

Siteroptes longisomus sp. n. from Poland, with remarks on the genus and key to the species (Acari, Pygmephoroidea)

MAREK KALISZEWSKI
(With 10 figures)

Abstract

The description of *Siteroptes longisomus* sp. n. is given and its systematic position is discussed. A new diagnosis and description of the genus *Siteroptes* Amerling, 1861 is given. Genealogical relationships among *Siteroptes* species are shown on a cladogram and a key to the species is presented.

Introduction

In the last systematic revision of the Tarsonemina (Mahunka 1970) nonphoretic females of the genera *Pediculaster* Vitzthum, 1931 and *Pygmephorellus* Cross et Moser, 1971 (family Pygmephoridae Cross, 1965) were put in the genus *Siteroptes* Amerling, 1861 (family Siteroptidae Mahunka, 1970). Based on rearing experiments, Moser and Cross (1975) gave evidences that some species have two types of females - a phoretic (*Pediculaster* or *Pygmephorellus* form) and a nonphoretic (*Siteroptes* form). As a consequence of this discovery, the genera *Pediculaster*, *Pygmephorellus* and *Siteroptes* were synonymized under the name *Siteroptes* by Smiley and Moser (1976). Mahunka (1979) tried to reestablish the genera *Pediculaster* and *Pygmephorellus* by distinguishing nonphoretic females and males of these genera from other species of *Siteroptes* sensu Mahunka (1970). However, the combination of features which he used to characterize nonphoretic females and males of the genera *Pediculaster*, *Pygmephorellus* and *Siteroptes* seem to be confusing (based on his key it is impossible to designate more than 60 % of the known species of nonphoretic *Siteroptes* type females to genus level).

To avoid further confusion I give a new diagnosis and description of the *Siteroptes* species group connected with grasses (*Siteroptes* sensu Krczal (1959): *Siteroptes cerealium* group sensu Suski (1973) plus *Siteroptes reniformis* Krantz, 1957) and call them genus *Siteroptes* Amerling, 1861. Other taxa of the Siteroptidae Mahunka, 1970 and Pygmephoridae Cross, 1965 sensu Mahunka (1970) are characterized elsewhere, base on cladistic analyses by Kaliszewski (in prep.).

Siteroptes mites, partly due to their association with meadow grasses, cereal crops and cotton plants, have been

studied in many countries of the world (Hardy 1851; Amerling 1861; Kirchner 1864; Reuter 1900, 1909; Müller 1905; Walcott 1908; Cooper 1940; Rack 1972; Laemmlen and Hall 1973; Suski 1973, 1984; Beng, Su and Chen 1978; Su, Beng and Chen 1979, 1981; Lindquist 1985; and others).

Members of the *Siteroptes reniformis* group (*S. reniformis* and *S. longisomus*) seem to be vectors of *Nigrospora* fungi and thus are implicated in diseases such as lint rot of cotton, stalk rot of corn and *Sorghum*, and spike rot of wheat and other grains (Alfaro 1946; Laemmlen and Hall 1973; Lindquist 1985).

Species of the *Siteroptes cerealium* group (Suski 1973) frequently carry spores of *Fusarium* and *Botrytis* fungi and in this way are connected with silver top disease of grasses.

In the case of some species from the *Siteroptes cerealium* group (*S. cerealium* (Kirchner, 1864) and *S. avenae* (Müller, 1905)) it is difficult to say for sure whether they are separate species or not (see Rack 1972; Suski 1973, 1984). At present, Suski's studies (1973, 1984) seem to indicate that *S. avenae* and *S. cerealium* are different species based on differences in morphology of females and males of both species as well as results of his rearing experiments. On the other hand, Rack (1972) reported finding a gravid female of *S. avenae* with larvae inside which (Kaliszewski, unpublished data) found to be identical in all details to the larvae of *S. cerealium*. Based on this finding and her interpretation of phenological data one can not exclude the possibility that *S. cerealium* and *S. avenae* are morphs of the same species. In this paper *S. cerealium* and *S. avenae* are treated as separate species according to Suski (1984) and Su, Beng and Chen (1979), however this problem needs further study. Species of Su, Beng and Chen (1979) are included in this paper based only on the literature since types were not available for study.

Nomenclature is based on Lindquist (1986) and Kaliszewski and Rack (1985).

All measurements are in microns.

Genus *Siteroptes* Amerling, 1861

Type species: *Therismoptes cerealium* Kirchner, 1864

List of known species:

1. *S. avenae* (Müller, 1905)
2. *S. cerealium* (Kirchner, 1864)
3. *S. graminisugus* (Hardy, 1851)
4. *S. huangshuiensis* Su, 1979
5. *S. longisomus* sp. n.
6. *S. qinghaiensis* Su, 1979
7. *S. reniformis* Krantz, 1957
8. *S. triticola* Su, 1979

Diagnosis: Species of this genus are distinguishable from all other Pygmephoroida by the combination of the following apomorphic features:

Females:

1. Peritremae trough-like, more than three times longer than wide.
2. Setae *e* on tergite *EF* absent.
3. Tarsus I with 12 setae.
4. Setae *lc* on coxae I bifurcate.
5. Genu II with two setae.
6. Coxae IV with one pair of setae, *4c* (setae *4a* absent).

Males:

1. Setae *e* on tergite *EF* absent.
2. Tarsus I with 12 setae.
3. Genu II with two setae.
4. Coxae IV with one pair of setae, *4c* (setae *4a* absent).
5. Trochanter IV without setae.

Larvae:

1. Setae *e* on tergite *EF* absent.
2. Tarsus I with 10 setae.
3. Eupathidia *tc'* and *tc* reduced, spinelike.
4. Genu II with two setae.

Description: Female: Gnathosoma rectangular in outline, slightly longer than wide, with three pairs of setae (*Gd*₁, *Gd*₂ and *Gv*₂). Palpi directed anteriorly, with supracoxal setae (*pp*), two pairs of setae on femurogenu (*Fed* and *Ged*), one pair modified eupathidial setae, one pair of solenidia and a single terminal tibial claw.

Idiosoma. Dorsum: Stigmae slit-like. Peritremae long, strongly sclerotized, oriented posteromedially to gnathosoma. On propodosomal shield setae *v*₁, *v*₂, *sc*₂ and club-like sensilli (*sc*₁) are present. On hysterosoma setae *c*₁, *c*₂, *d*, *f*, *h*₁ and *h*₂ are present. Setae *e* are absent. Cupuli *ia*, *im* and *ih* present on tergites *D*, *EF* and *H* respectively.

Venter: Pharynx forming three pharyngeal pumps in idiosoma. Apodemes V not developed. Lateral opisthosomal plates (*La*) separate from posterior sternal plate (*StPo*) or fused with it. Coxae I with three pairs of setae. Setae *lc* bifurcate. Coxae II with two pairs of setae. Coxae III with three pairs of setae. Coxae IV with one pair of setae (*4c*). Posterior sternal plate with setae *4b* or without setae. Usually three pairs of setae present on tergite *Ps*, only two pairs in *S. qinghaiensis*.

Legs: Leg I with one claw, without empodium. Legs II-IV with paired claws and membranous empodia. Leg setal formulae: leg I, 3 - 1 - 4 - 4 or 3 - 6 (2φ) - 12 (2ω); leg II, 2 - 1 - 3 - 2 - 4 (1φ) - 7 (1ω) or 6 (1ω); leg III, 3 - 1 - 2 - 2 - 4 (1φ) or 4 - 7 or 6; leg IV, 1 - 1 - 2 - 1 - 4 - 6.

Male: Gnathosoma nonfunctional, reduced, with one pair of modified eupathidial setae, one pair of solenidia and three pairs of "normal" setae.

Idiosoma. Dorsum: Propodosomal shield with four pairs of setae (*v*₁, *v*₂, *sc*₁ and *sc*₂). Distance between setae *v*₂ shorter than distance between setae *sc*₁, except in *S. reniformis*. Setae *v*₂ placed anteriorly to setae *sc*₁. Shield *CD* with three pairs of setae (*c*₁, *c*₂ and *d*). Setae *d* reduced to small tuberculi,

except in *S. reniformis*. Tergite *EF* with one pair of setae (*f*). Tergite *H* with two pairs of setae. Setae *h*, baculiform.

Venter: Apodemes relatively weak. Coxae I with three pairs. of setae, coxae II with two pairs, coxae III with three pairs and coxae IV with one pair. Posterior sternal plate (*StPo*) with one pair of setae or none. Tergite *Ps* with two pairs of setae.

Legs: Leg I with one claw, without empodium. Legs II and III with paired claws and membranous empodia. Claws and empodium on leg IV modified. Leg setal formulae: leg I, 3 - 1 - 4 - 4 or 3 - 6 (2 ϕ) - 12 (2 ω); leg II, 2 - 1 - 3 - 2 - 4 (1 ϕ) - 7 (1 ω); leg III, 3 - 1 - 2 - 2 - 4 (1 ϕ) - 7; leg IV, 1 - 0 - 2 or 1 - 1 - 4 (1 ϕ) or 3 (1 ϕ) - 6. Leg II and III with tarsal seta *pl*" spine-like, with exception of *S. reniformis*. Tarsus IV with whip-like seta *tc*".

Larva: Gnathosoma rectangular in outline, slightly longer than wide, with two pairs of setae (*Gd*₁ and *Gd*₂) on dorsum and one pair of setae (*Gv*₂) on venter. Cheliceral stylets shorter than half palpal width. Palpi directed anteriorly, with two pairs of setae on femurogenu (*Fed* and *Ged*), one pair of modified eupathidial setae, one pair of solenidia and a single terminal tibial claw.

Idiosoma. Dorsum: Propodosomal shield with four pairs of setae (*v*₁, *v*₂, *sc*₁ and *sc*₂). Tergite *C* consists of three plates: on lateral ones are placed setae *c*₂, on medial one setae *c*₁. Tergite *D* with one pair of setae. Tergite *EF* with one pair of setae (*f*). Tergite *H* with two pairs of setae (*h*₁, *h*₂). Cupuli indistinct.

Venter: Coxae I, II and III each with two pairs of setae. Tergite *Ps* with three pairs of needle-like setae. Leg setal formulae: leg I, 2 - 1 - 4 - 4 - 6 (1 ϕ) - 10 (1 ω); leg II, 2 - 1 - 3 - 2 - 4 (1 ϕ) - 7 (1 ω); leg III, 2 - 1 - 2 - 2 - 4 (1 ϕ) - 7. Tarsus I with four eupathidia (*tc*'₁, *tc*"₁, *p*' and *p*"₁), six "normal" setae and one solenidion. Eupathidia *tc*'₁, *tc*"₁ reduced, very short, spine-like.

Material examined: *S. avenae* females and males from Suski's collection (Institute of Pomology, Skierniewice, Poland), females, males and larvae from the collection of Zoologisches Institut und Zoologisches Museum der Universität Hamburg (ZMH), West Germany; *S. cerealium* females, males and larvae from the collections of Suski and ZMH; *S. graminisugus* females and males from Suski's collection; *S. longisomus* females from ZMH collection; *S. reniformis* females and males from the collection of Oregon State University, Corvallis, Oregon, USA, (type series) and from the collection of ZMH.

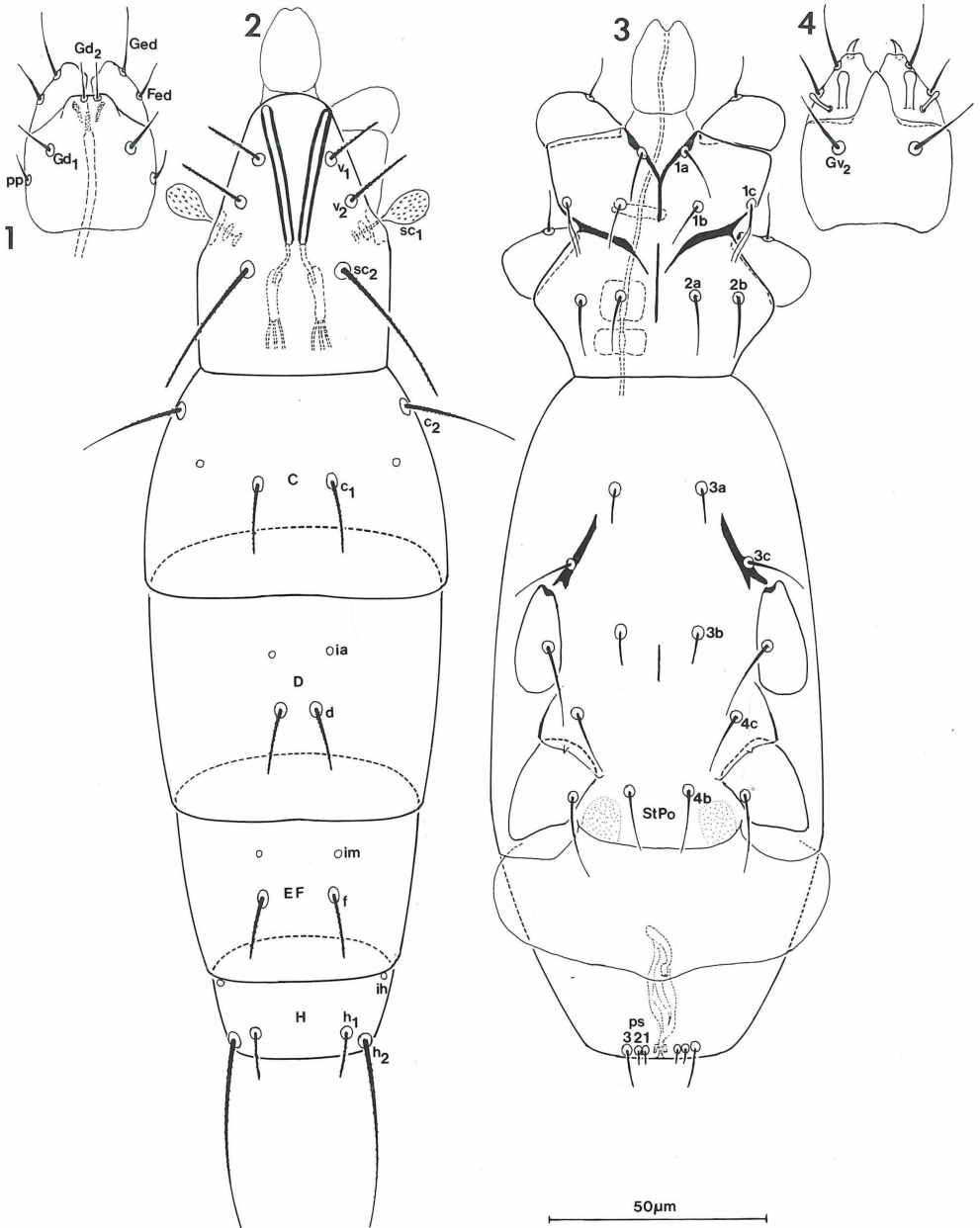
Siteroptes longisomus sp. n.

Female

(Figs 1-8)

Holotype: length 242, width 52.

Gnathosoma (figs 1, 4) 22 long, 17 wide, rectangular in outline, with two pairs of setae (*Gd*₁, *Gd*₂) dorsally, and one



Figs 1-4: *Siteroptes longisomus* sp. n., adult female. Gnathosoma: dorsal aspect (1), ventral aspect (4). Idiosoma: dorsal aspect (2), ventral aspect (3).

pair (Gv_2) ventrally. Setae Gv_2 longer than Gd_1 and Gd_2 , equal to nearly half gnathosomal width. Cheliceral stylets small, with bases directed anteriorly. Palpi short, approximate, directed anteriorly, with supracoxal setae (pp), two pairs of setae (Fed and Ged) on femurogenu, one pair of modified eupathidial setae, one pair of solenidia and small tibial claws. Setae Ged almost two times longer than setae Fed .

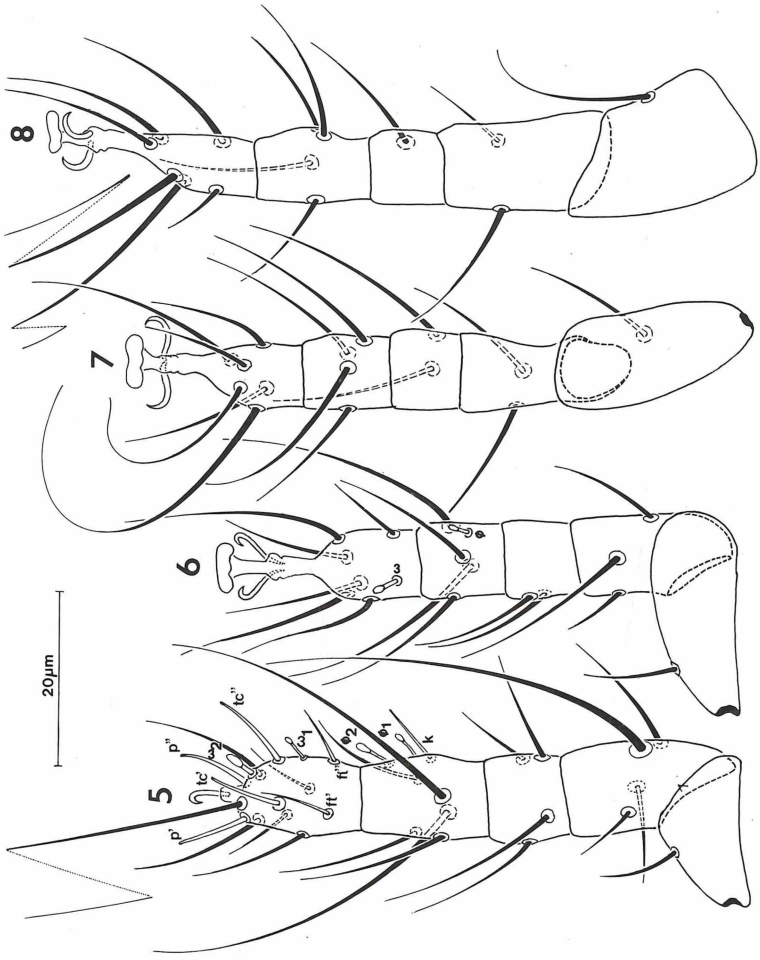
Idiosoma without distinct cuticular granulation.

Dorsum (fig. 2): Stigmae slit-like. Peritremae very long (33), 3 wide, sides parallel. Distance between anterior ends and posterior ends of peritremae are 15 and 3 respectively. Cupules ia , im and ih are present. Lengths of setae: v_1 14, v_2 17, sc_1 20, sc_2 37, c_1 17, c_2 27, d 15, f 15, h_1 11, h_2 44. Distances between setae: v_1-v_2 16, v_2-v_2 25, sc_2-sc_2 21, v_1-v_2 10, v_2-sc_2 15, c_1-c_1 17, c_2-c_2 52, $d-d$ 8, $f-f$ 17, h_1-h_1 21, h_1-h_2 5. Sensilli club-like, with small indistinct spines, located anteriorly in relation to setae sc_2 . Setae e absent. Setae v_1 , v_2 , sc_2 , c_1 , d , f and h_1 coarse with relatively stiff endings. Setae c_2 and h_2 coarse, flagellate.

Venter (fig. 3): Apodemes very weak. Anteromedian apodeme interrupted in its anterior part, not joining with posteriorly deflected apodemes II. Sejugal apodeme almost invisible. Posteromedian apodeme short, level with posterior parts of trochanters III. Apodemes IV and V absent. Lateral opisthosomal plates (La) rounded posteriorly and separated from posterior sternal plate ($StPo$). Lengths of setae: $1a$ 12, $1b$ 11, $1c$ 15, $2a$ 14, $2b$ 14, $3a$ 8, $3b$ 8, $3c$ 15, $4b$ 15, $4c$ 15, ps_1 3, ps_2 3, ps_3 10. Distances between setae: $3a-3a$ 20, $3c-3c$ 42, $3a-3b$ 32, $3b-3c$ 20, ps_3-ps_3 16. Setae $1c$ bifurcate. Setae $2c$ and $4a$ absent. Setae $3a$ and $3b$ blunt, hair-like, shorter than other propodosomal and metapodosomal setae which are flagellate, with fine tips. Setae ps_3 sharply ended. Setae ps_1 and ps_2 bluntly ended. Distance between ps_1-ps_2 equal to distance between ps_2-ps_3 .

Legs (figs 5-8): relatively robust. Leg I equal to leg IV and slightly longer than leg II and III. Leg I with one claw, without empodium. Legs II-IV with paired claws and large membranous empodia on short stalks. Formula of setae on leg I: 3 - 1 - 4 - 4 - 6 (2 ϕ) - 12 (2 ω). Tarsus with two apical eupathidia (p' , p''), two (tc' , tc'') in its distal third and one pair (ft' , ft'') in its proximal fourth. Solenidion ω_1 4 long, not striate, placed on the segment termination. Solenidion ω_2 3 long, without transverse striation, placed in the middle part of the tarsus. Solenidion ϕ_1 of tibia 5 long, not striate, placed slightly distally in relation to distal third of segment. Solenidion ϕ_2 4 long, not striate, and rod-like eupathidium k 8 long, both arising in middle part of segment. Formula of setae on leg II: 2 - 1 - 3 - 2 - 4 (1 ϕ) - 7 (1 ω). Solenidion ω 3 long, not striate, basally inserted. Solenidion ϕ 2.5 long, not striate, arising slightly basad of middle. Formula of setae of leg III: 3 - 1 - 2 - 2 - 4 - 6. Solenidion ϕ and one tarsal seta absent. Formula of setae on leg IV: 1 - 1 - 2 - 1 - 4 - 6. Solenidion ϕ absent.

Males and larvae unknown.



Figs 5-8: *Siteroptes longisomus* sp. n., adult female. Leg I (5), leg II (6), leg III (7), leg IV (8).

Type Material: Holotype, (slide no. PL-288/9-554) and one paratype were found in sample of *Carex* sp., grass and moss from swamp in "Nature Reserve Perkuny" near Gizycko, Poland, on September 15, 1971 by J. Rafalski.

Types in the collection of Zoologisches Institut und Zoologisches Museum der Universität Hamburg, West Germany.

Diagnosis: *S. longisomus* sp. n. is most similar to *S. reniformis* Krantz, 1957 and differs from it by the following characters:

*S. longisomus**S. reniformis*

- | | |
|---|---|
| 1. Distance between setae <i>d</i> equal to half length of setae <i>d</i> . | 1. Distance between setae <i>d</i> equal to length of setae <i>d</i> . |
| 2. Distance between setae <i>ps</i> ₂ - <i>ps</i> ₃ equal to that between setae <i>ps</i> ₁ - <i>ps</i> ₂ . | 2. Distance between setae <i>ps</i> ₂ - <i>ps</i> ₃ distinctly longer than that between setae <i>ps</i> ₁ - <i>ps</i> ₂ . |
| 3. Tarsi II and III with six setae. | 3. Tarsi II and III with seven setae. |
| 4. Tibia III without solenidion ϕ . | 4. Tibia III with solenidion ϕ . |

Key to the species of the genus *Siteroptes* Amerling

Females

1. Sporothecae present at the level of trochanters IV; distance between seta *d* and posterior edge of tergite *D* more than twice the distance between setae *d* (figs 2, 3) 2
- Sporothecae absent at the level of trochanters IV; distance between seta *d* greater than half distance between setae *d* and posterior edge of tergite *D* (figs 15, 16, Suski 1973) 3
2. Distance between setae *ps*₂-*ps*₃ more than three times distance between setae *ps*₁-*ps*₂ (fig. 8, Krantz 1957); tarsi II and III with seven setae *S. reniformis* Krantz
- Distance between setae *ps*₂-*ps*₃ similar to distance between setae *ps*₁-*ps*₂ (fig. 3); tarsi II and III with six setae (figs 6, 7). *S. longisomus* sp. n.
3. Setae *4b* absent from posterior sternal plate (*StPo*); sporothecae absent (fig. 2, Suski 1973) 4
- Setae *4b* present on posterior sternal plate; sporothecae present between propodosomal and metapodosomal plates (fig. 16, Suski 1973) 5
4. Solenidion ϕ ₁ on tibia I on the same level as solenidion ϕ ₂; peritremes slightly enlarged anteriorly (figs 1, 3, Suski 1973). *S. cerealium* (Kirchner)
- Solenidion ϕ ₁ inserted somewhat distally to solenidion ϕ ₂; peritremes not enlarged anteriorly (figs 17, 19, Su et al. 1979). *S. huangshuiensis* Su
5. Genu I with three setae; setae *h*₁ shorter than setae *c*₁ but distinctly greater than half length of setae *c*₁ (fig. 25, Suski 1973). *S. graminisugus* (Hardy)

- Genu I with four setae; setae h_1 less than half as long as setae c_1 (fig. 15, Suski 1973; figs 10, 17, Su et al. 1979) 6
- 6. Setae h_1 slightly longer than setae c_1 ; two pairs of setae ps present; sporothecae longer than 30 μm (figs 1, 2, Su et al. 1979).
 *S. qinghaiensis* Su
- Setae h_1 less than half as long as setae c_1 , three pairs of setae ps present; sporothecae shorter than 30 μm (figs 15, 16, Suski 1973)
 7
- 7. Setae 2a flagellate, longer than setae 2b but similar in structure; setae f two times longer than setae d and c_1 (figs 10, 12, Su et al. 1979).
 *S. triticolae* Su
- Setae 2a needle-like, shorter and different in structure from flagellate setae 2b; setae f similar in length to setae d and c_1 (figs 15, 16, Suski 1973) *S. avenae* (Müller)

Males

- 1. Setae d setiform; tarsi II and III without spines; femur IV with one seta; tibia IV with four setae *S. reniformis* Krantz
- Setae d tubercular, not setiform; tarsi II and III with spines, femur IV with two setae; tibia IV with three setae (figs 6,9,10, Suski 1973)
 2
- 2. Setae 4b absent from posterior sternal plate (fig. 7, Suski 1973)
 3
- Setae 4b present (fig. 21, Suski 1973) 4
- 3. "Dorsal apodeme" present in middle of tergite CD (fig. 20, Su et al. 1979); solenidion ϕ on tibia IV 10-12 μm long.
 *S. huangshiensis* Su, Beng and Chen
- "Dorsal apodeme" absent from middle of tergite CD (fig. 6, Suski 1973); solenidion ϕ on tibia IV 4-7 μm long . *S. cerealium* (Kirchner)
- 4. Genu I with three setae; tibia IV with seta $v''\text{Ti}$ longer than solenidion ϕ (fig. 29, Suski 1973) *S. graminisugus* (Hardy)
- Genu I with four setae; tibia IV with seta $v''\text{Ti}$ shorter than solenidion ϕ (fig. 10, Suski 1973) 5
- 5. Seta u' on tarsus IV spine-like (fig. 9, Su et al. 1979).
 *S. qinghaiensis* Su
- Seta u' on tarsus IV setiform (fig. 16, Suski 1973) 6
- 6. Setae v_1 , v_2 and c_1 more than twice as long as seta f ; "dorsal apodemes" absent from both propodosomal shield and tergite CD; tibia IV with seta $v''\text{Ti}$ less than twice as long as solenidion ϕ (figs 20, 23, Suski 1973) *S. avenae* (Müller)
- Setae v_1 , v_2 and c_1 shorter than half of seta f ; "dorsal apodemes" present on both propodosomal shield and tergite CD; tibia IV with seta $v''\text{Ti}$ more than twice as long as solenidion ϕ (figs 13, 16, Su et al. 1979).
 *S. triticolae* Su

Cladistic analysis

Character polarities which are proposed here are discussed in Kaliszewski (in prep.).

Female

(Fig. 9)

Plesiomorphic characters

1. Peritremes less than 1/3 length of propodosomal shield.
2. Twice the distance between setae *d* greater than distance between seta *d* and posterior margin of tergite *D*.
3. Seta *d* longer than seta *c*₁.
4. Seta *f* longer than setae *c*₁ and *d*.
5. Setae *h*₁ slightly longer than setae *c*₁.
6. Setae 2*a* flagellate, similar to setae 2*b*.
7. Setae 4*b* flagellate, similar to setae 2*b*.
8. Setae 4*b* present.
9. Distance between setae *ps*₂-*ps*₃ distinctly greater than distance between setae *ps*₁-*ps*₂.
10. Three pairs of setae *ps*.
11. Sporothecae absent between propodosomal and metapodosomal plates.
12. Sporothecae absent on the level of trochanters IV.
13. Sporothecae relatively short (shorter than 30 μm).
14. Genu I with four setae.
15. Tarsi II and III with 7 setae.
16. Solenidion φ present on tibia III.

Apomorphic characters

1. Peritremes distinctly greater than 1/3 length of propodosomal shield.
2. Twice the distance between setae *d* less than distance between seta *d* and posterior margin of tergite *D*.
3. Seta *d* equal to seta *c*₁.
4. Seta *f* equal to setae *c*₁ and *d*.
5. Setae *h*₁ more than twice as long as setae *c*₁.
6. Setae 2*a* hair-like, relatively stout, less than half as long as flagellate seta 2*b*.
7. Setae 4*b* hair-like, relatively stiff, less than half as long as flagellate setae 2*b*.
8. Setae 4*b* absent.
9. Distance between setae *ps*₂-*ps*₃ similar to distance between setae *ps*₁-*ps*₂.
10. Two pairs of setae *ps*.
11. Sporothecae present between propodosomal and metapodosomal plates.
12. Sporothecae present on the level of trochanters IV.
13. Sporothecae relatively long (longer than 30 μm).
14. Genu I with three setae.
15. Tarsi II and III with 6 setae.
16. Solenidion φ absent from tibia III.

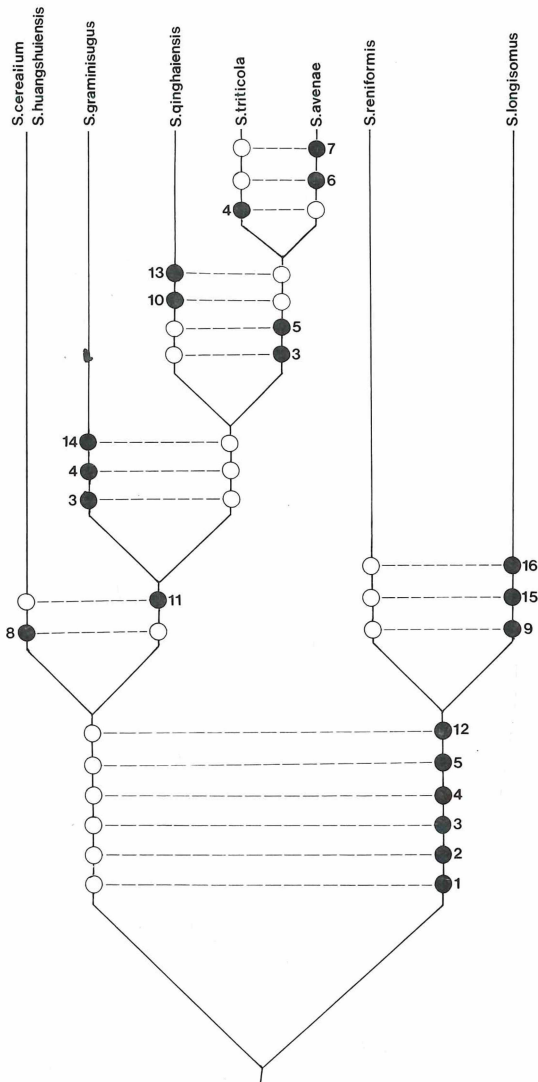


Fig. 9: Cladogram for females of the genus *Siteroptes* Amerling (plesiomorphic characters are marked as empty circles; apomorphic characters are marked as closed circles).

Male

(Fig. 10)

- | | |
|--|--|
| 1. "Dorsal apodeme" present on propodosomal shield. | 1. "Dorsal apodeme" absent from propodosomal shield. |
| 2. "Dorsal apodeme" present on tergite CD. | 2. "Dorsal apodeme" absent from tergite CD. |
| 3. Setae v_1 greater than one third length of setae f . | 3. Setae v_1 less than one third length of setae f . |
| 4. Setae v_2 greater than one third length of setae f . | 4. Setae v_2 less than one third length of setae f . |
| 5. Setae c_1 greater than half length of setae f . | 5. Setae c_1 less than half length of setae f . |
| 6. Setae d setiform. | 6. Setae d tubercular, not setiform. |
| 7. Setae $4b$ present. | 7. Setae $4b$ absent. |
| 8. Tibia I with solenidion ϕ_2 more than twice as long as solenidion ϕ_1 . | 8. Tibia I with solenidion ϕ_2 less than twice as long as solenidion ϕ_1 . |
| 9. Genu I with four setae. | 9. Genu I with three setae. |
| 10. Tarsus II with setae pl'' and tc' setiform. | 10. Tarsus II with setae pl'' and tc' spine-like. |
| 11. Tarsus III with setae pl'' and tc' setiform. | 11. Tarsus III with setae pl'' and tc' spine-like. |
| 12. Femur IV with two setae. | 12. Femur IV with one seta. |
| 13. Tibia IV with four setae. | 13. Tibia IV with three setae. |
| 14. Tibia IV with seta $v''Ti$ longer than solenidion ϕ . | 14. Tibia IV with seta $v''Ti$ shorter than solenidion ϕ . |
| 15. Tarsus IV with setae u' setiform (tarsus with one spine). | 15. Tarsus IV with seta u' spine-like (tarsus with two spines). |

Discussion

The *Siteroptes reniformis* group (*S. longisomus*, *S. reniformis*) and the *Siteroptes cerealium* group (*S. avenae*, *S. cerealium*, *S. graminisugus*, *S. huangshaiensis*, *S. qinghaiensis*, *S. triticola*) seem to have independently evolved mutualistic associations with two different kinds of fungi, *Nigrospora* and *Fusarium*, respectively (Lindquist 1985). It is interesting that species from both groups have developed analogous structures to carry the spores of fungi. In the case of the *Siteroptes reniformis* group, the sporothecae are located at the level of trochanters IV, and are covered by posterior sternal plate (*StPo*). In the *Siteroptes cerealium* group, the sporothecae, when present, are located anterior to trochanters III, between the propodosomal and metapodosomal plates (Lindquist 1985). The division of the genus *Siteroptes* into the *reniformis*

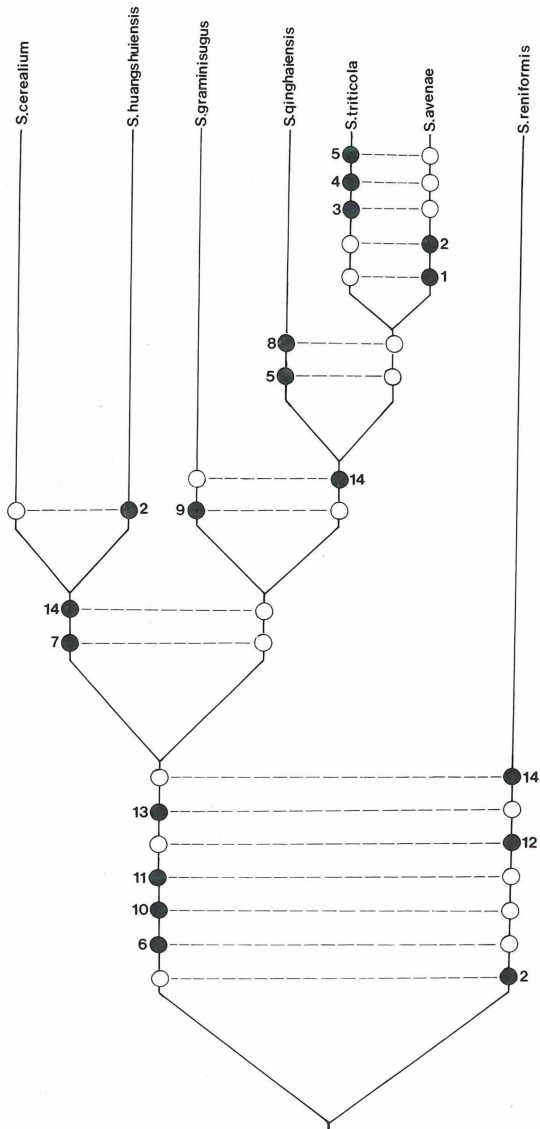


Fig. 10: Cladogram for males of the genus *Siteroptes* Amerling (plesiomorphic characters are marked as empty circles; apomorphic are marked as closed circles).

and *cerealium* groups is also supported by many other independently developed apomorphic characters (see figs 9 and 10).

Genealogical relationships among species in the *S. cerealium* group are difficult to assess. *S. cerealium* and *S. huangshaiensis* may be a first step in the adaptation to mutualistic association with *Fusarium* fungi, although these species have not developed sporothecae. They may be separated from other members of the *S. cerealium* group in that both species lack setae 4b in both females and males. These setae are present in all of the other species of the group. I could not find any exclusive synapomorphic characters for *S. avenae* and *S. cerealium*. My cladistic analysis supports Suski's opinion (1984) that *S. avenae* and *S. cerealium* are separate species.

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Author's address:

Dr. Marek Kaliszewski, Department of Biology, The University of Alabama P.O. Box. 1927, Tuscaloosa, Al 35486, USA. - Department of Animal Morphology, A. Mickiewicz University, Szamarzewskiego 91a, 60-569 Poznań, Poland.

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