

## Some new synonyms in Aphididae (Hemiptera: Sternorrhyncha)

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### Abstract

A total of 14 genus and 108 species synonyms in family Aphididae are listed with explanations and comments. Synonyms involving aphid names in the economic literature include: *Acyrtosiphon bidentis* Eastop 1953 = *Acyrtosiphon ilka* Mordvilko 1914; *Aphidura mingens* Pintera 1970 = *Aphidura picta* Hille Ris Lambers 1956; *Aphis armoraciae* Cowan 1895, *Aphis maidiradicis* Forbes 1891 and *Aphis menthaeradicis* Cowan 1895 = *Aphis (Protaphis) middletonii* Thomas 1879; *Diuraphis (Holcaphis) agropyronophaga* Zhang, 1991 = *Diuraphis (Holcaphis) tritici* (Gillette, 1911); *Sitobion chanikiwiti* (Eastop 1959) and *Sitobion howlandae* (Eastop 1959) = *Sitobion leelamaniae* (David 1958). An annotated list of 36 other proposed nomenclatural changes is provided.

**Key words:** Aphididae, nomenclature, synonyms

### Introduction

Synonyms are unavoidable in taxonomy. Apart from human fallibility, a common reason is that many species are first described from small samples obtained on collecting expeditions. This is inevitable with the present method of financing taxonomy, because it is difficult to obtain funds for further expeditions until the species found on the previous

visit are described. In insects such as aphids, where the morphology is strongly influenced by environmental factors, such small samples will probably show no more than a fraction of the total variation of the species. It is also possible, as aphids reproduce for most of the year by apomictic parthenogenesis, that all the individuals in a small sample will have the same genotype. Subsequent collections from the same or different localities will not only encompass greater genetic variation, but also may include additional samples of the same or related species that have developed under different conditions of host plant, temperature or humidity, and thus differ significantly in morphology from those collected previously. The “publish or perish” career structure in science may also put pressure on taxonomists to describe new species from small samples. It is thus almost inevitable that the same species will be described under different names, and conversely that similar species may be confused under the same name.

During the preparation of a book reviewing the aphids on the the worlds shrubs and herbaceous plants (Blackman and Eastop, in press), we have discovered many such cases of probable synonymy and confusion. In many of these we thought it sufficient to draw attention to the problem and suggest that further work was needed, but there were also numerous cases where the evidence for synonymy seemed clear, either from studies of type specimens or from published descriptions. These most evident synonymies, and also some other nomenclatural changes which we have found to be advisable in the course of this work, are reported in the present paper.

Some of the synonyms proposed here may nevertheless prove to be wrong. There is a fine dividing line between possible and probable synonymy, especially when only a small number of samples and specimens are available. There may indeed be two similar species, described in the same or different genera, that we have erroneously synonymised. Even so, we think it more useful to point out probable synonymies than to accept them as distinct species. Hille Ris Lambers (1933, 1934) proposed many synonyms for the western European aphids reviewed by Theobald in his three-volume (1926–1929) work on British aphids. Most of these synonyms are accepted today, but a few of the species that Hille Ris Lambers synonymised have been re-instated as good, closely-related species. Nevertheless, Hille Ris Lambers’ work stimulated European aphid taxonomic research by pointing out problematic areas and demonstrating why existing identification keys did not work. Ultimately, keys can only work if names are correctly applied, and names (both generic and specific) can only make sense in biological and ecological studies if we have the taxonomy right. As in all branches of science, achieving this “correct taxonomy” is an ongoing process.

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### List of synonyms

References to original descriptions of species published prior to 1972 can be found in Smith (1972), and to descriptions published from 1973 to 1996 in Remaudière and Remaudière (1997).

#### ***Acyrtosiphon bidentis* Eastop 1953 = *Acyrtosiphon ilka* Mordvilko 1914 (valid name)**

African populations identified as *A. bidentis* tend to have longer, more slender SIPH than Eurasian populations of *A. ilka*, but have almost identical host plant preferences across several families (Papaveraceae, Compositae, Cruciferae, Linaceae), so that *A. bidentis* is best considered as a geographical variant of *A. ilka*. Remaudière and Remaudière (1997) questioned the validity of Mordvilko's species but the 1914 description is detailed and seems unambiguous.

#### ***Acyrtosiphon huoense* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Acyrtosiphon cyparissiae* ssp. *propinquum* Mordvilko 1914**

Paratypes of *A. huoense* on slides 9278-1-2 and 9278-1-3 from the IOZ-CAS collection could not be distinguished from *A. cyparissiae* ssp. *propinquum*, which occurs commonly on *Euphorbia* in warmer parts of Asia.

#### ***Acyrtosiphon linisuctum* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Acyrtosiphon ilka* Mordvilko 1914**

Apterous and alate viviparae from *Linum* from the IOZ-CAS collection labelled as *A. linisuctum* could not be distinguished from *A. ilka*, which is recorded from *Linum* in Asia and Africa.

***Akkaia ouraplax* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Trichosiphonaphis polygona* (Van der Goot, 1917)**

Synonymy was established after examination of the holotype of *Akkaia ouraplax*, described from *Polygonum* in Gansu, China..

***Akkaiopsis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tuberocephalus Shinji* 1929  
*Akkaiopsis boschophaga* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tuberocephalus sasakii* (Matsumura 1917)**

A specimen from IOZ-CAS collection labelled as *Akkaiopsis boschophaga*, which was described from Qinghai, China, on “a shrub of family Ericaceae” appears to be an apterous exule of *Tuberocephalus sasakii*, which host-alternates between *Prunus* and *Artemisia* in eastern Asia.

***Anoecia nemoralis* Börner 1950 = *Anoecia furcata* (Theobald 1915)**

Börner briefly described *A. nemoralis* from a small sample on *Poa nemoralis* and distinguished it from *A. furcata* by small differences in larval and adult chaetotaxy, specifically in the frequency and distribution of spatulate hairs. This varies seasonally (Zwölfer 1957), and Paul (1977) found a complete range of intermediates between *A. furcata* and *A. nemoralis* in UK samples from a range of hosts. Female karyotype is  $2n=12$  for forms with both *furcata* and *nemoralis* morphology.

***Aphidura bharatia* David, Sekhon & Bindra 1970 = *Aphidura ornatella* Narzikulov & Winkler 1960**

*Aphidura bharatia* was described from *Saponaria* in north-west India, and *A. ornatella* from *Silene* in Tajikistan. After examining a paratype aptera of *A. bharatia* in the BMNH collection, and comparing the published descriptions, measurements and illustrations, we conclude that they are the same species. Particular features are the extensive dark dorsal shield, the long, dark and distinctly clavate siphunculi, and the well-developed mesosternal processes.

***Aphidura mingens* Pintera 1970 = *Aphidura picta* Hille Ris Lambers 1956**

*Aphidura picta* was described from a single specimen from cultivated *Dianthus* in Israel, which seems untypical of the species as a whole. Specimens in the BMNH collection subsequently collected from *Dianthus* in former Yugoslavia, Greece and Turkey, and from *Silene conoidea* in Iran, have a relatively longer antennal processus terminalis and a longer, more hairy last rostral segment than the type of *picta*, and are not clearly distinguishable from paratypes of *A. mingens* Pintera, described from *S. thymifolia* on the Black Sea coast, and also found on *S. fruticosa* in Sicily (Barbagallo & Stroyan 1982).

***Aphis clematidis* ssp. *simalensis* Kumar & Burkhardt 1970 = *Aphis longituba* Hille Ris Lambers 1960**

*A. longituba* was described from *Clematis* in Pakistan, and the aphid described from India as a subspecies of the European *A. clematidis* is clearly that species. The small cauda combined with dark-tipped siphunculi are distinctive.

***Aphis armoraciae* Cowan 1895 = *Aphis (Protaphis) middletonii* Thomas 1879**

See under *Aphis maidiradicis*

***Aphis (Zyxaphis) kochiae* Zhang & Zhang 2000 = *Xerobion eriosomatium* Nevsky 1928**

Paratypes of *Aphis (Zyxaphis) kochiae*, described from *Kochia prostrata* in China, (L. Zhang & G. Zhang, 2000b) are large specimens of *X. eriosomatium*, which feeds specifically on this plant and is previously recorded from Spain, Italy, Central Asia and Pakistan.

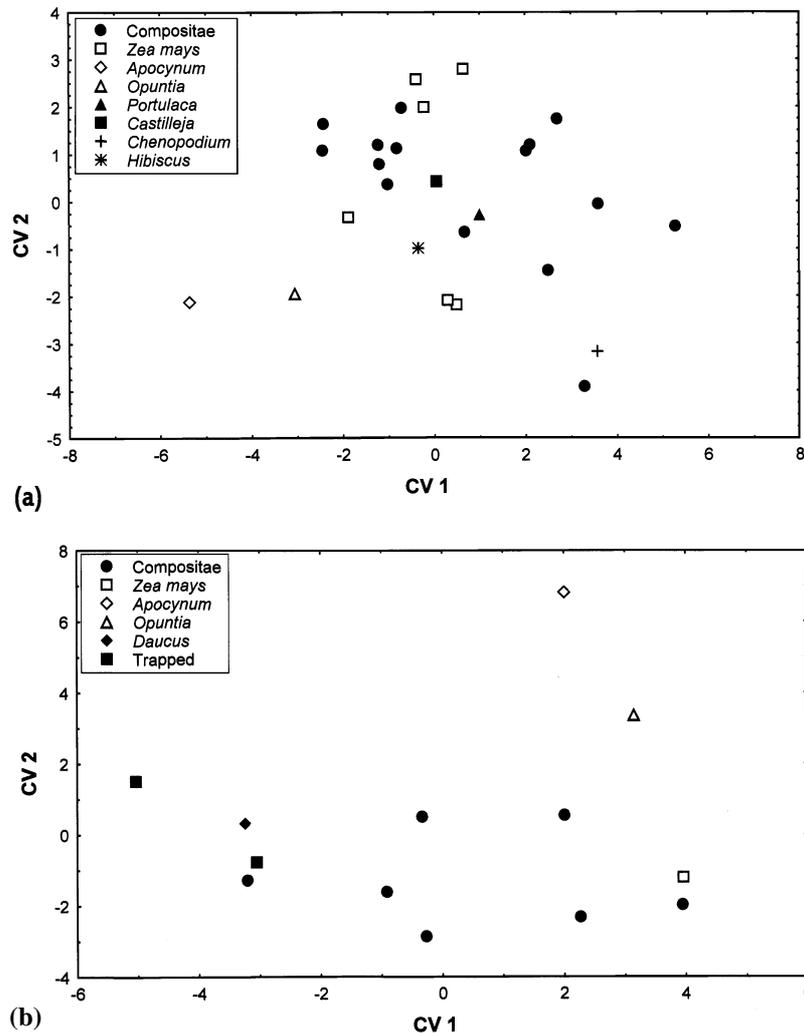
***Aphis liliago* Müller 1968 = *Aphis antherici* Holman 1966**

Holman in Czech Republic and Müller in Germany both gave full accounts of this aphid, which agree in almost every respect.. It lives in ant shelters on basal parts of *Anthericum liliago* in eastern Europe.

***Aphis maidiradicis* Forbes 1891 = *Aphis (Protaphis) middletonii* Thomas 1879**

***Aphis menthaeradicis* Cowan 1895 = *Aphis (Protaphis) middletonii* Thomas 1879**

Colonies of *Aphis (Protaphis)* found on roots of various plants in North America are all very similar and the number of taxa involved has always been in doubt (see Palmer 1952). We have done a multivariate analysis of morphometric variation (method of canonical variates) in 7 characters within and between 27 samples of apterous viviparae and 13 samples of alate viviparae from various plants, especially Compositae and *Zea mays*, in the BMNH colln (Fig. 1). Samples of both apterae and alatae from *Opuntia* in S Africa and *Apocynum* in USA had similar scores that discriminated them from all other samples, but apart from this the analysis failed to reveal any clustering of samples which might indicate the existence of more than one taxon, and notably failed to differentiate between samples from Compositae (putative *armoraceae*) and *Zea* (putative *maidiradicis*). This method has proved powerful for discriminating closely-related taxa in other species groups (Blackman 1992; Blackman & DeBoise 2002), so we conclude that a single name should be applied, the oldest available being *A. middletonii* Thomas (1879).



**FIGURE 1.** Plots of mean scores on the first and second canonical variates for (a) 27 samples of apterae and (b) 13 samples of alatae, of the *Aphis middletonii* group from various sources in the BMNH collection (identified on slide labels as *armoraciae*, *maidiradicis*, *menthaeradicis* or *middletonii*). Samples comprised 4–13 individuals collected on the same host at the same locality and on the same date (with the exception of two samples of trapped alatae). Seven linear parameters were measured on each specimen (lengths of siphunculus, third antennal segment, base of sixth antennal segment, processus terminalis, last segment of rostrum (combined third and fourth), hind tibia, second segment of hind tarsus). Data were analysed using the discriminant analysis package in Statistica (StatSoft Inc., Tulsa, USA), with the sample as the grouping variable. Collection data: *Apocynum androsaemifolium*, Utah, vii.1946; *Artemisia campestris*, Washington, 1994; *Aster*, California, ix.1930; *Aster*, Warnea HT, viii.1960; *Aster*, Jamaica, viii.1927; *Baccharis*, California, x.1944; *Castilleja*, Oregon, vi.1980; *Chenopodium album*, S Dakota, vii.1963; *Cichorium intybus*, Washington, v.1994; “Compositae”, N Carolina, iv.1964; “composite root”, Mexico, v.1981; *Conyza bonariensis*, Brazil; *Conyza canadensis*, California, viii.1940; “corn”, Utah, ix.1958; *Daucus carota*, California, xi.1975; *Echinops ritro*, California, xi.1971; *Erigeron linifolius*, California, ix.1975; *Hibiscus*, California, iv.1962; *Leontodon autumnalis*, New Brunswick, ix.1956; *Opuntia*, S Africa, x.1975; *Picris echioides*, California, ix.1941; *Portulaca oleracea*, California, ix.1975; *Rudbeckia serotina*, Manitoba, vii.1963; *Senecio* root, California, vii.1941; *Sonchus oleraceus*, California, ix.1975; *Zea mays*, Idaho, ix.1935; *Zea mays*, Mexico, viii.1981; *Zea mays*, Utah, ix.1955; pan traps, Louisiana, v.1969; water traps, Campinas, Brazil, 1966–70.

In the N American literature, populations identified as *A. armoraciae* are stated to produce alate males, whereas *maidiradicis* and *menthaeradicis* have apterous males, and oviparae of *menthaeradicis* are said to have very few scent glands on their hind tibiae (Palmer 1952); however, the criteria for naming these populations are unclear, and experimental work is needed to show whether these differences are of any taxonomic significance.

***Aphis pulsatillae* Ossiannilsson 1959 = *Aphis montanicola* Hille Ris Lambers 1950**

In the original description of *montanicola*, the last rostral segment is erroneously described as shorter than the second segment of the hind tarsus, leading to *pulsatillae* being described and recognised as a separate species. Comparison of type material of *montanicola* and *pulsatillae* in the BMNH collection failed to reveal any substantive differences.

***Aphis (Protaphis) funicularis* (F P Müller 1968) = *Aphis (Protaphis) picridicola* Holman 1966**

***Aphis (Protaphis) striata* (Hille Ris Lambers 1967) = *Aphis (Protaphis) picridicola* Holman 1966**

These three descriptions, of an *Aphis (Protaphis)* species on basal parts of composite plants in former Czechoslovakia, Italy and Germany respectively, were published in close succession. The BMNH collection has paratypes of all three and they are clearly all the same species. All three descriptions include apterous viviparae and oviparae. Holman and Müller both described the apterous males. This aphid lives in ant-attended colonies on the roots and at bases of radical leaves of a closely-related group of plant genera; *Picris*, *Hypochaeris* and *Leontodon* (Hypochaeridinae).

***Aphis senecionisdoriae* ssp. *fluviatilidis* Bozhko 1976 = *Aphis jacobaeae* Schrank 1801**

*A. senecionisdoriae* Bozhko 1953 is regarded as a synonym of *A. jacobaeae* (Remaudière & Remaudière 1997). Another population, collected in Ukraine on *Senecio fluviatilis* and named as *A. senecionisfluviatidis* but not described by Bozhko in 1959, was validly described as *A. senecionisdoriae* ssp. *fluviatilidis* in 1976, but also seems to be a synonym of *A. jacobaeae*.

***Aphis tahosalea* Hottes and Werhle 1951 = *Aphis sedi* Kaltenbach 1843**

Paratypes of *A. tahosalea*, described from *Bryophyllum pinnatum* (Lam.) Oken (= *Kalanchoe pinnata* Pers.) (Crassulaceae), a non-indigenous plant in Arizona, were borrowed from the USNM collection and found to be *A. sedi*, a widely-distributed species on Crassulaceae.

***Aphis turkestanica* Kadyrbekov 2001 = *Aphis ucrainensis* Zhuravlyov 1997**

Zhuravlyov (1997) described all morphs of a black-backed *Aphis* of the *craccivora* group living on *Spiraea* in Ukraine, characterised by regular presence of marginal tubercles on abdominal segments 2–4, short antennal process terminalis, short siphunculi and a cauda with 6–11 hairs. The apterous virginoparae described by Kadyrbekov (2001a) from *Spiraea* in south-eastern Kazakhstan correspond closely with those described by Zhuravlyov.

***Aphis verbenae* Nevsky, 1929, nec. Macchiati, 1883 = *Aphis mamonthovae* Davletshina 1964**

*A. verbenae* Nevsky is a junior homonym of *A. verbenae* Macchiati 1883, which is probably *Brachycaudus helichrysi* (Kaltenbach). *A. mamonthovae* Davletshina is given as a possible synonym in Remaudière and Remaudière (1997), and we here adopt this name as the valid one for the species. It is closely related to the *A. frangulae* group, and European records of *frangulae* from *Verbena* are probably referable to this species, which is also recorded from N Africa (Ethiopia), Middle East (Lebanon, Turkey), C Asia and N India (BMNH collection, leg. S.S. Sekhon).

***Aulacorthum capilanoense* Robinson 1969 = *Amphorophora forbesi* Richards 1959**

The original description of *Aulacorthum capilanoense*, and specimens from *Rubus spectabilis* from various places and dates in British Columbia and Oregon, agree with a paratype of *Amphorophora forbesi*, described from *R. spectabilis* from Lulu Is, British Columbia. This species has an unusual combination of characters (rather large size, spiculate ventral side to head, steep-sided antennal tubercles, no rhinaria on antennal segment III, slightly swollen siphunculi and a rather hairy cauda), so its generic position is not certain.

***Berberidaphis nepetae* Mukhamediev in Narzikulov & Mukhamediev, 1967 = *Eucarrazia elegans* (Ferrari, 1872)**

*Eucarrazia elegans* is a distinctive species feeding on *Mentha* and other Labiatae, and now occurring in four continents. *Berberidaphis nepetae*, described from apterae on *Nepeta* in Central Asia, is quite clearly this species.

***Bipersona hottesi* Knowlton & Smith 1936 = *Eomacrosiphum nigromaculosum* (MacDougall 1926)**

*E. nigromaculosum* is a very distinctive species occurring on stems of wild and cultivated *Rosa* spp. in western N America. Apteratae are bright red with black dorsal abdominal bands or patches, black SIPH held at right-angle to body, and black and yellow legs. We can find

no significant differences between this species and the description of *Bipersona hottesi*, found on wild *Rosa* in Utah, other than the twisted cauda of the latter, so assume that this was an artefact of the mounting process.

***Brachysiphoniella graminivora* Zhang & Zhang 2000 = *Brachysiphoniella montana* (van der Goot 1917)**

*Brachysiphoniella graminivora*, described from unidentified grasses in China (L. Zhang and G. Zhang, 2000a), has no clear features distinguishing it from the common grass-feeding east Asian species *B. montana*, apart from the quadrangular “anal” (subgenital?) plate, which is likely to be an ovipariform character.

***Brevicoryne crambinistataricae* Bozhko 1953 = *Brevicoryne crambe* Bozhko 1950**

Remaudière and Remaudière (1997) synonymised *B. nigrisiphunculata* Hodjat 1981 with *B. crambinistataricae* Bozhko. This latter name had previously been considered a synonym of *B. crambe*, but Szelegiewicz (1979) applied it to specimens collected in Armenia that were clearly distinct from *crambe*. However, the description, illustrations and measurements given by Bozhko (1953) for *B. crambinistataricae* more clearly relate to *B. crambe* Bozhko than to *nigrisiphunculata*, and a type specimen of *B. crambinistataricae* in the BMNH colln (“Bozhko 62”) is *B. crambe* (possibly Bozhko had a mixture of the two species). On the other hand, the description given by Szelegiewicz for the Armenian material clearly relates to *B. nigrisiphunculata*, described from Iran.. We therefore propose that *B. nigrisiphunculata* is the valid name for the species with jet black siphunculi much shorter than cauda, and long blunt dorsal hairs, and that *B. crambinistataricae* should be regarded as a synonym of *B. crambe*.

***Capitophorus tanensis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Capitophorus rhamnoides* Zhang, Chen, Zhong & Li, in Zhang 1999**

Paratypes of the two species, both described from *Hippophae rhamnoides* in north-west China, have been compared. *C. tanensis* (collected 30.ix.80) seems to be the autumn form of *C. rhamnoides* (collected 11.vii.86), which has page priority.

***Carolinaia (Glabromyzus) quednau* Remaudière & Muñoz Viveros 1992 = *Rhopalomyzus (Judenkoa) lonicerae* (Siebold 1839)**

The synonymy was established after examining the type material of *quednau* in the BMNH collection, collected on *Phleum pratense* in Quebec. *R. lonicerae* host-alternates between *Lonicera* and grasses, and has a holarctic distribution.

***Cavariella yuzhongensis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Cavariella largispiracula* Zhang, Chen, Zhong & Li, in Zhang 1999**

The synonymy was established after examining type specimens of these two nominal species, both collected from *Angelica sinensis* (Oliv.) Diels in Gansu, China. *C. largispiracula* has page priority.

***Cavariella zhangi* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Cavariella (Cavariella) aquatica* (Gillette & Bragg 1916)**

Synonymy was established after examining type specimens of *C. zhangi*, from an unknown host in Xinjiang, China. *C. aquatica* occurs in Europe, Asia and N America, but there appear to be no previous Asian records east of India.

***Ceruraphis hippophaetropis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tenuilongiaphis stata* Zhang, in Zhang & Zhong 1993**

Types of *Ceruraphis hippophaetropis*, described from gynoparae and an ovipara from *Hippophae rhamnoides*, were examined and agree in chaetotaxy, antennae, rostrum and tarsi with *Tenuilongiaphis stata* Zhang, described from apterae collected on *Artemisia*. Host alternation presumably occurs between *Hippophae* and *Artemisia*. (See also under *Sportaphis sporta*.) Types of both nominal species have been examined. *Sportaphis sporta* Zhang et al 1999 described from an unidentified shrub appears to be the fundatrix of the same species, implying host alternation between *Hippophae* and *Artemisia*. Types of all three nominal species have been examined.

***Chaetosiphella pamirica* Narzikulov 1970 = *Chaetosiphella stipae* Hille Ris Lambers 1947**

Nothing could be found in the description of *C. pamirica*, described from *Acantholimon pamiricum* Czerniak in C Asia, to distinguish it from *C. stipae* Hille Ris Lambers, which occurs on *Stipa* spp. in Europe (Austria, Switzerland, Czech Republic, France), C Asia and Mongolia (BMNH collection, leg. H Szelegiewicz).

***Coloradoa artemisiae* ssp. *artemiscicola* Takahashi 1965 = *Coloradoa campestrella* Ossiannilsson 1959**

Takahashi, describing *artemiscicola* as a subspecies of *C. artemisiae* in Japan, noted that it was close to *C. campestrella* but distinguished it by “ultimate rostral segment distinctly longer (1.2–1.3 times) second segment of hind tarsus”. The range for this ratio in European apterae of *campestrella* is 1.1–1.3, and no other distinguishing features could be found. *C. campestrella* is therefore a species that feeds on numerous *Artemisia* spp., with a range extending from Europe across Asia to Pakistan, China, Korea and Japan.

***Cyrtomyzus Gredina 1995 = Myzus (Prunomyzus) Hille Ris Lambers & Rogerson, 1946***

***Cyrtomyzus pedicularis Gredina 1995 = Myzus (Prunomyzus) padellus Hille Ris Lambers & Rogerson, 1946***

The description of *C. pedicularis*, from *Pedicularis resupinata* L. in the Russian Far East, agrees well with small specimens of *Myzus padellus*, which mostly host-alternates between *Prunus* and *Galeopsis* but also occurs in summer on *Pedicularis* and *Rhinanthus* (Scrophulariaceae), and is already known from Korea as well as Europe and west Siberia. *Cyrtomyzus* was distinguished from *Myzus* by having a gibbous genital plate, but this is also a feature of *M. padellus*.

***Desiforda Zhang, Qiao & Cheng, in Zhang 1999 = Pemphigus Hartig 1839***

Type material of *Desiforda echinochloaphaga* was examined and found to be a typical *Pemphigus*.

***Diuraphis (Holcaphis) agropyronophaga Zhang, 1991 = Diuraphis (Holcaphis) tritici (Gillette, 1911)***

*Diuraphis tritici* was described from North America, and is also recorded from Peru, but possibly originated from East Asia, where it is recorded from China, Tibet and Mongolia. *D. agropyronophaga* described from China is clearly this species. Zhang *et al.* (1991) made the interesting observation that it was able to colonise wheat (*Triticum* sp.) in fields treated with 2,4-D herbicide, because this curls wheat leaves and thus provides a suitable microclimate for the aphid.

***Dysaphis albocinerea (Hille Ris Lambers, 1956) = Dysaphis emicis Mimeur (1935)***

***Dysaphis rheicola Daniyarova in Mamontova and Daniyarova, 1971 = Dysaphis emicis Mimeur (1935)***

Synonymy of *D. albocinerea* with *D. emicis* was proposed by Shaposhnikov (1964). The description of *D. rheicola* also does not distinguish it from *D. emicis* on the same host.

***Evallocotaphis Zhang & Qiao 1998 = Myzodium Börner 1949***

The genus *Evallocotaphis* was erected for one species (*lutescens*) described from *Carissa spinarum* in Fujian Province, China, and subsequently collected from a species of Compositae (G. Qiao, personal communication). This aphid has all the characteristics of moss-feeding aphids of the genus *Myzodium*, and its true host is more likely to be a moss.

***Himalayaphis sorbarisorbifoliae* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chusiphuncula sorbarisucta* Zhang, in Zhang & Chen 1998**

Paratypes of *H. sorbarisorbifoliae* could not be distinguished from the holotype of *C. sorbarisucta*, described from the same plant species in China.

***Hyperomyzus (Neonasonovia) fronki* (Knowlton 1945) = *Hyperomyzus (Neonasonovia) petiolaris* (Knowlton & Allen 1945)**

The BMNH collection has paratypes of both these species, both described in the genus *Amphorophora* in the same year from *Ribes* in western USA. No differences could be found to justify separate species status. The description of *petiolaris* antedates that of *fronki*, which has been placed as a subspecies of *H. (N.) nabali* (Oestlund) in recent catalogues.

***Indomasonaphis indica* Verma 1971 = *Indomasonaphis anaphalidis* (Basu 1964)  
*Indumasonaphis tuberculata* Chakrabarti, Mandal & Raha 1983 = *Indomasonaphis anaphalidis* (Basu 1964)**

*Indomasonaphis anaphalidis* was originally described from *Anaphalis triplinervis* in West Bengal, and has since been recorded from various other Compositae. These are the secondary host generations of a host-alternating aphid with *Rhododendron* as the primary host. The primary host generations were described from northern India as both *Indomasonaphis indica* and *Indumasonaphis tuberculata*. It is also recorded from *Rhododendron* in Pakistan (Naumann-Etienne & Remaudière 1995, as *Neomasonaphis tuberculata*).

***Liosomaphis turanica* Narzikulov, 1960 = *Liosomaphis berberidis* (Kaltenbach, 1843)**

We have been unable to find any characters in the published descriptions of *L. turanica* (Narzikulov 1957, as *Rhopalomyzus? berberidis*, and Narzikulov 1960) to distinguish this species from *L. berberidis*, the measurements given all falling within the range of variation of that species.

***Lipaphis berteroella* Mamontova 1979 = *Lipaphis (Lipaphidiella) ruderalis* Börner 1939**

The description of *L. berteroella*, from *Berteroa incana* and *Lepidium ruderales* in Ukraine, does not distinguish it from *L. ruderalis* occurring on *Lepidium* spp. in eastern Europe, and also more recently recorded from China (Tao 1999).

***Macrosiphoniella aqua* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Macrosiphoniella (Phalangomyzus) grandicauda* Takahashi and Moritsu**

Paratypes of *M. aqua*, described from *Artemisia selengensis* in north-west China, seem to be small specimens of *M. grandicauda*, an aphid found on *Artemisia* spp. in Japan, China, Korea, east Siberia, India and Nepal.

***Macrosiphoniella chita* Pashtshenko 1999 = *Macrosiphoniella saussureae* Holman & Szelegiewicz 1978**

*M. chita* described from *Saussurea salicifolia* in the Russian Far East has the same morphology featuring adaptations for ant attendance as *M. saussureae*, described from the same host in Mongolia, and there can be little doubt that they are the same species.

***Macrosiphoniella jinghuali* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Macrosiphoniella oblonga* (Mordvilko 1901)**

After examining paratypes of *M. jinghuali* we conclude that it is a synonym of *M. oblonga*, a large aphid on *Artemisia* common in Europe and across Asia to Japan and Taiwan. Several other Asian populations with close resemblance to *oblonga* have been given the status of separate species; *M. hidaensis* Takahashi & Moritsu in Japan and east Siberia, *M. paraoblonga* Basu & Raychudhuri in India, and *M. similioblonga* Zhang in China (also recorded from Korea; Lee *et al.* 2002). Further work is needed to show that these are not all one geographically variable species.

***Macrosiphoniella sensorinuda* Zhang 1992 = *Macrosiphoniella lijiangensis* Zhang 1992**

*M. sensorinuda* is described in the same paper and from the same host (*Artemisia vulgaris* L.) as *M. lijiangensis*, and is distinguished as having shorter siphunculi and cauda. We have examined paratypes of both species, and conclude that there must have been an error in measuring these characters in the description of *M. sensorinuda*, and that it is a synonym of *M. lijiangensis*, which has page priority.

***Macrosiphum cockerelli* Hottes 1950 = *Macrosiphum rudbeckiarum* (Cockerell 1903)**

Hottes (1949) gave a very full description of an aphid from *Rudbeckia* that he identified as *Macrosiphum rudbeckiarum* (Cockerell). However, Hottes (1950) subsequently applied the name *M. cockerelli* to his aphid, in deference to M.A. Palmer, who had pointed out to him that the type alata of *rudbeckiarum* had fewer rhinaria. However there are no other significant differences, and no alatae with such low rhinarial numbers have since been collected, so it is highly unlikely that there are two separate species.

***Macrosiphum corallinum* Theobald 1925 = *Macrosiphum cholodkovskyi* (Mordvilko 1909)**

The type specimen of *Macrosiphum corallinum* agreed with samples identified by various European workers as *M. cholodkovskyi* in a multivariate morphometric analysis by Watson (1982), confirming the opinion of Hille Ris Lambers (1933). Theobald's aphid was "a most brilliant coral pink", and *M. cholodkovskyi* has a form of this colour.

***Macrosiphum sileneum* Theobald 1913 = *Macrosiphum stellariae* Theobald 1913**

Theobald described *Macrosiphum sileneum* from *Silene* in the same paper as *M. stellariae* from *Stellaria*, the latter having page priority. Synonymy has long been suspected (Börner, 1952; Heie, 1994). Material under both names in the Theobald collection, and samples subsequently collected from both plant genera, showed no consistent differences and clustered together in a multivariate analysis by Watson (1982)..

***Macrosiphum subarcticum* Robinson 1979 = *Macrosiphum valerianae* (Clarke 1903)**

Paratypes of *M. subarcticum*, described from *Epilobium angustifolium* in northern Manitoba, agree fully with other material from this host in Canada in the BMNH collection identified by several authors as *M. valerianae*. Types of *valerianae* are lost, and Robinson suggested that it should be regarded as a nomen dubium, but there is no adequate justification for this, and this species is relatively well-known as *valerianae* in western USA (e.g. Palmer, 1952; Antolin & Addicott, 1988).

***Metopolophium graminum* Raychaudhuri, L.K. Ghosh & Das 1980 = *Metopolophium chandrani* David & Narayanan 1968**

The description of *M. graminum* from unidentified Gramineae in Himachal Pradesh, India does not provide any characters to differentiate it from *M. chandrani*, described earlier from grasses in the same state. As both descriptions are of apterae with an unusually high number of rhinaria on antennal segment III, it is extremely likely that they are conspecific.

***Metopolophium humulisuctum* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Rhodobium porosum* (Sanderson, 1900)**

*Metopolophium humulisuctum*, reportedly collected on *Humulus lupulus*, are presumed vagrants of the widely-distributed rose-feeding species. The type specimen of *M. humulisuctum* examined has only 4 and 5 rhinaria on antennal segment III, but such low numbers have been seen in specimens of *Rh. porosum* from Australia, New Zealand and Nova Scotia. The worldwide range is 4–15, with the majority (68%) having 5–11.

***Metopolophium simlaense* (Chakrabarti & Raychaudhuri, in Chakrabarti, A.K. Ghosh & Raychaudhuri 1974) = *Metopolophium chandrani* (David & Narayanan 1968)**

Synonymy was established after examining paratypes of both species in the BMNH collection. Both were described from grasses in Himacahal Pradesh, India.

***Metopolophium sonchifoliae* Raychaudhuri, L.K. Ghosh & Das 1980 = *Acyrtosiphon rubi* Narzikulov 1957**

The description of *Metopolophium sonchifoliae*, collected on *Sonchus* sp. and undetermined Rosaceae in Himachal Pradesh, India, does not distinguish it from *A. rubi*, and it was subsequently recorded from a more likely host, *Rubus ulmifolius*, with an appropriate chromosome number for an *Acyrtosiphon*,  $2n=10$  (Pal & Khuda-Bukhs, 1982).

***Micromyzodium clinopodii* ssp. *minensis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chaetosiphon* (*Chaitomyzus*) *hirticorne* (Takahashi 1960)**

The type specimens of *M. clinopodii* ssp. *minensis*, described from an unidentified labiate in China, agree well with cotype specimens of *C. hirticorne* from *Clinopodium* in Japan.

***Micromyzus brachiariae* A.K. Ghosh 1978 = *Pentalonia gavarri* Eastop 1967**

Specimens in the BMNH collection presumed to have been collected from *Brachiaria* sp. (although the host-plant is not explicitly stated) in India (Assam), and having the same data as those in the published description of *Micromyzus brachiariae*, show close agreement with *Pentalonia gavarri* Eastop, occurring on grasses in south-east Asia and Australia.

***Micromyzus granotiae* A.K. Ghosh, M.R. Ghosh & Raychaudhuri 1970 = *Kaochiaoja arthraxonis* (Takahashi 1921)**

We place *Micromyzus granotiae*, described from *Garnotia* sp. (?) in West Bengal, as a synonym of *Kaochiaoja arthraxonis* because it is clearly part of the same group, although it was described as dark brown in life with a dusky head and a coating of wax, whereas *K. arthraxonis* was described as shining dark brown with yellowish brown head. Apteræ of Japanese populations on various Gramineae (e.g. *Microstegium*, *Digitaria*) currently regarded as *K. arthraxonis* were described as salmon pink to reddish brown in life, with a black head and dorsal abdominal patch (Miyazaki 1971, as *K. pollinae*). Further work is needed to establish whether or not this is all one variable species.

***Microsiphum wahlgreni* Hille Ris Lambers 1947 = *Microsiphum jazykovi* Nevsky 1928**

This synonymy was proposed more than 50 years ago by Börner (1952), and seems entirely valid, but was not adopted in subsequent catalogues.

***Mimeuria graminiradicis* Zhang, in Zhang & Qiao, 1997 = *Tetraneura nigriabdominalis* (Sasaki)**

Synonymy was established after studying type material of *Mimeuria graminiradicis* from the IOZ-CAS collection.

***Myzus asparagophagus* Zhang, Chen, Zhong and Li, in Zhang 1999 = *Myzus persicae* (Sulzer 1776)**

Synonymy was established by examining paratypes from the IOZ-CAS collection.

***Myzus asterophaga* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Metopolophium dirhodum* (Walker 1849)**

A slide from the IOZ-CAS collection labelled as type material of *Myzus asterophaga* has an aptera of *Myzus persicae* and an alata of *Metopolophium dirhodum*. The first description in the published account (Zhang, 1999) is of an alata and clearly applies to *M. dirhodum*, followed by a shorter description which is applicable to *Myzus persicae*.

***Myzus lagerstroemiae* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Myzus persicae* (Sulzer 1776)**

Synonymy was established by examining paratypes from the IOZ-CAS collection.

***Myzus leptotrichus* David, Rajasingh & Narayanan 1972 = *Myzus formosanus* Takahashi 1923**

Synonymy was established by comparing paratypes of *M. leptotrichus* from West Bengal in the BMNH collection with specimens from Taiwan identified by Takahashi.

***Myzus papaverisucta* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Myzus persicae* (Sulzer 1776)**

Synonymy was established by examining paratypes from the IOZ-CAS collection.

***Neoacyrthosiphon* Tao 1963 = *Ericolophium* Tao 1963**

Tao erected *Ericolophium* for *Macrosiphum itoe* Takahashi, but then erected *Neoacyrthosiphon* for a second species that Takahashi described from *Rhododendron* in Taiwan, *Macrosiphum holsti*, mistakenly claiming that it differed by lack of a median frontal tubercle.

Hille Ris Lambers and Basu (1966) pointed out the error and placed *Neocyrtosiphon* as a subgenus of *Ericolophium*, but it was given full generic status again by Ghosh and Raychaudhuri (1969). They distinguished *Neocyrtosiphon* from *Ericolophium* by (1) tarsi with spinulose imbrication and (2) apterae with papillate sculpturing of tergum. However, both characters vary greatly in the degree to which they are manifested in different species within the group, and specimens of *Ericolophium itoe* in BMNH from Taiwan have minute spinules on the second tarsal segments. We therefore see no justification for retaining the name *Neocyrtosiphon*.

***Neomasonaphis* Ghosh & Raychaudhuri 1972 = *Indomasonaphis* Verma 1971**

In this paper we place *Indomasonaphis indica* Verma and *Indomasonaphis tuberculata* Chakrabarti, Mandal & Raha as synonyms of *Masonaphis anaphalidis* Basu, which is the type species of *Neomasonaphis* Ghosh & Raychaudhuri. Accordingly *Neomasonaphis* becomes a synonym of the earlier generic name *Indomasonaphis*.

***Neomasonaphis rhododendris* Chakrabarti, Mandal & Raha 1983 = *Ericolophium holsti* (Takahashi 1935)**

In the key to Himalayan *Rhododendron*-feeding aphids by Chakrabarti *et al.* (1983), *Neomasonaphis rhododendris* is distinguished from *Ericolophium holsti*, described from *Rhododendron* in Taiwan, by first tarsal segments with 5 hairs (allegedly 4 in *holsti*, although 5 in the original description), last rostral segment with 18–20 accessory hairs (allegedly 10–12 in *holsti*, although not mentioned in original description) and faintly papillate (as opposed to papillate) tergum. We have been unable to distinguish paratype apterae of *rhododendris*, and other apterae from India in the BNMH colln (leg. D Hille Ris Lambers) previously identified as *holsti*, from the original description of *holsti*. Two alatae of *holsti* from Taiwan (leg. R Takahashi) differ from a paratype alata of *rhododendris* only in presence of a few rhinaria on antennal segment IV and a somewhat longer, thinner cauda.

***Netubusaphis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Longicaudus* van der Goot 1913**

*Netubusaphis netuba* was described from fundatrices of a *Longicaudus* and distinguished by the absence of siphunculi. A characteristic feature of this genus is that the fundatrices do not have siphunculi. The type material examined included immatures of the second generation and these had short siphunculi typical of *Longicaudus*. Without published descriptions or specimens of the fundatrices of other *Longicaudus* species in the region it is not clear whether *L. netuba* is a distinct species; it is possibly a synonym of *L. naumanni*.

***Parathecabius stammeri* Zwölfer 1957 = *Mordvilkoja vagabunda* (Walsh, 1863)**

Paratypes of *stammeri* in the BMNH collection from roots of *Lysimachia vulgaris* in Germany agree well with exules of *Mordvilkoja vagabunda* from *Lysimachia* spp. in North America, which were unknown until Smith (1971) discovered its life cycle. This aphid has a sexual phase on native North American *Populus* of the *deltoides* group. The population in Germany was anholocyclic (Zwölfer 1957).

***Piceaphis* Zhang, Chen, Zhong & Li 1999 = *Macrosiphoniella* Del Guercio**

The holotype of *Piceaphis piceaphis*, described from *Picea* sp. in NW China (Zhang *et al.* 1999), has been examined and found to be a *Macrosiphoniella*, close to *M. nitida* Börner which feeds on *Artemisia*. Although *Picea* is unlikely to be a normal host, it is of interest to note that the somewhat similar species *M. sejuncta*, an *Achillea* feeder, was also originally described from a conifer, *Cedrus libani* (as *Larix cedrus*; Walker 1848).

***Placoaphis siphunculata* Richards 1961 = *Ericaphis wakibae* (Hottes 1934)**

This synonymy was proposed by C.F. Smith (Remaudière & Remaudière, 1997). *P. siphunculata* was described from alate specimens on *Rosa* in British Columbia. Comparisons with alatae from several samples of *E. wakibae* from British Columbia collected by C.-k. Chan, and with the introduced UK population, support the synonymy.

***Pleotrichophorus acanthovillus* (Knowlton & Smith 1936) = *Pleotrichophorus utensis* (Pack & Knowlton 1929)**

*P. acanthovillus* has been distinguished from *P. utensis* occurring on the same hosts (*Chrysothamnus viscidiflorus* and *Gutierrezia* spp.) in western USA solely on the basis of differences in shape of dorsal hairs in apterae, and in particular the subapical caudal hair(s), which are said to be pointed in apterae of *acanthovillus*, and flattened apically in *utensis* (Corpuz-Raros & Cook 1974). This character is unreliable as it is related to the degree of alatiformity, alatae having longer and less expanded hairs than apterae.

***Pleotrichophorus rusticatus* (Knowlton & Smith 1937) = *Pleotrichophorus pullus* (Gillette & Palmer 1933)**

*P. rusticatus* was regarded as a synonym of *P. pullus* by Hille Ris Lambers (1969). Corpuz-Raros & Cook (1974) resurrected *P. rusticatus* as a good species on the basis of differences in shape of the frontal hairs, but after examining types of both, we think this is probably only local variation.

***Polygonaphis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Aspidaphis* Gillette 1917**

***Polygonaphis avicularisucta* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Aspidaphis adjuvans* (Walker 1848)**

The description of *avicularisucta* fits the alate vivipara of the widely distributed species *Aspidaphis adjuvans*, which feeds specifically on *Polygonum aviculare*.

***Radiaphis* Pashtshenko 2000 = *Chitinosiphum* Yuan & Xue 1992**

***Radcisiphum* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chitinosiphum* Yuan & Xue 1992**

***Radiaphis saussureae* Pashtshenko 2000 = *Chitinosiphum abdomenigrum* Yuan & Xue 1992**

In independently recognising a new east Asian genus of aphids feeding on roots and stem-bases of Compositae, Zhang *et al.* (in Zhang 1999) and Pashtshenko (2000) overlooked a short paper on a new genus and species on *Saussurea nigrescens* in China (Yuan & Xue 1992), the description of which agrees closely with that of an aphid described from a plant of the same genus in east Russia (Amur Province). Pashtshenko (2000) provided a key to five species of this new genus.

***Radcisiphum cirsomilos* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chitinosiphum cirsorhizum* (Zhang, Chen, Zhong & Li, in Zhang 1999, as *Aulacorthum*)**

Synonymy was established by examining holotypes of both species from the IOZ-CAS collection. The description of *Aulacorthum cirsorhizum* has page priority.

***Rhodiolaphis cholsunensis* Ivanoskaya 1975 = *Brachycaudus* (*Thuleaphis*) *sedi* (Jacob 1964)**

The species described and illustrated as *Rhodiolaphis cholsunensis* from *Rhodiola* (= *Sedum*) *rosea* (L.) Scop. in west Siberia agrees well with *Brachycaudus* (*T.*) *sedi*, occurring on this host in western Europe. The generic synonymy was noted in Remaudière and Remaudière (1997).

***Rhopalosiphoninus sensoriatus* Chakrabarti 1978 = *Eucarazzia elegans* (Ferrari, 1872)**

The description of *R. sensoriatus*, from an unidentified tree in north-west India agrees fully with *Eucarazzia elegans*, a distinctive, widely-distributed species on Labiatae. The considerable variation in numbers of rhinaria on antennal segments III–V in apterae of this species is probably related to the degree of alatiformity.

***Rhopalosiphoninus sorbariasuctus* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chusiphuncula sorbarisucta* Zhang 1998**

No significant differences could be found between the holotype of *sorbariasuctus*, described from *Sorbaria* in China, and paratypes of *Chusiphuncula sorbarisucta*.

***Rhopalosiphoninus yuzhongensis* Zhang, Chen, Zhong & Li 1999 = *Liosomaphis ornata* Miyazaki 1971**

The synonymy was established after comparing paratypes of both species.

***Sappaphis montana* Zhang, Chen, Zhong & Li 1999 = *Sappaphis sinipiricola* Zhang 1980**

*S. sinipiricola* was described from apt. and al. collected on *Pyrus* in Henan Province, China, in May, and subsequently recorded from *Artemisia* (Zhang *et al.* 1999). Paratypes of *S. montana* have been studied and appear to be gynoparae of this species. (Two other new species in the same publication, *S. albae* described from early-summer exules on *Artemisia*, and *S. angelicograstis* described from late-summer exules and gynoparae, may also be seasonal forms of *S. sinipiricola*, which is itself very close to *S. piri*.)

***Schizaphis laingi* Eastop 1956 = *Schizaphis nigerrima* (Hille Ris Lambers 1931)**

*Schizaphis laingi*, described from undetermined grasses in western UK, was distinguished from *S. nigerrima* by frequent presence of marginal tubercles on abdominal segments 2–6, a shorter antennal process terminalis, and more caudal hairs. Subsequent UK collections suggest that these differences are seasonal.

***Schizaphis siniscirpi* Zhang 1983 = *Schizaphis piricola* (Matsumura 1917)**

After examining type specimens of *S. siniscirpi* Zhang we find that they agree with the description of the secondary host form of *S. piricola* by Miyazaki (1988).

***Schizaphis viridirubra* (Gillette and Palmer 1932) = *Schizaphis* (*Paraschizaphis*) *nigra* (Baker 1918)**

Eastop (1961) pointed out the similarity between *nigra* and *viridirubra* after examining type material, and the fact that both share the unusual character of consistent presence of large marginal tubercles on abdominal segment 6 suggests that they are conspecific. *S. nigra* has previously been placed in subgenus *Paraschizaphis*, due partly to confusion with short-haired specimens of *S. caricis*.

***Schizoneurella gei* Bozhko 1979 = *Eriosoma japonicum* (Matsumura 1917)**

From Bozhko's description it appears that his species, described from *Geum* in the Russian Far East, is a synonym of *E. japonicum*, exules of which feed on roots of *Geum* and certain other Rosaceae in Japan and China.

***Sitobion chanikiwiti* (Eastop 1959) = *Sitobion leelamaniae* (David 1958)*****Sitobion howlandae* (Eastop 1959) = *Sitobion leelamaniae* (David 1958)**

*S. leelamaniae* was described from grasses and cereals (*Eleusine*, *Pennisetum*, *Sorghum*) in southern India. It has since been recorded from Sri Lanka and there is also a record from Africa (Cameroon). The African species *S. chanikiwiti* and *S. howlandae* described one year later are very similar, occur on a similar range of hosts, and are not reliably distinguishable on slides from *leelamaniae*. The observed differences in colour in life and in the form and length of hairs between *S. chanikiwiti* and *S. howlandae* may be ascribable to genetic polymorphism and/or environmental influences. Populations identified as *S. chanikiwiti* are widely distributed in eastern Africa, with a record also from Réunion, and a possible host-alternation in Burundi with *Hagenia abyssinica* as primary host (Remaudière & Autrique 1985). It seems probable that the aphid described from south India is an anholocyclic population of a *Sitobion* native to Africa. In the absence of any evidence to the contrary we propose that both *chanikiwiti* and *howlandae* should be treated as synonyms of *leelamaniae*.

***Sitobion javanicum* Noordam 2004 = *Sitobion graminis* Takahashi 1950**

Paratypes of *S. javanicum* in the BMNH collection, described from *Themeda arguens* (L.) Hack. in Java could not be distinguished from specimens of *S. graminis*, a species widely distributed on Gramineae in South-East Asia. *S. javanicum* was described as shiny brownish red, whereas *S. graminis* is typically wax-dusted in life, but this condition may vary according to age and humidity.

***Sportaphis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tenuilongiaphis* Zhang, in Zhang & Zhong 1993*****Sportaphis sporta* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tenuilongiaphis stata* Zhang, in Zhang & Zhong 1993**

The type of *Sportaphis sporta*, described from an unidentified shrub in north-west China, appears to be the fundatrix of *Tenuilongiaphis stata*, described from apterae on *Artemisia*. Autumn forms of this species on *Hippophae* were described as *Ceruraphis hippophaetrophis* (q.v.), so it is likely that the unidentified shrub was *Hippophae*.

*Surcaudaphis* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tuberocephalus* Shinji 1929

*Surcaudaphis supercauda* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tuberocephalus misakurae* Moritsu & Hamasaki 1983

The holotype and seven paratypes of *S. supercauda* were examined, and appear to be gynoparae of *T. misakurae*, which host-alternates between *Prunus* and *Dendranthema* in Japan and China.

*Taiwanomyzus darjeelingensis* M.R. Ghosh, R.C. Basu & D.N. Raychaudhuri 1977 = *Taiwanomyzus montanus* (Takahashi 1925)

M.R. Ghosh *et al.* described apterous specimens from *Astilbe rivularis* at Darjeeling, W Bengal as a new species, *T. darjeelingensis*, on the basis of a more rugose dorsal cuticle. The appearance of the cuticle can vary greatly according to the mountant and method of preparation, and the Indian specimens from *A. rivularis* at Darjeeling in the BMNH colln (leg. S.K. David) are clearly *T. montanus*.

*Tetraneura nigriabdominalis* of many authors nec. Sasaki, incl. Hille Ris Lambers, 1970 = *Tetraneura fusiformis* Matsumura

Hille Ris Lambers (1970) established that there were two species among samples of the “Rice Root Aphid” studied by Tanaka (1961) in Japan, but he unfortunately assigned the name *nigriabdominalis* to the wrong species, resulting in ongoing nomenclatural confusion. All African records of *T. nigriabdominalis* as well as many of those from Asia (Blackman & Eastop 2000) should be referred to *T. fusiformis*, although past pest outbreaks on upland rice in Japan, and perhaps elsewhere in E Asia, were of the true *nigriabdominalis* (Akimoto, pers. comm.). Hille Ris Lambers (1970, as *T. nigriabdominalis*) distinguished several root-feeding populations on the basis of abdominal chaetotaxy, and erected a subspecies, *bispina* (which becomes *T. fusiformis* ssp. *bispina*, **new combination**), for his material from Africa and N America. However, this subspecies name cannot be usefully employed, as most of the African material in the BMNH collection does not conform to *bispina*, and there may be other clonal populations distributed around the world.

*Thelazacallis* Zhang in Qiao & Zhang 2000 = *Thecabius* Koch 1857

*Thelazacallis ranunculicola* Zhang in Qiao & Zhang 2000 = *Thecabius affinis* (Kaltenbach, 1843)

Paratypes of *T. ranunculicola* were examined and appear to be apterous exules of *Thecabius affinis*, which occurs widely on *Ranunculus* roots across Eurasia, with *Populus* spp. as primary hosts.

***Therioaphis cana* Zhang, Chen, Qiao & Zhong, in Zhang 1999 = *Therioaphis trifolii* (Monell 1882)**

Holotype and paratypes were examined and are part of the world-wide complex of populations placed under the name *trifolii* (see Blackman & Eastop 2000).

***Titanosiphon baichengense* Zhang 1985 = *Titanosiphon dracunculi* Nevsky 1928**

We have examined the types of *T. baichengense*, and cannot find any characters that distinguish it from *T. dracunculi*.

***Titanosiphon bellicosum* Nevsky 1928 = *Titanosiphon neoartemisiae* (Takahashi 1921)**

Takahashi (1931) synonymised *T. bellicosum* with *T. neoartemisiae*, and the two original descriptions agree closely, but this synonymy has not appeared in catalogues. Both authors described aphids with black tibiae, whereas specimens in the BMNH collection from Iran, Georgia, Afghanistan, India, Pakistan and Mongolia have very variable pigmentation, with tibiae sometimes dark but often quite pale.

***Titanosiphon benoisti* Balachowsky 1933 = *Titanosiphon minkiewski* Judenko 1931**

Both these species have been treated as synonyms of *T. artemisiae*. The alatae of *T. benoisti* are described as having 4 rhinaria on antennal segment IV, indicating synonymy with *minkiewski* (0–7 rhinaria on IV), rather than *artemisiae* (without rhinaria on IV).

***Titanosiphon kazakhstanicum* Kadyrbekov 2002 = *Titanosiphon minkiewski* Judenko 1931**

*T. kazakhstanicum* was distinguished from *T. artemisiae* by Kadyrbekov, but not from *T. minkiewski*, as this had been erroneously synonymised with *artemisiae*. Apterous paratypes of *kazakhstanicum* were examined, and have the relatively short last rostral segment indicating synonymy with *minkiewski*.

***Titanosiphon zaisanicum* Kadyrbekov 2002 = *Titanosiphon neoartemisiae* (Takahashi 1921)**

*T. zaisanicum* was distinguished from *T. neoartemisiae* (as *bellicosum*) only by differences in pigmentation and fewer hairs on abdominal tergite 8 (6–9 as opposed to 8–11 in *neoartemisiae*), but samples from Iran in BMNH colln have 6–11 hairs on abdominal tergite 8.

***Trichosiphonaphis* (*Xenomyzus*) *forsythiae* Zhang, Zhong & Zhang 1992 = *Trichosiphonaphis* (*Xenomyzus*) *polygonifoliae* (Shinji 1944)**

The description of *T. forsythiae* fits the spring forms of *T. polygonifoliae*. *Forsythia* is unlikely to be the true host of a *Trichosiphonaphis*.

***Tumoranuraphis cerasophila* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Tumoranuraphis indica* (Chakrabarti & Maity 1957)**

This synonymy, established after examining the holotype slide containing five oviparae from the IOZ-CAS collection, provides a generic name for the species described as *Avicennina indica*, which differs in many ways from *A. sogdiana*, the type species of *Avicennina*, and clearly does not belong in that genus (Blackman & Eastop 1994)..

***Unisitobion cirsiariston* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Chitinosiphum cirsiarhizum* (Zhang, Chen, Zhong & Li, in Zhang 1999, as *Aulacorthum*)**

Synonymy was established after examining holotypes of both species from the IOZ-CAS collection. An ovipara with barely swollen hind tibiae bearing few scent glands, indicating lack of host alternation, was on a slide labelled as the holotype of *Unisitobion cirsiariston*.

***Uroleucon acutirostre* Banziger 1980 = *Uroleucon budhium* (Banerjee, Ghosh and Raychaudhuri 1969)**

Paratypes of *U. acutirostre*, described from N Thailand, could not be distinguished from paratypes and other Indian specimens (leg. N.D. Rishi) of *U. tenuirostre* (= *budhium*?) in the BMNH collection, so if the synonymy of *tenuirostre* with *budhium* is correct, *acutirostre* should also be regarded as a synonym. However, the colour in life of *acutirostre* is recorded as dark blackish red, whereas *budhium* is described as pale brown with a dark brown head, raising some doubt about the original synonymy. The original description of *tenuirostre* did not record the colour in life.

***Uroleucon (Uromelan) adenophorica* Holman 1975 = *Uroleucon (Uromelan) adenophorae* (Matsumura 1918), but *Uroleucon (Uromelan) triphyllae* Miyazaki 1966 is a valid species**

Miyazaki described *Uroleucon triphyllae* from *A. triphylla japonica* in Japan, but subsequently synonymised his species with *adenophorae* Matsumura, although pointing out differences from Matsumura's description. Holman, in describing *U. adenophorica* as a new species, accepted this synonymy. From examination of paratypes and other material from Holman and Miyazaki in the BMNH collection it is clear that *adenophorica* is the Matsumura species, and that *U. triphyllae* Miyazaki should be reinstated as a valid species.

***Uroleucon altaicum* Szelegiewicz 1982 = *Uroleucon mulgedii* (Nevsky 1928)**

Nevsky described *U. mulgedii* from Uzbekistan, and it is since recorded from Ukraine (Bozhko 1976) and Bulgaria (Tashev 1967, as *Macrosiphum mulgedifolii*). Szelegiewicz described *U. altaicum* from *Cichorium intybus* in Mongolia. His description agrees very closely with the redescription of Nevsky's species by Holman (1991).

***Uroleucon aquaviride* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Macrosiphum euphorbiae* (Thomas 1878)**

Paratypes labelled as *U. aquaviride* from the IOZ-CAS collection could not be distinguished from the widely distributed polyphagous species *Macrosiphum euphorbiae*.

***Uroleucon (Uromelan) glomeratae* (Börner 1950) = *Uroleucon (Uromelan) rapunculoidis* (Börner)**

*U. glomeratae*, previously listed as a synonym of *nigrocampanulae*, seems from cotypes to be a synonym of *U. rapunculoidis*.

***Uroleucon yiliense* Zhang, Chen, Zhong & Li, in Zhang 1999 = *Sitobion miscanthi* (Takahashi 1921)**

The holotype of *U. yiliense*, described on the slide label as from *Dendranthema morifolium* in Xijiang, China, was examined and could not be distinguished *Sitobion miscanthi*, for which this is unlikely to be a true host.

***Viburnaphis pseudosensoriata* Pashtshenko 1988 = *Viburnaphis viburnicola* (Sorin 1983)**

Pashtshenko erected a new genus for a *Sappaphis*-like species on *Viburnum* in the Russian Far East. Synonymy with a species from *Viburnum* in Japan previously described in *Sappaphis* by Sorin was kindly confirmed by G. Remaudière after examination of type specimens of both species in his collection.

***Xerobion tashevella* (Eastop & Hille Ris Lambers 1976) = *Xerobion cinae* (Nevsky 1928)**

*X. tashevella* is a replacement name given to *Brachyunguis lambersi* Tashev by Eastop and Hille Ris Lambers (1976) when they transferred it to *Aphis* (*Absinthaphis*). Kadyrbekov (2001b) subsequently placed this *Artemisia*-feeding species in *Xerobion*. Tashev (1964) provided a detailed description, and we cannot find any characters to distinguish between his species, described from Bulgaria, and *X. cinae*, described from Central Asia and subsequently recorded from Moldova and eastward as far as Kashmir.

### Other nomenclatural changes

***Acyrtosiphon calvulum* Ossiannilsson 1958 to *Sitobion (Metobion)***

The reticulation of the SIPH and probable association with Gramineae indicate that this species belongs in the *Sitobion (Metobion)* group.

***Acyrtosiphon tutigula* (Hottes 1933) to *Pseudocercidis***

This species has previously been placed in *Kakimia* (Palmer 1952) and *Acyrtosiphon* (e.g. Blackman & Eastop 2000), but it has characters that place it with *Pseudocercidis rosae* Richards, the type species of this previously monotypic genus, and is likewise associated with *Rosa*.

***Aphis bozhkoeae* replacement name for *Aphis eupatorii* Bozhko 1976 nec Passerini 1863**

As pointed out by Barbagallo and Stroyan (1982), Bozhkos species is clearly distinct from *A. eupatorii* Passerini, and therefore needs a new name.

***Aphis neothalictri* Pashtshenko 1994—new status**

This aphid was described from Kamchatca as a subspecies of *A. thalictri* Koch, but the difference in antennal sensoriation of alatae as well as longer siphunculi indicate that it should have separate species status.

***Aulacorthum circumflexum zhangjiajiensis* Zhang 1992 to *Anaulacorthum* as full species**

*Anaulacorthum* is a previously monotypic genus close to *Aulacorthum*, but with 4 hairs on the first tarsal segments. *A. zhangjiajiense* was described from an unidentified composite plant in Hunan Province, China as a subspecies of *Aulacorthum circumflexum* (= *Neomyzus circumflexus*), but is quite distinct from that species and seems to fit well into this genus.

***Aulacorthum cirsorhizum* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Chitinosiphon***

See comments in previous section under *Radiaphis* and *Radicisiphum cirsomilos*.

***Aulacorthum aegopodii* Börner 1939—new status**

This aphid has previously been treated as a subspecies of *Aulacorthum solani*. It is found on *Aegopodium podagraria* in Europe (Netherlands, Germany), has a distinctive appearance in life (opaque creamy white with yellow spots at bases of the siphunculi), and has a monoecious life cycle on *A. podagraria*. In laboratory experiments it did not hybridise readily with *A. solani* (Müller 1976). Four alatae of in the BMNH collection have only 4–8 rhinaria on the third antennal segment, whereas the range for *A. solani* is 8–18, mostly (167 out of 188 specimens examined) 9–15. We accordingly give this taxon full species status.

***Avicennina indica* Chakrabarti & Maity 1957 to *Tumoranuraphis* Zhang, Chen, Zhong & Li, in Zhang 1999**

See comments in previous section under *Tumoranuraphis cerasophila*.

***Brachycolus jiyuguanensis* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Brevicoryne***  
The broadly triangular cauda and the many (15–19) thick hairs on the eighth abdominal tergite as well as the host association indicate that this species belongs in *Brevicoryne*.

***Brachyunguis cahuille* (Dickson 1940) reinstated**

Records of *Brachyunguis tetrapteralis* from *Suaeda* (e.g. Remaudière & Halbert 1996) should perhaps all be referred to *B. cahuille*, which has a dark, very swollen clypeus, shorter siphunculi than *B. tetrapteralis*, and a shorter antennal process terminalis.

***Brevicoryne nigrisiphunculata* Hodjat reinstated**

See comments under *Brevicoryne crambe* Bozhko in previous section.

***Chaetosiphon scalare* Richards to *Acyrthosiphon***

This change was proposed by Eastop (1971), but was not adopted in subsequent catalogues. The first tarsal segments have 3 hairs and, although the dorsal hairs are long with expanded apices, their form and arrangement suggests a closer relationship to *Acyrthosiphon* than to *Chaetosiphon*.

***Dysaphis fluviivis* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Aphis* (*Protaphis*)**

Paratype apterae examined have marginal tubercles on abdominal segments 1 and 7, antennal process terminalis shorter than base of segment VI, last rostral segment 1.3–1.4 times longer than second segment of hind tarsus, 2–5 rhinaria on antennal segment III and 0–2 on IV, and siphunculi about equal in length to the cauda which bears c.15 hairs. All these characters indicate that this species belongs in *Aphis* (*Protaphis*).

***Evallocataphis lutescens* Zhang & Qiao 1998 to *Myzodium***

See comment under *Evallocataphis* in previous section.

***Liosomaphis gansuensis* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Hyperomyzus* (*Neonasonovia*)**

As a result of examination of paratypes from the IOZ-CAS collection we conclude that this species belongs in *Hyperomyzus* (*Neonasonovia*).

***Liosomaphis rhododendrophila* Zhang, Zhong & Zhang 1992 to *Chaetomyzus***

Although not a typical *Chaetomyzus*, paratype alatae fit this genus of *Rhododendron* feeders better than they do *Liosomaphis*, which live on *Berberis*.

***Macrosiphoniella (Sinosiphoniella) buryatica* Pashtshenko 1999 to *Metopeurum***

This species was described from the eastern shore of Lake Baikal, colonising flower stems of *Tanacetum vulgare*, and attended by ants. Except for the long dorsal body hairs the description and biology closely match that of *Metopeurum fuscoviride* Stroyan, but this species has not yet been found so far east..

***Macrosiphoniella kuwakusae* Uye 1924 to *Micromyzodium***

Described in *Macrosiphoniella* and regarded as a *nomen dubium* in catalogues, but rediscovered by M Miyazaki (personal communication, 1979), who donated specimens to the BMNH collection.

***Macrosiphum penfroense* Stroyan 1979—new status**

This was described as a subspecies of *M. sileneum*, but the consistent differences in morphology and host plant indicate that it should have separate species status (Watson 1982).

***Metopolophium lacheni* Agarwala, Mondal & Raychaudhuri 1982—new status**

*Metopolophium lacheni* was described from *Rubus* sp. in Sikkim, India, as a subspecies of “*M. darjeelingense*” (sic) Raychaudhuri, MR Ghosh & Basu, which was actually described (from an unknown member of the Acanthaceae) by the name *M. darjilingense* (Raychaudhuri *et al.* 1978). Remaudière and Remaudière (1997) suggest that this should be regarded as a junior homonym of *M. darjeelingensis* L.K. Ghosh 1970. *M. darjilingense* Raychaudhuri, MR Ghosh & Basu is of uncertain generic position, whereas the description and host of *M. lacheni* are appropriate for a member of the genus *Metopolophium*, and distinguish it sufficiently from *darjilingense* to justify separate species status.

***Metopolophium rubifoliae* Raychaudhuri, Ghosh & Basu 1978 to *Acyrthosiphon***

Although *Acyrthosiphon* and *Metopolophium* are not very well-defined genera, the long antennal processus terminalis and long ultimate rostral segment, as well as the association with *Rubus*, suggest that this species is more appropriately placed in *Acyrthosiphon*.

***Microparsus (Picturaphis) pojanii* (Smith & Cermeli, 1979) to *Micromyzella***

This species clearly belongs in *Micromyzella* with other fern-feeding aphids having alatae with dark-bordered wing-veins.

***Myzus ascalonicus* Doncaster 1946 transferred to *Myzus* subgenus *Sciamyzus***

This widely distributed polyphagous species (the Shallot Aphid) has previously been placed in *Myzus* subgenus *Nectarosiphon*, but apart from the clavate siphunculi it has little in common with members of that subgenus. We consider it is more usefully placed in subgenus *Sciamyzus* along with the superficially rather similar aphid *M. cymbalariae*, although it has certain features (shape of siphunculi, shape of antennal tubercles, dorsal abdominal sclerotic pattern of alatae and peculiar antennal sensoriation of alatae) that set it apart from all other *Myzus* and, together with total absence of a sexual phase, suggest a possible hybrid origin.

***Myzus brevisiphon* A.N. Basu 1969 reinstated**

To judge from a paratype slide in the BMNH colln, the synonymy with *M. formosana* Takahashi proposed by Eastop and Hille Ris Lambers (1976) is incorrect.

***Myzus kawatabiensis* Miyazaki 1971 reinstated**

To judge from paratypes in the BMNH colln, the synonymy of this species with *M. formosanus* Takahashi (Eastop & Hille Ris Lambers 1976) is incorrect. *M. kawatabiensis* occurs on *Polygonum thunbergii* in Japan, and possibly also in east Siberia (as *M. formosanus*, Pashtshenko 1988). (It might however be a synonym of the little-known *M. polygoniyanai* Shinji, described from *P. viscosum*.)

***Myzus persicae* ssp. *nicotianae* Blackman new status**

*Myzus nicotianae* was distinguished from *M. persicae* because samples collected from many parts of the world on tobacco (*Nicotiana tabacum*) and in different years showed consistent differences in morphology and biology associated with this host (Blackman 1987). Most of the samples analysed were from regions where populations are permanently parthenogenetic, but Margaritopoulos *et al.* (2000) found that holocyclic populations of tobacco aphids in Greece could also be discriminated morphometrically from those collected on other crops, and from peach away from tobacco-growing regions. It has been suggested (Clements *et al.* 2000a) that these morphological differences could be due to phenotypic plasticity associated with feeding on a particular host plant. However, it is clear that the differences are genetically-based, as all the samples analyzed by Margaritopoulos *et al.* were clones reared under controlled conditions on the same host plant; the clones originating from peach in tobacco-growing regions and conforming to the morphology of *nicotianae* had never fed on tobacco. Relative preference for tobacco by *nicotianae* has been demonstrated in the laboratory (Margaritopoulos *et al.*, 2005; Troncoso *et al.*, 2005). Genetic isolation between *nicotianae* and *persicae* cannot be complete, as ampli-

fied esterase genes conferring resistance to insecticides are identical in the two forms (Field *et al.* 1994). Absence of complete reproductive isolation, perhaps in conjunction with a very recent origin of *nicotianae*, may explain the failure to find consistent diagnostic genetic markers (Margaritopoulos *et al.* 1998, Fenton *et al.* 1998, Clements *et al.* 2000a,b), or the divergence of gene sequence that one might normally expect to find between separate taxa (Clements *et al.* 2000a). However, the degree of isolation must have been sufficient to preserve the integrity of the tobacco-adapted genome for at least 15–20 years, and it would be unwise to regard this form simply as synonymous with *M. persicae*, as suggested by Clements *et al.* (2000a,b), as this would hide important information. The tobacco aphid conforms to the broader definition of the subspecies category advocated by Müller (1986) and Rakauskas (2004), which aims to ensure that indexable names are available for intraspecific variants of economically important species. We therefore propose that the tobacco aphid should be called *M. persicae* ssp. *nicotianae*.

#### ***Neomyzus van der Goot* reinstated as full genus**

This group of about nine Asian species with distinctive black dorsal markings has been placed as a subgenus of *Aulacorthum*, but differs from *Aulacorthum* in several morphological features (shape of head, number of accessory hairs on the fourth rostral segment, immatures with spinulose hind tibiae) that place it closer to the *Myzus* group of genera. It includes the worldwide pest aphid *Neomyzus circumflexus*.

#### ***Paraphorodon* Tseng & Tao reinstated as full genus**

##### ***Paraphorodon omeishanaensis* Tseng & Tao -reinstated**

Paratypes of this species, described from an unidentified *Rubus* sp. in China, were examined. It has been mistakenly synonymised with *Phorodon cannabis*. *Paraphorodon* is quite distinct from *Phorodon*, and probably nearest to *Matsumuraja*.

#### ***Rhopalosiphum rostellum* Zhang, Chen, Zhong & Li 1999 to *Aphis***

From examination of paratypes this species is somewhat intermediate between *Aphis davletshinae* and *A. umbrella*.

#### ***Semiaphis peucedani* (Nevsky, 1928) to *Brachyunguis***

Originally described in *Xerophilaphis*, this species has erroneously been listed in catalogues as a *Semiaphis*. The presence of marginal tubercles on abdominal segments 1 and 7, and very short antennal processus terminalis together with short pale siphunculi indicate that it is a *Brachyunguis*.

***Sitobion dorsatum* Richards 1967 to *Aulacorthum***

This species was described in *Aulacorthum* but transferred to *Sitobion* by Eastop and Hille Ris Lambers (1976). The dorsal cuticle is sclerotic as in *Sitobion* and the siphunculi have several rows of subapical reticulation, but these features are also found in some *Aulacorthum*. However unlike any *Sitobion* the antennal tubercles are very well developed and steep-sided, and the ventral side of the head is spiculate. The karyotype (three samples collected by Cho-kai Chan), is  $2n=12$ , commonly found in *Aulacorthum*, whereas most *Sitobion* have  $2n=18$ . The alata, uncharacteristically for both genera, has a dark dorsal abdominal patch, which might indicate a closer affinity to *Neomyzus*, except that the hind tibiae are not spinulose. We conclude that this species should be returned to *Aulacorthum*, in spite of some features atypical of that genus.

***Therioaphis hungarica* Szelegiewicz 1968 not synonymous with *T. ononidis***

The proposed synonymy with *T. ononidis* (Remaudière & Remaudière 1997) is incorrect; *T. hungarica* has a shorter last rostral segment than *T. ononidis*, and is also shorter-haired. Quednau (2003) gave it subspecific status.

***Uroleucon nilkaense* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Obtusicauda***

The examined holotype aptera has the last rostral segment a little longer than hind tarsus II and third antennal segments with 7 and 11 rhinaria, and is similar to *Obtusicauda moldavica* (Bozhko).

***Uroleucon quinghaiense* Zhang, Chen, Zhong & Li, in Zhang 1999 to *Sitobion***

Paratype specimens are a member of the *Sitobion fragariae* group with siphunculi c.2.2 times longer than cauda, possibly *fragariae* itself. It is not the species introduced to Australia and New Zealand (Sunnucks *et al.*, 1996), which has a longer cauda.

***Utamphorophora himalayensis* Chakrabarti & Banerjee 1989 to *Taiwanomyzus***

*Taiwanomyzus* have many characters in common with *Utamphorophora*, but have dorsal spiculation of the head and feed on ferns.

**Conclusion**

A significant proportion of the synonymy identified in this paper is due to species being described in the wrong genera. Similar problems might be avoided in future if there were a more stable generic classification, so that putative new species were correctly compared with their closest relatives. Molecular studies should eventually provide us with a more

accurate phylogenetic framework for generic relationships, and indicate the most reliable morphological characters for correct generic placement of species within each group. The problems that have existed so far in aphid molecular phylogenies with the resolution of lineages, perhaps due in large measure to the rapid recent radiation and expansion of groups such as the Macrosiphini (von Dohlen & Moran, 2000), should become to some extent resolvable as the DNA is studied of more species representative of more genera.

Nevertheless there will always be an element of trial and error in species-level aphid taxonomy. Evidence has accumulated in recent years that phytophagous insects may undergo particularly rapid speciation related to the acquisition of and adaptation to new host plants (e.g. Groman & Pellmyr 2000; Hawthorne & Via 2001; Raymond *et al.* 2001), giving rise to many situations in which species boundaries may be impossible to define using morphological criteria. This is very apparent in certain well-studied European species-complexes, in genera such as *Aphis*, *Dysaphis* and *Cryptomyzus*. Work on lesser-known aphid faunas, and many of the taxonomic problems covered by this paper, are in a sense “low resolution taxonomy”, but no less important as first steps in the endeavour to build up a true picture of phylogenetic relationships.

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