The higher classification of southern African insects

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A number of changes have taken place in the higher classification of southern African insects since the last time it was documented in full (Scholtz & Holm 1985) and there is currently no comprehensive modern classification of higher insect taxa available for the region.

Since 1985 a new order has been discovered in the region (Mantophasmatodea; Klass *et al.* 2002) and there have been various rearrangements between closely-related groups that have resulted in orders being combined (Blattodea and Isoptera into Blattodea; Inward *et al.* 2007; Psocoptera and Phthiraptera into Psocodea; Grimaldi & Engel 2005) while others have been subsumed in larger groups (Hemimerina in Dermaptera; Kocarek *et al.* 2013). Furthermore, until quite recently Thysanura was the ordinal name used for silverfish or fish-moths but the group is now considered to be paraphyletic with Meinertellidae included; the latter has been moved to the Archaeognatha (Grimaldi & Engel 2005). Zygentoma was the suborder that included all other thysanurans so it became the default name for the order. Numerous major family-level changes in several large orders have also taken place; the most important being: Coleoptera – Beutel & Leschen 2005, but modified as in the in press revision of the book; Diptera – partially according to Anorim & Yeates 2006; also Kirk-Spriggs & Sinclair in press/in prep; Lepidoptera – based largely on Nieukerken *et al.* 2011; Hymenoptera – bees, Michener 2007, wasps, Pulawski 2012.

These studies bring to 25 the number of insect orders recorded from the region; three others Grylloblattodea, Zoraptera and Rhaphidioptera are absent.

Most of these changes have resulted from molecular phylogenetic analyses which have over the past decade uncovered deeper relationships that are mostly obscured by morphology and behaviour. Nevertheless, there has been strong opposition from some quarters that classification of morphologically and biologically divergent groups need not necessarily reflect hypothesised phylogeny to the letter (Lo *et al.* 2007). Furthermore, at issue is whether the levels of difference between certain major groups justify according them independence from their close relatives also remain contentious; for example, whether Mantophasmatodea justifies its own order rather than representing an independent African lineage of the Holarctic Grylloblattodea (Terry & Whiting 2005). However, in spite of resistance, it would seem that most of the changes are becoming entrenched in the literature as the 'accepted ' system.

Although modern classifications of most groups are readily accessible on various open-source web sites it remains surprisingly difficult to extract from them the information on which taxa are present in southern Africa. Hence this paper.

Most of these newer published developments were considered when drawing up the following list of higher taxa but I depended heavily on local and foreign specialists on higher classification of different orders to enable me to present a, hopefully, acceptable classification of all southern African higher taxa, from order to family. It should, however, be borne in mind that these classifications in many cases are highly dynamic and more changes will continue to be made over time.

Infraordinal taxon names in bold lettering are not accorded formal status, since the relevant specialists on those groups do not do so; furthermore the taxa lie at different hierarchical levels. Some may be equated to infraorder (*i.e.* between suborder and superfamily– Hemiptera, Coleoptera), others to a taxon between infraorder and superfamily – Diptera, or to a taxon between superfamily and family – [higher] Hymenoptera.

Order Archaeognatha
Meinertellidae
Order Zygentoma
Lepismatidae
Nicoletiidae
Order Ephemeroptera
Suborder Pisciforma
Superfamily Siphlonuroidea
Baetidae
Suborder Setisura

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- Superfamily Heptagenioidea
  - Heptageniidae
  - Oligoneuriidae
- Suborder Furcatergalia
  - Superfamily Ephemerelloidea
    - Dicercomyzidae
    - Tricorythidae
    - Ephemerythidae
    - Machadorythidae
    - Teloganodidae
  - Superfamily Caenoidea
    - Caenidae
  - Superfamily Ephemeroidea
    - Ephemeridae
    - Euthyplociidae
    - Polymitarcyidae
  - Superfamily Leptophlebioidea
    - Leptophlebiidae
- Suborder Carapacea
  - Prosopistomatidae

Order Odonata

- Suborder Zygoptera
  - Superfamily Lestoidea
    - Lestidae
    - Synlestidae
  - Superfamily Calopterygoidea
    - Calopterygidae
    - Chlorocyphidae
  - Superfamily Coenagrionoidea
    - Coenagrionidae
    - Platyctnemididae
- Suborder Anisoptera
  - Superfamily Aeshnoidea
    - Aeshnidae
  - Superfamily Gomphoidea
    - Gomphidae
  - Superfamily Libelluloidea
    - Synthemestidae
    - Corduliidae
    - Libellulidae
    - Macromiidae

Order Plecoptera

- Suborder Setipalpia
  - Perlidae
- Suborder Filipalpia
  - Notonemouridae

Order Embioptera

- Embiidae
- Teratembiidae
- Archembiidae
- Oligotomidae (introduced)

Order Orthoptera

- Suborder Ensifera
  - Superfamily Schizodactyloidea
    - Schizodactylidae
  - Superfamily Rhaphidophoroidea
    - Rhaphidophoridae
  - Infraorder Gryllidea
    - Superfamily Grylloidea
      - Gryllidae
      - Mogoplistidae
      - Phalangopsidae
      - Trigonidiidae
    - Superfamily Gryllotalpoidea
      - Gryllotalpidae
  - Infraorder Tettigoniidea
    - Superfamily Tettigonioidea
      - Tettigoniidae
    - Superfamily Stenopelmatoidea
      - Gryllacrididae
      - Stenopelmatidae
      - Anostostomatidae
- Suborder Caelifera
  - Superfamily Tridactyloidea
    - Tridactylidae
  - Superfamily: Tetrigoidea
    - Tetrigidae
  - Superfamily Acridoidea
    - Charilaidae
    - Acrididae
    - Pamphagidae
    - Lathiceridae
    - Lentulidae
    - Lithidiidae
  - Superfamily Eumastacoidea
    - Eumastacidae
    - Euschmidtiidae
    - Thericleidae
  - Superfamily Pneumoroidea
    - Pneumoridae
  - Superfamily Pyrgomorphoidea
    - Pyrgomorphidae

Order Phasmatodea

- Suborder Euphasmatodea
  - Prisopodidae
  - Bacillidae
  - Diapheromeridae
  - Phasmatidae

Order Dermaptera

- Suborder Hemimerina
  - Hemimeridae
- Suborder Forficulina
  - Pygidicranidae

Anisolabididae
Labiduridae
Apachyidae
Spongiphoridae (= Labiidae)
Forficulidae

Order Mantophasmatodea
Mantophasmatidae
Austrophasmatidae

Order Blattodea
Epifamily Blattoidae
Superfamily Corydioidea
Corydiidae (= Polyphagidae)
Superfamily Blaberoidea
Ectobiidae (= Blatellidae)
Blaberidae
Superfamily Blattoidea
Blattidae
Epifamily Termitoidae
Hodotermitidae
Kalotermitidae
Rhinotermitidae
Termitidae

Order Mantodea
Empusidae
Hymenopodidae
Mantidae
Sibyliidae
Thespidae

Order Psocodea
Suborder Trogiomorpha
Lepidopsocidae
Trogiidae
Psyllipsocidae
Suborder Troctomorpha
Amphientomidae
Liposcelidae
Group Phthiraptera
Suborder Amblycera
Menoponidae
Boopidae
Laemobothriidae
Ricinidae
Suborder Ischnocera
Philopteridae
Trichodectidae
Suborder Rhynchophthirina
Haematomyzidae
Suborder Anoplura
Echinophthiriidae
Haematopinidae
Neolinognathidae
Enderleinellidae
Hoplopleuridae
Polyplacidae
Hybophthiridae
Ratemiidae
Pedicinidae
Pediculidae
Pthiridae
Linognathidae
Suborder Psocomorpha
Caeciliidae
Elipsocidae
Amphipsocidae
Lachesillidae
Ectopsocidae
Peripsocidae
Pseudocaeciliidae
Mesopsocidae
Hemipsocidae
Myopsocidae
Psocidae

Order Hemiptera
Suborder Auchenorrhyncha
Superfamily Cicadoidea
Cicadidae
Superfamily Cercopoidea
Cercopidae
Aphrophoridae
Machaerotidae
Superfamily Cicadelloidea
Membracidae
Cicadellidae
Hylicidae
Superfamily Fulgoroidea
Tettigometridae
Delphacidae
Cixiidae
Fulgoridae
Derbidae
Meenoplidae
Achilidae
Dictyopharidae
Tropiduchidae
Nogodinidae
Hypochthonellidae
Acanaloniidae
Ricaniidae
Lophopidae
Eurybrachiidae
Gengidae
Issidae
Flatidae

- Suborder Sternorrhyncha
  - Superfamily Psylloidea
    - Aphalaridae
    - Calophyidae
    - Carsidaridae
    - Liviidae
    - Phacopteronidae
    - Psyllidae
    - Triozidae
  - Superfamily Aleyrodoidea
    - Aleyrodidae
  - Superfamily Aphidoidea
    - Adelgidae
    - Phylloxeridae
    - Aphididae
  - Superfamily Coccoidea
    - Aclerdidae
    - Asterolecaniidae
    - Cerococcidae
    - Coccidae
    - Conchaspididae
    - Dactylopiidae
    - Diaspididae
    - Eriococcidae
    - Halimococcidae
    - Kerriidae
    - Lecanodiaspididae
    - Margarodidae
    - Monophlebidae
    - Ortheziidae
    - Pseudococcidae
- Suborder Heteroptera
  - **Enicocephalomorpha**
    - Enicocephalidae
  - **Dipsocoromorpha**
    - Ceratocombidae
    - Shizopteridae
  - **Gerromorpha**
    - Superfamily Mesoveloidea
      - Mesoveliidae
    - Superfamily Hebroidea
      - Hebridae
      - Paraphrynoveliidae
    - Superfamily Hydrometroidea
      - Hydrometridae
    - Superfamily Gerroidea
      - Veliidae
      - Gerridae
  - **Nepomorpha**
    - Superfamily Nepoidea
      - Belostomatidae
      - Nepidae
    - Superfamily Ochteroidea
      - Gelastocoridae
      - Ochteridae
    - Superfamily Corixoidea
      - Corixidae
      - Micronectidae
    - Superfamily Naucoroidea
      - Naucoridae
      - Aphelocheiridae
    - Superfamily Notonectoidea
      - Notonectidae
      - Pleidae
      - Helotrephidae
  - **Leptopodomorpha**
    - Superfamily Saldoidea
      - Saldidae
      - Leptopodidae
  - **Cimicomorpha**
    - Superfamily Reduvioidea
      - Reduviidae
      - Phymatidae
    - Superfamily Microphysoidea
      - Microphysidae
    - Superfamily Miroidea
      - Thaumastocoridae
      - Miridae
      - Tingidae
    - Superfamily Naboidea
      - Nabidae
    - Superfamily Cimicoidea
      - Lyctocoridae
      - Anthocoridae
      - Cimicidae
      - Polyctenidae
  - **Pentatomorpha**
    - Superfamily Aradoidea
      - Aradidae
    - Superfamily Pentatomoidea
      - Acanthosomatidae
      - Cydnidae
      - Dinidoridae
      - Pentatomidae
      - Plataspidae
      - Scutelleridae
      - Tessaratomidae
      - Thaumastellidae
    - Superfamily Lygaeoidea
      - Artheneidae
      - Berytidae
      - Blissidae
      - Cymidae
      - Geocoridae

Heterogastridae
Lygaeidae
Malcidae
Ninidae
Oxycarenidae
Pachygronthidae
Rhyparochromidae
Piesmatidae
Superfamily Pyrrhocoroidea
Pyrrhocoridae
Superfamily Coreoidea
Alydidae
Coreidae
Rhopalidae
Stenocephalidae
Order Thysanoptera
Suborder Terebrantia
Aeolothripidae
Fauriellidae
Hetrothripidae
Melanthripidae
Merothripidae
Thripidae
Suborder Tubulifera
Phlaeothripidae
Order Megaloptera
Corydalidae
Sialidae
Order Neuroptera
Coniopterygidae
Sisyridae
Osmylidae
Mantispidae
Berothidae
Dilaridae
Psychopsidae
Hemerobiidae
Chrysopidae
Nemopteridae
Ascalaphidae
Myrmeleontidae
Order Strepsiptera
Suborder Mengenillidia
Mengenillidae
Suborder Stylopidia
Corioxenidae
Halictophagidae
Elenchidae
Myrmecolacidae
Stylopidae
Order Coleoptera
Suborder Archostemata
Cupedidae
Micromalthidae
Suborder Myxophaga
Superfamily Sphaeriusoidea
Torridincolidae
Superfamily Sphaeriusoidea
Hydroscaphidae
Sphaeriusidae
Suborder Adephaga
Gyrinidae
Rhysodidae
Carabidae
Haliplidae
Noteridae
Aspidytidae
Dytiscidae
Staphyliniformia
Superfamily Hydrophiloidea
Hydrochidae
Helophoridae
Spercheidae
Epimetopidae
Georissidae
Hydrophilidae
Histeridae
Superfamily Staphylinoidea
Hydraenidae
Ptiliidae
Leiodidae
Silphidae
Staphylinidae
Scarabaeiformia
Superfamily Scarabaeoidea
Bolboceratidae
Passalidae
Trogidae
Glaresidae
Lucanidae
Ochodaeidae
Hybosoridae
Scarabaeidae
Elateriformia
Superfamily Scirtoidea
Eucinetidae
Clambidae
Scirtidae
Superfamily Dascilloidea
Rhipiceridae
Superfamily Buprestoidea
Buprestidae
Superfamily Byrrhoidea
Byrrhidae

Elmidae
Dryopidae
Limnichidae
Heteroceridae
Psephenidae
Ptilodactylidae
Superfamily Elateroidea
Eucnemidae
Throscidae
Elateridae
Lycidae
Lampyridae
Cantharidae
Derodontiformia
Superfamily Derodontoidea
Nosodendridae
Jacobsoniidae
Bostrichiformia
Superfamily Bostrichoidea
Dermestidae
Bostrichidae
Ptinidae
Cucujiformia
Superfamily Lymexyloidea
Lymexylidae
Superfamily Cleroidea
Trogossitidae
Thanerocleridae
Cleridae
Acanthocnemidae
Prionoceridae
Melyridae
Superfamily Cucujoidea
Boganiidae
Sphindidae
Biphyllidae
Erotylidae
Monotomidae
Cryptophagidae
Silvanidae
Passandridae
Phalacridae
Laemophloeidae
Kateretidae
Nitidulidae
Bothrideridae
Cerylonidae
Discolomatidae
Endomychidae
Coccinellidae
Corylophidae
Latridiidae
Superfamily Tenebrionoidea
Mycetophagidae
Archeocrypticidae
Ciidae
Tetratomidae
Melandryidae
Mordellidae
Ripiphoridae
Zopheridae
Tenebrionidae
Prostomidae
Oedemeridae
Meloidae
Mycteridae
Pyrochroidae
Salpingidae
Anthicidae
Aderidae
Scraptiidae
Superfamily Chrysomeloidea
Disteniidae
Cerambycidae
Megalopodidae
Chrysomelidae
Superfamily Curculionoidea
Anthribidae
Belidae
Attelabidae
Brentidae
Curculionidae
Order Mecoptera
Bittacidae
Order Siphonaptera
Suborder Pulicomorpha
Superfamily Pulicoidea
Hectopsyllidae (= Tungidae; introduced)
Pulicidae
Superfamily Malacopsylloidea
Rhopalopsyllidae
Suborder Hystrichopsyllomorpha
Superfamily Hystrichopsylloidea
Hystrichopsyllidae
Chimaeropsyllidae
Suborder Ceratophyllomorpha
Superfamily Ceratophylloidea
Ceratophyllidae
Ischnopsyllidae
Leptopsyllidae
Order Diptera
Suborder Tipulomorpha
Limoniidae

Tipulidae
Suborder Psychodomorpha
Tanyderidae
Ptychopteridae
Blephariceridae
Psychodidae
Suborder Culicomorpha
Thaumaleidae
Simuliidae
Ceratopogonidae
Chironomidae
Dixidae
Corethrellidae
Chaoboridae
Culicidae
Neodiptera
Suborder Bibionomorpha
Bibionidae
Anisopodidae
Mycetophilidae
Sciaridae
Heterotricha-group (Sciaroidea, unassigned to family)
Scatopsidae
Cecidomyiidae
Keroplatidae
Lygistorrhinidae
Suborder Brachycera
Infraorder Stratiomyiomorpha
Xylomyidae
Stratiomyidae
Infraorder Tabanomorpha
Tabanidae
Rhagionidae
Athericidae
Vermileonidae
Infraorder Muscomorpha
Section Nemestrinoidea
Nemestrinidae
Acroceridae
Section Asiloidea
Therevidae
Scenopinidae
Apioceridae
Mydidae
Asilidae
Mythicomyiidae
Bombyliidae
Eremoneura
Section Empidoidea
Empididae
Hybotidae
Brachystomatidae
Atelestidae
Homalocnemiidae
Dolichopodidae
Section Cyclorrhapha
Superfamily Phoroidea
Lonchopteridae
Phoridae
Platypezidae
Superfamily Syrphoidea
Pipunculidae
Syrphidae
Schizophora
Superfamily Sciomyzoidea
Conopidae
Sepsidae
Natalimyzidae
Sciomyzidae
Coelopidae
Superfamily Tephritoidea
Tephritidae
Pyrgotidae
Ctenostylidae
Platystomatidae
Lonchaeidae
Piophilidae
Ulidiidae (Otitidae)
Superfamily Nerioidea
Neriidae
Micropezidae
Superfamily Diopsoidea
Diopsidae
Psilidae
Superfamily Lauxanioidea
Lauxaniidae
Chamaemyiidae
Celyphidae
Superfamily Sphaeroceroidea
Heleomyzidae
Sphaeroceridae
Chyromyidae
Superfamily Opomyzoidea
Opomyzidae
Xenasteiidae
Clusiidae
Marginidae
Odiniidae
Agromyzidae
Aulacigastridae
Neminidae
Asteiidae
Neurochaetidae

- Periscelididae
- Superfamily Ephydroidea
  - Braulidae
  - Camillidae
  - Ephydridae
  - Diastatidae (incl. Campichoetidae)
  - Curtonotidae
  - Drosophilidae
  - Cryptochetidae
- Superfamily Carnoidea
  - Carnidae
  - Milichiidae
  - Canacidae
  - Chloropidae
  - Calyptratae
- Superfamily Muscoidea
  - Scathophagidae
  - Anthomyiidae
  - Fanniidae
  - *Muscidae*
- Superfamily Hippoboscoidea
  - Glossinidae
  - Hippoboscidae
- Superfamily Oestroidea
  - Calliphoridae
  - Rhiniidae
  - Sarcophagidae
  - Tachinidae
  - Rhinophoridae
  - Oestridae

Order Trichoptera

- Suborder Annulipalpia
  - Infraorder Curvipalpia
    - Superfamily Hydropsychoidea
      - Ecnomidae
      - Hydropsychidae
      - Polycentropodidae
      - Dipseudopsidae
      - Psychomyiidae
      - Xiphocentronidae
    - Superfamily Philopotamoidea
      - Philopotamidae
  - Infraorder Spicipalpia
    - Superfamily Hydroptiloidea
      - Glossosomatidae
      - Hydroptilidae
- Suborder Integrepalpia
  - Infraorder Planitentoria
    - Superfamily Limnephiloidea
      - Goeridae
      - Lepidostomatidae
      - Pisuliidae
  - Infraorder Brevitentoria
    - Superfamily Leptoceroidea
      - Calamoceratidae
      - Leptoceridae
    - Superfamily Sericostomatoidea
      - Sericostomatidae
      - Barbarochthonidae
      - Hydrosalpingidae
      - Petrothrincidae

Order Lepidoptera

- Suborder Zeugloptera
  - Superfamily Micropterigoidea
    - Micropterigidae
- Suborder Glossata
  - Superfamily Hepialoidea
    - Prototheoridae
    - Hepialidae
  - **Division Monotrysia**
    - Superfamily Nepticuloidea
      - Nepticulidae
      - Opostegidae
    - Superfamily Tischerioidea
      - Tischeriidae
    - Superfamily Incurvarioidea
      - Incurvariidae
      - Heliozelidae
  - **Division Ditrysia**
    - Superfamily Tinneoidea
      - Tineidae
      - Eriocottidae
      - Psychidae
      - Schrenchensteiniidae
      - Gracillariidae
    - Superfamily Gelechioidea
      - Oecophoridae
      - Gelechiidae
      - Coleophoridae
      - Cosmopterigidae
    - Superfamily Copromorphoidea
      - Copromorphidae
      - Alucitidae
      - Carposinidae
    - Superfamily Yponomeutoidea
      - Plutellidae
      - Yponomeutidae
      - Lyonetiidae
      - Aegeriidae
      - Atychiidae
    - Superfamily Pyraloidea
      - Hyblaeidae
      - Thyrididae

Pyralidae
Anerastiidae
Superfamily Pterophoroidea
Pterophoridae
Superfamily Zygaenoidea
Zygaenidae
Superfamily Cossoidea
Cossidae
Limacodidae
Chrysopolomidae
Superfamily Tortricoidea
Tortricidae
Superfamily Calliduloidea
Pterothysanidae
Callidulidae
Superfamily Uranioidea
Uraniidae
Epiplemidae
Superfamily Geometroidea
Geometridae
Superfamily Hesperioidea
Hesperiidae
Superfamily Papilionoidea
Papilionidae
Pieridae
Lycaenidae
Libytheidae
Nymphalidae
Superfamily Drepanoidea
Drepanidae
Superfamily Bombycoidea
Bombycidae
Eupterotidae
Lasiocampidae
Saturniidae
Superfamily Sphingoidea
Sphingidae
Superfamily Notodontoidea
Notondontidae
Thyretidae
Lymantriidae
Arctiidae
Noctuidae

Order Hymenoptera

Suborder Symphyta
Superfamily Siricoidea
Siricidae
Superfamily Orussoidea
Orussidae
Superfamily Tenthredinoidea
Tenthredinidae
Argidae

Suborder Apocrita
Section Parasitica
Superfamily Megalyroidea
Megalyridae
Superfamily Stephanoidea
Stephanidae
Superfamily Trigonaloidea
Trigonalidae (Trigonalyidae)
Superfamily Ichneumonoidea
Braconidae
Ichneumonidae
Superfamily Evanioidea
Evaniidae
Gasteruptiidae
Superfamily Proctotrupoidea
Proctotrupidae
Superfamily Diaprioidea
Diapriidae
Superfamily Ceraphronoidea
Ceraphronidae
Megaspilidae
Superfamily Platygastroidea
Platygastridae
Superfamily Cynapoidea
Cynipidae
Figitidae
Ibaliidae
Liopteridae
Superfamily Chalcidoidea
Agaonidae
Aphelinidae
Azotidae
Chalcididae
Elasmidae
Encyrtidae
Eucharitidae
Eulophidae
Eupelmidae
Eurytomidae
Leucospidae
Mymaridae
Ormyridae
Perilampidae
Pteromalidae
Signiphoridae
Tanaostigmatidae
Torymidae
Trichogrammatidae
Section Aculeata
Superfamily Chrysidoidea
Plumariidae
Embolemidae

Dryinidae
Sclerogibbidae
Scolebythidae
Bethylidae
Chrysididae
Superfamily Apoidea
(**Spheciformes**)
Ampulicidae
Crabronidae
Nyssonidae
Sphecidae
Philanthidae
(**Apiformes**)
Colletidae
Halictidae
Andrenidae
Megachilidae
Fideliidae
Anthophoridae
Ctenoplectridae
Melittidae
Apidae
Superfamily Vespoidea
Tiphiidae
Sapygidae
Mutillidae
Bradynobaenidae
Scoliidae
Pompilidae
Rhopalosomatidae
Vespidae
Formicidae

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