

## Stratigraphic distribution of Aphidfauna (Hom.) in Eastern Andalusian Mountains (South Spain)

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**Key words:** Andalusian; *Aphidoidea*; frequency of occurrence; host associations; vertical distribution.

**Abstract.** A total of 148 aphid species belonging to 69 genera and 7 subfamilies collected over last 40 years in Eastern Andalusian mountains has been analyzed with regard to their vertical distribution pattern, percentage composition at generic and specific level with regard to the total fauna at each altitudinal gradient, rarity and abundance and extent of floral association. Comparison has been made with Eastern Himalayan fauna in India showing some striking similarities and also characteristic differential features.

**Resumen.** *Distribución altitudinal de la afidofauna (Hom.) de las montañas orientales de Andalucía (sur de España).* Denominamos en el presente estudio Montañas orientales de Andalucía los macizos montañosos situados en el oriente andaluz con más de dos mil metros de altura máxima y que reciben una precipitación anual superior a los 400 mm. De la mayoría de ellos (Sierras: Nevada, Mágina y de Cazorla, en las provincias de Granada y Jaén) se poseen suficientes datos afidofaunísticos (ciento cuarenta y ocho especies pertenecientes a sesenta y nueve géneros y siete subfamilias) para analizar la distribución altitudinal de los distintos grupos taxonómicos, relacionándola con otros factores ambientales. Se han comparado los resultados obtenidos con los correspondientes de la parte oriental del Himalaya (India y Bután), observándose notables semejanzas, junto a diferencias relacionadas con el alejamiento biogeográfico de ambas zonas de montaña.

### Introduction

Andalusian is the most meridional Spanish region in the Iberian Peninsula (Figura 1). It lies from East to West and has extension of 87.268 km<sup>2</sup>.

Eastern Andalusian is a very hilly region with several mountains massifs that overpass 2000 m. Some of them (c.f Sierras de Baza, de los Filabres, de María) are particularly dry, with less than 400 mm rain per year. the other ones, though with some differences between them, received more than 600 mm (Bosque Maurrel, 1991; Ortego Alba, 1991).

We have already aphid-faunistic data from the last ones, particularly from: Sierra Nevada, Sierra de Cazorla y Sierra Mágina (Figura. 1). For simplicity reason, in this article we will refer to these ones as Eastern Andalusian Mountains.

The aphid fauna of Eastern Andalusian Mountains have been surveyed by Mimeur (1936), Remaudière (1959, collections made by H. Janetschek and W. Steiner in Sierra Nevada en 1954), Notario *et al.* (1984), Gutiérrez Alaiz *et al.* (1985), Nieto Nafria *et al.* (1986), Meliá (1986), Mier Durante & Nieto Nafria (1988) and

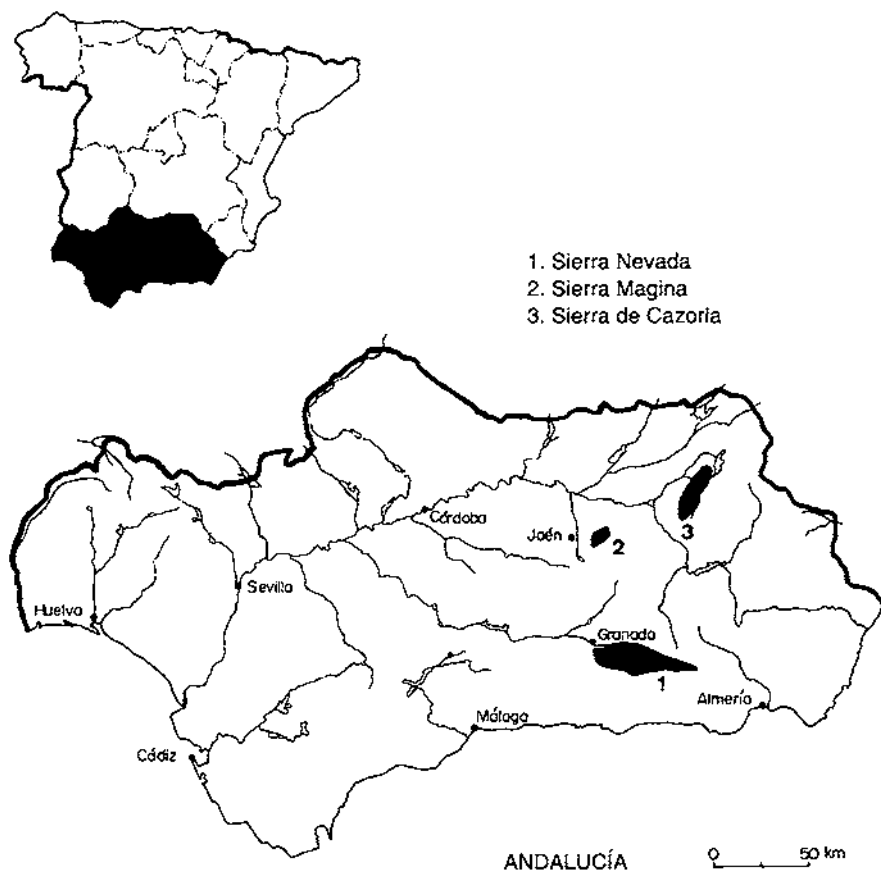


Figure 1. Map showing Andalusian region with Eastern Andalusian Mountains (shaded); inset, map of Spain showing Andalusia (shaded).

Nieto Nafría *et al.* (1990), revealing a total of 148 species belonging to 69 genera and 7 subfamilies (Table 1); this represents approximately 30% of the total Spanish aphid-fauna. The distribution of these species obviously depend on climatic conditions, vegetation and local dispersal pattern. In the present work an effort has been made to analyze the available aphid records from different locales (a total of 41) of Eastern Andalusian Mountains region with regard to their vertical distribution pattern, percentage composition at generic and specific levels and rarity and abundance.

### Material and methods

Aphid material collected during last 40 years from 41 localities located between c 500 m to 3500 m were identified by the authors of the respective articles. The most part of the collections were made by hand from the affected part of the host plant besides by sweeping net and unidentified host plant-parts were preserved in herbaria and later identified by scientist on the Botany, Department of Vegetal Biology of the University of León. All collections were preserved in 70% alcohol and numbered. No trap material has been used for the present study.

These data were systematically collated and analyzed with regard to the subfamily positions, generic and specific taxonomy and host plant associations. The entire collections records were then analyzed with relation to the subfamilies *Pemphiginae*, *Anoeciinae*, *Thelaxinae*, *Chaitophorinae*, *Drepanosiphinae* and *Lachninae*. Percentage composition of the total aphid-fauna with regard to altitudinal gradient, both for the genera and the species under each of the subfamilies has also been analyzed to determine the factors of dominance. The major host associations at subfamily level were analyzed to determine the correlation of this phytophagous group of insects with cultivated or natural vegetation at different gradient level.

An alphabetical list of localities from the collection records and their altitude is given in table 2. It may be noted that majority of the collection localities come under Granada province (Sierra Nevada) except a few from Jaen province (Sierra de Cazorla and Sierra Mágina).

### Results

The analysis shows that the *Aphidinae* forms the single largest group of taxa in the Eastern Andalusian Mountains represented by 40 genera and 97 species (Table 1), with 58% of the total genera and 65.5% of the total species known in the region. When analyzed at different gradient level, the aphidine genera and species represent: 62.2% and 69% in gradient I (500 to 1000 m), 68.5% and 69.5% in gradient II (1000 to 1500 m), 73.7% and 64% in gradient III (1500 to 2000 m), 66.7% for both genera and species in gradient IV (2000 to 2500 m), 42.9% for both genera and

species in gradient V (2500 to 3000 m) and 71.4% for both genera and species in gradient VI (3000 to 3500 m), with regard to the total genera and species in each gradient respectively. Only 24 out of a total of 97 aphidine species have been recorded above *c* 2000 m.

Of the total Aphidid taxa, the genus *Aphis* Linnaeus has a wide spectrum of species (29 out of 148) mostly recorded between *c* 500 m to 1500 m and only 4 of the 29 species have been recorded above *c* 1500 m; of these, *Aphis fabae* Scopoli seems to be abundant and to have exploited maximum altitudinal range and number of floral species while *Aphis gossypii* Glover has only been recorded once by a vagrant alate at the highest stratum (Remaudière, 1959).

Most of the aphidine genera is represented by one or two species while for *Acyrtosiphon* Mordvilko (3 species), *Brachycaudus* Van der Goot (3 species), *Coloradoa* Wilson (3 species), *Macrosiphoniella* Del Guercio (5 species), *Macrosiphum* Passerini (3 species) and *Uroleucon* Mordvilko (7 species) more species have been noted. Needless to mention that the aphidine taxa show the widest host plant spectrum in the entire region of study.

The subfamily *Pemphiginae* (11 genera) shows more generic dominance than *Drepanosiphinae* (9 genera) and *Lachninae* (6 genera) but is represented by only 12 species of which two species have been recorded above *c* 2000 m by vagrants. Host association remain mostly restricted to *Hordeum*, *Pistacia*, *Scirpus* and *Ulmus spp.* Percentage composition of genera and species of *Pemphiginae* with relation to the total aphid taxa at each gradient level has been given in table 3.

The subfamilies *Anoeciinae* and *Thelaxinae* each is obviously represented by a single genus and a species and as such form insignificant component of Eastern Andalusian Mountain fauna; it is however interesting to note that *Anoecia corni* (Fabricius) has only been recorded above *c* 2500 m from *Reseda complicata* (vagrants?) by Remaudière (1959) but *Thelaxes suberi* (Del Guercio) has been recorded a number of times between *c* 500 m to 1500 m from *Quercus spp.* (*Q. rotundifolia* and *Q. pyrenaica*) and once each on an unidentified gramine at *c* 2960 m and 3380 m.

The subfamily *Chaitophorinae* is represented by two genera and 5 species of which the genus *Chaitophorus* Koch occupies predominant position; of the 5 species only one, *C. gomesi* Ilharco has being noted above *c* 1500 m, the usual hosts for *Chaitophorinae* being available below *c* 1500 m (*Acer*, *Populus*, *Salix spp.*). The percentage composition of Chaitophorids is shown in table 3 and the vertical distribution has been observed in table 2.

The subfamilies *Drepanosiphinae* and *Lachninae* each is represented by 16 species (Table 2). While in *Drepanosiphinae* only 2 out of 16 species (9 genera) have been noted above *c* 2000 m, at least 50% of the Lachnids species (under 6 genera) occurred also above *c* 2000 m and in one case *Eulachnus agilis* (Kaltenbach) was recorded at *c* 2820 m on *Pinus* in Sierra Nevada. Percentage composition for group of genera and species for each of these to subfamilies have been given in table 3. The occurrence of Lachnids above *c* 2000 m can be correlated with the preponderance of appropriate conifer hosts at that level (*Pinus spp.*).

### *Rarity and abundance*

Most of the species of aphids in the region seem to be rare in occurrence but all the year round survey may invariably yield a better result. On the basis on random sampling done during five major survey periods, *Aphis fabae* Scopoli, seems to be most frequent in occurrence followed by *Aphis craccivora* Koch, *Brachycaudus helichrysi* (Kaltenbach), *Myzus persicae* (Sulzer), *Macrosiphum rosae* (Linnaeus) and *Uroleucon sonchi* (Linnaeus), all other species have been collected only once to four times. The preponderance of these six common aphid species can be attributed to their ability to feed on a number of host plants or easy availability of cultivated hosts (e.g. *Rosa* for *Macrosiphum rosae*) at different locations.

### **Discussion**

Some of the species, such as *Pemphigus spirothecae*, *Myzocallis castanicola*, *Chaitophorus leucomelas*, *C. salijaponicus niger*, *Brevicoryne brassicae*, *Diuraphis noxia*, *Rhopalosiphum insertum*, *Schizaphis graminum* and *Uroleucon (Uromelan) jaceae*, have not been recorded at certain altitudinal levels, where their presence may be possible due to their relatively abundance in Spain and to the presence of their host plants. There may be a small presence of these species at different levels, which could be detected by a more detailed sampling.

Either way, it is our opinion that these possible changes could not modify the general idea of the altitudinal distribution in the aphids subfamilies at Eastern Andalusian Mountains (Ghosh *et. al.* in press).

The aphid fauna in Eastern Andalusian Mountains shows a positive assemblage at lower altitude between *c* 500 to *c* 2000 m; the vegetation cover being more favorable such occurrence appears rational. However, 148 species recorded hearing appear to be largely restricted to 125 species of flora, both cultivated and wild. Of these, 14 species of flora have so far been used by *Aphis fabae* Scopoli, while *Aphis craccivora* Koch follows with seven host species in the region.

As regards frequency of distribution of aphid taxa, a similarity can be observed between Eastern Himalaya in India and Eastern Andalusian Mountains, where maximum concentration of aphidine species is noted between *c* 600 m to 2400 m (73 to 88%) [Ghosh & Raychaudhuri, 1977]. In terms of percentage composition Aphidine species comprise 66.8% in Eastern Himalaya as against 65.5% in Eastern Andalusian Mountains. The Drepanosiphine fauna in Eastern Himalaya represent 8.6% of the total aphid genera and 13% of the total aphid species as against 10% and 10.8% in Eastern Andalusian Mountains, respectively; the maximum number of the Drepanosiphine aphid occur between *c* 1200-*c* 2400 m in Eastern Himalaya while such concentration is noted at lower altitude between *c* 500 to 1500 m in Eastern Andalusian. The Pemphigine fauna shows preference to higher altitudes in Himalaya (*c* 1201 to 1800 m) in contrast to the fauna in Andalusian region (*c* 500 to 1000 m). Lachnid fauna has in general more representation in the Palearctic

Region and the occurrence of 16 species in Eastern Andalusian Mountains, with maximum concentration between *c* 1000 to 2000 m represent double the number of Lachnid species in Eastern Himalaya largely occurring between *c* 1800 to 2400 m. The edaphic factors and vegetation being different in these two widely separated geographical areas, the level of differences appears logical.

The present study indicates that a proper management strategy for control of aphid pest both on cultivated plants and natural vegetation could be formulated keeping in view the vertical distribution pattern, availability of obligatory or alternate host plants and other related biological parameters.

**Table 1.** Systematic list of aphid species from eastern Andalusian Mountains.

Name of species	Altitude in meters					
	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500
<b>Pemphiginae</b>						
1 <i>Baizongia pistaciae</i> (Linnaeus)	X	X				
2 <i>Colopha hispanica</i> Nieto Nafría et Mier	X	X				
3 <i>Eriosoma lanuginosum</i> (Hartig)	X					
4 <i>Forda marginata</i> Koch	X					
5 <i>Geoica utricularia</i> (Passerini)	X					
6 <i>Kaltenbachiella pallida</i> (Haliday)						X
7 <i>Paracletus cimiciformis</i> Von Heyden	X					
8 <i>Pemphigus groenlandicus crassicornis</i> H.R.L.				X		
9 <i>Pemphigus spirothecae</i> Passerini		X				
10 <i>Smynthuodes betae</i> Westwood	X					
11 <i>Tetraneura akinirae</i> Sasaki	X					
12 <i>Tetraneura ulmi</i> (Linnaeus)	X					
<b>Anoeciinae</b>						
13 <i>Anoecia corni</i> (Fabricius)					X	X
<b>Thelexinae</b>						
14 <i>Thelexes suberi</i> (Del Guercio)	X	X				
<b>Phyllaphidinae</b>						
15 <i>Chromaphis juglandicola</i> (Kaltenbach)	X	X				
16 <i>Drepanosiphum platanoidis</i> (Schrank)				X		
17 <i>Hoplocallis pictus</i> (Ferrari)				X		
18 <i>Myzocallis castanicola</i> (Baker)				X		
19 <i>Myzocallis komareki</i> (Pasek)				X		
20 <i>Myzocallis occidentalis</i> Remaudière et Nieto Nafría				X		
21 <i>Panaphis juglandis</i> (Goeze)	X	X		X	X	X
22 <i>Saltusaphis scirpus</i> Theobald	X					
23 <i>Therioaphis alatina</i> H.R.L. & Van den Bosch	X	X				
24 <i>Therioaphis brachytricha</i> H.R.L. & Van den Bosch	X					
25 <i>Therioaphis ononidis</i> (Kaltenbach)	X					
26 <i>Therioaphis riehmii</i> (Börner)	X					
27 <i>Therioaphis trifolii</i> Monell	X		X			

Table 1. Continuation.

Name of species	Altitude in meters					
	500- 1000	1000- 1500	1500- 2000	2000- 2500	2500- 3000	3000- 3500
28 <i>Tinocallis platani</i> (Kaltenbach)	X					
29 <i>Tinocallis saltans</i> (Nevsky)	X					
30 <i>Tuberculatus remaudierei</i> (Nieto Nafria)	X					
<b>Chaitophorinae</b>						
31 <i>Chaitophorus gomesi</i> Ilharco			X			
32 <i>Chaitophorus leucomelas</i> Koch		X				
33 <i>Chaitophorus populeti</i> (Panzer)	X	X				
34 <i>Chaitophorus salijaponicus niger</i> Mordvilko		X				
35 <i>Periphyllus acericola</i> (Walker)		X				
<b>Lachninae</b>						
36 <i>Cedrobium laportei</i> Remaudière		X	X			
37 <i>Cinara acutirostris</i> Hille Ris Lambers			X			
38 <i>Cinara cedri</i> Mimeur			X			
39 <i>Cinara cupressi</i> (Buckton)	X					
40 <i>Cinara juniperi</i> De Geer	X	X				
41 <i>Cinara maritimae</i> Dufour	X	X				
42 <i>Cinara pinea</i> (Mordvilko)		X	X			
43 <i>Cinara pini</i> (Linnaeus)			X			
44 <i>Cinara tujaphilina</i> (Del Guercio)	X					
45 <i>Eulachnus agilis</i> (Kaltenbach)					X	
46 <i>Eulachnus brevipilosus</i> Börner			X			
47 <i>Eulachnus mediterraneus</i> Binazzi		X				
48 <i>Eulachnus rileyi</i> Williams		X	X			
49 <i>Lachnus roboris</i> (Linnaeus)		X				
50 <i>Schizolachnus pineti</i> (Fabricius)		X				
51 <i>Tuberolachnus salignus</i> (Gmelin)	X					
<b>Aphidinae</b>						
52 <i>Acyrtosiphon malvae</i> (Mosley)	X					
53 <i>Acyrtosiphon pisum pisum</i> (Harris)	X	X				
54 <i>Acyrtosiphon pisum ononis</i> (Koch)		X				
55 <i>Amphorophora rubi</i> (Kaltenbach)		X				
56 <i>Aphis balloticola</i> Szelengiewicz		X				
57 <i>Aphis brotericola</i> Mier	X			X		
58 <i>Aphis chloris</i> Koch	X					
59 <i>Aphis clematidis</i> Koch	X	X				
60 <i>Aphis craccivora</i> Koch	X	X				
61 <i>Aphis cytisorum</i> Hartig	X					
62 <i>Aphis fabae</i> Scopoli	X	X	X			X
63 <i>Aphis farinosa</i> Gmelin		X				
64 <i>Aphis frangulae</i> Kaltenbach		X				
65 <i>Aphis gossypii</i> Glover						X
66 <i>Aphis hederæ</i> Kaltenbach	X	X				
67 <i>Aphis hillerislamberti</i> Nieto Nafria et Mier	X					
68 <i>Aphis intybi</i> Koch		X				

Table 1. Continuation.

Name of species	Altitude in meters						
	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	
	1000	1500	2000	2500	3000	3500	
69 <i>Aphis nasturtii</i> Kaltenbach	X						
70 <i>Aphis nerii</i> Boyer de Fonscolombe	X						
71 <i>Aphis parietariae</i> Theobald			X				
72 <i>Aphis passeriniana</i> (Del Guercio)			X				
73 <i>Aphis pomi</i> De Geer	X						
74 <i>Aphis ruborum</i> Börner	X	X					
75 <i>Aphis sambuci</i> Linnaeus			X				
76 <i>Aphis sanguisorbae</i> Schrank			X				
77 <i>Aphis sedi</i> Kaltenbach			X				
78 <i>Aphis serpylli</i> Koch			X				
79 <i>Aphis spiraeicola</i> Patch	X						
80 <i>Aphis thomasi</i> (Börner)	X						
81 <i>Aphis hrucallis</i> Hille Ris Lambers			X				
82 <i>Aphis ulicis</i> Walker			X	X			
83 <i>Aphis urticata</i> Gmelin			X				
84 <i>Aphis vallei</i> Hille Ris Lambers et Stroyan	X	X					
85 <i>Brachycaudus (B) helichrysi</i> (Kaltenbach)	X	X					
86 <i>Brachycaudus (A.) cardui</i> (Linnaeus)	X	X					
87 <i>Brachycaudus (A.) populi</i> (Del Guercio)	X						
88 <i>Brachycaudus (T) rumexicolens</i> (Patch)		X	X	X			
89 <i>Brevicoryne brassicae</i> (Linnaeus)		X					
90 <i>Capitophorus hippophaes</i> (Walker)	X						
91 <i>Cavariella aegopodii</i> (Del Guercio)	X	X	X				
92 <i>Cavariella theobaldi</i> (Gillette et Bragg)	X						
93 <i>Chaetosiphon tetrarhodus</i> (Walker)	X						
94 <i>Chondrillobium blatnyi</i> (Pintera)	X						
95 <i>Coloradoa bournieri bournieri</i> Remaudière et Leclant		X					
96 <i>Coloradoa bournieri iberica</i> Remaudière et Leclant	X	X					
97 <i>Coloradoa moralesi</i> Remaudière et Leclant	X						
98 <i>Cryptomyzus ballotae</i> Hille Ris Lambers	X	X					
99 <i>Diuraphis noxia</i> (Mordvilko)					X	X	
100 <i>Dysaphis (D) apiifoliae</i> (Börner)	X						
101 <i>Dysaphis (D) foeniculus</i> (Theobald)					X		
102 <i>Eucarazzia elegans</i> (Ferrari)	X						
103 <i>Hydaphis foeniculi</i> (Passerini)		X					
104 <i>Hyalopterus pruni</i> Geoffroy	X	X	X				
105 <i>Hyperomyzus lactucae</i> (Linnaeus)	X	X					
106 <i>Liosomaphis berberidis</i> (Kaltenbach)			X				
107 <i>Lipaphis erysimi</i> (Kaltenbach)		X					
108 <i>Longicaudus trirhodus</i> (Walker)	X						
109 <i>Macrosiphoniella dimidiata</i> Börner		X	X				
110 <i>Macrosiphoniella helichrysi</i> Remaudière	X	X					
111 <i>Macrosiphoniella obtecta</i> (Börner)	X						



Table 1. Continuation.

Name of species	Altitude in meters					
	500- 1000	1000- 1500	1500- 2000	2000- 2500	2500- 3000	3000- 3500
112 <i>Macrosiphoniella subequalis</i> Börner			X			
113 <i>Macrosiphoniella tapuskae</i> (Hottes et Frisson)	X				X	
114 <i>Macrosiphum euphorbiae</i> (Thomas)		X				
115 <i>Macrosiphum hellebori</i> Theobald et Walton		X	X	X		
116 <i>Macrosiphum rosae</i> (Linnaeus)	X	X	X			
117 <i>Megoura viciae</i> Buckton		X	X			
118 <i>Melanaphis pyrarica</i> (Passerini)	X					
119 <i>Metopolophium albidum</i> Hille Ris Lambers						X
120 <i>Metopolophium dirhodum</i> (Walker)		X				
121 <i>Metopolophium fasciatum</i> Stroyan			X			
122 <i>Microlophium carnosum</i> (Buckton)	X					
123 <i>Myzaphis bucktoni</i> Jacob	X					
124 <i>Myzaphis rosarum</i> (Kaltenbach)	X					
125 <i>Myzus (M.) varians</i> Davidson	X					
126 <i>Myzus (N.) persicae</i> (Sulzer)	X	X				
127 <i>Nasonovia ribisnigri</i> (Mosley)		X				
128 <i>Nearctaphis bakeri</i> (Cowen)	X	X	X			
129 <i>Ovatus crataegarius</i> (Walker)		X				
130 <i>Pleotrichophorus persimilis</i> Börner	X	X	X			
131 <i>Pterocomma pilosum konoii</i> Hori		X				
132 <i>Pterocomma populeum</i> (Kaltenbach)		X				
133 <i>Rhodobium porosum</i> (Sanderson)	X					
134 <i>Rhopalosiphum insertum</i> (Walker)		X				
135 <i>Rhopalosiphum padi</i> (Linnaeus)	X	X	X			
136 <i>Schizaphis graminum</i> (Rondani)			X			
137 <i>Sitobion avenae</i> (Fabricius)	X	X				
138 <i>Sitobion fragariae</i> (Walker)	X	X	X			
139 <i>Toxoptera aurantii</i> (Boyer de Fonscolombe)	X					
140 <i>Uroleucon (U.) chondrillae</i> (Nevsky)		X				
141 <i>Uroleucon (U.) hypochoeridis</i> (Fabricius)*						
142 <i>Uroleucon (U.) inulicola</i> (Hille Ris Lambers)		X				
143 <i>Uroleucon (U.) sonchi</i> (Linnaeus)	X	X	X			
144 <i>Uroleucon (B.) inulae</i> (Ferrari)	X					
145 <i>Uroleucon (U.) jaceae</i> (Linnaeus)	X					
146 <i>Uroleucon (U.) carthami</i> (Hille Ris Lambers)	X					
147 <i>Wahlgreniella nervata</i> (Gillette)	X					
148 <i>Wahlgreniella arbuti</i> (Davidson)		X				

\* No altitude record

Table 2. Collection localities in Eastern Andalusian Mountains.

Locality	Altitude	UTM designation
Bujaraiza	750 m	30S WH11
Capileira	1700 m	30S VF 69
Carretera Granada-Veleta, km 31	1500 m	30S VG60
Carretera Granada-Veleta, km 38	1700 m	30S VG60
Cástaras	600 m	30S VG78
Cerradura (La)	550 m	30S VG47
Cazorla [1]	950 m	30S WG09
Cazorla [2]	1350 m	30S WH00
Estación esquí Sol y Nieve	2150 m	30S VG60
Estación de Maitena	1200 m	30S VG61
Ferreira	1700 m	30S VG91
Granada	685 m	30S VG41
Guadix	1000 m	30S VG82
Güejar Sierra	1200 m	30S VG51
Hueneja	1260 m	30S WG01
Huelma	1800 m	30S VG57
Juñeres	800 m	30S VF78
Lacalahorra	1200 m	30S VG91
Lanjarón	800 m	30S VF88
Pampaneira	1100 m	30S VF68
Puerto de la Mora	1390 m	30S VG52
Puerto del Zegri	1080 m	30S VG44
Purrullena	800 m	30S VG83
Siete Lagunas	2850 m	30S VG70
Torviscón	750 m	30S VF78
Trevélez	1500 m	30S VF79
unspecified*	**	***

\* Collection localities in Sierra Nevada, Remaudière (1959)

\*\* 1300, 2000, 2400, 2500, 2600, 2700, 2800, 2820, 2960, 3080, 3100, 3130, 3170, 3380, 3460 m.

\*\*\* 30S VG51, VG52, VG61, VG62, approximately.

Table 3. Number and percentage composition of aphid genera and species at different altitudinal gradients.

Subfamily	Total		500 - 1000 m		1000 - 1500 m		1500 - 2000 m							
	Genus num.	Species %	Genus num.	Species %	Genus num.	Species %	Genus num.	Species %						
Pemphiginae	10	14.4	8	17.8	9	10.7	3	5.6	3	3.6	-	-		
Anoeciinae	1	1.4	1	0.7	-	-	-	-	-	-	-	-		
Thelexinae	1	1.4	1	0.7	1	2.2	1	1.2	1	1.2	1	1.2		
Drepanosiphinae	9	13.0	16	10.8	5	11.1	10	11.9	6	11.1	8	9.8		
Chaitophorinae	2	2.8	5	3.4	1	2.2	1	1.2	2	3.7	5	6.1		
Lachninae	6	8.7	16	10.8	2	4.4	5	6.0	5	9.3	8	9.8		
Aphidinae	40	58.0	97	65.5	28	62.2	58	69.0	37	68.5	57	69.5		
<b>Aphididae</b>	<b>69</b>	<b>148</b>	<b>45</b>	<b>65.2</b>	<b>84</b>	<b>56.8</b>	<b>54</b>	<b>78.2</b>	<b>82</b>	<b>55.4</b>	<b>19</b>	<b>27.5</b>	<b>25</b>	<b>16.9</b>
<i>(continuation)</i>														
			2000 - 2500 m		2500 - 3000 m		3000 - 3500 m							
			Genus num.	Species %	Genus num.	Species %	Genus num.	Species %						
Pemphiginae	1	16.7	1	16.7	1	14.3	1	14.3						
Anoeciinae	-	-	-	-	1	14.3	1	14.3						
Thelexinae	-	-	-	-	-	-	-	-						
Drepanosiphinae	1	16.7	1	16.7	1	14.3	1	14.3						
Chaitophorinae	-	-	-	-	-	-	-	-						
Lachninae	-	-	-	-	1	14.3	1	14.3						
Aphidinae	4	66.7	4	66.7	3	42.9	5	71.4						
<b>Aphididae</b>	<b>6</b>	<b>8.7</b>	<b>6</b>	<b>4.0</b>	<b>7</b>	<b>10.1</b>	<b>7</b>	<b>4.7</b>						

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