

## NEW RECORDS OF APHIDS (*HEMIPTERA: APHIDOIDEA*) AND THEIR HOST-PLANTS FROM NORTHERN CHILE

OLE E. HEIE<sup>1</sup>, JAN PETTERSSON<sup>2</sup>, EDUARDO FUENTES-CONTRERAS<sup>3</sup> AND HERMANN M. NIEMEYER<sup>3</sup>

### ABSTRACT

A list of eleven aphid species collected in the "Norte Chico" area in northern Chile is given. *Aphis danielae* Remaudière, *Eucarazzia elegans* (Ferrari) and *Hysteroneura setariae* (Thomas) are new records to Chile. In the collections seven species are agriculturally important pests introduced from the Northern hemisphere and only two are native to South America (*A. danielae* and *Uroleucon macolai* (Blanchard)), in accordance with previous experiences of a poor endemic aphid fauna in the Southern hemisphere. This could be explained by Heie's hypothesis based on palaeontological data.

### RESUMEN

Se entrega una lista de once especies de áfidos colectados en el "Norte Chico" de Chile. Las especies *Aphis danielae* Remaudière, *Eucarazzia elegans* (Ferrari) e *Hysteroneura setariae* (Thomas) son nuevos registros para Chile. En las recolecciones realizadas se encontraron siete especies que son plagas de importancia agrícola introducidas desde el hemisferio Norte y solo dos son nativas de América del Sur (*A. danielae* y *Uroleucon macolai* (Blanchard)), coincidiendo con estudios anteriores que reportan una fauna endémica de áfidos pobre para el hemisferio Sur. Esto podría ser explicado por la hipótesis de Heie basada en datos paleontológicos.

### INTRODUCTION

The aphid fauna of Chile seems to be very poor relative to areas of the Northern hemisphere of similar size. In particular, for Chile only 133 species have been previously reported in the literature, with 31 native representatives, many of them shared with Argentina (Smith & Cermeli, 1979; Carrillo, 1980; Quednau, 1990; Remaudière *et al.*, 1993-I Stary *et al.*, 1993; Quednau & Remaudière, 1994; Stary, 1995, Carvalho *et al.*, in press; Fuentes-Contreras *et al.*, unpublished data). This

paucity of the Chilean aphid fauna may be the result of large scale biogeographic and palaeontological processes as proposed by Heie (1994a, 1994b), but the lack of basic research on economically unimportant aphid species means that the species richness probably will be found to be larger in the future.

In order to increase the scant available information about Chilean aphids in noncultivated habitats, aphids and their host plants were collected in areas of the "Norte Chico" with special attention to the native flora. The list of aphids given below shows a total of ten aphid species on native plants, three of them being new to Chile. Also, the records of aphid host plant associations with native plant species are given.

<sup>1</sup>Department of Biology, DLH, Emdrupvej IO 1, DK-2400 Copenhagen NV, Denmark.

<sup>2</sup>Department of Entomology, Swedish University of Agricultural Sciences, P.O. Box 7044, S-750 07 Uppsala, Sweden.

<sup>3</sup>Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile, Casilla 653, Santiago, Chile.

(Received: July 9, 1996. Accepted: August 24, 1996)

### MATERIALS AND METHODS

During October 1991 collections of aphids and

their host plants were carried out at the following locations: site A: near Vicuña, 30°01'S-70°41'W, on October 18, 1991; site B on orange trees in the town of Vicuña, 30°01'S-70°42'W, on October 18, 1991, site C: East of Vicuña, 30°00'S-70°31'W, on October 19, 1991, site D: West of Vicuña, 30°00'S-70°48'W, on October 20, 1991; site E: near Domeyko 28°57'S-70°53'W, on October 21, 1991; site F, near La Serena, 29°51'-71°15', on October 21, 1991.

The aphids were collected in 70% ethanol, later preserved by mounting them in Euparal and identified by Ole E. Heie. Samples of host plants were identified by Sebastian Teillier and deposited in the herbarium at Museo Nacional de Historia Natural, Santiago, Chile. Aphid samples are deposited at Zoological Museum at Copenhagen.

For original references of cited species see Nieto Nafría *et al.*, (1994), Remaudière (1994), Remaudière *et al.*, (1991) and Smith & Cermeli (1979).

## RESULTS AND DISCUSSION

### List of aphids collected

The species are listed in alphabetical order. An asterisk (\*) designates a species new to Chile.

*Acyrtosiphon kondoi* Shinji: site D (see collection sites above), on *Melilotus albus* Desr. (Fabaceae); site E, 3 alate females on *Caesalpinia angulicaulis* Clos (Caesalpinaceae). It lives on many species of Fabaceae (Leguminosae) e.g. *Medicago*, *Melilotus* and *Trifolium* spp., and is an occasional pest to these plants in Chile. It is of East Asian origin and now nearly cosmopolitan; in the Neotropical region known from Argentina, Bolivia, Chile and Mexico (Smith & Cermeli, 1979; Remaudière *et al.*, 1991).

\* *Aphis danielae* Remaudière: site A, on *Lycium stenophyllum* Remy (a large colony) and on a cactus *Echinopsis chilensis* (Colla) Friedr. et Rowl. (colonies on buds). Remaudière (1994) described material collected on *Lycium* sp., *L. chilensis* and *Schinus polygamus* (probably not a host) in three localities in Argentina. The normal host is probably *Lycium*. The species is rather similar to *Aphis craccivora* Koch, but its processus terminalis is much shorter. In the Neotropical region it is de-

scribed from Argentina and now also found in Chile.

*Aphis spiraecola* Patch, (= *A. citricola* v.d. Goot, of authors as listed in Blackman & Eastop, 1994): site C, on *Calandrinia parviflora* Phil. (Portulacaceae) and *Oenothera picensis* Phil. (Onagraceae). site B, on *Citrus nobilis*; site F, on *Bahia ambrosioides* Lag. (Asteraceae); site E, on *Caesalpinia angulicaulis* Clos (Caesalpinaceae). The species is polyphagous. It is widespread in warm climates; in the Neotropical region known from, Argentina, Bolivia, Brazil, Caribbean Islands, Central America, Chile, Colombia, Peru, Surinam and Venezuela (Smith & Cermeli, 1979, as *A. citricola* v.d. Goot).

*Brevicoryne brassicae* (Linné): site A, on *Hirschfeldia incana* (R. et Pav.) Pers. (Brassicaceae). It lives on many species of Brassicaceae and on *Tropaeolum* (Tropaeolaceae). It is of Palearctic origin, but now cosmopolitan, in the Neotropical region it is known from Argentina, Bolivia, Brazil, Caribbean Islands, Central America, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela (Smith & Cermeli, 1979).

\* *Eucarazzia elegans* (Ferrari): site A, on *Phrodus microphyllus* (Miers) Miers (Solanaceae), one alate female. The hosts of this species belong to the Lamiaceae. The chief distinguishing characters are triangular shadows surrounding the ends of the wing veins and strongly swollen siphunculi. It is probably of Mediterranean origin, but now widely distributed in tropical and subtropical regions, in the Neotropical region recorded from Bolivia (Remaudière *et al.*, 1991) and now also Chile.

\* *Hysteroneura setariae* (Thomas): site A, on *Stipa* cfr. *speciosa* Trin. et Rupr. (Poaceae). It lives on many grasses. The chief distinguishing characters are the long processus terminalis and the pale cauda. The body color is brown. Widely distributed in warm climates; in the Neotropical region: Argentina, Bolivia, Brazil, Caribbean Islands, Colombia, Honduras, Peru, Surinam and Venezuela (Smith & Cermeli, 1979) and now also Chile.

*Lipaphis erysimi* (Kaltenbach): site A, on *Hirschfeldia incana* (R. et Pav.) Pers. (Brassicaceae). The species lives on many species

of Brassicaceae. It is cosmopolitan, outside Europe usually recorded as *L. pseudobrassicae* (Davis, 1914); in the Neotropical region known from Argentina, Bolivia, Brazil, Chile, Caribbean Islands, Colombia, Honduras, Mexico, Peru, Surinam and Venezuela (Smith & Cermeli, 1979).

*Macrosiphum euphorbiae* (Thomas): site C, on *Alstroemeria* cfr. *leporina* Bayer et Grau (Amaryllidaceae) and *Veronica anagallis-aquatica* L. (Scrophulariaceae); site D, on *Sonchus asper* (L.) J. Hill (Asteraceae) and *Pluchea absinthioides* (H. et Arn.) H. Rob. et Cuatrec. It is polyphagous and nearly exclusively anholocyclic. It is cosmopolitan; in the Neotropical region known from Argentina, Bolivia, Brazil, Caribbean Islands, Chile, Colombia, Ecuador, Peru and Venezuela (Smith & Cermeli, 1979).

*Metopolophium dirhodum* (Walker): site C, on *Chaetotropis* cfr. *elongata* (H.B.K.) Björk (Poaceae). It alternates between *Rosa* and grasses in the Northern hemisphere, but seems to be anholocyclic in Chile. Further native host-plant records for *M. dirhodum* and other cereal aphids are given by Vargas (1981), Quiroz *et al.* (1986) and Oehrens (1990). In the Neotropical region it has been reported from Argentina, Bolivia, Brazil, Chile, Mexico and Uruguay (Smith & Cermeli, 1979 as *Acyrtosiphum dirhodum* (Walker); Remaudière *et al.*, 1991).

*Myzus persicae* (Sulzer): site A, on *Hirschfeldia incana* (R. et Pav.) Pers. (Brassicaceae). It is polyphagous and may be host alternating between *Prunus* spp. (mainly *P. persica* L.) and a large number of plants, but predominantly anholocyclic on the latter. In Chile, Zúñiga (1968) cited *P. persica* and *P. amygdalus* Batsch. as overwintering hosts and gives further records of secondary host-plants. Cosmopolitan and widespread all over the Neotropical region (Smith & Cermeli, 1979; Nieto Nafría *et al.*, 1994).

*Uroleucon macolai* (Blanchard): site A, on *Baccharis salicifolia* (R. et Pav.) Pers. (Asteraceae), described as *Macrosiphon macolai* by Blanchard (1932) and redescribed by Remaudière *et al.*, (1991), who placed it in the genus *Uroleucon*. The samples deviate from the latter description, probably because the specimens are rather small (about

2.0 mm or less; in material from Bolivia 2.6-3.5 mm); the processus terminalis is shorter (4.3-4.8 x the basal part of antennal segments VI, against 5.4-6.4 x), most specimens have fewer than 5 hairs on tarsal segment I, and the number of caudal hairs is only 6-8 (against 9-14). The species has been found only on *Baccharis salicifolia*, *B. polifolia* and *B. sp* in Argentina, Chile and Bolivia (Nieto Nafría *et al.*, 1994).

## ZOOGEOGRAPHICAL NOTES

From the information in the literature (Smith & Cermeli, 1979; Fuentes-Contreras *et al.*, unpublished data) and the present aphid survey it has been confirmed that a large proportion of the aphid species in Chile, as in Bolivia (Remaudière *et al.*, 1991) and Argentina (Nieto Nafría *et al.*, 1994), have been introduced from Europe or North America. Among the eleven species collected in natural habitats and emphasising native plant species, the following seven are agriculturally relevant species that have spread nearly all over the world from the Northern hemisphere: *Acyrtosiphon kondoi*, *Aphis spiraecola*, *Brevicoryne brassicae*, *Lipaphis erysimi*, *Macrosiphum euphorbiae*, *Metopolophium dirhodum* and *Myzus persicae*. An eighth species, *Hysteroneura setariae*, is distributed all over the tropics and part of the subtropics, being new to Chile. Furthermore, *Eucarazzia elegans* is of Mediterranean origin and is also new to Chile and previously recorded from Bolivia (Remaudière *et al.*, 1991). Finally, in this collection only two species are endemic to South America, *Aphis danielae* and *Uroleucon macolai*, both originally described from Argentina.

The reason for the poor representation of species endemic to South America, even in natural habitats, has been given by Heie (1994a, 1994b). An adaptive radiation of Aphididae, the family richest in species today, took place on the Northern hemisphere rather late, after the middle of the Tertiary (probably in the Miocene or later), when the world climate became colder and herbaceous angiosperms formed plant societies covering large areas. Species of this family, which were less specialised than most other aphids at that time, developed a new kind of host alternation, very different from that found in Adelgidae, Pemphigidae, Anoeciidae and Hormaphididae, which was based

mostly on woody hosts, and became adapted to large seasonal oscillations, both climatic and vegetational. In their dispersal southwards, the tropics acted as a barrier except for those polyphagous species able to overwinter anholocyclically. At a biogeographical level, plant diversity in the tropics represents a problem to an alate monophagous aphid trying to find a new host plant after leaving the plant on which it was born, a mechanism proposed by Dixon *et al.*, (1987) to explain the low species richness of aphids in the tropics.

Most Aphididae genera have an Holarctic origin, e.g. also *Aphis* and *Uroleucon*, while genera evolved in the Southern hemisphere belong to families supposed to have been rich in species during the first half of the Tertiary on the basis of available palaeontological data, primarily Drepanosiphidae. In fact, from the 30 native species that are described from Chile, or described from Argentina and subsequently reported as present in Chile, the only two native genera reported to date belong to Drepanosiphidae: *Neuquenaphis* Blanchard (12 species, Quednau & Remaudière, 1994) and *Neosensoriaphis* Quednau (1 species, Blackman & Eastop, 1994), but they represent almost one half of the native species described to date. Other Drepanosiphidae are two species of *Neophyllaphis* Takahashi (Blackman & Eastop, 1994) and *Thripsaphis uncinata* Quednau (Quednau, 1990) adding up to 16 species of this family.

On the other hand, Aphididae is not represented by any native genus and by 15 native species, most of them belonging to the genus *Uroleucon* Mordvilko (9 species, Carvalho *et al.*, in press; Carrillo & Mundaca, 1995), which also has many species in Africa, but few representatives in South America compared with the Northern hemisphere where it has its origin.

The species richness in Chile and in other South American countries is probably much larger than known today, because basic research in non-agricultural areas is lacking. However, this factor may not change the global pattern of aphid diversity between hemispheres. For instance, Dixon *et al.*, (1987) model predicts to Chile more aphids than the species described to date, but this expected diversity is considerably less than the observed mean diversity for countries of the Northern hemisphere. In the meanwhile, further efforts should be done

to increase the knowledge of native aphid diversity. Both *Neuquenaphis* and *Uroleucon*, the two most species-rich genera in Chile and Argentina, continue to yield new species (e.g. Quednau & Remaudière, 1994; Delfino, 1994; Carvalho *et al.*, in press).

#### ACKNOWLEDGEMENTS

We thank Sebastián Teillier for identification of host plant species and to S. Langemark of the Zoological Museum of Copenhagen for mounting the aphids. Financial support of International Program in Chemical Sciences (IPICS) and the Department of Research Cooperation (SAREC, Sweden) is gratefully acknowledged. Eduardo Fuentes-Contreras wishes to acknowledge a Doctoral Fellowship from CONICYT-Chile.

#### LITERATURE CITED

- BLACKMAN, R.L. & V.F. EASTOP. 1994. Aphids on the World's Trees. An identification and Information Guide. CAB International, Cambridge, 986 pp.
- BLANCHARD, E.E. 1932. Aphid miscellanea. Part I. Physis, 11: 19-36.
- CARRILLO, R. 1980. Aphidoidea de Chile III. Agro Sur, 8: 21-29.
- CARRILLO, R. & N. MUNDACA, 1995. Aphidoidea de Chile IV. Agro Sur, 23: 186-188.
- CARVALHO, R.C.Z.; R.L. BLACKMAN & J.M. SPENCE. (in press). The genus *Uroleucon* Mordvilko (Insecta, Aphidoidea) in South America, with a key and descriptions of four new species. Zoological Journal of the Linnean Society.
- DELFINO, M.A. 1994. Descripción de dos nuevas especies de *Uroleucon* (Homoptera: Aphididae). Revista Chilena de Entomología, 21: 31-40.
- DIXON, A.F.G.; P. KINDLMANN; J. LEPS & J. HOLMAN. 1987. Why are there so few species of aphids, especially in the tropics?. American Naturalist 129: 580-592.
- HEIE, O.E. 1994a. Why are there so few aphid species in the temperate area of the Southern hemisphere?. European Journal of Entomology, 91: 127-133.
- HEIE, O.E. 1994b. Aphid ecology in the past and a new view on the evolution of Macrosiphini. In: Leather, S.; A.D. Watt; N.J. Mills & K.F.A. Walters. Individuals, Populations and Patterns in Ecology, pp. 409-417. Intercept, Andover.
- NIETO NAFRÍA, J.M., M.A. DELFINO & M.P. MIER DUARTE. 1994. La afidofauna de la Argentina, su conocimiento en 1992. Secretariado de Publicaciones Universidad de León, León. 235pp.
- OEHRENS, M.A. 1990. Interacciones entre los áfidos del trigo y sus enemigos biológicos en un cultivo de trigo y en gramíneas

- silvestres de la precordillera de la Región Metropolitana (Chile). MSc Thesis. Universidad de Chile. 107 pp.
- QUEDNAU, F.W. 1990. Two new genera and three new species of Drepanosiphinae aphids from the Nearctic and Neotropical regions (Homoptera-Aphididae). *Canadian Entomologist*, 122: 907-919.
- QUEDNAU, F.W. & G. REMAUDIÈRE. 1994. Le genre sud-américain *Neuquenaphis* E.E. Blanchard, description de deux nouvelles espèces et définition de nouvelles sous-familles d'Aphididae (Homoptera). *Bulletin de la Société Entomologique de France*, 99: 365-384.
- QUIROZ, C.E., E. ZÚÑIGA & A. RAMÍREZ. 1986. Vegetación cordillerana costera y andina como fuente de áfidos (Homoptera: Aphididae) que afectan la producción de trigo. *Agricultura Técnica (Chile)*, 46: 271-276.
- REMAUDIÈRE, G. 1994. Reuve et clé des espèces sud-américaines d'Aphidina et description d'un *Aphis* nouveau. *Revue Française d'Entomologie (N.S.)*, 16: 109-119.
- REMAUDIÈRE, G.; N. WEEMALS & J. NICOLAS. 1991. Contribution à la connaissance de la faune aphidienne de la Bolivie (Homoptera: Aphididae). *Parasitica*, 47: 19-46.
- REMAUDIÈRE, G.; P. STARÝ & M. GERDING. 1993. *Sitobion fragariae* (Walker) y *Metopolophium festucae cerealium* Stroyan (Homoptera: Aphididae), dos nuevos áfidos de los cereales en Chile. *Agricultura Técnica (Chile)*, 53: 91-92.
- SMITH, C.F. & M.M. CERMELI. 1979. An annotated list of Aphididae (Homoptera) of the Caribbean Islands and South and Central America. *North Carolina Agricultural Research Service, Technical Bulletin*, 259: 1-131.
- STARÝ, P. 1995. The Aphidiidae of Chile (Hymenoptera, Ichneumonoidea, Aphidiidae). *Deutsche Entomologische Zeitschrift, N.F.*, 42: 113-138.
- STARÝ, P.; M. GERDING; H. NORAMBUENA & G. REMAUDIÈRE. 1993. Environmental research on aphid parasitoid biocontrol agents in Chile (Hym., Aphidiidae; Hom., Aphidoidea). *Journal of Applied Entomology*, 115: 292-306.
- VARGAS, R.R. 1981. Hospederos secundarios de los áfidos del trigo. *Agricultura Técnica (Chile)*, 41: 269-271.
- ZÚÑIGA, E. 1968. Huéspedes para Chile del áfido *Myzus persicae* (Sulzer). *Revista Chilena de Entomología*, 6: 145-146.