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Heteroptera on flowering spontaneous herbs in differently managed orchards ^(*)

Abstract - Heteroptera were collected on spontaneous herbs, during flowering, in two environments with different mowing management. The highest number of Heteroptera was collected on *Medicago sativa*, *Daucus carota*, *Centaurea nigrescens* and *Erigeron annuus*. As foreseeable, a higher number of species was found in the environment less influenced by traditional farming methods and with a higher number of plant species.

Riassunto - Eterotteri su piante spontanee fiorite in colture con diversa gestione.

Sono state considerate le specie di Eterotteri raccolte su piante spontanee, al momento della fioritura, in due ambienti con diversa gestione degli sfalci. Le piante su cui sono stati catturati più Eterotteri sono *Medicago sativa*, *Daucus carota*, *Centaurea nigrescens* ed *Erigeron annuus*. Come prevedibile, la località caratterizzata da un maggiore numero di specie è risultata quella con una maggiore ricchezza botanica, meno disturbata dalle pratiche colturali.

Key words: Heteroptera, herbs, mowing management.

As Heteroptera show a considerable differentiation in food diets, they can offer a good measure of biodiversity; the richness in species in this Order is strongly related to the total insect diversity (Duelli & Obrist, 1998). In many crops Heteroptera represent most of the total fauna; they are particularly abundant in unsprayed apple and pear orchards, where they form 30-50% of predators throughout the growing season (Fauvel, 1999). Many species are supported by moss and lichens, found on unsprayed trees harbouring bark dwelling insects, such as Psocids (Fauvel, 1999).

Fencerows and hedgerows, called by Altieri (1999) "*biological corridors*", provide overwintering sites, food and alternative preys for parasitoids and predators, increasing abundance and favouring the diffusion in the crops (Remund *et al.*, 1992).

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Heteroptera present in two different plant mixtures were considered in a previous work (Limonta *et al.*, 2003). In this work Heteroptera collected on flowering spontaneous herbs in two differently managed crops were studied, as different mowing management can influence the composition of Heteroptera fauna (Di Giulio *et al.*, 2001). In fact, a careful management is important; it was observed that mowing all the plot in some perennial plants, like *Medicago sativa* L., causes the destruction of the field fauna while strip harvesting creates a more suitable environment and favours moving of beneficial insects to crop plants (van den Bosch *et al.* 1967; Summers, 1976; van den Bosch *et al.*, 1982).

MATERIALS AND METHODS

Researches were carried out in olive groves in Manerba del Garda and Portese (Brescia province) near Garda Lake.

In the first place unsprayed olive groves with ground cover plants, in “Parco Naturale della Rocca”, were surveyed. Herbs comes from previous seeding associated to olive grove: wide areas of meadow Fabaceae like clover, lucerne, five-finger, and also of Poaceae are present; however planted seeds are mingled with spontaneous ones, that belong to Apiaceae, Geraniaceae, Ranunculaceae and Asteraceae.

In Portese the olive grove is clean cultivated, only in the edge there are plants, regularly mowed. The ground is harrowed on the row and on the inter-row. It borders on another olive grove with ground cover regularly mowed. Both are pruned and sprayed with copper fungicide and organophosphates.

Insect sampling

Insects were sampled weekly, from April to September, from 1999 to 2001, on herbs under or near olive trees; the samples were collected on flowering plants, covering at least a square meter surface. In table 1 Families and species of collected plant are listed. In Parco della Rocca in Manerba a high number of plant species is present, but only synanthropic, ruderal or cultivated plants covered an adequate surface to sample.

Samples were collected with a suction device (a garden Blower-vac, whose direction of rotation was reversed). Sampling on plants lasted one minute each.

The exclusion of plants with a reduced flowering surface precluded the use of biodiversity indexes.

RESULTS AND DISCUSSION

In table 2 the species of Heteroptera and the number of collected individuals are listed; diet, pabulum and corology are shown in table 3 (Dioli, 1980, 1997; Tamanini, 1988; Southwood & Leston, 1959). The highest biodiversity is observed in Manerba olive grove, where the prevailing species, *Orius niger*, predator, form little more than 20% of

Table 1 - Plants surveyed in Portese and in Manerba.

Family	Species	Portese	Manerba
Caryophyllaceae	<i>Silene vulgaris</i> (Moench) Garke	*	
Fabaceae	<i>Lotus corniculatus</i> L.		*
	<i>Medicago sativa</i> L.	*	*
	<i>Trifolium repens</i> L.		*
Cistaceae	<i>Helianthemum nummularium</i> (L.) spp. <i>obscurum</i> (Celak) Ho		*
Apiaceae	<i>Daucus carota</i> L.	*	*
Rubiaceae	<i>Galium lucidum</i> All.		*
	<i>Galium verum</i> L.		*
Convolvulaceae	<i>Convolvulus arvensis</i> L.	*	
Verbenaceae	<i>Verbena officinalis</i> L.	*	
Lamiaceae	<i>Ajuga reptans</i> L.		*
	<i>Centaurea nigrescens</i> Willd.	*	*
	<i>Calamintha selvatica</i> Bromf.	*	*
	<i>Mentha</i> sp.	*	*
Scrophulariaceae	<i>Veronica chamaedrys</i> L.		*
Asteraceae	<i>Bellis perennis</i> L.	*	*
	<i>Erigeron annuus</i> (L.) Pers.	*	*
	<i>Taraxacum officinale</i> Web.		*

population, while in Portese *Nysius graminicola*, phytophagous, make up 80% and the total number of species is less than half of the number in the other place.

Species of Heteroptera and host plants, on which insects were collected, are reported in tables 4 and 5. In Portese *Erigeron annuus*, *Medicago sativa* and *Centaurea nigrescens* were the most visited plants; in Manerba *M. sativa* was colonized by 20 species of Heteroptera, *Daucus carota* and *C. nigrescens* by 11 species. *E. annuus* was studied by many Authors as nectar source, with contrasting results: *Pimpla turionellae* L. is unable to exploit nectar (Wackers *et al.*, 1996), while the opposite happens with *Ooencyrtus nezarae* Ishii (Takeshi & Numata, 2000); Fleischer *et al.* (1988) demonstrated that the presence of the plant decreased the number of adults of *Lygus lineolaris* (Palisot de Beauvois) in cotton fields. *Daucus carota* has exposed and accessible nectars (Patt *et al.*, 1997), exploited by many parasitoids (Idris & Grafius, 1997; Manojlovic *et al.*, 2000, 2001); *M. sativa* has a high nectar-carbohydrate production (Davis, 2001) and enhance the level of parasitoids (Lawrence *et al.*, 2003). *C. nigrescens* is present in uncultivated ground and permanent meadows; it is considered a weed (Ward *et al.*, 1974; Solymosi, 1996) and it is neglected as potential nectar source because it has hidden nectaries, like all Asteraceae, on which parasitoids can forage only difficultly (Patt *et al.*, op. cit.).

Table 2 - Species of Heteroptera and number of specimen collected in the two places.

		Portese	Manerba
Anthocoridae	<i>Orius niger</i> Wolff	169	195
Nabidae	<i>Aptus mirmicoides</i> (O.G.Costa)		5
	<i>Nabis pseudoferus</i> Remane	2	16
	<i>Nabis punctatus</i> A.Costa	8	28
Miridae	§ <i>Deraeocoris punctulatus</i> (Fallén) *		13
	<i>Deraeocoris serenus</i> Douglas & Scott	16	16
	<i>Halticus apterus</i> (L.)*	4	19
	<i>Adelphocoris lineolatus</i> (Goeze)	25	169
	<i>Adelphocoris seticornis</i> (Fabricius)		12
	<i>Charagochilus gyllenhalii</i> (Fallén)	1	57
	<i>Liocoris tripustulatus</i> (Fabricius)*		1
	<i>Orthops kalmi</i> (L.)		3
	<i>Stenodema laevigatum</i> (L.)		1
	<i>Stenotus binotatus</i> (Fabricius)	8	2
	<i>Trigonotylus ruficornis</i> (Goeffroy)	13	5
	<i>Chlamydatus pullus</i> Reuter	3	2
	<i>Criocoris crassicornis</i> (Hahn)		79
	<i>Plagiognathus arbustorum</i> (F.)	11	2
	Tingidae	<i>Copium clavicorne</i> (L.)	
<i>Kalama tricornis</i> (Schrank)		1	
<i>Tingis crespata</i> (Herrich-Schäffer)			1
<i>Tingis auriculata</i> (A.Costa)			3
Alydidae	<i>Alydus calcaratus</i> (L.)		7
	<i>Camptopus lateralis</i> (Germar)		4
Coreidae	<i>Syromastes rhombeus</i> (L.)		3
	<i>Coriomeris denticulatus</i> (Scopoli)	1	2
Rhopalidae	<i>Rhopalus subrufus</i> (Gmelin)	5	6
	<i>Stictopleurus crassicornis</i> (L.)		2
Lygaeidae	<i>Heterogaster affinis</i> Herrich-Schäffer	1	
	<i>Nysius graminicola</i> (Kolenati)	285	50
	<i>Nysius senecionis</i> (Schilling)		1
	<i>Macroplox preysleri</i> (Fieber)		1
	<i>Oxycarenus pallens</i> (Herrich-Schafer)	1	3
	<i>Beosus quadripunctatus</i> (O.F. Müller)	3	14
	<i>Megalonotus sabulicola</i> (Thomson)		3
	<i>Paromius gracilis</i> (Rambur)		1
	<i>Peritrechus gracilicornis</i> Puton		1
	<i>Rhyparochromus vulgaris</i> (Schilling)		1
<i>Scolopostethus thomsoni</i> Reuter		4	
Cydnidae	<i>Legnotus picipes</i> (Fallén)	2	
Pentatomidae	<i>Dolycoris baccarum</i> (L.)		4
	<i>Eysacoris aeneus</i> (Scopoli)		1
	<i>Nezara viridula</i> (L.)		21
	<i>Piezodorus lituratus</i> (Fabricius)		1
	<i>Graphosoma lineatum</i> (L.)		7
	<i>Vilpianus galii</i> (Wolff)		2

* species collected on mixed flowering plants Diet, pabulum and chorology of species are reported in tab. 3; species in normal character were already listed in a previous paper (Limonta *et al.*, 2003).

§ *Deraeocoris punctulatus* is separated from *D. serenus*, light colored, even if Wagner (1975) considered the last one the only valid species.

Table 3 - Main characteristics of Heteroptera surveyed in Portese and in Manerba.

Classification	Diet	Pabulum	Chorology ¹	Portese	Manerba
Anthocoridae					
<i>Orius niger</i> Wolff, 1811	Zoophagous	Prey Insects and Mites on <i>Artemisia, Achillea, Verbascum</i>	Mediterranean	*	*
Nabidae					
<i>Aptus mirmicoides</i> (O.G. Costa, 1834)	Zoophagous	Prey little Insects	Centraleuropean		*
<i>Nabis pseudoferus</i> (Remane, 1949)	Zoophagous	Prey Insect adults and larvae	N-Anatolian-European	*	*
<i>Nabis punctatus</i> (A. Costa, 1847)	Zoophagous	Prey Insects	European-Saharian	*	*
Miridae					
<i>Deraeocoris punctulatus</i> (Fallèn, 1807)	Zoophytophagous	Prey little Insects and eggs	Siberian-European		*
<i>Deraeocoris serenus</i> Douglas & Scott, 1868	Zoophytophagous	Prey little Insects	Mediterranean	*	*
<i>Halticus apterus</i> (L., 1758)	Phytophagous	<i>Ononis, Galium</i>	Mediterranean	*	*
<i>Adelphocoris lineolatus</i> (Goeze, 1778)	Phytophagous	<i>Artemisia, Verbascum, Achillea</i>	European	*	*
<i>Adelphocoris seticornis</i> (Fabricius, 1775)	Phytophagous	Fabaceae: <i>Trifolium, Vicia</i>	Asiatic-European		*
<i>Charagochilus gyllenhalii</i> (Fallèn, 1807)	Phytophagous	<i>Galium</i> spp.	Palaearctic	*	*
<i>Liocoris tripustulatus</i> (Fabricius, 1781)	Phytophagous	<i>Parietaria</i> spp., <i>Solanum</i> spp., <i>Urtica, Verbascum</i> spp., <i>Salvia</i>	Siberian-European		*
<i>Orthops kalmi</i> (L., 1758)	Phytophagous	Apiaceae: <i>Daucus</i> and <i>Pastinaca</i>	Palaearctic		*
<i>Stenodema laevigatum</i> (Linnaeus, 1758)	Phytophagous	Poaceae	Holarctic		*
<i>Stenotus binotatus</i> (Fabricius, 1794)	Phytophagous	Asteraceae, mainly <i>Dactylis, Phleum pratense</i>	Holarctic	*	*
<i>Trigonotylus ruficornis</i> (Geoffroy, 1758)	Phytophagous	Poaceae	Holarctic	*	*
<i>Chlamydatus pullus</i> Reuter, 1870	Phytophagous	<i>Achillea, Trifolium</i>	Palaearctic	*	*
<i>Criocoris crassicornis</i> (Hahn, 1834)	Phytophagous	<i>Galium</i> sp.	Turanian-European- Mediterranean		*
<i>Plagiognathus arbustorum</i> (Fabricius, 1794)	Phytophagous	<i>Urtica</i> sp.	Palaearctic	*	*

¹ According to Vigna Taglianti *et al.* (1999).

(Table 3 continued)

Classification	Diet	Pabulum	Chorology	Portese	Manerba
Tingidae					
<i>Copium clavicornis</i> (Linneus, 1758)	Phytophagous	<i>Teucrium chamaedris</i>	S-European		*
<i>Kalama tricornis</i> (Schrank)	Phytophagous	<i>Artemisia campestris</i>	Siberian-European	*	
<i>Tingis crespata</i> (Herrich-Schäffer, 1838)	Phytophagous	<i>Hieracium, Artemisia</i>	Centraleuropean Mediterranean		*
<i>Tingis auriculata</i> (A. Costa, 1847)	Phytophagous	<i>Daucus</i> spp., <i>Caucalis platycarpus</i> , <i>Cnidium silaifolium, Torilis</i> spp.	S-European		*
Alydidae					
<i>Alydus calcaratus</i> (L., 1758)	Phytophagous	Different plants	Holarctic		*
<i>Camptopus lateralis</i> (Germar, 1817)	Phytophagous	Polyphagous	S-Palearctic		*
Coreidae					
<i>Syromastes rhombeus</i> (Linneaus, 1767)	Phytophagous	<i>Euphorbia</i> , Caryophyllaceae	Centraleuropean		*
<i>Coriomeris denticulatus</i> (Scopoli, 1763)	Phytophagous	Polyphagous	Siberian-European Mediterranean	*	*
Rhopalidae					
<i>Rhopalus subrufus</i> (Gmelin, 1790)	Phytophagous	<i>Trifolium, Urtica, Salvia pratensis</i>	Cosmopolitan	*	*
<i>Stictopleurus crassicornis</i> (L., 1758)	Phytophagous	<i>Abutilon, Artemisia, Achillea</i>	European		*
Lygaeidae					
<i>Heterogaster affinis</i> Herrich-Schäffer, 1835	Detritivorous	<i>Cytisus scoparius, Artemisia</i> sp., <i>Coronilla</i> sp., <i>Scabiosa</i> sp.	Turanian-European Mediterranean	*	
<i>Nysius graminicola</i> (Kolenati, 1845)	Detritivorous Phytophagous	Different plants	Mediterranean	*	*
<i>Nysius senecionis</i> (Schilling, 1829)	Detritivorous Phytophagous	<i>Artemisia</i>	European Mediterranean		*
<i>Macroplox preyssleri</i> (Fieber, 1837)	Phytophagous	<i>Thymus serpyllum</i>	European		*
<i>Oxycarenus pallens</i> (Herrich-Schäffer, 1850)	Phytophagous	<i>Centaurea</i>	Centralasiatic Mediterranean	*	*

(Table 3 continued)

Classification	Diet	Pabulum	Chorology	Portese	Manerba
<i>Beosus quadripunctatus</i> (O.F. Müller, 1766)	Detritivorous	<i>Cytisus scoparius</i> , <i>Silene</i> sp., <i>Erica arborea</i> , <i>Calluna vulgaris</i>	Turanian Mediterranean	*	*
<i>Megalonotus sabulicola</i> (Thomson, 1870)	Detritivorous	Asteraceae, Poaceae	European		*
<i>Paromius gracilis</i> (Rambur, 1839)	Phytophagous	<i>Elianthus</i> , <i>Imperata</i> , <i>Andropogon</i>	Mediterranean-Ethiopian		*
<i>Peritrechus gracilicornis</i> Puton, 1877	Detritivorous	Poaceae, Ericaceae	Turanian-Mediterranean		*
<i>Rhyparochromus vulgaris</i> (Shilling, 1829)	Detritivorous	Poaceae	Turanian-European		*
<i>Scolopostethus thomsoni</i> Reuter, 1874	Detritivorous Phytophagous	<i>Urtica</i>	Holarctic		*
Cydnidae					
<i>Legnotus picipes</i> (Fallén, 1807)	Phytophagous	<i>Artemisia</i> spp	Siberian-European	*	
Pentatomidae					*
<i>Dolycoris baccarum</i> (L., 1758)	Phytophagous	Polyphagous ¹	Asiatic-European		*
<i>Eysacoris aeneus</i> (Scopoli, 1763)	Phytophagous	Lamiaceae	Asiatic-European	*	
<i>Nezara viridula</i> (Linnaeus, 1758)	Phytophagous	Polyphagous	Afrotropical-Indoaustral Mediterranean		*
<i>Piezodorus lituratus</i> (Fabricius, 1794)	Phytophagous	Fabaceae	Turanian-European Mediterranean		*
<i>Graphosoma lineatum</i> (Linnaeus, 1758)	Phytophagous	Apiaceae	Palaearctic		*
<i>Vilpianus galii</i> (Wolff, 1802)	Phytophagous	<i>Galium verum</i>	Turanian- S-European Mediterranean		*

Table 4 - Plants and Heteroptera collected in Portese olive grove.

Heteroptera		Plants									
		<i>Silene vulgaris</i> (Moench) Gark	<i>Medicago sativa</i> L.	<i>Daucus carota</i> L.	<i>Convolvulus arvensis</i> L.	<i>Verbena officinalis</i> L.	<i>Calamintha sylvatica</i> Bromf.	<i>Mentha</i>	<i>Erigeron annuus</i> (L.) Pers.	<i>Bellis perennis</i>	<i>Centaurea nigrescens</i> Willd.
Anthocoridae	<i>Orius niger</i> Wolff		x	x	x		x	x	x		x
Nabidae	<i>Nabis pseudoferus</i> Remane								x		
	<i>Nabis punctatus</i> A.Costa		x						x		
Miridae	<i>Deraeocoris serenus</i> (Douglas & Scott)		x				x		x		
	<i>Halticus apterus</i> (L.)								x	x	
	<i>Adelphocoris lineolatus</i> (Goeze)	x	x		x				x	x	
	<i>Charagochilus gyllenhalii</i> (Fallén)*		x								x
	<i>Stenotus binotatus</i> (Fabricius)										x
	<i>Trigonotylus ruficornis</i> (Goeffroy)	x	x			x					x
	<i>Chlamidatus pullus</i> Reuter	x	x								
	<i>Plagiognathus arbustorum</i> (Fabricius)	x									x
Tingidae	<i>Kalama tricornis</i> (Schrank)				x						
Coreidae	<i>Coriomeris denticulatus</i> (Scopoli)								x		
Rhopalidae	<i>Rhopalus subrufus</i> (Gmelin)					x	x	x	x		
Lygaeidae	<i>Heterogaster affinis</i> Herrich-Schäffer							x			
	<i>Nysius graminicola</i> (Kolenati)	x	x	x	x				x	x	
	<i>Oxycarenus pallens</i> (Herrich-Schäffer)			x							
	<i>Beosus quadripunctatus</i> (O.F.Müller)							x			
Cydnidae	<i>Legnotus picipes</i> (Fallén)			x							x
total		5	8	4	4	2	3	4	9	1	8

* the species was collected on mixed flowering plants.

In both places (tabb. 4-5), the minute pirate bug *Orius niger*, predator of insects and mites, was frequently collected on different plants. The presence in both environments is due to the ability of Anthocoridae to tolerate pesticides, probably thanks to the high mobility and to the large number of generations (Fauvel, 1999). Other predators present in both places are damsel bugs *Nabis pseudoferus*, species not influenced by intensive management of grass (Di Giulio *et al.*, 2001), and *N. punctatus*, lit-

Table 5 - Plants and Heteroptera collected in Manerba olive grove.

Heteroptera		Plants														
		<i>Medicago sativa</i> L.	<i>Trifolium repens</i> L.	<i>Lotus corniculatus</i> L.	<i>Helianthemum nummularium</i> (L.) Miller ssp. <i>obscurum</i>	<i>Daucus carota</i> L.	<i>Galium verum</i> L.	<i>Galium lucidum</i> All.	<i>Ajuga reptans</i> L.	<i>Calamintha selvatica</i> Bromi.	<i>Mentha</i>	<i>Veronica chamaedrys</i> L.	<i>Erigeron annuus</i> (L.) Pers	<i>Bellis perennis</i> L.	<i>Centaurea nigrescens</i> Willd.	<i>Taraxacum officinale</i> Web.
Anthracoridae	<i>Orius niger</i> Wolff	x	x		x				x	x					x	
Nabidae	<i>Aptus mirmicoides</i> (O.G.Costa)			x		x	x									
	<i>Nabis pseudoferus</i> Remane	x	x						x							
	<i>Nabis punctatus</i> A.Costa	x	x		x	x					x				x	
Miridae	<i>Deraeocoris serenus</i> Douglas & Scott	x	x		x	x						x				
	<i>Deraeocoris punctulatus</i> (Fallén)*															
	<i>Halticus apterus</i> (L.)*	x			x										x	
	<i>Adelphocoris lineolatus</i> (Goeze)	x	x		x	x	x			x					x	
	<i>Adelphocoris seticornis</i> (F.)	x													x	
	<i>Charagochilus gyllenhalii</i> (Fallén)	x	x			x						x				x
	<i>Liocoris tripustulatus</i> (F.)*	x	x				x									
	<i>Orthops kalmi</i> (L.)					x										x
	<i>Stenodema laevigatum</i> (L.)		x													
	<i>Stenotus binotatus</i> (Fabricius)	x		x			x									
	<i>Trigonotylus ruficornis</i> (Goeffroy)	x	x		x											
	<i>Chlamydatus pullus</i> Reuter							x								
	<i>Criocoris crassicornis</i> (Hahn)							x								
	<i>Plagiognathus arbustorum</i> (F.)								x							
Tingidae	<i>Copium clavicornis</i> (L.)				x											
	<i>Tingis crespata</i> (Herrich-Schäffer)								x							
	<i>Tingis auriculata</i> (A.Costa)		x	x												
Alydidae	<i>Alydus calcaratus</i> (L.)	x										x				
	<i>Camptopus lateralis</i> (Germar)	x														
Coreidae	<i>Syromastus rhombeus</i> (L.)					x						x				
	<i>Coriomeris denticulatus</i> (Scopoli)	x														
Rhopalidae	<i>Rhopalus subrufus</i> (Gmelin)	x					x									x
	<i>Stictopleurus crassicornis</i> (L.)															
Lygaeidae	<i>Nysius graminicola</i> (Kolenati)	x				x				x				x		
	<i>Nysius senecionis</i> (Schilling)															x
	<i>Macroplax preysleri</i> (Fieber)							x								
	<i>Oxycarenus pallens</i> (Herrich-Schafer)					x										x
	<i>Beosus quadripunctatus</i> (O.F.Müller)	x														x
	<i>Megalonotus sabulicola</i> (Thomson)															x
	<i>Paromius gracilis</i> (Rambur)				x											
	<i>Peritrechus gracilicornis</i> Puton								x							
	<i>Rhyparochromus vulgaris</i> (Schilling)								x							
	<i>Scolopostethus thomsoni</i> Reuter	x														
Pentatomidae	<i>Dolycoris baccarum</i> (L.)	x							x							x
	<i>Eysacoris aeneus</i> (Scopoli)															
	<i>Nezara viridula</i> (L.)	x								x						
	<i>Piezodorus lituratus</i> (Fabricius)	x														
	<i>Graphosoma lineatum</i> (L.)					x										
	<i>Vilpianus galii</i> (Wolff)							x	x							
<i>total</i>		20	3	9	4	11	8	7	5	4	2	2	3	1	11	2

* the species was collected on mixed flowering plants.

tle specialized predator (Chiappini & Reguzzi, 1994); both are spread all over Italy on herbs in dry environments. Also the plant bug *Deraeocoris serenus* is widely spread in Italy. *Aptus mirmicoides* and *Deraeocoris punctulatus* are the species present only in Manerba. The damsel bug *A. mirmicoides*, collected on different plants, more common in woods, preys little insects; Maceljski & Balarin (1977) list it among predators of *Corythuca ciliata* (Say), emphasizing the lesser efficiency with low temperatures, while Buchholz & Schruft (1994) report it as predator of eggs, larvae and pupae of *Eupoecilia ambiguella* Hbn.. *D. punctulatus* preys little insects on different plants and trees; it was collected on mixed flowering of *Galium verum* and *Silene vulgaris*.

Mirids are more abundant in Manerba and in fact they seem to be more linked to the host plant and more susceptible to the effect of chemical sprays than anthocorids (Fauvel, 1999).

Among phytophagous mirids, *Halticus apterus* is a widely common species, that colonize *Medicago sativa*, other Fabaceae and *Galium*; it is worth mentioning the collection of individuals on *C. nigrescens* and *E. annuus*. It was collected also on *D. carota* mixed with *M. sativa*. It is not influenced by intensive management of grassland like *Adelphocoris lineolatus*, *Stenodema laevigatum* and *Dolycoris baccarum* (Di Giulio *et al.*, 2001). Few individuals of the last two species were found only in Manerba (tab. 2).

Charagochilus gyllenhalii, palearctic species widespread in Italy, is linked to *Galium*, but it was collected also on Fabaceae and Asteraceae.

The specimen of *Liocoris tripustulatus*, with the same diffusion of the previous species, was collected in Manerba on mixed flowering of *Lotus*, *Medicago* and *Galium*; usually it colonize *Parietaria*, *Solanum*, *Urtica*, *Verbascum* and *Salvia*.

Also *Peritrechus gracilicornis* was found only in Manerba; in fact the species is negatively affected by intensive management, like *Adelphocoris seticornis* (Di Giulio *et al.*, 2001).

Adelphocoris lineolatus, *A. seticornis*, *Stenotus binotatus*, *Trigonotylus ruficornis*, *Nysius graminicola*, *Nezara viridula*, phytophagous, are common species and they can be pests of various crops (Southwood & Leston, 1959; Balarin, 1978; Di Giulio *et al.*, 2001; Accinelli *et al.*, 2002; Every *et al.*, 1992; Bin & Colazza, 1986; Parenzan *et al.*, 1994; Tanaka *et al.*, 1991). Even *Criocoris crassicornis* and *Beosus quadripunctatus* were frequently collected, but they are harmless: the first one colonize *Galium*, the second one is detritivorous.

On the whole, the higher plant biodiversity and the scarce mowing in Manerba directly affect the Heteropterofauna that is more abundant in term of number of species and of individuals than in Portese, where grass management is intensive.

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