The ant-lions of southern Africa (Neuroptera: Myrmeleontidae). Introduction and genus *Bankisus* Navás

by

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This is the first in a series of papers revising the systematics of the southern African Myrmeleontidae (Neuroptera). It introduces the series, reviews literature on Myrmeleontidae from the subregion, discusses zoogeography, biology and higher classification, provides a preliminary key to local genera and revises the genus *Bankisus* Navás. *Bankisus* comprises five species, *B. oculatus* Navás, *B. carinifrons* (Esben-Petersen), *B. elegantulus* (Esben-Petersen), *B. triguttatus* Navás and *B. maculosus* Hözel. The first two are recorded from southern Africa and are redescribed; the last three are known only by their holotypes, *elegantulus* and *triguttatus* from Zaïre and *maculosus* from Oman. No new species are introduced and *B. kristensenii* (Esben-Petersen) is synonymised with *B. oculatus*.

INTRODUCTION

Southern Africa has a rich fauna of Myrmeleontidae comprising about 140 species in 40 genera. It is the largest of 12 families of Neuroptera inhabiting the subregion and also includes the most striking representatives of the Order. The family has hitherto not been comprehensively studied, and accounts of local myrmeleontids are limited mainly to old scattered taxonomic papers. Existing descriptions are generally superficial, relying on wing venation and external morphology; none provide details of genitalia or immature stages, many are based on unique specimens and illustrations are meagre. This has led to inadequately defined taxa, complicating the interpretation of genera, species and their relationships, and resulting in numerous synonymies.

A study of the family is now being undertaken, aimed at providing a revision of the southern African species, and this is the first in a series of papers reporting on the work. It provides an introduction to the series by way of a literature review, a discussion of zoogeography, biology and higher classification and a preliminary key to the local genera, followed by a revision of the genus *Bankisus* Navás. Each subsequent contribution will treat one or more genera, local taxa will be redescribed to incorporate new data, to ensure uniformity and to provide a convenient reference source.

Many southern African genera and species are widespread and were originally described from areas to the north of the subregion. So, although dealing pri-
marily with the fauna south of the Zambezi and Cunene rivers (approximately 16° S to 18° S), the revision will also include relevant information on ant-lions from elsewhere in the Afrotropical region.

Terminology follows that of Aspöck et al. (1980), who also provides a diagnosis of the family, including morphological details of wing venation and genitalia. Techniques used in the study are similar to those described by them. Venational terminology and abbreviations are indicated in Figs 1 to 9, and that for genital structures in Figs 12 to 29. Under material examined, information in brackets is supplementary data not reflected on the specimen labels.

The revision is based on the author's collection of approximately 5000 specimens, in the National Collection of Insects, Pretoria, and on material in the following institutions, which will be referred to throughout the series by the accompanying abbreviations.

BMNH—British Museum (Natural History), London
IRSN —Institute Royal des Sciences Naturelles, Brussels
LS —Linnaean Society, London
MG —Muséum d'Histoire Naturelle, Geneva
MP —Muséum National d'Histoire Naturelle, Paris
MRAC —Musée Royal de l’Afrique Centrale, Tervuren
MZH —Museo de Zoología, Barcelona
NCI —National Collection of Insects, Pretoria
NMZ —National Museum of Zimbabwe, Bulawayo
SAM —South African Museum, Cape Town
UMO —University Museum, Hope Department of Entomology, Oxford
TM —Transvaal Museum, Pretoria
ZMC —Zoological Museum, Copenhagen University, Copenhagen
ZML —Zoological Museum, Lund University, Lund.

PREVIOUS WORK ON SOUTHERN AFRICAN MYRMELEONTIDAE

Publications pertinent to the local taxa cover a 218 year period from 1758 to 1976, and all except three of these accounts are taxonomic. Apart from the studies of Péringuey (1910, 1911) and Youthed & Moran (1969a, 1969b, 1969c), all research on Afrotropical Myrmeleontidae has been conducted by taxonomists outside Africa.

The first account of a southern African myrmeleontid appeared in 1758 when Linnaeus described *Hemerobius speciosum* (Palpares speciosus). In 1767 Linnaeus erected the genus *Myrmeleon*, an extant name, but considerably restricted compared to its original sense. Thunberg (1784), Olivier (1809, 1811) and Burmeister (1839) followed Linnaeus and between them added eight species to the documented fauna. Rambur (1842) described three new species from southern Africa and established the genus *Palpares*. Walker (1853, 1860) described 11 species from the subregion, but took the retrogressive step of ignoring all established genera except *Myrmeleon*. The German entomologist and bibliographer, Herman Hagen, correlated information on Myrmeleontidae in two publications (1860, 1866), the latter being of fundamental importance in any study of Neuroptera. In three other papers (Hagen 1853, 1862, 1887), he described and discussed several southern African species and erected the genera *Tomatares* and *Pamexis*. Gerstaecker (1863, 1885, 1888, 1894) worked extensively on east and
southern African ant-lions and many of his taxa, including Cymothales, are still recognised. The British neuropterist, Robert MacLachlan, revised Walker’s catalogue in 1867, adding one genus, Garamomorphus, and seven species, and in 1873 he examined and elaborated upon some of the species described by Rambur (1842). Although Kolbe (1898) only described genera and species from East Africa, many of those mentioned by him, including Syngenes, also occur further south. Van der Weele (1903, 1908) did not describe any new species from the subregion, but provided additional information on the taxa described by Olivier and Gerstaecker.

The only resident taxonomist to publish descriptions of local Myrmelontidae was Périnique. In two papers (Périnique 1910, 1911), he erected the genus Palparidius and described 23 new species, 13 of which are still valid.

In six publications, Nathan Banks (1909, 1911, 1913a, 1913b, 1938, 1941) contributed three new genera, Hagenomyia, Nesoleon and Capophanes, and ten species to the documented fauna, besides providing keys and explanatory notes on many others. In one paper (Banks 1913b), he endeavoured to elucidate and summarize all taxonomic data on Palpares. This genus was also the subject of a paper by Sitz (1912), who described 12 new species and varieties, including four from southern Africa. Only two of these species are still recognized.

A significant contribution to myrmelontid taxonomy was made by Esben-Petersen, who included southern African species in eight of his publications (Esben-Petersen 1912, 1916, 1920, 1922, 1925, 1928a, 1928b, 1931). He described four genera, Isorhina, Brachyplectron, Nannoleon and Tricholeon and eight species, but essentially he tried to synthesize and interpret the available information.

Longinos Naviás, in numerous publications between 1909 and 1937, compounded the problems of myrmelontid systematics. His taxonomic procedures were often superficial, resulting in descriptions of many taxa, a large proportion of which are synonyms. Amongst the profusion of names created by Naviás there are, however, many which are valid, necessitating a careful evaluation of his work. The confusion caused by Naviás is unlikely to be completely resolved as some of his type-specimens have been lost, and many descriptions are too cursory to permit accurate interpretation. Southern African taxa are described or mentioned in at least 46 publications, which are all cited in the reference list. He erected the following genera which pertain to the local fauna: Asia, Bankisus, Banyutus, Bordus, Campestretus, Centrolasis, Cueta, Fadrila, Gandulus, Golafurtis, Ladrus, Lachlathetes, Maula, Mironus, Mochus, Negretus, Nemoleon, Neuroleon, Nohovus, Nosa, Obus and Suca.

In 1943, Kimmings compared the genera Nesoleon and Cueta, and in 1948 he established the genus Exaetoleon and described two species from South Africa. Markl (1953) described a new genus and species Festella intermedia, and in 1954 he published a comprehensive study on the tribal classification of the family. In this latter work he attempted to arrange the myrmelontid genera of the world into 23 tribes, and although this arrangement is controversial (eg. Hölzle 1972), it concentrated all the described genera into one publication, thereby providing a valuable reference source. Youthed & Moran (1969a, 1969b, 1969c) published the only non-taxonomic studies yet undertaken on the Myrmelontidae of the subregion, in their papers on the pit-building behaviour of Myrmeloon obscurus Rambur. Mansell (1974) summarized the Myrmelontidae as part of a larger survey on the status of Hexapod taxonomy in southern Africa. Finally, the southern African genera, Bankisus, Cymothales, Mironus and Tricholeon, were included in a world catalogue of the tribe Dendroleontini by Stange (1976).
ZOOGEOGRAPHY

Aspöck et al. (1980) estimate the existence of approximately 2000 species, distributed on all the continents and especially in the arid regions of Africa, Asia and, to a lesser extent, Australia and the Americas. Myrmeleontidae also occur on many islands, for example, Hawaii (Zimmermann 1957), Galapagos (Stange 1969), Europa (Fraser 1951) and Mauritius. Some species extend as far north as British Columbia and Ontario in Canada, and Finland in Europe (Wheeler 1930), and as far south as New Zealand (Tillyard 1926).

In southern Africa, Myrmeleontidae reveal two main distributional trends. There is a rich fauna, characterized by a high degree of endemism, inhabiting the more arid western parts of the subregion, and an easterly fauna, influenced by elements extending along the tropical corridor into south east Africa from east and central Africa. A few species are very restricted in distribution, especially in the south western Cape, whilst several are cosmopolitan. Approximately 34 species (25%) are known only from the western areas of the subregion, about 42 (31%) occur in the eastern parts, some 15 (11%) are restricted in distribution whilst the remaining 33% are either cosmopolitan or too inadequately known to categorize at present.

IMMATURE STAGES AND BIOLOGY

Larvae possess important morphological and biological attributes which can be used in determining genera and species, in supra-generic classification and in resolving phylogenetic questions. Stange (1970b) listed the early publications dealing with myrmeleontid larvae, and recent papers include those by him (Stange 1970b, 1980), Steffan (1964, 1968, 1971, 1975) and Willmann (1977). Apart from these few contributions, which deal with non-Afrotropical forms, larvae have been largely ignored, as many species are difficult to find and rear. Larvae of Afrotropical species have hitherto not been described, and the vast majority are still unknown. Of the estimated 140 species in southern Africa, the larvae of 22 have been correlated with the adults. Of these, 13 species belong to Myrmeleon, Cueta and Hagenomyia, which are the only three southern African genera whose larvae are known to construct pits. Cymothales larvae inhabit tree-holes, those of Tricholeon and some Neuroleon species occur in caves or under rock overhangs, whilst the majority are probably freeliving in sand.

 Significant morphological characters include: shape of mandibles and tooth number, form of the eyes, shape of the thoracic spiracle, development of thoracic and abdominal scoli, form of the fossorial structures on sternite 8 and the structure of the setae. Tooth number in the southern African species varies from three to six, with three teeth the most prevalent. In most species the eyes are borne on prominent tubercles, but in the pit-building species these have become reduced, and the eyes are often sessile on the head. The prothoracic spiracle is sometimes situated on a protuberance of the pleurites. Lateral processes of the thorax and abdomen are well developed in some cave-dwelling forms (eg. Tricholeon), whilst the sand-inhabiting larvae are usually devoid of such processes. The fossorial setae of most species are stout bristles, but in Cueta the bristles are fused into small toothed plates, whilst in Palpares, Avia and Fadrina there are paired triangular digging appendages.

 One of the objectives of this study is to discover and correlate larvae of the southern African species and to use the biological and morphological features in the systematic revision of the family.
REVIEW OF HIGHER CLASSIFICATION

The supra-generic classification of the Myrmeleontidae is largely unresolved (Stange 1970a, Áspöck et al. 1980). Several authors, whose main contributions are reviewed below, have attempted to arrange the family into subfamilies, tribes and sub-tribes, but overall consensus on these categories has not been achieved. Tribal classification on a world basis is particularly controversial and complex because of insufficient knowledge of many genera, especially the immature stages. In all, some 7 subfamilies and 33 tribes have been proposed, of which about 4 subfamilies and 23 tribes are still taxonomically available.

One of the earliest classifications was by Banks (1899), who distinguished two groups, Myrmeleoni and Dendroleoni, in the North American fauna. Later, in his study on the African Myrmeleontidae (Banks 1911), he elevated these to subfamilies Myrmeleoninae and Dendroleoninae, each comprising two tribes, Palparini and Myrmeleoni, and Dendroleoni and Nemoleonini respectively. Navás (1912b, 1912d, 1913d, 1914e, 1914f, 1926c) added eight more tribes, Gymnocrinemini, Acanthaclisisini, Creagrinini, Megistopini, Neuroleini, Formicaleonini, Dimarini, Pornerini and Pignatellini, but did not consider subfamilies. Tillyard (1916) recognized Bank's two subfamilies and added two more tribes, Distoleonini and Protepectrini, in studies on the Australian fauna.

Esen-Petersen (1918) split the Myrmeleontidae into two groups, Archaeomyrmeleonidae and Neomyrmeleonidae, the former containing the Palparini and related forms, the latter comprising the Myrmeleoninae and Dendroleontinae, with four and six tribes respectively. He erected three new tribes, Macronemurini, Lopezini and Myrmecaelurini. Esen-Petersen considered the Archaeomyrmeleonidae to be the more primitive ant-lions, a view generally supported by later workers (e.g. Hölzel 1972:74), but not shared by the present author. The Palparini are regarded as an advanced group for several reasons, the most important being distribution and larval morphology. The subfamily is not represented in Australia or South America, indicating that the group probably evolved after Africa, Australia and South America had separated. It is unlikely that this large and successful Afrotropical subfamily could have disappeared without trace from the latter two continents. In the Palparinae, larval tooth number varies between three and six, and an increased number of teeth can be considered apomorphic relative to the other Neuroptera. The more primitive forms should be sought amongst the Dendroleontini and not Palparini as generally thought.

Banks (1927) raised the Palparini and Macronemurini to subfamily status, bringing the number to four, and added the tribes Brachynemurini and Glenurini for the Nearctic fauna. In 1938 he mentioned the tribe Gamini, and in 1943 elevated the Acanthaclisisini to subfamily level.

In 1954, Markl classified the myrmeleontid genera of the world into 23 tribes, adding 10 new tribes in the process. He synonymized Neuroleini with Formicaleonini, Lopezini with Myrmecaelurini and Creoleonini was established as a replacement name for Creagrum. Markl appeared to overlook the existing tribes Macronemurini, Distoleonini Gamini and Pignatellini, and erected the following new tribes: Pseudimarini, Palparidiini, Echthromyrmicini, Maulini, Acanthopectrini, Gepini, Nesoleonini, Obini, Nyutini, and Dimarellini. He did not attempt to arrange the tribes into subfamilies.

Stange (1961) mentioned three subfamilies, Acanthaclisiniae, Macronemurinae and Dendroleontinae, from the New World, but did not deal with the Myrmeleontinae or Palparinae. In 1967 and again in 1970a, Stange referred to four of the subfami-
lies (Macronemurinae expected), and also listed seven tribes in the first paper. In 1970b, Stange synonymized the Dendroleontinae and Macronemurinae with the Myrmeleontinae. The tribe Isoleonini was erected by Hölzel (1969) and in 1970 he included the tribes of Dendroleontinae within the Myrmeleontinae. At the same time, Riek (1970) placed the Australian Myrmeleontidae in four subfamilies, Dendroleontinae, Macronemurinae, Acanthaclisinae and Myrmeleontinae, but did not include a tribal division. Hölzel (1972) divided the Myrmeleontidae into three subfamilies, Palparinae, Myrmeleontinae and Echthromyrmicinae, and erected the tribe Distoleonini, apparently unaware that the name was already available (Tillyard 1916). Another significant contribution was made by Stange (1976) in his world catalogue of the Dendroleontini. Here he again recognized three subfamilies, and proposed a division of the tribe into five subtribes.

Willman (1977) mentioned two subfamilies, Palparinae and Myrmeleontinae, including five tribes in the latter. He synonymized Isoleonini Hölzel with Gepini Markl, stating that the latter name had priority. Aspöck et al. 1980 divided the family into two sister groups, Palparinae and Myrmeleontinae, but did not undertake a tribal classification of the European Myrmeleontidae. Most recently, New (1982) reappraised the status of the family Stilbopterygidae, referring the genus Albardia to the Ascalaphidae, and Stilbopteryx and Aeropteryx to the Myrmeleontidae, where they constitute the subfamily Stilbopteryginae.

Whilst some agreement on subfamilies seems to be emerging, three (Palparinae, Acanthaclisinae, Myrmeleontinae) according to Stange (1976) and two (Palparinae and Myrmeleontinae) recognised by Aspöck et al. (1980), plus Stilbopteryginae (New 1982), the tribes are still subjectively defined.

In the present study, southern African genera will be arranged in existing tribes as far as possible, where these are well defined. The situation will be reviewed again when more information is available. The genus Bankisus, now being revised, together with Cymothales and Tricholeon belongs to the Dendroleontini (Stange, 1976). Other genera could be accommodated as follows: Palpares, Pamexis, Tomatares, Crambomorphus, Golafrus, and Lachlathetes in Palparini; Palparidius in Dimarini; Avia, Centroclisis, Syngenes and Fadrina in Acanthaclisinae; Myrmeleon and Hagenomyia in Myrmeleontinae; Banyutus, Distoleon, Creoleon, Brachyplectron, Macronemurus, Nannoleon, Nemoleon and Neuroleon in Nemoleontini; Cueta, Furgella and Nesoleon in Gepini; Capophanes, Obus and Mochus in Obini; Maula and Isonemurus in Maulini, whilst Exaetoleon is uncertain. These tribes have been defined by Markl (1954).

Figs 1–9. Key figures. 1. Forewing of Palpares sp.; 2. Forewing of Cueta sp.; 3. Forewing of Crambomorphus sp. showing double costal series; 4. Forewing of Palpares sp. with single costal series; 5. Forewing of Palparidius sp.; 6. Hind wing of Palpares sp.; 7. Hind wing of Tricholeon sp.; 8. Hind wing of Myrmeleon sp.; 9. Hind wing of Creoleon sp.; Abbreviations: 1A – first anal vein; C – costa; Cua – anterior cubitus; Cup – posterior cubitus; Cua1 – upper branch of cubital fork; Cua2 – lower branch of cubital fork; Ma – anterior median; Mp1 – upper branch of posterior median; Mp2 – lower branch of posterior median (oblique vein); Ps – presectorial veins; R – radius; Rs – radial sector; Rv – recurrent vein; Sc – subcosta.
Mansell: ant lions of the genus Bankisus
PROVISIONAL KEY TO THE GENERA OF SOUTHERN AFRICAN MYRMELEONTIDAE

1. Veins Cup and 1A distinct, not fused (Fig. 1); large forms with heavily marked, usually broad wings ......................................................... 2

2. Veins Cup and 1A fused close to wing base (Fig. 2); smaller forms with narrower, often unmarked wings ......................................................... 8

3. Costal area of forewings with some cells double (Fig. 3); wings very narrow, with sinuate hindmargins ......................................................... Crambomorphus MacLachlan

4. Costal area of forewings with single row of cells, except occasionally near pterostigma (Fig. 4) ................................................................. 3

5. Wings narrow, each with a projecting lobe on hindmargin; hind legs long, slender, at least one half as long as abdomen ........................................... Gofraurus Navás

6. Wings broad, hindmargins not lobed; hind legs shorter than one half the abdomen length ............................................................... 4

7. Antennae short, clubbed, distinctly shorter than combined length of fore tibia and tarsus; smallish forms with bright yellow, heavily marked wings ................................................................................. 5

8. Antenna as long or distinctly longer than combined length of fore tibia and tarsus; wings may be yellowish, but not bright yellow ......................................................... 6

9. Basal half of hind wings yellow, unmarked ......................................................... Tomatares Hagen

10. Basal half of hind wings with dark brown markings ......................................................... Pamexis Hagen

11. In hind wings, Cu1 slightly curved at junction with posterior fork of M1p (Fig. 5); male ectoprocts very long, at least 12 mm in length ........................................... Palparidius Peringuey

12. Hind wings with Cu1 bent sharply at junction with posterior fork of M1p to form recurrent vein (Fig. 6); ectoprocts of male short, not approaching 12 mm .......................................................................... 7

13. Wings very broad, posterior margins sinuate; antennae long, cylindrical without distinct club ................................................................................. Lachlathetes Navás

14. Posterior margins of wings not distinctly sinuate; antennae clavate ........................................ Palpara Navás

15. One or two presectorial veins in hind wings (Fig. 7) .................................................. 18

16. Three or more presectorial veins in hind wings (Fig. 8) ................................................ 9

17. Labial palps very long, at least one half as long as antenna ........................................ Maula Navás

18. Labial palps normal, not one half as long as antenna ...................................................... 10

19. Tibial spurs stout, curved through 90° or right angled, longer than first tarsomere (which is short) in all three pairs of legs; combined length of tarsomeres 1 to 4 less than that of 5. Usually robust dull grey hairy species ................................................................................. 11

20. Tibial spurs slender, straight or slightly curved, shorter than first tarsomere, at least in hind legs legs; combined length of tarsomeres 1 to 4 usually greater than that of 5 ............................................................................. 14

21. Costal veins of forewings with double row of cells or costal veins mostly forked (see Fig. 3) ......................................................... 12

22. Costal area with single row of cells, except near pterostigma ........................................ 13

23. Costal veins forked or forming irregular cells; tibial spurs evenly curved .................... Syngenes Kolbe

24. Costal cells in two even rows; spurs strongly right angled ........................................ Fadrina Navás

25. Tibial spurs evenly curved ................................................................................. Avia Navás

26. Tibial spurs sharply right angled ........................................................................... Centroclisis Navás

27. In forewings, Rs arises slightly before or approximately on the same level as Cu1 and Cu2 .............................................................................. Hagenomyia Banks

28. In forewings Rs arises well beyond Cu fork .................................................................. 15

29. First tarsomere in fore- and middle legs short only slightly longer than second; tibial spurs curved longer than first and second tarsomeres on fore- and middle legs ................................................................. Furgella Markl

30. First tarsomere long (in all three pairs of legs), about twice the length of the second tarsomere, spurs straight equal or shorter than first tarsomere in all legs ........................................................................... 16

31. Yellow species, with yellow and brown striped thorax; eight to twelve presectorial veins in hind wings ................................................................. Cueta Navás

Not uniformly yellow or thorax not striped with brown and yellow; usually eight or fewer presectorial veins in hand wings ................................................................. 17
Mansell: ant lions of the genus Bankisus

17 Smallish species with rounded wingtips, wings heavily marked or blotched with brown or distinct black mark over pterostigma; seven or eight presectorial veins in hind wings ........................................... Nesoleon Banks

Wingtips usually acute, wings mostly hyaline, generally three to five (occasionally three to eight) presectorial veins in hand wings ...................................................... Myrmeleon Linnaeus

18 Cubital forks in forewings are parallel for most of their length (Fig. 9) .............................................................. 19

Cubital forks in forewings diverge (see Fig. 8) ...................................................... 20

19 Median forks in hind wings diverge; tibial spurs well developed, longer than first tarsomere ................................................. Creoleon Tillyard

Median forks in hind wings parallel; tibial spurs weakly developed, shorter than first tarsomere or absent .............................................................. Obus Navás

20 Tibial spurs absent .............................................................. 21

Tibial spurs present .............................................................. 22

21 Costal area of forewings with double row of cells (see Fig. 3) .............................................................. Capophanes Banks

Costal area of forewings with single row of cells .............................................................. 22

22 Radial sector arises before cubital fork in forewings, wings hyaline with brown marks;

Vertex raised .............................................................. Bankisus Navás

Rs arises beyond Cu fork in forewings, wings pink with brown spots; vertex rounded .............................................................. Exaetoleon Kimmins

23 Hind wings strongly falcate with acute apex; both pairs of wings prominently marked .............................................................. Cymothales Gerstaecker

Hind wings not falcate, if slightly falcate then not marked .............................................................. 24

24 Labial palps long, at least one half as long as antenna .............................................................. Isonemurus Esben-Petersen

Labial palps normal, not one half as long as antenna .............................................................. 25

25 In forewings Rs arises well before Cu fork; males with pilulae .............................................................. 26

In forewings Rs arises well beyond Cu fork or at approximately the same level as the Cu fork; males lack pilulae .............................................................. 27

26 Legs long slender, hind legs reaching beyond fourth abdominal tergite .............................................................. Tricholeon Esben-Petersen

Legs short, hind legs not extending beyond third abdominal tergite .............................................................. Nannoleon Esben-Petersen

27 Tarsi longer than tibiae in fore- and middle legs; with long narrow wings and long abdomen .............................................................. Nemoleon Navás

Tarsi shorter or same length as tibiae .............................................................. 28

28 Tibial spurs less than or equal to the length of the first tarsomere in hind legs .............................................................. 29

Tibial spurs longer than the first tarsomere in hind legs .............................................................. 30

29 Tibial spurs as long or longer than half the first tarsomere in fore- and middle legs .............................................................. Neuroleon Navás

Tibial spurs usually shorter than half of first tarsomere in all legs .............................................................. Brachyplectron Esben-Petersen

30 Antennae long cylindrical, longer than thorax, not distinctly clavate; forewing shorter than hind wing .............................................................. Banyutus Navás

Antennae distinctly clavate, shorter or equal to length of thorax; fore- and hind wings of equal length .............................................................. 31

31 Spurs on fore tibiae longer or equal to the combined length of tarsomeres one to four .............................................................. Distoleon Banks

Spurs less than the combined length of tarsomeres one to four .............................................................. Macronemurus Costa

The status of the following genera is uncertain, some are undoubtedly synonyms, so they have been omitted from the key: Campestretus Navás, Bordus Navás, Ladrus Navás, Mochus Navás, Gandulus Navás, Suca Navás, Mironus Navás, Nosa Navás and Negretus Navás.
Genus *Bankisus* Navás

**Bankisus** Navás, 1912a: 45; 1926a: 105; Banks, 1938: 126; Markl, 1954: 221; Stange, 1976: 262, 287; Hölzel, 1983: 211.

**Navasius** Esben-Petersen, 1936: 202; Markl, 1954: 221.

Type-species: *Bankisus oculatus* Navás, by original designation.

**REDESCRIPTION.** Small species, characterized by hyaline wings with brown markings, long slender legs and lack of tibial spurs.

Head with square raised vertex. Maxillary palps five-segmented, labial palps three-segmented, sense organ on third palpomere with rounded apperture.

Prothorax longer than broad with long setae. Wings hyaline, marked with brown, pterostigma of forewings prominent, maroon-coloured, pale in hind wings; forewings broader than hind wings. Forewings with 3 presectorial veins, Rs arises close to wing-base well before Cu fork, Mp2 meets Cua just beyond Cu fork, Cu forks widely divergent, 1A fused with Cup, banksian lines discernible; hind wings with 1 crossvein between R and M before Rs, Rs arises before M fork, 1A fused with Cup, banksian lines discernible, pilulae present in males. Legs long, slender, lacking tibial spurs; pretarsal claws long, straight, folding back against bristle-pad on fifth tarsomere, first tarsomere long, fifth slightly shorter, intermediate three shorter still; femoral sense hairs absent. Tibiae longer than tarsi in all legs.

Abdomen of males with tergite g divided, ectoprocts short; gonarcus, parameres distinct, parameres sclerotized, free from one another. Pleuritocavae absent. Females with tergite 9 divided, ectoprocts short, rounded; two or three pairs of gonapophyses present, gonapophyseal plate not developed; fossorial setae well developed.

**Larvae:** unknown

The genus comprises five species, two of which, *B. oculatus* Navás and *B. carinifrons* (Esben-Petersen), are recorded from southern Africa. The other three, *B. elegantulus* (Esben-Petersen), *B. triguttatus* Navás and *B. maculosus* Hölzel, are known only by their respective holotypes, *elegantulus* and *triguttatus* from Zaire and *maculosus* from Oman. *Navasius kristenseni* (Esben-Petersen) originally included in *Gymnocnemia* Schneider, by Esben-Petersen (1915) is a synonym of *B. oculatus* Navás. Markl (1954) synonymized *Navasius* Esben-Petersen with *Bankisus* Navás and Stange (1976) transferred the species in *Navasius* to *Bankisus*.

*Bankisus* is a widespread genus, ranging from southern Africa to Yemen and Oman on the Arabian peninsula.

*Bankisus oculatus* Navás, Figs 10, 12–20, 30.

**Bankisus oculatus** Navás, 1912a: 46; 1912b: 96; Banks, 1913a: 154; Markl, 1954: 198; Stange, 1976: 288; Hölzel, 1983: 211.

**Gymnocnemia kristenseni** Esben-Petersen, 1915: 179; 1936: 206.

*Navasius kristenseni* (Esben-Petersen); Esben-Petersen, 1936: 206.

**Bankisus kristenseni** (Esben-Petersen); Stange, 1976: 288. syn. nov.

**REDESCRIPTION:** based on the female holotype of *B. oculatus* Navás, and other material examined.

Sexes alike, characterized by long slender antennae and legs, long maculated wings, forewings broader than hind wings and whitish thoracic tergites.
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Fig. 10. Bankisus oculatus Navás.

Size: mean measurements in mm for 38 specimens, ranges in brackets: length of body (excluding head) 17.4 (14.0–20.0); forewing 20.9 (17.0–23.0); hind wing 19.6 (16.0–22.0); antenna 5.4 (4.4–6.0).

Head: frons, vertex, occiput dark shiny brown, darker towards toruli, inter-antennal mark shiny black, usually extending onto clypeus as a short vertical stripe; clypeus and labrum uniformly pale yellowish-brown or reddish. Maxillary palps uniformly pale yellowish, terminal segment spindle-shaped with acute apex, distal region of stripe with brown annulation, articulation of cardo and stripe brown; labial palps pale yellowish, terminal segment long, spindle-shaped; submentum black, bearing four long black setae. Antennae long, about one third the forewing length, slightly thickened apically; flagellum comprising 30 to 35 segments, pale yellowish white with two brown stripes on basal one third, covered with short black setae; scape and pedicel pale, each with a dark mark on inner surface.

Pronotum with transverse furrow anteriorly; pale midline flanked by two broad blackish marks, with four dark marks on anterior raised portion, lateral margins brown medially, pale anteriorly; prominent long white setae project over the head from anterior margin of prothorax, with shorter white setae on lateral margins and dorsal surface, dorsal surface also with some long black setae, all alveoli on pronotum black, imparting a stippled appearance. Cervical sclerites black, sternites pale. Mesothorax: mesoprescutum black anteriorly, pale posteriorly with long white setae set in black alveoli (remainder of pterothoracic tergites pale creamy-white except for a short narrow black stripe on mesopostnotum and metaprescutum); four prominent clumps of erect white setae occur on mesonotum, with mesoscutellum covered in fine white setae.
Metathorax: metaprescutum with long soft white setae, metanotum devoid of setae, metascutum with very fine sparse setae. Pterothoracic pleurites with a broad black band situated above coxae, but not extending to wing bases; long white setae present on pleurites. Sternites pale yellowish-white.

Legs: forelegs; coxae brown on outer surfaces, otherwise pale, trochanters with prominent black spot, femora pale with four narrow brown stripes and long white and shorter black setae interspersed with recumbent black setae, tibiae very long with two thin brown stripes and sparse long white setae amongst recumbent black setae, tarsi with first tarsomere only slightly longer than other four, pale with short black setae; middle legs similar to forelegs, but slightly shorter, first tarsomere distinctly longer than apical four; hind legs with coxae and trochanters similar to forelegs, femora completely brown dorsally, pale ventrally with recumbent black setae but lacking white setae, tibiae pale with short black setae, first tarsomere distinctly longer than apical four.

Wings: pointed apically, not falcate marked as depicted in Fig. 10. Rs with about 10 branches in forewing, 8 in hind wing, other venation as in genus.

Abdomen: shorter than hind wing; pale, banded with black, sparsely covered with short hyaline setae and black setae on external terminalia. Male (Figs 12–17, 30) with ventral margins of tergite 9 just reaching sternite 9 which is broad and convex with rounded posterior margin; ectoprocts almost rectangular, posteroventral margin not projecting. Gonarcus arcuate with fairly broad proximal regions; mediuncus not discernible apparently membranous; parameres sclerotized, hollow, boat-shaped, widest in proximal region with vertical projections and fine longitudinal striations ventrally (Fig. 30), gonopectae present; gonarcus and parameres enveloped in eversible membranous sac; hypandrium difficult to discern, apparently membranous. Female

Fig. 11. *Bankisus carinifrons* (Esben-Petersen).
(Figs 18–20) with tergite 8 tapering to acute apices ventrally; each half of tergite 9 elongately oval; ectoprocts rounded with long erect black setae, merging with short stout upwardly curved fossorial setae. Pregenital plate small, tooth-like, lying medially at posterior margin of sternite 7. Posterior gonapophyses small, oval, with dense straight setae; anterior gonapophyses digitiform, articulating with apices of tergite 8, bearing a dorsal brush-like pad of long erect setae with sparse long setae ventrally; lateral gonapophyses separated from each other by narrow membranous area, bearing short stout fossorial setae posteriorly and shortish bristles ventrally above genital opening; a plate-like structure ventral to genital opening bearing short straight stout fossorial setae. Spermatheca (Fig. 20) sclerotized, darkly pigmented, C-shaped, broad at base, tapering slightly.

The holotype of Navasius kristenseni (Esben-Petersen) is a small faded specimen, with slightly narrower wings than the typical forms of B. oculatus. Apart from these superficial differences, there are no features to distinguish it from B. oculatus. A comparison of the male genitalia of N. kristenseni with those of other specimens of B. oculatus showed no differences, so it was concluded that the two species are the same, with the latter having priority. This conclusion is further supported by a specimen identified by Esben-Petersen (in SAM) as Gymnocnemia kristenseni. It is a typical B. oculatus, with broad wings, but Esben-Petersen did not consider it different from his G. kristenseni, so identified it as this species.

A female specimen from Yemen (in BMNH) is also identified as B. oculatus as no differences could be found to distinguish it, indicating that B. oculatus probably has a wide distribution in the Afrotropical Region.

Specimens have been captured at light, and by sweeping dry twigs hanging from trees. At present nothing is known about the biology.

Distribution: widespread in the Afrotropical Region; recorded from South Africa, Mocambique, Zimbabwe, Malawi, Tanzania, Ethiopia and Yemen.

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Bankisus carinifrons (Esben-Petersen), Figs 11, 21-29, 31.

**Navasius carinifrons** Esben-Petersen, 1936: 204.


**Redescription:** based on the female holotype of *Navasius carinifrons* Esben-Petersen, and other material examined.

Sexes alike, characterized by short broad maculated wings, whitish thoracic tergites, short clavate antennae and longish legs.

Size: mean measurements in mm for 11 specimens, ranges in brackets: length of body 13.4 (12.0-15.0); forewing 18.3 (16.0-20.0); hind wing 17.7 (15.5-19.0); antenna 2.9 (2.4-3.6).

Head: frons, vertex, occiput yellowish, three black marks between vertex and occiput, a broad black band extends from above toruli, between antennae onto clypeus; clypeus dark above pale distally, labrum pale. Maxillary and labial palps black, articulations pale, terminal labial palpmere spindle-shaped; submentum pale, bearing about eight long pale setae. Antennae short, less than one third the forewing length, distinctly clavate; flagellum comprising 20 or 21 flagellomeres, pale with brown annulations, a few completely pale flagellomeres precede the black club; scape pale with dark spot on inner surface, pedicel and proximal flagellomere brown.

Pronotum with shallow anterior transverse furrow; three dark stripes extend posteriorly from furrow, with two lateral dark spots and diffuse markings usually discernible, markings may vary; setae on pronotum long, curved, pale on anterior and lateral margins, black centrally. Pleurites and sternites dark brown to black. Mesothorax: mesoprescutum black anteriorly, pale posteriorly, bearing long intermingled black and white setae in brown alveoli (remainder of pterothoracic tergites yellowish-white dorsally, except for diffuse marks on metatergites); sparse intermingled black and white setae occur on mesonotum and mesoscutellum, with long soft white setae along posterior margin of mesoscutellum. Metathorax: metanotum with sparse pale setae, metascutel-

Lum with sparse black and white setae. Pterothoracic pleurites with broad black band above coxae, but not reaching wing bases; long white setae present on pleurites.

Legs: forelegs; coxae brown on outer surfaces, otherwise pale, trochanters pale, femora with three brown stripes, and black and white setae in black alveoli, tibiae pale with narrow annulation distally and bearing black and white setae in black alveo-
li, tarsi with first tarsomere long, remaining four shorter, all covered with short black setae, first three tarsomeres pale, apical two black; middle legs similar to forelegs but with two femoral stripes, tibiae with three longitudinal stripes; hind legs similar to forelegs but with femora almost completely dark brown, tibiae pale with faint apical stripes, no white setae present.

Wings: short, broad, forewings broader than hind wings; marked as depicted in Fig. 11. Rs with about 7 or 8 branches in both wings, other venation as for genus.

Abdomen: shorter than hind wings, with markings and pubescence similar to B. oculatus. Male (Figs 21–26, 31) with each half of tergite 9 reaching sternite 9 which is broad with rounded apex; ectoprocts with posteriorventral margin projecting. Gonarcus arcuate, mediuncus prominent, sclerotized, surface covered with delicate scale-like sculpturing (Fig. 31); parameres broad, sclerotized, almost shoe-shaped with inner posterior margins projecting upwards, ventral surfaces with tooth-like sculpturing (Fig. 31); gonosetae present; gonarcus, mediuncus, parameres enveloped in eversible membranous sac; hypandrium internum very delicate, difficult to discern. Female (Figs 27–29) with tergite 8 tapering ventrally; each half of tergite 9 elongate; ectoprocts oval, bearing long black setae but no fossorial setae. Pregenital plate small, tooth-like, lying medially at posterior margin of sternite 7. Posterior gonapophyses absent; anterior gonapophyses large, digitiform, densely covered with black setae, membranously connected to apices of tergite 8; lateral gonapophyses separated from each other by narrow membranous area, bearing short stout curved fossorial setae posteriorly, and bristles ventrally above genital opening; a plate-like structure bearing setae occurs below the opening. Spermatheca sclerotized, darkly pigmented, shaped as in Fig. 29.

This species is easily distinguished from *B. oculatus* by its shorter broader wings, short clavate antennae and by features of the male and female genitalia, especially the form of the parameres.

All the locally collected specimens were captured at light. Nothing is known about the biology.

Distribution: widespread in the Afrotropical Region: recorded from South Africa, Zimbabwe and Zaire.


*Bankisus elegantulus* (Esben-Petersen).

*Navasius elegantulus* Esben-Petersen, 1936: 203.

**Bankisus elegantulus** (Esben-Petersen); Stange, 1976: 288; Hölzel, 1983: 211.

This species, known only from the holotype, is distinctive. The description by Esben-Petersen (1936) is accurate and cannot be elaborated without additional material. The holotype is a female, and not a male as stated by Esben-Petersen: the abdomen has been repaired, and the attached terminalia are those of a female. If an incorrect abdomen has been attached, lack of pilulae indicate that the specimen is a female.

*Bankisus elegantulus* can be distinguished from *B. carinifrons*, which it closely resembles, by the features outlined by Esben-Petersen (1936: 205), but especially by the reddish-brown thoracic tergites of *B. elegantulus*.


*Bankisus triguttatus* Navás.

**Bankisus triguttatus** Navás, 1926a: 104; 1926b: 88; Stange, 1976: 288; Hölzel, 1983: 211.

This species, also known only from the holotype is characterized by the exceptionally broad forewings and long narrow hind wings, which are markedly iridescent. The wings are less heavily maculated than the preceding three *Bankisus* species. *Bankisus triguttatus* can be distinguished from *B. oculatus* and *B. carinifrons* by its reddish-brown thoracic tergites, and from *B. elegantulus* by the much broader forewings, fewer
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markings and by absence of a row of spots along the raised vertex. The description by Navás (1926a) is accurate and must suffice in the absence of additional specimens.


Bankisus maculosus Hölzel.


This species resembles B. oculatus Navás (Hölzel, 1983), and is also known only from the holotype. The specimen has not been examined, so no comment can be made upon its status at present. It is the first Bankisus species to be described from outside Africa, and it was recorded from Oman on the Arabian Peninsula.

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