General trends of chromosomal evolution in Aphidococca (Insecta, Homoptera, Aphidinea + Coccinea)

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Abstract
Parallel trends of chromosomal evolution in Aphidococca are discussed, based on the catalogue of chromosomal numbers and genetic systems of scale insects by Gavrilov (2007) and the new catalogue for aphids provided in the present paper. To date chromosome numbers have been reported for 482 species of scale insects and for 1039 species of aphids, thus respectively comprising about 6% and 24% of the total number of species. Such characters as low modal numbers of chromosomes, heterochromatinization of part of chromosomes, production of only two sperm instead of four from each primary spermatocyte, physiological sex determination, "larval" meiosis, wide distribution of parthenogenesis and chromosomal races are considered as a result of homologous parallel changes of the initial genotype of Aphidococca ancestors. From a cytogenetic point of view, these characters separate Aphidococca from all other groups of Paraneoptera insects and in this sense can be considered as additional taxonomic characters. In contrast to available paleontological data the authors doubt that Coccinea with their very diverse (and partly primitive) genetic systems may have originated later than Aphidinea with their very specialised and unified genetic system.

Keywords
Aphids, scale insects, chromosome numbers, genetic systems, evolution, phylogeny

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Introduction

The name Aphidococca was recently introduced by Kluge (2010) for the taxon combining two closely related groups of Hemiptera insects, aphids and scale insects. According to the paleontological data (see for example, Shcherbakov and Popov 2002, Shcherbakov 2007) scale insects (Coccinea) could originate from ancient aphids (Aphidinea) or aphid-like ancestors in the Triassic (Fig. 1). The close relationship of both groups is well supported by numerous morphological, anatomical, embryological, cytogenetic, physiological and other characters and, as it seems, is not disputed by any modern taxonomists. In the framework of cladistic taxonomy, aphids and scale insects are considered as sister groups (see for example, Wojciechowski 1992, Gullan and Cook 2007 and others) originating from a common ancestor. However, various theoretical generalizations and attempts at analysis of any biological characters of aphids and scale insects are usually done separately for these groups. Below we shall try to analyze aphids and scale insects as a united group which can be exactly contrasted to other related groups of Paraneoptera insects with particular regard to their cytogenetics.

At present, about 5000 species of aphids and 8000 species of scale insects have been recorded from all over the world (Favret and Eades in on-line "Aphid species file" database: http://aphid.speciesfile.org, Ben-Dov et al. in on-line "ScaleNet" database: http://www.sel.barc.usda.gov/scalenet/scalenet.htm). There is no general agreement on the higher classification within both groups; the number of accepted families and their relationships are disputed in the papers of different modern authors. In general, the opposite tendencies (splitting vs. integration) of the families take place in scale insect and aphid modern systematics. Thus, some modern coccidologists (for example, Hodgson 2014) accept till 33 extant families of scale insects in contrast to the 15-19 "large" traditionally accepted families (Danzig 1986, Danzig and Gavrilov-Zimin 2014), whereas the last taxonomic catalogue of aphids (Remaudière and Remaudière 1997) places all recent "true aphids" in the single family Aphididae, in contrast to the acceptance of 6-13 true aphid families by some other authors in addition to two families of "not true aphids", Adelgidae and Phylloxeridae (Börner 1952, Shaposhnikov 1964, Heie 1987, Heie and Wegierek 2009a, b). These opposite tendencies in the systematics of scale insects and aphids reflect, to our mind, the generally higher biological diversity of scale insects, which demonstrate more patterns of morphological, cytogenetic, physiological, and ecological specialization than aphids. Here, for further discussions we shall follow the system and nomenclature of Paraneoptera accepted recently in Gavrilov-Zimin and Danzig (2012) and Danzig and Gavrilov-Zimin (2014):

Phylogenetic line Paraneoptera Martynov, 1923 (including 7 orders: Zoraptera, Copeognatha, Parasita, Thysanoptera, Homoptera, Coleorrhyncha, Heteroptera)
Cohort Hemiptera Linnaeus, 1758 (= Condylognatha Börner, 1904, non Hemiptera auct.)
Superorder Thysanoptera Haliday, 1836
Superorder Arthroidignatha Spinola, 1850 (= Hemiptera auct. non Linneaeus, 1758; = Rhynchota auct. non Burmeister, 1835)
Order **Coleorrhyncha** Meyers & China, 1929
Order **Heteroptera** Latreille, 1810 (= Hemiptera auct. non Linnaeus, 1758)
Order **Homoptera** auct. non Latreille, 1810
  - Suborder **Cicadinea** Batsch, 1789
  - Suborder **Psyllinea** Latreille, 1807
  - Suborder **Aleyrodinea** Newman, 1834
  - Suborder **Aphidinea** Latreille, 1802
  - Superfamily **Adelgoidea** Annand, 1928
  - Superfamily **Phylloxeroidea** Herrich-Schaeffer in Koch, 1854
  - Superfamily **Aphidoidea** Latreille, 1802
  - Suborder **Coccinea** Fallén, 1814 (= Coccoidea auct., Gallinsecta De Geer, 1776)
  - Superfamily **Orthezioidea** Amyot & Serville, 1843 (=Paleococcoidea Borchsenius, 1950; = Archeococcidea Bodenheimer, 1952)
  - Superfamily **Coccoidea** Fallén, 1814 (=Neococcoidea Borchsenius, 1950; = Neococcidea Bodenheimer, 1952)

Within the scale insects we recognize 19 extant families (Table 1). Within the aphids we follow the system of Shaposhnikov (1964, 1985) with minor changes (taking into account some conclusions of Heie and Wegierek 2009a, b) (see Table 3), and accept 15 recent families.

In the present paper we shall try to summarize data on chromosomal numbers, karyotypes and genetic systems of Aphidococca, mainly with regard to the evolutionary significance of these data, and try to demonstrate some previously neglected parallel tendencies in the chromosomal evolution of aphids and scale insects. Two catalogues of chromosomal numbers and genetic systems are used as the basis for this discussion – the catalogue recently published by the first author (Gavrilov 2007) for scale insects, and a catalogue for

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**Figure 1.** Phylogeny of Aphidococca placed on geochronological scale (after Shcherbakov and Popov 2002). Time periods: \( P_1, P_2 \) Early (Lower) and Late (Upper) Permian, \( T_1, T_2, T_3 \) Early, Middle and Late Triassic, \( J_1, J_2, J_3 \) Early, Middle and Late Jurassic, \( K_1, K_2 \) Early and Late Cretaceous, \( P_1 \) Palaeocene, \( P_2 \) Eocene, \( P_3 \) Oligocene, \( N_1 \) Miocene, \( N_2 \) Pliocene, \( R \) present time (Holocene).
aphids, compiled in the present paper from numerous scattered publications on aphid cytogenetics, the main sources being the tables in Kuznetsova and Shaposhnikov (1973), Blackman (1980, 1986) and the data from the monographs of Blackman and Eastop (1994, 2006) as well as from the on-line compilation of these monographs (Blackman and Eastop 2015: http://www.aphidsonworldsplants.info). We hope the combined catalogue will be useful for all colleagues irrespective of any of our theoretical speculations.

### Chromosome numbers

To date chromosome numbers have been reported for 482 species of scale insects belonging to 14 of the 19 known families and for 1039 species of aphids belonging to 14 families (all of those accepted here for the recent aphid fauna) (Tables 1–4), thus respectively comprising about 6% and 24% of the total number of coccid and aphid species. Thus, the greater knowledge of aphid karyotype diversity in contrast to that of scale insects is obvious at the species level as well as for the higher taxa in both these groups.
The smallest chromosome number is the same for aphids and for scale insects, 2n=4, and known in species of the tribe Iceryini (Coccinea: Margarodidae), in the genus *Apiomorpha* Rübsaamen, 1894 (Coccinea: Eriococcidae) (Hughes-Schrader

**Table 2.** Additions to the Gavrilov’s (2007) catalogue of chromosome numbers and genetic systems of scale insects. (H – heterochromatinization of one haploid set of chromosomes without details of genetic system; P(o) – obligatory pathogenesis).

| Taxon                          | 2n   | Genetic system | Reference                                                                 |
|-------------------------------|------|----------------|--------------------------------------------------------------------------|
| **Fam. Pseudococcidae**       |      |                |                                                                          |
| *Balanococcus boratynskii*    | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Belgorod Prov., Russia]                  |
| *Brevicoryne operta*          | 10   | ?              | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Pelococopsis prieneri*       | 10   | Lecanoid       | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Phenacoccus hordei*          | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Belgorod Prov., Russia]                  |
| *Ph. specificus* Matoseva, 1960 | 10   | ?              | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Ph. peruvianus* Granada de Willink, 2007 | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Portugal]                               |
| *Ph. phenacoides* (Kiritshenko, 1932) | 10+Bs | Lecanoid       | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Ph. prope avenae* Borchsenius, 1949 | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Portugal]                               |
| *Ph. tertragrornae* Borchsenius, 1956 | 10   | Lecanoid       | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Puto superbis* (Leonardi, 1907) | 16/17 | XX/X0         | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Rhizoecus balophilus* (Hardy, 1868) | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Bulgaria]                               |
| *Trebetina crassipinosa*      | 16   | ?              | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Trionymus arteniiurum* (Borchsenius, 1949) | 10   | Lecanoid       | Gavrilov-Zimin 2011 [Turkey]                                            |
| *T. baancheni* McKenize, 1960 | 16   | Lecanoid       | Gavrilov and Trapeznikova 2007 [USA]                                    |
| *T. radicum* (Newstead, 1895) | 10   | Lecanoid       | Gavrilov and Trapeznikova 2010 [Bulgaria]                               |
| **Fam. Eriococcidae**         |      |                |                                                                          |
| *Acanthococcus lactucae*      | 16   | ?Comstockioid  | Gavrilov-Zimin 2011 [Turkey]                                            |
| **Fam. Kermesidae**           |      |                |                                                                          |
| *Kermes robors* (Fourcroy, 1785) | 26   | ?Comstockioid  | Gavrilov-Zimin 2011 [Turkey]                                            |
| **Fam. Aclerdidae**           |      |                |                                                                          |
| *Aclerda pseudozoisiae*       | 16   | H              | Gavrilov-Zimin 2012 [New Guinea, Indonesia]                             |
| *A. takahashii* Kuwana, 1932  | 18   | P(o)           | Gavrilov-Zimin 2012 [Sulawesi, Indonesia]                               |
| **Fam. Coccidae**             |      |                |                                                                          |
| *Phyllostoma myrtilli*        | 16   | P, deuterotoky | Gavrilov and Trapeznikova 2008 [Bulgaria]                               |
| *Lecanopsis turcica* (Bodenheimer, 1951) | 18   | H              | Gavrilov-Zimin 2011 [Turkey]                                            |
| *Acanthopulvinaria orientalis* (Nasonov, 1908) | 18   | H              | Gavrilov 2007 [Astrakhan, Russia]                                       |
| *Anapulvinaria pistaciae* (Bodenheimer, 1926) | 16?  | H              | Gavrilov-Zimin 2011 [Turkey]                                            |

The smallest chromosome number is the same for aphids and for scale insects, 2n=4, and known in species of the tribe Iceryini (Coccinea: Margarodidae), in the genus *Apiomorpha* Rübsaamen, 1894 (Coccinea: Eriococcidae) (Hughes-Schrader
1925, 1930, 1948, 1963) and in the genus *Amphorophora* Buckton, 1876 (Aphidinea: *Aphididae*) (Blackman 1985). The greatest numbers are 2n=72 (in *Amphorophora sensu lata* Mason, 1923) (Blackman 1980) and 2n≈192 (in *Apiomorpha macqueeni* Froggatt, 1929 (Cook 2000). It is interesting that, both in aphids and in scale insects, the entire range of variation of chromosome number for the suborders is found in one genus in each group – *Amphorophora* in Aphidinea and *Apiomorpha* in Coccinea.

The range of diploid number variability, 2n=4-192, demonstrated by Aphidococca is wider than in any other group of Paraneoptera, including even such huge groups as Cicadinea and Heteroptera. Thus, for the groups of Homoptera nearest to Aphidococca the following diploid chromosome numbers have been reported: Aleyrodinea, 2n=20-26 (Blackman and Cahill 1998, but only a few species were studied until now); Psyllinea, 2n=8-26 (Maryańska-Nadachowska 2002); Cicadinea, 2n=8-38 (Emeljanov and Kirillova 1989, 1991). For Heteroptera the range of variability reported is 2n=6-80 (Ueshima 1979, Kuznetsova et al. 2011), for Thysanoptera 2n=20-106 (Brio et al. 2010), for Parasita (Mallophaga + Anoplura) 2n=4-24 (Golub and Nokkala 2004), and for the most ancient and primitive Paraneoptera group, Copeognatha – 2n=14-30 (Golub and Nokkala 2009).

Modal chromosomal numbers of Aphidococca as a whole, 2n=8, 10, 12, 18 are lower (with a small overlap) than in other Homoptera, and most other Paraneoptera groups that have been sufficiently studied to provide reliable data. Thus, comparable modal numbers are 2n=26 for Psyllinea (Maryańska-Nadachowska 2002), 2n=18, 20, 22, 26, 30 for Cicadinea (Emeljanov and Kirillova 1989, 1991), 2n= 14, 22, 26, 28,

### Table 3. Variation of diploid chromosome number in 14 families of aphids.

| Family      | Number of nominal taxa | Number of studied taxa | Range of variability | Kv   | Modal chromosome numbers |
|-------------|------------------------|------------------------|----------------------|------|--------------------------|
|             | Genera | Species | Genera | Species |                      |        |
| Adelgidae   | 7      | 69      | 7      | 18      | 16–24                | 0.22   | -                        |
| Phylloxeridae | 8      | 73      | 4      | 10      | 6–12                 | 0.45   | -                        |
| Eriosomatidae | 53     | 369     | 28     | 85      | 6–38                 | 0.16   | 10, 12, 20               |
| Mindaridae  | 1      | 9       | 1      | 2       | 8–12                 | 0.30   | -                        |
| Lachnidae   | 18     | 401     | 11     | 73      | 6–c.60                | 0.20   | 10, 12, 14               |
| Hormaphididae | 44     | 221     | 9      | 26      | 8–c.50                | -      | 12                       |
| Thelaxidae  | 4      | 18      | 3      | 8       | 8–56                 | 0.66   | -                        |
| Tamaliidae  | 1      | 6       | -      | -       | -                    | -      | -                        |
| Aiceonidae  | 1      | 18      | 1      | 1       | 18                   | -      | -                        |
| Anoceididae | 2      | 30      | 1      | 7       | 6–12                 | 0.50   | -                        |
| Phloeomyzidae | 1      | 11      | 1      | 1       | 10                   | -      | -                        |
| Greenideidae | 16     | 178     | 6      | 21      | 7–40                 | 0.36   | -                        |
| Drepanosiphidae | 92    | 573     | 48     | 141     | 6-c.48               | 0.09   | 8, 14, 18                |
| Chaitophoridae | 13    | 178     | 4      | 39      | (4?) 6–40            | -      | -                        |
| Aphididae   | 273    | 3033    | 120    | 605     | 4–72                 | 0.03   | 8, 10, 12                |
| **Total**   | **534** | **5177** | **243** | **1039** | **4–72**              |        |                          |
34 for Heteroptera (Ueshima 1979, Kuznetsova et al. 2011), and 2n=18 for Copeognatha (Golub and Nokkala 2004). Aleyrodinea and Thysanoptera are too poorly studied for reliable comparison, but for both these groups there are no recorded chromosome numbers lower than 2n=20. What can be a reason for the comparatively low modal numbers of Aphidococca? It is well known that there is no direct correlation between chromosomal number and complexity of an organism. On the other hand, if we look for the most general character that Aphidococca share with another group with low chromosomal numbers, the Parasita, but not with other Paraneoptera groups, we shall see that the tendency for lower modal numbers within the Paraneoptera correlates with a tendency to larvalization of imaginal structures or neoteny, with reduction of the number of postembryonic stages to three—five in Aphidococca and Parasita, in comparison with the six developmental stages usually found in most Paraneoptera.

The karyotype diversity within Aphidococca families can be characterized by a simple index of karyotypic variability (Kv) which is equal to the quantity of different diploid chromosome numbers in the taxon, divided by the number of cytogenetically studied species in this taxon. For example, in the family Diaspididae (Coccinea) six variants (2n= 6, 8, 10, 12, 16, 18) of the chromosomal number are known for 141 studied species. So, for Diaspididae, Kv is equal 6/141=0.04. Of course, Kv, based on the present available data may be changed when more species are studied, but it seems this change will not be very significant. Thus, if we calculate Kv for aphid families based on the old catalogue of Kuznetsova and Shaposhnikov (1973), we obtain values similar to those based on the present catalogue (Table 3), although the number of species studied has meanwhile increased 3–4 times. It is easy to see that Kv is smallest in the largest families of Aphidococca which include numerous poorly identified (recently diverged?) species: Aphididae (0.03), Diaspididae (0.04), Pseudococcidae (0.08). On the contrary, ancient families with a limited number of recent species show comparatively large Kv-s: Adelgidae (0.22), Phylloxeridae (0.45), Margarodidae s.l. (0.21). High Kv-s in some other families, for example, Eriococcidae (0.45) or Thelaxidae (0.66), are connected mainly with enormous variability of chromosomal number not in the family as a whole, but in one of the genera (Apiomorpha and Glyphina Koch, 1856 respectively).

In the higher (above family level) taxonomic groups of Paraneoptera the utility of Kv index is currently limited by the low percentage of studied species and by limited variation of chromosomal number itself, because there are thousands of species in these higher taxa, whereas chromosomal numbers higher than 2n=60 are very rare and higher than 2n=192 are unknown.

**Intrageneric and intraspecific chromosomal variability**

A typical Aphidococca karyotype has rod-like chromosomes whose number is more or less stable within a genus (with some notable expections which will be discussed below). For example, in the species-rich genus *Aphis* Linnaeus, 1758, the diploid chromosome number in majority of studied species is eight (2n=8) with only a few exceptions.
Figure 2. Mitotic and meiotic chromosomes of different scale insects. a–c Puto superbus (Leonardi, 1907), a cell of female embryo, 2n=18 b–c cells of male embryo, 2n=17, chromosomes with NORs are arrowed d Heliococcus sulci Goux, 1934, polyploid cell, about 140 chromosomes with numerous agglutinations e Peliococcopsis priesneri (Laing, 1936), male embryonic cells at interphase stage with one haploid set heterochomatinized f Planococcus vovae (Nasonov, 1908), male embryonic cell with one haploid set heterochomatinized g Dysmicoccus multivorus (Kritshenko, 1936), embryonic cell with 2n=10 + B, additional chromosomal element arrowed h Chloropulvinaria aurantii (Cockerell, 1896), 2n=26, spermatid i Protopulvinaria pyriformis (Cockerell, 1894), 2n=16, oogonial metaphase I. Bar = 10 µm.
Moreover, most of the species in the young and large tribe Aphidini of the family Aphididae have $2n=8$, and the same situation applies to the youngest and largest family of scale insects, Diaspididae, the overwhelming majority of species of which also have $2n=8$. On the other hand, many genera of Aphidococca demonstrate significant or even extraordinary variation of chromosome number, and, moreover, several diploid numbers can be found in the same nominal species. The most impressive example of such variation is in the scale insect genus *Apiomorpha* with its 42 diploid numbers, ranging from $2n=4$ to $2n\approx192$ in 47 studied species (Hughes-Schrader 1925, 1930, 1948, 1963, Cook 2000, 2001). A number of aphid genera, for example, *Phylloxera* Boyer de Fonscolombe, 1834, *Glyphina* Koch, 1856, *Forda* von Heyden, 1837, *Tetraneura* Hartig, 1841, *Cinara* Curtis, 1835, *Lachnus* Burmeister, 1835, *Triana* von Heyden, 1837, *Amphorophora* Buckton, 1876, *Euceraphis* Walker, 1870, *Chaitophorus* Koch, 1854 and others also demonstrate a great variability in diploid number both between and within nominal species (see Table 4).

Polyploidy is a very rare phenomenon in Aphidococca as in other Paraneoptera and probably does not play a significant role in the evolution of the group. For scale insects a polyploid (triploid) karyotype was reported for *Physokermes hemicryphus* (Dalman, 1826) from the family Coccidae (Nur 1979), but theoretically may be found to occur in some other species of soft scales, felt scales or mealybugs which have chromosome numbers three or four times those of species known to be diploid in the same genera. In aphids polyploid species are not known at all, but several cases of polyploidization in parthenogenetic populations have been reported (see discussion in Blackman 1987). On the other hand, females usually have highly polyploid cells (Fig. 2d) in bacteriomes, peculiar organs which include intracellular symbiotic bacteria.

Accessory chromosomal elements have been found in several species of mealybugs (Pseudococcidae) (Nur et al. 1987, Gavrilov 2007) (Fig. 2g), in one species of the Margarodidae (Hughes-Schrader 1942), in two species of soft scales (Coccidae) (Gavrilov 2007) and in some armored scales (Diaspididae) (Brown 1960). Blackman (1980, 1990) noted presumed B-chromosomes in numerous aphid species from different families, especially in anholocyclic populations, and these B-chromosomes are probably relics of multiple X-chromosomes.

**Evolution of genetic systems**

In contrast to other Paraneoptera, all Aphidococca have spermatocyte and oocyte meiosis in larvae or in neotenic females (which are in fact equivalent to larvae as in scale insects) and demonstrate a multiplicity of very different and unique genetic systems, which are probably based on an original XX-X0 system, considered by Blackman (1995) as ancestral for all Paraneoptera insects (Fig. 3). In species possessing this system, the sex of the progeny is determined during spermatogenesis. Spermatozoa with X-chromosomes produce females and spermatozoa without X-chromosomes produce males. This usual type of XX-X0 spermatogenesis (similar to that of Copeognatha, for example) is known
in some primitive scale insects (some Margarodidae, Ortheziidae, genus *Puto* Signoret, 1875 (Pseudococcidae)) (Hughes-Schrader 1931, 1942, 1944, 1955, Brown and Cleveland 1968) with only one peculiar character – spermatocytes fuse to form a quadrinucleate spermatid (Fig. 3). This fusion can be considered as a unique apomorphy of Coccinea. In some genera of Margarodidae, such as *Aspidoproctus* Newstead, 1901, *Protortonia*
Townsend, 1898, *Llaveia* Signoret, 1876, *Llaviela* Morrison, 1927, *Nautococus* Vays-sière, 1939 (all from the subfamily Monophlebinae) XX-X0 spermatogenesis is also complicated by the enclosure of meiotic prophase I chromosomes in peculiar separate vesicles, instead of a single nuclear membrane. This phenomenon was discovered by F. Schrader and S. Hughes-Schrader and was comprehensively reviewed by Hughes-Schrader (1948). Moreover, it is interesting to note that in *Protortonia* (Coccinea: Margarodidae), in the second meiotic division, all chromosomes form a chain stretched between the two poles of the cell (Schrader 1931), which is similar to the well-known example of chain formation in plants of the genus *Oenothera* Linnaeus, 1753 (Onagraceae) and some other plants and animals (White 1973).

In most cases, species with the XX-X0 system have only one pair of sex chromosomes in their karyotypes. For example, females of *Porphyrophora polonica* (Linnaeus, 1758) (Coccinea: Margarodidae) have 2n=12+XX and males have 2n=12+X. However, examples of multiple sex chromosomes are also known. Thus, species of the family Adelgidae (Aphidinae) have up to four pairs of X chromosomes, and some species of the families Phylloxeridae, Eriosomatidae, Lachnidae and Drepanosiphidae (Aphidinae) have one-two pairs of sex chromosomes (see Table 4). In scale insects, only *Matsucoccus gallicolus* Morrison, 1939 (Margarodidae) has a multiple sex chromosome system with 6 pairs of X chromosomes (2n=28+12X in females and 2n=28+6X in males), which probably evolved as a result of fragmentation of an initial pair of X chromosomes (Hughes-Schrader 1948) and it seems the number of sex chromosomes in this species is the highest known in Insecta. Multiple sex chromosomes are also known in Cicadinae and Heteroptera and can be probably considered as a non-unique apomorpic character in different genera of proboscidian insects (Arthroidignatha). This character is not known in studied Copeognatha (Golub and Nokkala 2009), which is considered as an ancestor group for probosciscians.

Hales (1989) reported a peculiar fusion of multiple X chromosomes with autosomes (X_A, X_B, X_C, X_D) in somatic cells of *Schoutedenia lutea* (van der Goot, 1917) (Aphidinae, Greenideidae), that demonstrates a special genetic system unknown in other aphids and in Paraneoptera as a whole, but this phenomenon needs further investigation.

Hovewer, in the majority of studied scale insects and in all studied aphids sex determination is not brought about by stochastic combination of male and female chromosome sets during fertilization, because male and female gametes in most Aphidococca are cytogenetically identical and physiological sex determination takes place. Thus, in all studied Aphidinae, gametogenesis is of a unified type and based on an XX-X0 mechanism, but has unique features which are probably unknown in any other animals with XX-X0. One of the secondary spermatocytes (which includes autosomes only) is smaller in size and degenerates just after anaphase I. The second, larger spermatocyte gives origin to two sperms; both with one X-chromosome (see Manicardi et al. 2015 and our Fig. 2). Thus, aphid males give rise only to female-producing sperm, and sexual females also produce only female-producing oocytes, so that all sexually-produced progeny are female. On the other hand, parthenogenetic females can pro-
duce embryos which are either XX or X0, using a special cytological mechanism in which the X-chromosome is lost in some of the oocytes (Orlando 1974, Blackman and Hales 1986). Thus, sex of progeny is totally dependent on the physiology of the parthenogenetic female, which starts to produce sexuales under certain environmental conditions. This mode of gametogenesis is closely connected with cyclic parthenogenesis and is undoubtedly a unique apomorphy of Aphidinea. In general we suggest that the genetic system of aphids could be termed the Aphidoid system for the uniformity with the names of the genetic systems of scale insects (see below).

The majority of scale insects (almost whole superfamily Coccoidea) and aphids of the tribe Tramini (Lachnidae) demonstrate specific heterochromatinization of part of chromosomes in their diploid set. The species of scale insects with Lecanoid, Comstockioid, and Diaspidoid genetic systems feature obligate heterochromatinization of the paternal set of chromosomes in the males (Fig. 2e–f). Paternal genome heterochromatinization (PGH) is known in some groups of insects (see reviews of White 1973 and Normark 2003), but in each of these groups PGH has specific characters and forms unique genetic systems. The coccid species with systems Lecanoid, Comstockioid, and Diaspidoid can be purely sexual with identical male and female gametes, or demonstrate diploid arrhenotoky and deuterotoky in addition to heterochromatinization of the paternal set of chromosomes. In all these cases the sex of the progeny depends on rather enigmatic physiological processes occurring inside the female, as in the Aphidoid system.

In the Lecanoid system, the heterochromatic chromosome set exists during all stages of the male life cycle. During meiosis in the male, the chromosomes do not pair and separate equationally during the first division. During the second division, two metaphase plates are formed, and the heterochromatic and euchromatic chromosomes then segregate to the opposite poles (Hughes-Schrader 1948, Nur 1980). As a result of meiosis, quadrinucleate spermatids are formed, but only the nuclei of maternal origin produce sperm (Fig. 3).

In the Comstockioid system, the heterochromatic set is partly (as separate chromosomes) eliminated during embryogenesis and different cells of the same tissue may differ in chromosome number. According to the number of eliminated chromosomes, several variants of the Comstockiella system are known: CL – Comstockioid-Lecanoid intermediates, C\textsuperscript{extH} – Comstockioid with one pair of paternal chromosomes, retained in different cysts, CC – complete Comstockioid. The course of spermatogenesis varies among the different taxa, depending on the number of non-eliminated heterochromatic chromosomes. If all these chromosomes are destroyed, the second division is absent (Brown 1965, 1967, Nur 1980).

In the Diaspidoid system, the heterochromatic set has been completely lost, and adult males are haploid. Hence, spermatogenesis consists of a single equational division (Brown 1965, 1967, Nur 1980, 1982).

In the aphid tribe Tramini (Lachnidae), almost all studied populations reproduce by thelytokous parthenogenesis and sex chromosomes have not been identified (Blackman 1980, 1990, Blackman et al. 2000). Some of the chromosomes in the diploid
set demonstrate heterochromatinization and even aggregation of heterochromatic elements in somatic cells until late prophase (Blackman 1980), thus resembling the Lecanoid-Comstockioid genetic system in scale insects. However, heterochromatic chromosomes in Tramini can vary significantly in number between populations and do not constitute a haploid set. These heterochromatic elements of Tramini are similar to B-chromosomes, and Blackman et al. (2000) suggest that they may be derived from ancestral redundant X chromosomes.

In the tribe Fordini (Aphidinea: Eriosomatidae), germ-line and somatic cells have radically different chromosome numbers (Blackman 1980). Unfortunately this very interesting phenomenon has not been additionally studied.

**Hermaphroditism** and **Haplo-diploidy** are known only in species of the tribe Iceryini (Coccinea: Margarodidae) (Hughes-Schrader 1948, 1963). The hermaphrodites are diploid and similar to females in their morphology and mode of life. During embryogenesis the gonads of these insects do not undergo sexual differentiation. Later, in the crawlers, haploid nuclei appear in the gonads and form the central testicular part of a hermaphroditic gland. The haploid nuclei appear as a result of degeneration and elimination of one set of chromosomes. The peripheral ovarian part of the gland is diploid and formed a little later. Fertilization takes place either in the ovarian part or in the cavity of the ovo-testis. Fertilized eggs always develop into female-like hermaphrodites, which usually reproduce by self-fertilization. However, the hermaphrodites may also copulate with accidental haploid males, which sometimes develop from unfertilized eggs (Hughes-Schrader 1948). Haplo-diploidy is known in Iceryini scale insects only and is in fact a result of haploid arthrogenitky as in other insects with haploid males. Fertilized eggs produce diploid females and unfertilized eggs produce haploid males (Hughes-Schrader 1948).

To date, species with heteromorphic sex chromosomes (genetic system XX/XY, neo-XX/XY) have not been found among Aphidococca in contrast to larger groups of Paraneoptera: Cicadinea + Heteroptera, where these systems are very common and to Psyllinea + Copeognatha, where XX/XY (or neo-XX/XY) system is known in several species. On the other hand, in some species of scale insects, such as *Neusteadia* sp., *Praelongorthezia praelonga* (Douglas, 1891) (both from Ortheziidae), *Lachnodius eucalypti* (Maskell, 1892) (Eriococcidae), and *Stictococcus* sp. (Stictococcidae), both females and males have the same number of chromosomes, but without distinct sex chromosomes or peculiar heterochromatinization of the paternal set (as in the unique coccid systems Lecanoid, Comstockioid, and Diaspidoid). Thus, the Australian felt scale *Lachnodius eucalypti*, having 2n=18 in both females and males (Brown, 1967, 1977, Nur, 1980), is especially noteworthy. In other studied species of the genus *Lachnodius* Maskell, 1896 and in the family Eriococcidae as a whole, the Comstockioid system has been discovered, but in males of *L. eucalypti* heterochromatinization of the paternal set is absent. The 2n-2n system probably evolved in scale insects more than once and from different ancestral systems: from the system with heterochromatinization in *L. eucalypti* and *Stictococcus* sp. and from the XX-X0 system in *Praelongorthezia praelonga* (Nur 1980). Meiosis in *L. eucalypti* comprises one reductional division only (Brown and Chandra 1977), whereas in *P. praelonga* it comprises two divisions without an inverted meiotic sequence (Brown 1958).
Parthenogenesis

It seems that absolutely all aphid species and many scale insects can produce their progeny by parthenogenesis. In aphids the parthenogenesis can be cyclic (with alternation of thelytoky and deuterotoky – the apomorphic condition for Aphidinea) or anholocyclic (with continuous thelytoky). In scale insects no examples of cyclic parthenogenesis are known and parthenogenesis can be thelytokous, deuterotokous or arrhenotokous. On the other hand, there are probably a few obligatory thelytokous species of scale insects, such as *Protopulvinaria pyriformis* (Cockerell, 1894) and *Eupulvinaria peregrina* Borchsenius, 1953 (Gavrilov and Trapeznikova 2008), which never produce males in any population or geographical region. A great many species, often reported as thelytokous (see, for example, Nur 1990 for the review), in reality combine thelytokous reproduction with amphimixis, producing males amphimictically or parthenogenetically (diploid arrhenotoky and deuterotoky), and these males have, as usual for scale insects, paternal genome heterochromatinization. Some species variously manifest thelytokous and sexual lineages in different geographical regions or on different host plants (Nur 1990). Haploid arrenotoky (noted above for Icerini) is connected with haplo-diploidy and can be interpreted as facultative, rather than obligatory parthenogenesis.

Unfortunately it is impossible to say now exactly how many scale insects species are able to reproduce by parthenogenesis, and this ignorance hampers a detailed comparison of scale insects and aphids in this respect.

Conclusion

Finally we can underline the following parallel trends in the evolution of Aphidinea and Coccinea:

1) Low modal numbers of chromosomes.
2) Heterochromatinization of part of chromosomes.
3) Production of only two sperms instead of four from each primary spermatocyte.
4) Physiological sex determination.
5) "Larval" meiosis.
6) Widely distributed parthenogenesis.
7) Intraspecific chromosomal races (some of which may be cryptic species).

We consider that at least some of these tendencies may be regarded as additional taxonomic characters, which support the erection of Aphidococca as a higher category differing radically from other Homoptera and more widely from all Paraneoptera groups.

A comparison of cytogenetic data between the two groups of Aphidococca shows that Coccinea demonstrate much more diverse cytogenetic characteristics than Aphidinea. From the cytogenetic point of view Coccinea seem to be more primitive, including specialized (in most families) as well as ancient plesiomorphic characters (in
some families): a simple XX-X0 genetic system with production of 4 sperms from one primary spermatocyte, chromosomal (not physiological) sex determination, simple bisexual reproduction, and later initiation of meiosis, i.e. characters which have been lost completely in all studied aphids. This deduction contradicts the current interpretation of paleontological data (discussed in the Introduction). It is difficult to imagine that the diverse (and partly primitive) cytogenetic mechanisms of scale insects could have originated from the very specialised and unified Aphidoid genetic system. We therefore suppose that the ancient scale insects originated at least not later than ancient aphids. The contradiction with the paleontological record may be explained by the well-known incompleteness of this record and the very limited number of taxonomic characters for fossil groups (mainly wing venation in ancient Aphidococca), which results in a very subjective identification of fossil insects. Thus, for example, fossil Naibiidae were described by Scherbakov (1990, 2007) as most ancient, four-winged scale insects, but the same group is considered to be aphids by some aphidologists (see, for example, Wojciechowski 1992). The Lower Jurassic *Mesococcus asiaticus* Becker-Megdisova, 1960, which demonstrates the unique facies of a neotenic scale insect female, was considered by the original author as an ancient scale insect, similar to modern Monophlebinae, but was excluded from scale insects (and not placed in any other group!) by Koteja 1990.

Table 4. Chromosome numbers and genetic systems of Aphidine. **P(c)** – cyclic parthenogenesis, **P(o)** – obligatory parthenogenesis in anholocyclic species, **B** – additional chromosomes.

| Taxon                                | Life cycle | 2n  | Genetic system | References and collecting data                          |
|--------------------------------------|------------|-----|----------------|--------------------------------------------------------|
| **Superfam. PHYLLXEROIDEA**          |            |     |                |                                                        |
| **Fam. Adelgidae**                   |            |     |                |                                                        |
| *Adelges geniculatus* (Ratzeburg, 1844) | P(o)        | 20  |                | Steffan 1968b [Germany; Canada]                         |
|                                      | P(c)        | 22, 21, 20/18 | 2(X,X,X,X)/X,X,X,0 | Frolowa 1924 (as *Chermes strobilobius*) [Moscow, Russia] |
|                                      |            | 20/18 | 2(X,X)/X,X,0    | Steffan 1968b [Germany]                                |
| *A. tardus* (Dreyfus, 1888)          | P(o)        | 20  |                | Steffan 1968b [Germany]                                |
|                                      | P(c)        | 20/18 | 2(X,X)/X,X,0    | Steffan 1968b [Germany]                                |
| *Aphistasia pectinatae* (Cholodkovsky, 1888) | P(c)        | 20/18 | 2(X,X)/X,X,0    | Steffan 1968b [Germany]                                |
| *Cholodkovskya viridana* (Cholodkovsky, 1888) | P(o)        | 24  |                | Steffan 1968b [Germany]                                |
| *Dreyfusia nordmanniana* (Eckstein, 1890) | P(c)        | 22  |                | Steffan 1968b [Germany]                                |
| *Gillettella cooleyi* (Gillette, 1907) | P(c)        | 22/20 | 2(X,X)/X,X,0    | Steffan 1968a, b [Germany; Canada]                     |
| *G. coueni* (Gillette, 1907)         | P(o)        | 22  |                | Steffan 1968a, b [Canada]                              |
| *Pineus boerneri* Annand, 1928       | P(o)        | 16  |                | Blackman and Eastop 1994 [Hawaii, USA]                 |
|                                      |            | 17  |                | Blackman and Eastop 1994 [California, USA; Africa; Australia; New Zealand] |
| *P. cembrae* (Cholodkovsky, 1888)    | P(c)        | 18  |                | Blackman and Eastop 1994 [2]                           |
| Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------|------------|--------|------------------|--------------------------------|
| **P. orientalis** (Dreyfus, 1889) | P(c) | 20 | Blackman and Eastop 1994 [?] |
| **P. pineoides** (Cholodkovsky, 1903) | P(o) | 17 | Blackman and Eastop 1994 [?] |
| | | 22 | Steffan 1968b [Germany; Canada] |
| **P. pini** (Goeze, 1778) | P(o) | 19 | Blackman and Eastop 1994 [New Zeland] |
| | | 20 | Blackman and Eastop 1994, Blackman et al. 1995 [Europe] |
| | | 21 | Blackman and Eastop 1994, Blackman et al. 1995 [Australia] |
| | | 22 | Steffan 1968b [Germany] |
| **P. similis** (Gillette, 1907) | P(o) | 22 | Steffan 1968b [Canada] |
| **P. strobi** (Harrig, 1839) | P(o) | 20 | Blackman and Eastop 1994 [?] |
| | | 22 | Steffan 1968b [Germany; Canada] |
| **P. (Pineoides) pinifoliae** (Fitch, 1858) | P(c) | 22 | Steffan 1968b [Canada] |
| **Sacchiphantes abietis** (Linnaeus, 1758) | P(o) | 18 | Pagliai 1967 [Italy], Steffan 1968b [Germany] |
| | | 20 | Steffan 1968b (as *S. laricifoliae* (Fitch, 1858)) [Canada; USA] |
| **P. similis** (Gillette, 1907) | P(c) | 18/16 | 2(X1X2)/X1X0 | Steffan 1968a, b [Germany] |

**Fam. Phylloxeridae**

| Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------|------------|--------|------------------|--------------------------------|
| **Aphanostigma piri** (Cholodkovsky, 1903) | P(c) | 8 | Wysoki and Swirsky 1970 [Israel] |
| **Daktulosphaira vitifoliae** (Fitch, 1851) | P(c), P(o) | 10/9 | XX/X0 | Maillet 1957 [France]; Forneck et al. 1999 [Europe; USA] |
| **Moritziella caryaefoliae** (Fitch, 1856) | P(o) | 8 | Morgan 1909b (as *Phylloxera*) [USA] |
| **Phylloxera caryaeaulis** (Fitch, 1855) | P(c) | 8/6 | 2(X1X2)/X1X0 | Morgan 1909a, 1912, 1915 [USA] |
| **Ph. caryaeaulax** Riley, 1875 | ? | 12 | Morgan 1909a, 1912, 1915 (as *Ph. fallax*) [USA] |
| **Ph. caryaevalbi** Walsh, 1863 | ? | 22 | Morgan 1906, 1909b [USA] |
| **Ph. depressa** (Shimer, 1869) | ? | 6 | Morgan 1909b [USA] |
| **Ph. globosa** (Shimer, 1867) | ? | 6 | Morgan 1906, 1909b [USA] |
| **Ph. quercus** Boyer de Fonscolombe, 1834 | P(c), P(o) | 12/11 | XX/X0 | Maillet 1957 [France] |
| **Ph. subelliptica** (Shimer, 1869) | ? | 6 | Morgan 1909b [USA] |
| **Phylloxera sp.** | ? | 12 | Morgan 1906 [USA] |

**Superfam. APHIDOIDEA**

**Fam. Eriosomatidae**

| Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------|------------|--------|------------------|--------------------------------|
| **Aloephagus myersi** Essig, 1950 | P(c), P(o) | 22 | Blackman and Eastop 1984 [?] |
| **Aploneura lentisci** (Passerini, 1856) | P(c), P(o) | 16 | Blackman 1980 (as *Asiphum*) [Great Britain], Blackman and Spence 1996 [Great Britain] |
| **Appendixetra robiniae** (Gillette, 1907) | P(c) | 10 | Blackman and Eastop 1994 [?] |
| **Baizongia pistaciace** (Linnaeus, 1767) | P(c), P(o) | 24 | Blackman 1980 [Great Britain] (anholocyclic population) |
| Taxon | Life cycle | \(2n\) ♀♀♂♂ | Genetic system, ♀♀♂♂ | References and collecting data |
|-------|------------|----------------|------------------|--------------------------------|
| *Colopa compressa* (Koch, 1856) | P(c), P(o) | 16 | | Blackman 1980 [Great Britain] |
| *C. kansugei* (Uye, 1924) | P(o), ? P(c) | 10 | 2(X,X)/X,X,0 | Blackman 1986 [Japan] |
| *Colaphina arma* Aoki, 1977 | P(c) | 10 (female), 8 (male) | 2(X,X)/X,X,0 | Blackman 1986 [Japan] |
| *C. clematicola* (Shinji, 1922) | ?P(c), P(o) | 20 | | Blackman and Eastop 2015 [?] |
| *C. clematis* (Shinji, 1922) | P(c), P(o) | 10 +B (female), 8+B (male) | 2(X,X)/X,X,0 | Blackman 1986 [Japan] |
| *Epipemphigus inacicus* (Cholodkovsky, 1912) | P(c) | 18 | | Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1983a [Garhwal, Uttarakhand, India] |
| *E. niimae* (Matsumura, 1917) | P(c) | 20 | | Blackman 1986 [Japan] |
| *Eriosoma cutatae* (Oestlund, 1887) | P(c) | 12 | | Robinson and Chen 1969a [Canada] |
| *E. lanigerum* (Hausmann, 1802) | P(c), P(o) | 12 | | Bahr 1908, 1909 (as *Schizoneura*) [Germany], Pagliai 1963 [Italy], Sun and Robinson 1966, Harper and MacDonald 1966, Robinson and Chen 1969a [Canada], Kulkarni and Kacker 1980 [India], Gautam and Verma 1982, Kulkarni 1984 [Shimla, Himachal Pradesh, India] |
| 12/11 | XX/X0 | Gautam and Verma 1983 [Shimla, Himachal Pradesh, India] |
| *E. (Mimaphidus) lanuginosum* (Hartig, 1839) | P(c) | 10 | | Blackman and Eastop 1984 [?] |
| *E. (M.) patchiae* (Börner & Blunck, 1916) | P(c) | 10 | | Blackman 1980 [Great Britain] |
| *E. (Schizoneura) auratum* Akimoto, 1983 | P(c) | 12 | | Blackman 1986 [Japan] |
| *E. (S.) grossulariae* (Schüle, 1887) | P(c) | 10 | | Blackman and Eastop 1984 [?] |
| *E. (S.) harunire* Akimoto, 1983 | P(c) | 10 | | Blackman 1986 [Japan] |
| *E. (S.) japonicum* (Matsumura, 1917) | P(c) | 10 | | Blackman 1986 [Japan] |
| *E. (S.) kalmiciricum* Ghosh, Verma & Raychaudhuri, 1976 | P(c) | 12 | | Pal and Khuda-Bukhsh 1983 [Garhwal, Uttarakhand, India] |
| *E. (S.) laciniatae* Pashtshenko, 1988 | P(c) | 16 | | Blackman and Eastop 1994 [?] |
| *E. (S.) longicornutum* Akimoto, 1983 | P(c) | 10 | | Blackman 1986 [Japan] |
| *E. (S.) moriokense* Akimoto, 1983 | P(c) | 10 | | Blackman 1986 [Japan] |
| *E. (S.) ulmi* (Linnaeus, 1758) | P(c) | 10 | | Blackman and Eastop 1984 [Europe] |
| 12 | | | Bahr 1908, 1909 (as *Schizoneura*) [Germany] |
| *E. near ulmi* (Linnaeus, 1758) | P(c) | 16 | | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *E. (S.) yangi* Takahashi, 1939 | P(c) | 10 | | Blackman 1986 [Japan] |
| Taxon | Life cycle | $2n$ | Genetic system, $♀♂$ | References and collecting data |
|-------|------------|------|-----------------------|--------------------------------|
| *Forda formicaria* von Heyden, 1837 | P(c), P(o) | 18-20 | Blackman 1987a [Great Britain; Czechoslovakia; Sicily, Italy; Cyprus; Israel; Iran; USA; Canada] |
| | | or 21-23 (germline cells) | |
| | | 21, 22, 23 | Blackman 1980 [Great Britain; North America] (anholocyclic populations) |
| *F. hirsuta* Mordvilko, 1928 | P(c), P(o) | 17-20 (somatic cells) or 25-40 (germline cells) | Blackman 1987a [Great Britain; Sicily, Italy; Cyprus; Israel; Iran; USA; Canada] |
| | | 24, 25, 26, 27, 32 | Blackman 1980 [Great Britain; North America] (anholocyclic populations) |
| | | 28 | Robinson and Chen 1969a [Canada] |
| *F. marginata* Koch, 1857 | P(c), P(o) | 30 (germline cells) | Blackman 2015 [?] (holocyclic populations on *Pistacia atlantica*) |
| | | 18 (somatic cells) or 30 (germline cells) | Blackman 1980 (as *F. dactylidis* Börner, 1950) [Iran] (but see Blackman 1987a: "Dr. V. F. Eastop has re-examined it and considers it to be closer to *F. riccobonii* (Stefani") |
| *F. riccobonii* (Stefani, 1899) | P(c) | 18 | Khuda-Bukhsh and Pal 1983b [Gharwal, Uttarakhand, India] |
| *Formosaphis micheliae* Takahashi, 1925 | P(o) | 10 | Blackman 1986 [Japan] (with structural heterozygosity) |
| *Geoica lucifuga* (Zehnter, 1897) | P(c), P(o) | 14 | Kulkarni 1984 [Darjeeling, West Bengal, India] |
| | | 18 | Blackman and Eastop 1994 [?] |
| *G. ?rungsi* Davatchi & Remaudière, 1957 | P(c) | 18 | Blackman and Eastop 2015 [?] (holocyclic populations on *Pistacia atlantica*) |
| *G. setulosa* (Passerini, 1860) | P(c), P(o) | 20, 24, 28, 31 | Blackman 1980 [Great Britain] (anholocyclic populations) |
| | | 20 | Blackman 1980 [Iran] |
| | | 20, 24 | Blackman and Eastop 2015 [?] (from grass roots) |
| *G. utricularia* (Passerini, 1856) | P(c), P(o) | 16, 17, 18? | Blackman 1980 (as *G. eragrostidis* (Passerini, 1860)) [Great Britain] (anholocyclic populations) |
| | | 18 | Blackman 1980 (as *G. eragrostidis* (Passerini, 1860)) [Italy] |
| *Geoica ?wertheimae* Brown & Blackman, 1994 | P(c) | 18 | Blackman and Eastop 2015 [?] (holocyclic populations on *Pistacia palaestina*) |
| Taxon                          | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data                          |
|-------------------------------|------------|--------|---------------------|---------------------------------------------------------|
| Geoica sp.                    | ?          | 18     |                     | Blackman 1980 [Israel]                                   |
| Gootiella tremulae Tullgren, 1925 | P(c), ♀/♂ 16 |        |                     | Blackman and Eastop 2015 [?]                             |
| Hemipodaphis persimilis       | P(c)       | 36     |                     | Blackman 1986 [Japan]                                   |
| Akimoto, 1983                 |            |        |                     |                                                         |
| Kaltenbachiella oboltriæ      | P(c)       | 32     |                     | Blackman 1986 [Japan]                                   |
| (Shinji, 1936)                |            |        |                     |                                                         |
| K. japonica (Matsumura, 1917) | P(c)       | 16/15  | XX/X0               | Blackman 1986 [Japan]                                   |
| K. pallida (Haliday, 1838)    | P(c)       | 28     |                     | Blackman 1980 [Great Britain]                           |
| K. spinosa Akimoto, 1985      | P(c)       | 18     |                     | Blackman 1985 [Japan]                                   |
| Melaphis rhoi (Fitch, 1866)   | P(c), ♀/♂  26 |        |                     | Blackman and Eastop 1994 [?]                             |
| Mordvilkoja vagabunda         | P(c), ♀/♂  20 |        |                     | Harper and MacDonald 1966, Robinson and Chen 1969 [Canada] |
| (Walsh, 1863)                 |            |        |                     |                                                         |
| Neoprociphilus aceris (Monell, 1882) | P(c), ♀/♂ 14 |        |                     | Robinson and Chen 1969 [Canada]                          |
| Pachypappa marrupialis lammersi Aoki, 1976 | P(c)       | 10     |                     | Blackman 1986 [Japan]                                   |
| P. rossetei (Maxson, 1934)    | P(c)       | 10     |                     | Robinson and Chen 1969a (as Asiphum) [Canada]           |
| P. sacculi (Gillette, 1914)   | P(c)       | 10     |                     | MacDonald and Harper 1965 (as Asiphum), Harper and MacDonald 1966 (as Asiphum) [Canada] |
| P. tremulae (Linnaeus, 1761)  | P(c)       | 10     |                     | Kuznetsova and Shaposhnikov 1973 (as Asiphum) [St. Petersburg, Russia] |
| P. warshavensis (Nasonov, 1894) | P(c)       | 10     |                     | Blackman and Eastop 1994 [?]                             |
| Pachypappa sp.                | ?          | 10     |                     | Blackman 1980 (as Asiphum) [Iran] (from Populus euphratica) |
| Paracletus cimiciformis von Heyden, 1837 | P(c), ♀/♂ 16 |        |                     | Blackman 1980 [Israel]                                   |
| Pancolelophus morrisoni (Baker, 1919) | P(c), ♀/♂ 10/8 | 2(X,X) |                     | S. Akimoto, personal communication in Blackman 1986 (as Colopha moriokaensis) (Monzen, 1923) [Japan], Blackman and Eastop 1994 [?] |
| Pancollophus (Kaltenbach, 1843) | P(c), ♀/♂ 12 |        |                     | Colling, 1955 (as Pachyappella) [Great Britain]          |
| Pemphigus borealis Tullgren, 1909 | P(c)       | 20     |                     | Blackman and Eastop 1994 [?]                             |
| P. bunarius (Linnaeus, 1758)  | P(c), ♀/♂  20 |        |                     | Baehr 1908, 1909 (as P. pyriformis) [Germany]            |
| P. dorocola Matsumura, 1917   | P(c)       | 20     |                     | Blackman 1986 [Japan]                                   |
| P. fuscicornis (Koch, 1857)   | P(o), ♀/♂  20/19 | XX/X0 |                     | Kuznetsova and Shaposhnikov 1973 [Kiev, Ukraine], Kuznetsova 1974 [?] |
| P. immunis Buckton, 1896      | P(c)       | 10     |                     | Pal and Khuda-Buksh 1982 [Srinagar, Jammu and Kashmir, India] |
| P.? laurifolia Dolgova, 1973  | P(c)       | 20     |                     | Blackman 1986 [Japan]                                   |
| Taxon                                      | Life cycle | 2n | Genetic system, ♀♂ | References and collecting data                                                                                                                                 |
|-------------------------------------------|------------|----|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *P. matsumurai* Monzen, 1929              | P(c)       | 12 |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan], Blackman and Eastop 1994 [2] ("an unusual chromosome number for a *Pemphigus*, confirmed for Japanese samples from *Thalictrum*"). |
| *P. microsetosus* Aoki, 1975              | P(c)       | 22 |                   | Blackman 1986 [Japan]                                                                                                                                          |
| *P. mordvilko* Cholodkovsky, 1912         | P(c)       | 20 |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Blackman and Eastop 1994 [2]                                                                     |
| *P. paseki* Börner, 1952                  | P(c)       | 22 |                   | Gut 1976 [Holland]                                                                                                                                           |
| *P. populicarius* Fitch, 1859             | P(c)       | 20 |                   | MacDonald and Harper 1965 [Canada]                                                                                                                        |
| *P. populinignae* (Schrank, 1801)         | P(c), P(o) | 22 |                   | Gut 1976 (as *P. flaginis* (Boyer de Fonscolombe, 1841) [Holland])                                                                                       |
| *P. populitransversus* Riley, 1879        | P(c), P(o) | 20 |                   | Harper and MacDonald 1966 [Canada]                                                                                                                        |
| *P. ssp. robecate* Passerini, 1856        | P(c)       | 20 |                   | Baehr 1909 [Germany]                                                                                                                                         |
| *P. sp. tartareus* Hottes & Frison, 1931  | P(c)       | 20 |                   | Robinson and Chen 1969a (as *P. juncisensoriatus* Maxson, 1934) [Canada]                                                                                   |
| *Pemphigus* sp.                          | ?          | 20 |                   | Blackman 1980 [USA] (from roots of *Euphorbia supina*)                                                                                                       |
| *Prociphilus micheliae* Hille Ris Lambers, 1933 | ?        | 14 |                   | Kar et al. 1990 [India]                                                                                                                                     |
| *P. osmanthae* Essig & Kuwana, 1918       | P(c)       | 18 |                   | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                                                                                                       |
| *P. (Meliarhizophagus) fraxinifolii* (Riley, 1879) | P(c)       | 20 |                   | Robinson and Chen 1969a [Canada]                                                                                                                        |
|                                           |            | 22 |                   | Blackman and Eastop 1994 [2]                                                                                                                                   |
| *P. (Panaprociphilus) baicalensis* (Cholodkovsky, 1920) | P(o), P(c) | 12 |                   | Blackman 1986 [Japan], Blackman and Eastop 1994 [2]                                                                                                     |
| *P. (P) tessellatus* (Fitch, 1851)        | P(c)       | 6  |                   | Blackman and Eastop 1994 [2]                                                                                                                                   |
| *P. (Stagona) konoi* Hori, 1938           | P(c)       | 18 |                   | Blackman 1986 [Japan], Blackman and Eastop 1994 [2]                                                                                                     |
| *P. (S) pini* (Burmeister, 1835)          | P(c)       | 16 |                   | Blackman 1980 [Great Britain]                                                                                                                                   |
| *P. (S.) xylostei* (De Geer, 1773)        | P(c)       | 10 |                   | Pal and Khuda-Bukhsh 1983 [Garhwal, Utrarakhand, India], Blackman and Eastop 2015 [Europe]                                                                  |
| *Prociphilus* sp. 1                       | ?          | 18 |                   | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                                                                                                       |
| *Prociphilus* sp. 2                       | ?          | 10 |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                                                       |
| *Rectinasus buxtoni* Theobald, 1914       | P(c), P(o) | 26 |                   | Blackman 1980 [Iran]                                                                                                                                 |
| *Schlechtendalia chinensis* (Bell, 1851)  | P(c)       | c. 36 |               | Blackman and Eastop 1994 [2]                                                                                                                                     |
| *Smyrathodes betae* Westwood, 1849        | P(c), P(o) | 8  |                   | Blackman 1980 [Great Britain; Iran]                                                                                                                     |
| Taxon                                | Life cycle | $2n$ | Genetic system, $♀/♂$ | References and collecting data |
|--------------------------------------|------------|------|------------------------|--------------------------------|
| *Tetraneura radicicola* Strand, 1929 | P(c), P(o) | 14   | 14/13 XX/X0            | Blackman and Eastop 1984 [?]    |
|                                      |            |      |                        | S. Akimoto, personal communication in Blackman 1986 [Japan] |
| *T. ulbi* (Linnaeus, 1758)          | P(c), P(o) | 14/13| XX/X0                 | Schwarz 1932 [Munich, Germany]  |
|                                      |            | 14, 16|                        | Galli and Manicardi 1998 (gall generation) [Italy] |
|                                      |            |      |                        | Blackman and Eastop 1984 [?]    |
| *T. yezoensis* Matsumura, 1917      | P(c), P(o) | 12/11| XX/X0                 | S. Akimoto, personal communication in Blackman 1986 [Japan] |
|                                      |            |      |                        | Blackman and Eastop 1994 [Japan] |
|                                      |            |      |                        | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *T. (Tetraneurella) fusiformis* Matsumura, 1917 | P(c), P(o) | 18/16| 2(X,X)/X,X,0           | S. Akimoto, personal communication in Blackman 1986 [Japan] |
|                                      |            |      |                        | Blackman and Eastop 2015 [?] (gall generation) |
|                                      |            |      |                        | Blackman and Eastop 2015 [?] (permanently parthenogenetic populations) |
| *T. (T.) nigriabdominalis* (Sasaki, 1899) | P(c), P(o) | 17   |                        | Kulkarni and Kacker 1981a (as *T. hirsuta* Baker) [Sukna, West Bengal, India], Kulkarni 1984 [Darjeeling, West Bengal, India] |
|                                      |            |      |                        | Gautam et al. 1993, Manicardi and Gautam 1994 (as *T. akinire*) [Modena, Italy] |
|                                      |            |      |                        | Blackman and Eastop 1984 [?] (one sample), Blackman and Eastop 1994 [?] (anholocyclic population) |
|                                      |            |      |                        | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan] |
|                                      |            |      |                        | 13-19 with modal number 18 XX/X0 | Galli and Manicardi 1998 (gall generation) [Italy] |
|                                      |            |      |                        | 19                        | Blackman and Eastop 1994 [?] (anholocyclic population) |
| *T. (T.) sp. 1 prope nigriabdominalis* (Sasaki, 1899) | ?          | 24   |                        | Blackman 1986 [Japan] |
| *T. (T.) sp. 2 prope nigriabdominalis* (Sasaki, 1899) | ?          | 22, 26|                        | S. Akimoto, personal communication in Blackman 1986 [Japan] |
| *T. (T.) sorini* Hille Ris Lambers, 1970 | P(c)       | 16/14| 2(X,X)/X,X,0           | S. Akimoto, personal communication in Blackman 1986 [Japan] |
|                                      |            |      |                        | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| Taxon                        | Life cycle | 2n  | Genetic system,  | References and collecting data                                                                 |
|-----------------------------|------------|-----|------------------|-----------------------------------------------------------------------------------------------|
| *Thecabius affinis* (Kaltenbach, 1843) | P(c), P(o) | 28  |                  | MacDonald and Harper 1965 (as *Th. populicoupleniformis* (Cowen, 1895)), Harper and MacDonald 1966 (as *Th. populicoupleniformis*) (Canada) |
|                             |            | 38  |                  | Blackman 1980 [Great Britain], Blackman 1986 (as *Thecabius orientalis* (Mordvilko, 1935)) [Japan], Blackman and Eastop 2006 [British Columbia, Canada] |
| *T. (Parasacabius) auriculae* (Murray, 1877) | ?          | 16  |                  | Blackman and Eastop 2006 [? ]                                                                      |
|                             |            | 18  |                  | Blackman 1986 (as *Thecabius*) [Japan]                                                               |
|                             |            | 18+1 (1 B-chromosome?) |                  |                                                                                                    |
|                             |            |     |                  |                                                                                                    |
|                             |            | 28  |                  |                                                                                                    |
|                             |            |     |                  |                                                                                                    |
| *Mindarus abietinus* Koch, 1857 | P(c)       | 12  |                  | Robinson and Chen 1969a [Canada], Blackman and Eastop 1994 [Europe]                                |
| *M. obliquus* (Cholodkovsky, 1896) | P(c)       | 8   |                  | Blackman and Eastop 1994; [?] (sample from *P. glauca* in British Columbia, Canada (leg. C.K. Chan) had 2n=8 (R.L. Blackman; unpublished data), indicating that there may be more than one species on *Picea* in Canada) |
|                             |            | 12  |                  | Robinson and Chen 1969a [Canada]                                                                   |
| **Fam. Mindaridae**                                      |            |     |                  |                                                                                                    |
| *Cinara atlantica* (Wilson, 1919) | P(c), P(o) | 10  |                  | Blackman and Eastop 1994 [?]                                                                        |
| *C. atrofimbri* David & Rajasingh, 1968 | P(o) | 10  |                  | Khuda-Buksh and Kar 1990 [Shillong, Meghalaya, India]                                              |
|                             |            | 22  |                  | Das et al. 1985 [India]                                                                             |
|                             |            |     |                  |                                                                                                    |
|                             |            | 10  |                  | Sun and Robinson 1966; Robinson and Chen 1969a [Canada]                                            |
|                             |            |     |                  |                                                                                                    |
|                             |            | 10  |                  | Blackman and Eastop 1994 [?]                                                                        |
|                             |            |     |                  |                                                                                                    |
| *C. cembrae* (Seitner, 1936) | P(c)       | 10  |                  | Rukavischnikov 1979 [Siberia, Russia]                                                               |
|                             |            |     |                  |                                                                                                    |
|                             |            | 10  |                  | Robinson and Chen 1969a [Canada]                                                                   |
|                             |            |     |                  |                                                                                                    |
| *C. confluens* (Koch, 1856) | P(c), P(o) | 12  |                  | Blackman and Eastop 1994 [?]                                                                        |
|                             |            | 10  |                  | Blackman and Eastop 1994 [?]                                                                        |
|                             |            |     |                  |                                                                                                    |
| *C. cuneosulcata* (del Guercio, 1909) | P(c)   | 10/9 |                  | Shinji 1931 (as *Dilachnus laricii* (Walker, 1848)) [Japan]                                        |
| *C. formosa* (Takahashi, 1924) | P(c)       | 10  |                  | Blackman and Eastop 1994 [?]                                                                        |
| *C. fornaculata* Hottes, 1930 | P(c)       | 10  |                  | Robinson and Chen 1969a [Canada]                                                                   |
| *C. hyperophila* (Koch, 1855) | P(c)       | 10  |                  | Rukavischnikov 1974, 1979 [Novosibirsk, Russia]                                                    |
| *C. kochiana* (Börner, 1939) | P(c)       | 10  |                  | Rukavischnikov 1974, 1979 (as *C. boerneri* Hille Ris Lambers, 1956 - see Mamontova 1991) [Novosibirsk, Russia], Blackman 1980 [Great Britain] |
| *C. lachnistrostris* Hille Ris Lambers, 1966 | ? | 8   |                  | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                           |
| *C. laricicolpa* (Matsumura, 1917) | P(c) | 10  |                  | Shinji 1927 (as *Dilachnus laricii*), 1931, 1941a (as *C. laricii*), Blackman 1986 [Japan]         |
| *C. laricifex* (Fitch, 1858) | P(c)       | 10  |                  | Robinson and Chen 1969a [Canada]                                                                   |
| Taxon                          | Life cycle | 2n  | Genetic system,  | References and collecting data                                                                 |
|-------------------------------|------------|-----|-----------------|------------------------------------------------------------------------------------------------|
| C. laricis Hartig 1839        | P(c)       | 10  |                 | Rukavischikov 1979 [Siberia, Russia]                                                             |
| C. maculipes Hille Ris Lambers, 1966 | P(c)       | 12  |                 | Das et al. 1985 [Jammu and Kashmir, India], Kurl and Chauhan 1968a, 1987a [Chail, Himachal Pradesh, India] |
| C. maghrebica Mimeour, 1934  | ?          | 10  |                 | Blackman and Eastop 1994 [2]                                                                   |
| C. matsumusana Hille Ris Lambers, 1966 | P(c)       | 10  |                 | Blackman 1986 [Japan]                                                                            |
| C. nuda Mordvilko, 1895       | P(c)       | 10  |                 | Rukavischikov 1974, 1979 [Novosibirsk, Russia]                                                   |
| C. palaestinensis Hille Ris Lambers, 1948 | ?P(o)     | 10  |                 | Blackman and Eastop 1994 [2]                                                                   |
| C. pectinatae (Nördlinger, 1880) | P(c)       | 6   |                 | Blackman and Eastop 1994 [Germany] (2 samples) (about record of Rukavishikov 1979 see Cinara confinis (Koch, 1856)) |
| C. pergandei (Wilson, 1919)   | P(c)       | 14  |                 | Blackman 1990 [?], Blackman and Eastop 1994 [2]                                                 |
| C. piceae (Panzer, 1801)      | P(c)       | 10  |                 | Rukavischikov 1979 (as C. piceae (Panzer, 1801) and also as misidentification of C. pectinatae (Nördlinger, 1880) – see Mamontova 1991) [Novosibirsk, Russia], Blackman and Eastop 1994 [Great Britain] |
| C. piceicola (Cholodkowsky, 1896) | P(c)       | 8   |                 | Blackman 1990 [?], Blackman and Eastop 1994 [2]                                                 |
| C. pilicornis (Hartig, 1841)  | P(c)       | 10  |                 | Blackman 1990, Blackman and Eastop 1994 [Great Britain; New Zealand]                           |
| C. pilicornis (Hartig, 1841)  | P(c)       | 14  |                 | Rukavischikov 1974, 1979 [Novosibirsk, Russia]                                                   |
| C. pilosa (Zetterstedt, 1840) | ?          | 8   |                 | Blackman 1990 [?], Blackman and Eastop 1994 [2]                                                 |
| C. pinea (Mordvilko, 1895)    | P(c)       | 10  |                 | Blackman 1990 [Great Britain]                                                                   |
| C. pinea (Mordvilko, 1895)    | P(c)       | 10, 11, 14 |               | Rukavischikov 1974, 1979 [Novosibirsk, Russia]                                                   |
| C. pini (Linnaeus, 1758)      | P(c)       | 10/9 | XX/X0           | Rukavischikov 1974, 1979 (as C. pini (Linnaeus, 1758) and as C. hyperophila (Koch, 1855) – see Mamontova 1991) [Novosibirsk, Russia], Blackman 1986 [Europe] |
| C. pinidensiflone (Essig & Kuwana, 1918) | P(c)       | 10  |                 | Blackman and Eastop 2015 [2]                                                                   |
| C. piniformosana (Takahashi, 1923) | P(c)       | 10  |                 | Shinji 1931 (as Dilachnus), Blackman 1986 [Japan] (based on 2n(♂) = 11 (Shinji 1931))          |
| C. pinimaritima (Dufour, 1833) | P(c), P(o) | 16  |                 | Blackman 1990, Blackman and Eastop 1994 [as C. maritima] [2]                                   |
| C. ponderosa (Williams, 1911) | P(c), P(o) | 10  |                 | Blackman 1980 [USA]                                                                             |
| C. pruinosa (Hartig, 1841)    | P(c), P(o) | 10  |                 | Blackman and Eastop 1994 [2]                                                                   |
| C. schimitscheki Börner, 1940 | P(c)       | 10  |                 | Blackman and Eastop 1994 [2]                                                                   |
| Taxon                                      | Life cycle | $2n$ | Genetic system, $♀/♂$ | References and collecting data                                                                                                                                 |
|-------------------------------------------|------------|------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *C. similis* (van der Goot, 1917)          | ?          | 12   | $♀/♂$  
Kulkarni and Kacker 1981a (as *Lachnus*) [Dadha, Himachal Pradesh, India]                                                                                   |
| *C. strobi* (Fitch, 1851)                 | P(c)       | 10   | $♀/♂$  
Pal and Khuda-Bukhsh 1982 (as *C. abieticola* tenuipes Chakrabarti and Ghosh) [Srinagar, Jammu and Kashmir, India] (probably misidentification – aphids were collected from unusual host plant, *Juniperus communis*) |
| *C. tenuipes* Chakrabarti & Ghosh, 1974   | ?          | 12   | $♀/♂$  
Pal and Khuda-Bukhsh 1982 (as *C. abieticola* tenuipes Chakrabarti and Ghosh) [Srinagar, Jammu and Kashmir, India] (probably misidentification – aphids were collected from unusual host plant, *Juniperus communis*) |
| *C. (Capresobium) cupressi* (Buckton, 1881) | P(c), P(o) | 12   | $♀/♂$  
Blackman 1980 [Great Britain]                                                                                                                                 |
| *C. (C.) fusci* Blanchard, 1939           | P(o)       | 13   | $♀/♂$  
Blackman 1980 [Great Britain]                                                                                                                                 |
| *C. (C.) juniperi* (de Geer, 1773)        | P(c)       | 12   | $♀/♂$  
Blackman 1980 [Great Britain]                                                                                                                                 |
| *C. (C.) louisianensis* Boudreaux, 1949   | ?          | 12   | $♀/♂$  
Blackman 1990 [?]                                                                                                                                              |
| *C. (C.) tujafilina* (del Guercio, 1909)  | P(c)       | 12   | $♀/♂$  
Blackman 1980 [USA; Iran], Das et al. 1985 [India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                           |
| *Essigella californica* (Essig, 1909)     | P(c), P(o) | 8    | $♀/♂$  
Blackman 1980 [USA]                                                                                                                                          |
| *Eulachnus agilis* (Kaltenbach, 1843)     | P(c)       | 8    | $♀/♂$  
Rukavischnikov 1979 (as *Protolachnus*) [Novosibirsk, Russia], Blackman 1980 [Great Britain; Sweden]                                                             |
| *E. brevipilosus* Börner, 1940            | P(o)       | 30   | $♀/♂$  
Blackman 1980 [Great Britain]                                                                                                                                 |
| *E. rileyi* (Williams, 1911)             | P(c), P(o) | 8    | $♀/♂$  
Blackman 1980 [USA; Iran]                                                                                                                                 |
| *E. thunbergii* (Wilson, 1919)            | P(c)       | 8    | $♀/♂$  
Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                                                                                                          |
|                                           | 14/13      | XX/X0 | $♀/♂$  
Shinji 1927, 1931 (as *E. piniformosanus* Takahashi, 1931), Blackman 1986 [Japan] (based on n(♀) = 7 (Shinji 1927, 1931)) |
| *E. tuberculostemmatus* (Theobald, 1915)  | ?          | 8    | $♀/♂$  
Blackman 1986 [Europe], Khuda-Bukhsh and Kar 1990 (cited after Blackman and Eastop 2015)                                                                       |
| *Lachnus acutihirsutus* Kumar et Burkhardt, 1970 | ?        | 16   | $♀/♂$  
Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                                                         |
| *L. longirostris* (Mordvilko, 1909)       | P(c)       | 8    | $♀/♂$  
Blackman 1990 (as *L. iliciphilus*) [West Germany]                                                                                                             |
|                                           | 7?         | 2(X,X)/X,X,0 | $♀/♂$  
Blackman 1990 [West Germany]                                                                                                                                 |
|                                           | 8 (7+1B)   |      | $♀/♂$  
Blackman 1990 [Czechoslovakia; West Germany]                                                                                                                   |
|                                           | 9 (7+2B)   |      | $♀/♂$  
Blackman 1990 [Czechoslovakia; Denmark; Poland]                                                                                                               |
|                                           | 10         |      | $♀/♂$  
Blackman 1990 [Portugal; Great Britain?]                                                                                                                     |
|                                           | 11 (10+1B) |      | $♀/♂$  
Blackman 1990 [Sweden; Great Britain]                                                                                                                         |
|                                           | 12?        |      | $♀/♂$  
Blackman 1990 [Portugal]                                                                                                                                 |
|                                           | 14         |      | $♀/♂$  
Blackman 1990 [Great Britain]                                                                                                                                 |
|                                           | 15 (13+2B), 16, 17? |      | $♀/♂$  
Blackman 1990 [Portugal]                                                                                                                                 |
| *L. roboris* (Linnaeus, 1758)             | P(c)       | 7, 8, 10, 11, 13, 16 and 17 | $♀/♂$  
Blackman and Eastop 2015 [?] (some of these may apply to *L. iliciphilus*; a sample from *Castanea* in Portugal had 2n=10 (Blackman 1990)) |
|                                           | 8 (7+1B)   |      | $♀/♂$  
Blackman 1990 [Czechoslovakia; West Germany]                                                                                                                   |
|                                           | 9 (7+2B)   |      | $♀/♂$  
Blackman 1990 [Czechoslovakia; Denmark; Poland]                                                                                                               |
|                                           | 10         |      | $♀/♂$  
Blackman 1990 [Portugal; Great Britain?]                                                                                                                     |
|                                           | 11 (10+1B) |      | $♀/♂$  
Blackman 1990 [Sweden; Great Britain]                                                                                                                         |
|                                           | 12?        |      | $♀/♂$  
Blackman 1990 [Portugal]                                                                                                                                 |
|                                           | 14         |      | $♀/♂$  
Blackman 1990 [Great Britain]                                                                                                                                 |
|                                           | 15 (13+2B), 16, 17? |      | $♀/♂$  
Blackman 1990 [Portugal]                                                                                                                                 |
|                                           | 7, 8, 10, 11, 13, 16 and 17 |      | $♀/♂$  
Blackman and Eastop 2015 [?] (some of these may apply to *L. iliciphilus*; a sample from *Castanea* in Portugal had 2n=10 (Blackman 1990)) |
| Taxon                                | Life cycle | 2n♀,♂ | Genetic system,♀,♂ | References and collecting data                                                                                                                                 |
|-------------------------------------|------------|--------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *L. tropicalis* (van der Goot, 1916)| P(c), P(o) | 10     | XX/X0               | Shinji 1927, 1941a (as *Pterochlorus*), Blackman 1986 [Japan] (based on n(♀) = 5 (Shinji 1927))                                                               |
|                                     |            | 16     |                     | Shinji 1931 (as *Pterochlorus*) [Japan], Blackman 1986 [Japan] (based on n(♀) = 8 (Shinji 1931))                                                             |
|                                     |            | 12, 13 or 16 |               | Blackman 1986, 1990 [Japan, China]                                                                                                                            |
|                                     |            | 12, 14, 16, 18, 22, 28, 38 |               | Muramoto 1987 [Japan] (Blackman and Eastop 2015: " Muramoto (1987) reported chromosome numbers from 2n=14-38, but his results are difficult to interpret and may include polyploid cells and/or preparations of more than one species.") |
| *Maculolachnus sipkensi* Hille Ris Lambers, 1962 | P(c)      | 10     |                     | Robinson and Chen 1969a [Canada]                                                                                                                             |
| *M. submacula* (Walker, 1848)       | P(c)       | 10     |                     | Blackman 1980 [Great Britain], Blackman and Spence 1996 [Great Britain]                                                                                     |
|                                     |            | 10/9   | XX/X0               | Blackman 1990 [Great Britain]                                                                                                                                |
| *Protrama flavescens* (Koch, 1857)  | P(o)       | 40-42, c, 42 | XX/X0 | Blackman 1980 [Great Britain]                                                                                                                                |
|                                     |            | - 42, 42 |                     | Blackman et al. 2000 [Great Britain]                                                                                                                          |
| *P. radici* (Kaltenbach, 1843)      | P(o)       | c.60   |                     | Blackman 1980 [Great Britain]                                                                                                                                |
|                                     |            | - 50   |                     | Blackman et al. 2000 [Great Britain]                                                                                                                          |
| *P. rnunculi* (del Guercio, 1909)   | ?          | c.36   |                     | Blackman 1980 [Great Britain]                                                                                                                                |
| *Pterochloroides persicae* (Cholodkovsky, 1899) | P(c), P(o) | 20     |                     | Blackman and Eastop 1984 [?], Blackman 1990 [?]                                                                                                             |
| *Schizolachnus pineti* (Fabricius, 1781) | P(c), P(o) | 10     |                     | Blackman 1980 [Great Britain]                                                                                                                                |
|                                     |            | 18     |                     | Rukavishnikov 1974, 1979 [Novosibirsk, Russia] (Blackman and Eastop 2015 supposed that the material from Novosibirsk may be misidentification of *S. obscurus*) |
| *Stomaphis bratislavensis* Czylok & Blackman, 1991 | P(c) | 8 |                     | Blackman 1990 (as *Stomaphis quercus* [Linnaeus, 1758]) [Czechoslovakia], Czylok and Blackman 1991 [Slovakia]                                           |
| *S. cupresi* (Pintera, 1965)        | ?          | 14     | 2(X,X,XX)/X,X,X,0   | Blackman 1990 [?]                                                                                                                                            |
| *S. japonica* Takahashi, 1960       | P(c)       | 10/8   | 2(X,X,0)/X,X,0      | Blackman 1986 [Japan], Blackman 1990 [?], Czylok and Blackman 1991 [Japan]                                                                                   |
| *S. quercus* (Linnaeus, 1758)       | P(c)       | 10/8   | 2(X,X,0)/X,X,0      | Blackman 1990 [Europe]                                                                                                                                           |
| *S. yanonis* Takahashi, 1918        | P(c)       | 15, 16?| 2(X,X,XX)/X,X,X,0   | Blackman 1990 [?]                                                                                                                                            |
|                                     |            | 20?    | 2(X,X,XX)/X,X,X,0   | Honda 1921 (as *S. yanonis*), Blackman 1986 [Japan] (based on n(♀) = 10 (Honda 1921))                                                                      |
| *Trama rara* Mordvilko, 1908        | ?          | 12     |                     | Blackman et al. 2000 [Great Britain]                                                                                                                          |
|                                     |            | 12, 13, 14 |             | Normark 1999 [Great Britain; Poland]                                                                                                                          |
|                                     |            | 13     |                     | Blackman 1980 [Great Britain]                                                                                                                                |
| *T. trogbuydes* von Heyden, 1837    | P(o), P(c) | 13, 14, 16, 17, 18, 19, 20, 21, 23 |                     | Normark 1999 [Great Britain; France; Germany; Czech Republic; Poland]                                                                                         |
| Taxon | Life cycle | 2n | Genetic system, ♀♂ | References and collecting data |
|-------|------------|----|-------------------|-------------------------------|
|       |            | 14, 15, 16, 17, 18, 19, 20, 21, 22 | Blackman 1980 [Great Britain] |
|       |            | 14, 15, 17, 18, 19, 20, 21, 22, 23 | Blackman et al. 2000 [Great Britain] |
|       |            | 16 | Blackman et al. 2000 [Poland] |
|       |            | 16 (colony without sexual morphs), 20 (colony with sexual morphs) | Blackman et al. 2001 [Great Britain] |
|       |            | 21 | Blackman and Spence 1996 [Great Britain] |
|       |            | 9, 11 | Blackman 1980 (as Neotrama) [Great Britain] |
|       |            | 9, 10, 11, 12 | Blackman et al. 2000 [Great Britain] |
|       |            | 10, 12 | Normark 1999 [Great Britain] |
|       |            | 10, 11, 12, 13, 14 | Normark 1999, Blackman et al. 2000 [Great Britain] |
|       |            | 8 | Morgan 1909b (as Lachmus dentatus Le Baron, 1872) [USA], Shinji 1927, 1931, 1941a (as Tuberolachnus viminalis (Fonscolombe)) [♀♂] (based on n(♂) = 4 (Shinji 1927, 1931, 1941a), but Blackman 1980 supposed that all these data are misidentifications of different species of Pterocomma). |
|       |            | 20 | Blackman 1986 [Japan], Blackman 1990 [Great Britain; Iran; India; Japan], Blackman and Spence 1996 [Great Britain] |
|       |            | 18, 19, 20 | Dhatwalia and Gautam 2009 [Himachal Pradesh, India] |
|       |            | 22 | Raychaudhuri and Das 1987 [India] |

**Fam. Hormaphididae**

| Taxon | Life cycle | 2n | Genetic system, ♀♂ | References and collecting data |
|-------|------------|----|-------------------|-------------------------------|
| Aleurodaphis asteris Takahashi & Sorin, 1958 | P(o) | 32 | Blackman 1986 [Japan] |
| A. impatiens Sorin & Miyazaki, 2004 | P(o) | c.30 | Blackman and Eastop 2006 [♀♂] |
| A. mikaniae Takahashi, 1925 | ? | c.30 | Blackman 1986 [Japan] |
| Astegopteryx bambusae (Buckton, 1893) | ? | 12 | Kar et al. 1990 [India] |
| A. formosana (Takahashi, 1924) | ? | 12 | Chen and Zhang 1985b (as A. insularis) (cited after Blackman and Eastop 2015) |
| A. himalayensis (M.R. Ghosh, Pal & D.N. Raychaudhuri, 1977) | ? | 12 | Kar et al. 1990 (as Pseudoastegopteryx) [India] |
| A. minuta (van der Goot, 1917) | ? | 12 | Kar et al. 1990 [India] |
| Cerataphis brasiliensis (Hempel, 1901) | P(c), P(o) | 18 | Blackman and Eastop 2006 [♀♂] |
| C. orchidearum (Westwood, 1879) | P(o) | 16 | Blackman and Eastop 1984, 2006 [♀♂] (samples from Cymbidium, Dendrobium and Epidendrum) |
|       |            | 18 | Blackman and Eastop 1984, 2006 [♀♂] (samples from Angraecum, Sarcochilus and Butia) |
| Taxon                                      | Life cycle | 2n | Genetic system | References and collecting data                                                                 |
|-------------------------------------------|------------|----|----------------|-----------------------------------------------------------------------------------------------|
| *Ceratoglyphina bambusae* van der Goor, 1917 | P(c)       | 12 |                | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)             |
| *C. bengalensis* L.K. Ghosh, 1972          | ?          | 12 |                | Khuda-Bukhsh and Kar 1987 (as *C. bambusae bengalensis* Ghosh) [Kalimpong, West Bengal, India] |
| *Ceratosacina indica* M.R. Ghosh, Pal & D.N. Raychaudhuri, 1977 | ?          | 12 |                | Kar et al. 1990 [India]                                                                         |
| *C. japonica* (Takahashi, 1924)            | P(c), P(o) | 12 |                | Blackman 1986 [Japan]                                                                           |
| *C. lanigera* Zehntner, 1897              | P(o)       | 12 |                | Blackman and Eastop 1984 [?], Blackman 1986 [Japan], Kar et al. 1990 [India]                   |
| *C. nekoashi* (Sasaki, 1910)              | P(c)       | 12 |                | Blackman 1986 [Japan]                                                                           |
| *C. perglandulosa* R.C. Basu, A.K. Ghosh & D.N. Raychaudhuri, 1975 | ?          | 12 |                | Khuda-Bukhsh and Kar 1987 [Kalimpong, West Bengal, India]                                      |
| *C. silvestrii* (Takahashi, 1927)         | ?          | 12 |                | Kurl 1980b [Meghalaya, India]                                                                   |
| *Euthoracaphis umbellulariae* (Essig, 1932) | ?P(c), P(o) | 14 |                | Blackman 1980 [USA]                                                                             |
| *Hamamelistes betulinus* (Horvath, 1896)   | P(o), P(c) | 12 |                | Kuznetsova and Shaposhnikov 1973 (as *Tetraphis*) [St. Petersburg, Russia], Blackman 1986 [Japan], Blackman and Eastop 2015 [?] (for anholocyclic European population) |
| *H. spinosus* Shimer, 1867                | P(c)       | c. 50 |                | Blackman 1980 [Canada], Blackman and Eastop 1994 [?]                                           |
| *Hormaphis betulae* (Mordvilko, 1901)      | P(o), P(c) | ?18 |                | Blackman 1986 [Japan]                                                                           |
| *H. cornu* (Shimer, 1867)                 | P(c)       | ?18 |                | Blackman and Eastop 1994 [?]                                                                   |
| *H. hamamelidis* (Fitch, 1851)            | P(c)       | ?18 |                | Blackman and Eastop 1994 [?]                                                                   |
| *Pseudoregma alexanderi* (Takahashi, 1924)| P(o), P(c) | 12 |                | Khuda-Bukhsh and Kar 1987 (as *Paraoregma*) [Kalimpong, West Bengal, India]                   |
| *P. bambucicola* (Takahashi, 1921)        | P(c), P(o) | 12 |                | Blackman 1986 [Japan], Chen and Zhang 1985b (cited after Blackman and Eastop 2015), Khuda-Bukhsh and Kar 1987 [Kalimpong, West Bengal, India] |
| *P. panicola* (Takahashi, 1921)           | P(o)       | 12 |                | Blackman 1986 [Japan]                                                                           |
| *Thornacaphis* sp.                       | ?          | 12 |                | Blackman 1980 [Japan]                                                                           |

**Fam. Thelaxidae**

| *Glyphina betulae* (Linnaeus, 1758) | P(c) | 10/9 | XX/X0 | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia] |
|                                     |     | 28/27, 56/55 | XX/X0 | Blackman 1989 [Poland; Great Britain; Lithuania] |
| *G. jacutensis* Mordvilko, 1931      | P(c) | 8    |       | Blackman 1989 [Romania; Lithuania] |
| *G. pseudoschrankiana* Blackman, 1989 | P(c) | 10   |      | Kuznetsova and Shaposhnikov 1973 (as *G. schrankiana* Börner, 1950) [St. Petersburg, Russia] |
| *Glyphina* sp. from Betula          | ?    | 55   |       | Blackman 1980 [Great Britain] |
| *Karisakia omigerumii* (Shinji, 1923) | ?P(c) | 18   |       | Blackman and Eastop 1994 [?] (or specimens from *Pterocaryastenoptera* in China) |
| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|-------------------------------------------|------------|-------|-------------------|-----------------------------------------------------------------------------------------------|
| *Thelaxes californica* (Davidson, 1919)   | P(c)       | 12    |                   | Blackman and Eastop 1994 [?][1]                                                               |
| *T. dryophila* (Schrank, 1801)            | P(c)       | 8     |                   | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia], Kuznetsova 1974 [2]                |
| *T. suberi* (del Guercio, 1911)           | ?          | 8     |                   | Blackman and Eastop 1984 [?]                                                                  |
| *T. saltadorosi* Remaudière, (1982) 1983  | ?          | 8     |                   | Blackman and Eastop 1994 [?]                                                                  |

**Fam. Aiceonidae**

*Aiceona retipennis* Davidson, Narayanan & Rajasingh, (1970) 1971

|              |            |       |                   |                                                                                               |
|---------------|------------|-------|-------------------|-----------------------------------------------------------------------------------------------|
| *Thelaxes californica* (Davidson, 1919)   | ?          | 18    |                   | Khuda-Bukhsh 1980 [Garhwal, Uttarakhand, India]                                                |

**Fam. Aiceonidae**

*Aiceona corni* (Fabricius, 1775)

|              | P(c), P(o) | 6     | 6, 7, 8 (rearrangements, hybridization?) | Blackman and Eastop 2015 [?] | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
|---------------|------------|-------|----------------------------------------|------------------------------|--------------------------------------------------------|
| *A. cornicola* (Walsh, 1863)               | P(o), P(o) | 10    |                                         | Robinson and Chen 1969a (as *A. querci* Fitch, 1859) [Canada] |

**Anoeciidae**

*A. furcata* (Theobald, 1915)

|              | P(o), P(p(c)) | 12    | 12, 13 (as *A. furcata* (Theobald, 1915) and *A. nemoralis* Börner, 1950) | Blackman 1980 [Great Britain] | Blackman and Eastop 2006 [?] |
|---------------|---------------|-------|--------------------------------------------------------------------------------|------------------------------|-------------------------------|
| *A. graminis* Gillette & Palmer, 1924     | P(c)          | 8     | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                         |                              |
| *A. haupsi* Börner, 1950                   | P(c)          | 8     | Blackman and Eastop 2015 [?]                                                   |                              |

**Fam. Phloeomyzidae**

*Phloeomyzus passerinii* Signoret, 1875

|              | P(c), P(o)  | 10    |                                      | Gut 1976 [Holland]                                                              |
|---------------|-------------|-------|-------------------------------------|--------------------------------------------------------------------------------|

**Fam. Greenideidae**

*Anomalosiphum indicum* A.K. Ghosh, M.R. Ghosh & D.N. Raychaudhuri, 1971

|              | ?           | 18    |                                      | Blackman 1980 [Sarawak, Malaysia]                                               |

*Ceraphis quercus* Takahashi, 1918

|              | ?           | 8     |                                      | Kurl 1980b [Meghalaya, India], Blackman 1986 [Japan]                            |

*C. nappardi* indica A.N. Basu, 1961

|              | ?           | 8     |                                      | Kar et al. 1990 [India]                                                        |

*Eutrichosiphon heterotrichum* (Raychaudhuri, 1956)

|              | P(c), P(o)  | 20    |                                      | Blackman 1986 (as *E. dubium*) [Japan] (see Blackman and Eastop 2015)        |

*E. makii* Raychaudhuri & Chatterjee, 1974

|              | ?           | 40    |                                      | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                        |

*E. parvulum* Eastop & Hille Ris Lambers, 1976

|              | ?           | 26    |                                      | Blackman and Eastop 2006 [?]                                                  |

*Eutrichosiphum sp.*

|              | ?           | 20    |                                      | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                       |
| Taxon | Life cycle | $2n$ | Genetic system | References and collecting data |
|-------|------------|------|----------------|-------------------------------|
| **Greenidea ayyari** D.N. Raychaudhuri, M.K. Ghosh, Banerjee, A.K. Ghosh, 1973 | ? | 18 | ♀♂ | Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
| **G. ficicola** Takahashi, 1921 | P(o) | 22 | | Blackman 1980 [Australia] |
| **G. longisetosa** Raychaudhuri, Ghosh, Banerjee & Ghosh, 1973 | ? | 18 | | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India] |
| **G. mangiferae** Takahashi, 1925 | ? | 20 | | Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| **G. querciphaga** Raychaudhuri, Ghosh, Banerjee & Ghosh, 1973 | ? | 18 | | Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
| **G. (Trichosiphum) azonae** (Pergande, 1906) | ?P(o), ?P(c) | 22 | | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India] |
| **G. (T) bucktonis** A.K. Ghosh, R.C. Basu & D.N. Raychaudhuri, 1970 | ? | 8 | | Kar et al. 1990 (as G. (T) schoutedeni Raychaudhuri, Ghosh, Banerjee and Ghosh) [India] |
| **G. (T) haldari** Maity & Chakrabarti, 1980 | ? | 20 | | Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
| **G. (T) heeri** D.N. Raychaudhuri, M.R. Ghosh, M. Banerjee & A.K. Ghosh, 1973 | ? | 7, 8, 9 | | Kurl 1986 (as G. (T) formosana heeri D.N. Raychaudhuri, M.R. Ghosh, M. Banerjee & A.K. Ghosh, 1973) [Meghalaya, India] |
| **G. (T) kuwanai** (Pergande, 1906) | ?P(c) | 20 | | Blackman 1980, 1986 [Japan], Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
| **G. (T) nipponica** Suenaga, 1934 | P(c) | 18 | | Blackman 1986 [Japan] |
| **G. (Trichosiphum) puidii** van der Goot, 1917 | P(o) | 18 | | | Kulkarni and Kacker 1979 (as G. (T) formosana formosana (Maki) ) [Rautara, West Bengal, India], Kar et al. 1990 (as G. (T) formosana formosana (Makiischout) ) [India], Khuda-Bukhsh and Kar 1990 (as G. (T) formosana formosana (Maki, 1917)) [Shillong, Meghalaya, India], Dutta and Gautam 1993 (as G. (T) formosana (Maki, 1917)) [Mandi, Himachal Pradesh, India], Samkaria et al. 2010 (as G. formosana (Maki)) [Palampur, Himachal Pradesh, India] |
| **Mollitrichosiphum nandii** A.N. Basu, 1964 | P(c) | 16 | | | Blackman and Eastop 1994 [?] |
| **Schoutedenia ralumensis** Rübsaamen, 1905 | P(c), P(o) | 14 (male) | | Blackman 1980 [Australia] |
| | | | | Khuda-Bukhsh and Kar 1990 (as S. lutea (van der Goot, 1917)) [Kalyani, West Bengal, India] |
| | | | | Dutta and Gautam 1993 (as G. (T) formosana (Maki, 1917)) [Mandi, Himachal Pradesh, India], Samkaria et al. 2010 (as G. formosana (Maki)) [Palampur, Himachal Pradesh, India] |
| | | | | Blackman and Eastop 1994 [Papua New Guinea] |
| | | | | Hales 1989 (as S. lutea (van der Goot)) [Australia] |

**Fam. Drepanosiphidae**

| Taxon | Life cycle | $2n$ | Genetic system | References and collecting data |
|-------|------------|------|----------------|-------------------------------|
| **Allaphis californica** (Hille Ris Lambers, 1974) | ? | 10 | | Blackman and Eastop 2006 (as Thripsaphis) [?] |
| **A. foxtonensis** (Cottier, 1953) | ? | 10 | | Blackman and Eastop 2006 (as Thripsaphis) [?] |
| **A. verrucosa** (Gillette, 1917) | P(c) | 10 | | Blackman and Eastop 2006 (as Thripsaphis) [?] |
| **Betacallis alnicolens** Matsumura, 1919 | ? | 22 | | Blackman 1986 [Japan] |
| Taxon                                         | Life cycle | 2n ♂/♀ | Genetic system, ♂/♀ | References and collecting data                                                                 |
|----------------------------------------------|------------|--------|--------------------|-----------------------------------------------------------------------------------------------|
| B. odaiensis Takahashi, 1961                 | ?          | 22     |                   | Blackman 1986 [Japan] provided these data and supposed that "Eucaphis betulifoliae" in Shinji 1927 (with n=11) is very possibly B. odaiensis. |
| B. sikkimensis R.C. Basu, M.R. Ghosh & D.N. Raychaudhuri, 1974 | P(c)       | 20     |                   | Blackman and Eastop 1994 [?]                                                                  |
| Betulaphis brevipilosa Börner, 1940          | P(c)       | 20     |                   | Blackman 1980 [Sweden]                                                                        |
| B. peeli Hille Ris Lambers, 1952             | ?          | 20     |                   | Blackman and Eastop 1994 [?]                                                                  |
| Boernerina variabilis Richards, 1961         | P(c)       | 16     |                   | Blackman and Eastop 1994 [Canada]                                                             |
| Calaphis arctica Hille Ris Lambers, 1952     | P(c)       | 18     |                   | Blackman and Eastop 1994 [?]                                                                  |
| C. betulaecolens (Fitch, 1851)               | P(c)       | 20     |                   | Sun and Robinson 1966, Robinson and Chen 1969 [Canada]                                        |
| C. betulella Walsh, 1863                     | P(c)       | 18     |                   | Blackman 1980 [USA]                                                                           |
| C. betulicola (Kaltenbach, 1843)             | P(c)       | 18     |                   | Gut 1976 [Holland]                                                                            |
| C. coloradensis Granovsky, 1939              | P(c)       | 18     |                   | Blackman 1980 [USA]                                                                           |
| C. flavacoluria Mordvilko, 1928              | P(c)       | 18     |                   | Gut 1976 [Holland], Blackman 1980 (as C. viridipallida Palmer, 1952) [Canada]                  |
| C. leonardi Quednau, 1971                    | P(c)       | 20     |                   | Blackman and Eastop 1994 [?]                                                                  |
| C. magnoliae (Essig & Kuwana, 1918)          | ?          | 8/7    | XX/X0             | Shinji 1927, 1931, 1941a (as Chromaphis), Blackman 1986 (as Neocalaphis) [Japan] (based on n(♂) = 4 (Shinji 1931)) |
| C. magnolicola (Takahashi, 1921)             | ?          | 20/19  | XX/X0             | Shinji 1927, 1931, 1941a (Japan), Blackman 1986 (as Neocalaphis) [Japan] (their own data and based on n(♂) = 10 (Shinji 1927, 1931)) |
| C. viridipallida Palmer, 1952                | P(c)       | 18     |                   | Blackman 1980 [Canada]                                                                        |
| Calaphis sp.                                 | ?          | 18/17  | XX/X0             | Shinji 1927, 1931, 1941a (as C. betulaecolens Fitch, 1851) [USA]                               |
| Callipterinella calliptera (Harrig, 1841)    | P(c)       | 20     |                   | Blackman 1980 [USA], Blackman 1986 [Japan]                                                    |
| C. tuberculata (von Heyden, 1837)            | P(c)       | 20     |                   | Blackman 1980 [Great Britain]                                                                 |
| Chromaphis juglandicola (Kaltenbach, 1843)   | P(c)       | 8      |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                        |
| Chromocallis nirecola (Shinji, 1933)         | P(c)       | 18     |                   | Blackman 1980 [Japan]                                                                         |
| Clethrobius comes (Walker, 1848)             | P(c)       | 11     |                   | Blackman 1986 [Japan], Blackman 1988 [Japan; Great Britain; Ireland; Finland]                  |
| Ctenocallis setosa (Kaltenbach, 1846)        | P(c)       | 18     |                   | Blackman 1980 [Great Britain]                                                                 |
| Drepanaphis acerifoliacea (Thomas, 1878)     | P(c)       | 38     |                   | Shini 1923 (as Dreafaphis) [USA]                                                                |
| D. simpsoni Smith, 1959                      | ?          | 30     |                   | Blackman 1980 [USA]                                                                           |
| D. utahensis Smith & Knowlwhon, 1943         | ?          | 30     |                   | Blackman 1980 [USA]                                                                           |
### General trends of chromosomal evolution in Aphidococca...

| Taxon                                      | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data                                                                 |
|--------------------------------------------|------------|--------|---------------------|------------------------------------------------------------------------------------------------|
| *D. platanoidis* (Schrank, 1801)           | P(c)       | 30     | XX/X0               | Shinji 1923 (as *Drepanosiphum flatanoides* [USA])                                          |
|                                            |            |        |                     | Shinji 1927, 1931, 1941a [USA]                                                               |
|                                            |            | 30/29  |                     | Blackman 1980 [Great Britain]                                                                |
| *Eucalipterus tiliae* (Linnaeus, 1758)     | P(c)       | 10     | XX/X0               | Blackman and Eastop 1994 [?]                                                                |
|                                            | 10 (female), 8 (male) | 2(X,X,0) |                     | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                   |
|                                            |            | 38-40? |                     |                                                                                             |
| *Eucalipterus betulae* (Koch, 1855)        | P(c)       | 10/8   | (X,X,0)             | Blackman 1976, 1977 [Great Britain], Blackman 1980 [Europe; West of North America], Blackman and Spence 1996 [Great Britain], Blackman and De Boise 2002 [Great Britain; New Zealand; USA] |
|                                            |            |        |                     | Blackman 1988 [Europe]                                                                      |
| *E. betulae* group 1 (from *Betula papyrifera*) | ?         | 7 (♀), 6 (♂) |                     | Blackman 1980 [Northwest Territories, Canada], Blackman 1988 (Fig. 4b) [Northwest Territories, Yukon, Canada] |
| *E. betulae* group 2                       | ?         | 8      |                     | Sun and Robinson 1966 (as *E. deducta* Baker, 1917), Robinson and Chen 1969a [Canada] (see comments in Blackman 1980) |
| *E. betulae* group 3                       | ?         | 8 (+2) | 2B-chromosomes      | Blackman 1986 [Japan] (as *E. betulae*)                                                     |
| *E. betulijaponicae* (Matsumura, 1919)     | P(c)       | 8 no   |                     | Blackman 1986 [Japan] (as *E. betulae*)                                                     |
|                                            |            | 8(1)B-chromosomes |                     |                                                                                             |
|                                            |            | 9/7    |                     | Blackman 1986 [Japan] (as *E. betulae*)                                                     |
| *E. borealis* Blackman, 2002               | P(c)       | 8/7    | XX/X0               | Blackman 1980 (as *E. betulae* group) [Northwest Territories, Manitoba, Canada], Blackman and De Boise 2002 [Canada] (one pair of X-chromosome) |
| *E. caerulescens* Pashtshenko, 1984        | P(c)       | 22     |                     | Blackman 1986 (as *E. ontakensis* Sorin, 1970), Blackman and De Boise 2002 [Japan]          |
| *E. gillettei* Davidson, 1915              | P(c)       | 15, 16, 18 |                     | Blackman 1980 [Canada; USA]                                                                |
|                                            |            |        |                     | Blackman 1988, Blackman and De Boise 2002 [Canada; USA]                                    |
| *E. lineata* Baker, 1917                   | P(c)       | 16     |                     | Blackman 1980 (also as *E. deducta* Baker, 1917) [USA]                                      |
|                                            |            | 16/14  |                     | Blackman 1988, Blackman and De Boise 2002 [USA]                                            |
| *E. mucida* (Fitch, 1856)                  | P(c)       | 20     |                     | Blackman 1980 [New York, Pennsylvania, USA]                                                 |
|                                            |            | 20, 21, 22/18, 19, 20 |                     | Blackman 1988, Blackman and De Boise 2002 [USA] (the differences are due to variation in the number of accessory (“B”) chromosomes) |
| *E. ontakensis* Sorin, 1970                | ?         | 22     |                     | Blackman 1986, 1988 [Japan]                                                                |
| Taxon                                      | Life cycle | $2n$ | Genetic system, $2n$ | References and collecting data |
|-------------------------------------------|------------|------|---------------------|--------------------------------|
| *E. papyrifericola* Blackman, 2002        | P(c)       | 9/7  | Blackman 1880 [USA; Canada] as *E. betulae* group | Blackman and De Boise 2002 [Canada] |
|                                           |            | 9-10/8 | Blackman 1980 [USA; Canada] as *E. betulae* group | Blackman, personal comm. |
|                                           |            | 7, 8, 9 | Blackman 1980 [Great Britain] | Blackman 1976 [Great Britain] |
| *E. punctipennis* (Zetterstedt, 1828)     | P(c)       | 7, 8/5, 6 | Blackman 1988 [Europe] | Blackman and De Boise 2002 [Canada] |
|                                           |            | 8/6   | Blackman 1977 [?], Sun and Robinson 1966 [Canada] | Blackman 1976 [Great Britain] |
|                                           |            | 8     | Blackman 1977 [?], Sun and Robinson 1966 [Canada] | Blackman 1976 [Great Britain] |
| *E. quednaui* Blackman, 2002              | P(c)       | 11/9 | Blackman 1980 [Utah, USA] as *E. betulae* group, Blackman and De Boise 2002 [western USA] (including 3 "B" chromosomes) | Blackman 1986 (as *Pterocallis*) [USA] |
| *Hoplocallis picta* (Ferrari, 1872)       | P(c)       | 14   | Blackman 1980 (as *I. tavaresi Ilharco, 1961) | Blackman and Eastop 2015 [?] |
| *Israelaphis carmini carmini* Essig, 1953 | P(c)       | 18   | Blackman 1980 (as *I. tavaresi Ilharco, 1961) [Portugal] | Blackman and Eastop 2015 [?] |
| *L. carlina Mier Durante, 1978*           | P(c)       | 18   | Blackman 1980 (as *I. tavaresi alistana* Mier Durante, 1978) [Spain] | Blackman and Eastop 2015 [?] |
| *I. lambersi Ilharco, 1961*               | P(c)       | 16   | Blackman 1980 (as *Pterocallis*) [USA] | Blackman and Eastop 2015 [?] |
| *Melanocallis caryaefoliae* (Davis, 1910) | P(c)       | 14   | Blackman 1980 (as *M. frumipennis* (Fitch)) [USA] | Blackman and Eastop 2015 [?] |
| *Mesocallis savashiae* (Matsumura, 1917)  | P(c)       | 10   | Blackman 1980 (as *M. frumipennis* (Fitch)) [USA] | Blackman and Eastop 2015 [?] |
| *M. (Panatinocallis) corylicola* (Higuchi, 1922) | P(c)       | 10   | Blackman 1980 (as *M. frumipennis* (Fitch)) [USA] | Blackman and Eastop 2015 [?] |
| *Monaphis antennata* (Kaltenbach, 1843)   | P(c)       | 20   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *Monellia caryella* (Fitch, 1855)         | P(c)       | 18   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. microsetosa* Richards, 1960           | P(c)       | 18   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *Monelliopsis caryae* (Monell, 1879)      | P(c)       | 18   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. nigropunctata* (Granovsky, 1931)      | P(c)       | 10   | Blackman 1980 [Canada; USA] | Blackman and Eastop 2015 [?] |
| *Myzocallis boerneri* Stroyan, 1957       | P(c)       | 14   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. carpini* (Koch, 1855)                 | P(c)       | 14   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. coryli* (Goetz, 1778)                 | P(c)       | 14   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. glandulosa* Hille Ris Lambers, 1948   | P(c)       | 14   | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
| *M. (Agrioaphis) castanicola* Baker, 1917 | P(c)       | 12/11 | Blackman 1980 [USA] | Blackman and Eastop 2015 [?] |
|                                           |            | 14    | Blackman 1941a [as *Agrioaphis castanae*] [Japan] | Shini 1941a [as *Agrioaphis castanae*] [Japan] |
|                                           |            | 14/13 | Blackman 1980 [USA] | Shini 1941a [as *Agrioaphis castanae*] [Japan] |
| *M. (A.) myricae* (Kaltenbach, 1843)      | P(c)       | 14   | Blackman 1980 [USA] | Shini 1941a [as *Agrioaphis castanae*] [Japan] |
| *M. (N.) punctata* (Monell, 1879)         | P(c)       | 14   | Blackman 1980 [USA] | Shini 1941a [as *Agrioaphis castanae*] [Japan] |
|                                           |            | 14   | Blackman 1980 [USA] | Shini 1941a [as *Agrioaphis castanae*] [Japan] |
| Taxon                                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                      |
|------------------------------------------------------------|------------|-------|-------------------|---------------------------------------------------|
| *M. (Paekia) coccifera* Quednau & Barbagallo, 1991         | ?P(o)      | 14    |                   | Blackman and Eastop 1994 [?]                      |
| *M. (P.) komareki* (Paek, 1953)                            | P(c)       | 14    |                   | Blackman and Eastop 1994 [?]                      |
| *Neochromaphis coryli* Takahashi, 1961                     | P(c)       | 18    |                   | Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| *Neophyllaphis araucariae* Takahashi, 1937                  | P(o), P(c) | 18    |                   | Hales and Lardner 1988 [Australia]                |
| *N. brimblecombei* Carver, 1971                           | P(c)       | 26/25 |                   | Hales and Lardner 1988 [Australia]                |
| *N. gingersis* Carver, 1959                                | P(c)       | 14    |                   | Hales and Lardner 1988 [Australia]                |
| *N. grobleri* Eastop, 1955                                | P(c)       | 18    |                   | Hales and Lardner 1988 [Africa], Blackman and Eastop 1994 [?] |
| *N. lanata* Hales & Lardner, 1988                          | P(c)       | 24/23 |                   | Hales and Lardner 1988 [Australia]                |
| *N. podocarpi* Takahashi, 1920                            | P(c), P(o) | 24    |                   | Blackman et al. 2003 [?]                          |
| *N. toranae* Cottier, 1953                                | P(c)       | 10    |                   | Blackman et al. 2003 [Chile]                      |
| *Neuenaphis bullicauda* Hille Ris Lambers, 1968             | ?           | 14    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. edwardsi* (Laing, 1927)                               | P(c)       | 12    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. palliceps* Hille Ris Lambers, 1968                     | P(c)       | 6     | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. schlingeri* Hille Ris Lambers, 1968                    | P(c)       | 12    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. sensoriata* Hille Ris Lambers, 1968                    | P(c)       | 16    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. similis* Hille Ris Lambers, 1968                       | P(c)       | 14    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. starzi* Quednau & Remaudière, 1994                     | ?           | 14    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. valdiviana* Carrillo, 1980                             | ?           | 6     | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. (Spicaphis) chilensis* Essig, 1953                     | ?           | 10    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *N. (S.) esigi* Hille Ris Lambers, 1968                    | ?           | 12    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *Neuenaphis* sp. 1                                        | ?           | 12    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *Neuenaphis* sp. 2                                        | ?           | 16    | XX/X0             | Blackman et al. 2003 [Chile]                      |
| *Oestlundiella flavus* (Davidson, 1912)                    | P(c)       | 8     |                   | Blackman 1980 [USA; Canada]                        |
| *Phylloxiphis fagi* (Linnaeus, 1761)                       | P(c)       | 16    |                   | Blackman and Eastop 1994 [?]                      |
| *Phylloxiphis fagiolae* Takahashi, 1919                    | P(c)       | 26/25 | XX/X0             | Blackman 1986 [Great Britain]                     |
| *P. fagifoliae* Takahashi, 1919                           | P(c)       | 26/25 |                   | Shinji 1931 (as *P. fagi* (Linnaeus, 1767) see Blackman 1986), Blackman 1986 [Japan] (based on n(♂) = 13 (Shinji 1931)) |
| *Protoperzellis gigantea* Bissell, 1978                    | P(c)       | 10    |                   | Blackman 1980 [USA]                               |
| *Pterocallis albi* (De Geer, 1773)                        | P(c)       | 20    |                   | Blackman 1980 [USA]                               |
| *P. montana* (Higuchi, 1972)                              | ?           | 16    |                   | Blackman 1986 [Japan]                             |
| *P. (Recticallis) nigrostriata* (Shinji, 1941)             | P(c)       | ≥26   |                   | Blackman and Eastop 1994 [?]                      |
| *Saltusaphis scirpus* Theobald, 1915                      | P(c)       | 10    |                   | Blackman and Eastop 2015 [?]                      |
| *Sarnicallis kahauwhakahalani* (Kirkaldy, 1907)            | P(c)       | 6     |                   | Kurl 1978 (as *Neotheiroaphis chlenafuli* Behura and Dash) [Meerut, Uttar Pradesh, India], Blackman 1980 [USA] |
| *Sinochaitophorus maui* Takahashi, 1936                    | P(c)       | 10    |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Sensoriaphis notobaghi* Cottier, 1953                     | P(c)       | 10    |                   | Blackman 1980 [New Zealand]                        |
| Taxon                                      | Life cycle          | 2n ♀♂/♂ | Genetic system, ♀♂/♀♂ | References and collecting data |
|-------------------------------------------|---------------------|----------|-----------------------|--------------------------------|
| *Shivaphis celti* Das, 1918               | P(c), P(o)          | 6/5      | XX/X0                | Shinji 1927, 1931, 1941, Blackman 1986 [Japan] (based on n(♂) = 3 (Shinji 1931)) |
|                                           |                     |          |                      | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Hong Kong] |
| *Sh. (Sinishivaphis) bangzhouensis* (G. Zhang & Zhong, 1982) | ?                   | 10       |                      | Blackman and Eastop 1994 [?]. |
| *Stegophylla exig* Hille Ris Lambers, 1966 | P(c), P(o)          | 12       |                      | Blackman 1980 [USA] |
| *S. quercina* Quednau, 1966               | P(c)                | >30      |                      | Blackman and Eastop 1994 (as *Stegophylla quercicola* (Monell, 1879) [?]) |
| *Sreunaphis elongata* (Baker, 1917)       | P(c)                | 10       |                      | Blackman and Eastop 2015 [?] |
| *Subsalutsaphis aquatilis* (Ossianilsson, 1959 | ? | 8 | | Blackman and Eastop 2006 [?] |
| *S. flava* (Hille Ris Lambers, 1939)     | P(c)                | 8        |                      | Blackman 1980 [Sweden] |
| *S. lambersi kamijenensis* Sorin, 2005    | P(c)                | 6        |                      | Blackman 1980 [Sweden] |
| *S. ornata* (Theobald, 1927)             | ?                   | 8        |                      | Gut 1976 [Holland] |
| *S. picta* (Hille Ris Lambers, 1939)     | P(c)                | 10       |                      | Blackman 1986 [Sweden] |
| *S. virginica* (Baker, 1917)             | P(c)                | 6        |                      | Blackman 1986 (as *S. sanacola* Higuchi, 1972) [Japan] |
| *Symydobius abianarius* (Matsumura, 1917) | P(c)                | 20       |                      | Blackman 1986 [Japan] |
| *S. intermedius* Gillette and Palmer, 1936 | P(c)            | 16       |                      | Blackman 1980 [USA] |
| *S. oblongus* (von Heyden, 1837)         | P(c)                | 14 (male), 15 (female) | | Blackman 1988 [Great Britain; Sweden; Czechoslovakia] |
|                                           |                     |          |                      | Gut 1976 [Holland] |
| *S. (Yezocallis) kabae* (Matsumura, 1917) | P(c)                | ?26/25   | XX/X0               | Shinji 1931, 1941a, Blackman 1986 [Japan] (based on n(♂) = 13 (Shinji 1931)) |
| *Takecallis arundicolens* (Clarke, 1903) | ?P(c), ?P(o)        | 18       |                      | Blackman and Eastop 1984 [?], Blackman 1986 [Japan] |
| *T. arundinariae* (Essig, 1917)          | P(o), ?P(c)         | 18       |                      | Blackman and Eastop 2006 [?] |
|                                           |                     |          |                      | Blackman 1980 [USA; Great Britain], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Great Britain], Khuda-Buksh and Kar 1990 [Shillong, Meghalaya, India] |
| *T. taiwana* (Takahashi, 1926)           | ?P(c), ?P(o)        | 16       |                      | Blackman and Eastop 1984 [?] |
| *Tamalia coveni* (Cockerell, 1905)       | P(c)                | 6/5      | XX/X0               | Morgan 1915 (as *Phyllaphis*, Ris 1942 [USA] |
| *Therioaphis natrii* Hille Ris Lambers & van den Bosch, 1964 | ? | 16 | | Blackman and Eastop 2006 [?] |
| *T. ononidis* (Kaltenbach, 1846)         | P(c)                | 16       |                      | Blackman and Eastop 2006 [?] |
| *T. tenera* (Aizenberg, 1956)            | P(c)                | 6        |                      | Blackman and Eastop 2006 [?] |
| *T. (Pterocalyllidium) trifoli trifoli* (Monell, 1882) | P(c), P(o) | 16 | | Blackman 1980 [USA] |
| *T. (P) t. maculata* (Buckton, 1899)     | P(c), P(o)          | 16       |                      | Blackman 1980 [USA; Australia] |
| *T. (Rhizoberlesia) riehmi* (Börner, 1949) | P(c)                | 16       |                      | Robinson and Chen 1969a [Canada] |
### General trends of chromosomal evolution in Aphidococca...

| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|--------------------------------------------|------------|-------|--------------------|--------------------------------|
| **Thripsaphis ballii pennsylvanica**       | ?          | 8     |                    | Blackman and Eastop 2006 [2]   |
| *Tilaphis coreana* Quednau, 1979           | P(c)       | 38    |                    | Blackman 1986 (cited after Blackman and Eastop 2015) |
| *T. shinae* (Shinji, 1924)                | P(c)       | 14/13 | XX/X0              | Shinni 1927, 1931, 1941a (as Therioaphis), Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1931)) |
| *Tinocallis ulmifolii* (Monell, 1979)      | P(c)       | 8     |                    | MacDonald and Harper 1965 (as Myzocallis), Robinson and Chen 1969a [Canada] |
| *T. ulmiparvifoliae* Matsumura, 1919       | P(c)       | 16    |                    | Blackman and Eastop 1994 [?]   |
| *T. zelhousae* (Takahashi, 1919)          | P(c)       | 12    |                    | Blackman 1986 (as T. nirecola (Shinji 1924) [Japan], Blackman and Eastop 1994 [?]) |
| *T. (Sappocallis) saltans* (Nevesky, 1929) | P(c)       | 16    |                    | Blackman and Eastop 2015 [?]   |
| *T. (S.) takachihoensis* Higuchi, 1972     | P(c)       | 16    |                    | Blackman and Eastop 2015 [?]   |
| *T. (S.) ubnica* (Matsumura, 1919)        | ?          | 16    |                    | Blackman 1986 (as Sappocallis) [Japan] |
| *Tinocalliooides montanus* Basu, 1970      | P(c)       | 18    |                    | Kurl 1981 [Shillong, Meghayala, India] |
| **Tuberculatus (Acanthocallis) quercicola** (Matsumura, 1917) | ?          | 14/13 | XX/X0              | Shinji 1927, 1931, 1941a, Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1931)) |
| *T. (Acanthotuberculatus) radiseetua* G. Zhang, W. Zhang & Zhong, 1990 | ?          | 14    |                    | Blackman 1986 [Japan], Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| *T. (Nippocallis) kuricola* (Matsumura, 1917) | P(c)       | 14/13 | XX/X0              | Shinji 1927, 1931 (as Callipterus) [Japan], Blackman 1986 (as Myzocallis) [Japan] (own data and based on n(♂) = 7 (Shinji 1931)) |
| *T. (Orientuberculoides) capitatus* (Essig et Kuwana, 1918) | P(c)       | 14    |                    | Blackman and Eastop 2015 [?]   |
| *T. (O.) kashiuae* Matsumura, 1917         | P(c)       | 14/13 | XX/X0              | Shinji 1927, 1931 [Japan], Blackman 1986 [Japan] (own data and based on n(♂) = 7 (Shinji 1931)) |
| *T. (O.) paranaracola hemitrichus* Hille Ris Lambers, (1972) 1974 | ?          | 14    |                    | Blackman and Eastop 2015 [?]   |
| *T. (O.) yoboyamai* (Takahashi, 1923)     | P(c)       | 14    |                    | Blackman 1986 [Japan] |
| *T. (Tuberculoides) annulatus* (Hartig, 1841) | P(c)       | 14    |                    | Blackman 1980 (as Tuberculoides) [Great Britain; USA] |
| *T. (T.) moerickei* Hille Ris Lambers, (1972) 1974 | ?          | 14    |                    | Blackman and Eastop 2015 [?]   |
| *Tuberculatus* dp.                         | ?          | 14    |                    | Kar et al. 1990 [India] |
| *Yamatocallis takagii* (Takahashi, 1963)   | ?          | c. 48 |                    | Blackman 1986 [Japan] |

### Fam. Chaitophoridae

| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|--------------------------------------------|------------|-------|--------------------|--------------------------------|
| *Atheroides hirreilla* Haliday, 1839        | P(c)       | 8     |                    | Blackman 1980 [Great Britain] |
| *A. serrulatus* Haliday, 1839               | P(c)       | 8     |                    | Blackman 1980 [Sweden]         |
| *Chaitophorus capreae* (Mosley, 1841)       | P(c)       | 30    |                    | Blackman 1980 [Great Britain] |
| *Ch. dorocola* Matsumura, 1919             | P(c)       | 14    |                    | Shinji 1941a, Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1941a)) (but see Blackman 1986 p. 77) |
| *Ch. eupraticus* Hodjat, 1981              | P(♂), P(♀) | 22    |                    | Blackman and Eastop 2015 [?]   |
| *Ch. furcatus* Quednau ex Pintera, 1987    | P(c)       | 16    |                    | Blackman and Eastop 1994 [?]   |
| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|------------------------------------------|------------|-------|-------------------|------------------------------------------------------------------------------------------------|
| *Ch. himalayensis* (Das, 1918)           | ?          | 18    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                          |
| *Ch. indicus* A.K. Ghosh, M.R. Ghosh & D.N. Raychaudhuri, 1970 | P(c)       | 18    |                   | Pal and Khuda-Bukhsh 1983 (as *Ch. manaliensis* Chakrabarti, 1975) [Garhwal, Uttarakhand, India], Dutta and Gautam 1993 (as *Ch. manaliensis* Chakrabarti, 1975) [Shimla, Himachal Pradesh, India] |
| *Ch. insoyae* Hille Ris Lambers, 1976    | ?          | 26    |                   | Blackman and Eastop 2015 (?)                                                                  |
| *Ch. leucomelas* Koch, 1854              | P(c)       | 4     |                   | Rubín de Celis and Ortiz 1993 [Lima, Peru]                                                    |
|                                          |            | 36    |                   | Blackman and Eastop 2015 [Israel]                                                            |
|                                          |            | 40    |                   | Blackman 1980 [Great Britain], Blackman and Eastop 2015 [Great Britain; South Africa]         |
| *Ch. ?matsumunai* Hille Ris Lambers, 1960 | ?          | 14    |                   | Shinji 1927 (as *Ch. salicicolus*), 1931 (as *Ch. saliniger*), Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1927, 1931, 1941)) |
| *Ch. neglectus* Hottes & Frison, 1931    | P(c)       | 12    |                   | Robinson and Chen 1969a [Canada]                                                             |
| *Ch. niger* Mordvillo, 1929              | P(c)       | 30    |                   | Blackman and Eastop 2015 [?]                                                                |
| *Ch. nigrae* Oestlund, 1886              | P(c)       | 24    |                   | Blackman and Eastop 1994 [?]                                                                |
| *Ch. nigritus* Hille Ris Lambers, 1966    | P(c)       | 18    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                          |
| *Ch. populeti* (Panzer, 1801)            | P(c)       | 10    |                   | Pal and Khuda-Bukhsh 1982 [Jammu and Kashmir, India]                                            |
|                                          |            | 12    |                   | Blackman and Eastop 1994 [Iran; China]                                                        |
|                                          |            | 14    |                   | Shinji 1941a (as *Ch. populii*), Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1941a)) (but see Blackman 1986, p. 77) |
| *Ch. populialbae* (Boyer de Fonscolombe, 1841) | P(c)    | 28    |                   | Chen and Zhang 1985 (cited after Blackman and Eastop 2015)                                    |
|                                          |            | 30    |                   | Blackman and Eastop 2015 [?]                                                                |
| *Ch. populicola* Thomas, 1878            | P(c)       | 18, 28, 32 |               | Blackman and Eastop 1994 [2]                                                                 |
| *Ch. populifolii* (Essig, 1912)          | P(c)       | 12    |                   | Robinson and Chen 1969a (also as *Ch. populifolii neglectus* Hottes and Frison, 1931) [Canada] |
| *Ch. saltapterus* Shinji, 1924           | ?          | 14/13 | XXXX0             | Shinji 1927, 1931, 1941a, Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1931)) (Blackman and Eastop 2015: "Shinji’s record of 2n=14 (n=7) should probably be applied to another species of "Chaitophorus") |
|                                          |            | 30    |                   | Blackman and Eastop 2015 [?]                                                                |
| *Ch. saliceti* (Schrank, 1801)           | P(c)       | 28    |                   | Blackman 1980 [Sweden]                                                                        |
| *Ch. prope salijaponicus niger* (Mordvillo, 1929) | ?          | 30    |                   | Kuznetsova and Shaposhnikov 1973 (*Ch. aff. niger* Mordv.) [Georgia; Turkmenistan]              |
| *Ch. saliniger* Shinji 1924              | P(c)       | 8     |                   | Shinji 1931, Blackman 1986 [Japan]                                                            |
|                                          |            | 14    |                   | Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1931)) (Blackman and Eastop 2015: "Shinji’s record of 2n=14 (n=7) should probably be applied to another species of "Chaitophorus") |
| *Ch. stevensis* Sanborn, 1904            | ?          | 14    |                   | Blackman and Eastop 2015 [2]                                                                 |
| *Ch. tremulae* Koch, 1854                | P(c)       | 18    |                   | Blackman and Eastop 1994 [2]                                                                 |
| *Ch. truncatus* Hausmann, 1802           | P(c)       | 30    |                   | Blackman and Eastop 2015 [?]                                                                |
| *Ch. viminalis* Monell, 1879             | P(c)       | 9, 10, 11 |               | Morgan 1909b [USA]                                                                            |
|                                          |            | 18    |                   | Robinson and Chen 1969a [Canada]                                                              |
| *Chaitophorus* sp. 1 (from *Populus euphratica*) | ?          | 22    |                   | Blackman 1980 [Iran]                                                                            |
### General trends of chromosomal evolution in Aphidococca...

| Taxon                                      | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data |
|--------------------------------------------|------------|--------|---------------------|--------------------------------|
| *Chaitophorus* sp. 2                      | ?          | 26     |                     | Blackman 1986 [Japan]          |
| *Periphyllus acericola* (Walker, 1848)    | P(c)       | 18     |                     | Gut 1976 [Holland], Blackman and Eastop 1994 [?] |
| *P. aceris* (Linnaeus, 1761)              | P(c)       | 16     |                     | Gut 1976 [Holland], Blackman and Eastop 1994 [?] |
| *P. californiensis* (Shinji, 1917)        | P(c)       | 18     |                     | Blackman 1986 [Great Britain]   |
| *P. concinus* (Koch, 1854)                | P(c)       | 18     |                     | Gut 1976 [Holland]              |
| *P. hirticornis* (Walker, 1848)           | P(c)       | 18     |                     | Gut 1976 [Holland], Blackman and Eastop 1994 [?] |
| *P. koeleriaterae* (Takahashi, 1919)      | ?          | 10     |                     | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
|                                            |            | 18     |                     | Blackman and Eastop 1994 [?]    |
|                                            |            | 20/19  | XX/X0              | Shinji 1931, Blackman 1986 [Japan] (based on n(♂) = 10 (Shinji 1931)) |
|                                            |            | 22     |                     | Shinji 1927, 1941a [Japan]      |
| *P. kuwanaii* (Takahashi, 1919)           | ?          | 18     |                     | Blackman and Eastop 1994 [?]    |
| *P. lyrupticus* (Kessler, 1886)           | P(c)       | 18     |                     | Gut 1976 [Holland]              |
| *P. negundinis* (Thomas, 1878)            | P(c)       | 20     |                     | Sun and Robinson 1966, Robinson and Chen 1969a [Canada] |
| *P. testudinaceus* (Ferni, 1852)          | P(c)       | 18     |                     | Gut 1976 [Holland]              |
| *Sipha flavia* (Forbes, 1885)             | P(c), P(o) | 10     |                     | Mayo and Starks 1972 [USA]      |
| *S. gyereria* (Kaltenbach, 1843)          | P(c)       | 10     |                     | Blackman and Eastop 2006 [?]    |
|                                            |            | 12     |                     | Gut 1976 [Holland]              |
| *S. (Rungsia) elegani* del Guercio, 1905  | P(c)       | 6      |                     | Sun and Robinson 1966 (as *S. agropyrella* Hille Ris Lambers, 1939), Robinson and Chen 1969a (as *S. kurdjumovi* Mordvilko, 1921) [Canada] |
| *S. (R.) maydis* Passerini, 1860          | P(c), P(o) | 12     |                     | Blackman and Eastop 2015 [?]    |

**Fam. Aphididae**

| *Abstrusomyzus phloxae* (Sampson, 1939)  | P(o)       | 18     |                     | Blackman and Eastop 2006 [?]    |
| *Acaudinum centaureae* (Koch, 1854)     | P(c)       | 10     |                     | Kuznetsova 1968 (as *A. dolichosiphon* Mordvilko,1928) [St.Petersburg, Russia] |
| *Acrthosiphon auriculadi* Martin, 1981  | P(c)       | 8      |                     | Martin 1981 [Great Britain]     |
| *A. bidenticola* Smith, 1960             | ?          | 8      |                     | Blackman and Eastop 2006 [?]    |
| *A. boreale* Hille Ris Lambers, 1952    | P(c)       | 10     |                     | Blackman and Eastop 2015 [?]    |
| *A. canaganae* (Cholodkowsky, 1907(1908)) | P(c)     | 10     |                     | Sun and Robinson 1966, Robinson and Chen 1969a [Canada] |
| *A. c. occidentale* Hille Ris Lambers, 1947 | P(c)     | 10     |                     | Blackman and Eastop 2015 [?]    |
| *A. ghanii* Eastor, 1971                | P(c), P(o) | 10     |                     | Kapoor and Gautam 1994 [Shimla, Himachal Pradesh, India] (Blackman and Eastop 2015: “...but aphid was possibly misidentified as host was *Medicago*”), Blackman and Eastop 2006 [?] |
| *A. gossypii* Mordvilko, 1914            | P(c), P(o) | 6      |                     | Blackman 1980 [Iran], Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India] |
| Taxon                                | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                                                                                 |
|--------------------------------------|------------|-------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *A. ignotum* Mordvilko, 1914         | ?          | 14    |                   | Pal and Khuda-Bukhsh 1984 (as *Metopolophium*), Khuda-Bukhsh and Pal 1986b (as *Metopolophium*) [Janunetri, Uttarakhand, India]                             |
| *A. sp. prope ignotum* Mordvilko, 1914 | ?          | 10    |                   | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                                                                                  |
| *A. kondoi* Shinji, 1938             | P(c)       | 10    |                   | Blackman 1980 [USA], Blackman 1986 [Japan]                                                                                                                  |
| *A. lactucae* (Passerini, 1860)      | P(c)       | 16    |                   | Blackman and Eastop 1984 [?]                                                                                                                                  |
| *A. loti* (Theobald, 1913)           | P(c)       | 10    |                   | Blackman 1980 [Great Britain]                                                                                                                               |
| *A. macrocephalum* (Wilson, 1912)    | P(c)       | 10    |                   | Blackman and Eastop 2015 [?]                                                                                                                                  |
| *A. malvae malvae* (Mosley, 1841)    | P(c)       | 10    |                   | Blackman 1980 (as *A. pelargonii* Kaltenbach, 1843) [Great Britain], Kurl and Chauhan 1987b [Barog, Himachal Pradesh, India]                        |
| *A. m. poteri* Prior & Stroyan, 1964 | P(c)       | 10    |                   | Blackman and Eastop 2015 [?]                                                                                                                                  |
| *A. m. rogersii* (Theobald, 1913)    | P(c)       | 10    |                   | Blackman and Eastop 2015 [?]                                                                                                                                  |
| *A. pisivorum* G. Zhang, 1980        | ?          | 14    |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)                                                                            |
|                                       |            | 8/7   | XX/X0             | Pagliat 1965, Manicardi, Bizzaro et al. 1991, Bizzaro et al. 2000 [Italia]                                                                                   |
| *A. pisum* (Harris, 1776)            | P(c)       | 8     |                   | Suomalainen 1933 (as *Macrosiphum pisi* (Kaltenbach, 1843) [Finland], Colling 1955 [Great Britain], Sun and Robinson 1966, Harper and MacDonald 1968, Robinson and Chen 1969a [Canada], Kuznetsova and Shaposhnikov 1973 (as *Dactinotus basalis* Walker, 1948) [St. Petersburg, Russia], Kuznetsova 1974 (as *Dactinotus basalis* Walk.) [?], Blackman 1986 [Japan], Khuda-Bukhsh and Kar 1990 [Kalimpong, West Bengal, India], Kar et al. 1990 [India], Blackman and Spence 1996 [Great Britain], Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India] |
| *A. primulae* (Theobald, 1913)       | ?          | 16    |                   | Blackman and Eastop 2015 [?]                                                                                                                                  |
| *A. rubi* Narzikulov, 1957          | P(c)       | 10    |                   | Pal and Khuda-Bukhsh 1982, Khuda-Bukhsh and Pal 1986b (as *Metopolophium sonchifolii* Raychaudhuri, Ghosh & Das, 1980) [Srinagar, Jammu and Kashmir, India] |
| *A. scariolae* Nevsky, 1929          | ?          | 18    |                   | Blackman and Eastop 1984 [?]                                                                                                                                  |
| *Akkaia polygoni* Takahashi, 1919    | P(c)       | 12    |                   | Shinji 1927, 1931 [Japan] (Blackman 1986 supposed that "Shinji's immature males were of another species of Akkaia")                                            |
| *Akkaia* sp.                         | ?          | 12/11 | XX/X0             | Shinji 1931 [Japan] (see comments of Blackman 1986)                                                                                                         |
| *Aleurosiphon* smilacifoli (Takahashi, 1921) | P(c) | 8 |                   | Blackman 1986 [Japan]                                                                                                                                         |
| Taxon                                                      | Life cycle | 2n♀♂ | Genetic system,♀♂ | References and collecting data                                                                 |
|-----------------------------------------------------------|------------|-------|-------------------|-------------------------------------------------------------------------------------------------|
| Amphicercidus japonicus (Hori, 1927)                      | P(c)        | 8     |                   | Chen and Zhang 1985b (cited after Blackman and Eastop 2015)                                    |
| A. lonicerae Maity & Chakrabarti, 1982                    | ?          | 18    |                   | Khuda-Bukhsh and Pal 1983a [Garhwal, Uttarakhand, India] (Blackman and Eastop 2015: «this was probably an error») |
| A. tuberculatus David, Narayanan & Rajaisingh, 1970 (1971)| ?          | 6     |                   | Chauhan and Kurl 1990 [Dachigam, Jammu and Kashmir, India]                                     |
|                                                          |            |       |                   | Pal and Khuda-Bukhsh 1984 [Jamunetri, Uttarakhand, India]                                      |
| Amphicercidus sp.                                         | ?          | 8♂    |                   | Khuda-Bukhsh 1980 [Garhwal, Uttarakhand, India] (Blackman and Eastop 2015: Amphicercidus lonicerae Maity and Chakrabarti) |
| Amphorophora agathonica Hottes, 1950                      | P(c)        | 14    |                   | Robinson and Chen 1969a [Canada]                                                              |
| A. ampullata ampullata Buckton, 1876                      | P(c)        | 12    |                   | Blackman 1980, 2010 [Great Britain], Blackman 1986 [Japan]                                    |
| A. a. bengalensis Hille Ris Lambers & Basu, 1966           | ?          | 12    |                   | Kurl and Chauhan 1986a [Kandaghat, Himachal Pradesh, India], Kurl and Chauhan 1987a [Manali, Himachal Pradesh, India] |
| A. a. laingi (Mason, 1925)                                | ?          | 12    |                   | Sun and Robinson 1966 (as A. laingi (Mason, 1925)), Robinson and Chen 1969a (as A. laingi (Mason, 1925)) [Canada] |
| A. amurensis (Mordvilko, 1919)                            | ?          | 14    |                   | Blackman 1986 [Japan]                                                                          |
| A. forbesi Richards, 1959                                 | ?          | 12    |                   | Blackman and Eastop 2015 [?]                                                                  |
| A. gei (Börner, 1939)                                     | P(c)        | 12    |                   | Blackman 1980 [Great Britain]                                                                  |
| A. idaei (Börner, 1939)                                   | P(c)        | 18    |                   | Blackman et al. 1977 [Europe], Blackman 1980 [Great Britain; Germany]                          |
| A. pacifica Hill, 1968                                    | P(o)        | 18    |                   | Blackman 1980 [USA]                                                                            |
| A. parviflori Hill, 1958                                  | ?          | 12    |                   | Blackman 1980 [USA; Canada]                                                                    |
| A. rosi Hottes & Frison, 1931                             | P(c)        | 46    |                   | Blackman and Eastop 2006 [?]                                                                   |
| A. rubi (Kaltenbach, 1843)                                | P(c), P(o)  | 20, 21|                   | Blackman et al. 1977 [Europe], Blackman 1980 [Great Britain]                                   |
| A. rubitoxica Knowlton, 1954                              | ?          | 30    |                   | Blackman 1980 [USA; Canada]                                                                    |
| A. sensoriata Mason, 1923                                 | ?          | 72    |                   | Blackman 1980 [USA; Canada]                                                                    |
| A. stachyophila Hille Ris Lambers, 1966                   | ?          | 12    |                   | Blackman 1980 [USA]                                                                            |
| A. stolonii Robinson, 1974                                | P(c)        | 48    |                   | Blackman 1980 [Canada]                                                                         |
| A. tiguatensa Hottes, 1933                                | ?          | 40    |                   | Blackman and Eastop 2006 [?]                                                                   |
| A. tuberculata Brown & Blackman, 1985                     | P(c)        | 4     | XX/X0             | Blackman 1985, Blackman and Hales 1986, Blackman and Spence 1996, Spence and Blackman 1998 [Great Britain] |
| Amphorophora sp.                                           | ?          | 10    |                   | Blackman and Eastop 2006, Blackman 2010 [populations on A. thalium felix-jemina in Netherlands and Great Britain] |
| Anaphus catonii Hille Ris Lambers, 1935                   | P(c)        | 22    |                   | Kuznetsova 1968 [Crimea, Ukraine]                                                               |
| A. farfanae (Koch, 1854)                                  | P(c)        | 12    |                   | Kuznetsova 1968, 1975 [St. Petersburg, Russia], Kuznetsova 1974 [?]                              |
| A. farfanae dianae Shaposhnikov, 1974                     | P(o)        | 12    |                   | Kuznetsova and Shaposhnikov 1973 [Georgia], Kuznetsova 1974 [?]                                 |
| A. pyriapsii Shaposhnikov, 1950                           | P(c), P(o)  | 12    |                   | Kuznetsova 1968, 1975 [Crimea, Ukraine]                                                         |
| A. subterranea (Walker, 1852)                             | P(c), P(o)  | 22    |                   | Kuznetsova 1968 [St. Petersburg, Russia]                                                         |
| Taxon                     | Life cycle | $2n$ | Genetic system, $♀/♂$ | References and collecting data |
|--------------------------|------------|------|------------------------|--------------------------------|
| *Anuromyzus cotoneasteris* (Shaposhnikov, 1959) | P(c)       | 12   |                        | Kuznetsova 1968 (as *Dysaphis (Anuromyzus)*) [Georgia] |
| *Aphidura pannonica* Szeglevicz, 1967            | ?          | 12   |                        | Blackman 1980 [Greece]         |
| *Aphis acaenovinae* Eastop, 1961                 | ?          | 8    |                        | Blackman and Eastop 2006 [Australia] (<D.F. Hales, pers. comm.>) |
| *A. achyranthi* Theobald, 1929                  | ?          | 7    |                        | Kurl and Chauhan 1987a [Solan, Himachal Pradesh, India] |
|                                           |            | 8    |                        | Kurl and Chauhan 1986b [Solan, Himachal Pradesh, India] |
| *A. affinis* Del Guercio, 1911                  | P(c)       | 8    |                        | Pal and Khuda-Buksh 1982, Khuda-Buksh and Pal 1985 [Srinagar, Jammu and Kashmir, India], Gautam and Sharma 1990 [Himachal Pradesh, India], Dutta and Gautam 1993, Gautam and Dharwal 2003 [Shimla, Himachal Pradesh, India] |
| *A. amaranthi* Holman, 1974                      | ?          | 8    |                        | Blackman 1980 [USA]          |
| *A. armata* Hausmann, 1802                       | P(c)       | 8    |                        | Gut 1976 [Holland]          |
| *A. asclepiadis* Fitch, 1851                     | ?          | 8    |                        | Stevens 1906, 1909 [USA], Robinson and Chen 1969a [Canada], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
|                                           |            | 8    |                        | Blackman and Eastop 2015 [?] |
| *A. brunnnea* Ferrari, 1872                      | ?          | 8    |                        | Sun and Robinson 1966 (as *Aphis helianthi* Monell, 1879), Robinson and Chen 1969a *Aphis helianthi* Monell, 1879 and *A. kurosawella* Davis, 1919 [Canada] |
| *A. carduella* Walsh, 1863                       | P(c)       | 8    |                        | Blackman and Eastop 2015 [?] |
| *A. celestrior* Matsumura, 1917                  | P(c)       | 8    |                        | Blackman 1986 (as *A. citricola celestrior* Matsumura, 1917) [Japan] |
| *A. chloris* Koch, 1854                          | P(c)       | 8    |                        | Blackman and Eastop 2015 [?] |
| *A. clematidis* Koch, 1854                       | P(c)       | 8    |                        | Khuda-Buksh and Pal 1985 [Garhwal, Uttarakhand, India] |
| *A. clerodendri* Matsumura, 1917                 | ?          | 8    |                        | Blackman and Eastop 2015 [?] |
| *A. near clerodendri* Matsumura, 1917            | ?          | 8    |                        | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *A. clinopodi* Passerini, 1861                   | P(c)       | 8    |                        | Blackman and Eastop 2015 [?] |
|                                           |            | 7,8  |                        | Kurl 1986 [Meghalaya, India] |
| *A. craccivort* Koch, 1854                      | P(o), P(c) | 8    |                        | Kurl 1978 [Jodhpur, Rajasthan; Modinagar, Uttar Pradesh, India], Kulkarni and Kacker 1979 [Kolkata, West Bengal, India], Blackman 1980 [USA; Iran], Chen and Zhang 1985a, c also as *A. robiniae* Machiat, 1979, 1981 [Beijing area, China] (Chen and Zhang 1985a cited after Blackman and Eastop 2015), Kurl and Chauhan 1986b, Kuznetsova and Sapunov 1985, 1987 [Russia], Kar and Khuda-Buksh 1985 [Kalimpong, West Bengal, India], Kar et al. 1990 [India], Sen and Khuda-Buksh 1992 [West Bengal, India], Dutta and Gautam 1993 [Kangra, Himachal Pradesh, India], Kapoor and Gautam 1994 [Himachal Pradesh, India], Bakhtadze et al. 2010 [Georgia] |
|                                           |            | 9    |                        | Blackman 1980 [Iran] (from *Lupinus*) |
| Taxon | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data |
|-------|------------|---------|---------------------|-------------------------------|
| *A. crepis* (Börner, 1940) | P(c) | 8 | ♀ | Blackman and Eastop 2015 [?] |
| *A. cytisorum cytisorum* Hartig, 1841 | P(c) | 8 | ♀ | Blackman 1980 [USA], Chen and Zhang 1985a (as *sophoricola* Zhang) [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *A. cytisorum sarothamni* Fransen, 1928 | P(c) | 8 | ♀ | Blackman and Eastop 2015 [?] |
| *A. epilobi* Kaltenbach, 1843 | P(c) | 8 | ♀ | Gut 1976 [Holland] |
| *A. eugeniae* van der Goot, 1917 | ? | 8 | | Blackman 1980 [Philippines; Australia] |
| *A. fabae fabae* Scopoli, 1763 | P(c) | 8 | ♀ | Colling 1955 [Great Britain], Orlando 1965 [Italy], Kurl and Chauhan 1986b, 1987a [Kangra, Himachal Pradesh, India], Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia], Dutta and Gautam 1993 [Solan, Himachal Pradesh, India], Kapoor and Gautam 1994 [Himachal Pradesh, India], Blackman and Spence 1996 [Great Britain], Rivi et al. 2009 [Italy], Jangra et al. 2014 [Jammu and Kashmir, India] |
| *A. f. evonymi* Fabricius, 1775 | P(c) | 8 | ♀ | Panigrahy and Patnaik 1991 (as *A. citricola*) [Chatrapur, Odisha, India] |
| *A. f. mordvilko* Börner & Janich 1922 | P(c) | 8 | ♀ | Stevens 1906 [USA], Bachr 1908, 1912 (as *A. saliceti*) [Germany], Morgan 1909b (as *A. saliceti* Gillette & Baker, 1895) [USA], Shinji 1941a (as *Aphis saliceti*) [Japan] |
| *A. farinosa* J.F. Gmelin, 1790 | P(c) | 6 | ♀ | Stevens 1906 [USA], Bachr 1909 (as *A. saliceti*) [Germany], Kuznetsova and Shaposhnikov 1973 [?], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *A. forbesi* Weed, 1889 | P(c) | 6 | ♀ | Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia] |
| *A. frangulae* Kaltenbach, 1845 | P(c), P(o) | 8 | ♀ | Stevens 1906 [USA], Bachr 1909 (as *A. saliceti*) [Germany], Kuznetsova and Shaposhnikov 1973 [?], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *A. fukii* Shinji, 1922 | ? | 8 | ♀ | Blackman 1986 [Japan] |
| *A. genistae* Scopoli, 1763 | P(c) | 8 | ♀ | Gut 1976 [Holland] |
| Taxon                          | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                                                                                                                                                 |
|-------------------------------|------------|-------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *A. gossypii* Glover, 1877    | P(o), P(c) | 8     |                   | Stevens 1906, 1909 [USA], Shinji 1927 [Japan], Robinson and Chen 1969a [Canada], Kurl 1978 [Jodhpur, Rajasthan; Modinagar and Meerut, Uttar Pradesh, India], Kulkarni and Kacker 1979 [Baruipur, West Bengal, India], Chattopadhyay and Raychaudhuri 1980 [Kolkata, West Bengal, India], Khuda-Bukhsh and Datta 1981a, b [India], Khuda-Bukhsh and Pal 1985 [Srinagar, Jammu and Kashmir, India], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan] (their own data and based on n♂ = 4 (Shinji 1927)), Kurl and Chauhan 1986b [Himachal Pradesh, India], Khuda-Bukhsh and Kar 1989b, Kar et al. 1990 [India], Gautam and Sharma 1990 [Himachal Pradesh, India], Kar and Khuda-Bukhsh 1991a [Meghalaya, West Bengal, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Gautam and Dhatwalia 2003 [Solan, Himachal Pradesh, India], Samikar et al. 2010 [Palampur, Himachal Pradesh, India], Reeta Devi and Gautam 2012 [Kullu region, Himachal Pradesh, India]  |
| *A. healyi* Cottier, 1953     | P(c)       | 8     |                   | Blackman and Eastop 2006 [New Zealand]                                                                                                                                                                                          |
| *A. heedere heedere* Kaltenbach, 1843 | P(c)       | 8     |                   | Bakhtadze et al. 2010 [Georgia]                                                                                                                                                                                                  |
| *A. heedere pseudohederae* Theobald, 1927 | ?          | 8     |                   | Blackman 1980 (as *A. heedere* form *pseudohederae* Theobald) [USA]                                                                                                                                                           |
| *A. borii* Takahashi, 1923    | ?          | 8     |                   | Chen and Zhang 1985b (cited after Blackman and Eastop 2015)                                                                                                                                                                   |
| *A. hyperici* Monell, 1879    | P(c)       | 8     |                   | Blackman and Eastop 2015 [?]                                                                                                                                                                                                  |
| *A. ichigo* Shinji, 1922      | ?          | 8     |                   | Blackman 1986 [Japan]                                                                                                                                                                                                           |
| *A. idei* van der Goot, 1912  | P(c)       | 8     |                   | Blackman 1980 [Great Britain]                                                                                                                                                                                                  |
| *A. ilicis* Kaltenbach, 1843  | ?P(c)      | 8     |                   | Blackman 1980 [Great Britain]                                                                                                                                                                                                  |
| *A. kuroswaii* Takahashi, 1921 | ?P(c)     | 8     |                   | Blackman 1986 [Japan], Kurl and Chauhan 1987a, 1987b [Solan, Himachal Pradesh, India]                                                                                                                                              |
| *A. near kuroswaii* Takahashi, 1921 | ?        | 8     |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)                                                                                                                                               |
| *A. lambersi* (Börner, 1940)  | P(c)       | 8     |                   | Blackman and Eastop 2015 [?]                                                                                                                                                                                                  |
| *A. longisetosa* Basu, 1969(1970) | ?       | 6     |                   | Kurl and Chauhan 1987a, b (as *Aphis ruborum longisetosus* Basu) [Solan, Himachal Pradesh, India], Khuda-Bukhsh and Kar 1990 (as *Aphis ruborum longisetosus* Basu) [Shillong, Meghalaya, India], Khuda-Bukhsh 1982 (as *A. ruborum longisetosus*) [Mussoorie, Uttarakhand, India], Khuda-Bukhsh and Pal 1985 (as *A. ruborum longisetosus*) [Srinagar, Jammu and Kashmir, India] |
| Taxon            | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|-----------------|------------|-------|--------------------|--------------------------------------------------------------------------------------------------|
| *A. longituba* Hille Ris Lambers, 1966 | ?          | 8     |                    | Kar et al. 1990 (as *A. clematidis simlaensis* Kumar & Burkhardt) [India], Dutta and Gautam 1993 (as *A. clematidis simlaensis* Kumar & Burkhardt) [Shimla, Himachal Pradesh, India] |
| *A. loti* Kaltenbach, 1862       | P(c)       | 8     |                    | Blackman 1980 [Great Britain]                                                                      |
| *A. maculatae* Oestlund, 1887    | P(c)       | 8     |                    | Robinson and Chen 1969a [Canada]                                                                  |
| *A. nasturtii* Kaltenbach, 1843 | P(c)       | 8     |                    | Dionne and Spicer 1957 (as *A. abbreviata* Patch), Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kurl and Chauhan 1986b [Himachal Pradesh, India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Kapoor and Gautam 1994 [Himachal Pradesh, India], Gautam and Dhatwalla 2003 [Shimla, Himachal Pradesh, India], Samkaria et al. 2010 [Yol, Himachal Pradesh, India] |
| *A. neogillettei* Palmer, 1938   | P(c)       | 8     |                    | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                          |
| *A. nerii* Boyer de Fonscolombe, 1841 | P(o), P(c) | 8     |                    | Kurl 1978 [Jodhpur, Rajasthan; Modinagar, Uttar Pradesh, India], Kulkarni and Kacker 1980 [India], Blackman 1980 [Great Britain], Chattopadhyay and Raychaudhuri 1980 [Kolkata, West Bengal, India], Khuda-Bukhsh and Datta 1981b [India], Khuda-Bukhsh and Pal 1985 [Garhwal, Uttarakhand, India], Kapoor and Gautam 1994 [Nahan, Himachal Pradesh, India] |
| *A. newtoni* Theobald, 1927      | P(c)       | 8     |                    | Blackman 1980 [Great Britain]                                                                      |
| *A. odinae* (van der Goot, 1917) | P(o), P(c) | 8     |                    | Kurt 1980a (as *Toxoptera*) [Assam, Meghalaya, India], Pal and Khuda-Bukhsh 1980 (as *Toxoptera*) [Uttarakhand, India], Khuda-Bukhsh and Pal 1984a (as *Toxoptera*) [Triyuginarayan, Uttarakhand, India], Chen and Zhang 1985a (as *Toxoptera*) [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 (as *Toxoptera*) [Japan], Kar and Khuda-Bukhsh 1989 (as *Toxoptera*) [Kalimpong, West Bengal, India], Kar et al. 1990 (as *Toxoptera*) [India] |
| *A. oestlundi* Gillette, 1927    | P(c)       | 8     |                    | Shinji 1941a [Japan]                                                                 |
| *A. paraverbasci* Chakrabarti (1976) 1977 | ?          | 8     |                    | Kurl and Chauhan 1986b, 1987a [Solan, Himachal Pradesh, India]                                    |
| *A. pavietariae* Theobald, 1922  | P(c)       | 8     |                    | Blackman and Eastop 2015 [?]                                                                      |
| *A. platylobii* Carver & White, 1970 | ?          | 8     |                    | Blackman and Eastop 2006 [New South Wales, Australia]                                            |
| *A. polygonata* (Nevsky, 1929)   | P(c)       | 8     |                    | Blackman and Eastop 2006 [?]                                                                      |
| *A. pomi* De Geer, 1773          | P(c)       | 8     |                    | Robinson and Chen 1969a [Canada], Kuznetsova and Shaposhnikov 1973 [Leningrad Prov., Russia], Gautam and Kumari 2003 [Shimla, Himachal Pradesh, India] |
|                               |           |       |                    | Criniti et al. 2005 [Italy]                                                                      |

**General trends of chromosomal evolution in Aphidococca...**
| Taxon                                      | Life cycle | 2n | Genetic system, ♀♂ | References and collecting data                                                                                                                                 |
|-------------------------------------------|------------|----|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *A. punicae* Paserini, 1863 | P(c), P(o) 8 | 8  |                  | Blackman and Eastop 1984 [?], Panigrahy and Patnaik 1987 [Chatrapur, Odisha, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Gautam and Dhatwalia 2003 [Solank, Himachal Pradesh, India] |
| *A. rhamnifila* David, Narayanan & Rajasingh, 1971 | ? 8 | 8  | 10                | Khuda-Bukhsh 1982 [Mussoorie, India]                                                                                                                                 |
| *A. rubicola* Oestlund, 1887              | P(c) 8     |     |                  | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                                                                                                                                                 |
| *A. ruborum* (Börner & Schilder, 1931)   | P(c) 8     |     |                  | Blackman 1980 [Great Britain], Bakhtadze et al. 2010 [Georgia]                                                                                                                                                          |
| *A. rumicis* Linnaeus, 1758               | P(c) 8     |     |                  | Colling 1955 [Great Britain]                                                                                                                                                                                          |
| *A. ulicisae* Koch, 1855                  | P(c) 8     |     |                  | Sun and Robinson 1966 (as *A. corniella* Hille Ris Lambers, 1935), Robinson and Chen 1969a (as *A. corniella* Hille Ris Lambers, 1935) [Canada]                            |
| *A. sambuci* Linnaeus, 1758               | P(c), P(o) 8 |     |                  | Gut 1976 [Holland], Blackman 1986 [Europe; Japan], Manicardi et al. 1998 [Italy]                                                                                                                                     |
| *A. sambuci* group                        | ? 10       | 12  |                  | Shinji 1941a (as *A. sambuci* Linnaeus) [Japan]                                                                                                                                                                          |
|                                             |            |     |                  | Shinji 1927, 1931 (as *A. sambuci* Linnaeus), Blackman 1986 [Japan] (based on n(♀) = 6 (Shinji 1927, 1931))                                                                                                           |
| *A. sedi* Kaltenbach, 1843                | P(c) 8     |     |                  | Blackman and Eastop 2015 [?]                                                                                                                                                                                          |
| *A. solanella* Theobald, 1914             | P(c), P(o) 8 |     |                  | Blackman 1980 [Iran] (from *Solanum*)                                                                                                                                                                                   |
|                                            |            |     |                  | Blackman 1980 [Great Britain], Khuda-Bukhsh and Pal 1985 (as *A. fabae solanella* Theobald, 1914) [Garhwal, Uttarakhand, India], Kar and Khuda-Bukhsh 1989 (as *A. fabae solanella* Theobald) [Kalimpong, West Bengal, India], Gautam and Sharma 1990 [Himachal Pradesh, India], Kar et al. 1990 (as *A. fabae solanella* Theobald) [India], Dutta and Gautam 1993 (as *A. fabae solanella* Theobald, 1914) [Shimla, Himachal Pradesh, India], Gautam and Dhatwalia 2003 (as *A. fabae solanella*) [Shimla, Himachal Pradesh, India] |
| *A. spiraecola* Patch, 1914               | P(c), P(o) 8 |     |                  | Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kurl 1978 [Jodhpur, Rajasthan, India], Kulkarni and Kacker 1981a [Solank, Himachal Pradesh, India], Khuda-Bukhsh 1982 [Mussoorie, India], Khuda-Bukhsh and Pal 1985 [Garhwal, Uttarakhand, India], Kurl and Chauhan 1986a, b (as *A. citrica* van der Goot) [Himachal Pradesh, India], Panigrahy and Patnaik 1987 (as *A. citrica* van der Goot) [Chatrapur, Odisha, India], Kar and Khuda-Bukhsh 1989 (as *A. citrica* van der Goot) [Shillong, Meghalaya, India], Sen and Khuda-Bukhsh 1992 [West Bengal, India], Kapoor and Gautam 1994 [Nahan, Himachal Pradesh, India], Gautam and Dhatwalia 2003 (as *A. citrica* van der Goot) [Solank, Himachal Pradesh, India] |
|                                            |            |     |                  | Chen and Zhang 1985a (as *A. citrica* van der Goot) [Beijing area, China] (cited after Blackman and Eastop 2015) |
| Taxon                                           | Life cycle | 2n | Genetic system, | References and collecting data                                      |
|------------------------------------------------|------------|----|----------------|---------------------------------------------------------------------|
| *A. spirephaga* F.P. Müller, 1961             | P(c)       | 8  |                | Blackman and Eastop 2015 [2]                                         |
| *A. spirephila* Patch, 1914                  | P(c)       | 8  |                | Robinson and Chen 1969a [Canada]                                     |
| *A. subnitida* (Börner, 1940)                | ?          | 8  |                | Blackman and Eastop 2015 [2]                                         |
| *A. tanaxacicolor* (Börner, 1940)            | P(c)       | 8  |                | Blackman 1980 [Great Britain]                                         |
| *A. thapii* Oestlund, 1887                   | ?          | 8  |                | Robinson and Chen 1969a [Canada]                                     |
| *A. trigochinis* Theobald, 1926              | P(c)       | 8  |                | Blackman and Eastop 1984 [2], Türčinavičienė et al. 1997 [Lithuania] |
| *A. ulicis* Walker, 1870                    | P(c)       | 8  |                | Blackman 1980 [Great Britain]                                         |
| *A. umbrella* (Börner, 1950)                 | P(c), ?P(o) | 6  |                | Blackman and Eastop 2006 [Iran]                                      |
| *A. verbasci* Schrank, 1801                  | P(c)       | 8  |                | Khuda-Bukhsh and Pal 1985 [Kalyaani, West Bengal, India]             |
| *A. viburni* Scopoli, 1763                   | P(c)       | 8  |                | Colling 1955 [Great Britain]                                          |
| *A. violae* Shouteden, 1900                  | P(c)       | 8  |                | Blackman and Eastop 2015 [2]                                         |
| *A. (Bursaphis) epilobiaria* Theobald, 1927  | P(c)       | 8  |                | Blackman 1980 [Great Britain]                                         |
| *A. (B.) fluvialis* Martin, 1982             | ?P(o)      | 9  |                | Blackman and Eastop 2015 [2]                                         |
| *A. (B.) grossulariae* Kaltenbach, 1843      | P(c)       | 8  |                | Türčinavičienė et al. 1997 [Lithuania]                               |
| *Aphis (B.) neomexicana* (Cockerell & Cockerell, 1901) | ? | 8  |                | Robinson and Chen 1969a [Canada]                                     |
| *A. (B.) oenotherae* Oestlund, 1887          | P(c), P(o) | 10/9|                | Stevens 1905a, b, 1906, 1910 [USA]                                   |
| *A. (B.) schneideri* (Börner, 1940)          | P(c)       | 8  |                | Türčinavičienė et al. 1997 [Lithuania]                               |
| *A. (B.) tarsiani* Patch, 1914               | P(c)       | 8  |                | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]              |
| *A. (Toxoptera) annantii* Boyer de Fonscolombe | P(o), ?P(c) | 8  |                | Pagliai 1961 [Italy], Kurl 1980a [Assam, Meghalaya, India], Kar et al. 1990 [India], Kar and Khuda-Bukhsh 1991a [Jammu and Kashmir, Meghalaya, West Bengal, India], Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India], Samkaria et al. 2010 [Palampur, Himachal Pradesh, India] |
| *A. (T.) citricidus* (Kirkaldy)              | P(o), P(c) | 7, 8|                | Kurl 1980a [Assam, Meghalaya, India], Kurl 1986 [Meghalaya, India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Kar et al. 1990 [India] |
| *A. (Toxopterina) vandergooti* (Börner, 1939) | P(c)       | 8  |                | Kuznetsova and Shaposhnikov 1973 [as Chomaphis] [Leningrad Prov., Russia], Blackman 1980 [as Toxopterina] [Great Britain] |
| *Aphis sp. 1*                                | ?          | 8  |                | Robinson and Chen 1969a [Canada]                                     |
| *Aphis sp. 2*                                | ?          | 8  |                | Robinson and Chen 1969a [Canada]                                     |
| *Aphis sp. 3*                                | ?          | 8  |                | Kuznetsova and Shaposhnikov 1973 [Crimea, Ukraine]                   |
| *Aphis sp. 4*                                | ?          | 10 |                | Khuda-Bukhsh and Pal 1985 [Srinagar, Jammu and Kashmir, India]       |
| *Aphis sp. 5*                                | ?          | 8  |                | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Aphis sp. 6*                                | ?          | 8  |                | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Aphis sp. 7*                                | ?          | 10 |                | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]               |
| Taxon                                      | Life cycle | 2n♀ | Genetic system, ♀♂ | References and collecting data                                                                                                                                 |
|-------------------------------------------|------------|------|-------------------|---------------------------------------------------------------------------------------------------------------------------------|
| *Aphis* sp. 8                             | ?          | 8    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                         |
| *Aphis* sp. 9                             | ?          | 8    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                         |
| *Aphis* sp. 10 (A. gossypii complex)      | ?          | 8    |                   | Dutta and Gautam 1993 [Solan, Himachal Pradesh, India], Kapoor and Gautam 1994 [Nahan, Himachal Pradesh, India]               |
| *Apithargelia symphoricarpi* (Thomas, 1878) | P(c)       | 14   |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                                                          |
| *Aspidaphis adjuvans* (Walker, 1848)       | P(c)       | 12   |                   | Blackman and Eastop 2006 [Cyprus; Israel; Iran]                                                                                   |
| *Aspidophorodon (Eoisgia) longicauda* (Richards, 1963) | ?          | 20   |                   | Blackman and Eastop 2015 [?]                                                                                                       |
| *Atarsos grindeliae* Gillette, 1911       | P(c)       | 12   |                   | Robinson and Chen 1969a [Canada]                                                                                                 |
| *Aulacophoroides boffmannni* (Takahashi, 1937) | P(c)      | 14   |                   | Blackman and Eastop 2006 [?]                                                                                                       |
| *Aulacorthum cercidiphylli* (Matsumura, 1918) | ?P(c)  | 12   |                   | Blackman 1986 [Japan]                                                                                                             |
| *A. ciricola* (Takahashi, 1923)           | P(c)       | 10   |                   | Blackman 1986 [Japan]                                                                                                             |
| *A. dorsatum* Richards, 1967              | P(c)       | 12   |                   | Blackman and Eastop 2006 [Western North America]                                                                                   |
| *A. flavum* F.P. Müller, 1958             | P(c)       | 12   |                   | Blackman and Eastop 2006 [?]                                                                                                       |
| *A. obotum* (Essig & Kuwana, 1918)        | ?          | 14/13| XX/X0             | Shinji 1927 ([as *Macroischium ligustrumae*], 1931 ([as *Macroischium*], Blackman 1986 [Japan] (based on n(♂) = 7 (Shinji 1927))) |
| *A. lindenae* (Shinji, 1922)              | ?P(c)      | 12   |                   | Shinji 1941b (as *Myzus*, Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1941b)))                                             |
| *A. magnolae* (Essig & Kuwana, 1918)      | P(c)       | 12/11| XX/X0             | Shinji 1931, 1941a (as *Amphorophora*) [Japan]                                                                                     |
| *A. muraodachi* (Shinji, 1928)            | ?P(c)      | 10   |                   | Blackman and Eastop 2015 [?]                                                                                                       |
| *A. myriopteroni* (G. Zhang, 1980)        | ?          | 10   |                   | Blackman and Eastop 2015 [?]                                                                                                       |
| *A. palustris* Hille Ris Lambers, 1947    | ?P(c), ?P(o)| 34   |                   | Blackman and Eastop 2006 [?]                                                                                                       |
| *A. phytolaccae* Miyazaki, 1968           | ?          | 10   |                   | Blackman and Eastop 2006 [Japan]                                                                                                 |
| *A. sensoriattum* (David, Narayanan & Rajasingh, 1971) | ?         | 18   |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                         |
| *A. similaci* Takahashi, 1965             | ?          | 10   |                   | Blackman 1986 [Japan]                                                                                                             |
| *A. solani* (Kaltenbach, 1843)            | P(c), P(o) | 10   |                   | Blackman 1980 [Great Britain; California, USA], Dionne and Spicer 1957 [Canada], Pagliai 1966 [Italy], Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia; Crimea, Ukraine], Kulkarni and Kacker 1980 [India], Pal and Khuda-Bukhsh 1980 [Tiriyuginarayan, Uttarakhand, India], Blackman 1986 [Japan], Khuda-Bukhsh and Pal 1986b [Tiriyuginarayan, Uttarakhand, India], Kapoor and Gautam 1994 [Nahan, Himachal Pradesh, India], Samkaria et al. 2010 [Shimla, Himachal Pradesh, India] |
| *A. speyeri* Börner, 1939                 | P(c)       | 10   |                   | Blackman 1980 [Iran]                                                                                                              |
| *A. spinacaudatum* (Kumar & Burchardt, 1971) | ?P(c)  | 12   |                   | Khuda-Bukhsh and Basu 1987 (as *A. magnolae*) (cited after Blackman and Eastop 2015)                                              |
| Taxon | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data |
|-------|------------|---------|----------------------|--------------------------------|
| Aulacorthum sp. 1 | ? | 12 | | Khuda-Bukhsh and Kar 1990 [Kalimpong, West Bengal, India] |
| Aulacorthum sp. 2 | ? | 12 | | Samkaria et al. 2010 [Yol, Himachal Pradesh, India] |
| Brachycorthis belichrysi (Kaltenbach, 1843) | P(c), P(o) | 12 | | Kuznetsova 1968 [Georgia], Kurl 1978 [Delhi, India], Pal and Khuda-Bukhsh 1980 [Gourikund, Uttarakhand, India], Kulkarni and Kacker 1981a [Dadhaul, Himachal Pradesh, India], Raychaudhuri and Das 1987 [India], Gautam and Sharma 1990 [Himachal Pradesh, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| B. spireae Börner, 1932 | P(c) | 12 | | Gut 1976 [Holland] |
| B. (Acoudus) klugesi (Börner, 1942) | P(c) | 10 | | Blackman and Eastop 2015 [?] |
| B. (A.) hydroidis (Linnaeus, 1758) | P(c) | 12 | | Kuznetsova 1968 [St.Petersburg, Russia] |
| B. (A.) populi (del Guercio, 1911) | P(c) | 12 | | Blackman and Eastop 2015 [?] |
| B. (Appelia) prunicala Kaltenbach, 1843 | P(c) | 12 | | Colling 1955 [Great Britain] |
| B. (A.) prunific (Theobald, 1926) | P(c) | 12 | | Blackman and Eastop 2015 [Great Britain] |
| B. (A.) schwartzi (Börner, 1931) | P(c) | 12 | | Gut 1976 [Holland], Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India] |
| B. (A.) tragapogonis tragapogonis (Kaltenbach, 1843) | P(c) | 12 | | Blackman and Eastop 1984 [?] |
| B. (A.) t. setosus (Kaltenbach, 1843) | ? | 12 | | Blackman and Eastop 2015 [Israel] |
| B. (M.) rumexicolens (Patch, 1917) | P(c) | 12 | | Kurl and Chauhan 1987a [Barog, Himachal Pradesh, India] |
| B. (M.) sedi (Jacob, 1964) | P(c) | 8 | | Blackman and Eastop 2006 [?] |
| B. (Nevskyaphis) bicolor (Nevsky, 1929) | P(o), P(c) | 12 | | Blackman and Eastop 2015 [?] |
| B. (N.) malvae Shaposhnikov, 1964 | ? | 12 | | Blackman and Eastop 2015 [?] |
| B. (Prunaphis) cardisi (Linnaeus, 1758) | P(c) | 10 | | Kuznetsova 1968 [Georgia], Blackman and Eastop 1984 [?] |
| B. (P.) jacobi Stroyan, 1957 | P(c) | 12 | | Gut 1976 [Holland] |
| B. (Scrophulaphis) persicae (Passerini, 1860) | P(o), P(c) | 10 | | Blackman and Eastop 1984 [?] |
| Brachycolus cerastii (Kaltenbach, 1846) | P(c) | 14/13 XX/X0 | | Gut 1976 [Holland] |
| Brachycorthis aeragi (Mordvilko, 1929) | P(c) | 10 | | Blackman and Eastop 1984 [?] |
| B. lonicerae (Shaposhnikov, 1952) | P(c) | 10 | | Blackman and Eastop 2006 [?] |
| Brachyunguis calhotropicus Menon & Pawar, 1958 | ? | 8 | | Kurl 1978, Kurl and Mista 1980, 1981 [Jodhpur, Rajasthan, India] |
| B. harmalae Das, 1918 | P(c), P(o) | 8 | | Blackman and Eastop 2015 [?] |
| B. hydroidis (Nevsky, 1928) | ? | 8 | | Blackman and Eastop 2006 [?] |
| B. tamaricó (Lichtenstein, 1885) | P(c) | 8 | | Blackman and Eastop 2015 [?] |
| Taxon | Life cycle | 2n | Genetic system, | References and collecting data |
|-------|------------|----|----------------|--------------------------------|
| Brevicoryne brassicae (Linnaeus, 1758) | P(c), P(o) | 8, 9 | | Panigrahy and Patnaik 1991 [Chatrapur, Odisha, India] |
| | | 12, 14 | | Reeta Devi and Gautam 2012 [Kullu region, Himachal Pradesh, India] |
| | | 14 | | Kulkarni 1984 [Darjeeling, West Bengal, India] |
| | | 16/15 XX/X0 | | Cognetti 1961a, b, Cognetti and Cognetti-Varriale 1961, Pagliai 1962 [Italy] |
| | | 16 | | MacDonald and Harper 1965, Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kar et al. 1990 [India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Kapoor and Gautam 1994 [Himachal Pradesh, India], Gautam and Dhatwalia 2003 [Hamirpur, Himachal Pradesh, India], Giannini et al. 2003 [Italy] |
| Capitophorus carduinus (Walker, 1850) | P(c) | 16 | | Blackman and Eastop 2015 [?] |
| C. cirripagus | ?P(c) | 16 | | Blackman and Eastop 2006 (recorded as C. euleagni in Blackman, 1986) [?] |
| C. euleagni (Del Guercio, 1894) | P(c) | 16 | | Robinson and Chen 1969a [Canada], Blackman 1986 [Japan] |
| C. formoartemisiae (Takahashi, 1921) | ? | 16 | | Blackman 1986 [Japan] |
| C. hippophae (Waller, 1852) | P(c), ?P(o) | 10 | | Sun and Robinson 1966, Robinson and Chen 1969a [Canada] |
| C. h. javanicus Hille Ris Lambers, 1953 | ? | 10 | | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan], Kar et al. 1990 [India] |
| C. borni Börner, 1931 | P(c) | 16 | | Blackman 1980 [Great Britain] |
| C. inulae (Passerini, 1860) | ?P(o) | 16 | | Blackman and Eastop 2015 [?] |
| C. mitegoni Eastop, 1956 | ?P(c) | 9 | | Kurl and Chauhan 1986a, 1987a [Manali, Himachal Pradesh, India] |
| C. pakansus Hottes & Frison, 1931 | P(c) | 16 | | Blackman and Eastop 1994 [?] |
| Capitophorus sp. [teniuinus Miyazaki, 1971] | ? | 10 | | Blackman and Eastop 2006 [China, near Beijing] |
| Casimina canberra (Eastop, 1961) | P(c) | 8 | | Blackman and Eastop 2015 [?] |
| Catamergus kickapoo (Hottes & Frison, 1931) | P(c) | 10 | | Robinson and Chen 1969a (as Macrosiphum) [Canada] |
| Cavariella aegopodii (Scopoli, 1763) | P(c), P(o) | 10 | | Blackman 1980 [Great Britain; Iran], Dutta and Gautam 1993, Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India] |
| C. araliae Takahashi, 1921 | ?P(c), P(o) | 14 | | Blackman 1986 [Japan] |
| C. archangelicae (Scopoli, 1763) | P(c) | 6 | | Blackman 1980 [Great Britain] |
| C. borealis Hille Ris Lambers, 1952 | P(c) | 6 | | Blackman and Eastop 1994 [?] |
| C. ciutae (Koch, 1854) | P(c) | 10 | | Blackman 1980 [Iran] |
| C. intermedia Hille Ris Lambers, 1969 | ?P(c) | 6 | | Blackman 1980 [Great Britain] |
| C. japonica (Essig & Kuwana, 1918) | P(c) | 8 | | Blackman 1986 [Japan] |
| C. konoi Takahashi, 1939 | P(c) | 8 | | Blackman and Eastop 1984 [?], Blackman 1986 [Iceland] |
| C. pastinacae (Linnaeus, 1758) | P(c) | 8 | | Gurt 1976 [Holland] |
| C. salicola (Matsumura, 1917) | P(c) | 10 | | Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| C. sericola Shinji, 1927 | ? | 8 | | Shinji 1927 [Japan] |
| Taxon | Life cycle | 2n \( \text{♀/♂} \) | Genetic system, \( \text{♀/♂} \) | References and collecting data |
|-------|------------|----------------|----------------|---------------------------------|
| *C. theobaldi* (Gillette & Bragg, 1918) | P(c) | 8, 10 | | Blackman 1980 [Great Britain] |
| *C. (Cavariella) aquatica* (Gillette & Bragg, 1916) | P(c) | 8 | | Blackman and Eastop 2015 [?] |
| *C. (Cavariella) aestuana* (Shinji, 1922) | ? | 8/7 | XXX0 | Shinji 1931, Blackman 1986 [Japan] (based on \( n(♀) = 4 \) (Shinji 1931)) |
| Cavariella sp. 1 | ? | 10 | | Robinson and Chen 1969a [Canada] |
| Cavariella sp. 2 | ? | 6 | | Kuznetsova 1978 [St.Petersburg, Russia] |
| Cavariella sp. 3 | ? | 10 | | Khuda-Bukksh 1980 [Gharwal, Uttarakhand, India] |
| Cavariella sp. 4 | ? | 12 | | Kar et al. 1990 [India] |
| *Ceruaphis eriophori* (Walker, 1848) | P(c) | 14 | | Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia] (they also noted that 2n=8 in Kuznetsova 1968, 1974 was erroneous) |
| Chaetomyza sp. | ? | 12 | | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| Chaetosiphon gracilicorne David, Rajasingh & Narayanan, (1970) 1971 | ?P(c) | 16 | | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *Ch. (Pentatrichopus) coreanum* (Paik, 1965) | P(c) | 8 | | Blackman and Eastop 1984 [?], Blackman 1986 [Japan] |
| Ch. (P) fragaeolii (Cockerell, 1901) | P(o), ?P(c) | 12, 13, 14, 15 | | Blackman et al. 1987 [Old World, North America] |
| | | 13, 14, 15 | | Blackman and Eastop 2015 [?] |
| | | 14 | | Blackman and Eastop 1984 [?] |
| *Ch. (P) jacobi* Hille Ris Lambers, 1953 | P(o) | 17 | | Blackman et al. 1987 [Western North America] |
| *Ch. (P) minor* Forbes, 1884 | P(c) | 12 | | Blackman et al. 1987 [Eastern North America] |
| *Ch. (P) tetrarhodum* (Walker, 1849) | P(c) | 14 | | Blackman 1980 (as *Pentatrichopus*) [Great Britain] |
| | | 16 | | Blackman and Eastop 2006 [one sample from Australian Capital Territory, Australia] |
| *Ch. (P) thomasi* Hille Ris Lambers, 1953 | P(c) | 12 | | Blackman et al. 1987 [Western North America] |
| Chomaphis mira Mordvilko, 1928 | ? | 8 | | Kuznetsova and Shaposhnikov 1973 [Voronezh, Russia] |
| *Coloradoa artemisiae* (Del Guercio, 1913) | P(c) | 16 | | Robinson and Chen 1969a [Canada] |
| *C. bournieri* Remaudière & Leclant, 1969 | P(o) | 22 | | Blackman and Eastop 2006 [?] |
| *C. bucaldi* Szelegiewicz, 1981 | ? | c.24 | | Blackman and Eastop 2006 [immature specimen from China] |
| *C. ponticae* (Börner, 1940) | ? | 16 | | Blackman and Eastop 2015 [?] |
| *C. rufomaculata* (Wilson, 1908) | P(o), ?P(c) | 8 | | Panigrahy and Patnaik 1987 [Chatrapur, Odisha, India] |
| | | 8, 17 | | Panigrahy and Patnaik 1991 [Chatrapur, Odisha, India] |
| | | 18 | | Das et al. 1985 [India] |
| *C. santolinae* Hille Ris Lambers, 1948 | ? | 20 | | Blackman and Eastop 2006 [?] (specimens from *Artemisia monogerma*) |
| *C. viridis* (Nevsky, 1929) | ? | 16 | | Blackman and Eastop 2006 [?] |
| *Corylophium avellanae* (Schrank, 1801) | P(c) | 10 | | Blackman and Eastop 1984 [?] |
| *Cryptaphis bromi* Robinson, 1967 | P(c) | 16 | | Robinson and Chen 1969a [Canada] |
| *C. geranicola* (Shinji, 1935) | P(c) | 14 | | Blackman 1986 [Japan] |
| *C. poae* (Hardy, 1850) | P(c) | 16 | | Sun and Robinson 1966 [Canada] |
| | | 20 | | Blackman and Eastop 1984 [?] |
| Taxon                          | Life cycle | 2n   | Genetic system, X0 | References and collecting data                                      |
|-------------------------------|------------|------|-------------------|---------------------------------------------------------------------|
| Cryptomyzus alboapicalis      | P(c), P(o) | 12   |                   | Blackman 1980 [Great Britain], Bašilova et al. 2008 [Lithuania]     |
| C. ballotae Hille Ris Lambers, 1953 | P(o), P(c) | 12   |                   | Blackman 1980 [Great Britain]                                        |
| C. galeopsis (Kaltenbach, 1843) | P(c)      | 12   |                   | Blackman 1980 [Great Britain], Bašilova et al. 2008 [Lithuania]     |
| C. korschelti Börner, 1938    | P(c)      | 12   |                   | Bašilova et al. 2008 [Lithuania]                                    |
| C. leonuri Božhko, 1961       | P(c)      | 12   |                   | Bašilova et al. 2008 [Lithuania]                                    |
| C. maudamanti Guldemond, 1990 | P(c)      | 12   |                   | Bašilova et al. 2008 [Lithuania]                                    |
| C. ribis (Linnaeus, 1758)     | P(c)      | 12   |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Bašilova et al. 2008 [Lithuania] |
| C. taoi Hille Ris Lambers, 1963 | P(c)      | 12   |                   | Blackman and Eastop 2015 [?]                                        |
| C. ulmert Börner, 1952        | P(c)      | 12   |                   | Bašilova et al. 2008 [Lithuania]                                    |
| C. (Ampullosiphon) stachydis (Heikhenhimo, 1955) | P(c) | 12 |                   | Blackman and Eastop 2006 [?]                                        |
| Cryptospirum artemisiae       | P(c)      | 8    |                   | Blackman 1980 [Great Britain], Blackman 1986 [Japan]                |
| Delphiniobium canadense       | P(c)      | 20   |                   | Blackman and Eastop 2006 [?]                                        |
| D. yeoense Miyazaki, 1971     | P(c)      | 12   |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| Diaphis mexicana (Baker, 1934) | P(o), P(c) | 8    |                   | Blackman and Eastop 2006 [?]                                        |
| D. noxia (Mordvilko et al., 1913) | P(c), P(o) | 10   |                   | Blackman 1980 [South Africa]                                         |
| D. (Holcaphis) agrostidis (Muddathir, 1965) | P(c) | 12 |                   | Blackman 1980 (as Holcaphis) [Great Britain]                        |
| D. (H.) frequens (Walker, 1848) | P(c)      | 14   |                   | Gut 1976 [Holland]                                                  |
| D. (H.) hokii (Hardy, 1850)   | P(c)      | 14   |                   | Gut 1976 [Holland]                                                  |
| Dysaphis affinis (Mordvilko, 1928) | P(c) | 12 |                   | Kuznetsova 1968 [Georgia]                                           |
| D. angelicae (Koch, 1854)     | P(c)      | 12   |                   | Blackman and Eastop 2015 [?]                                        |
| D. anthrisci anthrisci Börner, 1950 | P(c) | 12/11 | XX/X0            | Kuznetsova 1968 [St. Petersburg, Russia], Kuznetsova and Gandrabur 1991 [Ukraine] |
| D. a. majkopica Shaposhnikov, 1961 | P(c) | 12 |                   | Kuznetsova 1968 [North Caucasus, Russia], Kuznetsova 1974 [?]       |
| D. apitifolia (Theobald, 1923) | P(o), P(c) | 12   |                   | Blackman 1980 [Iran]                                                |
| D. chaerophyllina Shaposhnikov, 1959 | P(c) | 12 | XX/X0            | Kuznetsova 1968 [North Caucasus, Russia], Kuznetsova 1974 [?]       |
| D. crataegi crataegi (Kaltenbach, 1843) | P(c), P(o) | 12 |                   | Blackman 1980 [Great Britain]                                       |
| D. crataegi henacleana (Narzukulov, 1955) | ? | 12 |                   | Kuznetsova and Daniyarova 1980 [Kondara, Tajikistan]                |
| D. devecta (Walker, 1849)     | P(c)      | 12/11 | XX/X0            | Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia]              |
| D. fennica fenniculicola (Theobald, 1923) | P(o) | 12 |                   | Blackman and Eastop 1984 [?], Gautam and Kapoor 2002 [Shimla, Himachal Pradesh, India] |
| D. maldaeicial Shaposhnikov, 1976 | P(c) | 12 |                   | Kuznetsova 1968 [Alma-Ata, Kazakhstan]                              |
| D. hortivisia (Börner, 1940)   | P(c)      | 12   |                   | Kuznetsova 1968 [St. Petersburg, Russia]                            |
| D. narzukulov Shaposhnikov, 1956 | P(c) | 12 |                   | Kuznetsova and Daniyarova 1980 [Kondara, Tajikistan]                |
| Taxon                                                                 | Life cycle | 2n♀♂ | Genetic system,♀♂ | References and collecting data                                                                 |
|----------------------------------------------------------------------|------------|-------|-------------------|------------------------------------------------------------------------------------------------|
| *D. newskyi aizenbergi* (Shaposhnikov, 1949)                         | P(c)       | 12    |                   | Kuznetsova 1968 (as *D. aizenbergi* (Shaposhnikov, 1949)) [St.Petersburg, Russia]               |
| *D. radicola* (Mordvilko, 1897)                                      | P(c)       | 12    |                   | Kuznetsova 1968 [St.Petersburg, Russia], Blackman 1980 [Great Britain]                         |
| *D. ruumeicola* (Hori, 1927)                                        | P(c), P(o) | 12    |                   | Kuznetsova and Daniyarova 1980 (as *D. emicis* Mim.) [Kondara, Tajikistan]                    |
| *D. tulipae* (Boyer de Fonscolombe, 1841)                           | P(o)       | 11, 12|                   | Blackman 1980 [Great Britain]                                                                 |
| *D. (Cotoneasteria) microsiphon* (Nevsky, 1929)                      | P(c)       | 12    |                   | Kuznetsova 1968 [Georgia]                                                                      |
| *D. (Pomaphis) aucupariae* (Buckton, 1879)                           | P(c)       | 12    |                   | Blackman and Eastop 1994 [], Blackman and Eastop 2006 []                                      |
| *D. (P) maritina* (Hille Ris Lambers, 1955)                          | P(c)       | 12    |                   | Blackman and Eastop 2006 []                                                                    |
| *D. (P) pavlovskyana* Narzikulov, 1957                               | P(c)       | 12    |                   | Khuda-Bukhsh and Pal 1983a [Garhwal, Uttarakhand, India] (apparently it is *Dysaphis indica* Chakrabarti & Medda, 1993) |
| *D. (P) plantaginea* (Passerini, 1860)                               | P(c)       | 12    |                   | Kuznetsova 1968 (as *D. mali* Ferrari, 1872) [Crimea, Ukraine], Blackman 1986 [Japan], Criniti et al. 2009 [Italy] |
| *D. (P) pyri* (Boyer de Fonscolombe, 1841)                           | P(c)       | 12    |                   | Kuznetsova 1968 (as *D. mali* Ferrari, 1872) [Crimea, Ukraine]                                |
| *D. (P) reamuri* Mordvilko, 1928                                     | P(c)       | 12    |                   | Kuznetsova 1968 [Crimea, Ukraine]                                                               |
| *D. (P) sorbi* (Kaltenbach, 1843)                                    | P(c)       | 12    |                   | Kuznetsova 1968 [St.Petersburg, Russia]                                                        |
| *Dysaphis* sp.                                                       | ?          | 12    |                   | Kuznetsova 1968 (as *D. crataegi* (Kaltenbach, 1843)) [Georgia]                               |
| *Elatobium abietinum* (Walker, 1849)                                 | P(c), P(o) | 18    |                   | Blackman 1980 [Great Britain]                                                                  |
| *Elatobium* sp.                                                      | ?          | 8     |                   | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                                        |
| *Ericaphis* fimbriata (Richards, 1959)                               | P(c)       | 14    |                   | Blackman and Eastop 2015 []                                                                    |
| *E. gentneri* (Mason, 1947)                                          | P(c)       | 18, 19, 20, 21, 23/17, 19 |                   | Blackman and Eastop 2015 [British Columbia, Canada]                                            |
| *E. scammelli* (Mason, 1940)                                         | P(c)       | 14    |                   | Blackman and Eastop 2015 []                                                                    |
| *E. wakhshe* (Hottes, 1934)                                          | P(c)       | 12    |                   | Blackman and Eastop 2015 []                                                                    |
| *Ericolophium holsti* (Takahashi, 1935)                              | ?          | 22    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                       |
| *E. itoe* (Takahashi, 1925)                                          | ?          | 18    |                   | Blackman and Eastop 2006 []                                                                    |
| *Eucarazzia elegans* (Ferrari, 1872)                                 | ?          | 12    |                   | Gautam and Kapoor 2002 [Shimla, Himachal Pradesh, India]                                      |
| *Eunyzus etopii* Maity & Chakrabarti ex Maity, Bhattacharya & Chakrabarti, 1982 | ?          | 10    |                   | Khuda-Bukhsh and Pal 1986b [Triyuginarayan, Uttarakhand, India]                                |
| *E. gallicola* Takahashi, 1963                                       | ?          | 12    |                   | Blackman 1986 [Japan]                                                                          |
| *E. impatiensae* (Shinji, 1924)                                      | P(c)       | 10    |                   | Blackman 1986 [Japan]                                                                          |
| *Gypsoaphis oestlundi* Hottes, 1930                                  | ?          | 4     |                   | Sun and Robinson 1966 [Canada], Robinson and Chen 1969a [Canada]                               |
| *Hayhurstia atriplicis* (Linnaeus, 1761)                              | P(c)       | 14    |                   | Sun and Robinson 1966 (as *Brachycolus*), Robinson and Chen 1969a [Canada], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| Taxon                        | Life cycle | 2n♀/♂ | Genetic system, ♀/♂ | References and collecting data                                                                 |
|-----------------------------|------------|--------|--------------------|-----------------------------------------------------------------------------------------------|
| *Hyadaphis coriandri* (Das, 1918) | P(c), ?P(o) | 12     |                    | Blackman and Eastop 2006 [?]                                                                  |
|                             |            | 13     |                    | Blackman 1980 [Iran]                                                                          |
|                             |            | 14     |                    | Kuznetsova and Shaposhnikov 1973 (as *Semiaphis tataricae* [Aizenberg, 1935] [St. Petersburg, Russia]) |
| *H. foeniculi* (Passerini, 1860) | P(c)        | 12, 14 |                    | Blackman and Eastop 2006 [?] (one sample from *Foeniculum* had a mixture of 2n=12 and 2n=14 individuals) |
|                             |            | 13     |                    | Blackman and Eastop 2006 [?] (one sample from Lonicera, a foeniculi × passerinii hybrid?)       |
|                             |            | 14     |                    | Gut 1976 [Holland] (on *Conium maculatum*), Gautam and Kapoor 2002 [Unna, Himachal Pradesh, India], Blackman and Eastop 2006 [?] (for samples of H. foeniculi from Conium and Foeniculum) |
| *H. passerinii* (del Guercio, 1911) | P(c), P(o) | 12     |                    | Kuznetsova and Shaposhnikov 1973 [Crimea, Ukraine]                                            |
| *H. tataricae* (Aizenberg, 1935) | P(c)        | 14     |                    | Blackman and Eastop 2015 [?]                                                                  |
| *Hyadaphis* sp.             | ?          | 12     |                    | Blackman 1980 [Great Britain]                                                                 |
| *Hyalomyzus nosi* Hille Ris Lambers, 1973 | ? | 8      |                    | Khuda-Bukhsh and Kar 1990 [Shillong, Meghalaya, India]                                       |
| *Hyalopteroides humilis* (Walker, 1852) | P(c) | 16     |                    | Blackman 1980 [Great Britain]                                                                 |
| *Hyalopterus amygdali* (Blanchard, 1840) | P(c) | 10     |                    | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)             |
|                             |            |        |                    | Shibata 1941 [Japan], Robinson and Chen 1969a [Canada], Kuznetsova and Shaposhnikov 1973 [St.Petersburg, Russia; Turkmenistan], Kuznetsova 1974 [?], Pal and Khuda-Bukhsh 1982, Khuda-Bukhsh and Pal 1984a [Srinagar, Jammu and Kashmir, India], Blackman 1986 [Japan] |
| *H. pruni* (Geoffroy, 1762) | P(c)        | 10     |                    | Kurl and Chauhan 1986a [Dharapur, Himachal Pradesh, India], Kurl and Chauhan 1987a [Naldehra, Himachal Pradesh, India], Gautam and Kapoor 2002 [Unna, Himachal Pradesh, India] |
| *Hyperomyzus carduellinus* (Theobald, 1915) | P(o) | 12     |                    | Colling 1955 [Great Britain], Sun and Robinson 1966 (as *Naasonovia*), Robinson and Chen 1969a [Canada], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *H. lactaece* (Linnaeus, 1758) | P(c), P(o) | 12     |                    | Blackman 1980 [Great Britain]                                                                 |
| *H. lampsanae* (Börner, 1932) | P(c)        | 12     |                    | Blackman 1980 [Great Britain]                                                                 |
| *H. (Hyperomyzella) rhinanthi* (Schouteden, 1903) | P(c) | 12     |                    | Blackman 1980 [Great Britain], Blackman and Eastop 1984 [?]                                 |
| *H. (Neasonovia) picridis* (Börner & Blunck, 1916) | P(c) | 12     |                    | Blackman 1980 [Great Britain], Blackman and Eastop 1984 [?]                                 |
| *H. (N.) ribiellus* (Davis, 1919) | P(c) | 12     |                    | Blackman 1980 [Great Britain], Blackman and Eastop 1984 [?]                                 |
| *Hysteroneura setariae* (Thomas, 1878) | P(c), P(o) | 12     |                    | Robinson and Chen 1969a [Canada], Kurl 1986 [Meghalaya, India], Khuda-Bukhsh and Kar 1990 [Kalyani, West Bengal, India], Kapoor and Gautam 1994 [Shimla, Himachal Pradesh, India] |
| *Idiopterus nephrelepidis* Davis, 1909 | P(o) | 12     |                    | Blackman and Spence 1996 [Great Britain]                                                     |
|                             |            | 13     |                    | Blackman 1980 [Great Britain]                                                                 |
| Taxon                          | Life cycle | 2n♀♂ | Genetic system, ♀♂ | References and collecting data                        |
|-------------------------------|------------|------|-------------------|-------------------------------------------------------|
| *Illinoia alni* (Mason, 1925) | P(c)       | 10   |                   | Blackman 1980 [Canada]                                |
| *I. azaleae* (Mason, 1925)    | P(o), P(c) | 10   |                   | Blackman and Eastop 1984 [?]                         |
| *I. liviodendri* (Monell, 1879) | P(c)       | 10   |                   | Blackman 1980 [USA]                                  |
| *I. morrisonii* (Swain, 1918) | P(o)       | 10   |                   | Blackman and Eastop 2015 [?]                         |
| *I. pepperi* (MacGillivray, 1958) | P(c)       | 22   |                   | Blackman and Eastop 2000 [?]                         |
| *I. richardii* (MacGillivray, 1958) | ?         | 10   |                   | Blackman 1980 [Canada]                                |
| *I. spiraeae* (MacGillivray, 1958) | ?         | 10   |                   | Blackman and Eastop 2015 [?]                         |
| *I. subviride* (MacDougall, 1926) | ?         | 10   |                   | Blackman and Eastop 2006 [?]                         |
| *I. walmagii* (Hortes, 1952)  | P(c)       | 10   |                   | Sun and Robinson 1966 (as *Masonaphis*), Robinson and Chen 1969a (as *Masonaphis*) [Canada] |
| *I. (Amphorinophora) crystalae* (Smith & Knowlton, 1939) | P(c)       | 16   |                   | Blackman and Eastop 2006 [?]                         |
| *I. (Masonaphis) lamberti* (MacGillivray, 1960) | P(c), P(o) | 10   |                   | Gut 1976 (as *Masonaphis*) [Holland]                 |
| *I. (M.) menziesiae* (Robinson, 1969) | P(c)       | 10   |                   | Blackman and Eastop 2006 [?]                         |
| *I. (Oestlundia) davidsoni* Mason, 1925 | ?         | 12   |                   | Blackman 1980 [USA]                                  |
| *I. (O.) maxima* (Mason, 1925) | P(c)       | 12   |                   | Blackman 1980 [Canada]                                |
| *I. (O.) rubicola* (Oestlund, 1886) | P(c)       | 12   |                   | Shinji 1931 (as *Amphorophora rubicola* (Oestlund) [USA], Robinson and Chen 1969a (as *Masonaphis*) [Canada] |
| *Impatientinium asiaticum asiaticum* Nevsly, 1929 | P(c)       | 16   |                   | Gut 1976 [Holland], Pal and Khuda-Buksh 1980 [Sonprayag, Uttarakhand, India], Khuda-Buksh and Pal 1986b [Gourikund, Uttarakhand, India], Kapoor and Gautam 1994 [Nahan, Himachal Pradesh, India] |
| *I. a. dalhousiensis* Verma, 1969 | P(c)       | 16   |                   | Kurl and Chauhan 1986a, 1987a [Mecloadganj, Himachal Pradesh, India] |
| *I. basilamines* (Kaltenbach 1862) | P(c)       | 16   |                   | Blackman and Eastop 2015 [?]                         |
| *I. impatiens* (Shinji, 1922)  | P(c)       | 16   |                   | Blackman 1986 [Japan]                                |
| *Indoidiopterus genuit* (Chowdhuri, R.C. Basu, Chakrabarti, & D.N. Raychaudhuri, 1969) | P(c)       | 12   |                   | Pal and Khuda-Buksh 1980, Khuda-Buksh and Pal 1986b [Triyuginarayan, Uttarakhand, India] |
| *Indomasonaphis inucae* (A.K.Ghosh & Raychaudhuri, 1972) | P(c)       | 30   |                   | Kurl and Chauhan 1986c [Barog, Himachal Pradesh, India] |
|                              |            |      |                   | Kurl and Chauhan 1987a [Barog, Himachal Pradesh, India] |
| *Indomegoura indica* (van der Goot, 1916) | P(c)       | 10   |                   | Shinji 1927 (as *Amphorophora indicum*), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1927)) |
|                              |            | 12   |                   |                                                     |
| *Liosomaphis atru* Hille Ris Lambers, 1966 | ?         | 17   |                   | Kurl and Chauhan 1987b [Barog, Himachal Pradesh, India], Kurl and Chauhan 1988 [India] |
|                              |            | 18   |                   | Kurl and Chauhan 1987a [Barog, Himachal Pradesh, India] |
| *L. berberidis* (Kaltenbach, 1843) | P(c)       | 18   |                   | Blackman 1980 [Great Britain]                        |
| *L. himalayanus* A.N. Basu, 1964 | P(c)       | 18   |                   | Pal and Khuda-Buksh 1984 [Jamunetri, Uttarakhand, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *Lipaphis erysimi* (Kaltenbach, 1843) | P(c)       | 10   |                   | Gut 1976 [Holland]                                  |
| *L. fritschiuelleri* Börner, 1950 | P(c)       | 10   |                   | Blackman and Eastop 2015 [?]                         |
| Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------|------------|--------|--------------------|-------------------------------|
| *L. pseudobrassicae* (Davis, 1914) | P(c), P(o) | 6/5 XX/X0 | Chen and Zhang 1985a, c (as *L. erysimi*) [Beijing area, China] (Chen and Zhang 1985a cited after Blackman and Eastop 2015), Kar and Khuda-Bukhsh 1991b (as *L. erysimi*) [Kalyani, West Bengal, India] | Fox 1957 [Virginia, USA] |
| | | 8 | | Blackman and Eastop 2015 [?] (anholocyclic populations in most parts of the world have 2n=9) |
| | | 8–9 | | Gautam and Kapoor 2002 (as *L. erysimi*) [Una, Himachal Pradesh, India] |
| | | 8, 10 | | Feng and You 1988 (as *L. erysimi*) [Taiwan] |
| | | 9, 10 | | Kurl 1986 (as *L. erysimi*) [Meghalaya, India] |
| | | 10 | | Kurl and Misra 1981 (as *L. erysimi*) [Jodhpur, Rajasthan, India], Gautam and Sharma 1990 (as *L. erysimi*) [Himachal Pradesh, India], Gautam and Dhatwalia 2003 (as *L. erysimi*) [Shimla, Himachal Pradesh, India] |
| | | 4, 5, 6, 7, 8, 9, 10, 15, 18 | | Khuda-Bukhsh and Pal 1984b (as *L. erysimi*) [Kalyani, West Bengal, India] |
| *Longicaudus trirhodus* (Walker, 1849) | P(c) | 12 | Gut 1976 [Holland], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Macchiatiella itadori* (Shinji, 1924) | P(c) | 12/11 XX/X0 | Shinji 1927, 1931, 1941a (as *Acaudus*), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1927, 1931)) |
| *Macronyzeus woodwardiae* (Takahashi, 1921) | P(o), ?P(c) | 12 | Blackman 1986 [Japan] |
| *Macrostrongiella absinthii* (Linnaeus, 1758) | P(c) | 12 | Sun and Robinson 1966, Robinson and Chen 1969a [Canada] |
| *M. artemisiae* (Boyer de Fonscolombe, 1841) | P(c) | 12 | Gut 1976 [Holland] |
| *M. dimidata* Börner, 1942 | P(c) | 12 | Blackman and Eastop 2006 [?] |
| *M. formosartemisiae* Takahashi, 1921 | ?P(c), P(o) | 10 | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1986b [Rambara, Uttarakhand, India] |
| *M. huaidensis* G. Zhang, 1980 | ? | 12 | Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| *M. kikungshana* Takahashi, 1937 | P(c) | 12 | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1986b [Triyugarinayarayan, Uttarakhand, India] |
| *M. ludovicianae* (Oestlund, 1886) | P(c) | 12 | Robinson and Chen 1969a [Canada] |
| *M. millefolii* (De Geer, 1773) | P(c) | 12 | Gut 1976 [Holland] |
| *M. pseudoartemisiae* Shinji, 1933 | ? | 10 | Pal and Khuda-Bukhsh 1982, Khuda-Bukhsh and Pal 1986b [Srinagar, Jammu and Kashmir, India], Dutta and Gautam 1993 [Solan, Himachal Pradesh, India] |
| | | 12 | | Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India] (Blackman and Eastop 2006: "perhaps this was misidentified yomogifoliae") |
| *M. sanborni* (Gillette, 1908) | P(o) | 10 | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| Taxon                              | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data                                                                 |
|-----------------------------------|------------|--------|---------------------|------------------------------------------------------------------------------------------------|
| M. sanborni (Gillette, 1908)      | P(α)       | 12     |                     | Boschetti 1963 [Italia], Blackman and Eastop 2015 [many samples from Great Britain and India], Khuda-Bukhsh and Datta 1981b [India], Gautam and Sharma 1990 [Himalach Pradesh, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Blackman and Eastop 2006 [one sample from China] |
| M. rejuncta (Walker, 1848)        | P(c)       | 10     |                     | Blackman 1980 [Great Britain]                                                                 |
| M. subterranea (Koch, 1855)       | P(c)       | 12     |                     | Gut 1976 (as Macrosiphoniella trimaculata Hille Ris Lambers, 1938) [Holland]                    |
| M. szalaymarzsi Szelegiewicz, 1978| ?          | 12     |                     | Blackman and Eastop 2006 [?]                                                                     |
| M. tanacetaria (Kaltenbach, 1843) | P(c)       | 12     | 12/11 XX/X0         | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                         |
| M. tapuskae (Hottes & Frison, 1931)| P(c)       | 12     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. yomogifoliae (Shinji, 1922)    | ?          | 12     |                     | Kulkarni 1984 (as Macrosiphum yamagopholae (Shinji)) [Darjeeling, West Bengal, India]            |
| M. (Asterobium) yomenae (Shinji, 1922) | ?         | 12     |                     | Shinji 1927 (as A mphorophum), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1927))            |
| M. (Chononiella) myohangangi Szelegiewicz, 1980 | ?      | 12     |                     | Chen and Zhang 1985b (cited after Blackman and Eastop 2015)                                     |
| M. (Ch.) spinipes A.N. Basu, 1968 | ?          | 10     |                     | Kar et al. 1990 [India]                                                                         |
| M. (Phalangomyzus) antennata Holman & Szelegiewicz, 1978 | ?       | 12     |                     | Blackman and Eastop 2006 [?]                                                                     |
| M. (P.) grandicandia Takahashi & Moritsa, 1963 | ?   | 12     |                     | Chen and Zhang 1985b (cited after Blackman and Eastop 2015)                                     |
| M. (P.) oblonga (Mordvilko, 1901) | P(c)       | 12     |                     | Gut 1976 [Holland]                                                                              |
| M. (P.) persequent (Walker, 1852) | P(c)       | 12     |                     | Gut 1976 [Holland]                                                                              |
| Macrosiphoniella sp. 1            | ?          | 12     |                     | Samkaria et al. 2010 [Shimla, Himachal Pradesh, India]                                           |
| Macrosiphoniella sp. 2            | ?          | 12     |                     | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)                |
| Macrosiphum albifrons Essig, 1911 | P(c)       | 10     |                     | Blackman 1980 [USA]                                                                             |
| M. californicum (Clarke, 1903)    | P(c)       | 10     |                     | Blackman 1980 [USA]                                                                             |
| M. centranthi Theobald, 1915      | P(c), P(α) | 10     |                     | Blackman and Eastop 1984 [?]                                                                     |
| M. choldakovskyi (Mordvilko, 1909) | P(c)       | 10     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. claytoniae Jensen, 2000        | P(α)       | 16     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. clematiiolata Shinji, 1924     | P(c)       | 18     |                     | Blackman 1986 [Japan], Blackman and Eastop 2015 [?] ("the karyotype suggests that this species may be a Sitobion") |
| M. clydesmithi Robinson, 1980    | P(c)       | 16     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. cornifoliare (Shinji, 1924)    | ?P(c)      | 14/13  | XX/X0              | Shinji 1927, 1931, 1941a, Blackman 1986 [Japan] (based on 2n male = 13 (Shinji 1931))            |
| M. corydalis (Oestlund, 1886)     | P(c)       | 10     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. creelii Davis, 1914            | P(α)       | 10     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. daphnides Börner, 1940         | P(c)       | 10     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. denticrassae Jensen & Chan, 2009 | P(c)      | 16     |                     | Blackman and Eastop 2015 [?]                                                                     |
| M. equiseti (Holman, 1961)        | P(c)       | 16     |                     | Blackman and Eastop 2015 [?]                                                                     |

*Note: P(α) indicates a parthenogenetic species, and P(c) indicates a clonal species.*
| Taxon                      | Life cycle | $2n$ | Genetic system, $2n$ | References and collecting data                                                                 |
|---------------------------|------------|------|---------------------|-------------------------------------------------------------------------------------------------|
| *M. euphorbiae* (Thomas, 1878) | P(c), P(o) | 10/9 | XX/X0               | Lawson 1936 (as *M. solanifolii* Ashmead, 1882) [USA], Dionne and Spicer 1957 (as *M. solanifolii* [Canada], Pagliai 1966 [Italy], Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Gautam and Kapoor 2002 [Shimla, Himachal Pradesh, India], Monti et al. 2011 [Italy] |
| *M. euphorbiellum* Theobald, 1917 | P(c)       | 10   |                     | Blackman 1980 (as *M. amygdaloideis* Theobald, 1925) [Great Britain]                           |
| *M. funestum* (Macchiati, 1885) | P(c)       | 10   |                     | Blackman 1980 [Great Britain]                                                                   |
| *M. gei* (Koch, 1855) | P(c)       | 10   |                     | Gut 1976 [Holland]                                                                             |
| *M. gerani* (Oestlund, 1887) | ?          | 10   |                     | Robinson and Chen 1969a [Canada]                                                                |
| *M. hamiltoni* Robinson, 1968 | ?          | 10   |                     | Robinson and Chen 1969a [Canada]                                                                |
| *M. hellebori* Theobald & Walton, 1923 | P(c), P(o) | 10   |                     | Gut 1976 [Holland]                                                                             |
| *M. impatiens* Williams, 1911 | P(c)       | 10   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. knautiae* Holman 1972 | P(c)       | 12   | XX/X0               | Voronova et al. 2010 [Byelorussia]                                                              |
| *M. manitobense* Robinson, 1965 | P(c)       | 10   |                     | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                         |
| *M. monrdilkoi* Miyazaki, 1968 | P(c)       | 10   |                     | Blackman 1986 [Japan]                                                                           |
| *M. occidentalis* (Essig, 1942) | P(c)       | 16   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. opportunisticum* Jensen, 2012 | P(c)       | 16   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. osmanoniae* Wilson, 1912 | P(c)       | 16   |                     | Blackman and Eastop 2006 [?]                                                                   |
| *M. pachypipho* Hille Ris Lambers, 1966 | ?          | 18   |                     | Kurl 1980b [Meghalaya, India], Gautam and Kapoor 2002 [Shimla, Himachal Pradesh, India]          |
| *M. pallidum* (Oestlund, 1887) | ?          | 10   |                     | Robinson and Chen 1969a [Canada], Gautam & Dharwala 2003 [Shimla, Himachal Pradesh, India]      |
| *M. parvifoli* Richards, 1967 | ?          | 16   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. penfroense* Stroyan, 1979 | ?P(o)      | 10   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. pericolen* Patch, 1919 | P(c)       | 16   |                     | Blackman 1980 (as *Sitobion*) [Great Britain; USA]                                              |
| *M. peridus* Wilson, 1915 | P(c)       | 16   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. pyriformia* MacDougall, 1926 | ?P(c)     | 11   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. rhanni* (Clarke, 1903) | P(c)       | 16   |                     | Blackman and Eastop 2015 [?]                                                                  |
| *M. roae* (Linnaeus, 1758) | P(c), P(o) | 10   |                     | Stevens 1905b, 1906, 1909 (as *Aphis*) [USA], Hewit 1906 (as *Aphis*) [Great Britain], Baehr 1909 (as *Aphis*) [Germany], Cognetti 1961a, b, Cognetti and Cognetti-Varrile 1961 Boschetti and Pagliai 1964, Pagliai 1966 [Italy], Khuda-Bukhsh 1980 [Garrhwal, Uttarakhnd, India], Raychadhuuri and Das 1987 [India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Gautam and Dharwala 2003, Samakaria et al. 2010 [Shimla, Himachal Pradesh, India], Reeta Devi and Gautam 2012 [Kullu region, Himachal Pradesh, India] |
| *M. stanleyi* Wilson, 1915 | P(c)       | 16   |                     | Blackman and Eastop 1994 [?]                                                                  |
| *M. stellaria* Theobald, 1913 | ?          | 10   |                     | Blackman 1980 [Great Britain]                                                                  |
| *M. tenuicauda* Bartholomew, 1932 | ?          | 10   |                     | Blackman and Eastop 2006 [?]                                                                  |
| Taxon | Life cycle | 2n ♀/♂ | Genetic system, ♀/♂ | References and collecting data |
|-------|------------|---------|----------------------|------------------------------|
| *M. tinctum* (Walker, 1849) | P(o) | 10 | | Blackman and Eastop 2015 [?] |
| *M. walkeri* Robinson, 1980 | P(o), P(c) | 16 | | Blackman and Eastop 2015 [?] |
| *M. willmottensis* Jensen, 2000 | P(c) | 10 | | Blackman and Eastop 2006 [?] |
| *M.woodsiae* Robinson, 1980 | P(c) | 16 | | Blackman and Eastop 2006 [?] |
| *M. (Neocorylobium) pseudocoryli* Patch, 1919 | P(c) | 10 | | Blackman and Eastop 1994 [?] |
| *M. (Unistobion) perlilae* (G. Zhang, 1988) | P(c) | 18 | | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Macrosiphum* sp. | ? | 10 | | Robinson and Chen 1969a [Canada] |
| *Matsumuraea capitophoroides* Hille Ris Lambers, 1966 | ? | 14 | | Kurl and Chauhan 1986 [Manali, Himachal Pradesh, India] |
| *M. nuditerga* Hille Ris Lambers, 1965 | ? | 14 | | Blackman and Eastop 2015 [?] |
| *M. rubi* (Sorin, 1965) | ? | 14 | | Blackman 1986 [Japan] |
| *M. rubifoliace* Takahashi, 1931 | P(c), P(o) | 14 | | Blackman 1986 [Japan] |
| *M. rubiphila* Takahashi, 1965 | ? | 14 | | Blackman and Eastop 2015 [?] |
| *Matsumuraea* sp. | ? | 18 | | Blackman and Eastop 2006 [?] |
| *Megoura cerasiaceae* Mordvilko, 1919 | ? | 10 | | Blackman and Eastop 2015 [?] |
| *M. donarsi* (A.K. Ghosh & D.N. Raychaudhuri, 1969) | ? | 20 | | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *M. lespedezae* (Essig & Kuwana, 1918) | 12/11 XX/X0 | | | Shinji 1927, 1931 (as *Amphorophora*), Blackman 1986 [Japan] (based on 2n ♀ =6 (Shinji 1931)) |
| *M. viciae* Buckton, 1876 | P(c) | 10/9 XX/X0 | | Pagliai 1966, Orlando 1973, 1983 [Italy], Blackman 1986 [Japan] |
| *Melanaphis arundinariae* (Takahashi, 1937) | ? | 8 | | Khuda-Bukhsh and Pal 1984a [Triyuginarayan, Uttarakhand, India], Kar and Khuda-Bukhsh 1989 [Shillong, Meghalaya, India] |
| *M. bambusae* (Fullaway, 1910) | P(c), P(o) | 8 | | Blackman and Eastop 1984 [?], Blackman 1986 [Japan] |
| *M. bambusae* (Fullaway, 1910) | P(c), P(o) | 10 | | Kuznetsova and Shaposhnikov 1973 [Sukhumi, Georgia], Kuznetsova 1974 [?] |
| *M. donacis* (Passerini, 1861) | P(c) | 8 | | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1984a [Ghangaria, Uttarakhand, India], Kuznetsova and Shaposhnikov 1973 (as *Longiunguis*), Kuznetsova 1974 [?] |
| *M. japonica* (Takahashi, 1919) | P(c) | c.22 | | Blackman and Eastop 2006 [?] |
| *M. meghalayensis meghalayensis* D.N. Raychaudhuri & C. Banerjee, 1974 | ? | 10 | | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1984a [Gobindoghat, Uttarakhand, India], Kuznetsova and Shaposhnikov 1973 (as *Longiunguis*), Kuznetsova 1974 [?] |
| *M. pyraria* (Passerini, 1861) | P(c) | 8 | | Kuznetsova and Shaposhnikov 1973 (as *Longiunguis*), Kuznetsova and Shaposhnikov 1973 (as *Longiunguis*), Kuznetsova 1974 [?] |
| *M. sacchari* (Zehntner, 1897) | P(o), P(c) | 8 | | Blackman 1980 [India], Blackman 1986 [Hong Kong] |
| *M. sacchari* (Zehntner, 1897) | P(o), P(c) | 10 | | Khuda-Bukhsh and Kar 1990 [Kalyani, West Bengal, India] |
| Taxon | Life cycle | $2n$ | Genetic system, $2n$ | References and collecting data |
|-------|------------|------|---------------------|--------------------------------|
| *M. sorghi* (Theobald, 1904) | P(o), P(c) | 8 | ♀/♂ | Blackman and Eastop 2015 [?] |
| *Melanaphis* sp. | ? | 22 | ♀/♂ | Blackman 1986 [Japan] (Blackman and Eastop 2015: "a record of $2n=22$ for *M. sacchari* in Japan (Blackman 1986) is referable to another, undescribed species") |
| *Metopeurum fuscoviride* Stroyan, 1950 | P(c) | 8 | | Blackman 1980 [Great Britain] |
| *Metopolophium albicum* Hille Ris Lambers, 1947 | P(c) | 16 | | Blackman and Eastop 2006 [?] |
| *M. dirhodum* (Walker, 1849) | P(c), P(o) | 16, 18 | | Sun and Robinson 1966 (as *Acrystosiphon*), Robinson and Chen 1969a [Canada], De Barro 1992 [Australia] |
| *M. fasciatum* Stroyan, 1982 | P(o), P(c) | 18 | | Blackman and Eastop 2015 [?] |
| *M. festucae festucae* (Theobald, 1917) | P(G), P(o) | 16 | | Blackman and Eastop 1984 [?] |
| *M. f. cereali* Stroyan, 1982 | P(G), P(o) | 16 | | Blackman and Eastop 1984 [?] |
| *M. frisciic* Hille Ris Lambers, 1947 | P(c) | 16 | | Blackman 1980 [Great Britain] |
| *Metopolophium sp.* | ? | 16 | | Blackman and Eastop 2015 [?] |
| *Microlophium carnosum* (Buckton, 1876) | P(c) | 16 | | Kar et al. 1990 [India] (possible *Acrystosiphon*) |
| | | 18 | | Kuznetsova and Shaposhnikov 1973 (as *M. evansi* (Theobald, 1923)) [Crimea, Ukraine] |
| | | 20 | | Robinson and Chen 1969a [Canada] |
| *M. rubiformosanum* (Takahashi, 1927) | ? | 12 | | Pal and Khuda-Bulhsk 1982, Khuda-Bulhsk and Pal 1986b (as *Acrystosiphon*) [Srinagar, Jammu and Kashmir, India] |
| *Microlophium sibiricum tenuicauda* Hille Ris Lambers, 1949 | ? | 18 | | Blackman 1980 [North America] |
| *Microlophium sp.* | ? | 16 | | Blackman and Eastop 2006 [?] ("This is possibly the species with $2n=16$ from Crimea listed as *M. evansi* Theobald by Kuznetsova and Shaposhnikov (1973)), Blackman 2010 [Great Britain] |
| *Micromyzella filicis* (van der Goot, 1917) | ? | 36 | | Blackman and Eastop 2015 [New Zealand] |
| *Micromyzaeum filicium* David, 1958 | ? | 12 | | Kar et al. 1990 [India] |
| *M. spinulosum* Miyazaki, 1971 | ? | 10 | | Blackman 1986 [Japan] |
| *Micromyzus nikkorae* Miyazaki, 1968 | ? | 12 | | Blackman 1986 [Japan] |
| *Microsiphum woronieckae* Judenko, 1931 | P(c) | 12 | | Blackman and Eastop 2006 [?] |
| *Musaphis escherichiae inae* (Shaposhnikov, 1963) | P(c) | 12 | | Kuznetsova 1968 (as *Toxopterella drepanosiphoides inae* Shaposhnikov, 1963) [St. Petersburg, Russia] |
| *Myzaphis verbasci* (Chowdhuri, R.C. Basu, Chakrabarti & D.N. Raychaudhuri, 1969) | ? | 12 | | Kurl and Chauhan 1988a,1987a [Manali, Himachal Pradesh, India] |
| *Myzaphis bucktoni* (Jacob, 1946) | P(c) | 13 | | Blackman and Eastop 2006 [one sample from Portugal] |
| *M. rostrum* (Kaltenbach, 1843) | P(c), P(o) | 4 | | MacDonald and Harper 1965, Harper and MacDonald 1968 [Canada], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Reeta Devi and Gautam 2012 [Kullu region, Himachal Pradesh, India] |
| Taxon                              | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|-----------------------------------|------------|-------|-------------------|------------------------------------------------------------------------------------------------|
| *Myzus cerasi* (Fabricius, 1775)  | P(c)       | 10    |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kurl and Chauhan 1966d, 1987a [Solan, Himachal Pradesh, India], Bizzaro et al. 1999 [Italy], Blackman and Eastop 2015 [European and North American populations] |
| *M. c. umefoliae* (Shinji, 1924)  | P(c)       | 12    |                   | Khuda-Bukhsh and Pal 1986a (as *Myzus cerasi*, but Blackman and Eastop 2015 - "possibly *M. umefoliae*"") [Garhwal, Uttarakhand, India] |
| *M. dycei* Carver, 1961           | ?          | 12    |                   | Kurl and Chauhan 1986d,1987a [Solan, Himachal Pradesh, India], Kar et al. 1990 [India] |
| *M. fataanae* Shinji, 1924        | P(c)       | 8     |                   | Blackman 1986 [Japan] |
| *M. formosanus* Takahashi, 1923   | ?          | 12    |                   | Pal and Khuda-Bukhsh 1980 [Sonprayag, Uttarakhand, India], Khuda-Bukhsh and Pal 1986a [Garhwal, Uttarakhand, India] |
| *M. hemerocallis* Takahashi, 1921 | ?          | 8     |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015)  |
| *M. lybri* (Schrank, 1801)        | P(c)       | 12    |                   | Kuznetsova and Shaposhnikov 1973 (as *M. (Nevska) lybri* Sch.) [Crimea, Ukraine] |
| *M. mumecola* (Matsumura, 1917)   | ?          | 12    |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Khuda-Bukhsh and Pal 1986a [Garhwal, Uttarakhand, India] |
| *M. obtusirostris* S.K. David, Narayanan & Rajasingh, 1971 | ?P(c) | 12 |                   | Kurl and Chauhan 1987a [Barog, Himachal Pradesh, India] |
| *M. ornata* Laing, 1932           | P(o), P(c) | 12    |                   | Blackman 1980 [Great Britain], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Kapoor and Gautam 1994 [Himachal Pradesh, India] |
| *M. sorbi* Bhattacharya & Chakrabarti ex Maity, Bhattacharya & Chakrabarti, 1982 | P(c) | 12 |                   | Khuda-Bukhsh and Pal 1983a [Garhwal, Uttarakhand, India] |
| *M. varians* Davidson, 1912       | P(c)       | 12    |                   | Blackman 1980 [Great Britain], Blackman and Eastop 2015 [Italy] |
| *M. (Nectarocephon) ajugae* Schouteden, 1903 | P(c) | 12 |                   | Gut 1976 [Holland] |
| *M. (N.) antirhini* (Macchiati, 1883) | P(o), P(c) | 11, 12, 13 |                   | Hales et al. 2000 [Australia] |
| *M. (N.) asteriae* Shinji, 1941   | ?          | 12    |                   | Blackman 1986 [Japan] |
| *M. (N.) ceratans* (Walker, 1843) | P(c), P(o) | 12    |                   | Gut 1976 [Holland], Blackman 1987b [?], Spence et al. 1998 [Great Britain, USA] |
| *M. (N.) dianthicola* Hille Ris Lambers, 1966 | P(o) | 14 (heterozygous) |                   | Blackman 1980 [Great Britain; New Zealand], Blackman 1987b [?] |
| *M. (N.) icelandicus* Blackman, 1986 | P(c) | 10 |                   | Blackman and Eastop 2015 [?] |
| *M. (N.) ligustri* Mosley, 1841    | P(c)       | 12    |                   | Blackman 1980 [Great Britain] |
| *M. (N.) myosotides* Börner, 1950 | P(c)       | 12    |                   | Gut 1976 [Holland] |
| Taxon | Life cycle | 2n | Genetic system, ♀/♂ | References and collecting data |
|-------|------------|-----|---------------------|--------------------------------|
| M. (N.) persicae persicae (Sulzer, 1776) | 8 | ♂♀/♀♂ | P(c), P(o) | Chattopadhyay and Raychaudhuri 1980 [Kolkata, West Bengal, India] |
| | 8, 12, 13 | ♂♀/♀♂ | | Raychaudhuri and Das 1987 [India] |
| | 10, 11,12 | ♂♀/♀♂ | | Misra and Kurl 1983 [Jodhpur, Rajasthan, India] |
| | 10, 11,12, 13 | ♂♀/♀♂ | | Khuda-Buksh 1980 (as Macrosiphum) [Garhwal, Uttarakhand, India], Kurl 1986 [Meghalaya, India] |
| | 11, 12 | ♂♀/♀♂ | | Hales 1993 [Australia], Spence and Blackman 2000 [clon] |
| | 11, 12, 13 | ♂♀/♀♂ | | Spence et al. 1998 [France; Great Britain; lab. cultures] |
| | 11, 12, 18 (triploid) | ♂♀/♀♂ | | Yang and Zhang 2000, Yang et al. 2000 [China] |
| | 12/11 | XX/X0 | | Hales and Mittler 1983, 1987 [Australia], Searle and Mittler 1991 [Washington, USA] |
| | 12 | P(c), P(o) | | Shinji 1941b [Japan], Colling 1955 [Great Britain], Dionne and Spicer 1957 (as M. solanifolii), Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kuznetsova 1969 (as Myzodes) [Alma-Ata, Kazakhstan], Kuznetsova and Shaposhnikov 1973 (as Myzodes) [St. Petersburg, Russia], Kulkarni and Kacker 1980,1981b [India], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan] (based on 2n (♀♂) =6 (Shinji 1941b)), Khuda-Buksh and Pal 1986a [Garhwal, Uttarakhland, India], Blackman 1987b [♀♂], Kar et al. 1990 [India], Gautam and Sharma 1990 [Himachal Pradesh, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Blackman and Spence 1996 [Great Britain], Spence and Blackman 1998 [Great Britain], Terradot et al. 1999 [Great Britain; France; Spain; Cuba], Wilson et al. 2002 [Australia], Gautam and Dhanwalia 2003 [Solan, Himachal Pradesh, India], Samkaria et al. 2010 [Palampur, Himachal Pradesh, India], Jangra et al. 2014 [Jammu and Kashmir, India] |
| M. (N.) persicae nicotianae Blackman, 1987 | 12/11, 11 | XX/X0 | | Blackman 1987b [North America], Harlow et al. 1991 [North Carolina, USA], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Terradot et al. 1999 [France] |
| | 12 | P(c), P(o) | | Blackman 1987b [North America], Harlow et al. 1991 [North Carolina, USA], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India], Terradot et al. 1999 [France] |
| | 12 | P(c), P(o) | | Takada et al. 1978 [Japan] |
| | 12 | P(c), P(o) | | Cognetti 1961a, b (as Myzodes), Cognetti and Cognetti-Harral 1961 [Italy] |
| | 12, 13, 14, 15, 16, 17 | P(c), P(o) | | Monti et al. 2012b [clone from Hertfordshire, Great Britain] |
| | 12/11, 11, 12, 13, 14, 18 (triploid) | XX/X0 | | Blackman 1980 [Europe; Japan; USA; Chile; New Zealand] |
| Taxon                                                                 | Life cycle       | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|----------------------------------------------------------------------|------------------|-------|-------------------|------------------------------------------------------------------------------------------------|
| *M. (Sciarmyzus) ascalonicus* Doncaster, 1946                        | P(o)             | 12    |                   | Gut 1976 [Holland], Blackman 1987b [?], Kapoor and Gautam 1994 [Shimla, Himachal Pradesh, India], Blackman and Spence 1996 [Great Britain], Gautam and Dhatwalia 2003 [Solan, Himachal Pradesh, India] |
| *M. (S.) cymbalariae* Stroyan, 1954                                  | P(o), ?P(c)      | 12    |                   | Blackman 1980 [Great Britain], Blackman 1987b [?]                                                                                                      |
| *Myzus* sp. 1                                                       | ?                | 10    |                   |                                                                                                                                                    |
| *Myzus* sp. 2                                                       | ?                | 12    |                   |                                                                                                                                                    |
| *Myzus* sp. 3                                                       | ?                | 12    |                   |                                                                                                                                                    |
| *Nasonovia compositellae nigra* (Hille Ris Lambers, 1931)           | P(o), P(c)       | 11 (heterozygous) | Blackman 1980 (as *N. nigra* (Hille Ris Lambers, 1931)) [Great Britain], Blackman and Eastop 2006 [Great Britain] (one sample)             |
| *N. jammuensis* Verma, 1966                                         | ?                | 12    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                                              |
| *N. ribinigrri* (Mosley, 1841)                                       | P(c)             | 12    |                   | Blackman 1980 [Great Britain]                                                                                                                       |
| *N. rostrata* David & Hameed, 1974                                  | P(c)             | 12    |                   | Shinji 1941a (as *Amorphaphora vibicola*) [Japan]                                                                                                   |
| *N. (Kakimia) alpina* (Gillette & Palmer, 1928)                     | ?                | 10    |                   | Blackman and Eastop 2015 [?]                                                                         |
| *N. (K.) aquilegiae* (Essig, 1917)                                  | P(c)             | 10    |                   | Sun and Robinson 1966, Robinson and Chen 1969a (as *Kakimia essigi* (Gillette & Palmer, 1928)) [Canada]                                               |
| *N. (K.) cynosbati* (Oestlund, 1887)                                | P(c)             | 10    |                   | Sun and Robinson 1966, Robinson and Chen 1969a (as *Kakimia and as Kakimia thomasi* (Hottes & Frison 1931)) [Canada]                               |
| *N. (K.) dasyphylli* Stroyan, 1957                                  | P(c), P(o)       | 12 (heterozygous) | Blackman and Eastop 2006 [Great Britain] (one sample)                                                |
| *N. californica* Hille Ris Lambers, 1970                            | ?P(c)            | 12    |                   | Blackman and Eastop 1994 [?]                                                                         |
| *Neoceruraphis viburnicola* (Gillette, 1909)                        | P(c)             | 14    |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                                                                             |
| *Neomyzus circumflexus* (Buckton, 1876)                             | P(o)             | 8     |                   | Blackman 1980 [Great Britain], Dutta and Gautham 1993 [Shimla, Himachal Pradesh, India], Gautam and Dhatwalia 2003 [Hamirpur, Himachal Pradesh, India] |
| *N. parthenocissi* (Takahashi, 1965)                                | ?                | 12    |                   | Blackman 1986 (as *Aulacorthum (Neomyzus)*) [Japan]                                                |
| *N. parthenocissi* (Takahashi, 1965)                                | ?                | 12    |                   | Blackman 1986 (as *Aulacorthum (Neomyzus)*) [Japan]                                                |
| *Neotoxoptera formosaana* (Takahashi, 1921)                         | P(o)             | 12    |                   | Blackman and Eastop 1984 [?]                                                                         |
| *N. violae* (Pergande, 1900)                                        | ?                | 12    |                   | Blackman and Eastop 1984 (as *Neotoxoptera oliveri* (Essig, 1935)) [?]                             |
| *Obliviscuda coueni* (Hunter, 1901)                                | P(c)             | 12    |                   | Blackman and Eastop 2006 [?]                                                                         |
| *Oedissiphum soureni* A.N. Basu, 1964                               | ?                | 8     |                   | Kurl and Chauhan 1986c [Barog, Himachal Pradesh, India]                                             |
| *Oatomyzus boraginacearum* Eastop, 1952                             | P(o)             | 12    |                   | Gut 1976 [Holland]                                                                                  |
| *O. stachyi* Hille Ris Lambers, 1947                                | ?P(o)            | 12    |                   | Blackman and Eastop 2006 [?]                                                                         |
| Taxon                                 | Life cycle | $2n$ $♀/♂$ | Genetic system, $♀/♂$ | References and collecting data                                                                                                                                                                                                 |
|--------------------------------------|------------|------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *Ovatus crataegarius* (Walker, 1950) | P(c), P(o) | 12         |                      | Shinji 1941a (as *Phorodon menthae*) [Japan], Blackman and Eastop 1984 [?], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan] (based on $2n (♀) = 6$ (Shinji 1941a)), Gautam and Dhatwala 2003 [Shimla, Himachal Pradesh, India] |
| *O. insitus* (Walker, 1849)          | P(c)       | 12/11 XX/X0|                      | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                                                                                                                                                          |
| *O. malisuctus* (Matsumura, 1918)   | P(c)       | 12         |                      | Chen and Zhang 1985a (as *Myzus* [Beijing area, China] (cited after Blackman and Eastop 2015))                                                                                                                                 |
| *Paczkokia obecta* Börner, 1950      | ?          | 12         |                      | Blackman 1980 [Sweden]                                                                                                                                                                                                               |
| *Panadosaphis aristoteliae* Sunde, 1988 | P(c)   | 8          |                      | Blackman and Eastop 2015 [?]                                                                                                                                                                                                          |
| *Panaxyzas longirostris* Miyazaki, 1971 | ?      | 14         |                      | Blackman 1986 [Japan]                                                                                                                                                                                                                 |
| *Pentalonia kalimpengensis* (A.N. Basu, 1967) | P(c) | 12         |                      | Khuda-Bukhsh and Kar 1990 [Kalimpong, West Bengal, India]                                                                                                                                                                           |
| *P. nigronervosa* Coqueret, 1859     | P(o), P(c) | 14         |                      | Blackman and Eastop 1984 [?], Panigrahy and Patnaik 1987 [Chatrapur, Odisha, India], Khuda-Bukhsh and Kar 1990 [Kalyani, West Bengal, India]                                                                                           |
| *Phorodon cannabis* Passerini, 1860  | P(c)       | 12         |                      | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Patnaik 1986 [Triyuginarayan, Uttarakhand, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India]                                                                                   |
| *P. humuli humuli* (Schrank, 1801)   | P(c)       | 12         |                      | Kuznetsova and Shaposhnikov 1973 [as *Ph. pruni* Geoffr.] [Crimea, Ukraine], Blackman 1980 [Great Britain]                                                                                                                          |
| *P. h. japonensis* Takahashi, 1965   | P(c)       | 12         |                      | Shinji 1941a [Japan], Blackman and Eastop 1984 [?], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan] (their own data and based on $n(♂) = 6$ (Shinji 1941a)) |
| *P. humulifoliae* Tseng & Tao, 1938  | ?P(c)      | 12         |                      | Chen and Zhang 1985b (cited after Blackman and Eastop 2015)                                                                                                                                                                           |
| *Pentrichophora dauponti* Hille Ris Lambers, 1935 | P(c) | 14         |                      | Blackman 1980 [Great Britain]                                                                                                                                                                                                       |
| *P. glandulosus* (Kaltenbach, 1846)  | P(c)       | 14         |                      | Blackman 1980 [Great Britain]                                                                                                                                                                                                       |
| *Plocamaphis flocculosa* (Weed, 1891) | P(c)   | 30–34?     |                      | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                                                                                                                                                           |
| *Protaphis knoultoni* (Hottes & Frison, 1931) | P(c) | 8          |                      | Sun and Robinson 1966, Robinson and Chen 1969a (as *Aphis*) [Canada]                                                                                                                                                                |
| *P. middletonii* (Thomas, 1879)      | P(c), P(o) | 8          |                      | Blackman 1980 (as *Aphis armoricata* Cowen, 1895) [USA]                                                                                                                                                                          |
|                                       |            | 8, 9       |                      | Blackman 1980 (as *Aphis (Protaphis) maidiradicis* Forbes, 1891) [USA]                                                                                                                                                        |
| *P. pseudocardui* (Theobald, 1915)   | ?          | 8          |                      | Blackman and Eastop 2015 [?]                                                                                                                                                                                                       |
| *P. terricola* (Rondani, 1847)       | P(c)       | 8          |                      | Blackman 1980 (as *Aphis (Protaphis)* [Spain]                                                                                                                                                                                        |
| *Protaphis sp.*                       | ?          | 8, 9       |                      | Blackman 1980 (as *Aphis (Protaphis)* [Iran] (from *Artemisia dracunculus*)                                                                                                                                                        |
| *Pseudocercidis rosae* Richards, 1961 | P(c) | 12         |                      | Robinson and Chen 1969a [Canada]                                                                                                                                                                                                   |
| *Pseudomegoura magnoliae* (Essig & Kuwana, 1918) | P(o), P(c) | 12         |                      | Blackman 1986 [Japan] (their own data ex. cult. on potato and based on $n(♂) = 6$ (Shinji 1927))                                                                                                                                     |
| *Pterocomma bicolor* (Oestlund, 1887) | P(c) | 8          |                      | Robinson and Chen 1969a [Canada]                                                                                                                                                                                                   |
| *P. jacksoni* Theobald, 1921         | ?          | 30–34?     |                      | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                                                                                                                                                           |
| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|-------------------------------------------|------------|-------|-------------------|-----------------------------------------------------------------------------------------------|
| P. konoi Hori, 1939                        | P(c)       | 8     |                   | Blackman 1986 [Japan]                                                                          |
| P. pilosum Buckton, 1879                   | P(c)       | 8     |                   | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                      |
| P. populeum (Kaltenbach, 1843)             | P(c)       | 8     |                   | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                      |
| P. rufipes (Hartig, 1841)                  | P(c)       | 8, 9  |                   | Kuznetsova 1974 (as steinheili Mordv.) [?]                                                    |
| P. salicis (Linnaeus, 1758)                | P(c)       | 6     |                   | Tannreuther 1907 [USA]                                                                          |
| P. salijaponica (Shinji, 1924)             | P(c)       | 8/7   | XX/X0             | Shinji 1931 (as Melanoxantherium) [Japan], Blackman 1986 (as Plocamaphis) [Japan] (based on n(♂) = 4 (Shinji 1931)) |
|                                           |            | 22    |                   | Shinji 1927, 1941a (as Melanoxantherium), Blackman 1986 (as Plocamaphis) [Japan] (based on n(♂) = 11 (Shinji 1927, 1941)) |
| P. sanguiceps Richards, 1967               | P(c)       | 8     |                   | Blackman and Eastop 1994 [?]                                                                 |
| P. smithiae (Monell, 1879)                 | P(c)       | 8     |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                       |
| P. tremulae Börner, 1940                   | P(c)       | 8     |                   | Kuznetsova and Shaposhnikov 1973 [St. Petersburg, Russia]                                      |
| P. yezeense (Hori, 1929)                   | P(c)       | 8     |                   | Blackman and Eastop 1994 [?]                                                                 |
| Rhodobium pororum (Sanderson, 1900)        | P(o), P(o) | 14    |                   | Kar et al. 1990 [India]                                                                        |
| Rhopalomyza (Judenkoa) lonicerae (Siebold, 1839) | P(c)       | 12    |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada]                                       |
| Rhopalosiphonimus hydrangeae (Matsumura, 1918) | P(c)       | 12    |                   | Shinji 1941a [Japan]                                                                           |
| Rh. latypiphon (Davidson, 1912)            | P(o), P(c) | 6 (+1) |                   | Gut 1976 [Holland]                                                                             |
| Rh. tiliae (Matsumura, 1918)               | P(c)       | 12    |                   | Shinji 1941a (as Rh. adenocauli), 1941b (as Rh. nobukii), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1941b)) |
| Rh. (Neorhopalosiphonimus) staphyleae (Koch, 1854) | P(c), P(o) | 10    |                   | Blackman and Eastop 2015 [?]                                                                  |
| Rhopalosiphum cerasicola (Fitch, 1855)     | P(c)       | 8     |                   | Robinson and Chen 1969a [Canada]                                                                 |
| Rh. enignae Hotte & Frison, 1931           | P(c)       | 10    |                   | Blackman and Eastop 2006 [?]                                                                  |
| Rh. maidis (Fitch, 1856)                   | P(o), P(c) | 8     |                   | Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Mayo and Starks 1972 [USA], Kurl 1978 [Jodhpur, Rajasthan, India], Kar and Khuda-Buksh 1989 [Kalimpong, West Bengal, India], Dutta and Gauram 1993, Gautam and Dhatwalia 2003 [Shimla, Himachal Pradesh, India], Samkaria et al. 2010 [Palampur, Himachal Pradesh, India] |
|                                           |            | 8, 9  |                   | Blackman 1980, Hales and Cowen 1990 [Australia], Kuznetsova and Gandrabur 1991 [Fergana, Uzbekistan], De Barro 1992 [Australia] |
|                                           |            | 8,10  |                   | Chattopadhyay et al. 1982 [India], Panigrahy and Patnaik 1991 [Chatrapur, Odisha, India]       |
| Taxon                        | Life cycle | $2n$ | Genetic system, $♀/♂$ | References and collecting data                                                                                                                                 |
|------------------------------|------------|------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rh. nymphaeae (Linnaeus, 1761) | P(c)       | 8    |                        | Blackman et al. 1990, Blackman and Brown 1991 [USA], Jauet et al. 2000 [Catalonia, Spain]                                                                     |
| Rh. oxyacanthae (Schrank, 1801) | P(c)       | 10   |                        | Blackman, Brown and Eastop 1987 [Europe; North America; Iran; Israel; Australia (Tasmania)], Brown and Blackman 1988 [all continents except Antarctica] (“there is an association between karyotype and host plant, the barley-colonizing form in the northern hemisphere having $2n = 10$, whereas populations on maize and sorghum have $2n = 8$”) |
| Rh. padii (Linnaeus, 1758)    | P(c), P(o) | 8/7  | XX/X0                  | Sun and Robinson 1966, Robinson and Chen 1969a, b (as Rh. fitchii (Sanderson, 1902)) [Canada], Kuznetsova and Shaposhnikov 1973 (as Rh. insertum Walk.) [St. Petersburg, Russia], Kuznetsova et al. 1988 (as Rh. insertum Walk.) [St. Petersburg, Russia], Hales and Cowen 1990 (as Rh. insertum Walk.) [Australia] |
| Rh. padiformis Richards, 1962  | ?P(c)      | 10   |                        | Sun and Robinson 1966, Robinson and Chen 1969a, b [Canada], Mayo and Starks 1972 [USA], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Kurl and Misra 1979 [Rajasthan, India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia], De Barro 1992 [Australia], Valenzuela et al. 2009 [Victoria, Australia], Monti et al. 2010 [Italy] |
| Rh. rufulum Richards, 1960    | P(c), P(o) | 8    |                        | Sun and Robinson 1966, Robinson and Chen 1969a, b [Canada], Mayo and Starks 1972 [USA], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Kurl and Misra 1979 [Rajasthan, India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia], De Barro 1992 [Australia], Valenzuela et al. 2009 [Victoria, Australia], Monti et al. 2010 [Italy] |
| Rhopalosiphum sp.            | ?          | 8    |                        | Sun and Robinson 1966, Robinson and Chen 1969a, b [Canada], Mayo and Starks 1972 [USA], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Kurl and Misra 1979 [Rajasthan, India], Kar and Khuda-Bukhsh 1989 [Kalimpong, West Bengal, India], Kuznetsova and Gandrabur 1991 [St. Petersburg, Russia], De Barro 1992 [Australia], Valenzuela et al. 2009 [Victoria, Australia], Monti et al. 2010 [Italy] |
| Rhopalosiphum sp. ["undescribed species"] | ?          | 9    |                        | Hales and Cowen 1990 (similar to R. padii) [Australia], Valenzuela et al. 2009 [Victoria, Australia] |
| Rhopalosiphum sp. ["near insertum"] | ?          | 10   |                        | Valenzuela et al. 2009 [Victoria, Australia] |
| Roepkea marchali (Börner, 1931) | P(c)      | 12   |                        | Kuznetsova 1968 [Georgia] |
| Sappaphis piri Matsumura, 1918 | P(c)      | 12   |                        | Kuznetsova 1968 [Vladivostok, Russia] |
| S. sinipiricola G. Zhang, 1980 | ?          | 12   |                        | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------|------------|--------|-------------------|--------------------------------|
| *Schizaphis graminum* (Rondani, 1847(1852)) | P(c), P(o) | 6, 8 | Rubín de Celis et al. 1997 [Brazil] |
| | | 7, 8, 12 | Mayo and Starks 1972 [USA] |
| | | 8 | Sun and Robinson 1966, Robinson and Chen 1969a [Canada], Kuznetsova and Gandrabur 1991 [Ukraine] |
| | | 8 XX/X0 | Mandrioli et al. 1999 [Modena, Italia] |
| *S. mali* Shaposhnikov, 1979 | P(c) | 8 | Blackman and Eastop 2006 [?] |
| *S. piricola* (Matsumura, 1917) | P(c) | 8 | Chen and Zhang 1985a [Beijing area, China] |
| | | | (cited after Blackman and Eastop 2015) |
| *S. rotundiventris* (Signoret, 1860) | P(c), P(o) | 8 | Blackman and Eastop 2006 [?] |
| *S. (Paraschizaphis) acori* (Shinji) | P(c) | 8 | Blackman and Eastop 2006 [?] |
| *S. (P) rostzedoi* (Ilharco, 1961) | P(o) | 8 | Blackman and Eastop 2006 [?] |
| *S. (P) scripi* (Passerini, 1874) | P(c) | 8 | Gut 1976 (as *Paraschizaphis*) [Holland] |
| *Semiaphis heraclei* (Takahashi, 1921) | P(c) | 8 | Blackman and Eastop 1984 [?], Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015), Blackman 1986 [Japan], Gautam and Kapoor 2002 [Una, Himachal Pradesh, India] |
| | | 10 | Pal and Khuda-Bulksh 1983 [Garhwal, Uttarakhand, India] |
| *Shinjia orientalis* (Mordvilko, 1929) | P(c), P(o) | 12 | Shinji 1941b (as *Microtarsus pterydifoliae*), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1941b)), Blackman and Eastop 2006 [?] |
| *Sinomegoura citricola* (van der Goot, 1917) | P(o) | 12 | Kulkarni 1984 [Darjeeling, West Bengal, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| | | 16 | Chen and Zhang 1985b (cited after Blackman and Eastop 2015) |
| | | 18 | Kar and Khuda-Bulksh 1986, Khuda-Bulksh and Kar 1990 [Kalimpong, West Bengal, India] |
| *S. photiniae* (Takahashi, 1936) | ? | 18 | Khuda-Bulksh and Kar 1990 [Kalyani, West Bengal, India] |
| *S. pyri* A.K. Ghosh & D.N. Raychaudhuri, 1968 | ? | 8 | Kar et al. 1990 [India] |
| *S. rhododendri* (Takahashi, 1937) | ? | 18 | Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
| *Sitobion aloepecrii* (Takahashi, 1921) | P(c) | 18 | Blackman and Eastop 2015 [British Columbia] |
| *S. aulacorthoides* (David, Narayanman & Rajasighn, (1970) 1971) | ? | 18 | Blackman and Eastop 2015 [?] |
| *S. avenae* (Fabricius, 1775) | P(c), P(o) | 18 | Sun and Robinson 1966, Robinson and Chen 1969a (as *Macrosiphum*) [Canada], Kuznetsova and Shaposhnikov 1973 [Crimea, Ukraine], Kuznetsova and Gandrabur 1991 [St.Petersburg, Russia], Rubín de Celis et al. 1997 [Brazil] |
| *S. frugariae* (Walker, 1848) | P(c) | 18 | Kuznetsova and Shaposhnikov 1973 [Crimea, Ukraine], Gautam and Kapoor 2002 [Una, Himachal Pradesh, India] |
| *S. graminis* Takahashi, 1950 | ?P(o) | 18 | Kurl and Chauhan 1986a (as *Macrosiphum*) [Jwalaji, Himachal Pradesh, India] |
| *S. gravisil* (van der Goot, 1917) | ?P(c) | 12 | Khuda-Bulksh and Basu 1987 (as *M. spinosum* on *Artemisia vulgaris*) (cited after Blackman and Eastop 2015) |
| *S. iborae* (Matsumura, 1917) | ?P(o) | 14/13 | Shinji 1941a (as *Macrosiphum*) [Japan] |
| *S. indicum* A.N. Basu, 1964 | P(o) | 17, 18 | Kurl 1986 (as *Macrosiphum*) [Meghalaya, India] |
| | | 18 | Kurl 1980b (as *Macrosiphum*) [Meghalaya, India] |
| Taxon | Life cycle | 2n ♀ | Genetic system, ♀ | References and collecting data |
|-------|------------|------|------------------|-------------------------------|
| *S. luteum* (Buckton, 1876) | P(o) | 12 | | Gut 1976 [Holland] |
| | | | | Kurl and Chauhan 1986a (as *Macrosiphum*) [Solan, Himachal Pradesh, India] |
| | | | | Kurl and Chauhan 1987a (as *Macrosiphum*) [Solan, Himachal Pradesh, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *S. miscanthi* (Takahashi, 1921) | P(o), ?P(c) | 14, 18 | | Turak and Hales 1990 [Australia] |
| | | | | Hales et al. 1990, Sunnucks and Hales 1996, Hales et al. 2010 [Australia] |
| | | | | Sunnucks et al. 1996, Hales et al. 1998 [Australia] |
| | | | 17, 18, 20, 21 | Wilson et al. 1999 [New Zealand] |
| *S. nigrinectarium* (Theobald, 1915) | ? | 18 | | Blackman 1980 [Kenya] |
| *S. ochneearum* (Eastop, 1959) | ? | 18 | | Blackman and Eastop 2006 [?] |
| *S. pseudoluteum* A.K. Ghosh, 1969 | ? | 18 | | Kar et al. 1990 [India] |
| | | | | Gautam and Dutta 1994 [Shimla, Himachal Pradesh, India] |
| | | | | Kurl 1986 (as *Macrosiphum (Sitobion)* [Meghalaya, India] |
| | | | | Khuda-Buksh 1980 (as *Macrosiphum*) [Garhwal, Uttarakhand, India], Kulkarni and Kacker 1981a [Kursiong, West Bengal, India], Kurl and Misra 1983 (as *Macrosiphum (S.) roaeformis*) [Jodhpur, Rajasthan, India], Raychaudhuri and Das 1987 [India], Kar and Khuda-Buksh 1989 [Shillong, Meghalaya, India], Kar et al. 1990 [India] |
| *S. rosaeformis* (Das, 1918) | P(c) | 18 | | Chen and Zhang 1985a (as *Macrosiphum*) [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *S. rosivorum* (G. Zhang, 1980) | ? | 18 | | Blackman 1980 [Kenya] |
| *S. takahashii* (Eastop, 1959) | ? | 18 | | Blackman and Eastop 2015 |
| *S. wikstroemiae* (Mamet, 1939) | ? | 16 | | Blackman 1980 [Kenya] |
| *Sitobion* sp. prope *avenae* (Fabricius, 1775) | ? | 12 | | Kapoor Gautam 1994 [Shimla, Himachal Pradesh, India] |
| *S. luteum* (Buckton, 1876) | P(o) | 12 | | Gut 1976 [Holland] |
| | | | | Kurl and Chauhan 1986a (as *Macrosiphum*) [Solan, Himachal Pradesh, India] |
| | | | | Kurl and Chauhan 1987a (as *Macrosiphum*) [Solan, Himachal Pradesh, India], Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *S. miscanthi* (Takahashi, 1921) | P(o), ?P(c) | 14, 18 | | Turak and Hales 1990 [Australia] |
| | | | | Hales et al. 1990, Sunnucks and Hales 1996, Hales et al. 2010 [Australia] |
| | | | | Sunnucks et al. 1996, Hales et al. 1998 [Australia] |
| | | | 17, 18, 20, 21 | Wilson et al. 1999 [New Zealand] |
| *S. nigrinectarium* (Theobald, 1915) | ? | 18 | | Blackman 1980 [Kenya] |
| *S. ochneearum* (Eastop, 1959) | ? | 18 | | Blackman and Eastop 2006 [?] |
| *S. pseudoluteum* A.K. Ghosh, 1969 | ? | 18 | | Kar et al. 1990 [India] |
| Taxon                          | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data |
|-------------------------------|------------|-------|-------------------|--------------------------------|
| *S. rosaeformis* (Das, 1918)  | P(c)       | 14, 18 |                   | Gautam and Dutta 1994 [Shimla, Himachal Pradesh, India] |
|                              |            | 16, 17,18 |                 | Kurl 1986 (as *Macrosiphum (Sitobion)* [Meghalaya, India]) |
|                              |            | 18     |                   | Khuda-Buksh 1980 (as *Macrosiphum*) [Garhwal, Uttarakhand, India], Kularkarni and Kacker 1981a [Kursiong, West Bengal, India], Kurl and Misra 1983 (as *Macrosiphum* (S. rosaeformis)) [Jodhpur, Rajasthan, India], Raychaudhuri and Das 1987 [India], Kar and Khuda-Buksh 1989 [Shillong, Meghalaya, India], Kar et al. 1990 [India]) |
| *S. rosivorum* (G. Zhang, 1980) | ?         | 18    |                   | Chen and Zhang 1985a (as *Macrosiphum*) [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *S. takahashii* (Eastop, 1959) | ?         | 18    |                   | Khuda-Buksh and Kar 1989a (cited after Blackman and Eastop 2015) |
| *S. wikstroemiae* (Marnet, 1939) | ?         | 16    |                   | Blackman 1980 [Kenya] |
| *Sitobion* sp. prope *avenae* (Fabricius, 1775) | ?         | 12    |                   | Kapoor and Gautam 1994 [Shimla, Himachal Pradesh, India] |
| *Sitobion* sp. prope *fragariae* (Walker, 1848) | ?         | 18    |                   | Turak and Hales 1990, Hales et al. 1990, De Barro 1992, Sunnucks et al. 1996, Hales et al. 1998 [Australia], Wilson et al. 1999 [New Zealand] |
| *Sitobion* sp. prope *roseaeformis* (Das, 1918) | ?         | 18    |                   | Dutta and Gautam 1993 [Shimla, Himachal Pradesh, India] |
| *Soraphis chaetoaphis* (Shaposhnikov, 1950) | P(c)       | 38    |                   | Blackman 1986 [Japan] |
| Staticobium limonii (Contarini, 1847) | ?         | 12    |                   | Blackman and Eastop 2006 [?] |
| *Tansoaphis neoartemisiae* (Takahashi, 1921) | P(c), P(o) | 8     |                   | Blackman and Eastop 2006 [for specimens on *A. dracunculus* in Iran] |
| *Triacedatus polygoni* (Narzikulov, 1953) | P(c)       | 8     |                   | Kar et al. 1990 [India] |
| *Trichophosphatia (Xenomyzidae) polygoni* (van der Goot, 1917) | ?         | 12    |                   | Chen and Zhang 1985a (as *Trichophosphatia* *ishimikaeae* (Shinji 1941)) (cited after Blackman and Eastop 2015) |
| *T. (X) polygonfoliae* (Shinji, 1944) | P(c)       | 12    |                   | Blackman and Eastop 2015 [?] |
| *T. (X) tate* (Shinji, 1927) | ?         | 10/9  | XX/X0            | Shinji 1927, 1931, 1941a (as *Carolinaia*), Blackman 1986 [Japan] (based on n(♂) = 5 (Shinji 1927, 1931)) |
| *Tubaphis clamatophila* (Takahashi, 1965) | ?         | 12    |                   | Blackman 1986 [Japan] |
| *Tuberocephalus* (*Trichosphoniella*) *higanakurae* (Monzen, 1927) | P(c)       | 12    |                   | Blackman 1986 [Japan] |
| *T. (T) liaonengensis* G. Zhang & Zhong, 1976 | P(c)       | 12    |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *T. (T) misakurae* Moritsu & Hamasaki, 1983 | P(c)       | 12    |                   | Blackman and Eastop 1994 [?] |
| *T. (T) momonis* (Matsumura, 1917) | P(c)       | 12    |                   | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| *Uroleucon achilleae* (Koch, 1855) | P(c)       | 12    |                   | Blackman 1980 [Great Britain] |
| *U. ambrosiae* (Thomas, 1878) | P(c), P(o) | 12    |                   | Olive 1967 (as *Dactynotus*) [USA], Robinson and Chen 1969a (as *Dactynotus*) [Canada] |
| Taxon                                      | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data                                                                 |
|-------------------------------------------|------------|-------|-------------------|------------------------------------------------------------------------------------------------|
| U. chondrillae (Nevsky, 1929)             | P(c)       | 12    |                   | Blackman and Eastop 2006 [?]                                                                 |
| U. chrysopidcola (Olive, 1963)            | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. cirsii (Linnaeus, 1758)                | P(c)       | 10    |                   | Sun and Robinson 1966, Robinson and Chen 1969a (as Dactynotus) [Canada], Kuznetsova and Gandrahur 1991 [St.Petersburg, Russia] |
| U. formosanum (Takahashi, 1921)           | ?          | 12    | XX/X0             | Shinji 1927, 1931 (as Macrosiphum sonchi), Blackman 1986 [Japan] (based on n(♂) = 6 (Shinji 1927, 1931)) |
| U. fuscundatum Chakrabarti & D.N. Raychaudhuri, 1978 | ?          | 12    |                   | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1986b [Rambara, Uttarakhand, India] |
| U. cirsii (Linnaeus, 1758)                | P(c)       | 10    |                   | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1986b [Gobindoghat, Uttarakhand, India]          |
| U. formosanum (Takahashi, 1921)           | ?          | 12    |                   | Gut 1976 [Holland]                                                                             |
| U. hypochoeridis (Fabricius, 1779)        | P(c)       | 12    |                   | Gut 1976 [Holland]                                                                             |
| U. jaceicola (Hille Ris Lambers, 1939)    | P(c)       | 12    |                   | Gut 1976 [Holland]                                                                             |
| U. longisetaform Chakrabarti & Verma, 1975| P(c)       | 10    |                   | Pal and Khuda-Bukhsh 1980, Khuda-Bukhsh and Pal 1986b [Gobindoghat, Uttarakhand, India]          |
| U. macolai (Blanchard, 1932)              | P(c)       | 12    |                   | Blackman and Eastop 2006 [?]                                                                  |
| U. nigrorubesculatum (Olive, 1963)        | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. paucisensoriatum (Hille Ris Lambers, 1960) | P(c)       | 12    |                   | Robinson and Chen 1969a (as Dactynotus) [Canada]                                              |
| U. pseudambrosiae (Olive, 1963)           | ?          | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. pseudotanaceti (Verma, 1969 (1970))    | P(c)       | 12    |                   | Kurl and Chauhan 1986a,1987a [Kangra, Himachal Pradesh, India]                                |
| U. reynoldense (Olive, 1965)              | ?          | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. rudbeckiae (Fitch, 1851)               | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. ruelliae (Hille Ris Lambers, 1960)     | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. similae Chakrabarti, A.K. Ghosh & D.N. Raychaudhuri, 1971 | ?          | 12    |                   | Kurl and Chauhan 1987a [Kandaghat, Himachal Pradesh, India]                                  |
| U. sonchellum (Monell, 1879)              | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. sonchi (Linnaeus, 1767)                | P(c), P(o) | 12    | XX/X0             | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. tanaceti (Linnaeus, 1758)              | P(c)       | 12    |                   | Gut 1976 [Holland]                                                                             |
| U. tusilaginis (Walker, 1850)             | P(c)       | 12    |                   | Kuznetsova 1974 (as Dactynotus batalis Walker?) [?] (Blackman and Eastop 2015 supposed that the karyotype in Kuznetsova 1974 illustrated resembles that of Acrhisiphon pisum) |
| U. (Belachilum) inulae (Ferrari, 1872)    | ?          | 12    |                   | Blackman and Eastop 2006 [?]                                                                  |
| U. (Lambersius) anomalae (Hottes & Frison, 1931) | ?          | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. (L.) bradburyi (Olive, 1965)           | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. (L.) erigeronense (Thomas, 1878)       | P(c)       | 12    |                   | Blackman and Eastop 2015 [?]                                                                  |
| U. (L.) gravicorne (Patch, 1919)          | P(c)       | 12    |                   | Olive 1967 (as Dactynotus) [USA]                                                               |
| U. (L.) luteolum (Williams, 1911)        | P(c)       | 12    |                   | Olive 1967 (as Dactynotus luteoli Boudreaux, 1948 (1949)) [USA]                               |
| U. (L.) penderum Robinson, 1986           | ?          | 12    |                   | Blackman and Eastop 2006 [British Columbia, Canada]                                          |
### Taxon | Life cycle | 2n ♀♂ | Genetic system, ♀♂ | References and collecting data
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*U. (L.) richardsi* Robinson, 1964 | P(c) | 12 | Robinson and Chen 1969a (as *Dactynotus*) [Canada] |
*U. (Uromelan) carthami* (Hille Ris Lambers, 1948) | ? | 12 | Blackman and Eastop 2006 [?]
| | 14 | Khuda-Buksh and Kar 1990 [Kalyani, West Bengal, India] |
*U. (U.) composae* (Theobald, 1915) | P(o) | 12 | Karl and Misra 1983 (as *Dactynotus*) [Jodhpur, Rajasthan, India], Khuda-Buksh and Kar 1990 [Shillong, Meghalaya, India] |
*U. (U.) gobonis* (Matsumura, 1917) | P(c), P(o) | 12 | Blackman and Eastop 1984, Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
| | | 14 | XX/0 |
*U. (U.) helianthicola* (Olive, 1963) | ? | 12 | Olive 1967 (as *Dactynotus*) [USA] |
*U. (U.) himachali* L.K. Ghosh, 1975 | ? | 14 | Kar et al. 1990 [India] |
*U. (U.) illini* (Hottes & Frison, 1931) | P(c) | 12 | Blackman and Eastop 2006 [?] |
*U. (U.) jaceae* (Linnaeus, 1758) | P(c) | 12 | Blackman 1980 [Great Britain], Kar et al. 1990 [India] |
*U. (U.) ruralis* (Hottes & Frison, 1931) | P(c) | 10 | Olive 1967 (as *Dactynotus*) [USA] |
*U. (U.) taraxaci* (Kaltenbach, 1843) | P(c) | 12 | Sun and Robinson 1966 (as *Dactynotus*), Robinson and Chen 1969a (as *Dactynotus*) [Canada] |
*U. (U.) tuataiae* Olive, 1963 | ? | 12 | Olive 1967 (as *Dactynotus*) [USA] |
*U. (U.) verboisae* (Boudreaux, 1949) | ? | 10 | Olive 1967 (as *Dactynotus*) [USA] |
*Uroleucon* sp. 1 | ? | 12 | Robinson and Chen 1969a (as *Dactynotus*) [Canada] (five different taxonomic forms) |
*Uroleucon* sp. 2 | ? | 12 | Chen and Zhang 1985a [Beijing area, China] (cited after Blackman and Eastop 2015) |
*Uaphloraphora crataegi* (Monell, 1879) | P(c) | 10 | Robinson and Chen 1969a [Canada] |
*U. humboldti* (Essig, 1941) | P(c), P(o) | 20 | Robinson and Chen 1969a (as *Myzodes physocarpi* Pepper, 1950) [Canada], Blackman 1980 [Great Britain] |
*Vesiculaphis caerulea* Miyazaki, 1980 | ? | 6 | Blackman 1986 [Japan] |
*V. cephalata* Miyazaki, 1971 | P(c) | 20 | Blackman 1986 [Japan] |
*V. theobaldi* Takahashi, 1930 | P(c), P(o) | 36 | Blackman and Eastop 2006 [Great Britain, ?anholocyclic populations] |
| | | 38 | Blackman and Eastop 2006 [Great Britain, ?anholocyclic populations] |
| | | 40 | Gut 1976 [Holland] |
*Vesiculaphis* sp. | ? | 24 | Gautam and Kumar 2006 [Shimla, Himachal Pradesh, India] |
*Wahlgrenella nervata* (Gillette, 1908) | ?P(c), P(o) | 12 | Blackman 1980 [Great Britain] |
*W. vaccinii* (Theobald, 1924) | P(c) | 12 | Blackman and Eastop 2015 [?] |
*Xerobion cinae* (Nevsky, 1928) | P(c) | 8 | Blackman 1980 [Iran] |
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