Order Hemiptera

Key to families of Auchenorrhyncha from the Arabian Peninsula

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INTRODUCTION

The Hemiptera is the largest exopterygote groups of insects with over 80,000 described species. They may be recognized by the particular structure of the mouthparts, being modified into concentric stylets, the mandibular enclosing the maxillary ones and together forming the food and salivary channels. They are a very diverse group comprising scale insects, aphids, psyllids and whiteflies (Sternorrhyncha), true bugs (Heteroptera) and the Auchenorrhyncha (leafhoppers, planthoppers, treehoppers, spittlebugs and cicadas). Hemiptera feeding habits range from phytophagy to predation, including ectoparasitism and haematophagy. Many of them are important pest species of cultivated crops and some are important vectors of human diseases. Forero (2008) provides a useful review and summary of the phylogeny of the Hemiptera. Papers in Nault & Rodriguez (1985) provide good introductions to groups and topics.

The Auchenorrhyncha has been traditionally divided in two main groups, Cicadomorpha (leafhoppers, treehoppers, spittlebugs, cicadas) [see separate key] and Fulgoromorpha (the planthopper families). They are all plant feeding, either from phloem, xylem vessels or mesophyll tissue. Some are important pests of crop plants either by direct feeding or by spreading virus and phytoplasma diseases.

Auchenorrhyncha, especially Cicadellidae (leafhoppers) may be very common in many habitats, particularly in grasslands. Given the arid nature of much of the Arabian Peninsula the numbers of species appears to be relatively low. Few comprehensive studies have been made so far, with the exception of contributions by Dlabola for Saudi Arabia (1979, 1980, 1987). Linnavuori in several papers added species to the Arabian fauna (e.g. Linnavuori, 1973, 1989). For that country there are around 130 species of Auchenorrhyncha recorded. However, taken as a whole there are small numbers of species across a wide range of families; 13 out of 21 planthopper (Fulgoromorpha) families have been noted so far. The Cicadidae of the UAE have been studied by Schedl (2007). Gassouma (1991, 2003) dealt with a few agricultural pest species of the families Cicadellidae, Delphacidae and Tropiduchidae in the UAE.

This introduction to the Auchenorrhyncha of the Arabian Peninsula attempts to provide a key to the families known to be present and some expected to be found. Detailed studies on each family found in the UAE will be prepared as more samples become available and further studied.

Keys to families

1. Pedicel of antenna not broader than scape; tegulae never present ............ Cicadomorpha (leafhoppers, treehoppers, spittlebugs, cicadas) [see separate key]
2. Pedicel of antenna broader than scape, bearing wart-like sensilla (e.g. Plate 12); Tegula nearly always present on thorax at base of wing (e.g. Plate 24) ............ Fulgoromorpha (planthopper families) [see separate key]
Plates 1–6. 1: Head of cicada to show 3 ocelli on head; 2: Hind leg of Lophopidae to show spines absent on second tarsal segment; 3: Hind leg of cercopid to show pre-apical spines; 4: Hind leg of cicadellid to show rows of small spines; 5: Hind leg of Dictyopharidae to show row of spines on second tarsal segment; 6: Hind leg of Tropiduchidae to show apical spines on each lateral margin of the second tarsal segment.

Key to Cicadomorpha

1  Head with three ocelli arranged in triangle on crown (Plate 1) .................... Cicadidae
   –  Head with two ocelli, variously positioned, or ocelli absent ......................... 2
2 Hind coxa conical; hind tibia cylindrical, often with one or more large preapical spines (Plate 3), but never with rows of enlarged setae; ocelli on crown; body and wing surfaces clothed with fine setae ................................................................. (Cercopoidea)

3 Hind coxa transverse; tibia quadrate, usually with conspicuous longitudinal rows of enlarged setae (Plate 4); ocelli variously positioned; body and wings without a conspicuous vestiture of fine setae ........................................ (Membracoidea)

4 Pronotum not extended over scutellum. Hind tibia with setae of longitudinal rows usually large and conspicuous. Wings variously developed .......................................................... Cicadellidae (e.g. Plates 8–10)

– Pronotum extended posteriorly over and often largely or entirely concealing scutellum or, if scutellum completely exposed, then scutellum with distinct median posterior groove or emargination. Hind tibia with setae of longitudinal rows small and inconspicuous ........................................... Membracidae (Plate 13) [Leptocentrus spec.]

Key to Fulgoromorpha

1 Hind tibia with movable spur (Plate 16) ....................... Delphacidae (e.g. Plates 11–12)

– Hind tibia without a spur but with other arrangements of smaller spines ......................... 2

2 Second segment of hind tarsi with row of apical spines (Plate 5) ........................................ 3

– Second segment of hind tarsi with an apical spine on each lateral margin (Plate 6) or spines absent (Plate 2) ................................................................. 9

3 Apical and hind areas of hindwings with many cross veins .......... Fulgoridae (Plate 14)

– Apical areas of hindwing without cross veins ................................................................. 4

4 Forewings with apices overlapping when at rest (Plate 20) ......................... Achilidae

– Forewings without apices overlapping ........................................................................ 5

5 One or both claval veins tuberculate; apical segment of rostrum longer than wide ........

................................................................. Meenoplidae (Plate 15)

– Claval veins not tuberculate ................................................................. 6

6 Apical segment of rostrum as wide as long (Plate 17) ..................... Derbidae (Plate 21)

– Apical segment of rostrum longer than wide ......................................................... 7

7 Cephalic projection present but if not present then face with 2 or 3 median carina (Plate 18) [Tegulae absent in Orgeriini] ......................................................... Dietypharidae (Plate 22)

– Cephalic projection usually absent. Face with 1 median carina (e.g. Plate 19) ........... 8

8 Forewing with veins usually bearing setae in tubercles. Ovipositor often long and sword shaped ................................................................. Cixiidae (Plate 23)

– Forewing with veins not tuberculate and lacking setae. External genitalia reduced in female ................................................................. Kinnariidae (Plate 24)

9 Second hind tarsal segment with a spine at each side (Plate 6) ......................... 10

– Second hind tarsal segment often small and without spines (Plate 2) ......................... 15

10 Compound eyes not separated from frons by strong lateral carinae, lateral ocelli visible in frontal view ................................................................. Tettigometridae (Plate 25)

– Compound eyes separated from frons by strong lateral carinae, lateral ocelli not visible in frontal view ................................................................. 11
11  Mesonotum usually with posterior angle separated by transverse suture ................................................................. Tropiduchidae (Plate 26)
   – Mesonotum without transverse suture .......................................................................................................................... 12
12  Clavus with many prominent tubercles (Plate 28), fore wings usually opaque ................................................................. Flatidae (Plate 32)
   – Clavus without tubercles .................................................................................................................................................. 13
13  Paradiscal fields of pronotum (lateral parts of pronotum behind the eyes) comparatively long ................................................................. Caliscelidae (Plate 27) (only Adenissini)
   – Paradiscal fields of pronotum comparatively short ............................................................................................................... 14
14  Fore wing and hind wing well developed. Anterior margin of pronotum exceeding level of middle of eye, clypeus usually carinate. Gonoplaques flattened laterally, elongate. Anterior connective lamina of gonapophysis VIII narrow and long. Style without lateral tooth .................................................................................. Nogodinidae (Plate 29) [Philbyella spec.]
   – Fore wing brachypterous and hind wing may be absent or reduced in size. Gonoplaques convex, rounded. Anterior connective lamina of gonapophysis VIII wide. Style with lateral tooth .................................................................................. Issidae (Plate 28)
15  Claval suture extending almost to apex of fore wing; fore wing often with apical margin as broad or broader than length of anal margin; no wax production if female (Plate 33) ................................................................. Ricaniidae
   – Claval suture not extending to apex of fore wing, fore wing with apical margin shorter than anal margin. Wax production in female ............................................................................................................... 16
16  Vertex, narrow, width less than 3 times length at midline. Clypeus with lateral carinae, frons usually longer than wide (Plate 30) .............................................................................................................. Lophopidae
   – Vertex wide, three times wider in mid line than length. Clypeus without lateral carinae, frons wider than long (Plate 31) .................................................................................................................. Eurybrachidae

Notes on families found in the UAE

CICADOMORPHA

Cicadidae (cicadas)
Cicadas are usually large insects, all have three prominent ocelli on the vertex which as well as the large size serves to separate them from other Auchenorrhyncha. The nymphal stages of Cicadidae feed from xylem tissue from roots of their host plants. Schedl (2007) has covered the two species found in the UAE.

Cicadellidae (leafhoppers)
In the UAE the Cicadellidae are the most numerous both in numbers of individuals and species (for examples see Plates 8–10). Perhaps 50 species in 6 subfamilies will be present.

Membracidae (treehoppers)
In the UAE one species of Membracidae, Leptocentrus spec. (Plate 13) has been noted to date.

FULGOROMORPHA
Plates 16–19. 16: Hind leg of Delphacidae showing tibial spur; 17: Derbidae, globular apical segment of rostrum; 18: Dictyopharidae, face showing carinae; 19: Cixiidae: face showing one median carina.
Achilidae
Achilids may usually be identified by the forewings overlapping at the apex. They are usually pale brown in colour but some are brightly patterned. There are around 250 described world species, mostly in the tropics and subtropics. One species of *Akotropis* Matsumura, 1914 (Plate 20) has been noted in the UAE.
Caliscelidae
The Caliscelidae is a small family related to the Issidae, from which it has recently been removed to family status. Some species resemble issid species, in being ‘coleopterous’ and have short forewings, reduced hindwings and being flightless. Together with issids they are often found in arid areas. Being flightless they will not be present in light trap samples and only occasionally in Malaise traps.

Cixiidae
Cixiids are one of the larger of the planthopper families; at least 1000 species have been described. They may be recognised by a combination of characters, including the membranous fore wings with tubercles with small setae along the veins. Nymphal stages are found underground, where they feed from phloem tissue of their host plants. As adults they feed on a wide range of host plants but individual species may be restricted to certain habitats. A few species are known to be vectors of phytoplasma disease. They range in size from 4–10 mm.

Delphacidae
Delphacids may be recognised by the possession of a hind tibial spur (Plate 16), a character found in no other family. They are usually small insects, under 5 mm in length. Many species are associated with feeding on Poaceae, and most are specific to a narrow range of host plants. Some species have two wing forms, brachypterous, which cannot fly, and fully winged macropterous forms, which may disperse widely. There are at least 2000 described species, with many more to be described from little known areas such as the Afrotropical region.

Derbidae
The derbids are a very diverse family, over 800 species have been described, with forms with very long forewings and short hindwings as well as those species with shorter wings. Many can be recognised by having a very short, globular, apical segment to the rostrum. Two species of the genus *Diostrombus* Uhler, 1896 (Plate 21) have been recorded in the Arabian Peninsula.

Dictyopharidae
Dictyopharidae may be difficult to characterise, but the common species in the UAE are relatively large insects, with an elongated head process. (e.g. *Dictyophara* spec., Plate 22). It is likely that the brachypterous Orgerini will also be present, living on the ground vegetation. The superficially similar genus *Dorysarthus* Puton, 1895, has been transferred to Fulgoridae (Emeljanov, 1979).

Eurybrachidae
Eurybrachidae may be distinguished by the broad head and short body, and are often brightly coloured. Over 200 species have been described and one species, *Neoplatybrachys orientalis* Lallemand, 1950 (Plate 31) is known from Yemen (Constant, 2005).

Flatidae
Many Flatidae have large tent–like forewings, which are often brightly coloured and have numerous parallel cross veins on the costal margin and distinct tubercles on the clavus. The second tarsal segment has only a single spine on each side. Over 1000 species have been described. Several genera have been recorded from the Arabian Peninsula (e.g. Dlabola, 1980), including *Phantia* Fieber, 1866 (Plate 32), known from the UAE.

**Fulgoridae**
Many tropical Fulgoridae are very brightly coloured large insects, often sitting on the trunks of forest trees. The genus *Omaloecephala* Spinola, 1839, is known from the Arabian Peninsula, while *Dorysarthur* (Plate 14) with its distinctive very long apical process is known from the UAE.

**Issidae**
In the western Palaearctic the issid fauna is known from over 400 species, all of which are
flightless, and many living in arid areas, some may also have a limited distribution. There are over 1000 species described worldwide and many remain to be described. The taxonomy and faunistics of the family is under study by Vladimir Gnezdilov (Zoological Institute, St Petersburg, Russia). Like Caliscelidae, being flightless they are under-represented in trap samples.

Kinnaridae
The Kinnaridae, with around 80 species currently described, are recognised in both the Old and New World, predominantly from the tropics and subtropics. The discovery in the UAE of three species in the genus *Perloma* Emeljanov, 1984 (Plate 24) is remarkable, since the genus is only known by a few species based on a small number of specimens (see Wilson, 2010a, this volume).

Lophopidae
The Lophopidae is a small family, with the majority of species confined to the Old World tropics. The absence of spines on the second tarsal segment and the long narrow vertex assists in their identification. One species has been found in the Arabian Peninsula, *Lophops pallida* Melichar, 1902. Some species of *Pyrilla* Stål, 1859, are associated with sugarcane and are serious pests in India.

Meenoplidae
The Meenoplidae are found only in the Old World, with around 130 species described. They may be distinguished by one or both claval veins being ‘granulate’. A few species in the genera *Meenoplus* Fieber, 1866, and *Anigrus* Stål, 1866, are found in the west Palaearctic region, as well as the genus *Nisia* Melichar, 1903, which has been found in the UAE (see Wilson, 2010a, this volume).

Nogodinidae
The Nogodinidae has been a difficult family to characterise and many species that were formerly Issidae have now been transferred to it. However, the genus *Philbyella* China, 1938, is relatively easy to recognise (e.g. Plate 29) with fully developed fore and hind wings and is recorded from the Arabian Peninsula, including the UAE.

Ricaniidae
Many Ricaniidae have large tent-like forewings, which are often patterned in brown and yellow markings. They may often resemble the Flatidae but the Ricaniidae have no spines on the second tarsal segment. Over 400 species have been described but few are known from the western Palaearctic region. The genus *Saudoprivesa* Dlabola, 1980, has been described from Saudi Arabia (Dlabola, 1980).

Tropiduchidae
The family Tropiduchidae is among one of the smaller planthopper families, with around 300 species described. Most species are found in the tropics and sub-tropical regions of the world but a few genera are found in the Palaearctic region. The family is represented in the UAE by two genera, *Ommatissus* Fieber, 1872 (Plate 26) and *Kazerunia* Dlabola, 1974. The ‘Dubas bug’ (*Ommatissus lybicu*s Bergevin, 1930) is the most destructive pest in date producing regions of the Middle East (e.g. Al-Azawi, 1986; Al-Yahyai, 2007) (see Wilson, 2010b, this volume).

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REFERENCES


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