

# The Auchenorrhyncha fauna (Insecta, Hemiptera) of Villa Lante, Bagnaia (Italy): a study of an urban ecosystem

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## Abstract

Lists of plant and Auchenorrhyncha species collected in Villa Lante, Bagnaia (Latium, Viterbo Province) are given. 91 Auchenorrhyncha species belonging to 72 genera and nine families, in addition to 192 plant species belonging to 137 genera and 51 families were found. One Auchenorrhyncha species, *Wagneriala incisa* (Then), is recorded for the first time for peninsular Italy, and four, *Kelisia guttulifera* (Kirschbaum), *Edwardsiana ulmiphagus* Wilson et Claridge, *Zyginella pulchra* Loew and *Zygina hyperici* (Herrich-Schaeffer), are new records for Latium. Host plants and phenology of some Auchenorrhyncha species are discussed. The particular importance of studies on urban ecosystems and their biodiversity for environmental conservation and territorial planning is emphasized.

**Key words:** Fulgoromorpha, Cicadomorpha, faunistics, ecology, phenology, distribution, peninsular Italy.

## Introduction

According to Koh and Sodhi (2004) “urbanization often irreversibly replaces natural habitats (e.g. primary forests) with persistent artificial ones (e.g. human cities), resulting in long-lasting negative impacts (e.g. species extinctions) on the native biodiversity”. Several studies on the arthropod fauna in different areas of the world have shown that urbanization has negative effects on arthropod diversity (Koh and Sodhi, 2004; McFrederick and LeBuhn, 2006; Hunter and Hunter, 2008). However, other studies have demonstrated that green areas, represented prevalently by residues of forests and artificially revegetated habitats, such as urban parks, historical gardens, archaeological sites, etc., which serve primarily as tourist or recreation areas, work increasingly also as refuge areas for native species of plants and animals (Zapparoli, 1997a; 1997b; Koh and Sodhi, 2004). Thus, it is important to study the role of different habitats in maintaining the diversity of native species in urban environments (Chudzicka, 1982); and it is desirable to understand for each single species within urban biocenoses its responses to urbanization, in order to identify the most vulnerable ones and to develop adequate measures for their conservation.

Many studies have been conducted on synanthropic arthropod species of sanitary and economic relevance, whereas a relatively minor attention has been dedicated to the effects of urban development on the abundance of innocuous species and on biodiversity in general (McIntyre, 2000).

Among the insects, the most frequently studied groups in urban ecosystems have been Hemiptera, Neuroptera, Mecoptera, Lepidoptera, Coleoptera and Hymenoptera (Czechowska, 1982; 1986; Davis, 1983; 1984; Sawoniewicz, 1986; Séméria, 1992; Wasowska, 1981; 1986; McFrederick and LeBuhn, 2006; Koh and Sodhi, 2004).

In Italy, studies on the urban entomofauna have been conducted prevalently in the north (Zanella, 1995; Pagliano and Pesarini, 1995; Pantaleoni, 1995; Pesarini, 1995); in the central parts such investigations regard primarily the city of Rome and its surroundings (Mason and Mei, 2002; Migliaccio and Zampetti, 1989; Carpaneto and Piattella, 1990; Carpaneto *et al.*, 2005; Zapparoli, 1997a; 1997b); there are few data concerning southern Italy (Zapparoli, 1997a).

The present contribution aims to study, for the first time, the Auchenorrhyncha fauna of the park of the Villa Lante in Bagnaia (Latium, Viterbo), a complex of great architectonic, artistic and ambiental value. The data obtained may be useful as a preliminary base for our knowledge of the urban Auchenorrhyncha fauna in Italy.

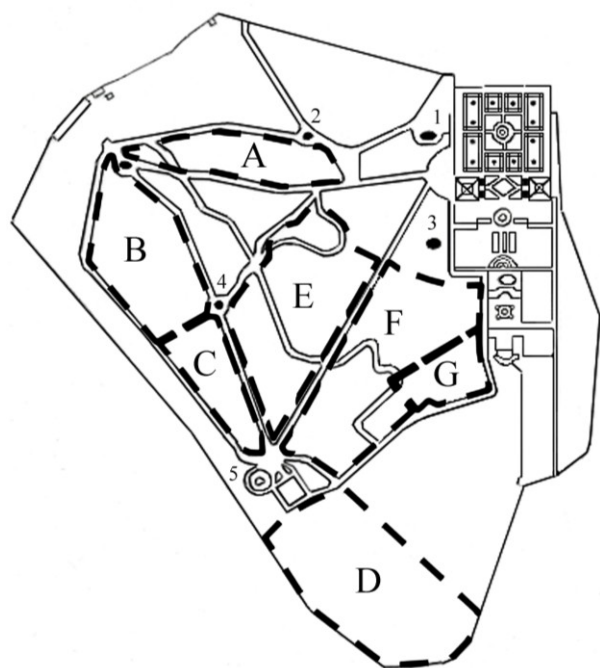
Villa Lante is placed in an urban environment in Bagnaia (Viterbo, Italy), a village on the northern slope of the Cimino mountains and once episcopal residence. It was built in 1498 by the cardinal Raffaele Galeotti Sansoni Riario, nephew of the Pope Sixtus IV della Rovere (Dinelli *et al.*, 1999; Piovesan *et al.*, 1994). It is one of the most important Italian villas with a garden in Italian style and an adjacent park extending on an area of 18 hectares at an altitude of about 450 m with northern-northeastern exposure. Presently, Villa Lante is property of the State of Italy, and the “Soprintendenza per i Beni Architettonici e per il Paesaggio nel Lazio” is trusted with its conservation (Dinelli *et al.*, 1999). The park has a surface of ca. 140,000 m<sup>2</sup> and includes trees, shrubs and herbaceous vegetation (Dinelli *et al.*, 1999; Piovesan, 1994; Piovesan *et al.*, 1994). The vegetation has changed conspicuously in respect of the original plan and this can be inferred from different documents. Already in 1588 Tydeo de Marchis, notary of the “Reverenda Camera Apostolica” indicates the presence of ways and groves of fruit trees, which have nowadays disappeared (Frittelli, 1990). On the old planimetry, a

dense cover of trees is visible in a large part of the park, today partly transformed in meadows. Finally, during the Renaissance age many tree species were introduced. As they were not acclimatized, they disappeared during the following period (Piovesan, 1994).

## Materials and methods

The investigated area is situated exclusively in the park (not in the Italian garden) (42°25'30"N 12°09'14"E). Seven sampling sectors (figure 1) of major ambiental interest have been established, three of which are covered largely by woodland (sectors A, E, F) and four by open meadows (sectors B-D, G). The area of each single sector has been calculated by means of ACME Planimeter (<http://acme.com/planimeter>).

The high importance of the flora for the Auchenorrhyncha communities both directly by offering host plants for these insects but also by creating the ecological background for them made it necessary to extend the investigation on the botanic condition of the Villa Lante in detail. The floristic study of the area (table 1), conducted by one of the authors (Scarici), started in spring 2014 and is going on until now. 192 species belonging to 137 genera and 51 families of vascular plants were identified. The most important families with the highest number of species are Asteraceae (20), Fabaceae (18), Poaceae (16), Lamiaceae (12) and Brassicaceae (9). This is not surprising as these taxa represent the major number of biological forms, the highest ecological plasticity and a vast distribution. The park of Villa Lante preserves, despite some interventions during the past



**Figure 1.** Plan of Villa Lante, A-G studied sectors. Numbers indicate the Italian names of fountains: 1, *Fontana del Pegaso*; 2, *Fontana del Monticelli*; 3, *Fontana del Fiore*; 4, *Fontana della Madonnella*; 5, *Fontana del Catino*.

centuries resulting in the introduction of plant species extraneous to the ecological and physiognomic context of the site, a significant level of naturalness, which is visible in the elevated number of typical species of forest formations with dominance of *Quercus ilex* L. subsp. *ilex*, accompanied by several characteristic species of deciduous forests; on the other side, species belonging to the herbaceous formations are prevailing on the clearings and meadows. From a phytogeographic point of view and in a context of nature conservation, the presence of *Linaria purpurea* (L.) Mill. and *Crepis bursifolia* L., both endemic to Italy, is particularly interesting (Pignatti, 1982; Conti *et al.*, 2005). Furthermore, the discovery of *Ajuga genevensis* L. should be highlighted; this species is very rare and vulnerable in Latium (Anzalone *et al.*, 2010). Finally we mention *Dactylorhiza romana* (Sebast.) Soo s.l., a species protected in Latium and included in the Convention on International Trade in endangered species of Wild Fauna and Flora (CITES) (Alonzi *et al.*, 2006).

The sampling of Auchenorrhyncha (71 samples) was carried out between March 2011 and January 2012 on the following dates:

- Sector A: 27/IV/2011; 01/VI/2011; 14/VI/2011; 30/VII/2011; 24/VIII/2011; 23/IX/2011; 21/X/2011; 15/XI/2011; 14/XII/2011; 18/I/2012;
- Sector B: 27/IV/2011; 18/V/2011; 23/VI/2011; 30/VII/2011; 29/VIII/2011; 29/IX/2011; 21/X/2011; 15/XI/2011; 14/XII/2011; 18/I/2012;
- Sector C: 08/IV/2011; 18/V/2011; 23/VI/2011; 29/VII/2011; 29/VIII/2011; 23/IX/2011; 21/X/2011; 16/XI/2011; 14/XII/2011; 18/I/2012;
- Sector D: 29/III/2011; 06/V/2011; 01/VI/2011; 23/VI/2011; 29/VII/2011; 29/VIII/2011; 29/IX/2011; 02/XI/2011; 15/XI/2011; 09/XII/2011; 19/I/2012;
- Sector E: 06/V/2011; 18/V/2011; 14/VI/2011; 30/VII/2011; 24/VIII/2011; 23/IX/2011; 04/XI/2011; 16/XI/2011; 09/XII/2011; 19/I/2012;
- Sector F: 06/V/2011; 01/VI/2011; 14/VI/2011; 30/VII/2011; 24/VIII/2011; 23/IX/2011; 04/XI/2011; 16/XI/2011; 09/XII/2011; 19/I/2012;
- Sector G: 06/V/2011; 01/VI/2011; 23/VI/2011; 29/VII/2011; 29/VIII/2011; 03/X/2011; 02/XI/2011; 16/XI/2011; 14/XII/2011; 19/I/2012.

We used two collection methods: a) sweep-netting using entomological net and aspirator, b) direct collecting of specimens on plants using aspirator.

In some Auchenorrhyncha genera (for example *Anaceratagallia*, *Empoasca*, *Psammotettix*), identification of females on species level is impossible based on morphology. The females of those genera were assigned to the males we had found at the same collection site. In the case we found males of more than one of these taxa at the same site, the females are listed separately as "sp."

Several species of the genus *Euscelis*, e.g. *E. alsius* Ribaut, *E. incisus* (Kirschbaum), *E. lineolatus* Brulle, *E. remanei* Struebing, with more than one generation during the year display different morphological characters (Müller, 1954; Strübing, 1980) dependent on the photoperiod and temperature. Males grown under short day conditions (spring or autumn) are smaller and darker and have an aedeagus which is strongly reduced

**Table 1.** List of plant taxa found in each sector (nomenclature after Conti *et al.*, 2005 and 2006).

Taxa	Sector						
	A	B	C	D	E	F	G
<i>Acer campestre</i> L.	+					+	
<i>Acer monspessulanum</i> L.					+		
<i>Acinops alpinus</i> (L.) Moench s.l.				+			
<i>Aira caryophyllea</i> L. subsp. <i>caryophyllea</i>				+			
<i>Ajuga genevensis</i> L.	+						
<i>Ajuga reptans</i> L.	+						
<i>Alliaria petiolata</i> (M. Bieb.) Cavara et Grande	+			+	+	+	+
<i>Allium pendulinum</i> Ten.		+					
<i>Anchusa undulata</i> L. subsp. <i>hybrida</i> (Ten.) Beg.				+			
<i>Anemone apennina</i> L. subsp. <i>apennina</i>	+				+	+	
<i>Anthoxanthum odoratum</i> L. s.l.	+		+	+		+	
<i>Anthriscus sylvestris</i> (L.) Hoffm. subsp. <i>sylvestris</i>	+						+
<i>Arabis turrata</i> L.				+		+	
<i>Arbutus unedo</i> L.						+	
<i>Arum italicum</i> Mill. subsp. <i>italicum</i>	+		+	+	+	+	+
<i>Asplenium onopteris</i> L.	+				+	+	
<i>Asplenium trichomanes</i> L. subsp. <i>quadrivalens</i> D.E. Mey.					+		
<i>Astragalus glycyphyllos</i> L.	+					+	
<i>Avena barbata</i> Pott ex Link			+	+			
<i>Ballota nigra</i> L. subsp. <i>meridionalis</i> (Beg.) Beg.	+			+			
<i>Bellis perennis</i> L.	+	+	+	+			+
<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv. subsp. <i>sylvaticum</i>	+				+	+	+
<i>Bromus hordeaceus</i> L. subsp. <i>hordeaceus</i>			+	+			
<i>Bromus</i> sp. pl.		+	+	+			+
<i>Bryonia dioica</i> Jacq.	+					+	
<i>Bunius erucago</i> L.				+			
<i>Buxus sempervirens</i> L.	+				+		
<i>Calendula arvensis</i> L.				+			
<i>Calepina irregularis</i> (Asso) Thell.		+		+			
<i>Campanula trachelium</i> L. subsp. <i>trachelium</i>	+					+	
<i>Capsella rubella</i> Reut.		+	+	+			
<i>Cardamine bulbifera</i> (L.) Crantz	+						
<i>Cardamine hirsuta</i> L.	+		+			+	
<i>Carduus pycnocephalus</i> L. subsp. <i>pycnocephalus</i>		+	+	+			
<i>Carex caryophyllea</i> Latourr.		+	+	+			
<i>Carex depauperata</i> Curtis ex With.	+	+	+		+	+	
<i>Carex distachya</i> Desf.	+	+		+			+
<i>Carex divulsa</i> Stokes	+	+		+	+	+	+
<i>Carex pendula</i> Huds.						+	
<i>Carpinus betulus</i> L.							
<i>Centaurea deusta</i> Ten.				+			
<i>Cerastium glomeratum</i> Thuill.				+			
<i>Cerastium ligusticum</i> Viv.			+	+			
<i>Chaerophyllum temulum</i> L.					+	+	
<i>Chelidonium majus</i> L.	+				+	+	+
<i>Clematis vitalba</i> L.						+	
<i>Cornus sanguinea</i> L.						+	
<i>Corylus avellana</i> L.						+	
<i>Crataegus monogyna</i> Jacq.					+		
<i>Crepis bursifolia</i> L.				+			
<i>Crepis sancta</i> (L.) Babc. subsp. <i>sancta</i>			+	+			
<i>Crepis vesicaria</i> L. subsp. <i>vesicaria</i>		+	+	+			
<i>Cyclamen repandum</i> Sm. subsp. <i>repandum</i>	+				+	+	
<i>Cymbalaria muralis</i> Gaertn., B. Mey et Scherb subsp. <i>muralis</i>					+		
<i>Cytisus scoparius</i> (L.) Link subsp. <i>scoparius</i>	+				+		
<i>Dactylis glomerata</i> L. subsp. <i>glomerata</i>	+	+	+	+		+	+
<i>Dactylohriza romana</i> (Sebast.) Soo s.l.	+	+	+		+	+	
<i>Daucus carota</i> L. subsp. <i>carota</i>		+	+				+
<i>Emerus majus</i> Mill. s.l.	+	+					
<i>Erigeron canadensis</i> L.	+	+	+		+	+	
<i>Erodium acaule</i> (L.) Bech. et Thell.			+	+			
<i>Erodium botrys</i> (Cav.) Bertol.			+	+			
<i>Erodium cicutarium</i> (L.) L'Her. subsp. <i>cutarium</i>			+	+			
<i>Euonymus europaeus</i> L.	+				+	+	

(Continued)

(Table 1 continued)

Taxa	Sector						
	A	B	C	D	E	F	G
<i>Euphorbia helioscopia</i> L. subsp. <i>helioscopia</i>			+	+			
<i>Euphorbia peplus</i> L.						+	+
<i>Ficus carica</i> L.						+	
<i>Fragaria vesca</i> L. subsp. <i>vesca</i>	+				+	+	
<i>Fraxinus ornus</i> L. subsp. <i>ornus</i>	+				+	+	
<i>Fumaria officinalis</i> L. subsp. <i>officinalis</i>				+			+
<i>Galium aparine</i> L.	+			+	+	+	
<i>Galium mollugo</i> L. s.l.	+						
<i>Geranium dissectum</i> L.				+	+		
<i>Geranium lucidum</i> All. subsp. <i>lucidum</i>	+				+		
<i>Geranium molle</i> L.		+	+	+			
<i>Geranium robertianum</i> L.	+				+	+	
<i>Geranium rotundifolia</i> L.		+		+			
<i>Geum urbanum</i> L.	+				+	+	+
<i>Hedera helix</i> L. subsp. <i>helix</i>	+				+	+	+
<i>Hieracium</i> sp.	+				+		
<i>Holcus lanatus</i> L.	+				+		+
<i>Hordeum murinum</i> L. subsp. <i>leporinum</i> (Link) Arcang.		+	+	+			
<i>Humulus lupulus</i> L.	+						
<i>Hypericum perforatum</i> L.				+	+		
<i>Hypochaeris radicata</i> L.			+	+			
<i>Lactuca muralis</i> (L.) Gaertn.	+				+	+	
<i>Lactuca serriola</i> L.				+			
<i>Lamium amplexicaule</i> L.				+			
<i>Lamium bifidum</i> Cirillo subsp. <i>bifidum</i>				+			
<i>Lamium maculatum</i> L.	+	+			+	+	+
<i>Lamium purpureum</i> L.	+	+	+	+		+	
<i>Lathyrus clymenum</i> L.		+					
<i>Lathyrus venetus</i> (Mill.) Wohlff.	+	+					
<i>Laurus nobilis</i> L.	+				+	+	
<i>Ligustrum vulgare</i> L.						+	
<i>Linaria purpurea</i> (L.) Mill.				+			
<i>Linum bienne</i> Mill.			+				
<i>Lolium multiflorum</i> Lam. subsp. <i>multiflorum</i>				+			
<i>Lonicera caprifolium</i> L.	+				+	+	
<i>Lupinus angustifolius</i> L.			+	+			
<i>Luzula forsteri</i> (Sm.) DC.	+				+	+	
<i>Malva sylvestris</i> (L.) Mill.				+			
<i>Medicago arabica</i> (L.) Huds.		+	+	+			
<i>Medicago lupulina</i> L.		+		+			
<i>Melica uniflora</i> Retz.						+	
<i>Melissa officinalis</i> L. subsp. <i>officinalis</i>						+	
<i>Mercurialis annua</i> L.							+
<i>Myosotis arvensis</i> (L.) Hill subsp. <i>arvensis</i>		+					
<i>Myosotis decumbens</i> Host subsp. <i>florentina</i> Grau					+	+	
<i>Myosotis ramosissima</i> Rochel ex Schult. subsp. <i>ramosissima</i>			+	+			
<i>Oenanthe pimpinelloides</i> L.		+				+	
<i>Olea europaea</i> L.				+			
<i>Orchis morio</i> L.				+			
<i>Ornithogalum umbellatum</i> L.				+			
<i>Ostrya carpinifolia</i> Scop.	+		+				
<i>Parentucellia latifolia</i> (L.) Caruel			+	+			
<i>Parietaria officinalis</i> L. s.l.	+					+	+
<i>Petrorhagia prolifera</i> (L.) P.W. Ball et Heywood				+			
<i>Phillyrea latifolia</i> L.	+				+		
<i>Picris hieracioides</i> L. s.l.		+					
<i>Plantago lanceolata</i> L.	+	+	+	+			
<i>Poa annua</i> L.		+	+				
<i>Poa bulbosa</i> L.	+		+	+			
<i>Poa pratensis</i> L.				+			
<i>Polygonatum multiflorum</i> (L.) All.	+				+	+	
<i>Polypodium cambricum</i> L.	+				+	+	
<i>Polypodium interjectum</i> Shivas						+	
<i>Potentilla reptans</i> L.	+						+

(Continued)

(Table 1 continued)

Taxa	Sector						
	A	B	C	D	E	F	G
<i>Prunella laciniata</i> (L.) L.		+					
<i>Prunella vulgare</i> L. subsp. <i>vulgare</i>	+	+			+	+	
<i>Quercus ilex</i> L. subsp. <i>ilex</i>	+				+	+	+
<i>Quercus pubescens</i> Willd. subsp. <i>pubescens</i>	+						
<i>Ranunculus ficaria</i> L. subsp. <i>ficaria</i>	+						
<i>Ranunculus lanuginosus</i> L.	+			+		+	+
<i>Ranunculus millefoliatus</i> Vahl			+				
<i>Ranunculus repens</i> L.							+
<i>Raphanus raphanistrum</i> L. subsp. <i>landra</i> (DC.) Bonnier et Layens				+			
<i>Rhadagiolus stellatus</i> (L.) Gaertn.	+		+	+			+
<i>Robinia pseudoacacia</i> L.	+						+
<i>Rubia peregrina</i> L. s.l.	+				+	+	
<i>Rubus ulmifolius</i> Schott	+	+			+	+	+
<i>Rumex acetosella</i> L. subsp. <i>angiocarpus</i> (Murb.) Murb.			+	+			
<i>Rumex bucephalophorus</i> L. subsp. <i>bucephalophorus</i>			+	+			
<i>Rumex obtusifolius</i> L. subsp. <i>obtusifolius</i>		+					
<i>Rumex sanguineus</i> L.					+	+	+
<i>Ruscus aculeatus</i> L.	+				+	+	
<i>Salvia verbenaca</i> L.				+			
<i>Sambucus nigra</i> L.	+	+					
<i>Saxifraga bulbifera</i> L.			+	+			
<i>Saxifraga tridactylites</i> L.				+			
<i>Scirpoides holoschoenus</i> (L.) Sojak							+
<i>Sedum cepaea</i> L.	+	+			+	+	
<i>Senecio vulgaris</i> L.				+			
<i>Sherardia arvensis</i> L.		+	+	+			
<i>Silene flos-cuculi</i> (L.) Clairv.		+			+		
<i>Silene italica</i> (L.) Pers. subsp. <i>italica</i>	+						
<i>Silene latifolia</i> Poir. subsp. <i>alba</i> (Mill.) Greuter et Burdet	+			+			+
<i>Silybum marianum</i> (L.) Gaertn.				+			
<i>Sisymbrium officinale</i> (L.) Scop.				+			
<i>Solanum nigrum</i> L.		+	+	+			
<i>Sonchus asper</i> (L.) Hill subsp. <i>asper</i>			+	+			
<i>Sonchus oleraceus</i> L.	+	+	+	+			+
<i>Sorbus torminalis</i> (L.) Crantz	+						+
<i>Stachys officinalis</i> (L.) Trevis.					+		
<i>Stellaria media</i> (L.) Vill. subsp. <i>media</i>	+	+	+	+		+	+
<i>Symphytum bulbosum</i> K.F. Schimp.					+	+	
<i>Tamus communis</i> L.	+	+			+	+	
<i>Taraxacum officinale</i> (group)		+					+
<i>Tragopogon porrifolium</i> L. s.l.				+			
<i>Trifolium angustifolium</i> L. subsp. <i>angustifolium</i>				+			
<i>Trifolium arvense</i> L. s.l.			+	+			
<i>Trifolium nigrescens</i> Viv. subsp. <i>nigrescens</i>			+				
<i>Trifolium pratense</i> L. subsp. <i>pratense</i>		+	+	+			
<i>Trifolium stellatum</i> L.				+			
<i>Trifolium subterraneum</i> L. subsp. <i>subterraneum</i>			+	+			
<i>Ulmus minor</i> Mill. subsp. <i>minor</i>	+				+	+	
<i>Umbellifcus rupestris</i> (Salisb.) Dandy					+	+	
<i>Urtica membranacea</i> Poir. ex Savigny	+					+	
<i>Urtica urens</i> L.					+		+
<i>Verbascum densiflorum</i> Bertol.				+			
<i>Veronica hederifolia</i> L. subsp. <i>hederifolia</i>	+				+		
<i>Veronica polita</i> Fr.							+
<i>Veronica serpyllifolia</i> L. subsp. <i>serpyllifolia</i>							+
<i>Viburnum tinus</i> L. subsp. <i>tinus</i>	+				+	+	
<i>Vicia lathyroides</i> L.				+			
<i>Vicia melanops</i> Sm.				+			
<i>Vicia sativa</i> L. s.l.		+		+			
<i>Vinca minor</i> L.	+				+	+	
<i>Viola alba</i> Besser subsp. <i>dehnhardtii</i> (Ten.) W. Becker					+	+	
<i>Viola odorata</i> L.	+						+
<i>Viola reichenbachiana</i> Jord. ex Boreau	+						
<i>Vulpia ligustica</i> (All.) Link			+	+			
<i>Vulpia myuros</i> (L.) C.C. Gmel.			+	+			

in respect of that of the summer generation, thus lacking the most important characters for species discrimination. As *E. lineolatus* was the only *Euscelis* taxon found in the Villa Lante area, we assign those short day specimens to this species.

Some species of particular interest are discussed in respect of collecting periods and sectors and, if data are available, the host plants.

General informations on host plants are taken from Vidano (1965; 1982), Vidano and Arzone (1981; 1987a; 1987b), Nickel and Remane (2002), Nickel (2003), Guglielmino and Bückle (2007; 2008), in addition to some of our own unpublished data.

The records in Italy are cited prevalently from Servadei (1967) and completed by data published later in the following papers: Alma (1999), Alma *et al.* (2009a; 2009b),

D'Urso (1995b; 2000), D'Urso *et al.* (1984; 1997), Guglielmino (1993), Guglielmino and Bückle (2007; 2008; 2015), Guglielmino *et al.* (2000; 2005), Mazzoni (2001; 2005), Mazzoni and Lucchi (2004), Osella and Pogliano Osella (1989), Proietti and Guglielmino (2012), Remane and Hellrigl (1996), Servadei (1968; 1976), Vidano (1975-76; 1982), Vidano and Arzone (1981; 1987a; 1987b).

## Results and discussion

### Faunistic remarks

About 3800 specimens of Auchenorrhyncha belonging to nine families, 72 genera and 91 species were collected in 71 samples from March 2011 until January 2012 (table 2). The highest number of species belong to

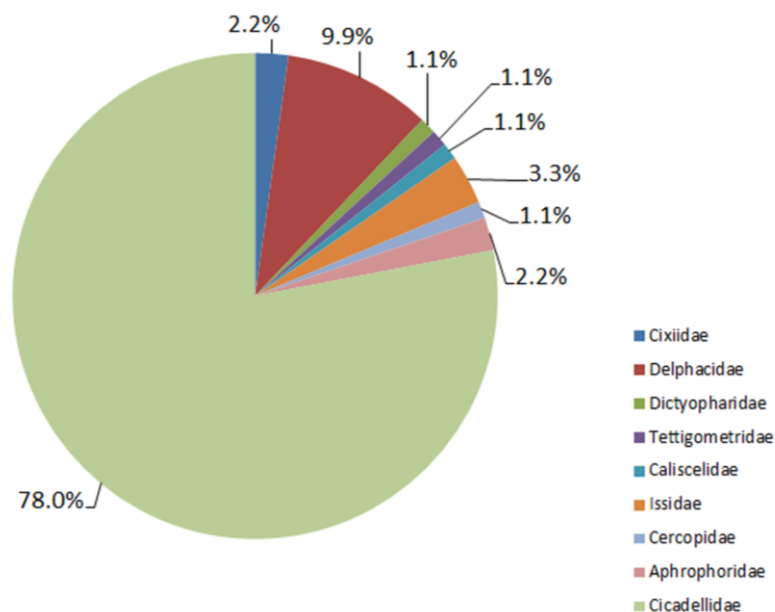
**Table 2.** List of Auchenorrhyncha species collected in each sector, the taxa are listed in the systematic order applied by D'Urso (1995a).

Taxa	Sector						
	A	B	C	D	E	F	G
<b>CIXIIDAE</b>							
<i>Reptalus panzeri</i> (Loew)						+	
<i>Hyalesthes luteipes</i> Fieber				+			
<b>DELPHACIDAE</b>							
<i>Asiraca clavicornis</i> (F.)			+		+	+	
<i>Kelisia guttulifera</i> (Kirschbaum)	+			+	+	+	+
<i>Stenocranus minutus</i> (F.)	+					+	
<i>Eurysa lineata</i> (Perris)	+	+	+		+		
<i>Eurysanoides rubripes</i> (Matsumura)			+	+			
<i>Laodelphax striatella</i> (Fallen)		+				+	
<i>Muellerianella</i> sp.						+	
<i>Toya propinqua</i> (Fieber)		+	+	+	+	+	+
<i>Javesella dubia</i> (Kirschbaum)							+
<b>DICTYOPHARIDAE</b>							
<i>Dictyophara europaea</i> (L.)		+	+		+	+	
<b>TETTIGOMETRIDAE</b>							
<i>Tettigometra griseola</i> Fieber			+				
<b>ISSIDAE</b>							
<i>Issus coleoptratus</i> (F.)	+				+	+	
<i>Latilica tunetana</i> (Matsumura)	+			+	+		
<i>Latissus dilatatus</i> (Fourcroy)					+		
<b>CALISCELIDAE</b>							
<i>Caliscelis bonellii</i> (Latreille)				+			
<b>CERCOPIIDAE</b>							
<i>Cercopis sanguinolenta</i> (Scopoli)			+	+			
<b>APHROPHORIDAE</b>							
<i>Aphrophora alni</i> (Fallen)			+			+	+
<i>Philaenus spumarius</i> (L.)	+	+	+	+	+	+	+
<b>CICADELLIDAE</b>							
<i>Megophthalmus scanicus</i> (Fallen)					+	+	
<i>Hephathus nanus</i> (Herrich-Schaeffer)		+					
<i>Agallia consobrina</i> Curtis	+	+	+	+	+	+	+
<i>Anaceratagallia laevis</i> (Ribaut)		+	+	+	+	+	+
<i>Anaceratagallia ribauti</i> (Ossiannilsson)		+			+	+	+
<i>Anaceratagallia</i> sp.		+	+	+	+	+	+
<i>Austroagallia sinuata</i> (Mulsant et Rey)	+	+	+	+			+
<i>Dryodurgades dlabolai</i> Wagner			+				
<i>Acericerus ribauti</i> Nickel et Remane	+						
<i>Acericerus vittifrons</i> (Kirschbaum)	+	+			+	+	+
<i>Tremulicerus fulgidus</i> (F.)							
<i>Aphrodes bicincta</i> (Schrank)		+	+	+		+	+
<i>Anoscopus albifrons mappus</i> Guglielmino et Bueckle				+			+

(Continued)

(Table 2 continued)

Taxa	Sector						
	A	B	C	D	E	F	G
<i>Anoscopus</i> sp.	+	+				+	+
<i>Evacanthus acuminatus</i> (F.)						+	
<i>Cicadella viridis</i> (L.)			+	+	+	+	+
<i>Emelyanoviana mollicula</i> (Boheman)	+	+		+	+	+	+
<i>Wagneria incisa</i> (Then)	+	+			+	+	
<i>Empoasca alsiosa</i> Ribaut	+			+	+	+	+
<i>Empoasca decipiens</i> Paoli	+	+	+	+	+	+	+
<i>Empoasca pteridis</i> (Dahlbom)	+		+	+	+	+	+
<i>Empoasca vitis</i> (Goethe)	+	+	+		+	+	
<i>Empoasca</i> sp.	+	+	+	+	+	+	+
<i>Edwardsiana diversa</i> (Edwards)		+			+		
<i>Edwardsiana ulmiphagus</i> Wilson et Claridge			+				
<i>Edwardsiana</i> sp.						+	
<i>Lindbergina aurovittata</i> (Douglas)	+	+	+	+	+	+	+
<i>Lindbergina (Youngiada)</i> cf. <i>chobauti</i> Ribaut	+		+	+	+	+	
<i>Ribautiana</i> cf. <i>debilis</i> (Douglas)	+						
<i>Ribautiana tenerrima</i> (Herrich-Schaeffer)	+				+	+	+
<i>Eupteryx curtisii</i> Flor	+		+	+	+	+	+
<i>Eupteryx filicum</i> (Newman)	+			+	+	+	
<i>Eupteryx urticae</i> (F.)	+					+	+
<i>Eupteryx zelleri</i> (Kirschbaum)	+	+				+	
<i>Zyginella pulchra</i> Loew	+			+			+
<i>Hauptidia provincialis</i> (Ribaut)	+	+	+	+	+	+	+
<i>Zyginidia ribauti</i> Dworakowska			+	+		+	+
<i>Zyginia angusta</i> Lethierry	+						
<i>Zyginia discolor</i> Horvath	+				+		
<i>Zyginia flammigera</i> (Fourcroy)	+			+	+	+	+
<i>Zyginia hyperici</i> (Herrich-Schaeffer)					+		
<i>Zyginia rorida</i> (Mulsant et Rey)	+						
<i>Zyginia</i> sp.	+				+	+	+
<i>Arboridia spathulata</i> (Ribaut)	+			+		+	
<i>Arboridia</i> sp.	+				+		+
<i>Goniagnathus brevis</i> (Herrich-Schaeffer)		+	+	+		+	
<i>Neoliturus fenestratus</i> (Herrich-Schaeffer)		+	+	+	+	+	+
<i>Balclutha punctata</i> (F.)	+	+	+		+	+	+
<i>Balclutha saltuella</i> (Kirschbaum)		+	+	+			
<i>Macrosteles quadripunctulatus</i> (Kirschbaum)		+	+	+			
<i>Maiestas schmidtgeni</i> (Wagner)				+			
<i>Chiasmus conspurcatus</i> (Perris)		+		+			
<i>Doratura paludosa</i> Melichar			+	+			
<i>Synophropsis lauri</i> (Horvath)	+		+	+	+	+	+
<i>Placotettix taeniatifrons</i> (Kirschbaum)	+		+		+	+	
<i>Anoplotettix fuscovenosus</i> (Ferrari)	+			+	+	+	+
<i>Lamprotettix nitidulus</i> (F.)	+				+	+	+
<i>Allygidius atomarius</i> (F.)				+			
<i>Allygus modestus</i> Scott				+		+	
<i>Phlepsius spinulosus</i> Wagner	+		+			+	
<i>Eohardya fraudulenta</i> (Horvath)	+		+	+	+	+	+
<i>Rhopalopyx elongata</i> Wagner				+			
<i>Mocydia crocea</i> (Herrich-Schaeffer)	+	+			+	+	+
<i>Mocydiopsis monticola</i> Remane	+		+	+	+	+	+
<i>Speudotettix subfuscus</i> (Fallen)	+		+	+	+	+	
<i>Thamnotettix dilutior</i> (Kirschbaum)	+	+	+	+	+	+	+
<i>Thamnotettix exentus</i> Melichar			+	+	+	+	
<i>Thamnotettix zelleri</i> (Kirschbaum)		+	+	+			
<i>Euscelidius variegatus</i> (Kirschbaum)				+			
<i>Conosanus obsoletus</i> (Kirschbaum)				+			
<i>Euscelis lineolatus</i> Brulle	+	+	+	+	+	+	+
<i>Artianus manderstjernii</i> (Kirschbaum)			+	+			
<i>Arocephalus longiceps</i> (Kirschbaum)	+	+	+		+	+	+
<i>Psammotettix alienus</i> (Dahlbom)	+	+	+	+	+	+	+
<i>Psammotettix confinis</i> (Dahlbom)		+	+	+			
<i>Psammotettix</i> sp.		+	+	+	+	+	+
<i>Adarrus exornatus</i> Ribaut					+		
<i>Jassargus bisubulatus</i> (Then)		+	+	+	+	+	+



**Figure 2.** Percentage of Auchenorrhyncha families found in the Villa Lante Park, based on the number of species. (in colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

Cicadellidae (71, corresponding to 78%); the following families in order of the species number are Delphacidae (9, 9.9%), Issidae (3, 3.3%), Cixiidae and Aphrophoridae (each 2, 2.2%), Cercopidae, Tettigometridae, Caliscelidae and Dictyopharidae (each 1, 1.1%) (figure 2).

One species, *Wagneriala incisa*, is a new record for peninsular Italy, and four (*Kelisia guttulifera*, *Edwardsiana ulmiphagus*, *Zyginella pulchra* and *Zygina hyperici*) are first records for Latium.

The number of collected specimens for each species ranges between 1 and ca. 400. The taxa with only one specimen are: *Reptalus panzeri*, *Tettigometra griseola*, *Hephathus nanus*, *Dryodurgades dlabolai*, *Acericerus ribauti*, *Evacanthus acuminatus*, *Edwardsiana ulmiphagus*, *Ribautiana cf. debilis*, *Zyginella pulchra*, *Z. discolor*, *Allygidius atomarius*, *Rhopalopyx elongata*, *Conosanus obsoletus*, *Adarrus exornatus*; the taxa with number of specimens between 200 and 400 are: *Euscelis lineolatus*, *Psammotettix alienus*, *Thamnotettix dilutior* and *Empoasca decipiens*.

The obtained data may be interpreted in different ways. Some species (for example the four most abundant species mentioned above) are generally very common in central Italy and occur there often in high abundance. Low abundance of a taxon can be explained in some cases by the rare presence of its host plant(s), above all if the Auchenorrhyncha species is monophagous. Furthermore, as most taxa are rather irregularly distributed and often clustered on single plant specimens, there is some casual element in the collecting results. Special ecological preferences (for example for the higher parts of trees or the lowest parts of tall herbaceous plants) may result in an underestimated abundance (this effect can be counteracted in part by using additional collecting methods, e.g. light traps or pitfall traps).

#### Auchenorrhyncha fauna of individual sectors

##### Sector A (ca. 5100 m<sup>2</sup>) (48 species)

*Agallia consobrina*, *Balclutha punctata*, *Empoasca decipiens*, *Eupteryx curtisii*, *E. urticae*, *Hauptidia provincialis*, *Mocydiopsis monticola* and *Thamnotettix dilutior* are the most common species in this sector. These taxa live on herbaceous vegetation of moderately dry to moist, often more or less shaded places. Whereas the nymphs of *Thamnotettix dilutior* feed on herbaceous vegetation, the adults are often found on trees, particularly on oaks. Unlike these species, *Acericerus vittifrons*, *A. ribauti*, *Anoplotettix fuscovenosus*, *Arboridia spathulata*, *Lindbergina aurovittata*, *Synophropsis lauri*, *Zyginella pulchra* and the *Zyginella* species live on shrubs and trees. Particularly interesting in this area is the presence of rich populations of *Kelisia guttulifera*, probably on *Carex depauperata* and *Wagneriala incisa* on *Carex* sp. (probably on *C. distachya* and/or *C. divulsa*). *Zyginella rorida* was found exclusively in this sector.

##### Sector B (ca. 5100 m<sup>2</sup>) (35 species)

*Anaceratagallia laevis*, *Empoasca* sp., *Euscelis lineolatus*, *Neotalitrus fenestratus*, *Philaenus spumarius*, *Psammotettix alienus* and *P. confinis* are the typical taxa of this sector. *Thamnotettix dilutior* is common in this area as well with adults living on the surrounding trees. In addition, the only specimen of *Hephathus nanus*, a species of dry open sites and often found on thistles and other Asteraceae, was found in this sector.

##### Sector C (ca. 1300 m<sup>2</sup>) (44 species)

The main elements of the Auchenorrhyncha fauna in this sector are *Balclutha saltuella*, *Doratura paludosa*, *Eohardya fraudulenta*, *Euscelis lineolatus*, *Jassargus bisubulatus*, *Philaenus spumarius*, *Psammotettix alienus* and *Thamnotettix zelleri*. All of these species feed on



the herbaceous vegetation. *Dryodurgades dlabolai* (on shrubs, probably Fabaceae), *Edwardsiana ulmiphagus* (on deciduous trees) and *Tettigometra griseola* (on the low vegetation) were found only in this sector. *Eury-sanooides rubripes* feeds on Poaceae and has a life cycle with adults only from autumn to spring. *Thamnotettix exemtus* has a similar ecology as *T. dilutior* but occurs generally in somewhat lower abundance. *Thamnotettix zelleri* is found in the adult stage only in spring and early summer.

#### Sector D (ca. 8000 m<sup>2</sup>) (52 species)

*Anoplotettix fuscovenosus*, *Doratura paludosa*, *Eohardya fraudulenta*, *Euscelis lineolatus*, *Lindbergina aurovittata*, *Philaenus spumarius*, *Psammotettix alienus* and *Thamnotettix zelleri* occur in high abundance in this sector. All these taxa live on the herbaceous vegetation with the only exception of *Anoplotettix fuscovenosus* which is found on shrubs. We mention in addition the presence of *Latilica tunetana*, collected on the herbaceous vegetation. *Caliscelis bonelii* (on herbaceous vegetation), *Conosanus obsoletus* (on *Juncus*, perhaps also on tall *Carex* or Poaceae species), *Euscelidius variegatus* (polyphagous on various dicotyledonous herbs) and *Rhopalopyx elongata* (on Poaceae) were all observed only in this area.

#### Sector E (ca. 6000 m<sup>2</sup>) (49 species)

Among the Auchenorrhyncha species collected in high abundance, there are *Agallia consobrina*, *Balclutha punctata*, *Mocycdia crocea*, *Mocycdiopsis monticola*, *Empoasca decipiens*, *Eupteryx curtisii*, *Hauptidia provincialis*, *Kelisia guttulifera* and *Wagneriala incisa* which are generally found in the low vegetation of rather shadowy sites on the margins of or within forests. *Lindbergina aurovittata*, *Anoplotettix fuscovenosus*, *Synphropsis lauri* and the adults of *Speudotettix subfuscus* and *Thamnotettix dilutior* feed on shrubs or trees (the nymphs of the latter two species, however, on the herbaceous vegetation). *Anaceratagallia ribauti*, *Euscelis lineolatus* and *Jassargus bisubulatus* are typically present in open areas on the low vegetation and occur in this sector rather in small clearings than in the forest undergrowth. *Zygina discolor* lives on *Crataegus* and other Rosaceae. *Euryrsa lineata* occurs only in spring and early summer and lives on Poaceae in rather shadowy places. *Adarrus exornatus* was found exclusively in this area; it lives, like *Mocycdia crocea*, on *Brachypodium sylvaticum*. *Zygina hyperici*, monophagous on *Hypericum perforatum*, was collected only in sector E as well.

#### Sector F (ca. 4500 m<sup>2</sup>) (57 species)

The group of dominant Auchenorrhyncha species in this sector resembles that of the other two wooded areas. *Agallia consobrina*, *Balclutha punctata*, *Empoasca decipiens*, *Eohardya fraudulenta*, *Hauptidia provincialis*, *Jassargus bisubulatus*, *Kelisia guttulifera*, *Mocycdia crocea* and *Wagneriala incisa* were collected on the low vegetation, *Anoplotettix fuscovenosus*, *Lindbergina aurovittata*, *Synphropsis lauri* and *Thamnotettix dilutior* on trees or shrubs. *Evacanthus acuminatus*, typical

for shadowy, moderately moist biotopes was found only in this sector.

#### Sector G (ca. 2000 m<sup>2</sup>) (40 species)

This sector is characterized primarily by euryoecious Auchenorrhyncha species as *Agallia consobrina*, *Anaceratagallia ribauti*, *Empoasca decipiens*, *E. pteridis*, *Euscelis lineolatus*, *Jassargus bisubulatus*, *Philaenus spumarius* and *Psammotettix alienus*.

#### Remarks on some species

##### *Kelisia guttulifera*

Species collected from June to January in the sectors A, D-G, in areas with *Carex depauperata* (probably the host plant), *C. divulsa* and *C. distachya*.

*K. guttulifera* is found generally in moist to moderately dry, often shadowy sites as *Quercus* forests, mixed deciduous forests, clearings or shadowy meadows near brooks. It feeds on different *Carex* spp.. The following species have been indicated as host plants in central Europe: *Carex remota*, *C. sylvatica* subsp. *sylvatica*, possibly also *C. vulpina*, *C. paniculata* subsp. *paniculata*, *C. elongata* and *C. distans* (Nickel, 2003). In Italy, the species has been recorded from Friuli-Venezia Giulia and Veneto (Servadei, 1976), Liguria (Guglielmino and Bückle, 2007), Marche and Abruzzo (Guglielmino *et al.*, 2005). New record for Latium.

##### *Euryranooides rubripes*

Few specimens of this species were found in November and December in the sectors C and D on the herbaceous vegetation.

This species is generally found from autumn until spring, thus it overwinters in the adult stage, on Poaceae. In Italy, it has been recorded only from the Apennine peninsula (Latium, Apulia) (Servadei, 1968 as *Euryrsa laeticiae* Dlabola; Guglielmino *et al.*, 2005) and Sicily (Servadei, 1967).

##### *Wagneriala incisa*

The specimens were collected in June and from August to December in the sectors A, B, E and F on an area with *Carex depauperata*, *C. divulsa* and *C. distachya*.

The species lives on *Carex* spp.; Vidano (1965) recorded it on xerophilous *Carex* species, generally present in forests of *Castanea* and *Quercus*.

The records of *W. incisa* in Italy have concerned only northern regions: Valle d'Aosta (Alma *et al.*, 2009a), Piedmont (Vidano, 1965), Trentino Alto Adige (Remane and Hellrigl, 1996), Liguria (Vidano, 1965) and Friuli Venezia Giulia (Then, 1897). New record for peninsular Italy.

##### *Edwardsiana ulmiphagus*

Only one specimen of this species was collected in October in sector C, on *Ulmus minor*.

*E. ulmiphagus* is oligophagous on *Ulmus* spp..

Previous Italian records were published only from Piedmont (Alma *et al.*, 2009b), Emilia Romagna (Guglielmino and Bückle, 2008) and Tuscany (Mazzoni, 2005). New record for Latium.

*Lindbergina (Youngiada) cf. chobauti*

Taxon collected in December and January in the sectors A, C-F, on *Quercus ilex*.

The studied males display an aedeagus slightly different from that figured by Ribaut (1952), but very similar to that of the specimens collected on the Mount Etna by Guglielmino (1993) and recorded as *Typhlocyba* cfr. *chobauti*. In order to define better the state of this taxon we think it necessary to collect and study further material.

Females probably belonging to this taxon were found in Latium (Monte Circeo) and Apulia (Bosco di Raucio) and cited as *Lindbergina (Youngiada)* sp. (Guglielmino *et al.*, 2005; Guglielmino and Bückle, 2015). Vidano and Arzone (1987b) recorded *Typhlocyba chobauti* generally for northern and central Italy. Mazzoni (2005) recorded *Lindbergina chobauti* from Tuscany and Guglielmino (1993) cited *Typhlocyba* cfr. *chobauti* from Sicily.

*Zyginella pulchra*

Species found in few specimens in January in the sectors A, D and G.

It lives on *Acer* spp.. Following Nickel (2003) this species can be collected on other trees as well (*Quercus*, *Alnus*, *Crataegus*), which are, however, not used for feeding; in Germany overwintering adults fly onto *Picea* (Nickel, 2003), in France on *Buxus*, *Cupressus*, *Taxus* and *Juniperus* (Ribaut, 1936).

There have been records in Italy from Piedmont (Alma *et al.*, 2009b), Friuli-Venezia Giulia and Emilia Romagna (Servadei, 1967), Tuscany (Mazzoni and Lucchi, 2004), Basilicata (Guglielmino and Bückle, 2007), Sicily (D'Urso *et al.*, 1984; Guglielmino, 1993) and Sardinia (Servadei, 1967). New record for Latium.

*Zygina hyperici*

Only one specimen of this species was collected in July in sector E. *Z. hyperici* is monophagous on *Hypericum perforatum*.

In Italy it has been recorded from Piedmont (Vidano and Arzone, 1975-76), Emilia Romagna (Guglielmino and Bückle, 2008), Tuscany (Mazzoni and Lucchi, 2004), Abruzzo (Guglielmino *et al.*, 2005), Apulia (Guglielmino and Bückle, 2007), Sicily (D'Urso, 1995b) and Sardinia (Vidano, 1964). New record for Latium.

Remarks on the Auchenorrhyncha communities

The Auchenorrhyncha species found in the Villa Lante Park can be grouped roughly in three entities:

1. Species in the wooded areas, feeding as nymphs and adults on trees or shrubs (these taxa may be found on the surrounding trees or shrubberies of the open areas as well).

To this group belong: *Latilica tunetana*, *Issus coleoptratus*, *Latissus dilatatus*, *Aphrophora alni*, *Acericerus ribauti*, *A. vittifrons*, *Tremulicerus fulgidus*, *Empoasca vitis*, *Edwardsiana diversa*, *E. ulmiphagus*, *Lindbergina aurovittata*, *L. (Youngiada) cf. chobauti*, *Ribautiana tenerrima*, *Zyginella pulchra*, *Zygina angusta*, *Z. discolor*, *Z. flammigera*, *Z. rorida*, *Arboridia spathulata*, *Synophropsis lauri*, *Placotettix taeniatifrons* and

*Anoplotettix fuscovenosus*.

*Lamprotettix nitidulus*, *Speudotettix subfuscus* and *Thamnotettix dilutior* represent a particular group: their adults live prevalently on shrubs or trees, but their nymphs on the low vegetation. *Reptalus panzeri* (as other cixiids) is generally found on trees, its nymphs live in the soil on roots.

2. Species in the wooded areas, feeding on herbaceous vegetation of the undergrowth and preferring more or less shaded habitats (these taxa may be found on the margins of the open areas as well).

To this group belong: *Asiraca clavicornis*, *Kelisia guttulifera*, *Stenocranus minutus*, *Eurysa lineata*, *Muellerianella* sp., *Dictyophara europaea*, *Megophthalmus scanicus*, *Agallia consobrina*, *Anaceratagallia laevis*, *A. ribauti*, *Evacanthus acuminatus*, *Emelyanoviana mollicula*, *Wagneriala incisa*, *Empoasca alsiosa*, *E. decipiens*, *E. pteridis*, *Eupteryx curtisii*, *E. filicum*, *E. urticae*, *E. zelleri*, *Hauptidia provincialis*, *Zygina hyperici*, *Balclutha punctata*, *Phlepsius spinulosus*, *Mocydia crocea*, *Mocydiopsis monticola*, *Euscelis lineolatus*, *Arocephalus longiceps*, *Adarrus exornatus* and *Jassargus bisubulatus*.

3. Species of open meadows and ruderal places feeding on herbaceous vegetation (these taxa may be present at some less shaded sites of the wooded areas, such as small clearings or along waysides, as well).

To this group belong: *Eurysanoides rubripes*, *Laodelphax striatella*, *Toya propinqua*, *Javesella dubia*, *Dictyophara europaea*, *Tettigometra griseola*, *Caliscelis bonellii*, *Cercopis sanguinolenta*, *Philaenus spumarius*, *Hephathus nanus*, *Anaceratagallia laevis*, *A. ribauti*, *Austroagallia sinuata*, *Dryodurgades dlabolai*, *Aphrodes bicincta*, *Anoscopus albifrons*, *Cicadella viridis*, *Emelyanoviana mollicula*, *Zyginidia ribauti*, *Goniagnathus brevis*, *Neoliturus fenestratus*, *Balclutha saltuella*, *Macrosteles quadripunctulatus*, *Maiestas schmidtgeni*, *Chiasmus conspurcatus*, *Doratura paludosa*, *Phlepsius spinulosus*, *Eohardya fraudulenta*, *Rhopalopyx elongata*, *Thamnotettix zelleri*, *Euscelidius variegatus*, *Euscelis lineolatus*, *Conosanus obsoletus*, *Artianus manderstjernii*, *Arocephalus longiceps*, *Psammotettix alienus*, *P. confinis*, *Jassargus bisubulatus*.

*Allygus modestus*, *Allygidius atomarius*, *Thamnotettix exemtus* were collected prevalently in the open areas, but on trees or shrubs on the margins. Their nymphs live on the low vegetation, the adults on shrubs or trees. *Hyalesthes luteipes* is generally found on shrubs or low vegetation, its nymphs live in the soil on roots.

*Dictyophara europaea*, *Anaceratagallia laevis*, *A. ribauti*, *Emelyanoviana mollicula*, *Phlepsius spinulosus*, *Euscelis lineolatus*, *Arocephalus longiceps* and *Jassargus bisubulatus* showed no clear preference for wooded areas or open meadows in our study, but occurred more or less equally in both sector groups. In the wooded areas, however, they were found prevalently in clearings or along waysides, rather than in the dense shadowy undergrowth.

Some taxa are pioneer species or at least they are adapted to disturbed environments (e.g. *Asiraca clavicornis*, *Laodelphax striatella*, *Toya propinqua*, *Dictyophara europaea*, *Megophthalmus scanicus*, *Empoasca*

*pteridis*, *Eupteryx urticae*, *Macrosteles quadripunctulatus*, *Thamnotettix zelleri*, *Euscelidius variegatus*, *Psamnotettix alienus* and *P. confinis*).

### Phenology

Our records, particularly those between November and January and from March until May, together with data from literature are quite interesting in respect of the overwintering instar of many species (table 3). In some cases we got new data, in others we were able to confirm the observations published by other authors. For example *Kelisia guttulifera*, *Stenocranus minutus*, *Agallia consobrina*, *Anaceratagallia ribauti*, *Acericerus vittifrons*, *Tremulicerus fulgidus*, *Empoasca decipiens*, *Lindbergina aurovittata*, *Lindbergina (Youngiada) cf. chobauti*, *Zyginella pulchra*, *Zygina rorida*, *Goniagnathus brevis*, *Neoaliturus fenestratus*, *Balclutha punctata*, *Eohardya fraudulenta*, *Mocydia crocea*, *Mocy-*

*diopsis monticola*, and probably also *Euscelis lineolatus* (short-day form), *Eurysanoides rubripes*, *Hauptidia provincialis* and *Arboridia spathulata* overwinter in the adult stage. Others, as *Dictyophara europaea*, *Philaenus spumarius*, *Aphrophora alni*, *Eupteryx curtisii*, *E. filicum*, *Wagneriala incisa*, *Lamprotettix nitidulus*, *Megophthalmus scanicus* overwinter as eggs, whereas *Eurysa lineata*, *Laodelphax striatella*, *Speudotettix subfuscus*, *Thamnotettix dilutior*, *T. exemtus* and *T. zelleri* pass the winter in the nymphal stage.

### Conclusions

The present study is a first survey of the Auchenorrhyncha biocenoses in the Villa Lante Park. These data can be used in the future as a basis for a monitoring in order to look for possible changes in the composition of these

**Table 3.** List of Auchenorrhyncha species and their collecting period (month); only adults were considered, the taxa are listed in the systematic order applied by D'Urso (1995a); o = short-day form (*Euscelis*).

Taxa	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I
<b>CIXIIDAE</b>											
<i>Reptalus panzeri</i> (Loew)						+					
<i>Hyalesthes luteipes</i> Fieber						+			+	+	
<b>DELPHACIDAE</b>											
<i>Asiraca clavicornis</i> (F.)			+						+	+	
<i>Kelisia guttulifera</i> (Kirschbaum)				+	+	+	+	+	+	+	+
<i>Stenocranus minutus</i> (F.)						+				+	
<i>Eurysa lineata</i> (Perris)			+	+							
<i>Eurysanoides rubripes</i> (Matsumura)									+	+	
<i>Laodelphax striatella</i> (Fallen)						+			+		
<i>Muellerianella</i> sp.									+	+	
<i>Toya propinqua</i> (Fieber)							+		+	+	
<i>Javesella dubia</i> (Kirschbaum)					+				+		
<b>DICTYOPHARIDAE</b>											
<i>Dictyophara europaea</i> (L.)						+	+	+			
<b>TETTIGOMETRIDAE</b>											
<i>Tettigometra griseola</i> Fieber						+					
<b>ISSIDAE</b>											
<i>Issus coleoptratus</i> (F.)				+	+		+				
<i>Latissus dilatatus</i> (Fourcroy)				+	+						
<i>Latilica tunetana</i> (Matsumura)						+		+	+	+	
<b>CALISCELIDAE</b>											
<i>Caliscelis bonellii</i> (Latreille)							+	+		+	
<b>CERCOPIIDAE</b>											
<i>Cercopis sanguinolenta</i> (Scopoli)			+	+							
<b>APHROPHORIDAE</b>											
<i>Aphrophora alni</i> (Fallen)				+	+				+		
<i>Philaenus spumarius</i> (L.)			+	+	+	+	+	+	+	+	
<b>CICADELLIDAE</b>											
<i>Megophthalmus scanicus</i> (Fallen)									+	+	
<i>Hephathus nanus</i> (Herrich-Schaeffer)						+					
<i>Agallia consobrina</i> Curtis				+	+	+	+	+	+	+	+
<i>Anaceratagallia laevis</i> (Ribaut)				+	+	+			+	+	
<i>Anaceratagallia ribauti</i> (Ossiannilsson)					+	+	+	+	+	+	+
<i>Anaceratagallia</i> sp.		+	+		+	+	+		+	+	
<i>Austroagallia sinuata</i> (Mulsant et Rey)							+		+	+	
<i>Dryodurgades dlabolai</i> Wagner											+
<i>Acericerus ribauti</i> Nickel et Remane									+		
<i>Acericerus vittifrons</i> (Kirschbaum)										+	+
<i>Tremulicerus fulgidus</i> (F.)											+
<i>Aphrodes bicincta</i> (Schrank)					+			+			

(Continued)

(Table 3 continued)

Taxa	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I
<i>Anoscopus albifrons mappus</i> Guglielmino et Bueckle				+							
<i>Anoscopus</i> sp.					+				+		
<i>Evacanthus acuminatus</i> (F.)				+							
<i>Cicadella viridis</i> (L.)						+	+		+		
<i>Emelyanoviana mollicula</i> (Boheman)					+	+	+	+	+	+	
<i>Wagneriala incisa</i> (Then)				+		+	+	+	+	+	
<i>Empoasca alsiosa</i> Ribaut					+	+		+	+	+	
<i>Empoasca decipiens</i> Paoli					+	+	+	+	+	+	
<i>Empoasca pteridis</i> (Dahlbom)					+	+		+	+		
<i>Empoasca vitis</i> (Goethe)						+		+	+	+	
<i>Empoasca</i> sp.		+	+	+	+	+	+	+	+	+	+
<i>Edwardsiana diversa</i> (Edwards)								+	+		
<i>Edwardsiana ulmiphagus</i> Wilson et Claridge								+			
<i>Edwardsiana</i> sp.					+						
<i>Lindbergina aurovittata</i> (Douglas)			+					+	+	+	+
<i>Lindbergina (Youngiada)</i> cf. <i>chobauti</i> Ribaut										+	+
<i>Ribautiana</i> cf. <i>debilis</i> (Douglas)									+		
<i>Ribautiana tenerrima</i> (Herrich-Schaeffer)							+		+		
<i>Eupteryx curtisii</i> Flor			+	+	+	+	+	+		+	
<i>Eupteryx filicum</i> (Newman)							+		+	+	
<i>Eupteryx urticae</i> (F.)			+	+		+	+	+	+		
<i>Eupteryx zelleri</i> (Kirschbaum)										+	
<i>Zyginella pulchra</i> Loew											+
<i>Hauptidia provincialis</i> (Ribaut)		+	+	+	+	+	+	+	+	+	
<i>Zyginidia ribauti</i> Dworakowska					+	+	+		+		
<i>Zygina angusta</i> Lethierry						+	+				
<i>Zygina discolor</i> Horvath							+		+		
<i>Zygina flammigera</i> (Fourcroy)								+		+	
<i>Zygina hyperici</i> (Herrich-Schaeffer)					+						
<i>Zygina rorida</i> (Mulsant et Rey)										+	+
<i>Zygina</i> sp.				+		+		+		+	
<i>Arboridia spathulata</i> (Ribaut)							+			+	
<i>Arboridia</i> sp.					+	+	+				
<i>Goniagnathus brevis</i> (Herrich-Schaeffer)					+		+		+		
<i>Neotalitrus fenestratus</i> (Herrich-Schaeffer)					+	+	+	+	+	+	+
<i>Balclutha punctata</i> (F.)			+	+	+	+	+		+		
<i>Balclutha saltuella</i> (Kirschbaum)				+		+	+				
<i>Macrosteles quadripunctulatus</i> (Kirschbaum)					+	+	+				
<i>Maiestas schmidtgeni</i> (Wagner)									+		
<i>Chiasmus conspurcatus</i> (Perris)						+					
<i>Doratura paludosa</i> Melichar				+	+	+	+	+	+		
<i>Synophropsis lauri</i> (Horvath)				+	+	+	+	+	+		
<i>Placotettix taeniatifrons</i> (Kirschbaum)						+	+	+	+		
<i>Anoplotettix fuscovenosus</i> (Ferrari)				+							
<i>Lamprotettix nitidulus</i> (F.)				+		+			+		
<i>Allygus modestus</i> Scott				+							
<i>Allygidius atomarius</i> (F.)				+							
<i>Phlepsius spinulosus</i> Wagner						+	+				
<i>Eohardya fraudulenta</i> (Horvath)	+				+	+	+	+	+	+	+
<i>Rhopalopyx elongata</i> Wagner									+		
<i>Mocydia crocea</i> (Herrich-Schaeffer)				+	+	+	+	+	+	+	
<i>Mocydiopsis monticola</i> Remane				+	+	+	+	+	+	+	
<i>Speudotettix subfuscus</i> (Fallen)		+	+	+	+	+					
<i>Thamnotettix dilutior</i> (Kirschbaum)			+	+	+	+	+	+	+		
<i>Thamnotettix exemtus</i> Melichar			+	+	+	+	+				
<i>Thamnotettix zelleri</i> (Kirschbaum)			+	+							
<i>Euscelidius variegatus</i> (Kirschbaum)					+						
<i>Conosamus obsoletus</i> (Kirschbaum)									+		
<i>Euscelis lineolatus</i> Brulle	o	o	o	+	+	+	+	+	+	o	o
<i>Artianus manderstjernii</i> (Kirschbaum)				+	+	+					
<i>Arocephalus longiceps</i> (Kirschbaum)			+	+	+	+	+	+	+		
<i>Psamnotettix alienus</i> (Dahlbom)				+	+	+	+	+	+	+	
<i>Psamnotettix confinis</i> (Dahlbom)			+	+	+		+	+	+	+	
<i>Psamnotettix</i> sp.			+	+	+	+	+	+	+	+	+
<i>Adarrus exornatus</i> Ribaut							+				
<i>Jassargus bisubulatus</i> (Then)			+	+	+	+	+	+	+	+	

biocenoses and their correlation with other parameters, such as climatic or floristic changes.

From the origin, human impact is certainly determinant for the villa surroundings. Presently, the anthropogenic activities consist in the work of the responsible personnel which periodically clean the meadows and the undergrowth vegetation of the forest and burn the mown or cut material. No pesticides treatments are carried out in the park assessment. Sport, recreation and scholastic activities of the visitors in all areas of the park have a direct impact on the vegetation. Thus, they may produce an impairment for the fauna correlated with plants, and cause both qualitative and quantitative changes in the structure of those biocenoses.

Studies on the urban ecosystems and their biodiversity are particularly important for the environmental conservation and territorial planning, and in the same time they may help to familiarize citizens with nature and to sensitize them for the conservation of the environment.

The number of species (91) found in the Villa Lante Park during this investigation demonstrates the value of this area for biodiversity conservation. Further intensive research with focus of host plants and microhabitats would certainly reveal the presence of further species and clarify many open problems regarding host plant specificity and life cycles. In addition to the conspicuous number of taxa (diversity), we mention also the presence of some particularly interesting species, above all *Kelisia guttulifera*, *Wagneriala incisa* and *Lindbergina (Youngiada) cf. chobauti*. Finally, the number of specimens (abundance) is quite high for several taxa (among them *Kelisia guttulifera* and *Wagneriala incisa*), another indicator for the value of this area. Similarly, the preliminary study of the floristic data underline both quantitatively (192 species) and qualitatively (e.g. *Linaria purpurea*, *Crepis bursifolia* and *Ajuga genevensis*) the high environmental value of the Villa Lante Park.

Generally, the gestion of the park appears conform with the aim to protect the rich populations of insects. Particular attention should be paid to some small moist areas within the forest and in the southern open areas in order to increase the ecological diversity and to offer niches for the colonization by additional plant and insect taxa.

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