

A review of the endemic planthoppers, leafhoppers and allies of Cyprus (Hemiptera: Auchenorrhyncha), with notes on additional species

Alex J. Ramsay¹

Summary: Cyprus is the third largest island in the Mediterranean with a total land area of 9,251 km², and has an altitudinal range from sea level to nearly 2000 m. The island is characterised by a high diversity of habitats including saltmarsh and seasonal saltpans, sand dunes, pine and cedar forest, broad-leaved evergreen and deciduous forests, mountains and coastal plains, and including many endemic plant species. Early records of Auchenorrhyncha from Cyprus include two species of Issidae described by Melichar (1906) and not subsequently recorded. The majority of the Auchenorrhyncha species on Cyprus were recorded by the Lindberg expedition of 1939 (Lindberg 1948), which recorded 118 species in 13 families (Aphrophoridae, Caliscelidae, Cicadellidae, Cicadidae, Cixiidae, Delphacidae, Dictyopharidae, Flatidae, Issidae, Meenoplidae, Tettigometridae, Tibicinidae, Tropiduchidae), with 33 species recorded as new to science by both Lindberg (1948b) and Ribaut (1948). Subsequent interest in the fauna has increased the number of recorded species on Cyprus to 170 representing 14 families. The majority of species recorded on Cyprus share faunal affinities with the Turkey, Greece and the Near East. Only seven species are now confirmed as endemic to Cyprus.

Key words: Auchenorrhyncha, Endemic, Cyprus, Mediterranean.

1. Introduction

Cyprus is the third largest island in the Mediterranean with an area of 9,251 km² (3,571 square miles) and is situated in the very eastern part. The island is characterised by two main mountain ranges, the Troodos mountains in the centre, and the Pentadaktylos mountains which parallel the northern coast. Between the two mountain ranges is the central Mesaoria plain (Micula & Micula 2014).

Cyprus has an altitudinal range from sea level to nearly 2,000 m, with the highest mountain, Mount Olympus (1,952 m), located in the central Troodos mountains, one of the few mountainous areas in the Mediterranean high enough to have snow in winter (Micula & Micula 2014). The island exhibits a high diversity of habitats including halophytic wetlands (saltmarsh and seasonal saltpans, salt steppe), sand dunes, endemic pine and cedar forest, oak forests, riparian forest, montane habitats including peat grasslands and serpentine grasslands, limestone grasslands and typical Mediterranean habitats such as matorral and garrigue, as well as more southern habitats including semi-desert (Kyriacos et al. 2008, Micula & Micula 2014).

Over 140 species of endemic plants have been recorded on Cyprus (Hand et al. 2011) the majority of which occur in the mountains. The high diversity of habitats and range of climatic conditions have attracted the attention of visiting naturalists for over a century, with some of the earliest records of Auchenorrhyncha including two species of Issidae described by Melichar (1906), which at that time had not been recorded elsewhere.

¹ Corresponding author; email: alexramsay6@yahoo.com

The Auchenorrhyncha fauna of Cyprus has received remarkably little attention since Lindberg (1948a, 1948b) and Ribaut (1948) recorded 118 species in 13 families (Aphrophoridae: 3, Caliscelidae: 1, Cicadellidae: 63 plus 1 unidentified, Cicadidae: 3, Cixiidae: 9 plus 2 unidentified, Delphacidae: 18, Dictyopharidae: 3, Flatidae: 1, Issidae: 6, Meenoplidae: 1, Tettigometridae: 2, Tibicinidae: 1, Tropiduchidae: 2) of which 33 were considered new species or subspecies and endemic to Cyprus, and comprising 28% of the known Auchenorrhyncha fauna.

Three of the species recorded by Lindberg (1948b) were females of two undetermined species of Cixiidae and one *Macrosteles* species (Cicadellidae), and Lindberg (1948) suggested that additional species could be present. The Lindberg expedition was only undertaken during June and July (Lindberg 1948a), and data on species recorded is therefore limited to summer. Certain parts of Cyprus were not visited at all during this expedition, including the northwest Akamas peninsula. However coverage of the island overall was relatively comprehensive and included the majority of recorded habitat types on Cyprus (Lindberg 1948a).

Further work in particular by Dlabola (1957, 1965, 1974, 1975, 1981, 1982) yielded additional species to Cyprus, including two further endemic Issids, *Tshurtshurnella duffelsi* Dlabola and *Pamphylium cypricum* Dlabola. Dlabola also recorded additional species of Issidae and a further species of Cicadellidae, *Macropsis acrotirica* Dlabola, all of which have been recorded in other countries in addition to Cyprus. Dlabola also clarified the status of many species which were recorded outwith Cyprus (for example Dlabola 1957, 1965, 1982).

Georgiou (1977) subsequently summarised records of all insect and Acarina orders (including Auchenorrhyncha) and included the species recorded by Lindberg (1948b) and Ribaut (1948), however records from Dlabola prior to 1977 were not included. Georgiou added further species of Auchenorrhyncha (Cicadellidae: 23 plus 15 unidentified, Delphacidae: 2, Tettigometridae: 1 unidentified) although none of these were newly described. It is notable that no further data were provided on any species previously described by Lindberg (1948b) or Ribaut (1948). Georgiou's work unfortunately includes errors, such as the inclusion of the scale insect *Kermes vermilio* Planchon (Coccoidea, Kermesidae, see Pellizzari et al. 2012) in the list of recorded Issidae from Cyprus.

Demir (2008) cited a Cyprus record of *Malenia bosnica* Horvath, 1907, adding Derbidae to the recorded families on Cyprus. Furthermore Gnezdilov et al. (2014) added seven species of Issidae and included species recorded by Lindberg (1948b) and Dlabola (1974, 1975, 1982). However the status of some species of this difficult group still requires clarification, as two species recorded by Lindberg (1948b) (*Mycterodus intricatus* Stål; *Bubastia suturalis* [Fieber] = *Hysteropterum suturale* Fieber) from Cyprus are not recorded by Gnezdilov et al. (2014). A further species, *Agalmatium flavescens* (Olivier), recorded by Lindberg (1948b) as *Hysteropterum grylloides* Fieber is not listed, and instead Gnezdilov et al. (2014) cite *Agalmatium bilobum* Fieber from Cyprus.

Recent interest in the Mediterranean cicada (Cicadidae) fauna have led to the discovery of additional species on Cyprus such as *Lyristes gemellus* Boulard (Simoes & Quartau 2013) and *Cicadetta hageni* Fieber (Hoch et al. 2015), however neither of these are regarded as endemic.

To date a total of 14 families of Auchenorrhyncha is recorded from Cyprus (Table 1), with the Cicadellidae comprising the majority of species. The fauna includes species reaching the western limit of their geographic range, notably *Dictyophara asiatica* Melichar, which

Table 1: Number of Auchenorrhyncha species recorded on Cyprus

Author	Confirmed	Undetermined	Total
Lindberg (1948b) & Ribaut (1948)	115	3	118
Georgiou (1977)	25	16	41
Other authors*	11	0	11
Total	151	19	170

*Gnezdilov et al. (2014); Simoes & Quartau (2013); Dlabola (1974, 1975, 1982); Hoch et al. (2015); Demir (2008)

occurs in northern parts of Western Asia (Mozaffarian & Wilson 2011) and also in Turkey (Demir 2008), and species more typical of the Mediterranean including *Phantia subquadrata* Herrich-Schaeffer, the sole species of Flatidae recorded on Cyprus. Species groups not yet recorded from Cyprus include the Cercopidae and Membracidae, but these are likely to occur since they are known from the adjacent mainland and also from other Mediterranean islands such as Sicily (Hoch et al. 2015).

Faunal coverage of Auchenorrhyncha on Cyprus can at best be regarded as incomplete, however the knowledge of the fauna is more advanced than for many other Mediterranean islands. In Malta for example, a catalogue of the recorded Auchenorrhyncha has only recently been initiated (D'Urso & Mifsud 2012).

2. Species described from Cyprus no longer regarded as endemic

Taxonomic revisions and further work on the planthopper and leafhopper faunas in adjoining countries and islands have meant that a number of species described from Cyprus are now no longer considered endemic. Many of these species have now been demonstrated to be more widespread in the eastern Mediterranean and Near East, as well as in other parts of Europe.

Twenty-seven species described by Lindberg (1948b) and Ribaut (1948) from Cyprus have subsequently been recorded in other countries or have been found to be conspecific with other species. These are detailed below.

Dictyopharidae

Dictyophara (Dictyophara) lindbergi Metcalf, 1955

Fulgora acuminata Lindberg, 1948

Known distribution: Cyprus, Bulgaria, Italy, Spain, Near East, Israel (Emeljanov et al. 2012, Hoch et al. 2015, Lindberg 1948b).

Issidae

Latilica oertzeni (Matsamura, 1910)

Hysteropterum oertzeni Matsamura, 1910

Hysteropterum quercus Lindberg, 1948

Known distribution: Cyprus, Greece (including Crete) & Skiatos I. (Gnezdilov et al. 2014, Lindberg 1948b).

Mycterodus (Mycterodus) denticulatus Lindberg, 1948

Known distribution: Cyprus, Turkey (Gnezdilov et al. 2014, Hoch et al. 2015, Lindberg 1948b, Lodos & Kalkandelen 1981).

Tshurtshurnella campestris (Lindberg, 1948)

Hysteropterum campestre Lindberg, 1948

Hysteropterum campestre longispinosum Linnavuori, 1962

Hysteropterum campestre bidens Linnavuori, 1965

Known distribution: Cyprus, Turkey, Israel (Gnezdilov et al. 2014, Lindberg 1948b, Lodos & Kalkandelen 1981).

Delphacidae

Chloriona sicula Matsamura, 1910

Chloriona flaveola Lindberg, 1948

Known distribution: Cyprus, Austria, Bulgaria, France, Germany, Greece, Italy, Spain, Turkey (Asche 1982, Demir 2007, Dlabola 1957, Dlabola 1981, Hoch et al. 2015, Lindberg 1948b).

Euidopsis truncata Ribaut, 1948

Euidopsis palaemon Fennah 1969

Known distribution: Cyprus, Albania, Greece (mainland, Crete, Aegean islands), Italy, Turkey, Near East, Afro-tropical (Dlabola 1974, Hoch et al. 2015, Lodos & Kalkandelen 1980 Ribaut 1948).

Flastena fumipennis (Fieber, 1866)

Liburnia lethierryi Scott, 1873

Delphax nigricans Matsamura, 1910

Calligypona fumata Lindberg, 1948

Flastena fumata (Lindberg, 1948)

Calligypona bifurcata Lindberg, 1961

Known distribution: Cyprus, British Isles (Channel Islands), France (including Corsica) Italy (including Sardinia & Sicily) former Yugoslavia, Bulgaria, Greece (including Crete), Macedonia, Malta, Spain, North Africa, Madeira, East Palearctic, Near East, (D'Urso & Mifsud 2012; Hoch et al. 2015; Lindberg 1948b; Nast 1972, 1987).

Gravesteiniella boldi (Scott, 1870)

Calligypona bicolor Lindberg, 1948

Known distribution: Cyprus, Austria, British Isles, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Lithuania, Netherlands, Poland, Russia (S&C), Slovakia, Sweden, Ukraine, former Yugoslavia, East Palearctic (Hoch et al. 2015, Lindberg 1948b)

Perkinsiella dorsata (Melichar, 1905)

Araeopides picta Ribaut, 1948

Known distribution: Cyprus, Near East, Afro-tropical, Oriental region (Hoch et al. 2015, Ribaut 1948).

Cicadellidae

Aconura oculata (Lindberg, 1948)

Henschia oculata Lindberg, 1948

Known distribution: Cyprus, Greece, Near East (Hoch et al. 2015, Lindberg 1948b).

Agallia sabulicola Lindberg, 1948

Known distribution: Cyprus, Jordan (Dlabola 1965, Hoch et al. 2015, Lindberg 1948b).

Balclutha frontalis (Ferrari, 1882)

Gnathodus rosea Scott, 1876

Gnathodus pallidulus Matsamura, 1908

Balclutha flava Haupt, 1927

Balclutha pulchella Lindberg, 1948

Balclutha haupti Metcalf, 1955

Known distribution: Cyprus, Albania, Belgium, France (including Corsica), Greece, Italy (including Sicily), Spain, Canary Islands, Madeira, Near East, Afrotropical, Nearctic, Neotropics, North Africa, Oriental region (Dlabola 1957, Hoch et al. 2015, Lindberg 1948b).

Balclutha hebe (Kirkaldy, 1906)

Balclutha virescens Haupt, 1927

Balclutha hortensis Lindberg, 1948

Known distribution: Cyprus, Turkey, Near East, Canary Islands, Afrotropical, Australia, Nearctic, Neotropics, North Africa, Oriental region (Hoch et al. 2015, Lindberg 1948b).

Batracomorphys glaber Haupt, 1927

Batracomorphys flavovirens Lindberg, 1948

Known distribution: Cyprus, Near East (Hoch et al. 2015, Lindberg 1948b).

Circulifer haematoceps (Mulsant & Rey, 1855)

Jassus haagi Kirschbaum, 1868

Circulifer interibilis Lindberg, 1948

Known distribution: Cyprus, Italy (Sicily & Sardinia), Spain (Hoch et al. 2015, Lindberg 1948b, Young & Frazier 1954).

Circulifer opacipennis (Lethierry, 1876)

Cicadula vittiventris Lethierry, 1876

Thamnotettix unicolor Haupt, 1927

Ciculifer haupti Zakhvatkin, 1935

Circulifer viridiflavus Lindberg, 1948

Known distribution: Cyprus, France, Greece, Hungary, Italy (including Sicily & Sardinia), Spain, Russia, Turkey, Near East, North Africa (Hoch et al. 2015, Lindberg 1948b, Young & Frazier 1954).

Docotettix cornutus Ribaut, 1948

Known distribution: Cyprus, Greece, Turkey, Near East (Başpinar et al. 2013, Hoch et al. 2015, Ribaut 1948).

Doratulina acuticeps (Ribaut, 1948)

Aconura acuticeps Ribaut, 1948

Known distribution: Cyprus, Greece, Near East (Hoch et al. 2015: Ribaut 1948).

Doratulina instabilis (Ribaut, 1948)

Aconura instabilis Ribaut, 1948

Known distribution: Cyprus, Italy, Greece, Near East, North Africa, Afrotropical region (Hoch et al. 2015, Ribaut 1948).

Eohardya fraudulenta (Horvath, 1903)

Hardya insularis Lindberg, 1948

Known distribution: Cyprus, Albania, Bulgaria, France, Greece, Italy (including Sardinia & Sicily), Romania, Slovakia, former Yugoslavia, Russia (south), Ukraine (Hoch et al. 2015, Lindberg 1948b).

Eupteryx cypria (Ribaut, 1948)

Cicadella cypria Ribaut, 1948

Known distribution: Cyprus, Turkey, Near East (Demir 2008, Hoch et al. 2015, Lindberg 1948b, Nast 1972, Ribaut 1948).

Eupteryx insulana (Ribaut, 1948)

Cicadella insulana Ribaut, 1948

Known distribution: Cyprus, Greece, Near East (Hoch et al. 2015, Ribaut 1948).

Osbornellus (Mavromoustacus) macchiaie (Lindberg, 1948)

Curculifer macchiaie Lindberg, 1948

Known distribution: Cyprus, Greece (Hoch et al. 2015, Lindberg 1948b).

Psammotettix cerinus Lindberg, 1948

Deltocephalus cerinus Lindberg, 1948

Known distribution: Cyprus, Greece, Near East (Hoch et al. 2015, Lindberg 1948b).

Tamaricella cypria (Ribaut, 1948)

Erythroneura tamaricis cypria Ribaut, 1948

Erythroneura tamaricis Linnavuori, 1953 (Misid.)

Helionidia fasciolata Dworakowska, 1970 (Misid.)

Tamaricella cypria Dworakowska, 1971

Known distribution: Cyprus, Turkey, Israel, Jordan, Egypt, Ethiopian region, Sudan, Kazakhstan, Turkmenistan, Uzbekistan; doubtful record from Pantelleria I. (Italy) (Demir 2008, Dmitriev 2014, Dworakowska 1970, Dworakowska 1971, Guglielmino et al. 2011, Hoch et al. 2015, Linnavuori 1953, Nast 1972, Ribaut 1948).

Zygina (Hypericiella) nebulosa (Ribaut, 1948)

Erythroneura nebulosa Ribaut, 1948

Known distribution: Cyprus, Near East (Hoch et al. 2015, Nast 1972, Ribaut 1948).

Zyginidia sohrab Zachvatkin 1947

Erythroneura coacta Ribaut, 1948

Known distribution: Cyprus, Greece, Near East, Iran, South Russia, Ukraine (Hoch et al. 2015; Nast 1972, 1987; Ribaut 1948).

The majority of these species now have recorded distributions which include the nearest countries to Cyprus, notably Turkey, Greece and the Near East, with their distribution often extending into Asia. Comparatively few of these species are apparently centered on the Mediterranean, and a few are essentially European in origin.

3. Endemic species

Of the 31 species described by Lindberg (1948b) and Ribaut (1948) only five have not been recorded outwith Cyprus, and can be considered as endemic to Cyprus. Two additional species of Issidae have been added subsequently by Dlabola (1975, 1982), giving a total of seven endemic species as follows:

Issidae

Nymphorgerius cyprius (Lindberg, 1948)

Sphenocratus cyprius Lindberg 1948

Distribution and ecology: Montane; Kykko and Stavros, Troodos mountains; on *Teucrium kotschyianum* (Lindberg 1948b). Not recorded elsewhere (Hoch et al. 2015).

Pamphylium cypriacum (Dlabola, 1982)

Latematium cypriacum Dlabola, 1982

Distribution and ecology: No data available (Dlabola 1982, Gnezdilov et al. 2014).

Tshurtshurnella duffelsi (Dlabola, 1975)

Hysteropterum duffelsi Dlabola, 1975

Distribution and ecology: Northern Cyprus (Bellapais, Kyrenia, Pentadaktylos mountains), and Southern Cyprus (Yermasoyia, Limassol) (Dlabola 1982, Gnezdilov et al. 2014).

Cicadellidae

Hauptidia armata (Ribaut, 1948)

Erythroneura armata Ribaut, 1948

Distribution and ecology: Ayios Neophytos, near Paphos, western Cyprus (Lindberg 1948b, Ribaut 1948). Not recorded elsewhere (Hoch et al. 2015).

Hauptidia stellata (Ribaut, 1948)

Erythroneura stellata Ribaut, 1948

Distribution and ecology: Saltmarsh, on *Galium canum*, Kyrenia, northern Cyprus (Lindberg 1948b, Ribaut 1948); due to a transcription error by Ribaut (1948) the type locality was listed as 'Kyreina' instead of Kyrenia.

Selenocephalus nervosus Lindberg, 1948

Distribution and ecology: Recorded from coastal habitats on *Echium* spp. in eastern Cyprus (Triкомо and Famagusta), also in montane gorge habitats in the northern mountains (Boghazi, Pentadaktylos) (Lindberg 1948b).

Zygina (Hypericiella) digitata (Ribaut, 1948)

Erythroneura digitata Ribaut, 1948

Distribution and ecology: Lapithos, Western Pentadaktylos mountains (Ribaut 1948). Not recorded elsewhere (Hoch et al. 2015).

Some of the endemic species are associated with montane habitats, however there does not appear to be a particular pattern to their occurrence on Cyprus, with species such as *Selenocephalus nervosus* Lindberg occurring in both montane and coastal habitats, suggesting that hostplant occurrence may be more important than the specific habitat. Perhaps surprisingly, more montane endemics are recorded from the Pentadaktylos mountains than the higher Troodos mountains, suggesting that additional endemic species may yet be recorded

in the Troodos range. Many of the endemics are in the family Issidae; however this family as a whole is rich in endemic species all over the Mediterranean (Gnezdilov et al. 2014).

4. Species of uncertain status which require clarification

Three species described from Cyprus have only doubtfully been recorded outside Cyprus or not been subsequently found on Cyprus itself since first described, and their status requires clarification as follows:

Issidae

Issus bellardi Melichar, 1906

Uncertain species known only from its original description with no subsequent records; doubtfully recorded from Greece (Gnezdilov et al. 2014, Haupt 1928, Melichar 1906).

Issus fieberi Melichar, 1906

Uncertain species known only from original description, no subsequent records (Gnezdilov et al. 2014, Melichar 1906).

Cicadellidae

Anoplotettix bitaeniatus Ribaut, 1948

No records available from other countries; potential endemic (Hoch et al. 2015, Ribaut 1948).

5. Discussion

The seven species of Auchenorrhyncha recorded as endemic for Cyprus (this paper) equate to 4.1% of the fauna, compared with 5.2 % for Heteroptera recorded for Cyprus (Lindberg 1948b). The endemic plant flora of Cyprus is approximately 7.1 % of the known flora (Hand et al. 2011), and it is considered restricted to the Troodos and Pentadaktylos mountain ranges, in contrast to a number of endemic Hemiptera (both Heteroptera and Auchenorrhyncha) recorded from coastal localities (Lindberg 1948a, Lindberg 1948b). The majority of the fauna shares affinities with the Near East and Turkey, which has a large pool of over 700 species (Demir 2008) and to a lesser extent with Greece, which has over 750 recorded species (Drosopoulos et al. 1986). Although the fauna of these countries is now far better known, it is still not possible to draw parallels in terms of proportions of endemic species recorded, a similar situation to that faced by Lindberg (1948c), who assessed only the Heteroptera fauna.

In particular, the fauna of Crete would provide a useful comparison as the nearest large Mediterranean island, however specific data for Auchenorrhyncha species composition of Crete is currently lacking, although the recent record from Crete of the newly described endemic *Cicada cretensis* Quartau & Simões (Quartau & Simões 2005) does suggest that further endemic species could yet be detected there. The endemic flora of Crete is approximately 10% from a total indigenous flora of 1.600 species (WWF 2016), slightly higher than that recorded for Cyprus, and suggesting that further endemic Auchenorrhyncha may also be present.

An indirect comparison can be made with two other large Mediterranean islands, Sicily and Sardinia, which however have a fauna with affinities to mainland Italy and France, in contrast to the Cyprus fauna which has similarities to the faunas of Turkey and the Near East. In comparison with Sardinia and Sicily the faunal diversity of Cyprus is relatively low, with only 170 recorded species, compared with Sardinia (240 species) (Guglielmino et al.

2000), whilst Sicily has the highest diversity with 378 recorded species (D'Urso & Sabella 2011). However, the Auchenorrhyncha faunas of both Italian islands are far better known and have been subject to intensive studies (e.g., D'Urso & Sabella 2011).

Levels of endemism are however proportionally higher on Cyprus (4.1%), with only Sicily having a higher percentage of endemic species (8.3%) (D'Urso & Sabella 2011), whilst Sardinia has only 2.5% (Guglielmino et al. 2000), and a similar percentage is recorded on Malta (2.2%), however the authors note that knowledge of the Maltese fauna is incomplete (D'Urso & Mifsud 2012), and to date only 46 species are recorded there, of which only one species is regarded as endemic (D'Urso & Mifsud 2012). The only other large central Mediterranean island, Corsica, has no recorded endemic species of Auchenorrhyncha (Guglielmino et al. 2000).

The relatively high proportion of endemic species recorded from Cyprus is likely in part due to the diversity of available habitats and altitudinal and climatic diversity-northern slopes of the Pentadaktylos mountains contain many European derived species, whilst African derived species are known from the south of Cyprus, particularly amongst the Heteroptera (Lindberg 1948b). It is considered likely that additional species are yet to be detected in Cyprus, although further work on the faunas of adjoining countries, particularly Syria and Turkey and Greek islands would assist in placing the fauna in better context.

Zusammenfassung

Eine Übersicht über die endemischen Zikaden von Zypern (Hemiptera: Auchenorrhyncha), mit Anmerkungen zu weiteren Arten. – Zypern ist die drittgrößte Insel im Mittelmeer mit einer Landfläche von 9.251 km² und einer Höhendifferenz von 0 m üNN bis 2000 m üNN. Die Insel zeichnet sich durch eine hohe Diversität an Lebensräumen aus, mit Salz-sümpfen, saisonalen Salzseen, Sanddünen, Kiefern- und Zedernwäldern, immergrünen wie auch sommergrünen Laubwäldern, Hoch- und Küstenebenen mit vielen endemischen Pflanzenarten. Erste Nachweise von Zikaden von Zypern beinhalten auch zwei von Melichar (1906) beschriebene Issidae-Arten, die seitdem nicht mehr nachgewiesen werden konnten. Die Mehrzahl der Zikadenarten von Zypern wurde während der Lindberg-Expedition 1939 festgestellt, bei der 118 Arten aus 13 Familien nachgewiesen wurden (Aphrophoridae, Caliscelidae, Cicadellidae, Cicadidae, Cixiidae, Delphacidae, Dictyopharidae, Flatidae, Issidae, Meenoplidae, Tettigometridae, Tibicinidae, Tropiduchidae). Darunter waren 33 Arten neu für die Wissenschaft (s. Lindberg 1948b und Ribaut 1948). Weiterführende Forschungen erweiterten die Kenntnis der zypriotischen Zikadenfauna auf 170 Arten aus 14 Familien. Der Großteil der Zikadenfauna Zyperns zeigt faunistische Beziehungen mit der Türkei, mit Griechenland und dem Nahen Osten. Lediglich sieben Arten werden als endemisch für Zypern angesehen.

Danksagung

My thanks to Inanç Özgen who provided valuable data on Turkish records of Auchenorrhyncha, to Herbert Nickel for providing encouragement and copies of obscure literature and to Werner Holzinger and Mike Wilson for assistance with taxonomic problems and providing additional literature. Special thanks to Vera D'Urso for supplying copies of papers on the Mediterranean Auchenorrhyncha. I am indebted to the fantastic resource of Fauna Europaea and the underlying work of Zeno P. Metcalf and Janusz Nast, without which much of this paper would not have been possible.

6. References

- Asche M. (1982): Beiträge zur Delphaciden-Fauna der Türkei (Anatolien) (Homoptera Cicadina Delphacidae). – Marburger Entomologische Publikationen 1: 71-98.
- Başpınar H., Yildirim E.M., Xing J. (2013): Determination and population fluctuations of Cicadellidae (Hemiptera: Cicadomorpha) species in pomegranate orchards in Aydin Province, Turkey. – Türk. entomol. Derg. 37: 3-11
- Demir E. (2007): Contributions to the Knowledge of Turkish Auchenorrhyncha (Homoptera, Fulgoromorpha and Cicadomorpha, excl. Cicadellidae) with a new record, *Setapius klapperichianus* Dlabola, 1988. – Munis Entomology and Zoology 2(1): 39-58.
- Demir E. (2008): The Fulgoromorpha and Cicadomorpha of Turkey. Part I: Mediterranean region (Hemiptera). – Munis Entomology & Zoology 3: 447-522.
- Dmitriev, D.A. (2014): 3i Typhlocybinae: 3i interactive keys and taxonomic databases, subfamily Typhlocybinae - Oct 2011 version. – Species 2000 & ITIS Catalogue of Life. 2014 annual checklist. DVD; Species 2000, Reading, UK.
- Dlabola J. (1957): Results of the Zoological Expedition of the National Museum in Prague to Turkey 20. Homoptera, Auchenorrhyncha. – Acta Entomologica Musei Nationale Pragae 31(469): 19-68.
- Dlabola J. (1965): Jordanische Zikaden (Homoptera Auchenorrhyncha) (Bearbeitung der von J. Klappe- rich im Jahre 1956-9 in Jordanien, Libanon und Syrien gesammelten Ausbeute). – Acta Faunistica Entomologica Musei Nationalis Pragae 36: 419-450.
- Dlabola J. (1974): Übersicht der Gattungen *Anoplotettix*, *Goldeus* und *Thamnotettix* mit Beschreibungen von 7 neuen mediterranen Arten (Homoptera: Auchenorrhyncha). – Acta Faunistica Entomologica Musei Nationalis Pragae 15: 103-129.
- Dlabola J. (1975): Neue mediterrane Zikadenarten der Gattungen *Hysteropterum* Amyot & Serville, 1843, *Macropsidius* Ribaut, 1952 und *Chlorita* Fieber, 1872 (Homoptera, Auchenorrhyncha). – Beaufortia 23(299): 75-83.
- Dlabola J. (1981): Ergebnisse der Tschechoslowakisch-Iranischen Entomologischen Expeditionen nach dem Iran (1970 und 1973). – Acta Entomologica Musei Nationalis Pragae 40: 127-311.
- Dlabola J. (1982): Fortsetzung der Ergänzungen zur Issiden-Taxonomie von Anatolien, Iran und Grie- chenland (Homoptera, Auchenorrhyncha). – Acta Musei Nationalis Pragae 38B(3): 113-169.
- Dworakowska, I. (1970): On the genus *Thaia* Ghauri (Homoptera, Cicadellidae, Typhlocybinae). – Bulle- tin de l'Academie Polonaise des Sciences (Serie des Sciences Biologiques) 18(2): 87-92.
- Dworakowska, I. (1971): On the genera related to *Tamaricella* Zachv. and some other Erythroneurini (Hom., Cicadellidae, Typhlocybinae). – Ann. Entomol. Fennica 37(2): 99-121.
- Drosopoulos S. Asche M. Hoch H. (1986) A preliminary list and some notes on the Cicadomorpha (Homoptera-Auchenorrhyncha) collected in Greece. – Proc. 2nd Int. Congr. Rhynchota Balkan, Mikrolimni, Greece: 8-13.
- D'Urso V., Mifsud D. (2012): A preliminary account of the Auchenorrhyncha of the Maltese Islands (Hemiptera). – Bulletin of the Entomological Society of Malta 5: 57-72.
- D'Urso V., Sabella G. (2011): Zoogeografia degli Auchenorrhynchi di Sicilia (Insecta Hemiptera). – Bio- geographia 30: 535-542.
- Emeljanov A.F., Stern T., Freidberg A. (2012): The Dictyopharidae (Homoptera: Cicadina: Fulgoroidea) of Israel. – Israel Journal of Entomology 41/42: 7-20.
- Georghiou G. P. (1977): The insects and mites of Cyprus. – Benaki Phytopathological Institute, Athens: 1-347.
- Gnezdilov V.M., Holzinger W.E., Wilson M.R. (2014): The Western Palaearctic Issidae (Hemiptera, Fulgoroidea): An illustrated checklist and key to genera and subgenera. – Proceedings of the Zoo- logical Institute RAS 318, Supplement 1: 1-118.

- Guglielmino A., D'Urso V., Alma A. (2000): Auchenorrhyncha (Insecta, Homoptera) from Sardinia (Italy): A faunistic, ecological and zoogeographical contribution. – *Deutsche Entomologische Zeitschrift* 47: 161-172.
- Guglielmino A., Poggi F., Bückle C. (2011): Contribution to the knowledge on Typhlocybinae (Hemiptera, Cicadellidae) in Italy with descriptions of two new species. – *Zootaxa* 2979: 41-59.
- Hand R., Hadjikyriakou G. N., Christodoulou C. S. (eds.) (2011): Flora of Cyprus – a dynamic checklist. – www.flora-of-cyprus.eu [accessed 23rd January 2016]
- Haupt H. (1928): Rhynchota Homoptera. – In: *Zoologische Streifzüge in Attika, Morea und besonders auf der Insel Kreta II. Abhandlungen herausgegeben vom Naturwissenschaftlichen Verein zu Bremen* 27: 91-92.
- Hoch H., Asche M., Bourgoïn T., Jach M. (2015): Hemiptera: Cicadomorpha. Fauna Europaea version 2.6.2. – www.faunaeur.org.
- Holzinger W.E., Kammerlander I., Nickel H. (2003): The Auchenorrhyncha of Central Europe (Die Zikaden Mitteleuropas). Vol 1: Fulgoromorpha, Cicadomorpha excl. Cicadellidae. – Brill, Leiden.
- Kyriacos G, Pinelopi D, Marios A, Niki K., Savvas Z. (2008): Conservation management in NATURA 2000 sites of Cyprus. – Layman's report. National and Kapodistrian University of Athens. Athens.
- Lindberg H. (1948a): On the insect fauna of Cyprus. Results of the expedition of 1939 by Harald, Hakan and P.H. Lindberg I. Introduction. – *Commentationes Biologicae* 10(7): 3-22.
- Lindberg H. (1948b): On the insect fauna of Cyprus. Results of the expedition of 1939 by Harald, Hakan and P.H. Lindberg II. Heteroptera und Homoptera Cicadina der Insel Zypern. – *Commentationes Biologicae* 10(7): 23-175.
- Linnavuori, R. (1953): On some new or interesting leafhopper species of the family Cicadellidae. Suomen Hyonteistieteellinen Aikakauskirja. – *Annales Entomologici Fennici* 19: 56-63.
- Lodos N., Kalkandelen A. (1980): Preliminary list of Auchenorrhyncha with notes on distribution and importance of species in Turkey II. Family Delpacidae Leach. – *Turk. Bit. Kor. Derg.* 4(2): 103-117.
- Lodos N., Kalkandelen A. (1981): Preliminary list of Auchenorrhyncha with notes on importance of species in Turkey IV. Family Issidae Spinola. – *Turk. Bit. Kor. Derg.* 5(1): 5-21.
- Melichar L. (1906): Monographie der Issiden (Homoptera). – *Abhandlungen der K.K. Zoologisch-botanischen Gesellschaft in Wien* 3: 1-327.
- Micula G., Micula M. (2014): Cyprus. Eyewitness Travel Guide. – Dorling Kindersley, London.
- Mozaffarian F., Wilson M.R. (2011): An annotated checklist of the planthoppers of Iran (Hemiptera, Auchenorrhyncha, Fulgoromorpha) with distribution data. – *ZooKeys* 145: 1-57.
- Nast J. (1972): Palaearctic Auchenorrhyncha (Homoptera). An annotated check list. – Polish Scientific Publ., Warszawa. 550 pp.
- Nast J. (1987): The Auchenorrhyncha (Homoptera) of Europe. – *Annales Zoologici Warszawa* 40: 536-661.
- Pellizzari G, Porcelli F, Convertini S., Marotta S. (2012): Description of nymphal instars and adult female of *Kermes pumilio* Planchon (Hemiptera, Coccoidea, Kermesidae), with a synopsis of the European and Mediterranean species. – *Zootaxa* 3336: 36-50.
- Quartau J.A. & Simões P.C. (2005) *Cicada cretensis* sp. n. (Hemiptera, Cicadidae) from southern Greece. – *Biologia Bratislava* 60: 489-494.
- Ramsay A.J. (2016): Chapter 13: Hemiptera - Bugs. – In: Sparrow D.J., John E. (eds.): *An Introduction to the Wildlife of Cyprus, Terra Cypria, Cyprus*: 222-241.
- Ribaut H. (1948): On the insect fauna of Cyprus. Results of the expedition of 1939 by Harald, Hakan and P.H. Lindberg III. Homopteres nouveaux de Chypre. – *Commentationes Biologicae* 10 (8): 1-14.
- Simões P.C., Quartau J.A. (2013): Distribution of cicadas of the genus *Lyristes* (Hemiptera: Cicadidae) in the eastern Mediterranean area. – *Biologia* 68(5): 961-965.

WWF (World Wildlife Fund) (2016): Island of Crete. – www.worldwildlife.org/ecoregions/pa1205 [accessed 14th December 2016].

Young D.A., Frazier N.W. (1954): A study of the leafhopper genus *Circulifer* Zakhvatkin (Homoptera, Cicadellidae). – *Hilgardia* 23(2): 25-52.

Address of the Author

Alex J. Ramsay, Jacobs, 5 First Street, Manchester, M15 4JU, UK