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Typhlocybinae of broadleaved trees and shrubs in Italy. 3. Corylaceae (*)

Introduction

This is a contribution to the knowledge of the typhlocybine fauna (Homoptera Auchenorrhyncha Cicadellidae) of broadleaved trees and shrubs following those concerning *Alnus* and Betulaceae (Vidano & Arzone, 1981, 1987). The Typhlocybinae of the Corylaceae until now were only partially known in Italy. Actually a study of this fauna was accomplished for *Corylus avellana* in Campania some years ago (Viggiani, 1971). In the present study all genera of Corylaceae were considered and the leafhoppers were analyzed from several points of view in order to ascertain their host association and specificity, according to our previous investigations with the aim to distinguish the various entities into categories related to the trophic activity of the nymphs, i.e. polyphagous, oligophagous and monophagous species (Vidano & Arzone, 1986).

Intense researches were carried out during the last three years, but data acquired during our pluriennial investigations were also employed to better clarify the chorology, ecology and ethology of the Italian typhlocybine fauna of Corylaceae.

Materials and methods

The investigated tree and shrub species were: *Corylus avellana* L. (hazel), which is distributed throughout all Italy (Sardinia and Sicily included) in the underwood of broadleaved and conifer forests and is

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also intensively cultivated in several territories, mainly in Piedmont, Campania and Sicily; *Carpinus betulus* L. (hornbeam), which is present in the mesophylous woods of continental Italy; *Ostrya carpinifolia* Scop. (hop-hornbeam), which grows in continental Italy, above all in the northeastern part, and also in Sardinia and Sicily. *Corylus maxima* Miller, indigenous only near Trieste and sometimes cultivated, and *Carpinus orientalis,* growing in the thermophilous woods in the central and southern part of Italy, were not considered owing to their discontinuous distribution.

The methods employed during the field and laboratory investigations were the same described in a previous paper (Vidano & Arzone, 1987). For the identification of the Typhlocybinae, the books by Ribaut (1936) and Ossiannilsson (1981), and the papers by Wagner (1940), Günthart (1974), Dworakowska (1971) and Le Quesne (1977) were followed. For the Italian Corylaceae, the volume by Pignatti (1982) was used.

Results

The Typhlocybinae found on Corylaceae in Italy were altogether thirtyfour. They are listed in Table 1 and subdivided into three groups: species found on Corylaceae as adults only; oligophagous or polyphagous species on broadleaved trees and shrubs; monophagous species.

The nineteen species found only as adults are regarded as erratic ones, being represented by individuals presumedly coming from near broadleaved trees, shrubs and herbaceous plants: *Alebra albostriella* from deciduous *Quercus* and other broadleaved trees; *A. wahlbergi* mainly from *Acer campestre; Empoasca alsiosa, E. decipiens* and *E. solani* from various herbaceous plants; *Edwardsiana platanicola* from *Platanus hybrida; E. rosae* from *Rosa* spp., *Malus domestica* and other Rosaceae; *Ribautiana debilis* mainly from *Rubus* spp.; *Typhlocyba quercus* from *Quercus robur* and a few other broadleaved trees; *Zyginella pulchra* from *Acer* spp.; *Zygina angusta* from several shrubby Rosaceae; *Z. discolor* from *Prunus* spp. and other Rosaceae; *Z. flammigera* from *Prunus* spp., *Malus domestica* and several other Rosaceae; *Z. ordinaria* from *Salix* spp.; *Z. rhamni* from *Vitis vinifera; Z. suavis* from *Frangula alnus* and *Rhamnus* spp.; *Z. tiliae* from *Alnus* spp.; *Z. tithide* from *Populus alba; Arboridia versuta* from deciduous *Quercus.*

The fifteen species found on Corylaceae both as adults and nymphs are regarded as follows: ten oligophagous or polyphagous on broadleaved trees and five monophagous (Table 1 and Fig. I).

The ten species found to multiply on Corylaceae and other broadleaved trees are listed in Fig. II. Among them, seven on *Corylus avellana,*

TABLE 1 - Typhlocybinae found on Corylaceae in Italy

Typhlocybinae \ Corylaceae	*Corylus avellana*	*Carpinus betulus*	*Ostrya carpinifolia*
Alebrini			
Alebra albostriella (Fallén)			*
" *coryli* Le Quesne	***		
" *neglecta* Wagner		***	
" *wahlbergi* (Boheman)	*	*	*
Empoascini			
Empoasca alsiosa Ribaut	*		
" *decipiens* Paoli	*	*	*
" *solani* (Curtis)	*	*	
" *vitis* (Göthe)	**	**	**
Typhlocybini			
Fagocyba cruenta (Herrich-Schäffer)	**	**	**
Edwardsiana avellanae (Edwards)	***	*	*
" *flavescens* (Fabricius)		**	**
" *frustrator* (Edwards)	**	**	**
" *hippocastani* (Edwards)	**		
" *platanicola* (Vidano)	*		
" *rosae* (Linnaeus)	*	*	
" *spinigera* (Edwards)	***	*	
" *staminata* (Ribaut)	***		
Ribautiana debilis (Douglas)	*	*	
" *tenerrima* (Herrich-Schäffer)	**	*	*
Typhlocyba bifasciata Boheman		**	**
" *quercus* (Fabricius)			*
Zyginella pulchra Löw			*
Erythroneurini			
Alnetoidia alneti (Dahlbom)	**	**	**
Zygina angusta Lethierry	*	*	*
" *discolor* Horváth	*		
" *flammigera* (Fourcroy)	*	*	*
" *ordinaria* (Ribaut)	*	*	
" *rhamni* Ferrari	*	*	
" *suavis* Rey		*	*
" *tiliae* (Fallén)	*	*	*
" *tithide* Ferrari	*		
Arboridia parvula (Boheman)	**	*	
" *ribauti* (Ossiannilsson)		**	*
" *versuta* (Melichar)	*	*	*

* species found on Corylaceae only as adults
** oligophagous or polyphagous species on broadleaved trees and shrubs
*** monophagous species

seven on *Carpinus betulus* and six on *Ostrya carpinifolia*: *Empoasca vitis,* present on *C. avellana, C. betulus* and *O. carpinifolia,* very common on Betulaceae and numerous other broadleaved trees, but well known as a pest of *Vitis; Fagocyba cruenta* also common on all the three Corylaceae as well as on Betulaceae and several other trees, but above all frequent on *Fagus sylvatica; Edwardsiana flavescens* more fre-

quent on *C. betulus* than on *O. carpinifolia,* and represented on some other broadleaved trees; *E. frustrator* above all common on *C. avellana* and represented on *C. betulus* and *O. carpinifolia* as well as on other broadleaved trees; *E. hippocastani* not very common on *C. avellana,* but frequent on *Acer campestre* and *Ulmus minor; Ribautiana tenerrima* represented on *C. avellana* and known as an oligophagous species preferring *Rubus* spp.; *Typhlocyba bifasciata* (Pl. II, 4) very common on *C. betulus,* less frequent on *O. carpinifolia* and represented also on *Alnus glutinosa; Alnetoidia alneti* represented on *C. betulus* and *O. carpinifolia,* very common on *C. avellana* as well as on Betulaceae and several other trees; *Arboridia parvula* present on low bushes of *C. avellana* but most frequent on *Rubus* spp. and undergrowing herbaceous plants; *A. ribauti* (Pl. I, 4) very common on *C. betulus* and present in other broadleaved trees and shrubs.

Five species showed to be monophagous: *A. coryli* (Pls I, 2; II, 1), *E. avellanae* (Pls I, 3; II, 3), *E. spinigera* and *E. staminata* on *C. avellana; A. neglecta* (Pl. II, 2) on *C. betulus* (Fig. III).

The Italian chorology of the fifteen Typhlocybinae reared from Corylaceae was as follows: northern Italy for *A. neglecta, E. flavescens* and *A. ribauti*; northern and central Italy for *E. frustrator* and *T.*

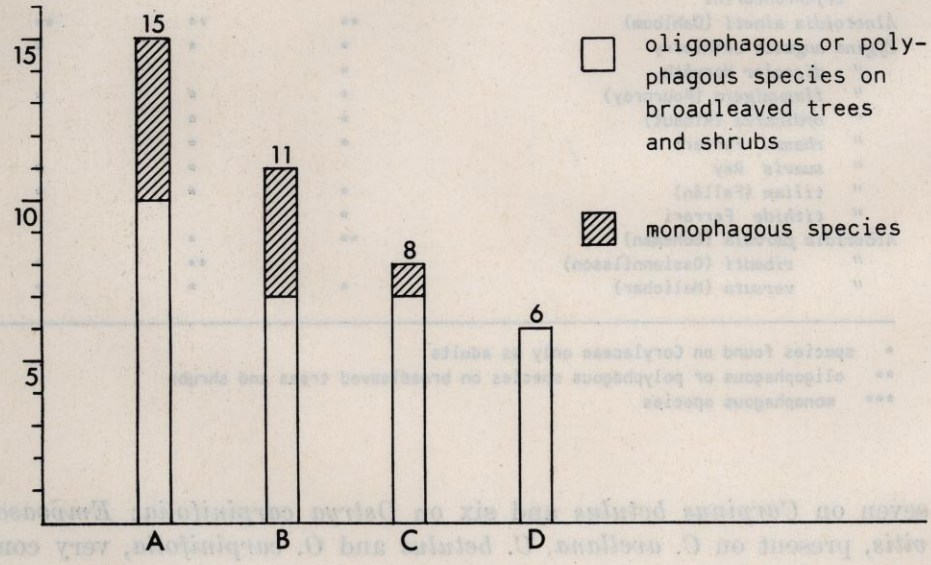

FIG. I

Total numbers of Typhlocybinae species reared from Corylaceae (A), *Corylus avellana* (B), *Carpinus betulus* (C), *Ostrya carpinifolia* (D). (Data from table 1).

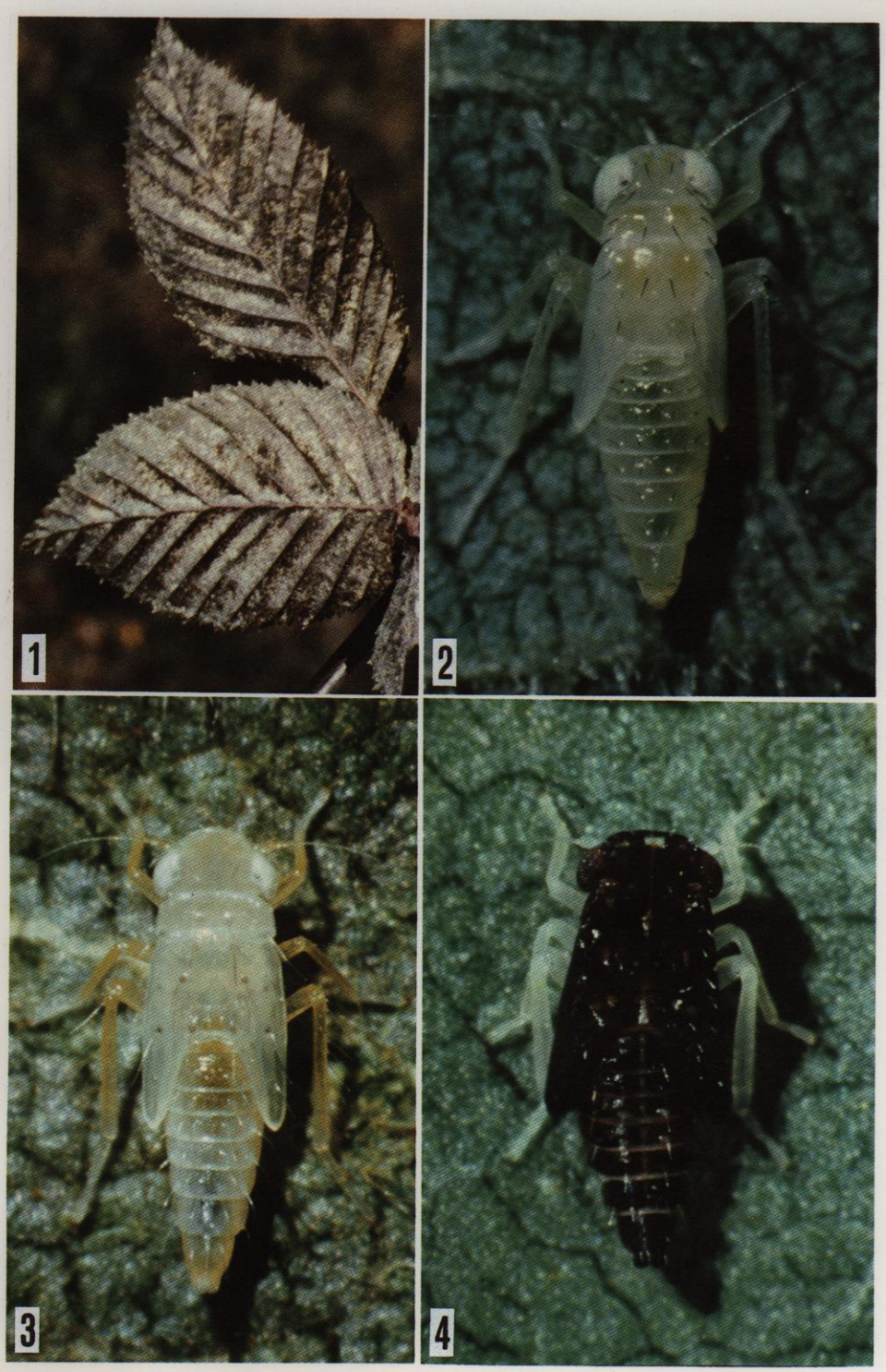

PLATE I. — Typhlocybinae of Corylaceae. 1, Dechlorophyllations by typhlocybines in leaves of *Carpinus betulus*. — Fifth instar nymphs of: 2, *Alebra coryli* (nat. length mm 2.5); 3, *Edwardsiana avellanae* (mm 2.5); 4, *Arboridia ribauti* (mm 2.0).

bifasciata; continental Italy for *A. coryli, E. avellanae, E. hippocastani, E. spinigera* and *E. staminata*; continental Italy and Sicily for *F. cruenta*; all Italy (Sardinia and Sicily included) for *E. vitis, R. tenerrima, A. alneti* and *A. parvula.*

The overwintering of the above fifteen species took place in the adult stage for *E. vitis, A. parvula* and *A. ribauti* and in the egg stage for the other species. The generations per year were 1 for *A. coryli,* 2 for *A. neglecta,* 2-3 in continental territories and 3-4 in southern territories for the other species. Apart from *E. vitis* that was a phloem feeder, all the other species were mesophyll feeders. Characteristic dechlorophyllations were evident on all the three considered Corylaceae. They were mainly due to: *A. coryli, E. avellanae, E. staminata* and *A. alneti* on *C. avellana; F. cruenta, T. bifasciata* and *A. ribauti* on *C. betulus* (Pl. I, 1); *F. cruenta* on *O. carpinifolia.* Damages were rarely observed in hazelnut cultures but remarkable white spots were frequently seen on ornamental hornbeam. Everywhere, among various natural enemies, the egg parasite *Anagrus atomus* was the most common and important.

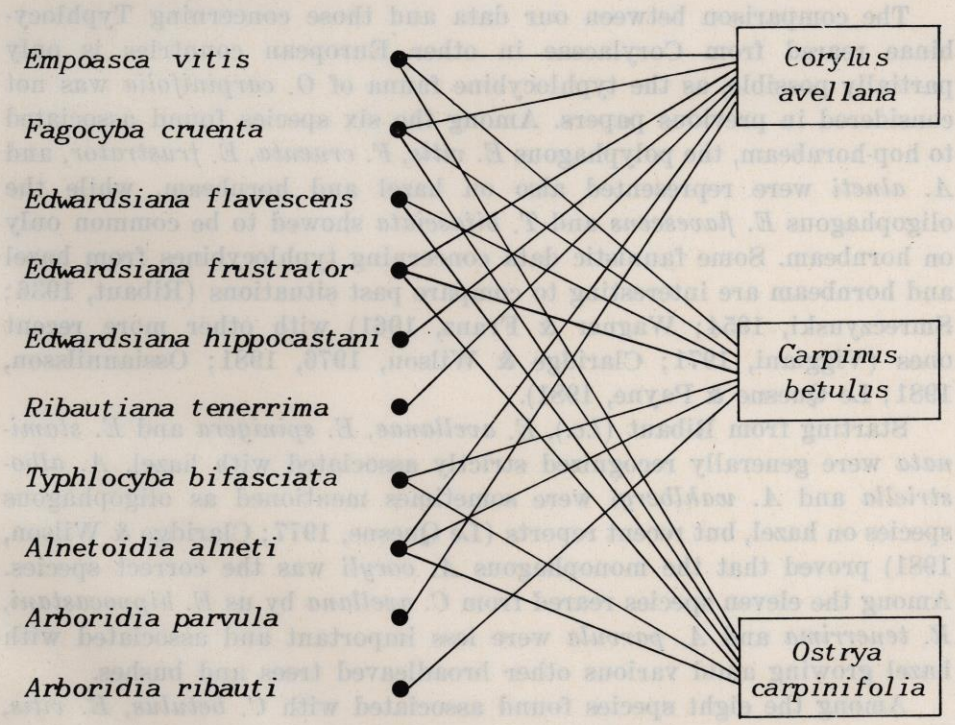

FIG. II

Typhlocybinae found to multiply on Corylaceae and other broadleaved trees.

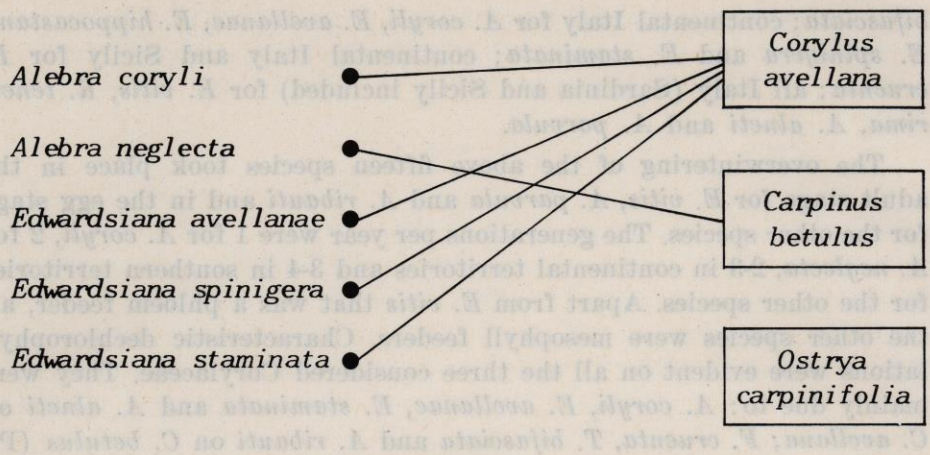

FIG. III
Typhlocybinae found to multiply only on Corylaceae.

DISCUSSION AND CONCLUSION

The comparison between our data and those concerning Typhlocybinae reared from Corylaceae in other European countries is only partially possible, as the typhlocybine fauna of *O. carpinifolia* was not considered in previous papers. Among the six species found associated to hop-hornbeam, the polyphagous *E. vitis, F. cruenta, E. frustrator,* and *A. alneti* were represented also on hazel and hornbeam, while the oligophagous *E. flavescens* and *T. bifasciata* showed to be common only on hornbeam. Some faunistic data concerning typhlocybines from hazel and hornbeam are interesting to compare past situations (Ribaut, 1936; Smreczynski, 1954; Wagner & Franz, 1961) with other more recent ones (Viggiani, 1971; Claridge & Wilson, 1976, 1981; Ossiannilsson, 1981; Le Quesne & Payne, 1981).

Starting from Ribaut (*l.c.*), *E. avellanae, E. spinigera* and *E. staminata* were generally recognized strictly associated with hazel. *A. albostriella* and *A. wahlbergi* were sometimes mentioned as oligophagous species on hazel, but recent reports (Le Quesne, 1977; Claridge & Wilson, 1981) proved that the monophagous *A. coryli* was the correct species. Among the eleven species reared from *C. avellana* by us *E. hippocastani, R. tenerrima* and *A. parvula* were less important and associated with hazel growing amid various other broadleaved trees and bushes.

Among the eight species found associated with *C. betulus, E. vitis, F. cruenta, E. flavescens, T. bifasciata* and *A. alneti* were known enough, while *A. neglecta, E. frustrator* and *A. ribauti* appeared reported only sometimes on hornbeam. The finding of *A. neglecta* has to be emphasized

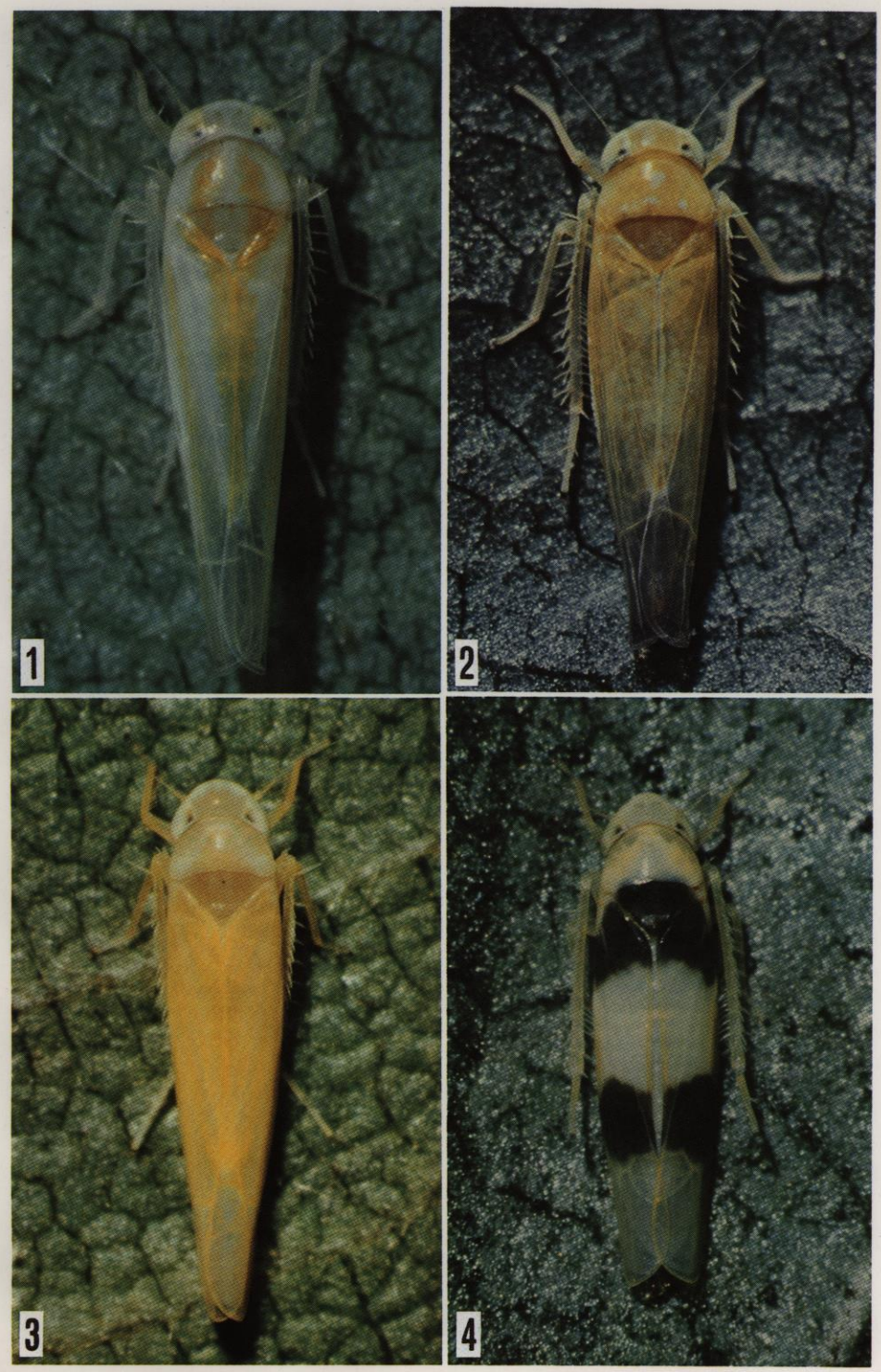

PLATE II. – Typhlocybinae of Corylaceae. 1, *Alebra coryli* ♀ (nat. length mm 4.0). 2, *A. neglecta* ♂ (mm 3.8). 3, *Edwardsiana avellanae* ♂ (mm 3.5). 4, *Typhlocyba bifasciata* ♂ (mm 3.3).

because this leafhopper was indicated as the only monophagous species of *C. betulus*.

E. avellanae, *E. spinigera* and *E. staminata*, although not reported for Italy in the Nast catalogue (1972), had already been found in Campania (Viggiani, *l.c.*). Instead *A. coryli* and *A. neglecta* have to be considered new for Italy.

From the phytopathological point of view, some of these mesophyll-feeding leafhoppers can cause remarkable dechlorophyllations in the involved leaves. Dense white spots due to both nymphs and adults were observed more on ornamental hornbeam than on hazelnut cultures. However worrying infestations seem not possible thanks to the activity of natural enemies, among which the very efficient egg parasite. *Anagrus atomus*.

SUMMARY

Among thirtyfour species of Typhlocybinae commonly present as adults on Corylaceae (*Corylus avellana*, *Carpinus betulus* and *Ostrya carpinifolia*), nineteen were regarded as erratic ones and represented by individuals coming from nearby broadleaved trees and shrubs. Fifteen species consisting of adults reared from nymphs in captivity were subdivided in two categories: Typhlocybinae able to multiply on Corylaceae and other broadleaved trees and shrubs (*Empoasca vitis*, *Fagocyba cruenta*, *Edwardsiana flavescens*, *E. frustrator*, *E. hippocastani*, *Ribautiana tenerrima*, *Typhlocyba bifasciata*, *Alnetoidia alneti*, *Arboridia parvula* and *A. ribauti*); Typhlocybinae found to multiply on *Corylaceae* only (*Alebra coryli*, *A. neglecta*, *Edwardsiana avellanae*, *E. spinigera* and *E. staminata*). The five Typhlocybinae of the last category showed to be monophagous on hazel (four species) and on hornbeam (one species). Data on life history, feeding activity, foliar symptoms and role of natural enemies have been given and discussed.
Key words: Typhlocybines, Hazel, Hornbeam, Hop-hornbeam, host preferences, host specificity.

Typhlocybinae di latifoglie arboree e arbustive in Italia. 3. Corylaceae

RIASSUNTO

Fra trentaquattro specie di Typhlocybinae comunemente presenti come adulti su Corylaceae (*Corylus avellana*, *Carpinus betulus* e *Ostrya carpinifolia*), diciannove vennero considerate come erratiche e rappresentate da individui provenienti da vicine latifoglie arboree ed arbustive. Quindici specie relative ad adulti allevati da ninfe furono suddivise in due categorie: tiflocibini capaci di moltiplicarsi su corilacee e altre latifoglie arboree ed arbustive (*Empoasca vitis*, *Fagocyba cruenta*, *Edwardsiana flavescens*, *E. frustrator*, *E. hippocastani*, *Ribautiana tenerrima*, *Typhlocyba bifasciata*, *Alnetoidia alneti*, *Arboridia parvula* e *A. ribauti*); tiflocibini capaci di moltiplicarsi soltanto su corilacee (*Alebra coryli*, *A. neglecta*, *Edwardsiana avellanae*, *E. spinigera*

ed *E. staminata*). Le cinque specie dell'ultima categoria dimostrarono di essere monofaghe su nocciolo (quattro specie) e su carpino (una specie). Dati su cicli biologici, attività trofica, sintomi fogliari e incidenza di limitatori naturali sono stati forniti e discussi.

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