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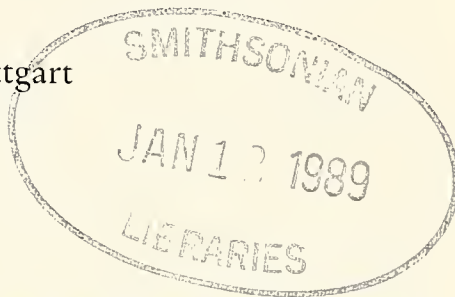
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The Terrestrial Isopod Genus *Schizidium* in Western Asia (Oniscidea: Armadillidiidae)

By Helmut Schmalzfuss, Stuttgart

With 63 figures

Summary



After re-examination of types and investigation of new collections of the western Asiatic species ascribed to the genus *Schizidium* the following taxa are considered to be valid species: *S. davidi* (Dollfus, 1887), *S. festai* (Dollfus, 1894), *S. fissum* (Budde-Lund, 1885), *S. hybridum* (Budde-Lund, 1896), *S. oertzeni* (Budde-Lund, 1896), *S. persicum* Schmalzfuss, 1986, and *S. tiberianum* Verhoeff, 1923. *Armadillidium bifidum* Dollfus, 1905 and probably *Schizidium almanum* Verhoeff & Strouhal, 1967 are junior **synonyms** of *S. fissum*; *Pareluma minuta* Omer-Cooper, 1923, *Schizidium kalalae* Frankenberger, 1939, *Armadillidium euphrati* Vandel, 1980, and possibly *Armadillidium granum* Dollfus, 1892 are junior **synonyms** of *S. davidi*. The **new species** *S. osellai*, *S. reinoehli* and *S. rausi* from Turkey and *S. golovatchi* from Armenia are described. New records are presented for *S. davidi*, *S. fissum*, *S. hybridum*, *S. oertzeni*, and *S. tiberianum*. The diagnostic characters of all treated species are illustrated.

Zusammenfassung

Die Nachuntersuchung von Typenmaterial und die Auswertung neuer Aufsammlungen der westasiatischen *Schizidium*-Arten erweisen die folgenden Taxa als gültige Arten: *S. davidi* (Dollfus, 1887), *S. festai* (Dollfus, 1894), *S. fissum* (Budde-Lund, 1885), *S. hybridum* (Budde-Lund, 1896), *S. oertzeni* (Budde-Lund, 1896), *S. persicum* Schmalzfuss, 1986 und *S. tiberianum* Verhoeff, 1923. *Armadillidium bifidum* Dollfus, 1905 und wahrscheinlich *Schizidium almanum* Verhoeff & Strouhal, 1967 sind **Synonyme** von *S. fissum*; *Pareluma minuta* Omer-Cooper, 1923, *Schizidium kalalae* Frankenberger, 1939, *Armadillidium euphrati* Vandel, 1980 und möglicherweise *Armadillidium granum* Dollfus, 1892 sind **Synonyme** von *S. davidi*. Die **neuen Arten** *S. osellai*, *S. reinoehli* und *S. rausi* aus der Türkei und *S. golovatchi* aus Armenien werden beschrieben. Für *S. davidi*, *S. fissum*, *S. hybridum*, *S. oertzeni* und *S. tiberianum* werden neue Funde gemeldet. Die diagnostischen Merkmale aller behandelten Arten werden abgebildet.

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1. Introduction

„Thanks“ to inappropriate original descriptions, no safe identifications of the Asiatic representatives of the genus *Schizidium* were possible by now. *Schizidium davidi* (Dollfus, 1887), as an extreme example, was described four or five times successively. With this situation as a starting point, and without a revision of the type specimens, it was inevitable that most subsequent published records of these species were misidentifications.

Having a number of recently collected *Schizidium*-samples from western Asia at hand, I re-examined types of „*Armadillidium*“ *fissum* Budde-Lund, 1885, „*Armadillidium*“ *davidi* Dollfus, 1887, „*Armadillidium Festae*“ Dollfus, 1894, „*Armadillidium*“ *bifidum* Dollfus, 1905, „*Pareluma*“ *minuta* Omer-Cooper, 1923, and „*Armadillidium*“ *euphrati* Vandel, 1980. Based on these type-revisions and an investigation of the new collections, a reasonably clarified account of the Asiatic species of *Schizidium* can be presented.

The following species list is arranged geographically according to the distribution patterns, starting from Asia minor and proceeding as far east as northern Persia.

Abbreviations used:

<i>BML</i>	=	British Museum (Natural History) London;
<i>MCSNV</i>	=	Museo civico di Storia naturale Verona;
<i>MNHNP</i>	=	Musée National d'Histoire Naturelle Paris;
<i>SMF</i>	=	Senckenberg-Museum Frankfurt/Main;
<i>SMNS</i>	=	Staatliches Museum für Naturkunde Stuttgart (with isopod collection numbers);
<i>ZMB</i>	=	Zoologisches Museum der Humboldt-Universität Berlin;
<i>ZMM</i>	=	Zoological Museum of the Lomonosov State University Moscow.

I wish to express my sincere thanks to the following persons: Dr. H. DALENS (Toulouse), J. ELLIS (BML), Prof. J. FOREST (MNHNP), Dr. H.-E. GRÜNER (ZMB), and Dr. M. TÜRKAY (SMF) for the loan of *Schizidium*-Material; Dr. R. DEELEMAN (Ossendrecht), Dr. S. GOLOVATCH (Moscow), Prof. R. KINZELBACH (Darmstadt) and his co-workers, Prof. W. KÜHNELT (Vienna), D. LIEBEGOTT (Frankfurt), Dr. H. MALICKY (Lunz), Dr. G. OSELLA (L'Aquila), A. PAULI (Illingen), Dr. H. PIEPER (Kiel), H. REINÖHL (Stuttgart), O. RUNZE (Kiel), and Dr. W. SCHAWALLER (SMNS) for providing their collections of *Schizidium*-samples; Prof. M. WARBURG (Haifa) for his help and guidance in Israel. Field work in Israel was financially supported by the Israel Institute of Technology (Haifa).

2. Genus *Schizidium* Verhoeff, 1901

Type-species: *Armadillidium Oertzenii* Budde-Lund, 1896 (designated by SCHMALFUSS 1986).

The diagnoses given for *Schizidium* (e. g. VERHOEFF 1901: 36, SCHMALFUSS 1986: 385) do not prove the genus to be a monophyletic taxon inside the Schizidiinae, to

which a number of additional European genera are ascribed (*Eluma*, *Paraschizidium* and others, see ARCANGELI 1948). An analysis of the phylogenetic interrelationships of these genera, aiming at a clarification of the generic taxonomy of this group, will be the subject of a future publication.

2.1. *Schizidium oertzeni* (Budde-Lund, 1896)

Armadillidium Oertzenii: BUDDE-LUND 1896: 40, 43.

Armadillidium Oertzeni: ARCANGELI 1914: 4, figs. 4–7.

Schizidium Oertzeni: VERHOEFF 1901: 36.

Schizidium oertzeni: VERHOEFF 1923: 226, figs. 7–8; – STROUHAL 1936: 199; 1937 b: 246; – SCHMÖLZER 1965: 304; – SCHMALFUSS 1972 b: 598; 1975: 57; 1979: 29; 1986: 384.

Schizidium oertzenii: STROUHAL 1928: 797; 1929: 112; – ARCANGELI 1948: 19.

Schizidium Oertzenii: ARCANGELI 1929: 259, 265; 1934: 30.

The record of this species from the Tria Nisia islands in the southern Aegean (STROUHAL 1937 a: 9) probably refers to *S. hybridum*, since the accompanying fig. 5 shows the I. pleopod-exopodite of *S. hybridum*.

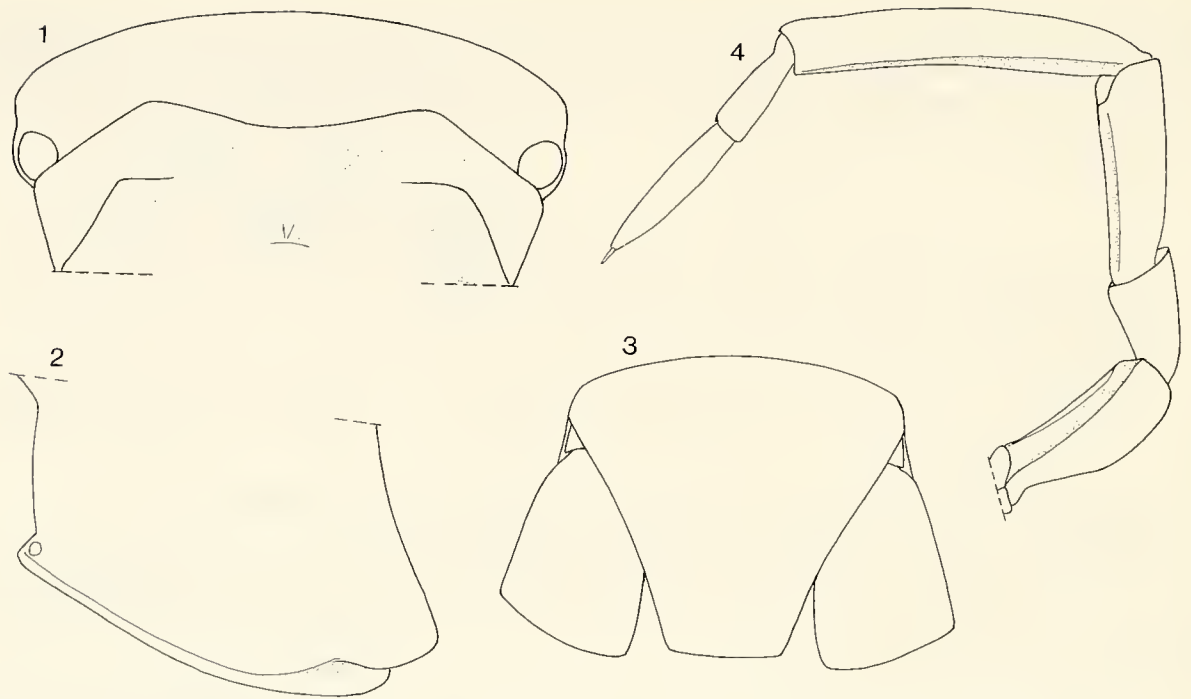
Material examined (all from Greek islands in the southern Aegean): 5 specimens, island of Naxos, leg. LIEBEGOTT V. 1984 (SMF). – 8 specimens, island of Iraklia S Naxos, leg. LIEBEGOTT IV. 1984 (SMF, SMNS 2082). – 7 specimens, island of Kato Kufonisi S Naxos, leg. LIEBEGOTT 30. IV. 1984 (SMF, SMNS 2083). – 3 specimens, island of Ano Kufonisi S Naxos, leg. LIEBEGOTT V. 1984 (SMF). – 1 specimen, island of Tilos NW Rodhos, leg. LIEBEGOTT 8. X. 1980 (SMNS 1348). – 1 specimen, island of Khalki W Rodhos, leg. LIEBEGOTT 7. IV. 1982 (SMNS 1452). – 1 specimen, island of Rodhos, leg. LIEBEGOTT 16. X. 1980 (SMNS 1351). – 2 specimens, island of Rodhos, leg. PAULI & SCHMALFUSS IV. 1981 (SMNS 1387, 1389). – 20 specimens, island of Rodhos, leg. SCHAWALLER IV. 1980 (SMNS 1150, 1152, 1154, 1157, 1158, 1159, 1160). – 1 specimen, island of Saria N Karpathos, leg. PIEPER 28. IV. 1983 (SMNS 2033). – 46 specimens, island of Karpathos, leg. PIEPER & SCHMALFUSS IV. 1982 (SMNS 1448, 1449, 1450, 1463, 1465, 1466, 1467, 1468, 1476, 1478). – 1 ♂ (20 mm long, see figs. 1–12), island of Karpathos, leg. PIEPER 13. III. 1966 (SMNS 1026, SCHMALFUSS 1972 b). – 6 specimens, island of Kasos SW Karpathos, leg. PIEPER & SCHMALFUSS IV. 1982 (SMNS 1454, 1495, 1497). – 13 specimens, island of Kasos, leg. SCHMALFUSS IV. 1983 (SMNS 1970, 1981). – 12 specimens, island of Armathia N Kasos, leg. PIEPER & SCHMALFUSS 19. IV. 1983 (SMNS 1967, 2035).

Distribution (map fig. 13): Greece: Known from the Aegean islands of Naxos, Iraklia S Naxos, Kato Kufonisi S Naxos, Ano Kufonisi S Naxos, Keros S Naxos, Tilos NW Rodhos, Khalki W Rodhos, Rodhos, Saria N Karpathos, Karpathos, Kasos SW Karpathos, Armathia N Kasos. The examined material contains the first records for the islands of Iraklia, Kato Kufonisi, Ano Kufonisi, Tilos, Khalki, Saria, and Armathia.

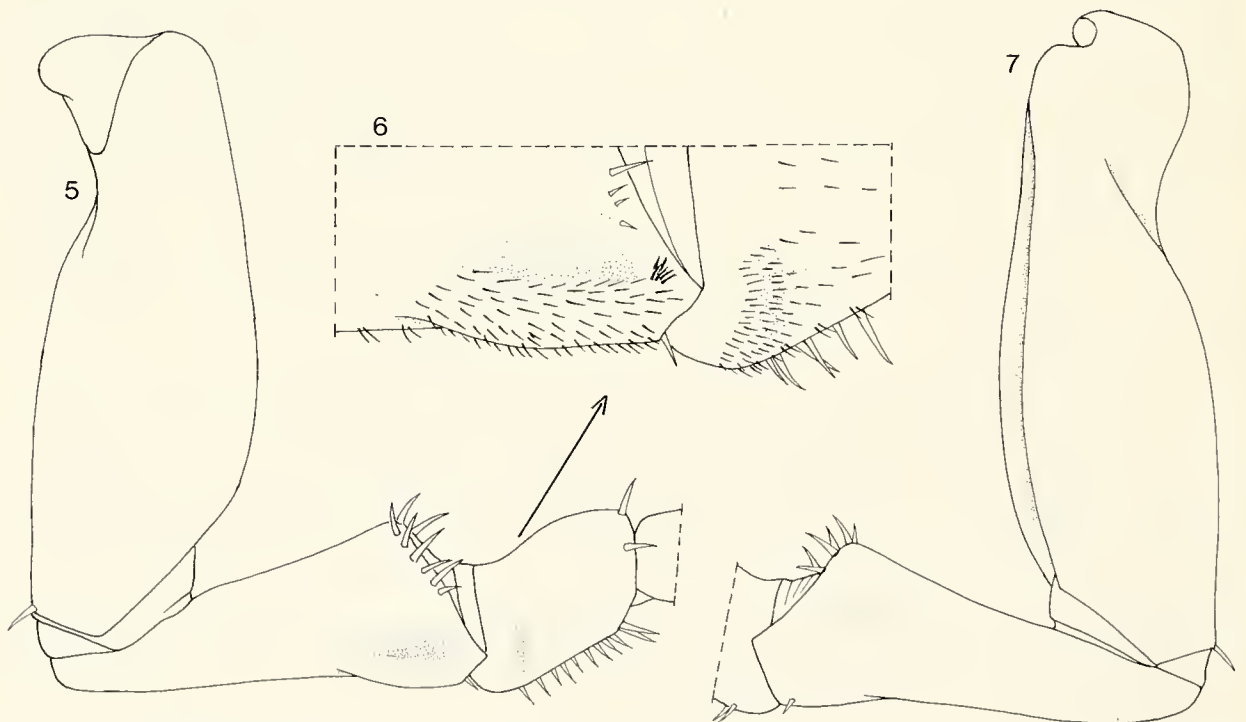
Turkey: BUDDE-LUND (1896) reports this species also from „Karien“, a name used at that time for the southwestern region of Asia minor. Subsequent records from that area are lacking.

Dimensions: Maximum length 26 mm for ♀♀ and 20 mm for ♂♂.

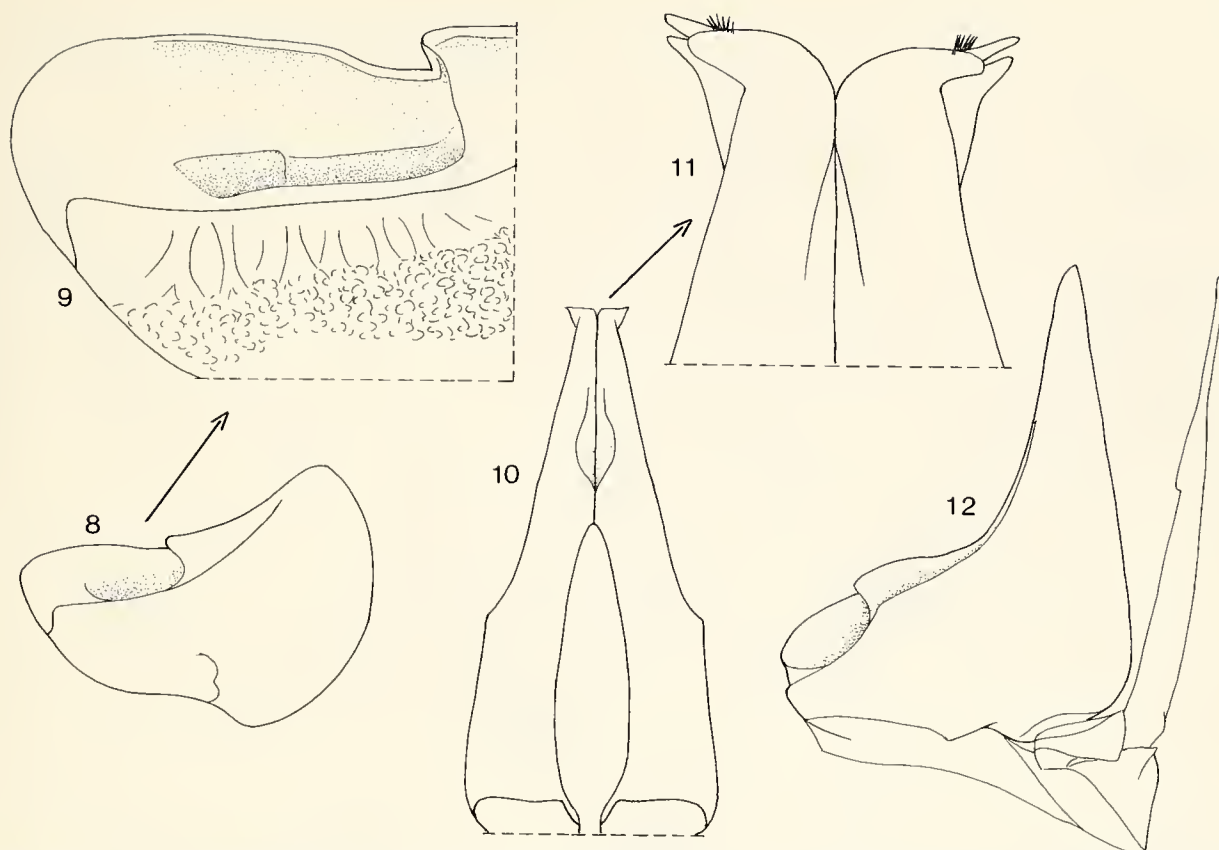
Diagnostic characters: Head with continuous frontal ridge (fig. 1); caudal schisma in pereon-epimeron I with inner lobe considerably shorter than outer lobe (fig. 2); telson with slightly concave sides, apex broadly truncated (fig. 3); antenna short and slender (fig. 4), distal article of flagellum 1.5 times the length of proximal article; ischium in male pereopod VII distally with bulbous ridge on frontal side (figs. 5–6), basipodite VII not laterally enlarged as in the species from the Near East (fig. 7); male pleopod-exopodite I with pointed hind-lobe (fig. 8), entrance to the



Figs. 1–4. *Schizidium oertzeni*, ♂, 20.0×8.3 mm; island of Karpathos (SMNS 1026). – 1. Head in frontal view, – 2. Pereon-epimeron I in lateral view, – 3. Telson with uropods in situ, – 4. Antenna.



Figs. 5–7. *Schizidium oertzeni*, same ♂ as before, pereopod VII. – 5. Basipodite, ischium and merus in caudal view; – 6. As before, distal part of ischium and proximal part of merus enlarged; – 7. Basipodite and ischium of the same leg in frontal view.



Figs. 8–12. *Schizidium oertzeni*, same ♂ as before. – 8. Pleopod-exopodite I, – 9. As before, „tracheal field“ enlarged; – 10. Pleopod-endopodite I, – 11. Tips of endopodites I enlarged, – 12. Pleopod II.

„pseudotracheae“ (lungs) closed to a narrow slot (fig. 9); endopodite I see figs. 10–11, pleopod II see fig. 12; uropod-exopodite trapezoidal (fig. 3).

Remarks: If the distribution of *S. oertzeni* is compared with the records of *Armadillidium vulgare* in the Aegean region (see map fig. 13), it becomes apparent that the two species do not coexist anywhere. So it is tempting to explain the present distribution pattern of *S. oertzeni* by competitive exclusion. The species lives in phrygana and macchia biotopes. The closest relative of *S. oertzeni* is probably *S. osellai* nov. spec. from the mainland of Asia minor.

2.2. *Schizidium hybridum* (Budde-Lund, 1896)

Armadillidium hybridum: BUDDE-LUND 1896: 40, 44.

Schizidium hybridum: VERHOEFF 1901: 36; 1923: 226; – STROUHAL 1929: 112; 1936: 199; 1937 b: 247; – ARCANGELI 1936: 6; 1937: 77, figs. I–III; 1948: 25; – VANDEL 1958: 82; – SCHMÖLZER 1965: 303; – SCHMALFUSS 1972 a: 51; 1972 b: 57; 1975: 57; 1979: 29; – SCHMALFUSS & SCHAWALLER 1984: 13.

Material examined: 1 ♀, Crete, Fassas valley (23°53'/35°24'), leg. MALICKY 18. II. 1981 (SMNS 2048). – 2 specimens, Crete, 14 km W Iraklio, leg. SCHMALFUSS 7. IV. 1982 (SMNS 1909). – 1 ♀, Crete, Psiloriti mountains, Nidda-Kusakas, leg. KÜHNELT 19. IV. 1962 (SMNS 1326). – 1 ♀, Crete, Festos, leg. LIEBEGOTT 26. XII. 1979 (SMNS 1142). – 3 specimens, Crete, Ierapetra, leg. LIEBEGOTT 29. XII. 1979 (SMNS 1143). – 5 specimens, SE-Aegean, island of Kasos SW Karpathos, leg. SCHMALFUSS IV. 1982 and IV. 1983 (SMNS 1497, 1980). – 19 specimens, SE-Aegean, island of Karpathos, leg. PIEPER & SCHMALFUSS IV. 1982 and IV. 1983 (SMNS 1475, 1478, 1450, 1984). – 27 specimens, SE-Aegean, island of Saria N Kar-

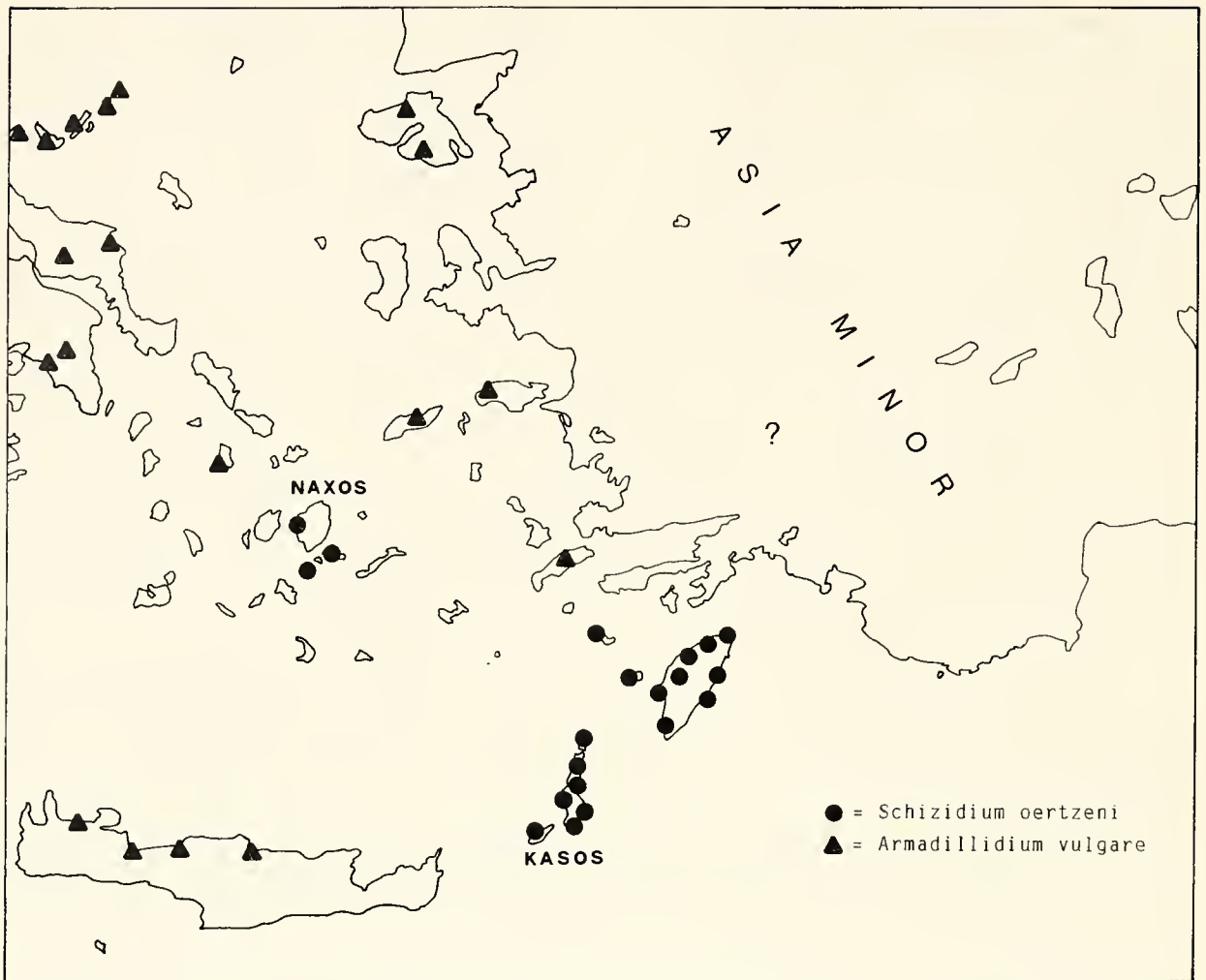
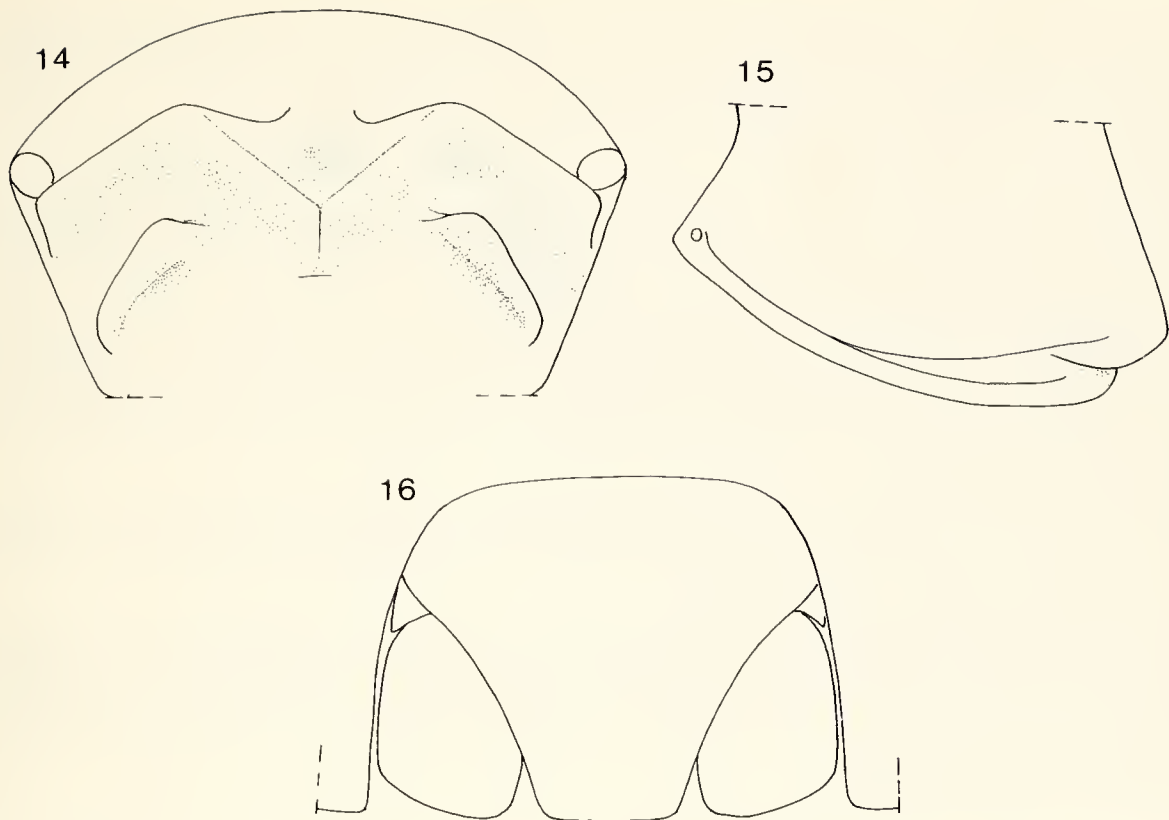


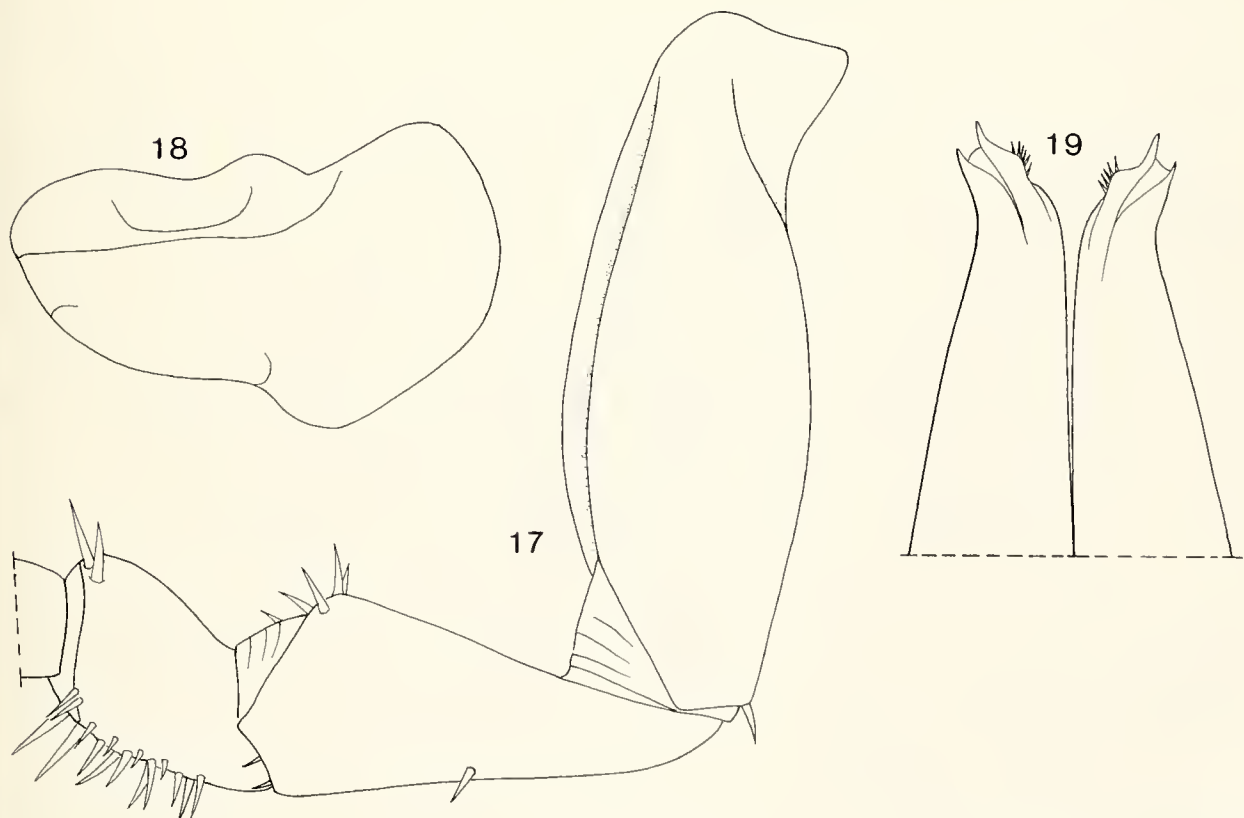
Fig. 13. Safe records of *Schizidium oertzeni* and of *Armadillidium vulgare* in the southern Aegean, suggesting competitive exclusion of the two species.

pathos, leg. PIEPER & SCHMALFUSS 28. IV. 1983 (SMNS 1968, 2033). — 36 specimens, SE-Aegean, island of Kos, leg. SCHMALFUSS V. 1976 (SMNS 1683, 1687, 1691, SCHMALFUSS 1979). — 3 specimens, SE-Aegean, island of Nisiros S Kos, leg. LIEBEGOTT 5. X. 1980 (SMNS 1346). — 2 specimens, island of Nisiros, leg. PIEPER & RUNZE 10. IX. 1981 (SMNS 1436). — 1 ♀, SE-Aegean, island of Tilos NW Rodhos, leg. LIEBEGOTT 23. V. 1983 (SMNS 1992). — 1 ♀, island of Khalki W Rodhos, leg. LIEBEGOTT 7. IV. 1982 (SMNS 1452). — 1 ♂ (10×4 mm, see figs. 14–19), island of Simi N Rodhos, leg. SCHMALFUSS 14. V. 1976 (SMNS 1668, SCHMALFUSS 1979). — 1 ♀, island of Simi, leg. LIEBEGOTT 12. X. 1980 (SMNS 1347). — 16 specimens, island of Simi, leg. PAULI & SCHMALFUSS IV. 1981 (SMNS 1377, 1381, 1384). — 2 specimens, islet of Ayia Marina (100 m diameter) in front of Pedhi on island of Simi, leg. PAULI & SCHMALFUSS 15. IV. 1981 (SMNS 1386) — 6 specimens, island of Nimos N Simi, leg. PAULI & SCHMALFUSS 15. IV. 1981 (SMNS 1382). — 1 ♂, island of Rodhos, leg. SCHMALFUSS 13. V. 1976 (SMNS 1662, SCHMALFUSS 1979). — 10 specimens, island of Rodhos, leg. SCHAWALLER IV. 1980 (SMNS 1151, 1154, 1158, 1159, 1160). — 2 specimens, island of Rodhos, leg. PAULI & SCHMALFUSS IV. 1981 (SMNS 1385, 1387). — 1 ♀, Greek island of Kastellorizo (= Meyisti) 100 km E Rodhos, leg. LIEBEGOTT 14. V. 1983 (SMNS 1991). — 1 ♂, 1 ♀, SW-Turkey, district Antalya, Bey Dağlari, Yaçakiftlik, 1200–2200 m, leg. OSELLA 8. VII. 1973 (♂: SMNS 11245, ♀: MCSNV). — 1 ♂, 1 ♀, NW-Turkey, district Eskişehir, Çukurhisar, leg. OSELLA 12. VIII. 1972 (MCSNV).

Distribution (map fig. 20): Greece: Islands of the southeastern Aegean south of Samos and east of Santorini and Crete. The examined material contains the first records for the islands of Nimos, Tilos, Khalki, Kastellorizo, Saria and Kasos.



Figs. 14–16. *Schizidium hybridum*, ♂, 10.0×4.0 mm; island of Simi (SMNS 1668); Simi is the type locality. – 14. Head in frontal view, – 15. Pereon-epimeron I in lateral view, – 16. Telson and uropods in situ.



Figs. 17–19. *Schizidium hybridum*, same ♂ as before. – 17. Pereopod VII in frontal view, – 18. Pleopod-exopodite I, – 19. Tips of pleopod-endopodites I.

Turkey: The two records from the north and the south of Asia minor, being the first records of this species from the Turkish mainland, suggest *S. hybridum* to populate the area between the reported localities (see map, fig. 20).

Dimensions: Biggest specimen 13.0×5.5 mm (♀ from island of Khalki W Rodhos).

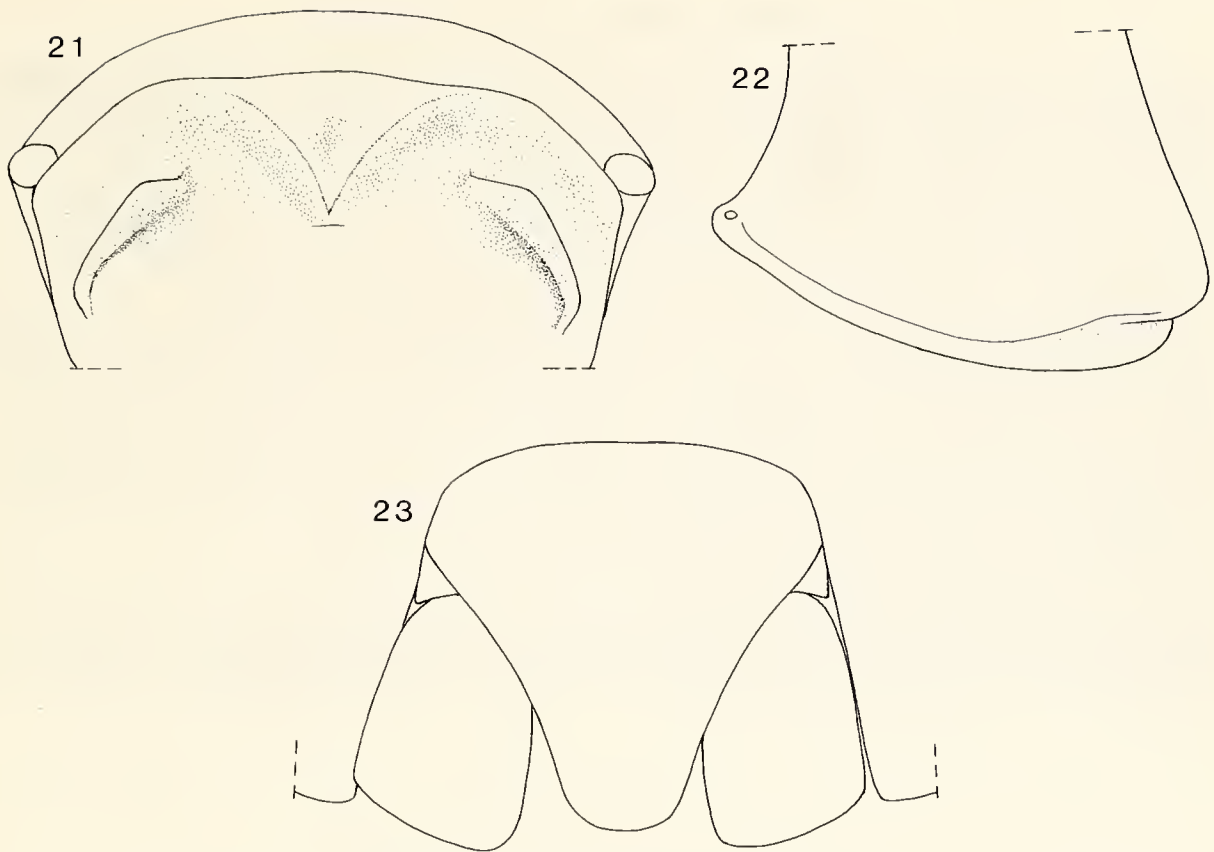
Diagnostic characters: Head with interrupted frontal ridge (fig. 14); caudal schisma in pereon-epimeron I with inner lobe considerably shorter than outer lobe (fig. 15), in the hind part of the epimeron with a secondary ridge above base of outer lobe; telson as in *S. oertzeni* with slightly concave sides and broadly truncated apex (fig. 16); ischium of male pereopod VII without any sexual specializations (fig. 17); male pleopod-exopodite I with rounded inner lobe (fig. 18); tips of male pleopod-endopodite I see fig. 19.

Remarks: The type of this species has been collected on the island of Simi (BUDDE-LUND 1896). Therefore the drawings of the diagnostic characters are based on a male specimen from this island.

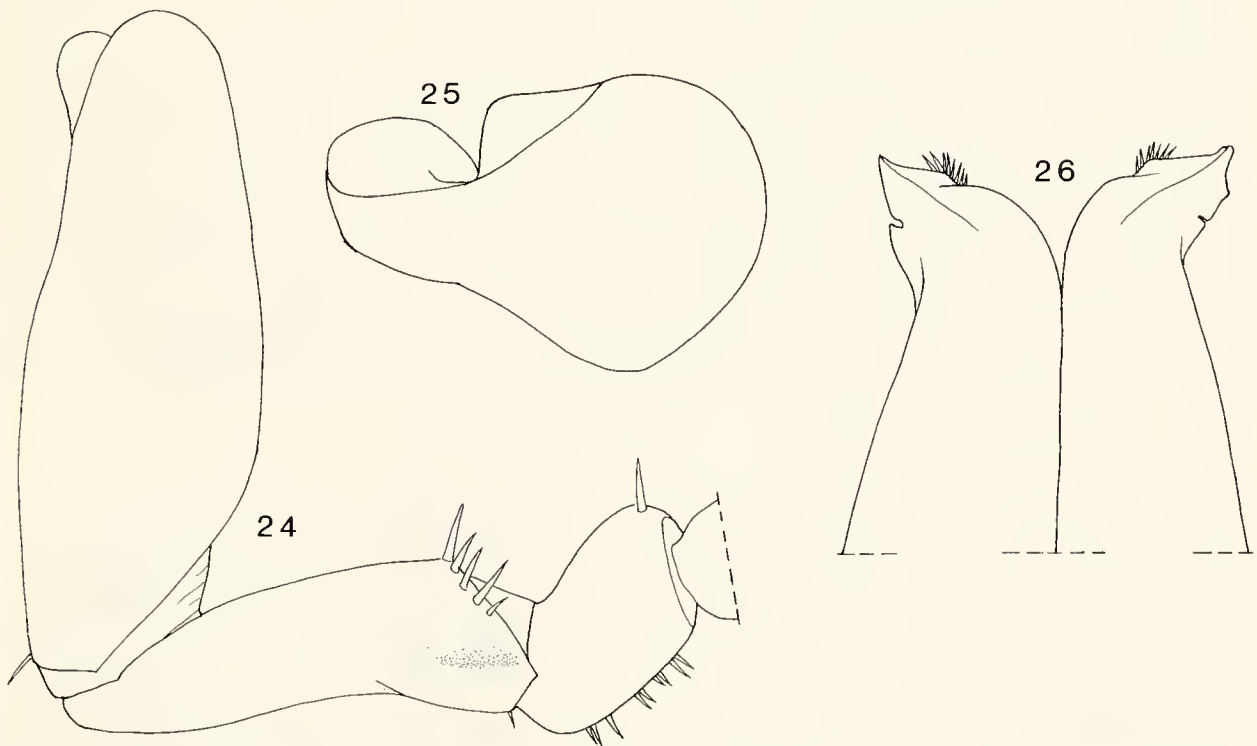
If the interrupted frontal line is considered as a common derived character *S. golo-vatchi* nov. spec. should be the closest known relative of *S. hybridum*. *S. hybridum* lives in the same biotopes as *S. oertzeni* (macchia and phrygana) but apparently prefers wetter micro-habitats.



Fig. 20. Known distribution of *Schizidium hybridum*.



Figs. 21–23. *Schizidium osellai* nov. spec., holotype ♂. – 21. Head in frontal view, – 22. Pereon-epimeron I in lateral view, – 23. Telson and uropods in situ.



Figs. 24–26. *Schizidium osellai* nov. spec., holotype ♂. – 24. Pereopod VII in caudal view, – 25. Pleopod-exopodite I, – 26. Tips of pleopod-endopodites I.

2.3. *Schizidium osellai* nov. spec.

Material examined: 3 ♂♂, 22 ♀♀ (holotype ♂ 7.5×2.9 mm), W-Turkey, Manisa district, Boz dağ, 1300–1900 m, leg. OSELLA 4. VII. 1973 (holotype ♂, 1 paratype ♂ and 19 paratype ♀♀: MCSNV, 1 paratype ♂ and 3 paratype ♀♀: SMNS T221).

Derivatio nominis: The species is named after Dr. G. OSELLA (L'Aquila, Italy), who collected, among many other interesting isopod samples, the type series of this species.

Dimensions: Maximum size of ♂ 7.5×2.9 mm, of ♀ 9.0×3.7 mm.

Diagnostic characters: Head with continuous frontal ridge (fig. 21); caudal schisma in pereon-epimeron I with inner lobe considerably shorter than outer lobe (fig. 22); telson (fig. 23) with slightly concave sides, apex broadly rounded, narrower than in *S. oertzeni* and *S. hybridum*; ischium of male pereopod VII ventrally concave, distally on frontal side with bulbous ridge (fig. 24) as in *S. oertzeni*; male pleopod-exopodite I (fig. 25) with hind-lobe reduced and broadly rounded, „tracheal“ field with deep incision; tips of male endopodites I see fig. 26.

Remarks: Taking the specializations on the male ischium VII and the deep incision in the „tracheal“ field of pleopod-exopodite I as common derived characters of *S. osellai* and *S. oertzeni*, the latter should be the closest relative of *S. osellai*.

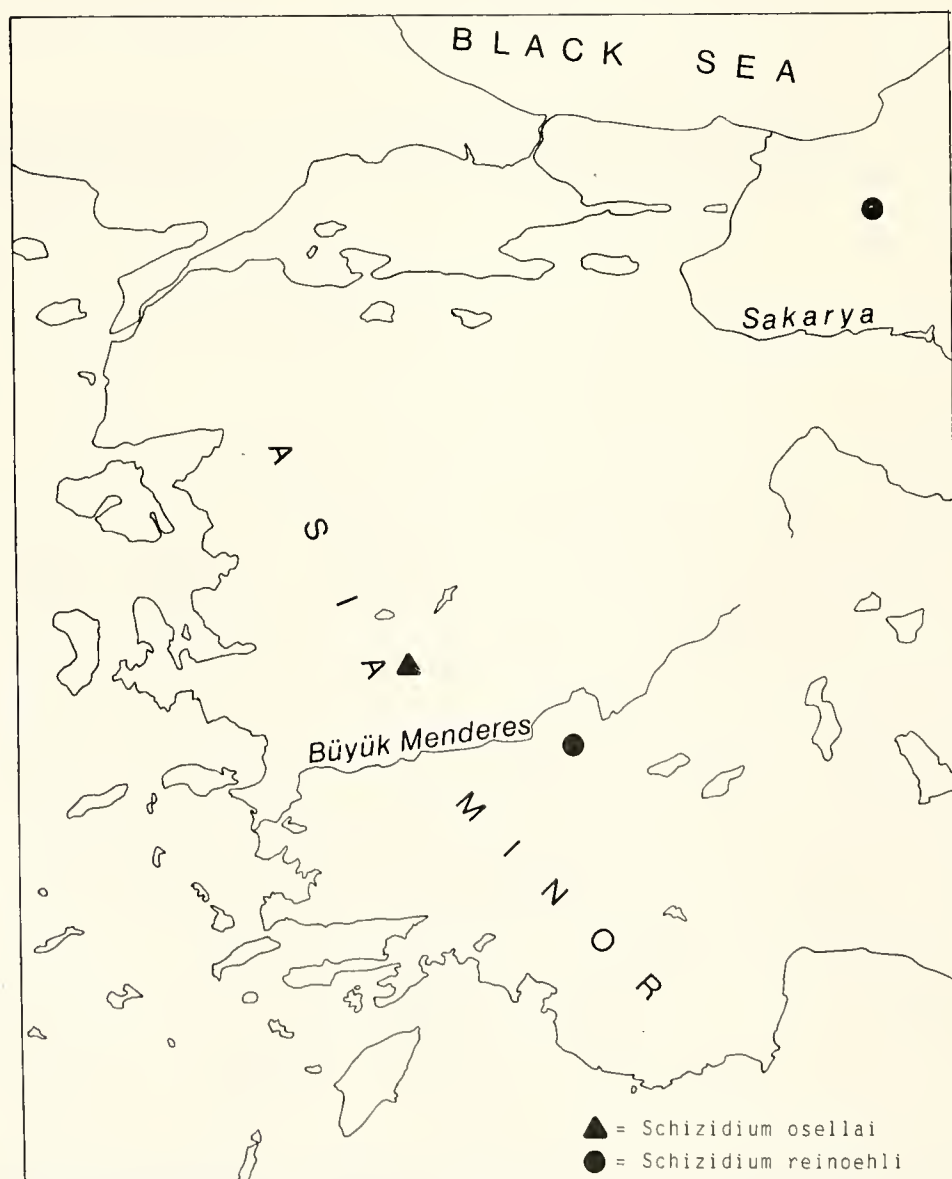
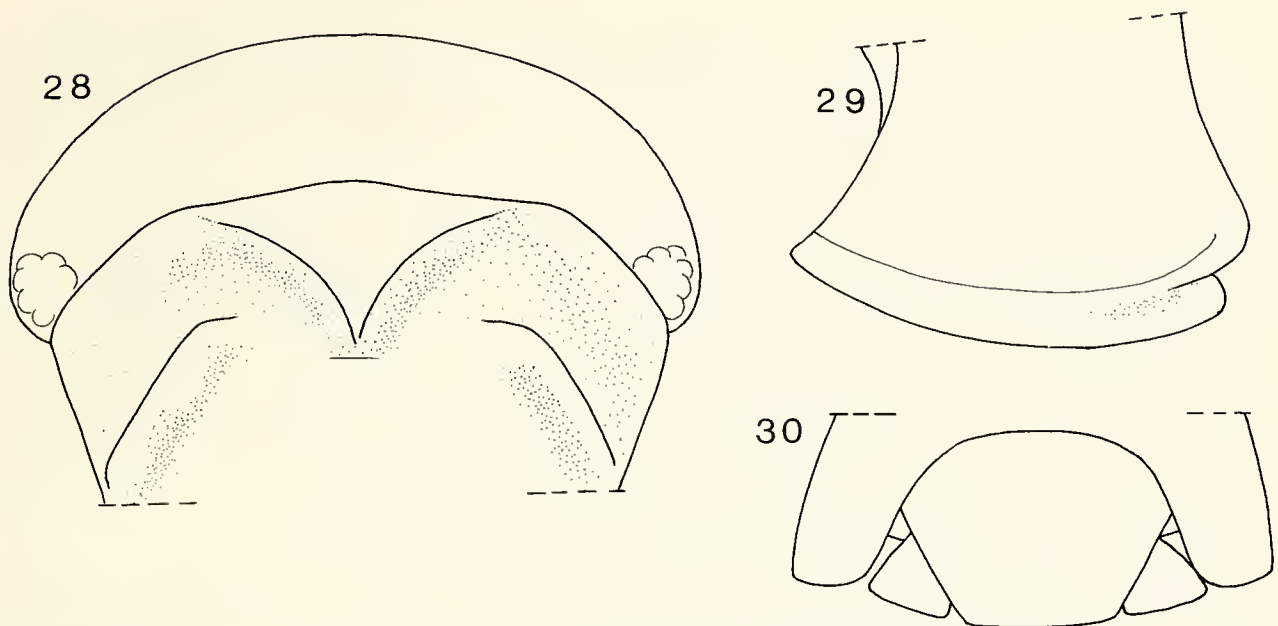


Fig. 27. Records of *Schizidium osellai* nov. spec. and of *S. reinoehli* nov. spec.



Figs. 28–30. *Schizidium reinoehli* nov. spec., holotype ♀. – 28. Head in frontal view, – 29. Pereon-epimeron I, lateral view; – 30. Telson and uropods in situ.

2.4. *Schizidium reinoehli* nov. spec.

Material examined: 1 ♀ with marsupium, 3.7×1.0 mm (holotype), W-Turkey, Pamukkale W Denizli, leg. REINÖHL 9. IV. 1986 (SMNS T217). – 1 ♀ (paratype), NW-Turkey, Lake Abant near Bolu, 1000 m, leg. OSELLA 30. VI. 1972 (MCSNV).

Derivatio nominis: The new species is dedicated to Dipl.-Agr. H. REINÖHL (Stuttgart), who collected the holotype.

Diagnostic characters: Head with well-developed and continuous frontal ridge (fig. 28). Eyes with 10 ommatidia. Pereon-epimeron I with schisma whose inner lobe is slightly shorter than the outer one (fig. 29); a ledge runs from above the base of the outer lobe of the schisma to the frontal margin of the epimeron (not in continuation of this as in *S. davidi*). Telson wider than long, very broadly truncated (fig. 30). „Normal“ brownish coloration.

Remarks: The small size and the shape of the telson points to the European species of *Paraschizidium* and *Typhloschizidium* which are, however, blind and without pigmentation. As long as the phylogenetic and systematic situation of the genera with schisma is not clarified I consider a preliminary ascription of this new species to the genus *Schizidium* a reasonable solution for the time being.

2.5. *Schizidium fissum* (Budde-Lund, 1885)

Armadillidium fissum: BUDDE-LUND 1885: 298.

Armadillidium bifidum: DOLLFUS 1905: 163, 172, fig. 1.

Schizidium fissum: ARCANGELI 1948: 28; – VANDEL 1965: 826; – STROUHAL 1968: 364.

Schizidium festae (non Dollfus): VANDEL 1955: 516 (at least ♂ from Les Cèdres, see below); 1965: 826.

Schizidium festai (non Dollfus): STROUHAL 1968: 364, figs. 73–86.

For all other reports of *S. fissum* or *S. festai* the species identity remains doubtful (e. g. VERHOEFF 1923, ARCANGELI 1936). Perhaps *S. almanum* Verhoeff & Strouhal, 1967, described after ♀♀ from S-Turkey (Hatay = Antakya), is synonymous with *S. fissum*. In the same region the ♂ reported and illustrated below has been collected.

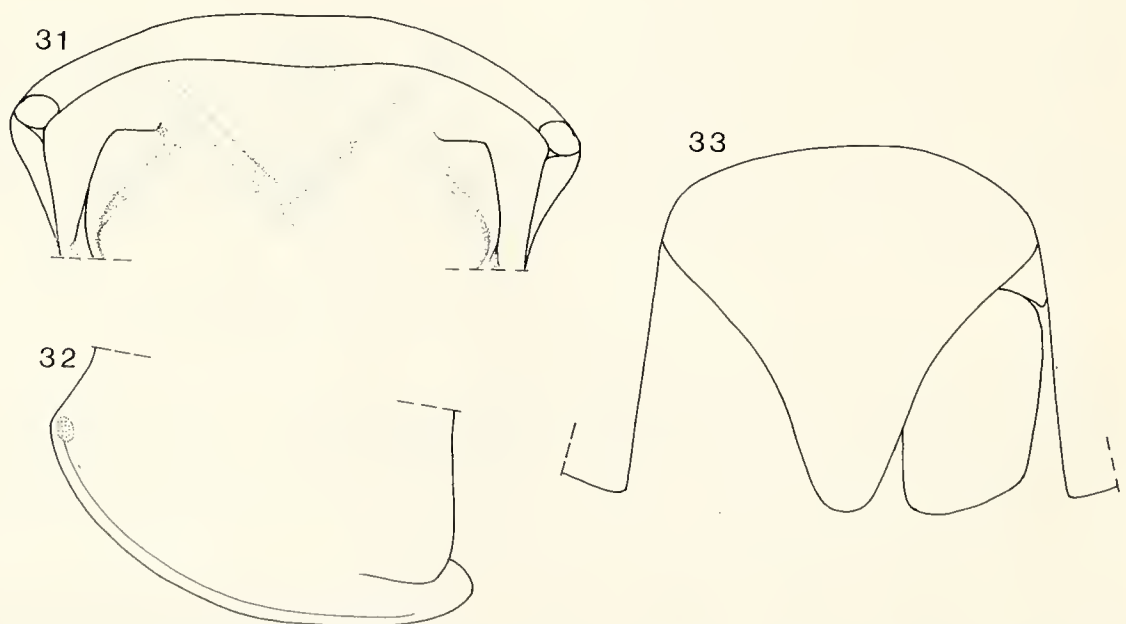
Material examined: 1 ♀ (holotype, 9×4 mm), Cyprus, Collection SIMON (MNHNP Nr. Is. 1994, BUDDÉ-LUND 1885). – 3 ♀♀ (syntypes of *Armadillidium bifidum*), Cyprus, Famagusta, leg. CECCONI 1898–99 (MNHNP Nr. Is. 2108, DOLLFUS 1905 as *Armadillidium bifidum*). – 1 ♀, Cyprus, „Episkopi Game Reserve“, leg. DEELEMANN 12. XII. 1985 (SMNS 11227). – 1 ♀, N-Cyprus, Pentadhaktilos, leg. LIEBEGOTT 28. XII. 1985 (SMF). – 3 ♀♀, N-Cyprus, 10 km NW Dipkarpaz, leg. LIEBEGOTT 1. I. 1986 (SMF). – 1 ♂, S-Turkey, Antakya, mountain Habib Neccar, leg. KINZELBACH et alii 18. IX. 1982 (SMNS 11188). – 1 ♀ (with abnormal telson, see below), S-Turkey, „Mersina“, leg. W. SIEKE (ZMB). – ? 1 ♀, Israel, N Qiryat Gat, S Tirosh, 150 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 12. II. 1987 (SMNS 11239). – ? 1 ♀, Jordan, ruins of Umm Qais, leg. KRUPP & SCHNEIDER 29. XI. 1980 (SMNS 11171).

Distribution: Cyprus, southern Turkey (along Gulf of Iskenderun), Lebanon. Possibly this species also occurs in Israel and NW-Jordan where however males have yet to be collected.

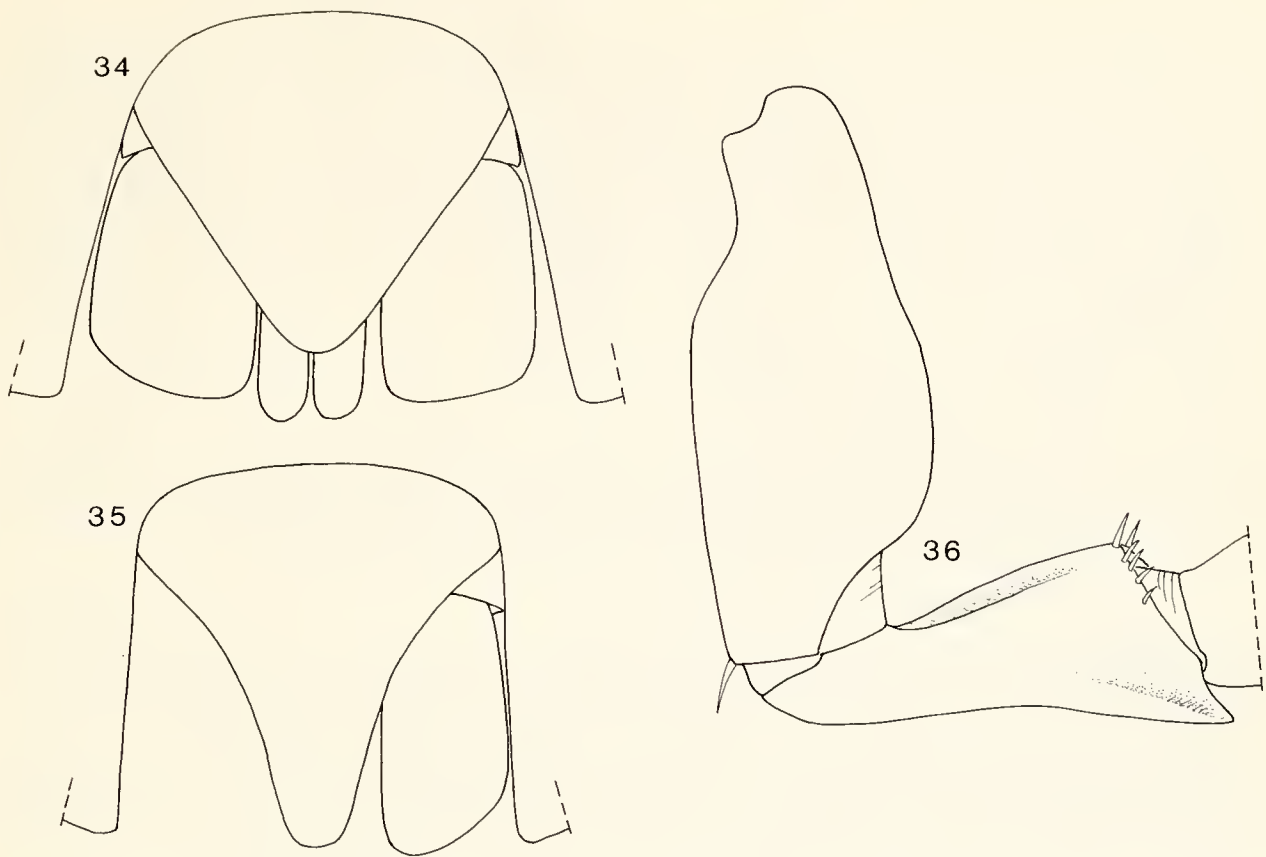
Dimensions: Maximal length 14 mm in ♀♀, 9 mm in ♂♂.

Diagnostic characters: Head with continuous frontal ridge (fig. 31). Inner lobe of schisma surpasses outer lobe backwards (fig. 32). Telson with rounded apex and slightly concave sides (fig. 33). One ♀ from Mersin in southern Turkey has a shortened telson with straight sides (fig. 34), as it has been reported by STROUHAL (1968: 366) in a ♀ from Cyprus. Ischium VII ♂ with a ventral-proximal prolongation (fig. 36, illustration from the opposite side of the appendage in STROUHAL 1968). Pleopod-exopodite I ♂ completely without hind-lobe (see STROUHAL 1968, fig. 82).

Remarks: The type specimen of *S. fissum* is a ♀. ♀♀ can be distinguished from *S. tiberianum* and *S. festai* by the shape and proportions of the schismatic lobes. A safe identification is, however, only possible by the male sexual characters (VII. pereopod, I. pleopod-exopodite). STROUHAL (1968) has illustrated the diagnostic characters of a species from Cyprus which he identified as *S. festai*, which agrees, however, completely with the type-specimen of *S. fissum*, as far as the female characters are concerned. The male characters of this species from Cyprus are identical with those of a ♂ from Antakya (S-Turkey) and, according to STROUHAL, with those of



Figs. 31–33. *Schizidium fissum*, holotype ♀. – 31. Head in frontal view, – 32. Pereon-epimeron I, lateral view; – 33. Telson and right uropod in situ.



Figs. 34–36. *Schizidium fissum*. – 34. Abnormal telson in ♀ from Mersin, S-Turkey (ZMB); – 35. ♂, 8.5 mm long, from Antakya, S-Turkey (SMNS 11188), telson and uropod in situ; – 36. Same ♂, basipodite and ischium of pereopod VII in caudal view.

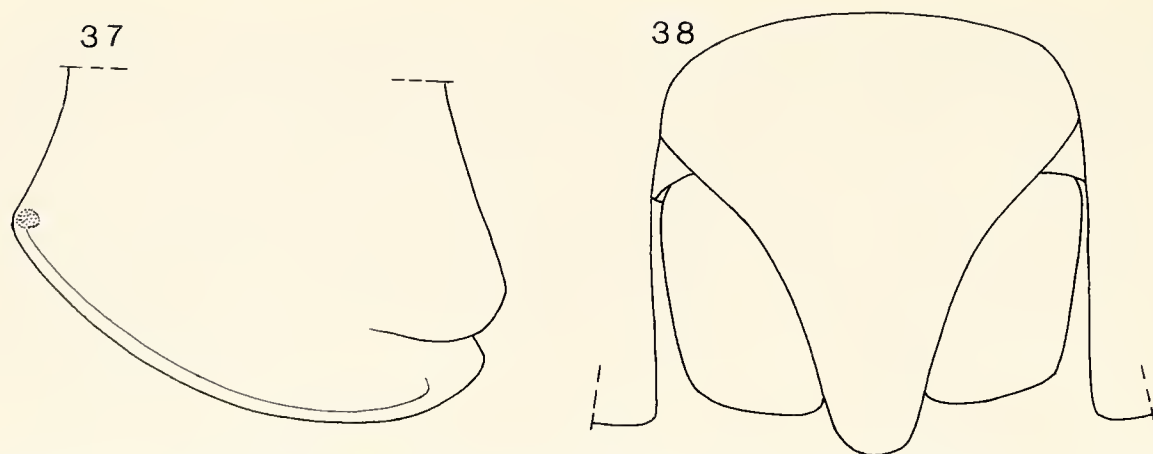
a ♂ from the Lebanese mountains, which has been reported by VANDEL 1955: 516) and re-examined by STROUHAL. The situation is complicated by the fact that the type-material of *S. festai* (Dollfus, 1984) also originates from the Lebanese mountains, and on the other hand by ARCANGELI's report of a species from Cyprus, with illustrations of the male characters that seem to differ from those figured by STROUHAL (1968). The type-series of *S. festai* and ARCANGELI's material from Cyprus have been deposited in the Natural History Museum in Torino where they are apparently not accessible for the time being. A ♀ which probably belongs to the type-series of *S. festai* is located in the Natural History Museum of Paris and could be examined for the present study. This ♀ clearly differs from *S. fissum* and from the specimens identified by STROUHAL as *S. festai* by the proportions of the schisma.

2.6. *Schizidium* ?*festai* (Dollfus, 1984)

Armadillidium Festae: DOLLFUS 1894: 2, figs. 1–5.

Material examined: 1 ♀ (12.0×5.2 mm) labelled „*Armadillidium Festae* Dollfus, Cèdres du Liban (Dr. Festa)“ (MNHNP Nr. Is. 1995, ? DOLLFUS 1894).

According to these labelling data this specimen should be a syntype of „*Armadillidium Festae*“ Dollfus, 1894; the other type-specimens, possibly also ♂♂, were deposited in the Natural History Museum of Torino (see under *S. fissum*). The examined ♀ differs clearly from *S. fissum* by the proportions of the schisma, the



Figs. 37–38. *Schizidium ?festai*, ?syntype ♀ („Cèdres du Liban“, MNHNP). – 37. Pereon-epimeron I in lateral view, – 38. Telson and uropods in situ.

inner lobe being shorter, not longer than the outer one (fig. 37). The other diagnostic characters fall into the variation range of *S. fissum*. Telson see fig. 38.

The specimens identified as *S. festai* by VANDEL (1955, 1965) and STROUHAL (1968) belong with all probability to *S. fissum*; the identity of the specimens reported by ARCANGELI (1936) as *S. festai* remains unclear.

2.7. *Schizidium tiberianum* Verhoeff, 1923

Armadillidium fissum (non Budde-Lund): DOLLFUS 1892: 5.

Schizidium tiberianum: VERHOEFF 1923: 227, fig. 9; – VERHOEFF & STROUHAL 1967: 496; – ARCANGELI 1936: 7 (as synonym of *S. „Festae“*); 1948: 23 (as synonym of *S. „Festae“*); – VANDEL 1955: 516; – STROUHAL 1968: 370; – SCHMALFUSS 1986: 385.

Schizidium festai tiberianum: PRETZMANN 1974: 451; – STROUHAL & PRETZMANN 1975: 652, figs. 31–47.

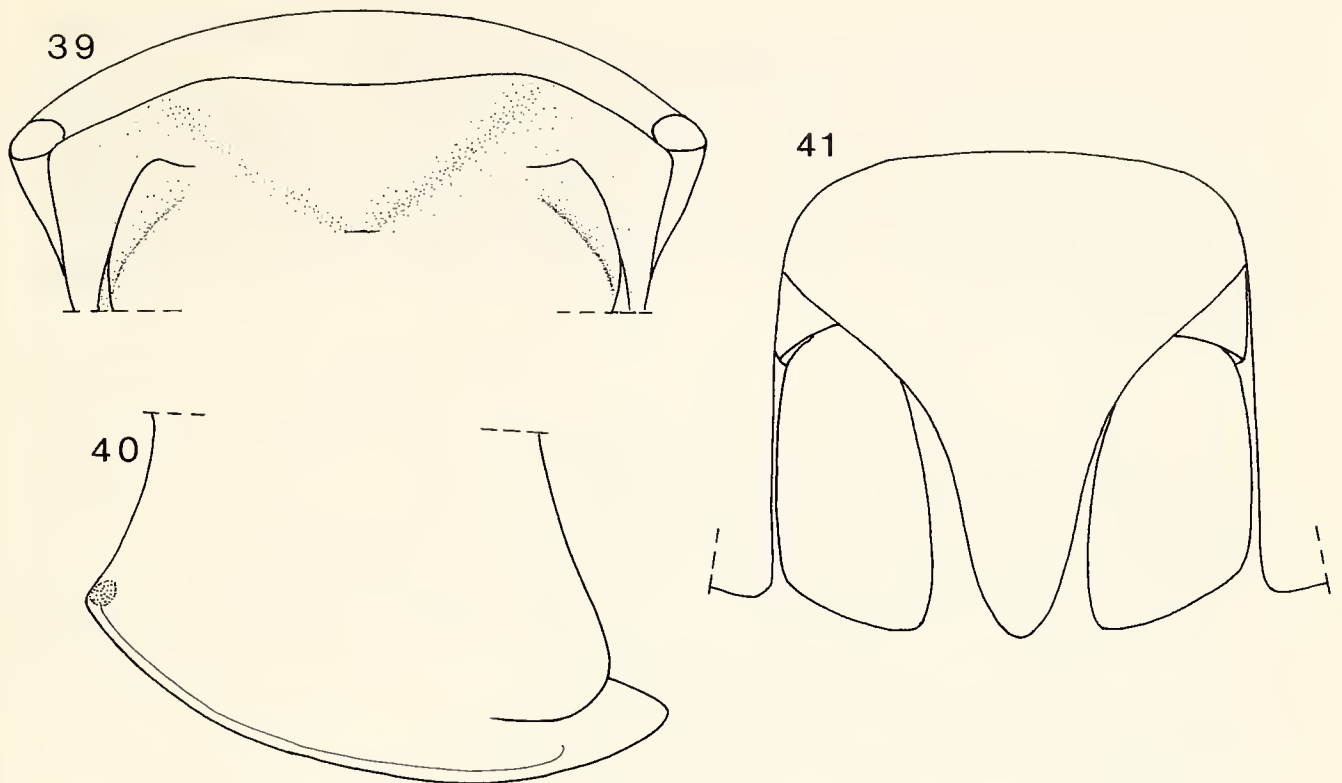
Schizidium festai (non Dollfus): WARBURG, RANKEVICH & CHASANMUS 1978: 158 ff.; – WARBURG, LINSENMAIR & BERCOVITZ 1984: 344 ff.

Material examined: 1 ♀, „Syrie“, leg. R. P. DAVID (MNHNP Nr. Is. 1996; DOLLFUS 1892 as *Armadillidium fissum*). – 1 ♂, 28 ♀♀, Israel, Lower Galil, W Yodefat, 300 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 9. II. 1987 (SMNS 11234, 11242). – 4 ♂♂, 2 ♀♀, Israel, Lower Galil, SE Haifa, Allonim, 200 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 7. II. 1987 (SMNS 11235). – 2 ♀♀, Israel, Lower Galil, 3 km W Segev, 200 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 9. II. 1987 (SMNS 11241). – 2 ♀♀, Israel, SE Haifa, Mount Karmel, monastery Muhraqa, 400 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 8. II. 1987 (SMNS 11236). – 1 ♀, Israel, Haifa, above Technion, 100 m, leg. SCHAWALLER 8. II. 1987 (SMNS 11237). – 8 ♀♀, Israel, SE Mount Karmel, SW Elyaqim, 300 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 11. II. 1987 (SMNS 11238). – 5 ♀♀, Israel, Gilboa mountains, SE Nurit, 400 m, leg. SCHAWALLER, SCHMALFUSS & WARBURG 10. II. 1987 (SMNS 11240). –

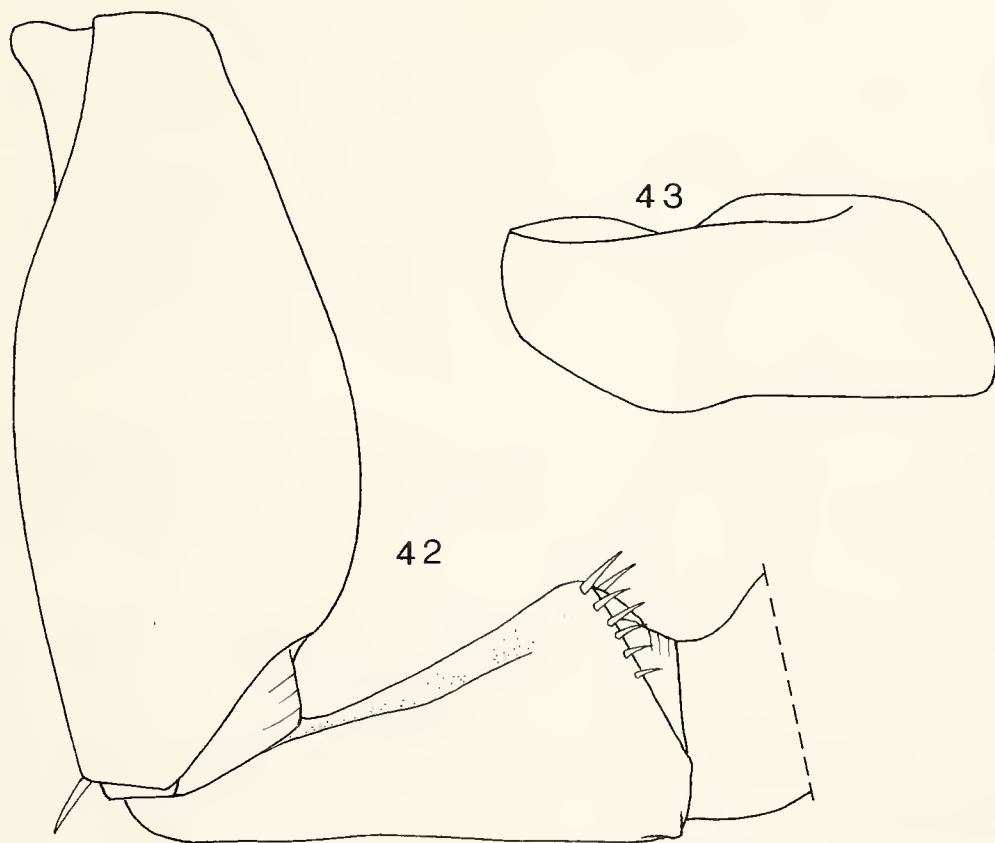
Distribution: Northern Israel in mediterranean macchia and phrygana vegetation. The types come from the shore of Lake Tiberias.

Dimensions: Maximum size 13.5×6.0 mm in ♀♀, 10.0×4.2 mm in ♂♂.

Diagnostic characters: Head very similar to the one of *S. fissum* (fig. 39), antennal lobes more oblique. Schisma with pointed inner lobe which surpasses the outer lobe twice as far as in *S. fissum* (fig. 40). Apex of telson more sharply pointed than in *S. fissum* (fig. 41). Ischium VII ♂ without ventral-proximal prolongation



Figs. 39–41. *Schizidium tiberianum*, ♂, 10 mm long; Israel, Allonim (SMNS 11235). – 39. Head in frontal view, – 40. Pereon-epimeron I in lateral view, – 41. Telson and uropods in situ.



Figs. 42–43. *Schizidium tiberianum*, same ♂ as before. – 42. Basipodite and ischium of pereopod VII in caudal view, – 43. Pleopod-exopodite I.

(fig. 42), but with a small tubercle in the corresponding position. Hind-lobe of pleopod-exopodite I ♂ completely missing as in *S. fissum* (fig. 43).

Remarks: The original description is based on ♀♀ only. The specific shape of the schisma, which has been illustrated by VERHOEFF, allows a safe identification also in ♀♀. This character and the morphology of the ischium VII ♂ prove *S. tiberianum* to be a separate species and not, as assumed by some authors, a synonym or a subspecies of *S. fissum* or *S. festai*. The closest known relative of *S. tiberianum* seems to be *S. fissum*.

2.8. *Schizidium davidi* (Dollfus, 1887)

Armadillidium Davidi: DOLLFUS 1887: 4; 1892: 5.

? *Armadillidium granum*: DOLLFUS 1892: 5, figs. 3 A–3C.

Armadillidium Davidii: BUDDE-LUND 1896: 44.

Schizidium davidi: VERHOEFF 1923: 226; – ARCANGELI 1936: 6; 1948: 27.

? *Schizidium granum*: VERHOEFF 1923: 227; – ARCANGELI 1936: 6; 1948: 24.

Pareluma minuta: OMER-COOPER 1923: 98, plate II, 9 figs.; – ARCANGELI 1936: 28; 1948: 29; – AHMED 1974: 17, figs. 4 A–E.

Schizidium minutum: FRANKENBERGER 1939: 24.

Schizidium kalalae: FRANKENBERGER 1939: 24, figs. 1–3.

Armadillidium euphrati: VANDEL 1980: 113, figs. 9 H–L.

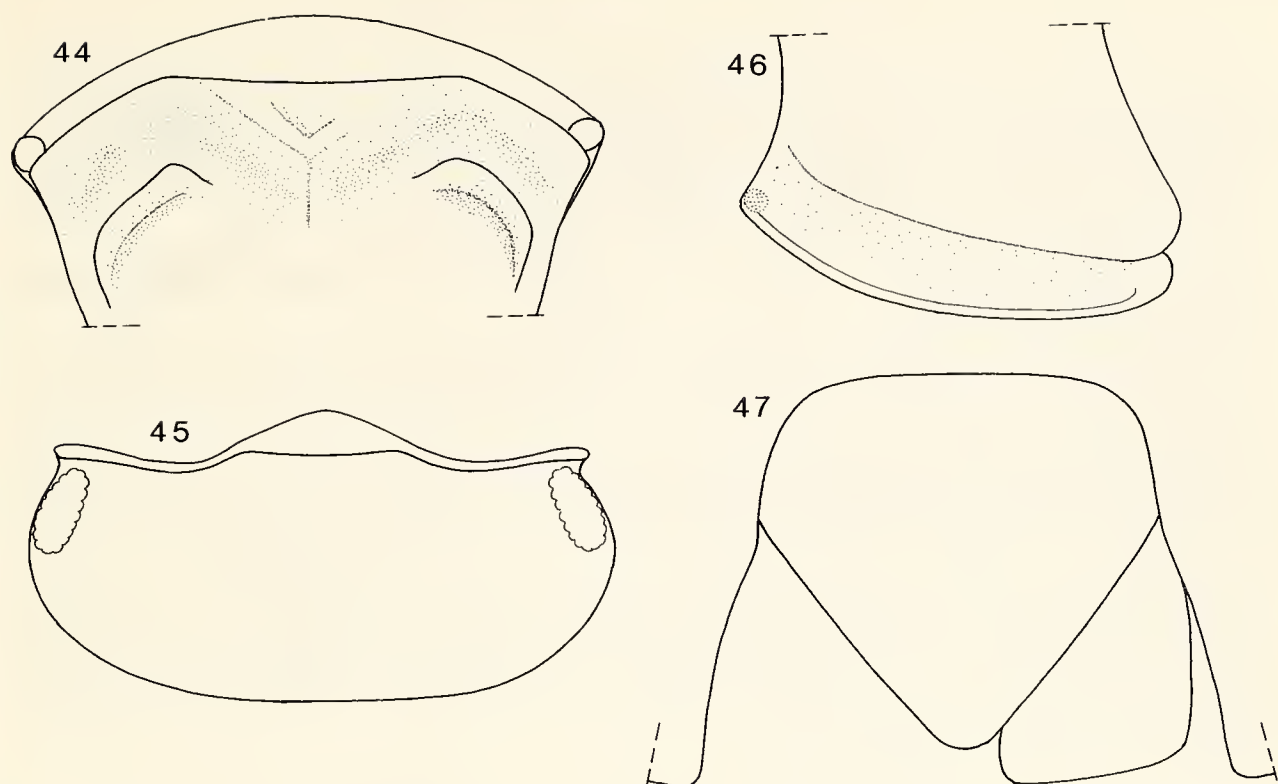
Eosphaerillo kosswigi (partim): VANDEL 1980: 116, figs. 10 D–F.

Material examined: 1 ♀ (holotype, 10×5 mm), „Syrie, Akbès“, leg. R. P. DAVID (MNHNP Nr. Is. 1993, DOLLFUS 1887). A place „Akbès“, which may be somewhere in Iraq of today, could not be localised. – 1 ♂ (7.0×3.2 mm), „Syrie, Akbès“, leg. R. P. DAVID (MNHNP Nr. Is. 1992). – 1 ♂, „Central Mesopotamien, Tell Halaf, Chabus, Exp. Oppenheim, Dr. KOHL S. 14. 1. 13“ (ZMB). The geographic data could not be localised, but should be somewhere in Iraq, as the following four records. – 7 ♂♂, 4 ♀♀, „Central Mesopotamien, Tell Halaf, Djisidjibufer, Exp. Oppenheim Dr. KOHL S. 14. III. 13“ (ZMB, 3 specimens SMNS 11243). – 3 juv., „Central Mesopotamien, Tell Halaf Steppe, Exp. Oppenheim, Dr. KOHL, 13. III. 13“ (ZMB). – 1 juv., „Central Mesopotamien, Tell Halaf Steppe, Exped. Baron M. D. Oppenheim G. Dr. KOHL S. 1913“ (ZMB). – 1 ♀, 1 juv., „Central Mesopotamien, Tell Halaf Steppe, Exped. Baron M. D. Oppenheim G. Dr. KOHL S., 5. III. 1913 (ZMB). – 1 juv. (syntype of *Pareluma minuta*), Iraq, Amara, leg. W. E. EVANS 13. XI. 1918 (BML, OMER-COOPER 1923 as *Pareluma minuta*). – 2 ♂♂, 1 ♀ (syntypes of *Armadillidium euphrati*), N-Iraq, Al Haditah, leg. KOSSWIG 9.–10. IV. 1970 (MNHNP, VANDEL 1980 as *Armadillidium euphrati*). – Fragments and slide preparations of 4 ♀♀ and 1 ♂ (misidentified by VANDEL 1980 as *Eosphaerillo kosswigi*), without locality label, but certainly also from Iraq, Al Haditah, leg. KOSSWIG (MNHNP, VANDEL 1980 as *Eosphaerillo kosswigi*, which is a synonym of *Koweitoniscus tamei*).

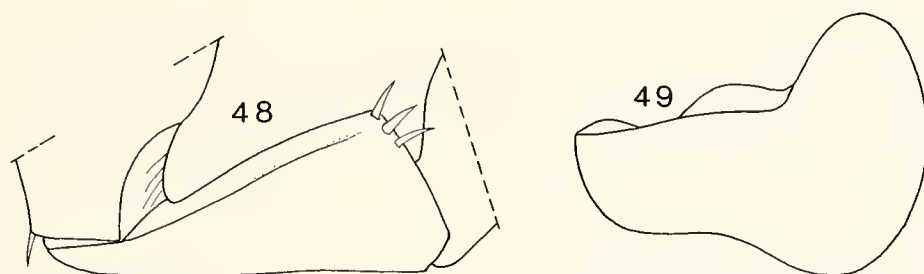
Distribution: Mesopotamia. All localisable records are from Iraq [Al Haditah: VANDEL (1980) as *Armadillidium euphrati*; Baghdad: FRANKENBERGER (1939) as *Schizidium kalalae*; Amara: OMER-COOPER (1923) as *Pareluma minuta*; Basrah: AHMED (1974) as *Pareluma minuta*].

Dimensions: ♀ up to 10×5 mm, ♂ 7.0×3.2 mm.

Diagnostic characters: The species is characterised by a faint ledge on pereon-epimeron I, running in continuation of the outer lobe of the schisma to the frontal margin of the epimeron (fig. 46). Along this ledge the surface of the epimeron forms an angle in cross-section. Inner lobe of schisma shorter than outer lobe. Head (fig. 44, 45) similar to that of *S. fissum*, but antennal lobes more oblique. Telson very short, triangular with straight sides and pointed apex (fig. 47). Pereopod VII ♂ without specializations (fig. 48), pleopod-exopodite I ♂ with well-developed rounded hind lobe (fig. 49).



Figs. 44–47. *Schizidium davidi*, holotype ♀. – 44. Head in frontal view, – 45. Head in dorsal view, – 46. Pereon-epimeron I, lateral view; – 47. Telson and uropod in situ.



Figs. 48–49. *Schizidium davidi*, ♂, 7.0×3.2 mm; from „Akbès“ (MNHNP). – 48. Ischium VII in caudal view, – 49. Pleopod-exopodite I.

Remarks: The species was described four or five times successively. Five years after the original description which lacks illustrations, the same author described „*Armadillidium granum*“ from the same locality. Probably *granum* is a synonym of *davidi*, the type specimen of *granum* could not be found. OMER-COOPER described 1923 *Pareluma minuta* from Amara in Iraq. An examination of a syntype revealed it to be a juvenile of *Schizidium davidi*. In 1939 FRANKENBERGER described *Schizidium kalalae* from Baghdad, which is, according to the description and the drawings, identical with *S. davidi*. Finally VANDEL described 1980 *Armadillidium euphrati* from western Iraq. Again the re-examination of the types showed this to be identical with *Schizidium davidi*. Additionally, VANDEL described in the same paper an *Eosphaerillo kosswigi* which is identical with *Koweitoniscus tamei* (Omer-Copper, 1923), but obviously the slide preparations were made from a specimen of *Schizidium davidi*, so VANDEL's figures 10 D–F pertain to *Armadillidium euphrati* = *Schizidium davidi* and not to *Eosphaerillo kosswigi* = *Koweitoniscus tamei*.

2.9. *Schizidium rausi* nov. spec.

Material examined: 11 ♂♂, 8 ♀♀ (holotype ♂, 9.0×3.5 mm, and 18 paratypes), eastern Turkey, Lake of Van, island of Akdamar in the southeast of the lake near Gevaş, 1700 m, leg. SCHMALFUSS 2. IV. 1986 (holotype: SMNS T219, paratypes: SMNS T220).

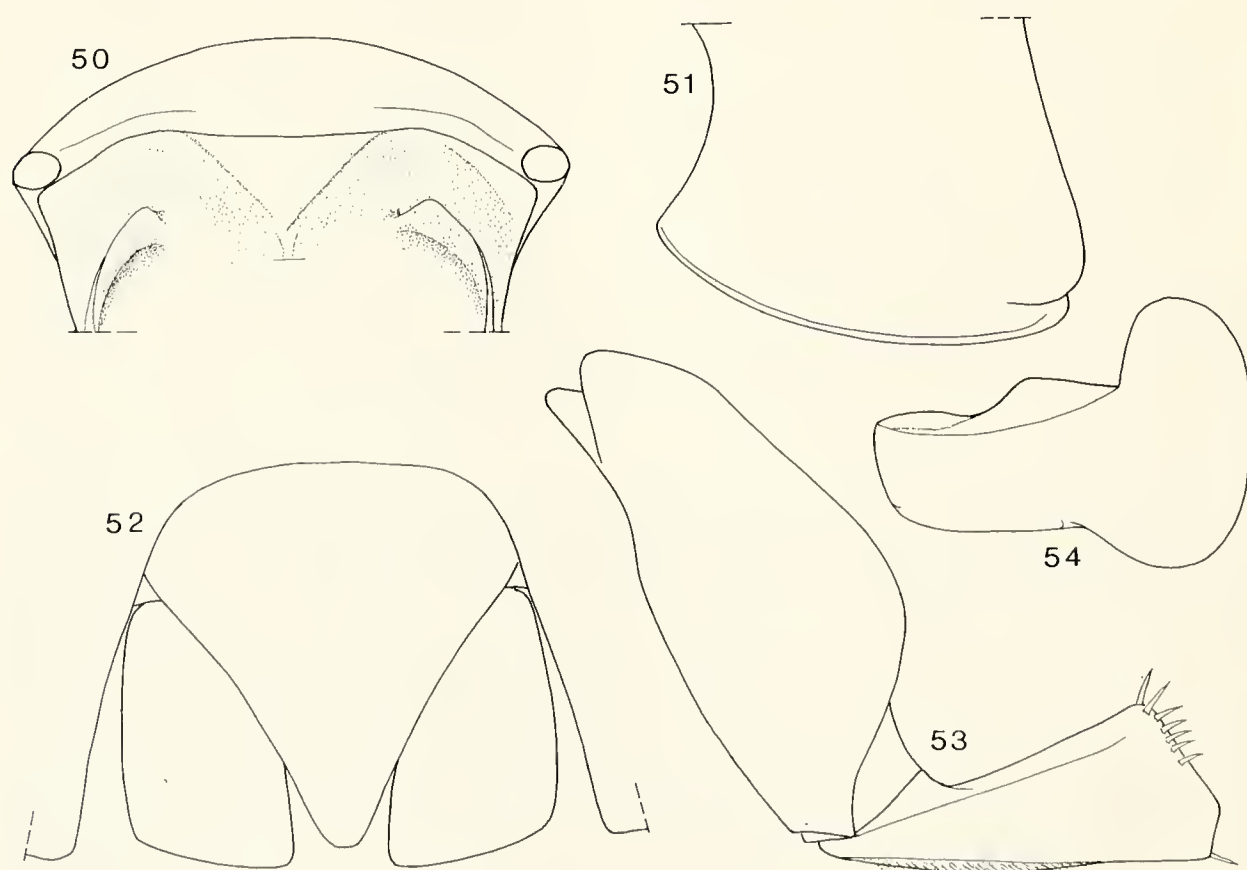
Derivatio nominis: The species is dedicated to the botanist Dr. THOMAS RAUS (Berlin), in whose experienced company the type series was collected.

Dimensions: Largest ♀ 11.0×4.7 mm, largest ♂ 9.0×3.5 mm, smallest ♀ with marsupium 9.0×3.8 mm.

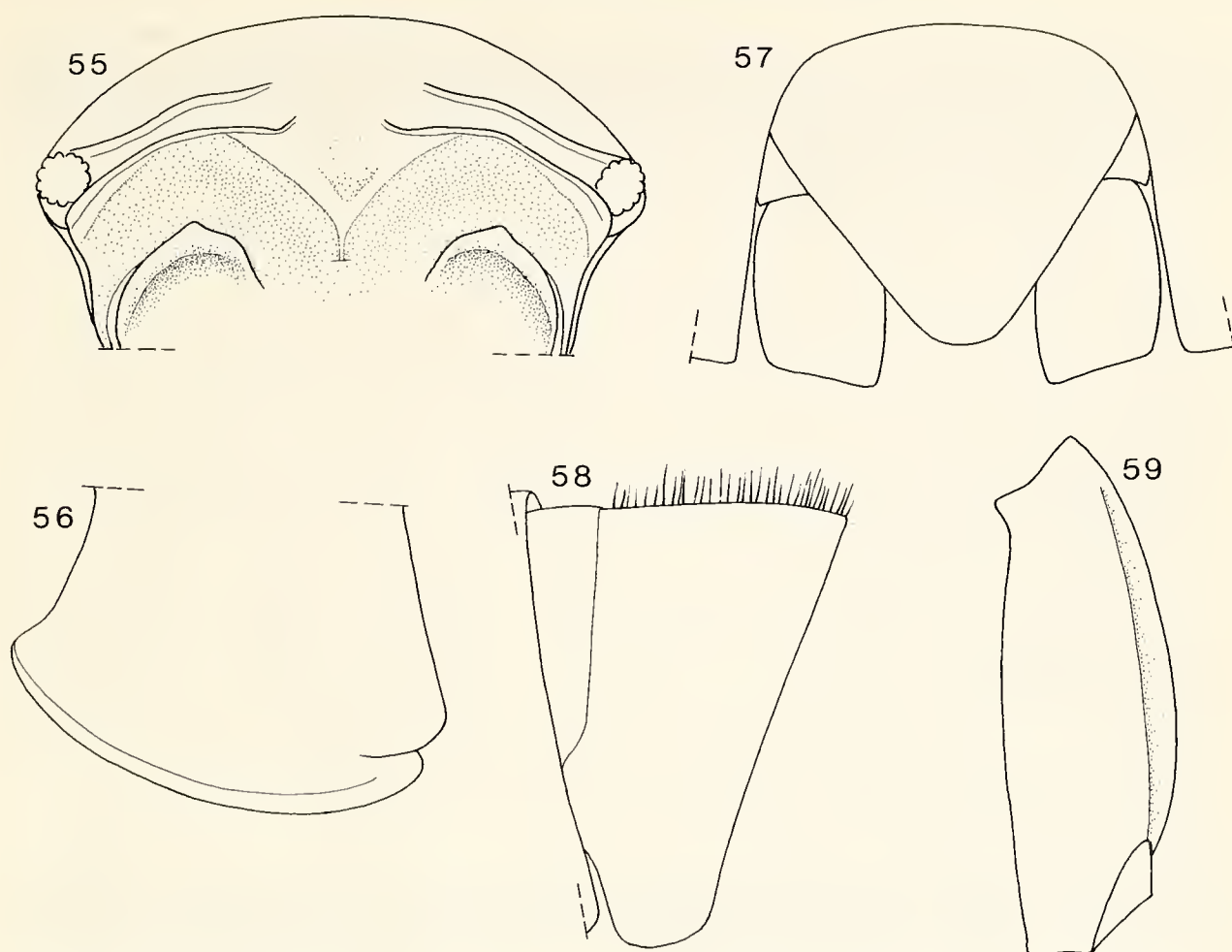
Diagnostic characters: Conspicuous coloration, light spots on tergites I, III, V and VI; pereon-epimera often, pleon-epimera III always yellowish as well as the uropods and in most specimens the telson. Head with continuous frontal ridge (fig. 50), behind this with a further interrupted ridge, which is not as pronounced as in *S. golovatchi*. Probably this second ridge is the rudimentary frontal line which is still present in all the species ascribed to the genus *Armadillidium*. Eyes with 17 ommatidia. Inner lobe of schisma shorter than outer lobe (fig. 51). Telson with narrowly rounded tip and slightly concave sides (fig. 52). Pleopod-exopodite I ♂ with rounded hind-lobe (fig. 54), similar to that in *S. davidi*. Ischium VII ♂ ventrally with a convex ridge (fig. 53).

2.10. *Schizidium golovatchi* nov. spec.

Material examined: 2 ♀♀ (holotype 7.5×3.0 mm, paratype 6.0×2.5 mm), USSR, Armenia, „Kafan distr., Shikahoh Res., village Shikahoh, 900–950 m, *Quercus-Fagus-Carpi-*



Figs. 50–54. *Schizidium rausi* nov. spec., holotype ♂, 9 mm long. — 50. Head in frontal view, — 51. Percon-epimeron I in lateral view, — 52. Telson and uropods in situ, — 53. Basipodite and ischium of pereopod VII in caudal view, — 54. Pleopod-exopodite I.



Figs. 55–59. *Schizidium golovatchi* nov. spec., holotype ♀, 7.5 mm long. – 55. Head in frontal view, – 56. Pereon-epimeron I in lateral view, – 57. Telson and uropods in situ, – 58. Pereon-tergite II, lateral view, dorsally with setae in profile to show relative length of setation; – 59. Basipodite VII in frontal view.

nus-forest by spring, litter, logs & under stones“, leg. GOLOVATCH 28. IV. 1983 (holotype: ZMM, paratype: SMNS T218).

Derivatio nominis: The species is named after Dr. SERGEI GOLOVATCH (Moscow) who has collected in the past decade a copious material of terrestrial isopods in the Caucasus region.

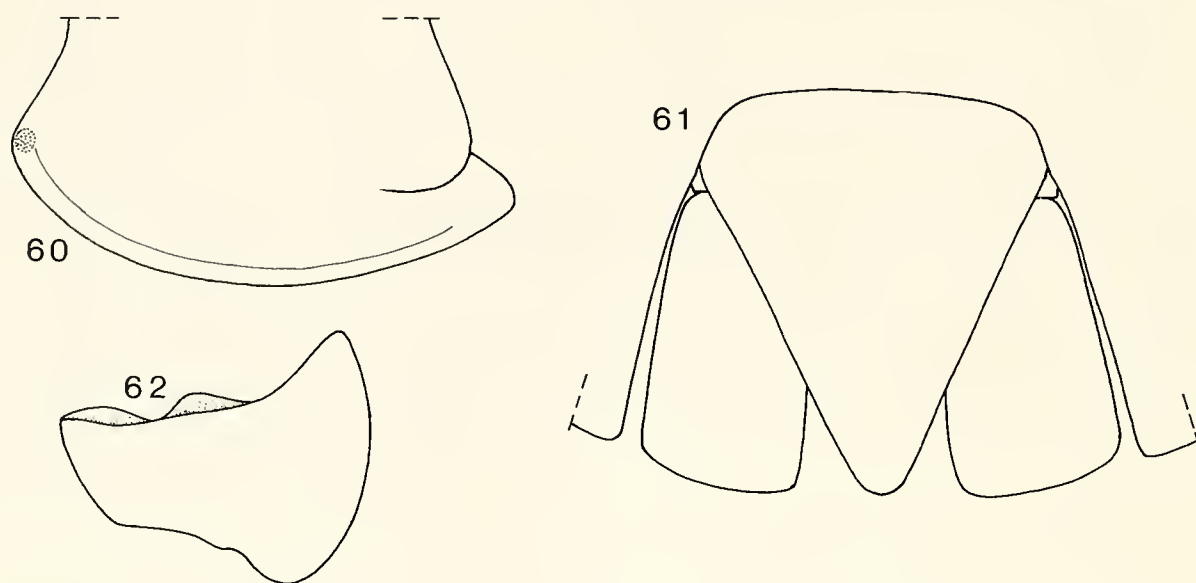
Diagnostic characters: Head with interrupted frontal ridge (fig. 55) as in *S. hybridum*. Behind the frontal ridge a further interrupted ridge which laterally starts from behind the eyes (comparable, if certainly convergent, to the situation in the south-american genus *Scleropactes*, family Scleropactidae). Schisma with inner lobe somewhat shorter than outer one (fig. 56). Telson with broadly rounded apex and straight sides (fig. 57). Tergites with long upright setation (fig. 58). Basipodite of pereopod VII narrow, without the broad lateral enlargement of the Near East species (fig. 59).

2.11. *Schizidium persicum* Schmalzfuss, 1986

Schizidium persicum: SCHMALFUSS 1986: 386, figs. 27–32.

Distribution (see map. fig. 63): Northern Iran, Elburs mountains, 1000–1800 m, in deciduous forest.

Diagnostic characters: Inner lobe of schisma surpasses outer lobe (fig. 60). Telson longer than wide, with narrowly rounded apex and straight sides (fig. 61). Pleopod-exopodite I ♂ with pointed hind-lobe (fig. 62). Figures of additional characters in SCHMALFUSS (1986).



Figs. 60–62. *Schizidium persicum*, holotype ♂, 11 mm long; redrawn after SCHMALFUSS 1986. — 60. Pereon-epimeron I in lateral view, — 61. Telson and uropods in situ, — 62. Pleopod-exopodite I.



Fig. 63. Map with the records of *Schizidium fissum*, *S. ?festai*, *S. tiberianum*, *S. davidi*, *S. rausi* nov. spec., *S. golovatchi* nov. spec., and *S. persicum*.

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