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Authors

Rapisarda, Carmelo
Conci, Cesare

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Faunistic notes and zoogeographical considerations on the psyllid fauna of the South-Eastern Alps (*)

CARMELO RAPISARDA (***) - CESARE CONCI (***)
(***) *Istituto di Entomologia agraria, Università di Catania*
(***) *Museo civico di Storia naturale, Milano*

SUMMARY

The results are given of a study on the composition of the psyllid fauna of the Adriatic side of the Carnic and Julian Pre-Alps and Alps and of the adjacent plains.

Eighty-eight psyllid species are recorded in the area under examination. All of them are reported in a list, which is ordered by families and made up on the basis of bibliographical information, direct collections on their host plants and captures by trays. Moreover, a few taxonomic notes are given on some species of little clear systematic interpretation.

Zoogeographical information is also given on the species under discussion, determining that the groups of the widely diffused in the Palaearctic and of the European species are the most represented in the psyllid fauna of the examined area.

In the end, a few faunistic notes are reported on the psyllid of the Italian administrative region Friuli-Venezia Giulia.

The knowledge on the jumping plant lice (Psylloidea) of the South-Eastern Alps is rather fragmentary and dispersed in numerous publications, which concern different subjects.

The present note wishes to gather all the available information on the topic, being it based not only on data from the literature but on both the direct field collections and captures by yellow water trays. Most of the formers have been carried out by one of us (C.R.); other samples come from Prof. L. Masutti (Istituto di Entomologia agraria, Università di Padova) and Mr L. Tamanini (Museo civico di Rovereto, TN). The captures by trays have been realized near Gorizia and Udine, during 1984 and 1985, and the specimens have been sent to us by Mr P.G. Coceano (Centro Regionale per la Sperimentazione Agraria, Pozzuolo del Friuli, UD). We acknowledge with many thanks the kind help of the mentioned Authors.

DEFINITION OF THE INVESTIGATED AREA

In the present study, the Adriatic side of South-Eastern Alps and Pre-Alps has been investigated, including the Italian slopes of Carnic Alps and

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Pre-Alps, the Julian Alps and Pre-Alps and the Yugoslav territories of Karst. As to the Carnic Alps, the area under examination is bounded westward by the basin of the river Piave and the region of Cadore, northward by the Gail Valley. The latter has not been included in the study, since the river Gail, as an affluent of the Drava, belongs to the Danubian basin rather than to the Adriatic one. All the basins of the rivers Livenza, Tagliamento and Isonzo have also been taken into consideration.

LITERARY SURVEY

The first indication of a psyllid for the examined area is not direct and concerns *Trioza rumicis*: Massalongo (1881) describes a cecidium on flowers of *Rumex arifolius* (now *alpestris*) nearby Pontebba (province of Udine), subsequently attributed to the action of the mentioned insect.

Five years later, Löw (1886) describes the new species *Floria vicina*, collected on *Genista radiata* (together with *F. vittipennella*) at Raibl (present Predil, province of Udine), in Kärnten (Carinthia), and indicates the occurrence of *Trioza alacris* at Abbazia (Istria). In a paper on the psyllids of the Austro-Hungarian Empire, Löw (1888) lists 42 species whose collection localities lie within the limits of the area here investigated and a great number of which were collected at Görz (now Gorizia). Three species were recorded in the previous work, while the indication of *Aphalara calthae* cannot be validate as it can be seen in note (2); the remaining 38 species were new for the zone.

In the Catalogue on the fauna of the Reign of Hungary, Horvath (1897) indicates 19 species of psyllids for the Hungarian «Regio Adriatica» (Southern Karst); eleven of them have previously been recorded in the area, the remaining 8 are new; yet *Trioza fraudatrix* may be synonymous of a species already recorded by Löw (1888) (*T. marginepunctata*).

In the Catalogue of Hemiptera of the «coastal land» (Küstenland), Gräffe (1911) reports 32 species of psyllids, whose determination have been partly verified by Horvath. Eight of them were not indicated in the region before and can be added to the 50 species already known by the previous literature for this area.

Prohaska (1927-28) reports 65 species from Kärnten and quotes for Raibl the seven species collected by Prof. F. Then and already reported by Löw (1888).

The occurrence in the South-Eastern Alps of some other psyllids has been occasionally indicated in following papers on different topics. Vondracek (1951) indicates 4 species (all previously recorded in the area) collected in Monfalcone (province of Gorizia), Flitsch (presently Plezzo or Bovek, in Jugoslavia) and Trieste. Vondracek (1953) mentions other two species collected at Flitsch; one of them (*Trioza senecionis*) is new for the South-Eastern Alps. Loginova (1975) reports a female of *Camarotoscena subrubescens* collected at Monfalcone (likely the same specimen already reported by Vondra-

cek (1951)). Minelli (1977) mentions *Psylla fusca*, collected at Fusine and Rutte (province of Udine); yet the species has been already indicated by Gräffe (1911) for Trieste. The records in various localities of the Carnic Alps of *Psylla alpina* and *Psylla saliceti*, found on snow, are due to Masutti (1978). The former species is new for the South-Eastern Alps, while the second one has already been indicated by Löw (1888) for Gorizia, under the name of *Psylla salicicola*.

Hodkinson (1981) describes the new species *Trioza trigonica*, with Godia (near Udine) as the type locality; he also reports, among the type material, various specimens collected by yellow water trays in other localities of the province of Udine: Moimacco and Rutte/Tarvisio. Subsequently, Hodkinson (1983) mentions 36 species of psyllids collected with the same method in the three above said localities and at Udine and Ugovizza⁽¹⁾. Nineteen of these species have already been indicated for the territory under discussion in the previous literature; the remaining 17 are new. Among the latter ones, 8 species are even new for the Italian fauna (*Aphalara calthae*, *Cacopsylla sorbi*, *Trioza pallida*, *T. schranki*, *T. tatrensis*, *Bactericera curvatinervis*, *B. harrisoni* and *B. sp. near striola*).

In the end, 4 species of psyllids are recorded for this zone by Conci & Tamanini (1984a), three of which (*Aphalara borealis*, *Cacopsylla brunneipennis* and *Trioza rotundata*) are new for the area. Conci & Tamanini (1984b) mention the occurrence of *Phylloplecta trisignata*, yet already evidenced in this region.

In conclusion, 81 species of jumping plant lice are presently known from the literature for the Adriatic side of the South-Eastern Alps.

LIST OF THE SPECIES AND TAXONOMIC NOTES

A complete list is here reported of the psyllids presently known for the South-Eastern Alps, compiled on the basis of both the above examined literature (verified under the present taxonomy of the group) and more recent, unpublished data. A total number of 87 species is listed, 6 of which have not been known till now for this area (*Aphalara sauteri*, *Floria variegata*, *Cacopsylla nigrita*, *C. peregrina*, *C. pulchra* and *C. rhododendri*).

The family division follows the recent classification of the superfamily Psylloidea, proposed by White & Hodkinson (1985).

A presently attributable chorological category is given for each species, together with the localities within the region under analysis (listed in alphabetical order) where they have been found and the Authors who quoted or collected them in each place. Authors' and Collector's names are shortened

⁽¹⁾ Hodkinson (1983) uses the same symbol (U) for both Udine and Ugovizza, so that it is impossible to discern the species collected in each one of the two localities. Therefore, in the list given by us in the following pages, the species indicated with «U» in this paper are considered as generically collected in province of Udine.

according to the following symbols: COC, P.G. Coceano collector; CTA, Conci & Tamanini (1984a); CTB, Conci & Tamanini (1984b); GRF, Gräffe (1911), H81, Hodkinson (1981); H83, Hodkinson (1983); HRV, Horvath (1897); L86, Löw (1886); L88, Löw (1888); LOG, Loginova (1975); MAS, Prof. L. Masutti collector; MIN, Minelli (1977); MLG, Massalongo (1881); MTT, Masutti (1978); PRO, Prohaska (1927-28), RAP, C. Rapisarda collector; TAM, L. Tamanini collector; V51, Vondracek (1951); V53, Vondracek (1953).

Moreover, the following abridgements are used in the list to indicate some localities: BL, province of Belluno; GO, province of Gorizia; JUG, Jugoslavia; PN, province of Pordenone; TS, province of Trieste; UD, province of Udine.

Other abbreviations: C, central; E, Eastern; N, Northern; S, Southern; W, Western.

Brief notes are given at the end of the list, regarding some taxonomically critical species. These notes are recalled in the list by means of bracketed numbers.

1. LIST OF THE SPECIES

Species	Collecting data		Chorological category
	Locality	Author	
<i>APHALARIDAE</i>			
<i>Strophingia</i> End.			
1) <i>ericae</i> (Curt.)	Gorizia	L88	European
<i>Livia</i> Latr.			
2) <i>juncorum</i> (Latr.)	Gorizia Zaule (TS)	L88 GRF	Holopalaeartic
3) <i>limbata</i> (Waga) or <i>crefeldensis</i> Mink (1)	Monfalcone (GO)	L88	—
<i>Aphalara</i> Förster			
4) <i>borealis</i> Hesl.-Harr.	Aviano (PN) (M.te Cavallo)	CTA	Euroasiatic
5) <i>calthae</i> (L.) (2)	Rutte/Tarvisio (UD)	H83	Eurosibirian
6) <i>exilis</i> (Web. & Mohr) (3)	Godia (UD) (?) Raibl (= Predil) (UD) (?) Rutte/Tarvisio (UD) (?)	H83 L88, PRO H83	—
7) <i>longicaudata</i> Wagn. & Fr.	Rutte/Tarvisio (UD)	H83	CE - European Asiatic orophylous
8) <i>polygona</i> Förster (4)	Godia (UD) Pozzuolo (UD)	H83 COC	—
9) <i>sauteri</i> Burck.	Tarvisio (UD)	MAS	Alpine
<i>Craspedolepta</i> End.			
10) <i>flavipennis</i> (Förster)	Raibl (= Predil) (UD) (?) (5) Tolmino (JUG) (?) (5) Udine	L88, PRO GRF TAM	Eurosibirian (except Scandinavia)

11) <i>nervosa</i> (Förster)	Lusevera (UD) Rutte/Tarvisio (UD) Verzegnig (UD)	RAP H83 RAP	Euromiddleasiatic
<i>Rhinocola</i> Förster			
12) <i>aceris</i> (L.)	Monfalcone (GO) UD	L88 H83	Euromiddleasiatic
<i>Camarotoscena</i> Haupt			
13) <i>speciosa</i> (Flor)	Buccari (JUG) Crikvenica (JUG) Novi (JUG) Zaule (TS)	HRV » » GRF	Euromiddleasiatic
14) <i>subrubescens</i> (Flor)	Buccari (JUG) Gorizia Monfalcone (GO) Novi (JUG)	HRV L88 V51, LOG HRV	S - European Anatolian
<i>Euphyllura</i> Förster			
15) <i>olivina</i> (Costa) (6)	Bivio - Duino (TS) Crikvenica (JUG) Fiume (JUG) Küstenland Selce (JUG) Susak (JUG) SV. Jelena (JUG)	L88 HRV L88 GRF HRV » »	CW - Mediterranean
16) <i>phillyreae</i> Förster	Susak (JUG)	L88, HRV	Ponto - Mediterranean
<i>Psyllopsis</i> Löw			
17) <i>fraxini</i> (L.)	Flitsch (= Plezzo) (JUG) Lusevera (UD) Malborghetto (UD) Monfalcone (GO) Raibl (= Predil) (UD) Tarvisio (UD) Tolmino (JUG)	V51 RAP MAS L88 L88, PRO MAS GRF	Euromiddleasiatic (introduced in N- America)
18) <i>fraxinicola</i> (Förster)	Godia (UD)	H83	Euromiddleasiatic - Mediterranean (introduced in N - America)
19) <i>meliphila</i> Löw	Fiume (JUG) Selce (JUG) Trieste	HRV » GRF	ECS - European Maghrebine
<i>PSYLLIDAE</i>			
<i>Floria</i> Löw			
20) <i>borvathi</i> Scott	Trieste (M.te Spaccato)	GRF	CS - European Anatolian
21) <i>spectabilis</i> (Flor)	Barcola (TS) Muggia (TS) Trieste	GRF » V51	SW - European transadriatic
22) <i>variegata</i> Löw	Lusevera (UD)	RAP	C - European (introduced in Great Britain)
23) <i>vicina</i> Löw (7)	Lusevera (UD) (P.sso Tanamea) Raibl (= Predil) (UD) Verzegnig (UD)	RAP L86, L88, PRO RAP	Alpine

24) <i>vittipennella</i> (Reut.) (8)	Lusevera (UD) (P.sso Tanamea) Raibl (= Predil) (UD)	RAP L86, L88, PRO	Alpine
<i>Livilla</i> Curtis 25) <i>ulicis</i> Curt.	Flitsch (= Plezzo)(JUG) Gorizia Prosecco (TS)	V51 L88 GRF	CS - European
<i>Psylla</i> Geoffroy 26) <i>alni</i> (L.)	Codroipo (UD) Malborghetto (UD) Tolmino (JUG)	RAP MAS GRF	Holarctic
27) <i>alpina</i> Förster	Malborghetto (UD) Souris (UD) Tarvisio (UD) Vigo di Cadore (BL)	MTT » » »	European orophylous (except western part)
28) <i>fusca</i> (Zett.)	Fusine (UD) Rutte/Tarvisio (UD) Tarvisio (UD) (Coccau) Trieste	MIN H83 MAS GRF	European (except western part)
<i>Asphgidella</i> End. 29) <i>buxi</i> (L.)	Godia (UD) Gorizia	H83 RAP	Euro-Mediterranean (introduced in N- America and Hawaii)
<i>Baeopelma</i> End. 30) <i>colorata</i> (Löw)	Gorizia Lusevera (UD) Pozzis (UD) Trieste	L88 RAP » GRF	SE-European
31) <i>försteri</i> (Flor)	Codroipo (UD) Gorizia Monfalcone (GO) Tolmino (JUG)	RAP L88 » GRF	Holopalaearctic
<i>Cacopsylla</i> Ossiann. 32) <i>albipes</i> (Flor)	Forest of Tarnova (JUG) Raibl (= Predil) (UD)	L88 L88, PRO	European orophylous
33) <i>ambigua</i> (Förster)	Gorizia Lusevera (UD) Pozzis (UD) Raibl (= Predil) (UD) Verzegnig (UD)	L88 RAP » L88, PRO RAP	Holopalaearctic
34) <i>breviantennata</i> (Flor)	Godia (UD) Lusevera (UD) Rutte/Tarvisio (UD) Verzegnig (UD) Volosca (JUG)	H83 RAP H83 RAP GRF	CS-European
35) <i>brunneipennis</i> (Edw.) (9)	Lusevera (UD) Tarvisio (UD) (Coccau) Verzegnig (UD)	RAP CTA RAP	European
36) <i>crataegi</i> (Schr.)	Aviano (PN) Gorizia Küstenland Verzegnig (UD)	TAM L88 GRF RAP	Euromiddleasiatic Mediterranean

37) <i>intermedia</i> (L�w)	Gorizia (10) Volosca (JUG)	L88 GRF	ECS - European
38) <i>mali</i> (Schm.)	Godia (UD) Rutte/Tarvisio (UD) Trieste	H83 » GRF	Holopalaearctic (introduced in N- America and Australia)
39) <i>melanoneura</i> (F�rst.)	Aviano (PN) (M.te Cavallo) Gorizia Regio Adriatica (JUG) Rutte/Tarvisio (UD) Trieste (Bosco Farneto) Verzegn�s (UD)	TAM L88 HRV H83 GRF RAP	Holopalaearctic
40) <i>nigrita</i> (Zett.) (11)	Aviano (PN) (M.te Cavallo) Tarvisio (UD)	TAM MAS	European (except western part)
41) <i>parvipennis</i> (L�w) (12)	Tolmino (JUG)	GRF	ENC-European
42) <i>peregrina</i> (F�rst.)	Aviano (PN) (M.te Cavallo) Verzegn�s (UD)	TAM RAP	Holopalaearctic
43) <i>pruni</i> (Scop.)	Flitsch (=Plezzo) (JUG) Gorizia Moggio (UD) Regio Adriatica (JUG) Trieste	V53 L88 TAM HRV GRF	Euromiddleasiatic
44) <i>pulcbella</i> (L�w)	Aviano (PN) Godia (UD) Pozzuolo (UD)	TAM H83 COC	S-European E- Mediterranean
45) <i>pulchra</i> (Zett.) (11)	Lusevera (UD)	RAP	European (quoted also for Japan)
46) <i>pyri</i> (L.)	Godia (UD) Gorizia Moimacco (UD) Pozzuolo (UD)	H83 L88, COC H83 COC	Euroasiatic (except central Asia)
47) sp. gr. <i>pyricola</i> (F�rst.) (13)	Gorizia Rutte/Tarvisio (UD)	COC H83	—
48) <i>pyrisuga</i> (F�rst.)	Godia (UD) Gorizia Rutte/Tarvisio (UD)	H83 L88 H83	Euroasiatic (except central Asia)
49) <i>rhododendri</i> (Put.)	Aviano (PN) (M.te Cavallo)	TAM	Holopalaearctic orophylous
50) <i>saliceti</i> (F�rst.) (11)	Aviano (PN) (M.te Cavallo) Gorizia Vigo di Cadore (BL)	TAM L88 MTT	European

51) <i>sorbi</i> (L.)	Rutte/Tarvisio (UD) Verzegnig (UD)	H83 RAP	European orophylous (introduced in N- America)
52) <i>suturalis</i> (Horv.) (12)	Crikvenica (JUG) Zengg (JUG)	HRV »	Ponto-Illirian
<i>CALOPHYIDAE</i>			
<i>Calophya</i> Löw 53) <i>rhois</i> (Löw)	Fiume (JUG) Godia (UD) Gorizia Martinsica (JUG) Pozzuolo (UD) Rutte/Tarvisio (UD)	HRV H83 COC HRV COC H83	CS-European
<i>HOMOTOMIDAE</i>			
<i>Homotoma</i> Guer.-Men. 54) <i>ficus</i> (L.)	Gorizia	COC	Ponto-N-Mediterranean
54bis) sp. gr. <i>ficus</i> (L.) (14)	Buccari (JUG) Crikvenica (JUG) Fiume (JUG) Novi (JUG) Selce (JUG) Susak (JUG) Tersatto (JUG) Tolmino (JUG) Trieste	HRV » L88 HRV » » » GRF »	—
<i>TRIOZIDAE</i>			
<i>Trichohermes</i> Kirk. 55) <i>walkeri</i> (Först.)	Gorizia Küstenland	L88 GRF	European
<i>Lauritrioza</i> Conci & Tamanini 56) <i>alacris</i> (Flor)	Abbazia (JUG) Fiume (JUG) Godia (UD) Gorizia Trieste	L86, L88 HRV H83 COC GRF	Euromediterranean Macaronesian (introduced in N and S-America)
<i>Trioza</i> Förster 57) <i>apicalis</i> Först. (15)	Godia (UD) Gorizia (?) (16) Pozzuolo (UD) Raibl (= Predil) (UD) (?) (16) Rutte/Tarvisio (UD) UD	H83 L88 COC L88 H83 »	Euroasiatic
58) <i>centranthi</i> (Vall.)	Godia (UD) Novi (JUG)	H83 HRV	CS-European Mediterranean

59) <i>dispar</i> Löw	Godia (UD) Rutte/Tarvisio (UD)	H83 »	Euromiddleasiatic
60) <i>fraudatrix</i> Horv. (17)	Novi (JUG) Susak (JUG)	HRV »	—
61) <i>galii</i> Först.	Fiume (JUG) Godia (UD) Gorizia Lusevera (UD) Monfalcone (GO) Noghera (TS) Pozzuolo (UD)	L88, HRV H83 L88 RAP L88 GRF COC	Holopalaeartic
62) <i>marginepunctata</i> Flor	Susak (JUG)	L88	N-Mediterranean
63) <i>pallida</i> Haupt (18)	Godia (UD) Lusevera (UD) Rutte/Tarvisio (UD) UD Verzegnis (UD)	H83 RAP H83 » RAP	CE-European Sibirian
64) <i>proxima</i> Flor	Buccari (JUG) Gorizia	HRV L88	European
65) <i>remota</i> Först.	Godia (UD) Pozzuolo (UD)	H83 COC	Holopalaeartic
66) <i>rhamni</i> (Schr.)	Gorizia	L88	European
67) <i>rotundata</i> Flor	Aviano (PN) (M.te Cavallo)	CTA	European orophylous (except western part)
68) <i>rumicis</i> Löw	Lusevera (UD) Pontebba (UD) Pozzis (UD)	RAP MLG RAP	ECS-European
69) <i>schranksi</i> Flor	Rutte/Tarvisio (UD)	H83	EC-European orophylous
70) <i>senecionis</i> (Scop.)	Flitsch (= Plezzo) (JUG)	V53, CTA	EC-European orophylous
71) <i>tatrensis</i> Klim.	Godia (UD) Rutte/Tarvisio (UD)	H83 »	C-European
72) <i>urticae</i> (L.)	Godia (UD) Küstenland Pozzuolo (UD) Rutte/Tarvisio (UD) Verzegnis (UD) Villa Opicina (TS)	H83 L88 COC H83 RAP GRF	Holopalaeartic
<i>Heterotrioza</i> Dobr. & Man.			
73) <i>chenopodii</i> (Reut.)	Godia (UD) Monfalcone (GO)	H83 L88	Holopalaeartic
<i>Bactericera</i> Puton			
74) <i>acutipennis</i> (Zett.) (19)	Trieste	GRF	Eurosibirian
75) <i>albiventris</i> (Först.)	Godia (UD) Gorizia Pozzuolo (UD) Trieste	H83 L88 COC GRF	Euroasiatic
76) <i>crithmi</i> (Löw)	Trieste	L88	Ponto-N-Mediterranean Atlantic

77) <i>curvatinervis</i> (Först.)	Malborghetto (UD) Rutte/Tarvisio (UD) Tarvisio (UD) Verzegnis (UD)	MAS H83 MAS RAP	Holopalaearctic
78) <i>femoralis</i> (Först.) (20)	Aviano (PN) (M.te Cavallo) Godia (UD) Raibl (= Predil) (UD) Forest of Tarnova (JUG)	TAM H83 L88 »	Euromiddleleasiatic
79) <i>harrisoni</i> (Wagn.)	Godia (UD)	H83	C-European orophylous
80) <i>maura</i> (Först.) (21)	Grizane (JUG) Novi (JUG)	HRV »	Euromiddleleasiatic
81) <i>modesta</i> (Först.) (22)	Fiume (JUG) Gorizia Grizane (JUG) Nabresina (= Aurisina) (TS) Novi (JUG)	HRV L88 HRV GRF HRV	ECS-European Middleleasiatic
82) <i>nigricornis</i> (Först.) (23)	Godia (UD) Gorizia Pozzuolo (UD) Rutte/Tarvisio (UD) Trieste (M.te Spaccato) Zengg (JUG)	H83 L88, COC COC H83 GRF HRV	Holopalaearctic
83) <i>perrisi</i> Puton	Forest of Tarnova (JUG) Gorizia Prosecco (TS) Trieste	L88 » GRF »	CS-European Middleleasiatic Mediterranean
84) <i>striola</i> (Flor) (24)	Gorizia Pozzuolo (UD) Tolmino (JUG) Trieste	L88 COC GRF »	—
85) sp. near <i>striola</i> (Flor) (25)	Godia (UD)	H83	—
86) <i>trigonica</i> (Hodk.) (23)	Godia (UD) Gorizia Pozzuolo (UD) Rutte/Tarvisio (UD) UD	H81 COC » H83 »	Mediterraneo Iranian
<i>Phylloplecta</i> Riley			
87) <i>trisinata</i> (Löw)	Crikvenica (JUG) Volosca (JUG)	HRV, CTB GRF, CTB	S-European NE- Mediterranean

2. NOTES

(1) While listing the present species, Löw (1888) reports its synonymous *L. crefeldensis* (Mink), which is now considered a valid species. We have no elements to ascribe Löw's specimens to one or to another of the mentioned species. Therefore, we attribute no chorological category to this taxon.

(2) Löw (1888) quotes *Apbalara calthae* for Raibl (present Predil, UD). In the light of the present taxonomic knowledge, this indication can be attributed to every species of the *polygoni* group and is therefore omitted. We consider *A. calthae* as an Eurosibirian element, according to Burckhardt (1983a), though this geographical distribution should be reviewed, on the basis of the modern taxonomy of the mentioned group.

(3) The *Aphalara exilis* group needs a taxonomic revision, so that Löw's (1888) and Hodkinson's (1983) quotations are reported as doubtful. For the same reason we attribute no chorological category to this species.

(4) Likewise for *Aphalara exilis*, we report no zoogeographical comment for *A. polygona*, a species whose geonomy is presently not completely known.

(5) The quotations for Raibl and Tolmino are doubtful, since referred to *Aphalara picta* (auct. nec Zetterstedt), a species later synonymized partly to *Craspedolepta sonchi* and to *C. flavipennis*. We attribute to the latter species both the Löw's (1988) and Gräffe's (1911) quotations, since its occurrence in the South-Eastern Alps is evidenced by the sample from Udine and owing to the lack of the former species in the Italian fauna.

(6) Species in need of taxonomic revision.

(7) *Arytaina montana* Cer. has been recently synonymized to the present species (Burckhardt, 1983b).

(8) Burckhardt (1983b) has recently synonymized *Floria lineata* Cer. to the species under analysis.

(9) Dimorphic species, with smoky forewinged populations and transparent winged ones. Before being synonymized (though still in a controversial way), these forms have been considered as two distinct species, respectively *brunneipennis* Edw. and *klapaleki* Sulc. The localities previously referred to both the species are therefore considered, to study the geographical distribution of the present one.

(10) The only quotation for the Italian fauna.

(11) We consider this species as an European element, rather than a Holopalaeartic one, for the uncertainty of its presence in Japan, probably to be referred to a different taxon, and for its total absence all over the Asiatic Continent.

(12) Species not quoted up to now for the Italian fauna.

(13) The *pyricola* Förster group has been recently revised by Burckhardt & Hodkinson (1986) and three species occur in Italy, previously ascribed to the only *Cacopsylla pyricola*. Therefore we generically attribute the findings of the South-Eastern Alps to the «species group», besides giving no zoogeographical comment.

(14) All the records of *H. ficus* preceding the description of *H. viridis* (Klimaszewski, 1961) can indifferently be referred to one of the two species and are therefore reported by us as «species group», since the present knowledge on the distribution of the Fig psyllids in Italy (Tamanini, 1966) makes us think that they both occur in the South-Eastern Alps.

(15) The Italian material of *Trioza apicalis* should be re-examined in the light of the recent Burckhardt's revision (1986). According to the host plants and geographical distributions of the presently known species of this group, we yet ascribe to *T. apicalis* (sensu stricto) the findings of the South-Eastern Alps.

(16) Löw's quotations (1888) for Gorizia and Raibl are given for *T. viridula* (auct. nec Zetterstedt) but they are probably to be referred to *apicalis*.

(17) A probable synonymous of *T. marginepunctata* Flor, to which we therefore assign no chorological category.

(18) In the mentioned revision of the *T. apicalis* Förster group, Burckhardt (1986) suggests to assign the new name *T. anthrisci* to the species under examination.

(19) Gräffes's (1911) quotation regards *T. saundersi* M.-D., a synonymous of *B. acutipennis* (Zett.), and is the only record of this species for the Italian fauna. The report is probably erroneous.

(20) Löw's records of *Trioza acutipennis* (auct. nec Zetterstedt) for Raibl and the Forest of Tarnova probably regard *Bactericera femoralis* (Förster).

(21) Species not quoted up to now for the Italian fauna. The findings of this species for the Nearctic Region need a confirm.

(22) The original quotations regard *Trioza recondita* Flor, a synonymous of *B. modesta*.

(23) Some records of *B. nigricornis* preceding the description of *B. trigonica* (Hodkinson, 1981) could regard the latter species.

(24) The geonomy of this species needs to be revised; therefore we give no zoogeographical comment.

(25) This species needs a taxonomical definition and is not included by us in the following zoogeographical considerations.

ZOOGEOGRAPHICAL CONSIDERATION

A detailed zoogeographical analysis on the psyllids of South-Eastern Alps is not easy, owing both to the little direct investigations which have been

carried out till now on the psyllid fauna of this area and to a deficient geometrical knowledge presently available on a large number of species.

With regard to the latter aspect, very little is known on the psyllids of the Iberian peninsula and North Africa; as to the palaeartic Asia, besides a good knowledge for some zones of USSR (especially Caucasus) and Mongolia, nearly nothing is known of the Chinese region, while numerous indications regarding Japan need a taxonomical confirm.

In spite of that, in the following pages we shall try to single out the most representative chorological elements among the psyllid fauna of South-Eastern Alps. To this end, the geographical distribution of each species has been defined (as far as possible) in the light of La Greca's (1964) considerations on the chorological categories of the Italian faunistic elements.

Livia limbata, *Aphalara exilis*, *A. polygoni*, *Cacopsylla* sp. gr. *pyricola*, *Trioza fraudatrix*, *Bactericera striola* and *B.* sp. near *striola* have not been taken into consideration in the present study, for the previously said reasons. The remaining 80 species can be divided into the following five chorological groups.

1. Species widely diffused in the Palaeartic Region

It is the most represented group, to which 35 species (the 43.75% out of the total) can be ascribed

We consider as holopalaeartic a complex of 13 species, though the occurrence in North Africa of some of them (even widely distributed from Europe to Japan) has not been indicated up to now, probably owing to the mentioned scarcity of data concerning this area. Among these holopalaeartic species, *Cacopsylla mali* and *C. rhododendri* are worth of mention. The former, trophically related to a plant of primary economic importance, has been accidentally introduced into North America and Australia; the latter one shows an almost discontinuous distribution within the Palaeartic Region, having it been recorded only for Central Europe, Siberia and Japan. Its even slight orophylous trend and the peculiar distribution of its host plants could be the reasons of the discontinuous geonemy of this species.

Euroasiatic elements can undoubtedly be considered *Aphalara borealis*, *Trioza apicalis* and *Bactericera albiventris*. The two pear psyllids, *Cacopsylla pyri* and *C. pyrisuga*, can be ascribed to the mentioned group, too; though their occurrence in Asia presently regards only the Eastern but not the Central side of the Continent. In the end, among the Euroasiatic species the orophylous *Aphalara longicaudata* is worth of mention, whose distribution in Europe is limited to the central-eastern regions.

Among the Eurosibirian species (totally four), *Craspedolepta flavipennis* does not occur in the well investigated Scandinavian territories, while *Trioza pallida* can be found only in the central-eastern part of Europe.

An Euromiddleasiatic geonemy is shown by a complex of twelve species, three of which (*Psyllopsis fraxinicola*, *Cacopsylla crataegi* and *Bactericera perri-*

si) are variously diffused in the Mediterranean Region, too. Among the remaining 9 species, *Psyllopsis fraxini* has been introduced into North America (such as *P. fraxinicola*), while the distribution in Europe of *Bactericera modesta* is bounded to the oriental regions of the central southern part.

2. European species

It is another widely represented group within the psyllid fauna of the South-Eastern Alps, of the same consistence as the previous one.

First of all, the holoeuropean elements (a total of nine species) belong to this group, of which the orophylous *Cacopsylla albipes* and *C. sorbi* are worth of mention, together with *C. pulchra*, which has been repeatedly recorded for Japan but whose occurrence has been indicated for no other region of the Asiatic Continent.

Besides the mentioned species, diffused all over Europe, other psyllids can be listed which populate only partially the Continent. *Psylla alpina*, *P. fusca*, *Cacopsylla nigrita* and *Trioza rotundata* do not occur in Western Europe, while *Floria variegata*, *Trioza schranki*, *T. senecionis*, *T. tatrensis* and *Bactericera harrisoni* mainly populate the central part of Europe. Among the CS-European species, *Cacopsylla intermedia* and *Trioza rumicis* occur only in the eastern regions; *C. parvipennis* show a similar trend not to spread westwards, though populating the north-central part of Europe. *Floria spectabilis* and *Baeopelma colorata* can be generically defined as South European species; more exactly, the former is a SW-European transAdriatic element, while the latter is a SE-European one.

Among the Euromediterranean species, *Asphagidella buxi* and *Lauritrioza alacris* are worth mentioning, both introduced into America and the former also into Hawaii.

In the end, a peculiar geographical distribution is shown by some other species, such as *Psyllopsis meliphila* (Euro-Maghrebine), *Camarotoscena subrubescens* and *Floria horvathi* (Euro-Anatolian) and *Cacopsylla suturalis* (Ponto-Illyrian).

3. Mediterranean species

Though including a complex of 6 species, which represent the 7.5% out of the total, this chorological group has a limited importance within the psyllid fauna of South-Eastern Alps. Infact all the species ascribed to it, except *Bactericera trigonica* (whose geographical distribution is not yet entirely known), have been recorded in the coastal band of the territory under examination, which is therefore only marginally affected by the occurrence of these species.

Besides the typical Mediterranean psyllids (such as *Euphyllura olivina* and *Trioza marginepunctata*), *Euphyllura phillyreae*, *Homotoma ficus* and *Bactericera crithmi* are worth mentioning, which are variously spread through the

Pontic area, too; the latter species extends itself also along the Atlantic coast, as far as Great Britain. As to *B. trigonica*, we only temporarily consider this species as a Mediterraneo-Iranian element.

4. Alpine species

Only three species among the listed psyllids belong to this chorological group; they are *Aphalara sauteri*, *Floria vicina* and *F. vittipennella*, the latter two both feeding on *Genista radiata*. Yet, more accurate faunistic researches carried out in the territory under examination could probably allow us to find other species of such group.

5. Species widely diffused also out of the Palaearctic Region

We can mention only *Psylla alni*, which is widespread all over the Palaearctic Region and in North America.

CONCLUSIONS

The results of the present analysis are graphically exposed in Fig. 1; there the predominance, within the psyllid fauna of South-Eastern Alps, of Palaearctic and European species easily emerges. On the contrary, the group of alpine endemisms is scarcely represented. However, besides the three psyllids listed by us in the latter group, nine other species of a wider geographical distribution exclusively populate the mountainous environments. Therefore, a total of 12 orophylous species is presently known for the South Eastern Alps, which represent the 15% out of the local psyllid fauna.

The zoogeographical considerations made in this work have, of course, a provisional value, and even big changes can derive from a more accurate faunistic study in the area and also a more detailed knowledge of the geographical distribution of the species here collected.

In the end it is worth to point out that only 79 species among the listed psyllids occur in the Italian region Friuli-Venezia Giulia. Infact *Euphyllura phillyreae*, *Cacopsylla parvipennis*, *C. suturalis*, *Trioza fraudatrix*, *T. marginepunctata*, *T. senecionis*, *Bactericera maura* and *Phylloplecta trisignata* have been recorded only in presently Yugoslav localities of the South-Eastern Alps. In particular, 4 out of these 8 species (*C. parvipennis*, *C. suturalis*, *T. fraudatrix* and *B. maura*) have not been quoted till now for the whole Italian fauna. Conversely, 3 out of the mentioned 79 species (*Cacopsylla intermedia*, *Trioza dispar*⁽²⁾ and *Bactericera acutipennis*) presently occur in Italy only in the region under discussion. As to the published data, Friuli-Venezia Giulia has therefore the largest psyllid fauna, among the Italian regions; while tak-

(²) Doubtful quotations of this species for the region Valle d'Aosta have been reported by Mariani (1909) and Sampò (1975).

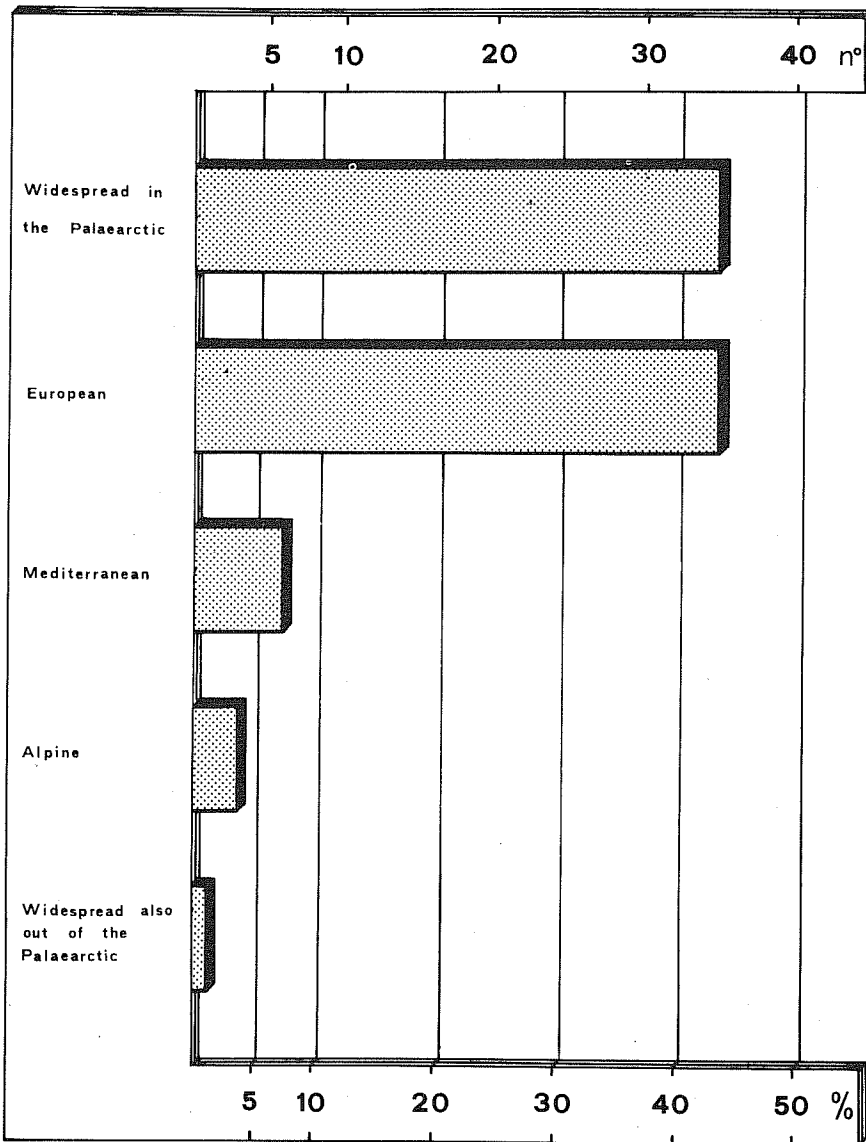


FIG. 1 - Chorological division of the psyllid fauna of South-Eastern Alps.

ing into consideration also the unpublished data at our disposal, it is the second one, largely below the 100 species of the region Trentino.

APPENDIX

Since going to press, other information on the psyllid fauna of South-Eastern Alps has been found in Nowak P. & W. Wagner, 1962 - *Beitrag zur*

Kenntnis der Homopteren-fauna Dalmatiens - God. biol. Inst. Univ. Sarajevo, 15: 31-53. Three species of psyllids are quoted for Susak in this work: *Agonoscena cisti* (Puton), *Euphyllura phillyreae* Förster and *Cacopsylla pyrisuga* (Förster). The latter two species have been already considered by us in the present paper. As to «*Agonoscena cisti*», it was not examined in the previous pages and represents the 88th species in the psyllid fauna of South Eastern Alps. Owing to the rather complicated taxonomic history of the complex *A. cisti*-*A. targionii*, it is not possible to ascribe the Nowak & Wagner's quotation to one of the two species. Thus no zoogeographical comment is given.

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