

## New data concerning Siphonaptera of Austria

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(Mit 21 Textabbildungen)

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In the catalogue of Austrian Siphonaptera (SMIT, 1955) 13 species are listed for Kärnten, 12 for Steiermark, 5 for Vorarlberg and only 3 for Burgenland. Consequently I was most gratified to receive for study from Prof. Dr. M. BEIER a good number of fleas collected in those Bundesländer (as well as in Niederösterreich, whence the flea-fauna — with 45 forms — is better known) by the ornitho-mammalogist Dr. K. BAUER and some of his associates during 1962—1966. This material, consisting of 34 species and subspecies, brings the number of forms known from Kärnten to 23, from Steiermark to 21, from Vorarlberg to 20 and from Burgenland to 12; moreover, it adds three subspecies of *Ctenophthalmus agyrtes* and a new subspecies of *Ctenophthalmus nivalis* to the country's faunal list which now comprises 65 species and subspecies<sup>1)</sup>.

The new data for the various species are of value per se, but of major interest are the specimens of *Ctenophthalmus agyrtes* because they elucidate the distribution pattern of the subspecies in and around Austria considerably (see Fig. 1). A note on some of the *agyrtes* material has already been published (SMIT, 1966b), partly in order to judge the appearance in print of a certain method of mapping the distribution of subspecies.

Dr. K. BAUER and colleagues deserve our heartfelt thanks for having taken great pains to preserve the fleas which they encountered during their field studies of mammals.

### List of collecting localities

VORARLBERG (all collected by K. BAUER and F. SPITZENBERGER):  
East of Alploch, 720 m, near Dornbirn — 4. VI. 1966.  
Altrhein, near Gaissau-Unterdorf — 7. VI. 1966.  
Dornbirn-Oberdorf, along Enz — 3.—5. VI. 1966.

<sup>1)</sup> *Ctenophthalmus caucasicus* (TASCHENBERG, 1880) should be deleted from the Austrian list as the record (SMIT, 1955: 3) of this specific parasite of *Spalax* (which does not occur in Austria) proved to be based on erroneous data.

Gortipohl, Montafon — 11. VI. 1966.

1 km south-east of Lorüns (4 km S. E. of Bludenz), Montafon — 12. VI. 1966.

1,5 km west-north-west of Nüziders — 1. VI. 1966.

Rohrspitz am Boden-See, near Fussach — 6.—7. VI. 1966.

Unterermunt, 1450 m, between Vermunt-Stausee and Partenen — 10. VI. 1966.

Wiesealpe, 1550 m, near Lech — 13. VI. 1966.

Zürs, 1720 m, 5 km south of Lech — 13. VI. 1966.

#### KÄRNTEN:

Bodenal, near Ferlach — X. 1964, F. SPITZENBERGER.

Franz-Josefs-Höhe, 2418 m, Grossglockner — 8. X. 1964, K. BAUER.

Gösselsdorfer See (11 km south of Völkermarkt), 470 m — 23.—24. VIII. 1963,

K. BAUER; the hosts were trapped on the north-west shore of the lake.

Koglereck (5½ km north-east of Lavamünd), 1350 m — 19.—20. VIII. 1963,

K. BAUER and M. GANSO.

Krasznig-Graben (17 km south of Klagenfurt, in the Loibltal), 860 m — 25. VIII. 1963, K. BAUER and M. GANSO.

Mölltal, near Winklern — 17. XI. 1965, F. SPITZENBERGER.

Shore of Pressegger See, 5 km east of Hermagor — 15.—17. IX. 1964, K. BAUER.

Siebenhütten (8 km south of Bleiburg, on the northern slope of the Petzen),

1750 m — 21.—22. VIII. 1963, K. BAUER and M. GANSO.

Sturm-Alpe, 2150 m (Grossglockner-Hochalpenstrasse) — 13.—14. IX. 1964,  
F. SPITZENBERGER.

#### STEIERMARK:

Eisenerz, 750 m — 29. IX.—5. X. 1962; 14. IV. 1963, K. BAUER.

Furtner Teich, near Neumarkt, 870 m — 26. VIII. 1963, K. BAUER and  
M. GANSO; the hosts were trapped on the north-west shore of the lake.

Gerichtsgraben (between the Prebichl Pass and Eisenerz), 1100 m — 3. X. 1962,  
K. BAUER.

Kalsdorf, 13 km south of Graz — 14. IV. and 4. VIII. 1962, K. BAUER.

Laafeld — 4. IX. 1962, K. BAUER; the hosts were trapped 2 km south-east of  
Laafeld.

Mur-Au, 1 km south of Laafeld — 5. IX. 1962, K. BAUER.

Pernitzen-Brücke (between Lavamünd and Eibiswald), 1100 m — 19.—  
20. VIII. 1963, K. BAUER and M. GANSO.

Prebichl Pass, 5 km south-east of Eisenerz, 1250 m — 3. X. 1962, K. BAUER.

Radkersburg — 6. IX. 1962, K. BAUER.

Packer Stausee, 900 m, near Voitsberg — 4. X. 1964, K. BAUER.

Spital am Semmering — 22. IX. 1963, M. GANSO.

Stuhleck, 1730 m, Fischbacher Alpen — 22. IX. 1963, M. GANSO.

## NIEDERÖSTERREICH:

Bruck an der Leitha — 8. VII. 1964, F. SPITZENBERGER.

Between Klosterneuburg and Korneuburg, along Danube — 9.—16. X. 1963,  
M. GANSO.

Königstetten — 6. IX. 1963, F. SPITZENBERGER; 30. IX. 1963, K. BAUER.

Langenzersdorf — 29. VI. 1966, H. GEHER.

Polzberg, near Gaming — 27. VIII. 1963, M. GANSO.

Wien — X. 1963, V.—VI. 1966, W. PODUSCHKA.

## BURGENLAND:

Deutschkreutz (in Deutschkreutzerwald, 200 m) — 14.—15. IX. 1963,  
M. GANSO.

North of Illmitz (in quarry) — 20. X. 1963, M. GANSO.

Neusiedl/See (on the northern shore of the Neusiedlersee) — 7. IV. 1962,  
K. BAUER; 4. VII.—21. VIII. 1964, F. SPITZENBERGER.

Parndorfer Platte, 7 km north of Neusiedl/See — 8. IV. 1962, K. BAUER.

Between Podersdorf and Illmitz — 13. X. 1963, M. GANSO.

Winden, east slope of Leithagebirge — 25. IX. 1963, 1. III. 1964, H. FREUNDL.

## Annotated list of material collected

The species of fleas are listed alphabetically under their generic names. The abbreviations for the Bundesländer are: V = Vorarlberg; K = Kärnten; ST = Steiermark; N = Niederösterreich; B = Burgenland.

*Archaeopsylla erinacei erinacei* (BOUCHÉ, 1835)V: Nüziders, *Erinaceus europaeus europaeus*: 4 ♂ 5 ♀; N: Wien, *Erinaceus europaeus roumanicus*: 27 ♂ 45 ♀.*Atyphloceras nuperum palinum* (JORDAN, 1931)ST: Packer Stausee, *Clethrionomys glareolus*: 1 ♂.

This is the second Austrian record of a rather uncommon winter- and nest-flea of Microtines living in mountains of central and south-eastern Europe; the first Austrian record is from Donnersbach, also in Steiermark.

*Chaetopsylla (Chaetopsylla) globiceps* (TASCHENBERG, 1880)B: Winden, *Vulpes vulpes*: 1 ♂.

A common winter-flea of the fox; new for Burgenland.

*Ctenocephalides felis felis* (BOUCHÉ, 1835)B: Winden, *Vulpes vulpes*: 1 ♂ 1 ♀.

Normally the dog-flea *Ctenocephalides canis* (CURTIS, 1826) is one of the parasites associated with the fox, not the cat-flea *C. f. felis*. As very common insects tend to escape the attention of a collector, the cat-flea had not yet been recorded from Burgenland (and still not from Tirol and Steiermark)!

RESSL (1963: 476) experimentally enabled cat-fleas to breed freely in his house for a short while; in view of recent interest in the influence of sex and age of host on the degree of infestation by fleas it is worth recounting here that his wife attracted 153 fleas, his 10 yr old daughter 7, his 8 yr old son 4 and RESSL himself only 2 specimens. However, Mr. RESSL kindly informed me that his wife was at home most of the time and consequently much more liable to attract fleas than either he himself (who in any case does not suffer from fleas) or the children.

*Ctenophthalmus agyrtes agyrtes* (HELLER, 1896)

K: Gösselsdorfer See: *Apodemus flavicollis*: 4 ♂ 9 ♀; *Apodemus sylvaticus*: 3 ♂ 2 ♀; *Microtus agrestis*: 11 ♂ 10 ♀; *Pitymys subterraneus*: 1 ♀; *Sorex minutus*: 1 ♀. Koglereck: *Apodemus flavicollis*: 1 ♀; *Pitymys subterraneus*: 1 ♀. ST: Eisenerz: *Apodemus flavicollis*: 1 ♂ 3 ♀; *Arvicola terrestris*: 2 ♀; *Microtus agrestis*: 3 ♂ 2 ♀; *Pitymys subterraneus*: 7 ♂ 7 ♀; *Sorex araneus*: 1 ♂; *Talpa europaea*: 3 ♂ 4 ♀. Furtner Teich: *Clethrionomys glareolus*: 2 ♂ 1 ♀; *Microtus arvalis*: 1 ♂; *Pitymys subterraneus*: 1 ♀. Gerichtsgraben, *Sorex araneus*: 1 ♂. Packer Stausee, *Clethrionomys glareolus*: 1 ♂ 3 ♀. Pernitz-Brücke, *Apodemus flavicollis*: 3 ♂ 2 ♀; *Pitymys subterraneus*, 1 ♂. Preibichl Pass, *Pitymys subterraneus*: 2 ♀; *Talpa europaea*: 1 ♂ 2 ♀. N: Bruck an der Leitha, *Apodemus flavicollis*: 3 ♂; *Clethrionomys glareolus*: 1 ♂ 1 ♀. Between Klosterneuburg and Korneuburg, *Clethrionomys glareolus*: 2 ♂. Polzberg, *Pitymys subterraneus*: 1 ♂ 1 ♀.

This subspecies deeply penetrates the eastern part of the country from Czechoslovakia and nearly reaches the middle portion of the frontier with Yugoslavia at Gösselsdorfer See and Pernitz-Brücke (Fig. 1). It will also be seen from the map that the area of intergrades between the nominate subspecies and *a. smitianus* is fairly wide (the range of *a. smitianus* continues between those of *a. agyrtes* and *a. impavidus* through Germany and into the southern half of The Netherlands; in the latter country the zone of intermediates between those two subspecies is also quite wide, cf. SMIT, 1962, Tijdschr. Ent. 105: 59, fig. 7). Although it is not always easy to determine the status of specimens which are actually intermediate between two subspecies, I have not yet seen any that are obvious intermediates between *a. agyrtes* and *a. bosnicus*. The map (Fig. 1) indicates that further collecting in eastern Steiermark and in Burgenland will eventually delineate the boundary between *a. agyrtes* and *a. bosnicus* and will also show the extent of hybridization — if any — between those two subspecies.

*Ctenophthalmus agyrtes bosnicus* WAGNER, 1930

ST: Kalsdorf, *Pitymys subterraneus*: 1 ♂; Laafeld, idem: 1 ♂. Mur-Au, *Apodemus flavicollis*: 1 ♂; *Clethrionomys glareolus*: 1 ♂ 3 ♀. B: Deutschkreutz, *Pitymys subterraneus*: 2 ♂ 10 ♀.

The map (Fig. 1) shows that in Austria this subspecies occurs only in

the south-eastern part of Steiermark and in central and southern Burgenland. Very little was known about this form and *e. g.* ist occurrence in western Hungary (Fig. 1) was published recently for the first time (SMIT, 1966 b), the records being based on material which Mr. I. SZABÓ collected with much zeal

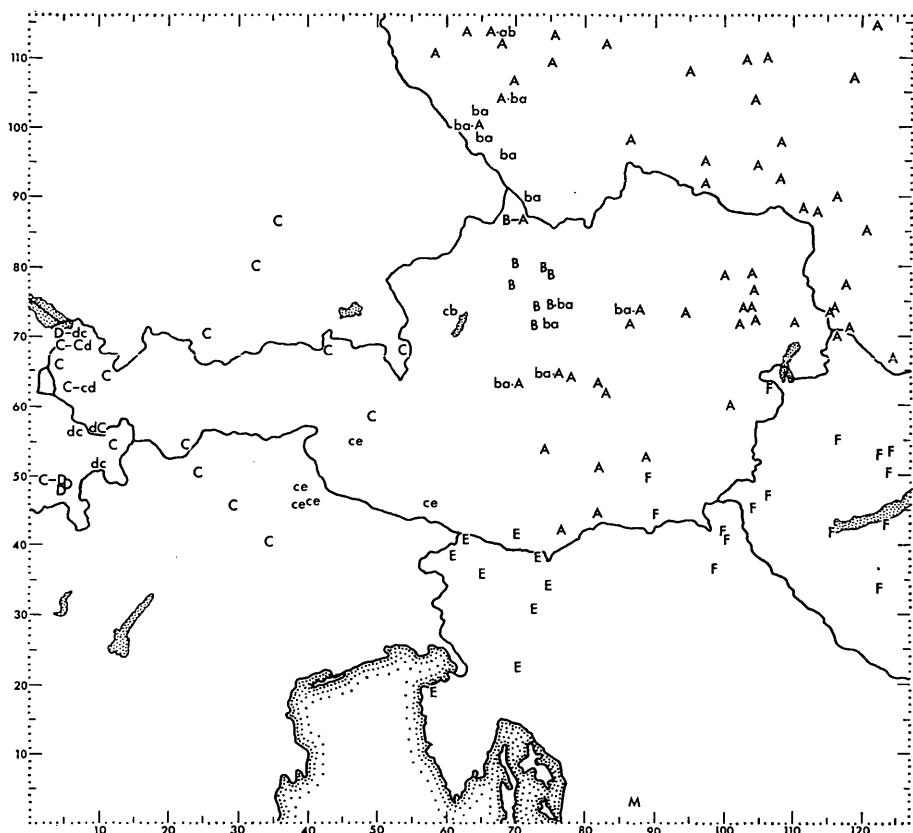
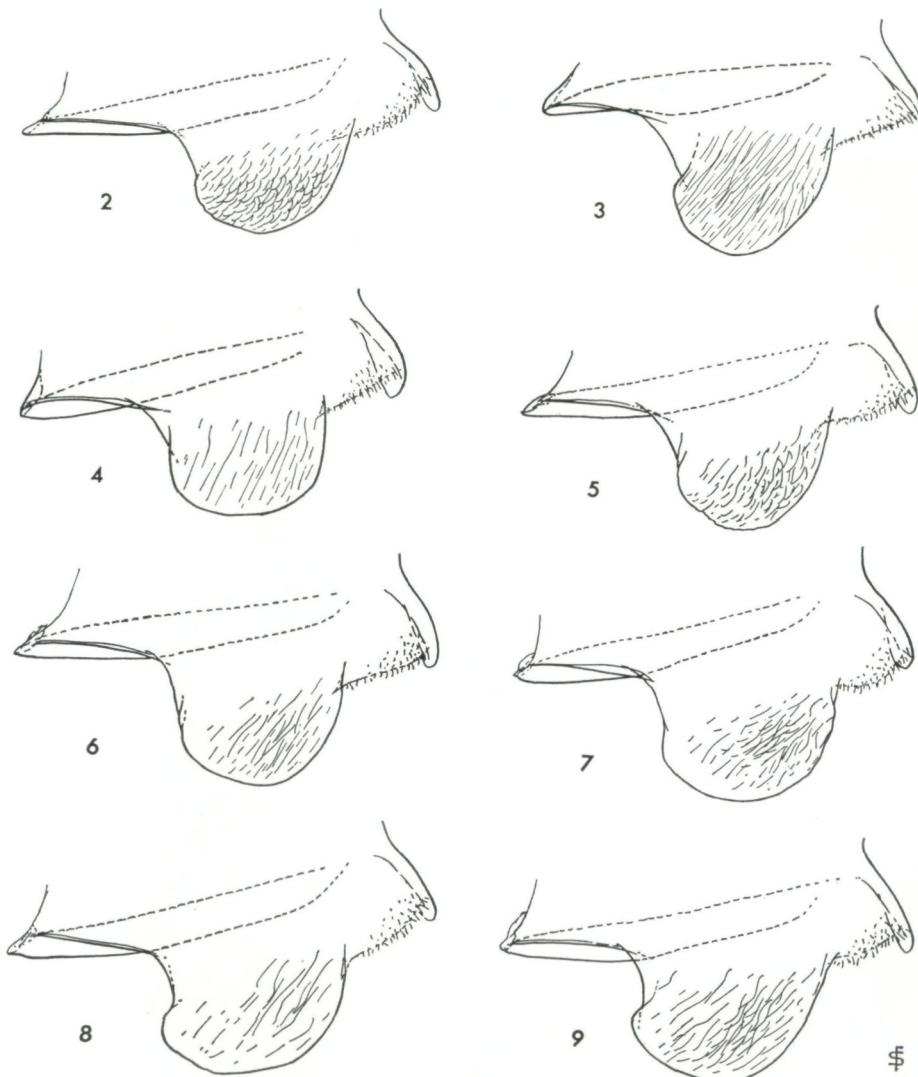


Fig. 1. Map showing the distribution of subspecies of *Ctenophthalmus agyrtes* in and around Austria. A = *a. agyrtes* (HELLER); B = *a. smitianus* PEUS; C = *a. impavidus* JORDAN; D = *a. verbanus* JORDAN & ROTHSCHILD; E = *a. wagnerianus* PEUS; F = *a. bosnicus* WAGNER; M = *a. dinarus* ROSTIGAYEV. Explanation of letter-combinations: A . B (or B . A) = two subspecies in one locality; A-B (or B-A) = two subspecies in one locality together with intergrades; ab (or ba) = intergrades between A and B; ba . A (or A . ab) = A with intergrades between A and B in one locality. If an intergrade veers more toward *e. g.* A than B, this can be indicated by Ab. The names of the localities are given in the text.

in recent years. I am much indebted to Mr. SZABÓ for generously permitting me to use the locality data in the present map. I am likewise indebted to Prof. Dr. B. ROSICKÝ for having enabled me to study material on which a number of other records are based.

Originally described from the Igman Planina, south-west of Sarajevo, this subspecies has subsequently been recorded from Yugoslavia, only, by

WAGNER (1939, Bull. Soc. sci. Skoplje 20 [Sect. Sci. nat.]: 155—163), namely from Crno-Polje (Prenj Planina), Boračko Jezero, Žabljak (Durmitor Mts), Sveti Miklavž and Bezdan. His records from Glamoč and Knin are based on specimens which are now known as representing *agyrtes dinarus* ROSTIGAYEV,



Figs. 2—9. Aedeagal lamella of specimens of *Ctenophthalmus agyrtes wagnerianus* PEUS from: 2. Rateče (holotype); 3, 4. Rateče (topotypes); 5. Jezersko; 6. Krvavac Planina; 7. Vodnikova Koča; 8. Bohinjska Bistrica; 9. Ljubljana.

1959, while the ones from Ljubljana come within the range of *agyrtes wagnerianus* PEUS, 1950. WAGNER (l. c.) observed that the entire area cornered by Maribor and Bezdan in the north and by the Prenj Planina and the Durmitor Mts. in the south would presumably be occupied by *agyrtes bosnicus*. Further-

more he surmised that *a. bosnicus* would doubtless extend northwards of Bezdan into Hungary (this proves to be the case) but he was not certain whether it would extend into Austria north of Maribor or that the river Drava would possibly constitute the northern limit of the range of *a. bosnicus*. It has now been ascertained that the Drava does not act as a barrier and that *a. bosnicus* does extend into Austria north of Maribor. It is unfortunate that no specimens of *agyrtes* are known to have been collected in the very large area between eastern Slovenija and Bezdan in the north and Prenj Planina, Igman and Durmitor Mts. in the south. However, a paralectotype of *a. bosnicus* (from the Mali Igman) (Fig. 10) agrees rather well with a specimen from Kisbalaton (Hungary) (Fig. 11). If material from the large intermediate region would eventually show that after all there are slight differences between the southern and northern populations, then the name *agyrtes hadzhii* ROSICKÝ & CARNE-LUTTI, 1959, must be applied to the northern ones as this subspecies was described from Srednja Bistrica and Rakičan.

*Ctenophthalmus agyrtes impavidus* JORDAN, 1928

V: Dornbirn-Oberdorf, *Apodemus* sp.: 1 ♂ 2 ♀. Gortipohl, *Neomys fodiens*: 1 ♂. 1 km S.E. of Lorüns, *Clethrionomys glareolus*: 3 ♂ 1 ♀. 1,5 km W.N.W. of Nüziders, *Crocidura leucodon*: 1 ♂; *Apodemus* sp.: 2 ♂ 4 ♀. Untervermunt, *Pitymys subterraneus*: 2 ♂ 9 ♀. Wiesealalpe, *Microtus nivalis*: 3 ♂ 8 ♀.

This subspecies occupies the narrow western half of the country and goes as far east as Salzburg. In Vorarlberg intergrades between *C. a. impavidus* and *a. verbanus* are found; the following intergrades veer more towards the former than to the latter: Dornbirn-Oberdorf, *Microtus agrestis*: 1 ♂; Gortipohl, *Apodemus flavicollis*: 1 ♂ 1 ♀; 1 km S.E. of Lorüns, *Apodemus* sp.: 1 ♂; Untervermunt, *Clethrionomys glareolus*: 1 ♂ 8 ♀; Zürs, *Microtus nivalis*: 1 ♂. Specimens which are more perfect intergrades are from: Altrhein, *Clethrionomys glareolus*: 1 ♂ 4 ♀; Gortipohl, same host; 4 ♂ 10 ♀; 1,5 km W.N.W. of Nüziders, same host: 3 ♂ 2 ♀; Rohrspitz, *Microtus agrestis*: 1 ♂.

As usual in a zone of intergradation, one may find in one locality specimens which are typical or near-typical representatives of either of the constituent subspecies together with a variety of intergrades.

*Ctenophthalmus agyrtes verbanus* JORDAN & ROTHSCHILD, 1920

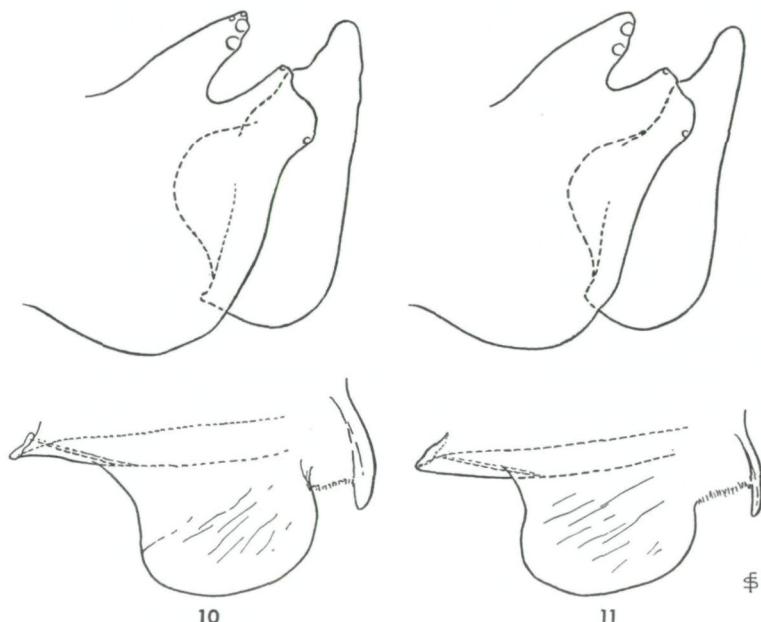
V: Altrhein, *Apodemus* sp.: 2 ♂.

Around this locality *C. a. verbanus* presumably reaches its most northern point of distribution as the two specimens are not quite 100% typical although they still predominantly exhibit the characters of this subspecies. The following material of *a. verbanus* shows a touch of *a. impavidus*: Altrhein, *Microtus agrestis*: 1 ♂ 1 ♀. Sub *C. a. impavidus* a male from the same locality is listed as a normal intergrade between the two subspecies. It is obvious, therefore, that the *agyrtes* population in north-west Vorarlberg, as well as in the adjacent part of Switzerland, actually consists mainly of hybrids between *a. verbanus* and *a. impavidus*.

*Ctenophthalmus agyrtes wagnerianus* PEUS, 1950

K: Krasznig-Graben, *Apodemus flavicollis*: 1 ♂ 3 ♀; *Clethrionomys glareolus*: 1 ♂.

This form is characterized in the male by the combination of a clasper and sternum IX of the *a. agyrtes* type with a rather broad, smoothly margined aedeagal lamella. However, there is noticeable variation in the surface sculpture of the lamella as can be seen from Figs. 2—9. On the whole *a. wagnerianus* seems to be a fairly unstable form, gradually changing and linking *a. impavidus* in the west with *a. bosnicus* in the east. As *a. wagnerianus* occurs over a reasonably extensive area and intergrades with *a. impavidus* in the Dolomites, its



Figs. 10—11. Outline of clasper and aedeagal lamella of *Ctenophthalmus agyrtes bosnicus* WAGNER from: 10. Mali Igman (paralectotype); 11. Kisbalaton (Hungary).

status is best retained for the time being as that of subspecies. There are also signs of intergradation with *a. bosnicus* in specimens from Bohinjska Bistrica (Fig. 8) and Ljubljana (Fig. 9) but the sample available for study from those localities has been insufficient and does not permit a firm decision one way or another. Collecting in the large gaps to the west and north-west and to the east and south-east of the known range of *a. wagnerianus* (see Fig. 1) will be most rewarding. The following specimens are intermediates between *a. wagnerianus* and *a. impavidus*: K: Pressegger See, *Microtus agrestis*: 1 ♂; *Apodemus sylvaticus*: 3 ♂; Sturm-Alpe, *Microtus nivalis*: 1 ♂.

A pictorial key to the subspecies of *C. agyrtes* occurring in Austria is given in Fig. 12.

The names of the localities shown in Fig. 1 can be found by the usual co-ordinates method (longitudes first; longitude and latitude are here arbitrary figures). The center of a letter or letter-group is the location of the collecting-locality. The localities, listed per country in north-eastern direction, are preceded by the co-ordinates of Fig. 1:

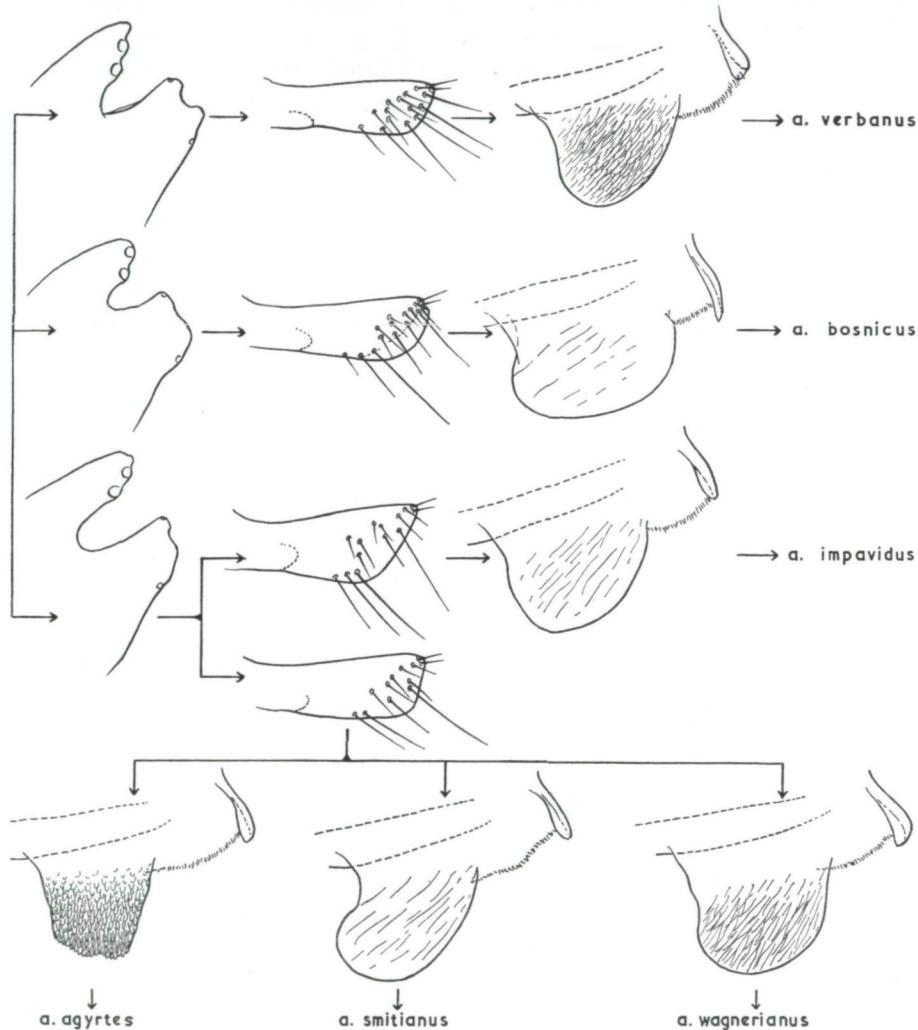


Fig. 12. Pictorial key to ♂ of the six subspecies of *Ctenophthalmus agyrtes* occurring in Austria. The structures shown (fixed process of clasper, distal arm of sternum IX and aedeagal lamella) were drawn from Austrian specimens: *a. verbanus* from Altrhein; *a. bosnicus* from Mur-Au; *a. impavidus* from Ferleiten; *a. agyrtes* from Eisenerz; *a. smitianus* from Steyr; *a. wagnerianus* from Krasznig-Grabn.

#### AUSTRIA:

42.70 Krasznig-Grabn. 42.77 Gösselsdorfer See. 44.82 Pernitz-Brücke; Koglereck. 44.90 Mur-Au; Laafeld. 46.58 Pressegger See. 50.89 Kalsdorf.

51.82 Packer Stausee. 52.89 Graz. 54.74 Furtner Teich. 55.23 Ober Gurgl. 55.47 Sturm-Alpe. 57.10 Untervermunt. 59.50 Ferleiten; Moserboden. 60.101 Krumbach. 62.83 Gerichtsgraben; Prebichl Pass. 63.07 Gortipohl; Lorüns; Nüziders; Wiesealpe; Zürs. 63.70 Donnersbach. 63.82 Eisenerz. 63.107 Deutschkreutz. 64.11 Aelpele. 64.78 Hesshütte. 65.75 Admont. 66.05 Satteins. 68.43 Wildbichl. 69.06 Dornbirn-Oberdorf. 70.06 Altrhein; Rohrspitz. 72.73 Leonstein. 72.76 Grosse Dirn. 72.86 Polzberg. 72.102 Baden. 72.105 München-dorf. 72.110 Bruck an der Leitha. 73.95 Hainfeld. 74.61 St. Georgen. 74.87 Purgstall and environs. 74.103 Kaltenleutgeben. 74.104 Kalksburg. 75.73 Bad Hall. 75.76 Steyr. 76.104 Wien. 77.70 Wels. 79.75 Ebelsberg. 79.100 Tullner-bach. 79.104 between Klosterneuburg and Korneuburg. 80.74 Linz. 81.70 Eferding. 87.70 Rohrbach.

#### GERMANY:

68.54 Berchtesgaden. 71.26 Ettal. 80.33 Planegg. 87.36 Haag am Amper.

#### CZECHOSLOVAKIA:

67.124 Čalovo. 71.118 Šamorín. 73.115 Petřžalka. 74.116 Podunajské Biskupice; Štefanikovce. 77.118 Pezinok. 85.121 Hlboké. 88.114 Tvrdonice. 89.112 Lednice; Hlohovec. 90.72 Černá v Pošumaví. 90.116 Hodonín. 92.97 Vranov. 93.108 Vranovice. 94.105 Krumlov. 95.97 Nové Syrovice. 96.69 Boubín. 98.65 Horská Kvilda. 98.86 Jindřichův Hradec. 98.108 Žebětín. 100.65 Kašperské Hory. 102.65 Sušice. 104.68 Horažďovice. 104.105 Rožná nad Pernštejnem; Střítež. 107.70 Lnáře. 107.119. Kopeček. 108.95 Havlíčkův Brod. 109.75 Bohostice. 110.103 Herálec Žďár. 110.107 Květná. 111.58 Bukovec. 112.68 Dobřív. 112.83 Líšno. 113.76 Dobříš. 114.63 Plžen-Vejprnice. 114.67 Volduchy; Mýto. 115.122 Bruntál.

#### HUNGARY:

34.122 Kaposmérő. 42.115 Kisbalaton. 43.123 Balatonlelle. 45.104 Őriszentpéter. 47.106 Szőce. 50.124 Sárcsikut. 53.122 Németbanya; Iharkút; Köris hegység. 54.124 Bakonybel. 55.116 Külsővárt. 70.116 Rajka.

#### YUGOSLAVIA:

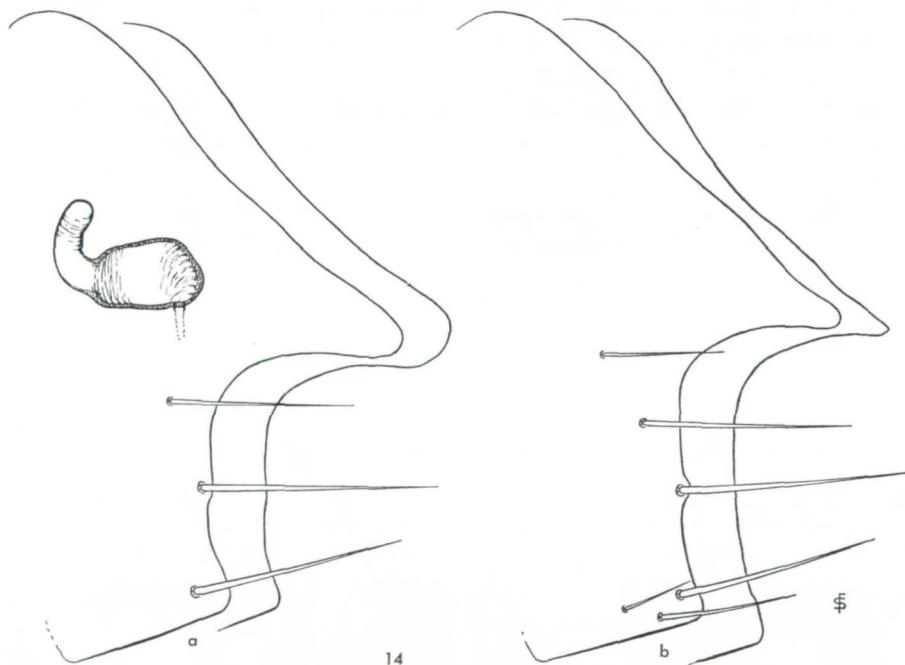
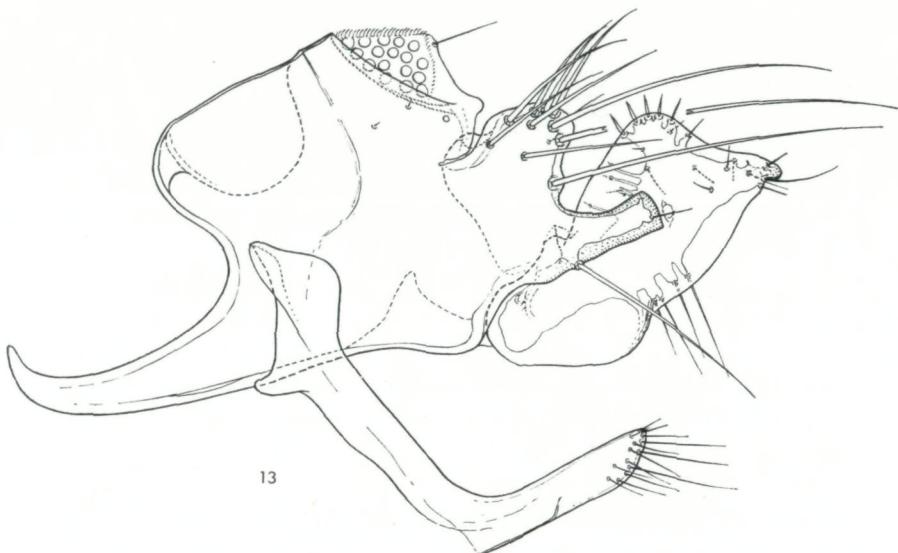
03.87 Plitvice. 19.58 Sečovlje. 23.71 Jurišče. 31.73 Ljubljana. 34.75 Kamnik; Kamniška Bistrica; Vrhopolje; Krvavac Planina. 36.65 Bohinjska Bistrica. 37.99 Sveti Miklavž. 38.61 Vodnikova Koča. 38.73 Jezersko. 41.62 Rateče. 41.100 Srednja Bistrica. 42.99 Rakičan.

#### ITALY:

40.35 San Martino di Castrozza. 46.29 Fiè (Völs); Laghetto di Fiè (Völser Weiher); Schlern. 46.39 Faloria Alp. 46.41 Misurina; Monte Cadini. 48.39 Prato Piazza (Plätzwiese). 51.24 Merano.

## SWITZERLAND:

48.05 Val Roseg. 49.04 Campfer; St. Moritz. 49.06 Schafberg. 52.10 Nationalpark. 54.12 Vulpera; Tarasp. 56.06 Aelpeltispitzalp.



Figs. 13–14. *Ctenophthalmus nivalis rhaeticus* subsp. nov. 13. Segment IX of holotype; 14. Sternum VII (outline of both sides) and spermatheca of allotype (a), sternum VII (outline of both sides) of paratype (b).

*Ctenophthalmus assimilis assimilis* (TASCHENBERG, 1880)

ST: Kalsdorf, *Microtus arvalis*: 1 ♀; *Pitymys subterraneus*: 3 ♂. B: Parnedorfer Platte, *Pitymys subterraneus*: 1 ♂; *Sorex araneus*: 2 ♂. Northern shore of Neusiedler See, *Microtus oeconomus*: 1 ♀. Between Podersdorf and Illmitz, *Microtus arvalis*: 1 ♂.

This is primarily a parasite of *Microtus arvalis*, hitherto only known in Austria from Ober- and Niederösterreich. *Pitymys subterraneus* and *Microtus oeconomus* are new Austrian hosts.

*Ctenophthalmus bisoctodentatus bisoctodentatus* KOLENATI, 1863

V: Lorüns, *Talpa europaea*: 2 ♀. Untervermunt, *Clethrionomys glareolus*: 1 ♂; *Pitymys subterraneus*: 1 ♂. Wiesealpe, *Sorex araneus*: 2 ♀.

Two subspecies are now recognized: *b. bisoctodentatus* KOLENATI, 1863, and *b. heselhausi* (OUDEMANS, 1914). As these are mainly distinguishable in the female sex and as the geography of the subspecies has not been worked out in detail, it is not yet possible to assign a subspecific name to the following males: ST: Eisenerz, *Talpa europaea*; 1 ♂. Furtner Teich, same host: 1 ♂. Prebichl Pass, same host: 1 ♂.

*Ctenophthalmus congener congener* ROTHSCHILD, 1907.

K: Gösselsdorfer See, *Microtus agrestis*: 1 ♀. Koglereck, *Pitymys subterraneus*. ST: Eisenerz, same host: 2 ♀. Pernitz-Brücke, same host: 1 ♂. Prebichl Pass, same host: 1 ♂ 1 ♀. N: Königstetten, *Glis glis*: 1 ♀. Polzberg, *Pitymys subterraneus*: 2 ♀.

This flea of Microtines had not yet been collected from *Pitymys* in Austria. New for Kärnten.

*Ctenophthalmus nivalis rhaeticus* subsp. nov. (Figs. 13, 14).

V: Untervermunt: *Microtus nivalis*: ♂ holotype, ♀ allotype; *Pitymys subterraneus*: 1 ♂ 1 ♀ paratypes. Holotype and allotype in the Naturhistorisches Museum, Wien, paratypes in the flea-collection of the British Museum (Natural History), Tring.

The new subspecies is more closely related to *C. n. nivalis* ROTHSCHILD and *C. n. cervinus* JORDAN & ROTHSCHILD than to *C. n. helvetius* SMIT and differs from all three in the male mainly by the shape of the movable process of the clasper (Fig. 13) which has a distinctly concave dorsal margin and a dorso-apical angle which is more strongly produced than the dorso-anterior angle. Phallosome as in the other three subspecies. Sternum VII of female (Fig. 14) similar to that of *C. n. nivalis*; there is considerable variation in the size and the tip of the triangular lateral lobe.

All four subspecies of *C. nivalis* are parasites of microtines living at high altitudes (above the treeline) in the Alps and the snowvole *Microtus nivalis* is therefore the usual host.

Dr. BAUER kindly furnished me with the following particulars concerning

the collecting locality: Untervermunt is a rather narrow valley which opens to the north and is therefore rather wet and cool as it receives relatively little sunshine and consequently is under snow for a considerable time of the year. The dominant open "Almwald" (open spruce-forest) is traversed by some large avalanche-paths. Some of these contain boulders and rock-falls which are more or less overgrown. The brook and the numerous small streams are bordered by lush vegetation. *Sorex alpinus* and *Pitymys subterraneus* are very characteristic of such humid submontane/subalpine habitats. *Microtus nivalis* can be found far below the tree-line in rock-strewn avalanche-paths and the place

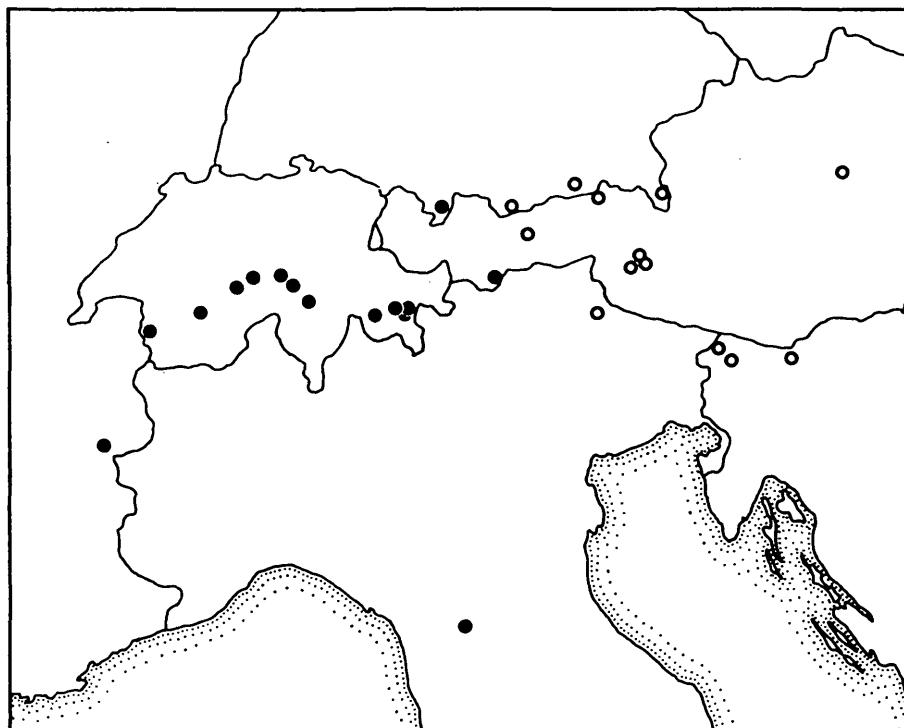


Fig. 15. Map showing the known entire distribution of the two subspecies of *Ctenophthalmus orphilus*: ● = *C. o. orphilus* JORDAN & ROTHSCHILD; ○ = *C. o. dolomiticus* JORDAN.

in Untervermunt where *M. nivalis* was collected (together with *Pitymys subterraneus*, *Clethrionomys glareolus*, *Sorex alpinus* and *Sorex araneus*) will be approximately at the lower limit of the altitudinal distribution of this vole (the same holds true for some of the alpine plants in the same habitat).

*Ctenophthalmus orphilus dolomiticus* JORDAN, 1928.

K: Sturm-Alpe, *Microtus nivalis*: 1 ♂.

The ecology of *C. orphilus* is similar to that of *C. nivalis*. The distribution of the two subspecies of *C. orphilus* is shown in Fig. 15. As can be seen from this map, the boundary between the two subspecies should be reasonably

easy to define in the western half of Tirol. Collecting in the Stubaier Alpen, for instance, could have interesting results; unfortunately fleas of *Microtus nivalis* are not readily collected and *C. orphilus* appears to be a rather uncommon insect although less so than *C. nivalis*.

The localities for each subspecies, on which the distribution-map (Fig. 15) is based, are:

*C. orphilus orphilus* — ITALY: Alpe Tre Potenze. FRANCE: Bonnenuit. SWITZERLAND: Salanfe, Fluhalp, Männlichen, Alpiglen und Schwarzwaldalp, Steingletscher, Göschenen, Val Piora, Juf, Campfer and St. Moritz, Schafberg, Pontresina and Val Roseg. GERMANY: Allgäu. AUSTRIA: Ober Gurgl.

*C. orphilus dolomiticus* — GERMANY: Schachen, S. S. E. of Schliersee, Berchtesgaden. AUSTRIA: Igls, Pyramidenspitze, Sturm-Alpe, Fuschartörl, Moserboden, Ötscher mt. ITALY: Monte Cadini, Tre Cimi hut. YUGOSLAVIA: Triglav mt., Bohinjsko Jezero, Kamniške Alpe.

#### *Ctenophthalmus solutus solutus* JORDAN & ROTHSCHILD, 1920.

V: Gortipohl, *Apodemus flavicollis*: 3 ♂ 9 ♀. Wiesealpe, *Microtus nivalis*: 1 ♂. N: Bruck an der Leitha, *Apodemus flavicollis*: 3 ♂ 4 ♀. B: Parndorfer Platte, *Apodemus sylvaticus*: 1 ♂; *Pitymys subterraneus*: 1 ♀.

A specific parasite of *Apodemus*, not seldom straying on to other micro-mammalia. New for Burgenland and Vorarlberg.

#### *Doratopsylla dasycnema dasycnema* (ROTHSCHILD, 1897).

V: East of Alploch, *Sorex araneus*: 1 ♂; *Sorex alpinus*: 1 ♂. Gortipohl, *Sorex alpinus*: 2 ♂ 1 ♀. Untervermunt, same host: 2 ♂. K: Gösselsdorfer See, *Sorex araneus*: 3 ♂. Siebenhütten, same host: 1 ♂. ST: Packer Stausee, same host: 1 ♂. Eisenerz: *Neomys anomalus*: 2 ♂ 1 ♀; *Sorex alpinus*: 4 ♂ 2 ♀; *Sorex araneus*: 2 ♂. Furtner Teich, *Sorex araneus*: 1 ♂. Pernitz-Brücke, *Sorex alpinus*: 1 ♂. B: Deutschkreutz, *Sorex araneus*: 1 ♂ 1 ♀.

The preponderance of ♂♂ *D. dasycnema* on collected hosts is striking — this is borne out again by above material (22 ♂ 5 ♀). No fleas had so far been collected from *Neomys anomalus* in Austria. New for Vorarlberg, Kärnten and Burgenland. Although *D. d. cuspis*, a mediterranean subspecies, is known in Graubünden from as far north as Vulpera (in the Unter Engadin) and Thusis, it looks as if this form does not extend into Vorarlberg.

#### *Hystrichopsylla talpae orientalis* SMIT, 1956.

K: Gösselsdorfer See, *Microtus agrestis*: 1 ♂. Krasznig-Graben, *Apodemus flavicollis*: 1 ♀. ST: Bodental, *Sorex alpinus*: 1 ♀. Furtner Teich, *Sorex araneus*: 1 ♂ 1 ♀.

This subspecies was described after the publication of the Austrian flea catalogue (SMIT, 1955). As both subspecies of *talpae* occur in this country, a map showing their distribution in Austria and in adjacent countries is given

here (Fig. 16). For information about the distribution of *talpae* spp. in Poland I am much indebted to Prof. W. SKURATOWICZ who also kindly permitted me to use the data in the map. The distribution of both subspecies in Switzerland is given by SMIT (1966a: Fig. 1).

Neither this nor the nominate subspecies had been collected in Austria from any of the hosts mentioned above.

*Hystrichopsylla talpae talpae* (CURTIS, 1826).

V: Untervermunt, *Pitymys subterraneus*: 4 ♂. ST: Eisenerz: *Neomys fodiens*: 1 ♀; *Microtus agrestis*: 1 ♂.

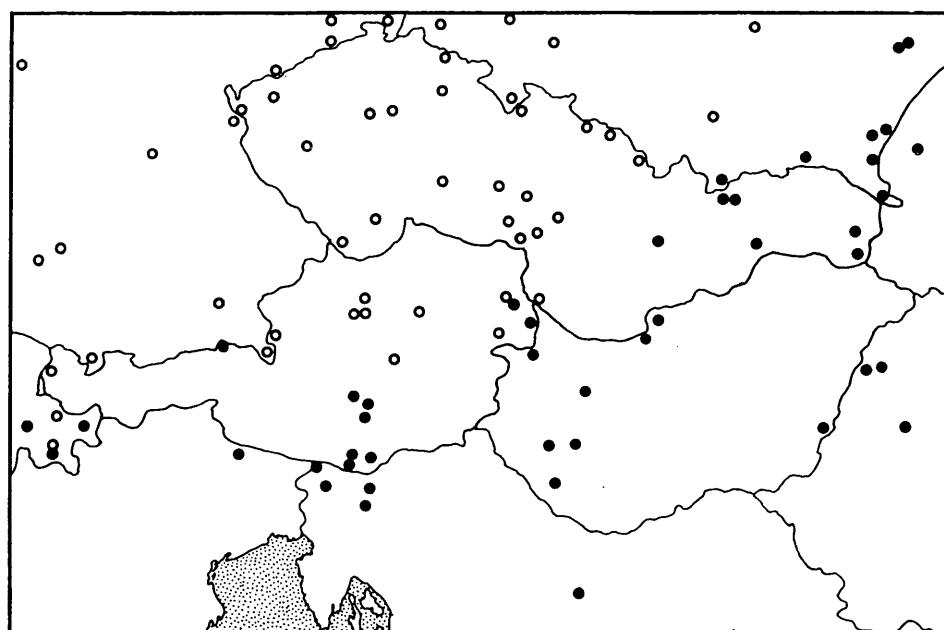


Fig. 16. Map showing the distribution in and around Austria of the two subspecies of *Hystrichopsylla talpae*: o = *H. t. talpae* (CURTIS); ● = *H. t. orientalis* SMIT.

*Ischnopsyllus simplex* ssp.

V: Untervermunt, *Microtus nivalis*: 1 ♀. N: Langenzersdorf, *Myotis mystacinus*: 3 ♀.

It is most unusual to find a bat-flea on any hosts other than bats. However, the snowvole *Microtus nivalis* may have shared the hibernation habitat (e. g. a hollow in rock or under a boulder) of the bat *Myotis mystacinus* which in the mountains occurs as high up as the treeline.

*Leptopsylla segnis* (SCHÖNHERR, 1811).

V: Gortipohl, *Apodemus flavicollis*: 1 ♂. ST: Pernitzten-Brücke, same host: 1 ♀. N: Wien (Naturh. Mus.), *Mus musculus*: 1 ♂ 2 ♀.

A flea of the house-mouse which under certain circumstances is also found on *Apodemus*; it had not yet been collected from *A. flavicollis* in Austria.

*Malaraeus arvicola* (IOFF, 1948).

V: Nüziders, *Clethrionomys glareolus*: 1 ♀. Untervermunt, *Pitymys subterraneus*: 1 ♂ 1 ♀. ST: Pernitzen-Brücke: same host: 1 ♀.

RESSL (1963: 483) was the first to record this species from Austria; he collected specimens at Purgstall, Rogatsboden, Petzelsdorf and Schauboden (all in the Scheibbs district, Niederösterreich). Ressl's series from Rogatsboden and Schauboden demonstrate anew the considerable degree of individual variation in the contour of the movable process of the clasper; the clasper of three males from Rogatsboden is shown in Fig. 17 (the ♂ from Untervermunt resembles Fig. 17 b).

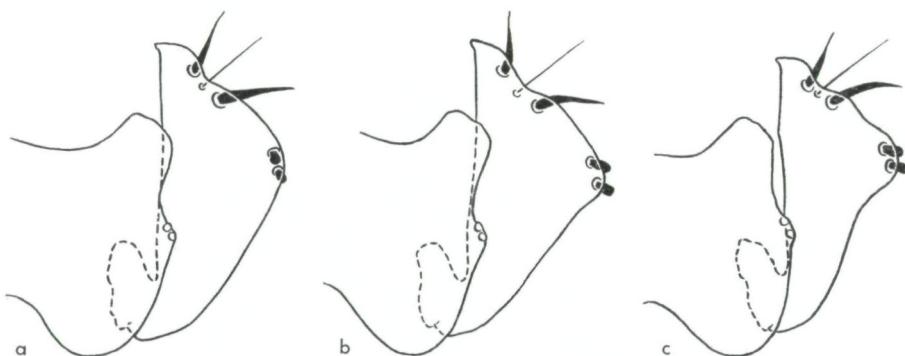


Fig. 17. Outlines of claspers of three males of *Malaraeus arvicola* (IOFF) from Rogatsboden (Niederösterreich).

*Malaraeus penicilliger kratochvili* ROSICKÝ, 1955.

V: Gortipohl, *Clethrionomys glareolus*: 1 ♂ 4 ♀. Wiesealpe; same host: 1 ♂ 1 ♀; *Microtus nivalis*: 2 ♂ 2 ♀. K: Sturm-Alpe, same host: 1 ♂ 3 ♀.

The specimens recorded in the catalogue (SMIT 1955: 5) as *M. penicilliger* belong to this subspecies; RESSL (1963: 484) adds Lunz am See.

*Megabothris turbidus* (ROTHSCHILD, 1909).

V: East of Alploch, *Clethrionomys glareolus*: 1 ♀. Altrhein, same host: 1 ♀. Nüziders, same host: 2 ♂ 1 ♀. K: Krasznig-Graben: *Apodemus flavicollis*: 1 ♀; *Clethrionomys glareolus*: 1 ♀. ST: Eisenerz: *Apodemus flavicollis*: 1 ♀; *Microtus agrestis*: 1 ♂ 1 ♀; *Pitymys subterraneus*: 1 ♂. Furtner Teich, *Clethrionomys glareolus*: 1 ♂. Gerichtsgraben, *Microtus agrestis*: 1 ♂. Mur-Au: *Apodemus flavicollis*: 1 ♀; *Clethrionomys glareolus*: 1 ♂ 2 ♀. Pernitzen-Brücke, *Apodemus flavicollis*: 4 ♀. N: Bruck an der Leitha: same host: 3 ♀; *Clethrionomys glareolus*: 1 ♂. Klosterneuburg, *Clethrionomys glareolus*: 1 ♀. Polzberg, same host: 1 ♂.

Although quite a common flea in most parts of its range, it had only been recorded from relatively few localities in this country. New for Vorarlberg and Kärnten. New Austrian hosts are *Pitymys subterraneus* and *Apodemus flavicollis*.

*Megabothris walkeri* (ROTHSCHILD, 1902).

K: Gösselsdorfer See, *Microtus agrestis*: 6 ♂ 4 ♀. B: Northern shore of Neusiedler-See, *Microtus oeconomus*: 4 ♂ 4 ♀. Neusiedl/See, same host: 1 ♂ 2 ♀.

As these new records indicate, this flea is mainly found on Microtines in relatively humid habitats. New for Burgenland; hitherto only known in Austria from Grafenstein in Kärnten from *Neomys fodiens*.

*Monopsyllus sciurorum sciurorum* (SCHRANK, 1803).

N: Königstetten, *Glis glis*: 13 ♂ 13 ♀.

*Nosopsyllus fasciatus* (BOSC, 1800).

V: Wieslealpe, *Apodemus flavicollis*: 1 ♀. K: Pressegger See, same host: 1 ♀. N: Wien, *Erinaceus europaeus*: 1 ♀. B: Parndorfer Platte, *Apodemus sylvaticus*: 1 ♂ 5 ♀. Illmitz, *Mus musculus*: 1 ♀. Between Podersdorf and Illmitz, *Apodemus sylvaticus*: 1 ♂ 2 ♀.

The common cosmopolitan rat flea was not yet known from Vorarlberg, Kärnten and Burgenland.

*Palaeopsylla kohauti* DAMPF, 1911.

K: Siebenhütten: *Talpa europaea*: 6 ♂ 8 ♀. ST: Eisenerz: *Neomys anomalus*: 1 ♀; *Talpa europaea*: 24 ♂ 23 ♀. Furtner Teich, *Talpa europaea*: 3 ♂ 3 ♀. Gerichtsgraben, same host: 1 ♀. Preibichl Pass, same host: 9 ♂ 7 ♀.

The occurrence of this highly specific parasite of *Talpa europaea* on *Neomys anomalus* is anomalous. Females from Eisenerz exhibit a most remarkable range of individual variation in the outline of the posterior margin of sternum VII (Fig. 18); the extreme forms (i, j) strongly resemble sternum VII of *Palaeopsylla similis similis* DAMPF or *P. cisalpina* J. & R.

*Palaeopsylla soricis rosickyi* SMIT, 1960.

K: Sturm-Alpe, *Sorex araneus*: 1 ♂. ST: Eisenerz: *Neomys anomalus*: 1 ♀; *Sorex alpinus*: 2 ♂ 1 ♀. Furtner Teich, *Sorex araneus*: 1 ♀. Preibichl Pass, same host, 3 ♂. B: Neusiedl/See, same host: 5 ♂ 3 ♀. Northern shore of Neusiedler See: same host: 3 ♂ 4 ♀; *Neomys fodiens*: 3 ♂ 7 ♀; *Neomys anomalus*: 9 ♂ 8 ♀; *Microtus oeconomus*: 1 ♂.

It should be noted that in the Austrian flea catalogue (SMIT, 1955: 3) only "*P. soricis soricis* (DALE), 1878" is listed. However, the specimens from Ferleiten and Admont proved to belong to *P. s. rosickyi*; from the third locality mentioned, Ober Gurgl, only female specimens are known and these cannot be determined to subspecific rank (presumably the nominate subspecies occurs

in Ober Gurgl). RESSL (1963: 479) mentions *P. s. rosickyi* from Sölling (Niederösterreich). *Neomys anomalus* is a new host for this flea in Austria. New for Kärnten and Burgenland.

*Palaeopsylla soricis soricis* (DALE, 1878).

V: East of Alploch, *Sorex alpinus*: 1 ♂ 1 ♀. Dornbirn-Oberdorf, *Sorex araneus*: 1 ♂ 2 ♀. Gortipohl: same host: 1 ♂ 1 ♀; *Sorex alpinus*: 3 ♂ 2 ♀; *Neomys fodiens*: 3 ♂ 1 ♀. Untervermunt: *Sorex araneus*: 1 ♂ 1 ♀; *Sorex alpinus*: 1 ♂. Wiesealpe, *Sorex araneus*: 2 ♂ 9 ♀. Zürs, same host: 5 ♀.

In Austria this west-European subspecies is presumably restricted to Vorarlberg and the adjacent part of Tirol.

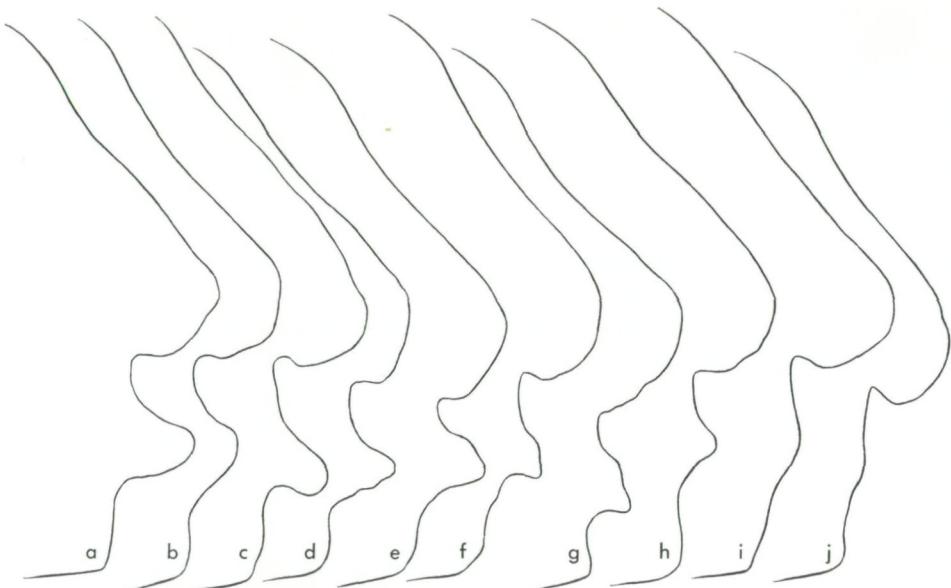


Fig. 18. Outlines of sternum VII of ten females of *Palaeopsylla kohauti* DAMPF from Eisenerz.

*Paraceras melis melis* (WALKER, 1856).

K: Mölltal, *Meles meles*: 2 ♀.

This parasite of the badger was not yet known from Kärnten.

*Peromyscopsylla bidentata* (KOLENATI, 1863).

V: Untervermunt: *Clethrionomys glareolus*: 2 ♀; *Pitymys subterraneus*: 1 ♀. ST: Packer Stausee, *Microtus agrestis*: 1 ♀.

Not a very common flea of Microtines, hitherto in Austria only recorded from Moserboden (Salzburg).

*Peromyscopsylla fallax* (ROTHSCHILD, 1909).

K: Koglereck, *Clethrionomys glareolus*: 1 ♂ 2 ♀. Krasznig-Graben, same host: 1 ♂ 3 ♀. ST: Stuhleck; same host: 1 ♂ 1 ♀; *Microtus agrestis*: 1 ♀. Eisen-erz, same host: 1 ♂. Gerichtsgraben: same host: 1 ♀; *Pitymys subterraneus*: 1 ♂.

In Austria hitherto only known from Nord-Tirol; as can be seen from the map (Fig. 19) the new records fill the gap which existed between Tirol, Slovenija and Hungary; *Pitymys subterraneus* is a new host for this flea in this country.

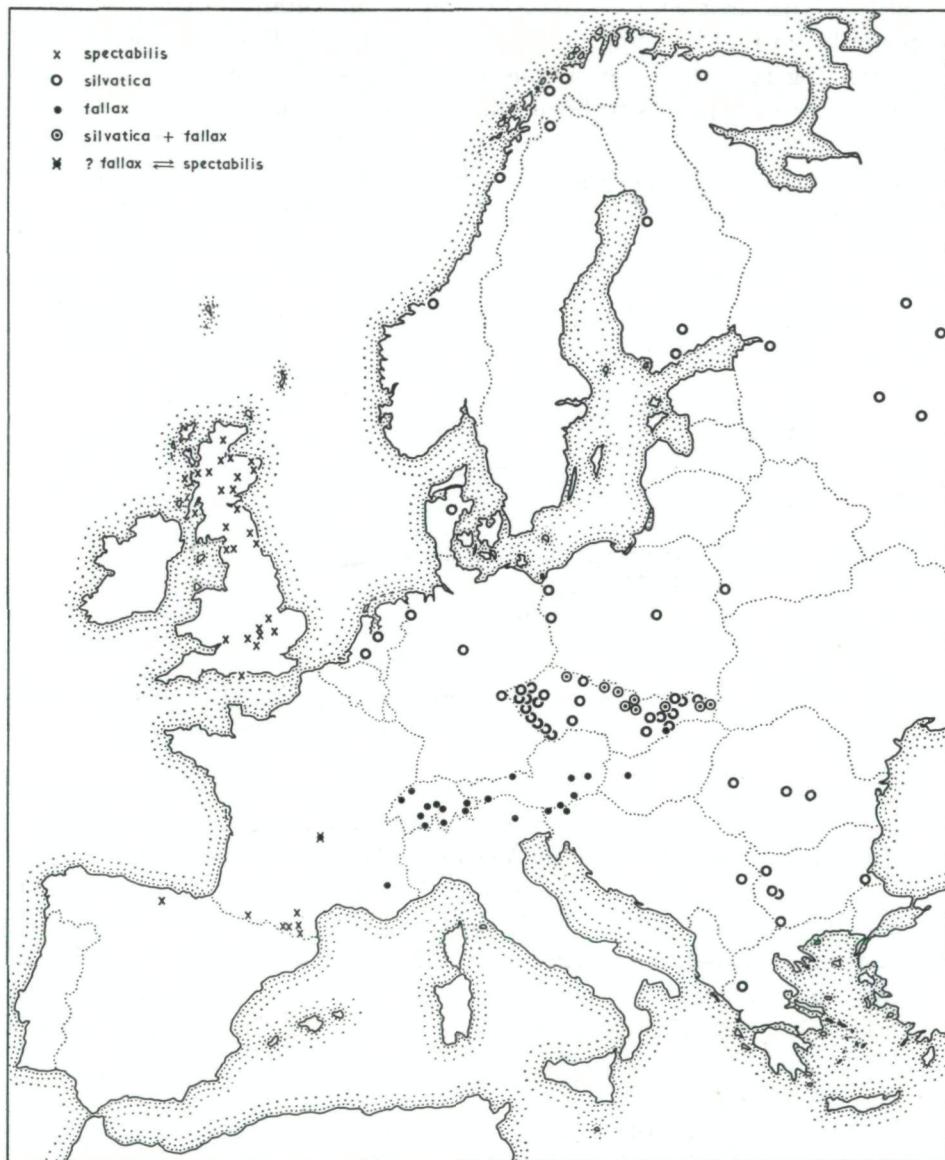
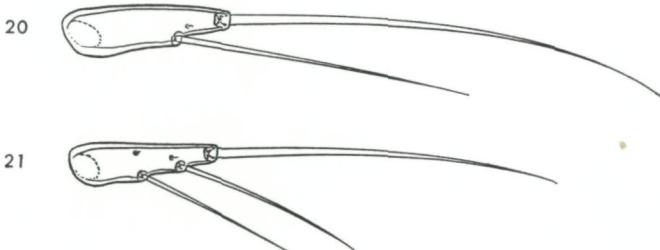


Fig. 19. Map showing the distribution in Europe of three species of *Peromyscopsylla*.

It should be noted that this taxon is no longer considered to be a subspecies of *P. silvatica*. The distribution of the three closely related forms (*fallax* (ROTHSCHILD), *silvatica* (MEINERT) and *spectabilis* (ROTHSCHILD); see Fig. 19) is strongly reminiscent of that of subspecies but there is considerable

overlap of *silvatica* and *fallax* in the mountains of Czechoslovakia. ROSICKÝ (1966: fig. 3) suggests that *fallax* spread during the post-glacial period from the Alps into Czechoslovakia; as this is a summer-autumn flea (like *silvatica*) there should indeed not have been a climatological barrier to prevent a bridging of the low-lying area between the Alps and the mountains of Czechoslovakia. Apparently no interbreeding occurs in the relatively large area where both forms live together. However, a male *Peromyscopsylla* from the Puy-de-Dôme district in France appears to be an intergrade (on structure of clasper and of sternum VIII) between *fallax* and *spectabilis*. It is unfortunate that only one male specimen has been collected in that part of France and obviously much more material should become available for study before a satisfactory conclusion can be reached regarding the status of *silvatica* (with a very extensive northern distribution, going east as far as the Tomskaya and Novosibirskaya oblasts), *fallax* (in the mountains of central Europe) and *spectabilis* (in Great Britain, northern Spain and southern France).



Figs. 20–21. Anal stylet of ♀ of: 20. *Peromyscopsylla spectabilis* (ROTHSCHILD); 21. *P. silvatica* (MEINERT).

The males of these three forms differ in the structure and chaetotaxy of the movable process of the clasper and of sternum VIII. There is no reliable difference in the contour of sterna VII and VIII of the female and the only difference appears to be in the chaetotaxy of the anal stylet (this is presumably the first instance of the use of this character to separate — if not entirely satisfactorily — closely related forms in the female sex): *spectabilis* (Fig. 20) has only one ventro-lateral seta (very rarely 2), *silvatica* (Fig. 21) normally has two such setae (occasionally 1 or 3) while two-thirds of the females of *fallax* examined has two setae, the rest only one seta.

*Pulex irritans* LINNAEUS, 1758.

B: Winden, *Vulpes vulpes*: 28 ♂ 17 ♀.

*Rhadinopsylla integella* JORDAN & ROTHSCILD, 1921.

V: Wiesealpe, *Microtus nivalis*: 1 ♂. ST: Eisenerz, *Pitymys subterraneus*: 1 ♀. Prebichl Pass, *Clethrionomys glareolus*: 1 ♂.

This species is listed in the Austrian flea catalogue (SMIT, 1955: 2) as

*R. fraterna casta* JORDAN, 1928, a synonymous name. The hosts mentioned above are new for this flea in Austria. RESSL (1963: 479) found a specimen near Purgstall.

In the same 1955 catalogue the sole record of "*R. (A.) isacantha* (ROTHSCHILD), 1907" was based on a misdetermined specimen which has meanwhile been described as *R. (Actenophthalmus) strouhalii* SMIT, 1957 (Bull. Brit. Mus. (nat. Hist.), Ent. 6: 52).

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