 1939: 112 (Somalia: Malea Guba). Cockerell 1939: 179 (*Nomioiodes muiri*, *N. variegatus* var. *luederitzi*; Namibia: Okahandja, Windhoek, Otavofontein; Republic of South Africa: Seeheim, Upington, Bot River; “Bechuanaland: Palapye”). Benoist 1950a: 629 (*Nomioiodes variegata* var. *intermedia*, nec Alfken 1924; Senegal: Dakar).

African material examined (1004 specimens). **Senegal:** Dakar, 1905, leg. G. Melou, 5 ♂♂, 3 ♀♀; MNHNP. Diedieng near Kaolack, 20.VIII.1979, leg. A. Pauly, 1 ♀; FUSAG. Ndangane, 6-7.IV.1988, leg. F. Borgato, 5 ♀♀; FUSAG, ZISP. Ranérou, 18.IX.1967, leg. A. Descarpentries, T. Leye & A. Villiers, 10 ♀♀; MNHNP. 3 km N Tanaff, 7.III.1977, leg. Cederholm and others, 2 ♀♀; ZML, ZISP. Tattaguine, 20.VIII.1979, leg. A. Pauly, 1 ♀; ZISP.

Gambia: Abuko Nature Reserve, 25-26.II.1977, leg. Cederholm and others, 1 ♀; ZML. Bakau, 16-18.XI.1977, leg. Cederholm and others, 1 ♀; ZML. Banjul, 17.XI.1983, leg. K.M. Guichard, 2 ♀♀; BMNH. Fajara, 21.XI.1983, leg. K.M. Guichard, 5 ♀♀; BMNH.

Mali: 150 km NE Mopti, 19.VIII.1991, leg. M. Schwarz, 1 ♂; SCH.

Niger: Aguié, 13°31' N, 7°46' E, 11.VIII.1987, leg. A. Pauly, 3 ♀♀; FUSAG, ZISP. Moujia, 14°22' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 1 ♂, 2 ♀♀; FUSAG, ZISP. 20 km S Tahoua, 14°45' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG.

Burkina Faso: Kougny, 20.II.1980, leg. A. Pauly, 1 ♂; ZISP. Bobo-Dioulasso, 20.II.1980, leg. A. Pauly, 3 ♀♀; FUSAG, ZISP.

Togo: Sokodé, XII.1982, leg. A. Pauly, 1 ♀; FUSAG.

Benin : 15 km SE Save, 8-25.IV.2000, leg. J. Halada, 26 ♂♂, 3 ♀♀; OLML.

Nigeria: Oloke Meji, Ibadan, 1914, leg. J.C. Bridwell, 2 ♂♂; NMNH.

Cameroon: Mindif, Mayo Boula River, 10°27' N, 14°25' E, 30.VII.1987, leg. A. Pauly, 1 ♂, 3 ♀♀; FUSAG, ZISP. Mindif, 10°23' N, 14°27' E, 30.VII.1987, leg. A. Pauly, 2 ♂♂; FUSAG, ZISP. Mokolo, 10°43' N, 13°46' E, 28.VII.1987, leg. A. Pauly, 1 ♀; FUSAG. Yagoua, 6.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG.

R.D. Congo: Parc National de la Garamba, 16.IV.1951, 4.II.1952, leg. H. De Saeger, 2 ♂♂; MRCT. Uvira, 28-29.VIII.1931, leg. A. Mackie, 1 ♂; ZISP.

Burundi: Rumonge, 780m, 23.II.1949, leg. F. François, 1 ♀; MRCT.

Somalia: Hargeisa, 5-7.XII.1920, 2 ♂♂, 1 ♀; AMNH, ZISP. Dabolak, 12.XII.1920, 1 ♀; ZISP.

Kenya: Forest, 12 mi [ca. 19 km] W Malindi, 400 ft [ca. 120 m], 30.V.1967, leg. C. D. Michener, 2 ♀♀; UKL. 13 mi [ca. 21 km] S Malindi, 26.V.1967, leg. C. D. Michener, 2 ♀♀; UKL. Rift Valley Province, Marich Pass Field Studies Centre, 1°32' N, 35°27' E, 9-29.VII.1999, 9 ♀♀, 13-14.VI.2000, 1 ♀, leg. W.J. Pulawski & J.S. Schweikert; CAS; ibid, 26-27.XI.2002, leg. M.A. Prentice, 2 ♀♀; CAS. Rift Valley Province, 4 km ESE Namanga, 2°31' S, 36°50' E, 5.V.2000, leg. M.H. Bourbin, V.F. Lee & W.J. Pulawski, 1 ♂; CAS. Voi, Tsavo, 23.III-4.IV.1997, 77 ♂♂, 4 ♀♀, 11-14.IV.1997, 35 ♂♂, 2 ♀♀, leg. M. Halada; OLML. Lodwar, 20.XII.1995, leg. M. Snizek, 1 ♂, OLML.

Tanzania: Nyassa-See, Langenburg 1-9.VI.[18]98, leg. S. Füllerborn, 2 ♀♀ (lectotype and paralectotype of *Nomioides variegatus* var. *albopictus*), 1 ♂; MNHUB. 6 km N Usa, near Arusha, 21.XI.1982, leg. T.L. & R.T. Griswold, 1 ♀; UUL. Tanga Region, 2km NE Mkomazi, 4°38' S, 38°05' E, 29-31.XII.2002, leg. M.A. Prentice, 1 ♀; CAS. Kilimanjaro Region, 20 km SE Same, 4°04' S, 37°53' E, 14.I.2003, leg. M.A. Prentice, 2 ♀♀; CAS.

Malawi: Domira Bay, 1670 ft, 23.I.1916, leg. W.A. Lamborn, 2 ♀♀; BMNH. Mulanje Mts env., 23-26.XII.2001, leg. J. Halada, 1 ♀; OLML.

Zambia : 30 km NW Kazangula, 23.XII.2002, leg. J. Halada, 1 ♀; OLML. 30 km W Livingstone, 19-22.XII.2002, leg. J. Halada, 1 ♀; OLML. Sesheke near Namibian border, 950 m, X.1989-III.1990, leg. W. Strobbe, 1 ♂; RNH.

Zimbabwe: Ngezi National Park, Kwekwe, 1.XII.1998, leg. J. Halada, 8 ♂♂, 8 ♀♀; OLML. Bubi River, 80 km NE Beitbridge, 8.XII.1998, leg. J. Halada, 28 ♂♂, 1 ♀; OLML. Mutare Dorowa, 29.XI.1998, leg. M. Snizek, 1 ♀; OLML. Mushandike Natinal Park, Masvingo, 10.XII.1998, leg. J. Halada, 1 ♂; OLML. Mushandike Sanct., Masvingo, 9-11.XII.1998, leg. S. Becvar, 1 ♂; OLML.

Mozambique : Nova Chupanga, 1928, leg. J. Surcouf, 2 ♂♂; MNHNP. Vallée du Pungoué, Guengère, 1906, leg. G. Vasse, 3 ♂♂; MNHNP. Manicata Prov., 30 km NW Catandica, 17-18.XII.2003, leg. J. Halada, 1 ♀; OLML. Manicata Prov., 70 km SE Chimoio, 23-24.XII.2003, leg. J. Halada, 2 ♂♂, 1 ♀; OLML. Sofala Prov., 110 km NW Save, 7.XII.2003, leg. J. Halada, 1 ♂, 2 ♀♀; OLML. Sofala Prov., 10 km NW Save, 6.XII.2003, leg. J. Halada, 14 ♂♂, 5 ♀♀; OLML.

Angola: 14 mi [ca. 23 km] NW Cacula, 1000 m, 25.V.1958, leg. E.S. Ross & R.E. Leech, 1 ♂; CAS. Huila District, Pediva, 30 mi [ca. 48 km] E Porto Alexandre, 24-27.VI.1954, leg. J.

Balfour-Browne, 1 ♀; BMNH.

Namibia: Aris, 25 km S Windhoek, 15.II.1990, leg. M. Schwarz, 1 ♀; SCH. Caprivi, 50 km W Rundu, 18°25' S, 19°30' E, 13.I.1985, 1 ♂; NCP. Gobabed, Namib Desert Research Station, 400 m, 5.X.1967, leg. E.S. Ross & A.R. Stephen, 21 ♂♂, 3 ♀♀; CAS, ZISP. W of Grootfontein, Meteorite, 15.I.1993, leg. M. Schwarz, 1 ♂; SCH. Heigums, 27°01' S, 16°59' E, 17.IV.1988, leg. C.D. Eardley, 2 ♂♂; NCP. Helmeringhausen, 25°55' S, 16°49' E, 17.II.1988, leg. G.D. Butler, 3 ♂♂; NCP. Karasburg, 850 m, 27.IX.1967, leg. R.G. Stephen, 1 ♀; LACM. 10 mi [ca. 16 km] S Karasburg, 850 m, 24.IX.1967, leg. E.S. Ross & A.R. Stephen, 1 ♀; CAS. Karibib, 7.II.1993, leg. M. Schwarz & J. Gusenleitner, 2 ♂♂; SCH; ibid, 30.XI.1995, leg. M. Kuhlmann, 1 ♂; KUH. 15 km W Karibib, 26.II.1990, leg. M. Schwarz, 1 ♂; SCH. Karibib Dist., 47 km S Wilhelmstal, Okandukaseibe Farm, 22°20' S, 16°21' E, 5.XI.1972, leg. C.L. Hogue, 4 ♂♂; LACM. 30 mi [ca. 48 km] SE Keetmanshoop, 23-31.X.1968, leg. J.G. Rozen & E. Martinez, 5 ♂♂, 5 ♀♀; AMNH, ZISP. 70 km SSW Keetmanshoop, 10.XII.1994, leg. M. Kuhlmann, 33 ♂♂, 1 ♀; KUH. 22 km SE Keetmanshoop, Huns River, 29.III-1.IV.2000, leg. P. Zabransky, 1 ♂; OLML. 40 mi [ca. 64 km] W Klein Karas, Fish River, 850 m, 25.IX.1967, leg. E.S. Ross & A.R. Stephen, 2 ♀♀; CAS. Kovangogeb, Rundu, 10.III.1990, leg. M. Schwarz, 3 ♀♀; SCH. Lüderitz, Aus, 11.II.1993, leg. M. Schwarz, 3 ♂♂; SCH. 74-81 km W Maltahöhe, 29.III.1979, leg. J.G. Rozen, 5 ♂♂, 1 ♀; AMNH, ZISP. Mariental, Anib Lodge, 15.XI.1994, leg. M. Kuhlmann, 1 ♂; KUH. 50 km W Mariental, 24°42' S, 17°33' E, 22.III.1983, leg. C.D. Eardley, 5 ♂♂, 2 ♀♀; NCP. 65 km S Mariental, 10.II.1990, leg. M. Schwarz, 10 ♂♂, 4 ♀♀; SCH; ibid, leg. W. J. Pulawski, 1 ♂; CAS. 73 km S Mariental, 10.II.1990, leg. M. Schwarz, 61 ♂♂, 21 ♀♀; SCH; ibid, leg. W.J. Pulawski, 1 ♂; ZISP. Naukluft Park, Ganab, 23°06' S, 15°33' E, 16.III.1983, leg. I.M. Millar, 1 ♂; NCP. Naukluft Park, Kuiseb River near Gobabeb, 23°34' S, 15°03' E, 18.II-20.III.1983, leg. C.D. Eardley, 2 ♂♂, 5 ♀♀; NCP. Naukluft Park, Kuiseb River Pass, 23°17' S, 15°46' E, 22.III.1983, leg. C.D. Eardley, 1 ♂; NCP. Namaqualand Cape, Ochtha Diamonds, Orange River, 28.X.1974, leg. R.H. Watmough, 1 ♂; NCP. Okahandja, 19-29.XII.1927, leg. R.E. Turner, 1 ♂ (holotype of *Nomioides variegatus* var. *quinquefasciatus*); BMNH. 23 km W Okahandja, 17.II.1977, leg. J.G. & B.L. Rozen, 1 ♂; AMNH. 27 km S Okahandja, 18.II.1990, leg. M. Schwarz, 1 ♂; SCH. 20 km NNE Omaruru, 24.II.1977, leg. J.G. & B.L. Rozen, 1 ♂, 1 ♀; AMNH. 18 km S Omaruru, 19-24.II.1977, leg. J.G. Rozen & B.L. Rozen, 2 ♂♂, 2 ♀♀; AMNH. 61 km W Omaruru, 21.III.1977, leg. J.G. Rozen, 3 ♂♂; AMNH. W of Omaruru, road C36, an inlet to Omaruru River, 11-13.IV.2000, leg. P. Zabransky, 2 ♀♀; OLML. 15 km NW Otjiwarongo, 3.III.1990, leg. M. Schwarz, 1 ♂; SCH. 55 km W Outjo, 4.III.1990, leg. M. Schwarz, 1 ♂; SCH. Otjiwarongo Dist., 50 km ESE Otjiwarongo, Okosongomingo Farm, 20°39' S, 17°05' E, 17.XI.1972, leg. C.L. Hogue, 1 ♂; LACM. Rehobot, 15 km N Kalkrand, 13.II.1990, leg. M. Schwarz, 22 ♂♂, 2 ♀♀; SCH. 9 km N Rehobot, 14.II.1990, leg. M. Schwarz, 2 ♂♂, 1 ♀; SCH. Rosh Pinah, 28°00' S, 16°47' E, 27.X.1974, leg. H.H. Watmough, 1 ♂; NCP. Rundu, 8-20.I.1993, leg. M. Schwarz & J. Gusenleitner, 31 ♂♂, 4 ♀♀; SCH, ZISP. 30 km E Rundu, 23.I.1993, leg. J. Gusenleitner, 1 ♀; SCH. 100 km SW Rundu, 1.II.1993, leg. J. Gusenleitner, 1 ♀; SCH. Rundu, Kaisosi Lodge, 21.XI.1994, leg. M. Kuhlmann, 7 ♂♂, 20 ♀♀; KUH. 2 mi [ca. 3,2 km] N Seeheim, 250 m, 26.IX.1967, leg.

E.S. Ross & A.R. Stephen, 2 ♀♀; CAS. Seeheim, road C12, 45 km SW Keetmanshoop, 14.IV.2000, leg. P. Zabransky, 1 ♂; OLML. 9 km ESE Seeis, 12.III.1976, leg. J.G. Rozen & B.L. Rozen, 1 ♂; AMNH. 10 km E Swakopmund, 23.II.1990, leg. M. Schwarz, 6 ♂♂; SCH. 15 km E Swakopmund, 4-8.II.1993, leg. M. Schwarz & J. Gusenleitner, 20 ♂♂; SCH. Tsumeb, 30 km E Namutoni, 7.III.1990, leg. M. Schwarz, 7 ♂♂; SCH. Tsumeb District, 80 km NE Grootfontein, 9.III.1990, leg. W.J. Pulawski, 1 ♂, 1 ♀; CAS. 4 km N Usakos, 18.II.1977, leg. J.G. Rozen & B.L. Rozen, 1 ♂; AMNH. 11 km W Usakos, 6.III.1977, leg. J.G. Rozen, 1 ♂, 1 ♀; AMNH. 88 mi [ca. 141 km] E Walvis Bay, 750 m, 2.X.1967, leg. E.S. Ross & A.R. Stephen, 26 ♂♂, 5 ♀♀; CAS, ZISP. Walvis Bay, 22.II.1990, leg. M. Schwarz, 2 ♂♂; SCH. 16 km E Windhoek, 16.I.1993, leg. M. Schwarz, 1 ♀; SCH. 25 km W Windhoek, 12.I.1993, leg. M. Schwarz, 1 ♂; SCH. 100 mi [ca. 160 km] W Windhoek, 1050 m, 2.X.1967, leg. E.S. Ross & A.R. Stephen, 1 ♀; CAS.

Botswana: Maun, 930 m, 6.XI.1967, leg. E.S. Ross & A.R. Stephen, 1 ♂; CAS. Maun, Crocodile Camp, 13.XI.1995, leg. M. Kuhlmann, 2 ♂♂, 8 ♀♀; KUH. Maun, Island Sateri, i.1997, leg. M. Snizek, 29 ♂♂, 3 ♀♀; OLML. Ngami, 2mi [ca. 3,2 km] NE Schitwa, 15-16.IV.1972, 2 ♂♂, 1 ♀; BMNH. Sepopa 50 km S, 19°00' S, 22°15' E, 5.I.1985, leg. C.D. Eardley, 1 ♀; NCP.

Republic of South Africa: Transvaal: Beitbridge, 22°14' S, 29°59' E, 9.III.1990, leg. C.D. Eardley, 4 ♂♂, 4 ♀♀; NCP. Ben Alberts Nat. Res., Thabazimbi, 24°37' S, 27°23' E, 24-28.XI.1980, leg. C.D. Eardley, 1 ♂; NCP. Ellisras, 6.IV.1962, 1 ♂, 2 ♀♀, 1.VI.1973, 1 ♀, leg. H.N. Empey; NCP. Kruger National Park, Pafuri, 22°26' S, 31°12' E, 26.I.1984, leg. C.D. Eardley, 1 ♂; NCP. Kruger National Park, Skukuza, 24°59' S, 31°55' E, 19.I.1984, leg. C.D. Eardley, 1 ♂, 2 ♀♀; NCP. Kruger National Park, Pretoriosky, 21.II.1968, leg. K.V. Krombein, 2 ♀♀; NMNH. Kruger National Park, Onder Sabie, 31.V.1969, leg. L.C. Starke, 1 ♂; NCP. Langjan Nature Res., 22°52' S, 29°14' E, 2.II.1984, leg. C.D. Eardley, 1 ♂; NCP. 25 mi [ca. 40 km] N Louis Trichardt, 2000 ft. [ca. 610 m], 24.III.1967, leg. C.D. Michener, 117 ♂♂, 32 ♀♀; UKL, ZISP. Mogol Nature Reserve, Ellisras district, 23°58' S, 27°45' E, 27-28.II.1984, leg. C. D. Eardley, 6 ♂♂, 6 ♀♀; NCP. *Natal*: 12 km N Greytown, 13.II.1967, leg. C.D. Michener, 4 ♂♂, 2 ♀♀; UKL. Zululand, Hluhluwe Reserve, 1500 ft. [ca. 457 m], 9.III.1967, leg. C.D. Michener, 1 ♂, 5 ♀♀; UKL. Kosi Bay, 26°58' S, 32°48' E, 10-11.II.1990, leg. C.D. Eardley, 2 ♀♀; NCP. Louwsburg, Itala, 9.II.2000, leg. J. Halada, 2 ♂♂, 1 ♀; OLML. 10 mi [ca. 16 km] N Ubombo, 160 m, 4.IV.1958, leg. E.S. Ross & R.E. Leech, 8 ♂♂, 4 ♀♀; CAS, ZISP. *Cape Province*: NE of Clanwilliam, Doringbos, 11.X.1999, leg. M. Snizek, 3 ♀♀; OLML. De Aar, 20.III.1949, leg. J.C. Bradley, 1 ♂; CUI. Doringbos, 3.XI.1966, leg. C.D. Michener, 2 ♂♂, 6 ♀♀; UKL, ZISP; *ibid*, 3.XI.1966, leg. J.G. Rozen, 4 ♂♂, 2 ♀♀; AMNH, ZISP. Garies, Nariiep, 16.X.1999, leg. M. Snizek, 1 ♀; OLML. Namaqualand, Grasdrif, 12.X.1974, leg. R.H. Watmough, 1 ♂♂; NCP. Hester Malan N.R., 10 mi [ca. 16 km] E Springbok, 7-8.I.1972, 5 ♂♂, 3 ♀♀; BMNH. Kakamas, 15-16.III.1949, leg. J.C. Bradley, 7 ♂♂, 7 ♀♀; CUI, ZISP. Kalahari Gemsbok Park, Twee Rivieren, 26°25' S, 20°37' E, 13.II.1988, leg. G.D. Butler, 2 ♂♂; NCP. Klein Karoo, Groot Riv., Langberg, 24.XI.2002, leg. M. Halada, 2 ♂♂; OLML. Laingsburg, 33°12'S 20°51'E, 25.XII.1996, leg. W.J. Pulawski, 1 ♀; CAS. Merweville, 32°40' S, 21°30' E, 15.XII.1988, leg. C.D. Eardley, 6 ♂♂; NCP. Messelpad Pass, 2.XII.1974, leg.

J.G. Rozen & B.L. Rozen, 2 ♂♂; AMNH. Olifantshoek, 24.II.1990, leg. M. Schwarz, 2 ♂♂; SCH. 70 km E Port Nolloth, 26.XI.1974, leg. J.G. Rozen & B.L. Rozen, 1 ♂; AMNH. 86 km SE Port Nolloth, 30.XII.1974, leg. J.G. & B.L. Rozen, 5 ♂♂; AMNH, ZISP. Karoo, Reitbron, 11.I.1965, leg. Empey, 2 ♂♂; NCP. Springbok, 7.I.1975, leg. H.N. Empey, 1 ♂; NCP. Buffels Wadi, SW of Springbok, 4.XI.1999, leg. M. Halada, 21 ♂♂; 1 ♀; OLML. Upington, 13.III.1949, leg. J.C. Bradley, 4 ♂♂, 1 ♀; CUI. 15 km S Vioolsdrif, 29.XI.1974, leg. J.G. Rozen & B.L. Rozen, 1 ♀; AMNH. Vioolsdrif, Orange River, 19.X.1999, leg. M. Halada, 5 ♂♂; OLML. Namaqualand, Grasdrif, 12.X.1974, leg. R.H. Watmough, 1 ♂; NCP.

Visited plants (in Africa). Anacardiaceae: *Mangifera indica* (1 ♀). Asteraceae: *Acanthospermum hispidum* (1 ♂). Boraginaceae (1 ♀). Caesalpiniaceae: *Cassia* sp. (1 ♂, 4 ♀♀). Combretaceae: *Guiera senegalensis* (3 ♀♀), *Terminalia prunioides* (1 ♂). Mimosaceae: *Acacia* sp. Rhamnaceae: *Ziziphus* sp. (1 ♂, 2 ♀♀). Rubiaceae: *Mitracarpus scaber* (1 ♀). Vitaceae: *Rhoicissus digitata*. Zygophyllaceae: *Tribulus* sp. (3 ♂♂), *Zygophyllum simplex* (2 ♂♂).

Ceylalicus (Ceylalicus) punjabensis (Cameron 1907)

[fig. 12a-12o; Pl. II: 60-61 (total view), VI: 128-129 (head), VIII: 166 (female propodeum), IX: 175 (male propodeum), X: 184 (female mesoscutum), XIII : 208-209 (male genitalia), XVI : 230 (map)]

Ceratina punjabensis Cameron 1907: 1003. ♀. Lectotype (designated by Pesenko 1983: 182): ♀, "Ferozepore (Punjab) [30°55'N 74°36'E], iv.[18]98, [leg. Nurse]", "B. M. type Hym. 17.a.1061b"; BMNH.

Nomioides exellens Saunders 1908: 223. ♀, ♂. Lectotype (designated by Pesenko 1983: 183): ♂, "Algeria, Biskra [34°51'N 5°44'E], 18.V.1893, [leg. Eaton]", "E. Saunders col. 1910: 266", "B. M. type Hym. 17.a.1044"; BMNH. Synonymised by Pesenko (1983: 183).

Nomioides comberi Cockerell 1911: 236. ♂. Syntypes: 3 ♂♂, "Karachi [Pakistan] [24°52'N 67°03'E], [leg.] Comber"; BMNH. Synonymised by Cockerell (1919: 9).

Taxonomy. Meade-Waldo 1914: 403 (*Nomioides punjabensis*). Dębski 1917: 31, 32, 46 (*Nomioides fasciata*, nec Friese 1898). Cockerell 1919: 9 (*Nomioides punjabensis*). Alfken 1924: 250 (*Nomioides fasciatus*). Blüthgen 1925: 61 (*Nomioides fasciata* var. *punjabensis*). Blüthgen 1934a: 258 (*Nomioides fasciata*). Pesenko 1983: 178 (key to females), 179 (key males), 182, fig. 206, 252, 347-349 (comb. n.). Pauly *et al* 2002: 206, fig. 8, 9, 27.

Male. Structure. Body length 5.0-5.5 mm. Head transverse elliptical in frontal view; its height / width ratio 0.85-0.9 (fig. 12a). Median lobe of clypeus flattened, its height / width ratio about 0.9; clypeus extending a fourth of its length below eyes. Malar space linear. Upper minimum distance between eyes 1.4 times as large as maximum lower distance between eyes. Emargination in inner orbits deep, right angular; its depth nearly half of extrapolated width of eye in frontal view (fig. 12a). Face flattened; supraclypeal area below upper margin with distinct small tubercle of variable form: from rounded elevation to pointed triangular process; slight carina present between antennal sockets. Antenna relatively short, nearly reaching posterior margin of scutellum; middle flagellomeres 1.1-1.2 times as long as their diameters (fig. 12b). Metapostnotum not bordered from adjacent surfaces of propodeum. Dorsal surface of propodeum flat, 1.4-1.5 times as long as scutellum, passing onto posterior vertical surface at widely rounded angle of 110°. Hind wing with 7 distal hamuli. Metasoma convex, in dorsal view elongate elliptical, nearly pointed at anterior and

posterior ends; T1 relatively wide, its length / maximum width ratio about 0.5 (fig. 12c). Posterior areas of terga relatively wide, flattened, usually separated from tergal discs by weak rounded steps. S8 short, without membranous lobe at posterior end, 1.3 times as long as wide (fig. 12f-12h). Length of genital capsule 1.0 mm. Gonobase with wide rounded lateral emarginations in its outline in dorsal or ventral views; ventral gonobasal bridge situated behind gonocoxal one, narrow, with small rounded median lobe (fig. 12i, 12k). Gonoforceps with small triangular parapennial lobe, slender, slightly curved mesad at distal end (fig. 12i-12l).

Sculpture. Clypeus usually finely densely punctate, smooth in interspaces. Supraclypeal area, frons, and vertex densely and finely granulate, mat. Genal area with upper part densely punctate, finely roughened or smooth in interspaces, shiny; lower part, granulose punctate, silk-mat. Mesoscutum slight

shiny, uniformly superficially granulate; each granule as large as eye facet; sometimes indistinctly granulate, shiny. Scutellum with only traces of granulation, nearly smooth, shiny. Dorsal surface of propodeum with microsculpture similar to that of mesoscutum, silky. Posterior vertical surface of propodeum usually sparsely punctate and roughened, silk-mat. T1-T3 uniformly finely granulate with traces of strigation, mat; subsequent terga shinier, their granulation step by step more obscure.

Coloration. Main coloration of head and mesosoma metallic dull olive-green; dark parts of face greenish bronze; dark parts of legs (coxae, trochanters, and most of hind femur) dark fuscous, usually with slight green tint; dark surfaces of metasoma black or dark fuscous; only T1 and T2 with metallic greenish tint. Pale pattern on body relatively rich: labrum, clypeus (fig. 12a), mandible (except for reddish apex), scapus on lower side, collar and stripe along anterior margin of pronotum, spiracular pronotal lobes, spot on anterior part of tegula, basal sclerites of wings, usually pattern on scutellum similar to that of female, scutellar crest, median area of metanotum, fore and middle femora, distal half of hind femur, all tibiae, all tarsi, lateral spots of variable size on T1, wide transverse bands on discs of T2-T5, usually interrupted medially on last two or T3 and T4 (fig. 12c); all yellow. Scapus on upper side and pedicel dark fuscous; flagellum light to ochre yellow on lower side, fuscous or dark fuscous on upper side. Tegula hyaline. Wing membrane hyaline; veins and pterostigma light yellow. Posterior areas of terga light fuscous translucent.

Vestiture. White, short, not dense, erect; denser and longer on genal areas, sides of mesosoma and metanotum. Lower half of face and genal areas also covered with dense, white appressed plumes. Mesoscutum and sides of mesosoma covered with sparse plumes.

Female. Structure. Body length usually 5.5-6.0 mm. Head transversely elliptical in frontal view; its height / width ratio 0.8 (fig. 12m). Median lobe of clypeus flattened, its height / width ratio about 0.5; clypeus extending half of its length below eyes. Malar space linear. Emargination in inner orbits deep, triangularly rounded; its depth half of extrapolated width of eye in frontal view (fig. 12m). Face flattened; with weak, but distinct longitudinal carina between antennal sockets; this carina in its upper end transforming into frontal line. Dorsal surface of propodeum as long as scutellum. Wing venation and armature as in male. Metasoma weakly convex; in dorsal view, elliptical, blunted at anterior end (fig. 12o). Posterior areas of terga relatively narrow, flattened, only on T1 and T2 separated from tergal discs by weak steps.

Sculpture. Clypeus usually more or less uniformly punctate, with shallow pits, nearly smooth in interspaces, shiny. Supraclypeal area and lower half of paraocular areas granulate, shiny. Frons, upper half of paraocular areas and vertex more distinctly granulate, mat. Microsculpture of genal areas similar to that of male, except for following differences: mesoscutum always distinctly granulate, slight shiny; scutellum and sides of mesosoma with distinct granulation, but denser, mat or submat; all terga mat on their discs and slightly shiny on posterior areas.

Coloration. Main coloration of body similar to that of male. Pale pattern on mesosoma and metasoma richer; also yellow transverse spot along posterior margin of mesoscutum, metasoma throughout, except for dark anterior surface of T1 and narrow bands or lateral spots on T2-T4 (fig. 12o). Clypeus

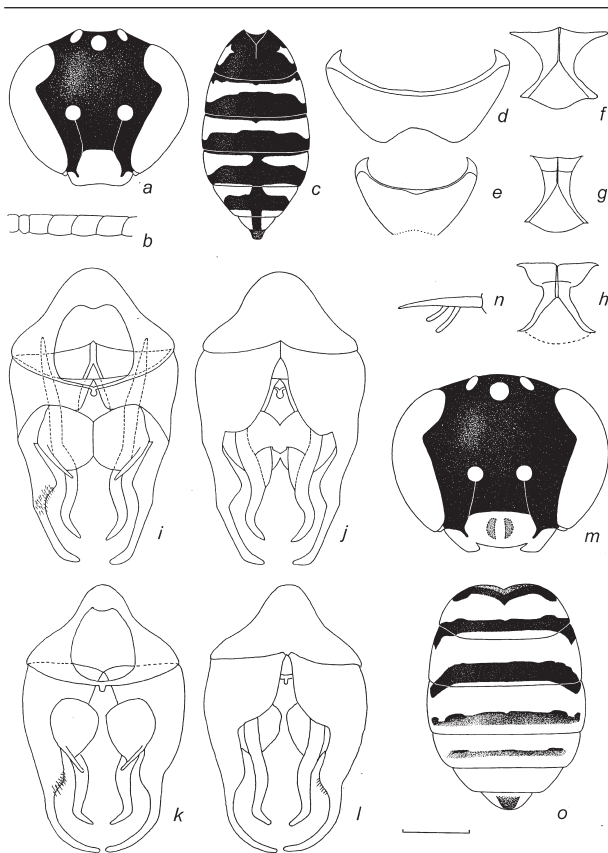


Figure 12
Ceylalictus (Ceylalictus) punjabensis (Cameron 1907): male (a-l) and female (m-o)

a and m, head in frontal view; b, flagellomeres 1-5 in lateral view; c, and o, metasoma in dorsal view; d and e, S7; f-h, S8; i and k, genital capsule in ventral view; j and l, genital capsule in dorsal view; n, inner metatibial spur; j, part of forewing.

a, d, and f, male from Biskra (Algeria); b, c, and o, male and female from Tata (Morocco); e, g, i, and j, male from Hoggar (Algeria); h, k, and l, male from Ibessene (Niger); m, lectotype of *C. punjabensis*; n, female from Laghouat (Algeria).

Scale line: 1 mm for c, o; 0.5 mm for a, b, m; 0.25 mm for d, e, f, g, h, i, j, k, l, n.

usually with two dark longitudinal spots (fig. 12*m*). Dark parts of hind femur and T1 with metallic tint.

Vestiture. Similar to that of male, except for characters related with sex, including absence of appressed plumes on face.

Distribution. Cape Verde Islands, North Africa, Mauritania, Senegal, Mali, Niger, Djibouti, Ethiopia, Kenya, Arabian Peninsula, Near East (Israel, Jordania), southern Iran, southern Afghanistan, Pakistan, northwestern India.

Records from Africa. Saunders 1908: 223 (*Nomioides excellens*; Algeria, Biskra). Friese 1909: 149 (*Halictus fasciatus*, nec Friese 1898; Egypt: Zeitoun). Dębski 1917: 50 (*Nomioides fasciata*, nec Friese 1898; Egypt: Cairo). Alfken 1924: 250 (*Nomioides fasciatus*; Egypt: El Obeid; Sudan: Bara). Blüthgen 1933b: 24 (*Nomioides fasciata*; Egypt: Assouan, Gezireh). Guiglia 1933: 134 (*Nomioides fasciatus*; Libya: Es-Sahabi, Gialo). Zavattari 1934: 346 (*Nomioides fasciata*; Libya: Homs, Guarabub). Cockerell 1936: 2 (*Nomioides fasciatus*; Sudan: Port Sudan). Benoit 1962: 45 (*Nomioides fasciata*; Algeria: Hoggar). Dekeyser & Villers 1956: 37 (*Nomioides fasciatus*; Mauritania: Adrar). Warncke 1983: 207 (*Nomioides fasciatus*; Algeria: Biskra). Simon *et al* 1993 (*Nomioides variegatus*; Cape Verde Islands). Pauly *et al.* 2002: 206 (Cape Verde Islands: Sal, Boa Vista).

African material examined (288 specimens). *Morocco*: 5 km N Agadir, 18.V.1997, leg. J. Halada, 1 ♂; OLML. Anti Atlas, Agdz, 13.V.2003, leg. M. Halada, 2 ♂♂; OLML. 15 km S Assa, 17-18.IV.1995, leg. M. Halada, 2 ♀♀; SCH. Ouarzazate, Boumalne, 31°22' N, 6°00' W, 1550 m, 5.VI.1996, leg. P. Rasmont, 1 ♂; UMH. 10 km N Erfoud, 10.IV.1995, leg. M. Halada, 1 ♀; SCH. 10 km E Guelmim, 5.V.1995, leg. M. Halada, 1 ♂; SCH. 10 km N Mhamid, 21-22.IV.1995, leg. M. Halada, 7 ♂♂, 1 ♀; OLML. SCH. 90 km E Tata, 29.III.1986, leg. M. Schwarz, 3 ♂♂, 1 ♀; SCH, ZISP. Oued Massa, Tiznit, 8.V.2003, leg. M. Halada, 1 ♀; OLML. Zagora, 15.V.1997, leg. K. Denes, 8 ♂♂; OLML. 34 km S Zagora (Mhamid road), Oued Draa area, 28-29.III.1983, leg. M. Edwards, 3 ♂♂, 8 ♀♀; BMNH, ZISP. Mhamid, 100 km S Zagora, 16.V.1997, leg. J. Halada, 11 ♂♂, 1 ♀; OLML. 30 km N of Zagora, 15.V.1997, leg. J. Halada, 9 ♂♂; OLML.

Algeria: Biskra, 18.V.1893, leg. Eaton, 1 ♂ (lectotype of *Nomioides excellens*); BMNH; *ibid.*, 24-28.V.1929, leg. J. C. Bradley, 3 ♂♂; CUI, ZISP. Laghouat, 25.VIII.1987, leg. A. Pauly, 12 ♂♂, 3 ♀♀; FUSAG, ZISP. Djelfa, 25.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG. Hoggar: In Amguel, Oued Tekouiat, 21.VIII.1987, leg. A. Pauly, 57 ♂♂, 1 ♀; FUSAG, ZISP. Hoggar, Tit, Oued Amded, 21.VIII.1987, leg. A. Pauly, 25 ♂♂, 3 ♀♀; FUSAG, ZISP. Hoggar: 60 km E Tamanrasset, 1500 m, 31.III.1989, leg. M. Schwarz, 1 ♂; SCH. Mission Saharienne Augerias Draper, 1928, leg. Th. Monod, 1 ♂; MNHN.

Tunisia: Tozeur, 7.IV.2001, leg. M. Halada, 2 ♀♀; OLML.

Libya: Tigi, 4.VI.1957, leg. K.M. Guichard, 1 ♀; BMNH. Giarabub, 16.II.1927, leg. Confalonieri, 4 ♀♀, MCG, ZISP.

Egypt: Helouan, 29.X.1932, leg. Farag, 2 ♀♀, MNHUB. Cairo, Kom-Ushim, 17.V.1978, leg. K.M. Guichard, 1 ♀; BMNH. Siwa, 19.VII.-20.VIII.1935, leg. J. Omer-Cuper, 8 ♂♂; BMNH, ZISP. Kom Oshim, 21.III-20.V.1965, leg. K.V. Krombein, 1 ♂, 4 ♀♀; NMNH, ZISP. 10 km W Tineida, Dakhla Oasis, 6.V.1965, leg. K.V. Krombein, 3 ♂♂, 1 ♀; NMNH, ZISP. El Gedida, Dakhla Oasis, 5. V.1965, leg. K.V. Krombein, 2 ♂♂, 3 ♀♀; NMNH, ZISP. Budkhula, Dakhla Oasis, 6.V.1965, leg. K.V. Krombein, 2 ♂♂; NMNH,

ZISP. Wadi Gadid Gorte, Bir Kurayim, 5-6.IV.1967, leg. K.V. Krombein, 1 ♂, 1 ♀; NMNH. Wade El Natrum, 16.V.1966, leg. P.M. Marsh, 1 ♂; NMNH. Fayum, 29.V.1991, leg. A. Mochi, 1 ♀; ZISP. Luxor, 2 ♀♀; NMW. Aswan, 21.X.1977, leg. R.T. Simon Thomas, 1 ♂; ZMA. Dakhla Oasis, Mauwhoop, 26.XII.1977, leg. T. Simon Thomas & M. Simon Thomas, 1 ♀; ZMA.

Cape Verde Islands: *Sal*: Santa Maria, 3.XI.1988, leg. Simon Thomas, 1 ♂; ZMA. *Boavista*: Santa Monica, 7.X.1998, 12 ♂♂; 8.XI.2002, 1 ♂, leg. F. LaRoche; LAR, ZISP. Praia da Chave, 21-22.XI.2000, 1 ♂, 1 ♀, leg. F. LaRoche; LAR. Campo da Serra, 21.XI.2000, leg. F. LaRoche, 1 ♂; LAR. *Santiago*: Cicade Velha, 13.X.1988, leg. Simon Thomas, 1 ♀; ZMA. Sao Jorge, 1983, leg. A. van Harten, 4 ♂♂, 2 ♀♀, ZMA. *Fogo*: Costa Bombardeiros, 23.III.1999, leg. F. La Roche, 1 ♂; LAR.

Mauritania: Nouakchott, XII.1990, leg. F. Borgato, 1 ♂; FUSAG. 25 km SW Tidjikja, 30.X.1993, leg. W.J. Pulawski, 1 ♂; CAS. 20 km NE Aleg, 3.XI.1993, leg. W.J. Pulawski, 1 ♂; CAS. Adrar, Maaden, 11.III.2001, leg. F. LaRoche, 1 ♂, 1 ♀; LAR. Adrar, El Berbara, 10.III.2001, leg. F. LaRoche, 1 ♂, 1 ♀; LAR. Adrar, Tounghad, 6.X.2000, leg. F. LaRoche, 3 ♂♂; LAR. Adrar, Plaine de Yaghref, 11.X.2000, leg. F. LaRoche, 1

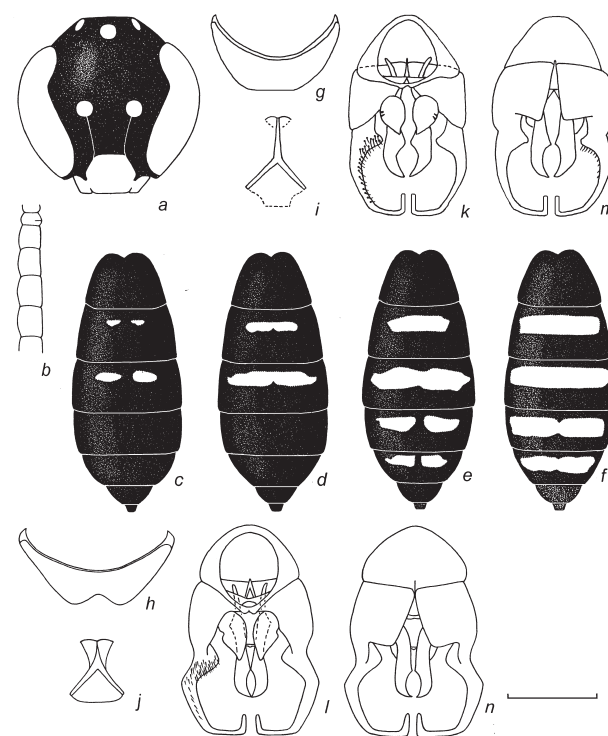


Figure 13

Ceylallictus (Ceylallictus) variegatus (Olivier 1789): male

a, head in frontal view; b, flagellomeres 1-5 in lateral view; c-f, metasoma in dorsal view; g and h, S7; i and j, S8; k and l, genital capsule in ventral view; m and n, genital capsule in dorsal view.

a, b, d, b, j, l and n, male from Hurgada (Egypt); c, male from Maspalomas (Canary Islands); e, male from Ibesselene (Niger); f, b, j, l, and n, male from Khartoum (Sudan).

Scale line: 1 mm for c, d, e, f; 0.5 mm for a, b; 0.25 mm for g, h, i, j, k, l, m, n.

♂; LAR. Adrar, Oujeft, 9-12.III.2001, leg. F. LaRoche, 2 ♂♂; LAR. Adrar, Oued Timinit, 10.III.2001, leg. F. LaRoche, 1 ♂; LAR. Passe d'Amogjar, 8.III.2000, leg. F. LaRoche, 1 ♀; LAR. Akjoujt, 10.III.2000, leg. F. LaRoche, 1 ♀; LAR. Banco de Arguin., Iouik, 12.III.2000, leg. F. LaRoche, 1 ♂, 2 ♀♀; LAR. Banco de Arguin, Nouamghar (Nouamrhar), 12.III.2000, leg. F. LaRoche, 1 ♂; LAR. Trarza, Amoukrouz, 7.III.2000, leg. F. LaRoche, 2 ♂♂; LAR. Terjit, 10.III.2000, leg. F. LaRoche, 2 ♂♂; LAR.

Senegal: 5 km SW Thiés, 8.VII.1991, leg. W.J. Pulawski, 1 ♂; CAS.

Mali: Anefis, 350 m, 2.XI.1981, leg. G. Popov, 1 ♀; BMNH.

Niger: km 54 Ibesselen, 15°15' N, 5°51' E, 14.VIII.1987, leg. A. Pauly, 2 ♂♂, 1 ♀; FUSAG, ZISP.

Sudan: Ed Damer, Hudeiba, 3.XI.1961, leg. R. Remane, 1 ♀; WAR. Shambad, 5 mi [ca 8 km] W Khartoum, 29.I.1962, leg. R. van der Bosch, 1 ♂, 2 ♀♀; UCR. Port Sudan, vi.1932, leg. J. Ogilvie, 1 ♂; MRACT. Ouadi Halfa, 8-10.II.1958, leg. W.J. Pulawski, 1 ♂, 4 ♀♀; OLML. Khor Arbaat, Delta, IV-V.1926, leg. H.B. Johnston, 1 ♂; BMNH.

Djibouti: Obok, 1 ♀; MNHNP.

Ethiopia: Miss, del Tana, di G. Danielli, iv.1937, leg. Barenti, 1 ♂; MCG.

Kenya: Rift Valley Province, 33 km N. Lodwar, 3°21' N, 35°28' E, 23.XI.2002, leg. M.A. Prentice, 1 ♂; CAS. Rift Valley Province, 4 km E. Lodwar, 3°09' N, 35°36' E, 23.XI.2002, leg. M.A. Prentice, 1 ♂; CAS. Rift Valley Province, Eliye Springs, western shore of Lake Turkana, 3°15' N, 36°01' E, 24.XI.2002, leg. M.A. Prentice, 2 ♀♀; CAS. Lodwar, 18-20.XII.1995, leg. M. Snizek, 6 ♂♂; OLML.

Visited plants (in Africa). Caesalpiniaceae: *Cassia obovata* (2 ♂♂, 1 ♀). Euphorbiaceae: *Euphorbia pubescens* (1 ♂). Fabaceae: red *Fabaceae* (1 ♂), *Medicago sativa*. Malvaceae: *Gossypium* sp. (1 ♂). Mimosaceae: *Prosopis juliflora* (1 ♂). Tamaricaceae: *Tamarix senegalensis* (5 ♂♂), *Tamarix* sp. (94 ♂♂, 7 ♀♀).

Ceylactis (Ceylactis) variegatus (Olivier 1789)

[fig. 13a-13n, 14a-14e, Pl. II: 62-63 (total view), VI: 130-131 (head), XIII: 210-211 (male genitalia), XVI: 231 (map)]

Apis variegata Olivier 1789: 139, ♀. Holotype: ♀, southern France; lost. *Andrena pulchella* Jurine 1807: 231, Pl. XI, ♀, ♂. Syntypes: ?Europe; lost. Synonymised by Handlirsch (1888: 402).

?*Allodape syrphoides* Walker 1871: 50, ♀. Syntype(s): "Tajura" [Tadjura, French Somaliland; see Michener 1975: 235] [11°47'N 42°53'E]; lost.

Andrena flavopicta Dours 1873: 284, ♀, ♂. Syntypes: Algeria; MNHNP. Synonymised by Handlirsch (1888: 403).

Nomioides jucunda Morawitz 1874: 161, ♀. Lectotype (designated by Pesenko 1983: 180): ♀, "Nizza" [Nice, France] [43°21'N 7°15'E]; ZISP. Synonymised by Handlirsch (1888: 403).

Nomioides fasciatus Friese 1898: 307, ♀, ♂. Lectotype (designated by Pesenko 1983: 180): ♂, "Aegyptus, Schmkn. [leg. O. Schmiedeknecht], Helouan [29°51'N 31°20'E], [18]77"; HNHMB. Synonymised by Pesenko (1983: 180).

Nomioides fasciatus var. *intermedius* Alfken 1924: 250, ♂. Holotype: ♂, "Port Sudan [19°37'N 37°14'E], 30.IV.[1914], [leg.] Werners"; MNHUB. Synonymised by Blüthgen (1925: 54; as *Nomioides variegata* var. *intermedia*).

Nomioides variegata var. *simplex* Blüthgen 1925: 51, ♀. Syntypes: "Tripoli,

Bengasi-Guiliana [32°06'N 20°04'E], [leg.] Krüger"; MNHUB.

Synonymised by Pesenko (1983: 180).

Nomioides variegata var. *unifasciata* Blüthgen 1925: 53, ♂. No indication of type material.

Nomioides labiatarum Cockerell 1931: 204, ♀, ♂. Holotype: ♀, "Asni, Morocco [31°15'N 7°59'W], at flowers of Labiatae, Aug. 11, [leg.], A. Mackie; MCZC (examined). Synonymised by Blüthgen (1934a: 255).

Nomioides variegata var. *nigrita* Blüthgen 1934a: 257, ♀. Holotype: ♀, "Turkmenia, Farab [39°09'N 63°36'E], 17.IV.1913, [leg.] Gol'bek" (label in Russian); ZISP (examined). Synonymised by Pesenko (1983: 181).

Nomioides variegata var. *pseudocerea* Blüthgen 1934a: 257, ♀, ♂.

Syntypes: "N. Gujarat [India], Deesa [24°15'N 72°10'E]"; BMNH. Synonymised by Pesenko (1983: 181).

Nomioides variegata var. *nigriventris* Blüthgen 1934a: 258, ♂. Holotype: ♂, "Algeria: La Guëtina [35°23'N 0°04'W], 6.VI.1929, [leg.] Bradley"; MNHUB. Synonymised by Pesenko (1983: 181).

Comments on synonymy of the specific name. Ebmer (1988) misunderstood the status of *Nomioides fasciatus* sensu Blüthgen considered by Pesenko (1983). He writes (p. 677):

"*Nomioides fasciatus* Friese 1898 (Ägypten) ist nach Blüthgen (1925 und 1934) eine einige Art., nach Pesenko (1983) ein Synonym zu *N. variegatus*. Von *N. fasciatus* kenne ich nur 3 ♀♀ (Ägypten <...> und Sudan). Diese unterscheiden sich durch breiteres Gesicht, flacheren Scheitel und dichtere, filzartige Thoraxbehaarung von *N. variegatus* auch von ägyptischen Fundorten, sodaß ich die Synonymisierung Pesenko's nicht recht nachvollziehen kann".

In fact, Pesenko (1983) recognised two species of *Ceylactis* subg. *Ceylactis* in Egypt (also in Algeria, Libya, Sudan, Saudi Arabia, Israel, Iran, and India): (a) *C. variegatus* = *Nomioides fasciatus* Friese 1898. The type series of *N. fasciatus* kept in the Hungarian Museum of Natural History (Budapest) was kindly sent to Pesenko by Dr. J. Papp in 1976. It includes four females of *N. rotundiceps* Handlirsch 1888, and four females and two males of *C.*

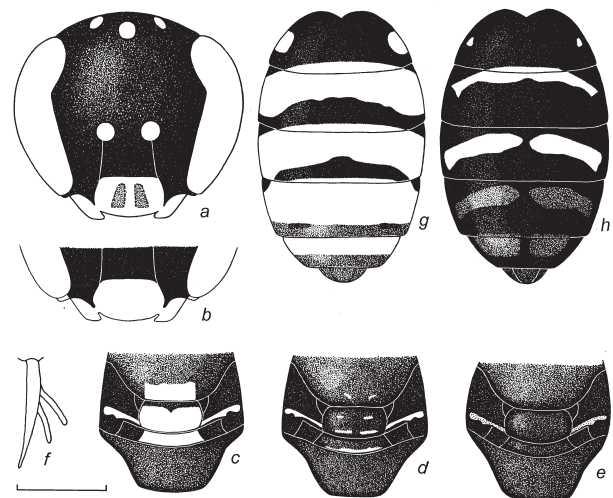


Figure 14

Ceylactis (Ceylactis) variegatus (Olivier 1789): female

a, head in frontal view; b, lower part of head; c-e, posterior two thirds of mesosoma in dorsal view; f, inner metatibial spur; g and h, metasoma in dorsal view.

a-c, f, and g, females from Kom Oshim (Egypt); d, female from Archer's Post (Kenya); e and h, female from Maspalomas (Canary Islands).

Scale line: 1 mm for c, d, e, g, h; 0.5 mm for a, b; 0.25 mm for f.

variegatus. One of the two males was designated as the lectotype (Pesenko 1983: 180); (b) *C. punjabensis* (Cameron 1907) = *Nomioiodes fasciatus* auctorum (including Blüthgen), nec Friese 1898; the synonymy and information on the types are given by Pesenko (1983: 182).

Taxonomy. Illiger 1807: 58 (*Hylaeus pulchellus*). Latreille 1809: 154 (*Halictus variegatus*). Spinola 1808: 194 (*Andrena pulchella*). Handlirsch 1888: 402, fig. 5, 8 (*Nomioiodes variegata*). Friese 1898: 308 (*Nomioiodes fasciatus*). Dębski 1917: 31, 32, 44. Blüthgen 1925: 49; 1930: 768 (key). Blüthgen 1934a: 255. Blüthgen 1934c: 499 (key) (*Nomioiodes variegata*). Ireland 1935: 107, fig. 38 (*Nomioiodes variegata*). Móczár 1967: 107 (key; *Nomioiodes variegata*). Constantinescu 1974: 275, fig. 15-26 (*Nomioiodes variegata*). Osytshnjuk *et al.* 1978: 412 (key; *Nomioiodes variegata*). Pesenko 1983: 178 (key to females), 179 (key to males), 180, fig. 205, 251, 343-346 (comb. n.). Pesenko *et al.* 2000: 145.

Male. Structure. Body length usually 3.5-4.5 mm. Head nearly rounded in frontal view; its height / width ratio usually 0.95 (fig. 13a). Median lobe of clypeus convex, its height equal to width or a little less; clypeus extending half of its length below eyes. Malar space linear. Upper minimum distance between eyes 1.3 times as large as minimum lower distance between eyes. Emargination in inner orbits moderately deep, rounded; its depth nearly a third of extrapolated width of eye in frontal view (fig. 13a). Face flattened; supraclypeal area and space between antennal sockets flat, not or very slightly elevated, the last with or without slight longitudinal carina. Supraclypeal area below upper margin with distinct small tubercle, variable from rounded elevation to pointed process. Antenna relatively long, nearly reaching posterior margin of propodeum; middle flagellomeres 1.1-1.2 times as long as their diameters (fig. 13b). Metapostnotum semicircular. Dorsal surface of propodeum flat, 1.2-1.3 times as long as scutellum, passing onto posterior vertical surface at widely rounded angle of 110°. Hind wing usually with 6 distal hamuli. Metasoma strongly flattened, in dorsal view elongate lancet-like, strongly broadened in posterior third; T1 relatively narrow, its length / maximum width ratio 0.6-0.7 (fig. 13c-13f). Posterior areas of terga narrow, flattened, usually separated from tergal discs by steps. S8 short, without membranous lobe in posterior end, as long as wide (fig. 13i, 13j). Length of genital capsule about 0.5 mm. Gonobase roundly triangular in dorsal view, without emargination in dorsolateral margins; ventral gonobasal bridge narrow, provided with two small rounded submedian lobes, situated behind gonocoxal bridge (fig. 13k, 13l). Gonoforceps with relatively large rounded parapennial lobe, slender in distal half, sharply curved forward. Penis valve moderately slender and short (fig. 13k-13n).

Sculpture. Clypeus provided with few large shallow pits, polished in interspaces. Supraclypeal area more densely roughened, lightly shiny. Frons densely and finely granulate, mat. Vertex granulate roughened, slightly shiny. Genal area with upper part usually densely punctate, finely roughened or smooth in interspaces, shiny; lower part, shagreened and striate, silk-mat. Mesoscutum more obscurely granulate punctate and shiny than that in female, on posterior half nearly smooth. Scutellum with microsculpture similar to that of mesoscutum. Metapostnotum with distinct and regular (reticulate) granulation, silk-mat, bordered along lateral and posterior margins with shiny stripe. Posterior vertical surface of propodeum granulate roughened, mat. T1 with anterior surface smooth, dorsal surface uniformly finely and superficially granulate, more or less shiny; subsequent terga shinier, their granulation step by step becoming more obscurely and transforming to fine strigation; posterior areas of terga nearly smooth, with only traces of strigation.

Coloration (typical form). Main coloration of head and mesosoma metallic dull blue-green or deep blue. Metasoma usually blackish blue with distinct metallic tint. Labrum, clypeus (fig. 13a), mandible (except for reddish apex), malar space, scapus on lower surface, collar (entirely or only on sides) and stripe along anterior margin of pronotum, spiracular pronotal lobes, spot on anterior part of tegula, basal sclerites of wings, distal ends of femora, tibiae (except for large brown spot on hind one), all tarsi, transverse spots in middles of discs of T2 and T3 (fig. 13c, 13d); all yellow. Scapus (except for pale stripe on lower side) and pedicel black; flagellum ochre yellow on lower side, fuscous on upper side. Tegula hyaline. Wing membrane hyaline; veins and pterostigma light yellow; except for fuscous vein R₁ and stripes along margins of pterostigma. Posterior areas of terga fuscous translucent.

Vestiture. Relatively weak, whitish, short, not dense, erect; denser and longer on genal areas, sides of mesosoma and metanotum. Paraocular area with lower part and genal area with upper half also usually covered with not dense, white appressed plumes.

Female. Structure. Body length usually 4-5 mm. Head transversely elliptical in frontal view; its height / width ratio 0.8-0.9 (fig. 14a). Median lobe of clypeus weakly convex, its height / width ratio 0.5-0.6; clypeus extending half of its length below eyes. Malar space linear. Emargination in inner orbits moderately deep, rounded; its depth a third of extrapolated width of eye in frontal view (fig. 14a, 14b). Face flattened; with weak longitudinal carina between antennal sockets. Structure of propodeum same as that of male. Hind wing usually with 7 distal hamuli. Metasoma weakly convex; in dorsal view, elongate elliptical, blunted at anterior end (fig. 14g, 14h). Posterior areas of terga relatively narrow, flattened, not separated from tergal discs in middle.

Sculpture. Clypeus usually smooth or finely transversely aciculate, with few shallow pits, shiny; sometimes obscurely granulate, slightly shiny. Frons and vertex densely and finely granulate, mat. Supraclypeal area usually more obscurely granulate, slight shiny. Genal area with upper part usually densely punctate, smooth in interspaces, shiny; lower part shagreened, slight shiny. Mesoscutum slight shiny, with uniform microsculpture, intermediate between obscure granulation and fine, not dense punctation; each granule as large as eye facet. Microsculpture of rest of mesosoma similar to that of male. Terga usually finely transversely aciculate, with very obscure granulation, shiny.

Coloration (typical form). Main coloration of head and mesosoma dull light green. Pale pattern on head similar to that of male; that on meso- and metasoma much richer; also yellow: wide transverse spot along posterior margin of mesoscutum, one or two large spots on scutellum, scutellar crests, median area of metanotum (fig. 14c), entirely hind tibia, lateral spots on T1, wide pale bands on T2-T5 occupying their discs nearly completely. Clypeus usually with two light fuscous spots (fig. 14a). T1 with distinct metallic green tint.

Vestiture. Relatively weak, white, short, not dense, erect; denser and longer on genal areas, sides of mesosoma, on metanotum and on intermediate area between dorsal and lateral surfaces of propodeum. Only on vertex pubescence sometimes light fuscous. Appressed plumes nearly absent.

Variation. In comparison with the very variable *C. congoensis* and moderately variable *C. muiri* (see above), which have a much narrower geographical distribution, *C. variegatus* is surprisingly uniform in all morphological characters

(including the body coloration and pubescence) throughout its very extensive geographical range. Only in some marginal populations and few other individuals, a certain variability in the body coloration is found.

For instance, most of individuals (but not all) from the Canary Islands are distinctly darker in comparison with the typical form: in males, only the T3 is provided with transverse pale spot; in females, the mesoscutum and scutellum are provided with poorer pale pattern (fig. 14*d*) or are entirely dark (fig. 14*e*), all pale bands on the terga are interrupted (fig. 14*h*); moreover, in some males, the bronze tint is present on the face.

In one of the females from Kenya, the pale pattern on the mesosoma is represented only by small lateral spots on the mesoscutum and scutellum and the narrow band on the metanotum, *i.e.* it is similar to the coloration of *C. congoensis*; in some other females, the bronze tint is present on the face.

By contrast, in many males from populations inhabiting Sudan, Mali, Niger, Senegal, and Cameroon (and in a few males from other countries), the face has a bronze tint, transverse pale spots are present on T2-T4 or even T2-T5 (fig. 13*e*, 13*f*), only T1 possesses a metallic blue tint, sometimes also the scutellum is provided with small pale lateral spots. So many males from southernmost localities of the species in Africa can be differentiated from males of *C. muiri* only by the structure of the genitalia.

In addition, many males from Niger and Senegal possess nearly polished mesoscutum and scutellum; in females, the clypeus is often yellow throughout.

Biology. Batra 1966: 396, fig. 10; 1977: 302; Pesenko *et al.* 2000: 145, fig. 194; Rust *et al.* 2005.

Distribution. North Africa to Kenya, Gambia, Burkina Faso, Cameroon and Senegal in the south, southern Europe and warm places of middle Europe to Austria in the north, steppes and deserts of Western Asia to northern China, northern India and Mongolia in the east.

Records from Africa. Magretti 1884a: 623 (*Nomioides pulchellus*; Sudan: Bahr el Salaam, Metemma). Magretti 1884b: 51, 97 (*Nomioides pulchellus*; "eastern Sudan"). Handlirsch 1888: 405 (*Nomioides variegata*; "Egypten"); Friese 1898: 308 (*Nomioides fasciatus*; Egypt: Zeitoin). Magretti 1899: 592 (*Nomioides variegata*; Somalia: Lago Bass Narok). Morice & Szépligeti 1904: 6 (Sudan: Khartum). Graeffe 1906: 453 (*Nomioides variegatus*; "Tunisia"). Saunders 1908: 221 (*Nomioides variegatus*; Algeria: Biskra, Le Tarf, Bône). Dębski 1917: 46 (*Nomioides variegatus*; Egypt: Cairo). Sowerby 1917: 31 (*Nomioides variegata*; Egypt: Cairo). Alfken 1924: 250 (*Nomioides fasciatus* var. *intermedius*; Sudan: Port Sudan, El Obeid, Sennar, Tonga). Schultess 1924: 305 (*Nomioides variegata*; Tunisia: Tunis, Tozeur, Nefta, Kairouan). Blüthgen 1925: 51 (*Nomioides variegata* var. *simplex*; Libya: Bengasi-Guiliana). Alfken 1926: 99 (*Nomioides variegatus*; Egypt: Kingi, Heliopolis desert). Guiglia 1929: 415 (*Nomioides variegata*; Libya: Oasis Giarabub, Homs). Cockerell 1931: 205 (*Nomioides labiatarum*; Morocco: Asni). Blüthgen 1933b: 24 (*Nomioides variegata*; Egypt: Helouan). Guiglia 1933: 133 (*Nomioides variegata*; Libya: Augila, Gioalo, Cuffra, Lago di Buema, Lago di Haret al Hafun). Alfken *et al.* 1934: 14 (Morocco: Marakesh: Oase Gueliz). Blüthgen 1934a: 258 (*Nomioides variegata* var. *nigriventris*; Algeria: La Guëtina). Zavattari 1934: 346 (*Nomioides variegata*; Libya: Homs, Giarabub, Lago di Buema, Haret el Hafun). Guiglia 1936: 16 (*Nomioides variegata*; Libya: Fèzzan, Gialo). Blüthgen

1937: 3 (*Nomioides variegata*; Canary Islands: Grand Canary: Las Palmas). Guiglia 1939: 191 (*Nomioides variegata*; Libya: Hon, Gat). Lieftinck 1958: 9 (Canary Islands: Fuerteventura). Benoist 1962: 45 (*Nomioides variegata*; Algeria: Hoggar). Warncke 1983: 207 (*Nomioides variegata*; Algeria: Biskra). Hohmann *et al.* 1993: 361 (Canary Islands: El Hiero, Gran Canary, Fuerteventura, Lanzarote).

African material examined (3510 specimens). *Canary Islands:* *Grand Canary:* Maspalomas, s. l., 7.VI.1964, leg. K. M. Guichard, 1 ♀; BMNH; *ibid.*, 17.VI.1966, leg. K.M. Guichard & Ward, 85 ♂♂, 10 ♀♀; BMNH, ZISP; *ibid.*, 8.XI.1976, leg. G.E. Bohart, 54 ♂♂, 26 ♀♀; UUL, ZISP. *La Isleta*, 50 m, 21.VI.1964, leg. K.M. Guichard, 1 ♀; BMNH. *Tenerife:* Los Christianos, V.1964, leg. K.M. Guichard, 6 ♂♂, 1 ♀; BMNH, ZISP. *Fuerteventura:* Puerte del Rosario, 6.V.1964, leg. K.M. Guichard, 1 ♀; BMNH. *Gran Tarajal*, s. l., 12.V.1964, leg. K.M. Guichard, 25 ♂♂, 11 ♀♀; BMNH, ZISP.

Morocco: 5 km N Agadir, 18.V.1997, leg. J. Halada, 6 ♂♂, 1 ♀; OLML. Agdz, Anti Atlas, 13.V.2003, leg. M. Halada, 24 ♂♂, 2 ♀♀; OLML. Asni, 9.IX, leg. T.D.A. Cockerell, 2 ♂♂ (paratypes of *Nomioides labiatarum*); 11.IX, leg. A. Mackie, 1 ♂ (holotype of *Nomioides labiatarum*); MCZC. 15 km S Assa, 17-18.IV.1995, leg. M. Halada, 1 ♂, 5 ♀♀; SCH. Beni-Bassia, 60 km NE Boudnib, 21.V.1995, leg. M. Halada, 6 ♂♂, 9 ♀♀; OLML, SCH. River near El-Menzel, Oued Sebou, 33°51' N, 4°39' W, V.1999, leg. Prudek, 1 ♂; OLML. Errachidia Province, Tamarakecht, 32°08' N, 4°22' W, 1220 m, 2.VI.1996, leg. M. Terzo, 2 ♀♀; UMH. Errachidia Province, Ksar et Souk, 27.IV.1981, leg. M. Tussac, 26 ♀♀; CAS, ZISP. 20 km SE Erfoud, 3.IV.1986, leg. M. Schwarz, 2 ♀♀; SCH, ZISP. Figuig, Ain Tazara, 32°12' N, 1°57' W, 1260 m, 31.V.1996, leg. P. Rasmont, 1 ♂, 1 ♀; UMH. Fizin-Bachkoum, 1700 m, 1.VII.1987, leg. M. Schwarz, 4 ♂♂, 8 ♀♀; SCH, ZISP. 30 km N Foum Zguid, 30.III.1986, leg. M. Schwarz, 1 ♀; SCH. 20 km N Foum-Zguid, 29-30.IV.1995, leg. Ma Halada, 17 ♂♂, 16 ♀♀; OLML, SCH. 10 km E Guelmim, 15-16.IV.1994, leg. M. Halada, 41 ♂♂, 15 ♀♀; SCH; *ibid.*, 15-16.IV.1995, leg. M. Halada, 10 ♂♂, 10 ♀♀; OLML, SCH; *ibid.*, 5.V.1995, leg. M. Halada, 12 ♂♂; OLML. Icht, 100 km E Bouzakame, 4.V.1995, leg. M. Halada, 1 ♀; SCH. Laayoune, 13.II.1988, leg. K.M. Guichard, 2 ♀♀; BMNH. 40 km W Meknes, 19.V.1997, leg. J. Halada; 1 ♂, 1 ♀, OLML. Mhamid, 100 km S Zagora, 16.V.1997, leg. J. Halada & K. Denes, 275 ♂♂, 35 ♀♀; OLML. 10 km N Mhamid, 21-22.IV.1995, leg. M. Halada, 25 ♂♂, 4 ♀♀; SCH. Ouarzazate Province, Boumalne, 31°22' N, 6°00' W, 1550 m, 5.VI.1996, leg. P. Rasmont, 2 ♀♀; UMH. Ouirgane, 1000 m, 2.VII.1974, leg. K.M. Guichard & G.R. Else, 2 ♂♂; BMNH, ZISP; *ibid.*, 19-24.V.1975, leg. K.M. Guichard & G.R. Else, 2 ♂♂; BMNH, ZISP. 20 km S Sefrou, 8.V.1997, leg. J. Halada, 1 ♂; OLML. Tagounite, 60 km S Zagora, 23.IV.1995, leg. M. Halada; 1 ♂, OLML. Tamri, 70 km N Agadir, 8.V.1995, leg. M. Halada, 58 ♂♂, 18 ♀♀; OLML, SCH. Taroudant, 11 ♀♀; OLML. Taroudant, Oued Souss, 31.III.1983, leg. M. Edwards, 1 ♂; BMNH; *ibid.*, 24.VI.1974, 19-24.V.1975, leg. K.M. Guichard & G.R. Else, 1 ♂, 2 ♀♀; BMNH, ZISP. 40 km E Taroudant, Aoulouz, 17.V.1997, leg. J. Halada, 7 ♂♂; OLML. Tissint, 70 km E Tata, 28.IV.1995, leg. M. Halada, 1 ♀; SCH. Tiznit, Oued Massa, 8.V.2003, leg. M. Halada, 4 ♂♂, 1 ♀; OLML. Zagora, 19.V.1961, leg. G. Gordt, 3 ♂♂, 3 ♀♀; LACM, UCR; *ibid.*, 29.III.1983, leg. M. Edwards, 1 ♀; BMNH; *ibid.*, 15.V.1997, leg. K. Denes, 11 ♂♂, 1 ♀; OLML.

30 km N Zagora, 15.V.1997, leg. J. Halada, 221 ♂♂, 23 ♀♀; OLML, 5 km S Zagora, 24-25.IV.1995, leg. M. Halada, 68 ♂♂, 95 ♀♀; OLML, SCH. 34 km S Zagora, Mhamid road, Oued Draa area, 28-29.III.1983, leg. M. Edwards & G.R. Else, 74 ♀♀; BMNH. 40 km SE Zagora, Foum Anagame, 5°40' N, 30°06' E, 1000 m, 13.IV.1996, leg. M. Schwarz, 2 ♂♂; SCH.

Algeria: Biskra, 24-28.V.1929, leg. J.C. Bradley, 19 ♂♂, 16 ♀♀; CUI, ZISP, Bou Hanifa, 6.VI.1929, leg. J.C. Bradley, 8 ♂♂; CUI, ZISP, Kerzaz, 21.III.1989, leg. M. Schwarz, 1 ♀; SCH. Laghouat, 25.VIII.1987, leg. A. Pauly, 154 ♂♂, 11 ♀♀; FUSAG, ZISP, La Guetna, 6.VI.1929, leg. J.C. Bradley, 27 ♂♂, 1 ♀; CUI, ZISP, Tougourt, 1921, leg. J. Surcouf, 1 ♀; MNHNP, Bechar, Taghit, st50, 4.V.1983, leg. R. Leys & P. van der Hurk, 5 ♂♂, 1 ♀; ZMA. Hoggar, In Amguel, Oued Tekouiat, 21.VIII.1987, leg. A. Pauly, 313 ♂♂, 21 ♀♀; FUSAG, ZISP, Hoggar, Tit, Oued Amded, 21.VIII.1987, leg. A. Pauly, 99 ♂♂, 9 ♀♀; FUSAG, ZISP, Hoggar, Guelta near Ilamane Mt., 1900 m, 29.III.1989, leg. M. Schwarz, 5 ♀♀; SCH.

Tunisia: Gabes, 17.IV.1981, leg. J. Gusenleitner, 1 ♀; GUS. Hammam-Lif, 10.VIII.1975, leg. A. Pauly, 2 ♂♂, 2 ♀♀; FUSAG, Djerba Island, Yati, 27.VII.1978, leg. K.M. Guichard, G.R. & A.C. Else, 3 ♂♂, 2 ♀♀; BMNH. Gafsa, 6.IV.2001, leg. M. Halada, 11 ♀♀; OLML. Kasserine, 13.IV.1998, leg. K. Denes, 3 ♀♀; OLML. Kasserine, Fousana, 4.IV.2001, leg. M. Snizek, 1 ♀; OLML. 20 km NW Kasserine, 4.IV.2001, leg. M. Halada, 1 ♀; OLML. Kebili, 8.IV.2001, leg. M. Halada, 4 ♀♀; OLML. Nefta, 15.IV.1981, leg. M. Schwarz, 1 ♂, 1 ♀; SCH; ibid, 15.IV.1981, leg. J. Gusenleitner, 2 ♀♀; GUS; ibid, 8-9.IV.1998, leg. K. Denes, 133 ♀♀; OLML; ibid, 31.V.1994, leg. S. Becvar, 191 ♂♂, 18 ♀♀; OLML. Sbeitla, 12.IV.1998, leg. K. Denes, 1 ♀; OLML. Sousse, 1-9.VIII.1981, leg. H. Wolf, 5 ♂♂, 5 ♀♀; SCH, ZISP, Tabarka, 28.VII.1975, leg. A. Pauly, 5 ♂♂, 6 ♀♀; FUSAG; ibid, 7.VIII.1978, leg. K.M. Guichard, G.R. & A.C. Else, 2 ♂♂, 8 ♀♀; BMNH. Tozeur, 24-28.III.1978, leg. K. M. Guichard, 27 ♀♀; BMNH; ibid, 7.IV.2001, leg. M. Halada, 2 ♀♀; OLML. Wilāyar al Qayrawān, Haffouz, 1-10.IX.1982, leg. M. Tussac, 28 ♂♂, 1 ♀; CAS, ZISP.

Libya: Gargaresc, 23.V.1952, leg. K. M. Guichard, 4 ♂♂; BMNH. Giarabub, 16.II.1927, leg. Confalonieri, 6 ♀♀; MCG. Homs, 31.VII.1955, 1 ♂; WAR. Hon, 6.III.1952, leg. K.M. Guichard, 14 ♀♀; BMNH, ZISP, Sabratha, 23.XII.1951, leg. K.M. Guichard, 1 ♂; BMNH. Tigi, 4.VI.1957, leg. K.M. Guichard, 5 ♀♀; BMNH, WAR. Tripoli, 12-17.III.1954, leg. K.M. Guichard, 1 ♀; BMNH. Zella Oasis, 10.II.1952, leg. K.M. Guichard, 1 ♀; BMNH.

Egypt: Alexandria, 1 ♀; OLML; ibid, 25.VII.1964, leg. G.E. Bohart, 33 ♂♂, 51 ♀♀; UUL, ZISP. 60 km S Alexandria, 25.X.1966, leg. J.G. Rozen, 15 ♂♂, 2 ♀♀; AMNH. Assiut, 5-10.V.1981, leg. K.M. Guichard, 17 ♂♂; BMNH, ZISP. Assouan, 31.III.1964, leg. O.W. Richards, 4 ♂♂, 1 ♀; BMNH; ibid, 24.VII.1966, leg. J. Maldonado, 1 ♂; NMNH. Beni Yusef, 13.VI.1939, leg. A. Mochi, 1 ♂, 1 ♀; BMNH. Burg el Arab, 3.VIII.1964, leg. G. E. Bohart, 3 ♂♂; UUL. Cairo, 29.VII-2.VIII.1964, leg. G. E. Bohart, 2 ♀♀; UUL; ibid, 9-20.V.1978, leg. K.M. Guichard, 3 ♂♂; BMNH. 42 km NW Cairo, 4.V.1966, leg. P. M. Marsh, 1 ♂; NMNH. Dahshur, 17.V.1965, leg. K.V. Krombein, 2 ♂♂; NMNH. Fayed, II.1943, leg. H. Priesner, 2 ♀♀; SCH, ZISP. Dakhla Oasis, Mut, 1-12.I.1978, leg. T. Simon Thomas & M. Simon Thomas, 1 ♀; ZMA. Fayum, 24.X.1966, leg. J.G. Rozen, 6 ♂♂, 3 ♀♀; AMNH; ibid, 3.V.1937, leg. A. Mochi, 1 ♀; BMNH; ibid,

30.IV.1966, leg. P. M. Marsh, 1 ♂, 3 ♀♀; NMNH; ibid, 29.V.1991, leg. A. Mochi, 1 ♀; ZISP. Gebel Asfar, 27.V.1939, leg. A. Mochi, 3 ♂♂, 1 ♀; BMNH. Giza, 27.VI.1964, leg. G.E. Bohart, 1 ♂, 1 ♀; UUL; ibid, 19.V.1965, leg. K.V. Krombein, 23 ♀♀; NMNH, ZISP; ibid, 1.V.1981, leg. K.M. Guichard, 6 ♂♂; BMNH, ZISP. Giza Prov., Manshiet Radwan, 28.IV.1965, leg. K.V. Krombein, 1 ♂, 1 ♀; NMNH. Ghizeh, Fairah Oasis, 2 ♀♀, OLML. Ismailia, 18.IV.1978, leg. F.D. Parker, 3 ♀♀; UUL; 14.V.1992, leg. A. Mochi, 1 ♀; ZISP. Ismailia, Moasar, v.1942, leg. T.W.S. Macfie, 1 ♀; BMNH. 8 km S Ismailia, 23.V.1965, leg. K.V. Krombein, 1 ♀; NMNH. El Kharga, Kharga Oasis, 4-7.V.1965, leg. K.V. Krombein, 3 ♂♂, 2 ♀♀; NMNH. Kerdasa, 3.IV.1983, leg. K.M. Guichard, 3 ♀♀; BMNH. Kom Oshim, 18-25.IV.1965, leg. K.V. Krombein, 31 ♂♂, 15 ♀♀; NMNH, ZISP; ibid, 9-18.IV.1983, leg. K.M. Guichard, 7 ♀♀; BMNH. Luxor, III.1974, leg. F.D. Parker, 6 ♂♂; UUL, ZISP. Maragi, 14.VIII.1935, leg. J. Omer-Cooper, 1 ♂, 2 ♀♀; MBL. Mariut, 15.V.1974, leg. F.D. Parker, 2 ♂♂, 6 ♀♀; UUL, ZISP. El Menya, Beni Hassan, 21.X.1977, leg. R.T. Simon Thomas, 2 ♂♂; ZMA. Pyramids, 30.VIII.1929, leg. H. Priesner, 1 ♀; OLML. Saqqara, 10.V.1966, leg. P.M. Marsh, 7 ♂♂; NMNH, ZISP. Central Sinai, near Naql, 16.V.1992, leg. A. Mochi, 2 ♂♂; ZISP. Siwa, 29.IV-2.IX.1935, leg. J. Omer-Cooper, 19 ♂♂, 52 ♀♀; BMNH, ZISP. Tineida, Dakhla Oasis, 6.V.1965, leg. K.V. Krombein, 1 ♂, 2 ♀♀; NMNH. Urgada [Ghurgada], 20.IV.2003, leg. E. Narchjuk, 7 ♂♂; 20-27.X.2003, leg. E. Narchjuk, 25 ♂♂; ZISP. Wadi Digla, IV. 1930, leg. H. Priesner, 1 ♂; OLML. Wadi el Natrun, 16.V.1966, leg. P.M. Marsh, 2 ♀♀; NMNH.

Mauritania: Kaedi, 17.IV.1983, leg. F. Borgato, 3 ♂♂, 2 ♀♀; FUSAG, ZISP. Adrar, Maaden, 11.III.2001, leg. F. LaRoche, 2 ♀♀; LAR.

Cape Verde: Boavista: Campo da Serra, 9.XI.2002, leg. F. LaRoche, 1 ♀; LAR. Santa Monica, 8.XI.2002, leg. F. LaRoche, 1 ♂; LAR. Ervatao, 9.XI.2002, leg. F. LaRoche, 1 ♀; LAR. *Maio*: Figueira da Horta, 13.XI.2002, leg. F. LaRoche, 3 ♂♂, 2 ♀♀; LAR. Vila do Maio, 15.XI.2002, leg. F. LaRoche, 1 ♀; LAR. Morrinho, 11.XI.2002, leg. F. LaRoche, 1 ♂; LAR. Ribeira D. Joao, 12.XI.2002, leg. F. LaRoche, 1 ♂; LAR. Flamengos, 12.XI.2002, leg. F. LaRoche, 1 ♂; LAR. Pilao Cao, 13.XI.2002, leg. F. LaRoche, 3 ♂♂; LAR. Vila do Maio, 15.XI.2002, leg. F. LaRoche, 3 ♂♂; LAR.

Senegal: Dakar, vi.1949, leg. A. Villiers, 1 ♂; MNHNP. N'Dierba, 8.X.1978, leg. G. Hevel & J. Fortin, 8 ♂♂, 1 ♀; NMNH, ZISP. Djourbel, 22.VII.1979, leg. A. Pauly, 1 ♂; FUSAG. 22 km W Kébémér, Konkoyo, 4.VIII-1.IX.1979, leg. A. Pauly, 52 ♂♂, 104 ♀♀; FUSAG, ZISP. Ndangane, 6-7.IV.1988, leg. F. Borgato, 12 ♂♂, 1 ♀; IBU, ZISP. Rosso, 4.XII.1997, leg. K.M. Guichard, 2 ♀♀; BMNH. 3 km NW Samba Dia, 9.VII.1991, leg. W.J. Pulawski, 1 ♂, 1 ♀; CAS, ZISP. St Louis, 26.X.1961, leg. A. Villiers, 1 ♀; MNHNP. 3 km N Tanaff, 7.III.1977, leg. Cederholm and others, 1 ♂, 2 ♀♀; ZML, ZISP. Tattaguine, 19-21.VIII.1979, leg. A. Pauly, 5 ♂♂, 9 ♀♀; FUSAG, ZISP. Tiougoune, 27.VII-21.VIII.1979, leg. A. Pauly, 8 ♂♂, 34 ♀♀; FUSAG, ZISP.

Gambia: Banjul, 17.XI.1983, leg. K.M. Guichard, 2 ♂♂, 4 ♀♀; BMNH. Bakau, 5.XI.1977, leg. Cederholm and others, 2 ♂♂, 1 ♀; ZML, ZISP. Kotu Stream, 3 km SW Bakau, 23.II.1977, leg. Cederholm and others, 1 ♀; ZML.

Mali: 30 km S Ansongo, 1976, leg. K.M. Guichard, 1 ♂, 2 ♀♀; BMNH. Ouatagouna, 7.X.1976, leg. K.M. Guichard, 1 ♂, 4 ♀♀; BMNH.

Niger: Abalak, 15°28' N, 6°16' E, 14.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG. Agadez, 16°58' N, 7°59' E, 15.VIII.1987, leg. A. Pauly, 2 ♀♀; FUSAG. Aguié, 13°31' N, 7°46' E, 11.VIII.1987, leg. A. Pauly, 11 ♂♂, 3 ♀♀; FUSAG, ZISP. Badéduichery, 14°31' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 22 ♂♂, 3 ♀♀; FUSAG, ZISP. Fezzan, Oum El Aveneb, 23.IV.1952, K.M. Guichard, 12 ♂♂, 3 ♀♀; BMNH. Guidam-Roumji, 13°41' N, 6°42' E, 12.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG. 61 km Ibesselenne, 15°15' N, 5°51' E, 14.VIII.1987, leg. A. Pauly, 1 ♂, 13 ♀♀; FUSAG, ZISP. Moujia, 14°22' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 1 ♂, 5 ♀♀; FUSAG, ZISP. Niamey, 11.X.1976, K. M. Guichard, 1 ♀; BMNH. 20 km S Tahoua, 14°45' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 14 ♂♂, 2 ♀♀; FUSAG, ZISP. Tsernaoua, 13°53' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 15 ♀♀; FUSAG, ZISP.

Burkina Faso: Kougny, 12°47' N, 3°07' W, 22.II.1980, leg. A. Pauly, 2 ♂♂, 1 ♀; FUSAG, ZISP. Ouagadougou, 15.III.1980, leg. A. Pauly, 1 ♀; FUSAG.

Cameroon: Yagoua, 10°21' N, 15°14' E, 6.VIII.1987, leg. A. Pauly, 3 ♂♂, 4 ♀♀; FUSAG, ZISP. Djafga, Logone River, 10°37' N, 15°09' E, 30.VII.1987, leg. A. Pauly, 1 ♂; FUSAG.

Chad: N'Gouri, Kanem district, IV.1958, leg. P. Renaud, 1 ♂; MRACT. N'Djamena, 22.VI-6.VII.1978, 1 ♀, 18.IV.1988, 7 ♂♂, 1 ♀, leg. G.G.M. Schulten; ZMA.

Sudan: El Obeid, 13-14.III.1914, leg. Ebner, 7 ♂♂ (paratypes of *Nomioides fasciatus* var. *intermedius*); NMW; ibid, 9.XII.1993, leg. G.G.M. Schulten, 2 ♂♂; ZMA. Khartoum, 4.XII.1991, leg. G.G.M. Schulten, 1 ♀; ZMA; ibid, 20.I.1962, leg. R. van der Bosch, 21 ♂♂; CAS, UCR, ZISP; ibid, 20-24.X.1978, leg. K. M. Guichard, 1 ♂; BMNH. 5 mi W. Khartoum, Shambad, 19-29.I.1962, leg. R. van der Bosch, 3 ♀♀; CAS, UCR. 15 mi [ca. 24 km] N Khartoum, 28.I.1962, leg. R. van der Bosch, 4 ♀♀; UCR, ZISP. Sennar, 18-27.II.1914, leg. Ebner, 3 ♂♂ (paratypes of *Nomioides fasciatus* var. *intermedius*); NMW. Tonga, 17.V.1914, leg. Ebner, 1 ♂ (paratype of *Nomioides fasciatus* var. *intermedius*); NMW. Wad Medani, 12.I.1927, leg. H.B. Johnston, 1 ♂; BMNH.

Somalia: Dabolak, 12.XII.1920, 1 ♂; ZISP. Hargesia, 5-7.XII.1920, 1 ♂, 1 ♀; AMNH. Mogadiscio, Afgoi, IV.1977, leg. F. Bin, 2 ♂♂; RNHL.

Kenya: Archer's Post Ewaso Nyiro River, 2300 ft. [ca. 700 m], 1-6.X.1969, leg. M.E. Irwin & E.S. Ross, 2 ♀♀; CAS, ZISP. Lodwar, 20.XII.1995, leg. M. Snizek, 11 ♂♂; OLML. 13 mi [ca. 21 km] S Malindi, 26.V.1967, leg. C.D. Michener, 1 ♀; ZISP. Rift Valley Province, Eliye Springs, western shore of Lake Turkana, 3°15' N, 36°01' E, 24.XI.2002, leg. M.A. Prentice, 6 ♀♀; CAS. Voi, Tsavo, 8-18.XI.1996, leg. M. Snizek, 1 ♂; OLML; ibid, 23.III-4.IV.1997, 12 ♂♂, 7 ♀♀; 11-14.VII.1997, 3 ♂♂, 4 ♀♀, leg. M. Halada; OLML.

Visited plants (in Africa). **Amaranthaceae:** *Aerva javanica* (1 ♂). **Balanitaceae:** *Balanites aegyptiaca* (2 ♂♂, 2 ♀♀). **Boraginaceae:** *Heliotropium bacciferum* (1 ♂). **Burseraceae:** *Boswellia sacra* (1 ♂). **Caesalpiniaceae:** *Cassia obovata* (1 ♂, 15 ♀♀), *Cassia* sp. (12 ♂♂, 3 ♀♀). **Cucurbitaceae:** *Cucurbita* sp. (2 ♀♀). **Euphorbiaceae:** *Euphorbia pubescens* (2 ♀♀). **Fabaceae:** red *Fabaceae* (1 ♂), *Indigofera* sp. (22 ♂♂, 3 ♀♀), *Medicago sativa* (3 ♀♀), *Retama retam* (1 ♂, 1 ♀), *Vicia faba* (1 ♂). **Malvaceae:** *Gossypium* sp. **Rubiaceae:** *Borreria verticillata* (54 ♂♂, 106 ♀♀), *Mitracarpus scaber* (3 ♂♂, 4 ♀♀). **Sterculiaceae** (1 ♂). **Pedaliaceae:** *Sesamum* sp. (15 ♀♀). **Rhamnaceae:** *Ziziphus* sp. (1 ♂, 5 ♀♀). **Tamaricaceae:** *Tamarix* spp. (566 ♂♂, 46 ♀♀).

Ceylalictus subgenus *Meganomioides* Pesenko 1983

Ceylalictus subg. *Meganomioides* Pesenko 1983: 179 (key), 183.

Type species. *Nomioides karachensis* Cockerell 1911, by original designation.

The subgenus includes three species: the type species known by the holotype from Pakistan and by a series from Mauritania, the North African *C. desertorum* (Blüthgen), and *C. seistanicus* (Blüthgen) known by a single male from southeastern Iran.

Ceylalictus (*Meganomioides*) *desertorum* (Blüthgen 1925), status n.

[fig. 15a-15j; Pl. II: 66 (total view), V: 120 (head), VIII: 164 (propodeum), XVII: 232 (map); tab. 3].

Nomioides karachensis var. *desertorum* Blüthgen 1925: 88, ♀. Holotype: ♀, "Temassinim, Südostalgerien [Tuggut, southeastern Algeria] [33°05'N 6°04'E], 26-28.I.1914, [leg.] Geyer"; MNHUB.

Taxonomy. Blüthgen 1933a: 126, fig. 11 (*Nomioides karachensis* var. *desertorum*; ♂ nov.). Pesenko 1983: 183 (*Ceylalictus karachensis* in part; comb. n.), fig. 253, 350-352.

Diagnosis. This is one of the largest species of the *Nomioidinae*. In the wing venation and the structure of the male genitalia, it is similar to *C. seistanicus* (Blüthgen), known by a single male from southeastern Iran. *C. desertorum* differs from the latter in the following characters of the male: the body is larger (length of the male 5.0-5.2 mm, *vs.* 4.0 mm in *C. seistanicus*), the head is higher (its height / width ratio 1.1, *vs.* 1.0 in *C. seistanicus*), the emargination in the inner orbit is deeper, the head and mesosoma are dull metallic green (*vs.* black-green with yellow metallic tint in *C. seistanicus*), the pale pattern on the body is richer, the hind wing bears 7 distal hamuli on the anterior margin (*vs.* 6 hamuli in *C. seistanicus*), T1 is covered

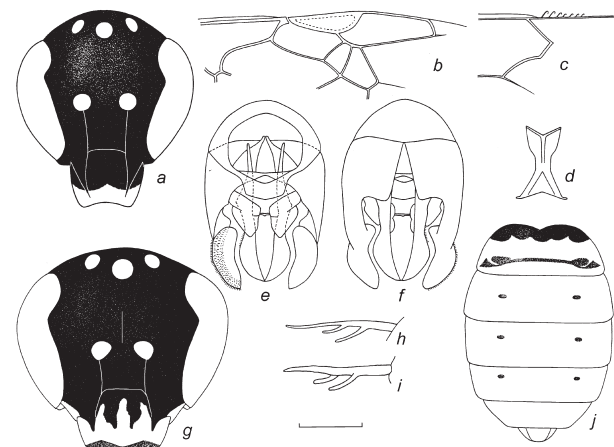


Figure 15

Ceylalictus (*Meganomioides*) *desertorum* (Blüthgen 1925): male (a-f) and female (g-j)

a and g, head in frontal view; b, part of forewing; c, part of hind wing; d, S8; e, genital capsule in ventral view; f, genital capsule in dorsal view; h and i, inner metatibial spur; j, metasoma in dorsal view.

a-c, male from Tozeur (Tunisia); d-f, male from Dhanikiya (Jordan); g-j, females from Nefta (Tunisia).

Scale line: 1 mm for j; 0.5 mm for a, b, c, g; 0.25 mm for d, e, f, h, i.

with short pubescence (*vs.* provided with long and dense plumose hairs on sides in *C. seistanicus*). Differences from the similar *C. karachensis*, known from southwestern Pakistan and Mauritania, are given in tab. 3.

Male. Structure. Body length 5.0-5.2 mm. Head nearly triangular in frontal view, 1.1 times as high as wide (fig. 15a). Ocellar elevation distinct. Median clypeal lobe 1.1 times as high as wide. Clypeus projecting about 0.8 of its height below lower margins of eyes. Malar space 0.15 of basal width of mandible. Inner orbits with deep triangular notch; its depth about 0.3 of maximal (extrapolated) ocular width in frontal view (fig. 15a); paraocular area in the notch flat. Longitudinal carina between antennal sockets absent. Frontal line indistinct. 2nd-7th flagellomeres 1.3-1.4 times as long as their diameters. Metanotum with distinct median tubercle. Dorsal surface of propodeum slightly concave, as long as scutellum. Marginal cell of forewing relatively short, widely truncated at distal end (transverse vein *3r* about 0.3 times as long as vein *R*₁); second submarginal cell trapezoidal (fig. 15b). Hind wings with 7 distal hamuli (fig. 15c). Posterior areas of terga distinctly separated from their discs by step. Genital capsule longitudinally elliptic. Genital foramen nearly rounded. Gonoforceps on distal half with a sole-like structure covered with dense short hairs along outer margin of ventral surface. Penis valve roundly broadened in distal half, pointed at apex (fig. 15e, 15f).

Sculpture. Vertex finely punctate, shiny. Mesoscutum finely and sparsely punctate; spaces between punctures more than diameters of punctures, slightly shagreened, shiny. Dorsal surface of propodeum finely sparsely punctate and shiny. Terga densely and regularly granulate, mat; their posterior areas finely strigate, slightly shiny.

Coloration. Head and mesosoma dull dark green, with metallic tint. Anterior surface of T1 fuscous and with green metallic tint or black. Coxae, trochanters, and femora dark fuscous or black, without or with very slight metallic tint. Mandible (except for reddish apex), labrum, clypeus on lower third (fig. 15a), narrow interrupted stripe along anterior margin of pronotum, posterior pronotal lobe, spot on tegula, band along posterior margin of scutellum, scutellar crest, tubercle on metanotum, tibiae, tarsi, and posterior halves of discs of terga, all yellow.

Vestiture. White everywhere. Face and genal area on upper half covered with very dense appressed short plumes. In addition, genal area, mesosoma (except for glabrous metapostnotum), and anterior surface of T1 covered with short plumose erect hairs. Tubercle on metanotum with a bunch of dense and very long plumose hairs.

Female. Structure. Body length 5.6-6.0 mm. Head triangularly rounded in frontal view; its height / width ratio 0.95 (fig. 15g). Face convex. Median lobe of clypeus weakly convex, as high as wide. Clypeus projecting 0.6 of its height below lower margins of eyes. Supraclypeal area flattened, with weak median tubercle. Ocellar elevation indistinct. Malar space 0.1-0.15 of basal width of mandible. Notch in inner orbits rounded, consisting only 0.3 of extrapolated maximum width of eye (fig. 15g); paraocular area in notch flat. Longitudinal carina between antennal sockets and frontal line absent. Mandible flattened and rounded at apex, with subapical tooth. Dorsal surface of propodeum flat, about 0.9 times as long as scutellum. Structure of metanotum and wing venation similar to those of male. Inner metatibial spur of normal length, with two long teeth (fig. 15b, 15i). Metasoma weakly convex; in dorsal view, elliptical, with maximum width at level of segment III (fig. 15j). Posterior areas of terga wide,

flat, not separated from tergal discs.

Sculpture. Clypeus polished, with several shallow pits in upper third. Supraclypeal area and frons slightly shiny, densely and finely punctate, with shagreened interspaces between punctures. Paraocular areas and vertex with same punctuation, but shinier. Mesoscutum and dorsal surface of propodeum shiny, densely and finely punctate, with smoothed interspaces equal to diameters of punctures. Scutellum nearly impunctate. Terga densely granulate, mat on discs, submat on posterior areas.

Coloration. Head and mesosoma dull dark green, with metallic tint. Clypeus (usually except for two dark longitudinal stripes of variable size in upper two thirds of median lobe; fig. 15g), mandible (except for brown apex), scapus (except for black stripe of variable size on upper side), pronotal corolla and spiracular lobes, scutellum along posterior margin or mostly, scutellar crests, metanotum mostly or on posterior half, nearly half of hyaline tegula, basal sclerites of wings, tarsi, distal third or half of femora (sometimes hind femur throughout), tibiae, and metasoma (except for fuscous anterior surface of T1 and small lateral spots on T1-T4; fig. 15j), all light yellow. Antenna light ochre on lower side and fuscous to ochre on upper side. Anterior surface of T1 with distinct green metallic tint. Wing membrane hyaline, veins and pterostigma light yellow.

Vestiture. Richer than that in male: also mesoscutum and metanotum covered with dense short appressed plumes. Tarsomeres 1-4 of middle legs provided with long, white, dense, shortly and densely pectinate hairs (same unusual hairs mostly constituting the scopa on tibia and basitarsus of hind legs).

Distribution. Algeria, Tunisia, Egypt, Jordan.

Records from Africa. Blüthgen 1925: 88 (Algeria: Tuggut; *Nomioiodes karachensis* var. *desertorum*).

African material examined (34 specimens). *Morocco*: 10 km N Erfoud, 10.IV.1995, M. Halada, 5 ♀♀; SCH, FUSAG.

Algeria: near El Golea, desert, VIII.1980, leg. P. Lambley, 1 ♀; BMNH. Kilian, 1 ♀, MNHN.

Tunisia: Tozeur, 24-28.III.1978, leg. K.M. Guichard, 2 ♂♂, 1 ♀; BMNH; *ibid.*, 15.IV.1981, leg. M. Schwarz, 2 ♀♀; SCH. Nefta, 15.IV.1981, leg. M. Schwarz, 10 ♀♀; SCH, ZISP; *ibid.*, 15.IV.1981, leg. J. Gusenleitner, 9 ♀♀; GUS; *ibid.*, 8-9.IV.1998, leg. K. Denes, 1 ♀; OLML.

Egypt: Abidos, 3-5.III.1958, leg. W.J. Pulawski, 1 ♂, 1 ♀; OLML.

Ceylalictus (Meganomioiodes) karachensis (Cockerell 1911)

[fig. 16a-16n; Pl. II: 64-65 (total view), V: 121-123 (head), VIII: 165 (female propodeum), IX: 174 (male propodeum), XI: 193 (male genitalia), XVII: 233 (map); tab. 3]

Nomioiodes karachensis Cockerell 1911: 235, ♀. Holotype: ♀, "[leg.] E. Comber, Karachi [Pakistan] [24°52'N 67°03'E], July [19]09", "B. M. type Hym. 17.a.1065"; BMNH (examined).

Taxonomy. Blüthgen 1925: 86 (*Nomioiodes karachensis*). Blüthgen 1934a: 263 (*Nomioiodes karachensis*). Pesenko 1983: 183 (in part, comb. n.), fig. 207.

Diagnosis. It is similar to the North African *C. desertorum*. Differences between them are given in the key above and tab. 3.

Male. Structure. Body length 5.0-5.2 mm. Head nearly triangular in frontal view, 1.1 times as high as wide (fig. 16a). Ocellar elevation distinct. Median clypeal lobe 1.2 times as high

as wide. Clypeus projecting about 0.8 of its height below lower margins of eyes. Malar space 0.25 of basal width of mandible. Inner orbits with deep triangular notch; its depth about 0.3 of maximal (extrapolated) ocular width in frontal view (fig. 16a, 16b); paraocular area in the notch flat. Longitudinal carina between antennal sockets absent. Frontal line indistinct. 2nd-7th flagellomeres 1.0-1.1 times as long as their diameters (fig. 16c). Metanotum with distinct median tubercle. Dorsal surface of propodeum slightly concave, as long as scutellum. Marginal cell of forewing relatively long, narrowly truncated or rounded at distal end (transverse vein 3r about 0.15-0.2 times as long as vein R_1); second submarginal cell trapezoidal (fig. 14d). Hind wings with 7 distal hamuli (fig. 16e). Posterior areas of terga distinctly separated from their discs by step. Genital foramen transversely elliptic. Gonoforceps in distal half slender, nearly hairless. Penis valve slender (fig. 16i, 16j).

Sculpture. Vertex finely punctate, shiny. Mesoscutum finely and sparsely punctate; spaces between punctures more than diameters of punctures, slightly shagreened, shiny. Dorsal surface of propodeum densely granulate and mat. Terga densely and regularly granulate, mat; their posterior areas finely strigate, slightly shiny.

Coloration. Head and mesosoma dull dark green, with metallic

tint. Anterior surface of T1 black, without metallic tint. Coxae, trochanters, and femora dark fuscous or black, without or with very slight metallic tint. Mandible (except for reddish apex), labrum, clypeus entirely (fig. 16a) or on most surface (fig. 16b), narrow interrupted stripe along anterior margin of pronotum, posterior pronotal lobe, spot on tegula, scutellar crest, tibiae, tarsi, and posterior 2/3 of discs of terga (fig. 16f), all yellow.

Vestiture. White everywhere. Face and upper half of genal area covered with very dense appressed short plumes. In addition, genal area, mesosoma (except for glabrous small triangular median area of metapostnotum), and anterior surface of T1 covered with short plumose erect hairs. Tubercle on metanotum with a bunch of dense and very long plumose hairs.

Female. Structure. Body length 5.6-6.0 mm. Head triangularly rounded in frontal view; its height / width ratio 1.1 (fig. 16k, 16l). Face shallowly depressed around antennal sockets. Median lobe of clypeus weakly convex, about as high as wide. Clypeus projecting 0.8 of its height below lower margins of eyes. Supraclypeal area flattened, with weak and shallow median tubercle. Ocellar elevation indistinct. Malar space 0.25 times as wide as mandible at base. Notch in inner orbits rounded, consisting only 0.3 of extrapolated maximum width of eye (fig. 16k, 16l); paraocular area in the notch flat. Longitudinal carina between antennal sockets and frontal line absent. Mandible pointed at apex, without subapical tooth. Dorsal surface of propodeum flat, as long as scutellum. Structure of metanotum and wing venation similar to those of male. Inner metatibial spur nearly half as long as outer metatibial spur, provided with one long process (fig. 16m). Metasoma weakly convex; in dorsal view, elliptical, with maximum width at level of T3 (fig. 16n). Posterior areas of terga wide, flat, not separated from tergal discs.

Sculpture. Clypeus polished, with several shallow pits in upper third. Supraclypeal area and frons slightly shiny, densely and finely punctate, with shagreened interspaces between punctures. Paraocular areas and vertex with same punctation, but shinier. Mesoscutum shiny, densely and finely punctate, with smooth interspaces equal to diameters of punctures. Scutellum nearly impunctate. Dorsal surface of propodeum densely granulate, mat. Terga densely granulate, mat on discs, submat on posterior areas.

Coloration. Head and mesosoma dull dark green, with metallic tint. Clypeus entirely (fig. 16k, 16l), mandible (except for brown apex), scapus (except for black stripe of variable size on upper side), pronotal corolla and spiracular lobes, scutellar crests, metanotal tubercle, nearly half of hyaline tegula, basal sclerites of wings, tarsi, distal third or half of femora (sometimes hind femur throughout), tibiae (except for dark spot on hind ones), and metasomal (except for fuscous anterior surface of T1 and small lateral spots on T1-T4; fig. 16n), all light yellow. Antenna light ochre on lower side and fuscous to ochre on upper side. Dark parts of legs (dark fuscous or black) and anterior surface of T1 without green metallic tint. Wing membrane hyaline, veins and pterostigma light yellow.

Vestiture. Richer than that in male: also mesoscutum, metanotum, and dorsal surface of propodeum (except for small glabrous median tringle) covered with dense short appressed plumes. Tarsomeres 1-4 of middle legs provided with long, white, dense, shortly and densely pectinate hairs (same unusual hairs mostly constituting scopa on tibia and basitarsus of hind legs).

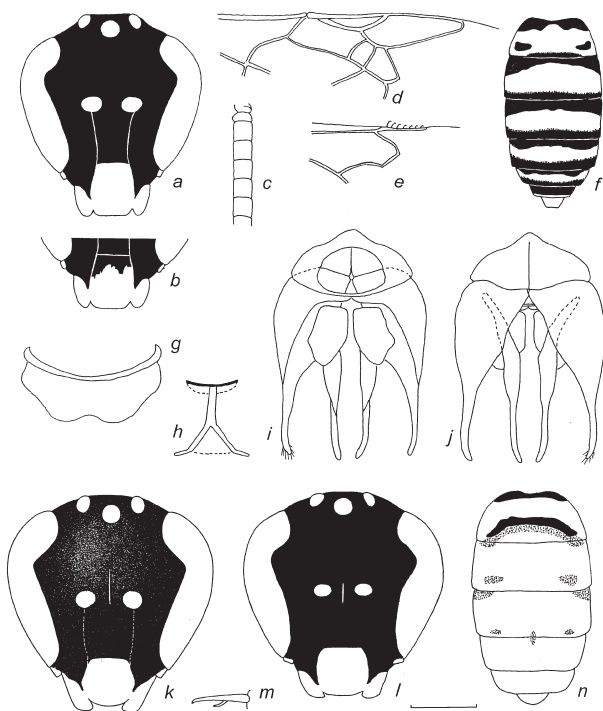


Figure 16
Ceylalictus (Meganomioides) karachensis (Cockerell 1911): male (a-j) and female (k-n)
a, k, and l, head in frontal view; b, lower part of head in frontal view; c, flagellomeres 1-5 in lateral view; d, part of forewing; e, part of hind wing; f and n, metasoma in dorsal view; g, S7; h, S8; i, genital capsule in ventral view; j, genital capsule in dorsal view; m, inner metatibial spur.
a-j, and l-n, males and females from Nouakchott (Mauritania); k, holotype of *C. karachensis*.

Scale line: 1 mm for f, n; 0.5 mm for a, b, c, k, l; 0.25 mm for g, h, i, j, m.

Table 3. Morphological differences between African individuals of *Ceylalictus desertorum* and *C. karachensis*

Characters	<i>C. desertorum</i>	<i>C. karachensis</i>
Males		
Median lobe of clypeus: height / width ratio	1.1 (fig. 15a)	1.2 (fig. 16a)
Malar space	Linear, about 0.15 of basal width of mandible	About 0.25 of basal width of mandible
Middle flagellomeres: length / diameter ratio	1.2-1.3	1.0-1.1 (fig. 16c)
Marginal cell of forewing: relative length and transverse vein $3r$ / vein R_1 ratio	Short, widely truncate; ratio 0.3 (fig. 15b)	Usually longer, narrower truncate; ratio 0.15-0.2 (fig. 16d)
Dorsal surface of propodeum: sculpture	Finely and sparsely punctate, shiny	Densely granulate, mat
Clypeus: coloration	Yellow on lower third (fig. 15a)	Yellow entirely (fig. 16a) or on most part (fig. 16b)
Scutellum: coloration	Yellow along posterior margin	Dark entirely
Metanotum: coloration	Yellow on tubercle	Usually dark entirely
Metapostnotum: vestiture	Glabrous	Covered with very dense plumes, except for small median triangle
T1 on anterior part: coloration	Fuscous, with green metallic tint	Black, without metallic tint
Terga: yellow coloration	About on posterior 1/2 of discs	About on posterior 2/3 of discs (fig. 16f)
Gonoforceps in distal half	Relatively wide, with sole-like structure covered with dense short hairs along outer margin of ventral surface (fig. 15e, 15f)	Slender, without sole-like structure (fig. 16i, 16j)
Females		
Head: height / width ratio	0.95 (fig. 15g)	1.1 (fig. 16k, 16l)
Portion of clypeus situated below eyes	0.6 (fig. 15g)	0.8 (fig. 16k, 16l)
Clypeus: coloration	Yellow, usually with two dark longitudinal stripes (fig. 15g)	Yellow entirely (fig. 16k, 16l)
Face	Convex	Shallowly depressed around antennal sockets
Malar space	Linear, about 0.1-0.15 of basal width of mandible	About 0.25 of basal width of mandible
Mandible	Flattened and rounded at apex, with subapical tooth	Pointed at apex, without subapical tooth
Scutellum: structure	Flattened	Convex
Scutellum: coloration	Usually yellow on most part	Dark entirely
Metanotum: coloration	Yellow on most surface or on posterior half	Usually yellow only on tubercle
Dorsal surface of propodeum: relatively length	0.9 times as long as scutellum	As long as scutellum
Dorsal surface of propodeum: sculpture	Finely and sparsely punctate, shiny	Densely granulate, mat
Hind tibia: coloration	Yellow entirely	Yellow, with large dark spot
Inner metatibial spur	As long as outer metatibial spur, provided with 2 long processes (fig. 15h, 15i)	Nearly twice smaller than outer metatibial spur, provided with 1 long processes (fig. 16m)
Marginal cell of forewing: relative length; transverse vein $3r$ / vein R_1 ratio	Short, widely truncate; ratio 0.3 (fig. 15b)	Usually longer, narrower truncate; ratio 0.15-0.2 (fig. 16d)
T1 on anterior part: coloration	Fuscous, sometimes with green metallic tint	Black, without metallic tint
T1: dark band before posterior area	Usually absent (fig. 15j)	Usually present (fig. 16n)

Variation. The females from Mauritania differ from the holotype of *C. karachensis* (a female from Karachi, the single specimen of the species that known from southern Asia) in the following characters: (1) clypeus without polished longitudinal median stripe (such a stripe is present in the holotype); (2) T1 on the anterior part without metallic tint (in the holotype, dark parts of T1 have a with distinct green metallic tint); (3) posterior areas of the terga mat (these are shiny in the holotype).

Distribution. Mauritania, Oman (Pesenko & Pauly, in press), southern Pakistan.

African material examined (30 specimens). *Mauritania*: Nouakchott, X.1990, XII.1990, III.1991, IV.1991, leg. F. Borgato, 23 ♂♂, 3 ♀♀; FUSAG, ZISP. Trarza, Tioulit, 11.III.2000, leg. F. LaRoche, 1 ♂; LAR. Maaden, 12.III.2001, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR.

Genus *Nomioides* Schenck 1867

Nomioides Schenck 1867: 333.

Type species *Apis minutissima* Rossi 1790, by designation under the plenary powers of ICZN (Opinion 1319; see also Pesenko & Kerzhner 1981).

Comment on the type species. In May 1976, Pesenko in co-operation with Dr. I.M. Kerzhner sent the following proposal to the International Commission on Zoological Nomenclature (below ICZN):

(1) Schenck (1866 [1867]: 333) established the new genus *Nomioides* for one species, *Andrena pulchella* Jurine 1807 (with *Apis parvula* Fabricius 1798, cited in synonymy). There was no redescription of the species but a reference was given to a previous good description of *A. pulchella* by Schenck (1859 [1861]: 295). (2) It was shown by Mocsáry (1879: 30) and accepted by Handlirsh (1888: 398-399) and Blüthgen (1925: 7), that Schenck (1859 [1861]) has misidentified *Andrena pulchella*. *Nomioides pulchellus* Jurine sensu Schenck (1859 [1861], 1866 [1867]), not Jurine (1807), is identical with *Apis minutissima* Rossi 1790, while *Andrena pulchella* Jurine 1807 is a junior synonym of *Andrena variegata* Olivier 1789, now *Nomioides variegatus*. The identity of *Apis parvula* Fabricius is doubtful; it is most probably a synonym of *Nomioides minutissimus* (Rossi) or of some other related species. (3) As Schenck misidentified the type species of his new genus, the type species should be designated by the ICZN (Code, Art.70a). (4) Sandhouse (1943: 578) and Michener (1965: 183; 1978: 504) indicated as type species of *Nomioides* "*Andrena pulchella* Jurine 1807 = *Apis minutissima* Rossi 1790", but this synonymy is wrong (see above). No other citations of the type species of *Nomioides* are known to us. (5) It is evident that *A. minutissima* Rossi (= *N. pulchellus* sensu Schenck), i. e. the species actually before Schenck, not *A. pulchella* Jurine, i. e. the species named by Schenck, is understood as type species by all later authors. For example, Blüthgen (1925: 4) distinguished the *N. minutissima* group later treated by Cockerell (1935: 90) and Blüthgen (1937: 3) as the subgenus *Nomioides* s. str., while Blüthgen (1937: 3) named the *N. variegata* group as the subgenus *Eunomioides*. Therefore designation of *Apis minutissima* as type species of *Nomioides* seems to be the best solution. (8). The ICZN is asked to use its plenary powers [i.e. to do the designation].

After examination and corrections this proposal was published in the Bulletin of Zoological Nomenclature as the Case Z. N. (S.) 2178 (Pesenko & Kerzhner 1981). In the end of 1984 the members of the Commission voted unanimously for the proposal. In June 1985 the ICZN published its Opinion 1319:

RULING. (1) Under the plenary powers, all designations of type species for the nominal genus *Nomioides* Schenck 1866 [1867] hitherto made are hereby set aside and the nominal species *Apis minutissima* Rossi 1790, is hereby designated as type species of that genus. (2) The generic name *Nomioides* Schenck 1866 [1867] (gender: masculine), type species, by designation under the plenary powers in (1) above, *Apis minutissima* Rossi 1790, is hereby placed on the Official List of Generic Names in Zoology with the Name Number 2261. (3) The specific name *minutissima* Rossi 1790, as published in the binomen *Apis minutissima* (specific name of the type species of *Nomioides* Schenck 1866 [1867]) is hereby placed on the Official List of Specific Names in Zoology with the Name Number 2964. One would think that the problem of type species of *Nomioides* was closed by the Opinion of the ICZN above. However, Ebmer (1987: 85) again calls in question the identity of *Andrena pulchella* sensu Schenck. Now Mr. Ebmer's critic of our interpretation for the species is not valid. He received a copy of the paper by Pesenko & Kerzhner (1981) soon after its publication and had the possibility to report his opinion to the ICZN in time. Moreover, the indication by Ebmer (1987: 85) of *Andrena pulchella* Jurine 1807 as the type species of *Nomioides* is wrong as it is in direct contradiction with the Ruling 1 of the Opinion 1319.

Taxonomy. Handlirsch 1888: 395-405. Dębski 1917: 25-50. Blüthgen 1925a: 1-100. Blüthgen 1933b: 114-127. Blüthgen 1933c: 63. Blüthgen

1934a: 238-283. Blüthgen 1934c: 493-501. Blüthgen 1935b: 231-237. Ireland 1935: 95-107. Cockerell 1936: 1-3. Michener 1978: 503-505. Pesenko & Kerzhner 1981: 225-227. Pesenko 1983: 122-177. Ebmer 1987: 85-87. Ebmer 1988: 677-678. Pagliano & Nobile 1995: 547-561. Pesenko 2000a: 120 (key). Pesenko 2000b: 215 (key), 217. Pesenko *et al.* 2000: 108 (key), 140-141. Michener 2000: 330 (key), 331-332.

Distribution. The genus includes 62 species mostly inhabiting deserts of Asia and North Africa. There are 45 currently recognised species in the Palaearctic region. All species belong to the nominotypical subgenus, except for two species. *N. socotranus* Blüthgen, differing in the large body, red metasoma, strongly elongate mandible, and the structure of the male genitalia, is considered as belonging to the monotypic subgenus *Erythronomioides* Pesenko. Also a separate subgenus, *Paranomioides* Pesenko, was established for *Nomioides steinbergi* Pesenko, known from a single male from Iran; the subgenus differs from *Nomioides* s. str. in the shortened propodeum, shortened gonobase and strongly broadened gonoforceps.

Key to African species and subspecies of the genus *Nomioides*

1. Male 2
 - Female 22
2. Body length 5 mm. Mandible long, distinctly curved, sabre-shaped. Metasoma red, with yellow bands. Apical lobe of S8 regularly narrowed to distal end, without neck near base (fig. 17b). (*Nomioides* subg. *Erythronomioides*) *N. socotranus* Blüthgen
 - Body length under 4.5 mm. Mandible short, slightly curved. Metasoma black, with yellow bands or entirely yellow. Apical lobe of S8 with a neck near base (*Nomioides* subg. *Nomioides*) 3
3. Head at least 1.1 times as high as wide. Apical lobe of S8 broadened towards distal end, truncate at apex. Gonoforceps narrow, of equal width in distal half or triangularly broadened at apex 4
 - Head wider than high, of equal height and width, at most 1.05 times as high as wide. Apical lobe of S8 of other form (except for *N. bluethgeni*). Gonoforceps variable 11
4. Mesoscutum punctate, with narrow, but distinct polished interspaces, slight shiny or shiny 5
 - Mesoscutum densely granulate, mat; sometimes obscurely granulate, more or less shiny. (*N. minutissimus* species group) 6
5. Mesoscutum densely uniformly punctate, interspaces as wide as diameters of punctures. Head and mesosoma dark metallic deep blue. Pale pattern of body poorer: paraocular area (fig. 37a); scutellum; usually metanotum; metasoma throughout, except for yellow pregradular areas of T2 (fig. 37d) or T2 and T3 (fig. 36d) seen through translucent posterior areas of preceding terga, all dark. Mesosoma without tomentose pubescence *N. turanicus* Morawitz
 - Mesoscutum more obscurely and sparsely punctate. Head and mesosoma light green; mesoscutum black, with yellow tint. Pale pattern of body richer: lower

- paraocular area (fig. 33a, 33b), band along posterior margin of scutellum, metanotum, about a third to half of tergal surfaces (fig. 33d, 33e), all yellow. Mesosoma (except for glabrous metapostnotum) covered with a tomentum (appressed plumes), especially dense on sides *N. ornatus* Pesenko
6. Head 1.2-1.4 times as high as wide, distinctly narrower than mesosoma 7
- Head 1.1-1.2 times as high as wide, as wide as mesosoma 8
7. Malar space nearly as half width of mandible at base. Head 1.4 times as high as wide (fig. 27a). Clypeus extending below eyes entirely, with rich dark pattern; paraocular area dark, without pale pattern (fig. 27a). Antenna shorter: middle flagellomeres 1.05-1.1 times as long as their diameters. Gonoforceps triangularly broadened at apex (fig. 27d, 27e) *N. longiceps* Blüthgen
- Malar space 0.1-0.2 width of mandible at base. Head 1.2-1.3 times as high as wide (fig. 31a, 31b). Clypeus extending below eyes about 0.7 of its height, entirely yellow; lower paraocular area yellow (fig. 31a, 31b). Antenna longer: middle flagellomeres 1.2 times as long as their diameters (fig. 31c). Gonoforceps of equal width in distal half (fig. 31g, 31h) *N. minutissimus maurus* Blüthgen
8. On average, larger: length 3.6-4.0 mm. Pale pattern poorer: paraocular areas (fig. 23a), pronotum and usually metanotum entirely dark. Middle flagellomeres 1.3-1.5 times as long as their diameters (fig. 23b). Mesoscutum and scutellum uniformly densely and coarsely granulate, mat. Dorsal surface of propodeum 1.3-1.4 times as long as scutellum. Body without tomentose pubescence. Gonoforceps of equal width in distal half (fig. 23f, 23g) *N. fortunatus* Blüthgen
- On average, smaller: length 3.0-3.7 mm. Pale pattern richer (except for *N. deceptor* ssp. *capverdensis*): lower paraocular area (fig. 19a, 20a, 20f), pronotal corolla and spiracular lobes or pronotum throughout and metanotum, all whitish yellow. Middle flagellomeres 1.0-1.1 times as long as their diameters (fig. 19b). Mesoscutum not so coarsely granulate, submat or shiny; scutellum shiny, with only traces of granulation. Dorsal surface of propodeum 1.1-1.3 times as long as scutellum. At least, face on lower half, genal areas and sides of mesosoma covered with dense tomentum (appressed plumes). Gonoforceps triangularly broadened at apex (fig. 19i-19l). (*N. deceptor*) 9
9. Main coloration of head and mesosoma darker: usually black or blackish fuscous, with an oil tint, sometimes dull metallic, dark greenish. Pale pattern poorer: usually paraocular areas (fig. 20g), scutellum entirely, and metanotum, all black. Pronotal collar and metanotum often entirely or partly fuscous. Tegula usually fuscous infuscated. Mesoscutum, mes- and metepisterna, propodeum and metasoma shinier *N. deceptor capverdensis* n. ssp.
- Main coloration of head and mesosoma paler: dull metallic green. Pale pattern richer: lower paraocular areas (fig. 19a, 20a), pronotal corolla, transverse band along posterior margin of scutellum, and metanotum throughout, all yellow. Tegula hyaline, with whitish

- yellow spot. Mesoscutum silk-mat, mes- and metepisterna mat, lateral surfaces of propodeum silk-mat, its posterior vertical surface mat, T1 nearly mat. (Two subspecies slightly differing in males) 10
10. On average, smaller (3.0-3.5 mm), paler (metasoma entirely or mostly yellow; fig. 19e, 19f), and covered with densertomentum *N. deceptor deceptor* Saunders
- On average, larger (3.4-3.7 mm), darker (metasoma yellowatmostonhalfitssurface; fig. 20b), and covered with sparser tomentum *N. deceptor canariensis* Blüthgen
11. Dark surfaces of body black, without metallic tints. Head and mesosoma covered with dense tomentum (appressed plumes), often except for glabrous metapostnotum. Paraocular area always yellow on lower part. Apical lobe of S8 parallel-sided (fig. 25f, 35j) or with slightly elongate club at apex (fig. 26f, 26g). (*N. rotundiceps* species-group) 12
- Head and mesosoma dull metallic green or blue. Pubescence of body, coloration of paraocular areas, and structure of S8 variable 15
12. Yellow pattern on paraocular areas not reaching up to bottom of emargination in inner orbit (fig. 25a, 35a, 34b). Apical lobe of S8 relatively short, parallel-sided (fig. 25f, 35j). Gonoforceps relatively wide, triangularly broadened in distal part and pointed at apex (fig. 25g, 35g, 35k) 13
- Yellow pattern on paraocular area reaching bottom of emargination in inner orbits (fig. 25a). Apical lobe of S8 with slightly elongate club at apex (fig. 26f, 26g) [unknown in *N. mucoreus*]. Gonoforceps long and slender, parallel-sided, narrowly rounded at apex (fig.

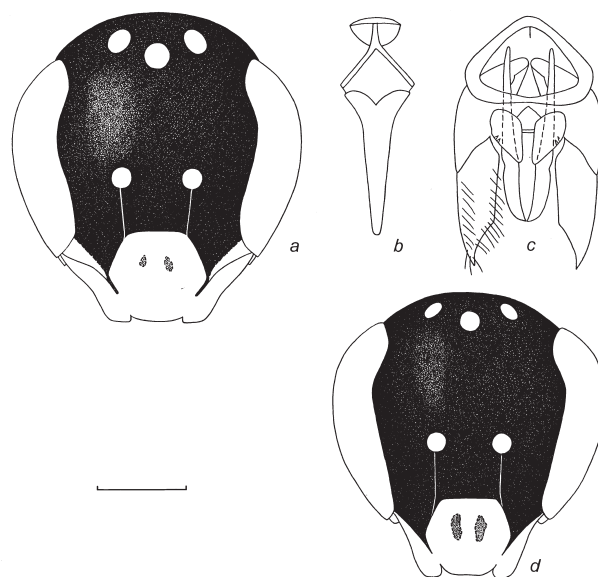


Figure 17
Nomioidea (Erythronomioides) socotranus Blüthgen 1925: male (a-c) and female (d)
a and d, head in frontal view; b, S8; c, genital capsule in ventral view.
a-c, lectotype; d, paralectotype.
Scale line : 0,5 mm for a, d ; 0,25 mm for b, c.

- 26*h*) [unknown in *N. mucoreus*] 14
13. Middle flagellomeres about as long as their diameters (fig. 35*c*). Dorsal surface of propodeum 1.2 times as long as scutellum. Apical lobe of S8 narrow (fig. 35*j*) *N. rotundiceps* Handlirsch
- Middle flagellomeres 1.3 times as long as their diameters (fig. 23*b*). Dorsal surface of propodeum 1.4 times as long as scutellum. Apical lobe of S8 relatively wide (fig. 25*f*) *N. kenyensis* n. sp.
14. Body length 3.2–3.5 mm. Head 1.0–1.05 times as high as wide (fig. 26*a*). Dorsal surface of propodeum 1.1–1.2 times as long as scutellum *N. klausi* Pesenko
- Body length 3.8–4.2 mm. Head wider than high. Dorsal surface of propodeum 1.4–1.5 times as long as scutellum *N. mucoreus* Blüthgen [Male unknown]
15. Mesoscutum covered with rather sparse tomentum (appressed plumes). Apical lobe of S8 long, with rounded elongate club at apex (fig. 36*f*; 36*j*) [unknown in *N. elbanus*]. Gonoforceps wide, widely rounded at apex (fig. 36*i*; 36*i*) [unknown in *N. elbanus*] 16
- Mesoscutum without or with few appressed plumes on its margins. Apical lobe of S8 and gonoforceps variable 17
16. Body length 3.0–3.3 mm. Dorsal surface of propodeum as long as scutellum or somewhat shorter. Border between

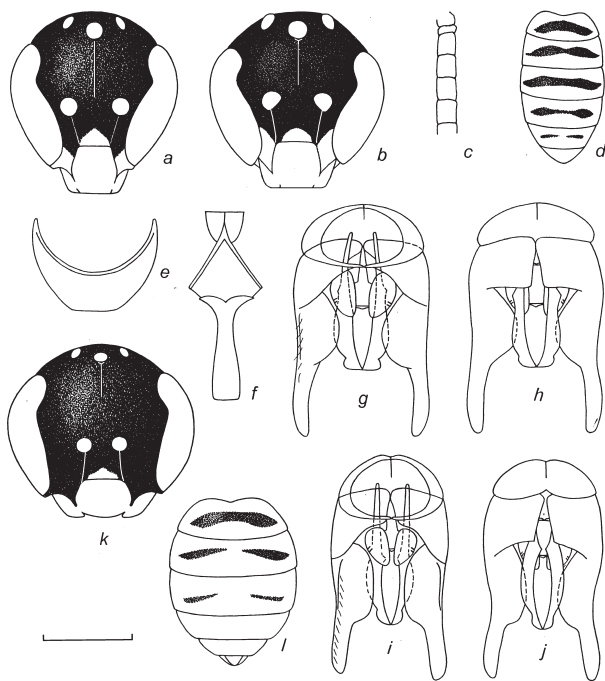


Figure 18
Nomioidea (Nomioidea) bluethgeni Pesenko 1979: male (a–f) and female (k and l)

a, b, and k, head in frontal view; c, flagellomeres 1–5 in lateral view; d and l, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view.

a and e–h, holotype; b–c, i, and j, male from Mariut (Egypt); k and l, female from Armenia.

Scale line: 1 mm for d, l; 0.5 mm for a, b, c, k; 0.25 mm for e, f, g, h, i, j.

- dorsal and posterior vertical surfaces of propodeum nearly polished, shiny *N. squamiger* Saunders
- Body larger. Dorsal surface of propodeum longer than scutellum. Border between dorsal and posterior vertical surfaces of propodeum mat *N. elbanus* Blüthgen [Male unknown]
17. Body length 3.0–3.1 mm. Antenna shorter: middle flagellomeres as long as their diameters or somewhat shorter (fig. 18*c*). Tomentose pubescence richer: lower half of face, genal area and sides of mesosoma covered with dense tomentum, mesoscutum with few appressed plumes on its margins. Mesoscutum shiny, its microsculpture of intermediate form between sparse obscure granulation and sparse obscure punctation. Dorsal surface of propodeum 0.9–1.0 times as long as scutellum. Metasoma entirely yellow or with narrow dark bands on terga (fig. 18*d*). Apical lobe of S8 relatively short, broadened in distal half, truncate at apex (fig. 18*f*). Gonoforceps narrow and parallel-sided in distal half, narrowly rounded at apex (fig. 18*g*) *N. bluethgeni* Pesenko
- Body length 3.2–4.0 mm. Antenna longer: middle flagellomeres at least 1.1 times as long as their diameters (except for *N. paulyi*). Tomentose pubescence absent or weak: genal area and sides of mesosoma with sparse tomentum, mesoscutum without appressed plumes. Mesoscutum mat, densely granulate (more or less shiny, obscurely and more sparsely granulate in *N. griseoldi*). Dorsal surface of propodeum distinctly longer than scutellum (except for *N. paulyi*). Metasoma nearly throughout dark or with narrow yellow bands on terga. Apical lobe of S8 and gonoforceps of other form 18
18. Head 0.9 times as high as wide, transversely elliptical in frontal view (fig. 34*a*). Antenna shorter, middle flagellomeres as long as their diameters or somewhat shorter (fig. 34*b*). Dorsal surface of propodeum 0.9–1.0 times as long as scutellum. Apical lobe of S8 slender, nearly parallel-sided (fig. 34*f*). Gonoforceps wide, pointed at apex (fig. 34*h*) *N. paulyi* Pesenko, n. sp.
- Head 0.95–1.05 times as high as wide, egg-shaped in frontal view (fig. 22*a*, 22*b*, 24*a*, 28*a*, 30*a*). Antenna longer, middle flagellomeres at least 1.1 times as long as their diameters (fig. 22*d*, 24*b*, 28*d*, 30*c*, 28*d*). Dorsal surface of propodeum distinctly longer than scutellum. Apical lobe of S8 and gonoforceps variable 19
19. Antenna shorter, middle flagellomeres 1.1–1.2 times as long as their diameters (fig. 22*d*). Border between dorsal and posterior vertical surfaces of propodeum nearly polished, shiny. Apical lobe of S8 long, with wide rounded elongate club at apex (fig. 22*g*, 22*h*). Gonoforceps wide, pointed at apex (fig. 22*i*, 22*k*) *N. facilis* (Smith)
- Antenna longer, middle flagellomeres 1.3–1.7 times as long as their diameters (fig. 24*b*, 28*d*, 30*c*, 30*d*). Border between dorsal and posterior vertical surfaces of propodeum mat. Apical lobe of S8 and gonoforceps of other form (except for *N. maculiventris*) 20
20. Mesoscutum more or less shiny, obscurely and sparsely granulate. Scutellum shiny. Dorsal surface of propodeum roundly passing onto its posterior vertical surface. Apical lobe of S8 nearly an inverted T-shaped

- figure (fig. 24f). Gonoforceps relatively slender, provided with a neck before distal third, rounded at apex (fig. 24g) ***N. griswoldi* n. sp.**
- Mesoscutum mat, densely granulate. Scutellum mat, at least along margins. Dorsal surface of propodeum passing onto its posterior vertical surface at angle. Apical lobe of S8 and gonoforceps of other form **21**
 - 21. Body darker: clypeus usually with dark pattern (fig. 28a, 28b); paraocular and genal entirely area dark; flagellum dark yellow to fuscous on lower side, dark fuscous to black on upper side; on legs only fore and middle tibiae and all tarsi pale (usually dark yellow); metasoma entirely dark (fig. 28b) or with narrow yellow bands on pregradular areas of T2 and T3 (fig. 28g), rarely of T2-T5 (fig. 28f). Antenna longer, middle flagellomeres 1.5-1.7 times as long as their diameters (fig. 28d). Apical lobe of S8 long, with narrow rounded elongate club at apex (fig. 28i, 28k). Gonoforceps wide, pointed at apex (fig. 28l, 28n) ***N. maculiventris* (Cameron)**
 - Body paler: clypeus entirely yellow; paraocular area yellow in lower part, at least to lower margin of antennal socket (fig. 30a, 30b); genal area usually yellow in lower sixth; flagellum yellow on lower side, fuscous on upper side; fore and middle femora and most of hind tibia yellow; metasoma with yellow bands on pregradular areas of T2-T4 or T2-T5 (fig. 30g, 30h). Antenna shorter, middle flagellomeres 1.3-1.4 times as long as their diameters (fig. 30c, 30d). Apical lobe of S8 relatively short, very narrow, parallel-sided, rounded at apex (fig. 30j). Gonoforceps wide, provided with thin hairy apical process directed mesad backward (fig. 30k) ***N. micheneri* n. sp.**
 - 22. Body length 5.5 mm. Mandible long, distinctly curved, sabre-shaped; metasoma red, with yellow bands. (*Nomioides* subg. *Erythronomioides*) ***N. socotranus* Blüthgen**
 - Body length under 4.5 mm. Mandible short, slightly curved; metasoma black, with yellow bands or entirely yellow. (*Nomioides* subg. *Nomioides*) **23**
 - 23. Head higher than wide (it as high as wide in *N. turanicus*, some *N. deceptor*) **24**
 - Head wider than high (it as high as wide in some *N. klausii*) **31**
 - 24. Mesoscutum slight shiny, densely punctate, with narrow, but distinct polished interspaces; if punctation similar to granulation (in some females of *N. ornatus*), then mesoscutum with bright copper-reddish tint **25**
 - Mesoscutum densely granulate, mat. (*N. minutissimus* species-group) **26**
 - 25. Head as high as wide (fig. 37i). Head and mesosoma dull metallic deep-blue or bluish-green. Pale pattern of body poorer: head capsule entirely (fig. 37i); pronotum; scutellum; metanotum; metasoma, except for yellow pregradular areas T2 and T3 (fig. 37j) or T2-T4 seen through translucent posterior areas of preceding terga, all dark. Body without tomentose pubescence ***N. turanicus* Morawitz**
 - Head 1.05-1.1 times as high as wide (fig. 33j). Head and mesosoma dull metallic light-green; mesoscutum often with goldish or bright copper-reddish tint. Pale pattern of body much richer: mandible, labrum, clypeus, lower paraocular area (fig. 33j), pronotal collar, scutellum, metanotum; metasoma, except for narrow dark bands on T1 or T1 and T2 (fig. 33k); all yellow. Head mostly and mesosoma (except for glabrous metapostnotum) covered with dense tomentum (appressed plumes) ***N. ornatus* Pesenko**
 - 26. Head 1.2-1.3 times as high as wide (fig. 27f, 31j), distinctly narrower than mesosoma **27**
 - Head 1.0-1.1 times as high as wide (fig. 19m, 20c, 20j, 20k, 23h), as wide as mesosoma **28**
 - 27. Malar space 0.3-0.5 width of mandible at base. Head 1.3 times as high as wide (fig. 27f). Clypeus pale only on lower fourth (fig. 27f) ***N. longiceps* Blüthgen**
 - Malar space 0.1-0.2 width of mandible at base. Head 1.2 times as high as wide (fig. 31j). Clypeus entirely yellow (fig. 31j) ***N. minutissimus maurus* Blüthgen**
 - 28. Mesoscutum and scutellum uniformly densely and coarsely granulate, mat. Head and mesosoma dull dark olive-green, with poorer pale pattern. Scutellum dark entirely. Dorsal surface of propodeum 1.2 times as long as scutellum. Body without tomentose pubescence ***N. fortunatus* Blüthgen**
 - Mesoscutum not so coarsely granulate, submat or slight shiny; scutellum shiny, with only traces of granulation. Dorsal surface of propodeum 1.0-1.1 times as long as scutellum. Main coloration of head and mesosoma paler and pale pattern richer (except for *N. deceptor* spp. *capverdensis*). Head and mesosoma covered with a tomentum (appressed plumes), especially dense on genal area and sides of mesosoma. (*N. deceptor*) **29**
 - 29. Pale pattern of head and mesosoma darker (dark yellow to yellowish fuscous) and poorer: labrum fuscous, clypeus entirely fuscous (fig. 20j) or with yellow fuscous pattern on lower part (fig. 20k), scutellum black, metanotum usually yellow fuscous to dark fuscous. Main coloration of metasoma dark yellow. Tegula usually fuscous infuscated, with fuscous spot ***N. deceptor capverdensis* n. ssp.**
 - Pale pattern of body paler (whitish yellow) and richer: labrum, clypeus and scutellum entirely or partly, metanotum; all yellow. Main coloration of metasoma yellow to light yellow. Tegula hyaline, with whitish yellow spot **30**
 - 30. On average, smaller: 3.5-4.0 mm. Pale pattern richer: clypeus, supraclypeal area, and scutellum always entirely yellow, usually lower part of paraocular area yellow (fig. 19m), metasoma entirely yellow, except for narrow dark bands on T1 (fig. 19n) or T1 and T2 and sometimes light fuscous lateral spots on T3 and T4 (fig. 19o) ***N. deceptor deceptor* Saunders**
 - On average, larger: 3.8-4.2 mm. Pale pattern usually poorer: clypeus often with fuscous lateral spots, supraclypeal area fuscous, paraocular area entirely dark (fig. 20c), scutellum often dark, with pale lateral spots, metasoma usually with dark bands on T1-T3 (fig. 20d) or T1-T5 (fig. 20e) ***N. deceptor canariensis* Blüthgen**
 - 31. Dark surfaces of body black, without metallic tints, except for sometimes metallic green mesoscutum. Head and mesosoma covered with dense tomentum, often except for glabrous metapostnotum. Face yellow on lower half, at least to level of antennal socket. (*N. rotundiceps* species group) **32**
 - Head and mesosoma dull metallic green or blue.

- Paraocular area dark, or with yellow spot on side of clypeus. Pubescence of body variable 35
32. Face yellow only below antennal socket (fig. 35o). Metapostnotum glabrous throughout 33
- Yellow coloration on paraocular area reaching upper margin of eye (fig. 26j, 26k, 32). Metapostnotum covered with dense tomentum, except for narrow glabrous stripe or triangle along anterior margin 34
33. Dorsal surface of propodeum as long as scutellum or somewhat shorter *N. rotundiceps* Handlirsch
- Dorsal surface of propodeum 1.1 times as long as scutellum *N. kenyensis* n. sp.
34. Body length 3.8–4.2 mm. Head 0.95 times as high as wide (fig. 26j, 26k). Metapostnotum 0.7 times as long as scutellum. Yellow coloration on face in middle reaching level of upper margin of antennal socket or even higher (fig. 26j, 26k) *N. klausi* Pesenko
- Body length 4.2–4.5 mm. Head 0.8 times as high as wide (fig. 32). Metapostnotum nearly as long as scutellum. Yellow coloration on face in middle reaching only level of lower margin of antennal socket (fig. 32) *N. mucoreus* Blüthgen
35. Mesoscutum covered with rather sparse tomentum (appressed plumes). Paraocular area with yellow spot at side of clypeus (fig. 21a, 36n, 36o) 36
- Mesoscutum without or with few appressed plumes on its margins. Paraocular area entirely dark (except for *N. facilis* and *N. paulyi*) 37
36. Body length 3.6–3.8 (rarely up to 4.0) mm. Head 0.9–0.95 times as high as wide, transversely elliptical in frontal view (fig. 36n, 36o). Yellow pattern on paraocular area usually reaching antennal socket along subantennal suture (fig. 36n, 36o). Scutellum shiny. Metapostnotum reticulate rugulose, on posterior half obscurely rugulose with a trend to striation, shiny. Dorsal surface of propodeum 0.6–0.7 times as long as scutellum. Border between dorsal and posterior vertical surfaces of propodeum nearly polished, shiny *N. squamiger* Saunders
- Body length 4.0–4.2 mm. Head 0.85 times as high as wide, shortly roundly triangular in frontal view (fig. 21a). Paraocular area only with triangular spot at side of clypeus (fig. 21a). Scutellum mat. Metapostnotum densely granulate throughout, with short striae before its anterior margin, mat. Dorsal surface of propodeum about as long as scutellum. Border between dorsal and posterior vertical surfaces of propodeum mat *N. elbanus* Blüthgen
37. Body length 3.0–3.2 mm. Tomentose pubescence richer: lower half of face, genal areas and sides of mesosoma covered with dense tomentum, mesoscutum with few appressed plumes on its margins. Mesoscutum slight shiny, its microsculpture of intermediate form between dense granulation and dense obscure punctation. Dorsal surface of propodeum 0.7 times as long as scutellum. Metasoma entirely yellow or with narrow dark bands on T1–T3 (fig. 18l) *N. bluethgeni* Pesenko
- Body length 3.6–4.4 mm. Tomentose pubescence absent or weak: genal area and sides of mesosoma with sparse tomentum, mesoscutum without appressed plumes. Mesoscutum mat, densely granulate. Dorsal surface of propodeum 0.85–1.15 times as long as scutellum (except for *N. paulyi*). Metasoma darker 38
38. Head 0.8 times as high as wide, transversely elliptical in frontal view (fig. 34i). Paraocular area with yellow spot on lower part (fig. 34i, 34j). Metapostnotum densely granulate throughout, with short striae behind its anterior margin, mat. Dorsal surface of propodeum 0.7–0.8 times as long as scutellum *N. paulyi* Pesenko, n. sp.
- Head 0.9–0.95 times as high as wide, rounded or triangularly rounded in frontal view (fig. 22m, 24i,). Paraocular area entirely dark (except for *N. facilis*, fig. 22m). Metapostnotum reticulate rugulose, alveolate or strigate. Dorsal surface of propodeum as long as scutellum or longer 39
39. Paraocular area with yellow spot on lower part (fig. 22m). Scutellum shiny. Border between dorsal and posterior vertical surfaces of propodeum nearly polished, shiny *N. facilis* (Smith)
- Paraocular areas entirely dark. Scutellum mat (except for *N. griswoldi*). Border between dorsal and posterior vertical surfaces of propodeum mat 40
40. Scutellum shiny. Metapostnotum coarsely strigate. Dorsal surface of propodeum 1.2 times as long as scutellum, roundly passing onto its posterior vertical surface *N. griswoldi* n. sp.
- Scutellum mat. Metapostnotum reticulate rugulose. Dorsal surface of propodeum about as long as scutellum, passing onto its posterior vertical surface at angle. (Two species are hardly distinguishable in females, because *N. maculiventris* is very variable in its pale pattern (see the section “Variation”) 41
41. Face and mesoscutum without appressed plumes. Metapostnotum somewhat more finely and densely rugulose, less shiny, always without carina along posterior margin. On average, pale pattern of body poorer (see fig. 29a–29j and the section “Variation”). Dorsal surface of propodeum about as long as scutellum *N. maculiventris* (Cameron)
- Face and mesoscutum along margins with sparse appressed plumes. Metapostnotum somewhat more coarsely, more sparsely and more uniformly rugulose, shinier, usually with weak transverse carina along posterior margin. On average, pale pattern body richer (see fig. 30m–30p and the section “Variation”). Dorsal surface of propodeum somewhat (1.05 times) longer than scutellum *N. micheneri* n. sp.

Nomioides subgenus *Erythronomioides* Pesenko 1983

Nomioides subg. *Erythronomioides* Pesenko 1983: 123 (key), 176.

Type species *Nomioides socotranus* Blüthgen 1925, by original designation.

Distribution. A monotypic subgenus known from the Socotra Island.

Taxonomy. Pesenko 2000b: 215 (key), 217.

Nomioides (Erythronomioides) socotranus Blüthgen 1925

[fig. 17a–17d; Pl. XVII: 234 (map)]

Nomioides socotrana Blüthgen 1925: 84, ♀, ♂. Lectotype (designated by Pesenko 1983: 177): ♂, “Sokotra, Ras Shoab [12°30'N 54°00'E], I.1899, [leg.] O. Simony”; NMW.

Taxonomy. Pesenko 1983: 123 (key), 177, fig. 204, 250, 339, 340.

Male. Structure. Body length 5 mm. Head rounded in frontal

view; its height / width ratio 1.05 (fig. 17a). Median lobe of clypeus flat, its height / width ratio 0.8; clypeus extending 2/3 of its length below eyes. Malar space linear. Upper minimum distance between eyes little more lower minimum distance between eyes. Emargination of inner orbits shallow, rounded; its depth about a fourth of extrapolated width of eye in frontal view (fig. 17a). Face flattened. Mandible very long, sabre-curved. Antenna short. Dorsal surface of propodeum flat, as long as scutellum. Apical lobe of S8 regularly narrowed to distal end, without neck near base (fig. 17b). Gonobase triangularly rounded in dorsal view. Genital foramen 0.7 times as long as wide. Gonoforceps wide, triangular in distal fourth, pointed at apex. Penis valve slender and short (fig. 17c).

Sculpture. Clypeus finely and very obscurely granulate, shiny, before lower margin with few elongate pits. Frons, vertex mesoscutum and scutellum densely and finely granulate, mat. Metapostnotum with microsculpture similar to that on mesoscutum, but even finer, mat; with short striae near anterior margin. Terga finely punctate, shiny, with distinct, slightly aciculate interspaces.

Coloration. Main coloration of head and mesosoma dull metallic dark green. Metasoma without metallic tint, T1 fuscous, T2 and T3 orange reddish, subsequent terga fuscous reddish. Clypeus (except for two small fuscous lateral spots; fig. 17a), mandible (except for reddish apex), malar space, stripe along lower margin of paraocular areas, small spot on lower part of genal areas, antennal scapus on lower side, pronotum, spiracular pronotal lobes, spot on anterior part of hyaline tegula, spots on metanotum, tibiae on outer surfaces, tarsi, narrow bands along posterior margins of postgradular areas of T1-T4, all white yellow.

Vestiture. White, plumose, erect or inclined; denser on lower half of face, genal areas and T1; longer on metanotum. Tomentum (appressed plumes) absent. Metapostnotum entirely glabrous.

Female. Structure. Body length 5.5 mm. Head roundly triangular in frontal view; its height / width ratio 1.05 (fig. 17d). Median lobe of clypeus flat, its height / width ratio 0.9; clypeus extending 2/3 of its length below eyes. Malar space linear. Upper minimum distance between eyes 1.1 times as large as lower minimum distance between eyes. Emargination of inner orbits shallow, rounded; its depth about a fourth of extrapolated width of eye in frontal view (fig. 17d). Face flattened. Frontal line absent. Mandible very long, sabre-curved. Dorsal surface of propodeum flat, 0.7-0.8 times as long as scutellum.

Sculpture. Clypeus finely and densely granulate, mat, except for polished stripe along lower margin. Frons, vertex, mesoscutum and scutellum densely and finely granulate, mat. Metapostnotum densely striate throughout or only on anterior half, then finely granulate and mat on posterior half. Terga obscurely granulate, silk-mat.

Coloration. Head, scutellum and propodeum dull metallic dark green; mesoscutum brighter metallic blue greenish; sides of mesosoma black, without metallic tints. Metasoma without metallic tint, orange reddish, except for black T1 or only its base. Clypeus (except for elongate fuscous lateral spots; fig. 17d), mandible (except for reddish apex), malar space, small spot on lower part of genal area, antennal scapus on lower side, pronotal corolla and spiracular lobe, spot on anterior part of hyaline tegula, scutellar crest, median area of metanotum, fore and middle tibiae and tarsi, pattern on hind tibia and tarsus, small lateral spots on metasomal T1, wide band on anterior part of disc of T2, and narrower band on T3, all yellow.

Vestiture. Yellowish white, plumose, erect; denser on genal areas and sides of mesosoma; longer on metanotum. Tomentum (appressed plumes) absent. Metapostnotum entirely glabrous.

Distribution. Island of Socotra.

Records from Africa. Blüthgen 1925: 84 (Socotra: Ras Shoab).

African material examined (4 specimens). Socotra: Ras Shoab, 1.1899, leg. O. Simony, 1 ♂ (lectotype), 3 ♀♀ (paralectotypes); NMW.

Nomioides subgenus *Nomioides* s. str.

Distribution. This subgenus comprises about 60 species. Its geographical range and species richness centres coincide with those of the genus.

Taxonomy. Pesenko 1983: 123 (key), 131. Pesenko 2000b: 215 (key), 217.

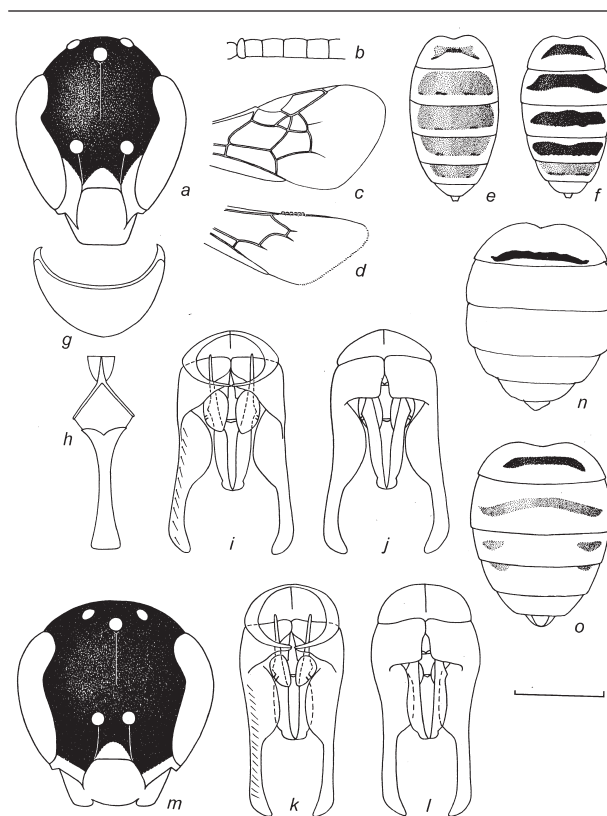


Figure 19
Nomioides (Nomioides) deceptor deceptor Saunders 1908: male (a-l) and female (m-o)

a and m, head in frontal view; b, flagellomeres 1-5 in lateral view; c, forewing; d, hind wing; e, f, n, and o, metasoma in dorsal view; g, S7; h, S8; i and k, genital capsule in ventral view; j and l, genital capsule in dorsal view.

a-d and g-j, paralectotype; e, k, and l, male from Nefta (Tunisia); f, male from Assiut (Egypt); m and o, lectotype; n, female from Sinai (Egypt). Scale line: 1 mm for c, d, e, f, n, o; 0.5 mm for a, b, m; 0.25 mm for g, h, i, j, k, l.

***Nomioides (Nomioides) bluethgeni* Pesenko 1979**

[fig. 18a-18f; Pl. II: 67 (total view), VI: 143 (head), VIII: 167 (propodeum), XVII: 235 (map)]

Nomioides (Nomioides) bluethgeni Pesenko 1979: 176, fig. 1-3, ♂.

Holotype: ♂, "Kurgan-Tyube, Ferghana valley, Uzbekistan [40°43'N 72°48'E], [on flowers of] *Horaninowia ulicina*, 12.VIII.1938, [leg.] V. Popov" [label in Russian]; ZISP.

Taxonomy. Pesenko 1983: 125 (♀ nov.; key to females), 128 (key to males), 165, fig. 198, 238, 315, 316.

Diagnosis. In appearance (size, sculpture, coloration and pubescence of the body) of both the sexes, this is more similar to *N. ornatus* Pesenko, than to other African species of the subgenus. *N. bluethgeni* differs from *N. ornatus* in the shorter head (especially in the female), somewhat less developed tomentose pubescence of the body (especially on the mesoscutum), much more densely punctate mesoscutum of the male and structure of the male gonoforceps (cf. fig. 18g-18j and fig. 33h, 33i).

Male. Structure. Body length 3.0-3.1 mm. Head egg-shaped in frontal view; its height / width ratio 1.0-1.05. Median lobe of clypeus weakly convex, about as high as wide; clypeus extending about half of its length below eyes (fig. 18a, 18b). Malar space linear. Face flattened. Antenna short, reaching posterior third of mesoscutum; middle flagellomeres as long as their diameters (fig. 18c). Metapostnotum weakly transversely depressed, semicircular; its lateral borders not marked even by change in microsculpture. Dorsal surface of propodeum 0.9-1.0 as long as scutellum, passing to posterior vertical surface at distinct angle of 100°. Apical lobe of S8 relatively short, broadened toward distal end, truncate at apex (fig. 18f). Gonobase semicircular in dorsal view. Gonoforceps relatively short, sharply narrowed in distal half (fig. 18g, 18h) or third (fig. 18i, 18j), narrowly rounded at apex.

Sculpture. Clypeus, supraclypeal area and pale part of paraocular area shiny, finely punctate. Frons and vertex very densely and finely granulate, mat. Mesoscutum densely punctate, slight shiny. Scutellum shiny, polished nearly throughout, along its margins and mid-line with obscure punctation. Mes- and metepisterna finely granulate, mat. Metapostnotum submat, densely finely granulate, with short fine striae near anterior margin. Dorsal surface of propodeum mat on border with its posterior vertical surface. Lateral and posterior vertical surfaces of propodeum densely finely granulate, mat.

Coloration. Main coloration of head and mesosoma dull metallic olive green; dark parts of metasoma fuscous, without metallic tints. Labrum, clypeus, supraclypeal area (fig. 18a, 18b), mandible (except for light fuscous apex), malar space, scapus, pronotal corolla and spiracular lobes, band along posterior margin of scutellum, scutellar crests, spot on anterior part of hyaline tegula, basal sclerites of wings, fore and middle femora, all tibiae and tarsi, metasoma except for fuscous bands on T1-T5 (fig. 18d), all yellow or white-yellow. Flagellum yellow on lower side, dark yellow or fuscous yellow on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surfaces of mesosoma. Appressed plumes present on most surfaces of head and mesosoma, except scutellum, metanotum and glabrous

metapostnotum, but including marginal parts of mesoscutum; tomentose pubescence especially dense between antennal sockets, on upper half of genal area and on sides of mesosoma.

Female. Structure. Body length usually 3.0-3.2 mm. Head nearly rounded in frontal view; its height / width ratio 0.9-0.93. Median lobe of clypeus weakly convex, its height / width ratio 0.6-0.7; clypeus extending nearly half of its length below eyes (fig. 18k). Malar space linear. Face flattened. Metapostnotum flat, semicircular, not occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture and appearance of dense pubescence. Dorsal surface of propodeum nearly 0.7 times as long as scutellum, passing onto its posterior vertical surface at rounded angle of about 110°. Wing venation as in male. Hind wing with 6 distal hamuli.

Sculpture. Clypeus and lower half (pale) of supraclypeal area very finely and obscurely granulate, submat. Frons and vertex densely and finely granulate, mat. Mesoscutum silk-mat, uniformly densely punctate, with narrow, but distinct interspaces. Scutellum smooth on disc, shiny; finely and densely punctate-granulate along margins and mid-line, mat. Metapostnotum uniformly reticulate rugulose, relatively shiny. Lateral and posterior vertical surfaces of propodeum obscurely punctate granulose, slightly shiny.

Coloration. Main coloration of head greenish black, with distinct bronze-green metallic tint. Mesosoma dull metallic green. Mesoscutum brighter metallic green, sometimes with gold-reddish stripes. Labrum, entirely clypeus, lower half or roundly triangular spot before lower margin of supraclypeal area (fig. 18k), mandible (except for reddish apex), scapus on lower and lateral surfaces, pronotal collar and spiracular lobes, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for dark hind femur, often large spot on hind tibia and sometimes small spots on fore and middle femora and hind basitarsus), metasoma, except for bands on T1 and T2 or T1-T3 (on T1 continuous, on T2 and T3 interrupted; fig. 18l); all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Whitish, plumose, erect; longer on metanotum and sides of mesosoma. Not dense tomentum (appressed plumes) present only on genal areas and lateral surfaces of mesosoma. Metapostnotum entirely glabrous. Metabasitarsal penicillus light yellow.

Distribution. Morocco, Egypt, Kenya, Jordan, Syria (**first record**: 60 km S Damascus, 1 ♀; 50 km SE Suwayda, 1 ♀). Armenia, Uzbekistan, Tajikistan, eastern Mongolia.

Records from Africa. Pesenko 1989: 123 (Egypt: Mariut).

African material examined (13 specimens; part of them labelled as "*Nomioides* aff. *hybridus*" by Pesenko in 1985-1989). **Morocco**: 10 km W Midelt, 1550 m, 3.VI.1983, leg. K.M. Guichard, 6 ♀♀; BMNH, ZISP. 30 km E Midelt, 13.V.1995, leg. M. Halada, 1 ♀; SCH.

Egypt: Mariut, 15.V.1974, leg. F.D. Parker, 2 ♂♂, 1 ♀; UUL, ZISP. Northern Coast, 5.V.1991, leg. A. Mochi, 1 ♂, 1 ♀; ZISP.

Kenya: Voi, Tsavo, 23.III.-3.IV.1997, leg. Ma. Halada, 1 ♀; OLML.

Nomioides (Nomioides) deceptor Saunders 1908

Nomioides (Nomioides) deceptor deceptor Saunders 1908

[fig. 19a-19o; Pl. III: 76-77 (total view), IV: 99 (mesoscutum), VI: 132-133 (head), IX: 176 (propodeum), X: 185 (mesoscutum), XIV: 218 (male genitalia), XVII: 236 (map)]

Nomioides deceptor Saunders 1908: 223, ♀, ♂. Lectotype (designated by Pesenko 1983: 135): ♀, "Algerie [Biskra], [leg.] Eaton [34°51'N 5°44'E]", "18.V.1893", "E. Saunders coll. 1910: 266", "B. M. type Hym. 17.a.1046"; BMNH.

Nomioides minutissima var. *deserticola* Blüthgen 1925: 11, ♂. Holotype: ♂, "Egypt, Khanka [30°13'N 31°21'E], 25.V.1914, [leg.] Dębski"; "in coll. Ministry Agric., Cairo". **Syn. n.**

Nomioides minutissimus f. *deceptor*: Pesenko 1983: 138.

Taxonomy. Blüthgen 1925: 11, 16. Blüthgen 1933b: 23. Blüthgen 1934a: 243. Blüthgen 1934b: 192 (*N. deceptor*). Blüthgen 1937: 3. Pesenko 1983: 134, fig. 170, 171, 209, 210, 256-259 (*N. minutissimus* f. *deceptor*).

Diagnosis. In the body size, sculpture, and coloration and in the structure of the male genitalia, this subspecies is very similar to the southern Asian *N. ino* (Nurse). The latter differs from *N. deceptor deceptor* in the higher head: height / width ratio 1.2-1.3 in males and 1.1-1.2 in females; in *N. deceptor deceptor* this ratio is 1.05-1.15 in males and 1.0-1.1 in females. *N. deceptor* should be considered as the African subspecies of *N. ino* if intermediate forms are found in southwestern Asia. In the African fauna, *N. deceptor* is very similar to *N. ornatus* Pesenko, especially in females, differing from the latter in the less shiny, densely granulate mesoscutum.

Male. Structure. Body length 3.0-3.5 mm. Head elongate elliptical or egg-shaped in frontal view; its height / width ratio 1.1-1.2. Median lobe of clypeus slightly convex, 1.1-1.2 times as high as wide; clypeus extending half of its length below eyes (fig. 19a). Malar space linear. Face flattened. Antenna relatively short, nearly reaching middle of scutellum; middle flagellomeres 1.0-1.1 times as long as their diameters (fig. 19b). Metapostnotum slightly transversely depressed, semicircular; its lateral borders marked by change in microsculpture and appearance of dense pubescence. Dorsal surface of propodeum 1.1-1.3 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 long, broadened toward distal end, truncate at apex (fig. 19h). Gonobase semicircular in dorsal view. Gonoforceps relatively slender, triangularly broadened and curved mesad before distal end, narrowly rounded at apex (fig. 19i-19l).

Sculpture. Pale part of face shiny, sparsely and finely punctate. Frons and vertex densely and finely granulate, mat. Mesoscutum silk-mat, densely, often obscurely granulate. Scutellum, polished nearly throughout or obscurely sparsely punctate-granulose, slight shiny. Mes- and metepisterna finely granulate, mat. Metapostnotum mat, finely granulate, often also with sparse weak strigae. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral surfaces of propodeum obscurely finely granulate, slightly shiny; its posterior vertical surface coarsely granulose roughened, mat.

Coloration. Main coloration of head dull metallic bronze-greenish black; of mesosoma, metallic dull olive green. Labrum, clypeus, supraclypeal area, paraocular area in lower part to level of middle of supraclypeal area or lower margin of antennal socket (fig. 19a), mandible (except for reddish or fuscous apex),

malar space, scapus, pronotal collar and spiracular lobes, band along posterior margin of scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for large fuscous spot on hind femur), metasoma nearly throughout or on most of surface (fig. 19e), except for weak varying dark pattern (fig. 19f); all yellow or white-yellow. Flagellum yellow on lower side, dark yellow or fuscous yellow on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surface of mesosoma. Appressed plumes present on most of surfaces of head and mesosoma, excepting scutellum, metanotum and glabrous metapostnotum, but including marginal parts of mesoscutum; tomentose pubescence especially dense between antennal sockets, on upper half of genal areas and on sides of mesosoma.

Female. Structure. Body length usually 3.5-4.0 mm. Head egg-shaped in frontal view; its height / width ratio 1.0-1.1. Median lobe of clypeus weakly convex, its height / width ratio 0.6-0.7; clypeus extending nearly two thirds of its length below eyes (fig. 19m). Malar space linear. Face flattened. Metapostnotum flat, semicircular, occupying only part of dorsal surface of propodeum, its borders marked by change in microsculpture and appearance of tomentose pubescence. Dorsal surface of propodeum nearly 1.0-1.1 times as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 110°.

Sculpture. Clypeus shiny, with few shallow pits, sometimes with traces of obscure granulation on upper half. Lower half (pale) of supraclypeal area nearly polished or with traces of obscure granulation, shiny; its upper half (dark) and paraocular area slight shiny, densely, obscurely and very finely granulate. Frons and vertex more coarsely and more densely granulate, mat. Mesoscutum silk-mat, uniformly densely granulate; each granule smaller than eye facet. Scutellum nearly smooth, shiny; usually with obscure granulation along margins and mid-line. Mes- and metepisterna finely granulate, mat. Metapostnotum more or less uniformly finely reticulate-rugulose, submat. Posterior vertical surface of propodeum granulose roughened, mat.

Coloration. Main coloration of head and mesosoma greenish black, with distinct bronze-green metallic tint. Mesoscutum brighter metallic green, usually with gold-reddish stripes. Labrum, entirely clypeus, usually lower part of paraocular area (fig. 19m), mandible (except for reddish apex), scapus on lower and lateral surfaces, pronotal collar and spiracular lobes, scutellum entirely or except for poor dark pattern (stripe along its posterior margin or inverted T-shaped figure), scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (usually except for dark hind trochanter and femur, large spot on hind tibia), metasoma, except for fuscous band on T1 (fig. 19n) or T1 and T2, sometimes also light fuscous lateral spots on T3I and T4 (fig. 19o); all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow.

Vestiture. Erect plumose pubescence white, usual. Dark surfaces of head and mesosoma covered with white tomentose pubescence (appressed plumes), very dense on genal areas and sides of mesosoma, sometimes also on mesoscutum. Metapostnotum entirely glabrous. Metabasitarsal penicillus gold or orange yellow.

Variation. The continental subspecies of *N. deceptor* is relatively constant as compared with both the insular subspecies (see below). The principal trends in its variability of body size, coloration of the metasoma and of some other characters are indicated in the description above.

Distribution. North Africa and Arabian Peninsula.

Records from Africa. Magretti 1884a: 623 (*N. minutissimus*; Sudan: Kassola, Keren). Magretti 1884b: 51, 97 (*N. minutissimus*; "eastern Sudan"). Saunders 1908: 223 (Algeria: Biskra). Alfken 1924: 249 (*N. parvulus*; Egypt: El Obeid). Schultess 1924: 305 (*N. pulchella*; Libya: Scéléid; Tunisia: Tozeur). Blüthgen 1925: 11 (*N. minutissima* var. *deserticola*; Egypt: Khanka). Blüthgen 1925: 15 (Algeria: Biskra; Libya: Sceleid-Bengasi; Egypt: Pyramids; Sudan: Nabardi). Alfken 1926: 99 (Egypt: Pyramids). Guiglia 1929: 414 (*N. pulchella*; Libya: Oasis Giararub). Blüthgen 1933b: 23 (Egypt: Wadi Um Elek, Wadi Hussein, Wadi Dugla; Sudan: Nabardi). Blüthgen 1934a: 243 (Algeria: Biskra; Egypt: Cairo). Blüthgen 1934b: 192 (Egypt: Wadi um Elek). Zavattari 1934: 347 (*N. pulchella*; Libya: Sceleidima, Giararub, Bengasi). Benoist 1943: 43 (*N. minutissima* var. *deserticola*; Morocco: Agadir). Dekeyser & Villiers 1956: 37 (Mauritania: Adrar). Benoist 1962: 45 (Algeria: Hoggar). Warncke 1983: 206 (*N. minutissimus* ssp.; Algeria: Biskra).

African material examined (450 specimens; part of them labelled as "*Nomioides minutissimus*"). **Morocco:** 20 km S Aoulouz, 5.IV.1986, leg. M. Schwarz, 1 ♂; ZISP. 90 km E Tata, 29.III.1986, leg. M. Schwarz, 1 ♀; SCH. 70 km E Tata, 29.III.1986, leg. M. Schwarz, 2 ♀♀; SCH. 12 km W Akka, 28.III.1986, leg. M. Schwarz, 4 ♀♀; SCH, ZISP. Tizi-n-Bachkoum, 1700 m, 1.VII.1987, leg. M. Schwarz, 1 ♀; SCH. Ait Saoun near Agdz, leg. J. Gusenleitner, 1 ♂, 1 ♀; GUS. Midelt, leg. J. Gusenleitner, 1 ♂, 2 ♀♀; GUS. Agadir, 3.V.1981, leg. M. Tussac, 1 ♂; CAS; ibid, 20.II.1988, leg. K.M. Guichard, 1 ♀; BMNH. W Taroudant, Oued Souss, 31.III.1983, leg. G.R. Else, 1 ♀; BMNH. 8 km N Ait Saoun, Ouarzazate Zagora road, 30.III.1983, leg. G.R. Else, 1 ♀; BMNH. Laayoune, 13.II.1988, leg. K.M. Guichard, 1 ♀; BMNH. 10 km E Guelmim, 5-15.V.1995, leg. M. Halada, 53 ♂♂, 95 ♀♀; OLML, SCH. 40 km SW Guelmim, 13.IV.1995, leg. M. Halada, 3 ♀♀; SCH. 10 km S Bouarfa, 20.V.1995, leg. M. Halada, 2 ♂♂; OLML. Beni-Bassia, 60 km NE Boudnib, 21.V.1995, leg. M. Halada, 1 ♂; OLML. 15 km S Assa, 17-18.IV.1995, leg. M. Halada, 16 ♀♀; SCH. 30 km N Bouarfa, 19.V.1995, leg. M. Halada, 1 ♀; SCH. 10 km W Tiznit, 6.V.1995, leg. M. Halada, 1 ♀; SCH. 20 km N Foum-Zguid, 29-30.IV.1995, leg. M. Halada, 4 ♀♀; SCH. Errachidia Province, Oulad M'Hamid, 32°55' N, 4°21' W, 1050 m, 4.VI.1996, 12 ♂♂, 1 ♀, leg. P. Rasmont & M. Terzo; UMH. Errachidia Province, Amouger, 32°24' N, 4°10' W, 1490 m, 2.VI.1996, leg. M. Terzo, 1 ♀; UMH. Errachidia Province, Aoufouss, Ksar Jdid, 31°43' N, 4°12' W, 995 m, 4.VI.1996, leg. M. Terzo, 1 ♀; UMH. Errachidia Province, Tarda, 31°49' N, 4°41' W, 1090 m, 5.VI.1996, leg. P. Rasmont, 1 ♀; UMH. Errachidia Province, Tiouzaguine, 32°27' N, 4°09' W, 1580 m, 2.VI.1996, leg. P. Rasmont, 1 ♀; UMH. Oujda, El Fouchal, 33°43' N, 1°59' W, 1080 m, 29.V.1996, leg. M. Terzo, 1 ♀; UMH. Figuig, Oued ed Defla, 32°35' N, 1°51' W, 1180 m, 30.V.1996, leg. P. Rasmont, 1 ♂, 1 ♀; UMH. Figuig, Ain Tanzara, 32°13' N, 1°57' W, 1260 m, 31.V.1996, leg. P. Rasmont, 6 ♂♂, 1 ♀; UMH. Figuig, Oued Tisserfine, 32°10' N, 1°25' W, 980 m, 31.V.1996, leg. P. Rasmont, 1 ♂; UMH. Figuig, Borj Hassi el Aricha, 32°48' N,

2°04' W, 29.V.1996, 1310 m, leg. P. Rasmont, 1 ♀; UMH.

Algeria: Biskra, 18.V.1893, leg. Eaton, 1 ♀ (lectotype), 1 ♂ (paralectotype); BMNH; ibid, 24-28.V.1929, leg. J.C. Bradley, 20 ♂♂, 3 ♀♀; CUI, UUL, ZISP; no date, 1 ♂, 1 ♀; MNHNP. NMW. Sidi Okba, V.1885, leg. L. Bleuse, 1 ♂; MNHNP. 40th km of road Tamanrasset-Assekrem, 19.VIII.1987, leg. A. Pauly, 4 ♂♂, 16 ♀♀; FUSAG, ZISP. Hoggar, Guelta near Ilamane Mt., 1900 m, 29.III.1989, leg. M. Schwarz, 3 ♀♀; SCH. Hoggar, Tamanrasset, 16 km NE Guelta, 25.III.1989, leg. M. Schwarz, 4 ♀♀; SCH. Hoggar, Amsel, 30 km S Tamanrasset, 1.IV.1989, leg. M. Schwarz, 4 ♀♀; SCH. Hoggar, 30.IV.1950, leg. A.G. Soika, 2 ♀♀; WAR. Sahara Algérien, Erg Chech, H. Oulad Ali, leg. F. Pierre, 2 ♀♀; MNHNP. Saida, 5 km SE Sfisifa, 6.IV.1983, leg. R. Leys & P. van der Hurk, 3 ♀♀; ZMA.

Libya: Bengasi Fuehat, leg. V. Zanon, 5 ♀♀; MCG.

Tunisia: Nefta, 14-15.IV.1981, leg. M. Schwarz, 11 ♂♂, 2 ♀♀; SCH, ZISP; ibid, 15.IV.1981, leg. J. Gusenleitner, 3 ♂♂, 2 ♀♀; GUS; ibid, 31.V.1994, leg. S. Becvar, 5 ♀♀; OLML. 30 km SW Sfax, 18.IV.1981, leg. M. Schwarz, 1 ♀; SCH. Chabania, leg. M. Heatwole & R. Muir, 4 ♀♀; NMNH, ZISP. Macnassi (Makhnassi), 1929, leg. C. Dumont, 1 ♀; MNHNP. Tataouine, 11.IV.2001, leg. M. Halada, 20 ♀♀; OLML. 15 km W Matmata, 9.IV.2001, leg. M. Halada, 2 ♀♀; OLML. Hammamet, 15.III.1996, leg. K. Denes, 2 ♀♀; OLML. Tozeur, 7.IV.2001, leg. M. Halada, 1 ♀; OLML. 10 km NW Remada, 10.IV.2001, leg. M. Halada, 8 ♀♀; OLML. Ksar Hadada, 4-5.IV.1998, leg. K. Denes, 2 ♀♀; OLML.

Egypt: Assiut, 5-10.V.1981, leg. K.M. Guichard, 8 ♂♂, 3 ♀♀; BMNH, ZISP. Quassasim, 23.IV.1965, leg. K.V. Krombein, 1 ♂; NMNH. Ein Sokhna, 21.IV.1965, leg. K.V. Krombein, 2 ♂♂; NMNH, ZISP. 25 km W Suez, 20.IV.1965, leg. K.V. Krombein, 1 ♀; NMNH. Fayid, IV-V.1943, leg. H. Priesner, 2 ♂♂, 6 ♀♀; SCH, ZISP. Wadi Digla, 20.IX.1929, 4.VI.1930, leg. H. Priesner, 2 ♂♂; MNHUB. Wadi Rashrash, 17-20.VI.1932, leg. Faraq, 9 ♂♂, 1 ♀; MNHUB. Ghobbet, 20.VI.1931, leg. Faraq, 1 ♂, 7 ♀♀; MNHUB. Wadi Kholeila, 20.IV.1933, leg. Kasim, 1 ♂; MNHUB. Wadi Khoda, 27.IV.1933, leg. Kasim, 1 ♀; MNHUB. Eastern Desert, Z. A. Afarama., 8.VI.1991, leg. A. Mochi, 1 ♂, 1 ♀; ZISP. Central Sinai, near Naql, 16.V.1992, leg. A. Mochi, 1 ♂; ZISP. Central Sinai, Wadi Gharandal, 30 km NW Abu Zenima, 21.V.1992, leg. A. Mochi, 3 ♂♂, 1 ♀; ZISP; ibid, 14.V.1993, leg. W.J. Pulawski, 1 ♂; CAS. Central Sinai, W of Coastal Rd., 14.V.1993, leg. A. Mochi, 1 ♂; ZISP. Sinai, W of Suor, 3.V.1993, leg. A. Mochi, 2 ♀♀; ZISP. Northern Coast, 5.V.1991, leg. A. Mochi, 1 ♂; ZISP. Alexandrie, Ikingi-Marlut, 3.V.1991, leg. A. Mochi, 1 ♂; ZISP. 60 km S Alexandria, 25.X.1966, leg. J.G. Rozen, 1 ♂; AMNH. Mariut, 15.V.1974, leg. F.D. Parker, 17 ♂♂, 4 ♀♀; UUL, ZISP.

Mauritania: Adrar, Sotof, 1911, 1 ♀; MNHNP. Trarza, Tafolli, 7.III.2000, leg. F. LaRoche, 1 ♀; LAR. Akjoujt, 7.III.2000, leg. F. LaRoche, 1 ♀; LAR. Banco de Arguin., Louik, 12.III.2000, leg. F. LaRoche, 1 ♂, 1 ♀; LAR.. Atar, Plaine de Yaghref, 9.III.2001, leg. F. LaRoche, 2 ♂♂; LAR.

Sudan: Gebel Oweinat, Wadi Ain el Brins, 9-12.IV.1967, leg. K. V. Krombein, 2 ♀♀; NMNH, ZISP. Khartoum, 20.I.1962, leg. R. van der Bosch, 1 ♂, 1 ♀; UCR.

Visited plants. Apiaceae: yellow Apiaceae (4 ♂♂, 16 ♀♀). Asteraceae: *Anthemis* sp. (1 ♀), *Centaurea* cf. *maroccana* (1 ♀), *Echinops spinosissimus* (1 ♀). Fabaceae: *Retama retam* (7 ♂♂, 2 ♀♀). Resedaceae: *Reseda* sp. (12 ♂♂, 1 ♀). Rhamnaceae:

Ziziphus lotus (1 ♂), *Ziziphus* sp. (2 ♀♀). Scrophulariaceae: *Scrophularia* cf. *ramosissima* (1 ♀).

***Nomioides (Nomioides) deceptor canariensis*
Blüthgen 1937, stat. n.**

[fig. 20a-20e; Pl. III: 72-73 (total view), VI: 134-135 (head)]

Nomioides canariensis Blüthgen 1937: 3, 10, fig. 4, ♀. Holotype: ♀, "Gr. Canaria, Las Palmas [28°06'N 15°25'W], [29.VI.1931], [leg.] R. Frey", "Mus. Zool. H-fors, Spec. typ. no. 5258"; ZMH (examined).

Nomioides minutissimus f. *canariensis*: Pesenko 1983: 137.

Taxonomy. Pesenko 1983: 137 (*N. minutissimus* f. *canariensis*).

Diagnosis. Most of the individuals examined of *N. deceptor* from the Canary Islands differ from continental ones in the following characters (for detail see the key above): the body smaller, yellow pattern of the metasoma reduced (cf. fig. 20b, 20d, 20e and fig. 19e, 19f, 19n, 19o), tomentose pubescence of the head and mesosoma less developed.

Variation. A very variable subspecies. The darkest individuals, including the holotype of *N. canariensis* and some others (e.g., one of females from Maspalomas), having also a reddish mesoscutum, distinctly differ from the nominotypical subspecies. The palest individuals from the Canary Islands are very similar to the darkest ones from the continental North Africa. We have found no distinct difference between populations from different islands of the archipelago.

Distribution. Canary Islands.

Records from Africa. Blüthgen 1937: 3 (Canary Islands: Grand Canary: Las Palmas). Lieftinck 1958: 8 (Canary Islands: Grand Canary: Maspalomas). Hohmann *et al.* 1993: 361 (Canary Islands: Fuerteventura, Grand Canary, La Aldea, La Gomera, Lanzarote, Tenerife).

African material examined (60 specimens, part of them labelled as "*Nomioides minutissimus*" by Pesenko in 1985-1989). *Spain. Canary Islands. El Hierro*: Sabinosa, 16.VIII.1922, 1 ♂; WAR.

Fuerteventura: Tarajalejo, 14.IV.1934, 1 ♂, 3 ♀♀; WAR, ZISP. Catalina, 20.IV.1934, 1 ♂; WAR. Puerto del Rosario, 27.IV, 6.V.1964, leg. K.M. Guichard, 5 ♂♂, 2 ♀♀; BMNH, ZISP. Cofete, 31.III.1996, leg. F. LaRoche, 1 ♂; LAR.

Gran Canaria: Las Palmas, 29.VI.1931, leg. Frey, 1 ♀ (holotype); ZMH. Gaudo, 7.X.1973, 2 ♂♂, 1 ♀; WAR, ZISP. Maspalomas, 17.VI.1966, leg. K.M. Guichard & Ward, 13 ♂♂, 2 ♀♀; BMNH, ZISP; *ibid.*, 19.V.1984, 1 ♂, 1 ♀, 23.VIII.1984, 1 ♂, leg. F. LaRoche; LAR. La Isleta, 21.VI.1964, leg. K. M. Guichard, 1 ♂; BMNH. Gando, 23.VIII.1991, 2 ♂♂; 22.II.1994, 1 ♀, leg. F. LaRoche; LAR. S. Agustín, 28.VIII.1989, leg. F. LaRoche, 1 ♂; LAR.

Lanzarote: Guatiza, 21.IX.1933, 3 ♂♂; WAR, ZISP. La Graciosa, 31.III.2002, 1 ♀; 30.V.2002, 1 ♀; 1.VI.2002, 1 ♀; 30.IV.2003, 1 ♂, leg. F. LaRoche; LAR.

Tenerife: Tenerife, 2 ♂♂, 8 ♀♀; WAR, ZISP. La Tejita, 2.VIII.1991, leg. F. LaRoche, 1 ♀; LAR. El Médano, 21.III.1996, leg. F. LaRoche, 1 ♀; LAR.

La Gomera: Punta Llana, S. Sebastian, 3.X.1985, leg. F. LaRoche, 1 ♂; LAR.

***Nomioides (Nomioides) deceptor capverdensis* n. ssp.**

[fig. 20f-20m; Pl. III: 74-75 (total view), VI: 136-137 (head)]

Nomioides aff. *minutissimus*: Pauly *et al.* 2002: 204.

Male. Body length 3.0-3.8 mm. Structure of body and its parts same as those of two other subspecies of *N. deceptor* (terminalia see fig. 19g-19l). Main coloration of head and mesosoma usually black or blackish fuscous, with an oil tint, sometimes dull metallic dark greenish. Paraocular area usually (fig. 20g; sometimes dark yellow in lower part, fig. 20f), entirely scutellum, usually metanotum and most of terga (fig. 20i), all black (sometimes terga mostly fuscous, fig. 20h). Pronotal collar and metanotum often entirely or partly fuscous. Tegula usually fuscous. Mesoscutum usually only with traces of granulation, nearly polished. Scutellum polished, with few punctures on posterior fourth. Mes- and metepisterna very finely granulate, silk-mat. Metapostnotum silk-mat, very obscurely granulate, usually without strigatation along anterior margin. Lateral

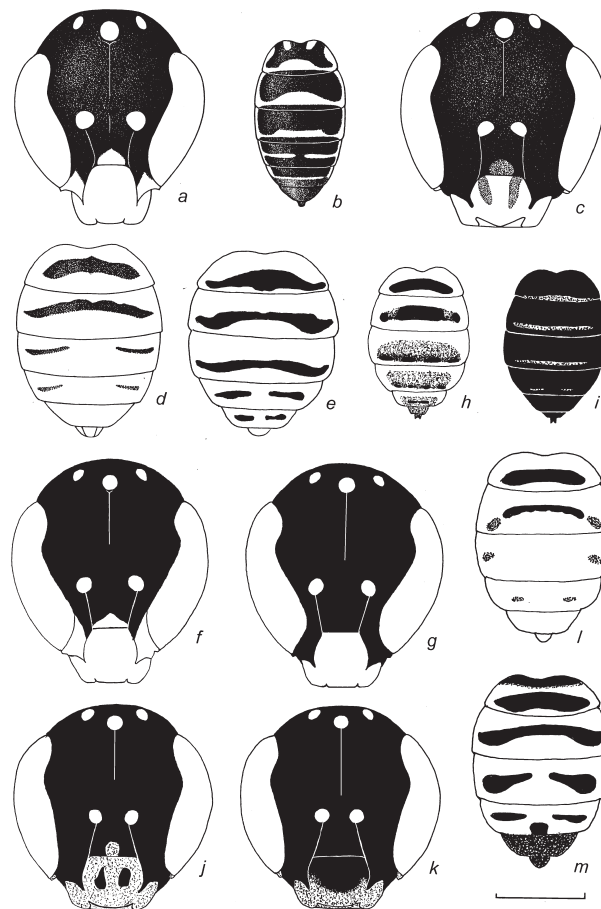


Figure 20

***Nomioides (Nomioides) deceptor canariensis* Blüthgen 1937 (a-e)**

and ***N. (N.) deceptor capverdensis* n. ssp. n. (f-m, paratypes):**

males (a, b, and f-i) and females (c, d, and j-m)
a, c, f, g, j, and k, head in frontal view; b, d, e, h, i, l, and m, metasoma in dorsal view.

Scale line: 1 mm for b, d, e, h, i, l, m; 0.5 mm for a, c, f, g, j, k.

and posterior surfaces of propodeum nearly smooth on upper fourths.

Female. Body length 3.5–3.8 mm. Structure of body and its parts same as those of two other subspecies of *N. deceptor*. Pale pattern of head and mesosoma dark yellow to yellowish fuscous. Labrum fuscous, clypeus fuscous entirely or with yellow fuscous pattern on lower part (fig. 20c), scutellum black, metanotum usually yellow fuscous to dark fuscous. Legs usually dark yellow to fuscous yellow; usually all femora, hind tibia and large spot on hind basitarsus fuscous. Main coloration of metasoma dark yellow. Tegula usually infusate, with fuscous spot.

Variation. A relatively variable subspecies, especially in the body coloration. However, we have found no distinct difference between populations from different islands of the archipelago.

Taxonomic note. The differences of this subspecies (in the majority of individuals examined) from *N. deceptor deceptor* and *N. deceptor canariensis* are much stronger than those between the last two subspecies. However, it can not be recognised as a separate species, because (1) no distinct differences in body structure exist between this and other subspecies of *N. deceptor*; (2) its variability in the body coloration partly overlaps with that in *N. deceptor canariensis*. Among the males of *N. deceptor capverdensis* examined, there are, at least two individuals which are nearly identical with the darkest males of *N. deceptor canariensis* in the body coloration and sculpture.

Distribution. Cape Verde Islands : Boavista, Fogo, Maio, Sal, Santa Luzia, Santiago, Sao Vincente. Also Santo Antao and Sao Nicolau (personal communication by F. LaRoche)

Records from Africa. Pauly *et al.* 2002: 204 («*N. aff. minutissimus*»; Cape Verde Islands, localities see below).

Holotype. ♂, *Cape Verde Islands: Boavista: Santa Monica* [16°05'N 22°50'W], 7.X.1998, leg. F. LaRoche; LAR.

Paratypes (36 specimens). *Cape Verde Islands. Boavista: Santa Monica*, 7.X.1998, leg. F. LaRoche, 7 ♂♂, 4 ♀♀; LAR, ZISP.

Fogo: Costa Bombardeiros, 23.III.1999, leg. F. LaRoche, 1 ♂, 2 ♀♀; LAR.

Maio: Morrinho, 6.X.1998, leg. F. LaRoche, 1 ♀; LAR.

Sal: Santa Maria, 3.XI.1988, leg. S. Thomas, 1 ♂, 1 ♀; ZMA; *ibid.*, 8.X.1998, leg. F. LaRoche, 1 ♂, 2 ♀♀; LAR, ZISP.

Santa Luzia: Ile Heu Branco, 11.X.1998, leg. F. LaRoche, 1 ♂; LAR. *Bco de las casas*, 11.X.1998, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR, ZISP. *Praia do Porto*, 11.X.1998, leg. F. LaRoche, 2 ♀♀; LAR.

Santiago: Praia, 3.X.1998, leg. F. LaRoche, 2 ♂♂, 2 ♀♀; LAR, ZISP. *Sao Jorge*, 1983, leg. A.von Harten, 2 ♂♂, 1 ♀; ZMA.

Sao Vicente: Sao Pedro, 12.X.1998, leg. F. LaRoche, 1 ♂, 2 ♀♀; LAR, ZISP.

Visited plants. Aizoaceae: *Sesuvium portulacastrum* (5 ♂♂, 4 ♀♀). Boraginaceae: *Heliotropium ramosissimum* (1 ♀). Capparidaceae: *Cleome viscosa* (2 ♀♀). Caryophyllaceae: *Polycarpea nivea* (2 ♂♂, 1 ♀). Mimosaceae: *Prosopis juliflora* (1 ♂, 2 ♀♀). Nyctaginaceae: *Commicarpus helenae* (2 ♂♂, 2 ♀♀). Tamaricaceae: *Tamarix senegalensis* (3 ♂♂, 2 ♀♀). Zygophyllaceae: *Zygophyllum simplex* (2 ♂♂, 2 ♀♀).

Nomioides (Nomioides) elbanus Blüthgen 1934, resurrected name

[fig. 21a, 21b; Pl. II: 68 (total view), VII: 152 (head), VIII: 168 (propodeum), XVII: 237 (map)]

Nomioides elbana Blüthgen 1934b: 200, ♀. Holotype: ♀, “[Egypt]: Djebel

Elba: Seir Arab [22°12'N 36°20'E], [21].I.1933”; “in coll. Ministry Agric. in Cairo”.

Nomioides hoggariensis Warncke (in lit.).

Female. Structure. Body length usually 4.0–4.2 mm. Head short, triangularly rounded in frontal view; its height / width ratio 0.85. Median lobe of clypeus weakly convex, its height / width ratio 0.6; clypeus extending about half of its length below eyes (fig. 21a). Malar space linear. Face flattened. Borders of metapostnotum not marked laterally by change in microsculpture. Dorsal surface of propodeum flattened, about as long as scutellum, widely roundly passing onto its lateral and posterior vertical surface.

Sculpture. Clypeus and pale surfaces of supraclypeal and of paraocular areas very densely and finely granulate, mat. on Dark surfaces of these sclerites, frons and vertex densely and finely granulate, slightly shinier, silk-mat. Mesoscutum silk-mat, uniformly densely granulate; each granule as large as eye facet. Scutellum mat, often except for two small shiny lateral spots. Mes- and metepisterna, lateral and posterior vertical surfaces of propodeum finely granulate, silk-mat. Dorsal surface of propodeum mat, densely and finely granulate, with short striae along anterior margin; sometimes with obscure striae reaching its lateral margins.

Coloration. Dark coloration of head and mesosoma greenish black, with distinct bronze-green metallic tint. Mesoscutum brighter metallic green. Labrum, clypeus entirely, lower half or two thirds of supraclypeal area, mandible (except for reddish apex), triangular spot on paraocular areas (fig. 21a), scapus (except for fuscous stripe on upper side), pronotum, scutellum, scutellar crests, median area of metanotum, anterior and mesal parts of anterior part of hyaline tegula, basal sclerites of wings, legs (except for coxae, dark hind trochanter and femur, large spot on hind tibia, small spot on hind basitarsus), metasoma except for wide blackish fuscous bands on T1 and T2, narrow band on T3 and interrupted band on T4 (fig. 21b), all yellow. Wing membrane hyaline; veins and pterostigma light yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence whitish, usual. Tomentum (appressed plumes) present on dark surfaces of head and mesosoma, including mesoscutum and excluding glabrous metapostnotum

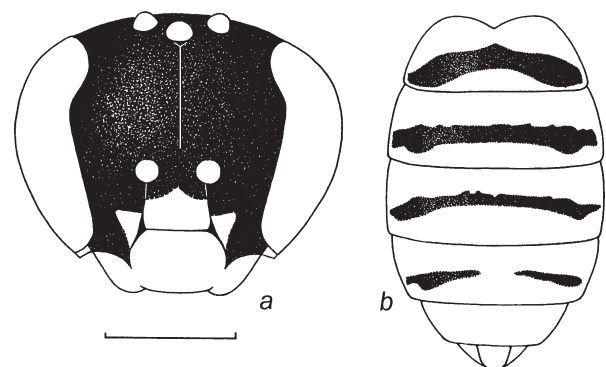


Figure 21
Nomioides (Nomioides) elbanus Blüthgen 1934: female (paratype)
a, head in frontal view; b, metasoma in dorsal view.
Scale line: 1 mm for b; 0,5 mm for a.

only on genal areas and lateral surfaces of mesosoma. Tomentose pubescence dense on vertex, upper half of genal areas and on metepisterna. Metabasitarsal penicillus gold yellow.

Male. Unknown.

Distribution. Algeria, Egypt, Arabian Peninsula (Pesenko & Pauly, in press).

Records from Africa. Blüthgen 1934b: 201 (Egypt: Djebel Elba).

African material examined (18 specimens). *Algeria*: Hoggar: Tamanrasset, 16 km NE Guelta, 25.III and 1.IV.1989, leg. M. Schwarz, 17 ♀♀; SCH, ZISP.

Egypt: Djebel Elba, 21.I.1933, leg. Priesner, 1 ♀ (paratype); MNHUB.

Nomioides (Nomioides) facilis (Smith 1853)

[fig. 22a-22n; Pl. III: 80-81 (total view), IV: 100 (mesoscutum), VII: 156-157 (head), IX: 178 (propodeum), XI: 188 (mesoscutum), 194-195 (male genitalia), XVIII: 238 (map)]

Halictus facilis Smith 1853: 51, ♂. Holotype: "Malta [35°55'N 14°26'E]", "B. M. type Hym. 17.a.1057"; BMNH (examined).

Nomioides fallax Handlirsch 1888: 401, fig. 2, 7, ♀, ♂. Lectotype (designated by Pesenko 1983: 162): ♀, "[leg.] Mann, 1865, Tultscha" [Dobruja, western Bulgaria] [45°10'N 28°48'E]; NMW. Synonymised by Blüthgen (1925: 34).

Nomioides callosus Pérez 1895: 56, ♀, ♂. Syntypes: 12 ♀♀, 1 ♂, northern Italy and Sicily; MNHNP. Synonymised by Blüthgen (1925: 34, 38; 1934a: 249).

Halictus handlirschi Dalla Torre & Fries 1895: 38, new name for *Nomioides fallax* Handlirsch 1888 (preoccupied in the genus *Halictus*) nec *Halictus fallax* Morawitz 1874.

Nomioides facilis var. *dusmeti* Blüthgen 1925: 35, ♀. Holotype: ♀, "Aranuez [Spain] [40°03'N 3°40'W], 30.V.1910, [leg.] Dusmet"; "in coll. Dusmet, Madrid". Synonymised by Pesenko (1983: 163).

Nomioides facilis var. *bipunctata* Blüthgen 1925: 37, ♂. Holotype: ♂, "Madrid [40°27'N 3°41'W], 18.VII.1900"; no indication of deposition place. Synonymised by Pesenko (1983: 163).

Nomioides cruciferarum Cockerell 1931: 205, ♀, ♂. Syntypes: 7 ♀♀, 1 ♂, "Rabat, Morocco [34°02'N 6°50'W], at flowers of *Synapis*, Aug. 5, 24, [leg.] Cockerell"; BMNH, MCZC (1 ♂ examined). Synonymised by Pesenko (1983: 163). Earlier, Blüthgen (1934a: 250) considered this nominal taxon as *Nomioides fallax* var. *cruciferarum*.

Taxonomy. Handlirsch 1888: 401, fig. 2, 7. Cockerell 1921: 368. Blüthgen 1922: 47; Blüthgen 1925: 34. Blüthgen 1934a: 247, fig. 4 (*N. facilis*), fig. 5 (*N. fallax*). Constantinescu 1974: 273, fig., 11-14. Pesenko 1983: 123 (key to females), 126 (key to males), 134, fig. 170, 171, 209, 210, 256-259.

Diagnosis. Among the African species, this is similar to *N. griswoldi* n. sp., *N. maculiventris* (Cameron), and *N. micheneri* n. sp. in the short head, densely granulate mesoscutum, dull metallic green head and mesosoma, less developed tomentose pubescence and relatively long propodeum of both sexes and the relatively long antenna of the male. Major differences of *N. facilis* from these three species are given in the key above. Also it is close to *N. elbanus* Blüthgen (known only in the female) in the form and coloration of the head, differing from the latter in the absence of the tomentose pubescence on the mesoscutum and in the mat border between the dorsal and posterior vertical surfaces of the propodeum.

Male. Structure. Body length 3.3-3.8 mm. Head egg-shaped or rounded in frontal view; its height / width ratio 0.95-1.0. Median lobe of clypeus flattened, somewhat higher than wide; clypeus extending half of its length below eyes (fig. 22a-22c).

Malar space linear. Face flattened. Antenna moderately long, nearly reaching metanotum; middle flagellomeres 1.1-1.2 times as long as their diameters (fig. 22d). Lateral borders of metapostnotum not marked even by change in microsculpture. Dorsal surface of propodeum 1.1-1.2 as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 110°. Apical lobe of S8 long, with rounded elongate club in distal part, rounded at apex (fig. 22g, 22h). Gonobase nearly semicircular in dorsal view. Gonoforceps wide, narrowed and curved mesad in distal part, narrowly rounded or pointed at apex (fig. 22i-22l).

Sculpture. Pale part of face usually nearly smooth, shiny, in some places slightly shagreened; clypeus also with few shallow pits. Frons and vertex densely and finely granulate, mat. Mesoscutum silk-mat, densely granulate. Scutellum shiny, polished nearly throughout. Mesepisterna, metepisterna and lateral surfaces of propodeum finely and obscurely granulate, silk-mat. Dorsal surface of propodeum finely densely granulate,

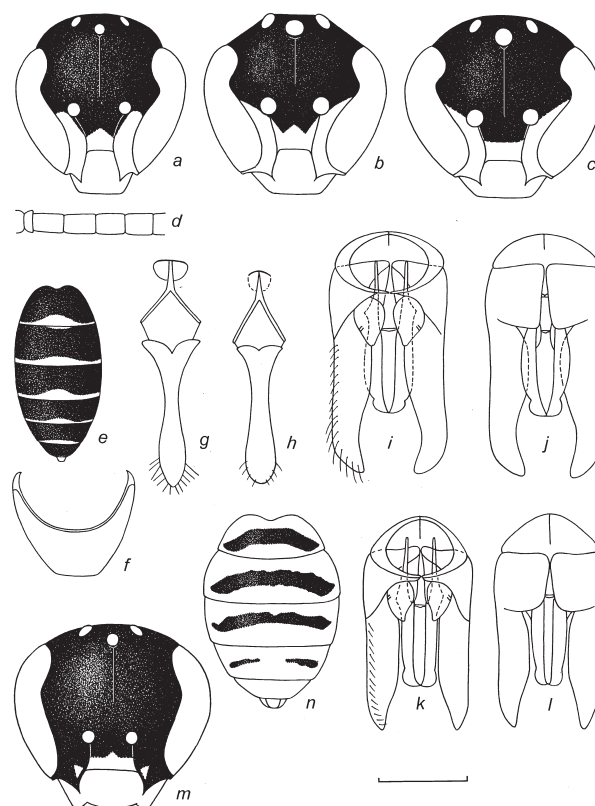


Figure 22

Nomioides (Nomioides) facilis (Smith 1853): male (a-l) and female (m and n)

a-c and m, head in frontal view; d, flagellomeres 1-5 in lateral view; e and n, metasoma in dorsal view; f, S7; g and h, S8; i and k, genital capsule in ventral view; j and l, genital capsule in dorsal view.

a, d, f, g, i, and j, holotype of *N. facilis*; b, paralectotype of *N. fallax* Handlirsch; c, male from Dadesschlucht (Morocco); h, k, and l, male from Sibi Mokhter (Morocco); e, male from Taroudant (Morocco); m and n, female from Goulimine (Morocco).

Scale line: 1 mm for e, n; 0.5 mm for a, b, c, d, m; 0.25 mm for f, g, h, i, j, k, l.

with short strigae near anterior margin, shiny on border with its posterior vertical surface. Posterior vertical surface of propodeum coarsely granulate roughened, mat.

Coloration. Main coloration of head and mesosoma dull metallic olive-green; of metasoma, fuscous to black, without metallic tints. Labrum, clypeus, supraclypeal area, paracocular area in lower part to level of upper margin of antennal socket (fig. 22a-22c), mandible (except for reddish apex), malar space, scapus on lower side, pronotum entirely or on most part, sometimes scutellar crests and metanotum, basal sclerites of wings, fore and middle femora and tibiae (except for most of hind one), all tarsi, pregradular areas of T2-T4 or T2-T5 seen through translucent posterior areas of preceding terga (fig. 22e); all yellow. Flagellum ochre-yellow to fuscous-yellow on lower side, dark fuscous on upper side. Tegula infusate. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal areas, metanotum, lateral and ventral surfaces of mesosoma. Tomentose pubescence absent or sometimes a few appressed plumes present on upper half of genal area and sides of mesosoma. Metapostnotum glabrous entirely.

Female. Structure. Body length usually 3.6-4.2 mm. Head triangularly rounded in frontal view; its height / width ratio 0.9-0.95. Median lobe of clypeus flattened, its height / width ratio 0.6; clypeus extending about two thirds of its length below eyes (fig. 22m). Malar space linear. Face flattened. Metapostnotum flat, trapezoidal, occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture and appearance of pubescence. Dorsal surface of propodeum nearly 0.8-0.9 times as long as scutellum, passing onto its posterior vertical surface at narrowly rounded angle of about 100°.

Sculpture. Pale surfaces of head mat, very finely and densely granulate. Frons, vertex and mesoscutum uniformly densely and finely granulate, silk-mat; each granule smaller than eye facet. Scutellum nearly smooth, shiny. Mesepisterna, metepisterna and lateral surfaces of propodeum finely and very obscurely granulate, silk-mat. Metapostnotum obscurely and sparsely reticulate granulate, shiny. Dorsal surface of propodeum on border with its posterior vertical surface nearly polished, shiny. Posterior vertical surface of propodeum granulate roughened, mat.

Coloration. Main coloration of head and mesosoma dull metallic green. Mesoscutum brighter metallic green, sometimes with gold-reddish stripes. Labrum, clypeus entirely, lower half of supraclypeal area (fig. 22m), mandible (except for reddish or fuscous apex), scapus on lower and lateral surfaces, pronotum entirely or only pronotal collar and spiracular lobes, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for fuscous hind trochanter and femur, large spot on hind tibia, small spot on hind basitarsus), metasoma, except for wide continuous dark (fuscous to black) bands on T1-T3 and narrow interrupted band on T4 (fig. 22n); all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence whitish, usual. Genal areas and lateral surfaces of mesosoma covered with rather sparse tomentum; few appressed plumes present also along margins of mesoscutum. Metapostnotum entirely glabrous. Metabasitarsal

penicillus gold yellow.

Distribution. Morocco, Algeria, Tunisia, southern Europe, southwestern Asia (Near East, Arabian Peninsula, Island of Socotra, Asia Minor, Iran).

Records from Africa. Schmiedeknecht 1896: 159 (*N. handlirschi*; Algeria: "Oran province"). Blüthgen 1933c: 63 (*N. fallax*; Morocco: Meknes, Agadir). Cockerell 1931: 206 (*N. criciferarum*; Morocco: Rabat). Zavattari 1934: 347 (*N. fallax*; Libya: Homs).

African material examined (348 specimens). *Morocco*: 5 km N Agadir, 18.V.1997, leg. M. Halada & K. Denes, 7 ♂♂, 3 ♀♀; OLML. Al Hoceima, S of Imzouren, 35°09' N, 3°51' W, 50 m, 26.V.1994, leg. Y. Barbier, 1 ♀; UMH. Haut Atlas, Reraria Valley, Asni, 1200 ft. [ca. 365 m], 20-23.IV.1961, leg. P.N. Lawrence, 5 ♀♀; BMNH. High Atlas, 10 km S Asni, Marrakech-Taroudant road, 10.IV.1983, leg. G.R. Else, 1 ♀; BMNH. 5 km SE Azrou, 31.V.1995, leg. M. Halada, 1 ♀; SCH. Dadesschlucht, 1900 m, 3.VII.1987, leg. M. Schwarz, 6 ♂♂, 12 ♀♀; SCH, ZISP. Oued Sebou River, near El-Menzel, 33°27' N, 4°39' W, 24-27.V.1999, leg. P. Prudek, 2 ♂♂, 1 ♀; OLML. 10 km S Goulimine, 24.III.1986, leg. M. Schwarz, 1 ♀, ZISP. 10 km E Guelmim (= Goulimime), 15.IV.-5.V.1995, leg. M. Halada, 144 ♂♂, 72 ♀♀; OLML, SCH. Ifrane, 1650 m, VI.1960, leg. N.L.H. Krauss, 1 ♀; NMNH. 12 km E Ifrane, 9-10.V.1997, leg. J. Halada, 1 ♀; OLML. Marrakesh, 15.IV.1990, leg. M. Halada, 1 ♂, 4 ♀♀; ZSM. 50 km W Meknes, 19.V.1997, leg. J. Halada, 42 ♂♂, 28 ♀♀; OLML. Meknes, El Kansera, Lake El Khansera, 10.VII.2002, leg. R. de Vos, 1 ♂; ZMA. 10 km W Midelt, 1550 m, 3.VI.1983, leg. K.M. Guichard, 7 ♀♀; BMNH. 25 km NW Midelt, 1400 m, 5.VII.1985, leg. M. Schwarz, 2 ♂♂, 2 ♀♀; SCH. High Atlas, 3 km N Ouirgane, Marrakech-Taroudant road, 11.IV.1983, leg. G.R. Else, 1 ♀; BMNH. Mischlifan, near Ifrane, 33°27' N, 4°6' W, V.1999, leg. Prudek, 2 ♂♂, 2 ♀♀; OLML. Nador, Zaia Oued, Moulouya, Pont Hassan II, 34°07' N, 2°55' W, 70 m, 21.V.1994, leg. Y. Barbier, 1 ♂; UMH. Oujda, Tafoughalt, 34°48' N, 2°48' W, 860 m, 23.V.1994, leg. Y. Barbier, 1 ♀; UMH. Oujda, Jbel Mahseur, 34°30' N, 1°56' W, 970 m, 26.V.1996, leg. P. Rasmont, 1 ♀; UMH. Ounara, 250 m, 22.V.1983, leg. K.M. Guichard, 1 ♀; BMNH. Oulad Teima, 19.IV.1995, leg. M. Halada, 1 ♀; SCH. Rabat, 5.VIII, leg. T.D.A. Cockerell, 1 ♂ (syntype of *N. criciferarum*); MCZC. New Atlas, Ras El Ksar, 900 m, 12-13.VI.1929, leg. F. Le Cerf, 1 ♀; MNHUB. Sidi Mokhtar, 500 m, 21.V.1983, leg. K.M. Guichard, 2 ♂♂, 5 ♀♀; BMNH, ZISP. Tamri, 70 km N Agadir, 8.V.1995, leg. M. Halada, 11 ♂♂, 4 ♀♀; OLML. Taroudannt (Qued Souss), 24.VI.1974, 1 ♂; 19-24.V.1975, 2 ♂♂, 1 ♀, 31.III.1983, 1 ♂, 12 ♀♀, leg. G.R. Else & A.C. Else; BMNH, ZISP; ibid, 18 and 22.IV.1990, leg. M. Halada, 9 ♂♂, 6 ♀♀; OLML, ZSM. Adouar, 5 km S Taroudannt, 2.IV.1983, leg. G.R. Else, 1 ♀; BMNH. Aoulouz, 40 km E Taroudant, 17.V.1997, leg. M. Mucka, 1 ♀; OLML. Taza, Safsofat, 34°12' N, 3°30' W, 490 m, leg. M. Terzo, 1 ♀; UMH. Taza, Oued Bathat ar Rbat, Merchich, 34°41' N, 3°10' W, 650 m, 20.V.1994, leg. M. Terzo, 1 ♀; UMH. Taza, Ighoudane, Oued Boulajraf, Merchich, 34°14' N, 3°55' W, 20.V.1994, leg. Y. Barbier, 2 ♀♀; UMH. Tazda, 20 km N Irherm, leg. J. Gusenleitner, 2 ♀♀; GUS. Tétouan, Cherfat, 35°04' N, 5°06' W, 900 m, 28.V.1994, leg. Y. Barbier, 1 ♀; UMH. Tizi-n-Bachkoum, 1700 m, 1.VII.1987, leg. M. Schwarz, 1 ♂, 1 ♀; SCH. High Atlas, 15 km S Tizi-n-Test, 800 m, 8.IV.1993, leg. G.R. Else, 1 ♀; BMNH. Haut Atlas, Jb. Ayachi, Tizi-n-Zou,

8.VIII.1963, leg. A. C. Pont, 3 ♂♂, 5 ♀♀; BMNH.

Algeria: Harifa, 6.VI.1929, leg. J. C. Bradley, 1 ♂, 1 ♀; CUI. Maghnia, 4 km E Tlemcen, 24.IV.1983, leg. R. Leys & P. van der Hurk, 2 ♀♀; ZMA.

Tunisia: Sousse, 1-9.IV.1981, leg. H. Wolf, 1 ♂, 2 ♀♀; SCH. Draham, Oued Dagidour, 8.VIII.1978, leg. K.M. Guichard and others, 1 ♂; BMNH.

Visited plants (in Africa). Apiaceae: *Ammi visnaga* (2 ♀♀). Brassicaceae: *Synapis* sp. (1 ♂). Resedaceae: *Reseda lutea* (1 ♀); *Reseda luteola* (1 ♀). Rhamnaceae: *Ziziphus lotus* (1 ♂).

Nomioides (Nomioides) fortunatus Blüthgen 1937

[fig. 23a-23i; Pl. III: 78-79 (total view), IV: 98 (total view), VI: 138-139 (head), IX: 177 (propodeum), X: 187 (mesoscutum), XVIII: 239 (map)]

Nomioides (Nomioides) fortunatus Blüthgen 1937: 3, 7, fig. 3, ♀, ♂.

Holotype: ♂, "Tenerife, La Esperanza [28°27'N 16°22'W], [16. VII.1931], [leg.] R. Frey"; ZMH; exam.

Nomioides minutissimus f. *fortunatus*: Pesenko 1983: 137.

Taxonomy. Pesenko 1983: 137 (*N. minutissimus* f. *fortunatus*).

Diagnosis. From the close *N. minutissimus* (Rossi), it differs in the following characters. In *both sexes*: head wider and shorter; mesoscutum and scutellum uniformly densely and coarsely granulate, mat; propodeum longer; pale pattern of body poorer. In *males*: middle flagellomeres longer, gonoforceps of equal width in distal half. In *females*: head and mesosoma dull dark olive-green.

Male. *Structure.* Body length 3.6-4.0 mm. Head egg-shaped in frontal view; its height / width ratio 1.1-1.2. Median lobe of clypeus flattened, 1.1-1.2 times as high as wide; clypeus extending about two thirds of its length below eyes (fig. 23a). Malar space linear. Face transversely depressed at level of antennal sockets. Antenna long, reaching posterior end of mesosoma; middle flagellomeres 1.3-1.5 times as long as their diameters (fig. 23b). Metapostnotum transversely depressed before anterior margin, nearly triangular; its lateral borders usually marked by change in microsculpture. Dorsal surface of propodeum 1.3-1.4 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 110°. Apical lobe of S8 long, narrow, broadened towards distal end, truncate at apex (fig. 23e). Gonobase semicircular in dorsal view. Gonoforceps slender, narrow in distal half, slightly curved mesad, rounded at apex (fig. 23f, 23g).

Sculpture. Clypeus and lower half of supraclypeal area nearly smooth, shiny, in some places slightly shagreened; clypeus also with few shallow pits. Frons and vertex densely and finely granulate, mat. Mesoscutum, scutellum, mesepisterna, metepisterna and lateral surfaces of propodeum uniformly densely granulate, mat; each granule smaller than eye facet. Metapostnotum mat, usually granulate on posterior half, striate on anterior half. Dorsal surface of propodeum mat on border with posterior vertical surface.

Coloration. Main coloration of head and mesosoma dull metallic olive-green. Metasoma fuscous to black, without metallic tints. Labrum, clypeus, triangular spot on supraclypeal area (fig. 23a), mandible (except for orange apex), malar space, scapus on lower side, pronotal spiracular lobes, sometimes scutellar crests and spot on metanotum, tibiae (except for large brown spot on hind one), tarsi, pregradular areas of T2-T5 seen through

translucent posterior areas of preceding terga (fig. 23c); all yellow. Flagellum ochre-yellow on lower side, fuscous on upper side. Tegula infusate. Wing membrane hyaline; veins and pterostigma light fuscous.

Vestiture. Erect pubescence white, usual. Tomentum (appressed plumes) absent. Metapostnotum entirely glabrous.

Female. *Structure.* Body length usually 3.8-4.3 mm. Head short egg-shaped in frontal view; its height / width ratio 1.05. Median lobe of clypeus flattened, its height / width ratio 0.8-0.9; clypeus extending nearly two thirds of its length below eyes (fig. 23b). Malar space linear. Face flattened. Metapostnotum flat, with an elevated anterior margin, semicircular, its borders marked by distinct change in microsculpture. Dorsal surface of propodeum nearly 1.2 times as long as scutellum, passing onto its posterior vertical surface at widely rounded angle of about 110°.

Sculpture. Clypeus very obscurely shagreened, shiny, provided with a few large shallow pits. Supraclypeal and paraocular areas densely and very finely granulate, silk-mat. Frons and vertex densely and finely granulate, mat. Mesoscutum and scutellum mat, uniformly densely granulate; each granule smaller than eye facet. Mesepisterna, metepisterna, lateral and posterior vertical surfaces of propodeum more finely and obscurely granulate than mesoscutum, mat. Metapostnotum obscurely rugulose, before posterior margin granulate, nearly mat.

Coloration. Main coloration of head and mesosoma dull metallic olive-green, with slight bronze tint; mesoscutum with reddish tint. Labrum, clypeus (except for two large fuscous spots), small triangular spot on supraclypeal area (fig. 23b), mandible (except

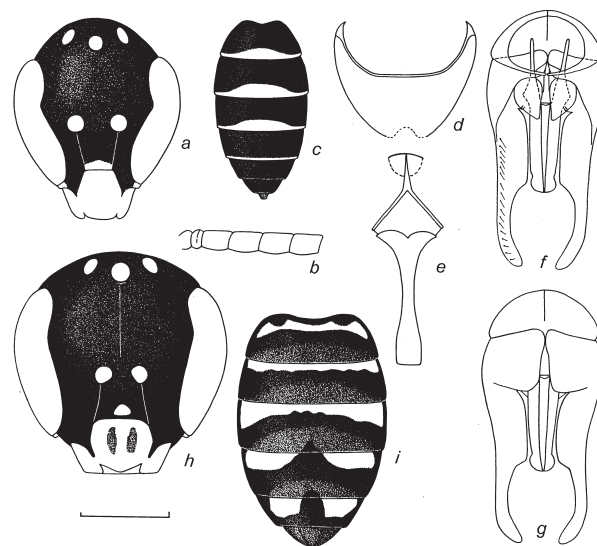


Figure 23
Nomioides (Nomioides) fortunatus Blüthgen 1937: male (a-g) and female (h and i)

a and h, head in frontal view; b, flagellomeres 1-5 in lateral view; c and i, metasoma in dorsal view; d, S7; e, S8; f, genital capsule in ventral view; g, genital capsule in dorsal view.

a, paratype from Las Palmas (Canary Islands: Grand Canary); b-i, male and female from Las Christianos (Canary Islands: Tenerife).

Scale line: 1 mm for c, i; 0.5 mm for a, b, h; 0.25 mm for d, e, f, g.

for reddish apex), scapus on lower surface, part of pronotal collar and spiracular lobes, scutellar crests, median area of metanotum, fore and middle tibiae and tarsi, wide bands on terga (fig. 23*i*), all yellow. Tegula infuscate. Wing membrane hyaline; veins and pterostigma yellow to light fuscous. Posterior areas of terga translucent.

Vestiture. Erect pubescence white, usual. Tomentum (appressed plumes) absent. Metapostnotum entirely glabrous. Metabasisarsal penicillus goldish-yellow.

Variation. A relatively constant species. A certain variation showing no distinct geographical trend (between populations from different islands of the archipelago) is found only in the following characters of the body coloration. In *males*: antennal scapus varying from nearly all yellow to nearly all fuscous; flagellum on lower side, from ochre-yellow to ochre-fuscous, on upper side from fuscous to black; sometimes scutellar crests partly yellow and metanotum with pale spot (in some males from La Gomera, it is entirely white); sometimes middle tibia yellow; pregradular areas yellow on T2 or T2 and T3, to sometimes on T2-T6. In *females*: mesoscutum from metallic green, often with copper-reddish tint, to bronze; often also fore and middle tibiae with fuscous spot; pale bands on metasoma varying in width.

Distribution. Canary Islands, Morocco.

Records from Africa. Blüthgen 1937: 3 (Canary Islands: Grand Canary: Las Palmas; Tenerife: La Esperanza). Lieftinck 1958: 9 (Canary Islands: Tenerife: Mt. La Esperanza). Hohmann *et al.* 1993: 361 (Canary Islands: El Hierro, La Palma, La Gomera, Gran Canary, Tenerife).

African material examined (253 specimens, part of them labelled as "*Nomioides minutissimus*" by Pesenko in 1985-1989). *Spain. Canary Islands. Fuerteventura*: Puerto del Rosario, 30.IV, 6.V.1964, leg. K. M. Guichard, 5 ♂♂, 3 ♀♀; BMNH, ZISP. El Esquinzo, 30.IV.1988, leg. F. LaRoche, 1 ♀; LAR. Tarajalejo, 29.IV.1988, leg. F. LaRoche, 1 ♀; LAR.

Lanzarote: Montana Clara, 3.VI.2002, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR.

Gran Canaria: Las Palmas, leg. R. Storå, 1 ♂ (paratype); ZMH. La Isleta, 50 m, 18 and 21.VI.1964, leg. K.M. Guichard, 22 ♂♂, 4 ♀♀; BMNH, ZISP; *ibid.*, 5.IV.1987, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR. Bco de Telde, 24.VIII.1998, leg. F. LaRoche, 1 ♂; LAR. Costa de Agüinos, 26.IX.1992, leg. F. LaRoche, 1 ♂; LAR. Maspalomas, 28.VIII.1989, leg. F. LaRoche, 1 ♂; LAR. Aldea Blanca, 4.IX.1993, leg. F. LaRoche, 2 ♀♀; LAR. Costa de Ingenio, 22.IV.1989, leg. F. LaRoche, 1 ♀; LAR. Bco de Tirajana, 3.V.1997, leg. F. LaRoche, 1 ♀; LAR.

El Hierro: below Sabinosa, s. l., 30.VII.1966, leg. K.M. Guichard & Ward, 18 ♂♂, 6 ♀♀; BMNH, ZISP. Costa de Frontera, Valverde, 31.X.1983, leg. F. LaRoche, 1 ♂; LAR. El Verodal, 8.X.1985, leg. F. LaRoche, 1 ♂; LAR.

La Gomera: Playa Calera, s. l., 4.VIII.1964, leg. K.M. Guichard and Ward, 6 ♂♂, 3 ♀♀; BMNH, ZISP; *ibid.*, leg. J. Gussenleitner, 1 ♀; GUS. Valle Gran Rey, 8.II.1987, leg. F. LaRoche, 1 ♀; LAR.

Tenerife: La Esperanza, leg. R. Frey & R. Storå, 3 ♂♂ (holotype and paratypes); ZMH, MNHUB. Güinar, leg. R. Storå, 1 ♂ (paratype); ZMH; *ibid.*, 27.IX.1966, leg. J. Klimesch, 3 ♂♂; SCH, ZISP. El Nédano, 8-12.IV.1972, leg. J. Klimesch, 1 ♀; UUL. Las Americas, 14-18.V.1978, leg. G.E. Bohart, 94 ♂♂, 4 ♀♀; UUL, ZISP. Las Canadas, 30.V.1964, leg. K.M. Guichard,

9 ♂♂; BMNH, ZISP. Las Christianos, s. l., 17.IV.1964, leg. K.M. Guichard, 18 ♂♂, 8 ♀♀; BMNH, ZISP. Pide la Cruz, 16.V.1978, leg. G.E. Bohart, 1 ♂, 1 ♀; UUL. Granadilla, Parque Eólico, 28.III.1996, leg. F. LaRoche, 1 ♂, 1 ♀; LAR. Las Mareas del Rio, 30.XI.1995, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR. La Tejita, 2.VIII.1991, leg. F. LaRoche, 1 ♂; LAR. Garachico, Santa Cruz, 1.XI.1985, leg. F. LaRoche, 1 ♂; LAR. Tejina, 10.IV.1988, leg. F. LaRoche, 1 ♀; LAR. Valle Guerra, Costa, 26.III.1988, leg. F. LaRoche, 1 ♀; LAR.

La Palma: Costa de Mazo, 28.IV.1990, leg. LaRoche, 2 ♂♂; LAR. Pantagorda, 1.V.1990, leg. LaRoche, 1 ♂; LAR. La Salemera, 29.I.1995, leg. F. LaRoche, 2 ♀♀; LAR.

Morocco: Cap Rhir, 1.V.1985 (3), leg. LaRoche, 1 ♂; LAR. Agadir, 20.II.1988, leg. K.M. Guichard, 1 ♀; BMNH. Agadir, 18.V.1997, leg. K. Denes, 1 ♀; OLML. Tiznit, Oued Massa, 8.V.2003, leg. M. Halada, 3 ♀♀; OLML. Tamri, 70km N. Agadir, 8.V.1995, 3 ♀♀; SCH.

Nomioides (Nomioides) griswoldi n. sp.

[fig. 24*a*-24*k*; Pl. XVIII : 240 (map)]

Diagnosis. In the body microsculpture, coloration, and pubescence, this species is very similar to *N. micheneri* n. sp. In addition to the structure of the male terminalia (fig. 24*f*-24*h*), it differs from the latter in the following characters. *Both sexes*: scutellum shiny; dorsal surface of propodeum roundly passing onto its posterior vertical surface. *Male*: mesoscutum shinier, obscurely and sparsely granulate. *Female*: metapostnotum coarsely strigate.

Male. Structure. Body length 3.6 mm. Head slightly transversely elliptical in frontal view; its height / width ratio 0.95. Median lobe of clypeus flattened, somewhat wider than high; clypeus extending half of its length below eyes (fig. 24*a*). Malar space linear. Face flattened. Antenna relatively long, nearly reaching middle of propodeum; middle flagellomeres 1.3-1.4 times as long as their diameters (fig. 24*b*). Metapostnotum nearly flat, semicircular; its lateral borders marked only by change in microsculpture. Dorsal surface of propodeum 1.1-1.2 as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 long, nearly an inverted T-shaped figure (fig. 24*f*). Gonobase semicircular in dorsal view. Gonoforceps relatively slender, with a neck before distal third, with long bristles in distal part, rounded at apex (fig. 24*g*, 24*h*).

Sculpture. Pale part of face usually nearly smooth, shiny, in some places slightly shagreened; clypeus also with few shallow pits. Frons and vertex densely and finely granulate, nearly mat. Mesoscutum shiny, with traces of obscure granulation, along margins more distinctly granulate. Scutellum shiny, polished nearly throughout. Mes- and metepisterna finely granulate, mat. Metapostnotum mat, finely shallowly granulate, with sparse weak strigae in lateral parts. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral surfaces of propodeum obscurely finely granulate, slightly shiny; its posterior vertical surface coarsely granulate roughened, mat.

Coloration. Main coloration of head metallic dull bronze-greenish black; of mesosoma, metallic dull olive green; of metasoma, black, without metallic tints. Labrum, clypeus, supraclypeal area, paraocular area in lower part to level of middle or upper margin of antennal socket (fig. 24*a*), mandible (except for reddish apex), malar space, lower sixth of genal area,

scapus, pronotal collar and spiracular lobes, spot or most part of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, fore and middle femora, all tibiae (except for large brown spot on hind one), all tarsi, pregradular areas of T2-T5 seen through translucent posterior areas of preceding terga, T6 entirely (fig. 24*d*); all yellow or white yellow. Flagellum yellow on lower side, dark fuscous on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surfaces of mesosoma. Face between antennal sockets and upper half of genal area covered with rather sparse tomentum; few appressed plumes usually present on margins of mesoscutum. Metapostnotum entirely glabrous.

Female. Structure. Body length usually 4.2-4.4 mm. Head nearly rounded in frontal view; its height / width ratio 0.9-0.93. Median lobe of clypeus weakly convex, its height / width ratio 0.6-0.7; clypeus extending nearly half of its length below eyes (fig. 24*i*, 24*j*). Malar space linear. Face flattened. Metapostnotum slightly convex, trapezoidal, occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture. Dorsal surface of propodeum nearly 1.2 times as long as scutellum, passing onto its posterior vertical surface at narrowly rounded angle of about 100°.

Sculpture. Clypeus finely and obscurely shagreened, mat, with a few large shallow pits. Pale lower half of supraclypeal area mat, dark upper half slight shiny, densely and very finely punctate. Frons and vertex densely and finely granulate, slightly shiny. Mesoscutum silk-mat, uniformly densely granulate; each granule as large as eye facet. Pale anterior part of scutellum nearly smooth, shiny; dark posterior part finely and very densely punctate, mat. Mes- and metepisterna finely granulate, mat. Metapostnotum coarsely densely strigate, without granulation and reticulation. Posterior vertical surface of propodeum granulose roughened, mat.

Coloration. Main coloration of head greenish black, with distinct bronze-green metallic tint. Dark parts supraclypeal area, prothorax, scutellum and metanotum without metallic tints. Mesoscutum brighter metallic green, with gold-reddish stripes. Labrum, entirely clypeus (fig. 24*i*) or part of it (fig. 24*j*), lower half of supraclypeal area (fig. 24*i*) or only large triangular spot on it (fig. 24*j*), mandible (except for reddish apex), scapus on lower and lateral surfaces, pronotal collar and spiracular lobes, scutellum (except for dark stripe along its posterior margin), scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for dark hind trochanter and femur, large spot on hind tibia, small spot on hind basitarsus), metasoma, except for fuscous bands on terga (fig. 24*k*); all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence whitish, usual. Not dense tomentum (appressed plumes) present only on genal areas and lateral surfaces of mesosoma. Metapostnotum entirely glabrous. Metabasitarsal penicillus light yellow.

Distribution. Kenya.

Holotype: ♂, Kenya: Mombasa [4°03'S 39°40'E], 12.XII.1982, leg. T.L. Griswold & R. T. Griswold; UUL.

Paratypes: same label, 2 ♀♀; UUL, ZISP.

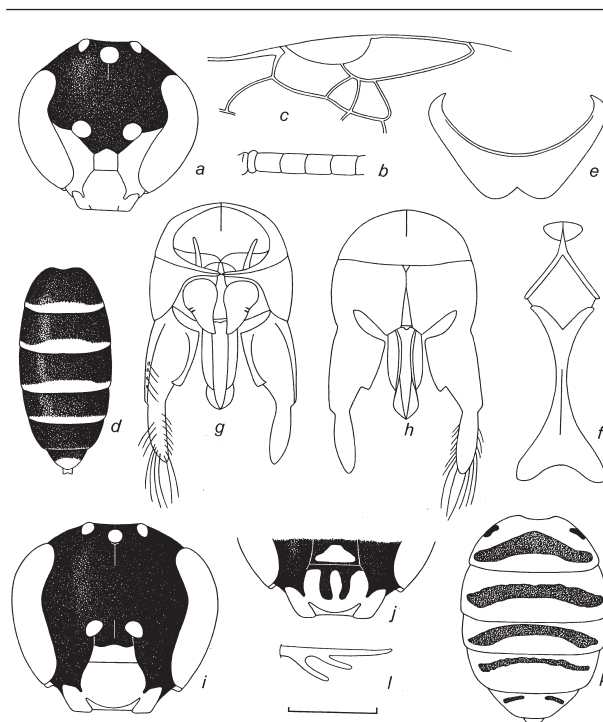


Figure 24

***Nomioioides (Nomioioides) griswoldi* sp. n.: male (a-h) and female (i-l)**

a and i, head in frontal view; b, flagellomeres 1-5 in lateral view; c, part of forewing; d, k, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view; j, lower part of head in frontal view; l, inner metatibial spur.

a-h, holotype; i-k, female paratype from Mombasa (Kenya).

Scale line: 1 mm for d, k; 0.5 mm for a, b, c, i, j; 0.25 mm for e, f, g, h, l.

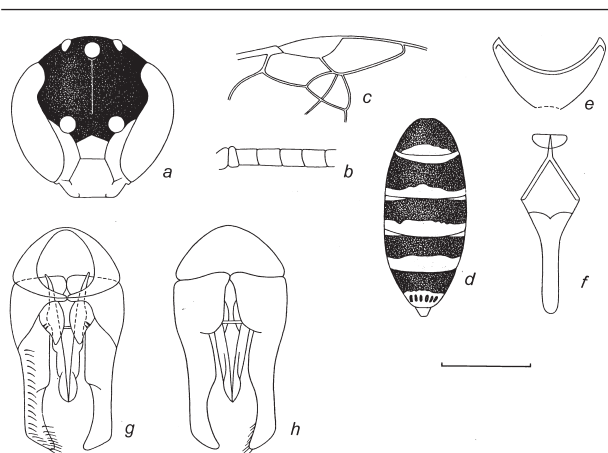
Etymology. This species is named after Terry L. Griswold (Logan, Utah, USA), a collector of the type series.

***Nomioioides (Nomioioides) kenyensis* n. sp.**

[fig. 25*a*-25*b*; Pl. IV: 94-95 (total view), VII: 146-147 (head), VIII: 169 (propodeum), XVIII: 241 (map)]

Diagnosis. This species is very similar to *N. rotundiceps* Handlirsch. In the male, it differs from the latter in the longer antenna, longer propodeum, and relatively wide apical lobe of S8; in the female, only the somewhat longer propodeum: its dorsal surface 1.1 times as long as the scutellum (*vs.* 0.9-1.0 in *N. rotundiceps*).

Male. Structure. Body length 3.4 mm. Head relatively thick, rounded in frontal view; as high as wide. Median lobe of clypeus flat, 0.85 times as high as wide; clypeus extending 0.3 of its length below eyes (fig. 25*a*). Malar space linear. Face flattened. Antenna short, nearly reaching posterior margin of scutellum; middle flagellomeres 1.3 times as long as their diameters (fig. 25*b*). Metapostnotum not defined (its lateral borders of not marked even by change in microsculpture). Dorsal surface of propodeum flat, 1.4 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 short, wide, parallel-sided (fig. 25*f*). Gonobase triangularly rounded in dorsal view. Gonoforceps relatively

**Figure 25*****Nomioides (Nomioides) kenyensis* sp. n.: male (holotype)**

a, head in frontal view; b, flagellomeres 1-5 in lateral view; c, part of forewing; d, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view.

Scale line: 1 mm for d; 0,5 mm for a, b, c; 0,25 mm for e, f, g, h.

short and wide, slightly triangularly broadened in distal part, pointed at apex (fig. 25g, 25h).

Sculpture. Pale parts of face polished, with few and microscopically fine punctures. Frons and vertex densely and finely granulate punctate, nearly mat. Mesoscutum uniformly and not dense granulate, slightly shiny. Scutellum polished, only along margins finely punctate. Mes- and metepisterna finely granulate, mat. Dorsal surface of propodeum with microsculpture similar to that on mesoscutum; shiny in middle of border with its posterior vertical surface. Lateral and posterior vertical surfaces of propodeum obscurely finely granulate.

Coloration. Body without metallic tints. Main coloration of head and mesosoma black; of metasoma, dark fuscous. Labrum, clypeus, supraclypeal area, paraocular area in lower part to level of upper margin of antennal sockets (fig. 25a), mandible (except for fuscous reddish apex), malar space, scapus (except for fuscous spot on upper side), pronotal collar and spiracular lobes, posterior half of propleura, narrow band along posterior margin of scutellum, metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for dark anterior half of middle and hind coxae, middle part of hind femur and large spot on hind tibia), pregradular areas of T2-T5 seen through translucent posterior areas of preceding terga, T6 and T7 entirely (fig. 25d); all yellow or light yellow. Flagellum ochre-yellow on lower side, dark fuscous on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Frons between antennal sockets, genal areas, mesoscutum (except for its central part) and sides of mesosoma covered with dense white tomentum (appressed plumes). Erect pubescence weakly developed on head and mesosoma. Metapostnotum glabrous entirely.

Female. Diagnosis is given above.

Distribution. Kenya, Somalia.

Holotype. ♂, «Africa: Kenya, Samburu Game Res. [3°46'S 39°17'E], 2.VI.1975, [leg.] M. K. Tourtellot»; UKL.

Paratypes. (10 specimens). *Kenya*: Same label as holotype, 4 ♂♂; UKL, ZISP. Eastern Province, 5 km NNE Isiolo, 0°24' N, 37°36' E, 8-10.VI.2000, leg. M.H. Bourbin & W.J. Pulawski, 1 ♂, 1 ♀; CAS. Eastern Province, near Ewaso Ng'iro, river opposite Archer's Post, 0°38' N, 37°40' E, 2-8.XII.2002, leg. M.A. Prentice, 1 ♀; CAS.

Somalia: Afgoi, Lower Shabelli Valley, 1-7.IV.1977, 1 ♂, 7-14.IV.1977, 1 ♀, leg. F. Bin, RNHL. Mogadiscio-Afgoi [road], IV.1977, leg. F. Bin, 1 ♂; RNHL.

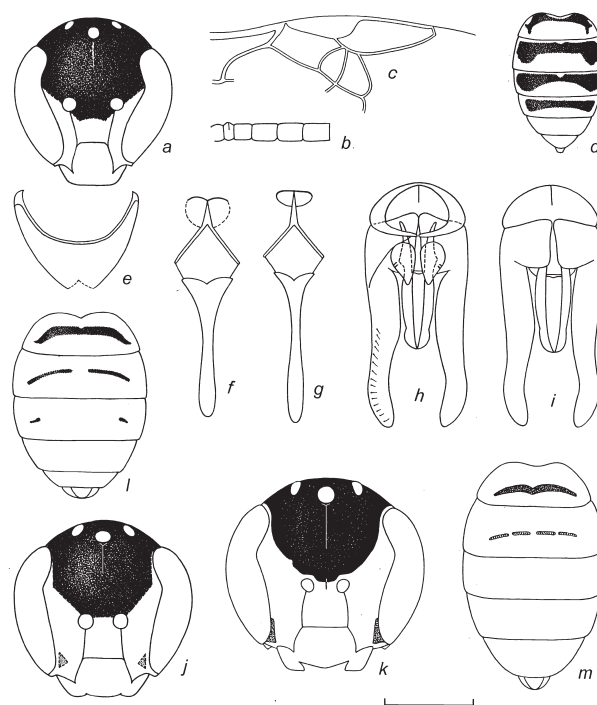
Etymology. This species is named after this type locality (Kenya).

***Nomioides (Nomioides) klausi* Pesenko 1983**

[fig. 26a-26m; Pl. IV: 96-97 (total view), VII: 148-149 (head), XIV: 178 (male genitalia), XVIII: 242 (map)]

Nomioides (Nomioides) klausi Pesenko 1983: 125 (key to females), 128 (key to males), 158, fig. 188, 229, 297, 298, ♀, ♂. Holotype: ♂, "Iran, Bandar Abbas, 50 km NW Jask [25°39'N 57°43'E], 22.V.1978, [leg.] K. Warncke", WAR.

Diagnosis. In the body coloration and pubescence and in the form of the head, this is similar to *N. pulverosus* Handlirsch occurring in deserts and sometimes semi-deserts of Central Asia (Kazakhstan, Turkmenia, Uzbekistan, southwestern Tajikistan,

**Figure 26*****Nomioides (Nomioides) klausi* Pesenko 1983: male (a-i) and female (j-m)**

a, j, and k, head in frontal view; b, flagellomeres 1-5 in lateral view; c, part of forewing; d, l, and m, metasoma in dorsal view; e, S7; f and g, S8; h, genital capsule in ventral view; i, genital capsule in dorsal view.

a, holotype; b, c, and g-i, male paratype; d-f, male from Gao (Niger); j, female paratype; k-m, female from N'Dierba (Senegal).

Scale line: 1 mm for d, l, m; 0,5 mm for a, j, k; 0,25 mm for e, f, g, h, i.

Afghanistan, and the Gobi Desert in Mongolia). It differs from the latter in the following characters: in *males*, the propodeum longer and the terminalia differ; in *females*, the pale pattern on the face somewhat richer and the metapostnotum mat.

Male. Structure. Body length 3.2–3.5 mm. Head egg-shaped in frontal view; its height / width ratio 1.0–1.05. Median lobe of clypeus flattened, as high as wide; clypeus extending half of its length below eyes (fig. 26a). Malar space linear. Face transversely depressed at level of antennal sockets. Antenna relatively long, nearly reaching propodeum; middle flagellomeres 1.3 times as long as their diameters (fig. 26b). Metapostnotum flattened, nearly triangular; its lateral borders marked by change in microsculpture and appearance of pubescence. Dorsal surface of propodeum 1.1–1.2 as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 long, with slight elongate club at apex (fig. 26f, 26g). Gonobase semicircular in dorsal view. Gonoforceps long and slender, parallel-sided, narrowly rounded at apex (fig. 26h, 26i).

Sculpture. Frons and vertex densely and finely granulate, nearly mat. Mesoscutum slight shiny, obscurely granulate. Scutellum shiny, with few fine punctures. Mes- and metepisterna obscurely and finely granulate, slight shiny. Metapostnotum mat, uniformly densely and finely granulate. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral surfaces of propodeum obscurely finely granulate, slight shiny; posterior vertical surface finely granulate, mat.

Coloration. Dark surfaces of head and mesosoma black, without metallic tints; of metasoma, fuscous to black, without metallic tints. Lower half of face and narrow stripe along eye to bottom of emargination in inner orbit (fig. 26a) or even higher, lower sixth of genal area, scapus, prothorax, entirely scutellum or at least band along its posterior margin, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs entirely, and rich pattern on metasoma (fig. 26d), all yellow or white=yellow. Flagellum light ochre-yellow on lower side, fuscous yellow on upper side. Wing membrane milk hyaline; veins and pterostigma white yellow.

Vestiture. Head and mesosoma covered with dense white tomentum (appressed plumes) nearly throughout, except for scutellum and bare metapostnotum.

Female. Structure. Body length usually 3.75–4.2 mm. Head rounded in frontal view; its height / width ratio 0.95–1.0. Median lobe of clypeus flat, its height / width ratio 0.6–0.7; clypeus extending nearly half of its length below eyes (fig. 26j, 26k). Malar space linear. Face flattened. Dorsal surface of propodeum nearly 0.7–0.8 times as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 100°.

Sculpture. Pale surfaces of face silk-mat, finely granulate; clypeus and supraclypeal area, in addition, sparsely punctate. Frons and vertex densely and finely granulate, mat. Mesoscutum uniformly densely and very finely granulate, mat. Scutellum finely and densely punctate granulate, mat. Mes- and metepisterna finely granulate, mat. Metapostnotum uniformly densely and very finely granulate, mat. Posterior vertical surface of propodeum granulate roughened, mat.

Coloration. Dark surface of head and mesosoma black, without metallic tints, except for usually metallic green mesoscutum. Lower half of face (except for small light fuscous lateral spots on lower part of paraocular area) in middle reaching level of lower

margin of antennal socket and narrowed to upper margin of eye (fig. 26j, 26k), mandible, most of posterior surface of head, scapus, prothorax, scutellum, scutellar crests, median area of metanotum, lower third of metepisterna, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for dark spot on hind basitarsus), metasoma except for narrow fuscous band on T1 (fig. 26m) or T1 and T2 and small lateral spots on T3 (fig. 26h), all light yellow. Wing membrane hyaline; veins and pterostigma light yellow. Posterior areas of terga translucent.

Vestiture. All dark surfaces of head and mesosoma covered with very dense whitish tomentum (appressed plumes) masking microsculpture of integument, except for narrow triangular glabrous area on metapostnotum, behind its anterior margin. Metabasitarsal penicillus light yellow.

Distribution. Tunisia, Algeria, Mauritania, Senegal, Mali, Niger, southwestern Iran.

Records from Africa: Pesenko 1983: 160 (“*N. mucoreus*”; Mali: Gao)

African material examined (48 specimens). *Morocco*: 10 km N Mhamid, 21–22.IV.1995, leg. M. Halada, 1 ♂; SCH.

Tunisia: Nefta, 14–15.IV.1981, leg. M. Schwarz, 3 ♀♀; SCH, ZISP. 10 km NW Remada, 10.IV.2001, leg. M. Halada, 2 ♀♀; OLML.

Algeria: Bechar, Taghit, 4.V.1983, leg. R. Leys & P. van der Hurk, 1 ♀; ZMA.

Mauritania: Noakchott, X.1990, XII.1990, I.1991, IV.1991, leg. F. Borgato, 6 ♂♂, 12 ♀♀; ISNB, ZISP. 60 km SE Nouakchott, 7.XI.1993, leg. W.J. Pulawski, 1 ♂; CAS. 153 km NE Nouakchott, 20.X.1993, leg. W.J. Pulawski, 1 ♂; CAS. 25 km SW Moujeria, 29.X.1993, leg. W.J. Pulawski, 2 ♂♂, 1 ♀; CAS. Tayart, 7 km W. Atar, 21.X.1993, leg. W.J. Pulawski, 1 ♂; CAS. Adrar, Oued Timinit, 10.III.2001, leg. F. LaRoche, 2 ♂♂, 1 ♀; LAR. Adrar, Maaden, 12.III.2001, leg. F. LaRoche, 2 ♀♀; LAR. Trarza, Amoukrouz, 7.III.2000, leg. F. LaRoche, 1 ♀; LAR.

Senegal: 40 km NW St. Louis, 9.VII.1991, leg. W.J. Pulawski, 1 ♂, 1 ♀; CAS. N'Dierba, 8.X.1978, leg. G. Hevel & J. Fortin, 1 ♀ (labelled as “*Nomioides mucoreus*” by Pesenko); NMNH.

Mali: Gao, 250 m, 20.IX.1976, leg. K.M. Guichard, 1 ♀ (labelled as “*Nomioides mucoreus*” by Pesenko); BMNH.

Niger: 20 km S Tahoua, 14°25' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 7 ♂♂, 1 ♀, FUSAG, ZISP.

Visited plants (in Africa). Boraginaceae (4 ♂♂). Fabaceae: *Indigofera* sp. (1 ♂)

Nomioides (Nomioides) longiceps Blüthgen 1933

[fig. 27a–27f; Pl. XVIII: 243 (map)]

Nomioides longiceps Blüthgen 1933a: 114, 124 (key), fig. 1, 2, ♀, ♂.

Lectotype (designated by Pesenko 1983: 140): ♀, “Cyrenaica, R. U. Agraria, no. 9535, 20.V.1925, [leg.] Geo. C. Krüger”, “Cyrenaica, Agedabia [30°46'N 20°14'E]”; MNHUB.

Taxonomy. Pesenko 1983: 123 (key to females), 126 (key to males), 140, fig. 176, 217, 271, 272.

Diagnosis. This differs from other species of the subgenus in the wide malar space consisting of about half of the width of the mandible at base and in a characteristic dark pattern of the clypeus in both the sexes (fig. 27a, 27f). In the majority of other characters, it is similar to the close *N. minutissimus* (Rossi).

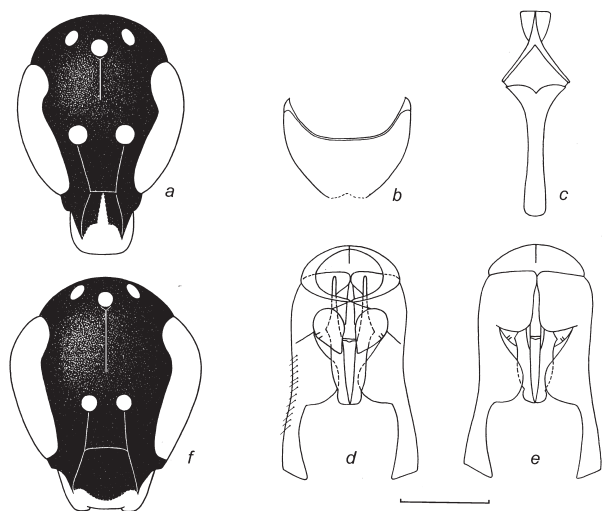


Figure 27
Nomioides (Nomioides) longiceps Blüthgen 1933: male (a-e) and female (f)
a and f, head in frontal view; b, S7; c, S8; d, genital capsule in ventral view; e, genital capsule in dorsal view.
a-e, male paralectotype; f, lectotype.
Scale line: 0,5 mm for a, f; 0,25 mm for b, c, d, e.

However, such a high (1.4 times as high as wide in males and 1.3 times as high as wide in females) and narrow head (about 0.8 times as wide as mesosoma), as that in *N. longiceps*, is rather an extreme case of elongation seen in *N. minutissimus* (e.g., “*N. minutissimus* f. *dolichocephalus*” recorded from some localities of Kazakhstan and Greece; see Pesenko 1983: fig. 170). *N. longiceps* differs from *N. minutissimus* also in the shorter antenna of the male.

Male. Structure. Body length 3.7 mm (3.5–4.0 mm, according to Blüthgen 1933a: 114). Head elongate egg-shaped in frontal view; 1.4 times as high as wide, about 0.8 times as wide as mesosoma. Median lobe of clypeus slightly convex, 1.6 times as high as wide; clypeus entirely situated below eyes (fig. 27a). Malar space nearly half of width of mandible at base. Face flattened. Antenna relatively short, middle flagellomeres 1.05–1.1 times as long as their diameters. Metapostnotum slightly transversely depressed in middle, trapezoidal, occupying about entire dorsal surface of propodeum; its lateral borders marked only by change in microsculpture. Dorsal surface of propodeum about as long as scutellum. [The apical lobe of the S8 and the gonoforceps of the paralectotype shown in fig. 27c–27e were rather broken in their distal ends before drawing. Therefore it can be considered that these sclerites are similar to those of typical males of *N. minutissimus*: apical lobe of the S8 long, slender, broadened towards to distal end, truncate at apex; gonoforceps long, narrow in distal half, triangularly broadened at apex.]

Sculpture. Clypeus relatively coarsely and densely punctate with elongate pits, polished in interspaces, shiny. Frons and vertex densely and finely granulate, nearly mat. Mesoscutum densely granulate and submat on anterior half of its disc and along margins; obscurely and sparse granulate, much shinier on posterior half of disc. Scutellum nearly polished on disc, very

densely and finely punctate along margins and mid-line. Mes- and metepisterna finely granulate and sparsely punctate, mat. Metapostnotum indistinctly strigate on anterior two thirds, obscurely reticulate rugulose on posterior third. Lateral surfaces of propodeum obscurely finely granulate, mat.

Coloration. Main coloration of head and mesosoma black, with slight dark bluish-green metallic tint; frons with brighter tint; mesoscutum black, without metallic tint. Most surface of metasoma fuscous black. Labrum, clypeus (except for rich dark fuscous pattern; fig. 27a), mandible (except for reddish apex), malar space, pronotal collar and spiracular lobes, narrow band along posterior margin of scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, distal end of femora, all tibiae and tarsi, pregradular areas of T2–T4 seen through translucent posterior areas of preceding terga, T5 and T6 entirely; all yellow. Wing membrane milk-hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area and metanotum. Face between antennal sockets, genal area on upper half and lateral surfaces of mesosoma covered with rather sparse tomentum (appressed plumes). Metapostnotum entirely glabrous.

Female. Structure. Body length 4.0–4.4 mm. Head elongate egg-shaped in frontal view, 1.3 times as high as wide. Median lobe of clypeus weakly convex, its height / width ratio 0.9; clypeus almost entirely extending below eyes (fig. 27f). Malar space 0.3–0.5 width of mandible at base. Face flattened. Metapostnotum flat, semicircular, occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture. Dorsal surface of propodeum about as long as scutellum.

Sculpture. Clypeus finely very densely granulate, mat on pale surface; sparsely punctate, shiny on lower fourth. Supraclypeal area, frons and vertex densely and finely granulate, submat. Mesoscutum and dark surfaces of scutellum mat, densely granulate; pale surfaces of scutellum very obscurely granulate, shiny. Mes- and metepisterna finely granulate, submat. Metapostnotum reticulate granulose on finely granulate underground surface.

Coloration. Main coloration of head and mesosoma black, with distinct dark-green metallic tint. Mesoscutum brighter metallic green. Lower fourth of clypeus (fig. 27f), mandible (except for reddish apex), scapus on lower and lateral surfaces, pronotal collar and spiracular lobes, scutellum (except for dark stripe along its posterior margin and lateral spots), scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, distal ends femora, tibiae (except for large fuscous spot on middle and hind ones), tarsi; all yellow. Metasoma yellow, except for wide fuscous bands on T1 and T2, narrow band on T3 interrupted medially, narrow transverse lateral stripes on T4. Wing membrane hyaline; veins and pterostigma yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect, plumose, white. Dense tomentum (appressed plumes) present on genal areas and side of mesosoma. Metapostnotum glabrous entirely.

Variation. The species is known only from the type series. The female paralectotype from the Djerba Island (Tunisia) differs from the lectotype and another female paralectotype from Tobruk (Libya) in the less developed malar space (only 0.3

width of mandible at base vs. 0.5 in the lectotype and another paralectotype), denser tomentum on the mesoscutum, paler antenna, scutellum, and legs.

One more female from Tunisia (Tozeur, see "African material examined") possibly also belongs to this species; it has less developed malar space, somewhat shorter head, and paler scutellum and metasoma than those of the lectotype. It is interesting that three individuals, caught from the Djerba Island (Tunisia, same locality as one of the types of *N. longiceps*) 92 years later, certainly belong to *N. minutissimus maurus*, although have somewhat wider malar space (about 0.2 width of mandible at base) than that in other individuals of *N. minutissimus maurus* examined.

Distribution. Libya, Tunisia.

Records from Africa. Blüthgen 1933a: 114 (Libya: Tobruk, Agedabia). Zavattari 1934: 347 (Libya: Tobruk).

African material examined (5 specimens). *Libya*: Agedabia, 20.V.1925, leg. G.C. Krüger, 1 ♀ (lectotype); MNHUB. Tobruk, 20.V.1926, leg. G.C. Krüger, 1 ♂ (paralectotype); MNHUB; same label, 1 ♀; WAR.

Tunisia: Djerba Island, 1910, leg. A. Weiss, 1 ♀ (paralectotype); MNHNP. Tozeur, 45 m, 14.VII.1979, leg. A.W. Ebmer, 1 ♀ (specimen labelled as "*Nomioides atroino* n. sp." by Pesenko in 1990); EBM.

Nomioides (Nomioides) maculiventris (Cameron 1905)

[fig. 28a-28n, 29a-29j; Pl. III: 84-85 (total view), IV: 102 (mesosoma), VII: 160-161 (head), X: 180 (propodeum), XI: 191 (mesoscutum), XIV: 213 (male genitalia), XIX: 244 (map); tabs 4, 5]

Ceratina maculiventris Cameron 1905: 244, ♀, ♂. Lectotype (**designated here**): ♀, "*Ceratina maculiventris* Cam. Type. Pearston, S. Af. [Republic of South Africa: Cape Province] [32°34'S 25°08'E]", "Cameron Coll. 1905-102", "B. M. type Hym. 17.a.1052b"; BMNH.

Halictus (Nomioides) pulchellus: Friese 1909: 149, nec Schenck 1869.

Nomioides maculiventris var. *convergens* Blüthgen 1934a: 251, ♀.

Holotype: ♀, "Cape Province: Matjesfontein [Republic of South Africa] [33°33'S 26°20'E], 1-18.XII.1928", "S. Africa, R. E. Turner. Brit. Mus. 1929-15", "B. M. type Hym. 17.a.1056"; BMNH (examined). **Syn. n.**

Nomioides callonotus Cockerell 1936: 2, ♀. Lectotype (**designated here**): ♀, "Cape Province: Ceres [Republic of South Africa] [33°21'S 19°19'E], 12-18.II.1932, [leg.] L. Ogilvie", "ac. 34187"; AMNH.

Syn. n.

Nomioides maculiventris var. *cyaneonotus* Cockerell 1937: 9, ♂. Lectotype (**designated here**): ♂, "S. Africa, Cape Province [Republic of South Africa]: Graaf-Reinet [32°15'S 24°33'E], X.1931, [leg.] Miss A. Mackie", "ac. 349708"; AMNH. **Syn. n.**

Taxonomy. Blüthgen 1934a: 251 (n. comb.). Cockerell 1932a: 2 (key). Cockerell 1935: 90. Ireland 1935: fig. 2, 9-11, 24-26.

Diagnosis. This species has the longest antenna inf the male in comparison with all other species of the subgenus. Principal differences from the similar *N. facilis* (Smith), *N. micheneri* n. sp., and *N. paulyi* n. sp. are given in the key above.

Male. Structure. Body length 2.9-4.2 mm, usually 3.3-4.0 mm. Head rounded or sometimes triangularly rounded in frontal view; its height / width ratio 1.0-1.05. Median lobe of clypeus weakly convex or nearly flat, about as high as wide; clypeus extending half of its length below eyes (fig. 28a-28c). Malar space linear. Face flattened. Antenna very long, reaching metasoma;

middle flagellomeres 1.5-1.7 times as long as their diameters (fig. 28d). Metapostnotum flat, semicircular; its lateral borders usually marked by slight carina. Dorsal surface of propodeum 1.2 time as long as scutellum, passing to posterior vertical surface at distinct angle of 100°. Apical lobe of S8 narrow, with weak rounded elongate club in distal part, narrowly rounded at apex (fig. 28i-28k). Gonobase semicircular in dorsal view. Gonoforceps relatively wide, narrowed distally, pointed at apex (fig. 28l-28n).

Sculpture. Clypeus usually polished, with small shallow pits on dark parts. Supraclypeal area densely obscurely granulate, slightly shiny. Frons and vertex densely and finely granulate, mat. Mesoscutum submat, uniformly densely granulate shiny; each granule as large as eye facet. Scutellum with microsculpture similar to that of mesoscutum, but more obscure, usually with two nearly polished areas on sides of midline. Mes- and metepisterna finely granulate, mat. Metapostnotum with short fine striae on anterior part, densely granulate on posterior part, slightly shiny or submat. Dorsal surface of propodeum mat

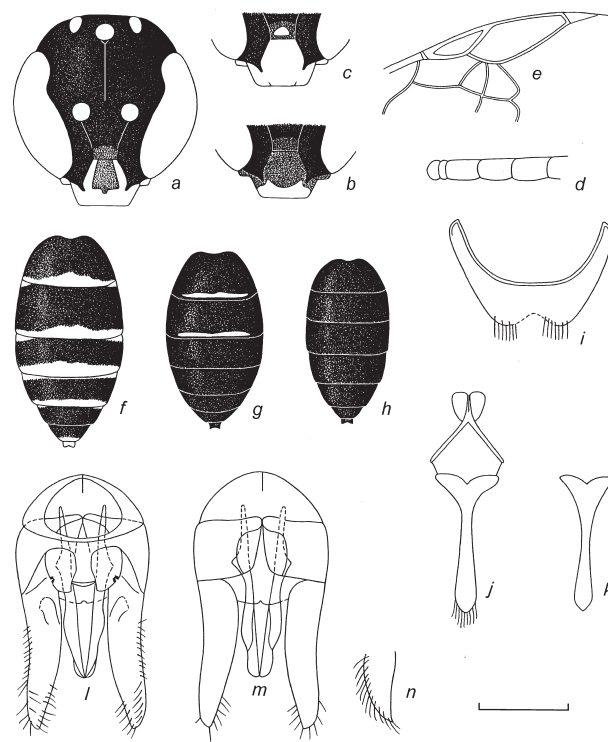


Figure 28

***Nomioides (Nomioides) maculiventris* (Cameron 1905): male**

a, head in frontal view; b and c, lower part of head in frontal view; d, flagellomeres 1-4 in lateral view; e, part of forewing; f-h, metasoma in dorsal view; i, S7; j, S8; k, apical lobe of S8; l, genital capsule in ventral view; m, genital capsule in dorsal view; n, distal part of right gonoforceps in ventral view.

a-d, and g, male from Graytown (Republic of South Africa); f, male from Maltahöhe (Namibia); h, Kroonstadt (Republic of South Africa); i, j, l, and m, male from Grahamstown (Republic of South Africa); k and m, male from Port Nolloth (Republic of South Africa).

Scale line: 1 mm for f, g, h; 0.5 mm for a, b, c, d, e; 0.25 mm for i, j, k, l, m, n.

on border with its posterior vertical surface; lateral surfaces of propodeum densely finely granulate, mat; its posterior vertical surface coarsely roughened, with few striae, mat.

Coloration. Main coloration of head and mesosoma dull metallic deep blue or bluish green; of metasoma, black or fuscous-black, without metallic tints; sometimes mesoscutum with reddish tint (e.g., in *N. maculiventris* var. *cyaneonotus* Cockerell). Pale pattern relatively poor and very variable (see Section "Variation"). Flagellum dark yellow on lower side, or dark fuscous throughout. Tegula fuscous translucent. Legs usually mostly dark. Wing membrane usually slightly infuscate; veins and pterostigma yellow or yellow fuscous.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surfaces of mesosoma. Sparse tomentose pubescence (appressed plumes) present between antennal sockets and on lower parts of paraocular and genal areas or tomentum absent entirely. Metapostnotum entirely glabrous.

Female. Structure. Body length 3.5–4.3 mm (usually 3.7–4.1 mm). Head nearly rounded in frontal view; its height / width ratio 0.9–0.95. Median lobe of clypeus weakly convex, its height / width ratio 0.6–0.7; clypeus extending nearly half of its length below eyes (fig. 29a–29e). Malar space linear. Face flattened, with slight carina between antennal sockets. Metapostnotum slightly convex, trapezoidal-semicircular, occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture. Dorsal surface of propodeum about as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 100°.

Sculpture. Pale surfaces of clypeus and supraclypeal area nearly polished, shiny, with few shallow pits; their dark surfaces finely

and obscurely shagreened-granulose, mat. Frons and vertex densely and finely granulate, slightly shiny. Mesoscutum and scutellum mat, uniformly densely granulate; each granule as large as eye facet. Mes- and metepisterna finely granulate, mat. Metapostnotum finely densely reticulate-rugulose, sometimes strigate on lateral and posterior parts. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral and posterior vertical surfaces of propodeum obscurely densely finely granulate, submat.

Coloration. Main coloration of head and mesosoma fuscous black or black, with distinct metallic green tint; this tint absent on lower parts of paraocular area in angle between median and lateral lobes of clypeus, on supraclypeal area, on prothorax and proximal (dark) parts of legs. Mesoscutum and scutellum brighter metallic green. Yellow pattern of integument relatively poor and very variable (see Section "Variation"). Wing membrane hyaline or slightly infuscate; veins and pterostigma yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence whitish, usual. Sparse appressed plumes absent or present only on genal area and sides of mesosoma. Metapostnotum entirely glabrous. Metabasitarsal penicillus light yellow.

Variation. This is relatively stable species in its characters of body structure, microsculpture, and pubescence. A certain variability of these characters is described above. However, in the variability of the body coloration, this species exceeds all other species of the tribe. Some of colour variants were described as separate taxa, e.g., "*N. maculiventris* var. *cyaneonotus*" is one of the darkest variants among males; "*N. callonotus*" and "*N. maculiventris* var. *convergens*", among females; the holotype of *N. maculiventris* is one of the palest females. Principal colour variants are presented in tab. 4 below.

Table 4. Principal colour variants of *Nomioides maculiventris*. From palest to darkest; pale parts of body indicated.

Colour variant	Male					Female		
	Supraclypeal area	Clypeus	Metanotum	Pregradular areas	Supraclypeal area	Clypeus	Scutellum	Metasoma
1	Spot (fig. 28c)	Entirely (fig. 28c)	Entirely or lower half	T2-T5 (fig. 28f)	Lower half (fig. 29b)	Entirely (fig. 29b)	Entirely	Nearly throughout (fig. 29g)
2	Spot (fig. 28c)	Entirely (fig. 28c)	-	T2-T5 (fig. 28f)	Lower half (fig. 29b)	Entirely (fig. 29b)	Entirely	Most part (fig. 29h)
3	-	Entirely (fig. 28c)	-	T2-T5 (fig. 28f)	Small spot (fig. 29a)	Entirely (fig. 29b)	Entirely	Most part (fig. 29h)
4	-	Entirely (fig. 28c)	-	T2-T3 (fig. 28g)	Small spot (fig. 29a)	With two dark spots (fig. 29a)	With two dark spots	Most part (fig. 29h)
5	-	Entirely (fig. 28c)	-	T2	-	With two dark spots (fig. 29a)	With two dark spots	Most part (fig. 29h)
6	-	With large dark spot (fig. 28a)	-	T2-T5 (fig. 28f)	-	With two dark spots (fig. 29a)	With two dark spots	Less part (fig. 29i)
7	-	With large dark spot (fig. 28a)	-	T2-T3 (fig. 28g)	-	Trident pattern (fig. 29c, 29d)	With two dark spots	Less part (fig. 29i)
8	-	With large dark spot (fig. 28a)	-	(fig. 28b)	-	Trident pattern (fig. 29c, 29d)	With two dark spots	Narrow bands (fig. 29j)
9	-	Lower margin (fig. 28b)	-	T2-T5 (fig. 28f)	-	Lower margin (fig. 29e)	With two dark spots	Less part (fig. 29i)
10	-	Lower margin (fig. 28b)	-	(fig. 28c)	-	Lower margin (fig. 29e)	Posterior margin	Narrow bands (fig. 29j)

Table 5. Occurrence of different colour variants of *Nomioides maculiventris* in the material examined from some localities

Colour variant	Namibia		Republic of South Africa										
	Maltahöhe (235 spec.)		Cradock (37 spec.)		Worcester (77 spec.)		Grahamstown (40 spec.)		Kroonstadt (110 spec.)		Port Nolloth (63 spec.)		Williston 63 ££ (males not counted)
	\$	£	\$	£	\$	£	\$	£	\$	£	\$	£	
1	7	43	5	24	1	3	-	-	13	3	-	5	15
2	19	44	2	5	6	9	-	3	9	2	-	6	30
3	20	13	-	1	-	2	-	-	17	-	-	2	-
4	10	6	-	-	-	-	-	7	26	-	-	1	5
5	2	-	-	-	2	1	-	10	2	-	2	-	2
6	11	14	-	-	2	3	1	4	8	-	1	-	11
7	10	2	-	-	5	-	2	-	2	-	4	-	-
8	16	-	-	-	14	-	2	-	23	-	2	-	-
9	8	-	-	-	22	5	-	-	3	-	9	-	-
10	10	-	-	-	-	1	11	-	2	-	31	-	-

Data on 625 specimens examined in 1985-1988.

Conclusions of an analysis of the colour variability (tabs 4 and 5) are as follows. (1) Usually, but not always, the smaller an individual, the darker it is. (2) Development of the pale pattern on different parts of the body (head, mesosoma, legs, and metasoma) usually is correlated. However, we have found many cases of a certain independence in the colour variation of different parts of the body, *e.g.*, some individuals are palest in coloration of the face, but are darkest in coloration of the metasoma, and *vice versa*. (3) The colour variation often depends on locality, *i.e.* it has an inter-population component. But most of populations examined are relatively heterogeneous in body coloration. (4) The correlation between the coloration of males and females demonstrates not always. (5) The colour variation shows no distinct geographical trend.

In addition to the variability in the pale pattern, there exists a certain variability in the coloration of the background (dark) surfaces of the body in females: often the face and mesoscutum having a bronze (not green or greenish blue) metallic tint, sometimes the mesoscutum with gold-reddish tint.

Distribution. Sub-Saharan Africa.

Records from Africa. Cameron 1905: 244 (*Ceratina maculiventris*; Republic of South Africa: Pearston). Friese 1909: 149 (*Halictus pulchellus*; Republic of South Africa: Willowmore). Friese 1915: 268 (*Halictus pulchellus*; Ethiopia: Asmara). Blüthgen 1925: 39 (*Nomioides facilis* var. *maculiventris*; Republic of South Africa: Zwartkops Salt Pan, Mossel Bay). Blüthgen 1934a: 251 (Namibia: Okahandja; Republic of South Africa: Mosel Bay, Matjesfontein, Oudtshoorn, Aliwal North). Cockerell 1935: 90 (Botswana: Kuke Pan). Cockerell 1936: 2 (Republic of South Africa: Calvinia, Doorn River, Van Ryus Pass, Oudtshoorn, Uitenhage, Nieuwoudtville; *Nomioides callonotus*; Republic of South Africa: Ceres). Cockerell 1937: 9, (*Nomioides maculiventris* var. *cyaneonotus*; Republic of South Africa: Graaf-Reinet, Calvinia, Blaukrans near Calvinia). Cockerell 1939: 179 (Namibia: Windhoek; Republic of South Africa: Bot River).

African material examined (1982 specimens). *Kenya*: Simu Beach, Kwale, 7.XI.1957, leg. E.S. Ross & R.E. Leech, 1 ♂; CAS.

Lesotho: Mamates, 17.II.1949, leg. J.C. Bradley, 1 ♂; CUI.

Botswana: Kalahari, Kuke-Pan, 21-30.III.1930, leg. T.D.A. Cockerell, 7 ♂♂, 15 ♀♀; CUI, LACM MRAC, MCZC, UKL, UUL. Maun, Island Sateri, I.1997, leg. M. Snizek, 11 ♂♂, 16 ♀♀; OLML.

Namibia: Aus, 8-30.XI.1929, leg. R.E. Turner, 1 ♂; BMNH. Bethanie Dist., 25 km WNW Helmeringhausen, Barby Farm, 25°55' S, 16°37' E, 3.X.1972, leg. C.L. Hogue, 2 ♀♀; LACM. Damaraland, 38 km W Khorixas, 4.III.1990, leg. M. Schwarz, 2 ♂♂; SCH; leg. W.J. Pulawski, 1 ♂, 1 ♀; CAS. Farm Namtib, 60 km NE Aus, 1-4.X.1997, leg. M. Kuhlmann, 1 ♀; KUH. Gobabis, 40 km W Witvlei, 16.II.1990, leg. M. Schwarz, 2 ♂♂; SCH. 15 km W Karibib, 28.II.1990, leg. M. Schwarz, 1 ♂; SCH. 5 km N Gobabeb, 4.XII.1978, 29.I.1979, leg. Wharton, 2 ♀♀; NCP. Meteorite, W of Grootfontein, 15.I.1993, leg. M. Schwarz & J. Gusenleitner, 7 ♂♂, 4 ♀♀; SCH. Helmeringshausen, 25°55' S, 16°49' E, 17.II.1988, leg. G.D. Butler, 2 ♂♂; NCP. Keetmans Dist., 1 km W Mata Mata, Welverdiend Farm, 25°47' S, 19°59' E, 20.X.1972, leg. C.L. Hogue, 2 ♂♂, 18 ♀♀; LACM. 30 mi [ca. 48 km] SE Keetmanshoop, 23-30.X.1968, leg. J.G. Rozen & E. Martinez, 1 ♂, 4 ♀♀; AMNH. 74-81 km W Maltahöhe, 29.III.1979, leg. J.G. Rozen, 133 ♂♂, 122 ♀♀; AMNH, ZISP. Mariental, 24.X.1968, leg. J.G. Rozen & E. Martinez, 1 ♂, 32 ♀♀; AMNH. 75 km S Mariental, 10.II.1990, leg. M. Schwarz, 2 ♂♂; SCH. Namib/ Naukluft National Park, Gobabeb, 23°34' S, 15°03' E, 18.II-20.III.1983, 1 ♂, 2 ♀♀; NCP. 5 km S Okahandja, 1.IV.1979, leg. J.G. Rozen, 1 ♀; AMNH. An inlet to Omaruru river, W. of Omaruru, road C36, 11-13.IV.2000, leg. P. Zebrowsky, 1 ♂; OLML. 25 km NW Otjiwarongo, 3.III.1990, leg. M. Schwarz, 2 ♂♂, 5 ♀♀; SCH. 29 km S Otjiwarongo, 23.III.1976, leg. J.G. & B.L. Rozen, 3 ♀♀; AMNH. 45 km SE Otjiwarongo, 23.III.1976, leg. J.G. Rozen & B.L. Rozen, 1 ♀; AMNH. Otjiw. Dist., 50 km ESE Otjiwarongo, Okosongomino Farm, 20°39' S, 17°05' E, 17.XI.1972, leg. C.L. Hogue, 3 ♀♀; LACM. 55 km W Outjo, 4.III.1990, leg. M. Schwarz, 3 ♂♂, 1 ♀; SCH. 10 km W Outjo, 23.XI.1994, leg. M. Kuhlmann, 1 ♂; KUH. 7 km N Rehobot, 7.III.1990, leg. M. Schwarz, 1 ♂, 18 ♀♀; SCH.

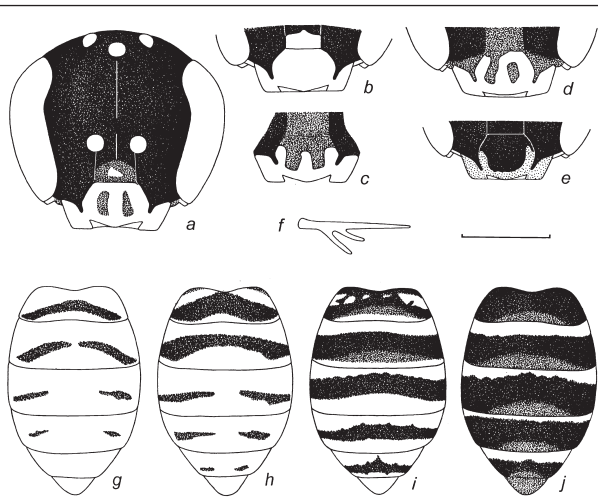


Figure 29

Nomiooides (Nomiooides) maculiventris (Cameron 1905): female

a, head in frontal view; b-e, lower part of head in frontal view; f, inner metatibial spur; g-j, metasoma in dorsal view.

a, f, and g, female from Worcester (Republic of South Africa); b, Doringbos (Republic of South Africa); c, holotype of *N. maculiventris* var. *convergens* Blüthgen; d and g, lectotype of *N. maculiventris*; e, i, and j, females from Graytown (Republic of South Africa).

Scale line: 1 mm for g, h, i, j; 0.5 mm for a, b, c, d, e; 0.25 mm for f.

Stampriet, 24°20' S, 18°24' E, 16.II.1988, leg. G.D. Butler, 1 ♂, 2 ♀♀; NCP. Swakopmund, 26-30.I.1972, 12 ♂♂, BMNH; ibid, 12.II.1993, leg. J. Gusenleitner, 1 ♂; OLML; ibid, 12.II.1993, leg. M. Schwarz & J. Gusenleitner, 9 ♂♂, 18 ♀♀; SCH. 15 km E Swakopmund, 4-8.II.1993, leg. M. Schwarz & J. Gusenleitner, 17 ♂♂, 4 ♀♀; SCH. Swakopmund District, 10 km N. Swakopmund, 22°35' S, 14°32' E, 6.XII.1996, leg. W.J. Pulawski, 1 ♂, 1 ♀; CAS. Tsumeb, 30 km E Namutoni, 7.III.1990, leg. M. Schwarz, 4 ♂♂, 1 ♀, SCH. Uguchab River near Aurusberg, 27°32' S, 16°11' E, 22.IV.1988, leg. C.D. Eardley, 4 ♂♂, 4 ♀♀; NCP. Windhoek Dist., 110 km E Windhoek, Arnhem Farm, 22°41' S, 18°08' E, 27.X.1972, leg. C.L. Hogue, 2 ♂♂; LACM.

Republic of South Africa: Transvaal: Langjan Nature Reserve, 22°52' S, 29°14' E, 2.II.1984, leg. C.D. Eardley, 6 ♂♂, 5 ♀♀; NCP. Ellisras, 21.X.1972, leg. H.N. Empey, 1 ♂; NCP. Altydroog Farm, 13 km W Beitbridge, 22°11' S, 29°53' E, 8.III.1990, leg. C.D. Eardley, 1 ♂; NCP. *Orange Province:* Kimberley, 11.II.1976, leg. G.E. Bohart, 1 ♂; UUL. Kroonstad, 19-22.XII.1966, leg. D.L. Brothers, 105 ♂♂, 5 ♀♀; AMNH, ZISP. Kroonstad, 3.X.1965, leg. H.N. Empey, 1 ♀; NCP. Tussen-die-Riviere Reserve, near Bethulie, 30°30' S, 26°12' E, 20-26.I.1994, leg. C.D. Eardley, 4 ♂♂, 4 ♀♀; NCP. Sandveld Nature Reserve, 27°40' S, 25°45' E, 24-25.II.1993, leg. C.D. Eardley, 1 ♂, 3 ♀♀; NCP. 30 km N Colesberg, Orange River, 25.XI.2002, leg. M. Halada, 4 ♀♀; OLML. 80 km N Bloemfontein, 26.XI.2002, leg. M. Halada, 1 ♀; OLML. *Natal*, 12 mi [ca. 19 km] N Greytown, 13.II.1967, leg. C.D. Michener, 95 ♂♂, 26 ♀♀; UKL, ZISP. *Cape Province*, Aliwal North, 1.I.1979, leg. C.D. Eardley, 1 ♂, 1 ♀; NCP. Ashton

(Robertson), 26.X.1999, leg. M. Halada, 1 ♂; OLML. 40 mi [ca. 64 km] E Barrydale, 13.XI.1966, leg. C.D. Michener, 2 ♂♂, 1 ♀; UKL, ZISP; leg. J.G. Rozen, 1 ♀; AMNH. 48 mi [ca. 77 km] E Barrydale, 13.XI.1966, leg. C.D. Michener, 1 ♀; UKL. Baviaanskloof, 23-24.XI.1983, leg. G.L. Prinsloo & N.C. Grobbelaar, 1 ♀; NCP. Bethesdweg, 31°54' S, 24°45' E, 8.II.1990, leg. M. Jonsson, 1 ♀; NCP. Bloukrans near Calvinia, X.1931, leg. T.D.A. Cockerell, 1 ♂, 8 ♀♀; MRAC, UKL, ZISP. Bloukrans near Calvinia, 17.XI.1931, leg. J. Ogilvie, 1 ♂; LACM. Brandkop, 31°13' S, 19°12' E, 9.IX.1987, leg. C.D. Eardley, 2 ♀♀; NCP. 15 km NW Calvinia, 1000 m, 31°23' S, 19°36' E, 26.IX.1997, leg. M. Kuhlmann, 1 ♂, 2 ♀♀; KUH. Cape Town, I-IV.1915, leg. J.C. Bridwell, 1 ♀; NMNH. Cederberg, 15-30 km SE Clanwilliam, XI.1984, leg. G.L. Prinsloo, 1 ♀; NCP. 24.X.1982, leg. T.L. & R.T. Griswold, 1 ♂, 9 ♀♀; UUL, ZISP. Ceres, 12-18.II.1932, leg. L. Ogilvie, 1 ♀ (lectotype of *Nomiooides callonotus*); AMNH. Citrusdal, 2.XI.1966, leg. J.G. Rozen, 1 ♂; AMNH. Clanwilliam Dist., Biedouw Valley, 32°08' S, 19°14' E, 5-7.IX.1987, leg. C.D. Eardley, 2 ♀♀; NCP. Die-Bos road, 30 mi [ca. 48 km] E Clanwilliam, 19.XI.1966, leg. C.D. Michener, 1 ♀; UKL. Doringbos, 3.XI.1966, leg. C.D. Michener, 2 ♂♂, 7 ♀♀; UKL, ZISP; ibid, leg. J.G. Rozen, 1 ♂, 5 ♀♀; AMNH; ibid, 11.X.1999, leg. M. Snizek, 2 ♀♀; OLML. 21 mi [ca. 34 km] N Cradock, 30.XI.1972, leg. B.L. Rozen & D.J. Brothers, 7 ♂♂, 30 ♀♀; AMNH, ZISP. Cradock, 32°10' S, 25°37' E, 7.II.1990, leg. V. Uys, 2 ♂♂, 1 ♀; NCP. 7 km S Cradock, 25.I.2000, leg. J. Halada, 40 ♂♂, 3 ♀♀; OLML. De Aar, 20.III.1949, leg. J.C. Bradley, 1 ♀; CUI. Doorn River, XI.1931, leg. L. Ogilvie, 1 ♀; UUL. De Doorns, 19.X.1982, leg. T.L. Griswold, 1 ♀; UUL. Garies, Nariep, 16.X.1999, leg. M. Snizek, 1 ♀; OLML. Wadi Groen, SW of Garies, 16.X.1999, leg. M. Halada, 11 ♂♂, 4 ♀♀; OLML. Graaf-Reinet, X.1931, leg. A. Mackie, 1 ♂ (lectotype of *Nomiooides maculiventris* var. *cyaneonotus*); AMNH; 1 ♂, 1 ♀, MCZC, MRAC. Grahamstown, 12.II.1967, leg. D.J. Brothers, 3 ♀♀; AMNH. 10 mi [ca. 16 km] N Grahamstown, 20.XI.1966, leg. C.D. Michener, 6 ♂♂, 6 ♀♀; UKL, ZISP; ibid, 30.XI.1966, leg. J.G. Rozen & D.J. Brothers, 8 ♂♂, 6 ♀♀; AMNH; ibid, 26.XI.1967, leg. D.J. Brothers, 2 ♂♂; AMNH. 12 mi [ca. 19 km] NW Grahamstown, 16.XI.1970, leg. H.V. Daly, 1 ♀; UKL. 17 mi [ca. 27 km] NW Grahamstown, 21-23.XI.1966, leg. J.G. Rozen & D.J. Brothers, 2 ♂♂, 8 ♀♀; AMNH. 30 km W Grahamstown, Olifantskop Pass, 25.I.2000, leg. J. Halada, 1 ♂; OLML. Graafwater, 4.XI.1966, leg. C.D. Michener & J.G. Rozen, 7 ♂♂, 1 ♀; UKL, AMNH. NE Gydo Pass, 33°12' S, 19°30' E, 9.XII.1988, leg. C.D. Eardley, 2 ♂♂, 2 ♀♀; NCP. Heidelberg District, Breede River, 6.II.1932, leg. R.E. Turner, 1 ♀; BMNH. Hester Malan N.R., 10 mi [ca. 16 km] E. Springbok, 7-8.I.1972, 8 ♂♂, 11 ♀♀; BMNH. Hex River Pass near De Doorns, 33°24' S, 19°46' E, 18.XI.1982, leg. C.D. Eardley, 5 ♂♂, 6 ♀♀; NCP. Jansenville, 13.III.1970, leg. L.C. Stark, 2 ♂♂, 3 ♀♀; NCP. Kakamas, 15-16.III.1949, leg. J.C. Bradley, 2 ♂♂; CUI. Kalahari Gemsbok Park, Twee Rivieren, 26°28' S, 20°37' E, 900 m, 29-30.X.1990, leg. M.W. Mansell, 4 ♂♂, 4 ♀♀; NCP. Kalahari Gemsbok National Park, Twee Rivieren, 26°25' S, 20°37' E, 13.II.1988, leg. G.D. Buttler, 8 ♂♂; NCP; ibid, 18-29.X.1989, leg. M.W. Mansell, 4 ♂♂, 3 ♀♀. Kalahari Gemsbok Park, Nossob camp, 25°26' S, 20°36' E, 2.X.1991, leg. M.W. Mansell, 1 ♂, 4 ♀♀; NCP. 15 km Kamieskroon, 30°10' S, 18°05' E, 27.IX.1997, leg. M. Kuhlmann, 1 ♀; KUH. Farm Arkoep, 6 km N. Kamieskroon, 30°19' S, 17°56' E, 1-2.X.1990, leg. C.D. Eardley, 1 ♀; NCP.

E of Kamieskroon, 2.XI.1999, leg. M. Halada, 1 ♂; OLML. Kango Mtn Resort, 33°31'S 22°21'E, 11.II.1990, leg. M. Jonsson, 3 ♂♂, 3 ♀♀; NCP. Karoo National Park, Mountain View, 32°15' S, 22°32' E, 14.XII.1988, leg. M.W. Mansell, 1 ♂; NCP. Karoo National Park, 32°20' S, 22°30' E, 13.XII.1988, 1 ♀, 13.II.1991, 5 ♀♀, leg. C.D. Eardley; NCP. Beaufort West, 32°21' S, 22°35' E, 12-13.II.1991, leg. C.D. Eardley, 1 ♀; NCP. Klein Karoo, Grot River, Langberg, 24.XI.2002, leg. M. Halada, 1 ♀; OLML. Klein Karoo, Ladismith, 25.X.1999, leg. M. Halada, 1 ♀; OLML. 12-18 km SW Kuruman, 27°30' S, 23°17' E, 5.IX.1986, leg. R. Oberprieler, 1 ♀; NCP. Kuruman, 14.I.2001, leg. M. Snizek, 1 ♀; OLML. 13 km ENE Laingsburg, 33°11' S, 20°59' E, 25.XII.1996, leg. W.J. Pulawski, 1 ♂; CAS. Lambert's Bay, 4.XI.1966, leg. C.D. Michener, 1 ♀; UKL. S of Lambert's Bay, 28.X.1999, leg. M. Snizek, 2 ♂♂, 1 ♀; OLML. SW of Loriesfontein, 13.X.1999, leg. M. Halada, 2 ♀♀; OLML. Matjesfontein, 1-18.XII.1928, leg. R.E. Turner, 1 ♀ (holotype of *Nomioides maculiventris* var. *convergens*); BMNH. Merweville, 32°40' S, 21°30' E, 15.XII.1988, leg. C.D. Eardley, 1 ♂; NCP. Messelpad, 30 km SW Springbok, 2.XII.1974, leg. J.G. Rozen & B.L. Rozen, 1 ♂, 1 ♀; AMNH. Middelburg, Grootfontein College, 31°29' S, 25°00' E, leg. M. de Jager, 1 ♂; NCP. Farm Grootfontein near Middelburg, 31°28' S, 25°01' E, II.1992, leg. M. de Jager, 1 ♀; NCP. Miller, 33°04' S, 23°55' E, 9.II.1990, leg. V.M. Uys, 1 ♀; NCP. Molteno Pass, near Beaufort West, 32°12' S, 22°33' E, leg. C.D. Eardley, 1 ♂; NCP. Mossel Bay, III-IV.1930, leg. R.E. Turner, 2 ♂♂, 7 ♀♀; CUI. ZISP. Mossel Bay, Herberstsdale to Langberg road, 19.I.2001, leg. M. Snizek, 1 ♂, 14 ♀♀; OLML. Nieuwoudtville, Farm Glen Lyon, 31°23' S, 19°08' E, 700 m, 23.VIII.2003, leg. K. Timmermann, 2 ♀♀; KUH. 15 km NW Nieuwoudtville, near Engelsepunt, Fynbos, 31°14' S, 18°58' E, 843 m, 23-25.IX.2003, leg. K. Timmermann, 2 ♀♀; KUH. Nuwerus, 31.X.1999, leg. M. Halada, 124 ♂♂, 347 ♀♀; OLML. 28 km E Olifantshoek, 24.III.1990, leg. M. Schwarz, 3 ♂♂, 1 ♀; SCH. Olifantshoek, 27°57' S, 22°48' E, 20.II.1991, leg. C.D. Eardley, 1 ♂, 3 ♀♀; NCP. Little Karoo, Oudtshoorn, 20.XII.1975, leg. H.N. Empey, 1 ♀; NCP. E of Pakhuis, 24.X.1982, leg. T.L. & R.T. Griswold, 4 ♂♂, 1 ♀; UUL. ZISP. Olifant Pass, N of Paterson, 25-26.I.2000, leg. S. Becvar, 1 ♂; OLML. Pearston, 1 ♀ (lectotype of *Ceratina maculiventris*); BMNH. Perdefontein, E. Middelpas, 31°45' S, 20°44' E, 11.XII.1988, leg. C.D. Eardley, 1 ♂, 8 ♀♀; NCP. 67 km E Port Nolloth, 17.X.1972, leg. B.L. Rozen & R. McGinley, 1 ♂; AMNH. 70 km E Port Nolloth, 25-26.XI.1974, leg. J.G. Rozen & B.L. Rozen, 2 ♀♀; AMNH. 81 km SE Port Nolloth, 30.XI.1974, leg. J.G. Rozen & B.L. Rozen, 24 ♂♂, 7 ♀♀; AMNH. ZISP. 86 km SE Port Nolloth, 30.XI.1974, leg. J.G. Rozen & B.L. Rozen, 24 ♂♂, 5 ♀♀; AMNH. ZISP. Prins Alfred Pass, 33°46' S, 23°10' E, 12.II.1990, leg. V.M. Uys, 1 ♀; NCP. 5 km S Putsonderwater, 29°17' S, 21°54' E, 19.II.1991, leg. C.D. Eardley, 1 ♀; NCP. Remhoogte, 4.X.2002, leg. C. Mayer, 1 ♀; KUH. Northern Cape, Soebatsfontein, 30°06' S, 17°34' E, 8-16.I.2002, leg. U. Schmiedel, 1 ♂; KUH. Somerset West, 22.X.1982, leg. T.L. & R.T. Griswold, 4 ♂♂, 3 ♀♀; UUL. ZISP. 40 km SW Springbok, 29°56' S 17°38' E, 29.IX.1997, leg. M. Kuhlmann, 2 ♂♂; KUH. Wadi Buffels, 50 km SW Springbok, 4.XI.1999, 17 ♂♂, 6 ♀♀; 18.X.1999, 8 ♂♂, 2 ♀♀, leg. M. Halada; OLML. 4 mi [ca. 6.4 km] NE Steytlerville, 12.XI.1968, leg. J.G. Rozen & E. Martinez, 1 ♂, 2 ♀♀; AMNH. Stormsvlei, 1.II.1971, leg. M.W. Strydom, 1 ♂; NCP. Touwsriver, 8.XI.1968, leg. J. G. Rozen & E. Martinez, 26 ♀♀; AMNH. ZISP. Uniondale, 16.XI.1966, leg.

J.G. Rozen, 1 ♀; AMNH. Vanrhynsdorp, 20.X.1968, leg. B.L. Rozen & E. Martinez, 3 ♂♂, 1 ♀; AMNH. 16.X.1972, leg. B.L. Rozen and others, 11 ♂♂, 16 ♀♀; AMNH. ZISP. 24 km NW Vanrhynsdorp, 16.X.1972, leg. B.L. Rozen and others, 7 ♂♂, 3 ♀♀; AMNH. 30 km N Vanrhynsdorp, Knersvlakte, 31°22' S, 18°43' E, 146 m, 11.IX.2003, leg. K. Timmermann, 1 ♀; KUH. 40 km NE Vanrhynsdorp, Farm Kalkgat, 31°07' S, 18°55' E, 140 m, 4.X.2003, leg. K. Timmermann, 1 ♀; KUH. Van Rhyns Pass, XI.1931, leg. T.D.A. Cockerell & W. P. Cockerell, 1 ♀; MCZC. Verlorenvlei near Ceres, 33°16' S, 19°43' E, 9.XII.1990, leg. C.D. Eardley, 6 ♂♂, 6 ♀♀; NCP. Orange River, Vloosdrif, 19.X.1999, leg. M. Halada, 1 ♂; OLML. 10 km NW Warmwaterberg, 33°42' S, 20°50' E, 17.XII.1988, leg. C.D. Eardley, 1 ♂; NCP. Whitehill, 26.XI.1931, leg. T.D.A. Cockerell, 1 ♀; MCZC. 5 km E Williston, 18.X.1972, leg. B.L. Rozen and others, 55 ♂♂; AMNH. ZISP. 13 km E Williston, 18.X.1972, leg. B. L. Rozen and others, 6 ♂♂, 63 ♀♀; AMNH. ZISP. 10 mi [ca. 16 km] SW Willowmore, 16.XI.1966, leg. C.D. Michener, 2 ♀♀; UKL. Worcester, 1000 ft. [ca. 305 m], 30.IX and 8.X.1966, leg. C.D. Michener, 11 ♀♀; UKL. ZISP. 5 mi [ca. 8 km] NE Worcester, 11.X.1966, leg. C.D. Michener, 3 ♂♂, 1 ♀; UKL; ibid, leg. J.G. Rozen and others, 48 ♂♂, 9 ♀♀; AMNH. ZISP. 12 mi [ca. 19km] NE Worcester, 11.X.1966, leg. C.D. Michener, 1 ♂; UKL. North West Prov., Wryburg, 14.I.2002, leg. M. Snizek, 2 ♂♂, 1 ♀; OLML. Zwart Kops Gaer Pan, 1 ♀; NMW.

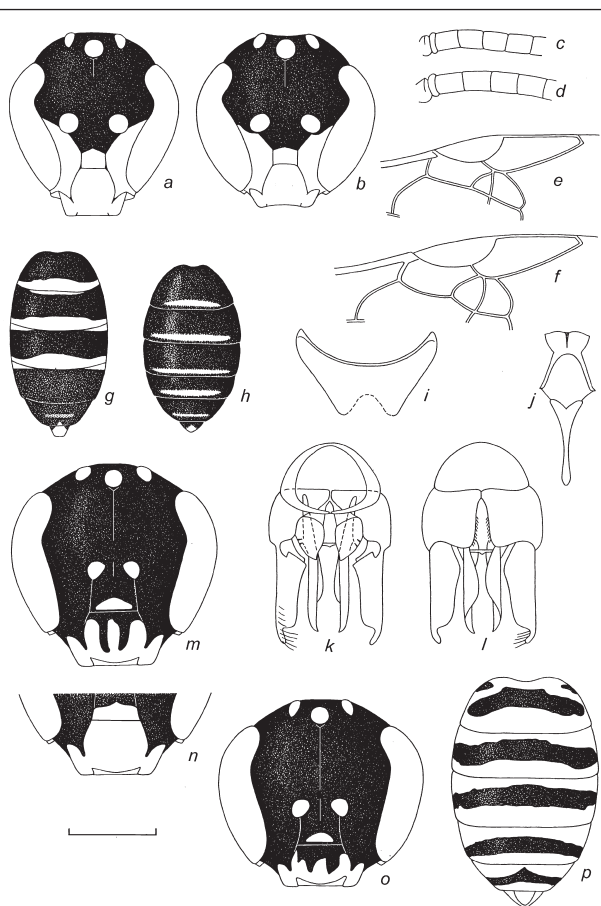
Visited plants. Aizoaceae: *Ruschia grisea* (1 ♂, 1 ♀); *Ruschia indecora* (6 ♂♂, 6 ♀♀). Asteraceae: *Chrysanthemum* sp. (2 ♀♀). Combretaceae: *Terminalia prunioides* (4 ♂♂, 3 ♀♀). Zygophyllaceae: *Zygophyllum simplex* (1 ♂, 4 ♀♀).

Nomioides (Nomioides) micheneri n. sp.

[fig. 30a-30p; Pl. III: 86-87 (total view), VII: 158-159 (head), X: 181 (propodeum), XI: 190 (mesoscutum), XIV: 214 (male genitalia), XIX: 245 (map)]

Diagnosis. In the structure of the genitalia and some other characters of the male, this species is very close to *N. arabicus* Pesenko known from Oman and the United Arabian Emirates. It differs from the latter in the following characters: the body smaller (3.1-3.5 mm *vs.* 4.0-4.2 mm in *N. arabicus*), clypeus without dark pattern, antenna longer (length / diameters ratio of middle flagellomeres 1.3-1.4 *vs.* about 1.0 in *N. arabicus*), genital capsule much smaller (its length about 0.5 mm *vs.* 0.7 in *N. arabicus*), gonoforceps on the ventral side without high U-shaped carina. In females, it is very similar to *N. maculiventris* (Cameron). Main characters for distinguishing them are given in the key above.

Male. Structure. Body length 3.1-3.5 mm. Head roundly triangular (fig. 30a) or roundish (fig. 30b) in frontal view; its height / width ratio 0.95-1.5. Median lobe of clypeus flattened, somewhat higher than wide; clypeus extending 0.4-0.5 of its length below eyes. Malar space linear. Face flattened. Antenna relatively long, nearly reaching middle of propodeum; middle flagellomeres 1.3-1.4 times as long as their diameters (fig. 30c, 30d). Metapostnotum slightly transversely depressed, semicircular; its lateral borders marked only by change in microsculpture; its posterior margin in middle marked by slight transverse carina, sometimes missing. Dorsal surface of propodeum, 1.1-1.2 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°.

**Figure 30**

Nomiooides (Nomiooides) micheneri sp. n.: male (a-l) and female (m-p) a, b, m, and o, head in frontal view; c and d, flagellomeres 1-5 in lateral view; e and f, part of forewing; g, h, and p, metasoma in dorsal view; i, S7; j, S8; k, genital capsule in ventral view; l, genital capsule in dorsal view; o, lower part of head in frontal view.

a, d, e, g, and i-l, holotype; b, c, f, h, and o, male and female paratypes from Madinat (Oman: Muscat); m, n, and p, female paratypes from Mogadi (Kenya).

Scale line: 1 mm for g, h, p; 0.5 mm for a, b, c, d, e, f, m, n, o; 0.25 mm for i, j, k, l.

Apical lobe of S8 relatively short, very narrow, parallel-sided, rounded at apex (fig. 30j). Gonobase semicircular in dorsal view. Gonoforceps wide, provided with thin hairy apical process directed mesad backward (fig. 30k, 30l).

Sculpture. Pale parts of face usually nearly smooth, shiny, in some places slightly shagreened; clypeus sometimes mat throughout. Frons and vertex densely and finely granulate, nearly mat. Mesoscutum slight shiny, with uniform microsculpture being intermediate between obscure granulation and fine, not dense punctation; each granule somewhat smaller than eye facet. Scutellum shinier, only with tracts of granulation. Mes- and metepisterna finely granulate, mat. Metapostnotum mat, with slight, mostly longitudinal wrinkles on finely shagreened surface. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral surfaces of propodeum obscurely finely

granulate, mat; its posterior vertical surface coarsely roughened, mat.

Coloration. Main coloration of head metallic dull greenish black or bronze-greenish black, often with reddish tint; of mesosoma metallic dull olive green; of metasoma dark fuscous or black, without metallic tints. Labrum, clypeus, supraclypeal area, paraocular area in lower part up to level of middle or upper margin of antennal socket (fig. 30a, 30b), mandible (except for reddish apex), malar space, lower sixth of genal areas, scapus, pronotal collar and spiracular lobes, propleura, spot on or most of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, fore and middle femora, all tibiae (except for large brown spot on hind one), all tarsi, pregradular areas of T2-T4 (fig. 30g) or T2-T6 (fig. 30h) seen through translucent posterior areas of preceding terga, usually T6 entirely; all yellow or white yellow. Flagellum yellow on lower side, fuscous on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surfaces of mesosoma. Face between antennal sockets and genal area on upper half covered with rather sparse tomentum; few appressed plumes usually present on margins of mesoscutum. Metapostnotum entirely glabrous.

Female. Structure. Body length usually 3.8-4.2 mm. Head rounded or slightly transversely elliptical in frontal view; its height / width ratio 0.9-0.95. Median lobe of clypeus weakly convex, its height / width ratio 0.7-0.8; clypeus extending 1/2 or 2/3 of its length below eyes (fig. 30m-30o). Malar space linear. Face flattened. Metapostnotum flat, trapezoidal, occupying nearly entire dorsal surface of propodeum, along posterior margin usually with slight, but distinct carina. Dorsal surface of propodeum 1.0-1.05 times as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 100°.

Sculpture. Clypeus smooth on dark parts and submat on pale ones. Frons and vertex densely and finely granulate, mat or silk-mat. Mesoscutum mat, uniformly densely granulate; each granule as large as eye facet. Scutellum twice more finely and twice more densely granulate, mat. Mes- and metepisterna finely granulate, mat. Metapostnotum shiny, reticulate or alveolate granulose. Posterior vertical surface of propodeum granulose roughened, mat.

Coloration. Main coloration of head and mesosoma greenish black, with distinct metallic tint. Dark parts of clypeus and supraclypeal area fuscous, without green metallic tints. Mesoscutum more brightly metallic green, usually with gold-reddish stripes. Labrum, entirely clypeus (fig. 30n) or more often except for trident fuscous pattern (fig. 30m, 30o), roundedly triangular spot on lower part of supraclypeal area, mandible (except for reddish apex), scapus on lower side, pronotal collar and spiracular lobes, anterior half of scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, distal part of fore and middle femora, fore and middle tibiae (except for small fuscous spots), all tarsi (except for large fuscous spot on metabasitarsus), metasoma, except for narrow or wide bands on terga (fig. 30p), all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence white, usual. Genal areas and side of mesosoma covered with rather sparse tomentum; few

appressed plumes usually present on margins of mesoscutum. Metapostnotum entirely glabrous. Metabasitarsal penicillus light yellow.

Variation. A relatively constant species. The variability found in the body coloration and in some other characters is described above.

Distribution. Senegal, Gambia, Mali, Burkina, Faso Niger, Cameroon, Kenya, Tanzania, southern Arabian Peninsula.

Holotype. ♂, Kenya: 8 mi [ca. 13 km] NE Magadi [1°54'S 36°17'E], 2500 ft. [ca. 762 m], 16.VI.1967, leg. C.D. Michener; UKL.

Paratypes (294 specimens). *Egypt*: Sinai, W Suor, 3.V.1993, leg. A. Mochi, 1 ♂; ZISP.

Senegal: near N'Djerba, 8.X.1978, leg. G. Hevel & J. Fortin, 1 ♀; NMNH. 5 km SW Thiès, 8.VII.1991, leg. W.J. Pulawski, 3 ♂♂, 1 ♀; CAS, ZISP. Tiougoune, 2.VIII.1979, leg. A. Pauly, 1 ♂; FUSAG. Fété-Olé, Ferlo, 23.IX.1971, leg. Gillon, 4 ♂♂; MNHN.

Gambia: Bakau, Cape St., 5.XI.1977, leg. Cederholm and others, 1 ♂; ZML. Banjul, 19.XI.1983, leg. K.M. Guichard, 3 ♂♂; BMNH.

Mali: 10 km S Mopti, 20.VIII.1991, leg. M. Schwarz, 2 ♀♀; SCH. 40 km W Mopti, 9.VIII.1991, leg. M. Schwarz, 4 ♀♀; SCH, ZISP. 70 km SW Mopti, 21.VIII.1991, leg. M. Schwarz, 1 ♀; SCH. 130 km NE Mopti, 19.VIII.1991, leg. M. Schwarz, 1 ♂; SCH. 30 km S San, 5.VIII.1991, leg. M. Schwarz, 17 ♂♂, 3 ♀♀; SCH, ZISP; *ibid*, leg. W. J. Pulawski, 1 ♂; CAS. 60 km NE San, 21.VIII.1991, leg. M. Schwarz, 3 ♂♂, 2 ♀♀; SCH. 100 km NE San, 6.VIII.1991, leg. M. Schwarz, 1 ♂; SCH. 40 km SW Segou, 31.VII.1991, leg. M. Schwarz, 1 ♂; SCH. 60 km SW Segou, 1.VIII.1991, leg. M. Schwarz, 2 ♂♂; SCH. 50 km N Bamako, 30.VII.1991, leg. M. Schwarz, 1 ♀; SCH.

Burkina Faso: Kougny, 20 and 22.II.1980, leg. A. Pauly, 112 ♂♂, 13 ♀♀; FUSAG, ZISP. Bobo-Dioulasso, 10.X.1979, 1 ♀, 22.II.1980, leg. A. Pauly, 1 ♀; FUSAG. Volta Noire River, 5 km E Boromo, 18.X.1979, leg. A. Pauly, 1 ♀; FUSAG. Kanchari, 10.XI.1979, leg. A. Pauly, 5 ♀♀; FUSAG, ZISP.

Niger: 25 km S Tahoua, 14°45' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 12 ♂♂, 1 ♀; FUSAG, ZISP. Badéguichéry, 14°31' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 3 ♂♂, 2 ♀♀; FUSAG, ZISP. Moujia, 14°22' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 7 ♂♂, 5 ♀♀; FUSAG, ZISP. Aguié, 13°31' N, 7°46' E, 11.VIII.1987, leg. A. Pauly, 2 ♂♂, 1 ♀; FUSAG. Guidam-Roumji, 13°41' N, 6°42' E, 12.VIII.1987, marsh, leg. A. Pauly, 1 ♀; FUSAG. Tsernaoua, 13°53' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 6 ♀♀; FUSAG.

Cameroon: Magdémé, 11°09' N, 14°16' E, 5.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG.

Kenya: 8 mi [ca. 13 km] NE Magadi, 2500 ft. [ca. 762 m], 16.VI.1967, leg. C.D. Michener, 1 ♂, 9 ♀♀; UKL, ZISP. Rift Valley Province, Olorgesailie, 3300 ft. [ca. 1005 m], 18.XI.1969, leg. M.E. Irwin & E.S. Ross, 1 ♀; CAS; Olorgesailie, 1°34' S, 36°27' E, 19.VII.1999, leg. W.J. Pulawski & J.S. Schweikert, 1 ♂; CAS. Rift Valley Province, Mpala Research Station, 48 km NW Nanviki, 0°17' N, 36°54' E, 18.VI.1999, leg. J.S. Schweikert, 1 ♂; CAS. Rift Valley Province, Magadi road, 46 air km SW Nairobi, 1°34' S, 36°27' E, 29.XI.2002, leg. W.J. Pulawski, 2 ♂♂; CAS. 10 mi [ca. 16 km] N Laisamis, 1750 ft. [ca. 533 m], 11.XII.1969, leg. M.E. Irwin & E.S. Ross, 2 ♀♀; CAS, ZISP. Masai Amboseli Reserve, 15 mi [ca. 24 km]

E Namanga, 3800 ft. [ca. 1158 m], 10.I.1970, leg. M.E. Irwin & E.S. Ross, 1 ♀; CAS. Vooi, Tsavo, 23.III-3.IV.1997, leg. M. Halada, 4 ♂♂; OLML.

Tanzania: Tanga Region, 2 km NE Mkomazi, 4°38' S, 38°05' E, 29-31.XII.2002, leg. M.A. Prentice, 2 ♂♂; CAS.

United Arabian Emirates: Margham, 18.IV.1986, leg. I.L. Hamer, 2 ♂♂; BAK, ZISP.

Oman: Rayy, 18.IV.1986, leg. I.L. Hamer, 1 ♂; BAK. Muscat, Madinat, Qaboos, 28.II.1986, leg. T. Huber, 1 ♂, 1 ♀; UUL. Muscat-Quriat road, wadi, 70 m, 23°32' N, 58°31' E, 17.XII.2003, leg. M. Kuhlmann, 3 ♂♂; KUH. Wadi Ghul, S of Nizwa, 22°53' N, 57°31' E, 500 m, 10-16.XII.2003, leg. M. Kuhlmann, 4 ♂♂, 1 ♀; KUH. Batinah, Seeb Airport, 23°36' N, 58°19' E, 11.IV.2001, leg. F. Strumia & P.L. Scaramozzino, 3 ♀♀; MSNP. Oman: Dhofar, Rd 10 verso Al Hayal, wadi, 23°27'48N 57°05'64E, 10.VI.2001, leg. P.L. Scaramozzino, 2 ♂♂; MSNP. Dhofar, Rd 47 per Sarfait, 1747 ft. [ca. 532 m], 16°45' N, 53°14' E, 28.VIII.2000, leg. M. Generari & P.L. Scaramozzino, 1 ♂; MSNP.

Yemen: 12 km NW Manakhah, 3.VII-21.VIII.2001, 6 ♂♂, 11 ♀♀; 15.IX-22.X.2003, 2 ♂♂, 3 ♀♀, leg. A. von Harten; RNHL; 27.III-5.V.2002, 7 ♂♂, 3 ♀♀; 6.VII-21.VIII.2002, 2 ♂♂, 1 ♀; 21.VIII-29.X.2002, 3 ♂♂, A. von Harten; ZMA. Lahj, IX.2000, 1 ♀; XI.2000, 2 ♂♂; iv.2001, 1 ♂; V.2001, 1 ♂; III-V.2002, 1 ♂, leg. A. von Harten & A. Sallam; RNHL. Al Kadan, 17.II-31.III.1998, leg. A. von Harten & H.M. Naser, 1 ♀; ZMA. Al Lahima, 1.I.2001-9.IV.2001, 1 ♀; 5.VI-24.VII.2001, 1 ♂, leg. A. von Harten & A.M. Hajer; ZMA. Jebel Jinaf, 7000ft [ca. 2133 m], 7-12.X.1937, leg. H. Scott & E. Britton, 1 ♀; ZISP.

Visited plants. Asteraceae (1 ♀). Balanitaceae: *Balanites aegyptiaca* (48 ♂♂, 7 ♀♀). Boraginaceae (11 ♂♂, 2 ♀♀). Caesalpiniaceae: *Cassia obovata* (3 ♂♂, 1 ♀), *Cassia* sp. (2 ♂♂, 1 ♀). Combretaceae: *Guiera senegalensis* (1 ♀). Fabaceae: *Indigofera* sp. (1 ♀). Mimosaceae: *Acacia tortilis* var. *raddiana* (64 ♂♂, 6 ♀♀). Pedaliaceae: *Sesamum* sp. (6 ♀♀). Rhamnaceae: *Ziziphus* sp. (7 ♂♂, 5 ♀♀). Sterculiaceae (1 ♂).

Etymology. This species is named after Charles D. Michener (Lawrence, Kansas, USA), a collector of the holotype and some paratypes from Kenya.

Nomioides (Nomioides) minutissimus (Rossi 1790)

Nomioides (Nomioides) minutissimus maurus Blüthgen 1925

[fig. 31a-31j; Pl. IV: 88-89 (total view), 103 (mesosoma), VI: 140-141 (head), X: 186 (mesoscutum), XIV: 219 (male genitalia), XIX: 246 (map)]

Nomioides maura Blüthgen 1925: 14, ♀, ♂. Lectotype (designated by Pesenko 1983: 135): ♀, "Amismiz, Atlas [Morocco] [31°13'N 8°15'W], [leg.] M. Escalera"; MNHUB.

Nomioides campanulae Cockerell 1931: 206, ♀, ♂. Syntypes: "Morocco: Ifrane [33°31'N 5°10'W], 29-31.VIII, at flowers of *Campanula*, [leg.] W. P. Cockerell"; BMNH, MCZC (1 ♂ examined). Synonymised by Blüthgen (1933c: 63; 1934: 242).

Nomioides senecionis Cockerell 1931: 208, ♀, ♂. Holotype: ♀, "Mogador [Morocco] [31°30'N 9°46'W], in a sandy place by the sea, at flowers of *Senecio*, [leg. T. D. A.] Cockerell"; BMNH. **Syn. n.**

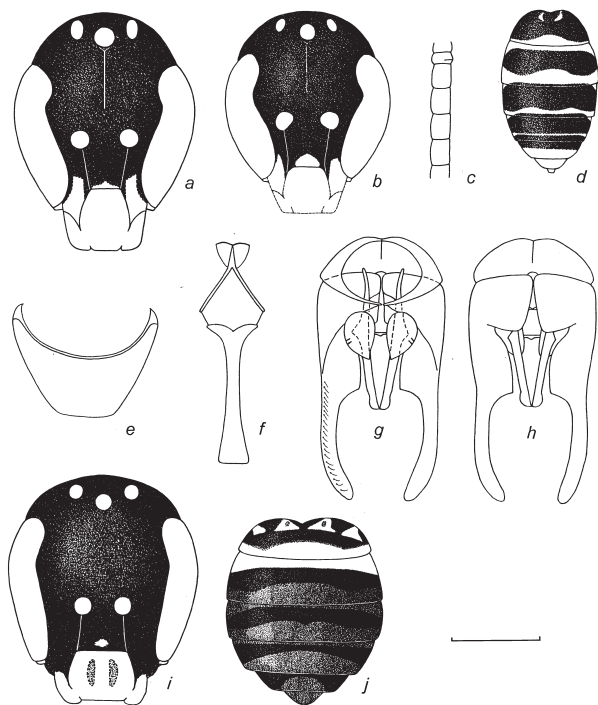


Figure 31
Nomiooides (Nomiooides) minutissimus maurus Blüthgen 1925: male (a–h) and female (i and j)
a, b, and i, head in frontal view; c, flagellomeres 1–5 in lateral view; d and j, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view.
a, paralectotype; b–h, and j, male and female from Ounara (Morocco); i, lectotype.
Scale line: 1 mm for d, j; 0.5 mm for a, b, c, i, j; 0.25 mm for e, f, g, h.

Nomiooides maura var. *tingitana* Blüthgen 1933c: 63, ♀. Holotype: ♀, “Tanger [Morocco] [35°47′N 5°48′W], 4.VII.1932”, [leg. A. Nadig]; “coll. A. Nadig, jun. in Chur, Switzerland”. **Syn. n.**

Nomiooides minutissimus f. *maurus*: Pesenko 1983: 137.

Taxonomy. Blüthgen 1934a: 242. Pesenko 1983: 137 (*N. minutissimus* f. *maurus*).

Diagnosis. From the nominotypical subspecies of *N. minutissimus* (Rossi) occurring in steppes and semi-deserts of Europe and Asia, the northwestern African *N. minutissimus* ssp. *maurus* differs in the following characters. The head and metasoma (fig. 31d, 31j) are darker in both the sexes than in usual in the Eurasian subspecies; the paraocular area of males are yellow on the lower part (fig. 31a, 31b; usually dark in spp. *minutissimus*); the male gonoforceps are parallel-sided in the distal half (fig. 31g, 31h; those always triangularly broadened at distal end in spp. *minutissimus*). The subspecific status of the taxon “*N. maurus*” is corroborated by the availability of intermediate forms (all of five individuals from Tunisia; see “African material examined”) between it and typical *N. minutissimus* in the body coloration and the structure of the male gonoforceps; these intermediate individuals have also more developed malar areas (about 0.25 width of the mandible at base).

Variation. In females from Morocco, the coloration of the scutellum varies from nearly yellow throughout (only with small dark lateral spot and narrow dark band along its posterior margin) to nearly all dark (only with small yellow lateral spots).

Distribution. Northwestern Africa. The nominotypical subspecies of *N. minutissimus* is distributed in Southern Europe (to Austria, Poland, and Udmurtia in the north), in the steppes of Asia as far in the east as Mongolia, northern China and northern India.

Records from Africa. Saunders 1908: 221 (*N. pulchellus*; Algeria: Médéa, Biskra). Blüthgen 1925: 14 (Morocco: Amismiz). Cockerell 1931: 207 (*N. campanulae*; Morocco: Ifrane). Cockerell 1931: 208 (*N. senecionis*; Morocco: Mogador). Blüthgen 1933c: 63 (*N. maura* var. *tingitana*; Morocco: Tanger). Blüthgen 1934a: 242 (*N. maura* var. *tingitana*; Morocco: Tanger).

African material examined (79 specimens; part of them labelled as “*Nomiooides minutissimus*” by Pesenko in 1985–1989). **Morocco:** High Atlas, Amismiz, leg. Escalera, 1 ♀ (lectotype), 1 ♂ (paralectotype); MNHUB. High Atlas, Archbalou, 1 ♀; GUS. Ifrane, 29.VIII, leg. W.P. Cockerell, 1 ♂ (syntype of *N. campanulae*); MCZC. Ounara, 250 m, 22.V.1983, leg. K. Guichard, 13 ♂♂, 14 ♀♀, BMNH, ZISP. Asilah Strand, leg. J. Gusenleitner, 1 ♂, 2 ♀♀; GUS. Pont Qued, Koriffa, 16.VI.1927, leg. Zaers, 4 ♂♂; MNHNP. De Zarjouška à Latache, 1901, leg. G. Buchet, 2 ♀♀; MNHNP. 5 km S Taroudant, 2.IV.1983, leg. M. Edwards, 2 ♀♀; BMNH, ZISP. 30 km E Midelt, 13.V.1995, leg. M. Halada, 2 ♂♂, 2 ♀♀; SCH. Talmest, 10.V.1995, leg. M. Halada, 1 ♂; SCH. Talmest, 10.V.1995, leg. M. Halada, 1 ♀; OLML. Essauira, 9.V.1995, leg. M. Halada, 1 ♀, OLML. El Jadida, Sidi Mhemed ou Said, 33°27′ N, 8°03′ W, 2 m, 2.VI.1994, leg. M. Terzo, 1 ♀; UMH. Nador, Oulad Youssef el Kbir, 35°05′ N, 2°28′ W, 50 m, 24.V.1994, leg. R. Wahis and others, 6 ♂♂, 5 ♀♀; UMH. 30 km N. Bouafia, 19.V.1995, leg. M. Halada, 1 ♀; SCH.

Algeria: Ghardaia, V.1942, 1 ♂; MNHNP.

Tunisia: Djerba Island, 14 km SE Houmt Souk, 33°50′ N, 11°00′ E, 7.V.1992, leg. M. Schwarz, 1 ♂; ZISP. Djerba Island, 10 km SE Matmata, 33°30′ N, 10°04′ E, 9.V.1992, leg. M. Schwarz, 1 ♀; ZISP. Djerba Island, 30 km SW Sfax, 18.IV.1981, leg. M. Schwarz, 1 ♀; ZISP. Gabes, 17.IV.1981, leg. J. Gusenleitner, 1 ♀; GUS. Kairouan, 30.VI.1909, 1 ♂; MNHNP. Thélepte, 14.IV.1998, leg. K. Denes, 1 ♂; OLML.

Visited plants. Asteraceae: *Senecio* sp. (2 ♂♂, 1 ♀). Campanulaceae: *Campanula* sp. (1 ♂, 1 ♀). Caryophyllaceae: *Herniaria fontanesi* ssp. *fontanesi* (1 ♂, 5 ♀♀). Frankeniaceae: *Frankenia laevis* ssp. *velutina* (1 ♀).

Nomiooides (Nomiooides) mucoreus Blüthgen 1933

[fig. 32; Pl. II: 69 (total view), VII: 150 (head), XIX: 247 (map)]

Nomiooides mucorea Blüthgen 1933a: 115, 124 (key), fig. 3, ♀. Holotype: ♀, “Cyrenaica, R. U. Agraria, 9523, [leg.] Geo C. Krüger, 20.V.1925”, “S.-W. Cyrenaica, Agedabia [Libya] [30°46′N 20°14′E]”, MNHUB (examined).

Taxonomy. Pesenko 1983: 125 (key to females), 159, fig. 190.

Female. Structure. Body length 4.2 mm (4.0–4.5 mm according Blüthgen 1933a: 115). Head transversely elliptical in frontal view; its height / width ratio 0.8. Median lobe of clypeus flat, its height / width ratio 0.6; clypeus extending nearly half of its

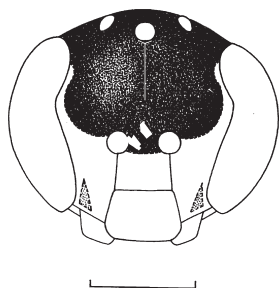


Figure 32
Nomioioides (Nomioioides) mucoreus Blüthgen 1933: female (holotype)
Head in frontal view. Scale line: 0,5 mm.

length below eyes (fig. 32). Malar space linear. Face flattened. Dorsal surface of propodeum almost as long as scutellum.

Sculpture. Pale surfaces of head and mesosoma silk-mat, very finely and densely granulate; clypeus and supraclypeal area, in addition, sparsely punctate. Frons and vertex densely and finely granulate, mat. Metapostnotum uniformly densely and very finely granulate, mat.

Coloration. Dark surface of head and mesosoma black, without metallic tints; except for mesoscutum having slight metallic bronze tint. Lower half of face (except for small light fuscous triangular lateral spots on lower part of paraocular area) in middle reaching level of lower margin of antennal socket and narrowed upward to upper margin of eye (fig. 32), mandible, lower third of genal area and narrow stripe along posterior margin of eye, scapus (except for narrow fuscous longitudinal stripe on upper side), prothorax, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs, metasoma, except for narrow fuscous band on T1; all light yellow. Wing membrane hyaline; veins and pterostigma light yellow. Posterior areas of terga translucent.

Vestiture. All dark surfaces of head and mesosoma covered with very dense whitish tomentum (appressed plumes) masking microsculpture of integument, except for narrow triangular glabrous area on metapostnotum, behind its anterior margin.

Male. Unknown.

Distribution. The species is known only by the type series (2 ♀♀) from Libya.

Nomioioides (Nomioioides) ornatus Pesenko 1983

[fig. 33a-33k; Pl. II: 71 (total view), VI: 142 (head), XIX: 248 (map)]

Nomioioides (Nomioioides) ornatus Pesenko 1983: 124 (key to females), 127 (key to males), 150, fig. 184, 226, 287-290, ♀, ♂. Holotype: ♀, "Turkmenia, Dzhebel [39°38'N 54°14'E], 21.VII.1934, [leg.] V. Popov" [label in Russian]; ZISP.

Diagnosis. This species is closest to *N. subornatus* Pesenko occurring in southern Kazakhstan and central Uzbekistan. Differences between these species are listed by Pesenko (1983: 150). Among the African species, *N. ornatus* is very similar to *N. deceptor* ssp. *deceptor* in its appearance, especially of females.

N. ornatus differs from the latter mostly in the much shinier mesoscutum.

Male. Structure. Body length 2.7-3.0 mm. Head egg-shaped in frontal view; its height / width ratio 1.05-1.25. Median lobe of clypeus flattened, 1.05-1.2 times as high as wide; clypeus extending half of its length below eyes (fig. 33a, 33b). Malar space linear. Face transversely depressed at level of antennal sockets. Antenna short, nearly reaching scutellum; middle flagellomeres as long as their diameters (fig. 33c). Metapostnotum nearly flat, semicircular; its lateral borders marked by change in microsculpture and appearance of pubescence. Dorsal surface of propodeum 1.1-1.2 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 slender, triangularly broadened in distal third, truncate at apex (fig. 33g). Gonobase semicircular in dorsal view. Gonoforceps slender, narrowed in distal half, somewhat broadened before distal end and curved mesad, narrowly rounded at apex (fig. 33h, 33i).

Sculpture. Pale part of face usually nearly smooth, with few fine punctures, shiny. Frons and vertex obscurely granulate, slight shiny or silk-mat. Mesoscutum and scutellum shiny, sparsely and finely punctate. Mes- and metepisterna finely densely granulate, mat. Metapostnotum mat, finely densely granulate, with indistinct short striae behind anterior margin. Dorsal surface of propodeum mat on border with its posterior vertical surface; lateral surfaces of propodeum very obscurely and finely punctate, shiny.

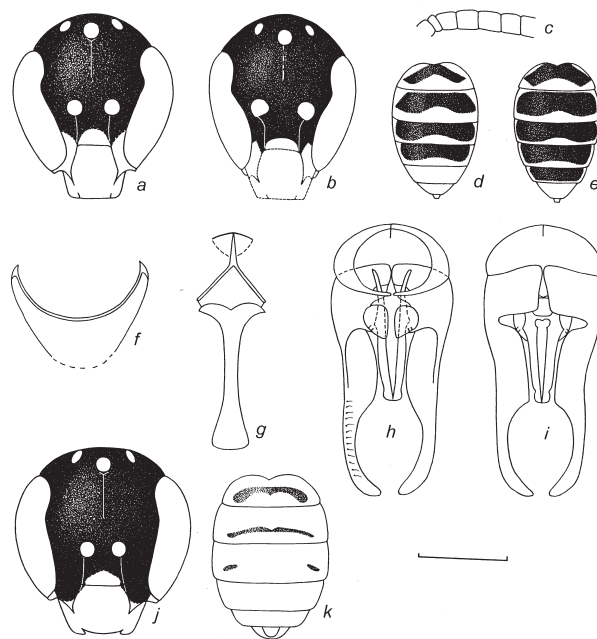


Figure 33
Nomioioides (Nomioioides) ornatus Pesenko 1983: male (a-i) and female (j and k)

a, b, and j, head in frontal view; c, flagellomeres 1-5 in lateral view; d, e, and k, metasoma in dorsal view; f, S7; g, S8; h, genital capsule in ventral view; i, genital capsule in dorsal view.

a, paratype from Tajikistan; b-i, males from Tahoua (Niger); j and k, holotype.

Scale line: 1 mm for d, e, k; 0,5 mm for a, b, c, j; 0,25 mm for f, g, h, i.

Coloration. Main coloration of head and mesosoma (including scutellum) light dull metallic green, mesoscutum black with yellow tint; metasoma fuscous to black without metallic tints. Labrum, clypeus, supraclypeal area on lower half, paraocular area in lower part to level of middle of supraclypeal area (fig. 33a, 33b), mandible (except for reddish apex), malar space, pronotal collar and spiracular lobes, band along posterior margin of scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for fuscous hind trochanter and most part of hind femur), and rich pattern on metasoma (fig. 33d, 33e), all white-yellow. Flagellum yellow on lower side, yellow to fuscous yellow on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Head and mesosoma covered with relatively dense erect or inclined white plumose hairs, especially long on lower half of genal area, metanotum, lateral and ventral surfaces of mesosoma. Lower half of face, upper half of genal area, mesoscutum (mostly on anterior third and along margin), mes- and metepisterna covered with rather sparse tomentum (appressed plumes). Metapostnotum glabrous entirely.

Female. Structure. Body length 3.0–3.4 mm. Head egg-shaped in frontal view; its height / width ratio 1.05–1.1. Median lobe of clypeus convex, its height / width ratio 0.8; clypeus extending two thirds of its length below eyes (fig. 33j). Malar space linear. Face flattened. Metapostnotum slightly concave, semicircular, occupying only part of dorsal surface of propodeum, its borders marked by distinct change in microsculpture and appearance of pubescence. Dorsal surface of propodeum nearly 0.9–1.0 times as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 100°.

Sculpture. Clypeus polished, with few shallow pits. Pale part of supraclypeal area polished. Microsculpture of frons, scutellum, and sides of mesosoma similar to that of male. Mesoscutum silk-mat to slight shiny, uniformly densely punctate. Metapostnotum densely striate on indistinctly granulate background. Posterior vertical surface of propodeum obscurely granulate, slightly shiny.

Coloration. Main coloration of head and mesosoma dark fuscous to black, with distinct metallic green tint. Dark part of supraclypeal area, genal area on lower half, and prothorax without metallic tints. Mesoscutum brighter metallic green, with goldish or reddish tint. Labrum, clypeus, triangular spot on supraclypeal area (fig. 33j), mandible (except for reddish apex), small spot at lower margin of paraocular area, antenna, pronotal collar and spiracular lobes, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs usually throughout, metasoma, except for narrow fuscous bands on T1 and T2 and interrupted band or lateral spots on T4 (fig. 33k); all yellow. Wing membrane hyaline; veins and pterostigma light yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence white, usual. Dark surfaces head and mesosoma (except for glabrous metapostnotum) covered with white tomentum, on mesoscutum mostly on anterior third and along margins. Appressed plumes especially dense on upper half of genal area and sides of mesosoma. Metabasitarsal penicillus light yellow.

Distribution. Egypt, Niger, Burkina Faso, Niger, Chad, Israel, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, northwestern China.

Records from Africa. Pesenko 1983: 150 (Egypt: Fayed).

African material examined (19 specimens). *Egypt*: Fayed, V.1943, leg. Priesner, 1 ♂ (paratype); ZISP.

Niger: 20 km S Tahoua, 14°25' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 7 ♂♂, 7 ♀♀; FUSAG, ZISP. Guidan-Roumji, 13°41' N, 6°42' E, 12.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG.

Burkina Faso: Kougny, 20.II.1980, leg. A. Pauly, 2 ♀♀; FUSAG.

Chad: Zouarké, Enneri, 20°25' N, 16°05' E, 1.IV.1953, leg. K.M. Guichard, 1 ♂; BMNH.

Visited plants (in Africa). Boraginaceae (7 ♂♂, 7 ♀♀). Caesalpiniaceae: *Cassia obovata* (1 ♀). Mimosaceae: *Acacia tortilis* (2 ♀♀).

Nomioides (Nomioides) paulyi Pesenko, n. sp.

[fig. 34a–34k; Pl. II: 70 (total view), VII: 151 (head), VIII: 171 (propodeum), XIX: 249 (map)]

Diagnosis. Differences of this species from the close *N. facilis* (Smith), *N. griswoldi* n. sp., *N. maculiventris* (Cameron), and *N. micheneri* n. sp. are given in the key above. In the structure of the male terminalia, it is similar to *N. hybridus* Blüthgen known from Uzbekistan and Tajikistan. *N. paulyi* differs from the latter in the following characters: the head shorter (height / width ratio 0.9 in the male and 0.8 in the female *vs.* about 1.0

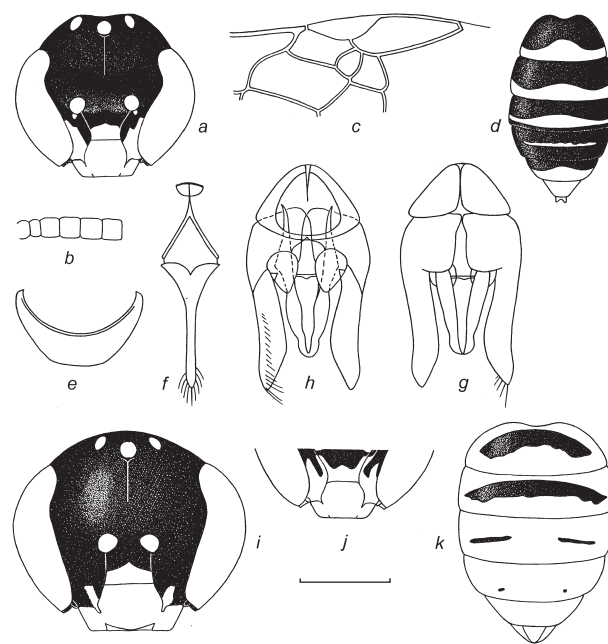


Figure 34
Nomioides (Nomioides) paulyi Pesenko, sp. n.: male (a–h) and female (i–k)

a and i, head in frontal view; b, flagellomeres 1–5 in lateral view; c, part of forewing; d and k, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in dorsal view; h, genital capsule in ventral view; j, lower part of head in frontal view.

a, c, e–k, male and female paratypes; b and d, holotype.

Scale line: 1 mm for d, k; 0.5 mm for a, b, c, i, j; 0.25 mm for e, f, g, h.

in both the sexes of *N. hybridus*), paraocular area of both the sexes with yellow pattern (absent in *N. hybridus*), scutellum of the female mat (shiny in *N. hybridus*), metapostnotum of the female granulate throughout (reticulate rugulose in *N. hybridus*). In its appearance, the female of *N. paulyi* is similar to *N. elbanus* Blüthgen, differing from the latter in somewhat smaller body (3.9–4.0 mm *vs.* 4.0–4.2 mm in *N. elbanus*), transverse elliptical head (it is triangularly rounded in *N. elbanus*) and much less developed tomentose pubescence.

Male. Structure. Body length 3.3 (in paratype) to 3.4 (in holotype) mm. Head transversely elliptical in frontal view; its height / width ratio 0.9 (fig. 34a). Median lobe of clypeus flattened, 0.85 as high as wide; clypeus extending a fourth of its length below eyes. Malar space linear. Face transversely depressed at level of antennal sockets. Vertex shallowly emarginate (in frontal view of head, fig. 34a). Antenna short, reaching only scutellum; middle flagellomeres as long as their diameters (fig. 34b). Metapostnotum nearly flat, trapezoidal; its lateral borders marked by slight change in microsculpture, occupying entire dorsal surface of propodeum. Dorsal surface of propodeum as long as scutellum, passing onto posterior vertical surface at narrowly rounded angle of 110°. Apical lobe of S8 long, narrow, nearly parallel-sided, with very slight elongate club in distal part, rounded at apex (fig. 34f). Gonobase roundly triangular in dorsal view. Gonoforceps relatively wide, nearly parallel-sided, narrowed in distal fourth, pointed at apex (fig. 34g, 34h).

Sculpture. Pale part of face finely obscurely shagreened, shiny. Frons densely and finely granulate, mat (in holotype) or silk-mat (in paratype). Vertex shagreened, with indistinct granulation, slight shiny. Mesoscutum densely granulate, silk-mat. Scutellum shiny, polished nearly throughout, with few punctures. Mes- and metepisterna finely and very densely granulate, mat. Metapostnotum slightly shiny, finely shallowly granulate, with short striae before anterior margin. Dorsal surface of propodeum mat on border with its posterior vertical surface. Lateral and posterior vertical surfaces of propodeum obscurely finely granulate, slightly shiny.

Coloration. Main coloration of head and mesosoma dull metallic blue-greenish; of metasoma, dark fuscous, without metallic tints. Labrum, clypeus, lower half of supraclypeal area, paraocular area on lower part to level of lower margin of antennal socket (fig. 34a), mandible, malar space, scapus on lower side, lateral thirds of pronotal collar, spiracular lobes, basal sclerites of wings, legs (except for fuscous hind coxa and femur), pregradular areas of T2–T5 seen through translucent posterior areas of preceding terga, T6 entirely (fig. 34d); all yellow. Flagellum ochre-yellow on lower side, dark fuscous on upper side. Tegula slightly fuscous hyaline. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Erect pubescence white, usual. Sparse tomentum (appressed plumes) present on lower half of face, on upper half of genal area and on sides of mesosoma.

Female. Structure. Body length usually 3.9–4.0 mm. Head transversely elliptical in frontal view; its height / width ratio 0.8. Median lobe of clypeus flat, its height / width ratio 0.6–0.7; clypeus extending nearly half of its length below eyes (fig. 34i). Malar space linear. Face slightly convex. Borders of metapostnotum not marked laterally by distinct change in microsculpture. Dorsal surface of propodeum flat, 0.7–0.8 times as long as scutellum, passing onto its posterior vertical surface at distinct angle of about 100°.

Sculpture. Pale surfaces of head and mesosoma mat, very finely and densely granulate roughened. Frons densely and finely granulate, silk-mat. Vertex more obscurely granulate, slightly shiny. Mesoscutum silk-mat, uniformly densely granulate; each granule smaller than eye facet. Mes-, metepisterna and lateral surfaces of propodeum finely and densely granulate, mat. Dorsal surface of propodeum coarsely granulate, mat, with traces of reticulation. Posterior vertical surface of propodeum granulose roughened, slight shiny.

Coloration. Main coloration of head and mesosoma black, with distinct bronze-green metallic tint. Mesoscutum brighter metallic bronze-green. Labrum, clypeus entirely, small spot on lower part of supraclypeal areas (fig. 34i), mandible (except for orange apex), scapus on lower side, pronotal collar and spiracular lobes, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for dark fuscous hind trochanter and femur), metasoma, except for wide dark fuscous bands on T1 and T2, narrow interrupted band on T3 and small lateral spots on T4 (fig. 34k); all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Erect pubescence white, usual. Upper half of genal area and sides of mesosoma covered with rather sparse tomentum. Few appressed plumes also present on face and mesoscutum along its margins. Metapostnotum entirely glabrous. Metabasitarsal penicillus light yellow.

Distribution. Algeria, Tunisia.

Holotype: ♂, "Algeria: Hoggar, 60 km of road Tamanrasset-Assekrem, near Afilale [23°00'N 5°45'E], 19.VIII.1987, on yellow Apiaceae no. 392, A. Pauly rec."; FUSAG.

Paratypes (12 specimens): *Algeria:* Same label as holotype, 1 ♂, 3 ♀♀; FUSAG, ZISP.

Tunisia: 25 km S Zarsis [Zarzi], 13.IV.2001, leg. M. Halada, 1 ♀; OLML. Tataouine, 11.IV.2001, leg. M. Halada, 1 ♀; OLML. Ksar Hadada [Ksar Haddada between Medenine and Tataouine, 33°05' N, 10°19' E], 4–5.IV.1998, leg. K. Denes, jr., 6 ♀♀; OLML, FUSAG.

Visited plants. Apiaceae (2 ♂♂, 3 ♀♀).

Etymology. This species is named by Pesenko in 1988 (in lit.) after Alain Pauly (Brussels, Belgium), a collector of the holotype.

Nomioioides (Nomioioides) rotundiceps Handlirsch 1888

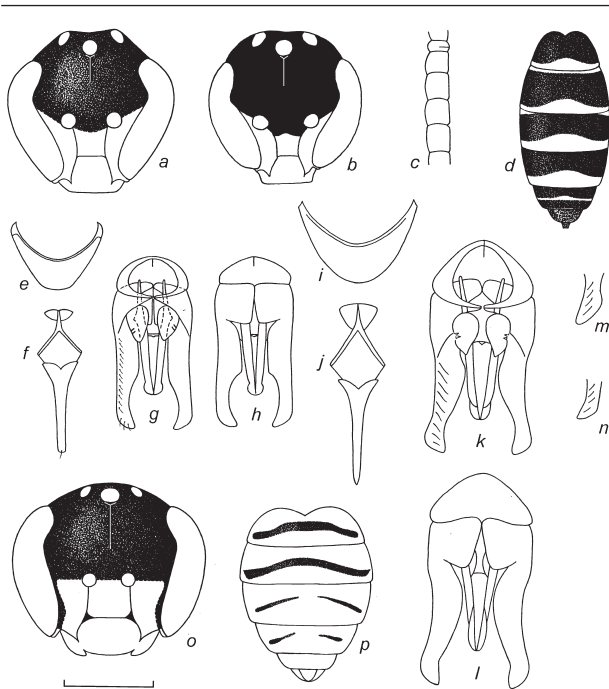
[fig. 35a–35p; Pl. IV: 92–93 (total view), VII: 144–145 (head), VIII: 170 (propodeum), XIV: 216 (male genitalia), XX: 250 (map)]

Nomioioides rotundiceps Handlirsch 1888: 405, fig. 3, ♀. Syntypes: 3 ♀♀, "Egypte, Cairo [30°03'N 31°15'E]"; lost (personal communication by Dr. M. Fischer, the curator of entomological collection at NMW, of 10 June 1976).

Nomioioides rotundiceps var. *viridana* Blüthgen 1925: 31, ♀ (no indication of type material). Synonymised by Pesenko (1983: 160).

Nomioioides persica Blüthgen 1933a: 124 (key to females), 125 (key to males), ♀, ♂. Lectotype (designated by Pesenko 1983: 160): ♀, "Bampur-Kaskin, SW Persia [Iran], VIII.1898, [leg.] Zarudny [27°11'N 60°27'E]" [label in Russian] ZISP. Synonymised by Pesenko (1983: 160).

Taxonomy. Dębski 1917: 30, 32, 35 (♂ nov.). Alfken 1924: 250. Blüthgen 1925: 29. Blüthgen 1933a: 124 (key), fig. 8. Blüthgen 1934a: 246, 273, fig.

**Figure 35**

Nomioides (Nomioides) rotundiceps Handlirsch 1888: male (a-n) and female (o and p)

a, b, and o, head in frontal view; c, flagellomeres 1-5 in lateral view; d and p, metasoma in dorsal view; e and i, S7; f and j, S8; g and k, genital capsule in ventral view; h and l, genital capsule in dorsal view; m and n, distal part of left gonoforceps in ventral view.

a, male from El Salf (Egypt); b, paralectotype of *Nomioides persica* Blüthgen; c and d, male from Koungny (Burkina Faso); e-h, male from Maasaran (Egypt); i-n, males from N'Dierba (Senegal); o, female from Helouan (Egypt); p, female from Abalak (Niger).

Scale line: 1 mm for d, p; 0.5 mm for a, b, c, o; 0.25 mm for e, f, g, h, i, j, k, l, m, n.

16, 18, 20. Pesenko 1983: 124 (key to females), 127 (key to males), 160, fig. 191, 192, 231, 232, 303-306.

Diagnosis. In the form of the head and in the body sculpture, coloration and pubescence, this is similar to *N. kenyensis* n. sp. (known only in the male). Major differences between males of these species are given in the key above.

Male. Structure. Body length 2.7-3.8 mm. Head nearly rounded in frontal view, about as high as wide. Median lobe of clypeus slightly convex, somewhat wider than high; clypeus extending a third of its length below eyes (fig. 35a, 35b). Malar space linear. Face flattened. Antenna short, reaching only posterior third of mesoscutum; middle flagellomeres about as long as their diameters (fig. 35c). Metapostnotum nearly flat, with an elevated anterior margin, semicircular; its lateral borders marked only by change in microsculpture. Dorsal surface of propodeum 1.2 times as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 relatively short, very narrow, parallel-sided, narrowly rounded at apex (fig. 35f-35j). Gonobase nearly triangular in dorsal view. Gonoforceps relatively wide, somewhat narrowed in distal half, but before distal end triangularly broadened, narrowly rounded or nearly pointed at apex (fig. 35g, 35h, 35k-

35n).

Sculpture. Pale parts of face finely punctate, shiny. Frons, vertex and sides of mesosoma uniformly densely and finely granulate, mat. Mesoscutum silk-mat, densely obscurely granulate, often even more obscurely so in middle. Scutellum shiny, polished nearly throughout. Metapostnotum usually mat, finely shallowly granulate, with short striae near anterior margin; sometimes very obscurely granulate, slightly shiny. Dorsal surface of propodeum mat on border with its posterior vertical surface, the latter coarsely granulose roughened, mat.

Coloration. Main coloration of head and mesosoma black, without metallic tints; of metasoma fuscous to black, without metallic tints. Labrum, clypeus, supraclypeal area, paraocular area in lower part to level of upper margin of antennal socket (fig. 35a, 35b), mandible (except for reddish apex), malar space, lower sixth to fourth of genal area, scapus, pronotal collar and spiracular lobe, variable pattern on scutellum (spot or narrow band along its posterior margin, or also two lateral spots), scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs entirely (sometimes with fuscous spots on hind femur and tibia), pregradular areas of T2-T5 seen through translucent posterior areas of preceding terga, T6 entirely (fig. 35d); all yellow or white-yellow. Flagellum yellow to ochre-yellow on lower side, light to dark fuscous on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Dark surfaces of head and mesosoma (except for glabrous metapostnotum) covered with tomentum (appressed plumes) of variable density.

Female. Structure. Body length 3.5-4.2 mm. Head transversely elliptical in frontal view; its height / width ratio 0.8-0.9. Median lobe of clypeus flat, its height / width ratio 0.6-0.7; clypeus extending nearly half of its length below eyes (fig. 35o). Malar space linear. Face flattened. Metapostnotum flat, nearly triangular, occupying only part of dorsal surface of propodeum, its borders marked by change in microsculpture and appearance of pubescence. Dorsal surface of propodeum nearly 0.9-1.0 times as long as scutellum, passing onto its posterior vertical surface at widely rounded angle of about 110°.

Sculpture. Pale surfaces of head finely and obscurely shagreened, mat or slightly shiny. Frons, vertex, mesoscutum, and sides of mesosoma uniformly densely and finely granulate, mat; each granule smaller than eye facet. Scutellum nearly polished. Metapostnotum obscurely reticulate granulose, slight shiny. Posterior vertical surface of propodeum granulose roughened, mat.

Coloration. Major coloration of head and mesosoma black, without metallic tint; mesoscutum often with bright metallic-green tint. Labrum, clypeus, lower half of supraclypeal area (fig. 35o), mandible (except for reddish apex), lower sixth of genal areas, scapus on lower surface, prothorax entirely or partly, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for fuscous hind trochanter and femur, large spot on hind tibia, small spot on hind basitarsus), metasoma, except for narrow bands on T1 and T2 and interrupted bands on T3 and T4 (fig. 35p), all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Dark surfaces of head and mesosoma (except for glabrous metapostnotum) covered with tomentum (appressed

plumes), denser on vertex, upper half of genal areas, and sides of mesosoma. Metabasitarsal penicillus gold yellow.

Variation. A relatively constant species. There is a certain variability in the body size (2.6–3.6 mm in males, 3.5–4.2 mm in females), also in the development of the yellow pattern on the scutellum (see above) and metasoma (width of yellow bands varying from 0.25 to 0.5 of the lengths of the terga).

Distribution. Morocco, Algeria, Egypt, Mauritania, Senegal, Mali, Burkina Faso, Niger, Cameroon, Chad, Sudan, Kenya, Israel, Jordania, Arabian Peninsula, southern Iran.

Records from Africa. Handlirsch 1888: 406 (Egypt: Cairo). Dębski 1917: 40 (Egypt: Cairo). Alfken 1924: 250 (Egypt: El Obeid; Sudan: Bara). Blüthgen 1925: 32 (Egypt: Cairo, Helouan, Luxor; Sudan: El Obeid, Bara). Alfken *et al.* 1934: 14 (Morocco: Marakesh: Oase Gueliz). Blüthgen 1934a: 246 (Egypt: Cairo). Benoist 1950b: 306 (Niger: Kori Isserserrène, Agadez). Dekeyser & Villiers 1956: 37 (Mauritania: Adrar).

African material examined (468 specimens). *Morocco*: 15 km S Assa, 17–18.IV.1995, leg. M. Halada, 4 ♂♂, 46 ♀♀; SCH. Mhamid, 100 km S Zagora, 16.V.1997, leg. M. Mucka, 2 ♀♀, leg. J. Halada, 1 ♀; OLML.

Algeria: Hoggar, In Amguel, Oued Tekouiat, 21.VIII.1987, leg. A. Pauly, 26 ♂♂, 4 ♀♀; FUSAG, ZISP. Hoggar, Tit, Oued Amded, 21.VIII.1987, leg. A. Pauly, 39 ♂♂, 16 ♀♀; FUSAG, ZISP.

Egypt: Al Fayyum, 24.X.1966, leg. J.G. Rozen, 6 ♂♂, 2 ♀♀; AMNH. Helouan, 27.VI.1933, leg. Farag, 1 ♀; MNHUB. Meadi, 7.XI.1933, leg. Farag, 1 ♀; MNHUB. Maasaran, 6.IX.1931, leg. Farag, 1 ♂; MNHUB. El Salf, 7.IX.1930, leg. Farag, 1 ♂; MNHUB. Cairo, 2.VII.1964, leg. G.E. Bohart, 1 ♂; UUL. Luxor, 6 ♀♀; NMW; *ibid.*, 1900, leg. O. Schmiedeknecht, 1 ♀; WAR. Wadi Heff, 4 ♀♀; NMW.

Mauritania: Oued Henné, 50 km NE Moudjeria, 2.XI.1993, leg. W.J. Pulawski, 1 ♂; CAS.

Senegal: Ferlo, Fété-Olé, 16°14' N, 15°07' W, 23.IX.1971, leg. Gillon, 15 ♂♂; MNHNP. Podor, 13.VIII.1980, leg. B. Sigwalt, 1 ♂; MNHNP. Tiougoune, 2.VIII.1979, leg. A. Pauly, 1 ♀; FUSAG. N'Dierba, 8.X.1978, leg. G. Hevel & J. Fortin, 93 ♂♂, 3 ♀♀; NMNH, ZISP. 5 km SW Thiés, 8.VII.1991, leg. W.J. Pulawski, 1 ♂; CAS. Ndangane, 6–7.IV.1988, leg. F. Borgato, 2 ♂♂, 1 ♀; FUSAG, ZISP.

Mali: 30 km S Ansongo, leg. K.M. Guichard, 7 ♂♂, 10 ♀♀; BMNH, ZISP. 100 km NE San, 21.VIII.1991, leg. M. Schwarz, 4 ♂♂, 14 ♀♀; SCH, ZISP. 40 km SW Segou, 31.VII.1991, leg. M. Schwarz, 1 ♀; SCH. Hombori, 11.VIII.1991, leg. M. Schwarz, 1 ♀; SCH.

Burkina Faso: Kougny, 22.II.1980, leg. A. Pauly, 18 ♂♂, 5 ♀♀; FUSAG, ZISP.

Niger: Aquilé, 13°31' N, 7°46' E, 11.VIII.1987, *Cassia* sp., leg. A. Pauly, 1 ♂, 2 ♀♀; FUSAG. Moujia, 14°22' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 6 ♂♂, 8 ♀♀; FUSAG, ZISP. Abalak, 15°28' N, 6°16' E, 14.VIII.1987, leg. A. Pauly, 4 ♂♂, 7 ♀♀; FUSAG, ZISP. Badéguichery, 14°31' N, 5°22' E, 13.VIII.1987, leg. A. Pauly, 6 ♂♂, 3 ♀♀; FUSAG, ZISP. 20 km S Tahoua, 14°46' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 23 ♂♂, 13 ♀♀; FUSAG, ZISP. Oasis Agadez, 16°58' N, 7°59' E, 15.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG. 90 km N Agadez, 17°37' N, 7°40' E, 15.VIII.1987, leg. A. Pauly, 19 ♂♂, 7 ♀♀; FUSAG, ZISP. 61 km Ibesselene, 15°15' N, 5°51' E, 14.VIII.1987, leg. A. Pauly, 6 ♀♀; FUSAG, ZISP. Tsernaoua,

13°53' N, 5°20' E, 13.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG.

Cameroon: Mindif, bord Mayo Boula, 10°21' N, 14°25' E, 30.VII.1987, leg. A. Pauly, 1 ♂; FUSAG. Maga, 10°50' N, 14°59' E, 3.VIII.1987, leg. A. Pauly, 1 ♀; FUSAG. Magdémé, 11°09' N, 14°16' E, 5.VIII.1987, leg. A. Pauly, 9 ♀♀; FUSAG, ZISP.

Chad: Zouar, 11.III.1953, leg. K.M. Guichard, 1 ♂, 1 ♀; BMNH, ZISP. Zouerke (Zouarke), 1.IV.1953, leg. K.M. Guichard, 1 ♂; BMNH. N'Djamena, 18.IV.1988, leg. G.G.M. Schulten, 1 ♀; ZMA.

Sudan: Khartoum, 20.I.1962, leg. R. van der Bosch, 1 ♂; UCR; 20–24.X.1978, leg. K.M. Guichard, 3 ♂♂; BMNH, ZISP. 5 mi [ca. 8 km] W Khartoum, 29.I.1962, leg. R. van der Bosch, 1 ♂; UCR. El Obeid, 1 ♂, 2 ♀♀; NMW. El Obeid, Kordofan, 9.XII.1993, leg. G.G.M. Schulten, 2 ♂♂; ZMA.

Kenya: Rift Valley Province, 33 km N. Lodwar, 3°21' N, 35°28' E, 23.XI.2002, leg. M.A. Prentice, 1 ♀; CAS.

Visited plants (in Africa). Asclepiadaceae: *Landolfia* sp. (1 ♀). Balanitaceae: *Balanites aegyptiaca* (18 ♂♂, 5 ♀♀). Boraginaceae: (13 ♂♂, 3 ♀♀). Caesalpiniaceae: *Cassia obovata* (234 ♂♂, 20 ♀♀), *Cassia* sp. (72 ♂♂, 5 ♀♀). Cappariaceae: *Cleome viscosa* (6 ♀♀). Euphorbiaceae: *Chrozophora brochiana* (8 ♂♂, 5 ♀♀). Fabaceae: *Indigofera* sp. (4 ♂♂, 1 ♀). Lamiaceae: *Ocimum* sp. Pedaliaceae: *Sesamum* sp. (1 ♀). Rhamnaceae: *Ziziphus* sp. (6 ♂♂, 8 ♀♀). Tamaricaceae: *Tamarix* spp. (65 ♂♂, 20 ♀♀). Zygophyllaceae: *Tribulus terrestris* (3 ♀♀).

Nomioides (Nomioides) squamiger Saunders 1908, resurrected name

[fig. 36a–36p; Pl. III: 82–83 (total view), IV: 101 (mesosoma), VII: 153–155 (head), IX: 179 (propodeum), XIV: 212 (male genitalia), XX: 251 (map)]

Nomioides squamiger Saunders 1908: 222, ♀, ♂. Lectotype (designated by Pesenko 1983: 163): ♀, “Algerie [Biskra] [34°51'N 5°44'E], [leg.] Eaton”, “18.V.1893”, “B. M. type Hym. 17.a.1048”; BMNH.

Taxonomy. Blüthgen 1925: 32. Blüthgen 1934a: 246. Blüthgen 1934b: 201 (key). Pesenko 1983: fig. 197, 237, 313, 314.

Diagnosis. In addition to the diagnostic characters given in the key above, one can indicate similarity of this species to *N. rotundiceps* Handlirsch in the pale pattern and pubescence of the body. *N. squamiger* differs from the latter in the following characters: the head and mesosoma dull metallic green in both the sexes, metapostnotum trapezoidal (it is nearly triangular in *N. rotundiceps*) and not bordered laterally with dense tomentum, male terminalia different, pale pattern on the paraocular areas of the female poorer. In the structure of the male terminalia and in the shiny border between the dorsal and posterior vertical surfaces of the propodeum, *N. squamiger* is close to *N. facilis* (Smith).

Male. Structure. Body length 3.2–3.6 mm. Head slightly transversely elliptical (fig. 36a) to nearly rounded (fig. 36b) in frontal view; its height / width ratio 0.9–0.98. Median lobe of clypeus slightly convex, 0.8–0.9 as high as wide; clypeus extending a third of its length below eyes (fig. 36a, 36b). Malar space linear. Face transversely depressed at level of antennal sockets. Antenna moderately long, nearly reaching metanotum; middle flagellomeres 1.2–1.3 times as long as their diameters (fig. 36c). Metapostnotum nearly flat or slightly transversely depressed, trapezoidal, occupying nearly entirely dorsal surface of propodeum; its lateral borders marked by appearance of

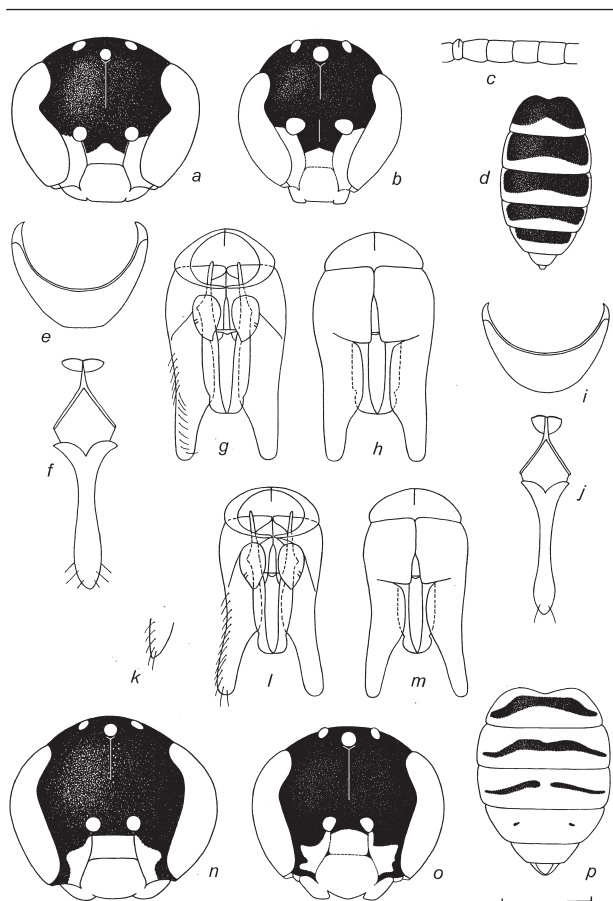


Figure 36
***Nomioideus (Nomioideus) squamiger* Saunders 1908: male (a-m) and female (n-p)**

a, b, n, and o, head in frontal view; c, flagellomeres 1-5 in lateral view; d and p, metasoma in dorsal view; e and i, S7; f and j, S8; g and l, genital capsule in ventral view; h and m, genital capsule in dorsal view; k, distal part of right gonoforceps in ventral view.

a and e-h, male paralectotype; b-d, k, o, and p, male and female from Hoggar (Algeria); i-m, male from Sinai (Egypt); n, lectotype.

Scale line: 1 mm for d, p; 0.5 mm for a, b, c, n, o; 0.25 mm for e, f, g, h, i, j, k, l, m.

pubescence. Dorsal surface of propodeum 0.9-1.0 as long as scutellum, passing to posterior vertical surface at narrowly rounded angle of 100°. Apical lobe of S8 long, provided with an elongate rounded club, rounded at apex (fig. 36f, 36j). Gonobase semicircular in dorsal view. Gonoforceps wide, slightly narrowed in distal half, widely (or sometimes narrowly) rounded at apex (fig. 36g, 36h, 36l, 36m).

Sculpture. Pale parts of face finely punctate, shiny. Frons and vertex densely and finely granulate, mat. Mesoscutum silk-mat, densely granulate punctate. Scutellum shiny, nearly polished. Mes- and metepisterna obscurely finely granulate, silk-mat. Metapostnotum mat, finely shallowly granulate. Dorsal surface of propodeum polished on border with its posterior vertical surface; lateral surfaces of propodeum obscurely finely granulate, slightly shiny; its posterior vertical surface shiny.

Coloration. Main coloration of head and mesosoma dull metallic green; face and mesoscutum with bronze tint; scutellum black, with an oil tint. Metasoma fuscous to black, without metallic tints. Labrum, clypeus, supraclypeal area, paraocular area (lower part to level of middle of antennal sockets; fig. 36a, 36b), mandible (except for reddish apex), malar space, lower sixth to fourth of genal area, scapus, prothorax entirely or mostly, usually band along posterior margin of scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (except for large brown spot on hind femur and tibia), pregradular areas of T2-T5 seen through translucent posterior areas of preceding terga, T6 entirely (fig. 36d), all yellow or white-yellow. Flagellum ochre-yellow on lower side, fuscous on upper side. Wing membrane hyaline; veins and pterostigma light yellow.

Vestiture. Dark surfaces of head and mesosoma covered with white tomentum (appressed plumes), very dense on vertex, upper half of genal area, and lateral surfaces of mesosoma. Metapostnotum entirely glabrous.

Female. Structure. Body length usually 3.5-4.0 mm. Head transversely elliptical in frontal view; its height / width ratio about 0.9. Median lobe of clypeus flat, its height / width ratio 0.6; clypeus extending nearly half of its length below eyes (fig. 36n, 36o). Malar space linear. Face flattened. Metapostnotum flat, trapezoidal, occupying nearly entire dorsal surface of propodeum, its borders marked by change in microsculpture and by appearance of pubescence. Dorsal surface of propodeum nearly 0.6-0.7 times as long as scutellum, passing onto its posterior vertical surface at narrowly rounded angle of about 100°.

Sculpture. Pale surfaces of head mat. Frons, vertex, mesoscutum, and lateral surfaces of mesosoma uniformly, very densely and finely granulate, silk-mat; each granule smaller than eye facet. Scutellum nearly smooth. Metapostnotum usually sparsely and obscurely reticulate rugulose, on finely granulate background. Posterior vertical surface of propodeum granulate, silk-mat.

Coloration. Major coloration of head and mesosoma dull metallic green or bronze-green. Mesoscutum brighter metallic green or bronze-green. Labrum, clypeus, supraclypeal area, characteristic pattern of paraocular areas (fig. 36n, 36o), mandible (except for reddish apex), scapus on lower and lateral surfaces, prothorax entirely or mostly, scutellum, scutellar crests, median area of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, legs (sometimes except for dark hind trochanter and spots on hind femur and tibia), metasoma except for dark bands on T1-T3 and lateral spots on T4 (fig. 36p), all yellow. Wing membrane hyaline; veins and pterostigma light yellow to fuscous yellow. Posterior areas of terga translucent.

Vestiture. Dark surfaces of head and mesosoma (except for glabrous metapostnotum) covered with whitish or yellowish tomentum (appressed plumes), very dense on vertex, genal areas and sides of mesosoma.

Variation. A relatively constant species. The mesoscutum and dark surfaces of the head have bronze or gold reddish tints in some females. In some males from Algeria, the gonoforceps are narrowly rounded at apex.

Distribution. North Africa, Israel, Arabian Peninsula (Pesenko & Pauly, in press).

Records from Africa. Saunders 1908: 222 (Algeria: Biskra, Col de Sfa, Médéa, Tizi Ouzou). Blüthgen 1934a: 246 (Algeria:

Biskra; Libya: Bu Chemmech). Warncke 1983: 206 (*N. facilis* ssp.; Algeria: Biskra).

African material examined (1154 specimens; part of them labelled as “*Nomioides facilis*” by Pesenko in 1985-1989). **Morocco:** Dadeschlucht, leg. M. Schwarz, 1 ♀; SCH. 10 km S Goulimine, 24.III.1986, leg. M. Schwarz, 1 ♀; ZISP. Quarzazate Province, Oued Dadés, 30.IV.1981, leg. M. Tussac, 1 ♀; CAS. Ouarzazate Province, Boumalne, 31°22' N, 6°00' W, 1550 m, 5.VI.1996, leg. P. Rasmont, 6 ♀♀; UMH. 15 km S Assa, 17-18.IV.1995, leg. M. Halada, 3 ♀♀; SCH. 30 km E Taroudant, 27.IV.1995, leg. M. Halada, 25 ♀♀; SCH. 40 km E Taroudant, Aoulouz, 17.V.1997, 3 ♀♀; OLML. 40 km S Guercif, 15-17.V.1995, leg. M. Halada, 7 ♀♀; SCH. 10 km S Rich, 22.V.1995, leg. M. Halada, 30 ♀♀; SCH. *ibid.*, leg. M. Halada, 2 ♂♂, 306 ♀♀; OLML. 70 km S Oujda, 8.IV.1995, leg. M. Halada, 3 ♀♀; SCH. 30 km N Zagora, 15.V.1997, leg. J. Halada, 7 ♂♂, 2 ♀♀, OLML. Mhamid, 100 km S Zagora, 16.V.1997, leg. M. Mucka and others, 106 ♂♂, 103 ♀♀; OLML. 10 km N Mhamid, 21-22.IV.1995, leg. M. Halada, 1 ♀; SCH. Beni-Bassia, 60 km NE Boudnib, 21.V.1995, leg. M. Halada, 10 ♀♀; SCH. 30 km E Midelt, 13.V.1995, leg. M. Halada, 14 ♀♀; SCH. 5 km S Tata, 3.V.1995, leg. M. Halada, 1 ♀; SCH. Oued Ziz, 45 km N Errachidia, 14.V.2003, leg. M. Halada, 2 ♂♂, 32 ♀♀; OLML. 35 km W Taza, 18.V.2003, leg. M. Halada, 3 ♂♂, 11 ♀♀; OLML. Beni-Bassia, 60 km NE Boudnib, 21.V.1995, leg. M. Halada, 1 ♂, 6 ♀♀; OLML. 5 km N Agadir, 18.V.1997, leg. J. Halada, 2 ♀♀; OLML. Figuig, Ksar Znaga, 32°06' N, 1°15' W, 860 m, 31.V.1996, leg. P. Rasmont, 1 ♀; UMH. Errachidia Province, Ksar et Souk, 27-28.IV.1981, leg. M. Tussac, 1 ♂, 21 ♀♀; CAS, ZISP. Errachidia Province, Abbart, 32°32' N, 4°23' W, 1870 m, 3.VI.1996, leg. P. Rasmont, 1 ♀; UMH. Errachidia Province, Amouger, 32°24' N, 4°10' W, 2.VI.1996, leg. M. Terzo, 1 ♀; UMH.

Algeria: Biskra, 18-26.V.1893, leg. Eaton, 2 ♂♂, 3 ♀♀ (lectotype and paralectotypes); BMNH; *ibid.*, no date, leg. Meyer, 1 ♀; CUI; *ibid.*, 24-29.V.1929, leg. J.C. Bradley, 7 ♂♂, 7 ♀♀; CUI, MNHUB, UUL, ZISP. Sidi Okba, V.1885, leg. L. Bleuse, 1 ♂; MNHNP. Hoggar, In Amguel, Oued Tekouiat, 21.VIII.1987, leg. A. Pauly, 16 ♂♂, 8 ♀♀; FUSAG, ZISP. Hoggar, Tit, Oued Amded, 21.VIII.1987, leg. A. Pauly, 17 ♂♂, 7 ♀♀; FUSAG, ZISP. Gorges d'Arak, 22.VIII.1987, leg. A. Pauly, 12 ♀♀; FUSAG, ZISP. Hoggar: Tamanrasset, 16 km NE Guelta, 1.IV.1989, leg. M. Schwarz, 31 ♀♀; SCH, ZISP. Amsel, 30 km S Tamanrasset, 1.IV.1989, leg. M. Schwarz, 1 ♀; ZISP. Hoggar: Guelta, 1900 m, 29.III.1989, leg. M. Schwarz, 3 ♀♀; ZISP. Laghouat, 25.VIII.1987, leg. A. Pauly, 1 ♂, 16 ♀♀; FUSAG, ZISP. Hammam Salihine, 24-25.V.1971, leg. A. Hoffer & J. Horek, 2 ♀♀; OLML.

Tunisia : Matmata, leg. M. Schwarz, 2 ♀♀; SCH. Sbeitla, 35°14' N, 9°07' E, 12.V.1992, leg. M. Schwarz, 42 ♀♀; SCH, ZISP; *ibid.*, 12.IV.1996, leg. K. Denes, 5 ♀♀; OLML. Sousse, 1-9.VIII.1981, leg. M. Schwarz, 1 ♀; SCH; *ibid.*, 23.IV.2001, leg. M. Snizek, 1 ♀; OLML. Macnassy (Makhnassi), 1927, leg. C. Dument, 2 ♀♀; MNHNP. Nefta, 15.IV.1981, leg. J. Gusenleitner, 1 ♂, 2 ♀♀; GUS; *ibid.*, 8-9.IV.1998, leg. K. Denes, 16 ♀♀, OLML. Wilāyat al Qayrawān, Haffouz, 1-8.IX.1982, leg. M. Tussac, 16 ♂♂, 5 ♀♀; CAS, ZISP. Gafsa, 5.IV.2001, leg. M. Halada, 20 ♀♀; OLML. Ksar Haddada, 4-5.IV.1998, leg. K. Denes, 176 ♀♀; OLML. M'Saken, 20-21.IV.1998, leg. K. Denes, 23 ♀♀; OLML. Kasserine, 13.IV.1998, leg. K. Denes, 5 ♀♀; OLML.

Egypt: Sinai, W Suor, 3.V.1993, leg. A. Mochi, 1 ♀; ZISP.

Visited plants (in Africa). Euphorbiaceae: *Euphorbia pubescens* (6 ♀♀). Fabaceae: *Medicago sativa* (1 ♀). Resedaceae: *Reseda lutea biaui* (1 ♀), *Reseda* sp. (1 ♀). Tamaricaceae: *Tamarix* spp. (34 ♂♂, 43 ♀♀).

Nomioides (Nomioides) turanicus Morawitz 1876

[fig. 37a-37j; Pl. IV: 90-91 (total view), VII: 162-163 (head), XIV: 215 (male genitalia), XX: 252 (map)]

Nomioides turanica Morawitz 1876: 214, ♀, ♂. Lectotype (designated by Pesenko 1983: 174): ♂, “Samarkand [38°35'N 68°03'E]” [Uzbekistan, 8.II, leg. A. Fedtschenko] [label in Russian]; ZISP.

Ceratina egeria Nurse 1904: 576, ♀, ♂. Syntypes: “Quetta [30°12'N 67°00'E]” [Pakistan]; BMNH. Synonymised by Blüthgen (1933b: 23; as *Nomioides turanica* var.).

Nomioides storeyi Dębski 1917: 33, ♀. Holotype: ♀, “Egypte, Galiub [30°10'N 31°11'E], 9.VII.1912, [leg.] Dębski”; “in coll. Ministry Agric. Cairo”. Synonymised by Blüthgen (1925: 19).

Nomioides heluanensis Dębski 1917: 33, ♂. Holotype: ♂, “Egypte, Heluan [29°51'N 31°20'E], 4.IX.1916, [leg.] Dębski”; “in coll. Ministry Agric. Cairo”. Synonymised by Blüthgen (1925: 18).

Nomioides turanica var. *maculosa* Blüthgen 1925: 20, ♀. Syntypes: 3 ♀♀, “Persien [Iran], Isphagan [32°00'N 57°30'E], 1900, [leg.] Escalera”; BMNH. Synonymised by Pesenko (1983: 174).

Nomioides turanica var. *nubica* Blüthgen 1925: 20, ♀. Holotype: ♀, “Nubische Wüste, Nabardi [= Nabari] [Sudan] [21°07'N 32°46'E], 1900, [leg.] Swail”; BMNH. Synonymised by Pesenko (1983: 174).

Nomioides turanica var. *subvariegata* Blüthgen 1933b: 23, ♀. Holotype: ♀, “Egypt, Djebel Elba (Wadi Aideb) [22°12'N 36°20'E], I.[19]33”; MNHUB. Synonymised by Pesenko (1983: 174).

Nomioides turanica var. *laeta* Blüthgen 1934a: 244, ♀. Holotype: ♀, “Buchar, Karschi” [Uzbekistan] [38°53'N 65°48'E]; MNHUB. Synonymised by Pesenko (1983: 174).

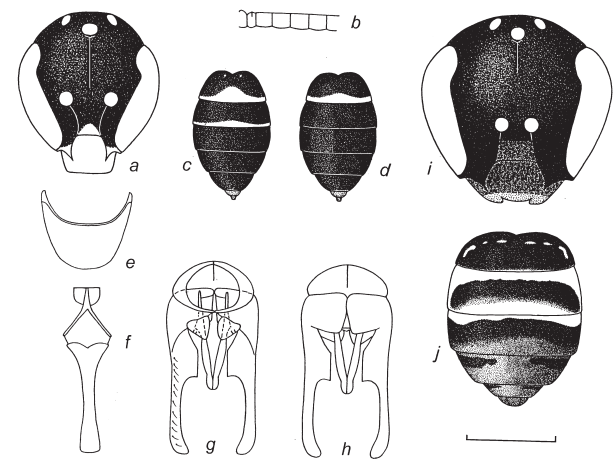


Figure 37
Nomioides (Nomioides) turanicus Morawitz 1876: male (a-h) and female (i and j)

a and i, head in frontal view; b, flagellomeres 1-5 in lateral view; c, d, and j, metasoma in dorsal view; e, S7; f, S8; g, genital capsule in ventral view; h, genital capsule in dorsal view.

a, b, d-h, lectotype; c, male from Hoggar (Algeria); i and j female from Tata (Morocco).

Scale line: 1 mm for c, d, j; 0,5 mm for a, i, b; 0,25 mm for e, f, g, h.

Taxonomy. Handlirsch 1888: 402. Blüthgen 1925: 18. Blüthgen 1934a: 243, fig. 3. Pesenko 1983: 125 (key to females), 130 (key to males), 174, fig. 203, 248, 333, 334.

Diagnosis. This is one of the smallest, especially in males, and darkest species of the subgenus. Due to the coloration and microsculpture of the body in both sexes and to much elongate of the male terminalia, the species occupies an isolated position in the subgenus.

Male. Structure. Body length 2.5 mm. Head egg-shaped in frontal view; its height / width ratio 1.1. Median lobe of clypeus convex, somewhat higher than wide; clypeus extending nearly two thirds of its length below eyes (fig. 37a). Malar space linear. Face transversely depressed at level of antennal sockets. Antenna relatively short, nearly reaching metanotum or middle of scutellum; middle flagellomeres about as long as their diameters (fig. 37b). Lateral borders of metapostnotum not marked. Dorsal surface of propodeum slightly concave, about as long as scutellum, passing to posterior vertical surface at distinct angle of 120°. Apical lobe of S6 long, narrow, broadened towards distal end, truncate at apex (fig. 37f). Gonobase semicircular in dorsal view. Gonoforceps slender, slightly broadened in distal end, rounded at apex (fig. 37g, 37h).

Sculpture. Clypeus finely punctate, shiny. Frons densely and finely granulate, mat. Vertex, genal areas on upper half, mesoscutum, and lateral surfaces of mesosoma slight shiny, densely and finely punctate, with narrow, but distinct shiny interspaces. Scutellum more obscurely punctate, shiny. Metapostnotum slightly shiny, finely shallowly granulate, with short striae near anterior margin. Dorsal surface of propodeum shiny on border with its posterior vertical surface; the latter coarsely granulate roughened, mat.

Coloration. Major coloration of head and mesosoma metallic deep blue; genal areas, and sides of mesosoma often dark fuscous, with deep blue-metallic tint. Pale pattern of body poorly developed: yellow or white yellow only labrum, clypeus, triangular spot on supraclypeal area, small spot at lower margin of paraocular areas (fig. 37a), mandible (except for reddish apex), malar space, pronotal spiracular lobes, scutellar crests, spot or most of metanotum, spot on anterior part of hyaline tegula, basal sclerites of wings, fore and middle femora and tibiae, all tarsi, pregradular areas of T2 (fig. 37d) or T2 and T3 (fig. 37c) seen through translucent posterior areas of preceding terga. Flagellum ochre-yellow on lower side, fuscous on upper side. Wing membrane hyaline; veins and pterostigma yellow to light fuscous.

Vestiture. Erect pubescence white, short and sparse; longer on metanotum and sides of mesosoma. Lower half of face and upper half of genal area covered with white tomentum (appressed plumes). Metapostnotum entirely glabrous.

Female. Structure. Body length usually 3.0–4.0 mm. Head triangularly rounded in frontal view, as high as wide or somewhat wider. Median lobe of clypeus weakly convex, its height / width ratio 0.6; clypeus extending nearly half of its length below eyes (fig. 37i). Malar space linear. Face flattened. Metapostnotum flat, nearly trapezoidal, occupying nearly entire dorsal surface of propodeum, its borders marked by distinct change in microsculpture. Dorsal surface of propodeum 1.1–1.2 times as long as scutellum, passing onto its posterior vertical surface at widely rounded angle of about 120°.

Sculpture. Clypeus and lower half of supraclypeal area silk-mat, transversely aciculate, with sparse shallow pits. Frons, vertex,

sides of mesosoma and posterior vertical surface of propodeum densely and finely punctate, silk-mat. Mesoscutum and scutellum silk-mat, uniformly densely punctate. Metapostnotum reticulate rugulose, slightly shiny.

Coloration. Head and mesosoma on most of surfaces metallic deep blue or blue green. Clypeus, supraclypeal area, and often prothorax, scutellum and propodeum dark fuscous to black, without metallic tints. Pale pattern very poorly developed: yellow or light yellow only on spiracular lobes of pronotum, scutellar crests, spot on anterior part of hyaline tegula and basal sclerites of wings. Clypeus entirely dark fuscous or with narrow dark yellow band along lower margin (fig. 37i). All coxae, trochanters, femora and usually hind tibia dark fuscous; fore and middle tibiae and all tarsi dark to fuscous yellow. Metasoma dark fuscous to black, with varying pale pattern: from only yellow pregradular areas of T2 and T3 seen through translucent fuscous posterior areas of preceding terga to richer pattern shown in fig. 37j.

Vestiture. Erect pubescence white, short and sparse. Tomentum (appressed plumes) absent. Metabasitarsal penicillus gold yellow.

Variation. A constant species over its vast geographical range. Only the variation in the number of pale bands (from one up to two or even three) on the metasoma of males is striking.

Distribution. North Africa to Sudan, Djibouti, Senegal, and Mauritania in the south; deserts of western Asia to Kirghizia and Pakistan in the east.

Records from Africa. Dębski 1917: 33, 35 (*N. heluanensis* and *N. storeyi*; Egypt: Qaliub [Galiub], Helouan). Blüthgen 1925: 21 (Algeria: Ghardala; Sudan: Nabardi). Blüthgen 1933b: 23 (Egypt: Helouan, Ramleh, Wadi Digla, Qualiub, Wadi Hof). Blüthgen 1934a: 244 (*N. turanica* var. *subvariegata*; Egypt: Helouan). Blüthgen 1934b: 192 (*N. turanica* var. *subvariegata*; Egypt: Djebel Elba). Dekeyser & Villiers 1956: 37 (Mauritania: Adrar). Benoist 1962: 45 (Algeria: Hoggar).

African material examined (294 specimens). *Morocco*: 5 km S Tata, 3.V.1995, leg. Ma. Halada, 1 ♀; SCH. 70 km Tata, 29.III.1986, leg. M. Schwarz, 2 ♀♀; SCH, ZISP. 90 km Tata, 29.III.1986, leg. M. Schwarz, 2 ♀♀; SCH, ZISP. 5 km S Zagora, 24–25.IV.1995, leg. M. Halada, 1 ♀; SCH. 30 km N Zagora, 15.V.1997, leg. J. Halada, 3 ♂♂, 6 ♀♀; OLML. 34 km S Zagora (Mhamid road), Oued Draa area, 28–29.III.1983, leg. M. Edwards, 4 ♀♀; BMNH, ZISP. Errachidia Province, Aoufouss, Ksar Jdid, 31°43' N, 4°12' W, 995 m, 4.VI.1996, leg. M. Terzo, 1 ♂, 2 ♀♀; UMH. Taroudant, 11.V.2003, leg. M. Halada, 1 ♀; OLML. W of Taroudant, Oued Souss, 31.III.1983, leg. G.R. Else, 1 ♂; BMNH. 8 km N Ait Saoun, Ouarzazate-Zagora road, 30.III.1983, leg. G.R. Else, 3 ♀♀; BMNH. 10 km E Guelmin, 5.V.1995, leg. M. Halada, 6 ♂♂, 27 ♀♀; SCH. Icht, 100 km E Bouzakame, 4.V.1995, leg. Ma. Halada, 1 ♂, 3 ♀♀; SCH. 15 km S Assa, 17–18.IV.1995, leg. Ma. Halada, 1 ♂, 1 ♀; SCH. 20 km SW Ouarzazate, 30°47' N, 6°43' W, 10.IV.1996, leg. M. Schwarz, 2 ♀♀; SCH. 30 km E Midelt, 13.V.1995, leg. M. Halada, 1 ♀; SCH. Beni-Bassia, 60 km NE Boudnib, 21.V.1995, leg. M. Halada, 1 ♀; SCH. 20 km S Tazenakht, 12.V.2003, leg. M. Halada, 1 ♂, 1 ♀; OLML. Anti Atlas, Agdz, 13.V.2003, leg. M. Halada, 2 ♀♀; OLML. Oued Massa, Tiznit, 8.V.2003, leg. M. Halada, 1 ♂, 2 ♀♀; OLML. 10 km E Guelmim, 5.V.1995, leg. M. Halada, 5 ♂♂, 4 ♀♀; OLML.

Western Sahara: Rio de Oro, Erch Amar, 150 km E Icla, 1911, leg. R. Chudeau, 1 ♀; MNHNP.

Algeria: Hoggar, In Amguel, Oued Tekouiat, 21.VIII.1987, leg. A. Pauly, 1 ♂, 4 ♀♀; FUSAG, ZISP. Hoggar, 30.VI.1950, leg. A. Giordania-Soika, 1 ♀; WAR. Hoggar, Ilamane Mt., 2200 m, 28.III.1989, leg. M. Schwarz, 1 ♀; SCH. Hoggar, Guelta near Ilamane, 1900 m, 23.III.1989, leg. M. Schwarz, 39 ♀♀; SCH. Hoggar, Tamanrasset, 16 km NE Guelta, 1.IV.1989, leg. M. Schwarz, 85 ♂♂, 47 ♀♀; SCH. Hoggar, Amsel, 30 km S Tamanrasset, 1.IV.1989, leg. M. Schwarz, 1 ♂, 4 ♀♀; SCH. Hoggar, 60 km E Tamanrasset, 1500 m, 31.III.1989, leg. M. Schwarz, 1 ♂, 1 ♀; SCH. 40th km of road Tamanrasset-Assekrem, 19.VIII.1987, leg. A. Pauly, 2 ♂♂, 1 ♀; FUSAG, ZISP.

Egypt: Cairo, V.1937, leg. A. Mochi, 1 ♀; BMNH. Wadi Digla, 9.VIII.1935, leg. H. Priesner, 1 ♀; UUL. Central Sinai, near Naql, 16.V.1992, leg. A. Mochi, 2 ♀♀; ZISP. Eastern Desert, 45 km E Quattania, 2, 10.V.1991, leg. A. Mochi, 2 ♂♂; ZISP. Sinai, W of Suor, 3.V.1993, leg. A. Mochi, 1 ♀; ZISP.

Sudan: Shambad, 15 mi [ca. 24 km] W Khartoum, 19-29.I.1962, leg. R. van der Bosch, 8 ♀♀; CAS, UCR, ZISP. Gebel Oweinat, Wadi Ain el Brins, 9-12.IV.1967, leg. K.V. Krombein, 2 ♂♂, 6 ♀♀; NMNH, ZISP.

Djibouti: Obock, 1 ♂; MNHNP.

Senegal: near N'Dierba, 8.X.1978, leg. G. Hevel & J. Fortin, 1 ♂; NMNH.

Mauritania: Adrar, Maaden, 11.III.2001, leg. F. LaRoche, 2 ♀♀; LAR.

Visited plants (in Africa). Apiaceae: yellow Apiaceae (2 ♂♂, 1 ♀). Asteraceae: *Anthemis* sp. (1 ♂, 2 ♀♀). Fabaceae: red Fabaceae (1 ♂, 1 ♀); *Medicago sativa* (3 ♀♀). Tamaricaceae: *Tamarix* sp. (1 ♂, 4 ♀♀).

DISCUSSION

Phylogenetic considerations

The sections "Morphological characters used in the phylogeny reconstruction", "Formation and main evolutionary trends", "Relationships between members of Nomioiinae" with a scheme on fig. 38, and "Geographical history" below are reprinted here from the paper by Pesenko (2000b), with a few changes connected with new data on the African Nomioiinae. Being an evolutionary systematist, the author accepts both holophyletic and paraphyletic groups as valid taxa. The phylogeny of the Nomioiinae was reconstructed by the traditional methods, *i.e.*, computer programs for deriving the most parsimonious cladograms were not used. Only morphological characters of adults were involved in the analysis, because premature phases and nests were described in only two nomioiine species, *Ceylaliectus variegatus* and *Nomioides minutissimus* (see above), and appear to be very similar. The paleontological data on the family were not used, as they are too scarce to elucidate the evolution of any morphological structure (see Engel 1997 for review). All other

subfamilies of Halictidae (Rophitinae, Nomiinae, and Halictinae) combined were taken as an outgroup. All bi-state and as well as multi-state characters considered to be ordered and were coded correspondingly, *e.g.*, <0, 1, and 1.1> (here, the apomorphic state 1.1 is derived from the intermediate apomorphic State 1, not directly from the plesiomorphic state 0) or, <0, 1, and 2> (here the apomorphic states 1 and 2 evolved from the plesiomorphic state 0 independently). The main goal of the reconstruction in relation to

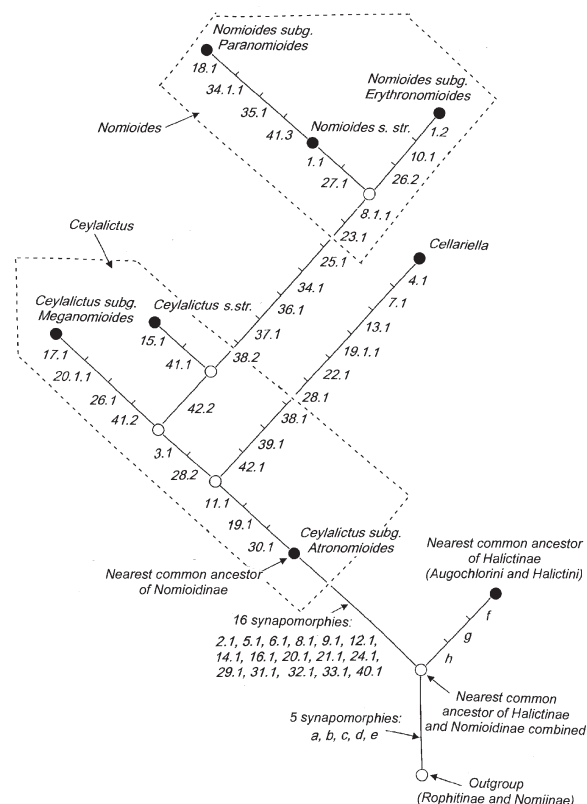


Figure 38
Phylogenetic relationships between the genera and subgenera of the subfamily Nomioiinae

The numbers on the scheme correspond to the apomorphic states of characters listed in the text below. Synapomorphies of the subfamilies Nomioiinae and Halictinae combined: (a) lower lateral parts of clypeus shifted backward at 45° (in non-parasitic forms); (b) secondary tentorial bridge attached to head capsule above hypostoma or fused with the latter; (c) malus of strigilis in distal half pectinate along both margins, bearing very long, densely arranged, radiating processes (in generalized forms); (d) S7 of male narrow, shortened, and weakly sclerotized, without lobes or processes; (e) S8 of male membranous, transverse, without posterior immovable process. (from Pesenko 2000b)

Synapomorphies of the tribes Halictini and Augochlorini (from Alexander & Michener 1995; Pesenko 2000a): (f) prepygidial fringe of T5 of female divided by median longitudinal gap, covered with fine silky hairs (in non-parasitic forms); (g) ventral parapenial lobe of gonocoxites or lower lobe of gonostyli present (in generalized forms); (h) gonostyli double (in generalized forms).

the substantiation of the classification is to show as follows: (1) all the genera and subgenera distinguished are not polyphyletic; (2) there is a certain balance in the morphological difference / similarity at the generic and subgeneric levels. In particular, two monotypical subgenera, *Erythronomioides* and *Paranomioides*, have been established owing to their strong morphological differences from members of *Nomioides* s. str., which has appeared to be a paraphyletic group.

The principal position of the author in relation to the methods of phylogenetic reconstructions and as well as to other problems in taxonomy was expounded in a number of large papers in Russian (Pesenko 1989b, 1992, 2005) and also was published very briefly in English (Pesenko 2000a: 105).

Morphological characters used in the phylogeny reconstruction

1. *Body length*. (0) 4-5 mm. (1) 3-4 mm: *Nomioides* (excluding subg. *Erythronomioides*); (2) 5-6 mm: *Nomioides* subg. *Erythronomioides*.
2. *Yellow pattern of body*. (0) Absent. (1) Present, often extensive: Nomioidinae.
3. *Principal coloration of body*. (0) Black. (1) Metallic green or blue (often excluding metasoma): All, except for *Cellariella*, *Ceylalicthus* subg. *Atronomioides*, and some *Nomioides* s. str.
4. *Body surface*. (0). Non-uniformly sculptured, usually partly shining. (1) Almost uniformly and densely granulate, dull: *Cellariella*.
5. *Upper end of subantennal sutures*. (0) Directed toward lower margin of antennal sockets. (1) Directed to outer margin of antennal sockets: Nomioidinae.
6. *Position of anterior tentorial pits; shape of epistomal suture and clypeus*. (0) Pits positioned at level of upper part of clypeus; lateral segments of epistomal suture straight or weakly curved; clypeus entire. (1) Pits positioned close to lower margin of face; epistomal suture forming a loop; clypeus 3-lobed: Nomioidinae.
7. *Frontal median line*. (0) Present. (1) Absent: *Cellariella*.
8. *Inner orbits*. (0) Weakly concave in both sexes. (1) Upper part in both sexes with deep rounded-triangular incision: Nomioidinae. (1.1) With weak incision in female: *Nomioides*.
9. *Labrum of female*. (0) With narrow apical process, bearing strong, laterally flattened longitudinal carina. (1) With short, trapeziform, dorsoventrally flattened apical process, without longitudinal carina: Nomioidinae.
10. *Mandible in both sexes*. (0). Short, weakly curved. (1) Long, strongly curved: *Nomioides* subg. *Erythronomioides*.
11. *Mandible in male*. (0) With subapical tooth. (1) Without subapical tooth: all, except *Ceylalicthus* subg. *Atronomioides*.
12. *Annulate hairs of glossa*. (0) Apically branching or bifid. (1). Simple, not bifid apically (secondarily simplified: Nomioidinae).
13. *Antenna in male*. (0) Long; middle flagellomeres as long as, or longer than their diameter. (1) Short; diameter of middle flagellomeres 1.5 times their length: *Cellariella*.
14. *Scutellar carina*. (0) Short and relatively wide. (1) Long, high, and narrow along its entire length, as far as hind-wing base: Nomioidinae.
15. *Mesoscutum of female*. (0) Without yellow patch. (1) With yellow transverse patch along posterior margin: *Ceylalicthus* s. str.
16. *Axillae*. (0) With carina along posterior margin. (1) Without carina: Nomioidinae.
17. *Metanotum*. (0) Of usual shape (transverse plate without median tubercle). (1) With median tubercle: *Ceylalicthus* subg. *Meganomioides*.
18. *Dorsal surface of propodeum*. (0) As long as scutellum or slightly shorter. (1) 0.8 times as long as scutellum: *Nomioides* subg. *Paranomioides*.
19. *Inner hind tibial spur of female*. (0) With 3-4 processes. (1) With 2 processes: *Nomioides* and *Ceylalicthus* (excluding subg. *Atronomioides*). (1.1) With 1 tooth: *Cellariella*.
20. *Marginal cell of fore wing*. (0) Long. (1) Relatively short; its costal margin shorter than the distance from end of cell to wing apex; vein strongly narrowed toward distal end, where narrowly truncate or, less frequently, narrowly rounded or pointed: Nomioidinae. (1.1) Strongly shortened and weakly narrowed toward distal end, where abruptly and broadly truncate: *Ceylalicthus* subg. *Meganomioides*.
21. *First submarginal cell of fore wing*. (0) As large as 3rd submarginal cell. (1) As large as, or larger than 2nd and 3rd submarginal cells combined (fig. 15-18): Nomioidinae.
22. *2nd submarginal cell of fore wing*. (0) Trapeziform or triangular. (1) Petiolate: *Cellariella*, *Ceylalicthus petiolatus*.
23. *RS vein to transverse r-m vein length ratio for hind wing*. (0) 1.0-1.7. (1) 2-3: *Nomioides*.
24. *Anal incision of hind wing*. (0) Longer than jugal incision. (1) As long as or shorter than jugal incision: Nomioidinae.
25. *Shape of metasoma of female in dorsal view*. (0) Elongate elliptical or obovate; widest in middle or posterior part. (1) Heart-shaped; widest at level of T2: *Nomioides*.
26. *Coloration of female metasoma*. (0) Dark with yellow bands, sometimes occupying most of terga. (1) Almost entirely yellow, except for base and T1: *Ceylalicthus* subg. *Meganomioides* and some *Nomioides* s. str. (2) Red with yellow bands: *Nomioides* subg. *Erythronomioides*, *Ceylalicthus warneki*, and female of *Cellariella fulviventris*.
27. *Pale coloration of metasoma*. (0) Formed by bands on tergal discs (postgradular areas). (1) Formed by pregradular tergal areas, visible under the transparent posterior areas of preceding terga: *Nomioides* (excluding subg. *Erythronomioides*).
28. *Pale pattern on T1*. (0) Absent. (1) Present as rectangular median patch: *Cellariella*. (2) Present as band or lateral spots: *Ceylalicthus* (excluding subg. *Atronomioides*), many *Nomioides*.
29. *Lateral gradular angles of T3 and T4*. (0) Present. (1) Absent: Nomioidinae.
30. *Pseudopygidium of male* (on posterior part of T6). (0) Wide. (1) Narrow: all, except *Ceylalicthus* subg. *Atronomioides*.
31. *T7 of male*. (0) External, not concealed by T6; well sclerotized,, pubescent. (1) Internal, concealed by T6; flat, weakly sclerotized, hairless: Nomioidinae.
32. *Graduli of S2-S6 of male*. (0) Complete. (1) Represented only by short median parts: Nomioidinae.
33. *S8 of male*. (0) Membranous, transverse. (1) Y-shaped, with membranous plate between posterolateral rami: Nomioidinae.
34. *Posterior margin of S8 of male*. (0) Straight or with membranous protrusion, without sclerotized lobe. (1) With long narrow sclerotized posterior lobe: *Nomioides*. (1.1) With very wide, rounded leaf-like lobe: *Nomioides* subg. *Paranomioides*.
35. *Gonobase; width to length ratio*. (0) Relatively long; 1.5-2.0. (1) Short; 5: *Nomioides* subg. *Paranomioides*.
36. *Genital foramen*. (0) Elongate or rounded. (1) Transverse: *Nomioides*.
37. *Position of ventral gonobasal bridge*. (0) Behind ventral gonocoxal bridge. (1) Directly under gonocoxal bridge: *Nomioides*.
38. *Middle part of ventral gonobasal bridge*. (0) Wide or/and with lobe directed backward. (1) Uniformly narrow: *Cellariella*. (2) In the form of narrow gonobasal rami with point junction: *Nomioides*.
39. *Ventral gonocoxal arms*. (0) Narrow, apically pointed, with point junction. (1) With broadly rounded ends and wide junction: *Cellariella*.
40. *Gonostyli*. (0) Articulated with gonocoxites. (1). Completely fused with gonocoxites (or reduced), forming a structure termed "gonoforceps":

Nomioioidinae.

41. *Gonoforceps*. (0) Relatively straight and flattened. (1) Narrow, curved mesad, with densely pubescent "knee"; *Ceylalictus* s. str. (2) With a "pad," covered with dense short hairs along lateral margin of ventral surface: *Ceylalictus* subg. *Meganomioides*. (3) Very wide, rounded leaf-like: *Ceylalictus* subg. *Paranomioides*.
42. *Penis valves*. (0) Long, extending nearly as far as ends of gonoforceps, moderately dilated. (1) Long, axe-shaped, strongly dilated in distal half (triangular): *Cellariella* (except in *C. fulviventr*). (2) Short, ending far from ends of gonoforceps, narrow: *Nomioides*, *Ceylalictus* s. str., some *Ceylalictus* subg. *Atronomioides*, and *Cellariella fulviventr*.

Formation and main evolutionary trends

In accordance with the tree topology established for the family Halictidae by Pesenko (2000a), the subfamily Nomioioidinae (as a tribe in the paper cited), the phylogenetic relationships of the subfamilies within the Halictidae are as following: Rophitinae (Nomiinae (Nomioioidinae, Halictinae)). Nomioioidinae is a sister group in relation to Halictinae (uniting the tribes Halictini and Augochlorini). It can be considered that the differentiation of Nomioioidinae, resulting in its recent diversity, was preceded by more intensive morphological evolution, as compared to other subfamilies of Halictidae, especially Halictinae. This is indicated by a considerable number of synapomorphies (16), revealed for the Nomioioidinae, compared with only three synapomorphies of the Halictinae and one synapomorphy describing each of the two tribes of the latter subfamily (Halictini and Augochlorini). Thus, Nomioioidini are on the whole a much more advanced (or specialized) group than other subfamilies and tribes of the family Halictidae.

The first important evolutionary trend in the formation of Nomioioidinae consisted in the thinning of the body tegument in adults. This trend, on the one hand, was accompanied by morphological transformations reinforcing the external and internal skeleton of the head and mesosoma. Such compensative changes included, in particular, the downward shift of the anterior tentorial arms (character 6 in the list above), which evidently increased the rigidity of the oral part of the head capsule, and the development of the scutellar carina (character 14) to ensure the normal functioning of the wings. On the other hand, the thinning of the metasomal tegument was accompanied by partial reduction of the tergal and sternal graduli (characters 29 and 32).

The second important evolutionary trend was represented by the development of the flitting flight typical of all representatives of the tribe (observations by the authors). This kind of flight became possible owing to the "costalization" of wings, i.e., the shift of veins toward the costal margin and base of the wing (characters 20 and 21). This progressive morphological

transformation is known in many insect groups. The shortening of the anal hind wing incision (character 24), occurring independently in different groups of Aculeata (Brothers 1975), also appears to be related to the advanced mode of flight.

Finally, the third trend in the formation of the subfamily Nomioioidinae consisted in essential structural modifications of the genitalia and pregenital segments in male: reduction of gonostyli and their merging with gonocoxites (character 40), partial reduction of T7 (character 31), and transformation of S8 (character 33). In addition, the Nomioioidinae possess the following evident synapomorphies: pale-coloured body pattern (character 2), which appears independently also in many Augochlorini and some advanced genera of Halictini; subantennal sutures adjacent to the outer margin of antennal sockets (character 5); deep incision on the inner eye orbit (character 8); trapeziform apical process of labrum in female (character 9); reduction of branches of glossal hairs (character, 12); and reduced axillar carina (character 16).

Relationships among members of Nomioioidinae

The recent phylogenetic reconstruction (see Pesenko 2000b), even though obtained by the traditional method (i.e., non-mathematically), proved to be the most parsimonious, because none of the characters shows parallel variations at the level of genera or subgenera. Five characters, however, vary within genera or subgenera as operation units. For example, the petiolate 2nd submarginal cell of the forewing (character 22.1), typical of the genus *Cellariella*, has also evolved independently in one species of the *Ceylalictus* subg. *Atronomioides*, *C. petiolatus*. The almost entirely yellow metasoma (character 26.1) can be found, besides in *Ceylalictus* subg. *Meganomioides*, also in some species of the subgenus *Nomioides* s. str. The red pattern on the metasoma (character 26.2), characterizing *Nomioides* subg. *Erythronomioides*, has also evolved independently in *Ceylalictus warnckei* and in the female of *Cellariella fulviventr*. The metallic-green or blue color of the body (character 3.1) has independently appeared in the Afrotropical *Ceylalictus halictoides*, and, *vice versa*, has been secondarily lost in some species of *Nomioides* s. str. Finally, character 42.2 (short and narrow valves of penis), considered a synapomorphy of the genus *Nomioides* and subgenus *Ceylalictus* s. str. (see Phylogenetic scheme), was also found in *Ceylalictus (Atronomioides) petiolatus* and *Cellariella fulviventr*.

More than one-third of the total number of morphological transformations within Nomioioidinae are related to the structure of the genitalia and pregenital

segments of males (characters 34–42). The adaptive or functional significance of changes in other characters remains obscure, because the two species studied (one from each genera, *Ceylalictus* and *Nomioides*) have proved to be very similar in biology.

According to the phylogenetic reconstruction of the subfamily (fig. 38), the genus *Ceylalictus* as a whole, its subgenus *Atronomioides*, and the nominotypical subgenus of *Nomioides* are paraphyletic groups. Moreover, the subgenus *Atronomioides* (primarily its Madagascan representatives, excluding the aberrant *C. petiolatus*; see Pesenko 1996; Pesenko & Pauly 2001) is identical to the nearest common ancestor of the subfamily (as a set of plesiomorphies) in all the characters analyzed. The genus *Cellariella* and as well other subgenera of *Nomioides* and *Ceylalictus* appear on the phylogenetic tree as strictly monophyletic (holophyletic) groups. With respect to the number and significance of their synapomorphies, the genera *Nomioides* (7 characters) and *Cellariella* (9) extend far beyond the limits of the morphological variability of the genus *Ceylalictus*.

Biogeographical considerations

Geographical history

The geographical history of the subfamily Nomiodinae appears quite obvious in view of their recent distribution. The origin of Nomiodinae is most probably in Eocene (this is only our assumption, as no fossil nomioidine is known; see Engel 2001) and major stages of their formation has proceeded in Africa. The fauna of Nomiodinae is presently most diverse in the Afrotropical Region, including Madagascar, on the generic (all 3 genera of the subfamily, including the endemic genus *Cellariella*) and subgeneric levels (4 of 6 subgenera, including the endemic *Nomioides* subg. *Erythronomioides*). The migration of the Nomiodinae to Eurasia was possible because Africa was connected with Europe during most of the Tertiary, and with Asia, since the Miocene (about 25 m.y. BP) (see Michener 1979 for distribution of other bees). At the same time, being associated with arid territories, this group could not enter the New World via the Atlantic or Beringian land-bridges, which were located in more humid as well as cooler zones.

At least three events of the invasion of the Nomiodinae into Asia occurred in the Neogene. The first invasion is indicated by the Palaeotropical distribution (excluding Australia) of the most primitive (see above) taxon of the subfamily, *Ceylalictus* subg. *Atronomioides*. The nominotypical subgenus of the genus *Ceylalictus* is represented in the Afrotropical and Palaearctic Regions

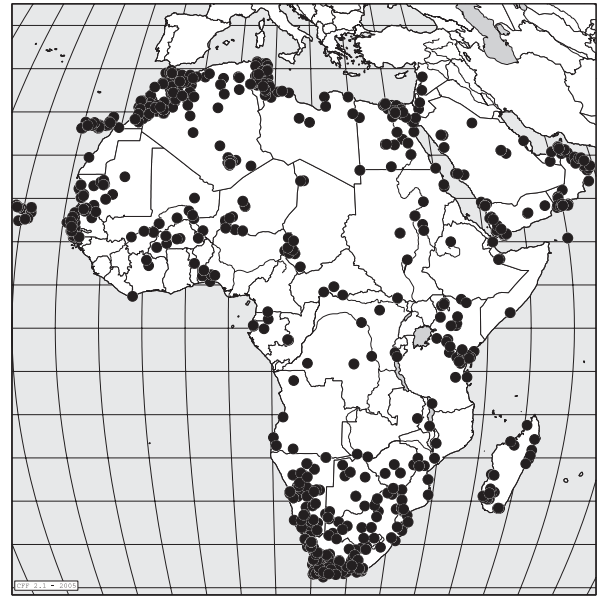


Figure 39
Sum of the data for Nomiodinae in Africa, Arabian Peninsula, and Madagascar

by 5 species only, 2 of which are widely distributed; the spreading of this subgenus resulted in the formation of a secondary center of speciation in southeastern Asia (20 species) and in the migration of its representatives to the Malay Archipelago (with 9 endemic species found) and Australia, where a single species, *Ceylalictus perditellus*, inhabits the deserts of northern and central part of the continent.

On the contrary, another large subgenus, *Nomioides* subg. *Nomioides*, represented by 9 species in the Afrotropical Region, has spread only as far eastwards as northern India, but formed speciation centers in the Sahara and Arabian Peninsula (about 20 species) and deserts of southwestern and Central Asia (over 30 species). One of these species, *Nomioides* (*Paranomioides*) *steinbergi*, known from eastern Iran, has received the subgeneric status owing to its morphological peculiarity. This last invasion was evidently related to the appearance of modern deserts; the same can be said of the formation of the small (3 species) subgenus *Ceylalictus* subg. *Meganomioides* in the southern and eastern Mediterranean Basin.

Distributional patterns of the African Nomiodinae

The geographical limits of this revision include the Mediterranean coasts to the Cape of Good Hope and the Canary Islands, Cape Verde Islands, Socotra but not Madagascar. The material on the African species,

Table 6. African Nomioiinae: a list of species, the number of specimens examined from Africa (excluding Madagascar), and regions of species occurrence in Africa

Species and subspecies	Number of specimens examined	Regions of occurrence in Africa								
		1	2	3	4	5	6	7	8	9
Genus <i>Cellariella</i>										
<i>fulviventr</i> is (Blüthgen 1925)	16									+
<i>inexpectata</i> sp. n.	129					+				
<i>kalaharica</i> (Cockerell 1936)	121					+			+	+
<i>schwarzi</i> sp. n.	3									+
<i>somalica</i> (Magretti 1899)	149				+	+			+	+
Genus <i>Ceylaliectus</i>										
Subgenus <i>Atronomioides</i>										
<i>capverdensis</i> Pesenko <i>et al.</i> 2002	63		+							
<i>grandior</i> Pesenko <i>et al</i> 2002	25		+							
<i>halictoides</i> (Blüthgen 1925)	438				?					+
Subgenus <i>Ceylaliectus</i>										
<i>congoensis</i> sp. n.	499				+			+	+	+
<i>muiri</i> (Cockerell 1909)	1004				+	+			+	+
<i>punjabensis</i> (Cameron 1907)	288		+	+	+	+				
<i>variegatus</i> (Olivier 1789)	3510	+	+	+	+	+				
Subgenus <i>Meganomioides</i>										
<i>desertorum</i> (Blüthgen 1925)	34			+						
<i>karachensis</i> (Cockerell 1911)	30				+					
Genus <i>Nomioides</i>										
Subgenus <i>Erythronomioides</i>										
<i>socotranus</i> Blüthgen 1925	4						+			
Subgenus <i>Nomioides</i>										
<i>bluethgeni</i> Pesenko 1979	13			+						
<i>deceptor deceptor</i> Saunders 1908	450			+	+					
<i>deceptor canariensis</i> Blüthgen 1937	60	+								
<i>deceptor capverdensis</i> ssp. n.	37		+							
<i>elbanus</i> Blüthgen 1934	18			+						
<i>facilis</i> (Smith 1853)	348			+			+			
<i>fortunatus</i> Blüthgen 1937	253	+		+						
<i>gristwoldi</i> sp. n.	3					+				
<i>kenyensis</i> sp. n.	11					+				
<i>klausi</i> Pesenko 1983	48			+	+					
<i>longiceps</i> Blüthgen 1933	5			+						
<i>maculiventr</i> is (Cameron 1905)	1982					+				+
<i>micheneri</i> sp. n.	294				+	+			+	
<i>minutissimus maurus</i> Blüthgen 1925	79			+						
<i>mucoreus</i> Blüthgen 1933	1			+						
<i>ornatus</i> Pesenko 1983	19			+	+					
<i>pauyi</i> Pesenko, sp. n.	13			+						
<i>rotundiceps</i> Handlirsch 1888	468			+	+	+				
<i>squamiger</i> Saunders 1908	1154			+						
<i>turanicus</i> Morawitz 1876	294			+	+	+				
Total (33 species)	11863	3	5	17	12	12	2	1	5	8

The main regions of Africa are distinguished as follows:

1. Canary Islands;
2. Cape Verde Islands;
3. Mediterranean and Saharan region;
4. Sahelosudanian region (semi-desert grassland, wooded grassland and dry forest);
5. Ethiopian-Somali-Masai region;
6. Island of Socotra;
7. Congoguinian region (rainforests);
8. Zambesian region (dry forest and secondary grassland);
9. Southern African region.

that are found in the Arabian Peninsula is also mapped but these localities will be listed in other our paper (Pesenko & Pauly, in press) (fig. 39).

Africa (30 millions square km) is an ancient continent with the largest desert of the World. The distributional patterns of 33 species of Nomiodinae occurring in Africa are given in tab. 6. The sum of data for Nomiodinae in Africa, Arabian Peninsula and Madagascar is shown on map fig.39. The points on maps of plates XV-XX represent the location of each record and show an approximate zone of distribution for each species. This does not mean that a species may not be encountered outside these delimited areas. In fact, the exact distribution of each species, particularly in the southern border of the Sahara Desert, is not completely known. Only scanty material on the bees has been collected in Mali, Chad, the Republic of Central Africa, southern Sudan, Ethiopia, Somalia, Angola, Tanzania and Mozambique.

As shown in table 6 (summarizing the distributional data on all species), the richest areas at the species level for the subfamily Nomiodinae are North Africa (17 species), followed by eastern Africa (12 species) and the Sahelosudanian Region (12 species), South Africa (8 species), Zambesian Region (5 species) and the most depauperate is the rainforest zone of the Sudanoguinean Region (1 species).

All three species of Nomiodinae occurring in Europe, *Ceylalictus variegatus*, *Nomioides facilis*, and *N. minutissimus*, are also found in the Mediterranean zone of North Africa. *N. facilis* is replaced in more xeric zone situated in the south of the Atlas Mts. by the very close species, *N. squamiger*. It seems that a "cline" following the Mediterranean - steppe zonation occurs into the *N. facilis* - *N. squamiger* complex; the exact limits between the two species remain unclear. *N. facilis* is distributed in the Atlantic zone of Morocco and in the Mediterranean zone of the Maghreb Area, while *N. squamiger* inhabits the more xeric pre-Saharan territory situated south of the Atlas Mts. and the Arabian Peninsula. *N. squamiger* is unusual in the development of the scale like pubescence, a characteristic feature of desert bees. *Nomioides minutissimus* is represented by a separate subspecies, *N. minutissimus* ssp. *maurus*, in the Maghreb Area. The close *N. longiceps* inhabits southern Tunisia and Lybia.

The fauna of the Maghreb Area and Egypt is relatively well known, but Cyrenaica remains poorly known, with a species recorded only by the type specimen (*Nomioides mucoreus*). *Nomioides bluethgeni* has an interesting disjunctive distributional range, confined only to one locality in Morocco (Middelt, 1500 m, enclave between the Middle and High Atlas

Mts.), southern Kenya (Voi near the Tsavo National Park), Egypt (Mariut) and is more common in the Near East, Asia Minor and central Asia to eastern Mongolia.

The Sahara Desert is actually a barrier but at some recent periods it was more humid (Adams & Faure 1997; Olago 2001). Exchanges between the two borders of the Sahara Desert were probably facilitated during the Early to Mid-Holocene (from 9000 to 5000 yr BP), when the Mediterranean steppes and semi-deserts extended to the south and when the Sahelian belt was enlarged to the north during more wet conditions; the most streaking feature of the Sahara Desert was the presence of an organized exorheic hydrological system faced to the Atlantic as well as to the Mediterranean. There was also a large lake system, Lake Arawan in northern Mali, the system of the former Lake Chad, and the former Lake Ptolemei in the northern Sudan. The vegetation maps of these periods show a clear mosaic of vegetation. Examples of trans-Saharan species are *Nomioides klausii*, *N. rotundiceps*, *N. turanicus*, *Ceylalictus punjabensis*, and *C. variegatus*.

Two rare species, *Nomioides paulyi* and *N. elbanus*, have an interesting Saharo-montane distributional range. *N. paulyi* is recorded only from the Ahaggar (around "Guelas") and Ksour Mts. in southern Tunisia, in rocky environment; *N. elbanus* is recorded only from Ahaggar Mts. and mountains around the Red Sea (Djebel Elba in Egypt). The Saharan mountains like Tibesti are poorly known in relation to the Nomiodinae.

The case of *Ceylalictus* subg. *Meganomioides* is particular: one species, *C. desertorum*, inhabits the semi-desert zone situated in the north of the Sahara Desert, the other, *C. karachensis*, the steppe zone of the southern border, with a possible disjunction between Mauritania (where the species is common) and the next locality situated in Oman; but the southern border of the Sahara Desert is too poorly known in relation to Nomiodinae for more definitive conclusion. The present range in Mauritania is perhaps more influenced by the Atlantic monsoon oscillating between extreme locations of about 2° and 25° N.

N. ornatus is a Central Asian species penetrating in Africa through Egypt and the southern margin of the Sahara Desert.

Only one species, *Nomioides micheneri*, seems to be a typically Sahelosudanian one. It inhabits wooded grasslands, with distributional range extending from Senegal to eastern Africa and the south of the Arabian Peninsula.

Steppes of eastern Africa have exchanges with Sahelian and Sudanian west Africa (*Cellariella somalica*,

Ceylalictus muiri, *C. punjabensis*, *C. variegatus*, *C. micheneri*, *Nomioides rotundiceps*, and *N. turanicus*) or with South Africa (*Cellariella kalaharica*, *C. somalica*, and *Ceylalictus muiri*). Three species are endemic to eastern Africa: *Cellariella inexpectata* and *Nomioides kenyensis* in xeric tablelands of Kenya, and *Nomioides griswoldi* on the coast. No species has an afromontane or high altitude distribution. Ethiopia and deserts of Somalia are very poorly known in relation to the Nomioiinae.

The lowland rainforests of central Africa are most depauperate, with only one adapted species, *Ceylalictus congoensis*. This species is found on the sandy coast of the Atlantic and penetrates the humid tropical forests following the sandy riverbanks. In Africa, no species of Nomioiinae inhabits the typically primary forest. [It can be mentioned that among the African and Madagascan Nomioiinae, the lone *Ceylalictus* (*Atronomioides*) *sylvestris* Pesenko & Pauly 2001 occurs in the forest of the middle altitude on the east coast of Madagascar.]

Savannas and dry forests of the Zambesian Region are rather poor (4 species): *Cellariella kalaharica*, *C. somalica*, *Ceylalictus muiri* and *C. congoensis*. The three first species are also widespread in South Africa.. Three large countries, Angola, Mozambique and Tanzania, in that region are very poorly known in relation to the Nomioiinae.

South Africa is moderately rich (8 species) and the Southwestern desert of Namibia is more diversified. Half of species from South Africa belong to the genus *Cellariella* (4 species including two endemics), two species, to *Ceylalictus* s. str. (commonest *C. muiri* and surprising intrusion of *C. congoensis* along gallery forests in northern Namibia), one endemic species, to *Ceylalictus* subg. *Atronomioides* (*C. halictoides*, only continental species of this subgenus) and only one species, also endemic to South Africa, to *Nomioides* s. str. (very variable colored *N. maculiventris*). The arid and semiarid west of South Africa is the lone place on the Earth, where a center of bee richness coincides with a phytodiversity hotspot (Kuhlmann 2005).

Insular environment around Africa has also a rich nomioiine fauna.

The Canary Islands are inhabited by three species: *Ceylalictus variegatus*, *Nomioides fortunatus* and *N. deceptor* ssp. *canariensis* (an endemic subspecies). *N. fortunatus* has an interesting distribution: the Canary Islands and a small continental territory in Morocco, around the Sous Valley, between the Cap Rhir, Agadir and Tiznit. The only other known bee with such a distribution is *Lasioglossum* (*Erylaeus*) *phoenicurus* (Warncke 1975), known from the Lanzarote and

Fuerteventura Islands (two islands situated nearer to Africa) and the Cap Rhir (F. LaRoche, personal communication). This kind of distribution is well known as "Macaronesian" distribution; it is characterized by a unique vegetation: a dry matorral with cactiform *Euphorbia* spp.

It is noteworthy that the Nomioiinae are the commonest and most important bees on the Cape Verde Islands: 5 species of the 13 bee species encountered there belong to the subfamily Nomioiinae. Two species of *Ceylalictus* subg. *Atronomioides*, *C. capverdensis* and *C. grandior* are endemics and are the largest species of Nomioiinae in the World: gigantism or nanism are well known phenomena of the evolution of insects in island environments. *Ceylalictus* (*Ceylalictus*) *punjabensis* is characterized by the largest Sahara-Indian distributional range: from the Cape Verde islands, throughout the Sahara Desert as far in the east as northwestern India. *Nomioides* (*Nomioides*) *deceptor*, is mostly North African in its occurrence; it is represented in these islands by a separate subspecies. The fifth species occurring on the Cape Verde Islands is the widespread *Ceylalictus* (*Ceylalictus*) *variegatus*.

Socotra is also particular with the endemic *Nomioides socotranus* belonging to the monotypic *Nomioides* subg. *Eythronomioides*. Another species found on the island has been formerly identified as *N. facilis* (see Pesenko 1983), but it is instead *N. squamiger* by its geographical position and the identity of the specimens checked.

The Madagascan fauna of the Nomioiinae includes 6 endemics, all belonging to *Ceylalictus* subg. *Atronomioides*, the most generalized subgenus of Nomioiinae, and two species widely distributed in continental Africa: *Ceylalictus muiri* and *Cellariella kalaharica*. *Nomioides* s. str. is completely lacking on that island. The islands of the Indian Ocean, the Seychelles and the Mascarenes, lack Nomioiinae, but one species, *Ceylalictus* (*Atronomioides*) *aldabranus*, is found on Aldabra, the Comores and the coast of Madagascar. *Ceylalictus muiri* is found on the Glorieuses Islands (new record). No species of Nomioiinae are actually known from the tropical islands of the Guinean Gulf (Fernando Poo, Principe and São Tome).

Trophic links or flower associations of the African Nomioiinae

The flora of Africa, the next-largest tropical continent after South America, comprises 40000 to 45000 species (35000 of these are endemics) (Davis & al. 1994). This is less than southeastern Asia (42000 to 50000 species) (Davis & Heywood 1995). Without Madagascar (with its 8000 endemics) and the Cape Region of South Africa, the total number of species in

Table 7. Plants, flowers of which were recorded to be visited by bees of the subfamily Nomioiinae in Africa (excluding Madagascar)

Plant family	Plant species	Bee-visitors
Aizoaceae	<i>Ruschia</i> spp.	<i>Nomioides maculiventris</i>
	<i>Sesubium portulacastrum</i> (L.) L.	<i>Ceylalicthus grandior</i> , <i>Nomioides deceptor</i>
Amaranthaceae	<i>Aerva javanica</i> (Burm. f.) Juss. ex Schult	<i>Ceylalicthus variegatus</i>
Anacardiaceae	<i>Mangifera indica</i> L.	<i>Ceylalicthus congoensis</i> , <i>C. muiri</i>
Apiaceae	<i>Ammi visnaga</i> (L.) Lam.	<i>Nomioides facilis</i>
Asclepiadaceae	<i>Landolfia</i> sp.	<i>Nomioides rotundiceps</i>
Asteraceae	<i>Acanthospermum hispidum</i> DC.	<i>Ceylalicthus congoensis</i> , <i>C. muiri</i>
	<i>Anthemis</i> sp.	<i>Nomioides deceptor</i> , <i>N. turanicus</i>
	<i>Centaurea maroccana</i> Ball	<i>Nomioides deceptor</i>
	<i>Chrysanthemum</i> sp.	<i>Nomioides maculiventris</i>
	<i>Echinops spinosissimus</i> Turra	<i>Nomioides deceptor</i>
	<i>Senecio</i> sp.	<i>Nomioides minutissimus</i>
Balanitaceae	<i>Balanites aegyptiaca</i> (L.) Delile Simar	<i>Cellariella somalica</i> , <i>Ceylalicthus congoensis</i> , <i>C. variegatus</i> , <i>Nomioides micheneri</i> , <i>N. rotundiceps</i>
Boraginaceae	<i>Echium stenosphon</i> Webb	<i>Ceylalicthus capverdensis</i>
	<i>Heliotropium bacciferum</i> Forsk.	<i>Ceylalicthus variegatus</i>
	<i>Heliotropium ramosissimum</i> (Lehm.) DC	<i>Ceylalicthus capverdensis</i> , <i>C. grandior</i> , <i>Nomioides deceptor</i>
Brassicaceae	<i>Sinapis</i> sp.	<i>Nomioides facilis</i>
Burseraceae	<i>Boswellia sacra</i> Flueck	<i>Ceylalicthus variegatus</i>
Caesalpiniaceae	<i>Cassia obovata</i> Linn.	<i>Ceylalicthus punjabensis</i> , <i>C. variegatus</i> , <i>Nomioides micheneri</i> , <i>N. ornatus</i> , <i>N. rotundiceps</i>
	<i>Cassia</i> sp.	<i>Ceylalicthus congoensis</i> , <i>C. muiri</i> , <i>C. variegatus</i> , <i>Nomioides micheneri</i> , <i>N. rotundiceps</i>
	<i>Dialium soyauxii</i> Harms	<i>Ceylalicthus congoensis</i>
Campanulaceae	<i>Campanula</i> sp.	<i>Nomioides minutissimus</i>
Capparidaceae	<i>Cleome viscosa</i> L.	<i>Nomioides deceptor</i> , <i>N. rotundiceps</i>
	<i>Crateva religiosa</i> Forst. f.	<i>Ceylalicthus congoensis</i>
Caryophyllaceae	<i>Polycarpea gayi</i> Webb	<i>Ceylalicthus capverdensis</i>
	<i>Polycarpea nivea</i> Webb	<i>Nomioides deceptor</i>
	<i>Herniaria fontanesii</i> Gay	<i>Nomioides minutissimus</i>
Combretaceae	<i>Guiera senegalensis</i> J.F. Gmel.	<i>Cellariella somalica</i> , <i>Ceylalicthus congoensis</i> , <i>C. muiri</i> , <i>Nomioides micheneri</i>
	<i>Terminalia prunioides</i> Lawson	<i>Ceylalicthus muiri</i> , <i>Nomioides maculiventris</i>
Cucurbitaceae	<i>Cucurbita</i> sp.	<i>Ceylalicthus variegatus</i>
Euphorbiaceae	<i>Antidesma venosum</i> E. Mey. ex Tul.	<i>Ceylalicthus congoensis</i>
	<i>Chrozophora</i> sp.	<i>Nomioides rotundiceps</i>
	<i>Euphorbia pubescens</i> Vahl	<i>Ceylalicthus punjabensis</i> , <i>C. variegatus</i> , <i>Nomioides squamiger</i>
Fabaceae	<i>Cajanus cajan</i> (L.) Millsp.	<i>Ceylalicthus capverdensis</i>
	<i>Indigofera</i> sp.	<i>Ceylalicthus variegatus</i> , <i>Nomioides klausi</i> , <i>N. micheneri</i> , <i>N. rotundiceps</i>
	<i>Medicago sativa</i> L.	<i>Ceylalicthus punjabensis</i> , <i>C. variegatus</i> , <i>Nomioides squamiger</i> , <i>N. turanicus</i>
	<i>Retama retam</i> Webb	<i>Ceylalicthus variegatus</i> , <i>Nomioides deceptor</i>
	<i>Vicia faba</i> L.	<i>Ceylalicthus variegatus</i>
Frankeniaceae	<i>Frankenia laevis</i> L.	<i>Nomioides minutissimus</i>
Irvingiaceae	<i>Irvingia smithii</i> Hook. f.	<i>Ceylalicthus capverdensis</i>
Lamiaceae	<i>Lavandula rotundifolia</i> Benth	<i>Ceylalicthus capverdensis</i>
	<i>Micromeria forbesii</i> Benth	<i>Ceylalicthus capverdensis</i>
	<i>Ocimum</i> sp.	<i>Nomioides rotundiceps</i>
Malvaceae	<i>Gossypium</i> sp.	<i>Ceylalicthus punjabensis</i> , <i>C. variegatus</i>
Mimosaceae	<i>Acacia tortilis</i> var. <i>raddiana</i> (Savi) Brenan	<i>Cellariella somalica</i> , <i>Nomioides micheneri</i> , <i>N. ornatus</i>
	<i>Acacia</i> sp.	<i>Ceylalicthus muiri</i>
	<i>Prosopis juliflora</i> (Sw.) DC.	<i>Ceylalicthus punjabensis</i> , <i>Nomioides deceptor</i>
Nyctaginaceae	<i>Commicarpus helenae</i> (J.A. Schult.) Meikle	<i>Nomioides deceptor</i>

Pedaliaceae	<i>Sesamum</i> sp.	<i>Ceylalicthus variegatus</i> , <i>Nomioides micheneri</i> , <i>N. rotundiceps</i>
Resedaceae	<i>Reseda lutea</i> L.	<i>Nomioides facilis</i> , <i>N. squamiger</i>
	<i>Reseda luteola</i> L.	<i>Nomioides facilis</i>
	<i>Reseda</i> sp.	<i>Nomioides deceptor</i>
	<i>Ziziphus lotus</i> (L.) Lam.	<i>Nomioides deceptor</i> , <i>N. facilis</i>
Rhamnaceae	<i>Ziziphus</i> sp.	<i>Ceylalicthus muiri</i> , <i>C. variegatus</i> , <i>Nomioides deceptor</i> , <i>N. micheneri</i> , <i>N. rotundiceps</i>
Rubiaceae	<i>Borreria verticillata</i> (L.) GF. May	<i>Ceylalicthus congoensis</i> , <i>C. variegatus</i>
	<i>Canthium</i> sp.	<i>Ceylalicthus congoensis</i>
	<i>Diodia vaginalis</i> Benth.	<i>Ceylalicthus congoensis</i>
	<i>Mitracarpus villosus</i> (SW.) DC (= <i>M. scaber</i> Zuc.)	<i>Ceylalicthus congoensis</i> , <i>C. muiri</i> , <i>C. variegatus</i>
Scrophulariaceae	<i>Scrophularia ramosissima</i> Loisel	<i>Nomioides deceptor</i>
Tamaricaceae	<i>Tamarix senegalensis</i> DC	<i>Ceylalicthus grandior</i> , <i>C. punjabensis</i> , <i>Nomioides deceptor</i>
	<i>Tamarix</i> sp.	<i>Ceylalicthus punjabensis</i> , <i>C. variegatus</i> , <i>Nomioides rotundiceps</i> , <i>N. squamiger</i> , <i>N. turanicus</i>
Verbenaceae	<i>Vitex doniana</i> Sweet	<i>Ceylalicthus congoensis</i>
Vitaceae	<i>Rhoicissus digitata</i> (Lf) Gilg & Brandt	<i>Ceylalicthus muiri</i>
Zygophyllaceae	<i>Tribulus terrestris</i> L.	<i>Nomioides rotundiceps</i>
	<i>Tribulus</i> sp.	<i>Ceylalicthus muiri</i>
	<i>Zygophyllum simplex</i> L.	<i>Ceylalicthus capverdensis</i> , <i>C. muiri</i> , <i>Nomioides deceptor</i> , <i>N. maculiventris</i>

the African flora is under 30000. This relative floristic poverty, compared to Latin America (90000 species) (Davis & al. 1997) and Asia, is thought to be the result of millennia of the human activity (human influence has been more intensive and long term than in other tropical regions), a drier climate and past drastic climatic fluctuations in which the forests contracted into small enclaves may have offered large areas to bees like the Nomioidinae. Perhaps the most extreme case of large numbers of plant species confined to a small area is the Fynbos, the evergreen bush land and thickets of the Cape Region in South Africa, famous for an amazing diversity of *Aloe*, *Protea* and *Erica*. The territory situated along the coast to the north and east of Cape Town, it is the home to about 6500 vascular plant species, mostly very narrow endemics. Compare this with 20 species, which is the total for the vast 200000 square km of the Sahara Desert. The plant richness in main regions of Africa is as following: 10000 species in North Africa; 21000, in Tropical Africa; 21000, in South Africa; 10000-12000, in Madagascar.

Most of the data on the plants visited by Nomioidinae are available from a collecting trip of one of us (Pauly) in western Africa, from collecting trips of the University of Mons-Hainaut in Morocco (Y. Barbier, P. Rasmont, M. Terzo & R. Wahis), and from collecting of F. LaRoche in the Cape Verde Islands. Practically no information is available from South and eastern Africa. Further investigations are necessary in regards of the numerous flowering plants inhabiting

the continent.

Nomioidinae are recorded in Africa as visitors of flowers of 77 species belonging to 33 plant families (tab. 7). They show no preference in the choice of flowers and seem to be wide polylectic species. Polylectism of the Nomioidinae confirms by the vast data from Asia (Pesenko 1983).

The Nomioidinae are the most abundant bees in the Saharan Desert and are predominant pollinators of plants in this biota. For example, three days of a collecting trip by one of us (Pauly) in the center of the Sahara Desert, in the wadis („Oueds“) near Ahaggar, during the monsoon rain of August, 1987, have provided 692 individuals of Nomioidinae; 100, of Hylaeinae; 15, of Colletinae; 14, of Megachilinae; 13, of Xylocopinae; 10, of Anthophorinae; 5, of Nomiinae; 3, of Halictinae.

The flowers of *Tamarix* are the most abundant and characteristic resources in this biota and are very attractive for the Nomioidinae. In the Sahelian belt, flowers of trees like *Acacia* spp. and *Balanites aegyptiaca* are also well visited. Weed plants like *Cassia* spp. are also good resources.

In southeastern Morocco, the abundance of the Nomioidinae depends on the period of a season. In February, there are no Nomioidinae fly, while they are very abundant in May-July (P. Rasmont, in lit.). Shmida & Dukas (1990) suggested that small bee species are more abundant in the hot period of a season because their higher surface/volume ratio facilitate

the cooling of the body during the flight. Moreover, Nomioioidinae frequently dominate not only in the number of specimens but also sometimes in biomass (original observations by Pesenko in Central Asia).

Nomioioidinae are also probably the most significant pollinators in the Cape Verde Islands, there they are the commonest bees in these islands and represents 40% of the bee species.

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REFERENCES

- Alexander B.A., Michener C.D. 1995.** Phylogenetic studies of the families of short-tongued bees (Hymenoptera: Apoidea). *The University of Kansas Science Bulletin* **55**(11): 377-424.
- Alfken J.D. 1924.** Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaft in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem anglo-ägyptischen Sudan (Kordofan) 1914. XVI. Hymenoptera. F. Apidae. *Denkschriften der Akademie der Wissenschaften in Wien, mathematisch-naturwissenschaftliche Klasse* **99**: 247-253.
- Alfken J.D. 1927.** Beitrag zur Kenntnis der Bienenfauna von Ägypten. *Senckenbergiana* **8**(2): 96-128.
- Alfken J.D. 1939.** Hymenoptera Apidae, p. 111-112 in: **Zavattari E.** (ed.). *Missione biologica nel paese dei Borana, Vol. 3. Raccolte zoologiche, Parte J.* Reale Accademia d'Italia, Roma, 467 p., 8 pls.
- Alfken J.D., Blüthgen P., Hedicke H. 1934.** Inventa entomologica itineris Hispanici et Marocani, quod a. 1926 fecerunt Harald et Hakan Lindberg. XIV. Apidae. *Commentationes Biologicae* **4**(2) [1933]: 1-20.
- Arnold G. 1947.** A key to the African genera of the Apidae. *Journal of the Entomological Society of South Africa* **9**: 193-218.
- Asams J.M., Faure H. 1997.** Preliminary vegetation maps of the World since the Last Glacial Maximum: An aid to archaeological understanding. *Journal of Archaeological Science*, **24**: 623-647.
- Barbier Y., Rasmont P., Dufrene M., Sibert J.M. 2000.** *Data Fauna-Flora. Guide d'utilisation.* Université de Mons Hainaut, Mons, 1-106, 1 CD-ROM.
- Batra S.W.T. 1966.** Nests and social behavior of halictine bees of India (Hymenoptera: Halictidae). *Indian Journal of Entomology* **28**(3): 375-393.
- Batra S.W.T. 1977.** Bees of India (Apoidea), their behaviour, management and a key to the genera. *Oriental Insects* **11**(3): 289-323.
- Benoist R. 1943.** Contribution a la connaissance des hyménoptères de l'Afrique du nord française. I. Apides recueillis par L. Berland dans le sud Marocain. *Bulletin de la Société Entomologique de France* **48**(3): 41-44.
- Benoist R. 1950a.** Apides de l'A.O. F. communiqués par A. Villiers. *Bulletin de l'Institut Français d'Afrique Noire* **12**(3): 629.
- Benoist R. 1950b.** Contribution a l'étude de l'AïR (Mission Z. Chopard et A. Villiers). Hyménoptères Apidae. *Mémoires de l'Institut Français d'Afrique Noire* **10**: 301-313.
- Benoist R. 1962.** Viaggi di A. Giordani Soika nel Sahara. X. Hyménoptères apides recueillis au Hoggar par A. Giordani Soika. *Bollettino del Museo Civico di Storia Naturale di Venezia* **14** [1961]: 43-52.
- Blüthgen P. 1922.** Beiträge zur Synonymie der Bienengattung *Halictus* Latr. [I]. *Deutsche entomologische Zeitschrift* **1922**(1): 46-66.
- Blüthgen P. 1925.** Die Bienengattung *Nomioides* Schenck. *Stettiner entomologische Zeitung* **86**(1): 1-100.
- Blüthgen P. 1930.** *Nomioides* Schck., p. 767-768 in: **Schmiedeknecht O.** *Die Hymenopteren Nord- und Mitteleuropas. Mit Einschluss von England, Südschwiz, Südtirol und Ungarn. Nach ihren Gattungen und zum grossen Teil auch ihren Arten analytisch bearbeitet.* G. Fischer, Jena, X + 1062 p.
- Blüthgen P. 1932.** Beiträge zur Synonymie der Bienengattung *Halictus* Latr. (Hym. Apid.) VIII. *Mitteilungen der deutschen entomologischen Gesellschaft* **3**(2): 30-31.
- Blüthgen P. 1933a.** Neue Arten aus der Gattung *Nomioides* Schenck (Hym. Apidae Halictinae Nomioioidini C. B.). *Memorie della Società Entomologica Italiana* **12**(1): 114-127.
- Blüthgen P. 1933b.** Ein Beitrag zur Kenntnis der Bienenfauna Ägyptens (Hymenoptera-Apidae-Halictidae-Halictinae). *Bulletin de la Société Royale Entomologique d'Egypte* **17**(1-3): 14-27.
- Blüthgen P. 1933c.** *Halictus* Latr., *Sphecodes* Latr., *Nomioides* Schenck, p. 52-63 in: **Nadig A., sen. & jun.** Beitrag zur Kenntnis der Hymenopterenfauna von Marokko und Westalgerien. Erster Teil: Apidae, Sphegidae, Vespidae. *Jahresberichte der naturforschender Gesellschaft in Graubünden* **71**: 37-107.
- Blüthgen P. 1934a.** 1. Nachtrag zur Monographie der Bienengattung *Nomioides* Schck. (Hym., Apidae, Halictinae). *Stettiner entomologische Zeitung* **95**(2): 238-283.
- Blüthgen P. 1934b.** Zweiter Beitrag zur Kenntnis der Halictinenfauna Ägyptens (Hymenoptera: Apidae Halictidae-Halictinae). *Bulletin de la Société Royale Entomologique d'Egypte* **18**(1-2): 188-201.
- Blüthgen P. 1934c.** New *Nomioides* from the F. M. S. Museums. *J. Feder. Malay St. Mus.* **17**(3): 493-501.
- Blüthgen P. 1937.** Halictinae (Hymenoptera: Apidae) von den Kanarischen Inseln. *Commentationes Biologicae* **6**(11): 1-11.
- Blüthgen P. 1961.** Ergebnisse der Deutschen Afghanistan Expedition 1956 der Landessammlungen für Naturkunde Karlsruhe. Diptera und Apoidea (partim) (Hymenoptera). *Beiträge zur naturkundlichen Forschung in Südwestdeutschland* **19**(3): 277-287.
- Bouček Z., Šustera O. 1957.** Superfamily Apoidea, p. 377-406 in: **Kratochvil J.** (ed.). *A key to insects of Czechoslovakia. Vol. 2.* Praha [in Czech].
- Brothers D.J. 1975.** Phylogeny and classification of the aculeate Hymenoptera, with special reference to Mutillidae. *The University of Kansas Science Bulletin* **50**(11): 483-648.
- Brothers D.J. 1976.** Modifications of the metapostnotum and origin of the "propodeal triangle" in Hymenoptera Aculeata. *Systematic Entomology* **1**(3): 177-182.
- Cameron P. 1905.** On some new genera and species of Hymenoptera from Cape Colony and Transvaal. *Transactions of the South African Philosophical Society* **15**(4): 195-257.
- Cameron P. 1907.** Description of a new genus and some new species of Hymenoptera captured by Lieut. Col. C. G. Nurse at Deesa, Matheran and Ferozepore. *Journal of the Bombay Natural History Society* **17**(4): 1001-1012.
- Cockerell T.D.A. 1909.** Descriptions and records of bees. XXIII. *Annals and Magazine of Natural History* (Ser. 8) **4**(23): 393-404.
- Cockerell T.D.A. 1911.** Descriptions and records of bees. XXXIV. *Annals and Magazine of Natural History* (Ser. 8) **7**(39): 225-237.

- Cockerell T.D.A. 1912.** Report of the Percy Sladen Trust Expedition to the Indian Ocean in 1905 under the leadership of Mr. J. Stanley Gardiner, M. A. Vol. IV. No. II. Hymenoptera, Apoidea. *Transactions of the Linnean Society of London, Ser. 2. Zoology* **15**(1): 29-41.
- Cockerell T.D.A. 1919.** The metallic-colored halictine bees of the Philippine Islands. *Philippine Journal of Science* **15**(1): 9-14.
- Cockerell T.D.A. 1921.** Descriptions and records of bees. XCI. *Annals and Magazine of Natural History* (Ser. 9) **8**(45): 359-368.
- Cockerell T.D.A. 1931.** Descriptions and records of bees. CXXV. *Annals and Magazine of Natural History* (Ser. 10) **7**(38): 201-212.
- Cockerell T.D.A. 1932.** Records of African bees. I. *American Museum Novitates* **547**: 1-16.
- Cockerell T.D.A. 1935.** Scientific results of the Vernay -Lang Kalahari Expedition, March to September, 1930. Hymenoptera (Apoidea). *Annals of the Transvaal Museum* **17**(1): 63-94.
- Cockerell, T.D.A. 1936.** African bees of the genus *Nomioides*. *American Museum Novitates* **857**: 1-3.
- Cockerell T.D.A. 1937.** Records of African bees. *American Museum Novitates* **29**: 1-15.
- Cockerell T.D.A. 1939.** Descriptions and records of bees. CLXXI. *Annals and Magazine of Natural History* (Ser. 11) **3**(14): 177-185.
- Constantinescu A. 1974.** Le genre *Nomioides* Schenck (Hymenoptere, Apoidea) en Roumanie. *Travaux du Museum d'Histoire Naturelle "Grigore-Antipa"* **15**: 267-282.
- Dalla Torre K. von, Friese H. 1895.** Synonymischer Katalog der europäischen Sammelbienen (2). *Entomologische Nachrichten* **21**(3): 37-50.
- Davis S.D., Heywood V.H. (eds). 1995.** *Centres of plant diversity. Vol. II: Asia, Australia and the Pacific*. I.U.C.N., Cambridge, XIV + 578 p.
- Davis S.D., Heywood V.H., Hamilton A.C. (eds.) 1994.** *Centres of plant diversity. Vol. 1: Europe, Africa, South West Asia and the Middle East*. I.U.C.N., Cambridge, xiv + 354 p.
- Davis S.D., Heywood V.H., Herrera-MacBryde O., Villa-Lobos J., Hamilton A.C. (eds) 1997.** *Centres of plant diversity. Vol. III: The Americas*. I.U.C.N., Cambridge, XVI + 562 p.
- Dębski B. 1917.** Sur la femelle de *Nomioides fasciatus* Friese et description des autres *Nomioides* d'Egypte. *Bulletin de la Société Royale Entomologique d'Egypte* **10**(1): 25-50.
- Dekeyser P.L., Villiers A. 1956.** Contribution à l'étude du peuplement de la Mauritanie. Notations écologiques et biogéographiques sur la faune de L'Adgar. *Mémoires de l'Institut Français d'Afrique Noire* **44**: 1-222.
- Dours A. 1873.** Hyménoptères du bassin méditerranéen: *Andrena* (suite), *Biareolina*, *Eucera*. *Revue et Magasin de Zoologie* (Sér. 3) **1**: 274-324.
- Dours A. 1874.** Catalogue synonymique des hyménoptères de France. *Mémoires de la Société Linné du Nord de la France* **3** [1873/1874]: 1-230.
- Ebmer A.W. 1969.** Die Bienen des Genus *Halictus* Latr. s. l. im Grossraum von Linz (Hymenoptera, Apidae). Systematik, Biogeographie, Ökologie und Biologie mit Berücksichtigung aller bisher aus Mitteleuropa bekannten Arten. Teil I. *Naturkundliches Jahrbuch der Stadt Linz* **1969**: 133-183.
- Ebmer A.W. 1987.** Die europäischen Arten der Gattungen *Halictus* Latreille 1804 and *Lasioglossum* Curtis 1833 mit illustrierten Bestimmungstabellen (Insecta: Hymenoptera: Apoidea: Halictidae: Halictinae). 1. Allgemeiner Teil, Tabelle der Gattungen. *Senckenbergiana Biologica* **68**(1-3): 59-148.
- Ebmer A.W. 1988.** Kritische Liste der nicht-parasitischen Halictidae Österreichs mit Berücksichtigung aller mitteleuropäischen Arten (Insecta: Hymenoptera: Apoidea: Halictidae). *Linzer biologische Beiträge* **20**(2): 527-711.
- Engel M.S. 2001.** A monograph of the Baltic Amber bees and evolution of the Apoidea (Hymenoptera). *Bulletin of the American Museum of natural History* **259**: 1-192.
- Fabricius J.C. 1798.** *Supplementum entomologiae systematicae*. Proft & Storch, Hafniae, II + 572 p..
- Friese H. 1898.** Beiträge zur Bienenfauna von Aegypten. *Természetrázi Füzetek* **21**(3-4): 303-313.
- Friese H. 1909.** Die Bienen Afrikas, nach dem Stande unserer heutigen Kenntnisse, p. 85-475 in: **Schulze L.** *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika 1903-1905. Bd II, Lfg 2. X. Insecta* (3. Ser.). Fischer, Jena (Jenaische Denkschriften **14**).
- Friese H. 1913a.** Neue Bienenarten aus Afrika. *Deutsche entomologische Zeitschrift* **1913**(5): 573-578.
- Friese H. 1913b.** II. Nachtrag zu "Bienen Afrikas". *Zoologische Jahrbücher. Abteilung für Systematik, Ökologie und Geographie der Tiere* **35**(5-6): 581-598.
- Friese H. 1915.** Zur Bienenfauna von Abessinien (Hym.). *Deutsche entomologische Zeitschrift* **1915**(3): 265-298.
- Friese H. 1916.** Hymenoptera. V: Apidae, p. 415-452 in: **Michaelsen W.** *Beiträge zur Kenntnis der Land- und Südwasserfauna Deutsch-Südwestafrikas. Ergebnisse der Hamburger deutsch-südwestafrikanischen Studienreise 1911*. Friederichsen, Hamburg.
- Giraud J. 1861.** Fragmentes entomologiques. I. Description de plusieurs apides nouvelles et observations sur quelques espèces connues. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien (Abhandlungen)* **11**: 447-470.
- Giraud J. 1863.** Hyménoptères recueillis aux environs de Suse, en Piémont, et dans le département des Hautes-Alpes, en France; et description de quinze espèces nouvelles. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien (Abhandlungen)* **13**(1): 11-46.
- Graeffe E. 1906.** Beiträge zur Insektenfauna von Tunis. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien* **56**(6-7): 446-471.
- Guiglia D. 1929.** Risultati zoologici della missione inviata dalla R. Società Geografica Italiana per l'esplorazione dell' Oasi di Giarabub (1926-1927). Hymenoptera Aculeata. *Annali del Museo Civico Storia Naturale "G. Doria" di Genova* **53**: 393-421.
- Guiglia D. 1933.** Spedizione scientifica all'oasi di Cufra (marzo-luglio 1931). Imenotteri aculeati. II parte. *Annali del Museo Civico Storia Naturale "G. Doria" di Genova* **56**: 130-140.
- Guiglia D. 1936.** Missione scientifica del Prof. Edoardo Zavattari nel Sahara Italiano (1933-34). Imenotteri aculeati. *Bollettino della Società Entomologica Italiana* **68**(1-2): 3-16.
- Guiglia D. 1939.** Imenotteri aculeati del Fezzan sud occidentale e dei Tassili d'Aggèr (Missione Scortecchi 1936). (Scoliidae, Psammodontidae, Specidae, Apidae). *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano* **78**(2): 179-193.
- Handlirsch A. 1888.** Die Bienenengattung *Nomioides* Schenck. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien (Abhandlungen)* **38**: 395-406, 1 pl.
- Hohmann H., La Roche F., Ortega G., Barquin J. 1993.** Bienen, Wespen und Ameisen der Kanarischen Inseln. *Veröffentlichungen aus dem Übersee Museum Bremen Naturwissenschaften* **12 i**: 1-465; **12 ii**: 493-894.
- Illiger K. 1807.** Vergleichung der Gattungen der Hautflügler, Piezota Fabr., Hymenoptera Linn. *Jur. Magazin für Insektenkunde* **6**: 189-199.
- Ireland L.M. 1935.** Scientific results of the Vernay-Lang Kalahari Expedition, March to September, 1930. Morphology of male Halictidae. *Annals of the Transvaal Museum* **17**(1): 95-107.
- Jurine L. 1807.** Nouvelle méthode de classer les Hyménoptères et les Diptères. *T. I. Hyménoptères*. Paschoud, Genf, IV + 320 p.
- Klug F. 1808.** Ueber die Geschlechtsverschiedenheit der Piezaten. Erste Hälfte der Fabricius'schen Gattungen. *Gesellschaft Naturforschender Freunde zu Berlin, Magazin für neusten Entdeckungen in der gesamten Naturkunde* **2**: 48-65.
- Kuhlmann M. 2005.** Diversity, Distribution patterns and endemism of southern African bees (Hymenoptera: Apoidea), p. 167-172 in :

- Huber B.A., Sinclair B.J., Lampe K.H.(eds.). *African biodiversity*. Springer, The Netherlands.
- Latreille P.A. 1809. *Genera crustaceorum et insectorum secundum ordinem naturalem in familias disposita, iconibus exemplisque plurimis explicata*. T. 4. A. Koenig, Parisiis, 399 p.
- Lieftinck M.A. 1958. A preliminary account of the bees of the Canary Islands (Hym., Apoidea). *Commentationes Biologicae* 18(5): 3-34.
- Magretti, P. 1884a. Risultati di raccolte imenoterologiche nell'Africa orientale. *Annali del Museo Civico Storia Naturale di Genova* (Sér. 2) 1: 523-636.
- Magretti P. 1884b. Nel Sudan orientale. Ricordi d'un viaggio in Africa. Per studii zoologici. *Atti Soc. Ital. Sci. Nat.* 27: 1-99 [separate].
- Magretti P. 1899. Imenotteri dell' ultima spedizione dell cap. Bottego. *Annali del Museo Civico Storia Naturale di Genova* (Sér. 2) 19: 583-612.
- Marikovskaya T.P. 1972. K biologii pchelinykh (Apoidea) Yugo-Vostoka Kazakhstana [On the biology of bees (Apoidea) in southeastern Kazakhstan]. *Trudy Vsesoyuznogo Entomologicheskogo Obshchestva* 55: 187-216. [In Russian].
- Marikovskaya T.P. 1997. Nakhodki pchelinykh triby Nomioidini (Hymenoptera, Halictidae) v Kazakhstane [Occurrence of bees of the tribe Nomioidini (Hymenoptera, Halictidae) in Kazakhstan]. *Selevinia* 1996/1997: 249-250. [In Russian].
- Meade-Waldo G. 1914. Family Apidae, p. 403-404 in: Meade-Waldo G., Morley C. Notes and synonymy of Hymenoptera in the collection of the British Museum. *Annals and Magazine of Natural History* (Ser. 8) 14(83).
- Michener C.D. 1944. Comparative external morphology, phylogeny, and a classification of the bees (Hymenoptera). *Bulletin of the American Museum of Natural History* 82(6): 151-326.
- Michener C.D. 1965. A classification of the bees of the Australian and South Pacific regions. *Bulletin of the American Museum of Natural History* 130: 1-362, pls. 1-15.
- Michener C.D. 1975. A taxonomic study of African allodapine bees (Hymenoptera, Anthophoridae, Ceratinini). *Bulletin of the American Museum of Natural History* 155(2): 71-240.
- Michener C.D. 1978. The classification of halictine bees: tribes and Old World nonparasitic genera with strong venation. *The University of Kansas Science Bulletin* 51(16): 501-538.
- Michener C.D. 1979. Biogeography of the Bees. *Annals of Missouri Botanical Garden* 66: 277-347.
- Michener C.D. 2000. *The bees of the World*. The Johns Hopkins University Press, Baltimore, XIV + 913 p.
- Mocsáry A. 1879. Data nova ad faunam hymenopterologicam Hungariae meridionalis comitatus Temesiensis. *Természettudományi Közlemények* 16: 1-70.
- Móczár M. 1967. *Fauna hungarica*, no. 85. Vol. XII. Hymenoptera III, Pt II. Halictidae. Akad. Kiado, Budapest 116 p. [In Hungarian].
- Morawitz F. 1874. Die Bienen Daghestans. *Horae Societatis Entomologicae Rossicae* 10(2-4): 129-189.
- Morawitz F. 1876. Pchely (Mellifera). II. Andrenidae [Bees (Mellifera). II. Andrenidae], p. 161-303, pls. 1-3 in: Fedchenko A.P. *Puteshestvie v Turkestan ...* [Travel to Turkestan ...]; Moscow (Also as *Izvestia Imperatorskogo Obshchestva Lyubitelei Yestestvoznania, Antropologii i Etnografii*, t. 21, pt 3, no. 2). [In Russian].
- Morice F.D., Szépligeti G. 1904. Chrysidae [sic!], Fossores, Vespidae, Apidae, p. 1-10 in: *Results of the Swedish Zoological Expedition to Egypt and the White Nile 1901 under the direction of L.A. Jägerskiöld*. No. 14. K. W. Appelberg, Uppsala.
- Nurse C.G. 1904. New species of Indian Hymenoptera. Apidae. *Journal of the Bombay Natural History Society* 15(4): 557-585.
- Olago D.O. 2001. Vegetation changes over palaeo-time scales in Africa. *Climate Research* 17: 105-121.
- Olivier A. 1789. Abeille, in: *Encyclopédie méthodique. Histoire naturelle T. 4, Insectes*. Pankoucke, Paris, CCLXXXVII + CCCLXXIII + 331 p.
- Opinion 1319. 1985. *Nomioides* Schenck, 1866 (Insecta, Hymenoptera): designation of type species. *Bulletin of Zoological Nomenclature* 42(2): 173-174.
- Osyshnjuk A.Z., Panfilov D.V., Ponomareva A.A. 1978. Nadsemeystvo Apoidea (pchelynye) [Superfamily Apoidea (Bees)], p. 279-519 in: Medvedev G.S. (ed.). *Opredelitel' nasekomykh evropeyskoy chasti SSSR. Tom III. Pereponchatokrylye. Pervaya chast' [A key to insects of the European part of the USSR. Vol. 3. Hymenoptera. Part 1]*. Nauka, Leningrad, 583 p. (in Series: *Keys to animals in the fauna of the USSR published by the Zoological Institute of the Academy of Sciences of the USSR*, 119). [In Russian].
- Pauly A. 1980. Descriptions préliminaires de quelques sous-genres afrotropicaux nouveaux dans la famille des Halictidae (Hymenoptera, Apoidea). *Revue de Zoologie Africaine* 94(1): 119-125.
- Pauly A. 1984. Mission entomologique en Afrique occidentale (1979-80): Renseignements éco-biologiques concernant les Hyménoptères. *Notes Fauniques Gembloux* 11: 1-43.
- Pauly A. 1998. Hymenoptera Apoidea du Gabon. *Annales Musée Royal de l'Afrique Centrale, Sciences Zoologiques* 282 : 1-121.
- Pauly A., Pesenko Yu.A., La Roche F. 2002. The Halictidae of the Cape Verde Islands. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie* 72: 201-211.
- Pérez J. 1895. *Espèces nouvelles de mellifères de Barbarie (Diagnoses préliminaires)*. Gounouihou, Bordeaux, 64 p.
- Pesenko Yu.A. 1979. Novyi vid pchely roda *Nomioides* Schenck (Hymenoptera, Halictidae) iz Srednei Azii [A new species of the bee genus *Nomioides* Schenck (Hymenoptera, Halictidae) from the Middle Asia]. *Trudy Vsesoyuznogo Entomologicheskogo Obshchestva* 61: 176-178. [In Russian].
- Pesenko Yu.A. 1983. Fauna SSSR, Pereponchatokrylye nasekomye, Pchely-halictidy, Triba Nomioidini v ob'eme palearktiki [Fauna of the USSR (n.s., 129). Hymenopterous insects. Vol. XVII, No. 1. Halictid bees (Halictidae). The tribe Nomioidini (in amount of the Palaearctic Region)]. Nauka, Leningrad, 199 p. [In Russian].
- Pesenko Yu.A. 1984. Pchely triby Nomioidini (Hymenoptera, Halictidae) fauny Mongolii: dopolneniya i izmeneniya [Bees of the tribe Nomioidini (Hymenoptera, Halictidae) of the Mongolian fauna: additions and corrections], p. 482-483 in: Korotyaev B.A. (ed.). *Nasekomye Mongolii [Insects of Mongolia]*. Vol. 9. Nauka, Leningrad. [In Russian].
- Pesenko Yu.A. 1989a. Pchely triby Nomioidini (Hymenoptera, Halictidae) Zakavkaz'ya i Maloy Azii s opisaniem novogo dida roda *Nomioides* Schenck [Bees of the tribe Nomioidini (Hymenoptera, Halictidae) of the Transcaucasus and Asia Minor, with description of a new species of the genus *Nomioides* Schenck]. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR* 188: 122-128. [In Russian].
- Pesenko Yu.A. 1989b. Metodologicheskii analiz sistematiki. Chast' I. Osnovnye taksonomicheskie shkoly [Methodological analysis of systematics: Part I. Main taxonomic schools]. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR* 206: 8-118. [In Russian].
- Pesenko Yu.A. 1992. Metodologicheskii analiz sistematiki. Chast' II. Filogeneticheskie rekonstruktsii kak nauchnyye ipotezy [Methodological analysis of systematics: Part II. Phylogenetic reconstruction as a scientific hypothesis]. *Trudy Zoologicheskogo Instituta Rossiiskoi Akademii Nauk* 234: 61-155. [In Russian].
- Pesenko Yu.A. 1993. A new halictine bee of the tribe Nomioidini from Madagascar (Hymenoptera: Halictidae). *Journal of the Kansas Entomological Society* 66(1): 1-5.
- Pesenko Yu.A. 1996. Madagascan bees of the tribe Nomioidini (Hymenoptera: Halictidae). *Entomofauna* 17 (36): 493-516.
- Pesenko Yu.A. 2000a. Phylogeny and classification of the family Halictidae revised (Hymenoptera: Apoidea). *Journal of the Kansas Entomological Society* 72(1) [1999]: 104-123.

- Pesenko Yu.A. 2000b.** Filogenia i klassifikatsia pchel triby Nomioidini (Hymenoptera, Halictidae) [Phylogeny and classification of bees of the tribe Nomioidini (Hymenoptera, Halictidae)]. *Entomologicheskoe Obozrenie* 79(1): 210–226. [In Russian; English translation in: *Entomological Review* 2000, 80(2): 100–110].
- Pesenko Yu.A. 2005.** "Filogeneticheskie prezumpitsii" - mogut li ponyatiya yuriprudentsii pomoch' sravnitel'noy biologii? ["Phylogenetic presumptions" - Can jurisprudence terms promote comparative biology?] *Zhurnal Obshchei Biologii* 66(2): 146–163. [in Russian].
- Pesenko Yu.A., Banaszak J., Radchenko V.G., Cierznia T. 2000.** *Bees of the family Halictidae (excluding Sphecoides) of Poland: taxonomy, ecology, bionomics.* Pedagogical University Press, Bydgoszcz, IX + 348 p.
- Pesenko Yu.A., Kerzhner I.M. 1981.** *Nomioides* Schenck, 1866: Proposed designation of type species (Insecta, Hymenoptera, Halictidae). *Z. N. (S.)* 2178. *Bulletin of Zoological Nomenclature* 38(3): 225–227.
- Pesenko Yu.A., Pauly A. 2001.** Tribu Nomioidini, p. 50–63 in: **Pauly A., Brooks R.W., Nilsson A., Pesenko Yu.A., Eardley C.D., Terzo M., Griswold T., Schwarz M., Patiny S., Munzinger J., Barbier Y.** *Hymenoptera Apoidea de Madagascar et des îles voisines. Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques* 286: 1–390 + 16 col. pls.
- Pesenko Yu.A., Pauly A. (in press).** A contribution to the fauna of the Nomioidine bees of the Arabian Peninsula (Hymenoptera: Halictidae). in: *Fauna of Saudi Arabia*.
- Pesenko Yu.A., Warncke K. 1987.** Beitrag zur Bienenfauna des Iran. 22. Die Tribe Nomioidini (Hymenoptera: Halictidae). *Bollettino del Museo Civico di Storia Naturale di Venezia* 36 [1985]: 109–115.
- Pesenko Yu.A., Wu Yanru 1991.** A study on Chinese Nomioidini, with description of a new species of *Ceylalicus* (Hymenoptera: Apoidea: Halictidae). *Acta Zootaxonomica Sinica* 16(4): 454–458. [In Chinese].
- Radchenko V.G. 1979.** Gnezhdovanie pchely *Nomioides minutissimus* (Rossi) (Hymenoptera, Halictidae) [The nesting of *Nomioides minutissimus* (Rossi) (Hymenoptera, Halictidae)]. *Entomologicheskoe Obozrenie* 58 (4): 762–765. [In Russian; English translation: *Entomological Review* 1980, 57(4): 71–74].
- Rossi P. 1790.** *Fauna Etrusca, sitens insecta quae in provinciis Florentina et Pisana praesertim collegit.* T. 2. T. Masi, Liburni, 348 p.
- Rust R.W., Cambon G., Vaissiere B.E. 2005.** Biology of *Nomioides variegatus* (Olivier) (Hymenoptera: Halictidae). *Annales de la Société Entomologique de France* (n. s.), 40(3–4): 269–276.
- Sandhouse G.A. 1943.** The type species of the genera and subgenera of bees. *Proceedings of the United States National Museum* 92(3156): 519–619.
- Saunders E. 1908.** Hymenoptera aculeata collected in Algeria by the Rev. A.E. Eaton, M. A., F. E. S., and the Rev. Francis David Morice, M. A., F. E. S. Part III. Anthophila. *Transactions of the Royal Entomological Society of London* 1908(2): 177–274.
- Schenck A. 1861.** Die nassauischen Bienen. Revision und Ergänzung der früheren Bearbeitungen. *Jahresbücher des Vereins für Naturkunde im Herzogthum Nassau* 14 [1859]: 1–414.
- Schenck A. 1867.** Verzeichnis der nassauischen Hymenoptera Aculeata mit Hinzufügung der übrigen deutschen Arten. *Berliner entomologische Zeitschrift* 10(4) [1866]: 317–369.
- Schenck A. 1869.** Beschreibung der nassauischen Bienen. Zweiter Nachtrag, enthaltend Zusätze zu nassauischen Arten und die Beschreibung der übrigen deutschen Arten. *Jahresbücher des Vereins für Naturkunde im Herzogthum Nassau* 21/22 [1867/1868]: 269–382.
- Schmiedeknecht O. 1896.** Meine Reise nach der Provinz Oran in Algerien. *Természertajzi Füzetek* 19(2): 140–164.
- Schulthess A. 1924.** Contribution a la connaissance de la faune des Hyménoptères de l'Afrique du Nord. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord* 15(6): 293–320.
- Shalaby F. 1958.** *Alphabetical list of Egyptian insects in the collection of the Ministry of Agriculture.* Government Printing Offices, Cairo, 135 p.

(Also as United Arab Republic Ministry of Agriculture, Egypt insect identification section, Techn. Bull., 284).

- Shmida A., Dukas R. 1990.** Progressive reduction in the mean body sizes of solitary bees active during the flowering season and its correlation with the sizes of bee flowers of the mint family (Lamiaceae). *Israel Journal of Botany* 39: 133–141.
- Simon Thomas R.T., Wiering H. 1993.** Notes on the Cape Verde Islands fauna of Sphecidae and Apidae (Hymenoptera). *Courier Forschung Institut Senckenberg* 159: 403–409.
- Smith F. 1853.** *Catalogue of hymenopterous insects in the collection of the British Museum. Part I. Andrenidae and Apidae.* Taylor & Francis, London, 195 p., pls. I–VI.
- Sowerby F.W. 1917.** Notes from Cairo. *Entomologist* 50(2): 30–32.
- Spinola M. 1808.** *Insectorum Liguria species novae aut rariores, quas in agro Ligustico nuper detexit, descripsit, et iconibus illustravit Maximilianus Spinola, adjecto catalogo specierum auctoribus jam enumeratarum, quae in eadem regione passim occurrunt.* T. 2. Y. Gravier, Genuae, II + 262 + 5 p., 5 pls.
- Strand E. 1926.** Miscellanea nomenclatorica zoologica et palaeontologica. I, II. *Archiv für Naturgeschichte. Abt. A* 92(8): 30–75.
- Walker F.A. 1871.** *A list of Hymenoptera collected by J. K. Lord, esq., in Egypt, in the neighbourhood of the Red Sea, and in Arabia; with descriptions of the new species.* E.W. Janson, London, 59 p.
- Warncke K. 1983.** Contributi alla conoscenza della Fauna dei Tamarix nel Sahara algerino. 2. Beitrag zur Kenntnis der Bienen besonders an Tamarisken in der nördlichen und zentralen Sahara Algeriens (Hym., Apidae). *Bollettino del Museo Civico di Storia Naturale di Venezia* 33 [1982]: 203–214.
- Zavattari E. 1934.** *Prodromo della fauna della Libia.* Pavia, VII + 1234 p.

Index of Latin names of the Nomioidinae from Africa (except for Madagascar)

Valid names of species are written in **bold**; valid names of subspecies are in normal font; synonyms, in *italics*. Original combinations of species, described earlier, are given in parentheses. Present combinations are in brackets.

- aegyptiaca* Blüthgen 1933 (Nomioides), **nomen dubium** in [Nomioides subg. Nomioides]
- albopicta* Blüthgen 1925 (Nomioides variegata var.) → **Ceylalicus (Ceylalicus) muiri**
- arnoldi* Friese 1913 (Nomioides) → **Cellariella somalica**
- atomella* Cockerell 1936 (Nomioides) → **Cellariella somalica**
- bipunctata* Blüthgen 1925 (Nomioides facilis var.) → **Nomioides (Nomioides) facilis**
- bluethgeni** Pesenko 1979 (Nomioides subg. Nomioides), [Nomioides subg. Nomioides]
- brooksii* Pesenko 1993 (Cellariella) → **Cellariella kalaharica**
- callonotus* Cockerell 1936 (Nomioides) → **Nomioides (Nomioides) maculiventris**
- callosus* Pérez 1895 (Nomioides) → **Nomioides (Nomioides) facilis**
- campanulae* Cockerell 1931 (Nomioides) → **Nomioides (Nomioides) minutissimus ssp. maurus**
- canariensis* Blüthgen 1937 (Nomioides), **Nomioides (Nomioides) deceptor ssp. canariensis**
- capensis* Blüthgen 1925 (Nomioides) → **Ceylalicus (Atronomioides) halictoides**
- capverdensis** Pesenko, Pauly & La Roche in Pauly *et al.* 2002 (Ceylalicus subg. Atronomioides), [Ceylalicus subg. Atronomioides]
- capverdensis* n. ssp., **Nomioides (Nomioides) deceptor ssp. capverdensis**
- comberi* Cockerell 1911 (Nomioides) → **Ceylalicus (Ceylalicus) punjabensis**
- completa* Blüthgen 1934 (Nomioides somalica var.) → **Cellariella somalica**

- congoensis** n. sp., [Ceylalictus subg. Ceylalictus]
convergens Blüthgen 1934 (*Nomioides maculiventris* var.) → **Nomioides (Nomioides) maculiventris**
criciferarum Cockerell 1931 (Nomioides) → **Nomioides (Nomioides) facilis**
cyaneonotus Cockerell 1937 (*Nomioides maculiventris* var.) → **Nomioides (Nomioides) maculiventris**
deceptor Saunders 1908 (Nomioides), [Nomioides subg. Nomioides]
deserticola Blüthgen 1925 (Nomioides minutissima var. deserticola) → **Nomioides (Nomioides) deceptor ssp. deceptor**
desertorum Blüthgen 1925 (Nomioides karachensis var.), [Ceylalictus subg. Meganomioides]
dusmeti Blüthgen 1925 (Nomioides facilis var.) → **Nomioides (Nomioides) facilis**
egeria Nurse 1904 (Ceratina) → **Nomioides (Nomioides) turanicus**
elbana Blüthgen 1934 (Nomioides), [Nomioides subg. Nomioides]
excellens Saunders 1908 (Nomioides) → **Ceylalictus (Ceylalictus) punjabensis**
facilis Smith 1853 (Halictus), [Nomioides subg. Nomioides]
fallax Handlirsch 1888 (Nomioides) → **Nomioides (Nomioides) facilis**
fasciatus Friese 1898 (Nomioides); nec auct. → **Ceylalictus (Ceylalictus) variegatus**
flavopicta Dours 1873 (Andrena) → **Ceylalictus (Ceylalictus) variegatus**
fortunatus Blüthgen 1937 (Nomioides), [Nomioides subg. Nomioides]
fulviventris Blüthgen 1925 (Nomioides somalica var.), [Cellariella]
grandior Pesenko, Pauly & La Roche in Pauly *et al.* 2002 (Ceylalictus subg. Atronomioides), [Ceylalictus subg. Atronomioides]
griswoldi n. sp., [Nomioides subg. Nomioides]
halictoides Blüthgen 1925 (Nomioides), [Ceylalictus subg. Atronomioides]
handlirschii Dalla Torre & Friese 1895 (Halictus) → **Nomioides (Nomioides) facilis**
heluanensis Dębski 1917 (Nomioides) → **Nomioides (Nomioides) turanicus**
inexpectata n. sp., [Cellariella]
intermedius Alfken 1924 (Nomioides fasciatus var.) → **Ceylalictus (Ceylalictus) variegatus**
jucunda Morawitz 1874 (Nomioides) → **Ceylalictus (Ceylalictus) variegatus**
kalaharica Cockerell 1936 (Nomioides somalica ssp.), [Cellariella]
karachensis Cockerell 1911 (Nomioides), [Ceylalictus subg. Meganomioides]
kenyensis n. sp., [Nomioides subg. Nomioides]
klausii Pesenko 1983 (Nomioides subg. Nomioides), [Nomioides subg. Nomioides]
labiatarum Cockerell 1931 (Nomioides) → **Ceylalictus (Ceylalictus) variegatus**
laeta Blüthgen 1934 (Nomioides turanica var.) → **Nomioides (Nomioides) turanicus**
longiceps Blüthgen 1933 (Nomioides), [Nomioides subg. Nomioides]
luederitzi Blüthgen 1925 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) muiri**
maculiventris Cameron 1905 (Ceratina), [Nomioides subg. Nomioides]
maculosa Blüthgen 1925 (Nomioides turanica var.) → **Nomioides (Nomioides) turanicus**
maurus Blüthgen 1925 (Nomioides), **Nomioides (Nomioides) minutissimus ssp. maurus**
micheneri n. sp., [Nomioides subg. Nomioides]
minutissimus Rossi 1790 (Apis), [Nomioides subg. Nomioides]
mucoreus Blüthgen 1933 (Nomioides), [Nomioides subg. Nomioides]
muiri Cockerell 1909 (Nomioides), [Ceylalictus subg. Ceylalictus]
nigrita Blüthgen 1934 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) variegatus**
nigriventris Blüthgen 1934 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) variegatus**
nubica Blüthgen 1925 (Nomioides turanica var.) → **Nomioides (Nomioides) turanicus**
ornatus Pesenko 1983 (Nomioides subg. Nomioides), [Nomioides subg. Nomioides]
pauyi Pesenko, n. sp., [Nomioides subg. Nomioides]
persica Blüthgen 1933 (Nomioides) → **Nomioides (Nomioides) rotundiceps**
pseudocerea Blüthgen 1934 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) variegatus**
pulchella Jurine 1807 (Andrena) → **Ceylalictus (Ceylalictus) variegatus**
punjabensis Cameron 1907 (Ceratina), [Ceylalictus subg. Ceylalictus]
quinquefasciata Blüthgen 1934 (Nomioides variegata var.) → **Ceylalictus muiri**
rotundiceps Handlirsch 1888 (Nomioides), [Nomioides subg. Nomioides]
schwarzi n. sp., [Cellariella]
senecionis Cockerell 1931 (Nomioides) → **Nomioides minutissimus ssp. maurus**
simplex Blüthgen 1925 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) variegatus**
socotranus Blüthgen 1925 (Nomioides), [Nomioides subg. Erythronomioides]
somalica Magretti 1899 (Nomioides), [Cellariella]
squamiger Saunders 1908 (Nomioides), [Nomioides subg. Nomioides]
storeyi Dębski 1917 (Nomioides) → **Nomioides (Nomioides) turanicus**
subvariegata Blüthgen 1933 (*Nomioides turanica* var.) → **Nomioides (Nomioides) turanicus**
syrrhoides Walker 1871 (Allodape) → ? **Ceylalictus (Ceylalictus) variegatus**
tingitana Blüthgen 1933 (Nomioides maura var.) → **Nomioides (Nomioides) minutissimus ssp. maurus**
turanicus Morawitz 1876 (Nomioides), [Nomioides subg. Nomioides]
unifasciata Blüthgen 1925 (Nomioides variegata var.) → **Ceylalictus (Ceylalictus) variegatus**
variegatus Olivier 1789 (Apis), [Ceylalictus subg. Ceylalictus]
vernayi Cockerell et Ireland in Cockerell 1935 (Nomioides halictoides ssp.) → **Ceylalictus halictoides**
viridana Blüthgen 1925 (Nomioides rotundiceps var.) → **Nomioides (Nomioides) rotundiceps**

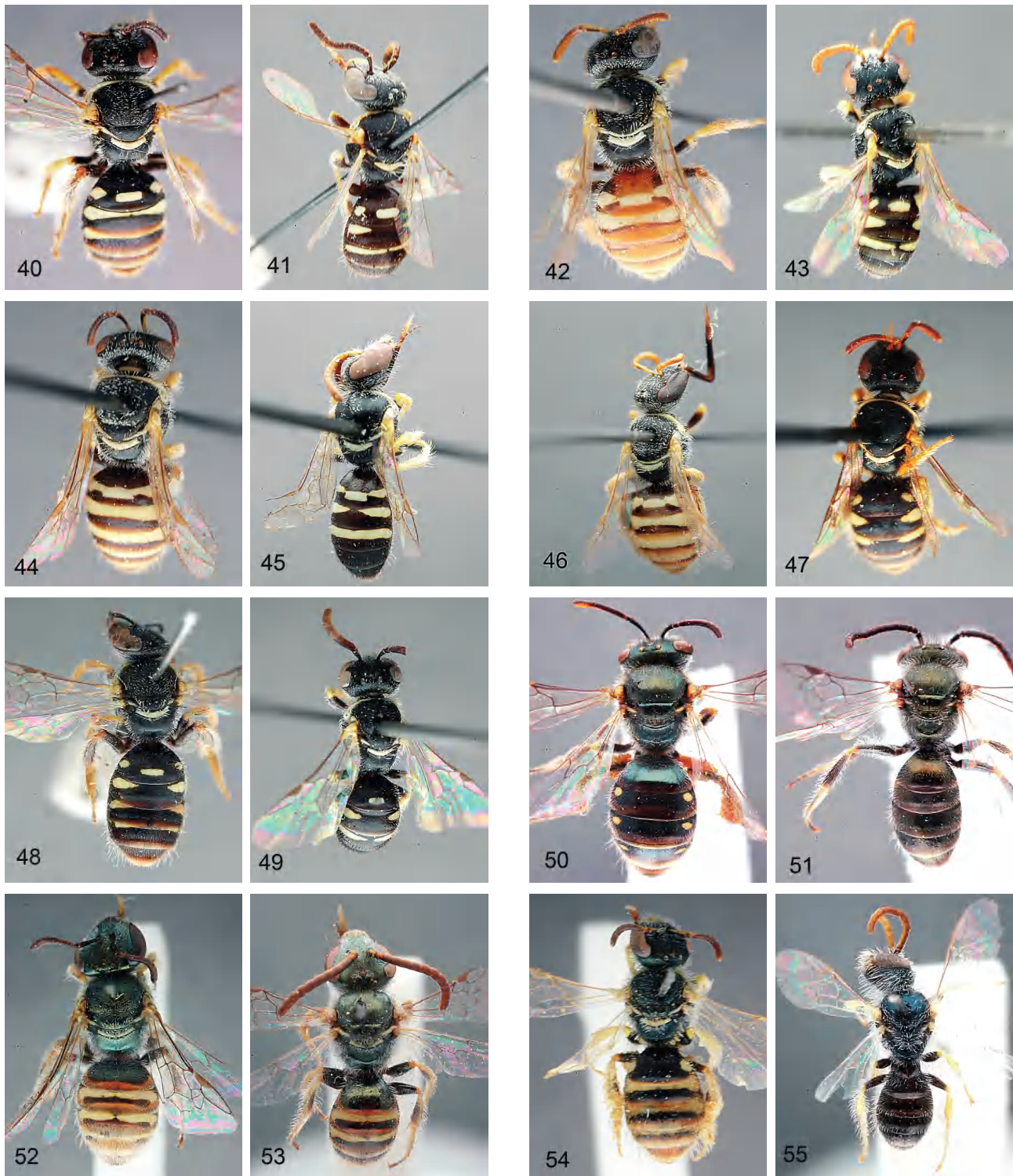


Plate I. Figures 40-55

Habitus. 40, *Cellariella kalaharica*, female (Kruger); 41, male (Komatipoort); 42, *C. fulviventris*, female (Vanhynsdorp); 43, male (Mariental); 44, *C. inexpectata*, female (Voi); 45, male (Voi); 46, *C. kalaharica* var., female (Luderitz); 47, *C. schwarzi*, female (Hondeklipbai); 48, *C. somalica*, female (Kruger); 49, male (Maun); 50, *Ceylactis (Atronomioides) capverdensis*, female (Fogo); 51, male (Fogo); 52, *C. (A.) grandior*, female (Sal); 53, male (Sal); 54 *C. (A.) halictoides*, female (Pakhuis); 55, male (Clanwilliam)

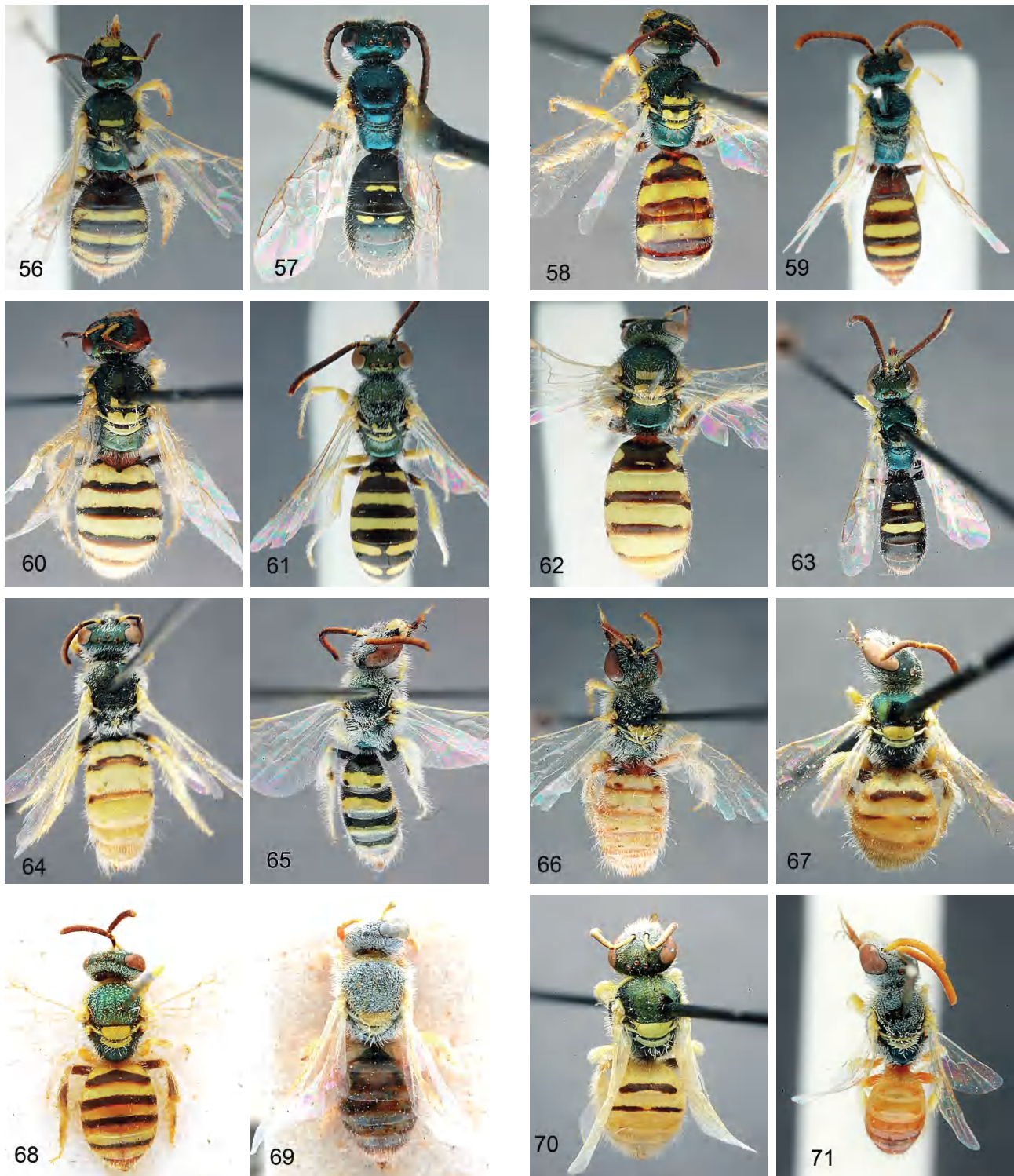


Plate II. Figures 56-71

Habitus. 56, *C. (Ceylalictus) congoensis*, female (Bambari); 57, male (Tabou); 58, *C. (C.) mui*, female (Kenya); 59, male (Naukluft); 60, *C. (C.) punjabensis*, female (Tozeur); 61, male (Adrar); 62, *C. (C.) variegatus*, female (Yemen); 63, male (Yemen); 64, *C. (Meganomioides) karachensis* (Mauritanie); 65, male (Oman); 66, *C. (M.) desertorum*, female (Nefta); 67, *Nomioidea (Nomioidea) bluethgeni*, female (Midelt); 68, *N. (N.) elbanus*, female (holotype); 69, *N. (N.) mucoreus*, female (holotype); 70, *N. (N.) paulyi*, female (Ksar-Hadada); 71, *N. (N.) ornatus*, male (Abu-Dhabi).

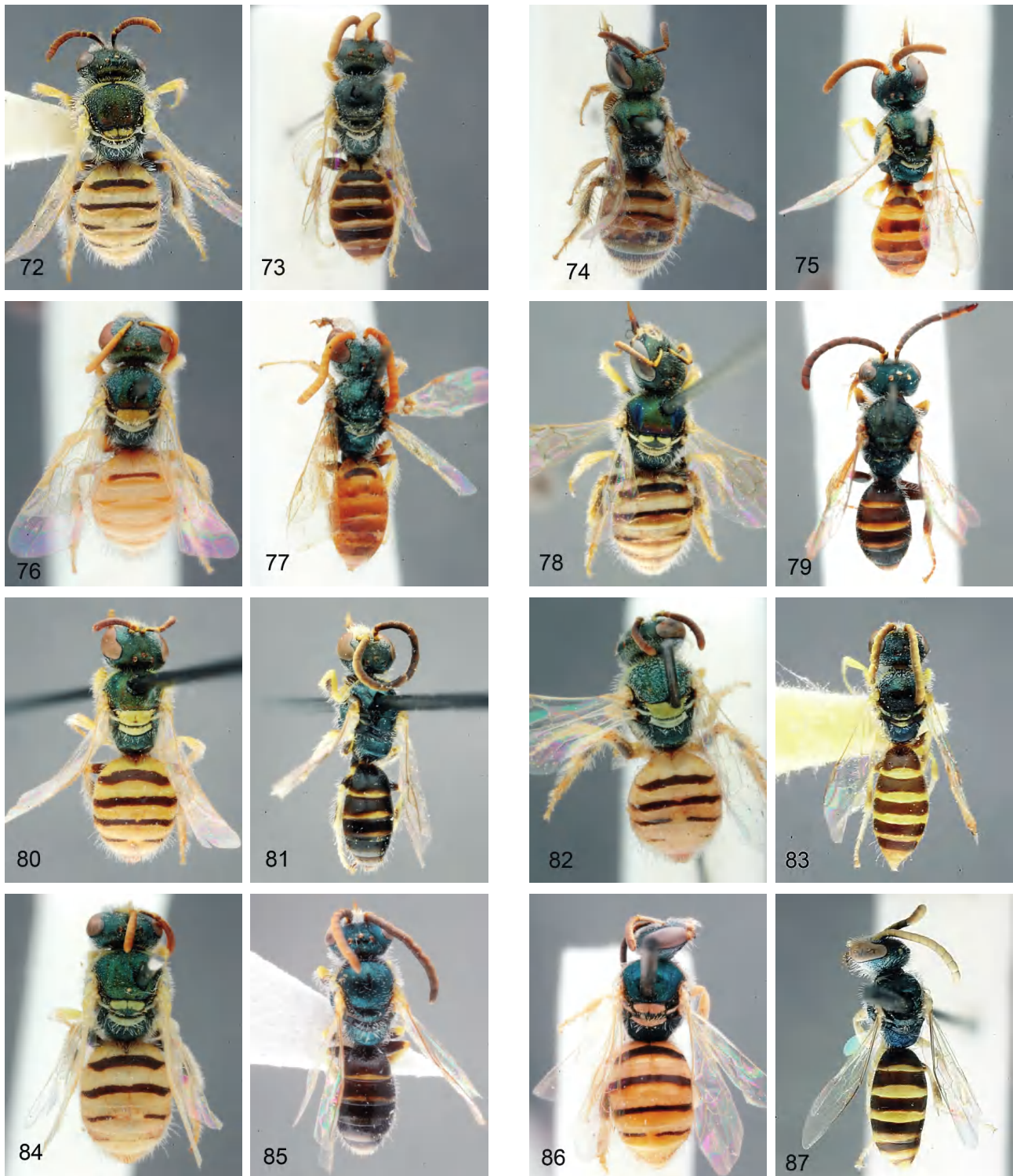


Plate III. Figures 72-87

Habitus. 72, *Nomioides (Nomioides) deceptor canariensis*, female (Lanzarote); 73, male (Gran Canaria); 74, *N. (N.) deceptor capverdensis*, female (Santa Luzia); 75, male (Boavista); 76, *N. (N.) deceptor deceptor*, female (Erg-Chech); 77, male (Ain Tanzara); 78, *N. (N.) fortunatus*, female (Gran Canaria); 79, male (Tenerife); 80, *N. (N.) facilis*, female (Meknes); 81, male (Meknes); 82, *N. (N.) squamiger*, female (Figuig); 83, male (Mhamid); 84, *N. (N.) maculiventris*, female (Swakopmund); 85, male (Cradock); 86, *N. (N.) micheneri*, female (Yemen); 87, male (Yemen).

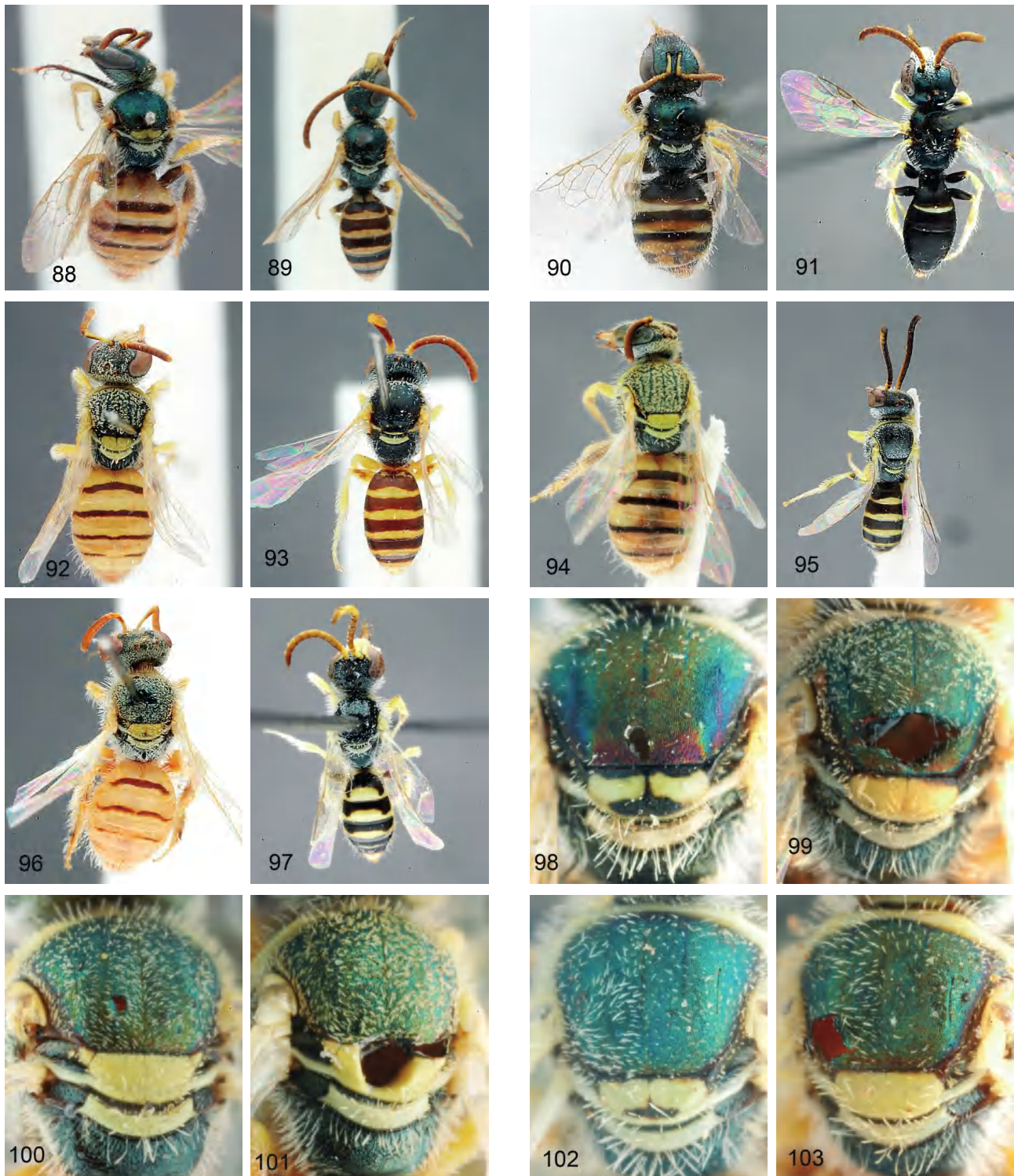


Plate IV. Figures 88-103

Habitus (88-97) and mesosoma of females (98-103). 88, *Nomioidea (Nomioidea) minutissimus maurus*, female (Nador); 89, male (Nador); 90, *N. (N.) turanicus*, female (Maroc); 91, male (Oman); 92, *N. (N.) rotundiceps*, female (Mali); 93, male (Mali); 94, *N. (N.) kenyensis*, female (Ewaso); 95, male (Isiolo); 96, *N. (N.) klausii*, female (Abu Arish); 97, male (Oman); 98, *Nomioidea (Nomioidea) fortunatus*; 99, *N. (N.) deceptor deceptor*; 100, *N. (N.) facilis* (France); 101, *N. (N.) squamiger*; 102, *N. (N.) maculiventris*; 103, *N. (N.) minutissimus minutissimus* (France).



Plate V. Figures 104-123

Head. 104, *Cellariella kalabarica*, female; 105, male; 106, *C. somalica*, female; 107, male; 108, *C. fulviventris*, female; 109, male; 110, *C. inexpectata*, female; 111, male; 112, *C. schwarzi*, female; 113, *C. kalabarica* var. (Luderitz); 114, *Ceylalicthus (Atronomioides) capverdensis*, female; 115, male; 116, *C. (A.) grandior*, female; 117, male; 118, *C. (A.) halictoides*, female; 119, male; 120, *C. (Meganomioides) desertorum*, female; 121, *C. (M.) karachensis*, female (holotype); 122, female (Mauritania); 123, male (Oman).

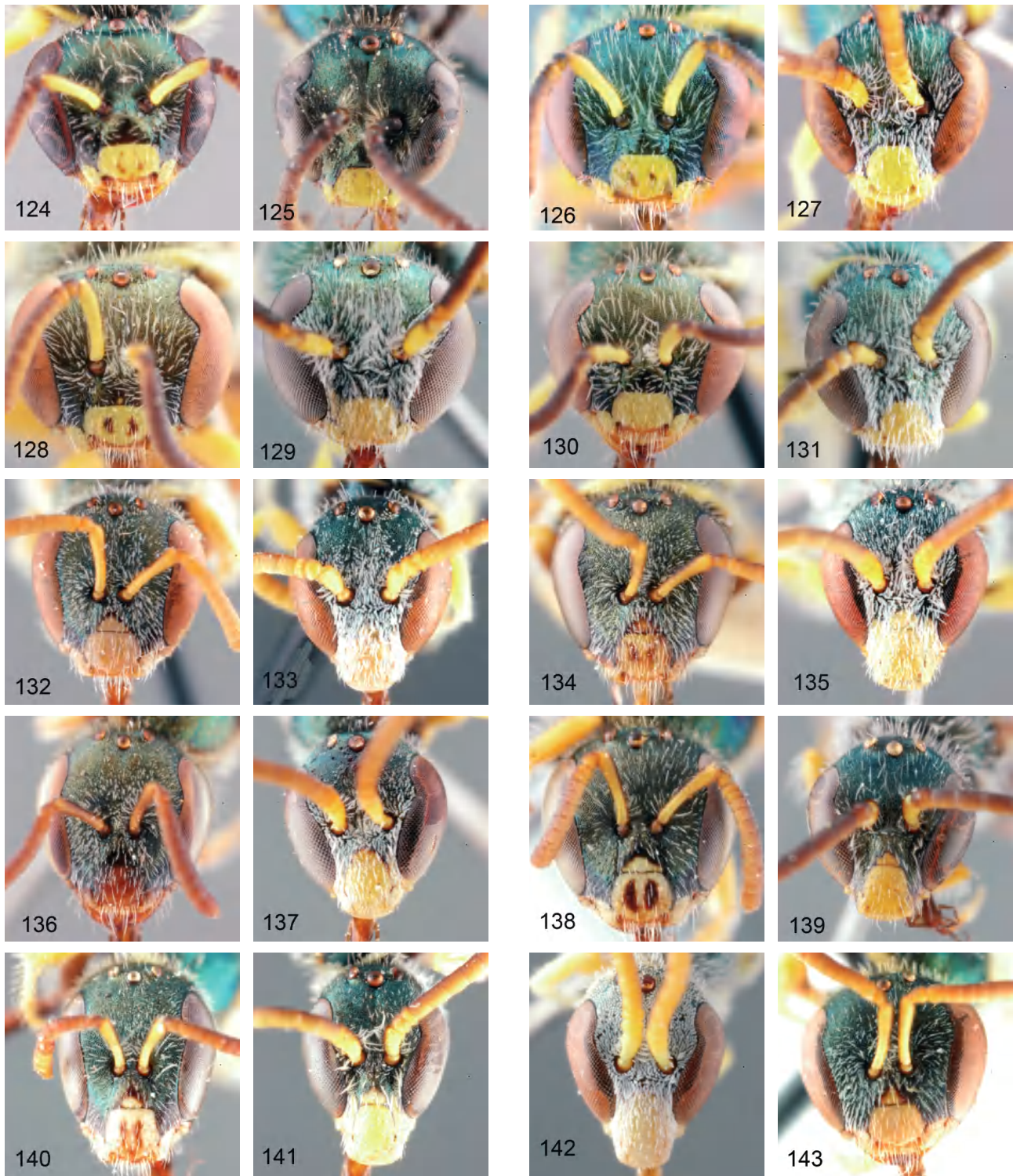


Plate VI. Figures 124-143

Head. 124, *Ceylalictus (Ceylalictus) congoensis*, female; 125, male; 126, *C. (C.) muiri*, female; 127, male; 128, *C. (C.) punjabensis*, female; 129, male; 130, *C. (C.) variegatus*, female; 131, male; 132, *Nomioides (Nomioides) deceptor deceptor*, female; 133, male; 134, *N. (N.) deceptor canariensis*, female; 135, male; 136, *N. (N.) deceptor capverdensis*, female; 137, male; 138, *N. (N.) fortunatus*, female; 139, male; 140, *N. (N.) minutissimus maurus*, female; 141, male; 142, *N. (N.) ornatus*, male; 143, *N. (N.) blueithgeni*, female.

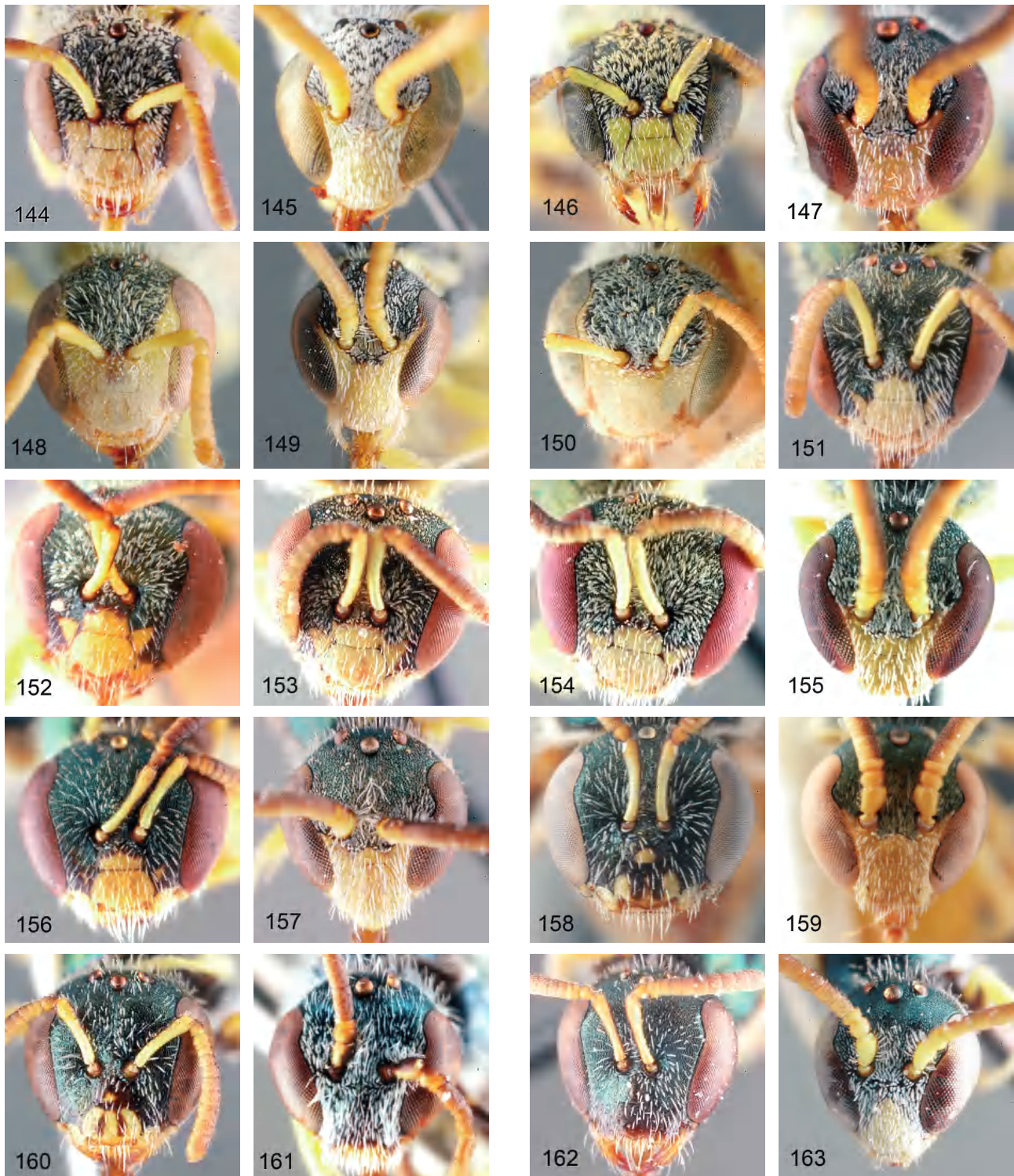


Plate VII. Figures 144-163

Head. 144, *Nomioidea (Nomioidea) rotundiceps*, female; 145, male; 146, *N. (N.) kenyensis*, female; 147, male; 148, *N. (N.) klausii*, female; 149, male; 150, *N. (N.) mucoreus*, female (holotype); 151, *N. (N.) paulyi*, female; 152, *N. (N.) elbanus*, female (holotype); 153, 154, *N. (N.) squamiger*, females; 155, male; 156, *N. (N.) facilis*, female; 157, male; 158, *N. (N.) micheneri*, female; 159, male; 160, *N. (N.) maculiventris*, female; 161, male; 162, *N. (N.) turanicus*, female; 163, male.



Plate VIII. Figures 164-171

Propodeum. 164, *Ceylalictus (Meganomioides) desertorum*, female; 165, *C. (M.) karachensis*, female; 166, *C. (Ceylalictus) punjabensis*, female; 167, *Nomioides (Nomioides) bluethgeni*, female; 168, *N. (N.) elbanus*, female; 169, *N. (N.) kenyensis*, female; 170, *N. (N.) rotundiceps*, female; 171, *N. (N.) paulyi*, female.

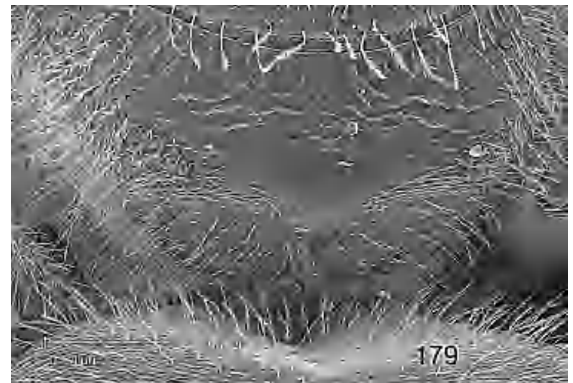
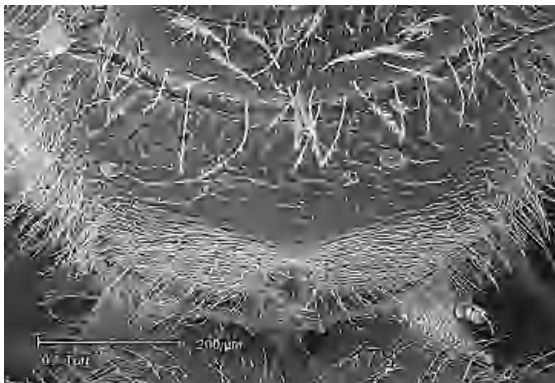
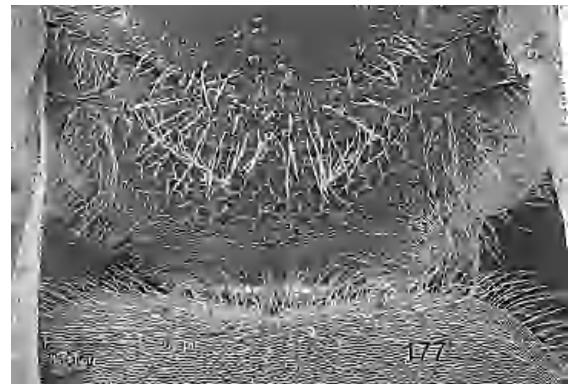
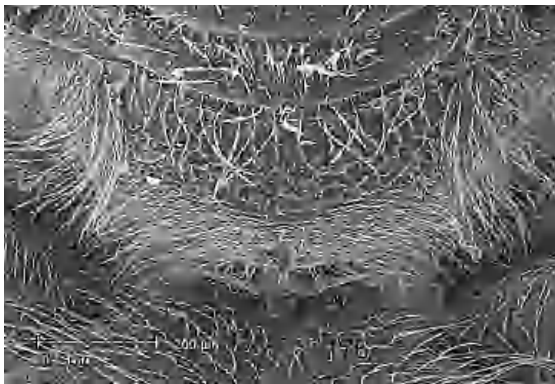
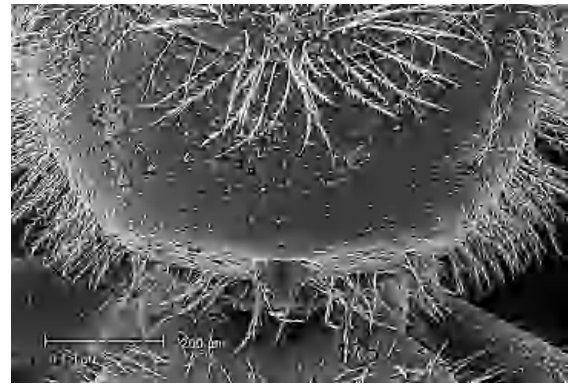
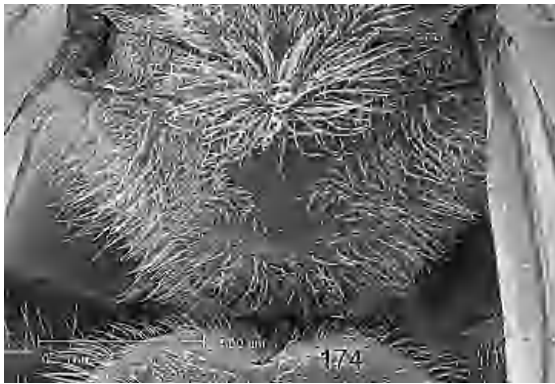
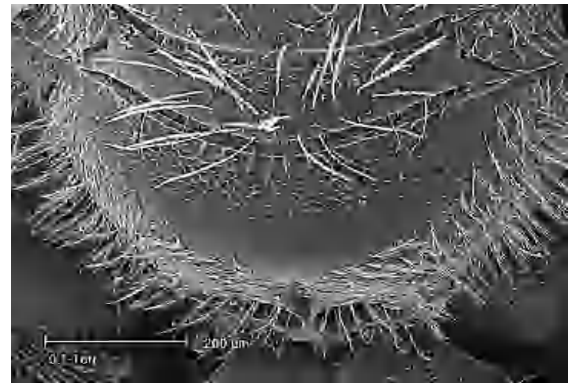
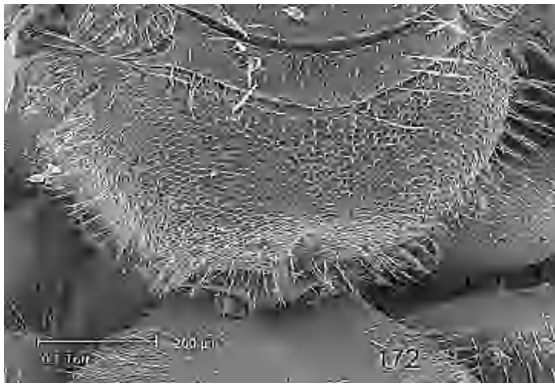


Plate IX. Figures 172-179

Propodeum. 172, *Cellariella kalabarica*, male; 173, *C. inexpectata*, male; 174, *Ceylaliectus (Meganomioides) karachensis*, male; 175, *C. (Ceylaliectus) punjabensis*, male; 176, *Nomiooides (Nomiooides) deceptor deceptor*, female; 177, *N. (N.) fortunatus*, female; 178, *N. (N.) facilis*, female; 179, *N. (N.) squamiger*, female.

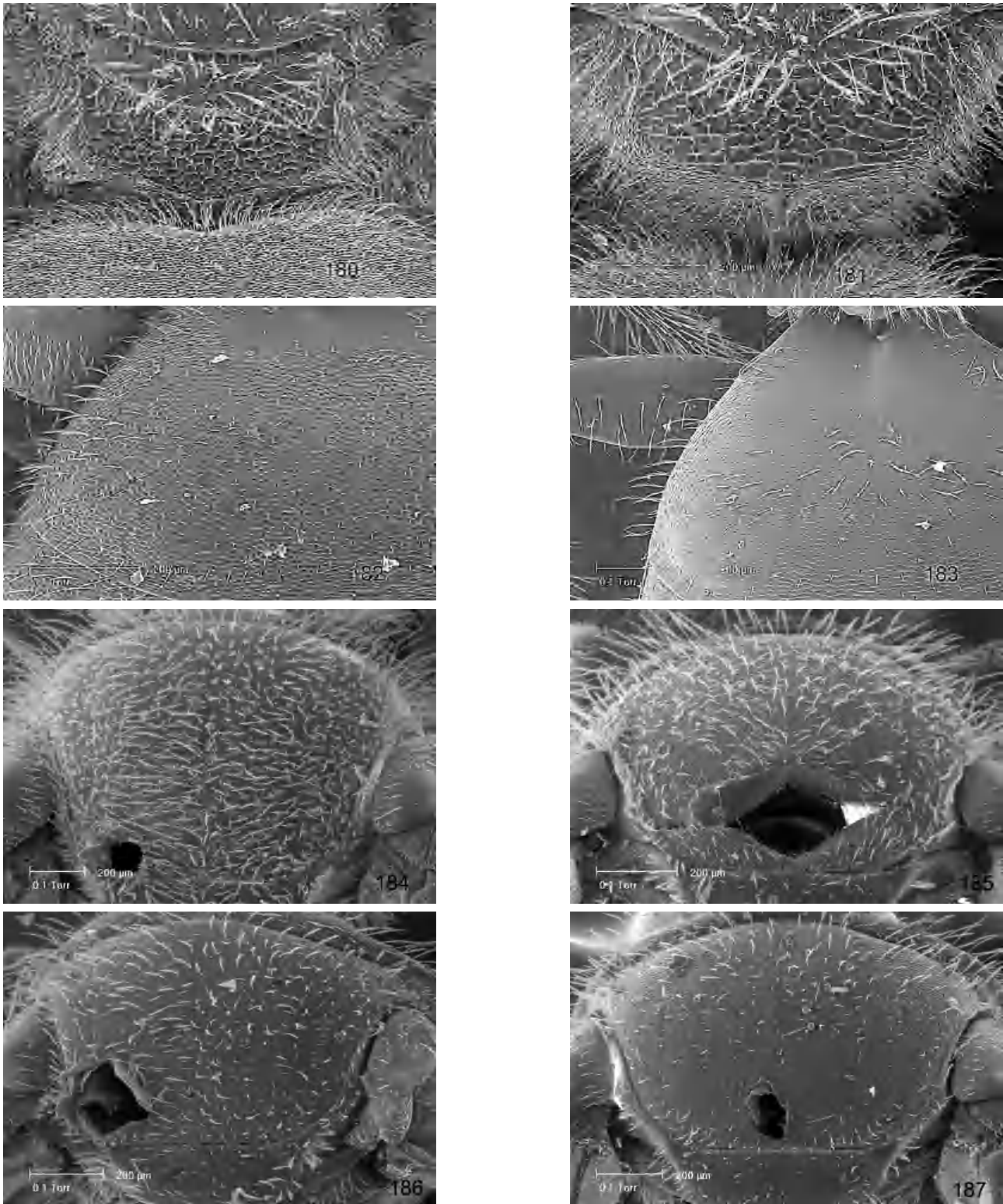


Plate X. Figures 180-187

Propodeum of female (180, 181), T1 of male (182, 183), and mesoscutum of female (184-187). 180, *Nomioidea (Nomioidea) maculiventris*; 181, *N. (N.) micheneri*; 182, *Cellariella kalaharica*; 183, *C. inexpectata*; 184, *Ceylalictus (Ceylalictus) punjabensis*; 185, *Nomioidea (Nomioidea) deceptor deceptor*; 186, *N. (N.) minutissinus minutissimus* (France); 187, *N. (N.) fortunatus*.

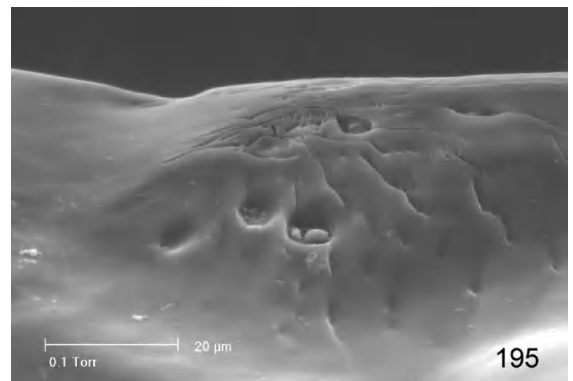
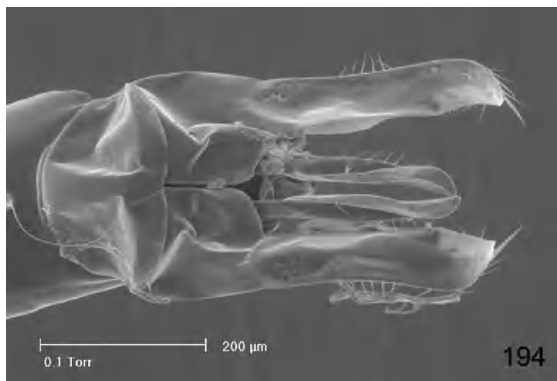
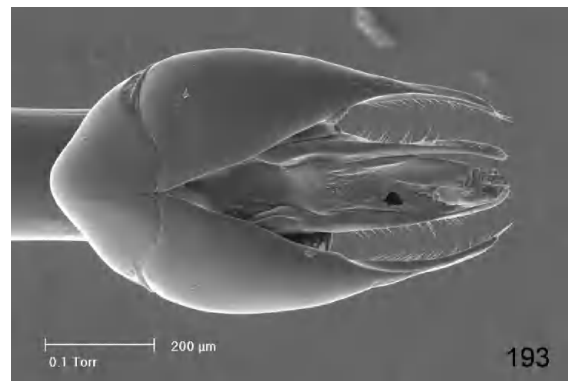
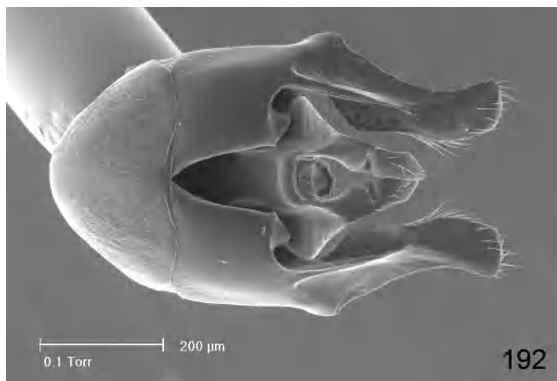
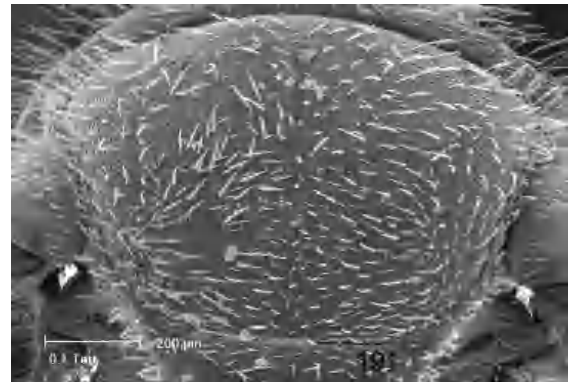
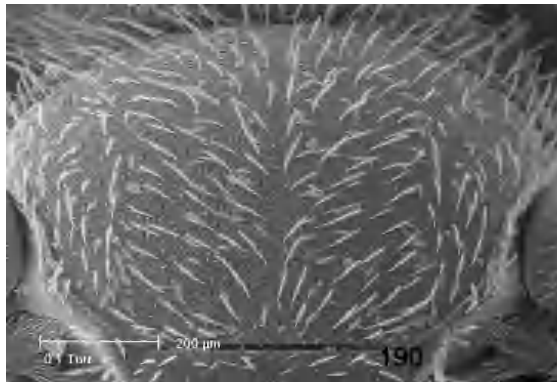
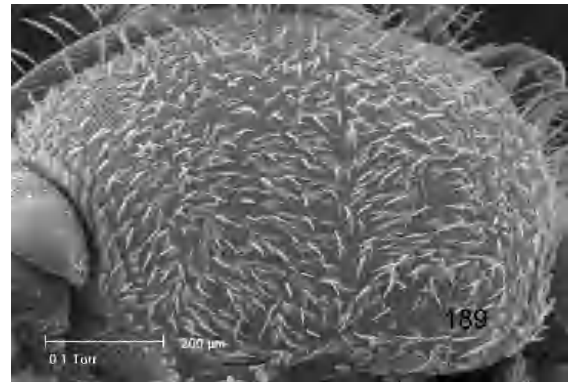
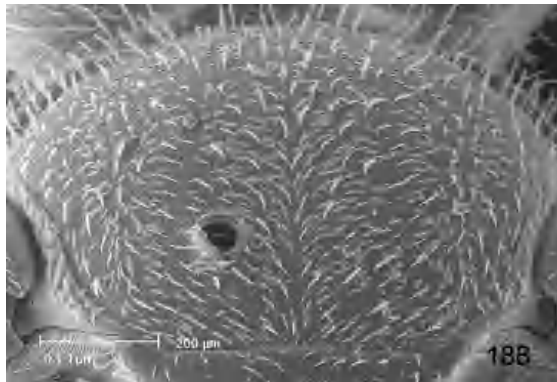
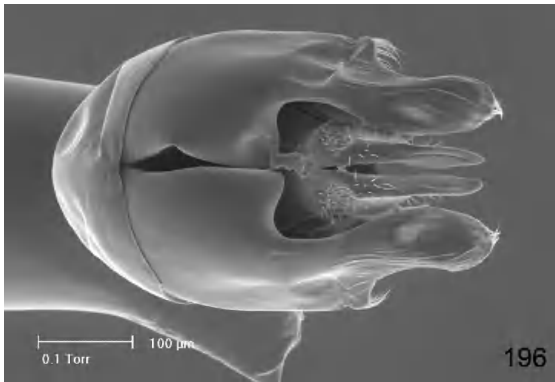
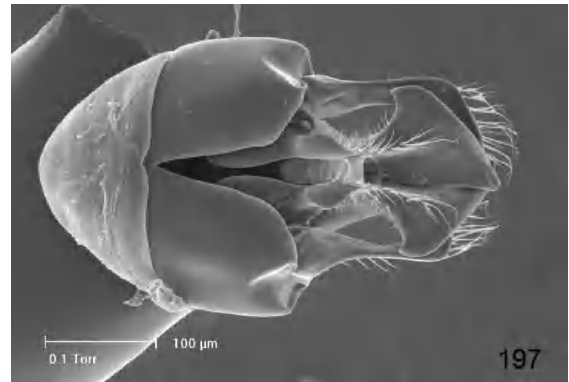


Plate XI. Figures 188-195

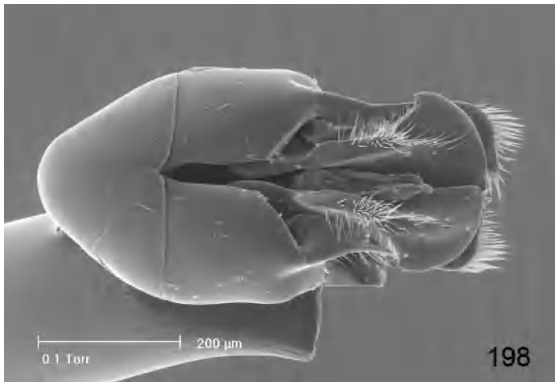
Mesoscutum of female (188-191) and male genitalia in dorsal view (192-195). 188, 194, 195 (pores), *Nomioides* (*Nomioides*) *facilis*; 189, *N. (N.) squamiger*; 190, *N. (N.) micheneri*; 191, *N. (N.) maculiventris*; 192, *Ceylallictus* (*Atronomioides*) *halictoides*; 193, *C. (Meganomioides)* *karachensis*.



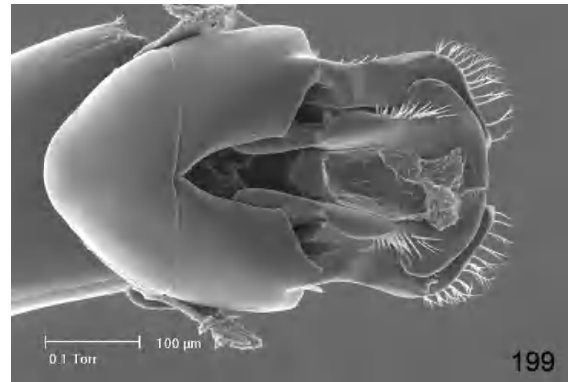
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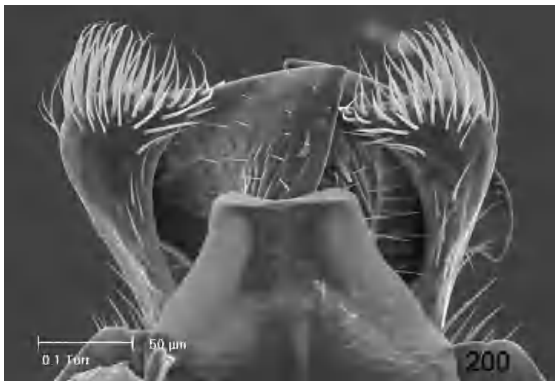
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198



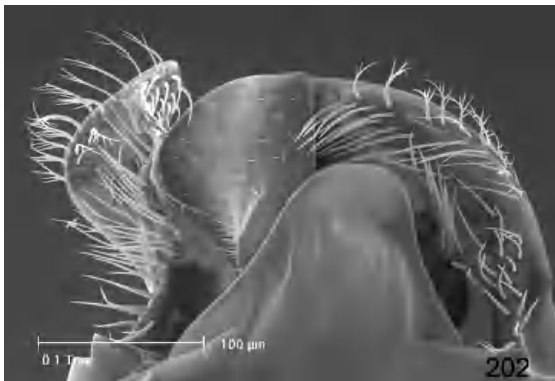
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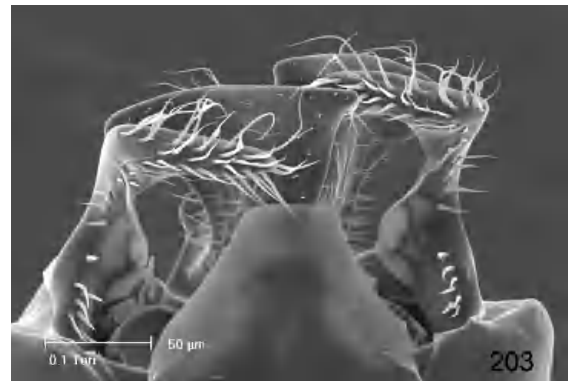
200



201



202



203

Plate XII. Figures 196-203

Male genitalia of *Cellariella* in dorsal (196-199), ventral (200, 202, 203), and lateral (201) views. 196, *C. fulviventris*; 197, 203, *C. somalica*; 198, 200, 201, *C. kalaharica*; 199, 202, *C. inexpectata*.

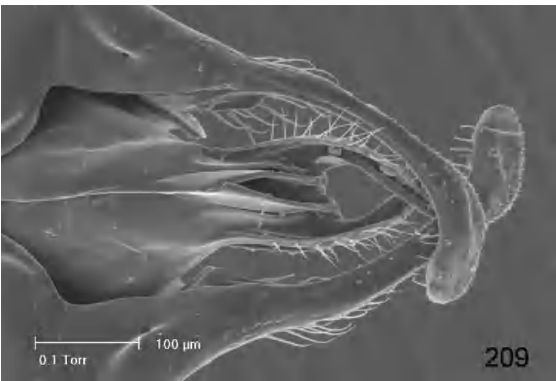
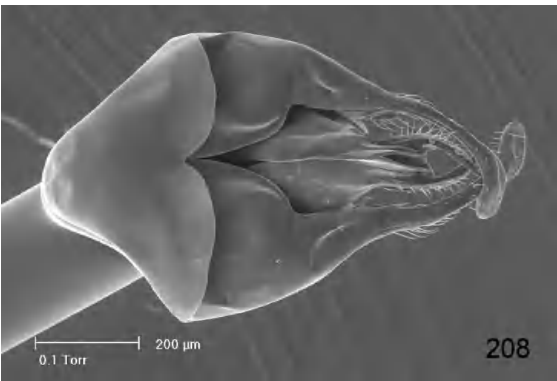
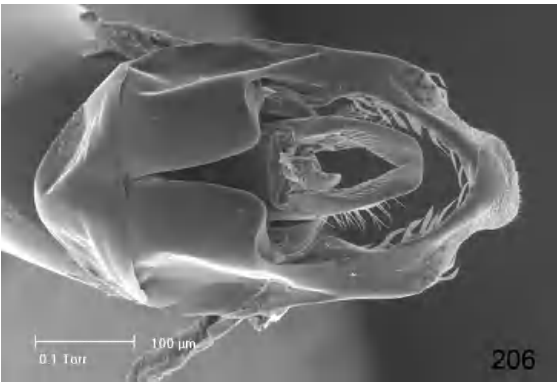
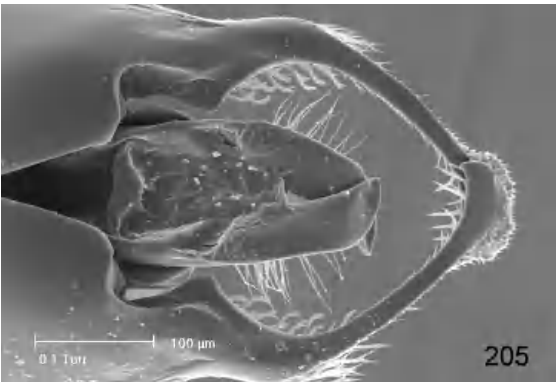
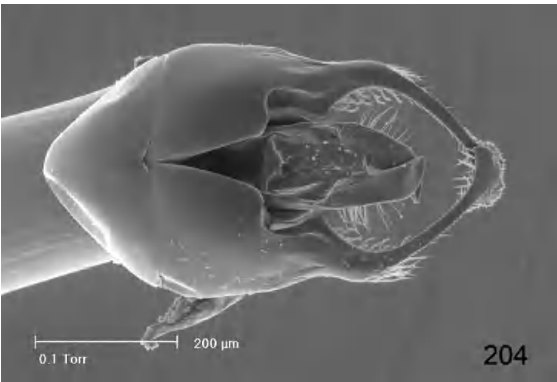


Plate XIII. Figures 204-211

Male genitalia of *Ceylalictus* subg. *Ceylalictus* in dorsal view. 204, 205, *C. congoensis*; 206, 207, *C. muiri*; 208, 209, *C. punjabensis*; 210, 211, *C. variegatus*.

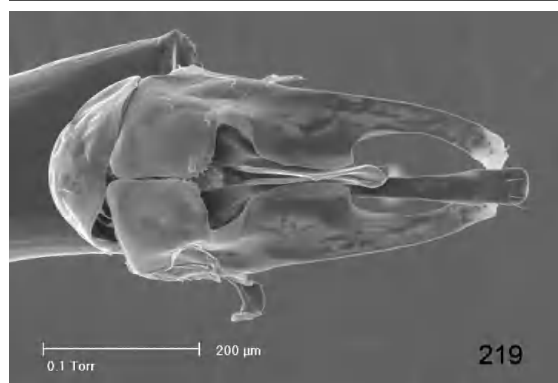
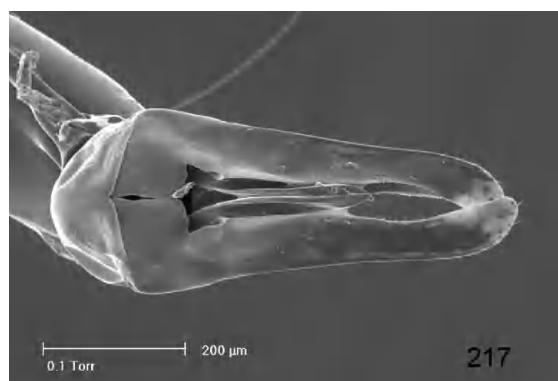
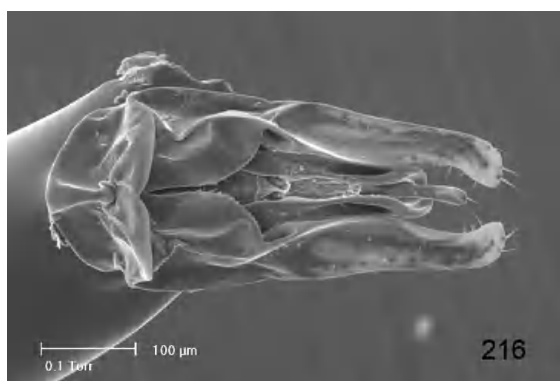
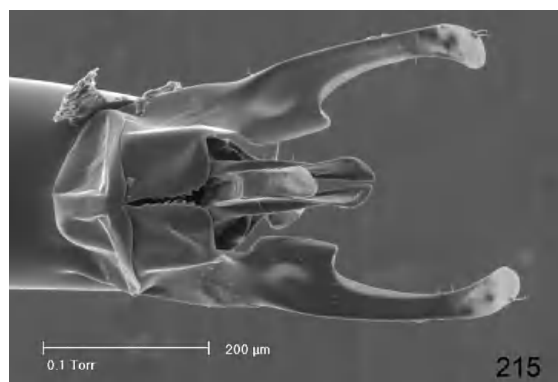
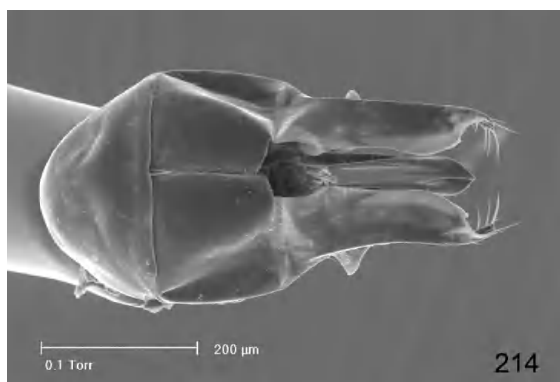
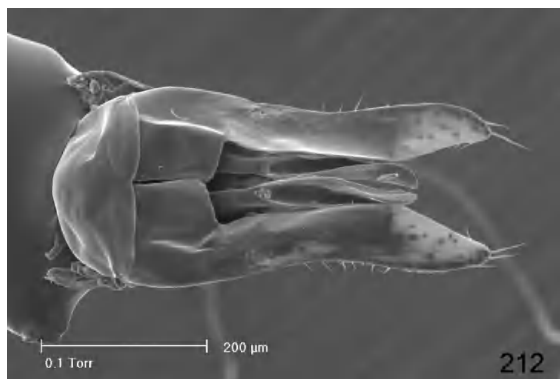


Plate XIV. Figures 212-219

Male genitalia of *Nomioides* subg. *Nomioides* in dorsal view. 212, *N. squamiger*; 213, *N. maculiventris*; 214, *N. micheneri*; 215, *N. turanicus*; 216, *N. rotundiceps*; 217, *N. klausi*; 218, *N. deceptor deceptor*; 219, *N. minutissimus maurus*.

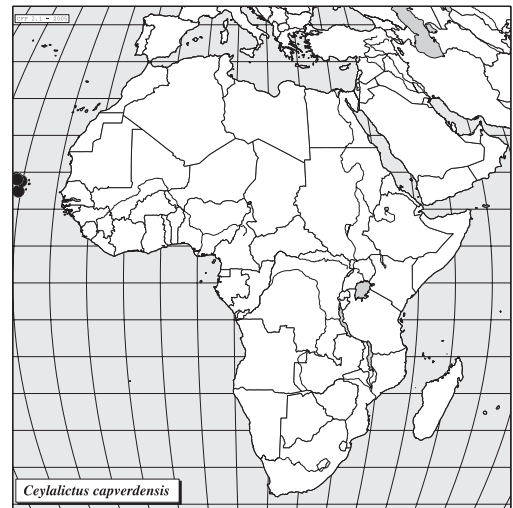
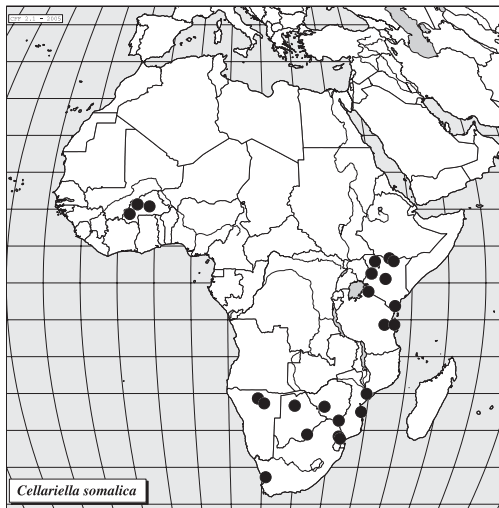
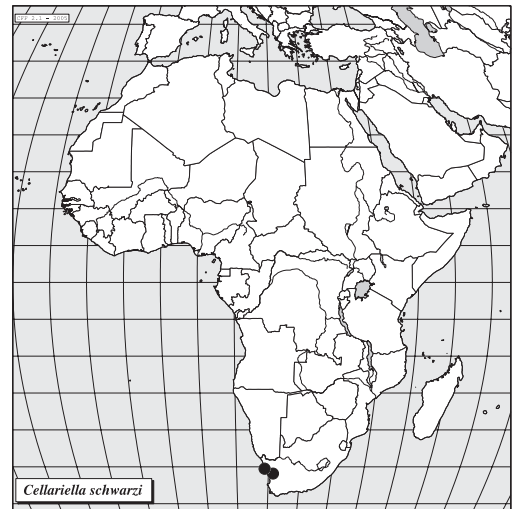
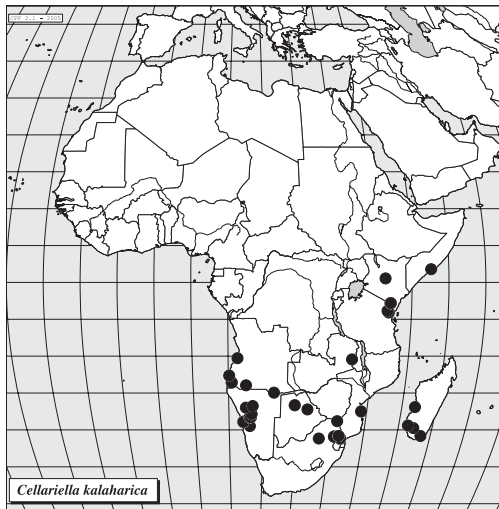
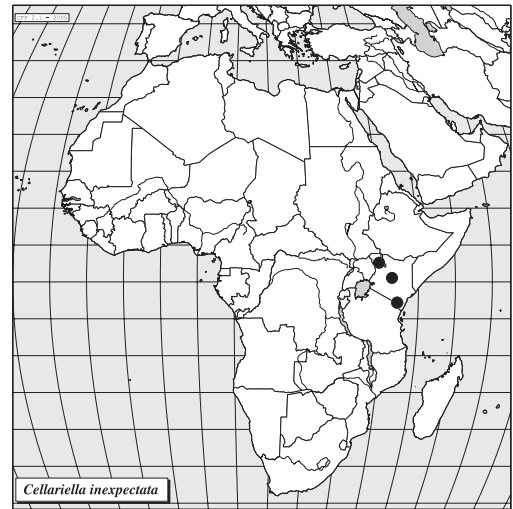
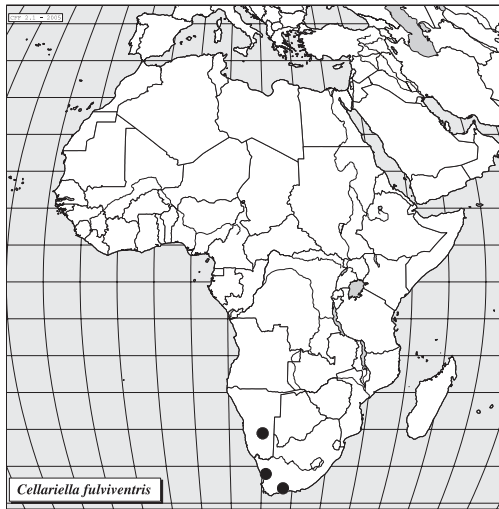


Plate XV. Figures 220-225

Distribution maps of species of *Cellariella* and *Ceylalictus* subg. *Atronomioides* (partim). 220, *Cellariella fulviventris*; 221, *C. inexpectata*; 222, *C. kalaharica*; 223, *C. schwarzi*; 224, *C. somalica*; 225, *Ceylalictus* (*Atronomioides*) *capverdensis*.

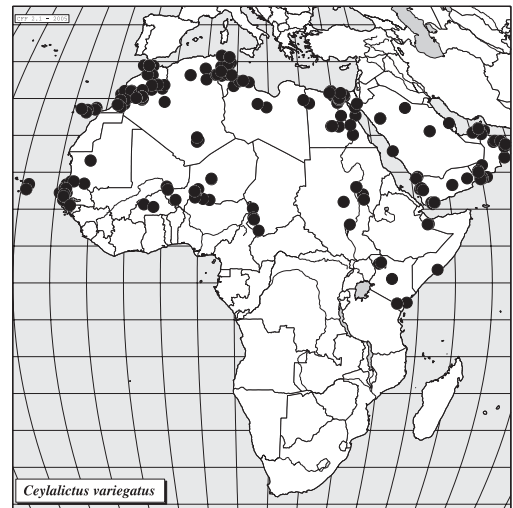
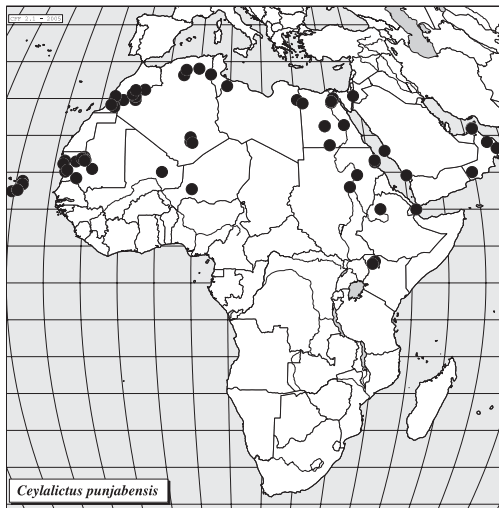
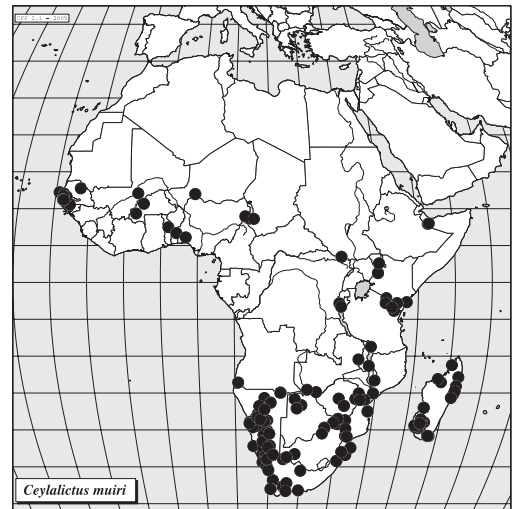
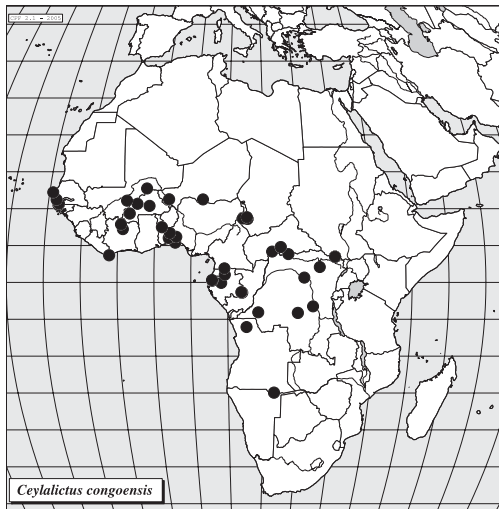
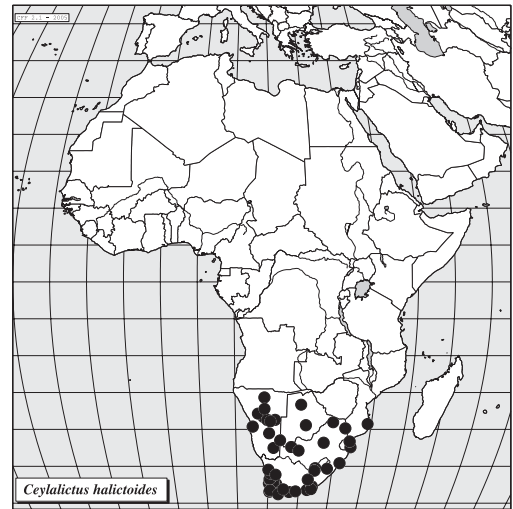
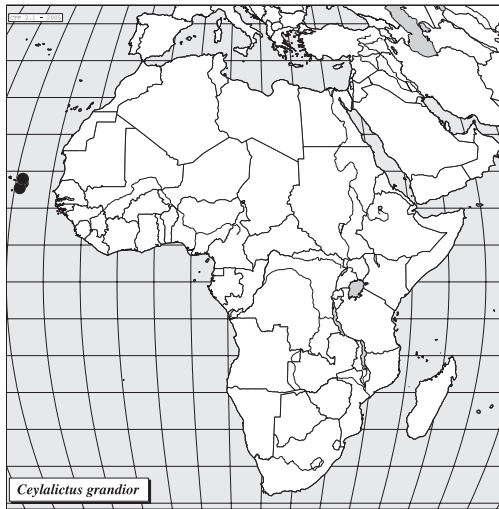


Plate XVI. Figures 226-231

Distribution maps of species of *Ceylalictus* subgenera *Atronomioides* and *Ceylalictus*.

Fig. 226, *Ceylalictus (Atronomioides) grandior*; 227, *C. (A.) halictoides*; 228, *C. (Ceylalictus) congoensis*; 229, *C. (C.) muiri*; 230, *C. (C.) punjabensis*; 231, *C. (C.) variegatus*.

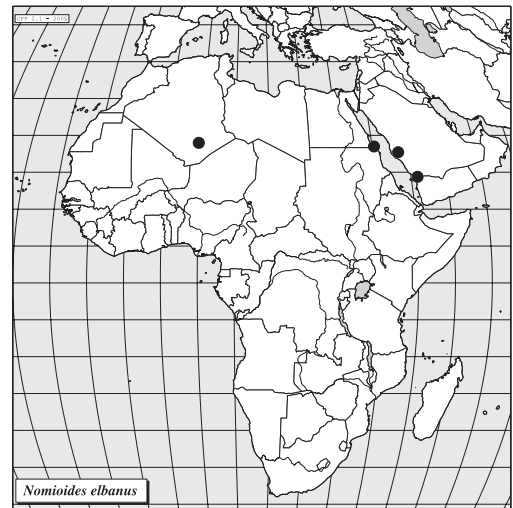
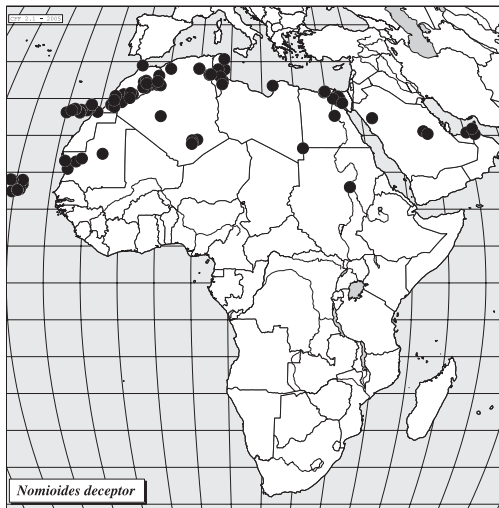
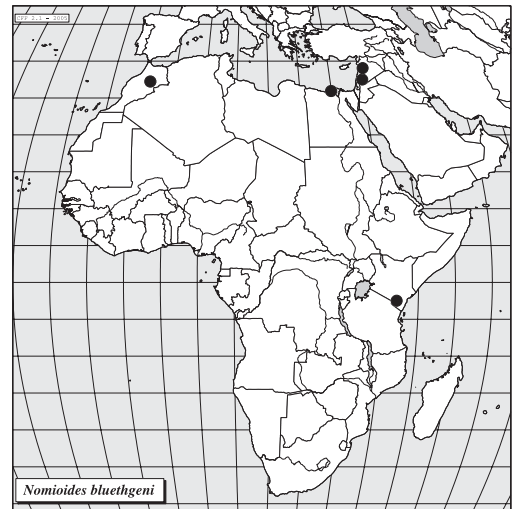
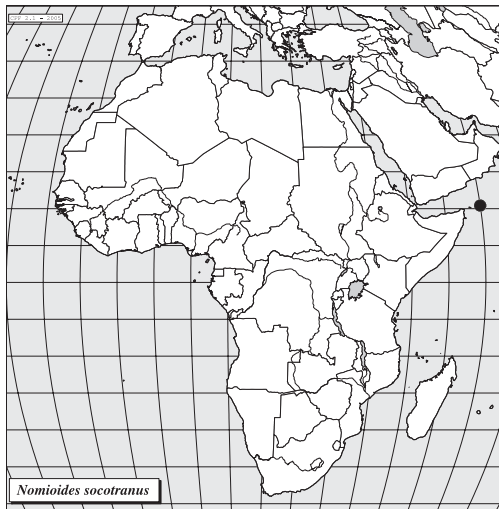
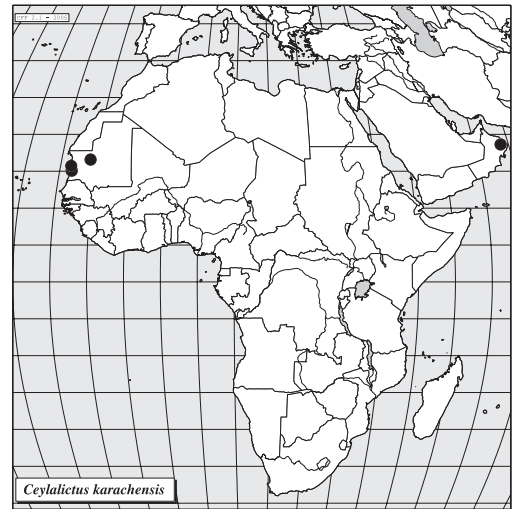
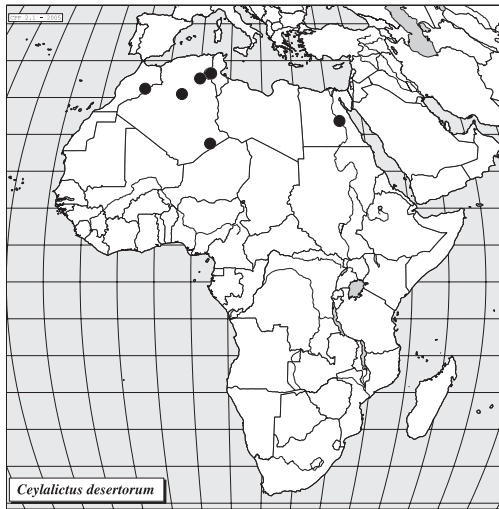


Plate XVII. Figures 232-237

Distribution maps of species of *Ceylalictus* subg. *Meganomioides*, *Nomioides* subg. *Erythronomioides* and *Nomioides* subg. *Nomioides* (partim). 232, *Ceylalictus* (*Meganomioides*) *desertorum*; 233, *C. (M.) karachensis*; 234, *Nomioides* (*Erythronomioides*) *socotranus*; 235, *N. (Nomioides) bluethgeni*; 236, *N. (N.) deceptor*; 237, *N. (N.) elbanus*.

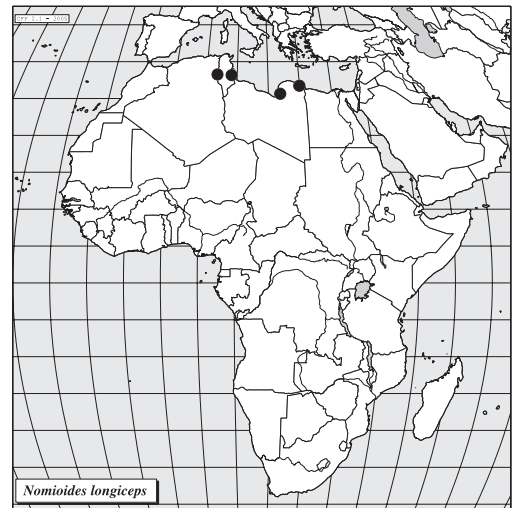
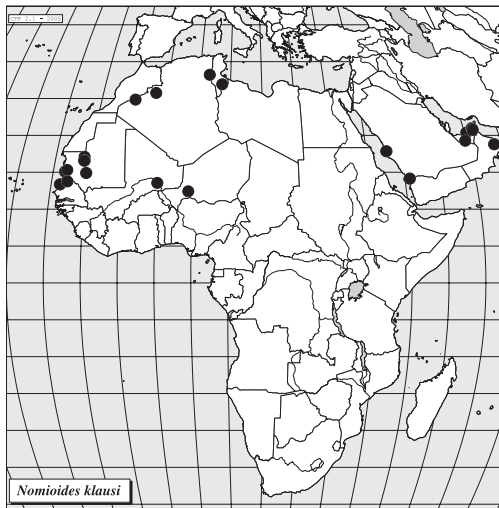
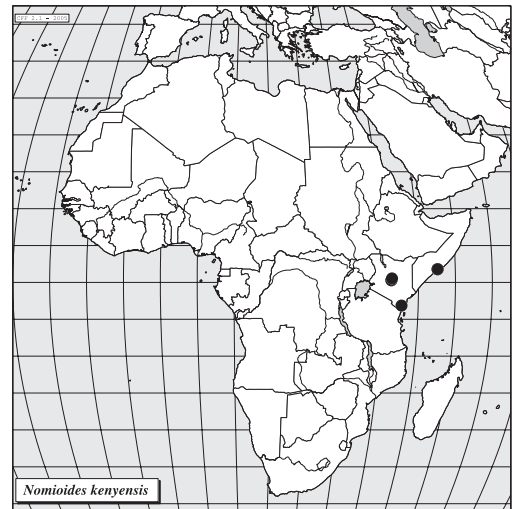
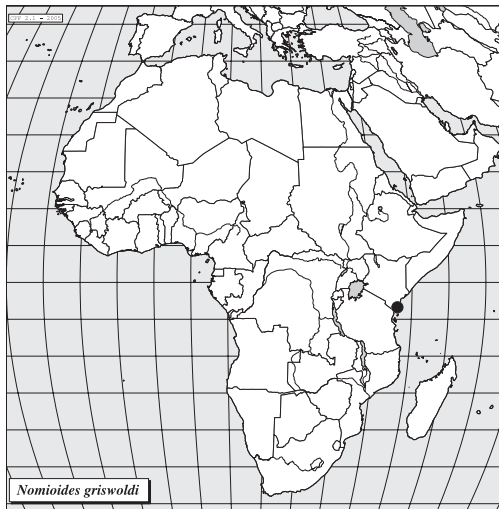
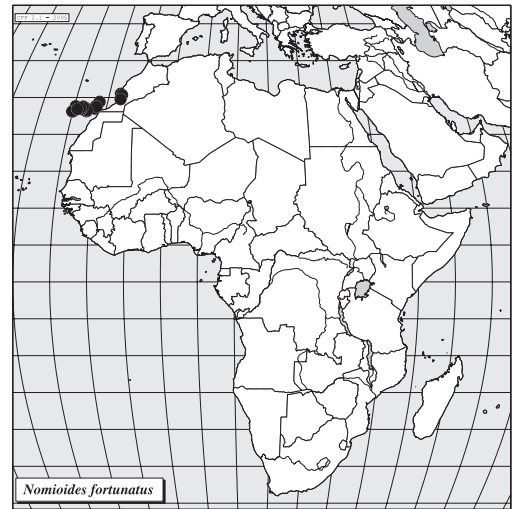
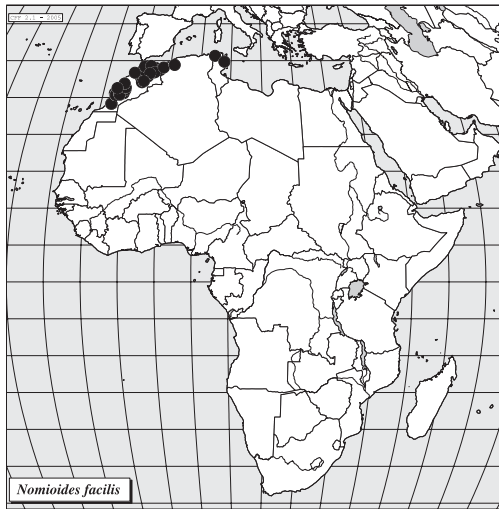


Plate XVIII. Figures 238-243

Distribution maps of species of *Nomioides* subg. *Nomioides* (partim). 238, *N. facilis*; 239, *N. fortunatus*; 240, *N. griswoldi*; 241, *N. kenyanensis*; 242, *N. klausii*; 243, *N. longiceps*.

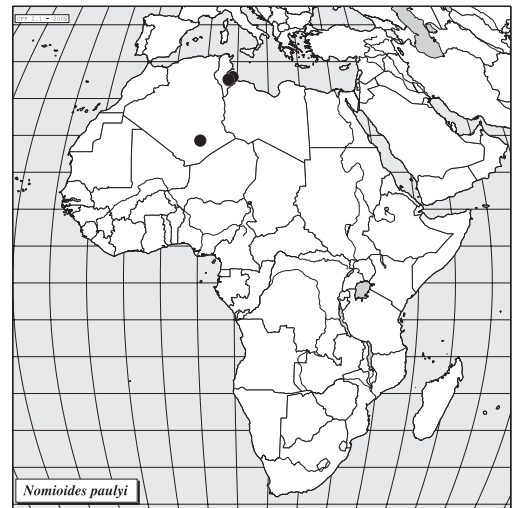
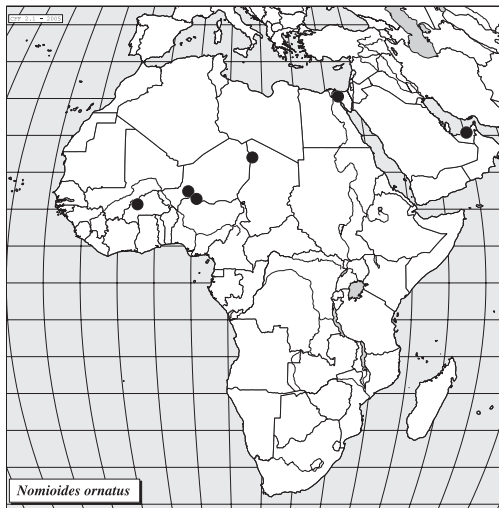
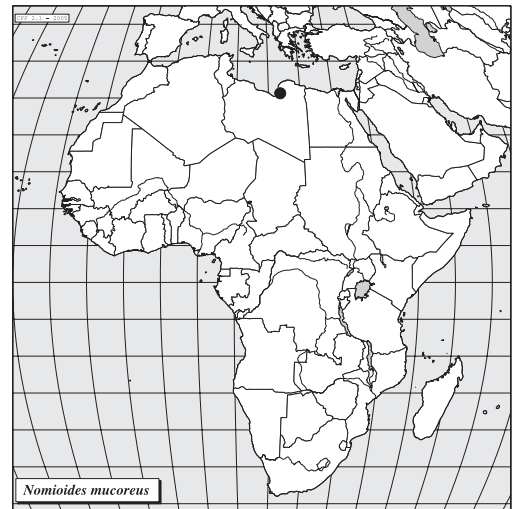
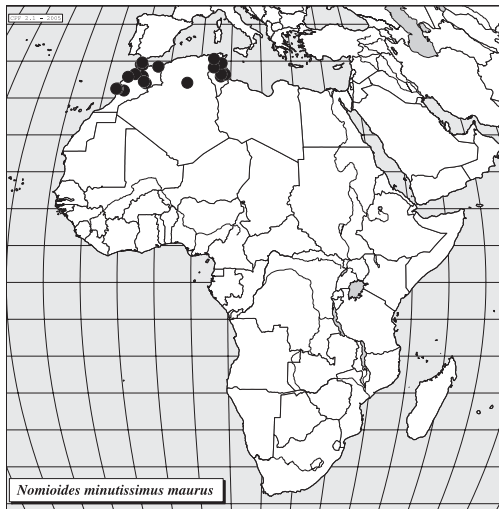
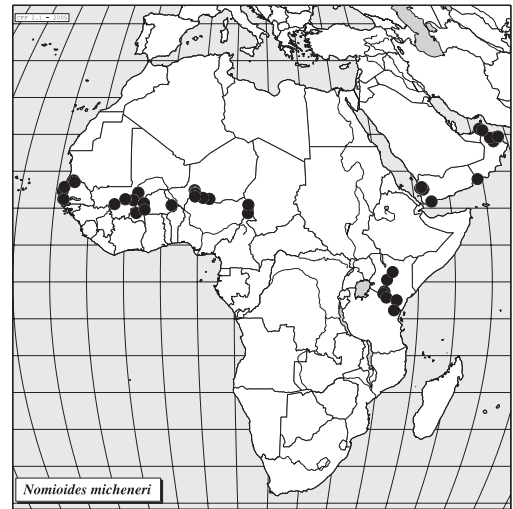
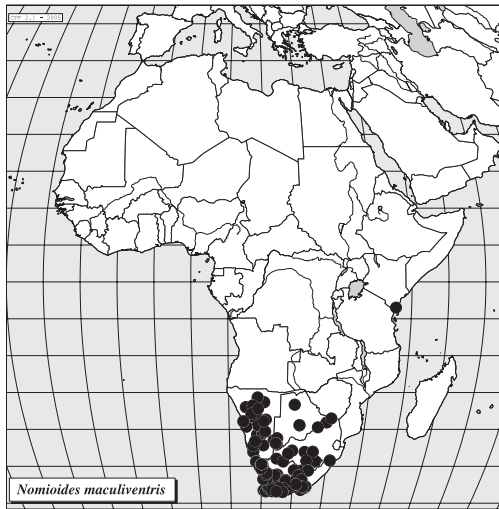


Plate XIX. Figures. 244-249

Distribution maps of species of *Nomioides* subg. *Nomioides* (partim). 244, *N. maculiventris*; 245, *N. micheneri*; 246, *N. minutissimus maurus*; 247, *N. mucoreus*; 248, *N. ornatus*; 249, *N. paulyi*.

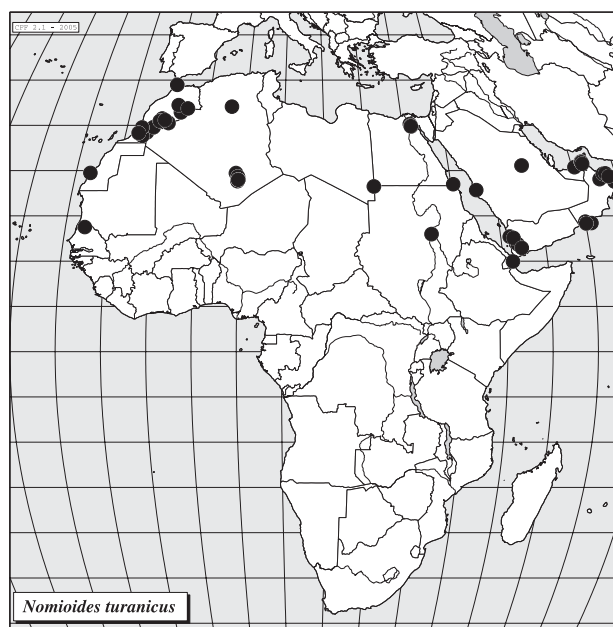
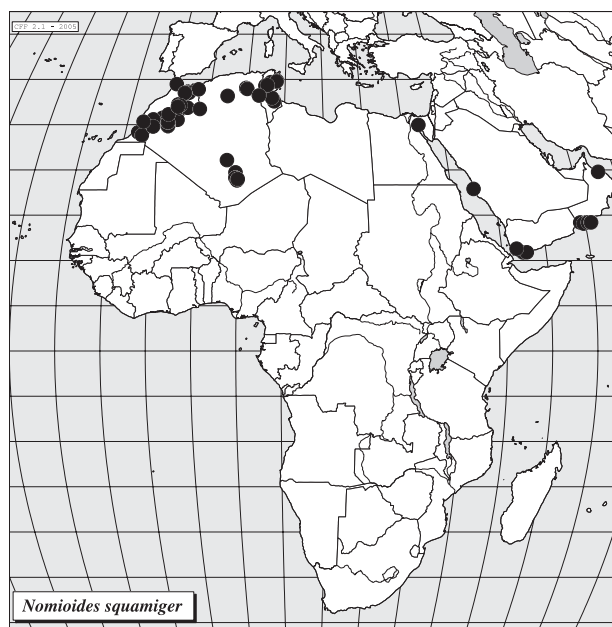
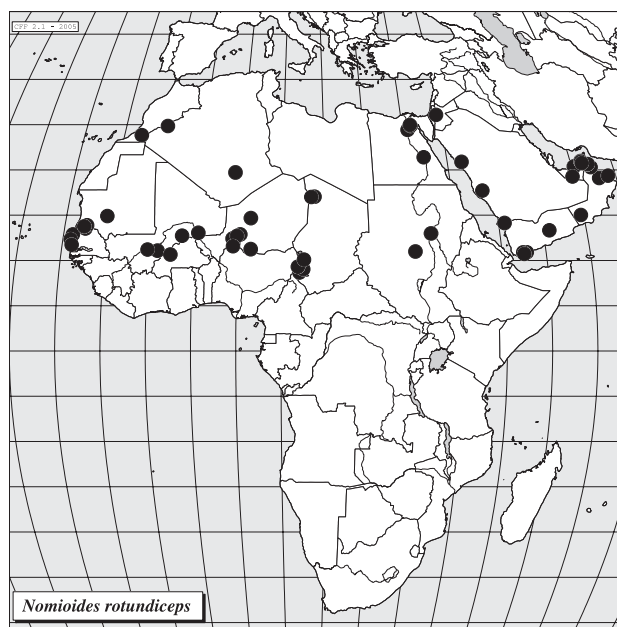


Plate XX. Figures 250-252

Distribution maps of species of *Nomioides* subg. *Nomioides* (partim). 250, *N. rotundiceps*; 251, *N. squamiger*; 252, *N. turanicus*.