

**EASTERN ELEMENTS IN THE SWISS APHID FAUNA
(XEROTHERMOPHILOUS STEPPE INHABITANTS)**

Erwin Jörg and Gerolf Lampel

Entomological Department, Zoological Institute,
CH-1700 Fribourg, Switzerland

ABSTRACT

After some general remarks on the inner Alpine dry valleys we review their xerothermophilous aphid fauna with special emphasis on the Valais (Switzerland). A survey of the collected aphid species is given in form of a table, which contains their areas of origin (geoelements) and general distribution. The most interesting species are discussed in detail.

THE DRY VALLEYS OF THE ALPS

At first sight, the Alps seem to be a uniform mountain-chain. But crossing them from north to south one passes through three completely different floristic and climatic regions:

1. north of the Alps a belt of deciduous forest with a relatively humid Central European-Atlantic climate,
2. the inner Alpine belt of conifers with a hot and dry subcontinental climate, and
3. a belt of deciduous forest or sweet chestnut with a mild, more or less Mediterranean climate south of the Alps (BRAUN-BLANQUET, 1961).

Shielded against rain by mighty mountains, a great number of plants of the inner Alpine valleys belong to the typical xerothermophilous steppe vegetation, which probably immigrated from the eastern and southern prairies during the warmer period after the last glacial epoch. These hot and dry valleys can be found across the Alps, from south-west to north-east. BRAUN-BLANQUET (1961) mentions the following different regions:

1. catchment area of the Durance (France = F)
2. upper Romanche Valley (F)
3. Maurienne and Tarentaise (F)
4. catchment area of the Dora Riparia and the uppermost part of the Val Chisone (Italy = I)
5. Valley of Aosta (I)
6. Valais (Switzerland = CH)
7. Rhine area of the North- and Central-Grisons (CH)
8. Lower Engadine (CH) and the upper Tyrolese Inn Valley (Austria = A)
9. upper Adda Valley (I)
10. South Tyrol (Val Venosta) (I)
11. central region of the River Adige and the Eisack Valley (I)
12. Puster Valley and the basin of Lienz (A)
13. Möll Valley, central Gurk and Metnitz Valley together with the adjacent Murgau (A).

The extremely dry regions are mostly located in the western part of the Alps with exception of the South Tyrol, which is located in the eastern part (cf. Fig. 1).

We carried out our investigations mainly in the Valais and less intensively in the Valley of Aosta, the Lower Engadine and South Tyrol. The climatic, floristic and faunistic conditions of these four different regions are discussed in detail by JÖRG & LAMPEL (1988).

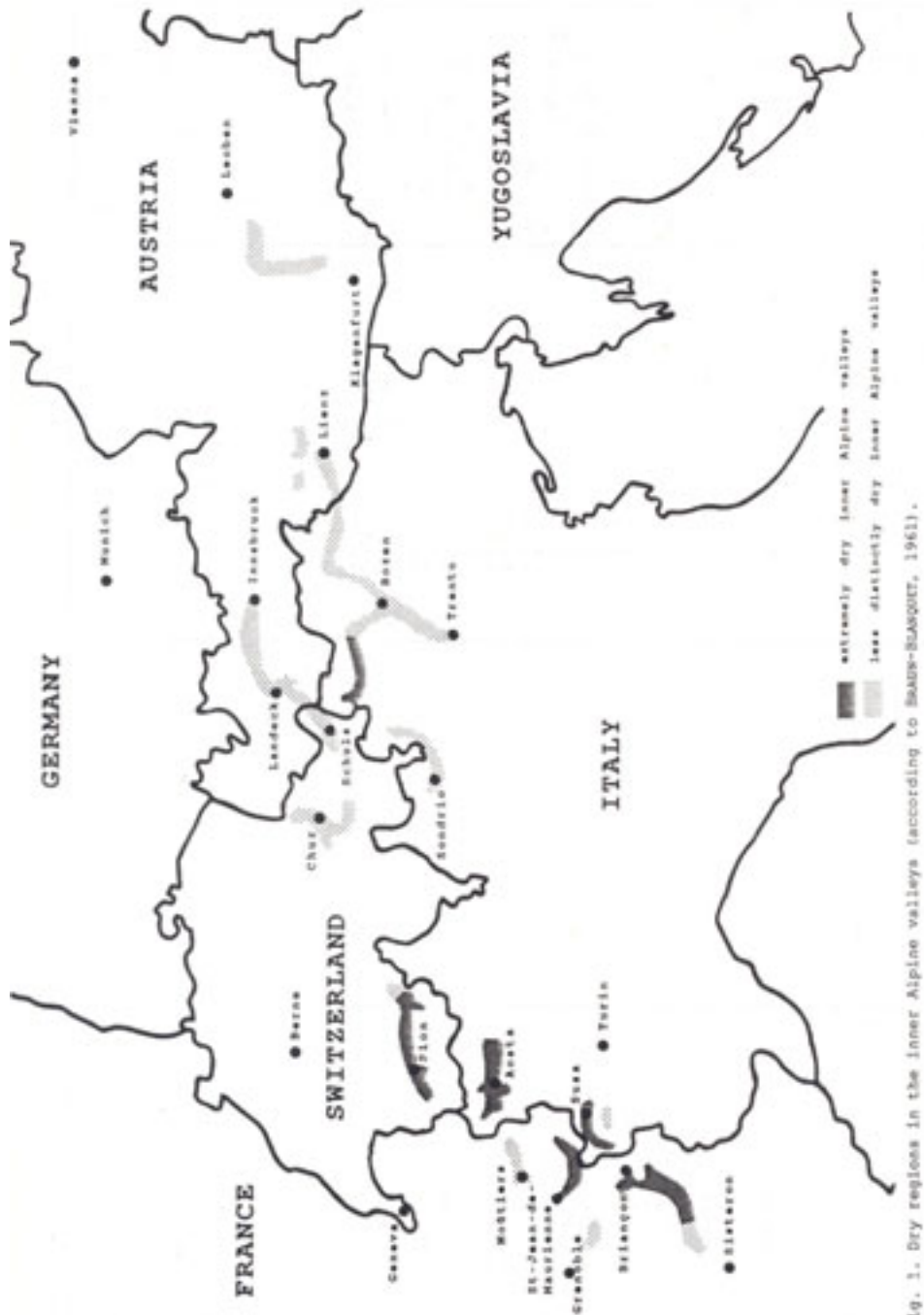


Fig. 1. Dry regions in the inner Alpine valleys (according to SANDER-SCHARROET, 1961).

Species	Host-plant	Origin	Collection sites	Further distribution
<i>Chaetosiphella stipae</i> HRL., 1947	<i>Stipa capillata</i> L.	PM	Martigny, Saillon, Mont d'Orge, Sion, Raron, (CH); Gressan, Laatsch (I)	P, E, F, D, CS, H, SU, Mongolia
<i>Therioaphis trifolii ventromaculata</i> F.P.MÜLLER, 1968	<i>Astragalus onobrychis</i> L.	SP	Sion (CH)	A, CS, PL
<i>Aphis calaminthae</i> (CB., 1952)	<i>Acinos arvensis</i> (LAM.) DANDY	PM	Saillon (CH); Aymavilles (I)	I, D, A, CS, PL, H
<i>Aphis gerardianae</i> MORDV., 1929	<i>Euphorbia seguierana</i> NECKER	PM	Saillon, Mont d'Orge, Sion (CH)	F, CS, R, H, SU
<i>Aphis montanicola</i> HRL., 1950	<i>Pulsatilla montana</i> (HOPPE) RCHB.	PM	Zeneggen (CH)	SU
<i>Aphis stachydis</i> MORDV., 1929	<i>Stachys recta</i> L.	SP	Saillon, Sion (CH); Schlanders, Tartsch (I)	F, D, DDR, CS, R, H, SU
<i>Xerobion eriosomatium</i> NEVS., 1929	<i>Kochia prostrata</i> (L.) SCHRADER	T	Nus, Gressan (I)	BG, SU
<i>Acaudinum longisetosum</i> HOLM., 1970	<i>Centaurea scabiosa tenuifolia</i> (SCHLEICHER ex GAUDIN) ARC.	?	Zeneggen (CH)	I, CS, R, SU
<i>Brachycaudus mimeuri</i> REMAUD., 1952	<i>Odontites lutea</i> (L.) CLAIRV.	PM	Saillon (CH)	E, F, I, DK, CS, H, PL
<i>Brachycorynella asparagi</i> (MORDV., 1929)	<i>Asparagus officinalis</i> L.	P	Charrat-Vison, Saillon (CH)	I, D, DDR, CS, PL, BG, SU, USA
<i>Coloradoa achilleae</i> HRL., 1939	<i>Achillea millefolium</i> L.	?	Saillon (CH)	E, F, I, Germany, NL, GB, S, DK, SF, CS, PL, R, H, BG, TR, SU
<i>Coloradoa campestris</i> CB., 1939	<i>Artemisia campestris</i> L.	?	Saillon (CH)	F, Germany, GB, S, SF, DK, A, CS, PL, H, BG, R, SU
<i>Macrosiphoniella linariae</i> (KOCH, 1855)	<i>Aster linosyris</i> (L.) BERNH.	PM	Branson, Saillon, Mont d'Orge, Raron (CH)	F, I, D, DDR, CS, R, H
<i>Macrosiphoniella staegei</i> HRL., 1947	<i>Centaurea vallesiaca</i> (DC.) JORD.	PM	Sion, Zeneggen (CH)	E, F, GR, DDR, CS, PL, R, BG, H, TR, SU
<i>Macrosiphoniella subaequalis</i> CB., 1942	<i>Artemisia campestris</i> L.	PM	Branson, Ardez (CH)	F, DDR, A, CS, PL, H, SU
<i>Macrosiphoniella vallesiaca</i> JÖRG & LAMPEL, 1988	<i>Artemisia vallesiaca</i> ALL. = <i>A. maritima vallesiaca</i> GAMS	T	Saillon, Raron (CH); Gressan (I)	?
<i>Staegeriella asperulae</i> BOSHKO, 1959	<i>Asperula aristata</i> L.f.	PM	Sion (CH); Apt (F)	SU
<i>Titanosiphon artemisiae</i> (KOCH, 1855)	<i>Artemisia campestris</i> L.	PM	Martigny, Branson, Sion, Zeneggen (CH); St-Marcel, Tartsch (I)	E, F, I, D, CS, PL, R, BG, H, SU, USA?
<i>Uroleucon chondrillae</i> (NEVS., 1929)	<i>Chondrilla juncea</i> L.	PM	Villefranche (I)	P, E, F, CH, GR, D, DDR, YU, CS, R, BG, H, PL, TR, SU

Tab. 1: Survey of the aphids collected in the inner Alpine valleys.

Like all the other inner Alpine valleys, the Valais was covered during the last glacial period (Würm) by a mighty ice-shield. So the immigration of plants and animals could take place only during the warmer period after the glacial epoch. Since the tree limit was at that time about 400 m higher than nowadays, it was possible for the organisms to traverse several passes to get into these valleys. To reach the Valais the eastern and southern elements probably had to cross the Little and Great Saint Bernard, the Theodul or the Simplon Pass. Some Mediterranean organisms came directly through the Rhone Valley, some eastern elements had the possibility to immigrate across the regions free from ice between the Alps and Scandinavia (cf. JÖRG & LAMPEL, 1988).

THE APHID MATERIAL: RESULTS AND REMARKS

A survey of the aphids, host-plants and localities is given in Tab. 1. In addition the recent distribution and the areas of origin are mentioned there. The latter correspond to the geoelements as they are defined by WALTER & STRAKA (1970). Therefore the abbreviations used in the table signify the following geographic regions: T = Turanian, P = Pontic, SP = Sub-Pontic and PM = Pontic-Mediterranean geoelement (more details in JÖRG & LAMPEL, 1988).

The Valais is one of the most interesting regions of Switzerland in regard to aphids. The first one who collected aphids there (between 1946 and 1948) was the late Swiss entomologist and botanist Dr. Robert Stäger. Unfortunately his material cannot be found in any Swiss collection, because it was given for determination to Dr. Hille Ris Lambers, who incorporated it into his own collection. Nevertheless he published three articles on this material (HILLE RIS LAMBERS, 1946-1947a,b, 1950), and also Stäger himself wrote a very short paper (STÄGER, 1957). Recently Stäger's work was shortly reported by MEIER (1985).

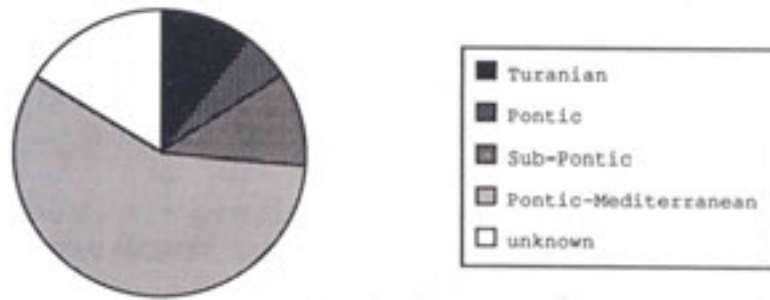


Fig. 2: The areas of origin of the aphid species collected.

From 1974 to 1989 the senior author (LAMPEL) and collaborators gathered 334 samples of aphids from the Valais, and the junior author (JÖRG) specially looked for xerothermophilous relicts of eastern origin. The collection sites of the latter are shown in Fig. 3. As it can be seen, these sites are all located in the Valaisan main valley, because the insolation is there much more intensive than in the other regions.

Finally we established a list of 17 species and one subspecies which may be regarded as strictly xerothermophilous elements of the Swiss aphid fauna, originated in the East-European and West-Asian steppe and semi-desert zones. Of these, six species (*Chaetosiphella stipae*, *Aphis montanicola*, *Aphis stachydis*, *Macrosiphoniella staegeri*, *Titanosiphon artemisiae*, and *Uroleucon chondrillae*) had already been detected by Stäger and were refound by us. A seventh species, *Acaudinum longisetosum*, had (after MEIER, 1985) "been collected by Hille Ris Lambers on April 29, 1950 near Visp" (Zeneggen?). Also the presence of this species was confirmed by us. Of the remaining species, ten are new for Switzerland (thereof one even new for science) or Western Europe (*Xerobion eriosomatium*, not found in Switzerland but nearby in the Valley of Aosta, Italy).

Below are some historical or other additional remarks on some of the established xerothermophilous aphids:

The material of Stäger enabled Hille Ris Lambers to erect many new taxa. *Chaetosiphella stipae*, *Aphis montanicola* and *Macrosiphoniella staegeri* were new for science.

- *Chaetosiphella stipae* was erected by Hille Ris Lambers as a subspecies of *C. tshernavini* (MORDV., 1921) and later on raised to the species level (see e.g. EASTOP & HILLE RIS LAMBERS, 1976). Hille Ris Lambers, who apparently had not seen specimens of *C. tshernavini* s. str., states that the Swiss material differs from the latter by "the remarkably forked or sawed dorsal hairs" (HILLE RIS LAMBERS, 1946-1947a). In reality also the dorsal hairs of *C. tshernavini* are sawed, but they are much shorter than in *C. stipae* and fan-shaped (SZELEGIEWICZ, 1985). As a second representative of the Siphinae in the Valais, which is very similar to *C. stipae*, exists *Atheroides hirtellus* HAL., 1839 (LAMPEL, 1983). It differs from *C. stipae* (*Atheroides stipae* in BÖRNER, 1950 !) in that the apical segment of the rostrum is shorter than the third antennal segment (HEIE, 1982). The distribution of *C. stipae* from Mongolia to Portugal can be seen in JÖRG & LAMPEL (1988, Fig. 3).

- *Aphis montanicola* seemed to be restricted to Switzerland and to one locality (Zeneggen, Valais), but meanwhile it was discovered also in the Moldavian SSR (VERESHZHAGIN *et al.*, 1985). The Moldavian SSR lies in the distribution zone of *Pulsatilla montana*. The existence of *A. montanicola* in Western Siberia (IVANOVSKAYA, 1977) however must be called into question (JÖRG & LAMPEL, 1988; HOLMAN, 1966).

- For *Macrosiphoniella staegeri* the authors together with Dr. A. Rupais as guest from Riga could establish on May 1, 1989 a third locality of its occurrence in the Valais: Sion, Tourbillon-Hill. It is of historical interest, that already



Fig. 3. Map of the collection sites in the Valais (Switzerland).

STÄGER (1957) supposed a Pontic origin for this "relict of a warmer period".

- Erroneously HILLE RIS LAMBERS (1950) described "*Dactynotus margarithae*" as a species new to science. It is now regarded as a synonym of *Uroleucon chondrillae*. *U. chondrillae* is widespread between Soviet Middle Asia and Portugal (see map in JÖRG & LAMPEL, 1988) and up to the Baltic Sea. F.P. MÜLLER (1987) records it from the GDR from dry and sandy ruderal places near the sea shore and mentions its "West-Asiatic origin".

Of those species not previously known from Switzerland, the most interesting are those that as a rule do not go farther westward and are relicts of a warmer climate that prevailed after the last glacial period. The nearest occurrence of them is now in the eastern steppes far from Switzerland. We can mention here the following species and subspecies: *Therioaphis trifolii* ssp. *ventromaculata*, *Aphis gerardianae*, and *Xerobion eriosomatium*, though the latter exists only in the Valley of Aosta (Italy) and - like its host-plant - has not succeeded in surmounting the Alps to Switzerland.

- *Therioaphis trifolii* ssp. *ventromaculata* was found only once in Switzerland in 1980 (LAMPEL, 1983). It is sure, that the aphid, like its host-plant *Astragalus onobrychis*, is of eastern origin. The nearest other place where the aphid can be found is in the region of the Lake of Neusiedl in Austria (near the Hungarian frontier). Though *Astragalus onobrychis* exists also in Eastern Switzerland (Lower Engadine), the aphid has not been found there (LAMPEL, 1988). The general distribution known today can be seen from Fig. 4 (CH,A,CS,PL). In Poland *T. trifolii* ssp. *ventromaculata* settles *Astragalus arenarius* L. and goes relatively far to the north. Therefore we believe it to be a Sub-Pontic element.



Fig. 4: Distribution map of *Astragalus onobrychis* and *Therioaphis trifolii* ssp. *ventromaculata*. 1 *A. onobrychis* (according to HESS, LANDOLT & HIRZEL, 1977); 2 *T. trifolii* ssp. *ventromaculata* (according to HOLMAN & PINTERA, 1977; HUCULAK, 1967; LAMPEL, 1983; F.P. MÜLLER, 1968; SZELEGIEWICZ, 1968, 1978).

- *Aphis gerardiana* is a black aphid living on *Euphorbia seguierana* (formerly *E. gerardiana*) in dry places in the Rhone Valley (Valais). The determination was possible only with the aid of Russian literature, which we do think was not available to HILLE RIS LAMBERS when he, in 1946-1947(a), identified the aphid collected by Stäger from *E. seguierana* at Raron (VS) as *Aphis euphorbiae* KALT., 1843. *Aphis gerardiana* can be distinguished from the latter by its much shorter siphunculi (LAMPEL, 1983). As can be seen from Fig. 5 in JÖRG & LAMPEL (1988), the nearest eastern locations of *A. gerardiana* are in Czechoslovakia and Hungary. According to LECLANT (1978) it exists also in Southern France.

- A very interesting finding is an aphid of Turanian origin, *Xerobion eriosomatium*, found in Italy near the Swiss frontier in the Valley of Aosta for the first time in Western Europe. Its nearest other location is Bulgaria; all other findings have been made in the European and South-West Asian Soviet Union (see Fig. 9 in JÖRG & LAMPEL, 1988; this map shows, that even the host-plant distribution is discontinuous).

- Probably also of Turanian origin is the new species *Macrosiphoniella vallesiaca* from the Valais and the Valley of Aosta living on *Artemisia vallesiaca* ALL. = *A. maritima* ssp. *vallesiaca* GAMS. The typically Turanian distribution of the host-plant (see Fig. 19 in JÖRG & LAMPEL, 1988) with two very disjunct western areas (Western Alps, Illyrian Coast) indicates, that the aphid must be of Turanian origin; but in the eastern literature we cannot find any reference to an aphid on *Artemisia vallesiaca*. Therefore we would be very interested to hear, if eastern colleagues are able to detect our species also in the main area of distribution of its host-plant.

For some other aphids found by us, Switzerland is also on the western edge of their distribution, but these species show a continuity in the eastern direction (see distribution maps in JÖRG & LAMPEL, 1988).

- *Aphis calamintae* and *Macrosiphoniella linariae* are typical Pontic-Mediterranean species which do not exist in the USSR, but go southward as far as Italy and (*M. linariae*) Southern France.

- *Aphis stachydis* does not exist in the south and seems to be a Sub-Pontic element, which has expanded not only westward, but also eastward. It was found by Stäger in the Ticino, and we have found it in the Valais and in South Tyrol.

- For *Brachycorynella asparagi* BÖRNER wrote in 1952: "So far known only from the East-Mediterranean region and Eastern Europe." But he expected it to occur sporadically also in Central Europe. Meanwhile beside our Swiss findings there are now records from the FRG, GDR and Northern Italy (JÖRG & LAMPEL, 1988; F.P. MÜLLER, 1961; COCEANO, 1989). As the host-plant *Asparagus officinalis* is now widely cultivated in Europe, it may be expected, that the aphid will in the future be found also in West- and Southwest-Europe.

REFERENCES

- BÖRNER, C. (1950): Neue europäische Blattlausarten. Selbstverlag, Naumburg/Saale, 19 pp.
- BÖRNER, C. (1952): Europae centralis Aphides. Schrift. Thüring. Landesarbeitsgemeinschaft Heilpflanzenkde. u. -beschaffung, 4, und Mitt. Thüring. Bot. Ges., Beiheft 3, Weimar, 488 pp.
- BRAUN-BLANQUET, J. (1961): Die inneralpine Trockenvegetation. Geobotanica selecta 1. Fischer, Stuttgart, 273 pp.
- COCEANO, P.G. (1989): Un nuovo pericolo per l'asparagicoltura italiana. L'Informatore Agrario, 45 (24), 73-74.
- EASTOP, V.F. & HILLE RIS LAMBERS, D. (1976): Survey of the world's aphids. Junk, The Hague, 573 pp.
- HEIE, O.E. (1982): The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. II. Scandinavian Science Press, Klampenborg, 176 pp.
- HESS, H.E., LANDOLT, E. & HIRZEL, R. (1977): Flora der Schweiz 2. Birkhäuser, Basel & Stuttgart, 956 pp.
- HILLE RIS LAMBERS, D. (1946-1947a): Neue Blattläuse aus der Schweiz (Homopt., Aphidae). Mitt. Schweiz. Entomol. Ges., 20, 323-331.
- HILLE RIS LAMBERS, D. (1946-1947b): Neue Blattläuse aus der Schweiz II (Homopt. Aphidae). Mitt. Schweiz. Entomol. Ges., 20, 649-660.
- HILLE RIS LAMBERS, D. (1950): Neue Blattläuse aus der Schweiz (III) (Homopt., Aphidae). Mitt. Schweiz. Entomol. Ges., 23, 37-46.
- HOLMAN, J. (1966): Contributions to the taxonomy of the genus *Aphis* (Homoptera, Aphididae) - II. Acta entomol. bohemoslov., 63, 91-110.
- HOLMAN, J. & PINTERA, A. (1977): Aphidodea. Acta Faunistica Ent. Mus. Nat. Pragae, Suppl. 4, 101-116.
- HUCULAK, S. (1967): Mszyce (Homoptera, Aphidodea) Pojezierza Mazurskiego III. Fragm. faunistica (Warszawa), 14, 93-131.
- IVANOVSKAYA, O.I. (1977): Tli sapadnoj Sibiri II (Semejstvo Aphididae). Isd. "Nauka", Sib. Otdel., Novosibirsk, 328 pp.
- JÖRG, E. & LAMPEL, G. (1988): Xerothermophile Aphiden der Schweiz und angrenzender Gebiete mit besonderer Berücksichtigung des Kantons Wallis (Homoptera, Aphidina). Mitt. Schweiz. Entomol. Ges., 61, 43-88. - See also : Aphids of hot, dry habitats in Switzerland. Aphidologists Newsletter, 24, 1, 15-17 (1989).
- LAMPEL, G. (1983): Für die Schweiz neue Blattlaus-Arten (Homoptera, Aphidina) 3. Mitt. Schweiz. Entomol. Ges., 56, 125-162.
- LAMPEL, G. (1988): Ökologische Untersuchungen im Unterengadin : Blattläuse (Sternorrhyncha, Aphidina). Ergebn. wiss. Unters. Schweiz. Nationalpark, 12, 13.Lfg., D301-D330. - See also : Ecology of aphids in the Lower Engadine area. Aphidologists Newsletter, 24, 1, 17-20 (1989).
- LECLANT, F. (1978): Étude bioécologique des aphides de la région méditerranéenne. Thèse Univ. Sci. Techn. Languedoc, Montpellier, 318 pp.

- MEIER, W. (1985): Aphid species from East and West with some additions to the aphid fauna of Switzerland and with descriptions of a new species (Additions to the aphid fauna of Switzerland III). Proc. Internat. Aphidol. Symp. Jablonna 1981, 431-446.
- MÜLLER, F.P. (1961): Ergänzungen zur Blattlausfauna von Mitteleuropa. Mitt. Dtsch. Entomol. Ges., 20, 69-70.
- MÜLLER, F.P. (1968): Eine neue Subspecies zu *Therioaphis trifolii* (MONELL 1882) (Homoptera, Aphidina). Reichenbachia, 10, 261-265.
- MÜLLER, F.P. (1987): Einfluss von Biotop und Biotopveränderungen auf die Aphidenfauna (Homoptera : Aphididae) im Küstenstreifen der DDR. Wiss. Z. Univ. Rostock, 36, Naturw. Reihe, Heft 2, 81-83.
- STÄGER, R. (1957): Beitrag zur Kenntnis der Aphiden-Fauna der Walliser Steppenheide. Mitt. Schweiz. Entomol. Ges., 30, 99-101.
- SZELEGIEWICZ, H. (1968): Mszyce, Aphidodea. Katalog fauny Polski 21,4. Pánstwowe Wydawnictwo Naukowe, Warszawa, 316 pp.
- SZELEGIEWICZ, H. (1978): Przegląd systematyczny mszyc Polski (A check list of the aphids of Poland). Pánstwowe Wydawnictwo Naukowe, Warszawa, 40 pp.
- SZELEGIEWICZ, H. (1985): Klucze do oznaczania owadów Polski XVII, 5b: Mszyce - Aphidodea Chaitophoridae. Pánstwowe Wydawnictwo Naukowe, Warszawa-Wroclaw, 58 pp.
- VERESHZHAGIN, B.V., ANDREEV, A.V. & VERESHZHAGINA, A.B. (1985): Tli Moldavii. Shtiinza, Kishinev, 160 pp.
- WALTER, H. & STRAKA, H. (1970): Arealkunde, 2. Aufl. Ulmer, Stuttgart, 478 pp.