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Third report on Symphypleona from Russia, and also from Georgia, Kazakhstan, Kirghizia, and the Ukraine (Insecta, Collembola)

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Abstract

Collembola Symphypleona from Eastern Europe and the Eastern Palaearctic as far as 179°E are described. 57 taxa are stated, of which 11 are new to science (including 3 new *Heterosminthurus* species and 5 new *Sminthurus* species). This set of samples also contains taxa common to both the Western and Eastern Palaearctic. Most of the new taxa belong to the Eastern Palaearctic, corresponding to the number of samples from that region. A zoogeographical survey summarises the findings.

Zusammenfassung

Dritter Bericht über Symphypleona aus Rußland, und auch aus Georgien, Kasachstan, Kirgisien und der Ukraine (Insecta, Collembola)

Collembola Symphypleona von Ost-Europa und der Ost-Paläarktis bis 179°E werden beschrieben. Von den 57 festgestellten Taxa sind 11 für die Wissenschaft neu (mit 3 neuen *Heterosminthurus*- und 5 neuen *Sminthurus*-Arten). Auch diese Proben enthalten Taxa, die sowohl in der West- wie in der Ost-Paläarktis vorkommen. Die meisten der neuen Taxa stammen aus der Ost-Paläarktis, entsprechend der Anzahl der Proben aus dieser Region. Eine zoogeographische Übersicht faßt die Befunde zusammen.

Introduction

Numerous samples of Collembola have been collected in recent years on several expeditions to northern and northeastern Russia, i. e. to the northern parts of the Eastern Palaearctic. I am glad that I had the opportunity to study the Symphypleona of these samples and of some others of smaller collections also from Eastern Europe and of the southern parts of the Eastern Palaearctic. Thus, I was able to study a total of 103 samples; they contain 57 taxa of which 11 are new to science. These samples, therefore, increase our knowledge of the distribution of the taxa already described. Because there are still only a few landscapes of this large eastern area the Collembola of which we know in more detail, the samples also show that the species diversity of these eastern landscapes is not yet completely known.

The collections studied are:

1. Coll. A. Babenko, Moscow, Russia, 1994 (collected during the Russian-Swedish Polar Expedition »Tundra Ecology-94«) (coll. Bretfeld no. Ba II T1 - T9);
2. Coll. A. Babenko, Moscow, Russia, 1996 (Ba III T1 - T20);
3. Coll. A. Babenko, Moscow, Russia, 1997 and 1998 (including 1 sample leg. O. Makarova) (Ba IV T1 - T9);
4. Coll. M. Potapov, Moscow, Russia, 1991 - 1994 (including 1 sample leg. O. Makarova) (Ba I T1 - T15);
5. Coll. A. Prinzing, Kiel, Germany, 1990 (2 *Sminthurus* samples not identified in BRETFELD (1996));
6. Coll. S. K. Stebaeva, Novosibirsk, Russia, 1960 - 1994 (7 *Sminthurus* samples not identified in BRETFELD (1996) marked ST I, and new samples marked ST II P1 - P16, T1 - T10);
7. Coll. Tarashchuk, Kiev, the Ukraine, 1978 - 1996 (including samples leg. I. Bondarenko and H. Starostenko) (Ta I 1 - 10).

In order to verify some identifications, I was able to study the following species of the following Museums collections:

1. *Sminthurides cruciatus* Axelson, 1905, *Sphyrotheca minnesotensis* (Guthrie, 1903), and *Sphyrotheca multifasciata* (Reuter, 1881) (all original material) from the Zoological Museum of the University, Helsinki, Finland;
2. *Sminthurides cruciatus* Axelson, 1905 out of the coll. Stach, Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków, Poland;
3. *Sminthurides inaequalis* Börner, 1903 out of the coll. Dallai, Department of Evolutionary Biology of the University, Siena, Italy;
4. *Sminthurides sexoculatus* Betsch & Massoud, 1970 (original material) from the Muséum Nationale d'Histoire Naturelle, Brunoy, France;
5. *Sminthurus variegatus* Tullberg, 1876 from the Swedish Museum of Natural History, Stockholm, Sweden.

The preparation method and the presentation of the results follow my previous papers, in particular the first of this series (BRETFELD 1996). The nomenclature is the same with the exception that the long row of setae of the posterior side of dentes is now neutrally called P (instead of former PJ). The description of the species follows their alphabetical order. For more information about taxonomy, characteristics, occurrence, and biology of the known species see BRETFELD (1999).

The holotypes and most of the paratypes are held in the author's collection, some other paratypes have also been deposited in the collection Babenko, Moscow and the collection Stebaeva, Novosibirsk.

The following taxa have been identified:

Bourletiella arvalis (Fitch, 1863)

Bourletiella hortensis (Fitch, 1863)

Cyprania gisae Bretfeld, 1992
Cyprania inopinata Bretfeld, 1996
Deuterosminthurus bicinctus f. flava (Gisin, 1946)
Deuterosminthurus pallipes f. principalis (Bourlet, 1842)
Deuterosminthurus pallipes f. repanda (Ågren, 1903) sensu Nayrolles, 1996
Dicyrtoma fusca (Lubbock, 1873)
Dicyrtomina minuta (Fabricius, 1783)
Fasciosminthurus albanicus (Stach, 1956)
Fasciosminthurus obtectus Bretfeld, 1992
Fasciosminthurus strigatus sajanensis Bretfeld, 1996
Fasciosminthurus virgulatus (Skorikov, 1899)
Fasciosminthurus Gisin, 1960 spec. A
Fasciosminthurus Gisin, 1960 spec. B
Heterosminthurus cf. *bilineatus* (Bourlet, 1842)
Heterosminthurus borealis Bretfeld & Zöllner, 2000
Heterosminthurus linnaniemii (Stach, 1920) f. principalis
Heterosminthurus linnaniemii (Stach, 1920) f. rubra n. f.
Heterosminthurus punctatus Bretfeld, 1996
Heterosminthurus putoranae n. sp.
Heterosminthurus quadristrigatus n. sp.
Heterosminthurus stebaevae Bretfeld, 1996
Heterosminthurus umbonicus n. sp.
Heterosminthurus Stach, 1955 spec. A
Heterosminthurus Stach, 1955 spec. B
Heterosminthurus Stach, 1955 spec. C
Kaszabellina minima Betsch, 1977
Sminthurides aquaticus (Bourlet, 1842)
Sminthurides inaequalis armatus n. ssp.
Sminthurides malmgreni (Tullberg, 1876)
Sminthurides parvulus (Krausbauer, 1898)
Sminthurides schoetti Axelson, 1903
Sminthurinus alpinus Gisin, 1953
Sminthurinus aureus var. ochropus (Reuter, 1892)
Sminthurinus elegans (Fitch, 1863)
Sminthurinus hygrophilus n. sp.
Sminthurinus cf. *pallescens* Yosii, 1970

Sminthurinus reticulatus Cassagnau, 1964
Sminthurinus Börner, 1901 spec. A
Sminthurinus Börner, 1901 spec. B
Sminthurus denticulatus n. sp.
Sminthurus multipunctatus Schäffer, 1896
Sminthurus nigrinus n. sp.
Sminthurus nigromaculatus Tullberg, 1871
Sminthurus orientalis n. sp.
Sminthurus osmeryzskensis n. sp.
Sminthurus rubidipunctatus n. sp.
Sminthurus viridis Linnaeus, 1758
Sminthurus Latreille, 1802 spec.
Spatulosminthurus flaviceps (Tullberg, 1871)
Spatulosminthurus guthriei sibiricus Bretfeld, 1996
Sphaeridia leutrensis Dunger & Bretfeld, 1989
Sphaeridia pumilis (Krausbauer, 1898) s. str.
Sphaeridia Linnaniemi, 1912 spec.
Sphyrotheca multifasciata (Reuter, 1881)
Stenacidia violacea (Reuter, 1881)

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List of the samples and their taxa

I. From Russia

A. W of the Ural Mts.

1. Ryazan Reg., about 180 km SE of Moscow, Priokskiy, Prioksko Terrasny, State Nature Reserve; meadow on forest clearing; 29.VII.1990 leg. Prinzing no. 1 (coll. Bretfeld no. 7/91) (*S. nigromaculatus*).
2. Yaroslavl Reg., about 300 km NNE of Moscow, Danilov; ruderal vegetation and grassy road border; 1.VIII.1990 leg. Prinzing no. 4 (10/91) (*S. viridis*).

3. Perm Reg., Basegi [?] Reserve in the Ural Mts.; rocky slope; 30.VIII.1990 leg. Esyunin (Ba I P7) (*Sminthurus* spec.).
4. As sample 3, but *Sphagnum* bog; 15.IX.1990 leg. Esyunin (Ba I P8) (*H. stebaevae*).
5. Krasnodar Reg., the NW Caucasus, Razvalka Mt. 25 km SW of Mineralnye Wody near Zeleznovodsk; forest at 1000 m altitude; 15.VIII.1975 leg. Stebaeva (St II T4) (*B. arvalis*, *D. pallipes* f. repanda, *Heterosminthurus quadristrigatus* n. sp.).
6. Arkhangel'sk Reg., Kanin Peninsula, Rybnaya River, 68°20'N - 46°10'E; under stones of river bank; 29. - 30.VIII.1994 leg. Babenko no. R126/94 (Ba II T8) (*S. aquaticus*).
7. As sample 6, but litter of willow forest on low river terrace; 29. - 30.VIII.1994 leg. Babenko no. R127/94 (Ba II T9) (*D. fusca*, *D. minuta*).

B. E of the Ural Mts., southern localities

8. Omsk Reg., 60 km N of Omsk, Krutaya Gorka; meadow on flood-plain of Irtysh River with *Agrostis*; 30.VII.1974 leg. Stebaeva no. 12 (St I 32/92) (*S. nigromaculatus*).
9. Omsk Reg., 230 km NNE of Omsk, Tara; wet meadow on 1st terrace of Irtysh River with *Salix* bushes and *Potentilla anserina*; 4.VIII.1974 leg. Stebaeva no. 14 (St I 34/92) (*S. nigromaculatus*).
10. Novosibirsk Reg., 25 km S of Novosibirsk, Akademgorodok; herbaceous lawn with low traffic pollution; 18.VII.1994 leg. Stebaeva (St II T9) (*D. pallipes* f. repanda, *S. guthriei sibiricus*).
11. As sample 10, but undisturbed meadow; 12.VII.1994 leg. Stebaeva (St II T10) (*S. elegans*).
12. SW Novosibirsk Reg., near Karasuk, 7 km NW of Lake Khorosheye; meadow along a small birch-forest; 9.VII.1976 leg. Stebaeva no. 9 (St I 29/92) (*S. nigromaculatus*).
13. As sample 12, but near Troitskoye; grassy meadow near a birch-forest; 11.IX.1976 leg. Stebaeva no. 22 (St I 42/92) (*S. multipunctatus*).
14. Khakasia Reg., 20 km N of Kopjovo near Lake Uchum; meadow litter in middle part of lake slope; 25.VII.1990 leg. Stebaeva (St II P9) (*S.* cf. *pallescens*, *S. pumilis*).
15. As sample 14, but 2 km from Lake Uchum; litter and grass of steppe on lake slope; 9.VIII.1960 leg. Stebaeva (St II P13) (*S. guthriei sibiricus*).
16. Khakasia Reg., 40 km SE of Belyy Yar, Lake Beresovskoye; mesophytic meadow on 2nd terrace of lake with *Agropyrum* and *Plantago*; 22.VI.1990 leg. Stebaeva (St II P11) (*B. hortensis*).
17. As sample 16, but with *Agropyrum ramosum*; 22.VI.1990 leg. Stebaeva (St II P15) (*S. guthriei sibiricus*).
18. As sample 16, but mesophytic meadow in small lowlands of steppe with *Caragana spinosa*, *Agropyrum*, and *Plantago*; 22.VI.1990 leg. Stebaeva (St II P14) (*B. hortensis*, *S. guthriei*).
19. Khakasia Reg., Kuznetskiy Alatau Range, 45 km NW of Askiz near Tey; wet meadow along a small river at 1100 m altitude; 7.VII.1990 leg. Stebaeva (St II P16) (*Sminthurinus* spec. A).

20. Tuva Reg., Ujuksky Range, 25 - 35 km NW of Kyzyl, near Seserlyg; steppe on southern slope with *Artemisia* and *Stipa*, under *Aster* in 0 - 5 cm depth at 1200 m altitude; 29.VI.1990 leg. Stebaeva (St II P8, P10) (*Sphaeridia* spec.).
21. Tuva Reg., Piy-Khem area, 40 km NW of Kyzyl, near Tsherbi; under *Caragana bungei* in steppe vegetation at 900 m altitude; 1.VII.1990 leg. Stebaeva (St II P2) (*F. strigatus sajanensis*).
22. As sample 21, but steppe with *Caragana bungei* at about 900 m altitude; 1.VII.1990 leg. Stebaeva (St II P6) (*D. pallipes* f. repanda, *K. minima*).
23. Tuva Reg., 14 km of Kyzyl; mesophytic meadow along old valley of Yenisey River at 680 m altitude; 2.VII.1990 leg. Stebaeva (St II P3) (*S. guthriei sibiricus*).
24. Tuva Reg., 3 - 4 km W of Kyzyl, near old valley of Yenisey River; mesophytic meadow at 700 m altitude; 2.VII.1990 leg. Stebaeva (St II P12) (*H. stebaevae*).
25. As sample 24, near Suk-Pak; steppe at 700 m altitude; 3.VII.1990 leg. Stebaeva (St II P5) (*F. strigatus sajanensis*).
26. Tuva Reg., southern slope of Eastern Tannu-Ola Range, 2 - 3 km W of Samagaltay; grassy meadow in flood-plain of small river Arys-Kazy; ; 15.VII.1993 leg. Stebaeva (St II T8) (*D. pallipes* f. repanda).
27. Tuva Reg., southern slope of Eastern Tannu-Ola Range, northern part of Uvs Nuur hollow, 35 km W of Samagaltay, Aryskanny-Khem area; flood-plain of Aryskanny-Khem River, under grass in a forest with *Populus*; 15.VII.1993 leg. Stebaeva (St II T7) (*D. pallipes* f. repanda, *H. stebaevae*).
28. As sample 27, but wet meadow near Aryskanny-Khem River with *Carex*; 15.VII.1993 leg. Stebaeva (St II T5) (*D. pallipes* f. repanda, *H. linnaniemii* f. principalis, *H. linnaniemii* f. rubra n. f., *H. stebaevae*).
29. As sample 27, but upper part of submountain plain; in grass of dry steppe with *Potentilla acaulis* and *Artemisia frigida*; 16.VII.1993 leg. Stebaeva (St II T6) (*H. linnaniemii* f. rubra n. f., *K. minima*).
30. As sample 27, but under *Artemisia* in 0 - 5 cm depth in an association with *Selaginella sanguinolentha* at 1200 m altitude; 16.VII.1993 leg. Stebaeva (St II P4) (*F. strigatus sajanensis*).
31. As sample 27, but in 0 - 5 cm depth in an association with *Lycopodium* on mountain steppe at 1200 m altitude; 17.VII.1993 leg. Stebaeva (St II T1) (*F. strigatus sajanensis*).
32. As sample 27, but under *Stipa krylovii* on mountain steppe at 1200 m altitude; 17.VII.1993 leg. Stebaeva (St II T2) (*Fasciosminthurus* spec. B).
33. As sample 27, but upper part of submountain plain; dry steppe with *Caragana pygmaea* and *Nanophyton erinaceum*; 17.VII.1993 leg. Stebaeva (St II T3) (*S. pumilis*)
34. SW Tuva Reg., Mugur-Aksy Range at 2000 m altitude; 22.VII.1993 leg. Stebaeva (St II P7) (*S. alpinus*).

C. E of the Ural Mts., northern localities

35. Krasnojarsk Reg., W Taimyr, mouth of Uboinaya River, about 73°30'N - 82°20'E; sedge and moss bog; 7.VIII.1988 leg. Babenko no. 145 (Ba I P1) (*S. leutrensis*).
36. As sample 35, but river slope; 22.VII.1988 leg. Babenko no. 36 (Ba I P2) (*S. leutrensis*).
37. As sample 35, but river slope; 22.VII.1988 leg. Babenko no. 55 (Ba I P3) (*S. parvulus*, *S. leutrensis*).
38. As sample 35, but river slope; 1.VIII.1988 leg. Babenko no. 94 (Ba I P4) (*S. leutrensis*).
39. As sample 35 [habitat?]; 7.VIII.1988 leg. Babenko no. 23 (Ba I P5) (*Heterosminthurus* spec. A).
40. Krasnoyarsk Reg., E Taimyr, northern shore of Lake Taimyr; pitfall traps in sedge and moss bog; 25.VII.1993 leg. Babenko no. 47 (Ba I P6) (*Heterosminthurus* spec. C).
41. As sample 40, but near Ozhidaniya Bay, about 75°N - 102°E; zonal tundra; 26.VII. - 11.VIII.1994 leg. Makarova no.? (Ba I T14) (*Heterosminthurus putoranae* n. sp.).
42. Krasnoyarsk Reg., Severnaya Zemlya Archipelago, Bol'shevik Island, Solnechnaya Bay; bare ground with black crust between tussocks of a plant association with predominance of *Carex ensifolia*; 12.VIII.1997 leg. Makarova no. 53/97 (Ba IV P1) (*S. inaequalis armatus* n. ssp.).
43. Krasnoyarsk Reg., Putorana Plateau S of Taimyr Peninsula, Dynkenda Mts., near Lake Yt-kyuel (Sobachye), about 69°N - 92°E; sweepnet sample from a herbaceous meadow on southern slope at 550 m altitude; 23.VII.1996 leg. Babenko no. R3/96 (Ba III T1) (*D. pallipes* f. reparida).
44. As sample 43, but mosses in wet depression at 600 m altitude; 28.VII.1996 leg. Babenko no. R18/96 (Ba III T2) (*S. malmgreni*, *S. schoetti*, *S. violacea*).
45. As sample 43, but sweepnet sample from a sedge and willow bog at 600 m altitude; 29.VII.1996 leg. Babenko no. R23/96 (Ba III T3) (*H. borealis*, *Heterosminthurus putoranae* n. sp.).
46. As sample 43, same method and habitat, but 29.VII.1996 leg. Babenko no. R24/96 (Ba III T4) (*D. pallipes* f. reparida, *Heterosminthurus putoranae* n. sp., *Sminthurides inaequalis armatus* n. ssp.).
47. As sample 43, same method and habitat, but 31.VII.1996 leg. Babenko no. R29/96 (Ba III T6) (*D. pallipes* f. reparida).
48. As sample 43, but on tent in a dry *Dryas* plant association; 8.VIII.1996 leg. Babenko no. R43/96 (Ba III T8) (*Heterosminthurus putoranae* n. sp., *Sminthurus denticulatus* n. sp.).
49. As sample 43, but *Sphagnum* bog with *Betula nana* at 100 m altitude; 9.VIII.1996 leg. Babenko no. R48/96 (Ba III T9) (*S. malmgreni*).
50. As sample 43, but pitfall traps in a nival desert at 750 m altitude; 25.VII. - 13.VIII.1996 leg. Babenko no. R61/96 (Ba III T10) (*Sminthurides inaequalis armatus* n. ssp., *S. malmgreni*, *S. violacea*).

51. As sample 43, but pitfall traps in a nival desert at 850 m altitude; 25.VII. - 13.VIII.1996 leg. Babenko no. R62/96 (Ba III T11) (*Sminthurides inaequalis armatus* n. ssp., *S. malmgreni*, *S. violacea*).

52. As sample 43, but pitfall traps in a *Dryas* plant association at 800 m altitude; 25.VII. - 13.VIII.1996 leg. Babenko no. R63/96 (Ba III T12) (*Heterosminthurus putoranae* n. sp., *Sminthurides inaequalis armatus* n. ssp., *S. violacea*).

53. As sample 43, but pitfall traps in a *Dryas* plant association at 700 m altitude; 25.VII. - 13.VIII.1996 leg. Babenko no. R64/96 (Ba III T13) (*Heterosminthurus putoranae* n. sp., *Sminthurides inaequalis armatus* n. ssp., *S. violacea*).

54. As sample 43, but pitfall traps in a *Dryas* plant association at 600 m altitude; 23.VII. - 14.VIII.1996 leg. Babenko no. R65/96 (Ba III T14) (*Heterosminthurus putoranae* n. sp., *Sminthurides inaequalis armatus* n. ssp., *S. malmgreni*, *S. schoetti*, *S. alpinus*, *Sminthurus denticulatus* n. sp., *S. violacea*).

55. As sample 43, but pitfall traps in sedge spotted tundra at 750 m altitude 25.VII. - 13.III.1996 leg. Babenko no. R66/96 (Ba III T15) (*S. alpinus*, *S. malmgreni*, *S. schoetti*, *S. violacea*).

56. As sample 43, but pitfall traps in sedge spotted tundra at 600 m altitude; 25.VII. - 13.II.1996 leg. Babenko no. R67/96 (Ba III T16) (*Heterosminthurus putoranae* n. sp., *Sminthurides inaequalis armatus* n. ssp., *S. malmgreni*, *S. leutrensis*).

57. As sample 43, but pitfall traps in a dry *Festuca* plant association on southern slope at 650 m altitude; 30.VII. - 13.VIII.1996 leg. Babenko no. R68/96 (Ba III T17) (*S. alpinus*, *Sminthurus denticulatus* n. sp.).

58. As sample 43, same habitat, but pitfall traps; 23.VII. - 6.VIII.1996 leg. Babenko no. R69/96 (Ba III T18) (*D. pallipes* f. repanda, *S. alpinus*).

59. As sample 43, but pitfall traps on a terrace edge with boreal dwarf shrubs at 600 m altitude; 23.VII. - 6.VIII.1996 leg. Babenko no. R70/96 (Ba III T19) (*D. pallipes* f. repanda, *S. alpinus*).

60. As sample 43, but pitfall traps in a bog with sedge, moss, and willows at 600 m altitude; 23.VII. - 14.VIII.1996 leg. Babenko no. R71/96 (Ba III T20 and 21) (*H.* cf. *bilineatus*, *H. borealis*, *S. malmgreni*, *S. schoetti*, *S. alpinus*, *S. leutrensis*, *S. violacea*).

61. As sample 43, but shrub belt; sweepnet sample from herbaceous meadow at 300 m altitude; 31.VII.1997 leg. Babenko no. R70/97 (Ba IV T1) (*D. pallipes* f. principalis and f. repanda).

62. As sample 43, but forest belt; saoking wet willow forest at 100 m altitude; 20.VII.1997 leg. Babenko no. R23/97 (Ba IV T2) (*H. borealis*, *S. malmgreni*).

63. As sample 43, but forest belt; sweepnet sample from grassy meadow on lake shore at 60 m altitude; 21.VII.1997 leg. Babenko no. R25/97 (Ba IV T3) (*D. pallipes* f. repanda, *H. stebaevae*).

64. As sample 43, but forest belt; sweepnet sample from willow shrubs in stony bed of temporal springs at 70 m altitude; 21.VII.1997 leg. Babenko no. R29/97 (Ba IV T4) (*D. pallipes* f. repanda).

65. As sample 43, but forest belt; on wet stones of a river bank without trees but with plant cover of forest (mosses, lichens, and dwarf boreal shrubs); 21.VII.1997 leg. Babenko no. R54/97 (Ba IV T5) (*Sminthurus denticulatus* n. sp.).

66. As sample 43, but shrub belt; sweepnet sample from herbaceous meadow under cliffs at 350 m altitude; 3.VIII.1997 leg. Babenko no. R83/97 (Ba IV T6) (*D. pallipes* f. repanda).

67. As sample 43, but forest belt, island in Khoronen River; sweepnet sample from grassy meadow on sandy ground at 60 m altitude; 4.VIII.1997 leg. Babenko no. R86/97 (Ba IV T7) (*D. pallipes* f. repanda, *H. stebaevae*).

68. Yakutia Reg., W of Olenëkskiy Bay, Lake Vaganytta-Kuyel, 73°30'N - 118°10'E; pitfall traps on sandy river bank; 6. - 8.VII.1994 leg. Babenko no. R13/94 (Ba II T1) (*Sminthurus orientalis* n. sp.).

69. Yakutia Reg., Yakutsk, about 62°N - 130°E; Leguminosae in a mixed forest of botanical garden; 12.VII.1992 leg. Potapov no. 92/10 (Ba I T4) (*D. pallipes* f. repanda).

70. Yakutia Reg. 12 km S of Yakutsk, near Tabago; Leguminosae on a pasture or meadow; 15.VII.1992 leg. Potapov no. 92/16 (Ba I T5) (*C. inopinata*).

71. Yakutia Reg., about 20 km N of Yakutsk, near Zhatay; surface of sandy bank dunes of Lena River; 18.VII.1992 leg. Potapov no. 92/21 (Ba I T6) (*B. hortensis*).

72. Yakutia Reg., E of Yana River Delta, Shirokostan Peninsula, near Lake Ledyanoe, 72°25'N - 141°E; sweepnet sample from tussock tundra with *Eriophorum vaginatum*; 4. - 6.VIII.1994 leg. Babenko no. R67/94 (Ba II T7) (*Sminthurus orientalis* n. sp.).

73. E Yakutia Reg., mountain part of River Indigirka near Ust'-Nera, about 65°N - 143°E; on stones near river at 700 m altitude and in lichens on stones at 800 m altitude; 21.VII.1992 leg. Potapov no. 92/27+29 respectively (Ba I T7) (*H.* cf. *bilineatus*).

74. As sample 73, but on moist *Sphagnum* in mountain tundra at 1500 m altitude; 22.VII.1992 leg. Potapov no. 92/34 (Ba I T8) (*H.* cf. *bilineatus*, *H. borealis*, *Heterosminthurus umbonicus* n. sp.).

75. As sample 73, but on moss and *Carex* in moist mountain tundra on a plateau at 1500 m altitude; 26.VII.1992 leg. Potapov no. 92/39 (Ba I T9) (*Heterosminthurus* spec. B).

76. Yakutia Reg., delta of Indigirka River, 71°26'N - 149°45'E; sweepnet sample of wet sedge and moss bog with *Salix repens*; 14. - 16.VII.1994 leg. Babenko no. R31/94 (Ba II T2) (*Sminthurus orientalis* n. sp.).

77. As sample 76, but pitfall traps on anthropogeneous meadow of an old settlement; 14. - 16.VII.1994 leg. Babenko no. R36/94 (Ba II T3) (*Sminthurus orientalis* n. sp.).

78. Yakutia Reg., delta of Kolyma River, 69°32'N - 160°44'E; sweepnet sample from tussock tundra with *Eriophorum vaginatum* on a hill top; 18. - 19.VII.1994 leg. Babenko no. R39/94 (Ba II T4) (*Sminthurus orientalis* n. sp.).

79. Magadan Reg., Ayon Island, about 70°N - 168°E; pitfall traps on sandy slope of a hill; 22.VII.1994 leg. Babenko no. R54/94 (Ba II T5) (*Sminthurus orientalis* n. sp.).

80. Magadan Reg., Wrangel Island, near Mamontovaya River, 70°50'N - 179°34'E; sweepnet sample from herbaceous tundra with willow, sedge, and mosses; 23. - 24.VII.1994 leg. Babenko no. R56/94 (Ba II T6) (*Sminthurus orientalis* n. sp.).

II. From Georgia

81. Abkhazia Reg., southern slopes of the Caucasus near Sukhumi, Nizhnjaja Jashtuka; pitfall traps in tobacco plantation; 1978 leg. Tarashchuk no. G.Su/78 (Ta I 8) (*B. hortensis*, *Heterosminthurus quadristrigatus* n. sp., *S. reticulatus*, *S. multifasciata*).

III. From Kazakhstan

82. Semipalatinsk Reg., southern slopes of Tarbagatay Range, area of Karabuga River; grassy steppe at 1300 m altitude; 3.VIII.1972 leg. Stebaeva (St II P1) (*F. obtectus*, *Sminthurus* spec.).

83. Semipalatinsk Reg., 100 km SE of Semipalatinsk, Charsk; semi-desert steppe on 3rd terrace of Char River; 29.VII.1972 leg. Stebaeva no. 11 (St I 31/92) (*Sminthurus rubidipunctatus* n. sp.).

84. Semipalatinsk Reg., 150 km SE of Semipalatinsk, near Georgiyevka; steppe with *Stipa*; 30.VII.1972 leg. Stebaeva no. 10 (St I 30/92) (*Sminthurus rubidipunctatus* n. sp.).

85. Pavlodar Reg., 120 km NW of Pavlodar near Kachiry, Osmeryzsk; meadow of floodplain of Irtysh River with *Agrostis*; 2.VII.1975 leg. Stebaeva no. 5 (St I 25/92) (*Sminthurus osmeryzskensis* n. sp.).

86. Alma-Ata Reg., Tien-Shan Mts., 40 km E of Alma-Ata, Zailiyskiy Alatau Range, near Aktogai, about 43°N - 78°E; on moist glay near a river; 18.VIII.1991 leg. Potapov no. 91/1 (Ba I T10) (*H. punctatus*, *H. stebaevae*).

87. Alma-Ata Reg., Tien-Shan Mts., 30 km SE of Issyk, Chinturgen Canion in Zailiysky Alatau Range; meadow in *Picea tianshanica* forest at 2500 m altitude; 19.VIII.1991 leg. Potapov no. 91/8 (Ba I T11) (*Fasciosminthurus* spec. A).

88. As sample 87, but 10 km S of Issyk, Bortnikovskoye Canion; anthropogenic meadow near river at 1500 m altitude; 27.VIII.1991 leg. Potapov no. 91/1 (tube note reads 91/43) (Ba I T12) (*B. arvalis*, *D. pallipes* f. repanda).

89. As sample 88, but agricultural field at 1600 m altitude; 27.VIII.1991 leg. Potapov no. 91/1 (tube note reads 91/46) (Ba I T13) (*D. pallipes* f. repanda).

IV. From Kirghizia

90. Northern spurs of Alaiskiy Range, Kek-Suu River, 39°41'N - 71°36'E; wet stones with mosses under waterfall at 3400 m altitude; 2.VIII.1998 leg. Babenko no. R6/98 (Ba IV T8) (*Sminthurinus hygrophilus* n. sp.).

91. Northern spurs of Turkestanskiy Range, near Zardaly, 39°37'N - 70°57'E; wet herbaceous meadow at 1700 m altitude; 12.VIII.1998 leg. Babenko no. R17/98 (Ba IV T9) (*S. aureus* var. ochropus, *S. elegans*).

V. From the Ukraine

92. Kiev Reg., Fastov distr., near Pivni; pitfall traps in mixed forest with *Quercus* and *Pinus*; 15.VI.1987 leg. Tarashchuk no. K-F-P/87/2 (Ta I 1) (*D. bicinctus* f. flava, *S. flaviceps*).

93. Nikolayev (Mykolayiv) Reg., Pervomaysk distr., near Kuripchyne; sweepnet sample from flood-plain meadow with *Phragmites* and *Coeleria* on left bank of Bough River; 7.XI.1996 leg. Tarashchuk no. M-K/96/241 (Ta I 3) (*Sminthurus nigrinus* n. sp., *S. nigromaculatus*).

94. As sample 93, but sweepnet sample from stony steppe (*Stipeto-Thymeto festucetum*) on left bank of Bough River; 7.XI.1996 leg. Tarashchuk no. M-K/96/242 (Ta I 4) (*Sminthurus nigrinus* n. sp.).

95. As sample 93, but Romaniv ravine; sweepnet sample on herbs (*Anthriscus sylvestris*) in deciduous forest with *Ulmus carpinifolia* and *Tilia cordata* on right bank of Bough River; 7.XI.1996 leg. Tarashchuk no. M-K/96/235 (Ta I 9) (*Sminthurus nigrinus* n. sp.).

96. Kherson Reg., Hola Prystan' distr., near Herojsk; litter and tree-fungi of young forest of *Pinus silvestris*; 15.X.1996 leg. Tarashchuk no. Kh/96 (Ta I 10) (*Sphaeridia* spec.).

97. Donetsk Reg., Kamjani Moghyly preserve; pitfall traps in stony steppe (*Herboso-Festuceto stipetum*); 20.X.1996 leg. Bondarenko no. D.K-M/96/103 (Ta I 5) (*Sminthurinus* spec. B, *S. multipunctatus*, *Sminthurus nigrinus* n. sp., *S. nigromaculatus*).

98. As sample 97, but 21.X.1996 leg. Starostenko no. D.K-M/96/104 (Ta I 6) (*Sminthurus nigrinus* n. sp., *S. nigromaculatus*).

99. As sample 97, but sweepnet sample; 23.X.1996 leg. Starostenko no. D.K-M/96/105 (Ta I 7) (*S. multipunctatus*, *Sminthurus nigrinus* n. sp., *S. nigromaculatus*).

100. Krym Reg., SE shore of Crimea Peninsula near Koktebel, Planerskoye, about 45°N - 35°E; dry steppe on a southern slope at 250 m altitude; 23. - 24.VI.1994 leg. Potapov no. 94/4 (Ba I T1) (*F. obtectus*, *F. virgulatus*).

101. As sample 100, but dry pasture at 50 m altitude; 24.VI.1994 leg. Potapov no. 94/4b (Ba I T2) (*C. gisae*, *F. albanicus*).

102. As sample 100, but Svyataya hill; fresh grass near a spring at 400 m altitude; 2.VII.1994 leg. Potapov no. 94/14 (Ba I T3) (*D. pallipes* f. repanda).

103. As sample 100, but extraction of moistened soil sample from dry steppe on a southern slope at 250 m altitude; 23.VI.1994 leg. Potapov no. 94/15 (Ba I T15) (*S. pumilis*).

Account of the species in alphabetical order

Bourletiella arvalis (Fitch, 1863)

Material: Russia: (NW Caucasus) sample 5: 2 males, 2 females. Kazakhstan: (Alma-Ata) sample 88: 1 female.

Dull yellow, sexually modified setae of male with seta m1 long acuminate and spine DL1 as broad as DL2, appendices anales broad fanlike.

B. arvalis was found here in the low vegetation of mountain forests at 1000 and 1500 m altitude. This Holarctic species is already known from N Russia (W Taimyr), (STEBAEVA 1976, according to SCHÖTT).

Bourletiella hortensis (Fitch, 1863)

Material: Russia: (Khakasia) sample 16: 15 specimens, 18: 1 male; (Yakutia) 71: 6. Georgia: (Sukhumi) sample 81: 18 specimens.

Dark brown to black, sexually modified setae of male with seta m1 long and coiled and spines DL1 and DL2 curved oppositely, appendices anales broad fanlike.

B. hortensis was found here in the low vegetation of mesophytic steppe meadows, of sandy river bank dunes, and on the soil of a tobacco plantation. This Holarctic species is already known from the E Palaearctic (S Ural Mts., Tomsk, Tuva), (STEBAEVA 1976).

Cyprania gisae Bretfeld, 1992

Material: Ukraine: (Krym) sample 101: 7 specimens.

Yellow with grey-blue points or shades on postero-lateral parts of abdomen, empodia and circumanal setae of females as originally described.

C. gisae was found here in the low vegetation of a dry pasture near the seashore. It is known from Cyprus and Kazakhstan (BRETFELD 1996).

Cyprania inopinata Bretfeld, 1996

Material: Russia: (Yakutia) sample 70: 16 specimens.

Yellow with a few blue spots or shades, chaetotaxy of circumanal setae and antennal segment III as originally described.

C. inopinata was found here in the vegetation of a pasture or meadow. It is known from SE Russia and Kazakhstan.

Deuterosminthurus bicinctus f. flava (Gisin, 1946)

Material: Ukraine: (Kiev) sample 92: 1 female.

Yellow, femur III lacks one postero-distal seta compared with femur II, tibiotarsi only with short setae, ventral circumanal setae of equal length.

D. bicinctus f. flava was found here, as it used to be in W Europe, in the low vegetation of a mixed forest. It is known from W and S Europe and from the E Palaearctic (Irkutsk), (BRETFELD 1996).

Deuterosminthurus pallipes (Bourlet, 1842) sensu Nayrolles, 1996

Colour more or less dark violet (f. principalis), yellow with red violet spots (f. fenyesi), or only yellow (f. repanda); femura II and III in both sexes with identical sets of postero-distal setae, antennal segment I and II of male with spinelike setae.

Deuterosminthurus pallipes f. principalis

Material: Russia: (Putorana Plateau) sample 61: 120 specimens.

D. pallipes f. principalis was found here in the vegetation of a herbaceous meadow at 300 m altitude. It is known from the W Palaearctic and from the mountains of SE Russia (Altai Mts. and in the Tuva Reg.), (STEBAEVA 1976).

Deuterosminthurus pallipes f. repanda (Ågren, 1903)

Material: Russia: (NW Caucasus) sample 5: 2 specimens; (Novosibirsk) 10: 1; (Tuva) 22: 1, 26: 10, 27: 31, 28: 62; (Putorana Plateau) 43: 12, 46: 6, 47: 34, 58: 2, 59: 1, 61: 70, 63: 10, 64: 30, 66: 68, 67: 5; (Yakutia) 69: 4. Kazakhstan: (Alma-Ata) sample 88: 8 specimens, 89: 3. Ukraine: (Krym) sample 102: 4 specimens.

D. pallipes f. repanda was found here in various meadows from a town lawn to tundra, in steppe vegetations, in meadows in forests up to 1000 m, and on an arable field at 1500 m altitude. It is widespread in the W and already known from the E Palaearctic (Russia, near Novosibirsk, and Kazakhstan, S of Tarbagatay Range), (BRETFELD 1996).

Dicyrtoma fusca (Lubbock, 1873)

Material: Russia: (Kanin Peninsula) sample 7: 1 female.

Dark blue, ratio of outer dens setae E1 - E4 = 2.3 : 1 : 4.3 : 5.8.

D. fusca was found here in forest litter of a river terrace. This Holarctic species is known from the whole Palaearctic.

Dicyrtomina minuta (Fabricius, 1783)

Material: Russia: (Kanin Peninsula) sample 7: 1 juvenile.

Posterior part of large abdomen with dark patch.

D. minuta was found here in forest litter of a river terrace. It is only known from the W Palaearctic.

Fasciosminthurus albanicus (Stach, 1956)

Material: Ukraine: (Krym) sample 101: 1 female.

Pale yellow with blue-grey pigment on posterior side of head and lateral sides of large abdomen; antennal segment III whorls 4, 5, 6 with 4, 4, 5 setae respectively; tibiotarsi II and III rows p with 4 and 3 setae respectively. These characteristics are a mixture of those of the two subspecies: tibiotarsi as in *F. a. albanicus*, antennal segment III as in *F. a. pontignanoi* Bretfeld, 1992.

F. albanicus was found here on a dry pasture near the sea shore; it is known from the Mediterranean.

Fasciosminthurus obtectus Bretfeld, 1992

Material: Kazakhstan: (Tarbagatay Range) sample 82: 1 female. Ukraine: (Krym) sample 100: 9 specimens.

Black with irregular white spots, in particular abdominal segments V and VI with 1 pair of white spots each; other characteristics as originally described.

F. obtectus was found here on a grassy steppe at 1300 m altitude and a dry steppe near the sea shore. The first locality (no. 82) is almost identical with one previously described (no. 39 in BRETFELD 1996), the second (no. 100) shows that this species also occurs in other localities of the S Palaearctic. It is known from E Austria, SE Russia, and other localities in Kazakhstan.

Fasciosminthurus strigatus sajanensis Bretfeld, 1996

Material: Russia: (Tuva) sample 21: 3 specimens, 25: 1 female, 30: 2 specimens, 31: 1 female.

Large abdomen with brown strong contrasting stripes, small abdomen with brown U-shaped margin, also other characteristics as originally described.

F. s. sajanensis was found here in steppe vegetation from 700 m up to 1200 m altitude; it is known from a steppe in the West Sayan Mts. at 1100 m altitude.

Fasciosminthurus virgulatus (Skorikov, 1899)

Material: Ukraine: (Krym) sample 100: 34 specimens.

Pigmentation and chaetotaxy mostly as described (BRETFELD 1990, 1992a), some stripes modified into grey shades.

F. virgulatus was found here on a dry steppe near the sea shore. This new record lies within the known occurrence of this species, the S Palaearctic; it was originally described from specimens found in the Ukraine, near Charkov.

Fasciosminthurus Gisin, 1960 spec. A

Material: Kazakhstan: (Alma-Ata) sample 87: 1 female.

Eye-patches black, background colour red, after longer storage in alcohol yellow and only head still red; thorax with a few blue spots; antennae, in particular segment IV, brown violet.

Total length 0.8 mm, head 0.27 mm, mucro 50 µm, appendices anales 36 µm. Whole antenna : head length = 1.7, antennal segment I : II : III : IV = 1 : 2 : 3 : 5.7, dens : mucro = 3.3, appendices anales : claw III inner edge = 2.1, mucro : claw III inner edge = 2.9, app. an. : mucro = 0.7.

Ventral head-back apparently without oval organs. Antennal segment III whorls 4, 5, 6 with 4, 4, 5 or 6 setae respectively; antenna IV region T with 1 seta, distal part with 5 dorso-anterior and 4 or 5 dorso-posterior sensilla. Appendices anales narrow and pointed. Tibiotarsus II and III rows p with 3 - 4 and 3 setae respectively; claws broad, sometimes with a small inner tooth; empodia each with a thin S-shaped filament. Dens row J with 3...2 setae, formula of anterior setae 3+1,2,1,1...1; mucro short, anterior furrow moderately broad.

Remarks: This single female seems to belong to a new species since the red colour may be a constant feature. A new species is not named here, however, because of the general variability of the chaetotaxic characteristics. This female was found in a meadow at 2500 m altitude.

Fasciosminthurus Gisin, 1960 spec. B

Material: Russia: (Tuva) sample 32: 1 male.

Eye-patches black, background colour yellow with white and grey to black pigment: White spot between eye-patches, yellow spot between antennal bases, grey pigment on other parts of head; large abdomen with white median stripe in heart region and 1+1 white, longitudinal, lateral stripes which converge on anterior and posterior parts, lateral parts grey; small abdomen with several black dorso-median spots, segment V also with 1+1

large lateral spots; antennae grey, segment II and III with dark distal ring, tip of segment IV darker than other part; legs without dark pigment, inner base of dentes with grey spots. Yellow and white faded during storage in alcohol.

Total length 0.56 mm, head 0.24 mm, mucro 50 µm. Whole antenna : head length = 1.8, antennal segment I : II : III : IV = 1 : 1.7 : 2.8 : 5.8, dens : mucro = 3.1, mucro : claw III inner edge = 3.3.

Ventral head-back with 1+0 oval organs. Antennal segment III whorls 4, 5, 6 with 3, 4, 5 setae respectively; antenna IV region T with 2 setae, distal part with 4 dorso-anterior and 4 dorso-posterior sensilla. Cuticula of tibiotarsi thickened, tibiotarsus II and III rows p with 6 and 3 setae respectively; claws broad with a small to minute inner tooth; empodia each with a thin and almost straight filament. Dens row J with 2/3...2 setae, formula of anterior setae 3+1,2,1,1...1; mucro moderately broad.

Remarks: Although special chaetotaxic characteristics are present (antenna III, tibiotarsus II row p), this single male is also not named as a new species, since the chaetotaxy generally varies. Reserve is also advisable since a striking colour pattern is missing and the males are usually paler than the females in this genus. This male was found under *Stipa* on a mountain steppe at 1200 m altitude.

Heterosminthurus Stach, 1955

The following descriptions of the new *Heterosminthurus* species refer to that of *H. insignis* (Reuter, 1876) (see BRETFELD 1990, 1996) and mainly note the differences from that species. The females of the yellow species are compared in Table 1, which also includes *H. chaetocephalus* Hüther, 1971, found in previously studied samples (BRETFELD 1996).

Heterosminthurus cf. *bilineatus* (Bourlet, 1842)

Material: Russia: (Putorana Plateau) sample 60: 2 females, 1 juv.; (Yakutia) 73: 1 female, 1 juv., 74: 1 female.

Two brown longitudinal bands, short inner setae of dentes, and flank setae as 4/- are characteristics of this species. A final identification, however, is not possible until males are collected.

These specimens were found here in wet habitats up to 1500 m altitude. *H. bilineatus* is mainly known from Europe, a record from SE Russia, Tuva Reg. (STEBAEVA 1976), should be also confirmed by males.

Heterosminthurus borealis Bretfeld & Zöllner, 2000

Material: Russia: (Putorana Plateau) sample 45: 3 males, 8 females, 60: 4 males, 7 females and juveniles, 62: 3 males, 4 females; (Yakutia) 74: 1 female.

The yellow colour and the chaetotaxy, in particular the strong anterior head setae and the two pairs of thickened setae of ventral head-back in the male, as originally described (see also Table 1).

H. borealis was found here in wet habitats up to 1500 m altitude. It is known from Russia, the Lena Delta.

Heterosminthurus linnaniemii (Stach, 1920) f. principalis

Material: Russia: (Tuva) sample 28: 5 females.

Typical dark violet pigment on dorsal side.

H. linnaniemii f. principalis was found here in a wet meadow. It has already been recorded from the mountains in SE Russia (Altay, Tuva, and Irkutsk Regs.), (STEBAEVA 1976, BRETFELD 1996) and also occurs in E Europe.

Heterosminthurus linnaniemii (Stach, 1920) f. rubra n. f.

Material: Russia: (Tuva) sample 28: 1 female, 6 males, 29: 1 male.

In the original description of *H. linnaniemii*, Stach distinguished a f. principalis (black violet pigment on head and dorsal part of large abdomen) and a f. decolorata (only a dark patch on head frons). Most of the males here have a rusty red pigment distributed as in the f. principalis, one male and the female, however, have their head pigment restricted to a patch on the frons as in the f. decolorata. As the modified head setae of the males are identical with those of the f. principalis, these rusty red specimens are designated here as a new colour variety; it was collected together with specimens of the f. principalis.

The specimens of this new variety were found in a wet meadow and on a dry steppe.

Heterosminthurus punctatus Bretfeld, 1996

Material: Kazakhstan: (Alma-Ata) sample 86: 3 males, 3 females.

Characteristics of males and long inner setae of dentes in both sexes as originally described (see also Table 1).

H. punctatus was found here on wet soil near a river. It was originally described from specimens found on a flood-plain in Kazakhstan, the Tarbagatay Range, and is also known (new observations) from Germany, Kiel, found in large numbers in a wet meadow, from Croatia, Omis, and from Central Finland, Oulu.

Heterosminthurus putoranae n. sp.

Holotype: Male (unbleached, 2 slides, in coll. Bretfeld) of sample 46: Russia, Krasnoyarsk Reg., Putorana Plateau S of Taimyr Peninsula, Dynkenda Mts., near Lake Yt-kyuel (Sobachye), about 69°N - 92°E; sweepnet sample from a herbaceous meadow on southern slope at 550 m altitude; 29.VII.1996 leg. Babenko (no. R24/96), coll. Bretfeld no Ba III T4.

Paratypes: 9 males, 8 females of sample 41 (Russia, E Taimyr, leg. Makarova). - 4 juv. of sample 45. - 1 male of sample 48. - About 150 juv., 5 females of sample 52. - About 200 juv., 9 females of sample 53. - 6 juv. of sample 54. - 75 juv., 1 female of sample 56 (all Russia, Putorana Plateau, leg. Babenko). - Deposition: Most specimens (alc. and slides) in coll. Bretfeld, some others (alc. and slides) in coll. Babenko.

Derivatio nominis: This new species is named after the Putorana Plateau, where most of the specimens were collected.

Diagnosis: A small, yellow or grey species of the genus *Heterosminthurus* Stach, 1955 with 4 diagnostic apomorphies:

- Uniform grey pigment in both sexes mainly in antennae, head, and anterior part of large abdomen (plesiomorphy: without such grey pigment),
- dorsal part of head clypeus in male with 4 - 5 thick spinelike setae (plesiom.: normal setae),
- genital papilla in male larger than one ventral anal valve (plesiom.: smaller than one valve),
- antennal segment III in male with a very short dorso-distal seta (plesiom.: normal seta).

Other characteristics: Formula of flank setae (4)5/-.

Description: Measurements and proportions (from 3 males and 3 females): Total male 0.6 mm, female up to 0.8 mm; head in male 0.23 mm, in female 0.3 mm; mucro in male 50 µm, in female 53 µm; appendices anales 43 µm. Whole antenna : head length = 3 in male, 2 in female; antennal segment I : II : III : IV = 1 : 2.3 : 4.5 : 8.5 in male, 1 : 2 : 3.6 : 7 in female; mucro : dens : manubrium = 1 : 3.3 : 3.2 in male, 1 : 3.6 : 3.6 in female; appendices anales : claw III inner edge = 2; mucro : claw III inner edge = 2.9 in male, 2.4 in female; app. an. : mucro = 0.9.

Colour: Eye-patches black; background colourless or whitish in juv. and females, yellow in males, with grey or yellow pigment: Head and large abdomen, in particular anterior part, with grey shades, antennae intensely grey-brown, legs with little pigment, furca almost unpigmented; frontal eye often yellow, some males with deep yellow streak between eye-patches and yellow regions on lateral and posterior parts of large abdomen.

Chaetotaxy and special structures: Head of males with several modifications (Figs. 1, 2): Apex with some short, frons with long setae; dorsal part of clypeus with 4 - 5 thick spinelike setae, ventral part slightly shifted dorsally, with short thin middle and normal lateral setae; ventral head-back with rows f and 1+1 oval organs in a more ventral position than usual.

Antennae: Segment II in both sexes without seta 2/1; segment III in male with a very short dorso-distal seta (Fig. 3).

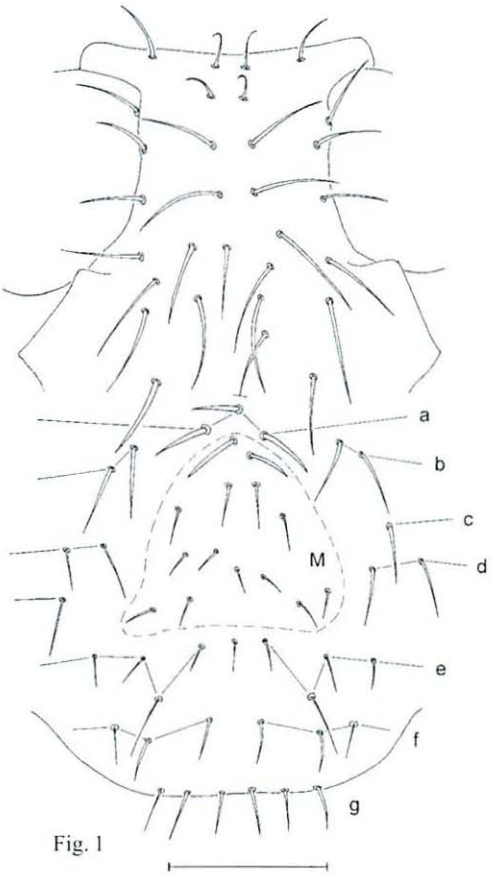


Fig. 1

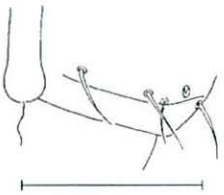


Fig. 2

Fig. 3

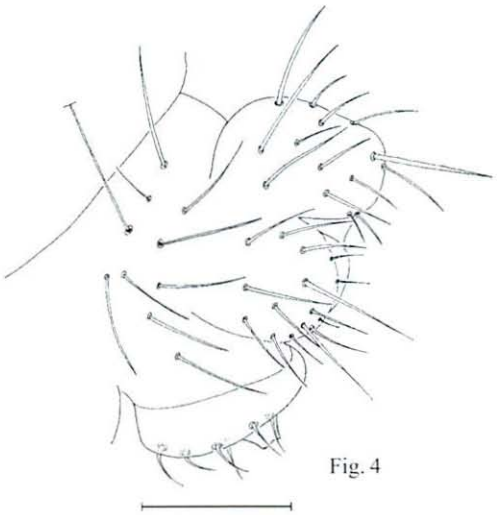


Fig. 4

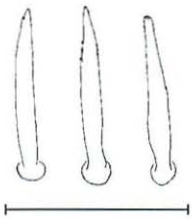


Fig. 5

Heterosminthurus putoranae n. sp.

Fig. 1 Male, frons and clypeus of head (bar = 50 µm)

Fig. 2 Male, ventral head-back from posterior with oval organ and setae f5 - f8 (bar = 50 µm)

Fig. 3 Male, short distal seta of antennal segment III (bar = 50 µm)

Fig. 4 Male, small abdomen (bar = 50 µm)

Fig. 5 Female, three different appendices anales (bar = 50 µm)

Large abdomen: Dorsal setae normal, chaetotaxy not studied; formula of flank setae (4)5/-.

Small abdomen: Genital papilla in male larger than one ventral anal valve and with 6+6 setae (Fig. 4); ventral circumanal setae in female with 3 short ones (av1', av1, av3) (in specimens from E Taimyr shorter than in those from Putorana Plateau); appendices anales (Fig. 5) slender, pointed without or with small teeth.

Legs: In males, inner setae of tibiotarsi up to 2x longer, outer setae up to 3x longer than diameter of tibiotarsus, inner setae sometimes rough; in females these setae not as long as in males. In both sexes, tibiotarsus I row p with 7(or 6) setae, tibiotarsi I and II without seta Jp, III with Jp; all tibiotarsi without seta IIi.

Furca: Inner setae of dens ≥ diameter of dens.

Remarks: *Heterosminthurus putoranae* resembles *H. umbonicus* n. sp.; both are apparently sibling species since the clypeal setae, the genital papilla, and the dorso-distal seta of antenna III of the males are similar or identical. It differs from the other species by its colour (colourless with grey or yellow instead of yellow with blue), its male clypeal setae (4 - 5 strong instead of 9 minute spines on a protuberance), and its formula of flank setae (5/- instead of 4/-). The missing seta IIi of all tibiotarsi is a characteristic also found in *H. umbonicus* n. sp. and in *H. punctatus* Bretfeld, 1996, both of which, however, clearly differ in the modified head setae of the male.

The large genital papilla of the male of *H. putoranae* and *H. umbonicus* n. sp. has not yet been observed in the genus *Heterosminthurus*, which is distinctly defined by its dimorphic empodia. A comparably large male genital papilla is also known from the genera *Bourletides* Betsch & Massoud, 1972 (Australia), *Navarrella* Bretfeld & Arbea, 2000 (Spain), and *Prorastriopes* Delamare Deboutteville, 1947 (S and N America) (see BRETFELD 1992b, 1999). Here in *Heterosminthurus*, this characteristic demonstrates the great morphological variability in the speciation of the males.

This new species was found in the low vegetation of meadows, wet tundra, and *Dryas* associations at 550 - 800 m altitude.

Heterosminthurus quadristrigatus n. sp.

Holotype: Male (no. 1, bleached, 3 slides, in coll. Bretfeld) of sample 5: Russia, Krasnodar Reg., the NW Caucasus, Razvalka Mt. 25 km SW of Mineralnye Wody near Zeleznovodsk; forest at 1000 m altitude; 15.VIII.1975 leg. Stebaeva (no. 4), coll. Bretfeld no. St II T4.

Paratypes: 7 males, 2 females, and 4 juv. (alc. and slides, in coll. Bretfeld); 5 males, 1 female, 4 juv. (alc. and slides, in coll. Stebaeva); together with the holotype.

Further material: 2 females (slide) of sample 81 (Georgia, tobacco plantation), in coll. Tarashchuk.

Derivatio nominis: This new species is named after its colour pattern.

Diagnosis: A medium-sized species of the genus *Heterosminthurus* Stach, 1955 with 4 diagnostic apomorphies:

- 2+2 dark longitudinal stripes on head and large abdomen (plesiomorphy: unpigmented),
- inner setae of dentes thick and long (plesiom.: normal setae),
- head clypeus of male with 2 median spinelike setae (plesiom.: normal setae),
- appendices anales of female bandlike with cut tip and several rough teeth (plesiom.: setalike).

Other characteristics: Formula of flank setae 4/+.

Description: Measurements and proportions: Total male 0.9 mm, female up to 1.2 mm; head in male 0.34 mm, in female 0.4 mm; mucro in male 95 µm, in female 110 µm; appendices anales 55 µm; length of dens seta J4 in male 90 µm, in female 115 µm. Whole antenna : head length = 2.6 in male, 1.9 in female; antennal segment I : II : III : IV = 1 : 3 : 5 : 7.6 in male, 1 : 2.5 : 4.2 : 6.4 in female; mucro : dens : manubrium = 1 : 3.5 : 3.3 in male, 1 : 3.2 : 3.3 in female; appendices anales : claw III inner edge = 1.6; mucro : claw III inner edge = 3.2; app. an. : mucro = 0.5; dens seta J4 : claw III inner edge = 3 in male, 3.5 in female.

Colour (Fig. 6): Eye-patches black; background colour of head and body whitish yellow with dark brown or dark blue pigment in 2+2 longitudinal stripes from mouth and lateral parts of head to posterior part of large abdomen, small abdomen with lateral spots or stripes, tip of segment VI unpigmented; antennae, in particular segment IV, dark blue, legs and furca unpigmented.

Chaetotaxy and special structures: Head (Figs. 7, 8): Apex and frons of male with short setae, clypeus with 2 spinelike median and long, normal lateral setae, ventral head-back with 2+2 oval organs.

Antennae: Segment II in both sexes without seta 2/1.

Large abdomen: Dorsal side with normal setae, chaetotaxy not studied; formula of flank setae 4/+.

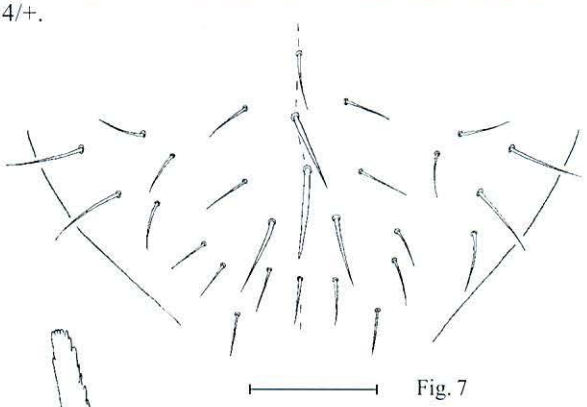


Fig. 7

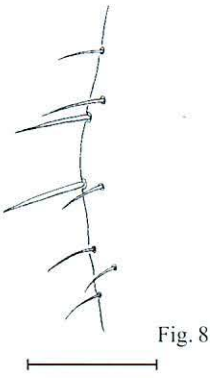


Fig. 8

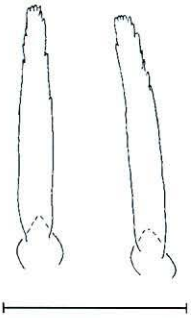
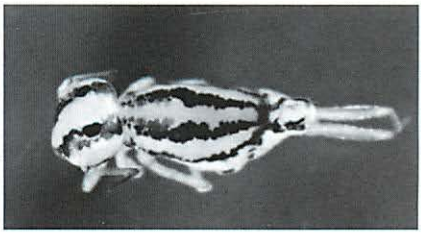


Fig. 9



Heterosminthurus quadristrigatus n. sp. Fig. 6

Fig. 6 Female, colour pattern, total length without furca about 1 mm

Fig. 7 Male, clypeus of head, frontal view (bar = 25 µm)

Fig. 8 Male, clypeus of head, lateral view (bar = 25 µm)

Fig. 9 Female appendices anales (bar = 50 µm)

Small abdomen: Ventral circumanal setae in female quite long without remarkable short ones, although setae av1' and av1 a little shorter than others; appendices anales (Fig. 9) bandlike with cut tip and rough distal teeth.

Legs: Tibiotarsus I row p with 7 setae, all tibiotarsi with seta Jp and without IIi.

Furca: Inner setae of dens long and thick.

Remarks: *Heterosminthurus quadristrigatus* can easily be identified in both sexes by its striking pigmentation and in the male also by its thickened clypeal setae. The chaetotaxy resembles *H. stebaevae* (see Tab. 1) and the female is apparently only distinguished from the latter species by its appendices anales (tip cut instead of narrowed or pointed).

Heterosminthurus stebaevae Bretfeld, 1996

Material: Russia: (Ural Mts.) sample 4: 1 male; (Tuva) 24: 1 male, 27: 5 specimens, 28: 2; (Putorana Plateau) 63: 10 females, 67: 10 females. Kazakhstan: (Alma-Ata) sample 86: 3 females and juv.

Yellow with brownish pigment in head stripes and as shades on lateral part of large abdomen; males without any special head setae, lateral parts of clypeus broadened; both sexes often with long inner setae of dentes.

H. stebaevae was found here, as originally described, in the low vegetation of wet habitats but only up to 700 m altitude. It is known from SE Russia and Kazakhstan.

The characteristics of the females of *H. stebaevae* are compared with other yellow *Heterosminthurus* species in Tab. 1. There is a correction of the original description included since the ventral circumanal setae of the female are very similar in shape, i. e. the setae av1', av1, and av3 are almost as long as av2 and av4, and not, as figured there and as in other species, remarkable shorter. Thus, in this setal row, *H. stebaevae* has no remarkable short seta (already mentioned in BRETFELD 1999).

Tab. 1 Characteristics of females of yellow *Heterosminthurus* species

	H. insignis	*H. chaeto-cephalus*	*H. punc-tatus*	*H. stebae-vae*	*H. borea-lis*	*H. multi-ornatus*
Length dens inner setae	long	medium	medium	+/- long	long	medium
Appendices anales	distally narrow, small teeth	pointed	pointed	tip narrow, toothed	tip cut, rough teeth	narrow, pointed, distal half toothed
Flank setae	5/+	4/+	4/+	4/+	4-5/+	5/+
Short ventral circ. anal setae	2	3	2	0	3	3
Tita. setae Jp	+++	--+	--+	+++	+++	--+
Tita. I row p	7	5	6	7	7	6-7

Heterosminthurus umbonicus n. sp.

Holotype: Male (bleached, 3 slides, in coll. Bretfeld) of sample 74: Russia, E Yakutia Reg., mountain part of River Indigirka near Ust'-Nera, about 65°N - 143°E; on moist *Sphagnum* in mountain tundra at 1500 m altitude; 22.VII.1992 leg. Potapov (no. 92/34), coll. Bretfeld no. Ba I T8.

No further specimens known.

Derivatio nominis: This new species is named after a small clypeal protuberance which resembles the umbo of a shield.

Diagnosis: A small, mainly yellow species of the genus *Heterosminthurus* Stach, 1955 with, in the male, 3 diagnostic apomorphies:

- Dorsal part of head clypeus with a small protuberance with 9 short spinelike setae (plesiomorphy: without protuberance and with normal setae);
- genital papilla larger than one ventral anal valve (plesiom.: smaller than one valve),
- antennal segment III with a very short dorso-distal seta (plesiomorphy: with seta of normal length).

Other characteristics: Blue pigment on head and thorax; formula of flank setae 4/-.

Description: Measurements and proportions of the single male: Total length 0.5 mm; head 0.2 mm; mucro 36 µm. Whole antenna : head length = 3; antennal segment I : II : III : IV = 1 : 2.4 : 4.8 : 8.8; mucro : dens : manubrium = 1 : 4.7 : 4.1; mucro : claw III inner edge = 2.5.

Colour: Eye-patches black; background colour yellow with some blue pigment: Head below antennae with a pale cross band, head-back and dorsal and ventral parts of thorax with blue shades, lateral parts of large abdomen with a few light blue spots, bases of bothriotrichia ABC light pigmented, of D darker; antennae light blue, legs and furca unpigmented.

Chaetotaxy and special structures: Head of males with several modifications (Figs. 10 - 12): Apex with some short, frons with long setae; dorsal part of clypeus with a small protuberance with 9 short spinelike setae, ventral part slightly shifted dorsally with short thin middle and longer lateral setae, region M with 11 setae of which 5 are short and thin and 6 belong to protuberance; ventral head-back with 1+1 oval organs.

Antennae: Dorsal side of segment I with 2 - 3 setae thicker than others, segment II without seta 2/1, segment III with a very short dorso-distal seta (see Fig. 3).

Large abdomen: Dorsal setae short, chaetotaxy not studied; formula of flank setae 4/-.

Small abdomen: Genital papilla larger than one ventral anal valve and with 6+6 setae (see Fig. 4); segment VI with quite short setae (shorter than in Fig. 4) and setae P3 longer than other long setae av2 and av4.

Legs: Tibiotarsus I row p with 7 setae; tibiotarsi I and II without seta Jp, III with Jp; all tibiotarsi without seta IIi.

Furca: Inner setae of dens ≥ diameter of dens.

Remarks: *Heterosminthurus umbonicus* resembles *H. putoranae* n. sp.; both are apparently sibling species since the clypeal setae, the genital papilla, and the dorso-distal seta of antenna III of the male are similar or identical. It differs from the other species by its colour (yellow with blue instead of

colourless with grey or yellow), its male clypeal setae (9 short spines on a protuberance instead of 4 - 5 strong ones), and its formula of flank setae (4/- instead of 5/-). For further comments see Remarks under *H. putoranae* n. sp.

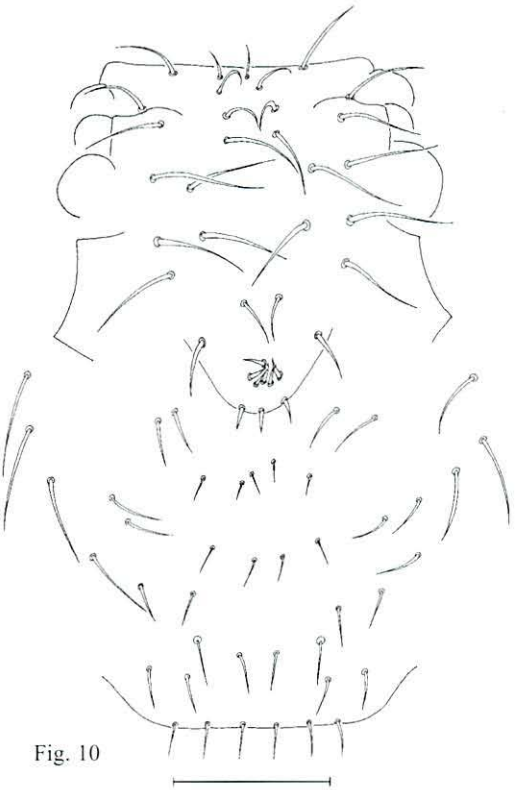


Fig. 10

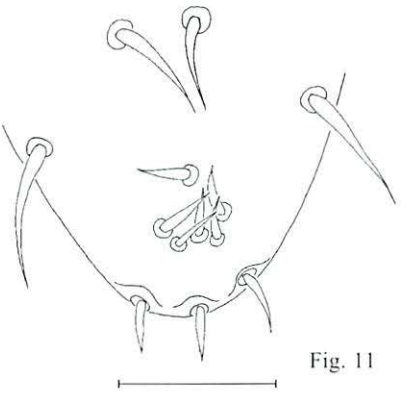


Fig. 11

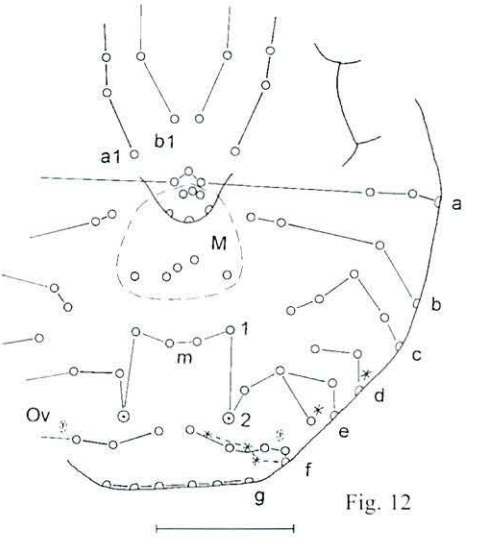


Fig. 12

Heterosminthurus umbonicus n. sp.

Fig. 10 Male, frons and clypeus of head (bar = 50 µm)

Fig. 11 Male, setae of clypeal protuberance (bar = 20 µm)

Fig. 12 Male, chaetotaxy of head (bar = 50 µm)

Heterosminthurus Stach, 1955 spec. A

Material: Russia: (W Taimyr) sample 39: 2 juv. males, 1 juv. female.

Eye-patches black, background colour pale with only antennal segment IV slightly pigmented. In juv. female, genital papilla without any seta; circumanal seta av5, the future appendices anales, already thicker than others; inner setae of dentes longer than in juv. males; flank setae of one side 5/+. In juv. males, genital papillae only slightly protruding with 1 or about 4 setae respectively; head apex and frons with 2 - 3 long setae, thorax with 9 - 10 pairs of conical spines, clypeus and antennae with normal setae; inner setae of dentes short.

Remarks: 1. The poorly developed genital papillae of these slide specimens show that all three are juveniles. 2. The inner setae of dentes are stronger in the female than in the males, which may mean that they belong to two different species. 3. The modified setae of head and thorax of the juv. males are singular, because it has been generally observed that only the adult male has special setae. 4. The species cannot be identified until adults with fully developed genital papilla are known (the males may belong to *H. multiornatus* Bretfeld & Zöllner, 2000). The habitat of these specimens is not known.

Heterosminthurus Stach, 1955 spec. B

Material: Russia: (Yakutia) sample 75: 5 females.

Eye-patches black, background colour yellow with some brown pigment in 1+1 stripes on head behind the eye-patches and on thorax, tip of abdominal segment VI with a dark spot; antennae pigmented, legs and furca unpigmented.

Ventral head-back with 1+1 oval organs. Formula of flank setae 4 and 5/+. Ventral circumanal setae with 2 short ones (av1', av1); appendices anales slender, pointed, with small teeth (Fig. 13). Tibiotarsus I row p with 6 setae, tibiotarsi I + II without seta Jp, III with Jp; claws without teeth. Inner setae of dentes ≥ diameter of dens.

Remarks: These females cannot be identified to species level. A new species, however, is not stated as the colour pattern is not very distinct and may vary as in other species, and because the corresponding males should be known. These specimens were found on moist moss and *Carex* at 1500 m altitude.

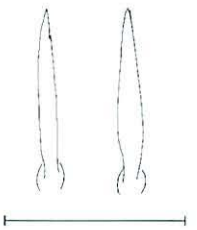


Fig. 13

Heterosminthurus spec. B.

Fig. 13 Female, two different appendices anales (bar = 50 µm)

Heterosminthurus Stach, 1955 spec. C

Material: Russia: (E Taimyr) sample 40: 1 juv.

Eye-patches black, head and body yellow without any pigmental pattern or other species specific characteristics. This juvenile was found in a sedge and moss bog.

Kaszabellina minima Betsch, 1977

Material: Russia: (Tuva) sample 22: 4 females, 29: 5 males, 10 females.

Yellow with a few grey-blue or brown spots and tints on head and large abdomen, antennae grey or brown, chaetotaxy as originally described.

K. minima was found here in steppe vegetations up to 900 m altitude. It is known from Mongolia, i. e. it has now been recorded from adjacent northern landscapes.

Sminthurides aquaticus (Bourlet, 1842)

Material: Russia: (Kanin Peninsula) sample 6: 1 male, 4 females.

Antennae and mucrones of both sexes as usually described.

S. aquaticus was found here under stones of a river bank. This Holarctic species is already known from N and E Russia (mouth of Ob River, W Taimyr, Chukotski Peninsula), (STEBAEVA 1976).

Sminthurides inaequalis Börner, 1903

(= *Sminthurides sexoculatus* Betsch & Massoud, 1970 n. syn.)

Among the *Sminthuridida* of the Putorana Plateau, numerous specimens with a striking colour pattern (Fig. 14) have been identified as *Sminthurides inaequalis* because of their mucro and their male antennae. A distinct setal difference, however, is best considered in separating the Siberian specimens (and those of a population from Norway, Spitsbergen) as a new subspecies.

In order to verify this determination, I first believed that I had found *Sminthurides cruciatus* Axelson, 1905, I studied some original material. The new subspecies and the original specimens are described in the following (see also Table 2).

Sminthurides inaequalis inaequalis Börner, 1903

Material: 3 males, 10 females, 1 juv. (alc. and slides, in coll. Dallai) from S Italy, island of Stromboli, 26. and 28.III.1971 leg. Dallai (see DALLAI 1973).

Since the type is no longer present in coll. Börner (SCHULZ, Görlitz, pers. comm.) and since this species was only briefly described by Börner based on one female from the botanical garden of Palermo, Sicily, Italy, the specimens from Stromboli are the first described in detail (DALLAI 1973) and may represent members of the nominate subspecies as they were collected near Sicily.

The description by Dallai is confirmed and supplemented with the following observations (compare Table 2): In both sexes, eye-patches with 6+6 distinct ommatidia; claws with small, basal, lateral teeth. In female, large abdomen with dorso-posterior setae about 2x longer than inner edge of claw III; antennal segment III with 1 long ventral seta (length > diameter of segment), antennal segment IV with 5 subsegments and partially with intermediate annulations. In male, antennal segment II with modified setae b1 - b6, b2 as a thick, pointed seta (see Fig. 15), and with a short spinelike seta behind b6 (nomenclature of these setae altered according to BRETFELD (1999) in that b2 always is the most anterior one near b1); antennal segment IV with 4 - 5 more or less blunt basal setae directed proximally; trochanter II with inner seta 3 as a short spine (see Fig. 16); femur II and tibiotarsus II only with normal setae.

Sminthurides inaequalis armatus n. ssp.

Holotype: Male (no. 2, bleached, 2 slides, in coll. Bretfeld) from sample 51: Russia, Krasnoyarsk Reg., Putorana Plateau S of Taimyr Peninsula, Dynkenda Mts., near Lake Ytkyuel (Sobachye), about 69°N - 92°E; pitfall traps in a nival desert at 850 m altitude; 25.VII. - 13.VIII.1996 leg. Babenko (no. R62/96), coll. Bretfeld no. Ba III T11.

Paratypes: About 150 specimens (alc. and slides, in coll. Bretfeld) together with the holotype. - About 100 specimens from sample 50. - 17 from sample 52. - 13 from sample 53. - 7 from sample 54. - 18 from sample 56 (all Russia, Putorana Plateau, alc. and slides, in coll. Babenko and coll. Bretfeld).

Further material: 1 female (alc., shrunk, in coll. Bretfeld) of sample 46 (Russia, Putorana Plateau). - 1 male, 1 female (one slide, in coll. Babenko) of sample 42 (Russia, Servernaya Zelmya). - Several hundreds of specimens (alc. and slides, in coll. Bretfeld) from Norway, Spitsbergen, NE of Hangen, 17.VIII.1968 leg. Hinz, det. Sick, coll. Bretfeld no. 1082-044.

Derivatio nominis: This new subspecies is named after the discriminating characteristic, the spine of male tibiotarsus II.

Diagnosis: A subspecies of *Sminthurides inaequalis* Börner, 1903 with one diagnostic apomorphy:

– In male, tibiotarsus II seta IVpe in form of a thick spine (plesiomorphy: normal seta).

Other characteristics: In female, antennal segments III and IV with some long ventral setae, antennal segment IV entire or more or less subsegmented.

Description: Mainly the differences from the nominate subspecies are noted.

Measurements: Total length of female up to 0.5 mm, male 0.35 mm.

Colour: Eye-patches black. Background colour reddish white with red violet or dark violet pigment: In the population from Spitsbergen, large abdomen more or less reddish blue to blackish violet in females, always without any distinct pattern. In the types from Putorana Plateau (Fig. 14), large abdomen more or less reddish or dark pigmented, anterior part with 1 - 3 pairs of pale cross-patches, median line dark, posterior part with 1 or 2 pairs of pale longitudinal stripes; middle part of lateral sides with 1+1 pale spots in connection with the lateral stripe or with the posterior pair of dorsal patches; small abdomen more or less pigmented or pale; antennae dark, legs slightly pigmented, furca unpigmented; males

often more reddish than females with similar but less intense pattern, dorso-anterior part of large abdomen only with thin cross-lines but median line pigmented.

Chaetotaxy and special structures (according to both sexes and both populations of Siberia and Spitsbergen, if not otherwise noted, see Tab. 2).

Tab. 2 Comparison of different populations of *Sminthurides inaequalis*

	Stromboli	**Brunoy**	**Putorana Plateau**	**Spitsbergen**
Colour	more or less blue violet	violet with pale spots	red violet, dorsal pattern	red or dark violet
Female ant. IV	subsegmented	subsegmented	entire	sligthly subsegmented
Female ant. III + IV setae	1 long ventral + normal	some long ventral	long ventral	long ventral
Male ant. II seta b2	pointed	blunt	pointed	blunt
Male ant. II seta behind b6	spiny	thin	thin	thin
Male ant. III small elements	2 slender	2 slender	2 slender	2 slender
Male ant. IV blunt basal setae	4-5	3-4	3-4	3-4
Male setae troch. II modified	1	2	1	1
Male setae femur II modified	--	1	1	1
Male spine tibiot. II	--	--	+	+
Mucro slender, inner edge toothed, tip smooth	+	+	+	+

Antennae: In female, all setae longer in Spitsbergen than in Siberia; segment III and IV with 2 and 3 long ventral setae respectively, other setae also quite long (ratio of length of ventral setae to diameter of segment = in segment II > diameter, III up to > 2x diameter); segment IV entire and without annulations in Putorana Plateau, slightly subsegmented and some annulations visible in Spitsbergen, subsegmented and with intermediate annulations in Servernaya Zelmya. In male, segment II with seta b2 pointed or forked in Putorana Plateau and blunt in Servernaya Zelmya and Spitsbergen (Fig. 15), with a thin and short seta behind seta b6; segment III with 2 slender, intermediate elements; segment IV with 3 - 4 more or less blunt basal setae directed proximally and 2 - 3 thick, blunt ventro-distal sensilla.

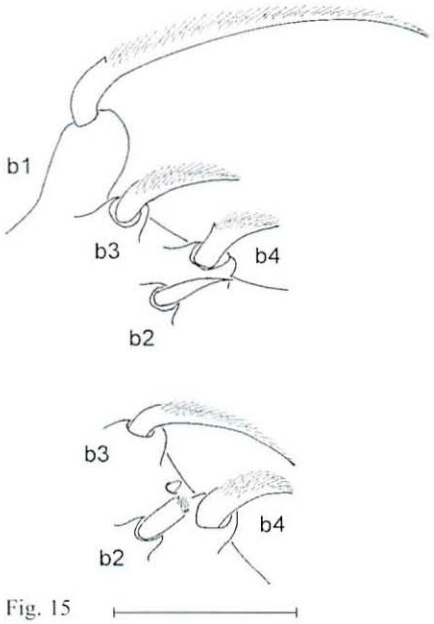


Fig. 15

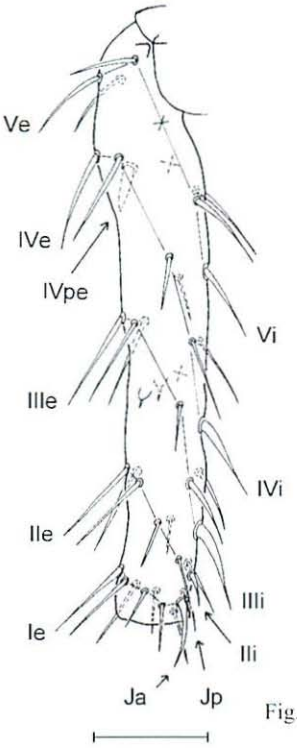


Fig. 17

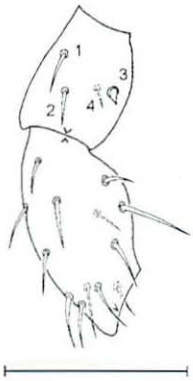


Fig. 16

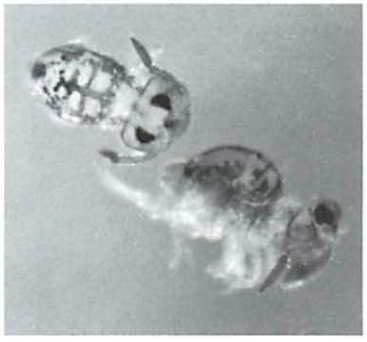


Fig. 14

Sminthurides inaequalis armatus n. ssp.

Fig. 14 Colour pattern of Siberian population, total lengths without furca about 0.3 and 0.4 mm

Fig. 15 Male, part of antennal segment II, above Siberian population, below population of Spitsbergen (bar = 20 µm)

Fig. 16 Male, trochanter and femur of leg II seen from anterior (bar = 50 µm)

Fig. 17 Male, tibiotarsus of leg II seen from anterior (bar = 25 µm)

Legs: Claws without a tunica. In male, leg II with some modified setae, trochanter with inner seta 3 as a short spine or point (Fig. 16), femur with one basal inner seta spinelike (Fig. 16), tibiotarsus seta IVpe as a thick spine (Fig. 17) (in Putorana Plateau only 1 of 11 males studied with a normal but long and thick setae IVpe, in Spitsbergen all tibiotarsal setae longer and thicker than in Siberia and spine IVpe broader).

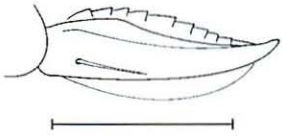
Furca: Inner posterior edge of mucro always with small teeth, without a seta in Putorana Plateau, but seta present in Servernaya Zemlya and Spitsbergen.

Remarks: This new subspecies was found in the low vegetation of meadows, wet tundra, *Dryas* associations, and nival deserts at 550 - 850 m altitude.

The original material studied additionally is commented on in the following.

1. *Sminthurides sexoculatus* Betsch & Massoud, 1970. - Material: 1 male and 1 female (one slide, in coll. Brunoy) labelled »*Sminthurides sexoculatus*, Types, entiers, Parc Gd. Château, Brunoy, Alleé, 25-IV-65« and 1 male (dissected, 5 slides, in coll. Brunoy) labelled »*Sminthurides sexoculatus*, B. J. Br. 68, 1«. - The original description is confirmed and supplemented with the following observations (see Table 2): In female, antennal segments III and IV with some ventral setae longer than others, subsegments of segment IV not distinct but some intermediate annulations present. In male, antennal segment II with one short and thin seta behind element b6; in leg II, trochanter with 2 modified setae 2 and 3, femur with one modified seta, tibiotarsus with a normal seta IVpe. - These observations result in the suggested synonymy, as the main species specific characteristics, the mucro and the male antennae, are the same. This population of Brunoy, near Paris, France, has a normal seta IVpe of tibiotarsus III and thus belongs to the nominate subspecies.
2. *Sminthurides cruciatus* Axelson, 1905. - The comparison with this species shall only be briefly mentioned here since there are too many details. I was able to study all the types from Museum Helsinki (see VILKAMAA 1988; 1 male was newly found in the original alcohol material), the specimens from coll. Stach, Kraków, (see STACH 1956) and one female of coll. Szeptycki, Kraków. - In summary, the descriptions of LINNANIEMI (1912) and STACH (1956) are confirmed: in particular in both sexes the form of mucro (Fig. 18); in female, the short antennae and short dorsal setae of large abdomen (length of shortest setae < 1/2 claw III inner edge); in male, the structure of antennal segment II (with b1 - b6, b2 - b4 and b5 - b6 near to each other respectively, b5 as a short spine), segment III (with a smooth blister and c2 near c3), and segment IV (3 thick, pointed or blunt basal setae directed proximally). The antennal segment II of the female, which was described by STACH (1956) as being as short and round as segment I and bearing 2 long and strong dorsal setae, cannot be observed with certainty. It seems that this structure belongs to the subadult male, whereas the female has a more slender segment II with the long setae not as distinctly differentiated as in Stach's figure. A new observation is that in the male femur II has an inner spine (Fig. 19) and seta IVpe of tibiotarsus II is long and strong but of normal shape.

Fig. 18



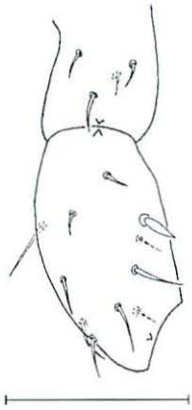


Fig. 19

Sminthurides cruciatus

Fig. 18 Mucro seen from lateral, outer edge smooth, inner serrate (bar = 50 µm)

Fig. 19 Male, trochanter and femur of leg II seen from anterior (bar = 50 µm)

In conclusion, the comparison of the above-mentioned populations of *Sminthurides inaequalis* and of *S. sexoculatus* and *S. cruciatus* show that:

1. The specimens from Siberia with their striking colour pattern do not belong to *S. cruciatus* since especially the male antennae differ clearly.
2. *Sminthurides sexoculatus* is a synonym of *Sminthurides inaequalis* since the male antennae are identical, especially in the slender elements of segment III, although there are small differences (Table 2).
3. The northern populations of *Sminthurides inaequalis*, which are separated from the others as a new subspecies *S. inaequalis armatus*, are characterised, in the males, by their thick spine IVpe of tibiotarsus II.
4. In the populations of *Sminthurides inaequalis* studied, and may be in other *Sminthurides* species too, the colour pattern, the subsegmentation of female antennal segment IV, the mucronal seta, and the tunica of the claws are no constant features; they must always be considered together with other characteristics.
5. The best species specific characteristics in the genus *Sminthurides* Börner, 1900 seem to be the mucro and the male antennae, slight setal differences in different population remain, however, to be expected.
6. It has been a unique opportunity to study these populations of *Sminthurides* inaequalis from so long distances, from S Italy to Spitsbergen and N Siberia. Constant and varying features within one species thus have been distinguished.

Sminthurides malmgreni (Tullberg, 1876)

Material: Russia: (Putorana Plateau) sample 44: 300 specimens, 49: 12 female and juv., 50: 50 specimens, 51: 30, 54: 10, 55: 150, 56: 55, 60: 200, 62: 4 females.

Antennae and mucrones of both sexes as usually described.

S. malmgreni was found here in the low vegetation and on the soil of mainly wet habitats from 100 m up to 800 m altitude; the highest number of specimens was found in moss. This Holarctic species is already known from N Russia (Novaya Zemlya, Taimyr, Lena Delta), (ANANJEVA et al. 1987, BABENKO & BULAVINTSEV 1993, BRETFELD & ZÖLLNER 2000).

Sminthurides parvulus (Krausbauer, 1898)

Material: Russia: (W Taimyr) sample 37: 1 male.

Antennae and gutterlike mucro as usually described.

S. parvulus was found here in the low vegetation of a river slope. This is the second record of this species from the E Palaearctic; it is known as a not frequent species from Europe and in one female from the Lena Delta (BRETFELD & ZÖLLNER 2000).

Sminthurides schoetti Axelson, 1903

Material: Russia: (Putorana Plateau) sample 44: 10 specimens, 54: 10, 55: 50, 60: 150.

Antennae and trough-shaped mucro as usually described.

S. schoetti was found here in the low vegetation and on the soil of mainly wet habitats from 600 - 700 m altitude. This Palaearctic species is already known from N and E Russia (Tomsk, Novaya Zemlya, W Taimyr, Lena Delta, Chukotski Peninsula, Tuva), (STEBAEVA 1976, BABENKO & BULAVINTSEV 1993, BRETFELD & ZÖLLNER 2000).

Sminthurinus alpinus Gisin, 1953

Material: Russia: (Tuva) sample 34: 2 specimens; (Putorana Plateau) 54: 3, 55: 9, 57: 14, 58: 4, 59: 2, 60: 18.

Chaetotaxy of dentes as originally described.

S. alpinus was found here in the low vegetation and on the soil of mainly open habitats, in the Putorana Plateau above 600 m and in the Tuva Reg. at 2000 m altitude. It is already known from N Russia (Novaya Zemlya, Taimyr), (BABENKO & BULAVINTSEV 1993); in the W Palaearctic it occurs mainly in mountains in wet and dry habitats up to 1400 m altitude.

Sminthurinus aureus var. ochropus (Reuter, 1892)

Material: Kirghizia: (Turkestanskiy Range) sample 91: 5 specimens.

Colour dark brown, dentes with chaetotaxy of *aureus*-group.

S. aureus was found here in a herbaceous meadow at 1700 m altitude. This Palaearctic species is already known from SE Russia (Irkutsk Reg.), (BRETFELD 1996).

Sminthurinus elegans (Fitch, 1863)

Material: Russia: (Novosibirsk) sample 11: 1 juv. Kirghizia: (Turkestanskiy Range) sample 91: 3 specimens.

Dark longitudinal stripes, dentes with chaetotaxy of *aureus*-group.

S. elegans was found here in meadows up to 1700 m altitude. These are the first records of this Holarctic species from the E Palaearctic.

Sminthurinus hygrophilus n. sp.

Holotype: Female (no. 1, bleached, 3 slides, in coll. Bretfeld) of sample 90: Kirghizia, northern spurs of Alaiskiy Range, Kek-Suu River, 39°41'N - 71°36'E; wet stones with mosses under waterfall at 3400 m altitude; 2.VIII.1998 leg. Babenko (no. R6/98), coll. Bretfeld no. Ba IV T8.

Paratypes: 11 specimens (alc. and slides, in coll. Babenko and coll. Bretfeld), together with the holotype.

Derivatio nominis: This new species is named after the wet habitat of its type locality.

Diagnosis: A dark species of the *niger*-group of the genus *Sminthurinus* Börner, 1901 with 3 diagnostic characteristics:

- Dens with 2 anterior subapical setae, posterior setae: 4 proximal (1 outer, 1 long median, 2 inner), and 2 outer and 3 median subapical setae,
- circumanal setae of female not winged (plesiomorphy, apomorphy: winged),
- posterior edges of mucro sparely serrate or smooth.

Other characteristics: Papilla of antennal segment III small, protruding, and undivided.

Description: Measurements and proportions (from 2 females): Total length up to 0.8 mm; head 0.28 mm (1 female); mucro 60 µm. Whole antenna : head length = 1.5; antennal segment I : II : III : IV = 1 : 2 : 2.6 : 5.1; mucro : dens : manubrium = 1 : 2.4 : 3.3; claw III outer edge : mucro = 0.6.

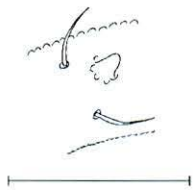


Fig. 20

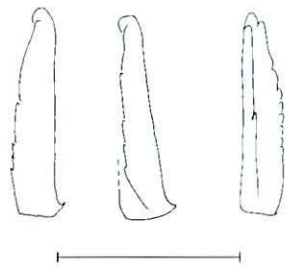


Fig. 21

Sminthurinus hygrophilus n. sp.

Fig. 20 Papilla of antennal segment III

Fig. 21 Mucro, left outer edge, middle inner edge, right inner edge serrate of another specimen (bar = 50 µm)

Colour: Eye-patches black; head and body blackish blue with some unpigmented spots and stripes: Head between antennae often pale and with 1+1 pale spots on inner sides of eye-patches; large abdomen sometimes with small pale spots, several specimens with narrow unpigmented crossband on anterior half, ventral side paler than dorsal; antennae dark, legs light blue, dentes unpigmented.

Chaetotaxy and special structures: Each eye-patch with 2 setae. Antennal segment III with a small, simple, and protruding papilla (Fig. 20). In female, circumanal seta a0 forked, others of normal form and not winged; appendices anales split into about 6 branches. Tibiotarsi each with 5 spatulate setae; claws with 3 inner teeth; empodium I with long

filament, II and III with short, each filament shorter than claw. Dens with 2 anterior subapical setae, posterior setae: 4 proximal (1 outer, 1 long median, 2 inner), and 2 outer and 3 median subapical setae; posterior edges of mucro sparely serrate or smooth (Fig. 21).

Remarks: The chaetotaxy of the dentes of *Sminthurinus hygrophilus* is the same as in the species *S. gisini* Gama, 1965, *S. orientalis* Stach, 1964, and *S. pekinensis* Stach, 1964. The new species resembles *S. orientalis* most since this species also has simple, not winged circumanal setae. *Sminthurinus hygrophilus* differs from that species by its colour (dark instead of only dark lateral band), by the papilla of antennal segment III (small and undivided instead of broad and divided into four), by the spatulate setae of tibiotarsi (each with 5 instead of 3), and by the mucro (posterior edges sparely serrate or smooth instead of inner edge with fine distinct teeth).

Sminthurinus cf. *pallescens* Yosii, 1970

Material: Russia: (Khakasia) sample 14: 1 female.

Dens, mucro, and antenna III as originally described; other features differ: colour blue instead of brown, claws with 2 small inner teeth instead of 1 large tooth, circumanal setae slightly broadened instead of not winged. The identification, thus, is not certain.

This female was found here in meadow litter near a lake slope. *S. pallescens* is only known from Japan, Kyoto.

Sminthurinus reticulatus Cassagnau, 1964

Material: Georgia: (Sukhumi) sample 81: 1 specimen.

Dark cross and longitudinal stripes, dentes with chaetotaxy of *aureus*-group.

S. reticulatus was found here on a tobacco plantation. This is the first record of this W European species from SE Europe.

Sminthurinus Börner, 1901 spec. A

Material: Russia: (Khakasia) sample 19: 2 males.

Total lengths 0.35 and 0.45 mm. Eye-patches black, background colour pale, large abdomen with 1+1 broad, blue, longitudinal bands (Fig. 22) which include the eye-patches and are joined by cross bands on head frons and on anterior and posterior parts of large abdomen, small abdomen unpigmented; antennae dark, legs and furca unpigmented.

Papilla of antennal segment III with 4 low lobes (Fig. 23). Spatulate setae of tibiotarsi, also teeth and tunica of the slender claws (Fig. 24) not observed with certainty. Dentes (Fig. 25) with 2 anterior subapical setae, posterior setae: 3 proximal, and 3 outer and 3 median subapical setae; inner posterior edge of mucro distinctly serrate, outer smooth or with few small teeth (Fig. 26).

Remarks: These two slide males resemble *S. speciosus* Yosii, 1970 from Japan, although in that species the papilla of antenna III is undivided, the claws each have a large tunica, and the dens has 4 proximal setae on posterior side. Thus these specimens seem to belong to a new species of the *niger*-group which, however, is not named here since the characteristics of adult females should be known to complete the description.

These specimens were found on a wet meadow at 1100 m altitude.

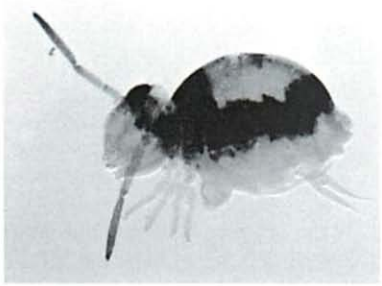


Fig. 22

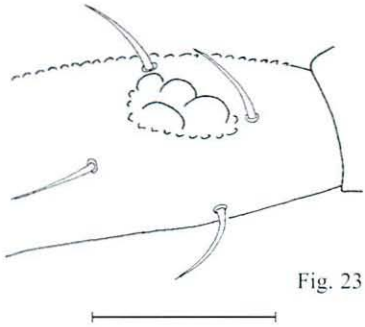


Fig. 23

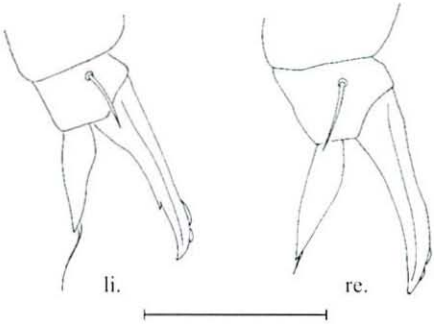


Fig. 24

Fig. 25

Fig. 26

Sminthurinus spec. A.

Fig. 22 Colour pattern, total length without antennae 0.45 mm

Fig. 23 Papillae of antennal segment III (bar = 20 µm)

Fig. 24 Claw and empodium I left, III right (bar = 20 µm)

Fig. 25 Dens seen from posterior (bar = 50 µm)

Fig. 26 Mucro with inner edge serrate (bar = 20 µm)

Sminthurinus Börner, 1901 spec. B

Material: Ukraine (Donetsk) sample 97: 1 juvenile.

Very small, general dark blue pigment, chaetotaxy of dentes (incomplete in juvenile): 2 anterior subapical setae, posterior setae: 3 proximal, 1 outer, 2 median subapical setae.

I was not able to identify this specimen, which was found on a stony steppe.

Sminthurus Latreille, 1802

The following descriptions of the *Sminthurus* species refer to the author's previous papers and to NAYROLLES (1988, 1990a, b, 1995), CHRISTIANSEN & BELLINGER (1998), and SNIDER (1985) (see Tab. 3).

Tab. 3 Comparison of terminology of main diagnostic setae of *Sminthurus* (– means no special term)

BRETFELD in this and previous papers	NAYROLLES 1988, 1990a, b, 1995	CHRISTIANSEN & BELLINGER 1998, SNIDER 1985
Abd V A1	p of abd. V	p of bothriothrix D complex
Abd V A2	abd. V dn	dn of bothriothrix D complex
Subcoxa III	SA3	--
Femur III p4	(FE3)ai5	--
Tibiotarsus III Vi	Vi	L6
Tibiotarsus III p5	(TI3)3p	PL4
Tibiotarsus III p7	(TI3)4p1	PL6
Ventral tube 1 or 2 pairs	--	--
Dens J7	(DE)V1pi	L7
Dens P5	(DE)3p	JD acc.

Sminthurus denticulatus n. sp.

Holotype: Female (unbleached, 4 slides, in coll. Bretfeld) of sample 48: Russia, Krasnoyarsk Reg., Putorana Plateau S of Taimyr Peninsula, Dynkenda Mts., near Lake Ytkyuel (Sobachye), about 69°N - 92°E; on tent in a dry *Dryas* plant association; 8.VIII.1996 leg. Babenko (no. R43/96), coll. Bretfeld no. Ba III T8.

Paratypes: 7 males, 2 juv. of sample 48. - 1 female, 1 juv. of sample 54. - 2 females of sample 57. - 9 specimens of sample 65 (all Russia, Putorana Plateau, leg. Babenko). Deposition: All specimens of sample 65 (alc.) in coll. Babenko. - 6 males and juv. (alc.) together with the holotype and all other specimens (alc. and slides) in coll. Bretfeld.

Derivatio nominis: This new species is named after its serrate mucrones.

Diagnosis: A mainly pale species of the genus *Sminthurus* Latreille, 1802 with 5 diagnostic apomorphies:

- Mucro with both posterior edges coarsely serrate (plesiomorphy: both edges smooth),
- abdominal segment V with 2+2 setae above bothriotrichia D (plesiom.: with only 1+1 setae),
- upper setal pair of abdominal segment V short and ciliate (plesiom.: long and smooth),
- subcoxa III with 2 distal setae (plesiom.: one distal seta),
- ventral tube with 2+2 setae (plesiom.: one pair of setae).

Other characteristics: Posterior part of large abdomen with grey to black pigment; postantennal setae long and acuminate; tunica of claws missing or small; appendices anales short and ciliate.

Description: Measurements and proportions (from 2 females and 1 male): Total female up to 1.7 mm, male 1.4 mm; head in female 0.62 mm, in male 0.47 mm; mucro in female 125 µm, in male 100 µm; appendices anales 48 µm. Whole antenna : head length = 2.2 in both sexes; antennal segment I : II : III : IV = 1 : 2 : 2.8 : 7 (7.3) in female (and male); dens : mucro = 3.5 in both sexes; app. an. : mucro = 0.4.

Colour: Eye-patches black; background colour whitish yellow; brown, grey, or black pigment mainly in antennae and on lateral and dorsal sides of posterior part of large abdomen including segment V, abdominal segment VI without pigment; darkest specimens also with grey shades on head; legs and furca always unpigmented.

Chaetotaxy and special structures (according to both sexes if not otherwise stated): Head: Postantennal setae long, acuminate, and ciliate (Fig. 27).

Antennae: Segment II with 4 short ventral setae; segment III with 5 long setae of proximal part; segment IV with 4 setae of basal whirl and 22 subsegments.

Large abdomen: Ratio of length of dorsal setae to mucro = 1.7 - 2.2.

Small abdomen: Segment V with 2+2 setae (A1 and A2) above bothriotrichia D, dorsal pair A1 short, acuminate, and ciliate. Segment VI with ratio of dorsal setae to mucro = 1.25. Appendices anales (Fig. 28) shorter than half of mucro, pointed, and one edge distally ciliate.

Legs: Subcoxa III with 2 distal setae. Femur III with antero-proximal seta p4. Tibiotarsus III seta Vi of normal shape, row p with 7 setae (seta p8 missing). Claws (Fig. 29) in male broader than in female, all with inner and outer tooth and lateral pseudonychia, tunica missing; empodia I without, II and III with outer tooth, length of filaments decreasing from empodium I to III, total length of empodia thus ranging from ≤ to < claw (Fig. 29).

Retinaculum: 4 setae. Ventral tube: 2+2 setae.

Furca: Dens row J with 7 setae, row P with additional seta P5, formula of anterior setae 3,3,3,2,2,1,1; both posterior edges of mucro with 9 - 13 teeth, seta present and length 0.3 - 0.4 of mucro (Fig. 30).

Remarks: There are in the Palaearctic 6 *Sminthurus* species with mucronal teeth; besides the different pigmentation, the differences from *Sminthurus denticulatus* are: *S. melanonotus* Uchida, 1938 has the outer mucronal edge smooth and 2 knobbed setae on posterior side of dens, *S. abei* Yoshii, 1992 and *S. serrulatus* Börner, 1909 have long mucronal setae (length = mucro), *S. ghilarovi* Stebaeva,

1966 has claws with a distinct tunica, *S. serratomucronatus* Grinbergs, 1962 has a mucro with many small teeth, and *S. cogsonzavi* Betsch, 1977 has distally serrate appendices anales.

This new species appears in the key in CHRISTIANSEN & BELLINGER (1998) at entry 25' with an undescribed species B which has claws with a tunica and 18 subsegments of antennal segment IV.

These comparisons show, that *Sminthurus denticulatus* clearly differs from all other known species of the Holarctic.

This new species was found in dry plant associations with *Dryas* and *Festuca*, and on wet stones.

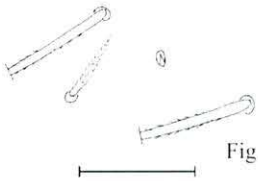


Fig. 27

Fig. 28

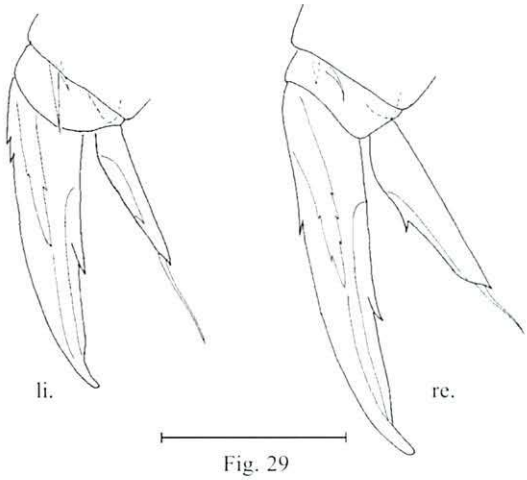


Fig. 29

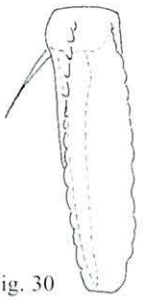


Fig. 30

Sminthurus denticulatus n. sp.

Fig. 27 Postantennal seta with accompanying oval organ and normal setae (bar = 50 µm)

Fig. 28 Female appendices anales (bar = 50 µm)

Fig. 29 Female, claw and empodium I left, III right (bar = 50 µm)

Fig. 30 Mucro seen from posterior (bar = 50 µm)

Sminthurus multipunctatus Schäffer, 1896

Material: Russia: (Novosibirsk) sample 13: 10 specimens. Ukraine: (Donetsk) sample 97: 2 specimens, 99: 2.

Subcoxa III with 2 distal setae, femora II and III each with an antero-proximal seta, ventral tube with 1 pair of setae, abdominal segment V with 1 pair of setae above bothriotrichia D; appendices anales bandlike and often toothed, ratio to mucro ≤ 1/2; colour varies.

S. multipunctatus was found here in a grassy meadow and on a stony steppe; it has mainly been recorded from Europe but is already known from N and SE Russia (W Taimyr, Lena Delta, Novosibirsk Reg.), (STEBAEVA 1976, BRETFELD & ZÖLLNER 2000).

Sminthurus nigrinus n. sp.

Holotype: Female (bleached, 4 slides, in coll. Bretfeld) of sample 95: the Ukraine, Nikolayev (Mykolayiv) Reg., Pervomaysk distr., near Kuripchyne; Romaniv ravine; sweepnet sample on herbs (*Anthriscus sylvestris*) in deciduous forest with *Ulmus carpinifolia* and *Tilia cordata* on right bank of Bough River; 7.XI.1996 leg. Tarashchuk no. M-K/96/235, coll. Bretfeld no. Ta I 9.

Paratypes: 2 specimens of sample 93, 12 of sample 94, 8 of sample 95 (all the Ukraine, Nikolayev, leg. Tarashchuk). - 3 specimens of sample 97, 12 of sample 98, 9 of sample 99 (all the Ukraine, Donetsk, leg. Bondarenko and Starostenko). - Deposition: All specimens (alc. and slides) in coll. Bretfeld.

Derivatio nominis: This new species is named after its dark body pigment.

Diagnosis: A dark species of the genus *Sminthurus* Latreille, 1802 with 3 diagnostic apomorphies:

- Tibiotarsi with 1 - 3 thick and blunt inner setae (plesiomorphy: setae slender and acuminate),
- subcoxa III with 2 distal setae (plesiom.: one distal seta),
- ventral tube with 2+2 setae (plesiom.: one pair of setae).

Other characteristics: Head and body with dark pigment and many unpigmented spots; postantennal setae short; tunica of claws missing; appendices anales short and toothed; mucronal edges smooth.

Description: Only two adults were present in the collections, one shrunken female (alc., prepared as the holotype) and one male (slide). Measurements and proportions (from female): Length of head 0.65 mm; mucro 155 µm; appendices anales 48 µm. Whole antenna : head length = 1.8; antennal segment I : II : III : IV = 1 : 2 : 3 : 6.5; dens : mucro = 2.7; app. an. : mucro = 0.3.

Colour (Fig. 31) : Eye-patches black; background colour yellow with more or less intense brown to black pigment on the whole surface except large pale spots on dorsal parts of head and small spots on lateral and dorsal sides of large abdomen (dorso-anterior part with cross rows, posterior with longitudinal rows, lateral with irregular pattern); abdominal segments V and VI with 1+1 unpigmented dorsal spots each; antennal segments I - III, tibiotarsi, and dentes without dark pigment.

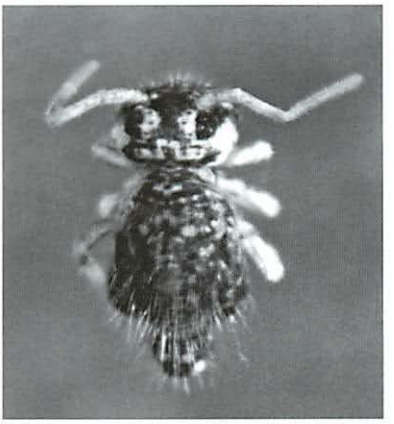


Fig. 31

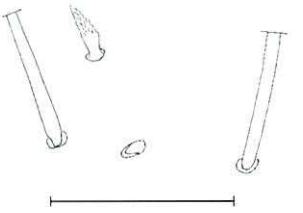


Fig. 32

Fig. 33

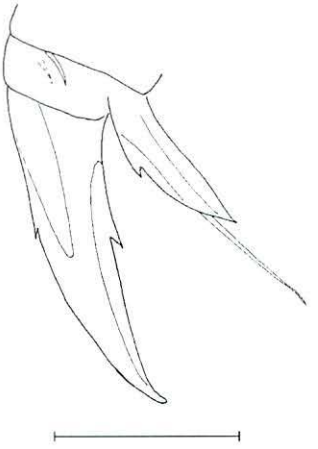


Fig. 35

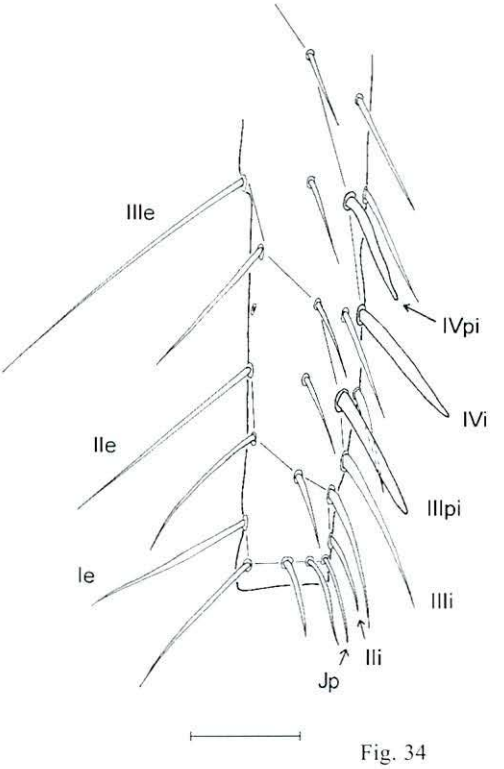


Fig. 34

Sminthurus nigrinus n. sp.

Fig. 31 Juvenile, colour pattern, total length about 0.7 mm

Fig. 32 Postantennal seta with accompanying oval organ and normal setae (bar = 50 µm)

Fig. 33 Female appendix analis, outer edge with more teeth than inner (bar = 50 µm)

Fig. 34 Tibiotarsus III, distal part seen from posterior (bar = 50 µm)

Fig. 35 Claw and empodium II (bar = 50 µm)

Chaetotaxy and special structures (according to both sexes if not otherwise stated): Head: Setal pair 1 of dorsal head-back often blunt; postantennal setae short and pointed (Fig. 32).

Antennae: Segment II with 4 short ventral setae; segment III with 5 long setae of proximal part; segment IV with 4 setae of basal whirl and 19 subsegments.

Large abdomen: Dorsal setae rough and pointed; ratio of length of antero-dorsal setae to mucro = 1, of posterior setae up to 1.2 in female and 2.2. in male.

Small abdomen: Segment V with 1+1 setae above bothriotrichia D. Appendices anales (Fig. 33) bandlike, tip cut and with rough teeth, outer edge distally ciliate.

Legs: Subcoxa III with 2 distal setae. Femur III with antero-proximal seta p4. Tibiotarsi I - III in female with 1, 3, 3 thick and blunt inner setae respectively (Fig. 34), in male and juv. 1, 1, 1 - 2 (or 3) thick and blunt or pointed inner setae respectively. Tibiotarsus III seta Vi of normal shape, row p with 7 or 8 setae (seta p7 varying), outer setae long (in female in tibiotarsus I and II about 2.5 x diameter of tibiotarsus, in III 3 - 4 x). Claws (Fig. 35) with inner and outer tooth and moderately long pseudonychia, tunica missing; empodia I without, II and III with outer tooth, length of filaments increasing from empodium I to III, total length of empodia thus ranging from = to ≥ claw (Fig. 35).

Retinaculum: 4 setae. Ventral tube: 2+2 setae.

Furca: Dens row J with 7 setae, row P with additional seta P5, formula of anterior setae 3,3,3,2,2,1,1; both posterior edges of mucro smooth, seta present and length 0.3 of mucro.

Remarks: *Sminthurus nigrinus* appears in the key in BRETFELD (1999) near *S. nigromaculatus*, which differs in having claws with a large tunica and appendices anales longer than half of mucro. It appears in the key in CHRISTIANSEN & BELLINGER (1998) near *S. nigromaculatus* and *S. incisus* Snider, 1978, which both have claws with a large tunica.

Sminthurus nigrinus thus differs from all other known species by its dark pigment and the thick and blunt inner setae of the tibiotarsi.

This new species was found on grass (in both forest and flood-plain) and on a stony steppe.

Sminthurus nigromaculatus Tullberg, 1871

Material: Russia: (SE of Moscow) sample 1: 13 specimens; (Omsk) 8: 7, 9: 8; (Novosibirsk) 12: 12. Ukraine: (Nikolayev) sample 93: 6 specimens; (Donetsk) 97: 3, 98: 4, 99: 1.

Subcoxa III with 2 distal setae, femora II and III each with an antero-proximal seta, ventral tube with 2 pairs of setae, abdominal segment V with 1+1 of setae above bothriotrichia D; appendices anales smooth and slender, ratio to mucro ≥ 1/2; colour varies.

S. nigromaculatus was found here in meadows near forests or of flood-plains but also on a stony steppe. This Holarctic species occurs in the Palaearctic from the Arctic to N Africa.

Sminthurus orientalis n. sp.

Holotype: Female (no. 1, unbleached, 4 slides, in coll. Bretfeld) of sample 72: Russia, Yakutia Reg., E of Yana River Delta, Shirokostan Peninsula, near Lake Ledyanoe, 72°25'N - 141°E; sweepnet sample from tussock tundra with *Eriophorum vaginatum*; 4. - 6.VIII.1994 leg. Babenko no. R67/94, coll. Bretfeld no. Ba II T7.

Paratypes: 19 adults and large juveniles (alc. and slides, in coll. Babenko and coll. Bretfeld) together with the holotype. - 45 small and large juveniles (alc., in coll. Babenko) of sample 76, 5 small and large juveniles (alc. and slides, in coll. Bretfeld) of sample 77 (both Yakutia, leg. Babenko). - 1 female and 3 juveniles (alc. and slides, in coll. Bretfeld) of sample 80 (Magadan, leg. Babenko).

Further material: 4, 16, and 2 small juveniles (alc., in coll. Bretfeld) of samples 68 (Yakutia, leg. Potapov), 78 (Yakutia, leg. Babenko), and 79 (Magadan, leg. Babenko) respectively.

Derivatio nominis: This new species is named after its occurence in the far east of northern Russia.

Diagnosis: A large species of the genus *Sminthurus* Latreille, 1802 with 5 diagnostic characteristics:

- Abdominal segment V with dark cross stripes,
- abdominal segment V with 1+1 setae above bothriotrichia D (plesiomorphy),
- claws with a large tunica (apomorphy, plesiom.: without a tunica),
- subcoxa III with 2/1-2 distal setae,
- appendices anales short, slender, pointed, with small teeth (apomorphy, plesiom.: setalike).

Description: Measurements and proportions (from 6 females and 2 males): Total female up to 2.2 mm, male 1.6 mm; head in female 0.7 mm, in male 0.6 mm; mucro in female 180 µm; appendices anales 65 µm. Whole antenna : head length = 1.9 in female, 2.1 in male; antennal segment I : II : III : IV = 1 : 2 : 2.6 : 6 in female, 1 : 2.2 : 2.8 : 7 male; dens : mucro = 3 in both sexes; app. an. : mucro = 0.36.

Colour: Eye-patches black; background colour whitish yellow with green (mostly in small juv.) or reddish brown pigment (Fig. 36): head with shades and spots, in particular behind and between the eyes; anterior part of large abdomen pale or with median stripe and several cross stripes, posterior part more or less dark or with 1+1 or 3 more or less sharp longitudinal stripes, lateral sides with irregular spots; abdominal segment V with narrow, lateral and dorsal cross rows, segment VI more or less pigmented up to 1+1 pale eyes in darker surrounding; antennae dark, legs and furca slightly pigmented, subcoxae and coxae with shades or spots, without dark cross stripes.

Chaetotaxy and special structures (according to both sexes if not otherwise stated): Head: Postantennal setae quite short, pointed or blunt, and ciliate (Fig. 37).

Antennae: Segment II with 4 short ventral setae; segment III with 5 long setae of proximal part; segment IV with 4 setae of basal whirl and 19 - 21 subsegments.

Small abdomen: Segment V with 1+1 setae above bothriotrichia D. Appendices anales (Fig. 38) slender, pointed, smooth or with small teeth.

Legs: Subcoxa III with 2/1-2 distal setae. Femur III with antero-proximal seta p4, but up to 5 other anterior setae missing. Tibiotarsus III seta Vi of normal shape, row p with 7 - 8 setae (setae p5 present, p7 varying), length of outer setae up to 3x diameter of tibiotarsus. Claws (Fig. 39) with inner and outer tooth and lateral pseudonychia with coarse teeth (length 3/4 of claw), large tunica; empodia I without, II with 1 - 2, III with 1 - 3 outer teeth, total length of empodia always < claw (Fig. 39).

Retinaculum: 4 (3 - 6) setae. Ventral tube: 1 - 2 setal pairs.

Furca: Dens row J with 7 setae, row P with additional seta P5, formula of anterior setae 3,3,3,2,2,1,1; both posterior edges of mucro smooth or notched, seta present and length 1/3 of mucro.

Remarks: *Sminthurus orientalis* seemed to resemble *S. variegatus* but the pigmentation and antennal segment IV differ (see below). In the keys (BRETFELD 1999, CHRISTIANSEN & BELLINGER 1998), it appears near *S. nigromaculatus*, *viridis*, and *multipunctatus* since some important chaetotaxic characteristics vary (subcoxa III, ventral tube, tibiotarsus III row p). Thus, in addition to the colour pattern of the small abdomen, the rather short postantennal setae, the tunica of claws, and the short, pointed, and toothed appendices anales help to identify this new species.

This new species was found in meadows, wet tundra, and on sandy grounds.

When I studied the specimens described above, I first believed that I had found *S. variegatus* Tullberg, 1876 since the colour pattern seemed to be comparable, although the characteristics of the original description were not seen. Fortunately, the Swedish Museum in Stockholm has two specimens of *S. variegatus* which I was able to study. Specimen 1 is labelled »Jenisejexp. 76 [= 1876], Dudinskoje, determ. H. Schött«, specimen 2 »Colleg. Vegaexp., Nunamo«; (this was the famous Vega Expedition through the Northeast Passage in 1878 - 1880; Nunamo - now spelled Nunyamo - lies on the Bering Strait at 65°30'N - 170°44'W and was apparently visited on the 21.VII.1879); (KRONESTEDT, pers. comm., GARTING 1979: 128). I studied the two specimens with the stereomicroscope for they seemed to be too crumbly for a preparation, although they were only slightly damaged.

In summary, the characteristics of the original description are confirmed: Both are females, total length 3.6 (specimen 1) and 2.6 mm (specimen 2); blackish-brown pigment in spots on head and abdomen, posterior part of large abdomen darker than anterior part with 3+3 oblique lateral stripes and 1+1 longitudinal stripes or with median spots, small abdomen with dark lateral spots (specimen 1) or lateral cross stripes (specimen 2) (Fig. 40), dorso-median part of small abdomen with only small spots in setal bases or unpigmented respectively, subcoxae and coxae always with horizontal stripes. Antennal segment II only little shorter than III (ratio about 1 : 1.10 - 1.16), antennal segment IV with 27 - 28 subsegments, the distal ones narrower than the proximal. Claws and empodia narrow, claws without a tunica. Appendices anales long, slender, smooth, slightly curved, and pointed; ratio of app. an. : mucro = 0.46 and 0.4. Mucro slender, seta not observed; ratio of dens : mucro = 2.8 (specimen 1).

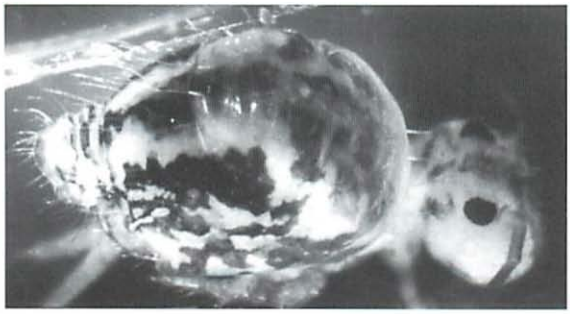


Fig. 36

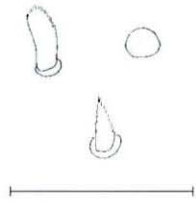


Fig. 37

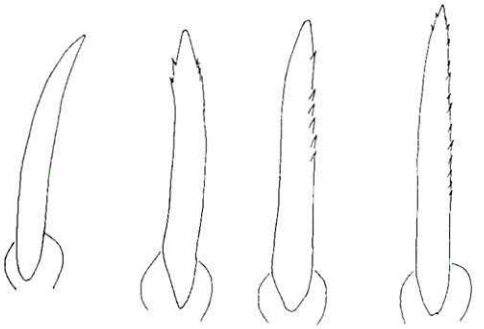


Fig. 38

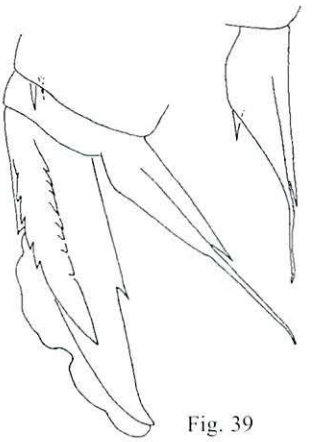


Fig. 39

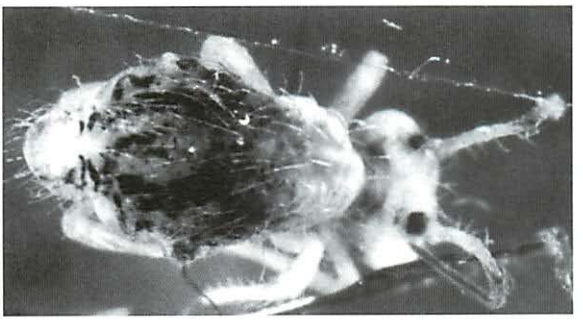


Fig. 40

Sminthurus orientalis n. sp.

Fig. 36 Colour pattern, total length about 2 mm

Fig. 37 Postantennal setae of different specimens and base of a normal seta (bar = 50 µm)

Fig. 38 Female, four different appendices anales, the right edges are the inner ones (bar = 50 µm)

Fig. 39 Claw and empodium I and empodium III (bar = 50 µm)

Sminthurus variegatus

Fig. 40 Colour pattern in particular of small abdomen, total length without antennae 2.6 mm

The following findings in particular are the same as described and figured by TULLBERG (1876): Body large (3 mm); spots and patches of dark brown to black pigment, dark stripes on subcoxae, coxae, and on lateral parts of small abdomen; antennal segment II and III of similar length, antennal segment IV with nearly 30 subsegments; mucro, claws, and empodia slender, claws without a tunica. None of these characteristics were found in *Sminthurus orientalis*, which therefore has to be described as a new species. A discussion of *S. variegatus* and other species, mainly *S. multipunctatus*, is given by LAWRENCE (1966), who also listed the geographical coordinates of the localities. They mostly lie between 83° - 86°E which is far more to the west than the records of *Sminthurus orientalis*. The locality »Nunamo« of specimen 2, however, does not fit into this range as it is situated far to the east (see above).

Sminthurus osmeryzskensis n. sp.

Holotype: Female (bleached, 4 slides, in coll. Bretfeld) of sample 85: Kazakhstan, Pavlodar Reg., 120 km NW of Pavlodar near Kachiry, Osmeryzsk; meadow of flood-plain of Irtysh River with *Agrostis*; 2.VII.1975 leg. Stebaeva no. 5, coll. Bretfeld no. St I 25/92.

No further specimen known.

Derivatio nominis: This new species is named after its type locality.

Diagnosis: A pale grey species of the genus *Sminthurus* Latreille, 1802 with 5 diagnostic apomorphies:

- Abdominal segment V with 2+2 setae above bothriotrichia D (plesiomorphy: with only 1+1 setae),
- upper setal pair of abdominal segment V short and ciliate (plesiom.: long and smooth),
- subcoxa III with 2 distal setae (plesiom.: one distal seta),
- ventral tube with 2+2 setae (plesiom.: one pair of setae),
- claws with a large tunica (plesiom.: without tunica).

Other characteristics: Postantennal setae long and acuminate; appendices anales long, narrow, and toothed; mucronal edges smooth.

Description: Measurements and proportions: Total length 1.5 mm; length of head 0.56 mm; mucro 115 µm; appendices anales 76 µm. Whole antenna : head length = 2.1; antennal segment I : II : III : IV = 1 : 2 : 3 : 7; dens : mucro = 3.5; app. an. : mucro = 0.64.

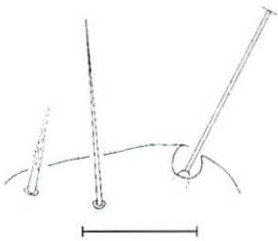


Fig. 41

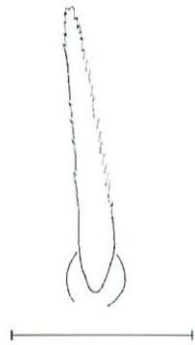


Fig. 42

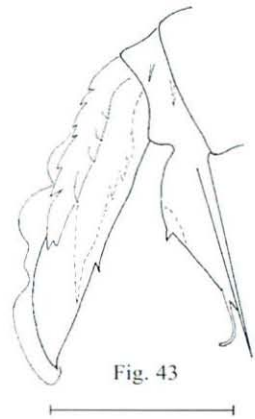


Fig. 43

Sminthurus osmeryzskensis n. sp.

Fig. 41 Abdominal segment V with short seta A1, normal A2, and bothriothrix D (bar = 50 µm)

Fig. 42 Female appendix analis, inner edge to the right (bar = 50 µm)

Fig. 43 Claw and empodium III (bar = 50 µm)

Colour: Eye-patches black; background colour pale greenish with pale blue-grey pigment on head and body; antennae distally increasing brown-violet, legs and furca unpigmented.

Chaetotaxy and special structures: Head: Postantennal setae long and acuminate.

Antennae: Segment II with 4 short ventral setae; segment III with 5 long setae of proximal part; segment IV with 4 setae of basal whirl and 17 subsegments.

Large abdomen: Dorsal setae rough and blunt; ratio of length of posterior setae to mucro up to 1.6.

Small abdomen: Dorsal setae long, rough and acuminate. Segment V with 2+2 setae above bothriotrichia D, dorsal pair A1 short and ciliate (Fig. 41). Appendices anales (Fig. 42) long and slender with tip toothed and edges ciliate.

Legs: Subcoxa III with 2 distal setae. Femur III with antero-proximal seta p4. Tibiotarsus III seta Vi of normal shape, row p with 8 setae (setae p5 and p7 present), length of outer setae only 2 x diameter of tibiotarsus. Claws (Fig. 43) with inner and outer tooth and pseudonychia (length = 2/3 - 3/4 of claw), tunica present; empodia each with long apical point and filament, empodium I narrow with long filament, without outer tooth, total length > claw, empodia II and III with outer tooth, total length = claw or < claw respectively (Fig. 43).

Retinaculum: 4 setae. Ventral tube: 2+2 setae.

Furca: Dens row J with 7 setae, row P with additional seta P5, formula of anterior setae 3,3,3,2,2,1,1; both posterior edges of mucro smooth, seta present and length about 1/3 of mucro.

Remarks: *Sminthurus osmeryzskensis* appears in the key in BRETFELD (1999) near *S. leucomelanus* Nayrolles, 1995, which differs in subcoxa III having only 1 distal seta and in tibiotarsus III missing seta p7. It appears in the key in CHRISTIANSEN & BELLINGER (1998) near *S. sylvestris* Banks, 1899, which, however, has clavate setae of the tibiotarsi (BETSCH & BETSCH-PINOT 1984).

Although there is only one female known, the above comparison shows that *Sminthurus osmeryzskensis* clearly differs from all other known species by its blue-grey pigment and its combination of chaetotaxic characteristics.

Sminthurus rubidipunctatus n. sp.

Holotype: Female (unbleached, 4 slides, in coll. Bretfeld) of sample 84: Kazakhstan, Semipalatinsk Reg., 150 km SE of Semipalatinsk, near Georgiyevka; steppe with *Stipa*; 30.VII.1972 leg. Stebaeva no. 10, coll. Bretfeld no St I 30/92.

Paratypes: 1 male, 1 female (alc., in coll. Bretfeld) together with the holotype. - 5 males (alc. and slides, in coll. Stebaeva and coll. Bretfeld) from sample 83: Kazakhstan, Semipalatinsk Reg., 100 km SE of Semipalatinsk, Charsk; semi-desert steppe on 3rd terrace of Char River; 29.VII.1972 leg. Stebaeva no. 11, coll. Bretfeld no. St I 31/92.

Derivatio nominis: This new species is named after its colour pattern.

Diagnosis: A light species of the genus *Sminthurus* Latreille, 1802 with 5 diagnostic characteristics:

- Abdominal segment V with 1+1 setae above bothriotrichia D (plesiomorphy, apomorphy: 2+2 setae),
- subcoxa III with 2 distal setae (apomorphy, plesiom.: only 1 seta),

- claws without a tunica (plesiom.),
- ventral tube with 2+2 setae (apomorphy, plesiom.: only 1 pair of setae),
- appendices anales narrow, tip with coarse teeth (apomorphy, plesiom.: setalike and smooth).

Other characteristics: Head and body with small or large violet spots; postantennal setae of medium length and acuminate; posterior edges of mucro smooth, seta present.

Description: Measurements and proportions (from 1 female and 1 male): Total female 1.8 mm, male 1.6 mm; head in female 0.55 mm, in male 0.53 mm; mucro in female 127 µm, in male 115 µm; appendices anales 63 µm. Whole antenna : head length = 2 in female, 2.2 in male; antennal segment I : II : III : IV = 1 : 2.2 : 3 : 7.5 (7) in female (and male); dens : mucro = 3 in both sexes; app. an. : mucro = 0.5.

Colour: Eye-patches black; background colour whitish with dark violet pigment in small or larger spots on head and body (Fig. 44): dorsal part of head with small spots, anterior part of large abdomen with small spots forming cross rows, posterior part with irregular or larger spots forming 1+1 or 3 longitudinal rows, abdominal segment V with small lateral or 1 dorsal spot, segment VI with 2 median dorsal spots; ventral side of large abdomen unpigmented or with grey shades; antennae brown violet, legs and furca unpigmented.

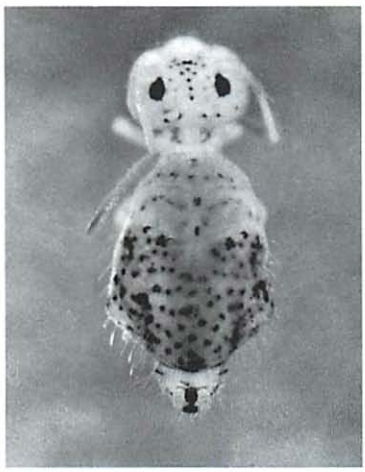


Fig. 44

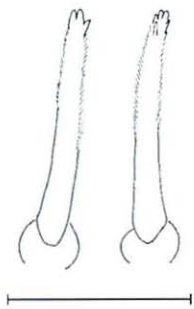


Fig. 45

Sminthurus rubidipunctatus n. sp.

Fig. 44 Colour pattern, total length about 1.8 mm

Fig. 45 Female appendices anales (bar = 50 µm)

Chaetotaxy and special structures (according to both sexes if not otherwise stated): Head: Postantennal setae of medium length, rough and pointed.

Antennae: Segment II with 4 short ventral setae; segment III with 5 long setae of proximal

part; segment IV with 4 setae of basal whirl and 17 - 18 subsegments.

Large abdomen: In male, postero-dorsal setae long and rough, ratio of length to mucro = 1.7 (in female, most setae fallen out).

Small abdomen: Segment V with 1+1 setae above bothriotrichia D. Appendices anales (Fig. 45) slender, tip cut and with coarse teeth, lateral edges ciliate.

Legs: Subcoxa III with 2 distal setae. Femur III without seta m6, with antero-proximal seta p4. Outer setae of tibiotarsi 2 - 2.5 x diameter of tibiotarsus. Tibiotarsus III seta Vi of normal shape, row p with 8 setae in female, 7 in male (p7 missing). Claws slender, all with inner tooth and lateral pseudonychia with few teeth (length 1/2 of claw in female, 2/3 in male), tunica missing; empodia I without, II and III with outer tooth, filaments thin, total length of empodium I ≤ claw, II and III > claw.

Retinaculum: 4 setae. Ventral tube: 2+2 setae.

Furca: Dens row J with 7 setae, row P with additional seta P5, formula of anterior setae 3,3,3,2,2,1,1; both posterior edges of mucro smooth, seta present and length 1/3 of mucro.

Remarks: With its violet spots, *Sminthurus rubidipunctatus* resembles *S. coeruleus* Strebel, 1938, which differs in having spatulate empodial filaments and short and stout appendices anales, and *S. stachi* Betsch, 1977, which has a dark pigmented ventral side of abdomen, no mucronal seta, and short and smooth appendices anales. The chaetotaxy of *Sminthurus rubidipunctatus* resembles *S. nigromaculatus* and *S. incisus* Snider, 1978, which both have claws with a large tunica and the latter stout and acuminate appendices anales. Thus, the combination of pigment and chaetotaxy allows to distinguish this new species from other known *Sminthurus* species.

Sminthurus viridis Linnaeus, 1758

Material: Russia: (NNE of Moscow) sample 2: 11 specimens.

Femora II and III each with an antero-proximal seta, subcoxa III with 1 short distal seta, ventral tube with 1 pair of setae, abdominal segment V with 1+1 setae above bothriotrichia D; appendices anales slender, ratio to mucro 0.4 - 0.6; colour varies.

S. viridis was found here in ruderal vegetation and a grassy road border. It is widespread in the W Palaearctic and was not found in the samples from N Siberia studied here (compare BABENKO 1993, BABENKO & BULAVINTSEV 1993).

Sminthurus Latreille, 1802 spec.

Material: Russia: (Ural Mts.) sample 3: 2 juv. (slide). Kazakhstan: (Tarbagatay Range) sample 82: 1 juv. (slide).

The juveniles from sample 3 have dark antennal segments IV without any species specific characteristics observable, that of sample 82 is near *S. nigromaculatus/multipunctatus*.

I was not able to identify these juveniles correctly, which were found on a rocky mountain slope and a grassy steppe at 1300 m altitude respectively.

Spatulosminthurus flaviceps (Tullberg, 1871)

Material: Ukraine: (Kiev) sample 92: 4 females.

Each tibiotarsus with 1 spatulate distal seta; colour varies. The appendices anales (Fig. 46)

are slender as described from southern localities instead of being laterally branched in northern (BRETFELD 1999).

S. flaviceps was found here in a mixed forest. It is known from Central and SE Europe.

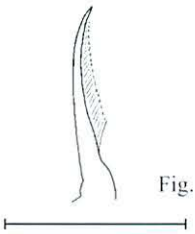


Fig. 46

Spatulosminthurus flaviceps

Fig. 46 Female, appendix analis with thin outer lamella (bar = 50 µm)

Spatulosminthurus guthriei sibiricus Bretfeld, 1996

Material: Russia: (Novosibirsk) sample 10: 120 specimens; (Khakasia) 15: 3 females, 17: 6 specimens, 18: 1 juv.; (Tuva) 23: 1 male.

Each tibiotarsus with 2 spatulate distal setae, claws without tunica, postantennal seta slender, male intensely coloured.

S. g. sibiricus was found here in grass of an urban lawn and of lake and river slopes; it is known from the whole SE Palaearctic from the Omsk to the Amur Regs.

Sphaeridia leutrensis Dunger & Bretfeld, 1989

Material: Russia: (W Taimyr) sample 35: 1 female, 36: 2 females, 37: 2 males, 38: 3 specimens (incl. 1 male); (Putorana Plateau) 56: 3 specimens (incl. 1 male), 60: 19 specimens (incl. 6 males).

Males and females as originally described.

S. leutrensis was found here on a river slope, in bogs, and tundra. It was already reported from Taimyr by FJELLBERG (in lit., BRETFELD 1999) and is, besides the type locality in central Germany, only known from N Russia.

Sphaeridia pumilis (Krausbauer, 1898) s. str.

Material: Russia: (Khakasia) sample 14: 8 specimens (incl. 1 male); (Tuva) 33: 5 specimens (incl. 1 male). Ukraine: (Krym) sample 103: numerous specimens (incl. males).

Males with 1+1 small posterior vesicles of ventral tube, tibiotarsi III each with a long, pointed seta IIpe; both sexes with all frontal head setae.

S. pumilis was found here in a meadow near a lake and on a dry steppe. This Holarctic species is already known in the E Palaearctic from S Russia (Novosibirsk and Irkutsk Regs.), in the W Palaearctic from many sites in Europe and NW Africa (BRETFELD 1995, 1996).

Sphaeridia Linnaniemi, 1912 spec.

Material: Russia: (Tuva) sample 20: 20 juv.; Ukraine: (Kherson) sample 96: 1 female.

These specimens cannot be identified yet since mainly the males show the species specific characteristics.

Sphyrotheca multifasciata (Reuter, 1881)

Material: Georgia: (Sukhumi) sample 81: 1 male (slide).

Total length about 0.7 mm, body 0.6 mm, head 0.26 mm, mucro 65 µm; whole antenna : head length = 1.9; antennal segment I : II : III : IV = 1 : 1.6 : 2.5 : 4.7; dens : mucro = 2.8; mucro : claw III inner edge = 1.9.

Dark blue pigment in coarsely spotted cross stripes on head and abdomen, extremities almost completely dark; long, rough, curved setae on dorsal parts of head and abdomen. Eye-patches with 2+2 setae (new observation), dorsal ones short and smooth, ventral ones longer, rough, blunt (Fig. 47); head frons with a specific pattern of short and long setae (Fig. 47), especially with 3 long median (m1, m2, apex m), 2+2 thick of medium length (a3, a4), 2+2 thick and short (a5, apex 1), and 1+1 thin and short setae (apex 2) (setae a5 + apex 1 and apex 2 arranged on inner and outer sides respectively of the pair of interocular vesicles); clypeus with 2 median and 6 pairs of setae (see Fig. 55); all dorsal head setae blunt (down to the second clypeal pair). Antennal segment IV with 10 - 11 subsegments. Thoracal vesicles missing. One pair of neosminthuroid setae long, appressed, and ciliate. Ventral anal lobes with 1+1 short spines like appendices anales (Fig. 48, see BETSCH 1980). Trochanter I - III each with knobbed posterior spine, in I thin, II median, III thick (Fig. 49); all tibiotarsi with short and thin seta Vi (Fig. 50); claws each with small inner tooth and small tunica; empodia each with thin filament, I and II > claw, III < claw. Dens with strong setae, rows J:6, E:7, PE:1, and P:9 setae, formula of anterior setae 3+1...1; mucro (Fig. 51) with shallow posterior hollow and apical incision, without seta, both posterior edges smooth.

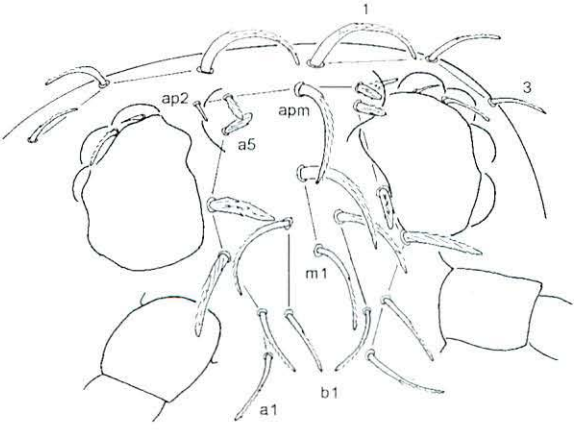


Fig. 47

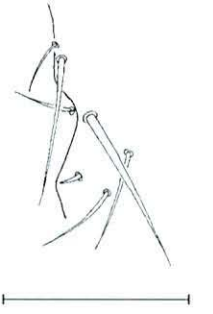


Fig. 48

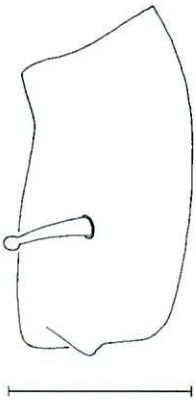


Fig. 49

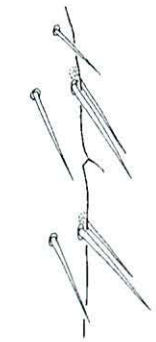


Fig. 50

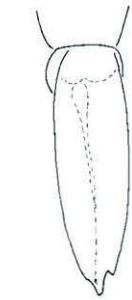


Fig. 51

Sphyrotheca multifasciata

Fig. 47 Male, frons of head (bar = 50 µm)

Fig. 48 Male, short seta of ventral anal valve like an appendix analis (bar = 50 µm)

Fig. 49 Spine of trochanter III (bar = 50 µm)

Fig. 50 Tibiotarsus with short seta Vi (bar = 50 µm)

Fig. 51 Mucro seen from posterior (bar = 50 µm)

Remarks: This single male was found here on a tobacco plantation. It had been mounted together with several other Symphypleonan and therefore I reprepared it on two slides. Its identification was possible by comparison with one type specimen and one specimen of *Sphyrotheca minnesotensis* (both from Museum Helsinki), which are described and discussed in the following (the specimens described by BÖRNER (1909) and STACH (1964) are no longer present in their collections in Görlitz and Kraków (SCHULZ and WEINER respectively, pers. comm.)).

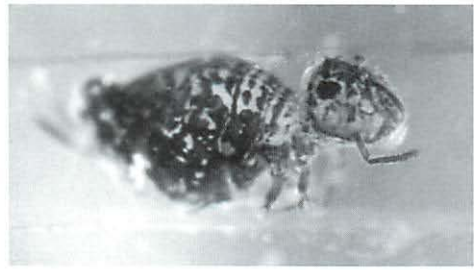


Fig. 52

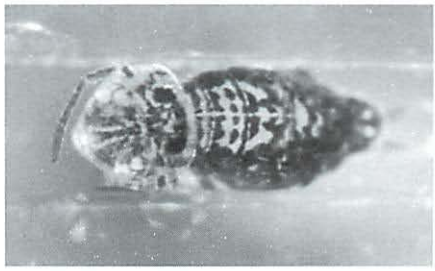


Fig. 53

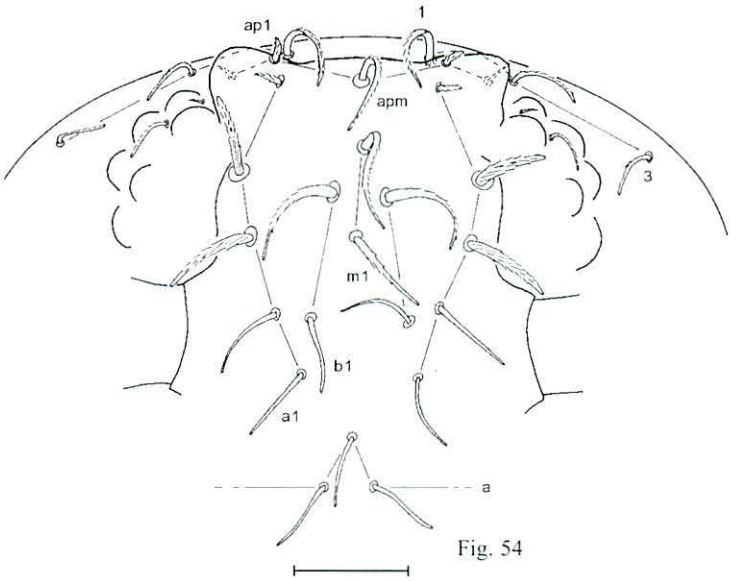


Fig. 54

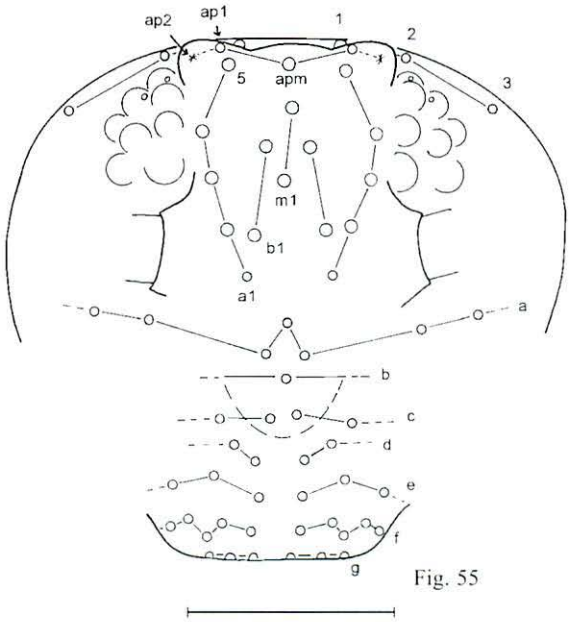


Fig. 55

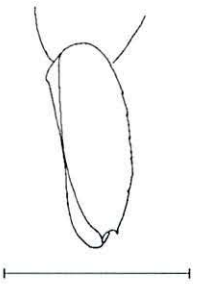


Fig. 56

Sphyrotheca multifasciata

Figs. 52, 53 Syntype, colour pattern, total length 0.8 mm

Fig. 54 Syntype, frons of head (bar = 50 µm)

Fig. 55 Syntype, chaetotaxy of frons and clypeus of head (bar = 50 µm)

Fig. 56 Syntype, mucro seen from posterior (bar = 50 µm)

1. *Sphyrotheca multifasciata* (Reuter, 1881). 1 female, alcohol, tube with four labels reading: »Mus. Zool. Helsinki, Sphyrotheca multifasciata (Reut.), Finland, Helsinki, Reuter, 1 Syntype«, »Syntype?«, »Reuter«, and »H:fors/Orang.«. The specimen was well preserved, but most claws were damaged and the thin setae were very transparent due to their long storage in alcohol. I reprepared head + antennae (bleached) and legs + furca (pigm.) on 2 slides; the body remained in the alcohol tube, to which I added a further label reading »Head and extr. prep. Bretf. 1999 on 2 slides«.

   Total length 0.8 mm, body 0.64 mm, head 0.32 mm, mucro 60 µm; whole antenna : head length = 1.6; antennal segment I : II : III : IV = 1 : 1.6 : 2.6 : 4.9; manubrium : dens : mucro = 4.7 : 3.4 : 1. General dark blue pigment laterally quite uniform and in spots and rather narrow stripes on dorsal parts of head and abdomen (Figs.52, 53); extremities dark except basal part of antennal segments II and III, claws, and mucrones. The other characteristics, especially the pattern of acuminate and blunt head setae, are the same as in the specimen from Georgia with a few exceptions: Setae of head frons more slender, short spines a5 and apex 1 shorter (Figs. 54, 55); antennal segment IV with 8 subsegments; neosminthuroid setae not observed; appendices anales long setalike and ciliate; trochanter III with a thin blunt spine, spines of other trochanters not visible, claws each without or with minute inner tooth, tunica not distinct; posterior setae of dentes not visible, mucro (Fig. 56) boat-like because of deep posterior hollow, inner posterior edge almost smooth, with slight apical incision.

2. *Sphyrotheca minnesotensis* (Guthrie, 1903). 1 female, slide, with two labels reading: »1 *Sminthurus minnesotensis* Guthrie, 3 *Papirius unicolor* Harvey, = *Dicyrtoma atra* (L.)« and »69c, 21 8/13 '99« [1899]. This specimen is pigmented, showing the left side to the observer, thus the study of the chaetotaxy is restricted.
   Total length 1.2 mm, head 0.42 mm, mucro 100 µm, appendices anales 100 µm; whole antenna : head length = 1.5; antennal segment I : II : III : IV = 1 : 1.6 : 2.8 : 4.6; manubrium : dens : mucro = 3.25 : 2.5 : 1, mucro : claw III inner edge = 2.3, app. an. : claw III inner edge = 2.3, app. an. : mucro = 1. Blackish blue pigment uniformly on head and ventral side of abdomen, dorsal side of large abdomen with broad cross stripes. The other characteristics are very similar to those described above with few exceptions: Spines of head frons even more slender than in *Sph. multifasciata* from Helsinki, setae a3 apparently acuminate and not blunt spinelike (Fig. 57, see also Fig. 883 F in CHRISTIANSEN & BELLINGER (1998): 1341); antennal segment IV with about 9 subsegments; neosminthuroid setae not observable since hidden by pigment; trochanter III with slender spine with small knob (Fig. 58), claws and empodia narrow, claws each with inner tooth, without a distinct tunica, length of empodia I and II each > claw, III = claw; chaetotaxy of dentes uncertain but identical anterior setae, mucro with shallow hollow and distinct inner teeth (Fig. 59), incision not visible.

3. Comparison with other known *Sphyrotheca* Börner, 1906 species. Among the known *Sphyrotheca* species, there are only a few without subapical setae on anterior side of dens and with long, ciliate appendices anales, namely the species described above and a further 9 which show the following differences: Two of these other

species have thick empodial filaments (*S. madagascarienis* Betsch, 1974 from Madagascar and *S. nani* Christiansen & Bellinger, 1992 from Hawaii), two have uniform frontal head setae (*S. dawydoffi* (Denis, 1948) from SE Asia has short and blunt spines, *S. gangetica* Yosii, 1966 from India has slender pointed spines), three have frontal head setae and spines like the species described above but with other arrangements (*S. multifasciata* Yosii, 1954 from Japan has only 1 median seta, = apical m, most others thick and blunt, and b1-3 instead of b1-2; *S. multifasciata* Stach, 1964 from China has only 2 median setae, = m2 and apical m, short thick and blunt setae b1, and only minute setae of interocular tubercle, = a5 and apex 1-2; *S. nanjingensis* Chen & Wu in Bretfeld, 1999 from China has the frontal head setae a5 very short and almost all head setae thick and blunt), and two are incompletely described (*S. multifasciata* Womersley, 1932 from Australia and *S. multifasciata* Uchida, 1957 from Japan).

4. The results of these comparisons are:

- The striking colour pattern is not a sufficiently discriminating characteristic, rather the frontal head setae have always to be analysed (as mentioned by CHEN & WU 1996);
- *S. multifasciata* (Reuter, 1881) is specifically characterised by its pattern of frontal head setae;
- the specimen from Georgia belongs to *S. multifasciata* (Reuter, 1881);
- *S. multifasciata* (Reuter, 1881) which was originally recorded from a warm house, seems to be a species of the warm climates of southern Europe not a subtropical one from Japan (LINNANIEMI 1912);
- *S. minnesotensis* (Guthrie, 1903) is very similar to *S. multifasciata* (Reuter, 1881) but is here regarded as a separate species, contrary to the synonymy stated in BRETFELD (1999), because of the acuminate frontal setae a3 and the relatively long mucrones with serrate inner edges;
- *S. nanjingensis* Chen & Wu in Bretfeld, 1999 resembles *S. multifasciata* (Reuter, 1881) but both distinctly differ by the frontal setae;
- *S. multifasciata* Yosii, 1954 from Japan, Ozé, National Park and Kyoto, is a separate species for which I suggest the new name *Sphyrotheca ozeiana*;
- *S. multifasciata* Stach, 1964 from China, Nanking (now Nanjing), is also a separate species for which I suggest the new name *Sphyrotheca sinensis*.

Stenacidia violacea (Reuter, 1881) sensu Bretfeld, 1999

Material: Russia: (Putorana Plateau) sample 44: 30 specimens, 50: 50, 51: 20, 52: 63, 53: 130, 54: 35, 55: 16, 60: 20.

Red-violet, adults quite large, chaetotaxy as described by BETSCH & MASSOUD (1970).

S. violacea was found here in the low vegetation or on the soil of open habitats above 600 m altitude. This Holarctic species is already known from N Russia (Taimyr, Putorana Plateau, Severnaya Zemlya) and SE Russia (Khakasia and Novosibirsk Regs.), and is widespread in Europe (ANANJEVA et al. 1987, BUDAEVA 1993, BABENKO & BULAVINTSEV 1997, BRETFELD 1996, 1999).

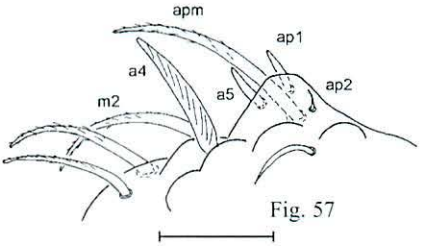


Fig. 57

Fig. 58

Fig. 59

Sphyrotheca minnesotensis

Fig. 57 Head, apex and part of frons seen from the left (bar = 50 µm)

Fig. 58 Spine of trochanter III (bar = 50 µm)

Fig. 59 Mucro seen from inner side (bar = 50 µm)

Conclusion

The 103 samples studied here contained 57 taxa of Collembola Symphypleona, of which 9 species, 1 subspecies, and 1 form are new to science, 8 taxa are not definitely defined, 3 taxa are only identified to genus level (not considered in the survey below), and 35 taxa are already known.

This quite large number of samples and taxa shall be summarised from a zoogeographical point of view. I use the terms of Holarctic and Palaearctic with the distinction of western, southern, northern, and eastern parts. The suggestion by CHRISTIANSEN & BELLINGER (1995) of new zoogeographical regions for Collembola are added below with their region numbers in brackets.

1. Taxa of the large regions Holarctic and Palaearctic.
   a) 9 species occur in the Holarctic (regions 1 - 8): *Bourletiella arvalis*, *Bourletiella hortensis*, *Dicyrtoma fusca*, *Sminthurides aquaticus*, *Sminthurides malmgreni*, *Sminthurinus elegans*, *Sminthurus nigromaculatus*, *Sphaeridia pumilis*, *Stenacidia violacea*;
   b) 8 taxa occur in the whole Palaearctic (regions 1 - 6) of which 5 are already known from N Siberia (regions 1, 2b): *Deuterosminthurus bicinctus* f. flava, *Sminthurides schoetti*, *Sminthurinus alpinus*, *Sminthurinus aureus*, *Sminthurus multipunctatus*, but 3 are new to N Siberia (regions 1, 2b): *Deuterosminthurus pallipes* f. principalis, *Deuterosminthurus pallipes* f. reparida, *Heterosminthurus* cf. *bilineatus*.
2. 9 taxa are restricted to the Western Palaearctic, i. e. west of the Ural Mts. (regions 1, 2a, 5, 6): *Dicyrtomina minuta*, *Fasciosminthurus albanicus*, *Heterosminthurus quadristrigatus* n. sp., *Sminthurinus reticulatus*, *Sminthurinus* spec. B, *Sminthurus nigrinus* n. sp., *Sminthurus viridis*, *Spatulosminthurus flaviceps*, *Sphyrotheca multifasciata*.
3. Taxa of western and eastern parts of the Palaearctic:
   a) 5 species occur in the western and central southern Palaearctic regions (regions 2a, 4, 5, 6): *Cyprania gisae*, *Fasciosminthurus obtectus*, *Fasciosminthurus*

virgulatus, *Heterosminthurus linnaniemii* f. principalis, *Heterosminthurus punctatus*;

b) 3 species occur in the western, northern, and northeastern Palaearctic regions (regions 1, 2a, 2b, 5, 6): *Sminthurides inaequalis*, *Sminthurides parvulus*, *Sphaeridia leutrensis*.

4. Taxa restricted to the Eastern Palaearctic, i. e. east of the Ural Mts.:

a) 10 taxa occur in the southern regions (region 4): *Fasciosminthurus strigatus sajanensis*, *Fasciosminthurus* spec. A, *Fasciosminthurus* spec. B, *Heterosminthurus linnaniemii* f. rubra, *Kaszabellina minima*, *Sminthurinus hygrophilus* n. sp., *Sminthurinus* spec. A, *Sminthurus osmeryzskensis* n. sp., *Sminthurus rubidipunctatus* n. sp., *Spatulosminthurus guthriei sibiricus*;

b) 8 taxa occur in the northern regions (regions 1, 2b): *Heterosminthurus borealis*, *Heterosminthurus putoranae* n. sp., *Heterosminthurus umbonicus* n. sp., *Heterosminthurus* spec. A, *Heterosminthurus* spec. B, *Sminthurides inaequalis armatus* n.ssp. (also in Norway, Spitsbergen), *Sminthurus denticulatus* n. sp., *Sminthurus orientalis* n. sp.;

c) 2 species occur in both the southern and northern regions (regions 1, 2b, 4): *Cyprania inopinata*, *Heterosminthurus stebaevae*;

d) 1 species occurs in both the southern and eastern regions (regions 3a, 4): *Sminthurinus* cf. *pallescens*.

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