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## The scale insect and whitefly species of Switzerland (Homoptera: Coccoidea and Aleyrodoidea)

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A survey of scale insects and whiteflies was carried out in different parts of Switzerland. 87 scale insect species, belonging to 9 families, were found. Among them 34 proved to be new for Switzerland, and one is new for the European fauna. The total number of all species recorded from Switzerland, from nature and greenhouses, is now 115; 90 of them can be considered as "natural" and 25 as "greenhouse" species. Recently, some important pests of orchards (*Quadraspidiotus marani*, *Q. ostreaeformis*, *Q. pyri*) and of ornamental plants (*Pseudaulacaspis pentagona*, *Carulaspis juniperi*, *Eupulvinaria hydrangeae*) substantially increased their population density. The paper presents data on the localities, on host plants, on the preferred parts of plants, on developmental stages and on population densities. In the survey 8 species of whiteflies were also collected. Among them 6 proved to be new for the Swiss fauna. The total number of recorded whitefly species in Switzerland is at present 9.

Keywords: Scale insects, whiteflies, Switzerland, faunistics, ecology.

### INTRODUCTION

The scale insect fauna of Switzerland was only superficially studied in the past. An early review can be found in LINDINGER (1912). The current monograph on scale insects of Central Europe (KOSZTARAB & KOZÁR, 1988) mentions only 56 species for Switzerland compared to 233 species known in Central Europe. The scale insect fauna of Swiss greenhouses was studied in more detail by HADORN (1940). He presented 27 species which can survive in Switzerland mostly under indoor conditions. Studies on economically important pests were carried out by BACHMANN (1952, 1953), BACHMANN & GEIER (1950), GEIER (1949), GEIER & BAGGIOLINI (1950), SUTER (1950), MANI & STAUB (1966), MANI (1970), WILDBOLZ (1992) and MANI *et al.* (1993).

The world catalogue of whiteflies (MOUND & HALSEY, 1978) mentions only two species for Switzerland, both known as pests (BOVEY, 1979). Recently a new species, *Bemisia tabaci* (GENNADIUS, 1889), appeared in the greenhouses of Central Europe, including Switzerland (KOCH, 1989; KOZÁR *et al.*, 1991).

In the last few years new scale insect and whitefly species have appeared from the Mediterranean area and from overseas. The detection of such newcomers is difficult unless the fauna is better known. Therefore a survey of these groups in the field and in collections became important.

## MATERIAL AND METHODS

Most of the insects were sampled by the senior author in April and May 1992 from host plants. Pheromone traps for *Pseudaulacaspis pentagona* (TARGIONI-TOZZETTI, 1886) were placed from June to August in 1992. In addition to this survey the collections of F. BACHMANN and E. GUIGNARD were consulted. Samples from these collections are designated with FB and EG, respectively. The insects collected by the senior author are mainly deposited at the Plant Protection Institute, Hungarian Academy of Sciences (Budapest), as microscopic slides, dry material, or preserved in alcohol. Some of the slides and dry material are deposited at the Eidgenössische Forschungsanstalt für Obst-, Wein- und Gartenbau (Wädenswil, Switzerland). The collection of E. GUIGNARD is deposited at the Station Fédérale de Recherches Agronomiques de Changins (Nyon, Switzerland).

The samples were evaluated and described according to the method of KOZÁR *et al.* (1979). In the list of species collected the following data are mentioned:

– Time of collection: Day and month. The year is 1992, if not otherwise indicated.

– Host plant.

– Infested part of the plant

– Phenological stage of the insect.

– The intensity of the infestation indicated by a score system from F=0 to F=4.

– Sample number in KOZÁR's collection (in brackets).

The remarks in the list of species about their distribution are from KOSZTARAB & KOZÁR (1988).

The pheromone traps were of the Wädenswil type (ARN *et al.*, 1979). The pheromone dispensers for *P. pentagona* were produced by B. KOVALEV (Kishinev, Moldavia).

## RESULTS

In the course of our survey 87 scale insect species belonging to 9 families were found: 3 in Ortheziidae, 2 in Margarodidae, 15 in Pseudococcidae, 7 in Eriococcidae, 2 in Cryptococcidae, 22 in Coccidae, 3 in Asterolecaniidae, 1 in Cerococcidae, 32 in Diaspididae. In our survey we also found 8 species of whiteflies.

New for the fauna of Switzerland are 34 scale insect and 6 whitefly species. With these additions the fauna of Switzerland comprises now 90 scale insect and 9 whitefly species.

*List of the species found in the survey:*

## COCCOIDEA

## I. ORTHEZIIDAE

*Arctorthezia cataphracta* (OLAFSEN, 1772) – Oberiberg, 13.9., *Vaccinium* sp. and under moss, female, F=1 (4065); Studen, 20.9., under moss, female 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=1 (4071).

*Orthezia urticae* (LINNAEUS, 1758) – Gersau, 15.5., *Galium* sp., *Teucrium* sp., on leaves and stems, female and 2<sup>nd</sup> instar larvae, F=1 (3938); Gersau, 6.9., *Allium* sp., *Rubus* sp., female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=3 (4046); Gersau, 6.9., *Hieratium staticifolium*, larvae, F=1 (4054); Sion, 18.5., *Clematis vitalba*, *Rubus caesius* and *Taraxacum* sp., female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=3 (3954).

*Ortheziola veydovskyi* ŠULC, 1894 – Wädenswil (in the town), 17.5., under moss, female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=1, (3943); Wädenswil (Eichmühle), 6.5., under moss, female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=1, (3910); Richterswil, 27.5., under moss, female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=1 (3988); Landquart, 9.10., *Dianthus* sp., on the roots, larvae, F=1 (4090).

## II. MARGARODIDAE

*Icerya purchasi* MASKELL, 1895 – Brissago, 15.10.1946, 1<sup>st</sup> instar larvae (EG).

*Paleococcus fuscipennis* (BURMEISTER, 1835) – Brissago, 18.9., *Pinus* sp. (?) (collected by L. RESER among Lepidoptera from linen with light at night!), female, male and larvae, F=3 (4080).

## III. PSEUDOCOCCIDAE

*Atrococcus cracens* WILLIAMS, 1962 – Gersau, 6.9., *Hieracium staticifolium*, *Knautia arvensis*, *Vaccinium vitis-idaea*, on roots, female and larvae, F=3 (4051, 4052, 4054); Unteriberg, 4.10., *Thymus* sp., on roots, female, F=1 (4084); Walenstadt, 12.9., *Vaccinium* sp., on roots, female, F=2 (4059).

*Balanococcus boratynskii* WILLIAMS, 1962 – Unteriberg, 19.9., *Poa* sp., in leaf sheaths, female and larvae, F=2 (4068).

*Coccura comari* (KÜNOW, 1880) – Sion, 18.5., *Rubus caesius*, on roots, female, F=1 (3953).

*Dysmicoccus walkeri* (NEWSTEAD, 1891) – Gersau, 6.9., *Brachypodium* sp., on leaves, female, F=1 (4047).

*Heliococcus bohemicus* ŠULC, 1912 – Wädenswil, 21.4., *Aesculus hippocastanum*, *Platanus occidentalis*, on branches, female, 2<sup>nd</sup> instar larvae, F=1 (3862); Wädenswil, 3.5., same hosts, female, eggs, F=1 (3908). – This species became in the last years a pest of grapes in Hungary and Italy, as well as earlier in the Rhine valley in Germany.

*Heterococcus nudus* (GREEN, 1926) – Gersau, 15.5., *Bromus* sp., in leaf sheaths, female, F=1 (3939); Gersau, 6.9., *Agrostis* sp., in leaf sheaths, female, larvae, F=1 (4055); Wädenswil (Eichmühle), 20.5., *Lolium perenne*, female, F=1 (3967); Wädenswil, 21.9., *Agropyron repens*, in leaf sheaths, dead female, eggs and 1<sup>st</sup> instar larvae, F=2 (4075).

*Mirococcopsis nagyi* KOZÁR, 1981 – Noes, 19.5., *Stipa pennata*, in leaf sheaths, female, F=1 (3957). – Until now this species was known only from Hungary.

*Phenacoccus aceris* (SIGNORET, 1875) – Luzern, 24.5., *Aesculus hippocastanum*, on branches, dead female, F=2 (3973); Muri, 8.5., *Prunus domestica* and *Malus pumila*, female, F=1 (3913); Sion, 18.5., *A. hippocastanum*, dead female F=1 (3946); Wädenswil, 3.5., *A. hippocastanum*, female, F=1 (3908); Wädenswil, 17.5., *Quercus turneri*, female, F=1 (3941); Zürich, 3.5., *Q. robur*, female, F=1 (3896); Zürich, 26.5., *Tilia platyphyllos*, dead female, F=1 (3983).

*Phenacoccus piceae* (LÖW, 1883) – Zürich, 3.5., *Picea orientalis*, on needles, female, F=2 (3898).

*Planococcus citri* (RISSE, 1813) – Zürich, 10.5., *Acacia* sp., *Citrus* sp., on leaves and branches, in greenhouse, female, eggs, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=3 (3922); Wädenswil, 28.9., *Coffea arabica*, on branches and leaves, female, male, eggs and larvae, F=3 (4079).

*Puto pilosella* (ŠULC, 1898) – Unteriberg, 19.9., *Thymus* sp., on the leaves, female, F=1 (4069).

*Spinococcus marrubii* (KIRITCHENKO, 1935) – Uerikon, 23.5., *Thymus serpyllum*, on roots, female, eggs, F=1 (3969). – Until now the species was only known from Bulgaria, Hungary and Russia.

*Spinococcus multispinosus* (SIRAIWA, 1939) – Sion, 18.5., *Thymus serpyllum*, on the root, female, F=1 (3951). – Until now it was known only from Far East and from Caucasus (DANZIG, 1980).

*Trionymus penium* (WILLIAMS, 1962) (?) – Zürich, 3.5., *Pseudosasa japonica*, in the leaf sheaths, female, eggs, F=3 (3906); Zürich, 3.10., *Pseudosasa japonica*, female, larvae, F=4 (4081). – The species supposedly originates from South-East Asia and needs further studies.

*Trionymus perrisii* (SIGNORET, 1875) – Feldmeilen, 26.9., *Festuca* sp., in leaf sheaths, female, F=2 (4078); Wädenswil, 18.9., *Agropyron repens*, in leaf sheaths, female, eggs and 1<sup>st</sup> instar larvae, F=1 (4067).

## IV. ERIOCOCCIDAE

*Acanthococcus aceris* SIGNORET, 1875 – Glarus, 1.5., *Carpinus betulus*, on branches, female, winged and wingless males, F=3 (3890); Zürich, 10.5., *Acer platanoides*, female, F=3 (3923); Zürich, 26.5., *A. pseudoplatanus*, female, F=1 (3984); Zürich, 3.5., *Carpinus betulus*, 2<sup>nd</sup> instar larvae, male pronymph, F=3 (3899); Zürich, 3.5., *Ulmus* sp., female, F=1 (3900).

*Acanthococcus greeni* (NEWSTEAD, 1898) – Noes, 19.5., *Stipa pennata*, on leaves, female, eggs, F=1 (3957).

- Acanthococcus roboris* (GOUX, 1931) – Luzern, 24.5., *Aesculus hippocastanum*, on branches, female, eggs, F=3 (3973).
- Eriococcus buxi* (FONSCOLOMBE, 1834) – Zürich, 23.5., *Buxus sempervirens*, on leaves and branches, female, male, eggs, F=3 (3068), Basel, 15.10., *Buxus* sp., dead female, F=1 (4097); Nyon, 30.9.1993, *Buxus sempervirens*, dead female, 2<sup>nd</sup> instar larvae, (EG).
- Gossyparia spuria* (MODEER, 1778) – Au, 13.5., female, F=2 (3928); Luzern, 24.5., female, F=3 (3974); Zürich, 26.4., female, 2<sup>nd</sup> instar larvae, F=1 (3874); Zürich, 26.5., all on *Ulmus* sp., on branches, F=3 (3980).
- Rhizococcus cynodontis* (KIRITCHENKO, 1940) – Unteriberg, 4. 10., *Festuca* sp., on leaves, female, F=1 (4082).
- Rhizococcus palustris* DZIEDZICKA & KOTEJA, 1971 – Studen, 20.9., *Luzula pilosa*, on leaves, female, F=1 (4072).

#### V. CRYPTOCOCCIDAE

- Cryptococcus fagisuga* LINDINGER, 1936 – Zürich, 10.5., *Fagus silvatica*, on bark, female, F=4 (3924).
- Pseudochermes fraxini* (KALTENBACH, 1860) – Nyon, 1.10.1993, female (EG); Zug, 9.5., female, F=2 (3918); Zürich, 26.5., all on *Fraxinus excelsior*, on bark, female, F=3 (3979).

#### VI. COCCIDAE

- Chloropulvinaria floccifera* (WESTWOOD, 1870) – Glarus, 1.5., *Taxus baccata*, on leaves, dead female, F=1 (3889); Richterswil, 22.4., *Taxus baccata*, 2<sup>nd</sup> instar larvae, F=2 (3866); Wädenswil, 26.4., *Mahonia* sp., *Ilex* sp., 2<sup>nd</sup> instar larvae, F=3 (3875); Wädenswil, 17.5., *Mahonia* sp., female, F=3 (3942); Wädenswil, 25.5., *T. baccata*, female, eggs, F=3 (3975); Zürich, 3.5., *Ilex* sp., 2<sup>nd</sup> instar larvae, F=3 (3907).
- Coccus hesperidum* LINNAEUS, 1758 – Wädenswil (outdoors!), 21.4., *Laurocerasus* sp., on leaves, female, F=1 (3865); Zürich (outdoors!), 3.5., *Laurocerasus* sp., female, F=1 ((3905)
- Eriopeltis festucae* (FONSCOLOMBE, 1834) – Unteriberg, 4.10., *Dactylis glomerata*, on leaves, female, eggs, F=1 (4083); Walenstadt, 12.10., *Brachypodium* sp., on leaves, F=1 (4062).
- Eulecanium tiliae* (LINNAEUS, 1758) – Basel, 15.10., *Ulmus* sp., dead female, F=1 (4098); Wädenswil, 17.5., *Aesculus hippocastanum*, on branches, female, male, F=2 (3944).
- Eupulvinaria hydrangeae* (STEINWEDEN, 1946) – Basel, 15.10., *Acer negundo*, on leaves, F=4 (4096); Gersau, 15.5., *Taxus baccata*, on leaves, female, F=1 (3932); Founex, 30.9.1993, *Hortensia* sp., dead female, 2<sup>nd</sup> instar larvae (EG); Nyon, 30.9.1993, *Hortensia* sp., dead female, 2<sup>nd</sup> instar larvae, (EG).
- Lecanopsis festucae* BORCHSENIUS, 1952 – Unteriberg, 4.10., *Festuca* sp., in leaf sheaths, female, F=1 (4082).
- Luzulaspis frontalis* GREEN, 1928 – Studen, 20.9., *Luzula pilosa*, on leaves, female, eggs, F=2 (4072); Unteriberg, 20.9., *Carex* sp., on leaves, female, eggs, F=2 (4074).
- Luzulaspis kosztarabi* KOTEJA & KOZÁR, 1979 – Walenstadt, 12.9., *Carex* sp., on leaves, female, F=1 (4061).
- Nemolecanium graniformis* (WÜNN, 1921) – Muri, 7.5., *Abies* sp., on needles, male, F=1 (3915).
- Palaeolecanium bituberculatum* (TARGIONI-TOZZETTI, 1868) – Jan./ Feb. 1952-54, *Malus pumila*, female (in contrary to literature), found several times on samples of branches coming from different localities north of the Alps (VOGEL & BACHMAN, 1956).
- Parafairmairia gracilis* GREEN, 1916 – Gersau, 6.9., *Carex* sp., on leaves, female, eggs, F=1 (4048).
- Parthenolecanium corni* (BOUCHÉ, 1844) – Au, 13.5., *Ulmus* sp., on branches, female, male, F=1 (3928); Gersau, *Rubus* sp. and *Spirea* sp., on branches, dead female, F=1 (4050, 4053); Glarus, 1.5., *Ulmus* sp., 2<sup>nd</sup> instar larvae, F=1 (3891); Güttingen, *Malus pumila*, dead female, 2<sup>nd</sup> instar larvae, F=2 (4094); Horgen, 16.5., *Vitis vinifera*, female, male, F=3 (3940); Luzern, 24.5., *Aesculus hippocastanum*, female, male, F=2 (3973); Richterswil, 23.5., *Prunus persica*, female, male, F=1 (3972); Richterswil, 27.5., *Rubus caesius*, on the root crown(!), female, eggs, F=2 (3987); Sion, 18.5., *P. cerasi*, female, F=3 (3955); Unteriberg, 19.9., *Rubus* sp., on leaves, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=1 (076); Wädenswil, 21.4., *Cotoneaster* sp., female, 2<sup>nd</sup> instar larvae, F=4 (3863); Wädenswil, 27.4., *P. domestica*, female, male pronymph, F=2 (3881); Richterswil, 22.4., *P. persica*, dead female, F=1 (3867); Wädenswil, 27.4., *P. pritchardi*, female, male pronymph, nymph, F=3 (3878); Wädenswil, 12.10., *Fragaria* sp., on leaves, 2<sup>nd</sup> instar larvae, F=1 (4091); Winterthur, *Ribes rubrum*, on branches, dead female, 2<sup>nd</sup> instar larvae, F=2 (4086); Zürich, 3.5., *Carpinus betulus*, 2<sup>nd</sup> instar larvae, male pronymph, F=2 (3899); Zürich, 3.5., *Cotynus cogygria*, female, F=3 (3895); Zürich, 26.4., *Ulmus* sp.,

- female, 2<sup>nd</sup> instar larvae, F=1 (3874); Zürich, 3.5., *Ulmus* sp., female, male pronymph, F=2 (3900); Zürich, 30.4., *Malus pumila*, 2<sup>nd</sup> instar larvae, F=1 (3887); Gersau, 15.5., *Platanus occidentalis*, female, F=1 (3933).
- Parthenolecanium fletcheri* (COCKERELL, 1893) – Wädenswil, 2.5., *Thuja occidentalis*, female, 2<sup>nd</sup> instar larvae, F=1 (3894).
- Parthenolecanium pomeranicum* (KAWECKI, 1954) – Gersau, 15.5., female, 2<sup>nd</sup> instar larvae, F=2 (3932); Glarus, 1.5., female, F=1 (3889); Wädenswil, 8.5., all on *Taxus baccata*, on needles, female, F=4 (3921).
- Parthenolecanium rufulum* (COCKERELL, 1903) – Conthey, 19.5., female, eggs, F=4 (3958); Wädenswil, 2.5., female, male pronymph, 2<sup>nd</sup> instar larvae, F=2 (3883); Zürich, 3.5., all on *Quercus robur*, on branches, female, male pronymph, F=1 (3896).
- Physokermes hemicryphus* (DALMAN, 1826) – Hochybrig, 5.9., *Picea abies*, on branches, dead female, eggs, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=2 (4044); Muri, 8.5., *P. abies*, on branches, dead female, F=1 (3912); Rapperswil, 23.5., *P. abies*, female, 2<sup>nd</sup> instar larvae, F=1 (3971); Wädenswil, 21.4., *P. abies*, dead female, 2<sup>nd</sup> instar larvae, F=1 (3864); Zürich, 3.5., *P. orientalis*, female, 2<sup>nd</sup> instar larvae, F=3 (3897). – This species earlier probably was mixed with *P. piceae*.
- Physokermes piceae* (SCHRANK, 1801) – Conthey, 19.5., *Picea omorica*, larva on needles, female on branches, female, eggs, F=3 (3965); Noes, 19.5., *P. abies*, female, F=3 (3964); Sion, 18.5., *P. abies*, dead female, 2<sup>nd</sup> instar larvae, F=3 (3952); Wädenswil, 21.5., *P. abies*, dead female, male pronymph, 2<sup>nd</sup> instar larvae, F=2 (3864); Zürich, 3.5., *P. orientalis*, dead female, 2<sup>nd</sup> instar larvae, F=1 (3897).
- Pulvinaria betulae* (LINNEAUS, 1758) – Gimel 25.9.1993, *Betula pendula*, female (EG); Gimel, 25.9.1993, *Ribes rubrum*, female, (EG).
- Pulvinaria regalis* CANARD, 1968 – Sion, 18.5., *Aesculus hippocastanum*, on bark, dead female, F=2 (3946). – This species is spreading all over Western Europe causing great problems on different ornamental trees.
- Saissetia coffeae* (WALKER, 1852) – Wädenswil (indoors), 28.5., *Ficus benjamina*, on leaves, female, F=1 (3885).
- Scythia craniumequinum* (KIRITCHENKO, 1938) – Noes, 19.5., *Stipa pennata*, on leaves, dead female, F=1 (3957). – Until now this typical steppic species, was known from Mongolia to Hungary
- Sphaerolecanium prunastri* (FONSCOLOMBE, 1834) – Gimel, 26.6.1958, 1<sup>st</sup> instar larvae, (EG).

## VII. ASTEROLECANIIDAE

- Asterodiaspis quercicola* (BOUCHÉ, 1851) – Wädenswil, 27.4., *Quercus robur*, on branches, female, F=2 (3883).
- Asterodiaspis variolosa* (RATZEBURG, 1870) – Conthey, 19.5., female, eggs, F=1 (3956); Wädenswil, 27.4., female, F=2 (3883); Zürich, 3.5., female, F=1 (3896); Zürich, 10.5., all on *Quercus robur*, on branches, female, eggs, F=1 (3929).
- Planchonia arabis* SIGNORET, 1877 – Walenstadt, 12. 9., *Thymus serpyllum*, on branches, female, F=1 (4060).

## VIII. CEROCOCCIDAE

- Cerococcus cycliger* GOUX, 1932 – Walenstadt, 12.9., *Thymus serpyllum* v. *rigidus*, on branches, female, F=1 (4060).

## IX. DIASPIDIDAE

- Aonidia lauri* (BOUCHÉ, 1833) – Locarno, 17.9.1949, *Laurus* sp., female, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, (EG); Locarno, 20.4.1950, *Laurus nobilis*, 2<sup>nd</sup> instar larvae, (FB); Muralto, 24.9.1958, *Laurus* sp., female, (EG).
- Aspidiotus nerii* (BOUCHÉ, 1833) – Genève, 8.12.1966, *Hovea* sp., female, (EG), Küsnacht, 29.10.1954, *Datura* sp., female, (FB); Kilchberg, 11.5.1951, *Oleander* sp., female, (FB); Wädenswil (indoors), 25.10., *Agave* sp., *Phoenix* sp., on leaves, female, male, F=3 (4101).
- Aulacaspis rosae* (BOUCHÉ, 1833) – Nyon, 12.11.1962, *Rubus* sp., female, (EG); Gersau, 6.9., *Rubus* sp., on branches, female, eggs, F=3 (4050); Stäfa, 1.4.1950, *Rubus* sp., female, 1<sup>st</sup> instar larvae, (FB); Rapperswil, 23.5., *Rubus caesius*, on stem, female, 1<sup>st</sup> instar larvae, F=2 (3970); Sargans, 26.5., *Rosa canina*, *Rubus caesius*, female, F=1 (3986); Walenstadt, 12.9., *Rubus* sp., F=1 (4057); Wädenswil, 13.5., *Rosa* sp., female, F=3 (3930).
- Carulaspis juniperi* (BOUCHÉ, 1851) – Chavannes Renens, 18.11.1963, *Thuja occidentalis*, female, (EG); Genève, 15.12.1964, *Juniperus* sp., female, (EG); Valais, 3.4.1984, *Sequoia* sp., female,

- (EG); Riehen, 3.1959, *Thuja* sp., female, (FB); Sion, 18.5., *Juniperus sabina*, female, eggs, F=3 (3949); Wädenswil, 2.5., *Thuja occidentalis*, female, F=2 (3894); Wädenswil, 26.4., *Chamaecyparis* sp., female, F=1 (3877); Zürich, 26.4., *Thuja* sp., female, F=1 (3873).
- Chionaspis salicis* (LINNAEUS, 1758) – Gersau, 6.9., *Fraxinus excelsior*, F=1 (4056); Sattellegg, 12.9., *Salix* sp., F=3; Studen, 20.9., *Salix* sp., F=3; Sustenpass, 16.8.1951, *Vaccinium myrtillus*, female (FB); Gersau, 15.5., *Salix* sp., on branches, eggs, F=2 (3934); Glarus, 1.5., *Fraxinus excelsior*, eggs, F=1 (3892); Unteriberg, 13.9., *Fraxinus excelsior*, *Alnus glutinosa*, F=1 (4064); Unteriberg, 19.9., *Vaccinium* sp., female, eggs, F=3 (4070); Wädenswil, 27.4., *F. excelsior*, eggs, F=1 (3881); Wädenswil, 27.4., *Malus pumila*, eggs, F=3 (3882); Wädenswil, 27.4., *Pyrus communis*, eggs, F=1 (3879); Weglosen, 5.9., *Salix* sp., Female, F=1 (4043); Zug, 9.5., *Sorbus* sp., eggs, F=3 (3919); Zug, 9.5., *Crateagus* sp., eggs, F=2 (3920). – An outbreak and the distribution of the species was studied in more detail by MANI & STAUB (1966).
- Diaspidiotus bavaricus* (LINDINGER, 1912) – Verscio, 18.5.1953, *Calluna vulgaris*, female, 2<sup>nd</sup> instar larvae, (FB).
- Diaspidiotus osborni* (NEWELL & COCKERELL, 1898) – Zürich, 26.5., *Corylus avellana*, on branches, female, 2<sup>nd</sup> instar larvae, F=3 (3976); Nyon, 30.9.1993, *Gleditsia triacanthos*, female, eggs, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, (EG). – Until now this American species was known only from southern Europe and only from *Platanus*.
- Diaspidiotus wuenni* LINDINGER, 1923 – Biasca, 22.3.1948, *Castanea sativa*, 2<sup>nd</sup> instar larvae, (FB); Malvaglia, April 1950, *Castanea sativa*, female, (FB); Sion, 25.5.1965, *Quercus pedunculata*, female, (EG); Zürich, 26.4., *Ulmus* sp., dead female, F=1 (3874).
- Diaspis boisduvali* SIGNORET, 1869 – Tenero, 15.10.1951, *Orchis* sp. female, (EG).
- Dynaspidiotus britannicus* (NEWSTEAD, 1898) – Wädenswil, 20.4.1950, *Hedera helix*, 2<sup>nd</sup> instar larvae, (FB).
- Epidiaspis leperii* (SIGNORET, 1869) – Gudo, 6.4.1950, *Crataegus oxyacantha*, female, (FB); Petit-Lancy, *Malus pumila*, female, (EG); Genève, 11.1.1967, *Amelanchier alnifolia*, female, (EG); Noes, 19.5., *Pyrus communis*, on branches, female, eggs, F=3 (3962); Zürich, 30.4., *Malus pumila*, female, F=1 (3887); Zürich, 26.5., *P. communis*, female, eggs, F=2 (3977).
- Furchadaspis zamiae* (MORGAN, 1890) – Gudo, 11.7.1961, *Cycas* sp., female, (EG).
- Lepidosaphes conchiformis* (GMELIN, 1789). – Riehen, 10.4.1979, *Syringa vulgaris*, female, (FB).
- Lepidosaphes minima* (NEWSTEAD, 1897) – Genève, 15.12.1966, *Alnus rubra*, female, (EG).
- Lepidosaphes ulmi* (LINNAEUS, 1758) – Bad Ragaz, 24.4., *Malus pumila*, on branches, dead female, eggs, F=1 (3872); Conthey, 19.5., *Quercus robur*, dead female, F=2 (3956); Lindau, 8.10., *M. pumila*, F=2 (4087); Noes, 19.5., *M. pumila*, dead female, eggs, 1<sup>st</sup> instar larvae, F=2 (3963); Noes, 19.5., *Populus nigra*, dead female, eggs, 1<sup>st</sup> instar larvae, F=3 (3961); Richterswil, 22.4., *M. pumila*, dead female, F=1 (3868); Sion, 18.5., *Prunus cerasi*, dead female, eggs, 1<sup>st</sup> instar larvae, F=1 (3955); Wädenswil, 27.4., *M. pumila*, dead female, eggs, F=1 (3882); Winterthur, 8.10., *M. pumila*, eggs, F=1 (4085); Winterthur, 8.10., *Ribes rubrum*, eggs, F=1 (4086); Zürich, 30.4., *Ribes nigrum*, dead female, F=1 (3888); Zürich, 26.5., *M. pumila*, dead female, F=3 (3982).
- Lepidosaphes newsteadi* (ŠULC, 1895) – Alvaschein, 31.3.1954, *Pinus silvestris*, female, (FB); Muri, 7.5., *Abies* sp., on needles, dead female, F=1 (3915).
- Leucaspis loewi* COLVÉE, 1882 – Muri, 4.12.48, *Pinus* sp., 2<sup>nd</sup> instar larvae, (FB); Alvaschein, 31.3.1954, *Pinus silvestris*, 2<sup>nd</sup> instar larvae, (FB); Conthey, 19.5., *Pinus mugo*, on needles, female, F=4 (3966); Sion, 18.5., *P. nigra*, female, eggs, F=3 (3947, 3948); Wädenswil, 24.4., *P. mugo*, 2<sup>nd</sup> instar larvae, male nymph, F=3 (3869); Wädenswil, 27.4., *P. nigra*, female, male pronymph and nymph, 2<sup>nd</sup> instar larvae, F=3 (3884); Zürich, 3.5., *P. mugo*, female, puparium, F=3 (3901); Zürich, 10.5., *P. pumila*, puparium, F=1 (3925); Zürich, 10.5., *P. thunbergiana*, puparium, F=2 (3926); Zürich, 10.5., *P. uncinata*, female, puparium, 2<sup>nd</sup> instar larvae, F=2 (3927).
- Leucaspis pini* (HARTIG, 1939) – Alvaschein, 31.3.1954, *Pinus silvestris*, 2<sup>nd</sup> instar larvae, (FB); Gersau, 15.5., *Pinus mugo*, on needles, female, F=2 (3936); Zürich, 3.5., *P. nigra*, female, puparium, F=3 (3902); Zürich, 3.5., *P. silvestris*, female, puparium, 2<sup>nd</sup> instar larvae, F=3 (3903).
- Leucaspis pusilla* LÖW, 1883 – Noes, 19.5., *Pinus nigra*, female, male, eggs, F=3 (3960).
- Nuculaspis abietis* (SCHRANK, 1776) – Alvaschein, 31.3.1954, *Pinus silvestris*, 2<sup>nd</sup> instar larvae, (FB); Otelfingen, 19.11.1953, *Abies alba*, female, (FB); Gersau, 15.5., *Pinus mugo*, on the needles, female, F=1 (3936); Muri, 4.12.1948, *Pinus* sp., 2<sup>nd</sup> instar larvae, (FB); Muri, 7.5., *Abies* sp., female, 2<sup>nd</sup> instar larvae, F=1 (3915); Wädenswil, 19.12.1953, *Abies alba*, female, (FB); Wädenswil, 21.4., *Picea abies*, female, F=1 (3864); Wädenswil, 24.4., *P. mugo*, dead female, F=1 (3869); Wädenswil, 27.4., *P. nigra*, female, 2<sup>nd</sup> instar larvae, F=1 (3884); Zürich, 10.5., *P. uncinata*, female, F=1 (3927).
- Parlatoria pergandei* COMSTOCK, 1881 – Muralto, 20.9.1958, *Camelia* sp., female, (EG).

- Pseudaulacaspis pentagona* (TARGIONI-TOZZETTI, 1886) – Wädenswil, 15.9., *Aesculus hippocastanum*, female, F=2 (4066); Wädenswil, 8.5., *Juglans nigra*, on branches and stem, female, F=2 (3917); Wädenswil, *Sophora japonica*, female, F=4 (3916); Wädenswil, 17.5., *Aesculus pavia*, female, F=3 (3945); Zürich, 3.5., *S. japonica*, F=4 (3904); Winterthur, *Campsis* sp., only dead females, F=3 (FB); Nyon, 25.6.-17.8., *Choysia ternata*, males collected by pheromone traps; Cadenazzo, 26.6.-28.7., *J. regia*, males collected by pheromone traps; Muzzaro, 26.6.-28.7., *S. japonica*, males collected by pheromone traps. – In Switzerland the species was known only in the Ticino (BOVEY, 1979). Recently it was reported from Nyon (BAGGIOLINI *et al.*, 1993). We can expect a spread into other parts of the country, seriously damaging ornamental trees. Later it may infest orchards. Results of a more detailed survey will be the subject of another paper.
- Quadraspidiotus gigas* (THIEM & GERNECK, 1934) – Loco, 6.12.1949, *Salix* sp., 2<sup>nd</sup> instar larvae, (FB); Zürich, 8.12.1948, *Salix* sp., 2<sup>nd</sup> instar larvae, (FB); La Sarraz, 22.12.1959, *Salix* sp., 2<sup>nd</sup> instar larvae, (EG); La Sarraz, 23.11.1964, *Populus* sp., 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, (EG); Adliswil, *Populus* sp., 31.8.1948, 2<sup>nd</sup> instar larvae; Noes, 19.5., *Populus nigra*, on branches, dead female, F=1 (3961); Zürich, 3.5., *P. simonii*, dead female, F=1 (3909).
- Quadraspidiotus labiatarum* (MARCHAL, 1909) – *Thymus serpyllum*, on the leaves and branches, dead female, F=2 (3958).
- Quadraspidiotus lenticularis* (LINDINGER, 1912) – Zizers, 15.10.1947, *Prunus domestica*, female, (FB); Wädenswil (Au), 7.4.1950, *Quercus* sp., female, (FB); Gudo, 11.4.1950, *Quercus* sp., female, (FB); Verscio, 18.5.1953, *Castanea sativa*, female, (FB); Saxon, Februar 1959, *Prunus* sp., female, (EG); Châteauneuf, 3.2.1960, *Quercus pedunculata*, female, (EG); Genève, 30.6.1961, *Ribes* sp., female, (EG); Changins, 30.4.1965, *Ribes* sp., female, (EG); Founex, 14.9.1988, *Ribes rubrum*, female, (EG).
- Quadraspidiotus marani* ZAHRADNIK, 1952 – Yverdon, 6.9.1947, *Malus pumila*, female, (EG); Vallorbe, 10.3.1953, *Pyrus communis*, female, (EG); Saxon, 29.12.1959, *Malus pumila*, female, (EG); Fully, 4.11.1959, *Pyrus communis*, female, (EG); Nyon, 20.1.1960, *Fraxinus excelsior*, female, (EG); Nyon, 21.1.1960, *Prunus spinosa*, female, (EG); Pont Riddes, *Malus pumila*, female (EG); Pont Russin, 10.2.1960, (EG); Châteauneuf, 18.3.1963, *Pyrus communis*, female, (EG); Gelfingen, 7.5., *Malus pumila*, on the branches, female, F=1 (3914); Uttwil, 13.10., *M. pumila*, female, male, 2<sup>nd</sup> instar larvae, F=2 (4095); Wädenswil, 20.10., *M. pumila*, female, F=2 (4099). – The spread of this species (as *Q. schneideri*) was described by BACHMANN (1953).
- Quadraspidiotus ostreaeformis* (CURTIS, 1843) – Verscio, 18.5.1953, *Betula alba*, *Populus* sp., female, (FB); Bätterkinden, 13.8.1950, *Pyrus communis*, female, 2<sup>nd</sup> instar larvae, (FB); Boncourt, 22.4.1953, *Tilia* sp., female, (FB); Otelfingen, 31.1.1953, *Prunus cerasus*, 2<sup>nd</sup> instar larvae, (FB); Männedorf, 20.3.1950, *Aesculus hippocastanum*, 2<sup>nd</sup> instar larvae, (FB); Winterthur, 7.3.1948, *Betula alba*, 2<sup>nd</sup> instar larvae, (FB); Gudo, 3.3.1950, *Alnus* sp., female, (FB); Uznach, 26.3.1952, *Malus pumila*, 2<sup>nd</sup> instar larvae; Frauenfeld, 21.12.1949, not identified host plant, female, (FB); Au, 7.4.1950, *Salix* sp., 2<sup>nd</sup> instar larvae, (FB); Le Prese, 7.5.1947, *Prunus* sp., female, (FB); Landquart, 8.6.1949, *Betula alba*, female, (FB); Saxon, 10.6.1948, *Malus pumila*, female, (FB); Changins, 3.12.1963, *Betula alba*, 2<sup>nd</sup> instar larvae, (EG); Obrist Riddes, 20.5.1959, *Malus pumila*, female, (EG); Pont Russin, 10.2.1961, *Ligustrum* sp., 2<sup>nd</sup> instar larvae, (EG); Genève, 15.12.1964, *Alnus rubra*, 2<sup>nd</sup> instar larvae, (EG); Russin, 16.11.1964, *Corylus avellana*, 2<sup>nd</sup> instar larvae, (EG); Nyon, 30.11.1965, *Carpinus* sp., 2<sup>nd</sup> instar larvae, (EG); La Sarraz, 25.5.1965, *Alnus* sp., female, (EG); Bad Ragaz, *Malus pumila*, on the branches and stems, dead female, F=4 (3872); Güttingen, 24.4., *M. pumila*, dead female, male nymph and pronymph, 2<sup>nd</sup> instar larvae, F=3 (3870); Güttingen, 13.10., *M. pumila*, 2<sup>nd</sup> instar larvae, F=2 ((4094); Lindau, 8.10., *Prunus domestica*, 2<sup>nd</sup> instar larvae, F=1 (4088); Muri, 8.5., *Prunus domestica*, female, F=2 (3911); Wädenswil, 30.4., *Betula pendula*, dead female, male nymph and pronymph, 2<sup>nd</sup> instar larvae, F=3 (3886); Richterswil, 22.4., *M. pumila*, dead female, F=1 (3868), Richterswil, 22.4., *P. persicae*, dead female, F=2 (3867); Wädenswil, 27.4., *P. domestica*, female, F=1 (3880); Winterthur, 8.10., *M. pumila*, dead female, 2<sup>nd</sup> instar larvae, F=1 (4085); Zürich, 30.4., *M. pumila*, dead female, F=1 (3887); Zürich, 30.4., *Ribes nigrum*, dead female, 2<sup>nd</sup> instar larvae, F=2 (3888).
- Quadraspidiotus perniciosus* (COMSTOCK, 1881) – Noes, 19.5., *Malus pumila*, on branches, female, F=3 (3963); Saxon, 20.9., *M. pumila*, female, male, 1<sup>st</sup> and 2<sup>nd</sup> instar larvae, F=2 (4077); Sion, 18.5., *Rosa* sp., female, F=3 (3950). – The spread of this species in Switzerland was described by MANI (1970).
- Quadraspidiotus pyri* (LICHTENSTEIN, 1881) – Fully, 4.11.1959, *Pyrus communis*, 2<sup>nd</sup> instar larvae, (EG); Fully, 4.11.1959, *Malus pumila*, 2<sup>nd</sup> instar larvae, (EG); Pont Riddes, 9.1.1961, *Malus pumila*, 2<sup>nd</sup> instar larvae, (EG); Gudo, 25.2.1965, *Prunus avium*, 2<sup>nd</sup> instar larvae, (EG); Changins, 3.12.1965, *Crataegus* sp., 2<sup>nd</sup> instar larvae, (EG); Monteggio, 19.5.1965, *Fraxinus excel-*



- sior*, female, (EG); Gelfingen, 7.5., *Malus pumila*, on branches, female, male pronymph, F=3 (3914); Landquart, 24.4., *Pyrus communis*, male nymph and pronymph, 2<sup>nd</sup> instar larvae, F=4 (3870a); Landquart, 13.10., *P. communis*, on the branches and fruits, 2<sup>nd</sup> instar larvae, F=3 (4092); Landquart, 24.4., *M. pumila*, male nymph and pronymph, 2<sup>nd</sup> instar larvae, F=4 (3871); Landquart, 13.10., *M. pumila*, on branches and fruits, 2<sup>nd</sup> instar larvae, F=3 (4093); Wädenswil, 27.4., *Fraxinus excelsior*, 2<sup>nd</sup> instar larvae, F=1 (3881); Wädenswil, 27.4., *M. pumila*, female, F=1 (3882). – The spread of this species was described by BACHMANN (1953).
- Quadraspidiotus zonatus* (Frauenfeld, 1868) – Winterthur, 11.4.1950, *Quercus* sp., female, (FB); Stäfa, 1.4.1950, *Quercus* sp., female, (FB); Duiller, 15.12.1959, *Quercus pedunculata*, female, (EG); Vich, 8.4.1959, *Quercus* sp., female, (EG); Nyon, 10.12.1960, *Quercus pedunculata*, female, (EG); Pont Russin, 10.2.1961, *Quercus* sp., female, (EG); Châteauneuf, *Quercus* sp., female (EG); Trélex, 26.11.1964, *Quercus pedunculata*, female (EG); Ecône, 17.1.1966, *Quercus* sp., female, (EG); Conthey, 19.5., *Quercus robur*, female, F=1 (3956); Noes, 19.5., *Quercus robur*, female, eggs, 1<sup>st</sup> instar larvae, F=2 (3959); Wädenswil, 2.3.1954, *Fagus sylvatica*, female, (FB); Wädenswil, 27.4., *Quercus robur*, on branches, 2<sup>nd</sup> instar larvae, F=1 (3883).
- Rhizaspidiotus canariensis* (LINDINGER, 1911) – Noes, 19.5., *Thymus serpyllum*, on root, dead female, F=1 (3958).
- Unaspis euonymi* (COMSTOCK, 1881) – Gudo, 22.10.1952, *Euonymus europaeus*, female, (FB); Duiller, 15.12.1959, *Euonymus europaeus*, female, (EG); Thonex, 17.11.1960. *Euonymus* sp., female, (EG).

#### ALEYRODOIDEA

- Aleurochiton acerinus* HAUPT, 1934 – Walenstadt, *Acer campestre*, F=1 (220).
- Aleurochiton aceris* (MODEER, 1778) – Gersau, 6.9., *Acer platanoides*, F=1 (215).
- Aleurochiton pseudoplatani* VISNYA, 1936 – Basel, 15.10., *Acer platanoides*, F=1 (229); Wädenswil, 15.9., *A. platanoides*, F=1 (223).
- Aleyrodes lonicerae* WALKER, 1852 – Unteriberg, 20.9., *Rubus* sp., F=1 (225); Wädenswil, 12.10., *Fragaria* sp., F=1 (228); *Ranunculus* sp., F=2 (224); Wädenswil, 7.9., *Rubus* sp., puparium, adult, F=2 (216).
- Aleyrodes proletella* LINNAEUS, 1758 – Wädenswil, 10.9., *Chelidonium majus*, adult, puparium, eggs, F=3 (218); Wädenswil, 15.9., *Brassica* sp., adult, puparium, F=3 (222).
- Aleyrotrachelus jelineki* (FRAUENFELD, 1867) – Changins, 20.9.1993, *Viburnum tinus*, puparium (collected by S. FISCHER).
- Siphoninus phillyreae* (HALIDAY, 1835) – Feldmeilen, 26.9., *Crataegus monogyna*, F=3 (227); Walenstadt, 12.9., *Fraxinus excelsior*, F=2 (221); Wädenswil, 11.9., *Crataegus intricata*, adult, puparium, F=2 (219); Wädenswil, 7.9., *Fraxinus excelsior*, adult, puparium, F=3 (217).
- Trialeurodes vaporariorum* WESTWOOD, 1856 – Wädenswil (indoor), 22.9., *Solanum melongana*, F=3 (226).

#### LIST OF SPECIES NEW FOR THE FAUNA OF SWITZERLAND

##### 1. Scale insects:

- Orthezia urticae* (LINNAEUS, 1758)  
*Atrococcus cracens* WILLIAMS, 1962  
*Balanococcus boratynskii* WILLIAMS, 1962  
*Coccurea comari* (KÜNOW, 1880)  
*Dysmicoccus walkeri* (NEWSTEAD, 1891)  
*Heliooccus bohemicus* ŠULC, 1912  
*Heterococcus nudus* (GREEN, 1926)  
*Mirococcopsis nagy* KOZÁR, 1981  
*Spinococcus marrubii* (KIRITCHENKO, 1935)  
*Spinococcus multispinosus* (SIRAIWA, 1939)  
*Trionymus penium* (WILLIAMS, 1962) (?)  
*Trionymus perrisii* (SIGNORET, 1875)  
*Acanthococcus greeni* (NEWSTEAD, 1898)  
*Acanthococcus roboris* (GOUX, 1931)  
*Rhizococcus cynodontis* (KIRITCHENKO, 1940)  
*Rhizococcus palustris* DZIEDZICKA & KOTEJA, 1971

*Eupulvinaria hydrangeae* (STEINWEDEN, 1946)  
*Lecanopsis festucae* BORCHSENIUS, 1952  
*Luzulaspis frontalis* GREEN, 1928  
*Luzulaspis kosztarabi* KOTEJA & KOZÁR, 1979  
*Parafairmairia gracilis* GREEN, 1916  
*Parthenolecanium rufulum* (COCKERELL, 1903)  
*Physokermes hemicryphus* (DALMAN, 1826)  
*Pulvinaria regalis* CANARD, 1968  
*Scythia craniumequinum* (KIRITCHENKO, 1938)  
*Asterodiaspis quercicola* (BOUCHÉ, 1851)  
*Planchonia arabidis* SIGNORET, 1877  
*Cerococcus cycliger* GOUX, 1932  
*Aonidia lauri* (BOUCHÉ, 1833)  
*Diaspidiotus osborni* (NEWELL & COCKERELL, 1898)  
*Diaspis bouisduvalii* SIGNORET, 1869  
*Lepidosaphes minima* (NEWSTEAD, 1897)  
*Leucaspis pusilla* LÖW, 1883  
*Rhizaspidotus canariensis* (LINDINGER, 1911)

## 2. Whiteflies:

*Aleurochiton acerinus* HAUPT, 1934  
*Aleurochiton aceris* (MODEER, 1778)  
*Aleurochiton pseudoplatani* VISNYA, 1936  
*Aleurotrachelus jelineki* (FRAUENFELD, 1867)  
*Aleyrodes loniceræ* WALKER, 1852  
*Siphoninus phillyrae* (HALIDAY, 1835)

## DISCUSSION

Our survey has increased the number of recorded species of scale insects in Switzerland considerably. New species were mainly found in families such as Pseudococcidae (11), Coccidae (9) and Eriococcidae (4), on which very few studies have been done so far. Several species already published for the Swiss fauna (LINDINGER, 1912; KOSZTARAB AND KOZÁR, 1988) were not found by us:

*Porphyrophora polonica* (LINNAEUS, 1758)  
*Xylococcus filiferus* LÖW, 1882  
*Puto antennatus* SIGNORET, 1875  
*Lecanopsis formicarum* NEWSTEAD, 1893  
*Parthenolecanium persicae* (FABRICIUS, 1776)  
*Acanthococcus devoniensis* (GREEN, 1896)  
*Carulaspis visci* (SCHRANK, 1781)  
*Chionaspis austriaca* LINDINGER, 1912  
*Chionaspis lepineyi* BALACHOWSKY, 1928  
*Diaspidiotus distinctus* (LEONARDI, 1900)  
*Lepidosaphes juniperi* LINDINGER, 1912.

HADORN (1940) collected scale insect species in Swiss greenhouses. The following list gives the current names of those species not found by us:

*Orthesia insignis* DOUGLAS, 1887  
*Nipaecoccus nipae* (MASKELL, 1893) (= *Ceroputo nipae*)  
*Pseudococcus longispinus* (TARGIONI-TOZZETTI, 1868) (= *P. adonidum*)  
*Rhizoecus falcifer* KÜNCKEL D'HERCULAIS, 1878 (= *Ripersia (Rhizoecus) falcifera*)  
*Coccus longulus* (DOUGLAS, 1887) (= *Lecanium elongatum*)  
*Saissetia oleae* (OLIVIER, 1791) (= *Lecanium oleae*)  
*Parasaissetia nigra* (NIETNER, 1861)  
*Chrysomphalus dictyospermi* (MORGAN, 1889)  
*Chrysomphalus aonidum* (LINNAEUS, 1758) (= *C. ficus*)

*Hemiberlesia lataniae* (SIGNORET, 1869) (= *Aspidiotus lataniae*)  
*Diaspis bromeliae* (KERNER, 1778)  
*Diaspis echinocacti* (BOUCHÉ, 1833)  
*Diaspis cymbidii* McINTIRE, 1888  
*Pinnaspis aspidistrae* (SIGNORET, 1869)  
*Eucornuaspis pinnaeformis* (BOUCHÉ, 1851) (= *Lepidosaphes tuberculata* = *L. pinniformis*)  
*Mycetaspis personata* (COMSTOCK, 1889) (= *Melanaspis personata*)  
*Asterolecanium epidendri* (BOUCHÉ, 1844) (= *A. aureum*).

Because of the synonymy of *L. tuberculata* the total number of the species recorded from greenhouses is 28; 11 of them we found and also cited in our list. The 3 species *I. purchasi*, *C. floccifera* and *D. britannicus* listed by HADORN are mainly found in the nature, so we transferred them to the list of natural species.

The total number of all species recorded from Switzerland (from nature and greenhouses) is now 115; 90 of them can be considered as “natural” and 25 as “greenhouse” species. The real total number must be much higher, probably more than 200. This guess can be made considering the 233 species known for Central Europe (KOSZTARAB & KOZÁR, 1988) and considering additional Mediterranean species probably living in the south of Switzerland. As expected we found the most interesting species in warm, dry regions such as the Valais. Another important site was Gersau-Oberholz at the border of Lake Lucerne. RÉZBÁNYAI-RESER (1984) had shown before that the fauna of this warm and sunny place is especially rich. Step-pic elements typical for Hungary and Russia are rarely found in Switzerland. Therefore the detection of *Scythia craniumequinum* on *Stipa* in Sion is worth mentioning. The insect was found in a place where the climate and flora resemble the steppe more than at any other place in Switzerland. *Spinococcus multispinus* on *Thymus* in Sion was found for the first time in Europe. This shows that the European fauna, well studied in many countries, is far from being complete.

Some remarkable catches of thermophilous species have been made: *Coccus hesperidum*, a species normally living only indoors in our region, has been found outdoors in Wädenswil and Zürich. *Chloropulvinaria floccifera* and *Eupulvinaria hydrangeae*, two thermophilous species, have also been detected in high density in different locations. A general increase has also taken place in some scale pests of ornamentals and fruit trees in the last years. *Pseudaulacaspis pentagona* has obviously extended its range of distribution. The population densities of *Quadraspidiotus perniciosus*, *Q. marani*, *Q. pyri*, *Q. ostreaeformis*, *Lepidosaphes ulmi* and *Parthenolecanium corni* have distinctly increased after many years of low occurrence (MANI *et al.*, 1993; WILDBOLZ, 1992). The reasons for this increase may be at least partially meteorological. The last years were in general characterised by mild winters and by periods of warm weather in summer and autumn.

Our survey has also increased the list of whitefly species of Switzerland: 9 species have now been recorded. More species may be found in the future since the whitefly fauna of Central Europe comprises about 20 species (MOUND & HALSEY, 1978; KOZÁR & BINK-MOENEN, 1988). In the southern regions of the country some Mediterranean species may also be present.

In conclusion, we see that Switzerland has a rich fauna of scale insects and whiteflies. However, further studies are necessary to complete our knowledge.

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## REFERENCES

- ARN, H., RAUSCHER, S. & SCHMID, A. 1979. Sex attractant formulations and traps for the grape moth *Eupoecilia ambiguella* Hb. *Mitt. schweiz. ent. Ges.* 52: 49-55.
- BACHMANN, F. 1952. *Quadraspidiotus schneideri* n. sp. eine neue Schildlausart. *Mitt. schweiz. ent. Ges.* 25: 357.
- BACHMANN, F. 1953. Untersuchungen an den gelben Obstbaumschildläusen *Quadraspidiotus pyri* LICHT. und *Quadraspidiotus schneideri* n.sp. *Z. angew. Ent.* 34: 357-404.
- BACHMANN, F. & GEIER, P. 1950. Einige für die Schweiz neue oder wenig bekannte Cocciden aus der Unterfamilie der Diaspidinae. *Mitt. schweiz. ent. Ges.* 23: 117-119.
- BAGGIOLINI, M., GUIGNARD, E. & BLOESCH, B. 1993. Foyers de cochenille du mûrier, *Pseudaulacaspis pentagona* TARG. (Homoptera, Diaspididae), observés dans la région de la Côte lémanique. *Rev. suisse Vitic. Arboric. Hortic.* 25: 161-165.
- BOVEY, R. 1979. *La défense des plantes cultivées*. 7<sup>e</sup> édition, Editions Payot Lausanne, 864 pp.
- DANZIG, E. M. 1980. *Coccoids of the Far East USSR* (In Russian). Nauka, Leningrad, 367 pp.
- GEIER, P. 1949. Contribution à l'étude de la Cochenille rouge du poirier (*Epidiaspis leperii* SIGN.) en Suisse. *Rev. Pathol. vég. Entomol. agr. France* 28: 177-264.
- GEIER, P. & BAGGIOLINI, M. 1950. Quelques observations sur la biologie de *Pericerya purchasi* MASK. au Tessin (Homopt. Margaroid.). *Mitt. schweiz. ent. Ges.* 23: 104-116.
- HADORN, C. 1940. Die Schildlausfauna unserer Gewächshäuser. Arbeit aus der Chemischen Fabrik Dr. R. Maag, Dielsdorf-Zürich. *Schweizer Garten*, 3-15.
- KOCH, W. 1989. *Bemisia tabaci*, eine "neue" Weisse Fliege in Gewächshauskulturen. *Gärtnermeister* 92: 242-243.
- KOSZTARAB, M. & KOZÁR, F. 1988. *Scale Insects of Central Europe*. Akadémiai Kiadó, Budapest, 456 pp.
- KOZÁR, F. & BINK-MOENEN, R. M. 1988. New data to the knowledge of the whiteflies of the Palearctic Region (Homoptera: Aleyrodoidea). *Folia entomol. hung.* 49: 117-121.
- KOZÁR, F. & ELEKESNÉ KAMINSZKY, M. (eds.). 1991. The appearance of a new pest, *Bemisia tabaci* GENNADIUS 1889 (Homoptera, Aleyrodidae) in Hungary. (In Hungarian). *Növényvédelem* 27: 460-463.
- KOZÁR, F., TSALEV, M., VIKTORIN, A. R. & HORVÁTH, J. 1979. New data to the knowledge of the scale insects of Bulgaria (Homoptera, Coccoidea). *Folia entomol. hung.* 32: 129-132.
- LINDINGER, L. 1912. *Die Schildläuse (Coccidae) Europas, Nordafrikas und Vorderasiens, einschliesslich der Azoren, der Kanaren und Madeiras*. Ulmer, Stuttgart, 388 pp.
- MANI, E. 1970. Die San José-Schildlaus als neuer Schädling im Gebiet Basel/Riehen. *Der Gartenbau* 47: 2150-2152.
- MANI, E., HIPPE, C. & SCHWALLER, F. 1993. Vermehrtes Auftreten von Austernschildläusen in Obstanlagen. *Schweiz. Z. Obst- u. Weinbau* 129: 299-302.
- MANI, E. & STAUB, A. 1966. Ein ungewohnt starkes Auftreten der Weidenschildlaus (*Chionaspis salicis* L.) auf Obstbäumen. *Schweiz. Z. Obst- u. Weinbau* 102: 339-346.
- MOUND, L. A. & HALSEY, S. H. 1978. *Whitefly of the world*. British Museum (Natural History). John Wiley and Sons, Chichester-New York-Brisbane-Toronto, 340 pp.
- RÉZBÁNYAI-RESER, L. 1984. Zur Insektenfauna von Gersau-Oberholz, Kanton Schwyz. *Entomol. Ber. Luzern* 11: 1-22.
- SUTER, P. 1950. Zur Biologie von *Lecanium corni* BCHÉ (Homopt. Coccid.). *Mitt. schweiz. ent. Ges.* 23: 95-103.
- VOGEL, W. & BACHMANN, F. 1956. Die Astproben-Untersuchung als Prognosemethode für das Auftreten wichtiger Schädlinge im Obstbau. *Flugschrift Nr. 57, Eidg. Forschungsanstalt f. Obst-, Wein- u. Gartenbau, Wädenswil*, 20 pp.
- WILDBOLZ, Th. 1992. Pest situations in orchards evolving: Natural and man made factors. *Acta phytopath. entomol. hung.* 27: 669-678.

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